Mountain Goat Management Report and Plan, Game Management Units 7 and 15:

Report Period 1 July 2013–30 June 2018, and

Plan Period 1 July 2018–30 June 2023

Jason Herreman

Photo by Dom Watts, U.S. Fish and Wildlife Service.

2022

Alaska Department of Fish and Game   Division of Wildlife Conservation

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PUBLISHED BY:

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Technical Reports Editor

Species management reports and plans provide information about species that are hunted or trapped and management actions, goals, recommendations for those species, and plans for data collection. Detailed information is prepared for each species every 5 years by the area management biologist for game management units in their areas, who also develops a plan for data collection and species management for the next 5 years. This type of report is not produced for species that are not managed for hunting or trapping or for areas where there is no current or anticipated activity. Unit reports are reviewed and approved for publication by regional management coordinators and are available to the public via the Alaska Department of Fish and Game's public website.

This species management report and plan was reviewed and approved for publication by Jeff Selinger, Management Coordinator for Region II for the Division of Wildlife Conservation.

Species management reports and plans are available via the Alaska Department of Fish and Game's public website (www.adfg.alaska.gov) or by contacting Alaska Department of Fish and Game's Division of Wildlife Conservation, PO Box 115526, Juneau, AK 99811-5526; phone: (907) 465-4190; email: dfg.dwc.publications@alaska.gov. The report may also be accessed through most libraries, via interlibrary loan from the Alaska State Library or the Alaska Resources Library and Information Services (www.arlis.org). To subscribe to email announcements regarding new technical publications from the Alaska Department of Fish and Game, Division of Wildlife Conservation please use the following link: http://list.state.ak.us/mailman/listinfo/adfgwildlifereport.

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Cover Photo: Dixon Glacier collared nanny, 2018. Photo by Dom Watts, U.S. Fish and Wildlife Service.

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Purpose of this Report

This report provides a record of survey and inventory management activities for mountain goat (*Oreamnos americanus*) in Game Management Units 7 and 15 for the 5 regulatory years 2013–2017 and plans for survey and inventory management activities in the next 5 regulatory years, 2018–2022. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY14 = 1 July 2014– 30 June 2015). This report is produced primarily to provide agency staff with data and analysis to help guide and record agency efforts but is also provided to the public to inform it of wildlife management activities. In 2016 the Alaska Department of Fish and Game's (ADF&G, the department) Division of Wildlife Conservation (DWC) launched this 5-year report to report more efficiently on trends and to describe potential changes in data collection activities over the next 5 years. It replaces the mountain goat management report of survey and inventory activities that was previously produced every 2 years.

I. RY13–RY17 Management Report

Management Area

Units 7 and 15 combined make up an area approximately 8,397 mi^2, which encompasses the Kenai Peninsula. The Kenai Peninsula has 3 major population centers including Seward, Kenai/Soldotna, and Homer, as well as numerous smaller towns interspersed throughout the Peninsula. The U.S. Fish and Wildlife Service (USFWS) is the largest land manager on the Peninsula with land throughout Units 7, 15A, 15B, and 15C.

Unit 7 is approximately 3,520 mi^2 in area and consists of the eastern portion of the Kenai Peninsula bounded by the western edge of the Kenai Mountains, the Russian River, and the Harding Ice Field on the west and the western edge of the Sargent Ice Field and eastern edge of Spencer Glacier on the east (Fig. 1). The landscape of Unit 7 consists of mountainous terrain interspersed with river and creek drainages, a few large lakes, and ice fields. Riparian areas and hillsides are densely forested until reaching the alpine zone. Approximately 78% of Unit 7 is comprised of federally managed lands; 50% U.S. Forest Service (USFS) Chugach National Forest (CNF), 22% National Park Service (NPS) Kenai Fjords National Park (KFNP), 5% USFWS Kenai National Wildlife Refuge, and 1% other federal land.

Unit 15 incorporates the western portion of the Kenai Peninsula and is broken up into 3 administrative units, 15A (1,314 mi^2), 15B (1,121 mi^2), and 15C (2,441 mi^2). Each unit is significantly different in its topography, flora, and ecological history. Unit 15A is the most northern unit separated from Unit 15B by the Kenai River and Skilak Lake. Unit 15C is the most southerly unit separated from Unit 15B by the Tustumena Glacier, Tustumena Lake, and the Kasilof River (Fig. 2).

Unit 15A is relatively flat with a multitude of small lakes leading up to the foothills of the Kenai Mountains in the east. The dominant flora is a mixed spruce/hardwood climax community. The Kenai National Wildlife Refuge is the largest landholder in Unit 15A. No significant habitat disturbance has occurred in Unit 15A since the last large wildfire that occurred in 1969 and encompassed approximately 85,306 acres.

Figure 1. Map of Unit 7 boundaries with indicators of controlled use areas (numbered circles), administrative subunits, and federal lands as found in the Alaska Hunting Regulations.

Fire I.

14C

16B

Tyonek

Pt. Possession

Chickaloon Bay

Girdwood

Hope

CHUGACH NATIONAL FOREST

LAKE CLARK NATIONAL PARK

Trading Bay

Kustatan River

Chakachatna River

COOK INLET

Seven Egg Cr.

Swanson River

Moose River

Mystery Creek

❷ 15A ❹

Nikiski

Kenai

Sterling

Kenai River

Sterling Hwy

Moose Pass

Cooper Landing

Trout Lake

Fuller Lake Trail

Dike Cr.

Juneau Creek

Alaska Railroad

Redoubt Bay

Kalgin Island

Kalifornsky Beach Road

Soldotna

15B

Killey River

Funny River

Skilak Lake

Skilak River

Russian River

Upper Russian Lake

Kenai Lake

Seward Highway

7

Redoubt Cr.

9A

Kasilof

Kasilof River

Crooked Cr.

Kalifonsky

TUSTUMENA LAKE

Bear Creek

Moose Creek

Indian Creek

Slater Cr.

KENAI NATIONAL WILDLIFE REFUGE

HARDING ICE FIELD

KENAI FJORDS NATIONAL PARK

Aialik Bay

Resurrection Bay

Day Harbor

Tuxedni Bay

Chisik I.

Clam Gulch

Sterling Highway

Ninilchik

❸

KENAI PENINSULA

15C

Anchor Point

Anchor River

East End Road

❻

Fox River

❼

Bradley Lake

KENAI MOUNTAINS

Rugged Cape

Granite I.

Cloudy Cape

Harbor Island

BLYING SOUND

CHISWELL IS.

COOK INLET

Homer

Coal Pt.

Kachemak Bay

McCarty Fjord

Nuka Bay

Ragged

GULF OF ALASKA

Dangerous Cape

Pt. Pogibshi

Seldovia

Nanwalek

Port Graham

Elizabeth Island

Chugach Bay

Windy Bay

Rocky Bay

E. Chugach

Perl

CHUGACH ISLANDS

KENNEDY ENTRANCE

Port Dick

Gore Pt.

Nuka I.

Outer I.

Nuka Pt.

Unit 15
Kenai

Region 2

0 5 10   20
Miles

N

26
23 24 25
21 20
15 13
9

Game Management Units / Special Management Areas

🟥 Closed Areas	🟩 National Parks	Military Boundary
🟪 Controlled Use Areas	🟦 National Preserves & Other Federal Lands	Military Closure
🟨 Management Areas	🟥 Unit Boundary	Tangle Lakes Archaeological District
🟪 State Refuges, Sanctuaries, & Critical Habitat Areas	🟥 Subunit Boundary	Roads
🟦 Other State Lands	City Boundary	Railroads
		Trails

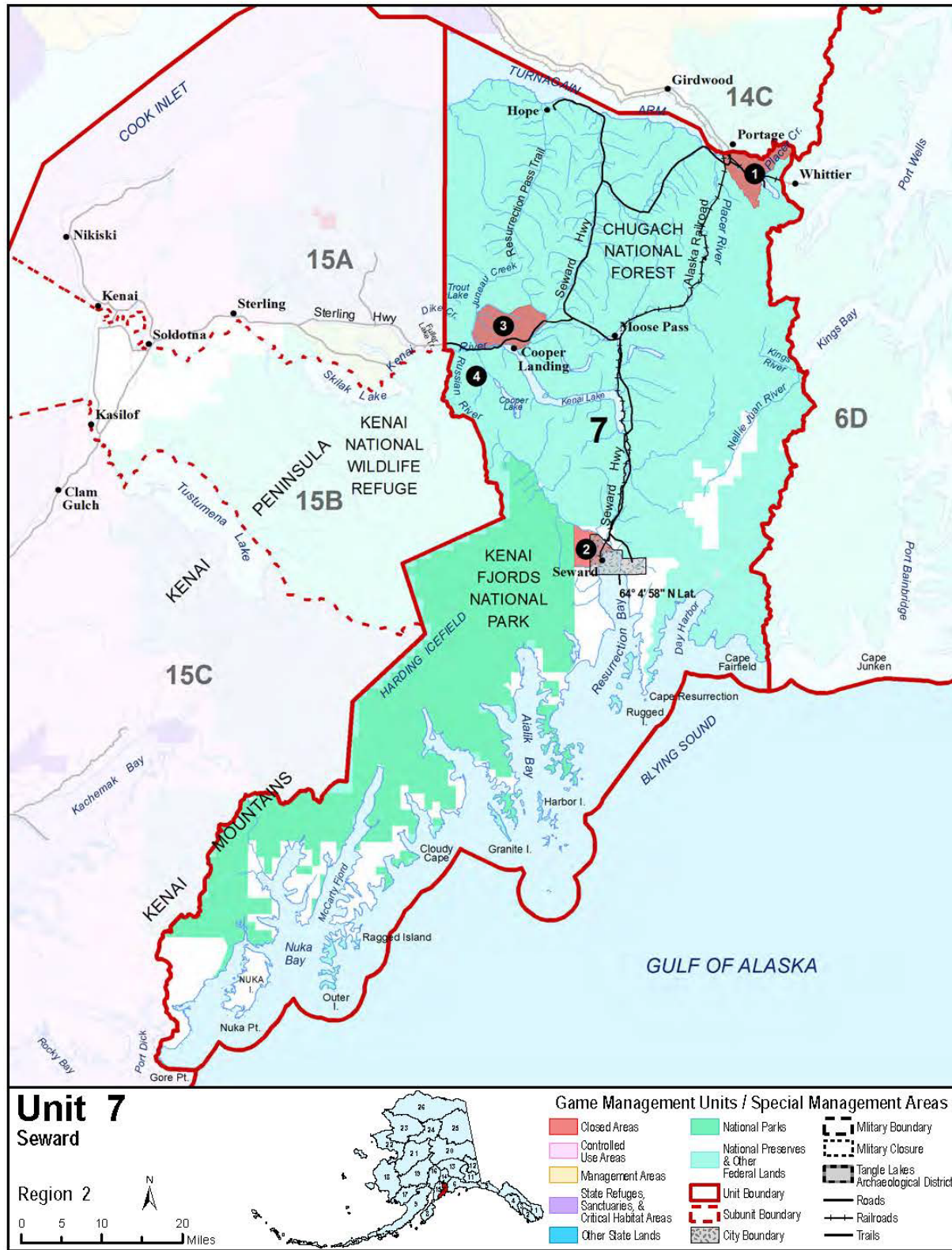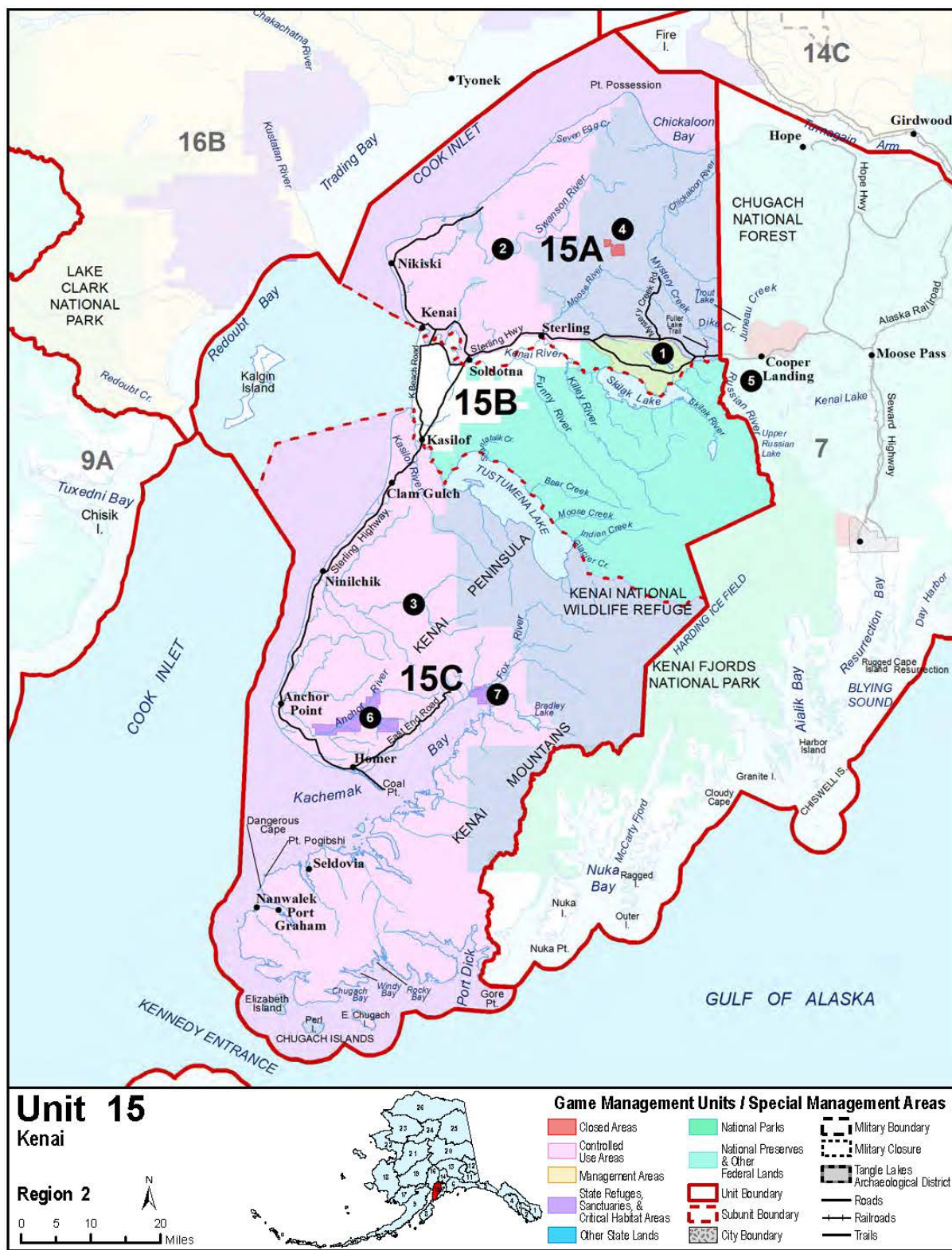U:\wc\regbook_MPS\MXD_2016\P_new.mxd 1/19/2017 skt

Figure 2. Map of Unit 15 boundaries with indicators of controlled use areas (numbered circles), administrative subunits, and federal lands as found in the Alaska Hunting Regulations.

The Kenai National Wildlife Refuge is also the largest landholder in Unit 15B. The western portion of Unit 15B is similar to Unit 15A in topography and flora. However, as you go east Unit 15B becomes more mountainous and transitions into an alpine ecosystem. Forests within Unit 15B succumbed to widespread spruce bark beetle (*Dendroctonus rufipennis*) infestations that began in the 1990s. Unlike Unit 15A, Unit 15B recently experienced significant habitat turnover in the form of the 2014 Funny River Fire that burned approximately 196,610 acres, the majority of which was in Unit 15B. This fire burned in a mosaic pattern and should provide good wildlife habitat in the near future.

Unit 15C is significantly different from both Units 15A and 15B. Refuge lands make up only a small portion of the unit in the northeast corner. The rest of Unit 15C is a mix of state, private, and municipal land ownership. The portion of Unit 15C north of Kachemak Bay and the Fox River peaks in the Caribou Hills and the Ninilchik Domes, sloping down to the lowlands. Very few small lakes are present but numerous riparian areas exist draining from the highlands. Dominant vegetation is a mosaic consisting of spruce (*Picea* spp.*)*, willow (*Salix* spp.*)*, reed grass (*Calamagrostis* sp.*, particularly in salvage logged areas)*, alder (*Alnus* spp.*)*, and some hardwood stands (*Betula* spp. *and Populus* sp.*)*. The portion of Unit 15C north of Kachemak Bay has seen fairly consistent habitat disturbance over the past 2 decades in the form of wildfires, beetle kill, logging, and human development. The portion of Unit 15C south of Kachemak Bay and the Fox River consists of a very different ecotype compared to the northern portion of Unit 15C as it is comprised primarily of coastal temperate rain forest and subalpine habitat.

Summary of Status, Trend, Management Activities, and History of Mountain Goats in Units 7 and 15

Mountain goats inhabit most areas of the Kenai Mountains. Goat densities are highest along the coastal mountains and lowest in the interior portions of the Kenai Mountains, where they coexist with Dall sheep and caribou. Nearly all the goat habitat on the Kenai Peninsula is within Kenai Fjords National Park (KFNP), the Kenai National Wildlife Refuge, Chugach National Forest, or Kachemak Bay State Park. Hunting goats within KFNP was abolished when the park was established in 1980.

Hunters that take a goat on the Kenai Peninsula are required to bring in the horns to the Homer, Soldotna, Anchorage, or Palmer ADF&G offices for measuring and sex confirmation. The results of a goat horn study comparing growth on the Kenai Peninsula, a native population, with Kodiak, a relatively new population, showed that horn growth can be used as a measure of habitat quality (McDonough et al. 2006).

Population declines occurred in the 1990s and early 2000s, which may be attributed to overharvest among other factors. In 2001, nannies with kids were protected from harvest in an effort to curb population decline with little effect. Starting in 2005 new management strategies were sought to recover mountain goat population and maintain a sustainable harvest. A harvest strategy was developed based on improved understanding of mountain goat reproduction, survival, and sustainable harvest rates garnered from studies conducted throughout mountain goat range (McDonough and Selinger 2008). By 2008 a new harvest strategy was officially instituted using a conservative harvest approach that is continued today. Details of this strategy

can be found in McDonough and Selinger (2008). Additionally, in 2009 a 5-year nonhunting penalty was instituted for any hunters that harvest a nanny. These harvest strategy changes have led to a recovery of goat numbers across the majority of the Peninsula and increased harvest opportunity.

Mountain goat numbers in some of the interior hunt units continue to remain below historic levels. The reason for the lack of recovery in these units is unknown at this time but is hypothesized to be related to high human recreational traffic in these areas, particularly during the stressful winter and early spring months.

Management Direction

EXISTING WILDLIFE MANAGEMENT PLANS

The 1976 Alaska Wildlife Management Plan (ADF&G 1976) contains several sections on Kenai mountain goat management including the West Chugach Goat Management Plan, the Portage Glacier Goat Management Plan, the Exit Glacier Goat Management Plan, the Kenai Peninsula Goat Management Plan, and the Tustumena Goat Management Plan. The West Chugach, Portage Glacier, and Exit Glacier goat management plans focused on encouraging public viewing, photography, and enjoyment of mountain goats. In addition, these plans closed some areas to hunting such as Chugach State Park, and several drainages in the Portage Glacier Area. The Kenai Peninsula Goat Management Plan focused on providing hunters the greatest opportunity to harvest goats; while the Tustumena Plan focused on providing hunters the opportunity to harvest goats under aesthetically pleasing conditions.

Recent management objectives, harvest strategies, and subsequent changes have resulted from public comment, staff recommendations, and Board of Game actions. These objectives have been reported in the division's previous species management reports. This report contains the current management plan for mountain goats in Units 7 and 15.

GOALS

The management goal for Kenai mountain goat populations is to provide optimum sustainable harvest across hunt areas.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

The Alaska Board of Game has established a positive finding of 7–10 goats for Units 7 and 15 outside the Anchorage-Matsu-Kenai Nonsubsistence Area.

Intensive Management

The Alaska Board of Game has not designated mountain goats an intensive management species in Unit 7 or 15.

MANAGEMENT OBJECTIVES

Our management objectives are to:

1. Monitor population trends.

2. Maintain a low proportion of nannies in the harvest.

3. Manage hunting permits and allowable harvest based on conservative assessments of minimum population size and population trends.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct minimum count surveys on a 3-year minimum rotational cycle for all 35 individual count areas.

Data Needs

Minimum population levels and recruitment information for each count area are needed to inform guideline harvest levels and set tag distribution numbers. The development of a sightability model from collared animals could be combined with minimum count data to develop population estimates for each count area.

Methods

Fixed-wing aerial surveys using a PA-18 or similar aircraft are conducted on a yearly basis when appropriate conditions allow, consisting of minimal snow cover, low turbulence (winds <24 km/hour or <15 mi/hour), high ceiling (>1,700 meters or >5,577 ft), and cool weather (typically <60°F). The current survey period is approximately 15 August to 15 October. Surveys are flown at speeds between approximately 110 and 130 km/hour (68 and 81 mph). Flight paths are between 500 m (1,640 ft) and 1,800 m (5,905 ft) above sea level (i.e., alpine mountain goat summer habitats). Survey routes are flown following the topography of the landscape and parallel to mountain faces beginning at tree/alder line and working up the mountain following landscape topography. Flight paths are flown from low elevations to increasing altitude/elevation in order to avert individuals at higher elevations from moving down into the tree/alder line where they are more likely to avoid detection. Flight path length varies by site-specific conditions and the number of animals observed. Two to 3 passes are flown parallel to each mountain face depending on mountain elevation and habitat (i.e., sightability). All mountain goats observed are circled from approximately 200–500 meters (656–1,640 ft) then enumerated and classified as either adults (including subadults) or kids. Interior units with high peaks are priority areas early in the survey season as early snowfalls can halt surveys.

Results and Discussion

Mountain goat surveys have been accomplished in all but 1 of the count areas (336) in recent years on the 3-year rotational schedule. Under the management strategy adopted in 2008 (McDonough and Selinger 2008), overall mountain goat numbers across the Peninsula have

increased to levels similar to pre-1990s when overharvest occurred; however, some areas remain at low levels (Table 1). Most areas that continue to have low goat numbers share common characteristics that include easy access from the road system and high winter recreational traffic. On average surveys are conducted in 15 count areas per year (Table 2).

Table 1. Kenai Peninsula, Alaska, mountain goat population trend by count area in Units 7 and 15, regulatory years 2013–2017.

Count area	Unit	Area description	Most recent count Total	Most recent count Percent kids	Current trend
331	7	Resurrection Creek West	53	19	increasing
332	7	Gilpatrick Mountain	43	26	decreasing
333[a]	7	Seattle Creek	39	13	stable
334	7	Mills Creek	34	6	decreasing
335[a]	7	Placer River West	30	23	stable
336	7	Spencer Glacier	57	7	stable
337	7	Cooper Mt.	18	11	decreasing
338	7	Crescent Lake	81	20	increasing
339	7	Grant Lake	71	23	increasing
340	7	Kings River	27	11	decreasing
341	7	Cecil Rhodes Mt	85	32	increasing
342	7	Lost Lake	73	16	stable
343	7	Victor Creek (Andy Simmons Mountain)	15	13	decreasing
344	7	Nellie Juan Lake	55	13	stable
345	7	Whidbey Bay	153	19	stable
346	7	Resurrection Peninsula	344	21	increasing
347	7	West Seward	127	20	decreasing
348	15C	Aialik Peninsula	–	–	unknown
349	15C	Holgate Glacier	–	–	unknown
350	15C	Harris Bay	–	–	unknown
351	15C	Petrof Lake	75	24	increasing
352	7,15C	Brown Mt.	174	18	increasing
353[a]	15B	Surprise Creek	2	0	stable
354	15B	Skilak Glacier	50	8	increasing
355[a]	15B	Twin Lakes	35	11	stable
356	15B	Indian Creek	92	15	stable
357	15C	Tustumena Glacier	60	17	stable
358	15C	Fox River	78	19	stable
359	15C	Bradley Lake	112	18	increasing
360	15C	Dixon Glacier	273	21	increasing
361	15C	Halibut Cove	127	23	stable
362	15C	Sadie Cove	185	14	increasing
363	15C	Port Dick	239	17	increasing
364	15C	Seldovia	151	21	increasing
365	15C	English Bay	256	21	decreasing

[a] Stable at low numbers.

Table 2. Mountain goat survey counts for the Kenai Peninsula, Alaska, Units 7 and 15, 2013–2017.

Survey year	Area	Adults	Kids	Total goats
2017	331	43	10	53
	332[a]	32	11	43
	333	34	5	39
	334[a]	3	1	4
	335[a]	2	0	2
	338	65	16	81
	339	55	16	71
	340	24	3	27
	341	58	27	85
	342	61	12	73
	344	48	7	55
	351	57	18	75
	352	142	32	174
	357	50	10	60
	364	120	31	151
2016	334	32	2	34
	335	23	7	30
	337	16	2	18
	338	52	11	63
	339	31	11	42
	342	61	10	71
	343	13	2	15
	353	2	0	2
	354	46	4	50
	355	31	4	35
	356	78	14	92
	358	63	15	78
	360	216	57	273
	361	98	29	127
	362	88	14	102
	362	159	26	185
	359	92	20	112
	365	203	53	256
2015	332	21	6	27
	337	34	9	43
	338	48	21	69
	339	27	11	38
	342	45	13	58
	345	124	29	153
	346	271	73	344

-continued-

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Survey year	Area	Adults	Kids	Total goats
2015	347	130	33	163
	352	104	15	119
	353	4	2	6
	356	25	12	37
	357	24	10	34
	363	198	41	239
	364	123	22	145
2014	331	29	9	38
	332	71	10	81
	333	48	7	55
	336	53	4	57
	337	23	6	29
	340	22	11	33
	341	53	14	67
	344	36	10	46
	351	14	3	17
	353	4	1	5
	355	4	2	6
	356	40	11	51
	357	46	12	58
2013	334	32	9	41
	335	27	3	30
	339	18	7	25
	343	6	0	6
	346	125	30	155
	354	20	6	26
	355	1	0	1
	355	35	9	44
	356	38	10	48
	356	74	26	100
	358	14	2	16
	358	58	16	74
	359	58	12	70
	360	118	46	164
	361	121	19	140
	362	114	31	145
	365	244	58	302

[a] Partial survey.

Recommendations for Activity 1.1

Modification of current aerial surveys should occur to include future data collection for the development of a Kenai Peninsula sightability correction factor. Data to be collected would include weather, animal behavior, habitat type, and group size. A subsample of animals should be fitted with VHF collars so that "marked animals" can be observed during surveys and data collected on individuals seen or unseen. Methods for this work should follow those developed by White et al. (2016).

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor harvest through permit reports.

Data Needs

Harvest must be assessed to avoid overharvest.

Methods

Harvest data are collected through permit reports and entered into ADF&G's Wildlife Information Network (WinfoNet) database. Harvest data were summarized by regulatory year.

During the required sealing process, samples are collected, sex of the harvested animal is verified, and horn information is recorded.

Season and Bag Limit

Hunting seasons and bag limits for RY13–RY17 are listed in Table 3. The most current seasons and bag limits may be found online at:
http://www.adfg.alaska.gov/index.cfm?adfg=wildliferegulations.hunting.

Table 3. Hunting seasons and bag limits for Kenai mountain goats from regulatory years 2013–2017.

Hunt area	Hunt type	Season	Bag limit
DG331–DG363	Draw	10 August–15 October	1 goat
RG364, RG365	Registration	10 August–15 October	1 goat
RG331–RG365[a]	Registration	1–14 November[b]	1 goat

[a] Open only if additional harvest opportunity exists after the 10 August–15 October season.
[b] The season dates changed during this reporting period: the season was 1–30 Nov in regulatory years 2013 and 2014, 1–7 Nov in 2015, and 1–14 Nov in 2016 and 2017.

Results and Discussion

Harvest by Hunters

Harvest is a direct reflection of the number of permits issued each year for a hunt area (Table 4). As populations have recovered from declines that occurred in the 1990s and early 2000s, overall permit numbers have slowly increased (Table 5). Adjustments to permit numbers, however, are made each year by hunt unit as directed by the management strategy.

Table 4. Mountain goat harvest data for early and late season hunts on the Kenai Peninsula, Alaska, Units 7 and 15, regulatory years 2013–2017.

Area	Regulatory year	Early season							Late season					
		Billy	Nanny	Unknown	Total	Permits issued	Number hunted	Percent success	Billy	Nanny	Total	Permits issued	Number hunted	Percent success
331	2013	2	1	0	3	5	3	100	–	–	–	0	–	–
	2014	0	1	0	1	5	2	50	–	–	–	0	–	–
	2015	1	0	0	1	5	3	33	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–
332	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	3	2	0	5	10	8	63	–	–	–	0	–	–
	2017	2	0	0	2	5	5	40	–	–	–	0	–	–
333	2013	0	0	0	0	2	2	0	–	–	–	0	–	–
	2014	0	1	0	1	2	2	50	–	–	–	0	–	–
	2015	0	0	0	0	2	1	0	–	–	–	0	–	–
	2016	2	0	0	2	4	3	67	–	–	–	0	–	–
	2017	0	0	0	3	4	0	0	–	–	–	0	–	–
334	2013	3	2	0	5	15	9	56	–	–	–	0	–	–
	2014	0	1	0	1	4	3	33	–	–	–	0	–	–
	2015	0	0	0	0	4	2	0	–	–	–	0	–	–
	2016	0	1	0	1	4	3	33	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–
335	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–

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Area	Regulatory year	Early season							Late season					
		Billy	Nanny	Unknown	Total	Permits issued	Number hunted	Percent success	Billy	Nanny	Total	Permits issued	Number hunted	Percent success
336	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	2	0	0	2	12	7	29	–	–	–	0	–	–
	2017	1	0	0	1	10	7	14	–	–	–	0	–	–
337	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
338	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	1	1	0	2	10	8	25	–	–	–	0	–	–
	2015	3	0	0	3	10	8	38	–	–	–	0	–	–
	2016	2	0	0	2	10	6	33	–	–	–	0	–	–
	2017	2	1	0	3	10	7	43	–	–	–	0	–	–
339	2013	0	0	0	0	2	2	0	–	–	–	0	–	–
	2014	0	0	0	0	4	3	0	–	–	–	0	–	–
	2015	3	0	0	3	4	3	100	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–
340	2013	0	0	0	0	20	5	0	–	–	–	0	–	–
	2014	0	0	0	0	4	0	–	–	–	–	0	–	–
	2015	0	0	0	0	4	0	–	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–

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Area	Regulatory year	Early season Billy	Early season Nanny	Early season Unknown	Early season Total	Early season Permits issued	Early season Number hunted	Early season Percent success	Late season Billy	Late season Nanny	Late season Total	Late season Permits issued	Late season Number hunted	Late season Percent success
341	2013	0	3	0	3	4	4	75	–	–	–	0	–	–
	2014	2	1	0	3	6	5	60	–	–	–	0	–	–
	2015	2	0	0	2	6	3	67	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	0	1	0	1	4	2	50	–	–	–	0	–	–
342	2013	4	0	0	4	16	12	33	–	–	–	0	–	–
	2014	4	3	0	7	15	10	78	–	–	–	0	–	–
	2015	2	2	0	4	15	9	44	–	–	–	0	–	–
	2016	3	1	0	4	12	9	44	–	–	–	0	–	–
	2017	3	0	0	3	5	4	75	–	–	–	0	–	–
343	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–
344	2013	1	0	0	1	10	3	33	–	–	–	0	–	–
	2014	0	0	0	0	15	1	0	–	–	–	0	–	–
	2015	1	0	0	1	15	5	20	–	–	–	0	–	–
	2016	1	0	0	1	10	6	17	–	–	–	0	–	–
	2017	1	0	0	1	10	6	17	–	–	–	0	–	–
345	2013	0	0	0	0	35	6	0	0	0	0	16	2	0
	2014	1	2	0	3	35	7	43	–	–	–	0	–	–
	2015	5	1	0	6	35	10	60	–	–	–	0	–	–
	2016	7	0	0	7	35	15	47	–	–	–	0	–	–
	2017	7	0	1	8	30	16	50	–	–	–	0	–	–

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Table 4. Page 4 of 7.

Area	Regulatory year	Early season					Number hunted	Percent success	Late season				Number hunted	Percent success
		Billy	Nanny	Unknown	Total	Permits issued			Billy	Nanny	Total	Permits issued		
346	2013	1	2	1	4	30	18	22	–	–	–	0	–	–
	2014	5	1	0	6	15	12	50	–	–	–	0	–	–
	2015	3	0	0	3	15	6	50	–	–	–	0	–	–
	2016	5	2	0	7	35	17	41	7	1	8	50	13	62
	2017	7	1	2	10	45	25	40	–	–	–	0	–	–
347	2013	1	4	0	5	20	10	50	–	–	–	0	–	–
	2014	3	2	0	5	20	12	42	–	–	–	0	–	–
	2015	5	1	0	6	20	12	50	–	–	–	0	–	–
	2016	2	2	0	4	20	9	44	–	–	–	0	–	–
	2017	1	1	0	2	20	11	18	4	0	4	16	0	–
351	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–
352	2013	2	1	0	3	30	7	43	–	–	–	0	–	–
	2014	0	0	0	0	25	3	0	0	0	0	5	0	–
	2015	3	1	0	4	25	6	67	–	–	–	0	–	–
	2016	4	0	0	4	25	5	80	–	–	–	0	–	–
	2017	3	1	1	5	25	10	50	–	–	–	0	–	–
353	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–

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Table 4. Page 5 of 7.

Area	Regulatory year	Billy	Nanny	Unknown	Total	Permits issued	Number hunted	Percent success	Billy	Nanny	Total	Permits issued	Number hunted	Percent success
				Early season							Late season			
354	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–
355	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	–	–	–	–	0	–	–	–	–	–	0	–	–
	2017	–	–	–	–	0	–	–	–	–	–	0	–	–
356	2013	–	–	–	–	0	–	–	–	–	–	0	–	–
	2014	2	0	0	2	4	2	100	–	–	–	0	–	–
	2015	1	0	0	1	4	3	33	–	–	–	0	–	–
	2016	3	0	0	3	15	7	43	–	–	–	0	–	–
	2017	6	0	0	6	15	9	67	–	–	–	0	–	–
357	2013	0	0	0	0	4	1	0	–	–	–	0	–	–
	2014	0	0	0	0	8	5	0	–	–	–	0	–	–
	2015	2	0	0	2	8	4	50	–	–	–	0	–	–
	2016	0	0	0	0	9	4	0	–	–	–	0	–	–
	2017	1	0	0	1	8	3	33	–	–	–	0	–	–
358	2013	0	0	0	0	2	1	0	–	–	–	0	–	–
	2014	–	–	–	–	0	–	–	–	–	–	0	–	–
	2015	–	–	–	–	0	–	–	–	–	–	0	–	–
	2016	2	0	0	2	12	4	50	–	–	–	0	–	–
	2017	5	1	0	6	12	6	100	–	–	–	0	–	–

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Area	Regulatory year	Early season							Late season					
		Billy	Nanny	Unknown	Total	Permits issued	Number hunted	Percent success	Billy	Nanny	Total	Permits issued	Number hunted	Percent success
359	2013	0	1	0	1	5	4	25	–	–	–	0	–	–
	2014	0	0	0	0	5	2	0	–	–	–	0	–	–
	2015	1	1	0	2	5	3	67	–	–	–	0	–	–
	2016	1	0	0	1	8	3	33	0	0	0	14	3	0
	2017	2	0	0	2	24	8	38	1	0	1	16	1	0
360	2013	7	0	1	8	25	15	53	–	–	–	0	–	–
	2014	2	1	0	3	25	9	33	1	0	1	12	6	17
	2015	7	1	0	8	25	12	67	–	–	–	0	–	–
	2016	1	3	0	4	25	12	33	6	1	7	28	11	64
	2017	6	0	0	6	36	16	38	–	–	–	0	–	–
361	2013	0	1	0	1	15	7	14	5	0	5	15	6	100
	2014	0	1	0	1	20	7	14	1	0	1	15	4	25
	2015	2	0	0	2	20	12	17	2	0	2	15	7	29
	2016	1	2	0	3	25	12	25	–	–	–	0	–	–
	2017	2	1	0	3	25	9	33	–	–	–	0	–	–
362	2013	5	1	0	6	15	10	60	–	–	–	0	–	–
	2014	5	1	0	6	18	11	55	–	–	–	0	–	–
	2015	5	1	1	7	18	12	58	–	–	–	0	–	–
	2016	3	0	0	3	15	6	50	–	–	–	0	–	–
	2017	2	1	0	3	18	10	30	3	2	5	9	6	83
363	2013	2	4	0	6	30	12	55	–	–	–	0	–	–
	2014	3	2	0	5	32	9	56	–	–	0	5	2	0
	2015	6	0	1	7	32	10	70	–	–	–	0	–	–
	2016	6	1	0	7	32	11	64	–	–	0	4	1	0
	2017	5	2	0	7	36	12	58	–	–	–	0	–	–

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| | | Early season | | | | | | | Late season | | | | | |
Area	Regulatory year	Billy	Nanny	Unknown	Total	Permits issued	Number hunted	Percent success	Billy	Nanny	Total	Permits issued	Number hunted	Percent success
364	2013	4	0	0	4	15	11	36	–	–	–	0	–	–
	2014	2	0	0	2	15	10	20	–	–	–	0	–	–
	2015	2	0	0	2	15	10	20	1	0	1	11	6	17
	2016	3	0	0	3	15	5	60	0	0	0	16	7	0
	2017	2	0	0	2	20	14	14	0	0	0	24	4	0
365	2013	8	0	0	8	24	19	42	–	–	–	0	–	–
	2014	10	2	0	12	24	20	60	–	–	–	0	–	–
	2015	9	1	0	10	30	19	53	–	–	–	0	–	–
	2016	11	1	0	12	30	19	63	–	–	–	0	–	–
	2017	7	2	0	9	30	18	50	–	–	–	0	–	–

Note: Late season registration hunts were opened only if harvest opportunity remained. An en dash indicates no data was collected as no permits were issued.

Table 5. Harvest totals for all drawing and registration permits for mountain goats on the Kenai Peninsula, Alaska, Units 7 and 15, regulatory years 2013–2017.

| | | | | Harvest | | | | |
Permit type	Regulatory year	Permits issued	No. Hunted	Males	Females	Unknown	Total	Percent success
Early Season	2013	324	161	40	20	2	62	39
	2014	308	139	40	20	0	60	43
	2015	317	148	63	9	1	73	49
	2016	363	171	62	15	0	77	45
	2017	392	201	65	12	4	82	41
Late Season	2013	31	7	5	0	0	5	71
	2014	37	12	2	0	0	2	17
	2015	26	10	3	0	0	3	30
	2016	112	22	13	2	0	15	68
	2017	65	11	8	2	0	10	91

Hunter Residency and Success

The most successful goat hunters are residents of the unit in which they hunted (local resident of Unit 7 or 15) with an average success rate of 81% from 2013 to 2017 (Table 6). Success by nonlocal residents (Alaskans residing outside of the unit) was much lower, at an average of 39%. Nonresident hunters on average represented 16% of the harvest and had a success rate of 70%, which is likely a reflection of the guide requirement for this species. The majority of nonresident harvest occurs in RG365, where a local guide contracts with native corporation land holders for sole guide access. This area has one of the most robust populations of goats on the Kenai Peninsula; and the terrain is mild compared to most other hunt areas.

Table 6. Hunter success by residency for Kenai Peninsula, Alaska, mountain goat harvest, regulatory years 2013–2017.

| Regulatory year | Successful | | | Unsuccessful | | | | Total hunters |
	Unit 7 or 15 resident	Nonlocal resident[a]	Nonresident	Unit 7 or 15 resident	Nonlocal resident[a]	Nonresident	Unspecified residency	
2013	15	44	8	26	74	5	0	172
2014	1	49	12	0	92	2	0	156
2015	2	61	13	0	79	10	2	167
2016	1	77	14	0	118	2	0	212
2017	2	73	16	1	130	11	0	233

[a] Nonlocal resident refers to an Alaska resident that does not reside in Units 7 or 15.

Harvest Chronology

Permits are issued in a manner to consistently encourage harvest to occur during the early season. The majority of mountain goat harvest occurs during September (Tables 4 and 7). The late season hunt directly overlaps the rut period for the Kenai Peninsula, which can impact breeding success and meat quality. In addition, hunter access is often limited later in the year by weather. Hair length on hides does appear to motivate some hunters to harvest later in the season.

Table 7. Harvest chronology as percent of harvest by month for mountain goat drawing permits on the Kenai Peninsula, Alaska, Units 7 and 15, regulatory years (RY) 2013–2017.

| Regulatory year | Percent harvest by month | | | |
	August	September	October	Unspecified
2013	14	54	32	0
2014	28	39	28	4
2015	29	45	24	2
2016	21	35	37	6
2017	28	41	25	6

Transport Methods

Boat was the most common mode of transport during RY13–RY17 for Kenai Peninsula goat hunters with an average of 43% hunters using this method. Airplanes were the second most common mode of transportation with a RY13–RY17 average of 20% hunters. Highway vehicles

were the third most common mode of transportation during RY13–RY17 with an average of 18% hunters (Table 8).

Table 8. Transport method reported used by Kenai Peninsula, Alaska, mountain goat hunters, regulatory years 2013–2017.

Regulatory year	Other or unknown	ATV or ORV[a]	Airplane	Boat	Foot	Highway vehicle	Horse	Total
2013	22	8	40	64	6	30	2	172
2014	5	13	25	72	7	33	1	156
2015	16	6	43	66	7	28	1	167
2016	11	8	33	102	8	48	2	212
2017	21	15	51	104	7	33	2	233

[a] ATV refers to all-terrain vehicle; ORV refers to off-road vehicle.

Other Mortality

No other common sources of anthropogenic mortality are known at this time. The highest known instances of natural mortality occurred during the winter period (White et al. 2011), which makes limiting stress during this period vital to sustainable mountain goat management.

Alaska Board of Game Actions and Emergency Orders

No Board of Game actions or emergency orders occurred during this management period.

Recommendations for Activity 2.1

Continue to monitor harvest through hunt permit reports.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. No habitat enhancement work is currently being conducted for mountain goat management in Units 7 and 15.

Data Needs

The development of a good resource selection function (RSF) model is needed to continue advancing mountain goat management on the Kenai Peninsula. An RSF model would help land managers designate no-disturbance areas for mountain goats from air traffic and winter recreation. A working agreement was established with USFWS, CNF, and KFNP to address this data need and develop a sightability model to develop future population estimates.

Methods

Sixteen mountain goats (11 in Indian Creek survey area 356, and 5 in Grant Lake survey area 339) were captured and fitted with iridium GPS radio collars containing remote release mechanism and VHF radio collars (Telonics, Inc., Mesa, AZ). Captures were conducted during July 11th to 14th to avoid kidding and minimize conflict with hunters. Standard helicopter darting techniques were used, and animals were immobilized by injecting 2.4–3.0 mg of carfentanil

citrate or 6.0–7.0 mg of thiafentanil oxalate fired from a Palmer dart gun (Cap-Chur, Douglasville, GA; Taylor 2000, White and Barten 2010). Captures were conducted by 1 USFWS biologist, 1 ADF&G biologist from Region I, and an ADF&G veterinarian as thiafentanil was being tested for use in mountain goats. During handling, animals were examined and monitored following standard veterinary procedures (Taylor 2000). Routine biological samples and morphological data were collected. After handling, effects of the immobilizing agent were reversed using the appropriate antagonist.

Mountain goat GPS location data is archived with USFWS. GPS locations will be post processed and screened for "impossible" data 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). Average daily positions will be calculated and plotted using ArcGIS, and seasonal home ranges will be delineated using fixed-kernel estimation calculated using the least-squares cross validation (LCSV) technique to parameterize the smoothing function (Seaman and Powell 1996, Seaman et al. 1999). Movements and home range areas will be calculated using surface area rather than planimetric area functions (Jenness 2004), which would enable more precise estimates of space use parameters (White 2006). Home range size and movement will be calculated for all 4 seasons and yearly for comparison between sexes and management unit type by analysis of variance (ANOVA) and t-tests. Activity switch data will be analyzed to determine activity output during different seasons with switch transitions correlating positively to animal activity (White 2006). Seasonal- and sex-specific variation in home range size and site fidelity will be analyzed using the R software adehabitat package. Critical mountain goat summer and winter habitat will be delineated using RSF modeling methods described in White and Gregovich (2017, 2018). Resights of collared animals will be conducted during minimum count surveys.

Results and Discussion

Region II supervisors decided to limit Kenai staff funding and participation for this work. No additional funding was allocated for collar deployment and no additional funding was allocated for collar resight work. Resight work for collars that were deployed will be limited to that which can be conducted during the normal minimum count rotational cycle or using USFWS pilots and planes.

Recommendations for Activity 3.1

This work should be continued and an RSF and sightability model should be developed for Kenai Peninsula mountain goats.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

No nonregulatory management problems or needs have been identified at this time.

<u>Data Recording and Archiving</u>

- Permit reports are entered into the WinfoNet database at
  http://winfonet.alaska.gov/index.cfm.

- Electronic records of the survey results, track files, and animal locations are stored on the
  Homer office shared drive (O):DWC/ADF&G-Homer Files/Species Data/

<u>Agreements</u>

A data sharing agreement was established among the USFWS, CNF, KFNP, and ADF&G to collect data from radiocollared animals and develop a sightability and RSF model. This agreement expires 1 January 2024. It may be extended by written amendment. A copy of this agreement can be found on the Homer shared drive O:\DWC\ADF&G-Homer Files\Research\goats\Peninsula wide goat survey\data sharing agreement.

<u>Permitting</u>

Although no specific permits exist for mountain goats in Units 7 and 15, all capture procedures were approved by the State of Alaska Animal Care and Use Committee under Region I's mountain goat institutional animal care and use committee (IACUC).

Conclusions and Management Recommendations

Goat populations are highly vulnerable to overharvest compared to other ungulates. The harvest of even a few females from small populations can be unsustainable (Hamel et al. 2006). The taking of female goats during the drawing season often prevents registration hunts from opening and the harvest of females during both seasons often decreases future permit allocations. For many years, ADF&G has attempted to educate hunters on how to distinguish males from females and the importance of limiting female harvest. These education efforts appear to be beginning to pay off in decreased nanny harvest. Continued education will be required to maintain this trend.

Even with increased harvest restrictions that have proven effective at increasing goat numbers in most harvest areas, populations continue to decline in others. Two factors that may be contributing to these declines include consistent helicopter traffic and increased winter recreation. Goats have been shown to be susceptible to disturbance by helicopters (Côte′ et al. 2013), and as with many species, winter is the most stressful period for goats with the highest known instance of mortality during this period (White et al. 2011). Future research should focus on efforts to obtain seasonal movement data for the development of a resource selection function (RSF) model and sightability correction factors for survey flights. A well-designed RSF model could be used to delineate no-disturbance areas during critical time periods throughout the year such as winter and kidding.

II. Project Review and RY18–RY22 Plan

Review of Management Direction

MANAGEMENT DIRECTION

The existing management direction and goals ensure that mountain goats will persist as part of the natural ecosystem while allowing for significant hunting opportunity. Kenai mountain goat management, however, could benefit by continuing the work started in 2017.

GOALS

The management goal for Kenai Peninsula mountain goat populations is to provide optimum sustainable harvest across hunt areas.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

No change is expected.

Intensive Management

No change is expected.

MANAGEMENT OBJECTIVES

No change is needed in the current management objectives to:

1. Monitor population trends

2. Maintain a low proportion of nannies in the harvest

3. Manage hunting permits and allowable harvest based on conservative assessments of minimum population size and population trends.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct minimum count surveys on a 3-year minimum rotational cycle for all 35 individual count areas and collect data for the development of a sightability correction factor.

Data Needs

Minimum population levels and recruitment information for each count area are needed to inform guideline harvest levels and set tag distribution numbers. A sightability correction factor

could be used to better estimate population levels and more precise sustainable harvestable levels.

Methods

Fixed-wing aerial surveys using a PA-18 or similar aircraft are conducted on a yearly basis when appropriate conditions allow, consisting of minimal snow cover, low turbulence (winds <24km/hour or <15 mi/hour), high ceiling (>1,700 meters or >1,859 yards), and cool weather (typically <60°F). The current survey period is approximately 15 August to 15 October. Surveys are flown at speeds between 110–130 km/hour (68–81 mph) along flight paths between 500 m (547 yards) and 1,800 m (1,969 yards) above sea level (i.e., alpine mountain goat summer habitats) following a single geographic contour. Survey routes are flown following the topography of the landscape and parallel to mountain faces beginning at the tree/alder line and working up the mountain following landscape topography. Flight paths are flown from low elevations to increasing altitude/elevation in order to avert individuals at higher elevations from moving down into the tree/alder line where they are more likely to avoid detection. Flight path length varies by site-specific conditions and the number of animals observed. Two to 3 passes are flown parallel to each mountain face depending on mountain elevation and habitat (i.e., sightability). All mountain goats observed are circled from a distance of approximately 200–500 meters (219–547 yards), enumerated, and classified as either adults (including sub-adults) or kids. During RY18–RY23 surveys, observers will now collect additional information including group size, habitat type, terrain type, and climatic conditions following White et al. (2016), which will be used to develop sightability models. All collared animals are noted, tracked, and verified for detection using radio telemetry and 10-14 power image-stabilizing binoculars in areas where collars have been deployed. At the end of each minimum count, any collared animal not seen during the survey will be accounted for.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor harvest through permit reports.

Data Needs

No change from RY13–RY17 reporting period.

Methods

No change from RY13–RY17 reporting period.

3. Habitat Assessment-Enhancement

ACTIVITY 3.1. Develop a resource selection function (RSF) model for mountain goat habitat use.

Data Needs

The development of a well-designed RSF model is needed to continue advancing mountain goat management on the Kenai Peninsula. An RSF model would help land managers designate no-disturbance areas for mountain goats from air traffic and winter recreation.

Methods

Mountain goats could be captured and fitted with iridium GPS radio collars containing remote release mechanisms (Telonics, Inc., Mesa, AZ). Captures could be conducted during July to avoid kidding and minimize conflict with hunters. Standard helicopter darting techniques would be used, and animals would be immobilized by injecting 6.0–7.0 mg of thiafentanil oxalate (White et al. 2021). Drugs would be administered via projectile syringe fired from a Palmer dart gun (Cap-Chur, Douglasville, GA). During handling, animals would be examined and monitored following standard veterinary procedures (Taylor 2000). Routine biological samples and morphological data would be collected. After handling, effects of the immobilizing agent would be reversed using 35–40 mg naltrexone/1 mg thiafentanil.

Mountain goat GPS location data would be archived in a centralized ADF&G database. GPS locations would be post processed and screened for "impossible" data 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). Average daily positions would be calculated and plotted using ArcGIS, and seasonal home ranges would be delineated using fixed-kernel estimation calculated using the least-squares cross validation (LSCV) technique to parameterize the smoothing function (Seaman and Powell 1996, Seaman et al. 1999). Movements and home range areas would be calculated using surface area rather than planimetric area functions (Jenness 2004), which would enable more precise estimates of space use parameters (White 2006). Home range size and movement would be calculated for all 4 seasons and yearly for comparison between sexes and management unit type by ANOVA and *t*-tests. Activity switch data would be analyzed to determine activity output during different seasons with switch transitions correlating positively to animal activity (White 2006). Seasonal- and sex-specific variation in home range size and site fidelity would be analyzed using the R software adehabitat package. Critical mountain goat summer and winter habitat would be delineated using RSF modeling methods described in White and Gregovich (2017, 2018).

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

No change from RY13–RY17 reporting period.

Agreements

No change from RY13–RY17 reporting period.

Permitting

If capture work were pursued, the appropriate permits would be obtained.

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