Alaska Department of Fish and Game Wildlife Restoration Grant

GRANT NUMBER: AKW-B-R1-2020 Amendment #1 SFY2021

PROJECT NUMBER: 12.01

PROJECT TITLE: Mountain goat population dynamics in southeastern Alaska

PERIOD OF PERFORMANCE: 1 July 2020–30 June 2021

REPORT DUE DATE: 1 September 2021

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 PERIOD OF PERFORMANCE

OBJECTIVE 1: CONDUCT 1 INVESTIGATION BY 06-30-2021

ACTIVITY 1A: 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 = 6), Haines (n = 15) and Baranof Island (n = 12) during July - September 2020. 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.

ACTIVITY 1B: <u>Annually estimate mountain goat population size and composition in each study area.</u>

ACCOMPLISHMENTS: We conducted fixed-wing aerial surveys during September-October 2020 in order to estimate mountain goat population size and composition (Lynn Canal, n = 2; Haines, n = 3, Baranof, n = 2). 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 51% of radio-collared mountain goats were actually seen during aerial surveys in 2020 (Lynn Canal = 56%, n = 25; Haines = 48%, n = 33; Baranof = 48%, n = 33). We successfully accomplished all activities associated with this objective that were planned for this reporting period.

ACTIVITY 1C: Monitor reproductive success and survival of mountain goats in each study area

ACCOMPLISHMENTS: We conducted fixed-wing aerial surveys in May-June 2020 (Lynn Canal, n = 5; Haines, n = 5; Baranof, n = 2) to determine kid status of radio-marked adult female mountain goats (Lynn Canal, n = 13; Haines, n = 15; Baranof, n = 13). Estimated parturition during spring of 2020 was variable between areas (Lynn Canal = 0.46 ± 0.14 , Haines = 0.53 ± 0.13 , Baranof = 0.46 ± 0.12) and also in relation to long-term averages (Lynn Canal = 0.67 ± 0.03 , n = 333; Haines = 0.66 ± 0.04 , n = 173; Baranof = 0.55 ± 0.04 , n = 128). 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.

We monitored survival of radio-marked mountain goats (Lynn Canal, n = 25; Haines, n = 39, Baranof, n = 34; Cleveland Peninsula, n = 0) via fixed-wing radio-telemetry surveys and/or from examining GPS-telemetry data. During 2019–2020, we investigated 22 mortality events involving radio-marked mountain goats (Lynn Canal, n = 5; Haines, n = 11; Baranof, n = 6; Cleveland Peninsula, n = 0). Estimated annual adult survival during the 2020/2021 biological year was relatively low (Lynn Canal = 0.80 ± 0.08 , Haines = 0.71 ± 0.07 , Baranof = 0.82 ± 0.07) in relation to long-term averages (Lynn Canal = 0.77 ± 0.02 , n = 559 mountain goat years; Haines = 0.80 ± 0.02 , n = 319; Baranof = 0.85 ± 0.02 , n = 296; Table 2). Severe winter conditions were likely an important factor influencing adult survival during 2020/2021, 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.

We conducted aerial surveys in May-June 2020 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, 0.76 ± 0.07 (19/25) of kids detected in May were observed again in September (Lynn Canal = 0.50 ± 0.12 , n = 8; Haines = 0.83 ± 0.10 , n = 12; Baranof = 1.00 ± 0.00 , n = 5). We successfully accomplished all activities associated with this objective that were planned for this reporting period.

ACTIVITY 1D: Determine seasonal habitat selection patterns.

ACCOMPLISHMENTS: Data collected from all GPS radio-marked mountain goats during 2020/2021 were archived in a geospatial database. 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 - 2021, we completed an analyses of mountain goat home range size and range fidelity using GPS locations data collected in the Haines-Skagway and Lynn Canal Areas between 2005-2018. This analysis was published in a peer-reviewed scientific journal during this reporting period (Shakeri et al. 2021). We

reporting period.

ACTIVITY 1E 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. This model was implemented in an integrated framework with mountain goat population genetic and structure data to evaluate sustainable harvest strategies for Cleveland Peninsula mountain goat populations. A peer-reviewed scientific journal article summarizing these findings was published during this reporting period (White et al. 2021). We prepared an annual progress report detailing activities conducted in Lynn Canal, as required by funding agreements with Coeur Alaska. We co-authored two additional papers in peer-reviewed journals based on data collected during this study (Schmidt et al. 2021, White et al., in press).

II. SUMMARY OF WORK COMPLETED ON PROJECT TO DATE.

Since 2010, we have captured and handled 290 mountain goats in the Lynn Canal (n = 79), Haines (n = 110), Cleveland Peninsula (n = 13) and Baranof Island (n = 88) 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, 2021). In addition, we have collected high resolution GPS location data from each radiocollared 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.

None

IV. PUBLICATIONS

White, K. S., D. Watts, K. B. Beckmen. In Press. Helicopter-based chemical immobilization of mountain goats in coastal Alaska. Wildlife Society Bulletin.

Shakeri, Y. N., K. S. White, and J. N. Waite. 2021. Staying close to home: ecological constraints on space use and range fidelity in a mountain ungulate. Ecology and Evolution, 11:11051-11064.

White, K. S., T. Levi, J. Breen, M. Britt, J. Merondun, D. Martchenko, Y. Shakeri, B. Porter and A. B. A. Shafer. 2021. Integrating genetic data and demographic modeling to facilitate conservation of small, isolated mountain goat populations. Journal of Wildlife Management, 85:271-282.

Schmidt, J. H., J. H. Reynolds, K. S. White, D. T. Schertz, J. M. Morton, and H. S. Kim. 2021.

Integrating distance sampling and minimum count data: a reply to Becker and Herreman. Journal of Wildlife Management, 85: 411-417.

White, K. S. 2021. 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: 8/20/21

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

Area	Date	Adults	Kids	Total	% Kids	Groups
Chilkat Range - Sullivan	9/5/20	10	1	11	9.1	8
Takhinsha - Upper	9/5/20	11	3	14	21.4	5
Takhinsha-Kicking Horse	9/5/20	29	8	37	21.6	17
Takhinsha-Middle	9/5/20	11	1	12	8.3	7
Takhin Chunakuklaik	0/5/20	23	6	20	20.7	11
Takhin-East	9/5/20	16	4	29	20.7	0
Takhin North	9/5/20	10	- -	20	20.0	2
Takhin South	9/5/20	2	1	2 1	25.0	2
Takimi-South	9/3/20	5	1	4	25.0	5
Porcupine-Cahoon	9/5/20	9	3	12	25.0	8
Porcupine-Flower	9/5/20	0	0	0	0.0	0
Porcupine-Summit	9/5/20	47	12	59	20.3	31
Porcupine-Upper	9/5/20	11	3	14	21.4	7
Jarvis	9/5/20	11	1	12	8.3	3
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Chilkoot-Ferebee	9/6/20	53	14	67	20.9	22
Chilkoot-North	9/6/20	29	3	32	9.4	18
Chilkoot-South	9/6/20	33	6	38	15.8	22
Four Winds-Canada	9/6/20	4	0	4	0.0	4
Four Winds-USA	9/6/20	32	9	41	22.0	17
Hiteshitak-Canada	9/6/20	46	9	55	16.4	16
Hiteshitak-USA	9/6/20	64	10	74	13.5	28
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Mt Raymond-USA	9/6/20	15	1	16	6.3	9
Mt Raymond-Canada	9/6/20	29	7	36	19.4	19
Takshanuk - N Goat Hollow	9/16/20	16	4	20	20.0	9
Takshanuk - North	9/16/20	30	1	31	3.2	18
Takshanuk - Tukgahgo	9/16/20	42	10	52	19.2	12
Takshanuk-East	9/16/20	25	4	29	13.8	11
Takshanuk-Ripinsky	9/16/20	14	1	15	6.7	8
Takshanuk-West	9/16/20	91	18	109	16.5	43

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

Area	Date	Adults	Kids	Total	% kids	Groups
Lions Head	9/17/2020	39	6	45	13.3	31
Sinclair	9/17/2020	41	6	47	12.8	38
Grand Total	9/17/2020	80	12	92	13.0	69
Kensington	9/17/2020	16	0	16	0.0	11
Met	9/17/2020	21	6	27	22.2	18
W Berners	9/17/2020	2	0	2	0.0	2
Katzehin Lk	9/17/2020	1	0	1	0.0	1
S Katzehin	9/17/2020	26	4	30	13.3	23
S Meade	9/17/2020	4	0	4	0.0	4
Yeldagalga	9/17/2020	10	2	12	16.7	10
U Lace	9/17/2020	0	0	0	0	0
BL Ridge	10/18/2020	14	2	16	12.5	9

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

Area	Date	Adults	Kids	Total	% Kids	Groups
Blue Lk - Bear Mtn	9/13/2020	16	1	17	5.9	11
Blue Lk - Clarence Kramer	9/13/2020	33	7	40	17.5	22
Blue Lk - Upper	9/13/2020	22	6	28	21.4	18
Indian	9/13/2020	5	1	6	16.7	2
Indigo Lake	9/13/2020	4	1	5	20.0	3
Katlian - Cold Storage	9/13/2020	2	1	3	33.3	2
Katlian - Hogan	9/13/2020	52	17	69	24.6	22
Katlian - Main	9/13/2020	49	4	53	7.5	28
Katlian - South Fork	9/13/2020	34	5	39	12.8	17
Katlian - Southwest	9/13/2020	12		12	0.0	12
Nakwasina - Slaughter Ridge	9/13/2020	18	2	20	10.0	9
Annahootz	9/15/2020	36	12	48	25.0	48
Baranof River	9/15/2020	32	7	39	17.9	32
Clear	9/15/2020	49	9	58	15.5	58
Fish - Rodman	9/15/2020	20	2	22	9.1	22
Glacial River - East	9/15/2020	4	1	5	20.0	4
Glacial River - West	9/15/2020	22	1	23	4.3	23
Kasnyku	9/15/2020	4	2	6	33.3	4
Middle Kelp	9/15/2020	26	5	31	16.1	31
Nakwasina - Main	9/15/2020	43	9	52	17.3	52
Nakwasina - Rosenberg Lake - N	9/15/2020	15	2	17	11.8	17
Nakwasina - Rosenberg Lake – S	9/15/2020	31	4	35	11.4	35
Nakwasina - Rosenberg Lk	9/15/2020	7	2	9	22.2	9
Rodman - Saook	9/15/2020	24	8	32	25.0	32
Saook - Eva	9/15/2020	21	3	24	12.5	24
Takatz	9/15/2020	4	1	5	20.0	4

Table 2. Annual survival estimates for adult mountain goats in southeastern Alaska, 2005-2021.

		М	ales			Females			Total			
	At	Died	Ŝ	SE	At	Died	Ŝ	SE	At	Died	Ŝ	SE
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	14	3	0.77	0.12	14	0	1.00	0.00	28	3	0.89	0.06
2019/2020	13	4	0.69	0.12	17	3	0.81	0.10	30	7	0.76	0.08
2020/2021	11	3	0.73	0.13	14	2	0.85	0.09	25	5	0.80	0.08
All years	283	78	0.73	0.03	278	50	0.82	0.02	559	128	0.77	0.02
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	0.92	0.08	13	2	0.84	0.10	26	3	0.88	0.06
2019/2020	14	4	0.69	0.12	18	3	0.83	0.08	32	7	0.77	0.07
2020/2021	17	5	0.69	0.10	22	6	0.72	0.10	39	11	0.71	0.07
All years	172	36	0.78	0.03	147	26	0.82	0.03	319	62	0.80	0.02
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	0.91	0.09	31	2	0.93	0.05
2019/2020	20	8	0.60	0.11	12	2	0.83	0.10	32	10	0.69	0.08
2020/2021	18	4	0.77	0.10	16	2	0.88	0.08	34	6	0.82	0.07
All years	180	31	0.82	0.03	116	12	0.89	0.03	296	43	0.85	0.02