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Alaska Department of Fish and Game Division of Wildlife Conservation

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Cover Photo: An adult male mountain goat (LG-172) seen during an aerial survey south of Mt. Sinclair, September 2014

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INTRODUCTION

This report was prepared to meet the annual reporting requirements for Coeur Alaska, Inc.. Funding for this project was made available in September 2005 and this report summarizes activities completed by December 30, 2014.

Background

In 2005, Coeur Alaska, Inc. re-initiated development activities at the Kensington mine site, located a short distance northwest of Berners Bay. In addition, the Alaska Department of Transportation and Public Facilities (ADOT/PF) proposed construction an all-season highway between Echo Cove and the Katzehin River. In the context of these proposed industrial development activities, mountain goats were identified as an important wildlife species likely to be affected by mine development and road construction activities.

A small-scale study of mountain goats conducted in the vicinity of the Kensington mine by Robus and Carney (1995) showed that goats moved seasonally from high alpine elevations in the summer and fall to low, timbered elevations during winter months. One of the main objectives of the Robus and Carney (1995) study was to assess the impacts of the mine development activities on habitat use, movement patterns and, ultimately, productivity of mountain goats. However, the mine never became operational, thus these objectives could not be achieved, and by 1995 goat monitoring in the area wound down and eventually ended. In 2005, when the mine development activities were re-initiated, the Alaska Department of Fish and Game (ADFG) maintained that many of the same concerns that prompted the Robus and Carney (1995) study were still valid and needed to be addressed. In addition, large-scale plans for development of the Juneau Access road raised new and potentially more substantial concerns regarding not only the enlarged "footprint" of industrial development activities in eastern Lynn Canal, but also the cumulative impacts of both development projects on wildlife resources.

The potential effects of mining and road development activities on local mountain goat populations in the vicinity of the Kensington mine and eastern Lynn Canal have potentially important ramifications for management and conservation of the species in the area. Studies conducted elsewhere indicate that mountain goats can be negatively impacted by industrial development activities. Such effects include temporary range abandonment, alteration of foraging behavior and population decline (Chadwick 1973, Foster and Rahs 1983, Joslin 1986, Cote and Festa-Bianchet 2003, Cote et al. 2013). Consequently, information about the distribution of mountain goats proximate to the mine and road development corridor is critical for determining the extent to which populations may be affected by associated industrial activities. Information collected by Robus and Carney (1995), in the vicinity of Kensington mine, as well as Schoen and Kirchhoff (1982) near Echo Cove, suggest that spatial overlap between mountain goats and the proposed industrial activity will be most pronounced when goats are over-wintering in low-elevation habitats.

In response to the above concerns, ADFG, with operational funding provided by ADOT/PF, Federal Highway Administration (FHWA) and Coeur Alaska, Inc., initiated monitoring and assessment activities to determine possible impacts of road construction and mine development on mountain goats and identify potential mitigation measures, to the extent needed. Assessment and monitoring work included collection of vital rate, habitat use and movement data from a sample of radio-marked mountain goats, in addition to conducting annual aerial population abundance and productivity surveys. These efforts are aimed at providing the ADFG with information necessary to appropriately manage mountain goats in the proposed areas of development.

Implementation of field objectives were initiated in 2005 and consisted of a 5-year monitoring program (2005-2011) jointly funded by ADOT/PF, FHWA, Coeur Alaska, Inc. and ADFG. Beginning in 2007, the ADFG committed additional annual funding for a complementary aerial survey technique development project within and adjacent to the project area. In 2009, the USDA-Forest Service (Tongass National Forest) also began contributing funding to further support aerial survey technique development data collection efforts. And, in 2010, Coeur Alaska, Inc. resumed funding of mountain goat monitoring near the Kensington Mine and adjacent areas (as per the Kensington Plan of Operations, USFS 2005). In 2012, the project components funded by ADOT/PF and associated with the Juneau Access project were completed (see White et al. 2012). Currently, mountain goat monitoring activities are focused on the area surrounding the Kensington mine and north to the Katzehin river, an area considerably smaller than the original Juneau Access/Kensington joint study area.

STUDY OBJECTIVES

Research efforts were designed to investigate the spatial relationships, vital rates, and abundance of mountain goats in the Berners Bay and upper Lynn Canal area. The research objectives were to:

1) determine seasonal movement patterns of mountain goats;

2) characterize mountain goat habitat selection patterns;

3) estimate reproductive success and survival of mountain goats; and

4) estimate mountain goat population abundance and composition.

STUDY AREA

Mountain goats were studied in a ca. 1077 km^2 area located in a mainland coastal mountain range east of Lynn Canal, a post-glacial fiord located near Haines in southeastern Alaska (Figure 1). The study area encompassed the Kakuhan Range and was oriented along a north-south axis and bordered in the south by Berners Bay (58.76N, 135.00W) and the Katzehin River (59.29N, 135. 35W) in the north (Figure 2).

Elevation within the study areas range from sea level to 6300 feet. This area is an active glacial terrain underlain by late cretaceous-paleocene granodiorite and tonalite geologic formations (Gehrels 2000). Specifically, it is a geologically young, dynamic and unstable landscape that harbors a matrix of perennial snowfields and small glaciers at high elevations (i.e. above 4000 feet) and rugged, broken terrain that descends to a rocky, tidewater coastline. The northern part of the area is bisected by the Katzehin River, a moderate volume (ca. 1500 cfs; USGS, unpublished data) glacial river system that is fed by the Meade Glacier, a branch of the Juneau Icefield.

The maritime climate in this area is characterized by cool, wet summers and relatively warm snowy winters. Annual precipitation at sea-level averages 55 inches and winter temperatures are rarely less than 5º F and average 30º F (Haines, AK; National Weather Service, Juneau, AK, unpublished data). Elevations at 2600 feet typically receive ca. 250 inches of snowfall, annually (Eaglecrest Ski Area, Juneau, AK, unpublished data). Predominant vegetative communities occurring at low-moderate elevations (<1500 feet) include Sitka spruce (*Picea sitchensis*)-western hemlock (*Tsuga heterophylla*) coniferous forest, mixed-conifer muskeg and deciduous riparian forests. Mountain hemlock (*Tsuga mertensiana*) dominated 'krummholtz' forest comprises a subalpine, timberline band occupying elevations between 1500-2500 feet. Alpine plant communities are composed of a mosaic of relatively dry ericaceous heathlands, moist meadows dominated by sedges and forbs and wet fens. Avalanche chutes are common in the study area, bisect all plant community types and often terminate at sea-level.

METHODS

Mountain Goat Capture

Mountain goats were captured using standard helicopter darting techniques and immobilized by injecting 3.0 - 2.4 mg of carfentanil citrate, depending on sex and time of

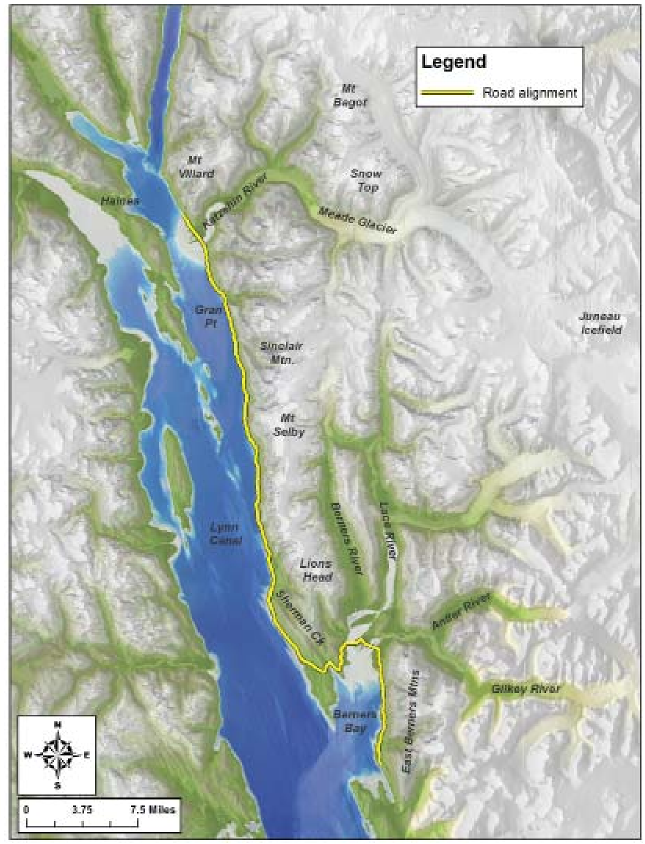

Figure 1: Map of the Lynn Canal and Berners Bay area. Local place names referenced in this report are identified. Mountain goats were studied in this area during 2005-2014.

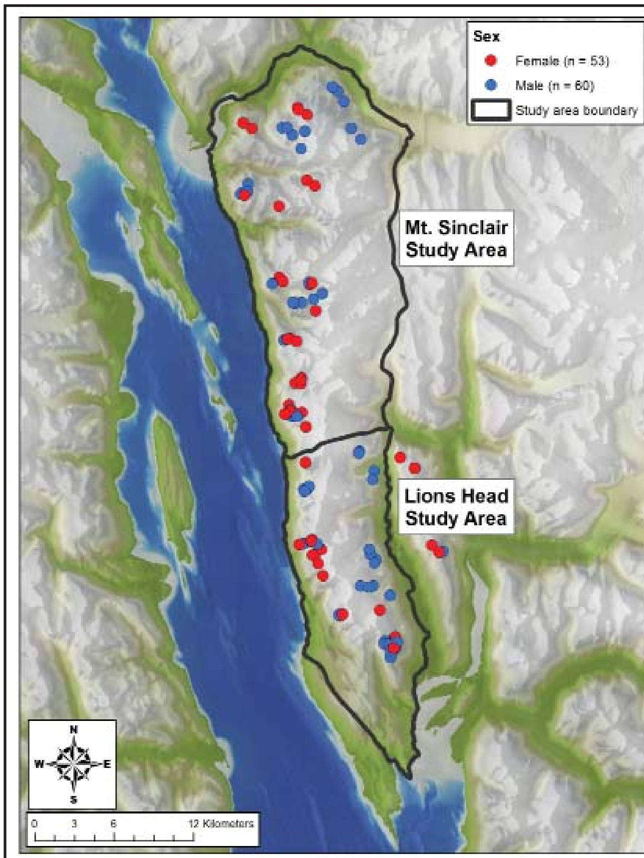

Figure 2: Locations of mountain goats captured and subsequently monitored in the Lynn Canal study area, 2005-2014.

year (Taylor 2000), via projectile syringe fired from a Palmer dart gun (Cap-Chur, Douglasville, GA). During handling, all animals were carefully examined and monitored following standard veterinary procedures (Taylor 2000) and routine biological samples and morphological data collected (Figure 3). Following handling procedures, the effects of the immobilizing agent was reversed with 100mg of naltrexone hydrochloride per 1mg of carfentanil citrate (Taylor 2000). All capture procedures were approved by the State of Alaska Animal Care and Use Committee.

Figure 3: ADFG wildlife biologist, Kevin White, collecting a blood sample from an immobilized male mountain goat (LG-170) captured in Lynn Canal, near Mt. Selby, August 2014.

GPS Location Data

Telonics TGW-3590 or TGW-4590 GPS radio-collars (Telonics, Inc., Mesa, AZ) were deployed on most animals captured. Telonics MOD-500 VHF radio-collars were been deployed on a subset (n = 23) of animals to enable longer-term monitoring opportunities. During 2009-2012, animals were simultaneously marked with GPS and lightweight (Telonics MOD-410) VHF radio-collars (370g). Double-collaring animals was conducted to extend the period of time individual animals could be monitored (lifespan, GPS: 3 years, VHF: 6 years), thereby increasing the long-term opportunity to gather mountain goat survival and reproduction data and reducing the frequency that mountain goats must be captured. The combined weight of radio-collars attached to animals comprise 1.2% of average male body weight and 2.0% of average female body weight and is well within the ethical standards for instrument deployment on free-ranging wildlife.

GPS radio-collars were programmed to collect location data at 6-hour intervals (collar lifetime: 2-3 years). During each location attempt, ancillary data about collar activity (i.e. percent of 1-second switch transitions calculated over a 15 minute period following each GPS fix attempt) and temperature (degrees C) were simultaneously collected. Complete data-sets for each individual were remotely downloaded (via fixed-wing aircraft) at 8-week intervals. Location data were post-processed and filtered for “impossible” points and 2D locations with PDOP (i.e. position dilution of precision) values greater than 10, following D’Eon et al. (2002) and D’Eon and Delparte (2005).

Movement Patterns and Habitat Selection

Diet Composition.—Fresh fecal pellets were collected from live-captured animals during the summer-fall period (late-July to mid-October). Fecal pellet samples were also collected opportunistically during winter reconnaissance and snow surveys. Samples were sent to Washington State University (Wildlife Habitat Analysis Lab, Pullman, WA) for dietary analyses. Specifically, microhistological analyses of plant cell fragments in pellet samples were conducted to provide an estimate of diet composition for individual mountain goats and a composite winter sample.

Activity, Movement Patterns and Resource Selection.— Analyses of mountain goat GPS location data (i.e. data collected during 2005-2011) to characterize activity, movement and resource selection patterns were summarized in White (2006), Shafer et al. (2012) and White et al. (2012). Additional analyses will be conducted in the future to update previous analyses as new data are collected.

Snow and Winter Severity Monitoring.—
Winter distribution of mountain goats is strongly influenced by snow depth and distribution. Since patterns of snow accumulation vary at both small and large spatial scales it is often necessary to collect site-specific field data in order to accurately characterize these relationships within focal areas. Unfortunately, standardized snow depth monitoring information is extremely limited within the study area and additional information is needed in order to properly characterize spatial patterns of snow accumulation and, ultimately, mountain goat winter distribution. Consequently, in 2006 we initiated field efforts designed to create a snow depth database in order to generate spatially explicit snow depth models within the study area.

Standardized field surveys were conducted in order to estimate patterns of snow depth as it related to habitat type (i.e. forested/non-forested), altitude, and slope aspect. These efforts focused on four sites located in different mountain goat winter ranges in 2007 but consistent annual monitoring was conducted at only one site located on Echo Ridge, near Davies Creek. During surveys snow depth was measured at geo-referenced locations along an altitudinal gradient (beginning at sea level). Snow measurements were replicated at each sampling location (n = 5) and associated covariate information was collected. Sampling locations were spaced at regular (100-200m) intervals, depending upon terrain complexity. Steep (>35 degrees), exposed slopes were, generally, not sampled due to safety considerations. In addition, daily climate information for reference weather stations was acquired from the National Weather Service (Haines COOP Weather Station).

Reproduction and Survival

Kidding rates and subsequent survival were estimated by monitoring individual study animals during monthly surveys using fixed-wing aircraft (usually a Piper PA-18 Super Cub) equipped for radio-telemetry tracking or via ground-based observations. During surveys, radio-collared adult female mountain goats were observed (typically using 14X image stabilizing binoculars) to determine whether they gave birth to kids and, if so, how long individual kids survived. Monitoring kid production and survival was only possible during the non-winter months when animals could be reliably observed in open habitats. We assumed that kids did not survive winter if they were not seen with their mothers the following spring. Cases in which kid status assessments were equivocal were filtered from the data set and not used for subsequent estimates of kid survival.

Figure 4: ADFG biologist Ben Williams rapelling down an escarpment to access an adult female mountain goat (LG-155) mortality, June 2014.

Mortality of individual radio-collared mountain goats was determined by detecting radio-frequency pulse rate changes during monthly monitoring surveys. In cases where mortality pulse rates were detected, efforts were made to investigate sites as soon as possible via helicopter or boat. To the extent possible, all mortalities were thoroughly investigated to ascertain the cause of death and relevant biological samples collected (Figure 4). We determined date of mortalities via examination of activity sensor data logged on GPS radio-collars. Annual survival of radio-collared animals was estimated using the Kaplan-Meier procedure (Pollock et al. 1989). This procedure allows for staggered entry and exit of newly captured or deceased animals, respectively.

Population Abundance and Composition Estimation

Aerial Surveys.—Population abundance and composition surveys were conducted using fixed-wing aircraft (Heliocourier and PA-18 Super Cub) and helicopter (Hughes 500) during August-October, 2005-2011. Aerial surveys were typically conducted when conditions met the following requirements: 1) flight ceiling above 5000 feet ASL, 2) wind speed less than 20 knots, 3) sea-level temperature less than 65 degrees F. Surveys were typically flown along established flight paths between 2500-3500 feet ASL and followed geographic contours. Flight speeds varied between 60-70 knots. During surveys, the pilot and experienced observers enumerated and classified all mountain goats seen as either adults (includes adults and sub-adults) or kids. In addition, each mountain group observed was checked (via 14X image stabilizing binoculars) to determine whether radio-collared animals were present.

Population estimation.—The number of mountain goats in each study area was estimated using Bayesian procedures that involved statistically integrating survey-specific mark-resight estimates and modeled covariate-based survey-level estimates (White and Pendleton 2011). Briefly, logistic models were fit to predict average sighting probability for all goats in an area during a given survey as a function of survey level covariates that included: survey date, time of day, aircraft type, temperature, sky conditions, wind (median and maximum), and the number of observers (≤2 vs. 3); models were fit using Bayesian procedures with the program OpenBUGS. Bayesian models allowed for including results from each survey along with covariate-based sighting functions produced across many surveys to improve the precision of the population estimates (relative to Lincoln-Petersen type estimates) and provide estimates when no marked goats were seen or when there were no marked goats in the area (with certain assumptions). These models also accounted for observed goats whose collar status could not be determined (i.e. cases where the view was insufficient to determine whether a goat was collared or not).

Sightability Data Collection.-During aerial surveys, data were simultaneously collected to evaluate individual- and survey-level "sightability". For accomplishing survey-level objectives, we enumerated the number of radio-collared animals seen during surveys and compared this value to the total number of radio-collared animals present in the area surveyed. To gather individual-based "sightability" data, we characterized behavioral, environmental and climatic conditions for each radio-collared animal seen and not seen (i.e. missed) during surveys. In cases where radio-collared animals were missed, it was necessary to back-track and use radio-telemetry techniques to locate animals and gather associated covariate information. Since observers had general knowledge of where specific individual radio-collared animals were likely to be found (i.e. ridge systems, canyon complexes, etc.), it was typically possible to locate missed animals within 5-15 minutes after an area was originally surveyed. In most cases, it was possible to completely characterize behavioral and site conditions with minimal apparent bias, however in some cases this was not possible (i.e. animals not seen in forested habitats, steep ravines, turbulent canyons) and incomplete covariate information was collected resulting in missing data.

RESULTS AND DISCUSSION

Mountain Goat Capture and Handling

Capture Activities.—During August 2014, 7 animals were captured in the Lions Head-Mt. Sinclair areas. All animals were simultaneously marked with GPS (TGW-4590) and lightweight VHF (Telonics MOD-410) radio-collars. Since 2005, 112 mountain goats have been radio-marked in the Lions Head and Sinclair Mountain study areas. Currently, 20 animals are marked in these two areas; all other previously deployed collars have either remotely released or animals have died. Annual capture activities are important for maintaining adequate sample sizes and compensating for natural or scheduled collar losses.

Helicopter captures were attempted during periods when mountain goats were distributed at high elevations and weather conditions were favorable (i.e. high flight ceiling and moderate wind speed). Additionally, captures were scheduled to avoid periods within 8 weeks of parturition in order to avoid unnecessary disturbance of adult females and associated neonates. Captures were attempted in areas where mountain goat access to dangerously steep terrain could be reasonably contained. As a result of these constraints, opportunities to capture mountain goats were fairly limited. Nevertheless, given the fairly large area of study and decent summer weather conditions, it was typically possible to capture approximately six mountain goats per day of effort.

Biological Sample Collection.—During handling procedures, standard biological specimens were collected and morphological measures recorded. Specific biological samples collected from study animals included: whole blood (4 mL), blood serum (8 mL), red blood cells (8mL), ear tissue, hair and fecal pellets. Whole blood, serum, red blood cells and fecal pellet sub-samples were either sent to Dr. Kimberlee Beckmen (ADFG, Fairbanks, AK) for disease and trace mineral screening or archived at ADFG facilities in Douglas, AK. During 2010, nasal and pharyngeal swab samples were collected from 5 animals to index prevalence of respiratory bacteria.

Genetic Analyses.—Tissue samples from all mountain goats captured between 2005-2011 have been genotyped by Aaron Shafer (University of Alberta, Edmonton, AB). (Sample collected during 2012-2014 have been archived for future analyses). These data have been analyzed and included in continent-wide analyses of mountain goat population genetics (Shafer et al. 2010). Shafer et al. (2010) indicated that substantial genetic structuring exists among mountain goats in southeastern Alaska (and across the western North American range of the species). More recent analyses indicated that three genetically distinct mountain goat populations occur in our study area [east Berners mountains, Kakuhan range (including Lions Head and Sinclair Mountain), and Mt. Villard]; population boundaries generally coincide with our specific study area boundaries (Shafer et al. 2012). These findings indicate that gene flow between our study areas (with the exception of the Lion Head and Sinclair study areas, which are genetically indistinct) is limited. Additional analyses examined the extent to which mountain goat habitat selection characteristics and landscape configuration are linked to genetic relatedness across the study area (Shafer et al. 2012). Results from this analyses indicated that small- (i.e. distance to cliffs, heat load) and large-scale (i.e. river valleys and marine waterways) landscape features are key determinants of mountain goat gene flow across our study area (Shafer et al. 2012).

Disease Surveillance.—In 2010, a subset of captured animals (n = 5) were tested (Washington Animal Disease Diagnostic Laboratory, Pullman, WA) for prevalence of respiratory bacteria associated with incidence of pneumonia (specifically *Pasteurella trehalosi* and *Mycoplasma ovipneumonia*). Results of these analyses were summarized in White et al. (2012).

During 2005-2013, blood serum samples collected from captured animals have been tested each year for a suite of 15 different diseases relevant to ungulates (Appendix 1). Of particular interest was contagious ecthyma (CE), a viral disease previously documented among mountain goats in Juneau, Haines and other areas of southeastern Alaska. Common symptoms of CE include presence of grotesque lesions on the face, ears, and nose which can lead to death of animals, primarily those in young or old age classes; healthy adults commonly survive the disease. Of the 54 animals successfully tested for CE in the Lions Head and Mt Sinclair areas, three animals (6%) tested positive for CE-specific antibodies; a level of prevalence comparable to other southeastern Alaska populations tested.

Trace Mineral Testing.—In 2010-2013, whole blood and serum samples were analyzed to determine trace mineral concentration for 24 mountain goats in order to examine whether mineral deficiencies were prevalent in our study population (Appendix 2a). While experimental data is limited to assess deficiency threshold values for Selenium, a trace mineral that can influence pregnancy, values less than 0.10 ppm are generally considered low. In the Lion Head/Sinclair study areas 38% of animals had blood Selenium values below this threshold (Appendix 2b); a high proportion of deficiencies relative to other mountain goat research study areas in southeastern Alaska. Presumably, deficiencies are related to site productivity and geologic substrate and can provide some level of insight relative to inherent productivity of mountain goat summer range in this area.

GPS Location Data

GPS System Performance.—The performance of GPS radio-collars (Telonics TGW-3590) was evaluated for 124 collars deployed since the beginning of the study (see White et al. 2012). In general, the remote GPS data collection system used in this study worked as expected. Specifically, we did not encounter any significant problems with GPS collar performance, nor did any notable problems occur with remote data download attempts. This high level of success was achieved despite occasionally poor weather conditions and, in some cases, substantial download distances between aircraft and mountain goats (i.e. up to 3 miles). However, several pre-programmed bi-monthly GPS data download periods were missed due to weather conditions. Nevertheless, it was always possible to download missed GPS data on subsequent surveys.

Winter Severity and Snow Modeling

Snow Surveys.—Field-based snow surveys were conducted within 5 days of April 1 during 2007-2008, 2010-2014 on Echo Ridge. Analyses of these data quantified the degree to which snow depth differs with increasing elevation between forested and non-forested sites (White et al. 2012). Overall, these data quantify the extent to which snow depth varied relative to elevation and habitat type (i.e. open vs. forest). Specifically, snow depth was 30-40 inches deeper in open relative to forested habitats, on average. Further, snow depth increased 2.3-2.7 inches per 100 foot gain in elevation, on average (White et al. 2012). Importantly, these data provide quantitative information about winter severity in areas representative of where mountain goats in our study area are wintering. Such data will be able to be used as covariates in future analyses of survival, reproduction and resource selection.

Climate Data.—Daily climate data were archived from the National Weather Service database to characterize

Table 1: Proportion of radio-marked adult female mountain goats observed with kids at heel during parturition in the Lynn Canal study area, 2005-2014. Data are also presented from other study areas, for comparative purposes.

Area	Year	Kids	AdF	Prop	SE
Baranof					
	2010	4	4	1.00	0.00
	2011	5	6	0.83	0.15
	2012	3	5	0.60	0.22
	2013	5	10	0.50	0.16
	2014	9	12	0.75	0.13
	Total	26	37	0.70	0.08
Haines-Skagway					
	2010	5	10	0.50	0.16
	2011	8	10	0.80	0.13
	2012	8	11	0.73	0.13
	2013	10	12	0.83	0.11
	2014	10	17	0.59	0.12
	Total	41	60	0.68	0.06
Lynn Canal					
	2005	8	12	0.67	0.14
	2006	16	25	0.64	0.10
	2007	20	32	0.63	0.09
	2008	19	33	0.58	0.09
	2009	15	25	0.60	0.10
	2010	18	26	0.69	0.09
	2011	18	27	0.67	0.09
	2012	9	15	0.60	0.13
	2013	9	13	0.69	0.13
	2014	8	14	0.57	0.13
	Total	140	222	0.63	0.03

Table 2: Estimates of mountain goat survival for different sex classes during 2005-2014, Lynn Canal, AK. Data are also presented from other study areas, for comparative purposes.

	Males				Females				Total			
	At Risk	Died	Ŝ	SE	At Risk	Died	Ŝ	SE	At Risk	Died	Ŝ	SE
Baranof Island												
2010/2011	6.0	1	0.88	0.11	3.0	0	1.00	0.00	9.0	1	0.92	0.08
2011/2012	10.8	0	1.00	0.00	5.5	0	1.00	0.00	16.3	0	1.00	0.00
2012/2013	15.0	3	0.82	0.09	6.0	0	1.00	0.00	21.0	3	0.87	0.07
2013/2014	16.0	2	0.88	0.08	9.3	0	1.00	0.00	25.3	2	0.92	0.05
All years	47.8	6	0.88	0.04	23.8	0	1.00	0.00	71.6	6	0.92	0.03
Cleveland Pen.												
2009/2010	5.0	0	1.00	0.00	2.0	0	1.00	0.00	7.0	0	1.00	0.00
2010/2011	5.8	2	0.67	0.16	5.0	0	1.00	0.00	10.8	2	0.83	0.10
2011/2012	4.0	2	0.50	0.18	6.0	0	1.00	0.00	10.0	2	0.80	0.11
2012/2013	1.6	1	0.50	0.35	6.0	0	1.00	0.00	7.6	1	0.88	0.12
2013/2014	1.0	0	1.00	0.00	5.5	1	0.83	0.15	6.5	1	0.86	0.13
All years	16.1	5	0.72	0.09	24.0	1	0.96	0.04	40.1	6	0.86	0.10
Haines-Skagway												
2010/2011	11.6	4	0.69	0.13	9.2	3	0.70	0.14	20.8	7	0.70	0.10
2011/2012	13.2	2	0.87	0.09	9.0	1	0.90	0.09	22.2	3	0.88	0.06
2012/2013	16.3	2	0.89	0.07	10.3	1	0.91	0.08	26.6	3	0.90	0.06
2013/2014	20.2	2	0.91	0.06	10.9	1	0.92	0.08	31.1	3	0.91	0.05
All years	59.3	10	0.85	0.04	37.9	6	0.86	0.05	97.2	16	0.86	0.03
Lynn Canal												
2005/2006	9.6	2	0.79	0.13	10.0	1	0.90	0.09	19.6	3	0.85	0.08
2006/2007	25.4	11	0.57	0.10	22.1	4	0.82	0.08	47.5	15	0.68	0.07
2007/2008	26.5	6	0.79	0.07	20.8	3	0.88	0.07	47.3	9	0.83	0.05
2008/2009	24.2	10	0.66	0.09	21.4	6	0.73	0.09	45.6	16	0.69	0.06
2009/2010	25.1	4	0.86	0.07	22.3	4	0.85	0.07	47.4	8	0.85	0.05
2010/2011	24.3	3	0.88	0.06	23.2	2	0.91	0.06	47.5	5	0.90	0.04
2011/2012	17.9	6	0.72	0.10	15.3	3	0.85	0.08	33.2	9	0.77	0.07
2012/2013	16.8	8	0.59	0.10	13.6	7	0.60	0.11	30.4	15	0.59	0.07
2013/2014	11.3	3	0.75	0.13	10.9	2	0.83	0.11	22.3	5	0.79	0.08
All years	178.8	54	0.73	0.03	157.0	33	0.81	0.03	335.8	87	0.77	0.02

At Risk = average number of animals monitored per month (per time period) broader scale climate patterns. Mean daily snow depth and snowfall data were summarized from data collected at the National Weather Service station in Haines, AK (Appendix 3). Mean snowfall in Haines during the study period (2005-2014) was 132% of the long-term normal (i.e. 1950-2014). Overall, snowfall in Haines during 6 of the 9 winters of the study was above normal (including 5 of the 10 highest snowfall winters on record; 39 years of data). The winter of 2012/2013 was 84% of normal.

Reproduction and Survival

Kid Recruitment.—Kid recruitment of radio-marked female mountain goats was estimated by determining the percentage of radio-marked females seen with kids during May-June aerial telemetry surveys (Table 1). Since each radio-marked female was not observed daily during the kidding period, it was not possible to determine if kids were born and subsequently died prior to, or between, surveys. As such, estimates of kid production reported here are presumably lower than the actual percentage of females that gave birth. Nevertheless, our estimates of kid production were similar to estimates of kidding rates reported elsewhere (Festa-Bianchet and Cote 2007).

Annual estimates of kid production in Lynn Canal ranged from 57-69% between 2005-2014 (Table 1). During 2014, 57% of radio-marked females (n = 14) had a kid at heel; the lowest estimate for the population but not statistically different from most previous years or from other southeastern Alaska populations studied (Table 1).

Survival.—Mountain goats were monitored monthly during fixed-wing aerial telemetry flights and/or via GPS-telemetry. During 2013/2014 biological year, 5 radio-marked animals died. One animal likely died in an avalanches and the remaining four animals died of unknown causes. Overall, 79±8% of animals survived during 2013/2014. Winter snowfall amounts during 2013/2014 was average, relative to the long term mean (see Winter Severity and Snow Modeling section above). The observed survival rate was average, relative to the long-term mean for the study area but likely too low to result in demographic growth of the population.

Population Abundance and Composition

Aerial Surveys.—During September 2013, we conducted three aerial surveys in the Lions Head and Sinclair Mountain study areas and the Berners-Lace ridge area (Appendix 4). The Berners-Lace ridge was surveyed because seasonal movement (albeit limited) by male mountain goats has been documented from the Lions Head study area to this site in past years. Other nearby areas were also surveyed (i.e. East Berners mountains and Mt. Villard) as part of a separate research project. Overall, data from all these survey areas are presented (Appendix 4) for comparative purposes.

Table 3: Population-level aerial survey sighting probabilities, based on surveys conducted between 2010-2014 in Lynn Canal and other areas in southeastern Alaska.

Area	Seen	Total	Prop. seen	SE
Baranof				
2010	--	--	--	--
2011	12	18	0.67	0.11
2012	11	21	0.52	0.11
2013	16	22	0.73	0.09
2014	18	25	0.72	0.09
Total	57	86	0.66	0.05
Cleveland Pen				
2010	--	--	--	--
2011	--	--	--	--
2012	3	16	0.19	0.10
2013	10	21	0.48	0.11
2014	2	5	0.40	0.22
Total	15	42	0.36	0.07
Haines-Skagway				
2010	14	20	0.70	0.10
2011	20	32	0.63	0.09
2012	9	19	0.47	0.11
2013	24	31	0.77	0.08
2014	23	34	0.68	0.08
Total	90	136	0.66	0.04
Lynn Canal				
2010	39	73	0.53	0.06
2011	19	28	0.68	0.09
2012	21	32	0.66	0.08
2013	13	22	0.59	0.10
2014	15	26	0.58	0.10
Total	107	181	0.59	0.04
Overall total	269	445	0.60	0.02

Sightability Modeling and Population Estimates.-During all surveys, data were collected for purposes of developing individual-based and population-level sighting probability models (exceptions occurred when surveys were conducted prior to marking). In addition, complementary aerial surveys were conducted in areas outside of the study area (Haines, Baranof Island) where mountain goats were marked as part of independent studies. Collection of data in other areas enabled acquisition of additional sightability data resulting in opportunity to more accurately parameterize sightability models; however, a majority of the data used to develop models was collected in the Lynn Canal/ Berners Bay study areas.

During 2014, we collected individual-based sightability modeling data from 26 radio-marked animals in the Lynn

Canal study areas. In addition we collected population-level data during 3 surveys. Preliminary estimates indicate that we observed 58% of animals during aerial surveys in the Lynn Canal areas during 2014 (Table 3). Overall, the sightability estimate for 2014 was moderate and statistically comparable to surveys conducted in previous years and areas (Table 3).

Estimation of population sizes for each study area and year is a computationally intensive process (White et al. 2012). In White et al. (2012), population estimates for 2005-2011 were provided for each study area. Computer programming efforts to automate estimation procedures are ongoing (White and Pendleton 2012) and in the future population estimates are expected to be conducted annually. In the interim, population estimates will be provided at multi-year intervals.

FUTURE WORK

The mountain goat population monitoring and assessment work in the vicinity of the Kensington Mine is planned to continue during the operational phase on mining operations (the current funding agreement between ADFG and Coeur Alaska, Inc. continues through 2016 but is expected to be renewed by Coeur Alaska, Inc. thereafter). The project area for ongoing mine-related monitoring work encompasses the area between Slate cove and the Katzehin River (i.e. the “Lions Head” and “Sinclair” study areas). In this area study animals (2014, n = 20) will continue to be monitored monthly to assess reproductive status and survival. Additionally, at 8-week intervals GPS data will be downloaded from each animal during aerial surveys. These data will be post-processed and integrated with the existing GPS location database. During late-summer 6-8 mountain goats will be captured to ensure scientifically defensible sample sizes are maintained. Three replicate aerial surveys will be conducted in early-fall 2014, weather permitting, in order to estimate mountain goat sightability, population abundance and composition. During winter 2015/2016 data analyses will be conducted to examine spatial patterns in population trends throughout the study area. In addition, analyses will be conducted to examine the extent to which mountain goat winter range in the direct vicinity of the mine is occupied relative to what is expected based on resource selection function models developed in White et al. (2012). These analyses are intended to provide insight relative to effects of mine activities on the local mountain goat population. Results of these efforts will be summarized and submitted to Coeur Alaska, Inc. and associated stakeholders as an annual research project report in spring 2016.

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Appendix 1: Incidence of disease prevalence of mountain goats in the Lions Head, Sinclair, Villard and East Berners study areas, 2010-2013. Results are also provided for three other populations in southeastern Alaska in 2010-2013, for comparison. (Kakuhan includes the Lions Head and Sinclair study areas combined).

	Baranof			Cleveland			Haines			Berners			Kakuhan			Villard			Total		
Disease	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**	**n**	**Pos.**	**Prop**
Contagious Ecthyma	30	1	0.03	10	1	0.10	32	3	0.09	20	1	0.05	54	3	0.06	24	0	0.00	170	9	0.05
Chlamydia	11	1	0.09	12	1	0.08	22	0	0.00	27	2	0.07	29	1	0.03	30	0	0.00	131	5	0.04
Q Fever	26	0	0.00	11	0	0.00	40	0	0.00	29	0	0.00	55	3	0.05	32	1	0.03	193	4	0.02
Bluetongue	17	0	0.00	10	0	0.00	20	0	0.00	20	0	0.00	17	0	0.00	18	0	0.00	102	0	0.00
Bovine respiratory synctial virus (BRSV)	17	0	0.00	10	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	16	0	0.00	101	0	0.00
Infectious bovine rhinotrachetis (IBR)	17	0	0.00	10	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	102	0	0.00
Parainfluenza-3 (PI-3)	17	0	0.00	10	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	102	0	0.00
Epizootic hemorrhagic disease (EHD)	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00
Caprinae arthritis encephalitis (CAE)	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	16	0	0.00	100	0	0.00
Malignant cataharral fever-ovine (MCF)	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	16	0	0.00	100	0	0.00
Leptospirosis cannicola	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00
Leptospirosis grippo	17	0	0.00	9	0	0.00	20	1	0.05	21	0	0.00	17	1	0.06	17	1	0.06	101	3	0.03
Leptospirosis hardjo	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00
Leptospirosis ictero	17	0	0.00	9	0	0.00	20	3	0.15	21	2	0.10	17	3	0.18	17	3	0.18	101	11	0.11
Leptospirosis pomona	17	0	0.00	9	0	0.00	20	0	0.00	21	0	0.00	17	0	0.00	17	0	0.00	101	0	0.00

Positive titers: PI3>1:120, IBR> 1:64, BRSV >1:32, Leptospirosis sp.>1:100

Appendix 2a: Trace mineral concentration documented for mountain goats in the Lions Head and Sinclair study areas, 2010-2013. Results are also provided for three other populations in southeastern Alaska in 2010-2013, for comparison. (Kakuhan includes the Lions Head and Sinclair study areas combined).

	Se			Mo			Mn			Fe			Cu			Zn		
Area	mean	SE	n	mean	SE	n	mean	SE	n	mean	SE	n	mean	SE	n	mean	SE	n
Baranof	0.31	0.01	31	0.05	0.00	31	0.01	0.00	31	1.67	0.08	31	1.08	0.03	31	0.80	0.03	31
Cleveland	0.26	0.01	5	0.05	0.00	5	0.01	0.00	5	1.71	0.09	5	0.81	0.03	5	0.70	0.04	5
Kakuhan	0.16	0.02	24	0.05	0.00	24	0.01	0.00	24	1.70	0.10	24	0.96	0.04	24	0.81	0.04	24
Haines	0.24	0.02	46	0.05	0.00	45	0.01	0.00	45	1.88	0.07	45	1.07	0.03	45	0.82	0.03	45
Average	0.24	0.01	108	0.05	0.00	107	0.01	0.00	107	1.79	0.05	107	1.03	0.02	107	0.81	0.02	107

Appendix 2b: Selenium concentration for mountain goats in the Lions Head and Sinclair study areas, 2010-2013. Results are also provided for three other populations in southeastern Alaska in 2010-2013, for comparison. (Kakuhan includes the Lions Head and Sinclair study areas combined).

Selenium (ppm)

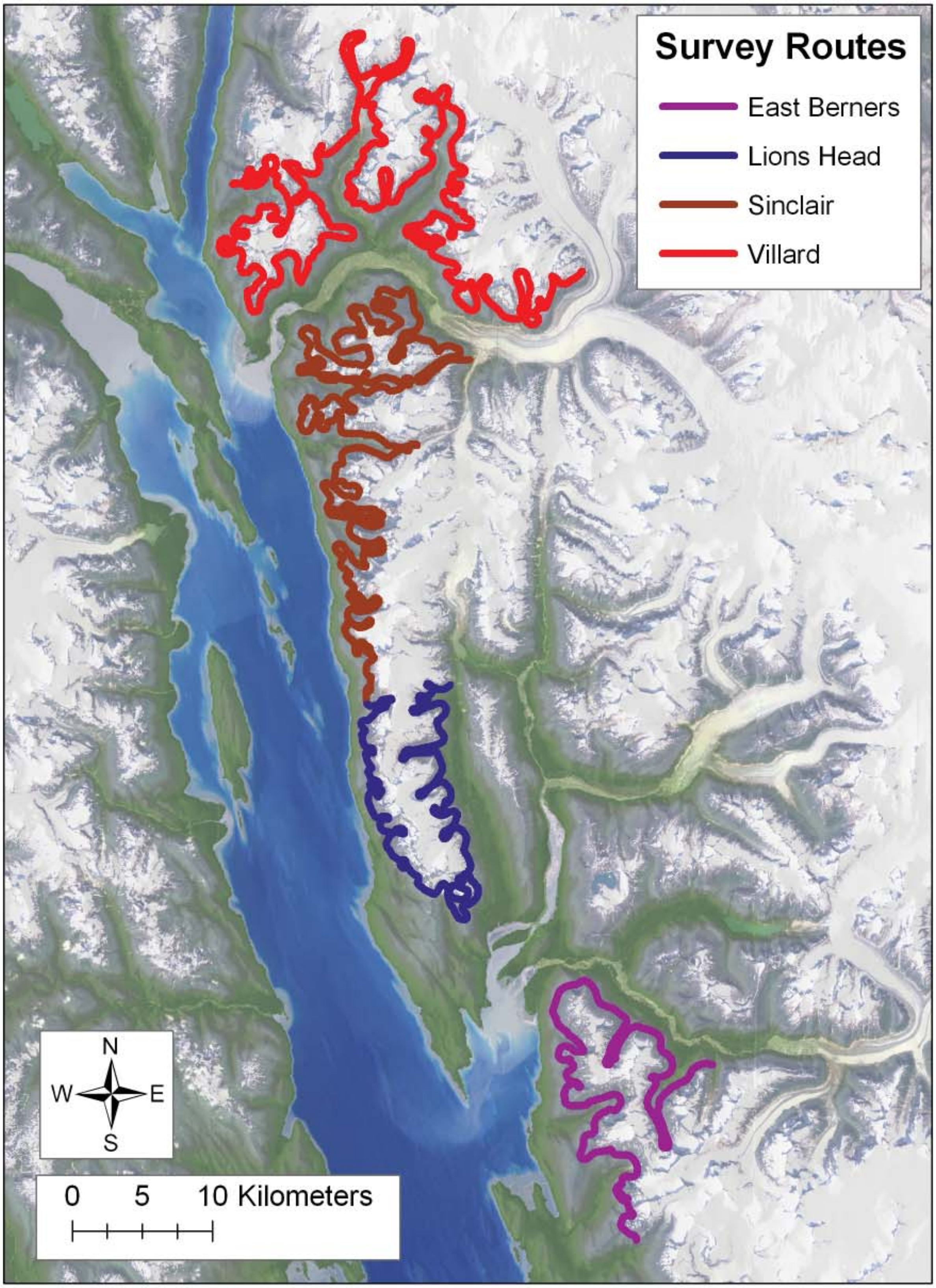
Area	mean	SE	n	Min	Max	# < 0.10	Prop < 0.10
Baranof	0.31	0.01	31	0.19	0.41	0	0.00
Cleveland	0.26	0.01	5	0.22	0.29	0	0.00
Haines	0.24	0.02	46	0.03	0.73	9	0.20
Berners	--	--	--	--	--	--	--
Villard	--	--	--	--	--	--	--
Kakuhan	0.16	0.02	24	0.05	0.37	9	0.38
Average	0.24	0.01	108	0.03	0.73	18	0.17

Appendix 3: Monthly snowfall (in.) recorded at the NWS weather station in Haines, AK between 2005-2014.

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total	% of normal
2005/2006	0	30	9	40	22	16	0	0	118	74%
2006/2007	0	42	78	81	28	78	3	0	309	195%
2007/2008	0	6	56	78	41	31	3	0	214	135%
2008/2009	22	24	56	62	45	43	9	0	261	165%
2009/2010	0	48	19	68	8	59	0	0	202	128%
2010/2011	0	24	25	19	20	3	3	0	93	59%
2011/2012	0	126	40	121	20	56	0	0	363	230%
2012/2013	4	20	41	21	23	10	14	1	133	84%
2013/2014	0	20	92	22	23	35	1	0	192	121%
Average, Study period	3	40	40	61	26	37	4	0	209	132%
Average, Long-term[1]	3	23	38	40	29	20	4	0	158	100%

[1]Haines Airport (1950-1955, 1973-1998) and Haines COOP NWS Station (1999-2014)

Appendix 4a: Mountain goat aerial survey routes in the Lynn Canal study area. Each area was surveyed by fixed- and/or rotor-wing aircraft during August-October, 2005-2014.



Appendix 4b: Summary of mountain goat population composition and minimum abundance data collected during aerial surveys on the East Berners Mountains survey route, 2006-2014. These data do not account for differences in mountain goat sighting probabilities that occur between surveys. As a result, the number of mountain goats recorded represent the minimum number of animals on the survey route during a given survey.

Study area	Year	Date	Adults	Kids	Total	% Kids	Temp (F)	Weather	Median wind speed (knots)	Aircraft	# Observers	Complete survey?
East Berners	2006	8/28/06	86	42	128	32.8	40-50	Mostly Clear	5	Heliocourier	3	N
East Berners	2006	9/3/06	83	21	104	20.2	51	Partly Cloudy	5	Heliocourier	2	Y
East Berners	2006	10/3/06	70	22	92	23.9	35-40	High Overcast	10	Heliocourier	3	Y
East Berners	2007	9/2/07	105	28	133	21.1	44	Clear	3	Heliocourier	2	Y
East Berners	2007	9/22/07	97	28	125	22.4	35-40	High Overcast	5	Cub	2	Y
East Berners	2007	10/4/07	97	22	119	18.5	26-34	High Overcast	5	Cub	2	Y
East Berners	2008	9/25/08	125	38	163	23.3	40	Mostly Clear	5	Hughes 500	3	Y
East Berners	2009	8/10/09	85	28	113	24.8	46	Cloudy	8	Cub	2	N
East Berners	2009	8/20/09	23	6	29	20.7	52	Cloudy	5	Cub	2	N
East Berners	2009	10/2/09	74	26	100	26.0	37-42	High Overcast	8	Cub	2	Y
East Berners	2010	9/11/10	72	14	86	16.3	51	Clear	0	Cub	2	Y
East Berners	2010	9/22/10	67	15	82	18.3	42	Mostly Clear	5	Cub	2	Y
East Berners	2011	9/27/11	116	31	147	21.1	35	High Overcast	5	Cub	2	Y
East Berners	2012	9/19/12	141	37	178	20.8	42-43	High Overcast	3	Cub	2	Y
East Berners	2013	9/25/13	78	17	95	17.9	37	High Overcast	8	Cub	2	Y
East Berners	2014	9/10/14	121	33	154	21.4	42-47	High Overcast	3	Cub	2	Y

Appendix 4c: Summary of mountain goat population composition and minimum abundance data collected during aerial surveys on the Lions Head survey route, 2005-2014. These data do not account for differences in mountain goat sighting probabilities that occur between surveys. As a result, the number of mountain goats recorded represent the minimum number of animals on the survey route during a given survey.

Study area	Year	Date	Adults	Kids	Total	% Kids	Temp (F)	Weather	Median wind speed (knots)	Aircraft	# Observers	Complete survey?
Lions Head	2005	8/11/05	35	5	40	12.5	70	Clear	5	Cub	2	Y
Lions Head	2005	10/3/05	55	8	65	12.3	45	Clear	5	Heliocouirer	3	Y
Lions Head	2006	8/28/06	49	9	58	15.5	40-50	Mostly Clear	5	Heliocourier	3	Y
Lions Head	2006	9/3/06	54	11	65	16.9	51	Partly Cloudy	5	Heliocourier	2	Y
Lions Head	2006	10/2/06	92	13	105	12.4	26-31	Mostly Cloudy	10	Heliocourier	3	Y
Lions Head	2006	10/16/06	91	23	114	20.2	35-42	Mostly Clear	18	Hughes 500	3	Y
Lions Head	2007	8/10/07	18	2	20	10.0	51-57	Clear	5	Heliocourier	3	Y
Lions Head	2007	8/27/07	43	3	46	6.5	44-50	High Overcast	3	Heliocourier	3	Y
Lions Head	2007	9/13/07	46	5	51	9.8	~45-55	High Overcast/ Low Fog	3	Cub	2	Y
Lions Head	2007	9/28/07	78	15	93	16.1	35-40	Mostly Clear	5	Hughes 500	3	Y
Lions Head	2007	10/4/07	78	8	86	9.3	26-34	High Overcast	8	Cub	2	Y
Lions Head	2008	9/25/08	62	18	80	22.5	40	Mostly Clear	5	Hughes 500	3	Y
Lions Head	2008	10/7/08	63	13	76	17.1	31	Clear/High Overcast	8	Cub	2	Y
Lions Head	2009	8/12/09	76	18	94	19.1	43-46	Ptly/Mostly Cloudy	5	Cub	2	N
Lions Head	2009	10/3/09	51	16	67	23.9	40	High Overcast	13	Cub	2	Y
Lions Head	2010	9/6/10	49	14	63	22.2	44-48	Mostly Clear	15	Cub	2	Y
Lions Head	2010	9/21/10	58	23	81	28.4	36-42	Clear	3	Cub	2	Y
Lions Head	2011	9/18/11	89	30	119	25.2	39-42	High Overcast	5	Cub	2	Y
Lions Head	2012	9/19/12	76	15	91	16.5	40-44	High Overcast	5	Cub	2	Y
Lions Head	2013	9/23/13	66	18	84	21.4	37	Partly Cloudy	5	Cub	2	Y
Lions Head	2014	9/10/14	48	10	58	17.2	43-47	High Overcast	8	Cub	2	Y

Appendix 4d: Summary of mountain goat population composition and minimum abundance data collected during aerial surveys on the Mt. Sinclair survey route, 2005-2014. These data do not account for differences in mountain goat sighting probabilities that occur between surveys. As a result, the number of mountain goats recorded represent the minimum number of animals on the survey route during a given survey.

Study area	Year	Date	Adults	Kids	Total	% Kids	Temp (F)	Weather	Median wind speed (knots)	Aircraft	# Observers	Complete survey?
Sinclair Mtn.	2005	8/11/05	77	17	94	18.1	70	Clear	5	Cub	2	Y
Sinclair Mtn.	2005	10/3/05	159	30	189	15.9	45	Clear	5	Heliocouirer	3	Y
Sinclair Mtn.	2006	8/28/06	86	21	107	19.6	40-50	Mostly Clear	5	Heliocourier	3	N
Sinclair Mtn.	2006	9/2/06	128	31	159	19.5	50-56	High Overcast	5	Heliocourier	4	Y
Sinclair Mtn.	2006	9/23/06	153	22	182	12.1	40-42	High Overcast	5	Heliocourier	3	Y
Sinclair Mtn.	2006	10/16/06	227	41	268	15.3	35-42	Mostly Clear	18	Hughes 500	3	Y
Sinclair Mtn.	2007	8/27/07	57	4	61	6.6	44-50	High Overcast	3	Heliocourier	3	Y
Sinclair Mtn.	2007	9/13/07	75	13	88	14.8	45-55	High Overcast/ Low Fog	3	Cub	2	Y
Sinclair Mtn.	2007	9/28/07	173	38	211	18.0	35-40	High Overcast	5	Hughes 500	3	Y
Sinclair Mtn.	2008	9/25/08	127	27	154	17.5	40	Mostly Clear	5	Hughes 500	3	Y
Sinclair Mtn.	2008	10/7/08	123	26	149	17.4	31	Clear/High Overcast	8	Cub	2	Y
Sinclair Mtn.	2010	9/6/10	62	18	80	22.5	44-48	Mostly Clear	15	Cub	2	Y
Sinclair Mtn.	2010	9/21/10	59	19	78	24.4	36-42	Clear	3	Cub	2	Y
Sinclair Mtn.	2011	9/18/11	127	33	160	20.6	39-42	High Overcast	5	Cub	2	Y
Sinclair Mtn.	2012	9/19/12	107	15	122	12.3	40-44	High Overcast	5	Cub	2	Y
Sinclair Mtn.	2013	9/23/13	67	14	81	17.3	37	High Overcast	5	Cub	2	Y
Sinclair Mtn.	2014	9/10/14	76	24	100	24.0	43-47	High Overcast	8	Cub	2	Y

Appendix 4e: Summary of mountain goat population composition and minimum abundance data collected during aerial surveys on the Mt. Villard survey route, 2005-2014. These data do not account for differences in mountain goat sighting probabilities that occur between surveys. As a result, the number of mountain goats recorded represent the minimum number of animals on the survey route during a given survey.

Study area	Year	Date	Adults	Kids	Total	% Kids	Temp (F)	Weather	Med wind speed (knots)	Aircraft	# Observers	Complete survey?
Mt. Villard	2005	8/12/05	23	4	27	14.8	68	Clear	5	Cub	2	Y
Mt. Villard	2006	9/2/06	102	23	125	18.4	50-56	High Overcast	5	Heliocourier	4	Y
Mt. Villard	2006	9/23/06	90	12	102	11.8	40-42	High Overcast	5	Heliocourier	3	N
Mt. Villard	2006	10/1/06	41	12	53	22.6	31	Mostly Cloudy	10	Heliocourier	3	N
Mt. Villard	2006	10/2/06	165	28	193	14.5	26-31	Mostly Cloudy	10	Heliocourier	3	Y
Mt. Villard	2006	10/17/06	145	29	174	16.7	35-31	High Overcast	5	Hughes 500	3	N
Mt. Villard	2007	9/3/07	88	23	111	20.7	47-54	Clear	5	Heliocourier	3	Y
Mt. Villard	2007	9/14/07	74	23	97	23.7	44	Overcast/Fog	14	Heliocourier	3	Y
Mt. Villard	2007	9/22/07	132	22	154	14.3	35-40	Overcast/Lt Snow/Fog	8	Cub	2	Y
Mt. Villard	2008	9/6/08	52	10	62	16.1	45-55	Partly Cloudy/High Overcast	5	Cub	2	N
Mt. Villard	2008	9/25/08	164	30	194	15.5	40	Mostly Clear	5	Hughes 500	3	Y
Mt. Villard	2009	10/3/09	56	16	72	22.2	32	High Overcast	15	Cub	2	Y
Mt. Villard	2010	9/12/10	62	19	81	23.5	41-48	Clear	20	Cub	2	Y
Mt. Villard	2011	9/18/11	156	35	191	18.3	39-42	High Overcast	5	Cub	2	Y
Mt. Villard	2012	9/21/12	104	17	121	14.0	49-51	High Overcast	3	Cub	2	Y
Mt. Villard	2013	9/23/13	57	10	67	14.9	39-40	High Overcast	18	Cub	2	Y
Mt. Villard	2014	9/10/14	112	31	143	21.7	32	High Overcast	5	Cub	2	Y

Appendix 4f: Summary of mountain goat population composition and minimum abundance data collected during aerial surveys on the Berners-Lace Ridge survey route, 2007-2014. These data do not account for differences in mountain goat sighting probabilities that occur between surveys. As a result, the number of mountain goats recorded represent the minimum number of animals on the survey route during a given survey.

Study area	Year	Date	Adults	Kids	Total	% Kids	Temp (F)	Weather	Median wind speed (knots)	Aircraft	# Observers	Complete survey?
B-L Ridge	2007	9/2/07	25	4	29	13.8	51.5	Clear	3	Helio	2	Y
B-L Ridge	2008	9/25/08	19	3	22	13.6	40	Clear	0	HD500	3	Y
B-L Ridge	2010	9/6/10	17	4	21	19.0	48-52	Mostly Clear	10	Cub	2	Y
B-L Ridge	2011	9/26/11	26	9	35	25.7	42	Clear	15	Cub	2	Y
B-L Ridge	2012	9/19/12	24	3	27	11.1	43	High Overcast	3	Cub	2	Y
B-L Ridge	2013	9/23/13	13	2	15	13.3	37	Clear	3	Cub	2	Y
B-L Ridge	2014	9/10/14	16	3	19	15.8	43-47	High Overcast	8	Cub	2	Y