# FIELD INVESTIGATIONS OF *ASTRAGALUS JEJUNUS* (STARVELING MILKVETCH), *CRYPTANTHA BREVIFLORA* (UINTA BASIN CRYPTATH) AND *ERIOGONUM BREVICAULE* VAR. *LAXIFOLIUM* (VARYING BUCKWHEAT) ON THE CARIBOU NATIONAL FOREST

by

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## Abstract

An inventory for Astragalus jejunus (starveling milkvetch), Cryptantha breviflora (Uinta Basin cryptanth) and Eriogonum brevicaule var. laxifolium (varying buckwheat) was completed on the Caribou NF by the Idaho Department of Fish and Game's Natural Heritage Program during June of 1990. The inventory was a cooperative Challenge Cost-share project between the Department and the Caribou National Forest. The purpose of the inventory was to obtain population, habitat, distribution and ecological information to provide substantive conservation data useful for land resource managers.

Starveling milkvetch is endemic to extreme southeastern Idaho and adjacent portions of Wyoming and Utah. Additionally, several disjunct populations occur in east-central Nevada. Previous to 1990, ten populations of starveling milkvetch, five of which occurred on the Caribou NF, were known from Idaho. This year's inventory discovered three new populations of starveling milkvetch, one of these on the Caribou NF.

Prior to the discovery of a single Idaho population on the Caribou NF in 1978, Uinta Basin cryptanth was thought to be endemic to Utah's Uinta Basin. Seven new populations, four on the Caribou NF, were discovered during the 1990 field survey.

Varying buckwheat is known from southeastern Idaho, south into Utah. It was known from five sites near and one site on the Caribou NF. Eight new populations, with four on the Caribou NF, were discovered during the 1990 status survey.

All three species share substrate specificity to a white shale component of the Twin Creek Limestone formation. A consequence of this shared specificity is that often two, and occasionally all three species occur sympatrically.

Data collected during the 1990 investigation indicates that varying buckwheat is well represented and few threats to population viability were encountered. No specific conservation measures are recommended at this time.

Uinta Basin cryptanth and starveling milkvetch are apparently much less common, with very scattered distribution patterns and less favorable population structures. It is recommended that both of these species be given due conservation concern for land-management decisions that may affect them.

TABLE OF CONTENTS



LIST OF APPENDICES

## INTRODUCTION

The National Forest Management Act and Forest Service policy require that Forest Service land be managed to maintain populations of all existing native animal and plant species at or above the minimum viable population level. A minimum viable population consists of the number of individuals, adequately distributed throughout their range, necessary to perpetuate the existence of the species in natural, genetically stable, self-sustaining populations.

The Forest Service, along with other Federal and State agencies, has recognized the need for special planning considerations in order to protect the flora and fauna on the lands in public ownership. Species recognized by the Forest Service as needing such considerations are those that (1) are designated under the Endangered Species Act as endangered or threatened, (2) are under consideration for such designation, or (3) appear on a regional Forest Service sensitive species list.

Currently on the Caribou National Forest, there are no plant species recognized as meeting any of the above criteria. Information from pre-survey herbaria research and earlier rare plant survey work (see Shultz and Shultz 1978), revealed the following three species warranted further study to better determine their conservation status; Astragalus jejunus (starveling milkvetch), Cryptantha breviflora (Uinta Basin cryptanth) and Eriogonum brevicaule var. laxifolium (varying buckwheat). Field investigations of these species were conducted on the Caribou NF by the Idaho Department of Fish and Game's Natural Heritage Program through the Cooperative Challenge Cost-share Program.

The primary objectives of these investigations were as follows:

1) Survey known populations of the three species and search potential habitat for new populations on the Montpelier District, Caribou National Forest and nearby lands.

2) Characterize habitat conditions for the populations.

3) Assess population data on, and threats to existing populations and make management recommendations to the forest based on these assessments.

Additional information concerning the projects background, work plan, methods and objectives can be found in Appendix 1.

## RESULTS

During June 1990, botanists from the Heritage Program surveyed suitable-appearing habitats for starveling milkvetch, Uinta Basin cryptanth and varying buckwheat in the southern Preuss Range, including the Sheep Creek Hills and portions of the Bear Lake Plateau as far south and east as the Pegram Creek area. To gain a more comprehensive understanding of the conservation status for these species, selected BLM (Idaho Falls District), State of Idaho and private lands were searched in addition to Caribou NF land.

All three species were found only on barren, eroding, shale substrate belonging to the Twin Creek Limestone formation. This pattern of being restricted to relatively barren sites is consistent with habitats in adjacent Wyoming and Utah. Twin Creek Limestone surfaces sporadically in discontinuous bands in the Bear Lake Plateau area, and more extensively along the east side of the southern Preuss Range (Mansfield 1927). Outcrops of this formation exhibit a white to gray to bluish-green, porcelain-like appearance that is distinctive even from a distance. Soils derived from the shale are poorly developed. There is typically low total vegetation cover, with noticeably less vegetation than adjacent sites where greater soil development is complemented by more vegetation, especially sagebrush, other shrubs and bunchgrasses. Texture and size of the eroded and fractured shale is variable,

even on the same outcrop. The Uinta Basin cryptanth and starveling milkvetch appear sensitive to size and texture attributes of the substrate, the varying buckwheat less so. Sites supporting one, two and even all three species were found.

Astragalus jejunus During our 1990 survey, three new populations of starveling milkvetch were discovered, including one on the Caribou NF. Additionally, an attempt was made to relocate all ten previously documented starveling milkvetch sites, five each on and off-forest. Despite considerable searching, we were able to relocate only six. The four records we could not relocate were Caribou NF sites. Three of the sites not relocated are in the Montpelier Canyon area.

The nine populations inventoried this year support a total of approximately 5000-6000 plants. Most populations are relatively small, with only three found to contain more than 500 individuals. The largest known population occurs on the Montpelier Ranger District at Whiskey Flats. All populations are restricted to a narrow range of habitat conditions that are generally discontinuous and not very extensive, especially on the Caribou NF.

Cryptantha breviflora We relocated the one known population north of Montpelier Reservoir and also discovered seven new populations. Four of these new populations are on the Montpelier District of the Caribou NF, for a total of five populations now documented on the Forest. All populations are small, with only two populations known to contain over 100 plants. A total of approximately 1,300 plants were inventoried, with the majority occurring on Caribou NF land. Uinta Basin cryptanth is restricted to a narrow range of habitat conditions similar to starveling milkvetch.

Eriogonum brevicaule var. laxifolium Five of the six populations previously known from the area were relocated in 1990. In addition, eight new populations were discovered, four on the Montpelier Ranger District. We found only a single plant at two populations, all the others contained a minimum of several hundred plants, including one with over 10,000 plants. At least 16,000 plants are estimated to comprise the 14 populations documented. Varying buckwheat reaches its greatest extent on areas near, but not within Caribou NF jurisdiction. It too is restricted to a narrow range of habitat conditions, but to varying degrees it is found over much of the area where these conditions are met. This contrasts with starveling milkvetch and Uinta Basin cryptanth, which are much less common in these habitats. Overall, varying buckwheat was found to be more abundant, widespread and predictable in occurrence.

For all three species, additional plants undoubtedly occur at most of the populations, as not all the potential habitat for all populations could be searched.

The following is a detailed discussion of each species, including information on its taxonomy and identification, range and habitat, conservation status, and recommendations to the Regional Forester and Caribou NF concerning its status in Idaho.

Astragalus jejunus Wats.

CURRENT STATUS USFS - None
USFWS - None
Idaho Native Plant Society - Monitor
Heritage Rank - G4/S2

TAXONOMY

Family: Fabaceae [Leguminosae (Pea)]

Common Name: Starveling Milkvetch

Citations: in King, Rep. Geol. Explor. 40th Parallel 5: 73. 1871.

Technical Description: Dwarf, tufted perennial with a stout woody taproot and strongly developed, shortly forking, suffructiculose caudex; the minute foliage strigulose with basifixed hairs, cinereous or greenish, the leaflets pubescent on both faces or medially glabrescent above; stems of the year not over 2 (3) cm long; stipules 1.5-2.5 mm long, papery-membranous, connate into a loose sheath; leaves erect, crowded on the young shoots 1-4 (6) cm long with 9-15 (17) linear to narrowly elliptic, obtuse or subacute thick-textured leaflets 1-5 mm long; racemes shortly but loosely 3-7 flowered, the flowers spreading, the banner 5-6.5 mm long, petals pink or lavender-purple, the wing-tips paler or white; pod spreading, sessile, bladdery-inflated, obliquely obovoid or globose, (8) 10-17 x 7-11 mm, brightly red-mottled (Barneby 1964, 1989).

Nontechnical Description: Starveling milkvetch is a dwarf, compact perennial herb with a long, stout taproot; the herbage is greenish or ashy in color; leaves are erect and small with 9-15 (17) minute leaflets each; each short flowering stalk has 3-7 very small flowers, the petals are pink to lavender-purple in color except the wing-tips are paler to white; the fruit is a spreading or ascending egg to globe shaped `pea pod' that is mottled with red. See Appendix 2 for a line drawing and Appendix 6 for photographs of starveling milkvetch.

Distinguishing Features and Similar Species: Starveling milkvetch is quickly recognized by its diminutive, tufted growth habit. Its very small `pea' flowers and red-mottled pods are also distinguishable. Although several other Astragalus species are found on the Caribou NF and adjourning areas, none should be confused with starveling milkvetch, which is smaller than any of them. The barren, white shale habitat where it occurs is also distinctive. It often grows in highly localized colonies.

DISTRIBUTION

Range: Discounting disjunct populations in east-central Nevada (White Pine County), starveling milkvetch is endemic to very southeastern Idaho (Bear Lake County) and adjacent portions of southwestern Wyoming (Carbon, Lincoln, Sublette, Sweetwater and Uinta Counties) and northeastern Utah (Rich County), centering around the Bear-Green River Divide. It is known to be locally abundant in parts of its Wyoming and Utah distribution (Barneby, 1989; Neighbours 1990). On the Caribou NF and adjacent areas in Idaho, starveling milkvetch is usually found in very local colonies. Survey results revealed its overall distribution to be sporadic and localized throughout the study area.

Starveling milkvetch was first collected in Idaho near Montpelier Canyon by T.D. Phinney in 1926. His ambiguous collection site details precluded relocation in 1990. In the later half of the 1970's and early 1980's nine additional collections were made on or near the Caribou NF. On the forest, starveling milkvetch has been documented in the Whiskey Flats, Snowslide Canyon and Montpelier Canyon areas. We were unable to relocate any of the Montpelier Canyon sites in 1990, however. No starveling milkvetch was found north of Whiskey Flats, this coincides with the disappearance of the bulk of suitable-appearing habitat in that direction. No starveling milkvetch or suitable-appearing habitat was seen west of approximately

Home Canyon or east of the head of Snowslide Canyon. The majority of off-forest habitat exists to the south in the Sheep Creek Hills and Bear Lake Plateau regions. Caribou NF populations may represent the most northerly extent of the species in Idaho.

Overall, our 1990 field inventory did not significantly expand the previously documented range of starveling milkvetch on the Caribou NF or Idaho. Below is a summary of the six documented populations on the Caribou NF (the number in parenthesis refers to the occurrence number of this species in the Heritage Program data base). See Appendix 5 for the Heritage Program's element occurrence records for starveling milkvetch on the Caribou NF. These records provide additional detail on location, ownership and population data, among other things.

Snowslide Canyon (001) - southern Preuss Range, Snowslide Canyon, elevation 6900 feet; first collected by Shultz and Shultz in 1978, not relocated in 1990.

Montpelier Canyon/Telephone Draw (003) - southern Preuss Range,along Highway 89, 0.5 mile east of Crow Creek Road intersection; elevation 6750 feet; first collected by Shultz and Shultz in 1978, they noted species was abundant at collection site; not relocated in 1990.

Whiskey Flat (004) - southern Preuss Range, Whiskey Flat area,near confluences of Little Beaver Creek and Whiskey Creek with Montpelier Creek; elevation 6900 feet; first collected in 1978 by Holmgren and Albee, revisited in 1990; several thousand plants observed.

Snowslide Canyon-East (009) - southern Preuss Range, Snowslide Canyon ca. 0.5 mile east of Crow Creek Road via FS Road 801;discovered in 1990; ca. 500 plants observed.

Montpelier Canyon (012) - southern Preuss Range, Montpelier Canyon; elevation 7000 feet; first collected by Phinney in 1926, no population data given; not relocated in 1990.

Montpelier Reservoir East (013) - southern Preuss Range, north side of Montpelier Canyon at top of ridge; elevation 7500 feet; first collected by Patton in 1983, no population data given; not relocated in 1990.

See Appendix 3 for the mapped locations of known starveling milkvetch populations on the Caribou NF and Appendix 4 for a list of all areas searched.

All Caribou NF populations occur on the Montpelier Ranger District.

Habitat and Associated Species: Barneby's (1989) habitat description for starveling milkvetch is: "Dry hilltops, gullied bluffs, and barren ridges or river terraces, on tuff, shale, sandstone, or derived gumbo clays". On the Caribou NF its habitat is relatively more restricted. Forest populations occur strictly on exposed Twin Creek Limestone (Mitchell and Bennett 1979; Mansfield 1927) substrate that is a raw, loose and eroding shale. It supports only sparse vegetation. Adjacent habitats characterized by more soil development and greater amounts of vegetation, do not have starveling milkvetch present.

The combination of whitish color and barren appearance make this habitat distinctive even at a distance. Twin Creek substrate surfaces on the Caribou NF exclusively in the southern portion of the Montpelier Ranger District, and is especially abundant in Snowslide Canyon, Whiskey Flats, along part of Crow Creek road, and parts of Montpelier Canyon. Texture can vary greatly on an outcrop and between outcrops and is an important edaphic attribute. Starveling milkvetch is less abundant where shale size is greater than approximately 5 cm, and is absent from large rocky sites. It also decreases in abundance when the texture becomes very fine/powdery. Outcrops and knolls (which often occur in series) are commonly associated topographic features. Sites are also characterized by being dry and open. It is most common on south to west aspects with slopes less than 20 degrees. There is a point where slope steepness eventually precludes starveling milkvetch. When found on knolls, it is most prevalent around the crest area. Populations were located between 6300 and 7500

feet elevation.

In several instances, roadcuts pass through shale outcrops occupied by starveling milkvetch. Starveling milkvetch occupies only a fraction of all the suitable-appearing habitat searched on and near the Caribou NF. It was commonly absent from similar-looking habitats near sites supporting the species.

The community in which starveling milkvetch is found is unclassified and has low species richness. The few associated species include Eriogonum brevicaule var. laxifolium, Haplopappus acaulis, Artemisia longiloba, Artemisia tridentata, Cryptantha breviflora, Ivesia gordonii, Phlox hoodii, Arenaria nuttallii, Berberis repens, Agropyron spicatum and Oryzopsis hymenoides.

The barren starveling milkvetch sites are often interspersed among more productive Artemisia tridentata - Agropyron spicatum, Artemisia longiloba or Artemisia arbuscula habitat types (Hironaka et al. 1983).

## CONSERVATION STATUS

Conservation Status - Idaho: Until recently, no populations of starveling milkvetch were recognized at the varietal rank. In Vascular Plants of Wyoming, Dorn (1988) describes a new variety endemic to the Big Horn Mountains of Wyoming, with the name Astragalus jejunus var. articulatus. This taxon is considered rare in Wyoming. The name Astragalus jejunus var. jejunus is reserved for the more widespread variety found throughout the rest of the species range, including southeastern Idaho. Rupert Barneby, the recognized expert for Astragalus, does not acknowledge this varietal distinction in his recent treatment to the regional flora (Barneby 1989). The starveling milkvetch referred to in this report is Astragalus jejunus var. jejunus.

Starveling milkvetch was included in the Report on the Botanical Survey of Endangered and Threatened Plants, Caribou National Forest (Shultz and Shultz 1978). It gained conservation recognition in the state when it was placed on the State Watch List in 1981, qualified with remarks that it may be abundant in Bear Lake County (Packard and Grimes 1981).

Starveling milkvetch is a Monitor species for The Idaho Native Plant Society, a category for taxa that are common within a limited range as well as those which are uncommon, but have no identifiable threats (Moseley and Groves 1990).

The Idaho Natural Heritage Program currently ranks starveling milkvetch as G4/S2 (G4 = apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery, S2 = in Idaho, imperiled because of rarity or because of other factors demonstrably making it very vulnerable to extirpation; Moseley and Groves 1990)

Starveling milkvetch is not currently recognized as a conservation concern in Idaho by either the Forest Service or BLM.

Conservation Status - Elsewhere:

Utah - The Utah Natural Heritage Program (Utah Natural Heritage Program 1990) currently ranks starveling milkvetch as S1 (S1 = critically imperiled in the state because of extreme rarity or because of some other factor of its biology making it especially vulnerable to extirpation; Moseley and Groves 1990).

Wyoming - The Wyoming Natural Heritage Program lists Astragalus jejunus var. articulatus, the variety endemic to the Big Horn Mountains, as a conservation concern, but does not extend this recognition to var. jejunus (Wyoming Natural Heritage Program 1990).

Ownership: Populations of starveling milkvetch in Idaho are known from the Montpelier District of the Caribou NF, the Idaho Falls District of the BLM, and lands under private ownership. Also, there is the possibility that one population not relocated in 1990 extends onto State land.

Threats: On the Caribou NF several potential threats do exist on a local basis. Largely, livestock avoid or quickly pass through the sparsely vegetated starveling milkvetch habitats. A local exceptions was in part of the Snowslide Canyon-East population (009), where livestock trampling was evident in areas where they congregated. Alterations to Forest Service Road 801 could adversely effect a small part of this same population that is adjacent to the road. Mansfield (1927) mentions that Twin Creek Limestone has been unsuccessfully prospected. Not a current threat, but prospecting could potentially cause adverse effects on a local basis if resumed. Off-forest, a few instances of localized trampling by livestock were observed, and there is potential for destruction of parts of two others if significant road alterations occur. Two other potential local threats were observed on private land. In one instance, a prescribed burn to eradicate sagebrush extended into the periphery of a starveling milkvetch population. Several plants were present where the fire passed, but it is unknown if others were destroyed. One small population was found to be completely surrounded by a field of crested wheatgrass. The small shale outcrop must have been too difficult to plow and was spared. Whether any habitat loss due to land use conversion has actually taken place is unknown.

Isolated, these threats may not be considered serious. However, the relatively small, localized extent of most populations may compound their susceptibility to the list of threats. When viewed in aggregate, their potential cumulative impacts may significantly effect the species long-term viability in Idaho.

Management Implications: Local threats described above, although uncommon, do exist on the Caribou NF. Activities such as road building or alterations, off-road vehicle use and grazing, may by themselves not be putting the species long-term viability at risk, although they could destroy a small population or part of a larger one. The affects of management decisions concerning cumulative impacts of these threats is potentially significant, however, and is probably the most pointed implication. All populations warrant careful consideration in land-management planning.

## ASSESSMENT AND RECOMMENDATIONS

Summary: Results of our field investigation in 1990, revealed that starveling milkvetch has a scattered, local distribution and is restricted to a narrow set of habitat conditions. It may be at its northern periphery in Idaho on the Caribou NF. Thirteen populations have now been documented in Idaho. Six of these on the Caribou NF, including two (004, 009) of the largest ones known. An estimated 5000 to 6000 plants are known from the nine populations inventoried in 1990. Assuming they are still extant, an additional unknown number exist at the four populations we were unable to relocate in 1990. No clear threats to long-term viability were apparent. However, livestock trampling, road alterations and possibly other activities do pose localized threats at several populations both on and off-forest.

Recommendations to the Regional Forester: Although common in parts of adjacent Wyoming and Utah, starveling milkvetch is apparently much less so in Idaho. Part of the Forest Service's directive is to help maintain the components of each states flora. The population, habitat and distribution attributes, and any threats to them need to be evaluated and judged by the Forest Service. It is recommended a conservative approach be taken when determining the species status. Consideration to add starveling milkvetch to the Region's Sensitive Species list for the Caribou NF is one option.

Recommendation to Caribou National Forest: Starveling milkvetch displays a localized distribution pattern in Idaho. Several actual and potential local threats have been identified on the Caribou NF. Prudent consideration in land-management planning and implementation of ongoing activities where starveling milkvetch is known to occur is recommended until the status of the species is resolved at the Regional level. It is recommended that monitoring of starveling milkvetch populations be incorporated into the Forest's Allotment Management Plan. The Snowslide Canyon-East population (009), where trampling affects were the most noticeable, could especially benefit from such monitoring. Uinta Basin cryptanth should also be monitored. Because the two species often occur sympatrically, simultaneous monitoring is possible.

Land managers and field personnel on the Caribou NF should be informed of the occurrence of this species in their area. Further documentation of the species will strengthen our understanding of its conservation status on the Forest. Possible sightings of this plant should be documented by specimens (if the size of the population warrants collecting), and should be sent to the University of Idaho Herbarium (Department of Biological Sciences, University of Idaho, Moscow 83843) for verification of their identity. Pertinent location, habitat and morphological information should be included with collected specimens. Confirmed sightings of this species should be reported to the Idaho Natural Heritage Program, via Region 4 TES reporting forms, for entry into their permanent data base on sensitive species.

Other Recommendations: The Idaho Natural Heritage Program will recommend a status change from Monitor to Sensitive for starveling milkvetch to the Idaho Native Plant Society at their 1991 Rare Plant Conference.

Cryptantha breviflora (Osterh.) Payson

CURRENT STATUS USFS - None
USFWS - 3c
BLM - Sensitive
Idaho Native Plant Society - Sensitive
Heritage Rank - G4/S1

TAXONOMY

Family: Boraginaceae (Borage)

Common Name: Uinta Basin cryptanth or Short-flower cryptanth

Citation: Annals of the Missouri Botanical Garden 14: 318. 1927.

Synonym: Oreocarya breviflora Osterh.

Technical Description: Perennial from a taproot and branching caudex, with several or numerous subequal, erect or curved-ascending stems (1) 1.5-3.5 dm tall; stems rather coarsely strigose to villous-puberlent or rather shortly setose-hirsute, few if any hairs more than about 1 mm long; leaves often with a somewhat bluish cast, covered with rather long straight, firm closely appressed hairs; basal leaves numerous and densely tufted, oblanceolate, mostly 2-10 cm long and 3-12 mm wide; cauline leaves scattered and more reduced; inflorescence copiously spreading-setose; flowers homostylic; calyx elongating to 6-9 mm in fruit; corollas white with yellow fornices, 3.5-4.5 mm long, the flat, rotately spreading limb mostly 9-13 mm wide; nutlets solitary or sometimes 2, ovate 3.0-4.2 mm long, strongly muricate on both sides, with a narrow scar open from about the middle of the nutlet downwards; style from a little shorter than the nutlets to surpassing them by as much as 1 mm (Cronquist 1984; Higgins 1987).

Nontechnical Description: Uinta Basin cryptanth is a taprooted perennial herb with a much branched caudex; it is usually 15-35 cm tall; the stems are covered by short hairs, the leaves by longer, straight, firm hairs; there are many, tufted basal leaves, while stem leaves are much less crowded, leaves are oblanceolate to spatulate and often possess a bluish cast; the flowering stem is elongated and very hairy; flowers are small and white with a yellow fornix (set of small appendages around corolla throat). See Appendix 2 for line drawing and Appendix 6 for photographs of Uinta Basin cryptanth.

Distinguishing Features and Similar Species: The genus Cryptantha is well represented in the western United States. However, the strong perennial habit of Uinta Basin cryptanth distinguishes it from many congeners. The only other perennial cryptanth seen during the survey was C. caespitosa (spreading cryptanth). It was never found sympatric with Uinta Basin cryptanth, although it was found on relatively barren, Twin Creek Limestone sites. Spreading cryptanth was found only on more exposed, windswept ridges. Hairs on the spreading cryptanth appear to be more tangled than on Uinta Basin cryptanth. Spreading cryptanth also has a restricted regional distribution. It is known from southwestern Wyoming, northeastern Utah and along the east side of Bear Lake to Montpelier in Idaho (Cronquist 1984). The following key, modified from Cronquist (1984), should help distinguish the two.

1. Stems lax or prostrate or so short they scarcely exceed the basal leaves, always relatively short, up to 10 (15) cm long..... Cryptantha caespitosa

1. Stems erect, generally well surpassing the basal leaves, often well over 10 cm tall ..... Cryptantha breviflora

DISTRIBUTION

Range: Until Shultz and Shultz (1978) discovered a disjunct population near Montpelier Reservoir in 1978, Uinta Basin cryptanth was not known to occur in Idaho. Prior to this discovery, it was considered a Uinta Basin, Utah endemic, where it can

be locally common. No subsequent populations were documented in Idaho until our 1990 field survey discovered seven other populations. This is not unexpected, as relatively little floristic work has been done on the forest or nearby lands. A total of five populations are now known from the Caribou NF. All are confined to shaley, barren, harsh sites on Twin Creek Limestone substrate, the same as starveling milkvetch and varying buckwheat. This shared substrate specificity results in an overlapping distribution pattern for the three species over much of their Idaho range.

On the Caribou NF, Uinta Basin cryptanth has now been documented in the Whiskey Flats, Snowslide Canyon and Montpelier Canyon areas. As with starveling milkvetch, no Uinta Basin cryptanth was found north of Whiskey Flats, west of approximately Home Canyon, or east of the head of Snowslide Canyon. These limits coincide with the disappearance of the bulk of suitable-appearing habitat in these directions.

The majority of off-forest habitat exists to the south in the Sheep Creek Hills and Bear Lake Plateau regions. Although suitable-appearing habitat is extensive in some areas to the south, Uinta Basin cryptanth is not consistently found, occurring only very sporadically and in low densities. This is the same general pattern found on the Caribou NF. Uinta Basin cryptanth does not form colonys, and is never abundant at a site. Its demography is unlike starveling milkvetch and varying buckwheat in this regard.

Our 1990 field investigation significantly expanded the known range of Uinta Basin cryptanth in Idaho. The range of Uinta Basin cryptanth on the Caribou NF and adjourning lands closely overlaps that of starveling milkvetch and varying buckwheat. Below is a summary of the five documented populations on the Caribou NF (the number in parenthesis refers to the occurrence number of this species in the Heritage Program data base). See Appendix 5 for the Heritage Program's element occurrence records for Uinta Basin cryptanth on the Caribou NF. These records provide additional detail on location, ownership and population data, among other things.

Montpelier Reservoir (001) - southern Preuss Range, on slopes east of the northern extension of the reservoi; elevation 6800 feet; comprised of three subpopulations totalling ca. 500 plants; first collected by Shultz and Shultz in 1978, revisited in 1990.

Snowslide Canyon (002) - southern Preuss Range, in the vicinity of Snowslide Canyon along Crow Creek Road, elevation 6800 feet; ca. 100 plants widely scattered; first collected in 1990.

Snowslide Canyon-East (003) - southern Preuss Range, both sides of USFS Road 801, west of junction with Crow Creek Road,elevation 6850 feet; suitable-appearing habitat is extensive in area, but only ca. 100 plants were found, uncommon to rare at all sites, additional plants undoubtedly exist where not searched; first collected in 1990.

Whiskey Flat (004) - southern Preuss Range, Whiskey Flat area, elevation 6920 feet; extensive suitable-appearing habitat in area, plants uncommon and widely scattered, ca. 100 were found, additional ones undoubtedly exist; first collected in 1990.

Telephone Draw (007) - southern Preuss Range, southeast of Montpelier Reservoir,elevation 6640 feet; comprised of three small and scattered subpopulations, ca. 100 plants were found; first collected in 1990.

In summary, eight populations are known. The five populations occurring on the Caribou NF support approximately 900 of the 1300 inventoried plants, plus it is reasonable to assume an additional unknown number. Regardless of this unknown number, it is nowhere abundant. Total forest habitat is roughly estimated to cover over two square miles. See Appendix 3 for mapped locations of these populations and Appendix 4 for list of all areas searched.

Habitat and Associated Species: Uinta Basin cryptanth's habitat in Utah has been

described in part as "mostly heavy clay soils" (Higgins 1987); "poor substrates of eroding knolls and badland slopes" (Goodrich and Neese 1986); and "dry, open places, variously on barren clay or in sandy soil" (Cronquist 1984). In Idaho, it is apparently restricted to exposed Twin Creek Limestone (Mitchell and Bennett 1979; Mansfield 1927) substrate that is a raw, loose and eroding shale; the same habitat as starveling milkvetch and varying buckwheat. Adjacent sites characterized by greater amounts of vegetation, do not have Uinta Basin cryptanth present. Refer to the habitat notes on starveling milkvetch for additional characteristics of this habitat.

Like starveling milkvetch, Uinta Basin cryptanth appears sensitive to substrate texture. It too is less abundant where shale size is greater than approximately 5 cm, and is absent from large rocky sites. It occurs at elevations from 6400 to 6900 feet and on all slope aspects, but southern exposures predominate. Although most common on slopes of little to moderate steepness, on several occasions it was observed on slopes greater than 20 degrees. Paralleling a pattern noted earlier for starveling milkvetch, Uinta Basin cryptanth occupies only a fraction of all the suitable-appearing habitat searched. It was commonly absent from similar-looking habitats near sites supporting the species.

The community in which Uinta Basin cryptanth is found is unclassified and has low species richness. The few associated species include Eriogonum brevicaule var. laxifolium, Haplopappus acaulis, Artemisia longiloba, Artemisia tridentata, Chrysothamnus viscidiflorus, Astragalus jejunus, Ivesia gordonii, Phlox hoodii, Physaria acutifolia, Berberis repens, Agropyron spicatum and Oryzopsis hymenoides.

Uinta Basin cryptanth is found on barren sites interspersed within more productive Artemisia tridentata - Agropyron spicatum, Artemisia arbuscula and Artemisia longiloba habitat types (Hironaka et al. 1983).

## CONSERVATION STATUS

Conservation Status - Idaho: For over ten years Uinta Basin cryptanth was known from only the one Idaho population discovered by Shultz and Shultz on the Caribou NF in 1978. In their report (Shultz and Shultz 1978), they note the species is widespread in the Uinta Basin and the Idaho population is large. They recommend it be removed from the Federal Register. Steele (1981) rejected Uinta Basin cryptanth for federal listing, noting it has been collected from large populations in Utah and Idaho and under no threats from present land use trends. Instead it is placed on the Idaho State Watch List, citing its rarity in Idaho, being known from only near Montpelier Reservoir.

Uinta basin cryptanth is currently a federal 3c taxon, which includes those taxa found to be more widespread or abundant than previously believed, or not subject to identifiable threats (Moseley and Groves 1990). It is currently on the state BLM Sensitive Species list, but is not recognized on any Forest Service Sensitive Species lists (Moseley and Groves 1990).

Seven new Uinta Basin cryptanth populations were discovered during our 1990 field investigation. All are relatively small and confined to a narrow range of habitat conditions. We were able to find only about 500 plants at the original Montpelier Resevior site. Collectively, approximately 1300 plants were inventoried in Idaho during 1990. This reflects a conservative estimate because not all potential habitat could be searched, especially off-forest. Still, for the Caribou NF and surrounding lands, evidence points to a mostly small, widely scattered, relatively low-density population structure.

The Idaho Native Plant Society considers Uinta Basin cryptanth a Sensitive species in the state. This ranking refers to taxa with small populations or localized distributions within Idaho that presently do not meet criteria for classification as Priority 1 or 2, but whose populations and habitats may be jeopardized without active management or removal of threats (Moseley and Groves 1990).

The Idaho Natural Heritage Program currently ranks Uinta Basin cryptanth as G4/S1 (G4 = taxa that are apparently secure globally, though it may be quite rare in parts

of its range, especially at the periphery, S1 = critically imperiled in Idaho because of extreme rarity or because of some factor of its biology making it especially vulnerable to extirpation; Moseley and Groves 1990).

The Idaho State Office of the BLM list Uinta Basin cryptanth as a Sensitive Species, defining such species as designated by the state director, usually in cooperation with the state agencies responsible for managing the species as sensitive. They are those species that are 1) under status review by USFWS/NMFS; or 2) whose numbers are declining so rapidly that federal listing may become necessary; or 3) with typically small and widely dispersed populations; or 4) those inhabiting ecological refugia or other specialized or unique habitats (Moseley and Groves 1990).

Conservation Status - Elsewhere:

Utah and Wyoming: Uinta Basin cryptanth was once considered a Region 4 Sensitive Species for Utah and Wyoming (D. Atwood 1990). It no longer receives consideration under this designation. It was found to be locally common in the Uinta Basin, while the species is unknown from Wyoming.

Ownership: In Idaho, populations of Uinta Basin cryptanth occur on Caribou NF, Idaho Falls District BLM, and private lands. There is the possibility that parts of a few populations extend onto adjacent State lands.

Threats: No clear threats to the long-term survival of any of the populations was observed. Their low population density may make them less susceptible to potential threats such as livestock trampling, but such threats should not be discounted. Several potential threats identified for starveling milkvetch are shared by Uinta Basin cryptanth. These include livestock trampling, roadwork, resumption of prospecting and habitat conversion, such as the case when Montpelier Reservoir was filled. Again, these threats do not currently appear to threaten the viability of the species in Idaho, but could be important in the long-term.

Management Implications: We found Uinta Basin cryptanth to be uncommon or rare within all populations. Additionally, because populations tend to be local, usually small and restricted to a narrow set of habitat conditions, certain activities (see Threats) could inadvertently destroy part of a population. A key management implication is that land-use decisions affecting Uinta Basin cryptanth should be evaluated on a cumulative basis to better reflect their impacts on the species long-term viability.

ASSESSMENT AND RECOMMENDATIONS

Summary: Results of our field investigation in 1990, revealed that Uinta Basin cryptanth has a scattered distribution within and between populations. These populations are local and restricted to a narrow set of habitat conditions. The species is disjunct on the Caribou NF from the majority of its range in the Uinta Basin. Eight populations have now been documented in Idaho. Five of these on the Caribou NF. A total of approximately 1300 plants were inventoried during 1990, with roughly 900 occurring on the Caribou NF. No clear threats to long-term viability were apparent, but the potential for habitat alterations to the small sites does exist.

Recommendations to the Regional Forester: Although locally common in parts of Utah's Uinta Basin, Uinta Basin cryptanth is apparently much less common in Idaho. Part of the Forest Service's directive is to help maintain the components of each state's flora. The population, habitat and distribution attributes, and any threats to them need to be evaluated and judged by the Forest Service. It is recommended, a conservative approach be taken when determining this species status, especially in light that the Caribou NF supports a majority of the Uinta Basin cryptanth plants known in Idaho. It was once considered a Sensitive Species for Utah and Wyoming. Our 1990 field survey indicates it merits consideration for Idaho.

Recommendation to Caribou National Forest: Uinta Basin cryptanth was found to be uncommon in Idaho, following a localized distribution pattern similar to starveling

milkvetch. Several potential local threats have been identified on the Caribou NF. It should be recognized that the majority of Idaho's known Uinta Basin cryptanth populations and plants occur on the Caribou NF, and it shares the same habitat as starveling milkvetch, another species of possible conservation concern. Prudent consideration in land-management planning and implementation of ongoing activities where Uinta Basin cryptanth is known to occur is recommended until the status of the species is resolved at the Regional level. Establishment of a monitoring program as part of the Forest's Allotment Management Plan is recommended for Uinta Basin cryptanth, in conjunction with monitoring starveling milkvetch, as previously discussed.

Land managers and field personnel on the Caribou NF should be informed of the occurrence of this species in their area. Possible sightings of this plant should be documented by specimens (if the size of the population warrants collecting), and should be sent to the University of Idaho Herbarium (Department of Biological Sciences, University of Idaho, Moscow 83843) for verification of their identity. Pertinent location, habitat and morphological information should be included with all collections. Confirmed sightings of this species should be reported to the Idaho Natural Heritage Program, via Region 4 TES reporting forms, for entry into their permanent data base on sensitive species.

Eriogonum brevicaule Nutt. var. laxifolium (T. & G.) Reveal

CURRENT STATUS USFS - None
USFWS - None
Idaho Native Plant Society - Review
Heritage Rank - G4T3?/S3

TAXONOMY

Family: Polygonaceae (Buckwheat)

Common Name: varying buckwheat

Technical Description: Perennial; stems of the year dying to the base, mainly 3-35 cm tall, glabrous or tomentose; leaves all basal or some with obvious short stems, 0.3-10 cm long, 1-9 mm wide, tomentose on one or both surfaces, revolute to flat, entire, linear to elliptic, oblanceolate, or lanceolate; petioles 1-40 mm long; inflorescences capitate or branched; flowers usually yellow, glabrous; achenes 1.5-3.5 mm long, brown (Welsh 1987).

Nontechnical Description: varying buckwheat is a low-growing shrub, often with prostrate-spreading stems; current year's stems die back to the base; leaves can be all basal or on short stems, up to 10 cm long and 1 cm wide, usually covered with matted hairs but sometimes without hairs, flat or with margins rolled under; clusters of small, usually yellow flowers in a tight head or sometimes branched arrangement; fruits are small and brown. See Appendix 6 for a photograph of varying buckwheat.

Distinguishing Features and Similar Species: The genus Eriogonum is one of the largest in the Intermountain region. Distinguishing characteristics are often times variable and subtle as intermediates exist in many species, including the E. brevicaule complex. Variety laxifolium is most similar to other members of the E. brevicaule complex, of which there are seven other varieties. None of these other varieties are known to occur in southeastern Idaho, although three approach the area; var. nanun and var. loganum from Utah, var. brevicaule from Wyoming and other parts of Idaho. Two other species of Eriogonum were found sympatric or nearly so with varying buckwheat, namely E. ovalifolium (cushion buckwheat) and E. umbellatum (sulphur buckwheat). E. heracleoides is also known from the area. The following key, modified from Welsh (1987), should help distinguish the allied varieties and the three other species.

1. Plants cushion-like, mound forming; leaves often less than 1 cm long.....Eriogonum ovalifolium

1. Plants may be small, but are not cushion-like; leaves often greater than 1 cm long .

   2. Flowers with attenuated, stipe-like bases; vegetative stems persistent.

      3. Stems with whorled, bracteate leaves near middle ..... Eriogonum heracleoides

      3. Stems lacking whorled, bracteate leaves ..... ..... Eriogonum umbellatum

   2. Flowers not with stipe-like bases; stems of the year dying back..... Eriogonum brevicaule

      4. Plants with definite woody caudex, this clothed with black, withered but persistent leaves; leaves usually undulating partially revolute..... Eriogonum brevicaule var. nanum

      4. Plants not combining above characters.

         5. Stems glabrous; the inflorescence branching in the upper 1/3-1/4..... var. brevicaule

5. Plants not as above.

6. Plants strictly acualescent ..... var. loganum

6. Plants usually with short stems.. var. laxifolium

DISTRIBUTION

Range: Varying buckwheat is known in Idaho from two sites in Bonneville County, one site in Cassia County, and the southern Preuss Range and Bear Lake Plateau regions in Bear Lake County. It is also known from several central Utah counties and at one time was believed to be a Utah endemic. Prior to our 1990 survey, varying buckwheat was known from six populations in southeast Idaho. Only Shultz and Shultz (1978) had previously collected it from Caribou NF lands. Eight new populations were discovered during the survey, including four on the Caribou NF. As with starveling milkvetch and Uinta Basin cryptanth, they are confined to shaley, barren, harsh sites on Twin Creek Limestone (Mitchell and Bennett 1979; Mansfield 1927) substrate, without exception. Varying buckwheat is the most widespread and abundant of the three species in the study area. It was absent from only one Uinta Basin cryptanth population and present at all starveling milkvetch populations visited in 1990. Whereas the other two species occur sporadically and occupy only portions of suitable-looking habitat, varying buckwheat was found nearly everywhere Twin Creek Limestone was exposed.

On the Caribou NF, varying buckwheat has now been documented in the Whiskey Flats, Snowslide Canyon, Montpelier Canyon and Preuss Creek areas. No populations were found north of Preuss Creek, otherwise its distribution on the forest closely follows starveling milkvetch and Uinta Basin cryptanth. Again, The majority of off-forest habitat exists to the south in the Sheep Creek Hills and Bear Lake Plateau regions. Suitable habitat is extensive in some areas to the south, and varying buckwheat reaches its greatest abundance and extent south of the Caribou NF. The Border Summit population covers an especially large area and includes a very large number of plants. A limited amount of Twin Creek Limestone reappears in the Crane Flats area approximately 50 miles northwest of the Caribou NF populations (Mansfield 1927). It is speculative whether any of the three species of concern here occur there. Varying buckwheat is probably the most likely candidate as it is known from a collection in Bonneville County.

Our 1990 field investigation revealed the broad and abundant extent of varying buckwheat in southeastern Idaho. Although restricted to a narrow set of habitat conditions, it occurs nearly everywhere these conditions are met. Especially south of the forest, these habitat conditions can be widespread. Below is a summary of the five documented populations on the Caribou NF.
Varying buckwheat will not be tracked by the Idaho Natural Heritage Program, thus no occurrence record numbers accompany the population names.

Snowslide Canyon - several hundred plants clustered on Twin Creek formation outcrops and slopes; first collected in 1978.

Snowslide Canyon-East - several hundred plants widely scattered; all habitat not searched, additional plants undoubtedly occur; first collected in 1990.

Whiskey Flat - at least several hundred plants with others expected in large amount of habitat not searched; first collected in 1990.

Montpelier Resevior - roughly 500 plants widely scattered; first collected in 1990.

Preuss Creek - slopes above Preuss Creek west of Crow Creek Road; scattered, small, Twin Creek formation outcrops occur in area; only one plant found, but others probably exist in area; first collected in 1990.

In summary, 14 populations are known from southeastern Idaho. The five occurring on the Caribou NF support over 1500 inventoried and an unknown number of additional plants. Off-forest populations support well over 10,000 more. Available habitat on

the Caribou NF is relatively limited in extent compared to off-forest. See Appendix 3 for mapped locations of these populations and Appendix 4 for list of all areas searched.

Habitat and Associated Species: In southeastern Idaho varying buckwheat is apparently restricted to exposed Twin Creek Limestone substrate that is a raw, loose and eroding shale; the same habitat as starveling milkvetch and Uinta Basin cryptanth. As with these other two species, it does not occupy adjacent sites characterized by greater soil development and greater amounts of vegetation. Some additional habitat notes can be found in the starveling milkvetch section. Of the three species, varying buckwheat is apparently the least sensitive to substrate texture. It tolerates relatively larger-sized shale and does not appreciably decrease in abundance where the substrate becomes very finely textured. It occurs at elevations from 6300 to 7150 feet and on all slope aspects, but southern exposures predominate. Sites are dry and open and range from lower slopes to ridge crests. Most common on slopes of little to moderate steepness, on several occasions it was observed on very steep slopes.

The community in which varying buckwheat is found is unclassified and has low species richness. The few associated species include Haplopappus acaulis, Artemisia longiloba, Artemisia tridentata, Artemisia arbuscula, Chrysothamnus viscidiflorus, Astragalus jejunus, Ivesia gordonii, Phlox hoodii, Oenothera caespitosa, Cryptantha breviflora, Berberis repens, Agropyron spicatum and Oryzopsis hymenoides.

In Utah, varying buckwheat has been found in or near mountain brush, sagebrush, pinyon-juniper, ponderosa pine, and aspen communities (Welsh 1987). Goodrich and Neese (1986) note that it's "usually on raw, shaley or marl limestone ground." In southeastern Idaho we found it on barren sites interspersed within more productive Artemisia tridentata - Agropyron spicatum, Artemisia arbuscula and Artemisia longiloba habitat types.

## CONSERVATION STATUS

Conservation Status - Idaho: Several 1970's and 1980`s collections first substantiated the presence of varying buckwheat in Idaho. It was first documented on the Caribou NF by Shultz and Shultz (1978), and this remained the only known collection from the forest until our 1990 field investigation. The species (without the varietal ranking) is noted, but not discussed in Shultz and Shultz's (1978) botanical survey report. 1990 field work discovered varying buckwheat to be widespread and common where suitable, barren shale habitats occurred. Most of the populations support a minimum of several hundred plants.

The Idaho Native Plant Society lists varying buckwheat as a Review species. This is reserved for taxa which may be of conservation concern, but for which we have insufficient data upon which to base a recommendation regarding their appropriate classification (Moseley and Groves 1990).

The Idaho Natural Heritage Program currently ranks varying buckwheat as G4T3?/S3 (G4 = Eriogonum brevicaule is apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery, T3 = var. laxifolium it is either very rare and local throughout its range or found locally in a restricted range or because of other factors making it vulnerable to extirpation, S3 = var. laxifolium in Idaho, the S3 rank definition is the same as in T3; Moseley and Groves 1990).

No federal agencies list varying buckwheat as a conservation concern in Idaho.

Conservation Status - Elsewhere:

Utah: Varying buckwheat is known to be common in parts of Utah and is not considered a conservation concern. Several of the other varieties are, however, including a Region 4 Sensitive Species (Utah Natural Heritage Program 1990).

Wyoming: Varying buckwheat is not known to occur in Wyoming, however, one of its allied varieties is considered rare in the state (Wyoming Natural Heritage Program

1990).

Ownership: In Idaho, populations of varying buckwheat occur on Caribou NF, Idaho Falls District BLM, State of Idaho and private lands.

Threats: There are no clear threats to the long-term viability of varying buckwheat on the Caribou NF or nearby areas. Minor threats on a local basis as discussed for starveling milkvetch and Uinta Basin cryptanth also hold true for varying buckwheat. Additionally, off-road vehicle tracks pass near the Preuss Creek population. Only a single plant is known from this population, but others probably exist. If the species were less common overall, this may be cause for concern.

Management Implications: In southeastern Idaho, varying buckwheat is common, but restricted to a narrow set of habitat conditions. These barren, shaley habitats currently receive minimal activity pressure. No current management actions appear to conflict with the long-term viability of varying buckwheat. This could potentially change if major habitat-altering activities such as mining were ever to occur.

## ASSESSMENT AND RECOMMENDATIONS

Summary: Results of our field investigation in 1990 discovered varying buckwheat confined to the same dry, barren shale habitat as starveling milkvetch and Uinta Basin cryptanth. The difference is that it is relatively common and more widespread in places where this habitat is available. Habitat for the species is restricted to part of the Montpelier Ranger District, but is more extensive on lands to the south. Fourteen populations are now documented in southeastern Idaho, five of these on the Caribou NF. No clear threats are apparent to long-term viability under current land use patterns.

Recommendations to the Regional Forester: Varying buckwheat was known to be common in parts of Utah. As discussed in this report, it is now known to be locally common in parts of southeastern Idaho. It does not appear that any special conservation designations or measures are necessary to insure the long-term viability of the species.

Recommendation to Caribou National Forest: No current management activities appear inconsistent with the long-term viability of varying buckwheat on the Caribou NF. It shares its narrow range of habitat requisites with both starveling milkvetch and Uinta Basin cryptanth. Because of this shared habitat, any protective measures for these other two species, if ever initiated, would also prove beneficial to varying buckwheat.

Other Recommendations: The Idaho Natural Heritage Program will recommend to the Idaho Native Plant Society they remove varying buckwheat from their state species of conservation concern list.

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## Appendix 1

1990 Work Plan for status survey
of three rare species occurring on shale habitats
of the Montpelier Ranger District, Caribou National Forest.

## Appendix 2

Line drawings of *Astragalus jejunus* and *Cryptantha breviflora*.

1. *Astragalus jejunus* (from Barneby 1989)

2. *Cryptantha breviflora* (from Cronquist 1984)

Appendix 3

Locations of Astragalus jejunus, Cryptantha breviflora and Eriogonum brevicaule var. laxifolium in southeastern Idaho.

Map 1. Astragalus jejunus - overview of distribution on the Caribou NF. Portion of Caribou NF map (1988), Montpelier and Soda Springs districts.

Map 2. Cryptantha breviflora - overview of distribution on the Caribou NF. Portion of Caribou NF map (1988), Montpelier and Soda Springs districts.

Map 3. Eriogonum brevicaule var. laxifolium - overview of distribution on the Caribou NF. Portion of Caribou NF map (1988), Montpelier and Soda Springs districts.

Map 4. Astragalus jejunus - overview of distribution on lands outside the Caribou NF. Portion of Caribou NF map (1988), Montpelier and Soda Springs districts.

Map 5. Cryptantha breviflora - overview of distribution on lands outside the Caribou NF. Portion of Caribou NF map (1988), Montpelier and Soda Springs districts.

Map 6. Eriogonum brevicaule var. laxifolium - overview of distribution on lands outside the Caribou NF. Portion of Caribou NF map (1988), Montpelier and Soda Springs districts.

Map 7. Whiskey Flat populations for all three species and Eriogonum brevicaule var. laxifolium, Preuss Creek population. Portion of Meade Peak 7.5' quadrangle.

Map 8. Snowslide Canyon and Snowslide Canyon-East populations for all three species. Portion of Meade Peak 7.5' quadrangle.

Map 9. Montpelier Canyon and Montpelier Reservoir area populations for all three species. Portion of Montpelier Canyon 7.5' quadrangle.

Map 10. West Fork Sheep Creek populations for all three species. Portion of Montpelier Canyon 7.5' quadrangle.

Map 11. Astragalus jejunus and Eriogonum brevicaule var. laxifolium populations in the Wood Canyon and northern Sheep Creek Hills areas. Portion of Geneva 7.5' quadrangle.

Map 12. Populations for all three species in the Border Summit and Horse Valley areas of the Sheep Creek Hills. Portion of Border 7.5' quadrangle.

Map 13. Eriogonum brevicaule var. laxifolium - Pine Gap population. Portion of Pegram Creek 7.5' quadrangle.

Map 14. Populations for all three species in the Pegram Creek area. Portion of Pegram Creek 7.5' quadrangle.

## Appendix 4

List of areas searched for
*Astragalus jejunus*, *Cryptantha breviflora* and
*Eriogonum brevicaule* var. *laxifolium* during 1990 field investigation.

Caribou National Forest - Montpelier Ranger District

Southern Preuss Range

1. north of Preuss Creek to upper Beaver Creek, west of Gannett Hills
2. slopes above Preuss Creek for approximately 0.5 mi west of Crow Creek Road
3. Whiskey Flat, including lower Little Beaver Creek
4. slopes of Shale Point
5. Snowslide Canyon
6. Montpelier Creek area between Highway 89 and Snowslide Canyon
7. ridges to east (above) Montpelier Resevior
9. Telephone Draw
10. Montpelier Canyon
11. Home Canyon
12. Fox Flat

Other lands

Southern Preuss Range - Sheep Creek Hills

1. head of Surnge Canyon
1. Geneva Summit
2. Wood Canyon
3. Sheep Creek
4. West Fork Sheep Creek
5. Highway 89 corridor to Thomas Fork Valley
6. parts of Thomas Fork Valley
7. Sheep Creek Hills from approximately three miles north, to one mile south of Border Summit area

Bear Lake Plateau

1. Pine Gap
2. Cow Hollow
3. Bear Hollow
4. Spring Hollow
5. Dairy Hollow
6. lower Indian Creek
7. Pegram Creek

## Appendix 5

Element occurrence records for
*Astragalus jejunus* and *Cryptantha breviflora*
on the Caribou National Forest.

*NOT INCLUDED IN CDC HOME PAGE VERSION OF THIS REPORT*

Appendix 6

Slides of
Astragalus jejunus, Cryptantha breviflora and
Eriogonum brevicaule var. laxifolium and their habitats.

1. Astragalus jejunus - close-up, note fine, very small leaflets and small pink-purple flowers (004).

2. Astragalus jejunus - note small stature of plant and texture of fractured shale substrate (004).

3. Twin Creek Limestone knolls, habitat for all three species, note overall sparse vegetation pattern (004).

4. outcrops of Twin Creek Limestone (white shale) discernable even from a distance, habitat for all three species (004).

5. Cryptanth breviflora - close-up, note plant beset with hairs, bluish cast to herbage, basal leaves densely clustered and more widely spaced stem leaves (001).

6. Cryptantha breviflora - habitat, note plant near hammer and sparse vegetation pattern (001).

7. Eriogonum brevicaule var. laxifolium - close-up; Twin Creek Limestone substrate.