Susitna–Watana Hydroelectric Project
(FERC No. 14241)

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

Initial Study Report
Part A: Sections 1-6, 8-10

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

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Palmer, Alaska

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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

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 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

[Section 7 appears in the Part C section of this ISR.]

8. LITERATURE CITED

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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

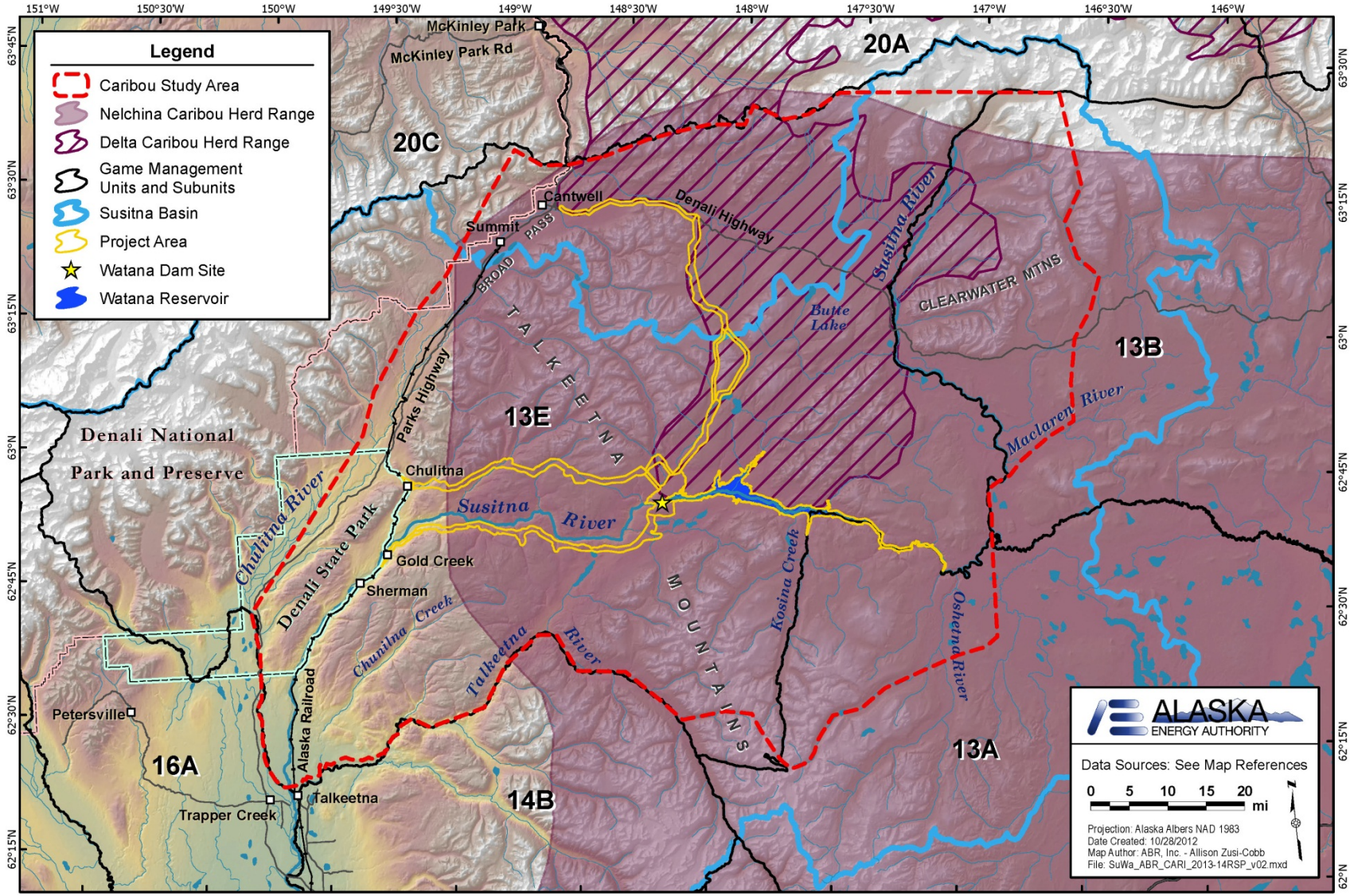

Figure 3-1. Caribou Study Area, 2012–2013.

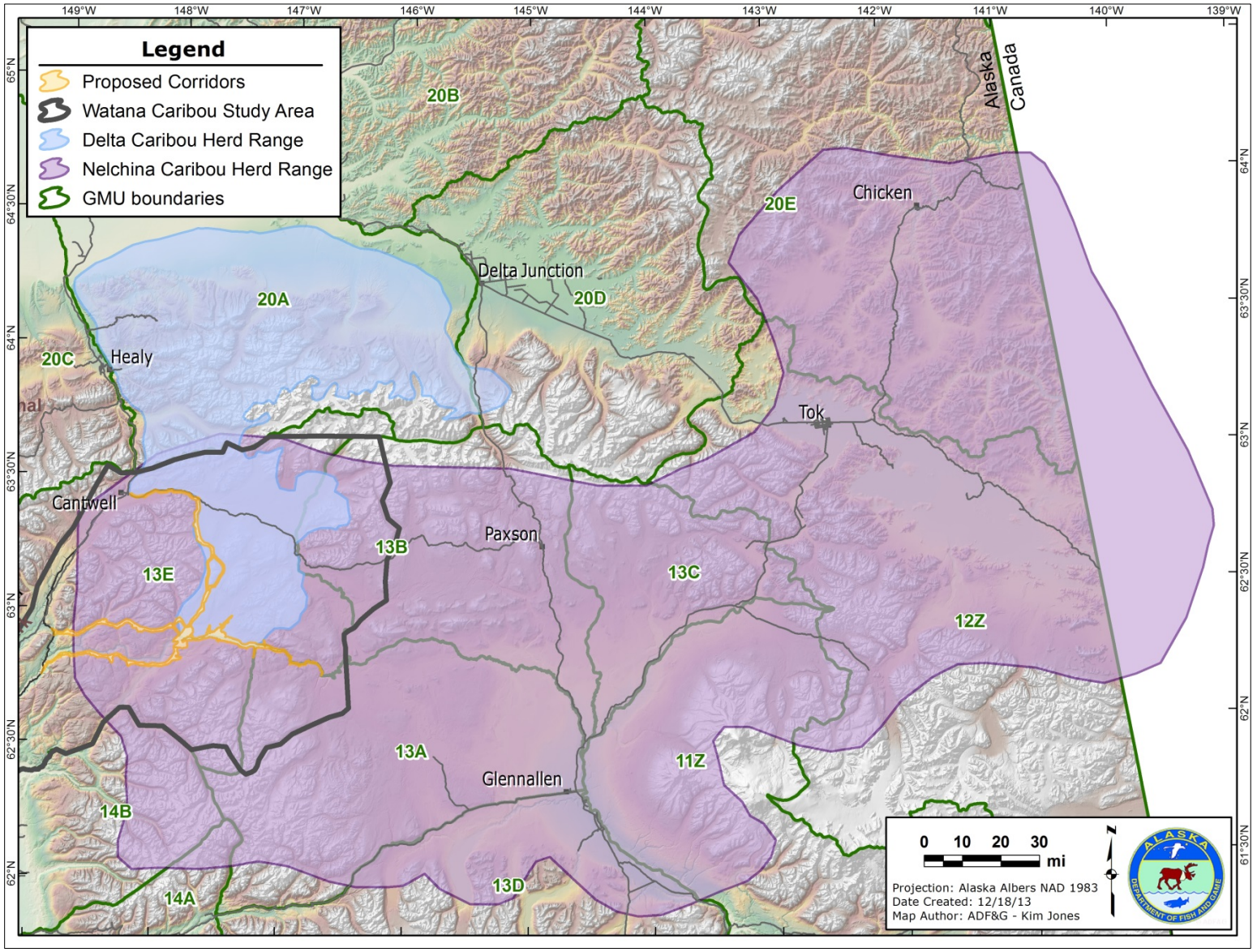

Figure 4.1-1. Nelchina and Delta Caribou Herd Ranges.

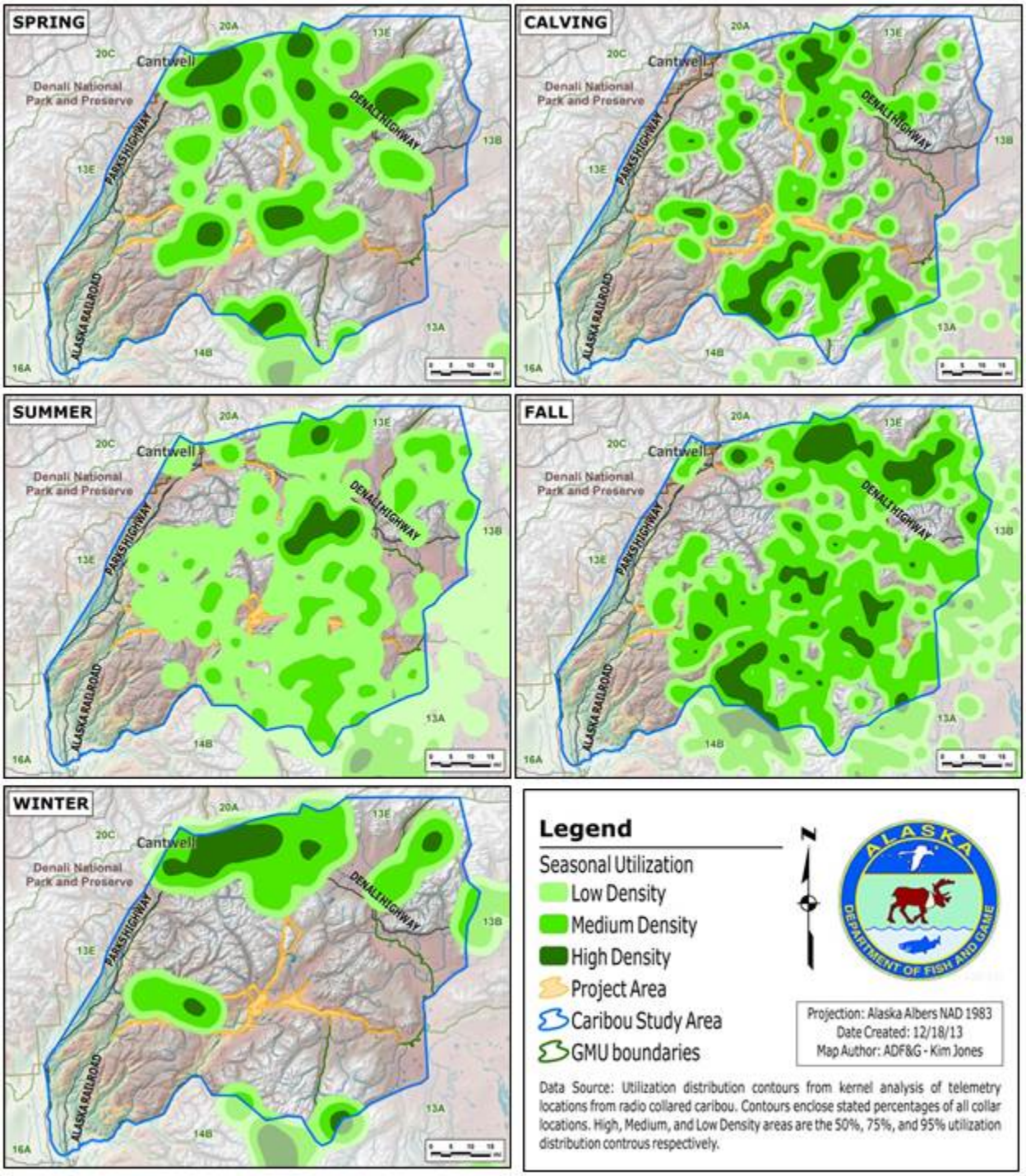

Figure 5.1-1. Seasonal Summaries of VHF-Collared Caribou Locations, 2012–2013.

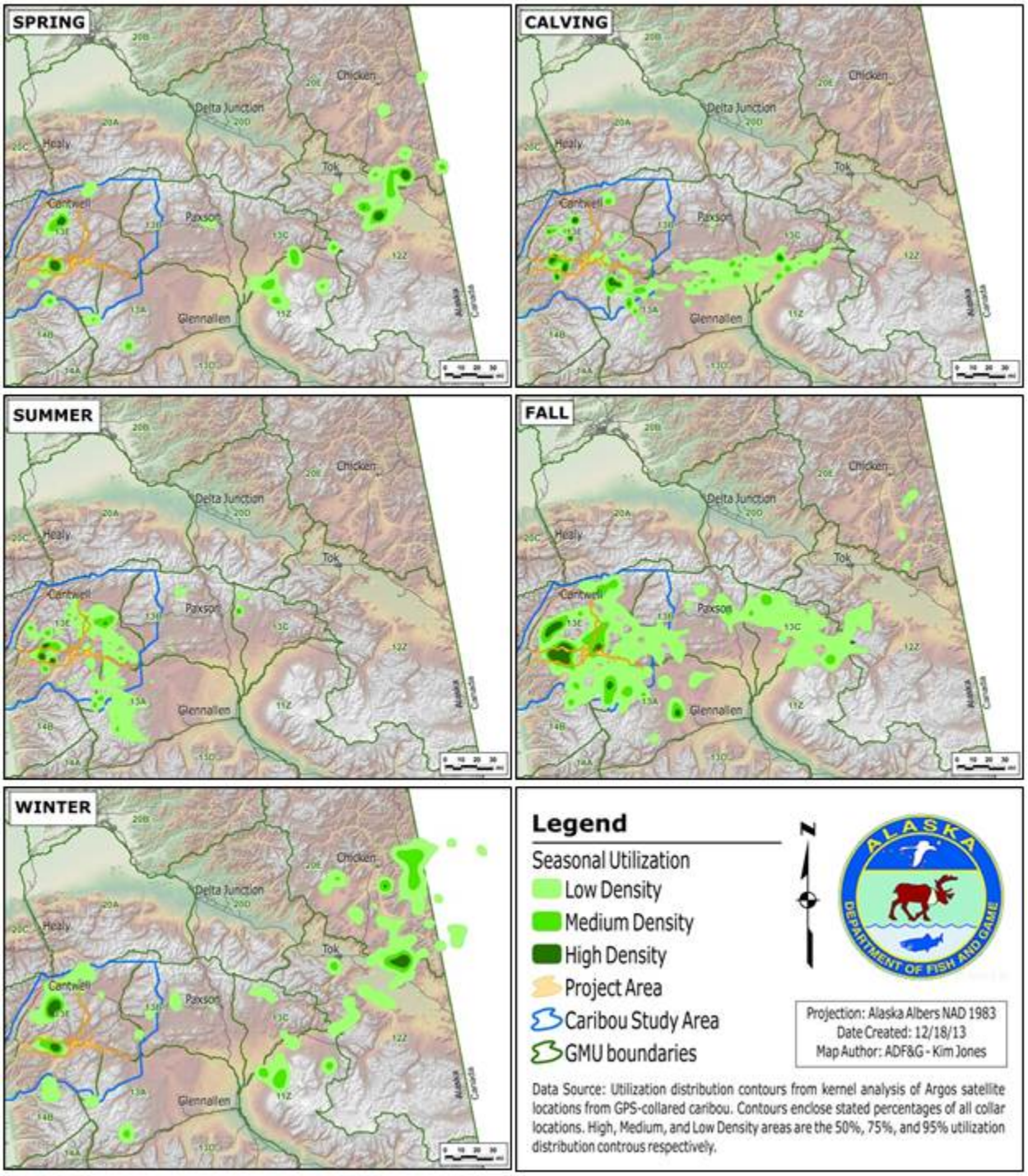

Figure 5.1-2. Seasonal Summaries of GPS-Collared Caribou Locations, 2012–2013.