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CHAPTER 1: MUSKOX MANAGEMENT REPORT

From: 1 July 2012
To: 30 June 2014

LOCATION

GAME MANAGEMENT UNIT: 18 (41,159 mi^2)

GEOGRAPHICAL DESCRIPTION: Yukon–Kuskokwim Delta

BACKGROUND

NUNIVAK ISLAND

Muskoxen were once widely distributed in northern and western Alaska but were extirpated by the middle or late 1800s. In 1929, with the support of the Alaska Territorial Legislature, the U.S. Congress initiated a program to reintroduce muskoxen in Alaska. Thirty-one muskoxen were introduced from Greenland to Nunivak Island in Unit 18 during 1935–1936, as a first step. 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 650 animals (Table 1), exhibiting considerable reproductive potential, even under heavy harvest regimes. Periods of low natural mortality and absence of predators benefit the Nunivak muskox population. Since 1992 a management plan with goals and strategies developed cooperatively by local organizations, land owners, stakeholders, subsistence users, and managing agencies has been used by the department as a basis for population and hunt management on Nunivak Island (Alaska Department of Fish and Game 1992).

NELSON ISLAND

During March 1967 and March 1968 groups of 8 and 23 subadult muskoxen, respectively, were translocated from Nunivak Island to Nelson Island, 20 miles across Etolin Strait. 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 fluctuated around 230 animals. In 1993 and 1994 the population dropped below 200 animals, resulting in closure of hunting opportunity in 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, exceeding the upper management goal of 450 animals. In 2014 the population had a minimum count of 979 animals, the single highest count for Nelson Island (Table 2).

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), subsistence users, and the department (Alaska Department of Fish and Game 1995). Since its inception, the draft plan has been used to guide population and hunt management on Nelson Island; it allows hunting when the population is above a minimum goal of 250 animals.

YUKON–KUSKOKWIM DELTA

From an unknown number of seed animals emigrating from Nelson Island, the mainland population has grown to a minimum of 200 muskoxen inhabiting the Yukon–Kuskokwim Delta (Y-K Delta). These muskoxen are scattered in small groups from the Kilbuck Mountains south of the Kuskokwim River to the Andreafsky Mountains north of the Yukon River. They are most consistently observed in the area around the mud volcanoes, Askinak and Kusivak mountains, in the area south and east of Baird Inlet, and more recently near Bethel. Poaching is the major factor preventing the mainland population from becoming firmly established. Marked muskoxen have been documented leaving Nelson Island for a period of up to two years before returning to the island. This behavior complicates muskox management for Nelson Island and makes it difficult to determine the size of the mainland population.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVES

- Survey populations on Nunivak and Nelson Islands in alternate years, using fixed-wing and/or rotary-wing aircraft, to estimate population size and composition.

- Maintain a posthunt/precalving population of a minimum of 250 and a maximum of 450 muskoxen on Nelson Island, and a minimum of 500 and maximum of 550 muskoxen on Nunivak Island.

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

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

- Determine the distribution and dispersal of muskoxen on the mainland.

- Use the cooperative management plans for Nunivak and Nelson islands.

METHODS

Censuses were flown using a PA-12 fixed-wing aircraft on Nunivak Island in August 2013 and June 2014. Population census flights were flown using 2 PA-18-160 aircraft on Nelson Island in June 2014. No surveys were completed during 2013. On all flights we classified muskoxen into 6 categories: calves, yearlings, 2-year-olds, 3-year-old and older bulls, 3-year-old and older cows, or unknown classification.

Since fixed-wing aircraft (with inherently higher flight speeds) were used to conduct surveys, animals were clumped into broad classes of age-sex composition. Within the time available to

study each animal, group size, and terrain on each pass, it becomes impractical to determine more detailed age-sex classification. Broader categories of composition allow for fewer numbers of aerial passes to classify each group, resulting in fewer disturbances to groups during surveys. The use of digital cameras and telephoto photography of group sizes of 5 animals and larger has also helped increase accuracy in classification and helped further reduce the need for multiple passes over individual groups.

The terminology describing composition cohorts used a single classification system even though data collections covered a wide range of months including precalving surveys in March/April and postcalving surveys occurring June through October. Initially, composition counts were conducted using snowmachines in late winter during the precalving period. At this time the youngest cohort was 10 months old and called "yearling," while the next older cohort, being nearly 2 years old, was called "2-year-olds", and so forth for older cohorts. In subsequent years, as surveys were completed between late June and early October, a "calf"' classification was added to the terminology to accommodate the presence of younger-aged animals. The "yearling" and older age classes were retained in both survey periods such that precalving age classes are "short" ages (e g. yearlings are 10 months old) and postcalving age classes are "long" ages (e g. yearlings range 14–18 months old). The standardized single classification system avoids confusion of multiple age classes from the same population, but means that comparing early records of precalving data with more recent postcalving records has a difference of 6–9 months within the same age class.

Currently, census and composition surveys have been completed after the calving period and before hunting commences so they are described as 'prehunt/postcalving' surveys. To express results as 'posthunt/precalving' levels, the number of calves was subtracted from the prehunt/postcalving census counts. This was done to compare the current number to management goals that were established in the cooperative agreements for both Nunivak and Nelson islands. These goals were all stated in posthunt/precalving terms.

Harvest data are summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY12 = 1 July 2012–30 June 2013). Harvests during RY12 and RY13 were monitored through the reporting system for drawing and registration permit hunts.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

The muskox population on Nunivak Island began to increase during this reporting period. However, the population fell below the targeted range of 500–550 animals posthunt/precalving in 2009–2011, and remained below objectives in 2013, and 2014. Nunivak Island was not surveyed in 2012.The numbers of permits issued for cow muskox were decreased while a large but reduced harvest of bull muskoxen was maintained throughout the reporting period.

The Nelson Island muskox population fluctuates significantly more than the Nunivak Island muskox population. Several factors contribute to the variability in numbers of muskoxen, including human-induced mortality and movements on and off the island. The population during the reporting period showed steady growth and remained healthy and productive.

Population Size

During a fixed-wing census of Nunivak Island conducted in August 2013 we counted 533 muskoxen. During a fixed-wing census conducted in June 2014 we counted 563 muskoxen. No survey was done in 2012. Excluding calves from the counts, the Nunivak Island population was at 468 and 434 posthunt/precalving levels in 2013 and 2014, respectively. Both years were below the management goal of a 500–550 posthunt/precalving population for Nunivak Island (Table 1).

In July 2012, a prehunt/postcalving census of Nelson Island muskoxen using a fixed-wing aircraft counted 761 muskoxen. No survey was done in 2013. In June 2014, a prehunt/ postcalving census of Nelson Island muskoxen using a fixed-wing aircraft counted 979 muskoxen. Excluding calves from the counts, the Nelson Island posthunt/ precalving population was at 592 in 2012 and 795 in 2014. From 2001 Nelson Island has been above the lower end of the management goal of a 250 posthunt/precalving population. In 2013 the department established 450 muskox as an upper end of the management goal for the island in an effort to preserve winter range. The population has been above 450 posthunt/precalving since 2012. The history of population counts 1981–2015 are shown in Table 2.

We do not have survey information to estimate the population of mainland muskoxen. Incidental observations from March 2010 indicate a minimum of 100 animals of mixed age and sex on the mainland. The population remains small and widely dispersed in Unit 18, with single animals and small groups now being observed in parts of Unit 19. Groups of muskoxen are commonly seen along the Unit 18/22A boundary. Lone bulls have been seen in Unit 17A. Muskoxen have been observed moving on and off of Nelson Island to and from the mainland, confounding census data in both areas.

Population Composition

No survey was conducted on Nunivak in 2012. In August 2013 the classification of muskoxen on Nunivak was 148 three-year-old or older bulls, 146 three-year-old or older cows, 32 two-year-old-bulls, 71 yearlings, 65 calves and 71 of unknown age and sex (Table 3). In June 2014 the classification was 113 three-year-old or older bulls, 158 three-year-old or older cows, 101 two-year-old-bulls and cows, 53 yearlings, 129 calves and 9 unknown (Table 4).

Muskoxen counted on Nelson Island in July 2012 were classified as 126 three-year-old or older bulls, 200 three-year-old or older cows, 42 two-year-old bulls, 103 yearlings, 169 calves, and 121 of unknown age (Table 5). No survey was conducted on Nelson Island in 2013. In June 2014, the classification was 176 three-year-old or older bulls, 257 three-year-old or older cows, 99 two-year-old bulls and cows, 131 yearlings, 184 calves, and 132 of unknown age (Table 6).

Distribution and Movements

Nunivak Island is a closed system. In the winter muskoxen are distributed throughout the island but are concentrated along the south and west sides of the island. In the summer muskoxen disperse more homogenously throughout the interior of the island.

Nelson Island muskoxen are distributed throughout the island but are concentrated on the cliffs of Cape Vancouver and on hills northeast of Tununak. Individuals and small groups are on the hills in the central portion of the island and along the escarpment above Nightmute.

Mainland muskoxen have been reported in the Kilbuck Mountains. In March 2011, an opportunistic flight from Bethel to Tuntutuliak, Kongiganak, Kipnuk, Chefornak, and Kasigluk and back to Bethel revealed 93 muskoxen in 5 separate mixed age-sex groups. Illegal harvest also confirms the distribution of animals elsewhere in Unit 18. In the winter of 2014 a single animal was poached just outside of Bethel city limits. In May 2013, a group of 20 muskoxen was near Bethel. This group evenly split into two groups, of which 9 animals remained near Bethel through the winter of 2014–2015.

Locations of mainland muskoxen collared during a 1989 cooperative collaring project by the department and federal staff (USFWS) show additional areas of distribution in Unit 18. Five collars were deployed in 2 groups of 9 and 12 animals, respectively, south of the Yukon River between Bethel and Pilot Station. A mature cow collared south of the Yukon River near Pilot Station in 1989 moved approximately 160 miles east to a location near the village of Lower Kalskag, north of the Kuskokwim River. Then, in 1990, a hunter legally shot this muskox near Toksook Bay on Nelson Island, approximately 200 mi west of its last known location.

MORTALITY

Harvest

Season and Bag Limit.

RY12 and RY13 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Unit 18, Nunivak Island:		
RESIDENTS and NONRESIDENTS**:**		
1 bull by drawing permit only. Up to 10 permits will be issued for the fall season and up to 50 for spring season; or 1 cow by registration permit only, with up to 60 cow permits issued on a first-come, first-served basis.	1 Sep–30 Sep 1 Feb–15 Mar	1 Sep–30 Sep 1 Feb–15 Mar
Unit 18, Nelson Island:		
RESIDENTS and NONRESIDENTS		
1 muskox by registration permit only; up to 42 permits will be issued on a first-come, first-served basis.	1 Feb–25 Mar	1 Feb–25 Mar

RY12 and RY13 Unit and Bag Limits	Resident Open Season (Subsistence and General Hunts)	Nonresident Open Season
Remainder of Unit 18	No open season	No open season

Board of Game (BOG) Actions and Emergency Orders. No emergency orders were issued during this reporting period. The board adopted 2 new regulatory actions at the March 2014 BOG meeting in Anchorage, effective in RY14. The first regulation change allows the department to adjust the number of permits for the spring hunt on Nelson Island, and allocates how and where the department will make permits available. The second regulation change allocated a portion of Nunivak Island bulls to the registration hunt in years when cow harvest is not warranted, but bull harvest is sustainable.

Human-induced Harvest. On Nunivak Island we are using management plan goals and strategies to manage hunts. In general, hunting is regulated by drawing and registration permits for fall and spring hunts. Hunters wishing to harvest bulls obtain permits through the statewide drawing permit process. Harvest of cows is regulated primarily using registration permits. Occasionally, when harvestable surplus of bulls allows, auction permits are made available to qualified organizations for fundraising purposes.

The history of total harvest of bulls and cows on Nunivak Island for RY92–RY14 is shown in Table 7. Most bulls taken during this period were harvested under the drawing permit system. In RY12, 26 bulls were harvested by hunters who had drawing permits, and an additional 2 bulls were harvested by auction permit recipients. In RY13 the harvest of 32 bulls by drawing permit included 7 bulls in the fall and 25 in the spring; additionally, 2 bulls were taken by hunters with an auction permit. Additional harvest after the reporting period included 28 bulls in RY14.

Registration permits for hunting Nunivak Island cows are distributed on a first-come, first-served basis in Bethel and Mekoryuk. Zero fall and 5 spring permits were issued in RY12; and 0 fall and 5 spring permits in RY13. Six cows were harvested in RY12, and 6 in RY13. Additional harvest after the reporting period included 5 cows in RY14 (Table 7).

The Nelson Island cooperative management plan has been used to guide hunting when the population is at or above 250 animals. When the population falls below 250 animals, the plan calls for cessation of hunting. We distribute Nelson Island registration permits on a first-come, first-served basis. The location where these permits are distributed rotates through the local villages of Newtok, Toksook Bay, Tununak, Nightmute, and Chefornak.

The history of permits issued and harvest of bulls and cows for RY81–RY14 is shown in Table 8. In RY12, 25 bull and 17 cow permits were distributed in Newtok, and in RY13, 10 bull and 32 permits were distributed in Toksook Bay. Twenty-one bulls and 15 cows were harvested in RY12. Ten bulls and 28 cows were harvested in RY13. Due to a regulation change effective after the reporting period 100 bull and 200 cow permits were distributed in RY14; harvest included 87 bulls and 138 cows.

We occasionally receive reports of muskoxen taken illegally. However, the number of animals taken is difficult to determine because we may receive reports of the same animal(s) from more than one source. We believe that some muskoxen taken illegally go undetected, so tallies of illegal harvest are considered minimum estimates. During RY12–RY14 a minimum of 3 muskoxen were harvested illegally on the mainland.

Permit Hunts. All hunts for muskoxen in Unit 18 are either by drawing permit or registration permit; the "Human-induced Harvest" section of this report includes specific information regarding permit hunts.

Hunter Residency and Success. Most drawing permittees for Nunivak Island are residents of Alaska. Four nonresidents were drawn and one purchased an auction permit in RY12; 7 nonresidents drew permits and 2 purchased auction permits in RY13. All Nelson Island registration permit hunters in this reporting period were Alaska residents.

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 have taken 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 particular guide or transporter and, consequently, these hunts were evenly distributed throughout the season.

Transport Methods. In the fall most hunters use a boat, all-terrain vehicle (ATV), or a small aircraft to access the hunting areas; access is occasionally on foot. All access in the winter season was by snowmachine.

Other Mortality

No natural predators of muskoxen are present on Nunivak Island, and large predators are rare on Nelson Island. Mainland muskoxen occur in areas that have few wolves, black bears, brown bears, and only occasionally polar bears, so predation rates are believed to be quite 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 small, presumably calf, muskoxen in the area between Scammon Bay and Hooper Bay. Most mortality is from illegal harvest, or by accidents—Drownings, stranding, falling off cliffs, and falling through ice—and weather such as freezing rain.

HABITAT

Assessment

No muskox habitat assessment activities were planned or completed during the reporting period. On Nunivak Island we believe reindeer have historically overgrazed the lichen range, yet the reindeer herd was within the management goal of no more than 2,000 animals precalving during this reporting period. In July 2012 an incomplete survey of Nunivak had a minimum count of 1,792 reindeer. The August 2013 count was 1,853 reindeer (Table 9). In June 2014 the number increased to 1,899 reindeer. The 2009 survey was the first time in 34 years that reindeer numbers were below the management goal objective of 2,000 animals that was established in the 1992 reindeer management plan (Wald 2009).

Anecdotally muskoxen taken by hunters on Nunivak and Nelson islands in recent years are reported to be in good body condition with adequate fat, and most harvested females are reported to be pregnant A department study of liver tissue from hunter harvested animals in RY07 and RY08 shows preliminary results that both island populations have healthy level of minerals and trace elements (Jones, unpublished data, ADF&G files, Bethel). Historically, Nunivak Island was overgrazed by wild caribou and more recently by high density of domesticated reindeer. There are no studies in place to determine if range conditions are improving as intended by managing for the current population goals of both reindeer and muskox on the island. Although we have no indications that habitat on Nelson Island has been damaged from overgrazing, there is concern that the high density of muskox on the western side of the island may impact winter habitat. Muskox habitat on the mainland is extensive and could support a much larger population.

Enhancement

No habitat enhancement activities were planned or completed during the reporting period. On Nunivak Island we are using hunt management strategies to meet muskox population goals and no enhancement is needed. On Nelson Island we are using hunt management strategies to meet muskox population goals and no enhancement is needed. Currently there are no habitat enhancement goals for the mainland.

NONREGULATORY MANAGEMENT PROBLEMS/NEEDS

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

CONCLUSIONS AND RECOMMENDATIONS

The Nunivak Island muskox population historically has been characterized by high productivity and low natural mortality. Currently, it is rebounding from a period of reduced productivity which has resulted in a lower population and harvest. We will continue to reduce the harvest of bulls and cows when the posthunt/precalving population is below 500 animals, or when bull:cow ratios warrant such actions. The management goals for Nunivak Island muskoxen include maintaining a maximum population of 500–550 muskoxen, translocation of muskoxen to other areas of Alaska, and providing opportunities to hunt muskoxen. When aerial surveys are conducted, it would be a minimum cost and high benefit to continue photographing Nunivak Island reindeer (simultaneously) while counting muskox. It adds approximately 1 hour of survey time to the muskox survey and substantiates direct counts of reindeer in survey reports to all parties involved in the Nunivak Island management plan.

Fluctuations in the observed size of the Nelson Island population are influenced by snow and ice conditions, the availability of escape terrain, and forage. The Nelson Island population is not confined to the island because animals can reach the mainland. The drop in population on Nelson Island from 297 in 1999 to 233 in 2000 was probably due to a combination of emigration and illegal harvest, both of which occurred and were reported during this reporting period. In recent years the Nelson Island population has continued to grow and appears healthy.

Variable annual harvests are needed to effectively manage the Nelson Island population in response to emigration and other natural losses. While the population is growing, we are harvesting variable numbers of muskoxen at a rate not exceeding 10% of the population to

maintain healthy age and sex components in the population. In each regulatory year of this reporting period the department issued the legal maximum of 42 permits. Currently Nelson Island has reached a population size that can support higher harvests. In March 2014 the BOG approved higher harvest rates on Nelson Island effective in RY14. Under the new regulation the department will attempt to reduce the population on Nelson Island to less than 550 animals within a 5-year period.

We continue to receive reports of mainland muskoxen, but illegal take of these animals is a key factor in preventing establishment of a reproductively viable population. A minimum of 200 muskoxen inhabit the extensive areas of mainland habitat. Although low numbers for mainland muskoxen are discouraging, there is still potential for a population to become established, particularly with the concern and cooperation shown by villagers from Nelson Island and with continued growth of the Nelson Island muskox population. The highly successful moose moratoriums in the area on both the Kuskokwim and Yukon rivers further demonstrate the ability of people to to work together to benefit local wildlife population.

A comprehensive information and education program explaining the benefits of a larger muskox population on the mainland of Unit 18 should be prepared for the benefit of local residents. We may want to pursue a cooperative project with the Yukon Delta National Wildlife Refuge and village councils to develop an educational program that encourages local residents to foster the establishment of a viable, harvestable mainland muskox population. We have purchased 3 GPS collars to use on adult cow muskoxen on the mainland to help determine distribution and movements. This will help promote understanding of the feasibility and importance of a large and healthy mainland population.

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.

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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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Jones, P. 2015. Unit 18 muskox. Chapter 1, pages 1-1 through 1-17 [*In*] P. Harper and L. A. McCarthy, editors. Muskox management report of survey and inventory activities 1 July 2012–30 June 2014. Alaska Department of Fish and Game, Species Management Report ADF&G/DWC/SMR-2015-2, Juneau.

While this unit report was actually published in 2016, it is part of the set of 2015 unit species management reports, so we suggest citing the report as a 2015 report to maintain its relationship to the other 2015 unit reports.

Table 1. Unit 18 Nunivak Island, Alaska muskox population survey results, 1981–2014.

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	361 [a]
1995		488	385 [a]
1996		435	363 [a]
1997		593	473 [a]
1998		643	536 [a]
1999		620	507 [a]
2000		628	526 [a]
2001		609	515 [a]
2002		527	440 [a]
2003		657	542 [a]
2004		638	526 [a]
2005		588	478 [a]
2006		615	524 [a]
2007	No survey	No survey	No survey
2008	No survey	No survey	No survey
2009		567	469 [a]
2010		517	433 [a]
2011		452	389 [a]
2012	No survey	No survey	No survey
2013		533	468 [a]
2014		563	434 [a]

[a] Are calculated numbers (removing the number of calves) from Prehunt/postcalving survey number for management purposes.

Table 2. Unit 18 Nelson Island, Alaska muskox population survey results, 1981–2014.

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	195 [a]
1998		293	225 [a]
1999		297	237 [a]
2000	233		172 [a]
2001		306	226 [a]
2002		293	220 [a]
2003		327	258 [a]
2004		318	253 [a]
2005	No Survey	No Survey	No Survey
2006	No Survey	No Survey	No Survey
2007		374	275 [a]
2008	No Survey	No Survey	No Survey
2009		541	453 [a]
2010		561	435 [a]
2011	No Survey	No Survey	No Survey
2012		761	592 [a]
2013		No Survey	795 [a]
2014		979	745 [a]

[a] Are calculated numbers (removing the number of calves) from Prehunt/postcalving survey number for management purposes.

Table 3. Unit 18 Nunivak Island, Alaska muskox composition, August 2013.

	Male		Female		Unknown		Total	
Age	*N*	%[a]	*N*	%[a]	*N*	%[a]	*N*	%[b]
+3 years[c]	148	50	146	50			294	55
2 years	32	100					32	6
Yearlings					71	100	71	13
Calves					65	100	65	12
Unknown					71	100	71	13
Total	180	55[d]	146	45[d]	207	37	553	

[a] Percentage of age-sex specific cohort based on number in sample.
[b] Percent of total sample classified.
[c] Adults are considered 3 years and older.
[d] Percentage based on known males and females (excludes unknown), *N*=326.

Table 4. Unit 18 Nunivak Island, Alaska muskox composition, June 2014.

	Male		Female		Unknown		Total	
Age	*N*	%[a]	*N*	%[a]	*N*	%[a]	*N*	%[b]
+3 years[c]	113	42	158	58			271	48
2 years					101	100	101	18
Yearlings					53	100	53	9
Calves					129	100	129	23
Unknown					9	100	9	2
Total	113	42[d]	158	58[d]	292	52	563	

[a] Percentage of age-sex specific cohort based on number in sample.
[b] Percent of total sample classified.
[c] Adults are considered 3 years and older.
[d] Percentage based on known males and females (excludes unknown), *N*=271.

Table 5. Unit 18 Nelson Island, Alaska muskox composition, July 2012.

	Male		Female		Unknown		Total	
Age	*N*	%[a]	*N*	%[a]	*N*	%[a]	*N*	%[b]
+3 years[c]	126	39	200	61			326	43
2 years	42	100					42	6
Yearlings					103		103	14
Calves					169		169	22
Unknown					121		121	16
Total	168	46[d]	200	54[d]	393		761	

[a] Percentage of age-sex specific cohort based on number in sample.
[b] Percent of total sample classified.
[c] Adults are considered 3 years and older.
[d] Percentage based on known males and females (excludes unkown), $N = 368$.

Table 6. Unit 18 Nelson Island, Alaska muskox composition, June 2014.

	Male		Female		Unknown		Total	
Age	*N*	%[a]	*N*	%[a]	*N*	%[a]	*N*	%[b]
+3 years[c]	176	41	257	59			433	44
2 years					99	100	99	10
Yearlings					131	100	131	13
Calves					184	100	184	19
Unknown					132	100	132	13
Total	176	41[d]	257	59[d]	546		979	

[a] Percentage of age-sex specific cohort based on number in sample.
[b] Percent of total sample classified.
[c] Adults are considered 3 years and older.
[d] Percentage based on known males and females (excludes unkown), $N = 433$.

Table 7. Unit 18 harvest of Nunivak Island, Alaska muskoxen, regulatory years[a] 1992–2014.

Regulatory year	Males	Females	Unknown	Total
RY92	45	31		76
RY93	47	26		73
RY94	35	23		58
RY95	20	5		25
RY96	20	19		39
RY97	25	24		49
RY98	26	30		56
RY99	43	45[b]		88
RY00	46[c]	40		86
RY01	45	42		87
RY02	43	41		84
RY03	45	43		88
RY04	45	42		87
RY05	43	44		87
RY06	37	38		75
RY07	29	39	1	69
RY08	39 [c]	35	6	80
RY09	51 [d,e]	30		81
RY10	47[e]	20		67
RY11	32 [c,e]	5		37
RY12	28 [e]	6 [b]		34
RY13	34 [e]	6 [b]		40
RY14	28 [e]	5		33
Total	853	639	7	1,499

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2012 = 1 July 2012–30 June 2013.
[b] Includes cow(s) taken by hunters issued a bull permit.
[c] Includes bull(s) taken by hunters issued a cow permit.
[d] 7 bulls taken during emergency order opening for stranded animals on Triangle and Abaramiut islands.
[e] Years that muskoxen were harvested with auction permits SX001 or SX003.

Table 8. Unit 18 permits and hunting harvest of Nelson Island, Alaska muskoxen, regulatory years[a] 1992–2014.

Regulatory	Permits issued		Muskoxen harvested	
year	Female	Male	Female	Male
RY92	15	15	15	15
RY93	0	30	0	30
RY94	5	25	5	21
RY95	0	0	0	0
RY96	0	0	0	0
RY97	10	10	7	10
RY98	10	10	10	10
RY99	15	15	15	15
RY00	15	15	14	15
RY01	0	0	0	0
RY02	2	1	1	2
RY03	15	23	14	22
RY04	15	24	14	24
RY05	15	23	14	21
RY06	15	23	11	15
RY07	15	15	14	14
RY08	14	24	13	22
RY09	17	25	15	21
RY10	17	25	17	20
RY11	17	25	15	20
RY12	17	25	15	21
RY13	10	32	10	28
RY14	200	100	138	87
Total	339	585	301	482

[a] Regulatory year begins 1 July and ends 30 June, e.g., regulatory year 2012 = 1 July 2012–30 June 2013.

Table 9. Nunivak Island, Alaska reindeer survey numbers, 2009–2014.

Year	Reindeer	Month of survey	Surveyed by	Survey method
2004	4,169	Late winter	Cooperative	Ground
2005	No Survey	No Survey	No Survey	No Survey
2006	3,250	March		Ground
2007	No Survey	No Survey	No Survey	No Survey
2008	No Survey	No Survey	No Survey	No Survey
2009	1,192	August	USFWS	Aerial
2010	1,605	July	ADF&G	Aerial
2011	1,534	October	ADF&G	Aerial
2012	1,792	July	ADF&G	Aerial
2013	1,853	August	ADF&G	Aerial
2014	1,899	June	ADF&G	Aerial

USFWS = U. S. Fish and Wildlife Service
ADF&G = Alaska Department of Fish and Game