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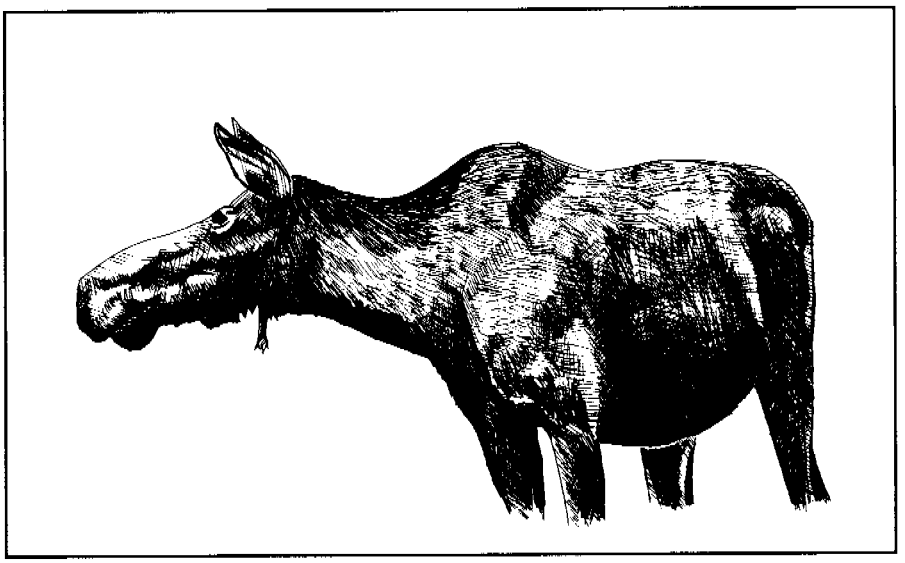
Alaska Department of Fish and Game
Division of Game
Federal Aid in Wildlife Restoration
Research Progress Report

LOWER SUSITNA VALLEY MOOSE POPULATION IDENTITY AND MOVEMENT STUDY



by
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Project W-23-1
Study 1.38
December 1988

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PROGRESS REPORT (RESEARCH)

State: Alaska Project Title: Big Game Investigations

Project No.: W-23-1 Study Title: Lower Susitna Valley moose population identity and movement study - GMU 14B Substudy

Study No.: IB-1.38

Period Covered: 1 July 1987 - 30 June 1988

SUMMARY

Moose related aerial-surveying, marking, and radio-relocating activities were conducted in the lower Susitna River Valley in Southcentral Alaska. Pertinent data from moose killed by collisions with trains and highway vehicles were collected. Several resource uses in the lower Susitna River valley that may significantly impact moose populations were noted, potential conflicts with moose examined, and future research plans outlined.

Seven and 6 moose, respectively, were captured and radio-marked in alpine habitats of the Talkeetna Mountains (Game Management Unit [GMU] 14B) and in forested habitats north of Wasilla (i.e., near Coal Creek) where birch trees had been cut for personal-use firewood. Thirteen surveys were conducted to relocate 60 radio-marked moose in the study area.

Between 5 and 8 December 1987, a stratified random census was conducted to estimate moose numbers in GMU 14B. Between 2 November 1987 and 20 April 1988, 7 composition and distribution surveys of moose herds were conducted in alpine habitats of the Talkeetna Mountains; sex-age composition of moose herds has been assessed there annually.

Lower jaws, information on sex, and date and location of kill were obtained from over 210 moose killed by collisions with trains and highway vehicles in GMU 14A, 14B, and 13E. Winter mortality of moose in GMU 16A was assessed by counting their carcasses on the Moose and Kroto Creek floodplains on 28 April 1988. Dense birch forest habitat in the Kashwitna Corridor was visited during the winter to determine food sources available to moose.

Data obtained during this reporting period are being transcribed and prepared for analysis. Analysis of these data has been deferred to a later reporting period. Some data gathered prior to this reporting period have been analyzed (Modafferi 1988). Plans for the next reporting period tentatively include radio-marking moose in areas where timber is harvested by clear-cutting methods.

CONTENTS

BACKGROUND

Prior to statehood, the Susitna River Valley was ranked as the most productive moose (Alces alces) habitat in the territory (Chatelain 1951). Today, the innate potential of this area as habitat for moose is probably unsurpassed throughout the state.

The lower Susitna River valley is the focal point of more development than any other region in the state. Proposed and progressing projects involving grain and crop agriculture, dairy and grazing livestock, commercial forestry and logging, personal-use cutting of firewood, mineral and coal mining, land disposals, hydroelectric projects, capital-site selections, wildlife ranges and refuges, human recreation and settlement, urban expansion, further development of the highway system, and increased railroad traffic in the region may greatly detract from the potential of the area to support moose.

Though development and associated activities may tend to decrease overall moose abundance, there is pressure from resource user groups to increase moose populations so that their demand for greater direct allocations to commercial, consumptive, and nonconsumptive uses can be satisfied. The development activities and conflicting demands of resource users have created a tremendous need for timely and accurate general and site-specific knowledge about moose populations in the lower Susitna River valley (GMU's 14A, 14B, 16A, 16B, and 13E). The demand for this information originates from an array of local, state, and federal land and resource management agencies, and it will likely intensify in the future in response to (1) increased pressures to develop additional lands, (2) increased numbers of users and types of resource use, and (3) a more complex system for allocating the resource to potential users.

Game Division presently lacks appropriate and/or sufficient information about moose populations in the lower Susitna River valley to accurately, consistently, and satisfactorily assess ultimate impacts of contemporary demands on the moose resource. The Division is therefore unable to knowledgeably dispute or condone specific demands or provide recommendations that would effectively regulate and minimize negative impacts on moose populations or habitat. Additionally, the Division must be knowledgeable about moose subpopulation behavior in order to propose, design and implement mitigation plans to offset unavoidable negative impacts to moose subpopulations or habitat.

Since major decisions on land use and resource allocation in the lower Susitna River Valley are presently being made and will continue to be made in the future, it is imperative that the Game Division (1) proceed to review, unify, and summarize the present state of knowledge on lower Susitna River valley moose populations and (2) proceed with new studies to augment this data base so future actions having an impact on moose populations or their habitat may be promptly recognized, evaluated, and minimized and/or mitigated.

Habitats and environmental conditions of the lower Susitna River valley vary greatly. Because many resource use conflicts require site-specific knowledge, numerous inter-related substudies must be conducted to adequately understand movement patterns and identities of major moose subpopulations throughout the area. Initial substudies will be conducted in areas where immediate problems or conflicts in moose management exist.

When I evaluated conflicts in resource use for the entire lower Susitna River valley, it was apparent that initial

research efforts should begin in the western foothills of the Talkeetna Mountains (GMU's 14A and 14B) for the following reasons: (1) this area possesses the largest, densest post-rutting aggregation of moose in the region and, perhaps, the state; (2) it is the nucleus of development activities and resource use; (3) it provides recreation and resources accessible to over half of Alaska's human population; and (4) it has unique problems involving railroad and highway systems. Also, recent Susitna River hydroelectric environmental studies and a habitat suitability assessment project have pointed out a lack of basic knowledge about moose in the area.

Historical information available on moose populations in the Susitna River valley is limited to (1) harvest statistics (ADF&G files), (2) annual, but inconsistently conducted, sex-age composition surveys (ADF&G files); (3) inconsistently collected data for train- and vehicle-killed moose (ADF&G files), (4) an outdated population movement study based on resightings of "visually collared" moose (ADF&G files), (5) studies on railroad mortality and productivity of the railbelt subpopulation (Rausch 1958, 1959), (6) a sporadically monitored radiotelemetry population identity study in the Dutch and Peters Hills (Didrickson and Taylor 1978), (7) an incomplete study of moose-snowfall relationships in the Susitna River valley, and (8) a study of extensive moose mortality in a severe winter (1970-71) for which there is no final report.

Recent studies designed to assess the impact of a proposed hydroelectric project on moose have provided substantial amounts of contemporary data on populations in areas adjacent to the Susitna River and downstream from Devil Canyon (Arneson 1981; Modafferi 1982, 1983, 1984). Circumstantial evidence and cursory examination of these studies suggest that traditional sex-age composition counts conducted in widely spaced alpine areas of GMU's 14A and 14B were biased and had excluded samples from large segments of hunted moose subpopulations. These data also suggest that moose killed during late-winter hunting seasons in Subunit 14B had originated in Subunit 16A and that moose killed during hunting seasons in Subunit 16A had been included in composition surveys for Subunit 14A and 14B.

I believe that moose subpopulations in Subunit 16A remain largely unsurveyed because they occur in forested habitats and that these moose could be surveyed during winter when they occur in riparian habitats common to both Subunits 14B and 16A. The aforementioned data and the fact that traditional composition surveys have remained relatively insensitive to large annual changes in moose mortality rates indicate that

contemporary assumptions about movements and identities of moose subpopulations in the western foothills of the Talkeetna Mountains (Subunits 14A and 14B) are incorrect or, at least, overly simplistic.

A recent joint study, conducted by Divisions of Game and Habitat (Modafferi and Albert, unpubl. data) and designed to evaluate methods for assessing moose population status and habitat suitability, has begun to identify important moose wintering areas and document moose-snowfall relationships in a large portion of the lower Susitna River valley (GMU's 14A, 14b, 16A, 16B and 13E). Previous progress reports for this study are available (Modafferi 1987, 1988).

OBJECTIVES

Primary

To identify and delineate major moose subpopulations in the lower Susitna River valley.

To more precisely delineate annual movement patterns and location, timing, and duration of use of seasonal habitats.

Peripheral

To identify habitats and land areas that are important for maintaining the integrity of moose subpopulations in the lower Susitna River valley.

To assess effects of seasonal timing on results of annual sex-age composition surveys.

To locate winter range and calving areas used by lower Susitna River valley moose subpopulations.

To identify moose subpopulations that sustain "accidental" mortality on highway and railroad right-of-ways and mortality from open hunting seasons.

To determine moose natality rates and timing of calf and adult mortality.

STUDY AREA

The overall study area encompasses the lower Susitna River valley in Southcentral Alaska. This area includes all watersheds of the Susitna River downstream from Devil Canyon (Fig. 1) and all or portions of GMU's 14A, 14B, 16A, 16B, and

13E (Fig. 2). Initial field studies in the winter of 1985-86 were centered in alpine habitats along the western foothills of the Talkeetna Mountains between the Little Susitna and Talkeetna Rivers (GMU's 14A and 14B). Moose were captured and radio-marked (Fig. 3), and aerial moose surveys (Fig. 4) were conducted in these areas.

In the late winter of 1986, field studies of radio-marked moose were initiated in a lowland forested wintering area (see Figs. 3 and 4) located in GMU 14B between the Kashwitna River and Willow Creek (Kashwitna Corridor), where the Department of Natural Resources (DNR), Division of Forestry, proposes to harvest and actively manage timber resources.

In the winter of 1987-88, additional field studies of radio-marked moose were initiated in lowland forest habitat near Coal Creek north of Wasilla (Fig. 3), where the Division of Forestry has permitted personal-use cutting of birch trees for firewood. Data on moose herd composition and mortality were gathered on aerial surveys in lowland riparian wintering areas in the lower Susitna River valley (Fig. 4). Parallel population and identity studies were initiated in other areas of the lower Susitna River valley in March 1987 and February 1988 (Appendix B).

METHODS

Individual moose were captured and marked with ear tags and radio-transmitting neck collars. Each ear tag featured a discrete numeral, and each neck collar featured a discrete radio-transmitted frequency and a highly visible number.

Moose were captured and marked in 3 different habitats: (1) alpine habitats along the western foothills of the Talkeetna Mountains between the Little Susitna River and the South Fork of Montana Creek (GMU's 14A and 14B) during the winters of 1985-86 and 1987-88, (2) lowland forest habitat between Willow Creek and the Kashwitna River (Kashwitna Corridor) during the late winter of 1986-87, and (3) lowland forest habitat near Coal Creek about 10 km north of Wasilla, where personal-use cutting of firewood occurred during the late winter of 1987-88. These capture sites will be referred to as the Talkeetna Mountains, Kashwitna Corridor, and the Coal Creek areas, respectively.

Twenty-five moose captured and radio-marked during previous winters in the lower Susitna River valley floodplain (Arneson 1980; Modafferi 1982, 1983, 1984) typically had ranged throughout the study area (i.e., GMU's 14A, 14B, 16A, 16B, and 13E). Information gathered from these moose was included in

the analyses. Capture sites for these radio-marked moose will be referred to as the Susitna River.

Moose were typically immobilized with 4-6 mg carfentanil (Wildlife Laboratories, Ft. Collins, Co.) dissolved in 2-3 cc H_2O and administered with Palmer Cap-Chur equipment by personnel aboard a hovering Bell 206B or Hughes 500D helicopter. While immobilized, moose were marked with ear tags and neck collars and aged by visual inspection of wear on incisor teeth; antler conformation was considered when assessing age of males. Moose were assigned to the following age categories: calves, yearlings, 2- to 5-year-olds, 6- to 12-year-olds, and >12-year-olds. Sex of marked moose and their association with young of the year were noted. Immobilized moose were revived with an intramuscular injection of 90 mg naloxone hydrochloride (Wildlife Laboratories, Ft. Collins, Co.) per mg of carfentanil administered.

Forty-four moose were captured and marked between 23 December 1986 and 4 February 1987 in alpine habitats in the western foothills of the Talkeetna Mountains (Fig. 3). Marking procedures were initiated after 18 November 1985, when peak numbers of moose had been observed on prior aerial surveys (Modafferi 1987). Distribution of sampling effort between subareas within the alpine area roughly paralleled the moose distribution observed during aerial surveys. The proportion of male moose marked was higher than that observed on sex composition surveys, because male moose usually dominate the open hunting season harvest and more complete information about their behavior (vs. females) was desired.

On 28 January 1987, 7 moose were captured and marked in the Kashwitna Corridor area (Fig. 3). Sampling effort roughly paralleled moose distribution observed on a 7 January 1987 survey conducted between Willow Creek and the Kashwitna River (Fig. 4). The latter area roughly corresponds to the Kashwitna Corridor forest area, where timber harvest is proposed.

On 14 December 1987, 6 moose were captured in alpine habitats in the Talkeetna Mountains area (Appendix A). Two of these moose were marked and fitted with neck collars containing radio transmitters that emitted location and activity information that was received by satellites. Information on moose activity was obtained from motion sensors designed to detect movement of the radio collar and was assessed each second. The movement information was accumulated and transmitted for (1) the previous 24-hour period at the beginning of and (2) each minute during a satellite overpass. During February and March 1988, 6 moose were captured and marked in the Coal Creek area (Fig. 3), where personal-use cutting of firewood

had been permitted by the Division of Forestry. Captured moose frequented these areas to browse on buds, catkins, and twigs of branches that had been trimmed off birch trees cut for firewood.

Survey flights in Cessna 180 or 185 and Piper PA-18 aircraft equipped with 2-element yagi antenna (Telonics, Mesa, Az.) were conducted periodically to relocate radio-marked moose; the relocation points (audio-visual or audio) were noted on USGS topographic maps (1:63,360) and later transferred to translucent overlays of those maps for computer digitization and geoprocessing. Relocation surveys were conducted at about 2- to 3-week intervals, providing 35, 20, 4, and 178 relocations in the Talkeetna Mountains, Kashwitna Corridor, Coal Creek, and Susitna River areas, respectively, through 27 May 1988.

To determine moose distribution, abundance, and herd composition and to help delineate timing, magnitude, and duration of habitat use, 8 aerial surveys were periodically conducted in alpine habitats of the Talkeetna Mountains (Fig. 4), where annual sex-age composition moose surveys had been conducted.

Additional information on herd size, composition, and distribution was obtained from a stratified random moose census (Gasaway et al. 1986) conducted 5-8 December 1987 in GMU 14B. To assess moose winter mortality in GMU 16A, the floodplains of Moose and Kroto Creeks were surveyed for moose carcasses on 28 April 1988.

To evaluate the impact of moose killed by collisions with trains and highway vehicles on the vitality of subpopulations in the lower Susitna River valley, recipients of salvaged moose were required to provide its lower jaw as well as information on the sex and method, date, and location of kill to the Department of Fish and Game. The Alaska Railroad and Department of Public Safety recorded the location and date of all moose killed in their respective right-of-ways.

To denote hypothetical moose subpopulations, 7 subareas were identified within the Talkeetna Mountains area: Moss, Willow, Witna, Brownie, Wolverine, and Sunshine Mountains and Bald Mountain Ridge (Fig. 3). Subarea names are those associated with Vertical Datum Bench Mark (VDBM) notations on 1:250,000 scale USGS topographic maps. On 11 January 1988 I visited forested habitats in the Kashwitna Corridor to determine food sources available to moose.

RESULTS AND DISCUSSION

Movements of Radio-Marked Moose

Data on moose radio-relocations gathered during this reporting period are presently being transferred to a computer-organized filing system to facilitate quantitative analysis. Radio-relocation data collected during this reporting period have not been analyzed. Analysis and discussion of these data will be presented in a subsequent report.

Moose Mortality

Information on the sex and date and location of 200 moose killed by collisions with trains and vehicles was obtained during this reporting period. Incisor teeth from moose jaws will be processed to enhance appearance of cemental annuli for age determination during the next reporting period. The other data will also be analyzed at that time. Information on moose winter mortality in GMU 16A was obtained by surveying the Moose and Kroto Creek floodplains for carcasses on 28 April 1988.

Resource Use in Lower Susitna River Valley That May Significantly Impact Moose Populations

Timber Harvest on State and Matanuska-Susitna Borough Lands:

The Division of Forestry and the Matanuska-Susitna Borough are proposing active management of forest resources, commercial and personal-use timber harvests, and development of timber-based industries for extensive areas of Southcentral Alaska. These proposed developments will affect moose subpopulations in the lower Susitna River valley.

Previous utilization of forest products in the lower Susitna River valley has been limited to small-scale commercial harvesting of timber for firewood and saw logs and personal-use cutting of timber for firewood. Initially, the sale of timber involved 100,000 acres of land in the lower Susitna River valley; more recently the sale area has been increased to 215,000 acres from which 60,000 to 100,000 acres would actually be cut. The Matanuska-Susitna Borough proposes active forest management on about 40,000 acres of land.

Timber harvesting can have positive effects on moose populations. Timber harvest and forest management have resulted in tremendous expansion of moose populations in Scandinavian countries (Markgren 1974). However, substantial differences in moose management and environmental conditions between Alaska and Scandinavia may tend to counteract a similar response by Alaskan moose populations to timber harvest and active forest management. Some major

environmental changes associated with active forest management policies follow: (1) habitats and plant species composition will be altered (e.g., late successional plant communities will be converted to earlier seral stages); (2) human access may be increased; (3) other human activities within areas may become more common.

Hatcher Pass Ski Resort:

The DNR, Division of Land and Water Management, is promoting development of a recreational and ski area on 12,000 acres of land located about 15 km northwest of Palmer. Habitats in this area are most commonly utilized by moose during postrut and winter periods. Several environmental changes associated with development of a ski resort that may impact moose are the following: (1) vegetation will be altered and/or removed and (2) human activities in the area will substantially increase during the winter and perhaps during other seasonal periods.

Willow State Capital Site:

The Division of Land and Water Management is reviewing interim use of 102 mi^2 of state land that had been set aside for a relocation of the state capital. Interim use of land in the area will be divided among livestock grazing, public recreation, mining, fish and wildlife resources, and forestry. Portions of this area are used by large numbers of moose throughout this year. Least use probably occurs during late winter when many moose utilize lowland habitats among human settlements between Houston and Palmer. Significant alteration of some habitats in this area may affect their desirability and carrying capacity for moose during nonwinter seasonal periods. Conversion of mixed-forest habitats at lower elevations to early seral plant communities through timber harvest may have positive effects on some moose subpopulations by enhancing quality and quantity of winter range.

Wishbone Hill Surface Coal Mining Project:

Plans exist for development of an open-pit mine for extraction of coal in the Jonesville area (i.e., about 20 km northeast of Palmer). The mine site is located east of Buffalo Mine road between Moose Creek and Wishbone Hill and lies within the Matanuska Valley Moose Range and near moose wintering areas. Alteration of vegetation on moose winter range may impact resident and migratory moose subpopulations. Development plans for the mine should include provisions for minimizing impacts to moose and revegetating the site with appropriate plant species when mining operations have been completed.

FUTURE RESEARCH PLANS

Continue periodic radio-relocation of marked moose.

Conduct herd distribution, abundance, and composition surveys as snow cover permits through the 1988-89 winter. Surveys will be conducted in alpine areas of Talkeetna Mountains where timber harvest will most likely be initiated (i.e., along Alexander Creek and along the Yentna River near the Skwentna and McDougall).

Conduct field excursions into Kashwitna Corridor forest area to observe and assess use of those habitats by moose.

As radio-transmitters from previously marked moose become available, capture and radio-mark additional moose in the timber cuts of the Kashwitna Corridor.

Continue joint study with U.S. Fish and Wildlife Service involving moose marked with satellite-tracked collars.

Conduct "ground truth" studies to compare activity data transmitted from moose collars with activities of moose observed in the field.

Incidental to other field activities, gather information on seasonal foods of moose in the study area.

ACKNOWLEDGEMENTS

I am especially grateful to Dennis C. McAllister, Alaska Dept. Fish and Game, who made useful suggestions, pertinent criticisms, and willingly provided his assistance throughout this study. Dennis always managed to be available when needed, sometimes at the expense of his own time. He was invaluable in field aspects of this study, and I am thankful for his able assistance in all facets of this study.

I am grateful to my immediate supervisor Karl Schneider, who has always diligently supported the study of moose in the lower Susitna River valley. His sincere interest in the study has been a welcome stimulus to my efforts. He has also labored to keep my administrative duties to a minimum so that I might concentrate on the biological problems. I gratefully appreciate all his efforts.

The following persons also deserve special thanks:

C. Soloy, Soloy Heli-Ops, Wasilla, for expertly piloting helicopters during moose capture procedures; B. Wiederkehr,

Wiederkehr Air Inc. Palmer, for piloting super cub aircraft during herd distribution, abundance and composition surveys and aerial surveys to relocate radio-marked moose; and Larry Rogers, Southcentral Air, Kenai, for piloting Cessna 180/185 on moose radio-relocation surveys. These individuals are commended for piloting aircraft safely and efficiently during low-level flight operations.

J. Page, DNR, Division of Forestry, is recognized for assistance in field aspects of this study.

C. Grauvogel, area game management biologist responsible for GMU 14 A and B (the study area), is acknowledged for providing support for this moose study, a congenial working atmosphere, and ideas and suggestions for improvement of the study and analysis of data obtained.

L. Pank, U.S. Fish and Wildlife Service, is acknowledged for stimulating my interest in the application of satellite telemetry on moose and willingly cooperating in a joint-agency study.

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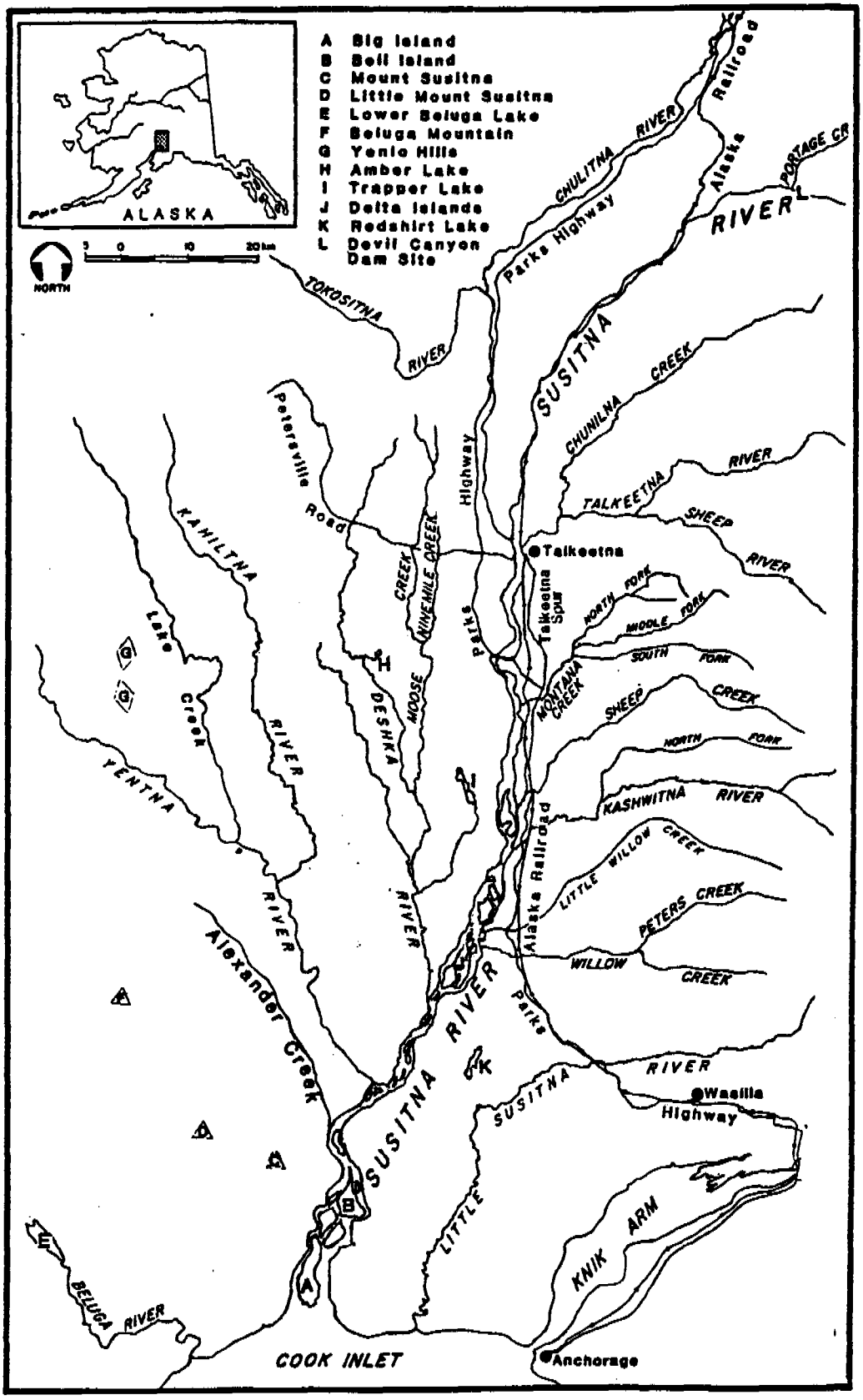

Figure 1. Map showing location of the study area in Alaska with names listed for rivers, lakes and other prominent landscape features.

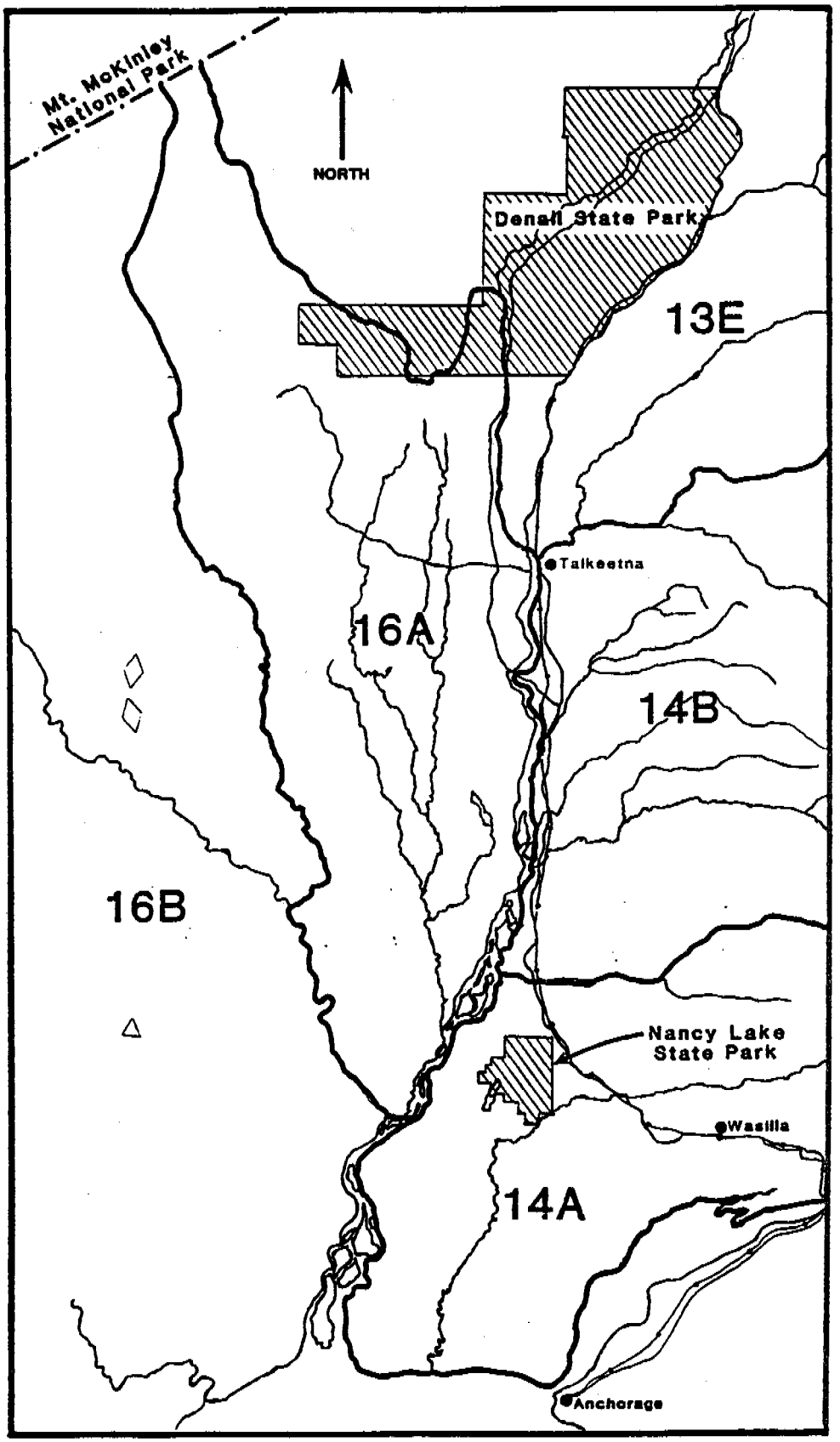

Fig. 2. Location of Game Management Subunits (13E, 14A, 14B, 16A and 16B) and state and national parks in the study area.

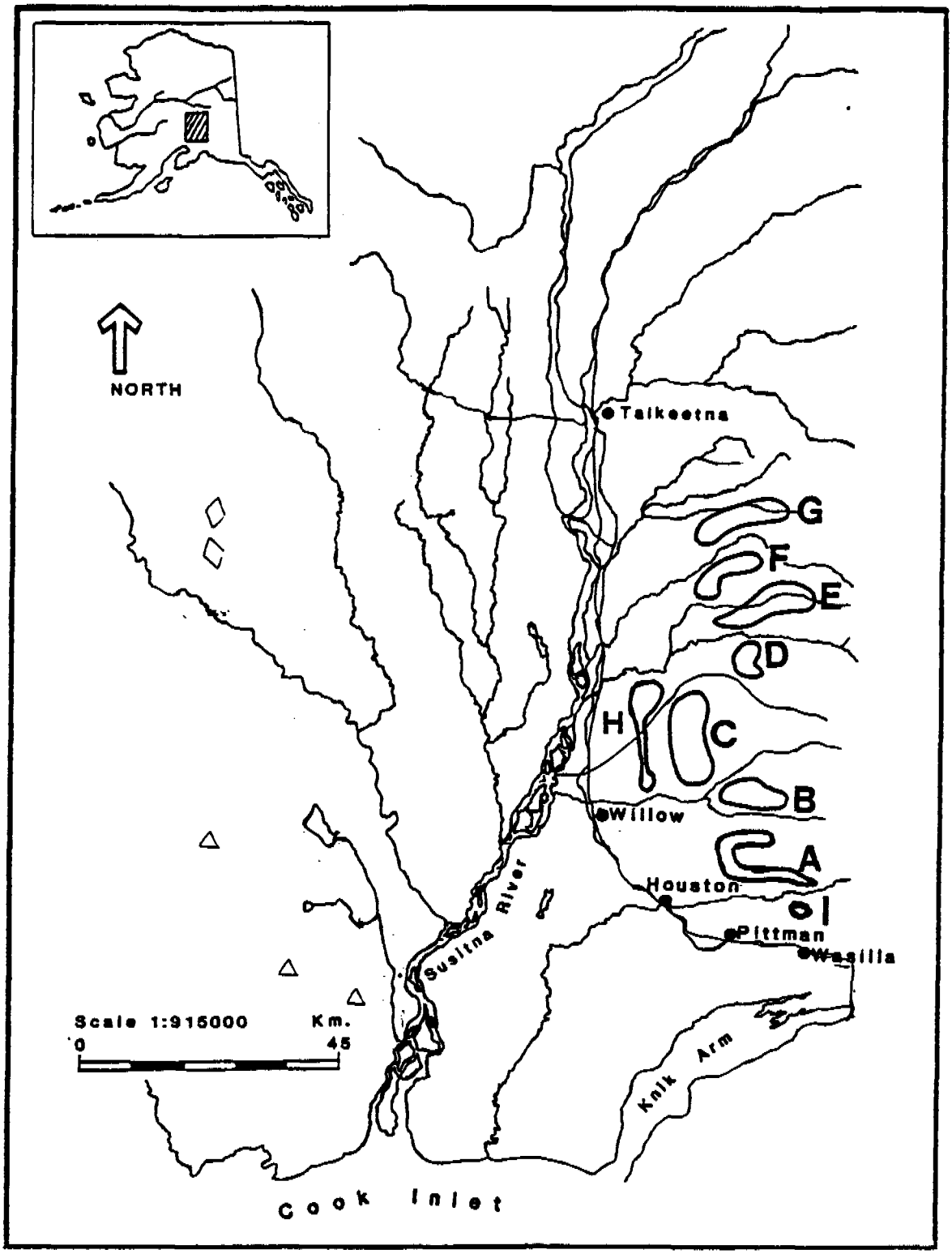

Fig. 3. Locations of Talkeetna Mountains alpine habitats (A-G), Kashwitna Corridor forested habitat (H) and the Coal Creek timber cut area (I) where moose were captured and radio-marked.

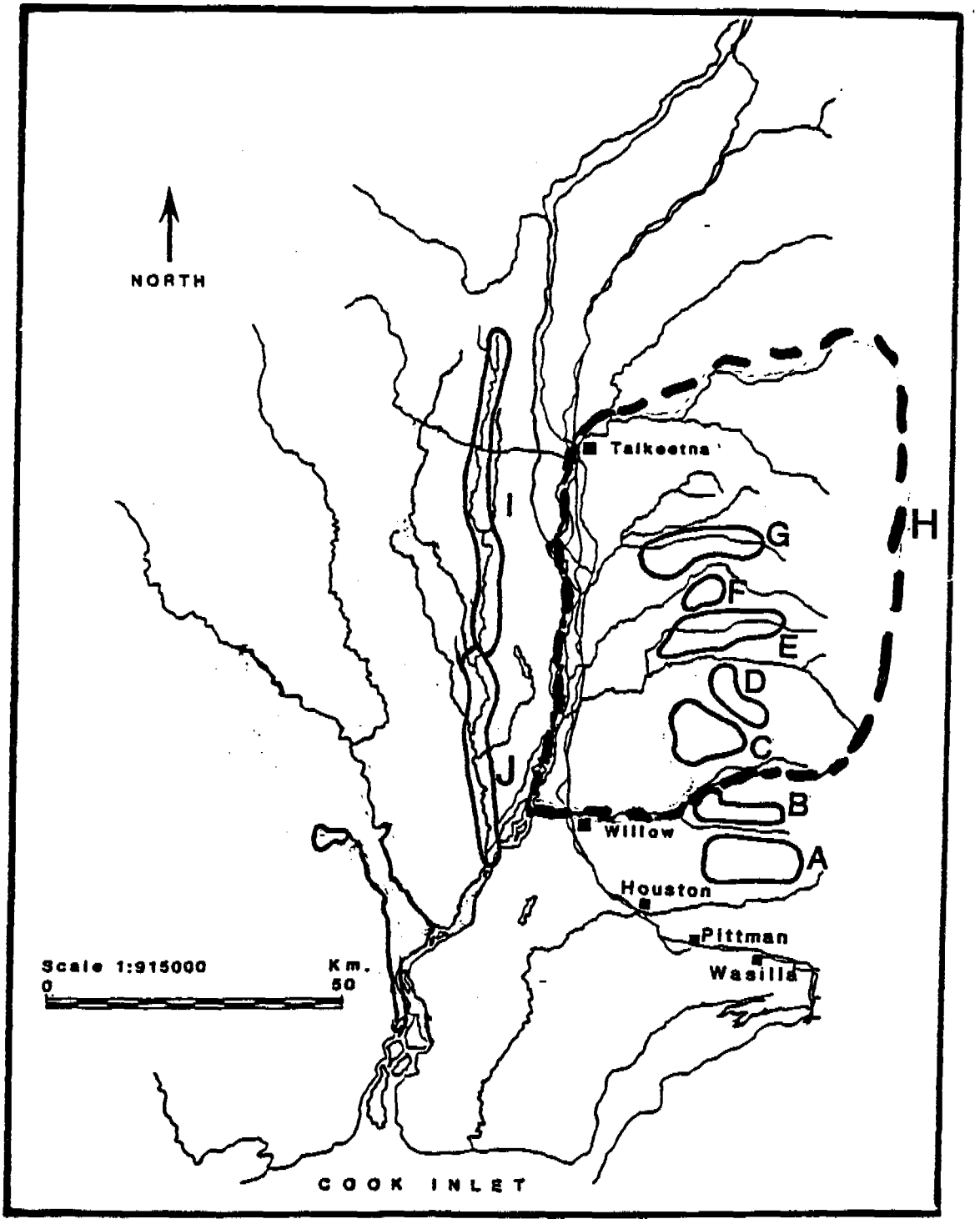

Fig. 4. Locations for Talkeetna Mountains subareas (A-G), Game Management Unit 14B (H) and Moose (I)/Kroto (J) Creeks where moose surveys were conducted.

APPENDIX A.

Fate and capture data for moose radio-marked in subareas of the lower Susitna River valley in Southcentral Alaska, 1987-88.

Capture date	Subarea	Sex	Age[a]	No. ear tag Left	No. ear tag Right	Visual collar	Trans-mitter	Status[b]
12/14/87	Willow Mtn.	F	12	3068	3032	79	5863	OK
12/14/87	Willow Mtn.	F	3	2355	2495	78	5862	OK
12/14/87	Willow Mtn.	M	3	3007	3094	97	29102	OK
12/14/87	Witna Mtn.	F	6	2359	3022	68	29101	OK
12/14/87	Witna Mtn.	F	8	3048	2375	84	6454	CM
12/14/87	Willow Mtn.	M	5	2489	3089	83	28129	OK
02/13/88	Coal Ck.	F	16	3202	3212	95	6503	CM
02/15/88	Coal Ck.	F	3	3206	3260	72	6454	OK
03/12/88	Coal Ck.	F	3	3265	3211	80	29100	OK
03/13/88	Coal Ck.	F	1	NA	NA	70	26100	OK
02/14/88	Coal Ck.	M	3	3271	3266	95	29100	CM

[a] Age determined from incisor wear. Assigned ages are probably encompassed within the following intervals: 1, 2-3, 4-6, 7-12, and 12+ years.

[b] OK = alive and functional as of 05/09/88; CM = capture/drug related mortality.

APPENDIX B.

Alexander Creek and Skwentna River Moose Population Identity and Movement Substudy

by

James B. Faro

SUMMARY

Moose-related aerial-survey, marking, and radio-relocation activities were conducted in the Alexander Creek and Skwentna-Yentna River areas in March 1987 and February 1988, respectively. A total of 489 radio relocations were obtained.

BACKGROUND

The Susitna River drainages contain some of the most productive moose habitat in the state. Late-fall aerial surveys were conducted in the area prior to statehood; additional survey areas were established in response to management needs and budget growth. A total of 35 sample units have been established, but fewer than 15 are surveyed annually. The 1984 stratified aerial census placed the moose population in Game Management Unit (GMU) 16 at approximately 9,000 animals. Population identity data are necessary for resolving conflicts between sport and winter subsistence users and responding to land-use development proposals that would alter existing habitat values for moose.

OBJECTIVES

Primary

To identify and delineate the moose subpopulations from which the major subsistence harvests in GMU 16B are taken.

To more precisely delineate annual movement patterns as well as location, timing, and duration of seasonal habitats.

To identify habitats that are important for maintaining the integrity of these subpopulations.

Peripheral

To identify location of calving and rutting areas of those moose subpopulations from which the major subsistence harvests in GMU 16B are taken.

STUDY AREA

Initial radio collaring took place along Alexander Creek (i.e., winter range); this study area will be expanded to include all seasonal habitats utilized by these radio-collared moose.

METHODS

Moose were captured and marked with ear tags and visually identifiable radio collars that had discrete transmitting frequencies. Individual animals were relocated from fixed-wing aircraft utilizing a programmable receiver fitted with 2-element yagi antennae. Locations of relocated animals were plotted on 1/63360-scale USGS topographic maps, and other pertinent data were recorded. Surveys were scheduled to identify calving areas, rutting concentrations, postrut feeding areas, and winter range boundaries. In March 1987, 20 moose were radio-collared along Alexander Creek between its confluence with the Susitna River and Alexander Lake. By May 1987 the sample had been reduced by 3 animals, leaving 17 functional collars. Additionally, 3 radio-collared moose captured in the spring of 1982 on the lower Susitna River adjacent to Alexander creek were monitored. Nineteen of these 20 collars have remained functional through this reporting period, and 22 surveys resulted in 375 aerial relocations.

In February 1988, 21 moose were radio-collared on the Skwentna and Yentna Rivers near the mouth of Lake Creek. Three moose died on the winter range, and 6 surveys resulted in 114 relocations.

RESULTS AND DISCUSSION

Data analysis has been deferred until larger samples have been collected. In early May moose from the Alexander Creek sample left the winter range for upland habitats. Major movements were to the west and north (i.e., toward Susitna and Beluga Mountains); however, some animals moved as far west as the Talachulitna River and Tordrillo Mountains. Arrival back on the winter range coincided with heavy snow fall in late December.

Initial movements of the Skwentna moose were to the south and west (i.e., toward Beluga Mountain and the Talachulitna River). Most of the Yentna River sample did not move far from their capture locations.

Appendix Table B-1. Alexander Creek and Skwentna Moose samples.

Radio freq.	Collar No.	Sex	Location	Status	Capture date
152.036	93	F	Susitna R.	Dead	82/03/10
152.135	40	F	Susitna R	Active	82/02/21
153.210	71	F	Susitna R	Active	82/03/10
152.880	13	M	Alex. Ck	Active	87/02/10
152.940	19	F	Alex. Ck	Active	87/02/10
152.931	9	F	Alex. Ck	Shed	87/02/10
153.021	8	F	Alex. Ck	Active	87/02/10
153.000	7	F	Alex. Ck	Active	87/02/10
153.061	3	F	Alex. Ck	Active	87/02/10
153.091	22	F	Alex. Ck	Active	87/02/10
152.010	39	F	Alex. Ck	Active	87/02/10
153.400	35	M	Alex. Ck	Active	87/02/10
152.310	31	M	Alex. Ck	Active	87/02/10
152.320	27	F	Alex. Ck	Shed	87/02/10
153.710	15	F	Alex. Ck	Active	87/02/10
152.450	30	F	Alex. Ck	Active	87/02/10
153.780	20	F	Alex. Ck	Active	87/02/10
153.830	42	F	Alex. Ck	Active	87/02/27
153.850	65	F	Alex. Ck	Active	87/02/27
153.880	66	F	Alex. Ck	Active	87/02/27
153.819	41	F	Alex. Ck	Dead	87/02/27
153.839	64	F	Alex. Ck	Active	87/02/27
152.040	67	M	Alex. Ck	Active	87/02/27
152.770	12	F	Skwentna	Active	88/02/08
152.800	17	M	Skwentna	Active	88/02/08
152.790	16	M	Skwentna	Dead	88/02/08
152.810	18	F	Skwentna	Active	88/02/08
152.730	5	F	Skwentna	Active	88/02/08
152.720	4	F	Skwentna	Active	88/02/09
152.700	1	F	Skwentna	Active	88/02/09
152.710		M	Skwentna	Active	88/02/09
152.760	9	F	Skwentna	Dead	88/02/09
152.780	14	F	Skwentna	Active	88/02/09
152.750	11	M	Skwentna	Dead	88/02/09
152.850	24	M	Yentna R	Active	88/02/10
152.830	21	M	Yentna R	Active	88/02/10
153.890	28	F	Yentna R	Active	88/02/10
152.840	23	F	Yentna R	Active	88/02/10
153.870	27	F	Yentna R	Active	88/02/10
152.931	9	M	Yentna R	Active	88/02/10
153.860	26	F	Yentna R	Active	88/02/10
152.740	6	F	Yentna R	Active	88/02/11
152.870	25	F	Yentna R	Active	88/02/11
152.820	19	F	Yentna R	Active	88/02/11