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## **Grizzly Bear Inventory Project in Bear Management Area 1**



# Grizzly Bear Inventory Project in Bear Management Area 1

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## **Conservation Report Series Type**

Data

ISBN: 978-1-989448-02-1

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## **Suggested Citation:**

Ranger, M., and M. Verhage. 2019. Grizzly bear inventory project in Bear Management Area 1. Data Report, produced by Alberta Conservation Association, Sherwood Park, Alberta, Canada. 12 pp.

**Cover photo credit:** David Fairless

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## EXECUTIVE SUMMARY

Grizzly bears are an iconic symbol of wilderness and historically an important part of Alberta's hunting heritage. In 2010, Alberta grizzly bears were designated as *Threatened* under the provincial *Wildlife Act*, and in 2012, the western population was federally designated as a species of *Special Concern* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Alberta Environment and Parks (AEP) has indicated that completing a population inventory to estimate the density and abundance of grizzly bears within Bear Management Area 1 (BMA 1) is a priority. Prior to this study, a population estimate for BMA 1 had never been completed. Preliminary set up of barbed wire corral hair trap sites (bear rub sites) in BMA 1 began in the summer and fall of 2015 and 2016. During this period AEP surveyed public and private lands within BMA 1 and set up a total of 215 bear rub sites. In the spring and summer of 2017, Alberta Conservation Association (ACA) partnered with AEP to set up an additional 39 rub sites and intensively sample all rub sites in BMA 1 over a series of repeated field visits. During the initial field visit we cleaned off any existing hair, retightened barbed wire, and applied lure to each rub site. During the second, third, and fourth visit we collected bear hair samples and re-applied lure to each rub site. On the fifth and final visit we collected hair samples and then removed the barbed wire and signage at all 254 rub sites. We made 1,238 visits to the 254 rub sites, with an average of 247 rub sites for each of the four hair collection visits. From the 42 trail cameras that were set up throughout BMA 1 we collected and processed over 112,000 photos. Upon analysis of the photos, 471 individual animals were identified, including 12 grizzly bears. We sent 3,974 bear hair samples to Wildlife Genetics International for DNA analysis. The DNA results will be used in a spatially explicit capture-recapture framework to estimate grizzly bear density and abundance in BMA 1. The BMA 1 grizzly bear population estimate will be published by AEP and released to the public in 2019.

**Key words:** Alberta, density estimate, DNA, grizzly bear, hair sample, non-invasive monitoring, population inventory, rub site, *Ursus arctos*.

## **ACKNOWLEDGEMENTS**

Thank you to the following Alberta Conservation Association (ACA) and Alberta Environment and Parks (AEP) staff who were involved in the planning and delivery of the BMA 1 project: Franco Alo, Lindsey Dewart, Amy Flasko, Lyle Fullerton, Chris Grainger, John Hallett, Courtney Hughes, Dave Jackson, Mike Jokinen, Paul Jones, Nikita Lebedynski, Jessica Lockhart, Doug Manzer, Caitlin Martin, Garret McKen, Nataalka Melnycky, Dave Moyles, Kyle Prince, Corey Rasmussen, Amanda Rezansoff, Adam Scharnau, Britt Schmidt, Caroline Seip, Robb Stavne, Dan Sturgess, Luke VanderVennen, Jon Van Dijk, Wanda Watts, and Ken Wright.

Funding and in-kind project support was provided by Alberta Agriculture and Forestry, AEP, and Forest Resource Improvement Association of Alberta (FRIAA).

The Grizzly Bear Inventory Project in Bear Management Area 1 is a collaborative effort between ACA and AEP.

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	ii
ACKNOWLEDGEMENTS.....	iii
TABLE OF CONTENTS .....	iv
LIST OF FIGURES .....	v
1.0 INTRODUCTION .....	1
2.0 STUDY AREA.....	1
3.0 MATERIALS AND METHODS.....	3
3.1 Set up of rub sites in 2015 and 2016 .....	4
3.2 Final set up of rub sites, trail cameras, and collection of bear hair samples in 2017 .....	5
4.0 RESULTS.....	8
5.0 SUMMARY .....	9
6.0 LITERATURE CITED .....	11

## LIST OF FIGURES

Figure 1.	The red border indicates the boundary of Bear Management Area 1 as well as the outer boundary of the Support Zone. The green border indicates the boundary of the Recovery Zone. The inset map shows the location within the province of Alberta.....	2
Figure 2.	Location of bear rub sites within Bear Management Area 1 in 2017. ....	7
Figure 3.	Number of bear hair samples collected per sampling visit in Bear Management Area 1 in 2017.....	9

## 1.0 INTRODUCTION

Grizzly bears (*Ursus arctos*) are an iconic symbol of Alberta's wilderness and historically an important part of Alberta's hunting heritage. In 2002, Alberta's Endangered Species Conservation Committee (ESCC) recommended that the provincial grizzly bear population be designated as *Threatened* under the provincial *Wildlife Act* due to its small population size, low reproductive rate, limited immigration from outside populations, and increased human activity on the landscape (Alberta Sustainable Resource Development (ASRD) and Alberta Conservation Association (ACA) 2010; ASRD 2008). In 2012, the western population of grizzly bears were federally designated as a species of *Special Concern* by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2012).

A provincial Grizzly Bear Recovery Team was tasked with providing recommendations including strategies and actions for the recovery of grizzly bears within Alberta (ASRD 2008). Alberta Environment and Parks (AEP) indicated that completing a population inventory to estimate the density and abundance of grizzly bears within Bear Management Area 1 (BMA 1) is a priority. Our goal was to set up barbed wire corral hair trap sites (bear rub sites), collect bear hair samples over repeated field visits, and together with AEP, use DNA analysis to help determine density and abundance estimates for grizzly bears in BMA 1. This population inventory will play an important role in proactive land-use planning, supporting grizzly bear management, and reducing human-bear conflicts in Alberta.

## 2.0 STUDY AREA

Bear Management Areas serve as administrative boundaries for the management of both grizzly and black bear (*Ursus americanus*) populations in Alberta. Within BMA 1, the Recovery Zone is primarily Crown Land, and the designated focus area in provincial government plans for the recovery of grizzly bears, while the Support Zone is predominantly deeded and leased land, and accounts for individuals whose home ranges are not entirely centered within the Recovery Zone (AEP 2017).

The entirety of BMA 1 spans approximately 41,548 km<sup>2</sup>; however, the primary focus area of this study lies within the Recovery Zone of BMA 1, extending approximately 23,458 km<sup>2</sup>. BMA 1 is bounded by Highway 35 to the north, Highway 64 and Highway 685 to the south, the Peace

River and Chinchaga River to the east, and the Alberta-British Columbia provincial border to the west (Figure 1).

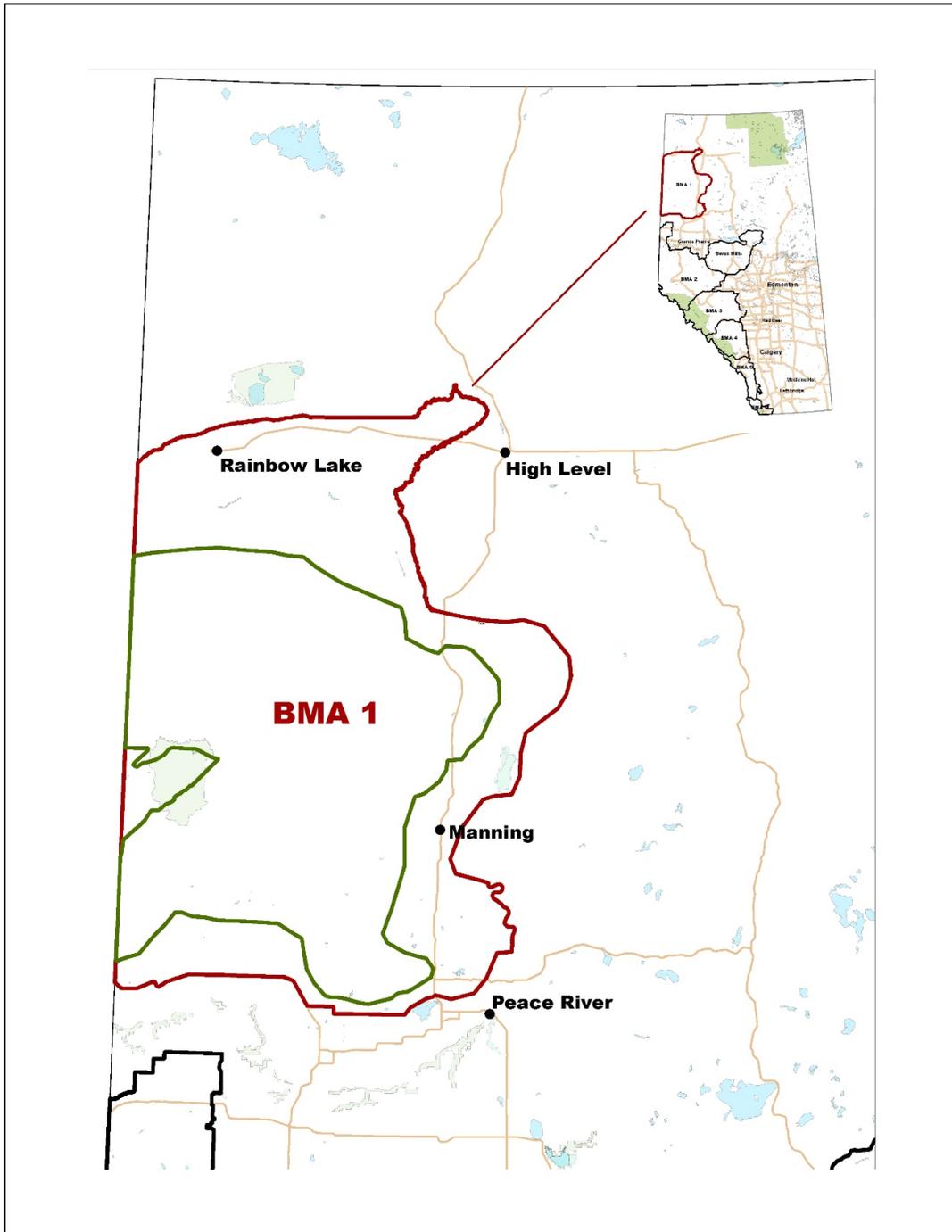


Figure 1. The red border indicates the boundary of Bear Management Area 1 as well as the outer boundary of the Support Zone. The green border indicates the boundary of the Recovery Zone. The inset map shows the location within the province of Alberta.

Just over half of BMA 1 falls within the lower boreal highlands natural subregion which is characterized by diverse mixedwood forests including trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), black and white spruce (*Picea mariana*, *Picea glauca*), white birch (*Betula papyrifera*), and lodgepole pine-jack pine (*Pinus contorta*, *Pinus banksiana*) hybrids. An additional 21% of BMA 1 falls within the dry mixedwood natural subregion, characterized by aspen forests and cultivated landscapes, with fens commonly occurring in low-lying areas. The remainder of BMA 1 consists of a nearly even split of the central mixedwood and upper boreal highlands natural subregions. The central mixedwood natural subregion is characterized by aspen-dominated deciduous stands, aspen-white spruce forests, and white spruce and jack pine stands on upland terrain. Wet, poorly drained fens and bogs overlie almost half of this subregion. The upper boreal highlands natural subregion consists of predominantly coniferous forests of lodgepole pine-jack pine hybrids and white and black spruce with locally extensive wetlands in low-lying portions of the plateaus (Natural Regions Committee 2006).

Winters are slightly cooler in the lower boreal highlands whereas summers tend to be more moist and cooler in the upper boreal highlands. On average, the central mixedwood natural subregion is slightly cooler and more moist than the dry mixedwood natural subregion, which experiences warmer summers and milder winters than most other subregions in the boreal natural region (Natural Regions Committee 2006).

BMA 1 encompasses two of Alberta's parks and protected areas; Notikewin Provincial Park to the east, bordering the Peace River, and Chinchaga Wildland Provincial Park in the west, near the Alberta-British Columbia provincial border. Land use within the Recovery Zone is dominated by forestry and oil and gas. Crop and livestock production, including cattle grazing allotments are predominant in the southern and eastern portions of the Support Zone, whereas forestry and oil and gas are the dominant industries in the northern portion of the Support Zone.

### **3.0 MATERIALS AND METHODS**

We collaborated with AEP and other project partners to complete a grizzly bear population inventory in BMA 1, as well as to provide information on bear density and abundance within northwestern Alberta. We accomplished this task by collecting bear hair samples from barbed wire corral hair trap sites (bear rub sites). DNA was extracted from hair samples and will be used to identify the species (grizzly vs black bear), sex, and provide unique signatures of

individual bears. These results will be used to estimate the density and abundance of grizzly bears in BMA 1.

Given the size of the study area and the challenge of navigating through difficult, remote terrain, a staged approach over three years was used to first set up bear rub sites (2015 - 2017) and then collect hair samples from the rub sites over one spring/summer period (2017).

### **3.1 Set up of rub sites in 2015 and 2016**

In 2015 and 2016, AEP staff set up 215 bear rub sites throughout the Recovery Zone and a small portion of the Support Zone of BMA 1. Prior to set up of rub sites, AEP completed a mapping exercise using the most current Geographic Information System (GIS) layers available. Linear feature layers (e.g., roads, all-terrain vehicle (ATV) trails, cut lines, lease sites, and power lines) were combined, overlaid on a township grid layer, and reviewed by local AEP biologists to determine ground-based sites versus rotary-winged-based sites. This was done to spatially distribute rub sites throughout BMA 1. Wherever possible, one centrally located rub site per township was set up; however, due to remoteness and inaccessibility of many areas within BMA 1, this was both logistically and financially prohibitive. Most bear rub sites were set up in the Recovery Zone (n = 240; 94.49%); the remainder were set up in the Support Zone (n = 14; 5.51%).

Sites were accessed using 4x4 trucks, ATVs, and rotary-winged aircraft. Each rub site was constructed using 16 meters of double stranded barbed wire, stretched and stapled taught around three to four large trees to form a corral at approximately 60-70 cm above ground level. A labelled aluminum tag was attached to the tree where the two ends of the wire strand met to serve as a unique site identifier. Existing rub sites (e.g., rub trees and power poles), when observed, were also set up as a rub site. The primary characteristics that were used to visually identify rub trees in the field included a smooth, discolored rub surface relative to the remaining tree bark, claw scars, and bite marks and the presence of bear hair (Stetz et al. 2010). Rubbed power poles were identified primarily through the presence of bear hair but also by claw scars, bite marks, and disturbed soil and trampled vegetation around the base of the pole. We attached 4 to 8 strands of double stranded barbed wire with fencing staples to the rub tree with each strand approximately 40 cm long. These short wire strands had 4 barbs and were typically attached in a zig-zag pattern to increase the likelihood of hair collection. The lowest strand was located approximately 40 cm above ground level and the upper most strand at approximately 180 cm above ground level. Because bear hair was often observed on all sides of

power poles the entire pole was wrapped in double stranded barbed wire from approximately 40 cm above ground level to approximately 180 cm above ground level with each wrap spaced approximately 30 cm apart. Rub trees were labelled with an aluminum tag attached above the highest wire on the tree and the existing numbered tag on each power pole served as site identifiers.

At each site, Universal Transverse Mercator (UTM) coordinates were taken using a handheld Geographic Positioning System (GPS) unit and site characteristics including rub site type (e.g., barbed wire corral, rub tree, power pole) were recorded.

In October 2016, we worked with AEP staff to set up approximately 20 rub sites while also gaining a better understanding of access to the Recovery Zone and logistical requirements for the upcoming intensive sampling field season in 2017. Logistical planning took place over the winter of 2016/17 (e.g., mapping, route planning, equipment preparation and purchase, and seasonal staff hiring).

### **3.2 Final set up of rub sites, trail cameras, and collection of bear hair samples in 2017**

In the spring and summer of 2017, we partnered with AEP to intensively sample the rub sites in BMA 1. Over a nine-week period (mid-May to mid-July) we deployed four field crews (one ACA rotary-winged, two ACA ground, and one AEP ground) that visited each rub site five times. During the fifth field visit, an additional AEP rotary-winged crew was added to assist with efficient sample collection in conjunction with site take-down. A total of 27 sampling routes were selected with the assistance of a mapping exercise, using the most current GIS layers available. Linear feature layers (e.g., roads, ATV trails, cut lines, lease sites and power lines) were combined, overlaid on a township grid layer and reviewed by local ACA and AEP biologists to determine potential sampling routes for ground-based sites versus rotary-winged-based sites. Independent survey routes of varying length were selected based on location, accessibility; distance travelled, and travel type (i.e., truck, ATV, helicopter).

During the first field visit, we set up an additional 39 rub sites for a total of 254 rub sites throughout BMA 1 (Figure 2). We also removed or burned off all existing hair at each rub site using a propane torch. This was done to establish the beginning of a discrete sampling period; the quality of DNA in hair samples degrades over time and when exposed to prolonged sunlight and/or moisture (Kendall and McKelvey 2008). We then retightened barbed wire, and

applied lure to each rub site. Lure had been prepared in advance by AEP staff and consisted of putrefied fish and elk, pigs' blood, and discarded cooking oil.

We set up 42 trail cameras throughout BMA 1 to capture opportunistic photos of grizzly bears for communications purposes. Fifteen trail camera sites were selected based on previous knowledge of grizzly bear activity in the area and the additional 27 sites were identified through random selection of the remaining 239 rub sites.

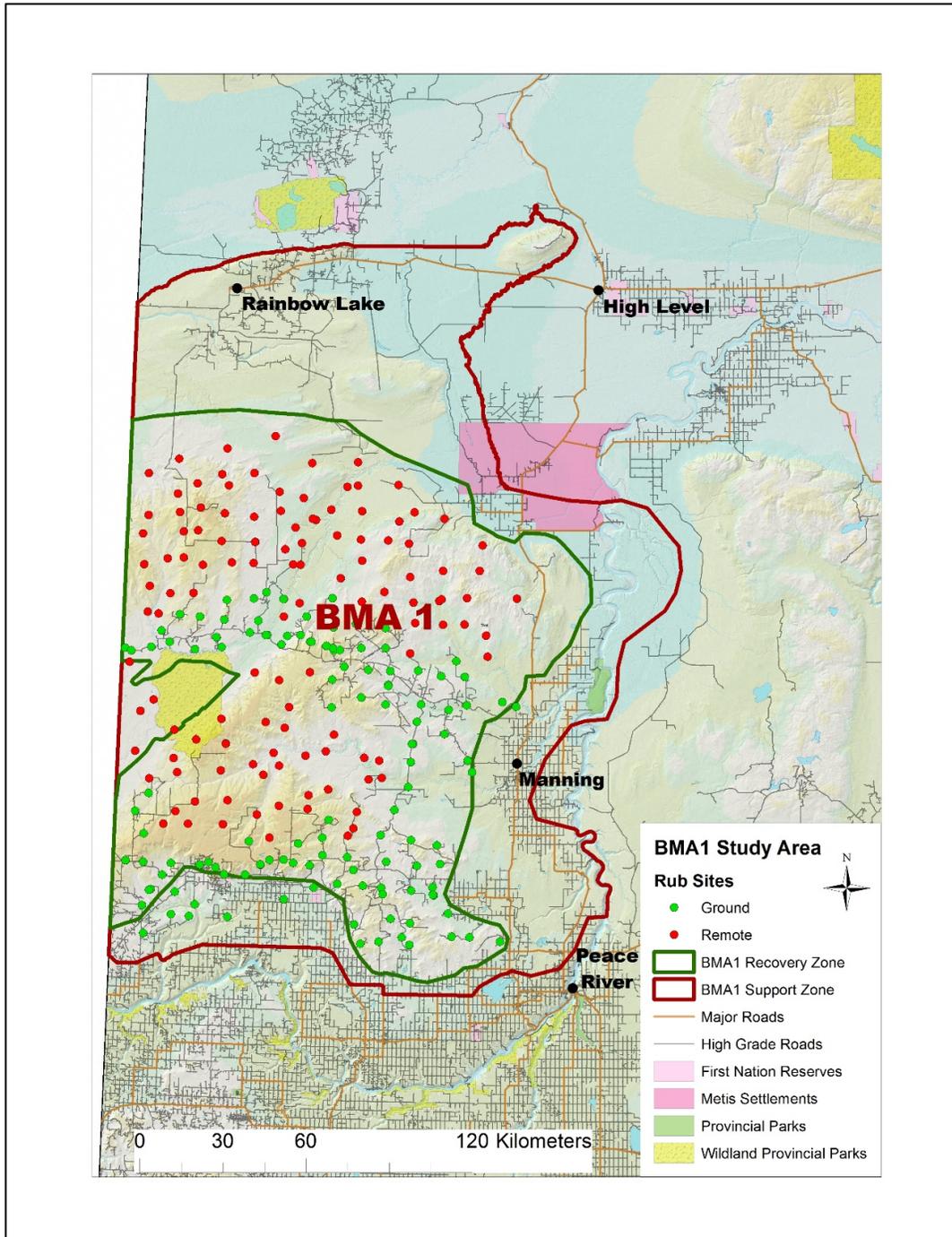


Figure 2. Location of bear rub sites within Bear Management Area 1 in 2017.

During the second, third, and fourth field visits we collected bear hair samples, burned any remaining hair fibers and re-applied lure to each rub site. On the fifth visit we collected hair samples and removed barbed wire, signs, labels, and flagging from all rub sites.

Bear hair samples were identified and collected as discrete samples so long as no two individual hairs were touching each other. Any hairs that were touching each other were collected as one unique sample. Hair samples were collected from the barbs of the wire, wire strands between barbs, on the bark and branches of rub trees, and on the surface of power poles. All hair samples were inserted into labelled, paper coin envelopes and were stored at room temperature in plastic Ziploc bags with silica gel dehumidifiers.

Throughout the 2017 field season a small number of rub sites were removed from the study and replaced due to inadequate helicopter landing conditions or territorial bears in the area. All rub sites and associated data collected in the field was later entered into a database by AEP staff.

#### **4.0 RESULTS**

From mid-May to mid-July of 2017, five ACA and AEP crews completed 1,238 visits to bear rub sites, averaging 247 rub sites for each of the four hair collection visits. A total of 3,974 bear hair samples were collected. We sent all hair samples to Wildlife Genetics International (WGI) in Nelson, British Columbia for genetic analysis. Through the extraction of nuclear DNA from the hair follicle, the lab will identify species, sex, and individual identity of the bears. The DNA results will be used by AEP in a spatially explicit capture-recapture framework to estimate grizzly bear density and abundance in BMA 1. Results will be published by AEP and released to the public in 2019.

We collected bear hair at 229 (90%) of the 254 rub sites on at least one of the four collection visits. Approximately 23% of hair samples (n = 903) were collected from rub sites during the first collection visit, 32% (n = 1,295) during the second collection visit, 28% (n = 1,116) during the third and 17% (n = 660) during the fourth collection visit (Figure 3).

From the 42 trail cameras that were set up throughout BMA 1, we collected and processed over 112,000 photos. Upon analysis of the photos, 471 individual animals were identified, including 12 grizzly bears.

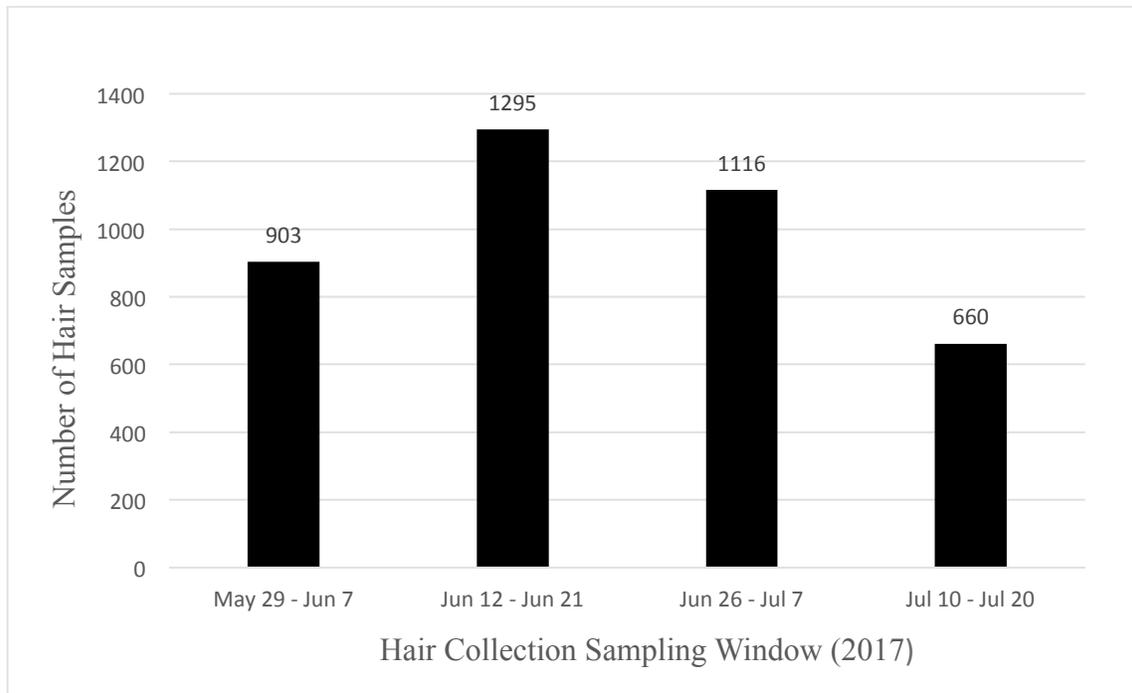


Figure 3. Number of bear hair samples collected per sampling visit in Bear Management Area 1 in 2017.

## 5.0 SUMMARY

Collecting hair from bear rub sites is a safe, non-invasive, and effective technique for gaining valuable information on the density and abundance of grizzly bears. However, the process is very time consuming, expensive, and in our case labour intensive requiring up to 5 field crews with continual use of helicopters, trucks, and ATVs.

There are many challenges associated with field projects of this scale and nature. Accessing remote areas in rugged terrain can be particularly challenging, especially when the sampling window is time-sensitive with repeat visits scheduled well in advance. Periodic and extreme rain events made travel challenging, along with occasional equipment failures and rerouting both ground and rotary-winged crews due to access issues.

We encountered several equipment failures throughout the project related to the ATVs, utility trailers and holiday trailers used as field camps. Responding to these situations in a timely fashion was necessary to ensure field crews were back up and running to continue collecting

the time-sensitive data. Often this meant sourcing alternate equipment and shuttling it out to field crews as a temporary replacement until repairs were completed to original equipment.

We also experienced several noteworthy weather events during the hair collection survey in 2017 that affected our ability to access routes and may have degraded hair quality for DNA analysis. Despite these weather events, we continued to collect damp hair samples from rub sites recognizing that sample degradation can occur when samples are exposed to prolonged moisture, wind or sunlight (Kendall and McKelvey 2008). To combat excessive moisture, we spread out damp hair samples to dry overnight (pers. comm. Andrea Morehouse) prior to inserting them into paper coin envelopes and then into Ziploc bags with silica gel dehumidifiers (Morehouse and Boyce 2016); however, hair degradation may have already occurred due to particularly moist field conditions over the collection period. Our final genetic analysis revealed a marginally lower pre-screen success rate (70%) when compared with the prescreen success rates for BMA 5 North in 2014 (76%), BMA 6 in 2012 (75%), and BMA 6 in 2013 (77%). Though not for certain, these rain events could have impacted DNA extraction success.

Other studies have shown that male grizzly bears rub more frequently than females, and typically earlier in the year, during the breeding season (Lamb et al. 2017, Morehouse and Boyce 2016, Sawaya et al. 2012). Other behavioral responses such as biting, and clawing have also been documented to peak during spring and early summer among male black bears (Burst and Pelton 1983). This is somewhat inconsistent with our data where the first sampling visit produced fewer hair samples than both the second and the third sampling visit. However, our numbers are preliminary given that our samples include a mix of black and grizzly bears, and have not been identified to the individual level at this stage.

There is ongoing concern over the conflict between humans and bears in northwestern Alberta. A large industrial footprint exists in the region with an associated network of roads, pipelines, cut lines, and ATV trails. Moreover, recreational activity is increasingly bringing more people into areas frequented by grizzly bears with the additive potential for human-bear conflict. Hair collected from rub sites will contribute to the detection of individuals, and DNA analysis will provide information on coarse-scale habitat considerations, bear movement corridors, landscape linkages, and areas of human-bear conflict.

## 6.0 LITERATURE CITED

- Alberta Environment and Parks. 2017. Alberta grizzly bear (*Ursus arctos*) recovery plan, 2017-2022. Alberta Species at Risk Recovery Plan No. 38, produced by Alberta Environment and Parks, Edmonton, Alberta, Canada.
- Alberta Sustainable Resource Development. 2008. Alberta Grizzly Bear Recovery Plan 2008-2013. Alberta Species at Risk Recovery Plan No. 15, produced by Alberta Sustainable Resource Development, Edmonton, Alberta, Canada. 68 pp.
- Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Status of the grizzly bear (*Ursus arctos*) in Alberta: Update 2010. Wildlife Status Report No. 37, produced by Alberta Sustainable Resource Development, Edmonton, Alberta, Canada. 44 pp.
- Burst, T.L., and M.R. Pelton. 1983. Black bear mark trees in the Smoky Mountains. International Conference on Bear Research and Management 5: 45-53.
- COSEWIC. 2012. COSEWIC assessment and status report on the Grizzly Bear *Ursus arctos* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xiv + 84 pp. ([www.registrelep-sararegistry.gc.ca/default\\_e.cfm](http://www.registrelep-sararegistry.gc.ca/default_e.cfm)).
- Kendall, K.C., and K.S. McKelvey. 2008. Hair Collection. Pages 135-176. *In*: R.A. Long, P. MacKay, W.J. Zielinski, and J.C. Ray. Noninvasive Survey Methods for Carnivores. Island Press, Washington, DC.
- Lamb, C.T., G. Mowat, S.L. Gilbert, B.N. McLellan, S.E. Nielsen, and S. Boutin. 2017. Density-dependent signaling: an alternative hypothesis on the function of chemical signaling in a non-territorial solitary carnivore. PLoS ONE 12(10): e0184176.
- Morehouse A.T., and M.S. Boyce. 2016. Grizzly bears without borders: spatially explicit capture-recapture in southwestern Alberta. Journal of Wildlife Management 80: 1152-1166.
- Natural Regions Committee. 2006. Natural Regions and Subregions of Alberta. Pub. No. T/852, compiled by D.J. Downing and W.W. Pettapiece, produced by the Government of Alberta, Edmonton, Alberta, Canada.

Sawaya, M.A., J.B. Stetz, A.P. Clevenger, M.L. Gibeau, and S.T. Kalinowski. 2012. Estimating grizzly and black bear population abundance and trend in Banff National Park using noninvasive genetic sampling. *PLoS ONE* 7: e34777.

Stetz, J.B., K.C. Kendall, and C. Servheen. 2010. Evaluation of bear rub surveys to monitor grizzly bear population trends. *Journal of Wildlife Management* 74: 860-870.



**Alberta Conservation Association acknowledges the following partner for its generous support of this project:**

Alberta

