

COOPERATIVE INVESTIGATION OF
MIGRATION PATTERNS OF THE MT. MYE
SHEEP POPULATION

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SUMMARY

The investigation of the Mt. Mye sheep population is a co-operative venture between Cyprus Anvil Mining Corporation of Faro, Yukon and the Yukon Wildlife Branch. It was initiated because the proposed mining development on the Vangorda Plateau may disrupt sheep migration patterns between summer and winter ranges.

The investigation was conducted by Heather McLeod, a contract employee, during October 1980 and April through June 1981.

The field work indicated that the Fannin Sheep do cross the proposed development area of the Grum and Vangorda ore deposits. Potential impacts of the operation and secondary activities were evaluated.

The overland conveyor system, destined to intersect the migration paths of these sheep will undoubtedly present the major obstacle.

Associated with expanding mining operations is an increase in human population and activity.

The overall picture indicates that this sheep population could be severely disrupted or destroyed unless proper mitigative measures are implemented to minimize the impact.

Recommendations include:

- If an overland conveyor is used, all mitigations that are necessary should be taken, otherwise it should be replaced by a railway system;
- Minimize air traffic in the area if a contract helicopter is to be on location;
- Restrict excessive recreational use, such as all-terrain vehicles

in the vicinity of critical areas and migration routes utilized by the sheep;

- Have a biologist on location to monitor behavioural reactions to mining activities during critical periods of migration during the construction phase and the initial two years of operation.
- Implement a program in which individuals are collared in order to facilitate the monitoring of the sheep and to acquire information on range utilization and seasonal distribution.

INTRODUCTION

In June 1980 the Cyprus Anvil Mining Corporation initiated a longterm program to develop the Grum and Vangorda lead-zinc deposits located on the Vangorda Plateau near Faro, Yukon Territory (fig 1).

A mountain sheep population is known to exist in the Mt. Mye area, the immediate vicinity of the proposed developments, (Russell, 1979). These animals spend the winter months on bluffs overlooking the Pelly River (fig 1). It is suspected that their migration routes between winter and summer ranges cross the Vangorda Plateau. Knowledge of seasonal patterns of habitat use are important in the determination and mitigation of potential impacts arising from the proposed developments.

The resulting impacts to the area in the next two or three decades could include:

- open pits
- creek diversion, a 1000m in length, to the west of Vangorda Creek
- 17 km overland conveyor system
- increased local human population and recreational activities

These concerns precipitated the co-operative sheep investigation.

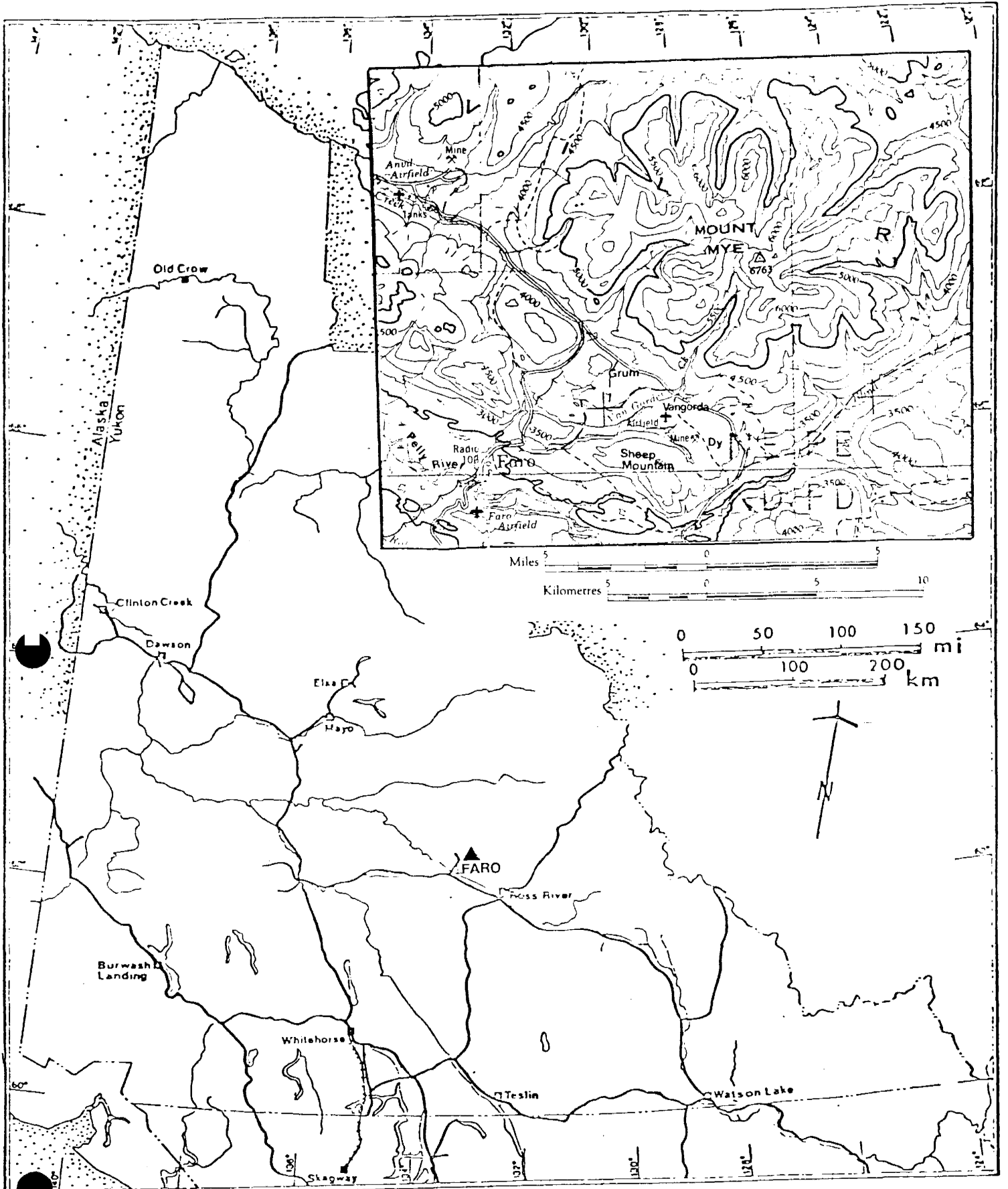


Fig. 1 Location of Faro and Study Area

OBJECTIVES

1. To determine as precisely as possible the migration paths between summer and winter ranges.
2. To determine the timing of migrations through the proposed development area.
3. To evaluate the impact of development.
4. To recommend mitigative measures to reduce the impact of development.
5. Secondary objectives were:
 1. To locate lambing areas
 2. To identify summer range
 3. To locate rutting areas
 4. To determine the winter range
 5. To determine present use and value of the sheep
 6. To determine the composition and recruitment of the sheep
 7. To record other animal sightings.

STUDY AREA

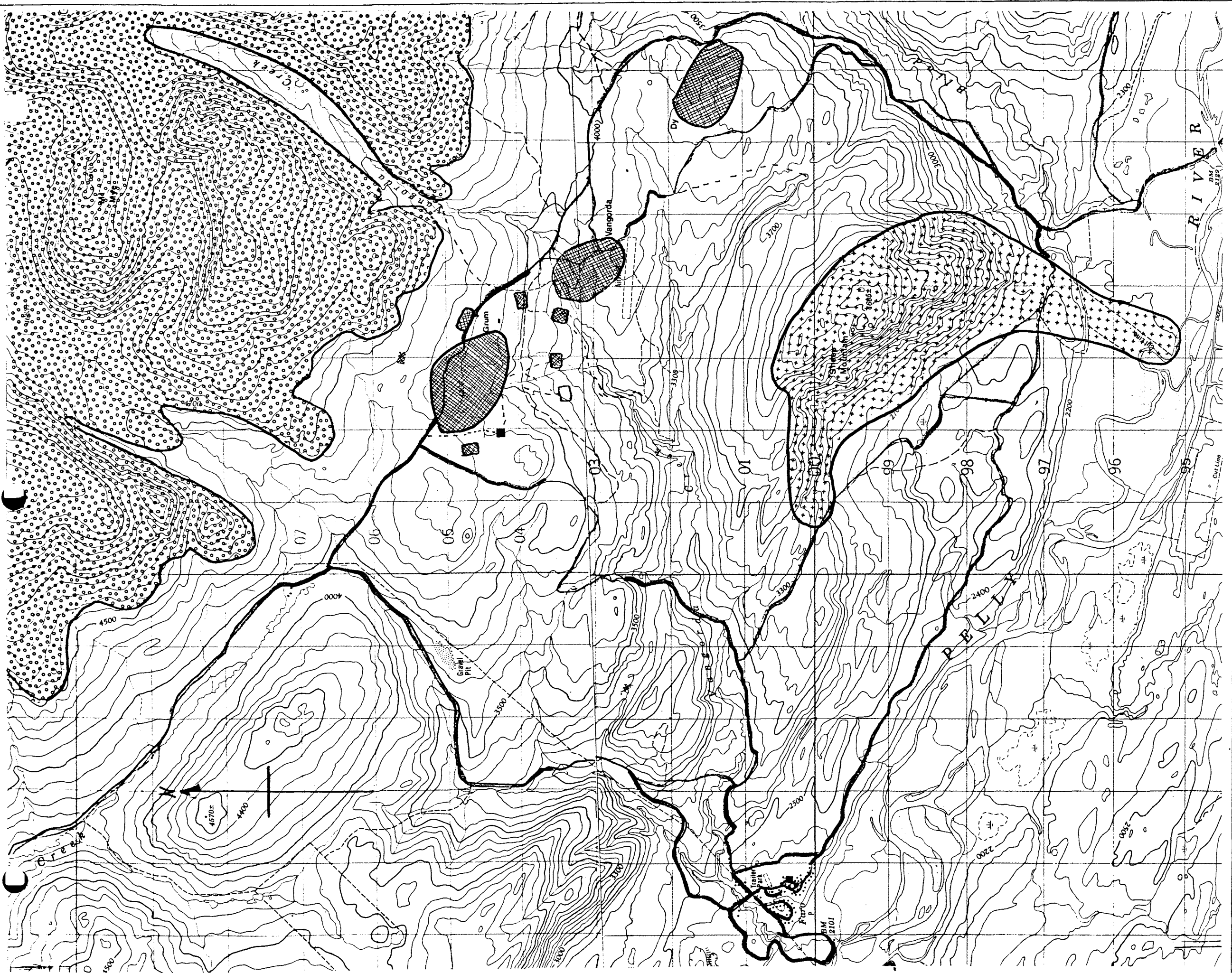
The 350 Km² area is 200 Km northeast of Whitehorse, Yukon (fig. 1). It is located north of the Pelly River, in the southern portion of the Anvil Mountain Range. This area includes the Vangorda Plateau, Mt. Mye to the north and Sheep Mountain to the south.

The town of Faro, founded in 1966, presently accommodates 1,940 residents. It is approximately 10 Km south of the Grum exploration camp. The locals use the area extensively for winter and summer sporting activities.

The majority of exploration roads throughout the study area were developed in 1967. More recently, extensive surveying and drilling has been carried out in preparation for the proposed development of open pit mines on the Grum and Vangorda deposits and an underground mine at the Dy deposit (fig. 2).

Within the study area is a drillers camp accommodating up to 50 persons (fig. 2). Presently this camp is occupied year round.

Presently the entire area is open to resident and non-resident hunting. Non-residents wishing to hunt this area are required to be guided by one of the two outfitters whose hunting districts border within the study area.



LEGEND

- SCALE 1:50,000
- 0 1 2 3 Kilometers
- Summer Range
- Winter Range
- Grum Camp
- Ore Exploration Sites
- Cat Trails
- Roads

Fig. 2 Present level of use on the Vangorda Plateau.

METHODS

Aerial Surveys

Eight aerial surveys using helicopters or a fixed wing were conducted during the study period (Table 1.)

The flight routes and observations are located in Appendix 1.

The sheep were classified as ewes, lambs and yearlings. Rams were classified by the degree curl:

180° - immature

270° - mature

360° - mature - dominant .

Ground Transects

Through hiking in an east-west direction approximately 7.5 Km across the Vangorda Plateau between Mt. Mye and Sheep Mountain, game trails were intersected. Each trail was flagged discreetly so not to affect sheep use and for future relocation.

For verification of sheep use, the trails were followed for their entire length recording evidence of sheep hair and wool, pellets, tracks and kill remains. Other signs of animal use were recorded.

Significant areas (lookouts, creek crossings, small springs and the convergence of alternate trails) along defined routes were recorded and marked on air photos, then transcribed onto topographical maps.

TABLE I - AERIAL SURVEYS OF STUDY AREA

Date	Observers	Aircraft	Pilot	Objectives
9 August 1980	P. Dean M. Hoefs H. McLeod	TNTA Jet Ranger 206 B	John Witham	Population estimate; summer distribution (Mt. Mye, Rose Mtn, Sheep Mountain)
20 October 1980	H. McLeod J. Michalski P. Silverman	TNTA Jet Ranger (206 B)	John Witham	Evidence of migration; Fall distribution
11 May 1981	H. McLeod R. Wolfe P. Silverman	TNTA Jet Ranger (206 B)	John Witham	Evidence of spring movement; pre-lambing survey Sheep Mountain
17 May 1981	H. McLeod J. Kuhn	Hiller	K. Guenter	Movement; Lambing sites (Sheep Mtn, Mt. Mye, Rose Mtn.)
26 May 1981	H. McLeod B. Deino	Viking Hughes (500 D)	Brian Ailkinson	Migration and number of lambs
17 June 1981	H. McLeod G. Sheuerholz	TNTA Jet Ranger (206 B)	John Witham	Distribution; number of lambs
26 June 1981	H. McLeod P. Long	Super cub	P. Long	Evidence of migration; numbers remaining on Sheep Mountain
14 July 1981	T. Nette P. Merchant	Hiller	K. Guenter	To estimate population size and summer distribution
16 July 1981	T. Nette P. Merchant	Hiller	K. Guenter	Summer distribution and population size of sheep on Rose Mountain.

Track Plots

During the spring study, 13 substrate plots, placed along known routes, were used to measure the frequency and intensity of trail use.

Observations by locals.

To obtain historical information present and former local residents, trappers and outfitters, conservation officers and pilots were contacted through personal interviews, by telephone, or mail (Appendix 2).

All sightings of sheep that were reported to the researcher by the Faro residents and Grum camp workers were recorded and the location marked on a 1:50,000 scale topographical map.

The first lambs were seen on Sheep Mountain 26 May 1981. The highest number of lambs (7) were sighted on 28 May 1981.

An aerial survey of Mt. Mye, Sheep Mountain and Rose Mountain conducted on 9 August 1980 indicated that there were 17 lambs and 43 ewes observed on Mt. Mye. On 17 June 1981, the same area was surveyed. Seven lambs and 24 ewes were found on Sheep Mountain. Caution should be taken when comparing numbers of different flight dates. The results however, appeared to indicate additional lambing areas.

From this years lamb crop (1981) two are known to have died. The first cause of death is unknown. On 19 July 1981 one lamb was fatally infected with contagious ecthyma.

1. Seasonal Range Utilization

Winter Range

Although a mid-winter aerial survey was not conducted it appears from reported observations by local residents, former trappers and local outfitters, that the winter range is predominantly the south, southwest facing aspects of Sheep Mountain overlooking Blind Creek (fig. 3). According to a local outfitter the sheep have been known to winter there before the burn 13 years ago. Sheep have been observed as low as the banks of the Pelly River during the winter months (Wight pers. com. 1981). The rams however, do not necessarily remain on Sheep Mountain until the spring migration. They have been known to winter west of Sheep Mountain on exposed rocky ridges more or less directly between Faro and the Grum camp (Russell, pers. com. 1980). A distinct dark, full-curled ram was sighted during mid-January at the

C.N. repeater tower (Van Patten, pers. com). This indicates that rams utilize Rose Mountain as winter range.

The elevation of Sheep Mountain is 4,500 feet. It was extensively burned during the summer of 1969 (fig. 3). Presently, it is sparsely treed with Picea glauca, Populus augustifolia, Populus balsami fera L and groves of Salix spp. and dense Betula glandulosa at higher altitudes. Small springs are common in the draws, while two waterholes are found on the plateau. Observations made during this study indicate winter utilization by sheep, as low as the banks of the Blind Creek road to Faro, and as high as the plateau. The bluff formation provides excellent escape terrain, an essential requirement for sheep habitat (fig. 4).

Lambing Areas

It is generally acknowledged that most lambing occurs on or in close proximity to winter ranges. Geist (1971) found that ewes select primarily broken rugged cliffs in which to lamb. The grey, brown saddle-backed colouration of Fannin Sheep, however, blends in with the timber remarkably well (fig. 5). This factor may contribute to successful lambing in this timbered/brush habitat.

Summer Range

The initial survey conducted in August 1980 encompassed Mt. Mye and an unnamed range to the east of Mt. Mye, the assumed summer range of these sheep. The survey revealed that Mt. Mye had 62 sheep, however, there were not any animals nor obvious sheep trails located on the mountain to the east. At the time it was felt that the northern range was not well defined.

On June 17 1981 one band of 9 sheep (7 ewes and 2 lambs) was observed on Mt. Mye during an aerial survey. A more extensive survey was conducted by the Yukon Wildlife Branch 14, 15, 16 July 1981, during which only 3 ewes

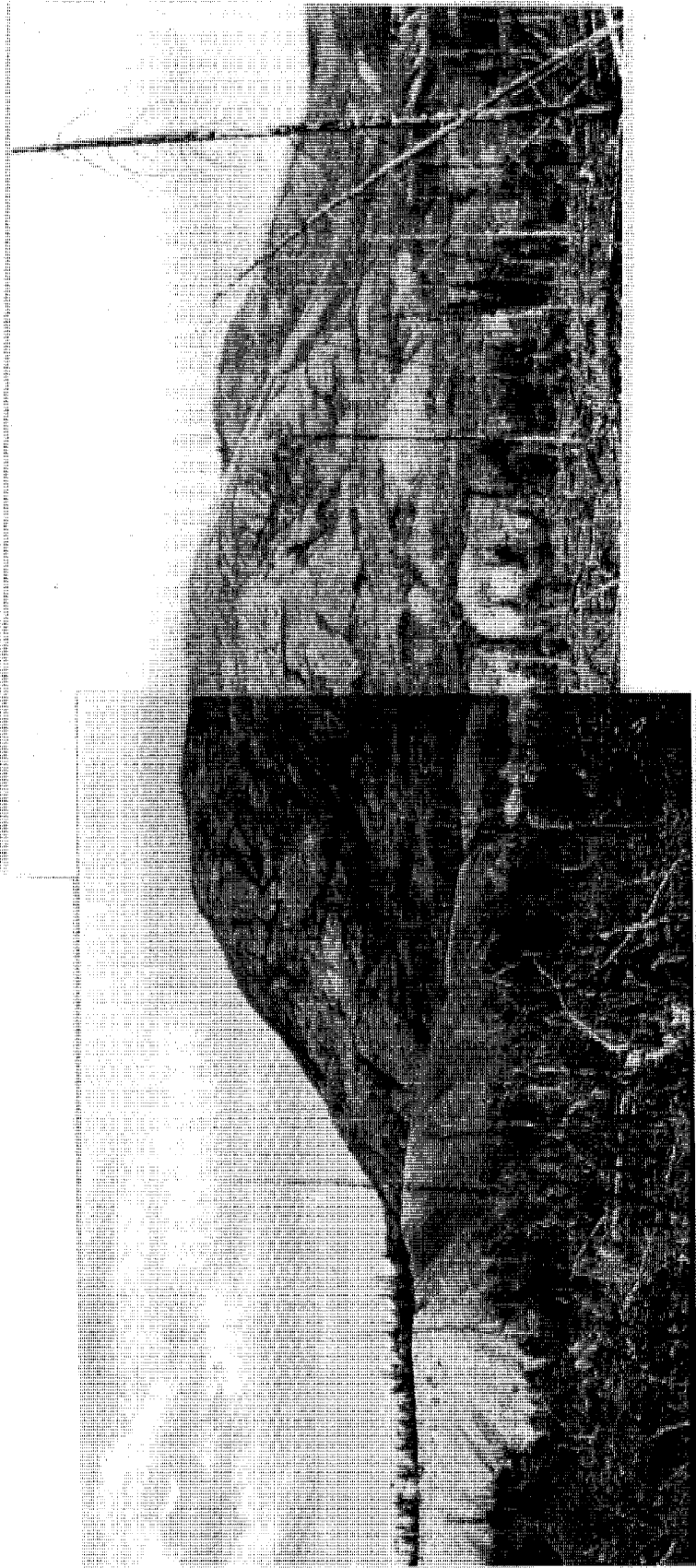


Fig. 3 Sheep Mountain, overlooking Blind Creek.

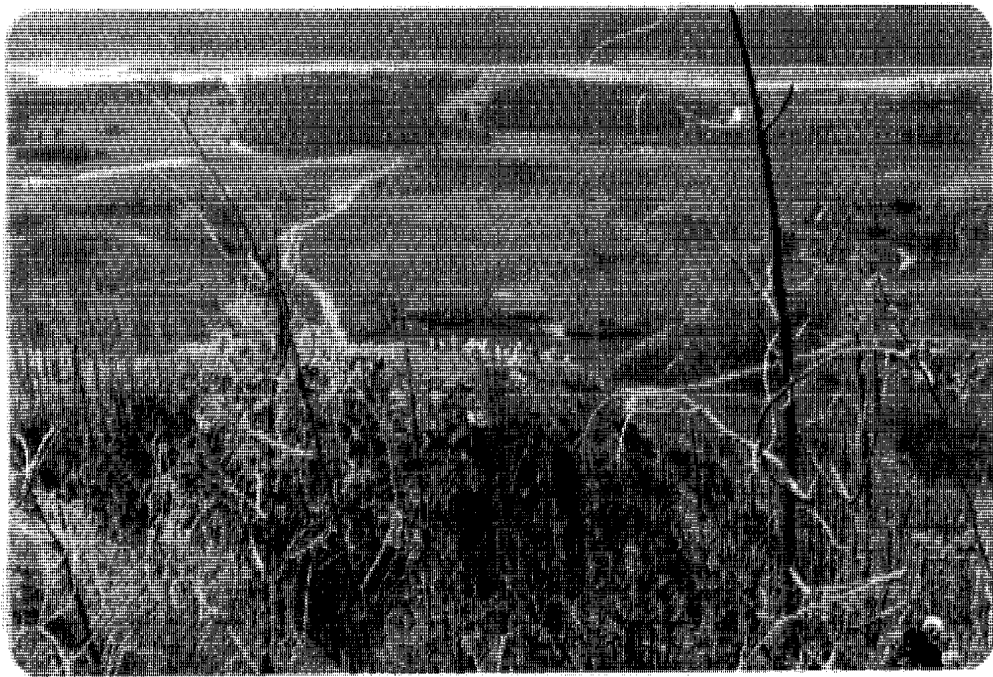


Fig. 4a Bench formation preferred. Winter habitat.



Fig. 4b Sheep foraging on sparsely vegetated benches on winter range.

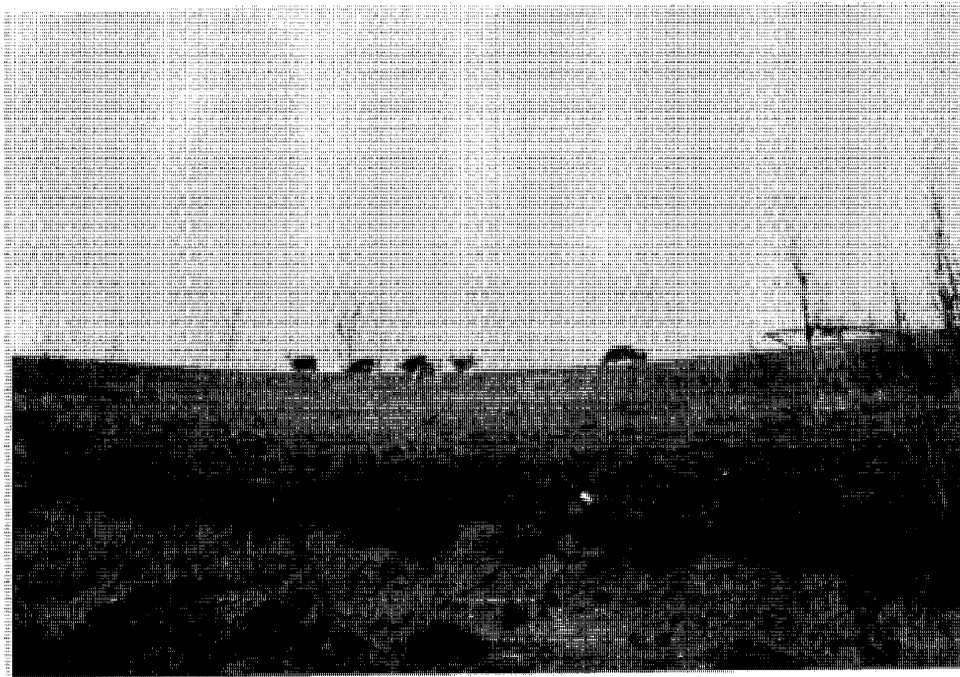


Fig. 4c Sheep foraging on lower grassy slopes just above the Blind Creek road.



Fig. 5 The camouflage effect of sheep among patches of timber.

Photo by D. Roloefs

and 1 lamb were recorded on Mt. Mye.

Subsequently, it appears that the summer range extends beyond the initial approximated boundaries Table 2 (fig. 6). These results indicate that the Mt. Mye sheep may not be a discreet population, but may intermix with other sheep in the Anvil range. [In Alaska, however, a sheep population constituting 1500 individuals appears to concentrate in smaller discreet bands of 100 sheep, (Heimer pers. com. 1981).] The proportion of sheep wintering on Sheep Mountain represents just over 1/4 of the total number of sheep seen on the aerial survey of the Anvil district July 14, 1981.

Rutting Area

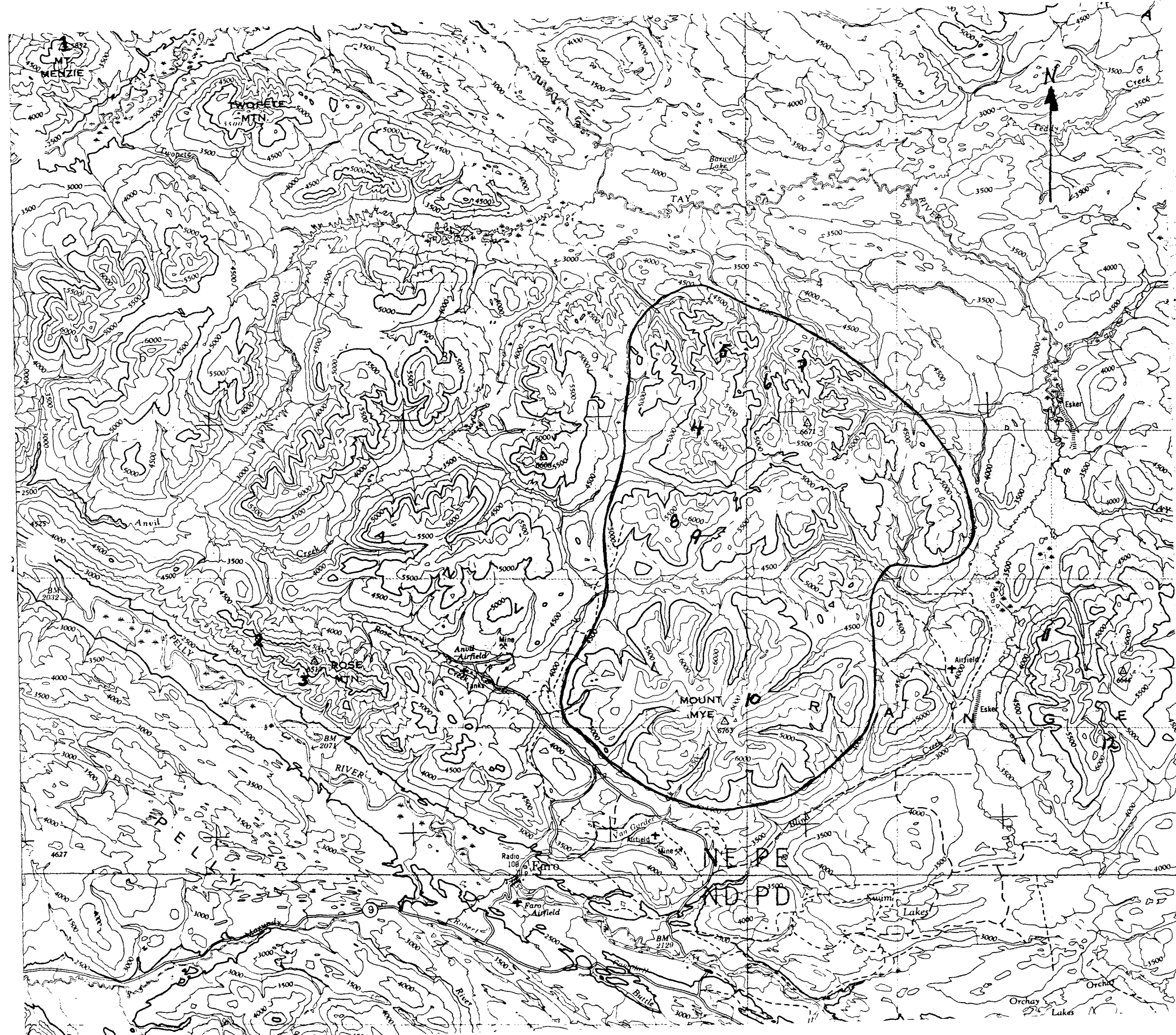
The duration of the field work did not include the period of the rut. Local reports suggest, however, that breeding activities occur on Sheep Mountain during the end of November and early December. Two rams were observed in rutting activity on the lower southeastern slopes of Sheep Mountain the last week in November, (Wiggins pers. com. 1981).

2. Migration Patterns

Sheep are known to follow traditional pathways, (Geist 1971). Nursery bands and rams often take different routes. The field work indicates that these sheep do not exclusively use one route (fig. 7). Normally open ridge top terrain is preferred where narrow valleys are crossed hastily, (Geist 1971). These sheep travel through fairly dense pine and spruce stands, thick willow groves, mossy bogs and disturbed ground. The enclosed photographs give an idea of the varied habitat the sheep pass through on their migration (fig. 8).

Verified Routes

Verified routes are those trails where evidence of sheep crossings were recorded by the investigator and verified during the fall and spring field sessions (fig. 7).



LEGEND

— Extended summer boundaries

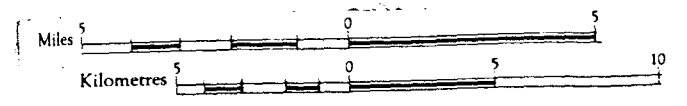
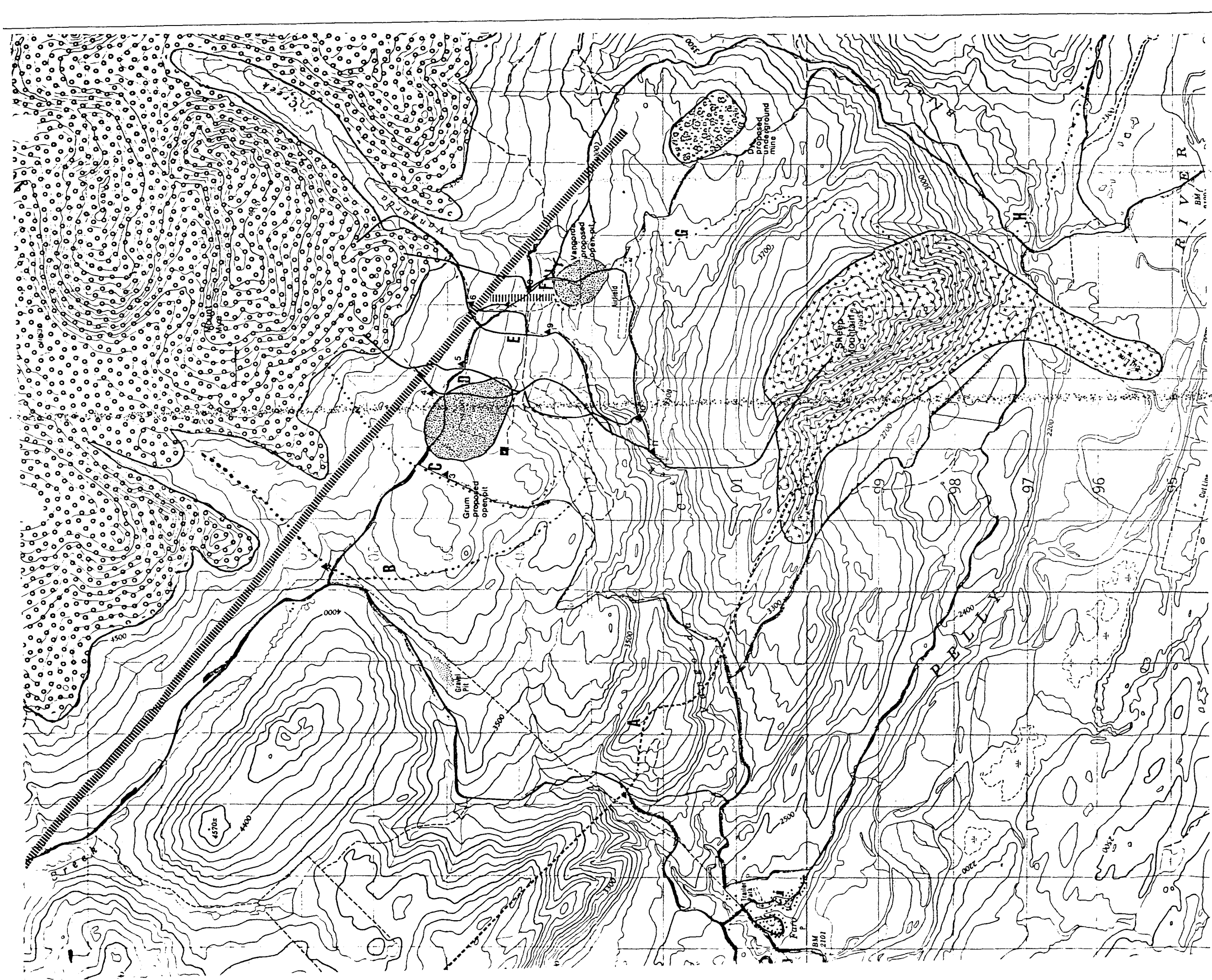


Fig. 6 Sheep observations during aerial surveys of the Anvil Range, summer 1981.



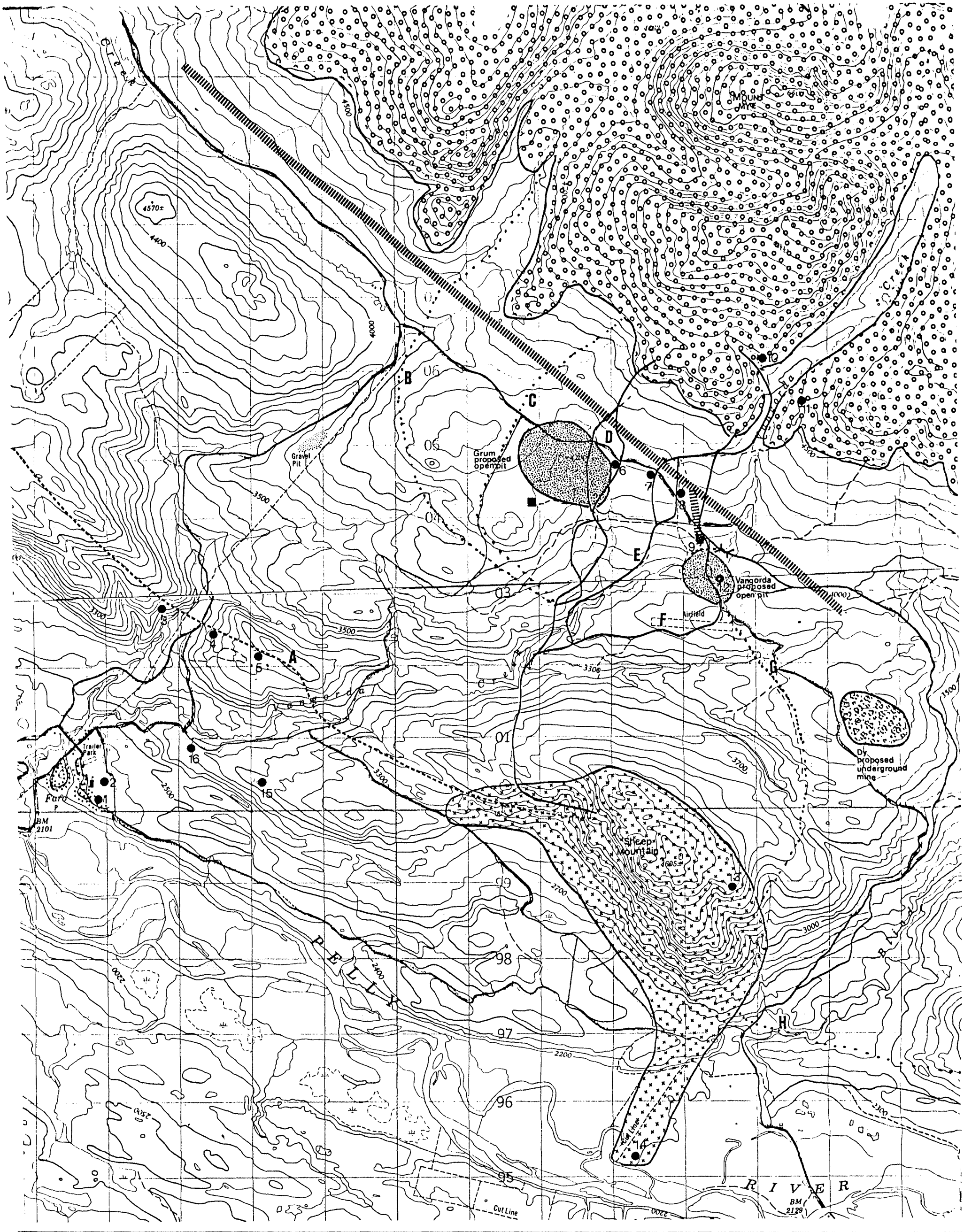
LEGEND

SCALE 1:50,000



- ▲ Prepared Substrate Plots
- Verified Migration Routes
- Unverified Migration Routes
- Migration Route of Rams from Rose Mtn.
- ◻ Summer Range
- ◻ Winter Range
- ◻ Proposed Open Pits
- ◻ Proposed Underground Mine
- ||||| Overland Conveyor
- ⌒ Dam and Vangorda Creek Diversion
- Grum Camp
- ⌒ Roads

Fig. 7 Migration Routes



LEGEND

SCALE 1:50,000

0 1 2 3 Kilometers

- Sheep Observations
- Verified Migration Routes
- ⋯ Unverified Migration Routes
- ⋯ Migration Route of Ram from Rose Mtn.
- ◻ Summer Range
- ◻ Winter Range
- ◻ Proposed Open Pits
- ◻ Proposed Underground Mine
- ||||| Overland Conveyor
- ⌒ Dam and Vangorda Creek Diversion
- Grum Camp
- Roads

Fig. 10 Location of sheep observed by locals

TABLE 2 SUMMARY OF SHEEP OBSERVATIONS IN THE ANVIL RANGE, FROM AERIAL SURVEYS CONDUCTED BY THE WILDLIFE BRANCH, SUMMER 1981.

*Observations	Date	Total	Ewes	Lambs	Rams
1	July 15	5			5
2	July 16	2	2		
3	July 16	22	17	5	
4	July 14	14	14		
5	July 14	29	24	5	
6	July 14	31	22	7	2
7	July 14	38	29	9	
8	July 14	1			1
9	July 14	26			26
10	July 14	4	3	1	
11	July 14	2	1	1	6
12	July 14	6			
TOTALS		180	112	28	40

* Numbered observations correspond to their locations in Figure 6.

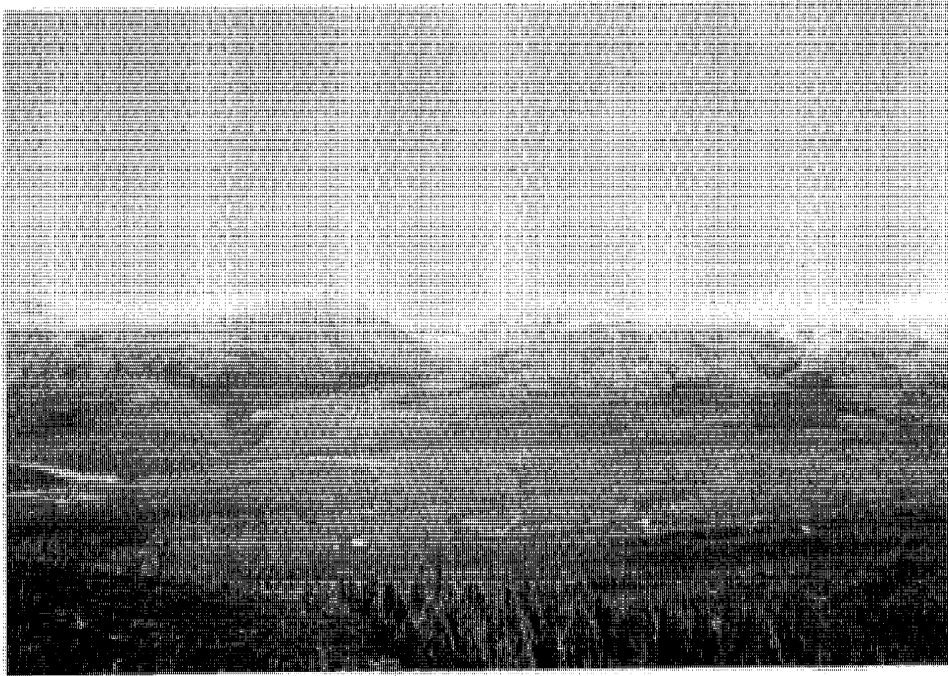


Fig. 8a The forested valley the sheep cross when migrating between Sheep Mountain and Mt. Mye.

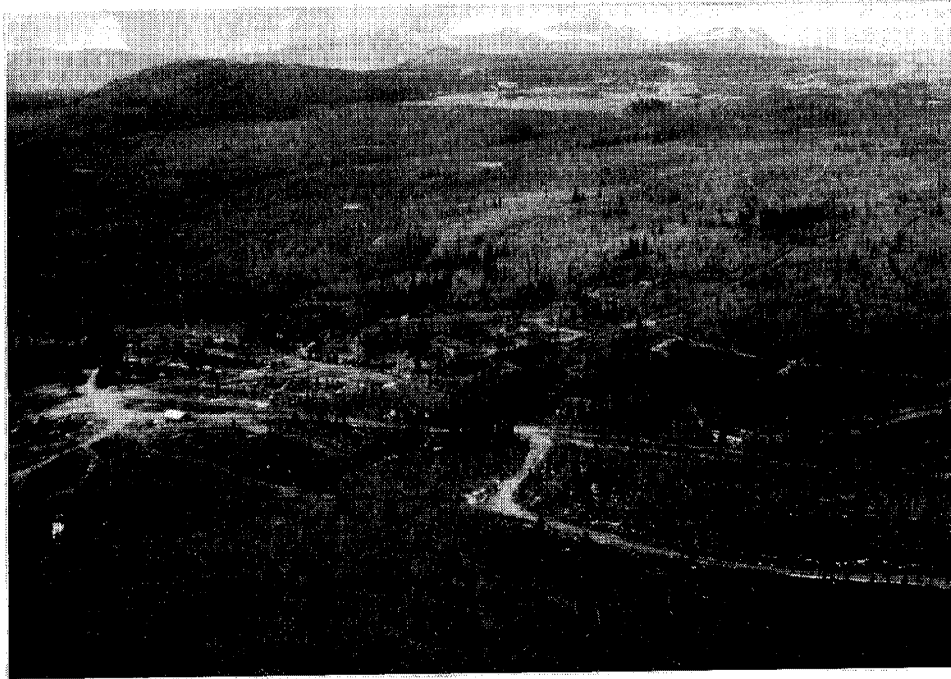


Fig. 8b The proposed site of the Vangorda open pit mine in the foreground. A section of the Grum open pit is in the upper right corner.

Photo by R. Tolbert



Fig. 8c Nursery bands have been known to pass by this cabin within the boundaries of the future development area.

Photo by R. Tolbert



Fig. 8d The disturbed ground that sheep travel across.

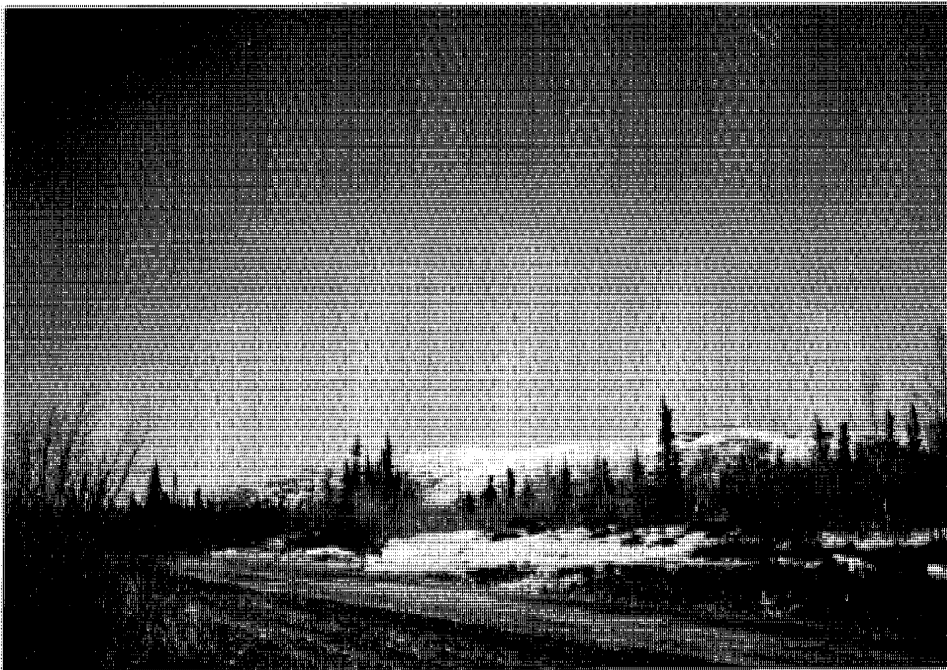


Fig. 8e One of the known road crossings of sheep 1 Km west of Vangorda Creek.



Fig. 8f Sheep tracks were recorded along this trench in the bog flats 1 Km east of the Grum camp.



Fig. 8g The western end of north slope of Sheep Mountain - the general direction of those sheep which had crossed the AEX road on April, 1981, 1 Km east of the Grum camp entrance.

- A. Route A is a well defined trail that follows the east/west ridge from Sheep Mountain. It crosses the main mine road at the C.N. repeater tower 1 Km north of Faro. It then follows the east/west ridges to Rose Mountain.

- D. Route D is a well defined traditional path, evidenced by wear, sheep pellets, sheep hair on branches and remains of kills (horn sheaths and skulls). It is very much a direct route from the western end of Mt. Mye due south crossing the AEX road 1 Km east of Grum Camp, down to the confluence of Shrimp Lake and Vangorda Creek, then ascending the north slope of Sheep Mountain at its west end.

- E. From the confluence of Shrimp Creek and Vangorda Creek, route E consists of a series of cat roads. The trail crosses the AEX road about 1 Km west of Vangorda Creek where it follows cut trails until a bare knoll at the eastern base of Mt. Mye, at which point it turns directly north and ascends to the summer pastures.

- F. Commencing at the confluence of Shrimp Creek and Vangorda Creek the trail follows a cat road in an eastward direction crossing the old airstrip at the eastern corner. It then follows a well-used road passing the original Kerr Addison Camp on the sight of the proposed Vangorda open pit. There does not appear to be a well defined route directly across the road. Sheep hair and pellets were found to the west side of Vangorda Creek.

Unverified Routes

The following routes were ascertained from information obtained from locals who have had an interest in the sheep population.

Route B. It is postulated that rams from Mt. Mye usually follow down the valley from the Little Mye Lake directly north of the junction of the AEX road and the main road to the Faro Concentrator (Russell 1980).

Route C. Route C was suggested as a spring route. It crosses the AEX road about 1 Km west of the Grum Camp road, passing the present dump, and eventually joining the other trails southeast of the Grum Camp (Montreal Engineering 1975).

Route G. Sheep were reported to descend from Mt. Mye proceeding past the Kerr Addison cabin and the airfield, then following an old corduroy road to the east of Shrimp Lake (Jennings, Ladue pers. com. 1981).

Route H. Two rams along with a band of 10-15 ewes were observed migrating towards Sheep Mountain from the Swim Lakes direction - almost directly east of the wintering area (McCormick 1980).

Frequency of Trail Use

The sheep tracks found on the prepared substrate plots indicated variability in the use of these routes (fig. 9 and 7).

The fall migration had taken place prior to the fall field work. It appears from sightings reported by locals (Table 3 and fig. 10) that route F is more heavily travelled by nursery bands on their fall migration to Sheep Mountain.

Number
of
tracks

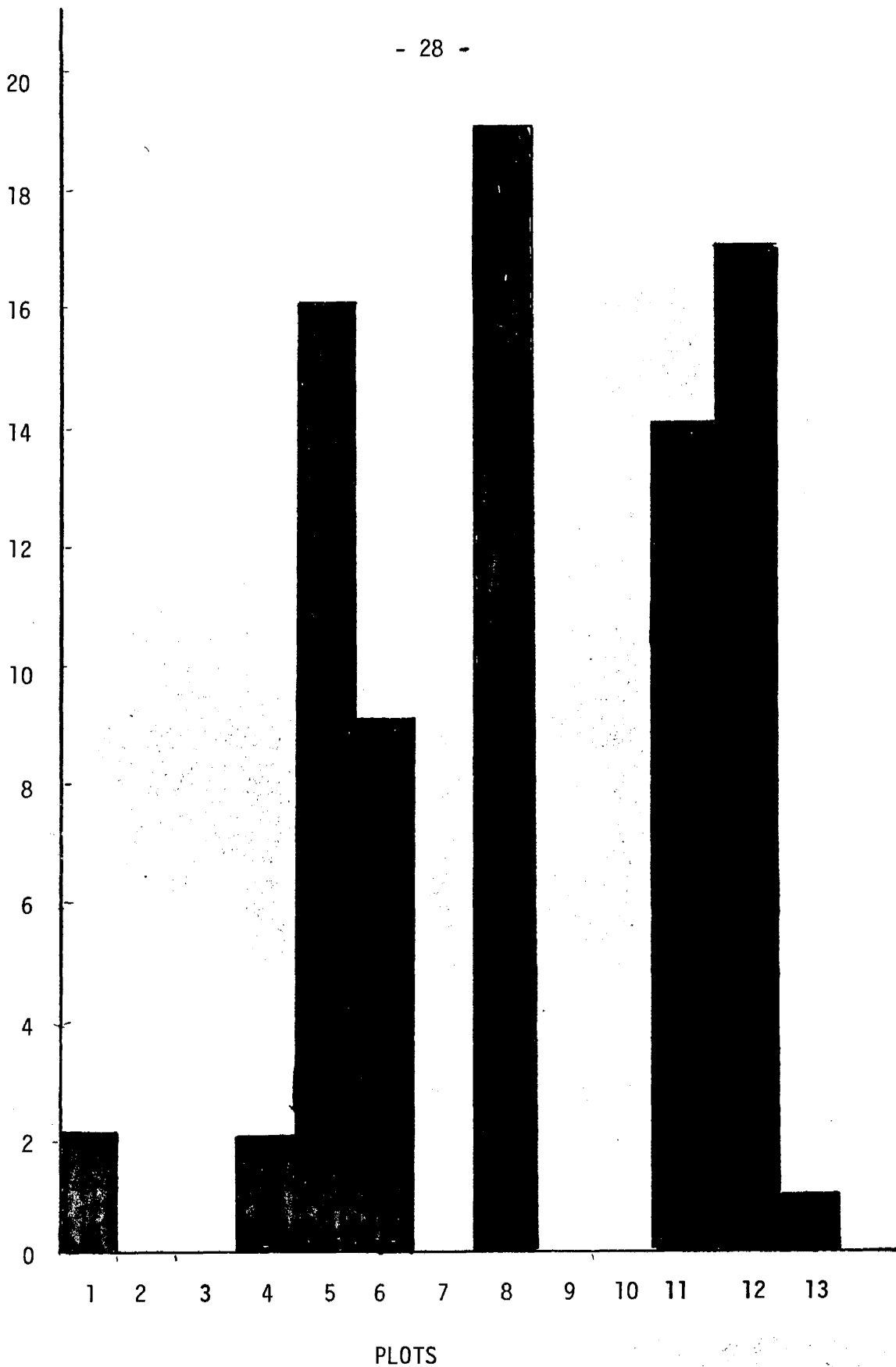


Fig. 9 Frequency of sheep tracks observed on prepared substrate plots. The plot numbers correspond to their location in fig. 7.

TABLE 3 OBSERVATIONS OF SHEEP IN THE STUDY AREA BY LOCALS AND THE RESEARCHER

DATE	LOCATION*	TOTAL #	ANIMALS INVOLVED	DIRECTION OF SHEEP TRAVEL	OBSERVER
Winter 1974	13		Small band	Sheep Mtn.	R. Wolfe
Fall 1978	12	18	Mixed band		J. Witham
Sept. 1978	10	40	Ewes and Lambs		J. Van Patten
Sept. 1978	1	1	Ram		J. Witham
Spring 1979	16	20	Mixed band		G. Wight
Fall 1979	4	1-2	Rams		D. Hanson
Fall 1979	2	4			G. Wight
Aug. 1980	11	40	Mixed band		D. Hanson
Sept. 16/80	9	18	Mixed band	Sheep Mtn.	J. Martinelli
Sept. 1980	9	4-6	Mixed band	Sheep Mtn.	J. Martinelli
Sept. 23/80	9	6	Ewes & Lambs	Sheep Mtn.	P. Nakai
Oct. 5/80	8	1	Ram	Sheep Mtn.	B. Deino
Oct. 21/80	4	3		Sheep Mtn.	B. Deino
Jan. 21/81	5	1	Ram	Rose Mtn.	J. Van Patten
April 13/81	6	4	2 Rams	Sheep Mtn.	B. Deino
April 28/81	3	2	2 Rams	Rose Mtn.	H. McLeod
April 29/81	3	2	2 Rams	Rose Mtn.	H. McLeod
May 11/81	4	2			H. McLeod
May 11/81	15	1	1 Ewe	Faro	R. Wolfe
May 12/81	4	2	3 Rams	Rose Mtn.	H. McLeod
July 19/81	8	2	1 Ewe 1 Lamb	Mt. Mye	Faro couple R. Tolbert

* The locations correspond to points marked on the 1:50,000 map in (fig. 10).

The ram observed in the vicinity of the C.N. repeater tower in mid January was heading towards Rose Mountain (Van Patten 1981). On 12 May 1981, two rams crossed in the vicinity of plot #1 and were headed towards Rose Mountain. This suggests that rams from Rose Mountain follow Route A to and from Sheep Mountain where the rut takes place.

An observation made on 13 April 1981, and the description of those animals suggests that young rams and possibly barren ewes make use of route D (Table 3 and fig. 10).

From the tracks observed on prepared substrate plots 8, 11, 12, (Table 4), it appeared that route E was travelled by nursery bands on their spring migration. Perhaps these cat roads offer an easier, more open corridor. The higher visibility along this route may offer protection from predators.

Fall Migration

This time period was extrapolated from reports and observations by local persons (Table 3 and fig. 10). It appeared that these sheep began to migrate to their winter range, (Sheep Mountain) by the third week in August. By the end of September, the nursery bands had crossed to their wintering area.

Data from the fall 1980 indicates that sheep did not appear to wander back and forth from the two locations throughout the month of October, contrary to the general consensus of local persons. Perhaps this was a result of test holes being drilled on the Grum deposit, surveying activity all along the plateau and preparation for future drill sites using a cat adjacent to the Vangorda Creek on the southwest side.

Spring Migration

Hoefs (1979) found that the migration from winter to summer range

TABLE 4 SUMMARY OF PLOT CROSSINGS FROM APRIL 1981 TO JULY 1981

DATE	HOUR	PLOT*	NUMBER OF TRACKS	COMMENTS	DIRECTION OF TRAVEL TO	DIRECTION OF TRAVEL FROM
April 13 1981	10:00	5	4		Mt. Mye	Sheep Mtn.
April 13 1981	15:30	5	4		Mt. Mye	Sheep Mtn.
April 29 1981	9:15	13	1		Sheep Mtn.	Mt. Mye
April 29 1981	9:25	12	1			
April 29 1981	10:05	8	1			
May 11 1981	10:30	8	2		Sheep Mtn.	Mt. Mye
May 12 1981	13:20	1	2		Sheep Mtn.	Rose Mtn.
May 24 1981	9:50	12	3		Sheep Mtn.	Mt. Mye
May 25 1981	12:10	5	3		Sheep Mtn.	Mt. Mye
May 25 1981	12:20	6	3		Sheep Mtn.	Mt. Mye
May 30 1981	16:00	4	2		Sheep Mtn.	Mt. Mye
June 1 1981	11:10	8	7	Nursery band including 2 lambs	Sheep Mtn.	Mt. Mye
June 4 1981	12:45	12	6	By variability in size of tracks, possibly a mixed band including yearlings.	Sheep Mtn.	Mt. Mye
June 6 1981	9:35	5	6			
June 6 1981	9:45	6	6			
June 12 1981	16:20	11	7	Nursery band including 2 lambs	Sheep Mtn.	Mt. Mye
June 29 1981	10:00	12	7	Nursery band including 2 lambs.	Sheep Mtn.	Mt. Mye
June 30 1981	11:00	8	7			
July 1 1981				Hoof prints seen on catroad running parallel to AEX road on south side heading toward Grum camp.	Sheep Mtn.	Mt. Mye
July 19 1981	Evening	8	2	Ewe & sick lamb		37

*PLOT LOCATIONS ARE FOUND IN FIG 12.

among the Kluane National Park sheep was a gradual process, which took place throughout the month of June. Unlike the sheep in the park, the Mt. Mye sheep appeared to be more sporadic and their movements continued over a longer period of time.

Aside from the rams moving off Sheep Mountain after the rut, the first sign of movement occurred 13 April 1981, five weeks prior to lambing around the 26 May 1981.

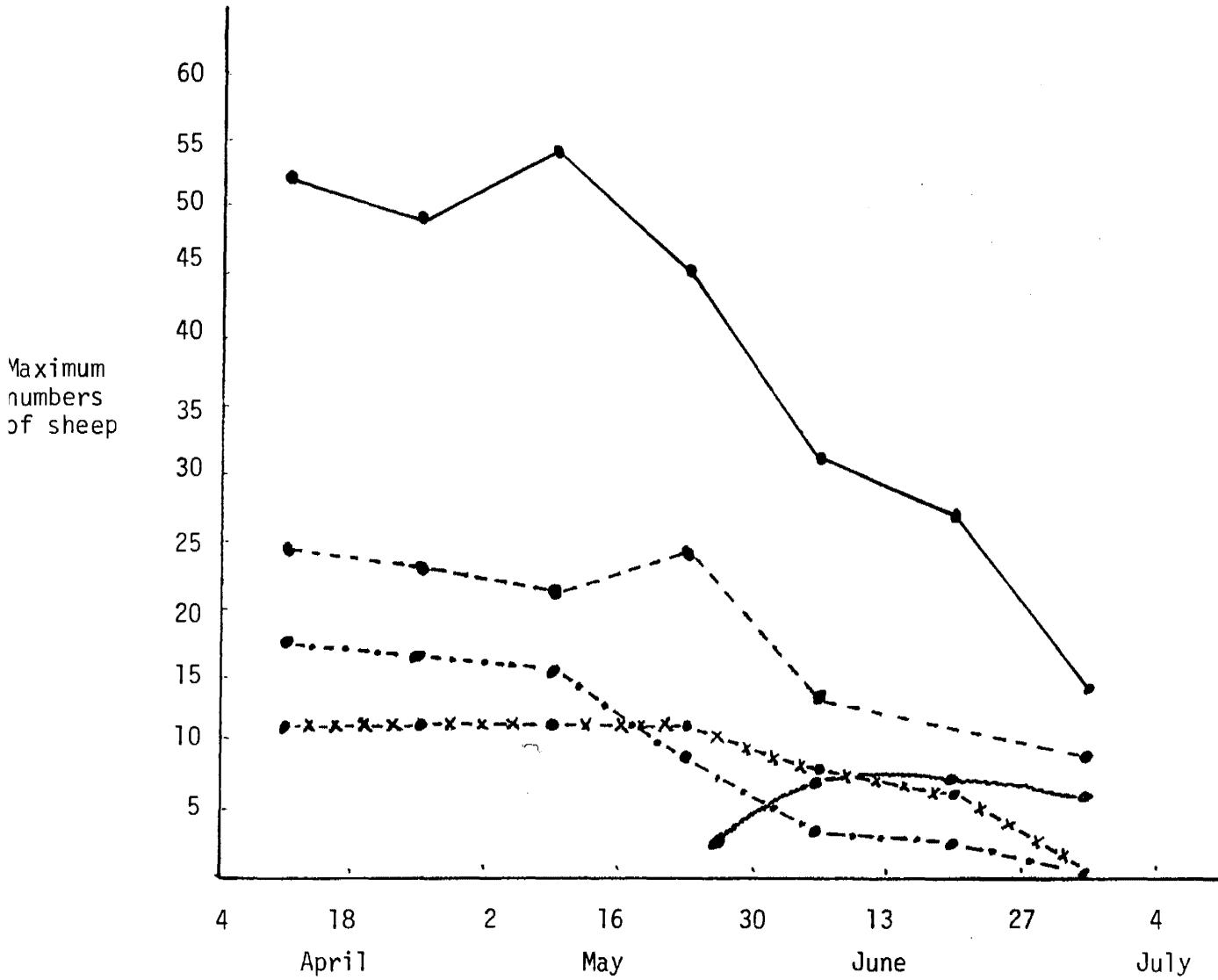
A ewe and lamb were seen on the roadside above Vangorda Creek as late as July 1981. This may have been an unusual incidence, since the lamb was sick and died within a few days.

There appears to have been a definite time period during which the majority of sheep began to move off their winter range (fig. 11). There was a decline in total numbers of sheep observed on Sheep Mountain around 12 May 1981. The rams four years and under were the first to leave followed by bands of ewes and yearlings. Ewes and lambs were the last to leave the last two weeks of June. The most intensive spring movement, across the Vangorda Plateau took place between the 14 May 1981 and 30 June 1981.

Critical Areas

A "critical area" as defined by the Canadian Wildlife Service is "that portion of the species range where a major concentration of the population traditionally occurs annually for part or all of the year and where disturbance of populations or habitat by man has the potential to reduce the population substantially".

The field work indicated that Sheep Mountain, the wintering area;



- combined maximum number
- - - maximum number of ewes
- · - · maximum number of rams 3 years
- x - x maximum number of yearlings
- ~~~~~ progression of lambing

* The First Lambs Were Observed For 1981.

Fig. 11 MAXIMUM BI-WEEKLY SHEEP COUNTS ON SHEEP MOUNTAIN

Vangorda Plateau, Rose Mountain where the rams range, the migration corridor and Mt. Mye, a portion of the summer range are traditional areas utilized by these sheep. The winter range and access to this habitat are the areas of major concern. Once the sheep are denied access to their winter range they suffer a loss of essential habitat where breeding and lambing activity takes place and an area most suitable for winter survival.

3. The Value of the Sheep Resource

Consumptive Use

Fannin sheep are an intermediate colour phase between two extreme forms of thin horn sheep, the white Dall sheep (*Ovis dalli dalli*) and the uniformly dark bodied stone's sheep (*Ovis stonei*). The Fannins are distinctive because of highly variable patterns of dark hair in a variety of shades (fig. 12). There are less than 4,000 Fannin sheep in the world and they are more or less unique to the Yukon, (Hoefs 1980). Because of this they are sought after by trophy hunters on an international level. A non-resident hunter may pay up to \$6,000 for the opportunity to hunt a Fannin ram. Total harvest reports in the Yukon Wildlife Branch records (Table 5) show that from 1979 through 1981, 18 rams have been taken from the Anvil Range by non-resident hunters. The total resident harvest in 1979 and 1980 was three rams. The proportion of sheep taken from Mt. Mye represents half of the total harvest in the Anvil Range from 1979 to 1980.

Non-resident hunting activities constitute important employment opportunities. There are 20 outfitting businesses in the Yukon employing up to a hundred seasonal employees. Werner Koser and Art Mintz are active outfitters in the area and provide employment for the nearby community of Ross River.

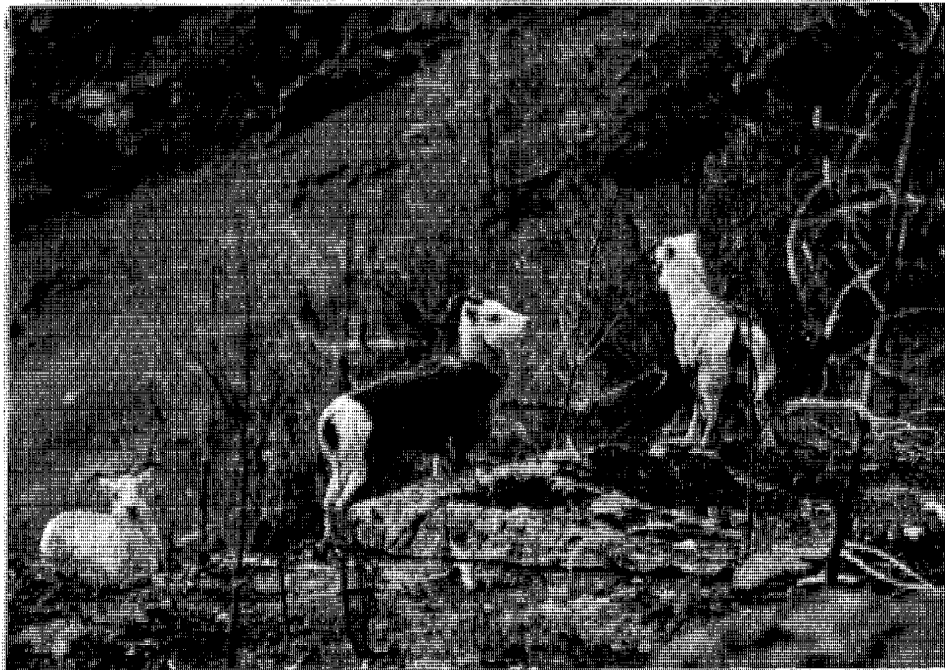


Fig. 12 The varied patterns and shades of dark hair that make the Fannin sheep distinctive.

TABLE 5 HARVEST INFORMATION OBTAINED THROUGH WILDLIFE BRANCH RECORDS

Non-Resident Hunters		Resident Hunters		Location	
1979	1980	1981	1979		1980
0	0	0	0	0	Mount Menzie
3	1	0	0	0	Twopete Mountain
0	0	0	1	1	Rose Mountain
2	2	4	1	0	Mt. Mye
0	0	0	0	0	Swim Lakes
1	0	3	0	0	Unnamed mountain north of Mt. Mye
0	2	0	0	0	Unnamed mountain to the east of Mt. Mye.
TOTAL	6	5	7	2	1

In the past natives have also been known to harvest the sheep from Mt. Mye and Sheep Mountain.

Non Consumptive Use

During recreational activities such as hiking, skiing, driving, locals are attracted to this area because of potential sheep observations. Most of the Faro residents are originally from other parts of Canada and this is their first opportunity to see wild mountain sheep. There are very few places in the Yukon where they can be viewed with such ease.

POTENTIAL IMPACT

These sheep have been gradually exposed to human activities during the past 15 years.

Development of the Vangorda Plateau, however, will interfere with one of the most critical activities, seasonal movements. Once sheep can no longer reach their winter range, a decrease in population may occur (Geist 1971).

More specifically, the causes of concern are: open pit mines, creek diversion a 17 Km overland conveyor and an increase in human population and recreational activities.

The open pit mine depicted in (fig. 13) exhibits the extent of physical change in the environment that could take place on the Vangorda Plateau. The general destruction of sheep habitat caused by open pit mining is: the pit itself, the terrace waste dumps of overburden rock, toxic tailings ponds, dams, water diversions and water reservoirs. It is an area of intense activity inducing high noise levels from drills, and heavy equipment traffic.

The future open pits will be smaller in size. Since the ore will be transported to the existing concentrator, toxic tailing ponds, extensive creek diversions and water reservoirs will not exist.

The Grum open pit would be located 13 Km east of the Faro concentrator (fig. 14 envelope insert). Doal Lake would be drained and the boundaries of the pit would ultimately encompass the present Grum exploration camp. The waste dumps would extend in a southeasterly direction towards the Vangorda deposit. Tentatively, a primary crushing site would be located northeast of the Grum deposit. This would be an area of frequent blasting, ore trucks, shovels and other heavy machinery in operation.

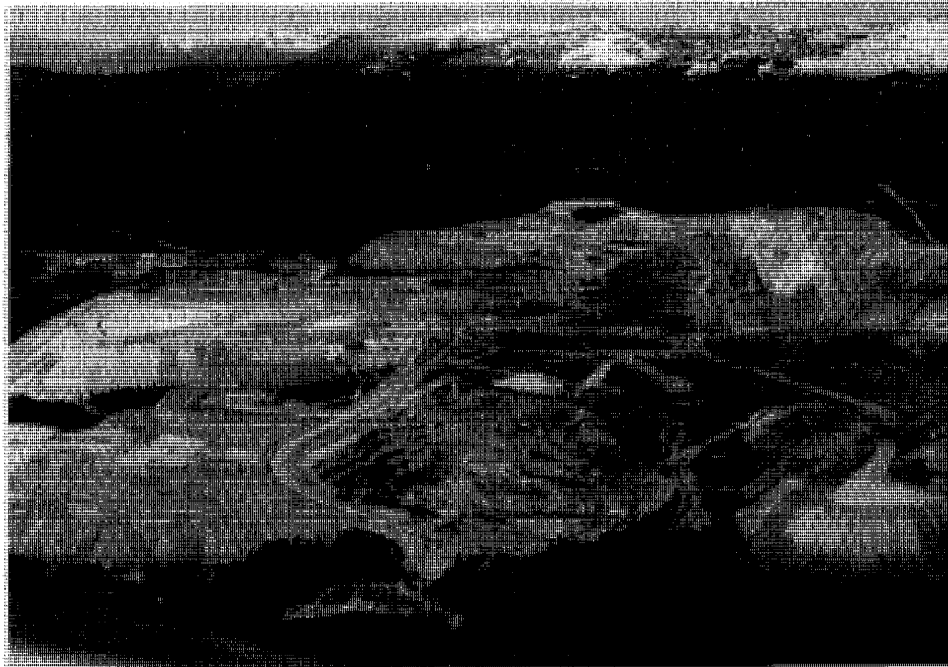


Fig. 13a View of the Faro open pit, 1981.



Fig. 13b The tailings pond and Rose Creek diversion which includes the fish ladder project.

Aside from the major concern of migrating sheep, other wildlife in the area, such as moose, caribou and bears, would be disrupted.

The Vangorda open pit would be located 16 Km east of the Faro concentrator (fig. 14). Of the mines, the Vangorda pit would be the most disruptive to sheep migration. It would straddle the creek, its boundaries to stretch eventually to the old airstrip. The mounds of waste would extend to the southwest of the pit. In the process the Vangorda Creek would be diverted west of creek 1,000 metres in length (fig. 14). Pre-production stripping may begin as early as 1985 (Tolbert, pers. com. 1981). It would operate for approximately four years.

Associated with open pits is heavy vehicle traffic of shift employees, service trucks and ore trucks that produce noise and dust.

In order to transport the ore from the respective mining sites on the Vangorda Plateau to the Faro concentrator, approximately 17 Km west, it is deemed necessary to install a linear system. Three modes of transportation were reviewed by Cyprus Anvil Engineers and considered for economic and practical feasibility:

- 1) overland conveyor paralleled by a service road;
- 2) off-highway trucks;
- 3) railway system.

As of April 30, 1981, a tentative decision was made to install the overland conveyor. This conveyor would run three to four feet above the ground surface and possibly underground where feasible. It would eventually extend from the Dy deposit following a straight line along the base of Mt. Mye on the north side of the AEX road due west to the Faro

concentrator (fig. 14). There would be a tributary belt connecting the Vangorda deposit just west of Vangorda Creek. The model would be a cable belt with a width of 750 cm. and would travel at a speed of 4.27 m/s. Noise level was not included in the list of system features.

A behavioural characteristic of sheep is their alertness to unfamiliar movements.

The overland conveyor would be a constantly moving object producing noise and also a constant tremor in the ground. This could alarm the sheep to the extent that they would refuse to cross it.

Sheep have gradually become accustomed to crossing a moderately travelled road. The off-highway trucks would produce an inevitable increase in traffic that would be noisy, frequent, and would create a lot of dust.

The railway would create a visual obstruction, however, the track would be at the surface level rather than three or four feet above the ground as with the proposed overland conveyor. The train would have a loud, but intermittent noise level. It would run less frequently than the off-highway trucks, and there would not be the problem of dust and poor visibility.

Studies of the effects of linear systems on wildlife migration have been performed on caribou (Banfield, 1971). Results indicate that animals will deflect left or right from their line of travel. There has not been a longterm study conducted to single out the effects of such a linear system from other natural environmental parameters that may contribute to the deterioration of an animal population. In this situation, a deflection

may result in the sheep never reaching their usual wintering area. If there is not a satisfactory alternative area available, these animals may perish during the first winter after installation of the system.

Associated with such mining development in the Anvil district is the inevitable growth in population of the Faro community. By 1983 or 1984 the population of Faro is estimated to increase from the present 1,940 to 2,300. As a result there is an increase in exposure of sheep to human activities.

Incidences in which sheep have been sighted in the baseball diamond in Faro and rams bedded and grazing close to the main road, 1 Km north of Faro show how accessible they can be to humans.

An Arctic Drilling employee witnessed a dog chasing a ram while its owner and friends looked on without attempting to control the dog. This type of harrassment is inexcusable.

RECOMMENDATIONS

The following are a number of recommendations that should be implemented to ensure the survival of the Mt. Mye sheep and to minimize disturbance to their traditional migration patterns.

1. In the event that the sheep no longer cross to their traditional winter range, it is necessary to research the availability, quality and carrying capacity of alternative winter ranges and lambing areas.
2. The seasonal distribution and population size should be determined to see if there is any inter-mixing of the sheep wintering on Sheep Mountain and other bands in the Anvil Range.
3. More work is needed to determine more accurately the time period of the fall migration.
4. A biologist, preferably answerable in part to the Yukon Wildlife Branch, should be on location to closely monitor the sheep behaviour during the construction phase and the first two years of operations.
5. A collaring program should be implemented to facilitate the assessment of behavioural responses to disturbance factors and the gathering of information regarding movement patterns, range perimeters and social requirements.
6. It appears that the corridor between the two open pits will not remain undisturbed, therefore it is necessary to establish alternative routes acceptable to the sheep. This could be achieved by clearing brush and trampling the trails using horses. The new trails would diverge from the starting point of their traditional routes so that they follow high ground to the east and west of the future development area. To train the sheep snow fences could be used to block traditional routes and future areas of danger.

This should commence as soon as possible so that the sheep may become habituated to the established routes before expansion begins and to determine whether this method is successful.

7. The conveyor belt if utilized will remain a visual barrier particularly if the sheep choose to follow the established route west of the Grum deposit. Appropriate provisions should be included in its design at predetermined crossing points. Overpasses or running the conveyor underground for the desired distance are two viable methods.

The overpass should be solidly built, at least 100 metres in width with gradually sloping ramps, ensuring good visibility which is essential to the sense of security of the sheep. A well defined trampled path should lead over the bridges.

To precondition the sheep to a visual obstacle before construction begins, a half culvert designed for sheep crossing should be built to simulate the overland conveyor.

To run the conveyor underground a tunnel could be built allowing enough room for maintenance requirements.

An alternative would be to dig a trench for the conveyor and place a half culvert over top.

Landscaping could be achieved by reseeding on and around constructed sheep crossings.

8. In the event that the sheep refuse to follow the established trails the narrow corridor between the two open pits, their traditional route, should be maintained. Restrictions should be made on the dumping of wastes into this confined area. Snow fence barriers should be put at points where sheep may encounter any danger.

9. In the structural design noise abatement measure should be put into effect by enclosing and well insulating the conveyor system.

If these designated measures cannot be strictly implemented, the overland conveyor will be an insurmountable barrier to sheep movement in which case it should be replaced by the railway system.

10. Suggested recommendations during the construction phase include:

- construction camps and service huts, airstrips or helicopter pads be located at least half a mile from known migration routes;
- prohibit dumping of any debris on or near known migration routes;
- during migration periods limit construction activity and make those people on location aware of possible sheep movement and factors which constitute harassment or interference;
- the volume of traffic from Vangorda and Dy sites to Faro should be maintained at a minimum by utilization of multi-occupant vehicles where possible, as well as convoyed vehicles where heavy traffic periods coincide with migration. Speed limits should be reduced so as to lessen the creation of dust;
- air traffic should be restricted in the area and the use of the present airstrip at Vangorda should be discouraged.

These measures would be most beneficial during the first few years after development.

11. Non-consumptive use of the sheep should be regulated such that the use of snowmobiles, motorcycles and other all-terrain vehicles be prohibited in the vicinity of Sheep Mountain and the migration routes towards Mt. Mye and to avoid unnecessary harassment, such as loose dogs.

12. In the past natives have been known to hunt sheep from Mt. Mye and Sheep Mountain. Restrictions on their hunting should be put into effect at least prior to and during the mining operations. This could be achieved by re-drawing the subzone boundaries making the designated area exempt from sheep hunting.

An awareness presentation by the Wildlife Branch should be given to all Cyprus Anvil employees and Faro residents in an attempt to reduce intentional and unintentional disturbance of the sheep.

It is strongly felt that the implementation of these recommendations is essential to the preservation of the Mt. Mye Fannin Sheep population.

ACKNOWLEDGEMENTS

Information so freely given about the sheep by all those local persons contacted in the Faro area and the cooperation of Cyprus Anvil employees was very much appreciated.

Credit should be given to Don Roloefs and Robin Tolbert for their photography expertise.

The professional assistance and cooperation of Yukon Wildlife Branch biologists was also extremely appreciated.

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APPENDIX I

AERIAL SURVEYS

AERIAL SURVEY 9 AUGUST 1980

Survey Time: 2:15 to 3:45
4:40 to 5:20

Weather: Mostly overcast, some sunshine calm

Aircraft: T.N.T.A. Jet Ranger (206B) piloted by John Witham

Observers: Peter Dean (Cyprus Anvil)
Heather McLeod (C.W.S.)

OBSERVATIONS: Mt. Mye sheep observed:

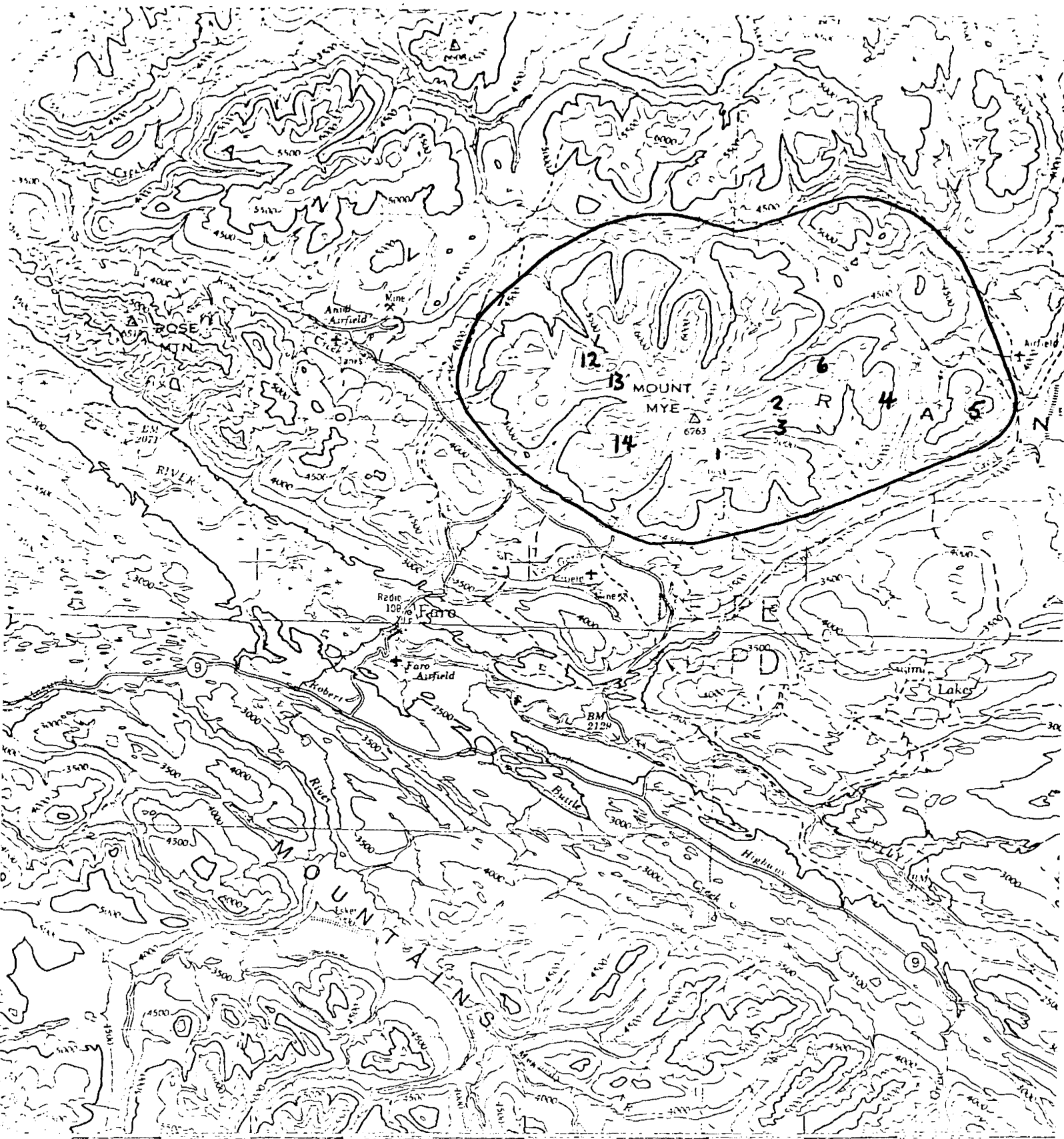
1. 1 Ram
2. 8 ewes, 5 lambs
3. 4 caribou (3 adults and 1 calf)
4. 1 ram

Two more sheep were observed here by Heather McLeod but could not be relocated for classification. This site has potential for winter range and should be checked out in winter.

3 adult caribou also seen on this ridge.

5. 1 bull moose
6. 3 ewes, 2 lambs
7. 1 adult caribou
8. 1 adult caribou
9. 3 ewes, 1 lamb
2 adult caribou
10. 7 ewes, 3 lambs
11. 4 ewes, 2 lambs
12. 1 adult caribou
13. 12 ewes, 2 lambs
1 adult caribou
14. 6 ewes, 2 lambs

Totals: 62 sheep, consisting of 2 rams, 43 ewes, 17 lambs
13 caribou and 1 moose.



AERIAL SURVEY 20 OCTOBER 1980

Survey Time: 14:30 - 16:30
Weather: Overcast, windy, light snowfall at higher altitudes
Aircraft: T.N.T.A. Jet Ranger (206B)
Pilot: John Witham
Observer: Heather McLeod (Yukon Wildlife Branch)
Jerry Michalski (C.O. Ross River)
Paul Silverman (Cyprus Anvil).
Area Surveyed: Mt. Mye southwest to Rose Mountain across Ridge,
southwest to Sheep Mountain.

OBSERVATIONS: Mt. Mye no sheep observed.
1. 3 Rams
2. 17 ewes, 7 lambs, 1 ram
3. 55 ewes, lambs and yearlings scattered across
Sheep Mountain.



45° 30' 15' 133° 00'

Map prepared by the ARMY SURVEY ESTABLISHMENT R.O.F. 1951
Scale 1:250,000

Scale 1:250,000
Approximately 1 inch to 4 miles

AERIAL SURVEY 11 MAY 1981

Survey Time: 14:15 - 15:15
Weather: Clear/Wind
Aircraft: T.N.T.A. Jet Ranger (206B)
Pilot: John Witham
Observers: Heather McLeod (Yukon Wildlife Branch)
Reg Wolfe (Cyprus Anvil)
Paul Silverman (Cyprus Anvil)
John Witham
Area Surveyed: Vangorda Creek across to C.N. repeater to Sheep Mountain.

OBSERVATIONS:

1. 1 Ram, 1 Ram
2. 1 ewe
3. 2 rams
4. 4 ewes
5. mixed band of 14
6. 1 ewe and yearling

DISTINCT TRAILS FOLLOWING EAST/WEST RIDGE FROM SHEEP MOUNTAIN TO C.N. REPEATER TOWER WERE OBSERVED. TIME LIMITED SO NOT A THOROUGH COUNT OF SHEEP.

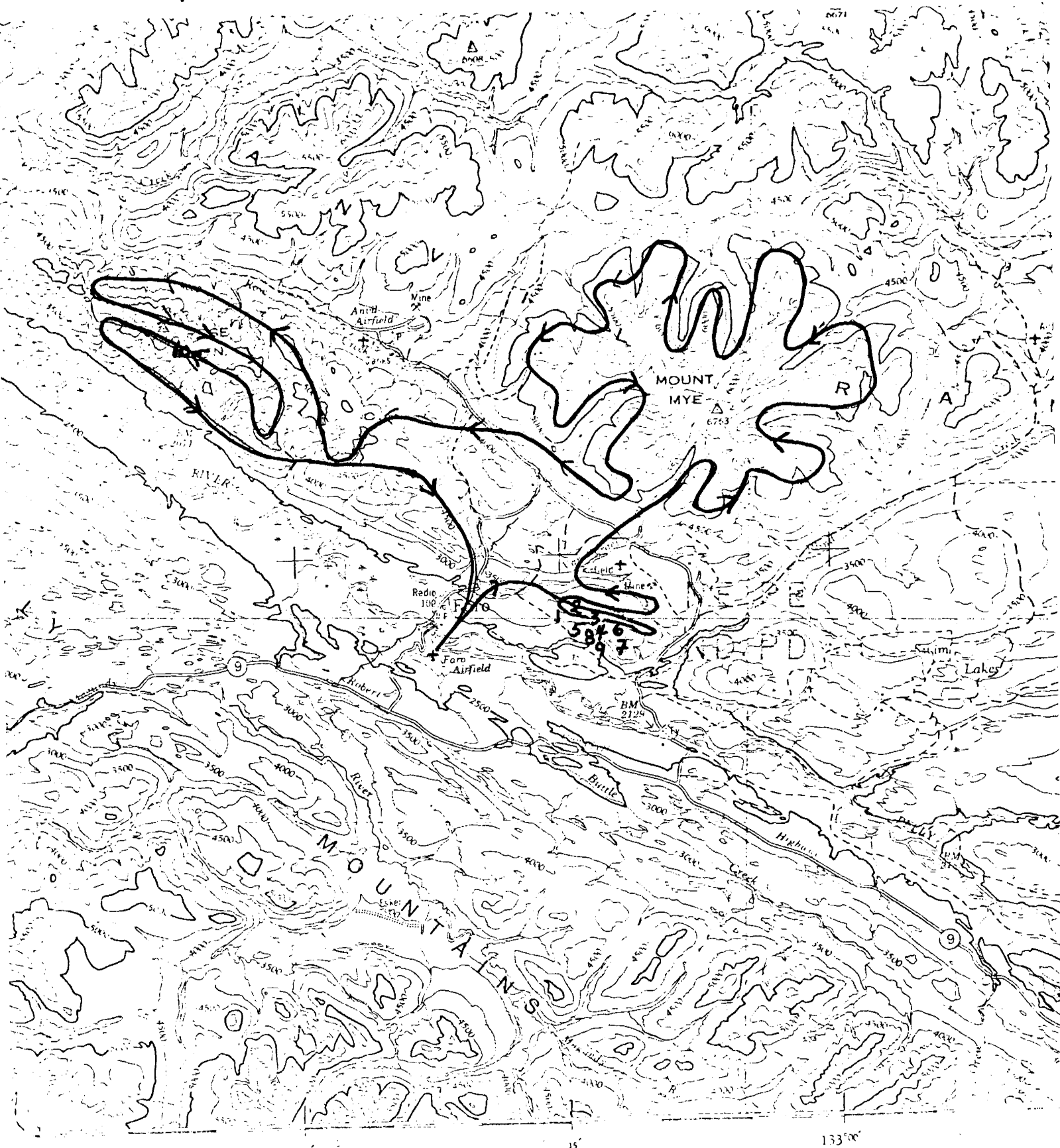
AERIAL SURVEY 17 MAY, 1981

Survey Time: 13:30 - 15:20
Weather: Clear, calm
Aircraft: Hiller
Pilot: K. Guenter
Observers: Heather McLeod (Yukon Wildlife Branch)
Joe Kuhn (Yukon Wildlife Branch)
K. Guenter

Area Surveyed: Sheep Mtn., Mt. Mye, Rose Mtn.

OBSERVATIONS:

1. 5 ewes, 3 yearlings
2. 3 ewes
3. 2 young rams
4. 2 young rams
7. 4 ewes, 2 yearling
8. 5 ewes, 2 yearling
9. 3 ewes, 2 yearlings, 1 young ram
10. 5 ewes and 3 yearlings



Scale 1:250,000
Approx. 1 inch = 4 Miles

AERIAL SURVEY 26 MAY, 1981

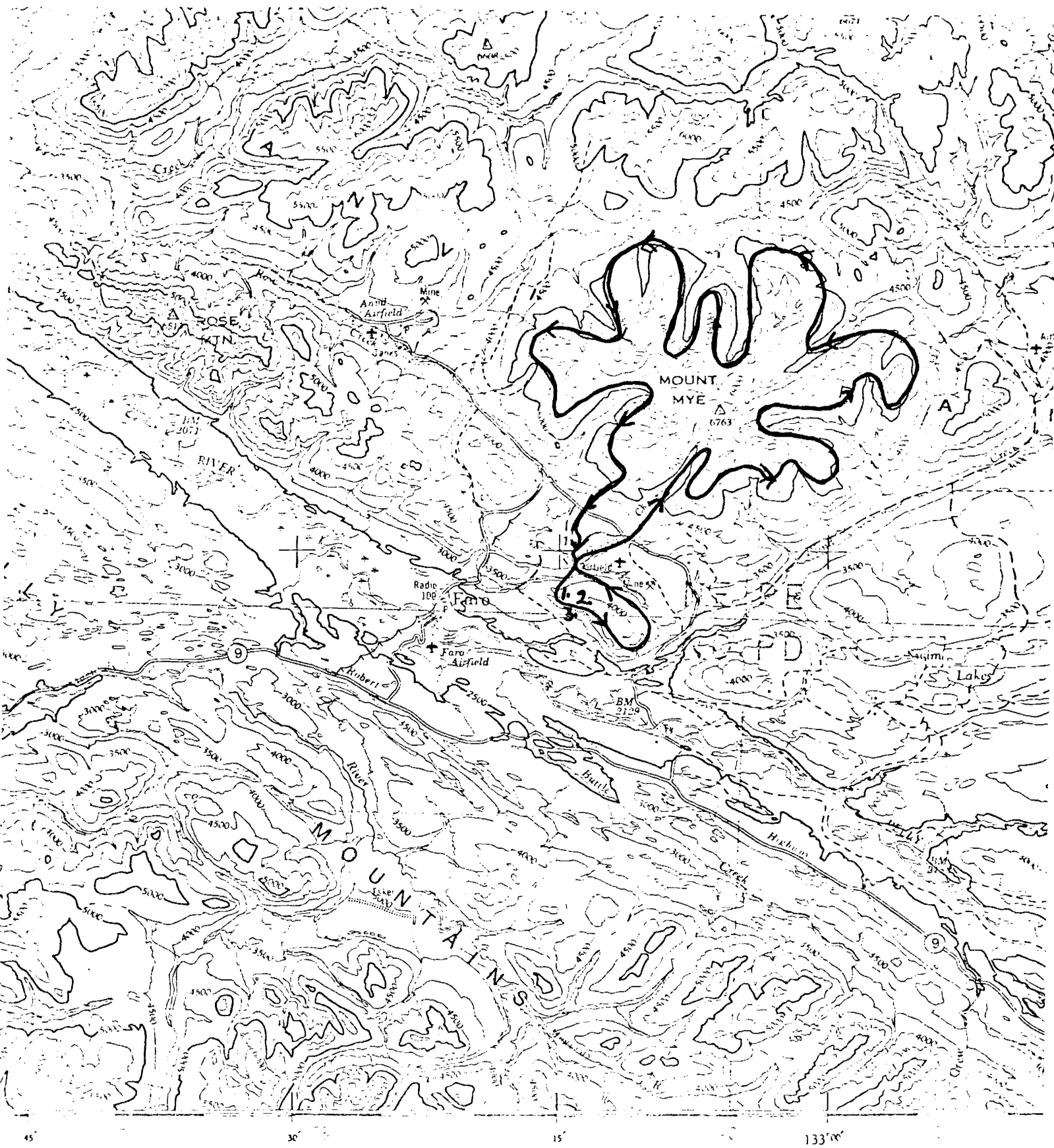
Survey Time: 14:40 - 15:30
Weather: East wind, cloud and drizzle on northside of Mt. Mye
Aircraft: Viking Hughes (500 D)
Pilot: Brian Wilkinson
Observers: Heather McLeod (Yukon Wildlife Branch)
Burt Deino (Grum Camp Foreman)
Brian Wilkinson

Area Surveyed: Sheep Mountain, Mt. Mye

OBSERVATIONS:

1. 18 ewes, yearlings
2. 14 ewes, rams
3. 8 ewes, yearlings, 2 lambs

FOLLOWED DISTINCT TRAIL 1 KM EAST OF GRUM CAMP UP BACK SIDE OF SHEEP MOUNTAIN.
VISIBILITY POOR ON NORTH FACE OF MT. MYE. SHEEP MAY ALSO HAVE CROSSED NARROW VALLEY
ON THE NORTHEAST END OF MT. MYE.

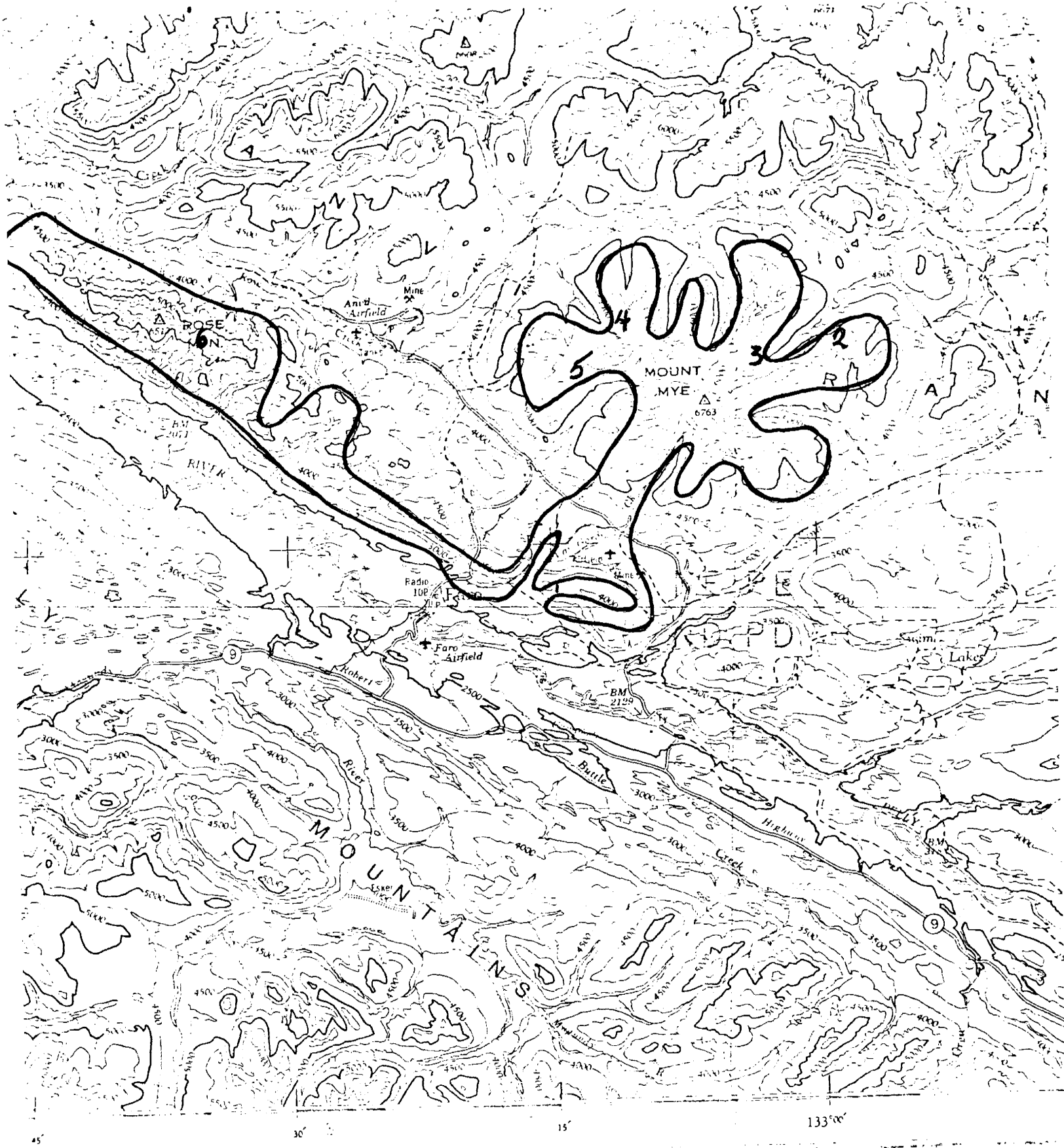


AERIAL SURVEY 17 JUNE, 1981

Survey Time: 7:10 - 9:15
Weather: Clear, Calm
Aircraft: T.N.T.A. Jet Ranger (206B)
Pilot: John Witham
Observers: Heather McLeod (Yukon Wildlife Branch)
Geotz Sheuerholtz (TAESCO)
John Witham

Area Surveyed: Sheep Mountain, Mt. Mye, Rose Mtn.

- OBSERVATIONS:
1. 15 ewes 4 lambs
 2. 4 caribou 2 calves
 3. Grizzly sow 2 cubs
 4. 8 caribou 5 calves
 5. 7 young rams 9 ewes 4 lambs
 6. 7 ewes 2 lambs

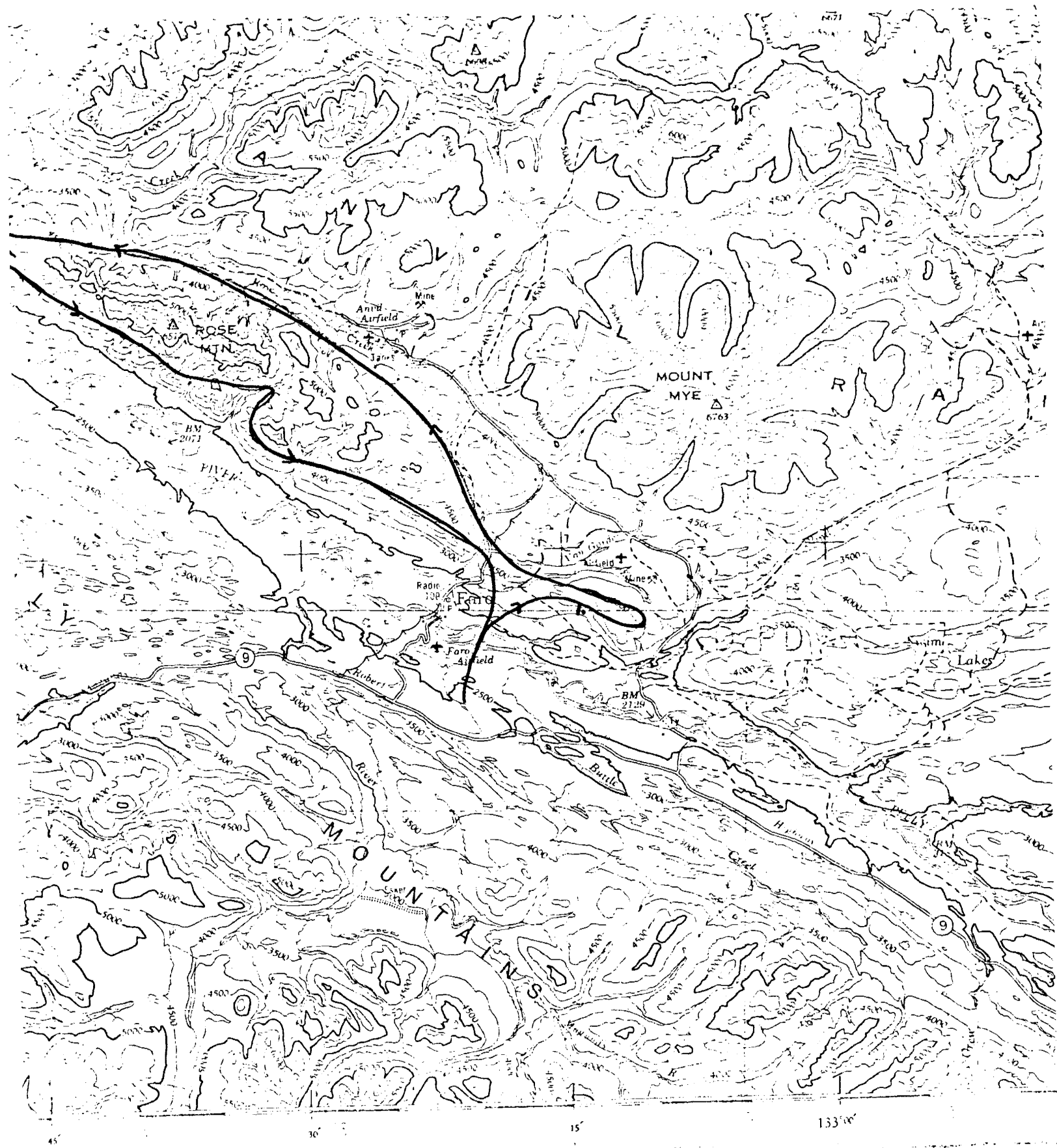


AERIAL SURVEY 26 JUNE 1981

Survey Time: 7:00 - 8:30
Weather: Northwest wind storm clouds to north
Aircraft: Super cab
Pilot: Dr. Peter Long
Observers: Heather McLeod (Yukon Wildlife Branch)
Peter Long (Faro Doctor)
Area Surveyed: Sheep Mountain, Rose Mountain, Glenlyon Lake

OBSERVATIONS: 1. 15 adults 4 lambs

THIS AIRCRAFT WAS FOUND TO BE INEFFECTIVE IN DOING THIS TYPE OF SURVEY BECAUSE TURBULENCE PREVENTED CLOSE PROXIMITY TO SIDE SLOPES AND LOW ALTITUDE FLYING SO LITTLE GAME WAS SEEN. THEREFORE, THIS SHOULD NOT BE CONSIDERED AN ACCURATE ESTIMATE OF SHEEP NUMBERS AND DISTRIBUTION.



45

30

15

133°

AERIAL SURVEY 14 JULY, 1981

Survey Time: 10:00-13:25
Weather: Clear, light winds
Aircraft: Hiller
Pilot: K. Guenter
Observers: Tony Nette (Yukon Wildlife Branch)
P. Merchant (Yukon Wildlife Branch)
K. Guenter
Area Surveyed: Faro/Blind Creek, North and east of.

OBSERVATIONS:

1. 3 caribou 1 bull
2. 3 ewes 1 lamb
3. 7 caribou including 3 calves
4. 19 caribou including 6 calves



Scale 1:250,000
Approx. 1 inch = 4 Miles

AERIAL SURVEY 16 JULY 1981

Survey Time: 10:15 - 17:00
Weather: Clear calm
Aircraft: Hiller
Pilot: K. Guenter
Observers: T. Nette (Yukon Wildlife Branch)
P. Merchant (Yukon Wildlife Branch)
K. Guenter

Area Surveyed: Mt. Armstrong and Rose Mountain on return.

OBSERVATIONS: Rose Mountain only:
1. 17 ewes 5 rams
2. 2 ewes
3. 4 rams



Published by the ARMY SURVEY ENLISTMENT BUREAU, 1951
Revised by the USAF, 1949.

Scale 1:250,000
Approximate 1:1 inch = 4 miles

APPENDIX II

PERSONS CONTACTED THROUGH PERSONAL INTERVIEWS BY TELEPHONE OR MAIL:

P. Silverman Cyprus Anvil Employees
B. Gantest
P. McCormick
D. Rolefs
J. Marttinelli
P. Nakai
B. Dieno
R. Wolfe
G. White
M. Hampton

A. Peel Former Employees of Cyprus Anvil
R. Fry
E. Kruasty

B. Wiggins Part owner of Faro Esso Service Station
J. Von Patten Employee of Northwestel
J. Witham Helicopter pilot from Ross River
W. Koser Outfitter
J. Michalski Conservation Officer for Ross River Region
A. Johns Trapper in Ross River area
J. Ledue Trapper in Dawson and Crew Creek area
E. Russell Former Conservation Officer for Ross River Region
V. Geist Faculty of Environmental Design, University of
 Calgary, Calgary, Alberta

Information on the timing and location of future mining developments in the immediate vicinity of the study area were obtained from personal conversations with the following people:

D. Jennings Chief Exploration Geologist
J. Mustard Exploration Geologist
D. Hanson Former Feasibility and Development Geologist
P. Dean Feasibility and Development Environmentalist
R. Tolbert Present Feasibility and Development Geologist