Species Management Report and Plan ADF&G/DWC/SMR&P–2021–7

Mountain Goat Management Report and Plan, Game Management Unit 1C:

Report Period 1 July 2013–30 June 2018, and

Plan Period 1 July 2018–30 June 2023

Roy Churchwell

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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 Stephen Bethune, Acting Management Coordinator for the Division of Wildlife Conservation.

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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 Unit (GMU) 1C for the 5 regulatory years 2013–2017 and plans for survey and inventory management activities in the following 5 regulatory years, 2018–2022. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY10 = 1 July 2010–30 June 2011). 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 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 3 years.

I. RY13–RY17 Management Report

Management Area

The area of Game Management Unit 1C in Southeast Alaska includes the mainland from Cape Fenshaw north to the latitude of Eldred Rock on both the east and west sides of Lynn Canal and out to the Pacific Ocean at Cape Fairweather (Fig. 1). Several islands are included in the unit, the largest being Douglas, Shelter, Lincoln, and Sullivan Islands. Other geographic areas include Port Houghton, Hobart Bay, Endicott Arm, Tracy Arm, Snettisham, Taku River, Berners Bay, most of the Chilkat Range, and most of Glacier Bay National Park. The largest community is Juneau, with 32,000 people. Other communities include Douglas, Auke Bay, and Gustavus with a few hundred people each. The unit is more than 13,000 mi^2 and 200 miles from north to south. The economy of the region is based on tourism, fishing, and mining. Most of the residents in this unit are not qualified to participate in hunts offered as subsistence hunts as the Alaska Board of Game (BOG) has determined that Juneau is in a nonsubsistence area. Most of the unit is managed by the Tongass National Forest, including the Endicott River Wilderness (98,700 acres) and Tracy Arm–Fords Terror Wilderness (653,200 acres) areas, which were designated as wilderness by the Alaska National Interest Lands Conservation Act (ANILCA) legislation in 1980. The other large land management unit is Glacier Bay National Park, which was established in 1925. Most of its 3.3 million acres lie within Unit 1C.

Much of the Unit 1C mainland is covered with glaciers, but between the icefields and the coast are rocky cliffs, upland alpine areas, and steep coniferous forest slopes that drop down to the coast. The alpine supports grasses, sedges, and forbs important to mountain goats as summer forage. In the winter goats feed on these same plants where the wind has scoured the snow away, or they feed on shrubs and ferns protected from deeper snow under the coniferous canopy. Average daily high temperatures for the region are 30°F in January and 59°F in August (Western Regional Climate Center 2021). Rainfall averages 80 inches. Snowfall averages 93 inches and falls mostly November through March.

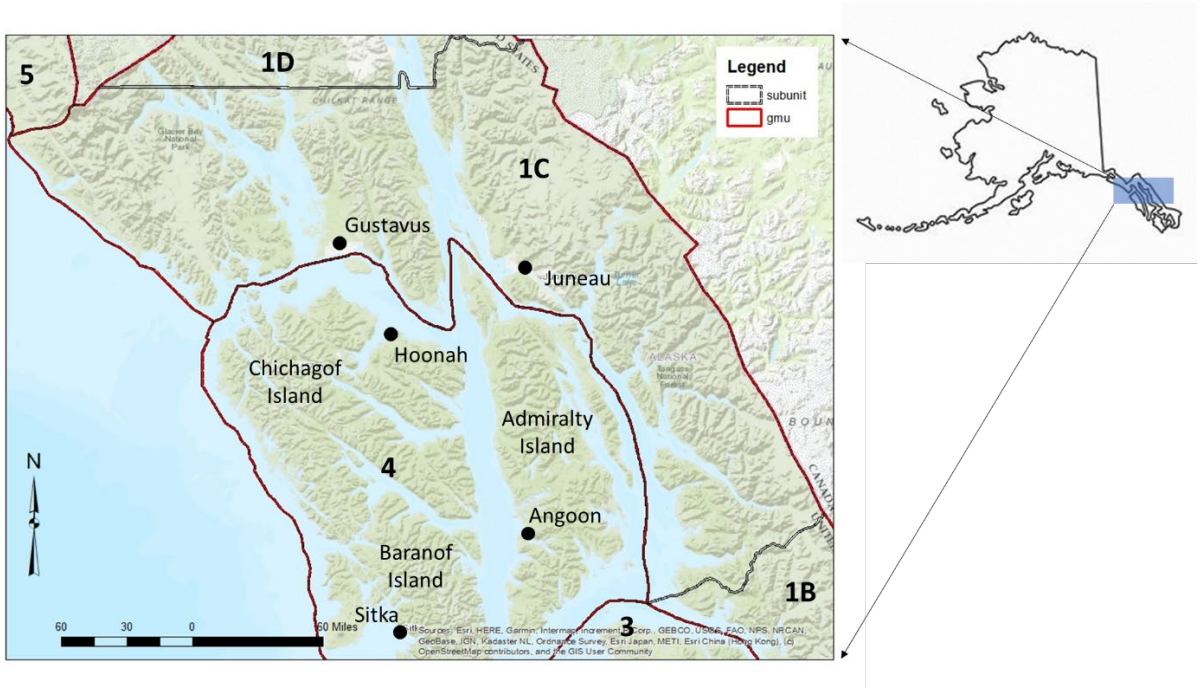

Figure 1. Map of Game Management Unit 1C, Southeast Alaska.

Summary of Status, Trend, Management Activities, and History of Mountain Goats in Unit 1C

Mountain goats are sought after both for meat and as trophy animals by resident and nonresident hunters. Nonresident goat hunters are required to hire a guide or hunt with an Alaska resident relative who is within second degree of kindred. In Unit 1C the annual number of guided nonresident hunters usually exceeds that of resident hunters. Commercial goat guiding is an important economic activity to the region that is dependent on healthy goat populations. Guided hunters are generally more successful than unguided hunters and take a higher percentage of billies.

Several aspects of the natural history of mountain goats are atypical of other ungulates in Alaska. Female goats rarely have twins, and they do not reach sexual maturity until 4 years of age (Johnson and White 2008). Males have expanded territories during the rut, but otherwise both sexes are very habitual, staying within small home ranges, especially in winter when animals show strong site fidelity (White et al. 2006). Site fidelity may help goats cope with their susceptibility to avalanches as winter survival can negatively impact population size during winters with heavy snowfall and numerous avalanches. Goats are also susceptible to starvation during hard winters (Barten 2008), and researchers documented a decline of one-third of the population in the Lynn Canal region after heavy snow during the severe winter of 2006-2007 (White 2019), although the cause of death for animals during this event was unknown. Mountain goats also contract contagious ecthyma (also known as orf) which is a virus passed from individual to individual by contact and can be fatal to young and old animals. The first reports of orf were in the early 1990s, but animals with the disease were documented through the hard winter of 2006-2007 (Barten 2008). The last documentation of the disease was in 2010 (Scott 2010), although there have been several undocumented reports since then.

The first Unit 1C mountain goat management report, published in 1971, reported a bag limit of 2 goats (Zimmerman 1973). In Unit 5, there was a 2-goat limit since at least as far back as 1949 (Alaska Game Commission 1949), suggesting that 2 goats may have been the harvest limit for a while in Unit 1C. Other information on goat management at that time is sparse. In 1972, the BOG prohibited hunting from a boat in Southeast Alaska, which was a common method used for hunting goats later in the season after snow moved the animals down to the beach (Ballard and Merriam 1975). The BOG changed the bag limit in Unit 1C to 1 goat in 1975 due to concerns of overhunting in easily accessible areas such as the Juneau road system and alpine lakes large enough for float planes (Zimmerman and Pegau 1977). Managers estimated the harvest during the early 1970s to be about 12% of the population along the Juneau road system (Ballard and Pegau 1976) and suggested reducing the harvest to 10% of the population. Beginning in 1980, registration hunts were initiated for goats across the state to better document harvest (Zimmerman 1983). In 1980, Unit 1C was managed under 2 registration hunts: Hunt Area 802 encompassed the Antler River to Taku Glacier and Hunt Area 803 was the remainder of Unit 1C (Zimmerman 1983). Hunter effort was high in Hunt Area 802 because it included the Juneau road system and access to goat habitat was easier. Goat numbers were low in the unit through the 1970s and 1980s due to a combination of increased harvest and severe winters. The department started closing parts of the unit by emergency order (EO) and then permanently closed Mount Juneau in 1983 (Zimmerman 1984). The next year Eagle Glacier to Taku Glacier was closed (Zimmerman 1985). A severe winter in 1984-1985 reduced goat populations around Lynn Canal and the first EO was issued for the Chilkat Range south of the Endicott River to prevent overharvest (Zimmerman 1986). The BOG made this closure permanent in 1987 (Zimmerman 1987). With so few goats around Juneau, a reintroduction of 11 goats was conducted on Mount Juneau in 1989 (Paul 2009). Also, at this time, managers started using a point system for goat management (McCarthy 1990). Early management reports do not describe the number of points allowed for harvest. The 2004 management report (Barten 2004) was the first to describe allowing 6 points to be harvested for every 100 goats observed on area surveys. With this management strategy a billy equals 1 point, and a nanny equals 2 points. This equates to roughly 4–5% harvest of the population. This management strategy started in 2004 and has continued to be used through this reporting period.

This history set the stage for modern goat management in Unit 1C. The registration Hunt Area 802 became RG012 in the northern portion and the southern portion became RG014, an archery only area (Robus 1996, Fig. 2). A portion between these registration hunts remains closed to hunting between Eagle Glacier and Eagle River south to and including the Lemon Creek drainage (Barten 2000). The registration Hunt Area 803 became RG015 and includes the Chilkat Peninsula south of the Endicott River and outside of Glacier Bay National Park. The remainder of Unit 1C became RG013; this hunt area includes the very northern portion of Unit 1C on the east and west sides of Lynn Canal as well as all of the unit south of the Taku River. Starting in 2003, the BOG changed the season start dates in RG014 and RG015 to 1 September instead of 1 October (Barten 2002). Then, in 2004, the BOG changed RG014 to start 1 August instead of 1 September (Barten 2006). For 2 years (RY12 and RY13) there was a draw hunt in the McGinnis and Herbert drainages (Scott 2012). This hunt contributed to a low number of goats in the draw unit because of high nanny harvest, so the hunt was closed and remains closed until there is an indication that goat numbers in this area have recovered (Scott 2014).

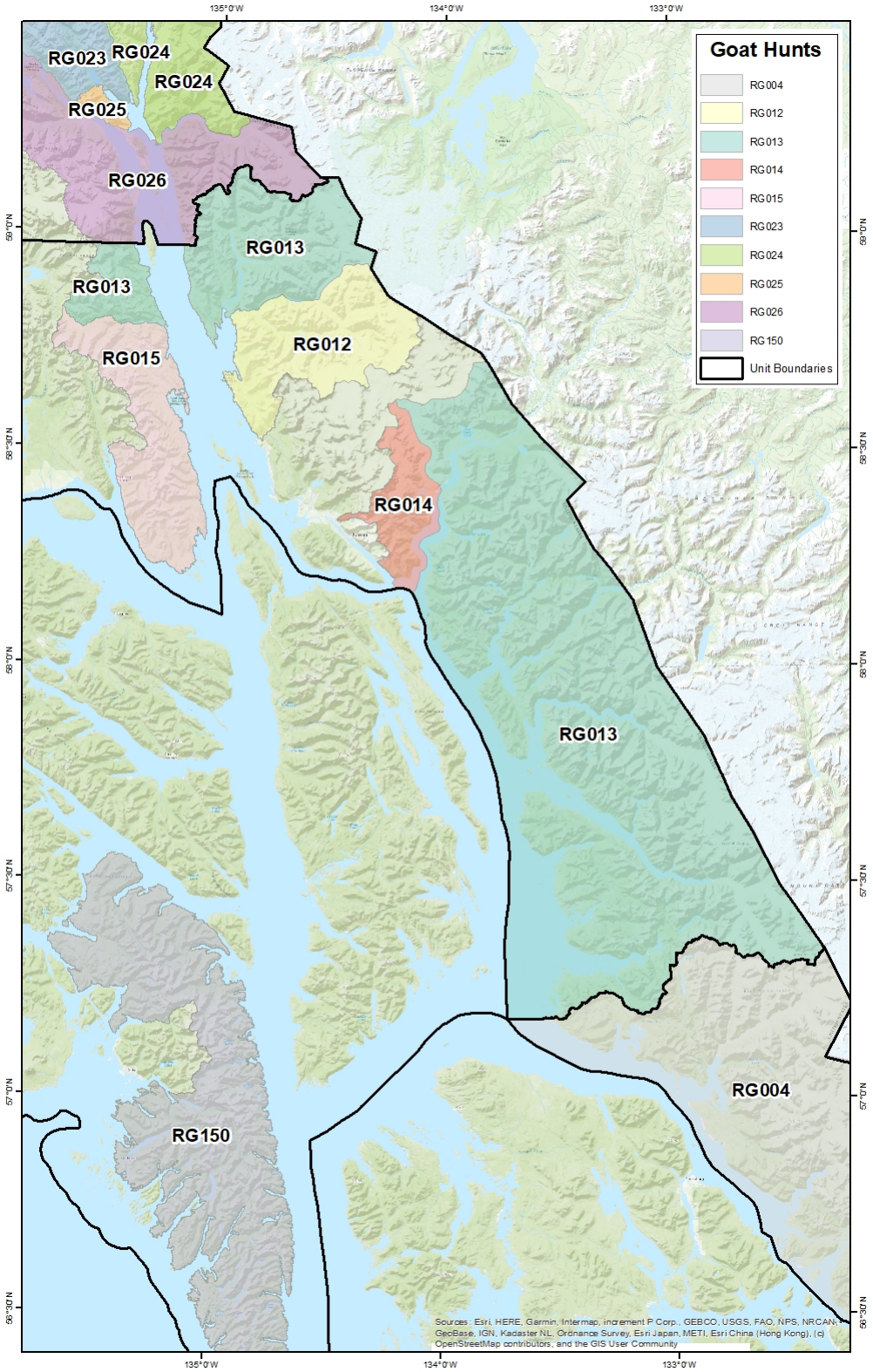

Figure 2. Unit 1C, Alaska, mountain goat registration hunt permit areas, including hunts RG012–RG015.

During the last 30 years there have been 3 major impacts to mountain goats resulting from economic development (Robus 1996). The first has been increased guiding within Tracy and Endicott arms. Guides use large boats to accommodate clients and do day hunts from the fiord. Later in the season goats are pushed down to the coast by snow and can be accessed more easily. The number of guided hunts increased steadily to the point where the department expected to put a limit on harvest. In 2001, the harvest increased by 20 goats, mostly due to an increase in guided hunts in this area (Barten 2002). Around 2002, the U.S. Forest Service (USFS) began limiting the number of clients a guide could take out through a commercial services permit, which in turn limited the harvest in this area (Barten 2004). These USFS actions helped stabilize harvest levels in the unit at 30–50 goats (Scott 2012).

The second impact has been increased mining and other development in the region. The Kensington Mine in Berners Bay was developed in an area containing winter goat habitat. Department research biologists found that goats avoided the mine by 1,500–1,800 meters (4,921–5,906 feet), which limited access to winter goat habitat in and around the mine (White and Gregovich 2017). The proposed Juneau Access Project would extend the main highway in the Juneau area across the Berners Bay tidelands and up the coast towards Skagway, bisecting winter goat habitat along the way (White et al. 2006). While this road has been in the planning stages for some time, project construction has not been funded. Other mines around Juneau are in the exploratory stage and development efforts are ongoing for a hydroelectric dam at Sweetheart Lake (Scott 2014).

The third impact has been development of a tourism industry based on helicopter flights (Barten 2004). In the summer, these flights travel to the glaciers around Juneau and in the winter, they take skiers to the top of remote ski runs. Summer flights to the glaciers number more than 19,000 flights per year. The effect of overflights on goats is not totally understood, but research has described changes in goat behavior from overflights that are 1,000 meters (3,281 feet) or more away (Hurley 2004). Another study observed that skiing impacted goats at a ski resort in Canada (Richard and Côté 2016), and other research has suggested goats do not become habituated to helicopter disturbance (Côté et al. 2013, Richard and Côté 2016). Individually, impacts from mining and tourism projects may be small, but cumulative impacts across projects could have population-level effects.

Mountain goats have been regularly monitored and researched in this area. During initial mountain goat aerial surveys managers noticed a great deal of variability among within-year counts and early research investigated better methods of censusing goats (Ballard 1975). Fixed-wing surveys varied greatly, by an average 66% (range = 30–97%) compared to helicopter surveys that were thought to yield a near total count. Estimates of kid-to-adult ratios were less variable than counts of the number of animals, but this variability was only described and not reported. Department biologists also found goats with kids were located at lower elevations than goats without kids. Goats with kids also reacted more strongly to aircraft than goats without kids and goats reacted more strongly to helicopters than to fixed-wing aircraft. This study suggested that a future study on the ecology of goats in Southeast Alaska should be executed. As a result, a research project spanning several years investigating habitat use and movement patterns was conducted (Schoen 1978; Schoen 1979; Schoen et al. 1980; Schoen and Kirchhoff 1982). These researchers found that female goats showed higher site fidelity to winter range than male goats, but all goats moved only short distances. The average change in relocations was 4 miles (range =

2–9 miles). They also found that the most important attribute of goat habitat was the proximity to cliffs and that forest habitats were used extensively in the winter. Schoen (1978) describes an elevational spring migration to below 2,500 feet for goats to find areas of green-up. The findings of Schoen's work as well as follow-up work in Fox's dissertation (Fox 1983) on forage and nutrition for wintering mountain goats are summarized in a technical report (Fox et al. 1989) published by the U.S Forest Service. It emphasizes the importance of escape terrain and in the winter of old-growth forests. The winter months are likely the most limiting for mountain goats because food resources are scarce, and their daily energy balance often cannot be met. This requires goats to eat into extra resources in the form of stored fat gained during the summer, when food is more plentiful. Winter survival is a balance between body condition as the goats go into winter and the availability of winter food. Availability of winter food is mostly determined by snow depth and the accessibility of old-growth coniferous forest habitat where snow depths can be less and food more readily available.

Since 2005, ADF&G research biologist Kevin White and others have conducted long-term research on mountain goats near the Kensington Mine and the proposed Juneau Access Road corridor. Their findings built on earlier research by Schoen and others. Some of their findings include that male goats are much more active than female goats during the rut, cover more territory, and that female goats prefer steeper and more rugged terrain than males in winter (White et al. 2006). Altitudinal home ranges of males and females in the winter were similar (White et al. 2006). Goat winter and summer habitat were modeled in a resource selection function using variables for elevation, slope, distance to escape terrain, solar radiation for 1 January and 1 August, and a ruggedness measure (White et al. 2012). In the analysis, goats were more closely associated with steep and rugged terrain in the winter than in the summer (White and Gregovich 2017), and female goats were found at higher elevations in the early summer than male goats. Male mountain goats and older goats of 9+ years also had lower survival rates. Winter weather impacts goat survival during winter, while summer weather impacts survival during the following winter (White et al. 2011). After modeling goat habitat, the researchers found that 25.3 km (15.7 mi) of the Juneau Access Road would cross medium to high quality winter goat habitat (White et al. 2012). Thus, the authors suggested, road construction would impact the goat population and goat management by resulting in increased hunter access, the possibility of goat-vehicle collisions, and avalanche control measures and other post-construction impacts.

Kevin White has also collaborated with several other researchers on mountain goat projects in Unit 1C. Shafer et al. (2012) found that resource selection functions based on summertime and male goat locations were good predictors of genetic relatedness among goats and of barriers to gene flow between metapopulations. Richard et al. (2014) found that male goats did not make breeding migrations during the rut, and their movements during this period were not based on their age or weight, which may help explain why these goats were found to have such high fidelity to their metapopulation (Richard et al. 2014). In an assessment of weather impacts on goats, current models indicate that winter snow depth has a negative effect on goat survival as does high summer temperature, while future climate models predict winters with less snow and higher summer temperatures (White et al. 2018). White et al. projected that increases in summer temperature will have a greater effect on goat survival than less winter snow, to the point that modeled goat populations went extinct over the next 70 years under 3 of the 5 global climate model projections. Fieberg et al. (2015) found that when conducting surveys of goats using the

same helicopter there was not a significant difference in detection the year after capture compared to other survey years.

Finally, data from mountain goat locations on the Kensington Mine and Juneau Access Road Corridor project (2006–2012) as well as data from the Haines and Skagway, Baranof, and Cleveland Peninsula areas are contributing to a sightability model to be used with aerial surveys that will make it possible to calculate population estimates from area surveys (White and Pendleton 2013). The model is nearly completed, but there is a bias resulting in an overestimated population when surveying small populations that still needs to be rectified.

Management Direction

Existing Wildlife Management Plans

Overall goals for mountain goat management in Unit 1C were established in 1976:

- Southeast Mainland Goat Management Plan in 1976 Alaska Wildlife Management Plans (ADF&G 1976a: 74–75).

- Bullard Mountain Goat Management Plan in 1976 Alaska Wildlife Management Plans (ADF&G 1976b: 78).

Management objectives and harvest management strategies have changed since the plan was written based on public comment, staff recommendations, and BOG actions. These periodic changes in management planning have been reported through the years in the division's previous mountain goat management reports for Unit 1C.

Goals

To provide for the following:

1. A sustainable harvest of mountain goats in Unit 1C.
2. The greatest opportunity to participate in hunting of mountain goats in Unit 1C.
3. The greatest opportunity for mountain goat viewing along the Juneau road system.

Codified Objectives

Amounts Reasonably Necessary for Subsistence Uses

The BOG has made a positive finding for customary and traditional use of mountain goats in Unit 1C and set 25–30 goats as the amount necessary for subsistence (ANS) outside the Juneau Nonsubsistence Area (5 AAC 99.025(a)(7)).

Intensive Management

Not applicable.

MANAGEMENT OBJECTIVES

- Maintain goat densities so at least 30 goats per hour are seen during fall surveys.
- Use pamphlets, videos, and other educational materials to ensure a male:female harvest of at least 2:1.
- Maintain goat viewing opportunities along the Juneau road system.
- Identify discrete geographic areas and manage within these areas.
- Maintain a guideline harvest not to exceed 6 points (billy = 1 pt, nanny = 2 pt) per 100 goats observed.
- Conduct aerial surveys at least every 3 years in areas of high harvest.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Monitor the population of mountain goats in Unit 1C.

Data Needs

Population abundance and composition data are important for establishing sustainable harvest objectives for specific mountain goat populations. Population-level estimates are not consistently available for most Unit 1C mountain goat populations. Because of high goat site fidelity, mountain goats are often managed by mountain range, which often show differing genetic structure. There are some population level data for goats in Berners Bay around the Kensington mine and north to the Unit 1C boundary (2005–2018). These population estimates are from minimum count data that were input into a sightability model developed by department research staff and biometricians (White and Pendleton 2013). The department anticipates using this model throughout the region once it is tested and refined for more general use.

Methods

Minimum count surveys have been conducted intermittently in several study areas since 1961 that cover much of the commonly hunted Unit 1C goat populations. During this reporting period, ADF&G biologists flew aerial surveys within established trend count areas to estimate a minimum count and the percentage of kids in each population. Results of the aerial surveys were used to establish harvest objectives for specific mountain goat populations within each registration hunt area. These objectives allow for a harvest quota of 6 points per 100 goats observed based on the most recent aerial survey and population trend data. Male goats (billies) count as 1 point and females (nannies) 2 points toward the allowable harvest quota.

Results and Discussion

Using aerial surveys, it was possible to document goat declines in the Juneau area, especially along the road system during the 1970s and 1980s. There was an especially severe winter in 1984-1985 that led to population declines in both the Chilkat Range and along the east side of Lynn Canal. However, goat numbers recovered and were stable by the late 1980s (Johnson 1988). Goat populations were doing well through the early 2000s (Table 1). Then again during the winter of 2006/07 there was a severe winter that caused goat populations to decline in the

Lynn Canal area (Table 1 and 2), but survey data from this time period are incomplete and it is difficult to determine trends. More recent area surveys indicate that goat populations may have stabilized after the 2006-2007 winter (Table 2). Since 2005, White and others have collected population estimates from 4 areas around the Kensington mine. The population changes since 2005–2017 in these areas were as follows: -1% at West Berners, -3% at Blue Ridge, -14% at Kensington, and -21% at Met (Table 3, White 2019). The decline portrayed in these numbers started during the winter of 2006-2007. Some populations seem to be recovering or are at least stabilized at a lower population at this time.

Recommendations for Activity 1.1

Researchers at Alaska Department of Fish and Game will continue to monitor goat populations at the north end of Unit 1C Lynn Canal in association with the Kensington Mine. These data will help develop our understanding of these populations as they recover from impacts to the population observed during the winter of 2006-2007. Minimum counts will also be flown in areas of high goat harvest at least every 3 years.

Weather permitting, aerial surveys will be conducted of high-use goat hunt areas while adding surveys of other areas as funding and weather allow. These surveys are conducted as minimum counts, but when the mountain goat survey sightability model becomes available it should be used to determine population estimates and confidence intervals for these surveys. Population estimates will continue for parts of Berners Bay and the north end of Unit 1C in association with the Department's mountain goat research in that area.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor mountain goat harvest through registration permit.

Data Needs

Harvest data provide the basis for mountain goat management since individual registration hunts are closed when a certain number of animals are taken from a hunt area. Because the hunt and season length are so linked, reporting of harvest is critical, which is why there is a 5-day reporting requirement for hunts in Unit 1C. Additionally, information on the sex of harvested animals helps with hunt management in populations with skewed sex ratios or low recruitment.

Methods

The department monitors hunter harvest through a registration permit system. All permit holders are required to report. All who received a permit report whether they hunted, their location and duration of their hunts and whether they harvested an animal, date of kill, sex, and transportation used. Anecdotal information from hunters and guides is also documented.

Harvest data were summarized by regulatory year (RY).

Table 1. Mountain goat surveys, Unit 1C, Southeast Alaska, 2000–2007.

Year	No. Adults	No. kids	Total goats	Kids:100 adults	Percent kids	Goats/hour	Location
2000	57	3	60	5	5	47	Lake Dorothy
2000	143	30	173	21	17	36	Chilkat Range
2001	464	113	577	24	20	132	Tracy and Endicott Arms
2001	174	57	231	33	25	139	North of Tracy Arm
2001	20	7	27	35	26	20	Whiting to Speel River
2001	18	1	19	5	5	27	Sharp Pt. to Bart Lake
2002	163	47	210	29	22	82	South of Endicott Arm
2002	152	26	178	17	15	85	Chilkat Range
2003	52	12	64	23	19	213	Berners Bay, Lions Head Mtn.
2003	98	14	112	14	13	170	Berners Bay, Antler Lake
2004	No survey						
2005	226	39	265	17	15	101	Berners Bay to Katzehin R.
2005	15	1	16	7	6	15	Border Lake in upper Taku
2006	203	33	236	16	14	16	Chilkat Range
2007	15	0	15	0	0	14	Lake Dorothy
2007	196	36	232	18	16	80	Cape Fanshaw
2007	179	18	197	10	9	39	South of Endicott Arm

Table 2. Mountain goat surveys, Unit 1C, Southeast Alaska, 2008–2017.

Year	No. adults	No. kids	Total goats	Kids:100 adults	Percent kids	Goats/hour	Location
2008	8	4	12	50	33	10	Lake Dorothy
2008	121	43	164	36	26	44	Endicott Arm
2009	235	67	302	29	22	110	Taku Glacier to Bullard
2009	306	62	368	20	17	123	S. Tracy/ N. Endicott
2009	86	11	97	13	11	108	N. Tracy Arm
2010	56	10	66	18	15	29	N. Tracy Arm
2010	85	21	106	25	20	29	S. Tracy/ N. Endicott
2011	8	1	9	13	11	–	Sweetheart Lake
2011	129	33	162	26	20	88	N. Tracy Arm
2011	256	46	302	18	15	88	S. Tracy/ N. Endicott
2011	223	44	267	20	16	51	Chilkat Range
2011	26	7	33	27	21	66	Taku/Klutchman
2012	134	25	159	19	16	51	N. Tracy Arm
2012	191	38	229	20	17	54	S. Tracy/ N. Endicott
2012	7	1	8	14	13	–	Sweetheart Lake
2013	40	16	56	40	29	24	Sweetheart Lake to Klutchman
2013	41	4	45	10	9	51	Mendenhall to Herbert Glacier
2014	105	31	136	30	23	49	Sweetheart Lake to N. Tracy Arm
2014	78	21	99	27	21	50	Mendenhall Glacier to Sawmill Cr.
2014	291	71	362	24	20	81	Mtn. Bullard to N. Side Taku Inlet
2015	176	26	202	15	13	202	North Tracy Arm
2015	365	68	433	19	16	111	South Tracy to North Endicott
2015	220	55	275	25	20	127	South Endicott to Port Houghton
2016	78	23	101	29	23	39	Upper Taku
2016	98	10	108	10	9	68	Mendenhall to Thiel Glacier
2017	70	19	89	27	21	89	North Tracy Arm
2017	242	58	300	24	19	89	South Tracy to North Endicott
2017	46	8	54	17	15	43	South Endicott
2017	79	5	84	6	6	83	Sawmill Creek to Thiel Glacier

Note: En dash denotes surveys for which the length of the survey was not recorded, and goats/hour could not be calculated.

Table 3. Berners Bay area Unit 1C, Alaska, mountain goat population estimates, 2008–2017 (White 2018).

		Minimum count				Population estimate[a]						
Survey Area	Year	Adults	Kids	Total	Prop. kids[b]	Total	LCI	UCI	Density	No. of surveys	Area (km^2)	Area (mi^2)
Blue Ridge	2008	19	3	22	0.14	49	18	26	1.6	1	30	11.6
Blue Ridge	2009	–	–	–	–	–	–	–	–	0	30	11.6
Blue Ridge	2010	–	–	–	–	–	–	–	–	0	30	11.6
Blue Ridge	2011	26	9	35	0.26	60	16	23	2	2	30	11.6
Blue Ridge	2012	24	3	27	0.11	43	12	17	1.4	1	30	11.6
Blue Ridge	2013	13	2	15	0.13	40	18	27	1.3	1	30	11.6
Blue Ridge	2014	16	3	19	0.16	36	13	18	1.2	1	30	11.6
Blue Ridge	2015	18	4	22	0.18	54	20	28	1.8	1	30	11.6
Blue Ridge	2016	13	2	15	0.13	31	14	22	1	1	30	11.6
Blue Ridge	2017	17	5	22	0.23	49	21	33	1.7	1	30	11.6
West Berners	2008	15	1	16	0.06	26	9	15	1.2	2	22	8.5
West Berners	2009	12	3	15	0.20	23	8	13	1	1	22	8.5
West Berners	2010	9	1	10	0.10	26	13	20	1.2	2	22	8.5
West Berners	2011	17	4	21	0.19	39	13	18	1.8	1	22	8.5
West Berners	2012	11	2	13	0.15	25	10	16	1.1	1	22	8.5
West Berners	2013	16	2	18	0.11	42	17	25	1.9	1	22	8.5
West Berners	2014	6	1	7	0.14	15	8	13	0.7	1	22	8.5
West Berners	2015	5	1	6	0.17	14	8	14	0.6	1	22	8.5
West Berners	2016	7	1	8	0.13	30	18	29	1.3	1	22	8.5
West Berners	2017	14	1	15	0.07	42	21	32	1.9	1	22	8.5
Kensington	2008	17	4	21	0.19	46	17	25	2.3	2	19.9	7.6
Kensington	2009	15	5	20	0.26	31	10	15	1.5	2	19.9	7.6
Kensington	2010	18	7	25	0.28	45	15	22	2.3	2	19.9	7.6
Kensington	2011	25	7	32	0.22	50	13	18	2.5	1	19.9	7.6
Kensington	2012	20	3	23	0.13	38	11	17	1.9	1	19.9	7.6
Kensington	2013	17	5	22	0.23	53	21	31	2.7	1	19.9	7.6

		Minimum count				Population estimate[a]						
Survey Area	Year	Adults	Kids	Total	Prop. kids[b]	Total	LCI	UCI	Density	No. of surveys	Area (km^2)	Area (mi^2)
Kensington	2014	16	1	17	0.06	34	13	19	1.7	1	19.9	7.6
Kensington	2015	7	2	9	0.22	25	14	21	1.2	1	19.9	7.6
Kensington	2016	13	4	17	0.24	47	23	36	2.4	1	19.9	7.6
Kensington	2017	10	2	12	0.17	36	19	31	1.8	1	19.9	7.6
Met	2008	39	13	52	0.25	102	26	33	6.6	2	15.4	5.9
Met	2009	30	9	39	0.23	56	13	19	3.6	2	15.4	5.9
Met	2010	32	14	46	0.30	91	24	32	5.9	2	15.4	5.9
Met	2011	42	15	57	0.26	84	16	22	5.5	1	15.4	5.9
Met	2012	37	7	44	0.16	74	17	24	4.8	1	15.4	5.9
Met	2013	31	11	42	0.26	81	24	34	5.3	1	15.4	5.9
Met	2014	30	10	40	0.25	63	15	21	4.1	1	15.4	5.9
Met	2015	–	–	–	–	–	–	–	–	0	15.4	5.9
Met	2016	17	7	24	0.29	65	27	39	4.2	1	15.4	5.9
Met	2017	12	4	16	0.25	39	19	32	2.6	1	15.4	5.9
Met	2014	30	10	40	0.25	63	15	21	4.1	1	15.4	5.9
Met	2015	–	–	–	–	–	–	–	–	0	15.4	5.9
Met	2016	17	7	24	0.29	65	27	39	4.2	1	15.4	5.9
Met	2017	12	4	16	0.25	39	19	32	2.6	1	15.4	5.9

Note: En dashes indicate no survey was conducted.

[a] LCI and UCI are abbreviations for 95% lower and upper confidence intervals.

[b] Prop. Kids = percentage of kids in the population: .06 = 6 percent kids.

Season and Bag Limit

Season and Bag Limit	Resident and Nonresident Hunters
RG012 Unit 1(C), that portion draining into Lynn Canal and Stephens Passage between Antler River and Eagle Glacier and River 1 goat by registration permit only; the taking of nannies with kids is prohibited	1 October–30 November
RG015 Unit 1(C), that portion including all drainages of the Chilkat Range south of the south bank of the Endicott River 1 goat by registration permit only; the taking of nannies with kids is prohibited	1 September–30 November
Unit 1(C), that portion bounded by Montana Creek Trail, McGinnis Creek to its headwaters, then due north to the edge of the south side of the Mendenhall Glacier, then north and west along the edge of the Mendenhall and Herbert Glacier, then along; the southwest side of the Herbert Glacier and river back to the Montana Creek trail	No Open Season
Unit 1(C), that portion draining into Stephens Passage between Eagle Glacier and River and Point Salisbury	No Open Season
RG014 Unit 1(C), that portion draining into Stephens Passage and Taku Inlet between Point Salisbury and Taku Glacier including the south side of Blackerby Ridge. 1 goat by registration permit by bow and arrow only; the taking of nannies with kids is prohibited	1 October–30 November (General hunt only)
RG013 Remainder of Unit 1(C) 1 goat by registration permit only; the taking of nannies with kids is prohibited	1 August–30 November

Results and Discussion

Harvest by Hunters

Excluding the islands in Unit 1C, mountain goat harvest occurs throughout most of the unit where hunting is allowed (Table 4). Most significantly, 60% of the harvest over the last 10 years is from Tracy and Endicott arms (WAA 2824 and 2825). With the increase in the popularity of archery hunting, the harvest around Juneau has also grown (WAA 2517). Other areas that contribute to mountain goat harvest include the Homeshore area of the Chilkat Peninsula (WAA 2306), Berners Bay (WAA 2409), and the upper Taku River drainage (WAA 2518).

The mountain goat harvest during this 5-year reporting period averaged 43 goats per year (range = 37–55 RY13–RY17) compared to an average of 36 goats per year during the previous five years (range = 30–42 RY08–RY12, Table 5). A high harvest of 55 goats in RY16 increased the average for this reporting period. High harvest is often tied to good weather during the hunting season (Scott 2014), and this is likely the explanation for the high harvest in RY16. More female goats were harvested (average = 6 female goats per season) in this 5-year reporting period compared to the previous 5 years (average = 3 female goats per season).

Permit Hunts

There are 4 different registration permits in Unit 1C, including hunts RG012 (north Juneau road system), RG013 (upper Taku Inlet to south Unit 1C and northern Lynn Canal), RG014 (archery hunt area behind Juneau), and RG015 (Chilkat Peninsula south of the Endicott River), which are combined under a single registration permit (RG012) in that a hunter can sign up for 1 registration hunt but hunt all 4 areas. There were between 167 and 205 registration permits given out each year during RY13–RY17.

Hunter Residency and Success

The annual number of both resident and nonresident hunters increased during this reporting period (Table 6: average RY13–RY17 resident = 48.6 and nonresident = 30.4) compared to the previous reporting period (average RY08–RY12 = 38.6 and nonresident = 27.4). Overall hunter success rates were slightly higher more recently. Nonresident hunters are more successful when goat hunting because, generally, nonresident hunters are with a professional guide (with the exception being hunters that use an Alaska resident relative within second degree of kindred as their guide). About twice as many nonresident hunters are successful compared to resident hunters.

The average number of permits issued decreased slightly compared to the previous 5 years (Table 7; RY08–RY12 = 206.4 and RY13–RY17 = 183). However, the average number of permit holders who hunted increased (RY08–RY12 = 74.6 and RY13–RY17 = 85.2). The average days hunted by successful versus unsuccessful hunters was just slightly higher for unsuccessful hunters (successful RY08–RY17 = 2.4 and unsuccessful RY08–RY17 = 3.0).

Table 4. Unit 1C, Alaska, mountain goat harvest by Wildlife Analysis Areas (WAA), regulatory years 2008–2017.

	Regulatory year										
WAA	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
2202	0	0	0	0	0	0	0	0	0	0	0
2203	0	0	0	0	1	2	0	0	0	0	3
2304	0	0	0	0	0	2	0	0	2	2	6
2305	1	0	1	0	0	0	0	0	2	1	5
2306	0	1	5	1	2	2	4	2	5	1	23
2307	0	0	0	0	0	0	0	0	0	0	0
2408	2	0	0	0	0	2	0	0	0	0	4
2409	2	0	1	0	1	0	1	1	2	1	9
2410	0	0	0	0	0	0	0	0	1	0	1
2411	0	0	0	0	0	0	0	0	0	1	1
2412	0	0	0	0	0	0	0	0	0	0	0
2413	0	0	0	0	0	1	0	0	0	0	1
2514	1	4	0	4	0	1	2	1	0	1	14
2515	0	0	0	0	0	0	0	0	0	2	2
2517	2	2	1	1	1	0	3	2	8	4	24
2518	1	0	3	3	0	2	1	2	1	1	14
2519	0	0	0	0	0	0	0	0	0	0	0
2722	0	0	0	0	0	0	0	0	0	0	0
2823	0	1	0	0	0	0	0	0	0	0	1
2824	15	12	13	13	12	19	13	14	15	13	139
2825	16	9	16	11	15	12	14	13	14	10	130
2926	0	0	0	0	0	0	0	0	2	0	2
2927	2	1	1	0	0	2	2	3	3	2	16
Total	42	30	41	33	32	45	40	38	55	39	395

Table 5. Unit 1C, Alaska, mountain goat harvest by sex, regulatory years 2008–2017.

Regulatory year	Males	Females	Percent females	Unknown	Total
2008	37	4	10	1	42
2009	28	2	7	0	30
2010	36	5	12	0	41
2011	30	3	9	0	33
2012	31	1	3	0	32
2013	37	7	16	1	45
2014	32	8	20	0	40
2015	33	4	11	1	38
2016	47	8	15	0	55
2017	35	4	10	0	39

Table 6. Unit 1C, Alaska, mountain goat hunter residency and success, regulatory years 2008–2017.

		Successful hunters			Unsuccessful hunters		
Regulatory year	Percent successful	Unit resident	Other AK[a]	Non-resident	Unit Resident	Other AK	Non-Resident
2008	45	14	0	28	40	8	3
2009	41	11	1	18	30	9	5
2010	55	8	6	27	27	4	2
2011	46	7	5	21	26	8	5
2012	53	7	0	25	23	2	3
2013	49	14	4	27	39	5	3
2014	47	13	1	26	34	6	5
2015	59	11	0	27	22	1	3
2016	53	22	4	29	42	5	2
2017	48	13	3	23	33	2	7

[a] Other AK = residents of Alaska but not of the unit.

Harvest Chronology

Most harvest in Unit 1C occurs in November, which is in part because the bulk of guided harvest occurs then. During RY13–RY17 approximately 51% of the harvest occurred in November. Overall, the monthly percentage of harvest increases as the season progresses, with 8% of the harvest in August, 9% in September and 31% in October. Snow tends to drive the goats from high elevations, and they are easier to access as the season progresses. This is the main reason that guides focus their efforts later in the season.

Transport Methods

Boating was the most common mode of transportation for hunters in Unit 1C, with 80% of hunters reporting they used this method (Table 8) for their hunt. The next most common was aircraft use with 10%. Highway vehicle use was another method used regularly, but only by about 6% of hunters. Boats continued to be the primary transportation method.

Use of commercial services was stable during this period (Table 9; RY13–RY17 average = 31.6 hunters per year) compared to RY08–RY12 (average = 29.6 hunters per year), although the number of hunters not using commercial services increased slightly. This increase is reflected in an increase in the number of resident hunters, who are more likely to hunt mountain goats without the help of commercial services. The number of hunters using registered guides each year was about 27 hunters; this does not change much from year to year due to the U.S. Forest Service permitting system to guide on Forest Service land. The number of hunters using transporters was also roughly the same among reporting periods, about 3 hunters.

Table 7. Unit 1C, Alaska, mountain goat hunter effort for successful and unsuccessful hunters, regulatory years 2008–2017.

		Successful hunters			Unsuccessful hunters			Total hunters		
Regulatory year	Permits issued	Number hunters	Total days	Avg days	Number hunters	Total days	Avg days	Number hunters	Total days	Avg days
2008	216	42	98	2.3	51	106	2.1	93	204	2.2
2009	228	30	59	2.0	44	116	2.6	74	175	2.4
2010	187	41	108	2.6	33	103	3.1	74	211	2.9
2011	207	33	89	2.7	39	145	3.7	72	234	3.3
2012	194	32	85	2.7	28	98	3.5	60	183	3.1
2013	197	45	93	2.1	47	186	4.0	92	279	3.0
2014	187	40	91	2.3	45	113	2.5	85	204	2.4
2015	159	38	99	2.6	26	76	2.9	64	175	2.7
2016	205	55	134	2.4	49	111	2.3	104	245	2.4
2017	167	39	83	2.1	42	116	2.8	81	199	2.5

Table 8. Unit 1C, Alaska, mountain goat hunter transport methods, regulatory years 2008–2017.

Regulatory	Airplane		Boat		Foot		Highway vehicle		Other	
year	Total	(%)	Total	(%)	Total	(%)	Total	(%)	Total	(%)
2008	1	(2)	38	(91)	0	(0)	3	(7)	0	(0)
2009	1	(3)	24	(80)	0	(0)	5	(17)	0	(0)
2010	4	(10)	32	(78)	1	(2)	1	(2)	3	(8)
2011	2	(6)	25	(76)	0	(0)	5	(15)	1	(3)
2012	1	(3)	28	(88)	0	(0)	2	(6)	1	(3)
2013	6	(13)	37	(82)	0	(0)	1	(2)	1	(2)
2014	3	(8)	33	(82)	0	(0)	2	(5)	2	(5)
2015	2	(5)	32	(85)	0	(0)	2	(5)	2	(5)
2016	5	(9)	44	(80)	0	(0)	5	(9)	1	(2)
2017	6	(15)	28	(72)	0	(0)	4	(10)	1	(3)

Table 9. Commercial services used by Unit 1C, Alaska, mountain goat hunters, regulatory years 2008–2017.

Regulatory year	Unit residents		Other Alaska residents		Nonresidents		Total use		Registered guide	Transporter	Other
	No.	Yes	No.	Yes	No.	Yes	No.	Yes			
2008	52	2	8	0	2	29	62	31	29	2	0
2009	40	1	9	1	1	22	50	24	22	2	0
2010	33	2	10	0	1	28	44	30	28	2	0
2011	28	5	11	2	0	26	39	33	27	5	1
2012	26	4	1	1	3	25	30	30	25	4	1
2013	48	4	8	1	0	30	56	36	29	5	1
2014	45	2	5	2	6	25	56	29	25	3	1
2015	31	2	1	1	0	30	32	32	29	3	0
2016	58	6	9	0	3	28	70	34	28	6	0
2017	45	1	5	0	4	26	54	27	25	2	0

Other Mortality

Other mortality due to human causes is rare for mountain goats. In one case a bullet ricochet or misplaced shot in 2016 resulted in a hunter shooting two goats. Also, in 2017 the harvest of a nanny with a kid probably resulted in the death of the kid. One other possible source of human-caused mortality that is not monitored is avalanche control in the Juneau area. In the winter of 2019, a mountain goat kid was found off the Perseverance Trail in an avalanche the day after avalanche control was conducted.

Alaska Board of Game Actions and Emergency Orders

During the 2015 Southeast BOG meeting there was a proposal accepted to increase the RG014 archery hunt area to include the south side of Blackerby Ridge.

Emergency orders (EOs) are common in mountain goat management to close hunt areas that have reached the number of points available in the annual harvest guideline. There were EOs in:

2013:
Eagle Glacier to Sawmill Creek

2014:
Eagle Glacier to Sawmill Creek
Antler Lake south to Sawmill Creek

2015:
Eagle Glacier to Sawmill Creek
Blackerby Ridge
Klutchman Mountain

2016:
Eagle Glacier to Sawmill Creek
Endicott River south to Lynn Sisters
Antler Lake South to Sawmill Creek
Blackerby
Juneau archery area
Klutchman Mountain

2017:
Eagle Glacier to Sawmill Creek
Antler Lake south to Sawmill Creek
Blackerby Ridge
Klutchman Mountain

Recommendations for Activity 2.1

The department will continue collecting mountain goat harvest information through registration permits.

3. Habitat Assessment-Enhancement

Currently, there are no projects to manage mountain goat habitat. There has been a long-term effort to map winter goat habitat throughout the Tongass National Forest, which is a project that the department and the U.S. Forest Service are collaborating on; an end date for this project has not been determined. Efforts to map summer kidding habitat for female goats are also underway, but this process is not as far along as the winter habitat work. Both mapping efforts should provide products for use at both local and regional scales in the future.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

Harvest data back to 1986 are archived on ADF&G's Wildlife Information Network database (WinfoNet). Management survey data are archived; hard copies are in the survey files in the Douglas office and the most recent surveys are archived in electronic form on the S: drive (S:\Region1Shared-DWC\Offices \Douglas\Management\Management Data\Mountain Goats).

Agreements

None.

Permitting

None.

Conclusions and Management Recommendations

Expansion of mining activity and winter and summer helicopter tourism has the potential to erode mountain goat habitat in Unit 1C. Individual projects may be small and have minimal impact to the population overall, but cumulative effects could add up over time as mining and recreation move further and further away from the main population centers. The department is not a land manager and as such our role is to recommend that land managers follow the guidelines of the North American Sheep and Goat Council (Hurley 2004) to keep regular helicopter use at least 1,000 m (3,281 ft) away from goat habitat (especially winter and kidding habitat), and consider the findings of White and Gregovich (2017) indicating that mining activity had impacts on goat habitat use out to 1,000 m (3,281 ft) from the Kensington Mine in the summer and 1,800 m in the winter.

Throughout Southeast Alaska severe winters have long-lasting impacts on mountain goat populations. During the late 1960s and early 1970s managers noticed substantial declines due to severe winters and overharvest (Ballard and Merriam 1975), but recovery in these populations was thought to have occurred by the mid-1980s. More recently, the winter of 2006-2007 caused a decline of up to 33 percent in some goat populations along eastern Lynn Canal. Since then, some populations have increased on their way to recovery while others have been stable but at lower population levels than prior to the winter declines. The department continues to keep certain areas along eastern Lynn Canal closed to hunting until those populations recover and can

again be sustainably harvested. Other areas with goat populations including the Chilkat Range, Upper Taku, and Tracy and Endicott arms seem to have stable, huntable goat populations, based on minimum counts and harvest information.

Guided hunts along the Tracy and Endicott arms are still very popular and contribute to much of the annual harvest in Unit 1C. Since the U.S. Forest Service has initiated permitting for guided hunts on Forest Service land, this has limited the number of permits and thus pressure on the goat population from harvest in this area. Currently, this seems to be working, both allowing for sustainable harvest and providing enough opportunity for both local and guided hunters.

Overall, the number of hunters increased slightly during this reporting period compared to the previous period, which is a reversal of a trend observed during the previous 2 reports (Scott 2014). Goat harvest also increased, in part due to a very successful year for hunters in RY16. Furthermore, all data indicate that goat numbers are stable or increasing slightly, including in areas along the Lynn Canal that experienced a decline during the winter of 2006-2007.

II. Project Review and RY18–RY22 Plan

Review of Management Direction

The existing management objectives appropriately direct the management of mountain goats in Unit 1C. The management direction for Unit 1C ensures that mountain goats will persist as part of the natural ecosystem and ensures continued hunting and viewing opportunities. The 6 goat points per 100 goats counted harvest strategy is allowing for sufficient harvest in Unit 1C goat management areas. The current collaboration on guide use with the U.S. Forest Service in the Tracy and Endicott Arm area is also allowing for sustainable harvest while providing opportunities for commercial guiding.

MANAGEMENT DIRECTION

GOALS

To provide for the following:

1. A sustainable harvest of mountain goats in Unit 1C.
2. The greatest opportunity to participate in hunting of mountain goats in Unit 1C.
3. The greatest opportunity for mountain goat viewing along the Juneau road system.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

The BOG has made a positive finding for customary and traditional use of mountain goats in Unit 1C and set 25–30 goats as the amount necessary for subsistence (ANS) outside the Juneau Nonsubsistence Area (5 AAC 99.025(a)(7).

Intensive Management

Not applicable.

MANAGEMENT OBJECTIVES

- Maintain goat densities so at least 30 goats per hour are seen during fall surveys.
- Use pamphlets, videos, and other educational materials to ensure a male:female harvest of at least 2:1.
- Maintain goat viewing opportunities along the Juneau road system.
- Identify discrete geographic areas and manage within these areas.
- Maintain a guideline harvest not to exceed 6 points (billy = 1 pt., nanny = 2 pt.) per 100 goats observed.
- Conduct aerial surveys at least every 3 years in areas of high harvest.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Monitor the population of mountain goats in Unit 1C.

There will be no immediate change to current data needs and methods. The department will continue minimum count aerial surveys at least every 3 years in high-use hunt areas. When the regional goat sightability model that allow for population estimation is completed department biologists will test its use first on previously completed surveys and then with future surveys. Population models will help managers better understand annual trends and control for variation in survey conditions as well as differences among observers and aircraft. Using population estimates instead of minimum counts will require an evaluation of the 6 goat points per 100 goats counted harvest quota allocation, which can be reviewed when the model is implemented.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor mountain goat harvest through registration permit.

Data Needs

The department must continue to monitor harvest through reporting on registration permits to understand the potential impact of harvest on the Unit 1C mountain goat population.

Methods

Unit 1C managers plan to continue the use of registration hunts with required reporting during the upcoming planning period. Management biologists collect harvest data when hunters report on their registration hunt. Biologists record location and date of harvest, method of take, transportation mode, and sex. These data are entered into an ADF&G's Wildlife Information Network database (WinfoNet). Harvest data are summarized by regulatory year (RY), which begins 1 July and ends June 30 (e.g., RY15 = 1 July 2015–30 June 2016).

3. Habitat Assessment-Enhancement

Unit 1C managers expect that while the habitat mapping project the department is collaborating with the U.S. Forest Service may not be complete during RY18–RY22, enough mapping data will be available within this period to provide products that will help managers evaluate impacts to goats at both local and regional scales.

There are no plans for enhancing mountain goat habitat.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Data Recording and Archiving

Species wildlife management reports and plans for mountain goats in Unit 1C will be available via the department's website (www.wildlifepublications.adfg.alaska.gov). Memos, data forms, and hard copies will be stored in the Juneau/Douglas Area Biologist files in Douglas.

Agreements

None.

Permitting

None.

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