Species Management Report and Plan ADF&G/DWC/SMR&P–2022–12

Moose Management Report and Plan, Game Management Unit 14C:

Report Period 1 July 2015–30 June 2020, and

Plan Period 1 July 2020–30 June 2025

Tim Spivey

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Alaska Department of Fish and Game Division of Wildlife Conservation

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PREPARED BY:

Tim Spivey
Regional Wildlife Biologist

APPROVED BY:

Jeff Selinger
Management Coordinator

David Battle
Area Wildlife Biologist, Unit 14C

REVIEWED BY :

Jeff Selinger
Management Coordinator

PUBLISHED BY:

Sky M. Guritz
Technical Reports Editor

Alaska Department of Fish and Game
Division of Wildlife Conservation
PO Box 115526
Juneau, AK 99811-5526

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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 the Division of Wildlife Conservation.

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Please contact the authors or the Division of Wildlife Conservation at (907) 465-4190 if you have questions about the content of this report.

Cover Photo: Bull moose during fall rutting period in Anchorage, Alaska. ©2020 ADF&G. Photo by ADF&G staff.

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Purpose of this Report

This report provides a record of survey and inventory management activities for moose (*Alces alces*) in Unit 14C for the 5 regulatory years 2015–2019 and plans for survey and inventory management activities in the following 5 regulatory years, 2020–2024. A regulatory year (RY) begins 1 July and ends 30 June (e.g., RY15 = 1 July 2015–30 June 2016). 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 more efficiently report on trends and to describe potential changes in data collection activities over the next 5 years. It replaces the moose management report of survey and inventory activities that was previously produced every 2 years.

I. RY15–RY19 Management Report

Management Area

Unit 14C is located in Southcentral Alaska and encompasses approximately 1,961 mi^2. The boundaries of Unit 14C closely approximate those of the Municipality of Anchorage (MOA). MOA is a mosaic of wildlife habitat and human development. Most of MOA is characterized by large tracts of natural lands including Chugach State Park, Chugach National Forest, the Anchorage Coastal Wildlife Refuge, and Joint Base Elmendorf-Richardson (JBER, a 131 mi^2 military base). Even the highly developed portions of MOA support wildlife in vegetated greenbelts, stream corridors and large municipal parks. Despite the amount of suitable habitat, the Unit 14C moose population is affected by habitat fragmentation, urbanization, and associated human activities. These factors have contributed to human-moose conflicts and other interactions with humans. Most human-moose conflicts are caused by encountering moose along roads, trails, or within greenbelts at close distances. Also, these conflicts are more prevalent during the spring calving season. Therefore, management of moose in Unit 14C involves a combination of population management through regulated hunting, participation in land management decisions affecting moose habitat, and responses to human-moose conflicts.

Summary of Status, Trend, Management Activities, and History of Moose in Unit 14C

Moose were uncommon in the Anchorage area before the 1940s. They increased in the late 1940s as brushy secondary growth replaced mature forests that had been cut or burned during the development of Anchorage and the Fort Richardson Military Reservation. Moose numbers increased considerably during the early 1950s, and by the late 1950s and early 1960s moose were abundant. Over the next several decades, the moose population remained relatively high, peaking in 2003. From 2003–2013, moose numbers fluctuated but remained within population objectives. However, during this reporting period (RY15–RY19), mild winters with low, early winter snowfall inhibited aerial surveys traditionally used to estimate the Unit 14C moose population.

Prime browse occurs in open-canopied, second-growth willow, birch, and aspen stands on burned-over or rehabilitated military lands. Parks, greenbelts, and residential areas in the Anchorage Bowl also contain browse. Quality riparian habitat abounds along streams and rivers, and extensive stands of subalpine willow are on south-facing slopes in most drainages.

Annual harvest has fluctuated dramatically. A record harvest of nearly 500 moose (50% females) occurred in 1965, but hunters harvested only 18 moose in 1978. Diverse harvests were often due as much to changes in seasons and bag limits as to changes in the Unit 14C moose population. Annual harvests increased steadily during the late 1980s and early 1990s but began to decline in 1992. Several new permit hunts established during the last few years have resulted in increased annual harvests. Harvest was within the harvest objective range during all 5 regulatory years (RY15–RY19) of this reporting period.

Management Direction

Existing Wildlife Management Plans

Direction for the management of Unit 14C moose was outlined in the Southcentral Alaska Wildlife Management Plan (ADF&G 1976) and has been reviewed and modified through public comments, staff recommendations, and Board of Game actions over the years. A record of these changes can be found in the division's management report series. The Project Review and RY20–RY24 Plan section of this report contains the current management plan for moose in Unit 14C.

In 2000 a wildlife plan called "Living with Wildlife in Anchorage: A Cooperative Planning Effort" was created in an attempt to outline common goals for Anchorage wildlife management (ADF&G 2000). The planning effort was initiated and led by ADF&G, and involved a team from local, state, and federal agencies with wildlife responsibilities, as well as people from various wildlife-related interest groups and members of the general public. This plan was intended to be used as a guide as Anchorage continues to be developed.

Goals

- Maintain the moose population in Unit 14C for both consumptive and nonconsumptive uses.

- Mitigate human-moose conflicts to promote public safety for Anchorage residents.

Codified Objectives

Amounts Reasonably Necessary for Subsistence Uses

None.

Intensive Management

In 2001, the Alaska Board of Game adopted a positive finding for the intensive management (IM) of moose in Unit 14C. The current intensive management objectives are as follows:

- Population objective: 1,500–1,800 moose.
- Harvest objective: 90–270 moose.

MANAGEMENT OBJECTIVES

- Maintain a population of 1,500–1,800 moose and an annual harvest of 90–270 moose.
- Maintain a posthunting season sex ratio of no fewer than 30 bulls:100 cows.
- Maintain the moose population at a level to promote public safety by reducing conflicts with Anchorage residents.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct winter moose surveys (modified Gasaway census [Gasaway et al. 1986]), supplemented by minimum counts in other drainages) to get a population estimate and composition figure.

Data Needs

Moose in Unit 14C are intensively managed. Vegetative cover in Unit 14C precludes any summer, fall, or no-snow surveys. However, winter fixed-wing aerial surveys prior to antler drop allow the opportunity to estimate the population size and sex composition. If aerial surveys are conducted after antler drop, they are primarily focused on the Twentymile River drainage in Unit 14C and the Portage and Placer River drainages in Unit 7 (typically counted at the same as the moose drawing hunt boundary covers portions of both of those rivers). Moose populations in these drainages may be susceptible to large population crashes during heavy snow winters. Furthermore, moose in these drainages may not be as likely to move out of the survey area during winter (unlike moose from many higher-elevation valleys), which allows for surveys to take place later than in some other survey areas. Minimum population count aerial surveys give wildlife managers a basic tool to monitor the population and prevent overharvest; thereby prolonging recovery of a population that may be declining (Battle and Stantorf 2018). They also allow us to issue more permits if the population starts increasing, which can minimize winterkill during heavy snow years.

Methods

Using fixed-wing aircraft (Piper Super Cub or similar aircraft), every fall we attempt to conduct minimum count sex composition surveys to develop a population estimate for moose in key areas that together cover most of Unit 14C. However, during some years inadequate snow cover or

inclement weather impedes survey activities. Composition counts summarizing the number of age/sex cohorts (i.e., adult male, adult female, male calf, and female calf) are conducted within various drainages, as well as in the Eklutna Management Area, Peters Creek Valley, Thunderbird Valley, and the front range of Chugach State Park. We also conduct a modified Gasaway census in Ship Creek Valley and on Joint Base Elmendorf-Richardson (JBER), where the survey unit is covered and then a smaller "intensive" polygon is flown with a higher number of passes to account for every single moose. The error between the initial observations and the intensive observations is factored into the overall population count; typically, this adjusts the total count higher as not all animals are observed during the initial survey coverage. Beginning in 2008, we were unable to count moose in 1 of 14 sample areas in the JBER census area due to a housing expansion on Elmendorf Air Force Base (AFB). As a result, the 138.8 mi^2 census area was modified to exclude this 6.9 mi^2. Data from each of these surveys were recorded on an "Anchorage Moose Census Form" (Appendix).

Results and Discussion

Composition counts were conducted in fall of RY16 in the Twentymile, Portage, and Placer River valleys (Table 1). During fall of 2016, 153 total moose were counted in the Twentymile-Portage-Placer-rivers area. The RY16 Twentymile River bull-to-cow ratio was 30:100, which is an increase from 23:100 in 2013. However, the calf-to-cow ratio declined from 27:100 in RY13 to 18:100 in RY16. Fluctuations in the composition counts such as these are seen regularly in the Twentymile-Placer-Portage-rivers area, which is known for substantial population declines following severe winters. Inadequate snow cover prevented completion of the remaining aerial survey areas.

Table 1. Number of moose observed during winter composition count flights in the Twentymile, Placer, and Portage River area of Units 7 and 14C, Alaska, during regulatory year 2016.

No. Bulls	No. Cows	No. Calves	Total moose	Estimated population size	Bulls per 100 cows	Calves per 100 cows
31	103	19	153	153	30	18

No moose surveys were flown in fall of RY15 and RY17–RY19 due to inadequate snow cover. While surveys were not flown during these years, anecdotal evidence (e.g., average harvest levels, few winter kills, and an average number of highway moose collisions) suggests that the moose population in the Anchorage area did not decline as drastically as has been observed during deep snow winters.

Recommendations for Activity 1.1

Continue and modify. Composition counts should continue to be conducted in Unit 14C, and different survey methods should be explored. As survey methodologies and analytical techniques continue to advance, we should continue to adapt our design in order to consistently provide reliable population estimates for Unit 14C.

Furthermore, we recommend including additional nontraditional survey techniques while also developing future studies using movement data from GPS collars deployed on moose in remote

areas of Unit 14C to elucidate whether immigration and emigration between the urban-backcountry interface exists. This information would help inform whether traditional aerial survey routes and urban genetic mark-recapture sampling of urban moose alone can provide a robust population estimate for the entirety of Unit 14C.

ACTIVITY 1.2. Estimate abundance and sex composition of Anchorage moose.

In RY16, a pilot study for what would later become the Anchorage moose count research project was initiated to estimate the abundance and sex composition of moose within the study area, which included the main part of the city of Anchorage from Potter Marsh to the north end of Muldoon Road. Annual sampling took place over a 3-day period in late February during the last 3 regulatory years (RY17–RY19) of this reporting period and will continue in RY20.

Data Needs

In addition to sex composition counts from aerial surveys (Activity 1.1), the genetics-based mark-recapture study of moose in the Anchorage Bowl will provide a better understanding of how many moose reside within Anchorage city limits. This new information, supplemented by future sex composition counts and potential research on seasonal movements of moose into the Anchorage Bowl via large greenbelts and riparian corridors along the edge of the Chugach Mountains, will provide a more comprehensive estimate of the moose population in Unit 14C.

Methods

For the Anchorage moose count project, Region II staff (ADF&G wildlife researchers, managers, and technicians) used Pneu-Dart projectors to biopsy dart moose within the Anchorage city limits during a short 3-day period in late February of each regulatory year of the study (RY17–RY20). Using a large-scale public outreach effort resulting in electronic report and phone call reports of moose sightings around the Anchorage Bowl, survey teams of 2–3 staff members were deployed to specific grid areas and responded to sightings of moose within neighborhoods, greenbelts, and along the trail systems in Anchorage. All moose were sampled with biopsy darts which collect a small tissue plug for deoxyribonucleic acid (DNA) analysis. In addition, sex composition data were collected, and sample locations were entered into the ArcGIS™ Collector App (Esri, Redlands, California) on iPads in an attempt to reduce double sampling the same individuals over the 3-day period. All biopsy samples were analyzed for genetic markers to identify individual moose and a molecular confirmation of sex. Moose age (i.e., adult or calf) was estimated visually prior to sampling with the dart projectors.

Results and Discussion

The pilot study (RY16) and first 3 years of data collection (RY17–RY19) for the Anchorage moose count occurred during RY16–RY19. The final year of samples collected (RY20) are currently being processed at the Anchorage ADF&G Gene Conservation Lab.

February 2017 (RY16): The pilot season of the Anchorage moose count project was completed during late February of 2017 (RY16). Despite several changes to the methodology, this project design proved to be a feasible way to sample moose in the Anchorage Bowl.

February 2018 (RY17): During the first year of the Anchorage moose count, a total of 143 individual moose were sampled (Table 2). Roughly half (52%) of the moose sampled were adult female moose (n = 75), with an almost even distribution of the male and female yearling calves sampled (Table 2).

February 2019 (RY18): During the second year of the Anchorage moose count, a total of 171 individual moose were sampled, with 123 new captures and 48 recaptured individuals (Table 2). More adult females were sampled (n = 56) than any other age-sex class, with a roughly even distribution of male and female calves sampled (Table 2).

February 2020 (RY19): In the third year of the Anchorage moose count, a total of 161 individual moose were sampled, with an almost even split between new individuals (n = 80) and recaptured individuals (n = 81; Table 2). All 4 age-sex classes were sampled relatively evenly, and sex was unknown for 1 moose sampled (Table 2).

Table 2. Composition of moose sampled during the Anchorage moose count during regulatory years 2017–2019, Alaska.

Regulatory year	Male adults	Female adults	Male calves	Female calves	Sex unknown	Captures	Recaptures	Total moose sampled
2017	26	75	22	20	0	143	0	143
2018	16	56	22	29	0	123	48	171
2019	20	21	16	22	1	80	81	161
Total	62	152	60	71	1	346	129	475

Recommendations for Activity 1.2

Continue and modify to include additional nontraditional (i.e., biopsy darting) survey techniques to estimate moose populations in areas where aerial surveys are not possible. Research and management biologists in Region II successfully developed and executed a methodology for estimating the population size and sex composition of moose within the Anchorage Bowl. Final results from this new technique will reveal the utility of combining visual census and genetic based mark-recapture methods for specific areas. However, the practicality of how often to deploy this survey technique, on an annual basis or every 4–5 years, has yet to be determined.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor harvest and mortality in Unit 14C annually.

Data Needs

Monitoring harvest data provides management biologists with a rough index of population status and a method to determine where the level of harvest falls in relation to Unit 14C moose management objectives, including the Unit 14C intensive management (IM) harvest objective.

Methods

We monitored moose hunter harvest through hunt permit reports entered into ADF&G's Wildlife Information Network (WinfoNet) database. Nonhunting mortality (vehicle, railroad strikes, and defense of life or property kills) was monitored using department reporting requirements in concert with records from Alaska Department of Public Safety and the Alaska Railroad.

Seasons and Bag Limits

Seasons and bag limits were consistent during RY15–RY18 (Table 3). For all hunts slated to begin the "Day after Labor Day", start dates were converted by the Board of Game to 1 September during regulatory year 2018 and implemented in regulatory year 2019 (Table 3).

Table 3. Season dates and bag limits for moose in Unit 14C from regulatory years 2015–2018, Alaska.

Area (permit no.)	Season date	Bag limit
Twentymile/Portage and Placer Valley (DM210)	20 August–30 September	1 Bull moose
Twentymile/Portage and Placer Valley (DM211)	20 August–10 October	1 Antlerless moose
JBER[1] (DM421, DM422, DM423, DM426, DM427)	Day after Labor Day[2]–31 March	1 Either sex
JBER[1] (DM424)	Day after Labor Day[2]–15 November	1 Bull moose
JBER[1] (DM427)	15 December–15 January	1 Either sex
JBER[1] (DM428)	Day after Labor Day[2]–30 September	1 Bull moose
JBER[1] (DM430)	15 October–15 November	1 Bull moose
Knik River and Hunter Creek (DM441)	Day after Labor Day[2]–20 October	1 Antlerless moose
Peters and Little Peters Creek (DM443)	No Open Season	1 Antlerless moose
Edmonds and Mirror Lake (DM444)	20 October–15 November	1 Bull moose
Upper Ship Creek (DM446 and DM447)	Day after Labor Day[2]–30 September	1 Bull moose
Birchwood Management Area (DM448)	Day after Labor Day[2]–30 September	1 Bull moose
Anchorage Management Area (DM466)	1 November–30 November	1 Antlerless moose

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Area (permit no.)	Season date	Bag limit
Ship Creek Drainage above JBER[1] Management Area (RM435)	25 October–30 November	1 Bull moose
Eklutna Lake Management Area (RM445)	Day after Labor Day[2]–20 October	1 Bull moose
General season (GM000)	Day after Labor Day[2]–30 September	1 Bull moose with spike-fork or 50" antlers or 3+ brow tines on one side

[1] Joint Base Elmendorf-Richardson
[2] All moose hunts with "Day after Labor Day" start dates were converted to 1 September during regulatory year 2018 and implemented in regulatory year 2019.

Results and Discussion

Harvest by Hunters

During RY15–RY19, hunters harvested an average of 125 moose each year in Unit 14C, with the total yearly harvest falling within the IM harvest objective during all 5 years of the reporting period (RY15–RY19; Table 4, Fig. 1). The yearly moose harvest remained stable across this reporting period (Range 115–138; Table 4).

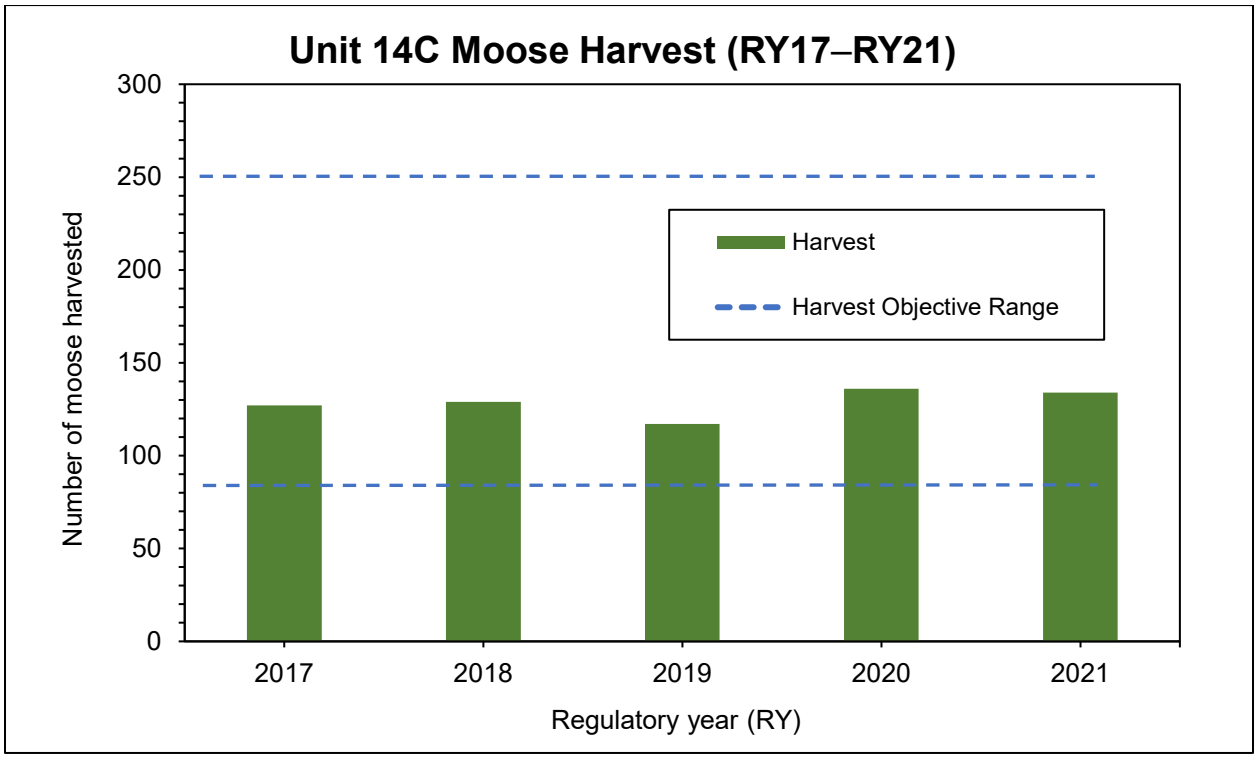

Figure 1. Estimated moose harvest in Unit 14C in comparison to the intensive management harvest objective, Alaska, regulatory years 2015–2019.

Table 4. Harvest and hunter participation for moose drawing and general season hunts in Unit 14C, regulatory years 2015–2019, Alaska.

Area	Hunt number	Regulatory year	Permits/tags issued	No. of hunters	Percent success	No. bulls (%)	No. cows (%)	Total harvest[a]
Twentymile, Portage, and Placer river valleys	DM210, DM211	2015	60	47	40	11 (58)	8 (42)	19
		2016	60	50	50	13 (52)	12 (48)	25
		2017	60	44	50	16 (73)	6 (27)	22
		2018	61	44	43	13 (68)	6 (32)	19
		2019	60	51	45	13 (57)	10 (43)	23
Joint Base Elmendorf-Richardson	DM421, DM422, DM423, DM424, DM426, DM427, DM428, DM430	2015	150	115	36	27 (66)	14 (34)	41
		2016	122	101	48	39 (81)	9 (19)	48
		2017	121	98	45	27 (61)	17 (39)	44
		2018	121	104	53	42 (76)	13 (24)	55
		2019	121	93	41	27 (71)	11 (29)	38
Knik River and Hunter Creek	DM441	2015	5	4	50	0 (0)	2 (100)	2
		2016	5	4	75	0 (0)	3 (100)	3
		2017	5	4	75	0 (0)	3 (100)	3
		2018	5	3	0	0 (0)	0 (0)	0
		2019	5	5	60	0 (0)	3 (100)	3
Peters and Little Peters creeks	DM443	2015	5	5	20	0 (0)	1 (100)	1
		2016	5	4	25	0 (0)	1 (100)	1
		2017	5	2	0	0 (0)	0 (0)	0
		2018	5	3	0	0 (0)	0 (0)	0
		2019	5	3	33	0 (0)	1 (100)	1
Edmonds and Mirror Lake parks	DM444	2015	2	1	0	0 (0)	0 (0)	0
		2016	2	1	0	0 (0)	0 (0)	0
		2017	2	1	0	0 (0)	0 (0)	0
		2018	2	2	0	0 (0)	0 (0)	0
		2019	2	2	50	1 (100)	0 (0)	1

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Area	Hunt number	Regulatory year	Permits/tags issued	No. of hunters	Percent success	No. bulls (%)	No. cows (%)	Total harvest[a]
Ship Creek drainage above Joint Base Elmendorf-Richardson	DM446, DM447, RM435	2015	120	70	29	20 (100)	0 (0)	20
		2016	120	83	18	15 (100)	0 (0)	15
		2017	120	76	17	13 (100)	0 (0)	13
		2018	120	83	19	16 (100)	0 (0)	16
		2019	120	70	23	16 (100)	0 (0)	16
Birchwood Management Area	DM448	2015	3	2	0	0 (0)	0 (0)	0
		2016	3	2	33	1 (100)	0 (0)	1
		2017	3	2	0	0 (0)	0 (0)	0
		2018	3	1	0	0 (0)	0 (0)	0
		2019	3	1	0	0 (0)	0 (0)	0
Anchorage Management Area	DM666	2015	12	9	78	1 (14)	6 (86)	7
		2016	13	9	78	0 (0)	7 (100)	7
		2017	13	11	82	1 (11)	8 (89)	9
		2018	13	10	90	0 (0)	9 (100)	9
		2019	13	9	67	2 (33)	4 (67)	6
Eklutna Management Area	RM445	2015	321	191	1	2 (100)	0 (0)	2
		2016	195	80	10	8 (100)	0 (0)	8
		2017	264	164	2	3 (100)	0 (0)	3
		2018	238	118	5	6 (100)	0 (0)	6
		2019	280	139	4	6 (100)	0 (0)	6
General season	GM000	2015	145	145	16	23 (100)	0 (0)	23
		2016	157	157	19	30 (100)	0 (0)	30
		2017	172	172	19	33 (100)	0 (0)	33
		2018	143	143	17	24 (100)	0 (0)	24
		2019	153	153	15	23 (100)	0 (0)	23

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Area	Hunt number	Regulatory year	Permits/tags issued	No. of hunters	Percent success	No. bulls (%)	No. cows (%)	Total harvest[a]
All areas combined	All hunts combined	2015	823	589	20	84 (73)	31 (27)	115
		2016	682	491	28	106 (77)	32 (23)	138
		2017	765	574	22	93 (73)	34 (27)	127
		2018	711	511	25	101 (78)	28 (22)	129
		2019	762	526	22	88 (75)	29 (25)	117

[a] Total does not include moose of unknown sex.

General Season

The general moose season included the remainder of Unit 14C and the Chugach State Park Management Area, excluding the Ship Creek drainage. During RY15–RY19, an average of 27 moose were taken annually with an average success rate of 17% (Table 4). Nonresident hunters made up 7% of the total number of hunters annually and were responsible for 17% of the annual harvest during the general season hunt. On average, 154 hunters participated in the Unit 14C general season hunt annually (Table 4). The Unit 14C general season provides restrictions for the harvest of bull moose, and by regulation, the harvest of bulls is legal if the bull has 1 antler on either side that is a spike (1 point) or a fork (2 points), 50-inch antlers, or antlers with 3 or more brow tines on at least 1 side.

Permit Hunts

From RY15–RY19 within Unit 14C, there were 17 drawing permit hunts, 2 registration permit hunts, and a general season hunt for moose (Tables 3 and 4, Fig. 2.) The number of permits available for drawing hunts in Unit 14C was adjusted annually in response to survey numbers,

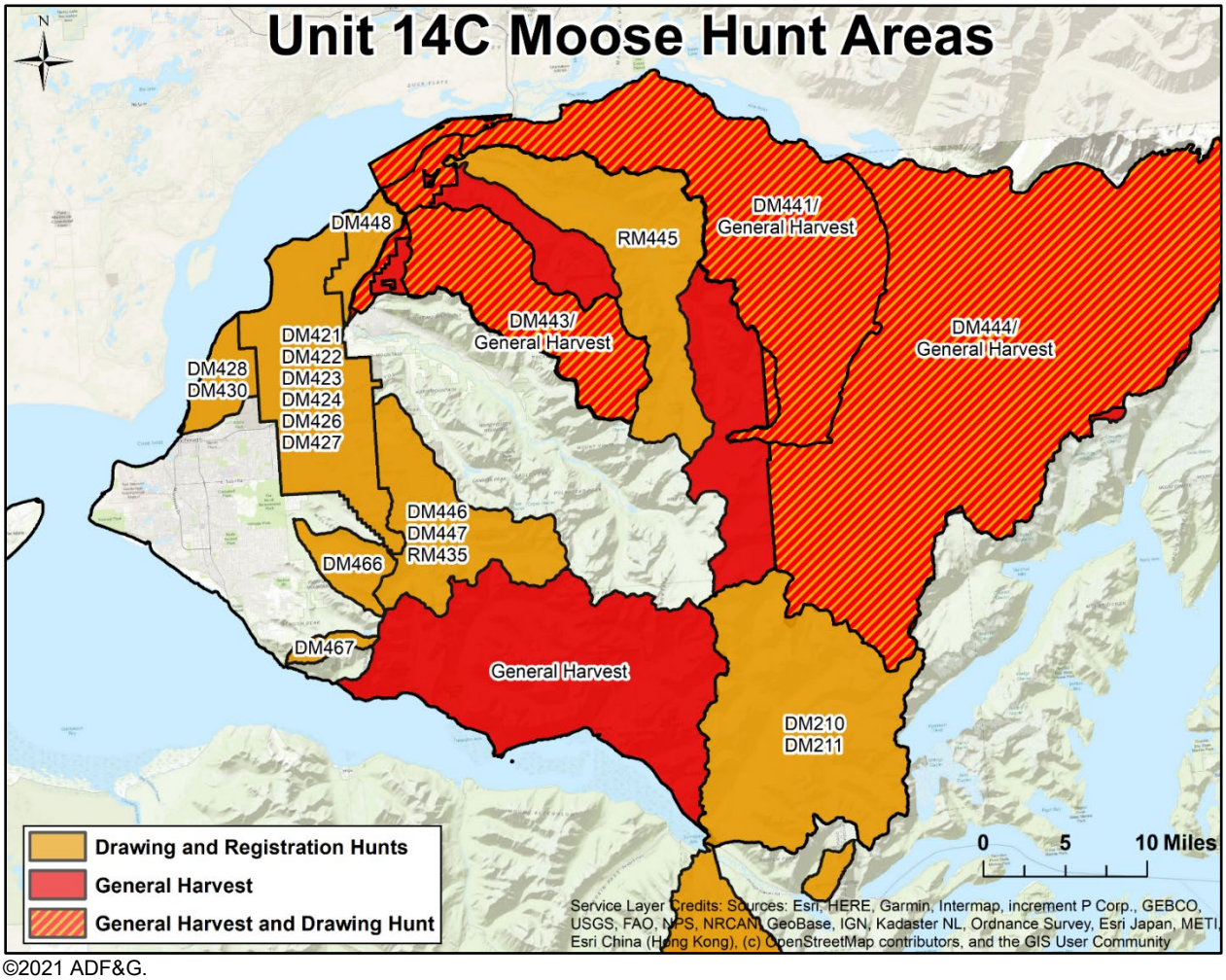

Figure 2. Drawing, registration, and general harvest moose hunts within Unit 14C, Alaska, for regulatory years 2015–2019.

harvest, and environmental factors (Table 4). An average of 595 permits (registration and drawing, Fig. 2) were issued per year, with the lowest number of permits issued (525 permits) in RY16. Due to a lack of conditions required to conduct viable aerial surveys on JBER, the number of permits available for the drawing hunts were reduced from 150 in RY15 to between 121 and 122 each year during RY16–RY19, adopting a more conservative harvest strategy in the absence of annual aerial survey data (Table 4). Otherwise, the number of permits issued remained stable for most Unit 14C hunts during RY15–RY19, with the other exception being the RM445 moose hunt in the Eklutna Lake Management Area, which fluctuated each year during RY15–RY19 based on hunter participation (Table 4, Fig. 2).

Hunter Residency and Success

During RY15–RY19, Alaska resident hunters comprised 95% of the total moose hunters, and hunters harvested an annual average of 125 moose in Unit 14C (Table 5). Total hunter success averaged 23% for all moose hunts. Hunter participation averaged 538 hunters with the highest number of individual hunters seen in RY15 at 589 hunters (Table 5). While hunter participation declined from the prior reporting period (RY10–RY14), hunter success increased slightly.

Residents of Unit 14C (i.e., local residents) made up a majority of the successful hunters (64%) during RY15–RY19, with nonresidents accounting for 10% of the successful hunters (Table 5). On average, only 26 nonresidents hunted in Unit 14C annually.

Other Mortality

Natural mortality was low in the Anchorage area from the mid-1950s to the late 1980s because of moderate annual snowpack and relatively low numbers of predators. Moose die every year from starvation-related causes due to 1) greater than average snowpacks in some years that cover potential browse and require a greater expenditure of energy, and 2) over-browsing in previous winters. In recent years, 4–5 packs of wolves have occupied Unit 14C. In addition, both black and brown bears typically kill moose calves in summer, particularly before the salmon return to local creeks.

Moose killed by vehicles and trains accounted for a large percentage of known, human-caused mortality during RY15–RY19. During RY15–RY19, reported nonhunting mortality averaged 106 moose per year, with the largest number of nonhunting mortalities reported in RY18, at 124 moose (Table 6). In RY18, there were 111 moose killed by vehicles and 4 killed under defense of life or property (DLP) circumstances. These are conservative numbers because not all collisions are reported, and some moose die from injuries but are never found.

An estimated 10–20 additional moose die from unknown causes each year and most of these deaths occur during winter. While many of these animals are not necropsied and a concrete cause of death cannot be determined, it is suspected that some of these deaths are due to the ingestion of highly toxic ornamental plants (which were found in the general vicinity). In previous years, at least 4 (all calves) died from cyanide gas produced during the digestion of what appeared to be Mayday tree (*Prunus padus*) or chokecherry tree (*Prunus virginianus*; K. Beckmen, ADF&G Wildlife Veterinarian, DVM, personal communication). Thousands of Mayday and chokecherry trees have been planted as ornamentals in Anchorage. In some parts of the municipality, these plants have become invasive, replacing natural woody vegetation in riparian areas. Other moose

Table 5. Hunter residency for all Unit 14C, Alaska moose hunts, regulatory years 2015–2019.

	Successful				Unsuccessful					
Regulatory year	Local resident[a]	Nonlocal resident[b]	Nonresident	Total (%)	Local[a] resident	Nonlocal resident[b]	Nonresident	Total (%)	Unknown residency	Total hunters
2015	75	29	11	115 (20)	302	154	17	473 (80)	1	589
2016	88	40	10	138 (28)	259	85	9	353 (72)	0	491
2017	78	36	13	127 (22)	292	136	18	446 (78)	1	574
2018	90	28	11	129 (25)	248	121	12	381 (75)	1	511
2019	68	33	16	117 (22)	250	148	11	410 (78)	0	526
Total	399	166	61	626 (23)	1,351	644	67	2,063 (77)	3	2,691

[a] A local resident resides in Unit 14C.
[b] Alaska resident that resides outside of Unit 14C.

Table 6. Reported nonhunting moose deaths in Unit 14C, Alaska, regulatory years 2015–2019.

Regulatory year	DLP[a]	Vehicle	Train	Total
2015	0	85	1	86
2016	1	105	10	116
2017	2	101	5	108
2018	4	111	9	124
2019	3	87	6	96
Total	10	489	31	530

[a] Defense of life or property.

in Anchorage have browsed ornamental evergreens and were found dead hours or a few days later. Evergreens such as Japanese yew (*Taxus* spp.) are known to be highly toxic to herbivores and at least 1 necropsied calf was confirmed to have died from the ingestion of Japanese yew. However, the number of potentially toxic ornamental plants available to moose in Anchorage is unknown.

Alaska Board of Game Actions and Emergency Orders

The Board of Game (BOG) reauthorized all antlerless moose hunts in Unit 14C and the Unit 7 portion of the DM210 and DM211 drawing permit hunt areas in every year of RY15–RY19.

2015–2017: No BOG action.

2018: At the March 2019 BOG meeting, the board modified the opening date of all hunts in Unit 14C that were set to start "the day after Labor Day" to open on 1 September.

2019: No BOG action.

Recommendations for Activity 2.1

We recommend continuing harvest and mortality monitoring.

3. Habitat Assessment-Enhancement

No habitat assessment or enhancement projects for moose were conducted by ADF&G in Unit 14C during this reporting period. However, on JBER lands habitat enhancement specifically for moose does occur via hydro-axing, selective harvest, and controlled burns. Joint Base Elmendorf–Richardson currently has a 10-year plan for moose habitat enhancement and may use any of the aforementioned methods to enhance different plots each year (U.S. Air Force 2021). During RY15–RY19, JBER moved away from solely relying on hydro-axing, began working with staff from the University of Alaska Anchorage (UAA), and developed a data-driven model to help determine which habitat can be enhanced for moose.

Extensive habitat enhancement on state and municipal lands has not occurred and is not economically feasible because burning, the most cost-effective method, is difficult to do safely in a densely populated area. The Chugach National Forest has reclaimed some areas denuded of vegetation with small willow plantings, usually in conjunction with fish habitat projects (Jessica Ilse, Wildlife Biologist, U.S. Forest Service, personal communication). Limited habitat enhancement projects (previously via hydro-axing and now also by selective harvest or controlled burns) have also taken place on JBER lands. Winter habitat has decreased and will inevitably continue to decrease over time in the Anchorage area, as will the number of moose that overwinter in the Anchorage Bowl.

Large tracts of subalpine and riparian habitat are protected throughout the 500,000-acre Chugach State Park, as well as Chugach National Forest lands between Girdwood and Portage. There are several thousand acres of lowland habitat on military lands between lower Ship Creek and Eagle River. Extensive urbanization has reduced winter range on portions of the military reservation and on private lands throughout the unit. Several new roads and road expansion projects bisect

natural areas and may result in increased moose-vehicle collisions. Fences are another growing problem for moose in that they hamper movements and often separate calves from cows.

As several lines of evidence suggest that the moose population in Unit 14C is near carrying capacity, basic habitat assessments are recommended to provide qualitative and quantitative information on habitat use and available forage quality. However, because habitat enhancement is problematic in Unit 14C due to equipment access, land status, and proximity to urban developments, habitat enhancement is not being conducted at this time.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

Moose-vehicle collisions in Unit 14C remain a significant problem. Development of new roads and expansion of existing roadways continues to reduce and fragment important moose habitat, increasing the likelihood of moose-vehicle collisions. Management and research staff wildlife biologists need to be involved early in the planning phase prior to implementation of roads and long fences within the unit. Current information on moose distribution and movement corridors will continue to aid in future decision making related to human development throughout Unit 14C.

As a result of moose living and breeding in the greater Anchorage Bowl, every spring we receive numerous calls regarding moose calves, particularly those thought to be alone and orphaned. In recent years, several organizations have been permitted to raise and release orphan calves back onto the landscape. Since the last reporting period, management biologists have developed a more comprehensive orphan moose calf protocol which has positively affected the decision-making process for staff involved in responding to lone calf reports. However, despite improvements in the overall process of determining whether a calf is truly orphaned and in good condition to bring to a facility, further refinement can be made to the permitting process of organizations interested in raising and releasing orphaned moose calves back into the wild.

Continue trail planning work with the Anchorage Parks and Recreation department and local trail advocate groups to work towards minimizing human-moose conflicts on singletrack and other bike trails throughout Unit 14C. Over recent years, the demand for more bike and singletrack trails has grown, mainly through development of new trails throughout various municipal parks. As green spaces become more saturated with trails, moose will have less escape terrain and the likelihood of human-moose encounters will increase. This activity can be particularly risky during the spring calving season.

To some people, moose may be considered residential pests in Unit 14C. Moose can cause considerable damage to ornamental plants, vegetable gardens, and fruit trees. Furthermore, during the winter when moose are nutritionally stressed, some residents feed local moose, despite the regulation prohibiting feeding of game (5 AAC 92.230). Management biologists spend a considerable amount of time educating the public about the consequences of feeding moose and the end result when a handout is not immediately forthcoming. These food-conditioned moose can be unusually aggressive toward people. Consequently, with moose frequenting neighborhoods throughout the city, public safety and especially the safety of children is a top concern. Despite ADF&G outreach campaigns through social media, news interviews with ADF&G staff, and Nextdoor© (San Francisco, CA) posts about the danger of cow moose

during spring calving season (late May through mid-June), each spring people are injured by cow moose aggressively defending their calves. Continuing to warn and educate the public on moose behavior and how to stay safe around moose, especially during the spring calving season, will help reduce conflicts and increase the public awareness and tolerance of moose in Unit 14C (Whittaker et al. 2001).

Continue discussions with the municipality and with concerned user groups regarding limited moose hunting opportunities in city parks at a future date.

DWC wildlife management staff in collaboration with DWC wildlife educators have developed the "Living With Moose" web page (ADF&G [n.d.]a), brochures, classroom presentations, moose safety presentations and videos, and other informational and educational activities to promote safe activities compatible with moose conservation and public safety. Fortunately, many Anchorage residents are proficient at living in moose country, yet there are always new people moving to the area, and new approaches for targeting a larger audience with moose safety messages should be identified, to better reach the public.

Anchorage staff have historically entered reports of wildlife conflicts on datasheets, which were only intermittently entered into a database. During RY15–RY19, a statewide wildlife conflict database was implemented, allowing for much better tracking of wildlife conflicts. This system should be continued and improved. One improvement would be to modify the system so that maps could automatically be generated based on parameters entered by staff. So far, staff have been exporting data into ArcGIS and producing custom maps when needed, but real time mapping of this information would allow human-moose conflict "hot spots" to be identified on a more frequent basis and help focus the limited department resources on moose education and conflict management in specific areas where encounters occur more often.

Data Recording and Archiving

- Moose survey form (Appendix).

- Management moose capture datasheets are stored in the Anchorage ADF&G building in office 2004. Digital copies of datasheets and a Microsoft Access database containing management capture data are found in: O:\DWC\Research\AnchManagement_CaptureDatabase.

- Reports of moose (and other wildlife) conflicts are recorded and stored in the Wildlife Encounter database (ADF&G [n.d.]b). Members of the public can enter reports on the ADF&G website and staff enter reports and record actions taken using the staff entry form on our intranet.

- Digital copies of all moose survey memoranda are stored at the following location on the Region II network drive: O:\DWC\common\Anch_Wildlife_Management\BGDIF\Moose\Surveys.

- Moose harvest reports for all 14C hunts are stored in the WinfoNet database.

Agreements

None.

Permitting

Animal Care and Use Committee (ACUC) Protocol No. 0049-2020-33.

Conclusions and Management Recommendations

The annual harvest objective was met for all 5 regulatory years (RY15–RY19) of this reporting period. Furthermore, the harvest objective of 90–270 moose was not exceeded even when combining both harvest and nonhunting mortality events (vehicle, train, and DLP kills), across all 5 regulatory years (Tables 4 and 6). Consequently, harvest must be carefully managed because of the large amount of additional nonhunting mortality that occurs each year around Anchorage and other Unit 14C communities. Additionally, we recommend continuation of the collection of age data of harvested moose. This is important in evaluating the type of moose harvest that is occurring in Unit 14C, and the impacts of that harvest on the moose population.

Despite relatively stable annual harvest and nonhunting mortality levels, valuable vital rate and movement information of moose from more remote portions of Unit 14C is lacking. Nonetheless, future studies involving movement data from collared individuals may provide evidence of immigration and emigration between the urban-wilderness interface, thereby representing a mechanism to supplement areas with lower moose abundance. However, in the absence of these data, and without being able to survey the entirety of Unit 14C using one method, development of a rigorous population estimation technique that could be completed in most years (assuming monetary and weather conditions are conducive) is critical for future management of the Unit 14C moose population. Fortunately, historical aerial survey data provides a baseline to be expanded upon using additional nontraditional survey techniques (i.e., genetic mark-recapture). Ultimately, we hope to consistently provide a more robust estimate of the moose population and sex composition in Unit 14C that may be less affected by changing weather patterns. For example, in 2016 a separate pilot study (outside of the scope of this report) was initiated by ADF&G Region II research staff to estimate the abundance and sex composition of moose within the Anchorage Bowl of Unit 14C. Preliminary Lincoln-Peterson estimates from that study using the first 2 years of data (RY17 and RY18) indicate that roughly 350 moose are present in the Anchorage Bowl (David Saalfeld, ADF&G Wildlife Biologist, unpublished data). While this study did not include DNA sampling of moose from the entirety of Unit 14C, it revealed that many of the moose present during a given winter in Anchorage likely remain within the Anchorage Bowl from year to year (David Saalfeld, ADF&G Wildlife Biologist, unpublished data).

Moose are adversely affected by snow depths of 70–90 cm (28–36 inches), which can impede movement, and depths greater than 90 cm which restrict movement to the extent that adequate food intake may be unattainable (Coady 1974). Mean snow depths in the Anchorage area lowlands are not normally challenging to wintering moose. However, the potential for severe winters provides a mechanism for moose to exacerbate over-browsing, which could result in substantial losses of moose in subsequent years. Furthermore, as trail use and public interest in

creation of new trails continues to increase within MOA, new development will likely decrease the available habitat for moose in Unit 14C. If upward trends in deep-snow winters and development of currently available moose habitat continues, future modifications to harvest and population objectives may be required.

Lastly, education and enforcement of state wildlife regulations are critical steps toward achieving the goal of reducing human-moose conflicts in Unit 14C. We recommend that ADF&G continue to educate the public about moose safety, particularly during the end of winter when moose are nutritionally stressed, and during the spring calving season when cow moose are extremely protective of newborn calves. We also recommend that ADF&G and Alaska Wildlife Troopers (AWT), as well as other enforcement agencies like Anchorage Police Department, JBER Conservation Enforcement, and Chugach State Park continue collaborative efforts focused on the goal of minimizing the number of human-moose conflicts in Unit 14C.

II. Project Review and RY20–RY24 Plan

Review of Management Direction

MANAGEMENT DIRECTION

There are no changes to the management direction for moose in Unit 14C.

GOALS

- Maintain the moose population in Unit 14C for consumptive and nonconsumptive uses.
- Mitigate human-moose conflicts to promote public safety for Anchorage residents.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

None.

Intensive Management

In 2001, the Alaska Board of Game adopted a positive finding for the intensive management (IM) of moose in Unit 14C. The current intensive management objectives are as follows:

- Population objective: 1,500–1,800 moose.
- Harvest objective: 90–270 moose.

MANAGEMENT OBJECTIVES

The management objectives have been to:

- Maintain a population of 1,500–1,800 moose and an annual harvest of 90–270 moose.
- Maintain a post-hunting season sex ratio of no fewer than 30 bulls:100 cows.
- Maintain the moose population at a level to promote public safety by reducing conflicts with Anchorage residents.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Conduct winter moose surveys (modified Gasaway census [Gasaway et al. 1986]), minimum counts, and genetic mark-recapture sampling to get a population estimate and composition figure.

Data Needs

A more robust population estimate with confidence intervals is needed, which would include all areas of Unit 14C that are open to harvest. Furthermore, despite traditional aerial surveys of JBER, the front range drainages, and the Twentymile, Portage, and Placer river valleys, abundance and sex composition data of moose from more remote locations of Unit 14C is lacking.

Methods

Application of the methods in use during RY15–RY19 should be continued.

ACTIVITY 1.2. Estimate abundance and sex composition of moose in the Anchorage Bowl.

Data Needs

A technique is required that will provide an estimate of moose numbers in those areas of Unit 14C in which aerial surveys cannot be conducted; a large portion of Unit 14C lies within the Anchorage urban area and the FAA Class C veil of the Ted Stevens Anchorage International Airport. Furthermore, portions of Eagle River, Eklutna, and Girdwood might be more reliably surveyed through ground-based genetic mark-recapture sampling due to the number of homes, roads, and fences subdividing the available winter moose habitat and making it harder to count moose from the air.

Methods

The ground-based technique, combining a visual census with genetic information collected from biopsy samples (including genetic samples from road killed and hunter harvested moose) has proven to be a reliable method for estimating both gender composition and abundance of moose

from road-accessible locations. Application of this survey technique in combination with modified Gasaway census techniques and minimum counts should provide a more robust estimate of the Unit 14C moose population.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor harvest and mortality in Unit 14C annually.

Data Needs

No change from RY15–RY19 reporting period.

Methods

No change from RY15–RY19 reporting period.

3. Habitat Assessment-Enhancement

No change from RY15–RY19 reporting period. There are currently no habitat assessment or enhancement activities planned for Unit 14C by ADF&G. However, on JBER lands, habitat enhancement specifically for moose is planned to occur via hydro-axing, selective harvest, and controlled burns. Joint Base Elmendorf-Richardson currently has a 10-year plan for moose habitat enhancement and may use any of the aforementioned methods to enhance different plots each year (U.S. Air Force 2021). JBER will continue working with staff from the University of Alaska Anchorage (UAA) using a data-driven model to help determine which habitat can be enhanced for moose. Extensive habitat enhancement on state and municipal lands is not economically feasible because burning, the most cost-effective method, is difficult to do safely in a densely populated area.

Large tracts of subalpine and riparian habitat are protected throughout the 500,000-acre Chugach State Park, as well as Chugach National Forest lands between Girdwood and Portage. There are several thousand acres of lowland habitat on military lands between lower Ship Creek and Eagle River. Extensive urbanization has reduced winter range on portions of the military reservation and on private lands throughout the unit. Several new roads and road expansion projects bisect natural areas and may result in increased moose-vehicle collisions. Fences are another growing problem for moose in that they hamper movements and often separate calves from cows.

While the work on JBER provides information on the available habitat on the installation, it is not necessarily a representation of the current status of moose habitat in the rest of Unit 14C. Habitat survey plots in different areas of Unit 14C could provide a better basic understanding of the current moose habitat quality and quantity within Unit 14C.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

No change from RY15–RY19 reporting period.

Data Recording and Archiving

- Moose Survey Form (Appendix).
- Management moose capture datasheets will be stored at the ADF&G Region II headquarters office in Anchorage, office number 2004. Digital copies of datasheets and a Microsoft Access database containing management capture data are stored at the following location: O:\DWC\Research\AnchManagement_CaptureDatabase.
- Reports of moose (and other wildlife) conflicts are recorded and stored in the Wildlife Encounter database (ADF&G [n.d.]b). Members of the public can enter reports on our website and staff enter reports and record actions taken using the staff entry form on our intranet.
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- Moose harvest reports for all 14C hunts are stored in the WinfoNet database.

Agreements

None.

Permitting

None.

References Cited

Alaska Department of Fish and Game. [n.d.]a. Living with moose [web page]. Division of Wildlife Conservation, Juneau. https://www.adfg.alaska.gov/index.cfm?adfg=livewith.moose (Accessed 21 March 2022)

Alaska Department of Fish and Game. [n.d.]b. Report wildlife encounters: Please let us know about human-wildlife conflicts, or injured, aggressive or orphaned animals [web page]. Division of Wildlife Conservation, Juneau. https://www.adfg.alaska.gov/index.cfm?adfg=reportwildlifeencounter.main (Accessed 21 March 2022)

Alaska Department of Fish and Game. 1976. Alaska wildlife management plans: Southcentral Alaska. Draft proposal subsequently approved by the Alaska Board of Game. Division of Game, Federal Aid in Wildlife Restoration Project W-17-R, Juneau.

Alaska Department of Fish and Game. 2000. Living with wildlife in Anchorage: A cooperative planning effort [web page]. Division of Wildlife Conservation, Anchorage. http://www.adfg.alaska.gov/index.cfm?adfg=anchoragewildlifeplanning.main (Accessed 21 March 2022)

Battle, D., and C. Stantorf. 2018. Moose management report and plan, Game Management Unit 14C: Report period: 1 July 2010–30 June 2015, and plan period 1 July 2015–30 June 2020. Alaska Department of Fish and Game, Species Management Report ADF&G/DWC/SMR&P-2018-6, Juneau.

Coady, J. W. 1974. Influence of snow on behavior of moose. [*In*] Bedard, J., editor. Alces: Moose ecology. Proceedings of the International Symposium on Moose Ecology, 26–28 March 1973, Quebec City, Canada. Naturaliste Canadien 101(1-2):417–436.

Gasaway, W. C., S. D. DuBois, D. J. Reed, and S. J. Harbo. 1986. Estimating moose population parameters from aerial surveys. Institute of Arctic Biology, Biological Papers of the University of Alaska, No. 22, Fairbanks.

U.S. Air Force. 2021. Winter Moose Browse Utilization Inventory and Management. Field Summary Report. Alaska. Contract number W911KB-19-2-001, task order 2502. 673d Civil Engineer Group, Joint Base Elmendorf-Richardson, Alaska.

Whittaker, D., M. J. Manfredo, P. J. Fix, R. Sinnott, S. Miller, and J. J. Vaske. 2001. Understanding beliefs and attitudes about an urban wildlife hunt near Anchorage, Alaska. Wildlife Society Bulletin 29(4):1114–1124.

Appendix. Anchorage Moose Census Form.

MOOSE CENSUS FORM

Pg.__of__
SU#_____ Strata_____
SU size_____ Date_____
Pilot_____
Observer_____
Acft type_____ Temp °F_____
GMU:_____ Location_____

TYPE OF SEARCH
___Standard (approx. 4-6 min/mi²)
___Intensive (approx. 12 min/mi²)

TIME SPENT SEARCHING

	STD.	INT.
Stop @	_____	_____
Start @	_____	_____
Elapsed:	_____	_____ min.

CHECK CONDITIONS THAT MAY HAVE AFFECTED THE QUALITY OF THE DATA:
__Inadequate search effort __ Inadequate snow cover __ Poor Light __Low clouds or fog
__ Windy / turbulent __ Improper aircraft __ Observer airsick __ Poor visibility / snow on trees
__ Uncooperative pilot __ Inexperienced pilot __ Inexperienced observer __ Movement in/out of adjacent SV
__ Classification errors __movement in/out of intensive search area __ Too many moose in intensive search area (>15)
__ Other (explain):

SURVEY RATING
A. Excellent
B. Good
C. Fair
D. Poor

SNOW AGE
1. Fresh
2. <1 week
3. >1 week

SNOW COVER
1. Complete
2. Some low veg showing
3. Bare ground showing

LIGHT TYPE
1. Bright
2. Flat

LIGHT INTENSITY
1. High 3. Low
2. Medium

PREDOMINANT HABITAT TYPE IN THE SAMPLE UNIT (circle one):
1. OPEN lower elevation, predom. shrub, riparian or wetland
2. MIXED OPEN FOREST with some shrub understory
3. DENSE SPRUCE FOREST with little shrub understory
4. DENSE DECIDUOUS FOREST birch, aspen, etc. – few shrubs
5. SUBALPINE SHRUB
6. BURN

Ref. nos.	≤30" YRLG	31-49" BULLS MED.	≥50" LRG.	Cow W/O	COWS Cow W/1	Cow W/2	Lone Calf	Unkn	Total Moose	in SCF Plot?	REMARKS
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											

ADDITIONAL LINES ON BACK OF PAGE IF NEEDED

SURVEY SUMMARY (Do not add calves to cows in column totals):

1-13											SCF Plot Summary:
14-42											# Moose reg. search _____
Total											# Moose int. search _____


ALASKA
DEPARTMENT OF FISH AND GAME