UPPER GLACIER CREEK
TRAIL DEVELOPMENT PROPOSAL

JIM GILLMAN
APRIL 4,1983
WILDLAND RECREATION

MEMORANDUM

TO: LEN DUNSFORD
JIM HOWARD
GORD GIBSON

DATE: April 5, 1983

FROM: JIM GILLMAN

RE: REPORT ON PROPOSED TRAIL SYSTEM FOR THE UPPER GLACIER CREEK AREA

I submit the accompanying report entitled "Upper Glacier Creek Trail Proposal" as required for the completion of "The Upper Glacier Creek Project".

The report contains proposals for the construction of three trails in the Upper Glacier Creek area. The rationale for trail locations was based on use considerations, environmental considerations, aesthetic considerations and economic considerations.

This proposal only deals with areas that should be considered for development. Further mapping would be necessary for the final layout and construction of "my" trail in the Upper Glacier Creek Drainage area.

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF ILLUSTRATIONS

INTRODUCTION

Purpose

The purpose of this report is to propose and design three trails in the upper Glacier Creek drainage area. These trails would provide access to the alpine meadows but would limit the environmental damage caused by the increasing use levels.

Need

The number of people using the upper Glacier Creek area is increasing. This is a result of the back-to-nature movement and also of the recreational quality of the Glacier Creek drainage. If present uncontrolled use continues, irreversible environmental damage will occur. At present, damage rates are equivalent to environmental recovery rates. In the future this balance, damage rate to recovery rate will be rapidly exceeded. Hence, the construction of trails as proposed would restrict damage to limited areas.

Scope

This report proposes three trails in the upper Glacier Creek area. The rationale for the construction of these trails is based on environmental, aesthetic and cost factors.

Method of Investigation

This proposal is developed from an inventory compiled from the following sources: Field investigation, aerial photographs, National Topographic Series Maps, and Ministry of Forests Use Level Records.

DESCRIPTION OF UPPER GLACIER CREEK

LOCATION OF UPPER GLACIER CREEK

General

Glacier Creek is located 35 km northeast of Kaslo in the rugged southern Purcells. The mountains and ridges on the east side of upper Glacier Creek form the divide between the East and West Kootenays. (fig. 1)

Boundaries

The boundaries for this area are defined by the drainage divides up upper Glacier Creek. The boundaries would follow the heights of land around the north and south fork of Glacier Creek. The area contained within these boundaries offers very good potential for mountaineering, hiking and wildlife viewing (fig. 2).

HUMAN HISTORY OF UPPER GLACIER CREEK

Forestry

The upper Glacier Creek area has an extensive history of logging. There are many clear cuts which form a mosaic on the valley bottoms and mountain sides. While skid roads and haul roads on these clear cut areas supply easy access to the base of mountains of the upper Glacier Creek drainage area, they are also a source of visual pollution. Any trail in this area should be carefully located in order to avoid having trails pass through clear cuts.

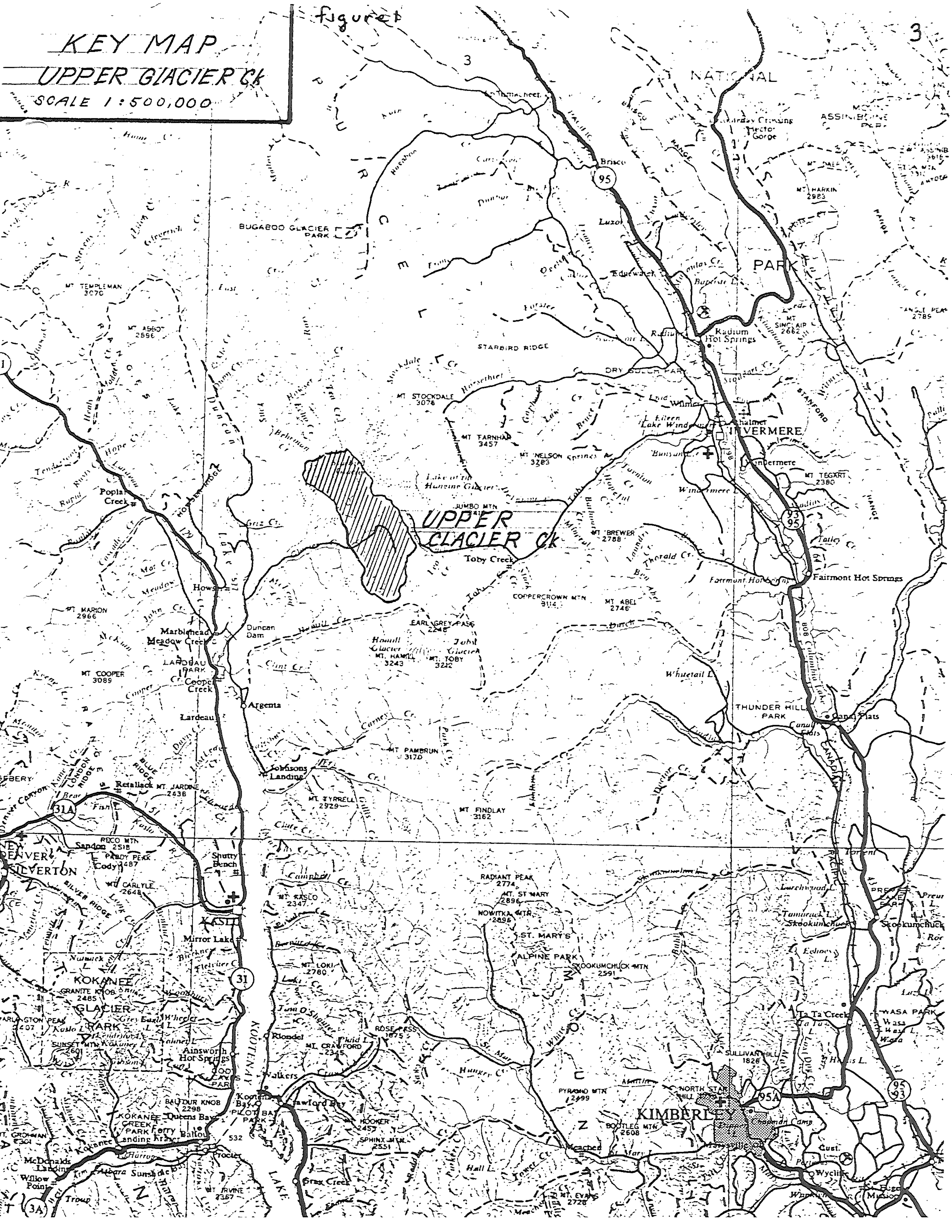
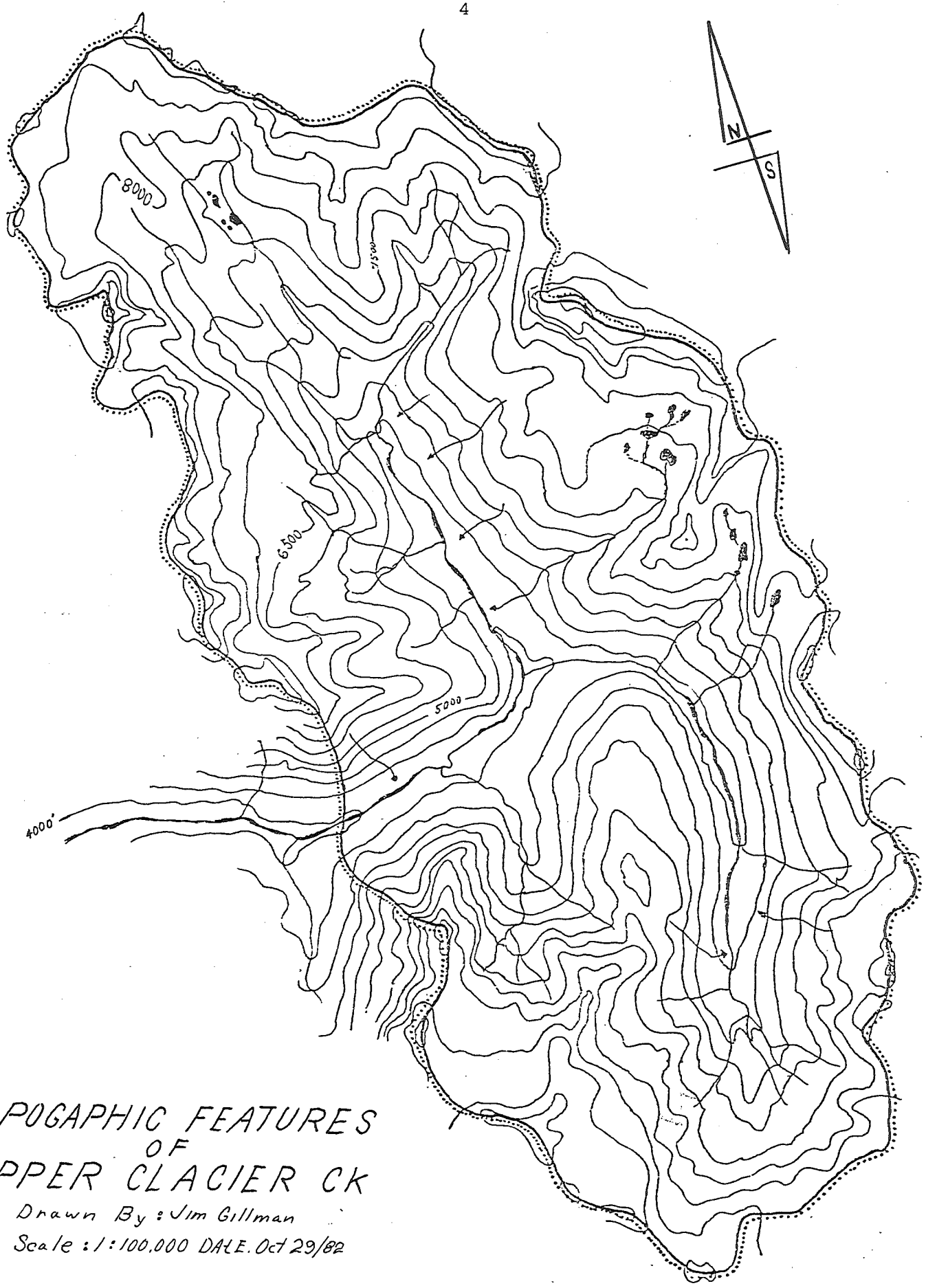


figure 1
KEY MAP
UPPER GLACIER Ck
SCALE 1:500,000
UPPER GLACIER Ck
BUGABOO GLACIER PARK
MT TEMPLEMAN 3070
MT ABBOT 2596
STARBIRD RIDGE
MT STOCKDALE 3076
MT FARNHAM 3457
MT NELSON 3283
JUMBO MTN
COPPERCROWN MTN 3114
MT ABEL 2746
MT BREWER 2788
EARL GREY PASS 2246
MT HAMILL 3243
MT TOBY 3212
MT MARION 2966
MT COOPER 3089
MT PAMBRUN 3170
MT TYRRELL 2929
MT FINDLAY 3162
MT JARDINE 2438
RECO MTN 2518
PADDY PEAK 2487
MT CARLYLE 2648
RADIANT PEAK 2774
MT ST MARY 2896
NOWITKA MTN 2896
MT KASLO 2347
MT LOKI 2780
ST. MARY'S ALPINE PARK
SKOOKUMCHUCK MTN 2591
KOKANEE GLACIER PARK
GRANITE KNOB 2485
ROSE PASS 1675
MT CRAWFORD 2345
SULLIVAN HILL 1826
NORTH STAR HILL
PYRAMID MTN 2499
BOOTLEG MTN 2608
BALFOUR KNOB 2298
HOOKER 2457
SPHINX MTN 2551
MT IRVINE 2367
MT EVANS 2728
MT TEGART 2380
MT SINCLAIR 2662
MT HARKIN 2983
TANGLE PEAK 2789
NATIONAL PARK
MOUNT ASSINIBOINE PARK
THUNDER HILL PARK
WASA PARK
KOOTENAY LAKE
Brisco
Luxor
Edgewater
Radium Hot Springs
INVERMERE
Windermere
Wilmer
Fairmont Hot Springs
Canal Flats
Skookumchuck
Ta Ta Creek
Wasa
KIMBERLEY
Marysville
Wycliffe
Howser
Duncan Dam
Argenta
Lardeau
Johnsons Landing
Marblehead
Meadow Creek
Cooper Creek
Poplar Creek
KASLO
Mirror Lake
Shutty Bench
NEW DENVER
SILVERTON
Sandon
Cody
Retallack
Ainsworth Hot Springs
Riondel
Kootenay Bay
Crawford Bay
Queens Bay
Balfour
Procter
McDonalds Landing
Willow Point
Toby Creek
95
93
95A
31
31A
3A
3

Fig 2



TOPOGAPHIC FEATURES
OF
'PPER CLACIER CK

Drawn By: Jim Gillman

Scale: 1:100,000 DATE. Oct 29/82

Recreation

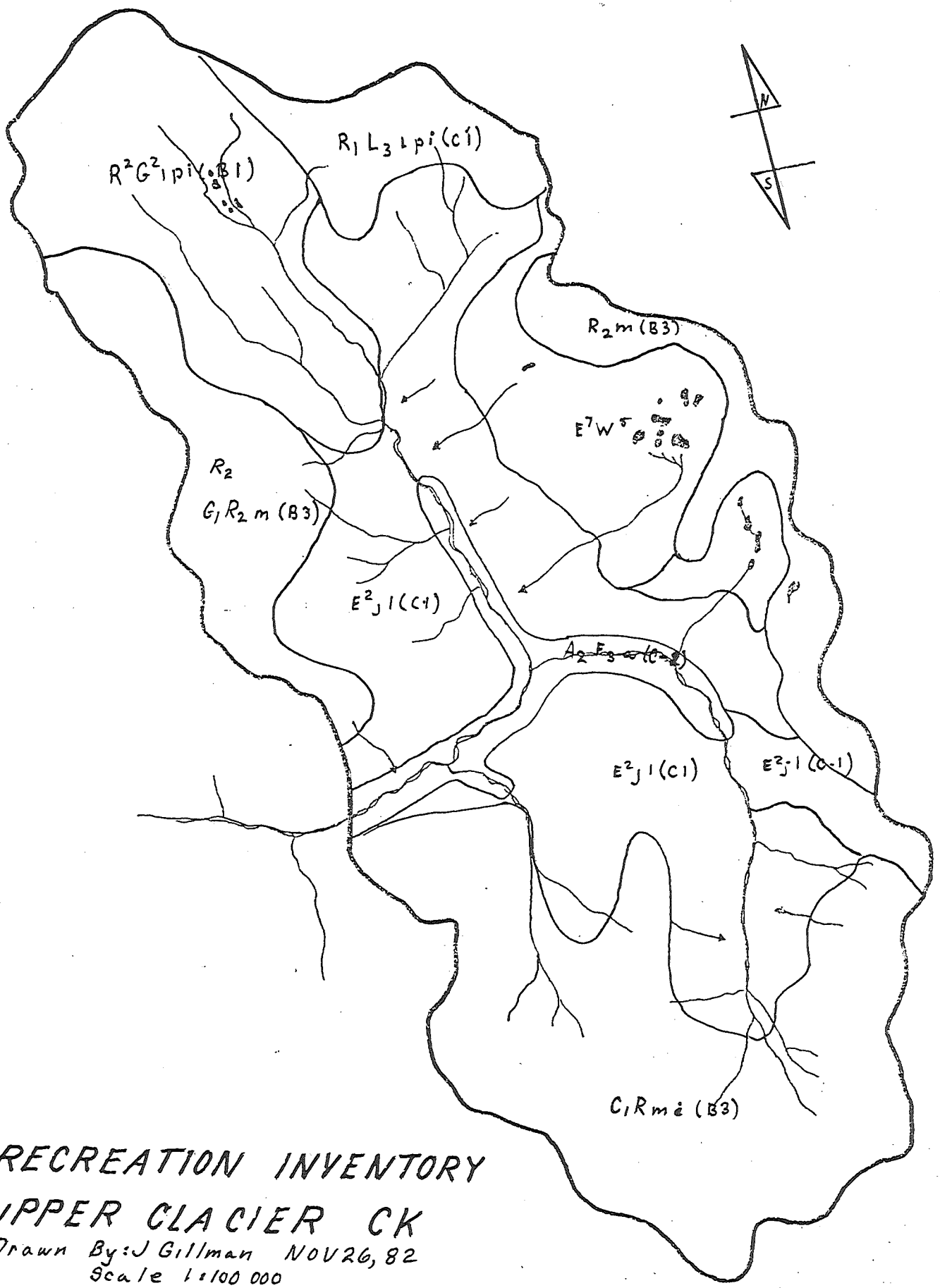
The area's recreation potential was mapped with the use of the British Columbia Recreational Land Use Inventory System. (fig. 3) The map provides a good visual image of the quality of the recreation in the area.

Mountaineering is by far the most important activity that occurs in the area. Camping and hiking are also very important activities followed by viewing, fishing and hunting respectively.

Hiking and Camping

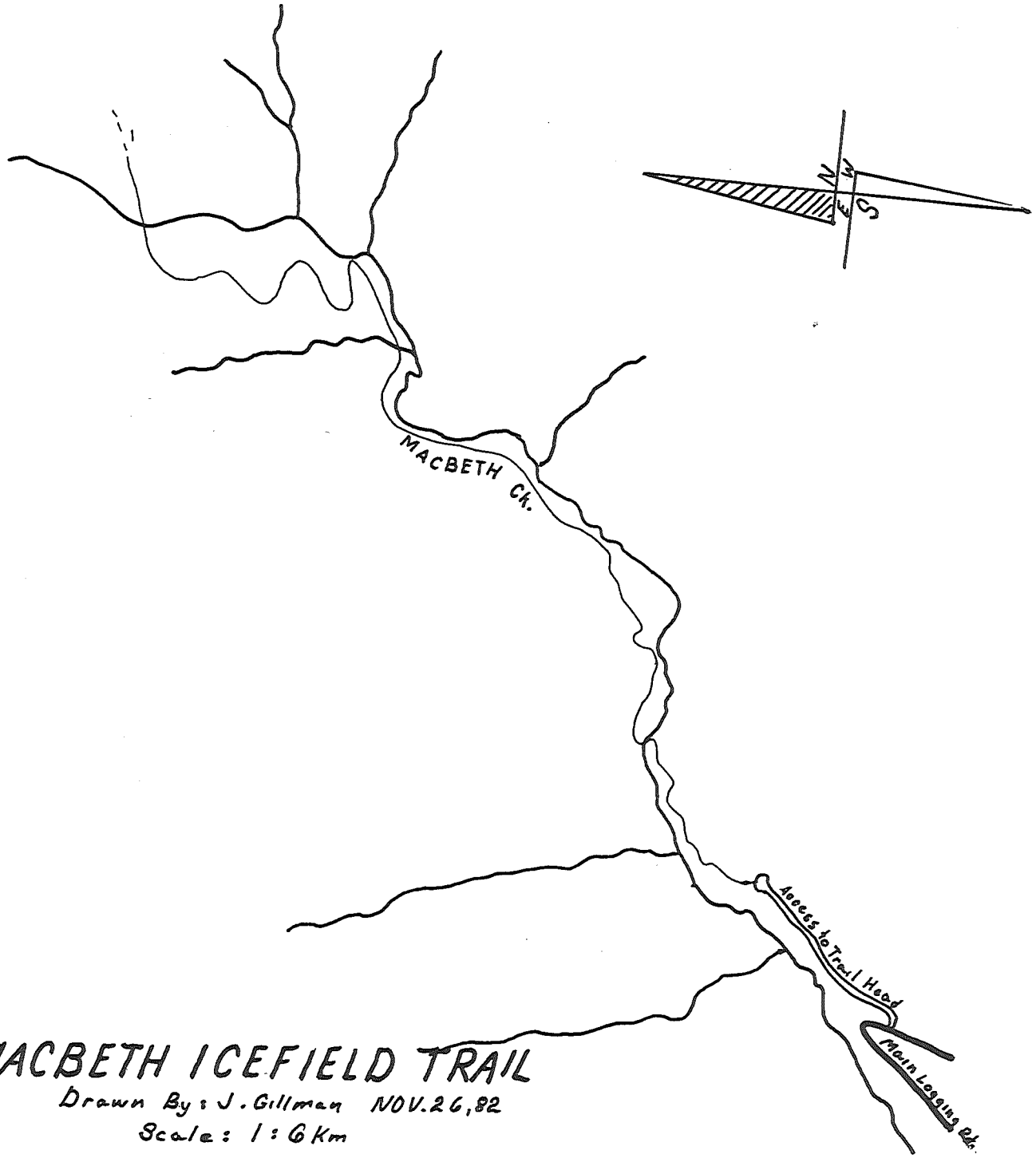
There are two hiking trails at present. These trails are the MacBeth Ice Field trail and the Jumbo Pass trail. The Jumbo Pass trail is the most popular of the two. It is a steep trail, 4.2 kilometers in length. The change in elevation is 840 meters The average grade is 18% with a maximum grade of 46%. (fig. 4, 5) The MacBeth Ice Field trail is a more difficult trail, 6 kilometers long with an elevation gain of 1,000 meters The trail has an average grade of 25% and maximum grade of 60%. This trail is used primarily by mountaineers to gain access to the MacBeth Ice Field. (BCMF 1982) Neither of these two areas has any specified camping areas.

User statistics are scarce at best for these trails. Statistics for 1981 indicate that 125 people used the MacBeth Ice Field trail. This figure is likely a slight underestimate of total user populations. The figures for 1982 are at present unavailable as well as previous years. (Forest Service 1982)



RECREATION INVENTORY
UPPER CLACIER CK
Drawn By: J Gillman NOV 26, 82
Scale 1:100 000

fig 3



MACBETH ICEFIELD TRAIL

Drawn By: J. Gillman NOV. 26, 82

Scale: 1:6 Km

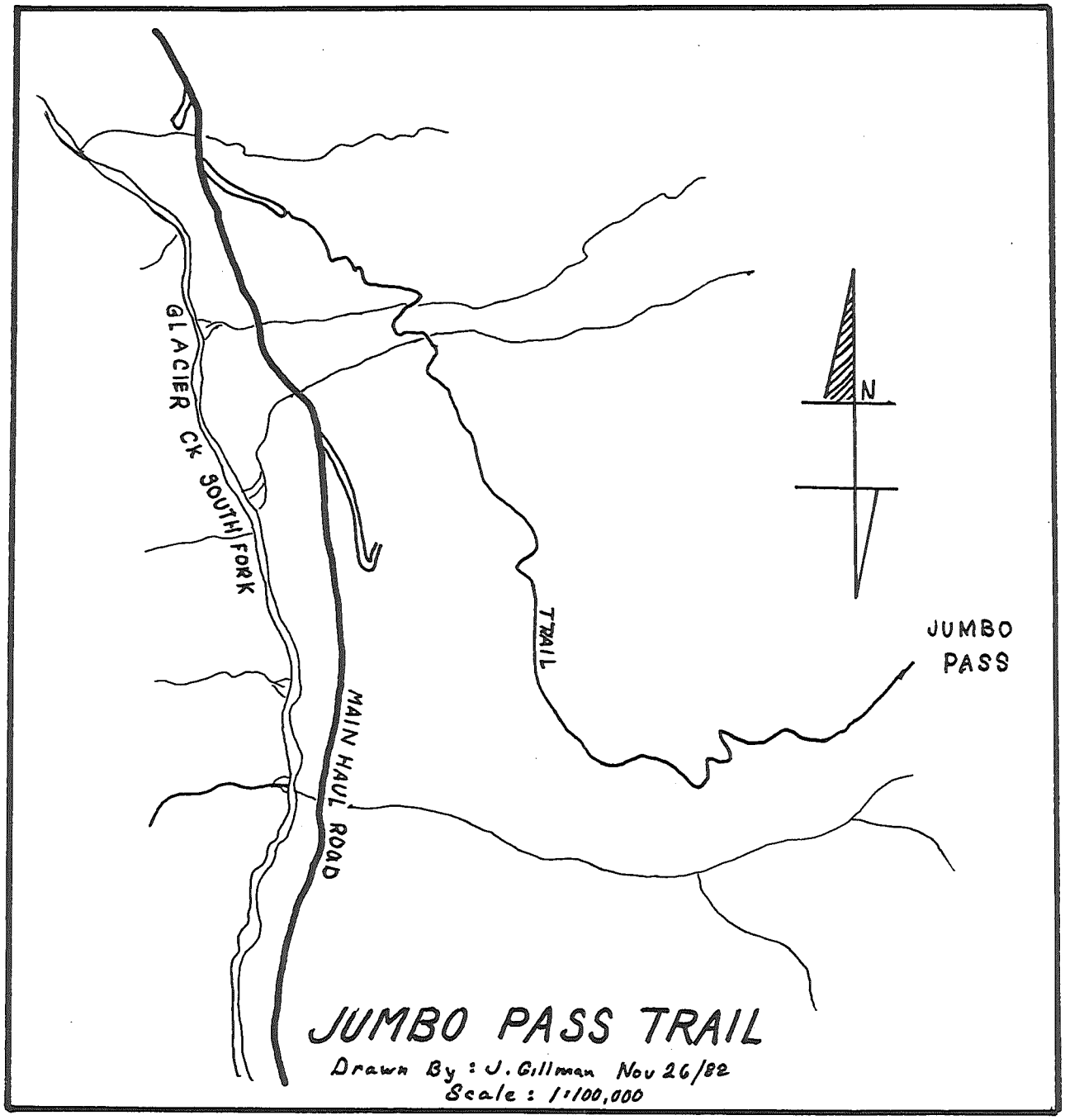

GLACIER CK SOUTH FORK
MAIN HAUL ROAD
TRAIL
JUMBO PASS
N
JUMBO PASS TRAIL
Drawn By: J. Gillman Nov 26/82
Scale: 1:100,000

fig 5

The environment of the meadows the MacBeth Ice Field trail travels through is moderately sensitive. However this area has a fairly high carrying capacity. This area has potential for much greater use and is capable of withstanding much greater pressure than present.

There are several other areas in North and South Glacier Creek that possibly receive more use than the trails mentioned previously, primarily the Monica Meadows area, North Glacier Creek area, and the Horseshoe Glacier area. These areas are used primarily by mountaineers. (fig. 6) Because there are no registration boxes or defined trails there is nothing to indicate use levels. However, my observations in the area almost always show greater concentrations of people in these areas than on the MacBeth Ice Field trail and Jumbo Pass trail areas.

Mountaineering

There are countless climbs in the area. These routes are all centred around 15 peaks that are all over 9,500 feet. Unfortunately many of these routes are very inaccessible. The difficult approaches make many of these routes too time consuming to be practical for many time conscious people. Among the more accessible routes are the mountains that are at the head of the Horseshoe Glacier. (fig. 6) This area contains the third and fourth highest peaks in the Purcells. (fig. 7)

fig 6

figure 6

Glacier Creek has boundless potential. The rock in the majority of the mountains is quite broken and offers easy routes for the novice. In several areas large clean rock faces offer climbing to challenge even the expert. Routes in these areas are hard and very vertical. The long vertical cracks are continuous and offer good protection, (fig. 7)

Glacier Creek does have one very large drawback, lack of safety in terms of rescue. This area is 75 miles from the nearest helicopter and 35 miles from the nearest telephone. This increases rescue time dramatically. In bad or even moderately bad weather, helicopter rescue is very difficult.

At present, very little winter recreation takes place in the valley. The access road is not maintained and distances make travel to this area impractical. Avalanche risk may be a serious drawback.

INVENTORY OF UPPER GLACIER CREEK

Geophysical Features of Upper Glacier Creek

Geological History

The present day Glacier Creek area is an expanse of rugged peaks, glaciers and morainal landscapes. The formation of the Glacier Creek area took place during the early Tertiary era. (Reesor 1973) Various intrusions took place in the area until the area was glaciated by the Cordilleran Ice Sheet during the last Ice Age. The present landforms are primarily

due to heavy alpine glaciation during the Pleistocene epoch. Evidence found in the Glacier Creek area indicates that the ice may have been as thick as 700 meters.

The geological features in the area are similar to the Horsethief mountain group. These formations consist mainly of green slate and argilite sediments that were laid down during the early Protozoic era. Two large areas of Granadiority exist in the MacBeth group, and Truce Caldern groups. (Reesor 1973) These formations were created very early in the Pleistocene epoch.

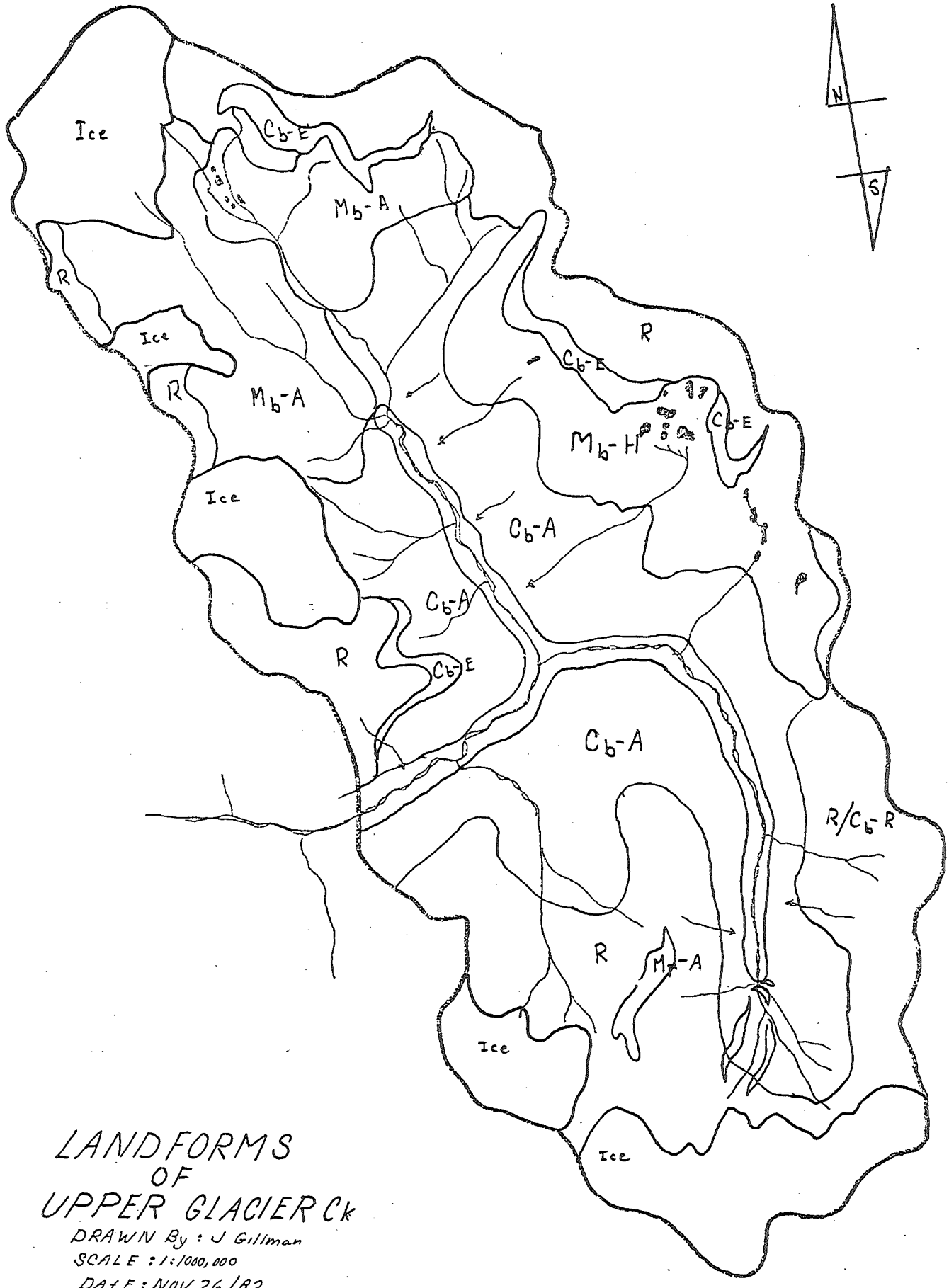
Very little evidence of fluvial action is present except in the immediate vicinity of the creek. This is due to relatively recent glaciation of upper Glacier Creek.

The majority of land forms in the area were created by glacial action. (fig. 8) The area provides textbook examples of alpine glaciation. Beautiful examples of lateral, terminal and recessional morains exist in the area, as well as eskers, scoured bedrock and ice sharpened peaks. All these features are very well preserved as the glacier has just recently receded in many of the areas. (fig. 9,10,11)

Soils

The soil types are very uniform since there is only one parent material for soil development, a thin morainal blanket. Two soils are predominantly associated with this area. They are Sombric Humo-ferric Podzol and Orthic Humo-ferric Podzol. (J.R. Jugen 1980)

fig 8



LANDFORMS
OF
UPPER GLACIER Ck

DRAWN By : J Gillman
SCALE : 1:1000,000
DATE ; NOV 26/82

(fig 9)

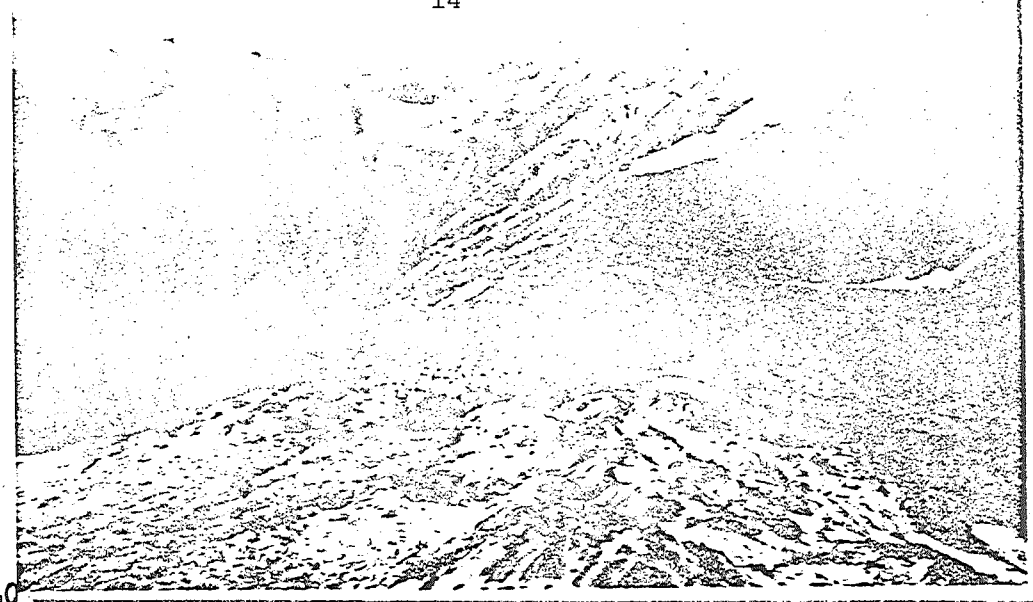
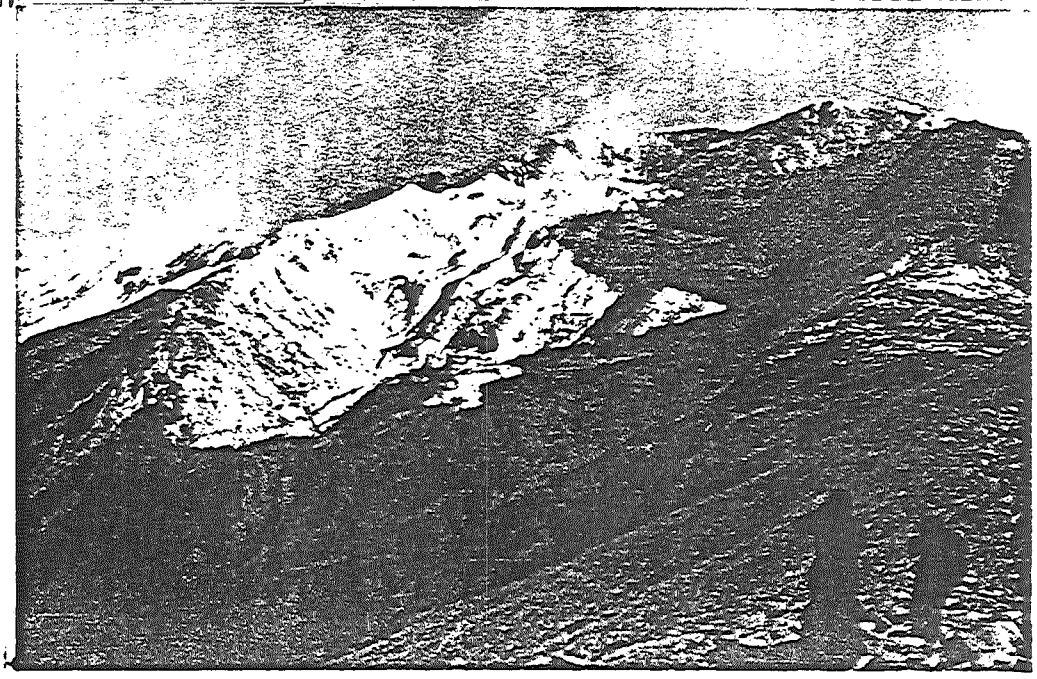


fig 10

fig 11



These soils are generally very rich in clay and lack good drainage. Great care must be taken in locating and building trails in these soils. Undercutting banks for trail construction can lead to serious problems, such as the increase in numbers of wind throws and mud flows.

Climatic Conditions

The Northern Purcells have the highest amount of precipitation of almost any other area in the Interior of British Columbia. This area receives between 150 cm and 250 cm of precipitation annually. The sub alpine zone receives an average of 1.5 to 2 m of snow in the winter. In the summer temperatures of between 18 and 20° C are average. In the winter temperatures of -10° to -5° C are average for the sub alpine area. In the alpine areas the temperatures and snow depths are more variable and change dramatically with altitutde and aspect. (R.C. Brooke 1970)

The wind patterns in this area are primarily from the south west. This is evident from the tremendous snow loading and cornice development in the north east facing slopes.

The heavy snowfall and constant wind patterns lead to very serious avalanche problems in the Glacier Creek drainage. For this reason people using the area for recreation in the spring must be particularly careful. The terrain in general is very steep. This means with any type of warming, instability in the snow pack is a certainty.

Biophysical Features of Upper Glacier Creek

Vegetation

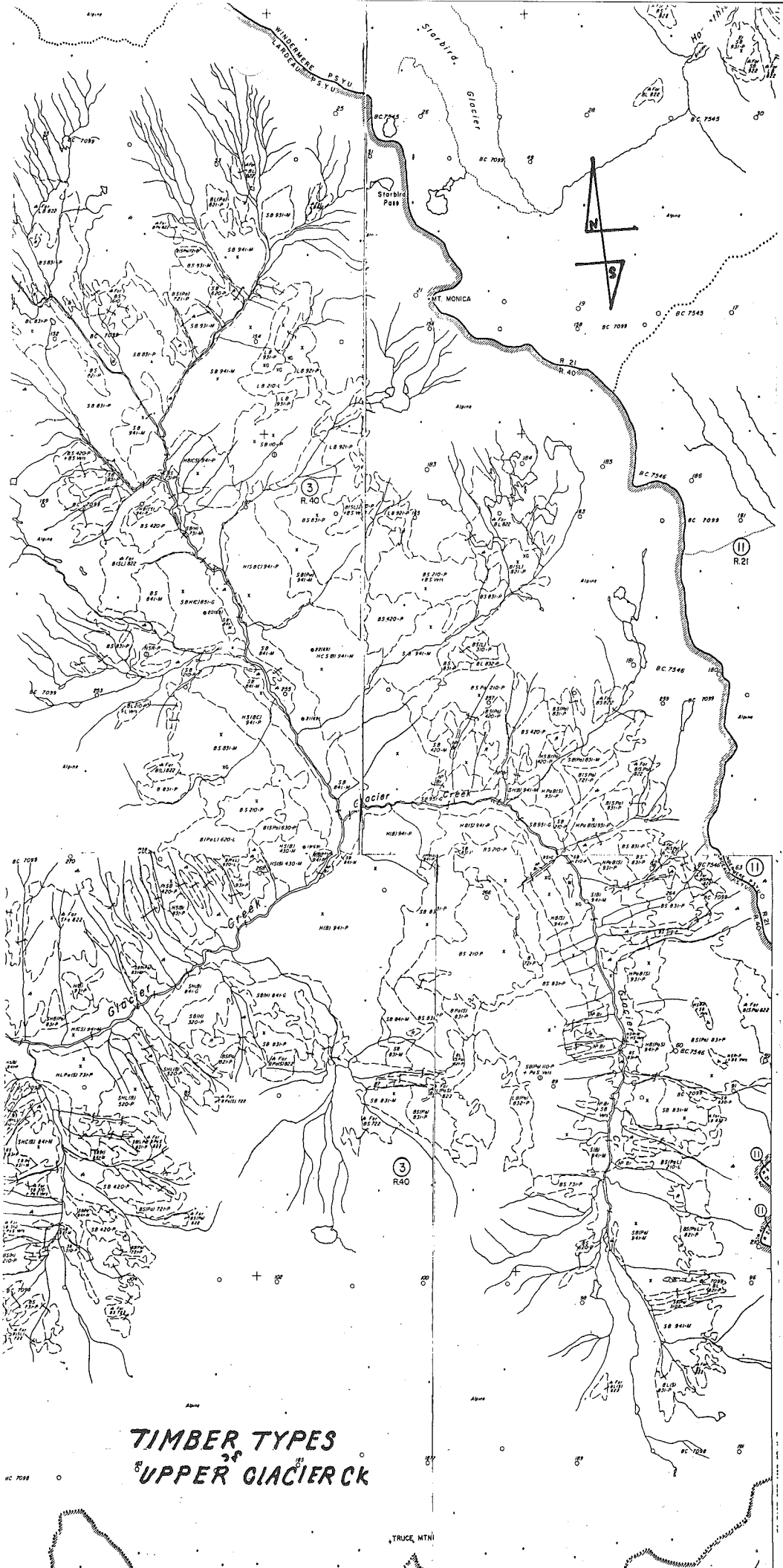
The large amount of topographic relief in this area gives rise to large amounts of diversity in plant species in a very small area. This little valley contains alpine tundra, sub alpine forest and montaine forest all of which contain their common plant associations. (fig.12)

The montaine forest is characterized by several common tree species and several common plant species. The predominant tree species is Western Red Cedar, (Thuja plicata) associated trees are Douglas Fir, Lodgepole Pine, Trembling Aspen and Western Hemlock. The plant association for this area is Corylus aralia. This association would indicate the growth of plants such as White Flowered Rhododendron, Vibernum edule, Lonicera involucata, Galium triflorum, Pyrola sp. and Athyrium filix-femina.

The sub alpine forest has a very different plant association. It is Vaccinium membranocen, Lonicera utahensis, Sorbus Sitchensis, Tiarella unifaliato and Rubus pedatus.

The alpine tundra has no defined plant association. The tundra is too variable and changes in a matter of feet. The Ministry of Forests has not yet worked out a system of classification for the alpine tundra. At present the cost does not justify the benefits as the tundra has no timber values. In the future the growing value of recreation may deem it necessary to complete a classification for the alpine tundra.

Figure 12



TIMBER TYPES
OF
UPPER GLACIER Ck

Fauna (Terrestrial Mammals)

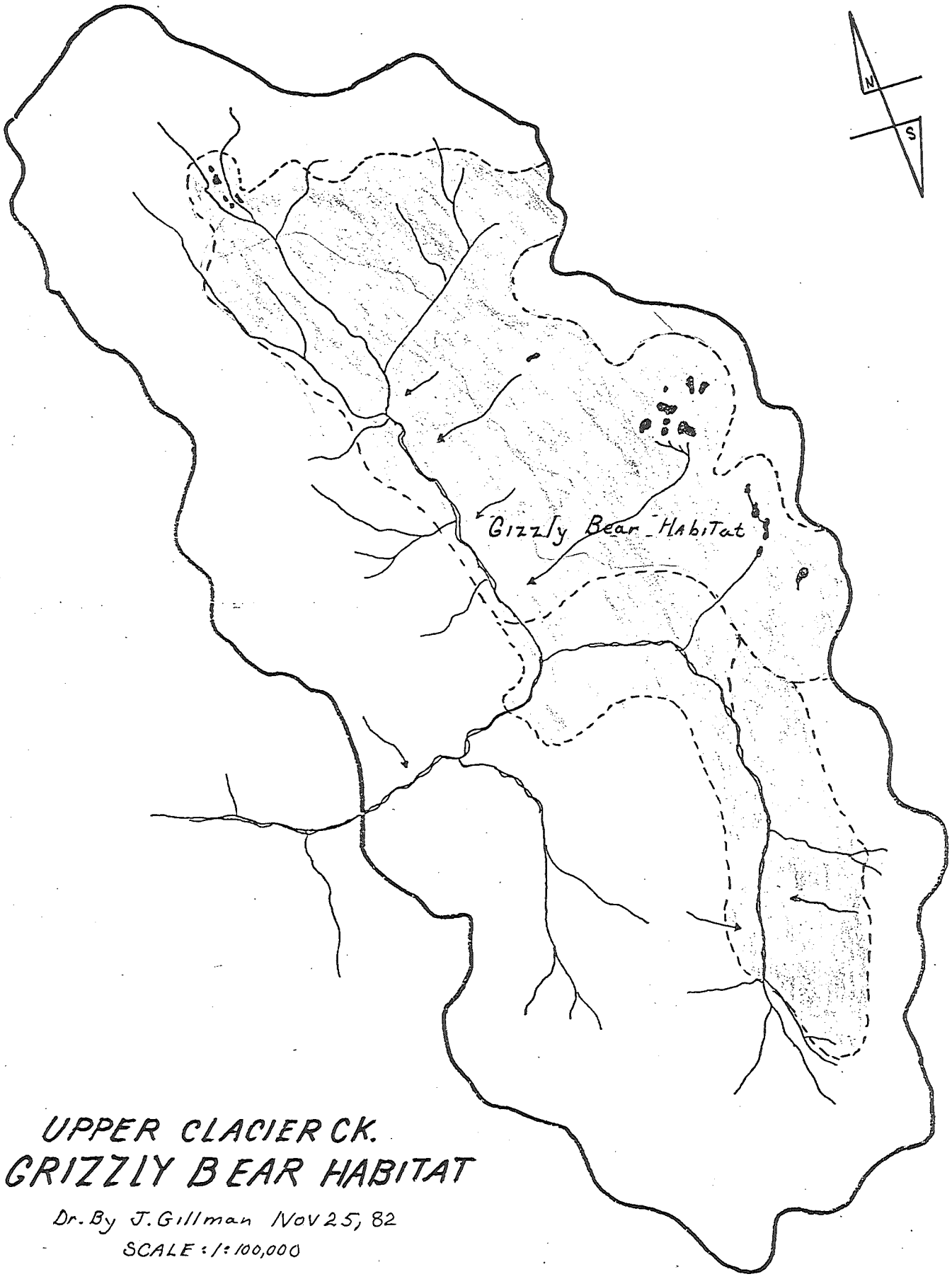
Glacier Creek plays a very important role in providing habitat for large animals. Goats, deer, elk and bear are found in this area. The quality of the range is different for each species.

Upper Glacier Creek provides some relatively small areas of excellent habitat for Grizzly Bear. There are large areas of transitions between alpine tundra and sub alpine forest which are perfectly suited for Grizzly Bear habitat. Associated with the alpine and sub alpine meadows are burned areas which extend out of Glacier Creek and into the Toby Creek drainage area. In the meadows there are extensive Grizzly Bear signs, territorial markings, diggings and feces. (fig. 13)

There is a large goat habitat contained in the Glacier Creek area. The huge alpine areas and large wind blown ridges are essential to goats for survival in the winter. The wind blows snow clear of small grassy ledges and humics. The habitat contained in this area is of reasonably good quality for goats.

The habitat for deer in the area is average. The logging has enhanced the area by creating more forest edge type habitat.

Very few studies ever seem to exist on small animals and Glacier Creek is no exception. From personal observation I found that there are large populations of marmots, squirrels and pikas.



UPPER CLACIER CK.
GRIZZLY BEAR HABITAT

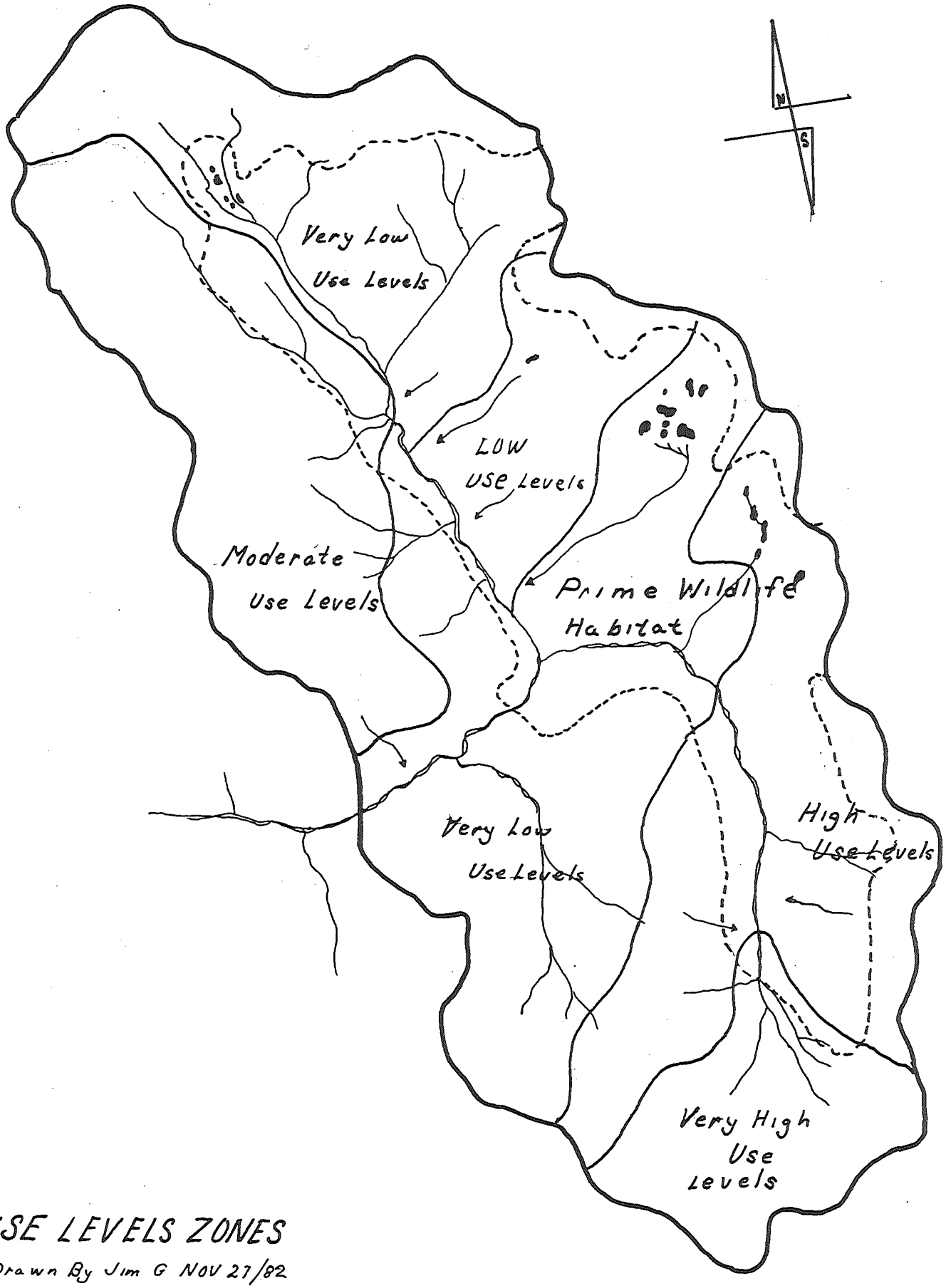
Dr. By J. Gillman Nov 25, 82
SCALE: 1: 100,000

figure #3

NEED FOR TRAIL DEVELOPMENT

INCREASING USE LEVELS

There are indications that use levels in the Upper Glacier Creek area are increasing rapidly. A survey conducted by the Ministry of Forests confirms this trend. User statistics indicate that in 1982, 125 people used the MacBeth Icefield trail (Forest Service 1982). This use level appears to be low but several things must be taken into consideration when applying this data to Recreational planning for the Upper Glacier Creek area. The survey conducted by the British Columbia Ministry of Forests collected data from only a small portion of Upper Glacier Creek. From personal observation, the area involved in the study (fig. 14)receives relatively low use levels compared to other areas of Upper Glacier Creek. Areas such as Horseshoe Glacier and Monica Meadows likely will receive triple the use level of the MacBeth Icefield area. Consideration also must be made when judging the validity of data collected from voluntary surveys. It is likely that many people will refuse to fill out the registration forms. Data collected in this manner usually shows a significantly lower number of users than the actual value. In most surveys of the type used by the Ministry of Forests, correction factors are used to indicate figures closer to the actual figures. In the case of the MacBeth Icefield survey no correction figures were used. So the number of people that actually use the area is almost certainly greater than 125. Use levels for 1982 show that use levels have doubled compared to figures for the previous year.



USE LEVELS ZONES

Drawn By Jim G NOV 27/82

SCALE 1:100,000

For the above reasons the actual number of people using the Upper Glacier Creek is likely much higher than the figure stated by the British Columbia Ministry of Forests. In the future, high growth levels will mean very large numbers of people are using the resources of the Upper Glacier Creek area. A system of trails would both enhance the quality of the recreational experience and help preserve the quality of the environment.

PROTECTION AGAINST ENVIRONMENTAL DAMAGE

The present level of recreational use in Upper Glacier Creek is beginning to cause environmental damage. At present this damage is very light. In the near future damage to the under growth will become more apparent. The shrub and herb layer will be the most sensitive to higher use levels. At present, the rate of environmental damage is roughly equivalent to the rate of environmental recovery. The environmental recovery will be exceeded by the damage created by increasing use levels in the near future.

At present the environmental damage is spread over a very large area. This is primarily due to a lack of defined routes into the more popular areas of the Upper Glacier Creek. A trail into many of these areas would restrict damage to small areas. There may actually be an increase in damage levels in areas associated with the trails; however, the total damage would be lower on a percentage by area basis (Defoe 1979). A trail system would greatly increase the ability of this area to support recreational use without serious environmental damage.

PLANNED TRAIL DEVELOPMENTS

GENERAL

At present there are three major areas in Upper Glacier Creek that are not served by trails. At present, all of these areas at present are receiving moderately high levels of use. In the future they will likely receive very high levels of use due to their high potential to support recreation. These areas include the extreme northern end of Glacier Creek, the meadows associated with Mount Monica and the area around the northern tip of the Horseshoe Glacier. To protect these areas from environmental damage trails must be constructed in the next several years (fig. 15).

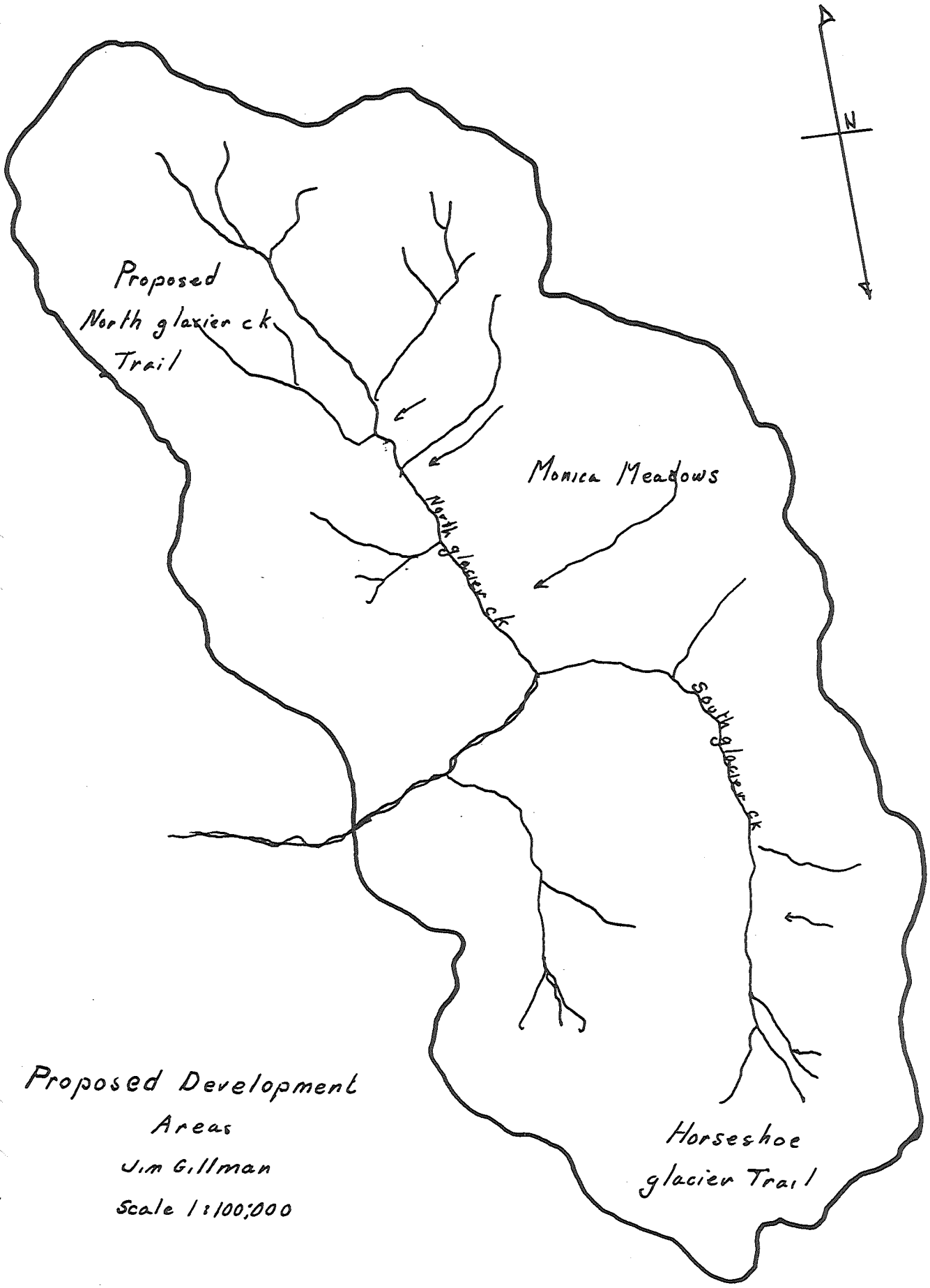
MOUNT MONICA MEADOWS

General Description

Mount Monica Meadows is perhaps the most aesthetically beautiful in the upper Glacier Creek area. Large alpine meadows stretch for miles dotted with small alpine lakes. This is a truly enjoyable area to visit. At present the hike into this area is difficult and a trail would greatly enhance the level of enjoyment of most visitors to the area.

Location

Monica Meadows is located on the shoulder of Mount Monica on the east side of the north fork of Glacier Creek. (fig. 15) It is



Proposed Development
Areas
Jim Gillman
Scale 1:100,000

situated on a shoulder which extends in a crescent shape around the peak of Mount Monica. The Meadow is perched 800 metres above the main valley floor.

Vegetation

The meadow lies along the transition between alpine tundra and sub alpine forest. There is only a very sparse tree cover consisting primarily of limber pine and alpine larch. The ground cover is predominantly sedges and lichens. There are also many alpine flowers spread throughout the area.

Soils

The majority of the soils in this area are reasonably well drained considering their parent material is glacial till. The reason for the better than average drainage appears to be the slope and the higher sand content of this glacial till. The most predominant soil types here are Humo-ferric Podzol on the areas of low slope and Ferric Podzol on areas of higher slope. (J.R. Jugen 1980)

Great care should be taken in locating trails in the Monica Meadow area. With proper design and location trails would cause very little damage to the environment.

Special Features

The area around Monica Meadows composes some of the finest grizzly bear habitat in the Upper Glacier Creek area. Features that enhance the quality of this area for bear habitat are the old

forest fire burn just below the meadows and the numerous talus slopes found in the area.

Rationale

Construction

The prime reason for the location of this trail is the high use levels in the area. At present many people are using this area to gain access to the mountains, primarily to Mount Monica, Mount Jumbo and Mount Eyebrow. The amount of bush travel is limited by the fact that a logging road can be followed by hikers which takes them to an area 500 metres below tree line. For this reason, this route is very popular.

Unfortunately, this popularity leads to several problems. Many of the people using this area choose a reasonably similar route. This limits damage to a particular corridor. Even though the use is only moderate, damage over a broad area is relatively high. This corridor is already showing serious signs of erosion primarily due to steep terrain and moderate use levels.

Once the hikers have reached the Monica Meadows area they spread out using the meadows as an easy route to obtain their objectives. At this point there appear to be two main routes, north along the meadows to Starbird Pass or south to the Mount Jumbo area. Along this route signs of human activity are readily apparent on the fragile alpine tundra.

To protect the Monica Meadows area from environmental damage a trail is required. This applies to present use levels as well as future use levels.

With the use of this area in the future, one overriding problem must be studied. This is the conflict between humans and grizzly bears. The lack of a trail in this area would not solve this problem. Use of this area would continue with or without the trail and the conflict would remain. The solution may lie in a public awareness program.

Location

The location of the Monica Meadow trail was based primarily on environmental factors. However, many other factors were considered in the choice of trail location: Topographic features, distance, viewing pleasure, soil type, drainage and cost. The location chosen for this trail fills the requirements of the above factors very well.

The site chosen for this trail was the most environmentally durable. In this area there are very few fragile species of plants. The soils along this route would be easily ecavated for trail construction and offer excellent drainage. Due to the well drained nature of the soil, erosion should not be a major concern. The underbrush in this area is moderately heavy; this would likely mean higher clearing costs. An old logging road "switchbacks" halfway up the shoulder of Mount Monica. It is close to the area of the proposed trail location. This road is for the most part inaccessible to vehicles due to snow and poor road conditions. The trail could follow this road thereby eliminating the necessity of

2.5 kilometers of hiking trail. This would cut down the trail construction cost dramatically.

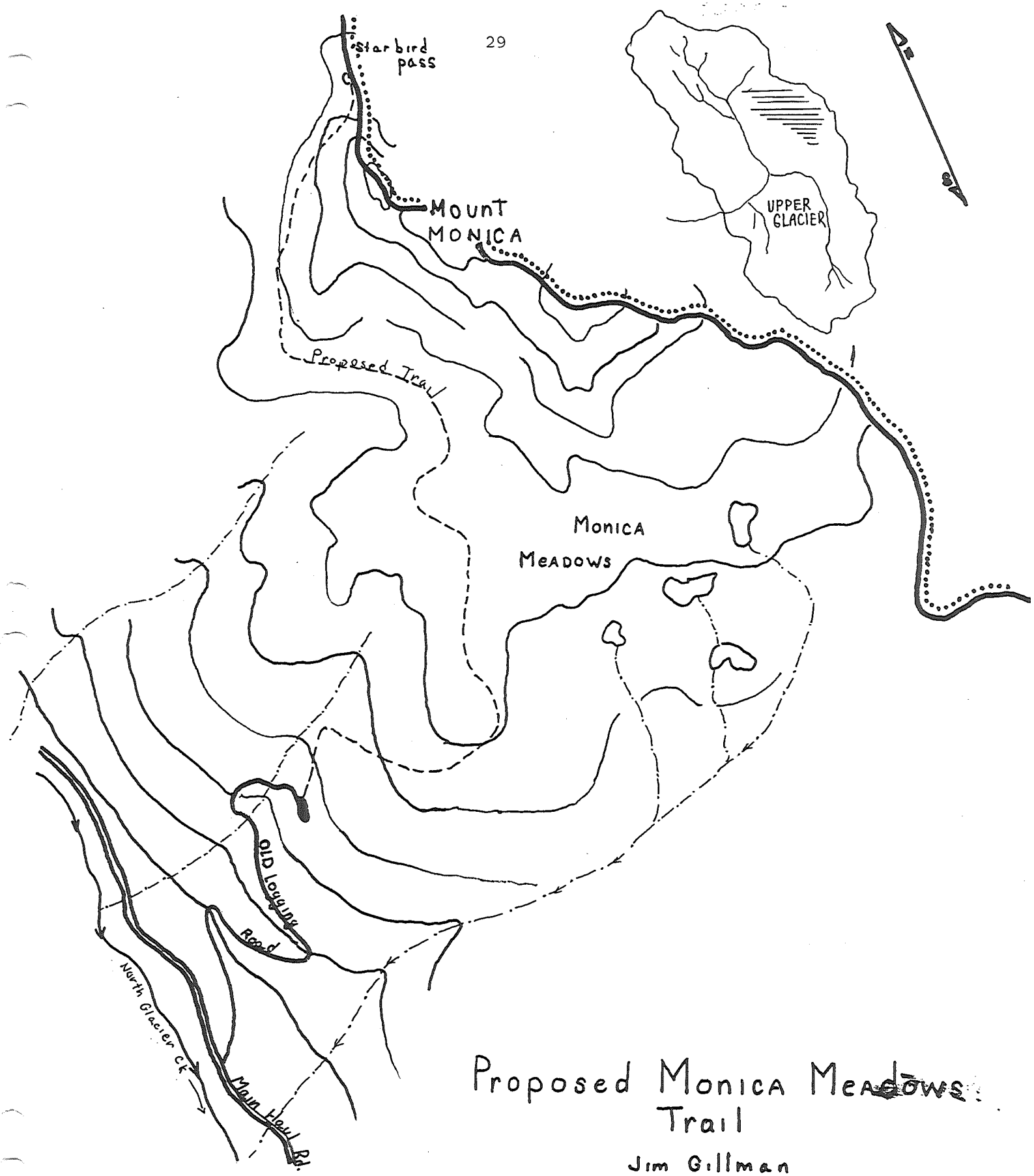
Trail Description

Layout

The trail head would be located 3 kilometers along the main haul road on the north fork of Glacier Creek. From this point the trail would follow an old logging skid road east, "switch-backing" up the lower portion to Mount Monica. (fig. 16) At the end of the skid road the trail would continue up the mountain directly east until the trail reached a prominant ridge which leads to Monica Meadows. Once the trail reached the shelf which Monica Meadows is located on the trail would turn directly north. At this point the trail would follow the Monica Meadows around the shoulder of Mount Monica to Starbird Pass. The trail would terminate at Starbird Pass on a large glacier. The total length of this trail would be 7 kilometers.

Design

The portion of the Monica Meadows trail leading to the meadows would be designed to meet class 4 standards as set forth by the British Columbia Ministry of Forests. As such this trail would have a tread width of 18 inches and a right-of-way clearing of 4 feet. The maximum allowable grade would be 35%. The trail constructed through Monica Meadows would also be constructed to class 4 standards. However, the last 1 kilometer would only be



Proposed Monica Meadows Trail

Jim Gillman

Scale: 1:22302 Date: April 6, 83

fig. 16

marked by cairns and snow poles. This part of the trail would be impossible to excavate as the trail follows a band of exposed bedrock.

Profile

The Monica Meadows trail would have a total elevation gain of 700 metres. The first section of the trail would have an average grade of 28% with a maximum grade of 35%. The middle section of the trail would have a maximum grade of 8% with maximum grades of 27%. The final section of the trail would have an average grade of 29% and a maximum of 45%. The maximum grade in this portion of the trail exceeds the maximum grade for a trail of this class. However, this is impossible to avoid due to topographic restraints.

Horseshoe Glacier Trail

General Description

Of all areas in the upper Glacier Creek area the Horseshoe Glacier area is without question the most popular area. Its large incredibly rugged ice capped peaks are an attraction to both hikers and mountaineers. Its popularity also depends heavily on its accessibility. A hiker can hike to the tongue of the glacier in 10 minutes. This easy access and popularity has unfortunately lead to large amounts of very visible human impact on the fragile environment.

Location

The Horseshoe Glacier trail would be located at the extreme south end of the southern fork of the Glacier Creek drainage area It would be located at the head of the main haul road along the south fork of Upper Glacier Creek.

Vegetation

There is very little vegetation in the Horseshoe Glacier area. Only a small fringe of alpine fir and spruce forest exist immediately around the terminous of the South Glacier Creek road. The underbrush in this area consists mainly of slide alder and white flowered rhododendron. The majority of this area consists of recently deposited glacial till will little or no vegetative cover. At higher elevations there are some small meadows. Vegetative cover in these areas consists mainly of sedges and grass, with a few scattered limber pines.

Soils

The soil development in the majority of the areas that the trail would travel through is non-existent. The ground consists of bouldery glacial till. The drainage in this area is generally very poor. The glacial till is very prone to mud slides and rotational slumping.

Special Features

In terms of wildlife or vegetation, there are no special features in the Upper Glacier Horseshoe Glacier area. However, the visual quality of landscape may be considered a special feature. The Horseshoe Glacier is one of the prime attractions of the area.

Rationale

Construction

When justifying the construction of a trail in this area no illusions to future use levels are necessary. This area is being used very heavily at present. This area has by far the highest use levels in the area and attracts people from all over British Columbia as well as other parts of Canada and the United States.

Damage to this area is easily seen. Very little of this damage is associated with the very limited vegetation in the area. Damage is primarily associated with the soils along the large lateral moraines. They are very prone to the erosion created by foot wear. These moraines are situated close to the end of the main haul road. This appears to concentrate hikers along the moraines as they leave or return to their cars.

To gain access to the Horseshoe Glacier a very dangerous creek crossing must be made. As is the nature of glacial fed streams flow levels are very unpredictable. A serious incident may occur if a hiker impatient to return home attempts to cross the creek in

high water. A bridge would eliminate this safety hazard. Very little trail development would be necessary to solve the environmental and safety problems associated with this area.

Location

There is very little choice in the location of the trail. Topographic features limit other alternatives. (fig.17) The trail would be located to avoid as many environmental and safety problems as possible; however in some areas this is impossible because of topographic constraints.

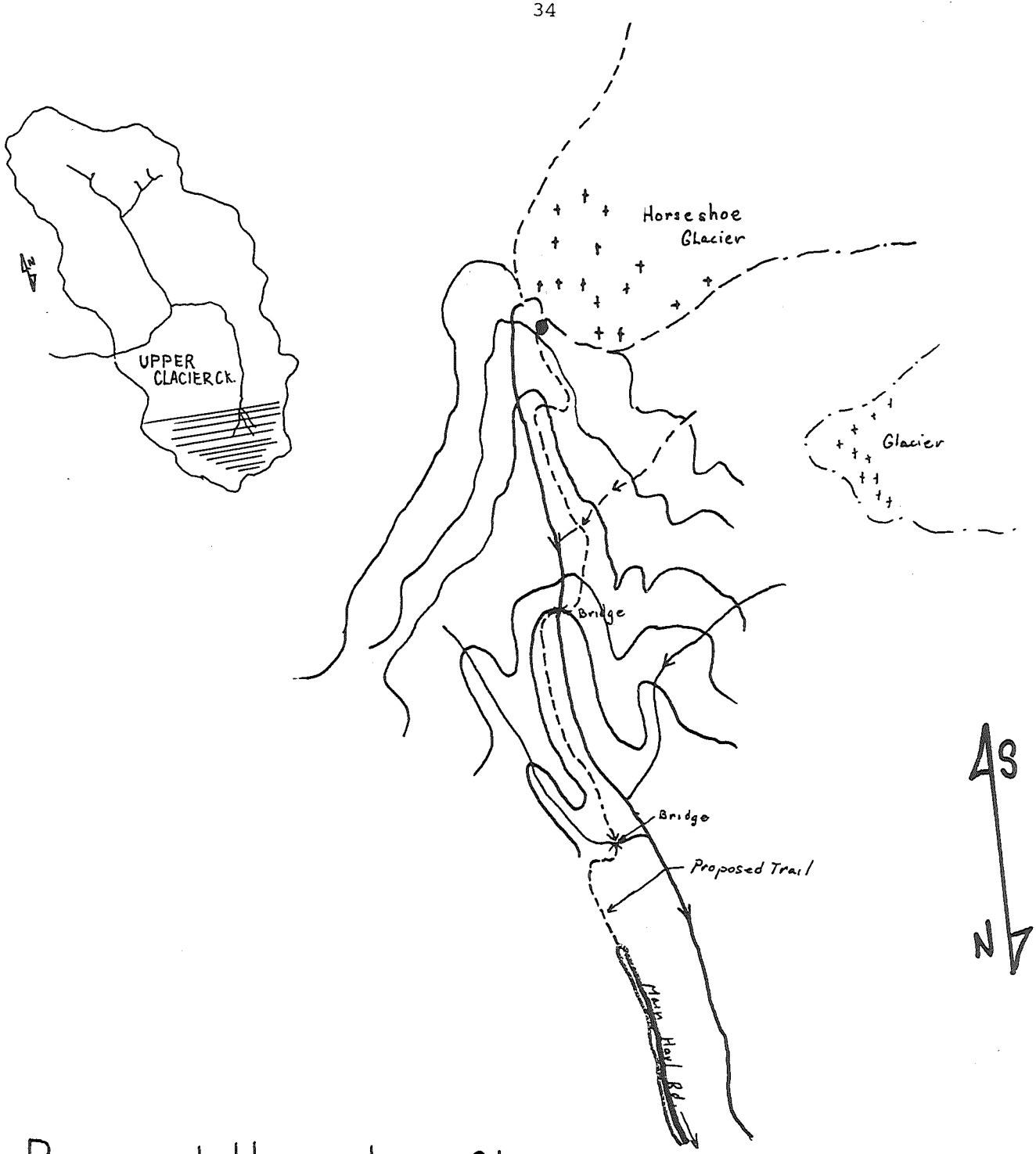
Trail Description

Layout

The Horseshoe Glacier trail would be a very short steep trail. The maximum length of this trail would be 2.5 kilometers. The trail head would be located at the end of the main haul road along the south fork of Upper Glacier Creek. From this point the trail would travel southwest crossing two large creeks. These creeks would be bridged. Just past the second bridge the trail would make a turn towards the south and follow a gully between two lateral moraines. The trail would terminate at the base of the Horseshoe Glacier.

Design.

This trail would receive very heavy use levels and trail standards must be very high. This trail would be built to class 3



Proposed Horseshoe Glacier Trail

Jim Gillman

Scale: 1:22302 Date: April 6, 83

fig. 17

criteria according to British Columbia Ministry of Forest Standards . The bridges for this trail may have to be redesigned to withstand heavy snow falls associated with alpine areas.

Profile

The Horseshoe Glacier trail would be a steep short trail. The Horseshoe Glacier trail would have a total elevation gain of 800 meters and an average grade of 28%. The maximum grade of this trail would be 38%.

North Glacier Creek Trail

General Description

The North Glacier Creek area at present receives moderately low use levels. Relatively small numbers of people are aware of the unique terrain features available here. It is very likely that the only people using this area at present are mountaineers. This is unfortunate because mountaineering quality is only one aspect of the land surrounding North Glacier Creek. The landforms found in here are likely among the more unique features in British Columbia.

Location

This area is located at the extreme north end of the northern fork of Upper Glacier Creek. (fig. 15) The main haul road along the northern fork of glacier creek is rough and sometimes

inaccessible. The North Glacier Creek area is relatively hard to gain access to.

Vegetation

The vegetation in the lower elevations around North Glacier Creek is predominantly subalpine fir and spruce. The ground cover in this area is very dense and composed mainly of white flowered rhododendron and black huckleberry.

The transition zone between the subalpine forest and alpine tundra is very sparcely forested. The predominant tree species here are alpine larch and limber pine. In this area the herb layer is very well developed displaying many species of alpine flowers.

The alpine tundra has little or no vegetation primarily due to the recent glaciation of the area. The majority of this area is smooth vegetation-free bedrock. The majority of the area is even void of lichen growth.

Soils

In general the North Glacier Creek area displays very limited soil development. However, the three vegetative zones in this area are characterized by their own soil group.

The subalpine forest is characterized by the soil group Ortho-ferric Podzol. (J.R. Jugen 1980) This soil has developed on a fine grained glacial till which displays very poor drainage. Great care should be taken to ensure good drainage when constructing trails in this material.

The soil associated with the transitional zones is Humo-ferric Podzol. (J.R. Jugen 1980) This soil has a similar parent material as the soils in the subalpine forest. The majority of the soils in the transitional zone are very thin and fragile. In the occasional area, thick soil development exists which is very sensitive to human or animal activity. This type of soil is very prone to erosion and slumping. (J.R. Jugen 1980)

There is little or no soil development in the alpine tundra vegetation zone. Much of this area was very recently glaciated and very little soil development has occurred. The majority of this zone is exposed smooth bedrock. In areas where there is some soil development drainage is very poor. These areas should be avoided when considering locating a trail.

Special Features

There are two special features of the North Glacier Creek area. These are the glacial landforms found in the area and the grizzly bear habitat.

The glacial landforms found in this area are varied. There are examples of almost every feature of alpine glaciation. Some of these features are: Table rock, lateral moraines, terminal moraines, medial moraines, eskers, and glacial scoured rock. This area could serve as an interpretive centre for natural history.

The grizzly bear habitat in this area is an extension of the

habitat found around Mount Monica Meadows. This area is much larger, however, and as such provides better food opportunities for grizzly bears. Due to the relatively low level of use, no conflicts have arisen.

Rationale

Construction

The North Glacier Creek area offers opportunity for both the hiker and mountaineer. At present getting to this area is difficult. The road along the north fork of Glacier Creek is in poor shape. Many people may have to leave their vehicles 5 kilometers from the end of the road due to the poor condition of the road. The use level at present is moderate. In the future it is likely that the Monica Meadows and Horseshoe Glacier areas will remain more popular. A trail into the North Glacier Creek area would relieve environmental pressure on other more popular areas.

Location

The rationale for locating the North Glacier Creek trail would be to provide the shortest environmentally sound route to the alpine zone. Since this trail's only functions would be to relieve pressure on other popular areas visual aesthetics is not an important factor in locating this trail.

Trail Description

Layout

The trail would begin at the end of the main haul road along the north fork of Glacier Creek. From this point the trail would angle up from the north side of the road towards a forested lateral moraine. (fig. 18)

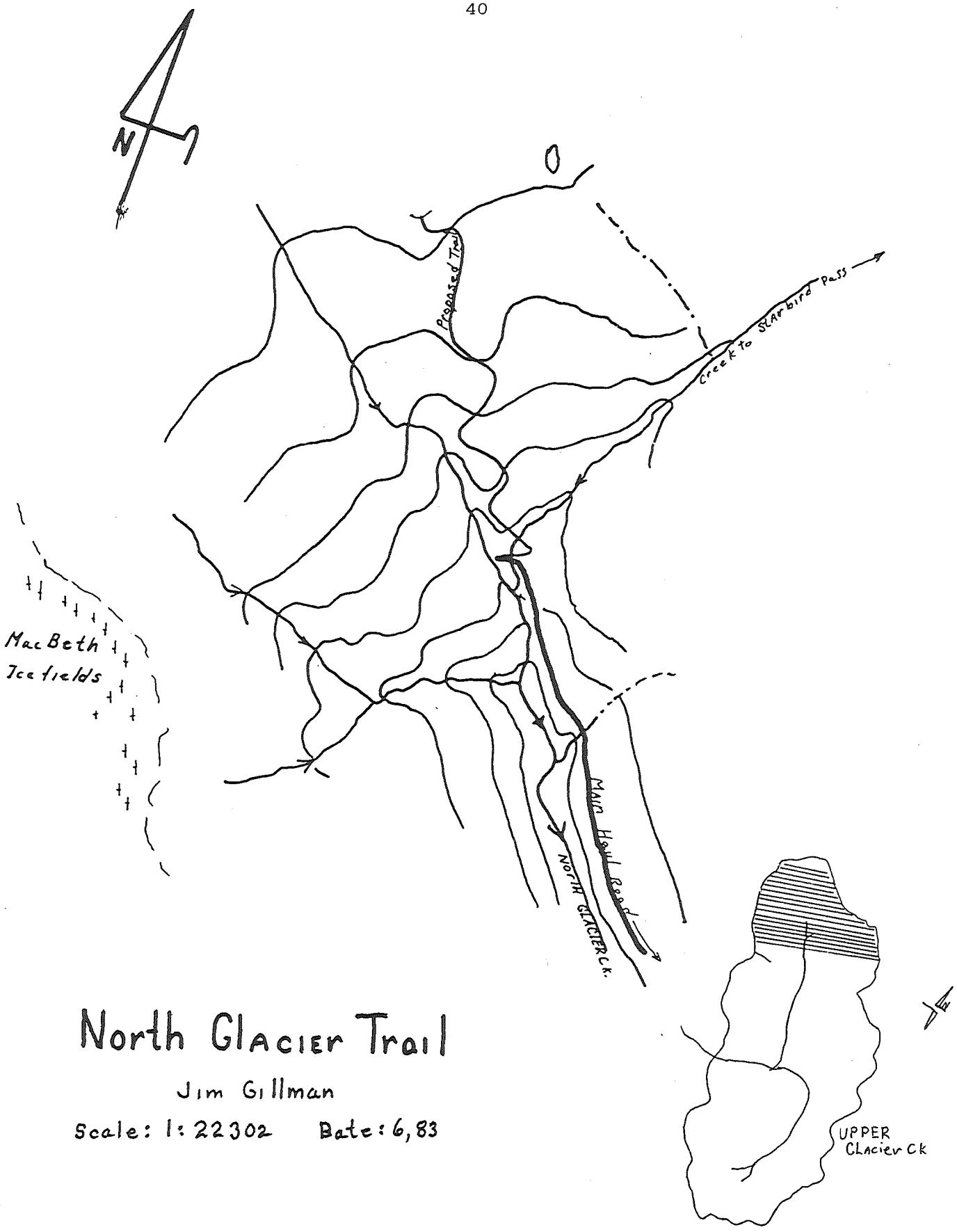
This moraine follows the north fork of Glacier Creek to an area above the tree line. The trail would follow this moraine switch-backing along the moraine until it reached timber line where the trail would terminate. There is very little need for trails beyond this point as the area is open, and lack of soil and vegetation makes the area moderately durable.

Design Standards

This North Glacier trail would be built to class 5 criteria accordingly to the British Columbia Ministry of Forests Standards ( ). The people using this trail would likely be more experienced on the low standard trails and it wouldn't pose any threat to their safety. Bridges would only be placed on the large creek.

Profile

The North Glacier Creek trail would have an average slope of 29% and a maximum slope of 40%. The total elevation gain on this trail would be 800 metres.



North Glacier Trail

Jim Gillman

Scale: 1:22302 Date: 6,83

fig. 18

CONCLUSION

With or without development, this area will continue to become more popular. By recognizing the potential of Upper Glacier Creek now and developing it to provide recreation along with preservation, we may better recognize the opportunities this land base will provide in the future. The benefits that this rugged wild area provides will become increasingly important as British Columbia's tourism industry grows. The construction of hiking trails in this area will provide employment and money now, and for years to come.

Due to the hard times in British Columbia, there is a negative response to monetary expenditures for recreation and conservation. However, the proposed Upper Glacier Creek trail development would provide an excellent government make work program. This program would have both immediate and long term benefits. The immediate benefits would be a limited number of jobs which would aid the depressed economy of the Lardeau area. The money spent to develop the Glacier Creek area would be a secure investment in the future, for British Columbia and the Lardeau area.

While economic considerations are very important so are recreation and environmental considerations. This is especially true when considering the future.

Residents of the West Kootenay have very limited access to the prime mountaineering areas of the Purcell Mountain range. This area

would provide Purcell mountaineering quality which would be reasonably accessible to West Kootenay residents.

Without a trail system the Upper Glacier Creek area's beauty might be destroyed by the people who come to visit. Because of the beauty of this area the use level will increase even without development; unfortunately this would lead to irreversible damage. A trail system would allow more people to enjoy the Upper Glacier Creek without destroying it.

The proposed trail developments would provide benefits now and in the future. Money spent would be an investment in the future of British Columbia's tourism industry.

BIBLIOGRAPHY

BOND, George. 1982 Interview. Nelson, British Columbia.

BOND, George. 1982. User Statistics for MacBeth Ice Field and Jumbo Pass Trail. Nelson, British Columbia: Ministry of Forests.

BROOK, R.C. 1970. Ecology of Western North America. Vancouver, British Columbia: University of British Columbia.

DAFOE, Eric. 1979. Valhalla Proposal. New Denver, British Columbia: Ministry of Forests.

JUGEN, J.R. 1980. Soils of the Nelson Map Area. Victoria, British Columbia.

MINISTRY OF FORESTS. 1977. Forestry Recreation Inventory. Nelson, British Columbia: Ministry of Forests.

MINISTRY OF HIGHWAYS. 1969. Highway Route Study. Victoria, British Columbia: Ministry of Highways.

NELSON CHAMBER OF COMMERCE. 1981. Proposed Jumo Pass Highway. Nelson, British Columbia: Nelson Chamber of Commerce.

OPPORTUNITIES FOR YOUTH. 1973. Earl Grey Pass Project. Castlegar, British Columbia: Tineth Books.

REESOR, J. 1972. Geology of Southern Purcell. Vancouver, British Columbia: Geological Survey of Canada.

STEVENS, H.H.A. 1954. Reconnaissance Report Jumbo Pass. Victoria, British Columbia: Ministry of Highways.

THORINGTON. 1946. Purcell Range. American Alpine Club.