Muskox Management Report and Plan, Game Management Unit 18

Report Period 1 July 2014–30 June 2019, and

Plan Period 1 July 2019–30 June 2024

Patrick Jones

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Alaska Department of Fish and Game Division of Wildlife Conservation

Muskox Management Report and Plan, Game Management Unit 18:

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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 Phillip Perry, Region V Management Coordinator for the Division of Wildlife Conservation.

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Cover Photo: Muskox (*Ovibos moschatus*) on the Yukon-Kuskokwim Delta ©2020 ADF&G. Photo by Patrick W. Jones.

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Purpose of this Report

This report provides a record of survey and inventory management activities for muskox (*Ovibos moschatus*) in Unit 18 for the 5 regulatory years 2014–2018 and plans for survey and inventory management activities in the next 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 report more efficiently on trends and to describe potential changes in data collection activities over the next 5 years. It replaces the muskox management report of survey and inventory activities that was previously produced every 2 years.

I. RY14–RY18 Management Report

Management Area

Unit 18 is 40,541 mi^2 in area and includes the Yukon-Kuskokwim Delta, and Nunivak and Nelson islands. The Yukon and Kuskokwim rivers roughly divide the unit into thirds. The middle third between the rivers is largely flat, wet, and dotted with many lakes. The portion north of the Yukon River and the portion south and east of the Kuskokwim River are mostly upland to mountainous, and some extensive areas with trees exist near the rivers and smaller tributaries that drain in to the 2 river systems. The habitat in Unit 18 is largely intact but is inhabited by more than 24,706 people in more than 38 villages, making Unit 18 one of Alaska's most densely populated rural units in Alaska (U.S. Census Bureau 2021). The boundaries of the Yukon Delta National Wildlife Refuge and the Togiak National Wildlife Refuge approximate the Unit 18 boundary.

Summary of Status, Trend, Management Activities, and History of Muskox in Unit 18

Yukon-Kuskokwim Delta muskox have been observed in almost every part of Unit 18 with the first observation dating back to 1972. Muskox have repeatedly been seen in the Kilbuck Mountains, but they are thought to persist in low numbers. Muskox have also been repeatedly observed north of the Yukon River (Ilivit or Andreafsky mountains), also in low numbers.

NUNIVAK ISLAND

Muskoxen were once widely distributed in northern and western Alaska but were absent from the landscape by the middle or late 1800s. In 1929, with the support of the Alaska Territorial Legislature, U.S. Congress initiated a program to reintroduce muskoxen (*Ovibos moschatus*) commonly referred to as "white-faced muskox" to Alaska. Thirty-one muskoxen were introduced from the east coast of Greenland to Nunivak Island in Unit 18 during 1935–1936 as a first step toward reintroducing this species to Alaska (Palmer and Rouse 1963). The Nunivak Island population grew slowly until approximately 1958 and then began a period of rapid growth. The

first hunting season was opened in 1975, and since 1981 the population has fluctuated between approximately 400 and 946 animals exhibiting considerable reproductive potential even under heavy harvest regimes (Table 1). Periods of low, natural mortality and the absence of predators benefit the Nunivak Island muskox population.

Table 1. Unit 18 Nunivak Island muskox population, 1981–2020, Alaska.

Year	No harvest/precalving	Prehunt/postcalving	Posthunt/precalving
1981	–	–	494
1982	–	–	510
1983	–	–	483
1984	–	552	–
1985	–	–	547
1986	–	–	487
1987	–	–	586
1988	–	–	609
1989	–	–	577
1990	–	–	568
1991	–	–	439
1992	–	–	407
1993	–	–	435
1994	–	438	–
1995	–	488	–
1996	–	–	435
1997	–	593	–
1998	–	643	–
1999	–	620	–
2000	–	628	–
2001	–	609	–
2002	–	527	–
2003	–	657	–
2004	–	638	–
2005	–	588	–
2006	–	615	–
2007[a]	–	–	–
2008[a]	–	–	–
2009	–	567	–
2010	–	517	–
2011	–	452	–
2012	–	–	–
2013	–	468	–
2014	–	434	–
2015	–	563	–
2016[a]	–	–	–
2017[a]	–	–	–
2018	–	787	–
2019	–	676	–

Note: Due to weather-related survey opportunity, At most, 1 survey is conducted each year—either when there was no harvest precalving, before the hunt (harvested animals included), or posthunt (animals harvested that year are not included). Therefore, in this table there is only 1 count in each row or year. En dashes indicate no count for that survey type.

[a] No survey was conducted that year of any type (no harvest/precalving, prehunt/postcalving, or posthunt/precalving).

NELSON ISLAND

During March 1967 and March 1968, groups of 8 and 23 subadult muskoxen (*O. moschatus*), respectively, were translocated 20 miles across Etolin Strait from Nunivak Island to Nelson Island (Jennings 1969). The Nelson Island muskox population exhibited an average annual growth rate of 22% between 1968 and 1981. When the population approached the management goal of 200–250 animals in 1981, the first hunting season was opened. From 1981 through 1992 the population was stable at an average of around 230 animals. In 1993 and 1994 the population decreased to below 200 animals resulting in closed hunting opportunity during 1995 and 1996. From 1995 through 2004 the population increased from 217 animals to just over 300. From 2007 through 2014 the population experienced consistent yearly growth resulting in a management goal with an upper end of 450 animals. In 2014 the population was estimated at 979 muskoxen (minimum count), which is the largest muskox population count in history for Nelson Island (Table 2). During this reporting period, Nelson Island was managed under a harvest strategy designed to reduce and then stabilize the herd within population objectives.

YUKON-KUSKOKWIM DELTA

The Bethel ADF&G office has maintained a log of muskox observed on the mainland since 1974 when a lone bull was observed. By the early 1980s observation of mixed sex groups started to occur and by 2010 observation became so commonly reported that the sighting log was no longer used. Just 6 years after muskox were introduced to Nelson Island, the first muskox was observed on the mainland near the village of Chefornak. Over 113 unique observations have been recorded in the log. Mainland muskoxen are scattered in small groups and most often observed on dry tundra within 20 miles of Nelson Island. Some groups have also sought out hills, small mountains, and dead volcanoes in and around Unit 18.

Management Direction

Muskox management in Unit 18 is guided by management plans for Nunivak and Nelson Island (ADF&G 1992, 1995) and 5 local Fish and Game Advisory Committees. The management goals listed below result from cooperative management with Yukon Delta National Wildlife Refuge, local communities, and recommendations from Advisory Committees.

EXISTING WILDLIFE MANAGEMENT PLANS

Since 1992 a management plan with goals and strategies developed cooperatively by local organizations, landowners, stakeholders, and managing agencies has been used by the department as a basis for population and hunt management on Nunivak Island (ADF&G 1992).

In 1995, partially in response to a declining population, a cooperative management plan was drafted through a joint planning effort of Nelson Island Native village corporations, U.S. Fish and Wildlife Service (USFWS), and the department (ADF&G 1995). Since its inception, the draft plan has been used to guide population and hunt management on Nelson Island; it allows for hunting when the population is above a minimum of 250 animals.

Table 2. Unit 18 Nelson Island muskox population, 1981–2020, Alaska.

Year	No harvest/precalving	Prehunt/postcalving	Posthunt/precalving
1981	–	265	245
1982	–	217	190
1983	–	230	206
1984	–	200	176
1985	–	225	195
1986	–	287	263
1987	–	180	150
1988	–	213	183
1989	–	234	205
1990	–	239	208
1991	–	232	207
1992	–	214	182
1993	–	198	168
1994	–	149	123
1995	217	–	–
1996	233	–	–
1997	–	265	–
1998	–	293	–
1999	–	297	–
2000	233	–	–
2001	–	306	–
2002	–	293	–
2003	–	327	–
2004	–	318	–
2005[a]	–	–	–
2006[a]	–	–	–
2007	–	374	–
2008	–	–	–
2009	–	541	–
2010	–	561	–
2011[a]	–	–	–
2012	–	761	–
2013[a]	–	–	–
2014	–	979	–
2015	–	944	–
2016	–	795	–
2017	–	755	–
2018	–	444	–
2019	–	380	–

Note: Due to weather-related survey opportunity, at most, 1 survey is conducted each year—either when there was no harvest precalving, before the hunt (harvested animals included), or posthunt (animals harvested that year are not included). Therefore, in this table there is only 1 count in each row or year. En dashes indicate no count for that survey type.

[a] No survey was conducted that year of any type (no harvest/precalving, prehunt/postcalving, or posthunt/precalving).

GOALS

G1. Maintain a sustainable hunt on Nunivak and Nelson Island.

G2. Minimize adverse interactions between muskoxen and the public.

G3. Identify population objectives for the mainland muskox population.

G4. Maintain productive working relationships with user groups and landowners.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary for Subsistence Uses

Muskox in Unit 18 have a negative customary and traditional use finding (C&T), determined by the Board of Game (5AAC 99.025).

Intensive Management

Alaska regulations state that muskox were not eligible for intensive management programs during RY14–RY18 (5AAC 92.106).

MANAGEMENT OBJECTIVES

M1. Maintain a posthunt, precalving population of 500–550 muskoxen on Nunivak Island.

M2. Maintain a posthunt and precalving population of 250–450 muskoxen on Nelson Island.

M3. Issue drawing and registration permits for harvesting muskoxen to maintain optimal size, composition, and productivity of the muskox populations on Nunivak and Nelson Islands.

M4. Provide online orientation and posthunt checkout to ensure hunters understand permit requirements, properly identify legal muskoxen, and report their harvests in a timely and accurate manner.

M5. Monitor the Yukon-Kuskokwim Delta mainland population of muskox, set a minimum population goal, and then determine when a hunt can be sustainably implemented.

M6. Use the cooperative management plans for Nunivak and Nelson Islands.

MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Survey populations on Nunivak and Nelson islands and the mainland Y-K Delta to estimate population size, composition, distribution, and movements of muskox in Unit 18 (M1, M2, M5).

Data Needs

Minimum counts are the primary metric used for monitoring the status of the population and are also important in assessing whether objectives have been met. These data are used to inform the public, cooperating federal agencies, advisory committees, and the Alaska Board of Game about the status, trend, and distribution of the population. Sex and age data are used to determine population trend and reproductive potential. These data are also used to inform hunt management.

Methods

Pilot-observer teams were instructed to fly all areas of suitable habitat focusing on dry tundra, hills, and volcanoes. Muskox were classified by age and sex into one of 5 categories: bulls 3-years old and older, cows 3-years old and older, 2-year-old animals, short yearlings, and calves of the year.

Nunivak Island was divided by transects and the entire island was surveyed (Fig. 1). Typically, a survey will take 3 days and 19–24 hours of direct survey time to complete. Width between adjacent transects varied as a function of terrain and was adjusted to allow complete coverage of the island, averaging approximately 2 miles. During RY14–RY18, we used Piper PA-18 and Maule M7-235 aircraft.

Nelson Island was divided by transects and the entire island was surveyed (Fig. 1). Width between adjacent transects varied as function of terrain and was adjusted to allow complete coverage of the island. We used a Piper PA-18 to fly the survey just like those on Nunivak Island.

For Yukon-Kuskokwim mainland surveys, we identified search areas located between the Yukon and Kuskokwim rivers based on our observation log and from the 2017 mainland survey. Pilot-observer teams were instructed to fly transects spaced 3 miles apart in areas with higher densities of observations and transects 7 miles apart in areas muskox have not been observed regularly (Fig. 1).

Groups of 3 or more muskoxen were photographed with a Canon EOS 6D digital camera and telephoto lens with a built-in stabilizer to reduce the number of passes required to photograph all animals. Animals were then classified from photos based on body size, horn conformation and characteristics, and hair formation. Groups of less than 3 muskoxen were directly counted and classified without the use of aerial photography. When small groups of reindeer were encountered, they were counted and recorded whereas large groups were photographed obliquely from the side window with a digital camera. Large groups were counted later from the best enlarged electronic images.

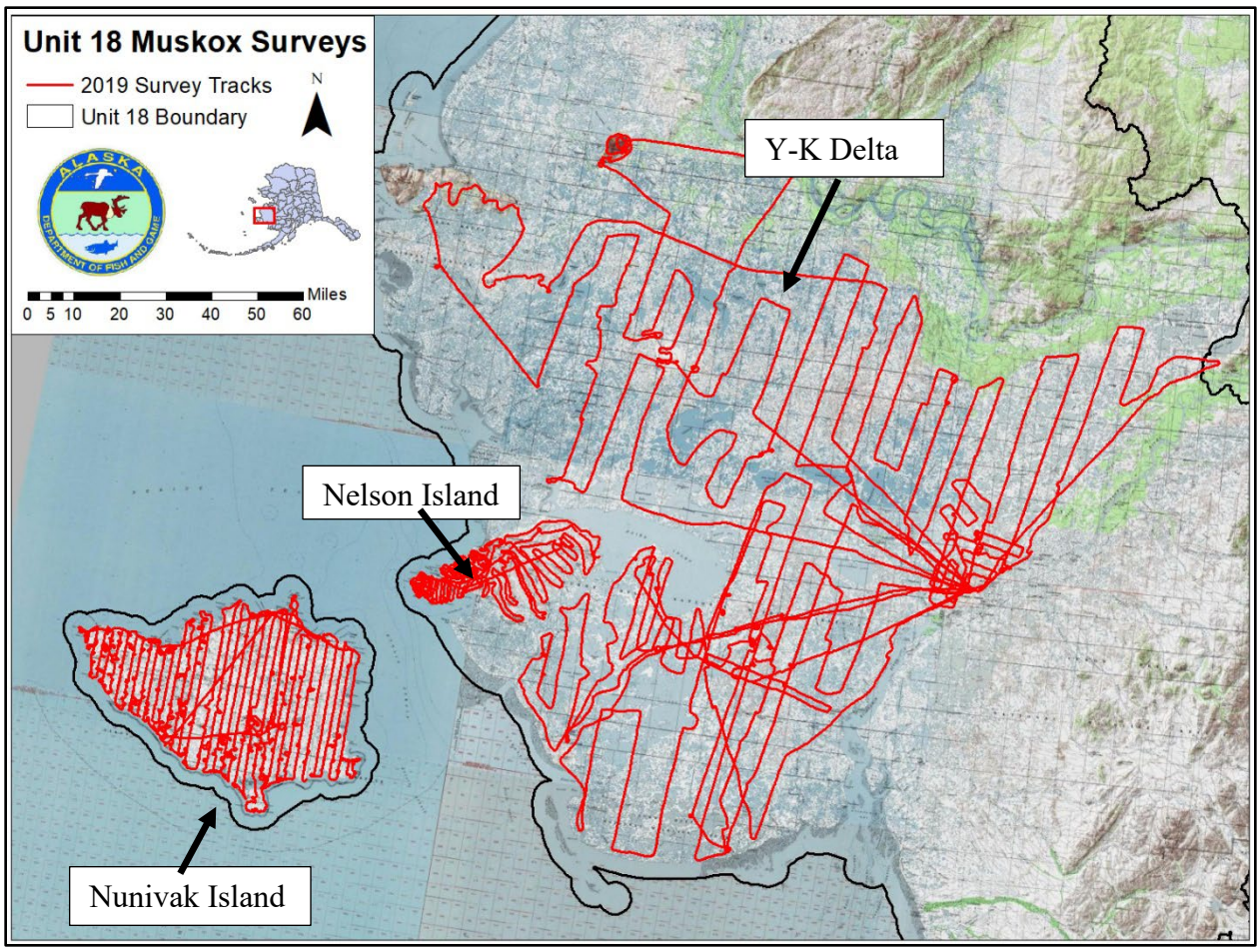

Figure 1. Map showing survey areas for Nunivak Island, Nelson Island, and the Yukon-Kuskokwim (Y-K) Delta, Unit 18, western Alaska. Note that Nelson and Nunivak islands are surveyed much more intensely than the Y-K Delta mainland area.

Results and Discussion

Nunivak Island

Surveys were completed on Nunivak Island in June 2015, June 2016, July 2018, and June 2019. Throughout 2015–2019, the population trend on Nunivak Island showed growth in abundance. The population peaked at 946 animals in 2018 with a posthunt precalving population of 789 which was 239 animals above the upper objective of the management plan (M1) with a density of 23 muskoxen per 100 km^2 (23 muskoxen per 38.6 mi^2; Table 3).

There is an established population management objective for Nunivak Island of 500–550 muskoxen posthunt and precalving (M1); however, the timing of when surveys are completed has changed over the years. For this reporting period, all surveys were completed postcalving and posthunt. Survey data were analyzed without calf counts to evaluate whether the established

Table 3. Nunivak Island muskox population, composition, and density, 2001–2020, Unit 18, Alaska.

Year	Bulls ≥3-years old	Cows ≥3-years old	2-year olds[a]	Yearlings	Calves	Unknown[a]	Total population	Density per 100 km^2
2001	148	167	56	115	94	29	609	14.90
2002[b]	–	–	–	–	–	–	–	–
2003	166	174	27	113	115	62	657	15.64
2004	156	177	40	113	112	40	638	15.18
2005	161	143	13	91	110	70	588	13.99
2006	156	128	38	68	91	100	581	14.64
2007[c]	–	–	–	–	–	–	–	–
2008[c]	–	–	–	–	–	–	–	–
2009	203	177	35	41	98	13	567	13.49
2010	172	125	32	65	84	39	517	12.30
2011	145	130	32	59	63	23	452	10.76
2012[b]								
2013	148	146	32	71	65	71	533	12.69
2014	113	158	101	53	129	9	563	13.40
2015	131	225	67	149	177	0	740	17.61
2016[c]	–	–	–	–	–	–	–	–
2017[c]	–	–	–	–	–	–	–	–
2018	215	226	149	195	157	4	946	22.51
2019	179	218	151	128	180	0	856	20.37

[a] From 2001–2013 only bulls were classified under the 2-year-old category; therefore, any 2-year-old cows are recorded under the unknown category for those years. From 2014–2019 all 2-year olds (bulls and cows) are in the 2-year old column.
[b] Incomplete survey.
[c] No survey was conducted.

management goal was met. The 2015 survey population was 740 muskoxen. No surveys were completed in 2016 or 2017. Surveys conducted in 2018 and 2019 resulted in population estimates of 946 and 856 muskoxen, respectively, posthunt and precalving. The posthunt and precalving population management objective (M1) for Nunivak Island was exceeded during 2018–2019 (Table 1).

In 2015 the bull-to-cow ratio was 58:100, which is the lowest ratio documented for Nunivak Island. During the 4 surveys completed between 2015 and 2019, the department documented 4 of the largest calf counts on the island since 1937. Calf production on Nunivak Island has been above average from 2014 through 2019, in contrast to the 6-year trend of reduced recruitment of calves and yearlings during 2008–2011. No survey was conducted in 2008 but the number of yearlings observed in the 2009 survey $n = 41$ is result of poor parturition or poor calf recruitment.

Nunivak Island is a closed system. Muskox tend to be distributed along the south and west sides of the island during the winter. During years with deep snow, they disperse to higher elevations

on volcanoes and mountains with windswept slopes. The majority of muskoxen are located on the southern half of the island during spring. The south side of the island is consistently warmer and tends to green up weeks before the northern half. During summer and fall, muskoxen disperse more uniformly throughout the interior of the island.

Nelson Island

Surveys were conducted on Nelson Island in June 2015, June 2016, June 2017, June 2018, and May 2019. All surveys completed on Nelson Island during 2015–2019 were posthunt and postcalving surveys. Total counts of muskoxen observed ranged from 380 in 2019 to 944 in 2015 (Tables 2 and 4). Nelson Island was above the upper end of its new management objective (M2) of 250–450 total muskoxen from 2015 to 2017, and within the targeted range of objective M2 in 2018 and 2019 (Tables 2 and 4).

Table 4. Nelson Island muskox population, composition, and density during 2001–2019, Unit 18, Alaska.

Year	Bulls ≥3years old	Cows ≥3-years old	2-year-old muskox[a]	Yearlings	Calves	Unknown	Total population	Density[c] per 100 km^2
2001	–	–	–	–	80	226	306	38.21
2002	71	94	–	48	73	7	293	36.58
2003	75	101	–	64	69	18	327	40.83
2004	76	91	–	58	65	28	318	39.71
2005[b]	–	–	–	–	–	–	–	–
2006[b]	–	–	–	–	–	–	–	–
2007	67	106	–	0	99	102	374	46.70
2008[b]	–	–	–	–	–	–	–	–
2009	113	107	22	61	88	150	541	67.55
2010	110	191	20	62	126	52	561	70.05
2011[b]	–	–	–	–	–	–	–	–
2012	126	200	42	103	169	121	761	95.02
2013[b]	–	–	–	–	–	–	–	–
2014	176	257	99	131	184	132	979	122.24
2015	133	267	160	203	199	0	962	117.87
2016	107	210	149	183	139	7	795	99.26
2017	131	211	127	132	143	11	755	94.27
2018	88	111	83	101	61	0	444	55.44
2019	75	118	72	47	68	0	380	47.45

[a] From 2001–2013, only bulls were classified out of all the two-year-old if any were classified. Any 2-year-old cows would be in the unknown category for those years. From 2014–2020 all 2-year-old's (bulls and cows) are in the 2-year old column.
[b] No survey was conducted.
[c] Density per 100 km^2 or 38.6 mi^2 using the 800 km^2 (309 mi^2) of the island that muskoxen occupy year round.

The Nelson Island population showed steady growth during the last reporting period (2009–2013). The population peaked at an all-time high in 2014 at 979 animals. The department subsequently reevaluated its management plan for Nelson Island. This abundance equates to a density of 80.0 muskoxen per 100 km^2; however, muskox do not inhabit the island uniformly (Table 4). The animals concentrate on the western half of the island year round, and animals

move to the tops of hills and cliffs during years with deep snow. A more realistic density just using the 800 km ^{2} (309 mi^2) of the island that muskox occupied year round is approximately 122.0 muskoxen per 100 km^2 (38.6 mi^2), which is approximately 10 times higher than the density that Nunivak Island is managed for (12.0 per 100 km^2).

During 2015–2019, between 88 and 133 muskoxen were classified as 3-year-old or older bulls, 111–267 as 3-year-old or older cows, 83–160 as 2-year-old muskoxen, 47–203 as yearlings, 61–199 as calves, and 0–11 as unknown age or sex (Table 4). Surveys from 2015–2017 included 3 of the 5 largest numbers of calves since 1967. The 2015 survey documented the largest number of calves observed in history (199 calves). The ratio of calves to 3-year-old and older cows averaged 66:100 during 2015–2019 .

Nelson Island was managed for population reduction over a 5 year period (2015–2019) to preserve the age class component of the adult portion of the population and to spread the harvest over a period long enough to provide opportunity in each community where permits are distributed. To reduce the population, during 2014–2017 the department issued an average of 251 registration permits (RX070, RX071) per year. This was a very large number of permits compared to the 10-year average during 2004–2013 of 39 registration permits (RX070, RX071; M4). This effort was successful, and the total population during 2018–2019 decreased to within the range of management objective M2. While the 444 muskoxen observed in 2018 fell within M2, it was met one year earlier than planned. Beginning in 2018, the number of registration permits issued resumed to historical norms at around 40 permits per year.

While the effort to reduce the population by increasing the number of registration permits was successful, the reduction in population is larger than what the muskoxen harvested in 2015–2018 accounts for. The survey completed in May 2019 resulted in an estimated 380 muskoxen. Potentially as many as 275 adults and calves are unaccounted for in the 2018 and 2019 surveys. Natural mortality is typically low on Nelson Island and no unusual mortality events were documented. An increase in illegal harvest may explain some of the missing animals but does not account for the hundreds missing. Most of these animals are believed to have emigrated from Nelson Island onto the mainland of the Yukon-Kuskokwim Delta.

Nelson Island muskoxen are distributed throughout the island but are concentrated on the cliffs of Cape Vancouver and on hills northeast of Tununak all year. Individuals and small groups are on the hills in the central portion of the island and along the escarpment above Nightmute. It is uncommon to find more than a few muskoxen east of Nightmute.

Yukon-Kuskokwim Delta Mainland.

Two minimum count surveys were conducted on the Yukon Kuskokwim Delta mainland during the RY14–RY18 report period (Table 5). In June 2017, the first minimum count was completed using fixed-wing aircraft in a pilot study. A total of 175 muskoxen were observed during this survey (Table 5). A second survey on the mainland was completed in June of 2019 resulting in a total of 174 muskoxen being observed (Table 5). Both surveys were part of a feasibility study which aimed to establish location and methods (i.e., where, and how) for surveying mainland

Table 5. Yukon-Kuskokwim Delta mainland muskox population composition for 2017–2019, Unit 18, Alaska.

Year	Bulls ≥3-years old	Cows ≥3-years old	2-year-old muskox	Yearlings	Calves	Unknown	Total estimated population	Month of survey
2017	29	52	26	21	35	12	175	June
2018[a]	–	–	–	–	–	–	–	–
2019	29	53	14	31	46	1	174	June

[a] No survey was conducted in 2018.

muskoxen in Unit 18. Future attempts should be conducted during complete snow cover. Marked animals provide insight into seasonal and yearly movements that are poorly understood at this time.

Minimum count surveys done in 2017 and 2019 indicate that muskoxen concentrate on the dry tundra around Baird Inlet, the Mud Volcanoes, and near the large lakes north of Baird Inlet. Muskoxen were observed near Bethel and north of the Johnson River to the Unit 21E border. Documented illegal harvest also confirms the distribution of animals elsewhere in Unit 18.

The first attempts at counting muskox in the area resulted in a minimum population of 174 muskoxen in 2017 and 175 in 2019 was not surprising. It is very likely that this is still a low number due to limitations such as funding and time constraints which prevented surveying all areas where muskox have been observed. During the 2017 survey, we received a report of muskox on Kusilvak Mountain, but were unable to investigate it. Muskox have been observed on this solitary mountain numerous times over the years and should be included in future surveys. In 2019 a group of muskox were observed on the top of Kusilvak Mountain.

In 2018 muskoxen were reported outside of the survey area at Crooked Creek and also 27 miles up the Holitna River. The mainland population has expanded across Units 17, 18, 19, and 21 and has grown to a minimum of 252 animals in 2017.

The mainland population remains small and widely dispersed in Unit 18. No management plan or population goals have been developed for the mainland population in Unit 18 and a hunting moratorium was in effect throughout this reporting period.

Recommendations for Activity 1.1

Continue to survey Nunivak and Nelson islands every 1–2 years. Populations are relatively small with high harvest rates, and without annual or biennial surveys, the potential exists for under or over harvest. Little is known about this population at this time and an enhanced survey and inventory (S&I) program, including marked animals, would help track movements and locate key areas for future surveys.

Continue to conduct abundance and composition surveys on Nelson and Nunivak islands using fixed-wing aircraft in early summer using digital cameras with image stabilization. Muskox are relatively sedentary in late winter, limiting their options for grazing. Developing a technique to evaluate winter severity in relation to muskox densities would be helpful for management.

Continue to conduct surveys every 3 years on the Yukon-Kuskokwim Delta muskox population growth and expansion and refine survey techniques. Deploying Global Positioning System (GPS) collars on mainland muskoxen could be extremely informative to movement patterns and areas of high use by muskoxen. This information may help to define the extent of the mainland population's distribution and how it can be monitored. Transect lines with 3-miles of separation were used during this reporting period; future surveys should consider decreasing this to transects with 2-miles of separation in places where high concentrations of muskoxen were observed in 2019. Other techniques to increase detectability (snow cover, phenological timing) should also be considered.

2. Mortality-Harvest Monitoring and Regulations

ACTIVITY 2.1. Monitor harvest through sealing records (M1, M2).

Data Needs

Accurate harvest reporting is needed to understand patterns in levels of harvest. Hunt managers rely on these data in determining sustainable harvest rates.

Methods

Muskox harvested by hunters or killed in defense of life and property (DLP) in Unit 18 were recorded. Harvest data were archived in the muskox harvest database which is accessible through the ADF&G Wildlife Information Network (WinfoNet). Harvest is reported by regulatory year and by hunt numbers through a combination of registration permits (RX060, RX061, RX062, RX070, RX071, and RX055), draw permits (DX001, and DX003), and auction permits (SX001, and SX003). Information recorded for each muskox includes date of kill, name of hunter, specific location of kill, method of take, method of transportation, commercial services used, and sex. Hunters who did not report on their permits were contacted by the department.

Season and Bag Limit

Area	Bag limit	Resident open season (subsistence and general hunts)	Nonresident open season
Nunivak Island	1 bull by drawing permit only; or 1 muskox by registration permit only	1 Sep–30 Sep 1 Feb–15 Mar	1 Sep–30 Sep 1 Feb–15 Mar
Nelson Island	1 Musk ox by registration permit only	1 Feb–25 Mar (General hunt only)	1 Feb–25 Mar
Remainder of Unit 18	None	No open season	No open season

Results and Discussion

Harvest by Hunters

On Nunivak Island, hunts are the primary tool used for managing the population. In general, hunting is regulated by drawing and registration permits for fall and spring hunts. In response to population abundance exceeding the upper end of management objective M1, which is also in

the Nunivak Island management plan (ADF&G 1992, M6), the number of permits issued during 2015–2019 increased (Table 6). As a result, harvest during 2015–2019 increased.

Table 6. Total permits issued and total harvest, 2000–2019, Nunivak Island, Alaska.

Year	Total cow permits issued	Total bull permits issued	Total cow harvest	Total bull harvest	Total harvest
2000	45	44	43	46	89
2001	45	46	40	45	85
2002	45	45	44	45	89
2003	45	45	44	44	88
2004	45	45	42	43	85
2005	45	49	38	39	77
2006	45	50	40	29	69
2007	45	63	41	38	79
2008	45	49	38	39	77
2009	35	56	29	44	73
2010	25	70	20	47	67
2011	10	52	5	33	38
2012	5	37	5	29	34
2013	5	52	6	34	40
2014	5	32	5	28	33
2015	40	15	36	16	52
2016	45	52	44	39	83
2017	50	40	46	33	79
2018	80	88	71	67	138
2019	87	102	71	83	154

Note: Table includes all permits and harvest from RX055, RX060, RX061, RX062, DX001, DX003, SX001, and SX003.

Current regulations are adequate to maintain a sustainable population with harvest. Nelson Island was above the upper end management objective M2 from 2014 to 2017 and within the targeted range of objective M2 in 2018 and 2019 (Table 7).

We occasionally receive reports of muskox being harvested illegally on the Yukon-Kuskokwim Delta mainland. However, the number of animals taken illegally is difficult to determine because there is not a method to identify individual animals and reports of the same animal are likely reported by more than one source. We believe that some illegal harvest goes undetected, so counts are considered a minimum number. During RY14–RY18, a minimum of 5 muskoxen were harvested illegally on the mainland, and 1 was harvested legally in defense of life or property near Russian Mission.

Table 7. Historical muskox harvest on Nelson Island including number of permits issued and number of muskoxen harvested, 1981–2019, Alaska.

Year	Bull permits issued (RX070)	Bull harvest	Cow permits issued (RX071)	Cow harvest	Total permits	Total harvest
1981	0	0	20	20	20	20
1982	0	8	30	19	30	27
1983	25	25	0	0	25	25
1984	15	14	15	9	30	23
1985	15	16	15	14	30	30
1986	15	10	15	14	30	24
1987	15	16	15	14	30	30
1988	15	15	15	15	30	30
1989	15	14	15	15	30	29
1990	15	17	15	14	30	31
1991	15	15	15	10	30	25
1992	15	15	15	17	30	32
1993	30	30	0	0	30	30
1994	25	21	5	6	30	27
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	10	10	10	7	20	17
1998	10	10	10	10	20	20
1999	15	15	15	15	30	30
2000	15	15	15	14	30	29
2001	0	0	0	0	0	0
2002	15	14	21	19	36	33
2003	23	22	15	14	38	36
2004	24	24	15	14	39	38
2005	23	17	15	11	38	28
2006	15	14	15	14	30	28
2007	24	23	18	17	42	40
2008	25	24	14	11	39	35
2009	25	21	17	15	42	36
2010	25	20	17	17	42	37
2011	25	20	17	15	42	35
2012	25	21	17	15	42	36
2013	10	10	32	28	42	38
2014	100	87	200	138	300	225
2015	75	68	200	148	275	216
2016	40	39	115	92	155	131
2017	100	84	174	108	274	192
2018	25	20	24	17	49	37
2019	20	18	15	14	35	32

Note: Table includes all permits and harvest from RX070 and RX071.

Permit Hunts

All hunts for muskoxen in Unit 18 are either by drawing permit, auction permit, or registration permit. In addition, there are permits available for taking incidental or stranded muskoxen (5 AAC 92.046). There are also permits available to take and use game for cultural purposes (5 AAC 92.034).

Hunters wishing to harvest bulls obtain permits through the statewide drawing permit process. On Nunivak Island, when fewer than 10 cows are available for harvest, the department will supplement the difference with registration bull permits if bulls are available for harvest. The Nunivak Island draw hunt for bulls is considered a trophy hunt and the department manages to maintain its trophy quality. Managing for high bull-to-cow ratios ensures that trophy quality animals will persist on the landscape. Harvest of cows is regulated using registration permits. Occasionally, when a harvestable surplus of bulls is available, auction permits (governor's permits) are available to qualified organizations for fundraising purposes.

In response to population abundance exceeding the upper end of management objective M1, which is also in the Nunivak Island management plan (ADF&G 1992, M6), the number of permits issued during 2015–2019 increased. These liberalizations were granted by the Board of Game (BOG). As a result, harvest during 2015–2019 increased. The department adjusted the harvest strategy on Nunivak Island based on the most recent surveys. When the population is above the management objective (M1), an increased number of permits are issued to hunters over several years to reduce population size and maintain age and sex composition. This strategy preserves the trophy bull hunt as well as the cow cohort and stabilizes the population. When the population is below objectives, permits are reduced (especially cow permits). These hunt management options help achieve the population management objective (M1) while providing some opportunity for hunters.

Most bulls taken during RY14–RY18 on Nunivak Island were harvested under the drawing permit system. Governor's auction permits were issued in 2014 and 2016–2019 (Table 8), and 5 RX062 registration permits were issued in 2014 to supplement the low number of RX060 ($n = 0$) and RX061 ($n = 5$) cow permits available. In 2016, bulls were harvested with stranded muskox registration permits (RX055). Most cows harvested on Nunivak Island are taken using either the fall or winter registration permits (RX060 and RX061), though occasionally cows are mistakenly harvested by bull hunters.

On Nelson Island, when the population is above 250 animals, the department distributes all registration permits on a first-come, first-served basis; the location of distribution rotates annually through the local villages of Newtok, Toksook Bay, Tununak, Nightmute, and Chefornak. Changes in permit allocation were approved at the 2013 statewide Alaska Board of Game meeting; these changes went into effect in RY14. RY14–RY18 permits were distributed on a first-come, first-served basis, but in years when more than 40 permits were issued, 44% were available in 1 of the 5 Nelson Island communities, 44% were available online, and 12% were available in Bethel.

Table 8. Nunivak Island governor's auction muskox permits (DX001-003) by organization and total selling price, 2013–2019, Unit 18, Alaska.

Year	Organization	Total receipts
2013	FNAWS-Eastern	$6,500.00
2014	WSF-Eastern	$18,000.00
2014	Southcentral Alaska Ruffed Grouse Society	$5,500.00
2016	SCI-Alaska	$19,000.00
2016	WSF-California	$3,500.00
2016	Alaska WSF	$9,000.00
2017	SCI-Alaska	$9,000.00
2017	Alaska WSF	$6,600.00
2017	Midnight Sun Gun Dog Association	$1,875.00
2018	SCI-Alaska	$7,000.00
2018	Alaska WSF	$8,500.00
2018	Resident Hunters of Alaska	$5,800.00
2019	WSF-California	$9,000.00
2019	Alaska Bowhunters Assoc.	$6,500.00
2019	Resident Hunters of Alaska	$4,970.00

Note: Safari club International (SCI), Wild Sheep Foundation (WSF), Four North American Wild Sheep (FNAWS).

Hunter Residency and Success

Most drawing permit winners for Nunivak Island are residents of Alaska. Between 2014 and 2019, 636 permits were issued for Nunivak Island, and of these 642, Alaska residents received 575 permits. Nonresidents received 66 bull permits and 1 cow permit. Between 2014 and 2019 1,088 registration permits were issued for Nelson Island. Residents of Alaska received 1,075. Nonresidents received 10 bull, and 3 cow registration permits for Nelson Island between 2014 and 2019.

Harvest Chronology

Most cow hunters on Nunivak Island harvested their muskox between late February and mid-March during periods of increasing daylight hours and milder weather. Nelson Island hunters also take most of their animals late in the season. Bull hunters on Nunivak Island usually hunted with guides or transporters. These hunters must fit their hunts into the times available with a guide or transporter, and consequently these hunts occur uniformly throughout the season.

Transport Methods

In the fall most hunters use a boat, all-terrain vehicle (ATV), or a small aircraft to access their hunting areas. Almost all access in the winter season is by snowmachine, except during years with little or no snow, when 4-wheelers are commonly used. Five people reported hunting on foot between 2014 and 2019.

Other Mortality

No natural predators of muskoxen are present on Nunivak Island and predators are rare on Nelson Island. Few wolves, black bears, brown bears, and polar bears are found in areas that have mainland muskoxen, so predation rates are believed to be low. The only report of predation on muskox in Unit 18 was in the spring of 2009 when witnesses from Scammon Bay said a polar bear killed several muskoxen, presumably calves, in the area between Scammon Bay and Hooper Bay. Illegal harvest is the most common nonhunting mortality, followed by accidents (e.g., standings at sea, falling off cliffs, falling through ice), and starvation (rain freezes guard hairs to the ground in cold temperatures preventing animals from standing up). Illegal harvest is believed to be the primary factor hindering the mainland population from becoming firmly established.

Alaska Board of Game Actions and Emergency Orders

Due to concern about the potential for muskox overgrazing their winter range on Nelson Island, the department requested that the Board of Game (BOG) allow harvest to exceed 42 animals per regulatory year, which was the maximum allowed under codified regulation 5AAC 85.050 from RY81–RY13. An upper population goal was set at 450 animals for Nelson Island during RY14–RY17. The department set high harvest rates to reduce abundance and stabilize the population within the range of 250–450 animals. Realized harvest rates averaged 22% during RY14–RY17.

The Board of Game took the following actions at its 2014 meeting in Kotzebue:

1) Reallocation of some Nunivak Island bull draw permits. The BOG had previously allocated all bull permits on Nunivak Island to draw and auction hunts. The BOG decided up to 10 bull permits could be issued as registration permits if less than 10 cow registration permits were available and that all the permits be issued in Mekoryuk. For example, if only 5 cows were available for harvest in a given year, the department would issue 5 cow registration permits and 5 bull registration permits in Mekoryuk on a first-come, first-served basis. Additionally, any bull permits issued under the registration system would be deducted from the available draw permits.

2) Reaffirmed the negative C&T finding for muskox in Unit 18 and kept the mainland muskox population hunt closed.

3) Modified 5 AAC 92.046, permits for the taking incidental or stranded musk oxen. Allowed residents of Alaska to harvest up to 2 muskox found stranded on sea ice within the coastal waters of Unit 18 without a permit. The successful hunter must then provide a photo or video to the department posthunt proving that the muskox was stranded.

The March 2014 statewide BOG meeting took place in Anchorage. At this meeting, BOG modified and passed a board-generated proposal for allocating muskox permits for Nelson Island.

1) The BOG modified the Nelson Island permit allocation. When 40 or less permits are available, the department will give out all the permits in 1 of the 5 Nelson Island communities on an annual rotation. When there are more than 40 permits available, the 5 Nelson Island communities will receive the first 40 permits and the remaining permits will be distributed as follows: 44% dispensed online, 44% to the Nelson Island communities, and 12% dispensed in Bethel. All permits were to be given out on a first-come, first-served basis.

Actions taken by the BOG in Nome 2020 include:

1) Nunivak Island resident and nonresident hunting season was extended from the prior season of 1–30 September to 1 August–30 September, and from 1 February–15 March to 15 January–31 March.

2) Nelson Island resident and nonresident hunting season was extended from the prior season 1 February–25 March to 1 February–31 March.

The board also modified 5 AAC 92.034 (9), permits to take and use game for cultural purposes, to include Unit 18 muskox.

Recommendations for Activity 2.1

Continue with current hunt management plans and harvest strategies. Continue to talk with hunters, members of the public, and local advisory committees about hunting regulations.

3. Habitat Assessment-Enhancement

No direct study of habitat was undertaken during the report period. Reindeer and muskox population goals have been set at the lower end of what Nunivak Island is believed to be able to sustainably support while winter range restores for both species. On Nunivak Island DWC wildlife biologists believe that wild caribou, and more recently domestic reindeer, have overgrazed the lichen range on the island. The reindeer were below their herd management goal of no more than 2,000 reindeer in 2013 and 2014, and above the goal during this reporting period (RY14–RY18). Reindeer were not counted in 2015–2017. The 2009 survey was the first time in 17 years that reindeer numbers were below the management goal objective of 2,000 animals that was established in the 1992 management plan (Wald 2009). Currently there are no studies in place to determine if habitat conditions are improving, nor is there a historical benchmark to compare it with. It is unclear when or how USFWS will determine if the goal to reestablish the habitat/range conditions on Nunivak has been met.

Muskoxen taken by hunters on Nunivak Island in recent years are reported to be in good condition with adequate body fat and high pregnancy rates. Large numbers of calves recruiting into the population, numerous observations by department staff of 2-year-old cows with calves, and exceeding population goals in 2018 and 2019 indicate that habitat was not a limiting factor on Nunivak Island during this reporting period.

Although we have no way of empirically evaluating the habitat on Nelson Island, the potential for overgrazing winter range on Nelson Island became a concern in 2014 when the population reached 979 muskoxen. Muskox concentrate heavily on the ridges and slopes on the western side of the island for most of the year, especially in the winter. The density of this occupied winter range was 122.24 per 100 km^2 in 2014. For context, Banks Island in Northwest Territories of Canada reached a muskox density of 93.87 per 100 km^2 before the population went through a steep decline. In addition, 2 Greenland muskox populations (Ivittuut and Zackenberg Research Station) were documented at density of 292.09 and 287.00 per 100 km^2, respectively, before those populations went through steep declines (Cuyler et al 2019). Anecdotally, some evidence of stress was observed by Nelson Island hunters who noted that some animals had less body fat

than normal during 2016–2018. These observations were more common in mature bulls but noted in adult cows as well. The 2018 and 2019 abundance surveys noted possible emigration of animals off the island. This potential movement could be a result of density dependent factors stemming from lack of habitat.

Muskox habitat on the Y-K Delta mainland is extensive and could support a much larger population.

Recommendations for Activity 3.1

Modify. The management plan (ADF&G 1992, M6) for Nunivak calls for USFWS to monitor habitat. Develop methods for equating quality and quantity of muskox winter habitat so that it is possible to maximize the sustainable harvest on islands.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

There were no activities related to nonregulatory muskox management issues in Unit 18 during the reporting period.

Education and outreach activities will remain the backbone of our approach to mitigating muskox conflicts. This involves informing the public about steps they can take to reduce their risk in situations involving muskox. This is accomplished through the distribution of muskox safety and viewing informational materials, social media, muskox safety presentations; and consultations with local organizations, area residents, and law enforcement officials. More information about this outreach is on the ADF&G website at ADF&G Home | Species | Living With Wildlife | Muskoxen (http://www.adfg.alaska.gov/index.cfm?adfg=livewith.muskoxen).

Data Recording and Archiving

All electronic files such as survey memos, reports, survey data, and maps are located on the Bethel server (O:\WILDLIFE\MUSKOX). All hard copy data sheets, paper files, etc. are found in the file cabinet in the Bethel Fish and Game office.

Agreements

- Nunivak Island reindeer and muskox management plan (ADF&G 1992).
- Nelson Island muskox herd cooperative management plan. Preliminary draft (ADF&G 1995).

Permitting

None.

Conclusions and Management Recommendations

Muskox management in Unit 18 during the RY14–RY18 period was in alignment with strategies developed cooperatively by local organizations, landowners, stakeholders, and managing agencies has been used by the department (M6). Online orientations and posthunt checkout was

provided to ensure hunters understood permit requirements, properly identified legal muskoxen, and reported their harvests in a timely and accurate manner.

On Nunivak Island, management objective (M1) was exceeded during 2018–2019. In an effort to decrease abundance on Nunivak Island to within population objectives, higher harvests of bulls and cows were implemented in 2018. This period of increased harvest also allowed the department to manage for a bull-to-cow ratio of 80:100, which is believed to be optimal for trophy management. In years 1988–1992 and 2005–2013, bull-to-cow ratios on Nunivak Island exceeded 100:100, and the corresponding calf-to-cow ratios decreased. Current harvest strategy anticipates the population being within the management goals by 2021. The Nunivak population was managed for decreasing abundance during the report period (RY14–RY18). During 2015, normal levels of cow harvest were reinstated, and during 2016 normal levels of bull harvest were reinstated. The current regulations and management actions are adequate for maintaining a healthy population with harvest. The department has no recommended regulatory changes at this time.

Nelson Island was above the upper end management objective M2 from 2014 to 2017 and within the targeted range of objective M2 in 2018 and 2019. The population on Nelson Island is responding to the management actions taken to reduce the population during the report period (M3). Current regulations are adequate to maintain a sustainable population with harvest.

ADF&G will continue monitoring the Y-K Delta population of muskox, which is in the early stages of development, and continue to survey this population while refining survey techniques. The extent of the population's distribution is still being defined; therefore, no formal population goal was established during this report period (M5). Hunt implementation will be considered following a population objective and more data on this population. The mainland population is thought to be small and widely dispersed. The first population survey for this area occurred in 2017. There was a hunting moratorium on the Yukon-Kuskokwim (Y-K) Delta mainland during the RY14–RY18 period. Continuing with the muskox moratorium on the mainland is recommended until the population reaches a minimum of 300 animals in a definable area of the mainland. If the population reaches or exceeds 300 animals, discussion about whether a hunt should take place will occur with local Advisory Committees which will be open to the public for comment.

II. Project Review and RY19–RY23 Plan

Review of Management Direction

MANAGEMENT DIRECTION

The RY14–RY19 management direction and goals for Nelson and Nunivak Islands were generally appropriate. Management will continue to follow the guidance provided by the 5 local advisory committees and the Nelson and Nunivak Island Muskox Management Plans (ADF&G 1992, 1995). During RY14–RY18, several regulations (5AAC 85.050, 5 AAC 92.034, and 5 AAC 92.045) were passed by the Alaska Board of Game. Some were intended to provide additional opportunity for hunter success. Effective in RY20, muskox will be able to be harvested with an educational permit. The state regulatory process has effectively provided for

harvest opportunities consistent with applicable state laws while also addressing specific management needs as necessary through time.

GOALS

Goals for the RY19–RY23 reporting period have been updated as follows:

G1. Allow for continued growth and range expansion of the Y-K Delta mainland population.

G2. Provide for sustained-yield harvest in a manner consistent with existing state laws by following the goals and objectives endorsed by the Nunivak and Nelson Island Muskox management plans (ADF&G 1992, 1995).

G3. Protect and maintain the habitats and other components of the ecosystem upon which muskoxen depend.

G4. Encourage cooperation and sharing of information among agencies and users of the resource in developing and executing management and research programs.

CODIFIED OBJECTIVES

Amounts Reasonably Necessary (ANS) for Subsistence Uses

Muskox in Unit 18 have a negative customary and traditional use finding (C&T), determined by the Board of Game (5AAC 99.025).

Intensive Management

Alaska regulations 5 AAC 92.106 state that muskox are not eligible for intensive management programs.

MANAGEMENT OBJECTIVES

The RY14–RY18 management objectives for Unit 18 were appropriate. Continuing to collect sex and age composition will allow us to continually adapt management and meet objectives.

The management objectives during RY19–RY23 will be as follows:

M1. Complete population surveys at 1- or 2-year intervals to document changes in abundance, composition, and distribution of muskox on Nunivak and Nelson islands. Complete surveys for Y-K delta mainland population every 3 years to monitor population growth, composition, and range expansion.

    a. Manage harvest to maintain the Nunivak and Nelson Island populations within their population goals. Adjust harvest by sex to maintain mature-bull-to-mature-cow ratios at or above 60:100 but less than 100:100.

M2. Administer permits for Nunivak and Nelson islands' hunts. Work with hunters that harvest muskox stranded on small islands or icebergs and administer educational muskox permits to appropriate programs when requested.

REVIEW OF MANAGEMENT ACTIVITIES

1. Population Status and Trend

ACTIVITY 1.1. Estimate population abundance, composition, and distribution for Nunivak and Nelson Island every 1 or 2 years, and the Y-K Delta mainland every 3 years (M1, M2).

Data Needs

Population survey information from all 3 Unit 18 muskox populations will meet 3 primary needs; 1) to inform the public, cooperating federal agencies, advisory committees, and the Alaska Board of Game about the status, trend, composition and distribution of the populations, 2) to estimate the harvestable surplus, and set harvest quotas for permit issuance, and 3) inform timing of hunt season start for the Y-K Delta mainland population.

Methods

Aerial survey methods and analysis will be the same as those described in the RY14–RY18 report section above. Transect spacing for the Y-K Delta population will be decreased in areas that have higher densities. Surveys will also be attempted with complete snow cover on the ground to compare with summer surveys to discern whether sightability improves.

2. Mortality-Harvest Monitoring

ACTIVITY 2.1. Monitor harvest data and improve harvest reporting through public education and improved communication (M1, M2).

Data Needs

No change from RY14–RY18 reporting period. Accurate harvest reporting is necessary to understand patterns and levels of harvest. This also assists hunt managers with their understanding of sustainable harvest rates which are used to manage hunts.

Methods

No change from RY14–RY18 reporting period.

3. Habitat Assessment-Enhancement

The Nunivak Island management plan has established population goals for both the muskox and the reindeer on the island (ADF&G 1992). These population goals are set at levels below what the habitat can probably sustain. At this point in time, we are not able to determine how far below carrying capacity the goals are currently set or what time scale is necessary for the range to recover from historic overgrazing of reindeer at these current population goals. During RY19–RY23, DWC area wildlife biologists will work with the Nunivak Cooperators Group to adjust the population goals for both muskox and reindeer on Nunivak Island.

NONREGULATORY MANAGEMENT PROBLEMS OR NEEDS

As muskox populations grow and their range expands on the Y-K Delta, encounters with humans will increase. In other areas, many of these encounters have ended negatively, with dogs being killed and implicated muskox getting subsequently dispatched. Increased documentation of incidences involving muskox will continue to be a priority, which will aid in assessing the effectiveness of outreach efforts.

Education and outreach activities will remain the backbone of our approach to mitigating muskox conflicts. This involves informing the public about steps they can take to reduce their risk in situations involving muskox. This is accomplished through the distribution of muskox safety and viewing informational materials, social media, muskox safety presentations; and consultations with local organizations, area residents, and law enforcement officials. More information about this outreach is on the ADF&G website at ADF&G Home | Species | Living With Wildlife | Muskoxen (http://www.adfg.alaska.gov/index.cfm?adfg=livewith.muskoxen).

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- Nelson Island muskox herd cooperative management plan. Preliminary draft (ADF&G 1995).

Permitting

None.

Acknowledgments

The long-standing cooperative nature of muskox management in Unit 18 requires close cooperation between ADF&G and the communities of Mekoryuk, Newtok, Tununak, Toksook Bay, Nightmute, Chefornak, and USFWS. ADF&G relies heavily on the contributions of various pilots from across the state to complete surveys for muskox including Brett Thoft, Stan Hermens, Wade Renfro, Randy Cone, Isaac Bedingfield, Dan Sailors, and Eugene Peltola. Department staff have also contributed substantial portions of their time in support S&I activities including Lincoln Parrett, Brynn Parr, Tony Gorn, Phillip Perry, Keith Oster, and Adam Craig.

References Cited

Alaska Department of Fish and Game. 1992. Nunivak Island reindeer and muskox management plan: Final, June 1992. Summary of cooperative planning by Alaska Department of Fish and Game, Alaska Soil and Water Conservation District, Bering Sea Reindeer Products, Bureau of Indian Affairs, NIMA Corporation, Soil Conservation Service, and U.S. Fish and Wildlife Service. Division of Wildlife Conservation, Bethel, Alaska.

Alaska Department of Fish and Game. 1995. Nelson Island muskox herd cooperative management plan. Preliminary draft, 24 January 1995. Summary of cooperative planning by Alaska Department of Fish and Game, U.S. Fish and Wildlife Service, and Nelson Island native village corporations (United Villages of Nelson Island). Division of Wildlife Conservation, Bethel, Alaska.

Cuyler, C., J. Rowell, J. Adamczewski, M. Anderson, J. Blake, T. Bretten, V. Brodeur, M. Campbell, S. L. Checkley, H. D. Cluff, et al. 2019. Muskox status, recent variation, and uncertain future. Ambio 49:805–819.

Jennings, L. B. 1969. Muskox report. Alaska Department of Fish and Game, Annual Project Segment Report 1 July 1967–30 June 1968, Work Plan Q, Federal Aid in Wildlife Restoration Project W-15-R-3 Juneau.

Palmer, L. J., and C. H. Rouse. 1963. Progress of muskoxen investigations in Alaska 1930–1935 [mimeo]. Bureau of Sport Fisheries and Wildlife. Juneau.

U.S. Census Bureau. 2021. 2010 Decennial census guidance for data users [web page]. U.S. Department of Commerce, Washington, DC.

Wald, E. J. 2009. Nunivak Island reindeer and muskoxen survey—2009. U.S. Fish and Wildlife Service, Yukon Delta National Wildlife Refuge, Technical Report Series Number 2009-01, Bethel, Alaska.


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