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SENSITIVE PLANT SURVEY
OF THE TENDOY MOUNTAINS
IN THE BEAVERHEAD NATIONAL FOREST
BEAVERHEAD COUNTY, MONTANA

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January 1995

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This document should be cited as follows: Vanderhorst, Jim. 1995. Sensitive plant survey of the Tendoy Mountains in the Beaverhead National Forest, Beaverhead County, Montana. Unpublished report to the Beaverhead National Forest. Montana Natural Heritage Program. Helena, MT.

EXECUTIVE SUMMARY

The Beaverhead National Forest in the Tendoy Mountains was surveyed for sensitive and prospective sensitive plant species. Eight populations of five target species were located including three populations of Cusick's horsemint (*Agastache cusickii*), two of Sitka columbine (*Aquilegia formosa*), and one each of Bitterroot milkvetch (*Astragalus scaphoides*), valley sedge (*Carex vallicola*), and tapertip biscuitroot (*Lomatium attenuatum*). None of these species currently has official U.S. Forest Service status but at this time Region 1 sensitive status is recommended for *Agastache cusickii*, *Astragalus scaphoides*, and *Aquilegia formosa* and Beaverhead National Forest watch status is recommended for *Carex vallicola* and *Lomatium attenuatum*. This project was the second part of a sensitive plant survey of the Tendoy Mountains vicinity, which commenced in 1993 with a survey of BLM lands. There are now 23 target species known from the vicinity and a total of 469 taxa of vascular plants have been identified in the study areas.

ACKNOWLEDGEMENTS

I would like to thank all of the people and organizations who helped in the completion of this project: Bonnie Heidel for providing the opportunity and for support in many ways, Peter Lesica for conversations on many plants, Steve Cooper for ecological tutoring and 4-wheel drive rides to the crest, Margaret Beer for sorting things out of the database, Cedron Jones for GIS mapping, and the others at the Montana Natural Heritage Program, the Beaverhead National Forest, and the herbaria (Intermountain, Rocky Mountain, Montana State University, and the University of Montana) who provided invaluable services, facilities, and support.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	ii
ACKNOWLEDGMENTS	iii
LIST OF TABLES	v
LIST OF FIGURES	v
INTRODUCTION	1
THE STUDY AREA	1
METHODS	4
RESULTS	5
<i>Agastache cusickii</i>	8
<i>Aquilegia formosa</i>	12
<i>Astragalus scaphoides</i>	16
<i>Carex vallicola</i>	21
<i>Lomatium attenuatum</i>	25
DISCUSSION	30
LITERATURE CITED	33
APPENDIX A: Map showing principle search routes	36
APPENDIX B: Former target species which have been dropped .	37
APPENDIX C: Primary search targets identified on BLM lands	38
APPENDIX D: EORs and maps showing precise occurrence locations	39
APPENDIX E: Target species from the Tendoy Mountains vicinity	56
APPENDIX F: List of vascular plants of the Tendoy Mountains vicinity	62
APPENDIX G: Photographic slides	69

LIST OF TABLES

Table 1. Recommendations on USFS status of target species .	30
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LIST OF FIGURES

Figure 1. Map of the Tendoy Mountains vicinity	2
Figure 2. Map showing occurrences of target species in the Tendoy Mountains vicinity	7
Figure 3. Illustration of <i>Agastache cusickii</i>	9
Figure 4. Illustration of <i>Aquilegia formosa</i>	14
Figure 5. Illustration of <i>Astragalus scaphoides</i>	18
Figure 6. Illustration of <i>Carex vallicola</i>	23
Figure 7. Illustration of <i>Lomatium attenuatum</i>	26

INTRODUCTION

This report describes a sensitive species botanical survey of Beaverhead National Forest lands in the Tendoy Mountains in southwestern Montana. The purpose of this work was to locate and survey populations of sensitive plant species recognized by Region 1 of the U.S. Forest Service (USDA Forest Service 1994), and prospective sensitive species currently tracked by the Montana Natural Heritage Program (MTNHP) as plant species of special concern (Heidel 1994). Surveys to determine the status of sensitive species are being conducted throughout the west in response to the Endangered Species Act of 1973 and subsequent conservation initiatives by the U.S. Forest Service and other agencies. These surveys represent a botanical baseline to aid in identifying conservation priorities and developing protection and compatible management strategies.

In 1993, a similar study was conducted on Bureau of Land Management (BLM) lands in the Tendoy Mountains and adjacent upper Big Sheep Creek drainage (Vanderhorst and Lesica 1994). The BLM study provided a list of "target" species for this project. A secondary goal of both of these surveys was to document the general flora of the area. Together these projects represent a recent rapid advance in the knowledge of the unique flora of the Tendoy Mountains vicinity.

THE STUDY AREA

The Tendoy Mountains are located in Beaverhead County in the southwest corner of the state (Figure 1). They lie about 30 miles south-southwest of the county seat, Dillon, and directly west of the small communities of Red Rock, Kidd, and Dell. The Tendoy's are isolated from ranges to the east and north by broad basins and low hills drained by Red Rock and Horse Prairie Creeks respectively. The valley of Medicine Lodge Creek separates the Tendoy's from the Beaverhead Mountains to the west. The deep canyon of Big Sheep Creek divides the Tendoy's from White Pine Ridge to the south, its tributary, Muddy Creek, forms an interior basin between the eastern and western flanks of the range, and its upper tributaries form a broad basin to the southeast. Relatively high elevation connections between the Beaverhead and Tendoy ranges are formed by White Pine Ridge and by the divide between Medicine Lodge Creek and Cabin Creek, a tributary of Big Sheep Creek. Elevations range from under 6,000 feet in the valley bottoms to just over 9,500 feet on a few of the highest peaks.

Figure 1. Map of the Tendoy Mountains vicinity

Beaverhead National Forest lands in the Tendoy are mostly at higher elevations flanking the crests of the range, but some lower elevation foothills and stream courses are represented. Forest lands on White Pine Ridge were not included in this survey. The lower elevations peripheral to the National Forest and in Muddy Creek Basin are mostly BLM and state lands. Private land in the range is limited to the periphery and a few inholdings along Muddy and Kate Creeks and in the northern foothills.

The Tendoy Mountains were formed by folding and faulting of Precambrian, Paleozoic and Mesozoic strata as described by Geach (1972) and Alt and Hyndman (1986). The north-south trending Red Rock fault is evidenced by the steep eastern flank of the range, visible from Interstate 15 between Dell and Red Rock. Exposed bedrock in the mountains and foothills includes some precambrian granite and gneiss, along with extensive beds of Mississippian and Pennsylvanian sedimentary rocks, mostly limestone and quartzite, respectively. Much of the lower foothills and the Muddy Creek basin are covered by Tertiary sediments (conglomerates, shales, sandstones, limestones, and tuff). A limited area of younger Tertiary volcanics is exposed in the vicinity of Sourdough Point. Quaternary deposits include alluvial flood plains, terraces, and fans, and extensive talus and boulder fields mass-wasted from steep cliffs.

The climate regime of the Tendoy Mountains vicinity is semi-arid with cold winters and relatively warm summers. Data from the nearby station at Lima (elevation 6,265 feet) are taken to approximate the climate of the lower elevations in the study area (from Geach 1972). Average annual precipitation was 9.92 inches with a seasonal peak in May and June. The average monthly temperature in January was 16.3° F, and in July was 63.0° F. The climate becomes colder and wetter at the higher elevations, and prevailing conditions are greatly modified by local aspect and topography.

Vegetation in the Beaverhead National Forest in the Tendoy consists of extensive coniferous forests, grasslands, and shrublands, and limited areas of wetlands. The forests are primarily Douglas fir (*Pseudotsuga menziesii*) at lower elevations and limber pine (*Pinus flexilis*) and Engelmann spruce (*Picea engelmannii*) at higher elevations. A small area restricted to non-calcareous bed rock is covered by lodgepole pine (*Pinus contorta*). The grasslands include small areas of low elevation canyon bottoms dominated by Great Basin wild rye (*Elymus cinereus*), rather extensive montane and sub-alpine areas dominated by bluebunch wheatgrass (*Elymus spicatus*) and Idaho fescue (*Festuca idahoensis*), and at the highest elevations, wind swept alpine-like vegetation dominated by low growing graminoids such as purple reedgrass (*Calamagrostis*

purpurescens) and curly sedge (*Carex rupestris*). Sagebrush grasslands are extensive at all but the highest elevations and are most commonly dominated by *Artemisia tridentata* var. *vaseyana*, but in some cases at lower elevations by *Artemisia tridentata* var. *tridentata*, *Artemisia tripartita*, and *Artemisia nova*. Mountain mahogany (*Cercocarpus ledifolius*) covers significant areas of dry, rocky, southern exposed slopes at lower elevations. Wetlands are confined to springs and narrow stream corridors. Apparently absent from the Beaverhead National Forest in the Tendoy are the moist, alkaline bottomlands where many species of special concern were found on BLM and state lands in the vicinity (Vanderhorst and Lesica 1994, also see Appendix F).

The flora of the Tendoy, and of southwest Montana in general, is characterized by the presence of many species with their centers of distribution in the Great Basin. These are species which have a peripheral or disjunct distribution in Montana, with their central distribution in southern Idaho, western Wyoming and Colorado, Utah, Nevada, and eastern Washington, Oregon, and California. Examples include many of the target species which are treated in the text and appendices of this report. Most of these taxa have Montana distributions confined to the southwestern part of the state, but some also occur in southcentral Montana in the vicinity of the Pryor Mountain Desert (Lesica and Achuff 1992).

METHODS

A previous botanical survey of BLM lands in the Tendoy Mountains vicinity (Vanderhorst and Lesica 1994) documented occurrences of 31 plant species tracked at that time by the Montana Natural Heritage Program. Of these, 14 have subsequently been determined to be too common to warrant further tracking (Appendix B), leaving a list of 17 primary target species for this project (Appendix C). In addition, all current Montana plant species of special concern (Heidel 1994) were considered targets to insure that species were not omitted which may warrant consideration as sensitive. None of these, however, was known prior to this project from the Beaverhead National Forest in the Tendoy. Throughout this report, the terms "target species", and "prospective sensitive species," will be used synonymously with "Montana plant species of special concern."

I searched for populations of target species on Beaverhead National Forest lands in the Tendoy Mountains in July and August of 1994. Specific survey dates were July 6-14, July 20-22, July 28-30, and August 14. Searches were made on foot in both known and potential habitats for target

species, representing many of the typical and unusual habitat types found in the range. A Map showing principle survey routes is given in Appendix A.

Field notes included lists of all vascular plant taxa identified. The primary floras used to key out plants in the field were Dorn (1984, 1992) and Hitchcock and Cronquist (1973). Whenever populations of target species were encountered, more detailed notes were taken, standard field survey forms were filled out, and the populations were mapped. Collected data included information on habitat (associated vegetation, landscape position, soils), demography (population numbers and area covered), plant biology (phenology, vigor, reproductive success), and potential threats to the populations. Photographs (35 mm slides) were taken of the target species and their habitats.

Voucher specimens of the target species were collected when adequate material was available. Some collections were also made of the general flora, especially when field identification was difficult or to document notable taxa. The first set of all collections will be deposited at the herbarium at Montana State University (MONT).

RESULTS

Eight populations of five target species were documented for the first time in the Beaverhead National Forest in the Tendoy Mountains. These include three populations of Cusick's horsemint (*Agastache cusickii*), two of Sitka columbine (*Aquilegia formosa*), and one each of Bitterroot milkvetch (*Astragalus scaphoides*), valley sedge (*Carex vallicola*), and tapertip biscuitroot (*Lomatium attenuatum*). *Aquilegia formosa* and *Carex vallicola* are new additions to the flora of the Tendoy; the others were previously documented on BLM land in the range (Vanderhorst and Lesica 1994). None of these are currently listed as sensitive species by Region 1 (USDA Forest Service 1994), but *Agastache cusickii*, *Astragalus scaphoides*, and *Lomatium attenuatum* have BLM proposed sensitive status (USDI Bureau of Land Management 1993). Element Occurrence Records (EORs) and topographic maps showing precise locations are given in Appendix D for each of the populations. Photographic slides of some of the plants and/or their habitats are attached at the end of the report.

In addition to the five target species found on the Beaverhead National Forest, six taxa previously tracked by the Montana Natural Heritage Program were documented in the study area (Appendix B). Of the 17 targets previously documented in the BLM Tendoy study area, 14 were not encountered on the

Beaverhead National Forest (Appendix C). Figure 2 is a map showing locations of populations of target species in the vicinity of the Tendoy Mountains in the Beaverhead National Forest, and on BLM, state, and private land. With the addition of two species found by Peter Lesica on BLM land in 1994, *Lomatogonium rotatum* (a state record) and *Townsendia condensata*, there are now a total of 23 target species known from the map area. Each of these is given brief treatment in Appendix E including an indication of the likelihood of the species to occur on the Beaverhead National Forest.

Appendix F is a list of vascular plant taxa identified in the Tendoy Mountains on the Beaverhead National Forest in 1994 and on BLM land in the vicinity in 1993 (Vanderhorst and Lesica 1994). A total of 302 taxa were identified on the Beaverhead National Forest. The number of plant taxa from the BLM study area now stands at 384. Two hundred and seventeen taxa were found in both study areas. The total number of vascular plant taxa documented here on BLM and Beaverhead National Forest lands is 469. Of these, 28 species are adventive to this continent from Eurasia; many of these are potentially serious weeds.

The remainder of this section is devoted to summaries of information on each of the five target species found on the Beaverhead National Forest in the Tendoy. Subheadings include description, present legal or other formal status, geographic distribution, habitat, population demography and biology, and management concerns. The information is based on data collected from populations in this study area as well as from other occurrences of the species in Montana which are entered in the Biological Conservation Database maintained by MTNHP and on citations from literature. Throughout these summaries, individual populations are referred to by their survey site name and the last three digits of their element occurrence code given on the EORs in Appendix D.

Figure 2. Map showing occurrences of target species in the Tendoy Mountains vicinity

Agastache cusickii (Greenman) A. A. Heller
Cusick's Horse-mint

A. DESCRIPTION

1. **General description:** *A. cusickii* is an aromatic perennial in the mint family (Lamiaceae). Its habit, low growing from a long, flexible, branching woody caudex, is adapted to growing in deep, loose talus. The small simple leaves are diamond to egg shaped with serrated margins and short petioles and are borne opposite each other on relatively short aerial stems which are square in cross section. The small flowers are borne in a dense spike-like inflorescence with leaf like bracts. The flowers are bilaterally symmetrical with a fused 5-toothed calyx and a tubular, 2-lipped, usually lavender corolla. There are 4 exerted stamens and a single pistil with a bilobed stigma. Figure 3 is an illustration of the species, and photographic slides of the plants are attached at the end of this report.
2. **Technical species description** (quoted from Cronquist et al. 1984): Stems numerous from a woody taproot and branching caudex, 1-2(3) dm tall, simple or branched, tending to be somewhat woody at the base; stem, leaves, bracts, and calyces finely hirtellous-puberlent; leaf blades ovate, deltoid-ovate, or a little narrower, crenate, mostly (0.5)1-2(2.5) cm long and (4)6-15 mm wide, borne on petioles up to 1(1.5) cm long; inflorescence mostly (1)1.5-4 cm long (exclusive of any remote verticillasters), the bracts and calyces usually tinted with lavender-purple (seldom whitish in part); calyx teeth 2-5 mm long, lance-subulate, obscurely veined, or only the midrib evident, seldom more evidently tri-nerved; corolla 8-12 mm, measured to the tip of the upper lip, this 1-2 mm long and evidently bilobed; lower pair of stamens ascending under the upper lip and exerted 1-2 mm past it; upper stamens thrust downward and outward between the lower stamens, exerted 2-5 mm.
3. **Diagnostic characters:** In Montana, *Agastache urticifolia*, common horsemint, is the only other species in the genus. The two taxa are easily distinguished based on their overall size; *A. cusickii* is dwarf (1-3 dm high) with smaller leaves (1-2.5 cm), while *A. urticifolia* is large and coarse (>4 dm) with larger leaves (3.5-10 cm) (Hitchcock and Cronquist 1973).

Figure 3. Illustration of *Agastache cusickii* (from Cronquist et al. 1984)

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. Federal Status

a. **U.S. Fish and Wildlife Service:** 3C (USDI Fish and Wildlife Service 1993); This signifies that the species has "proven to be more abundant or widespread than previously believed and/or....(is) not subject to any identifiable threat."

b. **U.S. Forest Service:** none

c. **Bureau of Land Management:** *Agastache cusickii* is included on the BLM list of proposed sensitive species for Montana (USDI Bureau of Land Management 1993).

2. **State:** The Montana Natural Heritage Program ranks the species as G3 and S1. In Montana it is "critically imperiled due to extreme rarity (5 or fewer occurrences)" (Heidel 1994). Globally, it is somewhat less vulnerable to extinction.

C. GEOGRAPHICAL DISTRIBUTION

1. **Species range:** scattered in the mountains of southeastern Oregon, north and central Nevada, central Idaho (Cronquist et al. 1984), and southwestern Montana. The species is not included in Dorn (1984).

2. **Montana distribution:** Tendoy Mountains, Beaverhead County.

3. **Occurrences in the Tendoy Mountains:** Prior to 1994, *Agastache cusickii* was known in Montana from a single population on BLM land in the southwestern Tendoy on a slope above Big Sheep Creek (001). Three additional populations were found during this project on the Beaverhead National Forest in Kelmbeck (004), Patterson (002), and Williamson-Wood (003) canyons. Element Occurrence Records and maps showing precise locations of the populations on the Beaverhead National Forest are included in Appendix D.

D. HABITAT

1. **Associated vegetation:** In the Tendoy, *Agastache cusickii* grows on open slopes with little vegetation cover. Woody dominants which are present on these slopes, but not generally immediately associated with *Agastache cusickii*, include limber pine (*Pinus flexilis*), Douglas fir (*Pseudotsuga menziesii*), mountain mahogany (*Cercocarpus*

ledifolius), big sagebrush (*Artemisia tridentata*), and a gooseberry (*Ribes setosum*). Subdominant grasses in these habitats include bluebunch wheatgrass (*Elymus spicatus*) and western grass (*Leucopoa kingii*). Forbs which are often more closely associated with *Agastache cusickii* than the above listed dominants include the talus adapted perennials *Arenaria nuttallii*, *Oenothera caespitosa*, *Phacelia hastata*, and *Penstemon montanus*, and annuals such as *Collinsia parviflora* and *Polygonum douglasii*. Photographic slides showing the vegetation at each of the three sites on the Beaverhead National Forest are attached at the end of this report.

2. **Topography:** On the Beaverhead National Forest, *Agastache cusickii* is confined to the southerly facing slopes of narrow canyons, at elevations ranging from 7,000 to 7,600 feet. The BLM site is similar but is on a slope facing a broader valley and has a slightly lower minimum elevation. The population centers are on steep, loose talus downslope from limestone outcrops, often in chutes, but a few plants are usually found on more level talus deposits at the base of the slopes. Photographic slides of the population sites are attached at the end of this report.
3. **Soil relationships:** Soil development is minimal on the limestone talus where *Agastache cusickii* grows in the Tendoys, however, at the BLM site where the banks have been cut by quarrying, some horizonation can be seen; fine particles have been weathered and leached from the surface layer and deposited at depths. The upper zone of the talus is thus extremely well drained but the clays confer a higher water holding capacity in the lower zone. *Agastache cusickii* seems to be confined to the smaller sizes of limestone talus found in the area. The substrate is constantly settling and shifting and is easily disturbed.

E. POPULATION DEMOGRAPHY AND BIOLOGY

1. **Demographic details:** Populations of *Agastache cusickii* on the Beaverhead National Forest are rather small and local, with estimates of numbers and area ranging from 100 plants (considered as clumps of aerial stems) covering a single acre at Kelmbeck Creek (004) to 1,000 plants covering 15 acres in Patterson Canyon (003). The Williamson-Wood Canyon (002) population is intermediate with an estimated 200-500 plants over 5 acres. The BLM's Big Sheep Creek population is larger and more extensive in comparison.

2. **Reproduction:** Vegetative reproduction is probably common. Seedlings have not been observed. Seedling establishment may be a factor limiting population size because the seeds would probably have to germinate and seedlings develop relatively deep in the talus. The flowering period is rather long, lasting from mid-June to August.

F. MANAGEMENT CONSIDERATIONS

Although this project has quadrupled the number of known occurrences (from 1 to 4) of *Agastache cusickii* in Montana, the species still appears to be extremely rare in the state, and at least one population is threatened by road maintenance. Since populations have been discovered on the Beaverhead National Forest, designation of the species as Sensitive by the U.S. Forest Service Region 1 is appropriate at this time.

The habitats of *Agastache cusickii* in the Tendoy are by nature easily disturbed, but all occurrences on the Beaverhead National Forest are at remote sites in near pristine condition. This is not the case for the BLM occurrence, which is located along a major gravel road, where past quarrying of the limestone talus has reduced the area of potential habitat and road maintenance continues to threaten the stability of the slopes. Roads are also found in the bottoms of Kelmbeck, Patterson, and Williamson-Wood canyons, but these are primitive and infrequently traveled. Future road improvement or maintenance, and mining activities in these canyons should be managed so as not to disturb the populations of *Agastache cusickii* or the slopes they inhabit. Other human caused threats to these populations are minimal; the steep slopes are mostly inaccessible to cattle, and timber on the slopes is not of commercial quality.

Aquilegia formosa Fisch. ex DC.
Sitka Columbine

A. DESCRIPTION

1. **General Description:** Sitka or red columbine is a delicate, showy flowered member of the Buttercup Family (Ranunculaceae). The plants are herbaceous perennials from a woody caudex with mostly basal leaves. The leaves are twice ternately compound with thin bladed leaflets which are glaucous underneath. The flowers are distinctive with 5 deep red, spreading, petal-like sepals, and 5 petals with long red spurs and relatively short erect yellow blades. There are numerous stamens,

and usually five pistils which develop into many seeded follicles, dry fruits which split along one side only. Figure 4 is an illustration of the species.

2. **Technical Description:** (adapted from Welsh et al. 1987) Plants 1.5-10.5 dm tall; stems glabrous or glandular-hirtellous above; leaves mainly basal, 4-38 cm long, biternate, glabrous or villous or glandular, green above, paler beneath; flowers usually 2-4, nodding, as broad as long or broader, regular, showy; sepals 5, petaloid, horizontally spreading, not spurred, 14-27 mm long, red, reddish, or rarely yellowish; petals 5, with spurs colored like the sepals, the blades yellow, 2-7(9) mm long, spurs 15-20 mm long; stamens numerous, exceeding the petal blades by 12-17 mm; follicles usually 5, pubescent, 15-25 mm long; $2n=14$.
3. **Diagnostic characters:** Deep red sepals and petal spurs; petal blades 2-6 mm long; averaging somewhat taller than *Aquilegia flavescens*, which has yellow sepals and petal spurs, and usually longer petal blades (Hitchcock and Cronquist 1973).

B. CURRENT LEGAL OR OTHER FORMAL STATUS

1. Federal

- a. U.S. Fish and Wildlife Service: none
- b. U.S. Forest Service: none
- c. Bureau of Land Management: none

2. **State:** The Montana Natural Heritage Program ranks *Aquilegia formosa* G5 and S1 (Heidel 1994), meaning that the species is demonstrably secure globally, but critically imperiled due to extreme rarity in Montana. The species is also ranked S1 in Wyoming (Fertig 1994).

C. GEOGRAPHIC DISTRIBUTION

1. **Species range:** Widely distributed in western North America, from southern Alaska south along the coast and in the coastal mountains to Baja California, east to western Alberta, Montana, and Utah (Hitchcock and Cronquist 1964). Also in Park County, Wyoming (Dorn 1992).
2. **Distribution in Montana:** *Aquilegia formosa* is currently known from 5 sites in Beaverhead County in the Beaverhead, Centennial, and Tendoy mountains.

Figure 4. Illustration of *Aquilegia formosa*
(from Hitchcock and Cronquist 1964)

3. **Occurrences in the Tendoy Mountains:** Two populations were found by this survey on the Beaverhead National Forest, in the canyon of Kelmbeck Creek (005) and in an unnamed draw on the northeast flank of Timber Butte (004). Element Occurrence Records and maps showing the precise locations of the populations are included in Appendix D.

D. HABITAT

1. **Associated vegetation:** At four of its occurrences in Montana, *Aquilegia formosa* is associated with Douglas fir (*Pseudotsuga menziesii*), either in pure stands, with aspen (*Populus tremuloides*), or in ecotone with lakeshore habitat. The fifth site is a grassland. On the Beaverhead National Forest in the Tendoy, the two populations occur under dense canopies of Douglas fir. Subdominant plants at these sites include *Populus tremuloides*, *Shepherdia canadensis*, *Physocarpus malvaceus*, and *Arnica cordifolia*. Additional associated forbs include *Astragalus miser*, *Orthilla secunda*, *Pyrola chlorantha*, and *Valeriana dioica*. A photographic slide showing the habitat in Kelbeck Canyon is attached at the end of this report.
2. **Topography:** The two sites in the Tendoy are in the rocky bottoms of a canyon and a draw on the east flank of the range at 7,200-8,400 feet.
3. **Soil relationships:** The soils of the Tendoy populations are moderately dry rocky loams with high organic matter and a heavy surface accumulation of litter.

F. POPULATION DEMOGRAPHY AND BIOLOGY

1. **Demographic details:** Each population in the Tendoy was estimated to have 200-500 plants. The Timber Butte population was estimated to cover 20 acres, while the area of the Kelmbeck canyon population was estimated at 10 acres. Other populations in Montana were estimated to have fewer than 200 plants per site.
2. **Reproductive biology:** In nature, reproduction is primarily by seed but in cultivation columbines can be propagated by crown divisions. No seed dormancy is reported for columbines, however the seeds are slow to germinate, requiring a steady supply of moisture (Bailey 1950). At the Timber Butte site on July 6, ca. 20% of the plants were flowering and ca. 80% were vegetative. At the Kelmbeck Canyon site, on July 29, ca. 50% of the plants were vegetative and ca. 50% had mature fruit; seed from many capsules was already dispersed.

Species of *Aquilegia* are well known for freely hybridizing. The population on Timber Butte included a few individuals with yellow sepals and petal spurs (the individuals of this type which were collected were also somewhat shorter than the red flowered collections), indicating possible hybridization with *Aquilegia flavescens*, a common species in Montana. The purity of the Kelmbeck canyon population is not known; only a few shriveled flowers were found and these had bright red sepals and petal spurs. No pure populations of *A. flavescens* were seen in the Tendoys, but *A. coerula* was found on the west side of the range.

F. MANAGEMENT CONSIDERATIONS

Aquilegia formosa is rare and peripheral in Montana, now known from only 5 sites in southern Beaverhead County. Three of these sites are on the Beaverhead National Forest, in the Tendoys, and in the Beaverhead Range at Morrison Lake (Figure 2). Because of its rarity and its presence in habitats potentially subject to logging, the species should be designated Sensitive in Montana by Region 1 of the U. S. Forest Service.

Both population sites on the Beaverhead National Forest in the Tendoys were logged in the past. The stumps are tall and are confined to the draw bottoms and lower slopes, suggesting that the logs were removed in the winter for local use, thus ground disturbance would have been minimized. The resilience of populations of *Aquilegia formosa* to intensive timber harvest is not proven at these sites. The highest plant densities are in heavily shaded depressions. Canopy removal and surface disturbance would be likely to effect seedling establishment. Logging and disturbance of the water channels in these draws should be avoided. Other potential threats to this species are trampling by cattle and collection by people for domestication and cut flowers.

Astragalus scaphoides (Jones) Rydb.
Bitterroot Milkvetch

A. DESCRIPTION

1. **General description:** *Astragalus scaphoides* is a member of an extremely diverse genus in the Fabaceae (pea family). The plants are herbaceous perennials with pinnately compound leaves borne on the flowering stems. The inflorescence is a compact to somewhat elongate raceme of many relatively large, zygomorphic flowers.

The perianth consists of a fused, five lobed calyx and a cream to yellowish corolla which includes a banner (the top segment), two wings (the side segments), and a keel (the boat shaped bottom segment). There are 10 stamens, nine connected in a group and one free, and a single ovary. The mature fruit is a distinctively stalked legume which contains several seeds. Figure 5 is an illustration of the species, and photographic slides of the plant are attached at the end of this report.

2. **Technical species description** (quoted from Hitchcock and Cronquist 1961): Sparsely strigillose perennial with a taproot and branched crown; stems several, stout, ascending to erect, 2-6 dm tall; leaves 10-25 cm long; stipules lanceolate, 1-4 mm long, not connate; leaflets 15-21, lance-oblong to elliptic-oblong, 1.5-3.5 cm long, as much as 13 mm broad, glabrous on the upper surface at least; peduncles mostly 10-15 cm long; racemes closely 15- to 30-flowered but elongating and open in fruit; pedicels 2-5 mm long; flowers spreading to slightly reflexed, white to ochroleucous, about 2 cm long; calyx usually blackish-hairy, 8-10 mm long, the narrowly lanceolate lower teeth about 2 mm long; banner erect; wings 2-4 mm longer than the keel; pod erect, with a stout upward-arching stipe about twice as long as the calyx, the body 1.5-2 cm long, cartilaginous, glabrous, slightly mottled, corrugate-wrinkled, oblong-ovoid, inflated and slightly obcompressed, 4-6 mm broad, 6-10 mm thick, with both sutures sulcate, the lower intruded to form a $3/4$ complete partition.
3. **Diagnostic characters:** The following combination of characters separates this from other Montana species of *Astragalus* (adapted from Dorn 1984):

- Leaflets more than 5, not awl shaped
- Hairs attached at their base
- Stipules not united on side of stem opposite the petiole
- Pods stipitate, glabrous, obcompressed with the lower suture nearly forming a partition within the fruit, 7-20 mm wide, less than 3 times as long as wide
- Calyx 8-12.5 mm long, banner more than 15 mm long

B. PRESENT LEGAL AND OTHER STATUS

1. Federal

- a. **U.S. Fish and Wildlife Service:** 3C (UDSI Fish and Wildlife Service 1993); This signifies that the species has "proven to be more abundant or widespread than previously believed and/or....(is) not subject to any identifiable threat."

Figure 5. Illustration of *Astragalus scaphoides* (from Hitchcock and Cronquist 1961)

b. U.S. Forest Service: none

c. Bureau of Land Management: *Astragalus scaphoides* is included on the BLM's list of proposed sensitive species for Montana (USDI Bureau of Land Management 1993).

2. **State:** The Montana Natural Heritage Program ranks the species G3 and S1 (Heidel 1994). The global ranking is a reflection of vulnerability due to a restricted range. Within Montana, the species is considered critically imperiled due to extreme rarity and/or other factors.

C. GEOGRAPHIC DISTRIBUTION

1. **Species range:** *Astragalus scaphoides* is a narrow endemic restricted to the foothills of the Bitterroot Mountains and adjoining valleys in Lemhi County, Idaho and across the mountains in southwestern Beaverhead County, Montana (Barneby 1964).
2. **Distribution in Montana:** *Astragalus scaphoides* is known only from southwestern Beaverhead County, in the drainages of Grasshopper, Horse Prairie, and Medicine Lodge creeks and the upper Beaverhead River. There are now a total of 14 Montana occurrences entered in the Biological Conservation Database.
3. **Occurrences in the Tendoy Mountains:** One population was found on the Beaverhead National Forest in the drainage of Kate Creek (012). An Element Occurrence Record and map showing the precise location of the population is included in Appendix D. In addition, two populations occur on BLM land in the range, in the vicinities of Baker Canyon (Vanderhorst 1995a) and Johnson Gulch (Vanderhorst and Lesica 1994). The species is thus known only from the western flank of the range constituting the drainage of Medicine Lodge Creek.

D. HABITAT

1. **Associated vegetation:** In Montana, *Astragalus scaphoides* grows in sagebrush grasslands usually dominated by *Artemisia tridentata* (big sagebrush) and *Elymus spicatus* (bluebunch wheatgrass). Other shrub species which are subdominant or in some cases replace big sagebrush in these habitats include *Artemisia tripartita*, *Artemisia nova*, and *Chrysothamnus nauseosus*. Other common or subdominant grasses at the sites include *Stipa comata*, *Oryzopsis hymenoides*, *Festuca idahoensis*, and *Poa secunda*. Among the most conspicuous forb associates are other species of milkvetches including *Astragalus*

agrestis, *A. adsurgens*, *A. atropubescens*, *A. drummundii*, and *A. lentiginosus*. The Kate Creek population on the Beaverhead National Forest occurs in a big sagebrush/mixed bunchgrass community with scattered, small limber pine (*Pinus flexilis*). A photographic slide showing the habitat of the Kate Creek occurrence is attached at the end of this report.

2. **Topography:** Barneby (1964) describes the settings of *Astragalus scaphoides* throughout its range as "open valleys, low hills, (and) canyon benches ... from 3,500-6,000 feet." This describes the landforms where the species occurs in Montana, however, the elevation at some sites is somewhat higher and populations are often confined to warm, southerly facing aspects or micro-aspects. In the Tendoys, the species occurs on gentle to moderate slopes in the foothills of the western flank of the range from 6,800-7,100 feet.
3. **Soil relationships:** In Montana, *Astragalus scaphoides* grows in dry soils ranging from clayey to gravelly and stony loams. The soils are derived from limestones, volcanics, and basin sediments. At Kate Creek the main population grows in limestone derived soil while a smaller subpopulation is on a soil of undetermined parent material, possibly volcanic.

E. POPULATION DEMOGRAPHY AND BIOLOGY

1. **Demographic details:** The Kate Creek population is of medium size, consisting of an estimated 500-1,000 plants scattered over 7 acres in 2 subpopulations. On July 28, 1994, approximately 15% of the plants were vegetative, 15% had mature fruit, and 70% had inflorescences of aborted flowers or were browsed. Most populations of *Astragalus scaphoides* in Montana are smaller but the Johnson Gulch occurrence on BLM land in the Tendoys is relatively large, consisting of an estimated 1,000-5,000 plants.
2. **Reproductive biology:** Reproduction is by seed. The low numbers of successfully reproducing plants at Kate Creek suggests that seed production may be a major limitation to population size and distribution of *Astragalus scaphoides* in Montana. This conclusion is supported by data from other Montana populations where low percentages of flowering plants and high percentages of aborted flowers have been documented. Browsing of flowering heads, probably by cattle, has also been observed at Kate Creek and other sites. Some differences in reproductive success were noted between the two subpopulations at Kate Creek in 1994, a hot, dry season; the main population,

which grows in soil derived from limestone, had a high proportion of aborted flowers and almost no mature fruit, while a smaller subpopulation downhill on a different soil type had a high percentage of large plants with mature fruit. However, many of these large fruiting plants were partially browsed, probably by cattle, which were present at the site at the survey date. *Astragalus scaphoides* flowers in June and produces fruit from June-July.

F. MANAGEMENT CONSIDERATIONS

Astragalus scaphoides has one of the narrowest global distributions of plant species in Montana. The species is locally plentiful in Idaho (Barneby 1964, Lesica and Elliott 1987) but is uncommon in Montana. Although new populations were discovered in the state in 1994 (this report and Vanderhorst 1995), most of these were small or otherwise in poor shape. Only three of the currently known populations in the state are large and prolific. With the discovery of the species on the Beaverhead National Forest, designation of the species as Sensitive by Region 1 of the U.S. Forest Service is now appropriate.

The major threat to *Astragalus scaphoides* in Montana is cattle grazing. Heavy spring grazing has been shown to damage populations (Lesica and Elliott 1987). Most occurrences on public lands are located within grazing allotments, and most are accessible to cattle. The species has not generally been found in heavily grazed habitat and the larger populations are found in rangeland in excellent condition. Spring grazing of public rangeland with populations of *Astragalus scaphoides* should be kept to a minimum and preferably, these sites should not be grazed until after seeds have dispersed (late July to August).

Carex vallicola Dewey
Valley Sedge

A. DESCRIPTION

1. **General description:** *Carex vallicola* is a clump forming sedge (Cyperaceae). The thin leaves are borne basally and on the lower culm. The heads consist of several densely clustered spikes which are, however, not easily distinguishable without magnification. The spikes have male flowers above the female flowers, which have two styles. The perigynia (the sacs which contain the fruits) are filled at maturity by the lens shaped

achenes, so their marginal nerves become displaced to the side towards the stem, and sometimes rupture. Figure 6 is an illustration of the species.

2. **Technical description** (quoted from Hermann 1970):
Cespitose from short-prolonged, fibillose rootstocks; culms slender, 2-6 dm. high, roughened on the angles below the head; leaves about 3 to a culm, 1-1.5 mm wide, thin, the sheaths light, thin ventrally, the ligule very short, wider than long; spikes closely aggregated into a dense, terminal, oblong-linear head, 1.5-2.5 cm. long, 6-8 mm wide, the staminate flowers terminal and inconspicuous; scales broadly triangular, shorter than the perigynia, hyaline with the centers brownish and 1-3-nerved, acute to short-cuspidate; perigynia plano-convex, oblong-elliptic, 3.5-3.75 mm. long, 1.75-2.25 mm. wide, margined, greenish or brown tinged, nerveless ventrally, obscurely nerved dorsally, glossy at maturity, the margin more or less serrulate above, abruptly narrowed into a minutely serrulate beak about 1 mm. long, obliquely cut and only shallowly bidentulate; achenes lenticular, orbicular, substipitate, 2 X 2 mm.
3. **Diagnostic characters:** *Carex vallicola* can be distinguished from other sedges in Montana by the following technical characters: 2 stigmas, lenticular achenes; fewer than 10 sessile, androgenous (male flowers above female flowers) spikes per head; cespitose culms; leaves 0.5-3.5 mm wide; perigynia abruptly narrowed to a beak which is obliquely cut and only minutely bidentulate (Dorn 1984). The mature perigynia are distinctively distended so that the margins run down the ventral side (Hermann 1970).

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. Federal

- a. U.S. Fish and Wildlife Service: none
- b. U.S. Forest Service: none
- c. BLM: none

2. **State:** The Montana Natural Heritage Program ranks *Carex vallicola* as G5 and S2S3 (Heidel 1994). This means that it is demonstrably secure globally, but it is more rare and somewhat vulnerable to extirpation in Montana.

Figure 6. Illustration of *Carex vallicola* (from Cronquist et al. 1977)

C. GEOGRAPHIC DISTRIBUTION

1. **Species range:** from the Great Plains in South Dakota, east to the Great Basin extending to Oregon and California, and south to Mexico (Cronquist et al. 1977).
2. **Montana distribution:** *Carex vallicola* is known from 9 sites widely distributed in southern Montana, in Beaverhead, Carbon, Lewis and Clark, Madison, Silver Bow, and Gallatin (or Park) counties. Four of these sites are in Beaverhead County. Two occurrences are known only by historical collections (1908 and 1921) and few have been thoroughly surveyed.
3. **Occurrences in the Tendoy Mountains:** The species was collected but not fully surveyed on the Beaverhead National Forest in the vicinity of Sourdough Spring (010). An Element Occurrence Record and map showing the precise location of the population is included in Appendix D.

D. HABITAT

1. **Associated vegetation:** In Montana, *Carex vallicola* is generally found in grasslands with or without sagebrush, but at two northern and eastern sites it was reported from Douglas fir forests. In the Intermountain Region it often grows under aspen (Cronquist et al. 1977). The population on the Beaverhead National Forest in the Tendoy occurs in an *Artemisia tridentata*/*Festuca idahoensis* association with *Castilleja rustica*, *Eriogonum umbellatum*, and *Lupinus argenteus*.
2. **Topography:** Throughout its range, *Carex vallicola* inhabits slopes from the foothills to moderate elevations in the mountains (Cronquist et al. 1977). In Montana, it is reported from gentle to moderate slopes of various aspects in the foothills and mountains, at elevations ranging from 5,870 to 8,500 feet. In the Tendoy, the population is on a moderate, south facing slope at 8,500 feet, in a bowl at the head of a drainage below the crest of the range.
3. **Soil relationships:** In Montana, *Carex vallicola* is known from dry to moist, relatively fine textured soils derived from parent materials of limestone and alluvium.

E. POPULATION DEMOGRAPHY AND BIOLOGY

1. **Demographic details:** As mentioned above, the population in the study area was not fully surveyed, however, the population density was locally high enough that the

species was considered subdominant at the site. The areal extent of the population is not known. Demographic details are lacking or minimal for all occurrences in Montana.

2. **Reproductive biology:** *Carex vallicola* is a clump forming sedge, reproducing sexually by seed. Mature fruit are reported from most of the known occurrences in Montana; fruit were present from mid-June to mid-August. The population in the study area had mostly dispersed fruit on July 21, 1994.

F. MANAGEMENT CONSIDERATIONS

Carex vallicola has a wide range in the Great Plains, Rocky Mountains and Great Basin, but it is poorly known in Montana. Studies in Utah suggest that the species has undergone a decline due to its high palatability and sensitivity to grazing (Lewis 1958). Distribution and population trends in Montana are impossible to judge due to lack of available data. Considering these facts, designation as a Sensitive species by Region 1 of the U.S. Forest Service is probably not warranted at this time. Designation as a Watch species by the Beaverhead National Forest, however, would encourage the needed collection of additional distribution and population data. In addition, this species may have value as an indicator of range quality.

The population on the Beaverhead National Forest in the Tendoy is close to a spring which has been developed as a water source for cattle, and the habitat immediately adjacent to the spring has been degraded by trampling and weed infestations. At the date of the survey there was no evidence of recent grazing at the site. The impact of grazing on *Carex vallicola* in the study area is not known.

Lomatium attenuatum Evert
Tapertip Biscuitroot

A. DESCRIPTION

1. **General description:** This is a yellow flowered member of the Apiaceae (carrot family). The leaves are dissected and have a sheathing petiole. The flowers are borne in a compound umbel with an inconspicuous involucre subtending the umbels. The flowers are 5-merous except for the bicarpellate ovary. The fruits are schizocarps which are flattened parallel to their sutures, with low ribs on their faces. Figure 7 is an illustration of the species.

Figure 7. Illustration of *Lomatium attenuatum* (from Evert 1983)

2. Technical species description (quoted from Evert 1983):
 Plant perennial, short-caulescent, with only one or two cauline leaves, more or less scaberulous, (7-)10-25 cm tall, from an elongated thickened taproot and also occasionally from a several-branched caudex; leaves petiolate, 3-pinnate or ternately 3-pinnate, blades 2.0-11 cm long, 1.5-10 cm wide, ovate in outline, the ultimate divisions linear to oblanceolate, 2-5 mm long, 0.5-1.5 mm wide, obtuse to somewhat acute and mucronate; petioles 1.5-5 cm long, the dilated and scarious sheathing extending to the middle or above; peduncles 1-3(4), scaberulous, exceeding the leaves in fruit, 10-15 cm long; involucre usually absent but occasionally 1 inconspicuous, filiform bract present; fertile rays 5-8, spreading, angled, unequal, (1.5)3-5 cm long in fruit; sterile rays 4-8 spreading, 3-10 mm long in fruit; involucre absent or of 1-6 inconspicuous linear-lanceolate, attenuate, non-connate bractlets, 1-4 mm long; umbellets ca. 15-flowered, only 2-6 developing into fruit; pedicels 3-10 mm long in fruit; petals 1.5 mm long including the incurved apex, yellow, obovate, glabrous; styles 1-1.5 mm long, spreading or reflexed; ovaries glabrous to slightly scaberulous; fruit oblong-elliptic, glabrous, glossy, 5-8 mm long, 3-5 mm wide, the wings ca. 0.5-0.75 mm wide, narrower than the body; oil tubes prominent, 1 in each interval, 2 on the commissure; carpophore bipartite.
3. Diagnostic characters: *L. attenuatum* differs from *L. cous*, which it resembles in habit, leaf dissection, and fruit characters, by having a less conspicuous involucre and greater overall scabrosity (Evert 1983).

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. Federal

- a. U.S. Fish and Wildlife Service: 3C (USDI Fish and Wildlife Service 1993); This signifies that the species has "proven to be more abundant or widespread than previously believed and/or....(is) not subject to any identifiable threat."
- b. U.S. Forest Service: none
- c. Bureau of Land Management: *Lomatium attenuatum* is included on the BLM's list of proposed sensitive species for Montana (USDI Bureau of Land Management 1993).

2. State: The Montana Natural Heritage Program ranks the species G3 and S1 meaning that it is somewhat vulnerable

on a global scale due to a limited range, but it is critically imperiled within the state due to extreme rarity (Heidel 1994). In Wyoming, the species is ranked S3 (Fertig 1994), however it may be ranked too high (Fertig, pers. commun.); it is known from a fair number of collections, but these are all from a relatively narrow range.

C. GEOGRAPHIC DISTRIBUTION

1. **Species range:** The species is known only from Park County in northwestern Wyoming (Evert 1983, Dorn 1992) and from Beaverhead County, Montana.
2. **Montana distribution:** *Lomatium attenuatum* was first discovered in the state in 1993 by Peter Lesica on BLM land in the Tendoy Mountains (Vanderhorst and Lesica 1994). Additional populations were found in 1994 in the Tendoy and to the north near Bannack (Vanderhorst 1995b).
3. **Occurrences in the Tendoy Mountains:** The species was found on the Beaverhead National Forest on a slope above Sourdough Creek (004). An Element Occurrence Record and map showing the precise location of the population is included in Appendix D. In addition, three populations are known from BLM land in the Tendoy (Figure 2).

D. HABITAT

1. **Associated vegetation:** In the Tendoy, *Lomatium attenuatum* grows in limber pine (*Pinus flexilis*) and mountain mahogany (*Cercocarpus ledifolius*) communities. The limber pine forest of the population site on the Beaverhead National Forest was sampled by an ecodata plot (NHMT020194SC005). There was 40% canopy coverage by *Pinus flexilis* and *Pseudotsuga menziesii*. Shrubs, which contributed a total of 10% coverage, included *Juniperus communis*, *Artemisia tridentata*, and *Ribes cereum*. Graminoids, having a total coverage of less than 30%, included *Leucopoa kingii*, *Elymus spicatus*, *Festuca idahoensis*, *Poa cusickii*, and *Carex rossii*. There were 24 forbs in the plot, but only *Phlox caespitosa* had a coverage greater than 1%.
2. **Topography:** In Montana, *Lomatium attenuatum* occurs on mountain and canyon slopes ranging in elevation from 6,200 to 8,500 feet. The Beaverhead National Forest site is a steep, south facing, upper slope just below the crest of the range, and is the highest elevation known for the species in the state.

3. **Soil relationships:** In Montana, *Lomatium attenuatum* grows in talus and gravelly to rocky soils derived from limestone. A soil sample was collected from the Beaverhead National Forest site in the Tendoys, but has not yet been analyzed. Evert (1983) describes the soils where the species is found in Wyoming as "lithosols derived from volcanic material or limestone." The species has not yet been found on volcanics in Montana.

D. POPULATION DEMOGRAPHY AND BIOLOGY

1. **Demographic details:** The population of *Lomatium attenuatum* on the Beaverhead National Forest was estimated to consist of at least 1,000 plants covering at least 5 acres. The area around and upslope from the ecodata plot was surveyed, but potential habitat downhill was not. Population estimates for other Montana occurrences range from 200 to a maximum of 10,000 plants. A population in the Tendoys on BLM land in Limekiln Canyon is quite extensive, stretching for 2-3 miles in the canyon bottom.
2. **Reproductive biology:** Reproduction is by seed. The flowers appear with the leaves in spring (Evert 1983). Plants were in a mature fruiting stage on the survey dates (early June to mid-July) for all Montana populations. Specimens which I collected have between 2 and 30 mature fruits per plant and there is a range in maturity between umbellets on a plant.

E. MANAGEMENT CONSIDERATIONS

The population sites of *Lomatium attenuatum* in the Tendoys are remote, in near pristine condition, and are not impacted by current land uses. However, the species has a very narrow distribution both in Montana and Wyoming; for this reason, designation of Watch status by the Beaverhead National Forest is appropriate. Management requirements for the species are minimal because the slopes where it grows are not generally accessible to cattle and do not produce timber of commercial quality. The species could be impacted in the future by road construction or mining activities.

DISCUSSION

Recommendations on U.S. Forest Service Region 1 and Beaverhead National Forest status for the five target species found on the Beaverhead National Forest in the Tendoy are summarized in Table 1. Region 1 sensitive status is recommended for *Agastache cusickii*, *Aquilegia formosa*, and *Astragalus scaphoides*. These are species which are extremely rare in Montana and/or are imperiled due to other factors. Populations of *Aquilegia formosa* are potentially impacted by timber harvest, and populations of *Astragalus scaphoides* may be impacted by livestock grazing. Populations of *Agastache cusickii* on the Beaverhead National Forest are not threatened by current land uses, but the species is known from only four sites in Montana, is confined to a very specific habitat, and most of its populations are small. Beaverhead National Forest watch status is recommended for *Carex vallicola* and *Lomatium attenuatum*. *Carex vallicola* is a poorly known species in Montana and may be impacted by grazing. *Lomatium attenuatum* has a limited global distribution and has only recently (1993) been documented in Montana. Designation of watch status would encourage needed additional data collection on these species, and would ensure they are considered in future management plans.

Table 1. Recommendations on U.S. Forest Service Region 1 (sensitive) and Beaverhead National Forest (watch) status for the five target species found in the study area. Columns are also included for the current Montana Natural Heritage Program rank (Heidel 1994) and currently proposed BLM status (USDI Bureau of Land Management 1993).

Scientific name	MTNHP status GRANK/SRANK	Proposed BLM status	Recommended USFS status
<i>Agastache cusickii</i>	G3 S1	sensitive	sensitive
<i>Aquilegia formosa</i>	G5 S1	none	sensitive
<i>Astragalus scaphoides</i>	G3 S1	sensitive	sensitive
<i>Carex vallicola</i>	G5 S2	none	watch
<i>Lomatium attenuatum</i>	G3 S1	sensitive	watch

The most significant potential human caused impact to sensitive plants and native vegetation in the study area is cattle grazing. Range lands in the Beaverhead National Forest

in the Tendoy mountains are, however, generally in relatively good condition, with severe disturbances noted only in wet areas around springs and streams. None the less, two target species found by this project, *Astragalus scaphoides* and *Carex vallicola*, may be especially vulnerable to grazing due to their palatability and occurrence in primary range. Both of these species may be useful indicators of range quality. Also considered an indicator of range quality is the occurrence of communities dominated by *Elymus cinereus* (Great Basin wild rye) at lower elevations in canyon bottoms. These productive habitats are often degraded on more heavily grazed BLM, state, and private lands adjacent to the Beaverhead National Forest.

Other potential impacts to populations of the recommended sensitive and watch plants in the study area are quarrying and mining, road construction and maintenance, and timber harvest. The *Agastache cusickii* and *Lomatium attenuatum* occur on limestone slopes which may be disturbed by quarrying for road material. The *Aquilegia formosa* grows in forests which have been logged in the past. Clearances for these activities should consider the occurrence and potential occurrence of sensitive plants at or near the project sites and projects should be designed to minimize impacts to populations of these species.

The results of this survey are a sample of the total plant diversity of the Tendoy Mountains and should be considered in light of sensitive plant survey results from BLM lands (Vanderhorst and Lesica 1994) and other known occurrences of sensitive plants in the vicinity. Although only five target species are documented here from the Beaverhead National Forest in the range, a total of 23 are now known from the vicinity (mapped in Figure 2 in the Results section) and there is potential for some others of these to occur on the Forest. Brief treatments of each of these 23 targets are given in Appendix E; included are habitat profiles and phenology to guide field surveys for the targets, and an indication of the likelihood of their occurrence on the Beaverhead National Forest.

Conspicuously missing from the Beaverhead National Forest in the Tendoy mountains are known occurrences of target species which grow in alkaline wetlands (e.g. *Carex parryana* ssp. *idahoensis*, *Lomatogonium rotatum*, and *Thalictrum alpinum*). These habitats were not seen on the Beaverhead National Forest, but there may be some potential for small areas of them at lower elevations and in basin topographic positions. One interesting wetland site on the Beaverhead National Forest which was seen in the distance but not surveyed by this project is Porcupine Spring; this is at a higher elevation than known occurrences of the alkaline wetland targets, but may be similar to the habitat at Poison Lakes on state land in the range, where *Carex parryana*

ssp. *idaho* is known. Wetlands in the study area are often heavily impacted by cattle, thus surveys to identify sensitive species which occur in these habitats should be given high priority. Also apparently missing from the Beaverhead National Forest in the Tendoy are examples of low sagebrush (*Artemisia arbuscula*) communities, where the target species, *Eriogonum caespitosum* and *Haplopappus macronema* ssp. *linearis*, are known in the nearby basins.

Perhaps the most unique and characteristic plants of the Tendoy Range, in its strict sense, are those which grow in lithic substrates of Madison limestone parent material. Two target species, *Agastache cusickii* and *Lomatium attenuatum*, were found in limestone habitats on both Beaverhead National Forest and BLM lands. Although it was not found, the annual *Phacelia incana*, known in Montana only from the Tendoy, is likely to occur on limestone canyon slopes in the Beaverhead National Forest. The hot, dry growing season of 1994 was not conducive to the germination and growth of annuals and few were seen. Other target species which should be sought in limestone habitats include *Hutchinsia procumbens*, *Sphaeromeria argentea* and *Thlaspi parviflorum*. Two limestone endemics, *Delphinium bicolor* ssp. *novum* and *Sphaeromeria capitata*, are common on BLM land in the range and are not considered sensitive; these occur at low elevations in the foothills and are not expected to be common on the Beaverhead National Forest in the range.

Prior to 1993, the flora of the Tendoy Mountains was not well known, although an indication of its uniqueness was given by several known occurrences of rare plants in the range. After two seasons of surveys, the range is now better known botanically. These surveys resulted in the discovery of three state records, *Lomatogonium rotatum*, *Lomatium attenuatum*, and *Eriogonum caespitosum*, all by Peter Lesica. Fourteen species previously tracked as Montana plant species of special concern were found, largely by these surveys, to be too common to warrant further tracking (Appendix A). This project resulted in first records on a National Forest for three target species, *Agastache cusickii*, *Astragalus scaphoides*, and *Lomatium attenuatum*. These results are an indication of a rapid advance in the knowledge of a unique flora, and an indication of the potential for similar progress in other poorly known areas. Despite these advances, the results of this survey should not be considered complete. They are meant to serve as a baseline and reference for biological assessments and evaluations and for long term planning by the Beaverhead National Forest, but should not be construed as site clearances or as a definitive inventory of plant biodiversity in the range.

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APPENDIX A. Map of the study area showing principle survey routes.

APPENDIX B. Former target species found on BLM land in the Tendoy which have subsequently been dropped from tracking by the Montana Natural Heritage Program due to relative abundance and security.

<u>Species</u>	<u>Also found on the Beaverhead National Forest?</u>
<i>Arenaria kingii</i>	yes
<i>Astragalus argophyllus</i>	no
<i>Astragalus lentiginosus</i>	yes
<i>Astragalus leptaleus</i>	no
<i>Cirsium subniveum</i>	yes
<i>Delphinium bicolor</i> ssp. novum	no
<i>Erigeron gracilis</i>	yes
<i>Eriogonum ovalifolium</i> var. nevadense	no
<i>Gentiana aquatica</i>	no
<i>Mimulus suksdorfii</i>	no
<i>Pediocactus simpsonii</i>	yes
<i>Senecio debilis</i>	no
<i>Sphaeromeria capitata</i>	no
<i>Stanleya viridiflora</i>	yes

APPENDIX C. Primary search targets identified by a sensitive plant survey of BLM lands in the Tendoy Range (Vanderhorst and Lesica 1994).

<u>Species</u>	<u>Also found on the Beaverhead National Forest?</u>
Agastache cusickii	yes
Astragalus scaphoides	yes
Astragalus terminalis	no
Carex parryana ssp. idahoa	no
Eriogonum caespitosum	no
Halimolobos virgata	no
Haplopappus macronema ssp. linearis	no
Hutchinsia procumbens	no
Lomatium attenuatum	yes
Penstemon lemhiensis	no
Phacelia incana	no
Sphaeromeria argentea	no
Taraxacum eriophorum	no
Thalictrum alpinum	no
Thelypodium sagittatum	no
Thlaspi parviflorum	no
Townsendia nuttallii	no

APPENDIX D. Element Occurrence Records and topographic maps showing the precise locations of populations of species of special concern on the Beaverhead National Forest in the Tendoy Mountains.

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: AGASTACHE CUSICKII
Common Name: CUSICK'S HORSE-MINT

Global rank: G3 Forest Service status:
State rank: S1 Federal Status: 3C

Element occurrence code: PDLAM03030.002
Element occurrence type:

Survey site name: WILLIAMSON WOOD CANYON
EO rank: A
EO rank comments: SMALL POPULATION CONFINED BY SIZE OF TALUS.

County: BEAVERHEAD

USGS quadrangle: CABOOSE CANYON

Township: Range: Section: TRS comments:
014S 010W 18 SE4

Precision: S
Survey date: 1994-07-20 Elevation: 7450 - 7750
First observation: 1994-07-20 Slope/aspect: 0-60% / S-SE
Last observation: 1994-07-20 Size (acres): 5

Location:
TRAVEL CA. 0.8 MILE SOUTH ON BIG SHEEP CREEK ROAD FROM JUNCTION WITH
MUDDY CREEK ROAD. TURN WEST ON DIRT ROAD, FOLLOW CA. 1.5 MILES TO
WILLIAMSON WOOD CANYON AND GO UP CANYON CA. 2.5 MILES.

Element occurrence data:
4 SUBPOPULATIONS WITH 200-500 PLANTS TOTAL. 99% FLOWERING.

General site description:
DRY, OPEN, UNSTABLE LOWER TO MIDSLOPE ROCKSLIDE. OCCURRING ONLY IN
FINE GRAVEL IN CHUTES AND AT BASE OF SLOPE. LIMESTONE PARENT MATERIAL,
GRAVELLY CLAY SOIL. ASSOCIATED SPECIES: LEUCOPOA KINGII, CERCOCARPUS
LEDIFOLIUS, RIBES SETOSUM, ARENARIA NUTTALLII, PENSTEMON MONTANUS,
ERIOGONUM OVALIFOLIUM.

Land owner/manager:
BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

Information source: VANDERHORST, J. [BOTANIST]. 1515 LAKE STREET,
OGDEN, UTAH 84401.

Specimens: VANDERHORST, J. (5243). 1994. MONT.

Agastache cusickii: Williamson-Wood Canyon (002)
USGS Caboose Canyon 7.5' quadrangle

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: AGASTACHE CUSICKII
Common Name: CUSICK'S HORSE-MINT

Global rank: G3 Forest Service status:
State rank: S1 Federal Status: 3C

Element occurrence code: PDLAM03030.003
Element occurrence type:

Survey site name: PATTERSON CANYON
EO rank: A
EO rank comments: SMALLER THAN PREVIOUSLY-KNOWN BIG SHEEP CREEK
POPULATION.

County: BEAVERHEAD

USGS quadrangle: CABOOSE CANYON

Township: Range: Section: TRS comments:
014S 010W 28 SE4

Precision: S
Survey date: 1994-07-14 Elevation: 6960 - 7360
First observation: 1994-07-14 Slope/aspect: 30-50% / S-SE
Last observation: 1994-07-14 Size (acres): 15

Location:
CA. 1 MILE WEST OF BIG SHEEP CREEK UP PATTERSON CANYON. ALTERNATE
ACCESS VIA PUBLIC LAND FROM PILEUP CANYON.

Element occurrence data:
CA. 1000 PLANTS (CLUMPS OF AERIAL STEMS); 2 SUBPOPULATIONS. 70%
FLOWERING, 30% VEGETATIVE.

General site description:
DRY, OPEN, LOWER TO MIDSLOPE ROCKSLIDE. LIMESTONE PARENT MATERIAL,
GRAVELLY CLAY SOIL. ASSOCIATED SPECIES: ARTEMISIA TRIDENTATA, ELYMUS
SPICATUS, PINUS FLEXILIS, LEUCOPOA KINGII, CERCOCARPUS LEDIFOLIUS,
RIBES SETOSUM, OENOTHERA CAESPITOSA, ARENARIA NUTTALLII, BUPLEURUM
AMERICANUM, PENSTEMON ARIDIS.

Land owner/manager:
BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT
BLM: BUTTE DISTRICT, DILLON RESOURCE AREA

Comments:

Information source: VANDERHORST, J. [BOTANIST]. 1515 LAKE STREET,
OGDEN, UTAH 84401.

Specimens: VANDERHORST, J. (5241 (B)). 1994. MONT.

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: AGASTACHE CUSICKII
Common Name: CUSICK'S HORSE-MINT

Global rank: G3 Forest Service status:
State rank: S1 Federal Status: 3C

Element occurrence code: PDLAM03030.004
Element occurrence type:

Survey site name: KELMBECK CREEK
EO rank: A
EO rank comments: SMALL POPULATION.

County: BEAVERHEAD

USGS quadrangle: KIDD

Township: Range: Section: TRS comments:
012S 010W 20 NW4

Precision: S
Survey date: 1994-07-29 Elevation: 7550 -
First observation: 1994-07-29 Slope/aspect: 60% / SOUTH
Last observation: 1994-07-29 Size (acres): 1

Location:
TAKE KIDD EXIT OFF I-15/91. TRAVEL WEST ON GRAVEL ROAD UP KELMBECK
CANYON. POPULATION IS ON SOUTH-FACING TALUS CA. 2 MILES UP CANYON FROM
USFS BOUNDARY.

Element occurrence data:
CA. 100 PLANTS, MOSTLY LATE FLOWER.

General site description:
DRY, OPEN, UNSTABLE LOWERSLOPE ROCKSLIDE. LIMESTONE PARENT MATERIAL,
GRAVELLY CLAY SOIL. ASSOCIATED SPECIES: CERCOCARPUS LEDIFOLIUS,
PSEUDOTSUGA MENZIESII, PINUS FLEXILIS, ELYMUS SPICATUS, LEUCOPOA
KINGII, PHACELIA HASTATA, POLYGONUM DOUGLASII.

Land owner/manager:
BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

Information source: VANDERHORST, J. [BOTANIST]. 1515 LAKE STREET,
OGDEN, UTAH 84401.

Specimens: VANDERHORST, J. (5269). 1994. MONT.

Agastache cusickii: Kelmbeck Creek (004)
USGS Kidd 7.5' quadrangle

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: AQUILEGIA FORMOSA
Common Name: SITKA COLUMBINE

Global rank: G5 Forest Service status:
State rank: S1 Federal Status:

Element occurrence code: PDRAN050B0.004
Element occurrence type:

Survey site name: TIMBER BUTTE
EO rank: A
EO rank comments:

County: BEAVERHEAD

USGS quadrangle: DIXON MOUNTAIN
KIDD

Township: Range: Section: TRS comments:
012S 010W 33

Precision: S
Survey date: 1994-07-06 Elevation: 7850 - 8400
First observation: 1994-07-06 Slope/aspect: 0-10% / NORTH
Last observation: 1994-07-06 Size (acres): 20

Location:
TAKE KIDD EXIT OFF I-15/91. TRAVEL SOUTHWEST ON MAIN GRAVEL ROAD TO
ITS END AT MCKNIGHT CANYON. PLANTS ARE IN UNNAMED DRAW ON NORTH SIDE
OF TIMBER BUTTE.

Element occurrence data:
CA. 200-500 PLANTS. 20% FLOWERING, 80% VEGETATIVE. YELLOW COLUMBINES
ALSO PRESENT BUT NOT AS COMMON; MIXED OR HYBRID POPULATION.

General site description:
BOTTOM OF DRAW; SHADED. RECEIVES SEASONAL RUN-OFF FLOW. PSEUDOTSUGA
MENZIESII HABITAT TYPE, WITH VALERIANA DIOICA.

Land owner/manager:
BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:
OBSERVED BY J. VANDERHORST. PAST LOGGING PROBABLY CAUSED MINIMAL
SURFACE DISTURBANCE; LOGS PROBABLY TAKEN OUT OVER SNOW.

Information source: VANDERHORST, J. [BOTANIST]. 1515 LAKE STREET,
OGDEN, UTAH 84401.

Specimens: VANDERHORST, J. (5215). 1994. MONT.

Aquilegia formosa: Timber Butte (004)
 USGS Dixon Mountain and Kidd 7.5' quadrangles

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: *AQUILEGIA FORMOSA*
Common Name: SITKA COLUMBINE

Global rank: G5 Forest Service status:
State rank: S1 Federal Status:

Element occurrence code: PDRAN050B0.005
Element occurrence type:

Survey site name: KELMBECK CREEK
EO rank: A
EO rank comments:

County: BEAVERHEAD

USGS quadrangle: KIDD

Township: Range: Section: TRS comments:
012S 010W 20 N2

Precision: S
Survey date: 1994-07-29 Elevation: 7080 - 7240
First observation: 1994-07-29 Slope/aspect: 0-5% / NE
Last observation: 1994-07-29 Size (acres): 10

Location:

TAKE KIDD EXIT OFF I-15/91. TRAVEL WEST ON GRAVEL ROAD UP KELMBECK CANYON. POPULATION IS IN WOODED CANYON BOTTOM, CA. 1.5 MILES PAST USFS BOUNDARY.

Element occurrence data:

200-500 INDIVIDUALS, 50% VEGETATIVE, 50% MATURE FRUIT. PLANTS PAST FLOWERING BUT SOME OLD FLOWERS FOUND WITH RED SEPALs AND PETAL SPURS.

General site description:

SHADED, DRY (WITH SEASONAL RUNOFF) CANYON BOTTOM. HIGH ORGANIC MATERIAL LOAM SOIL. ASSOCIATED SPECIES: PSEUDOTSUGA MENZIESII, POPULUS TREMULOIDES, SHEPHERDIA CANADENSIS, PHYSOCARPUS MALVACEUS, ARNICA CORDIFOLIA, ORTHILLA SECUNDA, PYROLA CHLORANTHA, ASTRAGALUS MISER, SENECEO STREPTANTHIFOLIUS, SYMPHORICARPOS OREOPHILLUS.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

PAST WINTER LOGGING NOTED. PLANTS PAST FLOWERING, BUT SOME OLD FLOWERS HAD RED SEPALs AND PETAL SPURS.

Information source: VANDERHORST, J. [BOTANIST]. 1515 LAKE STREET, OGDEN, UTAH 84401.

Specimens:

Aquilegia formosa: Kelmbek Creek (005)
USGS Kidd 7.5' quadrangle

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: ASTRAGALUS SCAPHOIDES
Common Name: BITTERROOT MILKVETCH

Global rank: G3 Forest Service status:
State rank: S1 Federal Status: 3C

Element occurrence code: PDFAB0F7V0.012
Element occurrence type:

Survey site name: KATE CREEK
EO rank: B
EO rank comments: ONLY A FEW PLANTS WITH VIABLE FRUIT; AREA
MODERATELY GRAZED.

County: BEAVERHEAD

USGS quadrangle: DEER CANYON

Township: Range: Section: TRS comments:
012S 011W 19 NE4; 20NW4

Precision: S
Survey date: 1994-07-28 Elevation: 6920 - 7160
First observation: 1994-07-28 Slope/aspect:
Last observation: 1994-07-28 Size (acres): 7

Location:

CA. 0.4 MILES UP KATE CREEK FROM MEDICINE LODGE CREEK ROAD. PLANTS ARE
ON SLOPES TO WEST OF CREEK AND ROAD. OBTAIN PERMISSION TO ACCESS FROM
HANSEN RANCH.

Element occurrence data:

2 SUBPOPULATIONS WITH CA. 500-1000 PLANTS TOTAL. 15% VEGETATIVE, 15%
MATURE FRUIT, 70% WITH ABORTED FLOWERS OR BROWSED HEADS.

General site description:

DRY RESIDUAL SLOPES. LIMESTONE AND VOLCANIC PARENT MATERIAL. FINE
SOIL. ASSOCIATED SPECIES: ARTEMISIA TRIDENTATA, ELYMUS SPICATUS,
FESTUCA IDAHOENSIS, PINUS FLEXILIS, CHRYSOTHAMNUS NAUSEOSUS, IVESIA
GORDONII, ORYZOPSIS HYMENOIDES, ALLIUM TEXTILE, ASTRAGALUS DRUMUNDII,
ASTRAGALUS ADSURGENS, SENECIO STREPTANTHIFOLIUS.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

BADGER DIGGINGS, BROWSED HEADS, AND CATTLE IN DRAINAGE ON DATE OF
SURVEY. POOR FRUIT PRODUCTION, PROBABLY DUE TO DROUGHT. LARGER (BUT
FEWER) PLANTS WITH RIPENED FRUIT MOSTLY IN LOWER SUBPOPULATION ON
VOLCANIC ROCK TYPE.

Information source: VANDERHORST, J. [BOTANIST]. 1515 LAKE STREET,
OGDEN, UTAH 84401.

Specimens:

Astragalus scaphoides: Kate Creek (012)
USGS Deer Canyon 7.5' quadrangle

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: CAREX VALLICOLA
Common Name: VALLEY SEDGE

Global rank: G5 Forest Service status:
State rank: S2 Federal Status:

Element occurrence code: PMCYPO3EA0.010
Element occurrence type:

Survey site name: SOURDOUGH SPRING
EO rank: B
EO rank comments: DENSE POPULATION, TAXON SUB-DOMINANT AT SITE.
VIABILITY WILL DEPEND ON FUTURE STOCKING RATES.

County: BEAVERHEAD

USGS quadrangle: DEER CANYON

Township: Range: Section: TRS comments:
012S 011W 13 W2

Precision: S
Survey date: 1994-07-21 Elevation: 8500 -
First observation: 1994-07-21 Slope/aspect: 10% / SOUTH
Last observation: 1994-07-21 Size (acres):

Location:

SOURDOUGH SPRING. FROM DELL, FOLLOW BIG SHEEP CREEK ROAD TO MUDDY CREEK ROAD. GO UP MUDDY CREEK, THEN TURN UP SOURDOUGH CREEK TO SPRING AT HEADWATERS.

Element occurrence data:

1000+ PLANTS, MATURE FRUIT; MATURE PERIGYNIA, MANY DEHISCED.
BOUNDARIES NOT DETERMINED.

General site description:

OPEN, DRY (WITH SEASONAL SEEPAGE) RESIDUAL SEDIMENTARY MIDSLOPE.
LIMESTONE PARENT MATERIAL, FINE SOIL. ASSOCIATED SPECIES: ARTEMESIA TRIDENTATA, FESTUCA IDAHOENSIS, LUPINUS ARGENTUS ERIOGONUM UMBELLATUM, CASTILLEJA RUSTICA, THLASPI ARVENSE, POA PRATENSE.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

OBSERVED BY J. VANDERHORST. WEEDS ABUNDANT IN AREA, DEVELOPED SPRING NEARBY; CATTLE HISTORICALLY IN AREA.

Information source: VANDERHORST, J. [BOTANIST]. 1515 LAKE STREET, OGDEN, UTAH 84401.

Specimens: VANDERHORST, J. (5245). 1994. MONT.

Carex vallicola: Sourdough Spring (010)
USGS Deer Canyon 7.5' quadrangle

MONTANA NATURAL HERITAGE PROGRAM
Element Occurrence Record

Scientific Name: LOMATIUM ATTENUATUM
Common Name: TAPER-TIP DESERT-PARSLEY

Global rank: G3 Forest Service status:
State rank: S1 Federal Status: 3C

Element occurrence code: PDAPI1B240.004
Element occurrence type:

Survey site name: SOURDOUGH CREEK
EO rank: A
EO rank comments: NO EVIDENCE OF DISTURBANCE.

County: BEAVERHEAD

USGS quadrangle: DEER CANYON

Township: Range: Section: TRS comments:
012S 011W 24 NE4

Precision: S
Survey date: 1994-07-08 Elevation: 8700 -
First observation: 1994-07-08 Slope/aspect: 50% / SOUTH
Last observation: 1994-07-08 Size (acres): 5

Location:

FROM DELL, FOLLOW BIG SHEEP CREEK ROAD TO MUDDY CREEK ROAD AND FOLLOW
THIS UP SOURDOUGH CREEK. POPULATION IS JUST BELOW RIDGE ON SOUTH
FACING SLOPES, FAR ABOVE SOURDOUGH CREEK.

Element occurrence data:

1000+ ESTIMATED PLANTS. DOWNSLOPE HABITAT NOT COMPLETELY SURVEYED.

General site description:

DRY, PARTIAL SHADE, UPPERSLOPE. LIMESTONE PARENT MATERIAL. ASSOCIATED
SPECIES: PINUS FLEXILUS, FESTUCA IDAHOENSIS, LEUCOPOA KINGII,
PSEUDOTSUGA MENZIESII, JUNIPERUS COMMUNIS, CAREX ROSSII, ELYMUS
SPICATUS, ARTEMISIA TRIDENTATA, POA CUSICKII, POA INTERIOR, SENECIO
CANUS, PENSTEMON ARIDUS, PHLOX CAESPITOSA.

Land owner/manager:

BEAVERHEAD NATIONAL FOREST, DILLON RANGER DISTRICT

Comments:

OBSERVED BY J. VANDERHORST AND S. COOPER.

Information source: VANDERHORST, J. [BOTANIST]. 1515 LAKE STREET,
OGDEN, UTAH 84401.

Specimens: VANDERHORST, J. (5222). 1994. MONT.

Lomatium attenuatum: Sourdough Creek (004)
USGS Deer Canyon 7.5' quadrangle

APPENDIX E. Target plant species documented in the Tendoy Mountains vicinity. Locations of occurrences of the following species are mapped in Figure 2 (Results section). The top line of each entry gives the scientific name of the plant, followed (in order) by the Montana Natural Heritage Program global and state rank (Heidel 1994), the U.S. Forest Service Region 1 status (USDA Forest Service 1994), the proposed Montana BLM status (USDI Bureau of Land Management 1993), and the U.S. Fish and Wildlife Service status (USDI Fish and Wildlife Service 1993).

<u>SPECIES</u>	<u>MTNHP</u>	<u>USFS</u>	<u>BLM</u>	<u>USFWS</u>
<i>Agastache cusickii</i>	G3S1	-	Sensitive	3C
This species is known from Montana only in the Tendoy Mountains. Three populations are on the Beaverhead National Forest in Kelmbeck, Patterson, and Williamson-Wood Canyons. One population is on BLM land on a slope above upper Big Sheep Creek. Additional populations should be sought on southern exposed limestone talus slopes, especially in the canyons. Plants have a long flowering period and are easily recognized at all stages.				
<i>Aquilegia formosa</i>	G5S1	-	-	-
Two populations are known from the Tendoy Mountains on the Beaverhead National Forest on the north side of Timber Butte and in Kelmbeck Canyon. Both of these occurrences are in heavily shaded Douglas fir stands in bottoms of draws. A third population occurs on the Beaverhead National Forest in forest/lakeshore ecotone habitat at Morrison Lake in the Beaverhead Mountains. Forested habitats are less common on BLM land in the range but the species should be looked for in forested canyon bottoms and northern exposures. The flowering period is June to early July; flowers are essential for positive identification.				
<i>Astragalus scaphoides</i>	G3S1	-	Sensitive	3C
A total of three occurrences are known in the range, one on the Beaverhead National Forest and two on BLM land. All of these are on the western flank of the range in the drainage of Medicine Lodge Creek. The species occurs in sagebrush grasslands (<i>Artemisia tridentata</i> / <i>Elymus spicatus</i> habitat types), usually on slopes with southern exposures. Additional populations are likely, especially on the western flank of the range. The plants flower in June and produce fruit in July; they are identifiable in either of these stages and the presence of old fruits may allow identification at other stages.				

Astragalus terminalis G3G4S1 - Watch -
 One population is known from the range on BLM land in Limekiln Canyon. The species occurs in grasslands and sagebrush grasslands, usually in soils derived from limestone. Additional populations in the Tendoys are most likely to occur on BLM land but may also occur at lower elevations on the Beaverhead National Forest. It is most likely to be found on the eastern flank of the range (Red Rock Creek drainage). Plants flower in June and produce fruit in July; they are identifiable in either of these stages.

Carex parryana ssp. *idaho* G2QS2 Sensitive Sensitive 3C
 Three populations are known on BLM land from the vicinity of the Tendoys, in the Basins of Muddy Creek and upper Big Sheep Creek, and one population is known on state land in the Tendoys at Lower Poison Lake. An additional population is on the Beaverhead National Forest at Morrison Lake in the Beaverhead Mountains. The species occurs in moist floodplain bottoms often in *Potentilla fruticosa*/*Juncus balticus* communities, and, at Poison Lake, in a fen. Wetlands are not extensive on USFS land in the Tendoys but the species may be found around springs or along creeks; one potential site which has not been surveyed is Porcupine Spring. The plants produce mature fruit in late July to August. Mature fruit is necessary to key out the species, but it is recognizable, with experience, in earlier stages.

Carex vallicola G5S2S3 - - -
 One population was found on the Beaverhead National Forest in a high elevation sagebrush grassland near Sourdough Spring. Additional occurrences should be sought in sagebrush, grassland, and aspen communities throughout the Tendoys. This sedge produces fruit, needed for reliable identification, in July.

Erigeron asperugineus G4S1 Sensitive - -
 This Great Basin species was not found in the Tendoy Mountain study areas, but is known in the Beaverhead National Forest from the Beaverhead Mountains. It grows in open soil and scree in the subalpine and alpine zones. There is some potential for this plant at the higher elevations in the Tendoys. Flowering is in July.

Eriogonum caespitosum G5S1 - - -
 The population on state land in the upper Big Sheep Creek drainage is the only verified occurrence of this species in Montana. Here it grows in dry soil derived from limestone in a low sagebrush (*Artemisia arbuscula*) community, a vegetation type which is not known on the Beaverhead National Forest in the Tendoys, but it is reported from a variety of arid and rocky community types elsewhere (Dorn 1992, Welsh 1987). The plants flower in July.

Halimolobos virgata G2G3S2 - Sensitive -
 Four occurrences are now known from the Tendoy Mountains vicinity on BLM and state land. One population is on dry slopes in a mountain mahogany community in Pileup Canyon and the other is on a seasonally moist bench in a sagebrush community in Limekiln Canyon. Two additional populations were found in 1994 by Peter Lesica in the northern foothills of the range, and in the basin of upper Big Sheep Creek. It should be looked for at lower elevations on the Beaverhead National Forest in the Tendoy. The species flowers early and produces fruit in June and July. It is most easily identified in fruit.

Haplopappus macronema ssp. *linearis* G4T?S2 - Watch -
 One occurrence is known from state land in the drainage of upper Big Sheep Creek. The habitat is an *Artemisia tripartita*/*Festuca idahoensis* community in a basin setting. Similar habitats are most common on BLM land but the species should be sought at the lower elevations of the Beaverhead National Forest in the Tendoy. The flowering period is late July to September.

Hutchinsia procumbens G5S1 - - -
 This annual is known from one occurrence on BLM land above upper Big Sheep Creek, where it grows on the same slope with *Agastache cusickii* and *Phacelia incana*. It is also known from a historical collection from Armstead, now submerged by Clark Canyon Reservoir. The plant usually grows along the edges of alkaline or saline waters but at upper Big Sheep Creek it was found on limestone talus under sagebrush. It should be looked for in its primary habitat on BLM land along the shore of Clark Canyon Reservoir and other alkaline wetlands, but may also occur on limestone talus slopes in the canyons of the Tendoy. Plants flower in early summer.

Kochia americana G5SH - - -
 This Great Basin species is known from Montana only by two historical collections from Beaverhead County. The reported occurrence on the Beaverhead National Forest near Medicine Lodge Peak has been investigated but not located. The location data given on the specimen label (also mapped in Figure 2) is probably wrong; the cited legal description and elevation are in conflict and vegetation in the area is not appropriate for the species (Vanderhorst 1995c). This species usually grows in barren, alkaline habitats and is most likely to occur on BLM, state, or private land in the basins surrounding the Tendoy Mountains (Muddy Creek, Big Sheep, Red Rock). The plant flowers in middle to late summer, and flowers may be required to distinguish this from species of *Suaeda*.

Lomatium attenuatum G3S1 - Watch 3C
Known from one occurrence on the Beaverhead National Forest in the Tendoy's near the crest of the range and from three sites on BLM land in canyons of the northern foothills of the range. The plants grow in soils derived from limestone in Douglas fir, limber pine, and mountain mahogany communities. Additional occurrences are likely on canyon and mountain slopes in the range, in substrates derived from limestone and possibly volcanic parent materials. The plants flower in early spring and produce fruit in June.

Lomatogonium rotatum G5S1 - - -
This species was collected for the first time in Montana by Peter Lesica with Steve Cooper in 1994 from BLM land along a tributary of Cabin Creek (upper Big Sheep Creek Basin). Here it grows in saturated soil in a *Potentilla fruticosa*/*Juncus balticus* community. Similar wet, alkaline habitats are found on BLM and state lands in the basins in the vicinity, but are not known from the Beaverhead National Forest in the Tendoy's. Flowering is in late summer.

Penstemon lemhiensis G3S2 Sensitive Sensitive C2
One occurrence is known from BLM land in the Tendoy's in Johnson Gulch, and another is reported from private land in the valley of Medicine Lodge Creek. The species most commonly occurs in sagebrush grasslands; apparently suitable habitat is extensive on both BLM and Forest Service land at low to middle elevations in the Tendoy's. Flowering plants of this species are very conspicuous but have been especially rare in recent years and the species was not found by the recent MTNHP surveys in the Tendoy's. Plants flower in early June to late July, depending on the site and the season.

Phacelia incana G3S1 - - -
The Montana distribution of this species is limited to the Tendoy Range where it is known from 5 sites on BLM land. This annual species grows on limestone talus slopes often in mountain mahogany communities. There is plentiful habitat for the species and it is likely to occur in the canyons of the Tendoy's in the Beaverhead National Forest, but it was not found by surveys in 1994, probably due to the hot, dry growing season. The plant could not be found at its known locality at upper Big Sheep Creek in 1994 either, although it was seen here in 1993, a wet year. Plants flower in June and can be identified in flower or fruit.

Sphaeromeria argentea G?S1 - - -
One occurrence is known from state land in the drainage of upper Big Sheep Creek where the habitat is an unusual low sage (*Artemisia arbuscula*) and greasewood (*Sarcobatus vermiculatus*) community in an alkaline basin setting. It has also been collected to the east of Red Rock Creek in the vicinity of

Dell and Matador Ranch. At other sites in Beaverhead County the species grows in rocky (usually limestone) habitats, in limber pine and mountain mahogany communities. The low sagebrush habitat type may be found on BLM land in the basins of Muddy and upper Big Sheep Creek, and limestone habitats are common on both BLM land and the Beaverhead National Forest throughout the Tendoys. Plants flower in July.

Taraxacum eriophorum G4S1 - Sensitive -
This species is known from BLM land in the southern Tendoys in the moist bottom of Pileup Canyon and nearby in the drainage of upper Big Sheep Creek where it was collected in "open rangeland." It should be looked for in the bottoms of canyons and in other moist to mesic habitats on BLM and USFS land in the range. In 1994, it was searched for on the Beaverhead National Forest further up Pileup Canyon from the known BLM occurrence (which was relocated) but was not found. Plants flower and produce fruit in early summer.

Thalictrum alpinum G5S1 Sensitive - -
The species is known from BLM land in the drainage of upper Big Sheep Creek and nearby from the Beaverhead National Forest in the Beaverhead Range at Morrison Lake. These sites are moist alkaline bottomlands dominated by *Potentilla fruticosa* and *Juncus balticus*. This habitat is rare, if present, on the Beaverhead National Forest in the Tendoys, however one potential wetland site for this species which has not been surveyed is Porcupine Spring. Flowering is in June and July.

Thelypodium sagittatum G3G4S2 - Watch -
Known from three sites in the vicinity in the basins of Muddy Creek and upper Big Sheep Creek. The species usually grows in fine, often alkaline soils which are moist in spring but dry by mid-summer. These habitats are not known on the Beaverhead National Forest in the Tendoys. Plants produce fruit, needed for identification, in July.

Thlaspi parviflorum G3S2 Sensitive - -
Located twice in the vicinity, in the basin of upper Big Sheep Creek in a moist bottomland habitat and on state land in the northern part of the range. Hitchcock and Cronquist (1973) cite a variety of habitats for this species including "sagebrush foothills, meadows, dry grassy slopes, (and) limestone cliffs." All of these habitats are common in the Tendoys on both Beaverhead National Forest and BLM lands. The species may be more common than known due to its early flowering and fruiting period (May-June).

Townsendia condensata G3S2 - - -
This species was found on BLM land in the Tendoys by Peter Lesica in 1994 and is also known on the Beaverhead National Forest in the Beaverhead Mountains. In the Tendoys, it grows

in open habitat at a high elevation near the crest of the range and potential habitat was thought to occur on adjacent Beaverhead National Forest land (Lesica, pers. commun.). Flowering is in early summer.

Townsendia nuttallii G3SU - - -
Collected twice from rocky habitats in the Tendoys on BLM land. An occurrence near the Medicine Lodge/Cabin Creek divide in a rocky *Artemisia nova* habitat type is adjacent to Beaverhead National Forest land with similar habitat. The flowering period, the only time when plants are likely to be seen, is in the spring and early summer.

APPENDIX F. Vascular plants identified in the Tendoy Mountains vicinity. Included are taxa identified by this project on the Beaverhead National Forest and a revised list of taxa identified on BLM land in 1993 (Vanderhorst and Lesica 1994). Taxa printed in plain typeface were seen only on the Beaverhead National Forest (85). Taxa in bold typeface were seen only on BLM land (167). Taxa in *italics* were seen both on the Beaverhead National Forest and on BLM land (217). An asterisk following the taxon name signifies it is adventive to this continent (28). MONT signifies specimens collected by Jim Vanderhorst, deposited at the herbarium at Montana State University; MONTU designates specimens collected by Peter Lesica, deposited at the herbarium at the University of Montana.

PTERIDOPHYTES

ADIANTACEAE

Cheilanthes feeii

ASPLENIACEAE

Cystopteris fragilis

EQUISETACEAE

Equisetum variegatum

SELAGINELLACEAE

Selaginella densa

APIACEAE

Angelica arguta

Bupleurum americanum

Cymopterus nivalis

Lomatium attenuatum MONT,
MONTU

L. cous MONT

L. foeniculaceum

L. triternatum

Musineon divaricatum

Osmorhiza chilensis

O. depauperata

Perideridia gairdneri

ASTERACEAE

Achillea millefolium

Agoseris glauca

Antennaria anaphaloides

A. microphylla

A. parvifolia

A. racemosa

Arnica cordifolia

A. longifolia

A. sororia

Artemisia arbuscula MONTU

A. cana

A. dracunculus

A. frigida

A. ludoviciana

A. michauxiana

A. nova

A. tridentata

var. *tridentata*

var. *vaseyana*

A. tripartita

GYMNOSPERMS

CUPRESSACEAE

Juniperus communis

J. scopulorum

PINACEAE

Picea engelmannii

Pinus contorta

P. flexilis

Pseudotsuga menziesii

ANGIOSPERMS

ACERACEAE

Acer glabrum

Aster ascendens MONT
Aster conspicuus
A. foliaceus MONT
A. laevis
A. occidentalis
A. scopulorum
Balsamorhiza sagittata
Brickellia grandiflora
*Centaurea maculosa**
Chaenactis douglasii
Chrysothamnus nauseosus
C. viscidiflorus
*Cirsium arvense**
C. canovirens
C. scariosum
C. subniveum MONTU
C. undulatum
Crepis acuminata
C. modocensis
C. nana MONT
C. occidentalis
C. runcinata
Erigeron acris MONTU
E. caespitosus
E. compositus MONTU
E. corymbosus MONT
E. glabellus MONTU
E. gracilis MONT, MONTU
E. lonchophyllus
E. ochroleucus MONTU
E. speciosus
E. tweedyi
Gaillardia aristata
Grindelia squarrosa
Gutierrezia sarothrae
Haplopappus acaulis MONT
H. integrifolius MONT
H. macronema
 ssp. linearis MONTU
H. suffruticosus MONT
H. uniflorus
Helianthella uniflora
Heterotheca villosa
Hymenopappus filifolius
*Lactuca serriola**
Machaeranthera canescens
Senecio canus
S. debilis MONTU
S. dimorphophyllus MONT
S. integerrimus MONT
S. pauperculus MONT
S. serra

S. streptanthifolius MONT
Solidago missouriensis
S. multiradiata
S. spathulata
Spahaeromeria argentea
 MONTU
S. capitata MONT
Stephanomeria runcinata
Taraxacum eriophorum MONT
*T. laevigatum** MONT
*T. officinale**
Tetradymia canescens
Townsendia condensata MONTU
T. hookeri
T. montana MONT
T. nuttallii MONT
T. parryi MONT
*Tragopogon dubius**
*T. pratensis**

BERBERIDACEAE

Mahonia repens

BETULACEAE

Betula occidentalis

BORAGINACEAE

Cryptantha celosioides
C. torreyana
C. watsonii MONT, MONTU
*Cynoglossum officinale**
Eritrichum nanum
Hackelia deflexa
H. floribunda
H. patens
Lappula redowskii
L. squarrosa
Lithospermum incisum
L. ruderales
Mertensia ciliata
M. oblongifolia MONT
Myosotis alpestris
Plagiobothrys scouleri

BRASSICACEAE

Arabis confinis
A. drummondii
A. hirsuta
A. holboellii MONT, MONTU
A. nuttallii
Descurainia incana
D. pinnata

*D. sophia**
Draba cana MONT
D. nemorosa
D. oligosperma MONT
Draba praealta MONT
Erysimum asperum MONT
E. inconspicuum MONT
E. repandum
Halimolobos virgata MONTU
Lepidium virginicum
Lesquerella alpina MONT
Physaria didymocarpa MONT,
 MONTU
Schoenocrambe linifolia
*Sisymbrium altissimum**
Stanleya pinnata
S. viridiflora
Thelypodium integrifolium
Thelypodium sagittatum
 MONT, MONTU
*Thlaspi arvense**
Thlaspi parviflorum MONTU

CACTACEAE

Opuntia polyacantha
Pediocactus simpsonii MONT,
 MONTU

CAMPANULACEAE

Campanula rotundifolia

CAPRIFOLIACEAE

Symphoricarpos oreophilus
 MONTU

CARYOPHYLLACEAE

Arenaria capillaris
A. congesta
A. kingii MONT, MONTU
Cerastium arvense
Minuartia nuttallii MONT
M. obtusiloba
M. rubella MONT
Paronychia sessiliflora
Silene douglasii
S. menziesii
S. parryi MONT

CHENOPODIACEAE

Atriplex gardneri
A. rosea MONTU

*Chenopodium album**
C. fremontii
Krascheninnikovia lanata
Monolepis nuttalliana
*Salsola australis**
Sarcobatus vermiculatus

CORNACEAE

Cornus sericea

CRASSULACEAE

Sedum lanceolatum

CYPERACEAE

Carex aquatilis
C. aurea
C. douglasii
C. filifolia
C. lanuginosa
C. microptera MONT
C. nebraskensis
C. norvegica MONT
C. obtusata
C. parryana
 var. *parryana* MONTU
 var. *idaho* MONTU
C. petasata
C. praegracilis
C. raynoldsii
C. rossii
C. rupestris
C. scirpoidea
C. simulata MONT
C. utriculata
C. vallicola MONT
Eleocharis acicularis
E. palustris

ELEAGNACEAE

Shepherdia canadensis

ERICACEAE

Arctostaphylos uva-ursi
Orthilia secunda
Pyrola chlorantha

FABACEAE

Astragalus adsurgens MONT
A. agrestis
A. argophyllus MONT
A. atropubescens
A. bisulcatus

A. canadensis MONT
A. cibarius
A. drummondii MONT
A. lentiginosus MONT
A. leptaleus MONTU
A. miser
A. purshii
A. scaphoides MONT, MONTU
A. terminalis MONTU
Hedysarum boreale
H. sulphurescens
Lupinus argenteus
L. polyphyllus
 var. humicola
*Melilotus officinalis**
Oxytropis besseyi
O. campestris
 var. cusickii
O. deflexa
O. lagopus MONT
O. sericea
O. viscida
Thermopsis montana
*Trifolium hybridum**
T. longipes

FUMARIACEAE

Corydalis aurea

GENTIANACEAE

Frasera speciosa
Gentiana affinis
Gentiana aquatica MONTU
Lomatogonium rotatum MONTU

GERANIACEAE

Geranium richardsonii
G. viscosissimum

GROSSULARIACEAE

Ribes americanum
R. cereum
R. lacustre
R. montigenum
R. setosum

HIPPURIDACEAE

Hippuris vulgaris

HYDROPHYLLACEAE

Phacelia franklinii
P. hastata
P. heterophylla
P. incana MONT, MONTU
P. linearis

IRIDACEAE

Iris missouriensis
Sisyrinchium angustifolium

JUNCACEAE

Juncus alpinus
J. balticus
J. bufonus
J. ensifolius
 var. montanus MONT
J. longistylis

JUNCAGINACEAE

Triglochin maritimum
T. palustre

LAMIACEAE

Agastache cusickii MONT,
 MONTU

LEMNACEAE

Lemna minor

LILIACEAE

Allium brevistylum MONT
A. cernuum
A. geyeri
A. schoenoprasum
A. textile
Disporum trachycarpum
Fritillaria atropurpurea
Maianthemum stellatum
Zigadenus elegans
Z. venenosus

LINACEAE

Linum lewisii

LOASACEAE

Mentzelia albicaulis MONT
M. dispersa MONT
M. laevicaulis

MALVACEAE

Sphaeralcea coccinea

ONAGRACEAE

Epilobium anagallidifolium
E. angustifolium
E. ciliatum
E. glaberrimum
E. palustre
Gayophytum diffusum
G. humile MONTU
G. ramosissimum
Oenothera breviflora MONTU
O. cespitosa

ORCHIDACEAE

Habenaria hyperborea

OROBANCHACEAE

Orobanche corymbosa
O. fasciculata

POACEAE

*Alopecurus aequalis**
*A. pratensis**
Beckmannia syzigachne
Bromus carinatus
*B. inermis**
*B. tectorum**
Calamagrostis montanensis
C. purpurascens
C. rubescens
C. neglecta
Catabrosa aquatica
Deschampsia cespitosa
Elymus cinereus
E. elymoides
*E. hispidus**
E. lanceolatus MONT
E. repens *
E. spicatus MONT
E. trachycaulus MONT
E. scribneri
E. smithii
Festuca idahoensis
F. occidentalis
Glyceria striata
Hordeum brachyantherum
H. jubatum
Koeleria macrantha MONT
Leucopoa kingii
Muhlenbergia richardsonis
 MONTU
Oryzopsis hymenoides
Phleum alpinum

*P. pratense**
Poa alpina
P. cusickii MONT
P. interior MONT
P. juncifolia MONT
P. nevadensis
P. nervosa
*P. pratensis**
Poa rupicola MONT
P. secunda MONT
Puccinellia distans
Stipa comata
S. nelsonii
S. occidentalis
Trisetum spicatum

POLEMONIACEAE

Collomia linearis
Ipomopsis spicata
Leptodactylon pungens
Phlox hoodii
P. longifolia MONT
P. multiflora
P. muscoides
P. pulvinata
Polemonium occidentale
P. pulcherrimum

POLYGONACEAE

Eriogonum caespitosum MONTU
E. flavum MONTU
E. mancum MONT
E. microthecum
E. ovalifolium MONT
E. umbellatum
*Polygonum aviculare**
P. bistortoides
P. douglasii MONTU
P. kelloggii MONTU
*Rumex acetosella**
R. aquaticus
 var. *fenestratus*
*R. crispus**
R. salicifolius

PORTULACACEAE

Lewisia rediviva
L. pygmaea MONT

POTAMOGETONACEAE

Potamogeton pectinatus

PRIMULACEAE

Androsace septentrionalis

Dodecatheon conjugens

Douglasia montana

D. pulchellum

Glaux maritima

Primula incana MONTU

RANUNCULACEAE

Actaea rubra

Anemone cylindrica

A. lithophila

A. multifida

Aquilegia coerulea

A. formosa MONT

Delphinium bicolor

var. *bicolor*

var. *novum*

D. glaucum

D. occidentale MONTU

Myosurus aristatus MONTU

Ranunculus aquatilis

R. cymbalaria

R. glaberrimus

R. inamoenus

R. macounii

R. natans

R. sceleratus

Thalictrum alpinum MONTU

T. occidentale

ROSACEAE

Amelanchier alnifolia

Cercocarpus ledifolius

Fragaria vesca

F. virginiana

Geum macrophyllum

G. triflorum

Ivesia gordonii MONTU

Petrophyton caespitosum

Physocarpus malvaceus

Potentilla anserina

P. biennis

P. diversifolia

P. fruticosa

P. glandulosa

P. gracilis

P. ovina MONTU

P. pensylvanica

Prunus virginiana

Rosa woodsii

Rubus idaeus

Spiraea betulifolia

RUBIACEAE

Galium boreale

SALICACEAE

Populus angustifolia

P. balsamifera

P. tremuloides

Salix bebbiana

S. boothii

S. exigua

S. geeyeriana

S. lemmonii

S. lutea

S. melanopsis

S. wolfii

SANTALACEAE

Commandra umbellata

SAXIFRAGACEAE

Conimitella williamsii MONT

Heuchera cylindrica

H. grossulariifolia

H. parviflora

Lithophragma parvifolia

Saxifraga bronchialis

S. integrifolia MONT

S. occidentalis

S. odontoloma

S. rhomboidea MONT

SCROPHULARIACEAE

Besseyia wyomingensis

Castilleja angustifolia

C. hispida

C. miniata

C. pallescens MONTU

C. pulchella

C. rustica MONT, MONTU

Collinsia parviflora

Cordylanthus ramosus

Mimulus guttatus

M. suksdorfii MONT, MONTU

Pedicularis contorta

var. *ctenophora* MONT

P. groenlandica

P. parryi

Penstemon aridus

P. attenuatus MONTU
P. eriantherus
P. fruticosus
P. montanus MONT
P. procerus
P. radicosus MONTU
P. rydbergii MONTU
Synthyris pinnatifida
Veronica americana
V. perigrina

SOLANACEAE

*Hyoscyamus niger**
*Solanum triflorum** MONTU

URTICACEAE

Parietaria pensylvanica
Urtica dioica

VALERIANACEAE

Valeriana dioica
V. edulis
V. occidentalis

VIOLACEAE

Viola adunca
V. nephrophylla
V. nuttallii

APPENDIX G. Photographic slides

1. *Agastache cusickii* (plants at Kelmbeck Creek)
2. *Agastache cusickii* (plant at Patterson Canyon)
3. Habitat of *Agastache cusickii* (Williamson Wood Canyon)
4. Habitat of *Agastache cusickii* (Patterson Canyon)
5. Habitat of *Agastache cusickii* (Kelmbeck Creek)
6. Habitat of *Aquilegia formosa* (Kelmbeck Creek)
7. *Astragalus scaphoides* (plant)
8. *Astragalus scaphoides* (close-up of fruit)
9. Habitat of *Astragalus scaphoides* (Kay Creek)

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