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JUNEAU, ALASKA

STATE OF ALASKA
Walter J. Hickel, Governor

DEPARTMENT OF FISH AND GAME
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MOOSE REPORT

by

Richard Bishop

Volume X
Annual Project Segment Report
Federal Aid in Wildlife Restoration
Project W-15-R-3, Work Plan K

(Printed January, 1969)

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FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-15-R-3 TITLE: Big Game Investigations

WORK PLAN: K TITLE: Moose

JOB NO.: 1,2,3,4,5,6,7

PERIOD COVERED: January 1, 1968 to June 30, 1968

ABSTRACT

Publications

Compilation and data analysis continued with the assistance of Mr. Sam Harbo, biometrician.

Harvest

The reported moose harvest in 1967 was 4856 males, 993 females and 73 sex unknown moose for a total of 5,922, about 1,100 fewer than in 1966. Of nearly 32,000 harvest tickets issued, 27 percent did not hunt. Of about 20,000 who reported hunting, 29 percent were successful. The lower harvest is probably due to the cancallation of antlerless seasons in southcentral Alaska in response to public opinion and to a major flood in Interior Alaska.

Highway vehicles were shown to be the most widely used conveyance in reaching hunting areas. Tracked vehicles, boats and airplanes were of varying importance depending upon access in a particular game management unit, its proximity to a major population center, and probably upon the economic welfare of residents in an area.

The success of hunters using specialized equipment was consistently higher than that of those without specialized equipment. The reported use of snow machines contributed little to the harvest. Data on residence of hunter: transportation used suggests a strong relationship to the most common means of transport available in the area, but Anchorage hunters seem to use airplanes and off-road vehicles proportionately more than Fairbanks hunters while the reverse is suggested for boats. Reports from Homer indicate that off-road vehicles are the major transportation while in the Kenai-Soldotna area highway vehicles are the major means of transportation. Continued data collection is expected to reveal trends in the relationships between success, transportation,

residence, and chronology. Comparison of voluntarily returned harvest ticket reports with those returned after a reminder letter was received showed that "reminder reports" exceeded voluntary returns in number by over 16 percent, but only 8 percent were successful, compared with 42 percent of those reporting voluntarily.

Range Inventories

Canopy-coverage analysis of vegetation in exclosures and on control plots in the Matanuska Valley was completed.

Sex and Age Composition

Slightly lower but good production was found in the Haines area of Unit 1. Slightly improved production was indicated in Unit 5. In Unit 6 the moose population east of the Copper River appears to be expanding rapidly. Although variations exist within Unit 13, the production appears to be generally fair and stable. Production in Unit 14 has remained fair to good. In Unit 15 production is fair on the northern part of the Kenai, and good on the lower portion. Production appears to be improving in central Unit 20 but remains fair.

Production

Early spring counts in the Matanuska and lower Susitna Valley indicate excellent survival of calves to one year of age. In Unit 20A initial production of calves appeared to be very good.

Tagging and Movements

Adult tagging in the Matanuska Valley was curtailed due to poor weather and snow conditions. In Unit 20A, 358 calves were tagged on the Tanana Flats in the second year of tagging operations there. Visual and physical recoveries of calves tagged in 1966 have come from the Chena River drainage, the Alaska Range, and the Flats themselves.

Range - Productivity Relationships

Type mapping, canopy-coverage analysis and the first estimates of browse production and utilization in the Kenai Moose Research Station were completed.

Moose were stocked in two of the enclosures.

RECOMMENDATIONS

Although the harvest ticket system is very valuable and is providing good harvest data in many Units, it is apparent that

the efficiency and reliability of the system would be enhanced by a vigorous effort to inform the public of the need for and value of the data, which can only be obtained through their cooperation. Such a program would be especially helpful in outlying areas where the harvest ticket is largely ineffective now.

A minimal fee for harvest tickets should reduce the cost of the overall program and increase its efficiency by eliminating casual users of harvest tickets who have no serious intention of hunting, and who contribute considerably to the need for reminder letters and other extra work presently expended with little benefit derived in terms of data obtained. Holders of subsistence licenses could be excepted from the fee to avoid discrimination against people of low income groups.

Harvest tickets are only a part of the greater problem of conveying the concepts involved in moose management to the public effectively. This is a continuing problem, because we are dealing with few absolute data, and it is difficult for people to grasp the connection between several types of population data which are expressed only in relative terms.

The Department, as an agency of State government, should remain responsive to the needs and wishes of the citizenry but at the same time resource management in general needs to be protected from the influences of political considerations and vested interests. The State Constitution and laws relating to the Department of Fish and Game presently do not provide the needed protection. The only good alternative at present is an intensified effort in public education.

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-15-R-3 TITLE: Big Game Investigations

WORK PLAN: K TITLE: Moose

JOB NO: 1,2,3,4,5,6,7

PERIOD COVERED: January 1, 1968 to June 30, 1968

OBJECTIVES

To obtain and evaluate data on the status of Alaska's moose populations in terms of productivity, trends of abundance, fertility, movements, sex and age compositions, and harvest to guide annual management decisions.

To obtain information on basic relationships of climatology and range, and the physiological response of moose to these environmental components in order to provide a broader base of knowledge for management of the species.

TECHNIQUES

Publications

Compilation and analysis of data from specimen collections and aerial count work done in past years was continued.

Harvest Statistics

The form of the mandatory harvest ticket was revised to provide information on areas hunted unsuccessfully, and means of transportation used by moose hunters. Computer programs were designed and written to provide information on magnitude, sex, and chronology of the harvest as in past years. In addition, programs were written to extract data on success rates, means of transportation used by moose hunters, relationships of residence to Unit hunted, to transportation used, and to success, and the relationship between means of transportation and success.

Age composition of the hunter harvest in several important areas was based on cementum layers in the incisors of moose collected from successful hunters through check stations, field collections, and hunter cooperation.

Range Inventories

A field crew established plant exclosures in representative vegetative types in two study areas in the Matanuska Valley, Alaska. The first exclosure was erected between the Knik and Matanuska Rivers at T.16N., R.1E., Section 10. The second exclosure was erected near the northwest end of the Willow airstrip at T.19N., R.4W., Section 6. The exclosure near the Knik and Matanuska Rivers was erected during the summer of 1966 and the Willow exclosure was constructed during the fall of 1966. Corner-marked sites lying adjacent to one side of the exclosures are used as controls. A canopy-coverage method of vegetation analysis (Daubenmire, 1959) was used to describe the plant taxons. The only deviation from the method described is found in mosses, where a "strike" method of determining coverage was applied. Legs welded to each corner of the microplot frame were used to determine moss coverage. If one leg struck moss, coverage was determined to be 25%. This technique was repeated adding 25% for each leg striking moss, until a point was reached where all four legs struck moss indicating 100% coverage.

Within the 66' square, one-tenth acre exclosures were placed four fifty-foot north-south lines in a random manner. A similar procedure was followed in the corner-marked sites outside the exclosures, except for the Knik-Matanuska area, where the outside lines are not random, but systematic. Figures 2 and 3 describe the locations of the permanent steel stakes installed at each end of the fifty-foot lines inside and outside each exclosure.

Using the 20x50 cm. frame described in Appendix A, 25 microplots were examined along each line at two-foot intervals, beginning at 0 feet and running to 48 feet. All microplots face the center in both the exclosures and the control plots when read along the 50 foot tape stretched between two posts, except for line 3 in the exclosure at Willow, which had to face away from the center of the exclosure because vegetation analysis crews would have damaged the plants in line 2 by trampling. All microplots were read beginning at the south end of the tape line in the southwest corner of the exclosure of control plot and proceeding northerly. The taxons were assigned a coverage class and recorded. Reading the microplots at five year intervals should evaluate trends in quantity and type of plant taxons available. Examples of plant species found in the two areas were collected, identified, pressed, and placed on file in the Palmer office of the Alaska Department of Fish and Game.

Phillip D. Havens, Game Biologist, assisted by Doug Jones of the Palmer office of the A.D.F.&G. took slides of the exclosures which are presently on file in the Palmer office. A description

of the slides and information regarding camera positioning within the exclosure is found in Table 20. The slides were taken on July 7, 1967.

At each point except those taken from the top of the fence, a stake was driven in the ground and painted orange, to mark it for several years. The camera was placed on a tripod over the stake and adjusted so that the lens would be 24" from the ground. Those pictures taken from the top and 75 feet outside the fence were hand held. The camera was aimed from one corner to the opposite corner, or from the middle of one side to the middle of the opposite side of the exclosure, depending upon the circumstances. No slides were taken of the control area.

Jack Didrickson, Ron Somerville, Jay Bergstrand, Phillip Havens, Doug Jones, Ed Bellringer Jr., Sterling Eide, Greg Bos, Lou Bottcher, Angus Robertson, and John Bury, all A.D.F.&G. employees, were responsible for and participated in the construction of the exclosures and recording and evaluation of the information contained in this report. The assistance rendered by Dr. William Mitchell of the U.S.D.A. in Palmer for help in identifying many of the plant species is gratefully acknowledged.

Method of Vegetation Analysis (abridged from Daubenmire, R.F., 1959. A canopy coverage method of vegetation analysis. Northwest Science 33:43-64).

Objective: To obtain a 2-dimensional evaluation of the influence each plant taxon exerts over the other components of its ecosystem.

Equipment: (1) A frame of 3/16" steel with inside dimensions 20x50 cm, legs about 2 cm long at each corner, and painted to indicate quarters (as in figure) with 2 sides of a square 71x71 mm indicated in one corner; (2) tape, or cord with knots at half meter intervals; (3) stakes for ends of tape; (4) paper ruled to facilitate recording coverage of several dozen taxa in no more than 50 plots.

Method of recording data: Consider all individuals of one taxon in the plot as a unit, ignoring for the moment all other kinds of plants. Imagine a line drawn about the leaf tips of the undisturbed canopies (ignoring inflorescences) and project these polygonal images onto the ground. This projection is considered "canopy-coverage." Decide which of the classes (see table) the canopy coverage of the taxon falls into, and record this value. Then consider the remaining taxa in turn. (see example in figure) The painted design of the frame provides visual reference areas equal to 5, 25, 50, 75, and 95% of the plot area. Note that a plant does not have to be rooted in the plot to have coverage over it,

and accidents of foliage dispersal within the projected canopy outline are ignored.

COVERAGE-CLASS	RANGE OF COVERAGE	MIDPOINT OF RANGE
1	0-5%	2.5%
2	5-25	15
3	25-50	37.5
4	50-75	62.5
5	75-95	85
6	95-100	97.5

Method of calculation: If 50 plots have been examined in one stand and Poa ampla was found in 5 of them, the classes recorded in the field being: 1, 6, 6, 3, and 4, then in the laboratory: Add together 2.5 + 97.5 + 37.5 + 62.5 + 297.5 +97.5 and divide by the number of plots examined (50) to get average coverage (5.9) for the total area sampled (50 x 1/10m = $5m^2$), which may be considered an estimate of average coverage for the stand as a whole.

Miscellaneous notes: The series of plots should fall in an area of maximum vegetation homogeneity, and should trend along the contour rather than cross it so as to stay within one soil type. Closely reproducible results are usually obtained with 40-50 plots. Single plots or groups of plots may be randomized as desired, or a completely systematic system of sampling may be used. Some competent statisticians have stated that biometric tests for adequacy of sampling are valid for either of these sampling procedures. Each plant should be evaluated at a time approximating its period of maximum annual leaf spread, and if the phenologies of the plants are staggered over the season, the series of plots must be tallied twice or more each time recording only those plants that are near their prime. The method is applicable to most vegetation not exceeding about 1m in height. The tiny annuals it sometimes helps to estimate the numbers of individuals that would be required to fill 5% of the frame (the 71 x 71 mm area), then a quick estimate of the numbers of individuals in each frame provides an answer as to whether the aggregate coverage falls in Class 1 or 2.

Sex and Age Composition

The aerial sex and age composition count techniques presently used have been described in detail in past annual segment reports (Rausch, 1966, 1967, 1968). Counts were made in most of the established count areas, and some new areas of increasing importance were added.

The square-mile census of the Matanuska Valley (Rausch 1966, 1967) was attempted but was unsuccessful due to foul weather and loss of snow cover.

A stratified random block census similar in design to that used in the Matanuska Valley and on the Kenai Peninsula was planned for the Yakutat area in March, 1968 but lack of snow precluded doing the work. A strip or transect count analogous to that done in 1964 was substituted in an effort to obtain some indication of population size. The U.S. Forest Service provided most of the aircraft charter, personnel, and reported on the survey. Loyal Johnson and Wayne Fleek, A.D.F.&G., assisted. The techniques and findings presented here were abstracted from the report written by M. M. Perensovich, Wildlife Biologist, North Tongass Forest, U.S. Forest Service, Juneau, with discussion added by Loyal Johnson and R. H. Bishop, A.D.F.&G.

Parallel transects about 0.5 miles wide and lying between the ocean beach and the foothills were examined using a Cessna 180 aircraft with two observers and a PA18-150 with a pilot observer and one observer. U.S.F.S. observers were M. M. Perensovich Jr., Jim Page and Okla Duffle. Johnson and Fleek from the A.D.F.&G. assisted. The area was divided into eight counting units. Moose were counted but not classified with respect to sex and age. Snow cover was less than 1 foot in depth and was not continuous. Foul weather delayed completion of the count; from April 10 to April 23 was required to complete it.

Production

Aerial composition counts were made between mid-May and mid-June in the Matanuska and Susitna Valleys and on the Tanana Flats. The counting technique is similar to that used for sex and age composition, but cows must be examined more closely to detect newborn calves, and because animals one year old can be confused with older animals at times.

No attempt was made to re-examine the progression of calving by daily counts over an extended period in either area this year.

Areas where calves had been tagged on the Tanana Flats in 1968 were re-counted after tagging to obtain estimates of calf production.

Tagging and Movements

Adult moose were marked with ear tags and streamers and collars in the Matanuska Valley. The immobilization and marking techniques were described in past annual segment reports (Rausch 1967, 1968). Poor snow conditions hampered the operation during the current period.

Calves were marked with ear tags and streamers on the Tanana Flats from May 26, 1968 through May 31, 1968, using commercial Helicopters, and military helicopters through the cooperation of the U.S. Army, Fort Wainwright.

The first calf tagging program in Alaska was begun in 1960 in the Matanuska-Susitna Valley. Because it has been several years since the techniques have been described in detail, they will be included here.

General: A PA18-150 Supercub with pilot and observer is used to spot cows with calves. The location of the moose is radioed to the helicopter carrying the tagging crew. The Supercub then goes on to find another calf. The helicopter finds the cow and calf and hazes the cow away, then lets the tagging crew off to catch the calf. While the taggers are on the ground the helicopter keeps the militant cow away.

A numbered monel metal cattle ear tag is placed on the anterior edge of, and midway from the base to the tip of the ear of the calf. The metal tag is used to hold a brightly colored streamer in place and in addition to provide a numerical identification for the individual calf. Streamers are color-coded to area, and sex of the calf is indicated by which ear has a streamer (left=♂, right=♀). In the case of twins a second streamer of another color designating twins is attached to the second ear. Tag numbers, sex, streamer color and ear (left or right), approximate age, and other observations are recorded on a 4" x 6" card form by one of the taggers. The calf is then released. Streamer size is 9"x3".

Crews consist of two to three men; one tags the calves, the other carries a rifle for protection if the cow should get past the helicopter and charge; he also records if a third man is not present.

Aircraft: Helicopters carrying the tagging crews in the past have included H-21 and HU1A through military cooperation, Hiller 12E-4, and Hiller 12E. Spotting aircraft are generally PA-18 150 Supercubs, but L-19 fixed wing military aircraft and a light military helicopter have been used. Radio communication between spotter and tagging aircraft must be working for the spotter to be effective.

Tagging equipment: The metal ear tags used are #49 Hasco monel metal cattle ear tags made by National Band and Tag Co., Newport, Kentucky. Tagging pliers are available from the same company. The streamer material is 3" wide, plastic-impregnated nylon called Saflag, available from Safety Flag Co. of America, P.O. Box 1005, Pawtucket, Rhode Island, in a variety of colors.

Tennis shoes seem to be the most suitable footwear. Fluorescent vests or similar outfits help the helicopter pilot keep track of the taggers' position with respect to the cow.

Success of the operation depends upon the ability of the helicopter pilots to quickly learn how to maneuver the cow away from the calf and place the tagging crew on the ground.

Range Productivity Relationships

Aside from the major continuing work of fence construction, two technical aspects of the work at the enclosures of the Kenai Moose Research Station were continued during this period; vegetation studies and stocking of enclosures No. 1 and 2 with moose.

Procedures for data collection and analysis, vegetation studies:

1. Successional and Plant Ecological Studies

   Permanent successional study plots are to be established in each vegetation type that supports a winter food source for moose. The objective is to measure changes which may occur in the plant communities and to obtain an array of internal stand variations within and between major types.

   A. Methods and Measurements

   For successional studies it is desireable to use a method of sampling the vegetation which is applicable to all types and all stages of plant succession.

   Generally a larger plot is required to measure mature trees than is required to measure tree reproduction or shrubs and herbs. It was found by experimentation in the field that plots 66' x 99' (3/20 acre) are an adequate size for determining the density of mature trees. This is an area at which a further increase in size does not add significantly to the accuracy and precision of the data to be gathered. In long term successional studies of this nature it is necessary to measure changes that may take place in the stands which are presently mature and also to be prepared to measure the regrowth stands as they become mature.

   Efficient sampling of the smaller forms of vegetation is normally accomplished on smaller plots. Cover and density are the two parameters with the greatest significance. Lindsey (1956) found that canopy coverage "is the most important single parameter of a species in its community relations."

The literature also revealed "A Canopy-Coverage Method of Vegetational Analysis" by Daubenmire (1959) which was evaluated and modified for this study (see Range Inventories).

Microplots 20 x 50 centimeters are used to measure the cover value of each species of plant and the density of tree reproduction within the larger macroplot.

It was determined that fifty microplots would provide data with consistent reliability. This figure was doubled to one hundred in order to insure that different types or different stages of succession than those in the original design would be sampled with the same reliability.

Cover is defined as the percentage of the total area covered by the vertical projection of a polygon drawn about the extremities of the canopy of each plant. The overlapping portions of canopies of plants of the same species with the same stature in the stand are not additive. In the case where plants of the same species have different stature in the stand such as an overstory of mature trees (browse not available to moose) with an understory of reproduction (available browse) they are recorded separately.

Density is simply the number of stems per unit area. When reading the plots a stem is recorded if it occurs on the plot at the surface of the ground cover. No further attempt should be made to determine if a particular stem is only a part of multi-stemmed plant such as willow.

B. Field Procedure

1. Reconnaissance

Each stand should be examined and a species list made. An estimate of the canopy coverage should be recorded for each species. Notes should be taken on surface features, topography, and soils.

2. Location of Plots

Plots within each specific type should be located subjectively after a reconnaissance of the various stands within each type has been made. Within the plot boundaries the vegetation, topography, soil and other surface features should be relatively homogenous.

3. Plot layout and marking

Lay out the plots with a staff compass and metalic tape. The macroplots are 99 x 66 feet.

Mark the four corners of the plot and both ends of the two microplot lines with iron stakes (1/2" x 33" reinforcing rod driven halfway into the ground).

The above ground portion of the stakes should be painted bright orange or a piece of orange plastic flagging should be tied around the stake near the top.

Bright orange flagging tied high on a spruce stem near each permanent stake will increase the speed at which the plots can be found in the future.

Mark the "zero" end of the two microplot lines with a metal tag with the plot number and line number on it.

The plots are numbered consecutively as they are established and read. Line numbers are one and two for each plot and recorded as such on the data sheets.

Record the plot location and number on the type map. Plots which are not true north-south or east-west should have their true bearings recorded on the map.

4. Reading the Plots and Recording the Data

When the microplots are to be read a metalic tape is stretched between the two stakes on the line. The tape should be straight and close to the ground.

The first time each microplot line is laid out small iron stakes 1/4" x 12" should be driven 2/3 of the way into the ground at the 33 and 66 foot marks along the tape. This will help to speed up the tape layout when the plots are read again.

The fifty microplots are spaced at two foot intervals along the tape. The corner of the first microplot is at zero on the tape (the line stake with a numbered tag on it). The microplots are placed along the tape and toward the center of the macroplot.

For each microplot the cover value of each species of plant, dead material, rocks and exposed soil is recorded. The number of stems of spruce, birch, aspen, and willow is also recorded.

One digit numbers 1 through 6 are used in recording the corresponding cover values of 0-5%, 5-25%, 25-50%, 50-75%, 75-95%, and 95-100% respectively.

A separate cover value will be read for trees which are so tall that their crowns cannot be reached by moose (at the present time this means mature trees).

One form will be used for each line of 50 microplots.

The back of the form should be used to record a sketch of the plot indicating its direction, the zero end, and number of each line.

Record the number of mature stems by species, percent slope and aspect, information on soils and other pertinent data.

5. Number of Plots

Establish at least five plots in each major type in each pen. More plots should be established if there is a great variation within a particular type. Establish at least one reference plot in each type in exclosures (protected from moose at all times).

Establish at least one reference plot in each of the same types outside the pens (subject to "normal" moose use).

C. Data Analysis

The data will be summarized for each plot and tabulated by type. A list of species present, percent cover, frequency, and density are easily obtainable from the data sheets. Comparison can be made between stands, types, and years.

Whenever these data are analyzed statistically and written up or published it must be noted that the plots were located subjectively rather than randomly.

D. Time of Data Collection

The plants should be at same stage of annual growth each time the plots are read. The month of July is probably the best time to read them.

II. Available Browse, Production, and Utilization Studies

The objectives of this portion of the study are to determine the total amount of winter browse available each fall; the annual production of winter browse, and the utilization of browse during the winter.

A. Methods and Measurements

Generally browse sampling methods involve clipping and weighing or ocular estimating or a combination of both. In this study clipping the entire number of plots necessary for a reliable sample in each of the seven browse types would be time consuming and expensive; destructive to the habitat; and increase the difficulty of obtaining a representative sample over a period of years. Ocular estimating or a combination of clipping and ocular estimating would be open to serious question in a long-term detailed study of this type where there will no doubt be changes in personnel.

The following is a method which insures consistently reliable data to be readily taken on permanently established plots by personnel with a minimum of training. Stems are categorized by diameter and height; each type is randomly sampled to determine the number of stems in each category; a second separate and much smaller random sample is made to determine the average weight of the stems in each particular category. These average weight values are then applied to the plot data to determine the pounds of browse for each type.

Stem diameters are measured in quarter inch increments (0 - 1/4 = 1/4"; 1/4 - 1/2 = 1/2"; 1/2 - 3/4 = 3/4"; etc. at one foot above ground, and heights are measured in increments of one foot (1 - 2 = 2'; 2 - 3 = 3', etc.). Stems shorter than one foot are not measured. Examples of the categories are: 2' x 1/2"; 3' x 1/4"; 2' x 1/2"; 3' x 1/2"; 4' x 1/2"; 3' x 3/4", etc.

Preliminary study indicated a plot eight by twenty-four feet (192 sq. ft. or 1/227 acre) would be the proper size and shape for adequate and efficient sampling. The exact size of the plot is directly related to the method of obtaining weight values for the browse species. More precise measurements can be taken in the field when a gram scale is used. In this case one-half the weight in grams of browse on a plot equals the pounds per acre of browse on that plot.

In order to determine the average weight (and the standard error) of available browse and annual growth for each category, plants are randomly selected in each category for measuring. The stems and branches one-half inch and smaller in each plant are removed (clipped) and weighed. The linear annual growth is then removed (clipped) and weighed. These are the values used in determining total available browse and browse production. The one-half inch diameter criterion was determined by observations of weedy plants in areas where moose have been hard pressed for food.

B. Random Sampling Procedure

Grid lines two-tenths of an inch apart are drawn on the type maps which have a scale of 1^{π} = 310 feet. The grid lines are then numbered on both the x and the y axes.

The random location of plots is accomplished by drawing two numbers (one from x and one for y) for each plot from a random numbers table.

Thirty-five points are drawn for each of the seven important browse types.

The coordinate point for the first pair of numbers is located on the map and the plot is drawn in from that point south (true bearing) 24 feet. The second pair of coordinates is drawn from the table and located on the map. This second plot runs east 24 feet from the point. The plots are alternately located north-south and east-west as they are drawn from the table.

Every seventh point drawn for each type is marked with an x on the map. These points will be used to obtain samples for clipping. When 35 points have been located in a specific type any additional points falling in that type are ignored and the drawing continues until all the types have 35 points.

The plot locations are then transferred to aerial photographs and maps for field use.

C. Field Procedure - Permanent Plots

1. Establishing and Marking the Plots

To establish a plot for the first reading the point on the photograph is located on the ground. From this point the tape is run 24 feet by compass bearing

south or east, whichever the case may be, for 24 feet. At that point an iron stake (1/2" x 33" reinforcing rod) is driven into the ground and the tape is run another 24 feet and the second stake is driven into the ground. This procedure should eliminate personal bias in establishing the plots.

Blue plastic flagging is placed on mature trees or on spruce reproduction near the stakes in order to speed locating the plots the next time they are read.

2. Reading the Plots and Recording the Data

The tape stretched straight between the two stakes serves as the center line of the 8' x 24' plot.

The 4 foot measuring sticks are placed perpendicular to and on one side of the tape. These are used to indicate the edge of the plot and to keep track of the area as the plants are measured.

On each plant the height is measured with a 6 foot pole marked in feet. Plants shorter than 1 foot are not included in the sample. Plants 1 foot to 2 feet are called 2 feet; plants 2 feet to 3 feet are called 3 feet, etc.

The diameter of each plant is measured at 1 foot above ground in increments of 1/4 inch. Zero to 1/4 inch is called 1/4; 1/4 to 1/2 inch is called 1/2; etc. A go and no-go gage is used.

Birch is the most common species; therefore, it is not specifically identified on the form. Other browse species are tallied in the same space and marked with an identifying letter so that the various species can be analyzed separately. Aspen will be marked with an A, willow with a W, viburnum with a V, dwarf birch with an N, cottonwood with a C, and alder with an AL.

First one-half of the plot is read by moving the 4 foot sticks then the other half is read. Care must be used not to damage the plants in the plot.

The plots are numbered in sequence as they are established. A metal plot number tag is wired to one of the permanent stakes. The plot number is recorded on the map.

3. Number of Plots

Thirty plots will be established in each type initially. This number may be increased or decreased after fall and spring measurements have been made and the data has been analyzed.

One reference plot should be established in each type in exclosures and outside the pens.

D. Field Procedure - Clipping Data

The points are located in the field from aerial photographs. When a point is located three plants in each category are cut in the ground line. The diameter and height are marked on their bases and the three plants are tied together.

When samples have been obtained for all the categories represented at the particular location the plants are taken to a laboratory.

E. Laboratory Procedure - Clipping Data

Each plant is handled individually in the laboratory. First the dead material is removed. Then all the living material 1/2 inch in diameter and smaller is removed and weighed to the nearest gram.

The material from one stem in each category from each area is placed in paper bags marked with the location and green weight (the annual growth is kept separate from the other portion of the total). These samples will be used to determine oven dry weight.

F. Data Analysis

The clipping data will be analyzed statistically to determine the mean and the standard error of the mean for each category.

These mean values will then be applied to the plot data in order to determine the mean of the browse per acre in each type.

Utilization will be determined by subtracting the weight of the remaining browse on each plot in the spring from the available browse measured on each plot the previous fall.

The minimum requirement for the final analysis is 75 percent of the mean. These criteria will be used only for birch reproduction. The other browse species are so sparse that it is neither necessary nor worthwhile to obtain a valid statistical sample of them.

G. Time of Data Collection

Fall measurements to determine available browse and production (annual growth) should be made during the first 2 weeks of October.

Spring measurements to determine utilization should be made the last 2 weeks of April.

III. Supporting Procedures

a) Permanent photographic points will be established at each of the successional study plots. These will help evaluate the studies. Plot line stakes will be used as photographic points. Initially one black and white photograph and one color transparency should be made of each line. These should be taken in July, October, and April in order to record the greatest degree of plant growth and browsing. This should be done in an orderly and efficient manner under proper conditions. It would not be efficient to have two crews reading the plots try to take the photographs at the same time.

b) Weather Data

Weather recording instruments will be set up in the pen area by the Alaska Department of Fish and Game as part of the overall project. Snow depth, percipitation, daily maximum temperatures, and wind velocity will be recorded and analyzed.

c) Soil Surveys and Compaction Tests

A soil survey was conducted prior to stocking of the pens and a soil map prepared. This will help interpret vegetative changes occurring during the study. Soil compaction tests will be taken at yearly intervals.

d) Voucher Collections

Collections will be made of each species found in the area (even for common items such as blue huckleberry and ground dogwood; these two for example, commonly include two species and hybrids in South Coastal Alaska).

Specimens should be in flower and preferably possess some relatively mature fruit, and be accompanied by notation of date of collection, location, and type found in.

Stocking of Moose Enclosures

Through the natural movements of moose in the area both enclosures 1 and 2 contained moose by January and February when stocking was planned. The gates, which had been open, were closed when aerial counts indicated about the desired number were in the enclosures. The enclosed moose were shot with a dart syringe from a helicopter to capture them for marking, removing a tooth, collecting a blood sample, and in some cases, palpating. Palmer 32 ga. shotguns with an insert designed for 22 cal. blank charges were used to fire the Palmer Cap-chur darts. For adults, 23.5mg of succinylcholine chloride was used; for calves 16mg was used. Ear tags and streamers and numbered, color coded collars similar to those used in the Matanuska Valley (see Tagging and Movements) were placed on the captured moose to provide individual identification. Excess moose in enclosure 2 were herded out or collected to obtain specimens reflecting age, parasite load, body condition and reproductive condition.

Winter Browse Preference

This job is being reported upon by the Alaska Cooperative Wildlife Research Unit.

FINDINGS

Publications

Analysis of the volume of past data for inclusion in a comprehensive review of moose research and management is continuing with the assistance of Mr. Sam Harbo, University of Alaska Biometrician. Results are not yet available.

Harvest

Issuance and Return

The general statistics on moose harvest ticket distribution and recovery for 1967 and 1966 are summarized in Table 1. The number of tickets issued in 1967 was essentially the same as in 1966. The percentage recovered declined slightly although the number recovered remained essentially the same. During the period 1963 through 1965, 90 percent of the tickets or more were recovered annually. The current decline is related to the elimination of a second reminder letter after 1965 when it was decided that the second letter was too expensive considering the data it secured.

The overall analysis of ticket returns is shown in the second part of Table 1. The decline in the harvest and the success rate is readily accounted for by the closure of antlerless seasons in Units 14, 15 and 16 in response to public sentiment. Lesser contributing factors were the preoccupation of Fairbanks hunters with rehabilitating their property after the August 14th flood, the distribution of moose in parts of the Interior and access to the moose, which were also adversely affected by the flood, and apathy toward the use of harvest tickets in outlying areas.

The summary shows that 27 percent of those who returned reports did not hunt. Although this proportion varies from year to year, generally one-fifth or better of those who obtain the free moose harvest tickets do not use them. Most of that group probably have no serious intentions of hunting, but obtain a harvest ticket just in case they happen upon a moose. The cost of issuing and processing these reports are the same as for the reports turned in by hunters who do hunt.

The harvest ticket report offers the hunter the choice of indicating that he "did hunt" or "did not hunt". The term "hunt" is used in the very broadest sense, and an individual who drove along the highway one evening during the moose season hoping to see a moose is perhaps as likely to reply that he hunted as an individual who spent several days hunting in the bush. It seems likely that the "unsuccessful" group contains a substantial number of the former type of hunter, who actually does little or no hunting. There may also be some bias for hunters indicating they hunted when they actually did not (McDonald & Dillman, 1968), perhaps for reasons of personal prestige. The total of "did not hunt", "unsuccessful" (who hunted little or none), and "no information" reports may represent 35 to 50 percent of the total issuance. A corresponding proportion of the cost of the harvest ticket program is expended for data which at best is of neutral value, and at worst misleading, as in the example where the individual out for an evening drive on the highway indicated he hunted moose. It may be that a study to determine the nature of the hunting done by those who reported hunting unsuccessfully should be devised in order to evaluate their responses. On the other hand a simple expedient to reduce the number of "incidental" reports of little value which are issued, returned and compiled would be to charge one or two dollars for the moose harvest ticket, except to those people holding 25-cent licenses. The subsequent decline in issuance and return would presumably be due to fewer people obtaining harvest tickets simply because they were free. The efficiency of reporting would surely be aided also, since most of the late returns are "unsuccessful", "did not hunt", and "no information" reports, which probably are obtained by the casual or incidental hunter. The fee would not be large enough to discourage any hunter entertaining any serious idea of hunting moose.

Table 1. Summary of moose harvest ticket program, 1966 and 1967.

	1966		1967	
ISSUANCE & RETURN	NO.	%*	NO.	%*
Tickets issued	31,549	100	31,941	100
Ticket reports returned	28,210	89.4	27,921	87
Ticket reports outstanding	3,339	10.6	3,841	12
Could not contact	637	2.0	---	---
No response to reminder letter	2,702	8.5	---	---

* Percentages for issuance and return based on tickets issued.

ANALYSIS OF RETURNS	NO.	%**	NO.	%**
Successful hunters	7,048	32.2	5,922	29
Antlered kill	5,450	---	4,856	---
Antlerless kill	1,444	---	993	---
Sex unknown kill	154	---	73	---
Unsuccessful hunters	14,791	67.8	14,160	71
Did not hunt	6,371	20.1	7,539	27
Total, unsuccessful and did not hunt	21,162	75.0	21,699	78
No information	---	---	300	1

** Percentages: For successful and unsuccessful based on number who hunted; for did not hunt and total of unsuccessful and did not hunt, based on reports returned.

Harvest Ticket Report Data

The harvest ticket program was initiated primarily to provide accurate measure of the harvest. The potential for obtaining additional data about the harvest was apparent. The harvest ticket report design has been modified and refined to provide data on chronology of the harvest, success and means of transportation used (Fig. 1). These data when related to the hunter's residence recorded on the overlay (Fig. 1) provide the means of answering many growing questions about the characteristics of moose hunting in Alaska. The information sought through the harvest ticket reports included: harvest, chronology of the harvest, successfulness of hunters, relationships of residence and transportation used, relationship of residence and Unit hunted, and successfulness of those hunters reporting voluntarily versus those reporting after receiving a reminder letter.

Harvest

The harvest is recorded for the State, for each Unit, and in many Units for sub-units and smaller divisions referred to as areas or drainages. Table 2 shows the 1967 harvest in all sub-units and Units corrently recognized. "Unit 27" is an accumulation of kills for which no Unit was designated by the hunters. Table 3 summarizes the harvest by Unit for each year since the inception of the harvest ticket system in 1963. In most Units the harvest has remained essentially stable although fluctuations of minor magnitude have occurred. In Units 14 and 15 where the harvest dropped considerably in 1966 and 1967, the major cause was the timing of antlerless seasons, which were held in late September before moose had moved to the lowland wintering grounds in 1966, and the cancellation of antlerless seasons in all of Southcentral Alaska in response to public pressure in 1967. In Unit 7 residents have demanded successively more restrictive regulations for several years although the winter browse in much of the area is very heavily utilized, which suggest a maximal population. The harvest in Unit 16 reflects the influence of seasons in adjacent Units. With the restriction of antlerless seasons in Units 14 and 15 in 1966, the Unit 16 harvest increased considerably, although not dangerously. In 1967 the antlerless season was cancelled in Unit 16 and the harvest fell.

In outlying Units (17, 19, 21 to 26) some Unit harvests have remained stable, but more show a decline. From aerial survey work and casual observation the moose populations in most of these Units are known to be at least sufficient to sustain a much higher harvest, and in some cases the populations are high. It is also known that the harvest ticket reports are not widely used in many of the outlying areas nor has their use been encouraged actively enough by the Department. For this reason the reported kill has dwindled as

MOOSE HARVEST TICKET 1968 No. A 48106

NON-TRANSFERABLE

Name_____
PLEASE PRINT CLEARLY

Mailing Address_____

City_____ State_____

Resident ☐ Non-Resident ☐ Zip_____

Date Issued:_____, 1968 License No._____

VENDOR:

WRITE NUMBER OF THIS TICKET ON BACK OF APPLICANT'S LICENSE.

Detach and Mail to Alaska Dept. of Fish and Game
(1018 International Airport Road, Anchorage, Alaska 99502)

1968 No. A 48106

NON-TRANSFERABLE

MOOSE HUNTING REPORT

- _____
  HUNTER'S NAME (PRINT)
- HUNTED MOOSE ☐ YES ☐ NO
- SPECIFY LOCALITY_____
- MOOSE KILLED ☐ YES ☐ NO
- SEX OF KILL ☐ MALE ☐ FEMALE
- KILLED IN GAME MGMT UNIT_____
- DATE KILLED ___ / ___ /1968
  MO. DAY
- METHOD OF TRANSPORT

1 ☐ HIGHWAY VEHICLE	5 ☐ AIRPLANE
2 ☐ BOAT	6 ☐ SNOW MACHINE
3 ☐ TOTE GOAT	7 ☐ OFF ROAD VEHICLE
4 ☐ HORSE	8 ☐ AFOOT

THIS REPORT MUST BE FILLED OUT AND MAILED WITHIN 15 DAYS IF YOU KILL A MOOSE, OR WITHIN 30 DAYS AFTER CLOSE OF SEASON IF YOU DID NOT HUNT, OR HUNTED BUT WERE UNSUCCESSFUL.

Fig 1. Moose harvest ticket, overlay (top) and report (below). 1967 and 1968 format are the same.

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967.

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
1	A	01	Unuk, Stikine, Muddy	36			1			1	38
1	B	02	Taku-Berner's Bay	47			0			1	48
1	C	03	Haines Drainages	90			47			0	137
1		(Total)		174			48			2	224
5	A	01	(See Fig. 9) Yakutat, Situk	76			46			1	123
5	B	02	Ahrnklin, Seal, Antlen	3			2			0	5
5	C	03	Dangerous R.Area	14			18			0	32
5	D	04	Harlequin L.	5			5			0	10
5	E	05	Italio R.	5			12			0	17
5	F	06	Akwe R.	10			3			0	13
5	G	07	Ustay R. - Square L.	5			3			0	8

* Indicates second moose, legal in Units 9, 19, 21, 24, and 25.

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967 (cont.).

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
5	H	08	Tanis Mesa	9			3			0	12
5	I	09	Dry Bay-Alsek R.	20			14			0	34
5	Unknown	10	Exact Location Unknown	4			2			0	6
5	Unknown	11	Exact Location Unknown	3			0			0	3
5		(Total)		154			108			1	263
6		(Total)		37			0			0	37
7		01	(See Fig. 10) Portage, 20 Mi.R. Ingram Cr.	13			0			0	13
7		02	Hope, Silvertip, Quartz Cr.	27			0			0	27
7		03	Resurrection Cr. Kenai L. Western U. 7	40			0			1	41
7		04	Seward-Kenai L.	21			1			0	22

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967 (cont.)

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
7		05	Eastern Unit 7	9			0			0	9
7		10	Area Unknown	13			0			0	13
7		(Total)		123			1			1	124
9		01	L. Clark-Chulitna R.	9	1	10	2	0	2	0	12
9		02	Iliamna L.-Kvichak R.	18	1	19	2	1	3	0	22
9		03	Open	1	0	1	0	0	0	0	1
9		04	Tuxedni Bay-Crescent R.	4	0	4	2	0	2	1	7
9		05	Chinitna Bay-Point	3	1	4	1	0	1	0	5
9		06	Kamishak Bay	0	0	0	1	0	1	0	1
9		07	Alagnak-Kakakluk	3	0	3	0	0	0	0	3
9		09	Naknek Area	24	0	24	16	0	16	0	40
9		10	Unknown Area	30	0	30	9	0	9	1	40

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967 (cont.).

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
9		14	King Salmon R.	19	2	21	1	0	1	1	23
9		15	Becharof L.	11	0	11	1	0	1	0	12
9		16	Ugashik L.-R.	41	5	46	5	0	5	1	52
9		21	Dog Salmon R.	14	1	15	0	0	0	3	18
9		22	Wide Bay	3	1	4	0	0	0	0	4
9		23	Mother Goose	29	5	34	10	1	11	0	45
9		24	Cinder	9	5	14	2	1	3	2	19
9		25	Meshik	16	1	17	9	3	12	0	29
9		31	Black L.-Chignik	19	1	20	1	0	1	0	21
9		32	Bear L.	10	3	13	0	0	0	0	13
9		33	Blueberry Cr.	1	1	2	0	0	0	0	2
9		34	Port Moller	4	1	5	0	0	0	0	5
9		35	Stepovak Bay	1	0	1	0	0	0	0	1
9		36	Dakavak Bay	1	0	1	0	0	0	0	1

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967 (cont.).

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
9		40	Bristol Bay	2	0	2	0	0	0	0	2
9		(Total)		272	29	301	62	6	68	9	378
11	Unknown		Area Unknown	97		97	65		65	2	164
11	Unknown	0	Area Unknown	1		1	0		0	0	1
11		01	Nabesna Rd.	7		7	4		4	0	11
11		02	Slana R.	3		3	1		1	0	4
11		(Total)		108		108	70		70	2	180
12		01	North Half General	41		41	4		4	1	46
12		02	South Half General	76		76	34		34	3	113
12		03	Unknown	1		1	0		0	0	1
12	Unknown	10	Unknown	18		18	4		4	0	22
12		(Total)		136		136	42		42	4	182

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967 (cont.).

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
13		01	Glenn Hwy	74		74	48		48	1	123
13		02	Rich. Hwy	85		85	24		24	1	110
13		03	Denali Hwy	144		144	63		63	3	210
13		04	Tok-Slana	14		14	2		2	0	16
13		05	Edgerton Hwy	1		1	0		0	0	1
13		06	Central U. 13	423		423	83		83	5	511
13		07	S. of Glenn Hwy	63		63	12		12	0	75
13		08	N. of Denali Hwy	38		38	8		8	0	46
13		09	E. of Rich. Hwy	221		221	57		57	3	281
13		10	Area Unknown	154		154	22		22	3	179
13		(Total)		1217		1217	319		319	16	1552
14	A	01	Matanuska Valley	159		159	1		1	1	161
14	B	02	Anchorage-Knik	61		61	2		2	1	64

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967 (cont.).

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
14	B	03		55		55	0		0	1	56
14	C	04	Lower Susitna	41		41	1		1	1	43
14	C	05	Lower Susitna	67		67	0		0	1	68
14	C	06	Lower Susitna	53		53	0		0	3	56
14		10	Sub-unit Unknown	46		46	0		0	1	47
14		(Total)		482		482	4		4	9	495
15	A	01	No. of Sterling Hwy	247	0	247	0		0	0	247
15	B	02	Skilak L.-Tustumena L	69	0	69	0		0	1	70
15	C	03	S. of Tustumena L.	268		268	0		0	5	273
15		10	Unknown	57		57	0		0	0	57
15		(Total)		641		641	0		0	6	647

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967 (cont.).

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
16		01	Petersville	50		50	0		0	0	50
16		02	Fairview Mt.	3		3	0		0	0	3
16		03	Susitna-Alexander Cr.-Talkeetna	36		36	0		0		36
16		04	Yenta-Kichatna	67		67	1		1	0	68
16		05	Rainy Pass Area	21		21	0		0	0	21
16		06	Tlikakila R.	1		1	0		0	0	1
16		07	Chakachatna R.-L.	5		5	0		0	0	5
16		08	Redoubt Bay-Drift R.	16		16	0		0	0	16
16		09	Trading Bay-McArthur R.	12		12	0		0	0	12
16		10	Unknown	16		16	0		0	0	16
16		12	Beluga R.-Beluga L.	23		23	0		0	0	23

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967 (cont.).

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
16		13	Tyonek	2		2	0		0	0	2
16		14	Kahiltna-Chelatna	29		29	0		0	0	29
16		(Total)		281		281	1		1	0	282
17		(Total)		37		37	0		0	1	38
18		(Total)		18	1	19	3	1	4	1	24
19		(Total)		88	5	93	36	4	40	5	138
			(Fig. 16)								
20	A	01		125		125	82		82	3	210
20	B	02		85		85	9		9	0	94
20	C	03		434		434	92		92	7	533
20	Unknown	04 & 10		14		14	4		4	1	19
20		(Total)		658		658	187		187	11	856
21		(Total)		100	11	111	32	10	42	2	155

Table 2. Moose Harvest in Sub-units of Game Management Units 1-26, 1967 (cont.).

Unit	Sub-unit	Code	Description	Harvest ♂	♂*	Total ♂	♀	♀*	Total ♀	No Sex	Total
22		(Total)		56		56	0		0	1	57
23		(Total)		65		65	10		10	1	76
24		(Total)		58	3	61	16	5	21	0	82
25		(Total)		35	3	38	10	5	15	1	54
26		(Total)		5		5	0		0	0	5
27		(Total)	Unit of Kill Unknown	59		59	12	1	13	0	72
Statewide		(Total)		4801	55	4856	960	33	993	73	5922

Table 3. Moose Harvest by Game Management Unit, 1963-1967, Alaska.

Unit	Year	♂	♂*	♀	♀*	Sex Unknown	Total
1	1963	149		1		0	150
	1964	158		65		0	223
	1965	128		35		4	167
	1966	168		60		2	230
	1967	174		48		2	224
5	1963	189		111		2	302
	1964	154		111		0	265
	1965	153		125		4	282
	1966	116		90		6	212
	1967	154		108		1	263
6	1963	15		2		0	17
	1964	15		0		0	15
	1965	24		0		0	24
	1966	23		1		0	24
	1967	37		0		0	37
7	1963	251		174		2	427
	1964	163		206		0	369
	1965	60		1		0	61
	1966	112		1		0	113
	1967	123		1		1	125
9	1963	179	0	46	0	2	227
	1964	184	1	64	0	0	249
	1965	200	13	63	5	4	285
	1966	240	0	75	0	8	323
	1967	272	29	62	6	9	378
11	1963	86		37		0	123
	1964	89		38		0	127
	1965	116		70		2	188
	1966	89		69		5	163
	1967	108		70		2	180
12	1963	138		22		1	161
	1964	145		16		0	161
	1965	151		33		6	190
	1966	156		19		7	182
	1967	136		42		4	182

* These columns indicate second moose taken in units 9, 19, 21, 24, 25, where the bag limit is two moose.

Table 3. Moose Harvest by Game Management Unit, 1963-1967, Alaska.(cont.)

Unit	Year	♂	♂*	♀	♀*	Sex Unknown	Total
13	1963	1,385		343		7	1,735
	1964	1,213		394		0	1,607
	1965	1,318		3		10	1,331
	1966	1,336		181		36	1,553
	1967	1,217		319		16	1,552
14	1963	925		557		4	1,486
	1964	795		525		0	1,320
	1965	1,127		1,125		10	2,262
	1966	565		202		9	776
	1967	482		4		9	495
15	1963	1,021		417		2	1,440
	1964	1,212		858		0	2,070
	1965	841		731		12	1,584
	1966	819		307		18	1,144
	1967	641		0		6	647
16	1963	344		27		2	373
	1964	262		61		0	323
	1965	333		52		7	392
	1966	393		144		18	555
	1967	281		0		1	282
17	1963	61		0		0	61
	1964	31		1		0	32
	1965	41		1		0	42
	1966	25		1		0	26
	1967	37		0		1	38
18	1963	75		3		0	78
	1964	39		0		0	39
	1965	28		0		2	30
	1966	31		1		1	33
	1967	19		4		1	24
19	1963	144	0	24	0	0	168
	1964	93	3	31	2	0	129
	1965	114	7	27	1	1	150
	1966	130	6	39	4	4	183
	1967	88	5	36	4	5	138
20	1963	1,324		131		2	1,457
	1964	1,034		242		0	1,276
	1965	1,050		140		33	1,223
	1966	814		157		28	999
	1967	648		187		11	856

Table 3. Moose Harvest by Game Management Unit, 1963-1967, Alaska.(cont.)

Unit	Year	♂	♂*	♀	♀*	Sex Unknown	Total
21	1963	168	0	72	0	7	247
	1964	125	12	43	6	0	186
	1965	87	9	30	1	1	128
	1966	106	8	46	4	2	166
	1967	100	11	32	10	2	155
22	1963	68		1		0	69
	1964	57		0		0	57
	1965	55		3		2	60
	1966	52		1		1	54
	1967	56		0		1	57
23	1963	76		1		0	77
	1964	73		0		0	73
	1965	44		0		1	45
	1966	68		0		1	69
	1967	65		10		0	75
24	1963	92	0	4	0	0	96
	1964	81	3	18	0	0	102
	1965	58	8	14	0	4	84
	1966	50	2	17	0	3	72
	1967	58	3	16	5	0	82
25	1963	77	0	2	0	0	79
	1964	55	0	2	0	0	57
	1965	51	1	1	0	0	53
	1966	69	1	12	7	2	91
	1967	35	3	10	5	1	54
26	1963	13		0		0	13
	1964	13		0		0	13
	1965	0		0		1	1
	1966	12		0		0	12
	1967	5		0		0	5
Unknown	1963	59		4		1	64
Unit	1964	6		1		70	77
	1965	32		9		0	41
	1966	57		13		9	79
	1967	59		12		0	72
TOTALS	1963	6,839	0	1,979	0	32	8,850
	1964	5,997	19	2,676	8	70	8,770
	1965	6,011	38	2,463	7	104	8,623
	1966	5,431	17	1,436	15	155	7,054
	1967	4,801	55	960	33	73	5,922

time passed and the novelty of the reports faded. The situation demands effective public relations work.

A number of factors have affected the harvest in Unit 20. A hard winter with record snowfall in 1965-66 caused heavy mortality in the central part of Unit 20. Calves born in 1965 were hit very hard, as were calves born in the spring of 1966. The loss of the yearlings was probably especially significant to hunting success along the roads and rivers, where much of the early season hunting is done. The very dry summer caused extremely low water in most of the streams, essentially cutting river access off over much of central Unit 20. Fifteen to twenty percent of hunters in Unit 20 use boats. In 1967, weather patterns were reversed, and in spite of relatively good winter survival, hunters in central Unit 20 (especially 20B) had difficulty because of too much water. The August 14 flood kept hunters from flooded areas at home cleaning up before freeze-up, and the flood had pushed moose out of many river- and road-side areas. Given a normal year the harvest in Unit 20 should show a decided rise, although it may be that in Sub-unit 20B where antlerless seasons have never been held the unbalanced sex ratio favoring cows will perpetuate low harvests of males if bulls-only seasons persist.

Chronology of Harvest

The chronology of the male moose harvest in selected units is shown in Figs. 2 through 5. Chronology of the harvest for the respective units illustrated has been rather consistent annually since the data became available starting in 1963. In all the Units illustrated the opening week of the season contributes a substantial percentage of the harvest. The next period which contributes heavily is the first active week of the rut, September 16-24. There is some variation; in Unit 14 the rut period is seemingly not as important. Accessible portions of the population contain relatively few bulls, and they are harvested heavily early in the season. The moose inhabiting the higher, inaccessible country only become accessible when they move to lowland wintering areas. The fall and winter of 1967-1968 were quite mild and moose did not move to the wintering areas such as the Matanuska Valley in numbers until December and January, yet the November season produced over 30 percent of the harvest in Unit 14. A similar situation exists in Unit 15, where early season hunting is briefly effective, but a substantial harvest is dependent upon weather forcing the moose out of the high country. In Units 13, 20A and 20C the situation is different in that much of the country is usually inaccessible in November except by air or snow vehicle. However, the movements of the moose during the rut make them accessible and therefore the rutting period is the most productive period in these units. In Sub-Unit 20B the opening week kill is generally the highest, apparently due to the relatively high proportion of yearling bulls

Figure 2. Chronology of 1967 Moose Harvest, Expressed in Percent by Period, Males, Unit 13.

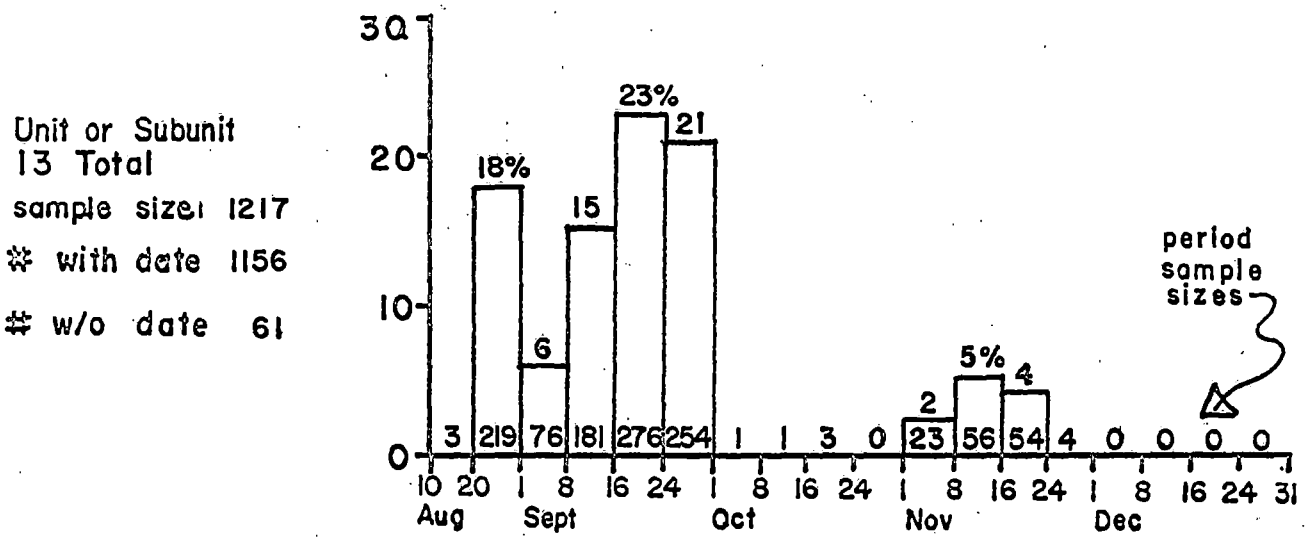
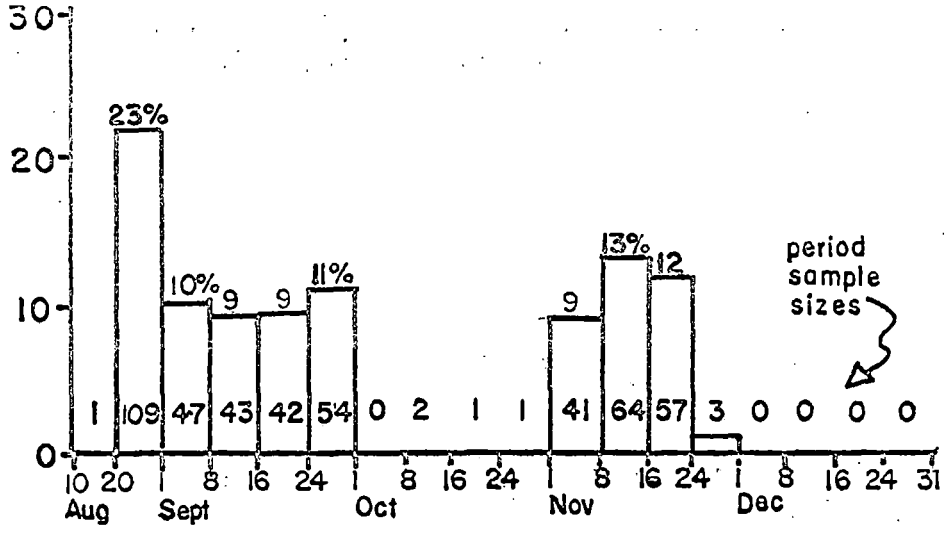
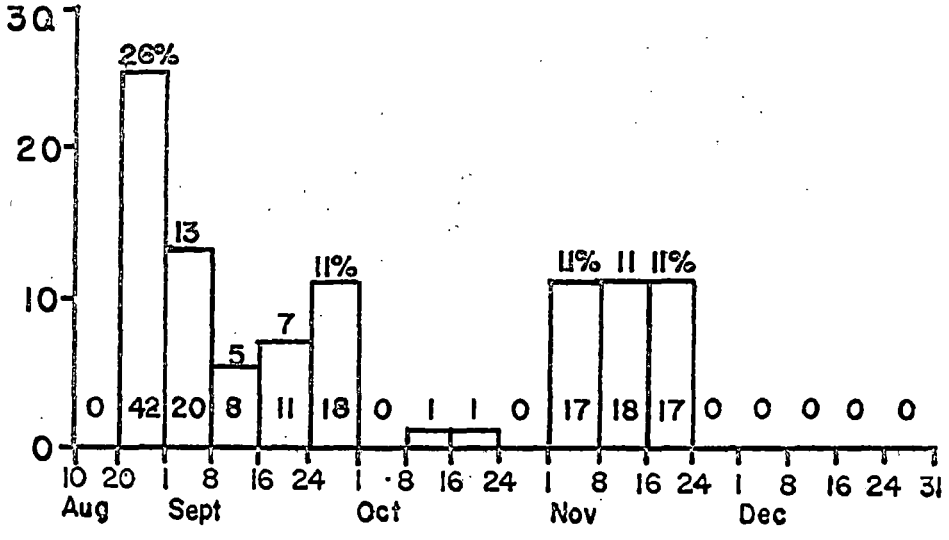


Figure 3. Chronology of 1967 Moose Harvest, Expressed in Percent by Period, Males, Unit 14.

Unit or Subunit
14 TOTAL
sample size 482
* with date 469
* w/o date 13



Unit or Subunit
14-01 (A)
sample size 159
* with date 155
* w/o date 4



Unit or Subunit
14-02 (C)
sample size 61
* with date 60
* w/o date 1

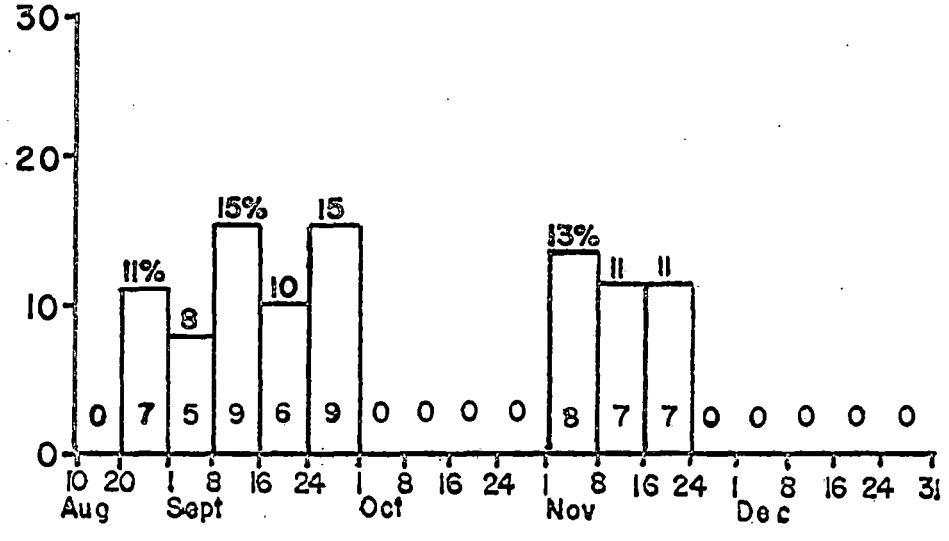


Figure 3. Chronology of 1967 Moose Harvest, Expressed in Percent by Period, Males, Unit 14.

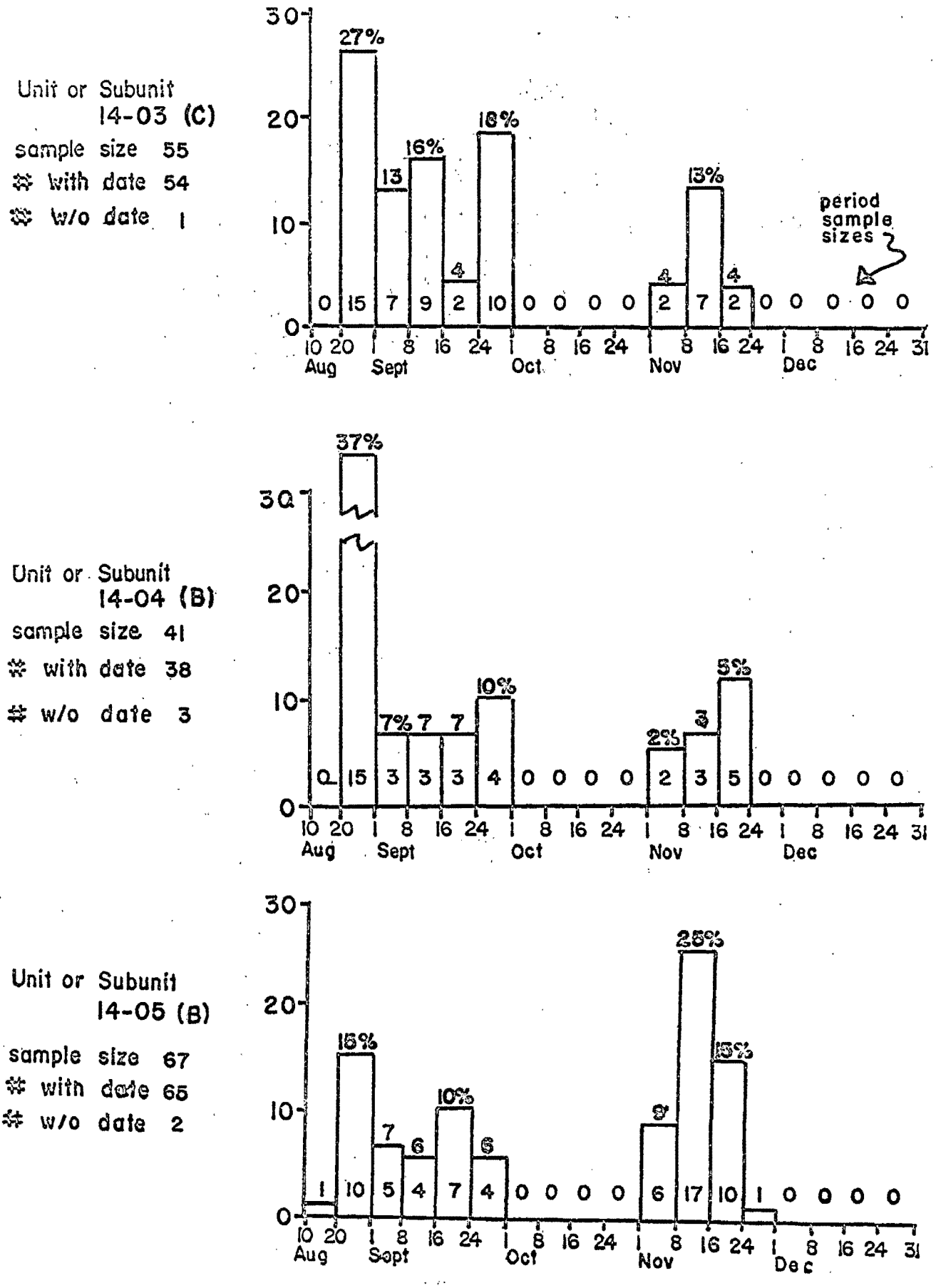
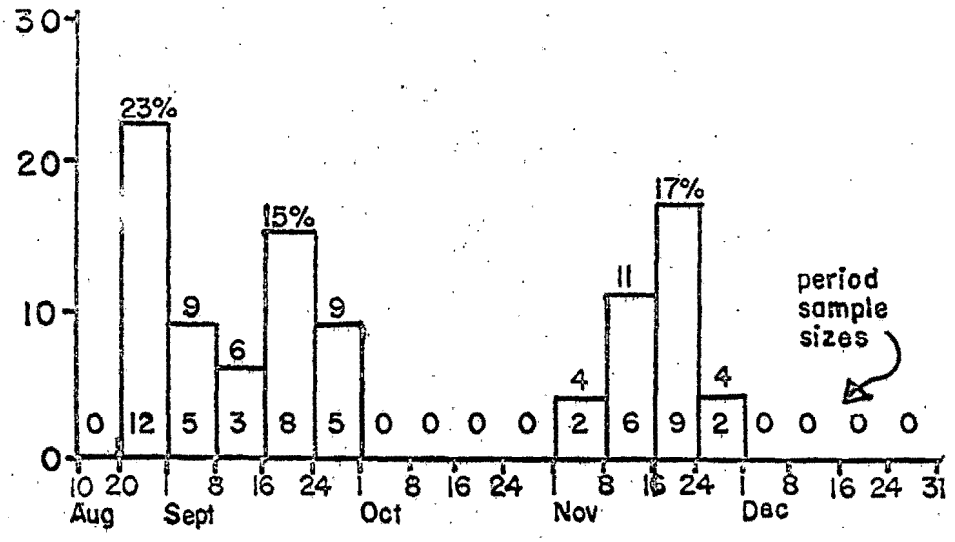


Figure 3 Chronology of 1967 Moose Harvest, Expressed in Percent by Period, Males, Unit 14.

Unit or Subunit
14-06 (B)
sample size 53
with date 52
w/o date 1



Unit or Subunit
14 Unknown
sample size 46
with date 45
w/o date 1

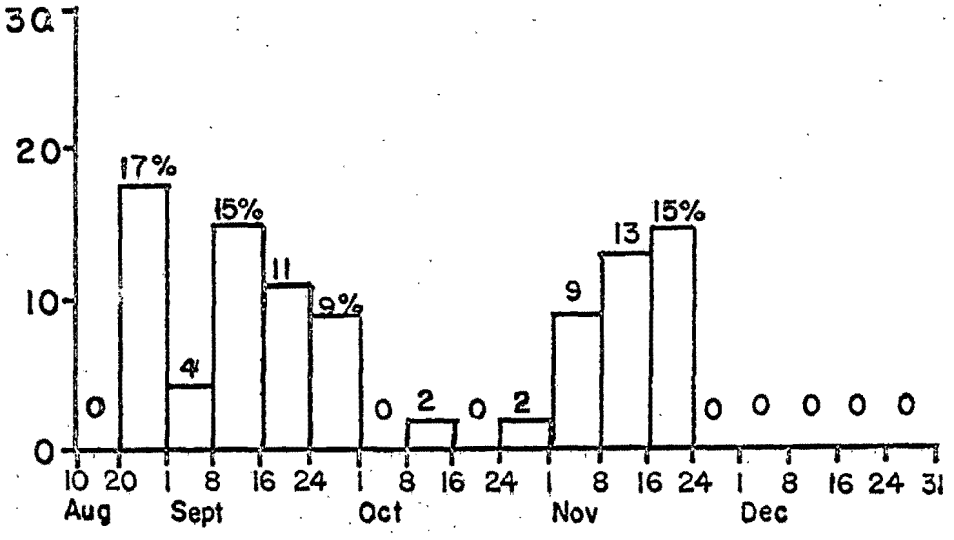


Figure 4. Chronology of 1967 Moose Harvest, Expressed in Percent by Period, Males, Unit 15.

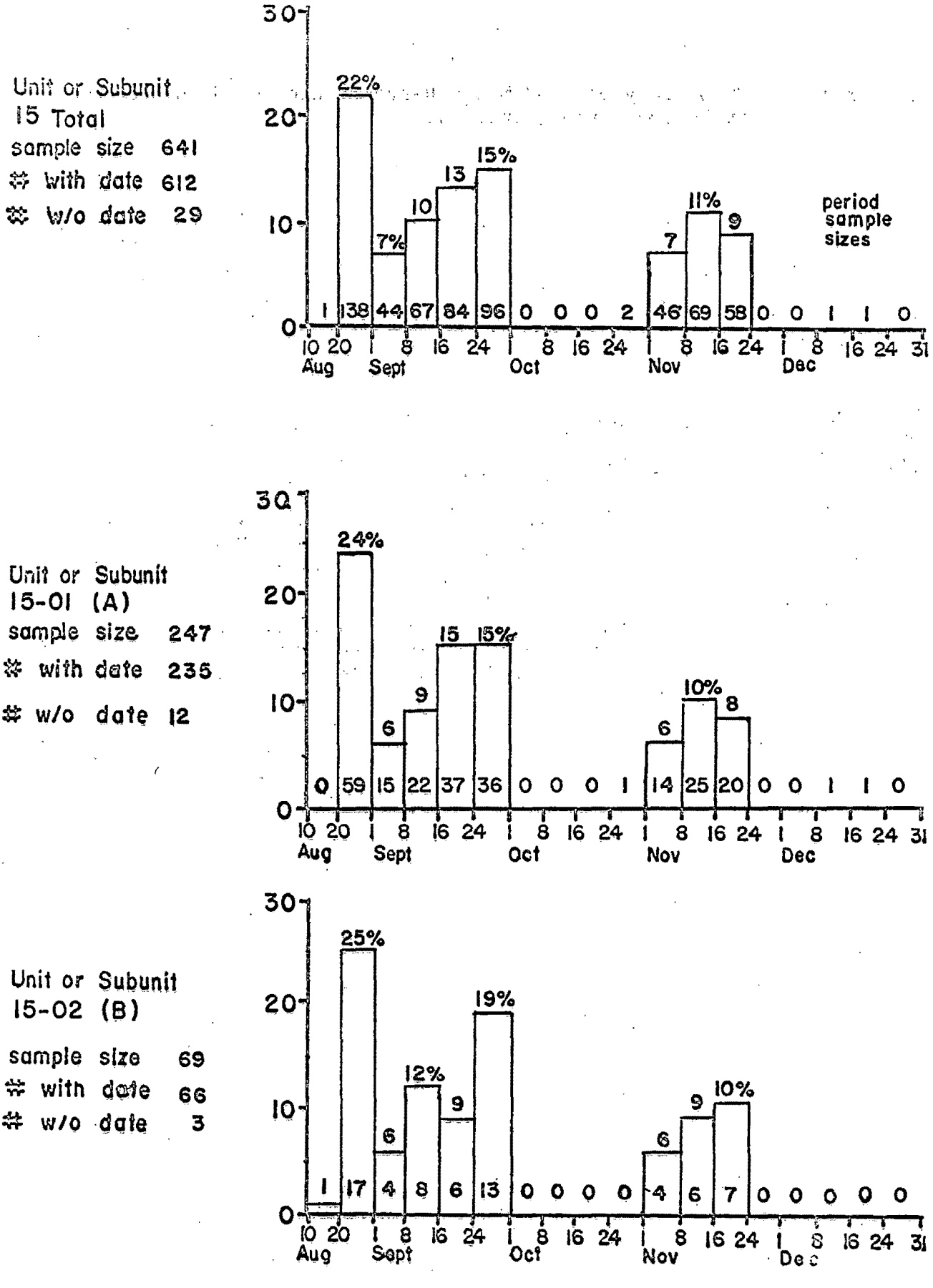


Figure 4. Chronology of 1967 Moose Harvest, Expressed in Percent by Period, Males, Unit 15.

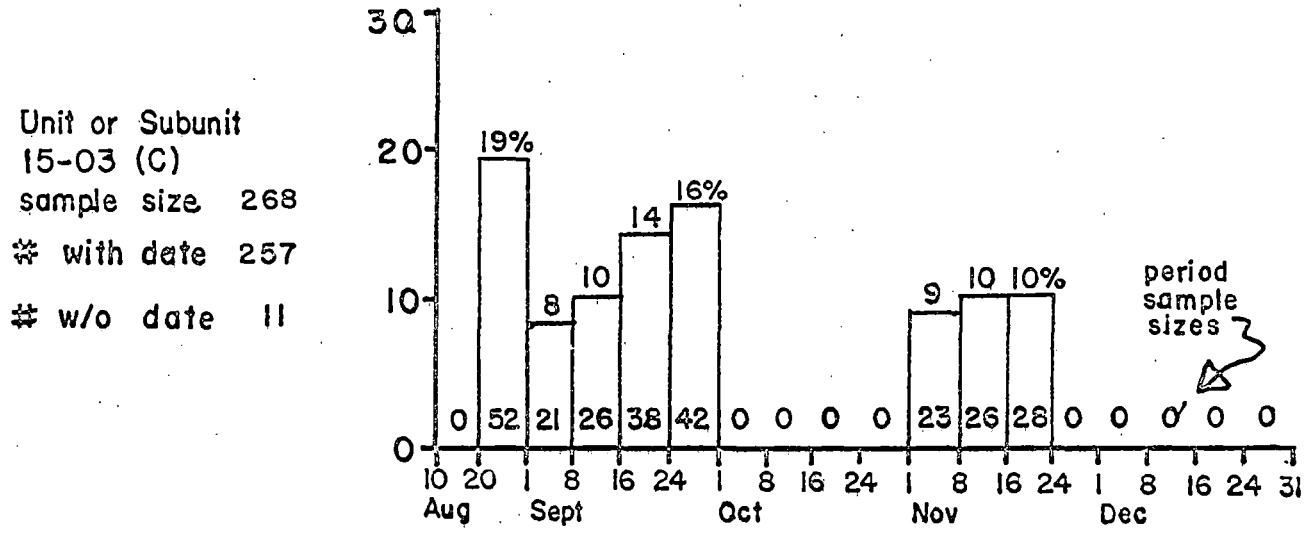


Figure 5. Chronology of 1967 Moose Harvest, Expressed in Percent by Period, Males, Unit 20.

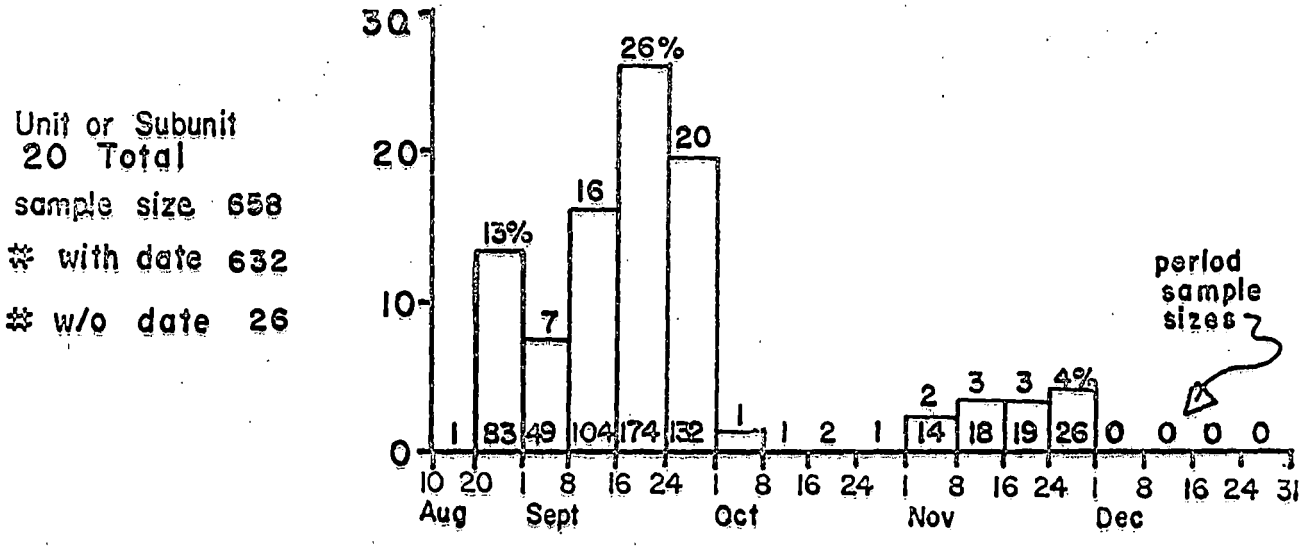
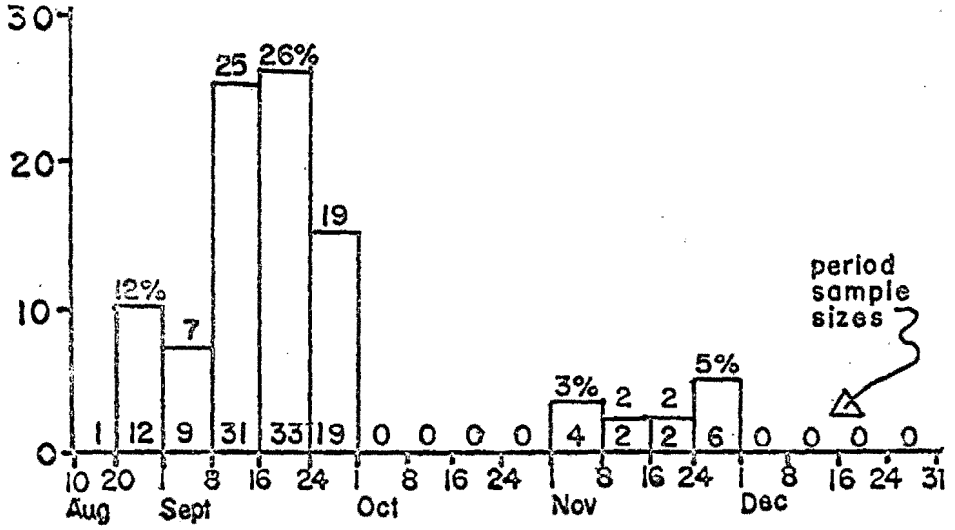


Figure 5. Chronology of 1967 Moose Harvest, Expressed in Percent by Period, Males, Unit 20.

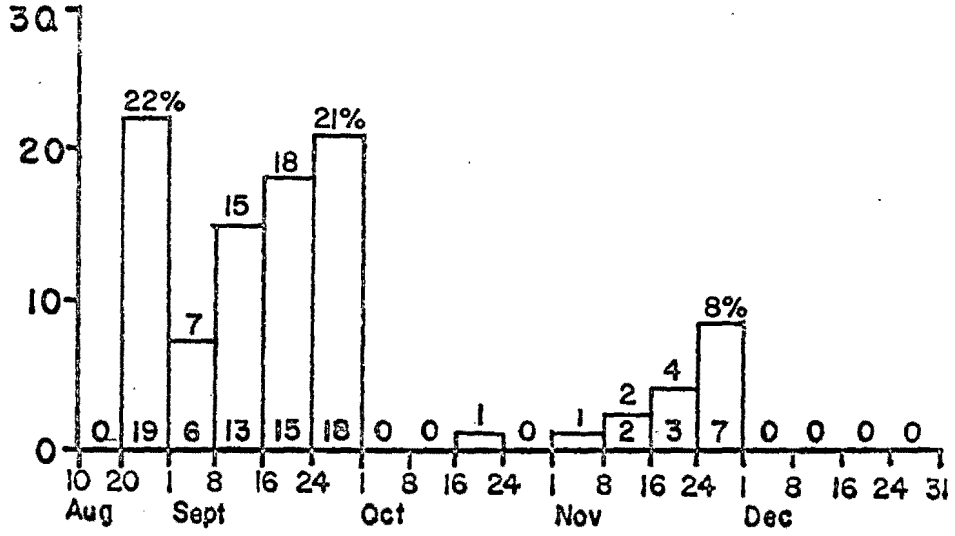
Unit or Subunit
20-01 (A)

sample size 125
* with date 119
* w/o date 6



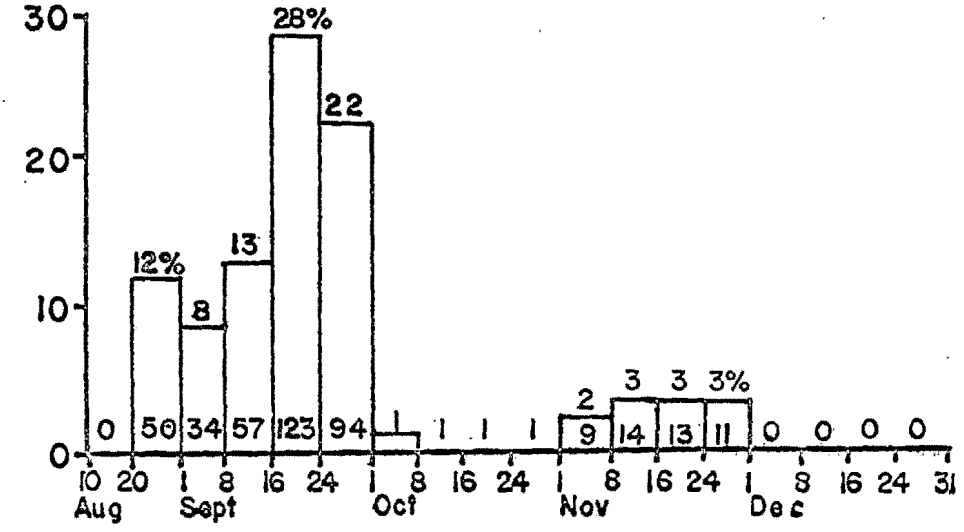
Unit or Subunit
20-02 (B)

sample size 85
* with date 85
* w/o date 0



Unit or Subunit
20-03 (C)

sample size 434
* with date 415
* w/o date 19



which frequent the more easily hunted areas. In this respect Unit 14 (especially 14A) and Sub-Unit 20B are similar. The hypothesis remains to be verified by checking the age distribution of an adequate sample of the early harvest from 20B. In most of the other units the small sample sizes and long seasons make interpretation of the chronologies difficult. Some interesting variations do occur. In Unit 5 the major hunting effort seems to be in late September and October. In Units 11 and 12, interest in November hunting increased in 1967, probably due to cancellation of antlerless seasons in southcentral Alaska. It is also interesting that the November season in Unit 13 has never been of major importance from the standpoint of the harvest.

Hunter Success

In 1966 the number of hunters hunting in each unit and their success were estimated on the basis of replies to a special reminder letter. In 1967 these data were obtained directly from the harvest tickets. The results are compared in Table 4. The two years' estimates are not consistently comparable, yet in most units the estimates from 1966 are close enough to the known value from the 1967 data to allow some confidence in the 1966 estimates. In certain units other information available supports some of the differences found between 1966 and 1967. In Unit 5, the weather during the 1966 season was consistently bad for even getting out hunting, much less being successful; the harvest was lower than it had been since the inception of the harvest ticket report. In 1967 with better weather the harvest went up along with the success rate. In Unit 13 with a similar harvest in both years, the number of hunters and their success are remarkably similar. In Unit 14 the decline in the number of hunters in 1967 may be an artifact of sampling but it could be related to the confusion surrounding the antlerless moose seasons in that unit in 1967. Without a flexible season providing for the harvest of moose after the fall downward movement, the moose harvest will continue to be uncertain in Unit 14.

In Unit 20, cleaning up after the August 14 flood kept much of the population busy until freeze-up. The decline in numbers of hunters in Unit 20 shown in the hunter success data is probably close to the true decline, and may even be conservative.

Variation in hunting success may be expected in geographical areas as large as the game management units. Table 5 shows the hunter success in sub-units of Units 13, 14, 15 and 20. Factors affecting success are means of access, distribution and movements of moose, and weather, as discussed previously. The poor success shown in unknown sub-units is the result of hunter attitude; many unsuccessful hunters do not indicate where they hunted with any precision. Unsuccessful hunters are not alone in their inaccurate

Table 4. Index of moose hunter success, 1966 & 1967.*

Unit	1966 Total Est. Hunters	1966 Est% Successful	1967 Reporting	1967 Est % Successful
1	1275	18.0	749	30
5	579	36.6	426	62
6	174	13.8	132	28
7	445	25.4	414	30
9	519	62.2	509	67
11	263	62.0	317	57
12	571	31.9	464	39
13	4163	37.3	4027	39
14	4206	18.4	2968	17
15	2980	39.4	2548	25
16	826	67.2	503	56
17	90	28.9	77	49
18	136	24.3	59	37
19	347	52.7	208	62
20	4185	23.8	3345	26
21	302	55.0	171	78
22	279	19.4	153	37
23	151	45.7	117	65
24	93	77.4	88	84
25	151	55.0	69	67
26	26	46.2	7	71
Totals	21,761	32.0	19,921	29

* 1966 estimates based on replies to harvest ticket follow-up letters and reported moose harvest. 1967 figures based on final IBM tabulation

Table 5. Moose hunter success, subunits of Units 13,14,15,20, 1967.

Subunit*	Hunters Reporting	% Successful
Unit 13		
13-?	656	27
13-00	6	0
13-01	477	26
13-02	307	36
13-03	433	48
13-04	458	3
13-05	59	2
13-06	959	53
13-07	202	37
13-08	58	79
13-09	412	68
13 TOTAL	4,027	39
Unit 14		
14-?	3	0
14-01	998	16
14-02	241	27
14-03	160	35
14-04	115	37
14-05	382	18
14-06	346	16
14-10	732	6
14-14	1	0
14 TOTAL	2,968	17
Unit 15		
15-?	4	0
15-01	1,036	24
15-02	233	30
15-03	643	42
15-05	1	0
15-07	1	0
15-10	630	9
15 TOTAL	2,548	25
Unit 20		
20-?	8	0
20-01	568	37
20-02	808	12
20-03	1,597	33
20-04	348	5
20-10	16	6
20 TOTAL	3,345	26

* Unknown sub-unit areas as designations: 13-?, 14-?, 14-10, 14-14; 15-?, 15-05, 15-07, 15-10; 20-?, 20-04, 20-10.

reporting. Some successful hunters do not wish to disclose their favored hunting area, and give misleading broad or erroneous locations on their harvest ticket reports. Considering the probable number of people who indicate they hunted but do very little actual hunting, and last-minute regulation changes which eliminated the 1967 antlerless seasons in southcentral Alaska, the overall success of 29 percent is reasonably good.

Means of Transport and Their Relationship to Success

The major means of transport reported by hunters and their success are summarized for each Unit in Table 6.

Considering the entire state, highway vehicles were the most used means of transportation. However, variations did occur which were related to the physiography of the Unit, the extent of roads available, and the financial circumstances of the hunters. Such variations were generally predictable from a general knowledge of the Unit and hunting activities within it. The high use of highway vehicles is related to socio-economic factors. The greatest number of hunters live in the population centers located on the road system and most have a highway vehicle as a normal component of their everyday life. The number of people who can or want to support specialized equipment for hunting is limited, and the automobile is adequate to get them to a hunting area. The relatively low success of this group of hunters is probably related to the loose definition of "hunting", their minimal mobility off the road, and the likelihood of this group containing a greater proportion of unskilled hunters. The other widely used conveyances are off-road vehicles, boats, and airplanes.

The use of off-road vehicles is also related to Units with road systems. The road system provides the means of transporting the equipment to a hunting area or taking the hunter to where the equipment can be rented. Thus in Units 11, 12, 13, 14, 15 and 20 the use of off-road vehicles is of major importance. In Unit 7 it apparently cannot compete with the horse. The success rate of off-road vehicle users is consistently high. The Units where boats are of major importance are those where their use corresponds to that of highway vehicles. In Units 1, 6, and 17 through 25 boats are used extensively. Their use in Unit 20 is interesting because they have persisted as a popular and effective means of hunting even though an extensive road system exists. As the road system continues to expand it will be interesting to see how the use of boats will be affected.

Airplanes are used in moose hunting throughout the state, but it is in Units or parts of Units which are inaccessible by other means yet are relatively close to population centers containing affluent hunters that they are used most extensively. Units 5, 9,

16 and 19 are good examples. The lack of other access as well as the airplane's efficiency are also important factors in the extent of their use. In Unit 5 the limited access by other means and the development of airstrips and cabins has made the airplane almost a necessity. In Unit 9 natural tundra landing areas provide great mobility for the airborne hunter. The interest in guide trophy hunting in Unit 9 must stimulate the use of aircraft also. Unit 16 is an example of an area close to a major population center but with practically no roads. As a result the airplane is the major means of getting to the moose. Both Unit 13 and 15 are Units with large central areas lacking good access except by air. Unit 14 is almost literally in Anchorage's backyard from the standpoint of the aircraft user, and in the lowland portion many lakes are available for landing sites. Unit 13 is close enough to Anchorage to be attractive to Anchorage hunters and in addition numerous aircraft equipped guides operate in this Unit. Aircraft will likely continue to be of major importance in these Units. Proposed highway development to and on the Kenai Peninsula may alter the pattern in Unit 15 in the future. The northern and western portion of Unit 11 is physiographically similar to adjacent parts of Unit 13, and the use of aircraft in the two areas is similar.

The use of aircraft in Unit 14 is much less significant than in adjacent Units, probably due to the much better road access in much of the Unit, and to the relative lack of good landing sites in the rugged country comprising the remainder of the Unit.

In Units 17 through 21 the airplane continues to be of major importance, although in Unit 20 the alternatives available limit its importance somewhat. The importance of boats in the outlying Units has been mentioned. As one might expect, the importance of airplanes in these Units declines, probably due to the generally lower incomes of the residents. It seems likely that the importance of the airplane in these outlying Units may be overemphasized in the data because the harvest tickets are little used by the majority of the residents, who are not as well informed in the details of regulations.

The data listed for "Unit 27" includes returns for which no Unit was indicated. It is interesting that success indicated in these data is much lower than that found in data for which Units were indicated.

The positive and negative values of snow machines as a means of hunter transportation have been speculated upon as their popularity has grown. The extent and efficiency of their use in moose hunting as shown by harvest ticket reports are amoung the first documented data on their merits. In Table 6 where they are represented they appear to be quite successfully used, but this may be a result of the type of complition. In Table 7 where all reported

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967.

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 1					
1	Hi.veh.	47	17	36.2	7.8
1,8	Hi.veh.,Afoot	40	6	15.0	2.7
1,2	Hi.veh.,Boat	22	9	40.9	4.1
1,2,8	Hi.veh.,Boat Afoot	26	10	38.5	4.6
2	Boat	249	96	38.6	43.8
2,8	Boat,Afoot	34	10	29.4	4.6
5	Airplane	35	20	57.1	9.1
7	Off Road Veh.	12	8	66.7	3.7
8	Afoot	54	27	50.0	12.3
	TOTAL	519	203		
Total Hunters Reporting Transportation		563	219	38.9	

*Method of Transport

1. Highway vehicle
2. Boat
3. Tote Gote
4. Horse
5. Airplane
6. Snow Machine
7. Off Road Vehicle
8. Afoot

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport* Code	Description	No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
UNIT 5					
1	Hi.veh.	29	19	65.5	7.3
2	Boat	29	26	89.7	10.0
5	Airplane	163	121	74.2	46.5
5,8	Airplane,Afoot	50	34	68.0	13.1
8	Afoot	33	25	75.8	9.6
	TOTAL	304	225		
Total Hunters Reporting Transportation		367	260	70.8	
UNIT 6					
1	Hi.veh.	21	2	9.5	5.4
1,2	Hi.veh.,Boat	3	2	66.7	5.4
2	Boat	10	8	80.0	21.6
5	Airplane	12	9	75.0	24.3
5,8	Airplane,Afoot	3	2	66.7	5.4
8	Afoot	17	8	47.1	21.6
	TOTAL	66	31		
Total Hunters Reporting Transportation		99	37	47.0	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*					
Code	Description	No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
UNIT 7					
1	Hi.veh.	49	18	36.7	14.5
1,2	Hi.veh.,Boat	4	2	50.0	1.6
1,2,8	Hi.veh.,Boat Afoot	10	1	10.0	.8
1,8	Hi.veh.,Afoot	51	10	19.6	8.1
2	Boat	14	9	64.3	7.3
2,3	Boat,Tote Gote	2	2	100.0	1.6
4	Horse	16	15	93.8	12.6
4,5	Horse,Airplane	1	1	100.0	.8
4,8	Horse,Afoot	2	1	50.0	.8
1,5,8	Horse,Airplane, Afoot	4	2	50.0	1.6
5	Airplane	30	20	66.7	16.1
5,8	Airplane,Afoot	11	8	72.7	6.5
8	Afoot	78	26	33.3	21.0
	TOTAL	272	115		
Total Hunters Reporting Transportation		305	124	40.7	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 9					
1	Hi.veh.	14	8	57.1	2.2
2	Boat	69	48	69.6	12.9
2,5	Boat,Airplane	6	5	83.3	1.3
2,5,8	Boat,Airplane Afoot	5	2	40.0	.5
2,8	Boat,Afoot	27	21	77.8	5.7
1,5	Hi.veh.,Airplane	4	2	50.0	.5
5	Airplane	229	174	76.0	46.9
5,8	Airplane,Afoot	41	36	87.8	9.7
7	Off Road Veh.	20	18	90.0	4.9
7,8	Off Road Veh., Afoot	6	5	83.3	1.3
8	Afoot	55	47	85.5	12.7
	TOTAL	476	366		
Total Hunters Reporting Transportation		500	371	74.2	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport* Code	Description	No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
UNIT 11					
1	Hi.veh.	51	26	51.0	14.5
1,8	Hi.veh.,Afoot	34	10	29.4	5.6
4	Horse	6	6	100.0	3.4
4,5	Horse,Airplane	1	1	100.0	.6
4,7	Horse,Off Road Veh.	2	1	50.0	.6
5	Airplane	36	35	97.2	19.6
5,7	Airplane,Off Road Veh.	1	1	100.0	.6
5,8	Airplane,Affot	5	5	100.0	2.8
1,5	Hi.veh., Airplane	3	2	66.7	1.1
6	Snow Mach.	13	13	100.0	7.3
7	Off Road Veh.	51	39	76.5	21.8
8	Afoot	21	13	61.9	7.3
	TOTAL	224	152		
Total Hunters Reporting Transportation		276	179	65.0	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport* Code	Description	No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
UNIT 12					
1	Hi.veh.	135	51	37.8	28.3
1,2,8	Hi.veh.,Boat Afoot	11	5	45.5	2.8
1,8	Hi.veh.,Afoot	36	6	16.7	3.3
2	Boat	12	7	58.3	3.9
4	Horse	15	13	86.7	7.2
5	Airplane	8	8	100.0	4.4
6	Snow Mach.	9	8	88.9	4.4
7	Off Road Veh.	45	33	73.3	18.3
8	Afoot	41	24	58.5	13.3
	TOTAL	312	109		
Total Hunters Reporting Transportation		379	180	47.5	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport* Code	Description	No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
UNIT 13					
1	Hi.veh.	705	263	37.3	17.1
1,5	Hi.veh., Airplane	20	18	90.0	1.2
1,8	Hi.veh.,Afoot	396	77	19.4	5.0
2	Boat	115	57	49.6	3.7
4	Horse	37	26	70.3	1.7
5	Airplane	305	245	80.3	16.0
5,7	Airplane, Off Road Veh.	29	26	89.7	1.7
5,8	Airplane,Afoot	54	47	87.0	3.1
6	Snow Mach.	60	21	35.0	1.4
7	Off Road Veh.	654	426	65.1	27.7
7,8	Off Road Veh. Afoot	68	23	33.8	1.5
8	Afoot	332	185	55.7	12.0
	TOTAL	2,775	1,414		
Total Hunters Reporting Transportation		3,233	1,536	47.5	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 14					
1	Hi.veh.	529	115	21.7	23.6
1,7,8	Hi.veh., Off Road Veh.,Afoot	49	6	12.2	1.2
1,8	Hi.veh.,Afoot	477	43	9.0	8.8
2	Boat	17	8	47.1	1.6
4	Horse	29	24	82.8	4.9
5	Airplane	72	39	54.2	8.0
6	Snow Mach.	33	10	30.3	2.1
7	Off Road Veh.	196	89	45.4	18.3
7,8	Off Road Veh. Afoot	52	7	13.5	1.4
8	Afoot	449	119	26.5	24.4
	TOTAL	1,903	460		
Total Hunters Reporting Transportation		2,136	487	22.8	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*					% Successful
Code	Description	No. Hunters	No. Successful	% Success	Hunters Using This Means
UNIT 15					
1	Hi.veh.	477	142	29.8	22.3
1,7	Hi.veh.,Off Road Veh.	20	10	50.0	1.6
1,8	Hi.veh.,Afoot	293	34	11.6	5.3
2	Boat	52	25	48.1	3.9
4	Horse	27	19	70.4	3.0
5	Airplane	165	117	70.9	18.3
5,8	Airplane,Afoot	27	11	40.7	1.7
6	Snow Mach.	32	21	65.6	3.3
7	Off Road Veh.	161	110	68.3	17.2
7,8	Off Road Veh. Afoot	38	9	23.7	1.4
8	Afoot	336	106	31.5	16.6
	TOTAL	1,628	604		
Total Hunters Reporting Transportation		1,839	638	34.7	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 16					
1	Hi.veh.	43	24	55.8	8.6
1,5	Hi.veh.,Airplane	5	4	80.0	1.4
1,8	Hi.veh.,Afoot	19	6	31.6	2.2
2	Boat	18	10	55.6	3.6
5	Airplane	188	132	70.2	47.5
5,8	Airplane, Afoot	37	27	73.0	9.7
6	Snow Mach.	12	5	41.7	1.8
7	Off Road Veh.	10	6	60.0	2.2
8	Afoot	56	47	83.9	16.9
	TOTAL	388	261		
Total Hunters Reporting Transportation		439	278	67.3	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 17					
1	Hi.veh.	4	2	50.0	5.3
2	Boat	29	12	41.4	31.6
2,8	Boat,Afoot	5	2	40.0	5.3
5	Airplane	16	15	93.8	39.5
5,8	Airplane,Afoot	1	1	100.0	2.6
6	Snow Mach.	2	2	100.0	5.3
8	Afoot	5	4	80.0	10.5
	TOTAL	62	38		
Total Hunters Reporting Transportation		66	38	57.6	
UNIT 18					
2	Boat	41	16	39.0	66.7
2,5	Boat,Airplane	2	1	50.0	4.2
2,8	Boat,Afoot	3	1	33.3	4.2
5	Airplane	7	6	85.7	25.0
	TOTAL	53	24		
Total Hunters Reporting Transportation		57	24	42.1	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 19					
1,5	Hi.veh., Airplane	2	2	100.0	1.5
2	Boat	97	58	59.8	43.6
5	Airplane	33	31	93.9	23.3
5,8	Airplane,Afoot	9	9	100.0	6.8
6	Snow Mach.	5	3	60.0	2.3
7	Off Road Veh.	6	6	100.0	4.5
8	Afoot	30	19	63.3	14.3
	TOTAL	182	128		
Total Hunters Reporting Transportation		200	133	66.5	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*					
Code	Description	No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
UNIT 20					
1	Hi.veh.	724	223	30.8	26.2
1,2	Hi.veh.,Boat	82	15	18.3	1.8
1,7	Hi.veh., Off Road Veh.	55	13	23.6	1.5
1,8	Hi.veh.,Afoot	371	36	9.7	4.2
2	Boat	178	138	49.6	16.2
2,8	Boat,Afoot	41	11	26.8	1.3
5	Airplane	131	89	67.9	10.4
5,8	Airplane,Afoot	32	24	75.0	2.8
6	Snow Mach.	41	29	70.7	3.4
7	Off Road Veh.	179	112	62.6	13.1
7,8	Off Road Veh. Afoot	38	10	26.3	1.2
8	Afoot	254	94	37.0	11.0
	TOTAL	2,126	794		
Total Hunters Reporting Transportation		2,536	852	33.6	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 21					
1	Hi.veh.	12	8	66.7	5.2
1,2	Hi.veh.,Boat	2	2	100.0	1.3
2	Boat	64	58	90.6	37.9
2,5	Boat,Airplane	10	10	100.0	6.5
5	Airplane	54	50	92.6	32.7
6	Snow Mach.	7	7	100.0	4.6
8	Afoot	15	14	93.3	9.2
	TOTAL	164	149		
Total Hunters Reporting Transportation		175	153	87.5	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 22					
1	Hi.veh.	14	8	57.1	14.3
1,2	Hi.veh.,Boat	7	2	28.6	3.6
1,8	Hi.veh.,Afoot	9	5	55.6	8.9
2	Boat	67	26	38.8	46.4
2,8	Boat, Afoot	7	5	71.4	8.9
5	Airplane	3	3	100.0	5.4
6	Snow Mach.	2	2	100.0	3.6
	TOTAL	109	51		
Total Hunters Reporting Transportation		123	56	45.5	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport* Code	Description	No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
UNIT 23					
2	Boat	58	46	79.3	60.5
2,8	Boat,Afoot	9	6	66.7	7.9
5	Airplane	14	12	85.7	15.8
5,8	Airplane,Afoot	2	2	100.0	2.6
6	Snow Mach.	4	3	75.0	3.9
8	Afoot	4	4	100.0	5.3
	TOTAL	91	73		
Total Hunters Reporting Transportation		101	76	75.2	
UNIT 24					
2	Boat	27	26	96.3	44.8
2,8	Boat,Afoot	6	4	66.7	6.9
5	Airplane	16	13	81.3	22.4
5,8	Airplane,Afoot	6	3	50.0	5.2
7	Off Road Veh.	4	3	75.0	5.2
8	Afoot	12	9	75.0	15.5
	TOTAL	71	58		
Total Hunters Reporting Transportation		71	58	81.8	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 25					
1	Hi.veh.	3	3	100.0	5.9
1,2	Hi.veh.,Boat	4	2	50.0	3.9
1,5	Hi.veh.,Airplane	2	2	100.0	3.9
2	Boat	38	27	71.1	52.9
2,8	Boat,Afoot	5	4	80.0	7.8
5	Airplane	6	6	100.0	11.8
8	Afoot	6	3	50.0	5.9
	TOTAL	64	47		
Total Hunters Reporting Transportation		70	51	72.8	
UNIT 26					
5	Airplane	5	5	100.0	100.0
	TOTAL	5	5		
Total Hunters Reporting Transportation		7	5	71.4	

Table 6. Relationship of Means of Transport and Success of Moose Hunters, 1967 (con't.).

Means of Transport*		No. Hunters	No. Successful	% Success	% Successful Hunters Using This Means
Code	Description				
UNIT 27 (Unit Unknown)					
1	Hi.veh.	340	8	2.4	11.3
2	Boat	123	17	13.8	23.9
5	Airplane	66	16	24.2	22.5
7	Off Road Veh.	64	6	9.4	8.5
8	Afoot	196	14	7.1	19.7
	TOTAL	789	61		
Total Hunters Reporting Transportation		1,439	71	4.9	

Table 7. Hunting Success with the aid of Snow Machine, 1967.

Unit	Number Hunters Reporting	Number Hunters Using Snow Machine	% Using Snow Machine	% Success of Snow Machine Users	Number Moose Taken W/aid of Snow Machine
Composite of All Units	14,983	746	4.9	24.3	182
1	563	0	0	0	0
3	4	0	0	0	0
5	367	3	.8	33.3	1
6	99	1	1.01	0	0
7	305	4	1.31	0	0
9	500	9	1.8	44.4	4
11	276	31	11.2	58.0	18
12	379	25	6.5	40.0	10
13	3,230	164	5.07	25.0	41
14	2,136	134	6.27	12.6	17
15	1,839	59	3.2	35.5	21
16	439	35	7.9	28.5	10
17	66	3	4.5	66.6	2
18	57	2	3.5	0	0
19	200	10	5.0	30.0	3
20	2,536	114	4.5	32.4	37
21	175	7	4.0	100.0	7
22	123	6	4.8	50.0	3
23	101	10	9.9	40.0	4

Table 7. Hunting Success with the aid of Snow Machine, 1967 (cont.).

Unit	Number Hunters Reporting	Number Hunters Using Snow Machine	% Using Snow Machine	% Success of Snow Machine Users	Number Moose Taken W/aid of Snow Machine
Composite of All Units	14,983	746	4.9	24.3	182
24	71	0	0	0	0
25	70	3	4.2	66.6	2
26	7	0	0	0	0
Unit Unknown	1,439	126	8.7	1.5	2

combinations involving snow machines for each Unit are compiled it is clear that in the State as a whole snow machines were used by only about 5 percent of the hunters reporting, and their overall success was similar to the average found among all hunters reporting in the State. Two factors probably depress the figures; (1) The inclusion of Southeast Alaska data where snow machines are probably of little value, and (2), the poor reporting from northern and western bush areas where snow machines are known to be more widely used. The exclusion of the data from Units 1 through 6 raises the percentage of hunters using snow machines to 5.3 percent, and depresses the success rate slightly, to 23.3 percent.

A similar summary of aircraft use in hunting indicates the overall importance of the airplane. The number of moose reported taken using aircraft is 26.7 percent of the reported total harvest.

Relationships of Residence and Unit Hunted

In order to formulate practical management plans for moose, particularly in intensively hunted areas, the amount of hunting pressure, how it relates to access available, and its source should be understood. With sufficient background data some prediction of hunting pressure, patterns of access use, and harvest may be possible. The data in Table 9 relates the number of hunters in each Unit to the major population centers of the State. From the data it is apparent that in Southcentral Alaska the number of hunters in a given Unit will be strongly affected by the distribution of Anchorage hunters alone. The regulations in a given year as they affect the opportunities of Anchorage hunters to hunt with some hope of success will probably be a prominent factor in the distribution of those hunters. However, it is clear that a large proportion of them will continue to hunt in Unit 14, presumably due to the convenient access.

Few hunters from other parts of the State go to Southeast Alaska to hunt according to the data at hand. However, a substantial number of Juneau and Ketchikan hunters hunt elsewhere, mainly in Units 13 and 20. From the standpoint of Unit totals, their percentage is small, but they may contribute considerably to hunting activity in a smaller area such as the Taylor Highway; which is popular with Southeastern hunters.

With the exception of Fairbanks, communities in the Interior-Arctic tend to be small and their hunting is largely restricted to the Unit in which they are located. Fairbanks hunters hunt largely in Unit 20, but some travel to Unit 13, while others through the uses of aircraft and boats reach the more remote Units north and west of Unit 20.

Table 8. Hunting Success with the aid of Aircraft, 1967.

Unit	Number Hunters Reporting	Number Hunters Using Airplanes	% Using Air-planes	% Success of Airplane Users	Number Moose Taken W/aid of Aircraft
Composite All Units	14,983	2,423	16.1	65.3	1,584
1	563	69	12.2	15.9	11
3	4	0	0	0	0
5	367	246	67.0	72.3	178
6	99	18	18.1	72.2	13
7	305	54	17.7	57.4	31
8	1	0	0	0	0
9	500	293	58.6	74.7	219
10	0	0	0	0	0
11	276	55	19.9	85.4	47
12	379	15	3.9	80.0	12
13	3,230	483	14.9	77.6	375
14	2,136	119	5.6	40.3	48
15	1,839	231	12.5	61.4	142
16	439	243	55.3	68.7	167
17	66	18	27.2	88.8	16
18	57	9	15.7	77.7	7
19	200	51	25.5	86.2	44
20	2,536	227	8.9	62.5	142
21	175	68	38.8	91.1	62
22	123	6	4.8	66.6	4

Table 8. Hunting Success with the aid of Aircraft, 1967 (cont.).

Unit	Number Hunters Reporting	Number Hunters Using Airplanes	% Using Air planes	% Success of Airplane Users	Number Moose Taken W/aid of Aircraft
Composite All Units	14,983	2,423	16.1	65.3	1,584
23	101	16	15.8	93.75	15
24	71	22	30.9	72.7	16
25	70	8	11.4	100	8
26	7	5	71.4	100	5
27 Unknown	1,439	167	11.6	13.1	22

Table 9. Relationships of residence of moose hunters and game Management Unit hunted, 1967. The number of hunters from a given community hunting in a particular unit and their number as a proportion of the total hunters reporting that unit are listed under unit headings thus: #/%.

		UNIT											
Residence	Code	1	5	6	7	9	10	11	12	13	14	15	16
Anchorage	11	2/0	17/4	8/6	207/50	89/16	1/1	154/48	190/41	1725/43	1682/56	792/31	324/64
Anchor Pt.	12	0/0	0/0	0/0	1/0	0	0	0	0	3/0	1/0	75/3	0
Auke Bay	18	17/2	11/3	0	0	0	0	0	0	4/0	0	1/0	0
Bethel	22	0	0	0	0	0	0	0	0	0	0	0	0
College	48	0	0	0	0	0	0	0	2/0	31/1	0	1/0	1/0
Delta Jct.	55	0	0	0	0	0	0	0	9/2	16/0	0	1/0	0
Eagle Riv.	60	0	0	1/1	2/0	2/0	0	6/2	5/1	124/3	132/4	9/0	15/3
Fairbanks	69	0	0	0	0	2/0	0	8/2	15/3	215/5	1/0	4/0	3/1
Glennallen	79	0	0	0	0	0	0	9/3	9/2	108/3	2/0	2/0	0
Haines	84	225/30	3/1	0	0	0	0	0	0	6/0	0	0	0
Homer	90	0	0	0	1/0	2/0	0	0	0	2/0	1/0	259/10	0
Juneau	100	198/26	127/30	0	0	0	0	1/0	8/2	37/1	4/0	9/0	1/0
Kenai	109	0	2/0	0	6/1	12/2	0	0	0	14/0	228/8	418/16	14/3
Ketchikan	110	33/4	19/4	0	1/0	1/0	0	0	4/1	13/0	0	0	0
Nenana	147	0	0	0	0	0	0	0	0	2/0	0	0	0

Table 9. Cont'd

Residence	Code	UNIT 1	5	6	7	9	10	11	12	13	14	15	16
No. Pole	156	0	0	0	0	0	0	0	0	9/0	1/0	0	0
Palmer	163	0	1/0	0	2/0	2/0	0	5/2	4/1	181/4	330/11	4/0	10/2
Seward	193	1/0	0	0	74/18	4/1	0	1/0	0	9/0	3/0	98/4	2/0
Soldotna	203	0	0	0	4/1	8/1	0	1/0	0	2/0	3/0	359/15	3/1
Tok	221	0	0	0	0	0	0	2/1	46/10	24/1	0	0	0
Valdez	231	0	0	5/4	0	0	0	5/2	3/1	73/2	1/0	0	0
Wasilla	236	1/0	2/0	0	0	1/0	0	0	0	28/1	164/5	4/0	4/1
Wrangell	241	114/19	6/1	0	0	0	0	1/0	0	2/0	0	0	0
Eielson	243	0	0	2/2	0	0	0	0	6/1	61/2	2/0	0	0
Elmendorf	244	0	0	0	18/4	8/1	0	18/6	13/3	156/4	203/7	66/3	17/3
Ft. Rich.	246	0	0	0	4/1	2/0	0	5/2	8/2	70/2	113/4	15/1	6/1
Ft. Wain.	247	0	0	0	0	0	0	0	2/1	2/0	19/0	0	0
Tot. # Hunters in Units.		750	428	132	416	548	1	321	466	4052	2986	2562	505

Table 9. Cont'd.

Residence	UNIT											Total hunters from residence indicating unit.
	17	18	19	20	21	22	23	24	25	26	27	
Anchorage	5/6	0/0	20/9	106/3	8/4	2/1	0/0	2/2	2/3	0	961/37	6297
Anchor Pt.	0	0	0	0	0	0	0	0	0	0	13/1	93
Auke Bay	0	0	0	6/0	0	0	0	0	0	0	3/0	42
Bethel	3/4	21/34	23/11	3/0	36/19	0	0	0	0	0	11/0	97
College	0	0	0	180/5	5/3	3/2	1/1	0	2/3	0	23/1	249
Delta Jct.	0	0	0	194/6	2/1	0	0	0	0	0	29/1	251
Eagle Riv.	0	0	4/2	3/0	0	0	0	0	0	0	42/2	345
Fairbanks	0	0	0	1213/36	15/8	1/1	0	11/11	11/14	0	183/7	1682
Glennallen	0	0	0	2/0	0	0	0	0	0	0	16/1	148
Haines	0	0	0	8/0	0	0	0	0	0	0	45/2	287
Homer	2/3	0	0	3/0	0	0	0	0	0	0	36/1	306
Juneau	0	0	2/1	69/2	2/1	0	0	0	2/3	0	6/0	466
Kenai	3/4	0	0	1/0	0	1/1	0	0	0	0	88/3	787
Ketchikan	0	0	0	13/.4	0	0	0	0	0	0	3/0	87
Nenana	0	0	0	63/2	1/1	0	0	0	0	0	19/1	85
No. Pole	0	0	0	34/1	1/1	0	0	0	0	0	14/1	59
Palmer	1/1	0	0	2/0	0	0	0	1/1	0	0	88/3	631
Seward	0	0	0	1/0	0	0	0	0	0	0	44/2	237

Table 9. Cont'd.

Residence	UNIT 17	18	19	20	21	22	23	24	25	26	27	Total hunters from residence indicating unit.
Soldotna	0	0	0	3/0	0	0	0	0	0	0	59/2	442
Tok	0	0	0	50/2	1/1	0	0	0	0	0	26/1	149
Valdez	0	0	0	1/0	0	0	0	0	0	0	15/1	103
Wasilla	0	0	0	0	0	0	0	0	0	0	24/1	228
Wrangell	0	0	0	5/0	0	0	0	0	0	0	17/1	145
Eielson	0	0	1/0	387/12	0	0	0	0	2/3	0	82/3	543
Elmendorf	0	0	0	8/0	7/4	0	0	0	0	0	125/5	639
Ft. Rich.	0	0	0	4/0	0	0	0	0	0	0	57/1	284
Ft. Wain.	0	0	0	297/9	0	0	0	0	0	0	35/1	355
											Total hunters from selected residences	15,037
Total hunters in units	77	61	217	3356	192	153	117	97	78		2568	
											(Total hunters, State	20,082)

These residence - Unit hunted data provide a valuable basis for understanding the movements of hunters within the State, but at this point it is necessary to remember that one year's data can not be considered conclusive.

Residence: Transportation Relationships

The most used means of transport used by hunters from selected major communities are shown in Table 10. Some differences in the distribution of means of transport used are apparent, although highway vehicles alone or in combination with afoot constitute 20 percent or more of the means used in all cases. Airplanes are clearly used more by Anchorage hunters than by Fairbanks hunters. The same is true of off-road vehicles. The reverse situation is true of boat use. An interesting difference in the reporting by Anchorage and Fairbanks hunters is where highway vehicles are used alone or in combination with "afoot", the Anchorage hunters reported mainly "highway vehicles plus afoot" while Fairbanks hunters reported mainly "highway vehicle alone".

The category "afoot" introduces problems of interpretation. Technically all hunters must be afoot to legally take a moose, and most probably are. Some undoubtedly report "afoot" which strictly speaking is correct, even though they used some vehicle to reach their hunting area. The intent of the question assumes the hunter is afoot when hunting or shooting, and is intended to find out how he got to the hunting area. The majority of hunters probably understand the intent of the question and answer accordingly. There is no way to determine what proportion of hunters used only foot transportation. The whole problem could be eliminated by replacing "afoot" with "other".

An interesting contrast also exists between Homer, where off-road vehicles are the major means used, and Kenai and Soldotna, where highway vehicles are by far the most popular transportation. Highway vehicles are the major means of transportation of Seward hunters also.

The strong showing of highway vehicle use by Ketchikan hunters is partly attributable to their interest in hunting the northern part of Unit 1 and the Taylor Highway country in Unit 20C.

The large proportion of hunters who did not indicate what transportation they used presents a problem in interpretation of the data. Distributing these returns proportionately among the reported means may be done if the number not reporting remains high in the future.

Table 10. Major Means of Transportation Used by Moose Hunters from Selected Urban Areas, 1967. Means with less than 10 users are not listed separately.

Means of Trans.*	# of Hunters using Means	% of Total Hunters using Means
ANCHORAGE		
None reported	534	11.9
1	124	2.8
1,2	76	1.7
1,2,5,8	10	.2
1,2,6	10	.2
1,2,6,8	12	.3
1,2,7,8	12	.3
1,2,8	103	2.3
1,5	28	.6
1,5,8	45	1.0
1,6	59	1.3
1,6,7,8	21	.5
1,6,8	46	1.0
1,7	73	1.6
1,7,8	72	1.6
1,8	805	18.0

* 1. Highway Vehicle
2. Boat
3. Tote, Gote
4. Horse
5. Airplane
6. Snow Machine
7. Off Road Vehicle
8. Afoot

Table 10. Major Means of Transportation Used by Moose Hunters from Selected Urban Areas, 1967 (con't.). Means with less than 10 users are not listed separately.

Means of Trans.*	# of Hunters using Means	% of Total Hunters using Means
ANCHORAGE (cont.)		
2	175	3.9
2,5	18	.4
2,8	50	1.1
4	31	.7
5	511	11.4
5,7	10	.2
5,8	69	1.3
6	102	2.3
6,8	17	.4
7	586	13.1
7,8	90	2.0
8	613	13.7
Other	176	3.9
Total Hunters:	4478	
FAIRBANKS		
None reported	343	20.4
1	374	22.3
1,2	45	2.7
1,2,8	31	1.8

Table 10. Major Means of Transportation Used by Moose Hunters from Selected Urban Areas, 1967 (con't.). Means with less than 10 users are not listed separately.

Means of Trans.*	# of Hunters using Means	% of Total Hunters using Means
FAIRBANKS (cont.)		
1,6,8	12	.7
1,7	30	1.8
1,7,8	29	1.7
1,8	159	9.5
2	174	10.4
2,8	12	.7
5	88	5.2
5,8	17	1.0
6	29	1.7
7	108	6.4
7,8	10	.6
8	106	6.3
Other	112	6.7
Total Hunters:	1679	
HOMER		
None reported	76	24.8
1	41	13.4
1,8	23	7.5

Table 10. Major Means of Transportation Used by Moose Hunters from Selected Urban Areas, 1967 (con't.). Means with less than 10 users are not listed separately.

Means of Trans.*	# of Hunters using Means	% of Total Hunters using Means
HOMER (cont.)		
7	66	21.6
7,8	19	6.2
8	37	12.1
Other	44	14.4
Total Hunters:	306	
KENAI		
None reported	195	34.6
1	125	22.2
1,8	62	11.0
2	14	2.5
5	33	5.9
7	15	2.7
8	65	11.5
Other	55	9.8
Total Hunters:	564	
KETCHIKAN		
None reported	14	15.6
1	18	20.0
2	12	13.3

Table 10. Major Means of Transportation Used by Moose Hunters from Selected Urban Areas, 1967 (con't.). Means with less than 10 users are not listed separately.

Means of Trans.*	# of Hunters using Means	% of Total Hunters using Means
KETCHIKAN (cont.)		
5	17	18.9
Other	29	32.1
Total Hunters:	90	
SEWARD		
None reported	95	36.6
1	44	16.9
1,8	53	20.4
5	13	5.0
8	32	12.6
Other	23	8.8
Total Hunters:	260	
SOLDOTNA		
None reported	159	35.6
1	89	19.9
1,8	53	11.9
5	21	4.7
8	43	9.6
Other	82	18.4
Total Hunters:	447	

Hunter Success, Voluntary and Reminder Letter Returns

Table 11 gives a comparison of the success rates of hunters who returned their moose harvest tickets voluntarily and those who responded only after a reminder letter advising them to return the card or the information. The data shows that the group which voluntarily returned their tickets had a much higher success rate in most Units. These data document a fact previously known in a general way. The data also point our the need for more effective communication with the public regarding the harvest ticket program. The total responding to reminder letters was greater than the total voluntary returns. In some of the outlying Units practically no returns were obtained without reminder letters, while in supposedly conservation-conscious Units like 7, 13, 14 and 15, voluntary returns were not far ahead of reminder returns. In Unit 20 reminder returns were the largest. It seems clear that the Department needs to "sell" this valuable data gathering technique to obtain better quality results more promptly.

Check Stations: Check stations were operated on the Denali Highway and the Taylor Highway to obtain data on the number of people hunting in each area, their results, and to collect biological specimens and data.

The Denali station was open for an extended period (Table 12) in order to contact as many moose and caribou hunters as possible. The Taylor check station was operated only during the height of the moose hunting activity (Table 13). Traffic before and after this period is sporadic unless caribou are available.

The data from these stations provide knowledge of hunting activities in local areas, including details of hunting pressure which are not obtained through harvest ticket reports. Data on residence of a sample of hunters at the Taylor station suggest the relative importance of the area to residents of the three major areas of the State.

Both stations have been operated for several years and a more detailed examination of the data acquired is planned.

Range Inventories

Range inventory work was carried out by Jack Didrickson and his assistants in the Matanuska Valley as described under "Techniques". The data obtained are given in Tables 14 through 17, and Figs. 6 and 7.

Table 11. Comparison of moose hunter success data of voluntarily returned harvest reports and reminder letter reports, 1967.

	Voluntary Reports			Reminder Reports		
Unit	Total Reporting	No. Successful	% Successful	Total Reporting	No. Successful	% Successful
1	551	204	37	198	20	10
5	326	239	73	100	24	24
6	73	33	45	59	4	7
7	251	106	42	163	19	12
9	344	298	87	202	80	40
11	245	157	64	72	23	32
12	307	158	51	157	24	15
13	2,531	1,338	53	1,496	214	14
14	1,653	396	24	1,315	99	8
15	1,459	529	36	1,090	118	11
16	347	236	68	156	46	29
17	31	24	77	46	14	30
18	7	4	57	54	20	37
19	90	81	90	127	57	45

Table 11. Comparison of moose hunter success data of voluntarily returned harvest reports and reminder letter reports, 1967.

	Voluntary Reports			Reminder Reports		
Unit	Total Reporting	No. Successful	% Successful	Total Reporting	No. Successful	% Successful
20	1,643	676	41	1,705	180	11
21	103	90	87	89	65	73
22	55	45	82	99	13	13
23	59	53	90	58	23	40
24	76	72	95	20	10	50
25	45	34	76	33	20	61
26	5	5	100	2	0	0
27 (Unk)	1,353	59	4	1,279	13	1
TOTAL	11,554	4,837	42	13,357	1,086	8

Table 12. Denali Check Station Summary, 1966 and 1967.

	1967	1966
Period of Operation.....	14 Aug. - 9 Oct.	15 Aug. - 10 Oct.
Individual Hunters.....	2977	2799
Hunting Parties.....	1306	1202
Average Party Size.....	2.38	2.33
Range in Party Size.....	1 - 9	1 - 11
Number of Successful Hunters.....	864	907
Percent Hunter Success.....	29.02	32.40
Caribou Harvest.....	740 (65% males)	857 (71% males)
Moose Harvest.....	312 (78% males)	290
Sheep Harvest.....	10	9
Grizzly Harvest.....	2	9
Black Bear Harvest.....	2	2

Table 13. Taylor Highway Moose Harvest Data, 1967.

Dates of operation: September 15 - October 1, 1967

Hours of operation: 3:00-4:00 AM. to 11:00-12:00 PM.

Total hunters: 485

No. parties: 208

Mean party size: 2.3

Range of party size: min: 1 - max: 7

Total days expended: 663

No. days hunted/hunter: 1.5 days

No. moose checked: 68 No. moose taken, harvest ticket data, 3/15/68 = 110.

% success of moose hunters: 14

Successful resident: 51; non-resident: 17

Other species harvested:

Caribou - 5
Wolf - 1
Black Bear - 1
Brown Bear - 1
Grizzly - 1
Grouse - 20 - 40

Residence of Taylor Highway hunters

Interior					
Fairbanks	Tok	Delta Junction	Other Int.		
17	4	3	3	=	27
Southcentral					
Anchorage	Other S.C.				
3	2			=	5
Southeastern					
Ketchikan	Juneau	Other S.E.			
3	10	4		=	17
				Total	49

Table 14. Canopy coverage by taxon, Willow Moose exclosure, 1967. Total by sampling line and average for exclosure and control plot.

	Outside					Inside				
	1	2	3	4	Total 100	1	2	3	4	Total 100
Picea gl a.										
b.	127.5	135.0	10.0	152.5	4.2	5.0	37.5	2.5		0.4
Stem #	4	3	1	2	10	1	1	0	0	2
Betula r. a.					0.0					0.0
b.	110.0	230.0	97.5	182.5	6.20	132.5	207.5	257.5	355.0	9.5
Stem #	13	14	13	16	56	10	7	12	13	42
Populus a.					0.0					0.0
b.	32.5		92.5	30.0	1.6	282.5	52.5	300.0	242.5	8.8
Stem #	1	0	3	0	4	2	1	2	2	7
Salix	752.5	660.0	750.0	480.0	26.4	642.5	335.0	130.0	517.5	16.2
Stem #	28	15	19	11	73	3	6	3	6	18
Vaccinium	55.0	102.5	197.5	90.0	4.4	220.0	392.5	232.5	215.0	10.6
Cornus	272.5	155.0	175.0	177.5	7.8	247.5	645.0	252.5	610.0	17.6
Epilobium	217.5	112.5	140.0	160.0	6.3	280.0	142.5	192.5	255.0	8.7
Dead	475.0	172.5	285.0	405.0	13.4	97.5	260.0	92.5	427.5	8.8
Calamagrostis	242.5	665.0	1045.0	422.5	23.8	537.5	745.0	702.5	1455.0	34.4
Ledum	37.5	62.5		87.5	1.9	15.0	285.0	70.0	162.5	5.3
Polytrichum	2040.0	1950.0	1892.5	1942.5	78.2	2065.0	2140.0	2127.5	2192.5	85.2
Fruiticose	15.0	22.5	10.0	27.5	0.8	5.0	15.0		92.5	1.1
Equisetum	80.0	15.0	10.0	70.0	1.8					0.0
Hylocomium	15.0	177.5	25.0	67.5	2.8	50.0	30.0	160.0	167.5	4.1
Mushroom	12.5	12.5	5.0		0.3	2.5	2.5	7.5	7.5	0.2
Vaccinium u	92.5	432.5	382.5	377.5	12.8	1172.5	882.5	1095.0	92.5	32.4
Solidago	2.5				0.02					0.0
Agrostis	2.5	165.0	115.0	150.0	4.3	2.5			2.5	0.05
Lupine		262.5			2.6					0.0
Rosa sp				2.5	0.02		2.5	80.0	72.5	1.6
Luzula					0.0			2.5		0.02
Peltigera	100.0	100.0	127.5	37.5	3.6	2.5	52.5	37.5	55.0	1.5

Table 15. Canopy coverage by taxon, Knik Moose exclosure, 1967. Total by sampling line, and average for exclosure and control plot.

	Outside					Inside				
	1	2	3	4	Total 100	1	2	3	4	Total 100
Picea gl. a					0.0					0.0
b			2.5		0.02					0.0
Stem #			1		1					0
Betula r. a		32.5			0.3					0.0
b			42.5		0.4					0.0
Stem #					0					0
Populus t. a					0.0					0.0
b					0.0					0.0
Stem #					0					0
Salix	272.5	575.5	487.5	960.0	23.0	37.5	62.5	55.0	15.0	1.7
Stem #	2	14	3	32	51	1		1		2
Vaccinium					0.0					0.0
Cornus					0.0					0.0
Epilobium		15.0			0.2					0.0
Dead	130.0	805.0	662.5	592.5	21.9	1150.0	855.0	1067.5	752.5	38.2
Eleagnus	600.0	465.0	460.0	370.0	19.0	692.5	355.0	630.0	722.5	24.0
Stem #		1	8	4	13	3	10	15	15	43
Equisetum		17.5	80.0	47.5	1.4	540.0	177.5	32.5	52.5	8.0
Artemsia				2.5	0.02	185.0	162.5	130.0	92.5	5.7
Hedysarum		40.0		85.0	1.2	45.0	162.5	15.0	167.5	3.9
Achillea	275.0	270.0	512.5	367.5	14.2	902.5	830.0	705.0	530.0	29.7
Aster sp	45.0	445.0	477.5	25.0	9.9	122.5	217.5	825.0	402.5	15.7
Elymus m	410.0	707.5	747.5	852.5	27.2	1037.5	867.5	597.5	1220.0	37.2
Festuca r	1365.0	1602.5	965.0	435.0	43.7	1377.5	2267.5	2195.0	2147.5	79.9
Rhinanthus m					0.0			15.0		0.2
Agropyron	457.5	265.0	617.5	552.5	18.9	1072.5	1165.0	1317.5	1267.5	48.2
Smilacina		55.0		162.5	2.2					0.0
Iris setosa	72.5	2.5		2.5	0.8		30.0			0.3
Bromus p			2.5	20.0	0.2	5.0			32.5	0.4
Mertensia	2.5	15.0	52.5	142.5	2.1	20.0	130.0	2.5	15.0	1.7
Lathyrus m	7.5			482.5	4.9	162.5		15.0	132.5	3.1
Calamagrostis	1112.5	1427.5	932.5	1007.5	44.8	575.0	310.0	1085.0	1025.0	30.0
Poa sp		5.0		2.5	0.1					0.0
Poa eminens					0.0					0.0
Parnassia			2.5	7.5	0.1	17.5	17.5	22.5	20.0	0.8
Aster sibiricus			120.0	35.0	1.6	52.5	2.5			0.6
Lathyrus p	2.5	55.0	72.5	25.0	1.6	102.5	65.0	52.5	80.0	3.0
Habenaria					0.0		2.5	17.5		0.2
Potentilla					0.0					0.0
Angelica					0.0					0.0
Conioselinum				7.5	0.1	2.5	5.0			0.1
Sedge			15.0		0.2					0.0
Moss	1212.5	937.5	1037.5	475.0	36.6	1200.0	1650.0	937.5	887.5	46.8
Rosa sp			2.5		0.02	2.5				0.02
Cerastium			2.5		0.02	137.5			15.0	1.5
Agrostis					0.0				30.0	0.3
Taraxacum					0.0	17.5	2.5		2.5	0.2

Table 16. Estimated percentages of Plant Coverages, Matanuska Valley Moose Exclosures, 1967.

Species	WILLOW AREA Outside	WILLOW AREA Inside	MATANUSKA-KNIK Outside	MATANUSKA-KNIK Inside
Picea gl a.			0.0	0.0
b.	4.2	0.4	0.02	0.0
Stem #	10	2	1	0
Betula r. a.	0.0	0.0	0.3	0.0
b.	6.20	9.5	0.4	0.0
Stem #	56	42	0	0
Populus a.	0.0	0.0	0.0	0.0
b.	1.6	8.8	0.0	0.0
Stem #	4	7	0	0
Salix	26.4	16.2	23.0	1.7
Stem #	73	18	51	2
Vaccinium	4.4	10.6	0.0	0.0
Cornus	7.8	17.6	0.0	0.0
Epilobium	6.3	8.7	0.2	0.0
Dead	13.4	8.8	21.9	38.2
Calamagrostis	23.8	34.4	44.8	30.0
Ledum	1.9	5.3		
Polytrichum	78.2	85.2		
Fruiticose	0.8	1.1		
Equisetum	1.8	0.0	1.4	8.0
Hylocomium	2.8	4.1		
Mushroom	0.3	0.2		
Vaccinium u	12.8	32.4		
Solidago	0.02	0.0		
Agrostis	4.3	0.05	0.0	0.3
Lupine	2.6	0.0		
Rosa sp	0.02	1.6	0.02	0.02
Luzula	0.0	0.02		
Peltigera	3.6	1.5		
Artemisia			0.02	5.7
Hedysarum			1.2	3.9
Achillea			14.2	29.7
Aster sp			9.9	15.7
Elymus m			27.2	37.2
Festuca r			43.7	79.9
Rhinanthus			0.0	0.2
Agropyron			18.9	48.2
Smilacina			2.2	0.0
Iris setosa			0.8	0.3
Bromus p.			0.2	0.4
Mertensia			2.1	1.7
Lathyrus m.			4.9	3.1
Poa sp			0.1	0.0
Poa eminens			0.0	0.0
Parnassia			0.1	0.8
Astersibiricus			1.6	0.6
Lathyrus p			1.6	3.0
Habenaria			0.0	0.2
Potentilla			0.0	0.0
Angelica			0.0	0.0
Conioselinum			0.1	0.1
Sedge			0.2	0.0
Moss			36.4	46.8
Cerastium			0.02	1.5
Taraxacum			0.0	0.2

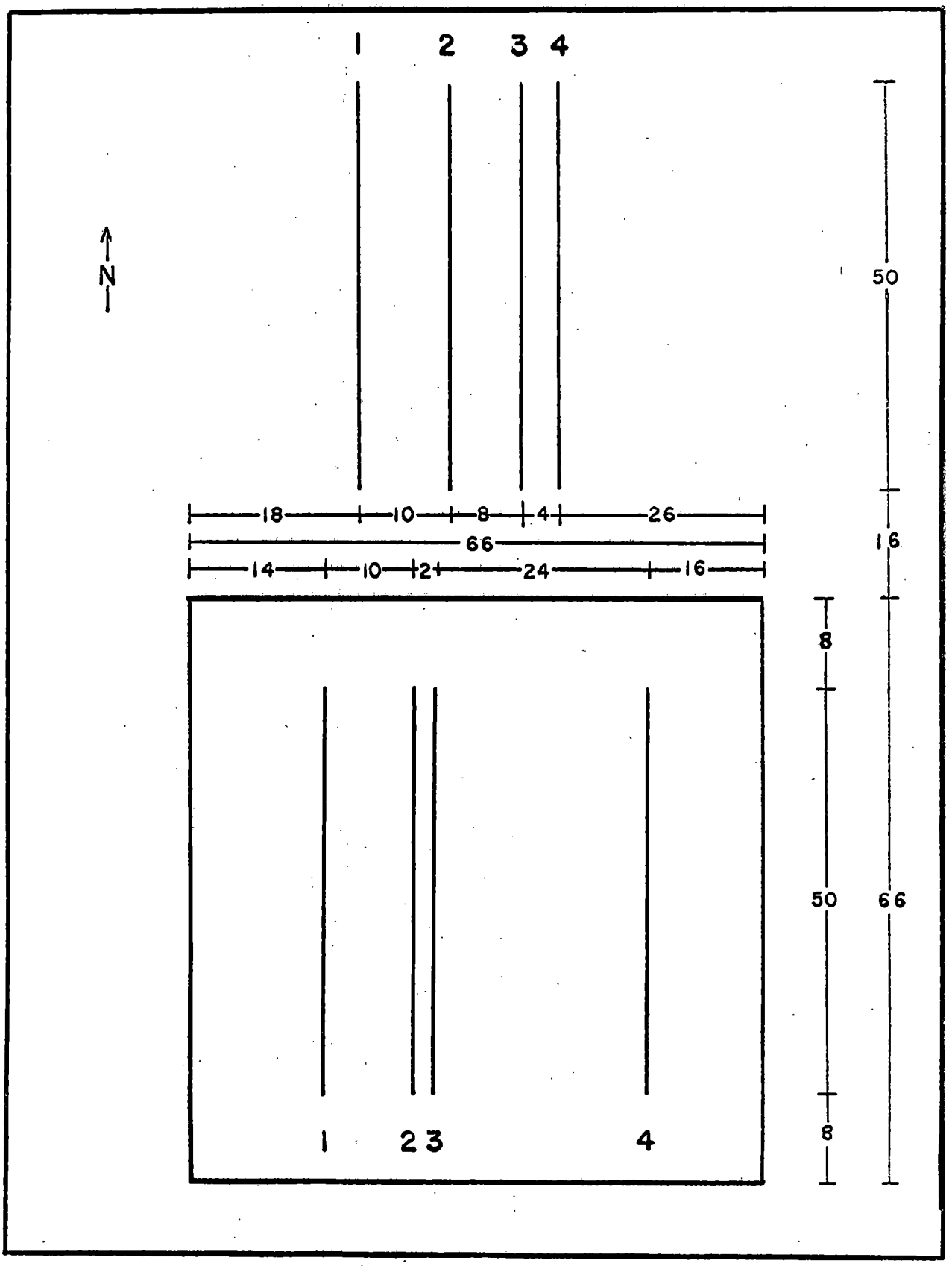


Fig. 6. Location of Lines along which microplots were examined inside and outside the Willow Moose Exclosure, 1967.

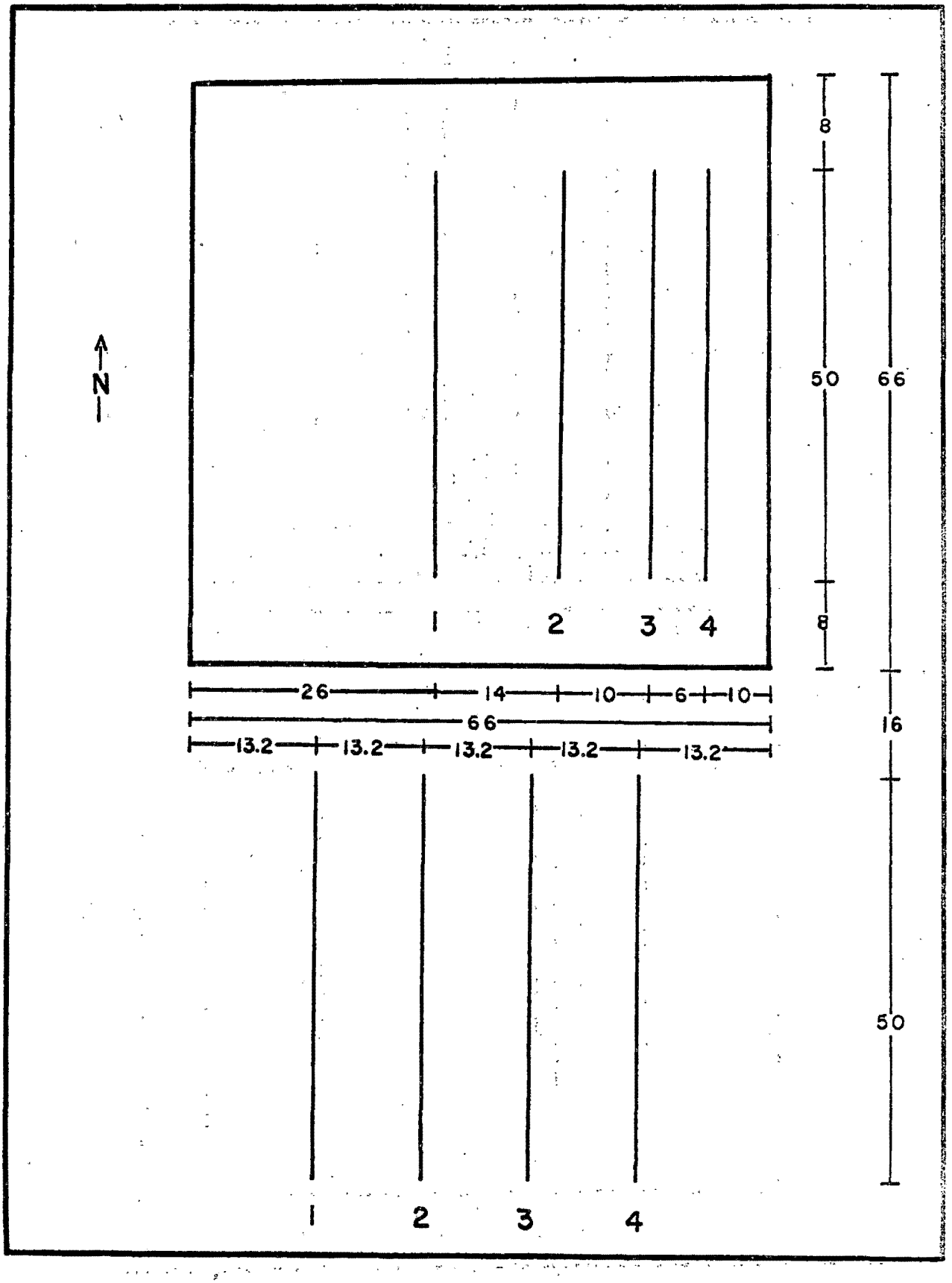


Fig. 7. Location of lines along which microplots were examined inside and outside of the Knik Moose Exclosure, 1967.

Table 17. Information Relating to Transparancies Taken of the Exclosures at Willow and Matanuska-Knik Area, 1967.

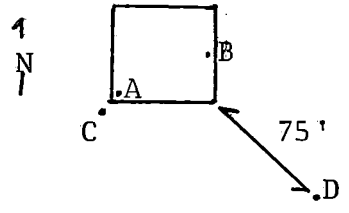
W I L L O W E N C L O S U R E

Camera Point	Location	Camera Height	Camera	Film	Shutter Opening	Shutter Speed	Time of Day
A - 1	SW Corner	24"	Rollicord	Hi-Speed Ektachrome	F 16	125	0945
- 2	"	"	"	"	"	60	"
- 3	"	"	"	"	"	250	"
B - 4	Middle E side	"	"	"	F 11	125	"
- 5	"	"	"	"	"	250	"
- 6	"	"	"	"	"	60	"
C - 7	SW Corner	Top of fence	"	"	"	125	"
- 8	"	"	"	"	"	250	"
- 9	"	"	"	"	"	60	"
D - 10	75' out from SE corner	50"	"	"	F 16	125	"
- 11	"	"	"	"	"	250	"
- 12	"	"	"	"	"	60	"

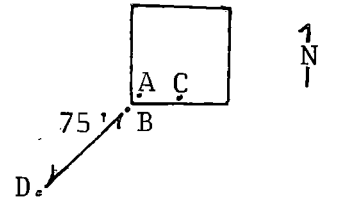
M A T A N U S K A - K N I K E N C L O S U R E

A - 1	SW Corner	24"	"	"	F 16	125	1200
- 2	"	"	"	"	"	250	"
- 3	"	"	"	"	"	60	"
B - 4	"	Top of fence	"	"	F 22	125	"
- 5	"	"	"	"	"	250	"
- 6	"	"	"	"	"	60	"
C - 7	Middle S Side	24"	"	"	F 16	125	"
- 8	"	"	"	"	"	250	"
- 9	"	"	"	"	"	60	"
D - 10	75' from SW corner	50"	"	"	"	250	"
- 11	"	"	"	"	"	500	"
- 12	"	"	"	"	"	125	"

WILLOW ENCLOSURE



MATANUSKA-KNIK ENCLOSURE



Sex and Age Composition

Aerial counts of moose in the fall provide indices to the general status of, and are used to assess trends in the welfare of, moose populations in important hunting areas. These counts are not intended to provide an estimate of the number of moose in any given area, but are simply a means of sampling the sex and age composition in a particular population or portion thereof. The data suggest that in most populations sampled changes in sex and age ratios from 1966 to 1967 were slight.

In the Haines area a decline in the proportion of calves and twin calves between 1966 and 1967 may represent a decline in production or it may be an artifact of sampling. However, production in 1967 was still very good. The 1968 counts should help to identify any trend which may be developing.

In Unit 5 slightly improved yearling and calf survival and production are indicated. Conception rates have generally been high in the Yakutat area, but in the last 2 to 3 years production has been low for unknown reasons. The most likely cause seems to have been a very high population on a limited quantity of range.

In Unit 13 where harvests have been rather stable over the past several years production has also been rather stable in each area. As might be expected portions of Unit 13 exhibit better productivity than others. The variations are probably related to general range conditions (which are not well known at this time) and population composition, which has been monitored closely for a number of years.

Moose in the Matanuska Valley where hunting pressure on bulls is high continue to have good production and survival. In the lower Susitna Valley counts made in late winter indicate good survival of calves. Subsequent yearling proportions should be examined carefully since deep snows in the upper portions of this region in early 1968 may have had some affect of survival after the counts. However, in a population subject to so little hunting pressure there is little danger to the general welfare of the population.

In Unit 15 on the Kenai National Moose Range composition counts from 1967 are not strictly comparable to earlier counts. Those data from the "lowland" area indicate a low male:female ratio, similar to the Matanuska Valley. Calf production appears to be fair. In the Funny River Benchland the data show a different herd composition with a higher proportion of bulls and lower proportion of calves. Studies to determine whether these two population segments are distinct or only seasonally separate are being planned. On the lower Kenai production is generally good, especially in the Homer - Anchor Point areas.

Aerial counts in Unit 20A and B suggest that in these areas production of calves and survival of yearlings has improved over the last 2 years. Production however is still only fair. In the Taylor Highway area of 20C, the counts suggest extremely low calf production, so low in fact that it seems very likely that the distribution of moose when the counts were done produced a strongly biased sample in which calves were grossly under-estimated.

Composition counts were made in several new areas (Units 9, 19, 13, 14 and 16) in an effort to obtain data on areas where increases in hunting activity are anticipated.

Censuses

Bad weather precluded completing the square mile-random sample census of the Matanuska Valley moose herd and prevented the use of a similar system at Yakutat.

A transect "total" count was substituted at Yakutat. Results of the 1967 transect "total" count are compared with the results of an analogous survey made in 1964 at Yakutat in Table 18.

Discussion: The total number of moose seen in 1968 is in the same order of magnitude as the total seen in 1964. Considering this and the poor snow cover and therefore visibility prevailing in 1968, moose are at least as numerous as they were in 1964, and probably are more numerous. The counting technique used does not lend itself to statistical determination of confidence limits on the population estimate. Experience in Alaska and other areas indicates that this technique tends to underestimate the number of moose present from 20 to 50 percent.

Production

Counts were made in several Units during the calving period to obtain data on parturition rates. In the Matanuska and lower Susitna Valleys where considerable data on magnitude and timing of parturition are available, counts were made earlier, when cows and "short yearlings" were still together, to see if better data might be obtained on survival of calves of the previous year.

At Yakutat (Unit 5) foul weather all but eliminated counting, and the limited data can not be interpreted meaningfully.

In Unit 14, Susitna and Matanuska Valleys, the data suggest excellent survival of moose to about 1 year old. The earlier counts appear to have merit in more accurately assessing survival of calves over the winter.

Table 18. Comparison of numbers of moose counted on the Yakutat foreland in 1964 and 1968, using a transect system of aerial counting (Data from U.S.F.S., M.M. Perensovich, Jr.).

Area	1964	1968	Moose/hr. 1964	1968
1. Yakutat Bay-Situk R.	11	13	8.5	6.2
2. Situk R.-Ahrnklin R.	185	179	105.7	89.5
3. Ahrnklin R.-Dangerous R.	227	213	174.6	236.6
4. Dangerous R. Italio R.	259	223	196.2	101.4
5. Italio R.-Akwe R.	36	29	32.2	22.2
6. Akwe R.-Tanis R.	168	97	104.9	80.8
7. Tanis R.-Alsek R.	345	258	269.5	143.3
8. Alsek R.-Doame R.	158	114	121.5	114.0
TOTAL	1,389	1,126	120.8	93.1

TABLE 19. Summary of moose population composition counts, Haines Area, Unit 1, 1967. (See Fig. 8, map of count areas.)

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
Portions of Chilkat, Takhin Big Salmon, Klehini Rivers	11/30, 12/1	28	22	50	106	61	6	173	223	2	75	0	298	2.8	91

TABLE 20. Moose sex and age ratios, Haines Area, Unit 1, 1967. (See Fig. 8, map of count areas.)

Area	Date	Total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂% in herd	small per 100 ♂ calves	calves per 100 ♀	Incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
Chilkat Takhin Big Salmon Klehini Rivers	11/30 12/1	28.9	12.7	78.6	7.4	58.7	43.4	8.9	25.2	91	298

TABLE 21. Summary of moose population composition counts, Yakutat, Unit 5, 1967. (See Fig. 8, map of count area.)

area	date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hrs)	moose per hour
Yakutat-Dangerous River (area-1)	11/29	29	19	48	97	14	1	112	160	0	16	0	176	2.8	64
Dangerous River Italio River (area-2)	11/29	10	4	14	95	24	3	122	136	1	31	0	167	1.3	134
Italio River Alsek River (area-3)	12/1	61	12	73	160	39	4	203	276	1	48	0	324	2.3	144
Total		100	35	135	352	77	8	437	572	2	95	0	667	6.3	107

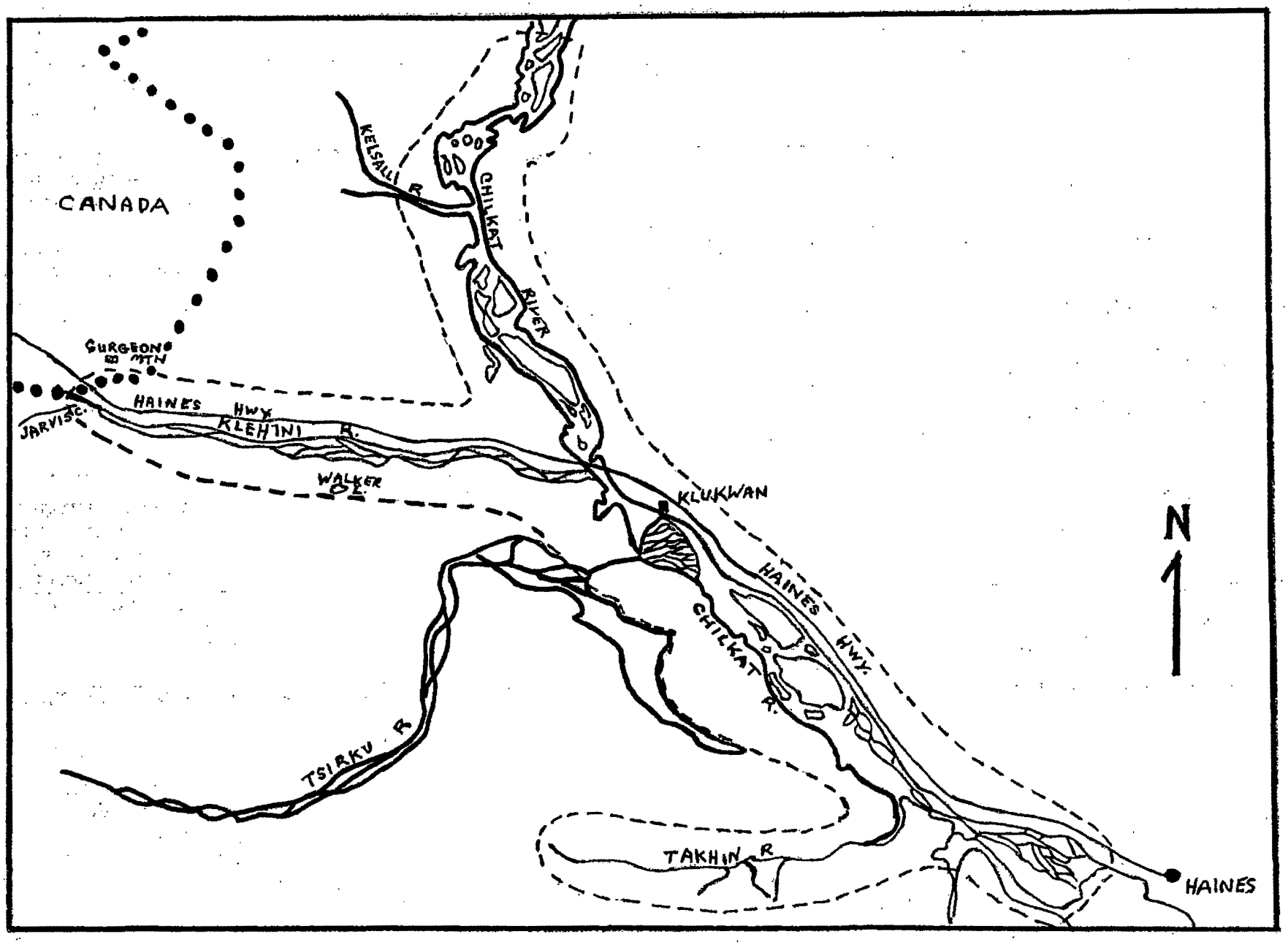


Fig. 8 Moose population composition count areas. Unit 1, Haines.

Table 22. Moose sex and age ratios, Yakutat, Unit 5, 1967.*

Area		total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
Yakutat-Dangerour River (area-1)	11/29	42.8	17.0	65.6	10.8	118.8	14.3	6.7	9.1	64.0	176
Dangerous River Italio River (area-2)	11/29	11.5	3.2	40.	2.4	26.7	25.5	11.1	18.6	134.0	167
Italio River Alsek River (area-3)	12/1	36.0	5.9	19.7	3.7	50.0	23.6	9.3	14.8	144.0	324
Total		30.9	8.0	35.	5.2	74.5	21.7	9.4	14.2	107.0	667

* See Fig. 9, map of count areas.

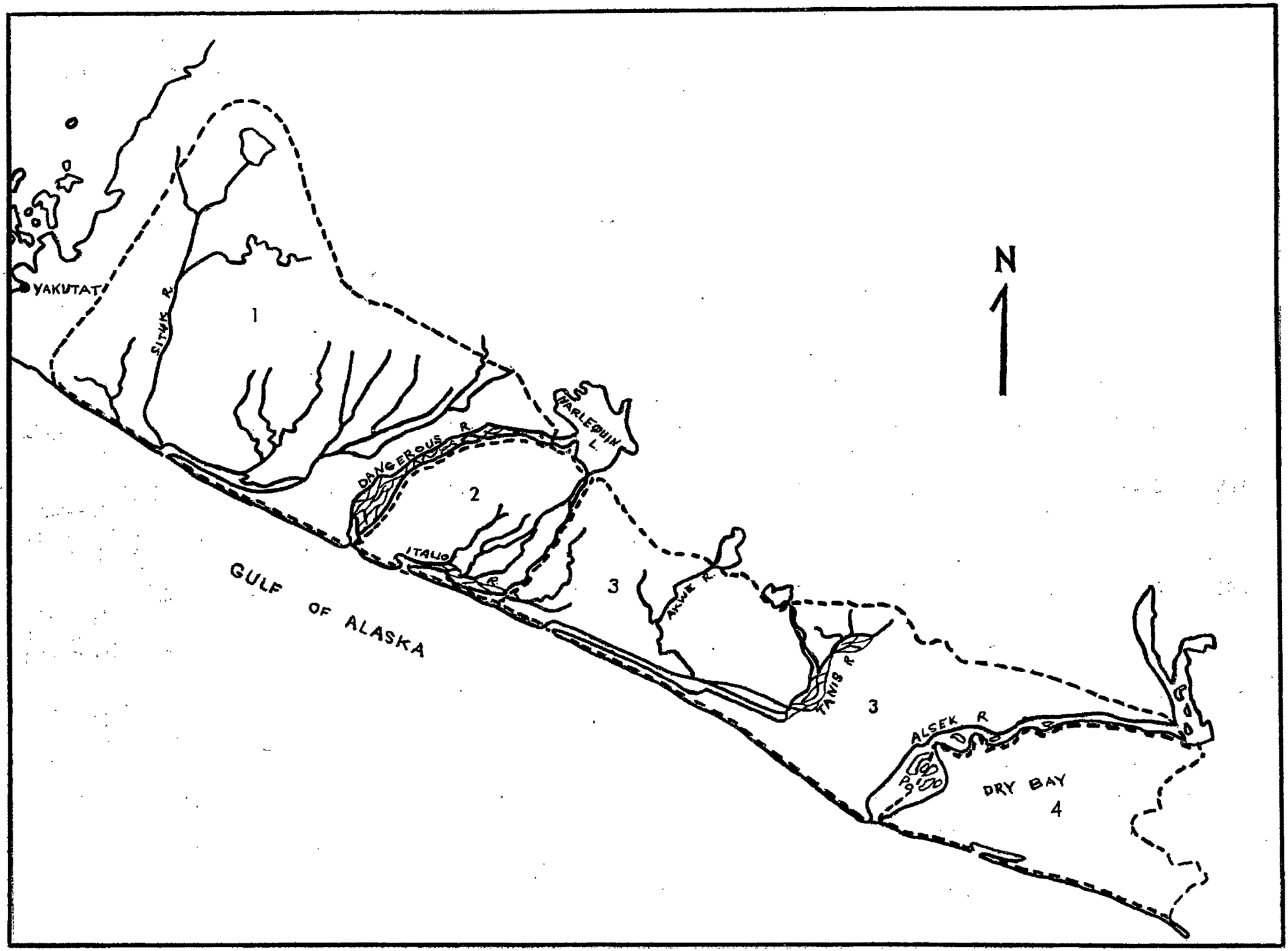


Fig. 9 Moose composition count areas, Unit 5, Yakutat.

Table 23. Summary of moose population composition counts, Copper River Delta, Unit 6, 1967.*

area	date	large ♂	small ♂	total ♂	♀ w/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hrs)	moose per hour
Mile 24 to Smith Lake South of Road (area-1)	11/24	2	4	6	29	19	1	49	55	0	21	0	76	.3	31.9
Smith Lake to Eyak River - South of Road (area-2)	12/7	0	0	0	3	3	0	6	6	0	3	0	9	0.8	10.8
Mile 13 to Mile 7-North of Road (area-3)	12/7	3	1	4	17	2	0	19	23	0	2	0	25	1.4	16.7
Mile 24-27 (area-4)	12/11	0	0	0	0	2	1	3	3	0	4	0	7	0.1	46.7
Total West of Copper River		5	5	10	49	26	2	77	87	0	30	0	117	4.8	24.4
East of Copper River	12/11	33	31	64	37	35	12	84	148	0	59	0	207	3.1	67.4
Total		38	36	74	86	60	14	161	235	0	89	0	314	7.8	40.0

* Not illustrated.

Table 24. Moose sex and age ratios, Copper River Delta, Unit 6, 1967.

Area	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
Copper River Delta West of Copper River	13.5	6.8	100	4.5	33.3	39.0	7.1	25.6	24.4	117
East of Copper River	76.1	37.0	93.9	15.0	103.3	70.2	25.5	28.5	67.4	207
Total	46.0	22.4	94.7	11.5	80.0	55.3	18.9	28.3	40.0	314

Table 25. Summary of moose population composition counts, Unit 7, 1967*

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
Resurrection Cr. (10)	11/28	30	15	45	69	35	4	108	153	0	43	3	199	2.2	90
Twentymile R. (6)	11/28	2	4	6	53	15	3	71	77	0	21	0	98	1.2	82
Total		32	19	51	122	50	7	179	230	0	64	3	297	3.4	87

*See Figure 10, map of count areas.

Table 26. Moose sex and age ratios, Unit 7, 1967.*

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % moose in herd	moose per hr	Total moose
Resurrection Cr. (10)	11/28	41.7	13.9	50.0	7.5	69.8	39.8	10.3	21.6	90	199
Twentymile R. (6)	11/28	8.5	5.6	200.0	4.1	38.1	29.6	16.7	25.6	82	98
Total		28.5	10.6	59.4	6.4	59.4	35.8	12.3	21.5	87	297

* See Fig. 10, map of count areas.

Table 27. Summary of moose population composition counts, Alaska Peninsula, Unit 9, 1967*

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
King Salmon R. (North of Becharof)	10/9	125	22	147	96	29	7	132	279	1	44	0	323	3.1	104
Becharof	10/10	68	14	82	60	15	2	77	159	1	20	0	179	3.2	56
Ugashik	10/10	11	1	12	4	1	0	5	17	0	1	0	18	0.5	36
Dog Salmon	10/12	14	6	20	38	7	0	45	65	0	7	0	72	0.9	80
Mother Goose	10/13	220	61	281	380	71	13	464	745	2	99	0	844	8.4	100
Cinder R.	10/13	7	0	7	2	1	0	3	10	0	1	0	11	0.1	110
Totals		445	104	549	580	124	22	726	1275	4	172	0	1447	16.2	89

*See Figure 11, map of count areas. King Salmon R. to Becharof areas not illustrated.

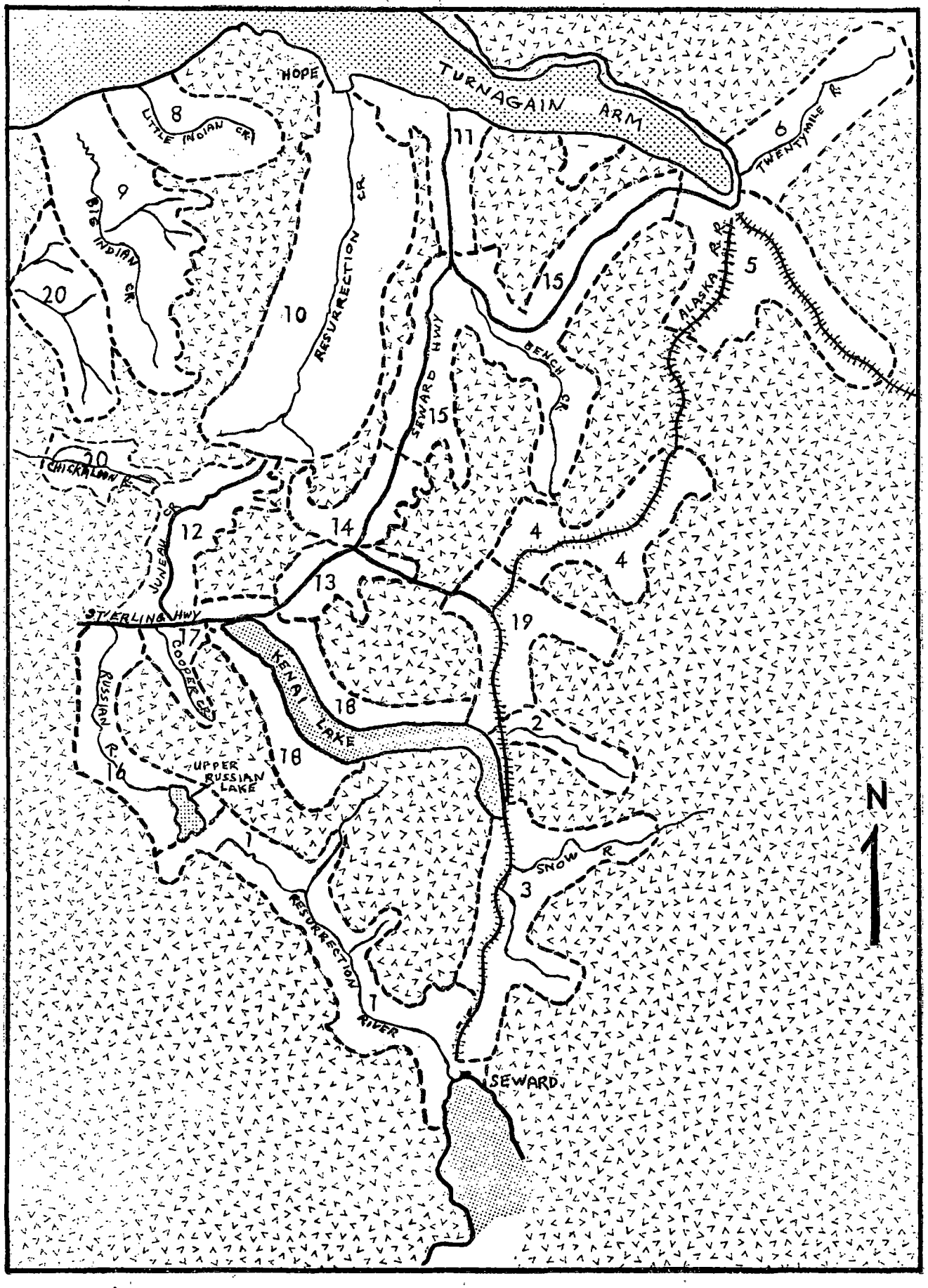


Fig. 10 Moose composition count areas, Unit 7

Table 28. **Moose sex and age ratios,** Alaska Peninsula, Unit 9, 1967.*

Area		total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
King Salmon R. (North of Becharof	10/9	111	17	18	7	100	33	39	14	104	323
Becharof	10/10	106	18	21	8	70	26	24	11	56	179
Ugashik	10/10	140	20	9	6	100	20	0	6	36	18
Dog Salmon	10/12	44	13	43	8	171	16	0	10	80	72
Mother Goose	10/13	61	13	28	7	123	21	31	12	100	844
Cinder River	10/13	233	0	0	0	0	33	0	9	110	11
Total		73	14	23	7	121	24	30	12	89	1447

*See Figure 11, map of count areas. King Salmon R. and Becharof areas not illustrated.

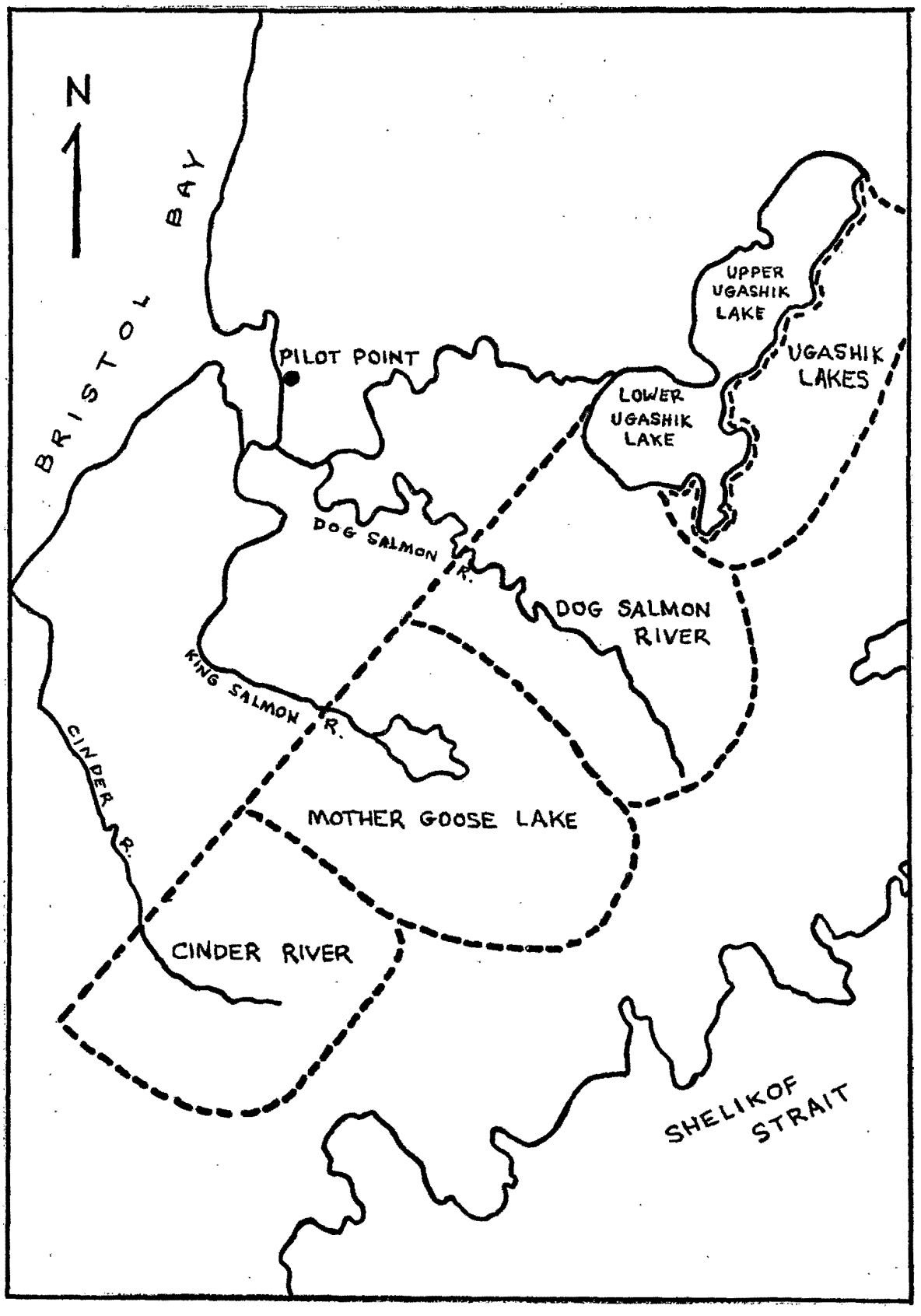


Fig. 11 Moose composition count areas. Unit 9, Alaska Peninsula.

Table 29. Summary of moose population composition counts. Nelchina Basin, Units 13 and 11, 1967.*

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
1	11/10/67	23	15	38	105	57	7	169	207	0	71	0	278	2.9	96
2	11/10, 11	43	4	47	63	49	3	115	162	1	56	5	224	4.7	47
3	11/11, 28	56	31	87	129	53	3	185	272	0	59	0	331	3.4	97
5	11/8, 10, 28, 29, 30	206	52	258	493	134	4	631	889	0	142	0	1031	20.0	52
6	11/11, 28, 29	104	23	127	305	121	1	427	554	0	123	4	681	7.9	86
7	11/10	135	28	163	318	77	2	397	560	1	82	0	642	8.3	68
8	11/8	11	10	21	35	32	0	67	88	0	32	0	120	1.9	63
9	11/8	9	7	16	18	11	0	29	45	0	11	0	56	1.0	56
10	11/9, 10	88	21	109	149	84	1	234	343	0	86	0	429	4.4	98
11	11/10	140	23	163	163	62	2	227	390	0	66	0	455	3.9	117
12	12/12	30	8	38	138	52	0	190	228	0	52	2	282	7.3	39
13	11/8, 9, 10	25	33	58	238	45	2	285	343	1	50	0	394	7.9	50
14	11/8, 9	66	14	80	137	66	2	205	285	0	70	0	355	3.0	118
15	11/9	77	17	94	159	17	1	177	271	0	19	0	290	3.5	83
16	11/8	66	11	77	70	40	0	110	187	0	40	0	227	2.6	87
Totals		1079	297	1376	2520	900	28	3448	4824	3	959	11	5794	82.7	71

*See Figure 12, map of count areas. Count area #11 is in Unit 11.

Table 30. Moose sex and age ratios, Nelchina Basin, Units 13 and 11, 1967.*

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
1	11/10	22.5	8.9	65.2	5.4	42.3	42.0	10.9	25.5	96	278
2	11/10, 11	40.9	3.5	9.3	1.8	14.3	48.7	5.8	25.0	47	224
3	11/11, 28	47.0	16.8	55.4	9.4	114.8	31.9	5.4	17.8	97	331
5	11/8,10, 28-30	40.9	8.2	25.2	5.0	73.2	22.5	2.9	13.8	52	1031
6	11/11,28, 29	29.7	5.4	22.1	3.4	37.4	28.8	0.8	18.1	86	681
7	11/10	41.1	7.1	20.7	5.0	68.3	20.7	2.5	14.6	68	561
8	11/8	31.3	14.9	90.9	8.3	62.5	47.8	0.0	26.7	63	120
9	11/8	55.2	24.1	77.7	12.5	127.3	37.9	0.0	19.6	56	56
10	11/9, 10	46.5	9.0	23.9	4.9	48.8	36.8	1.2	20.0	98	429
11	11/10	71.8	10.1	16.4	5.0	69.7	29.1	3.1	14.5	117	456
12	12/12	20.0	4.2	26.7	2.8	30.8	27.4	0.0	18.4	39	282
13	11/8-10	20.4	11.6	132.0	8.4	132.0	17.5	4.3	12.7	50	394
14	11/8, 9	39.0	6.8	21.2	3.9	40.0	34.1	2.9	19.7	118	355

*See Figure 12, map of count areas. Count area #11 is in Unit 11.

Table 30. Moose sex and age ratios, Nelchina Basin, Units 13 and 11, 1967.* (Continued)

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
15	11/9	53.1	9.6	22.1	5.9	178.9	10.7	5.6	6.6	83	290
16	11/8	70.0	10.0	16.7	4.8	55.0	36.4	0.0	17.6	87	227
Totals		39.9	8.6	27.5	5.1	62.1	27.8	3.0	16.6	71	5794

Table 31. **Summary of moose population composition counts,** Eagle River, Unit 14, 1967*

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
Eagle River	12/20-21	5	10	15	36	31	1	68	83	2	35	10	128	5.2	24

Table 32. **Moose sex and age ratios,** Eagle River, Unit 14.*

Area	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
Eagle River	22.1	14.7	200	7.8	57.1	51.5	3.1	27.3	24.4	123

*Not illustrated.

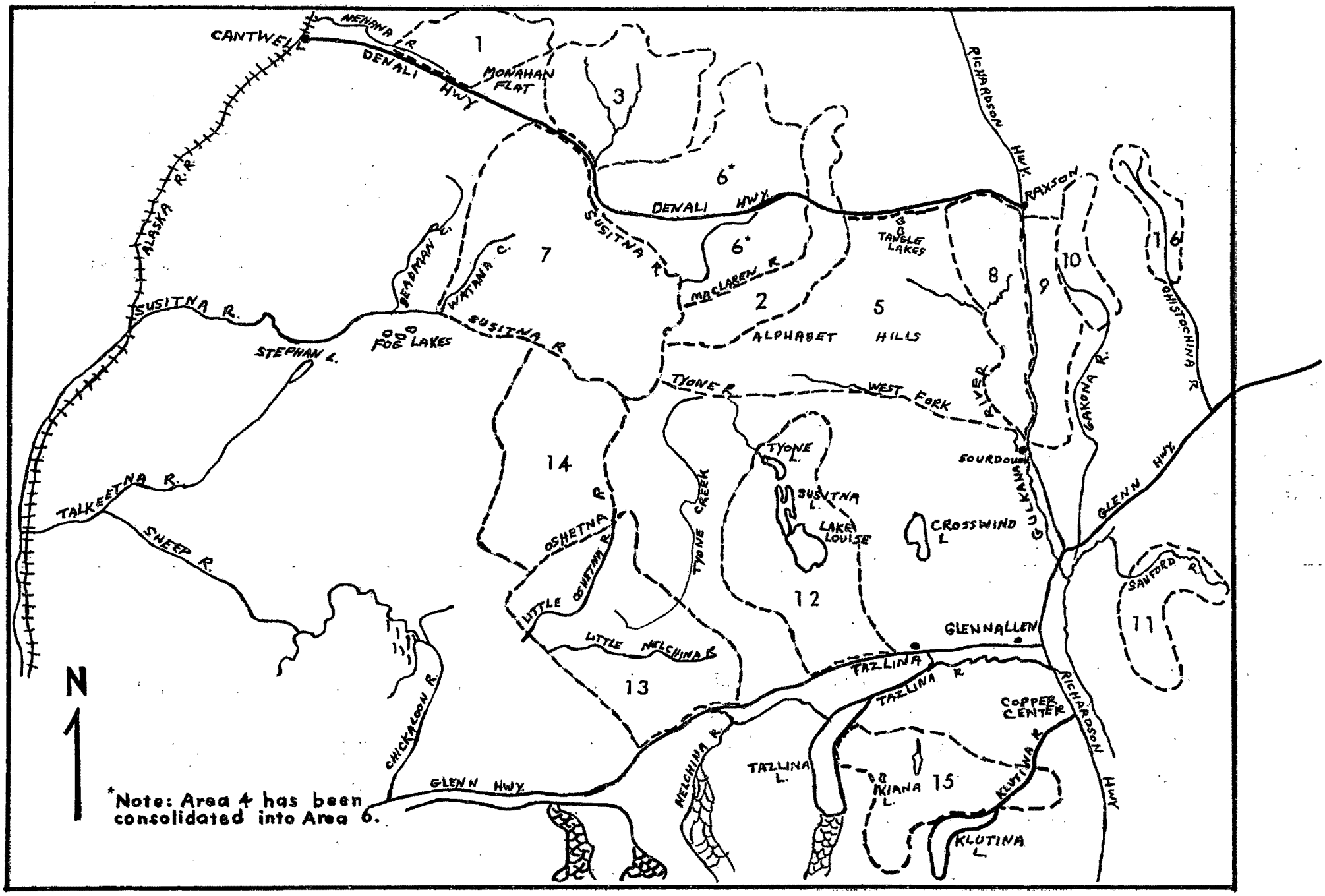


Fig. 12 Moose composition count areas, Unit 13 Nelchina Basin.

Table 33. Summary of moose population composition counts, Matanuska Valley, Unit 14, 1967.*

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
1.	12/19,20	3	23	26	161	118	6	285	311	1	131	3	445	9.2	48.5
2.	12/12,19	14	39	53	63	78	5	146	199	3	91	0	290	6.0	48.4
3.	12/10	3	5	8	51	58	6	115	123	2	72	5	200	4.0	49.4
4.	12/9,11	3	9	12	32	23	1	56	68	2	27	0	95	2.6	36.8
5.	12/18	6	18	24	126	92	6	224	248	2	106	1	355	5.3	66.0
6.	12/9,18	0	0	0	9	13	0	22	22	0	13	0	35	3.6	9.8
7.	12/6,8,9	22	15	37	156	87	12	255	292	0	111	0	403	6.4	62.7
8.	12/4,6,8	22	22	44	263	139	4	406	450	3	150	1	601	9.2	65.0
9.	12/11	7	5	12	70	34	1	105	117	0	36	0	153	2.6	59.0
TOTAL		80	136	216	931	642	41	1614	1830	13	737	10	2577	48.9	52.7

*See Figure 13, map of count area.

Table 34. Moose sex and age ratios, Matanuska Valley, Unit 14, 1967.*

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
1.	12/19, 20	9.1	8.1	766.7	5.2	35.1	46.0	4.8	29.4	48	445
2.	12/12, 19	36.3	26.7	278.6	13.4	85.7	62.3	6.0	31.4	48	290
3.	12/10	7.0	4.3	166.7	2.5	13.9	62.6	9.4	36.0	49	200
4.	12/9, 11	21.4	16.1	75.0	9.5	66.7	48.2	4.2	28.4	37	95
5.	12/18	10.8	8.0	300.0	5.1	34.0	47.3	6.1	29.8	66	355
6.	12/9, 18	0	0	0	0	0	59.1	0	37.1	10	35
7.	12/6, 8,9	14.5	5.9	68.2	3.7	27.0	44.5	12.1	27.5	63	403
8.	12/4, 6,8	10.8	5.4	100.0	3.7	29.3	36.9	2.8	25.0	65	601
9.	12/11	11.4	4.8	71.4	3.3	27.8	34.3	2.9	23.5	59	153
TOTALS		13.4	8.4	170.0	5.3	36.9	45.7	6.0	28.6	53	2577

*See Figure 13, map of count area.

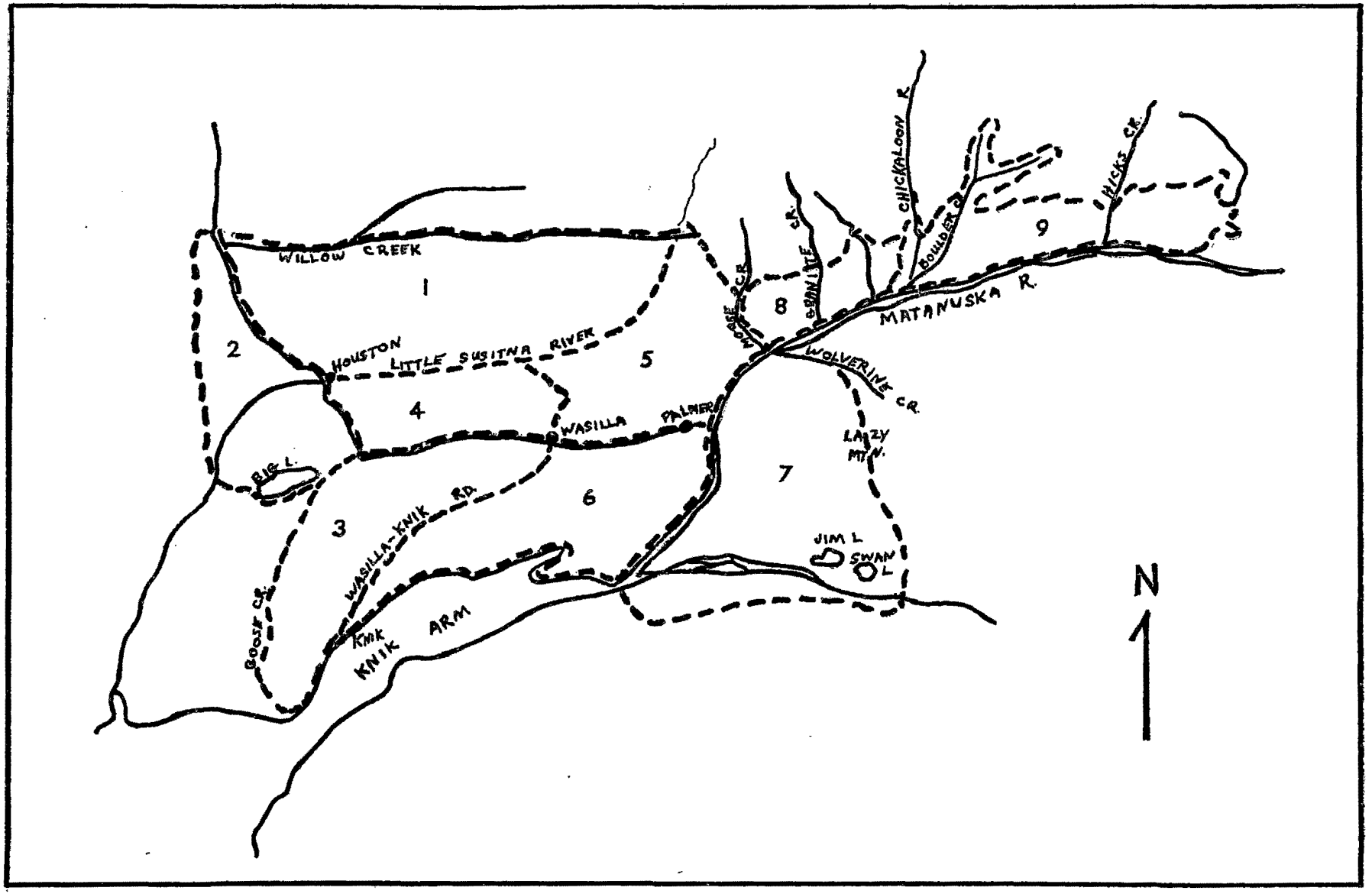


Fig. 13 Moose composition count areas, Unit 14, Matanuska Valley.

Table 35. **Summary of moose population composition counts,** Lower Susitna River, Unit 14, 1967.*

Area	Date	large ♂	small ♂	total ♂	♀* W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
Willow to Little Willow	1/25/68	--	--	--	101	46	0	--	147	0	46	0	193	2:03	94.1
L. Willow to Kash-witna	1/25/68	--	--	--	61	55	8	--	124	1	72	0	29	3:13	60.9
Kashwitna** to Montana Creek	1/27/68	--	--	--	15	7	0	--	22	0	7	0	29	:35	49.7
Talkeetna*** to Montana Creek	1/25/68	--	--	--	105	82	1	--	188	4	88	1	277	3:21	63.7
Talkeetna to Sheep River	1/26/68	--	--	--	64	33	1	--	98	1	36	0	134	1:19	101:8
Total		--	--	--	346	223	10	--	579	6	249	1	829	10:31	78.8

* Includes all adults without calves.
** Not completed.
*** West of Alaska Railroad only.

* See Fig. 14, map of count areas.

Table 36. **Moose sex and age ratios,** Lower Susitna River, Unit 14, 1967.*

Area	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
Willow to Talkeetna	--	--	--	--	--	--	4.3	30.0	78.8	829

* See Fig. 14, map of count areas.

Table 37. **Summary of moose population composition counts,** Talkeetna-Cantwell, December 1967.*

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
#4 Curry to Fountain R.	12/5-6	8	2	10	28	7	0	35	45	2	9	0	54	1.9	28.4
#5 Talkeetna to Curry	12/5-6	46	27	73	124	73	9	206	279	1	92	0	371	6.5	57.1
#6 Peters Hills to Kahiltna	12/4 & 12/6	121	52	173	443	205	31	679	852	2	269	0	1121	8.9	126.0
Yentna	12/4	34	15	49	41	10	7	58	107	0	24	0	131	1.1	119.1
Summary All Areas	12/4-6	209	96	305	636	295	47	978	1283	5	394	0	1677	18.4	91.1

* Not illustrated.

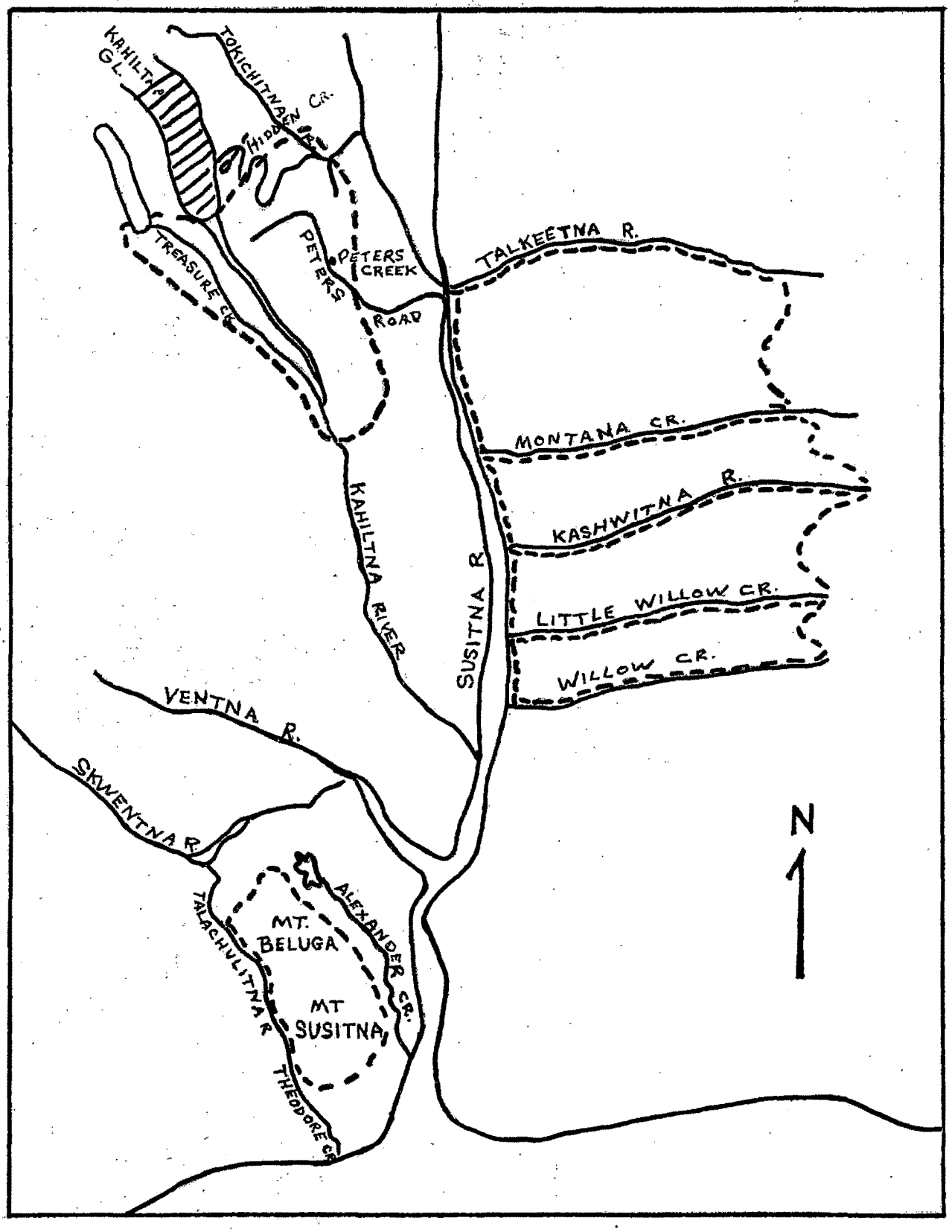


Fig. 14. Moose composition count areas, Units 14 and 16, Lower Susitna Valley.

Table 38. **Moose sex and age ratios,** Talkeetna-Cantwell, Units 14 and 16, 1967.

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
4. Curry-Fountain	12/ R. 5-6	28.6	5.7	25.0	3.7	44.4	25.7	0.0	16.7	28	54
5. Talkeetna-Curry	12/5-6	35.5	13.1	58.7	7.3	58.7	44.7	11.0	24.8	371	57
6. Peters Hills-Kahitna	12/4&6	25.5	7.7	43.0	4.6	38.7	39.6	13.1	24.0	126	1121
Yentna	12/4	84.5	25.9	44.1	11.5	125.0	41.4	41.2	18.3	119	131
Total		31.2	9.8	31.5	5.7	48.7	40.3	13.7	23.5	91	1677

Table 39. Summary of moose population composition counts Kenai National Moose Range, 1967*

area	date	large ♂	small ♂	total ♂	♀ w/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hrs)	moose per hour
Swan Lake Road Area	10/3-16	9	7	16	135	42	8	185	201	1	59	--	260	--	--
Skilak Pipeline Area	10/3-16	14	6	20	116	45	9	170	190	2	65	--	255	--	--
Misc. Areas Sunken I, Rd. Dabbler L.	10/3-16	6	4	10	29	9	1	39	49	0	11	--	60	--	--
Total, Lowland Area		29	17	46	280	96	18	394	440	3	135	--	575	--	--
Funny R. Bench Land	10/3-16	80	11	91	267	48	1	316	407	0	50	--	457	--	--

*Data from W. Troyer, Refuge Manager. Count areas not illustrated.

Table 40. **Moose sex and age ratios,** Kenai National Moose Range, 1967*

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
Swan L. Rd. area	10/3-16	8.0	3.5	77.8	2.7	23.7	31.9	16.0	22.7	--	260
Skilak Pipeline area	10/3-16	11.8	3.5	42.9	2.4	18.5	38.2	16.7	25.5	--	255
Misc. areas, Sunken I. Rd. Dabbler L.	10/3-16	25.6	10.3	66.7	6.7	72.7	28.2	2.6	18.3	--	60
Total, Lowland area	10/3-16	11.7	4.3	58.6	3.0	1133.3	34.3	15.8	23.5	--	575
Funny R. Bench Land	10/3-16	28.8	3.5	13.8	2.4	44.0	15.8	2.0	10.9	--	457

*Computed from data from W. Troyer, Refuge Manager. Count areas not illustrated.

Table 41. **Summary of moose population composition counts**, Lower Kenai Peninsula, Unit 15, 1967*

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
C (Below timber)	10/24	4	5	9	24	28	1	53	62	1	31	0	93	2.3	41
C (Above timber)	10/25	53	61	114	462	232	20	714	828	2	274	0	1102	4.0	276
C Total		57	66	123	486	260	21	767	890	3	305	0	1195	6.3	191
I Below Timber	10/25	8	8	16	28	7	3	38	54	0	13	0	67	1.0	67
I Above Timber	10/26	179	31	210	431	155	8	594	804	0	171	0	975	3.5	279
I Total		187	39	226	459	162	11	632	858	0	184	0	1042	4.5	233
Homer	10/26-27	12	9	21	110	99	9	218	239	1	118	0	357	5.8	62
Anchor Point	10/28	18	13	31	130	113	9	252	283	2	133	0	416	1.9	219
A	10/24	0	0	0	2	3	0	5	5	0	3	0	8	0.3	27
3	10/24	3	0	3	9	4	0	13	16	0	4	0	20	0.3	67
Total		277	127	404	1196	641	50	1887	2291	6	747	0	3038	19.0	160

*See Figure , map of count areas.

Table 42. **Moose sex and age ratios,** Lower Kenai Peninsula, Unit 15, 1967*

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
C Below Timber	10/24	17	9.4	125	5.4	32	58	3	33.3	41	93
C Above Timber	10/25	16	8.5	115	5.5	45	38	8	24.9	276	1102
C Total		16	8.6	116	5.5	43	40	7	25.5	191	1195
I Below Timber	10/25	42	21.0	100	11.9	123	34	30	19.4	67	67
I Above Timber	10/26	35	5.2	17	3.2	36	29	5	17.5	279	975
I Total		36	6.2	21	3.7	42	29	6	17.6	233	1042
Homer	10/26-10/27	10	4.1	75	2.5	15	54	8	33.0	62	357
Anchor Point	10/28	12	5.2	72	3.1	20	53	15	32.0	219	416
A	10/24	0	0	0	0	0	60	0	37.5	27	8
3	10/24	23	0	0	0	0	31	0	20.0	67	20
Total		21	6.7	46	4.2	34	40	14	25.6	160	3038

*See Figure 15, Map of count areas.

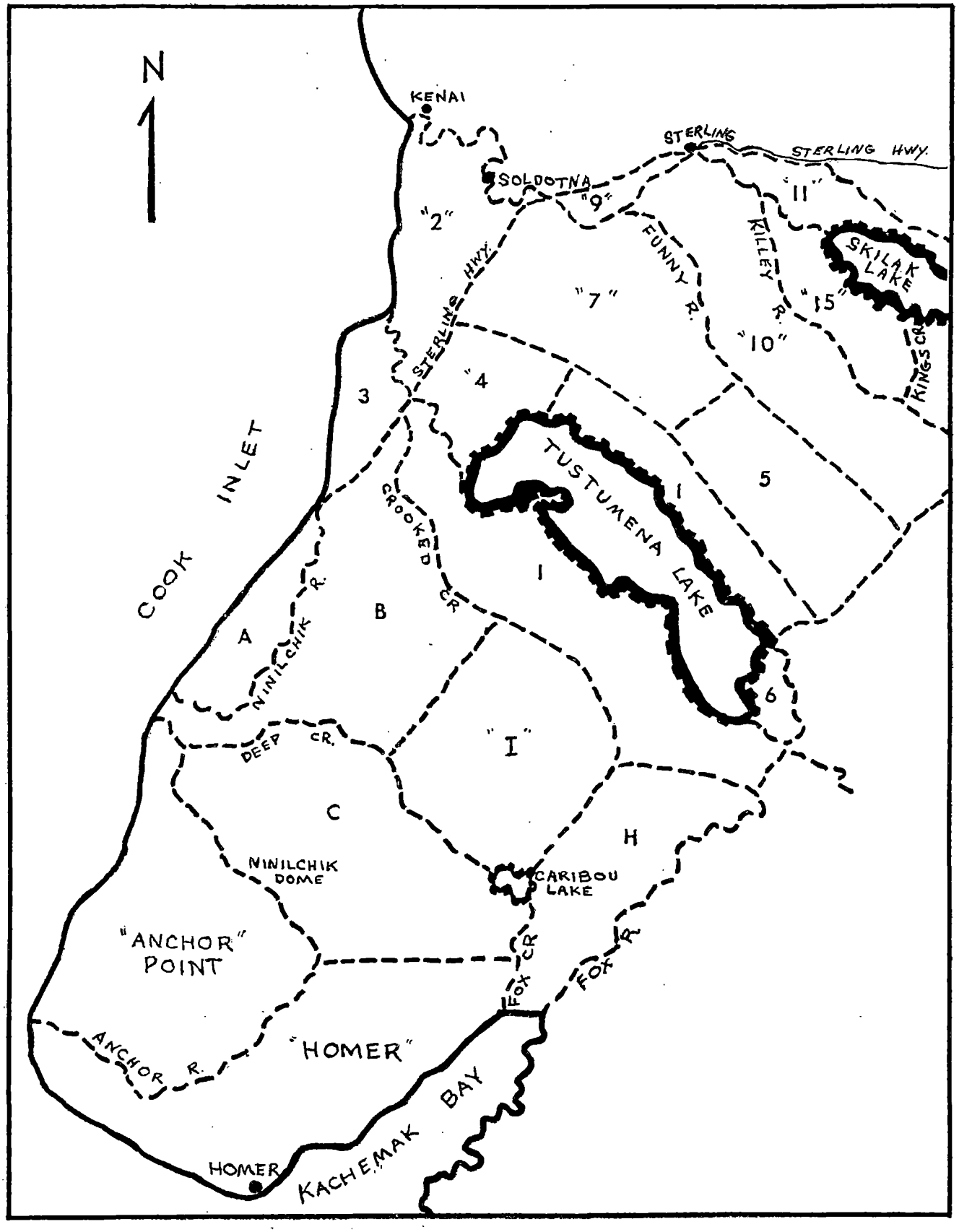


Fig. 15 Moose composition count areas, Unit 15, Lower Kenai Peninsula.

Table 43. Summary of moose population composition counts. Kuskokwim River, Unit 19, 1967-68*

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
Takotna R.	Mar. 15 1968	-	-	-	-	13	1	-	72	0	15	-	87	1.8	48
Kuskokwim R. Medfra-Selatna R.	Mar. 14 1968	-	-	-	-	38	4	-	130	0	46	-	176	4.3	41
Pitka, Middle Forks, Big R.	Mar. 14 1968	No Significant Sample						-	-	-	-	-	-	-	-
Kuskokwim R. Selatna R. to Sleetmute	Mar. 15 1968	Small Sample			3	1	-	16	0	5	-	16	0.6	26	
Total, Kuskokwim River		-	-	-	54	6	-	218	0	66	-	279	6.7	42	

*Not illustrated.

Table 44.

Moose sex and age ratios, Kuskokwim River, Unit 19, 1967-68.*

Area	Date	Total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	Incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
Takotna R.	Mar. 15 1968	-	-	-	-	-	-	7.1	17.2	48	87
Kuskokwim R. Medfra Selatna R.	Mar. 14 1968	-	-	-	-	-	-	9.5	26.1	41	176
Pitka, Middle Fork, & Big River	Mar. 14 1968	No Significant Sample			-	-	-	-	-	-	-
Kuskokwim R., Selatna R. to Sleetmute	Mar. 14 1968	No Significant Sample			-	-	-	-	-	27	16
Total, Kuskokwim River	Mar. 14-15 1968	-	-	-	-	-	-	10.0	23.7	42	279

*Count areas not illustrated.

Table 45. Summary of moose population composition counts, Tanana Flats, Unit 20, 1967.*

area	date	large ♂	small ♂	total ♂	♀ w/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hrs)	moose per hour
2	Oct. 26,27	35	3	38	68	15	0	83	121	0	15	0	136	3.1	44
3	Oct 25	10	4	14	35	16	1	52	66	0	18	0	84	1.8	47
4	Oct 27	22	0	22	19	5	0	24	46	0	5	0	51	3.0	18
5	Oct 25	9	2	11	12	7	0	19	30	0	7	0	37	2.1	18
6	Oct 25	18	5	23	30	5	0	35	58	0	5	0	63	1.7	37
7	Oct 28, 30	14	0	14	14	3	0	17	31	0	3	1	35	2.5	14
8	Oct 30	4	0	4	14	2	0	16	20	0	2	0	22	1.3	17
9	Oct 27,28	20	6	26	33	20	0	53	79	1	21	0	100	3.6	29
Totals		132	20	152	225	73	1	299	451	1	76	1	528	19.1	28

*See Figure 16 map of count areas.

Table 46. Moose sex and age ratios, Tanana Flats, Unit 20, 1967.*

Area		total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
2	Oct 26,27	45.8	3.6	8.6	2.2	40.0	18.1	0.0	11.0	44	136
3	Oct 25	26.9	7.7	40.0	4.8	44.4	34.6	5.9	21.4	47	84
4	Oct 27	91.6	0.0	0.0	0.0	0.0	20.8	0.0	9.8	18	51
5	Oct 25	57.9	10.5	22.2	5.4	57.1	36.8	0.0	18.9	18	37
6	Oct 25	65.7	14.3	27.8	7.9	200.0	14.3	0.0	7.9	37	63
7	Oct 28,30	82.4	0.0	0.0	0.0	0.0	17.6	0.0	8.6	14	35
8	Oct 30	25.0	0.0	0.0	0.0	0.0	12.5	0.0	9.1	17	22
9	Oct 27,28	49.1	11.3	30.0	6.0	57.1	39.6	0.0	21.0	29	100
Total		50.8	6.7	15.2	3.8	52.6	25.4	1.4	14.4	28	528

*See Figure 16, map of count areas.

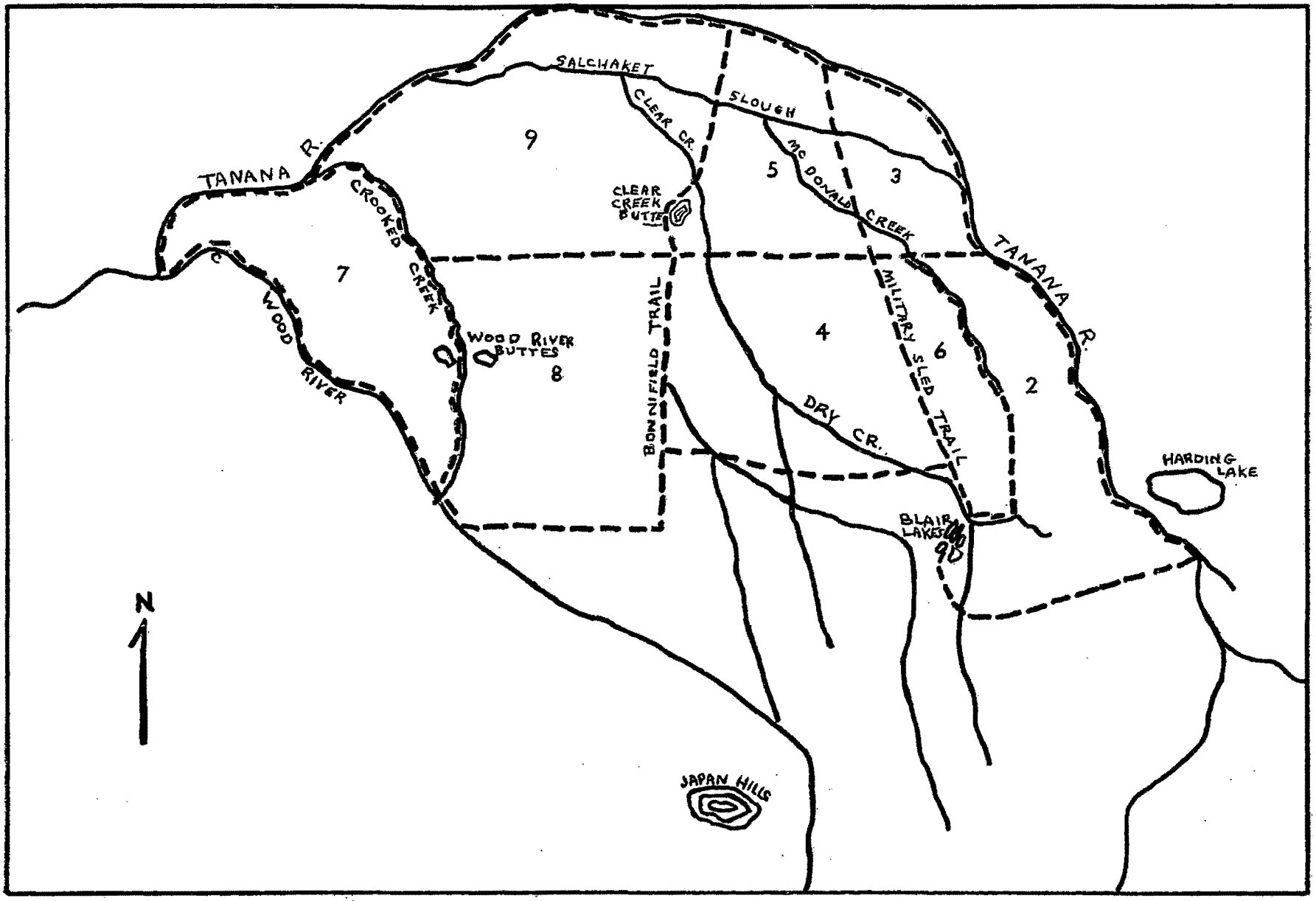


Fig. 16 Moose composition count areas, Unit 20A, Tanana Flats.

Table 47. Summary of moose population composition counts. Tanana Valley, Unit 20, 1967-68*.

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
Chena R.	11-12 Mar. 68	-	-	-	-	15	0	-	75	1	16	-	92	6.8	14
Chatanika R.	12-13 Mar. 68	-	-	-	-	10	2	-	53	0	14	-	65	6.6	10
Total, Chena, & Chatanika R.		-	-	-	-	25	2	-	128	1	30	-	157	13.4	12
Shaw Cr. Goodpaster R.	15 Mar. 68	-	-	-	-	3	0	-	15	0	3	-	18	1.9	9
Salcha R.	15 Mar. 68	-	-	-	-	8	0	-	38	0	8	-	46	1.2	38
Total, Shaw Cr. Goodpaster R. & Salcha R.		-	-	-	-	11	0	-	53	0	11	-	64	3.1	21
Total, Tanana Valley		-	-	-	-	36	2	-	181	1	41	-	221	17.5	

*Not illustrated.

Table 48. Moose sex and age ratios, Tanana Valley, Unit 20, 1967-68*.

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf		Calf % moose in herd	moose per hr	Total moose
Chena R.	11/12 March '68	--	--	--	--	--	--	--	--	17.4	14	92
Chatanika R.	12/13 March '68									21.6	10	65
Total, Chena R. & Chatanika R.		--	--	--	--	--	--	--	--	19.1	12	157
Shaw Cr. Goodpaster R.		--	--	--	--	--	--	--	--	16.7	9	18
Salcha R.		--	--	--	--	--	--	--	--	17.4	38	46
Total, Shaw Cr. Goodpaster, Salcha R.		--	--	--	--	--	--	--	--	17.2	21	64
Total, Tanana Valley		--	--	--	--	--	--	--	--	18.6	13	221

*Not illustrated.

Table 49. **Summary of moose population composition counts.** Tok area, Units 20 and 12, 1967. *

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
1-A Ketchumstuk	11/17	39	11	50	98	9	0	107	157	0	9	0	166	1.9	87
1-B 1966 Burn, NE of Mt. Fair-Play	10/16	1	0	1	0	1	0	1	2	0	1	0	3	0.4	8
Taylor Mt.	10/19	20	10	30	68	7	0	75	105	0	7	0	112	1.1	102
Mi. 95-105 Taylor Hwy. & Walker Fk. Bridge to head.	11/16	5	5	10	17	0	0	17	27	0	0	0	27	1.1	25
W. side Wade Cr.	11/16	4	0	4	20	3	0	23	27	0	3	0	30	0.4	75
Total, 1-B		30	15	45	105	11	0	116	161	0	11	0	172	3.0	57
Total, 1 A&B		69	26	95	203	20	0	223	318	0	20	0	338	4.9	69
2-A E. side, Mt. Fairplay	10/16	13	1	14	29	2	0	31	45	0	2	0	47	0.9	52
Tanana Hills, Heads, E. & W. Fk. Dennison	10/27	11	6	17	33	2	0	35	52	0	2	0	54	1.0	54
W. Fk. Dennison, upstream from Taylor Hwy.	10/19	15	1	16	20	0	0	20	36	0	0	0	36	1.3	28
W. Fk. Dennison, W. of Mt. Fairplay	11/16	4	5	9	14	0	0	14	23	0	0	0	23	0.3	77

* See Fig. 17, map of count areas.

Table 49. **Summary of moose population composition counts.** Tok area, Units 20 and 12, 1967 (continued).

Area	Date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hr.)	moose per hr.
Total, 2-A		43	13	56	96	4	0	100	156	0	4	0	160	3.5	46
2-B Alaska Range, Cathedral Bluffs E. to Tok. Slana Hwy.	10/27	7	5	12	19	2	0	21	33	0	2	1	36	.7	51
Tanana Hills N. of Tok-60 mi. dome.	11/15	26	10	36	45	8	0	53	97	0	8	0	105	1.2	88
Total, 2-B		33	15	48	64	10	0	74	130	0	10	1	141	1.9	74
Total, 2 A&B		76	28	104	160	14	0	174	286	0	14	1	301	5.4	56
Total, 1&2		145	54	199	363	34	0	397	604	0	34	1	639	10.3	

Table 50. Moose sex and age ratios, Tok Area, Units 20 and 12, 1967.*

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
1-A	11/17										
Ketchumstuk		46.7	10.3	28.2	6.6	244.4	8.4	0.0	5.4	87	166
1-B	10/16										
1966 Burn		100.0	0.0	0.0	0.0	0.0	100.0	0.0	33.3	8	3
	10/19										
Talyor Mt.		40.0	13.3	50.0	8.9	285.7	9.3	0.0	6.2	102	112
	11/16										
Mi. 95-105, to Walker Fk.		58.8	29.4	100.0	18.5	-	0.0	0.0	0.0	25	27
	11/16										
Wade Cr.		17.4	0.0	0.0	0.0	0.0	13.0	0.0	10.0	30	75
Total 1-B		38.8	12.9	50.0	8.7	272.7	9.5	0.0	6.4	57	172
Total 1 A & B		42.6	11.7	37.7	7.7	260.0	9.0	0.0	5.9	69	338
2A	10/16										
E. Mt. Fairplay		45.2	3.2	7.7	2.1	100.0	6.5	0.0	4.3	52	47
	10/27										
Tanana Hills E & W Dennison		48.6	17.1	54.5	11.1	600.0	5.7	0.0	3.7	54	54
W. Fk. Dennison, Taylor-Up	10/19	80.0	5.0	6.7	2.8	-	0.0	0.0	0.0	28	36

*See Figure 17, map of count areas.

Table 50. Moose sex and age ratios, Tok Area, Units 20 and 12, 1967.*

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
W. Fk. Dennison, W. of Fairplay	11/16	64.3	35.7	125.0	21.7	-	0.0	0.0	0.0	77	23
Total, 2-A		56.0	13.0	30.2	8.1	650.0	4.0	0.0	2.5	46	160
2-B											
Alaska Range, Cathedral-E		57.1	23.8	71.4	13.9	500.0	10.5	0.0	5.6	51	36
Tanana Hills, Tok-60 Mi. Dome		67.9	18.9	38.5	9.5	250.0	15.1	0.0	7.6	88	105
Total 2 B		64.8	20.3	45.5	10.6	300.0	13.5	0.0	7.1	74	141
Total, 2A & 2B		59.7	16.1	36.8	9.3	400.0	8.0	0.0	4.7	56	301
Total 1 & 2		50.1	13.6	37.2	8.5	317.6	8.6	0.0	5.3	62	639

*See Figure 17, map of count areas.

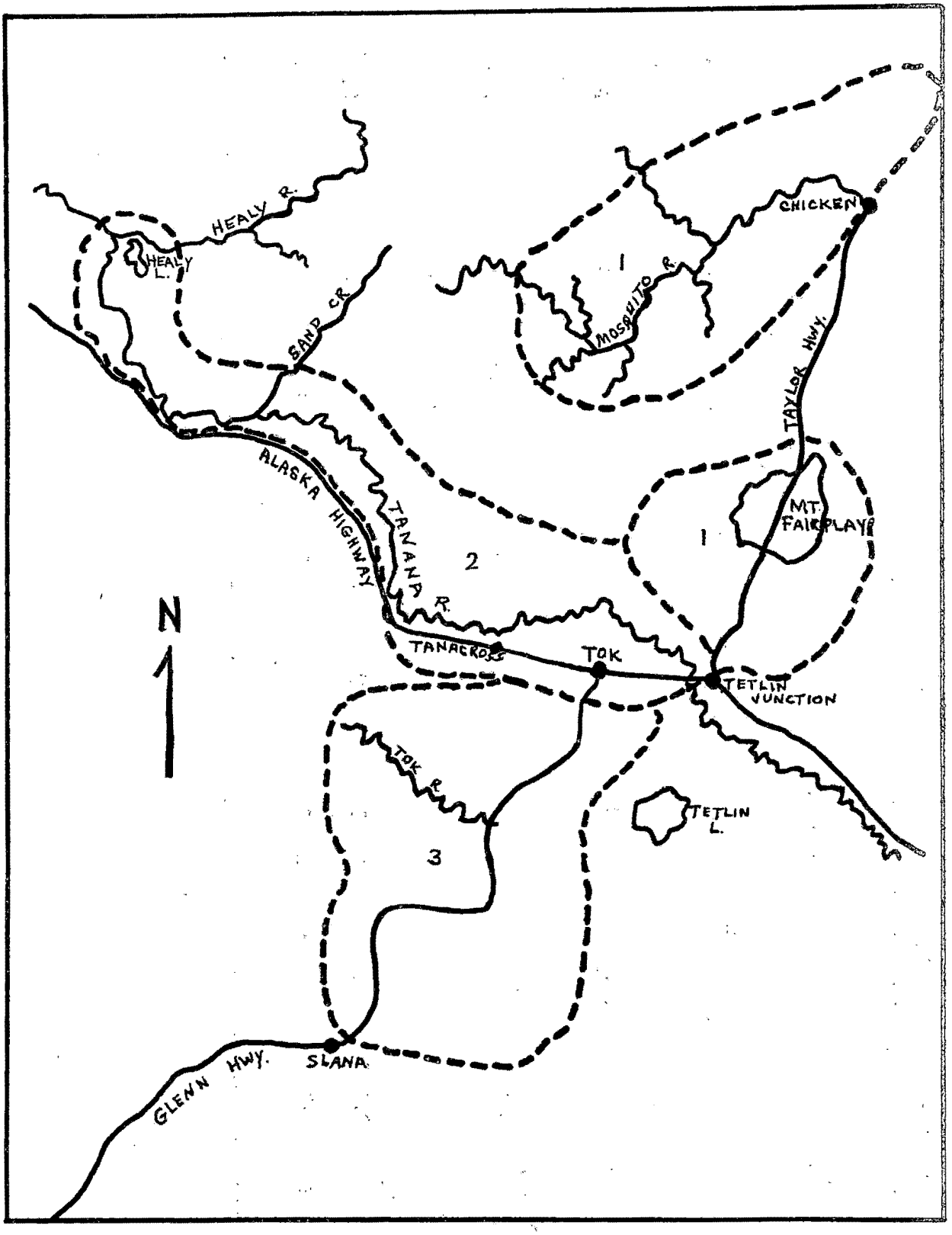


Fig. 17 Moose composition count areas, Units 20C and 12, Tok area.

Table 51. Moose sex and age ratios, Yukon River, Unit 21, 1962-1968.*

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % in herd	moose per hr	Total moose
Lower Yukon	11/62	45.9	16.3	57.1	10.1	222.2	14.6	20.0	9.1	-	395
Middle Yukon (Kaltag-Tanana)	3/63	-	-	-	-	-	-	6.3	15.8	95	647
Middle Yukon (Tanana Holy Cross)	3/66	-	-	-	-	-	-	7.8	18.6	99	704
Middle Yukon (Tanana-Nulato)	3/68	-	-	-	-	-	-	-	-	-	476

* Not illustrated.

Table 52. Moose sex and age ratios, Koyukuk River, Units 21 and 24, 1954-1967.*

Area	Date	total ♂ per 100 ♀	small ♂ per 100 ♀	small ♂ per 100 large ♂	small ♂ % in herd	small ♂ per 100 ♂ calves	calves per 100 ♀	incidence of twins per 100 cows w/calf	Calf % moose in herd	moose per hr	Total moose
Koyukuk	10-12 1954	131.6	65.8	100.0	21.0	161.3	81.6	36.7	26.1	-	119
"	10-12 1957	79.5	15.9	25.0	6.2	48.3	65.9	23.9	25.7	35	226
"	10-12 1958	43.5	13.4	44.3	6.3	48.6	55.0	19.0	26.0	132	553
"	12/ 1959	99.3	21.6	27.8	8.1	77.9	55.4	20.6	20.8	51	370
"	1/ 1961	-	-	-	-	-	-	29.2	32.1	-	579
"	3/ 1963	-	-	-	-	-	-	4.6	11.4	133	1003
"	3/ 1966	-	-	-	-	-	-	6.0	21.4	223	668
"	3/ 1968	-	-	-	-	-	-	-	-	264	739

*Not illustrated.

Table 53. Summary of moose parturition counts, Tanana Flats, Post-Tagging, 1968.

Area	Date	Newborn Calves ♀/0	♀/1	♀/2	♀/?	Yearlings W/0♀	♀/1	♀/2	Tagged	Total Calves	Total Yrlings	Total ♀	Calves: 100 ♀	Yrlings: 100 ♀	♂	Total Moose	Moose/ Hr
I	6/4-5	79	67	8	23	5	18	1	0	83	20	201	41.2	9.9	267	571	88
										45 tagged calves							
II	6/13	31	22	1	0	0	3	0	0	24	3	57	42.7	5.2	70	154	42
										7 tagged calves							
III	6/12	18	14	6	8	1	24	0	0	26	24	71	36.6	33.8	73	194	68
										7 tagged calves							
Tanana-Salchaket	6/4	2	13	1	5	1	1	0	0	15	1	23	65.2	4.3	2	41	20
										5 tagged calves							
E. of area I, S. of Salchaket	6/4	2	7	1	0	0	2	0	0	9	2	12	75.0	16.7	1	24	26
										1 tagged calf							
TOTALS		132	123	17	36	7	48	1	0	157	50	364	43.4	11.0	413	984	
										65 tagged calves, total							

Table 54. Summary of moose parturition counts, Yakutat, Unit 5, 1968.

Area	Date	Newborn Calves ♀/0	♀/1	♀/2	♀/?	Yearlings W/0♀	♀/1	♀/2	Tagged	Total Calves	Total Yrlings	Total ♀	Calves: 100 ♀	Yrlings: 100 ♀	♂	Total Moose	Moose/ Hr
Ustay R.-Alsek R.	5/27	23	4	4	1	3	1	0	-	12	1	36	33.3	2.7	19	68	29
Situk R.-Dangerous R.	5/24	11	1	3	0	1	1	1	-	7	3	18	38.8	16.7	11	39	34
TOTAL		34	5	7	1	4	2	1	-	19	4	54	35.2	7.4	30	107	32

Table 55. Summary of Moose Yearling Counts, Matanuska and Lower Susitna, Unit 14, May 1968.

area	date	large ♂	small ♂	total ♂	♀ W/0	♀ W/1	♀ W/2	total ♀	total adults	lone calves	total calves	unid. sex & age	total moose	count time (hrs)	Yrlys/ 100 ♀
Matanuska Valley 1*	4/30	0	2	2	86	24	2	112	114	2	30	0	114	3.33	27
Palmer Hwy. Flats	5/3	0	0	0	23	5	1	29	29	1	8	0	37	0.5	28
Matanuska Valley 2*	5/3	1	0	1	48	17	1	61	62	0	19	0	81	1.6	31
Matanuska Valley 3*	5/7	0	0	0	6	3	0	9	9	0	3	0	12	0.6	33
Total Matanuska Valley		1	2	3	163	49	4	211	214	3	60	0	244	6.0	28
Jim-Swan	5/3	1	0	1	24	11	1	36	37	1	14	0	51	0.5	39
Lower 4* Susitna	5/1	1	0	1	18	6	0	24	25	0	6	0	31	2.30	25
Lower 5* Susitna	5/2	3	0	3	84	35	0	119	122	0	35	0	157	5.33	29
Lower 6* Susitna	5/7	0	1	1	38	10	0	48	49	1	11	0	60	4.3	23
		4	1	5	140	51	0	191	196	1	52	0	248	11.9	27

1* Timberline, Premier Mine to Little Susitna
2* Timberline, Little Sue to Willow
3* Lake Nancy Flats to Willow
4* Willow Creek from Susitna River to Alpine
5* Alpine and below from Willow to Sheep Creek
6* Flats from Willow to Little Willow

Exploratory counts in the McArthur River and Susitna River flats (Unit 16) yielded small sample sizes from which conclusions should not be drawn, but also provided information about favored calving areas which will be useful in future counts.

In Unit 20A on the Tanana Flats initial production of calves seemed good, although phenologically the spring was advanced over the previous two years which made finding moose more difficult in early June especially in areas II and III.

Tagging and Movements

Tanana Flats

Moose calves were tagged on the Tanana Flats south of Fairbanks from May 26 through May 31. Tagging effort was concentrated in Area I, an arbitrarily described portion of the Flats lying between the Bonnifield Trail on the west, the Military Sled Trail on the east, the Tanana River on the north and the dense spruce timber on the south. Much of Area I consists of large wet marshes with shrub and tree growth of any size limited to present or former stream and pond banks. Tagging conditions are nearly ideal. In Areas II and III which lie between the Bonnifield Trail and the Wood River much of the cover consist of mature black spruce or birch and the marshes are smaller and support taller shrub growth. The few large marshes generally have deeper water than those in Area I. Thus tagging is much more difficult as are subsequent sightings of tagged moose.

The data reflecting numbers and location of calves tagged are summarized in Tables 57 and 58.

Returns from the 1966 tagging operation suggest that many of the moose tagged on the Tanana Flats are also winter residents there, but that a substantial number also move to the Alaska Range, thirty to fifty miles away, and some cross the Tanana River to winter in adjacent portions of sub-unit 20B. Returns from the 1968 tagging effort are still rather limited and will not be discussed at this time.

Department personnel assisting in moose calf tagging included Art Bratlie, John Frank, Jack Didrickson, Larry Jennings, Scott Grundy, Tom Cates, Jim Miller, Lonnie Richards, Sam Snyder, Bea Faber, Jean Ernest, and Dick Bishop. U.S. Army personnel assisting are listed in Table 59.

Matanuska Valley

Adult tagging in the Matanuska Valley was curtailed due to poor weather and snow conditions.

Table 56. Summary of moose parturition counts, Cook Inlet, Unit 16, 1968.

Area	Date	Newborn Calves ♀/O	♀/1	♀/2	♀/?	Yearlings W/O♀	♀/1	♀/2	Tagged	Total Calves	Total Yrlings	Total Calves: 100 ♀	Yrlings: 100 ♀	♂	Total Moose	Moose/ Hr
McArthur R. Flats	6/13-14	39	17	6	0	18	0	0	0	23	0	80	28.8	0.0	18	121	-
Susitna R. Flats	6/14	23	3	4	1	13	0	0	0	11	0	44	25.0	0.0	24	79	-
TOTAL		62	20	10	1	31	0	0	0	34	0	124	27.4	0.0	42	200	-

Table 57. Summary of Moose Calf tagging data, Tanana Flats, 1968.

Area	Calves Tagged ♂	♀	?	Sets Twins	One of twins	Total Tagged	Time * Required	# Tagged per hour	Helicopter Used
I	114	120	0	18	10	234	50.5	4.6	12E4 HU1A
II	33	24	0	6	3	57	12.1	4.7	12E4
III	37	30	0	8	3	67	19.8	3.4	12E4
TOTAL	184	174	0	32	16	358	82.4	4.3	HU1A 12E4

Table 58. Area Moose Tagging Results, Tanana Flats, 1968.

AREA I

	26 May	27 May	28 May	29 May	30 May	31 May		TOTAL
Total Moose	35	53	72	51	1	22		234
No. Males	18	30	32	25	-	9		114
No. Females	17	23	40	26	1	13		120
Sets of Twins	2	5	5	5	-	1		18
One of Set	1	5	1	2	-	1		10
Color Marker **	R W/tw	R W/tw	R W/tw	R W/tw	Red	R W/tw		
Tag Series *								
Chopper Use Hrs.	12E4 6.6	HUIA 10-12	HUIA 12-13	HUIA 10-12	12E4 -	12E4 6.9		50.5

* 6830-6847, 6864-6866, 6868-6890, 6892-6895, 6897-6898, 6899, 6926-6938, 6940-6946, 6976-6977, 6979-6983, 6985-6999, 7301-7380, 7384-7425, 7428-7430, 7432-7437, 7439-7445, 7447-7450, 7452-7454, 7459-7489, 7491-7552, 7554, 7571-7575, 7701-7732, 7734-7760, 7762-7775, 7778-7799, 7803, 7805-7821, 7823, 7831-7832, 7851-7875, 7883, 7887, 8098, 8226-8227, 8505, 8524, 8601-8607, 8609,8611-8615, 8619, 8623, 8625, 8672, 8675, 8693-8698, 8700

Duplicate Numbers:

7856 on RE, Specimen #1 and LE, Specimen #7, May 28
7415 on RE, Specimen #21 and LE, Specimen #22, May 28
7498 on LE, Specimen #15 and 16, May 29
8698 on LE, Specimen #23 and 24, May 29

** R - Red
W - White
tw - Twin

Table 58. Area Moose Tagging Results, Tanana Flats, 1968.

AREA II

	26 May	27 May	28 May	29 May	30 May	31 May	TOTAL
Total Moose	--	--	--	40	17	--	57
No. Males	--	--	--	25	8	--	33
No. Females	--	--	--	15	9	--	24
Sets of Twins	--	--	--	5	1	--	6
One of Set	--	--	--	3	--	--	3
Color Marker**				⊕ B/tw	O B/tw		
Tag Series *							
Chopper Use Hrs				12E4 8.11	12E4 4.0		12.1

* 7512, 7525, 7542-7547, 7901-7914, 7916-7924, 7926-7935, 7937-7949, 7951-7952, 7954-7956, 7985-7988, 7991, 7994-7998, 8513-8522, 8526-8539 (7987 duplicated on Specimen #1 & 3, May 30)

7987 - LE on Specimen #1 and 3, May 30

** O - Orange
B - Blue
tw - Twin

Table 58. Area Moose Tagging Results, Tanana Flats, 1968.

AREA III

	26 May	27 May	28 May	29 May	30 May	31 May		TOTAL
Total Moose	--	21	33	1	11	1		67
No. Males	--	11	19	--	6	1		37
No. Females	--	10	14	1	5	--		30
Sets of Twins	--	1	6	--	1	--		8
One of Set	--	1	1	--	1	--		3
Color Marker **			Y P/tw @7539	O	Y P/tw	Y		
Tag Series *								
Chopper Use Hrs		12E4 5.1	12E4 6.8	12E4 7.9	12E4	12E4		19.8

* 6901-6909, 6911-6912, 6916-6917, 6921-6922, 6924-6925, 6947-6948, 6951-6964, 6966-6967, 6969-6972, 6974-6975,7438, 7501-7510, 7513-7522, 7526-7529, 7532-7541, 7556,7557-7559, 7561-7568, 7576-7577, 7579-7591,7594-7595, 7598-7600, 7983-7984, 7990, 7992-7993, 7995, 7999, 8000, 8501-8506, 8509-8510, 8540-8544, 8546-8547, 8648-8649

** Y - Yellow
P - Pink
O - Orange
tw - Twin

Table 59. U.S. Army support, Tanana Flats Moose Calf Tagging, 1968.

SSG Wayne Booher, Post Conservation NCO

SFC Gail L. Burch, 171st Inf Bde CM1 - NCO

2nd Lt Roger S. Streeter, 171st Bde, CM1 OFF

CPT John C. Taylor, 47th MED Det Post Dent. CL.

CPT Arthur S. Hansen, B.A.H. Dent. CL.

MAJ. William E, Kalmus, 12th Avn Co. (FW)

CPT Mendeln S. Solomon, 171st Avn Section, 171st Inf Bde.

TRANS MDM HEL CO (N)

Cpt John G. Swan, Jr.

CW3 Billie M. Couch

CW3 Kenneth E. Estess, 18th Transportation Det.

CW2 Gordon D. Colis

CW2 Ronald H. Cone

CW2 David R. Talbot

CW2 Wayne F. Woodbury

SFC Enzie A. Stovall

SSG Jerry D. Jordan

SSG Henry A. Hamman

SP6 Maurice L. Holman

SP5 Charles G. Lampert

SP4 James A. Donaldson

Range - Productivity Relationships

Construction

Construction of the four, 1 mi^2 enclosures continued in 1967-1968. Installation of fence posts for all enclosures was completed, exclosures were completed in enclosures 1 and 2. Enclosures 1 and 2 were completed, and spruce poles were installed along the mid-line and top-line of the fence in enclosure 1 to reduce efforts of and damage by moose attempting to go over or through the fence.

Vegetation (Data and Summary By R. Seemel, Kenai Moose Range).

Details of techniques used in the vegetation studies are included in the "Techniques" section.

During the summer of 1967 Bob Seemel, Assistant Refuge Manager, Kenai National Moose Range, and assistants located and gathered data on plant succession on over 100 plots in the various vegetation types in enclosures 1 and 2. The data are being summarized.

Thirty plots of 3/20 acre in size were established in each of the seven cover types in each of enclosures 1 and 2 for the study of browse production and utilization. Total available browse and annual growth were measured on these plots. The plots were examined again in the spring of 1968 to determine utilization of the browse by moose which were held in the two enclosures over the winter.

In enclosure 2, moose browsed on about 30 percent of the stems, from which they removed an average of 66 percent of the annual growth. Moose rarely utilized more than the annual growth in the winter of 1967-1968.

The data for enclosure 2 are given in Table 60 through 63. Data for enclosure 1 are being analyzed.

Stocking

The gates of enclosures 1 and 2 were left open until late December - early January when aerial observation showed that at least 10 moose were in each enclosure. The moose had wandered into and out of the enclosures naturally.

In January the moose in the pens were captured by using a Cap-chur dart gun and darts (Table 65). Sixteen mg. and 23.5 mg. of succinylcholine chloride were the doses given to calves and adults respectively. An incisor and blood sample were taken from the captured animals and they were marked with ear tags and

Table 6Q. Estimated number of stems of browse species per acre in Vegetation Types and diameter classes, Enclosure #2, Kenai Moose Research Station, Fall 1967.

Dia.Class (≤N)	VEGETATION TYPE*																											
	Dense Birch				Med. Birch			Thin Birch				Spruce Birch				Spruce				M.H. Thin				M.H. Dense		
	Bir	A	V	W	Bir	A	W	Bir	A	W	AL	Bir	A	V	W	Bir	A	W	N	Bir	A	V	W	Bir	A	V
1/4"	7242	23	23	114	4458	23	152	3730	91	75	0	1113	27	9	36	667	23	104	1072	1371	218	36	27	471	336	309
1/2"	16995	58	23	325	10161	31	227	6885	61	122	129	4030	36	27	118	1453	30	160	2341	1243	145	36	9	127	173	0
3/4"	6313	15	0	166	3481	23	98	2569	52	68	0	1878	18	0	36	455	15	0	129	190	36	0	0	0	18	18
1"	1189	0	0	52	682	0	7	562	15	15	0	426	0	0	0	123	0	0	8	9	0	0	0	0	0	0
1 1/4"	408	0	0	7	217	0	0	129	0	0	0	281	0	0	0	37	0	0	0	0	0	0	0	0	0	0
1 1/2"	173	0	0	0	26	0	0	30	0	0	0	63	0	0	0	7	0	0	0	0	0	0	0	0	0	0
1 3/4"	46	0	0	0	14	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2"	21	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2 1/4"	7	0	0	0	14	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL & (%)	32394(97.57)				19110(96.86)			13914(95.68)				7809(96.22)				2742(41.48)				2813(84.73)				616(42.16)		
	96(0.29)				137(0.69)			219(1.51)				81(1.0)				68(1.03)				399(12.02)				527(36.56)		
	46(0.14)							280(1.92)				36(0.44)				264(3.9)				72(2.17)						
	664(2.0)				484(2.45)			129(0.89)				190(2.34)				3550(53.59)				36(1.08)				309(21.28)		
GRAND TOTAL	33,200				19,731			14,542				8,116				6,624				3,320				1,452		

* Species within types are abreviated thus: Bir = White Birch, A = Aspen, V = High bush cranberry, W = Willow, AL = Alder, N = Dwarf Birch, "M.H." = Mature Hardwood.

Table 61. Estimated annual production of Browse Species in enclosure #2, Kenai Moose Research Station, Fall 1967. Estimates are given for diameter class, and Vegetation Type, in LB/Acre.

	VEGETATION TYPE*														
Dia.Class	Dense Birch				Med.Birch			Thin Birch				Spruce Birch			
(≤N)	Bir	A	V	W	Bir	A	W	Bir	A	W	AL	Bir	A	V	W
1/4"	15.88	0.06	0.03	0.42	12.98	0.06	1.12	12.96	0.22	0.55	0	3.84	0.07	0.01	0.13
1/2"	145.12	0.09	0.06	2.82	109.89	0.22	1.96	78.83	0.16	1.06	0.02	19.25	0.09	0.07	1.06
3/4"	138.03	0.03	0	3.77	86.94	0.03	2.24	67.87	0.40	1.53	0.36	34.53	0.04	0	0.82
1"	66.13	0	0	1.22	35.31	0	0.20	30.44	0	0.20	0.24	18.70	0	0	0
1 1/4" & over	62.13	0	0	0	36.55	0	0	32.14	0	0	0	28.97	0	0	0
TOTALS	427.29	0.18	0.09	8.23	281.67	0.31	5.52	222.24	0.78	3.34	0.64	105.29	0.20	0.08	2.01

* M.H. = Mature Hardwoods. Species abbreviations: Bir = Paper Birch, A = Aspen, V = High Bush Cranberry, W = Willow, AL = Alder, N - Dwarf Birch.

Table 61. Estimated annual production of Browse Species in enclosure #2, Kenai Moose Research Station, Fall 1967. Estimates are given for diameter class, and Vegetation Type, in LB/Acre. (continued)

	VEGETATION TYPE*										
Dia.Class		Spruce			M.H. Thin				M.H. Dense		
(≤N)	Bir	A	W	N	Bir	A	V	W	Bir	A	V
1/4"	1.60	0.09	0.43	1.47	3.28	0.54	0.05	0.10	1.13	0.83	0.43
1/2"	8.34	0.08	1.45	6.20	7.12	0.36	0.10	0.20	7.28	0.43	0
3/4"	12.66	0.03	0	0.36	5.32	0.09	0	0	0.51	0.04	0
1"	5.91	0	0	0	0.44	0	0	0	0	0	0
1 1/4" & over	2.63	0	0	0	-	-	-	-	-	-	-
TOTALS	31.14				16.16				8.92		
		0.20				0.99				1.30	
			1.88				0				
				8.03				0.30			0.43

Table 62. Utilization of Browse Species within Vegetation Types and Diameter Classes, Enclosure #2, Kenai Moose Research Station Winter 1967-1968. In LB/Acre.

Dia.Class (≤N)	VEGETATION TYPE* Dense Birch Bir	A	V	W	Med. Birch Bir	A	W	Thin Birch Bir	A	W	AL	Spruce Birch Bir	A	V	W	Spruce Bir	A	W	N	M.H. Thin Bir	A	V	W	M.H. Dense Bir	A	V
1/4"	0.32	-	-	0.02	0.18	-	0.08	0.16	-	-	-	0.12	-	-	-	0.01	-	-	0.30	0.28	0.07	-	-	-	-	-
1/2"	28.12	-	-	0.85	20.35	-	0.34	17.46	0.05	0.13	0.01	2.26	0.03	-	-	0.66	0.02	0.09	2.03	1.40	0.12	0.02	-	0.63	0.03	-
3/4"	33.72	-	-	0.88	22.51	0.02	0.47	21.68	0.05	0.20	0.24	7.90	-	-	0.21	5.50	0.02	0.31	0.13	2.31	0.02	-	-	0.39	0.07	-
1"	23.21	-	-	0.34	10.14	0	0.20	8.85	0.02	0	0.18	6.73	-	-	-	0.71	0	0.20	0	0.61	-	-	-	-	-	-
1 1/4" & over	11.85	-	-	-	1.51	-	-	1.79	-	-	-	2.49	-	-	-	0.20	-	-	-	-	-	-	-	-	-	-
TOTALS	97.22				54.69			49.94				19.50				7.08				4.60				1.02		
		0				0.02			0.12				0.03				0.04				0.21				0.10	
			0							0.33				0				0.60				0.02				
				2.09			1.09				0.43				0.21				2.46				0			0

* M.H. = Mature Hardwoods. Species Abbreviations: Bir = Paper Birch, A = Aspen, V = High bush cranberry, W = Willow, A = Alder, N = Dwarf Birch.

Table 63. Total Utilization of Browse Species within Vegetation Types and in all Types, Enclosure #2, Kenai Moose Research Station, Winter 1967-1968.

Type	Area (Acres)	UTILIZATION BY SPECIES, IN LB/ACRE											
		Birch		Willow		Aspen		High-Bush C.		Dwarf Br.		Alder	
		LB/Acre	LB	LB/Acre	LB	LB/Acre	LB	LB/Acre	LB	LB/Acre	LB	LB/Acre	LB
Dense Birch	71	97.22	6903	2.09	148								
Med. Birch	80	54.69	4325	1.09	87	0.02	2						
Thin Birch	82	49.94	4095	0.33	27	0.12	10					0.43	35
Spruce Birch	35	19.50	682	0.21	7	0.03	1						
Spruce	106	7.08	751	0.60	63	0.04	4			2.46	261		
Mature Hardwood Thin	170	4.60	782	-	-	0.21	36	0.02	3				
Mature Hardwood Dense	107	1.02	109	-	-	0.10	11						
TOTALS			17,697		332		64		3		261		35=18,392 LB.

18,392 LB. of Browse used by 25 to 35 moose between Oct. 15 and May 1, or 92 LB. per day.

Table 64. Data on moose captured and marked at the Kenai Moose Research Station, January 1968.*

Date	Pendant No.	Tag Nos.	Sex	Age	W/Calf	Pen No.	Anectine Dose (mg)	Hit Location	Time to* Drop	Time to* Recover	Remarks
1/24/68	10	LE 4240 RE 4241	F	Calf		1	16	L. Thigh R. Ribs	--	--	Two shots
1/24/68	8	LE 4239 RE 4238	F	Calf		1	16		--	--	
1/25/68	Ear Tag 4250	LE 1138 RE 1137	M	Calf		2	?	R. upper ham	9:20	?	
1/25/68	17	LE 3991 RE 3994	F	Calf		2	16	R. rump	3:00	30:00	Art. resp. used for recovery
1/17/68	1	LE 1119 RE 1120	F	Adult 4+		1	23	R. ham	6:30	30:45	Pregnant
1/17/68	2	LE 1121 RE 1122	F	Adult 4+		1	23	R. ham	13:25	28:50	Pregnant
1/17/68	3	LE 1123 RE 1126	F	Adult 5+		1	23	R. ham	13:30	23:10	Pregnant
1/18/68	4	LE 1127 RE 1128	F	Adult 15+	Yes	1	23.5	L. underside	17:35	36:00	
1/18/68	5	LE 1129 RE 1130	F	Adult 7+		1	23.5	L. high middle	15:00	?	Old
1/18/68	6	LE 1131 RE 1132	F	Adult 10+		1	23.5	L. high middle	15:00	1:7:20	Old

* min:sec.

Table 64. Data on moose captured and marked at the Kenai Moose Research Station, January 1968. (cont.)

Date	Pendant No.	Tag Nos.	Sex	Age	W/Calf	Pen No.	Anectine Dose (mg)	Hit Location	Time to* Drop	Time to* Recover	Remarks
1/24/68	9	LE 3987 RE 3988	F	Adult 5+	Yes	1	23.5	L. flank	19:45	35:15	
1/24/68	7	LE 4244 RE 4245	F	Adult 4+		2	23.5	L. rump	5:00	?	Art. resp. used for recovery
1/24/68	11	LE 3990 RE 3989	F	Adult —		2	23.5	Loin, dorsal surface	17:00	26:40	Conscious and hackles up
1/24/68	12	LE 4242 RE 4243	F	Adult 6+		2	23.5	High L. loin	18:00	?	
1/24/68	13	LE 3398 RE 3400	F	Adult —	Yes	2	23.5	L. dorsal forward of loin	14:10	25:35	
1/24/68	14	LE 3992 RE 3993	F	Adult —	Yes	2	23.5	?	16:35	24:20	Alert, with ears back
1/25/68	15	LE 4248 RE 4249	M	Adult 2+		2	23.5	?	9:00	?	
1/25/68	16	LE 4247 RE 4246	F	Adult 9+		2	23.5	L. R. Spine	?	?	
1/25/68	Ear tag 3995	LE 3996 RE 3997	F	Adult 5+		2	23.5	L. flank high	15:00	?	

a collar of the type developed for moose in the Matanuska Valley. Results with the drug dosages were variable on adults probably due to variation in size of the moose and relatively crude method of measuring the dosage. The Palmer .22 blank charges used in a Palmer shotgun with an adapter give extremely erratic results in penetration at similar ranges. Some darts barely stuck while with others the dart body was driven into the flesh. These charges can not be recommended for this work. They are generally too powerful for use on calves. One calf (Pendant #17) later died probably as the result of injuries caused by the dart.

The presence of 13 to 15 moose beyond the needs for stocking in enclosure 2 provided a much needed opportunity to obtain reproductive, age, and blood specimens. No collections had been made in the area since the 1965 antlerless season. These moose were removed by herding out the gates or by shooting them to obtain blood, age and reproductive tract specimens. Data on these moose will be presented at a later time.

Most work on the moose enclosures was abruptly interrupted in June by the fatal airplane accident involving Art Bratlie, who had supervised the construction activities, and John Frank, who was organizing the studies on moose at that time. Active work is just being resumed at the time of writing. Al Johnson deserves considerable credit for having kept the construction and maintenance underway following the accident.

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APPENDIX

Alaska Department of Fish and Game personnel and cooperators of the moose work plan.

Southeastern Alaska

Frank Jones
Jerold Deppa

Southcentral Alaska

Loyal Johnson
Arthur Bratlie (Deceased)
John Frank (Deceased)
Jack Didrickson
Julius Reynolds
Royce Perkins
Lyman Nichols
James Erickson
John Klingbiel
Walt Cunningham

Interior-Arctic Alaska

Robert A. Rausch
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Robert A. Rausch
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