

STATUS REVIEW OF Goodyera repens
U.S.D.A. FOREST SERVICE - REGION 1
LEWIS AND CLARK NATIONAL FOREST
MONTANA

prepared by

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Montana Natural Heritage Program
1515 E. 6th Ave.
Helena, MT 59620

Order No.
40-03k0-0-0314

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SUMMARY

Goodyera repens is an orchid with a circumboreal distribution in North America and Eurasia. In the Rocky Mountains, the distribution extends south continuously from the boreal forest to central Alberta and British Columbia, and then is disjunct in Montana, Colorado, Arizona, and New Mexico. In Montana, eighteen locations are currently known; one in northwest Glacier National Park and eighteen in central Montana in the Little Belt and Big Snowy Mountains on Lewis and Clark National Forest lands. Goodyera repens is a sensitive species in Region 1 of the U.S. Forest Service and is classified as an S2 species in Montana by the Montana Natural Heritage Program.

Goodyera repens typically occurs in old Douglas fir forests on cool, northerly aspects, with a well developed moss layer. Populations seem restricted to this specialized habitat, and are usually sparsely distributed in it. Due to its habitat specialization and obligate relationship with certain soil fungi, Goodyera repens is probably intolerant of habitat disturbance such as timber harvest activities or fire. Management planning should take all Montana sites into consideration in order to maintain viable populations on U.S. Forest Service Region 1 lands. Field surveys should be continued in areas of suitable habitat for new populations, and in remnant stands that escaped burning in the Sage Creek drainage. Monitoring of existing populations should be continued and expanded.

I. SPECIES INFORMATION**A. CLASSIFICATION**

1. **SCIENTIFIC NAME:** Goodyera repens (L.) R.Br.
2. **COMMON NAME:** rattlesnake plantain.
3. **FAMILY:** Orchidaceae (Orchid Family).
4. **GENUS:** The genus Goodyera contains about 25 species that occur widely in subarctic and temperate parts of the Northern Hemisphere, and extend south into the tropics in New Caledonia and the Mascarene islands (Hitchcock et al. 1969, Willis 1960). Two species, G. oblongifolia and G. repens, occur in Montana (Dorn 1984).
5. **SPECIES:** Goodyera repens is a circumpolar species occurring throughout northern North America and Eurasia, and was first described from Siberia (Hulten 1968). The species worldwide contains a complex of subspecific varieties. In Montana, the species is apparently represented by both the var. ophioides, with white-mottled leaves, and var. repens, with uniformly green leaves (Kallunki 1990).

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. **FEDERAL STATUS:** Goodyera repens has recently been submitted for listing as a sensitive species for Region 1 of the U.S. Forest Service. It has no status under the U.S. Fish & Wildlife Service Endangered Species Act.
2. **STATE:** Goodyera repens has most recently been ranked by the Montana Natural Heritage Program as an S2 species (= 6-20 occurrences), and is considered imperiled in Montana due to rarity.

C. DESCRIPTION

1. **GENERAL NON-TECHNICAL DESCRIPTION:** Goodyera repens is a small herbaceous, perennial plant with dark-green, heart-shaped to spear-shaped, basal leaves that are 0.5-1.5 inches long and sometimes have white patterning along the veins. The flowering stems are 4-8 inches tall, with glandular hairs, and a 2-4 inch terminal spike of small white or pale greenish flowers. The flower consists of a curved hood above, two lateral

sepals and a deeply pouched lip below. The seed capsule is up to 0.4 inch long (adapted from Hitchcock *et al.* 1969 and Szczawinski 1959).

2. **TECHNICAL DESCRIPTION:** Rhizomatous perennial with glandular-pubescent scapes 1-2 dm tall; leaves mainly basal, petiole wing-margined, 5-15 mm long, the blade ovate to ovate-lanceolate, 1-3 cm long, dark green, often white-reticulate along the veins (var. ophioides), midrib not white; scapes with 2-3 linear, basally sheathing, greenish bracts; inflorescence a secund, 3-8 cm, closely-flowered raceme, perianth white or pale green, occasionally pinkish; petals and sepals narrowly lanceolate, mostly 3-10 mm, the hood (dorsal sepal and lateral petals) 3-3.7 mm long, strongly concave; lateral sepals concealing the lip, oblique, two-thirds as broad as long, the short blunt tip slightly recurved; lip deeply saccate, 3-3.5 mm long with recurved or flaring margins, basal pouch greater than or equal to 2 mm deep; column ca. 3 mm long, the stylar disk about equal length with the slender prongs of the rostellum; the single anther blunt, 1-1.5 mm long about equalled by the filament, attached near the base of the column; two pollinia with a common linear, elongate viscidium; seed capsule erect, scarcely 1 cm (adapted from Hitchcock *et al.* 1969, Packer 1983, and Szczawinski 1959).
3. **LOCAL FIELD CHARACTERS:** Goodyera repens is distinguished from G. oblongifolia, by its overall size; plants are usually less than 2 dm tall, leaves are less than or equal to 4 cm long, and the hood is less than 4 mm in length. Also, the midrib of leaves is not white, and the lip of G. repens plants are deeply saccate, with recurved or flaring margins (Hitchcock *et al.* 1969, Packer 1983, and Szczawinski 1959).

D. GEOGRAPHICAL DISTRIBUTION

1. **RANGE:** Goodyera repens is a circumpolar species occurring throughout northern North America and Eurasia (Hitchcock *et al.* 1969, Hulten 1968). In North America, it occurs, more or less continuously, in the boreal forest from Alaska to Newfoundland, and south to the Great Lakes area, and in the Appalachians to North Carolina. In the Rocky Mountains, the distribution extends south continuously to central Alberta and British Columbia, and then is disjunct in Montana,

Colorado, Arizona, and New Mexico (Colorado Natural Areas Program 1989, Great Plains Flora Association 1986, Packer 1983, Szczawinski 1959). It is also disjunct in the Black Hills of western South Dakota (Great Plains Flora Association 1986).

2. **CURRENT SITES:** Although G. repens was previously reported from Montana (Booth 1950, Luer 1975), the first documented occurrence was in 1980 from Upper Kintla Lake in Glacier National Park (occurrence 002). A second site was located in 1987 in the Little Belt Mountains (001). Three additional collections were made in 1989 from the Little Belt and Snowy mountains of central Montana (003-005). Additional field survey in 1990 added 13 more locations (006-018) in the Little Belt Mountains. Currently, 18 occurrences are known in the state; 17 in central Montana and one from northwestern Glacier National Park (Figure 1, p. 4). Counties of occurrence include Judith (14 locations), Wheatland (2), Fergus (1), and Flathead (1).

One site is in Glacier National Park and the other seventeen are on lands managed by the U.S. Forest Service, Lewis and Clark National Forest. Details of occurrence locations are in Section IV, pp. 16-47.

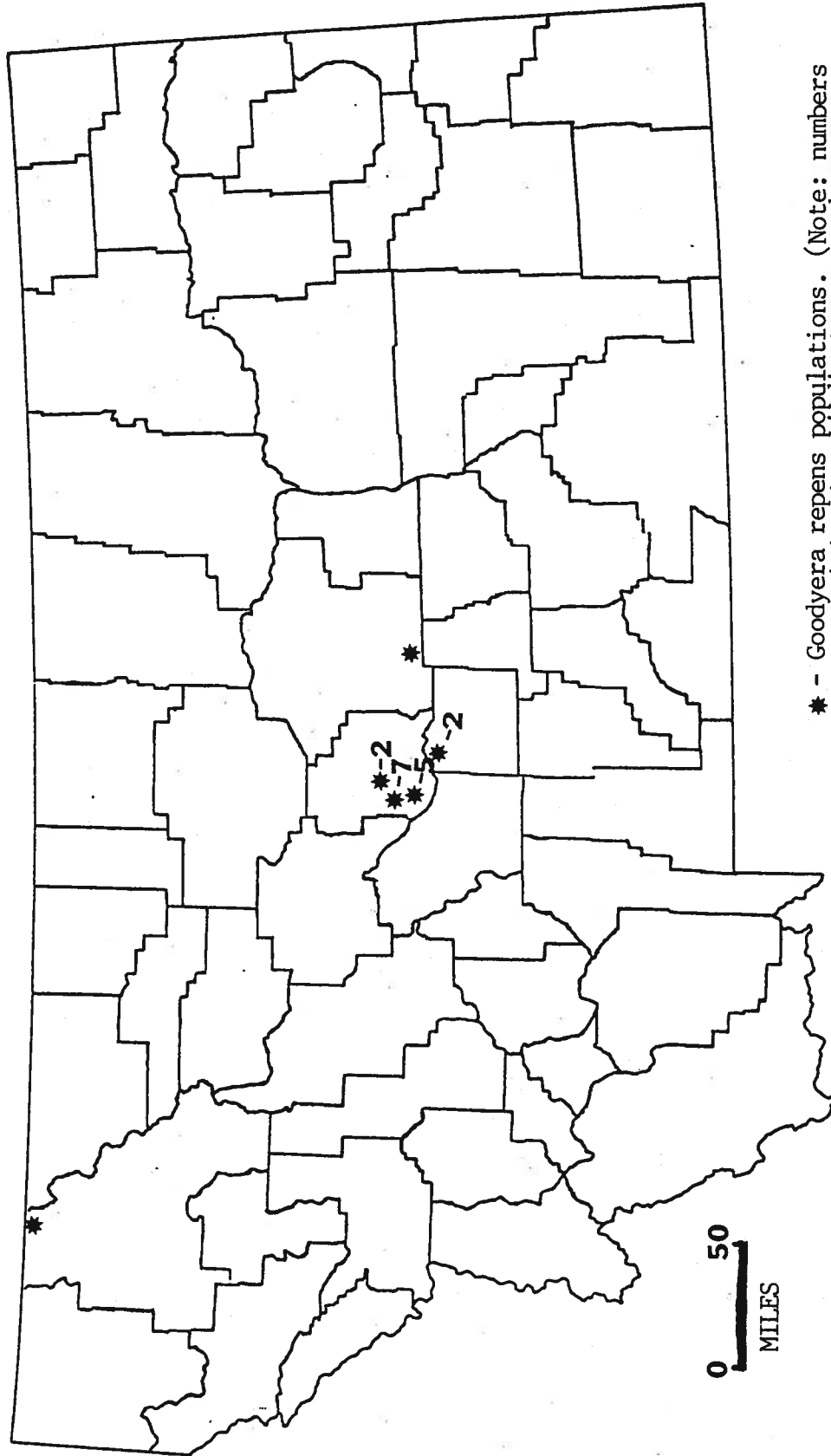
Recent surveys or observations of Goodyera repens include:

Lisa Ann Schassberger - Montana Natural Heritage Program: 6-10 August 1990.

Dana Field - Lewis and Clark National Forest: 11-13 & 18 & 20 September 1990.

3. **HISTORICAL SITES:** None.
4. **UNVERIFIED/UNDOCUMENTED SITES:** None.
5. **AREAS SURVEYED BUT SPECIES NOT LOCATED:** Only a few areas were surveyed by Heritage Program staff during 1990 where G. repens did not occur. These sites were north-facing slopes, with a more open canopy, some at higher elevations. These areas were dominated by species other than Pseudotsuga menziesii (Douglas fir), usually Picea engelmannii (Engelmann spruce), or Pinus contorta (lodgepole pine).

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* - *Goodyera repens* populations. (Note: numbers next to stars indicate areas where more than one population occurs in close proximity.)

Figure 1. Distribution of *Goodyera repens* in Judith Basin, Wheatland, Fergus and Flathead counties, Montana.

Areas searched without success include portions of the following sections:

T11N R08E S36, NE $\frac{1}{4}$
 T14N R10E S12, SW $\frac{1}{4}$ NE $\frac{1}{4}$, SE $\frac{1}{4}$ NW $\frac{1}{4}$
 T14N R10E S25, W $\frac{1}{2}$
 T14N R10E S27, S $\frac{1}{2}$
 T14N R10E S29, SW $\frac{1}{4}$ SW $\frac{1}{4}$
 T14N R10E S33, NW $\frac{1}{4}$
 T14N R10E S34, NE $\frac{1}{4}$
 T14N R10E S35, NW $\frac{1}{4}$ NW $\frac{1}{4}$
 T15N R10E S36, NW $\frac{1}{4}$ NW $\frac{1}{4}$

E. **HABITAT:** Goodyera repens occurs on sites dominated by Pseudotsuga menziesii, with a well developed moss layer. The habitat type as defined by Pfister *et al.* (1977) would be considered a Picea engelmannii/Linnaea borealis. However, the percentage cover of Picea engelmannii and other tree species as described for this type is much higher than was present in the vicinity of G. repens populations. Goodyera repens appeared to drop out if the percentage of Picea engelmannii increased in the canopy. This appeared to be due to the narrower crown shape of Picea engelmannii compared with Pseudotsuga menziesii, which allowed a higher percentage of light to pass through the canopy. The sites are typically on cool, northerly aspects of gentle to moderate slopes (5-35%), at elevations of 5800-6200 feet (1770-1890 m). Populations occurred in valleys or ravines, where solar radiation was limited by a horizon to the west, or on due north slopes. The underlying substrate of the central Montana populations is mostly Madison limestone, although G. repens is generally shallowly rooted in the thick surficial organic layers of the sites.

1. **ASSOCIATED VEGETATION:** Goodyera repens populations typically occur in older forests dominated by Pseudotsuga menziesii, with a well developed moss layer dominated by feathermosses (Hylocomium splendens, Pleurozium schreberi). Other native plant species commonly associated with Goodyera repens include:

Abies lasiocarpa (subalpine fir)
Juniperus communis (common juniper)
Pinus contorta (lodgepole pine)
Acer glabrum (Rocky Mountain maple)
Cornus stolonifera (red-osier dogwood)
Physocarpus malvaceus (ninebark)
Ribes setosum (gooseberry)
Spiraea betulifolia (shiny-leaf spiraea)

Symphoricarpos albus (snowberry)
Actaea rubra (baneberry)
Arctostaphylos uva-ursi (bearberry)
Arnica cordifolia (heart-leaf arnica)
Astragalus miser (weedy milkvetch)
Calamagrostis rubescens (pine grass)
Clematis columbiana (Columbia clematis)
Clematis tenuiloba (matted purple virgin's-bower)
Disporum trachycarpum (wartberry fairybell)
Fragaria virginiana (wild strawberry)
Galium boreale (northern bedstraw)
Galium triflorum (sweetscented bedstraw)
Goodyera oblongifolia (western rattlesnake
 plantain)
Habenaria viridis (bracted orchid)
Linnaea borealis (twin-flower)
Osmorhiza chilensis (mountain sweet-root)
Pyrola chlorantha (greenish wintergreen)
Pyrola secunda (one-sided wintergreen)
Saxifraga odontoloma (brook saxifrage)
Senecio streptanthifolius (cleft-leaf groundsel)
Senecio triangularis (arrowleaf groundsel)
Thalictrum occidentale (western meadowrue)
Zigadenus elegans (white death camas)
Peltigera apthosa (leather lichen).

2. **TOPOGRAPHY:** Goodyera repens occurs predominantly at altitudes of 5800-6200 feet (1770-1890 m) in Montana, with the highest location at 6280 feet (1890 m), and the lowest at 4400 feet (1340) (Glacier National Park). The sites are predominantly well drained, on cool northerly aspects of gentle to moderate slopes (5-35%), on mid- to lower slopes.
3. **SOIL RELATIONSHIPS:** The soils under Goodyera repens populations in central Montana are mostly developed in parent materials derived from calcareous bedrock, mostly Madison Group limestones (Reeves 1930, Veseth and Montagne 1980, Weed 1900). Site-specific soil information for the sites is not available. General information indicates that Cryochrepts and Ustochrepts are most likely at the central Montana sites, and that Cryochrepts and Cryoboralfs are most likely at the Glacier National Park site (Montagne et al. 1982). However, Goodyera repens roots shallowly in the moss and upper organic horizons of the soil, and the relationship to underlying calcareous mineral horizons is not clear.

4. **REGIONAL CLIMATE:** The regional climate of central Montana is characterized by warm summers and cold, snowy winters. The climate of the single location in Glacier National Park is generally moister, more temperate, and less affected by cold, dry continental air masses than the central Montana occurrences. The precipitation peak in central Montana is generally as rain or wet snow in May and June, but in northwestern Montana is typically as snow in December and January (U.S. Department of Commerce 1982).

The climatic station closest to the central Montana sites is at Stanford, which is about 18 miles northeast and, at 4308 feet (1315 m), about 1500 feet (460 m) lower than most of the sites in the Little Belt Mountains. For the period 1951-1980 (U.S. Department of Commerce 1982), the January mean temperature was 20.5°F (2.6°C), the July mean temperature was 65.2°F (18.6°C), and the annual mean temperature was 43.2°F (6.3°C). The mean annual precipitation was 15.34 inches (38.4 cm), with May (3.01 inches) (7.5 cm) and June (3.07 inches) (7.7 cm) being the wettest months.

The Polebridge climatic station is about 15 miles south of the Kintla Lake site and, at 3690 feet (1125 m), is about 700 feet (210 m) lower. For the period 1951-1980 (U.S. Department of Commerce 1982), the January mean temperature was 17.1°F (-8.3°C) the July mean temperature was 60.5°F (15.9°C), and the annual mean temperature was 39.4°F (4.1°C). The mean annual precipitation was 23.34 inches (58.4 cm) with December (2.94 inches) (7.4 cm) and January (3.03 inches) (7.6 cm) being the wettest months.

F. POPULATION DEMOGRAPHY AND BIOLOGY

1. **PHENOLOGY:** In Montana, flowering appears to begin in late July or early August, and extend into mid-September.
2. **POPULATION SIZE AND CONDITION:** Populations of G. repens are generally sparsely or sporadically scattered throughout areas of suitable habitat. Population sizes generally range from ten to a few hundred stems, although a population of greater than 10,000 stems has been observed. Population size (number of visible stems or rosettes) appears to be quite variable from year to year, as noted by fluctuations in the Sandpoint Creek (001)

population between 1988 and 1989. A sample plot was established in this population in 1988; 198 plants were observed. In 1989, only 53 plants were observed. The cause of the variation is not known; however, it might be the effect of climatic conditions on the germination or bolting and flowering of G. repens.

Only one large population was observed in 1990. Low population counts may be due to lack of germination or limited bolting by established rhizomes; this may be the result of warm dry climatic conditions which existed from May through July of 1990. Many plants were observed to be drying out as they were flowering.

Details of population size and condition for each occurrence are in Section IV, pp. 16-34.

3. REPRODUCTIVE BIOLOGY

- a. **TYPE OF REPRODUCTION:** Goodyera repens reproduces both vegetatively, via rhizomes, and sexually through seeds. From seed, it is five years until a rhizome produces a rosette of evergreen leaves, which after approximately three years produces a flowering stalk and seed capsules (Luer 1975). The rosette dies after flowering and the rhizome then produces new rosettes.

The plants are not naturally autogamous due to the physical structure and timing of flower development, but are self-compatible if pollinated artificially (Kallunki 1976, 1981). Natural hybrids between Goodyera repens and G. oblongifolia have been reported from northern Michigan (Kallunki 1981), where reproductive isolating mechanisms of floral characteristics and flowering time are imperfect. It is not known if natural hybrids occur in Montana, but the two species only rarely occur together in the state.

- b. **POLLINATION BIOLOGY:** Goodyera repens is pollinated by insects, with bumblebees (Bombidae) the most likely vector (Kallunki 1981). The flowers on a plant develop sequentially from the base to the tip of the inflorescence, and undergo two phases of development. In the earlier (male) phase, visiting bees remove pollen but cannot

deposit it on the stigma of that flower since access to the stigma is physically blocked. In the later (female) phase, after the pollen has been removed, the flower parts shift permitting access to the stigma. The pollen is then transferred to another flower or plant. Goodyera repens plants are probably also naturally geitogamous (pollinated by pollen from flowers in the same inflorescence or between plants of the same clone) (Kallunki 1981).

- c. **SEED DISPERSAL AND BIOLOGY:** Numerous very small seeds are produced in a capsule that dries upon maturation, splitting the walls and releasing the seeds. Orchid seeds are typically dispersed by air currents. A symbiotic relationship between a fungus and the orchid seeds is necessary for the seeds to effectively germinate and grow (Alexander and Hadley 1984). If a suitable fungus is not available where the seeds disperse, a new plant will not likely establish.

G. POPULATION ECOLOGY

1. BIOLOGICAL INTERACTIONS

- a. **COMPETITION:** The widely dispersed pattern of most Goodyera repens populations makes intraspecific competition unlikely to be significant. Interspecific competition is likely mostly from the mosses which form a dense layer at most sites. Competition from other vascular plants is probably low at most sites since there is generally low cover of understory vascular plants, although this may be a factor in restricting Goodyera repens to sites with low vascular understory cover. Goodyera repens does seem adapted to the lower light intensities under the coniferous overstory. This may be related to the need for high moisture levels in the moss layer until flowering begins in late July and early August.
- b. **HERBIVORY:** The sites occupied by Goodyera repens are not commonly used by grazing animals due to low numbers of forage plants. Cattle activity was noted at the Kelly Coulee site (013), but no damage to the Goodyera repens population was apparent.

- c. **MUTUALISM:** As with most orchids, the seed of Goodyera repens consists of an immature embryo and limited food reserves. The seed germinates into a protocorm and development of the protocorm into a seedling is dependent on forming a mutualistic association with soil fungi, usually Rhizoctonia goodyerae-repentis (Peterson and Currah 1990). This mycorrhizal relationship increases nutrient uptake and results in a higher growth rate (Alexander and Hadley 1984).

2. ABIOTIC INTERACTIONS

- a. **Fire:** Due to the habitat requirements of this species, populations are not likely to respond well to fire. In the fall of 1990 a fire burned through the Hay Coulee (006) and Sage Creek (007) populations. Observations of these sites should be made in 1991 to determine if G. repens is still present in any of patches of unburned timber as occurred at Sandpoint Creek (001). Burned areas are not likely to support G. repens populations.

H. LAND OWNERSHIP

1. Seventeen of the 18 occurrences of Goodyera repens in Montana are on land managed by the U.S. Forest Service; the other site is in Glacier National Park. Specific information for each occurrence is given below and exact locations are listed in Section IV, pp. 16-47.

a. U.S.D.A. Forest Service

Lewis and Clark National Forest

Judith Ranger District

Sandpoint Creek (001)
 Nickerson Coulee (003)
 Lost Fork Judith River (004)
 Half Moon Creek (005)
 Hay Coulee (006)
 Sage Creek (007)
 South Fork Running Wolf Creek (008)
 Bear Gulch (009)
 North Fork Running Wolf Creek (010)
 Skunk Gulch (011)
 Woodhurst Mountain (012)
 Kelly Coulee (013)

South Fork Judith (014)
 Hay Canyon I (015)
 Hay Canyon II (016)

Musselshell Ranger District

Dry Gulch (017)
 West Fork Hopley Creek (018)

b. U.S. National Park Service

Glacier National Park

Upper Kintla Lake (002)

II. ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

A. THREATS TO CURRENTLY KNOWN POPULATIONS

1. **GRAZING:** Although cattle use the general area around Goodyera repens populations, there appears to be little use and no current damage to plants at these sites.
2. **TIMBER HARVEST:** Timber harvest is a potential threat to nearly all Goodyera repens populations. The old age forests in which populations occur are often considered mature or overmature for timber purposes. The opening of the tree canopy, and the physical disturbance associated with harvesting, will have a detrimental effect on the Goodyera repens populations; populations extended up to, but not into small clearcut areas in the Sage Creek drainage (T 14N R 11E, Section 19, SE $\frac{1}{4}$ NW $\frac{1}{4}$). It was observed that the well established mat of feather moss decreased with increasing light intensity, and logging completely eliminated these mosses. In addition to the direct loss of plants, the lowered density (greater interplant distance) would reduce the effectiveness of pollinators necessary for seed production. The disturbance may also affect the mycorrhizal fungi which are necessary for growth and reproduction. These combined effects would reduce the ability of these already sparse populations to maintain or re-establish after harvesting.

The following sites are currently potentially threatened by proposed timber harvest:

Bear Gulch (009)
 North Fork of Running Wolf Creek (010)

Skunk Gulch (011)
Woodhurst Mountain (012)
Hay Canyon I (015)
Hay Canyon II (016).

- B. **MANAGEMENT PRACTICES AND RESPONSE:** Little is known of the specific responses of Goodyera repens to grazing or timber harvest. However, given its restriction to a fairly specialized habitat and obligate relationship with mycorrhizal fungi, and due to its association in Montana with moist sites in established feather moss layers, management practices especially timber harvest, are likely to be detrimental to populations.

- C. **RECOMMENDATIONS FOR MAINTAINING VIABLE POPULATIONS:**
The following recommendations are made to ensure that the long-term viability of Goodyera repens populations is maintained on U.S. Forest Service land in Montana.

1. Protection of natural habitats that currently support Goodyera repens populations. Management plans on the Lewis and Clark National Forest should take all known populations into consideration and prevent disturbance of the sites.
2. Notification of U.S. Forest Service personnel of sites on U.S. Forest Service lands. To prevent inadvertent impacts on currently known sites, personnel involved in planning activities should be provided with detailed information on the location of Goodyera repens populations. It is especially important that timber sale managers, engineers, and range conservationists at the Ranger District level know these locations so that disturbance can be prevented.

- D. **RECOMMENDATIONS FOR FURTHER ASSESSMENT**

1. Further field surveys of potential habitats. Additional field surveys should be made in central Montana in portions of the Lewis and Clark National Forest in the Little Belt Mountains, the Snowy Mountains, and the Castle Mountains. Prime potential habitats are old age Douglas fir forests on cool, northerly-aspect sites, with well developed moss understories. In the Little Belt Mountains and in the Big Snowy Range, populations were observed only on calcareous substrates. The substrate on which the population in Glacier Park is located is not known. Further surveys to the

west of the known populations in the Little Belt Mountains, in Douglas fir forest not underlain by calcareous parent material should be completed, along with surveying sites with calcareous parent materials.

2. Establish monitoring studies to assess population condition and status. Monitoring studies should be established at several locations to better determine population dynamics, life history, and the effects of habitat alteration on Goodyera repens. A modification of methods as outlined in Lesica (1987) would be suitable for monitoring these populations and could be combined with other techniques. An ECODATA plot was established at Sandpoint Creek (001) as a baseline for nearby plots established in a recent burn. Some data are available for G. repens from this plot, but the information only relates to stem number present from year to year.

III. LITERATURE CITED

- Alexander, C. and G. Hadley. 1984. The effect of mycorrhizal infection of Goodyera repens and its control by fungicide. *New Phytologist* 97:391-400.
- Booth, W.E. 1950. Flora of Montana. Part I. Conifers and monocots. Montana State College, Bozeman. 232 pp.
- Colorado Natural Areas Program. 1989. Colorado plant species of special concern - May 1989. State of Colorado, Division of Parks and Outdoor Recreation. 28 pp.
- Dorn, R.D. 1984. Vascular plants of Montana. Mountain West Publishing, Laramie, Wyoming. 276 pp.
- Great Plains Flora Association. 1986. Flora of the Great Plains. University Press of Kansas, Lawrence. 1392 pp.
- Hitchcock, C.L., A. Cronquist, and M. Ownbey. 1969. Vascular plants of the Pacific Northwest. Part 1. Vascular cryptogams, gymnosperms and monocotyledons. University of Washington Press, Seattle. 914 pp.
- Hulten, E. 1968. Flora of Alaska and neighboring territories. Stanford University Press, Stanford, California. 1008 pp.
- Kallunki, J.A. 1976. Population studies in Goodyera (Orchidaceae) with emphasis on the hybrid origin of G. tessellata. *Brittonia* 28:53-75.
- Kallunki, J.A. 1981. Reproductive biology of mixed-species populations of Goodyera (Orchidaceae) in northern Michigan. *Brittonia* 33:137-155.
- Kallunki, J.A. 1990. Letter to H.W. Phillips, Lewis & Clark National Forest, Great Falls, Montana, 3 June 1990.
- Lesica, P. 1987. A technique for monitoring nonrhizomatous perennial plant species in permanent belt transects. *Natural Areas Journal* 7:65-68.
- Luer, C.A. 1975. The native orchids of the United States and Canada, excluding Florida. New York Botanical Garden, Bronx, New York. 361 pp.
- Montagne, C., L.C. Munn, G.A. Nielsen, J.W. Rogers and H.E. Hunter. 1982. Soils of Montana. Montana Agricultural Experiment Station Bulletin 744. 95 pp.
- Packer, J.G. 1983. Flora of Alberta, 2nd Edition. University of Toronto Press, Toronto. 687 pp.

- Peterson, R.L. and R.S. Currah. 1990. Synthesis of mycorrhizae between protocorms of Goodyera repens (Orchidaceae) and Ceratobasidium cereale. Canadian Journal of Botany 68:1117-1125.
- Pfister, R.D., B.L. Kovalchik, S.F. Arno and R.C. Presby. 1977. Forest habitat types of Montana. USDA Forest Service General Technical Report INT-34. 174 pp.
- Reeves, F. 1930. Geology of the Big Snowy Mountains, Montana. U.S. Geological Survey Professional Paper 165 D. pp. 135-149.
- Szczawinski, A.F. 1959. Orchids of British Columbia. British Columbia Provincial Museum Handbook 16. 124 pp.
- U.S. Department of Commerce. 1982. Monthly normals of temperature, precipitation, and heating and cooling degree days 1951-80, Montana. National Oceanic and Atmospheric Administration, Climatology of the United States No. 81. 23 pp.
- Veseth, R. and C. Montagne. 1980. Geologic parent materials of Montana soils. Montana Agricultural Experiment Station Bulletin 721. 117 pp.
- Weed, W.H. 1900. Geology of the Little Belt Mountains, Montana. U.S. Geological Survey Annual Report 20:257-461.
- Willis, J.C. 1960. A dictionary of flowering plants and ferns. Cambridge University Press, Cambridge, England. 752 pp.

IV. ELEMENT OCCURRENCE PRINT-OUTS AND MAPS

Occurrence number: 001

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

Survey site name: SANDPOINT CREEK
EO rank: B
EO rank comments: SMALL POPULATION, IN REMOTE UNDISTURBED
AREA.

County: JUDITH BASIN

USGS quadrangle: ETTIEN SPRING

Township-range: 012N010E Section: 10 Precision: S
Township-range comments: SE4

Survey date: 1987-08-03	Elevation: 6100
First observation: 1987	Slope/aspect:
Last observation: 1989-08-03	Size (acres): 1

Location:

LITTLE BELT MOUNTAINS, SANDPOINT CREEK DRAINAGE, CA. 1.6
MILES WNW OF CONFLUENCE WITH LOST FORK JUDITH RIVER.

Element occurrence data:

CA. 200 PLANTS OBSERVED IN A 400 SQUARE-METER AREA; ADJACENT
AREAS BURNED IN 1985. 198 PLANTS IN 1988 (IN PLOT AREA). 53
FLOWERING STEMS 3 AUGUST 1989 (IN PLOT).

General site description:

NORTH-FACING SLOPE, LIMESTONE SUBSTRATE; GROWING IN THICK
MATS OF MOSS, WITH ABIES LASIOCARPA, PSEUDOTSUGA MENZIESII,
PINUS CONTORTA, PICEA ENGELMANNII, LINNAEA BOREALIS, PYROLA
SECUNDA.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

VOUCHER-H. WAYNE PHILLIPS (870803-34), 1987, MRC. DANA FIELD
HAS MADE OBSERVATIONS AT THIS SITE.

Information source:

PHILLIPS, H. W. U.S. FOREST SERVICE, LEWIS & CLARK N.F.,
P.O. BOX 871, GREAT FALLS, MT 59403.

Occurrence number: 002

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

Survey site name: UPPER KINTLA LAKE

EO rank:
EO rank comments:

County: FLATHEAD

USGS quadrangle: KINTLA PEAK

Township-range: 037N020W Section: 10 Precision: G
Township-range comments: 9,11-16

Survey date: 1980-08-06	Elevation: 4400
First observation: 1980	Slope/aspect:
Last observation: 1980-08-06	Size (acres):

Location:

GLACIER NATIONAL PARK, NEAR UPPER KINTLA LAKE.

Element occurrence data:
UNKNOWN.

General site description:
UNKNOWN.

Land owner/manager:
GLACIER NATIONAL PARK

Comments:
NONE.

Information source:
DeSANTO, J. (S.N.) 1980. GNP.

Occurrence number: 003

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

Survey site name: NICKERSON COULEE
EO rank:
EO rank comments:

County: JUDITH BASIN

USGS quadrangle: WOLF BUTTE

Township-range: 015N010E Section: 36 Precision: S
Township-range comments: N2NW4

Survey date:	Elevation: 5700
First observation: 1989	Slope/aspect: 35% / NORTH
Last observation: 1989-08-11	Size (acres): 0

Location:
LITTLE BELT MOUNTAINS, ABOVE NICKERSON COULEE, CA. 9 MILES
SOUTHWEST OF STANFORD.

Element occurrence data:
UNKNOWN.

General site description:
DOUGLAS-FIR FOREST ZONE, IN SHADE.

Land owner/manager:
LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:
SCHASSBERGER, L. A. THIS POPULATION WAS NOT RELOCATED IN
1990, LOCATION INFORMATION WAS NOT ADEQUATE. THE POPULATION
MAY BE FURTHER TO THE WEST THAN WHERE IT IS CURRENTLY
MAPPED.

Information source:
STICKNEY, P. (4758). 1989. MRC.

Occurrence number: 004

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

Survey site name: LOST FORK JUDITH RIVER
EO rank: B
EO rank comments:

County: JUDITH BASIN

USGS quadrangle: ETTIEN SPRING

Township-range: 012N010E Section: 14 Precision: S
Township-range comments: SE4,13SW4NW4,23N2NE4

Survey date: 1989-08-03	Elevation: 5800
First observation: 1989	Slope/aspect: 15-35% / N,NW
Last observation: 1989-08-03	Size (acres): 30

Location:

LITTLE BELT MOUNTAINS, LOST FORK JUDITH RIVER, CA. 12 MILES
SOUTHWEST OF SAPPHIRE VILLAGE.

Element occurrence data:

CA. 125+ PLANTS IN 7 SUBPOPULATIONS; FLOWERING (3 AUG
1989). PLANTS OFTEN IN CLUSTERS OF 3 TO 6 INDIVIDUALS.

General site description:

PLANTS FOUND ON WELL-DRAINED MID-SLOPES AND RIDGES, WITH
FILTERED LIGHT IN OLDER DOUGLAS-FIR FOREST. DOUGLAS-FIR AGE
CA. 200 YRS; LODGEPOLE PINE AGE CA. 180 YRS. ASSOCIATED
VEGETATION INCLUDES PSEUDOTSUGA MENZIESII, PINUS CONTORTA,
PINUS ALBICAULIS, CALAMAGROSTIS RUBESCENS, ASTRAGALUS MISER,
SPIRAEA BETULIFOLIA, JUNIPERUS COMMUNIS, AND ARCTOSTAPHYLOS
UVA-URSI. PLANTS OFTEN OCCUR WITH PELTIGERA APHTHOSA
(LICHEN).

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

SEE ORIGINAL ECODATA AND HERITAGE SURVEY FORMS (ON FILE AT
MONTANA NATURAL HERITAGE PROGRAM) FOR ADDITIONAL ASSOCIATED
SPECIES. ALSO SURVEYED BY DANA FIELD.

Information source:

PHILLIPS, H.W. LEWIS AND CLARK NATIONAL FOREST, P.O. BOX
871, GREAT FALLS, MT. (S.N.) MRC.

Occurrence number: 005

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

Survey site name: HALF MOON CREEK
EO rank:
EO rank comments:

County: FERGUS

USGS quadrangle: HALF MOON CANYON

Township-range: 012N019E Section: 14 Precision: M
Township-range comments:

Survey date:	Elevation: 5800
First observation: 1989	Slope/aspect: 15-35% / N
Last observation: 1989-09-24	Size (acres): 3

Location:

SNOWY MOUNTAINS, HALF MOON CANYON, CA. 17 MILES SOUTHEAST OF
LEWISTOWN, CA. 2 MILES SOUTHWEST OF RED HILL ROAD.

Element occurrence data:

SCATTERED GROUPS OF PLANTS.

General site description:

DOUGLAS-FIR/SPRUCE FOREST IN SHADE, FROM 5,800 - 6,000 FEET
IN ELEVATION, ON LIMESTONE SUBSTRATES IN THICK DUFF AND
MOSS. ASSOCIATED SPECIES INCLUDE LINNAEA BOREALIS, PYROLA
SECUNDA, THALICTRUM OCCIDENTALE, FRAGARIA VIRGINIANA,
CLEMATIS COLUMBIANA.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

NO MAP INCLUDED WITH SURVEY RECORD; COMPLETE LIST OF
ASSOCIATED SPECIES ON FILE AT MONTANA NATURAL HERITAGE
PROGRAM.

Information source:

PHILLIPS, H.W. LEWIS AND CLARK NATIONAL FOREST, P.O. BOX
871, GREAT FALLS, MT 59403. (890924-1). 1989. NY.

Occurrence number: 006

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

Survey site name: HAY COULEE
EO rank: C
EO rank comments: THREATENED BY FUTURE LOGGING ACTIVITIES.

County: JUDITH BASIN

USGS quadrangle: WOODHURST MOUNTAIN

Township-range: 014N011E Section: 21 Precision: S
Township-range comments: SW4SE4, NW4SE4, SE4SW4, 28NW4, 29N2SE4

Survey date:	1990-08-07	Elevation:	6000
First observation:	1990	Slope/aspect:	13-35% / NNW
Last observation:	1990-08-07	Size (acres):	250

Location:

LITTLE BELT MOUNTAINS; HAY COULEE, CA. 11 MILES WEST OF
UTICA, SOUTH OF SAGE CREEK ROAD (F.S. #265).

Element occurrence data:

PLANTS WERE DRYING FROM THE BOTTOM AS THEY FLOWERED (7
AUGUST 1990). INDIVIDUALS SPARSELY DISPERSED ACROSS THE
LANDSCAPE.

General site description:

IN OLD-GROWTH PSEUDOTSUGA MENZIESII FOREST WITH PICEA
ENGELMANNII, LINNAEA BOREALIS, ZIGADENUS ELEGANS, JUNIPERUS
COMMUNIS, GALIUM BOREALE, CLEMATIS TENUILOBA, PYROLA
CHLORANTHA AND SENECIO STREPTANTHIFOLIUS, ON STEEP SLOPES IN
SHADE; PLANTS ROOTED IN THICK MOSS MATS.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

THIS SPECIES IS VERY VULNERABLE TO LOGGING, PLANTS OCCUR
ONLY IN SHADED LOCATIONS IN THICK MOSS MATS; REESTABLISHING
POPULATIONS WOULD NOT BE POSSIBLE. VOUCHER - SCHAASBERGER,
L.A. (408), 1990.

Information source:

SCHAASBERGER, L.A. 1990. [FIELD SURVEY OF THE LITTLE BELT
MOUNTAINS 6-10 AUGUST (GOODYERA REPENS)].

Occurrence number: 007

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

Survey site name: SAGE CREEK
EO rank: C
EO rank comments: PROPOSED TIMBER SALE AREA.

County: JUDITH BASIN

USGS quadrangle: WOODHURST MOUNTAIN

Township-range: 014N011E Section: 20 Precision: S
Township-range comments: N2NE4, N2NW4, 19NE4

Survey date: 1990-08-08	Elevation: 6200
First observation: 1990	Slope/aspect: 13-35% / NNW
Last observation: 1990-08-08	Size (acres): 160

Location:

LITTLE BELT MOUNTAINS; SAGE CREEK, CA. 12 MILES WEST OF
UTICA, SOUTH OF F.S. ROAD #265.

Element occurrence data:

INDIVIDUALS SPARSELY DISPERSED ACROSS LANDSCAPE.

General site description:

IN OLD-GROWTH PSEUDOTSUGA MENZIESII FOREST WITH PICEA
ENGELMANNII, LINNAEA BOREALIS, ZIGADENUS ELEGANS, JUNIPERUS
COMMUNIS, GALIUM BOREALE, CLEMATIS TENUILOBA, PYROLA
CHLORANTHA AND SENECIO STREPTANTHIFOLIUS. PLANTS ONLY OCCUR
IN THICK MOSS MATS.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

THIS SPECIES IS VERY VULNERABLE TO LOGGING. PLANTS OCCUR
ONLY IN SHADED LOCATIONS IN THICK MOSS MATS; REESTABLISHING
POPULATIONS WOULD NOT BE POSSIBLE.

Information source:

SCHASSBERGER, L.A. 1990. [FIELD SURVEY OF THE LITTLE BELT
MOUNTAINS 6-10 AUGUST (GOODYERA REPENS)].

Occurrence number: 008

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

Survey site name: SOUTH FORK RUNNING WOLF CREEK
 EO rank: A
 EO rank comments: EXCELLENT HABITAT, POPULATION IN GOOD
 CONDITION.

County: JUDITH BASIN

USGS quadrangle: BANDBOX MOUNTAIN

Township-range: 014N010E Section: 23 Precision: S
 Township-range comments: SW4

Survey date: 1990-08-08	Elevation: 6200
First observation: 1990	Slope/aspect: 0-30% / NNW
Last observation: 1990-08-08	Size (acres): 30

Location:

LITTLE BELT MOUNTAINS; HEADWATERS OF SOUTH FORK OF RUNNING
 WOLF CREEK, CA. 11 MILES SOUTHWEST OF STANFORD.

Element occurrence data:

CA. 28 INDIVIDUALS SCATTERED OVER A LARGE AREA.

General site description:

OLD GROWTH PSEUDOTSUGA MENZIESII FOREST. PLANTS ROOTED IN
 MOSS WITH PICEA ENGELMANNII, SENECIO TRIANGULARIS, LINNAEA
 BOREALIS, ARNICA CORDIFOLIA, SAXIFRAGA ODONTOLOMA. PLANTS
 OCCUR IN SHADED LOCATIONS.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

THIS IS AN EXCELLENT OLD-GROWTH FOREST SITE. POPULATION
 PROBABLY EXTENDS DOWN THE CREEK. VOUCHER - SCHAASBERGER,
 L.A. (415), 1990.

Information source:

SCHAASBERGER, L.A. 1990. [FIELD SURVEY OF THE LITTLE BELT
 MOUNTAINS 6-10 AUGUST (GOODYERA REPENS)].

Occurrence number: 009

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

Survey site name: BEAR GULCH
EO rank: D
EO rank comments: IN AREA SOON TO BE LOGGED.

County: JUDITH BASIN

USGS quadrangle: BANDBOX MOUNTAIN

Township-range: 014N010E Section: 35 Precision: S
Township-range comments: NE4NW4

Survey date: 1990-08-09	Elevation: 6200
First observation: 1990	Slope/aspect: 0-30% / NNE
Last observation: 1990-08-09	Size (acres): 25

Location:

LITTLE BELT MOUNTAINS; UPPER BEAR GULCH, CA. 12 MILES
SOUTHWEST OF STANFORD.

Element occurrence data:

30+ INDIVIDUALS, SCATTERED.

General site description:

IN OLD GROWTH PSEUDOTSUGA MENZIESII FOREST. PLANTS ROOTED IN
MOSS IN VERY SHADED LOCATIONS, WITH PICEA ENGELMANNII,
LINNAEA BOREALIS.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

POPULATION MAY EXTEND DOWNSTREAM. VOUCHER - SCHASSBERGER,
L.A. (414), 1990.

Information source:

SCHASSBERGER, L.A. [FIELD SURVEY OF THE LITTLE BELT
MOUNTAINS 6-10 AUGUST (GOODYERA REPENS)].

Occurrence number: 010

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

Survey site name: NORTH FORK OF RUNNING WOLF CREEK
EO rank: C
EO rank comments: NOT AN EXTENSIVE POPULATION, FUTURE
PLANS FOR LOGGING.

County: JUDITH BASIN

USGS quadrangle: BANDBOX MOUNTAIN

Township-range: 014N010E Section: 11 Precision: S
Township-range comments: NE4SE4

Survey date: 1990-08-10	Elevation: 5800
First observation: 1990	Slope/aspect: 10-30% / NNW
Last observation: 1990-08-10	Size (acres): 10

Location:

LITTLE BELT MOUNTAINS; NORTH FORK RUNNING WOLF CREEK, CA. 12
MILES SOUTHWEST OF STANFORD.

Element occurrence data:

CA. 10 PLANTS; SCATTERED.

General site description:

IN OLD-GROWTH PSEUDOTSUGA MENZIESII FOREST. ASSOCIATED
SPECIES INCLUDE PICEA ENGELMANNII, ACER GLABRUM, LINNAEA
BOREALIS.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

THIS HABITAT DID NOT APPEAR TO BE AS SUITABLE FOR GOODYERA
REPENS, POSSIBLY DUE TO HIGHER SHRUB COVER. VOUCHER -
SCHASSBERGER, L. A. (418), 1990.

Information source:

SCHASSBERGER, L.A. 1990. [FIELD SURVEY OF THE LITTLE BELT
MOUNTAINS 6-10 AUGUST (GOODYERA REPENS)].

Occurrence number: 011

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

Survey site name: SKUNK GULCH
EO rank: C
EO rank comments: NICE SITE, FUTURE LOGGING AREA.

County: JUDITH BASIN

USGS quadrangle: BANDBOX MOUNTAIN

Township-range: 014N010E Section: 33 Precision: S
Township-range comments: E2SW4

Survey date: 1990-08-07	Elevation: 6280
First observation: 1990	Slope/aspect: 3-15% / ENE
Last observation: 1990-08-07	Size (acres): 35

Location:

LITTLE BELT MOUNTAINS; SKUNK GULCH, CA. 15 MILES WSW OF
UTICA.

Element occurrence data:

55+ PLANTS, SCATTERED OVER 25 ACRES.

General site description:

IN OLD-GROWTH PSEUDOTSUGA MENZIESII FOREST. WITH PICEA
ENGELMANNII, HABENARIA VIRIDIS, GOODYERA OBLONGIFOLIA,
LINNAEA BOREALIS; PLANTS ROOTED IN MOSS IN SHADED LOCATIONS.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

POPULATION DID NOT EXTEND UP CREEK FURTHER; POSSIBLE CHANGE
IN OVERSTORY AND PARENT MATERIAL. VOUCHER - SCHASSBERGER,
L.A. (410), 1990.

Information source:

SCHASSBERGER, L.A. 1990. [FIELD SURVEY OF THE LITTLE BELT
MOUNTAINS 6-10 AUGUST (GOODYERA REPENS)].

Occurrence number: 012

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

Survey site name: WOODHURST MOUNTAIN
EO rank: C
EO rank comments: NOT AN EXTENSIVE POPULATION; AREA SLATED
FOR LOGGING.

County: JUDITH BASIN

USGS quadrangle: WOODHURST MOUNTAIN

Township-range: 014N011E Section: 10 Precision: S
Township-range comments: SE4SE4

Survey date: 1990-08-09	Elevation: 5800
First observation: 1990	Slope/aspect: 8-30% / N
Last observation: 1990-08-09	Size (acres): 2

Location:

LITTLE BELT MOUNTAINS; WOODHURST MOUNTAIN, CA. 11 MILES WEST
OF UTICA.

Element occurrence data:

CA. 14 PLANTS, SCATTERED.

General site description:

IN OLD-GROWTH PSEUDOTSUGA MENZIESII FOREST. ASSOCIATED
SPECIES INCLUDE PICEA ENGELMANNII, LINNAEA BOREALIS.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

VOUCHER - SCHASSBERGER, L.A., (417), 1990.

Information source:

SCHASSBERGER, L.A. 1990. [FIELD SURVEY OF THE LITTLE BELT
MOUNTAINS 6-10 AUGUST (GOODYERA REPENS)].

Occurrence number: 013

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

Survey site name: KELLY COULEE
EO rank: A
EO rank comments: NO TIMBER ACTIVITY; CATTLE TRAILING--NO
DAMAGE TO ORCHID.

County: JUDITH BASIN

USGS quadrangle: ETTIEN SPRING
INDIAN HILL

Township-range: 013N010E Section: 26 Precision: S
Township-range comments: N2N2, 22SE4SE4; 25NE4NW4; S4S2S2;
T13NR11E: 19S2

Survey date: 1990-09-13	Elevation: 6000
First observation: 1990	Slope/aspect: 3-35% / N
Last observation: 1990-09-13	Size (acres): 0

Location:

LITTLE BELT MOUNTAINS, NORTH OF WOODCHOPPER RIDGE, ALONG 4
MILES OF KELLY COULEE.

Element occurrence data:

CONTINUOUS POPULATION OF CA. +10,000 INDIVIDUALS FOR 4
MILES.

General site description:

VALLEY BOTTOM AND NORTH SLOPE OF KELLY COULEE; DRY LIMESTONE
DRAINAGE. PICEA/LINNAEA BOREALIS HABITAT TYPE, WITH
PSEUDOTSUGA MENZIESII, ACER GLABRUM, PYROLA SECUNDA,
PHYSOCARPUS MALVACEUS, AND CLEMATIS COLUMBIANA.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

VOUCHER - FIELD, D. (091390-3). 1990.

Information source:

FIELD, DANA. LEWIS AND CLARK NATIONAL FOREST, 1101 15TH ST.
NORTH, BOX 871, GREAT FALLS, MT 59403.

Occurrence number: 014

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

Survey site name: SOUTH FORK JUDITH
EO rank: AB
EO rank comments:

County: JUDITH BASIN

USGS quadrangle: INDIAN HILL

Township-range: 012N011E Section: 23 Precision: S
Township-range comments: CENTER

Survey date: 1990-09-11	Elevation: 5280
First observation: 1990	Slope/aspect: 0-3% / NW
Last observation: 1990-09-11	Size (acres): 0

Location:

LITTLE BELT MOUNTAINS, CA. 2.5 MILES SOUTH OF INDIAN HILL
CAMPGROUND, ALONG FS ROAD #487.

Element occurrence data:

SPARSE POPULATION, POSSIBLY YOUNG; A FEW PLANTS FOUND AS
SINGLE INDIVIDUALS WELL APART FROM ESTABLISHED CLONES.

General site description:

PICEA/LINNAEA BOREALIS HABITAT TYPE, LIMESTONE SUBSTRATE; ON
FORESTED BENCH ABOVE STREAM AND IN OLD CHANNEL BY TOESLOPE
(STAND IS CA. 100 YRS. OLD), WITH PSEUDOTSUGA MENZIESII,
CORNUS STOLONIFERA, JUNIPERUS COMMUNIS, PYROLA SECUNDA, AND
PELTIGERA APHTHOSA (LICHEN).

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

VOUCHER - FIELD, D. (091290-2), 1990.

Information source:

FIELD, DANA. LEWIS AND CLARK NATIONAL FOREST, 1101 15TH ST.
NORTH, BOX 871, GREAT FALLS, MT 59403.

Occurrence number: 015

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

Survey site name: HAY CANYON I
EO rank: A
EO rank comments: POTENTIAL FOR TIMBER HARVEST, GRAZING
NEARBY, CURRENTLY MANAGED FOR
RECREATION.

County: JUDITH BASIN

USGS quadrangle: INDIAN HILL

Township-range: 012N011E Section: 14 Precision: S
Township-range comments: NE4SW4

Survey date: 1990-09-12	Elevation: 5200
First observation: 1990	Slope/aspect: 3-15% / NE
Last observation: 1990-09-12	Size (acres): 2

Location:

LITTLE BELT MOUNTAINS. FROM INDIAN HILL CAMPGROUND, GO SOUTH ON FS ROAD #487 CA. 1.5 MILES TO FS ROAD #6390 (HAY CANYON); THEN WEST CA. 0.25 MILE.

Element occurrence data:

POPULATION SPARSE BUT WIDESPREAD.

General site description:

LIMESTONE SUBSTRATE, IN BOTTOM OF CANYON AND ALONG TOE OF NORTH SLOPE. IN MOSS UP TO 6" DEEP, WITH PICEA, LINNAEA BOREALIS, GALIUM TRIFLORUM, DISPORUM TRACHYCARPUM, PYROLA SECUNDA, ARNICA CORDIFOLIA, OSMORHIZA CHILENSIS, HERACLEUM LANATUM, THALICTRUM OCCIDENTALE, ACTAEA RUBRA.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

SELECTIVE CUT CA. 1970; VERY LIGHT. VOUCHER - FIELD, D. (091290-3), 1990.

Information source:

FIELD, DANA. LEWIS AND CLARK NATIONAL FOREST, 1101 15TH ST. NORTH, BOX 871, GREAT FALLS, MT 59403.

Occurrence number: 016

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

Survey site name: HAY CANYON II
EO rank: A
EO rank comments: POTENTIAL FOR TIMBER HARVEST, GRAZING
NEARBY, CURRENTLY MANAGED FOR
RECREATION.

County: JUDITH BASIN

USGS quadrangle: INDIAN HILL

Township-range: 012N011E Section: 22 Precision: S
Township-range comments: NW4

Survey date:	1990-09-12	Elevation:	5480
First observation:	1990	Slope/aspect:	3-15% / NE
Last observation:	1990-09-12	Size (acres):	0

Location:

LITTLE BELT MOUNTAINS, HAY CANYON. FROM INDIAN HILL
CAMPGROUND GO SOUTH ON FS ROAD #487 CA. 1.5 MILES TO FS ROAD
#6390 (HAY CANYON), THEN WEST CA. 1.5 MILES.

Element occurrence data:

POPULATION SPARSE BUT WIDESPREAD.

General site description:

LIMESTONE SUBSTRATE, IN BOTTOM OF CANYON AND ALONG TOE OF
NORTH SLOPE. IN MOSS UP TO 6" DEEP, WITH PICEA, LINNAEA
BOREALIS, GALIUM TRIFLORUM, DISPORUM TRACHYCARPUM, PYROLA
SECUNDA, ARNICA CORDIFOLIA, OSMORHIZA CHILENSIS, HERACLEUM
LANATUM, THALICTRUM OCCIDENTALE, ACTAEA RUBRA.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, JUDITH RANGER DISTRICT

Comments:

VOUCHER - FIELD, D. (091290-3), 1990.

Information source:

FIELD, DANA. LEWIS AND CLARK NATIONAL FOREST, 1101 15TH ST.
NORTH, BOX 871, GREAT FALLS, MT 59403.

Occurrence number: 017

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

Survey site name: DRY GULCH
EO rank: A
EO rank comments: PROBABLY AT DRY END OF RANGE FOR THIS
SPECIES.

County: WHEATLAND

USGS quadrangle: JELLISON PLACE

Township-range: 011N013E Section: 23 Precision: S
Township-range comments: SW4NE4, SE4SE4; 25NW4

Survey date:	1990-09-20	Elevation:	5900
First observation:	1990	Slope/aspect:	
Last observation:	1990-09-20	Size (acres):	2

Location:

DRY GULCH; CA. 2 AIR MILES NORTHEAST OF JELLISON PLACE.

Element occurrence data:

101-1000 GENETS; FEW IN FLOWER.

General site description:

IRREGULAR IN DEEP MOSS ALONG EAST TOESLOPE AND VALLEY BOTTOM
WITH MATURE DOUGLAS FIR-SPRUCE FOREST; PROBABLE COLD AIR
DRAINAGE BETWEEN LIMESTONE CLIFFS. VALLEY BOTTOM 20-150 FEET
WIDE.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, MUSSELSHELL RANGER DISTRICT

Comments:

VOUCHER - FIELD, D. (091790-1), 1990. HABITAT NOT THOROUGHLY
SEARCHED.

Information source:

FIELD, DANA. LEWIS AND CLARK NATIONAL FOREST, 1101 15TH
STREET NORTH, BOX 871, GREAT FALLS, MT 59403.

Occurrence number: 018

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

Survey site name: WEST FORK HOPLEY CREEK
EO rank: B
EO rank comments:

County: WHEATLAND

USGS quadrangle: JELLISON PLACE

Township-range: 011N013E Section: 32 Precision: S
Township-range comments: SW4,29SW4;T10NR13E:S5NW4

Survey date:	1990-09-18	Elevation:	6000
First observation:	1990	Slope/aspect:	0-15% / ESE
Last observation:	1990-09-18	Size (acres):	2

Location:

CA. 2.25 MILES WEST OF JELLISON PLACE. OCCURRENCE CONTINUES
FOR CA. 2 MILES ALONG WEST FORK HOPLEY CREEK.

Element occurrence data:

100-1000 GENETS; SPORADIC.

General site description:

VALLEY BOTTOM AND EAST TOESLOPE, PICEA/LINNAEA BOREALIS
HABITAT TYPE, LIMESTONE SUBSTRATE. IN DEEP MOSS, WITH PICEA,
PSEUDOTSUGA MENZIESII, RIBES SETOSUM, LINNAEA BOREALIS,
PYROLA SECUNDA, ACTAEA RUBRA, SYMPHORICARPOS ALBUS, DISPORUM
TRACHYCARPUM.

Land owner/manager:

LEWIS & CLARK NATIONAL FOREST, MUSSELSHELL RANGER DISTRICT

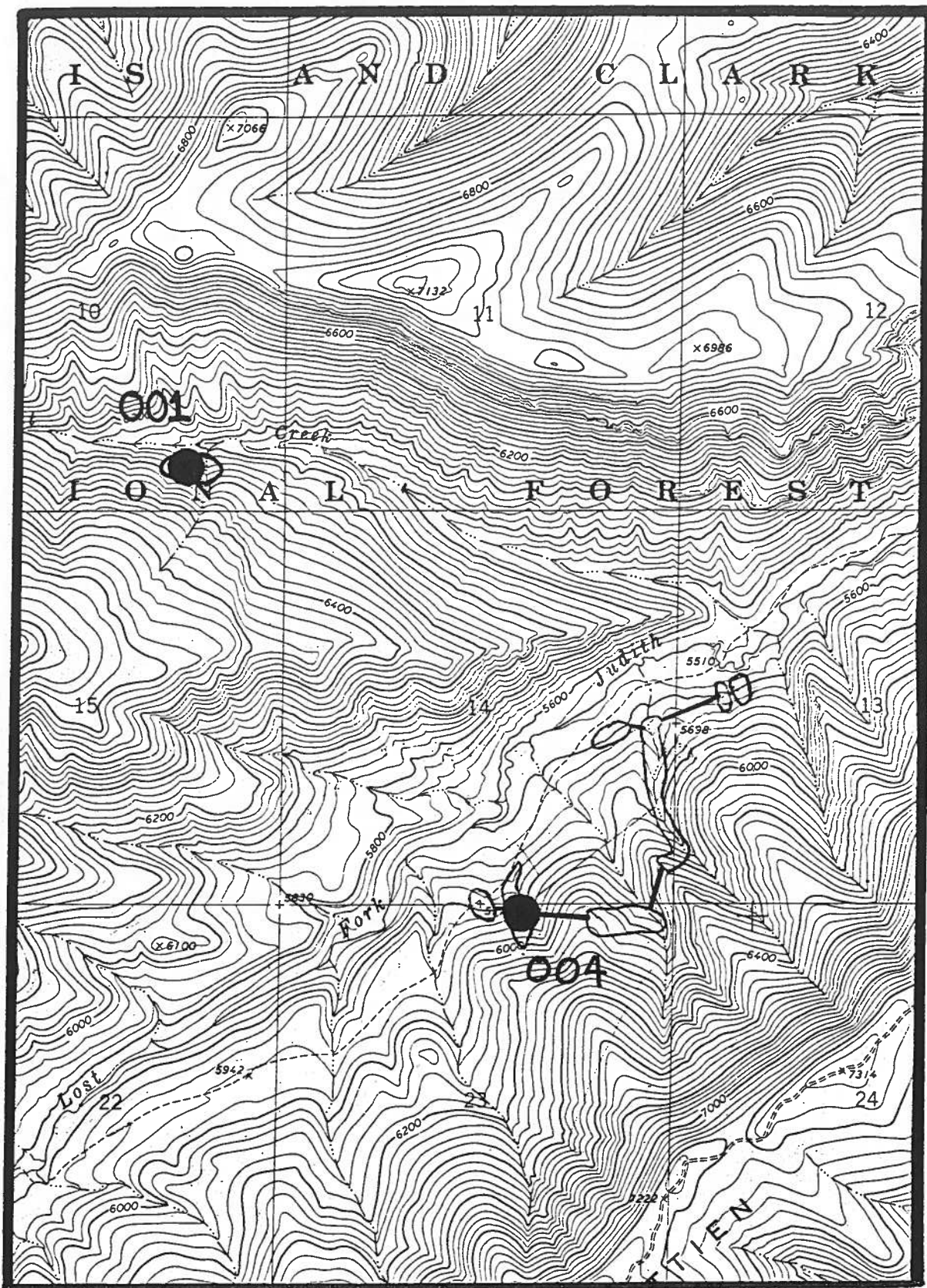
Comments:

VOUCHER - FIELD, D. (091890-2), 1990. AREA NEEDS MORE
THOROUGH SURVEY.

Information source:

FIELD, DANA. LEWIS & CLARK NATIONAL FOREST, BOX 871, GREAT
FALLS, MT 59403.

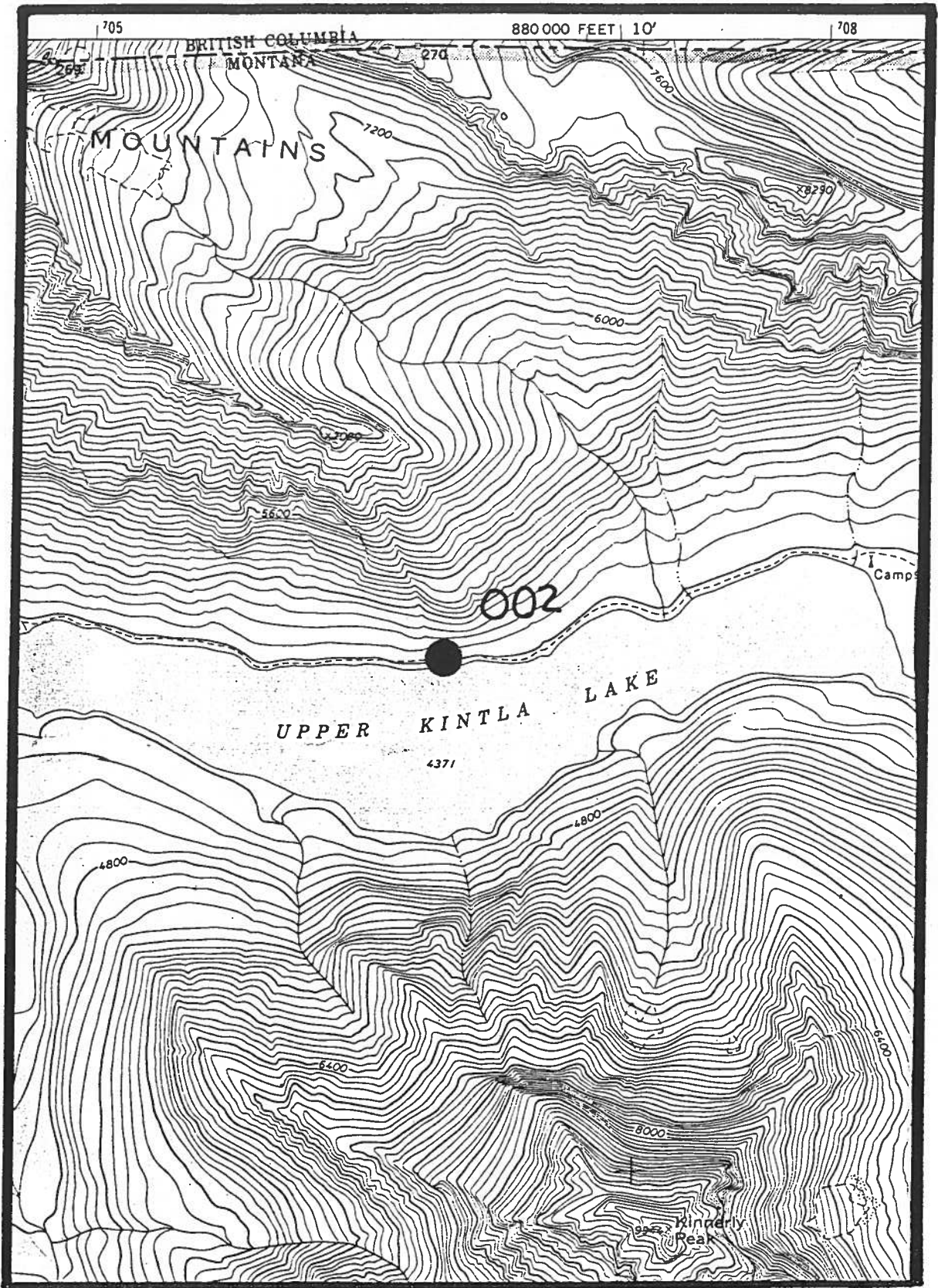
MONTANA



Goodyera repens

Sandpoint Creek (001)
Lost Fork Judith River (004)

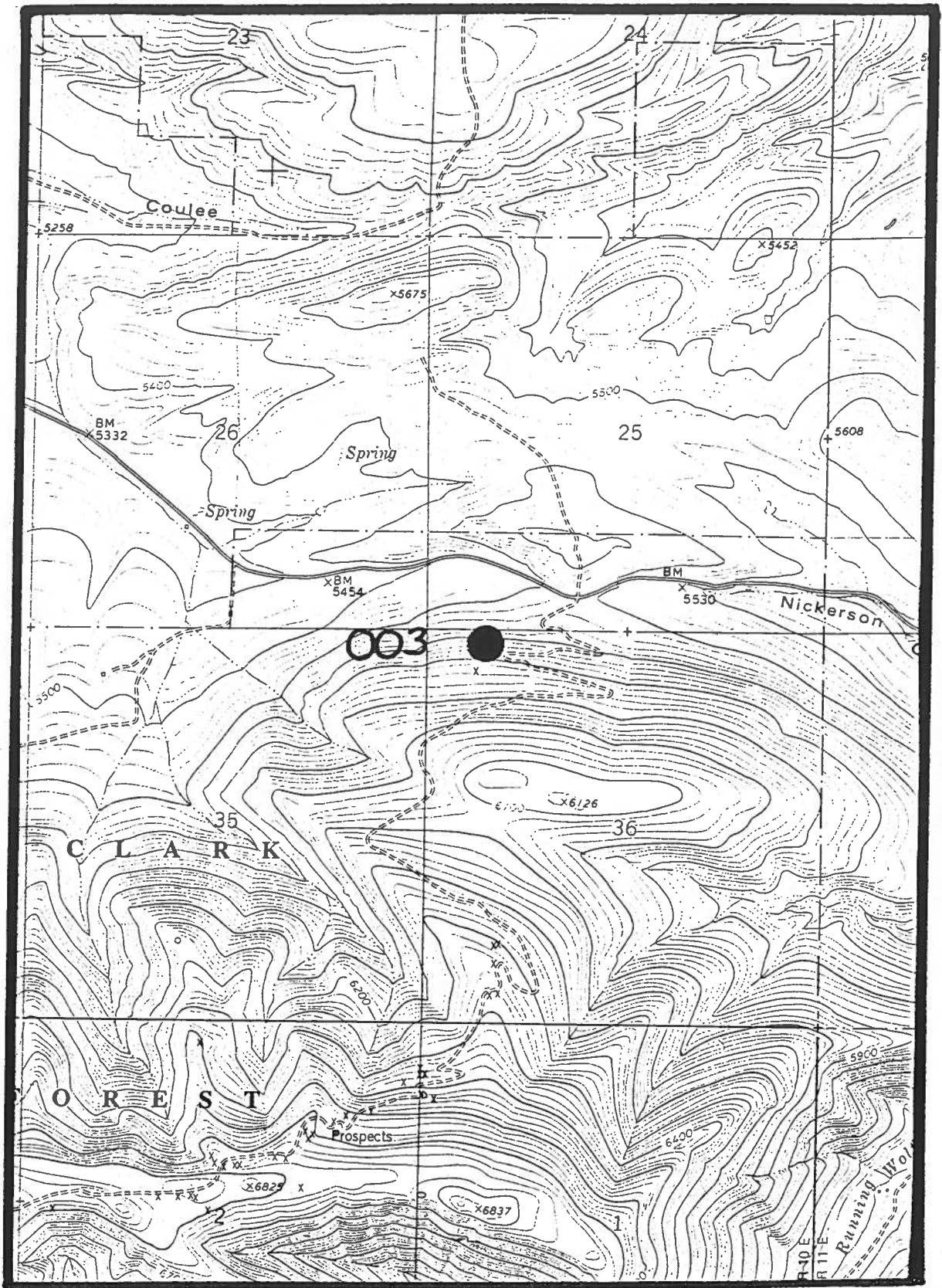
USGS Etti Spring Quadrangle (7.5')



Goodyera repens

Upper Kintla Lake (002)

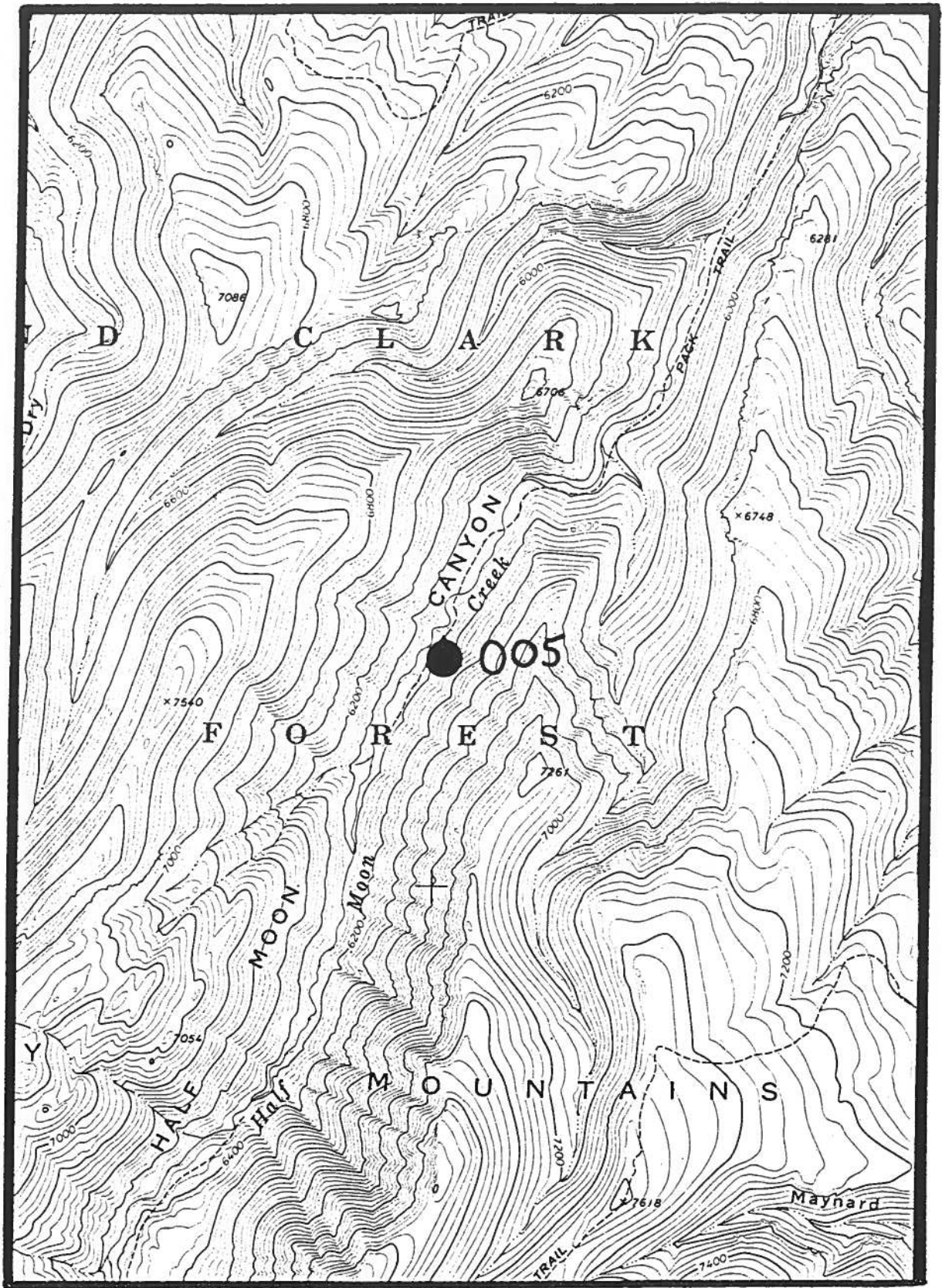
USGS Kintla Peak Quadrangle (7.5')



Goodyera repens

Nickerson Coulee (003)

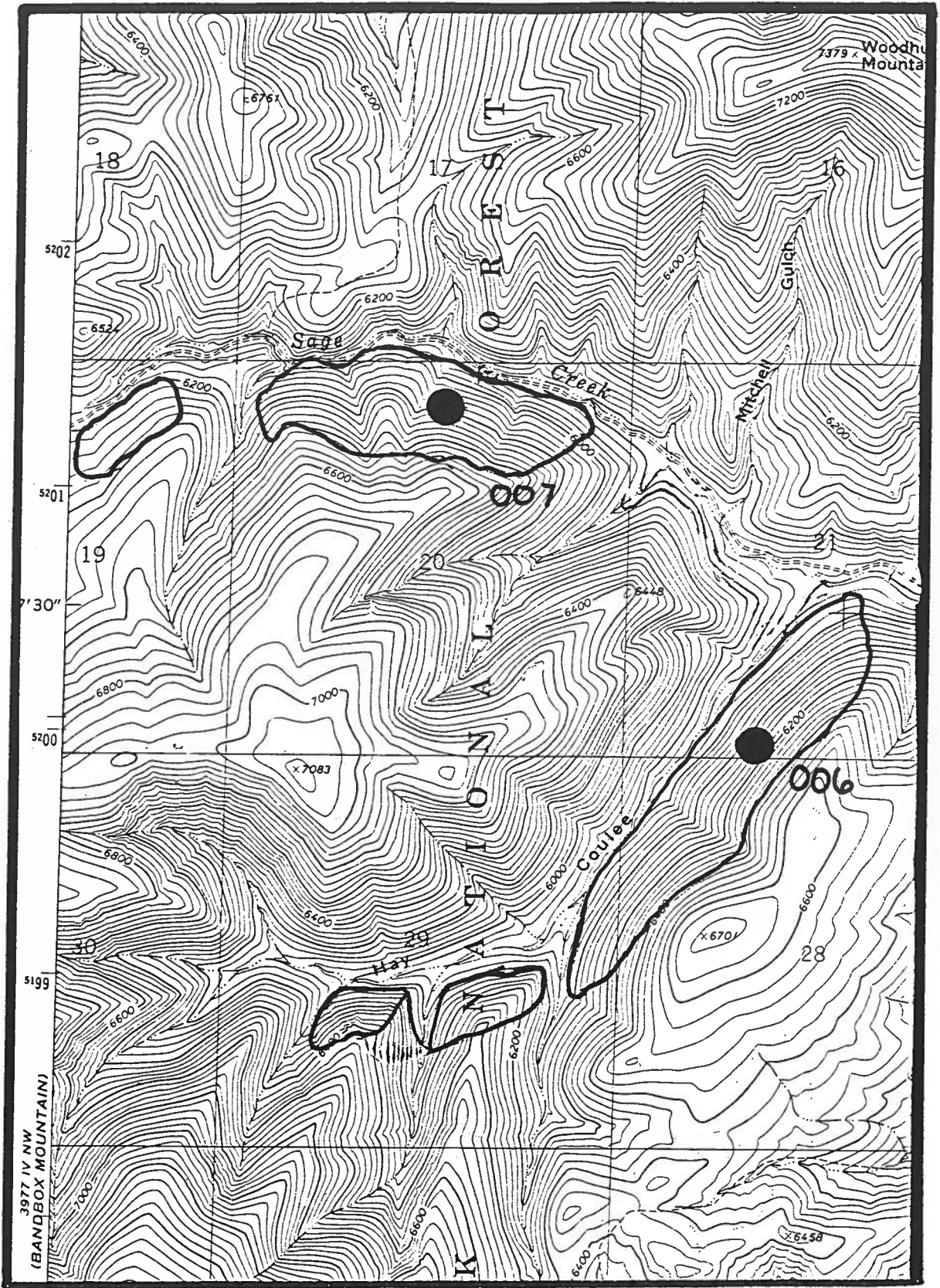
USGS Wolf Butte Quadrangle (7.5')



Goodyera repens

Half Moon Creek (005)

USGS Half Moon Canyon Quadrangle (7.5')

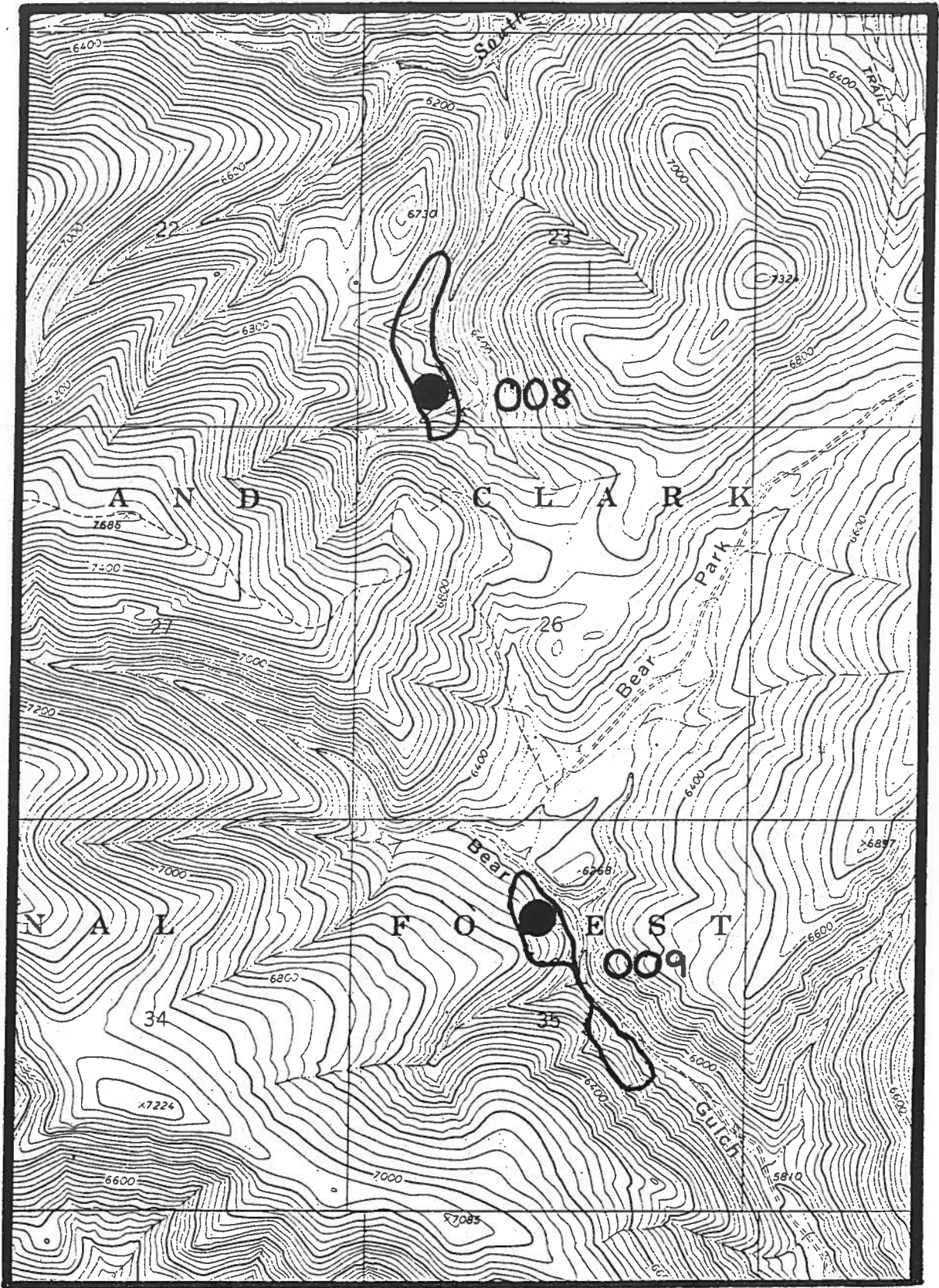


Goodyera repens

Hay Coulee (006)
Sage Creek (007)

USGS Woodhurst Mountain Quadrangle (7.5')

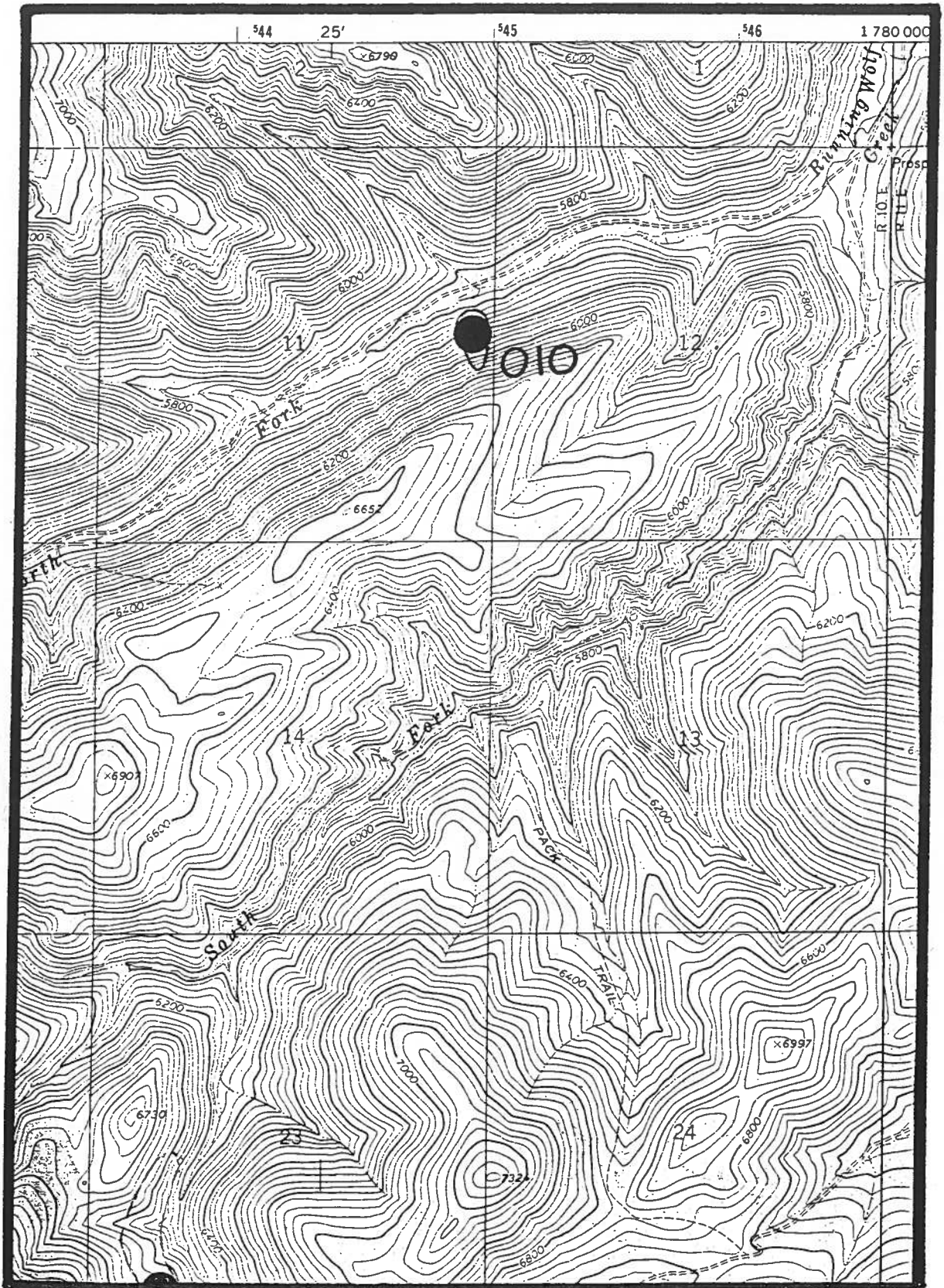
MONTANA



Goodyera repens

South Fork of Running Wolf Creek (008)
Bear Gulch (009)

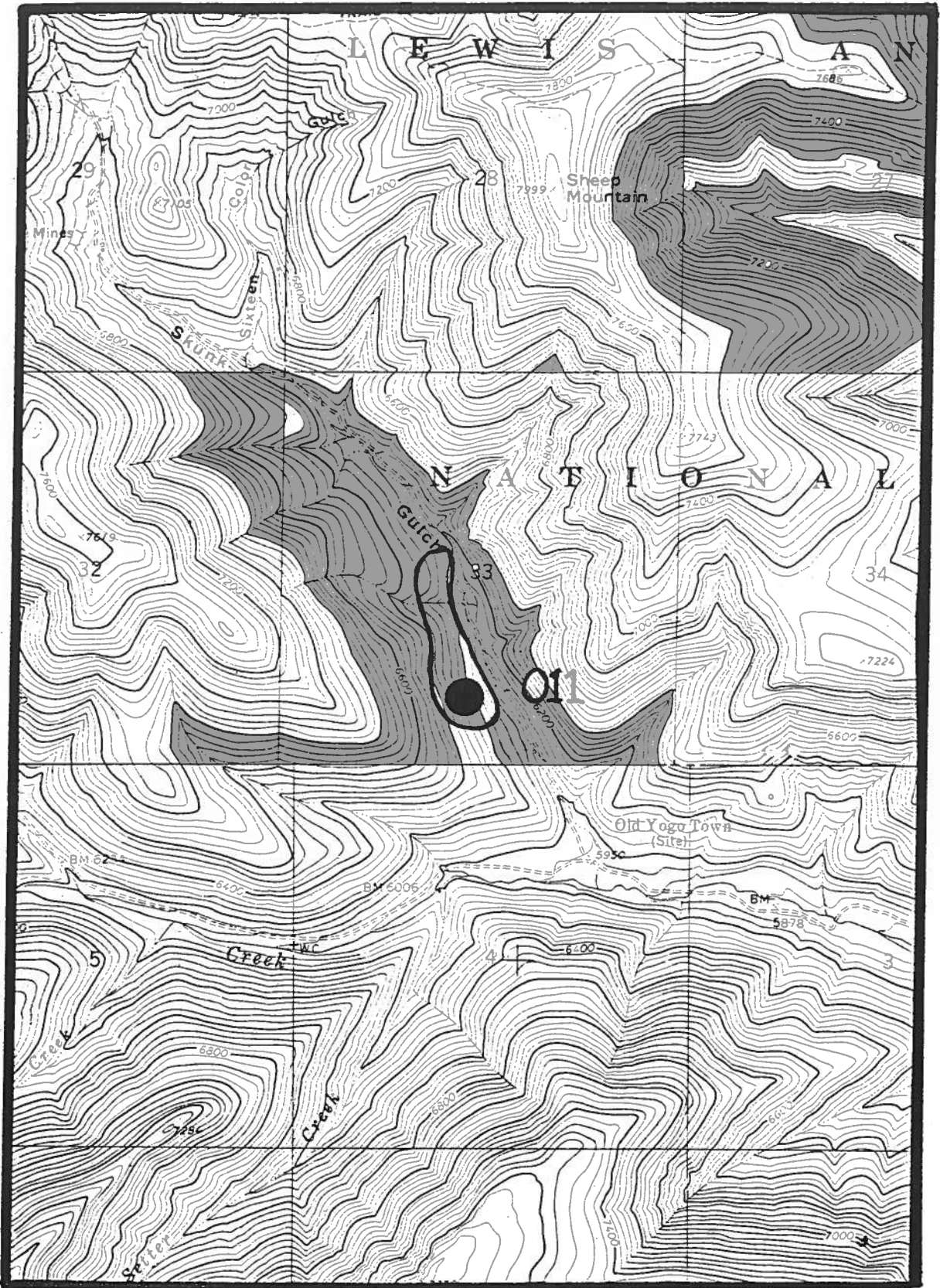
USGS Bandbox Mountain Quadrangle (7.5')



Goodyera repens

North Fork of Running Wolf Creek (008)

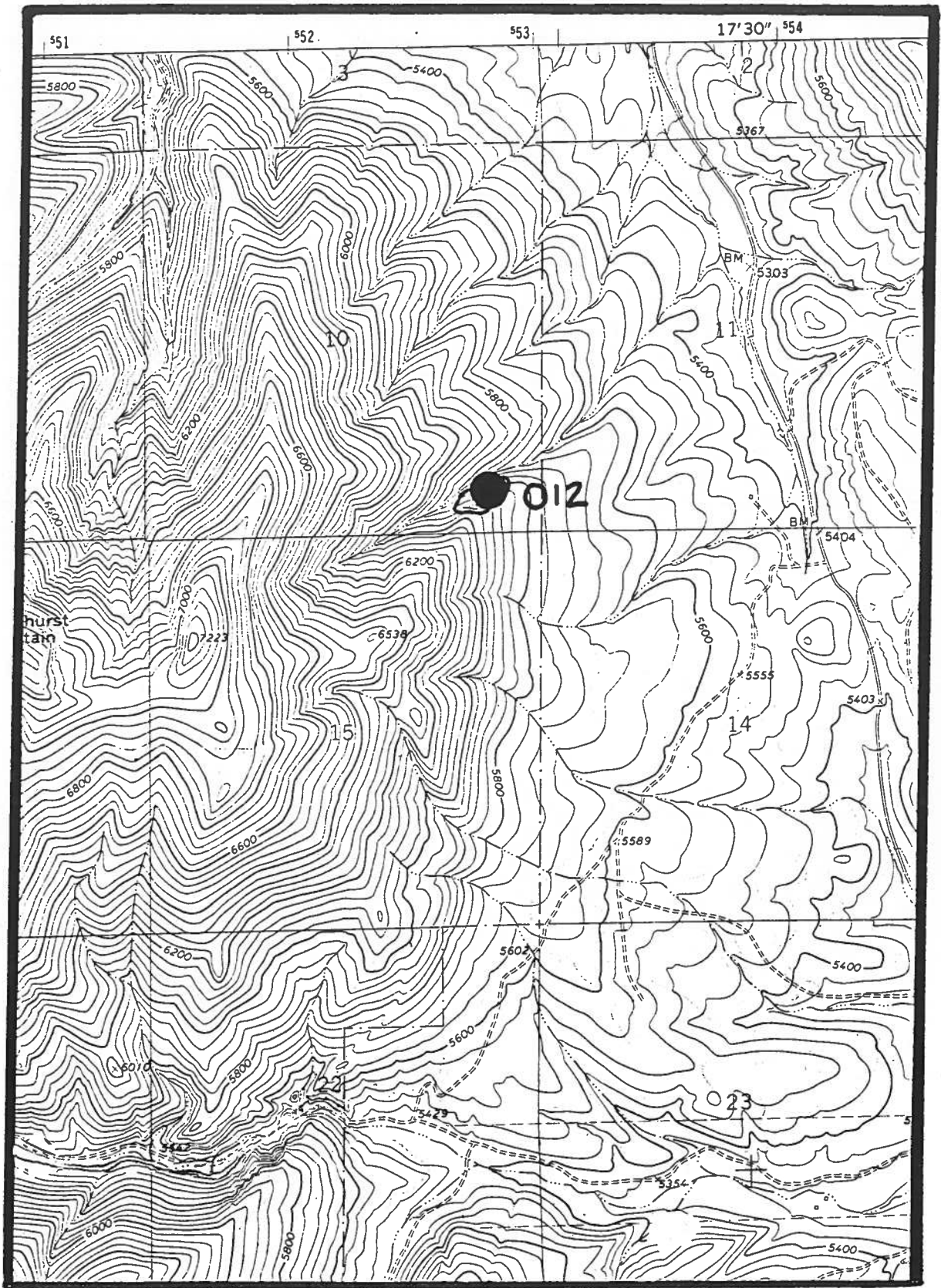
USGS Bandbox Mountain Quadrangle (7.5')



Goodyera repens

Skunk Gulch (011)

USGS Bandbox Mountain Quadrangle (7.5')

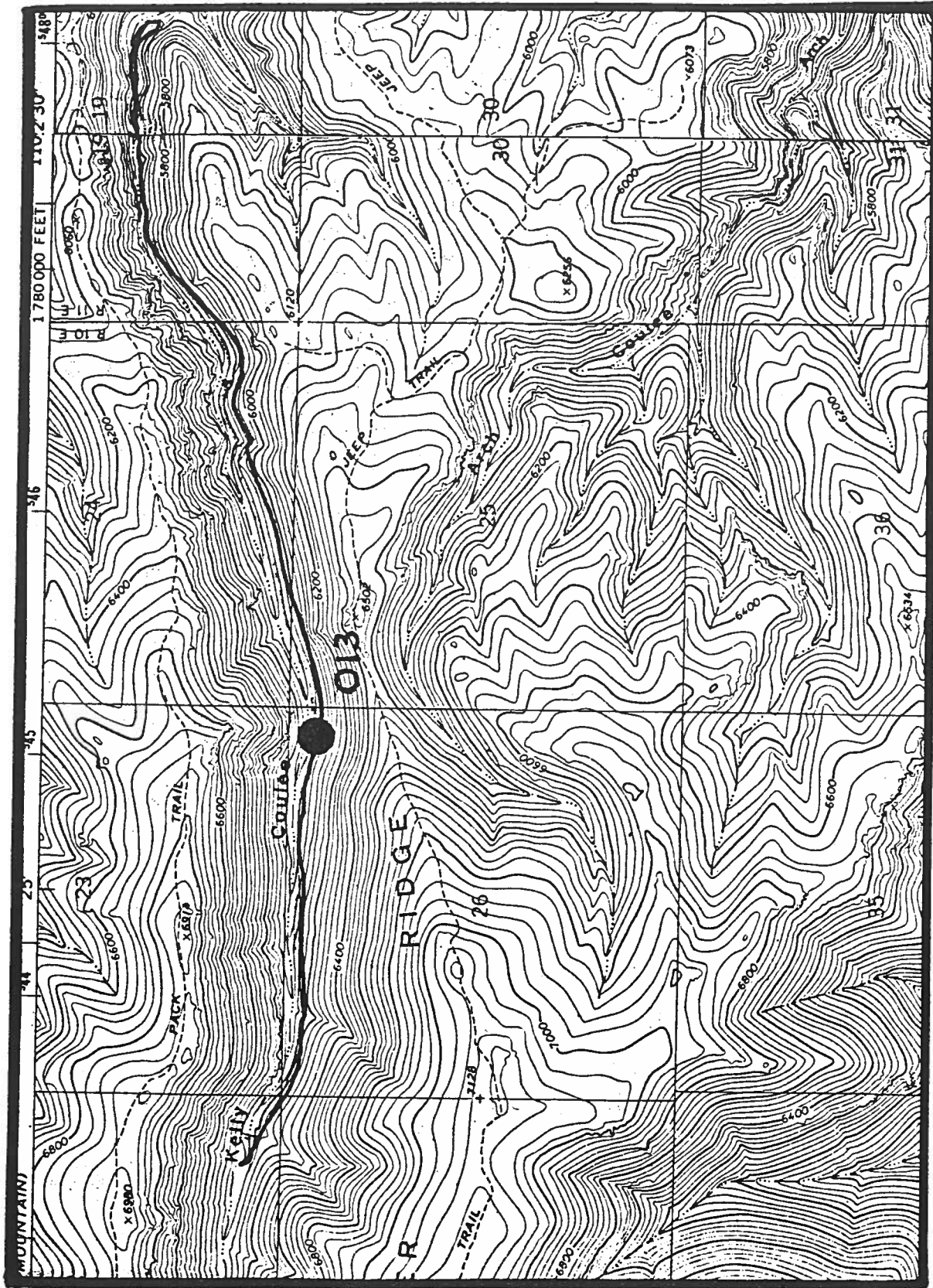


Goodyera repens

Woodhurst Mountain (012)

USGS Woodhurst Mountain Quadrangle (7.5')

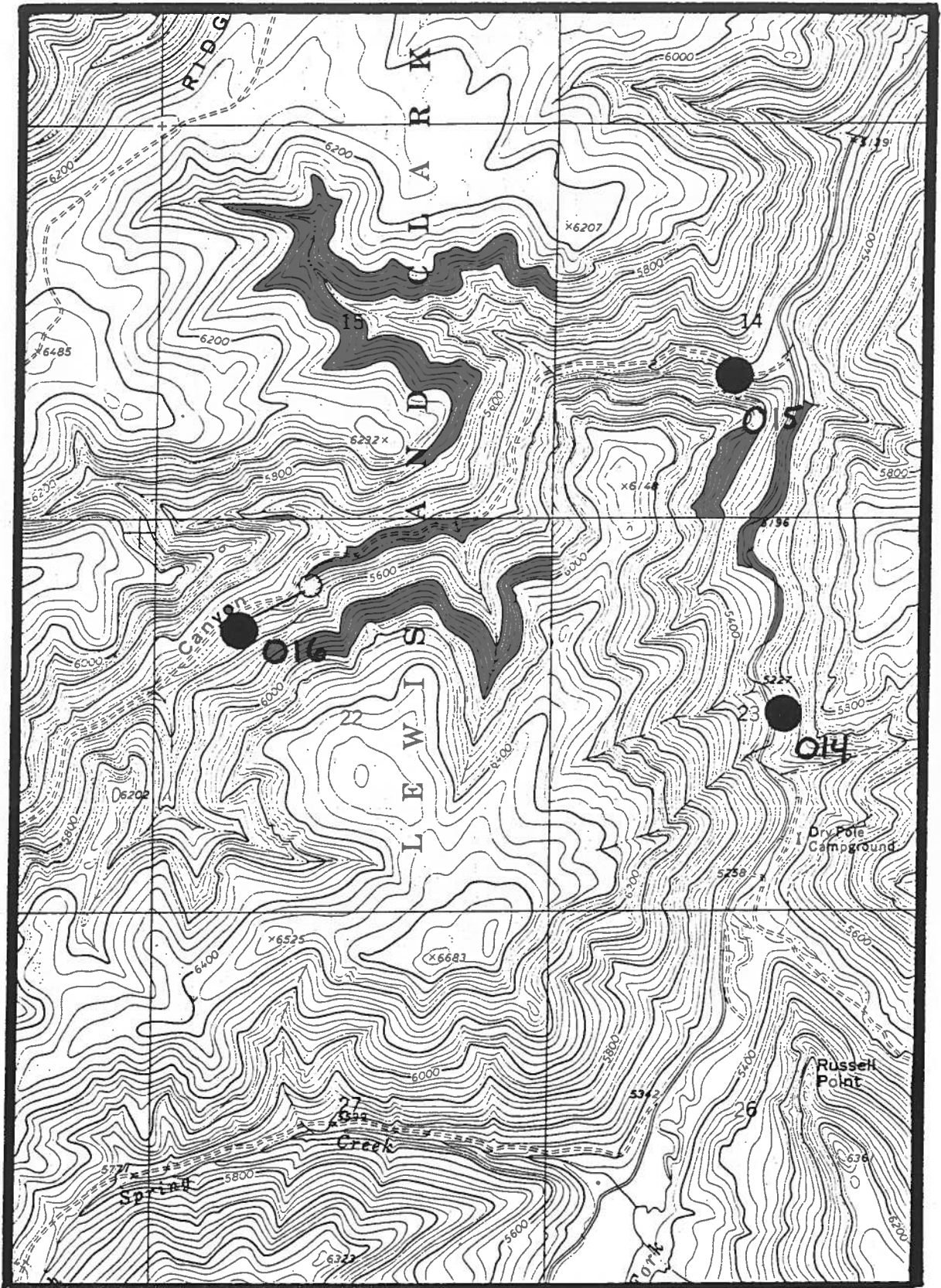
MONTANA



Goodyera repens

Kelly Coulee (013)

USGS Ettien Spring (left) and Indian Hill (right) Quadrangles

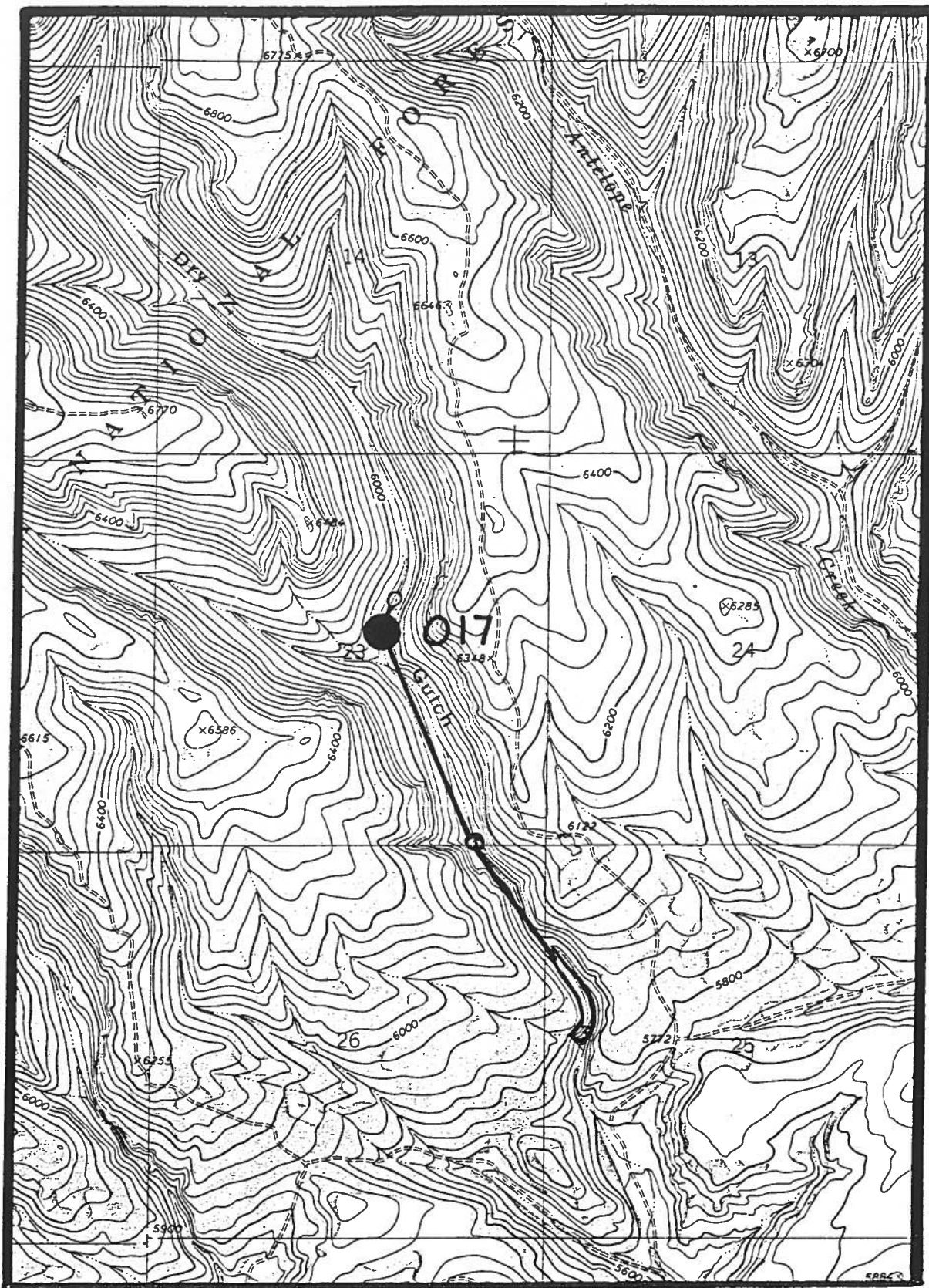


Goodyera repens

South Fork Judith (014)
Hay Canyon I (015)
Hay Canyon II (016)

USGS Indian Hill Quadrangle (7.5')

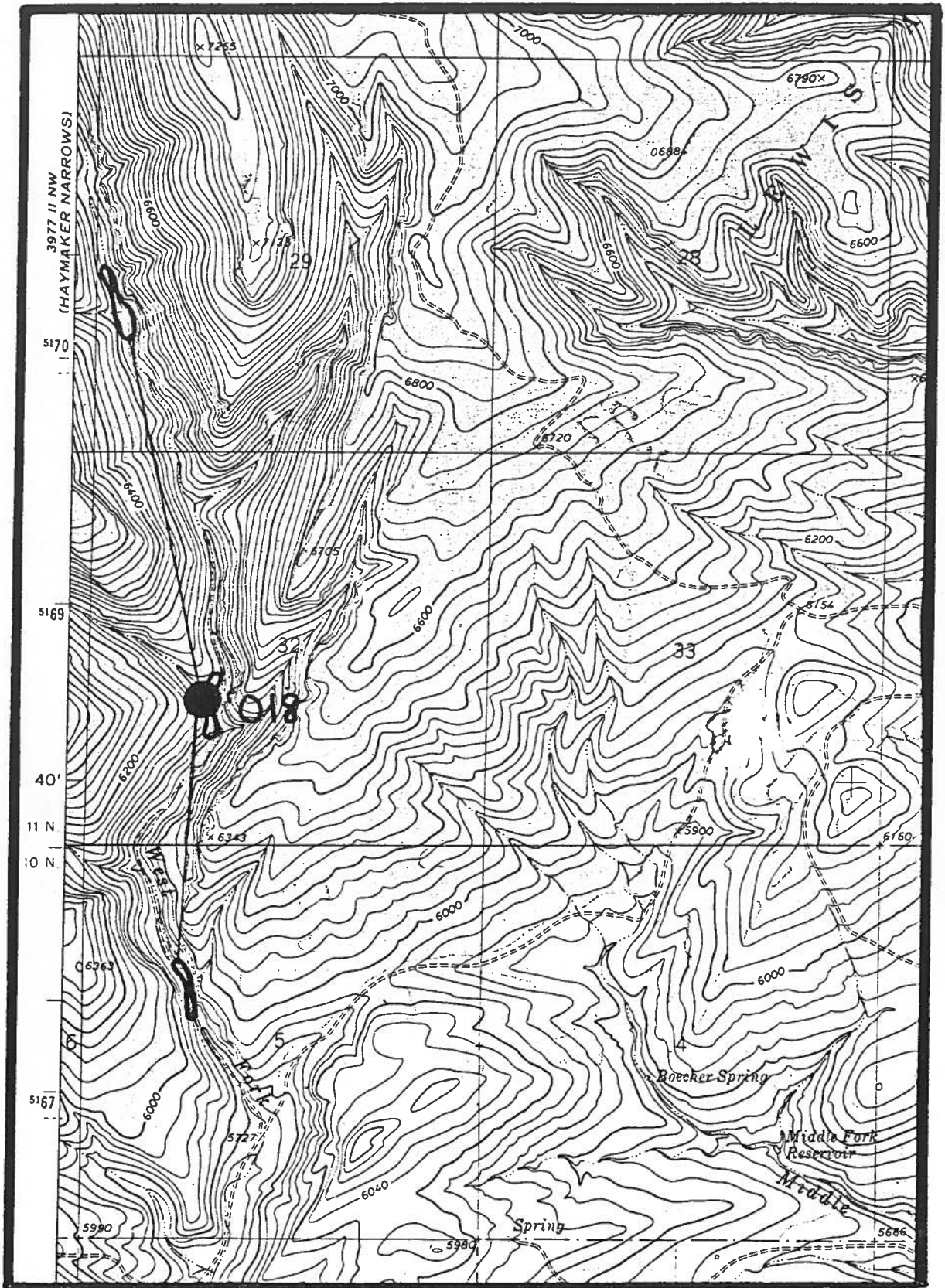
MONTANA



Goodyera repens

Dry Gulch (017)

USGS Jellison Place Quadrangle (7.5')



Goodyera repens

West Fork Hopley Creek (018)

USGS Jellison Place Quadrangle (7.5')

V. PHOTOGRAPHS

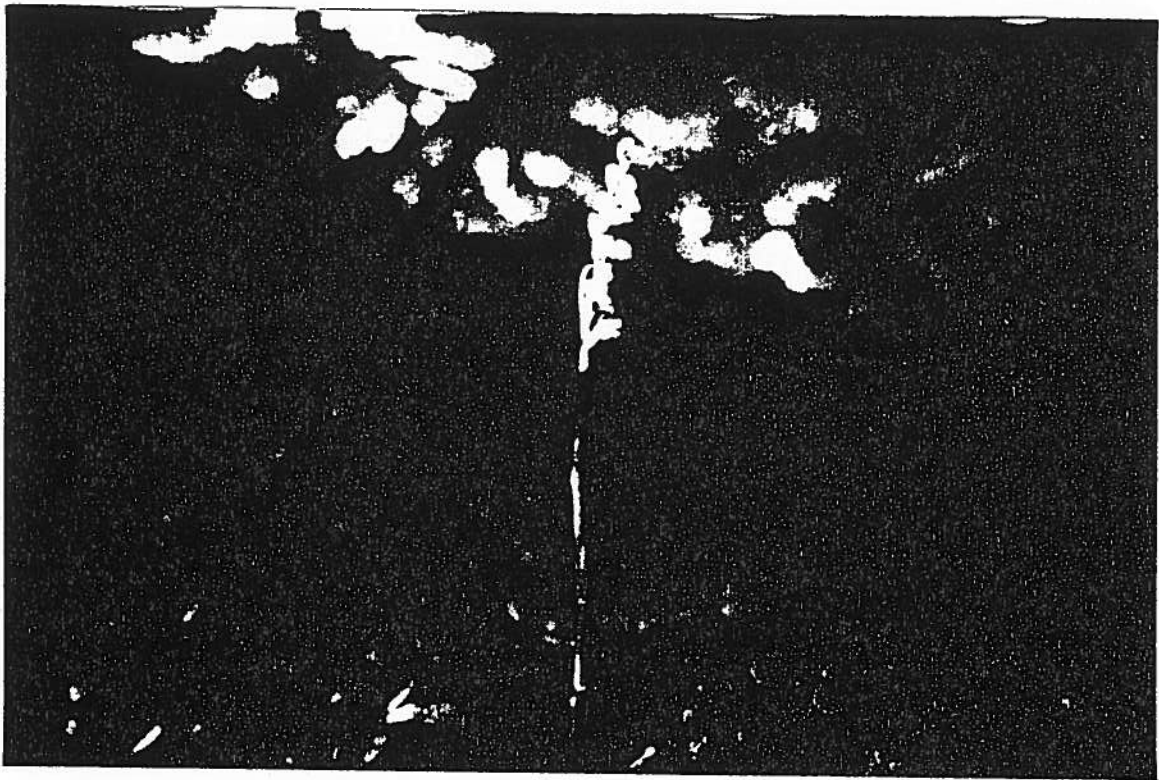


Figure 1. Goodyera repens - habit.



Figure 2. Goodyera repens - habitat, note extensive cover of feathermoss (Woodhurst Mountain (012)).



Figure 3. Goodyera repens - habitat (South Fork of Running Wolf Creek (008)).



Figure 4. Goodyera repens - habitat (Sage Creek (007)).

