Susitna–Watana Hydroelectric Project (FERC No. 14241)

Distribution, Abundance, and Habitat Use by Large Carnivores

Study Plan Section 10.8

2014–2015 Study Implementation Report

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

Alaska Department of Fish & Game

Anchorage and Palmer, Alaska

and

ABR, Inc.—Environmental Research & Services

Fairbanks and Anchorage, Alaska

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Abbreviation	Definition
ADF&G	Alaska Department of Fish and Game
AEA	Alaska Energy Authority
APA	Alaska Power Authority
ARRC	Alaska Railroad Corporation
CIRWG	Cook Inlet Regional Working Group
FERC	Federal Energy Regulatory Commission
GIS	geographic information system
GMU	Game Management Unit
ILP	Integrated Licensing Process
ISR	Initial Study Report
NPS	National Park Service
PRM	Project river mile
Project	Susitna–Watana Hydroelectric Project
RSP	Revised Study Plan
SPD	Study Plan Determination

1. INTRODUCTION

This Distribution, Abundance, and Habitat Use by Large Carnivores Study, Section 10.08 of the Revised Study Plan (RSP) approved by the Federal Energy Regulatory Commission (FERC) for the Susitna-Watana Hydroelectric Project, FERC Project No. 14241, focuses on using a reanalysis of existing data to estimate the brown and black bear populations in the study area, collecting hair samples from black and brown bears in the downstream area to estimate a minimum count of bears using the area and estimate the major diet components from stable isotope analysis, and summarize existing information on wolves in the area.

A summary of the development of this study, together with the Alaska Energy Authority's (AEA) implementation of it through the 2013 study season, appears in Part A, Section 1 of the Initial Study Report (ISR) filed with FERC in June 2014 (ADF&G and ABR 2014a). As required under FERC's regulations for the Integrated Licensing Process (ILP), the ISR describes AEA's "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)).

Since filing the ISR in June 2014, AEA has continued to implement the FERC-approved plan for the Distribution, Abundance, and Habitat Use by Large Carnivores Study. For example:

- On October 21, 2014 AEA held an ISR meeting for the Distribution, Abundance, and Habitat Use by Large Carnivores Study.
- Conducted a second year of field work in 2015 to collect bear hair samples along the Middle Susitna River and associated sloughs and tributaries.
- Conducted an aerial survey of wolves in Game Management Unit 13E during January 2015.

In furtherance of the next round of ISR meetings and FERC's SPD expected in 2016, this report describes AEA's overall progress in implementing the Distribution, Abundance, and Habitat Use by Large Carnivores Study prior to October 2015. Rather than a comprehensive reporting of all field work, data collection, and data analysis since the beginning of AEA's study program, this report is intended to supplement and update the information presented in Part A of the ISR for the Distribution, Abundance, and Habitat Use by Large Carnivores Study through September 2015. It describes the methods and results of the 2015 effort, and includes a discussion of the results achieved.

2. STUDY OBJECTIVES

The goal of the Distribution, Abundance, and Habitat Use by Large Carnivores Study (henceforth the Large Carnivores Study) is to obtain sufficient information on three species of dominant predators and game animals in the region—brown bear, black bear, and wolf—to use in evaluating Project-related effects and identifying any appropriate protection, mitigation, or enhancement measures. Four primary objectives were established for the Large Carnivores Study in RSP Section 10.8.1:

1) Estimate the current populations of brown bears, black bears, and wolves in the study area, using existing data from ADF&G.
2) Evaluate bear use of streams supporting spawning by anadromous fishes in habitats downstream of the proposed dam that may be altered by the Project.
3) Describe the seasonal distribution of, and habitat use by, wolves in the study area using existing data from ADF&G.
4) Synthesize historical and current data on bear movements and seasonal habitat use in the study area, including the substantial body of data gathered by radio-tracking during the 1980s, as a continuation of the 2012 wildlife studies (AEA 2012b).

3. STUDY AREA

As established in RSP Section 10.8.3, the study area for spatial modeling of density and population estimation of bears encompasses a large region, including the proposed Project area (reservoir inundation zone, access and transmission corridors, and other Project features) as well as surrounding areas (Figure 3-1). The bear study area includes the entire area of Game Management Unit (GMU) Subunit 13E plus parts of adjacent Subunits 13A, 16A, and 16B, to provide a broad regional context for the analysis of bear densities.

As described in the ISR Overview (Section 1.4) filed in June 2014 and subsequently the *Proposal to Eliminate the Chulitna Corridor from Further Study* filed with FERC September 17, 2014, AEA explained that it had decided to pursue the study of an additional alternative north-south corridor alignment for transmission and access from the dam site to the Denali Highway, referred to as the "Denali East Corridor Option," and to eliminate the Chulitna Corridor from further study. This change to the study area did not impact this study, because the study area for the Large Carnivore Study already included all of the corridor options.

Fieldwork conducted in 2013 and 2015 under the Study Plan comprised surveys of bear use of spawning streams used by anadromous fishes in the Middle Susitna River Segment (Middle River, from Project River Mile [PRM] 102 to 187) and its tributaries from the proposed Watana Dam site as far downstream as the confluence of the Susitna River and the Chulitna River (all of which are located within GMU Subunit 13E).

No field surveys were proposed in the Study Plan for wolves. However, ADF&G conducted aerial surveys of GMUs 13A, 13D, and 13E during January 2015. Because most of the successfully surveyed areas in GMU 13D and 13A were far from the Susitna River, only the results of the survey of GMU 13E are described in this report. The study also involves office-based analysis of existing ADF&G data on wolves from GMU Subunits 13E and 13A, and from adjacent Subunits 14B, 16A, and 20A, as available.

4. METHODS AND VARIANCES

The methods for each of the Large Carnivores Study components are presented in this section.

4.1. Bears

4.1.1. Population Estimation

AEA implemented the methods described in the Study Plan, with the exception of variances described in Section 4.1.1.1 of the ISR Part A (ADF&G and ABR 2014a). The methods for this section are described in the ISR Part A Section 4.1.1. This study component is completed and all results are described in the ISR Part A Section 5.1.1.

4.1.2. Downstream Surveys

AEA implemented the methods described in the Study Plan, with the exception of variances explained below (Section 4.1.2.1).

Fieldwork in 2013 and 2015 focused on surveying bear use of spawning streams and sloughs used by anadromous fish. The study team conducted a survey of bear use of fish-spawning areas in the Middle River and associated tributaries downstream from the proposed Watana Dam site to the confluence of the Susitna and Chulitna rivers to assess the use of those resources by bears in the Project area. The surveys were designed to obtain samples of bear hair for DNA analysis that could be used to quantify the minimum number of bears using the downstream area and for stable-isotope analysis that could be used to characterize the diet of brown and black bears in the sampled area. Modified, nonlethal, single-catch cable snares (henceforth, hair-snag snares; Beier et al. 2005) were deployed in documented salmon-spawning areas in the Middle Susitna River. Hair-snag snares were also deployed in several other locations where bears were regularly seen by local river users or where signs of bear activity were observed. At each site, hair-snags were placed opportunistically along recently used bear trails, areas where bear sign was present, or in locations where bear movements were likely to be funneled to hair-snag locations by local topography or vegetation. The placement of hair-snags was constrained by land access limitations in 2013 (see Section 4.1.2.1 below) and the study team avoided Alaska Railroad Corporation (ARRC) lands in both years which limited access to some small tributary streams. The study team also did not sample at areas of high human traffic by local residents or recreational users in either years, or in areas with heavy use by other researchers associated with the Project in 2013. In both years, a river boat was used for access to the hair-snag locations, therefore, hair-snags were only deployed in areas below Devils Canyon due to the difficulty of boat navigation farther upstream. Radio-tagging studies conducted from 2012 to 2014 have shown that few salmon spawn upstream of Devils Canyon. Over the three years, a total of only 17 tagged Chinook Salmon were detected upstream of Devils Canyon (LGL and ADF&G 2015). Because few salmon spawn upstream of Devils Canyon, concentrated use of stream locations by bears is also unlikely to occur. Overall, the sampled sites were widely distributed across the study area in areas that were expected to have concentrated salmon spawning.

Following initial deployment of the hair-snag snares, each site was checked approximately every 11 to 14 days (mean = 12.2 days; standard deviation = 2.1 days), for a total of five snare-check surveys in each year. Researchers removed hair from the hair-snag snares using tweezers and placed the hair samples in paper envelopes. After all visible hair was removed, the hair-snag snare was reset and a small butane torch was used to burn any hair remnants from the snare.

During the final check (September 24–25 in 2013 and September 19–20 in 2015), each hair-snag snare was removed from the field.

Bear-hair samples collected in 2013 were provided to laboratories at the University of Alaska Fairbanks for analysis of DNA and stable isotopes. DNA and stable-isotope analyses of the hair samples will provide information on the sex and species of bear, a minimum estimate of the number of different individuals using the area sampled, and stable isotope signatures for diet characterization. The isotopic signature will be used to estimate the proportions of the diet composed of salmon, terrestrial meat, and vegetation (Fortin et al. 2007). Laboratory analysis of hair samples collected in 2015 will be conducted during the winter of 2015–2016.

The Study Plan includes an evaluation of berry resources in the reservoir inundation zone during the concurrent mapping efforts of the Vegetation and Wildlife Habitat Mapping Study in the Upper and Middle Susitna Basin (Study 11.5) and the Wetland Mapping Study in the Upper and Middle Susitna Basin Study (Study 11.7). Those mapping studies are ongoing and this study component will be addressed after completion of the mapping on which it depends.

4.1.2.1. Variances

Researchers were unable to access Cook Inlet Regional Working Group (CIRWG) lands in 2013 because land-access agreements were not available at the time of the study. Hence, two documented salmon spawning sites on the Middle Susitna River below Devils Canyon were inaccessible due to this land access restriction in that year (see Section 5.1.2 below). The study team was able to set hair-snag snares on many suitable locations between PRM 113.7 and 145.2 in 2013 and PRM 105.1 and 152.3 in 2015 and was still able to sample a large variety of locations used by bears. The Study Plan recognized that logistical constraints would influence the study design and only a subsample of all potential locations could be sampled. Thus, the study objectives will be met by producing a minimum estimate of the number of bears using the sampled spawning streams and will provide information on the sex, species, and diet composition of bears from multiple locations along the Middle River.

4.2. Wolf

AEA implemented the methods described in the Study Plan (RSP Section 10.8.2.2) with the exception of variances explained below (Section 4.2.1). ADF&G's Division of Wildlife Conservation stated that ongoing ADF&G monitoring work would be sufficient to describe the distribution and habitat use of wolves (ADF&G memorandum to AEA; November 22, 2011), so no additional field surveys were deemed necessary for the Project and a desktop analysis of existing ADF&G data was sufficient to meet the study objectives for wolves. Since the RSP, ADF&G conducted an aerial minimum count estimate of wolves in GMU 13A, 13D, and 13E during January 2015.

For the desktop component of this study, the study team reviewed and synthesized historical reports from the original Alaska Power Authority Susitna Hydroelectric Project (APA Project) study, where possible, with data from other recent and current monitoring by ADF&G of wolves in GMU Subunits 13A, 13B, 13E, 14B, 16A, and 20A, as a continuation of AEA's wildlife studies that were initiated in 2012 (AEA 2012a).

The primary aerial survey effort occurred January 26 and 27, 2015, using a total of 4 PA-18 fixed-wing aircraft for a total of 8 flight days. Planes were based in the greater Copper River Basin and in Talkeetna. Two ADF&G staff from Palmer acted as observers in the Talkeetna-based planes. Owing to the difficulty in getting observers for the remaining 2 planes, and the substantial wolf-tracking experience of the remaining pilots, the pilots acted as the sole observer in those two planes. The survey began 24 hours after a major multi-day snowfall event, during which there was minimal cloud cover. Prevailing wind conditions prevented the survey of the Matanuska River west of Sheep Mountain in Subunit 13D, as well as the Reindeer Hills to Pyramid Peak and south to the northern extreme of the Talkeetna Mountains (Figure 4.2-1). Broad Pass and the Talkeetna Mountains south of the Susitna River and west of the Talkeetna River also had high winds that created poor tracking conditions, especially on ridges. In the Middle Fork of the Chulitna River, the upper Jack River, and the western edge of the Talkeetna Mountains, numerous caribou made tracking conditions difficult. The remainder of the area varied between 'fair' and 'excellent' tracking conditions, with the best conditions occurring in the eastern portion of the study area.

Following the end of survey activities in Subunit 13E, the Glennallen-based pilots surveyed Subunit 13D, starting on January 28 and ending February 1, using a total of 5 flight days of airtime. All flights occurred 1–2 days after a major snowfall event except for a single half day of 'clean up' flights. Tracking conditions during these surveys were described as 'excellent.' Due to the aging snow, surveys of Subunit 13A, between the Kosina and the Oshetna rivers, and an area east of Lake Louise were not conducted. Snow conditions never substantially recovered in the area, and the next major snow event, in March, failed to deposit more than an inch of snow in most of that area. Consequently, only a small portion of GMU 13A was surveyed. Because most of the successfully surveyed areas in GMU 13D and 13A were far from the Susitna River, only the results of the survey of GMU 13E are described in this report.

4.2.1. Variances

The Study Plan proposed to use existing information on wolf distribution and population size in the area. However, since the Study Plan was approved, ADF&G conducted an aerial survey in January 2015 to estimate the minimum count of wolves in GMU 13E. This is an additional study component that will complement the literature review described in the Study Plan and enhance the ability for AEA to meet the study objectives.

5. RESULTS

Because animal location data collected during ADF&G population surveys are restricted under Alaska State Statute (AS 16.05.815(d)), the location coordinates of the bears and wolves observed during the previous population surveys analyzed for the ISR (ADF&G and ABR 2014a, Sections 5.1.1 and 5.2) or for this report are not included in the data posted on the Project website.

Data developed in support of the downstream bear survey component of this study are available for download in the following file at: http://gis.suhydro.org/SIR/10-Wildlife/10.8-Lrg_Carnivore/

See Table 5-1 for details.

5.1. Bears

5.1.1. Population Estimation

This study component is completed and all results are described in the ISR Part A Section 5.1.1 (ADF&G and ABR 2014a).

5.1.2. Downstream Surveys

5.1.2.1. 2013

Results of this study component for the 2013 field season are described in the ISR Part A Section 5.1.2 (ADF&G and ABR 2014a). Results of the laboratory analysis of hair samples are described in the ISR Part B (ADF&G and ABR 2014b).

5.1.2.2. 2015

A total of 64 hair-snag snares were set in 19 different sampling locations throughout the Middle Susitna River Segment in 2015 (Tables 5.1-1 and 5.1-2, Figure 5.1-1). Ten of the 12 sites sampled in 2013 were reused (Slough 10 and South Indian Slough were dropped due to low bear activity in 2013). Two sites on CIRWG land were added in 2015 (Jack Long Creek and Portage Creek). Two sites with high activity by researchers in 2013 were added in 2015 (Whisker's Creek and Slough and Gold Creek), and five other new sites were added in 2015. These five sites were not sampled in 2015 because they were either not checked in 2013 (Little Portage Creek, Slough 8A area, and Slough at PRM 133.4) or there was no bear sign observed in 2013 (Tulip Creek and Slough 9B; Tables 5.1-2 and 5.1-3). Three sites sampled in 2015 (McKenzie Area, Slough 8A area, and Slough at PRM 133.4) were not identified as potential salmon spawning areas (Table 5.1-3) but were sampled based on observations of bear activity or recommendations by local residents, and because small sloughs or local topography provided good snare locations. Hair-snag snares were deployed for an average of 59.4 days (range = 15–62; SD = 6.5) between July 20 and September 20, 2015. Hair-snag snares were deployed July 20–23 and removed from the field at the end of the study, although two hair-snag snares (Lane Creek and Slough 8A) were removed earlier than planned because of low bear activity (Table 5.1-1).

The 64 hair-snag snares were checked between one and five times each for a total 314 snare-checks during five field surveys. A total of 203 (64.6 percent) of the hair-snag snares were tripped when checked and 131 samples (64.5 percent of tripped snares) were collected from 58 different hair-snag snares at all 19 sampling locations. Fifth of July Creek, Slough 21, and Slough 20 produced the most hair samples (20, 16, and 13, respectively). The least productive sampling locations were Whiskers Creek (two samples), Oxbow Slough (three samples), and Lane Creek (zero samples) (Table 5.1-2). Each of the five snare-checks produced between 15 and 40 bear-hair samples, with the largest number of samples obtained during the August 4–6 snare-check (40 samples) and the August 15–16 snare-check (31 samples) (Table 5.1-1). Only one hair-snag snare, located at Tulip Creek, produced a hair sample during each snare-check survey. Three hair-snag snares had multiple (two) clumps of hair that were collected in more

than one sample envelope. Overall, a total of 134 bear-hair samples were available for laboratory analysis.

The study team identified 37 documented salmon spawning sites (i.e., sloughs and tributaries) throughout the Middle Susitna River Segment that were considered to be potentially suitable for deployment of hair-snag snares. Due to private property or ARRC land, high human activity, lack of boat access, or lack of bear sign, however, the study team deployed hair-snag snares at 11 of those sites in 2013 and 16 of those sites in 2015 (Figure 5.1-2, Table 5.1-3). The sampled locations were widely distributed throughout the study area and included many of the locations with high potential for bear use.

The bear-hair samples collected in 2015 will be delivered to two analytical laboratories (one for DNA, one for stable isotopes). Analytical results for 2015 hair samples are not yet available at this writing.

5.2. Wolf

The analysis of existing data on wolf numbers and distribution in the study area was completed and described in the ISR Part A Section 5.2 (ADF&G and ABR 2014a).

Within the GMU 13E survey area, a total of 6 groups of wolves were identified during the January 2015 aerial survey. Most of those groups were small, comprising two or three individuals, with one pack of 16 comprising the majority of the 27 animals directly seen in the subunit. Combining tracks and wolf sightings, there may have been three wolves not seen during the survey, north of the Denali Highway. Immediately prior to the survey, there was a single pack of 4 seen within the subunit, of which one had a National Park Service (NPS) radio collar. This pack was not seen during the survey, but was tracked to the Sanctuary River immediately after the survey. Finally, the group of 16 wolves was seen two times in subsequent months, 11 km and 40 km from their initial location. The NPS reports that there was a pack of approximately 20 individuals 40 km north in the Yanert River drainage during the period, but this is unlikely to be the same pack given both the group of 16 and group of 20 were seen in their respective territories on consecutive days on two subsequent relocations. While it is not infeasible for wolves to travel 40 km in a day, this happening twice is unlikely. Most wolves or wolf sign was observed in lower elevation areas including the vicinity of the Denali Highway and the Susitna River.

6. DISCUSSION

6.1. Bears

6.1.1. Population Estimation

The analysis described in the ISR Part A Sections 4.1.1 and 5.1.1 of this study complete the objective to estimate the populations of black and brown bears in the study area using existing data from ADF&G.

6.1.2. Downstream Surveys

The use of modified, nonlethal, break-away snares as hair snags proved to be effective at collecting a reasonable number of samples of bear hairs. Compared with a similar study conducted in an area of higher bear density in southeastern Alaska (Beier et al. 2005), the percentage of hair-snag snares tripped in this study was lower in 2013 but similar in 2015 (49.8 percent in 2013 and 64.6 in 2015 compared to 65.0 percent), but a greater proportion of the hair-snag snares tripped in this study produced hair samples in both years (72.6 percent in 2013 and 64.5 percent in 2015 compared to 45.5 percent in the southeastern Alaska study).

The low number of samples obtained during the late August 2013 check was likely the result of high water in the Susitna River that reduced salmon abundance and reduced the number of functional hair-snag snares. Approximately 11 hair-snag snares showed signs of having been flooded during that high-water event and the study team removed three snares due to sustained high water levels. Bears appeared to be more abundant in tributaries of the Susitna River than in sloughs. The tributary stream locations averaged 0.42 samples per snare-check (n = 189 snare-checks), whereas the slough locations averaged 0.38 samples per snare-check (n = 314 snare-checks). The highest rate of hair sample collection occurred at Tulip Creek (0.70 samples/snare-check), Portage Creek (0.67 samples/snare-check), and Slough 21 (0.58 samples/snare-check) although these results are influenced by the quality of the hair-snag snare locations as well as the amount of bear activity in the area. Fourth of July and 5th of July creeks had the highest rate of sample collection in 2013 (0.67 and 0.60 samples/snare-check, respectively), but lower rates in 2015 (0.16 and 0.50 samples/snare-check, respectively).

The study team did not sample at all the potential salmon spawning locations along the Middle Susitna River Segment (see Section 4.1.2.1 above), especially in 2013, which reduced the area in which the study team can produce an estimate of minimum population size of bears along the Middle Susitna River. The population estimation section of this study (Section 4.1.1) produced spatial models of spring brown and black bear density over the larger bear study area (ADF&G and ABR 2014a). Black and brown bears are highly territorial and tend to use the same high-quality foraging areas throughout a season (Barnes 1990). The study area was expanded in 2015 to include CIRWG land, several locations that had high human activity in 2013, and additional new locations. There is also likely annual variation in the diet of bears. For example, Miller (1987) observed a prevalence of berries in black bear scats along sloughs of the Middle Susitna River, but predicted that salmon constituted an important buffer food during years when berry crops fail.

The 2013 DNA and stable isotope results show that the area is used by both black and brown bears and the two bear species differ in their use of salmon (ADF&G and ABR 2014b). The 2013 stable isotope results suggest that the diet of black bears is predominantly vegetation while brown bears consume a larger proportion of salmon and terrestrial meat. A more complete analysis of stable isotope results will be conducted after 2015 laboratory results are available.

6.2. Wolf

The combination of a literature review and an aerial survey provided information on current wolf numbers and distribution as well as on long-term trends in population. A minimum count of 27 wolves was estimated for GMU 13E in 2015.

6.3. Conclusion

The analysis of bear survey data (RSP Section 10.8.4.1.1) and the review of wolf data (RSP Section 10.8.4.2) have been completed per the FERC-approved Study Plan and those study objectives have been met.

The field work for the downstream bear survey (RSP Section 10.8.4.1.2) has been completed. Laboratory results for DNA and stable isotope analyses of bear hair samples collected from nonlethal snares deployed in the downstream bear survey during 2015 have not yet been completed. AEA expects to complete all remaining laboratory data analysis in 2016, which will be reported in the USR. The study team expects that the combination of the 2013 and 2015 effort (and variances described in Section 4), and integration with other studies will fully achieve the Study Plan objectives.

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8. TABLES

Table 5-1. Server Location and File Names for the Field Data for Large Carnivores Collected in 2013–2015.

Server Pathway or File/Folder Name	Description
http://gis.suhydro.org/SIR/10-Wildlife/10.08-Lrg_Carnivore/	Pathway to data files
LCAR_10_08_Data_2013_2015_ABR_ADFG.gdb	Geodatabase file containing spatial layers of the wolf aerial survey area, anadromous streams in the downstream bear area, potential salmon spawning locations, and the large carnivore study area.
LCAR_10_08_Data_2013_2015_ABR.accdb	Access file with tables of bear hair snare locations, bear hair snare-checks, bear hair snare samples, and bear hair lab results for 2013.

Table 5.1-1. Number of Hair-snag Snares Set for Bears, and Samples Collected during Each Field Survey, in 2013 and 2015.

Year	Survey Dates	Number of Snares Set	Number of Snares Removed	Number of Snares Deployed	Number of Snares Checked	Number of Hair Samples Collected
2013	July 22–24	37	0	37	0	–
	August 6–7	8	4	41	37	20
	August 15–16	7	0	48	41	11
	August 27–28	0	3	45	48	11
	September 10–11	0	3	42	45	21
	September 24–25	0	42	0	42	14
2015	July 20–23	64	0	64	0	–
	August 4–6	0	1	63	64	40
	August 15–16	0	0	63	63	31
	August 27–28	0	1	62	63	25
	September 8–9	0	0	62	62	15
	September 19–20	0	62	0	62	20

Table 5.1-2. Number of Hair-snag Snares Set for Bears, Total Active Days, and Total Samples Collected, by Sampling Location, 2013 and 2015.

Year	Project River Mile	Sampling Location	Number of Snares Set	Total Active Snare Days[1]	Total Samples Collected
2013	113.7	Oxbow Slough	7	418	6
	117.2	Lane Creek	2	50	1
	119.4	McKenzie Area	2	50	0
	127.3	5th of July Creek	4	194	12
	128.7	Slough 8A	1	11	0
	134.3	4th of July Creek	3	144	8
	134.4	4th of July Slough	10	423	17
	136.3	Slough 9A	3	189	5
	137.1	Slough 10	7	359	2
	141.2	South Indian Slough	2	38	0
	143.6	Slough 20	4	225	8
	145.2	Slough 21	7	426	18
2015	105.1	Whiskers Creek	4	232	2
	113.7	Oxbow Slough	4	236	3
	117.2	Lane Creek	1	36	0
	119.4	McKenzie Area	2	122	5
	121.4	Little Portage Creek	3	183	7
	124.4	Tulip Creek	2	122	7
	127.3	5th of July Creek	8	496	20
	128.7	Slough 8A	4	198	9
	130.1	Slough 8A Area	2	122	5
	132.6	Slough 9B	2	122	4
	133.4	Slough at PRM 133.4	3	183	4
	134.3	4th of July Creek	5	305	4
	134.4	4th of July Slough	5	305	7
	136.3	Slough 9A	2	122	6
	140.1	Gold Creek	3	177	4
	143.6	Slough 20	4	240	13
	145.2	Slough 21	5	300	16

Year	Project River Mile	Sampling Location	Number of Snares Set	Total Active Snare Days[1]	Total Samples Collected
	148.3	Jack Long Creek	2	120	5
	152.3	Portage Creek	3	180	10

Notes:

Total active snare days is equal to the total number of days between initial deployment and removal for each snare at that sampling location.

Table 5.1-3. Potential Salmon Spawning Areas Sampled and Not Sampled in the Middle Susitna River Segment, 2013 and 2015.

Project River Mile	Salmon Spawning Area[1]	Sampled in 2013?	Sampled in 2015?	Reason for Not Sampling
105.1	Whisker's Creek & Slough	No	Yes	High level of human activity in 2013
110.5	Chase Creek	No	No	High level of human activity
113.7	Oxbow Slough	Yes	Yes	–
114.9	Slash Creek	No	No	Access to ARRC land restricted
115.0	Gash Creek	No	No	Access to ARRC land restricted
117.2	Lane Creek	Yes	Yes	Limited access due to ARRC land
117.2	Slough 8	No	No	Access to ARRC land restricted
120.2	McKenzie Creek	No	No	Access to ARRC land restricted
121.4	Little Portage Creek	No	Yes	Limited access due to ARRC land
124.4	Deadhorse Creek	No	No	Access to ARRC land restricted
124.4	Tulip Creek	No	Yes	No bear sign observed in 2013
125.7	Slough 8B	No	No	No bear sign observed
127.3	Fifth of July Creek	Yes	Yes	–
128.1	Skull Creek	No	No	Access to ARRC land restricted
128.7	Slough 8A	Yes	Yes	Limited due to high human activity
131.5	Slough 9	No	No	Difficult to access by boat
132.5	Slough 9B	No	Yes	No bear sign observed in 2013
134.1	Sherman Creek	No	No	Access to ARRC land and private property restricted
134.3	Fourth of July Creek	Yes	Yes	–
134.4	Fourth of July Slough	Yes	Yes	–
136.3	Slough 9A	Yes	Yes	–
137.1	Slough 10	Yes	No	Low success in 2013
138.7	Slough 11	No	No	High level of human activity
140.1	Gold Creek	No	Yes	High level of human activity in 2013
142.1	Indian River	No	No	High level of human activity
142.3	Slough 17	No	No	High level of human activity
142.5	Slough 18	No	No	High level of human activity
143.6	Slough 20	Yes	Yes	–
145.2	Slough 21	Yes	Yes	–
148.3	Jack Long Creek	No	Yes	Access to CIRWG lands restricted in 2013
152.3	Portage Creek	No	Yes	Access to CIRWG lands restricted in 2013
155.9	Cheechako Creek	No	No	Not accessible by boat
160.5	Chinook Creek	No	No	Not accessible by boat
164.8	Devil Creek	No	No	Not accessible by boat
179.3	Fog Creek	No	No	Not accessible by boat
184.6	Tsusena Creek	No	No	Not accessible by boat

Notes:

Current and historic salmon spawning areas and bear concentration areas documented by one or more of the following references: Barrett et al. (1985), Miller (1987), ADF&G (2012), Link et al. (2013), R2 Resource Consultants, Inc. (2013).

9. FIGURES

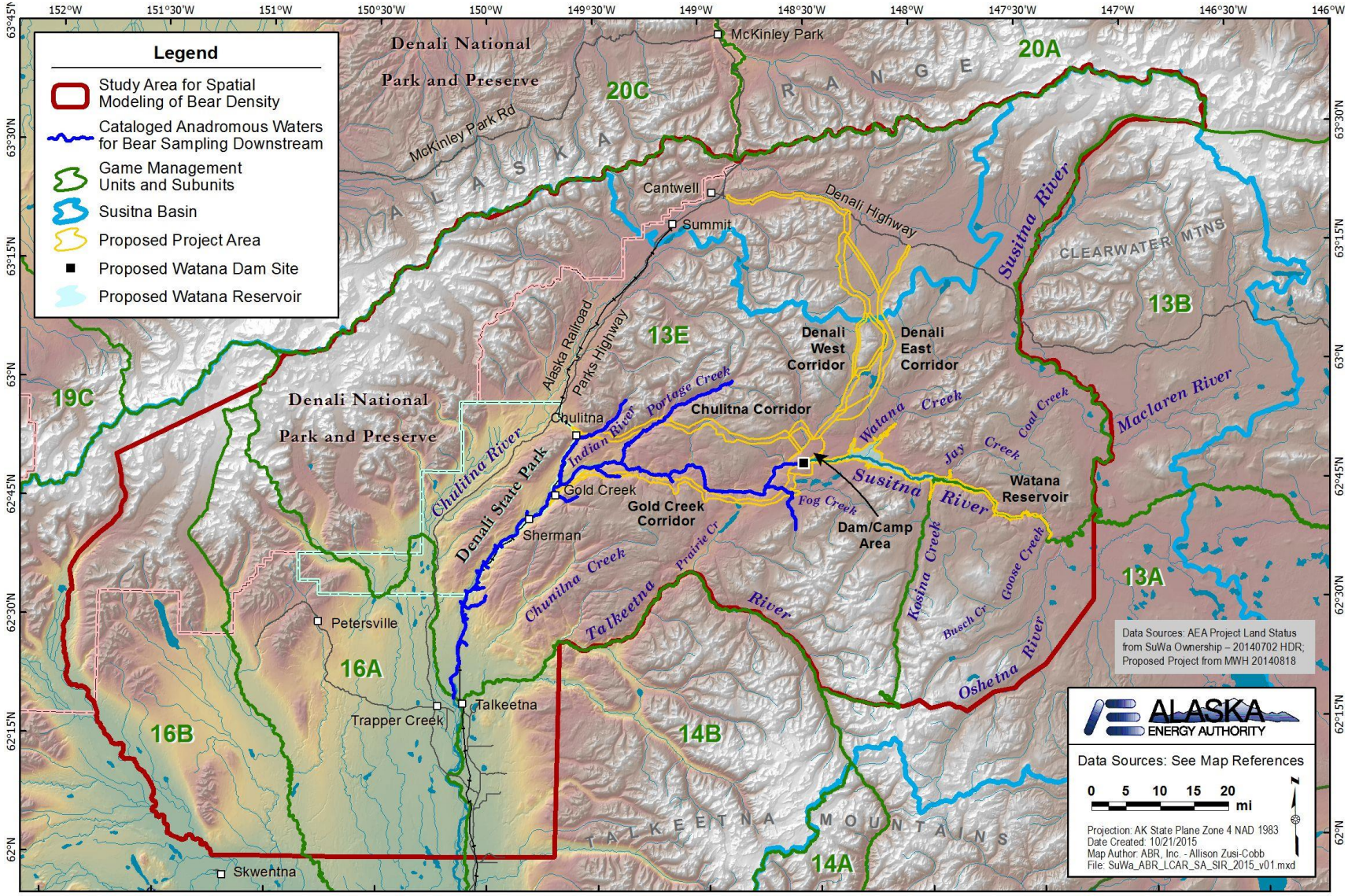

Figure 3-1. Study Area for Large Carnivores.

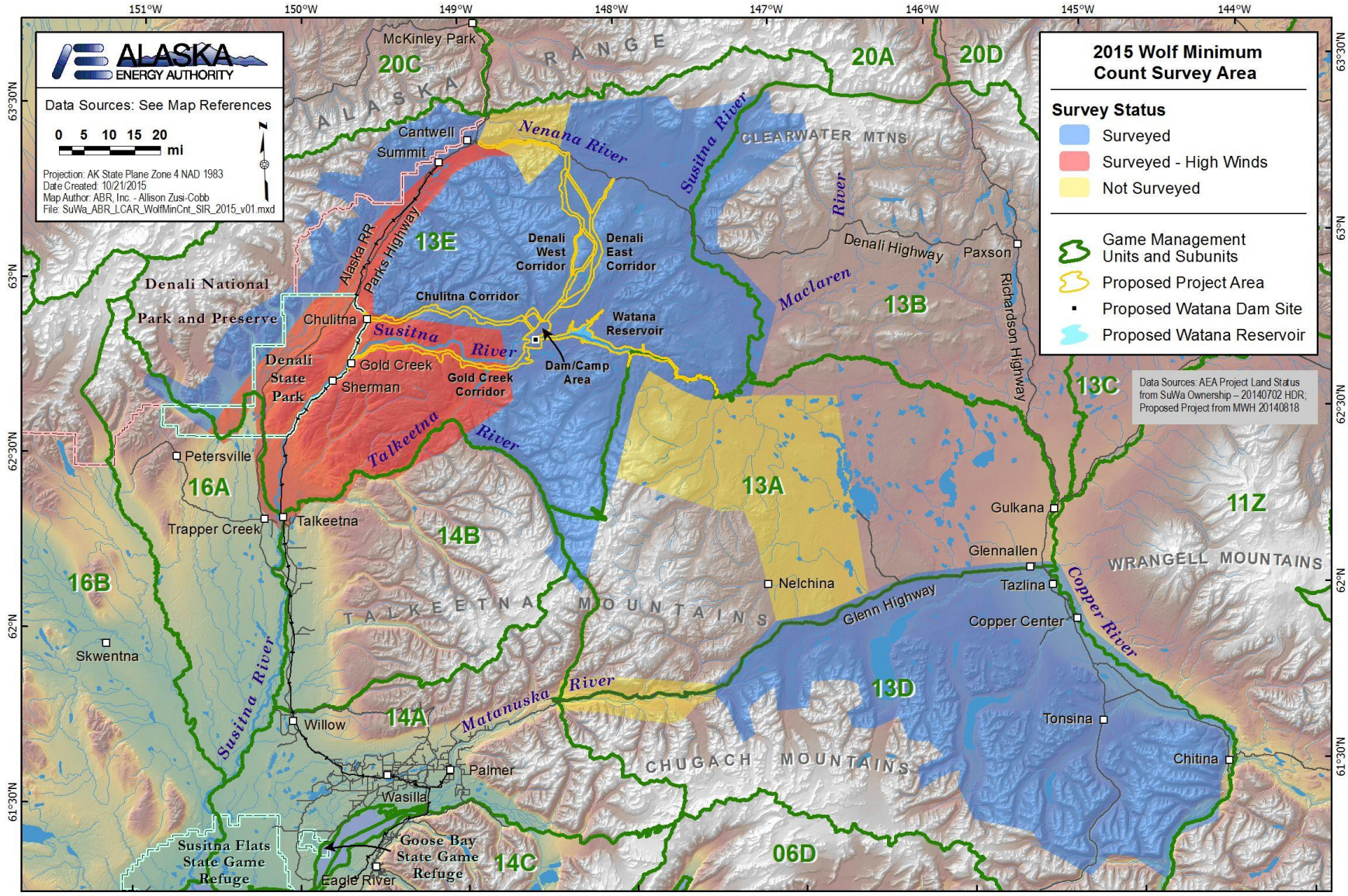

Figure 4.2-2. Wolf minimum count survey area in GMU 13. Survey boundaries are approximate.

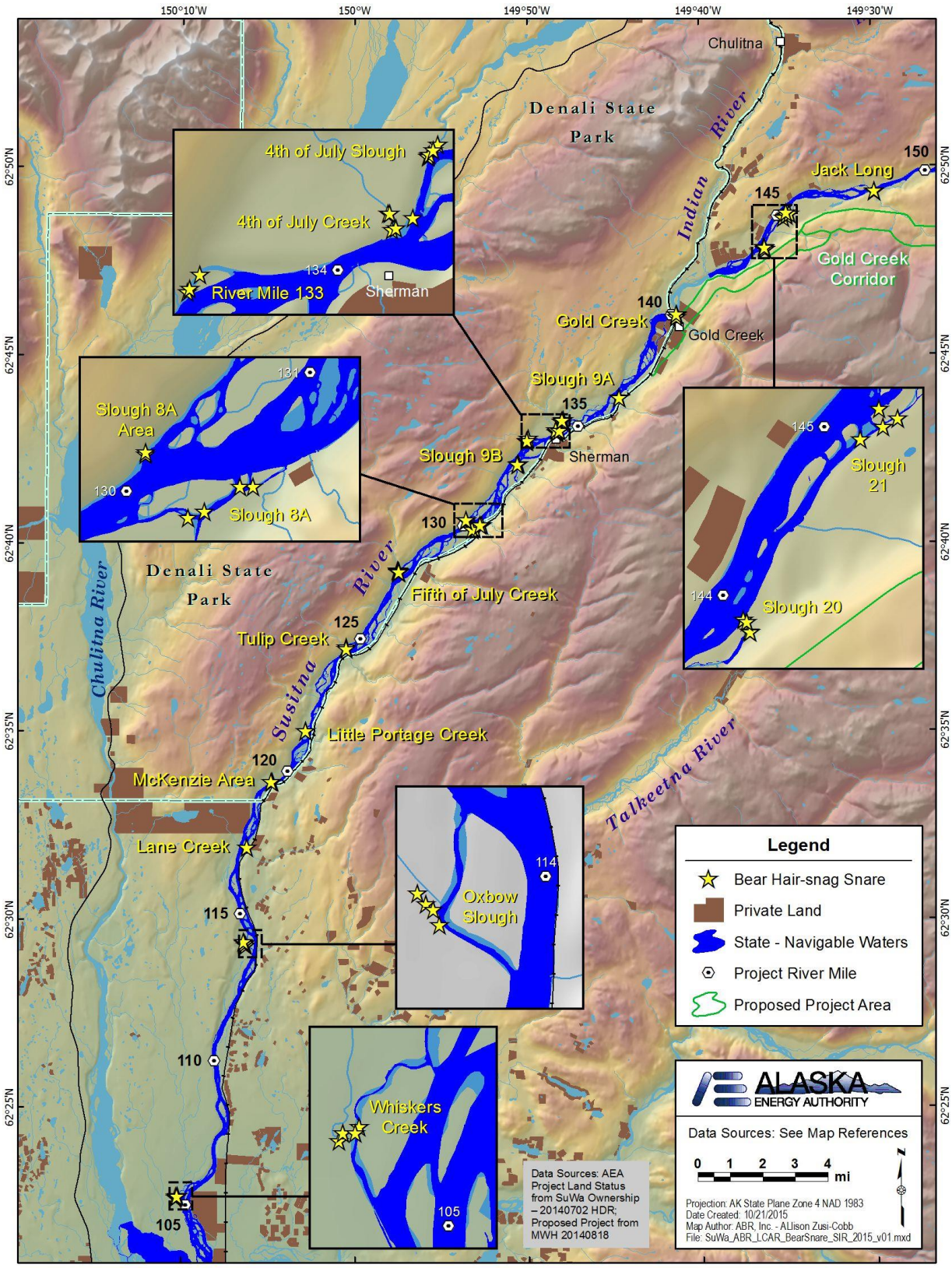

Figure 5.1-1. Locations of Hair-snag Snares for Bears in 2015.

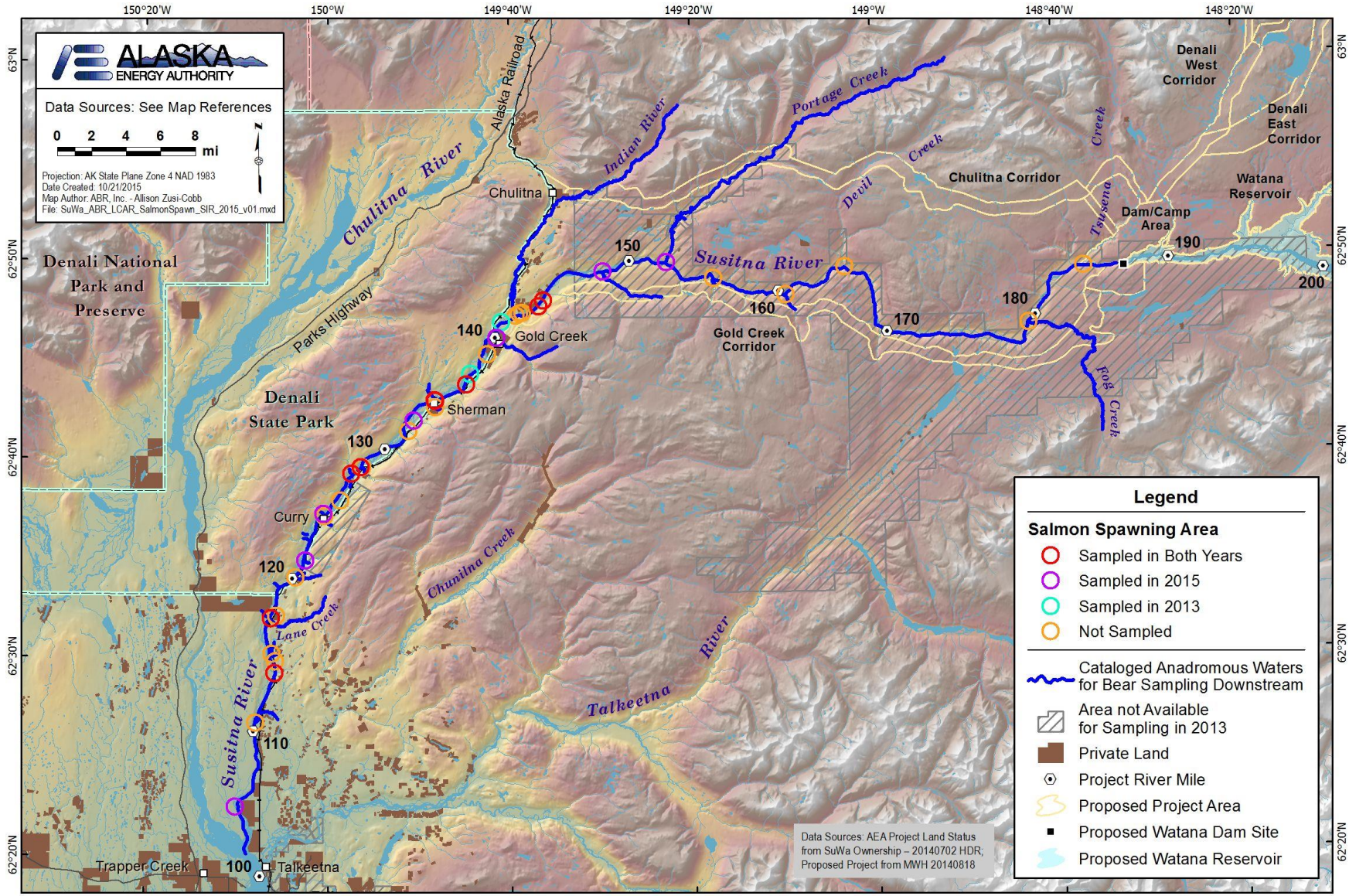

Figure 5.1-2. Potential Salmon-Spawning Areas Identified and Sampled or Not Sampled during Downstream Survey of Bear Use, 2013 and 2015.