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SHEEP AND GOAT REPORT

by

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Annual Project Segment Report
Federal Aid in Wildlife Restoration
Project W-6-R-4, Work Plan E

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FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: E TITLE: Sheep Investigations

JOB NOS.: 1; 2-a,b,c.

PERIOD COVERED: May 1, 1962 to April 30, 1963

ABSTRACT

Six aerial surveys were conducted during this reporting period. These flights required about 25 hours of counting time and gave a total count of 3,750 animals. The percentage of legal rams found was from 10.2 to 13.5 per cent. The area receiving the most hunting pressure, the south slopes of the Wrangells, contained the highest percentage of legal rams.

Field work was conducted in the Dry Creek valley in the Alaska Range where a long term range study is being initiated. The important vegetation types in the valley are described and are being mapped. The vegetation of the valley consists of black and white spruce stands to 3,500 feet, a shrub zone to 4,000-4,500 feet, and a mosaic of alpine tundra and meadows to 6,500 feet.

Utilization of vegetation types, seasonal movements, and daily feeding cycles were determinedly analysis of observations recorded on data cards. In early spring the sheep were feeding primarily on greening vegetation in the shrub zone, but by mid-June they began to move upward and toward the upper part of the valley, the area that can be considered as their summer range. During this period there was very heavy use of a local mineral lick. By late July the sheep were feeding in alpine meadows where the snow had recently melted and this pattern continued into August. By late winter the sheep were concentrated on the south-facing slopes near the mouth of the canyon but were feeding in meadows as high as 5,500 feet in that location.

Few occurrences of attempted predation have been observed and none were successful. Three unsuccessful attacks by

golden eagles have been observed. The first newborn lamb was observed on May 18, 1962 and by the first part of June there were 56 lambs/100 ewes. Survival of the 1961 lamb crop was good, as indicated by our counts of 41 yearlings/ 100 ewes. The ewe travels to well protected locations to have her lamb, away from other sheep. After the lamb is strong enough to travel the ewe and new lamb join the ewe band. We have no record of the birth of twins. Nursing periods are but a few seconds in length and the lamb is grazing by the end of the first week. By the end of four weeks it is mostly on forage.

The rut seemed to be a few days earlier in 1962 than that observed in 1961. No butting contests were observed and the ewes seemed to be in oestrus early. No difference in breeding behavior was seen this year except that one young ram was observed holding or herding a group of ewes. When he was challenged by a larger ram he did not defend his position.

RECOMMENDATIONS

No recommendations relating to management can be made at this time.

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OBJECTIVES

To determine the distribution and relative abundance of sheep on a statewide basis and to relate these to accessibility and hunting pressure received.

To conduct an ecological survey of sheep range in parts of Alaska. To determine and describe the dominant plant communities and the environmental factors affecting them. To determine the sheep utilization of plant communities and individual plant species throughout the year.

To obtain information about the life history of sheep, with special attention to daily and seasonal behavior and movements.

To obtain information regarding breeding behavior and sexual cycles, fertility and natality rates, growth of fetus and lamb, magnitude of lamb crop, and survival of lambs to the yearling age.

TECHNIQUES

Aerial surveys were flown in a Piper PA-18 over several areas of the Alaska Range in an attempt to locate and assess the abundance of sheep in those areas. The locations and numbers of sheep observed were plotted on charts. Composition data were taken where terrain and air conditions permitted.

The vegetation of the Dry Creek study area is being mapped through field observations of the vegetation and through the use of aerial photographs.

A rapid survey method for describing the various vegetation types in the study area is used. Plant species are listed for the entire stand and their cover estimated using the following scale:

1. Less than 1/16 cover
2. 1/16 to 1/8 cover
3. 1/8 to 1/4 cover
4. 1/4 to 1/3 cover
5. 1/2 to 3/4 cover
6. 3/4 to 1/1 cover

A detailed quantitative description of the more important stands is being made using a system devised by Bocher for use on arctic vegetation in Greenland. The system uses three concentric circular plots of .001, .01, and .1 square meters.

A complete collection of all of the species in the flora of the Dry Creek areas for use as a reference collection for the vegetation analysis and the food habits studies has been attempted.

Direct observations of the vegetation utilized by the sheep have been made in both summer and winter. In the winter the feeding craters have been marked so that they can be analyzed during the following summer. A rumen sample from a ewe collected in March of 1963 was analyzed.

Snow poles were established in most of the main vegetation types in the Dry Creek study area. Snow depths were read during the period of maximum snow deposition in March and April.

In order to determine the utilization of the different vegetation types as well as the distribution of the sheep at various times of the year, a sheep data card was utilized. On this card were recorded the date, location of the observation, a classification of the sheep, the elevation, slope, and exposure.

In addition, observations were made at one half hour intervals to determine what percentage of the sheep were feeding, resting or engaged in other activities and in which vegetation type the sheep were feeding.

In order to obtain information on the effects of sheep populations on the range, exclosures were established in an area of maximum winter use. These exclosures were 10 feet on a side and constructed of logs, fencing and barbed wire.

A square meter of vegetation within the exclosure and in a nearby control plot were mapped in detail.

Clip quadrats one square meter in size were made in one important vegetation type in order to obtain some indication of the productivity of the alpine ecosystem.

The sheep were kept under direct daily observation in order to determine their general activities and behavior. In addition the timing and duration of the rut, the lambing period, and the behavior during these times were determined by the same method. The survival of lambs to the yearling age was determined by composition counts made just prior to the start of the lambing. Progressive counts of ewes and lambs were taken during lambing to find the progression of lambing, the peak of lambing, and the size of the lamb crop.

FINDINGS

Current Abundance and Distribution

Aerial Surveys

Twenty-five hours of aerial surveys conducted in six different areas of Alaska during this reporting period resulted in a total count of 3,570 animals. Aerial counts do not give accurate totals of sheep in each area, but they do give data on relative abundance between areas.

One composition count was made on foot in McKinley Park on August 16-17, 1962 in order to compare composition found in an unhunted population with that found in heavily hunted areas. One hundred sixty-eight sheep were tabulated on this count. The percentage of legal size rams (10.2%) was the lowest found in any area, despite no hunting pressure.

The first aerial counts were made in the White Mountains on July 2-3, 1962. We found four distinct groups of sheep in this area: Mt. Schwatka, Victoria, Lyon Peak, and a group just south of the headwaters of Beaver Creek. The total found in these groups was 186 animals. (The compositions for all counts are given in Table 1.) The group on Victoria was the largest with 61 animals, Mt. Schwatka had 59 sheep, Lyon Peak and near vicinity had 48 sheep, and the area just south of the Beaver had 18. These White Mountains are lightly hunted, but they could not sustain very much pressure.

Table 1. Aerial sheep counts made from July 2, 1962 to September 28, 1962.

Area	Legal Rams	Young Rams	Ewes	Lambs	Year-lings	Unid.	Total No.	Flying Time	# Sheep Per Hr.
White Mountains	25	16	77	34	29	5	186	2.6	71
% of Total	13.4	8.8	41.5	18.2	15.5	2.6			
Chisana-Nabesna	164	195	466	224	66	183	1298	7.0	188
% of Total	12.6	15.0	36.0	17.4	5.0	14.0			
Robertson River, East and West Fork Little Delta	37	48	91	46	23	55	300	1.7	176
% of Total	12.3	16.0	30.3	15.3	7.7	18.4			
McKinley Park	17	18	69	21	12	31	168		
% of Total	10.2	10.7	41.0	12.5	7.2	18.4			
South Slopes Wrangell Mts	87	110	267	109		68	641	2.9	221
% of Total	13.5	17.2	41.6	17.1		10.6			
Chugach	3	4	8	4		7	26	1.7	15
% of Total	11.5	15.4	30.7	15.4		27.0			
TOTALS	333	391	978	438	130	352	2619	15.9	164
% TOTAL	12.7	14.9	37.3	16.7	4.9	13.5			

On July 14 through 17 the Chisana-Nabesna areas were flown. This required seven hours counting time and gave counts of 1,298 sheep. The heaviest concentrations of sheep were found in the high mountains just west of Ptarmigan Lake, along both sides of the Nabesna Glacier, and on Stuver Creek. The Ptarmigan Lake area contained 354 animals, the upper Nabesna Glacier, 201 animals, and Stuver Creek, 125. One group of rams near Ptarmigan Lake contained 74 animals and included at least 19 full curl rams. The Nabesna portion of this area has heavy hunting pressure and the Chisana portion moderate pressure.

It is interesting to note that this same area (Chisana-Nabesna) was flown by Robert F. Scott of the Fish and Wildlife Service in September of 1949. On his counts at that time he recorded 497 animals.

On July 18, the Robertson River and both the East and West Forks of the Little Delta River were covered. We found only 11 sheep on the Robertson River and very few signs of sheep. The two Forks of the Little Delta contained 289 animals. These are areas of moderate hunting pressure.

On August 8, 9, and 10, 1962, Mr. Robert A. Rausch, Alaska Department of Fish and Game, Fairbanks Office, made counts on the upper Koyukuk drainages, in conjunction with other projects. He was unable to get composition counts in most instances but did locate 1,119 sheep. On August 9, one group of more than 100 animals was located on the West Fork of the Koyukuk. This group included many lambs. On the same date while en route to Anaktuvuk via the Allen River one group of more than 100 animals was seen. On these flights over 15 groups containing from 20 to 75 animals were located. Due to the nature of the flights, counting time as an index to population density could not be tabulated as has been done for the other surveys.

On September 27, 1962 the south slopes of the Wrangell Mountains were flown in a Cessna 185. All drainages from Mount Drum to May Creek airstrip were covered. This survey resulted in a count of 641 animals in 2.9 hours counting time. Three groups of sheep in this area contained more than 60 animals each. There were many fine trophy rams in the area even though this is a heavily hunted area.

The last area flown was on September 28, 1962--the area between the Tonsina River and Tazlina Lake including the drainages in Klutina Lake. In this area we found but 26 animals and it required 1.7 hours to cover.

The large rams, or legal rams, are the animals easiest located and identified from the air; therefore, it is interesting to note that all areas checked contained very similar percentages of legal rams. This ranges from 10.2 to 13.5 per cent of the total counted per area, a small difference in view of variations in pressure. In fact, in the area sustaining the greatest hunting pressure (the south slopes of the Wrangells) the highest percentage of legal rams was found. This also contained the greatest number of animals per flying hour.

Several items seem worth comment. Several drainages flown contained no sheep or very few; the West Fork of the Robertson River, the mountains just southwest of Ptarmigan Lake, and two small drainages just east of Chisana even though these places appear from the air to be good sheep range. Mr. Rausch stated that sheep range of good quality was not extensive of the upper Koyukuk drainages, but that range capable of supporting sheep was considerable and was occupied by sheep.

Survey of Range Ecology

Vegetation Types and Their Distribution in Dry Creek

The vegetation of Dry Creek can be divided into three distinct altitudinal zones. Well developed stands of white and black spruce occur on well drained sites in the valley bottom, south-facing slopes up to 3,500-3,600 feet, and north-facing slopes to about 3,200 feet. At treeline and for about 1,000 feet above there is a zone of shrubs on south-facing slopes consisting of shrub birch (Betula glandulosa) and willows (Salix spp.). On north-facing slopes alders sometimes form dense stands but willow is the primary shrub in this zone. Above the shrub zone, and extending downward through the shrub zone on exposed ridges is a zone of low, matted alpine vegetation. The alpine zone consists of a mosaic of several vegetation types that are controlled largely by snow depth, elevation, slope, exposure, etc. Above 6,000 feet the vegetation cover becomes very sparse, but flowering plants occur to an elevation of slightly over 7,000 feet.

The sheep ranges of the Dry Creek valley are found along both sides of the upper 12 miles of the creek. Dry Creek originates in permanent snow and ice fields on the north side of a 7,723 foot peak. These streams descend rapidly and combine

to form the main creek at an elevation of about 4,300 feet just above the upper Dry Creek cabin. At this point some willow shrubs occur along the creek and on the north-facing slopes up to 200 to 300 feet above the Creek. Below this point several small tributaries enter the main Creek from high snow-filled valleys. On the outwashes of tributaries are extensive stands of Salix alaxensis (felt-leafed willow) which reach a height of 15-20 feet although in most cases they are kept at a height of 6-8 feet by moose browsing.

At about 8 miles from the source, Dry Creek swings to the northeast and a large tributary, the West Fork of Dry Creek, enters. At this junction and slightly above, individual spruce trees and small spruce clumps become common on the outwashes of tributary streams and on the gravel benches of the main creek. Below this point the valley widens for about 3 miles and there are extensive stands of white spruce on the south-facing terraces and outwash. Above the spruce is a continuous zone of shrubs, primarily Betula glandulosa (shrub birch). On the north-facing slopes black spruce is found scattered along the Creek and extensive areas of sedges and willows occur on the slopes above. Just above the junction with Red Mountain Creek the valley narrows into a canyon with extensive bluffs and outcrops on the south-facing slopes. Here the spruce is confined to a narrow zone along the steep walls and a past forest fire has eliminated even this narrow zone in many places. To the east of the canyon are extensive low areas of wet sedge tundra and to the west are steep slopes ascending to 6,000 feet. Below the canyon, 2 miles in length, the valley again opens out and extensive stands of spruce are found along the river with wet tundra on the rolling country on either side of the river.

The following is a brief preliminary description of the main vegetation types in the Dry Creek valley. Because the plant species identifications are incomplete and analysis of the quantitative data unfinished, no attempt has been made to include a complete description of these vegetation types in this report. Only the most important species are listed below.

I. Spruce Zone

1. White Spruce Stands

Only the open spruce stands on the south and southeast facing slopes of the valley were examined in any detail because these were the only timbered areas in which sheep were observed. These stands occur on well drained sites from 2,500-3,500 feet as far up the valley as the West Fork. These stands are open with 15-20 feet between the rather spindly gnarled spruce.

Between the spruce are loose clumps of shrub birch (Betula glandulosa), Labrador Tea (Ledum groenlandicum) and scattered willows (primarily Salix pulchra). Between the birch clumps and often covering nearly 50 per cent of the stand are dense mats of fruticose lichens, Cladonia rangiferina, C. alpestris and Cetraria cucullata. On wetter sites and where trees are more dense, the lichen mat is often replaced by a moss layer consisting of Hylocomium alaskanum. Other important plants in these white spruce stands include the shrubs, Vaccinium vitis-idaea, V. uliginosum, Empetrum nigrum, the herbs Carex bigelowii, Petasites frigidus, Saussaurea angustifolia, Pedicularis labradorica, and the lichens Cladonia sylvaticum, Cetraria islandica and C. richardsonii.

2. Black Spruce Stands

On north-facing slopes just above the creek small stands of spindling black spruce (Picea mariana) occur. These are open stands, often with a loose shrub layer of alder, willow and Labrador Tea. The ground cover consists mostly of a mat of Sphagnum spp. and other mosses. These stands are not extensive in the Dry Creek valley.

3. Felt-leafed Willow Stands

On areas of gravel alluvium along Dry Creek and its tributary extensive stands of Salix alaxensis are found. The willows form such a dense canopy in some areas that few plants except a thick layer of mosses exist under the shrubs. In Dry Creek the moose have browsed heavily on the willows in this type and have kept all but a few isolated shrubs from attaining a height of more than 6-8 feet.

II. Shrub Zone

1. Shrub Birch/Festuca Type

Along the south-facing exposures just at and above timber line there are large areas occupied by clumps of shrub birch (Betula glandulosa) and willows (Salix glauca and S. pulchra) interspersed with mats of the low shrubs, cranberry (Vaccinium vitis-idaea), crowberry (Empetrum nigrum), and alpine bearberry (Arctostaphylos alpina). Under the tall shrubs are a moss mat of Hylocomium alaskanum and Tomenthypnum nitens and a loose layer of grasses, mostly Festuca altaica and Hierochloe alpinum. In the openings between the shrubs, meadow-like areas of grasses and forbs are common and provide sheep grazing during spring. Some fruticose lichens, mostly Cladonia and Cetraria species, occur in loose mats between the clumps of shrubs.

2. Willow Thickets

In moist protected gulleys on both north and south-facing slopes where snow accumulates in the winter there are dense stands of several different species of willows. These willows, primarily Salix alaxensis, S. pulchra, S. glauca and S. richardsonii, often attain a height of 8-10 feet but are more commonly 3-6 feet in height. Beneath and surrounding these clumps is a dense growth of forbs including Petasites frigidus Polemonium acutiflorum, Claytonia sarmentosa, Anemone parviflora, A. richardsonii; grasses, primarily Arctagrostis latifolia and Calamagrostis canadensis; and the moss, Hylocomium splendens. Many other forbs and grasses occur in these rich stands but are not significant in cover.

3. Alder Thickets

Dense alder thickets occur in isolated localities on steep (30^{o}- 40^{o}) north or east-facing slopes. These alders (Alnus crispa) form a dense canopy up to 12 feet high along with Salix arbusculoides and S. glauca. Beneath this canopy is a lush growth of herbs and grasses and a thin discontinuous mat of mosses. Forbs and grasses include Delphinium glaucum, Aconitum delphinifolium, Calamagrostis sp., Mertensia paniculata, Epilobium latifolium and several other. The principal moss species are Hylocomium alaskanum and Climacium dendroides.

4. Shrub/Sedge/Moss Type

This type is found on steep north-facing slopes along the middle section of Dry Creek at elevations of from 3,000 to 4,000 feet. It consists of scattered loose shrubs of alder and willow, between and under which is a hummocky step like mat of Sphagnum spp. and other mosses, Ledum, birch, and Carex bigelowii. Scattered through this mat are a large number of herbs and low shrubs including Spirea beuverdiana, Empetrum nigrum, Rumex arcticus, Petasites frigidus, Therofon richardsonii, Arctagrostis latifolia, Astragalus umbellatus etc. The mosses consist of Sphagnum spp., Hylocomium splendens, Pleurozium schreberi, Ptilidium crista-castrensis and Aulacomnium turgidum. The important willow species are Salix richardsonii, S. glauca, and S. pulchra. Occasional low individuals of black spruce occur in this type at lower elevations.

III. Alpine Zone

By far the most common vegetation type in alpine areas of Dry Creek is that formed by nearly continuous mats of dryas (Dryas octopetala). Wherever ridges are swept free of snow during the winter this type is found from elevations of from 3,500 to 6,000 feet. The type varies somewhat depending on slope, substrate, exposure and degree to which the area is snowfree in the winter. As the slopes become more mesic or more snow covered in winter the composition of species changes within the general type. I have therefore recognized three types within the Dry Creek study area: 1) Dryas/Hierochloe mats where wind exposure is greatest; 2) Dryas/Cassiope/moss mats on north-facing slopes where there is some snow accumulation in winter but which melts early in the spring; and 3) Dryas/sedge meadow where snow accumulation and moisture are at a maximum for Dryas octopetala growth.

1. Dryas Mat Type

This type is characterized by nearly continuous mats of Dryas octopetala in which some grasses, sedges, and forbs are scattered. Lichens and mosses are also found in small amounts but in all cases the Dryas occupies nearly 90 per cent of the vegetation of the stands. Important species found scattered in this stand include the grasses, Hierochloe alpina, Trisetum spicatum and Poa spp; the forbs, Arnica alpina, Oxytropis nigrescens, Anemone narcissiflora, Saxifraga tricuspidata; and the lichens, Cetraria islandica, Cetraria cucullata, and Thamnolia vermicularis. In depressions within the stands several low shrubs including Vaccinium uliginosum, V. vitis-idaea, and Salix arctica are found.

2. Dryas/Cassiope/Moss Mat

Where some snow accumulates in winter but melts out quickly in the spring the Dryas mat is dense and interspersed with Cassiope tetragona. These stands occur commonly on north-facing slopes at elevations from 3,500 to 4,500 feet. The vegetation consists of a continuous mat of Cassiope tetragona, Dryas octopetala, Salix reticulata and S. arctica through which protrude several grasses and forbs. A thick moss mat is found within the low shrub mat. Some of the more important species in this stand include the grasses, Arctagrostis latifolia, Trisetum spicatum, and Festuca altaica; the forbs, Anemone narcissiflora, Petasites frigidus, Saussaurea angustifolia, Oxyria digyna, and Pedicularis capitata. Occasionally the mat of low shrubs includes Vaccinium

vitis-idaea and V. uliginosum.

3. Dryas/Sedge Meadow

Many of the high meadows in the Dry Creek area are of this type. They occur commonly between elevations of 4,500 and 5,500 feet and are moist during most of the summer. Snow accumulates in these areas during the winter but melts out in late spring or early summer. The vegetation consists primarily of a loose layer of Carex bigelowii which attains a height of 8-14 inches, and a mat of Dryas octopetala and Salix reticulata. Mosses are scattered to abundant depending, probably, on the slope and snow accumulation. A large number of forbs and grasses protrude through the Dryas and low willow mat. In most of the stands of this type soil movement has created solifluction ridges and microrelief features.

4. Sedge Meadows

In high basins where the snow remains until early summer and which remain wet most or all of the summer, a high growth of sedges occurs. These pine meadows form an important part of the summer range of the sheep. In the wetter areas the sedge mat consists primarily of Eriophorum angustifolium while in the slightly dryer sites Carex bigelowii forms the dominant cover. Mosses are common throughout the sedge mat and low shrubs of Salix pulchra occur occasionally in the stands. Some of the more important forbs that occur in the sedge mat include Polygonum bistortum, P. viviparum, Aconitum delphinifolium, Eutrema edwardsii, Anemone parviflora and Corydalis pauciflora. In some areas tussocks of cotton grass (Eriphorum vaginatum) also occur. Lichens are found on some of the raised dryer sites within the stand.

5. Talus Slopes

Talus slopes occur in all areas and at all elevations in the Dry Creek valley. They consist of loose rocks of varying sizes that are usually subject to occasional movement. In this type of habitat plant growth is very sparse. However, several alpine plants are adapted to this type of habitat and are found widely scattered on most talus slopes. A few of these plants include poppies (Papaver spp.), the opposite leaved saxifrage (Saxifraga oppostifolia), Silene acaulis, Poa spp., Epilobium latifolium, Claytonia scammaniana, Dryopteris fragrans and Arenaria macrocarpa.

6. Snow-bed Communities

A great array of plant communities occurs where snow accumulates in the winter and remains until late summer. The characteristics of these communities vary with slope, lateness of snow melt, etc., and it is impossible to describe one type for the Dry Creek area. These communities are very rich in forbs and grasses and provide excellent grazing for the sheep in late summer.

Several other vegetation types occur in the Dry Creek area but are of such little areal extent that I have not described them in this report.

Seasonal Distribution of Sheep

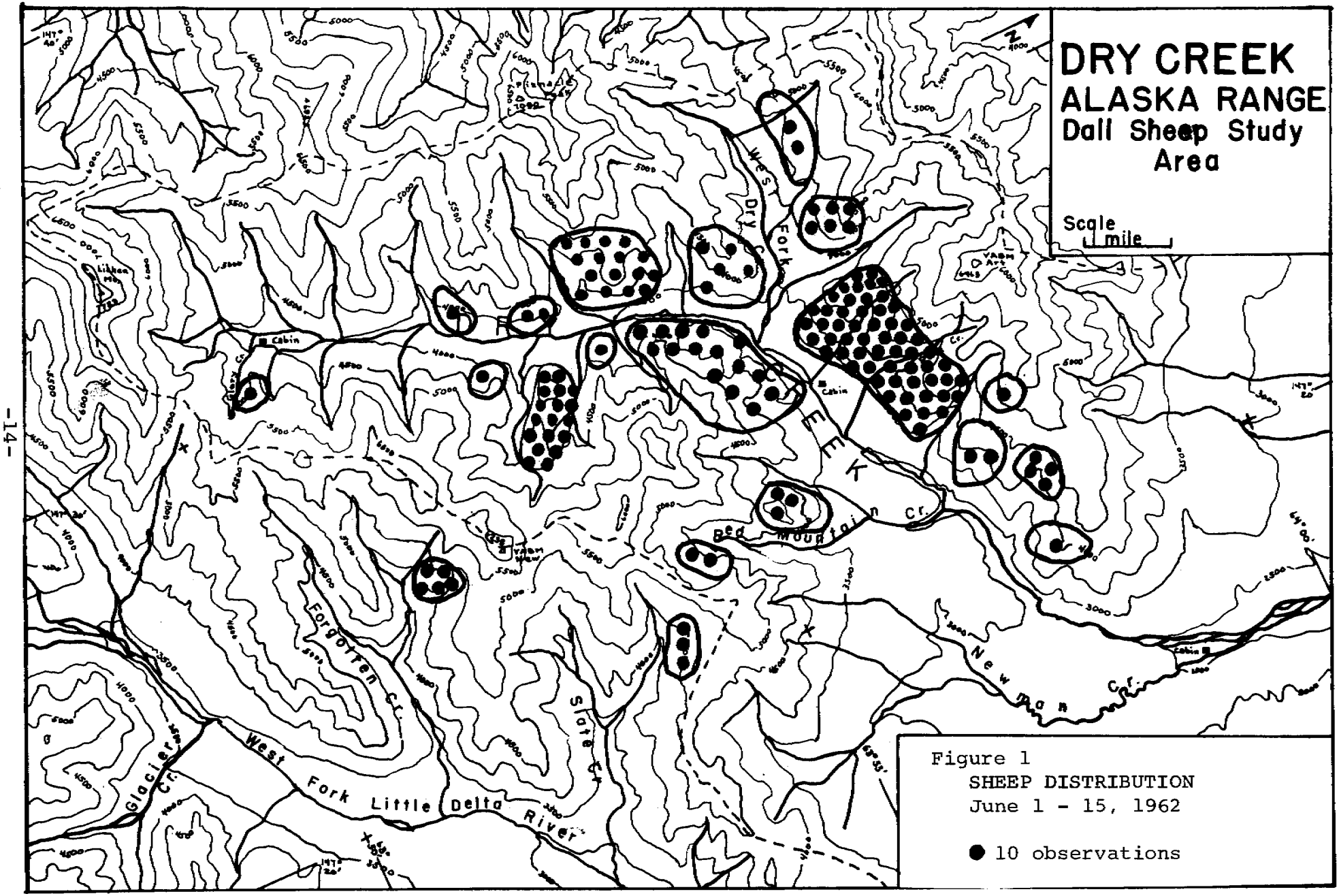
One of the important characteristics of sheep range appears to be the availability of wind-swept ridges at a low elevation in the winter and high valleys where snow melts out in late spring or early summer for newly developing vegetation during the summer months. The change over from summer to winter range in Dry Creek is a gradual process. However, in some areas such as McKinley Park, the migration may be a definite move requiring the crossing of 3 or 4 miles of lowland (Murie, 1944).

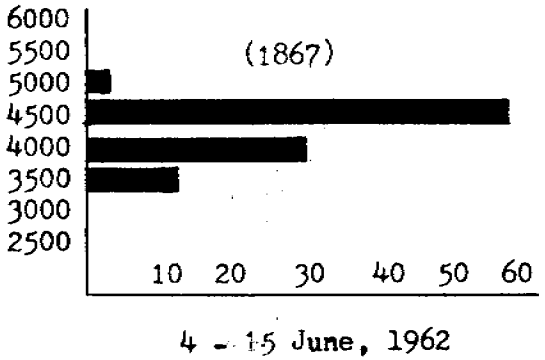
In Dry Creek in 1962 there seemed to be a definite movement beginning on June 6 when several bands of sheep were observed to be crossing the south-facing slopes moving up-valley. However, the sheep did not reach their highest elevations until the first week in August, there being a gradual shift in distribution during the entire summer; nor was the movement from winter to summer range complete. Several bands of sheep, mostly rams, remained in the winter range area during most of the summer, feeding on the few meadows that are found in these lower elevations.

Figure 1 shows the distribution of sheep in Dry Creek from June 1-15, 1962. The areas shown are largely those of the winter range but as mentioned above, the shift to summer range began at about this period. From Figure 2 it can be seen that most of the sheep are found between 3,500 and 4,500 feet elevation during this period. The pattern shown on the maps is fairly typical for winter range except for the concentration of sheep around the lower salt lick. This period proved to be optimum for censusing sheep, most of the bands being visible from the valley bottom.

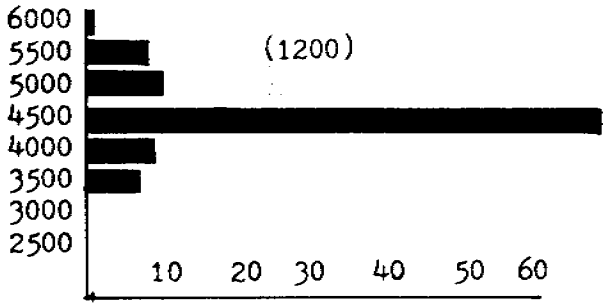
During the period June 16-30, the sheep moved upward but many still remained along the slopes of the lower part of Dry Creek. (Figure 3). However, increasing numbers were observed farther up in the valley as meadows in side valleys were exposed from under melting snow. The graph of elevation distribution of the sheep at this time shows maximum concentrations at 4,500 feet with a few still as low as 3,500 feet and a small band observed at nearly 6,000 feet.

During the period July 1-15, the same trend was observed (Figure 4). Most of the sheep had left the slopes above the mouth of the canyon--only one old ram with one horn was observed in this area and may have been a social outcast or too old and weak to move up with the rest of the sheep. The sheep were concentrated along the higher ridges, especially the divide between Dry Creek and Forgotten and Slate Creek, and in the higher valleys along the north and west side of the Creek. During this period the largest number of sheep were observed at altitudes of about 5,000 feet. The distribution of the sheep from mid-July to the 5th of August probably represents the maximum dispersal of sheep into the high country during the summer. Although I was not in the area to observe subsequent distribution and movements, Mr. Buzby, a local guide, stated that the sheep usually begin moving downward in mid-August. During late July the sheep were found primarily along the high divides and valleys adjacent to the divide. (Figure 5). Very few sheep were seen even on the high slopes above the lower cabin or in the lower salt lick but large concentrations were seen in the vicinity of the upper cabin and lick. During this period most of the sheep were observed at 5,000 feet and none were observed below 4,500 feet (Figure 2).

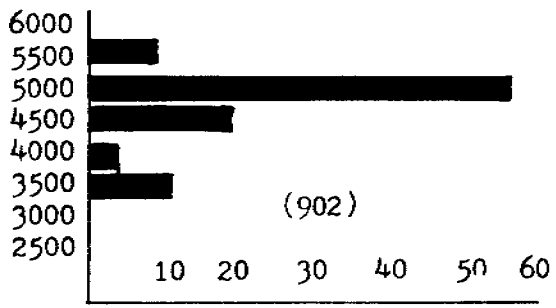

DRY CREEK
ALASKA RANGE
Dall Sheep Study
Area
Scale
1 mile
West Dry Fork
DRY CREEK
Bed Mountain Cr.
Newman Cr.
Forgotten Cr.
Slate Cr.
Glacier Cr.
West Fork Little Delta River
Cabin
Figure 1
SHEEP DISTRIBUTION
June 1 - 15, 1962
● 10 observations



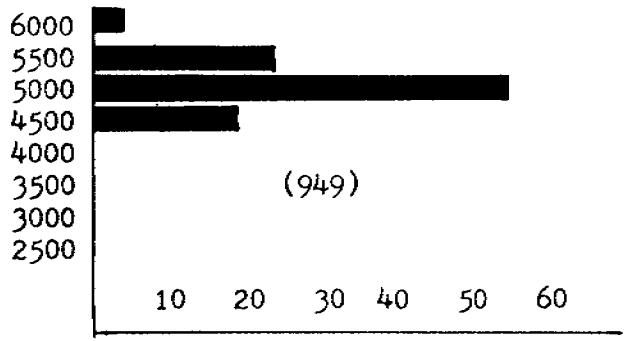
4 - 15 June, 1962



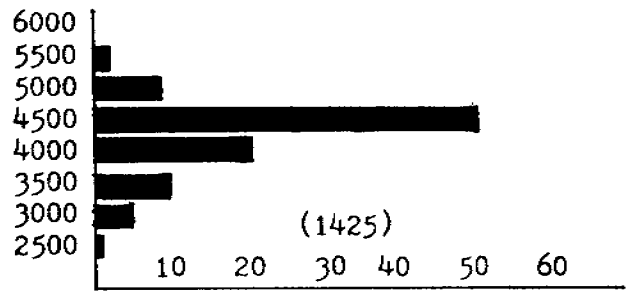
16 - 30 June, 1962



1 - 15 July, 1962

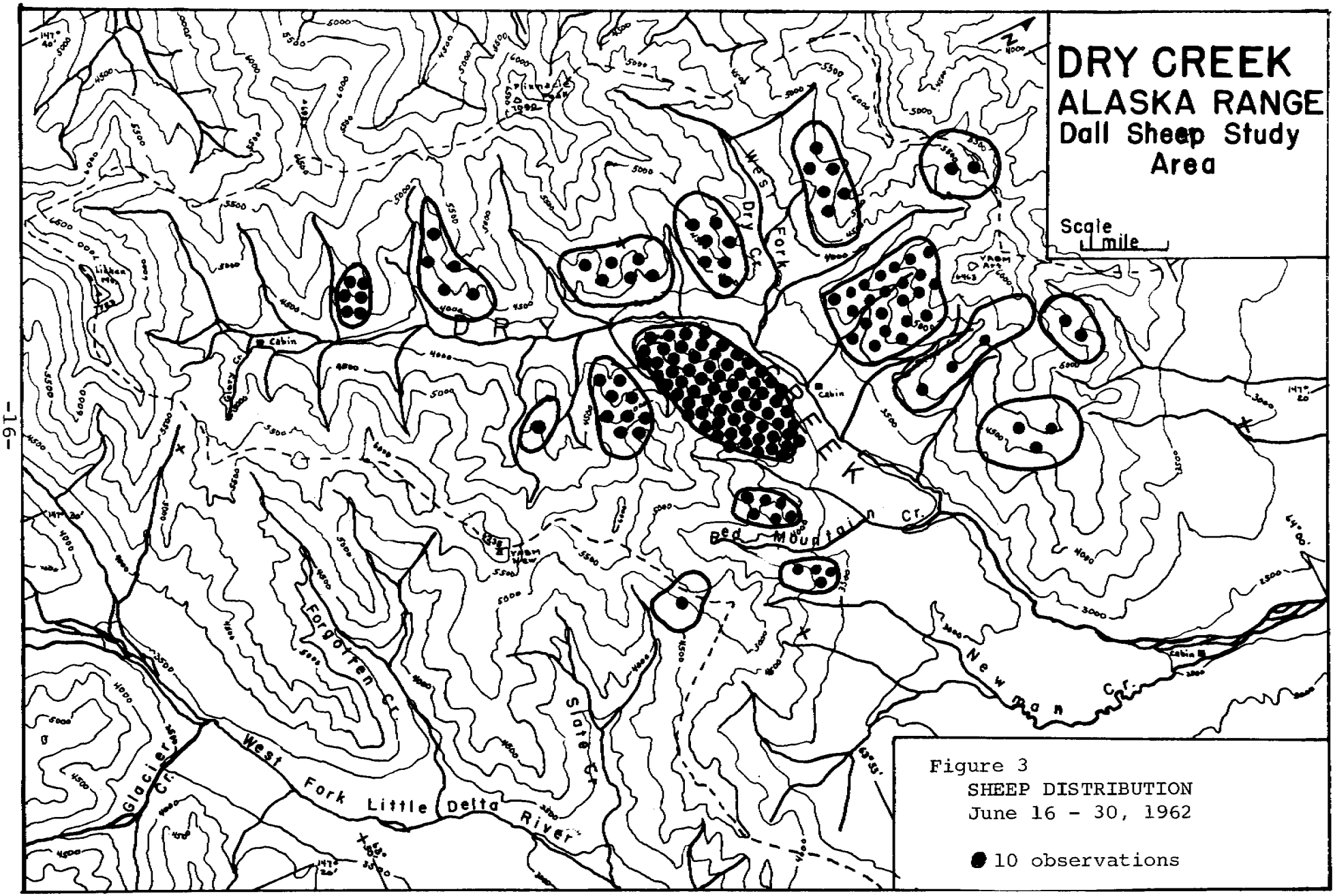


16 July - 5 Aug. 1962



28 Feb. - 5 Apr. 1963

Figure 2. Per cent of observations of sheep at different altitudes in Dry Creek. (Number in parentheses refers to total number of observations).


DRY CREEK
ALASKA RANGE
Dall Sheep Study
Area
Scale
1 mile
West Fork Dry Cr.
DRY CREEK
Cabin
Cabin
Red Mountain Cr.
Forgotten Cr.
Slate Cr.
Glacier Cr.
West Fork Little Delta River
Newman Cr.
Figure 3
SHEEP DISTRIBUTION
June 16 - 30, 1962
10 observations

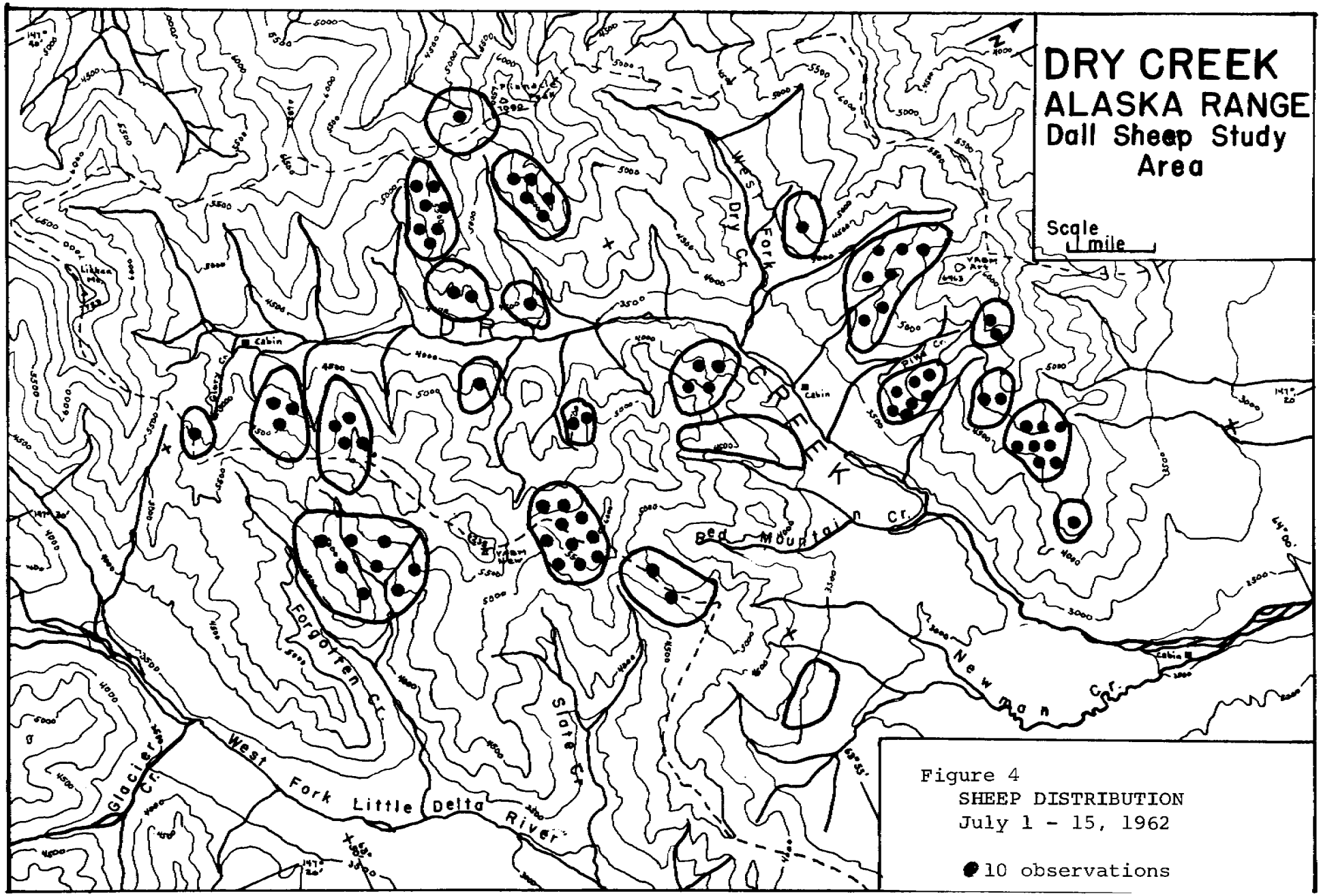
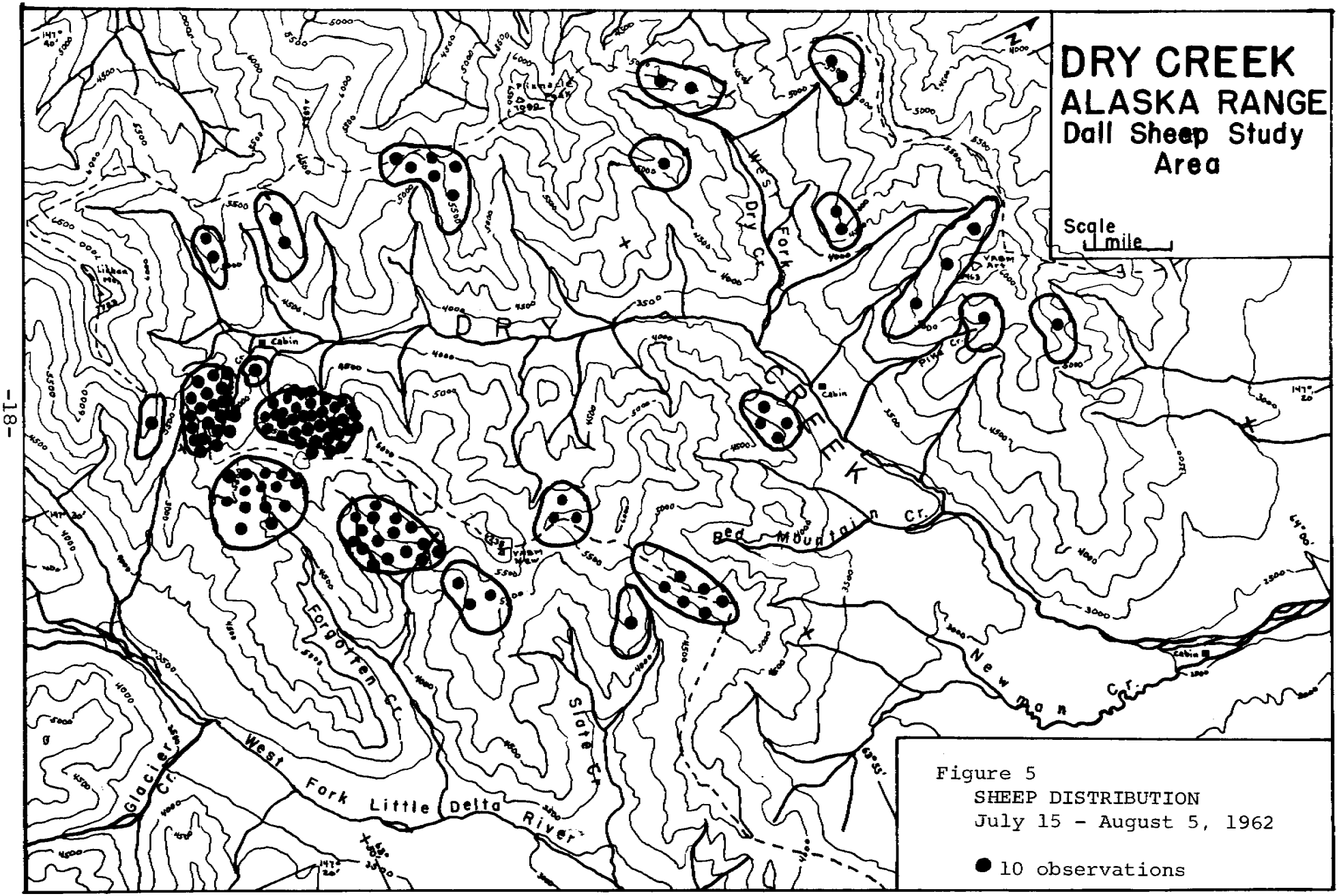


Figure 4
SHEEP DISTRIBUTION
July 1 - 15, 1962

● 10 observations


DRY CREEK
ALASKA RANGE
Dall Sheep Study
Area
Scale
1 mile
DRY
CREEK
West Fork Dry Cr.
Bed Mountain Cr.
Newman Cr.
Forgotten Cr.
Slate Cr.
Glacier Cr.
West Fork Little Delta River
Cabin
Figure 5
SHEEP DISTRIBUTION
July 15 - August 5, 1962
● 10 observations

The late winter-early spring distribution is shown in Figure 6 for the period February 28 - April 12. The winter of 1962-1963 was a very light snow year in Dry Creek and this distribution is thought to be slightly higher than would occur under conditions of heavier snow deposition. However, the distribution can be seen to be very similar to that found in 1962 during early June, except that during the February-April period there were only 22 sheep observed in the vicinity of the lower lick. At this time the sheep were found at elevations of from 2,700 to nearly 5,500 feet but the largest concentrations were observed at about 4,500 feet.

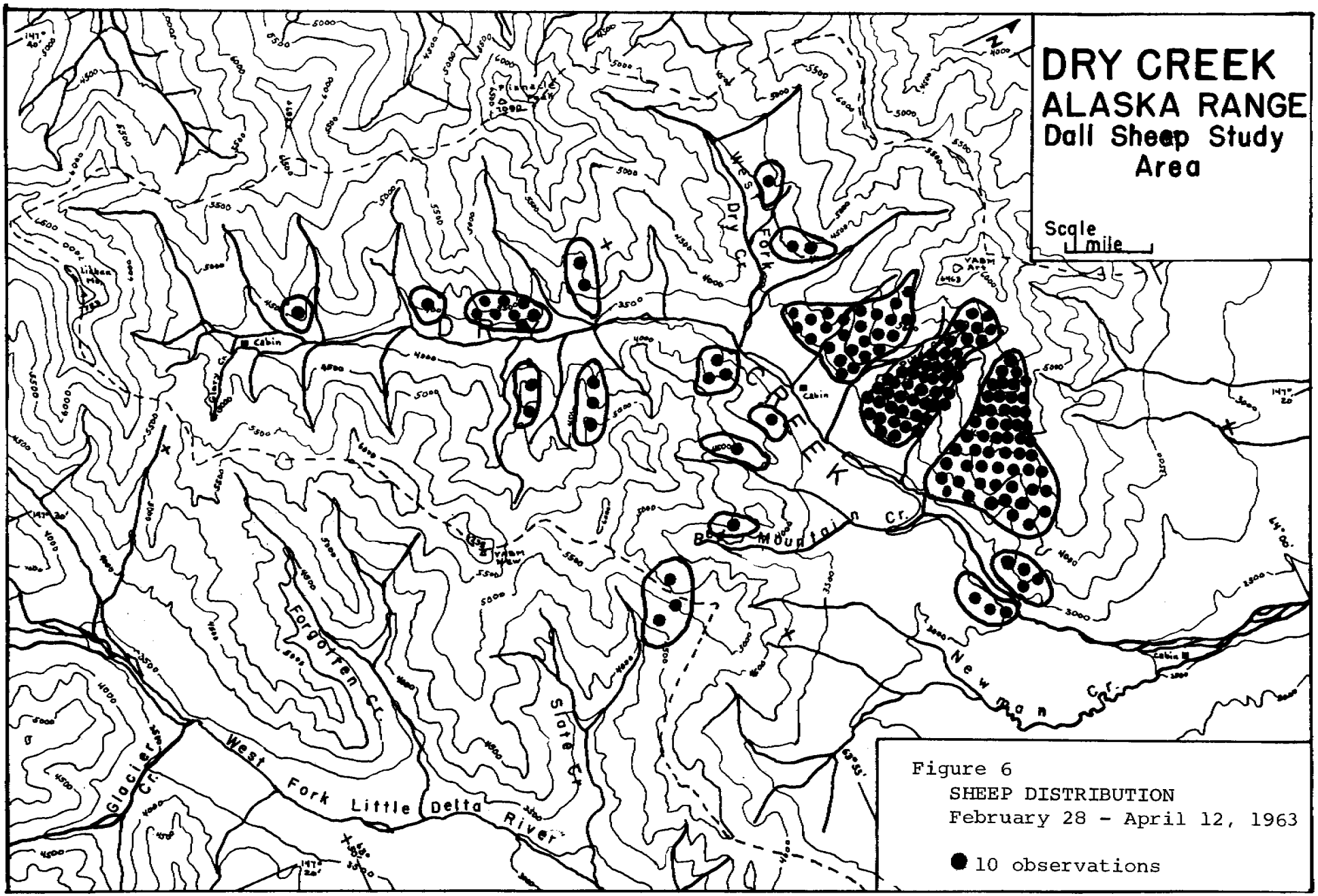
Feeding Habits

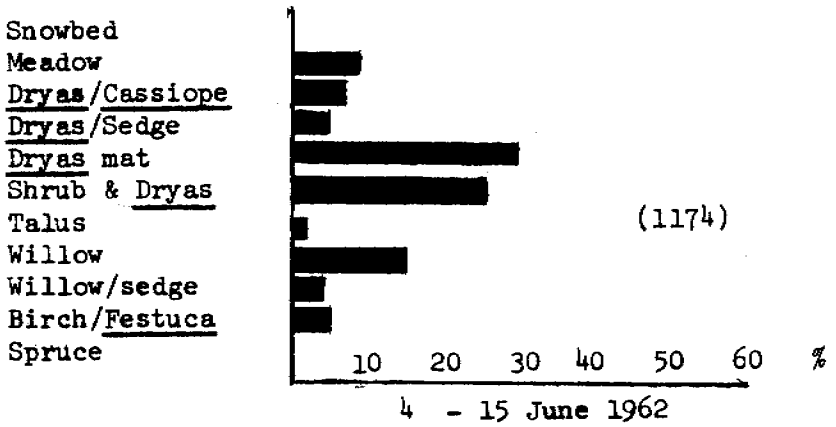
In addition to showing an annual pattern of distribution in the Dry Creek valley, the sheep demonstrate a change in the selection of vegetation types and of the species of plant on which they graze and browse. The changes in vegetation types occupied are demonstrated graphically in Figure 7.

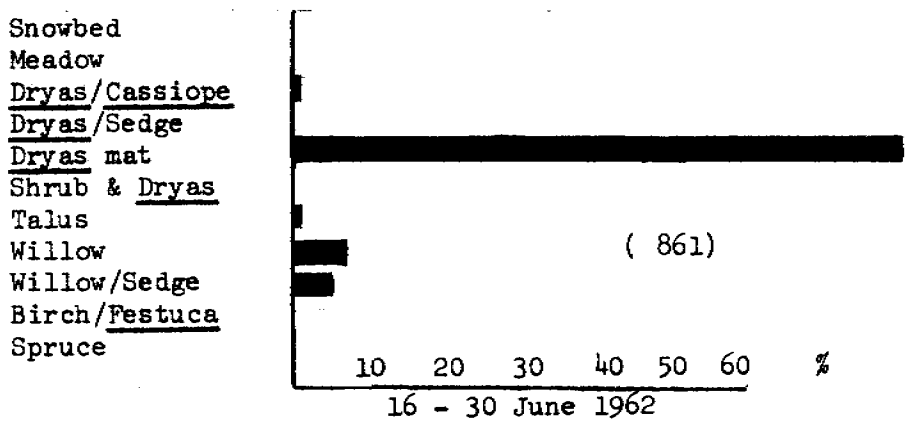
In May and early June the sheep feed on the greening Dryas octopetala at low elevations and on the shrubs, grasses and forbs on the south facing slopes in the shrub zone. This feeding pattern is demonstrated on Figure 7 for the period June 4-15. At this time the sheep are feeding primarily on Dryas mats, on willows, and in areas that are an intermingling of the two types.

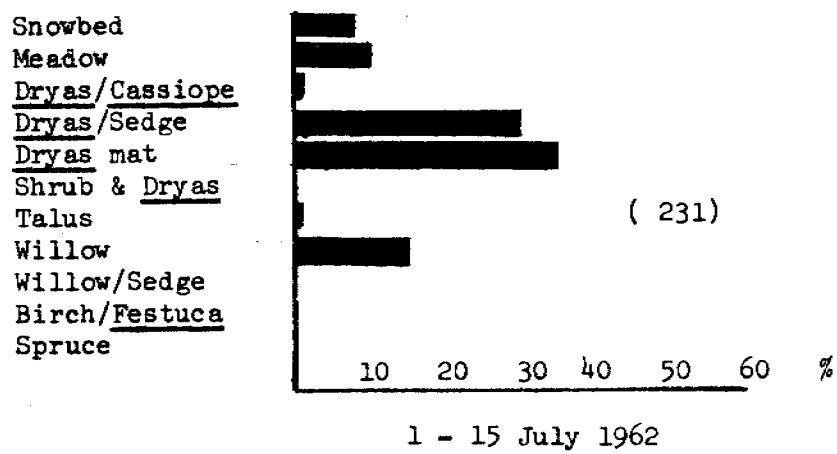
As summer progresses, especially during the time that the sheep are moving to higher country, they feed primarily in the Dryas mat type. At this time they seem to be feeding on the Dryas leaves and other vegetation in the Dryas mats at the time that it is producing optimum leaf growth but prior to the time of flowering.

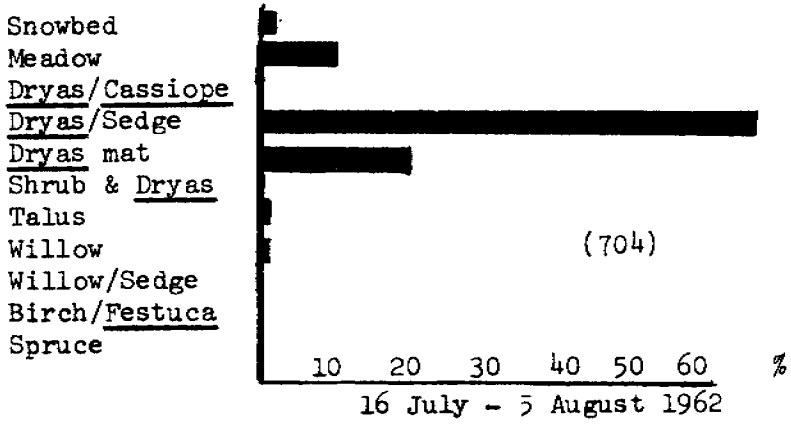
During early July the sheep were seen occasionally in the higher snow beds and meadows but still were feeding to a large extent in the Dryas type and in the Dryas/sedge type. Feeding in the willow shrubs during this period was limited to the clumps of willow near their upper altitudinal distribution and on north-facing slopes where the young green willow leaves were just beginning to develop.


DRY CREEK
ALASKA RANGE
Dall Sheep Study
Area
Scale
mile
Dry Creek
West Fork
Cabin
Glory Cr.
Cabin
Mountain cr.
Forgotten Cr.
Glacier Cr.
West Fork Little Delta River
State Cr.
Newman Cr.
Figure 6
SHEEP DISTRIBUTION
February 28 - April 12, 1963
10 observations









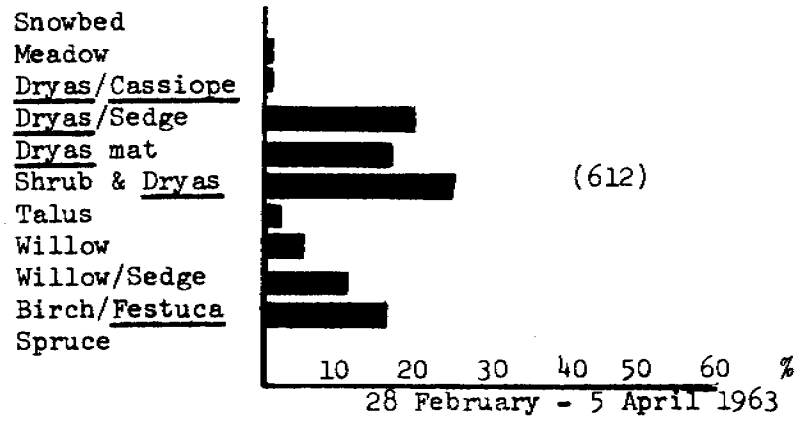


Figure 7. Per cent of observations of sheep feeding in the main vegetation types in Dry Creek. (Number in parenthesis refers to total number of observations).

This same pattern of feeding continued until I left the field on the 7th of August. During the period of July 15-August 7, 66 per cent of the observations of feeding sheep were in the Dryas/sedge type. The sheep were feeding well above the shrub zone in most cases and only 1 per cent of our observations were of sheep feeding in the willow thickets.

The pattern of feeding in the late summer and fall was not observed. However, Murie (1944) found a definite switch in fall from fresh herbaceous vegetation to dry cured grasses. At the time of frosts in the fall, much of the green forbs become unpalatable to the sheep. The sheep do not seem to feed extensively on Dryas leaves during the winter in spite of the fact that they are readily available. In addition to grasses, the sheep feed on low shrubs and willows during the winter period.

My observations in February to April of 1963 showed that the sheep had fed primarily on grasses and sedges during the winter. In the winter of 1963 light snows had left much of the sedge meadow vegetation available to the sheep and this type was heavily grazed although there was a large supply of ungrazed grasses and sedges available to the sheep. In addition, grasses in many exposed areas had been grazed and Kobresia myosuroides, a small sedge, was heavily utilized wherever it grew.

Sheep were observed to be feeding in the Dryas mat stands many times during this period but closer inspection in most cases found them to be pawing through the snow in depressions in the Dryas mats to feed on the low shrubs of Vaccinium vitis-idaea, V. uliginosum, Empetrum nigrum, and the grasses, mostly Festuca altaica, that grow with these shrubs.

Occasionally, especially during stormy weather, the sheep were observed in the shrub zone and along the bluffs well down into the spruce zone. At these times the sheep were feeding on willow shrubs and on grasses that grow in the open areas between the shrubs.

During heavy snow years, such as occurred in the late winter of 1961-1962, the sheep may be forced to feed more at the lower elevations and on the scattered grasses that occur in the Dryas mat type. Willows at the edge of the Dryas type have been heavily browsed in past years and I suspect that this browsing occurs during periods of deep snow when the protruding willows are the most readily available vegetation for the sheep.

Time of Feeding

It seemed to me from my observations in the field, that the sheep had fairly definite feeding periods in early morning and late afternoon and that they usually rested during midday. In order to substantiate this general observation, the sheep were listed as "feeding" or "resting" at each observation on the data cards. I have broken the results of this down into 2-hour groupings in Figure 8. From these data there does not appear to be a significant pattern of feeding and resting.

Another general observation that I made was that the sheep seemed to feed more during the day in winter and to rest less frequently. This is demonstrated in the graph comparing the summer observations with those from the winter. In the winter the sheep were recorded as feeding 84 per cent of the time. It is quite logical that with shorter hours of daylight for feeding and with less food available, the sheep would have to feed more continuously during the winter days than they do during the summer days.

Size of the Bands

The average size of the bands of sheep increased notably during the summer of 1962. When first observed in early June the sheep were scattered in small isolated bands of one to several individuals with only an occasional large band of 30-40 individuals. As the summer progressed, few small bands were seen and occasional bands numbering nearly 100 individuals were observed. Table 2 shows the average number of sheep per band during 5 summer and late winter periods. The average band size during the last of July and first week in August was 26.4. In the fall the sheep again break up into smaller bands so that by late winter the average band size was 10.0 sheep.

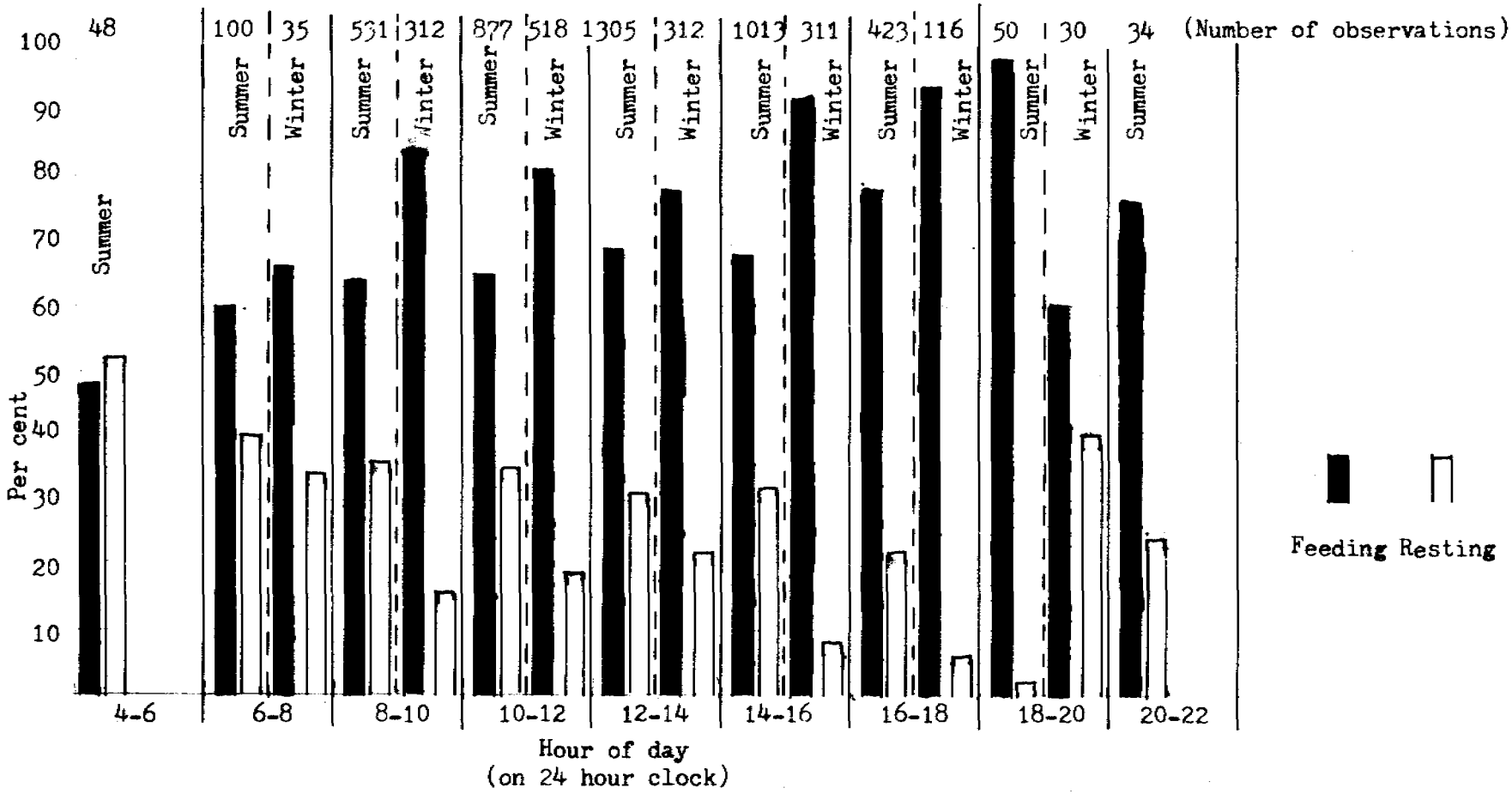


Figure 8. Per cent of feeding and resting observations for two-hour periods during the summer and winter.

Table 2. Number of sheep per band for different periods of the year in Dry Creek.

Period	Number of Bands	Total Number of Sheep	Sheep Per Band
June 1-15	108	1,867	5.8
June 16-30	76	1,200	15.8
July 1-15	48	902	18.8
July 16-August 5	36	949	26.4
Feb. 28-April 12	143	1,425	10.0

Mineral Licks

Almost all literature on mountain sheep has some reference to the use of mineral licks. In Dry Creek there are two major licks that are used regularly by the sheep and many areas scattered through the valley where small numbers of sheep were observed to be feeding on the earth or licking the rocks and dirt surface.

It has also been recorded that sheep use the licks primarily during summer and that the peak of use is during early summer, that is, the month of June. This was certainly true if the lower of the two main licks in Dry Creek. This lick received its greatest use during the month of June at the time that sheep were moving from winter range to summer range. We also noted a strong correlation between weather and use of the lick: the hotter the day, the higher the number of sheep in the lick. This held for the maximum period of use during the month of June but did not hold true for July when use of the lick became very sporadic. On June 17th, when the maximum temperature reached 73 degrees, 137 sheep were observed in the lick or the immediate vicinity. Table 3 lists the sheep activity in the Dry Creek salt lick during the summer of 1962.

The drive to use the salt lick seemed very strong in June. Sheep trails lead directly into the lick from nearly 5 miles away over the divide from the West Fork of the Little Delta (Figure 9). During this period sheep were observed to make long moves across the low country into the lick and seemingly had little fear of man or predators at this time. Once in the lick the sheep seem oblivious to humans and could be approached to within 100 feet, a condition that never occurs outside of the lick.

Table 3. Sheep activity in the lower Dry Creek salt lick during June and July 1962.

Date	In Lick	Adjacent Slopes	Total	Max. Temp.
June 4	0	2	2	cool
7	0	5	5	56
9	102	?	102	72
10	64	?	64	78
12	47	?	47	70
14	11	19	30	60
15	13	15	28	62
16	33	47	80	72
17	137	?	137	72
18	59	12	71	72
20	50 est.	25 est.	75	74
21	0	0	0	50 est.
22	0	2	2	48
23	4	15	19	50
24	0	0	0	60
25	-	-	54	54
27	-	-	73	56
29	-	-	16	54
July 1	-	-	81	62
4	-	-	41	60
5	-	-	88	58
10	-	-	9	68
27	-	6	6	62

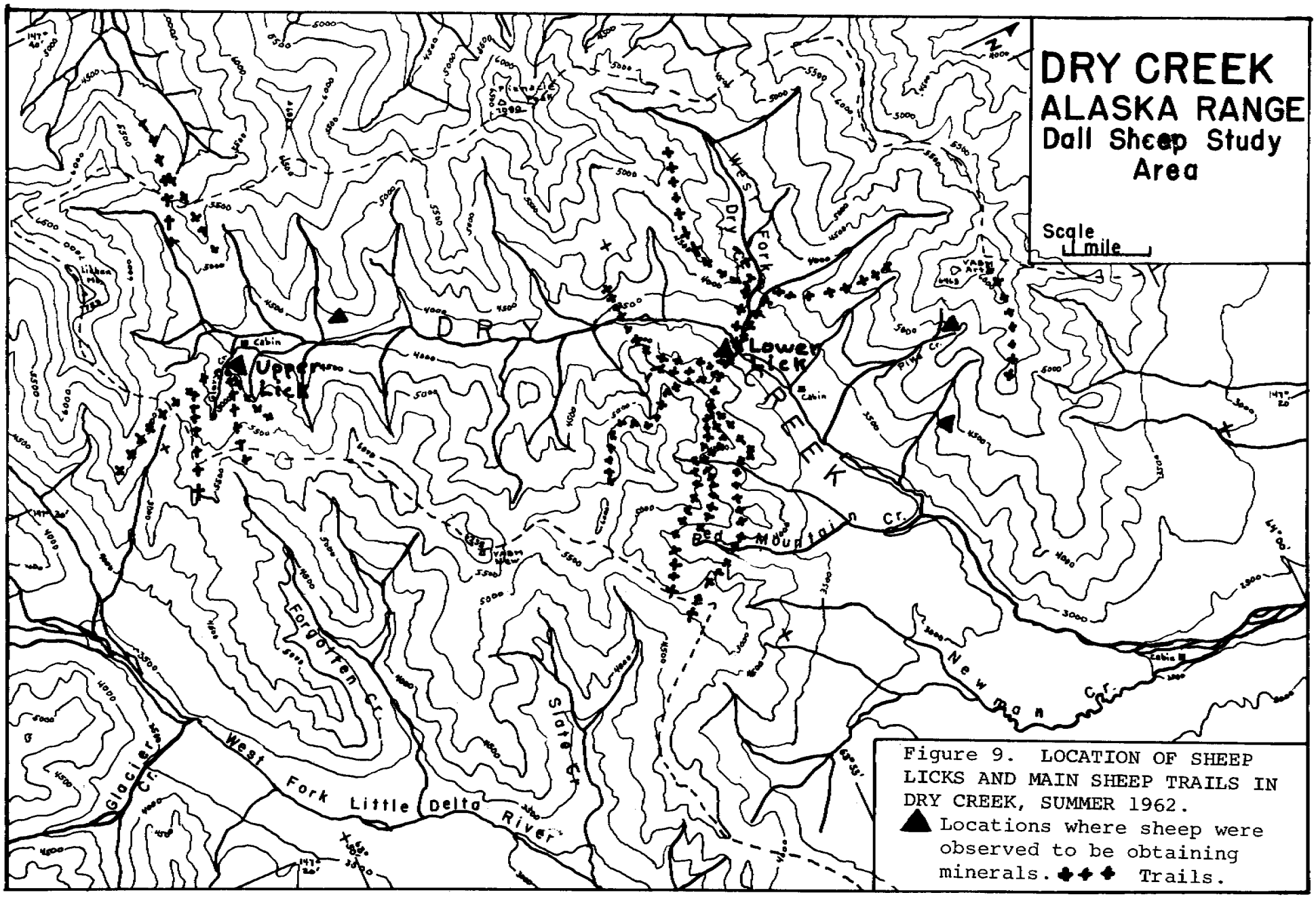


Figure 9. LOCATION OF SHEEP LICKS AND MAIN SHEEP TRAILS IN DRY CREEK, SUMMER 1962.
▲ Locations where sheep were observed to be obtaining minerals. ✚✚✚ Trails.

The upper lick, at about 4,600 feet, is used much less frequently than the lower lick and in 1962, at least, much later in the season. During July and early August small bands of up to 25 sheep were observed in this lick but their use was sporadic.

Winter use of licks seems to be infrequent. During our observations in February-April 1963, we observed sheep licking at the rocks on two occasions. No sheep were observed in the vicinity of the lower Dry Creek lick until April 7th when a band of 22 sheep was observed on the ridge above the lick, but not in the lick itself. When I flew over the lick on February 12, 1963, there were a few sheep tracks in the lick but no sheep were observed in the vicinity.

Both Palmer (1941) and Scott and Klein (1953) discuss the lick at Dry Creek. Palmer had a nearby lick in Slate Creek analyzed and concluded that the sheep were after magnesium sulfate or ferrous sulfates. Scott and Klein (1953) report that the Dry Creek lick contains large amounts of bentonite, a mineral with a peculiar affinity for water. The samples contained high quantities of soluble bases. One sample was relatively high in copper and manganese. All samples were high in nitrates and phosphates. The report on the analysis stated that these nitrates and phosphates are probably the result of sheep droppings and urine concentrations in these areas but that the possibility that nitrogen and phosphates might offer the major attraction and be the causitive factor, for the development of the lick should not be ruled out.

The concentrations of sheep in the salt licks provides an ideal situation for the spread of communicative diseases among the sheep. This aspect of the salt licks will be investigated in future work.

Exclosures

Two 10 x 10 foot exclosures were constructed on the south-facing slope above the middle Dry Creek cabin, one in the Dryas mat type and one in the shrub birch/Festuca type. One-square-meter quadrats were mapped in detail in each exclosure and in a control area for each exclosure. These are on file at the College office.

Vegetation Map

The compiling of a vegetation map of Dry Creek is still in process and will be reported in a later report.

Sheep Ecology and Behavior

Most of the observations made relating to this job have been covered in the previous section since it also directly relates to the feeding habits of sheep.

Interspecific Relationship

In our work to this point, few occurrances of attempted predation have been observed and no successful attacks have been seen. The high precipitous terrain in which sheep live, the ability to traverse this terrain with ease, and their extreme wariness plus excellent eyesight makes it most difficult for predators to achieve a great deal of success. In any natural population there is death by many causes. During our field work we have collected all bone, horns, hair, etc. of sheep that would indicate death in any manner. The majority of the older appearing materials are the skulls and horns of old rams and ewes. The fresher material is primarily of younger animals.

On June 27 a golden eagle was observed making three attacks on a yearling sheep. The eagle would dive at the sheep, then flare out with claws extended in an attempt to use its talons, but in each attack the yearling was able to evade the eagle with ease.

On two different occasions eagles attempted to take lambs. On each occasion the ewe was successful in driving away the intruder. On one of these observations the ewe stood over her lamb and hooked at the diving bird with her horns. On the other the ewe, some distance from the lamb, charged the attacking bird. Many times bands of ewes and lambs can be located by the presence of a circling eagle.

On July 13, Viereck observed a wolverine running along a sheep trail at an elevation of about 4,500 feet. As it approached a band of ewes and lambs, they scattered and moved about 100 yards out of the wolverine's path. The wolverine seemingly paid no attention to the sheep and the sheep returned to grazing shortly after the wolverine had passed. This was the only interaction between predator and sheep that he actually observed.

Grizzly bears were seen from time to time during the warm season and the tracks of wolves were seen occasionally.

Productivity

The month of May and the first week of June were spent in the Dry Creek area to ascertain the timing of the lambing season, the progression of lambing, the natality rates, and the behavior of sheep during this period.

Progression of Lambing

The first lamb was seen on May 18, 1962. This lamb had just been born as he was still wet and his mother was finishing licking it clean when I arrived on the scene. One more lamb was observed later in the day that appeared to be older, perhaps having been born one or two days previously.

The lamb to ewe ratio gradually increased until on June 3 there were 56 lambs per 100 ewes. After this point there was a decrease in the lamb to ewe ratio when the last count was made on June 10. This count gave 49 lambs per 100 ewes. Table 4 presents the lamb-ewe counts as they were made.

Table 4. Counts made to secure lamb-ewe ratios.

Date Taken	Lambs	Ewes	Lamb/Ewe Ratio
May 18, 1962	2	33	6/100
20, 1962	-	34	0/100
25, 1962	3	12	25/100
26, 1962	11	51	21/100
27, 1962	10	40	25/100
28, 1962	20	47	43/100
30, 1962	41	91	45/100
June 1, 1962	33	62	53/100
3, 1962	37	66	56/100
10, 1962	25	51	49/100

From these data it appears the natality rate was about 56 lambs per 100 ewes. In addition the peak of lambing occurred the first few days of June. Lambs were probably born after June 10, but unless one observed the parturition or was present immediately after, it would be most difficult to tell.

Lamb Survival

Natality rates for 1961 are not available for the Dry Creek area but composition counts made on May 14, 1962, gave 41 yearlings per 100 ewes. This would seem to be good survival; better than that found on the Tonzona River where we found 29 yearlings per 100 ewes for this same period.

Lambing Behavior

A few days before the ewes are ready to give birth, they evade their yearling, or drive the yearling away and depart the band they have been with. A secure protected spot is selected, sometimes high in a rough outcropping, at other times low in the timber; away from the other sheep where she is well protected from predators. Here she spends a few days until her lamb is born. After parturition, as soon as the lamb is strong enough to travel, she returns to the other ewes and lambs.

In the Dry Creek area a definite lambing area is not evident. Ewes are found scattered over most of the winter range for this event.

The number of young could easily be confused for it is not unusual to observe two lambs, sometimes three or four, following one ewe. However, if they are kept under observation the extra lambs will be found to belong to other ewes. We have no record of twins being born.

Actual parturition has not been observed, but a ewe was observed cleaning up her lamb after it was dropped. Shortly after this cleaning up process the lamb struggled to its feet, took a few wobbly steps and was down again. Within two hours the newborn lamb was able to stay on its feet and move about. It nursed shortly after it gained its feet the second time.

Growth and Care of Young

The nursing period is of very short duration. The actual duration of nursing is but a few seconds, but at first is frequent. The lamb nurses from either side, behind, or underneath the ewe; however, both animals are always on their feet. The lamb is vigorous and sometimes butts her udder hard, but after a few seconds the ewe moves away.

By the end of the first week the lamb has started to graze, nibbling at the plants the ewe is feeding on, and as he increases in size and strength the nursing periods become farther and farther apart.

At 3 to 4 weeks of age the lambs are grazing incessantly when not resting. They occasionally nurse but seem to be mostly dependent on the forage by this time. Lambs have not been observed nursing after the middle of September, but a ewe killed by a poacher in November was still lactating.

The ewe during the first week of the lamb's life in very concerned for its protection, hooking viciously at any other animal that might come near. Thereafter the mother seems to pay little attention to the welfare of its lamb, but if she looses it or it tarries very far behind she calls and if necessary will returen to search for it. After the first week she is quite willing to leave her lamb playing with other lambs while she feeds; sometimes several hundred yards away. Many times groups of lambs seem to be left in charge of a "babysitter" --usually a ewe bedded down or feeding close to the group of lambs. This "babysitting" has been observed too often to be the accidental proximity of a ewe.

The lamb usually stays with its mother until the next spring just before she is ready to have another lamb. At this time she either runs it off or evades it. Groups of yearlings are quite often seen by themselves and often appear to be rather bewildered and lost. In a few days they join the larger bands of sheep, the ram bands if they are males or the ewe bands if they are females.

The ewe bands gradually build up in size as the ewes with their new lambs join the group. In the Dry Creek area the build-up is quite apparent during the latter part of the lambing season and by the end of lambing the bands may number better than 100 animals.

The Rutting Period

The start of the rut was not observed this year but apparently started earlier than it did in 1961. Inclement weather prevented our arrival in the Dry Creek area until November 12. On November 13, ewes were already in oestrus, at least five days before the first oestrus was observed in 1961. In addition, no butting contests were observed this year, and the rams had departed the presence of the ewes by December 7. This was at least five days before the rut was over last year.

The rutting behavior of both males and females were much the same as was described in report W-6-R-3, E-2c except that, as mentioned above, no butting contests were observed.

The peak of the rut appeared to be the third week in November. We were fortunate to see many more courtships and successful copulations than had been observed before; all, with the same patterns of behavior described in the previous report.

One difference in the behavior of rams not previously observed was noted on November 17. A young ram, 1/2 curl probably in his fourth year, had 7 ewes and 3 lambs in a group and was holding or herding them. When a ewe wandered from the group the ram would circle and drive her back to the group. The ram would feed but at the same time maintain his vigilance, not allowing the ewes to wander. He made no attempt to mount a ewe and paid no heed to a urinating ewe but when a smaller ram approached, the guarding ram charged and drove the youngster away. After about an hour of this herding activity a large full curl ram approached the ewes and challenged the young ram. The young ram ignored the big ram's challenge and bedded down. The large ram checked each ewe and the lambs, found none in oestrus and then started to feed. After a short time he bedded down. The ewes drifted away without either ram following.

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Federal Aid Coordinator

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WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: E TITLE: Sheep and Goat Investigations

JOB NO.: 3-a

PERIOD COVERED: July 1, 1962 to January 31, 1963

ABSTRACT

Flights to determine mountain goat distribution in Southeast Alaska were continued in 1962, covering the area between Endicott Arm and Berners Bay. In three flights, 941 goats were counted, the kid-adult ratio being 25:100. The largest concentration of goats yet observed in Southeast Alaska was found between Endicott Arm and Tracy Arm where 593 were observed.

RECOMMENDATIONS

Counts should be made between Berners Bay and Haines and between Bradfield Canal and the Chickamin River to complete the distribution coverage for Southeast Alaska.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-6-R-4 TITLE: Alaska Wildlife Investigations

WORK PLAN: E TITLE: Sheep and Goat Investigations

JOB NO.: 3-a

PERIOD COVERED: July 1, 1962 to January 31, 1963

OBJECTIVES

To determine the distribution, abundance and age composition of mountain goat populations in Southeast Alaska.

TECHNIQUES

Aerial counts were made during the month of September using Cessna 180 and Piper Super Cruiser aircraft. Flights were made on clear days during the early morning and evening hours when goats were feeding on the open hillsides. Total numbers of goats, the kid-adult ratio and distribution were recorded.

FINDINGS

Table 1 summarizes mountain goat composition counts made in 1962. These counts complete the coverage from Berners Bay to Bradfield Canal, leaving only the areas from Berners Bay to Haines and from Bradfield Canal to the Chickamin River yet to cover.

Of particular interest was the large number of goats located between Endicott Arm and Tracy Arm. On September 3, 593 goats were counted in this relatively limited area. Also of interest is the good population located close to the city of Juneau. Some goats were found throughout the area from the Taku River to Berners Bay with concentrations near Twin Lakes above the Taku River and between Echo Cove and the Antler River at Berners Bay.

The total count for three flights was 941 goats with a kid-adult ratio or 25:100. Counts over a period of three years have shown the kid-adult ratio to range between 20:100 and 35:100 for most areas.

During the first week of November 1962, a U. S. Forest Service employee reported five mountain goats on Chichagof Island, directly east of the Tenakee cannery site. A plant of 6 male and 11 female goats was made at Basket Bay between 1953 and 1956. No goats have been reported on the island since August 1958. The goats seen in 1962 had traveled approximately 75 miles from the point of release.

Table 1. Mountain goat composition counts made in Southeast Alaska in 1962.

Date	Location	No. Kids	No. Adults	Total Count	Kid-Adult Ratio
9-2-62	Mendenhall Glacier to Berners Bay	30	147	177	20:100
9-3-62	Endicott Arm to Sweetheart Lake	118	475	593	25:100
9-17-62	Taku River to Carlson Creek	40	131	171	30:100

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