ALASKA DEPARTMENT OF FISH AND GAME
DIVISION OF WILDLIFE CONSERVATION
PO Box 115526
Juneau, AK 99811-5526

Alaska Department of Fish and Game
Wildlife Restoration Grant

GRANT NUMBER: AKW-B-R1-2020

PROJECT NUMBER: 12.01

PROJECT TITLE: Mountain goat population dynamics in southeastern Alaska

PERIOD OF PERFORMANCE: 1 July 2019–30 June 2021

PERFORMANCE YEAR: 1 July 2019–30 June 2020

REPORT DUE DATE: 1 September 2020

PRINCIPAL INVESTIGATOR: Kevin S. White

COOPERATORS: Bureau Land Management, City of Sitka, Coeur Alaska, U.S. Forest Service, Oregon State University.

I. PROGRESS ON PROJECT OBJECTIVES DURING PERFORMANCE YEAR

OBJECTIVE 1: Capture and radio-collar a sample of mountain goats in each study area.

ACCOMPLISHMENTS: We captured and deployed GPS/VHF radio-collars on mountain goats in Lynn Canal (n = 7), Haines (n = 12) and Baranof Island (n = 6) during July - August 2019. All mountain goats were captured using helicopter darting methods. Following capture, we collected biological samples (i.e. blood, tissue, fecal pellets, hair) and recorded morphological characteristics. Biological samples were analyzed via laboratory analysis to characterize disease status, diet composition, genetic structure and trace mineral concentration. We successfully accomplished all activities associated with this objective that were planned for this reporting period.

OBJECTIVE 2: Annually estimate mountain goat population size and composition in each study area.

ACCOMPLISHMENTS: We conducted fixed-wing aerial surveys during September-October 2019 in order to estimate mountain goat population size and composition (Lynn Canal, n = 1; Haines, n = 4, Baranof, n = 3). Aerial survey results are summarized by study area and survey unit in Table 1a-c. During these surveys mountain goat sighting probabilities were estimated based on data collected from radio- marked mountain goats. Overall, we determined that 57% of radio-collared mountain goats were actually seen during aerial surveys in 2019 (Lynn Canal = 55%, n = 29; Haines = 59%, n = 27; Baranof = 57%, n = 30). We successfully accomplished all activities associated with this objective that were planned for this reporting period.

OBJECTIVE 3A: Monitor reproductive success of female mountain goats in each study area

ACCOMPLISHMENTS: We conducted fixed-wing aerial surveys in May-June 2020 (Lynn Canal, n = 3; Haines, n = 3; Baranof, n = 2) to determine kid status of radio-marked adult female mountain goats (Lynn Canal, n = 9; Haines, n = 14; Baranof, n = 10). Estimated parturition during spring of 2020 was variable between areas (Lynn Canal = 0.67±0.16, Haines = 0.57±0.13, Baranof = 0.40±0.15) and also in relation to long-term averages (Lynn Canal = 0.68±0.03, n = 315; Haines = 0.67±0.04, n = 150; Baranof = 0.57±0.05, n = 114). Severe winter conditions, particularly on Baranof Island, were likely an important factor influencing parturition estimates. We successfully accomplished all activities associated with this objective that were planned for this reporting period.

OBJECTIVE 3B: Monitor survival of adult mountain goats in each study area.

ACCOMPLISHMENTS: We monitored survival of radio-marked mountain goats (Lynn Canal, n = 29; Haines, n = 32, Baranof, n = 31; Cleveland Peninsula, n = 0) via fixed-wing radio-telemetry surveys and/or from examining GPS-telemetry data. During 2019–2020, we investigated 24 mortality events involving radio-marked mountain goats (Lynn Canal, n =7; Haines, n = 7; Baranof, n = 10; Cleveland Peninsula, n = 0). Estimated annual adult survival during the 2019/2020 biological year was relatively low (Lynn Canal = 0.74±0.08, Haines = 0.77±0.07, Baranof = 0.63±0.08) in relation to long-term averages (Lynn Canal = 0.77±0.02, n = 533 mountain goat years; Haines = 0.82±0.02, n = 281; Baranof = 0.85±0.02, n = 262; Table 2). Severe winter conditions were likely an important factor influencing adult survival during 2019/2010, yet predation and population age structure also represent important considerations. We successfully accomplished all activities associated with this objective that were planned for this reporting period.

OBJECTIVE 3C: Monitor/estimate survival of mountain goat kids in each study area.

ACCOMPLISHMENTS: We conducted aerial surveys in May-June 2019 to determine kid status of radio-marked adult female mountain goats. We subsequently monitored these radio-marked females to determine survival of their kids through September (it was not possible to reliably observe radio-marked females on largely forested winter range). Overall, 0.82±0.08 (18/22) of kids detected in May were observed again in September (Lynn Canal = 73%, n = 11; Haines = 86%, n = 7; Baranof = 100%, n = 4). We successfully accomplished all activities associated with this objective that were planned for this reporting period.

OBJECTIVE 4: Determine seasonal habitat selection patterns.

ACCOMPLISHMENTS: Data collected from all GPS radio-marked mountain goats during 2019/2020 were archived in a geospatial database (however a widespread GPS collar failure during April 2019 reduced the amount of data collected after that time). A two-stage resource selection function (RSF) modeling framework was developed and described in White et al. (2012). Further refinements to the modeling framework (i.e. computer programming) were conducted in 2017–2018. We conducted RSF analyses examining mountain goat resource selection patterns in the vicinity of the Kensington Mine (White and Gregovich 2016, White

and Gregovich 2017). In addition, we developed winter and summer RSF models in the Haines-Skagway area in order to inform land management decision making processes in the context of helicopter tourism regulation (White and Gregovich 2018). During 2019/2020, we completed an analyses of mountain goat home range size and site fidelity using GPS locations data collected in the Haines-Skagway and Lynn Canal Areas between 2005-2018. This analysis has been reviewed by ADFG and submitted for publication in a peer reviewed journal. We successfully accomplished all activities associated with this objective that were planned for this reporting period.

OBJECTIVE 5 Analyze data and prepare reports.

ACCOMPLISHMENTS: In collaboration with Oregon State University (Taal Levi), we continued analysis of demographic data to develop population projection models for simulating sustainable harvest. We prepared an annual progress report detailing activities conducted in Lynn Canal, as required by funding agreements with Coeur Alaska. We co-authored two papers published in peer-reviewed journals based on data collected during this study; four other manuscripts are being prepared or in the review process.

II. SUMMARY OF WORK COMPLETED ON PROJECT TO DATE

Since 2010, we have captured and handled 257 mountain goats in the Lynn Canal (n = 73), Haines (n = 95), Cleveland Peninsula (n = 13) and Baranof Island (n = 76) study areas. In each area, we have annually conducted aerial surveys to derive population estimates via mark-resight and sightability modeling techniques. In addition, we have monitored survival and reproduction of radio-collared mountain goats monthly and seasonally in order to derive estimates of survival and fecundity. Vital rate estimates (i.e. survival and reproduction) along with population estimates have enabled development of population models that can be used to project population trajectories into the future and are used for research and management purposes (White et al. 2018). In addition, we have collected high resolution GPS location data from each radio-collared mountain goat in order to develop predictive habitat models in a remote sensing framework. These models have been used to inform land management decisions.

III. SIGNIFICANT DEVELOPMENT REPORTS AND/OR AMENDMENTS

Part of Project Objective 1 states: ***During immobilization, biological samples (i.e., blood, hair, fecal pellets), body condition measurements (e.g., rump fat thickness via ultrasonography, body weight), and morphological data will be collected to provide baseline information about animal nutritional condition, diet, and morphology, and to acquire blood and tissue samples for the ADF&G biological sample archive.*** Until now some rump fat measurements have been taken during capture operations, yet we have not been able to quantitively convert such measurements to actual estimates of percent body fat. Calibration of this technique requires mortality (accidental or intentional) of the goats. Intentional mortality has not been undertaken and our sample size of accidental mortalities is not large enough to perform these calibrations.

In July and August 2019, we had the opportunity to calibrate this method. Specifically, we received training in Olympic National Park in Washington and began developing our capabilities

for using real-time portable ultrasound to quantify body fat reserves on live captured or euthanized mountain goats, as well as conducting necropsies on mountain goat carcasses. Portable ultrasound machines are widely used for estimating body condition for many different Alaska ungulate species including moose, caribou, deer and mountain sheep. The technique represents a key tool for gathering data about nutritional condition of ungulate populations, and such data are frequently used for informing management decisions. The activities were three-fold: 1) work with Tom Stephenson of California Department of Fish and Wildlife (who developed/validated the technique for moose, caribou and mountain sheep) to handle and measure live-captured animals to learn the precise measurement protocol, 2) develop the capability to conduct necropsies for validating the technique, and 3) gather data from necropsied animals needed to validate the ultrasound body condition technique. In FY20, all costs of training, travel, logistics, etc. were paid for by a NGO (Rocky Mountain Goat Alliance) and matched with Federal Aid funding (25%:75%); salary costs were covered under AKW-23 12.01 while participating in field data collection and training activities.

During July and August 2019, we estimated rump fat thickness of 35 live-captured mountain goats using real-time ultrasonography. We also had the opportunity to necropsy and collect validation samples from 5 animals that died during capture. Validation samples later analyzed at the Washington State University Wildlife Nutrition Laboratory determined that body fat varied between 6-15% (n = 5), substantially lower than the estimates derived in September 2008 (20-22%, n = 3). These findings provide important preliminary insights about the rate mountain goats accumulate fat reserves during short summer growing season.

PCN 11-2253 was moved to headquarters, reduce allocation to actuals. Moved $18.1K to headquarters grant. Because PCN 11-2253 is no longer associated with this project and due to COVID 19, travel was scientifically reduced. Also, many Telonics collars prematurely failed and PI wanted to test Vectronic Aerospace collars. This purchase was for a total of 32.8K.

IV. PUBLICATIONS

Haworth, S., K. S. White, S. Côté, and A. Shafer. 2019. Space, time, and captivity: quantifying the factors influencing the fecal microbiome of an alpine ungulate. FEMS Microbiology Ecology, DOI: 10.1093/femsec/fiz095.

Schmidt, J., J. Reynolds, K. Rattenbury, L. Phillips, K. White, D. Schertz, J. Morton, and S. Kim. 2019. Integrating distance sampling with minimum counts to improve monitoring. Journal of Wildlife Management, DOI: 10.1002/jwmg.21691

White, K. S. 2020. Mountain goat population ecology and habitat use near the Kensington Mine, Alaska. Research progress report. Alaska Department of Fish and Game, Juneau, AK.

V. RECOMMENDATIONS FOR THIS PROJECT

This project should be continued as described in the research operation plan and project statement.

Prepared by: Kevin White

Date: 1 September 2020

Table 1a. Number of mountain goats seen during aerial surveys conducted during September 2019 in Lynn Canal, AK. Results are summarized by survey area.

Area	Adults	Kids	Total	% kids	# groups	Minutes
BL Ridge	15	6	21	28.6	13	51
Katzehin Lk	4	0	4	0.0	3	28
Kensington	20	7	27	25.9	14	26
Met	29	13	42	31.0	21	33
S Katzehin	30	5	35	14.3	21	63
S Meade	6	0	6	0.0	6	46
U Lace	4	3	7	42.9	4	16
W Berners	6	0	6	0.0	6	23
Yeldagalga	34	10	44	22.7	17	43
Total	148	44	192	22.9	105	328

Table 1b. Number of mountain goats seen during aerial surveys conducted during September 2019 in the Haines-Skagway area, AK. Results are summarized by survey area.

Large Area	Adults	Kids	Total	% kids	# groups	Minutes
Chilkat Range	42	7	49	14.3	29	57
Chilkoot	116	37	153	24.2	76	169
Dewey-Denver	37	8	45	17.8	27	23
Face	9	4	13	30.8	9	26
Four Winds	41	18	59	30.5	21	141
Halutu	59	14	73	19.2	49	88
Hiteshitak	127	27	154	17.5	59	123
Jarvis	4	0	4	0.0	3	18
Kasidaya	8	0	8	0.0	8	15
Laughton Gl	28	5	33	15.2	22	26
Meade-Nunatak 4	10	2	12	16.7	5	8
Meade-Nunatak 5	12	1	13	7.7	8	13
Nourse-East	34	7	41	17.1	28	37
Nourse-West	15	5	20	25.0	12	16
Porcupine	52	6	58	10.3	34	96
Skagway Pie	54	20	74	27.0	33	80
Takhin	91	21	112	18.8	48	104
Takhinsha	51	6	57	10.5	35	162
Takshanuk	282	88	370	23.8	112	212
Villard	77	10	87	11.5	48	127
Warm Pass	5	1	6	16.7	4	14
Yeatman	4	0	4	0.0	4	22

Table 1c. Number of mountain goats seen during aerial surveys conducted during September 2019 on Baranof Island, AK. Results are summarized by hunt area.

Hunt Zone	Adult	Kids	Total	% kids	# groups	Minutes
Annahootz	46	15	61	24.6	25	20
Baranof River	30	5	35	14.3	21	35
Bear Mountain	24	6	30	20.0	13	29
Clarence Kramer	38	7	45	15.6	24	19
Clear River	39	7	46	15.2	25	32
Cold Storage	45	17	62	27.4	25	36
Glacial River	67	10	77	13.0	37	31
Gut Bay/Hoggatt Bay	16	1	17	5.9	7	32
Hogan Lake	70	23	93	24.7	31	30
Indian River	23	6	29	20.7	15	27
Indigo Lake	13	2	15	13.3	5	16
Kasnyku/Takatz	27	7	34	20.6	16	47
Kelp Bay	46	11	57	19.3	33	53
Lake Diana	58	16	74	21.6	21	42
Lake Eva	39	4	43	9.3	21	21
Lake Irina	2	1	3	33.3	2	36
Lucky Chance	8	4	12	33.3	2	12
Mt Katlian	36	6	42	14.3	25	21
Nakwasina	48	5	53	9.4	31	30
Necker Bay	1	0	1	0.0	1	36
Nelson Bay	13	3	16	18.8	11	67
North Kelp	2	0	2	0.0	1	14
Red Bluff Bay	75	8	83	9.6	34	34
Red Bluff Bay/Hoggatt Bay	62	9	71	12.7	31	40
Rosenberg	23	5	28	17.9	9	18
Saook	35	7	42	16.7	24	33
Slaughter Ridge	10	3	13	23.1	8	15
Upper Benzeman	47	12	59	20.3	16	39
Upper Blue Lake	29	12	41	29.3	18	28
Upper Katlian	72	19	91	20.9	46	50
Vodopod River	18	3	21	14.3	13	18
Whale Bay	29	3	32	9.4	23	44
Total	1091	237	1328	17.8	614	1004

Table 2. Annual survival estimates for adult mountain goats in southeastern Alaska, 2005-2020.

	Males				Females				Total			
Area/Year	At Risk	Died	Ŝ	SE	At Risk	Died	Ŝ	SE	At Risk	Died	Ŝ	SE
Baranof Island												
2010/2011	8	1	0.88	0.11	4	0	1.00	0.00	12	1	0.92	0.08
2011/2012	12	0	1.00	0.00	6	0	1.00	0.00	18	0	1.00	0.00
2012/2013	17	3	0.82	0.09	6	0	1.00	0.00	23	3	0.87	0.07
2013/2014	17	3	0.82	0.09	10	0	1.00	0.00	27	3	0.89	0.06
2014/2015	17	3	0.82	0.09	12	1	0.92	0.08	29	4	0.86	0.06
2015/2016	14	0	1.00	0.00	13	2	0.84	0.11	27	2	0.92	0.06
2016/2017	23	3	0.85	0.08	13	2	0.82	0.12	36	5	0.84	0.06
2017/2018	21	5	0.76	0.09	11	2	0.80	0.13	32	7	0.77	0.07
2018/2019	18	1	0.94	0.06	13	1	0.90	0.09	31	2	0.93	0.05
2019/2020	19	8	0.47	0.10	12	2	0.82	0.11	31	10	0.63	0.08
All years	162	27	0.83	0.03	100	10	0.89	0.03	262	37	0.85	0.02
Cleveland Pen.												
2009/2010	5	0	1.00	0.00	2	0	1.00	0.00	7	0	1.00	0.00
2010/2011	6	2	0.67	0.16	6	0	1.00	0.00	12	2	0.83	0.10
2011/2012	4	2	0.50	0.18	6	0	1.00	0.00	10	2	0.80	0.11
2012/2013	2	1	0.50	0.35	6	0	1.00	0.00	8	1	0.88	0.12
2013/2014	1	0	1.00	0.00	6	2	0.67	0.19	7	2	0.71	0.17
All years	18	5	0.72	0.09	26	2	0.92	0.05	44	7	0.84	0.05
Haines-Skagway												
2010/2011	13	4	0.69	0.13	10	3	0.70	0.14	23	7	0.70	0.10
2011/2012	16	2	0.87	0.09	10	1	0.90	0.09	26	3	0.88	0.06
2012/2013	18	2	0.89	0.07	11	1	0.91	0.08	29	3	0.90	0.06
2013/2014	22	2	0.91	0.06	12	1	0.92	0.08	34	3	0.91	0.05
2014/2015	19	2	0.89	0.07	16	2	0.85	0.08	35	4	0.88	0.05
2015/2016	18	5	0.72	0.10	16	3	0.79	0.10	34	8	0.75	0.07
2016/2017	13	6	0.56	0.13	14	4	0.71	0.11	26	10	0.64	0.09
2017/2018	12	3	0.73	0.12	11	0	1.00	0.00	23	3	0.86	0.07
2018/2019	13	1	0.91	0.08	12	2	0.83	0.10	25	3	0.87	0.07
2019/2020	21	4	0.77	0.09	11	3	0.73	0.12	32	7	0.77	0.07
All years	162	31	0.80	0.03	119	20	0.83	0.03	281	51	0.82	0.02
Lynn Canal												
2005/2006	11	2	0.82	0.12	11	1	0.91	0.09	22	3	0.86	0.07
2006/2007	33	11	0.67	0.08	25	4	0.84	0.07	58	15	0.74	0.05
2007/2008	36	7	0.77	0.08	31	4	0.83	0.08	67	11	0.80	0.05
2008/2009	36	10	0.66	0.09	34	6	0.73	0.09	70	16	0.69	0.06
2009/2010	28	4	0.86	0.07	26	4	0.85	0.07	54	8	0.85	0.05
2010/2011	25	3	0.88	0.06	24	2	0.91	0.06	49	5	0.90	0.04
2011/2012	23	6	0.72	0.10	23	3	0.85	0.08	46	9	0.77	0.07
2012/2013	19	8	0.56	0.11	16	7	0.60	0.11	34	15	0.58	0.08
2013/2014	14	4	0.71	0.12	11	2	0.83	0.11	25	6	0.76	0.08
2014/2015	12	5	0.60	0.13	14	1	0.93	0.07	26	6	0.77	0.08
2015/2016	9	1	0.88	0.10	17	2	0.88	0.08	26	3	0.88	0.06
2016/2017	14	6	0.57	0.13	17	3	0.82	0.09	31	9	0.71	0.08
2017/2018	12	1	0.92	0.08	18	6	0.67	0.11	30	7	0.77	0.08
2018/2019	13	3	0.76	0.12	14	0	1.00	0.00	27	3	0.89	0.06
2019/2020	12	4	0.67	0.13	17	3	0.80	0.10	29	7	0.74	0.08
All years	272	75	0.73	0.03	264	48	0.82	0.02	533	123	0.77	0.02