

**DRAFT
ECOLOGICAL EVALUATION
for the**

DIFFICULT CREEK POTENTIAL RESEARCH NATURAL AREA

WHITE RIVER NATIONAL FOREST

PITKIN COUNTY, COLORADO

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INTRODUCTION

The Difficult Creek potential Research Natural Area is located approximately four miles southeast of Aspen, Colorado, in the Collegiate Peaks Wilderness. It includes approximately 11,400 acres (5,096 ha.), consisting of the entire drainage of Columbia Creek, and the drainage of Difficult Creek above its confluence with Columbia Creek. The area has forests of Engelmann spruce and subalpine fir, which fade into krummholtz at the upper elevations; substantial areas of alpine tundra dominated by alpine avens (*Geum rossii*), false strawberry (*Sibbaldia procumbens*), and tufted hairgrass (*Deschampsia cespitosa*); and wetlands with willows and sedges. At lower elevations there are lodgepole pine and aspen forests.

LAND MANAGEMENT PLANNING

This document has been prepared by the Colorado Natural Heritage Program through a Challenge Cost-Share Agreement with the White River National Forest to produce Ecological Evaluations of potential Research Natural Areas. These evaluations are intended to aid the National Forest in environmental analysis during revision of their Forest Management Plan. The specific areas and boundaries for evaluation were chosen by the White River National Forest.

OBJECTIVES

One of the primary objectives of RNAs as listed in the Forest Service Manual (4063.02, USDA Forest Service 1990) is to "preserve a wide spectrum of pristine representative areas that typify important forest, shrubland, grassland, alpine, aquatic, geologic and similar natural situations..." The Difficult Creek potential RNA would meet this objective by representing a number of plant associations within the spruce-fir, subalpine willow and alpine tundra alliances. The potential RNA is of particular interest for its extensive area (approximately 4751 acres) of alpine wetlands, made up of a mosaic of willows, grasses, forbs and sedges. A Difficult Creek RNA would meet further objectives of the RNA system by (1) protecting elements of biodiversity, (2) serving as a reference area for the study of succession and long-term ecological changes... (3) providing a site for non-manipulative scientific research, and (4) serving as a control area for comparing results of manipulative research and resource management in other areas with similar ecosystem types. In order to accomplish these objectives, a Difficult Creek RNA should be managed to maintain, as much as possible, the natural composition, structure, and function of the area's ecosystems (Andrews 1993).

PRINCIPAL DISTINGUISHING FEATURES

The Difficult Creek potential RNA is located four miles southeast of Aspen, CO. Elevations in the area range from approximately 8,600 ft. to 12,934 ft. (2,621 m. to 3,942 m.)

Ecoregion: The area occurs within the North Central Highlands and Rocky Mountain Section (M311H) of Bailey's (1994) map of the ecoregions of the United States.

Physiography and Geology: The Difficult Creek potential RNA is located in the Southern Rocky Mountain Province (Fenneman 1931), in the Sawatch Range. The region has uplifted Precambrian metamorphic rocks (schist and gneiss) with mid-Tertiary intrusives. Some areas have ash flow and tuffs from Tertiary volcanic activity. The mountains were scoured by glaciers, and some parts were covered with glacial drift during the Quaternary (Bryant 1979; Bryant and Martin 1988).

Vegetation: The area has dense forests of Engelmann spruce and subalpine fir in the creek drainages, and spruce-fir krummholz at the upper elevations. There are substantial areas of alpine tundra dominated by alpine avens, false strawberry, and tufted hairgrass; and wetlands with willows and sedges. At lower elevations there are lodgepole pine and aspen.

Human use: District personnel say that this is one of the least used areas in the district. The upper area near Taylor Pass is bordered by 4-wheel drive roads. Taylor Pass and Taylor Lake are popular destinations, but not many people leave the road and enter the potential RNA. At the lower end, Difficult Trail is popular because of its origin at the Difficult Campground, but not many people go as far as the Potential RNA boundary. There is some hunting use, both from Taylor Pass and from the New York Peak area. Prior to the 1980's, sheep grazed in the alpine areas at the upper end. There are several old mines, and the remains of old cabins in the area.

Fire history: A large fire (900 A), started from a campfire, burned in the Weller Lake area in July 1980.

LOCATION

National Forest, County, and Legal Description. The potential RNA is located on the Aspen District of the White River National Forest, in Garfield County. It occupies all or part of Township 11 South, Range 84 W, Sections 11-4, 9-15, 21-27, and 34-36; and T11S R83W S6, 7, 18, 19 and 30.

Maps.

USDA Forest Service 1:126,720 map of White River National forest, 1991.

U. S. Geological Survey 1: 24,000 topographic maps: Aspen 3910627

Hayden Peak, CO 3910617

New York Peak, CO 3910616

Total Acreage and Elevation. The area comprises approximately 11,400 acres (4614 ha.), ranging in elevation from 8,600 ft. to 12,934 ft. (2,621 m. to 3,942 m.)

Boundary Description. Beginning in T11S R84W S21, at the Collegiate Peaks Wilderness boundary, at the head of the west fork of Difficult Creek, the potential RNA boundary follows the wilderness boundary south to the boundary between the White River National Forest and the Gunnison National Forest. It then follows the forest boundary northeast to the ridge top separating the Difficult Creek-Bruin Creek drainage from the New York Creek drainage. It follows the divide north to the Wilderness boundary, just south of the Roaring Fork River, then follows the Wilderness boundary west to a point 0.4 miles west of Tagerts Lake. From there, it turns southwest to the ridgetop east of Difficult Creek which it climbs to the 10,200 ft. elevation, then follows that contour line southwest, then southeast, until it reaches the confluence of Columbia Creek and Difficult Creek; then heads southwest, intercepting a peak at 11,576 ft. and continues to the point of origin at the wilderness boundary.

Access and Travel Routes.

There are no roads, and only about a one-mile stretch of trail, within the Difficult Creek potential RNA. The area can be reached from the northwest by the Difficult Creek Trail which begins at the Difficult Creek Campground, off Colorado Highway 82, about four miles southeast of Aspen, CO., and runs parallel to and west of the boundary to Columbia Creek. According to District personnel, few people hike the trail as far as the potential RNA boundary.

Forest Road 123, from Richmond Hill, south of Aspen, parallels the southeast boundary of the potential RNA, and connects with the Express Creek Road (Forest Road 122) from Ashcroft to Taylor Pass. Of the two forest roads, No. 123 is much less rough. Forest Road 122 requires a high clearance, four-wheel drive vehicle, and has some very narrow places with sharp drop-offs.

On the east side of the potential RNA, the New York Creek pack trail parallels the boundary, and could provide access via its tributaries, south of New York Peak.

There is a trail from Highway 82 to Weller Lake. It may be possible to access the northern end of the area from there.

AREA BY COVER TYPES

The cover type map of the site with acreages of each cover type is attached. Aerial photo interpretation and field observation indicate that the area is approximately 31% lodgepole pine, 25% spruce-fir, 25% grass-forb meadows and tundra, and 17% willow. Vegetation was mapped based on interpretation of aerial photographs (USDA Color infra-red, 1:58,000, and USGS Ortho photographs, 1:24,000); topographic maps; and field observation. Not all areas have been field checked. In cases where a mixture of cover types was impossible to separate, polygons were mapped as mixtures. Acreage for each major cover type was determined by using a planimeter to measure areas of polygons on the attached map. Mixed polygons were arbitrarily assumed to contain equal amounts of each cover type to arrive at the estimated acreages below.

Table 1.
Society of American Foresters Cover Types (Eyre 1980)

Type (SAF no.)	Acres	Hectares
Engelmann spruce-subalpine fir (206)	2,875	1,164
Lodgepole pine (218)	3,526	1,427
Aspen (217)	236	96
Non-forested	4,751	1,922
Total	11,388	4,609

Table 2.
Kuchler Cover Types (Kuchler 1985)

Type (No.)	Acres	Hectares
Western spruce-fir forest (14) (includes lodgepole pine and aspen)	6637	2686
Alpine meadows and barrens (45) (includes willow)	4751	1922
Total	11,388	4608

Table 3.

Plant Series / Plant Associations

If the series or plant association is well represented in the area it is given an M for major representation. If the series or plant association covers only a small area, it is given an m for minor representation. Plant association names which are from Johnston (1987) are given using his nomenclature. For updated plant association names using SCS nomenclature see Appendix 1. For common names and plant name synonyms, see Appendix 2.

Series / Plant Association (see plot data for cross references with CNHP names)	Representation	Acres	Hectares
Abies lasiocarpa-Picea engelmannii	M	2,875	1,163
Abies lasiocarpa-Picea engelmannii / Vaccinium myrtillus	M		
Abies lasiocarpa-Picea engelmannii / Vaccinium scoparium	M		
Abies lasiocarpa-Picea engelmannii / Salix glauca	M		
Abies lasiocarpa-Picea engelmannii / Senecio triangularis	m		
Subtotal			
Pinus contorta	M	3,526	1,426
Pinus contorta / Vaccinium myrtillus	M		
Aspen (no plots)	m	236	96
Combined shrub and grass/forb:		4,751	1,923
Salix spp.	M		
Salix planifolia / Caltha leptosepala	M		
Salix planifolia / Deschampsia cespitosa	M		
Sibbaldia procumbens	M		
Sibbaldia procumbens / Lidia biflora		M	
Caltha leptosepala	M		
Caltha leptosepala / Clementsia rhodantha	M		
Deschampsia cespitosa	M		
Deschampsia cespitosa / Acomastylis (Geum) rossii	M		
Cardamine cordifolia	m		
Cardamine cordifolia / Caltha leptosepala	m		
Vaccinium spp.	m		
Vaccinium scoparium -Vaccinium cespitosum / Lidia biflora	m		
Carex spp.	M		
Carex scopulorum / Caltha leptosepala	M		
Carex scopulorum / Acomastylis (Geum) rossii	M		
Acomastylis (Geum) rossii			
Acomastylis (Geum) rossii/ Carex rupestris	M		
Pedicularis groenlandica	m		
Pedicularis groenlandica / Eleocharis quinqueflora	m		
Juncus spp.	m		
Juncus drummondii / Carex spp.	m		
Total acreage		11,388	4,608

Description of Values

Flora:

Threatened and Endangered species: Three CNHP Species of Special Concern were observed: *Erigeron pinnatisectus*, *Erigeron elatior* and *Erigeron melanocephalus*. All three are ranked G3 S3 (Colorado Natural Heritage Program 1995a) Nearby, along the Roaring Fork River, *Sullivantia hapemannii* var. *purpusii* has been recorded.

Exotic species: The only exotic species found was common dandelion, *Taraxacum officinale*, which is ubiquitous in the west. It did not occur in significant amounts.

Vegetation:

The Difficult Creek potential RNA contains excellent examples of spruce fir forest, dry alpine tundra and alpine wetlands in the upper elevations. Lower elevations contain large stands of lodgepole pine.

Fauna: Wildlife or their sign observed include mule deer, elk, and marmots. Although there are large elk herds in the area, hunting is limited to the early season because of snow. Undoubtedly, the area serves as suitable habitat for a wide variety of vertebrates and invertebrates which were not documented during this brief survey.

Threatened and endangered species: None were observed.

Exotic species: None were observed.

Geology: The Difficult Creek area has uplifted Precambrian metamorphic rocks (schist and gneiss) with mid Tertiary intrusives. Some areas have ash flow and tuffs from Tertiary volcanic activity. The area was scoured by glaciers, and some areas were covered with glacial drift during the Quaternary.

Lands: The potential RNA is entirely within the White River National Forest, and the Collegiate Peaks Wilderness.

Impacts and Possible Conflicts:

Mineral resources: Lands associated with patented mining claims within the area were acquired by the Forest Service through the Mt. Sopris Legislated Land Exchange (Act of May 19, 1994 [PL1103-255]). These lands were acquired from Pitkin County. The exchange law provides for a six year period within which anyone claiming title to any of the lands conveyed to the Forest Service must file a title claim.

Grazing: The area has not been grazed since the 1980's, and the grazing allotment for this area is currently vacant.

Timber: The area has not been logged, and is protected by its wilderness status.

Recreation: There may be some ATV or motorcycle use on the tundra close to roads.

Special Uses: There is a cabin located below the four wheel drive road in the southwestern part of the potential RNA. According to the guest book inside, it belongs to the Richard Deanes of Aspen.

Watershed: RNA designation would protect watershed values.

Evaluation

Criteria of quality, condition, viability and defensibility were developed by the Rocky Mountain Region to assess how well a potential RNA meets RNA qualification (Anderws 1993). These criteria are based on those developed by the Colorado Natural Heritage Program to evaluate occurrences of individual elements and communities.

Quality is based on how well a site represents the targeted ecosystem type or protected biodiversity elements.

Condition refers to the naturalness of the site and the degree to which it has been degraded or altered from presettlement conditions.

Viability is the prospect for long-term survival of the ecosystem and its protected elements.

Defensibility is the extent to which the site can be protected from extrinsic anthropogenic factors.

The Difficult Creek potential RNA has been evaluated according to these criteria as follows:

Quality: The Difficult Creek potential RNA has excellent sized representations of high elevation spruce-fir forests, alpine wetlands and dry gravelly tundra. The site is large enough, at 11,388 acres, to represent these ecosystems without significant edge effect. Two globally rare plant communities were observed (Salix planifolia / Deschampsia cespitosa p. a. G2G3 S2S3, plots 18 and 25; and Abies lasiocarpa / Senecio triangularis p. a. G2G3 S2S3, plots 19 and 21.) Three CNHP plant species of special concern were observed: *Erigeron pinnatisectus*, *Erigeron elatior* and *Erigeron melanocephalus*. All three are ranked G3 S3 (Colorado Natural Heritage Program 1995a)

Condition: No recent impacts from grazing, logging, fire suppression, or roads were observed. There were few exotic species in the area, and none occurred in significant numbers.

Viability: There are no known threats to the survival of this ecosystem. Its large size of 11,388 acres is a valuable asset.

Defensibility: The potential RNA is entirely within the Collegiate Peaks Wilderness of the White River National Forest. RNA designation would further protect the area from future land use impacts.

Literature Cited

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APPENDIX 1

PLOT DATA FOR PLANT ASSOCIATIONS SAMPLED

Plant Association names are from Johnston (1987) or Hess and Wasser (1982) whenever a reasonably good fit can be found in those publications. Plant association names, edited to include the more recent plant species names from USDA Soil Conservation Service (1994), are given in parentheses where there are differences. Plant Association names are cross referenced with the names used by the Colorado Natural Heritage Program wherever possible. CNHP names are listed in bold type, followed by their global and state ranks.

Plant species coverage within plots was estimated into cover classes, and species are listed alphabetically within each class. Because of time limitations, not all species within the plots were always identified or collected. Plant species names are from USDA Soil Conservation Service (1994). Where these species names differ from Weber (1987), the Weber names are shown in parentheses. For instances in which the Weber and SCS names differ from Johnston (1987), the plant species names used by Johnston are given in parentheses and followed by *. See Appendix 2 for common names.

Similar to, but drier than Carex scopulorum / Acomastylis rossii p. a. (Johnston 1987)
(*Carex scopulorum* / *Geum rossii*)

Sibbaldia procumbens / Artemisia scopulorum potential p.a. (undescribed in Johnston [1987] and Hess and Wasser [1982]).

Similar to: Carex rupestris / Geum rossii (Hess and Wasser 1982).

and to Sibbaldia procumbens / Lidia biflora-moss p.a. (Johnston 1987)

Sibbaldia procumbens p.a. G4G5 (Colorado Natural Heritage Program 1995 b)

Plot 1 (10 X 10 ft.) Photo 7-2

Sampled near the wilderness boundary, about 1.2 air miles southeast of MacArthur Mt., on dry tundra with fine gravelly soil.

UTM's: 347,300 E / 4,323,300 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 12, 160 ft.

Slope: 5 degrees

Aspect: 32 degrees

Bare ground (includes lichen and small gravel)		50 - 75
Rock		< 1
Sibbaldia procumbens	creeping sibbaldia	5 - 25
Artemisia scopulorum	alpine sagebrush	1 - 5
Carex scopulorum	mountain sedge	1 - 5
Castilleja occidentalis	western Indian paintbrush	1 - 5
Geum rossii var. turbinatum (Acomastylis)	Ross' avens	1 - 5
Pedicularis parryi	parry's lousewort	1 - 5
Silene acaulis var. subacaulescens	moss campion	1 - 5
Erigeron simplex	onestem fleabane	< 1
Polygonum bistortoides (Bistorta)	American bistort	< 1
Saxifraga rhomboidea (Micranthes)	diamondleaf saxifrage	< 1
Trollius laxus ssp. albiflorus (T. albiflorus)	American globeflower	< 1

Similar to Caltha leptosepala/Clementsia rhodantha p.a. (Johnston 1987). However, no *Clementsia rhodantha* occurred in the plot, and it is infrequent in the area. *Sedum integrifolium* is more common. Also related to Carex scopulorum / Caltha leptosepala h.t. (Hess and Wasser 1982).

Caltha leptosepala p. a. G4 S4 (Colorado Natural Heritage Program 1995 b)

Plot 2 (20 X 20 ft.) Photo 7-3

Sampled in wetter area, of late snowmelt, downhill from plot 1. This was downhill from a snowbank, and had some standing water. *Caltha leptosepala* was the single dominant species.

UTM's: 348,350 E / 4,323,600 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,920 ft.

Slope: 5

Aspect: 32 degrees

Bare ground		5 - 25
Rock		< 1
<i>Caltha leptosepala</i>	white marshmarigold	50 - 75
<i>Festuca brachyphylla</i> ssp. <i>coloradense</i>	Colorado fescue	5 - 25
<i>Geum rossii</i> var. <i>turbinatum</i> (<i>Acomastylis</i>)	Ross' avens	< 1

Deschampsia cespitosa / Acomastylis rossii p.a. (Johnston 1987)

(Deschampsia cespitosa / Geum rossii)

Related to Acomastylis rossii / Bistorta bistortoides p.a. (Johnston 1987)

and Acomastylis rossii / Carex rupestris p.a. (Johnston 1987)

Deschampsia cespitosa / Geum rossii p. a. G5S5 (Colorado Natural Heritage Program 1995 b)

Plot 3 (20 X 20 ft.) Photo 7-04

Adjacent to plot 2, but on a convex slope and better drained. Perhaps free of snow longer than plot 2.

With many more species.

UTM's: 348,350 E / 4,323,600 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,920

Slope: 10 degrees

Aspect: 32 degrees

Bare ground		1 - 5
Rock		< 1
Deschampsia cespitosa	tufted hairgrass	50 - 75
Festuca brachyphylla ssp. coloradense	Colorado fescue	5 - 25
Castilleja occidentalis	western Indian paintbrush	5 - 25
Geum rossii var. turbinatum (Acomastylis)	Ross' avens	5 - 25
Castilleja rhexifolia	rosy Indian paintbrush*	1 - 5
Poa alpina	alpine bluegrass	1 - 5
Trisetum spicatum ssp. montanum	spike trisetum	1 - 5
Trollius laxus ssp. albiflorus (T. albiflorus)	American globeflower	1 - 5
Draba crassifolia	snowbed whitlowgrass	< 1
Erigeron melanocephalus	blackhead fleabane	< 1
Polygonum bistortoides (Bistorta)	American bistort	< 1
Saxifraga rhomboidea (Micranthes)	diamondleaf saxifrage	< 1
Senecio dimorphophyllus	splitleaf groundsel	< 1
Sibbaldia procumbens	creeping sibbaldia	< 1
Thlaspi montanum (Noccaea montana)	alpine pennycress	< 1
Viola labradorica	alpine violet	< 1

Cardamine cordifolia / Caltha leptosepala p.a. (Bourgeron and Engelking (1994) V.D.2.a. Cardamine cordifolia-Caltha leptosepala, ref. 163,347)

Similar to Primula parryi / Deschampsia cespitosa p.a. (Johnston 1987)

Cardamine cordifolia / Caltha leptosepala p.a. GU S? (Colorado Natural Heritage Program 1995 b)

Plot 4 (10 X 10)

Sampled in a small mossy depression, with a small stream.

UTM's: 348,150 E / 4,323,800 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,760 ft.

Slope: 5 degrees

Aspect: 32 degrees

Bare ground	< 1
Rock	< 1
Moss	50 - 75
Primula parryi	5 - 25
Cardamine cordifolia	5 - 25
Caltha leptosepala	1 - 5
Carex sp.	1 - 5
Parry's primrose	5 - 25
heartleaf bittercress	5 - 25
white marshmarigold	1 - 5

A. Vaccinium scoparium-Vaccinium cespitosum / Lidia biflora pa. (Johnston 1987)

(Vaccinium scoparium-Vaccinium cespitosum / Minuartia obtusiloba)

Vaccinium cespitosum/ Vaccinium scoparium p. a. G4S4? (Colorado Natural Heritage Program 1995 b)

B. Carex scopulorum / Caltha leptosepala p.a. (Johnston 1987)

Carex scopulorum / Caltha leptosepala p.a. G3G4 S3S4 (Colorado Natural Heritage Program 1995 b)

Plot 5 (4 X 5 ft) (no photos)

Sampled two adjacent hummocks in peat bog, about two feet high, with no apparent difference, other than species composition.

UTM's: 348,150 E / 4,323,800 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,760 ft.

Slope: na

Aspect: na

A:

Bare ground		1 - 5
Artemisia scopulorum	alpine sagebrush	25 - 50
Lichen		25 - 50
Vaccinium cespitosum	whortleberry	5 - 25
Sibbaldia procumbens	creeping sibbaldia	1 - 5
Juncus drummondii	Drummond's rush	1 - 5
Erigeron melanocephalus	blackhead fleabane	< 1

B:

Bare ground		1 - 5
Carex scopulorum	mountain sedge	25 - 50
Caltha leptosepala	white marshmarigold	5 - 25
Saxifraga rhomboidea (Micranthes)	diamondleaf saxifrage	1 - 5
Polygonum bistortoides (Bistorta)	American bistort	1 - 5

Abies lasiocarpa-Picea engelmannii / Salix glauca p.a. (Johnston 1987)

(Picea engelmannii-Abies lasiocarpa / Salix brachycarpa)

Picea engelmannii-Abies lasiocarpa / Salix pseudolapponum h.t. (Hess and Wasser 1982).

(Picea engelmannii-Abies lasiocarpa / Salix brachycarpa)

Abies lasiocarpa / Salix brachycarpa p. a. GU S? (Colorado Natural Heritage Program 1995 b)

Plot 6 (30 X 50 ft.) Photo 10

Sampled on a rocky (granitic) knoll with krummholtz.

UTM's: 348,050 E / 4,323,900 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,720 ft.

Slope: 5 degrees

Aspect: 32 degrees

Bare ground		5 - 25
Rock		5 - 25
Abies lasiocarpa	subalpine fir	25 - 50
Salix brachycarpa	barrenground willow	25 - 50
Polemonium pulcherrimum ssp. delicatum	skunkweed polemonium	1 - 5
Trollius laxus ssp. albiflorus (T. albiflorus)	American globeflower	1 - 5
Vaccinium myrtilus var. oreophilum	whortleberry	1 - 5
Artemisia scopulorum	alpine sagebrush	< 1
Epilobium angustifolium (Chamerion danielsii)	fireweed	< 1
Erigeron pinnatisectus	featherleaf fleabane	< 1
Erigeron simplex	onestem fleabane	< 1
Penstemon whippleanus	Whipple's penstemon	< 1
Potentilla diversifolia	varileaf cinquefoil	< 1
Salix arctica	arctic willow	< 1
Saxifraga flagellaris ssp. crandallii (Hirculus platysepalus) Crandall's saxifrage		< 1

Deschampsia cespitosa / Acomastylis rossii p.a. (Johnston 1987)
 (Deschampsia cespitosa / Geum rossii)

Deschampsia cespitosa / Geum rossii p. a. G5 S5 (Colorado Natural Heritage Program 1995 b)

Plot 7 (20 X 20 ft.)

Sampled west of group of small lakes.

UTM's: 348,200 E / 4,324,000 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,720 ft.

Slope: 10

Aspect: 32 degrees

Bare ground		5 - 25	
Rock		< 1	
Deschampsia cespitosa	tufted hairgrass	25 - 50	
Festuca brachyphylla ssp. coloradense	Colorado fescue	5 - 25	
Geum rossii var. turbinatum (Acomastylis)	Ross' avens	5 - 25	
Vaccinium myrtillus var. oreophilum	whortleberry	5 - 25	
Trollius laxus ssp. albiflorus (T. albiflorus)	American globeflower	1 - 5	
Sibbaldia procumbens	creeping sibbaldia		1 - 5
Erigeron melanocephalus	blackhead fleabane	< 1	
Viola labradorica	alpine violet	< 1	
Lewisia pygmaea (Oreobrama)	pygmy bitterroot*	< 1	
Castilleja occidentalis	western Indian paintbrush	< 1	
Trisetum spicatum ssp. montanum	spike trisetum	< 1	
Artemisia scopulorum	alpine sagebrush	< 1	

Salix phylicifolia ssp. planifolia / Caltha leptosepala p.a. (Johnston 1987)

(Salix planifolia / Caltha leptosepala)

Salix planifolia / Caltha leptosepala h.t. (Hess and Wasser 1982).

Salix planifolia-Salix brachycarpa / Caltha leptosepala p. a. G4S4 (Colorado Natural Heritage Program 1995 b)

Plot 8 (50 X 50 ft.)

Sampled in a wet area at the head of the west fork of Difficult Creek.

UTM's: 348,300 E / 4,324,000 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,720 ft.

Slope: 5 degrees

Aspect: 315 degrees

Bare ground		< 1
Rock		< 1
Salix planifolia	diamondleaf willow	25 - 50
Caltha leptosepala	white marshmarigold	25 - 50
Cardamine cordifolia	heartleaf bittercress	25 - 50
Senecio triangularis	arrowleaf groundsel	< 1
Castilleja rhexifolia	rosy Indian paintbrush*	< 1
Pedicularis groenlandica	elephanthead lousewort	< 1
Saxifraga odontoloma	brook saxifrage	< 1
Achillea millefolium var. occidentalis (A. lanulosa)	western yarrow	< 1
Arenaria congesta (Eremogone)	* sandwort	< 1
Pedicularis racemosa	sickletop lousewort	< 1
Hieracium gracile	var. gracile (Chlorocrepis tristis) slender hawkweed	< 1
Arabis (Boechera) drummondii	Drummond's rockcress	< 1

Salix phylicifolia ssp. planifolia / Caltha leptosepala p.a. (Johnston 1987)

(Salix planifolia / Caltha leptosepala)

Salix planifolia / Caltha leptosepala h.t. (Hess and Wasser 1982).

Salix planifolia-Salix brachycarpa / Caltha leptosepala p. a. G4S4 (Colorado Natural Heritage Program 1995 b)

Plot 9 (50 X 50 ft.)

Sampled just west of small lakes.

UTM's: 348,500 E / 4,324,000 N

USGS Quadrangle: New York Peak, CO 3910616

Elevation: 11,600 f

Slope: level

Aspect: na

Bare ground		< 1	
Rock		< 1	
Salix planifolia (S. phylicifolia ssp. planifolia)	diamondleaf willow		75 - 95
Caltha leptosepala (Psychrophila)	white marshmarigold	75 - 95	
moss		50 - 75	
Castilleja occidentalis	western Indian paintbrush	< 1	
Pedicularis groenlandica	elephanthead lousewort	< 1	
Saxifraga odontoloma (Micranthes)	brook saxifrage	< 1	
Saxifraga oregana (Micranthes)	Oregon saxifrage	< 1	
Senecio triangularis	arrowleaf groundsel	< 1	
Trollius laxus ssp. albiflorus (T. albiflorus)	American globeflower	< 1	

Similar to Pedicularis groenlandica / Eleocharis quinqueflora p.a. (Komarkova)
 Similar to Salix phylicifolia ssp. planifolia / Deschampsia cespitosa p.a. (Johnston 1987)
 Also related to Salix phylicifolia ssp. planifolia / Carex aquatilis p.a. (Johnston 1987)
 See also Bourgeron and Engelking (1994) V.C.6.a. Eleocharis quinqueflora, ref.
 347,1073,1099,616,1027,610,1040,1134

Eleocharis quinqueflora alpine wetland p. a. G4S? (Colorado Natural Heritage Program 1995 b)

Plot 10 (50 X 50 ft.)

Sampled on east side of small lakes. This area is wetter than plot 9, and has some standing water.

UTM's: 348,600 E / 4,324,000 N
 USGS Quadrangle: New York Peak, CO 3910616
 Elevation: 11,720 ft.
 Slope: level
 Aspect: na

Bare ground		< 1
Rock		< 1
Eleocharis quinqueflora	fewflower spikerush	50 - 75
Carex rupestris var. drummondiana	Drummond sedge	25 - 50
Salix planifolia (S. phylicifolia ssp. planifolia)	diamondleaf willow	5 - 25
Carex utriculata	Northwest Territory sedge	5 - 25
Caltha leptosepala (Psychrophila)	white marshmarigold	1 - 5
Pedicularis groenlandica	elephanthead lousewort	1 - 5
Sedum integrifolium (Rhodiola)	entireleaf stonecrop	< 1

Abies lasiocarpa-Picea engelmannii / Vaccinium myrtillus p. a. (Johnston 1987)

Similar to Picea engelmannii / Vaccinium myrtillus p.a. (Johnston 1987)

Similar to Picea engelmannii / Vaccinium scoparium h.t. (Hess and Wasser 1982), probably differing because it is at its upper elevational limit.

Abies lasiocarpa / Vaccinium myrtillus p. a. G5S5 (Colorado Natural Heritage Program 1995 b)

Plot 11 (100 X 100 ft.) Photo 12

Sampled in patch of spruce fir on slope overlooking small lakes. This is typical of the small spruce-fir patches in the area.

UTM's: 348,700 E / 4,324,400 N

USGS Quadrangle: New York Peak, CO 3910616

Elevation: 12,040 ft.

Slope: 30 degrees

Aspect: 212 degrees

Bare ground		25 - 50
Rock		1 - 5
Picea engelmannii	Engelmann's spruce	25 - 50
Vaccinium myrtillus var. oreophilum	whortleberry	5 - 25
Arnica cordifolia	heartleaf arnica	1 - 5
Carex geveeri	elk sedge	1 - 5
Achillea millefolium var. occidentalis (A. lanulosa)	western yarrow	< 1
Androsace septentrionalis	pygmyflower rockjasmine	< 1
Antennaria rosea	rosy pussytoes	< 1
Polemonium pulcherrimum	ssp. delicatum	skunkweed polemonium < 1
Potentilla diversifolia	varileaf cinquefoil	< 1
Saxifraga rhomboidea (Micranthes)	diamondleaf saxifrage	< 1

Abies lasiocarpa-Picea engelmannii / Vaccinium myrtillus p.a. (Johnston 1987)
 Similar to Picea engelmannii / Vaccinium scoparium h.t. (Hess and Wasser 1982)

Abies lasiocarpa / Vaccinium myrtillus p. a. G5S5 (Colorado Natural Heritage Program 1995 b)

Plot 12 (100 X 100 ft.)

Sampled east of 4-wheel drive road along west boundary of potential RNA.

UTM's: 347,350 E / 4,325,100 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,720 ft.

Slope: 25 degrees

Aspect: 302 degrees

Bare ground		5 - 25
Rock		< 1
Picea engelmannii	Engelmann's spruce	25 - 50
Vaccinium myrtillus var. oreophilum	whortleberry	25 - 50
Mosses and liverworts		5 - 25
Lichens		5 - 25
Abies lasiocarpa	subalpine fir	1 - 5
Arnica cordifolia	heartleaf arnica	1 - 5
Mertensia ciliata	mountain bluebells	1 - 5
Polemonium pulcherrimum	ssp. delicatum	skunkweed polemonium 1 - 5
Ribes montigenum	gooseberry currant	1 - 5
Senecio amplexans var. amplexans (Ligularia)	showy alpine groundsel	1 - 5
Castilleja rhexifolia	rosy Indian paintbrush*	< 1
Oxypolis fendleri	Fendler's cowbane	< 1
Ribes wolfii	Wolf's currant	< 1
Sibbaldia procumbens	creeping sibbaldia	< 1
Thlaspi montanum (Noccaea)	alpine pennycress	< 1

Juncus drummondii / Carex spp. p. a. (Johnston 1987)

Juncus drummondii / Carex spp. p. a. GU SU (Colorado Natural Heritage Program 1995 b)

Plot 13 (20 X 20 ft.) (Photo 24)

Sampled in clearing in spruce-fir forest, on a mesic bench.

UTM's: 347,500 E / 4,325,500 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,480 ft.

Slope: 2 degrees

Aspect: 67 degrees

Bare ground		1 - 5	
Rock		< 1	
Juncus drummondii	Drummond's rush	25 - 50	
Moss		5 - 25	
Arnica mollis	hairy arnica	5 - 25	
Veronica wormskjoldii (V. nutans)	American alpine speedwell		1 - 5
Senecio pseudoaureus var. flavulus	falsegold groundsel	1 - 5	
Cirsium tioganum var. coloradense (C. coloradense)	Colorado thistle	1 - 5	
Silene drummondii var. drummondii (Gastrolychnis)	Drummond's campion	< 1	
Fragaria virginiana	Virginia strawberry	< 1	
Antennaria rosea	rosy pussytoes	< 1	
Erigeron elatior	tall fleabane	< 1	CSSC
Carex ebenea	ebony sedge	< 1	
Agoseris aurantiaca	orange agoseris	< 1	
Castilleja occidentalis	western Indian paintbrush	< 1	
Mertensia ciliata	mountain bluebells	< 1	
Phleum alpinum (P. commutatum)	alpine timothy	< 1	
Epilobium hornemannii	Hornemann's willowherb	< 1	
Taraxacum officinale	common dandelion	< 1	
Achillea millefolium var. occidentalis (A. lanulosa)	western yarrow	< 1	

Perhaps Abies lasiocarpa-Picea engelmannii / Vaccinium myrtillus p.a. (Johnston 1987) without the trees.

Abies lasiocarpa / Vaccinium myrtillus p. a. G5S5 (Colorado Natural Heritage Program 1995 b)

Plot 14 (50 X 50 ft.)

Sampled in clearing in spruce-fir forest.

UTM's: 347,350 E / 4,325,500 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 11,480 ft.

Slope: 10 degrees

Aspect: 212 degrees

Bare ground		25 - 50
Rock		< 1
Festuca brachyphylla ssp. coloradense	Colorado fescue	5 - 25
Fragaria virginiana	Virginia strawberry	5 - 25
Vaccinium myrtillus var. oreophilum	whortleberry	5 - 25
Antennaria rosea	rosy pussytoes	1 - 5
Achillea millefolium var. occidentalis (A. lanulosa)	western yarrow	< 1
Agoseris aurantiaca	orange agoseris	< 1
Arabis (Boechera) drummondii	Drummond's rockcress	< 1
Arenaria congesta (Eremogene)	* sandwort	< 1
Arnica cordifolia	heartleaf arnica	< 1
Castilleja occidentalis	western Indian paintbrush	< 1
Cirsium tiogianum var. coloradense (C. coloradense)	Colorado thistle	< 1
Hieracium gracile var. gracile (Chlorocrepis tristis)	slender hawkweed	< 1
Penstemon whippleanus	Whipple's penstemon	< 1
Poa alpina	alpine bluegrass	< 1
Senecio crassulus	thickleaf groundsel	< 1
Taraxacum officinale	common dandelion	< 1
Vaccinium scoparium	grouse whortleberry	< 1

Abies lasiocarpa-Picea engelmannii / Vaccinium scoparium p.a. (Johnston 1987)
Picea engelmannii-Abies lasiocarpa / Vaccinium scoparium h.t. (Hess and Wasser 1982).

Abies lasiocarpa / Vaccinium scoparium p.a. G5S5 (Colorado Natural Heritage Program 1995 b)

Plot 15 (100 X 100 ft.)

UTM's: 347,350 E / 4,325,500 N
USGS Quadrangle: Hayden Peak, CO 3910617
Elevation: 11,360 ft.
Slope: 10 degrees
Aspect: 212 degrees

Bare ground		5 - 25
Rock		1 - 5
Picea engelmannii	Engelmann's spruce	5 - 25
Abies lasiocarpa	subalpine fir	5 - 25
Vaccinium scoparium	grouse whortleberry	50 - 75
Arnica cordifolia	heartleaf arnica	< 1
Senecio amplexans var. amplexans (Ligularia)	showy alpine groundsel	< 1

Abies lasiocarpa-Picea engelmannii / Vaccinium scoparium p.a. (Johnston 1987)
Picea engelmannii-Abies lasiocarpa / Vaccinium scoparium h.t. (Hess and Wasser 1982).

Abies lasiocarpa / Vaccinium scoparium p.a. G5S5 (Colorado Natural Heritage Program 1995 b)

Plot 16 (100 X 100 ft.)

UTM's: 347,250 E / 4,326,900 N
 USGS Quadrangle: Hayden Peak 3910617
 Elevation: 11,400 ft.
 Slope: 20 degrees
 Aspect: 32 degrees

Bare ground		25 - 50
Rock		5 - 25
Vaccinium scoparium	grouse whortleberry	25 - 50
Picea engelmannii	Engelmann's spruce	5 - 25
Pedicularis racemosa	sickletop lousewort	5 - 25
Arnica cordifolia	heartleaf arnica	1 - 5
Antennaria rosea	rosy pussytoes	< 1
Cirsium tioganum var.coloradense (C. coloradense)	Colorado thistle	< 1
Fragaria virginiana	Virginia strawberry	< 1
Penstemon whippleanus	Whipple's penstemon	< 1

Acomastylis rossii / Carex rupestris p.a. (Johnston 1987)
 (Geum rossii / Carex rupestris)
Carex rupestris / Geum rossii h.t. (Hess and Wasser 1982).

Carex rupestris / Geum rossii p. a. G4S4 (Colorado Natural Heritage Program 1995 b)

Plot 17

Sampled 8 random mini-plots (1 X 1 ft.) on dry tundra, within 50 X 50 foot area.

UTM's: 347,600 E / 4,324,200 N

USGS Quadrangle: Hayden Peak, CO 3910617

Elevation: 11,800 ft.

Slope: level

Aspect: na

Raw data:

	A:	B.	C.	D.	E.	F.	G.	H.
Bare ground	5 - 25	5 - 25	5 - 25	25 - 50	5 - 25	5 - 25	< 1	5 - 25
includes fine gravel								
Rock	--	50 - 75	1 - 5	5 - 25	--	1 - 5	--	--
Selaginella densa	50 - 75	--	--	--	--	--	--	--
(lesser spikemoss)								
Potentilla diversifolia	1 - 5	1 - 5	< 1	--	1 - 5	1 - 5	--	--
(varileaf cinquefoil)								
Geum rossii var. turbinatum	1 - 5	5 - 25	--	1 - 5	--	--	1 - 5	25 - 50
(Acomastylis) Ross' avens								
Saxifraga rhomboidea	< 1	--	--	--	--	--	--	--
(Micranthes)diamondleaf saxifrage								
Silene acaulis var. subacaulescens	< 1	5 - 25	< 1	< 1	5 - 25	< 1	< 1	--
moss campion								
Polemonium viscosum	--	< 1	--	--	5 - 25	< 1	--	--
sticky polemonium								
Pedicularis parryi	--	--	< 1	--	< 1	--	--	--
--								
Carex sp.	--	< 1	--	1 - 5	25 - 50	5 - 25	--	--
Tetranuris grandiflora (Rydbergia)--	--	--	< 1	--	--	--	--	--
graylocks hymenoxys								
Moss	--	--	--	1 - 5	--	--	--	--
Lichen	--	--	--	--	--	< 1	50 - 75	--
Minuartia obtusiloba (Lidia)	--	--	--	--	--	< 1	< 1	--
twinflower sandwort								
Castilleja occidentalis	--	--	--	--	--	--	< 1	--
western Indian paintbrush								
Artemisia scopulorum	--	--	--	--	--	--	1 - 5	--
alpine sagebrush								
Erigeron melanocephalus	--	--	--	--	--	--	< 1	--
blackhead fleabane								
Sibbaldia procumbens	--	--	--	--	--	--	1 - 5	5 - 25
creeping sibbaldia								
Thlaspi montanum (Noccaea)	--	--	--	--	--	--	--	< 1
alpine pennycress								

Constancy, mean cover using mid-points of cover classes, modal cover.

	% plots	cover: mean	cover: mode
Bare ground includes fine gravel	100	20	5-25
Rock	50	11	--
Selaginella densa (lesser spikemoss)	12.5	8	--
Potentilla diversifolia (varileaf cinquefoil)	62.5	1	1 - 5
Geum rossii var. turbinatum (Acomastylis) Ross' avens	62.5	8	1 - 5
Saxifraga rhomboidea (Micranthes)diamondleaf saxifrage	12.5	< 1	--
Silene acaulis var. subcaulescens moss campion	87.5	5	< 1
Polemonium viscosum sticky polemonium	37.5	2.5	--
Pedicularis parryi	25	< 1	--
Carex sp.	50	7.5	--
Tetraneuris grandiflora (Rydbergia) graylocks hymenoxys	12.5	< 1	--
Moss	12.5	< 1	--
Lichen	25	8	--
Minuartia obtusiloba (Lidia) twinflor sandwort	25	< 1	--
Castilleja occidentalis western Indian paintbrush	12.5	< 1	--
Artemisia scopulorum alpine sagebrush	12.5	< 1	--
Erigeron melanocephalus blackhead fleabane	12.5	< 1	--
Sibbaldia procumbens creeping sibbaldia	25	3	--
Thlaspi montanum (Noccaea) alpine pennycress	12.5	< 1	--

Highest constancy = Silene, Potentilla and Geum.

In retrospect, if a species occurred at all in a plot as small as 1 X 1 ft., then it probably deserves at least a 1 - 5 score. If all < 1 are changed to 1 - 5, then total of average cover of all species plus bare ground and rock comes to 98.

Converted to standard form:

Bare ground (includes fine gravel)	5-25
Rock	5 - 25
Carex sp. (rupestris?)	5 - 25
Geum rossii var. turbinatum	5 - 25
Lichen	5 - 25
Selaginella densa	5 - 25
Silene acaulis var. subcaulescens	5 - 25
Polemonium viscosum	1 - 5
Potentilla diversifolia	1 - 5
Sibbaldia procumbens	1 - 5

<i>Artemisia scopulorum</i>	< 1	
<i>Castilleja occidentalis</i>	< 1	
<i>Erigeron melanocephalus</i>	< 1	
<i>Minuartia obtusiloba</i> (Lidia)	< 1	
Moss	< 1	
<i>Pedicularis parryi</i>	< 1	< 1
<i>Saxifraga rhomboidea</i>	< 1	
<i>Tetraneuris grandiflora</i> (Rydbergia)	< 1	
<i>Thlaspi montanum</i> (Noccaea)	< 1	

Salix phyllicifolia ssp. planifolia / Deschampsia cespitosa p.a. (Johnston 1987)

(Salix planifolia / Deschampsia cespitosa)

This is the best fit in Johnston, as it includes Eleocharis quinqueflora, Caltha leptosepala and Carex scopulorum in the species list. It doesn't seem to have a counterpart in the Colorado Natural Heritage Program list. Salix planifolia / Deschampsia cespitosa is listed in Bourgeron and Engelking (1994) with a reference to Hess and Wasser (1982). However, it is not listed in that publication under that name. It is similar to Hess and Wasser's Salix planifolia / Caltha leptosepala h.t.

Salix planifolia-Salix brachycarpa / Caltha leptosepala p. a. G2G3 S2S3

Plot 18 (100 X 100 ft.)

Sampled east of Bruin Creek in peat fen with some standing water and dry hummocks.

UTM's: 351,700 E / 4,324,450 N

USGS Quadrangle: New York Peak, CO 3910616

Elevation: 11,840 ft.

Slope: 15 degrees

Aspect: 232 degrees

Bare ground		1 - 5	
Rock		< 1	
Open water		1 - 5	
Eleocharis quinqueflora	fewflower spikerush	25 - 50	
Salix planifolia (S. phyllicifolia ssp. planifolia)	diamondleaf willow		25 - 50
Carex norvegica ssp. norvegica	Norway sedge	5 - 25	
Moss		5 - 25	
Trifolium dasyphyllum	alpine clover	5 - 25	
Caltha leptosepala (Psychrophila)	white marshmarigold	1 - 5	
Carex scopulorum	mountain sedge	1 - 5	
Deschampsia cespitosa	tufted hairgrass	1 - 5	
Pedicularis groenlandica	elephanthead lousewort	1 - 5	
Picea engelmannii	Engelmann's spruce	1 - 5	
Salix brachycarpa	barrenground willow		1 - 5
Senecio triangularis	arrowleaf groundsel	1 - 5	
Arnica mollis	hairy arnica	< 1	
Carex ebenea	ebony sedge	< 1	
Epilobium hornemannii	Hornemann's willowherb	< 1	
Equisetum arvense	field horsetail	< 1	
Erigeron peregrinus ssp. callianthemus	subalpine fleabane	< 1	
Phleum alpinum (P. commutatum)	alpine timothy	< 1	
Poa leptocoma	bog bluegrass	< 1	
Polygonum viviparum (Bistorta)	alpine bistort	< 1	
Saxifraga oregana (Micranthes)	Oregon saxifrage	< 1	
Sedum integrifolium (Rhodiola)	entireleaf stonecrop	< 1	
Senecio dimorphophyllus	splitleaf groundsel	< 1	
Swertia perennis	star gentian	< 1	
Veronica wormskjoldii (V. nutans)	American alpine speedwell		< 1

Abies lasiocarpa-Picea engelmannii / Senecio triangularis p.a. (Johnston 1987)

Similar to, but a little wetter than, Abies lasiocarpa-Picea engelmannii / Vaccinium myrtillus p.a. (Johnston 1987) Also similar to Picea engelmannii / Caltha leptosepala p.a. (Johnston 1987)

Abies lasiocarpa / Senecio triangularis p. a. G2G3 S2S3 (Colorado Natural Heritage Program 1995 b)

Plot 19 (100 X 100 ft.)

Sampled in wet forested area above Bruin Creek. Trees were large and widely spaced. Largest trees were >30 in. dbh. There were 10 dead and down, and 5 standing dead trees in the plot. Also in the area, but not in the plot, were *Carex geyeri*, *Polemonium pulcherrimum*, *Arnica cordifolia*, and *Mertensia ciliata*.

UTM's: 351,950 E / 4,324,600 N

USGS Quadrangle: New York Peak, CO 3910616

Elevation: 11,750 ft.

Slope: 20 degrees

Aspect: 232 degrees

Bare ground		5 - 25
Rock		< 1
Picea engelmannii	Engelmann's spruce	25 - 50
Sibbaldia procumbens	creeping sibbaldia	5 - 25
Vaccinium myrtillus var. oreophilum	whortleberry	5 - 25
Calamagrostis canadensis	bluejoint	1 - 5
Caltha leptosepala (Psychrophila)	white marshmarigold	1 - 5
Cardamine cordifolia	heartleaf bittercress	1 - 5
Carex microptera	smallwing sedge	1 - 5
Poa reflexa	nodding bluegrass	1 - 5
Ribes montigenum	gooseberry currant	1 - 5
Saxifraga odontoloma (Micranthes)	brook saxifrage	1 - 5
Senecio triangularis	arrowleaf groundsel	1 - 5
Epilobium hornemannii	Hornemann's willowherb	< 1
Erigeron melanocephalus	blackhead fleabane	< 1
Hieracium gracile	var. gracile (Chlorocrepis tristis) slender hawkweed	< 1
Luzula parviflora	smallflowered woodrush	< 1
Mitella pentandra	five-stamen miterwort	< 1
Oxypolis fendleri	Fendler's cowbane	< 1
Potentilla diversifolia	varileaf cinquefoil	< 1
Swertia perennis	star gentian	< 1
Viola biflora (V. canadensis, V. scopulorum)	field pansy	< 1

Abies lasiocarpa-Picea engelmannii / Vaccinium myrtillus p.a. (Johnston 1987)

Also similar to Pinus contorta / Shepherdia canadensis p.a. (Johnston 1987)

Abies lasiocarpa / Vaccinium myrtillus p. a. G5S5 (Colorado Natural Heritage Program 1995 b)

Plot 20 (Photo 8)

Sampled on steep hillside above bench. The lodgepole pines are large (18 in. dbh) with rounded tops, and widely spaced, while the firs, which account for more areal cover, are smaller (to 30 or 40 ft., 10-12 in. dbh.). There were about 7 dead and down trees and 2 standing dead trees in the plot. There was some regrowth of lodgepole, but most understory trees were aspen or fir.

UTM's: 347,800 E / 4,331,450 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 9,520 ft.

Slope: 50 degrees

Aspect: 332 degrees

Bare ground		25 - 50
Rock		25 - 50
Abies lasiocarpa	subalpine fir	50 - 75
Vaccinium myrtillus		25 - 50
Moss-lichen		25 - 50
Pinus contorta		5 - 25
Shepherdia canadensis		1 - 5
Populus tremuloides	quaking aspen	1 - 5
Chimaphila umbellata		< 1
Orthilia secunda	sidebells wintergreen	< 1
Senecio sp.		< 1
Paxistima myrsinites	mountain lover	< 1
Rosa woodsii	Woods' rose	< 1
Erigeron eximius		< 1

Abies lasiocarpa /Alnus incana ssp. tenuifolia / Senecio triangularis (unclassified)

Possibly similar to Bourgeron and Engelking (1994) III.B.3.c. *Alnus incana*/Mesic Forb, ref. 1052,1134. This fits Abies lasiocarpa-Picea engelmannii / Senecio triangularis p. a. (Johnston 1987) well, except that *Alnus* is not mentioned there.

Abies lasiocarpa / Senecio triangularis p. a. G2G3 S2S3 (Colorado Natural Heritage Program 1995 b)

Plot 21 (30 X 50 ft.)

Sampled in riparian area along tributary of Difficult Creek. The creek is narrow, deeply entrenched, partially underground. Adjacent uplands have large (18 in. dbh) aspen, and higher up, lodgepole and subalpine fir.

UTM's: 347,550 E / 4,331,300 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 9,800 ft.

Slope: 15 degrees

Aspect: 33 degrees

Bare ground		1 - 5
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	thinleaf alder	25 - 50
<i>Senecio triangularis</i>	arrowleaf groundsel	25 - 50
<i>Abies lasiocarpa</i>	subalpine fir	1 - 5
<i>Actaea rubra</i>	red baneberry	1 - 5
<i>Disporum trachycarpum</i>	roughfruit fairybells	1 - 5
<i>Mertensia ciliata</i>	mountain bluebells	1 - 5
<i>Ribes montigenum</i>	gooseberry currant	1 - 5
<i>Orthilia secunda</i>	sidebells wintergreen	< 1

Pinus contorta / Vaccinium myrtillus p.a. (Johnston 1987)

Also similar to Pinus contorta / Shepherdia canadensis p.a. (Johnston 1987); that plant association, however, is subtitled “Persistent Lodgepole Pine Forests” (Colorado Natural Heritage Program 1995 b), and the presence of *Abies lasiocarpa* in the understory supports the common name “Seral Lodgepole Pine Forests” which is given to Pico/Vasc. Neither Colorado Natural Heritage Program (1995 b) nor Bourgeron and Engelking, (1994) list Pico/Vamy; however, Johnston’s Pico/Vasc also lists *Vaccinium myrtillus*.

Pinus contorta / Vaccinium scoparium p. a. G5S4 (Colorado Natural Heritage Program 1995 b)

Plot 22(100 X 100 ft.)

Sampled on steep, well drained hillside.

UTM’s: 347,350 E / 4,331,600 N

USGS Quadrangle: Hayden Peak 3910617

Elevation: 9,400 ft.

Slope: 60 degrees

Aspect: 42 degrees

Bare ground		50 - 75	
Rock		< 1	
Pinus contorta	lodgepole pine	75 - 95	
Vaccinium myrtillus var. oreophilum	whortleberry		25 - 50
Paxistima myrsinites	mountain lover	5 - 25	
Abies lasiocarpa	subalpine fir	1 - 5	
Shepherdia canadensis	russet buffaloberry	1 - 5	
Chimaphila umbellata ssp. occidentalis	pipsissewa	< 1	
Mahonia repens	Oregon grape	< 1	
Rosa woodsii	Woods’ rose	< 1	

Vaccinium scoparium-Vaccinium cespitosum / Lidia biflora p.a. (Johnston 1987)

This is the closest named plant association found. Although only four of the eighteen species listed in Johnston occur in this plot, most of them are found in the area.

Vaccinium cespitosum / Vaccinium scoparium p. a. G4S4? (Colorado Natural Heritage Program 1995 b)

Plot 23 (10 X 10 ft.) Photo 30

Sampled on tundra, just above krummholz, between two forks of Bruin Creek.

UTM's: 351,300 E / 4,324,350 N

USGS Quadrangle: New York Peak 3910616

Elevation: 11,880 ft.

Slope: 15 degrees

Aspect: 232 degrees

Bare ground		5 - 25	
Rock		< 1	
Vaccinium cespitosum	dwarf blueberry	25 - 50	
Deschampsia cespitosa	tufted hairgrass	5 - 25	
Geum rossii var. turbinatum (Acomastylis)	Ross' avens	5 - 25	
Potentilla diversifolia	varileaf cinquefoil		1 - 5
Androsace septentrionalis	pygmyflower rockjasmine	< 1	
Artemisia scopulorum	alpine sagebrush	< 1	
Carex microptera	smallwing sedge	< 1	
Poa alpina	alpine bluegrass	< 1	
Pseudocymopterus montanus	alpine false springparsley	< 1	
Viola labradorica	alpine violet	< 1	

Similar to Sibbaldia procumbens / Lidia biflora p.a. (Johnston 1987)

Sibbaldia procumbens p. a. G4G5 S4S5 (Colorado Natural Heritage Program 1995 b)

Plot 24 (25 X 25 ft.) Photo 32

Sampled above the west fork of Bruin Creek. The surrounding area has even more *Podistera eastwoodiae* which is a Colorado endemic.

UTM's: 351,050 E / 4,323,700 N

USGS Quadrangle: New York Peak 3910616

Elevation: 12,120 ft.

Slope: 45 degrees

Aspect: 2 degrees

Bare ground		25 - 50
Rock (< 1 m.)		5 - 25
Festuca brachyphylla ssp. coloradense	Colorado fescue	5 - 25
Podistera eastwoodiae	Eastwood's podistera	5 - 25
Sibbaldia procumbens	creeping sibbaldia	5 - 25
Geum rossii var. turbinatum (Acomastylis)	Ross' avens	1 - 5
Caltha leptosepala (Psychrophila)	white marshmarigold	< 1
Castilleja occidentalis	western Indian paintbrush	< 1
Polygonum bistortoides (Bistorta)	American bistort	< 1
Saxifraga rhomboidea (Micranthes)	diamondleaf saxifrage	< 1

Salix phylicifolia ssp. planifolia / Deschampsia cespitosa p.a. (Johnston 1987)

(*Salix planifolia* / *Deschampsia cespitosa*) This is a fairly good fit, except that Johnston's plant association doesn't mention *Senecio triangularis* or *Mertensia ciliata*. These taller forbs were in a protected area at the base of a hill.

Salix planifolia / Deschampsia cespitosa p. a. G2G3 S2S3 (Bourgeron and Engelking, 1994)

Plot 25 (50 X 50 ft.) Photo 34

Sampled on wet hillside above Goodwin Greene cabin.

UTM's: 350,100 E / 4,323,800 N

USGS Quadrangle: New York Peak 3910616

Elevation: 11,760 ft.

Slope: 5 degrees

Aspect: 230 degrees

Bare ground		< 1	
Rock		< 1	
<i>Salix planifolia</i> (<i>S. phylicifolia</i> ssp. <i>planifolia</i>)	diamondleaf willow		50 - 75
<i>Senecio triangularis</i>	arrowleaf groundsel	25 - 50	
<i>Polygonum bistortoides</i> (<i>Bistorta</i>)	American bistort	1 - 5	
<i>Deschampsia cespitosa</i>	tufted hairgrass	5 - 25	
<i>Juncus drummondii</i>	Drummond's rush	5 - 25	
<i>Mertensia ciliata</i>	mountain bluebells	1 - 5	
<i>Angelica pinnata</i>	smallleaf angelica		< 1
<i>Arnica mollis</i>	hairy arnica	< 1	
<i>Erigeron peregrinus</i> ssp. <i>callianthemus</i>	subalpine fleabane	< 1	
<i>Pedicularis groenlandica</i>	elephanthead lousewort	< 1	
<i>Phleum alpinum</i> (<i>P. commutatum</i>)	alpine timothy	< 1	
<i>Potentilla diversifolia</i>	varileaf cinquefoil		< 1
<i>Saxifraga oregana</i> (<i>Micranthes</i>)	Oregon saxifrage	< 1	
<i>Senecio dimorphophyllus</i>	splitleaf groundsel	< 1	
<i>Veronica wormskjoldii</i> (<i>V. nutans</i>)	American alpine speedwell		< 1

APPENDIX 2

PLANT SPECIES OBSERVED AT DIFFICULT CREEK POTENTIAL RNA SITE

Scientific names follow the USDA Soil Conservation Service (1994). Synonyms used by Weber (1987) are included in parentheses (small differences such as slight changes by Weber in spelling or the difference between ssp. and var. are not noted). If either of these names differs from those used in Johnston (1987), the name in Johnston is also included in parentheses with an *. Common names follow the U. S. D. A. Soil Conservation Service PLANTS list. Species listed by the Colorado Natural Heritage Program as Colorado Species of Special Concern are followed by CSSC. Adventive species are followed by ADV.

SCIENTIFIC NAME

COMMON NAME

Trees

<i>Abies lasiocarpa</i>	subalpine fir
<i>Picea engelmannii</i>	Engelmann's spruce
<i>Pinus contorta</i>	lodgepole pine
<i>Populus tremuloides</i>	quaking aspen

Shrubs

<i>Alnus incana</i> ssp. <i>tenuifolia</i>	thinleaf alder
<i>Mahonia repens</i>	Oregongrape
<i>Paxistima myrsinites</i>	mountain lover
<i>Ribes montigenum</i>	gooseberry currant
<i>Ribes wolfii</i>	Wolf's currant
<i>Rosa woodsii</i>	Woods' rose
<i>Salix arctica</i>	arctic willow
<i>Salix brachycarpa</i>	barrenground willow
<i>Salix planifolia</i>	diamondleaf willow
<i>Salix reticulata</i> ssp. <i>navalis</i>	snow willow
<i>Sambucus racemosa</i> (<i>S. microbotrys</i>)	European red elderberry
<i>Shepherdia canadensis</i>	russet buffaloberry
<i>Vaccinium cespitosum</i>	dwarf blueberry
<i>Vaccinium myrtillus</i> var. <i>oreophilum</i>	whortleberry
<i>Vaccinium scoparium</i>	grouse whortleberry

Graminoids

<i>Agrostis stolonifera</i> (<i>A. alba</i>)	creeping bentgrass
<i>Calamagrostis canadensis</i>	bluejoint
<i>Carex aquatilis</i> var. <i>stans</i>	water sedge
<i>Carex ebenea</i>	ebony sedge
<i>Carex elynoides</i>	blackroot sedge
<i>Carex geyeri</i>	elk sedge
<i>Carex haydeniana</i>	cloud sedge
<i>Carex heteroneura</i> var. <i>chalciolepis</i> (<i>C. chalciolepis</i>)	Holm sedge
<i>Carex illota</i>	sheep sedge
<i>Carex microptera</i>	smallwing sedge

<i>Carex nigricans</i>	black alpine sedge
<i>Carex norvegica</i> ssp. <i>norvegica</i>	Norway sedge
<i>Carex nova</i>	black sedge
<i>Carex saxatilis</i> var. <i>saxatilis</i>	russet sedge
<i>Carex scopulorum</i>	mountain sedge
<i>Carex utriculata</i>	Northwest Territory sedge
<i>Deschampsia cespitosa</i>	tufted hairgrass
<i>Eleocharis quinqueflora</i>	fewflower spikerush
<i>Elymus lanceolatus</i>	streambank wheatgrass
<i>Elymus trachycaulus</i>	slender wheatgrass
<i>Festuca brachyphylla</i> ssp. <i>coloradensis</i>	Colorado fescue
<i>Juncus drummondii</i>	Drummond's rush
<i>Juncus parryi</i>	Parry's rush
<i>Kobresia myosuroides</i>	Bellardi kobresia
<i>Luzula parviflora</i>	smallflowered woodrush
<i>Luzula spicata</i>	spiked woodrush
<i>Phleum alpinum</i> (P. <i>commutatum</i>)	alpine timothy
<i>Poa alpina</i>	alpine bluegrass
<i>Poa fendleriana</i> (P. <i>cusickii</i> ssp. <i>epilis</i>)	muttongrass
<i>Poa glauca</i> ssp. <i>rupicola</i>	timberline bluegrass
<i>Poa interior</i>	inland bluegrass
<i>Poa leptocoma</i>	bog bluegrass
<i>Poa nervosa</i>	Wheeler bluegrass
<i>Poa reflexa</i>	nodding bluegrass
<i>Trisetum spicatum</i> ssp. <i>montanum</i>	spike trisetum

Forbs

<i>Achillea millefolium</i> var. <i>occidentalis</i> (A. <i>lanulosa</i>)	western yarrow
<i>Actaea rubra</i>	red baneberry
<i>Agoseris aurantiaca</i>	orange agoseris
<i>Agoseris glauca</i> var. <i>dasycephala</i>	pale agoseris
<i>Androsace septentrionalis</i>	pygmyflower rockjasmine
<i>Angelica pinnata</i>	smallleaf angelica
<i>Antennaria rosea</i>	rosy pussytoes
<i>Arabis</i> (Boechera) <i>drummondii</i>	Drummond's rockcress
<i>Arabis lemmonii</i> var. <i>lemmonii</i>	Lemmon's rockcress
<i>Arenaria congesta</i> (Eremogene)	* sandwort
<i>Arnica cordifolia</i>	heartleaf arnica
<i>Arnica mollis</i>	hairy arnica
<i>Arnica parryi</i>	Parry's arnica
<i>Arnica rydbergii</i>	Rydberg's arnica
<i>Artemisia scopulorum</i>	alpine sagebrush
<i>Besseyia alpina</i>	alpine besseyia
<i>Caltha leptosepala</i> (Psychrophila)	white marshmarigold
<i>Cardamine cordifolia</i>	heartleaf bittercress
<i>Castilleja occidentalis</i>	western Indian paintbrush
<i>Castilleja rhexifolia</i>	rosy Indian paintbrush*
<i>Cerastium beeringianum</i> ssp. <i>earlii</i>	Earl's chickweed
<i>Chimaphila umbellata</i> ssp. <i>occidentalis</i>	pipsissewa
<i>Cirsium tioganum</i> var. <i>coloradense</i> (C. <i>coloradense</i>)	Colorado thistle
<i>Coralorhiza striata</i>	striped coralroot
<i>Disporum trachycarpum</i>	roughfruit fairybells
<i>Draba crassifolia</i>	snowbed whitlowgrass

<i>Epilobium angustifolium</i> (<i>Chamerion danielsii</i>)	fireweed	
<i>Equisetum arvense</i>	field horsetail	
<i>Erigeron elatior</i>	tall fleabane	CSSC
<i>Erigeron eximius</i>	sprucefir fleabane	
<i>Erigeron melanocephalus</i>	blackhead fleabane	CSSC
<i>Erigeron peregrinus</i> ssp. <i>callianthemus</i>	subalpine fleabane	
<i>Erigeron pinnatisectus</i>	featherleaf fleabane	CSSC
<i>Erigeron simplex</i>	onestem fleabane	
<i>Eritrichum aretoides</i>	alpine forget-me-not*	
<i>Fragaria virginiana</i>	Virginia strawberry	
<i>Geum rossii</i> var. <i>turbinatum</i> (<i>Acomastylis</i>)	Ross' avens	
<i>Helianthella quinquenervis</i>	fivenerve helianthella	
<i>Hieracium gracile</i> var. <i>gracile</i> (<i>Chlorocrepis tristis</i>)	slender hawkweed	
<i>Lewisia pygmaea</i> (<i>Oreobrama</i>)	pygmy bitterroot*	
<i>Lloydia serotina</i>	common alplily	
<i>Mertensia ciliata</i>	mountain bluebells	
<i>Mertensia lanceolata</i> var. <i>lanceolata</i>	prairie bluebells	
<i>Minuartia obtusiloba</i> (<i>Lidia</i>) (<i>Lidia biflora</i> *)	twinflor sandwort	
<i>Mitella pentandra</i>	festamen miterwort	
<i>Orthilia secunda</i>	sidebells wintergreen	
<i>Oxypolis fendleri</i>	Fendler's cowbane	
<i>Pedicularis groenlandica</i>	elephanthead lousewort	
<i>Pedicularis parryi</i>	parry's lousewort	
<i>Pedicularis racemosa</i>	sicketop lousewort	
<i>Pedicularis sudetica</i> ssp. <i>scopulorum</i> (<i>P. scopulorum</i>)	sudetic lousewort	
<i>Penstemon whippleanus</i>	Whipple's penstemon	
<i>Phacelia sericea</i>	purplefringe	
<i>Podistera eastwoodiae</i>	Eastwood's podistera	
<i>Polemonium pulcherrimum</i> ssp. <i>delicatum</i>	skunkweed polemonium	
<i>Polemonium viscosum</i>	sticky polemonium	
<i>Polygonum bistortoides</i> (<i>Bistorta</i>)	American bistort	
<i>Polygonum viviparum</i> (<i>Bistorta</i>)	alpine bistort	
<i>Potentilla diversifolia</i>	varileaf cinquefoil	
<i>Primula parryi</i>	Parry's primrose	
<i>Saxifraga bronchialis</i> ssp. <i>austromontana</i> (<i>Cilaria austromontana</i>)	matted saxifrage	
<i>Saxifraga flagellaris</i> ssp. <i>crandallii</i> (<i>Hirculus platysepalus</i>)	Crandall's saxifrage	
<i>Saxifraga odontoloma</i> (<i>Micranthes</i>)	brook saxifrage	
<i>Saxifraga oregana</i> (<i>Micranthes</i>)	Oregon saxifrage	
<i>Saxifraga rhomboidea</i> (<i>Micranthes</i>)	diamondleaf saxifrage	
<i>Sedum integrifolium</i> (<i>Rhodiola</i>)	entireleaf stonecrop	
<i>Sedum rhodanthum</i> (<i>Clementsia</i>)	redpod stonecrop	
<i>Selaginella densa</i>	lesser spikemoss	
<i>Senecio amplexens</i> var. <i>amplexens</i> (<i>Ligularia</i>)	showy alpine groundsel	
<i>Senecio crassulus</i>	thickleaf groundsel	
<i>Senecio crocatus</i>	saffron ragwort	
<i>Senecio dimorphophyllus</i> var. <i>dimorphophyllus</i>	splitleaf groundsel	
<i>Senecio fremontii</i> var. <i>blitoides</i>	dwarf mountain ragwort	
<i>Senecio pseudoaureus</i> var. <i>flavulus</i>	falsegold groundsel	
<i>Senecio triangularis</i>	arrowleaf groundsel	
<i>Senecio wernerifolius</i>	hoary groundsel	
<i>Sibbaldia procumbens</i>	creeping sibbaldia	
<i>Silene acaulis</i> var. <i>subacaulescens</i>	moss campion	
<i>Silene drummondii</i> var. <i>drummondii</i> (<i>Gastrolychnis</i>)	Drummond's campion	
<i>Smelowskia calycina</i>	alpine smelowskia	

Solidago parryi (Oreochrysum)	Parry's goldenrod	
Stellaria umbellata	umbrella starwort	
Swertia perennis	star gentian	
Taraxacum officinale	common dandelion	ADV
Tetraneuris grandiflora (Rydbergia)	graylocks hymenoxys	
Thlaspi montanum (Noccaea)	alpine pennycress	
Tonestus pygmaeus	pygmy goldenweed	
Trifolium dasyphyllum	alpine clover	
Trifolium parryi (T. salictorum)	Parry's clover	
Trollius laxus ssp. albiflorus (T. albiflorus)	American globeflower	
Veronica wormskjoldii (V. nutans)	American alpine speedwell	
Viola biflora (V. canadensis, V. scopulorum, V. epipsaloides)	field pansy	
Viola labradorica	alpine violet	

APPENDIX 3

Species observed along Difficult Trail, adjacent to boundary, expected to be representative of other parallel drainages at this elevation (not included in Appendix 1)

By Roaring Fork and campground:

<i>Pseudotsuga menziesii</i>	Douglas fir
<i>Ceanothus velutinus</i> *	snowbrush ceanothus
<i>Prunus (Padus) virginiana</i> var. <i>melanocarpa</i>	black chokecherry
<i>Paxistima myrsinites</i>	mountain lover
<i>Eriogonum umbellatum</i> var. <i>umbellatum</i>	sulphurflower buckwheat
<i>Amelanchier alnifolia</i>	Saskatoon serviceberry
<i>Populus tremuloides</i>	quaking aspen
<i>Quercus gambelii</i>	Gambel's oak

At wilderness boundary, and along trail:

<i>Acer glabrum</i>	Rocky Mountain maple
<i>Amelanchier alnifolia</i>	Saskatoon serviceberry
<i>Aster foliaceus</i> var. <i>foliaceus</i>	alpine leafybract aster
<i>Carex geyeri</i>	elk sedge
<i>Chimaphila umbellata</i> ssp. <i>occidentalis</i>	pipsissewa
<i>Cornus stolonifera</i> (<i>Swida sericea</i>)	red-oshier dogwood
<i>Cystopteris fragilis</i>	brittle bladderfern
<i>Goodyera oblongifolia</i>	western rattlesnake plantain
<i>Juniperus communis</i> var. <i>montana</i> (ssp. <i>alpina</i>)	common juniper
<i>Orthilia secunda</i>	sidebells wintergreen
<i>Osmorhiza depauperata</i>	bluntseed sweetroot
<i>Paxistima myrsinites</i>	mountain lover
<i>Pinus contorta</i>	lodgepole pine
<i>Populus angustifolia</i>	narrowleaf cottonwood
<i>Populus tremuloides</i>	quaking aspen
<i>Pseudotsuga menziesii</i>	Douglas fir
<i>Pterospora andromedea</i>	woodland pinedrops
<i>Pyrola asarifolia</i> (<i>rotundifolia</i>) ssp. <i>asarifolia</i>	liverleaf wintergreen
<i>Rosa woodsii</i>	Woods' rose
<i>Rubiacer parviflorum</i>	thimbleberry
<i>Sambucus racemosa</i> (<i>S. microbotrys</i>)	European red elderberry
<i>Vaccinium myrtillus</i> var. <i>oreophilum</i>	whortleberry
<i>Viola biflora</i> (<i>V. canadensis</i> , <i>V. scopulorum</i>)	field pansy
<i>Woodsia oregana</i>	Woods fern
<i>Maianthemum (Smilacina) stellatum</i>	starry false Solomon's seal
<i>Bromus ciliatus</i> (<i>Bromopsis canadensis</i>)	fringed brome
<i>Trifolium hybridum</i>	alsike clover
<i>Coralorhiza striata</i>	striped coralroot
<i>Erigeron speciosus</i>	aspen fleabane
<i>Achillea millefolium</i> var. <i>occidentalis</i> (<i>A. lanulosa</i>)	western yarrow

**COVER TYPES OF THE
DIFFICULT CREEK POTENTIAL RESEARCH NATURAL AREA**

Legend

- sf** Engelmann spruce - subalpine fir (SAF 206)
Western spruce - fir forests (Kuchler 14)
includes plant associations:
Abies lasiocarpa-Picea engelmannii / Vaccinium scoparium
Abies lasiocarpa-Picea engelmannii / Salix glauca
Abies lasiocarpa-Picea engelmannii / Senecio triangularis
Abies lasiocarpa-Picea engelmannii / Vaccinium myrtillus
- lp** Lodgepole pine (SAF 218)
includes plant association:
Pinus contorta / Vaccinium myrtillus
- w** Willow
includes plant associations:
Salix planifolia / Caltha leptosepala
Salix planifolia / Deschampsia cespitosa
- as** Aspen (SAF 217)
includes series:
Populus tremuloides
- g** Grasslands
includes plant associations:
Carex scopulorum / Caltha leptosepala
Carex scopulorum / Acomastylis (Geum) rossii
Deschampsia cespitosa / Acomastylis (Geum) rossii
Juncus drummondii / Carex spp.
- f** Forblands
includes plant associations:
Acomastylis (Geum) rossii / Carex rupestris
Caltha leptosepala / Clementsia rhodantha
Cardamine cordifolia / Caltha leptosepala
Pedicularis groenlandica / Eleocharis quinqueflora
Sibbaldia procumbens / Lidia biflora
Vaccinium scoparium -Vaccinium cespitosum / Lidia biflora
- r** Rock outcrops with little or no vegetation.
- Potential RNA boundary

