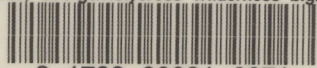


NR6.2/B48/1993

c.2

COLORADO STATE PUBLICATIONS LIBRARY  
NR6.2/B48/1993 c.2 local  
Hess, George/Holycross Wilderness bighor



3 1799 00021 6671

# HOLYCROSS WILDERNESS BIGHORN SHEEP REINTRODUCTION STUDY

George Hess  
Dave Terrall

RECEIVED

JAN 26 1996

STATE PUBLICATIONS  
Colorado State Library



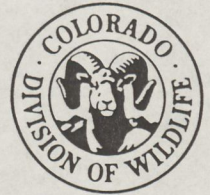


STATE OF COLORADO  
Roy Romer, Governor  
DEPARTMENT OF NATURAL RESOURCES  
**DIVISION OF WILDLIFE**

AN EQUAL OPPORTUNITY EMPLOYER

Perry D. Olson, Director  
6060 Broadway  
Denver, Colorado 80216  
Telephone: (303) 297-1192

REFER TO



*For Wildlife—  
For People*

Colorado Division of Wildlife  
50633 Hwy. 6 & 24  
Glenwood Springs, CO 81601

December 23, 1993

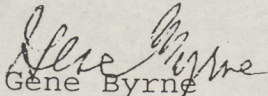
Dear Holy Cross Bighorn Sheep Reintroduction Study Participant:

Attached is the final report for the *Holy Cross Bighorn Sheep Reintroduction Study* by CSU wildlife interns George Hess and Dave Terrall. This project was funded by a 1993 grant from the Colorado Bighorn Sheep Auction and Raffle Fund - project 4NW401ST.

Based upon the favorable forage quantity results from this study, the DOW is proceeding with a proposal to complete two full transplants of Bighorn Sheep, approximately 36-44 sheep total, into the southern portions of the Holy Cross Wilderness Area. If successful, this action will result in the establishment of a viable herd of 60+ sheep that will use alpine windswept ridges for winter range. This proposal will dependant upon Forest Service approval to complete the reintroduction and to allow the use of a helicopter in the wilderness area.

I wish to thank George Hess and Dave Terrall for the inordinate effort they put into this project for very little compensation. Their efforts are very much appreciated.

Sincerely,

  
Gene Byrne  
Wildlife Biologist

xc: White River National Forest (4 copies), Ellenberger, Konishi, Andree, Heicher, Vayhinger, Martin, Bighorn Sheep Auction and Raffle Fund (Lytle), Gill, Hess, Terrall, DOW Fort Collins library (2 copies), DOW Denver Library (2 copies), file



## **BACKGROUND:**

The natural occurrence of Rocky Mountain bighorn sheep ( *Ovis canadensis canadensis* ) in the Holy Cross Wilderness area most likely dates back to early archaic indians. Documented accounts of bighorn sheep inhabiting the study area date back to the 1880's. More recently, two bighorn sheep herds existed within the area. One herd wintered in the Brush Creek area and summered in the Fools/Eagle peaks and New York Mountains. The other herd occupied summer ranges in the headwaters of Cross Creek, but their winter range was unknown. There is no indication that either herd was ever very abundant. It appears that the total bighorn population in the study area underwent a decline in the 1960's and, for all practical purposes, was extinct in the 1970's. One possible explanation for the bighorn's demise is disease. Bighorn sheep were introduced on Brush Creek from the Tarryall herd that was subsequently determined to be infested with lungworms and associated pulmonary diseases ( Hoover 1992).

Another possible explanation for the demise of the bighorn sheep could be winter range. Even if a site is satisfactory in all other respects, when winter ranges are inadequate or lacking bighorn sheep populations have failed to survive (Smith et al 1991). The limiting factor on bighorn sheep habitat in the study area is winter range.

Bighorn sheep winter ranges are characterized by lack of persistent snow and by warm - south- and west facing slopes at low elevations and/or exposed ridges that are above tree line and consistently cleared of snow by wind ( Geist



1971, Shannon et al 1975 ).

During the winter of 1992 the Colorado Division of Wildlife made aerial surveys to identify ridges and mountain tops, above tree line, that were significantly cleared of snow by wind. Seven areas were identified. It is hypothesized that one or more of these areas could possibly support the re-establishment of a non-migratory bighorn sheep herd in the Holy Cross Wilderness, using sheep from similar areas elsewhere in Colorado.

This study had multiple objectives: 1) The primary objective was to sample vegetation on the windswept areas identified and determine if sufficient winter vegetation exist to sustain a re-introduced bighorn sheep herd of approximately 60 animals. 2) To visually inspect the seven areas identified from the air and other drainages, for any remnant populations of bighorn sheep.3) Collect backcountry use data for the USFS.4) Collect data on any animal species seen in the Holycross Wilderness. 5) Collect data on quality of fishing and species caught at high country lakes within the Holycross Wilderness.

We would like to thank Gene Byrne, Colorado Division of Wildlife Biologist, for his dedication to this project. Thanks also to Bill Andree and Bill Heicher, both Division Wildlife Managers and Tom Johnston, USFS Wildlife Biologist. Thanks to Wayne Nelson and Mike Daignault at the USFS for training us in the Cover Frequency sampling method. Special thanks to Nancy Redner, USFS Botanist, for her expertise at identifying our alpine plant samples.

**STUDY AREA:**



The study area is situated south and east of the town of Eagle and southwest of Vail, Colorado. It is bounded by the Eagle-Thomasville Road on the west, Interstate Highway 70 on the north, U.S. Highway 6 on the east and the Fryingpan River on the south ( Hoover 1992).

The study area contains many high, rugged mountains and treeless areas in the Alpine zone. Mount of the Holy Cross, elevation 14,005 feet above mean sea level, is the highest peak in the area. There are seven other peaks over 13,000 feet and numerous others above 12,000 feet ( Hoover 1992).

Vegetation varies from the alpine tundra downward through engelmann spruce and subalpine fir, lodgepole pine, and pinyon juniper to the lowland shrubs comprised of Gambel oak, serviceberry, chokecherry and snowberry ( Hoover 1992)

#### **METHODS:**

Visual inventories of several drainages took place in the first two weeks of the study. Each drainage was observed for any remnant populations of bighorn sheep. Observations were conducted with 10X50 binoculars and 20-60 power spotting scopes. Observations periods lasted between 2 and 6 hours at each drainage. Observations took place in the evening and early morning, to coincide with bighorn sheep movement periods. Two observers were used to maximize the area viewed.

The remainder of the study consisted of sampling vegetation on those windswept ridges identified in 1992-1993 aerial flights. Topographical maps of the



areas sampled are supplied in figures 1-5. The Cover Frequency transect method was utilized for vegetation sampling. This method requires the placement of 20 X 50 centimeter plot frames at 5 foot intervals along a 100 -foot tape transect. The standard for the Rocky Mountain region is to place the plot frames at 5 foot intervals beginning at the 0-foot mark on the tape. Each transect was photographed twice (See Appendix 3 for photos). Transect locations were biased towards areas on top of ridges or mountains that had the greatest probability of being windswept and vegetation presently existed. These areas were determined visually or by pictures taken of windswept areas during winter 1992-1993 aerial flights.

Estimates of plant cover frequency by species were recorded using six standard cover classes ( Table 1).

TABLE 1	CANOPY COVER CLASS
COVER CLASS	RANGE
1	0-5%
2	6-25%
3	26-50%
4	51-75%
5	76-95%
6	96-100%



An estimate of ground cover frequency was also made for categories such as rock, gravel, litter, moss and bareground ( See Cover Frequency Data in Appendix 1).

The "total gross weight" (measured in grams) for each plant species was determined by manually clipping and weighing production in each plot using a standard gram scale and adding these values for the 20 plots ( See Production Data in Appendix 1). The "total gross weight" for each species was then divided by 20 (the number of plots) to get the "average gross weight" of each species per plot. Each plant was then assigned a dry weight factor (DWF) to account for air dry matter in the harvested plant material at the plants stage of growth ( Table 2 ). These value were obtained from the Rangeland Ecosystem Analyses and Management Guide provided by the U.S.F.S.( Table 3 ).

The "average gross weight", "dry weight factor" and 89.2 ( Production conversion factor to get LBS./Acre) were then multiplied. The result was the total air dried production in "LBs/acre (See Production Data in Appendix 1).

Thirty-percent of the "LB/acre" figure was then subtracted from this same figure to arrive at the "FINAL LB./ACRE". This thirty-percent represents plants that may still be covered by snow and are inaccessible, plants simply not present at the site due to death, being blown off the site or consumed by other animals. Alpine forget-me-not, Alpine Sandwort, Moss Campion and Dwarf Clover were not used in production calculations due to unacceptance by animals of cushion plants as forage (Redder pers. commun. 1993).

"FINAL LB./ ACRE" value were averaged for sites where more than one



Table 3 PERCENTAGE OF AIR-DRY MATTER IN HARVESTED PLANT MATERIAL AT VARIOUS STAGES OF GROWTH

SHRUBS	New leaf/twig growth until leaves full size	Older and full-size green leaves	Green fruit	Dry fruit	
Evergreen big sagebrush, bitterbrush	55%	65%	35%	85%	
Deciduous snowberry, rabbitbrush, snakeweed, Gambel oak	35%	50%	30%	85%	
Yucca and Yucca-like plants	55%	65%	35%	85%	
FORBS	Initial growth to flowering	Flowering to seed maturity	Seed ripe; leaf tips dry	Leaves dry; stems drying	Dry
Succulent violet, cow parsnip, waterleaf, buttercup, bluebells, ligusticum, sweet-anise, onion, lilies, monkshood	15%	35%	60%	90%	100%
Leafy lupine, balsamroot, and others	20%	40%	60%	90%	100%
Fibrous leaves or mat phlox, pussytoes, mat eriogonum	30%	50%	75%	90%	100%
GRASSES	Before heading; initial growth to boot stage	Headed out; boot stage to flowering	Seed ripe; leaf tips dry	Leaves dry; stems partly dry	Apparent dormancy
Cool Season wheat grasses, perennial bromes, bluegrasses, needlegrasses, prairie junegrass	35%	45%	60%	85%	95%
Warm Season Tall grasses big bluestem, indiagrass, switchgrass	30%	45%	60%	85%	95%
Mid grasses side-oats grama, little bluestem, galleta	40%	55%	65%	90%	95%
Short grasses blue grama, buffalograss, short tree-awn	35%	45%	60%	85%	95%



TABLE 2

## PLANT SPECIES COLLECTED- HOLY CROSS WILDERNESS

COMMON NAME	SCIENTIFIC NAME	TYPE	Dry Weight Factor
Alpine Avens	<i>Acomastylis rossii</i>	Forb	0.5
Alpine Bluegrass	<i>Poa alpina</i>	Grass	0.45
Alpine Chickweed	<i>Alsianthe macrantha</i>	Forb	0.5
Alpine Chiming Bells	<i>Martentensia lanceolata</i>	Forb	0.5
Alpine Clover	<i>Trifolium dasyphyllum</i>	Forb	0.4
Alpine Fairy Primrose	<i>Primula angustifolia</i>	Forb	0.4
Alpine Fescue	<i>Festuca brachyphylla</i> spp. <i>coloradensis</i>	Grass	0.45
Alpine Forget-Me-Not	<i>Eritrichum aretioides</i>	Forb	
Alpine Kittenails	<i>Besseya alpina</i>	Forb	0.4
Alpine Meadow Rue	<i>Thalictrum alpinum</i>	Forb	0.5
Alpine Parsely	<i>Oreoxis alpina</i>	Forb	0.5
Alpine Pussytoes	<i>Antennaria media</i>	Forb	0.4
Alpine Sandwort	<i>Lidia obtusiloba</i>	Forb	
Alpine Timothy Grass	<i>Phleum commutatum</i>	Grass	0.45
American Bistort	<i>Bistort bistortoides</i>	Forb	0.4
Arctic Gentian	<i>Gentianodes algida</i>	Forb	0.4
Arctic Sage	<i>Artemesia arctica</i>	Forb	0.5
Arctic Willow	<i>Salix artica</i>	Shrub	0.65
Cinquefoil	<i>Potentilla</i> spp.	Forb	0.5
Dwarf Clover	<i>Trifolium nanum</i>	Forb	
Elk Sedge	<i>Carex elynoides</i>	Grass-like	0.6
Golden Draba	<i>Draba aurea</i>	Forb	0.4
Many - Rayed - Goldenrod	<i>Solidago multiadata</i>	Forb	0.4
Moss Champion	<i>Silene acaulis</i>	Forb	
Mountain Dryad	<i>Dryas octopetula</i>	Forb	0.4
Mountain Parsely	<i>Pseudocymopterus montanus</i>	Forb	0.5
Mustard	<i>Draba</i> spp.	Forb	0.4
Narcissus Anemone	<i>Anemonastrum narcissus</i>	Forb	0.4
Old Man Of The Mountain	<i>Rydbergia grandiflora</i>	Forb	0.5
One Headed Daisy	<i>Erigeron Simplex</i>	Forb	0.4
Patterson Bluegrass	<i>Poa abbreviata</i> spp. <i>pattersonii</i>	Grass	0.6
Pinnate Leaved Daisy	<i>Erigeron pinnatisectus</i>	Forb	0.4
Rock Sedge	<i>Carex rupestris</i>	Grass-like	0.6
Rock Willow	<i>Salix brachcarpa</i>	Shrub	0.35
Sandwort		Forb	0.5
Scribners's Wheatgrass	<i>Elymus scribneri</i>	Grass	0.6
Sedge	<i>Carex microptera</i>	Grass-like	0.6
Serpent Grass	<i>Bistorta vivipara</i>	Forb	0.45
Skyline Bluegrass	<i>Poa cusickii</i> spp. <i>epilis</i>	Grass	0.6
Sky Pilot	<i>Polemonium viscosum</i>	Forb	0.5
Smelovskii	<i>Smelowskia calycina</i>	Forb	0.75
Snow Willow	<i>Salix reticulata</i>	Shrub	0.35
Thistle	<i>Cirsium</i> spp.	Forb	0.5
Timberline Grass	<i>Poa Glauca</i>	Grass	0.45
Timber Oatgrass	<i>Danthonia intermedia</i>	Grass	0.6
Western Yellow Paintbrush	<i>Castilleja occidentalis</i>	Forb	0.4
Wild Rye Grass	<i>Elymus tracycaulus</i> spp. <i>andinus</i>	Grass	0.45
Yarrow	<i>Achillea lanulosa</i>	Forb	0.5



sample was taken. These values were then multiplied by the sample areas total acreage to obtain "TOTAL PRODUCTION AVAILABLE" (Table 4 ). Forty percent of the total production available was then used as "PREFERRED UTILIZATION" as bighorn sheep will not eat all the forage available on a site. Acreage was calculated using a dot matrix method on Figures 1-5 topographical maps where each dot represented 5.74 acres.

**RESULTS:**

"Total Production Available" figures are provided in Table 4 below.

Table 4 Site:	Final Lbs/acre for each sample	Average	Acres	Total Production Available (Lbs.)	Preferred Utilization (Lbs.)
Homestake Ridge	157, 488 248,496 734	416.6	534	222,464	88,986
Grouse Mtn.	946.2, 333	639.6	295	188,682	75,472
Raggedy Ass Ridge	253.8, 258 315.9	275.9	398	109,808	43,923



FIG. 1

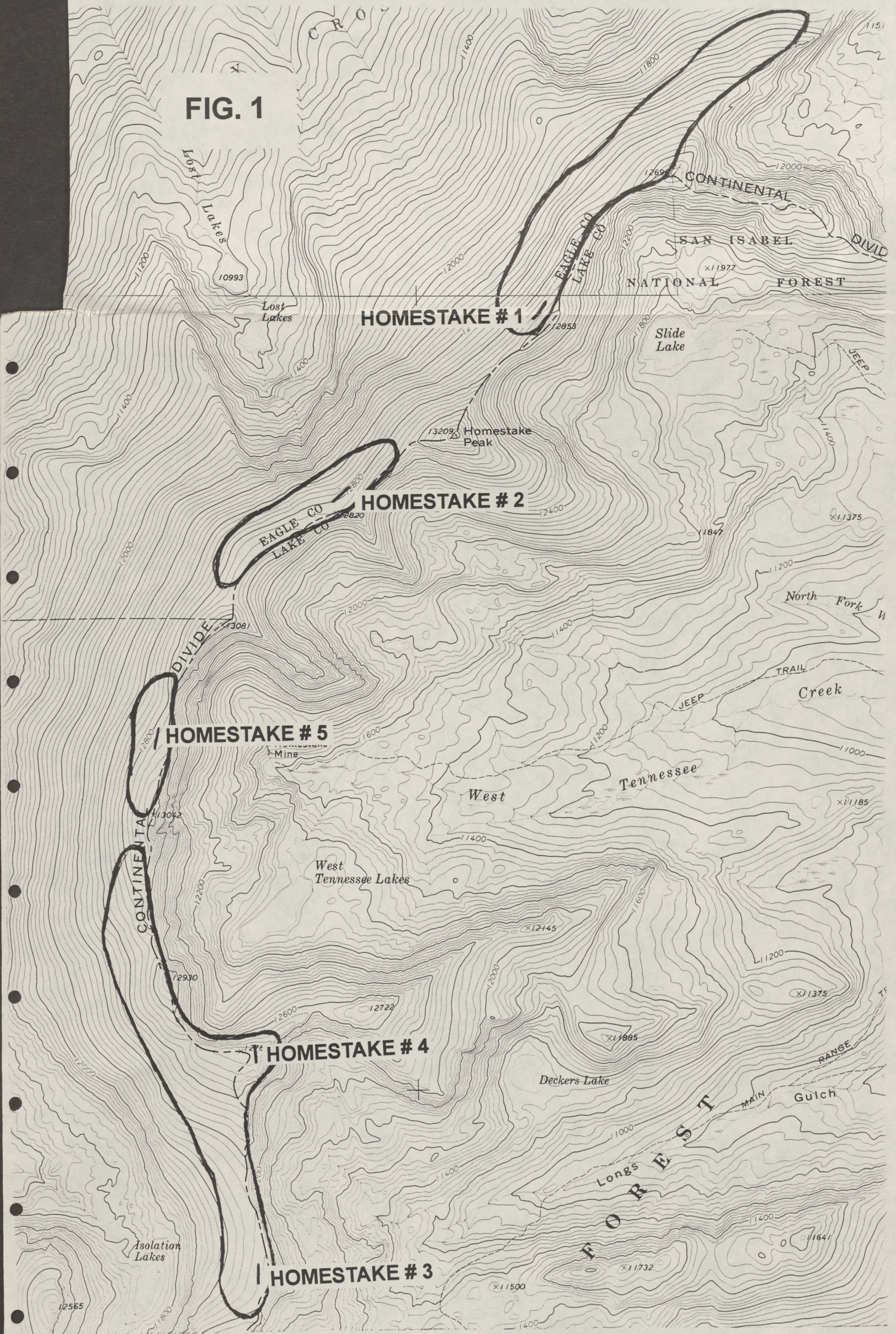
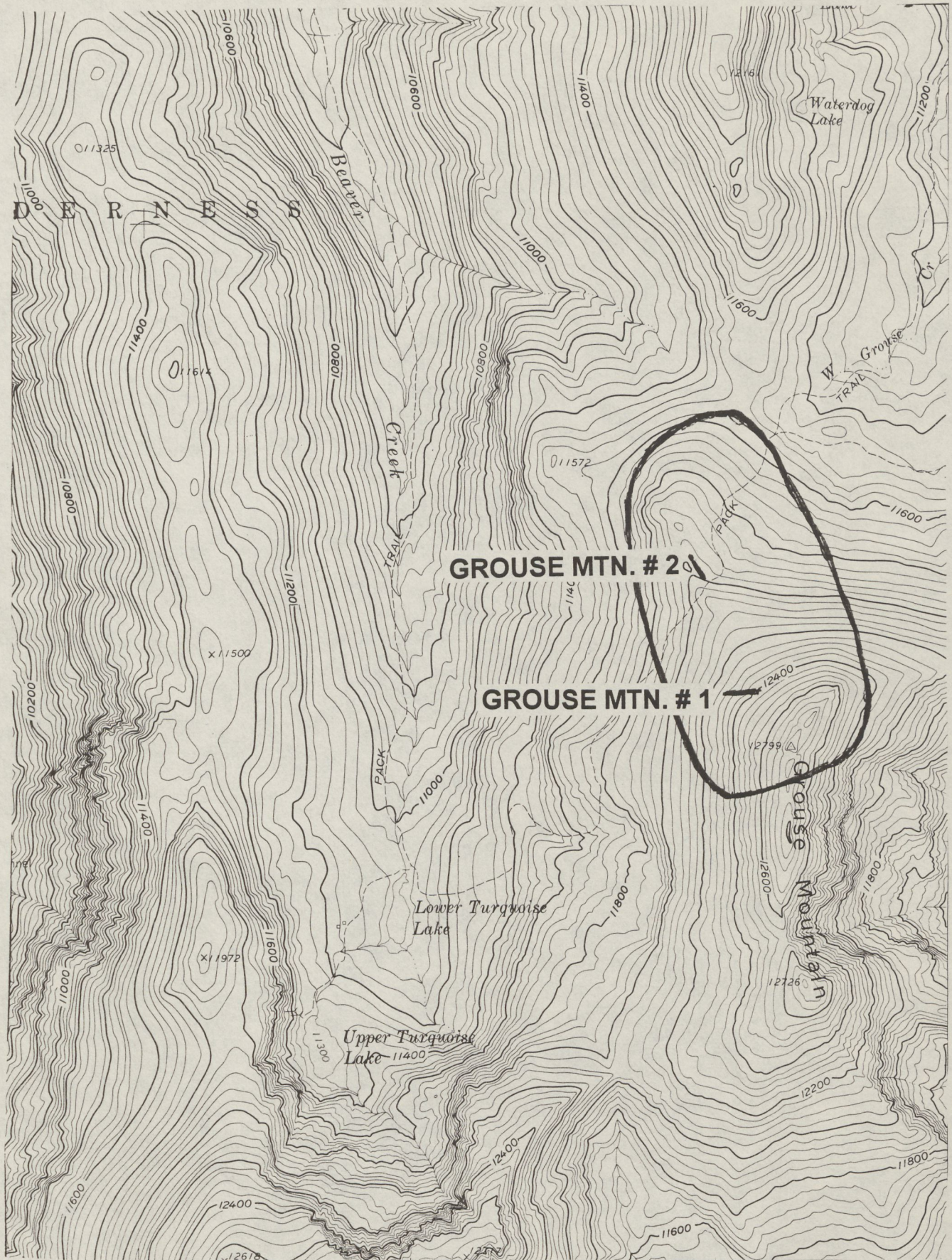




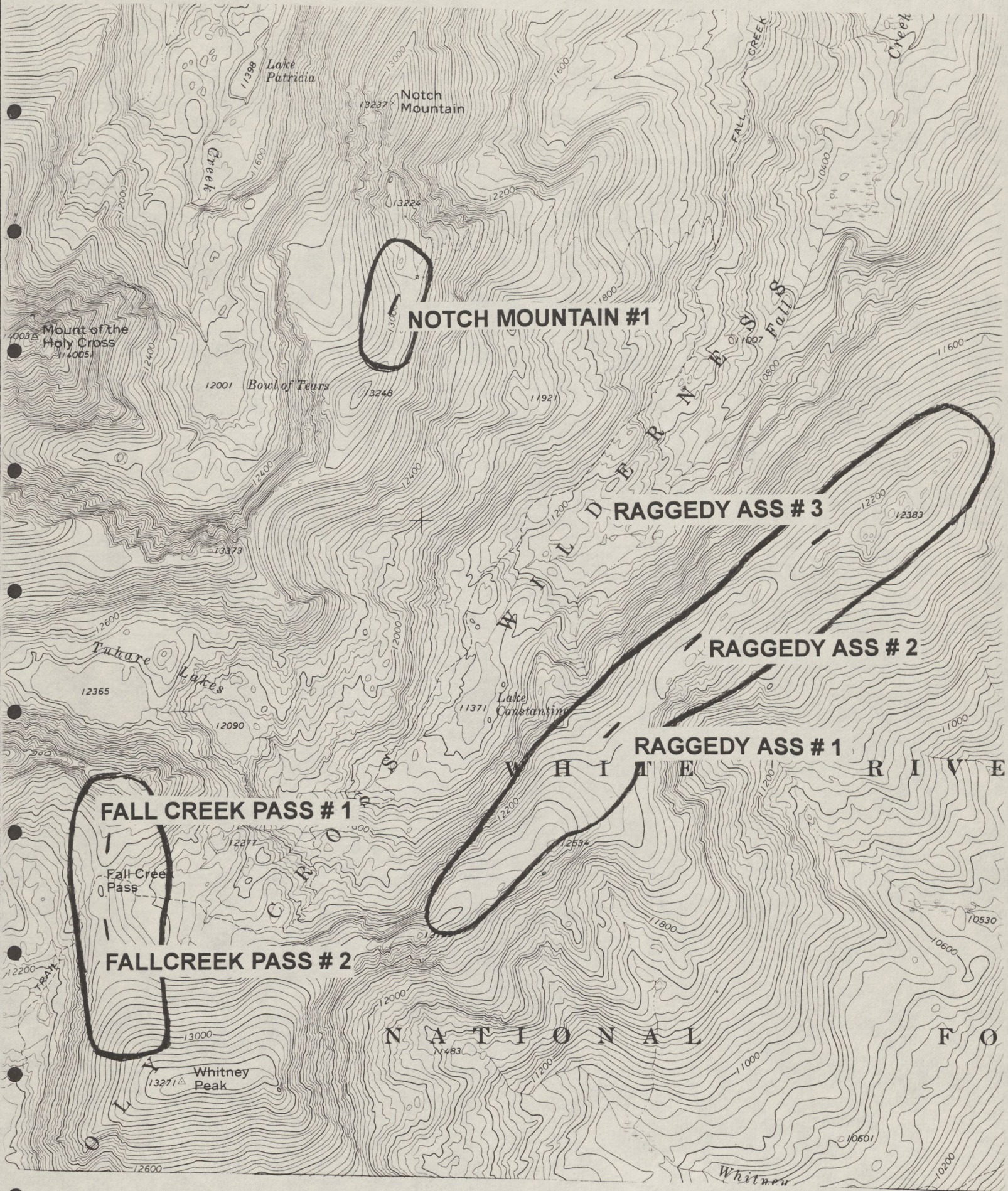
FIG. 2



FROM GROUSE MOUNTAIN QUADRANGLE



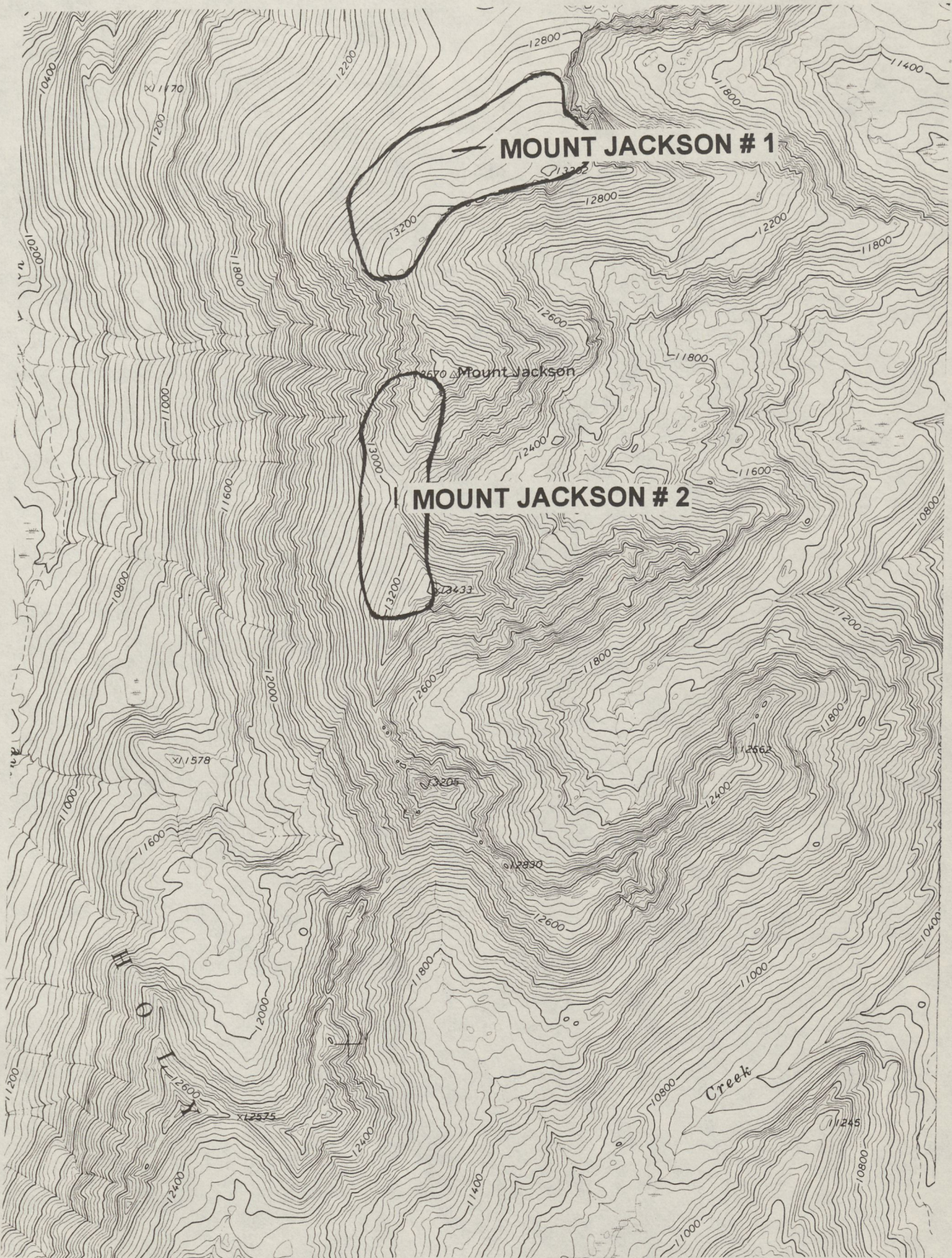
FIG. 3



FROM MT. OF THE HOLY CROSS QUADRANGLE



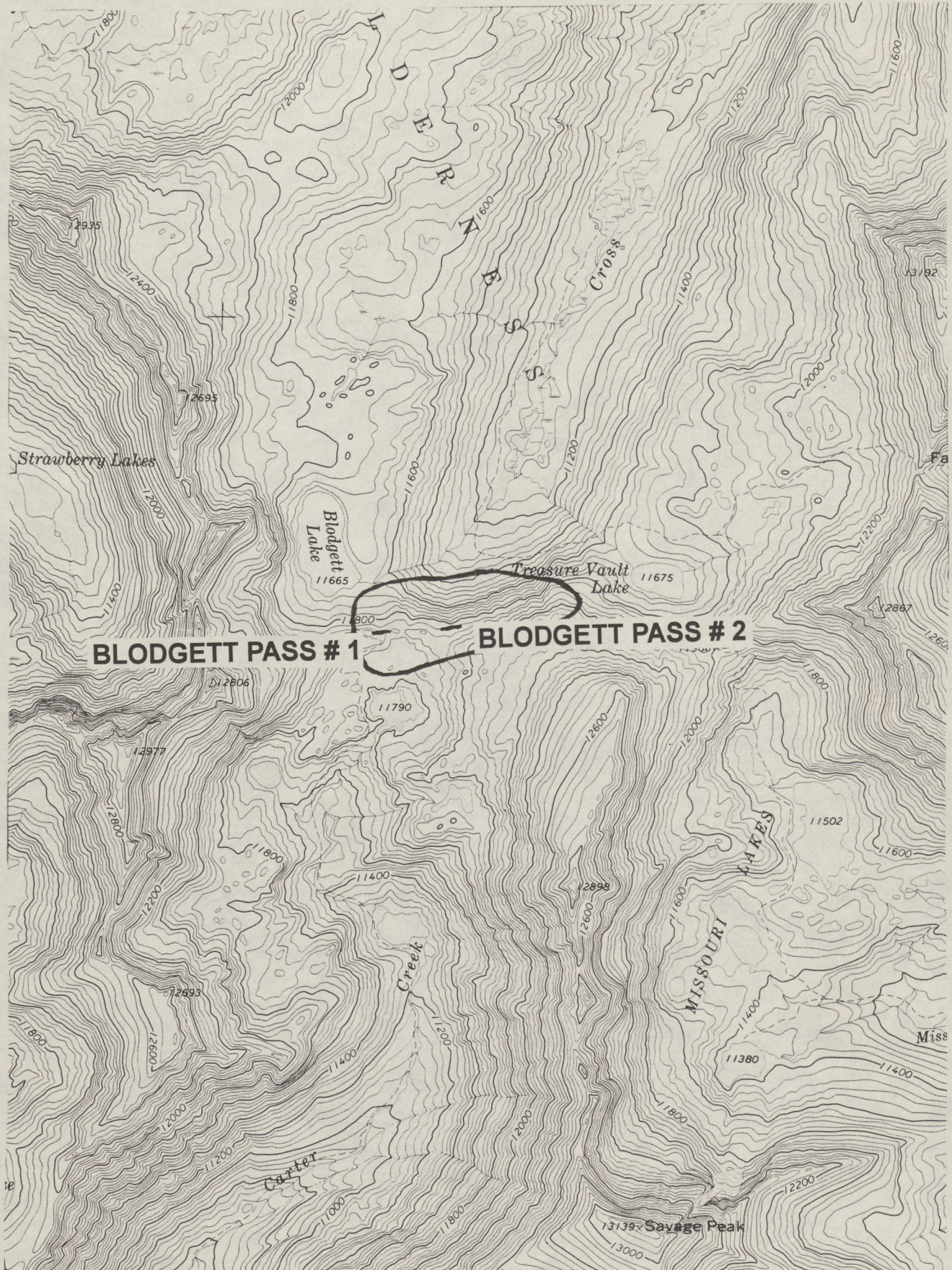
FIG. 4



FROM MOUNT JACKSON QUADRANGLE



FIG. 5



FROM MOUNT JACKSON QUADRANGLE



Fall Creek Pass	811.7, 588	699.8	138	96,580	38,632
Mount Jackson	309.3, 300.3	304.8	207	63,093	25,273
Blodgett Pass	484, 416	450	72	32,400	12,960
Notch Mtn.	624	624	42	26,208	10,483

Homestake Ridge had the highest preferred utilization, 88,986 lbs, while Notch Mountain had the lowest at 10,483 lbs. available. Visual observations, user and fishing data be found in Appendix 2.

**DISCUSSION:**

Even if a bighorn sheep reintroduction site is satisfactory in all other aspects, when winter range is inadequate or lacking, a transplant will fail. Indeed, some transplant failures in Utah have been due, in part, to inadequate winter ranges ( Smith et al. 1988). Winter ranges are delineated as follows:

- A) Areas within 300 meters of escape terrain. Areas of up to 1000 meters from escape terrain may also be included if multiple escape routes exist.



B) Within areas selected above, identify sites receiving less than 25 centimeters of snow pack. Heavy snow accumulations render potential winter ranges unusable ( McCann 1956, Tilton and Willard 1982, Johnson 1983, Smith and Flinders 1991). Research in northeastern Utah indicated that bighorns abandoned ranges when snowpack exceeded 25 cm.

C) Of the areas selected above, exclude all escape terrain without southern exposures ( SW-S-SE ) unless otherwise exposed and consistently cleared of snow by wind ( Geist 1971, Shannon et al 1975). Studies addressing winter range requirements have consistently noted that key winter ranges are typified by southern exposures ( Shannon et al. 1975, Hudson et al. 1976, Stelfox 1976, Johnson 1983, Smith and Flinders 1991)

The area sampled at Grouse mountain can be excluded as potential bighorn sheep winter range due to the lack of escape terrain. All other areas sampled had adequate escape terrain.

The authors tried to estimate how many days one bighorn sheep could survive on the areas sampled. Rangeland data showed that a 430 pound. elk consumes approximately 12 pounds of dry weight production daily. A 135 pound mule deer consumes approximately 4.5 pounds of dry weight production daily. A similar figure for bighorn sheep could not be found.



A bighorn sheep ewe weighs approximately 150 pounds while a ram may weigh approximately 350 pounds ( Rennieke 1990 ). We assumed a daily dry weight consumption of 6 pounds for bighorn sheep. This figure was derived by looking at the weights of the animals only. A lower number was chosen assuming that most bighorn sheep herds are predominantly composed of lighter weight ewes.

The number of days forage for each site, using the daily dry weight consumption of six pounds is presented in Table 5 below.

TABLE 5		
SITE:	DAYS OF FORAGE 60 BIGHORN SHEEP	DAYS OF FORAGE 125 BIGHORN SHEEP
HOMESTAKE RIDGE	247	119
RAGGEDY ASS	122	58
FALL CREEK PASS	107	52
MOUNT JACKSON	70	34
BLODGETT PASS	36	17
NOTCH MOUNTAIN	29	14

The authors must point out that all production estimates are "rough" at best. We attempted to sample bighorn sheep winter range during the summer. No similar endeavor concerning bighorn sheep or other species could be found in the



literature.

We had to make some big assumptions which could change the production data calculated. Our biggest assumption was that 30% of the air dry production would not be available due to snowcover, death, being blown off the site or being consumed by other animals. We feel that this assumption may be relatively conservative. A higher value for this production loss would decrease "total production available" significantly.

Another point the Division of Wildlife should consider in its bighorn sheep reintroduction plans is minimum viable population. A minimum viable population, MVP, has been defined by Shaffer (1983) as the smallest isolated population having a 95% probability of surviving at least 100 years. Though precise MVP estimates for bighorn sheep are not available, Berger (1990) studied 122 bighorn sheep populations in the southwestern United States and found that 100% of the bighorn populations with fewer than 50 individuals went extinct within 50 years. Berger also reported that bighorn populations with more than 100 sheep had persisted for 70 or more years. Consequently, he concluded that 50 bighorn sheep did not constitute a minimum viable population and that managers should strive for herds numbering more than 100. Additionally, Geist (1975) and others (Sands 1976, Van Dyke et al. 1983) have suggested that wildlife managers should maintain herds of at least 125 individuals if the herds are to maintain genetic variability and persist. Based on this information, it is suggested that 125 individuals represent a current "best estimate" MVP for bighorn sheep populations. This requirement can be relaxed if a reintroduction site is situated so that genetic



exchange with nearby herds is expected.

**CONCLUSION:**

Recommendations regarding the size and reintroduction location for bighorn sheep in the Holycross Wilderness vary depending on genetic interaction with other herds. If genetic interaction with other bighorn sheep herds in the Holycross Wilderness is expected, a reintroduced herd of 60 bighorn sheep could be reintroduced to either the Homestake or Raggedy Ass ridges. If no genetic interaction with other herds is expected, a minimum viable population of 125 reintroduced bighorn sheep is recommended. However, it is doubtful whether the 119 days of forage available on Homestake Ridge will be sufficient to sustain a minimum viable population of 125 animals through winter.



## BIBLIOGRAPHY

- Berger, J., 1990. Persistence of different-sized populations: an empirical assessment of rapid extinctions in bighorn sheep. *Conservation Biology*. 1:91-98.
- Geist, V. 1971. *Mountain Sheep, a study in behavior and evolution*. University Of Chicago Press, Chicago. 383pp.
- Hoover, R.L., 1992. Historical Status of bighorn sheep in the Holycross area, Eagle and Pitkin Counties, Colorado. 40 pp.
- Hudson, R.J.; D.M. Hebert, and V.C. Brink, 1976. Occupational patterns of wildlife on major east Kootenay winter-spring range. *Journal of Range Management*. 29:38-42
- Johnson, R.L., 1983. Mountain goats and mountain sheep of Washington. Washington Department of Game, Biological Bulletin No. 18. 196pp.
- McCann, L.J., 1956. Ecology of the mountain sheep. *American Midland Naturalist*. 56:297-324
- Redner, N., 1993. United States Forest Service. Botanist. Personal communication.
- Rennicke, J., 1990. *Colorado Wildlife*. Falcon Press Publishing, Helena & Billings, Montana. 138 p. Text copyright 1990 by the Colorado Division of Wildlife.
- Sands, A.R., 1976. Evaluation of potential Californis bighorn sheep habitat, Jackson mountains, Nevada. unpublished master's thesis, Humboldt State University, Arcata. California. 104 pp.
- Shaffer, M.L., 1983. Determining minimum viable population size for the grizzly bear. International conference on bear research and management. 5:133-139.
- Shannon, N.H., R.J. Hudson, V.C. Brink, and W.D. Kitts, 1975. Determinants of spatial distribution of Rocky Mountain bighorn sheep. *Journal of Wildlife Management*. 39:387-401.



- Smith, T.S. and J.T. Flinders, 1991. The bighorn sheep of Bear Mountain: ecological investigations and management recommendations. Utah Division of Wildlife Resources, research final report. 425 pp.
- Smith, T.S., J.T. Flinders and D.W. Olson, 1988. Status and distribution of Rocky Mountain bighorn sheep in Utah. Biennial Symposium of Northern Wildsheep and Goat Council. 6:5-12.
- Smith, T.S., J.T. Flinders and D.S. Winn, 1991. A habitat evaluation procedure for Rocky Mountain bighorn sheep in the inter-mountain West. Great Basin Naturalist. 51(3), pp. 205-225
- Stelfox, J.G., 1976. Range ecology of Rocky Mountain bighorn sheep in Canadian National Parks. Canadian Wildlife Report series no. 39.
- Tilton, M.E. and E.E. Willard, 1982. Winter habitat selection by mountain sheep. Journal of Wildlife Management. 46:359-366.
- Van Dyke, W.A.; A. Sands, J. Yonkum, A. Polentz and J. Blaisdell, 1983. Wildlife habitat in managed rangelands- the Great Basin of southeastern Oregon: bighorn sheep. USDA Forest Service. General Technical Report PNW-159. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon. 37 pp.



# APPENDIX 1

PRODUCTION DATA  
COVER FREQUENCY DATA















## Cover Frequency

## HOMESTAKE RIDGE # 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Alpine Avens	2						2	2	4											3
Arctic Sage	2	2	1	1	1	1	1				1	1	1			2		2		
Cinquefoil	1	1				1	1	1			1			2	1	1		1	1	2
Dwarf Clover	3	2	2	2	2	2				2			2	2	1	2	2	3	3	2
Timber Oatgrass	1	1	1	1	2	2	1	4	1	3	3	3	3	3	3	3	3	3	1	1
Timberline Grass	1				1	1			2		1	1					2	2	2	
One Headed Daisy			2	2		1														
Alpine Sandwort				2	2	2														
Carex Sp.						1		1												
Smelovskii							1					1				1				
Alpine Chickweed										2	1									
Western Yellow Paintbrush													1					2	1	
Sky Pilot														2		1	2		2	
Old Man Of The Mountain																			1	2
Rock	1	3	3	2	2	5	0	1	0	0	0	0	1	0	0	0	0	1	2	1
Gravel	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0
Litter	2	1	1	2	1	1	2	2	2	2	2	1	1	3	3	2	2	2	2	2
Moss	2	2	2	2	2	0	1	1	2	1	0	0	1	0	1	1	0	1	0	0
Bareground	0	0	0	0	1	0	0	0	0	0	2	4	2	0	0	0	0	0	0	1







## Cover Frequency

## HOMESTAKE RIDGE # 3

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Dwarf Clover	3	2		4	2	2	3	2	2		2	3	3	1	1		2	1	3	2
Alpine Sandwort											2		3	2	1		3	2		
Alpine Avens		3	2	1	1	1		3		5		2								
Arctic Sage									1			1								
Cinquefoil		1	1	1	2	2	1	1	2	1										
Timberline Grass		3			1	1	2		1						1		1		1	1
Timber Oat Grass		2		1	2	1	2	1	2									2		
Sky Pilot			1	1					1											
Alpine Chimming Bells					1			1			1									
Western Yellow Paintbrush							1													
Rock	3	0	0	0	0	2	1	0	0	0	0	1	2	3	2	0	2	0	1	0
Gravel	0	0	0	0	0	0	0	0	0	0	1	2	1	3	4	2	2	3	3	3
Litter	0	2	2	2	2	2	2	2	3	3	1	2	0	0	0	0	0	0	0	0
Moss	2	0	2	2	3	2	1	2	1	0	3	1	3	0	0	0	2	2	2	3
Bareground	1	2	2	1	1	0	2	2	2	2	1	0	0	0	0	4	0	1	0	0







## Cover Frequency

HOMESTAKE RIDGE # 4	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Alpine Avens	2	3	2	2	2	1	1		2	1	3		3	1		4	1		1	2
Carex Sp.	3	1	2	2	2	3	2	2	1	3	2	3	2	2	2		1	2	1	2
Western Yellow Paintbrush	1	1				1	1													
Cinquefoil	1	1	1		1	1			1	1	1	1		1			1	2	1	1
Old Man of the Mountain	2	1		1		1	1	1	1			1				1				1
Arctic Sage	1		2			2	1	1	1						1	1	1	2		1
Dwarf Clover	2	2	1				1	1					2	2	2		2	2		
Timber Oat grass	1		1	1	1	1	1	1	2	2		1		1	2	2		1	3	1
Timber line Grass				2									1		1				1	
Moss Champion			2					2	2		2			2	2		2	1		
One Headed Daisy			1																	

Rock	1	3	0	2	3	2	5	3	2	1	3	3	1	1	2	2	4	3	3	2
Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Litter	2	2	1	2	2	2	1	2	1	0	2	2	3	3	2	1	1	1	1	2
Moss	2	1	3	1	1	1	0	0	3	2	1	1	1	2	2	2	1	2	1	2
Bareground	0	0	0	0	0	0	0	1	0	3	0	0	0	0	0	1	0	0	0	0







## Cover Frequency

## HOMESTAKE RIDGE # 5

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Alpine Avens	2	2	1	1	1	2	2	2	2	1	2	2	3	2	3		2	2	1	1
Alpine Clover	3	3	2	2	2	3	4	2	3											
Arctic Sage	1	2	1	2	1	1		2	1		1	1	2	1		2	1	2	1	
Carex. Sp.	2	2	3	3	3	2	2	3	2	3	3	2	2	2	2	3	2	2	2	1
American Bistort	1	1	1	1	1		1		1											
Arctic Gentian	2																			
Cinquefoil						1			1	1	1			1	1					1
Old Man Of The Mountain		1		1					1				1							
Western Yellow Paintbrush						1	1	1		1		1								
Dwarf Clover										2	2		2		2	1	2	2	3	1
Timberline Grass											1		1	1				2	1	1
Alpine Sandwort																	2		2	
Smelovskii													1							
Rock	0	0	0	0	0	2	0	1	1	2	1	2	0	1	1	2	1	2	3	4
Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Litter	2	3	3	3	2	2	3	2	3	2	2	2	2	1	2	1	1	3	2	1
Moss	0	0	0	0	0	0	0	0	1	0	1	2	2	2	1	2	2	1	1	1
Bareground	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0















## Cover Frequency

GROUSE MOUNTAIN # 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Alpine Avens	3	3	2				1	1		1		3		3				2			
Dwarf Clover	2	1	3	3	3	3	3	2	2	2	2	1	2		1	1	3		2	3	
Cinquefoil	1	1	1	1	2	2	1		2	1	1			1		1	2				
Arctic Sage	1		2	1			1			1											
Sky Pilot	2	1	1															1			
Elk Sedge	2	3	1	2	2	1	1	3	2	1	2	3	4	3	2	3	3	2	2	2	
Scribner's Wheatgrass	2	1	2	2	2	2	1	2	2	2	2	1						1	1	2	1
Carex Sp.	1					2								2							
Western Yellow Paintbrush		1	1	1					1												
Alpine Sandwort				2							2										
One Headed Daisy				1	1	1				1								1	1	1	
Alpine Parsely															2	2					
Alpine Bluegrass															2	1				2	
Rock	2	0	2	2	1	1	1	1	2	1	2	1	0	0	0	2	2	2	2	2	
Gravel	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	
Litter	2	2	1	1	2	2	0	1	0	1	1	2	1	1	1	2	1	1	1	1	
Moss	0	1	0	2	0	0	0	1	0	0	2	1	2	1	0	1	1	0	0	1	
Bareground	0	0	0	0	1	1	1	0	2	0	1	1	0	0	0	0	0	1	1	0	
Elk Droppings	0	1	0	0	1	1	0	0	0	1	0	1	1	0	0	0	0	1	0	0	







## Cover Frequency

RAGGEDY ASS RIDGE # 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Unknown Grass	2	3	2	3	3	2	1	2	2		3	2	3	2	1	1	1	1		1
Unknown Grass	2		1		1	1		1			1		1				1		1	
Dwarf Clover	2	1				2														1
Unknown Forb	1				1			1	1						1			1		
Alpine Avens	1	1	1	1	1		1			1	1				1	1				
Old Man Of The Mountain	1																			1
Sandwort	1					2							1			1	1	1		
Serpent Grass			1				1		1						1					
Alpine Clover					1															
Cinquefoil					1															
Mountain Dryad							3		2			2	2	3	3	1	1		2	2
Rock	0	3	3	2	0	2	1	2	3	6	1	5	1	3	0	0	2	2	2	3
Gravel	0	0	0	0	0	0	2	0	0	0	0	0	0	2	2	5	2	4	2	1
Litter	1	1	1	1	1	0	0	1	2	0	1	0	1	1	1	0	0	0	0	1
Moss	2	2	2	1	3	3	1	2	1	0	2	1	2	0	1	1	1	0	1	1
Bareground	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	1	0	0	0







## Cover Frequency

RAGGEDY ASS RIDGE # 2	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Unknown Grass	2	2	2	1	2	2	2	2	2	2	2	2	3	1	2	3	2	2	1	1
Unknown Grass	1	1	3	2	2	1	2	1	1	2	2		1	2			1		1	1
Dwarf Clover		1	1		1		1		1						2			1	2	3
Arctic Gentian	1	1	1	1	2	2					1	1		1		1		1	1	2
Alpine Avens				1			1		2	3			1	1						1
Old Man of the Mountain							1													
Alpine Sandwort		1	2		1	2		3		1	2		2	2						2
Serpent Grass																				
Alpine Clover																				
Cinque Foil		1			1	1	2	1	1		1		1							1
Mountain Dryad																				
Western Yellow Paintbrush	1				1	1			1		1	1	1		1		1	1	1	
Moss Campion	1	1		2			1					1		2						
Pinnate-Leaved Daisy									2	1										
Rock	3	3	0	2	2	2	2	2	2	1	2	0	1	2	4	0	0	1	2	0
Gravel	0	0	0	0	0	0	0	0	0	0	1	5	0	0	0	2	2	2	2	1
Litter	1	1	1	1	1	1	2	0	2	1	1	0	2	0	0	0	0	0	1	0
Moss	2	2	2	2	2	2	2	3	1	2	2	0	2	4	2	3	3	3	1	3
Bareground	0	1	1	1	1	0	0	1	0	0	0	1	0	0	0	1	1	0	0	1







## Cover Frequency

## RAGGEDY ASS RIDGE # 3

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Mountain Dryad	2			1	2	3	1	1												
Alpine Avens	1	1	2	1					1				1	2	2	1				
Arctic Sage	1	1	1	2	1		1	2	1	1		1					1			
Old Man Of The Mountain	1	1		1																
Unknown Grass	1	1	1	1	1	1		2	1	2	2	1	4	1	3	2	2	3	3	1
Unknown Grass		2	1		1	1		2	1			1	1	1	2				2	1
Moss Campion		2		1	1						1					1				2
One Headed Daisy		1			1	1		1	1								1	1		
Pinnate-Leaved Daisy		1																		
Alpine Clover		1	3	1					2	2				1	1		1	1	2	2
Cinquefoil					1					1	2					1	1			
Arctic Gentian						1														
Sandwort											2	2		2		2				
Many Rayed Goldenrod							1	3					1	1		1		1		1
Alpine Bluegrass									1	1										
Rock	3	3	3	3	2	2	3	1	0	0	1	2	0	0	1	2	2	0	1	2
Gravel	0	1	0	2	2	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0
Litter	2	1	1	0	2	2	2	0	2	2	2	1	2	2	2	1	1	2	1	1
Moss	0	1	1	1	0	2	1	2	1	0	2	3	1	2	1	1	2	2	0	2
Bareground	0	0	1	0	0	1	0	0	0	2	0	0	0	2	0	1	0	1	0	1







## Cover Frequency

FALL CREEK PASS # 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Sedge	1	1	3	1	1		1				1	1	2	2	1	2		2		2
Arctic Sage	1		3	1	1	1	2	1	2	2	2	2	1	1			1			2
Alpine Fescue	3	4	2	1						1	1	2	2	2	2	1	2	2		1
Alpine Avens	1		2	2	2	3	2	5	5	2	3	3	3	3	3	3	3	2		2
Dwarf Clover	2	1	2	3	1											1				
Old Man Of The Mountain	1		1	3			1		1			1			2			1		
American Bistort	1	1	2	1			1	1	1			1				1		2		1
Arctic Gentian	1		1					2							1					
Western Yellow Paintbrush						1											2			
Alpine clover			1			2	2	2	2		3	1								
Cinquefoil											1									
Timberline Bluegrass																				
Rock	1	1	0	0	4	3	3	0	1	4	1	0	1	2	1	1	0	0	6	0
Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Litter	2	3	2	2	0	2	1	2	2	2	1	2	2	2	1	2	2	2	0	2
Moss	2	1	1	1	1	0	0	0	0	0	2	0	0	0	3	0	0	0	0	1
Bareground	0	1	1	1	0	0	0	0	1	0	0	1	1	0	0	0	1	0	0	0



Production Data ( Grams)

FALL CREEK PASS # 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total GW	Avr. GW	DWF	LB./acre	FINAL LB./ACRE
Sedge	5	1			1							2				1					10	0.5	0.6	26.76	18.732
Arctic Sage					2											2					4	0.2	0.5	8.92	6.244
Alpine Fescue	2	5	1	18	8	5	4	3	10	10	14	11	12		1	2	8		9	8	131	6.55	0.45	262.917	184.0419
Alpine Avens	10	1		2	20	21	9		10	9	2	13	17	11	35	24	17		15	8	224	11.2	0.5	499.52	349.664
Old Man of the Mountain					2																2	0.1	0.5	4.46	3.122
American Bistort						2															2	0.1	0.4	3.568	2.4976
Arctic Gentian			6																		6	0.3	0.4	10.704	7.4928
Western Yellow Paintbrush		2		5			2														9	0.45	0.4	16.056	11.2392
Alpine Clover																					0	0	0.4	0	0
Cinquefoil										1						2					3	0.15	0.5	6.69	4.683
Timberline Grass																					0	0	0.45	0	0

TOTAL: 587.7165



## Cover Frequency

## FALL CREEK PASS # 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Sedge	2	1			1					1		1				1				
Arctic Sage					1											1				
Alpine Fescue	1	3	1	4	2	2	2	2	3	3	5	3	3		1	1	2		2	3
Alpine Avens	2	1		1	3	3	2		2	2	1	3	3	3	4	4	3		3	2
Dwarf Clover	3	1	1	1		2	3	2	1	2	1	1	2	2	1		3		2	2
Old Man of the Mountain					1															
American Bistort						1														
Arctic Gentian			2																	
Western Yellow Paintbrush		1		2			1													
Alpine Clover																				
Cinquefoil										1							1			
Timberline Grass																				
Rock	0	0	4	0	0	1	3	0	0	3	0	2	0	3	1	0	1	6	3	2
Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Litter	2	2	0	2	2	2	0	1	1	1	2	2	0	0	1	2	1	0	1	2
Moss	1	0	1	0	0	0	0	3	0	1	2	0	2	2	1	0	0	0	2	0
Bareground	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0







## Cover frequency

MOUNT JACKSON # 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Alpine Avens	2	2	3	4	4	5	5	4					3	3	2	2				2
Alpine Clover	1	1		1			1									1	1			
Alpine Kittenails	1							1						1						
American Bistort	2																			
Arctic Willow		2	2	2				1					2	1	1	1				2
Alpine Fairy Primrose	1				1								1							1
Arctic sage	1		1	2	2	2	2	1					1	1		1				
Arctic Gentian	1	1		1		1	1	2					1		1					
Western Yellow Paintbrush		1			2											1				
Wild Rye Grass		1				1	1						1		1					











Production Data ( Grams)

BLODGETT PASS # 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTAL GW	Avr. GW	DWF	LB./acre	FINAL LB./ACRE	
Alpine Avens	2	3							1	7		1	2	1	17	7	9	7	8	3	68	3.4	0.5	151.64	106.148	
Arctic Sage	2	1		1		1	1	3	1	1	1	2		1		1	1	2			19	0.95	0.5	42.37	29.659	
Unknown Grass	6	9						2	2	2	4	2	6	1	1	2	1	2	7	1	48	2.4	0.45	96.336	67.4352	
Cinquefoil	1				1											1	1	1			5	0.25	0.5	11.15	7.805	
Unknown Forb	3									1	2	2	1	1			2		2	1	15	0.75	0.5	33.45	23.415	
Rock Sedge	1	1								1		1									4	0.2	0.6	10.704	7.4928	
American Bistort	1	2	1	1		1		1	2				1	1	1		2	1			15	0.75	0.4	26.76	18.732	
Narcissus Anemone			4	13		6		7	3	10		5	5	4	4	5		2	1		69	3.45	0.4	123.096	86.1672	
Rock Willow		4		4		2	3	6	8	5	8	3	5	10		9	6	8	3	3	5	92	4.6	0.35	143.612	100.5284
Alpine Parsely		1																			1	0.05	0.5	2.23	1.561	
Arctic Willow						3	1	1	2	2	2										11	0.55	0.65	31.889	22.3223	
Arctic Gentian										10											10	0.5	0.4	17.84	12.488	
Western Yellow Paintbrush																					0	0	0.4	0	0	
																							TOTAL:			483.7539



## Cover Frequency

BLODGETT PASS # 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Alpine Avens	2	2							1	3		1	1	1	3	2	2	2	2	1
Arctic Sage	2	1		1		1	1	2	2	1	1	2		1		1	1	2		
Unknown Grass	3	3						2	1	1	2	2	2	1	1	1	1	1	3	1
Cinquefoil	1				1											1	1	1		
Unknown Forb	1									1	1	1	1		1		1		1	
Rock Sedge	1	1								1		1								
American Bistort	1	1	1	1		1		1	1			1	1			1	1			1
Narcissus Anemone			2	3		3		2	2	3	2	2	3	1			1	1		3
Rock Willow		2		2		2	1	2	4	2	3	2	3	3	2	3	3	1	2	
Alpine Parsely		1																		
Arctic Willow						2	1	1	1	2	1									
Arctic Gentian										2										
Western Yellow Paintbrush															1		1			
Dwarf clover															1		1		1	1
Rock	0	2	5	2	5	2	5	0	1	0	0	0	0	0	0	3	0	4	3	1
Gravel	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Litter	1	1	1	2	0	0	0	1	1	1	0	2	1	1	0	0	2	0	0	0
Moss	2	1	1	4	0	1	0	2	3	2	2	1	1	2	1	1	1	1	1	2
Bareground	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
Elk Droppings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0



Production Data ( Grams)

BLODGETT PASS # 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Total GW	Avr. GW	DWF	LB./acre	FINAL LB./ACRE
Alpine Avens	4	1	1				1	2	1	1	1	1	5	1	1	1		1	1		23	1.15	0.5	51.29	35.903
Arctic Sage	1	1	1		1	1	2	5	1	1	1	1	1		1	1	1	1	1		22	1.1	0.5	49.06	34.342
Unknown Grass											1	2	1	1	1	2	1				9	0.45	0.45	18.063	12.6441
Cinquefoil														1							1	0.05	0.5	2.23	1.561
Unknown Forb							1									1					2	0.1	0.5	4.46	3.122
Rock Sedge																1					1	0.05	0.6	2.676	1.8732
American Bistort	1	1				1			1					1		1				1	7	0.35	0.4	12.488	8.7416
Narcissus Anemone	3	4	8		1		12	17				1	4		2	2	1				55	2.75	0.4	98.12	68.684
Rock willow	8	13	2		8	2	5	3	11	5	10	2	2	3	6	1	2	1		1	85	4.25	0.35	132.685	92.8795
Arctic Willow	6	7	15		5	7	5	6	5										3	4	63	3.15	0.65	182.637	127.8459
Arctic Gentian		1					1			1											3	0.15	0.4	5.352	3.7464
Western Yellow Paintbrush			2		1	1	1	3	2		2	1	5		1						19	0.95	0.4	33.896	23.7272
Alpine Fescue								1													1	0.05	0.45	2.007	1.4049

TOTAL 416.4748



## Cover Frequency

## BLODGETT PASS # 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Alpine Avens	2	1	1				1	1	1	1	1	1	2	1	1	1		1	1	
Arctic Sage	1	1	1		1		1	3	2	1	1	1	1		1	1	1	1	1	
Unknown Grass											1	2	1	1	1	1	1			
Cinquefoil						1								1						
Unknown Forb								1								1				
Rock Sedge																1				
American Bistort	1	1				1			1					1		1				1
Narcissus Anemone	2	4	3		1		3	3				1	2		1	1	1			
Rock willow	3	3	1		2	1	1	2	3	2	3	1	4	1	2	2	1	1		1
Arctic Willow	2	3	4		3	3	3	2	2								1	1	2	
Arctic Gentian		1					1		1											
Western Yellow Paintbrush			1		1	1	1	1	1		1	1	1	1	1					
Dwarf Clover	1																			
Alpine Fescue								1												
Moss Champion											1	1			1					
Rock	0	2	0	6	2	3	0	0	0	5	1	1	0	4	0	0	1	2	0	1
Gravel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	5	3	3	5
Litter	2	2	2	0	2	1	2	3	2	1	0	1	2	0	1	1	0	0	0	0
Moss	3	1	3	0	2	2	3	1	2	1	3	1	2	2	1	1	2	1	3	0
Bareground	1	0	0	0	0	0	0	0	1	0	0	0	1	0	2	0	1	0	0	0



Production Data ( Grams)

NOTCH MOUNTAIN # 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTAL GW	Avr. GW	DWF	LB./acre	FINAL LB./ACRE	
Alpine Avens	20	30	20	18	10	21	10	2	7	20	25	7		10				23	23		2	248	12.4	0.5	553.04	387.128
Alpine Kittenails	2	1					1								2		2					8	0.4	0.4	14.272	9.9904
Alpine Meadow Rue	5	1		2	1																	9	0.45	0.5	20.07	14.049
Patterson Bluegrass	2																					2	0.1	0.6	5.352	3.7464
Sedge	2	1	1	2		5	3	2	2	1	2	2	5	4		8		1		1		42	2.1	0.6	112.392	78.6744
Alpine Fescue	3	1	7	4	9		2	3	3	2			2	2		7	6	5				56	2.8	0.45	112.392	78.6744
Alpine Bluegrass	3	1		1	1																	6	0.3	0.45	12.042	8.4294
American Bistort	1		3	1	1																	6	0.3	0.4	10.704	7.4928
Arctic Gentian		1	5		1													7				14	0.7	0.4	24.976	17.4832
Western Yellow Paintbrush					1		1			1	1		2			1						7	0.35	0.4	12.488	8.7416
Cinquefoil						1	1			1												3	0.15	0.5	6.69	4.683
Arctic Sage							1								1		1					3	0.15	0.5	6.69	4.683

TOTAL 623.7756



## Cover Frequency

NOTCH MOUNTAIN # 1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Alpine Avens	3	4	3	4	3	4	2	1	2	3	3	2		2			4	3		1
Alpine Kittenails	1	1					1								1		1			
Dwarf Clover	3	3	3	3	3	1	2	1	1	1		2	1	1		3	3			
Alpine Meadow Rue	2	2		1	1															
Patterson Bluegrass	1																			
Sedge	1	1	1	1		2	3	2	1	1	1	2	3	2		3		1		1
Alpine Fescue	2	1	2	2	2		2	2	2	2			1	1		3	2	3		
Alpine Bluegrass	2	1		1	1															
American Bistort	1		2	1	2													3		
Arctic Gentian		1	1		1															
Western Yellow Paintbrush							1			1	1		1							
Cinquefoil							1			1						1				
Moss Champion							1													
Alpine Sandwort														1						
Arctic Sage							1									1		1		
Rock	0	0	0	1	0	0	2	2	2	0	3	4	2	1	5	0	1	0	6	5
Gravel	1	2	1	1	1	1	2	2	0	1	0	0	2	1	0	2	2	2	0	0
Litter	0	0	0	0	0	0	1	1	1	1	0	0	2	3	0	1	0	0	0	1
Moss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bareground	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0



# APPENDIX 2

VISUALS  
USAGE  
FISHING DATA



## VISUAL OBSERVATIONS

DATE	SPECIES	NUMBER	TIME	UTM-X	UTM-Y	COMMENTS
07/13/93	ELK	1	17:26	374200	4365200	Cow on ridge above Whitney Lake.
07/14/93	COYOTE	1	15:30	374500	4365200	Hunting in drainage below Whitney peak, above Whitney Lake.
07/15/93	GOLDEN EAGLE	1	18:05	370500	4364800	Immature Golden Eagle
07/19/93	ELK	4	12:22	363400	4366700	Bedded North of Halfmoon Lake
07/19/93	RED TAILED HAWK	1	12:25	363300	4364675	South of Lime Creek
07/21/93	BROOK TROUT	30	12:40	363050	4368350	First outlet pool at Mystic Island Lake.
07/22/93	MULE DEER	1	10:20	365800	4367700	3X3 Buck bedded on West aspect slope of East Lake Creek Valley. Fed 16:20.
07/22/93	ELK	2	10:45	366400	4369250	Two bulls, 4X4 and 3X3. West aspect slope of East Lake Creek Valley.
07/22/93	GOLDEN EAGLE	1	15:35	364000	4368000	Immature Golden Eagle on ridge east of Mystic Island Lake
07/22/93	ELK	15	15:50	363400	4377400	Feeding on grassy slope.
07/22/93	ELK	1	16:15	367100	4370900	4X4 Bull feeding below saddle of Mount Jackson.
07/29/93	MULE DEER	1	10:30	374500	4381700	Spike buck in velvet walking on Grouse Mountain trail.
07/29/93	MULE DEER	1	13:15	371800	4379350	Doe walking on Grouse Mountain trail.
07/29/93	ELK	43	17:36	370100	4375800	Feeding on Saddle North of Grouse Mountain. 6 calves. No bulls.
07/30/93	ELK	23	06:30	370500	4375900	Part of herd seen the previous day. Remainder had moved over ridge East of Grouse Mtn.
08/03/93	ELK	37	06:30	362500	4376400	Feeding on East aspect slope across from Mount Jackson.
08/03/93	ELK	87	07:30	367200	4372700	On grassy slope below Mount Jackson. 17 calves. one 4X4 Bull in Velvet.
08/03/93	Long tailed Weasel	2	15:05	367700	4371800	On narrow rocky ridge just North of Mount Jackson.
08/03/93	ELK	1	19:30	365750	4371700	Feeding 100 meters West of East Lake Creek.
08/09/93	MULE DEER	1	08:30	371300	4378500	4X4 Buck just North of Grouse Mountain trail. Approx. 20-25 inch antler spread.
08/09/93	ELK	6	09:10	369950	4375750	Two 3X3 Bulls and 4 cows. Bedded on ridge East of Grouse Mountain.
08/13/93	ELK	2	10:35	372500	4354300	Two Bulls, 3X3 and 2X2. North Homestake drainage.
08/16/93	ELK	76	17:05	377800	4359400	7 Bulls. 2 Cows with blue neck collars. West of Homestake Peak.
08/17/93	PTARMIGAN	1	06:10	378700	4359500	On West aspect slope of Homestake Ridge.
08/17/93	Elk	72	06:15	377800	4359400	Same group observed the previous evening.
08/18/93	PTARMIGAN	4	17:20	379100	4359400	West aspect slope of Homestake ridge.
08/18/93	PTARMIGAN	2	07:45	379900	4360500	On Homestake ridge.
08/18/93	PORCUPINE	1	03:30	370500	4369700	Reeds Meadow
08/18/93	MINK	1	03:30	370500	4369700	Reeds Meadow



## BACKCOUNTRY USE

LOCATION	DATE	NUMBER IN PARTY	MODE	COMMENTS
Whitney Lake	07/13/93	2	Dayhikers	
Whitney Lake	07/13/93	4	Dayhikers	
Whitney Lake	07/13/93	2	Dayhikers	
Whitney Lake	07/14/93	4	Dayhikers	
Fancy Lake	07/15/93	4	Backpackers	Camped at Fancy Lake. Caught 1 cutthroat trout. Dayhiked over Fancy Pas
Fancy Lake	07/15/93	2	Backpackers	Had camped at Fancy Lake
Fancy Lake	07/15/93	1	Dayhiker	Over Fancy Pass.
Strawberry Lake	07/20/93	14	Backpackers	Camped at Strawberry Lakes. Inner city youth group from Chicago.
Lake Charles	07/21/93	2	Backpackers	Camped at Lake Charles. Reported fishing was "good" with gold spinners.
Lake Charles	07/21/93	2	Dayhikers	Seen at Lake Charles. Later hiked to Mystic Island Lake
Lake Charles	07/21/93	2	Dayhikers	Couple ate lunch at Lake.
Grouse Mountain Trail	07/29/93	5	Backpackers	Family camped at Olson Lake. Did not fish. Spent 1 night at lake.
Grouse Mountain Trail	07/30/93	2	Backpackers	On their way to Turquoise Lake.
East Lake Creek Trail	08/03/93	6	Backpackers	On three day family backpacking trip. None Fished.
East Lake Creek Trail	08/04/93	2	Dayhikers	Elder couple from Texas vacationing. Went about 1 mile up trail .
Treasure Vault Lake	08/05/93	6	Dayhikers	Exploring mines above Treasure Vault Lake.
Missouri Pass	08/05/93	5	Backpackers	No fishermen. On 3 day trip .
Missouri Pass	08/06/93	6	Backpackers	4 fishermen. Destination unknown.
Missouri Lake	08/06/93	2	Backpackers	Camped at Missouri Lake. Did no fishing.
Missouri Lake	08/06/93	2	Dayhikers	
Missouri Creek Trail	08/06/93	2	Backpackers	Hiking to Missouri Lake. No fishing gear.
Missouri Creek Trail	08/06/93	2	Dayhikers	Hiking to Missouri Lake.
Grouse Mountain Trail	08/09/93	4	Dayhikers	
Notch Mountain Trail	08/10/93	3	Dayhikers	Hiked to top of Notch Mountain
Notch Mountain Trail	08/10/93	19	Dayhikers	Four members of group dressed in religious robes, thongs and crosses.
Lake Constantine	08/10/93	4	Dayhikers	
Lake Constantine	08/10/93	2	Backpacers	Couple camped at lake
Lake Constantine	08/10/93	4	Backpackers	Camped at lake. Caught 3 cutthroat trout.
Lake Constantine	08/10/93	2	Backpackers.	Camped at lake
Lake Constantine	08/10/93	4	Backpackers.	Camped at lake.
Fall Creek Pass	08/11/93	2	Backpackers	Couple hiking to Seven Sisters Lakes to camp.
Lake Constantine	08/11/93	7	Dayhikers	To Lake Constantine
Lake Constantine	08/11/93	2	Dayhikers	To Lake Constantine
Lake Constantine	08/11/93	2	Dayhikers	To Lake Constantine
Lake Constantine trail	08/12/93	4	Dayhikers	To Lake Constantine
Lake Constantine trail	08/12/93	3	Backpackers	To Lake Constantine
Homestake resevoir	08/13/93	4	Campers	Canoed across resevoir and camped on West shore.
Cross Creek	08/16/93	4	Dayhikers	Near bottom of Cross Creek
Cross Creek	08/16/93- 08/18/93	20	Backpackers	



## FISHING DATA

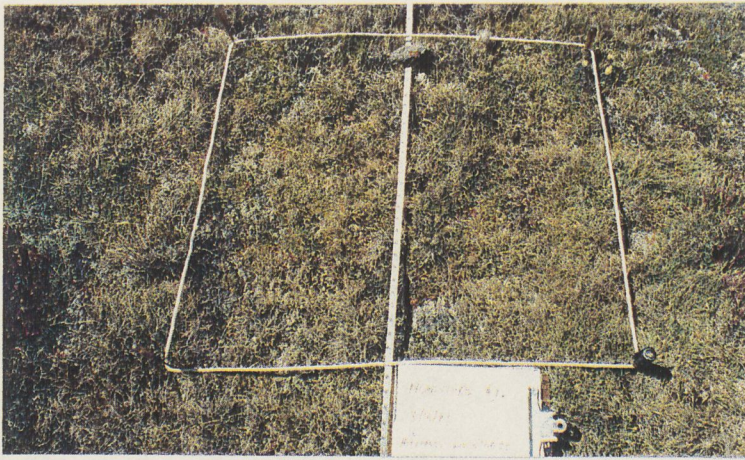
LAKE	DATE	TIME	SPECIES	NUMBER CAUGHT	MINUTES FISHED	FISH LENGTHS (inches)	TACKLE USED
CHARLES	07/21/93	12:30-13:10	Cutthroat	1	40	Cutthroat: 10	Spinners/ Mosquito Fly
MYSTIC ISLAND	07/21/93	14:30-15:30	Cutthroat	5	60	Cutthroat: 9, 10, 12, 12, 13	
			Brook	1		Brook: 12	
MYSTIC ISLAND	07/21/93	20:00-21:00	Cutthroat	9	60	Cutthroat: 8, 9, 9, 9, 10, 10.5, 12, 12, 13	Mosquito Fly.
			Brook	1		Brook: 13	



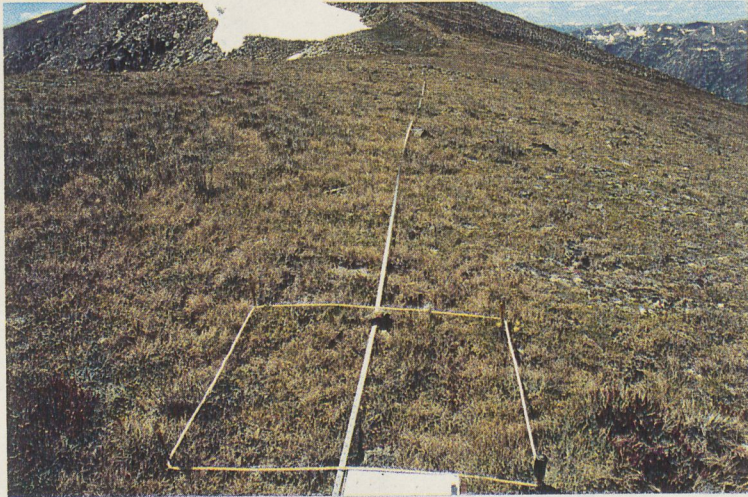
**APPENDIX 3**

**PHOTOGRAPHS**





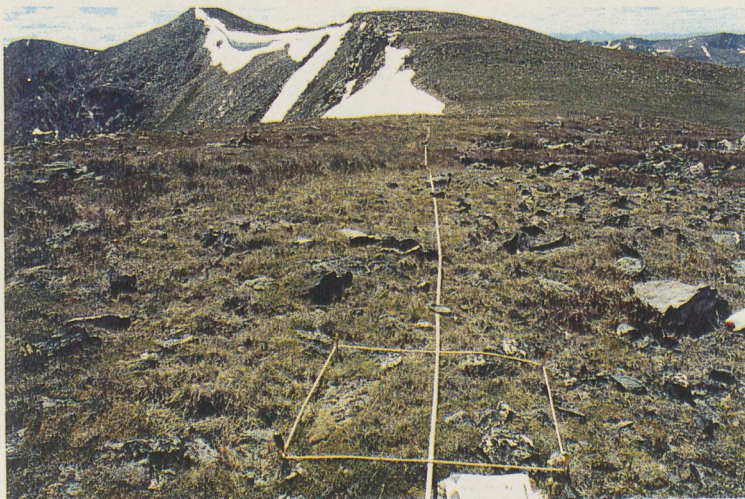
Homestake #1



Homestake #1



Homestake #2

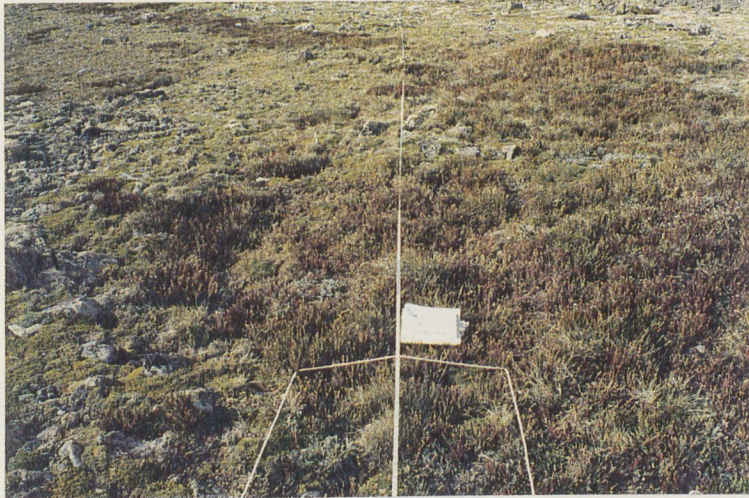


Homestake #2

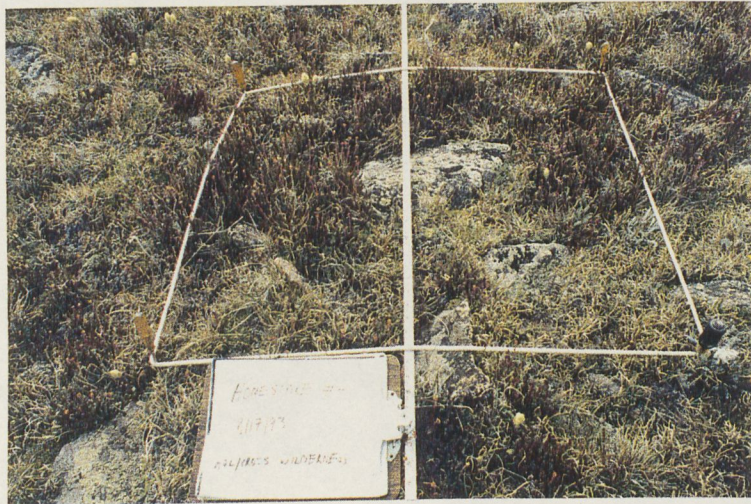




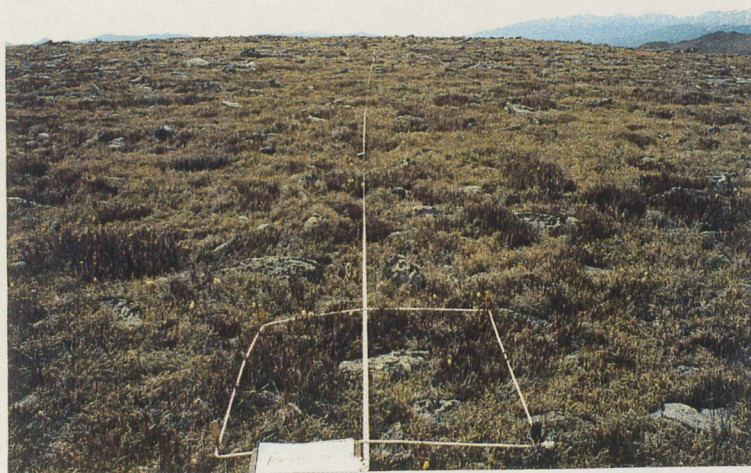
Homestake #3



Homestake #3

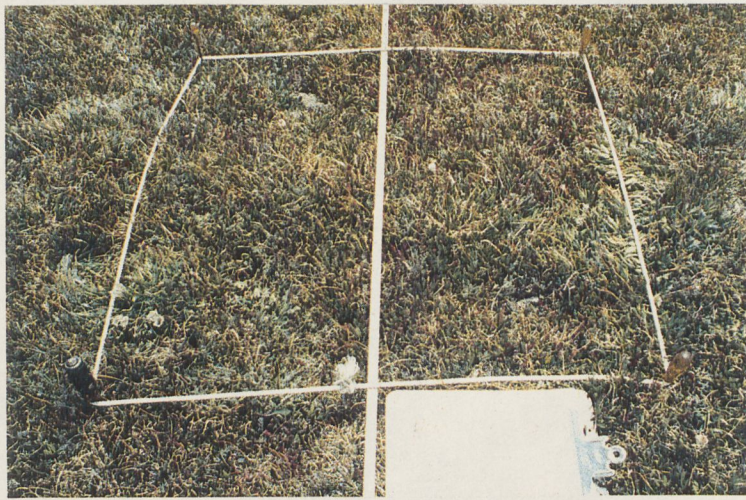


Homestake #4

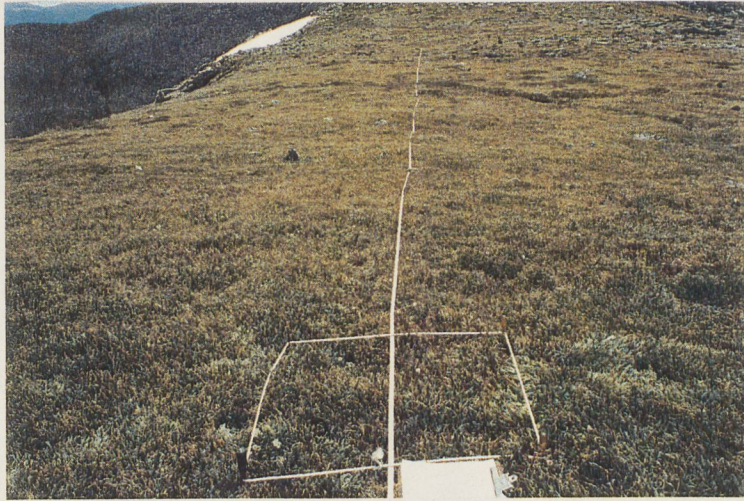


Homestake #4





Homestake #5



Homestake #5



Grouse Mtn. #1



Grouse Mtn. #1

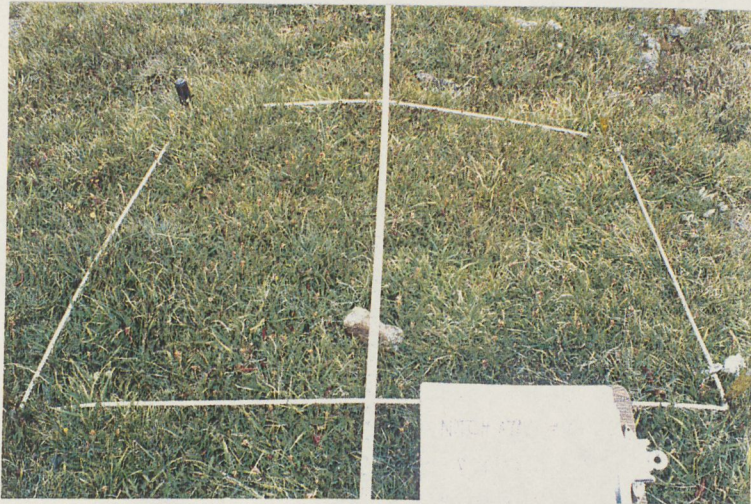




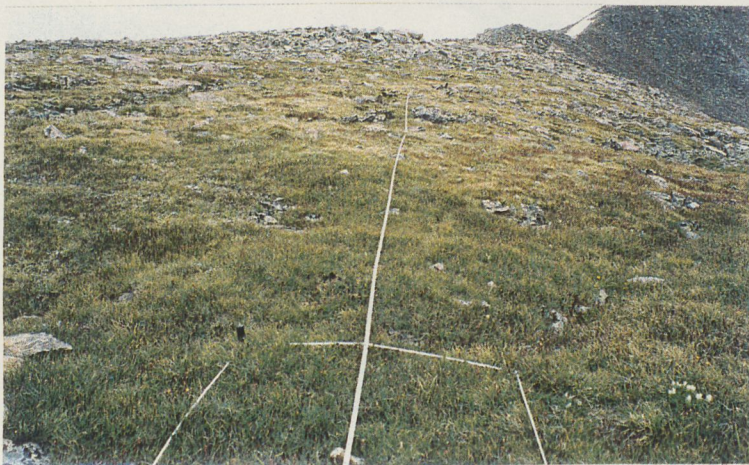
Grouse Mtn. #2



Grouse Mtn. #2

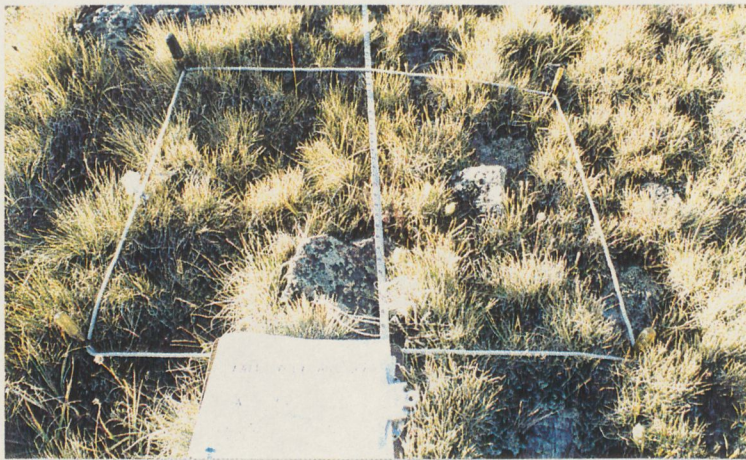


Notch Mtn. #1



Notch Mtn. #1





Fall Creek  
Pass #1



Fall Creek  
Pass #1



Fall Creek  
Pass # 2

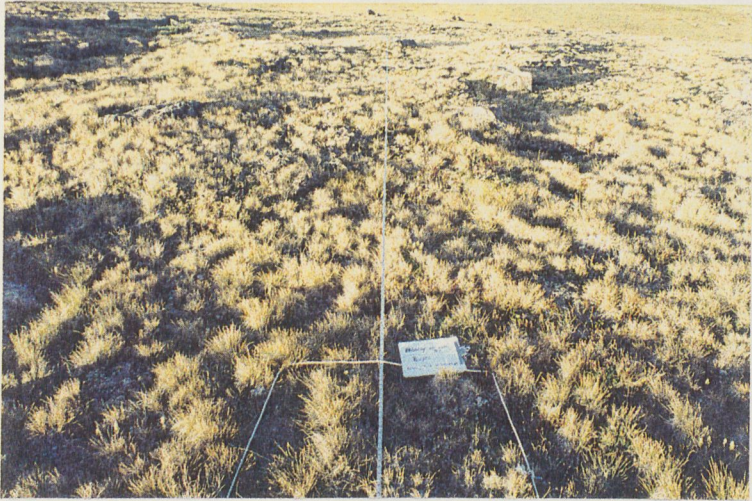


Fall Creek  
Pass # 2

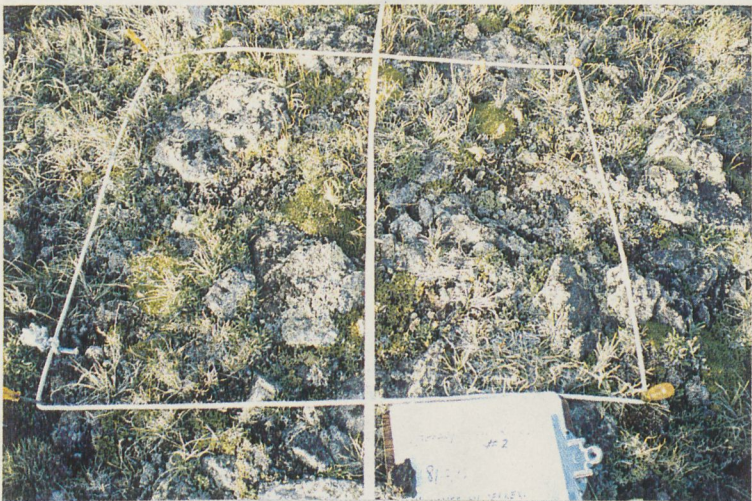




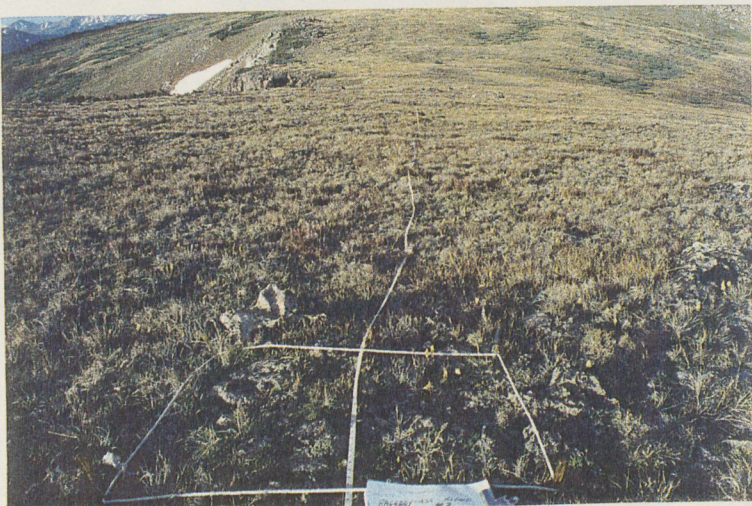
Raggedy Ass #1



Raggedy Ass #1



Raggedy Ass #2

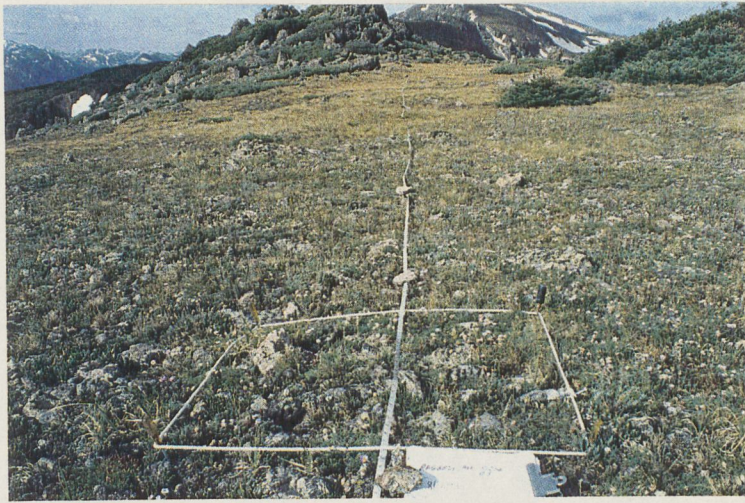


Raggedy Ass #2

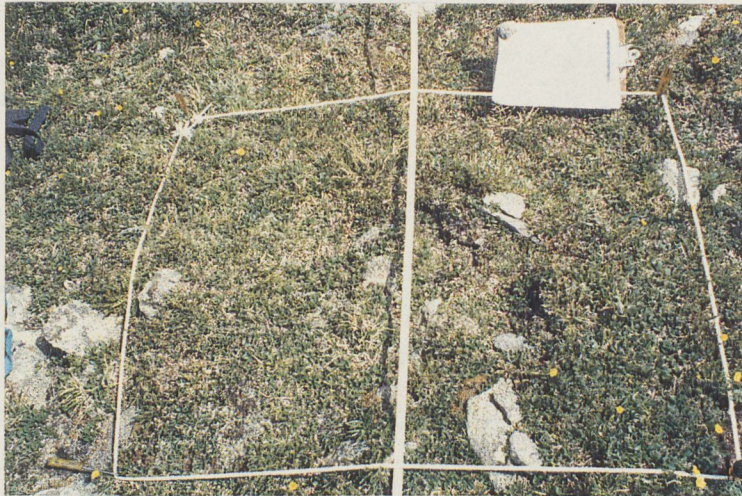




Raggedy Ass #3



Raggedy Ass #3



Mount Jackson  
#1

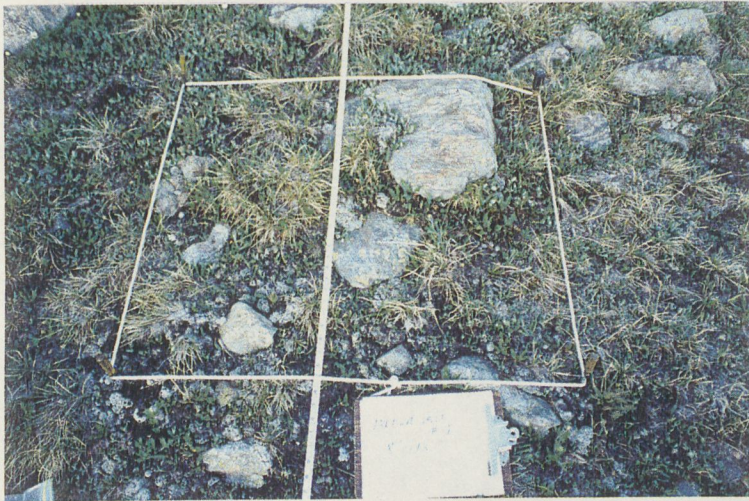


Mount Jackson  
#2

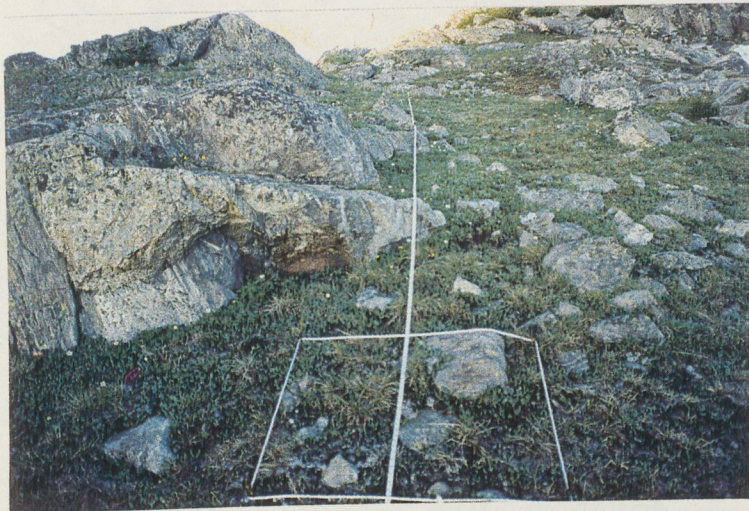




Mount Jackson  
#2



Blodgett Pass #1



Blodgett Pass #1



Blodgett Pass # 2





Blodgett Pass # 2



