

**Susitna–Watana Hydroelectric Project
(FERC No. 14241)**

**Caribou Distribution, Abundance, Movements,
Productivity, and Survival
Study Plan Section 10.6**

Initial Study Report

Prepared for

Alaska Energy Authority



SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

Alaska Department of Fish and Game

Palmer, Alaska

February 2014 Draft

TABLE OF CONTENTS

Executive Summary	iii
1. Introduction.....	1
2. Study Objectives.....	1
3. Study Area	1
4. Methods and Variances in 2013.....	2
4.1. Radio Collar Deployment	2
4.1.1. Variances.....	2
4.2. VHF Telemetry Surveys	3
4.2.1. Variances.....	3
4.3. GPS Collar Monitoring	4
4.3.1. Variances.....	4
4.4. Data Analysis	4
4.4.1. Variances.....	4
5. Results	4
5.1. Radio Collar Deployment	4
5.2. Telemetry Surveys	5
5.2.1. Calving Survey.....	5
5.3. Data Analysis	6
6. Discussion.....	6
7. Completing the Study	7
8. Literature Cited	7
9. Tables	8
10. Figures.....	10

LIST OF TABLES

Table 5.1-1. Caribou Captures and Radio Collar Deployment, 2012–2013.....	8
Table 5.1-2. Caribou Telemetry Survey Summary, 2012.....	8
Table 5.1-3. Caribou Telemetry Survey Summary, 2013.....	9

LIST OF FIGURES

Figure 3-1. Caribou Study Area, 2012–2013.....	11
Figure 4.1-1. Nelchina and Delta Caribou Herd Ranges.....	12
Figure 5.1-1. Seasonal Summaries of VHF-Collared Caribou Locations, 2012–2013.....	13
Figure 5.1-2. Seasonal Summaries of GPS-Collared Caribou Locations, 2012–2013.....	14

LIST OF ACRONYMS, ABBREVIATIONS, AND DEFINITIONS

Abbreviation	Definition
ADF&G	Alaska Department of Fish and Game
AEA	Alaska Energy Authority
DCH	Delta Caribou Herd
EMG	Eastern Migratory Group
FERC	Federal Energy Regulatory Commission
GMU	Game Management Unit
GPS	Global Positioning System
ILP	Integrated Licensing Process
ISR	Initial Study Report
NCH	Nelchina Caribou Herd
PRM	Project River Mile
Project	Susitna-Watana Hydroelectric Project No. 14241
RSP	Revised Study Plan
SPD	study plan determination
VHF	Very High Frequency
WG	Western Group

EXECUTIVE SUMMARY

Caribou Distribution, Abundance, Movement, Productivity and Survival 10.6	
Purpose	This goal of this study is to obtain sufficient population information on caribou to evaluate Project-related effects on important seasonal ranges, such as calving areas, rutting areas, wintering areas, and migration/movement corridors. The study supplements ongoing ADF&G caribou research in the study area and surrounding region by increasing the sample size of radiocollared caribou from both the Nelchina caribou herd (NCH) and the Delta caribou herd (DCH). Telemetry and GPS locations from these radiocollared caribou are being used to document the seasonal use of and movement through the Project area by both females and males of the NCH and the DCH; document the extend of herd mixing between the NCH and the DCH; document productivity and survival of caribou using the Project area; and compare current movements and distributions in the Project area to historical data.
Status	Monitoring of the seasonal use of, and movements in, the Project area by both cows and bulls from the NCH and DCH is ongoing via the 223 currently active radio collars (168 VHF and 55 GPS). Calving surveys were conducted May-June 2013 and will be conducted again in the next study season. Data collection, analysis, and comparison to historic data are underway and will continue through the completion of the study.
Study Components	<p>The components of this study consist of the following:</p> <ol style="list-style-type: none"> 1) Deployment of Very High Frequency (VHF) radio collars on bulls and Argos satellite-linked (GPS) radio collars on bulls and cows from the NCH and DCH. 2) Redeployment of radio collars available from mortality collar pickups and hunter harvested caribou. 3) Monitoring of all existing VHF-collared Nelchina and Delta caribou monthly within the Project area via aerial radiotracking with additional flights (every two weeks) during peak fall and spring migration and telemetry flights twice a week during peak calving. 4) Collection of locational information from GPS-collared caribou via a satellite data link using the Argos Data Collection System on a regular basis. 5) Data analysis and evaluation of the spatial distribution and movements of cows and bulls from each herd using a Geographic Information System (GIS).
2013 Variances	The study plan (RSP Section 10.6.4) proposed that two-thirds of the radio collars be deployed on Nelchina caribou and one-third of the radio collars be deployed on Delta caribou. However, the herd designation for caribou collared within the study area is complicated by mixing of caribou from both the DCH and the NCH, and it has become evident that the study team will not be able to definitely determine herd designation upon capture for those individuals

Caribou Distribution, Abundance, Movement, Productivity and Survival 10.6	
	<p>captured in the study area. So, caribou collared during the course of the study were instead classified into two groups based on wintering strategies and capture locations (the Eastern Migratory Group and the Western Group). These classifications were merely semantics used in the planning of collar distribution and are not intended to replace the Nelchina and Delta caribou herd designations. Therefore, the study team is confident that these new name conventions will not interfere with their ability to meet the study objectives outlined in RSP Section 10.6.1.</p>
Plans to Complete the Study	<p>As explained in the cover letter to this draft ISR, AEA’s plan for completing this study will be included in the final ISR filed with FERC on June 3, 2014.</p>
Highlighted Results and Achievements	<p>The study team deployed all initial VHF and GPS radio collars in 2012 with additional re-deployments in 2013. The study team obtained 2,854 locations for 272 individual caribou (199 VHF-collared caribou and 73 GPS-collared caribou) during 33 telemetry surveys from April 18, 2012, to October 22, 2013. The study team is continuing to monitor VHF collars via telemetry and GPS collars via Argos satellite uplink. The study team conducted telemetry flights once or twice weekly during May 7–July 1, 2013, to monitor the parturition status and calf survival of VHF- and GPS-collared cows. Of the 128 cows located, 84 (66 percent) were determined to be pregnant or were observed with a calf at heel. Forty-six percent (n = 39) of parturient cows lost their calves. Spring migration and peak calving were delayed during the unusually late spring in 2013 and very few collared cows were found on the traditional calving grounds in GMU Subunit 13A during the typical period of peak calving.</p>

1. INTRODUCTION

On December 14, 2012, Alaska Energy Authority (AEA) filed with the Federal Energy Regulatory Commission (FERC or Commission) its Revised Study Plan (RSP) for the Susitna-Watana Hydroelectric Project No. 14241 (Project), which included 58 individual study plans (AEA 2012). Section 10.6 of the RSP described the Caribou Distribution, Abundance, Movement, Productivity, and Survival Study. On February 1, 2013, FERC staff issued its study plan determination (February 1 SPD) for 44 of the 58 studies, approving 31 studies as filed and 13 with modifications. RSP Section 10.6 was one of the 31 studies approved with no modifications.

This study focuses on characterizing caribou distribution, movements, population size, productivity, group size, and density in the Project vicinity through radio telemetry and geospatial analyses. RSP Section 10.6 described the goal, objectives, and proposed methods for data collection regarding caribou.

Following the first study season, FERC's regulations for the Integrated Licensing Process (ILP) require AEA to "prepare and file with the Commission an initial study report describing its overall progress in implementing the study plan and schedule and the data collected, including an explanation of any variance from the study plan and schedule" (18 CFR 5.15(c)(1)). This Initial Study Report (ISR) on the Caribou Distribution, Abundance, Movement, Productivity, and Survival Study has been prepared in accordance with FERC's ILP regulations and details AEA's status in implementing the study, as set forth in the FERC-approved RSP (referred to herein as the "Study Plan").

2. STUDY OBJECTIVES

The goal of this study is to obtain sufficient population information on caribou to evaluate Project-related effects on important seasonal ranges, such as calving areas, rutting areas, wintering areas, and migration/movement corridors.

The study objectives are established in RSP Section 10.6.1:

- Document seasonal use of and movement through the Project area by both females and males of the Nelchina caribou herd (NCH) and the Delta caribou herd (DCH).
- Assess the relative importance of the Project area to both the NCH and DCH.
- Document productivity and survival of caribou using the Project area.
- Analyze data from historical caribou studies and synthesize with recent data for the NCH and DCH, as a continuation of the caribou task of the 2012 study (AEA 2012).

3. STUDY AREA

As established by RSP Section 10.6.3, the study area includes most of Game Management Unit (GMU) Subunit 13E east of and including Broad Pass. The study area also includes drainages

emptying into the upper Susitna River in GMU Subunit 13B, as well as a small portion of northwestern GMU Subunit 13A from Kosina Creek east to the Oshetna River. The study area encompasses the proposed reservoir inundation zone, associated infrastructure, and potential access and transmission line corridors (Figure 3-1).

4. METHODS AND VARIANCES IN 2013

The study team implemented the methods described in the Study Plan with one variance in the collar deployment methods (RSP Section 10.6.4), as described in Section 4.1.1 below.

4.1. Radio Collar Deployment

This study, initiated in 2012, supplements ongoing Alaska Department of Fish and Game (ADF&G) caribou research in the study area and surrounding region by increasing the sample size of radiocollared caribou from both the NCH and the DCH. Using small piston-powered helicopters (Robinson R-44) and chemical immobilization techniques, the study team deployed 30 Very High Frequency (VHF) radio collars on bulls and 60 Argos satellite-linked (GPS) radio collars on bulls and cows from the NCH and DCH to detect temporal and geographical fine-scale movements. The study team deployed 70 percent of GPS collars on cows because the female segment represents the reproductive portion of the herd and the leading edge of seasonal movements. Spring captures (April 27–28 and May 11, 2012) targeted caribou overwintering in the Project area, and fall captures (October 13–28, 2012) targeted migratory caribou. The study team re-deployed radio collars that were available from mortality collar pickups and hunter-harvested caribou on 22 bulls and 14 cows during additional captures in 2013.

ADF&G also deployed VHF collars on cohorts of female calves from the NCH and DCH for routine ADF&G management purposes in 2012 and 2013. DCH management captures occurred north of the Alaska Range in GMU Subunit 20A. NCH management captures occurred east of the study area in GMU Subunits 13A and 13B and targeted NCH animals during their fall migration (Figure 4.1-1). Management captures occurred outside of the study area and were paid for through ADF&G management funds. Although these management captures were not an explicit part of the Study Plan, these collared caribou have the potential to use the study area and are included in the regular radiotracking flights.

4.1.1. Variances

The study team proposed (RSP Section 10.6.4) that 20 VHF collars be deployed on NCH bulls, 10 VHF collars be deployed on DCH bulls, 40–45 GPS collars be deployed on NCH animals (cows and bulls), and 15–20 GPS collars be deployed on DCH animals (cows and bulls). However, the herd designation for caribou collared within the study area is complicated by mixing of caribou from both the DCH and the NCH. Caribou collared north of the Alaska Range in GMU Subunit 20A are generally considered to be part of the DCH, and caribou collared east of the study area in GMU subunits 13A and 13B during the Nelchina fall migration period are generally considered to be part of the NCH (Figure 4.1-1). Because individual caribou can deviate from these generalized patterns of distribution and movements, caribou collared within the study area may be from either the DCH or the NCH when there is overlap and mixing.

Despite this difficulty in correctly classifying individual caribou by herd when mixing occurs, herd designations remain the best tool for understanding caribou population dynamics and quantifying the potential effects of development. At this time, more movement data are needed before assigning herd designations for caribou captured within the study area. Therefore, post-hoc movement analysis at the completion of the study will be used to assign a herd designation for caribou collared within the study area.

Because the study team cannot definitively distinguish herd designation for caribou collared in the study area without additional data and analysis, the study team has divided the caribou using the study area into two functional groups with separate wintering strategies. Caribou collared east of the study area in GMU Subunits 13A and 13B during the fall are likely part of the NCH and make up the Eastern Migratory Group (EMG). These individuals typically calve in the eastern Talkeetna Mountains south of the Project area and spend the summer in and near the study area before starting a mass migration in August east to their wintering grounds. Their winter range extends as far east as the Wrangell Mountains foothills, the Mentasta Mountains, the Tetlin area, and into Canada. Caribou in the Western Group (WG) tend to spend all or most of the year in and near the study area (western GMU 13), but may also spend time in GMU Subunit 14B to the south or GMU Subunit 20A to the north; this group includes individuals from both the DCH and NCH. If these individuals move north of the Alaska Range into GMU subunit 20, then they likely belong to the DCH; if these individuals move east into GMU subunits 13A and 13B during the fall, then they likely belong to the NCH. However, at the time of capture it is not possible to predict these movements so they were grouped into the WG with other individuals that stay in the general study area throughout the year. These classifications are intended to be used only for discussion purposes and collar distribution and are not intended to replace the NCH and DCH designations. So, instead of definitively distributing collars between the DCH and NCH, the study team deployed two-thirds of the new collars on EMG caribou in GMU Subunits 13A and 13B during the fall migration and one-third of the collars on WG caribou wintering in the study area (GMU Subunit 13E).

4.2. VHF Telemetry Surveys

The study team monitored all existing VHF-collared NCH and DCH animals monthly within the Project area via aerial radiotracking (telemetry) from small fixed-wing aircraft (Piper PA-18 “Super Cub”) to provide general documentation of herd distribution and the extent of herd mixing in the Project vicinity. The study team recorded reproduction, survival status, group size, and any additional comments for located caribou. The study team conducted additional flights (every two weeks) during peak fall migration (August–October) and peak spring migration (May 1–20). The study team used telemetry flights twice a week during peak calving (May 25–30) to document parturition status by noting presence/absence of antlers, udders, and calves at heel (Whitten 1995). All telemetry flights covered the study area; additional ADF&G management flights covered the NCH range to a greater extent.

4.2.1. Variances

No variances from the telemetry survey methods described in the Study Plan were necessary in 2013. However, as detailed in Section 5.2 below, the NCH range was occasionally covered by additional routine ADF&G management telemetry flights that were not part of this study.

Additional data from these routine ADF&G flights were included in the data analysis described in Section 5.3 below.

4.3. GPS Collar Monitoring

Caribou locations are regularly obtained from deployed GPS collars via a satellite data link using the Argos Data Collection System and locations are provided to the study team on a monthly CD from Telonics, Inc. (Mesa, AZ). The full data set of all locations for each GPS collar will be downloaded after collar retrieval.

4.3.1. Variances

No variances from the GPS-collar monitoring methods described in the Study Plan were necessary in 2013.

4.4. Data Analysis

Data collection and analysis are underway and will continue through the next study season. The study team used kernel-density analysis (Seaman and Powell 1996) and *ArcGIS*® software to summarize the seasonal locations of radiocollared caribou and satellite locations of GPS-collared caribou from May 2012 through September 2013.

4.4.1. Variances

No variances from the analytical methods described in the Study Plan were necessary in 2013.

5. RESULTS

5.1. Radio Collar Deployment

The study team deployed 30 VHF radio collars on bull caribou and 60 GPS collars on bull and cow caribou during spring and fall 2012 as proposed in the Study Plan. The study team deployed 15 VHF collars on bulls during April 27–28, 2012, and eight GPS collars on bulls on May 11, 2012. Because of the impending calving season, the study team did not deploy collars on cows in the spring. The study team deployed the remainder of the bull VHF and bull and cow GPS collars during October 13–28, 2012. These collars were distributed between wintering strategies; 20 VHF collars were deployed on EMG bulls, 10 VHF collars were deployed on WG bulls, 40 GPS collars were deployed on EMG animals, and 20 GPS collars were deployed on WG animals (Table 5.1-1). These capture events supplemented the 125 existing VHF collars on caribou cows in the study area and surrounding region, including 85 collars on NCH cows and 40 collars on DCH cows.

The number of collared caribou that potentially were present in the study area varied over the course of the study as individuals died and others were collared during additional capture events. During capture events on April 15–17, October 1–4, and November 8–9, 2013, the study team re-deployed radio collars that were available from mortality collar pickups and hunter-harvested

caribou (Table 5.1-1). During annual captures for standard ADF&G management studies (which are contributing telemetry data to this study), ADF&G biologists also deployed VHF collars on cohorts of five-month-old female calves from the NCH during October 1–2, 2012, and October 1–4, 2013, and on a cohort of 10-month-old female calves from the DCH during March 12–19, 2013.

5.2. Telemetry Surveys

The study team obtained 2,854 locations for 272 individual caribou (199 VHF-collared caribou and 73 GPS-collared caribou) during 33 telemetry surveys from April 18, 2012, to October 22, 2013 (Tables 5.1-2 and 5.1-3). The total number of active radio collars on NCH and DCH animals has fluctuated during the study because of the loss of some collars from collar drops and caribou mortalities and the addition of more collars during capture events. At the end of October 2013, 223 radio collars were active on caribou from the NCH and DCH. Of those collars, 55 were GPS collars (40 on cows and 15 on bulls) and 168 were VHF collars (147 on cows and 21 on bulls).

The NCH typically is spread out over a large area (Figure 4.1-1), so the study team did not locate all collared caribou during each telemetry flight. The type of caribou targeted and the survey area covered also varied between flights. All telemetry flights covered the study area and the remainder of the NCH range was occasionally covered by additional ADF&G management telemetry flights (Table 5.1-2 and Table 5.2-3). These routine management telemetry flights were paid for through ADF&G management funds and therefore not part of this study. However, this additional data was included in the data analysis described in Section 5.3 below. The study team attempted to locate all VHF- and GPS-collared caribou during the June–October 2012 telemetry flights (Table 5.1-2) to monitor survival of newly collared individuals. In subsequent flights, the study team targeted only VHF-collared caribou, with the exception of the calving surveys, when all cows (VHF- and GPS-collared) were located (Table 5.1-3). Caribou locations are regularly obtained from deployed GPS collars via a satellite data link using the Argos Data Collection System and locations are provided to the study team on a monthly CD from Telonics, Inc. (Mesa, AZ).

5.2.1. Calving Survey

The study team conducted telemetry flights once or twice weekly during May 7–July 1, 2013, to monitor the parturition status and calf survival of VHF- and GPS-collared cows. The study team evaluated parturition status by noting presence/absence of antlers, udders, and calves at heel during each survey flight. The study team located collared cows during each flight until they were determined to either not be pregnant or to have lost their calves (Table 5.1-3). The study team considered calves to have been lost when they were not seen during three consecutive telemetry flights. Of the 128 cows the study team located, 84 (66 percent) were determined to be pregnant or were observed with a calf at heel. Forty-six percent ($n = 39$) of parturient cows lost their calves. Spring migration and peak calving were delayed during the unusually late spring in 2013 and very few collared cows were found on the traditional calving grounds in GMU Subunit 13A during the typical period of peak calving (Figure 5.1-2).

5.3. Data Analysis

Telemetry locations of radiocollared caribou and satellite locations of GPS-collared caribou from May 2012 to September 2013 were divided into five seasons for summary and analysis: spring migration (April 1–May 24), calving (May 25–June 10), summer (June 11–August 15), fall migration (August 16–November 20), and winter (November 21–March 31). The study team used kernel-density analysis (Seaman and Powell 1996) and *ArcGIS*® software to create 50 percent, 75 percent, and 95 percent utilization distribution contours for each season, using both the VHF telemetry survey data (Figure 5.1-1) and the GPS-collar movement data (Figure 5.1-2).

6. DISCUSSION

Monitoring of the seasonal use of and movement through the Project area by both cows and bulls is continuing through radio-tracking of the 223 radio collars (168 VHF and 55 GPS) currently active on caribou from the NCH and DCH.

From 1980 to 1985, 85 VHF-collared caribou (69 cows and 16 bulls) were monitored throughout the NCH range. Those collared animals were relocated 2,651 times over the course of the Alaska Power Authority proposed project study, for an average of 31 relocations per animal (Pitcher 1987). From April 18, 2012, to October 22, 2013, the study team for the current Project obtained 2,463 relocations of 199 individual VHF-collared caribou, averaging 12 relocations per animal. The study team will continue to radio-track VHF-collared caribou through the duration of the study. In addition, from May 24, 2012, to September 28, 2013, the study team collected 63,787 GPS locations from 69 GPS-collared caribou via the Argos Data Collection System. The study team will continue to collect regular locations from these individuals until the GPS collars are removed in April and October 2014. Results from these telemetry surveys and locations from these GPS collars will be compared with results from previous years in the Updated Study Report (USR).

The study team implemented the methods outlined in RSP Section 10.6.4 with only one variance in the radio collar deployment methods. RSP Section 10.6.4 proposed that two-thirds of the radio collars be deployed on Nelchina caribou and one-third of the radio collars be deployed on Delta caribou. However, the herd designation for caribou collared within the study area is complicated by mixing of caribou from both the DCH and the NCH, and it has become evident that the study team will not be able to definitely determine herd designation upon capture for those individuals captured in the study area. So, caribou collared during the course of the study were divided into two groups based on wintering strategies and capture locations: the EMG and the WG. Caribou that migrated east during the Nelchina fall migration period and were subsequently captured in GMU Subunits 13A and 13B were classified as the EMG, which likely includes individuals primarily from the NCH. Two-thirds of the radio collars in this study were deployed on individuals from this group. Caribou that were collared while wintering within the study area (GMU Subunit 13E) were classified as the WG, which may include individuals from both the NCH and the DCH (Figure 4.1-1). One-third of the radio collars in this study were deployed on individuals from this group. Post-hoc movement analysis at the completion of the study will be used to assign a final herd designation for all caribou collared during the course of the study. The study team is confident that it will be able to meet the objectives of documenting seasonal use of

and movement through the Project area by both females and males of the NCH and the DCH, and of assessing the relative importance of the Project area to both the NCH and DCH (RSP Section 10.6.1.1), by using this modified naming convention.

7. COMPLETING THE STUDY

[As explained in the cover letter to this draft ISR, AEA's plan for completing this study will be included in the final ISR filed with FERC on June 3, 2014.]

8. LITERATURE CITED

- AEA (Alaska Energy Authority). 2012. Revised Study Plan: Susitna-Watana Hydroelectric Project FERC Project No. 14241. December 2012. Prepared for the Federal Energy Regulatory Commission by the Alaska Energy Authority, Anchorage, Alaska. <http://www.susitna-watanahydro.org/study-plan>.
- Horne, J. S., E. O. Garton, S. M. Drone, and J. S. Lewis. 2007. Analyzing animal movements using Brownian bridges. *Ecology* 88: 2354–2363.
- Pitcher, K. W. 1987. Susitna Hydroelectric Project, Final report, Big game studies, Vol. IV—Caribou. Report prepared by Alaska Department of Fish and Game, Anchorage, for the Alaska Power Authority, Anchorage. 59 pp. [APA Doc. No. 3496]
- Sawyer, H., M. J. Kauffman, R. M. Nielson, and J. S. Horne. 2009. Identifying and prioritizing ungulate migration routes for landscape-level conservation. *Ecological Applications* 19: 2016–2025.
- Seaman, D. E., and R. A. Powell. 1996. An evaluation of the accuracy of kernel density estimators for home range analysis. *Ecology* 77: 2075–2085.
- Whitten, K. 1995. Antler loss and udder distension in relation to parturition in caribou. *Journal of Wildlife Management* 59: 273–277.

9. TABLES

Table 5.1-1. Caribou Captures and Radio Collar Deployment, 2012–2013.

Collar Type	Sex	Group	2012			2013		
			Apr–May	Oct	Total	Apr	Oct–Nov	Total
VHF	Bull	Western	8	2	10	9	0	9
		Eastern	7	13	20	0	1	1
	Cow	Western	0	0	0	0	3	3
		Eastern	0	0	0	0	4	4
Satellite	Bull	Western	4	2	6	9	1	10
		Eastern	4	8	12	0	2	2
	Cow	Western	0	14	14	1	1	2
		Eastern	0	28	28	0	5	5
TOTAL			23	67	90	19	17	36

Table 5.1-2. Caribou Telemetry Survey Summary, 2012.

Survey Start Date		Caribou Targeted			Number of Caribou Located			Area Surveyed		
Season	Date	Collar Type ¹	Sex ²	# Target Caribou Collared	Total # Located	# in Study Area	# out of Study Area	Study Area	Western Range ³	Entire Range
Calving	May 25	Both	Cows	144 cows	106	94	12	X	X	X
Summer	Jun 10	Both	Both	168 total	96	95	1	X	X	
Summer	Jun 22	Both	Both	167 total	105	67	38	X	X	
Summer	Jul 14	Both	Both	167 total	113	110	2	X		
Summer	Aug 5	Both	Both	166 total	105	51	54	X	X	
Fall	Aug 21	Both	Both	163 total	96	50	46	X	X	
Fall	Sep 3	Both	Both	162 total	50	50	0	X		
Fall	Sep 24	Both	Both	161 total	97	58	39	X	X	
Fall	Oct 8	Both	Both	176 total	104	35	69	X	X	
Fall	Nov 8	VHF	Both	241 VHF	43	20	23	X	X	X
Winter	Dec 7	VHF	Both	224 VHF	110	18	92	X	X	X
TOTAL					1,025	648	376	11	9	3

Notes:

- 1 During May–Oct., both VHF- and GPS-collared caribou were targeted; during Nov.–Dec., only VHF-collared caribou were targeted.
- 2 Only cow caribou were targeted during the May flight, whereas both cows and bulls were targeted in all remaining flights.
- 3 These flights covered the western portion of the NCH range.

Table 5.1-3. Caribou Telemetry Survey Summary, 2013.

Survey Start Date		Caribou Targeted			Number of Caribou Located			Area Surveyed		
Season	Date	Collar Type	Sex	# Target Caribou Collared	Total # Located	# in Study Area	# out of Study Area	Study Area	Western Range ³	Entire Range
Winter	Jan 10	VHF	Both	223 VHF	32	16	16	X	X	
Winter	Feb 12	VHF	Both	218 VHF	32	15	17	X	X	
Winter	Mar 14	VHF	Both	162 VHF	92	11	81	X	X	
Spring	Apr 11	VHF	Both	158 VHF	19	11	8	X	X	X
Spring	May 7 ¹	Both	Cows	182 cows	26	19	7	X	X	
Spring	May 14 ²	Both	Both	224 total	30	26	4	X	X	
Spring	May 20 ¹	Both	Cows	182 cows	97	32	65	X	X	X
Calving	May 25 ¹	Both	Cows	182 cows	57	35	22	X	X	
Calving	May 28 ¹	Both	Cows	182 cows	112	40	72	X	X	X
Calving	Jun 3 ¹	Both	Cows	174 cows	107	50	57	X	X	
Summer	Jun 11 ¹	Both	Cows	174 cows	108	65	43	X	X	
Summer	Jun 19 ²	Both	Both	214 total	123	59	64	X	X	X
Summer	Jun 25 ¹	Both	Cows	174 cows	36	16	20	X	X	
Summer	Jul 1 ¹	Both	Cows	174 cows	9	9	0	X	X	
Summer	Jul 15	Both	Both	165 VHF	95	91	4	X	X	X
Summer	Aug 5	VHF	Both	165 VHF	90	47	43	X	X	X
Fall	Aug 24	VHF	Both	163 VHF	89	64	25	X	X	X
Fall	Sep 3	VHF	Both	163 VHF	83	61	22	X	X	X
Fall	Sep 16	VHF	Both	163 VHF	78	67	11	X	X	X
Fall	Sep 27	VHF	Both	158 VHF	95	52	43	X	X	X
Fall	Oct 10	VHF	Both	174 VHF	109	30	79	X	X	X
Fall	Oct 20	VHF	Both	172 VHF	108	18	90	X	X	X
TOTAL					1,253	644	609	22	22	12

Notes:

- 1 During these calving surveys, cow caribou were located until they were determined to not be pregnant or to have lost their calf.
- 2 During these flights, VHF-collared caribou of both sexes were located in addition to GPS-collared cows for calving surveys.
- 3 These flights covered the western portion of the NCH range.

10. FIGURES

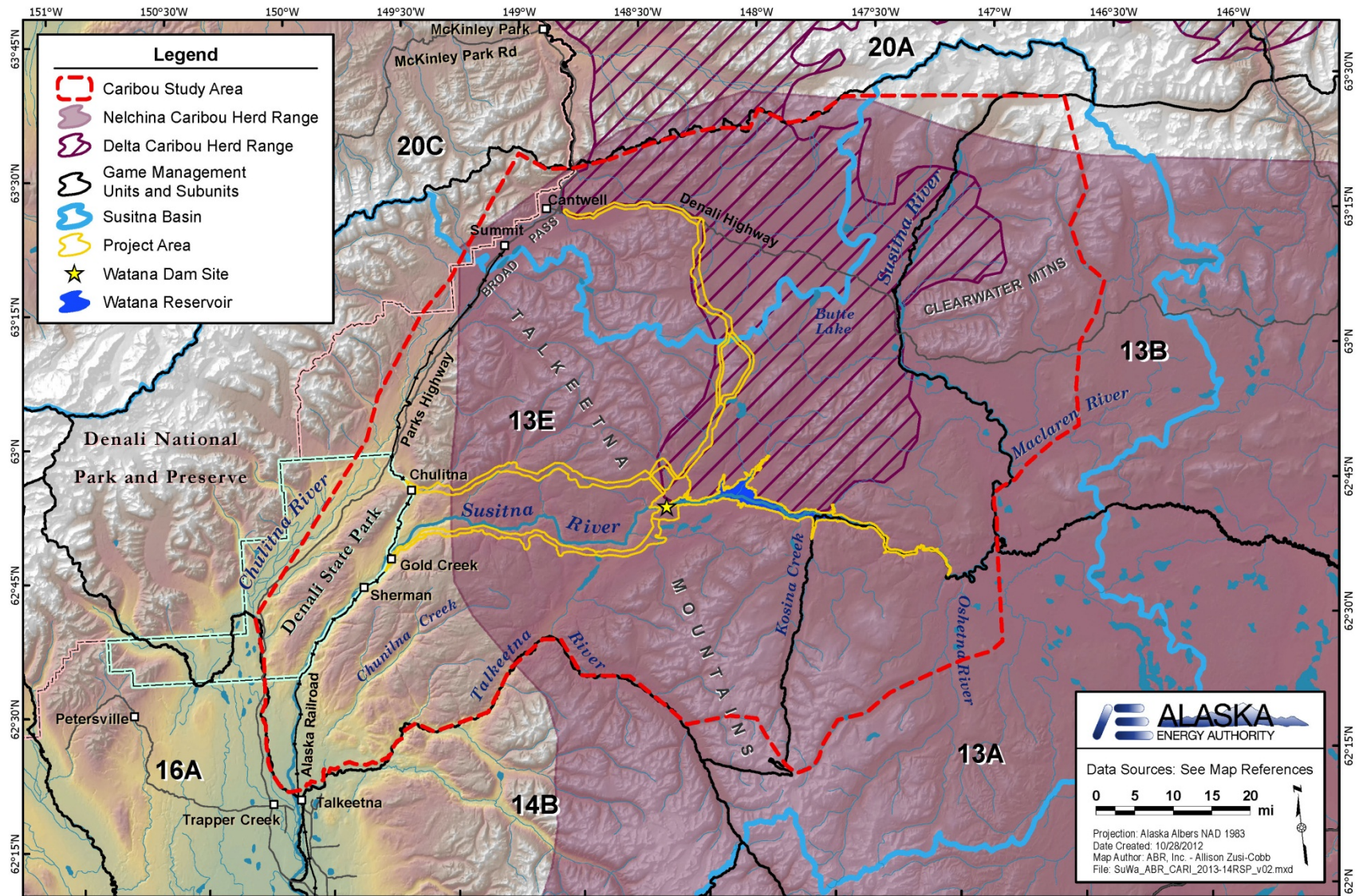


Figure 3-1. Caribou Study Area, 2012–2013.

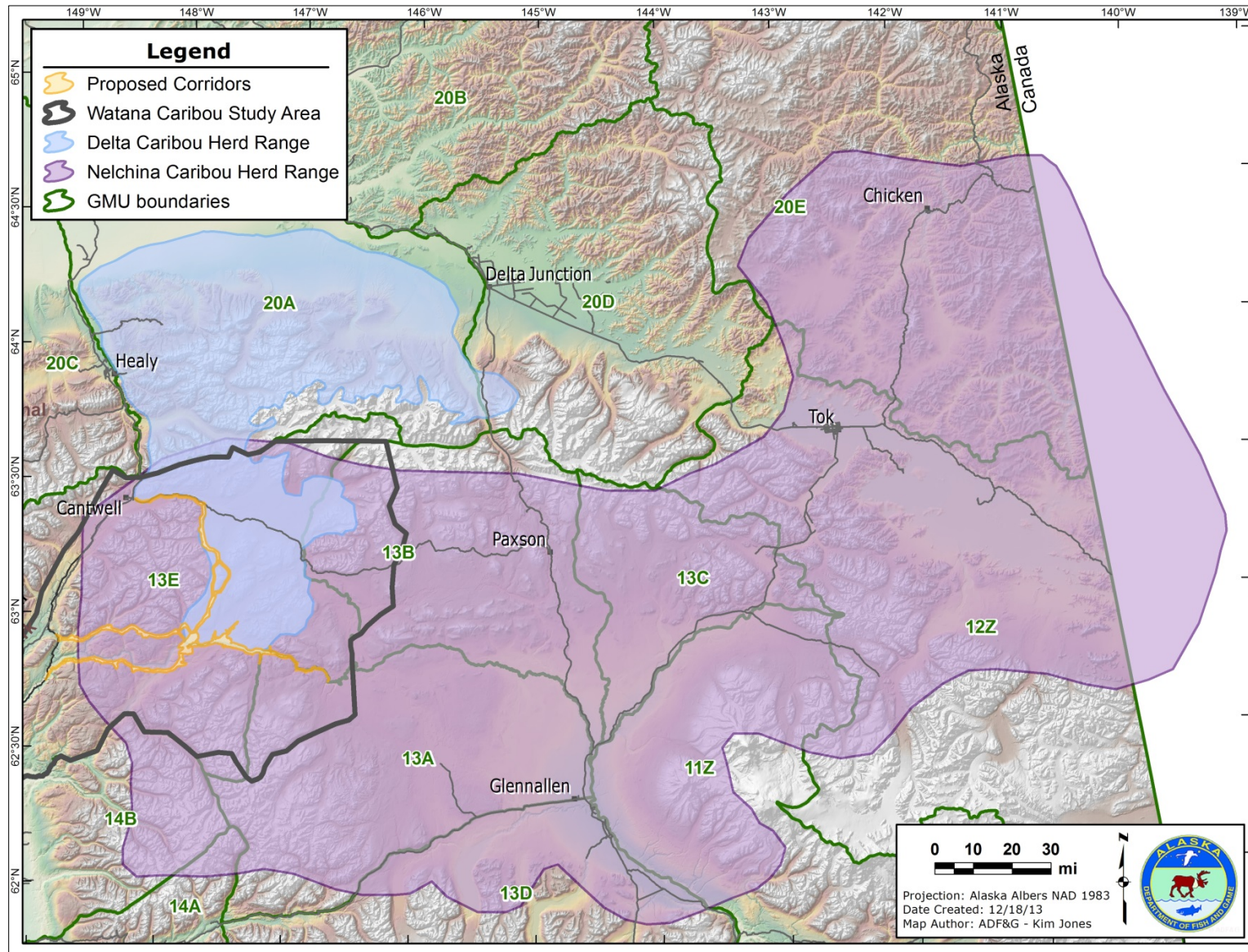


Figure 4.1-1. Nelchina and Delta Caribou Herd Ranges.

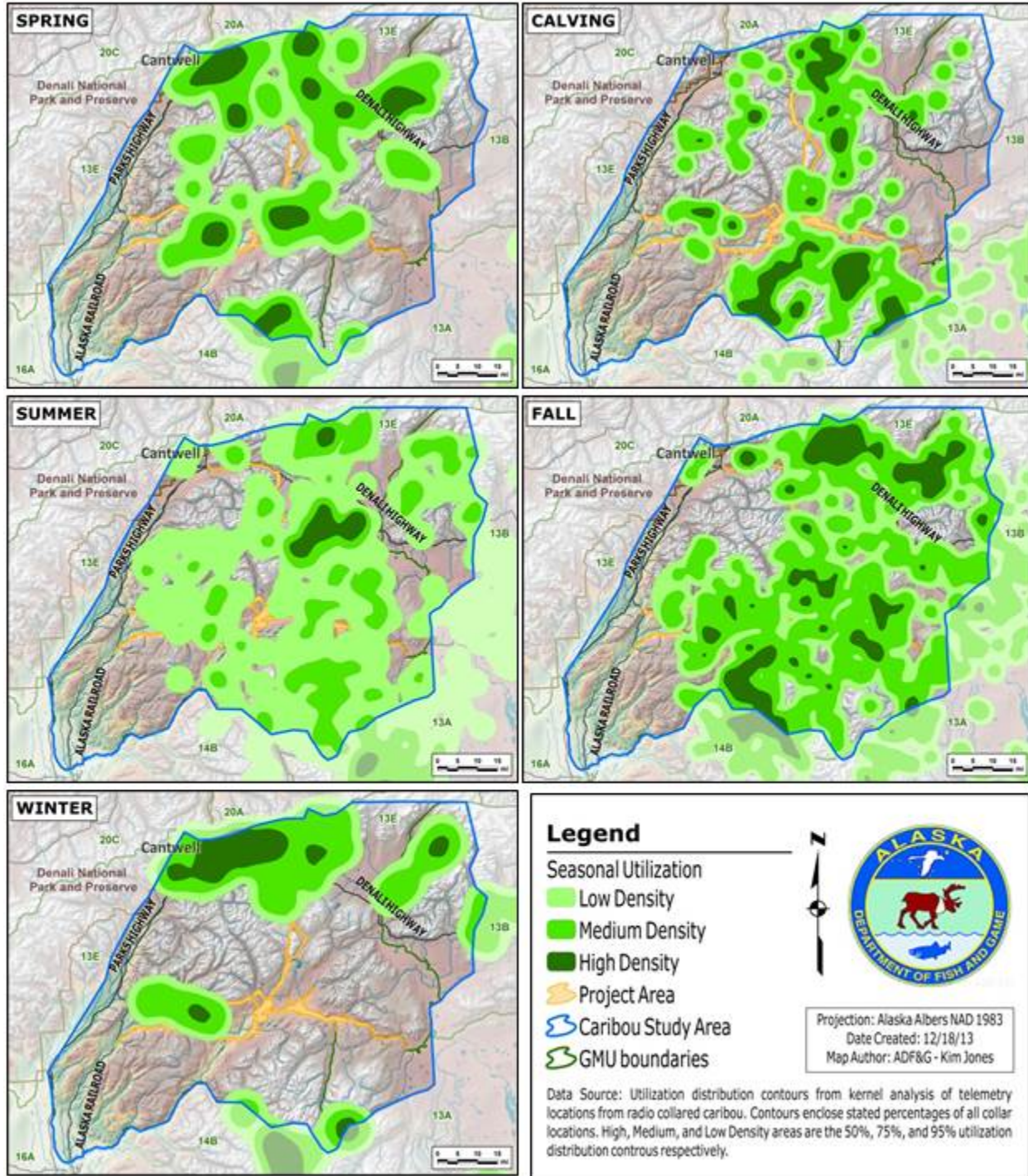


Figure 5.1-1. Seasonal Summaries of VHF-Collared Caribou Locations, 2012–2013.

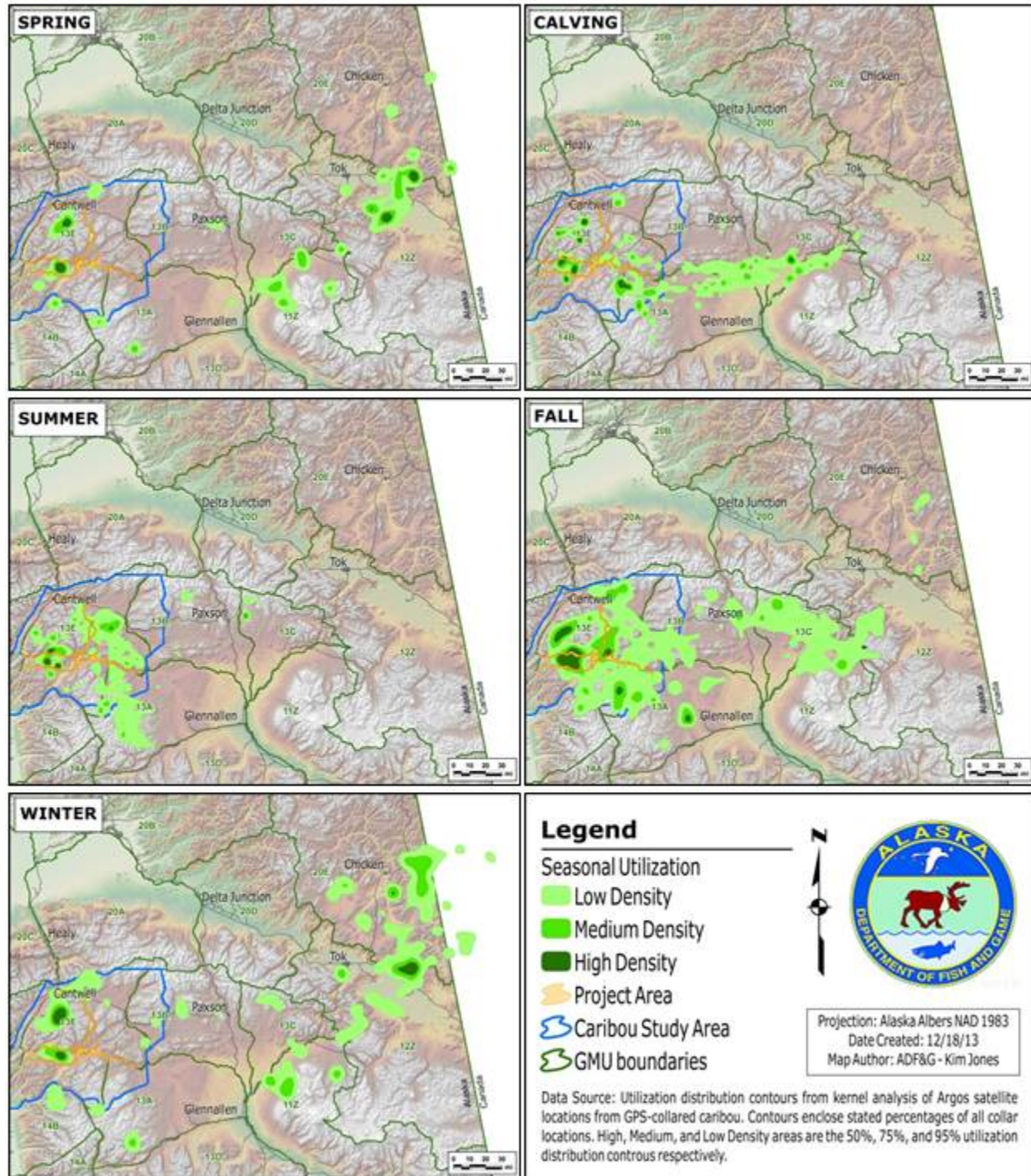


Figure 5.1-2. Seasonal Summaries of GPS-Collared Caribou Locations, 2012–2013.