# BOTANICAL SURVEY

# OF THE GOAT FLAT

# PROPOSED RESEARCH NATURAL AREA

# DEERLODGE NATIONAL FOREST

by

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## INTRODUCTION

The Goat Flat Proposed Research Natural Area is located southwest of Anaconda in the Anaconda Range along the Continental Divide on the Deerlodge National Forest. The area extends from Storm Lake mostly south to Mount Tiny and Goat Flat (Fig. 1) and is centered at about 46°03'N 113°15'W. A portion of the area is within the Anaconda-Pintlar Wilderness. The Goat Flat Proposed Research Natural Area contains 10 special plant species, five of which are Sensitive in Region 1, and a wide variety of upper subalpine and alpine plant communities.

A preliminary survey of the botanical features of the Goat Flat Proposed Research Natural Area was conducted by the Montana Natural Heritage Program in July and August 1991.

## TOPOGRAPHY AND GEOLOGY

Altitudes in the Goat Flat Proposed Research Natural Area range from about 8200 ft along the shore of Storm Lake to 9989 ft at the top of Little Rainbow Mountain. Topographically, the area is mountainous and includes gently sloping terrain southeast of Storm Lake, steep mountain slopes rising above the lake basin to a number of peaks, and two small, high-altitude plateaus including Goat Flat and the northeastern portion of the area.

Storm Lake sits in a glacial cirque surrounded by steep, colluvial slopes. Snow avalanching occurs on several of the colluvial slopes and fans. Much of the glacial moraine in the bottom of the cirque south of the lake appears to have been reworked or overlain by fluvial action. Fluvial fans and aprons occur on the gentler terrain especially southeast of Storm Lake. At high elevations, the landforms are predominantly weathered bedrock and colluvial rubble. Active, frost-patterned, polygonal ground and solifluction terraces occur in portions of Goat Flat itself.

The bedrock geology of the Goat Flat Proposed Research Natural Area includes both sedimentary and igneous rocks (Calkin and Emmons 1915). The mountain east of Storm Lake is composed predominantly of medium and basic, granular granodiorite of Tertiary age that is irruptive into the surrounding sedimentary rocks and contains abundant sedimentary inclusions. The area south and west of Storm Lake, including Mount Tiny and Goat Flat, is composed primarily of calcareous shales and impure limestones of Cambrian and Precambrian age. The impure limestones include a great deal of quartz. At higher elevations, some sandstones and quartzitic sandstones occur also.

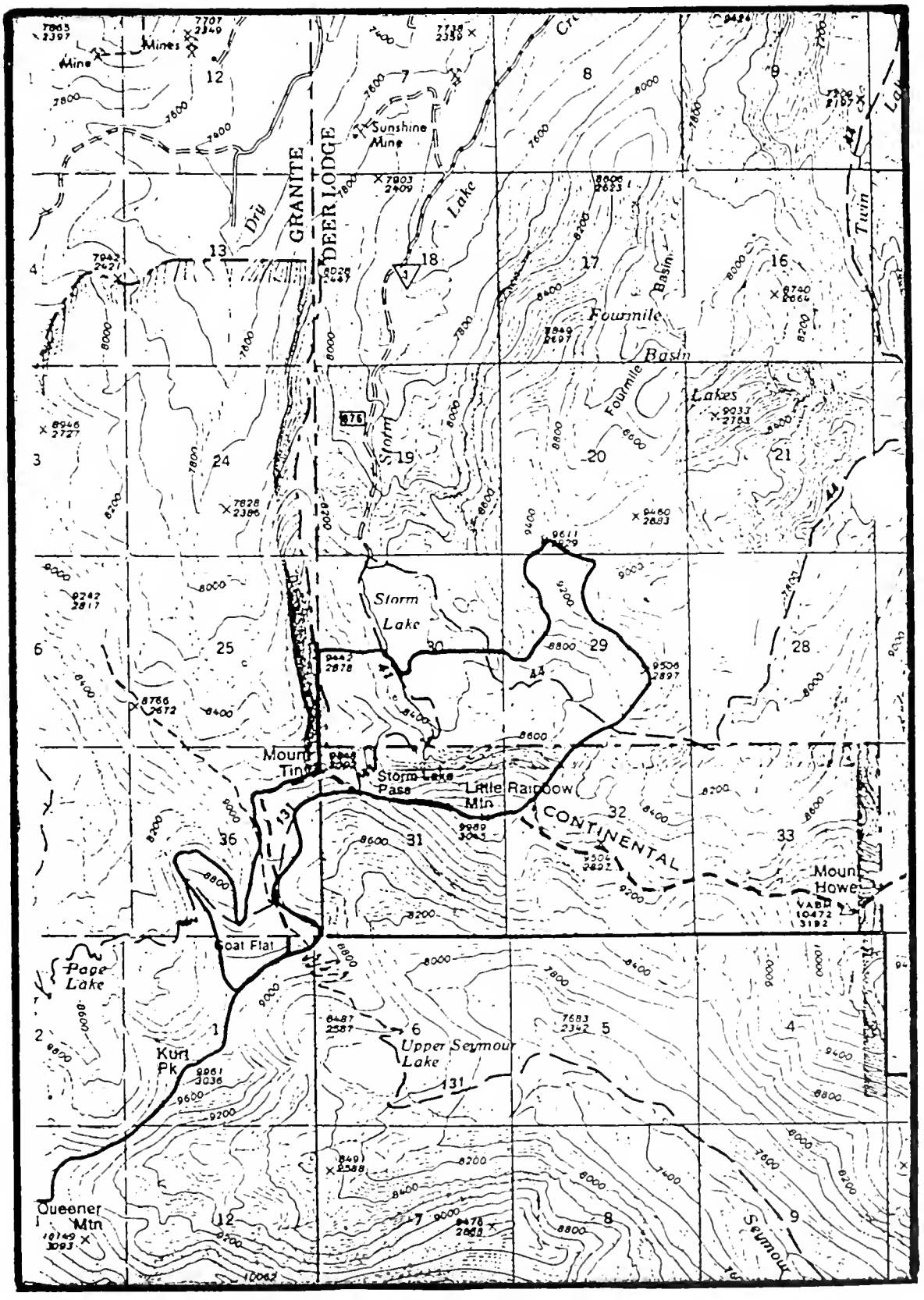


Figure 1. The Goat Flat Proposed Research Natural Area

## FLORA

The vascular flora of the Goat Flat Proposed Research Natural Area currently consists of 190 species (Appendix 1). The list is based on limited survey and additional species undoubtedly will be found with further effort. Ten of these species are considered Species of Special Concern by the Montana Natural Heritage Program (Achuff 1991) and five are Sensitive within Region 1 of the U.S. Forest Service (Table 1). The current status of the five sensitive species is described briefly below. Locations within the area are in Appendix 2.

**Table 1. Sensitive Plant Species and Species of Special Concern in the Goat Flat Proposed Research Natural Area.** See Achuff (1991) for an explanation of ranks and sensitivity status.

| Species | Rank | Sensitive |
|---|---|---|
| Agoseris lackschewitzii | G3/S2 | yes |
| Antennaria densifolia | G3/S1 | yes |
| Carex maritima | G4-5/S1 | no |
| Gentiana prostrata | G5/S2 | no |
| Polystichum kruckebergii | G3-4/S1 | no |
| Salix cascadensis | G4-5/S1 | no |
| Salix wolfii var. wolfii | G4T4/S1 | yes |
| Saussurea weberi | G3/S1 | yes |
| Saxifraga tempestiva | G2/S2 | yes |
| Selaginella selaginoides | G5/S1 | no |

**Agoseris lackschewitzii (pink agoseris)**

**Species Information:** Agoseris lackschewitzii is one of four species in the genus that occurs in Montana. None of the other species is special, rare or sensitive (Lesica and Shelly 1991). Agoseris lackschewitzii has pink petals when flowering which differentiates it from the closely related species A. glauca which has yellow flowers and from A. aurantiaca which has reddish-orange flowers. The flowers of the latter two species may age or dry to a pinkish color.

**Present Legal or Other Formal Status:** Agoseris lackschewitzii currently has no status under the Endangered Species Act but is on the Sensitive list for Region 1 of the U.S. Forest Service. It is currently ranked by the Montana Natural Heritage Program globally as G3 (either rare and local or locally in a restricted range, 21-100 occurrences) and in Montana as S2 (imperiled because of rarity, 6-20 occurrences). The state rank is currently under review because of many new locations reported from the 1991 field season; it will likely be revised to S3. In addition, a population of this species was found in the Banff National Park, Alberta area in 1991 (Achuff 1992) and thus, the global ranking may also need to be revised.

**Geographic Distribution:** Agoseris lackschewitzii is currently known from 27 locations in eight counties of central and southwestern Montana (Cascade, Deer Lodge, Judith Basin, Madison, Meagher, Park, Silverbow, Sweetgrass) and two counties in southcentral Idaho (Fremont, Lemhi). A disjunct occurrence is also known from the Sunshine Meadows area of western Banff National Park, Alberta and adjacent British Columbia.

**Habitat and Associated Species:** Agoseris lackschewitzii occurs primarily in moist herbaceous meadows and in the ecotone between moist meadows and forest. Associated species in Montana include:

| | |
|---|---|
| Androsace septentrionalis | fairy candelabra |
| Antennaria alpina | alpine pussytoes |
| Arnica mollis | hairy arnica |
| Caltha leptosepala | elkslip |
| Carex rostrata | beaked sedge |
| Carex scopulina | Holm's sedge |
| Castilleja rhexifolia | rhexia-leaved paintbrush |
| Deschampsia caespitosa | tufted hairgrass |
| Erigeron peregrinus | subalpine daisy |
| Habenaria dilatata | white bog-orchid |
| Juncus balticus | Baltic rush |
| Pedicularis groenlandica | elephant's head |
| Phleum alpinum | alpine timothy |
| Poa leptocoma | bog bluegrass |
| Polygonum bistortoides | bistort |
| Potentilla diversifolia | diverse-leaved cinquefoil |
| Salix drummondiana | Drummond willow |
| Saxifraga oregana | bog saxifrage |
| Veronica wormskjoldii | alpine speedwell |
| Zygadenus elegans | glaucous death-camas |

**Population Biology and Ecology:** Populations of Agoseris lackschewitzii are generally small, ranging from 15-100 plants. Flowering is generally in July and August. Reproduction is primarily by seed with some vegetative reproduction by splitting of the caudices.

**Threats:** The primary threats to Agoseris lackschewitzii are from grazing by domestic livestock and trampling associated with grazing or trails. The moist meadows in which the species occurs are quite susceptible to trampling damage due to their low bearing capacity. Such sites may also be susceptible to water erosion.

**Recommendations for Maintaining Viable Populations:** Management plans should take the occurrence of this species fully into account and prevent disturbance to the sites. To prevent inadvertent impacts, detailed information on the location of Agoseris lackschewitzii populations in the Goat Flat Proposed Research Natural Area should be made known to all personnel involved in planning activities in the area. Additional surveys of the moist and wet meadows in the Goat Flat Proposed Research Natural Area should be done to fully delineate the extent of Agoseris lackschewitzii populations in the area.

**Antennaria densifolia (tufted pussytoes)**

**Species Information:** The genus Antennaria contains perhaps 30 species (Hitchcock et al. 1955-1969), about 13 of which are currently known from Montana (Dorn 1984). Antennaria densifolia is closely related to Antennaria aromatica (Bayer 1989a) and is the only member of the genus in Montana to have sensitive status.

**Present Legal or Other Formal Status:** Antennaria densifolia currently has no status under the Endangered Species Act but is on the Sensitive list for Region 1 of the U.S. Forest Service. It is currently ranked by the Montana Natural Heritage Program globally as G3 (either rare and local or locally in a restricted range, 21-100 occurrences) and in Montana as S1 (imperiled because of rarity, <5 occurrences).

**Geographic Distribution:** Antennaria densifolia occurs primarily on the unglaciated eastern slopes of the Mackenzie, Richardson and Ogilvie mountains of the Northwest Territories and the Yukon Territory (Bayer 1989a & b). The occurrence in the Goat Flat Proposed Research Natural Area is a disjunction of ca. 1850 km and is the only site known for Montana or the U.S.

**Habitat:** The habitat at Goat Flat is limestone talus in alpine tundra at ca. 9150 ft which is typical of its habitat elsewhere. Antennaria densifolia appears to be a narrowly restricted endemic that occurs on calcareous, unglaciated habitats (Bayer 1989a).

**Population Biology and Ecology:** Some populations of this species in Canada contain only pistillate plants which suggests that they are apomictic. However, the Goat Flat population contains both staminate and pistillate plants (Bayer 1989a) and reproduces sexually. The Goat Flat population is diploid as are the plants in Canada (Bayer 1989a). The plants flower in July and August.

**Threats:** The precise location of the Antennaria densifolia population at Goat Flat is not known but it is likely that the only threat would be from trampling or trail development. Also, the size and areal extent of the population is unknown which makes it impossible to gauge the results of possible impacts.

**Recommendations for Maintaining Viable Populations:** Management plans should take the occurrence of this species fully into account and prevent disturbance to the sites. To prevent inadvertent impacts, detailed information on the location of populations in the Goat Flat Proposed Research Natural Area should be made known to all personnel involved in planning activities in the area. Additional surveys of talus slopes in the Goat Flat area should be done to fully delineate the extent and size of populations in the Goat Flat Proposed Research Natural Area.

## Salix wolfii var. wolfii (Wolf's willow)

**Species Information:** The genus Salix contains about 300 species, mostly in the Northern Hemisphere (Hitchcock et al. 1955-1969). Thirty-four species are reported for Montana (Dorn 1984). Salix wolfii contains two varieties which are differentiated primarily by whether the capsules are hairy or not. Variety wolfii has glabrous, or occasionally subglabrous, capsules and occurs mainly in Colorado, Utah and Wyoming, barely entering southwestern Montana and eastern Idaho (Hitchcock et al. 1955-1969). Variety idahoensis has hairy capsules and occurs more in the northern and western parts of the range, although both varieties are sympatric in southwest Montana.

**Present Legal or Other Formal Status:** Salix wolfii var. wolfii currently has no status under the Endangered Species Act but is on the Sensitive list for Region 1 of the U.S. Forest Service. It is currently ranked by the Montana Natural Heritage Program globally as G4T4 (apparently secure globally although it may be rare at the periphery of its range, >100 occurrences; T refers to the variety) and in Montana as S1 (imperiled because of rarity, <5 occurrences).

**Geographic Distribution:** The species as a whole occurs widely from Oregon to Montana and south to Nevada, Utah and Colorado. The variety wolfii occurs from southwest Montana and eastern Idaho south to Colorado and Utah, and is currently known from four locations in Montana. The other three locations are in southern Madison and Gallatin counties. Thus, the population at the Goat Flat Proposed Research Natural Area is peripheral and the most northeasterly location known for the species.

**Habitat:** Salix wolfii var. wolfii occurs along streambanks and in wet meadows in the subalpine zone.

**Population Biology and Ecology:** The capsules of this plant mature in July and August but little is known of other specific aspects of its biology or ecology. It presumably reproduces both sexually by seeds and vegetatively.

**Threats:** No threats are known to this species.

**Recommendations for Maintaining Viable Populations:** Management plans should take the occurrence of this species fully into account and prevent disturbance to the sites. To prevent inadvertent impacts, detailed information on the location of populations in the Goat Flat Proposed Research Natural Area should be made known to all personnel involved in planning activities in the area. Additional surveys of the moist and wet meadows south of Storm Lake should be done to fully delineate the extent and size of populations in the Goat Flat Proposed Research Natural Area.

Saussurea weberi **(Weber's sawwort)**

**Species Information:** The genus Saussurea contains more than 50 species most of which are in Eurasia. Three species occur in Montana (Dorn 1984). Saussurea weberi is distinguished from S. densa, which also is a short plant occurring at high altitudes, by having broadly rounded involucral bracts rather than the narrow, pointed bracts of S. densa.

**Present Legal or Other Formal Status:** Saussurea weberi currently has 3C status (more abundant or widespread than previously believed and/or not subject to identifiable threat) under the Endangered Species Act and also is on the Sensitive list for Region 1 of the U.S. Forest Service. It is currently ranked by the Montana Natural Heritage Program globally as G3 (either rare and local or locally in a restricted range, 21-100 occurrences) and in Montana as S1 (imperiled because of rarity, <5 occurrences).

**Geographic Distribution:** Saussurea weberi occurs from Colorado north to southwestern Montana with the Montana population being disjunct from westcentral Wyoming (Dorn 1988). The population at Goat Flat is the only known occurrence in Montana.

**Habitat and Associated Species:** At Goat Flat, Saussurea weberi occurs in a moist alpine meadow with a southwest aspect at 9400 ft. Associated species include Poa interior, Senecio lugens and Arnica rydbergii.

**Population Biology and Ecology:** The population at Goat Flat consists of 500-1000 plants scattered in small colonies across the meadow. The population was first discovered in 1973 and was last observed in 1978. This species flowers in July and early August.

**Threats:** The only current potential threat to the population is from a nearby hiking trail.

**Recommendations for Maintaining Viable Populations:** Management plans should take the occurrence of this species fully into account and prevent disturbance to the sites. To prevent inadvertent impacts, detailed information on the location of populations in the Goat Flat Proposed Research Natural Area should be made known to all personnel involved in planning activities in the area. Additional surveys of the high altitude meadows of Goat Flat and also east of Storm Lake should be done to fully delineate the extent and size of populations in the Goat Flat Proposed Research Natural Area.

**Saxifraga tempestiva (storm saxifrage)**

**Species Information:** Saxifraga is a large genus of ca. 300 species, most of which are in the Northern Hemisphere and including many that are circumboreal. In contrast, Saxifraga tempestiva is endemic to southwestern Montana. Thirteen locations are currently known for it in Montana and the Goat Flat populations are at the center of the range. It can be distinguished from other high-altitude members of this genus by the combination of small size, more nearly linear leaves, and petals that are smaller than the sepals, rather than longer or absent.

**Present Legal or Other Formal Status:** Saxifraga tempestiva currently has no status under the Endangered Species Act but is on the Sensitive list for Region 1 of the U.S. Forest Service. It is currently ranked by the Montana Natural Heritage Program globally as G2 (imperiled globally because of rarity, 6-20 occurrences) and in Montana as S2 (imperiled because of rarity, 6-20 occurrences).

**Geographic Distribution:** The global range of Saxifraga tempestiva currently comprises thirteen locations in Ravalli, Beaverhead, Deer Lodge and Granite counties. It is endemic to southwestern Montana. Four populations of Saxifraga tempestiva are currently known from the Goat Flat Proposed Research Natural Area.

**Habitat and Associated Species:** Saxifraga tempestiva occurs in vernally moist, exposed mineral soil in meadows or on rock ledges near or above treeline. The sites receive snowmelt through the early part of the growing season. Associated species include:

| | |
|---|---|
| Dodecatheon pulchellum | few-flowered shooting star |
| Erigeron peregrinus | subalpine daisy |
| Erigeron simplex | alpine daisy |
| Pedicularis pulchella | pretty dwarf lousewort |
| Poa alpina | alpine bluegrass |
| Poa cusickii | Cusick's bluegrass |

**Population Biology and Ecology:** Saxifraga tempestiva flowers in June and July and sets seed quickly, usually by mid-summer before the site dries out as run-off from snow melt ends. The populations are often large, consisting of hundreds of plants.

**Threats:** No threats are currently known.

**Recommendations for Maintaining Viable Populations:** Management plans should take the occurrence of this species fully into account and prevent disturbance to the sites. To prevent inadvertent impacts, detailed information on the location of populations in the Goat Flat Proposed Research Natural Area should be made known to all personnel involved in planning activities in the area. Populations of this species are often hard to detect from a distance and thus, additional surveys of the high altitude meadows of Goat Flat and also east of Storm Lake should be done during early summer to fully delineate the extent and size of populations in the Goat Flat Proposed Research Natural Area.

Additionally, two species of Botrychium (grapefern) are known from a meadow on the northeast shore of Storm Lake, just north of the current boundary of the area. Botrychium paradoxum is currently on the Region 1 Sensitive plant list and is ranked G1/S1. B. hesperium is not a Sensitive species and is ranked G3/S1. These species are often difficult to find and were not located in 1991. If further survey finds them at the previously reported site, the boundary of the Goat Flat Proposed Research Natural Area should be changed to include them.

## VEGETATION

This preliminary survey concentrated on the plant species present in the Goat Flat Proposed Research Natural Area and little was done with the plant communities. The following is based on sketchy field notes and no plots or releves were done. Some of the major vegetation types are briefly noted (Table 2) but additional types occur in the area.

The Goat Flat Proposed Research Natural Area lies within both the Upper Subalpine and Alpine vegetation zones. The Upper Subalpine here includes the timberline transition from a treed Subalpine to a treeless Alpine. At the lowest elevations in the area, closed forests predominate. As elevations increase and climatic conditions become more rigorous, the forests become more open as the distance between trees or tree clumps increases.

Closed forests dominated by Picea engelmannii and Abies lasiocarpa with an understory characterized by Vaccinium scoparium are most common south of the lake. At higher elevations, an open forest of Picea engelmannii and Abies

**Table 2. Preliminary list of vegetation types in the Goat Flat Proposed Research Natural Area.**

| |
|---|
| **Upper Subalpine** |
| *Picea engelmannii-Abies lasiocarpa/Vaccinium scoparium* |
| *Picea engelmannii-Abies lasiocarpa/Phyllodoce* spp. |
| *Larix lyallii/Luzula hitchcockii* |
| *Larix lyallii/Vaccinium scoparium* |
| *Trollius albiflorus-Senecio triangularis-Erigeron peregrinus* |
| *Caltha leptosepala* |
| **Alpine** |
| *Dryas octopetala-Salix reticulata* ssp. *nivalis* |
| *Carex nigricans* |
| *Antennaria lanata* |
| *Phyllodoce glanduliflora* |
| *Festuca ovina-Carex* spp. |

*lasiocarpa* with an understory dominated by *Phyllodoce* spp. and *Vaccinium scoparium* is characteristic.

Forests dominated by *Larix lyallii* generally occur at higher elevations than the *Picea-Abies* forests although the two overlap to some degree. Both open and closed forests of *Larix lyallii* occur in the area. On moister sites, the vegetation type is *Larix lyallii/Luzula hitchcockii* while on somewhat drier sites, *Larix lyallii/Vaccinium scoparium* is more common.

Moist herb meadows occur at low elevation, south of the lake near streams and in seepy areas. This species-rich vegetation type is characterized by *Trollius albiflorus*, *Senecio triangularis* and *Erigeron peregrinus*. Other common species include *Deschampsia caespitosa*, *Valeriana sitchensis*, *Potentilla diversifolia* and *Veronica wormskjoldii*.

In the wettest sites, a vegetation type dominated by *Caltha leptosepala* occurs.

Vegetation patterning in the Alpine is controlled primarily by winter snow depth-exposure and summer moisture. The vegetation types noted here can be arranged along these gradients. The vegetation in the deepest, latest-melting snowbeds that are often in hollows is dominated by Carex nigricans. In slightly shallower snowbeds, often forming a ring around the Carex nigricans vegetation, is a vegetation type dominated by Antennaria lanata.

Areas with moderate snow depths are characterized by a heath tundra dominated by Phyllodoce glanduliflora but also commonly containing Vaccinium scoparium and Cassiope mertensiana. The most exposed sites, which typically have very little snow cover in the winter, contain the Dryas octopetala-Salix reticulata ssp. nivalis vegetation type. Also characteristic of these sites are Kobresia myosuroides and Carex nardina communities.

On some sites, a graminoid tundra occurs with Festuca ovina, Carex spp. (especially Carex phaeocephala), Poa cusickii and Poa pattersonii most common.

## SUMMARY

The Goat Flat Proposed Research Natural Area is located southwest of Anaconda in the Anaconda Range along the Continental Divide on the Deerlodge National Forest. Altitudes range from about 8200 ft along the shore of Storm Lake to 9989 ft at the top of Little Rainbow Mountain.

Topographically, the area is mountainous and includes gently sloping terrain southeast of Storm Lake, steep mountain slopes rising above the lake basin to a number of peaks, and two small, high-altitude plateaus including Goat Flat and the northeastern portion of the area. Active, frost-patterned, polygonal ground and solifluction terraces occur in portions of Goat Flat itself. The bedrock geology includes both sedimentary and igneous rocks.

The vascular flora of the Goat Flat Proposed Research Natural Area currently consists of 190 species. Ten of these species are considered Species of Special Concern by the Montana Natural Heritage Program and five are Sensitive within Region 1 of the U.S. Forest Service.

The occurrence of Antennaria densifolia in the Goat Flat Proposed Research Natural Area is a disjunction of ca. 1850 km from the main part of its range in Canada and is the only site known for this species in Montana or the U.S.

Saussurea weberi occurs from Colorado north to southwestern Montana with the Montana population being disjunct from westcentral Wyoming (Dorn 1988). The population at Goat Flat is the only known occurrence in Montana.

The global range of Saxifraga tempestiva currently comprises thirteen locations in southwestern Montana where it is endemic. Four populations of Saxifraga tempestiva are currently known from the Goat Flat Proposed Research Natural Area.

The Goat Flat Proposed Research Natural Area lies within both the Upper Subalpine and Alpine vegetation zones. Forests are dominated by Picea engelmannii, Abies lasiocarpa and Larix lyallii. Moist, species-rich herb meadows occur at low elevation near Storm Lake and a variety of herb and dwarf shrub vegetation types occur above treeline in the alpine tundra. Eleven major vegetation types are recognized preliminarily but additional types occur in the area.

Additional survey work is needed for both the flora and the vegetation of the Goat Flat Proposed Research Natural Area.

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## APPENDIX 1 - FLORA OF THE GOAT FLAT PROPOSED RNA

The following list of plant species is derived from information in the Montana Natural Heritage Program database and from field surveys done in the summer of 1991. The species are arranged alphabetically by family and species. Nomenclature primarily follows Dorn (1984) and Hitchcock et al. (1955-1969).

### APIACEAE

| | |
|---|---|
| Bupleurum americanum | American thorough-wax |
| Lomatium ambiguum | swale desert-parsley |
| Lomatium cous | cous |
| Osmorhiza depauperata | blunt-fruit sweet-cicely |

### ASTERACEAE

| | |
|---|---|
| Achillea millefolium | yarrow |
| Agoseris aurantiaca | orange agoseris |
| Agoseris glauca | pale agoseris |
| Agoseris lackschewitzii | pink agoseris |
| Antennaria alpina | alpine pussytoes |
| Antennaria anaphaloides | tall pussytoes |
| Antennaria densifolia | pussytoes |
| Antennaria lanata | wooly pussytoes |
| Antennaria microphylla | small-leaved pussytoes |
| Antennaria racemosa | raceme pussytoes |
| Antennaria rosea | rosy pussytoes |
| Arnica cordifolia | heart-leaf arnica |
| Arnica diversifolia | sticky arnica |
| Arnica mollis | hairy arnica |
| Arnica rydbergii | Rydberg's arnica |
| Artemisia campestris | Pacific sagewort |
| Aster alpigenus | alpine aster |
| Chaenactis alpina | alpine chaenactis |
| Erigeron compositus | cut-leaved daisy |
| Erigeron humilis | arctic-alpine daisy |
| Erigeron lanatus | wooly daisy |
| Erigeron peregrinus | subalpine daisy |
| Erigeron simplex | alpine daisy |
| Erigeron subtrinervis | three-veined fleabane |
| Haplopappus lyallii | Lyall's goldenweed |
| Hieracium gracile | slender hawkweed |
| Hulsea algida | alpine hulsea |
| Saussurea weberi | Weber's sawwort |
| Senecio cymbalarioides | few-leaved groundsel |
| Senecio fremontii | dwarf mountain butterweed |
| Senecio integerrimus | western groundsel |
| Senecio lugens | black-tipped butterweed |
| Senecio triangularis | arrowleaf groundsel |

| | |
|---|---|
| Solidago multiradiata | northern goldenrod |
| Solidago spathulata | dune goldenrod |

**BORAGINACEAE**

| | |
|---|---|
| Eritrichium nanum | pale alpine forget-me-not |
| Mertensia viridis | green bluebells |

**BRASSICACEAE**

| | |
|---|---|
| Arabis lemmonii | Lemmon's rockcress |
| Arabis lyallii | Lyall's rockcress |
| Draba oligosperma | few-seeded draba |
| Smelowskia calycina | alpine smelowskia |

**CAMPANULACEAE**

| | |
|---|---|
| Campanula rotundifolia | harebell |
| Campanula scabrella | rough harebell |

**CARYOPHYLLACEAE**

| | |
|---|---|
| Arenaria obtusiloba | arctic sandwort |
| Arenaria rossii | Ross sandwort |
| Cerastium arvense | mouse-ear chickweed |
| Cerastium beeringianum | alpine chickweed |
| Silene acaulis | moss campion |

**CRASSULACEAE**

| | |
|---|---|
| Sedum lanceolatum | lanceleaved stonecrop |
| Sedum roseum | roseroot |

**CUPRESSACEAE**

| | |
|---|---|
| Juniperus communis | common juniper |

**CYPERACEAE**

| | |
|---|---|
| Carex atrata | blackened sedge |
| Carex elynoides | kobresia-like sedge |
| Carex filifolia | thread-leaved sedge |
| Carex geyeri | elk sedge |
| Carex lenticularis | lenticular sedge |
| Carex maritima | seaside sedge |

| | |
|---|---|
| Carex nardina | spikenard sedge |
| Carex neurophora | alpine nerved sedge |
| Carex nigricans | black alpine sedge |
| Carex phaeocephala | dunhead sedge |
| Carex prionophylla | saw-leaved sedge |
| Carex scirpoidea | Canadian single-spike sedge |
| Carex scopulorum | Holm's Rocky Mountain sedge |
| Eleocharis pauciflora | few-flowered spikerush |
| Kobresia myosuroides | Bellard's kobresia |

**EQUISETACEAE**

| | |
|---|---|
| Equisetum arvense | field horsetail |

**ERICACEAE**

| | |
|---|---|
| Cassiope mertensiana | Mertens' mountain heather |
| Gaultheria humifusa | alpine wintergreen |
| Kalmia microphylla | small-leaved laurel |
| Ledum glandulosum | trapper's tea |
| Phyllodoce empetriformis | red mountain-heather |
| Phyllodoce glanduliflora | yellow mountain-heather |
| Rhododendron albiflorum | white rhododendron |
| Vaccinium scoparium | grouseberry |

**FABACEAE**

| | |
|---|---|
| Astragalus aboriginum | Indian milk-vetch |
| Astragalus alpinus | alpine milk-vetch |
| Astragalus bourgovii | Bourgeau's milk-vetch |
| Astragalus miser | weedy milk-vetch |
| Hedysarum sulphurescens | yellow hedysarum |
| Lupinus argenteus | silvery lupine |
| Oxytropis cusickii | Cusick's milk-vetch |
| Oxytropis viscida | sticky crazyweed |

**GENTIANACEAE**

| | |
|---|---|
| Frasera speciosa | giant frasera |
| Gentiana algida | whitish gentian |
| Gentiana calycosa | mountain bog gentian |
| Gentiana prostrata | moss gentian |
| Swertia perennis | swertia |

**HYDROPHYLLACEAE**

| | |
|---|---|
| Phacelia hastata | silverleaf phacelia |

| | |
|---|---|
| Phacelia lyallii | Lyall's phacelia |

**JUNCACEAE**

| | |
|---|---|
| Juncus drummondii | Drummond's rush |
| Juncus mertensianus | Mertens' rush |
| Juncus parryi | Parryi's rush |
| Juncus tracyi | Tracy's rush |
| Luzula campestris | field woodrush |
| Luzula hitchcockii | smooth woodrush |
| Luzula parviflora | smallflowered woodrush |
| Luzula spicata | spiked woodrush |

**LILIACEAE**

| | |
|---|---|
| Allium schoenoprasum | chives |
| Erythronium grandiflorum | glacier lily |
| Lloydia serotina | alpine lily |
| Tofieldia glutinosa | sticky tofieldia |
| Xerophyllum tenax | beargrass |
| Zygadenus elegans | glaucous death-camas |

**LINACEAE**

| | |
|---|---|
| Linum perenne | wild blue flax |

**ONAGRACEAE**

| | |
|---|---|
| Epilobium anagallidifolium | alpine fireweed |

**ORCHIDACEAE**

| | |
|---|---|
| Habenaria dilatata | white bog orchid |

**PINACEAE**

| | |
|---|---|
| Abies lasiocarpa | subalpine fir |
| Larix lyallii | subalpine larch |
| Picea engelmannii | Engelmann spruce |

**POACEAE**

| | |
|---|---|
| Danthonia intermedia | timber oatgrass |
| Deschampsia caespitosa | tufted hairgrass |
| Festuca idahoensis | Idaho fescue |
| Festuca ovina | sheep fescue |

| | |
|---|---|
| Koeleria macrantha | June grass |
| Phleum alpinum | alpine timothy |
| Poa alpina | alpine bluegrass |
| Poa cusickii | Cusick's bluegrass |
| Poa interior | inland bluegrass |
| Poa nervosa | Wheeler's bluegrass |
| Poa pattersonii | Patterson's bluegrass |
| Poa rupicola | timberline bluegrass |
| Poa stenantha | Trinius' bluegrass |
| Trisetum spicatum | spike trisetum |

**POLEMONIACEAE**

| | |
|---|---|
| Polemonium viscosum | skunk polemonium |

**POLYGONACEAE**

| | |
|---|---|
| Eriogonum capistratum var. muhlickii | wild buckwheat |
| Eriogonum ovalifolium | oval-leafed eriogonum |
| Oxyria digyna | mountain sorrel |
| Polygonum bistortoides | western bistort |
| Polygonum viviparum | alpine bistort |

**POLYPODIACEAE**

| | |
|---|---|
| Cryptogramma crispa | parsley fern |
| Polystichum kruckebergii | Kruckeberg's sword fern |

**PORTULACACEAE**

| | |
|---|---|
| Claytonia lanceolata var. lanceolata | western springbeauty |
| Claytonia megarhiza | alpine springbeauty |
| Lewisia pygmaea | dwarf lewisia |

**PRIMULACEAE**

| | |
|---|---|
| Androsace septentrionalis | fairy candelabra |
| Dodecatheon conjugens | slimpod shooting star |
| Dodecatheon jeffreyi | Jeffrey's shooting star |
| Dodecatheon pulchellum | few-flowered shooting star |
| Douglasia montana | Rocky Mountain douglasia |
| Primula parryi | Parry's primrose |

**RANUNCULACEAE**

| | |
|---|---|
| Anemone lithophila | Drummond's anemone |
| Anemone multifida | cut-leaved anemone |
| Anemone patens | pasque flower |
| Aquilegia flavescens | yellow columbine |
| Caltha leptosepala | elkslip |
| Delphinium bicolor | Montana larkspur |
| Ranunculus eschscholtzii | subalpine buttercup |
| Thalictrum occidentale | western meadowrue |
| Trollius albiflorus | American globeflower |

**ROSACEAE**

| | |
|---|---|
| Dryas octopetala | white mountain avens |
| Fragaria virginiana | common strawberry |
| Geum rossii | Ross' avens |
| Potentilla diversifolia | diverse-leaved cinquefoil |
| Potentilla fissa | cinquefoil |
| Potentilla fruticosa | shrubby cinquefoil |
| Potentilla gracilis | slender cinquefoil |
| Sibbaldia procumbens | creeping sibbaldia |

**SALICACEAE**

| | |
|---|---|
| Salix boothii | Booth's willow |
| Salix cascadensis | cascade willow |
| Salix reticulata ssp. nivalis | snow willow |
| Salix farriae | Farr's willow |
| Salix wolfii var. wolfii | Wolf's willow |

**SAXIFRAGACEAE**

| | |
|---|---|
| Lithophragma parviflora | smallflower fringecup |
| Mitella pentandra | alpine mitrewort |
| Parnassia fimbriata | fringed grass-of-parnassus |
| Ribes montigenum | mountain gooseberry |
| Saxifraga bronchialis | spotted saxifrage |
| Saxifraga lyallii | red-stemmed saxifrage |
| Saxifraga odontoloma | brook saxifrage |
| Saxifraga rhomboidea | diamondleaf saxifrage |
| Saxifraga tempestiva | storm saxifrage |

**SCROPHULARIACEAE**

| | |
|---|---|
| Besseya wyomingensis | Wyoming besseya |
| Castilleja crista-gali | cockscomb paintbrush |
| Castilleja miniata | scarlet paintbrush |

| | |
|---|---|
| Chionophila tweedyi | chionophila |
| Pedicularis bracteosa | bracted lousewort |
| Pedicularis contorta | white coiled-beak lousewort |
| Pedicularis groenlandica | elephant's head |
| Pedicularis pulchella | pretty dwarf lousewort |
| Penstemon attenuatus | sulphur penstemon |
| Synthyris pinnatifida | cut-leaf synthyris |
| Veronica wormskjoldii | alpine speedwell |

**SELAGINELLACEAE**

| | |
|---|---|
| Selaginella selaginoides | lesser clubmoss |

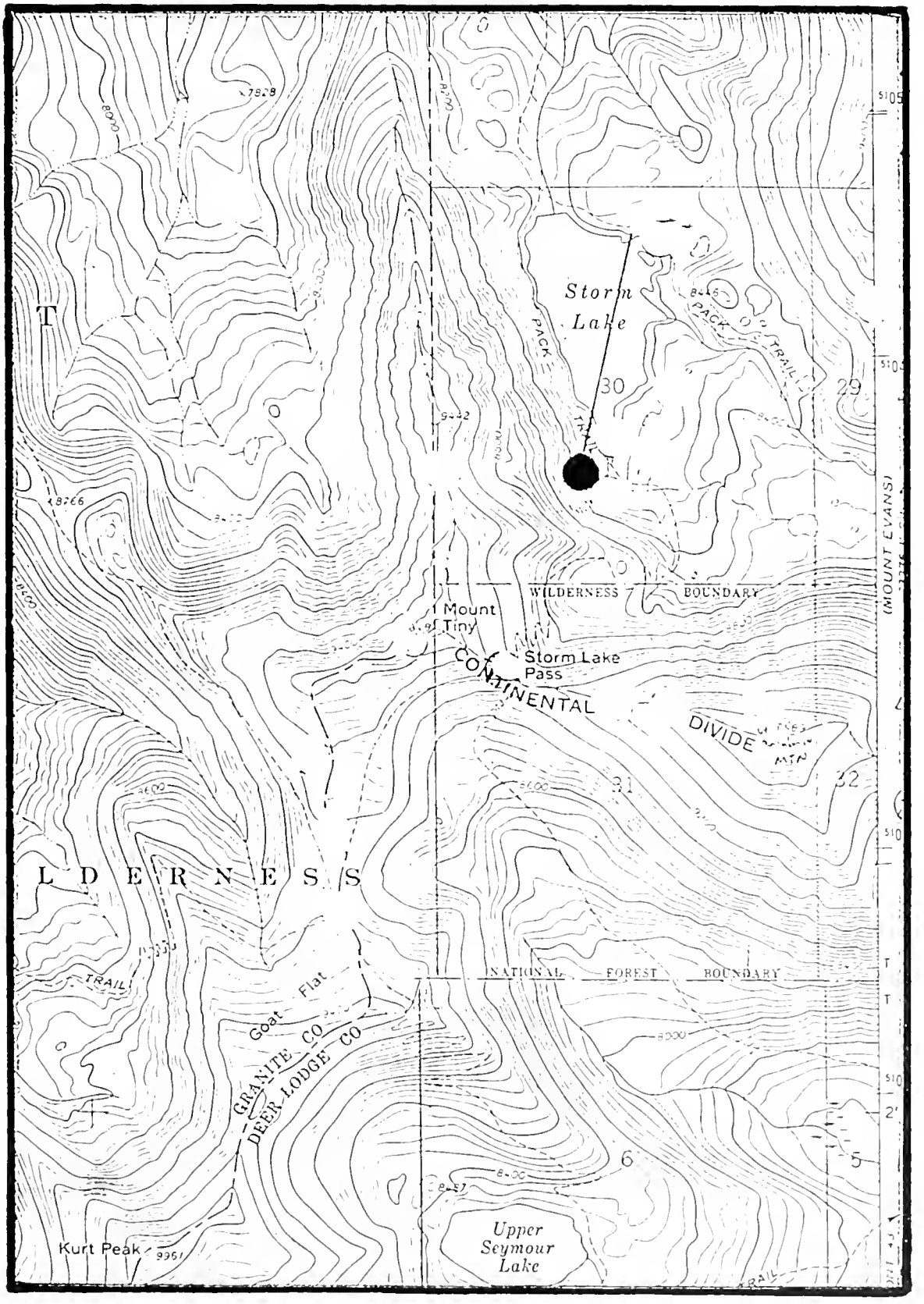
**VALERIANACEAE**

| | |
|---|---|
| Valeriana sitchensis | Sitka valerian |

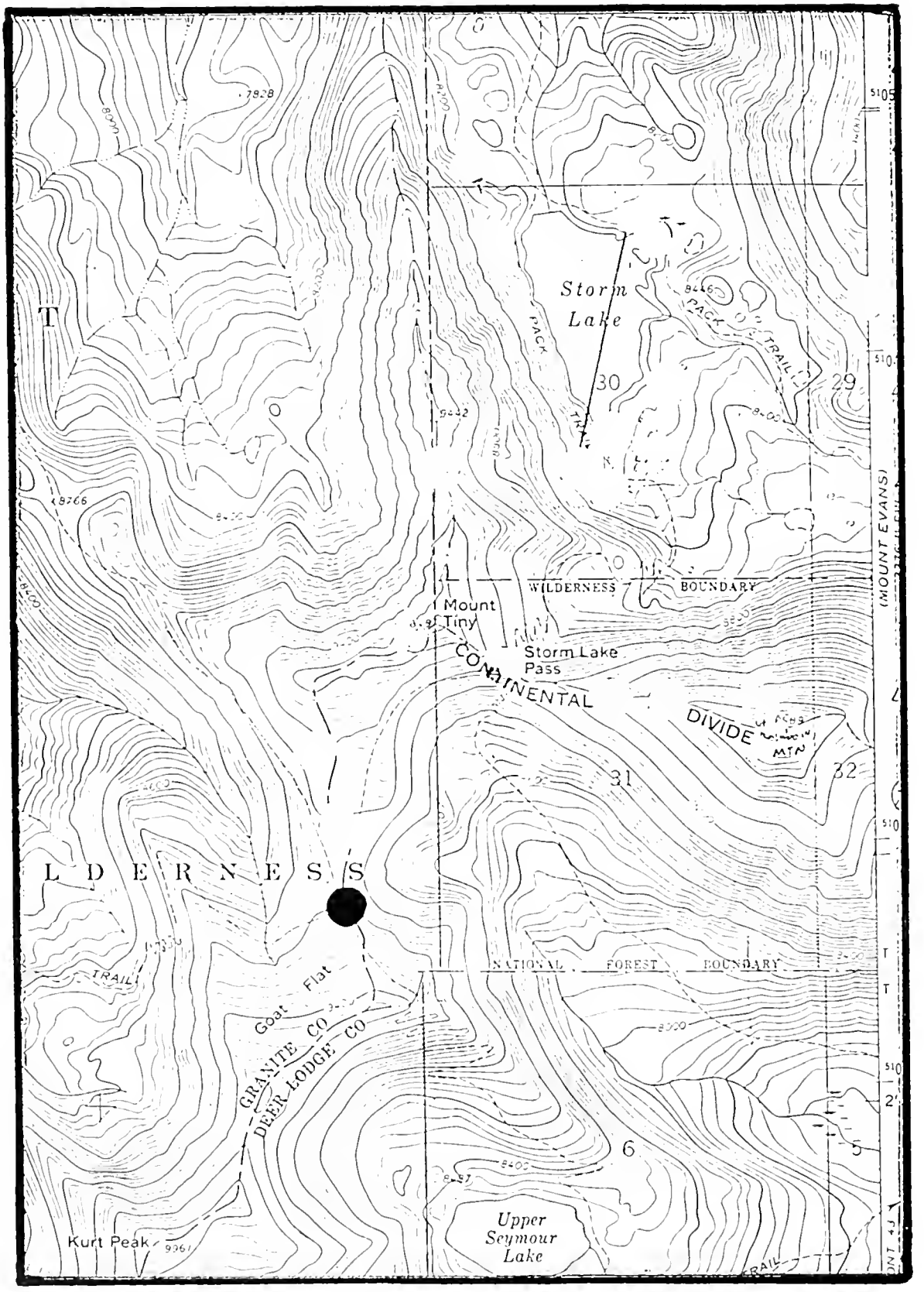
**VIOLACEAE**

| | |
|---|---|
| Viola nephrophylla | kidney-leaved violet |

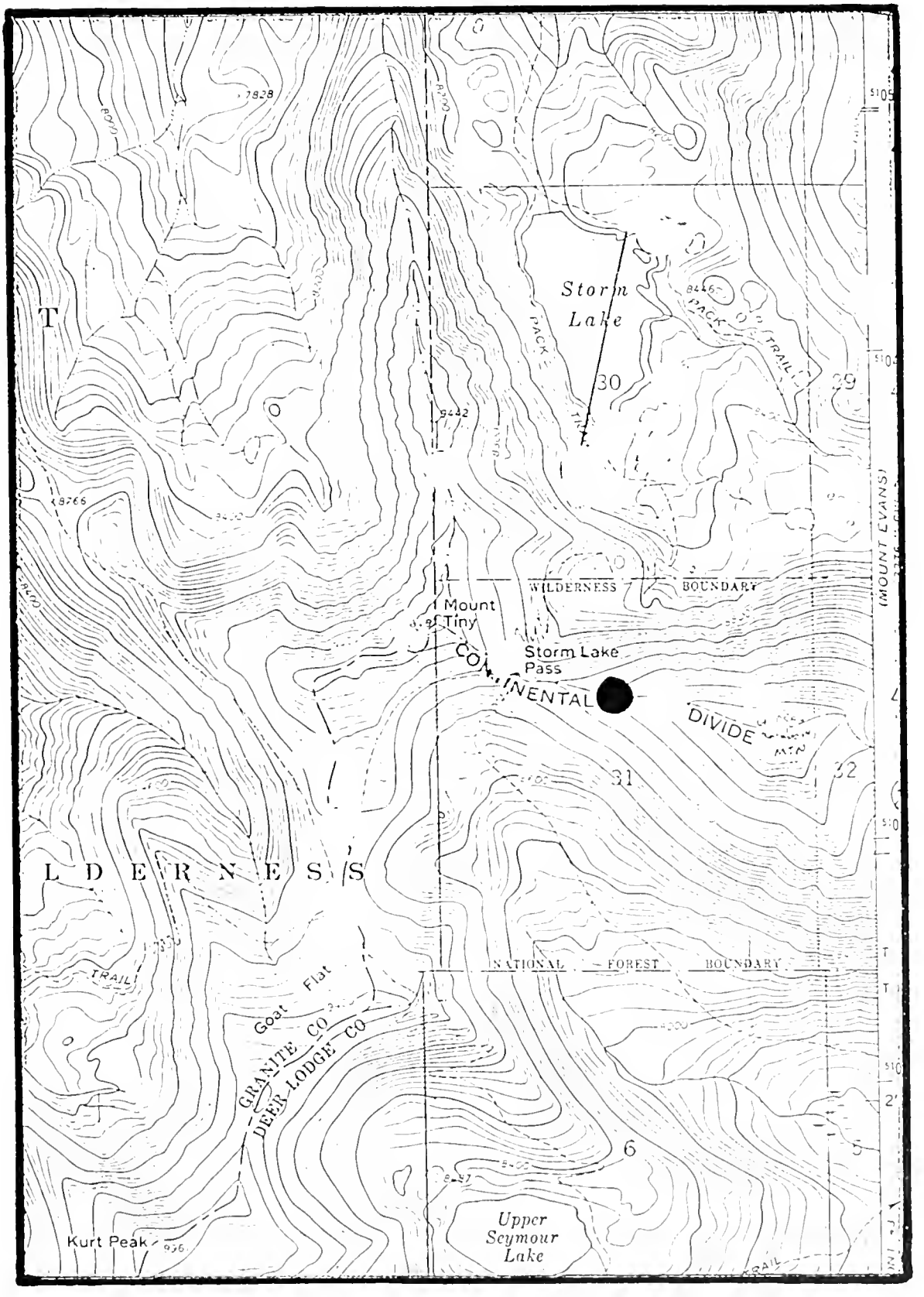
# APPENDIX 2 - LOCATIONS OF SPECIAL PLANT SPECIES



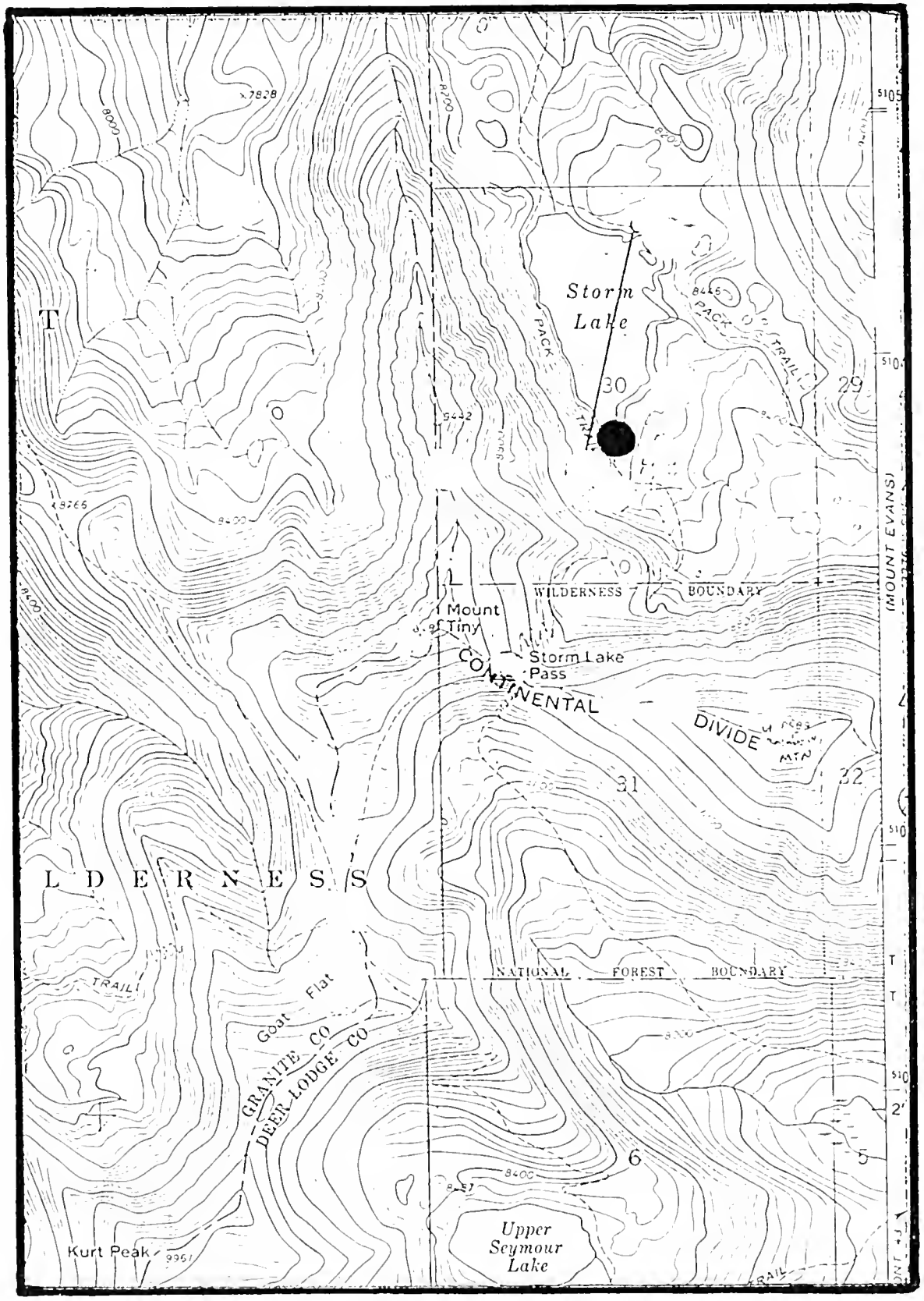

Location of Agoseris lackschewitzii in the Goat Flat PRNA.



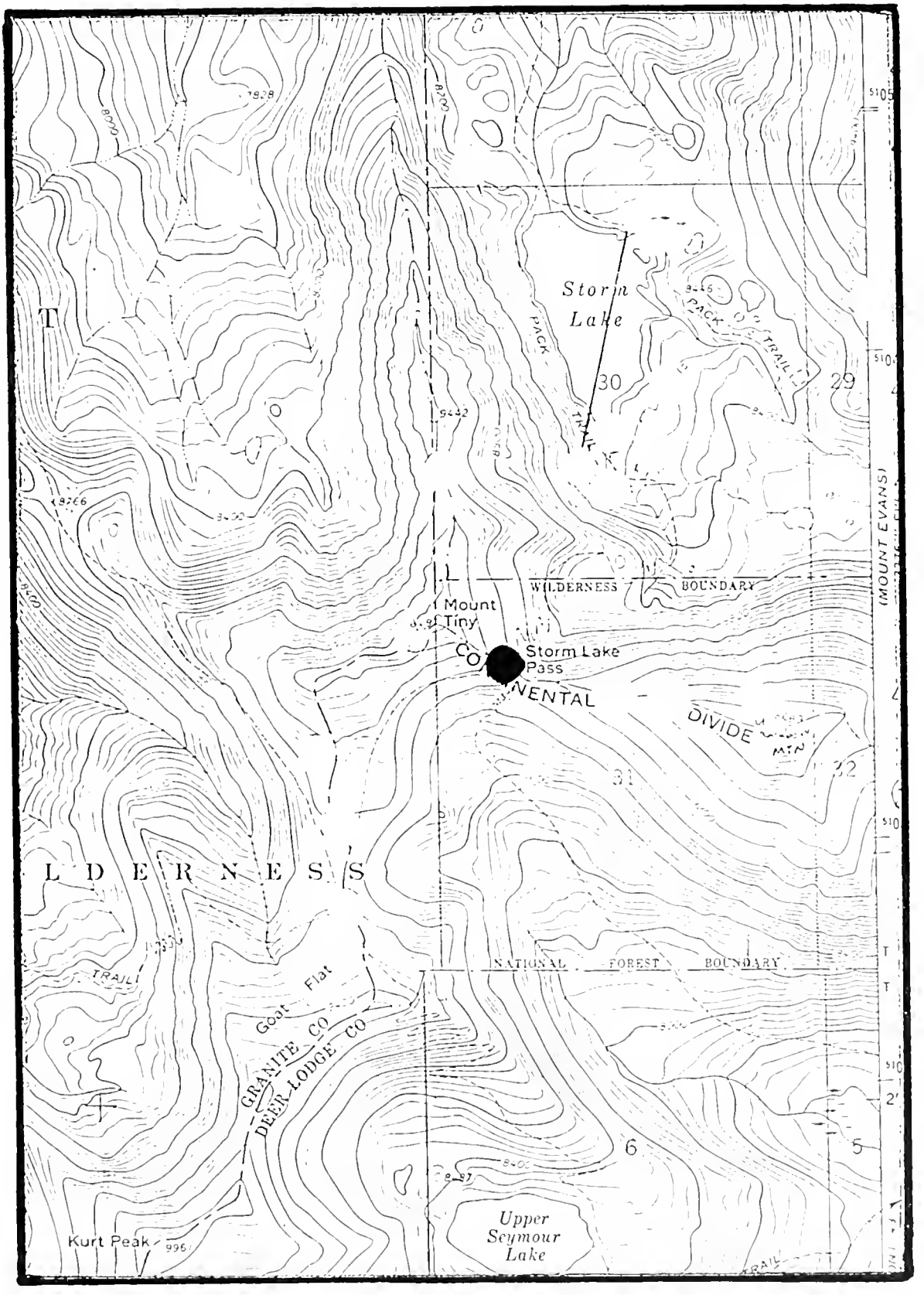

Location of Antennaria densifolia in the Goat Flat PRNA.



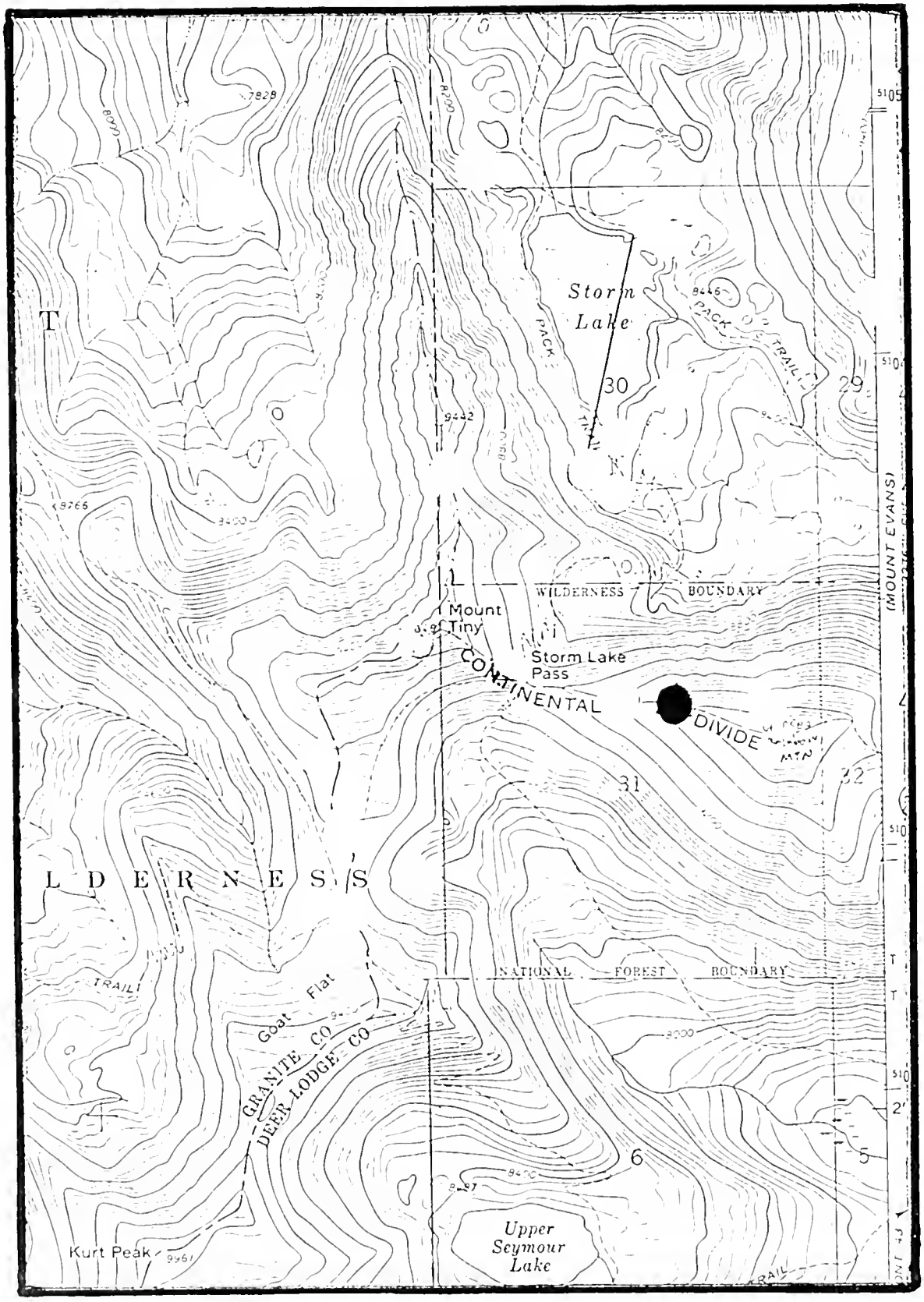

Location of Carex maritima in the Goat Flat PRNA.



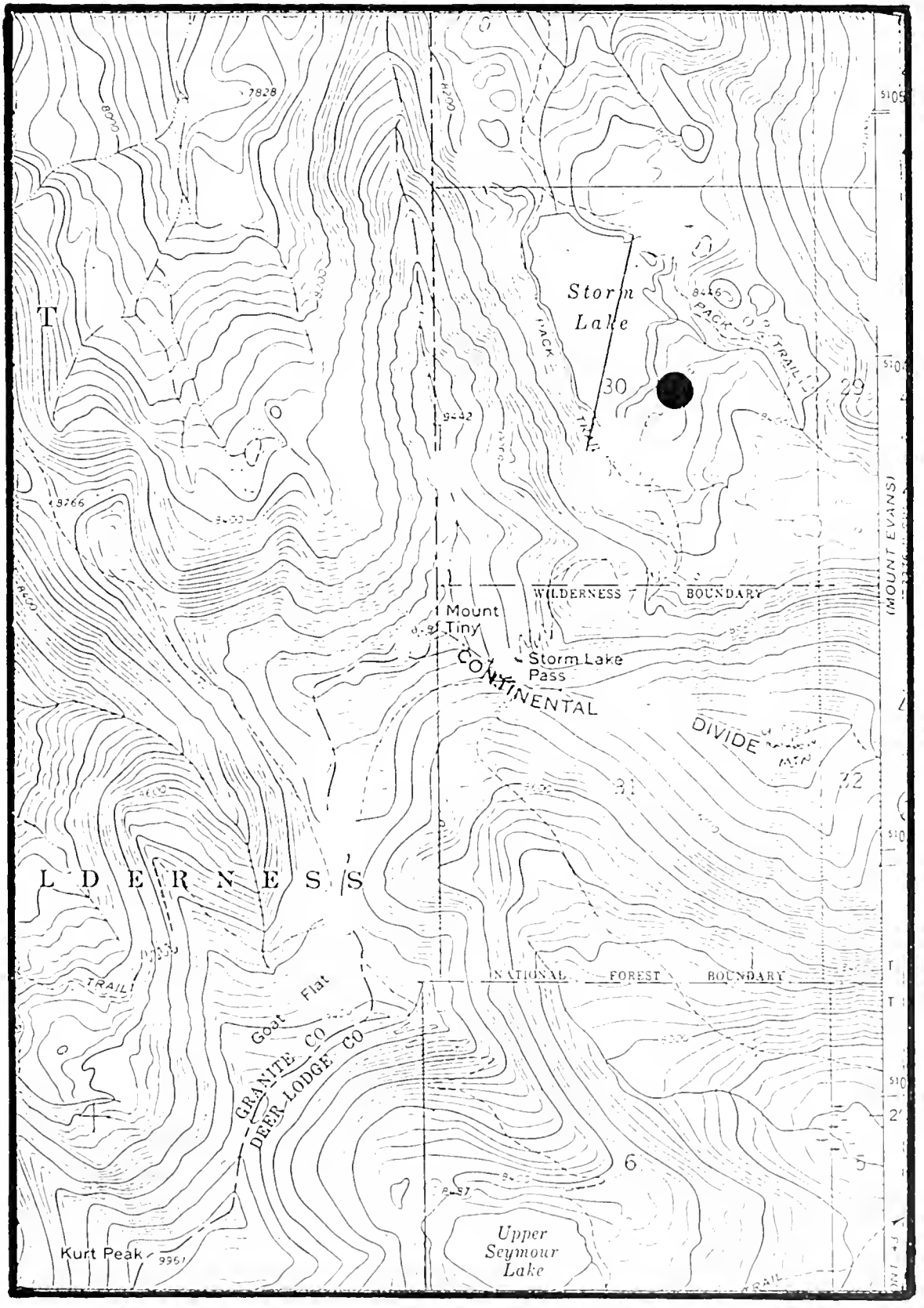

Location of Gentiana prostrata in the Goat Flat PRNA.



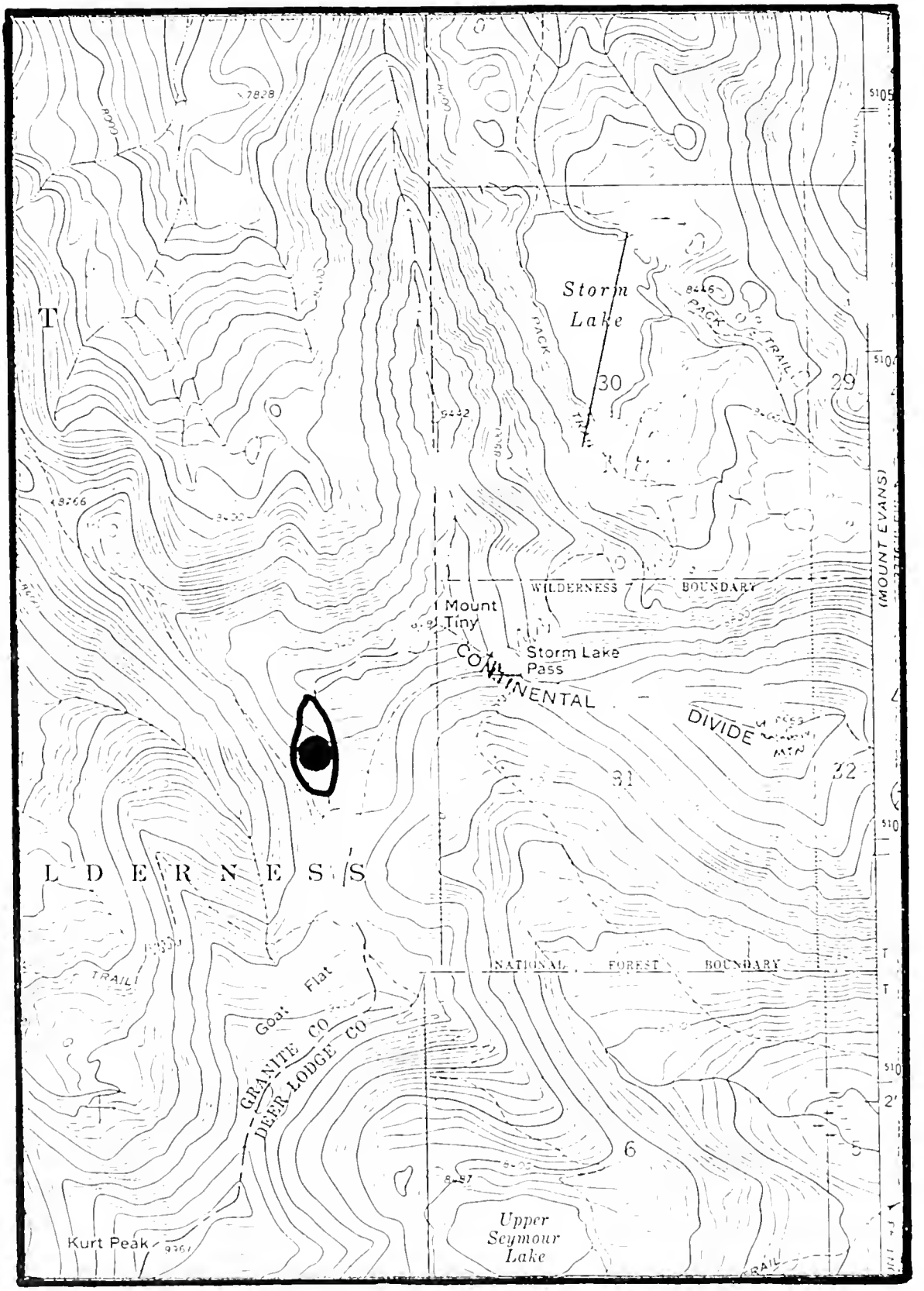

Location of Polystichum kruckebergii in the Goat Flat PRNA.



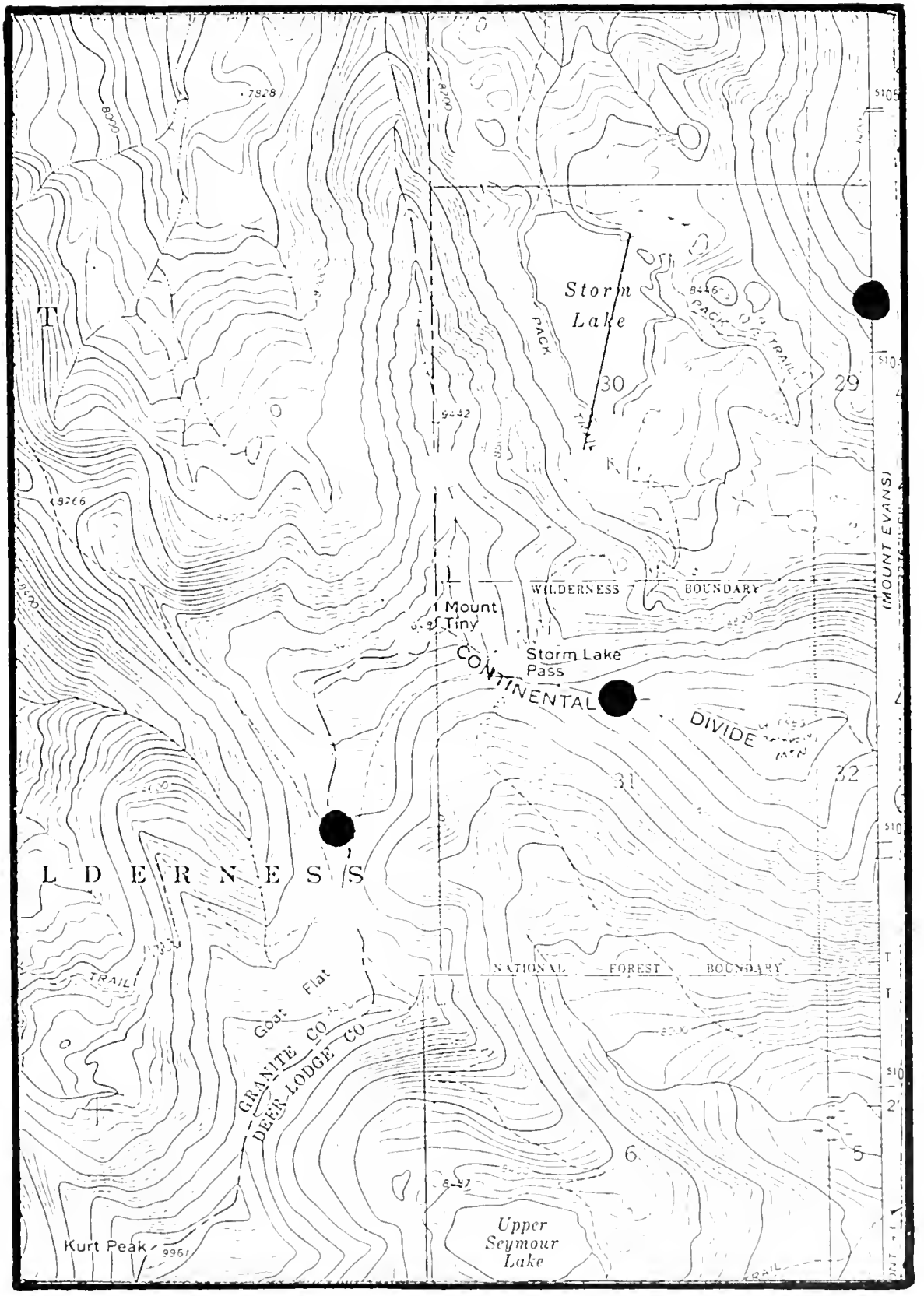

Location of Salix cascadensis in the Goat Flat PRNA.



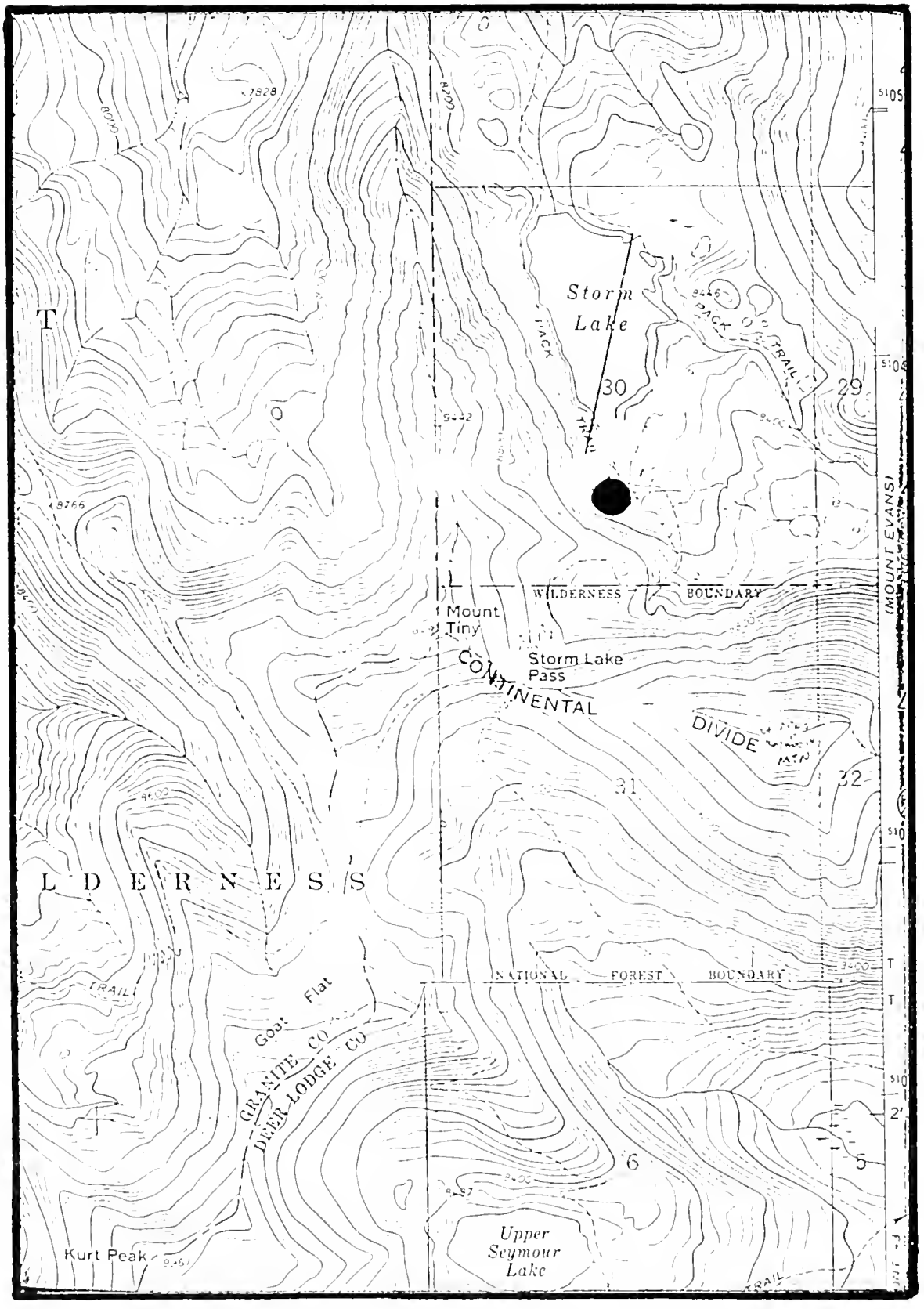

Location of Salix wolfii var. wolfii in the Goat Flat PRNA.




Location of Saussurea weberi in the Goat Flat PRNA.




Location of Saxifraga tempestiva in the Goat Flat PRNA.




Location of Selaginella selaginoides in the Goat Flat PRNA.