Rare Plant Survey of San Juan Public Lands, Colorado

2005

Prepared by
Colorado Natural Heritage
Program
254 General Services Building
Colorado State University
Fort Collins CO 80523

Natural Heritage Program
COLORADO

Colorado State University
Knowledge to Go Places

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Cover: Imperiled (G1 and G2) plants of the San Juan Public Lands, top left to bottom right: *Lesquerella pruinosa, Draba graminea, Cryptantha gypsophila, Machaeranthera coloradoensis, Astragalus naturitensis, Physaria pulvinata, Ipomopsis polyantha, Townsendia glabella, Townsendia rothrockii.*

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Executive Summary

This survey was a continuation of several years of rare plant survey on San Juan Public Lands. Funding for the project was provided by San Juan National Forest and the San Juan Resource Area of the Bureau of Land Management. Previous rare plant surveys on San Juan Public Lands by CNHP were conducted in conjunction with county wide surveys of La Plata, Archuleta, San Juan and San Miguel counties, with partial funding from Great Outdoors Colorado (GOCO); and in 2004, public lands only in Dolores and Montezuma counties, funded entirely by the San Juan Public Lands. Funding for 2005 was again provided by San Juan Public Lands.

The primary emphases for field work in 2005 were:

1. revisit and update information on rare plant occurrences of agency sensitive species in the Colorado Natural Heritage Program (CNHP) database that were last observed prior to 2000, in order to have the most current information available for informing the revision of the Resource Management Plan for the San Juan Public Lands (BLM and San Juan National Forest);
2. survey areas throughout the seven counties in the BLM's San Juan Resource Area and San Juan National Forest that had been missed in previous surveys;
3. survey known and potential locations and assessing viability of two newly described species, Gypsum Valley cat-eye (*Cryptantha gypsophila*) and cushion bladderpod (*Physaria pulvinata*);

CNHP began the project in April 2005 with an analysis of existing records, selection of targeted inventory areas, gathering other information and planning access to targeted sites. Field work began in April, starting on BLM lands at the lowest elevations, and moving upward to alpine sites by July and August.

Seventy-five targeted inventory areas were surveyed. Seventy new and updated occurrences of rare plants were documented. Sixteen new Potential Conservation Areas (PCAs) were delineated and six existing PCAs revised with new information. These include two sites ranked B1 (Extremely high biodiversity significance), fifteen ranked B2 (Very high), two B3 (High), two B4 (Moderate) and one B5 (General biodiversity significance). Species lists were prepared for fifty-five sites.

Highlights of the field season included surveys of sites for two newly described species, *Cryptantha gypsophila* and *Physaria pulvinata*. Gypsum outcrops in Big Gypsum Valley were found to support three rare lichen species and a state rare grass, in addition to *Cryptantha gypsophila.* One of the most rare plants in the state, the Pagosa skyrocket (*Ipomopsis polyantha*) was found for the first time on public lands. Another globally imperiled species, Gray's Townsend daisy (*Townsendia glabella*), was found to be locally abundant in the Pagosa Springs area.

Acknowledgments

We are continually grateful for the ongoing support of Jeff Redders, San Juan National Forest, and Gary Thrash (BLM). We couldn't ask for better people to work with. Leslie Stewart at the San Juan National Forest and BLM in Dolores and Sara Brinton at the USFS in Pagosa Springs have been extremely helpful, and do a great job of working to protect rare plants in their districts.

We thank Larry St. Clair for traveling from Utah to Colorado to check out the lichens in Big Gypsum Valley.

At various times we had help and companionship in the field from Rick Lyon, Al and Betty Schneider, Laura Cosse, Millie and Jordy Cosse, Sue Coe, Art Goodtimes, and of course Misia (golden retriever). We thank Julia's husband Matthias and daughters Alpin and Valgedur for managing at home alone so allow Julia could spend time in the field.

The great crew of Colorado Native Plant Society members from Pagosa Springs, including Charlie King, Dick Mosely, Sue Coe and Sandy Friedley, and Ellen Mayo of the U.S. Fish and Wildlife Service, made tremendous strides this year toward increasing our knowledge and protecting the most rare plant in the area, the Pagosa skyrocket.

Our staff in Fort Collins, including the botany team--Jill Handwerk, Dave Anderson and Susan Spackman--and Amy Lavender, GIS specialist, all deserve much credit for their patience and work behind the scenes.

Table of Contents

Executive Summary i

Acknowledgments ii

Chapter I 1
- Introduction 1
- Objectives 2
- Methods 2
- Results 7

Chapter II. Updates of existing element occurrence records 9

Chapter III. Rare Plants of San Juan Public Lands with New and Updated Occurrences in 2005 14
- Species profiles and Element Occurrence Rank Specifications 16
  - Amsonia jonesii (Jones blue-star) 17
  - Artemisia pygmaea (pygmy sagebrush) 19
  - Astragalus naturitensis (Naturita milkvetch) 21
  - Calochortus flexuosus (weak-stemmed or winding mariposa lily) 23
  - Cryptantha gypsophila (Gypsum Valley cat-eye) 25
  - Cypripedium parviflorum (yellow lady's slipper) 28
  - Draba borealis (boreal whitlow-grass) 30
  - Draba graminea (San Juan whitlow-grass) 32
  - Draba streptobrachia (Colorado Divide whitlow-grass) 34
  - Eriophorum altaicum var. neogaeum (Altai cottongrass) 36
  - Eriophorum chamissonis (Chamisso's cottongrass) 38
  - Hippochaete variegata (variegated scouring rush) 40
  - Ipomopsis polyantha (Pagosa gilia) 42
  - Machaeranthera coloradoensis (Colorado tansy-aster) 45
  - Penstemon breviculus (short-stem beardtongue) 47
  - Penstemon utahensis (Utah beardtongue) 49
  - Physaria pulvinata (cushion bladderpod) 51
  - Polypodium saximontanum (Rocky Mountain polypody) 54
  - Sporobolus nealleyi (gyp dropseed) 57
  - Townsendia glabella (Gray's Townsend-daisy) 59
  - Townsendia rothrockii (Rothrock's Townsend-daisy) 61
  - Trifolium kingii (King's clover) 63
  - Woodsia neomexicana (New Mexico cliff fern) 65
  - Acarospora nodulosa var. nodulosa (nodule cracked lichen) 67
  - Gypsoplaca macrophylla (changing earthscale) 68
  - Lecanora gypsicola (gypsum rim-lichen) 69

Chapter IV. Potential Conservation Areas. 71

Big Gypsum Valley PCA 73
Plateau Creek PCA 77
Blackhawk Mountain PCA 80
Cave Basin Lakes PCA 83
Colorado Trail at Lime Creek Headwaters PCA 85
Crater Lake PCA 89
Disappointment Valley Northwest PCA 92
Dolores River from Slick Rock to Bedrock PCA 95
Highland Mary Lakes PCA 100
Little Gypsum Valley PCA 103
Rolling Mountain PCA 106
Slick Rock PCA 109
Snowdon Peak PCA 112
Spring Creek Basin PCA 114
Stollsteimer Creek North PCA 118
Summit Pass PCA 122
Yellowjacket Pass PCA 125
Cannon Ball Mesa PCA 128
Piedra River Trail PCA 132
Clear Lake PCA 135
Rincon Canyon PCA 138
Ismay Trading Post PCA 141

Literature Cited and Other Useful References 144

Appendix I: The Natural Heritage Network and Biodiversity 147
What is Biological Diversity? 147
The Colorado Natural Heritage Program 148
The Natural Heritage Ranking System 150
Legal Designations for Rare Species 152
Element Occurrence Ranking 153
Potential Conservation Areas and Their Ranking 153
Off-Site Considerations 154
Ranking of Potential Conservation Areas 154
Protection Urgency Ranks 155
Management Urgency Ranks 156

Appendix II: Species Lists from selected representative locations in the San Juan Public Lands 158

Appendix III: Lichen Communities of Selected Gypsiferous Sites in Big Gypsum Valley, Miguel County, Colorado 218

Appendix IV: Common and scientific names of species mentioned in report, San Juan Public Lands 221

List of Tables

Table 1. Targeted Inventory Areas 2005 (areas in italics were not surveyed in 2005). 5
Table 2. Element occurrences updated through site surveys 2005. 12
Table 3: Species profiles for plants with new or updated occurrences in 2005. 14

List of Figures

Figure 1. Targeted Inventory Areas 2005 4
Figure 2. *Amsonia jonesii*. 17
Figure 3. Distribution of *Amsonia jonesii* in Colorado 17
Figure 4. Habitat of *Amsonia jonesii* in Rincon Canyon 17
Figure 5. *Artemisia pygmaea*. 19
Figure 6. Distribution of *Artemisia pygmaea*. in Colorado 19
Figure 7. Habitat of *Artemisia pygmaea* in Spring Creek Basin.Canyon. 19
Figure 8. *Astragalus naturitensis* 21
Figure 9: Distribution of *Artemisia pygmaea*.in Colorado 21
Figure 10. *Calochortus flexuosus.* 23
Figure 11. Distribution of *Calochortus flexuosus* in Colorado 23
Figure 12. *Cryptantha gypsophila*. 25
Figure 13. Habitat of *Cryptantha gypsophila* in Big Gypsum Valley. 25
Figure 14. Known global range of *Cryptantha gypsophila*. 26
Figure 15. *Cryptantha gypsophila* may be locally abundant in its restricted habitat. 26
Figure 16. ATV tracks in *Cryptantha gypsophila* site at Big Gypsum Valley. 26
Figure 17. *Cypripedium parviflorum* 28
Figure 18. Distribution of *Cypripedium parviflorum* in Colorado 28
Figure 19. *Draba borealis.* 30
Figure 20. Distribution of *Draba borealis* in Colorado 30
Figure 21. *Draba graminea*. 32
Figure 22. Distribution of *Draba graminea* in Colorado 32
Figure 23. *Draba streptobrachia*. 34
Figure 24. Distribution of *Draba streptobrachia* in Colorado 34
Figure 25. *Eriophorum altaicum* var. *neogaeum* 36
Figure 26. Distribution of *Eriophorum altaicum* var. *neogaeum* in Colorado 36
Figure 27. *Eriophorum chamissonis* 38
Figure 28. Distribution of *Eriophorum chamissonis* in Colorado 38
Figure 29. *Hippochaete variegata* 40
Figure 30. Distribution of *Hippochaete variegata* in Colorado 40
Figure 31. *Ipomopsis polyantha* 42
Figure 32. Distribution of *Ipomopsis polyantha* in Colorado 42
Figure 33. Habitat of *Ipomopsis polyantha* on BLM parcel at Stollsteimer Creek PCA. 43
Figure 34. Dense stand of *Ipomopsis polyantha* at fairgrounds in Pagosa Springs. 43
Figure 35. *Machaeranthera coloradoensis* 45
Figure 36. Distribution of *Machaeranthera coloradoensis* in Colorado 45
Figure 37. *Penstemon breviculus* 47
Figure 38. Distribution of *Penstemon breviculus* in Colorado 47
Figure 39. *Penstemon utahensis* 49

Figure 40. Distribution of *Penstemon utahensis* in Colorado 49
Figure 41. *Physaria pulvinata* 51
Figure 42. Habitat of *Physaria pulvinata* by James Reveal 51
Figure 44. *Polypodium saximontanum* 54
Figure 45. Distribution of *Polypodium saximontanum* in Colorado 54
Figure 46. Habitat of *Polypodium saximontanum* at Piedra River Trail PCA 55
Figure 47. *Sporobolus nealleyi* 57
Figure 48. Distribution of *Sporobolus nealleyi* in Colorado 57
Figure 49. *Townsendia glabella* 59
Figure 50. Distribution of *Townsendia glabella* in Colorado 59
Figure 51. *Townsendia rothrockii* 61
Figure 52. Distribution of *Townsendia rothrockii* in Colorado (CNHP records only) ... 61
Figure 53. *Trifolium kingii* 63
Figure 54. Distribution of *Trifolium kingii* in Colorado 63
Figure 55. *Woodsia neomexicana* 65
Figure 56. Distribution of *Woodsia neomexicana* in Colorado 65
Figure 57. *.Acarosproa nodulosa* var. *nodulosa.* 67
Figure 59. *Gypsoplaca macrophylla.* 68
Figure 65. Habitat of *Cryptantha gypsophila* at Big Gypsum Valley near Mary Jane Draw 75
Figure 66. Habitat of *Physaria pulvinata* at Plateau Creek. 78
Figure 67. Colorado tansy-aster (*Machaeranthera coloradoensis*) 81
Figure 69. Wetland at Cave Basin Lakes PCA. 84
Figures 70, 71, 72. Top and left: habitat of *Machaeranthera coloradoensis*; above: *M. coloradoensis.* 87
Figure 73. San Juan whitlow-grass (*Draba graminea*) 90
Figure 74. Disappointment Valley Northwest. 93
Figure 75. Wild privet shrubland along Dolores River near Slick Rock. 98
Figure 76. Wetlands surrounding this lake in the Highland Mary Lakes PCA support Altai cottongrass, ... 101
Figures 77 and 78. Draba graminea habitat at Rolling Mountain. 107
Figure 79. Habitat of *Astragalus naturitensis* and *Penstemon breviculus* in Slick Rock PCA. 110
Figure 80. Habitat of *Draba graminea* at Snowdon Peak PCA. 113
Figure 81. Habitat of *Cryptantha gypsophila* at Spring Creek Basin PCA. 116
Figure 82. Surveying for Pagosa skyrocket at Stollsteimer Creek PCA, 2005. 120
Figures 83, 84, 85. Habitat of *Machaeranthera coloradoensis* at Summit Pass Northwest PCA. 123
Figure 86. Gray's townsend-daisy (*Townsendia glabella*). 126
Figure 68. Utah Juniper woodland community, Cannon Ball Mesa. 129
Figure 87. *Polypodium saximontanum.* 133
Figure 88. Wetland community at Clear Lake. 136
Figure 89. Habitat of Jones blue-star in Rincon. 139
Figure 90. Greasewood flats and side of Cannon Ball Mesa. 142
Figure 91. *Penstemon utahensis* at Ismay Trading Post PCA. 142

Chapter I

Introduction

This survey was a continuation of several years of rare plant survey on San Juan Public Lands. Funding for the project was provided by San Juan National Forest and the San Juan Resource Area of the Bureau of Land Management. Previous rare plant surveys on San Juan Public Lands by the Colorado Natural Heritage Program (CNHP) were conducted in conjunction with county wide surveys of La Plata, Archuleta, San Juan and San Miguel counties, with partial funding from Great Outdoors Colorado (GOCO); and in 2004, public lands only in Dolores and Montezuma counties, funded entirely by the San Juan Public Lands. Funding for 2005 was again provided by San Juan Public Lands. The following reports are available for previous surveys:

Dolores and Montezuma Counties:
Lyon, P. and J. Hanson. 2005. Survey of Rare Plants San Juan Public Lands in Dolores and Montezuma counties, Colorado. Prepared for and funded by San Juan National Forest Hard copy available from CNHP.

La Plata County:
Lyon, P., J. Huggins, J. Lucht, D. Culver, M. March and J. Hanson. 2004. Assessment of Critical Biological Resources, La Plata County, Colorado. Prepared for La Plata County, with funding from Great Outdoors Colorado and San Juan National Forest. Available online at www.cnhp.colostate.edu/reports.html

San Juan County:
Lyon, P., D. Culver, M. March and L. Hall. 2003. San Juan County Biological Assessment. Prepared for San Juan County with funding from Great Outdoors Colorado, San Juan National Forest and Bureau of Land Management. Available online at www.cnhp.colostate.edu/reports.html

Archuleta County:
Sovell, John, P. Lyon and L. Gruneau. 2003. Upper San Juan Basin Biological Assessment. Prepared for Southwest Land Alliance with funding from Great Outdoors Colorado. Available online at www.cnhp.colostate.edu/reports.html

Archuleta County:
Lyon, Peggy and Michael Denslow. 2002. Rare Plant Survey San Juan National Forest. Prepared for San Juan National Forest. Available online at www.cnhp.colostate.edu/reports.html

San Miguel County:
Lyon, Peggy and John Sovell. 2000. A Natural Heritage Assessment, San Miguel and Western Montrose Counties, Colorado. Prepared for San Miguel County, funded by Great Outdoors Colorado. Hard copy available from CNHP.

Descriptions of the study area were included in each of the prior survey reports, and will not be repeated here. This report includes details of updates of existing records, new element occurrences (Eos), new and revised Potential Conservation Areas (PCAs), and plant species lists from selected locations.

Objectives

The primary emphases for field work in 2005 were:

1. revisit and update information on rare plant occurrences of agency sensitive species in the CNHP database that were last observed prior to 2000, in order to have the most current information available for informing the revision of the Resource Management Plan for the San Juan Public Lands (BLM and San Juan National Forest);
2. survey areas throughout the seven counties in the BLM's San Juan Resource Area and San Juan National Forest that had been missed in previous surveys;
3. survey known and potential locations and assessing viability of two newly described species, Gypsum Valley cat-eye (*Cryptantha gypsophila*) and cushion bladderpod (*Physaria pulvinata*);
4. and, in conjunction with the above, make field observations and document ecological systems and plant communities, to inform the development of ranking specifications and descriptions of these systems and communities as they occur on the San Juan Public Lands.

Methods

See Appendix I for general information on CNHP methods and ranking information. For the 2005 field season the following specific methods were employed:

1. Query CNHP database for plant element occurrence records dated prior to 2000, or lacking precise locational information or element occurrence ranks. Many or these are records based on herbarium specimens, with little or no information on size, condition, landscape context, and giving only general locational information.

2. Determine other targeted species and acquire information about each, including habitat requirements and best time for survey.

3. Select targeted inventory areas including locations (Figure 1 and Table 1) for updating and other areas that are likely to support targeted species (primarily those on agency special status species lists). Eighty-two areas were targeted. Seventy-five of these were surveyed.

4. Plan access, acquire necessary maps, etc.

5. Perform field surveys at appropriate time for identification of species. Map locations of rare plants found using GPS. Document size, condition and landscape context of each population. Rank each occurrence based on above.

6. At selected sites prepare a list of all plant species observed.

7. Enter data in CNHP's BIOTICS data system.

8. Design or edit Potential Conservation Areas as needed.

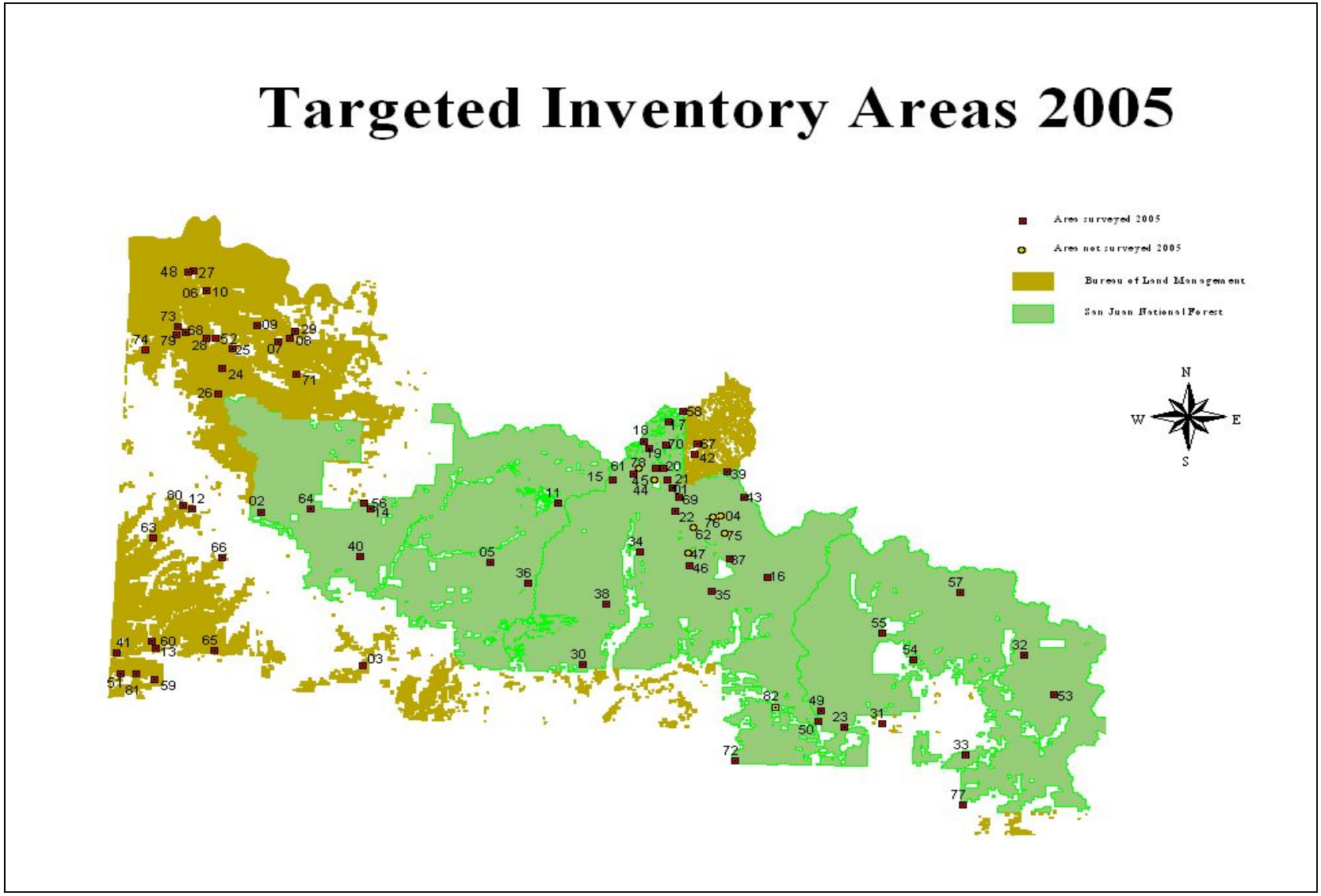


Figure 1. Targeted Inventory Areas 2005

Table 1. Targeted Inventory Areas 2005
(areas in italics were not surveyed in 2005)

TIA No.	TIA name	targeted species
1	Andrews Lake	Carex spp.
2	Armiston Point	Artemisia nova shrubland
3	BLM near Mesa Verde NP	Townsendia glabella
4	*Balsam Lake*	Parnassia kotzebuei
5	Bear Creek	Populus tremuloides community
6	Big Gypsum Valley at Mary Jane Draw	Cryptantha gypsophila, lichens
7	Big Gypsum Valley at Road 23R	Cryptantha gypsophila, lichens
8	Big Gypsum Valley site 1	Cryptantha gypsophila, lichens
9	Big Gypsum Valley site 2	Cryptantha gypsophila, lichens
10	Big Gypsum Valley site 3	Cryptantha gypsophila, lichens
11	Blackhawk Mountain	Machaeranthera coloradoensis
12	Cahone	Pinyon-juniper/Artemisia nova
13	Cannon Ball Mesa	Juniperus osteosperma/Forsellesia meionandra
14	Cannon Ball Mesa at BLM boundary	Trifolium kingii
15	Cascade Creek	Eriophorum chamissonis
16	Cave Basin Trail	Townsendia rothrockii
17	Chattenooga Iron Fen	Carex spp.
18	Clear Lake	Eriophorum altaicum var. neogaeum
19	Clear Lake Road	Abies lasiocarpa//Erigeron eximius
20	Colorado Trail at Lime Creek Headwaters	Machaeranthera coloradoensis
21	Colorado Trail at Little Molas Lake	Draba borealis
22	Crater Lake	Draba graminea
23	Devil Creek	Townsendia glabella
24	Disappointment Valley South	Pinus edulis-Juniperus osteosperma/Cercocarpus montanus
25	Disappointment Valley at Road ..	Cryptantha gypsophila
26	Dolores Pump Station	Epipactis gigantea
27	Dolores River at Big Gypsum Valley	Forestiera pubescens
28	Dolores River at Disappoinment Creek	Forestiera pubescens
29	Dry Creek Basin	Sagebrush comm
30	Dry Fork	Ponderosa pine forest
31	Dyke	Townsendia glabella
32	East Fork San Juan River	Draba smithii
33	Eight Mile Mesa	Ponderosa pine forest
34	Electra Lake	Cypridpedium parviflorum
35	Endliich Mesa	Eriophorum chamissonis
36	Grindstone Lake	Eriophorum altaicum var. neogaeum
37	Haviland Lake	Salix candida
38	Hermosa Creek	Cypripedium calceolus ssp. par
39	Highland Mary Lakes	Eriophorum altaicum var. neogaeum
40	House Creek	Triteleia grandiflora
41	Ismay Trading Post	Sarcobatus vermiculatus/Suaeda moquinii
42	Kendall Mountain	Abies lasiocarpa /Erigeron eximius
43	Kite Lake	Machaeranthera coloradoensis
44	West Lime Creek	Hippochaete variegata
45	Lime Creek Headwaters	Eriophorum altaicum var. neogaeum
46	*Lime Mesa*	Eriophorum altaicum var. neogaeum
47	*Lime Mesa North*	Eriophorum altaicum var. neogaeum
48	Little Gypsum Valley	Cryptantha gypsophila, Astragalus naturitensis
49	Lower Piedra	Epipactis gigantea
50	Lower Piedra Campground Road	Astragalus proximus
51	Mesa south of McElmo	Juniper shrubland, Calochortus flexuosus
52	Nichols Draw	Astragalus naturitensis
53	Nipple Mountain	Picea engenmannii/Trautvetteria caroliniensis
54	Perry Road	Ponderosa pine forest
55	Piedra Canyon	Woodsia neomexicana
56	Plateau Creek	Physaria pulvinata
57	Red Mountain	Eriophorum altaicum var. neogaeum
58	Red Mountain CR 14	Geum rossii/Trifolium sp.
59	Rincon Canyon	Juniperus osterosperma/Forsellesia meionandra
60	Risley Canyon	Juniper shrubland
61	Rolling Mountain	Draba streptobrachia
62	*Ruby Lake*	Eriophorum altaicum var. neogaeum
63	Ruin Canyon	Pinyon-Juniper/Cercocarpus montanus
64	Salter Reservoir	Stipa comata West

65	Sand Canyon	Astragalus naturitensis
66	Sandstone Canyon	Astragalus naturitensis
67	Silverton Cemetery	Aspen forest
68	Slick rock	Penstemon breviculus
69	Snowdon Peak	Draba graminea
70	South Mineral Creek	Aspen/juniper/carex
71	Spring Creek Basin	Artemisia pygmaea
72	Spring Creek at Ignacio	Astragalus proximus
73	Summit Canyon	Astragalus naturitensis
74	Summit Canyon West	Pinyon-juniper community
75	*Sunlight lake*	Eriophorum altaicum var. neogaeum
76	*Ten Mile Creek*	Eriophorum altaicum var. neogaeum
77	Trujillo	Astragalus proximus
78	*Twin Sisters*	Machaeranthera coloradoensis
79	Upper Corral Draw	Pinyon-juniper woodland
80	Upper Cross Canyon	PJ community
81	Upper Rincon Canyon	Amsonia jonesii
82	Yellowjacket Pass	Townsendia glabella

Results

Targeted inventory areas surveyed: Eighty two areas were targeted for survey, for updating existing element occurrence records or to search for new occurrences. Thirty-four element occurrences of sensitive plants on the San Juan National Forest were targeted for updating because they were documented prior to 2000 or needed more precise locational information or ranking. Twenty-eight of these were updated in 2005. These are described in Chapter II, and listed in more detail in the access database provided in the accompanying CD. An additional forty-eight sites were targeted to survey for new occurrences on BLM and Forest Service land. Altogether, seventy-five sites were surveyed. The seven that were not surveyed will require major wilderness backpacking or horse packing for future access.

New and updated element occurrence records (EORs). Seventy new and updated occurrences of rare plants were documented. Eighteen of these were updates (the other updated records did not result in new element occurrence records, as they were determined to be duplicates, mapped incorrectly, or not to occur on public lands). Fifty-three were new occurrences. Thirty-six occurrences were found on BLM land, 24 on San Juan National Forest land, and 10 on other (private or state) land. The 10 occurrences that were not on public lands were documented during a survey for *Ipomopsis polyantha* in Pagosa Springs, and are included here to help inform the general distribution and rarity of those species.

New and revised Potential Conservation Areas (PCA's). Sixteen new potential conservation areas were delineated, and six existing PCAs were revised. New and revised PCAs are profiled in Chapter IV. PCAs included in this report are:

PCA Name	PCA Rank	Manager
Big Gypsum Valley	B1	BLM
Plateau Creek	B1	SJNF
Blackhawk Mountain	B2	SJNF
Cave Basin Lakes	B2	SJNF
Colorado Trail at Lime Creek Headwaters	B2	SJNF
Crater Lake (revised)	B2	SJNF
Disappointment Valley Northwest	B2	BLM
Dolores Canyon Slick Rock to Bedrock	B2	BLM
Highland Mary Lakes	B2	SJNF
Little Gypsum Valley (revised)	B2	BLM
Rolling Mountain	B2	SJNF
Slick Rock	B2	BLM
Snowdon Peak	B2	SJNF
Spring Creek Basin	B2	BLM
Stollsteimer Creek North (revised)	B2	BLM
Summit Pass	B2	SJNF

Yellowjacket Pass	B2	SJNF
Cannon Ball Mesa (revised)	B3	BLM
Piedra River Trail (revised)	B3	SJNF
Clear Lake	B4	SJNF
Rincon Canyon	B4	BLM
Ismay Trading Post (revised)	B5	BLM

Species lists: Plant species lists were made for fifty-five sites. These are included in Appendix II.

Ecological Systems observations. Field observations were made to help inform the preparation of ranking specifications for ecological systems that occur on San Juan Public Lands. These will be presented in a related project report from the Nature Conservancy (San Juan Public Lands Biodiversity Project, Phase II)

Discussion: Highlights of the 2005 field season were the surveys of sites for two newly described species, *Cryptantha gypsophila* and *Physaria pulvinata*. These species are described in Chapter III, and are represented in potential conservation areas profiled in Chapter IV. Gypsum outcrops in Big Gypsum Valley were found to support three rare lichen species and a state-rare grass, in addition to *Cryptantha gypsophila.*

A major effort was made to evaluate known occurrences and locate additional sites of *Ipomopsis polyantha* in the Pagosa Springs area, and resulted in the discovery of the first known occurrences of that species on BLM land. However, that property is slated for exchange to the adjacent private landowner, subject to a conservation easement to protect the plants. A huge population of *Ipomopsis polyantha* was found on private land which may not be defensible.

Townsendia glabella, a globally imperiled (G2 S2) plant was found to be locally abundant in the Pagosa Springs area, growing in the same habitat as *Ipomopsis polyantha*.

It remains to be seen whether the local abundance of *Ipomopsis polyantha* and *Townsendia glabella* will persist in future years, or whether this was an unusually productive year.

Data gaps remaining include updating the remaining historic element occurrence records that were not accessed in 2005; revisiting fens identified by San Juan NF crews in 2005 to further identify species; and documenting ecological systems, especially upland systems, that occur on the San Juan Public Lands.

Chapter II. Updates of existing element occurrence records

Thirty-four element occurrences of special status species on the San Juan National Forest (SJNF) were targeted for updating because they were documented prior to 2000 or needed more precise locational information or ranking. Of these, the outcomes were as follows:

SJNF Sites surveyed, targets found and updated:	9
Sites surveyed, targets not found	7
Sites unable to access	10
Occurrences invalid (duplicates, not on public land)	8
Total	34

An additional 12 occurrences were updated on BLM land.

A total of 28 site visits for updating records was completed (Table 2). This included 16 on the San Juan National Forest and 12 on BLM land.

San Juan National Forest targeted sites surveyed, targets found and records successfully updated:

Scientific name	**EO number**	**Location**
Eriophorum altaicum var. *neogaeum*	40	Highland Mary Lakes
Lesquerella pruinosa	16	Nichols Draw
Machaeranthera coloradoensis	26	Summit Pass, AA
Eriophorum altaicum var. *neogaeum*	15	Clear Lake
Astragalus proximus	7	Ignacio
Cypripedium parviflorum	4	Electra lake
Eriophorum altaicum var. *neogaeum*	18	Cave Basin Trail
Eriophorum chamissonis	2	Endlich Mesa
Machaeranthera coloradoensis	31	Blackhawk Peak

San Juan National Forest sites surveyed, targets not found:

Scientific name	**EO number**	**Location**
Eriophorum altaicum var. *neogaeum*	36	Grindstone Lake. *Eriophorum* is *angustifolium*
Eriophorum chamissonis	5	Surveyed area to north, found *E. angustifolium*
Eriophorum altaicum var. *neogaeum*	24	Molas Trail
Cryptogramma stelleri	14	West Lime Creek, BLM sensitive, not FS upstream from 550.

Eriophorum altaicum var. *neogaeum*	39	visited, not habitat; found *E. angustifolium*
Cypripedium parviflorum	15	Hermosa Creek. Site is heavily impacted by.motorbikes, ATVs, cattle, hikers, etc
Salix candida	1	Pack trail Vallecito Cr to Johnson Cr. Searched, not found in 2003

Sites that could not be accessed in 2005:

Scientific name	EO number	Location
Parnassia kotzebuei	7	Ten Mile, Balsam Lake. need to pack in.
Eriophorum altaicum var. *neogaeum*	26	Sunlight Lake from Vallecito. no trail? need horses.
Eriophorum altaicum var. *neogaeum*	17	Lime Mesa. Road impassable
Astragalus proximus	11	Searched area, not found. Found *Townsendia glabella*
Eriophorum altaicum var. *neogaeum*	19	Lime Mesa. Road impassable
Eriophorum altaicum var. *neogaeum*	1	Ruby Lake, major hike, no trail
Astragalus proximus	2	Yellowjacket Pass. Searched area, not found
Eriophorum altaicum var. *neogaeum*	7	Assigned to Outward Bound volunteers, not found
Machaeranthera coloradoensis	1	Twin Sisters. Attempted, turned back by storm.
Eriophorum altaicum var. *neogaeum*	23	Need horses. Trail closed due to downfalls and slides

Note: Most of these are in protected alpine areas, and although not recently observed, are presumed extant.

Occurrences determined to be invalid, duplicates or not on San Juan Public Lands:

Scientific name	EO number	Location
Lesquerella pruinosa	11	On private land. Neeley, seconds record
Calochortus flexuosus	3	Mapped incorrectly, not on NF
Astragalus proximus	10	roadside, Hwy 160, not on NF
Epipactis gigantea	29	updated 2001. Only one occurrence, mapped incorrectly by FS, deleted.
Lesquerella pruinosa	14	On private land per Dick Moseley, who documented EOR originally
Astragalus missouriensis var. *humistratus*	1	Not on NF--"Sawmill site" at jct 160 and 84, per Sara Brinton
Astragalus proximus	4	Same as 2001 Chimney Rock EORs, general record should be replaced
Machaeranthera coloradoensis	7	Kite Lake. Occurrence is on east side of Continental Divide in Rio Grande NF

BLM records updated:

Scientific name	EO number	Location
Calochortus flexuosus	16	Ismay
Amsonia jonesii	10	Rincon Canyon
Astragalus naturitensis	31	Little Gypsum Valley
Astragalus naturitensis	15	Disappointment Valley
Astragalus naturitensis	8, 28, 29, 37, 38, 39, 40	Slick Rock
Calochortus flexuosus	15	Cannon Ball Mesa
Ipomopsis polyantha	3	Dyke
Penstemon breviculus	18	Slick Rock
Penstemon breviculus	8	Little Gypsum Valley
Penstemon utahensis	9	Cannon Ball Mesa
Townsendia glabella	8	Devil Creek
Townsendia glabella	10	Mesa Verde Entrance*

*in National Park, Adjacent BLM areas searched, not found.

Table 2. Element occurrences updated through site surveys 2005.

EO No.	Scientific name	Date last observed	Date surveyed 2005	Population found?	Old EO rank	New EO rank	Old precision	New precision	New map?	New PCA?	Comments	Survey site	Owner	Special status	G rank	S rank
*010	*Amsonia jonesii*	2003-09-05	2005-04-17	yes	B	B	S	S	yes	yes	re-visited in 2004 and 2005	Rincon Canyon	BLM	BLM sensitive	G4	S1
*008, *028, *029, *037, *038, *039, *040	*Astragalus naturitensis*	1999-07-14	2005-05-05	yes	A,B, E	A	S	S	yes	yes	combined old eors 8, 28, 29, 37, 38, 39, 40 and add new polygons	Slick Rock	BLM	BLM sensitive	G2G3	S2S3
*015	*Astragalus naturitensis*	1995-04-26	2005-05-07	yes	B	A	S	S	yes	yes	Extended polygon	Nichols Draw, Disappointment Valley	BLM	BLM sensitive	G2G3	S2S3
*031	*Astragalus naturitensis*	1999-05-26	2005-05-10	yes	C	C	S	S	yes	yes		Little gypsum Valley	BLM	BLM sensitive	G2G3	S2S3
*007	*Astragalus proximus*	1994-06-01	2005-06-13	yes	AB	B	M	S	yes	no		Spring Creek Ignacio	BLM	USFS/BLM sensitive	G4	S2
*015	*Astragalus proximus*	?	2005-06-10	yes	B	B	S	S	No	no	Population still extant, no changes	Lower Piedra	USFS	USFS/BLM sensitive	G4	S2
*015	*Calochortus flexuosus*	2000-04-26	2005-04-19	yes	B	AB	S	S	yes	yes		Cannon Ball Mesa at BLM boundary	BLM	X	G4	S1
*016	*Calochortus flexuosus*	2004-06-09	2005-04-16	yes	C	C	S	S	yes	yes	Property is being negotiated for exchange for BLM parcels at Dyke, Archuleta County	Ismay Trading Post	BLM/ Private	X	G4	S2
*011	*Carex viridula*	2003-07-11	2005-06-27	yes	A	A	S	X	no	no	Negative searches for Salix serissima and Utricularia and Cypripedium at the site.	Haviland Lake	State Wildlife Area	X	G5?	S1
*004	*Cypripedium parviflorum*	1978-06-08	2005-06-21	yes	H	C	M	S	yes	no		Electra Lake	USFS	USFS sensitive	G5	S2
*015	*Cypripedium parviflorum*	1993-06-04	2005-06-17	no	NR	F	S	S	no	no	area searched, none found. heavy use area recreation/grazing suggest a vistit in 2006	Hermosa Creek	USFS	USFS sensitive	G5	S2
*015	*Draba graminea*	1934-07-09	2005-07-16	yes	H	A	M	S	yes	yes	new sub-populations found	Rolling Mountain	USFS	X	G2	S2
*027	*Draba streptobrachia*	9999-99-99	2005-07-16	yes	NR	B	S	S	yes	yes	Found in general area, expect continues to original mapped site.	Rolling Mountain	USFS	X	G3	S3
*015	*Eriophorum*	1993-08-22	2005-07-21	yes	A	B	G	S	yes	revised		Clear Lake	USFS	USFS	G4?T	S3

EO No.	Scientific name	Date last observed	Date surveyed 2005	Population found?	Old EO rank	New EO rank	Old precision	New precision	New map?	New PCA?	Comments	Survey site	Owner	Special status	G rank	S rank
	altaicum var. *neogaeum*													sensitive	3	
*018	*Eriophorum altaicum* var. *neogaeum*	1995-08-11	2005-08-26	yes	B	A	S	S	no	yes		Cave Basin	USFS	USFS sensitive	G4?T3	S3
*040	*Eriophorum altaicum* var. *neogaeum*	1994-08-03	2005-07-15	yes	E	B	M	S	yes	yes	new sub-populations found	Highland Mary Lakes	USFS	USFS sensitive	G4?T3	S3
*002	*Eriophorum chamissonis*	1995-08-14	2005-08-20	yes	A	A	S	S	yes	no	added 2 new polygons	Endlich Mesa	USFS	USFS sensitive	G5	S1
*005	*Hippochaete variegata*	2002-07-29	2005-07-14	yes	C	C	S	S	yes	no		West Lime Creek	USFS	?	G5	S1
*003	*Ipomopsis polyantha*	1993-06-25	2005-06-04	yes	B	B	S	S	yes	no	Property is being considered for exchange. If exchanged, BLM will require a conservation easement on the south half of the 80 acre parcel.	Dyke	BLM	USFS/BLM sensitive	G1	S1
*016	*Lesquerella pruinosa*	2003-07-17	2005-06-10	yes	AB	AB	S	S	no	no	presence and condition confirmed by Anita King	Nichols Draw, AA	USFS	USFS/BLM sensitive	G2	S2
*026	*Machaeranthera coloradoensis*	2000-07-29	2005-08-24	yes	NR	B	S	S	yes	no		Summit Pass	USFS	X	G2	S2
*031	*Machaeranthera coloradoensis*	1995-08-15	2005-07-21	yes	E	A	S	S	yes	yes		Blackhawk Mountain	USFS	USFS sensitive	G2	S2
*008	*Penstemon breviculus*	1982-05-30	2005-05-10	yes	NR	NR	M	S	yes	yes		Little Gypsum Valley	BLM	X	G3	S2
*018	*Penstemon breviculus*	1999-07-14	2005-05-10	yes	C	C	S	S	yes	yes		Slick Rock	BLM	X	G3	S2
*009	*Penstemon utahensis*	1994-05-11	2005-04-02	yes	NR	B,C	M	X	no	yes	update no new map needed	Cannon Ball Mesa at BLM boundary	BLM	X	G4	S2
*008	*Polypodium hesperium*	2001-07-13	2005-09--?	yes	C	A	S	X	no	yes		Piedra River Canyon	USFS	X	G3?	S3?
*008	*Townsendia glabella*	1925-06-02	2005-06-18	yes	H	D	M	X	no	no		Devil Creek	USFS	X	G2	S2
*010	*Townsendia glabella*	2004-05-15	2005-04-29	yes	A	A	S	S	yes	no	Henneman private property/Revise size ranking criteria based on very large populations in Archuleta County	Mesa Verde entrance	NPS, PVT	X	G2	S2

Chapter III.
Rare Plants of San Juan Public Lands with New and Updated Occurrences in 2005

Field work in 2005 resulted in the addition of seventy new or updated element occurrence records of 26 species of rare plants on San Juan Public Lands (Table 3). Descriptions of those species are below.

Table 3: Species profiles for plants with new or updated occurrences in 2005.

Scientific Name	Common Name	Global rank	State Rank	2005 new or update	PCAs in San Juan Public Lands supporting species, surveyed in 2005*
Vascular plants:					
Amsonia jonesii	Jones blue star	G4	S1	Update	Rincon Canyon (BLM)
Artemisia pygmaea	Pygmy sagebrush	G4	S1	New	Spring Creek Basin (BLM)
Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3	New and updates	Slick Rock, Little Gypsum Valley, Dolores River from Slickrock to Bedrock, Disappointment Valley, Sand Canyon (BLM)
Calochortus flexuosus	Weak-stemmed mariposa lily	G4	S2	New and updates	Spring Creek Basin, Rincon Canyon, Ismay Trading Post, Cannon Ball Mesa, Big Gypsum Valley (BLM)
Cryptantha gypsophila	Gypsum Valley cat-eye	G1	S1	New	Big Gypsum Valley, Little Gypsum Valley, Disappointment Valley North, Spring Creek Basin (BLM)
Cypripedium parviflorum	Yellow lady's slipper	G5	S2	Update	Electra Lake, Haviland Lake (NF)
Draba borealis	Boreal whitlow-grass	G4	S2	New	No PCA
Draba graminea	San Juan whitlow-grass	G2	S2	New and updates	Snowdon Peak, Rolling Mountain, Highland Mary Lakes, Crater Lake (NF)
Draba streptobrachia	Colorado Divide whitlow-grass	G3	S3	New and updates	Rolling Mountain, Crater Lake
Eriophorum altaicum var. *neogaeum*	Altai cottongrass	G4?T3 T4	S3	Updates	Snowdon Peak, Highland Mary Lakes, Crater Lake, Clear Lake, Cave Basin Lakes

Eriophorum chamissonis	Chamisso's cottongrass	G5	S1	Update	Endlich Mesa
Hippochaete variegata	Variegated scouring rush	G5	S1	Update	West Lime Creek
Ipomopsis polyantha	Pagosa skyrocket	G1	S1	New and updates	Stollsteimer Creek North (BLM)
Machaeranthera coloradoensis	Colorado tansy-aster	G2	S2	New and updates	Colorado Trail at Lime Creek, Blackhawk Mountain (FS)
Penstemon breviculus	Little penstemon	G3	S2	Updates	Slick Rock, Little Gypsum Valley, Cannon Ball Mesa (BLM)
Penstemon utahensis	Utah penstemon	G4	S2	New and updates	Rincon Canyon, Ismay Trading Post, Cannon Ball Mesa (BLM)
Physaria pulvinata	Cushion bladderpod	G1	S1	New	Plateau Creek (FS)
Polypodium saximontanum	Rocky Mountain polypody	G3?	S3	New	Piedra River Trail (FS)
Sporobolus nealeyi	Gyp dropseed	G5	S1	New	Big Gypsum Valley (BLM)
Townsendia glabella	Gray's townsend-daisy	G2	S2	New	Yellowjacket Pass (FS), Stollsteimer Creek North (BLM)
Townsendia rothrockii	Rothrock's Townsend daisy	G2	S2	New	Cave Basin Lakes (FS)
Trifolium kingii	King's clover	G5	S1	New	No PCA (FS)
Woodsia neomexicana	New Mexico woodsia	G4?	S2	New	Piedra River Trail
Non-vascular plants:					
Acarospora nodulosa var. *nodulosa*	Nodule cracked lichen	G2	S1	New	Big Gypsum Valley
Gypsoplaca macrophylla	Changing earthscale	G3G4	S1	New	Big Gypsum Valley
Lecanora gypsicola	Gypsum rim-lichen	G1	S1	New	Big Gypsum Valley

* see individual profiles for all PCAs containing species in San Juan Public Lands.

Species profiles and Element Occurrence Rank Specifications

Amsonia jonesii (Jones blue-star)

Taxonomy
Class: Dicotyledoneae
Order: Gentianales
Family: Apocynaceae
Genus: *Amsonia*

Taxonomic Comments: *Amsonia jonesii* Woodson was described in 1928. Synonyms include *A. latifolia* M. E. Jones and *A. texana*.

CNHP Ranking: G4 S1

State/Federal Status: BLM sensitive

Figure 2. *Amsonia jonesii*.
Photo by Peggy Lyon

Description and Phenology: *Amsonia jonesii* is a glabrous perennial plant with a thickened or woody root. Stems are 20 to 50 cm. tall, with leaf blades 3 to 6 cm long. The inflorescence is a dense cluster of powder-blue flowers.

Habitat Comments: Jones blue star grows in sandy or gravelly soils in rocky draws in the sagebrush and pinyon-juniper zones. Several of the occurrences were on Mancos shale.

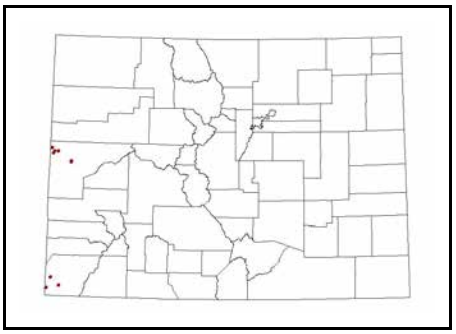


Figure 3. Distribution of *Amsonia jonesii* in Colorado

Global Range: *Amsonia jonesii* is known from the Four Corners states: Colorado, Utah, New Mexico and Arizona. It is ranked S2 in Arizona, S3 in Utah, and is present, but unranked, in New Mexico.

State Range: Jones blue star occurs in Mesa and Montezuma counties.

Distribution/Abundance: There are nine occurrences in the CNHP database. Two and ranked "good" (B), one poor (D), one is historic (H) and the remainder are not ranked. Six are in Mesa County and three in Montezuma County. One of these is on BLM land, and the other two are on Ute Mountain Ute tribal land.

Known Threats and Management Issues: Weed invasion and off-road vehicle use are potential threats.

Potential Conservation Areas on San Juan Public Lands that support Jones blue star: Rincon Canyon (BLM).

Figure 4. Habitat of *Amsonia jonesii* in Rincon Canyon
Photo by Peggy Lyon

Amsonia jonesii

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	500 or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact. There is no evidence of excessive damage from herbivory or trampling.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality, i.e., no exotic plant species or significant human disturbances. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species.	The site is of good quality. It has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means.	The site is of fair quality, and may be somewhat degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance. The site may have low defensibility, i.e. on private land with no other protection.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Artemisia pygmaea (pygmy sagebrush)

Taxonomy
Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae
Genus: *Artemisia*

Taxonomic Comments: synonym: *Serephidium pygmaeum*

CNHP Ranking: G4 S1

State/Federal Status: None

Figure 5. *Artemisia pygmaea*.
Photo by Peggy Lyon

Description and Phenology: This diminutive sagebrush is only about three inches tall, except for its taller inflorescence, but it has a hefty root system worthy of a large shrub. Its leaves are so narrow that they resemble tiny evergreen needles.

Habitat Comments: It grows in the driest parts of the driest sagebrush areas, along with black sage and viscid rabbitbrush.

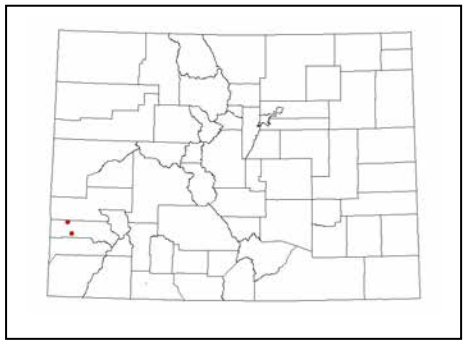


Figure 6. Distribution of *Artemisia pygmaea*. in Colorado

Global Range: Its global range is limited to the Four Corners states (Utah, Arizona, New Mexico and Colorado), Nevada and the Navajo Nation. It is ranked S1 in Arizona and Colorado, and not ranked in the other states.

State Range: There are two documented occurrences in Colorado, both in San Miguel County, in Dry Creek Basin and Spring Creek Basin. Both sites are on BLM land.

Distribution/Abundance: The population in Dry Creek Basin is unranked, but believed to be small. The Spring Creek Basin population is ranked good (B), with an estimated population size of over 1000 individuals.

Known Threats and Management Issues: Since the species grows in extremely dry sites with little competition from other vegetation, any treatments to increase forage such as seeding or irrigating would be detrimental to the population. The Spring Creek population is within the wild horse area, and may be subject to some trampling.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Artemisia pygmaea***:** Dry Creek Basin, Spring Creek Basin. Both PCAs are ranked B2 (very high biodiversity significance).

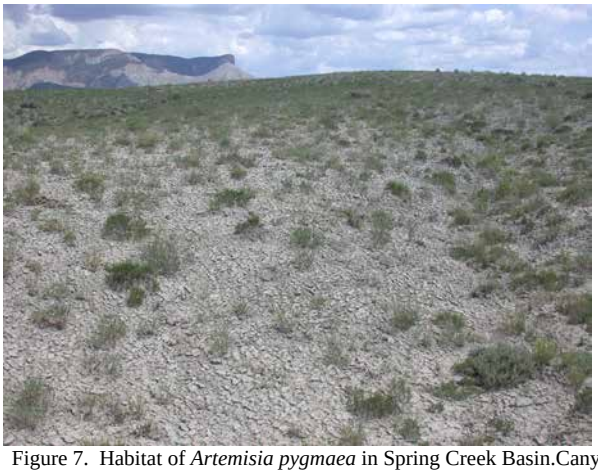


Figure 7. Habitat of *Artemisia pygmaea* in Spring Creek Basin.Canyon.
Photo by Peggy Lyon

Artemisia pygmaea

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	1000or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact. There is no evidence of excessive damage from herbivory or trampling. Plants may be resistant to some natural disturbance.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality, i.e., no exotic plant species or significant human disturbances. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. It should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species.	The site is of good quality. It has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means.	The site is of fair quality, and may be somewhat degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance. The site may have low defensibility, i.e. on private land with no other protection.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Astragalus naturitensis (Naturita milkvetch)

Taxonomy
Class: Dicotyledoneae
Order: Fabales
Family: Fabaceae
Genus: *Astragalus*

Taxonomic Comments: Naturita milkvetch was first described by Edwin Payson in 1915.

CNHP Ranking: G3S3 (as of 3-2005)

State/Federal Status: BLM sensitive

Figure 8. *Astragalus naturitensis*
Photo by Peggy Lyon

Description and Phenology: Naturita milkvetch is a white and purple flowered member of the pea family (Fabaceae), growing from a basal rosette of leaves. The plants are often only vegetative, and have extremely small pinnate leaves with tiny gray-green leaflets that tend to fold in half, showing their lighter-colored undersides. The pods are red-mottled, firm-walled, and dorsiventrally compressed (front to back).

Habitat Comments: It is found in pinyon-juniper woodland and shrubland communities, in areas with shallow soils over exposed bedrock. Usually it is in small soil pockets or rock crevices in sandstone pavement along canyon rims. It is often associated with well developed biological soil crusts.

Figure 9: Distribution of *Artemisia pygmaea*.in Colorado

Global Range: *Astragalus naturitensis* is known from Colorado, New Mexico, Utah and the Navajo Nation. It is ranked S2 in New Mexico and S1 in Utah and the Navajo Nation.

State Range: The species has been found in five counties in Colorado: Garfield, Mesa, Montezuma, Montrose and San Miguel. It is known from two counties in New Mexico and from one occurrence in San Juan County, Utah.

Distribution/Abundance: There are 40 occurrences documented in the CNHP database. Twenty of these fall on BLM lands in the San Juan Resource Area.

Known Threats and Management Issues: Naturita milkvetch seems to tolerate and even thrive on some disturbance. The plants have been found around power poles and in the compacted tracks of dirt roads. The plants are notably absent from areas invaded by cheatgrass and other exotic or increaser species. Off-road vehicle use, heavy trampling by livestock and uranium mining pose threats. Any treatments to increase forage for livestock, such as seeding or irrigating, would be detrimental to the plants.

Potential Conservation Areas on San Juan Public Lands that support *Astragalus naturitensis:* Mud Canyon, Sand Canyon at McElmo, Slick Rock, Silvey's Pocket, Little Gypsum Valley, McIntyre Canyon, Dolores Canyon from Slick Rock to Bedrock and Disappointment Valley Northwest. All of these are on BLM land.

Astragalus naturitensis

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences. No information on mobility of pollen and propagules is available on which to base the separation distance for this species.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	500 or more individuals	100 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality, i.e., no exotic plant species or significant human disturbances. Biological soil crusts should be intact, providing a defense against annual plant invasion. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. It should be surrounded by an area which is unfragmented There is sufficient area to support the expansion or movement of the population over time.	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Calochortus flexuosus (weak-stemmed or winding mariposa lily)

Taxonomy
Class: Monocotyledoneae
Order: Liliales
Family: Liliaceae (or Calochortaceae)
Genus: *Calochortus*

Taxonomic Comments: *Calochortus flexuosus* S. Watson

CNHP Ranking: G4 S1

State/Federal Status: Formerly on the sensitive list for the Forest Service, due to an error in mapping. The species is not known to occur on the forest.

Description and Phenology: An attractive relative of the more common sego lily (*C. nuttallii*), the weak-stemmed mariposa lily varies from white to pink, and has wildly contorted stems. Petals have a yellow band at the gland, which is densely covered with short processes and surrounded by sparse hairs.

Habitat Comments: Throughout its range, it occurs in a number of habitats including deserts, pinyon-juniper, Joshua tree and chaparral. In the San Juan area, it was found in desert shrub communities with shadscale (*Atriplex confertifolia*) and galleta (*Pleuraphis jamesii*) and in grassy openings in pinyon-juniper woodlands with galleta and alkali sacaton (*Sporobolus airoides*).

Figure 10. *Calochortus flexuosus.* Photo by Peggy Lyon

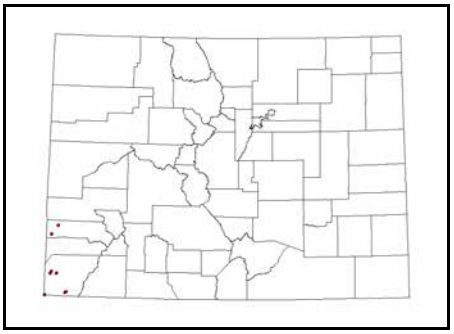


Figure 11. Distribution of *Calochortus flexuosus* in Colorado

Global Range: Colorado, California, Nevada, Utah, New Mexico, Arizona and northern Baja California. It is unranked in all states but Colorado. It apparently reaches its eastern limit in western Colorado.

State Range: Of the 14 Colorado records in the CNHP database, ten are from BLM lands in the San Juan Resource Area. Three are on Ute Mountain Ute land and one is on private land.

Distribution/Abundance: Of the 14 Colorado records in the CNHP database, ten are from BLM lands in the San Juan Resource Area. Three are on Ute Mountain Ute land and one is on private land. Five of these were new in 2005. Two occurrences are ranked excellent (A), with hundreds of plants in extensive, good condition habitat. Two are ranked good (B), six fair (C), and 4 are unranked due to insufficient information. Abundance varies from year to year, depending on moisture.

Known Threats and Management Issues: Threats to the species include improper grazing, off-road vehicle use and oil and gas exploration and drilling.

Potential Conservation Areas on San Juan Public Lands that support *Calochortus flexuosus:* Sand Canyon, Cannonball Mesa, Rincon Canyon, Spring Creek Basin, Ismay Trading Post and Big Gypsum Valley.

Calochortus flexuosus

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	500or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Cryptantha gypsophila (Gypsum Valley cat-eye)

Taxonomy
Class: Monocotyledoneae
Order: Lamiales
Family: Boraginaceae
Genus: *Cryptantha*

Taxonomic Comments: *Cryptantha gypsophila* was described as a new species in 2004 by James Reveal.

CNHP Ranking: G1S1

State/Federal Status: none

Figure 12. *Cryptantha gypsophila*.
Photo by Peggy Lyon

Description: *Cryptantha gypsophila* plants are low densely tufted herbaceous perennials, 0.3-2.5 dm high, 0.5-4 dm across, with a highly branched, woody caudex system arising from a deeply-seated taproot. Leaves are glabrous on top and have appressed pustulate-based bristles on lower surface. Basal leaves are tufted, narrowly oblanceolate to narrowly spatulate, 1-2.5 (3) cm long, 1.5-3 mm wide. Cauline leaves are scattered, oblanceolate to spatulate, 1-4 cm long, 2-4 (5) mm wide. Stems are erect and softly hairy. The calyx is turbinate, with segments narrowly lanceolate, 4-6 mm long in anthesis, (4) 6-9 mm long in fruit. The corolla is white with yellow fornices, about 10-12 mm long, prominently exserted from the calyx. Usually all 4 nutlets mature, and are rugose-tuberculate on both surfaces. Styles surpass the nutlet by 4-7 mm. (Reveal 2004). Similar to the more common *Cryptantha paradoxa*, *C. gypsophila* can be distinguished in the field by its glabrous upper leaf surfaces.

Phenology: Plants were in flower in May in 2004 and 2005. Flowers were dried and fruits maturing in late June, 2005.

Habitat Comments: *Cryptantha gypsophila* is often the dominant vascular plant on the grayish, near-barren gypsum hills of the Paradox Member of the Hermosa Formation in western Colorado (Reveal 2004). It is also found on other barren shale substrates in the area. In some sites, the dominant plant is a whitish gray cryptobiotic lichen. In a survey of the associated lichens in May 2005 by Larry St.Clair, over 20 lichen species were identified, including two that are globally rare. More information on the lichen flora will be available soon from St.Clair. *Cryptantha gypsophila* is found on light gray soils, and is absent from the adjacent more reddish-brown soils. Associated vascular plant species include snakeweed (*Gutierrezia sarothrae*), spearleaf buckwheat (*Eriogonum lonchophyllum*), winterfat (*Krascheninnikovia lanata*), fourwing saltbush (*Atriplex canescens*), galleta (*Pleuraphis jamesii*), Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), slimleaf plains mustard (*Schoencrambe linearifolia*), fullstem (*Chamaechaenactis scaposa*), Torrey's hymenoxys (*Tetraneuris torreyana*) and western tansy-mustard (*Descurainia pinnata*).

Figure 13. Habitat of *Cryptantha gypsophila* in Big Gypsum Valley.
Photo by Peggy. Lyon

Figure 14. Known global range of *Cryptantha gypsophila*.

Global Range: *Cryptantha gypsophila* is known only from western Colorado.

State Range: Populations are known from Sinbad Valley in southwestern Mesa Co., Big Gypsum Valley and adjacent Little Gypsum Valley in northwestern San Miguel Co. and extreme southwestern Montrose Co., and from Disappointment Valley (San Miguel Co.) It was recently also found in Spring Creek Basin, north of Disappointment Valley. The area within which all but one site are located is approximately 22 x 7 miles. One disjunct occurrence in Sinbad Valley is about 24 miles north of the nearest southern site.

Distribution/Abundance: Currently, the species is known from only eleven locations in western Colorado, in Montrose, San Miguel and Dolores counties. However, further survey work is expected to add more locations. The species has probably been overlooked in the past, due to its close resemblance to *C. paradoxa*. Although the species is locally common, with thousands of individuals at a site, it is very restricted as to habitat and geographic range.

Known Threats and Management Issues: Much of the area where the plants have been found is being explored or developed for oil and gas production. ATV off-road use may also threaten some populations. Invasion of exotic species such as cheatgrass (*Bromus tectorum*) may be a threat. No plants have been observed in areas dominated by cheatgrass (Lyon, pers. obs.) It does not grow in naturally moist or irrigated areas.

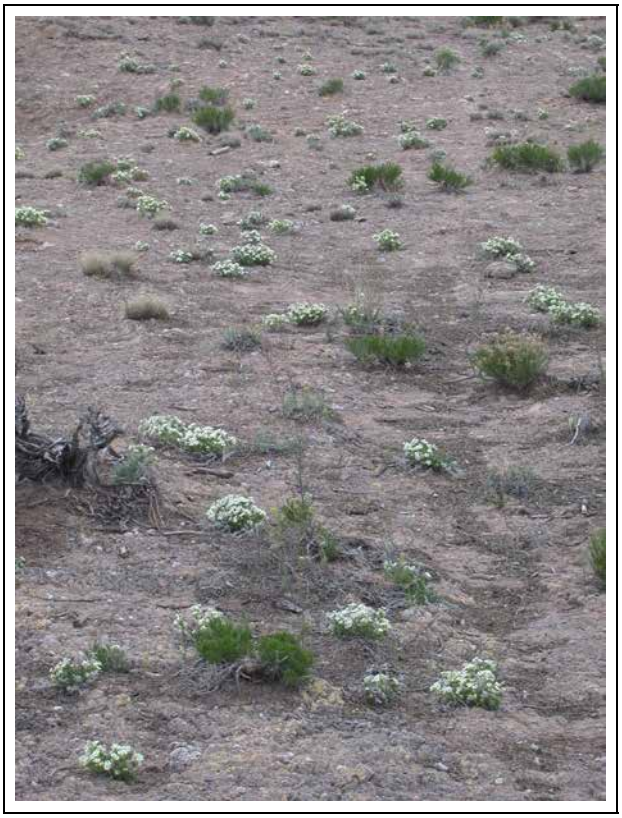


Figure 15. *Cryptantha gypsophila* may be locally abundant in its restricted habitat.

Figure 16. ATV tracks in *Cryptantha gypsophila* site at Big Gypsum Valley.

Photos by Peggy Lyon.

Cryptantha gypsophila

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences. No information on mobility of pollen and propagules is available on which to base the separation distance for this species.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	500 or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Cypripedium parviflorum (yellow lady's slipper)

Taxonomy
Class: Monocotyledoneae
Order: Orchidales
Family: Orchidaceae (Cypripediaceae)
Genus: *Cypripedium*

Taxonomic Comments: Traditionally included in the family *Orchidaceae*, Dr. Weber puts it in its own family, the *Cypripediaceae.* It is synonymous with *Cypripedium calceolus* ssp. *parviflorum* (Weber and Wittman 2001).

CNHP Ranking: G5 S1

State/Federal Status: Forest Service Sensitive

Figure 17. *Cypripedium parviflorum.*
Photograph by CNHP

Description: A striking yellow orchid with a large pouch.

Habitat Comments: Wet areas in the subalpine zone. In La Plata County, it was found under patches of blue spruce (*Picea pungens*) bordering a wetland near Haviland Lake.

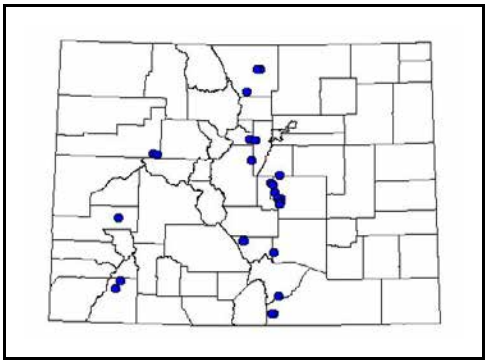


Figure 18.
Distribution of *Cypripedium parviflorum* in Colorado

Global Range: It is widespread in North America, although it is considered rare in several states.

State Range: There are 26 occurrences in Colorado, in 11 counties. The University of Colorado Herbarium has 10 specimens.

Distribution/Abundance: Globally, there are thousands of occurrences. In Colorado, only four of the 26 occurrences are ranked B, with the others either unranked or historic. Most of the occurrences that have abundance information have fewer than 100 individuals. Two occurrences have been recently observed in the San Juan National Forest. A third population at Hermosa Creek was searched for but not found in 2005, and the habitat has been heavily disturbed.

Known Threats and Management Issues: This species may be threatened by collecting, since orchids are prized in the horticultural trade, and are sometimes collected from the wild. However, CNHP is not aware of specific threats at this time. Grazing and foot traffic may have extirpated the population at Hermosa Creek.

Potential Conservation Areas in the San Juan Public Lands that support *Cypripedium parviflorum*: Haviland Lake, Electra Lake.

Cypripedium parviflorum

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	50 or more individuals	20 or more individuals	10 or more individuals	Less than 10 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Draba borealis (boreal whitlow-grass)

Taxonomy
Class: Dicotyledoneae
Order: Capparales
Family: Brassicaceae
Genus: *Draba*

Taxonomic Comments: *Draba borealis* De Candolle

CNHP Ranking: G4 S2

State/Federal Status: None

Figure 19. *Draba borealis.*
Photo by Peggy Lyon

Description and Phenology: *Draba borealis* has one to several leafy stems, erect to drooping, pubescent with simple or branched hairs. Leaves are oval, sometimes coarsely toothed, and pubescent. Flowers are white or pale yellow with four petals. Fruits are pubescent and sometimes twisted. Flowering/Fruiting Period: June-August/July-September

Habitat Comments: Habitat in Wyoming is described as moist, north-facing limestone slopes and cliffs and shady streamsides at elevations from 6200 to 8600 ft. In Dolores County, it was found growing in soil pockets in cliffs and in shallow soils of tundra ridges at 12,000 to 12,500 ft. The small population found in 2005 along the Colorado Trail above Little Molas Lake was on a sparsely vegetated rocky hill above timberline. Associated species included *Pseudocymopterus montanus, Allium geyeri, Taraxacum officinale,Cystopteris fragilis, Senecio tridenticulata,Valeriana edulis, Potentilla diversifolia* and *Artemisia scopulorum*.

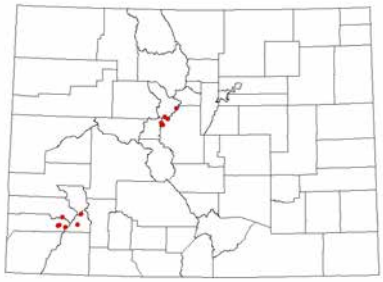


Figure 20.
Distribution of *Draba borealis* in Colorado

Global Range: *Draba borealis* is known from five Canadian provinces, Alaska, Washington, Montana, Wyoming and Colorado. It is ranked S2 in Colorado and Wyoming and unranked in the other states. Colorado represents the southernmost location for the species.

State Range: *Draba borealis* is known in Colorado from the central Rockies in Summit and Park counties, and the San Juan Mountains in Ouray, San Juan and Dolores counties. The four Dolores County occurrences were first located in 2004.

Distribution/Abundance: There are 11 occurences in the CNHP database. There are four specimens at the University of Colorado Herbarium, from Summit and Park counties. Populations tend to be small. The four occurrences found in Dolores County in 2004 ranged from two to over 100 individuals, and the occurrence found in 2005 had about 50 individuals.

Known Threats and Management Issues: Hiking, horse packing and sheep grazing may pose threats at sites along alpine ridges.

Potential Conservation Areas on San Juan Public Lands that support *Draba borealis:* Navajo Basin, Elliott Mountain, Hermosa Peak.

Draba borealis

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	100 or more individuals	50 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Draba graminea (San Juan whitlow-grass)

Taxonomy
Class: Dicotyledoneae
Order: Capparales
Family: Brassicaceae
Genus: *Draba*

Taxonomic Comments: *Draba graminea* Greene was first described by Baker in 1901. The type locality is in Hinsdale County, Colorado.

CNHP Ranking: G2 S2

State/Federal Status: None. Currently on list of species considered for inclusion on Forest Service sensitive species list for Region 2, but for which more information is needed.

Figure 21. *Draba graminea*.
Photo by Peggy Lyon

Description and Phenology: San Juan whitlow-grass is a yellow flowered perennial with small green leaflike bracts beneath each flower. Its basal leaves are narrow with ciliate margins and glabrous surfaces. It may have up to two reduced leaves on its flower stem. Plants are usually flowering and easiest to see in late July and early August. Look for bright yellow, four-petaled flowers nestled in dark green, narrow-leaved rosettes.

Habitat Comments: gravelly tundra, shaded areas in crevices or base of cliffs, late snowmelt areas, 12,400 to 13,500 ft. San Juan whitlow-grass is nearly always found above 12,000 feet in elevation. It often grows near the melting edge of a snow bank, or at the shaded base of cliffs in cold wet tundra. The plants depend on the depth and longevity of the snowpack, stability of the soil, and presence or absence of appropriate pollinators.

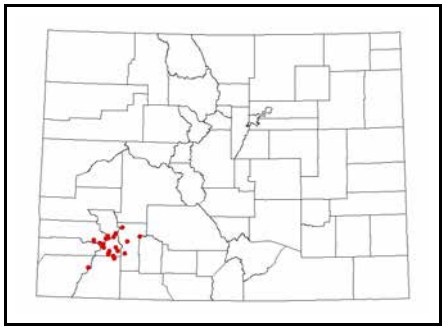


Figure 22.
Distribution of *Draba graminea* in Colorado

Global Range: This species is endemic to Colorado.

State Range: *Draba graminea* is endemic to the San Juan Mountains, known from five counties: Ouray, San Miguel, San Juan, Hinsdale, La Plata, and Montezuma.

Distribution/Abundance: There are 26 occurrences of the species, including four found in 2005.

Known Threats and Management Issues: Concern for the viability of the species is based on its limited abundance and restricted global distribution. Most occurrences are on National Forest land, at high elevations and in habitats that are not subject to much disturbance. Climate change could cause the extinction of this species, along with other endemic high elevation species, as there is little room for it to move upward if the global climate becomes warmer.

Potential Conservation Areas on San Juan Public Lands that support *Draba graminea:* Navajo Basin, Centennial Peak, Snowdon Peak, Rolling Mountain, Crater Lake, Highland Mary Lakes, South Twilight Peak, Kite Lake.

Draba graminea

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	500 or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact. There is no evidence of excessive damage from herbivory or trampling.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality, i.e., no exotic plant species or significant human disturbances. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species.	The site is of good quality. It has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means.	The site is of fair quality, and may be somewhat degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance. The site may have low defensibility, i.e. on private land with no other protection.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Draba streptobrachia (Colorado Divide whitlow-grass)

Taxonomy
Class*:* Dicotyledoneae
Order: Capparales
Family: Brassicaceae
Genus: *Draba*

Taxonomic Comments: The species was first described in 1980.

CNHP Ranking: G3 S3

State/Federal Status: None. Currently on list of species considered for inclusion on Forest Service sensitive species list for Region 2, but for which more information is needed.

Figure 23. *Draba streptobrachia.*
Photo by Peggy Lyon

Description: Colorado Divide whitlow-grass is one of several *Draba* species found in the high mountains of Colorado. All are diminutive yellow or white flowered plants with four petals. The Colorado Divide whitlow-grass is a tap-rooted perennial plant with a rosette of stellate-pubescent basal leaves and yellow flowers. It resembles the San Juan whitlow-grass (*Draba graminea*), but can be distinguished from it by the absence of bracts below the flowers, and the presence of stellate hairs on the leaves.

Habitat Comments: Alpine zone, usually in rock outcrops, at elevations from 10,800 to 13,500 ft. The plants grow on weathered rock and loose soil in the alpine tundra, on scree margins and in fell-fields. Associated species often include alpine avens (*Geum rossii*), snow willow (*Salix reticulata*), false strawberry (*Sibbaldia procumbens*), and alpine bistort (*Bistorta bistortoides*).

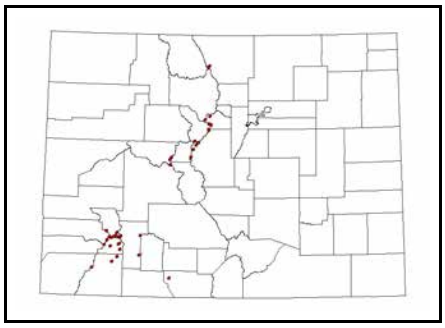


Figure 24.
Distribution of *Draba streptobrachia* in Colorado

Global Range: Endemic to Colorado.

State Range: Found in 15 counties, in the San Juan Mountains and also in the Sawatch, Mosquito, and Front Ranges. New occurrences found in 2005 are at Rolling Mountain and Crater Lake.

Distribution/Abundance: There are 42 known occurrences in Colorado. Several have over 1000 individuals, although a typical location usually has fewer than 200.

Known Threats and Management Issues: Most occurrences are in National Forests, with several in designated wilderness areas. This species is found at high elevations, often in fairly inaccessible locations, and therefore enjoys some natural protection. However, some plants are still vulnerable to direct disturbances such as trampling. This, along with other alpine species that are restricted to high elevations may be threatened by global climate change.

Potential Conservation Areas on San Juan National Forest in Dolores and Montezuma counties that support *Draba streptobrachia:* Elliott Mountain-Sockrider Peak; Navajo Basin, Rolling Mountain, Crater Lake.

Draba streptobrachia

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	500or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact. There is no evidence of excessive damage from herbivory or trampling.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality, i.e., no exotic plant species or significant human disturbances. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species.	The site is of good quality. It has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means.	The site is of fair quality, and may be somewhat degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance. The site may have low defensibility, i.e. on private land with no other protection.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Eriophorum altaicum var. *neogaeum* (Altai cottongrass)

Taxonomy
Class: Monocotyledoneae
Order: Cyperales
Family: Cyperaceae
Genus: *Eriophorum*

Taxonomic Comments: A more common, closely related plant, the narrowleaf cottongrass (*E. angustifolia*), has multiple heads and leaf blades nearly as long as the stems. It is closely related to plants found in Siberia (Weber and Wittman 2001).

CNHP Ranking: G4?T3? S3

State/Federal Status: Forest Service Sensitive

Figure 25. *Eriophorum altaicum* var. *neogaeum*
Photo by Peggy Lyon

Description: The plants are rhizomatous, with solitary white fleecy heads on the tops of the stems, and lacking well-developed leaf blades (Weber 1996).

Habitat Comments: Altai cottongrass grows in wet meadows, fens, and around ponds, usually above or at treeline. It is often associated with elephant-head (*Pedicularis groenlandica*), tufted hairgrass (*Deschampsia cespitosa*), marsh marigold (*Caltha leptosepala*), mosses and sedges. It grows in patches in wetlands at high elevations, often associated with water sedge (*Carex aquatilis*), marsh marigold (*Caltha leptosepala*), elephant head (*Pedicularis groenlandica*) and tufted hairgrass (*Deschampsia cespitosa*). In San Juan County, it is sometimes associated with iron fens.

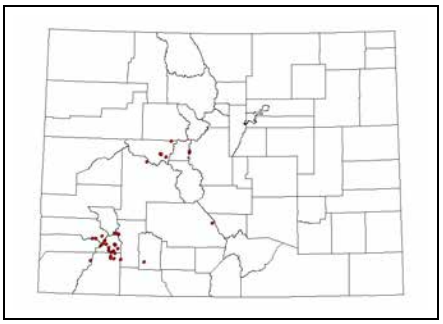


Figure 26. Distribution of *Eriophorum altaicum* var. *neogaeum* in Colorado

Global Range: *Eriophorum altaicum* var. *neogaeum* is the New World variety of a circumpolar species. In North America, it occurs in Colorado, Montana, Utah, Wyoming and British Columbia. It is unranked in all but Colorado.

State Range: Altai cottongrass occurs in 13 counties in Colorado: Eagle, Gunnison, La Plata, Mineral, Park, Pitkin, Saguache, San Juan, Dolores, Hinsdale, Montezuma, Archuleta and San Miguel. There are 22 Potential Conservation Areas in the San Juan National Forest that support Altai cottongrass.

Distribution/Abundance: There are 36 known occurrences in Colorado, in 13 counties. Several locations have over a thousand individuals.

Known Threats and Management Issues: Threats appear to be limited for this species; however, local trampling may affect easily accessed occurrences. The primary management issue is maintaining the natural hydrologic regime of the wetlands in which it occurs.

Potential Conservation Areas on San Juan Public Lands that support *Eriophorum altaicum* var. *neogaeum:* Grindstone Lake, Navajo Basin, Endlich Mesa, Lime Mesa, Ice Lakes Basin, Snowdon Peak, Crater Lake, Highland Mary Lakes, Clear Lake, Molas Pass, West Lime Creek, Kite Lake, California Gulch, Cinnamon Pass, Balsam Lake, Sunlight Lake, Needle Creek at Emerald Lake, Lake Marie, West Virginia Gulch, Spencer Basin, South Fork Mineral Creek, Cave Basin Lakes.

Eriophorum **altaicum var.** *neogaeum*

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	500 or more individuals	100 or more individuals	25 or more individuals	Less than 25 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact. There is no evidence of excessive damage from herbivory or trampling.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality, i.e., no exotic plant species or significant human disturbances. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species.	The site is of good quality. It has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means.	The site is of fair quality, and may be somewhat degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance. The site may have low defensibility, i.e. on private land with no other protection.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Eriophorum chamissonis (Chamisso's cottongrass)

Taxonomy
Class: Monocotyledoneae
Order: Cyperales
Family: Cyperaceae
Genus: *Eriophorum*

Taxonomic Comments: Similar to Altai cottongrass, the five specimens at the University of Colorado Herbarium were all originally identified as *E. altaicum* var. *neogaeum*, until they were annotated by R. Hartman in 2001. A more common, closely related plant, the narrowleaf cottongrass (*E. angustifolia*), has multiple heads and leaf blades nearly as long as the stems.

CNHP Ranking: G5 S1

State/Federal Status: Forest Service Sensitive

Figure 27. *Eriophorum chamissonis.*
Photo by Emmet J. Judziewicz, Wisconsin State Herbarium Vascular Plant Database, used with permission

Description: Like Altai cottongrass, the plants are rhizomatous perennials, with solitary white fleecy heads on the tops of the stems, and lacking well-developed leaves. *E. chamissonis* has anthers about 1 mm. long, and may have cinnamon colored bracts (Dorn 1984). However, on many speciment at the University of Colorado herbarium the cinnamon color is not obvious.

Habitat Comments: Chamisso's cottongrass grows in patches in wetlands at high elevations, often associated with water sedge (*Carex aquatilis*), marsh marigold (*Caltha leptosepala*), elephant head (*Pedicularis groenlandica*), tufted hairgrass (*Deschampsia cespitosa*) and other *Eriophorum* species (*altaicum, gracile, angustifolia*). In La Plata County, it was found in a peat bog dominated by water sedge in a pristine basin at 11,800 ft.

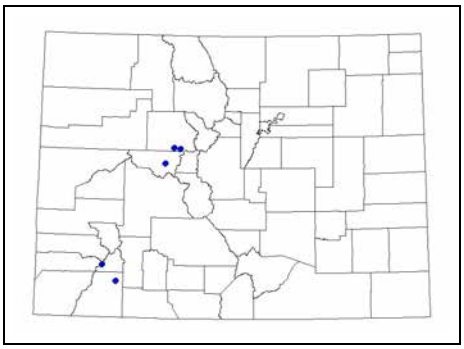


Figure 28.
Distribution of *Eriophorum chamissonis* in Colorado

Global Range: *Eriophorum chamissonis* is a circumpolar species, occurring primarily in Canada, where it is considered secure. In the U.S. it is known from the northern tier of states—Washington, Idaho, Montana, North Dakota and Michigan, extending to Oregon Wyoming and Colorado. It is ranked S1 in Oregon, North Dakota and S2 in Wyoming. Colorado is its southernmost location.

State Range: It occurs in 4 counties: Eagle, Pitkin, San Juan and La Plata.

Distribution/Abundance: There are 6 known occurrences in Colorado, two of which are in the San Juan National Forest. Each population was estimated at between 50 and 100 individuals.

Known Threats and Management Issues: Threats appear to be limited for this species; however, local trampling may affect easily accessed occurrences. The primary management issue is maintaining the natural hydrologic regime of the wetlands in which it occurs.

Potential Conservation Areas in the San Juan Public Lands that support *Eriophorum chamissonis*: Endlich Mesa Basin.

Eriophorum chamissonis

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	200 or more individuals	100 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact. There is no evidence of excessive damage from herbivory or trampling.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality, i.e., no exotic plant species or significant human disturbances. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species.	The site is of good quality. It has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means.	The site is of fair quality, and may be somewhat degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance. The site may have low defensibility, i.e. on private land with no other protection.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Hippochaete variegata (variegated scouring rush)

Taxonomy
Class: Equisetopsida
Order: Equisetales
Family: Equisetaceae
Genus: *Equisetum*

Taxonomic Comments: *Hippochaete variegata* Schleich. *ex* Weber & Mohhr is also known as *Equisetum variegatum* var. *variegatum and Equisetum hyemale var. variegatum.* Variegated scouring rush is a member of the primitive horsetail family, *Equisetaceae*. The horsetails are one of the most ancient lineages of land plants, abundantly found in fossils from the Paleozoic era and relatively unchanged since then.

CNHP Ranking: G5T5 S1

State/Federal Status: None

Figure 29. *Hippochaete variegata*
Photo by Peggy Lyon

Description: *Hippochaete variegatum* var. *variegata* is a perennial herbaceous plant with rough-surfaced evergreen stems. Its cones can mature in late summer, or they can overwinter and shed spores in spring. It is distinguished from the more common *H. hyemalis* by its smaller and more slender stems. This relative of the more common scouring rush is slender, with 5 to 12 angled and grooved stems compared with 16 to 48 grooves in the more stout stems of its relatives. Silica on the surface of the stems gives them their common name, and today, as in Colonial times they are sometimes used for scouring out pots and pans (Weber and Wittman 2001).

Habitat Comments: *Hippochaete variegatum* var. *variegatum* is found at lakeshores, riverbanks, and ditches and in wet woods. In La Plata County it was found in a small marshy area within a Colorado blue spruce/Drummond's willow community at 8447 ft. Associated species included *Carex aurea, Oxypolis fendleri, Equisetum arvense, Habenaria hyperborea, Swertia perennis, Distegia involucrata* and *Parnassia fimbriata*.

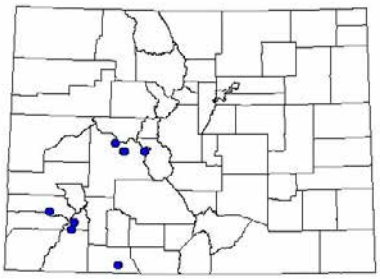


Figure 30.
Distribution of *Hippochaete variegata* in Colorado

Global Range: The range of *Hippochaete variegatum* var. *variegatum* is circumpolar in the North Temperate Zone, extending into the Arctic.

State Range: There are seven records of the species in the CNHP database, in Gunnison, Archuleta, San Miguel, San Juan and La Plata counties. Specimens at the University of Colorado Herbarium represent seven additional counties.

Distribution/Abundance: This species may be more common than believed, and merely overlooked.

Known Threats and Management Issues: Threats to the variegated scouring rush include human activities (recreation, road and trail maintenance activities, selection of grazing areas), invasion by exotic plant species, and changes in hydrology.

Potential Conservation Areas in the San Juan Public Lands that support *Hippochaete variegata*: Cascade Creek, West Lime Creek, Kenney Flats.

Hippochaete variegata

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	500 or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact. There is no evidence of excessive damage from herbivory or trampling.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality, i.e., no exotic plant species or significant human disturbances. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species.	The site is of good quality. It has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means.	The site is of fair quality, and may be somewhat degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance. The site may have low defensibility, i.e. on private land with no other protection.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Ipomopsis polyantha (Pagosa gilia)

Taxonomy
Class: Dicotyledoneae
Order: Solanales
Family: Polemoniaceae
Genus: *Ipomopsis*

Taxonomic Comments: This species is sometimes placed in the genus Gilia. As treated by Kartesz (2/99 review draft dataset), the plants sometimes called *Gilia polyantha* var. *whitingii* are included here, without recognition of varieties or subspecies. CNHP treats plants of Colorado (the typical variety) as distinct from those of New Mexico and Arizona (locality of var. *whitingii*).

CNHP Ranking: G1 S1

State/Federal Status: Forest Service and BLM Sensitive

Phenology: *Ipomopsis polyantha* flowers from July to August with a fruiting period extending from August to September.

Figure 31. *Ipomopsis polyantha*
Photo courtesy of Sara Brinton.

Habitat Comments: *Ipomopsis polyantha* is restricted to clay soils derived from Mancos Shale, which forms a wide swath through the center of Archuleta County from northwest to southeast. The plants grow in areas that are recently disturbed. Although presumably there are areas where disturbance is natural, for instance by natural erosion or burrowing animals, all populations that we observed were disturbed by humans.

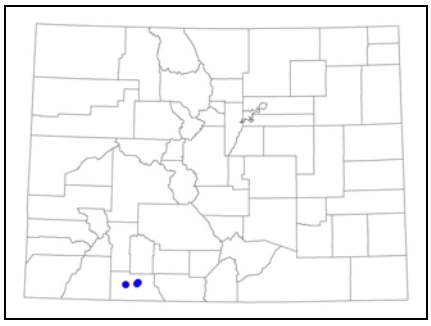


Figure 32.
Distribution of *Ipomopsis polyantha* in Colorado

Global Range: *Ipomopsis polyantha*, is known only from Archuleta County, Colorado.

State Range: Nearly all the suitable habitat for this species is on private land in the vicinity of Pagosa Springs, and is subject to development. The other major habitat is along the Highway 84 right-of-way, where it is vulnerable to road maintenance or improvement activities. There are several small patches in vacant lots, roadsides and pastures scattered throughout sub-divisions south of Pagosa Springs, but they are fragmented, and may be too small to be viable in the long term. A new population was found in 2002 on private land along Mill Creek, more than a mile east of the closest known location.

Distribution/Abundance: *Ipomopsis polyantha* is one of the most rare species in Colorado, and threatened with extinction. The extreme rarity of this species may call for unusual measures to prevent its extinction. Several private landowners have expressed interest in the plant, and could be approached for conservation easements or management agreements. Most of the plants are on very small parcels, containing only a fragment of the total population. Areas of this size are usually considered too small for easements. However, the risk of losing an entire species may dictate that small easements are worthwhile in this case. The first occurrence on public land was located in 2005, on an 80 acre BLM parcel north of Highway 160 at Dyke, in the Stollsteimer Creek PCA. This parcel is slated for exchange to the adjacent private property owner, subject to a conservation easement. By far the largest population extant was found on private land at the Archuleta County Fairgrounds. There is no protection in place for this site, although development may not occur for several years. The property owners have given permission to use this population as a seed source for propagation in protected areas.

Known Threats and Management Issues: Development of the private land with the largest population would severely limit the number of individuals and increase the threat of extinction. Management strategies for the Pagosa gilia are complicated by the fact that the species often colonizes disturbed areas. However, extreme disturbances such as horse grazing have been shown to extirpate the species. Much of the population is along the right of way of Highway 84. Widening of the highway would probably exterminate these plants. On the other hand, it has been noted that the population has been extended southward along the highway, perhaps due to movement of soils from shoulder maintenance. Spraying of roadside weeds would probably be extremely detrimental. The species was listed as a candidate under the Endangered Species Act in 2005. Local volunteers have begun a program of transplanting rosettes and seeding

Potential Conservation Areas in the San Juan Public Lands that support *Ipomopsis polyantha*: Stollsteimer Creek North.

Figure 33. Habitat of *Ipomopsis polyantha* on BLM parcel at Stollsteimer Creek PCA.

Figure 34. Dense stand of *Ipomopsis polyantha* at fairgrounds in Pagosa Springs.

Photos by Peggy Lyon

Ipomopsis polyantha

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	10,000 or more individuals	1000 or more individuals	50 or more individuals	Less than 50 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Both flowering plants and first year rosettes are represented, indicating that the reproductive mechanisms and other ecological processes are intact. There is no evidence of excessive damage from herbivory or trampling.	The occurrence should have a good likelihood of long-term viability. Both flowering plants and first year rosettes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality for this species. Disturbance within the last five years, whether natural or human caused may be a requisite. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. It should be surrounded by an area which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species.	The site is of good quality. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means.	The site is of fair quality, and may be somewhat degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance. The site may have low defensibility, i.e. on private land with no other protection.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Machaeranthera coloradoensis (Colorado tansy-aster)

Taxonomy
Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae
Genus: *Machaeranthera*

Taxonomic Comments: Two formerly recognized varieties, var. *brandegei* and var. *coloradoensis*, are no longer considered distinct by experts (Beatty et al 2004). Reclassification of the genus to *Xanthisma* has been proposed (Beatty et al. 2004).

CNHP Ranking: G2 S2

State/Federal Status: Forest Service Sensitive

Figure 35. *Machaeranthera coloradoensis*
Photo by Peggy Lyon

Description and Phenology: Colorado tansy-aster is a striking member of the sunflower family (*Asteraceae*). It is a low-growing perennial cushion plant with a large taproot, short stems, a large head with rose-colored ray flowers and shallowly to coarsely toothed leaves. The plants flower from early July through mid-August, and set seed from August through September.

Habitat Comments: Colorado tansy-aster is found in gravelly places or rock outcrops, often on sandstone or limestone, from ponderosa pine communities to alpine tundra. It is reported from elevations between 7,675 to 12,940 ft. (Beatty et al. 2004) in both moist and dry sites, often on gravelly soils with sparse vegetation. In the San Juan National Forest in Dolores County, it was found on eroded sandstone of the Dolores Formation above timberline.

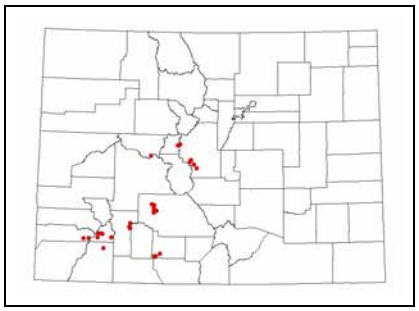


Figure 36. Distribution of *Machaeranthera coloradoensis* in Colorado

Global Range: The species is restricted to the Rocky Mountains in south-central Wyoming and western Colorado. It is ranked very rare (S1) in Wyoming. There is a large gap between the southern Colorado and southern Wyoming populations.

State Range: In Colorado it is known from Dolores, Gunnison, Hinsdale, Lake, La Plata, Park, Pitkin, Rio Grande, Saguache, and San Juan counties. There are five occurrences on the San Juan National Forest: three in San Juan County and one each in La Plata and Dolores counties.

Distribution/Abundance: There are 25 known occurrences in Colorado, several with over 1000 individuals. There are 18 specimens at the University of Colorado Herbarium. Seven occurrences, including one historic (H) are within the San Juan National Forest.

Known Threats and Management Issues: No immediate threats are known. Potential threats include trampling and herbivory by domestic sheep or direct disturbance by recreationists. Invasion of non-native species could threaten some habitats.

Potential Conservation Areas on San Juan Public Lands in Dolores and Montezuma counties that support *Machaeranthera coloradoensis*: Storm Peak, Summit Pass, Colorado Trail at Lime Creek Headwaters, Kite Lake, Lime Mesa, and Grand Turk South.

Machaeranthera coloradoensis

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A	B	C	D
Size	1000 or more individuals	500 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, and there is evidence of flowering and fruiting, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	There is a fair likelihood of long-term viability. The occurrence may be less productive than the above situations, but is still viable.	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. The ecological processes needed to sustain the species are intact Depth and longevity of snowpack and exposure are likely to be highly pertinent to the persistence of occurrences of this species .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible. The ecological processes needed to sustain the species are intact	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility. The ecological processes needed to sustain the species are still intact	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Penstemon breviculus (short-stem beardtongue)

Taxonomy
Class: Dicotyledoneae
Order: Scrophulariales
Family: Scrophulariaceae
Genus: *Penstemon*

Taxonomic Comments: Synonym: *Penstemon jamesii* Bentham ssp. *breviculus* Keck. Its closest relatives are *P. ophianthus* and *P. jamesii (NMRP).*

CNHP Ranking: G3 S2

State/Federal Status: None

Figure 37. *Penstemon breviculus*
Photograph courtesy Southwest Colorado Wildflowers. www.swcoloradowildflowers.com used with permission

Description and Phenology: *Penstemon breviculus* is an herbaceous perennial with stems 0.8-2.0 dm tall, erect, or slightly upward-curving, retrorsely puberulent; leaves are mostly basal, opposite, entire or rarely few toothed, lanceolate, elliptic, or spatulate. Basal leaves are somewhat petiolate, and stem leaves sessile. The inflorescence is short, 4-12 cm long; calyx 5-8 mm long in flower, lobes lanceolate, glandular hairy; corollas 10-15 mm long, throat 3.5-6 mm wide, dark blue to purple with dark violet-purple guidelines, glandular, pubescent externally. The staminode is included within the throat or barely projecting but clearly visible, bearded with yellow thread-like hairs its full length, the hairs pointing back down the throat. Fertile stamens are explanate (open up flat). The plants flowers in May and June. (New Mexico Rare Plants)

Habitat Comments: Sandy or clay soils in sagebrush, semi-desert shrub and pinyon-juniper communities from 4,800 to 6,000 ft. (NMRP)

Figure 38.
Distribution of *Penstemon breviculus* in Colorado

Global Range: *Penstemon breviculus* is found in the Four Corners states: Colorado, Arizona, New Mexico and Utah. In Utah it is ranked S1, S3 in New Mexico, and is not ranked in Arizona. This species has a patchy distribution throughout its range, from Grand County, Utah, to the Four Corners region.

State Range: In Colorado, it has been documented in Montrose, San Miguel and Montezuma counties.

Distribution/Abundance: There are 21 occurences in Colorado. Ten of these are on BLM lands within the San Juan Resource Area, in Montrose, San Miguel and Montezuma counties. It is expected that with further survey this species will be found to fairly common and its state rank lowered.

Known Threats and Management Issues: The New Mexico Rare Plants website states that the species is not significantly threatened by the prevailing land uses within its habitat. Small portions of some populations have been eliminated by energy development activities, including pipelines, well pads, and road building. (New Mexico Rare Plants 2004)

Potential Conservation Areas on San Juan Public Lands that support *Penstemon breviculus:* Mesa Verde Entrance, Mud Canyon, Sand Canyon, Cannonball Mesa, Slick Rock, Little Gypsum Valley, Big Gypsum Valley, Dry Creek Basin (all BLM).

Penstemon breviculus

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A	B	C	D
Size	500 or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Penstemon utahensis (Utah beardtongue)

Taxonomy
Class: Dicotyledoneae
Order: Scrophulariales
Family: Scrophulariaceae
Genus: *Penstemon*

Taxonomic Comments: *Penstemon utahensis* Eastwood

CNHP Ranking: G4 S2

State/Federal Status: None

Figure 39. *Penstemon utahensis*
Photo by Peggy Lyon

Description and Phenology: *Penstemon utahensis* is unique among the *Penstemons* of the Four Corners area in its bright magenta flower color. Its flowers are large with spreading corolla lobes, and tend to be horizontal rather than ascending. Its leaves are glaucous, although less so than those of *P. lentus.*

Habitat Comments: *Penstemon utahensis* grows on hot sunny rocky slopes in the semi-desert shrub zone. At the Cannon Ball Mesa site, plants were growing on rocky slopes with scattered junipers (*Juniperus osteosperma*), shadscale (*Atriplex confertifolia*) and snakeweed (*Gutierrizia sarothrae*). Other associated species were twin bladderpod (*Physaria acutifolia*), mock thrift goldenweed (S*treptanthus armerioides*) and yucca (*Yucca harrimanieae*).

Figure 40.
Distribution of *Penstemon utahensis* in Colorado

Global Range: *Penstemon utahensis* is known from five southwestern states: Colorado, California, Arizona, Nevada and Utah. It is ranked S2 in California, and not ranked in Arizona, Nevada or Utah.

State Range: In Colorado it is found close to the Utah border in Mesa and Montezuma counties.

Distribution/Abundance: There are 9 occurrences in Colorado in the CNHP database, including two new occurrences from 2005.

Known Threats and Management Issues: Herbivory by livestock has been observed. Weed invasion and direct disturbance from roads or OHVs are potential threats to some occurrence.

Potential Conservation Areas on San Juan Public Lands that support *Penstemon utahensis:* Cannon Ball Mesa, Rincon Canyon and Ismay Trading Post.

Penstemon utahensis

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A	B	C	D
Size	500 or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Physaria pulvinata (cushion bladderpod)

Taxonomy
Class: Dicotyledoneae
Order: Capparales
Family: Brassicaceae
Genus: *Physaria*

Taxonomic Comments: *Physaria pulvinata* Reveal was newly discovered and described by James Reveal in 2004. The type locality is in San Miguel County near Miramonte Reservoir. The genus *Physaria* (Nutt.) A. Gray (*Brassicaceae* Burnett) was recently redefined to include most of the taxa previously assigned to *Lesquerella* S. Watson (Al-Shehbaz & O'Kane 2002).

CNHP Ranking: G1S1

State/Federal Status: none

Figure 41. *Physaria pulvinata*
Photo by Peggy Lyon

Description: Plants are low and compact, densely matted, densely pubescent, long-lived perennials (0.3) 0.5-3 dm across with reddish stems and gray-green foliage arising from a deep-seated taproot terminated by a buried, densely branched caudex system of up to several hundred branches each ending in a tufted cluster of leaves. Flowers are yellow, 4-7 mm. long, narrowly spatulate. Siliques are ellipsoid, compressed, 4-6 mm. long, densly pubescent.

Phenology: Plants were in flower in June in 2004 and in late May in 2005. The population at Plateau Creek was in fruit by July 1, 2005.

Figure 42. Habitat of *Physaria pulvinata* by James Reveal.
Used with permission. This and other photos may be viewed online at http://www.life.umd.edu/emeritus/reveal/pbio/RevealSlides/brasphypul.html

Habitat Comments: The species is described from widely scattered, grayish, argillaceous shale (Mancos shale) at elevations between 7600 an 8500 ft. When in flower, it often appears to be the dominant plant in openings between low shrubs of *Artemisia nova*, *Chrysopsis*, and *Tetraneuris*, and herbs such as *Sphaeraclea* and *Cryptantha*. *Juniperus* tends to be nearby but only occasionally does this pygmy conifer grow with the bladderpod (Reveal 2004).

Global Range: Dolores and San Miguel counties of southwestern Colorado.

State Range: Central Dolores and San Miguel counties.

Distribution/Abundance: *Physaria pulvinata* is known only from scattered outcrops of a grayish, argillaceous shale in central Dolores and San Miguel counties, Colorado. The species tends to be locally common where it occurs, and when in flower, often appears to be the dominant plant in openings between low shrubs.

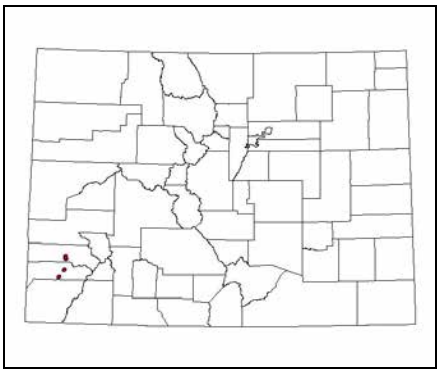


Figure 43.
Global and state distribution of *Physaria pulvinata.*

Known Threats and Management Issues: Populations of *Physaria pulvinata* are currently known from lands managed by the U. S. Forest Service, the Bureau of Land Management, and the State of Colorado. Without exception, all of these populations are subject to immediate and on-going threats from over-grazing, intense recreational use, and soil disturbance. It is the latter that has had the greatest impact on the extant populations as the shale, to which the plant is confined, is used to surface local gravel roads. Portions of populations are presently protected from active soil removal because they are near lakeshores or along power line right-of-ways. Nonetheless, off-road vehicle traffic still takes a toll. Until a thorough search for the cushion bladderpod is conducted, federal and state agencies should curtail their use of the shale where the plant occurs. We urge an immediate survey to ascertain the full extent of the distribution of *P. pulvinata* beyond what is mentioned here (Reveal 2004).

Physaria pulvinata

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A	B	C	D
Size	500 or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Polypodium saximontanum (Rocky Mountain polypody)

Taxonomy
Class: Filicopsida
Order: Filicales
Family: Polypodiaceae
Genus: *Woodsia*


Figure 44. *Polypodium saximontanum*
Photo by Peggy Lyon

Taxonomic Comments: Prior to its recognition as a species, collections were variously referred to as *Polypodium montense, P. amorphum, P. hesperium* and *P. virginianum.* It is morphologically distinguishable from all these species and also has a different range from both *P. amorphum* and *P. virginianum.* However, these early misidentifications may have caused some confusion and there may be misidentified specimens still present in herbaria. For example, at the University of Wyoming herbarium there are records (10 August, 1998) for *P. vulgare* var. *columbianum* in southeast Wyoming. Kartesz (1994) reports that *P. vulgare* var. *columbianum* is a synonym for *P. hesperium* that, according to FNA (1993) does not occur in this region. It appears that the records in the University of Wyoming herbarium more likely refer to *P. saximontanum*. Considering its range and the documented EOs that either refer, or are likely to refer, to *P. saximontanum* it is estimated that there are at least 20 extant EOs. The population at Piedra River Trail was originally identified as *P. hesperium*, and corrected in 2005.

CNHP Ranking: G3? S3

State/Federal Status: None

Description and Phenology: *Polypodium saximontanum* is a slender fern. Its stems are often whitish, to 6mm in diameter, and acrid tasting. The scales are weakly bi-colored, lanceolate and contorted at the ends. The bases and margins are light brown and the margins often coarsely dentate. The leaves are up to 25 cm long with slender petioles and pinnatifid blades that have an oblong and linear outline. The widest part of the leaf is widest near the middle and up to 4cm wide. The sori are midway between the margin and midrib and less than 3mm in diameter. This species produces spores during the summer and fall (Haufler et al. 1993). It is distinguished from the closely related *P. hesperium* by the darker stripe in the middle of the rhizome, as opposed to the single color of the *P. hesperium* rhizomes.

Habitat Comments: *Polypodium saximontanum* grows in rock crevices or at the base of rocks in dry montane forests. In the Piedra River Canyon, it was found within a community of Douglas fir and blue spruce (*Pseudotsuga menziesii* and *Picea pungens*), with mixed shrubs and some white fir and aspen (*Abies concolor* and *Populus tremuloides*). Pinus ponderosa is dominant at the upper elevations. Other associated species were Gambel oak (*Quercus gambellii*), mountain lover (*Paxistima myrsinite*), common juniper (*Juniperus communis*), poison ivy (*Toxicodendron rydbergii*), meadowrue (*Thalictrum fendleri*), Oregon grape (*Mahonia repens*) and a high diversity of ferns, mosses and lichens.

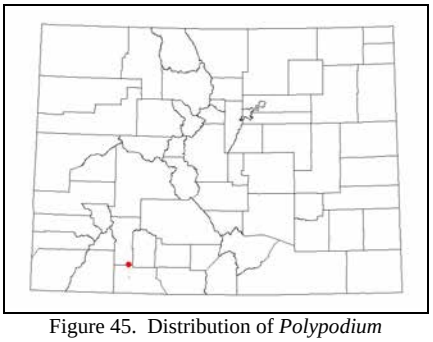


Figure 45. Distribution of *Polypodium saximontanum* in Colorado

Global Range: *Polypodium saximontanum* is sporadically scattered throughout its range, which is restricted to the mountains of extreme northern New Mexico, Colorado, eastern Wyoming, and extreme western South Dakota. It is ranked S1 in Wyoming, and not ranked in New Mexico and South Dakota.

State Range: The occurrence in the Piedra River Canyon documented in 2005 is the first in the CNHP database. However, there are 21 collections from 10 Colorado counties at the University of Colorado herbarium. Many of these were originally identified as other *Polypodium* species. The Piedra River Canyon occurrence is the first for Archuleta County and for the San Juan National Forest.

Distribution/Abundance: There is little information on abundance given for the Colorado collections. One herbarium label says "frequent" and another "rare", with only five plants. Most imply that the collection was taken from a single boulder. Since it is difficult to determine what constitutes a single plant, it may be more practical to compare linear distance along a crevice. Ranking specifications given below are provisional, and more field observations will help to better evaluate comparative population sizes.

Known Threats and Management Issues: *Polypodium* species are recommended in popular medicinal plant guides (e.g. Forey and Lindsay, 1991). This may threaten populations near urban centers but the remoteness of many of the areas where it grows suggests that it is unlikely that this is a significant threat. Similarly, the locations inhabited by this species are unlikely to be impacted by typical human land uses in the near future. The impact of livestock grazing, logging and of wildfire and its control has not been studied. However, the populations in the Piedra River Canyon, although near popular hiking trails, are in crevices of cliffs and large boulders, where they are unlikely to be disturbed.

Potential Conservation Areas on San Juan Public Lands that support *Polypodium saximontanum:* Piedra River Trail (NF)

Figure 46. Habitat of *Polypodium saximontanum* at Piedra River Trail PCA
Photo by Peggy Lyon.

Polypodium saximontanum

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria (provisional)

Rank:	A	B	C	D
Size (provisional)	50 or more linear feet	20 or more linear feet	2 or more linear feet	Less than 2 linear feet
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Sporobolus nealleyi (gyp dropseed)

Taxonomy
Class: Monocotyledoneae
Order: Cyperales
Family: Poaceae
Genus: *Sporobolus*

Taxonomic Comments: *Sporobolus nealleyi* Vassey

CNHP Ranking: G5 S1

State/Federal Status: None

Description and Phenology: A native perennial grass. The slender, erect culms are 4 to 20 inches tall, and not rhizomatous. Leaf blades are 1-3 inches long and less than 1/16 inch wide, spreading at right angles from the culm, slightly rough on the upper surface and with inrolled edges. The panicles of the inflorescence are 1-4 inches long, and the lower portion may be partly or even completely enclosed by the sheath. The short secondary panicle branches are commonly solitary, and lack spikelets on the lower portion (Peterson et al. 2003).

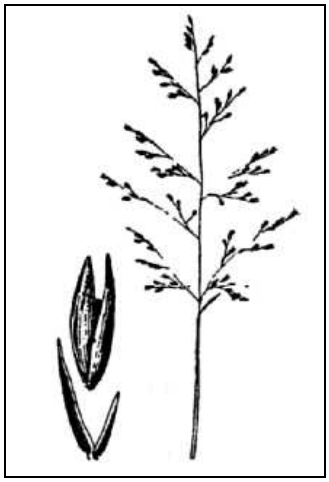


Figure 47. *Sporobolus nealleyi*
USDA-NRCS PLANTS Database / Hitchcock, A.S. (rev. A. Chase). 1950. Manual of the grasses of the United States. USDA Misc. Publ. No. 200. Washington, DC.

Habitat Comments: .*Sporobolus nealleyi* is found in a variety of habitats, but primarily on gypsum outcrops with sparse vegetation. In some areas of New Mexico, it can be the dominant species in a sparse grassland community. In Colorado, it was found on gypsum outcrops with several other rare species, *Cryptantha gypsophila*, and three lichens. Other associated species were needle-and-thread (*Hesperostipa comata*), alkali sacaton (*Sporobolus aeroides*), broom snakeweed (*Gutierrezia sarothrae*), cheatgrass (*Bromus tectorum*), longleaf buckwheat (*Eriogonum lonchophyllum*), winterfat (*Krascheninnikovia lanata*) and tansy mustard (*Descurainia pinnata*).

Figure 48.
Distribution of *Sporobolus nealleyi* in Colorado

Global Range: *Sporobolus nealleyi* is known from the southwestern U.S. in Arizona, New Mexico, Nevada and Texas. The occurrence at Big Gypsum Valley is the first for Colorado. It is also, surprisingly, shown as occurring in Maine. It is unranked in all of the states but Colorado, where it is provisionally given a state rank of S1.

State Range: Known only from Big Gypsum Valley in San Miguel County. However, more research in other areas with gypsum outcrops may lead to additional occurrences.

Distribution/Abundance: The species appears to be quite common in New Mexico, Arizona and Texas.

Known Threats and Management Issues: The same threats that apply to the other rare species in Big Gypsum Valley threaten this grass, including surface disturbance associated with oil and gas development, off-road vehicle traffic and trampling by livestock .

Potential Conservation Areas on San Juan Public Lands that support *Sporobolus nealleyi*: Big Gypsum Valley.

Sporobolus nealleyi

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A	B	C	D
Size (provisional)	500 or more individuals	100 or more individuals	50 or more individuals	Fewer than 50 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Townsendia glabella (Gray's Townsend-daisy)

Taxonomy
Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae
Genus: Townsendia

Taxonomic Comments: *Townsendia glabella* A. Gray was first described as *T. bakeri* Greene in 1900. The type specimen was collected at Los Pinos in Archuleta County in 1899.

CNHP Ranking: G2 S2

State/Federal Status: None. Currently on list of species considered for inclusion on Forest Service sensitive species list for Region 2, but for which more information is needed.

Figure 49. *Townsendia glabella*
Photo by Peggy Lyon

Description and Phenology: *Townsendia glabella* is an herbaceous caespitose perennial, with bluish-white flowers. Leaves are mostly glabrous, or with a few sparse hairs, distinguishing it from the more common *T. incana*, which has cinereous leaves. Its phyllaries (bracts at the base of the flower head) are narrower and more sharp pointed than the similar Rothrock's Townsend-daisy. Plants flower in May and June.

Habitat Comments: *Townsendia glabella* grows on level to steeply sloping shale slopes with clay soils derived from Mancos Shale. In Montezuma County, it was found in the pinyon-juniper zone on a relatively rare member of the Mancos formation known as the Smoky Hill oyster bench. Fragments of fossil oyster shells can be seen in this member. In Archuleta County it was common on shale slopes with human or natural disturbance.

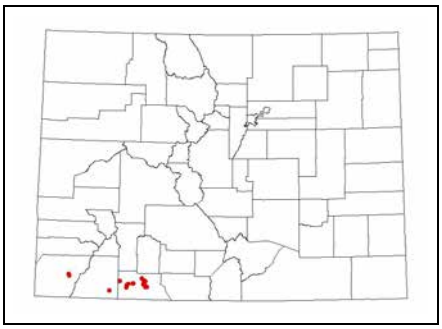


Figure 50.
Distribution of *Townsendia glabella* in Colorado

Global Range: This species is endemic to Colorado in Montezuma, La Plata, and Archuleta counties, Colorado, and is known from at most 10 to 20 locations.

State Range: In Colorado the total range of *Townsendia glabella* is very small, extending from Pagosa Springs to Mesa Verde N.P. A record from Grand Junction is suspected to be a mis-identification.

Distribution and Abundance: *Townsendia glabella* has a very limited distribution, and it is rare throughout its limited range. There are currently 20 known occurrences. In 2005 it was found to be locally abundant in the Pagosa Springs area, with seven new occurrences documented. These populations should be monitored to determine whether they persist at this level or may have been unusually abundant in 2005.

Known Threats and Management Issues: Threats to *Townsendia glabella* include direct disturbance on individuals from human activities and invasion by exotic plant species. It naturally grows in sparsely vegetated areas, and any treatments to increase forage or stabilize soils by planting grasses or irrigating would be detrimental to the species.

Potential Conservation Areas in San Juan Public Lands that support *Townsendia glabella.* Stollsteimer Creek North (BLM), Yellowjacket Pass (FS),and Turkey Mountain (FS).

Townsendia glabella

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A	B	C	D
Size (provisional)	500 or more individuals	100 or more individuals	50 or more individuals	Fewer than 50 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. Natural disturbances such as erosion are common and may be required for the species. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Townsendia rothrockii (Rothrock's Townsend daisy)

Taxonomy
Class: Dicotyledoneae
Order: Asterales
Family: Asteraceae
Genus: *Townsendia*

Taxonomic Comments:

CNHP Ranking: G2 S2

State/Federal Status: None. Currently on list of species considered for inclusion on Forest Service sensitive species list for Region 2, but for which more information is needed.

Figure 51. *Townsendia rothrockii*
Photo by Peggy Lyon

Description and Phenology: Rothrock's Townsend daisy is a perennial herb that forms low tufts of thick leaves, 1-3.5 cm long. Large, showy flower heads with pale blue rays surround a yellow disk. The plants begin to bloom as the snow melts in early summer.

Habitat Comments: *Townsendia rothrockii* grows in dry, rocky tundra above timberline in areas that retain snow into the summer, as well as occasionally on high plateau ridgetops and in openings in ponderosa pine forests, between 8,200 and 13,000 ft. The two occurrences in La Plata County, at Endlich Mesa and Lime Mesa, share similar habitats: fellfields, with shallow rocky soils over limestone, between 11,000 and 12,000 ft.

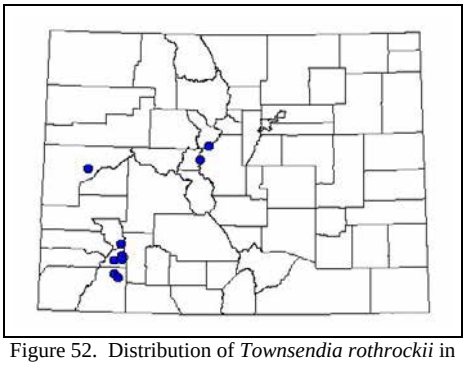


Figure 52. Distribution of *Townsendia rothrockii* in Colorado (CNHP records only)

Global Range: Endemic to Colorado

State Range: Park, San Juan, La Plata, Chaffee, Gunnison, Dolores, Lake, Mesa, Pitkin, Summit counties.

Distribution/Abundance: There are eight occurrences in the CNHP database, and 27 specimens at the University of Colorado Herbarium. Most of these occurrences have no information as to abundance. The two sites found in La Plata County this year each have thousands of individuals.

Known Threats and Management Issues: No immediate threats are known. Trails run through both populations in La Plata County, and direct disturbances may affect certain individuals, but no damage was noted. The rarity of this endemic plant would recommend it for addition to the Forest Service sensitive species list.

Potential Conservation Areas in La Plata County that support *Townsendia rothrockii*: Lime Mesa, Endlich Mesa.

Townsendia rothrockii

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A	B	C	D
Size	1000 or more individuals	500 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, and there is evidence of flowering and fruiting, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	There is a fair likelihood of long-term viability. The occurrence may be less productive than the above situations, but is still viable.	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. The ecological processes needed to sustain the species are intact Depth and longevity of snowpack and exposure are likely to be highly pertinent to the persistence of occurrences of this species .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible. The ecological processes needed to sustain the species are intact	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility. The ecological processes needed to sustain the species are still intact	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Trifolium kingii (King's clover)

Taxonomy
Class: Dicotyledoneae
Order: Fabales
Family: Fabaceae
Genus: *Trifolium*

Taxonomic Comments: *Trifolium kingii* ssp. *macilentum* - (Greene) J. Gillett. Other Related Names: *Trifolium kingii* var. *macilentum* (Greene) Isely ;*Trifolium macilentum* Greene

CNHP Ranking: G5 S1

State/Federal Status: None

Figure 53. *Trifolium kingii*
Photo by Peggy Lyon

Description and Phenology: This attractive tall pink clover has bright green three-parted toothed leaves and down-turned flowers that soon turn brown.

Habitat Comments: *Trifolium kingii* is found in wet meadows and streambanks in aspen and mixed conifer communities.

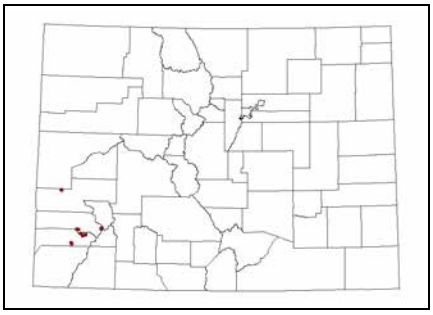


Figure 54.
Distribution of *Trifolium kingii* in Colorado

Global Range: *Trifolium kingii* is known from Colorado, Arizona, Idaho, Nevada and Utah. It is ranked S1 in Arizona, and unranked in Idaho, Nevada and Utah..

State Range: In Colorado, there are records from Montrose, San Miguel and Dolores counties.

Distribution/Abundance: There are now 14 known occurences in Colorado, including six found in 2004 in Dolores County There are five A ranked occurrence, 5 B-ranked, 1 C and 3 D.

Known Threats and Management Issues: Survival of *Trifolium kingii* populations is dependent on continuing the existing moisture regime. Any upstream diversions would negatively impact the plants. Direct disturbance from grazing or roads are additional threats.

Potential Conservation Areas on San Juan Public Lands that support *Trifolium kingii:* Mavreeso Creek-Cottonwood Canyon; Upper Fish Creek; Willow Creek at Groundhog Mountain; Navajo Lake Trail.

Trifolium kingii

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria (provisional)

Rank:	A Excellent viability	B Good viability	C Fair viability	D Poor viability
Size	500 or more individuals	200 or more individuals	20 or more individuals	Less than 20 individuals
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact. There is no evidence of excessive damage from herbivory or trampling.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	The site should be of high quality, i.e., no exotic plant species or significant human disturbances. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means. should be surrounded by an area which is unfragmented and which includes the ecological processes (such as reproductive mechanisms, fire, or flooding) which are needed to sustain this species.	The site is of good quality. It has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible, i.e., it should be on public land or protected from development by a conservation easement or other legal means.	The site is of fair quality, and may be somewhat degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance. The site may have low defensibility, i.e. on private land with no other protection.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Woodsia neomexicana (New Mexico cliff fern)

Taxonomy
Class: Filicopsida
Order: Filicales
Family: Dryopteridaceae
Genus: *Woodsia*

Taxonomic Comments: Weber (2001) puts this in the family *Woodsiaceae.*

CNHP Ranking: G4? S2

State/Federal Status: None. Currently on list of species considered for inclusion on Forest Service sensitive species list for Region 2, but for which more information is needed.

Figure 55. *Woodsia neomexicana*
Photo by CNHP

Description: A fern with pinnately compound fronds. It can be distinguished from the superficially similar common species *Cystopteris fragilis* by the indusium at base of the sorus, which splits evenly all around in a stellate pattern at maturity, as opposed to the one-sided indusium, attached like a hood, of *Cystopteris.* It can be distinguished from other species of *Woodsia* by its light brown or straw-colored stipe and translucent projections on the leaf margins.

Habitat Comments: Woodsia neomexicana is always found in crevices of rocks or cliffs, not in soil. Elevations of the species in Colorado range from 4,200 to 9,500 ft.

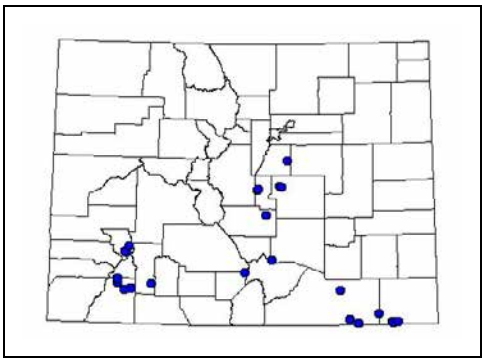


Figure 56.
Distribution of *Woodsia neomexicana* in Colorado

Global Range: Arizona, Colorado, New Mexico, Oklahoma, South Dakota, Texas and Utah.

State Range: Known from ten counties: Alamosa, Baca, Douglas, El Paso, Fremont, La Plata, Las Animas, Ouray, Archuleta and Teller counties.

Distribution/Abundance: There are 29 occurrences in the CNHP database. Six of these are in the San Juan National Forest. They are represented in five conservation areas. The sixth was ranked D (not viable), and therefore no PCA was created for it. There are usually fewer than 50 individuals per occurrence, many with only 10 or 12.

Known Threats and Management Issues: None. Most occurrences are naturally protected by their location in rock crevices.

Potential Conservation Areas in the San Juan Public Lands that support *Woodsia neomexicana*: Vallecito Creek, Cascade Creek, Electra Lake, Lost Lake, Piedra River Trail.

Woodsia neomexicana

Element Occurrence (EO) Specification: Any naturally occurring population. EOs are separated by either: 1 mile or more across unsuitable habitat or altered and unsuitable areas; or 2 miles or more across apparently suitable habitat not known to be occupied. Justification: The rationale for this large a separation distance across suitable but apparently unoccupied habitat is that it is likely additional research will find this habitat to be occupied. It can often be assumed that apparently unconnected populations will eventually be found to be more closely connected; these are best regarded as sub-occurrences.

Element Occurrence Ranking Criteria

Rank:	A	B	C	D
Size (provisional)	50 or more linear feet	20 or more linear feet	2 or more linear feet	Less than 2 linear feet
Condition	The occurrence should have an excellent likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact.	The occurrence should have a good likelihood of long-term viability. Various size classes are represented, indicating that the reproductive mechanisms and other ecological processes are intact).	There is a fair likelihood of long-term viability	The occurrence has a low probability of long-term survival
Landscape Context	High quality site (i.e. no exotic plant species or significant human disturbances) that is defensible. .	The site has little human disturbance. If exotic species are present then they comprise less than 10% of the total ground cover. The site should be defensible.	The site is degraded. Exotic plant species make up between 10-50% of the total ground cover and\or there is a moderate level of human disturbance). The site may have low defensibility.	The site is degraded. Exotic plant species make up over 50% of the total ground cover and\or there is a high level of human disturbance. The site may not be defensible.

Acarospora nodulosa var. *nodulosa* (nodule cracked lichen)

Taxonomy
Class: Ascomycetes
Order: Lecanorales
Family: Acarosporaceae
Genus: *Acarospora*

CNHP Ranking: G2 S1

State/Federal Status: None.

Description: Light gray crustose lichen, with reddish to dark brown apothecia that are immersed in the lobed thallus (Brodo and Sharnoff 2001).

Figure 57. .*Acarosproa nodulosa* var. *nodulosa.*
Photo © Stephen Sharnoff. Used with permission.

Habitat Comments: *Acarospora nodulosa* is found mixed with other lichen species on gypsiferous soil crusts. The fine textured soils have high concentrations of sulfate and calcium (USDI 2001). There are few vascular plant species in the barren sites. In Big Gypsum Valley the geology is mapped as the Paradox member of the Hermosa Formation. Associated species are *Cryptantha gypsophila, Sporobolus nealeyii* and a variety of other lichen species. See Appendix II for species list.

Distribution in Colorado

Global Range: Southwestern U. S. in Colorado and Utah. Also reported from Spain and Australia.

State Range: Known only from three sites in Colorado: Big Gypsum Valley, east of Glenwood Springs and Colorado National Monument.

Distribution/Abundance: This species is endemic to gypsum sites in the intermountain western United States; it has been collected from 8-10 sites (St. Clair 2005).

Known Threats and Management Issues: Gypsiferous sites are worthy of protection because of their high potential for cover and biological crust diversity. These sites are often threatened by mining activity due to the commercial value of gypsum (USDI BLM 2001). Unlike vascular plants, crustal organisms, particularly lichens, are not greatly influenced by short-term climatic conditions. This makes them ideal indicators of long-term environmental factors. Therefore, each community component can provide information that may complement, explain, or indicate something about a site's characteristics and disturbance history for rangeland management and evaluation. Just as plants increase or decrease with livestock grazing, many biological soil crust components are good indicators of physical disturbance, such as by livestock, human foot traffic, or motorized vehicles (Belnap 1995).

The three sites in Big Gypsum Valley are threatened by oil and gas development. A "no surface occupancy" designation of all gypsum outcrops in the valley is recommended. Lichens may be destroyed by compression, including trampling by vehicles, humans and livestock, especially when dry. Although the sites contain little forage, livestock may pass through the sites to reach forage in other areas (note cattle trail in habitat photo below). Travel management that limits vehicles to established roads would help to protect the soil crusts. Any treatments to increase forage or stabilize soils would be detrimental to the lichen and rare plant populations.

Potential Conservation Areas in the San Juan Public Lands: Big Gypsum Valley.

Gypsoplaca macrophylla (changing earthscale)

Taxonomy
Class: Ascomycetes
Order: Lecanorales
Family*:* Gypsoplaceae
Genus: *Gypsoplaca*

CNHP Ranking: G2 S1

State/Federal Status: None.

Description: A gypsum soil lichen with a thallus of closely appressed squamules that are rounded to irregular, yellowish brown to olive brown (sometimes white pruinose at the edges), and 2-9 mm in diameter. Apothecia appear as reddish brown swellings on the squamules (Brodo 2001).

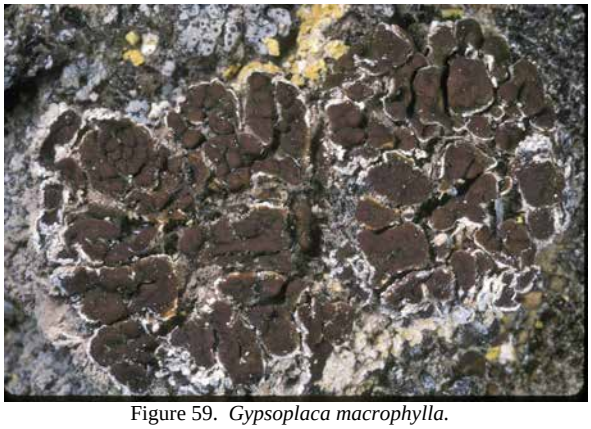


Figure 59. *Gypsoplaca macrophylla.*
Photo © Stephen Sharnoff. Used with permission.

Habitat Comments: *Gypsoplaca macrophylla* is found mixed with other lichen species on gypsiferous soil crusts. There are few vascular plant species in the barren sites. In Big Gypsum Valley the geology is mapped as the Paradox member of the Hermosa Formation. Associated species are *Acarospora nodulosa, Lecanora gypsicola, Cryptantha gypsophila, Sporobolus nealeyii* and a variety of other lichen species. See Appendix II for species list.

Distribution in Colorado

Global Range: Colorado and Utah. Gypsoplaca macrophylla has been reported for Greenland and the western US.

State Range: It is known from gypsum sites in Big Gypsum Valley, Colorado National Monument, and the Glenwood Springs area.

Distribution/Abundance: This species is endemic to gypsum sites in the intermountain western United States; it has been collected from only 5 or 6 sites (St. Clair 2005).

Known Threats and Management Issues: Gypsiferous sites are worthy of protection because of their high potential for cover and biological crust diversity (USDI BLM 2001). Unlike vascular plants, crustal organisms, particularly lichens, are not greatly influenced by short-term climatic conditions. This makes them ideal indicators of long-term environmental factors. Therefore, each community component can provide information that may complement, explain, or indicate something about a site's characteristics and disturbance history for rangeland management and evaluation. Just as plants increase or decrease with livestock grazing, many biological soil crust components are good indicators of physical disturbance, such as by livestock, human foot traffic, or motorized vehicles (Belnap 1995).

The three sites in Big Gypsum Valley are threatened by oil and gas development. A "no surface occupancy" designation of all gypsum outcrops in the valley is recommended. Lichens may be destroyed by compression, including trampling by vehicles, humans and livestock, especially when dry. Although the sites contain little forage, livestock may pass through the sites to reach forage in other areas (note cattle trail in habitat photo below). Travel management that limits vehicles to established roads would help to protect the soil crusts. Any treatments to increase forage or stabilize soils would be detrimental to the lichen and rare plant populations.

Potential Conservation Areas in the San Juan Public Lands: Big Gypsum Valley.

Lecanora gypsicola (gypsum rim-lichen)

Taxonomy
Class: Ascomycetes
Order: Lecanorales
Family*:* Lecanoraceae
Genus: *Lecanora*

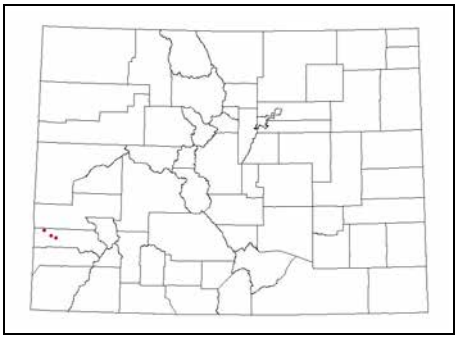
CNHP Ranking: G2 S1

State/Federal Status: None.

Description: The genus *Lecanora* is described as crustose lichens (rarely fruticose) with thalli varying from very thin and barely perceptible to very thick and lobate; yellowish, gray, brown, or greenish; often sorediate (Brodo 2001).


Figure 61. Habitat of *Lecanora gypsophila* at Big Gypsum Valley. Photo by Peggy Lyon

Habitat Comments: *Lecanora gypsicola* is found mixed with other lichen species on gypsiferous soil crusts. All three lichen species profiled here are limited to these fine textured soils with high concentrations of sufate and calcium. There are few vascular plant species in the barren sites. In Big Gypsum Valley the geology is mapped as the Paradox member of the Hermosa Formation. Associated species are *Cryptantha gypsophila, Sporobolus nealleyii* and a variety of other lichen species. See Appendix II for species list.


Distribution in Colorado

Global Range: Endemic to Western U. S. in Colorado and Utah.

State Range: It is known only from gypsum sites in Big Gypsum Valley.

Distribution/Abundance: This species is endemic to gypsum sites in the intermountain western United States; besides the Big Gypsum Valley location, it has been collected from only three other locations in Utah

Known Threats and Management Issues: Gypsiferous sites are worthy of protection because of their high potential for cover and biological crust diversity (USDI BLM 2001). Unlike vascular plants, crustal organisms, particularly lichens, are not greatly influenced by short-term climatic conditions. This makes them ideal indicators of long-term environmental factors. Therefore, each community component can provide information that may complement, explain, or indicate something about a site's characteristics and disturbance history for rangeland management and evaluation. Just as plants increase or decrease with livestock grazing, many biological soil crust components are good indicators of physical disturbance, such as by livestock, human foot traffic, or motorized vehicles (Belnap 1995).

The three sites in Big Gypsum Valley are threatened by oil and gas development. A "no surface occupancy" designation of all gypsum outcrops in the valley is recommended. Lichens may be destroyed by compression, including trampling by vehicles, humans and livestock, especially when dry. Although the sites contain little forage, livestock may pass through the sites to reach forage in other areas (note cattle trail in habitat photo below). Travel management that limits vehicles to established roads would help to protect the soil crusts. Any treatments to increase forage or stabilize soils would be detrimental to the lichen and rare plant populations.

Potential Conservation Areas in the San Juan Public Lands: Big Gypsum Valley.

Figure 63. Habitat of three rare lichen species in Big Gypsum Valley.

Figures 64. Rare lichen habitat with *Cryptantha gypsophila.*
Photos by Peggy Lyon.

Chapter IV. Potential Conservation Areas.

Eighteen new Potential Conservation Areas (PCAs) containing rare plants were identified on San Juan Public Lands in 2005. Another three were revised. Seven of the new PCAs are on BLM managed lands and eleven are on the San Juan National Forest.

Potential Conservation Areas represent our best estimate of the primary area needed to support the plants, animals or communities on which the PCA is based. Each Potential Conservation Area is described in a standard site profile reflecting data fields in CNHP's Biotics Data System. They are arranged below in the approximate order of their need for conservation attention, i.e. by Biodiversity Rank, and then alphabetically within each rank. This report does not include PCAs that were drawn for animals or natural communities. However, when natural community occurrences fall within the boundaries of the PCA, they are included.

Each PCA profile below contains the following information:

Biodiversity Rank (B-rank): The overall significance of the site in terms of rarity of the Natural Heritage resources and the quality (condition, abundance, etc.) of the occurrences. For rank definitions, please see the Natural Heritage Ranking System section of this report.

Protection Urgency Rank (P-rank): An estimate of the urgency of conservation protection. This rank generally refers to the need for a major change of protective status (i.e., ownership or designation as a natural area). For rank definitions, please see the Natural Heritage Ranking System section of this report (Appendix I)

Management Urgency Rank (M-rank): An estimate of the time frame in which conservation management must occur. Using best scientific estimates, this rank refers to the need for management such as weed control, trail closures, etc. For rank definitions, please see the Natural Heritage Ranking System section of this report (Appendix I).

Location: County, general location, usually in approximate air miles from the nearest town, and USGS 7.5 minute topographic map name.

Legal Description: Township, range and section(s).

Elevation Range: Lowest and highest elevations within the site boundaries, as drawn on U.S.G.S. topographic maps.

Size: Number of acres within the site boundary, as determined from GIS mapping (ArcView).

General Description: A brief narrative of the topography, vegetation, and current use of the potential conservation area. Common names are used in the text, followed by scientific names in parentheses. A list of common and scientific names is also provided in Appendix IV.

Biodiversity Rank Justification: A synopsis of the significant elements occurring in the site. A table within the site profile lists the element occurrences found within the site, their rarity ranks, the occurrence ranks and federal and state agency special designations. The species or communities that are the primary element of concern are printed in bold type within the table. When several entries are in bold type, any one of the occurrences would be sufficient to justify the site rank. See Table 1, Chapter I, for explanations of ranks, and Table 2, Chapter I, for legal designations.

Table of elements found in the PCA: Includes scientific name, common name, global and state ranks, federal or state status and element occurrence rank.

Boundary Justification: Justification for the location of the potential conservation site planning boundary delineated in this report, including all known occurrences of natural heritage resources and, in some cases, adjacent lands required for their protection.

Protection rank comments: Any additional pertinent information regarding the need for protection of the site.

Management rank comments: Any additional pertinent information regarding the need for management actions at the site.

Big Gypsum Valley PCA

Biodiversity Rank: B1: Outstanding biodiversity significance. This PCA supports excellent (A-ranked) occurrences of a globally imperiled (G1) plant.

Protection Urgency Rank: P1: Protection actions needed immediately. It is estimated that current stresses may reduce the viability of the plants in the PCA within 1 year.

Management Urgency Rank: M2: New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.

Location: The Big Gypsum Valley PCA is located in northern San Miguel County about 14 miles southwest of Naturita. To access the PCA, drive Hwy 141 going east from Slick Rock or south from Naturita and turn west on County Road 20R.

U.S.G.S. 7.5 minute quadrangle: Gypsum Gap and Hamm Canyon
Legal Description: T43N R16W, Sections 4-9 and 33;
T43N R17W, Sections 1 and 2
T44N R16W, Sections 19, and 28-
T44N R17W, Sections 7-9, 14-29, 35 and 36
T44N R18W, Sections 1- 3, and 10-14
T45N R18W, Sections 26-29 and 33-35

Elevation: 6,100 to 6,500 feet **Size:** Approximately 21,145 acres

General Description: This PCA is located north of Disappointment Valley and east of the Dolores River. It extends from the Dolores River canyon on the west to the headwaters of Big Gypsum Creek east of Highway 141. The valley is one of several parallel northwest-southeast trending valleys that were formed by the collapse of ancient salt domes. It runs parallel to Dry Creek Basin on the north and Disappointment Valley on the south. The valley is the result of a large sea embayment separated from the remaining sea that covered this area in the Pennsylvanian age. Upon evaporation of this sea, its salts became concentrated in domes overlain with sedimentary rock. Once these sedimentary rocks were breached by erosion, the domes, comprised of soluble salt and gypsum, were washed away and the flanking structures collapsed, leaving the broad valleys at Paradox, Gypsum, and Dry Creek.

Gypsum outcrops of the Paradox member of the Hermosa Formation form low hills, surrounded by alluvial deposits. These outcrops are the habitat of rare lichens and a recently described plant, Gypsum Valley cat-eye (*Cryptantha gypsophila*), which are often the dominant species in these sparsely vegetated areas. Associated species include gyp dropseed (*Sporobolus nealleyi*), needle and thread (*Hesperostipa comata*), cheatgrass (*Bromus tectorum*), broom snakeweed (*Gutierrezia sarothrae*), spearleaf buckwheat (*Eriogonum lonchophyllum*), winterfat (*Krascheninnikovia lanata*), fourwing saltbush (*Atriplex canescens*), galleta (*Pleuraphis jamesii*), Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*), skeleton mustard

(*Schoenocrambe linifolia*), and western tansymustard (*Descurainia pinnata*). Hillsides on the south side of the valley have patches of good quality needle and thread grassland, although these are usually small and interspersed with areas dominated by cheatgrass. The bottomlands of the valley tend to be weedy, with cheatgrass, cranesbill (*Erodium cicutarium*) and western tansy mustard.

BLM land in the valley is currently used primarily for grazing. There are popular rock climbing areas in the canyons on the north side of the valley, and the valley provides access to the Dolores River for rafting and other recreational pursuits. Oil and gas exploration is underway and development is likely in the near future.

Biodiversity Rank Justification and Comments: The Big Gypsum Valley PCA's outstanding (B1) biodiversity significance rank is based on two excellent (A-ranked) and two good (B-ranked) occurrences of Gypsum Valley cat-eye, a plant that is critically imperiled (G1,S1) state wide and globally. Other rare plants in the PCA include gypsum rim-lichen (*Lecanora gypsicola*) and nodule cracked lichen (*Acarospora nodulosa var. nodulosa*), both critically imperiled (G1S1) state wide and globally, changing earthscale (*Gypsoplaca macrophylla*), a globally vulnerable plant (G3G4), weak-stemmed mariposa lily (*Calochortus flexuosus*), an apparently secure plant globally(G4) but imperiled (S2) in Colorado, and gyp dropseed (*Sporobolus nealleyi*), a demonstrably secure(G5) plant globally and a critically imperiled (S1) plant in Colorado .

Natural Heritage element occurrences at Big Gypsum Valley PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Cryptantha gypsophila	**Gypsum Valley cat-eye**	**G1**	**S1**		**A**
Cryptantha gypsophila	**Gypsum Valley cat-eye**	**G1**	**S1**		**A**
Cryptantha gypsophila	Gypsum Valley cat-eye	G1	S1		B
Cryptantha gypsophila	Gypsum Valley cat-eye	G1	S1		B
Lecanora gypsicola	Gypsum rim-lichen	G1	S1		E
Lecanora gypsicola	Gypsum rim-lichen	G1	S1		E
Lecanora gypsicola	Gypsum rim-lichen	G1	S1		E
Acarospora nodulosa var. nodulosa	Nodule cracked lichen	G2	S1		E
Acarospora nodulosa var. nodulosa	Nodule cracked lichen	G2	S1		E
Acarospora nodulosa. nodulosa	Nodule cracked lichen	G2	S1		E
Gypsoplaca macrophylla	Changing earthscale	G3G4	SNR		E
Gypsoplaca macrophylla	Changing earthscale	G3G4	SNR		E
Calochortus flexuosus	Weak-stemmed mariposa lily	G4	S2		A
Sporobolus nealleyi	Gyp dropseed	G5	S1		B

*EO=Element Occurrence. Multiple listings represent separate locations.

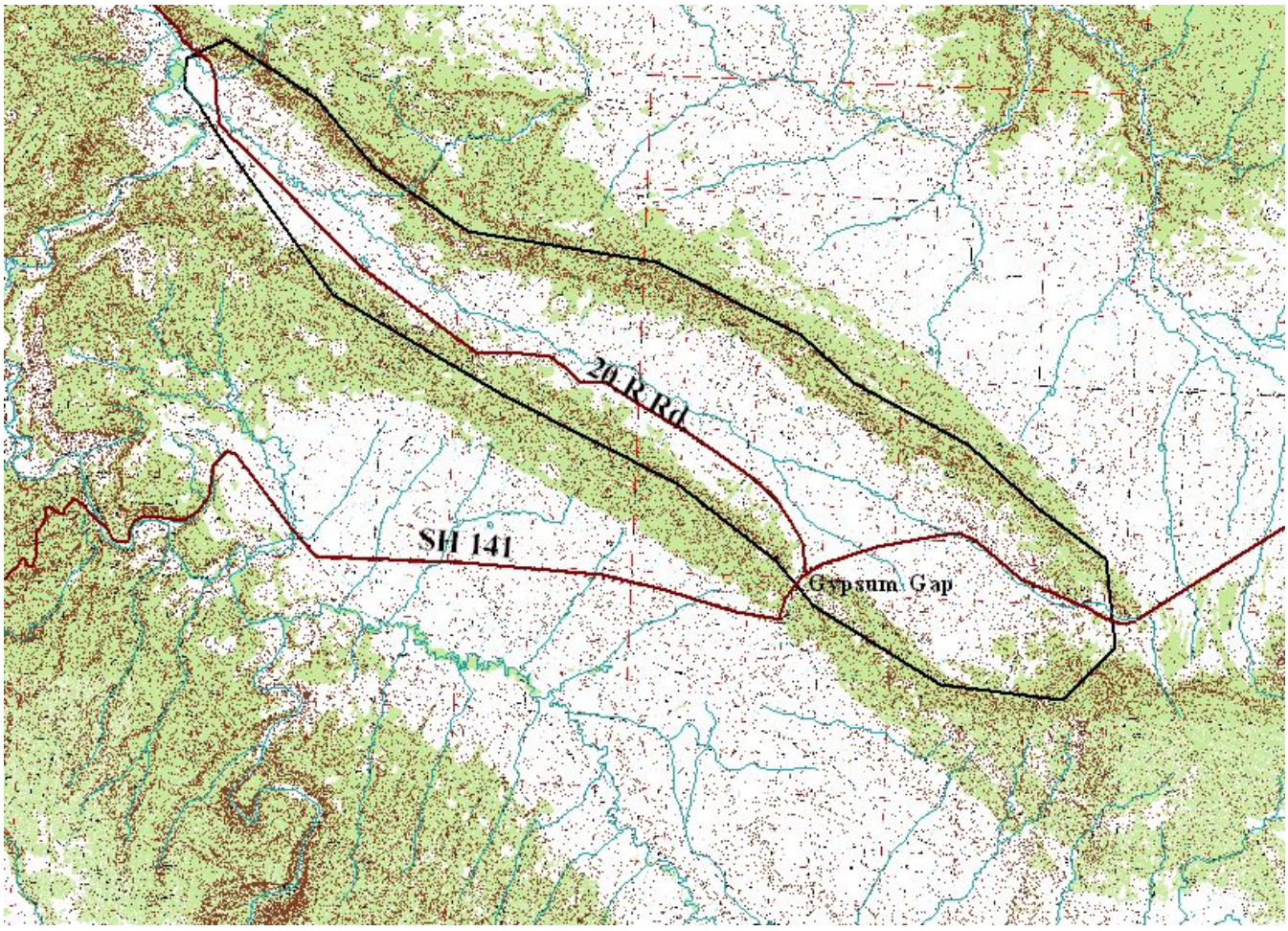
Boundary Justification: The PCA boundary was drawn to encompass the element occurrences for Gypsum Valley cat-eye and three lichens. It includes all areas mapped as the Paradox member of the Hermosa Formation (&h).

Protection Comments: Special designation such as ACEC in gypsum areas would help to protect the Gypsum Valley cat-eye and lichen community.

Management Rank Comments: Imminent oil and gas exploration pose a threat to the PCA from direct disturbance and introduction of exotic species. There is ATV use at one site, and cattle trails traverse another site (see below).

Figure 65. Habitat of *Cryptantha gypsophila* at Big Gypsum Valley near Mary Jane Draw.
Photo by Peggy Lyon.

Big Gypsum Valley B1: Outstanding Biodiversity Significance



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Fort Collins CO 80523-8002

Disclaimer

Data are provided on an as-is, as-available basis without warranties of any kind, expressed or implied, including (but not limited to) warranties of merchantability, fitness for a particular purpose, and non-infringement. CNHP, Colorado State University and the State of Colorado further expressly disclaim any warranty that the data are error-free or current as of the date supplied.

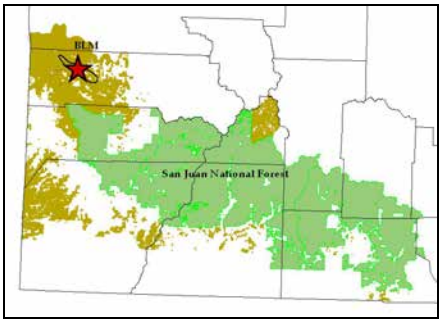
PCA Boundary

Hamm Canyon,
Gypsum Gap
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 31 January 2005
UTM Zone 12 NAD 27

Location in Study Area



Plateau Creek PCA

Biodiversity Rank: B1. Outstanding biodiversity significance. This PCA supports excellent (A ranked) occurrence of a plant critically imperiled globally (G1).

Protection Urgency Rank: P2. Protection actions may be needed within 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA within this approximate timeframe.

Management Urgency Rank: M2. New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.

Location: The Plateau Creek PCA is located in Dolores County, approximately 15 miles north of the town of Dolores. To access this PCA take the Dolores-Norwood Road north of Dolores to FS road 514 and go west to the San Juan Forest boundary.

U.S.G.S. 7.5 minute quadrangle: Willow Spring
Legal Description: T39N, R14W, Section 6
T39N, R15W, Sections 1-3, and 35
T40N, R14W, Section 31
T40N, R15W, Sections 25-27, and 34, and 36

Elevation: 7,500 – 7700 feet **Size:** Approximately 2,524 acres

General Description: The site occupies a level to gently sloping, sparsely vegetated valley bottom with outcrops of light gray Mancos shale. It includes a section of Plateau Creek, and many intermittent tributary streams. There are several human created features, including an old railroad grade, a county road and several stock ponds. Surrounding areas are sagebrush shrublands. Cattle grazing is the primary use of the area.

The recently described cushion bladderpod is one of the most abundant species in the site. This is one of only a handful of known locations for this species. Other plants include black sagebrush (*Artemisia nova*), green rabbitbrush (*Chrysothamnus greenii*), Torrey's hymenoxys (*Tetraneuris torryana*), crescent milkvetch (*Astragalus amphioxys*), blue flax(*Linum lewisii*), mat penstemon (*Penstemon cespitosus*), and spearleaf buckwheat (*Eriogonum lonchophyllum*). See Appendix II for complete species list.

The site includes San Juan National Forest, BLM, Colorado State (school section) and private lands with suitable habitat for the cushion bladderpod.

Biodiversity Rank Justification and Comments: The Plateau Creek PCA biodiversity rank is based on the excellent (A-ranked) occurrence of cushion bladderpod (*Physaria pulvinata*), a critically imperiled plant globally (G1) and in Colorado state (S1).

Natural Heritage element occurrences at Plateau Creek PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Physaria pulvinata	**Cushion bladderpod**	**G1**	**S1**		**A**

*EO=Element Occurrence. Multiple listings represent separate locations.

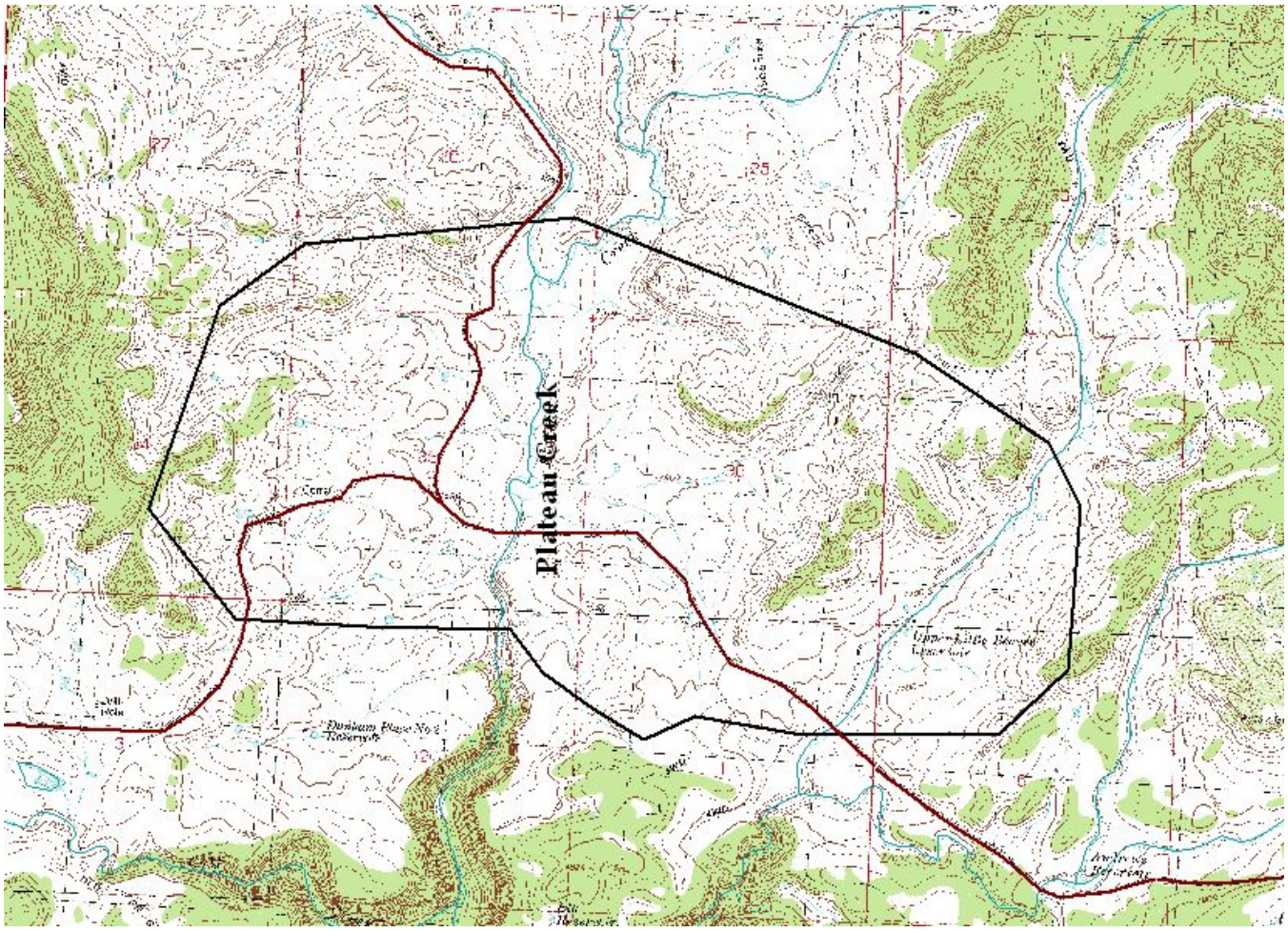
Boundary Justification: The boundary for the Plateau Creek PCA was drawn to include the habitat occurrence of cushion bladderpod and adjacent suitable habitat. It includes Plateau Creek and Upper Little Beaver Reservoir.

Protection Comments: Although National Forest at BLM lands are probably secure, private land in the site has no protection**.** There are so few known occurrences of cushion bladderpod, that each one is indispensable for the survival of the species.

Management Rank Comments: Grazing management and road maintenance may need to be address to protect the rare plant population. Monitoring this population would add to the little known about the species and detect any changes in the population.

Figure 66. Habitat of *Physaria pulvinata* at Plateau Creek.
Photo by Peggy Lyon.

Plateau Creek PCA B1: Outstanding Biodiversity Significance



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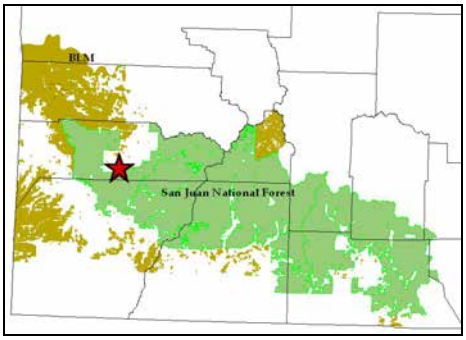
PCA Boundary

Willow Spring
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Blackhawk Mountain PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports an excellent (A-ranked) occurrence of a globally imperiled (G2) plant.

Protection Urgency Rank:P4: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M4: Current management seems to favor the persistence of the plants in the PCA, but management actions may be needed in the future to maintain the current quality of the plants occurrences.

Location: The Blackhawk Mountain PCA is located on the eastern edge of Dolores County about 3 miles east of Rico. To access the PCA drive up Hermosa Creek Road to Bolam Pass and hike south on the Colorado Trail to Blackhawk Peak and the SE facing ridge.

U.S.G.S. 7.5 minute quadrangle: Hermosa Peak
Legal Description: T39N R10W, Sections 4 and 5;
T40N R10W, Section 32

Elevation: 11,900 feet **Size:** Approximately 42 acres

General Description: The Blackhawk Mountain PCA is located on a high alpine ridge in the Rico Mountains, just west of the Colorado Divide Trail. To the northeast is Hermosa Peak and to the south is Whitecap Mountain. Blackhawk Peak has a rocky summit of Precambrian rock, with sparsely vegetated red soil slopes below. It includes the ecological systems Rocky Mountain Dry Tundra, Rocky Mountain Alpine Fellfields and Rocky Mountain Alpine Bedrock and Scree.

Dense clusters of Colorado tansy-aster dominate the gently sloping barren red soil. Other common species in the dry tundra area include old-man-of-the-mountain (*Rydbergia grandiflora*), Rocky Mountain clover (*Trifolium attenuatum*) and paintbrush (*Castilleja sp*.).

Recreation, primarily hiking on the Colorado Trail, is the primary use for the San Juan Forest here. The plants' remote location helps to protect the population from other threats.

Biodiversity Rank Justification and Comments: The Blackhawk Mountain PCA's very high biodiversity significance (B2) is based on an excellent (A-ranked) occurrence of Colorado tansy-aster, a globally imperiled (G2) plant.

Natural Heritage element occurrences at the Blackhawk Mountain PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Machaeranthera coloradoensis	**Colorado tansy-aster**	**G2**	**S2**	**FS sensitive**	**A**

*EO=Element Occurrence. Multiple listings represent separate locations.

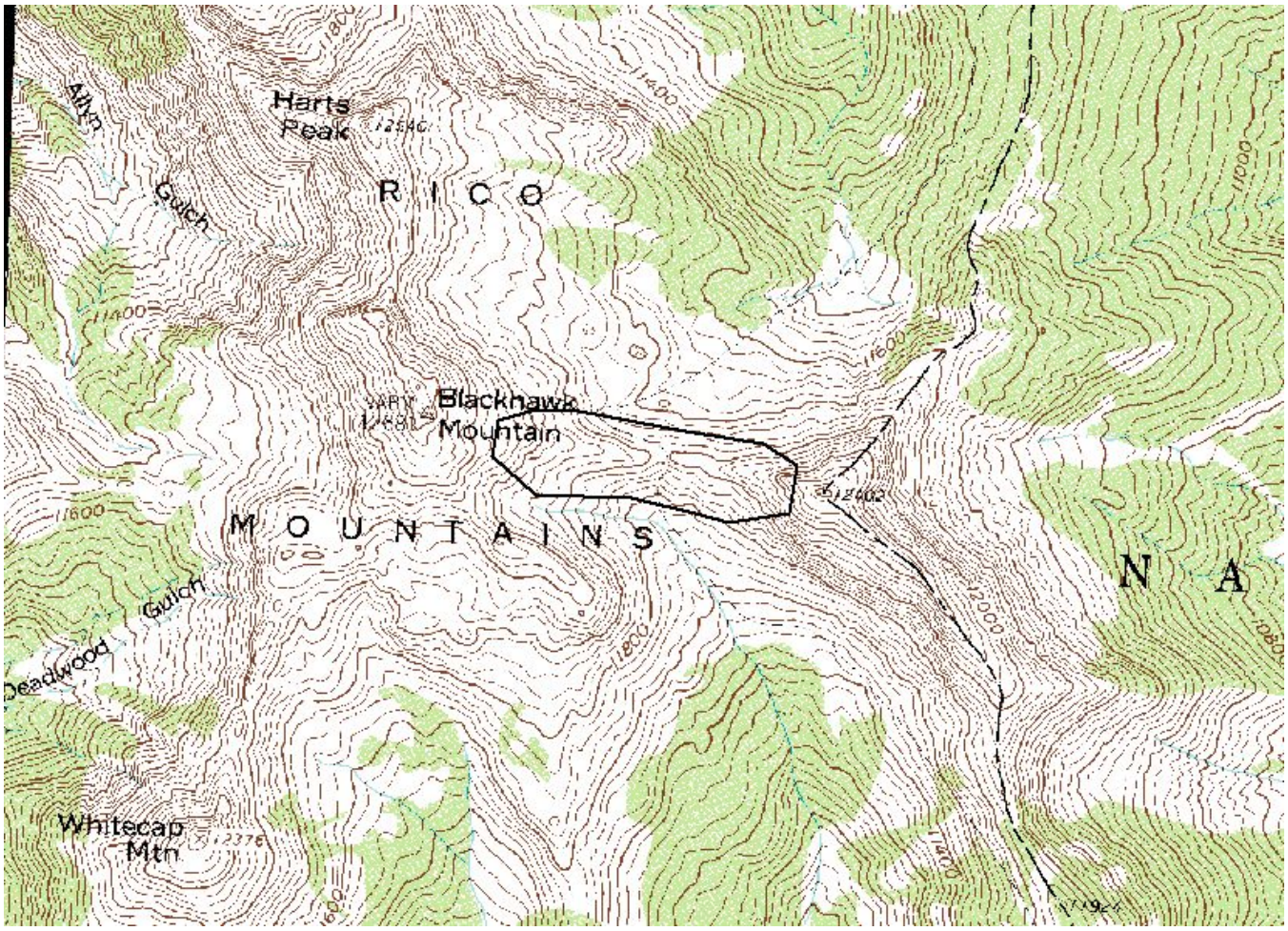
Boundary Justification: The boundary encompasses the population of Colorado tansy-aster which follows the ridge of Blackhawk Peak down to the pass and Colorado Trail route.

Protection Comments: The area is adequately protected within the San Juan National Forest.

Management Rank Comments: Periodic monitoring to detect any impacts from hiker use would be warranted.

Figure 67. Colorado tansy-aster (*Machaeranthera coloradoensis*)
Photo by Peggy Lyon.

Blackhawk Mountain PCA B2: Very High Biodiversity Significance



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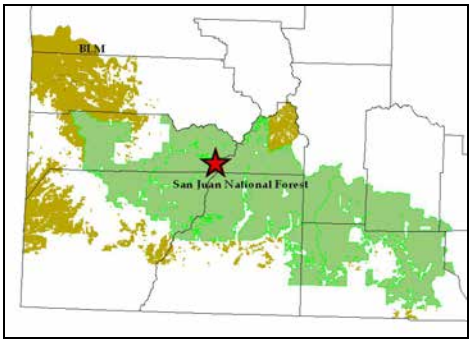
PCA Boundary

Hermosa Peak
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Cave Basin Lakes PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports an excellent (A-ranked) occurrence of an imperiled plant (G2).

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M4: Current management seems to favor the persistence of the plants in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.

Location: The Cave Basin Lakes PCA is located in La Plata and Hinsdale Counties about 22 miles north of Bayfield. To access this PCA take the Cave Basin Pack Trail at the end of Middle Mountain Road which begins at the north end of Vallecito Reservoir.

U.S.G.S. 7.5 minute quadrangle: Emerald Lake
Legal Description: T38N R5W, Sections19 and 30
T38N R6W, Sections 24 and 25

Elevation: 11, 800 to 12,000feet **Size:** Approximately 770 acres

General Description: The Cave Basin Lakes PCA occupies an open level area in the Weminuche Wilderness just above timberline. It is situated between Table Mountain to the west and Emerald Lake to the east. The landscape is a mosaic of wetlands and dry tundra, sprinkled with numerous small lakes. Ecological systems are mapped as Rocky Mountain Dry Tundra and Rocky Mountain Alpine Riparian Shrubland (Southwest Regional GAP). The rocky uplands consist of metamorphic rocks, derived from sedimentary and volcanic rocks. Wetlands in the site are dominated by water sedge (*Carex aquatilis*) and marsh marigold (*Caltha leptosepala*) with thickets of planeleaf willow (*Salix planifolia*). Other common wetland species present are tufted hairgrass (*Deschampsia caespitosa*), elephantella (*Pedicularis groenlandica*), bistort (*Bistorta bistortoides*), rose crown (*Clementsia rhodantha*), and star gentian (*Swertia perennis*). See Appendix II for complete species list. There are small patches of Altai cottongrass (*Eriophorum altaicum* var. *neogaeum*) as well as the more common narrowleaf cottongrass (*Eriophorum angustifolium*). Rothrock's Townsend daisy (*Townsendia rothrockii*) was found on naturally eroded hillsides in an open area above as small stream. Ross' avens (*Geum rossii*), arrowleaf ragwort (*Senecio triangularis*), creeping sibbaldia (*Sibbaldia procumbens*) and Fendler's sandwort (*Eremogone fendleri*) were associated with Rothrock's Townsend daisy. The primary use of the area is by hikers and horseback riders. Although lower elevations nearby are grazed, there was no evidence of recent grazing in the PCA.

Biodiversity Rank Justification and Comments: The highly significant (B2) rank of the Cave Basin Lakes PCA is based on the excellent (A-ranked) occurrence of Rothrock's Townsend daisy, a globally imperiled (G2) plant. This PCA also supports a good (B-ranked) occurrence Altai cottongrass, a vulnerable (G4?T3T4) subspecies.

Natural Heritage element occurrences at Cave Basin Lakes PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Townsendia rothrockii	**Rothrock's Townsend daisy**	**G2**	**S2**		**A**
Eriophorum altaicum var. *neogaeum*	Altai cottongrass	G4?T3T4	S3	FS sensitive	B

*EO=Element Occurrence. Multiple listings represent separate locations.

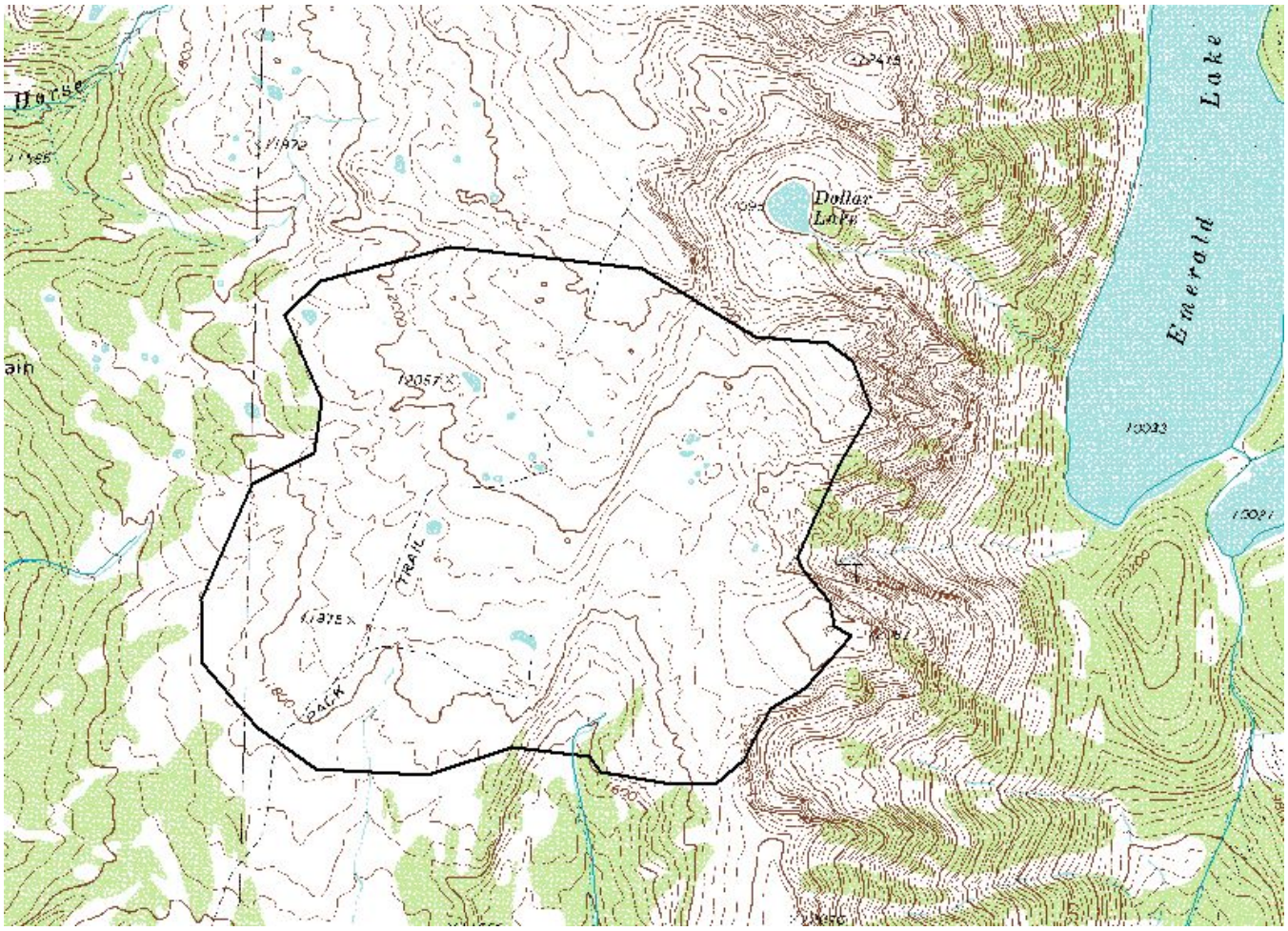
Boundary Justification: The boundary was drawn to include habitat that supports the Rothrock's Townsend daisy and the Altai cottongrass occurrences. Both upland and wetland areas are included.

Protection Comments: The site is well protected within the Weminuche Wilderness.

Management Rank Comments: No management needs were noted. There were no exotic species present, and other than hiking trails, no evidence of human disturbance.

Figure 69. Wetland at Cave Basin Lakes PCA.
Photo by Peggy Lyon.

Cave Basin Lakes PCA B2: Very High Biodiversity Significance



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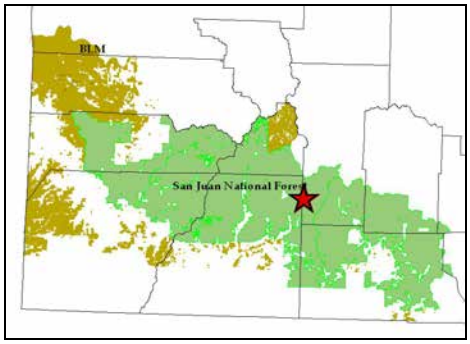
PCA Boundary

Emerald Lake
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Colorado Trail at Lime Creek Headwaters PCA

Biodiversity Rank: B2: Very high Biodiversity significance. This PCA supports a good (B-ranked) occurrence of a globally imperiled plant (G2).

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M4: Current management seems to favor the persistence of the plants in the PCA, but management actions may be needed in the future to maintain the current quality of the plants occurrences.

Location: The Colorado Trail at Lime Creek Headwaters PCA is located in San Juan County about 4 miles to the southwest of Silverton. To access the PCA hike the Colorado Trail from Little Molas Lake.

U.S.G.S. 7.5 minute quadrangle: Silverton
Legal Description: T41N R8W, Section 34

Elevation: 12,100 to 12,500 feet **Size:** Approximately 147 acres

General Description: The PCA lies within the San Juan National Forest and runs the length of a steep cliff in a band of red soil below two summits. The substrate is mapped as Precambrian. The site includes the ecological systems Rocky Mountain Dry Tundra and Rocky Mountain Alpine Bedrock and Scree (Southwest Regional GAP 2004).

Colorado tansy-aster (*Machaeranthera coloradoensis*) is found growing in open gravelly areas between clumps of Rocky Mountain clover (*Trifolium attenuatum*), yarrow (*Achillea lanulosa*), Colorado columbine *(Aquilegia coerulea*), mountain deathcamus (*Zigadenus elegans*), Thurber fescue (*Festuca thurberi*), and goldenrod (*Solidago sp*.). Common dandelion (*Taraxacum officianale*) was the only exotic species observed.

The primary use in the area below the PCA is grazing and recreation. However, the occurrence is well above the trail in a seldom accessed area.

Biodiversity Rank Justification and Comments: The site supports a good (B-ranked) occurrence of Colorado tansy aster, a state imperiled plant (S2). The occurrence was ranked fair (C) for size, with over 100 plants estimated; however, condition and landscape context were excellent (A), resulting in an overall occurrence rank of B.

Natural Heritage element occurrences at Colorado Trail at Lime Creek Headwaters PCA.
Elements in bold are those upon which the PCA's B-rank is based.

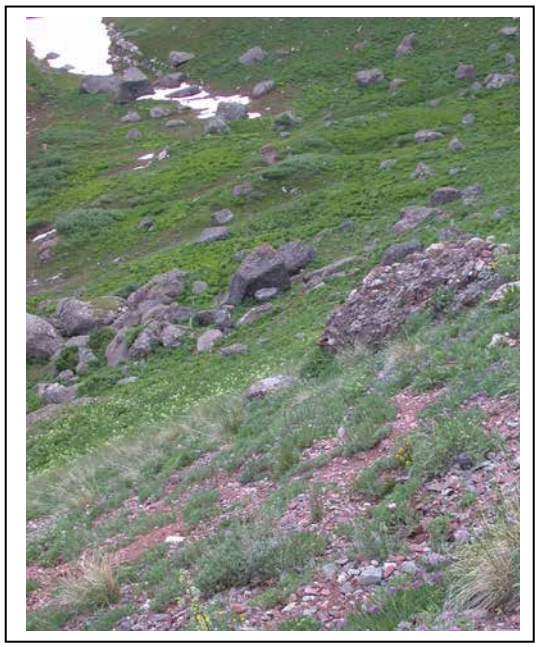
Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Machaeranthera coloradoensis	**Colorado tansy-aster**	**G2**	**S2**	**FS sensitive**	**B**

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to incorporate the occurrence of Colorado tansy aster. Potential habitat extends beyond the PCA based on similar vegetation, soils, slope and elevation.

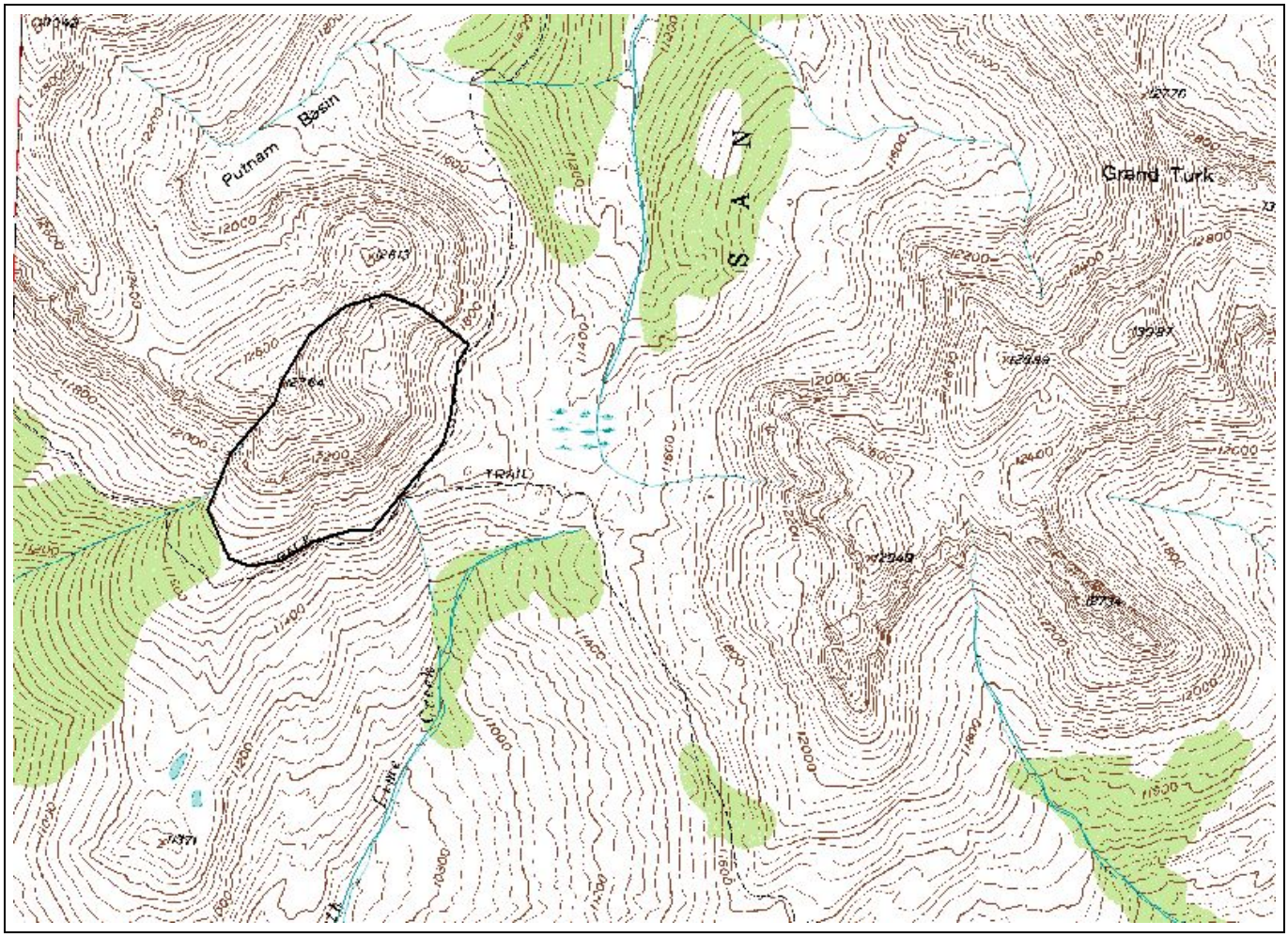
Protection Comments: The site is within the San Juan National Forest, and is well above the trail, in an area that receives little use.

Management Rank Comments: No management needs were noted.



Figures 70, 71, 72. Top and left: habitat of *Machaeranthera coloradoensis*; above: *M. coloradoensis.* Photos by Peggy Lyon.

Colorado Trail at Lime Creek Headwaters PCA
B2: Very High Biodiversity Significance



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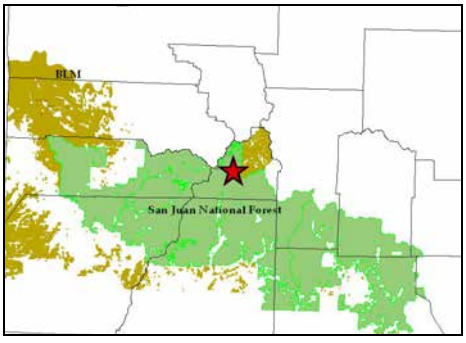
PCA Boundary

Silverton
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Crater Lake PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports an excellent (A-ranked) and a good (B-ranked) occurrence of a globally imperiled (G2) plant.

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.

Location: Crater Lake PCA is located in San Juan County about 8.5 air miles southwest of Silverton in the Weminuche Wilderness. To reach the PCA hike the Crater Lake trail from Andrews Lake.

U.S.G.S. 7.5 minute quadrangle: Snowdon
Legal Description: T39N R8W, Sections 1 and 2
T40N R8W, Sections 35 and 36

Elevation: 11,600 to 12,200 feet **Size:** Approximately 458 acres

General Description: The Crater Lake PCA is a pristine area in the Needle Mountains of the Weminuche Wilderness. The site includes Crater Lake, a beautiful natural lake, and several smaller lakes and wetlands, as well as alpine tundra leading up to the ridge above the Animas River Canyon. The site is flanked by spruce-fir forest on the northwest and the Twilight Peaks on the southwest. The lake is a popular destination for camping, via a trail from Andrews Lake, about 5 miles north. It is also a departure point for climbers who continue on to Twilight Peaks. Rock outcrops on the slopes to the east retain snow late into the year, and support an excellent population of San Juan whitlow-grass (*Draba graminea*). The plants grow in a cool microhabitat provided by crevices of vertical rocks on the north-facing, shaded side of drainages. The paucity of these very specialized habitats make the plants vulnerable to any warming or drying climatic changes. Other common tundra species in the PCA include fringed grass-of-Parnassus (*Parnassia fimbriata*), snow willow (*Salix reticulata*), moss saxifrage (*Cilaria austromontana*), brittle fern (*Cystopteris fragilis*), moss campion (*Silene acaulis*), alpine sandwort (*Lidia obtusiloba*), mountain parsley (*Pseudocymopterus montanus*), king's crown (*Rhodiola integrifolia*), spreading sandwort (*Spergulastrum lanuginosum*), pygmy bitterroot (*Oreobrama pygmaea*), alpine avens (*Geum rossii*), alpine spring beauty (*Claytonia megarhiza*), and alpine sage (*Artemisia scopulorum*).

Colorado Divide whitlow-grass (*Draba streptobrachia*) was found in rock outcrops with snowbed draba (*Draba crassifolia*), snow willow (*Salix reticulata* ssp. *nivalis*), and creeping sibbaldia (*Sibbaldia procumbens*).

A small un-named lake north of Crater Lake supports an aquatic community of buckbean (*Menyanthes trifoliata*), and is rimmed by mud sedge (*Carex limosa*). Other species in this wetland are water sedge (*Carex aquatilis*), elephantella (*Pedicularis groenlandica*) and spike

rush, (*Eleocharis* sp.). Extensive wetlands to the east of Crater Lake are the site of Altai cottongrass (*Eriophorum altaicum* var. *neogaeum*).

Biodiversity Rank Justification and Comments: The very high (B2) biodiversity rank of the Crater Lake PCA is based on an excellent (A-ranked) and a good (B-ranked) occurrence of San Juan whitlow-grass, a globally imperiled (G2) plant. The site also supports an excellent (A-ranked) occurrence of Altai cotton grass, a globally vulnerable subspecies (G4?T3T4); a good (B-ranked) occurrence of mud sedge, a species that is globally secure (G5) but rare in Colorado (S2); and a fair (C-ranked) occurrence of Colorado Divide whitlow-grass , a globally vulnerable (G3) plant.

Natural Heritage element occurrences at Crater Lake PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Draba graminea	**San Juan whitlow-grass**	**G2**	**S2**		**A**
Draba graminea	**San Juan whitlow-grass**	**G2**	**S2**		**B**
Draba streptobrachia	Colorado Divide whitlow-grass	G3	S3		C
Eriophorum altaicum var. *neogaeum*	Altai cotton grass	G4?T3T4	S1	FS sensitive	A
Carex limosa	Mud sedge	G5	S2		B

*EO=Element Occurrence. Multiple listings represent separate locations.

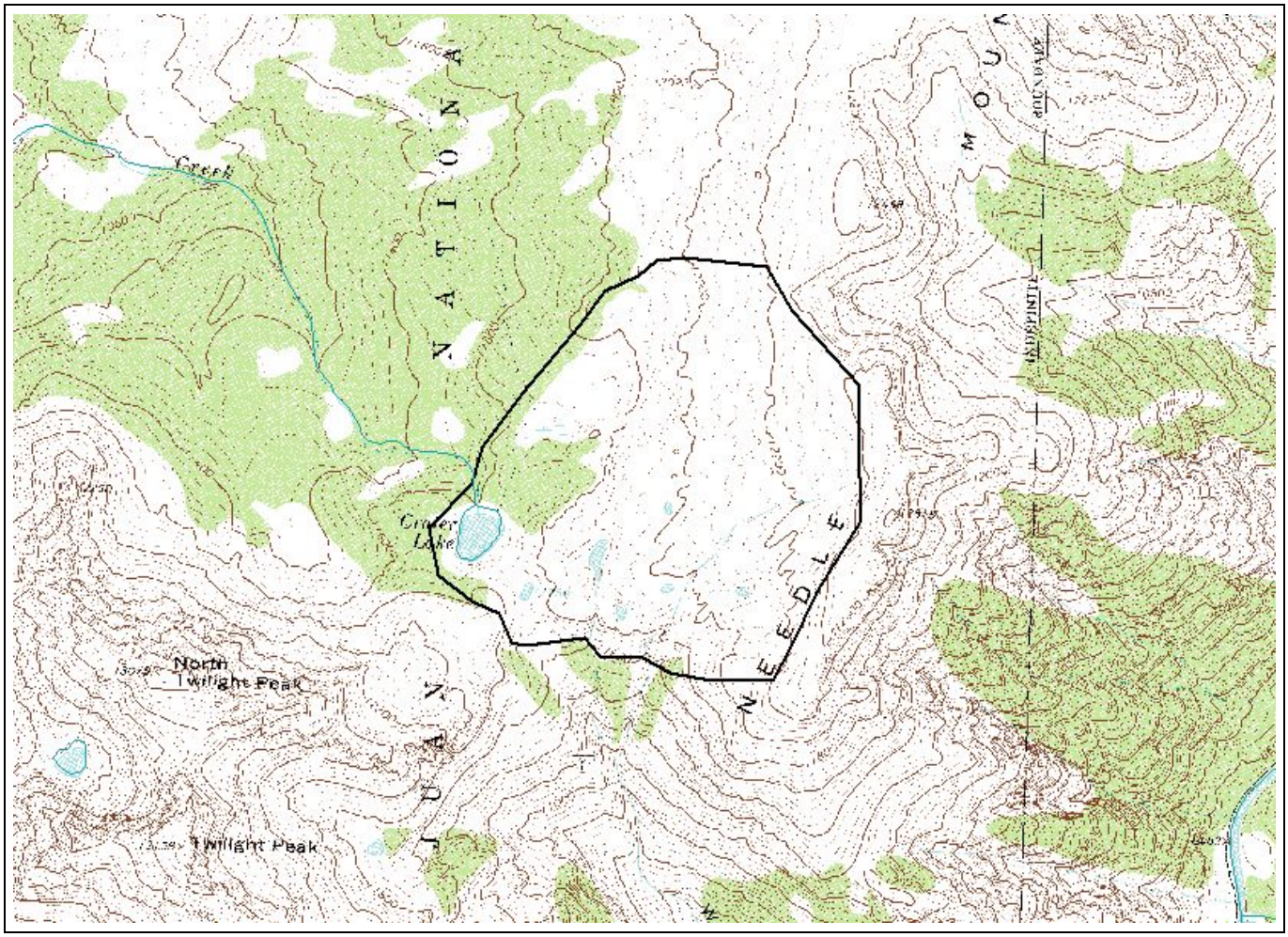
Boundary Justification: The boundary for Crater Lake PCA was drawn to include the high alpine rocky outcrops that are habitat for San Juan and Colorado divide whitlow grasses, and the wetlands that support Altai cotton grass and mud sedge.

Protection Comments: The site is entirely within the San Juan National Forest, in the Weminuche Wilderness, and is adequately protected.

Management Rank Comments: Although the rare plant populations do not require any management, the area around Crater Lake is impacted by campers with numerous heavily used trails and has been depleted of firewood. Since the habitat of San Juan whitlow-grass is dependent on snow pack and cool temperatures, this would be a good site to monitor for effects of climate change or drought.

Figure 73. San Juan whitlow-grass (*Draba graminea*). Photo by Peggy Lyon.

Crater Lake PCA
B2: Very High Biodiversity Significance



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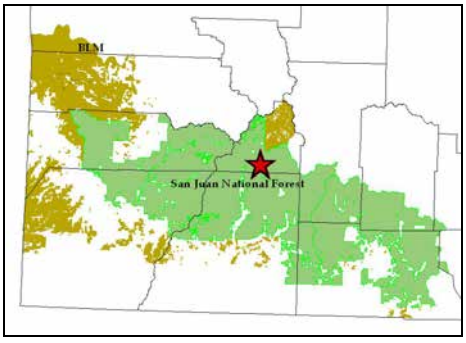
PCA Boundary

Snowdon Peak
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Disappointment Valley Northwest PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports a good (B-ranked) occurrence of a globally imperiled (G1) plant.

Protection Urgency Rank: P1: Protection actions needed immediately. It is estimated that current stresses may reduce the viability of the plants in the PCA within 1 year.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.

Location: The Disappointment Valley PCA is Located in San Miguel County about 20 miles southwest of Naturita. To access this PCA drive Hwy 141 south from Naturita toward Dove Creek.

U.S.G.S. 7.5 minute quadrangle: Hamm Canyon and Joe Davis Hill
Legal Description: T43N R17W, Sections 6-8, and 17-20
T43N R18W, Sections 1-3, 11, and 12
T44N R18W, Sections 27, 28, 33, and 34

Elevation: 5,600- 5,800 feet **Size:** Approximately 4,192 acres

General Description: Disappointment Valley is the southernmost of several parallel northwest/southeast trending valleys in western Colorado that were formed by the collapse of ancient salt domes. The PCA lies to the south of Big Gypsum Valley, on the north side of Disappointment Creek, a major tributary of the Dolores River. Vegetation of the valley is mapped as a mosaic of big sagebrush, greasewood and salt desert scrub. The northern part of the valley floor has clay soils derived from Mancos shale. Small knolls of light gray soils that contrast to the darker surrounding soils are scattered throughout the valley. These outcrops support widely scattered clumps of Gypsum Valley cat-eye (*Cryptantha gypsophila*), a species first described in 2004. Although not mapped as such, these soils appear to be similar to those in Big Gypsum Valley that are mapped as the Paradox member of the Hermosa formation, and also support the Gypsum Valley cat-eye. However, they differ in being somewhat more rocky and in the absence of a dense lichen community. Associated species are shadscale (*Atriplex confertifolia*), blue grama (*Bouteloua gracilis*), western tansymustard (*Descurainia pinnata*) and scarlet globemallow (*Sphaeralcea coccinea*).

Dakota sandstone on canyon rims on the south side of the valley support Naturita milkvetch (*Astragalus naturitensis*) and a community dominated by black sagebrush (*Artemisia nova*). Associated plants here include lavenderleaf sundrops (*Calyophus lavandulifolia*), scorpion weed (*Phacelia crenulata*), trailing fleabane (*Erigeron flagellaris*), rabbitbrush (*Chrysothamnus nauseosus*), pricklypear (*Opuntia polyacantha*), scarlet globemallow (*Sphaeralcea coccinea*), sixweeks fescue (*Vulpia octoflora*), blue grama (*Bouteloua gracilis*), sulphur-flower buckwheat (*Eriogonum umbellatum*), bastard toadflax (*Comandra umbellata*), skunkbrush (*Rhus trilobata*), cushion buckwheat (*Eriogonum ovalifolium*), tawny cryptantha (*Cryptantha fulvocanescensa*), and Ives'fournerved daisy (*Tetraneuris ivesiana*). Cheatgrass

(*Bromus tectorum*) was the only exotic species noted. Predominant current land use of this PCA is grazing. There is some oil and gas development, with a potential for more in the future.

Biodiversity Rank Justification and Comments: The Disappointment Valley PCA supports a good (B-ranked) and fair (C-ranked)occurrence of the Gypsum Valley cat-eye, a globally imperiled (G1) plant. There is also an excellent (A-ranked) occurrence of Naturita milkvetch, globally imperiled to vulnerable (G2G3).

Natural Heritage element occurrences at Disappointment Valley PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Cryptantha gypsophila	**Gypsum Valley cat-eye**	**G1**	**S1**		**B**
Cryptantha gypsophila	Gypsum Valley cat-eye	G1	S1		C
Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3	BLM sensitive	A

*EO=Element Occurrence. Multiple listings represent separate locations.

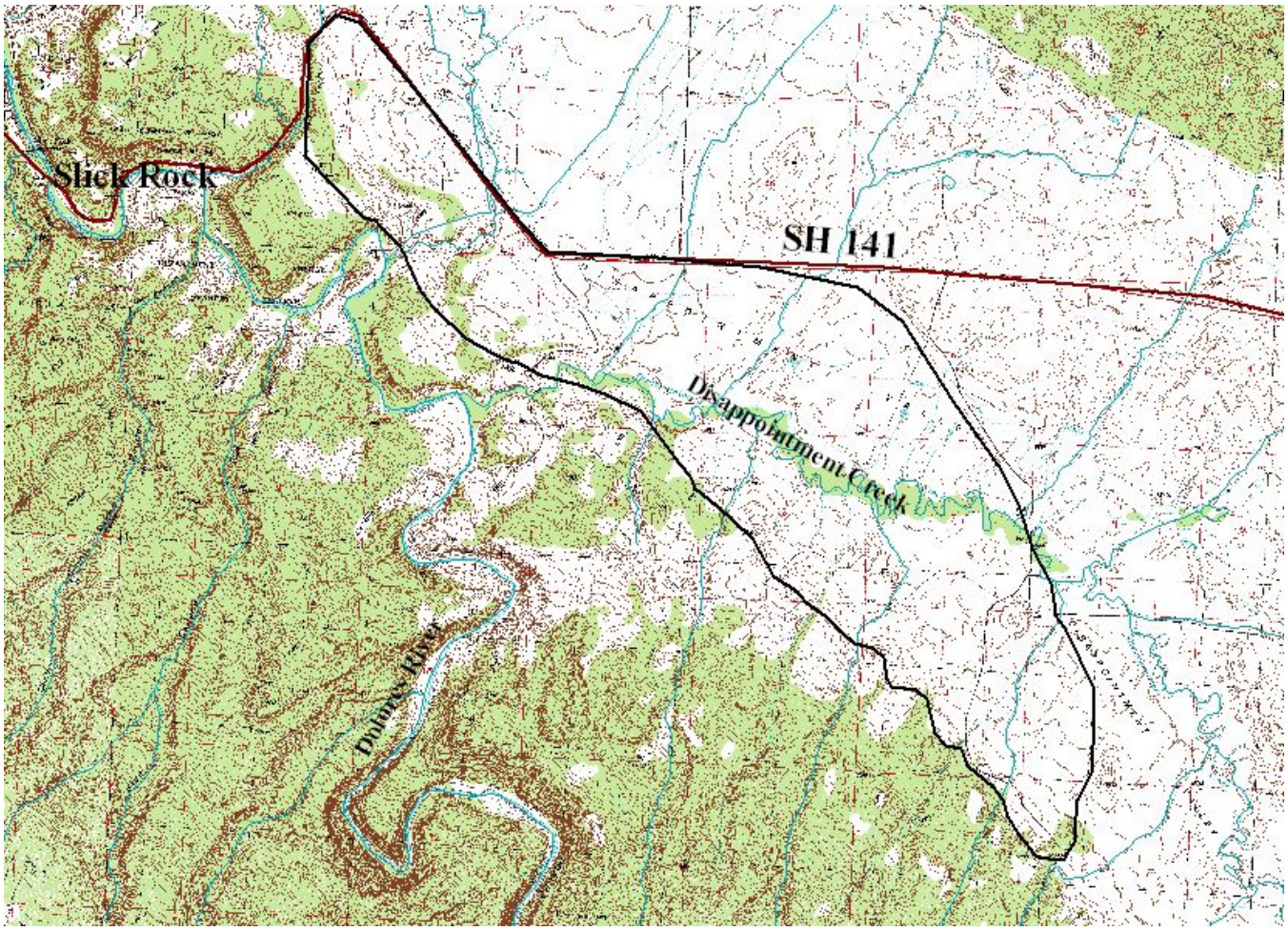
Boundary Justification: The PCA boundary was drawn to include both the Gypsum Valley cat-eye and Naturita milkvetch occurrences, along with suitable habitat for both species.

Protection Comments: Rare plant occurrences may need protection from surface disturbance if oil and gas development occur. A special designation such as an ACEC would help to protect the natural values of the site.

Management Rank Comments: Grazing and OHV/ATV use are potential threats to the rare plant populations.

Figure 74. Disappointment Valley Northwest.
Photo by Peggy Lyon.

Disappointment Valley Northwest
B2: Very High Biodiversity Significance



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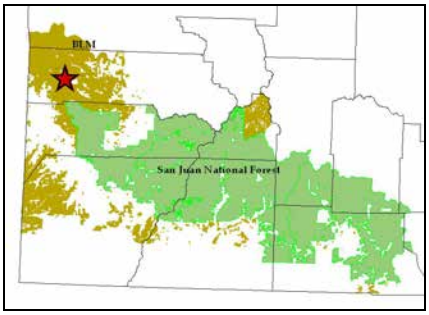
PCA Boundary

Hamm Canyon
Joe Davis Hill
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Dolores River from Slick Rock to Bedrock PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports two excellent (A-ranked) occurrences of a wild privet shrubland, a globally imperiled (G2) community.

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.

Location: The Dolores River from Slick Rock to Bedrock PCA is located in San Miguel and Montrose counties along the Dolores River, about 18 miles west of Naturita.

U.S.G.S. 7.5 minute quadrangle: Paradox, Anderson Mesa, Horse Range Mesa, and Hamm Canyon

Legal Description: T43N, R18W, Sections 3-5, and 10
T44N, R18W, Sections 30-34, 5, 7, 8, and 18
T44N, R19W, Sections 12, 13, 24, 25, and 36
T45N, R18W, Sections 5-9, 17, 18, 20,28,29,32, 33
T45N, R19W, Sections 1and 12
T46N, R18W, Section 31
T46N, R19W, Sections 1, 2, 10, 11, 14, 15, 22, 23, 25-27, 35, and 36
T47N, R19W, Section 35

Elevation: 5,400 feet **Size:** Approximately 3014 acres

General Description: The Dolores River has carved a spectacular deep canyon through Jurassic and Triassic sandstones at this PCA. Steep vertical cliffs dominate the canyonsides, broken only when tributaries enter the canyon. Major geologic formations in the canyon are Wingate, Kayenta, Navajo and Entrada sandstones. The Morrison Formation appears near the southern end of the PCA.

This PCA includes the riparian zone and adjacent uplands along the Dolores River for approximately fifty miles, from south of Slick Rock north to Bedrock. Most of this area is roadless and accessible only by raft, canoe or kayak. The canyon bottoms support a nearly continuous occurrence of the riparian plant association known as Wild privet Foothills Riparian Shrubland (*Forestiera pubescens* shrubland). Typical vegetation along the river includes a band of coyote willow (*Salix exigua*), mixed with giant reed (*Phragmites australis*) at the water's edge between the low and high water marks. On slightly higher ground is a band of New Mexico privet (*Forestiera pubescens*), often accompanied by skunkbrush (*Rhus trilobata*), Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), giant reed (*Phragmites australis*) and wild rose (*Rosa woodsii*). Narrow leaf cottonwood (*Populus angustifolius*) and box elder (*Negundo aceroides*) are occasional. Most of this area has few weeds, and surprisingly little tamarisk (*Tamarix ramosissima*) compared with other parts of the river.

In an alcove seep at river mile 77.5, CNHP researchers found a hanging garden community with Eastwood's monkeyflower (*Mimulus eastwoodiae*) and Mancos columbine (*Aquilegia micrantha*). While Mancos columbine was abundant, the monkeyflower was represented by only six plants. Adjacent species were Utah juniper (*Juniperus osteosperma*), Mormon tea (*Ephedra viridis*), skunkbrush (*Rhus trilobata*), single leaf ash (*Fraxinus anomala*), New Mexico wild privet, and two ferns: purple cliffbrake (*Pallaea atropurpurea*) and slender lip-fern (*Cheilanthes feei*). Kachina daisy (*Erigeron kachinensis*) was not present. Several other alcoves in this stretch support hanging garden communities, but did not contain any of the targeted species. A cliff base just upstream of Spring Creek was the site of a good population of Helleborine orchids (*Epipactis gigantea*). Another smaller occurrence was found below the seep at mile 77.5.

Uplands in this area have Pinyon-Juniper Woodlands(*Pinus edulis- Juniperus osteosperma*), sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), or barren sandstone cliffs. Naturita milkvetch (*Astragalus naturitensis*) was found in the pinyon-juniper community at a campsite at mile 72. Benches sometimes have patches of native grasslands. Relic patches of high quality grasslands were identified by BLM in 1980. Formerly known as "*Stipa comata* – West", this community is now called *Stipa comata*, or "Needle and thread Great Basin Herbaceous Vegetation". The species composition of the communities varies. It usually includes, in addition to needle and thread grass, galleta (*Pleuraphis (Hilaria) jamesii*), Indian ricegrass (*Oryzopsis hymenoides*), and blue grama (*Bouteloua gracilis*). In the occurrences in this PCA, needle and thread was the dominant grass, ranging from 6% to 20% cover. Blue grama accounted for 1% to 11% cover.

This area has a number of occurrences of animal species with conservation significance, the rarest of which are the Roundtail chub and Flannelmouth sucker. Nesting Peregrine Falcons also occur at this PCA. The Peregrine eyries occur along the cliff tops to approximately 100 feet below the cliff tops of the Dolores River Canyon. Also found within the PCA are a number of animals that globally are demonstrably secure (G5) including the Yuma skipper, Canyon tree frog, Plateau striped whiptail, and Tree lizard.

Biodiversity Rank Justification and Comments: The biodiversity rank for the PCA is based on two excellent-good (AB-ranked) occurrences of Wild privet Shrubland, a globally imperiled (G2) community. Several rare plants occur within the site including Naturita milkvetch with a historic (H-ranked) and updated good (B-ranked) occurrences. The Paradox breadroot (*Pediomelum aromaticum*) is an historical record (H-ranked) and Helleborine and Smooth cliff-brake are found as good (B-ranked) occurrences. Eastwood monkey flower is a state rare (S1) and had a fair (C-ranked) occurrence.

Natural Heritage element occurrences at Dolores River from Slickrock to Bedrock PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Natural communities					
***Forestiera pubescens* shrubland**	**Wild privet shrubland**	**G2**	**S1S2**		**AB**
***Forestiera pubescens* shrubland**	**Wild privet shrubland**	**G2**	**S1S2**		**AB**
Aquilegia micrantha-Mimulus eastwoodiae	Hanging gardens	G2G3	S2S3		C
Plants					
Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3	BLM sensitive	B
Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3	BLM sensitive	H
Pediomelum aromaticum	Paradox breadroot	G3	S2	BLM sensitive	H
Mimulus eastwoodiae	Eastwood monkey-flower	G3?	S1	BLM sensitive	C
Epipactis gigantea	Helleborine	G4	S2	FS sensitive	B
Epipactis gigantea	Helleborine	G4	S2	FS sensitive	C
Pellaea glabella ssp. *simplex*	Smooth cliff-brake	G5T4?	S2		B

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary for this PCA was drawn to include the community of Wild privet stretching along the riparian zone of the Dolores River. It incidentally includes natural communities and rare plants that fall within that boundary.

Protection Comments: The roadless section of BLM land in the Dolores Canyon between McIntyre Canyon and La Sal Creek warrants special protection as wilderness, based on its biological significance and remoteness.

The BLM Resource Management Plan of 1985 found this to be the only one of seven Wilderness Study Areas in the Uncompahgre and San Juan Resource Areas that is suitable for wilderness designation. It was found to possess "highly outstanding characteristics for primitive and unconfined recreation, solitude, and naturalness, as well as scenic grandeur and superb wilderness characteristics. It is a nationally unique area and is worthy of preservation in its natural state." The significant values listed are: Wild and Scenic River candidate; "outstanding primitive and unconfined recreation opportunities associated with the river, canyons, and mesas; unique plant and animal communities found within the WSA that contain threatened and endangered species habitat; and extremely diverse topography and geology that create outstanding scenic vistas and excellent solitude opportunities." BLM recommended wilderness designation for a total of 28,539 acres, which includes some side canyons represented here in separate PCAs. Effects of such designation, while protecting the PCA in perpetuity, could lead to an increase in visitors, with resulting impacts to plants, animals and plant communities.

Relic natural communities such as the *Stipa comata* Great Basin Herbaceous Vegetation could be protected by BLM as Research Natural Areas. They are valuable as reference sites to compare ungrazed areas with those currently grazed.

Management Rank Comments: If private river use greatly increases in the future, BLM may need to initiate a permit system as is presently in place for commercial rafters. There are a few disturbed areas in this fifty-mile stretch, mostly near campsites used by rafters and kayakers.

These areas often have significant Russian knapweed (*Acroptilon repens*) infestations. The quality of the riparian area noticeably deteriorates a few miles south of the confluence of La Sal Creek, where tamarisk is well established. There have been some problems with trespass cattle in the lower portion of La Sal Creek, and grazing issues remain to be settled.

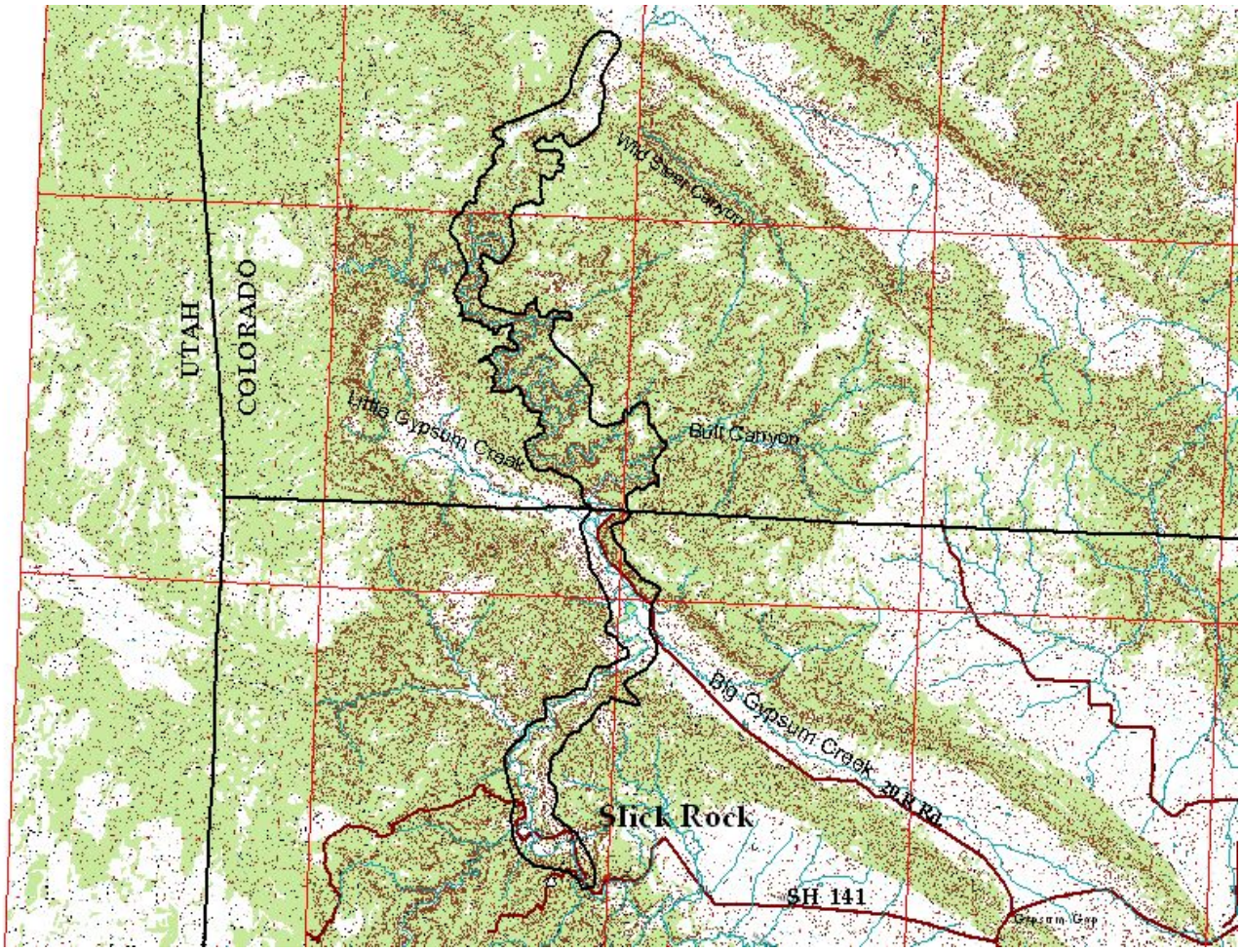
Conservation of the high quality relic sites of Needle and thread Great Basin herbaceous vegetation could be aided by protection from livestock grazing by maintaining their remoteness and abstaining from building of any new roads, trails or water developments in their vicinity. Periodic monitoring of these areas would permit the detection of changes in condition that might warrant management action.

Both the Roundtail chub and Flannelmouth sucker are sensitive to disturbance, including the blockage of migration routes, introduction of non-native fish, and the alteration of hydrologic and thermal characteristics of the river, including channelization, modifications of flow regimes, and increased sedimentation.

Tamarisk invasion may threaten Yuma skipper habitat by displacing its host plant, the giant reed (CNHP 1999). Protection of natural wetlands with stands of giant reed (*Phragmites australis*) will help to assure the continued existence of this species in Colorado.

Figure 75. Wild privet shrubland along Dolores River near Slick Rock.
Photo by Peggy Lyon.

Dolores River from Slick Rock to Bedrock PCA
B2: Very High Biodiversity Significance



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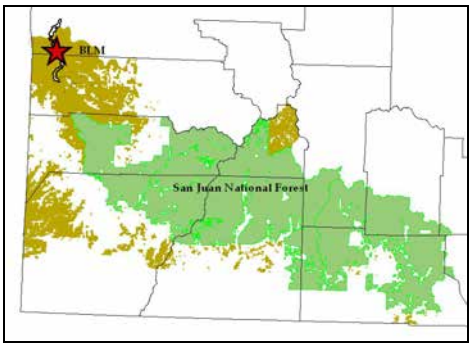
PCA Boundary

Paradox, Anderson Mesa, Hamm Canyon, Bull Canyon, Horse Range Mesa 7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Highland Mary Lakes PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports a good (B-ranked) occurrence of a globally imperiled (G2) plant.

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M4: Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.

Location: The Highland Mary Lakes PCA is located in San Juan County approximately 5 miles south east of the town of Silverton. To access the PCA from Silverton drive west on CR 110 to Cunningham Gulch Road 589 to Trail head for Highland Mary Lakes. Hike about 3 miles to lakes.

U.S.G.S. 7.5 minute quadrangle: Howardsville
Legal Description: T41N, R6W, Section 31
T41N, R7W, Section 36

Elevation: 11,800 to 12,200 feet **Size:** Approximately 727 acres

General Description: The Highland Mary Lakes PCA includes a group of seven connected high alpine lakes and associated wetlands that form the headwaters of Cunningham Creek, along with adjacent rocky dry tundra, just west of the Continental Divide. The PCA lies within the Weminuche Wilderness of the San Juan National Forest.

San Juan whitlow-grass (*Draba graminea*) was found on a rocky northwest-facing slope below a late-melting snowbank.

Altai cottongrass (*Eriophorum altaicum* var. *neogaeum*) was first located at the PCA in 1994 at the southwest outlet of the largest lake. A second sub-population was found in 2005 on the flat sheltered rim of the northernmost lake. Associated species were marsh-marigold (*Caltha leptosepala*), elephantella (*Pedicularis groenlandica*), planeleaf willow (*Salix planifolia*), water sedge (*Carex aquatilis*), and king's crown (*Rhodiola integrifolia*).

Biodiversity Rank Justification and Comments: The biodiversity site rank for Highland Mary Lakes PCA is based on a good (B-ranked) occurrence of San Juan whitlow-grass, a globally imperiled (G2) plant. It also includes a good (B-ranked) occurrence of Altai cottongrass, a globally vulnerable (T3) subspecies. Alpine wetlands *(Cardamine cordifolia/Senecio triangularis*) had a good (B-ranked) occurrence and is apparently secure (G4S4) globally and in the state of Colorado.

Natural Heritage element occurrences at Highland Mary Lakes PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
Draba graminea	**San Juan whitlow-grass**	**G2**	**S2**		**B**
Eriophorum altaicum var. *neogaeum*	Altai cotton grass	G4?T3T4	S1	FS sensitive	B
Natural communities					
Cardamine cordifolia/Senecio triangularis	Alpine wetlands	G4	S4		B

*EO=Element Occurrence. Multiple listings represent separate locations.

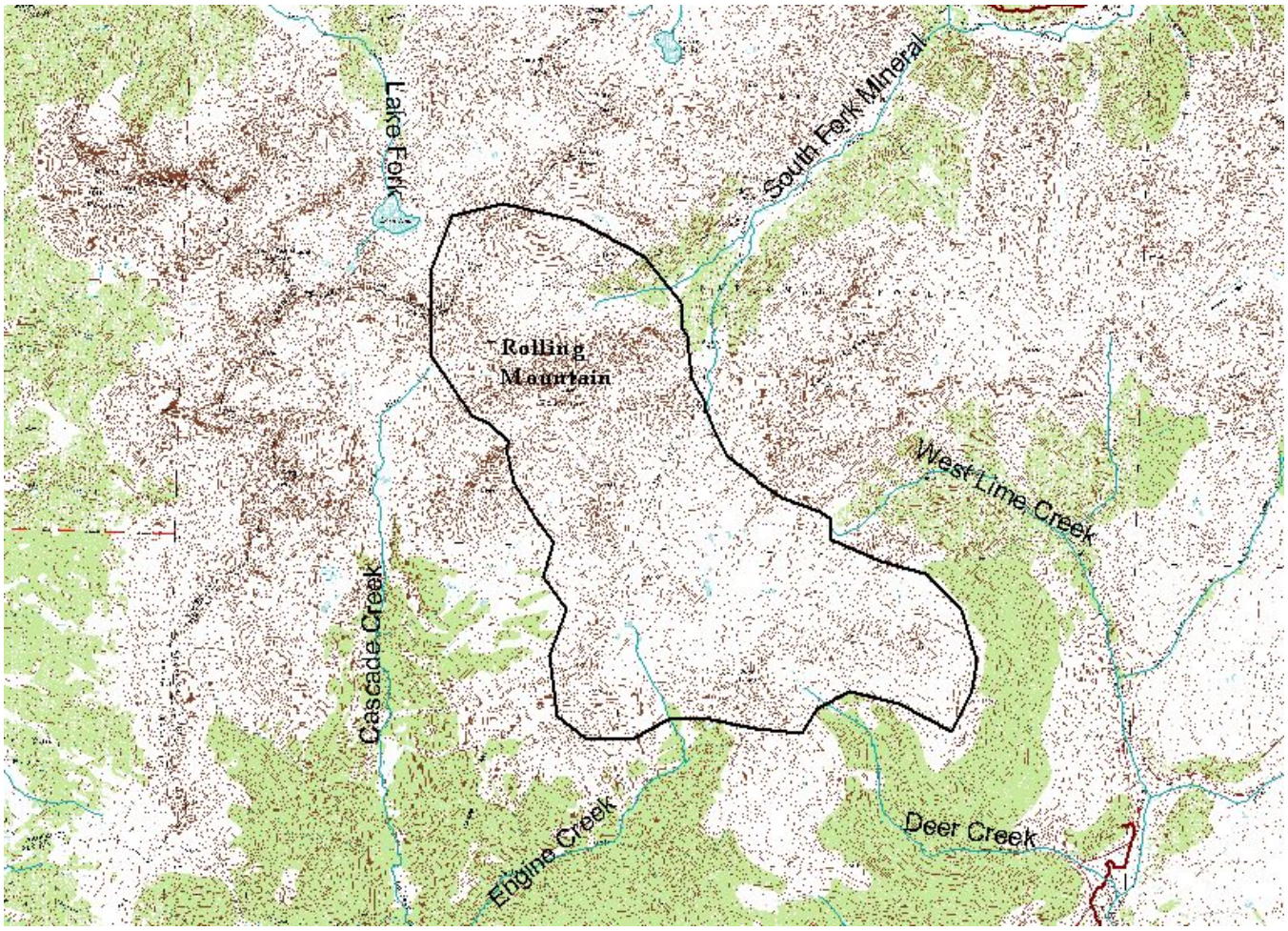
Boundary Justification: The boundary for Highland Mary Lakes PCA was drawn to include the San Juan whitlow-grass occurrence below the lakes and in the outcrops above the lakes. It includes the locations of Altai cottongrass found in 1994 and 2005. It also includes potential habitat for both species.

Protection Comments: The PCA is within the Weminuche Wilderness of the San Juan National Forest.

Management Rank Comments: Although the area is a popular destination for hikers, no direct impacts on rare plants were noted. No exotic species were observed in the PCA.

Figure 76. Wetlands surrounding this lake in the Highland Mary Lakes PCA support Altai cottongrass, while rocky tundra above is home to San Juan whitlow-grass. Photo by Peggy Lyon.

Highland Mary Lakes PCA
B2: Very High Biodiversity Significance



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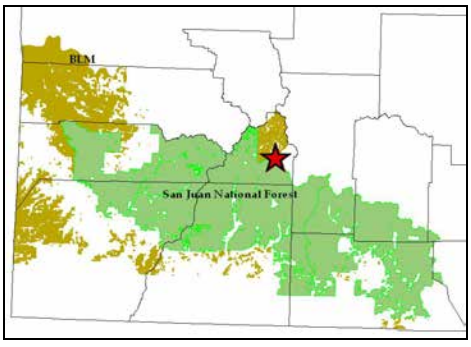
PCA Boundary

Howardsville
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Little Gypsum Valley PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports an extant (E-ranked) occurrence of a critically imperiled (G1) plant.

Protection Urgency Rank: **P2.** Protection actions may be needed within 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA within this approximate timeframe.

Management Urgency Rank: M3. New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.

Location: The Little Gypsum Valley PCA is located along the southern boarder of Montrose County and the Northern boarder of San Miguel County about 20 miles west of Naturita. To access this PCA drive Highway 141 at Big Gypsum Valley, go west 15 miles, cross Dolores River and continue in Little Gypsum Valley for about 4 miles.

U.S.G.S. 7.5 minute quadrangle: Anderson Mesa
Legal Description: T45N, R18W, Sections7, and 18
T45N, R19W, Sections 2, 3, and 10-14

Elevation: 5,400 feet **Size:** Approximately 2333 acres

General Description: The PCA circumscribes Little Gypsum Valley, the continuation of Big Gypsum Valley north of the Dolores River. The valley is the result of a large sea embayment separated from the remaining sea that covered this area in the Pennsylvanian age. Upon evaporation of this sea, its salts became concentrated in domes overlain with sedimentary rock. Once these sedimentary rocks were breached by erosion, the domes, comprised of soluble salt and gypsum, were washed away and the flanking structures collapsed, leaving the broad valleys at Paradox, Gypsum, and Dry Creek. Soils of the PCA consist of the Mikim composition, characterized by ustic torriothents, fine-loamy, mixed (calcareous), and mesic soils. Geologic features of the area include Quaternary landslide deposits, Cretaceous Mancos Shale, and the Jurassic Morrison, Summerville, and Entrada Formations. There is also an unusual gypsum outcrop of the Paradox member of the Hermosa Formation, on which the rare Gypsum Valley cat-eye (*Cryptantha gypsophila*) was found. This formation is mapped in only 8 locations in Colorado, including Little Gypsum Valley (1), Big Gypsum Valley (2), Paradox Valley (3), Sinbad Valley (1) and Ouray County (1).

Gypsum Valley cat-eye (*Cryptantha gypsophila*) was collected in the site on "grayish-white, lichen-covered gypsum slopes", about one mile west of the Dolores River Bridge in 2004 by James Reveal. This site was not visited by CNHP in 2005, so the population size, condition and landscape context are not known; however, it is expected to be similar to other *Cryptantha* sites in Big Gypsum and Disappointment Valleys. In nearby Big Gypsum Valley, about 20 species of lichens, including three rare species, occurred with the *Cryptantha* (see Big Gypsum Valley PCA).

Naturita milkvetch (*Astragalus naturitensis*) was found on a low sandstone hill, where bedrock of the Salt Wash member of the Morrison Formation was exposed above the Mancos Shale of the valley bottom. This was a small population, but the species appears to be widely distributed in the western parts of San Miguel and Montrose counties in suitable habitat. A previous herbarium record from this area listed the habitat as "open pinyon-juniper woodland with sagebrush openings". The occurrence was updated in 2005, and ranked fair (C).

The little penstemon (*Penstemon breviculus*) record is based on a herbarium specimen at the University of Colorado. Its habitat was given as "gently sloping valley floor, sheep driveway."

Biodiversity Rank Justification and Comments: The PCA biodiversity rank is based on an unranked (NR) occurrence of Gypsum Valley cat-eye (*Cryptantha gypsophila*), a critically imperiled (G1) plant (for purposes of assigning biodiversity ranks, an unranked occurrence is considered equivalent to a C rank). A fair (C-ranked) occurrence of Naturita milkvetch (*Astragalus naturitensis*), and an unranked (NR) occurrence of short-stem beardtongue add to the biodiversity value of the site.

Natural Heritage element occurrences at Little Gypsum Valley PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Cryptantha gypsophila	**Gypsum Valley cat-eye**	**G1**	**S1**		**E**
Astragalus naturitensis	Naturita milkvetch	G2G3	S2S3	BLM sensitive	C
Penstemon breviculus	Short-stem beardtongue	G3	S2		NR

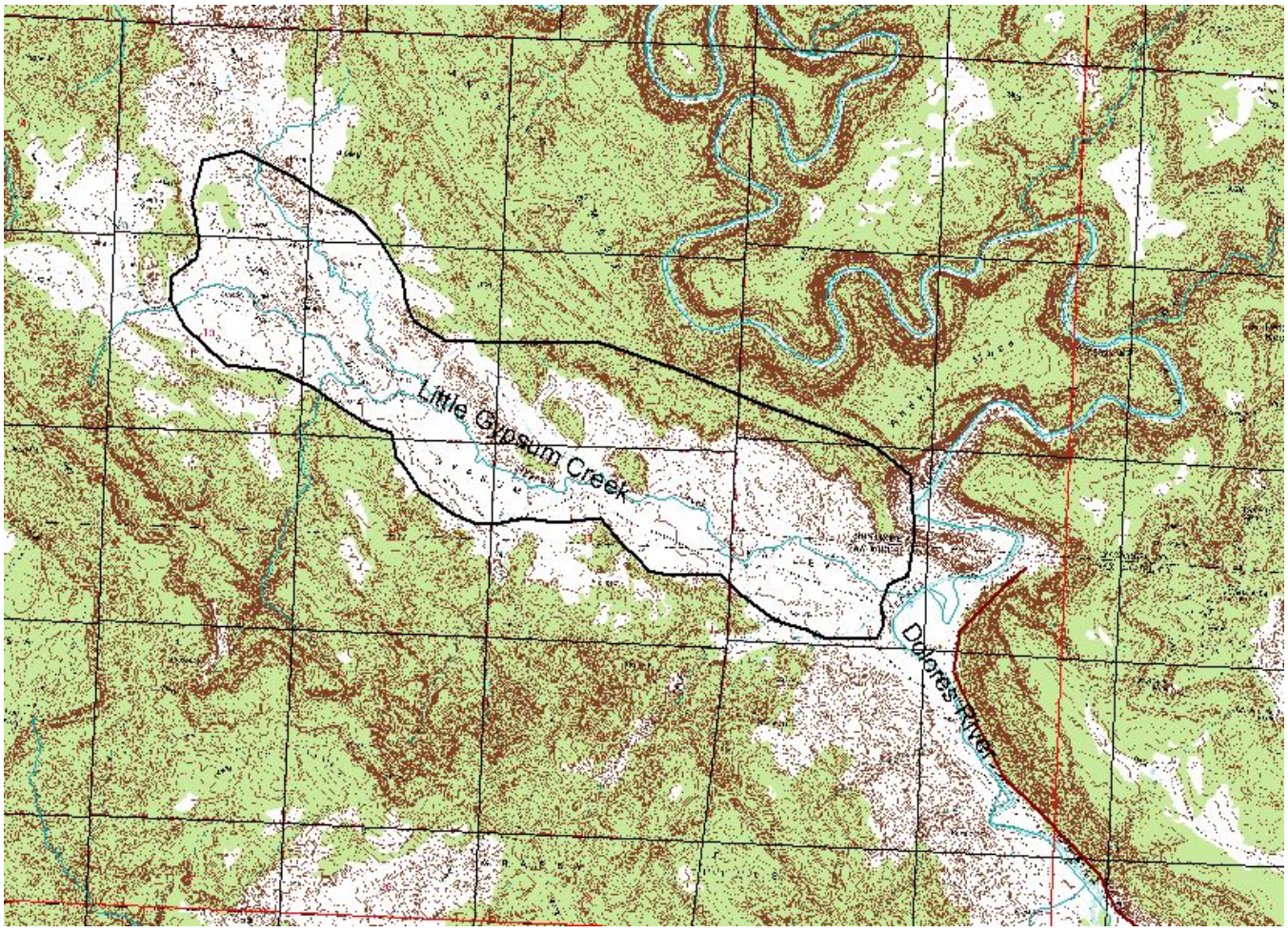
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The Little Gypsum Valley PCA boundary was drawn to encompass the occurrences of Gypsum Valley cat-eye (*Cryptantha gypsophila,* short-stem beardtongue (*Penstemon breviculus),* and Naturita milkvetch (*Astragalus naturitensis).* It includes the entire area that is mapped as the Paradox member of the Hermosa formation.

Protection Comments: There is potential for oil and gas development at the site. The survival of the rare plants (and possibly lichens) may depend on allowing no surface occupancy at these locations.

Management Rank Comments: No management needs have been noted; however, the site should be monitored for invasion of exotic species. The occurrence of Gypsum Valley cat-eye should be visited and evaluated in 2006.

Little Gypsum Valley PCA
B2: Very High Biodiversity Significance



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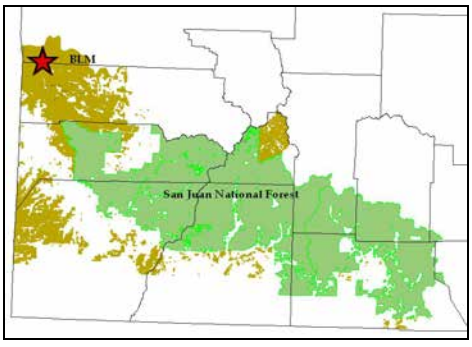
PCA Boundary

Anderson Mesa
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Rolling Mountain PCA

Biodiversity Rank. B2: Very high biodiversity significance. This PCA supports an excellent (A-ranked) occurrence of a globally imperiled (G2) plant.

Protection Urgency Rank: **P4.** No protection actions are needed in the foreseeable future.

Management Urgency Rank: M4. Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.

Location: The Rolling Mountain PCA is located in San Juan County, approximately 9 air miles west of the town of Silverton. To access this PCA take the South Fork Mineral Creek Road to South Park and Lake Hope trail head.

U.S.G.S. 7.5 minute quadrangle: Ophir and Engineer Mountain
Legal Description: T40N, R8W, Sections 7, 17, and 18
T40N, R9W, Sections 1, 2, and 11-14
T41N, R9W, Sections 26, 27, and 34-36

Elevation: 12,200 feet **Size:** Approximately 4,510 acres

General Description: The Rolling Mountain PCA is a high alpine basin with rocky slabs and thin gravelly soils. Areas where the snow lasts until late in the year are habitat for two rare mustard species, San Juan whitlow-grass (*Draba graminea*) and Colorado divide whitlow-grass (*Draba streptobrachia*).

Draba graminea was first documented in the northwestern part of the PCA in 1934 by a specimen collection at Fort Lewis College. An additional occurrence to the south was found in 2005. There is abundant suitable habitat in the PCA, and it is expected that the area between the two occurrences is also occupied. The habitat continues all around the basin, at lower elevevations on north facing slopes, where it reaches almost down to a large wetland known as South Park.

The rocky tundra is dominated by mosses, lichens and alpine species including alpine sandwort (*Lidia obtusiloba*), cinquefoil (*Potentilla diversifolia*), pygmy bitterroot (*Oreobrama pygmaea*), diamond-leaf saxifrage (*Micranthes rhomboidea*), one stem fleabane (*Erigeron simplex*), moss saxifrage (*Silene acaulis*), old-man-of-the-mountain (*Rydbergii grandiflora*), alpine sage (*Artemisia scopulorum*), Eastwood's podistera (*Podistera eastwoodiae*), and several *Draba* species.

Two popular hiking trails pass through the PCA: The Lake Hope Trail, heading west and connecting the South Mineral Creek area with Lake Hope and Trout Lake near Lizard Head Pass in San Miguel County; and the Rico-Silverton trail, heading south to connect with the Highline Trail and Cascade Creek.

Biodiversity Rank Justification and Comments: The PCA biodiversity rank is based on an excellent (A-ranked) occurrence of San Juan whitlow-grass (*Draba graminea*), a critically imperiled plant globally (G2). The site also supports a good (B) occurrence of Colorado Divide whitlow-grass, a globally vulnerable (G3) plant.

Natural Heritage element occurrences at Rolling Mountain PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Draba graminea	**San Juan whitlow-grass**	**G2**	**S2**		**A**
Draba graminea	San Juan whitlow-grass	G2	S2		H
Draba streptobrachia	Colorado Divide whitlow-grass	G3	S3		B
Draba streptobrachia	Colorado Divide whitlow-grass	G3	S3		H

*EO=Element Occurrence. Multiple listings represent separate locations.

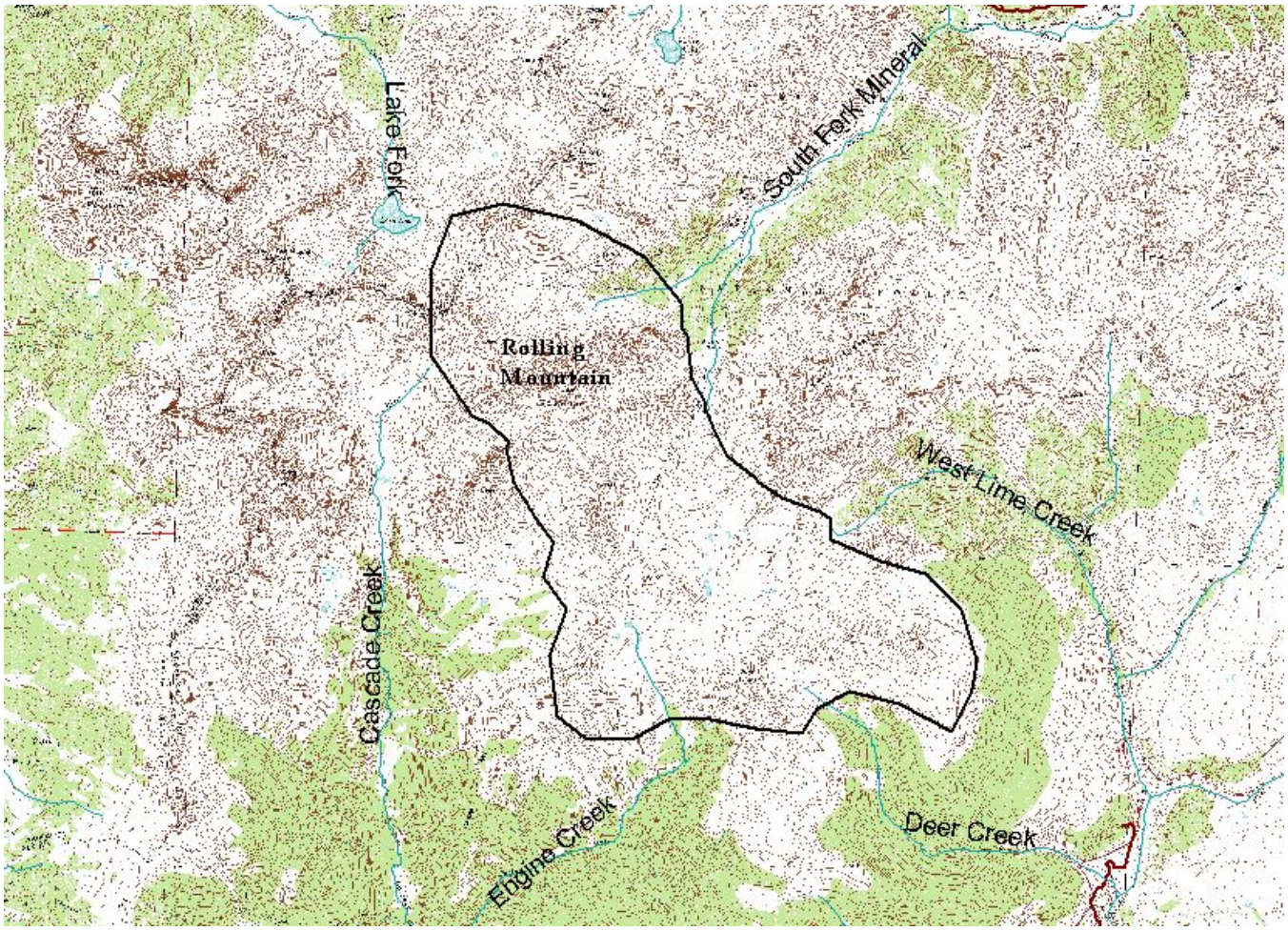
Boundary Justification: The boundary for the Rolling Mountain PCA was drawn to include occurrences documented in 2005 as well as two historic records for Colorado Divide whitlow-grass and San Juan whitlow-grass. The site also includes potential habitat in the basin south of Twin Sisters, and includes Jura Knob.

Protection Comments: The site is within the San Juan National Forest, and has no additional special designation.

Management Rank Comments: No management needs were noted. Hiking trails have created no visible impacts, and no exotic species were observed.

Figures 77 and 78. *Draba graminea* habitat at Rolling Mountain.
Photos by Peggy Lyon.

Rolling Mountain PCA
B2: Very High Biodiversity Significance



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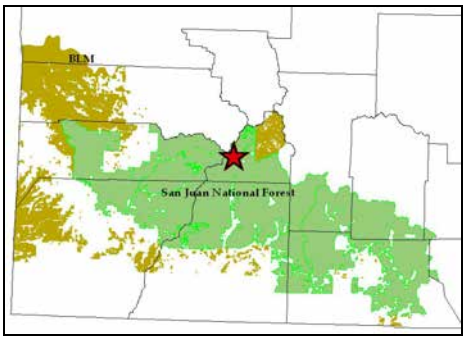
PCA Boundary

Ophir
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Slick Rock PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports an excellent (A-ranked) occurrence of a globally imperiled plant (G2G3).

Protection Urgency Rank: P2: Protection actions may be needed within 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA within this approximate timeframe.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.

Location: The Slick Rock PCA is located in San Miguel County approximately 18 miles north of the town of Dove Creek. To access this PCA drive north of Dove Creek on U.S. 666 to Hwy 141 and continue north past Egnar, or go south on Hwy 141 from Naturita.

U.S.G.S. 7.5 minute quadrangle: Horse Range Mesa
Legal Description: T43N, R18W, Section 6
T43N, R19W, Sections 1 and 2
T44N, R18W, Sections 30 and 31
T44N, R19W, Sections 25, 26, 35, and 36

Elevation: 6,000 feet **Size:** Approximately 2901 acres

General Description: Pinyon-juniper woodlands and shrublands cover the hillsides of this PCA above the Dolores River. The dominant plant community is Pinyon pine-Utah juniper/mountain mahogany (*Pinus edulis-Juniperus osteosperma/Cercocarpus montanus*).

The site includes part of Slick Rock Hill, Poverty Flats and several slickrock (Entrada sandstone) canyons that are tributary to the Dolores River. Benches of Entrada sandstone and the Morrison formation above the river support two rare plants, Naturita milkvetch (*Astragalus naturitensis*) and short-stem beardtongue (*Penstemon breviculus*). Other common species growing on the red sandy soils include the shrubs Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), cliff fendlerbush (*Fendlera rupicola*), mountain mahogany (*Cercocarpus montanus*), prickly pear (*Opuntia polyacantha*), Mormon tea (*Ephedra viridis*), and viscid rabbitbrush (*Chrysothamnus viscidiflorus*), the grasses needle and thread (*Stipa comata*), Indian ricegrass (*Oryzopsis hymenoides*), galleta (*Pleuraphis jamesii*), three-awn (*Aristida purpurea*) and blue grama (*Bouteloua gracilis*); and forbs snakeweed (*Gutierrezia sarothrae*), fineleaf hymenopappus (*Hymenopappus filifolius*), woolly milkvetch (*Astragalus mollissimus*), and crescent milkvetch (*Astragalus amphioxys*). Good cryptobiotic crust is present in undisturbed sites.

Primary use of the area is cattle grazing, recreation on the Dolores River, and uranium mining. Oil and gas development are potential in the future. There is some ATV use.

Biodiversity Rank Justification and Comments: The biodiversity site rank for the Slick Rock PCA is based on an (A-ranked) occurrence of Naturita milkvetch, a globally imperiled plant (G2G3). Eight sub-populations were found for this occurrence with an estimated total of 1500 individuals. There is also a fair (C-ranked) occurrence of short-stem beardtongue, a globally vulnerable (G3) species.

Natural Heritage element occurrences at Slick Rock PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Astragalus naturitensis	***Naturita milkvetch***	**G2G3**	**S3**	**BLM sensitive**	**A**
Penstemon breviculus	*Short-stem beardtongue*	G3	S2		C

*EO=Element Occurrence. Multiple listings represent separate locations.

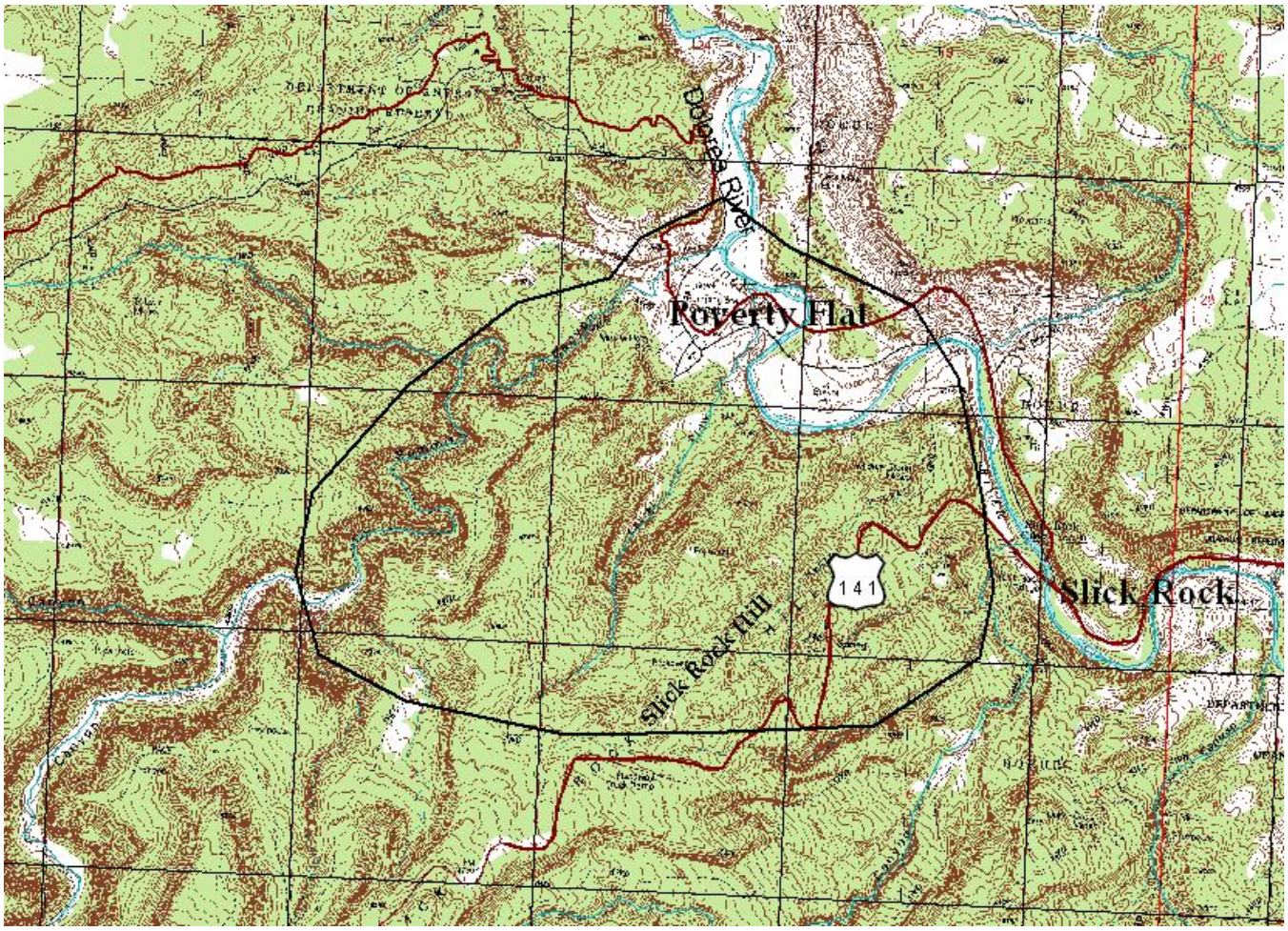
Boundary Justification: The boundary for the Slick Rock PCA was drawn to include the occurrences of Naturita milkvetch and Short-stem beardtongue, along with some additional potential habitat. It includes Summit Canyon and Corral Draw.

Protection Comments: Although much of the site is BLM land, it does include some private land. BLM land may be subject to mining or oil and gas impacts.

Management Rank Comments: ATV use and exotic species invasion may threaten rare plant populations. Exotic species noted in the site include cheatgrass (*Bromus tectorum*), cranesbill (*Erodium cicutarium*) and tall tumblemustard (*Sisymbrium altissimum*).

Figure 79. Habitat of *Astragalus naturitensis* and *Penstemon breviculus* in Slick Rock PCA. Photo by Peggy Lyon.

Slick Rock PCA
B2: Very High Biodiversity Significance



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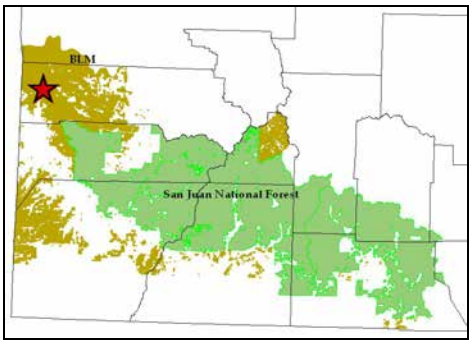
PCA Boundary

Horse Range Mesa
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Snowdon Peak PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports an excellent (A-ranked) occurrence of an imperiled plant (G2).

Protection Urgency Rank: P5: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M4: Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.

Location: The Snowdon Peak PCA is located in San Juan County approximately 7 miles south of Silverton. To access this PCA take the Crater Lake Trail from Andrews Lake and the cut off trail for Snowdon Peak.

U.S.G.S. 7.5 minute quadrangle: Snowdon Peak
Legal Description: T40N, R8W, Section 25

Elevation: 12,000 to 12,400 feet **Size:** Approximately 117 acres

General Description: The Snowdon Peak PCA encompasses a high alpine basin overlooking Andrews Lake and Molas Pass. This rocky peak has talus slopes that cascade down to a mix of alpine pools and willow islands at higher elevations and Spruce-Fir forest below. San Juan whitlow-grass (*Draba graminea*) was found in the north facing rocky outcrops with late season snow melt and steep gravel slopes with low plant competition. This alpine habitat is characterized by north exposure, minimum competition from other plants, cooler temperatures, and mid- to late summer plant development (depending on when the snow melts). Associated species include Arctic willow (*Salix arctica*), pygmy goldenweed (*Tonestus pygmaeus*), creeping sibbaldia (*Sibbaldia procumbens*), moss campion (*Silene acaulis*), Eastwood's podistera (*Podistera eastwoodiae*), and Siberian gentian (*Condrophylla prostrata*).

The Altai cottongrass (*Eriophorum altaicum* var. *neogaeum*) ccurrence was found on the flat boggy side of a small alpine pool dominated by marsh marigold (*Caltha leptosepala*), and sedges (*Carex* sp.).

Primary use of the area is hiking and climbing. Although the rare plant occurrences are away from trails, there is still some danger of trampling by humans. A more long-term impact on these plants could result from climate change or prolonged drought.

Biodiversity Rank Justification and Comments: The biodiversity site rank for the Snowdon Peak PCA is based on an excellent (A-ranked) occurrence of San Juan whitlow-grass, a globally imperiled (G2) plant. There is also a fair (C-ranked) occurrence of Altai cottongrass, a globally vulnerable (T3) subspecies.

Natural Heritage element occurrences at Snowdon Peak PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Draba graminea	**San Juan whitlow- grass**	**G2**	**S2**		**A**
Eriophorum altaicum var. *neogaeum*	Altai cottongrass	G4?T3T4	S1	FS sensitive	C

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary for Snowdon Peak PCA was drawn to include the occurrences of San Juan whitlow-grass and the surrounding north facing cliffs and steep rocky slopes of potential habitat. The Altai cottongrass occurrence was found on the grassy rim of the most southern cirque. Potential habitat for this critically imperiled plant is included in the northern areas of the PCA.

Protection Comments: The PCA is within the Weminuche Wilderness of the San Juan National Forest and is adequately protected.

Management Rank Comments: Periodic monitoring of the rare plant occurrences would help to determine if they are being impacted by trampling by hikers.

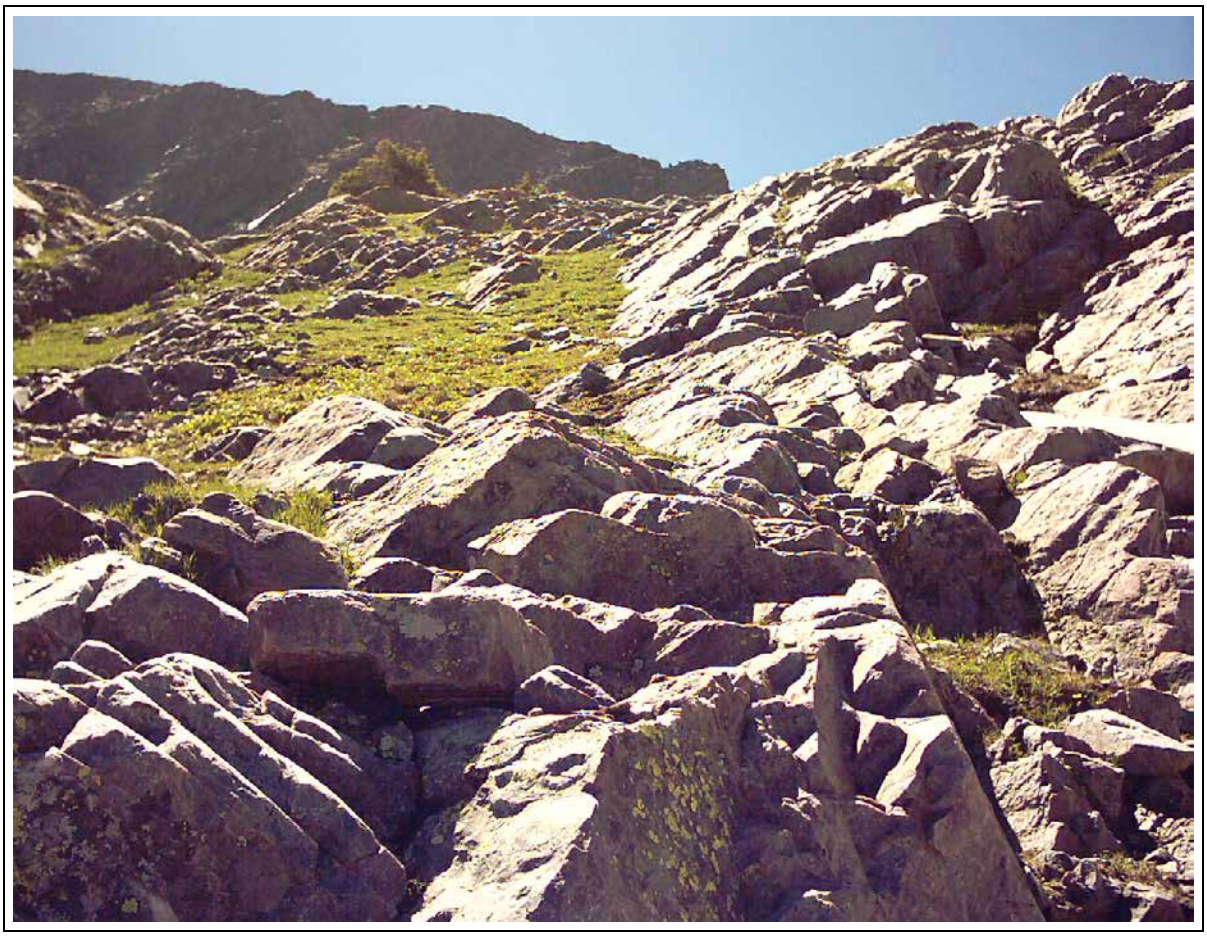
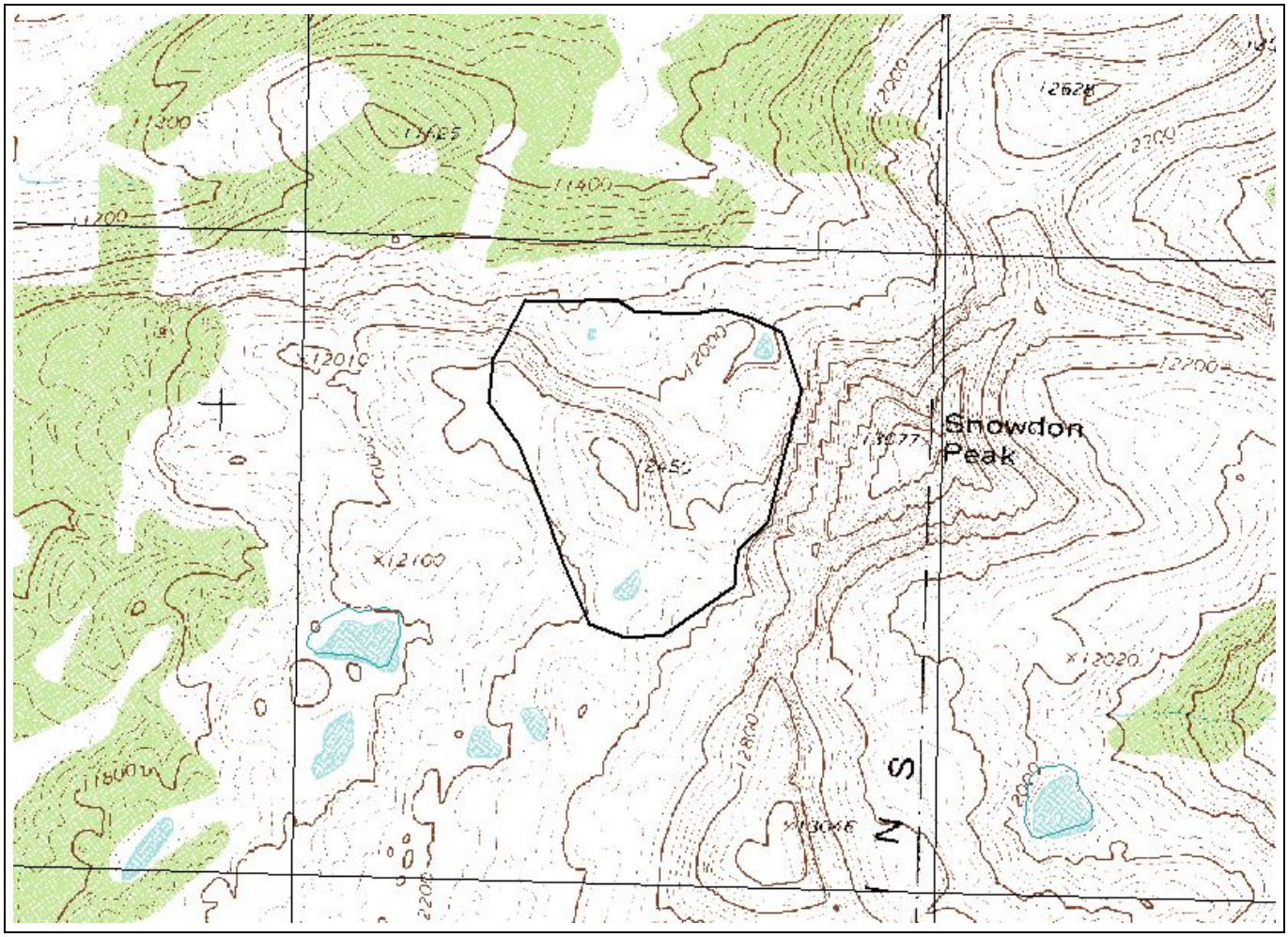


Figure 80. Habitat of *Draba graminea* at Snowdon Peak PCA.
Photo by Peggy Lyon.

Snowdon Peak PCA
B2: Very High Biodiversity Significance



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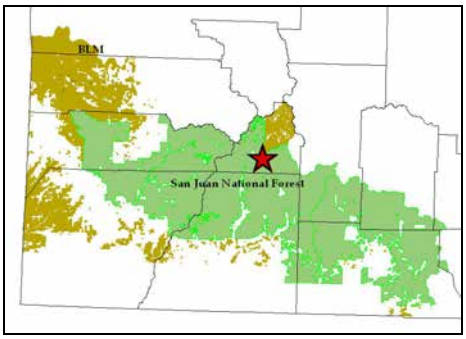
PCA Boundary

Snowdon Peak
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Spring Creek Basin PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports a good (B-ranked) occurrence of a critically imperiled (G1) plant.

Protection Urgency Rank: P3: Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken.

Management Urgency Rank: M2: New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.

Location: The Spring Creek Basin PCA is located in San Miguel County approximately 20 miles northeast of Dove Creek. To access this PCA drive Hwy 145 to Spring Creek Basin Road K20 from Disappointment Valley Road 19Q. Continue on BLM Roads to Spring Creek Basin.

U.S.G.S. 7.5 minute quadrangle: Dawson Draw and Mc Kenna Peak
Legal Description: T42N, R15W, Sections 6 and 7
T42N, R16W, Sections 1-4, and 10-14

Elevation: 6,300 feet **Size:** Approximately 5,659 acres

General Description: Spring Creek Basin is a large fairly level area at the eastern end of Disappointment Valley near the foot of McKenna Peak. It is within the 20,000 acre Spring Creek Wild Horse Management area, home to one of the few wild horse herds in Colorado, and managed by BLM for the horses' benefit. Much of the site is sparsely vegetated Mancos shale. Some of the hillsides at higher elevations support a community of shadscale (*Atriplex confertifolia*) with galleta (*Pleuraphis jamesii*) and needle and thread (*Hesperostipa comata*). Associated native species are winterfat (*Krascheninnikovia lanata*), snakeweed (*Gutierrezia sarothrae*), prince's plume (*Stanleya pinnata*), pepperweed (*Lepidium densiflorum*), stinking milkvetch (*Astragalus praelongus*), blue grama (*Bouteloua gracilis*), and scarlet globemallow (*Sphaeralcea coccinea*).

Much of the area at lower elevations has been invaded by exotics. Large areas on the west and south sides of the basin are solidly covered with tall tumble mustard (*Sisymbrium altissimum*). Other common non-native species are cheatgrass (*Bromus tectorum*), Russian knapweed (*Acroptilon repens*), halogeton (*Halogeton glomeratus*) and alyssum (*Alyssum parviflorum*).

Gypsum Valley cateye (*Cryptantha gypsophila*) occupies gentle north facing slopes of Mancos shale on the eastern side of the basin. It is most abundant in shallow drainages, but some plants also occur on convex slopes between. The plants are found only on light gray soils, and not on the adjacent light brown soils. Black sagebrush (*Artemisia nova*) is dominant at this site, with Gardner saltbush (*Atriplex gardneri*), scarlet globemallow (*Sphaeralcea coccinea*), fineleaf hymeopappus (*Hymenopappus filifolius*), weak stemmed mariposa lily (*Calochortus flexuosus*), hairy golden aster (*Heterotheca villosa*), prince's plume (*Stanleya pinnata*) and scapose pincushion (*Chamaechaenactis scaposa*).

There are several BLM roads through the area, and some recreational ATV use, although the area is not heavily used. The site includes some private land adjacent to the BLM, where land use is unknown. Grazing by the wild horse herd is probably the dominant use.

Biodiversity Rank Justification and Comments: The biodiversity site rank for the Spring Creek PCA is based on an excellent (A-ranked) occurrence of Gypsum Valley cateye, a critically imperiled plant in Colorado (S1) and globally (G1). The good (B-ranked) occurrence of pygmy sagebrush (*Artemisia pygmaea*), a critically imperiled plant in Colorado (S1), supports this PCA with an estimated population over 1000 plants. Pygmy sagebrush has only one other occurrence in Colorado.

Natural Heritage element occurrences at Spring Creek Basin PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Cryptantha gypsophila	**Gypsum Valley cateye**	**G1**	**S1**		**B**
Artemisia pygmaea	Pygmy sagebrush	G4	S1		B
Calochortus flexuosus	Weak-stemmed mariposa lily	G4	S2		C

*EO=Element Occurrence. Multiple listings represent separate locations.

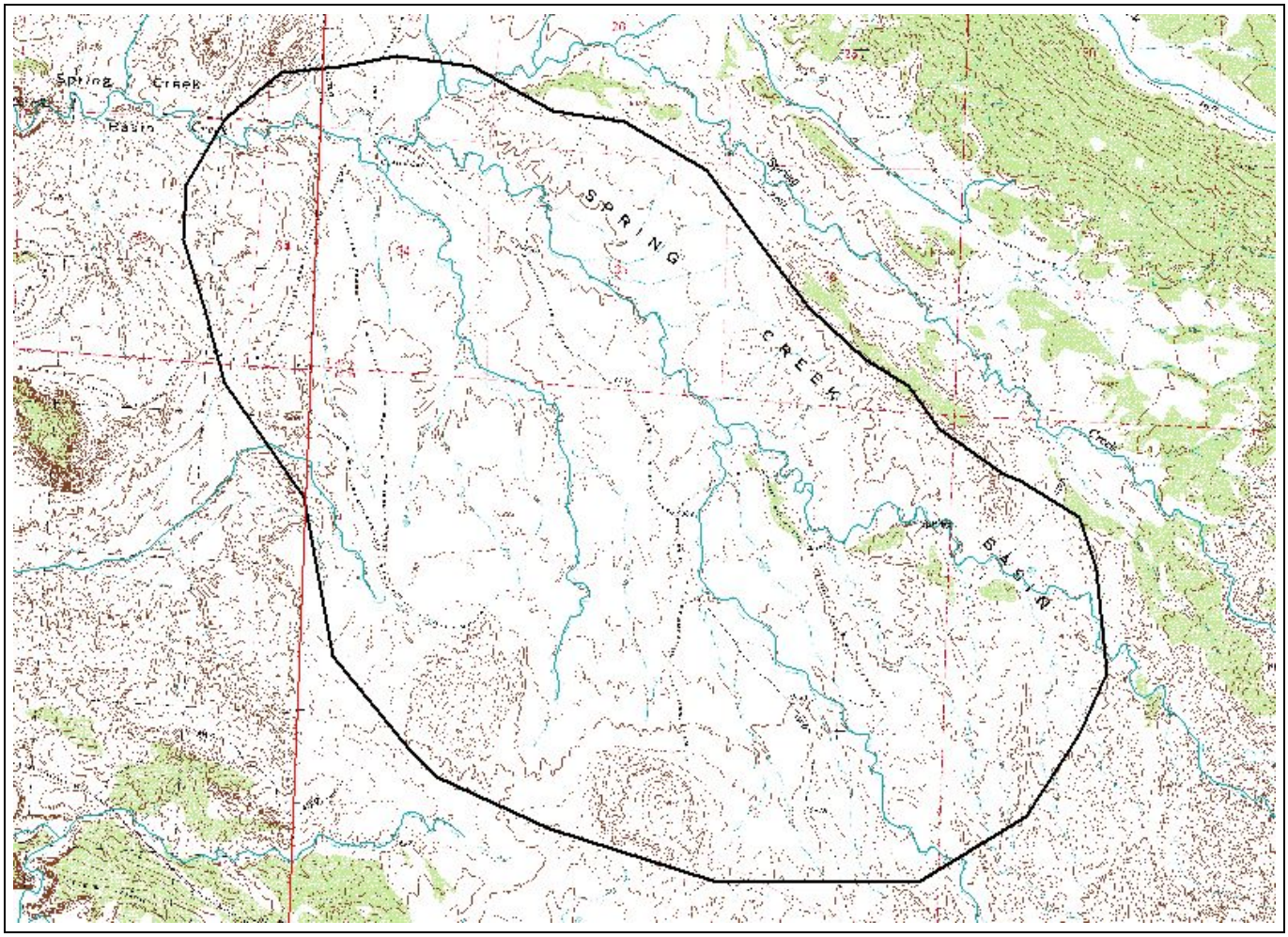
Boundary Justification: The boundary for the Spring Creek PCA was drawn to include the habitat for Pygmy sagebrush and Gypsum Valley cateye. The PCA spans northwest to southeast through Spring Creek Basin.

Protection Comments: Although the majority of the site is on BLM land, there is some private land within the site.

Management Rank Comments: Weed invasion is a major impact in the PCA. Native grasses are extremely sparse in the lower elevations. Gypsum Valley cateye has never been seen growing in areas severely invaded by cheatgrass.

Figure 81. Habitat of *Cryptantha gypsophila* at Spring Creek Basin PCA. Photo by Peggy Lyon.

Spring Creek Basin PCA



B2: Very High Biodiversity Significance

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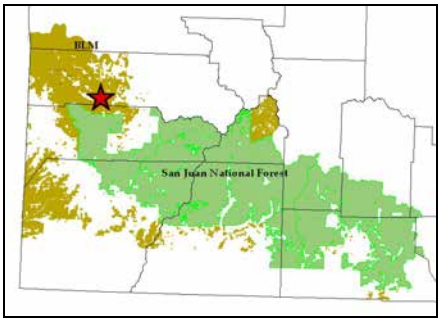
PCA Boundary

Dawson Draw
McKenna Peak
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Stollsteimer Creek North PCA

Biodiversity Rank: B2 (Very high significance)
This PCA includes a good (B rank) occurrence, one of only two known occurrences in the entire world, of the critically imperiled (G1) Pagosa skyrocket (*Ipomopsis polyantha*). The site also contains good (B), unranked (E) and poor (D) occurrences of the Pagosa bladderpod (*Lesquerella pruinosa*), and a good occurrence of Gray's Townsend-daisy (*Townsendia glabella*), both globally imperiled (G2).

Protection Urgency Rank: P2. (High urgency)
Protection actions may be needed to protect the private land from development within 5 years. It is estimated that development may reduce the viability of the plant populations in the PCA within this approximate timeframe. If the BLM parcels are sold to a private party, a conservation easement to protect the rare plants is essential.

Management Urgency Rank: M2. (High urgency)
New management actions (weed control) may be needed within 5 years to prevent the decline of the rare plant occurrences within the PCA. The Pagosa skyrocket population is extremely vulnerable to highway maintenance activities and grazing management.

Location: Archuleta County, along State Highway 160 and north, about 11 miles west of Pagosa Springs.

U.S.G.S. 7.5 minute quadrangle: Lonetree Canyon, Chris Mountain.
Legal Description: T34 N R3W S2-5, 8-11, 16
T35N R3W S32-34

Elevation: 6,750 to 7,614 feet **Size:** Approximately 3,018 acres

General Description: The PCA comprises disturbed areas along Highway 160 at Dyke, and foothills north of the highway to the National Forest boundary. It includes private land and several parcels of BLM land. It is characterized by low hills of Mancos Shale, with sparse to moderately dense vegetation including Rocky Mountain juniper (*Juniperus scopulorum*), skunkbrush (*Rhus trilobata*), rabbitbrush (*Chrysothamnus nauseosus*), chokecherry (*Prunus virginiana* var. *melanocarpa*), bitter brush (*Purshia tridentata*), Gambel oak (*Quercus gambelii*) and a mixture of native and introduced grasses and forbs, including Indian rice grass (*Oryzopsis hymenoides*), blue grama (*Bouteloua gracilis*) and galleta (*Pleuraphis jamesii*). Upper slopes have ponderosa pine (*Pinus ponderosa*) and Gambel oak, with Douglas fir (*Pseudotsuga menziesii*) present on cooler sites. The PCA also includes an irrigated pasture on the south side of the highway. The Pagosa skyrocket was observed to be abundant along the highway and in the pasture on south of the highway in 2001. However, in 2002 only a few plants were found, and in May of 2003 none were located. In 2005, there were plants along the road south of the highway, but none in the pasture where they had once been abundant. New occurrences of Pagosa skyrocket were found on BLM land in 2005, the first known on any public lands.

Also, in 2005, Gray's Townsend daisy (*Townsendia glabella*) was found on the same BLM parcel.

Biodiversity Rank Justification: This PCA includes a good (B rank) occurrence, one of only two known occurrences in the entire world of the critically imperiled (G1) Pagosa skyrocket (*Ipomopsis polyantha*). The site also contains good (B), unranked (E) and poor (D) occurrences of the Pagosa bladderpod (*Lesquerella pruinosa*), a globally imperiled (G2) plant. The Pagosa bladderpod is restricted to soils derived from Mancos shale and currently known from 16 occurrences, all within a small area in Archuleta County, Colorado and one recently discovered population in New Mexico. Habitat destruction is the biggest threat to *L. pruinosa*, especially considering its limited range. Residential growth and development around the city of Pagosa Springs could threaten nearby populations of the bladderpod. A third rare plant, the globally imperiled (G2) Gray's Townsend-daisy (*Townsendia glabella*) was located in the site in 2005. The occurrence was ranked good (B), with over 200 individuals.

Natural Heritage element occurrences at the Stollsteimer Creek North PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Element	Common Name	Global Rank	State Rank	Federal Status	State Status	Federal Sensitive	EO Rank
Ipomopsis polyantha	**Pagosa skyrocket**	**G1**	**S1**	C		**FS/BLM**	**B**
Townsendia glabella	**Gray's Townsend-daisy**	**G2**	**S2**				**B**
Lesquerella pruinosa	**Pagosa bladderpod**	**G2**	**S2**			**FS/BLM**	**B**
Lesquerella pruinosa	Pagosa bladderpod	G2	S2			FS/BLM	E
Lesquerella pruinosa	Pagosa bladderpod	G2	S2			FS/BLM	D

*EO=Element Occurrence. Multiple listings represent separate locations.

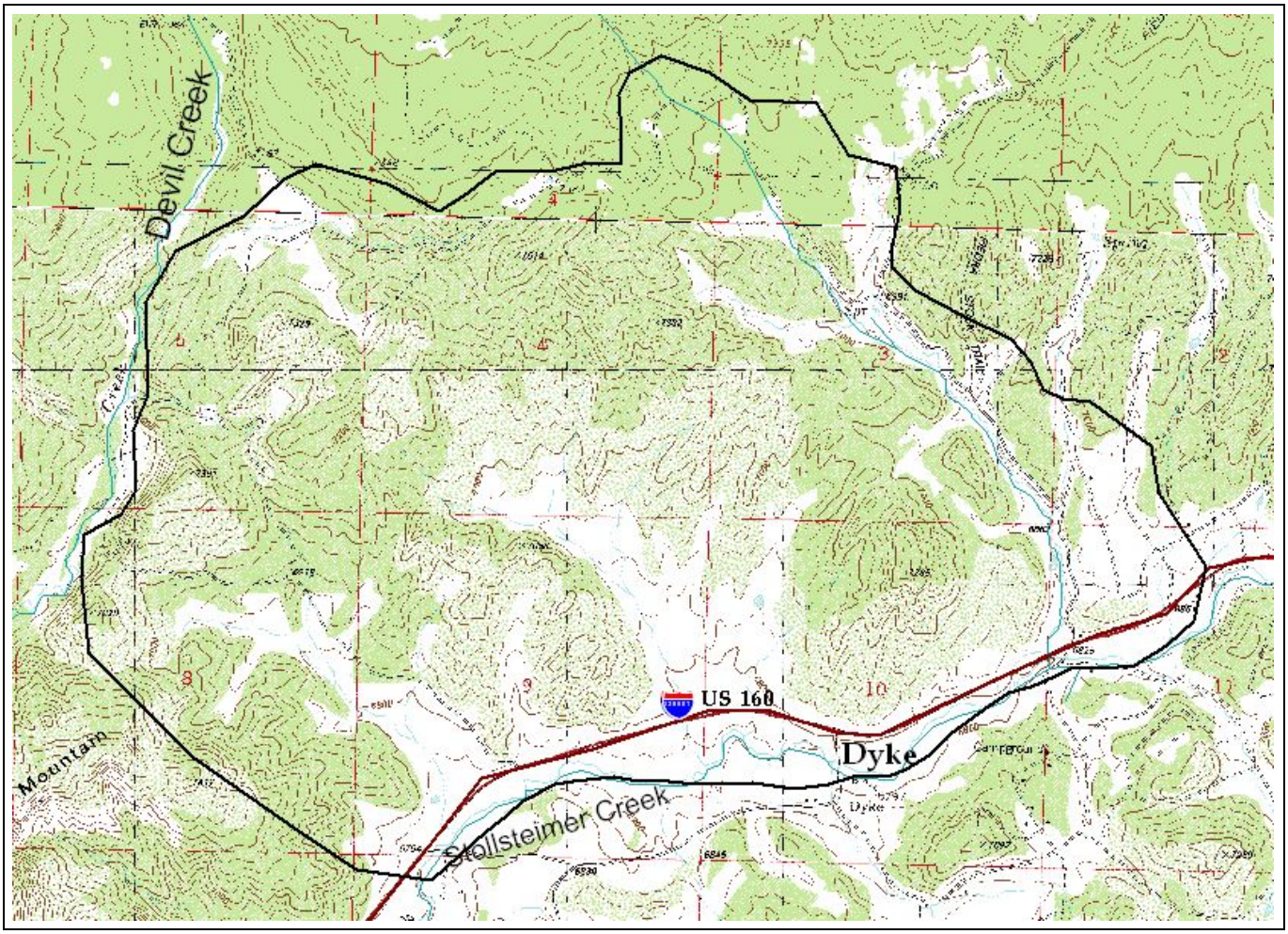
Boundary Justification: The site encompasses three occurrences of the Pagosa bladderpod (*Lesquerella pruinosa*), one occurrence of the Pagosa skyrocket (*Ipomopsis polyantha*), and one occurrence of Gray's Townsend-daisy (*Townsendia glabella*), along with some unoccupied or unsurveyed but suitable adjacent habitat. The boundaries incorporate areas of Mancos Shale and alluvial soils that are subject to some degree of natural erosion.

Protection Rank Comments: The majority of this PCA is privately owned. There is a small area (approximately 100 ac) of National Forest on the north, and three isolated parcels of BLM land comprising about 320 acres, surrounded by private land. One occurrence each of Pagosa bladderpod, Pagosa skyrocket and Gray's Townsend-daisy are located on BLM land. This parcel is proposed for a land exchange, and is expected to be sold to the adjacent private property owner, with a conservation easement. The other occurrences in this PCA are on private land within an area undergoing rapid development. The Archuleta Community Plan designates the area of this PCA for very low density residential development consisting of lots of 35 acres or more in size. Protection of this site should be a high priority.

Management Rank Comments: The Pagosa skyrocket population is extremely vulnerable to highway maintenance activities and grazing management. State highway personnel should be made aware of the location of the Pagosa skyrocket along Highway 160 and avoid spraying or other actions that would threaten the plants. The plants on the south side of the highway may be vulnerable to changes in grazing and irrigation management of the pasture in which they occur. Present management of this area is unknown. Most of the Pagosa skyrocket occurrences are on private property in an area where development pressures are increasing and development of the area would result in the loss of the species.

Figure 82. Surveying for Pagosa skyrocket at Stollsteimer Creek PCA, 2005.
Photo by Peggy Lyon.

Stollsteimer Creek North PCA
B2: Very High Biodiversity Significance



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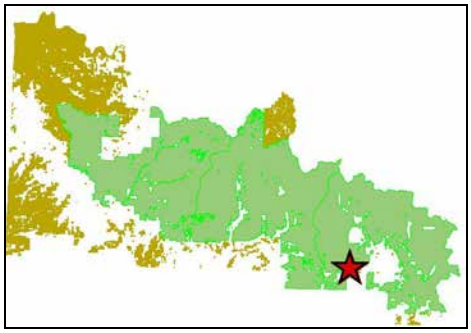
PCA Boundary

Chris Mountain
Lonetree Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Summit Pass PCA

Biodiversity Rank: B2: Very high biodiversity significance. This PCA supports a good (B-ranked) occurrence of a globally imperiled (G2) plant.

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future.

Management Urgency Rank: M4: Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.

Location: The Summit Peak Northwest PCA is located along the Continental Divide, in the San Juan National Forest in Rio Grande County, approximately 25 miles northeast of Pagosa Springs.

U.S.G.S. 7.5 minute quadrangle: Elwood Pass
Legal Description: T37N, R3E, Sections 27 and 28

Elevation: 11,700 to 12,100 feet **Size:** Approximately 166 acres

General Description: The PCA is located north of Summit Pass just at or above treeline. The Continental Divide Trail runs through the site. Geology at the site is Tertiary volcanics, mapped as intra-ash-flow quartz latitic lavas. Outcrops of barren reddish soil support a population of Colorado tansy-aster. Forested areas below the site are dominated by Engelmann spruce (see species list 43, Appendix II).

Biodiversity Rank Justification and Comments: The biodiversity site rank for summit Pass Northwest PCA is based on a good (B-ranked) occurrence of Colorado tansy-aster, a globally imperiled (G2) plant.

Natural Heritage element occurrences at Summit Pass PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
Machaeranthera coloradoensis	**Colorado tansy-aster**	**G2**	**S2**		**B**

*EO=Element Occurrence. Multiple listings represent separate locations.

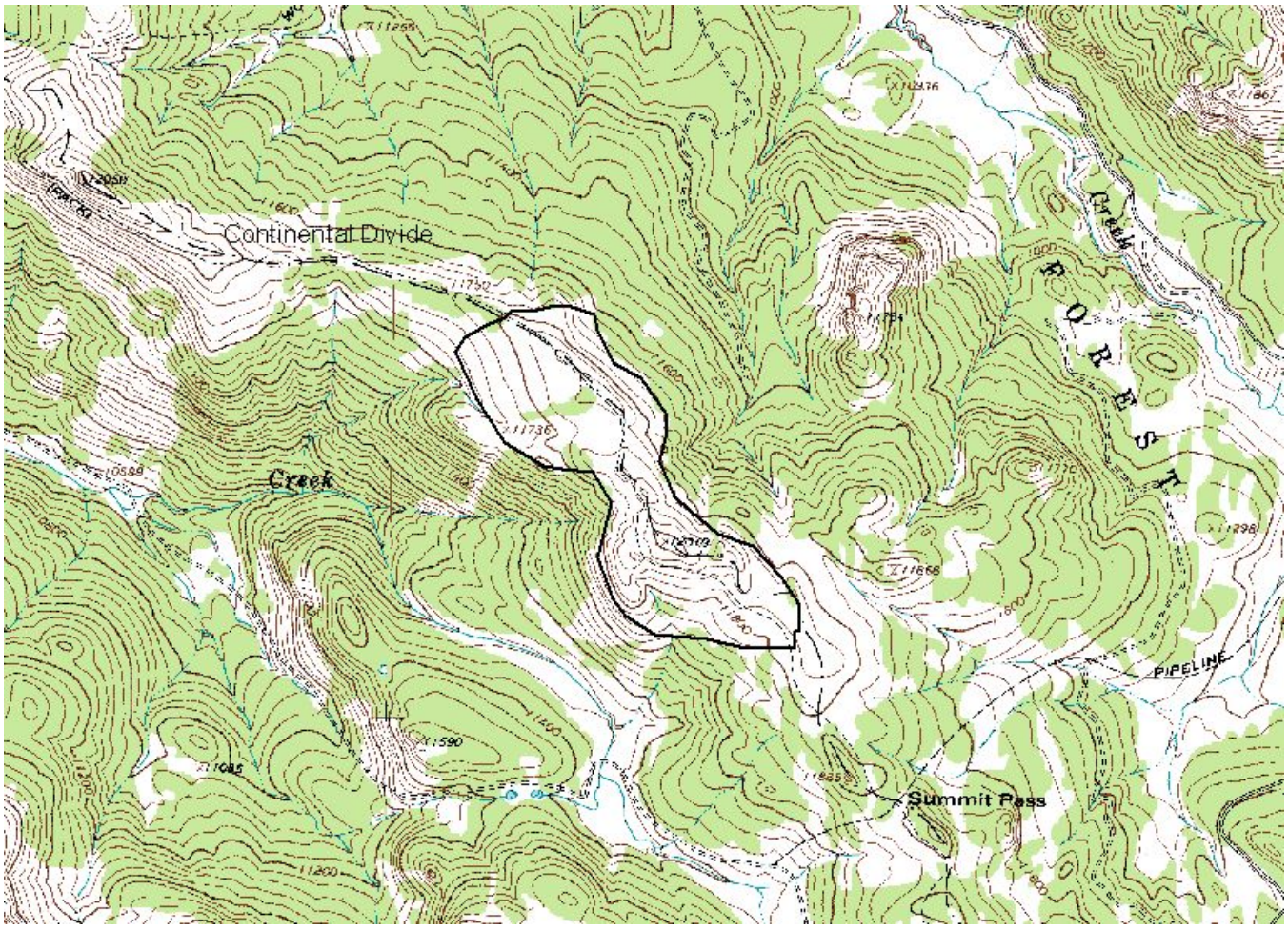
Boundary Justification: The boundary for Summit Pass Northwest PCA was drawn to include the Colorado tansy-aster occurrence and potential habitat above treeline along the divide to the north and south. Although the rare plants at this site were found at a high point along the divide, at 12,100 feet, in other areas they are known from as low as 7,675 ft.

Protection Comments: The PCA is within the San Juan and Rio Grande National Forests. There is no other special designation.

Management Rank Comments: Although the area is a popular destination for hikers, no direct impacts on rare plants were noted. Cattle and sheep were observed nearby. No exotic species were observed in the PCA.

Figures 83, 84, 85. Habitat of *Machaeranthera coloradoensis* at Summit Pass Northwest PCA. Photo by Peggy Lyon.

Summit Pass PCA
B2: Very High Biodiversity Significance



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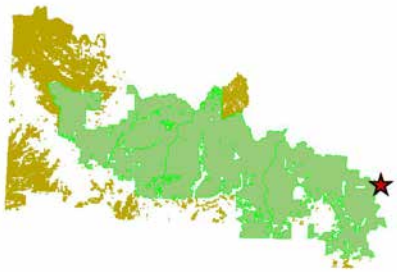
PCA Boundary

Bowdish Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Yellowjacket Pass PCA

Biodiversity Rank: B2. Very high biodiversity significance. This PCA supports an excellent (A-ranked) occurrence of a globally imperiled (G2) plant.

Protection Urgency Rank: P3. Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken.

Management Urgency Rank: M3. New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.

Location: The Yellowjacket Pass PCA is located in Archuleta County approximately 8 miles east of Bayfield on the north side of Hwy 160.

U.S.G.S. 7.5 minute quadrangle: Baldy Mountain
Legal Description: T35N, R5W, Sections 29-32

Elevation: 7,700 feet **Size:** Approximately 42 acres

General Description: The Yellowjacket Pass PCA, located near the eastern edge of the La Plata County line and Chimney Rock Archeological Area, is dominated by Ponderosa pine/Gambel oak (*Pinus ponderosa*/ *Quercus gambelii*) woodland. The Gray's Townsend-daisy (*Townsendia glabella*) was found on the north side of Hwy 160 just east of the summit of Yellowjacket Pass, in openings between oakbrush on a gentle south-facing slope. Associated species include trailing fleabane (*Erigeron flagellaris*), tapertip onion (*Allium acuminatum*), mat penstemon (*Penstemon caespitosus*), alyssum (*Alyssum parviflorum*), Kentucky bluegrass (*Poa pratensis*), Utah serviceberry (*Amelanchier utahensis*), littleleaf pussytoes (*Antennaria parviflora*), smooth brome (*Bromus inermis*), white sagebrush (*Artemisia ludoviciana*), mule-ears (*Wyethia X magna*), yellow sweetclover (*Melilotus officinalis*), western wheatgrass (*Pascopyrum smithii*), redroot buckwheat (*Eriogonum racemosum*), hawksbeard (*Psilochenia* sp.), fernleaf biscuitroot (*Lomatium dissectum*), yarrow (*Achillea lanulosa*), snowberry (*Symphoricarpos oreophilus*), and beautiful cinquefoil (*Potentilla pulcherrima*).

The site is underlain by the Animas formation, consisting of Arkosic sandstone, shale, and conglomerates.

Biodiversity Rank Justification and Comments: The biodiversity rank of Yellowjacket Pass PCA is based on the good (B-ranked) occurrence of Gray's townsend-daisy, a globally imperiled (G2) plant. An estimated 500 individuals were found at the site. This site was surveyed in an effort to update a historic record of Aztec milkvetch (*Astragalus proximus*), based on a specimen collected somewhere east of Yellowjacket Pass in 1951. This specimen has subsequently been annotated to *A. flexuosus*. The plants were not found in 2005.

Natural Heritage element occurrences at Yellowjacket Pass PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Townsendia glabella	**Gray's townsend-daisy**	**G2**	**S2**		**B**

*EO=Element Occurrence. Multiple listings represent separate locations.

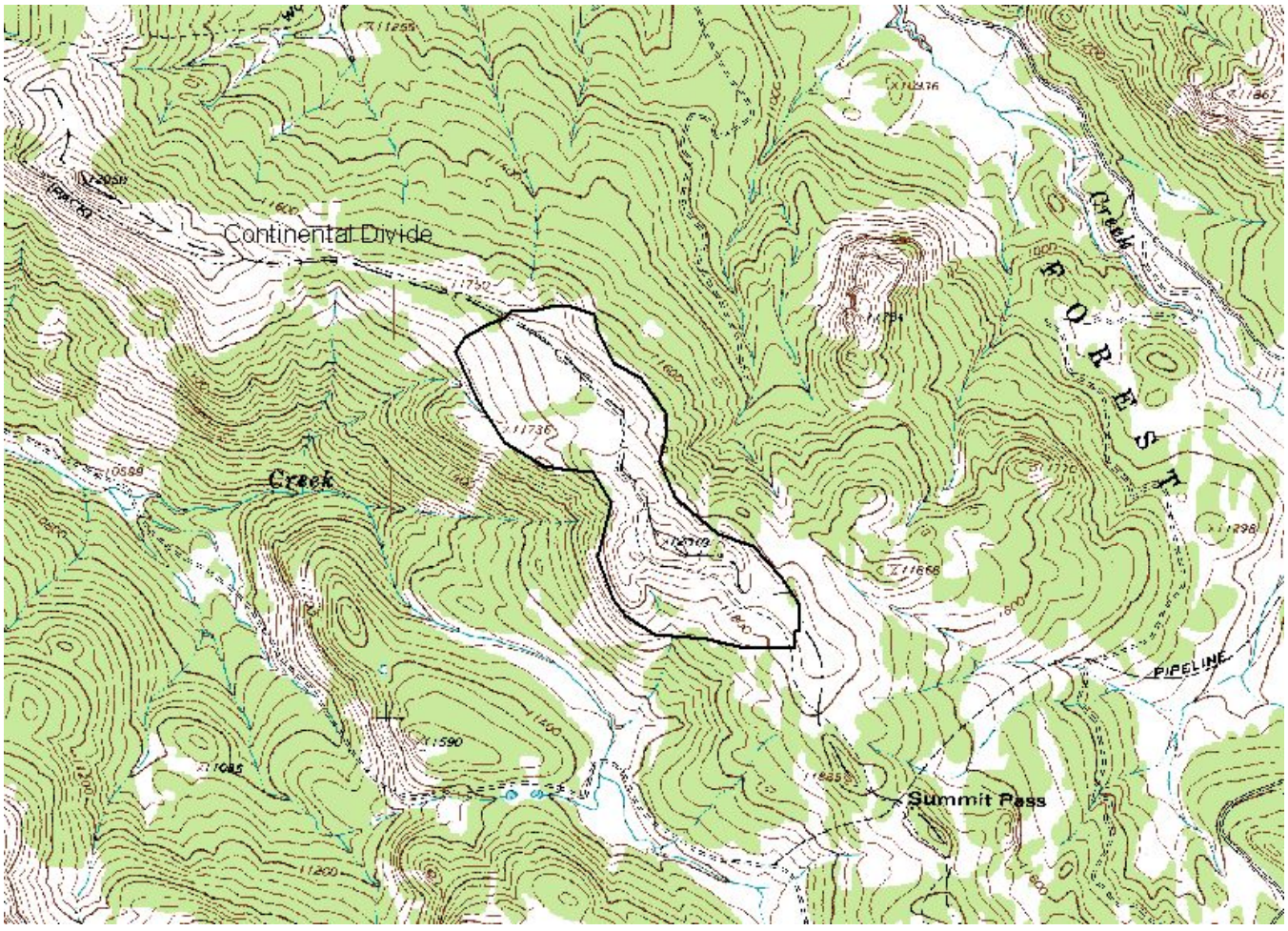
Boundary Justification: The boundary for the Yellowjacket Pass PCA was drawn to include the occurrence and potential habitat for Gray's townsend-daisy.

Protection Comments: The rare plant occurrence was located on San Juan National Forest land. There is also potential habitat on private land north of the occurrence.

Management Rank Comments: There is a state highway adjacent to occurrence. Introduced species, including yellow sweetclover (*Melilotus officinalis*), smooth brome (*Bromus inermis*) and Kentucky bluegrass (*Poa pratensis*), frequently planted for soil stabilization, preclude the growth of the Gray's townsend-daisy. There is also some cheatgrass (*Bromus tectorum*) in the site.

Figure 86. Gray's townsend-daisy (*Townsendia glabella*).
Photo by Peggy Lyon.

Yellowjacket Pass PCA
B2: Very High Biodiversity Significance



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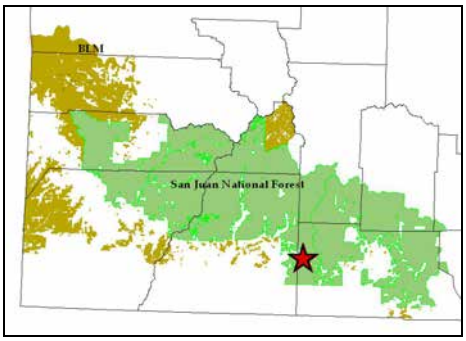
PCA Boundary

Baldy Mountain
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Cannon Ball Mesa PCA

Biodiversity Rank: B3: High biodiversity significance. This PCA has an excellent (A) occurrence of an unusual plant community, a good (B) occurrence of a globally vulnerable (G3) plant, and good and excellent occurrences of three plants that are rare in Colorado (S1, S2).

Protection Urgency Rank: P4: No protection actions are needed in the foreseeable future. The PCA is within the Canyons of the Ancients National Monument.

Management Urgency Rank: M2: New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA. Control of noxious weeds will help preserve the quality of the rare plant and community occurrences.

Location: Cannon Ball Mesa is located in western Montezuma County, about 24 miles west of Cortez. Drive County Road G 19 miles west from Highway 789 (was US Highway 666) at Cortez, toward Ismay Trading Post. Here an unnamed gravel road heads north into the Canyons of the Ancients National Monument and the Cannon Ball Mesa PCA.

U.S.G.S. 7.5-minute quadrangle: Bowdish Canyon
Legal Description: T36N R19W, Sections 14, 15, 21-23, 27-29, 33, 34

Elevation: 5,200 to 5,600 feet **Size:** Approximately 2,773 acres

General Description: Cannon Ball Mesa PCA lies within the Canyons of the Ancients National Monument boundary and incorporates parts of many drainages and mesas within a highly heterogeneous landscape in the Morrison and Dakota geological formations. The dominant landscape feature is Cannon Ball Mesa, the eastern portion of which has an excellent example of a shrubland dominated by shadscale saltbush (*Atriplex confertifolia*), greasewood (*Sarcobatus vermiculatus*), and galleta (*Pleuraphis jamesii*), classified as a Cold Desert Shrubland *(Atriplex confertifolia/Pleuraphis jamesii*). Here the mesa top is very slightly concave and poorly drained, creating unusually mesic conditions. Two tributaries of Yellowjacket Canyon, Risley Canyon and Moccasin Canyon, run east to west within the PCA.

Open pinyon-juniper woodlands, with a diverse and interesting herbaceous understory, dominate most of the area. Some of the many understory species noted are Desert frasera (*Frasera albomarginata*), bulbous spring parsley (*Cymopterus bulbosus*), sharpleaf twinpod (*Physaria acutifolia*), heartleaf twistflower (*Streptanthus cordatus*), crescent milkvetch (*Astragalus amphioxys*), thrift mock goldenweed (*Stenotus armerioides*), tufted evening primrose (*Oenothera caespitosa*), and Whipple's fishhook cactus (*Sclerocactus whipplei*).

The eastern flanks of Cannonball Mesa support an unusual woodland dominated by Utah greasebush (*Forsellesia meionandra*), Utah juniper (*Juniperus osteosperma*), and Mountain mahogany (*Cercocarpus montanus*). This community is similar to the Utah juniper/ Mountain mahogany (*Juniperus osteosperma*/ *Cercocarpus montanus*) woodland community, but with the notable addition of Utah greasebush, which is unusually large and robust at this site.

An access road for part of the Canyons of the Ancients National Monument passes through the PCA and is acting as a major corridor for weed invasion into the area. The tenacious Russian knapweed (*Acroptilon repens*) was the dominant roadside weed along much of the road.

It was seen along the road within the occurrences of Utah beardtongue (*Penstemon utahensis*) and weak-stemmed mariposa lily (*Calochortus flexuosus*). It was also observed spreading into the species' occurrences, particularly within the Utah beardtongue occurrence, where it is moving downslope from a road cut. Tamarisk (*Tamarix ramosissima*) was found in low to moderate densities in the dry washes throughout the PCA. Hoary cress (*Cardaria draba*) was found where the road crosses Moccasin Creek, and it appears to be spreading along the wash in areas disturbed by periodic flows. Cheatgrass (*Bromus tectorum*) was most abundant near roadsides, particularly in the southern portion of the site. However, many areas across the rest of the site have little or no cheatgrass and remain in excellent condition. Evidence of illegal off-road activity that could spread cheatgrass was observed.

Biodiversity Rank Justification and Comments: The Cannon Ball Mesa PCA supports two plant communities documented within the site: an excellent (A) occurrence of Utah juniper/Utah Greasebush; and a good (B) occurrence of cold desert shrublands. There are four rare plant species in the site: two good (B) and one excellent (A) occurrence of weak-stemmed mariposa lily, rare (S1) in Colorado; a good (B) occurrence of short-stem beardtongue (*Penstemon breviculus*), vulnerable globally (G3), two good (B) and one fair (C) occurrence of Utah beardtongue (*Penstemon utahensis*), rare (S2) in Colorado, and an unranked (E) occurrence of Palmer buckwheat (*Eriogonum palmerianum*), rare (S1) in Colorado. Three of these occurrences were added in 2005, and the juniper-greasebush community was mapped and re-ranked to A.

Figure 68. Utah Juniper woodland community, Cannon Ball Mesa.
Photo by Peggy Lyon.

Natural Heritage element occurrences at Cannon Ball Mesa PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plant communities					
Juniperus osteosperma/Forsellesia meionandra	Utah juniper/Utah greasebush	GU	SU		A
Atriplex confertifolia/Pleuraphis jamesii	Cold desert shrublands	G3G5	S2		B
Plants					
Penstemon breviculus	**Short-stem beardtongue**	**G3**	**S2**		**B**
Calochortus flexuosus	Weak-stemmed mariposa lily	G4	S1		A
Calochortus flexuosus	Weak-stemmed mariposa lily	G4	S1		B
Calochortus flexuosus	Weak-stemmed mariposa lily	G4	S1		B
Penstemon utahensis	Utah beardtongue	G4	S2		B
Penstemon utahensis	Utah beardtongue	G4	S2		B
Penstemon utahensis	Utah beardtongue	G4	S2		C
Eriogonum palmerianum	Palmer buckwheat	G4	S1		E

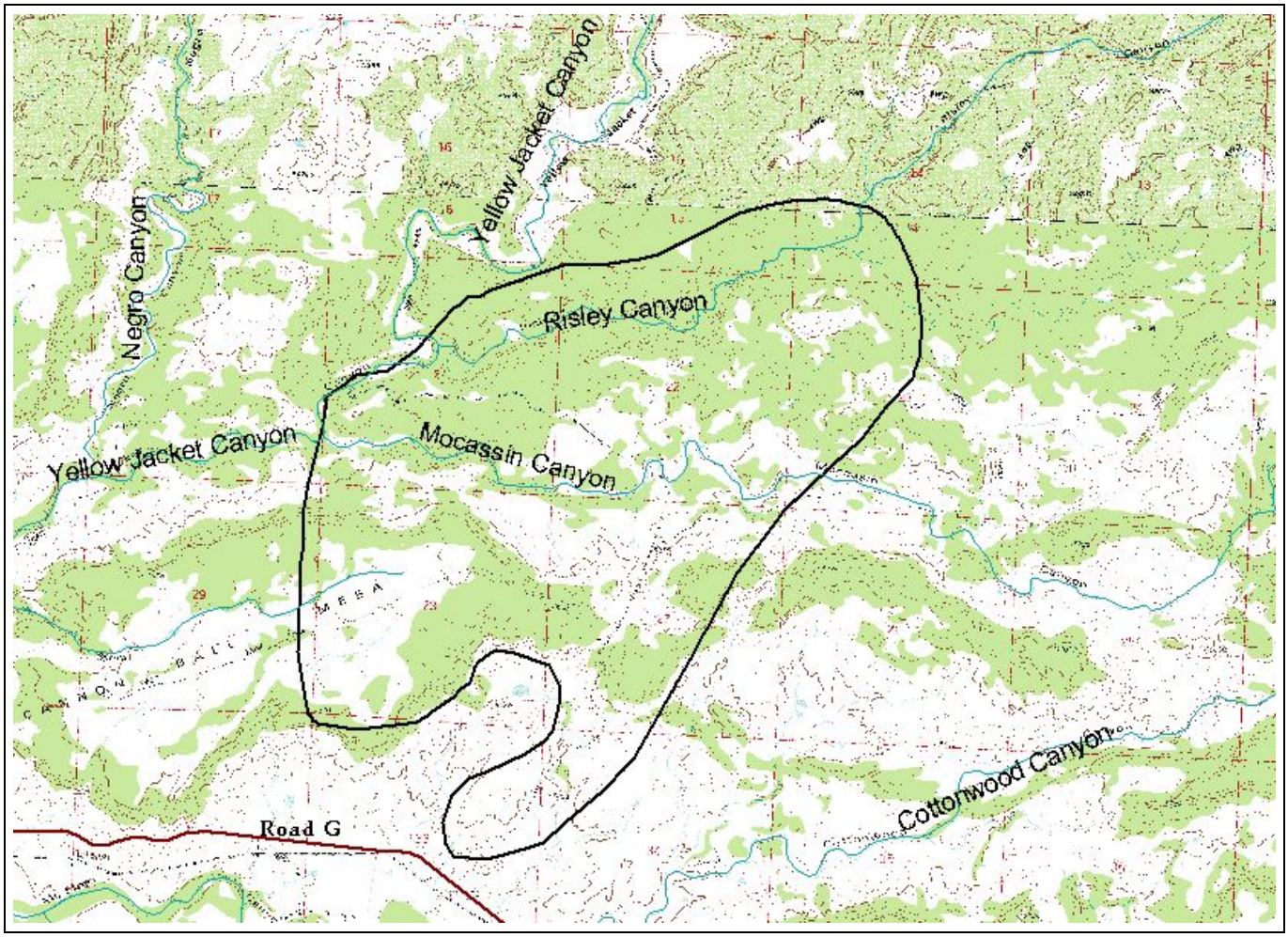
*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to include all of the element occurrences in the vicinity of Cannon Ball Mesa, including occurrences near Risley and Moccasin Canyons. Further refinement of this planning boundary may be warranted if survey work is done in the vicinity in the future, since other rare plant occurrences may remain to be found nearby in unsurveyed areas.

Protection Comments: The core of the PCA is owned and managed by the BLM, but adjacent areas at the edges of the PCA are privately owned.

Management Rank Comments: Most of the site contains few weeds at present, however noxious weeds are invading the occurrence of Utah penstemon. Focused weed management in this area would benefit the element occurrence. Additionally, off-road vehicle traffic is impacting rare plant habitat in many areas, and increased enforcement may be necessary to manage vehicle traffic.

Cannon Ball Mesa PCA B3: High Biodiversity Significance



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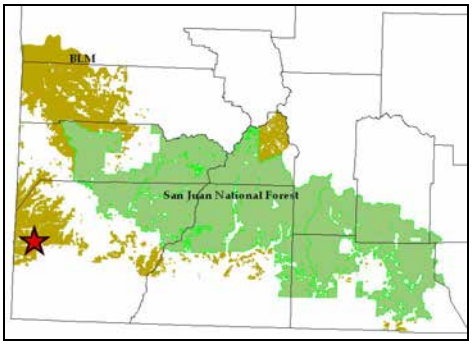
PCA Boundary

Bowdish Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Piedra River Trail PCA

Biodiversity Rank: B3. High biodiversity significance. This PCA has an excellent (A-ranked) occurrence of a plant believed to be globally vulnerable (G3?).

Protection Urgency Rank: P4. No protection actions are needed in the foreseeable future.

Management Urgency Rank: M3. New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.

Location: The Piedra River Trail PCA is located in Hinsdale County about 14 miles northwest of Pagosa Springs. To access this PCA hike south on the Piedra trail from the trailhead on the Piedra Road, across from the Upper Piedra campground.

U.S.G.S. 7.5 minute quadrangle: Oakbrush Ridge
Legal Description: T36N, R3W, Section 3
T37N, R3W, Section 21

Elevation: 7,800 feet **Size:** Approximately 74 acres

General Description: The PCA is located on the steep east facing slope of a beautiful canyon in a lower montane mixed conifer forest, with many ferns and mosses. Douglas fir (*Pseudotsuga menziesii*) and Colorado blue spruce (*Picea pungens*) are dominant on lower slopes, with lesser amounts of aspen (*Populus tremuloides*) and white fir (*Abies concolor*). Understory species include poison ivy (*Toxicodendron rydbergii*), meadowrue (*Thalictrum fendleri*), wild rose (*Rosa woodsii*), Gambel oak (*Quercus gambellii*), Utah serviceberry (*Amelanchier utahensis*), Oregon grape (*Mahonia repens*), slender wheatgrass (*Elymus trachycaulis*), pussytoes (*Antennaria marginata*), hairy golden aster (*Heterotheca villosa*), bracken fern (*Pteridium aquilinum* var. *pubescens*), starry false-solomonseal (*Maianthemum stellatum*), and mountain lover (*Paxistima myrsinites*), mosses and lichens. Ponderosa pine (*Pinus ponderosa)* forest occupies the upper elevations. Cliffs and large boulders of the cool canyon support a rich diversity of ferns, including Rocky Mountain polypody (*Polypodium saximontanum*), New Mexico cliff fern (*Woodsia neomexicana*), forked spleenwort (*Asplenium septentrionale*), maidenhair spleenwort (*Asplenium trichomanes,*) brittle bladderfern (*Cystopteris fragilis*), Rocky Mountain woodsia (*Woodsia scopulina*), slender lipfern (*Cheilanthes feei*) and male fern (*Dryopteris filix-mas*).

A popular hiking trail begins across from the Upper Piedra campground, and follows the river downstream. A second trail splits off and leads uphill to ice caves.

Biodiversity Rank Justification and Comments: The biodiversity site rank of the PCA is based on the excellent (A-ranked) occurrence of Rocky Mountain polypody (*Polypodium saximontanum*), a fern believed to globally vulnerable (G3?), and a good (B) occurrence of New Mexico cliff fern (*Woodsia neomexicana*), imperiled (S2) in Colorado. Formerly identified as *Polypodium hesperium, P. saximontanum* is sporadically scattered throughout its range which is

restricted to the mountains of extreme northern New Mexico, Colorado, eastern Wyoming, and extreme western South Dakota.

Natural Heritage element occurrences at Piedra River Trail PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Polypodium saximontanum	**Rocky Mountain polypody**	**G3?**	**S3?**		**A**
Woodsia neomexicana	New Mexico cliff fern	G4?	S2		B

*EO=Element Occurrence. Multiple listings represent separate locations.

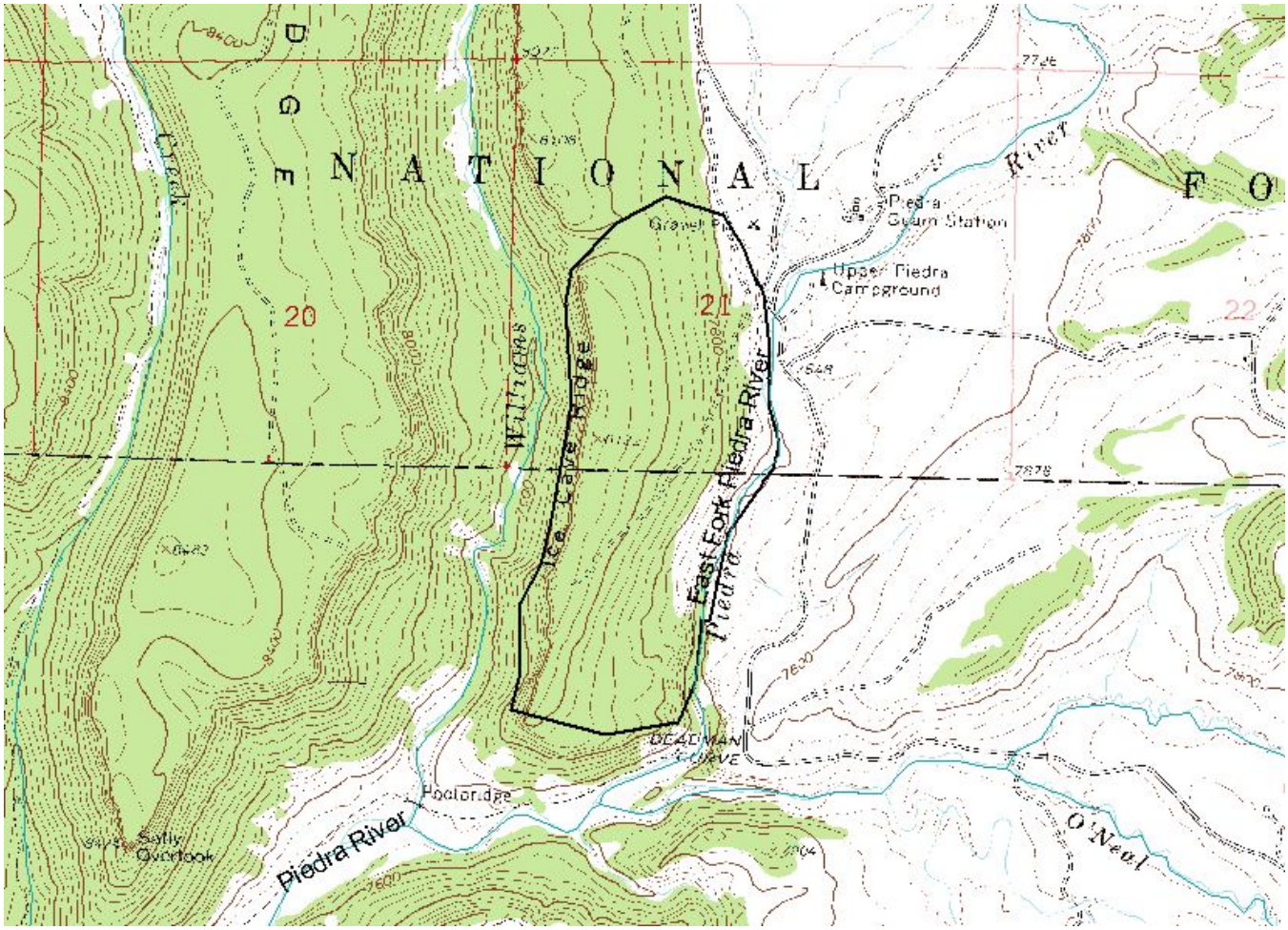
Boundary Justification: The boundary encompasses the locations of two rare ferns and some additional unsurveyed potential habitat.

Protection Comments: The site is within the San Juan National Forest.

Management Rank Comments: A trail passes by the rare fern occurrences, but the position of the ferns on cliff faces provides protection from direct disturbance. *Polypodium saximontanum* has been cited in some herbal texts as having medicinal values, but it is unlikely that major collection would occur at this location. There is some *Bromus inermis* along the lower trail, and potential for additional exotics to be accidentally dispersed by hikers.

Figure 87. *Polypodium saximontanum.*
Photo by Peggy Lyon.

Piedra River Trail PCA
B3: High Biodiversity Significance



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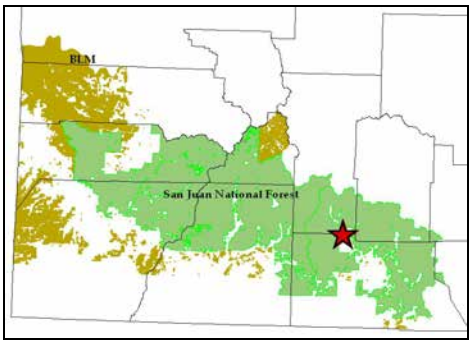
PCA Boundary

Oakbrush Ridge
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Clear Lake PCA

Biodiversity Rank: B4. Moderate biodiversity significance. The PCA has a good (B-ranked) occurrence of a globally vulnerable subspecies (G4?T3T4).

Protection Urgency Rank: P4. Protection actions may be needed within 5 years. It is estimated that current stresses may reduce the viability of the plants in the PCA within this approximate time frame.

Management Urgency Rank: M3. New management actions may be needed within 5 years to maintain the current quality of the plants occurrences in the PCA.

Location: Clear Lake PCA is located in San Juan County in the South Mineral Creek drainage, about five air miles west of Silverton. Access to this PCA is from Hwy 550 going north from Silverton to South Fork Mineral Creek Road, then north on County Road 12.

U.S.G.S. 7.5 minute quadrangle: Ophir
Legal Description: T41N R8W, Sections 7 and 8

Elevation: 12,000 feet **Size:** Approximately 2,080 acres

General Description: Clear Lake is a glacial tarn located in a high alpine basin above timberline, north of South Mineral Creek Rocky peaks encircle the west side of the lake and a gently sloping wetland borders Clear Creek on the east end. Altai cotton grass (*Eriophorum altaicum* var. *neogaeum*) occurs in a dense patch on the east side of Clear Lake by the outlet to Clear Creek. The riparian area supports a high diversity of flora. Associated species along the stream include tufted hairgrass (*Deschampsia cespitosa*), bittercress (*Cardamine cordifolia)* and rose Indian paintbrush (*Castilleja rhexifolia*). Surrounding areas display a great deal of heterogeneity of habitats. The steep hillsides on the east side of the lake are covered with grasses and forbs, including kittentails (*Besseya ritteriana*), a San Juan endemic which is co-dominant with alpine avens (*Geum rossii*) and western paintbrush (*Castilleja occidentalis*). Associated species include rose Indian paintbrush, orange sneezeweed (*Dugaldia hoopsii*), Whipple's penstemon (*Penstemon whippleanus*) and American bistort (*Bistorta bistortoides*). Drier areas on the east side support snow willow (*Salix reticulata* ssp. *nivalis)*, alpine avens (*Geum rossii*), creeping sibbaldia (*Sibbaldia procumbens*), alpine sage (*Artemisia scopulorum*), and dwarf bilberry (*Vaccinium cespitosum*). Interspersed with the meadows are talus slopes where Harbour beardtongue (*Penstemon harbouri*) was found. Its long elastic roots allow it to adjust to the constantly shifting rocks. Other species found in the talus are Colorado columbine (*Aquilegia coerulea*) and Colorado ragwort (*Senecio soldanella*). On the west side of the lake, the slopes are barren and rocky, almost devoid of vegetation. A county road provides access to the site, and it is a popular destination for fishing, sight-seeing and 4-wheel drive enthusiasts.

Biodiversity Rank Justification and Comments: The site rank is based on a good (B-ranked) occurrence of Altai cotton grass, a globally vulnerable subspecies (G4?T3T4).

Natural Heritage element occurrences at Clear Lake PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Eriophorum altaicum* var. *neogaeum	**Altai Cotton grass**	**G4?T3T4**	**S1**	**FS sensitive**	**B**

*EO=Element Occurrence. Multiple listings represent separate locations.

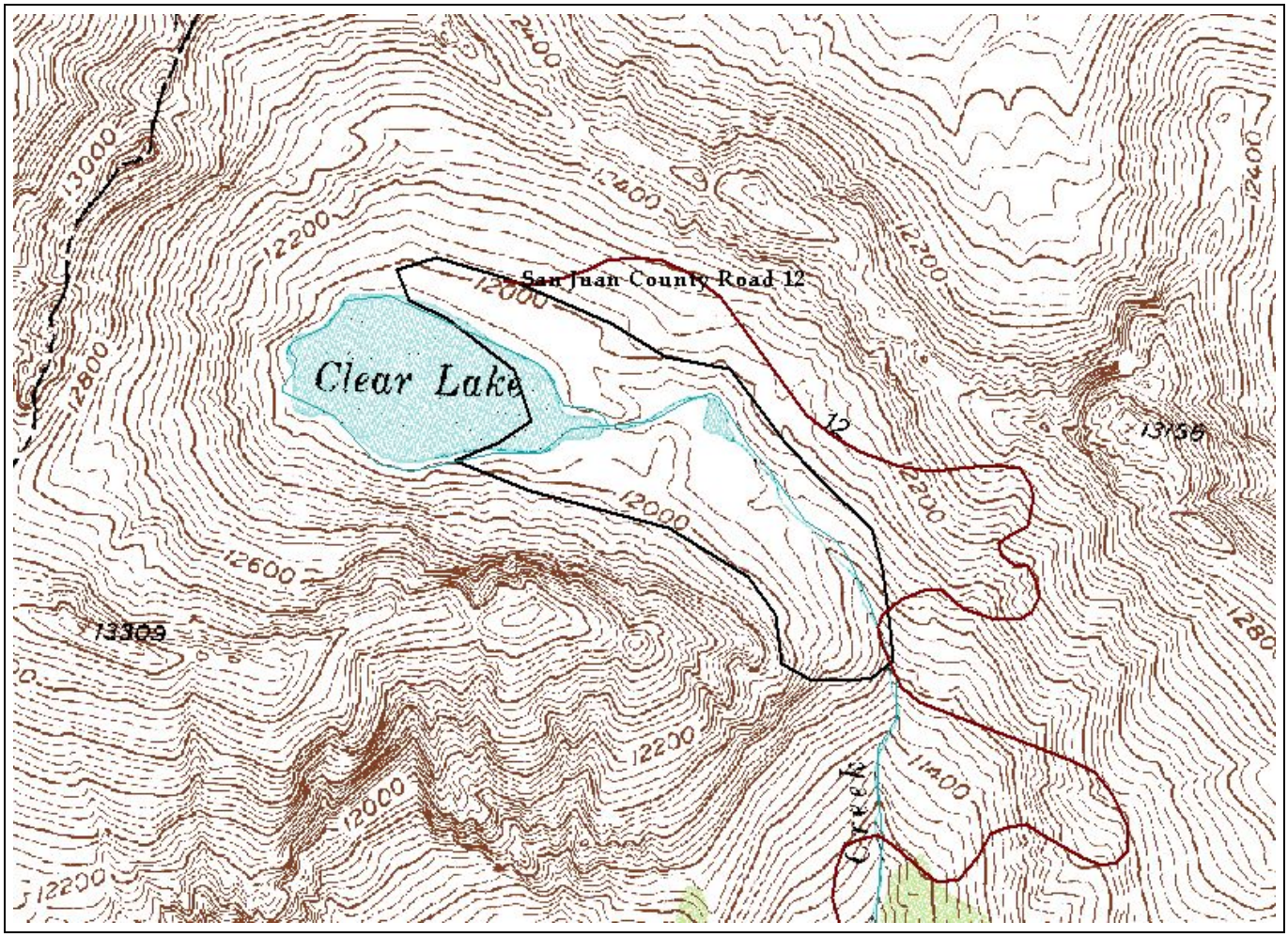
Boundary Justification: The boundary of the PCA encompasses the Altai cottongrass occurrence and additional potential habitat along Clear Creek.

Protection Comments: The site is entirely within the San Juan National Forest. It has no special designation.

Management Rank Comments: Because this beautiful lake can be accessed by vehicle, it is a popular destination for sightseeing and fishing. The trail around the lake has experienced some erosion, and there is some trampling by hikers and fishermen around the rare plant occurrence. No exotic species have been noted, but there is potential for introduction by vehicles and hikers. Periodic monitoring would detect changes in the site.

Figure 88. Wetland community at Clear Lake.
Photo by Peggy Lyon.

Clear Lake PCA
B4: Moderate Biodiversity Significance



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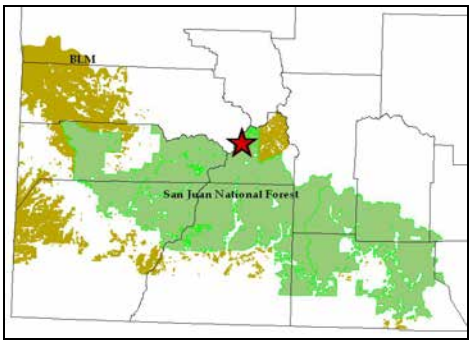
PCA Boundary

Ophir
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Rincon Canyon PCA

Biodiversity Rank: B4: Moderate biodiversity significance. The PCA supports a good (B-ranked) occurrence of a plant that is rare (S1) in Colorado.

Protection Urgency Rank: P3: Protection actions may be needed, but probably not within the next 5 years. The PCA is primarily within the Canyons of the Ancients National Monument, but includes some private land with no protection.

Management Urgency Rank: M3: New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA. Although no urgent management needs are known at this time, further survey is warranted and planned for 2005.

Location: The Rincon Canyon PCA is located in western Montezuma County, about 18 miles west of Cortez and five miles from the Utah border. The site can be accessed from the Hamilton Mesa Road, south of McElmo Creek and east of Ismay Trading Post. A small side road leading to Horny Toad Mesa diverges from the Hamilton Mesa Road and crosses Rincon Canyon.

U.S.G.S. 7.5 minute quadrangles: Bowdish Canyon
Legal Description: T35N, R19 W, Sections 16, 17, 21, 22 and 23

Elevation: 5,320 to 5,800 feet **Size:** Approximately 728 acres

General Description: Rincon Canyon, a tributary of McElmo Creek, contains headwaters of the San Juan River. An intermittent creek runs northwest, forming a shallow canyon through the Dakota and Morrison formations. The PCA is situated within a salt desert shrub community and includes patches of sparse juniper, sagebrush and grass dominated areas. At the lower, western end of the canyon, the stream occupies an eroded gully in greasewood flats that are in very poor condition. The condition of the canyon improves upstream. Rocky benches on an east facing slope in the canyon support a small population of Jones blue star (*Amsonia jonesii*). The plants were documented here by BLM in 2001, and have been re-visited in 2004 and 2005. Associated species include spiny horsebrush (*Forsellesia meionandra*) and galleta (*Pleuraphis jamesii*). Cryptobiotic crust covered about 20 to 30 percent of the unvegetated areas. Grassy slopes with galleta support a population of weak-stemmed mariposa lily (*Calochortus flexuosus*), while patches of Utah penstemon (P*enstemon utahensis*) were found along the canyon bottom in rocky areas.

Biodiversity Rank Justification and Comments: The Rincon Canyon PCA supports a good (B) occurrence of Jones Blue-star (*Amsonia jonesii*), a plant that is globally secure (G4) but rare in Colorado (S1); a fair (C) occurrence of Utah penstemon (*Penstemon utahensis*), rare in Colorado (S2); and a good (B) occurrence of an unusual plant community, Utah juniper/Spiny greasebush (*Juniperus osteosperma/Forsellesia meionandra*), that has not yet been assigned a rarity rank (GU SU)

Natural Heritage element occurrence at Rincon Canyon PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Plants					
Amsonia jonesii	**Jones blue-star**	**G4**	**S1**	**BLM sensitive**	**B**
Penstemon utahensis	Utah penstemon	G4	S2		C
Calochortus flexuosus	Weak-stemmed mariposa lily	G4	S2		C
Natural communities					
Juniperus osteosperma/Forsellesia meionandra	Utah juniper/spiny greasebush	GU	SU		C

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary was drawn to encompass the upper canyon, including the locations of three rare plants and a unique plant community, with a section of the canyon both upstream and downstream that includes unsurveyed areas expected to contain suitable habitat for movement or expansion of these species.

Protection Comments: The PCA is located primarily on BLM land within the southern part of the Canyons of the Ancients National Monument, with about a half mile of private land at the lower end. The area within the monument is adequately protected. There is no special protection for the private land.

Management Rank Comments: Exotic species in the site include cheatgrass (*Bromus tectorum*) and tamarisk (*Tamarix ramosissima*). The greasewood flats at the western end of the canyon are in poor condition and would provide an opportunity for restoration. There was some ATV use in the upper canyon.

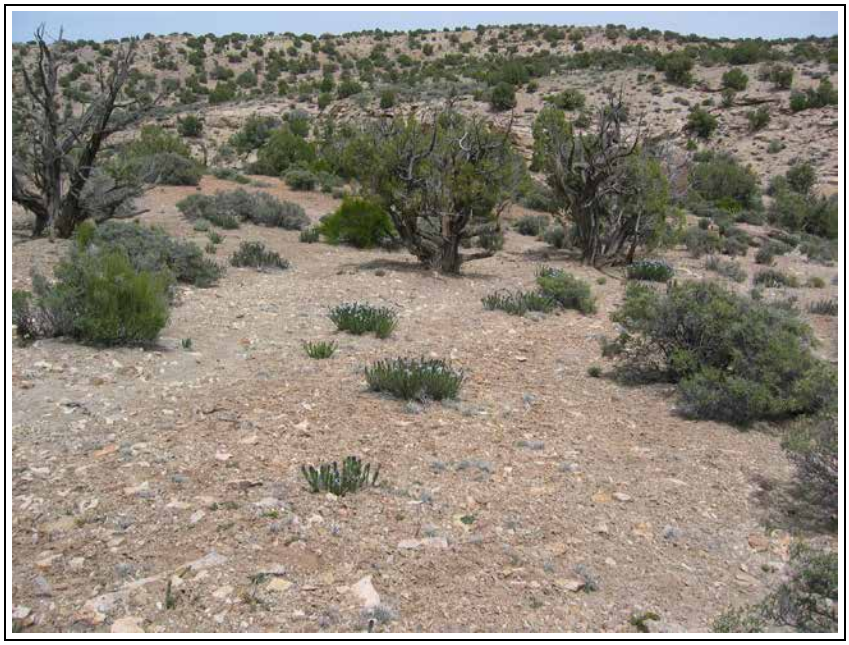
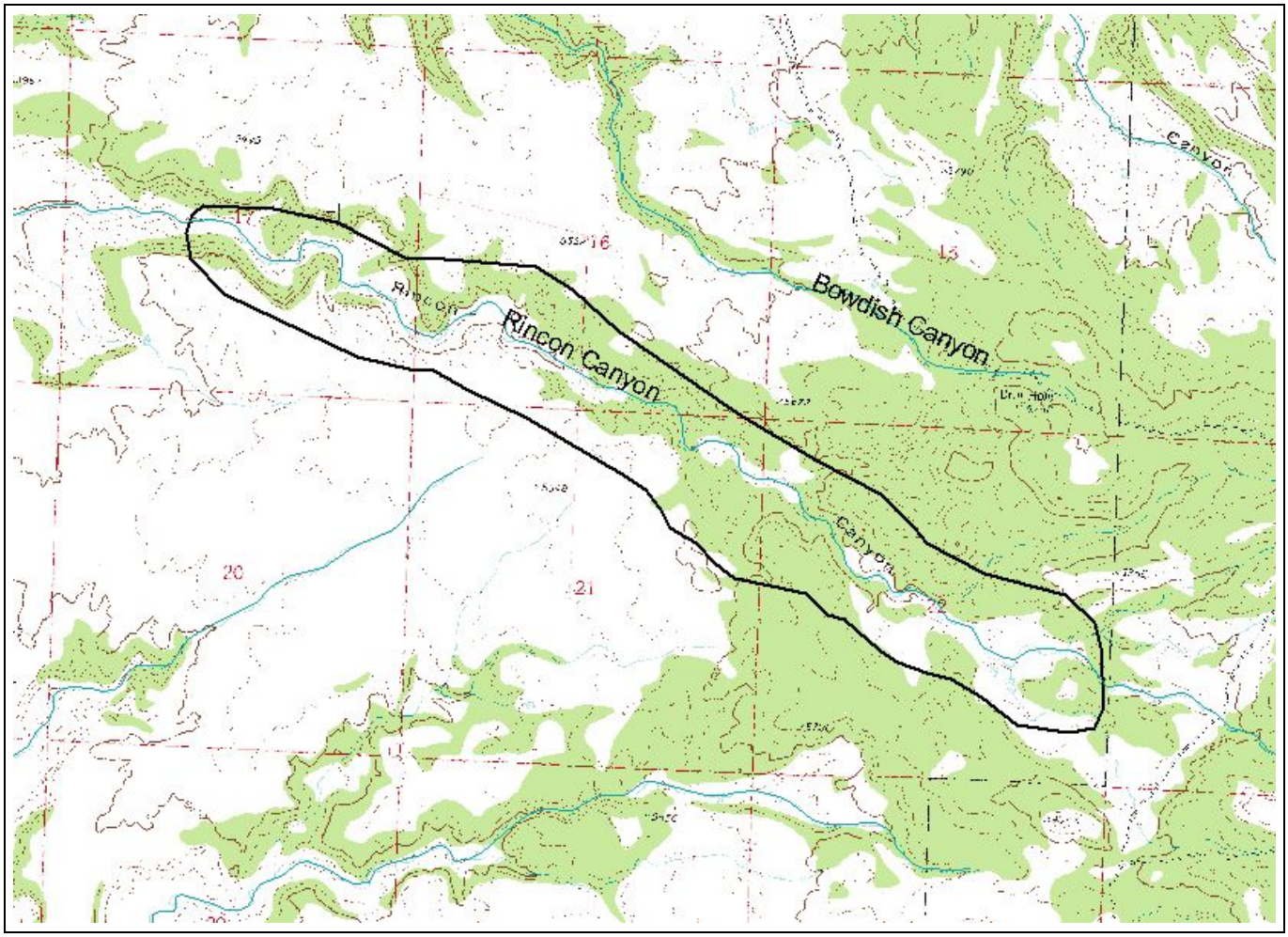


Figure 89. Habitat of Jones blue-star in Rincon.
Photo by Peggy Lyon.

Rincon Canyon PCA
B4: Moderate Biodiversity Significance



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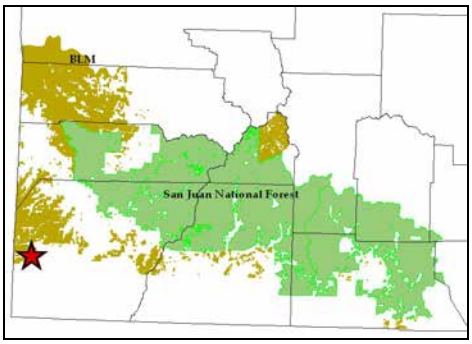
PCA Boundary

Bowdish Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



Ismay Trading Post PCA

Biodiversity Rank: B5: General biodiversity significance. This PCA has an excellent (A-ranked) occurrence and a fair (C-ranked) occurrence of two plants that are imperiled (S2) in Colorado.

Protection Urgency Rank: P3: Protection actions may be needed, but probably not within the next 5 years. It is estimated that stresses may reduce the viability of the elements in the PCA if protection action is not taken.

Management Urgency Rank: M2: New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.

Location: The Ismay Trading Post PCA is located in Montezuma County about 25 miles west of Cortez. To access the PCA drive Mc Elmo Canyon Road G to Ismay trading post near the Utah border.

U.S.G.S. 7.5 minute quadrangle: Wickiup Canyon
Legal Description: T35N, R20W, Section 3
T36N, R20W, Sections 26, 34, and 35

Elevation: 4,900 ft. **Size:** Approximately 406 acres

General Description: The Ismay Trading Post PCA extends along the western edge of Yellow Jacket Canyon and the rocky west and south facing hillsides of Cannon Ball Mesa. The BLM portion of this PCA is in Canyons of the Ancients National Monument and the remaining area is private. Shadscale (*Atriplex confertifolia*) and galleta (*Pleuraphis jamesii*) dominate the community where the occurrence of Utah penstemon (*Penstemon utahensis*) was found. The immediate area of the population is in excellent condition with longleaf phlox (*Phlox longifolia*), Durango tumblemustard (*Thelypodiopsis aurea*), sharpleaf twinpod (*Physaria acutifolia*), weak-stemmed mariposa lily (*Calochortus flexuosus*), roughseed cryptantha (*Cryptantha flavoculata*), and scorpion weed (*Phacelia crenulata*). See complete list in Appendix II.

The site of the weak-stemmed mariposa lily in the bottomland of Yellow Jacket Canyon is covered by a Greasewood/ Mojave seablite (*Sarcobatus vermiculatus/ Suaeda moquinii*) community. The area is disturbed, apparently from heavy cattle grazing, and is very weedy, with both exotics and native increaser species, in contrast to the rocky upland areas which are in good condition. Common species in the valley bottom include annual Townsend daisy (*Townsendia annua*), cranesbill (*Erodium cicutarium*), broom snakeweed (*Gutierrezia sarothrae*), miniature woollystar (*Eriastrum diffusum*), western tansymustard (*Descurainia pinnata*), tall tumblemustard (*Sisymbrium altissimum*), cheatgrass(*Bromus tectorum*), flatspine stickseed (*Lappula redowskii*), smallflowered milkvetch (*Astragalus nuttallianus*), and little cryptantha (*Cryptantha minima*). Native grasses are virtually absent from the community.

Biodiversity Rank Justification and Comments: The Ismay Trading Post PCA supports a good (B-ranked) occurrence of Utah penstemon (*Penstemon utahensis*) and a fair (C-ranked) occurrence of weak-stemmed mariposa lily, both state imperiled (S2) plants. A record of strigose Townsend daisy (*Townsendia strigosa*) at this site from 1980 was determined to be a misidentification of the common annual Townsend daisy (*Townsendia annua*).

Natural Heritage element occurrences at the Ismay Trading Post PCA.
Elements in bold are those upon which the PCA's B-rank is based.

Scientific Name	Common Name	Global Rank	State Rank	Federal and State Status	EO* Rank
Penstemon utahensis	**Utah penstemon**	**G4**	**S2**		**B**
Calochortus flexuosus	Weak-stemmed mariposa lily	G4	S2		C

*EO=Element Occurrence. Multiple listings represent separate locations.

Boundary Justification: The boundary is drawn to include the occurrence of Utah penstemon in the cliffs on the southern end of Cannon Ball Mesa near the Trading Post and the occurrence of Weak-stemmed mariposa lily in the flat bottoms of Yellow Jacket Canyon.

Protection Comments: The site lies within the boundaries of Canyons of the Ancients National Monument, and includes both BLM and private lands. Acquisition of the private land by BLM would add to the integrity and be a benefit to management of the National Monument.

Management Rank Comments: The Canyons of the Ancients resource management plan is scheduled to be in effect by 2006. The poor condition of the valley bottom presents an excellent opportunity for restoration.

Figure 90. Greasewood flats and side of Cannon Ball Mesa.

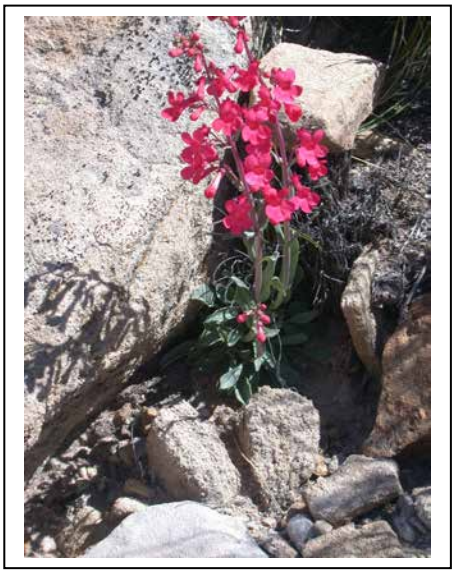
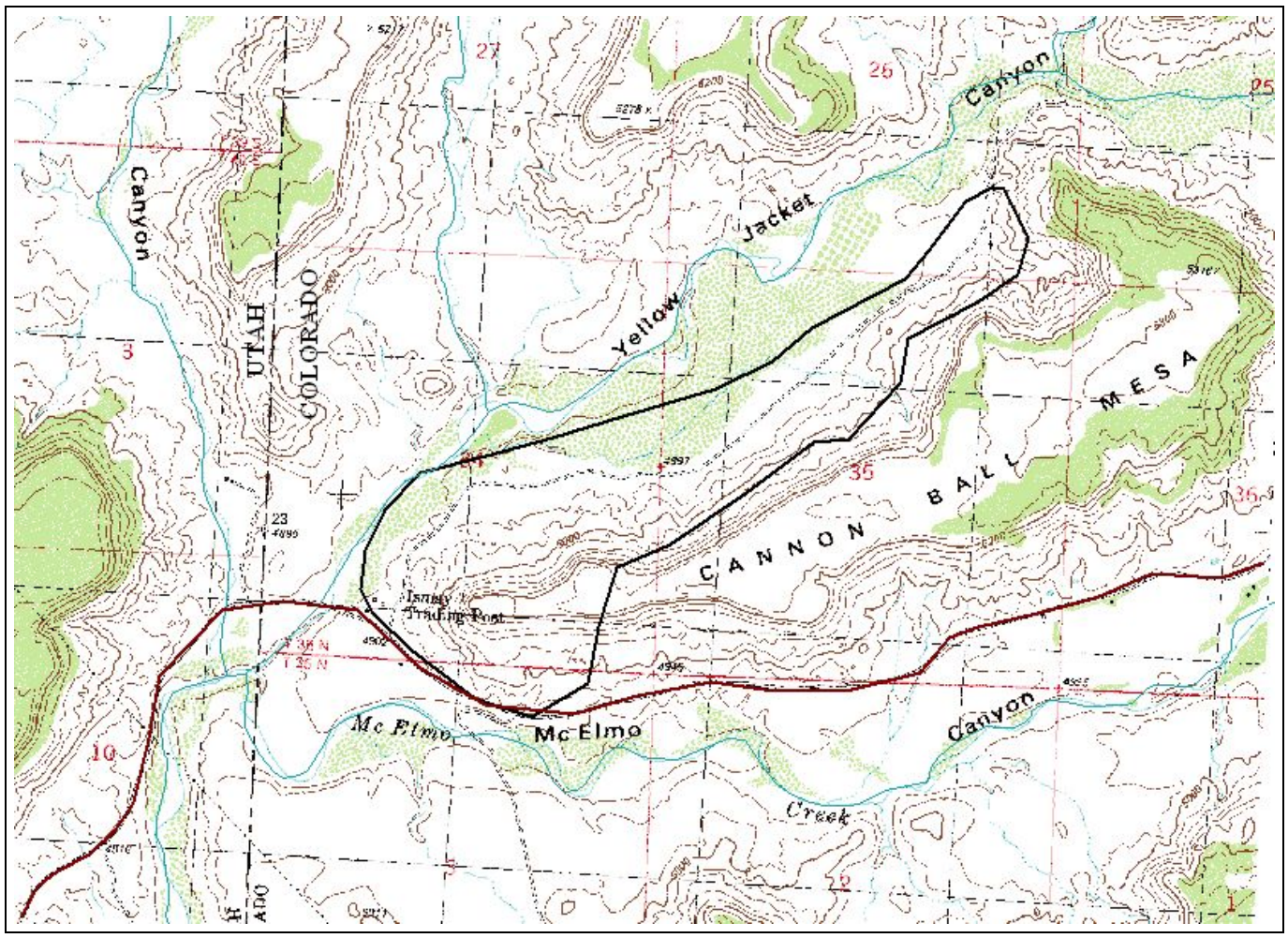


Figure 91. *Penstemon utahensis* at Ismay Trading Post PCA.

Photos by Peggy Lyon.

Ismay Trading Post PCA
B5: General Biodiversity Significance



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Disclaimer

Data are provided on an as-is, as-available basis without warranties of any kind, expressed or implied, including (but not limited to) warranties of merchantability, fitness for a particular purpose, and non-infringement. CNHP, Colorado State University and the State of Colorado further expressly disclaim any warranty that the data are error-free or current as of the date supplied.

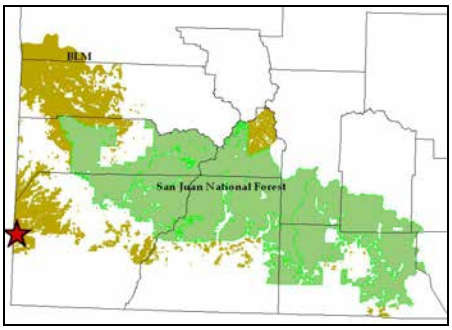
PCA Boundary

Wickiup Canyon
7.5 Minute Series

Digital Raster Graphics
Produced by the U.S. Geological Survey

Map created 16 November 2005
UTM Zone 12 NAD 27

Location in Study Area



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Appendix I: The Natural Heritage Network and Biodiversity

Colorado is well known for its rich diversity of landscape, wildlife, plants, and plant communities. However, like many other states, it is experiencing a loss of much of its flora and fauna. This decline in biodiversity is a global trend resulting from human population growth, land development, and subsequent habitat loss. Globally, the loss in species diversity has become so rapid and severe that it has been compared to the great natural catastrophes at the end of the Paleozoic and Mesozoic eras (Wilson 1988). The need to address this loss in biodiversity has been recognized for decades in the scientific community. However, many conservation efforts made in this country have not been based upon preserving biodiversity; instead, they have primarily focused on preserving game animals, striking scenery, and locally favorite open spaces. To address the absence of a methodical, science-based approach to preserving biodiversity, The Nature Conservancy developed the Natural Heritage Methodology in 1978.

Recognizing that rare and imperiled species are more likely to become extinct than common ones, the Natural Heritage Methodology ranks species according to their rarity or degree of imperilment. The ranking system is based upon the number of known locations of the species as well as its biology and known threats. By ranking the relative rarity or imperilment of a species, the quality of its populations, and the importance of associated conservation sites, the methodology can facilitate the prioritization of conservation efforts so the most rare and imperiled species may be preserved first. As the scientific community began to realize that plant communities are equally important as individual species, this methodology has also been applied to ranking and preserving rare plant communities as well as the best examples of common communities. Preserving representative plant communities provides a "coarse filter" for attending to species that depend on a particular ecosystem, but may be insufficiently known to be addressed as individual species, in addition to the "fine filter" of preserving rare plants and animals.

The Natural Heritage Methodology is used by Natural Heritage Programs throughout North, Central, and South America, forming an international database network under the umbrella of NatureServe (www.natureserve.org). Natural Heritage Network data centers are located in each of the 50 U.S. states, five provinces of Canada, and 13 countries in South and Central America and the Caribbean. This network enables scientists to monitor the status of species from a state, national, and global perspective. It also enables conservationists and natural resource managers to make informed objective decisions in prioritizing and focusing conservation efforts.

What is Biological Diversity?

Protecting biological diversity has become an important management issue for many natural resource professionals. Biological diversity at its most basic level includes the full range of species on earth, from unicellular bacteria and protists, through multicellular plants, animals, and fungi. At finer levels of organization, biological diversity includes the genetic variation within species, both among geographically separated populations and among individuals within a single population. On a wider scale, diversity includes variations in the biological communities

in which species live, the ecosystems in which communities exist, and the interactions among these levels. All levels are necessary for the continued survival of species and plant communities, and all are important for the well being of humans. It is clear that biological diversity should be of concern to all people.
The biological diversity of an area can be described at four levels:

1. **Genetic Diversity** -- the genetic variation within a population and among populations of a plant or animal species. The genetic makeup of a species is variable between populations within its geographic range. Loss of a population results in a loss of genetic diversity for that species and a reduction of total biological diversity for the region. This unique genetic information cannot be reclaimed.

2. **Species Diversity** -- the total number and abundance of plant and animal species and subspecies in an area.

3. **Community Diversity** -- the variety of plant communities within an area that represent the range of species relationships and inter-dependence. These communities may be diagnostic or even endemic to an area. It is within communities that all life dwells.

4. **Landscape Diversity** -- the type, condition, pattern, and connectedness of plant communities. A landscape consisting of a mosaic of plant communities may contain one multifaceted ecosystem, such as a wetland ecosystem. A landscape also may contain several distinct ecosystems, such as a riparian corridor meandering through shortgrass prairie. Fragmentation of landscapes, loss of connections and migratory corridors, and loss of natural communities all result in a loss of biological diversity for a region. Humans and the results of their activities are integral parts of most landscapes.

The conservation of biological diversity must include all levels of diversity: genetic, species, community, and landscape. Each level is dependent on the other levels and inextricably linked. In addition, and all too often omitted, humans are also linked to all levels of this hierarchy. We at the Colorado Natural Heritage Program believe that a healthy natural environment and human environment go hand in hand, and that recognition of the most imperiled species or communities is an important step in comprehensive conservation planning.

The Colorado Natural Heritage Program

To place this document in context, it is useful to understand the history and functions of the Colorado Natural Heritage Program (CNHP).

CNHP is the state's primary comprehensive biological diversity data center, gathering information and field observations to help develop statewide conservation priorities. After operating in the Colorado Division of Parks and Outdoor Recreation for 14 years, the Program

was relocated to the University of Colorado Museum in 1992, and then to the College of Natural Resources at Colorado State University in 1994, where it has operated since.

The multi-disciplinary team of scientists, planners, and information managers at CNHP gathers comprehensive information on the rare, threatened, and endangered species and significant plant communities of Colorado. Life history, status, and locational data are incorporated into a continually updated data system. Sources include published and unpublished literature, museum and herbaria labels, and field surveys conducted by knowledgeable naturalists, experts, agency personnel, and our own staff of botanists, ecologists, and zoologists.

All Natural Heritage Programs that house data about imperiled species are implementing use of the Biotics 4 data system developed by NatureServe. This database includes taxonomic group, global and state rarity rank, federal and state legal status, observation source, observation date, county, township, range, watershed, and other relevant facts and observations. Biotics 4 also has an ArcView based mapping program for digitizing and mapping occurrences of rare plants, animals, and plant communities. These rare species and plant communities are referred to as "elements of natural diversity" or simply "elements."

Concentrating on site-specific data for each element enables CNHP to evaluate the significance of each location for the conservation of biological diversity in Colorado and in the nation. By using species imperilment ranks and quality ratings for each location, priorities can be established to guide conservation action. A continually updated locational database and priority-setting system such as that maintained by CNHP provides an effective, proactive land-planning tool.

To assist in biological diversity conservation efforts, CNHP scientists strive to answer questions like the following:

- What species and ecological communities exist in the area of interest?
- Which are at greatest risk of extinction or are otherwise significant from a conservation perspective?
- What are their biological and ecological characteristics, and where are these priority species or communities found?
- What is the species' condition at these locations, and what processes or activities are sustaining or threatening them?
- Where are the most important sites to protect?
- Who owns or manages those places deemed most important to protect, and what is threatening those places?
- What actions are needed for the protection of those sites and the significant elements of biological diversity they contain?
- How can we measure our progress toward conservation goals?

CNHP has effective working relationships with several state and federal agencies, including the Colorado Department of Natural Resources, the Colorado Division of Wildlife, the Bureau of Land Management, and the U.S. Forest Service. Numerous local governments and private entities, such as consulting firms, educators, landowners, county commissioners, and non-profit organizations, also work closely with CNHP. Use of the data by many different individuals and organizations encourages a cooperative and proactive approach to conservation, thereby reducing the potential for conflict.

The Natural Heritage Ranking System

Each of the plant and animal species and plant communities tracked by CNHP is considered an **element of natural diversity**, or simply an **element**. Each element is assigned a rank that indicates its relative degree of imperilment on a five-point scale (e.g., 1 = extremely rare/imperiled, 5 = abundant/secure). The primary criterion for ranking elements is the number of occurrences, i.e., the number of known distinct localities or populations. This factor is weighted more heavily because an element found in only one place is more imperiled than something found numerous places. Also considered in the ranking is the size of the geographic range, the number of individuals, trends in population and distribution, identifiable threats, and the number of already protected occurrences.

Element imperilment ranks are assigned both in terms of the element's degree of imperilment within Colorado (its State or S-rank) and the element's imperilment over its entire range (its Global or G-rank). Taken together, these two ranks give an instant picture of the degree of imperilment of an element. For example, the lynx, which is thought to be secure in northern North America but is known from less than 5 current locations in Colorado, is ranked G5S1. Naturita milkvetch (*Astragalus naturitensis*), which is known from 43 locations in western Colorado, is ranked G3S3. Further, a tiger beetle that is only known from one location in the world at the Great Sand Dunes National Monument is ranked G1S1. CNHP actively collects, maps, and electronically processes specific occurrence information for elements considered extremely imperiled to vulnerable (S1 - S3). Those with a ranking of S3S4 are "watchlisted," meaning that specific occurrence data are collected and periodically analyzed to determine whether more active tracking is warranted. A complete description of each of the Natural Heritage ranks is provided in Table 1.

This single rank system works readily for all species except those that are migratory. Those animals that migrate may spend only a portion of their life cycles within the state. In these cases, it is necessary to distinguish between breeding, non-breeding, and resident species. As noted in Table 1, ranks followed by a "B", e.g., S1B, indicate that the rank applies only to the status of breeding occurrences. Similarly, ranks followed by an "N", e.g., S4N, refer to non-breeding status, typically during migration and winter. Elements without this notation are believed to be year-round residents within the state.

Table 1. Definition of Colorado Natural Heritage Imperilment Ranks.

Global imperilment ranks are based on the range-wide status of a species. State imperilment ranks are based on the status of a species in an individual state. State and Global ranks are denoted, respectively, with an "S" or a "G" followed by a character. **These ranks should not be interpreted as legal designations.**

G/S1	Critically imperiled globally/state because of rarity (5 or fewer occurrences in the world/state; or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction.
G/S2	Imperiled globally/state because of rarity (6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range.
G/S3	Vulnerable through its range or found locally in a restricted range (21 to 100 occurrences).
G/S4	Apparently secure globally/state, though it might be quite rare in parts of its range, especially at the periphery.
G/S5	Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
GX	Presumed extinct.
G#?	Indicates uncertainty about an assigned global rank.
G/SU	Unable to assign rank due to lack of available information.
GQ	Indicates uncertainty about taxonomic status.
G/SH	Historically known, but not verified for an extended period.
G#T#	Trinomial rank (T) is used for subspecies or varieties. These species or subspecies are ranked on the same criteria as G1-G5.
S#B	Refers to the breeding season imperilment of elements that are not permanent residents.
S#N	Refers to the non-breeding season imperilment of elements that are not permanent residents. Where no consistent location can be discerned for migrants or non-breeding populations, a rank of SZN is used
SZ	Migrant whose occurrences are too irregular, transitory, and/or dispersed to be reliably identified, mapped, and protected.
SA	Accidental in the state.
SR	Reported to occur in the state, but unverified.
S?	Unranked. Some evidence that species may be imperiled, but awaiting formal rarity ranking.

Notes: Where two numbers appear in a state or global rank (e.g., S2S3), the actual rank of the element falls between the two numbers.

Legal Designations for Rare Species

Natural Heritage imperilment ranks are not legal designations and should not be interpreted as such. Although most species protected under state or federal endangered species laws are extremely rare, not all rare species receive legal protection. Legal status is designated by either the U.S. Fish and Wildlife Service under the Endangered Species Act or by the Colorado Division of Wildlife under Colorado Statutes 33-2-105 Article 2. In addition, the U.S. Forest Service recognizes some species as "Sensitive," as does the Bureau of Land Management. Table 2 defines the special status assigned by these agencies and provides a key to the abbreviations used by CNHP.

Table 2. Federal and State Agency Special Designations.

Federal Status:

1. U.S. Fish and Wildlife Service (58 Federal Register 51147, 1993) and (61 Federal Register 7598, 1996)

LE Endangered; species or subspecies formally listed as endangered.

E(S/A) Endangered due to similarity of appearance with listed species.

LT Threatened; species or subspecies formally listed as threatened.

P Potential Endangered or Threatened; species or subspecies formally Potential for listing as endangered or threatened.

PD Potential for delisting

C Candidate: species or subspecies for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened.

2. U.S. Forest Service (Forest Service Manual 2670.5) (noted by the Forest Service as "S")

FS Sensitive: those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by:

a. Significant current or predicted downward trends in population numbers or density.

b. Significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

3. Bureau of Land Management (BLM Manual 6840.06D) (noted by BLM as "S")

BLM Sensitive: those species found on public lands, designated by a State Director that could easily become endangered or extinct in a state. The protection provided for sensitive species is the same as that provided for C (candidate) species. This list does not include species that are listed endangered (LE) or threatened (LT).

State Status:

1. Colorado Division of Wildlife

CO-E Endangered

CO-T Threatened

CO-SC Special Concern

Element Occurrence Ranking

Actual locations of elements, whether they are single organisms, populations, or plant communities, are referred to as element occurrences. The element occurrence is considered the most fundamental unit of conservation interest and is at the heart of the Natural Heritage Methodology. In order to prioritize element occurrences for a given species, an element occurrence rank (EO-Rank) is assigned according to the estimated viability or probability of persistence (whenever sufficient information is available). This ranking system is designed to indicate which occurrences are the healthiest and ecologically the most viable, thus focusing conservation efforts where they will be most successful. The EO-Rank is based on 3 factors:

Size – a quantitative measure of the area and/or abundance of an occurrence such as area of occupancy, population abundance, population density, or population fluctuation.

Condition – an integrated measure of the quality of biotic and abiotic factors, structures, and processes within the occurrence, and the degree to which they affect the continued existence of the occurrence. Components may include reproduction and health, development/maturity for communities, ecological processes, species composition and structure, and abiotic physical or chemical factors.

Landscape Context – an integrated measure of the quality of biotic and abiotic factors, and processes surrounding the occurrence, and the degree to which they affect the continued existence of the occurrence. Components may include landscape structure and extent, genetic connectivity, and condition of the surrounding landscape.

Each of these factors is rated on a scale of A through D, with A representing an excellent grade and D representing a poor grade. These grades are then considered to determine an appropriate EO-Rank for the occurrence. If there is insufficient information available to rank an element occurrence, an EO-Rank is not assigned. Possible EO-Ranks and their appropriate definitions are as follows:

A Excellent estimated viability.
B Good estimated viability.
C Fair estimated viability.
D Poor estimated viability.
E Viability has not been assessed.
H Historically known, but not verified for an extended period of time
X Extirpated

Potential Conservation Areas and Their Ranking

In order to successfully protect populations or occurrences, it is helpful to delineate Potential Conservation Areas (PCAs). These PCAs focus on capturing the ecological processes that are necessary to support the continued existence of a particular element occurrence of natural heritage significance. Potential Conservation Areas may include a single occurrence of a rare element, or a suite of rare element occurrences or significant features.

The goal of the PCA process is to identify a land area that can provide the habitat and ecological processes upon which a particular element occurrence, or suite of element occurrences, depends for its continued existence. The best available knowledge about each species' life history is used in conjunction with information about topographic, geomorphic, and hydrologic features; vegetative cover; and current and potential land uses. In developing the boundaries of a Potential Conservation Area, CNHP scientists consider a number of factors that include, but are not limited to:

- ecological processes necessary to maintain or improve existing conditions;
- species movement and migration corridors;
- maintenance of surface water quality within the PCA and the surrounding watershed;
- maintenance of the hydrologic integrity of the groundwater;
- land intended to buffer the PCA against future changes in the use of surrounding lands;
- exclusion or control of invasive exotic species;
- land necessary for management or monitoring activities.

The boundaries presented are meant to be used for conservation planning purposes and have no legal status. The proposed boundary does not automatically recommend exclusion of all activity. Rather, the boundaries designate ecologically significant areas in which land managers may wish to consider how specific activities or land use changes within or near the PCA affect the natural heritage resources and sensitive species on which the PCA is based. Please note that these boundaries are based on our best estimate of the primary area supporting the long-term survival of targeted species and plant communities. A thorough analysis of the human context and potential stresses has not been conducted. However, CNHP's conservation planning staff is available to assist with these types of analyses where conservation priority and local interest warrant additional research.

Off-Site Considerations

Frequently, all relevant ecological processes cannot be contained within a Potential Conservation Area of reasonable size. For instance, while a PCA for Colorado River cutthroat trout may be drawn to include only the riparian zone of a river or creek, it should be remembered that activities in the entire watershed can affect water quality, which will in turn affect the trout population. The boundaries illustrated in this report signify the immediate, and therefore most important, area in need of protection. Continued landscape level conservation efforts are needed. This will involve countywide efforts as well as coordination and cooperation with private landowners, neighboring land planners, and state and federal agencies.

Ranking of Potential Conservation Areas

CNHP uses element and element occurrence ranks to assess the overall biological diversity significance of a PCA, which may include one or many element occurrences. Based on these ranks, each PCA is assigned a biological diversity rank (or B-rank). See Table 3 for a summary of these B-ranks.

Table 3. Natural Heritage Program Biological Diversity Ranks and their Definitions.

B1	Outstanding Significance (irreplaceable): only known occurrence of an element A-ranked occurrence of a G1 element (or at least C-ranked if best available occurrence) concentration of A- or B-ranked occurrences of G1 or G2 elements (four or more)
B2	Very High Significance (nearly irreplaceable): B- or C-ranked occurrence of a G1 element A- or B-ranked occurrence of a G2 element One of the most outstanding (for example, among the five best) occurrences rangewide (at least A- or B-ranked) of a G3 element. Concentration of A- or B-ranked G3 elements (four or more) Concentration of C-ranked G2 elements (four or more)
B3	High Significance: C-ranked occurrence of a G2 element A- or B-ranked occurrence of a G3 element D-ranked occurrence of a G1 element (if best available occurrence) Up to five of the best occurrences of a G4 or G5 community (at least A- or B-ranked) in an ecoregion (requires consultation with other experts)
B4	Moderate Significance: Other A- or B-ranked occurrences of a G4 or G5 community C-ranked occurrence of a G3 element A- or B-ranked occurrence of a G4 or G5 S1 species (or at least C-ranked if it is the only state, provincial, national, or ecoregional occurrence) Concentration of A- or B-ranked occurrences of G4 or G5 N1-N2, S1-S2 elements (four or more) D-ranked occurrence of a G2 element At least C-ranked occurrence of a disjunct G4 or G5 element Concentration of excellent or good occurrences (A- or B-ranked) of G4 S1 or G5 S1 elements (four or more)
B5	General or State-wide Biological Diversity Significance: good or marginal occurrence of common community types and globally secure S1 or S2 species, sites of local interest.

Protection Urgency Ranks

Protection urgency ranks (P-ranks) refer to the timeframe in which it is recommended that conservation protection occur. In most cases, this rank refers to the need for a major change of protective status (for example agency special area designations or ownership). The urgency

for protection rating reflects the need to take legal, political, or other administrative measures to protect the area. Table 4 summarizes the P-ranks and their definitions.

Table 4. Natural Heritage Program Protection Urgency Ranks and their Definitions.

P1	Protection actions needed immediately. It is estimated that current stresses may reduce the viability of the elements in the PCA within 1 year.
P2	Protection actions may be needed within 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA within this approximate timeframe.
P3	Protection actions may be needed, but probably not within the next 5 years. It is estimated that current stresses may reduce the viability of the elements in the PCA if protection action is not taken.
P4	No protection actions are needed in the foreseeable future.
P5	Land protection is complete and no protection actions are needed.

A protection action involves increasing the current level of protection accorded one or more tracts within a potential conservation area. It may also include activities such as educational or public relations campaigns, or collaborative planning efforts with public or private entities, to minimize adverse impacts to element occurrences at a site. It does not include management actions. Situations that may require a protection action are as follows:

- Forces that threaten the existence of one or more element occurrences at a PCA. For example, development that would destroy, degrade or seriously compromise the long-term viability of an element occurrence; or timber, range, recreational, or hydrologic management that is incompatible with an element occurrence's existence;
- The inability to undertake a management action in the absence of a protection action; for example, obtaining a management agreement;
- In extraordinary circumstances, a prospective change in ownership or management that will make future protection actions more difficult.

Management Urgency Ranks

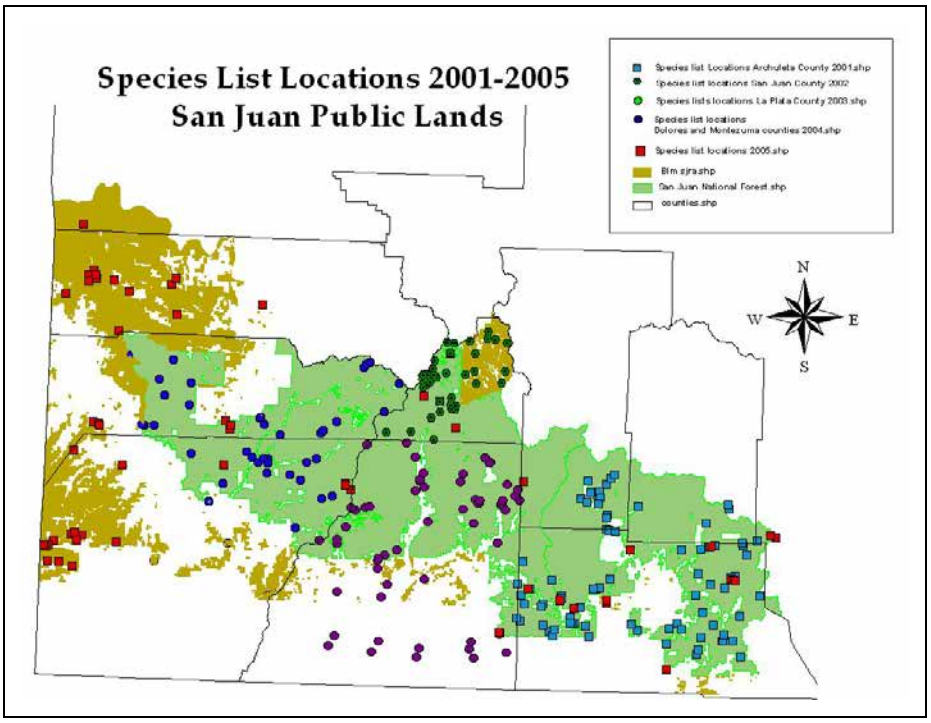
Management urgency ranks (M-ranks) indicate the timeframe in which it is recommended that a change occur in management of the element or PCA. This rank refers to the need for management in contrast to protection (for example, increased fire frequency, decreased grazing, weed control, etc.). The urgency for management rating focuses on land use management or land stewardship action required to maintain element occurrences at the potential conservation area.

A management action may include biological management (prescribed burning, removal of exotics, mowing, etc.) or people and site management (building barriers, rerouting trails, patrolling for collectors, hunters, or trespassers, etc.). Management action does not include legal, political, or administrative measures taken to protect a potential conservation area. Table 5 summarizes M-ranks and their definitions.

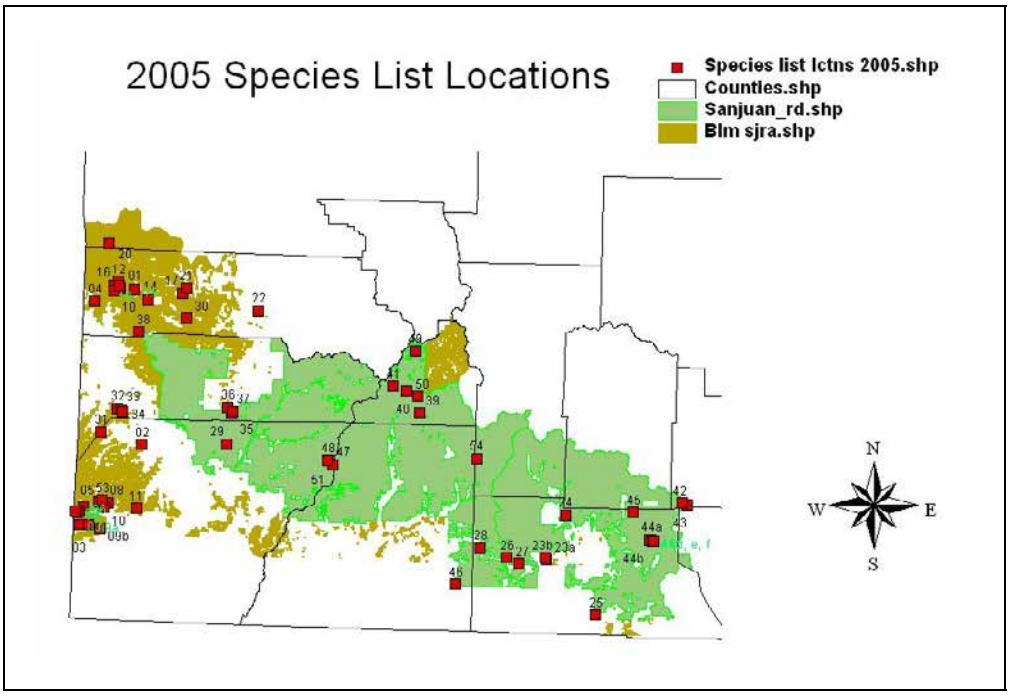
Table 5. Natural Heritage Program Management Urgency Ranks and their Definitions.

M1	Management actions may be required within one year or the element occurrences could be lost or irretrievably degraded.
M2	New management actions may be needed within 5 years to prevent the loss of the element occurrences within the PCA.
M3	New management actions may be needed within 5 years to maintain the current quality of the element occurrences in the PCA.
M4	Current management seems to favor the persistence of the elements in the PCA, but management actions may be needed in the future to maintain the current quality of the element occurrences.
M5	No management needs are known or anticipated in the PCA.

Appendix II:
Species Lists from selected representative locations in the San Juan Public Lands



Species list locations from 2001 to 2005.



Species List Locations 2005.

Plants are listed alphabetically under life forms (tree; shrub and sub-shrub, including cacti; graminoid, including grasses, sedges, and rushes; and forb or herbaceous plants)
Non-native species are in italics
Species tracked by CNHP are in bold type. See Appendix IV for common names.

1. Slick Rock Hill 03-28-05 and 5-9-05
U.S.G.S. Quadrangle: Horse Range Mesa
T 44N R18W 31S
Elevation: approx. 5800 ft.
Owner: BLM
Habitat: Pinyon-Juniper Woodland. Good soil crust with black moss and yellow lichen

Trees
Pinus edulis
Juniperus osteosperma

Shrubs
Amelanchier utahensis
Artemisia nova
Atriplex canescens
Cercocarpus montanus
Chrysothamnus viscidiflorus
Ephedra viridis
Fendlera rupicola
Fraxinus anomala
Opuntia polyacantha
Purshia stansburiana
Purshia tridentata

Graminoids
Bouteloua gracilis
Bromus tectorum
Carex rossii
Elymus elymoides
Pleuraphis jamesii
Leymus salina
Oryzopsis hymenoides
Poa fendleriana
Hesperostipa comata
Vulpia octoflora

Forbs
Astragalus amphioxys
Astragalus lonchocarpus
Astragalus mollissimus
Astragalus naturitensis
Castilleja scabrida
Chaetopappa ericoides
Cryptantha flava
Cymopterus purpureus
Descurainia pinnata
Draba cuneifolia
Eremogone kingii
Erodium cicutarium
Eriogonum microthecum
Gutierrezia sarothrae
Hymenopappus filifolius
Lappula redowskii
Lesquerella rectipes
Lithospermum incisum
Penstemon breviculus
Phlox hoodii
Phlox longifolia
Physaria acutifolia
Platyschkuhria integrifolia
Silene antirrhina
Sphaeralcea coccinea
Stanleya pinnata
Streptanthella longirostris
Tetraneuris ivesiana

2. Sandstone Canyon 03-28-05
U.S.G.S. Quadrangle: Pleasant View
T 38N R18W 13S
Elevation: approx. 5600 ft.
Owner: BLM
Habitat: Pinyon-juniper shrubland

Trees
Pinus edulis

Shrubs
Amelanchier utahensis
Artemisia nova
Artemisia tridentata
Chrysothamnus sp.
Opuntia fragilis
Paxistima myrsinites
Purshia tridentata
Quercus gambelii

Graminoids
Bouteloua gracilis
Bromus tectorum
Oryzopsis hymenoides

Forbs
Claytonia lanceolata
Cymopterus bulbosus
Draba cuneifolia
Eriogonum umbellatum
Hymenopappus filifolius
Ipomopsis aggregata
Petradoria pumila
Ranunculus testiculatus
Senecio multilobatus

3. Mesa south of McElmo Canyon 04-03-05
U.S.G.S. Quadrangle: Wickiup Canyon
T35N R20W S14 Elevation: approx. 5,999 ft.
Owner: BLM
Habitat: Juniper shrubland

Trees
Juniperus osteosperma

Shrubs
Artemisia nova
Ephedra viridis
Yucca angustissima

Graminoids
Aristida purpurea
Oryzopsis hymenoides

Forbs
Cryptantha bakeri
Cryptantha flavoculata
Cryptantha minima
Descurainia pinnata
Draba cuneifolia
Eriogonum microthecum
Erodium cicutarium
Gutierrezia sarothrae
Lepidium montanum
Physaria acutifolia
Stenotus armerioides
Streptanthella longirostis

4. Summit Canyon Rim 4-7-05
U.S.G.S. Quadrangle: Egnar
T43N R19W S17, 18
Elevation: approx. 6800 ft.
Owner: BLM
Habitat: Old growth Pinyon-juniper woodland

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Amelanchier utahensis
Artemisia nova
Artemisia tridentata ssp. wyomingensis
Artemisia nova
Atriplex canescens
Cercocarpus montanus
Chrysothamnus nauseosus
Echinocereus triglochidiatus
Ephedra viridis
Opuntia fragilis
Opuntia polyacantha
Pediocactus simpsonii
Yucca baccata
Yucca harrimaniae

Graminoids
Agropyrum cristatum
Bouteloua gracilis
Bromus tectorum
Oryzopsis hymenoides
Poa fendleriana

Forbs
Arabis perennans
Castilleja chromosa
Cryptantha flavoculata
Descurainia pinnata
Draba cuneifolia
Eriogonum alatum
Eriogonum ovalifolium
Gutierrezia sarothrae
Hymenopappus filifolius
Lepidium montanum
Lesquerella rectipes
Machaeranthera canescens
Pedicularis centranthera
Penstemon breviculus
Penstemon cespitosus
Penstemon lentus
Petradoria pumila
Physaria acutifolia
Platychkuhria integrifolia
Ranunculus testiculatus
Senecio multilobatus
Stenotus armerioides
Streptanthus cordatus
Tetraneuris ivesiana
Townsendia incana

5. Mesa between Yellowjacket and Risley Canyons 4-16-05
U.S.G.S. Quadrangle: Bowdish Canyon
T36N R19W S21 Elevation: approx. 5210ft.
Owner: BLM
Habitat: Widely scattered Juniperus osteosperma with Purshia stansburiana, good cryptobiotic crust

Trees
Fraxinus anomala
Juniperus osteosperma
Pinus edulis

Shrubs
Amelanchier utahensis
Artemisia nova
Atriplex confertifolia
Ephedra torreyana
Ephedra viridis
Eriogonum microthecum
Purshia stansburiana
Rhus trilobata
Yucca harrimaniae

Graminoids
Pleuraphis jamesii
Poa fendleriana

Forbs
Arabis perennans
Astragalus sp.
Calochortus flexuosus
Cryptantha flava
Delphinium scaposum
Descurainia pinnata
Gutierrezia sarothrae
Leptodactylon pungens
Penstemon utahensis
Stanleya pinnata
Stenotus armerioides
Streptanthella longirostris

6. Cannon Ball Mesa NW 4-16-05
U.S.G.S. Quadrangle: Wickiup Canyon
T36N R20W S25,36
Elevation: approx. 5286 ft.
Owner: BLM
Habitat: Juniperus osteosperma- Sarcobatus vermiculatus shrubland

Trees
Juniperus osteosperma

Shrubs
Artemisia arbuscula
Artemisia tridentata ssp. wyomingensis
Atriplex canescens
Atriplex confertifolia
Atriplex grayi
Chrysothamnus viscidiflorus
Echinocereus triglochidiatus
Ephedra viridis
Opuntia phaeocantha
Purshia stansburiana
Sarcobatus vermiculatus

Graminoids
Bromus tectorum
Erodium cicutarium
Pleuraphis jamesii

Forbs
Arabis perennans
Astragalus nuttalianus
Astragalus mollissimus
Descurainia pinnata
Gutierrezia sarothrae
Lappula redowskii
Lepidium montanum
Streptanthella longirostris

7. West rim Cannon Ball Mesa 4-16-05
U.S.G.S. Quadrangle: Wickiup Canyon
T36N R20W S35
Elevation: approx. 5277 ft.
Owner: BLM
Habitat: Juniperus osteosperma shrubland

Trees
Juniperus osteosperma

Shrubs
Artemisia nova
Amelanchier utahensis
Ephedra torreyana
Ephedra viridis
Purshia stansburiana
Rhus simplicifolia

Graminoids
Oryzopsis hymenoides

Forbs
Calochortus flexuosus
Cymopterus fendleri
Gilia ophthalmoides
Gutierrezia sarothrae
Phlox longifolia
Stenotus armerioides
Streptanthus cordatus

8. Risley Canyon 4-17-2005
U.S.G.S. Quadrangle: Bowdish Canyon
T 36N R19 W S23
Elevation: approx. 5485 ft.
Owner: BLM
Habitat: Juniperus osteosperma- Purshia tridentata

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Amelanchier utahensis
Cercocarpus montanus
Chrysothamnus nauseosus
Chrysothamnus viscidiflorus
Ephedra viridis
Purshia stansburiana
Rhus trilobata
Tetradymia canescens
Yucca harrimaniae

Graminoids
Pleuraphis jamesii
Poa fendleriana

Forbs
Astragalus amphioxys
Astragalus mollissimus
Calochortus flexuosus
Castilleja chromosa
Cymopterus fendleri
Cymopterus purpureus
Descurainia pinnata
Gutierrezia sarothrae
Hedysarum boreale
Hymenopappus filifolius
Leptodactylon pungens
Lesquerella rectipes
Mirabilis multiflora
Physaria acutifolia
Purshia stansburiana
Sphaeralcea coccinea
Streptanthus cordatus
Tetraneuris ivesiana
Townsendia incana

9. Rincon Canyon 4-17-05
U.S.G.S. Quadrangle: Bowdish Canyon
T35N R19W S18
Elevation: approx. 5405 ft.
Owner: BLM
Habitat: Desert shrub, PJ, canyon

9a. lower canyon greasewood flats

Shrubs
Atriplex canescens
Chrysothamnus nauseosus
Sarcobatus vermiculatus
Tetradymia spinosa

Graminoids
Bromus tectorum

Forbs
Astragalus nuttalianus
Atriplex argentea
Erodium cicutarium
Ranunculus testiculatus
Suaeda moquinii

9b. Upper canyon, Juniperus osteosperma-Artemisia tridentata and Juniperus osteosperma/Forsellesia meionandra communities

Trees
Juniperus osteosperma
Fraxinus anomala

Shrubs
Amelanchier utahensis
Ephedra viridis
Artemisia tridentata ssp. tridentata
Artemisia tridentata ssp. wyomingensis
Chrysothamnus nauseosus
Forsellesia meionandra
Purshia stansburiana
Rhus trilobata
Tamarix ramosissima
Yucca harrimaniae

Graminoids
Aristida purpurea
Pleuraphis jamesii
Oryzopsis hymenoides
Poa fendleriana

Forbs
Allium macropetalum
Amsonia jonesii
Arabis pulchra
Calochortus flexuosus
Castilleja chromosa
Cryptantha flava
Eriogonum ovalifolium
Gutierrezia sarothrae
Hedysarum boreale
Machaeranthera grindelioides
Mirabilis multiflora
Pediomelum megalanthum
Penstemon utahensis
Phlox hoodii
Schoencrambe linifolia
Sphaeralcea coccinea
Stanleya pinnata
Stenotus armerioides
Streptanthella longirostis

10. BLM boundary, Cannon Ball Mesa Road 4-19-05
U.S.G.S. Quadrangle: Bowdish Canyon
T36N R19W S27
Elevation: approx. 5356ft.
Owner: BLM
Habitat: Pinyon-juniper shrubland and desert shrub

10a. Pinyon-Juniper shrubland

Trees
Pinus edulis
Juniperus osteosperma

Shrubs
Artemisia arbuscula
Artemisia tridentata ssp. wyomingensis
Atriplex confertifolia
Chrysothamnus viscidiflorus
Echinocereus triglochidiatus
Ephedra torreyana.
Ephedra viridis
Purshia stansburiana
Rhus trilobata
Sclerocactus whipplei
Yucca harrimaniae

Graminoids
Aristida purpurea
Pleuraphis jamesii
Oryzopsis hymenoides

Forbs
Allium macropetalum
Astragalus amphioxys
Castilleja chromosa
Cirsium tracyi
Cryptantha flavoculata
Cryptantha gracilis
Cymopterus bulbosus
Cymopterus fendleri
Cymopterus purpureus
Descurainia pinnata
Eremogone kingii
Eriogonum ovalifolium
Gilia ophthalmoides
Gutierrezia sarothrae
Hymenopappus filifolius
Lepidium montanum
Leptodactylon pungens
Mirabilis multiflora
Oenothera caespitosa
Penstemon utahensis
Petradoria pumila
Phacelia crenulata
Physaria acutifolia
Sphaeralcea coccinea
Stenotus armerioides
Streptanthus cordatus
Tetraneuris ivesiana
Thelypodiopsis aurea

10b. open areas

Shrubs
Artemisia sp.
Atriplex confertifolia
Chrysothamnus viscidiflorus
Opuntia polyacantha

Graminoids
Bromus tectorum
Pleuraphis jamesii
Hordeum brachyantherum
Poa fendleriana
Sporobolus airoides

Forbs
Artemisia ludoviciana
Astragalus mollissimus
Astragalus nuttallianus
Calochortus flexuosus
Cirsium tracyi
Cryptantha minima
Cymopterus bulbosus
Delphinium scaposum
Draba cuneifolia
Erodium cicutarium
Gilia sinistra
Gilia tweedyi
Gutierrezia sarothrae
Gutierrezia sarothrae
Lappula redowskii
Lappula sp.
Machaeranthera pinnatifida
Plantago patagonica
Platyschkuhria integrifolia
Ranunculus testiculatus
Sphaeralcea coccinea
Thelypodiopsis aurea

11. Sand Canyon 4-19-05
U.S.G.S. Quadrangle: Battle Rock
T36N R18W S26
Elevation: approx. 5600 ft.
Owner: BLM
Habitat: Pinyon-juniper shrubland

11 a. Near trailhead

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Artemisia tridentata ssp. tridentata
Artemisia tridentata ssp. wyomingensis
Atriplex canescens
Echinocereus triglochidiatus
Opuntia phaeocantha
Opuntia polyacantha
Rhus trilobata

Graminoids
Bromus tectorum
Pleuraphis jamesii
Oryzopsis hymenoides

Forbs
Alyssum parviflorum
Astragalus mollissimus
Cryptantha gracilis
Descurainia pinnata
Draba cuneifolia
Erodium cicutarium
Gutierrezia sarothrae
Lappula redowskii
Lepidium montanum
Sisymbrium altissimum
Streptanthella longirostris

11b. farther north on Entrada slickrock

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Amelanchier utahensis
Cercocarpus montanus
Chrysothamnus viscidiflorus
Krascheninnikovia lanata
Purshia stansburiana
Yucca baccata
Yucca harrimaniae

Graminoids
Aristida purpurea
Pleuraphis jamesii
Poa fendleriana

Forbs
Arabis pulchra
Astragalus nuttalianus
Calylophus lavandulifolius
Cryptantha sp.
Cymopterus fendleri
Eriogonum alatum
Heterotheca villosa
Hymenopappus filifolius
Lesquerella rectipes
Penstemon sp.
Penstemon lentus
Rumex sp.
Senecio multilobatus
Sphaeralcea parvifolia
Streptanthella longirostris
Tetraneuris ivesiana

12. Dolores River above Poverty Flat 5-2-05
U.S.G.S. Quadrangle: Horse Range Mesa
T 44N R19W S25
Elevation: approx. 5500 ft.
Owner: BLM
Habitat: Juniperus osteosperma shrubland, Entrada slickrock with dark red sandy soils

Trees
Pinus edulis
Juniperus osteosperma

Shrubs
Artemisia nova
Atriplex canescens
Chrysothamnus viscidiflorus
Ephedra viridis
Fraxinus anomala
Opuntia phaeocantha
Opuntia polyacantha
Rhus trilobata
Tetradymia spinosa
Yucca harrimaniae
Yucca baccata

Graminoids
Bouteloua gracilis
Pleuraphis jamesii

Forbs
Astragalus lonchocarpus
Astragalus mollissimus
Chaetopappa ericoides
Cryptantha fulvocanescens
Cymopterus fendleri
Delphinium scaposum
Descurainia pinnata
Draba cuneifolia
Eriogonum microthecum
Gutierrezia sarothrae
Heterotheca villosa
Hymenopappus filifolius
Lappula redowskii
Machaeranthera grindelioides
Mirabilis multiflora
Oenothera caespitosa
Phacelia crenulata
Phlox hoodii
Physaria acutifolia
Plantago patagonica
Platyschkuhria integrifolia
Stanleya pinnata
Streptanthella longirostris
Tetraneuris ivesiana
Townsendia incana

13. South side Cannon Ball Mesa 4-2-05
U.S.G.S. Quadrangle: Wickiup Canyon
T36N R20W S35
Elevation: approx. 4900 ft.
Owner: BLM
Habitat: Pinyon-juniper shrubland

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Amelanchier utahensis
Atriplex confertifolia
Chrysothamnus greenei
Chrysothamnus viscidiflorus
Ephedra torreyana
Ephedra viridis
Rhus trilobata
Sclerocactus whipplei
Tetradymia canescens
Yucca angustissima
Yucca harrimaniae

Graminoids
Aristida purpurea
Pleuraphis jamesii

Forbs
Arabis pulchra
Astragalus amphioxys
Astragalus sp.
Castilleja chromosa
Cirsium tracyi
Cryptantha flavoculata
Cymopterus bulbosus
Cymopterus fendleri
Cymopterus purpureus
Delphinium scaposum
Descurainia pinnata
Draba cuneifolia
Eriogonum inflatum
Gilia sinistra
Gutierrezia sarothrae
Lappula redowskii
Lepidium lasiocarpum
Leptodactylon pungens
Linum lewisii
Machaeranthera pinnatifida
Penstemon utahensis
Phacelia crenulata
Phlox longifolia
Physaria acutifolia
Plantago patagonica
Rumex crispus
Sphaeralcea coccinea
Stenotus armerioides
Streptanthella longirostris
Thelypodiopsis aurea
Vulpia octoflora

14. Disappointment Valley 5-7-05
U.S.G.S. Quadrangle: Joe Davis Hill
T 43 N R17W S7
Elevation: approx. 5677 ft.
Owner: BLM
Habitat: Gypsum knolls, desert shrubland

14a. Top of knoll, light gray soil, sparse vegetation

Shrubs
Artemisia nova
Atriplex confertifolia
Atriplex gardneri
Chrysothamnus viscidiflorus

Graminoids
Bouteloua gracilis

Forbs
Astragalus amphioxys
Cryptantha gypsophila
Cymopterus fendleri
Descurainia pinnata
Eriogonum lonchophyllum
Lepidium densiflorum
Physaria acutifolia
Stanleya pinnata

14b. Base of knolls, more dense vegetation

Shrubs
Atriplex confertifolia
Atriplex gardneri
Chrysothamnus viscidiflorus
Opuntia phaeocantha
Opuntia polyacantha
Sarcobatus vermiculatus

Graminoids
Pleuraphis jamesii
Vulpia octoflora

Forbs
Allium macropetalum
Astragalus amphioxyis
Castilleja chromosa
Cryptantha gypsophila
Cymopterus bulbosus
Eriogonum lonchophyllum
Phacelia crenulata
Phlox longifolia
Tetraneuris torreyana

14c.On brown soils on flats

Shrubs
Artemisia nova
Krascheninnikovia lanata
Sarcobatus vermiculatus
Sclerocactus whipplei

Graminoids
Bromus tectorum

Forbs
Descurainia pinnata
Eriogonum lonchophyllum
Lappula redowskii
Lappula sp.
Lepidium densiflorum
Lesquerella rectipes
Sphaeralcea coccinea
Townsendia annua

15. Nichols Draw 5-7-05
U.S.G.S. Quadrangle: Hamm Canyon
T44N R18W S34
Elevation: 5800 ft.
Owner: BLM
Habitat: Rim of small canyon, with Pinus edulis- Juniperus osteosperma/Artemisia nova

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Artemisia nova
Chrysothamnus nauseosus
Opuntia polyacantha
Rhus trilobata

Graminoids
Bouteloua gracilis
Vulpia octoflora

Forbs
Astragalus naturitensis
Calylophus lavandulifolius
Comandra umbellata
Cryptantha fulvocanescens
Erigeron flagellaris
Eriogonum ovalifolium var. ovalifolium
Eriogonum umbellatum
Lepidium sp.
Penstemon breviculus
Phacelia crenulata
Sphaeralcea coccinea
Tetraneuris ivesiana

16. Summit Canyon trail to alcoves 05-08-05
U.S.G.S. Quadrangle: Horse Range Mesa
T 41N R19W S36
Elevation: approx. 6700 ft.
Owner: BLM
Habitat: Pinyon-Juniper, slickrock

16a. Bench of Entrada sandstone

Shrubs
Opuntia polyacantha

Graminoids
Bouteloua gracilis
Poa fendleriana
Hesperostipa comata

Forbs
Astragalus mollissimus
Astragalus naturitensis
Castilleja scabrida
Cymopterus fendleri
Delphinium scaposum
Erysimum capitatum
Gutierrezia sarothrae
Hymenopappus sp.
Lesquerella rectipes
Oenothera sp.
Oryzopsis hymenoides
Penstemon cyanocaulis
Phlox hoodii
Phlox longifolia
Plantago patagonica
Silene antirrhina
Streptanthella longirostris
Townsendia incana

16b. Base of cliffs by first alcove with small stream

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Amelanchier utahensis
Artemisia ludoviciana
Cercocarpus montanus
Ephedra viridis
Fendlera rupicola
Forestiera pubescens
Fraxinus anomala
Mahonia repens
Rhus trilobata
Symphoricarpos oreophilus
Yucca baccata
Yucca harrimaniae

Forbs
Antennaria sp.
Astragalus naturitensis
Draba cuneifolia
Erigeron concinnus
Eriogonum microthecum
Lithospermum sp.
Machaeranthera grindelioides
Penstemon cyanocaulis
Phlox hoodii
Ranunculus testiculatus
Stenotus armerioides

17. Big Gypsum Valley at Road 23R 5-9-05
U.S.G.S. Quadrangle: Gypsum Gap
T43N R16W S5
Elevation: approx. 6406 ft.
Owner: BLM

Habitat: Gypsum hills

Trees
Juniperus osteosperma

Shrubs
Krascheninnikovia lanata

Graminoids
Bouteloua gracilis
Hesperostipa comata

Forbs
Chaetopappa ericoides
Cryptantha gypsophila
Descurainia pinnata
Gilia ophthalmoides
Gutierrezia sarothrae
Lappula redowskii
Mirabilis multiflora
Sisymbrium altissimum

18. Upper Corral Draw 05-09-05
U.S.G.S. Quadrangle: Horse Range Mesa
T 43N R19W S1
Elevation: approx. 6424 ft.
Owner: BLM
Habitat: Pinyon-juniper/Mountain mahogany woodland

Trees
Fraxinus anomala
Juniperus osteosperma
Pinus edulis

Shrubs
Amelanchier utahensis
Artemisia nova
Atriplex canescens
Cercocarpus montanus
Chrysothamnus viscidiflorus
Echinocereus triglochidiatus
Ephedra viridis
Opuntia phaeocantha
Opuntia polyacantha
Purshia stansburiana
Purshia tridentata
Rhus trilobata

Graminoids
Pleuraphis jamesii
Leymus salina
Oryzopsis hymenoides
Poa fendleriana
Hesperostipa comata
Vulpia octoflora

Forbs
Astragalus lentiginosus.
Astragalus lonchocarpus
Calylophus lavandulifolius
Castilleja scabrida
Chaetopappa ericoides
Cryptantha flavoculata
Cryptantha fulvocanescens
Cymopterus purpureus
Descurainia pinnata
Eremogone kingii
Gutierrezia sarothrae
Heterotheca villosa
Hymenopappus filifolius
Lappula redowskii
Lesquerella rectipes
Mirabilis multiflora
Phacelia crenulata
Phlox hoodii
Phlox longifolia
Physaria acutifolia
Platyschkuhria integrifolia
Silene antirrhina
Sphaeralcea coccinea
Stanleya pinnata
Stenotus armerioides
Streptanthella longirostis
Streptanthus cordatus
Tetraneuris ivesiana
Townsendia incana

19. Poverty Flat South of Dolores River 5-9-05
U.S.G.S. Quadrangle: Horse Range Mesa
T44N R18W S31
Elevation: approx. 5558 ft.
Owner: BLM and private

Habitat: Pinyon-Juniper/Mountain mahogany woodland. Red sandy soil with cobbles, good soil crust

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Cercocarpus montanus
Ephedra viridis
Fendlera rupicola
Fraxinus anomala
Opuntia polyacantha
Sclerocactus whipplei

Graminoids
Bromus tectorum
Carex heliophila
Pleuraphis jamesii
Oryzopsis hymenoides
Poa fendleriana
Vulpia octoflora

Forbs
Astragalus amphioxys
Astragalus lentiginosus
Astragalus mollissimus
Erigeron concinnus
Gutierrezia sarothrae
Hymenopappus filifolius
Penstemon cyanocaulis
Stenotus armerioides
Streptanthella longirostris
Tetraneuris ivesiana
Townsendia incana

20. Little Gypsum Valley 5-9-05
U.S.G.S. Quadrangle: Anderson Mesa
T45N R19W S11
Elevation: approx. 5600 ft.
Owner: BLM
Habitat: Juniper shrubland

Trees
Juniperus osteosperma

Shrubs
Artemisia nova
Opuntia polyacantha

Graminoids
Bouteloua gracilis

Forbs
Astragalus naturitensis.
Cymopterus fendleri
Eriastrum diffusum
Gilia ophthalmoides
Phlox longifolia
Phacelia crenulata

21. Dry Creek Basin 5-10-05
U.S.G.S. Quadrangle: Gypsum Gap
T44N R16W S28
Elevation: approx. 6500 ft.
Owner: BLM
Habitat: Sagebrush shrubland, gravelly soil with deep eroded gullies

Shrubs
Artemisia nova
Artemisia tridentata ssp. tridentata
Artemisia tridentata ssp. wyomingensis
Atriplex confertifolia
Chrysothamnus viscidiflorus
Krascheninnikovia lanata.
Opuntia polyacantha
Sarcobatus vermiculatus

Graminoids
Bromus tectorum
Pascopyrum smithii

Forbs
Alyssum parviflorum
Descurainia pinnata
Descurainia sophia
Gutierrezia sarothrae
Lepidium perfoliatum
Phlox longifolia

22. Miramonte Reservoir 05-28-05
U.S.G.S. Quadrangle: Lone Cone
T43N R13W S19
Elevation: approx. 7623 ft.
Owner: BLM
Habitat: Sagebrush

Shrubs
Artemisia nova
Physaria pulvinata

Forbs
Alyssum parviflorum
Astragalus amphioxys
Delphinium scaposum
Erigeron flagellaris
Eriogonum sp.
Gutierrezia sarothrae
Hymenopappus filifolius
Lithospermum incisum
Mahonia repens
Oenothera caespitosa
Oryzopsis hymenoides
Penstemon lentus
Senecio tridenticulatus
Tetraneuris torreyana
Townsendia incana

23. Dyke 6-4-05
U.S.G.S. Quadrangle: LoneTree Canyon
T34N R3W S10
Elevation: approx. 6824 ft.
Owner: BLM
Habitat: Juniperus osteosperma

23a. Lower slopes

Trees
Juniperus osteosperma
Juniperus scopulorum

Shrubs
Purshia tridentata

Graminoids
Agropyron cristatum
Oryzopsis hymenoides

Forbs
Achillea lanulosa
Alyssum parviflorum
Apocynum androsaemifolium
Asclepias cryptoceras
Astragalus lonchocarpus
Erigeron flagellaris
Eriogonum lonchophyllum
Frasera speciosa
Glycyrrhiza lepidota
Hymenopappus filifolius
Ipomopsis polyantha
Lathyrus eucosmus
Lesquerella pruinosa
Psilochenia sp.
Senecio sp.
Tetraneuris torreyana
Townsendia glabella

23b. Upper slopes

Trees
Juniperus scopulorum
Pinus ponderosa
Pseudotsuga menziesii

Shrubs
Cercocarpus montanus
Chrysothamnus nauseosus
Mahonia repens
Prunus virginiana
Purshia tridentata
Quercus gambelii
Rhus trilobata
Rosa woodsii
Symphoricarpos oreophilus

Graminoids
Bromus tectorum
Oryzopsis hymenoides

Forbs
Chaetopappa ericoides
Descurainia pinnata
Eriogonum lonchophyllum
Lesquerella pruinosa
Lupinus ammophilus
Marrubium vulgare
Oenothera caespitosa
Penstemon linarioides

24. Perry Road 06-09-05
U.S.G.S. Quadrangle: Pagosa Springs
T36N R2.5W S12
Elevation: approx. 8103 ft.
Owner: San Juan National Forest
Habitat: Open Pinus ponderosa woodland

Trees
Pinus ponderosa

Shrubs
Crataegus macrantha
Prunus virginiana
Quercus gambelii

Rhamnus smithii
Rosa woodsii
Symphoricarpos oreophilus

Forbs
Artemisia ludoviciana
Cirsium arvense
Coriflora hirsutissima
Dugaldia hoopesii
Erigeron flagellaris
Heterotheca villosa
Ipomopsis aggregata
Linaria genistifolia
Penstemon cespitosus
Potentilla sp.
Townsendia exscapa
Viola sororia

25. Montezuma Creek 06-10-05 (Site of Astragalus proximus, not found)
U.S.G.S. Quadrangle: Edith
T33N R1W S31
Elevation: approx. 7405 ft.
Owner: San Juan National Forest
Habitat: Quercus gambelii

Shrubs
Chrysothamnus nauseosus
Mahonia repens
Purshia tridentata
Quercus gambelii
Rhus trilobata
Ribes inerme

Graminoids
Achnatherum hymenoides
Bromus tectorum.
Elymus elymoides
Pleuraphis jamesii

Forbs
Alyssum parviflorum
Artemisia frigida
Asclepias cryptocerus
Astragalus lonchocarpus
Chaenactis douglassii
Chaetopappa ericoides
Cirsium neomexicanum
Cymopterus purpureus
Delphinium scaposum
Descurainia pinnata
Eriogonum racemosum
Erodium cicutarium
Lactuca serriola
Lupinus kingii
Melilotus officinalis
Oenothera caespitosa
Psilochenia intermedia
Sisymbrium altissimum
Sphaeralcea coccinea
Townsendia glabella

26. Lower Piedra Campground Road 6-18-05
U.S.G.S. Quadrangle: Chimney Rock
T34N R4W S5
Elevation: approx. 6567ft.
Owner: San Juan National Forest
Habitat: Pseudotsuga menziesii/ Juniperus scopulorum community

Trees
Juniperus scopulorum
Pseudotsuga menziesii

Shrubs
Cercocarpus montanus
Mahonia repens
Purshia tridentata
Quercus gambelii
Rhus trilobata
Symphoricarpos oreophilus

Graminoids
Bromus tectorum
Carex geyeri
Koeleria macrantha
Poa fendleriana

Forbs
Achillea lanulosa
Alyssum parviflorum
Artemisia ludoviciana
Astragalus lonchocarpus
Astragalus proximus
Erigeron flagellaris
Eriogonum racemosum
Melilotus officinalis
Psilochenia sp

27. Devil Mt. Road 6-18-05
U.S.G.S. Quadrangle: Chimney Rock
T34N R4W S15
Elevation: approx.7000 ft.
Owner: San Juan National Forest
Habitat: Pinus ponderosa woodland

Trees
Pinus ponderosa

Shrubs
Ceanothus fendleri
Mahonia repens
Purshia tridentata
Quercus gambelii
Rhus trilobata

Graminoids
Bromus tectorum
Elymus elymoides
Pascopyrum smithii

Forbs
Alyssum parviflorum
Antennaria parviflora
Artemisia carruthii
Artemisia ludoviciana
Collomia linearis
Erigeron divergens
Erigeron flagellaris
Eriogonum alatum
Eriogonum racemosum
Geranium cespitosum
Heterotheca villosa
Lupinus kingii
Melilotus officinalis
Penstemon linarioides
Plantago patagonica
Sphaeralcea coccinea
Tetraneuris ivesiana

28. Yellowjacket Pass 6-18-05
U.S.G.S. Quadrangle: Baldy Mountain
T35N R5W S32
Elevation: approx.7674ft.
Owner: San Juan National Forest
Habitat: Pinus ponderosa woodland

Trees
Pinus ponderosa

Shrubs
Amelanchier utahensis
Quercus gambelii
Symphoricarpos oreophilus

Graminoids
Bromus inermis
Pascopyrum smithii
Poa pratensis

Forbs
Achillea lanulosa
Allium acuminatum
Alyssum parviflorum
Antennaria parviflora
Artemisia ludoviciana
Erigeron flagellaris
Eriogonum racemosum
Lomatium dissectum
Melilotus officinalis
Penstemon cespitosus
Potentilla pulcherrima
Psilochenia sp.
Townsendia glabella
Wyethia x magna

29. House Creek 6-22-05
U.S.G.S. Quadrangle: Boggy Draw
T38N R15W S13 (email to Cara Gilder 10-17 to confirm TRS of unit 3)
Elevation: approx. 7500 ft.
Owner: San Juan National Forest
Habitat: Pinus ponderosa forest

Trees
Pinus ponderosa

Shrubs
Amelanchier utahensis
Mahonia repens
Purshia tridentata
Quercus gambelii
Rosa woodsii
Symphoricarpos oreophilus

Graminoids
Poa fendleriana
Poa pratensis

Forbs
Achillea lanulosa
Alyssum parviflorum
Antennaria parviflora
Artemisia ludoviciana
Astragalus flexuosus
Collinsia parviflora
Coriflora hirsutissima
Dephinium andersonii
Erigeron flagellaris
Eriogonum racemosum
Eriogonum umbellatum
Galium septentrionale
Ipomopsis aggregata
Lupinus caudatus
Penstemon linarioides
Potentilla hippiana
Potentilla pucherrima X hippiana
Pseudocymopterus montanus
Solidago sp.
Toxicoscordion venenosum
Vicia americana
Wyethia x magna

30. Spring Creek Basin 6-22-05
U.S.G.S. Quadrangle: Dawson Draw
T44N R16W S34
Elevation: approx. 6132 ft.
Owner: BLM
Habitat: Desert scrub

Shrubs
Artemisia nova
Artemisia pygmaea
Artemisia tridentata
Atriplex confertifolia
Atriplex gardneri
Chrysothamnus nauseosus
Ephedra torreyana
Krascheninnikovia lanata
Opuntia polyacantha
Sarcobatus vermiculatus
Suaeda moquinii

Graminoids
Bouteloua gracilis
Bromus tectorum
Elymus elymoides
Pleuraphis jamesii
Oryzopsis hymenoides

Forbs
Astragalus praelongus
Centaurea repens
Cryptantha gypsophila
Descurainia pinnata
Eriastrum diffusum
Erigeron concinnus
Eriogonum gordonii
Eriogonum lonchophyllum
Erysimum repandum
Gutierrezia sarothrae
Halogeton glomeratus
Lappula redowskii
Lepidium densiflorum
Mirabilis multiflora
Phlox hoodii
Phlox longifolia
Sisymbrium altissimum
Sphaeracea coccinea
Stanleya pinnata

31. Cross Canyon South 6-18-05
U.S.G.S. Quadrangle: Ruin Canyon
T38N R19W S4
Elevation: approx. 6500 ft.
Owner: BLM
Habitat: pinyon-juniper woodland on NW facing slopes above Cross Canyon

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Amelanchier utahensis
Artemisia nova
Cercocarpus montanus
Chrysothamnus viscidiflorus
Ephedra viridis
Opuntia polyacantha
Sclerocactus whipplei
Yucca baccata

Graminoids
Bromus tectorum
Carex heliophila
Leymus salina
Festuca arizonica
Oryzopsis hymenoides
Poa fendleriana

Forbs
Arabis sp
Astragalus flexuosus
Cordylanthus wrightii
Cryptantha sp.
Cymopterus purpureus
Descurainia pinnata
Draba cuneifolia
Gutierrezia sarothrae
Lepidium sp.
Lupinus ammophilus
Pedicularis centranthera
Penstemon lentus
Penstemon linarioides
Physaria acutifolia
Stanleya pinnata
Stenotus armerioides

32. Upper Cross Canyon bottom 6-18-05
U.S.G.S. Quadrangle: Champagne Spring
T39 R19W S7
Elevation: approx. 6500 ft.
Owner: BLM
Habitat: riparian in bottom of canyon

Trees
Populus angustifolia

Shrubs
Chrysothamnus nauseosus
Salix exigua
Tamarix ramosissima

Graminoids
Bromus tectorum
Scirpus sp.
Eleocharis palustris
Juncus balticus

Forbs
Achillea lanulosa
Alisma triviale
Carduus nutans
Erigeron divergens
Heterotheca villosa
Melilotus officinalis
Oenothera albicaulis

33. Cross Canyon tributary south of Alkali Canyon 6-18-05
U.S.G.S. Quadrangle: Cahone
T38N R18W S7
Elevation: approx. 6400 ft.
Owner: BLM
Habitat: narrow drainage with riparian shrubland and juniper shrubland

Trees
Juniperus osteosperma

Shrubs
Artemisia nova
Artemisia tridentata ssp. tridentata
Chrysothamnus nauseosus
Peraphyllum ramosissimum
Rhus trilobata
Salix exigua
Tamarix ramosissima

Graminoids
Bromus inermis
Bromus tectorum
Elymus elymoides
Polypogon monspeliensis

Forbs
Achillea lanulosa
Artemisia frigida
Artemisia ludoviciana
Carduus nutans
Castilleja linariifolia
Erigeron divergens
Gutierrezia sarothrae
Helianthus annuus
Heterotheca villosa
Ipomopsis aggregata
Lactuca serriola
Melilotus officinalis
Penstemon commarhenus
Solidago sp.

34. Upper Cross Canyon slopes 6-18-05
U.S.G.S. Quadrangle: Cahone
T39N R18W S7
Elevation: approx. 6475 ft.
Owner: BLM
Habitat: Juniperus osteosperma-Pinus edulis-Artemisia nova community

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Artemisia nova
Peraphyllum ramosissimum

Graminoids
Bouteloua gracilis
Bromus tectorum
Elymus elymoides
Koeleria macrantha
Poa fendleriana
Hesperostipa comata

Forbs
Cordylanthus sp.
Cymopterus purpureus
Gutierrezia sarothrae
Ipomopsis aggregata
Linum lewisii
Lupinus sp.
Petradoria pumila
Phlox hoodii
Psilochenia intermedia
Trifolium gymnocarpum

35. FS Rd. 514L 07-05-05
U.S.G.S. Quadrangle: Willow Spring
T39N R1W S6, 7, 18
Elevation: approx. 7800 ft.
Owner: San Juan National Forest
Habitat: Pinus ponderosa forest

Trees
Pinus ponderosa
Populus tremuloides

Shrubs
Amelanchier utahensis
Artemisia nova
Chrysothamnus nauseosus
Mahonia repens
Quercus gambelii
Rosa woodsii
Symphoricarpos oreophilus

Graminoids
Bromus tectorum
Festuca arizonica
Koeleria macrantha
Poa fendleriana
Poa pratensis
Hesperostipa comata

Forbs
Achillea lanulosa
Allium acuminatum
Allium textile
Antennaria rosea
Artemisia carruthii
Artemisia ludoviciana
Astragalus bisulcatus
Bromus tectorum
Carduus nutans
Ceanothus fendleri
Cirsium centaureae
Collinsia parviflora
Collomia linearis
Cordylanthus wrightii
Dactylis glomerata
Eremogone congesta
Erigeron flagellaris
Erigeron speciosus
Eriogonum racemosum
Fragaria virginiana
Geranium richardsonii
Galium septentrionale
Geum triflorum
Heliomeris multiflora
Ipomopsis aggregata
Linum lewisii
Lupinus caudatus
Oligosporus dracunculus
Penstemon strictus
Potentilla hippiana
Pseudocymopterus montanus
Psilochenia acuminata
Psilochenia intermedia
Rosa woodsii
Schoencrambe linifolia
Senecio sp.
Solidago sp
Taraxacum officinale
Thalictrum fendleri
Tragopogon dubius
Trifolium kingii
Trifolium longipes
Verbascum thapsus
Wyethia X magna

36. Plateau Creek PCA, FS Rd. 514 west of Little Beaver Reservoir 07-05-05
U.S.G.S. Quadrangle: Willow Spring
T39N R14W S1
Elevation: approx. 7700 ft.
Owner: San Juan National Forest
Habitat: Small barren shale outcrops

Shrubs
Amalanchier utahensis
Artemisia nova
Chrysothamnus greenei
Physaria pulvinata
Rosa woodsii

Graminoids
Koeleria macrantha
Oryzopsis hymenoides
Pascopyrum smithii

Forbs
Achillea lanulosa
Allium acuminatum
Astragalus amphioxis
Astragalus praelongus
Calylophus lavandulifolius
Circium tracyi
Eriogonum lonchophyllum
Hymenopappus filifolius
Lesquerella rectipes
Linum lewisii
Penstemon cespitosus
Physaria acutifolia
Rosa woodsii
Tetraneuris torryana
Townsendia incana

37. Plateau Creek tributary 7-5-05
U.S.G.S. Quadrangle: Willow Spring
T39N R14 W S6
Elevation: approx. 7781ft.
Owner: San Juan National Forest
Habitat: Riparian in rocky draw

Trees
Populus angustifolia

Shrubs
Berberis fendleri
Cornus sericea
Crataegus rivularis
Paxistima myrsinites
Potentilla fruticosa
Prunus virginiana
Quercus gambelii
Rosa woodsii
Salix planifolia

Graminoids
Juncus balticus
Phleum pratense
Poa pratensis

Forbs
Anticlea elegans
Castilleja miniata
Cystopteris fragilis
Eremogone fendleri
Erigeron speciosus
Frasera speciosa
Galium septentrionale
Geranium richardsonii
Helianthella quinquenervis
Heuchera parvifolia
Iris missouriensis
Maianthemum stellatum
Prunella vulgaris
Rudbeckia laciniata
Sisyrinchium montanum
Toxicodendron rydbergii
Trifolium longipes
Valeriana edulis
Vicia americana

38. Dolores Canyon at Dolores Pump Station 07-07-05
U.S.G.S. Quadrangle: Joe Davis Hill
T42N R18W S14, 18, 23, 26, 35, 36; T41N R18W S1, 11, 12, 14, 23, 26.
Elevation: approx. 5910 ft.
Owner: BLM
Habitat: riparian and upland habitats in Dolores Canyon from Secret Canyon to Snaggletooth Rapids

Trees
Acer negundo
Betula occidentalis
Juniperus osteosperma
Juniperus scopulorum
Pinus edulis
Pinus ponderosa
Populus angustifolia
Pseudotsuga menziesii
Ulmus pumila

Shrubs
Amelanchier utahensis
Artemisia bigelovii
Artemisia tridentata ssp. tridentata
Atriplex canescens
Berberis fendleri
Cercocarpus montanus
Chrysothamnus nauseosus
Ephedra viridis
Fraxinus anomala
Holodiscus dumosus
Mahonia repens
Opuntia phaeocantha
Peraphyllum ramosissimum
Prunus virginiana var. melanocarpa
Rosa woodsii
Quercus gambelii
Rhus trilobata
Salix exigua
Shepherdia argentea
Symphoricarpos oreophilus
Tetradymia canescens
Yucca harrimaniae
Yucca baccata

Graminoids
Alopecurus pratensis
Bouteloua gracilis
Bromus inermis
Bromus tectorum
Carex aquatilis
Dactylis glomerata
Elymus elymoides
Pleuraphis jamesii
Oryzopsis hymenoides
Pascopyrum smithii
Phalaris arundinacea
Poa bulbosa
Poa fendleriana
Poa pratensis
Hesperostipa comata
Stipa nelsonii
Thinopyrum intermedium

Forbs
Achillea lanulosa
Allium acuminatum
Allium cernuum
Apocynum androsaemifolium
Artemisia ludoviciana
Astragalus sp.
Balsamorhiza sagittata
Brickellia grandiflora
Brickellia microphylla
Calochortus nuttallii
Carduus nutans
Chaetopappa ericoides
Chamerion danielsii
Cirsium tracyi
Clematis ligusticifolia
Collinsia parviflora
Cordylanthus wrightii
Descurainia pinnata
Equisetum arvense
Erigeron divergens

Erigeron flagellaris
Erigeron speciosus
Eriogonum racemosum
Galium septentrionale
Geranium cespitosum
Glycyrrhiza lepidota
Gutierrezia sarothrae
Hedysarum boreale
Helianthus sp.
Heliomeris multiflora
Heterotheca villosa
Hippochaete hyamalis
Hymenopappus filifolius
Ipomopsis aggregata
Lactuca serriola
Leucanthemum vulgare
Ligusticum porteri
Linaria genistifolia
Machaeranthera grindelioides
Maianthemum racemosum
Maianthemum stellatum
Medicago sativa
Melilotus officinalis
Mentha arvensis
Monarda fistulosa
Oligosporus dracunculus
Oxybaphus linearis
Pedicularis centranthera
Penstemon commarhenus
Penstemon strictus
Physaria acutifolia
Plantago lanceolata
Salsola australis
Solidago canadensis
Sphaeralcea coccinea
Stanleya pinnata
Streptanthus cordatus
Tetraneuris ivesiana
Thalictrum fendleri
Toxicodendron rydbergii
Tragopogon dubius

39. Needle Mountains east of Crater Lake 07-12-05
U.S.G.S. Quadrangle: Snowdon
T40N R8W S2
Elevation: approx.11,800 ft.
Owner: San Juan NF (Weminuche Wilderness)
Habitat: Alpine rocky areas and dry tundra

Trees
Picea engelmannii

Shrubs
Salix arctica
Salix brachycarpa
Salix reticulata
Vaccinium myrtillus

Graminoids
Carex elynoides
Carex sp.
Poa alpina

Forbs
Allium geyeri
Androsace septentrionalis
Aquilegia coerulea
Bistorta bistortoides
Castilleja occidentalis
Castilleja rhexifolia
Claytonia megarhiza
Cystopteris fragilis
Draba aurea
Draba crassifolia
Draba graminea
Draba streptobrachia
Eremogone fendleri
Erigeron pinnatisectus.
Geum rossii
Lloydia serotina
Mertensia lanceolata
Micranthes rhomboidea
Noccaea montana
Oreobrama pygmaea
Pedicularis groenlandica
Pedicularis parryi
Podistera eastwoodiae
Polemonium pulcherrimum
Potentilla diversifolia
Primula parryi
Pseudocymopterus montanus
Ranunculus alismifolius
Ranunculus mccauleyi
Rhodiola integrifolia
Rydbergia grandiflora
Sibbaldia procumbens
Silene acaulis
Spergulastrum lanuginosum
Trifolium attenuatum
Trifolium nanum

40. West Lime Creek 07-14-05
U.S.G.S. Quadrangle: Engineer Mountain
T40N R8W S9
Elevation: approx. 10,200 ft.
Owner: San Juan National Forest
Habitat: Spruce-fir/Carolina tasselrue and seep

40a. spruce-fir forest

Trees
Abies lasiocarpa
Picea engelmannii

Shrubs
Actaea rubra
Distegia involucrata
Ribes montigenum
Ribes wolfii
Symphoricarpos oreophilus
Vaccinium myrtillus

Forbs
Adoxa moschatellina
Aquilegia coerulea
Aquilegia elegantula
Arnica cordifolia
Cilaria austromontana
Cystopteris fragilis
Geranium richardsonii
Mertensia ciliata
Orthilia secunda
Osmorhiza depauperata
Polemonium pulcherrimum
Pseudocymopterus montanus
Thalictrum fendleri
Valeriana capitata
Viola canadensis

40b. hillside seep

Shrubs
Salix planifolia

Graminoids
Carex capillaris
Carex dioeca
Carex microptera
Juncus ensifolius
Juncus tracyi

Forbs
Aconitum columbianum
Besseya ritteriana
Cardamine cordifolia
Cystopteris fragilis
Epilobium hornemannii
Equisetum arvense
Geranium richardsonii
Habenaria hyperborea
Hippochaete variegata
Mertensia ciliata
Micranthes odontoloma
Mimulus guttatus
Mitella pentandra
Oxypolis fendleri
Parnassia fimbriata
Pedicularis groenlandica
Senecio triangularis

41. Rolling Mountain 07-16-05
U.S.G.S. Quadrangle: Ophir
T41N R9W S12
Elevation: approx.12,000 ft.
Owner: San Juan National Forest
Habitat: dry tundra

Shrubs
Salix reticulata

Forbs
Artemisia scopulorum
Draba streptobrachia.
Draba aurea
Draba crassifolia
Draba graminea
Erigeron simplex
Erysimum capitatum
Geum rossii
Lidia obtusiloba
Micranthes rhomboidea
Oreobrama pygmaea
Phlox austromontana
Podistera eastwoodiae
Potentilla diversifolia
Ranunculus macauleyi
Rydbergia grandiflora
Sibbaldia procumbens
Silene acaulis

42. Wetland at Ponds, Elwood Pass Road 08-04-05
U.S.G.S. Quadrangle: Elwood Pass
T37N R 3E S33
Elevation: approx. 11,473 ft.
Owner: San Juan National Forest
Habitat: High alpine wetland around ponds

Shrubs
Salix planifolia

Graminoids
Carex ebenea
Deschampsia cespitosa

Forbs
Achillea lanulosa
Aconitum columbianum
Cirsium parryi
Clementsia rhodantha
Epilobium hornemannii
Erigeron coulteri
Fragaria virginiana
Mertensia ciliata
Mimulus guttatus
Pedicularis groenlandica
Potentilla pulcherrima
Senecio atratus
Senecio triangularis
Veratrum tenuipetalum
Veronica nutans

43. Continental Divide Trail north from Elwood Pass 8-4-05
U.S.G.S. Quadrangle: Elwood Pass
T37 N R3E S 34
Elevation: approx. 12,000 ft.
Owner: San Juan National Forest
Habitat: Abies lasiocarpa-Picea engelmannii forest and wetland

43a. Abies lasiocarpa-Picea engelmannii forest

Trees
Abies lasiocarpa
Picea engelmannii

Shrubs
Ribes montigenum
Salix planifolia

Graminoids
Calamagrostis canadensis
Carex ebenea
Carex nova
Deschampsia cespitosa
Elymus trachycaulus
Luzula parviflora
Phleum commutatum
Poa alpina
Poa arctica
Poa reflexa
Trisetum spicatum

Forbs
Achillea lanulosa
Agoseris aurantiaca
Agoseris glauca
Arabis drummondii
Arnica cordifolia
Besseya ritteriana
Bistorta bistortoides
Bistorta vivipara
Castilleja miniata
Castilleja sulphurea
Cerastium beeringianum
Chamerion danielsii
Cirsium parryi
Draba helleriana
Erigeron coulteri
Erigeron peregrinus
Fragaria virginiana
Geranium richardsonii
Helianthella quinquenervis
Hieracium gracile
Ligularia amplectens
Ligularia bigelovii
Ligusticum porteri
Micranthes odontoloma
Noccaea montana
Pedicularis bracteosa
Penstemon whippleanus
Polemonium pucherrimum
Potentilla pulcherrima
Pseudocymopterus montanus
Ranunculus alismifolius
Senecio triangularis
Senecio crassulus
Sibbaldia procumbens
Stellaria umbellata
Trifolium brandegei
Vaccinium myrtillus
Valeriana capitata
Veratrum tenuipetalum
Veronica nutans

43b.Wetland

Shrubs
Salix planifolia

Graminoids
Carex aquatilis
Carex microptera
Carex nova
Deschampsia cespitosa
Juncus drummondii

Forbs
Aconitum columbianum
Allium geyeri
Bistorta bistortoides
Caltha leptosepala
Cardamine cordifolia
Clementsia rhodantha
Erigeron peregrinus
Micranthes odontoloma
Mimulus guttatus
Oxypolis fendleri
Pedicularis groenlandica
Ranunculus alismifolius
Senecio triangularis
Senecio crassulus
Swertia perennis
Trifolium parryi
Trollius albiflorus
Veronica nutans

44. Nipple Mountain 8-5-05
U.S.G.S. Quadrangle: Blackhead Peak
T35N R1E S1; T35N R2E S6
Elevation: approx. 10,533 ft.
Owner: San Juan National Forest
Habitat: Spruce-fir forest, subalpine and alpine meadows, dry tundra and scree

44a. End of road wet, clear-cut area in spruce-fir forest

Trees
Picea engelmannii

Shrubs
Ribes montigenum
Sambucus racemosa

Graminoids
Bromopsis ciliata
Carex chalciolepis
Carex geyeri
Carex microptera
Carex rossii
Elymus glaucus
Elymus trachycaulus
Luzula parviflora
Phleum commutatum
Poa arctica
Poa reflexa

Forbs
Anticlea elegans
Arnica cordifolia
Botrychium lunaria
Chamerion danielsii
Cirsium parryi
Corydalis caseana
Delphinium barbeyi
Erigeron coulteri
Erigeron speciosus
Fragaria virginiana
Geranium richardsonii
Goodyera oblongifolia
Heracleum lanatum
Ligularia amplectens.
Ligularia bigelovii
Ligusticum porteri
Linanthastrum nuttallii
Mertensia ciliata
Oreochrysum parryi
Osmorhiza depauperata
Orthilia secunda
Pedicularis racemosa
Penstemon whippleanus
Phacelia heterophylla
Potentilla pulcherrima
Pseudocymopterus montanus
Rudbeckia laciniata
Senecio atratus
Senecio triangularis
Senecio tridenticulatus
Senecio wernerifolius
Trautvetteria caroliniensis
Trifolium brandegei
Vaccinium myrtillus

44b. Spruce-fir forest, drier area

Trees
Abies lasiocarpa
Picea engelmannii

Shrubs
Vaccinium myrtillus

Graminoids
Carex geyeri
Carex rossii
Elymus glaucus
Poa arctica

Forbs
Anticlea elegans
Arnica cordifolia
Delphinium barbeyi
Erigeron speciosus
Goodyera oblongifolia
Ligularia amplectens.
Ligusticum porteri
Linanthastrum nuttallii
Oreochrysum parryi
Orthilia secunda
Osmorhiza depauperata
Pedicularis racemosa
Potentilla pulcherrima
Pseudocymopterus montanus
Senecio tridenticulatus
Senecio wernerifolius
Trautvetteria caroliniensis
Trifolium brandegei

44c. Subalpine meadow by waterfall

Shrubs
Ribes montigenum

Graminoids
Carex microptera
Elymus trachycaulus

Forbs
Aconitum columbianum
Agoseris aurantiaca
Anticlea elegans
Arabis drummondii
Campanula rotundifolia
Cirsium parryi
Delphinium barbeyi
Draba helleriana
Draba spectabilis
Dugaldia hoopesii
Erigeron coulteri
Erigeron elatior
Fragaria virginiana
Hydrophyllum fendleri
Ligularia bigelovii
Ligusticum porteri
Linanthastrum nuttallii
Mertensia ciliata
Noccaea montana
Polemonium pulcherrimum
Potentilla pulcherrima
Senecio triangularis
Senecio atratus
Trautvetteria caroliniensis
Vicia americana

44d. Moist alpine meadow

Graminoids
Carex illota
Carex nigricans
Deschampsia cespitosa
Phleum commutatum
Poa alpina

Forbs
Bistorta bistortoides
Castilleja rhexifolia
Castilleja sulphurea
Epilobium hornemannii
Gastrolichnis drummondii
Hieracium gracile
Juncus drummondii
Lidia obtusiloba
Luzula parviflora
Ranunculus alismifolius
Rhodiola integrifolia
Senecio crassulus
Senecio dimorphophyllus
Sibbaldia procumbens
Silene acaulis
Veronica nutans
Viola labradorica

44e.Wet alpine meadow

Shrubs
Salix planifolia

Graminoids
Carex chalciolepis
Carex nova

Forbs
Aconitum columbianum
Allium geyeri
Androsace septentrionalis
Cardamine cordifolia
Caltha leptosepala
Castilleja rhexifolia
Cerastium beeringianum
Geum rossii
Mertensia ciliata
Micranthes odontoloma
Oxypolis fendleri
Rumex sp
Senecio triangularis
Stellaria sp.
Trollius albiflorus
Veronica nutans

44f. Scree slope

Forbs
Aquilegia coerulea
Bistorta bistortoides
Cystopteris fragilis
Erigeron melanocephalus
Erigeron simplex
Mertensia ciliata
Rhodiola integrifolia
Rydbergia grandiflora
Silene acaulis

45. East Fork San Juan River 8-6-05
U.S.G.S. Quadrangle: Wolf Creek Pass
T36N R1E S4
Elevation: Elevation: 8000 ft.
Owner: San Juan National Forest
Habitat: Moist spruce-fir forest and riparian

Trees
Abies lasiocarpa
Alnus incana
Picea engelmannii
Populus angustifolia
Populus tremuloides

Shrubs
Amalanchier alnifolia
Berberis fendleri
Cornus sericea
Juniperus communis
Paxistima myrsinites
Rosa woodsii
Rubus idaeus
Rubus parviflorus
Salix drummondiana
Salix monticola
Shepherdia canadensis
Symphoricarpos oreophilus

Graminoids
Bromopsis ciliata
Carex geyeri
Festuca thurberi
Koeleria macrantha

Forbs
Achillea lanulosa
Androsace septentrionalis
Antennaria marginata
Antennaria rosea
Apocynum androsaemifolium
Artemisia ludoviciana
Aster glaucodes
Campanula rotundifolia
Cirsium parryi
Cirsium tracyi
Equisetum arvense
Erigeron eximius
Erigeron flagellaris
Erigeron speciosus
Fragaria virginiana
Galium septentrionale
Galium triflorum
Gastrolichnis drummondii
Geranium richardsonii
Heracleum lanatum
Hippochaete hyemalis
Ipomopsis aggregata
Ligularia bigelovii
Maianthemum racemosum
Maianthemum stellatum
Mertensia ciliata
Mohringia macrophylla
Noccaea montana
Orthilia secunda
Osmorhiza depauperata
Pneumonanthe parryi
Polemonium pulcherrimum
Potentilla hippiana
Pseudocymopterus montanus
Rudbeckia laciniata
Senecio atratus
Senecio tridenticulatus
Solidago missouriensis
Solidago simplex
Thalictrum fendleri
Valeriana edulis
Vicia americana
Viola sp

46. Spring Creek at Ignacio 6-13-05
U.S.G.S. Quadrangle: Bayfield
T34N R6W S31
Elevation: approx. 6500 ft.
Owner: San Juan National Forest
Habitat: Pinus edulis-Juniperus osteosperma-Quercus gambelii community

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Artemisia tridentata sp. tridentata
Echinocereus triglochidiatus
Fendlera rupicola
Opuntia polyacantha
Yucca baccata

Graminoids
Bromus tectorum
Elymus elymoides
Hesperostipa comata

Forbs
Alyssum parviflorum
Artemisia ludoviciana
Asclepias sp.
Castilleja chromosa
Cymopterus purpureus
Erigeron flagellaris
Erodium cicutarium
Glandularia bipinnatifida
Gutierrezia sarothrae
Lupinus kingii
Melilotus officianale
Mirabilis glandulosa
Psilochenia acuminata
Sisymbrium loeselii
Sphaeralcea coccinia
Tetraneuris ivesiana
Townsendia incana
Tragopogon dubius
Trifolium sp.

47. Indian Trail Ridge 08-12-05
U.S.G.S. Quadrangle: Orphan Butte
T37N R11W S2
Elevation: approx. 11,400 ft.
Owner: San Juan National Forest
Habitat: Wetland and

47a. Wetland

Graminoids
Carex nova
Carex canescens
Carex ebenea
Deschampsia cespitosa
Juncus drummondii
Luzula spicata
Phleum commutatum
Poa alpina

Forbs
Agoseris glauca
Bistorta bistortoides
Caltha leptosepala
Cardamine cordifolia
Clementsia rhodantha
Dugaldia hoopesii
Epilobium hornemannii
Erigeron coulteri
Erigeron peregrinus
Geum rossii
Mertensia ciliata
Oxypolis fendleri
Pedicularis groenlandica
Penstemon whippleanus
Potentilla pucherrima
Pseudocymopterus montanus
Ranunculus alismifolius
Senecio crassulus
Senecio dimorphophyllus
Senecio triangularis
Taraxacum officinale
Trifolium brandegei
Trollius albiflorus
Veronica nutans

47c. Drier areas dominated by *Geum rossii* and *Trifolium brandegei* at top of ridge

Trees
Picea engelmannii
Abies lasiocarpa

Shrubs
Ribes montigenum

Graminoids
Luzula parviflora
Poa reflexa

Forbs
Arnica mollis
Castilleja rhexifolia
Draba spectabilis
Erigeron coulteri
Erigeron peregrinus
Ligusticum porteri
Mertensia ciliata
Micranthes odontoloma
Noccaea montana
Osmorhiza depauperata
Polemonium pulcherrimum
Senecio amplectens
Stellaria umbellata
Rhodiola integrifolia
Trifolium brandegei
Valeriana capitata

48. Grindstone Fen North 8-12-05
U.S.G.S. Quadrangle: Orphan Butte
T38N R11W S34
Elevation: approx. 11,400 ft.
Owner: San Juan National Forest
Habitat: Wetland on north side of road.

Graminoids
Carex aquatilis
Carex canescens
Carex disperma
Carex norvegica
Carex nova
Carex sp.
Deschampsia cespitosa
Eriophorum angustifolium

Forbs
Caltha leptosepala
Clementsia rhodantha
Epilobium hornemannii
Habeneria hyperborea
Pedicularis groenlandica
Senecio dimorphophyllus
Senecio neomexicanus
Senecio triangularis
Swertia perennis
Veratrum tenuipetalum

49. Chattenooga Iron Fen 8-17-05
U.S.G.S. Quadrangle: Silverton
T42N R8W S27
Elevation: approx. 10,200 ft.
Owner: San Juan National Forest
Habitat: Iron fen

49a. fen

Trees
Picea engelmannii

Shrubs
Betula glandulosa
Salix planifolia

Graminoids
Calamagrostis canadensis
Carex canescens
Carex magellanica
Carex microptera
Deschampsia cespitosa
Juncus ensifolius
Juncus mertensianus

Forbs
Antennaria corymbosa
Caltha leptosepala
Cardamine cordifolia
Conioselinum scopulorum
Epilobium hornemannii
Galium sp.
Gaultheria humifusa
Gentianopsis thermalis
Polemonium caeruleum ssp. amygdalinum
Swertia perennis

Non-vascular plants
Sphagnum angustifolium
Sphagnum sp.
Other mosses

49b. Dry areas on edge of fen

Shrubs
Potentilla fruticosa

Graminoids
Bromopsis ciliata
Festuca thurberi

Forbs
Achillea lanulosa
Androsace septentrionalis
Aster lanceolatus ssp. hesperius
Campanula rotundifolia
Fragaria virginiana
Geum macrophyllum
Ligularia bigelovii
Potentilla pulcherrima
Solidago simplex
Taraxacum officinale
Veronica nutans

50. Andrews Lake 8-17-05
U.S.G.S. Quadrangle: Snowdon
T40N R8W S14
Elevation: approx. 10,400ft.
Owner: San Juan National Forest
Habitat: Carex buxbaumii wetland

Shrubs
Potentilla fruiticosa
Salix planifolia

Graminoids
Carex aquatilis
Carex aurea
Carex buxbaumii
Carex capillaris
Carex illota
Carex limosa
Carex pachystachya
Deschampsia cespitosa
Eriophoroum angustifolium

Forbs
Antennaria pulcherrima ssp. anaphaloides
Aster lanceolatum ssp. hesperius
Bistorta vivipara
Caltha leptosepala
Conioselinum scopulorum
Habenaria hyperborea
Pedicularis groenlandica
Swertia perennis

51. Grindstone Lake 8-18-05
U.S.G.S. Quadrangle: Orphan Butte
T38N R11W S34
Elevation: approx. 11,200 ft.
Owner: San Juan Forest
Habitat: wetland

Graminoids
Calamagrostis canadensis
Carex angustior
Carex aquatilis
Carex canescens
Carex magellanica
Carex microptera
Carex nova
Deschampsia cespitosa
Eriophorum angustifolium
Juncus drummondii
Poa alpina

Forbs
Bistorta bistortoides
Caltha leptosepala
Chamerion danielsii
Clementsia rhodantha
Menyanthes trifoliata
Pedicularis groenlandica
Spiranthes romanzoffiana
Swertia perennis
Veratrum tenuipetalum

52. Ismay Trading Post 4-16-05
U.S.G.S. Quadrangle: Wickiup Canyon
T 36N R20W S34
Elevation: approx. 5800 ft.
Owner: BLM and private
Habitat: Greasewood flats, very poor condition

Shrubs
Sarcobatus vermiculatus
Suaeda moquinii
Tetradymia canescens

Graminoids
Bromus tectorum

Forbs
Astragalus nuttalianus
Calochortus flexuosus
Cryptantha minima
Descurainia pinnata
Eriastrum diffusum
Erodium cicutarium
Gutierrezia sarothrae
Lappula redowskii
Oenothera caespitosa
Sisymbrium altissimum
Sphaeralcea coccinea
Townsendia annua

53. Risley Canyon North 4-17-05
U.S.G.S. Quadrangle: Bowdish Canyon
T 36N R19W S22
Elevation: approx. 5386 ft.
Owner: BLM
Habitat: Juniper shrubland

Trees
Juniperus osteosperma
Pinus edulis

Shrubs
Artemisia arbuscula
Artemisia tridentata ssp. wyomingensis
Ephedra viridis
Fendlera rupicola
Fraxinus anomala
Purshia stansburiana
Rhus trilobata
Rhus trilobata var. simplicifolia

Graminoids
Bromus tectorum
Pleuraphis jamesii

Forbs
Calochortus flexuosus
Cryptantha flavoculata
Cryptantha gracilis
Delphinium scaposum
Descurainia pinnata
Erodium cicutarium
Gilia ophthalmoides
Gutierrezia sarothrae
Hedysarum boreale
Lepidium montanum
Linum lewisii
Senecio multilobatus
Silene antirrhina
Townsendia incana
Yucca harrimaniae

54. Cave Basin Lakes 8-27-05
U.S.G.S. Quadrangle: Emerald Lake
T38N R6W S25
Elevation: approx. 11,840 ft.
Owner: San Juan N.F., Weminuche Wilderness
Habitat: Wetlands

Shrubs
Salix brachycarpa.
Salix planifolia,

Graminoids
Carex aquatilis
Carex canescens
Carex canescens
Carex chalciolepis
Carex dioeca
Carex ebenea
Carex nova
Danthonia intermedia
Deschampsia cespitosa
Eleocharis acicularis.
Eriophorum altaicum var. neogaeum
Eriophorum angustifolium.
Phleum commutatum,

Forbs
Bistorta bistortoides
Bistorta vivipara
Caltha leptosepala
Cardamine cordifolia
Castilleja sulphurea
Clementsia rhodantha
Condrophylla aquatica
Conioselinum scopulorum
Erigeron coulteri
Erigeron peregrinus
Gentianodes algida
Gentianopsis thermalis
Trollius albiflorus
Juncus drummondii
Parnassia fimbriata
Pedicularis groenlandica
Podistera eastwoodiae
Swertia perennis

Appendix III:
Lichen Communities of Selected Gypsiferous Sites in Big Gypsum Valley, Miguel County, Colorado

23 May 2005

Collections and Identifications
By
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And
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Collection Sites: Below is a list of the lichen species either observed or collected at three sites in Big Gypsum Valley, San Miguel County, Colorado. All collections were made on 23 May 2005.

Site No. 1 (along State Road no. 141 @ County Road no. 23R)
38º 01.354´ North latitude
108º 38.880´ West longitude
6400 feet elevation

Acarospora nodulosa* var. *nodulosa – this species is endemic to gypsum sites in the intermountain western United States; it has been collected from 8-10 sites.

Collema tenax – this species is one of the most common soil lichens in the western United States. It occurs on a wide variety of soil types including gypsiferous soils.

Diploschistes diacapsis – this species is the most abundant lichen associated with gypsiferous soil crust communities.

Endocarpon pusillum – this species is commonly associated with gypsiferous soil crust communities; however, it is generally found in very small quantities.

Fulgensia bracteata – this species is commonly found on western United States aril land soil.

Fulgensia (subbracteata) – this species typically co-occurs with its sister species *(Fulgensia bracteata)*

***Gypsoplaca macrophylla* – this species is endemic to gypsum sites in the intermountain western United States; it has been collected at 5-6 sites.**

***Lecanora gypsicola* – this species is endemic to gypsum sites in the intermountain western United States; it has been collected from three other locations**.

Placidium rufescens – this species is often associated with gypsum soils but it is not as common as *Placidium squamulosum.*

Placidium squamulosum – this species is broadly distributed and occurs on a variety of soil types.
Psora cerebriformis – this species is broadly distributed on soils including gypsiferous soils.
Psora decipiens – this is one of the most common and broadly distributed soil crust lichen in the western United States.
Squamarina lentigera – this species is a somewhat common soil species in the western intermountain United States; its distribution is not limited to gypsiferous soils.

Site No. 2 (along County Road no. 20R)
38º 03.350´ North latitude
108º 44.686´ West longitude
5900 feet elevation

Acarospora nodulosa* var. *nodulosa – this species is endemic to gypsum sites in the intermountain western United States; it has been collected from 8-10 sites.
Caloplaca tominii – this species is a common component of arid land soil crust communities, including gypsiferous sites.
Collema tenax – this species is one of the most common soil lichens in the western United States. It occurs on a wide variety of soil types including gypsiferous soils.
Diploschistes diacapsis – this species is the most abundant lichen associated with gypsiferous soil crust communities.
Fulgensia bracteata – this species is commonly found on western United States aril land soil.
Fulgensia (subbracteata) – this species typically co-occurs with its sister species *(Fulgensia bracteata)*
***Gypsoplaca macrophylla* – this species is endemic to gypsum sites in the intermountain western United States; it has been collected at 5-6 sites.**
Heteroplacidium congestum – this species is broadly distributed on soils in the western United State, including gypsiferous soils.
***Lecanora gypsicola* – this species is endemic to gypsum sites in the intermountain western United States; it has been collected from three other locations.**
Placidium rufescens – this species is often associated with gypsum soils but it is not as common as *Placidium squamulosum.*
Placidium squamulosum – this species is broadly distributed and occurs on a variety of soil types.
Psora cerebriformis – this species is broadly distributed on soils including gypsiferous soils.
Psora decipiens – this is one of the most common and broadly distributed soil crust lichen in the western United States.
Squamarina lentigera – this species is a somewhat common soil species in the western intermountain United States; its distribution is not limited to gypsiferous soils.

Site No. 3 (at mouth of Mary Jane Canyon)
38º 07.151´ North latitude
108º 51.451´ West longitude
5400 feet elevation

Acarospora nodulosa* var. *nodulosa – this species is endemic to gypsum sites in the intermountain western United States; it has been collected from 8-10 sites.

Caloplaca tominii – this species is a common component of arid land soil crust communities, including gypsiferous sites.

Collema tenax – this species is one of the most common soil lichens in the western United States. It occurs on a wide variety of soil types including gypsiferous soils.

Diploschistes diacapsis – this species is the most abundant lichen associated with gypsiferous soil crust communities.

Fulgensia bracteata – this species is commonly found on western United States aril land soil.

Fulgensia (subbracteata) – this species typically co-occurs with its sister species *(Fulgensia bracteata)*

***Lecanora gypsicola* – this species is endemic to gypsum sites in the intermountain western United States; it has been collected from three other locations.**

Placidium rufescens – this species is often associated with gypsum soils but it is not as common as *Placidium squamulosum.*

Placidium squamulosum – this species is broadly distributed and occurs on a variety of soil types.

Psora decipiens – this is one of the most common and broadly distributed soil crust lichen in the western United States.

Squamarina lentigera – this species is a somewhat common soil species in the western intermountain United States; its distribution is not limited to gypsiferous soils.

Conclusions and recommendations: Lichen communities at all three sites are very similar. The number of species at each site ranged from 11 to 14 species. Ten species were common to all three sites with three species common to two sites and two species limited to only one site. Three species are endemic to gypsiferous soil crust communities ***(Acarospora nodulosa* var. *nodulosa, Gypsoplaca macrophylla,* and *Lecanora gypsicola*)** and should be considered rare and potentially threatened. Human-related activities associated with gypsiferous sites (i.e. ATV usage and gypsum mining operations) represent the most important threats to these unusual and delicate communities.

Appendix IV:
Common and scientific names of species mentioned in report, San Juan Public Lands

Note: Many plants do not have true common names. Those listed below are those known by the authors to be traditionally used. Where no common name is known, the name from USDA PLANTS database is given (although we have taken the liberty to separate some compound words).

Scientific name	Common name
Abies concolor	White fir
Abies lasiocarpa	Subalpine fir
Acarospora nodulosa var. nodulosa	Nodule cracked lichen
Acer negundo	Box elder
Achillea lanulosa	Yarrow
Achnatherum hymenoides	Indian ricegrass
Aconitum columbianum	Monkshood
Acroptilon repens	Russian knapweed
Actaea rubra	Baneberry
Adoxa moschatellina	Muskroot
Agoseris aurantiaca	Orange false dandelion
Agoseris glauca	Pale false dandelion
Agropyrum cristatum	Crested wheatgrass
Alisma triviale	Northern water plantain
Allium acuminatum	Tapertip onion
Allium cernuum	Nodding onion
Allium geyeri	Geyer's onion
Allium macropetalum	Large-flower onion
Allium textile	Textile onion
Alnus incana	Thinleaf alder
Alopecurus pratensis	Meadow foxtail
Alyssum parviflorum	Alyssum
Amalanchier alnifolia	Saskatoon serviceberry
Amelanchier utahensis	Utah serviceberry
Amsonia jonesii	Jones blue star
Androsace septentrionalis	Rock jasmine
Antennaria corymbosa	Flattop pussytoes
Antennaria marginata	Pussytoes
Antennaria parviflora	Littleleaf pussytoes
Antennaria pulcherrima ssp. anaphaloides	Pearly pussytoes
Antennaria rosea	Rosy pussytoes
Anticlea elegans	Death camas
Apocynum androsaemifolium	Spreading dogbane
Aquilegia coerulea	Colorado columbine
Aquilegia micrantha	Mancos columbine
Arabis drummondii	Drummond's rockcress
Arabis perennans	Perennial rockcress
Arabis pulchra	Beauty rockcress

Scientific name	Common name
Aristida purpurea	Three-awn
Arnica cordifolia	Heartleaf arnica
Arnica mollis	Hairy arnica
Artemisia arbuscula	Low sagebrush
Artemisia bigelovii	Bigelow's sagebrush
Artemisia carruthii	Carruth's sagewort
Artemisia frigida	Fringed sage
Artemisia ludoviciana	Louisiana sagewort
Artemisia nova	Black sagebrush
Artemisia pygmaea	Pygmy sagebrush
Artemisia scopulorum	Alpine sagebrush
Artemisia tridentata sp. tridentata	Big sagebrush
Artemisia tridentata ssp. wyomingensis	Wyoming big sagebrush
Asclepias cryptoceras	Pallid milkweed
Asplenium septentrionale	Forked spleenwort
Asplenium trichomanes	Maidenhair spleenwort
Aster glaucodes	Gray aster
Aster lanceolatus ssp. hesperius	Siskiyou aster
Astragalus amphioxys	Crescent milkvetch
Astragalus bisulcatus	Two-grooved milkvetch
Astragalus flexuosus	Flexile milkvetch
Astragalus lentiginosus	Specklepod milkvetch
Astragalus lonchocarpus	Rushy milkvetch
Astragalus mollissimus	Woolly locoweed
Astragalus naturitensis	Naturita milkvetch
Astragalus nuttallianus	Nuttall's milkvetch
Astragalus praelongus	Stinking milkvetch
Astragalus proximus	Aztec milkvetch
Atriplex argentea	Silverscale saltbush
Atriplex canescens	Fourwing saltbush
Atriplex confertifolia	Shadscale
Atriplex gardneri	Gardner's saltbush
Atriplex grayi	Spiny hopsage
Balsamorhiza sagittata	Arrowleaf balsamroot
Berberis fendleri	Colorado barberry
Besseya ritteriana	Kittentails
Betula glandulosa	Bog birch
Betula occidentalis	River birch
Bistorta bistortoides	American bistort
Bistorta vivipara	Alpine bistort
Botrychium lunaria	Western moonwort
Bouteloua gracilis	Blue grama
Brickellia grandiflora	Tassleflower brickelbush
Brickellia microphylla	Rough brickelbush
Bromopsis ciliata	Nodding brome
Bromus inermis	Smooth brome
Bromus tectorum	Cheatgrass
Calamagrostis canadensis	Canada wild rye
Calochortus flexuosus	Weak stemmed mariposa lily

Scientific name	Common name
Calochortus nuttallii	Sego lily
Caltha leptosepala	Marsh marigold
Calylophus lavandulifolius	Lavenderleaf sundrops
Campanula rotundifolia	Harebell
Cardamine cordifolia	Bittercress
Cardaria draba	Hoary cress
Carduus nutans	Musk thistle
Carex angustior	Prickly sedge
Carex aquatilis	Water sedge
Carex aurea	Golden sedge
Carex buxbaumii	Buxbaum's sedge
Carex canescens	Silvery sedge
Carex capillaris	Hairlike sedge
Carex chalciolepis	Holm sedge
Carex dioeca	Northern bog sedge
Carex disperma	Softleaf sedge
Carex ebenea	Ebony sedge
Carex elynoides	Blackroot sedge
Carex geyeri	Elk sedge
Carex heliophila	Sun sedge
Carex illota	Sheep sedge
Carex limosa	Mud sedge
Carex magellanica	Boreal bog sedge
Carex microptera	Smallwing sedge
Carex nigricans	Black alpine sedge
Carex norvegica	Norway sedge
Carex nova	Black sedge
Carex pachystachya	Chamisso sedge
Carex rossii	Ross' sedge
Castilleja chromosa	Wavyleaf Indian paintbrush
Castilleja linariifolia	Wyoming Indian paintbrush
Castilleja miniata	Scarlet Indian paintbrush
Castilleja occidentalis	Western paintbrush
Castilleja rhexifolia	Rose Indian paintbrush
Castilleja scabrida	Rough Indian paintbrush
Castilleja sulphurea	Sulphur Indian paintbrush
Ceanothus fendleri	Fendler's ceanothus
Centaurea repens	Russian knapweed
Cerastium beeringianum	Beering chickweed
Cercocarpus montanus	Mountain mahogany
Chaenactis douglassii	Douglas' dustymaiden
Chaetopappa ericoides	Sand aster
Chamaechaenactis scaposa	Scapose pincushion
Chamerion danielsii	Fireweed
Cheilanthes feei	Slender lip-fern
Chondrophylla aquatica (Gentiana fremontii)	Moss gentian
Chondrophylla prostrata (Gentiana prostrata)	Pygmy gentian
Chrysothamnus greenii	Green rabbitbrush,
Chrysothamnus nauseosus	Rabbitbrush

Scientific name	Common name
Chrysothamnus viscidiflorus	Viscid rabbitbrush
Cilaria austromontana	Spotted saxifrage
Cirsium arvense	Canada thistle
Cirsium centaureae	Fringed thistle
Cirsium neomexicanum	New Mexico thistle
Cirsium parryii	Parry's thistle
Cirsium tracyi	Tracy's thistle
Claytonia lanceolata	Spring beauty
Claytonia megarhiza	Alpine spring beauty
Clematis ligusticifolia	Virgin's bower
Clementsia rhodantha	Rose crown
Collinsia parviflora	Blue-eyed Mary
Collomia linearis	Narrowleaf mountain trumpet
Comandra umbellata	Bastard toadflax
Conioselinum scopulorum	Rocky Mountain hemlockparsley
Cordylanthus wrightii	Wright's bird's beak
Coriflora hirsutissima	Sugarbowls
Cornus sericea	Red-osier dogwood
Corydalis caseana	Sierra corydalis
Crataegus macrantha	Fleshy hawthorn
Crataegus rivularis	River hawthorn
Cryptantha bakeri	Baker's cryptantha
Cryptantha flava	Plateau yellow cryptantha
Cryptantha flavoculata	Roughseed cryptantha
Cryptantha fulvocanescens	Tawny cryptantha
Cryptantha gracilis	Narrow stem cryptantha
Cryptantha gypsophila	Gypsum Valley cat-eye
Cryptantha minima	Little cryptantha
Cymopterus bulbosus	Bulbous spring-parsley
Cymopterus fendleri	Fendler's spring-parsley
Cymopterus purpureus	Purple spring-parsley
Cypripedium parviflorum	Yellow lady's slipper
Cystopteris fragilis	Brittle bladderfern
Dactylis glomerata	Orchard grass
Danthonia intermedia	Intermediate oatgrass
Delphinium barbeyi	Tall larkspur
Delphinium scaposum	Tall mountain larkspur
Deschampsia cespitosa	Tufted hairgrass
Descurainia pinnata	Western tansymustard
Descurainia sophia	Herb sophia
Distegia involucrata	Twinberry honeysuckle
Draba aurea	Golden whitlow-grass
Draba borealis	Boreal whitlow-grass
Draba crassifolia	Snowbed draba
Draba crassifolia	Snowbed whitlow-grass
Draba cuneifolia	Wedgeleaf draba
Draba graminea	San Juan whitlow-grass
Draba helleriana	Heller's whitlow-grass
Draba spectabilis	Showy whitlow-grass

Scientific name	Common name
Draba streptobrachia	Colorado Divide whitlow-grass
Dryopteris filix-mas	Male fern
Dugaldia hoopesii	Orange sneezeweed
Echinocereus triglochidiatus	Kingcup cactus
Eleocharis acicularis.	Needle spikerush
Eleocharis palustris	Common spikerush
Eleocharis sp.	Spike rush
Elymus elymoides	Bottlebrush squirreltail
Elymus glaucus	Blue wildrye
Elymus trachycaulus	Slender wheatgrass
Ephedra torreyana	Torrey's jointfir
Ephedra viridis	Mormon tea
Epilobium hornemannii	Hornemann's willow herb
Epipactis gigantea	Helleborine
Equisetum arvense	Horsetails
Eremogone congesta	Capitate sandwort
Eremogone fendleri	Fendler's sandwort
Eremogone kingii	King's sandwort
Eriastrum diffusum	Miniature woollystar
Erigeron concinnus	Navajo fleabane
Erigeron coulteri	Coulter daisy
Erigeron divergens	Spreading fleabane
Erigeron elatior	Tall fleabane
Erigeron eximius	Spruce-fir fleabane
Erigeron flagellaris	Trailing fleabane
Erigeron kachinensis	Kachina daisy
Erigeron melanocephalus	Blackhead fleabane
Erigeron peregrinus	Subalpine fleabane
Erigeron pinnatisectus.	Featherleaf fleabane
Erigeron simplex	One stem fleabane
Erigeron speciosus	Aspen fleabane
Eriogonum alatum	Winged buckwheat
Eriogonum gordonii	Gordon's buckwheat
Eriogonum inflatum	Native American pipeweed
Eriogonum lonchophyllum	Spearleaf buckwheat
Eriogonum microthecum	Slender buckwheat
Eriogonum ovalifolium	Cushion buckwheat
Eriogonum palmerianum	Palmer's buckwheat
Eriogonum racemosum	Redroot buckwheat
Eriogonum sp.	Buckwheat
Eriogonum umbellatum	Sulphurflower buckwheat
Eriophorum altaicum var. neogaeum	Altai cottongrass
Eriophorum angustifolium	Narrowleaf cottongrass
Eriophorum chamissonis	Russet cottongrass
Erodium cicutarium	Cranesbill
Erysimum capitatum	Wallflower
Erysimum repandum	Spreading wallflower
Fendlera rupicola	Cliff fendlerbush
Festuca thurberi	Thurber fescue

Scientific name	Common name
Forestiera pubescens	New Mexico or wild privet
Forsellesia meionandra	Spiny horsebrush/Utah greasebush
Fragaria virginiana	Wild strawberry
Frasera albomarginata	Desert frasera
Frasera speciosa	Green gentian
Fraxinus anomala	Single leaf ash
Galium septentrionale	Northern bedstraw
Galium triflorum	Fragrant bedstraw
Gastrolichnis drummondii	Drummond's campion
Gaultheria humifusa	Alpine wintergreen
Gentianodes algida	Arctic gentian
Gentianopsis thermalis.	Rocky Mountain fringed gentian
Geranium cespitosum	Pineywoods geranium
Geranium richardsonii	Richardson's geranium
Geum macrophyllum	Large-leaf avens
Geum rossii	Alpine avens
Geum triflorum	Prairie smoke
Gilia ophthalmoides	Eyed Gilia
Gilia sinistra	Alva Day's Gilia
Gilia tweedyi	Tweedy's Gilia
Glandularia bipinnatifida	Dakota mock vervain
Glycyrrhiza lepidota	American licorice
Goodyera oblongifolia	Rattlesnake plantain
Gutierrezia sarothrae	Broom snakeweed
Gypsoplaca macrophylla	Changing earthstar
Habenaria hyperborea	Northern green orchid
Halogeton glomeratus	Halogeton
Hedysarum boreale	Chainpod
Helianthella quinquenervis	Little sunflower
Helianthus annuus	Common sunflower
Heliomeris multiflora	Showy golden eye
Heracleum lanatum	Cow parsnip
Hesperostipa comata	Needle and thread
Heterotheca villosa	Hairy golden aster
Heuchera parvifolia	Littleleaf alumroot
Hieracium gracile	Slender hawkweed
Hippochaete hyemalis	Scouring rush
Hippochaete variegata	Variegated scouring rush
Holodiscus dumosus	Rock spirea
Hordeum brachyantherum	Meadow barley
Hydrophyllum fendleri	Fendler's waterleaf
Hymenopappus filifolius	Fineleaf hymenopappus
Ipomopsis aggregata	Scarlet skyrocket
Ipomopsis polyantha	Pagosa skyrocket
Iris missouriensis	Rocky Mountain iris
Juncus balticus	Baltic rush
Juncus drummondii	Drummond's rush
Juncus ensifolius	Swordleaf rush
Juncus mertensianus	Merten's rush

Scientific name	Common name
Juncus tracyi	Tracy's rush
Juniperus communis	Common juniper
Juniperus osteosperma	Utah juniper
Juniperus scopulorum	Rocky Mountain juniper
Koeleria macrantha	June grass
Krascheninnikovia lanata	Winterfat
Lactuca serriola	Prickly lettuce
Lappula redowskii	Flatspine stickseed
Lathyrus eucosmus	Bush vetchling
Lecanora gypsicola	Gypsum rim-lichen
Lepidium densiflorum	Pepperweed
Lepidium densiflorum	Common pepperweed
Lepidium lasiocarpum	Broadleaved pepperweed
Lepidium montanum	Mountain pepperweed
Lepidium perfoliatum	Clasping pepperweed
Leptodactylon pungens	Granite prickly Gilia
Lesquerella pruinosa	Frosty bladderpod
Lesquerella rectipes	Straight bladderpod
Leucanthemum vulgare	Oxeye daisy
Leymus salina	Salina wild rye
Lidia obtusiloba	Alpine sandwort
Ligularia bigelovii	Nodding ragwort
Ligusticum porteri	Osha
Linanthastrum nuttallii	Nuttall's desert trumpets
Linaria genistifolia	Dalmatian toadflax
Linum lewisii	Blue flax
Lithospermum incisum	Narrowleaf gromwell
Lithospermum sp.	Stoneseed
Lloydia serotina	Alp lily
Lomatium dissectum	Fernleaf biscuitroot
Lupinus ammophilus	Sand lupine
Lupinus caudatus	Tailcup lupine
Lupinus kingii	King's lupine
Luzula parviflora	Small flowered woodrush
Luzula spicata	Woodrush
Machaeranthera canescens	Hoary aster
Machaeranthera coloradoensis	Colorado tansy aster
Machaeranthera grindelioides	Rayless aster
Machaeranthera pinnatifida	Lacy tansy aster
Mahonia repens	Oregon grape
Maianthemum racemosum	Feathery false Solomonseal
Maianthemum stellatum	Starry false-solomonseal
Marrubium vulgare	Horehound
Medicago sativa	Alfalfa
Melilotus officinalis	Yellow sweet clover
Mentha arvensis	Wild mint
Menyanthes trifoliata	Buckbean
Mertensia ciliata	Mountain bluebells
Mertensia lanceolata	Lanceleaf bluebells

Scientific name	Common name
Micranthes odontoloma	Brook saxifrage
Micranthes rhomboidea	Diamond-leaf saxifrage
Micranthes rhomboidea	Diamond leaf saxifrage
Mimulus eastwoodiae	Eastwood's monkeyflower
Mimulus guttatus	Monkey flower
Mirabilis glandulosa	Glandular four-o'clock
Mirabilis multiflora	Colorado four-o'clock
Mitella pentandra	Bishop's cap
Mohringia macrophylla	Largeleaf sandwort
Monarda fistulosa	Wild oregano
Negundo aceroides	Box elder
Noccaea montana	Pennycress
Oenothera albicaulis	Whitestem evening primrose
Oenothera caespitosa	Tufted evening-primrose
Oenothera cespitosa	Tufted evening primrose
Oligosporus dracunculus	Wild tarragon
Opuntia fragilis	Potato cactus
Opuntia polyacantha	Pricklypear
Oreobrama pygmaea	Pygmy bitterroot
Oreochrysum parryi	Parry's goldenrod
Orthilia secunda	One-sided wintergreen
Oryzopsis hymenoides	Indian ricegrass
Osmorhiza depauperata	Sweet cicely
Oxybaphus linearis	Narrowleaf four-o'clock
Oxypolis fendleri	Cowbane
Pallaea atropurpurea	Purple cliffbrake
Parnassia fimbriata	Fringed grass of Parnassus
Pascopyrum smithii	Western wheatgrass
Paxistima myrsinites	Mountain lover
Pedicularis bracteosa	Bracted lousewort
Pedicularis centranthera	Dwarf lousewort
Pedicularis groenlandica	Elephantella
Pedicularis parryi	Parry's lousewort
Pedicularis racemosa	Parrot's beak
Pediocactus simpsonii	Simpson's hedgehog cactus
Pediomelum aromaticum	Paradox breadroot
Pediomelum megalanthum	Intermountain Indian breadroot
Pellaea glabella ssp. simplex	Smooth cliff-brake
Penstemon breviculus	Short-stem beardtongue
Penstemon caespitosus	Mat penstemon
Penstemon cyanocaulis	Bluestem beardtongue
Penstemon harbouri	Harbour beardtongue
Penstemon lentus	Abajo penstemon
Penstemon linarioides	Toadflax penstemon
Penstemon strictus	Rocky Mountain penstemon
Penstemon utahensis	Utah beardtongue
Penstemon whippleanus	Whipple's penstemon
Peraphyllum ramosissimum	Squaw apple
Petradoria pumila	Rock goldenrod

Scientific name	Common name
Phacelia crenulata	Scorpion weed
Phacelia heterophylla	Varileaf Phacelia
Phalaris arundinacea	Reed canary grass
Phleum commutatum	Alpine timothy
Phleum pratense	Meadow timothy
Phlox austromontana	Desert phlox
Phlox hoodii	Hood's phlox
Phlox longifolia	Longleaf phlox
Phragmites australis	Gaint reed
Physaria acutifolia	Sharpleaf twinpod
Physaria pulvinata	Cushion bladderpod
Picea engelmannii	Engelmann spruce
Picea pungens	Colorado blue spruce
Picea spp. – Abies spp.	Spruce/fir
Pinus edulis	Pinyon pine
Pinus ponderosa	Ponderosa pine
Plantago lanceolata	Narrowleaf plantain
Plantago patagonica	Wooly plantain
Platyschkuhria integrifolia	Oblong leaf bahia
Pleuraphis(Hilaria) jamesii	Galleta
Pneumonanthe parryi	Bottle gentian
Poa alpina	Alpine bluegrass
Poa arctica	Arctic bluegrass
Poa bulbosa	Bulbous bluegrass
Poa fendleriana	Mutton grass
Poa pratensis	Kentucky bluegrass
Poa reflexa	Nodding bluegrass
Podistera eastwoodiae	Eastwood's podistera
Polemonium caeruleum ssp. amygdalinum	Western polemonium
Polemonium pucherrimum	Jacob's ladder
Polypodium hesperium	Western polypody
Polypodium saximontanum	Rocky Mountain polypody
Polypogon monspeliensis	Rabbit's foot grass
Populus angustifolia	Narrow leaf cottonwood
Populus tremuloides	Quaking aspen
Potentilla diversifolia	Cinquefoil
Potentilla fruiticosa	Shrubby cinquefoil
Potentilla hippiana	Wooly cinquefoil
Potentilla pulcherrima	Beautiful cinquefoil
Primula parryi	Parry's primrose
Prunella vulgaris	Common selfheal
Prunus virginiana var. melanocarpa	Chokecherry
Pseudocymopterus montanus	Mountain parsley
Pseudotsuga menziesii	Douglas fir
Psilochenia acuminata	Longleaf hawksbeard
Psilochenia intermedia	Intermediate hawksbeard
Psilochenia sp.	Hawksbeard
Pteridium aquilinum var. pubescens	Bracken fern
Puccinellia parishii	Parish's alkaligrass

Scientific name	Common name
Purshia stansburiana	Cliffrose
Purshia tridentata	Antelope bitterbrush
Quercus gambelii	Gambel oak
Quercus gambelii	Gambel oak
Ranunculus alismifolius	Plantain leaf buttercup
Ranunculus macauleyi	Rocky Mountain buttercup
Ranunculus testiculatus	Bur buttercup
Rhamnus smithii	Smith's buckthorn
Rhodiola integrifolia	King's crown
Rhus trilobata	Skunkbrush
Ribes inerme	Whitestem gooseberry
Ribes montigenum	Gooseberry currant
Ribes wolfii	Wolf's currant
Rosa woodsii	Wild rose
Rubus idaeus	Wild raspberry
Rubus parviflorus	Thimbleberry
Rudbeckia laciniata	Cutleaf coneflower
Rumex crispus	Curly dock
Rydbergia grandiflora	Old-man-of-the-mountain
Salix arctica	Arctic willow
Salix brachycarpa.	Barrenground willow
Salix drummondiana	Drummond's willow
Salix exigua	Coyote willow or sandbar willow
Salix monticola	Rocky Mountain willow
Salix planifolia	Planeleaf willow
Salix reticulata ssp. nivalis	Snow willow
Salsola australis	Russian thistle
Sambucus racemosa	Elderberry
Sarcobatus vermiculatus	Greasewood
Schoenocrambe linifolia	Skeleton mustard
Sclerocactus whipplei	Whipple's fishhook cactus
Senecio amplectens	Alpine groundsel
Senecio atratus	Tall blacktip ragwort
Senecio crassula	Thickleaf groundsel
Senecio dimorphophyllus	Different-leaf groundsel
Senecio multilobatus	Lobeleaf groundsel
Senecio neomexicanus	New Mexico groundsel
Senecio soldanella	Colorado ragwort
Senecio triangularis	Arrowleaf ragwort
Senecio tridenticulatus	Threetooth ragwort
Senecio wernerifolius	Hoary groundsel
Shepherdia argentea	Silver buffaloberry
Shepherdia canadensis	Russet buffaloberry
Sibbaldia procumbens	Creeping sibbaldia
Silene acaulis	Moss campion
Silene antirrhina	Sleepy catchfly
Sisymbrium altissimum	Tall tumble mustard
Sisymbrium loeselii	Tall hedge mustard
Sisyrinchium montanum	Mountain blue-eyed grass

Scientific name	Common name
Solidago canadensis	Canada goldenrod
Solidago missouriensis	Missouri goldenrod
Solidago simplex	Mt. Albert goldenrod
Solidago sp.	Goldenrod
Spergulastrum lanuginosum	Spreading sandwort
Sphaeralcea coccinea	Scarlet globemallow
Sphaeralcea parvifolia	Globemallow
Sphagnum angustifolium	Narrowleaf sphagnum
Spiranthes romanzoffiana	Hooded lady's tresses
Sporobolus airoides	Alkai sacaton
Sporobolus nealleyi	Gyp dropseed
Stanleya pinnata	Prince's plume
Stellaria umbellata	Umbrella starwort
Stenotus armerioides	Thrift mock goldenweed
Stipa comata	Needle and thread
Stipa nelsonii	Nelson's needlgrass
Streptanthella longirostris	Longbeak streptanthella
Streptanthus cordatus	Heartleaf twistflower
Suaeda moquinii	Mojave seablite
Swertia perennis	Star gentian
Symphoricarpos oreophilus	Snowberry
Tamarix ramosissima	Tamarisk
Taraxacum officianale	Common dandelion
Tetradymia canescens	Spineless horsebrush
Tetradymia spinosa	Shortspine horsebrush
Tetraneuris ivesiana	Ives' four-nerve daisy
Tetraneuris torreyana	Torrey's four-nerve daisy
Thalictrum fendleri	Meadowrue
Thelypodiopsis aurea	Durango tumble mustard
Thinopyrum intermedium	Intermediate wheatgrass
Tonestus pygmaeus	Pygmy goldenweed
Townsendia annua	Annual Townsend daisy
Townsendia exscapa	Stemless Townsend daisy
Townsendia glabella	Gray's Townsend daisy
Townsendia incana	Hoary Townsend daisy
Townsendia rothrockii	Rothrock's Townsend daisy
Townsendia strigosa	Strigose Townsend daisy
Toxicodendron rydbergii	Poison ivy
Toxicoscordion venenosum	Foothill death camas
Tragopogon dubius	Salsify
Trautvetteria caroliniensis	Carolina tasselrue
Trifolium attenuatum	Rocky Mountain clover
Trifolium brandegei	Brandegee's clover
Trifolium gymnocarpum	Hollyleaf clover
Trifolium kingii	King clover
Trifolium longipes	Longstalk clover
Trifolium nanum	Dwarf clover
Trifolium parryi	Parry's clover
Trisetum spicatum	Spike trisetum

Scientific name	Common name
Trollius albiflorus	Globe flower
Ulmus pumila	Siberian elm
Vaccinium myrtillus	Whortleberry
Vaccinnium cespitosum	Dwarf bilberry
Valeriana capitata	Sharpleaf valerian
Valeriana edulis	Edible valerian
Veratrum tenuipetalum	False hellebore
Verbascum thapsus	Common mullein
Veronica nutans	Alpine speedwell
Vicia americana	American vetch
Viola canadensis	Canada violet
Viola labradorica	Alpine violet
Viola sororia	Wooly blue violet
Vulpia octoflora	Sixweeks fescue
Woodsia neomexicana	New Mexico cliff fern
Woodsia scopulina	Rocky Mountain cliff fern
Wyethia X magna	Mule’s-ears
Yucca angustissima	Fineleaf yucca
Yucca baccata	Banana yucca
Yucca harrimaniae	Spanish bayonet
Zigadenus elegans	Mountain deathcamas