Species Management Report and Plan ADF&G/DWC/SMR&P–2025–49

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

Report Period 1 July 2018–30 June 2023, and

Plan Period 1 July 2023–30 June 2028

Jason Herreman

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Alaska Department of Fish and Game Division of Wildlife Conservation

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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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Purpose of this Report

This report provides a record of survey and inventory management activities for mountain goats (*Oreamnos americanus*) in Game Management Units 7 and 15 for the 5 regulatory years 2018–2022 and plans for survey and inventory management activities in the next 5 regulatory years, 2023–2027. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY18 = 1 July 2018–30 June 2019). 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. RY18–RY22 Management Report

Management Area

Units 7 and 15, combined, cover an area of approximately 8,397 mi^2 and encompass the Kenai Peninsula. This peninsula has 3 major population centers, including Seward, Kenai–Soldotna, and Homer, as well as numerous smaller towns interspersed throughout. The U.S. Fish and Wildlife Service (USFWS) is the largest land manager on the peninsula, overseeing land across Units 7, 15A, 15B, and 15C. Mountain goat habitat is split into 35 management units, 3 of which are located inside Kenai Fjords National Park (KFNP; Fig. 1).

Unit 7 is approximately 3,520 mi^2 in area and encompasses the eastern portion of the Kenai Peninsula. 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 they reach the alpine zone. Approximately 78% of Unit 7 consists of federally managed lands: 50% U.S. Forest Service Chugach National Forest (CNF), 22% National Park Service KFNP, 5% USFWS Kenai National Wildlife Refuge, and 1% other federal land.

Unit 15 comprises the western portion of the Kenai Peninsula and is divided into 3 administrative units: 15A (1,314 mi^2), 15B (1,121 mi^2), and 15C (2,441 mi^2). Each unit has distinct topography, flora, and ecological history. Unit 15A, the northernmost unit, is separated from Unit 15B by the Kenai River and Skilak Lake; Unit 15C, the southernmost unit, is separated from Unit 15B by Tustumena Glacier, Tustumena Lake, and Kasilof River.

Unit 15A is relatively flat with a multitude of small lakes leading eastward up to the foothills of the Kenai Mountains. The dominant flora consists of mixed spruce and hardwood forest. The Kenai National Wildlife Refuge is the largest landholder in Unit 15A. Between 1969 and 2019, no significant habitat disturbances occurred in Unit 15A. In 1969, 85,306 acres burned; this significantly affected moose habitat but had little to no impact on mountain goat habitat. The next major disturbance, in 2019, was the Swan Lake fire, which burned 167,182 acres but had minimal impact on alpine areas and mountain goat habitat.

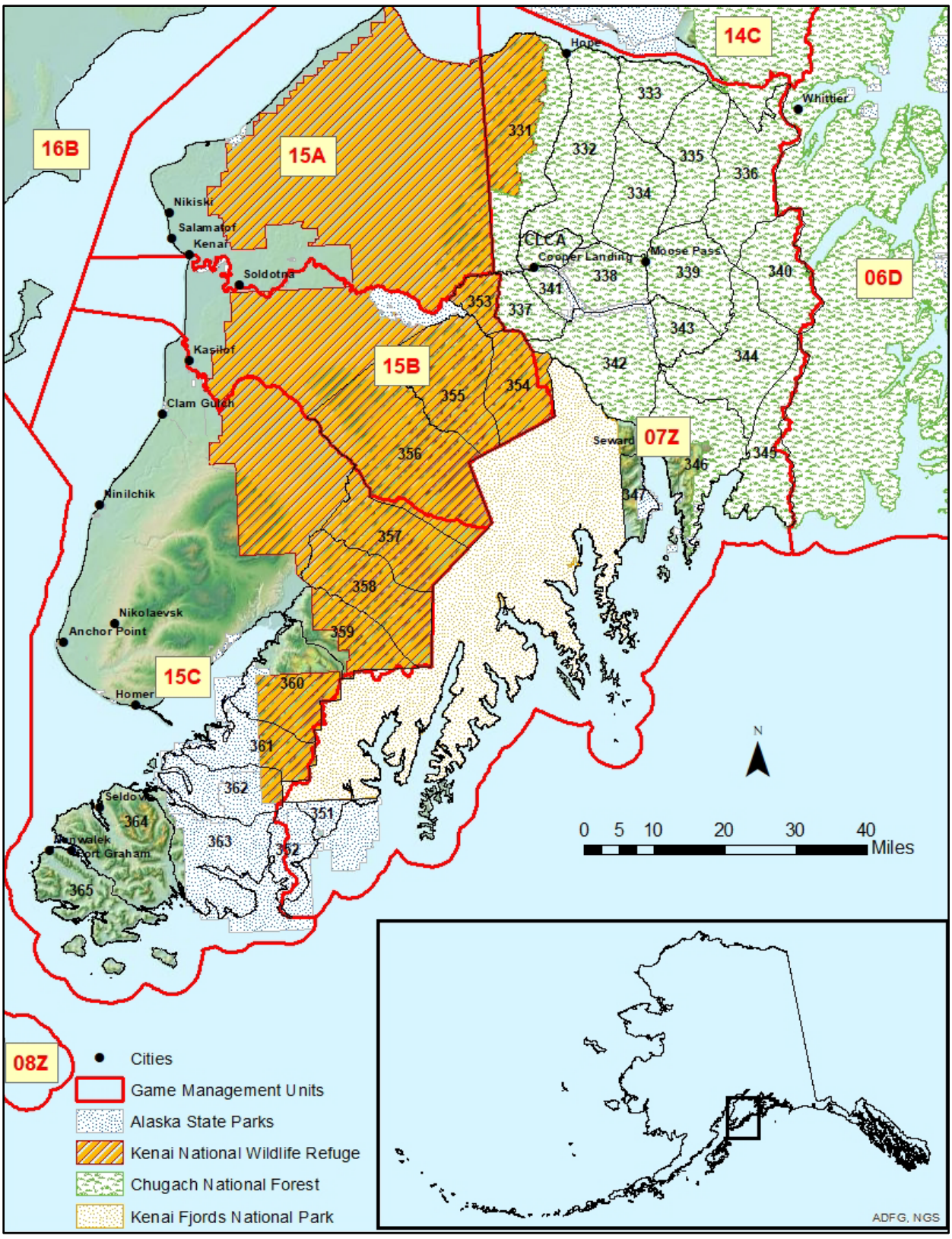

Figure 1. Map of mountain goat management areas (numbered) and landownership, Kenai Peninsula, Alaska, 2018–2022.

The Kenai National Wildlife Refuge is the largest landholder in Unit 15B. The western portion of Unit 15B shares similarities with Unit 15A in terms of topography and flora; however, further east, Unit 15B becomes more mountainous and transitions into an alpine ecosystem and mountain goat habitat. Forests within Unit 15B have succumbed to widespread infestations of spruce bark beetle (*Dendroctonus rufipennis*), which began in the 1990s. Additionally, Unit 15B recently experienced significant habitat turnover due to the 2014 Funny River Fire, which burned approximately 196,610 acres (the majority of which were in Unit 15B). This fire burned in a mosaic pattern and is recovering into suitable wildlife habitat. It did not, however, burn into the alpine areas that contain mountain goat habitat in Unit 15B.

Unit 15C is significantly different from Units 15A and 15B. Refuge lands are 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 forms a mosaic 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 experienced 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 landscape compared to the northern portion of Unit 15C, as it primarily consists of coastal temperate rain forest and subalpine habitat. Most mountain goat habitat in Unit 15C is found in this area.

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 (*Ovis dalli*) and caribou (*Rangifer tarandus*). Nearly all the goat habitat on the Kenai Peninsula falls within KFNP, CNF, the Kenai National Wildlife Refuge, or Kachemak Bay State Park. Hunting goats in KFNP was abolished when the park was established in 1980. Hunters who take a goat on the Kenai Peninsula are required to bring its horns to the Homer, Soldotna, Anchorage, or Palmer ADF&G office for measurement and sex confirmation.

Population declines occurred during 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. Starting in 2005, new management strategies were sought to recover the mountain goat population and maintain a sustainable harvest. A harvest strategy was developed based on studies conducted throughout mountain goat range, which improved understanding of mountain goat reproduction, survival, and sustainable harvest rates (McDonough and Selinger 2008). By 2008, a new harvest strategy was officially instituted using a conservative harvest approach, which will continue through RY28. Details of this strategy can be found in McDonough and Selinger (2008). Additionally, in 2009, a 5-year no-hunting penalty was instituted for any hunters who harvest a nanny. These changes in harvest strategy have led to

a recovery of goat numbers across most of the peninsula, resulting in increased harvest opportunity.

Mountain goat numbers in the northeast corner of the Kenai Peninsula (management areas 333, 335, 336, 339, and 340; Fig. 1) remain below historic levels. The reason for the lack of recovery in these areas is currently unknown, but it is hypothesized to be related to winter weather conditions and high levels of human recreational traffic, particularly during the stressful winter and early spring months.

Management Direction

Existing Wildlife Management Plans

Alaska Wildlife Management Plans: A Public Proposal for the Management of Alaska's Wildlife: Southcentral Alaska (1976) contains several sections on Kenai Peninsula 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 focus on encouraging public viewing, photography, and enjoyment of mountain goats. Additionally, these plans have closed some areas to hunting, such as Chugach State Park and several drainages in the Portage Glacier Area. The Kenai Peninsula Goat Management Plan focuses on providing hunters with the greatest opportunity to harvest goats. In contrast, the Tustumena Plan focuses on providing hunters with the opportunity to harvest goats under aesthetically pleasing conditions (ADF&G 1976).

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

Goals

The management goal for the Kenai Peninsula mountain goat population is to provide an optimum sustainable harvest across management areas.

Codified Objectives

Amounts Reasonably Necessary for Subsistence Uses

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

Intensive Management

The BOG has not designated mountain goats as an intensive management species in Units 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 management areas.

Data Needs

Minimum population levels and recruitment information for each management 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 management area.

Methods

Fixed-wing aerial surveys using a PA-18 or similar aircraft are conducted annually when there are appropriate conditions: minimal snow cover, low turbulence (winds <15 mi/h or <24 km/h), high ceiling (>5,577 ft or >1,700 m), and cool weather (typically <60°F). The current survey period spans approximately from 15 August to 15 October. Surveys are flown at speeds ranging from approximately 68 to 81 mi/h (110–130 km/h).

Flight paths vary between 1,640 ft (500 m) and 5,905 ft (1,800 m) above sea level (i.e., alpine mountain goat summer habitats). Survey routes follow the topography of the landscape and are flown parallel to mountain faces, beginning at the tree line, which consists of alders in many areas, and progressing up the mountain. Flight paths are flown from low to increasing altitudes to avert mountain goats at higher elevations from moving down into the tree (alder) line, where they are more likely to avoid detection. Flight path length varies based on site-specific conditions and the number of animals observed. Typically, 2 or 3 passes are flown parallel to each mountain face, depending on mountain elevation and habitat, which contribute to sightability.

All mountain goats observed are circled from an altitude of approximately 656–1,640 ft (200–500 m), then enumerated and classified as either adults (including subadults) or kids. For the future development of a sightability model, additional data collected during surveys includes terrain type, habitat type, and group size. In management areas where collared goats are present, data is also collected on whether a collared animal was seen during a survey. Interior areas with high peaks are priority areas early in the survey season, as early snowfall can halt surveys. Under

normal funding conditions, counts are conducted in approximately 15 management areas per year.

Results and Discussion

Mountain goat surveys have been accomplished in all but 2 of the management areas open to harvest (management areas 335 and 355) during RY18–RY22 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 those of the pre-1990s, a time when overharvest occurred; however, some areas remain at low levels (Table 1). Most areas that continue to have low goat numbers share common characteristics, including easy access from the road system and high winter recreational traffic.

Recommendations for Activity 1.1

Modify.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1 Monitor harvest through permit reports and sealing.

Data Needs

Harvest must be assessed to avoid overharvest.

Methods

During the required sealing process, samples were collected, the sex of each harvested animal was verified, and horn information was recorded. Harvest data were then collected through permit reports, entered into the department's Wildlife Information Network (WinfoNet) database,[1] and summarized by regulatory year.

Season and Bag Limit

Hunting seasons and bag limits for RY18–RY22 are listed in Table 2. The most current seasons and bag limits may be found online.[2]

Results and Discussion

Harvest by Hunters

Harvest directly reflects the number of permits issued each year for a management area (Table 3). As mountain goat populations recovered from the declines in the 1990s and early 2000s, overall permit numbers gradually increased. However, permit numbers are adjusted each year by management area in accordance with the current management strategy (Table 4).

[1] http://winfonet.alaska.gov/index.cfm.
[2] http://www.adfg.alaska.gov/index.cfm?adfg=wildliferegulations.hunting.

Table 1. Mountain goat population minimum count and trend by management area, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022.

			Most recent count				
Management area	Unit	Area description	Total	Kids	Percent kids	Current trend[a]	Survey year
331	7	Resurrection Creek West	53	7	13	Stable	2022
332[b]	7	Gilpatrick Mountain	38	8	21	Stable	2022
333[b]	7	Seattle Creek	46	7	15	Stable	2020
334	7	Mills Creek	104	25	24	Increasing	2022
335[b]	7	Placer River West	22	4	18	Stable	2019
336[b]	7	Spencer Glacier	36	4	11	Stable	2022
337	7	Cooper Mountain	22	2	9	Decreasing	2022
338	7	Crescent Lake	92	18	20	Increasing	2021
339	7	Grant Lake	88	18	20	Increasing	2022
340	7	Kings River	11	2	18	Decreasing	2020
341	7	Cecil Rhodes Mountain	53	8	15	Decreasing	2022
342	7	Lost Lake	83	7	8	Stable	2022
343	7	Victor Creek (Andy Simons Mountain)	59	15	25	Increasing	2022
344	7	Nellie Juan Lake	77	7	9	Increasing	2022
345	7	Whidbey Bay	246	41	17	Increasing	2021
346	7	Resurrection Peninsula	342	57	17	Stable	2021
347	7	West Seward	130	26	20	Stable	2021
348[c]	15C	Aialik Peninsula	–	–	–	Unknown	–
349[c]	15C	Holgate Glacier	–	–	–	Unknown	–
350[c]	15C	Harris Bay	–	–	–	Unknown	–
351	15C	Petrof Lake	64	14	22	Stable	2022
352	7 and 15C	Brown Mountain	146	28	19	Stable	2020
353	15B	Surprise Creek	11	4	36	Increasing	2022
354	15B	Skilak Glacier	77	11	14	Increasing	2021

-continued-

Table 1. Mountain goat population minimum count and trend by management area, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022, continued.

			Most recent count				
Management area	Unit	Area description	Total	Kids	Percent kids	Current trend[a]	Survey year
355	15B	Twin Lakes	24	3	13	Unknown	2018
356	15B	Indian Creek	95	16	17	Stable	2020
357	15C	Tustumena Glacier	94	18	19	Increasing	2021
358	15C	Fox River	101	22	22	Increasing	2021
359	15C	Bradley Lake	170	43	25	Increasing	2021
360	15C	Dixon Glacier	251	51	20	Stable	2020
361	15C	Halibut Cove	132	24	18	Stable	2022
362	15C	Sadie Cove	112	19	17	Stable	2022
363	15C	Port Dick	279	43	15	Stable	2021
364	15C	Seldovia	138	22	16	Stable	2020
365	15C	English Bay	191	42	22	Decreasing	2022

Note: Management areas correspond with hunt areas.
[a] Trend (increasing, decreasing, or stable) is established based on the 3 most recent survey results for a management area.
[b] This management area has a stable trend with a low number of mountain goats.
[c] En dashes indicate no recent data available.

Table 2. Hunting seasons and bag limits for mountain goats, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022.

Hunt area	Hunt type	Season	Bag limit
DG331–DG363	Draw	10 August–15 October	1 goat
RG364 and RG365	Registration	10 August–15 October	1 goat
RG331–RG365, RG374, and RG375	Registration[a]	1–14 November	1 goat

[a] Open only if additional harvest opportunity exists after the 10 August–15 October season.

Table 3. Mountain goat harvest data for early and late season hunts, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022.

Management area	Regulatory year	Early season[a]							Late season[b]						
		Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success	Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success
331	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	1	0	0	1	5	2	50	–	–	–	–	0	–	–
	2020	1	1	0	2	5	3	67	–	–	–	–	0	–	–
	2021	1	0	0	1	3	2	50	–	–	–	–	0	–	–
	2022	0	0	0	0	1	0	–	–	–	–	–	0	–	–
332	2018	3	0	0	3	5	4	75	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2021	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2022	–	–	–	–	0	–	–	–	–	–	–	0	–	–
333	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2021	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2022	–	–	–	–	0	–	–	–	–	–	–	0	–	–
334	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	4	0	0	4	8	6	67	–	–	–	–	0	–	–
	2021	3	0	0	3	8	6	50	–	–	–	–	0	–	–
	2022	–	–	–	–	–	–	–	–	–	–	–	0	–	–
335	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2021	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2022	–	–	–	–	0	–	–	–	–	–	–	0	–	–
336	2018	2	0	0	2	5	4	50	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2021	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2022	–	–	–	–	0	–	–	–	–	–	–	0	–	–

-continued-

Table 3. Mountain goat harvest data for early and late season hunts, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022, continued.

Management area	Regulatory year	Early season[a]							Late season[b]						
		Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success	Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success
337	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2021	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2022	–	–	–	–	0	–	–	–	–	–	–	0	–	–
338	2018	3	2	0	5	10	9	56	–	–	–	–	0	–	–
	2019	1	2	0	3	10	7	43	–	–	–	–	0	–	–
	2020	0	1	0	1	8	6	17	–	–	–	–	0	–	–
	2021	2	0	0	2	7	4	50	–	–	–	–	0	–	–
	2022	0	1	0	1	7	5	20	–	–	–	–	0	–	–
339	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	1	0	0	1	8	3	33	–	–	–	–	0	–	–
	2020	1	1	0	2	8	3	67	–	–	–	–	0	–	–
	2021	3	0	0	3	7	4	75	–	–	–	–	0	–	–
	2022	1	1	0	2	7	5	40	–	–	–	–	0	–	–
340	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2021	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2022	–	–	–	–	0	–	–	–	–	–	–	0	–	–
341	2018	3	1	0	4	6	6	67	–	–	–	–	0	–	–
	2019	3	0	0	3	10	9	33	–	–	–	–	0	–	–
	2020	0	1	1	2	6	4	50	–	–	–	–	0	–	–
	2021	1	0	0	1	3	2	50	–	–	–	–	0	–	–
	2022	1	2	0	3	3	3	100	–	–	–	–	0	–	–
342	2018	2	0	0	2	5	5	40	–	–	–	–	0	–	–
	2019	1	0	0	1	5	3	33	–	–	–	–	0	–	–
	2020	4	0	0	4	8	5	80	–	–	–	–	0	–	–
	2021	3	0	0	3	8	5	60	–	–	–	–	0	–	–
	2022	2	1	0	3	8	6	50	–	–	–	–	0	–	–

-continued-

Table 3. Mountain goat harvest data for early and late season hunts, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022, continued.

		Early season[a]							Late season[b]						
Management area	Regulatory year	Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success	Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success
343	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2021	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2022	–	–	–	–	0	–	–	–	–	–	–	0	–	–
344	2018	0	0	0	0	10	3	0	–	–	–	–	0	–	–
	2019	2	1	0	3	10	6	50	–	–	–	–	0	–	–
	2020	1	0	0	1	8	3	33	–	–	–	–	0	–	–
	2021	2	1	0	3	8	4	75	–	–	–	–	0	–	–
	2022	1	0	0	1	6	3	33	–	–	–	–	0	–	–
345	2018	8	1	1	10	30	18	56	–	–	–	–	0	–	–
	2019	10	1	0	11	30	18	61	–	–	–	–	0	–	–
	2020	5	0	0	5	20	6	83	–	–	–	–	0	–	–
	2021	2	1	0	3	20	12	25	–	–	–	–	0	–	–
	2022	5	3	1	9	30	14	64	–	–	–	–	0	–	–
346	2018	5	0	3	8	45	24	33	–	–	–	–	0	–	–
	2019	4	3	0	7	35	22	32	–	–	–	–	0	–	–
	2020	10	1	0	11	35	18	61	–	–	–	–	0	–	–
	2021	6	2	0	8	28	16	50	5	1	1	7	27	15	47
	2022	9	0	0	9	40	20	45	2	1	0	3	32	13	23
347	2018	2	3	1	6	22	13	46	–	–	–	–	0	–	–
	2019	3	2	0	5	20	15	33	–	–	–	–	0	–	–
	2020	4	4	0	8	16	11	73	–	–	–	–	0	–	–
	2021	1	3	0	4	10	6	67	–	–	–	–	0	–	–
	2022	1	0	1	2	10	6	33	–	–	–	–	0	–	–
351	2018	1	0	0	1	10	4	25	–	–	–	–	0	–	–
	2019	0	1	0	1	10	4	25	–	–	–	–	0	–	–
	2020	2	0	0	2	12	3	67	–	–	–	–	0	–	–
	2021	0	1	0	1	12	4	25	–	–	–	–	0	–	–
	2022	2	0	0	2	12	5	40	–	–	–	–	0	–	–

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Table 3. Mountain goat harvest data for early and late season hunts, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022, continued.

		Early season[a]							Late season[b]						
Management area	Regulatory year	Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success	Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success
352	2018	5	0	1	6	30	8	75	–	–	–	–	0	–	–
	2019	5	0	0	5	30	11	45	–	–	–	–	0	–	–
	2020	5	2	0	7	35	11	64	–	–	–	–	0	–	–
	2021	6	1	0	7	24	10	70	–	–	–	–	0	–	–
	2022	4	0	0	4	16	10	40	–	–	–	–	0	–	–
353	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2021	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2022	–	–	–	–	0	–	–	–	–	–	–	0	–	–
354	2018	0	0	0	0	6	3	0	–	–	–	–	0	–	–
	2019	1	1	0	2	10	3	67	–	–	–	–	0	–	–
	2020	1	1	0	2	6	4	50	–	–	–	–	0	–	–
	2021	2	0	0	2	6	4	50	–	–	–	–	0	–	–
	2022	4	0	0	4	6	5	80	–	–	–	–	0	–	–
355	2018	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2019	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2020	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2021	–	–	–	–	0	–	–	–	–	–	–	0	–	–
	2022	–	–	–	–	0	–	–	–	–	–	–	0	–	–
356	2018	3	1	0	4	15	8	50	–	–	–	–	0	–	–
	2019	1	1	0	2	15	8	25	–	–	–	–	0	–	–
	2020	2	3	0	5	15	9	56	–	–	–	–	0	–	–
	2021	4	1	0	5	11	6	83	–	–	–	–	0	–	–
	2022	3	2	0	5	9	7	71	–	–	–	–	0	–	–
357	2018	1	1	0	2	10	5	40	–	–	–	–	0	–	–
	2019	0	0	0	0	10	1	0	–	–	–	–	0	–	–
	2020	2	1	0	3	10	8	38	–	–	–	–	0	–	–
	2021	1	0	0	1	7	2	50	–	–	–	–	0	–	–
	2022	2	0	0	2	9	7	29	–	–	–	–	0	–	–

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Table 3. Mountain goat harvest data for early and late season hunts, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022, continued.

		Early season[a]							Late season[b]						
Management area	Regulatory year	Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success	Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success
358	2018	1	0	1	2	10	3	67	–	–	–	–	0	–	–
	2019	1	1	0	2	10	5	40	–	–	–	–	0	–	–
	2020	2	0	0	2	10	5	40	–	–	–	–	0	–	–
	2021	1	1	0	2	10	5	40	–	–	–	–	0	–	–
	2022	1	0	0	1	10	2	50	–	–	–	–	0	–	–
359	2018	3	0	0	3	24	8	38	–	–	–	–	0	–	–
	2019	6	0	0	6	24	15	40	–	–	–	–	0	–	–
	2020	3	3	0	6	20	11	55	–	–	–	–	0	–	–
	2021	1	1	0	2	12	4	50	1	2	0	3	18	4	75
	2022	1	2	0	3	28	8	38	0	0	0	0	12	0	–
360	2018	10	3	0	13	42	22	59	–	–	–	–	0	–	–
	2019	5	3	0	8	40	21	38	–	–	–	–	0	–	–
	2020	8	3	0	11	40	26	42	–	–	–	–	0	–	–
	2021	5	2	0	7	36	19	37	1	0	0	1	12	5	20
	2022	5	0	0	5	36	17	29	2	0	0	2	23	3	67
361	2018	1	3	0	4	25	17	24	–	–	–	–	0	–	–
	2019	2	0	0	2	25	12	17	–	–	–	–	0	–	–
	2020	2	1	0	3	25	11	27	–	–	–	–	0	–	–
	2021	4	1	1	6	25	15	40	–	–	–	–	0	–	–
	2022	1	1	0	2	20	8	25	–	–	–	–	0	–	–
362	2018	6	3	0	9	22	15	60	–	–	–	–	0	–	–
	2019	2	0	0	2	22	12	17	–	–	–	–	0	–	–
	2020	7	1	0	8	16	12	67	–	–	–	–	0	–	–
	2021	1	1	0	2	12	4	50	–	–	–	–	0	–	–
	2022	1	0	0	1	12	8	13	–	–	–	–	0	–	–
363	2018	5	0	0	5	32	10	50	–	–	–	–	0	–	–
	2019	9	0	1	10	32	16	63	–	–	–	–	0	–	–
	2020	7	3	1	11	32	13	85	–	–	–	–	0	–	–
	2021	6	3	0	9	26	14	64	–	–	–	–	0	–	–
	2022	8	1	0	9	26	14	64	–	–	–	–	0	–	–

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Table 3. Mountain goat harvest data for early and late season hunts, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022, continued.

Management area	Regulatory year	Early season[a]							Late season[b]						
		Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success	Billy	Nanny	Unk	Total	Permits issued	No. hunted	% success
364/374[c]	2018	4	0	0	4	24	10	40	1	0	–	1	21	2	50
	2019	4	0	0	4	25	11	36	2	0	–	2	16	7	29
	2020	0	0	2	2	36	16	13	2	0	–	2	20	7	29
	2021	2	0	0	2	34	10	20	0	0	–	0	20	5	0
	2022	2	2	0	4	38	16	25	–	–	–	–	0	0	–
365/375[c]	2018	15	0	1	16	27	20	80	–	–	–	–	0	–	–
	2019	9	0	0	9	23	16	56	–	–	–	–	0	–	–
	2020	11	1	0	12	24	16	75	–	–	–	–	0	–	–
	2021	9	0	0	9	19	12	75	–	–	–	–	0	–	–
	2022	4	2	0	6	21	19	32	–	–	–	–	0	–	–

Note: Management areas correspond with hunt areas. En dashes indicate no harvest occurred. Unk refers to unknown.

[a] Includes all Kenai Peninsula mountain goat hunts that occur between 10 August and 15 October.

[b] Includes all Kenai Peninsula mountain goat hunts that occur after 1 November.

[c] In 2019, late-season hunts in these units were renumbered for administrative purposes.

Table 4. Harvest totals and success rates for all drawing and registration permits for mountain goats, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022.

Permit type	Regulatory year	Permits issued	No. hunted	Harvest				Percent success
				Males	Females	Unknown	Total	
Early season	2018	418	220	83	17	8	108	49
	2019	411	220	71	16	1	88	40
	2020	393	210	82	28	2	112	53
	2021	338	170	66	19	1	86	51
	2022	363	194	60	18	2	80	41
Late season registration	2018	52	7	2	0	0	2	29
	2019	32	7	2	0	0	2	29
	2020	20	7	2	0	0	2	29
	2021	87	30	7	4	1	12	40
	2022	73	16	4	1	0	5	31

Hunter Residency and Success

The most successful goat hunters were residents from the units where they hunted (local residents of Units 7 or 15), with an average success rate of 87% between RY18 and RY22 (Table 5). In contrast, the success rate of nonlocal residents (Alaska residents residing outside of the unit) was much lower, at an average of 41%. Nonresident hunters, on average, represented 20% of the harvest and had an average success rate of 86%, which is likely a reflection of the guide requirement for this species. A significant portion of nonresident harvest occurred in RG365, where a local guide contracts with Native corporation landholders for exclusive guide access. This area has one of the most robust populations of goats on the Kenai Peninsula, and its terrain is milder than most other management areas.

Table 5. Mountain goat harvest, hunter success by residency, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022.

	Successful			Unsuccessful			
Regulatory year	Unit Resident	Nonunit resident	Nonresident	Unit Resident	Nonunit resident	Nonresident	Total hunters
2018	5	80	25	0	115	2	227
2019	3	67	20	2	132	6	230
2020	6	87	21	1	100	1	216
2021	7	74	17	1	102	1	202
2022	3	66	16	0	123	7	215

Harvest Chronology

Permits are issued in a manner that consistently encourages harvest to occur during the early season. The highest proportion of mountain goat harvest occurs during September (Tables 4 and 6). The late-season hunt directly overlaps with the rut period for the Kenai Peninsula, which can impact breeding success and meat quality. In addition, weather often limits hunter access later in the year. Hair length of hides appears to motivate some hunters to harvest later in the season.

Table 6. Harvest chronology as percent of harvest by month for mountain goat drawing permits, Units 7 and 15, Kenai Peninsula, Alaska, regulatory years 2018–2022.

Regulatory year	August	September	October	Unspecified
2018	22%	45%	22%	10%
2019	28%	48%	22%	2%
2020	31%	39%	22%	8%
2021	27%	48%	21%	5%
2022	21%	58%	20%	1%

Note: Percentages may not total to 100% due to rounding error.

Transport Methods

During RY18–RY22, the most common modes of transport used by Kenai Peninsula goat hunters were boat (average = 45%), airplane (average = 26%), and highway vehicle (average = 16%; Table 7).

Table 7. Transport method reported used by Kenai Peninsula mountain goat hunters, Units 7 and 15, Alaska, regulatory years 2018–2022.

Regulatory year	Other or unknown	3- or 4-wheeler, ATV, or ORV	Airplane	Boat	Foot	Highway vehicle	Horse	Total
2018	11	8	59	106	6	36	1	227
2019	3	11	62	108	10	35	1	230
2020	10	15	56	96	12	28	0	217
2021	9	9	55	84	6	39	0	202
2022	6	20	47	96	9	36	1	215

Note: ATV refers to all-terrain vehicles, and ORV refers to off-road vehicles.

Other Mortality

No other common sources of anthropogenic mortality are currently known. The highest known instances of natural mortality occur during winter (White et al. 2011), making it vital to limit stress during this period for sustainable mountain goat management.

Alaska Board of Game Actions and Emergency Orders

In 2019, the BOG established a new draw hunt, DG364, in management area 364. That same year, the BOG at the department's behest renumbered the late-season hunts in management areas 364 and 365 to RG374 and RG375, respectively, to eliminate administrative confusion.

Recommendations for Activity 2.1

Continue to monitor harvest through hunt permit reports and sealing.

3. Habitat Assessment-Enhancement

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

Data Needs

The development of a resource selection function (RSF) model is needed to further advance mountain goat management on the Kenai Peninsula. An RSF model would help land managers designate no-disturbance areas to protect 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

In 2017 and 2018, USFWS and ADF&G personnel captured 28 mountain goats. The goats were fitted with iridium Global Positioning System (GPS) radio collars that contained remote release mechanisms and very-high frequency (VHF) radio collars (Telonics, Inc., Mesa, AZ). Captures were conducted in July and October to avoid kidding and hunting seasons. 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, which were administered using a Palmer dart gun (Cap-Chur, Douglasville, GA; Taylor 2000, White and Barten 2010). Routine biological samples and morphological data were collected. After handling, the 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 position dilution of precision (PDOP) values greater than 10, following the methods from 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 with 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 will be calculated using surface area rather than planimetric area functions (Jenness 2004), which will 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 area types through 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).

Results and Discussion

ADF&G withdrew from the joint project shortly after collars were deployed in 2018. During the remainder of the reporting period (RY18–RY22), the department did not conduct habitat enhancement work for mountain goat management in Units 7 and 15. USFWS has continued to develop the RSF model in collaboration with other partners using preliminary data returned from collars.

USFWS, with funding from both CNF and KFNP, has captured additional mountain goats in addition to the original 31 animals that ADF&G helped collar. Their continued efforts will bolster the sample size and help provide a more robust representation of mountain goat habitat, which will aid in developing an appropriate RSF model for Kenai Peninsula mountain goats. Between collar years 2017 and 2022, 51 mountain goats were collared for this project (Table 8).

Table 8. Mountain goats captured and radiocollared to develop an RSF model and conduct sightability trials, Units 7 and 15, Kenai Peninsula, Alaska, collar years 2017–2022.

Collar year	Management area	Number of goats	Agency
2017	339	3	USFWS, ADF&G
2017	343	2	USFWS, ADF&G
2017	356	11	USFWS, ADF&G
2018	356	3	USFWS, ADF&G
2018	360	12	USFWS, ADF&G
2022	347, KFNP	20	USFWS

Note: USFWS refers to the U.S. Fish and Wildlife Service, ADF&G refers to the Alaska Department of Fish and Game, and KFNP refers to Kenai Fjords National Park. Management areas correspond with hunt areas.

Recommendations for Activity 3.1

This activity should be modified, the work should be continued, and an RSF and sightability model should be developed for Kenai Peninsula mountain goats. Data collected from any collars put out by ADF&G in the future should be added to the model.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

No nonregulatory management problems or needs were identified during RY18–RY22.

Data Recording and Archiving

Permit reports were entered into the WinfoNet database.

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

Agreements

USFWS, CNF, KFNP, and ADF&G established a data-sharing agreement to collect data from radiocollared animals and to develop a sightability and RSF model. This agreement was set to expire on 1 January 2024 and could be extended through a written amendment. No plans exist to extend this agreement beyond the expiration date. 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.

Permitting

A capture permit exists for USFWS to continue collaring goats to develop an RSF model and sightability index.

Conclusions and Management Recommendations

Goat populations are highly vulnerable to overharvest compared to other ungulates. Harvesting even a few nannies from small populations can be unsustainable (Hamel et al. 2006). The taking of nannies during the drawing season often prevents registration hunts from opening, and the harvest of nannies during both seasons often decreases future permit allocations. For many years, ADF&G has attempted to educate hunters on how to distinguish between males and females and the importance of limiting nanny harvest. These educational efforts appear to be effective in decreasing 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 some areas. Factors that may be contributing to these declines include consistent anthropogenic disturbances, increased winter recreation activities, winter weather severity, and habitat conversion. Goats have been shown to be susceptible to disturbance by helicopters (Côté et al. 2013). As with many species, winter is the most stressful period for goats, with the highest known instances of mortality occurring during this period (White et al. 2011).

Future research should focus on obtaining seasonal movement data and identifying the reasons why goats have not recovered in some units under current management while recovering in all others. Seasonal movements can be used to develop an RSF model and sightability correction factors for survey flights. A well-designed RSF model could be used to delineate important use

areas during critical time periods throughout the year, such as winter and kidding. Movement data could also help determine if current goat management area boundaries are realistic or if those boundaries should be adjusted.

II. Project Review and RY23–RY27 Plan

Review of Management Direction

Management Direction

The existing management direction and goals ensure that mountain goats persist as part of the natural ecosystem while allowing for significant hunting opportunities. However, mountain goat management on the Kenai Peninsula could benefit from continuing the work started in 2017 and answering additional questions about goat movement between areas, the effects of disturbance on goats, and factors influencing population demographics.

Goals

No change from RY18–RY22.

Codified Objectives

Amounts Reasonably Necessary for Subsistence Uses

No change is expected from RY18–RY22.

Intensive Management

No change is expected from RY18–RY22.

Management Objectives

No change from RY18–RY22.

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 32 individual management areas where hunting is allowed and collect data to develop a sightability correction factor.

Data Needs

Minimum population levels and recruitment information for each management area where hunting is allowed are needed to inform guideline harvest levels and determine tag distribution numbers. A sightability correction factor could be used to estimate population and sustainable harvest levels more precisely. Additionally, improved information on the factors driving

population demographics is needed, along with a better understanding of how recreational traffic and development activities in mountain goat habitat affect population trends.

Methods

Continue to survey mountain goats on a minimum 3-year rotation in all areas where legal harvest could occur.

To better understand the effects of recreational traffic on mountain goat populations and to begin collecting information on the factors driving these population demographics, a controlled study could be conducted using 2 different levels of recreational traffic in 2 areas with similar hunting pressure and habitat conditions. Any such study should follow population demographics, including pregnancy rates, birth rates, and survival rates within the populations over a 5- to 10-year period. All recreational traffic would need to be documented. Goats would be captured and fitted with GPS and VHF collars to track movements and survival. Collaring should occur after the breeding season but before kidding, allowing blood samples to be taken to determine pregnancy rates. Additionally, this would enable staff to monitor nannies for parturition and offspring for survival. Alternatively, a before-and-after study could be conducted in a location such as the Seldovia (management area 364) or Port Dick (management area 363) hunt areas, where recreational access is increasing due to improved access and trail development.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor harvest through permit reports and sealing.

Data Needs

No change from RY18–RY22.

Methods

No change from RY18–RY22.

3. Habitat Assessment-Enhancement

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

Data Needs

No change from RY18–RY22.

Methods

Data collected from any collars deployed by ADF&G in the future should be incorporated into any ongoing efforts to develop an RSF model for the Kenai Peninsula.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

No change from RY18–RY22.

Agreements

The data-sharing agreement established among USFWS, CNF, KFNP, and ADF&G expired on 1 January 2024. There are no plans to extend the agreement beyond that date.

Permitting

No change from RY18–RY22.

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