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CHAPTER 25: MOOSE MANAGEMENT REPORT

From: 1 July 2011
To: 30 June 2013[1]

LOCATION

GAME MANAGEMENT UNIT: 20D (5,637 mi^2, 5028 mi^2 of moose habitat)

GEOGRAPHIC DESCRIPTION: Central Tanana Valley near Delta Junction

BACKGROUND

Unit 20D was created in 1971 from a portion of Unit 20C. During 1962–1970, the moose hunting season in the area that is currently Unit 20D consisted of a 70- to 72-day bull season and a 1- to 8-day antlerless moose season. Most (51–74%) of the harvest during 1964–1970 came from the highly accessible areas near Delta Junction (Clearwater Lake, Donnelly Dome, and the Delta farming area). However, several severe winters in the mid-1960s and early 1970s killed many moose throughout this unit and other portions of Interior Alaska and set the stage for predation and hunting to compound and aggravate already widespread population declines. Poor recruitment of yearlings to the population in combination with intense bulls-only hunting depressed the bull:cow ratio to only 4:100 in the more accessible portions of the unit. The moose hunting season was closed during 1971–1973 because the depressed moose population could no longer support any significant harvest (McIlroy 1974).

Despite restrictions on hunting, the moose population in Unit 20D continued to decline because of chronically high moose mortality from other causes. In 1973 the moose population south of the Tanana River and between the Johnson and Delta rivers was estimated at only 600. When limited moose hunting was resumed in 1974, it was conducted under a registration permit system for the entire unit; however, an area around Delta Junction was closed to moose hunting. The moose population decline in western Unit 20D was gradually reversed by a combination of continued hunting restrictions, mild winters, and wolf control in adjacent Unit 20A (1976–1982) and western Unit 20D (1980–1983).

In 1978, Unit 20D was enlarged by moving the eastern boundary from the Johnson River to the Robertson River. It was further enlarged in 1981 to include all drainages north of the Tanana River from the mouth of the Robertson River to Banner Creek.

In 1983 the closed area around Delta Junction, established in 1974, was formally named the Delta Junction management area (DJMA). The name of the DJMA was changed to the Delta

[1] At the discretion of the reporting biologist, this unit report may contain data collected outside the report period.

Junction closed area (DJCA) in 1990 to more accurately reflect its status as an area closed to hunting. In 1991 DJCA was reduced in size to provide more hunting opportunity in the area. In 1996 DJCA was renamed DJMA because a drawing permit hunt was established in the area.

Unit 20D is subdivided into 4 areas for moose management purposes: southwestern Unit 20D, the area south of the Tanana River from the Johnson River to the Delta River; southeastern Unit 20D, the area south of the Tanana River from the Robertson River to the Johnson River; northwestern Unit 20D, the area north of the Tanana River from Banner Creek to and including the Volkmar River; and northeastern Unit 20D, the area north of the Tanana River and east of the Volkmar River.

As moose populations recovered during the mid-1970s and early 1980s, hunting opportunities were expanded in southwestern Unit 20D by first eliminating the registration permit requirement and then by lengthening the season. In southeastern and northern Unit 20D, the seasons were also increased. Antler restrictions were implemented in southwestern Unit 20D in 1988 to stabilize the increasing harvest and to improve the age structure in the bull segment of the population. In March 1995 the Alaska Board of Game determined that the preferred use of moose in Unit 20D was for human consumption and established a moose population objective of 8,000–10,000 and an annual harvest objective of 240–500. The harvest objective was increased to 500–700 moose in 2000.

To regulate moose hunting in the fields of the Delta Junction Bison Range (hereinafter referred to as Bison Range), the Bison Range youth hunt management area was created in 2002. This drawing permit hunt was implemented primarily to reduce the impact of moose hunting on bison management on the bison range.

Antlerless moose hunting began in fall 2006 in southwestern Unit 20D with a limited number of permits issued in response to a high density population, moderate overwinter browse removal and moderately low twinning rates. The goals of the antlerless hunts were to stabilize population growth in the unit and to address concerns about range degradation, reduced nutritional conditions, and reduced reproductive success. Antlerless moose hunting in southwestern Unit 20D continued through fall 2009.

The southwestern Unit 20D moose density was reduced by the antlerless hunts. Three indices of density-dependent moose nutritional conditions — biomass removal of current annual growth on winter browse, proportion of females with twin calves, and late-winter calf weights — were evaluated in relation to changes in density. The post-antlerless hunt evaluation of these 3 indices was compared to prehunt data and data collected during the hunts. The comparison detected a decrease in winter browse removal, an increase in twinning rate, and an increase in the average weight of 9-month-old calves. There have been no antlerless hunts since the 2009 season, with the exception that an antlerless moose (except a cow accompanied by a calf or a calf) is part of the legal bag limit in the Bison Range youth moose hunt.

MANAGEMENT DIRECTION

MANAGEMENT OBJECTIVE

- Increase the fall moose population to 8,000–10,000 moose with an annual reported sustainable harvest of 500–700 moose per year.

Indices of density-dependent nutritional limitation provide scientific and objective means for prudent management of a rapidly growing moose population. Boertje et al. (2007) ranked nutritional status of moose populations across Interior and northern Alaska using several density-dependent indices to moose nutrition. Using these density-dependent thresholds, we developed the following interim population and harvest objectives for Unit 20D.

Population Objective

- Manage the northern and southern Unit 20D moose populations independently (north and south of the Tanana River) for optimal population size based on indices to density-dependent nutritional limitation, to guard against eventual site-specific long-term range damage and starvation from overabundance.

Moose populations will be managed for:

1) increasing population growth when the average 2-year prior twinning rate exceeds 20%, but a reduced rate of growth as this twinning rate average approaches 20%;

2) stable population size when the 2-year prior twinning rate averages 11–20%; and

3) decreasing population growth when the 2-year prior twinning rate averages ≤10%.

Harvest Objective

- Harvest the northern and southern Unit 20D moose population (north and south of the Tanana River) independently. The bull segment of the population will be managed in any portion of Unit 20D for a sustainable harvest to take the maximum number of bulls.

The bull bag limit will be liberal for any significant portion of Unit 20D with a ratio of ≥30 bulls:100 cows for ≥2 consecutive years. If, in any portion, the bull:cow ratio decreases to <30 bulls:100 cows for ≥2 consecutive years, regulations will be adopted to restrict bull harvest sufficient to maintain a ratio of >20 bulls:100 cows.

Antlerless moose harvest will be implemented as needed to manage for increasing population growth, no growth, or a decreasing population as described in the population objective. Antlerless harvest will not be implemented on a declining population even if the 2-year prior twinning rate averages >20%.

METHODS

POPULATION ESTIMATES

We used the geospatial population method (GSPE; Ver Hoef 2001, Ver Hoef 2008) to conduct moose population estimation surveys in southern and northern Unit 20D. We maximized accuracy and precision of GSPE surveys by allocating 60% of sampling effort to the high-density stratum and 40% of effort to the low-density stratum (Kellie and DeLong 2006).

We stratified southern Unit 20D sample units (SU) as high or low density of moose based on previous stratifications and existing knowledge of the area. In general, SUs were stratified low if we expected to count <5 moose in them and stratified high if we expected to count ≥5 moose. In

an attempt to keep variance as small as possible, we placed borderline SUs in the high stratum to minimize variance in the population estimate for the low stratum.

Northern Unit 20D GSPE SUs were stratified using a Piper PA–18 Super Cub. We stratified by flying north–south transects through the midpoint of each SU. The proportion of moose habitat in each SU was estimated and classified as low shrub (generally *Salix* species), tall shrub, deciduous forest, sparse spruce forest, spruce forest, or nonhabitat. The presence of moose tracks and number of moose seen in the SU were recorded. Before exiting the SU, it was stratified as either high or low density.

GSPE SUs are a continuous grid of squares with boundaries every 2 degrees of latitude and 5 degrees of longitude. SUs varied in size from approximately 5.7 to 5.9 mi^2 in Unit 20D. Each SU is identified by the latitude and longitude of its southeastern corner.

Selection of SUs was optimized for the GSPE spatial sampling design by selecting adjacent pairs of SUs within blocks of similar habitat distributed somewhat evenly, rather than randomly, throughout the survey area. The number of SU pairs that could be surveyed was based on funding. First, the number of SUs to be surveyed in each stratum was divided by 2 to determine the number of SU pairs in each stratum. Next, the number of SU pairs to be surveyed per stratum was divided into the total number of SUs in the survey area to determine the number of survey blocks. I then grouped SUs in our survey area into blocks with similar anticipated moose densities, habitat types, and topographic features. Blocks of SUs were grouped within strata. Within each block of SUs, pairs of SUs were selected by randomly selecting the first SU, and then randomly selecting an adjacent SU to form the pair. Ten percent of available SUs were not allocated to pairs, but held in reserve and placed singly, rather than as pairs, within the survey area where selected SU pairs were >50 km apart. If SUs are separated by greater than 50 km, autocorrelation cannot be calculated for the population estimate (Kellie and DeLong 2006).

Sample units were surveyed with a Piper PA-18 Super Cub and flown at altitudes of approximately 300–800 feet above ground level, depending on vegetative cover. Flight speed was 60–70 mph. When terrain permitted, east–west linear transects were flown every 0.15 degrees of latitude, or north–south every 0.25 degrees of longitude. A global positioning system receiver was used to follow transect headings. In hilly or mountainous terrain, the flight path followed terrain contours within SU boundaries, rather than transects. Our objective was to spend 8–10 min/mi^2 of search effort in each SU sampled to achieve consistently high sightability of moose. However, large areas of nonhabitat (i.e., lakes, areas covered with ice) within these SUs were not surveyed.

We circled all moose seen to look for additional moose and to classify moose as bulls, cows, or calves. Bulls were further classified into 5 categories based on antler size and morphology: 1) yearlings with spike-fork antlers, 2) yearlings with palmate antlers, 3) medium bulls with antler spread of 31–40 inches, 4) medium bulls with antler spread 41–49 inches, and 5) large bulls with antler spread ≥50 inches. We estimated antler spread on all medium and large bulls. We identified yearling bulls as those with antler spread <30 inches and with no antler brow palm development.

Information recorded for each SU included 1) survey start and stop times, 2) snow and light conditions, 3) major habitat type, 4) location, and 5) survey rating of excellent to poor, based on the observer's general impression.

GSPE methodology allows survey areas to be subdivided into smaller analysis areas with separate population estimates calculated for each area. In southern Unit 20D, separate population estimates were calculated for southwestern and southeastern Unit 20D for those years when GSPE surveys met the criteria. Population estimates and compositions were calculated by entering SU data into the Alaska Department of Fish and Game's (ADF&G) GSPE application software (DeLong 2006) to calculate a population estimate and composition of observable moose.

GSPE slightly underestimates the size of a moose population because it does not account for moose missed while conducting the survey. However, the moose population objective for Unit 20D is based on actual moose population size so we applied a sightability correction factor (SCF) to GSPE estimates based on recent research by Boertje and others (Boertje et al. 2009; Keech et al. 2011; R. Boertje, ADF&G, unpublished data, Fairbanks). An SCF of 1.21 was applied to estimates for southern Unit 20D and an SCF of 1.25 was applied to estimates for northern Unit 20D.

Population estimates in southern and northern Unit 20D were combined in some years to estimate a total unitwide estimate following the methods described in Gasaway et al. (1986). We applied the area-specific SCFs to the area population estimates.

Twinning Surveys

Surveys were flown in a Piper PA-18 at 300–700 feet above ground level at approximately 60–70 mph by flying linear transects spaced approximately 0.25 miles apart. The survey objective was to observe a sample of 50 cows with calves. Large areas where there was little chance of spotting a moose (i.e., large agricultural grain fields, areas of dense spruce) were not surveyed.

Twinning survey SUs were drawn on 1:63,360 scale U.S. Geological Survey topographic maps using topographic features as boundaries. Twinning surveys were flown in 6 SUs totaling approximately 90 mi^2 south of the Tanana River between the Gerstle and Delta rivers (southwestern Unit 20D). The SUs surveyed include Big Lake, Butch Lake, Clearwater Lake, Sawmill Creek North, Donnelly, and Delta Agricultural Project West. In addition to surveying the SUs listed above, we classified and recorded moose observed while flying en route to SUs.

When moose were spotted, a low pass was made to determine the sex and to look for newborn calves. Moose ≥1 year old with visible antlers were classified as bulls; all others were classified as cows. If no calves were observed with cows, 2–4 additional low passes were made over the cow to improve sightability of calves, if present. Data recorded for each observation included the sex of the moose, the presence or absence and number of calves or yearling offspring, and the moose location. Twinning rates were calculated by dividing the total number of cows seen with any calves at heel (single or twins) by the number of cows seen with twins at heel.

Harvest Monitoring

Harvest of moose by hunters during the general hunting seasons was monitored by requiring hunters to acquire moose harvest tickets and report hunting activities that included the location hunted, how long they hunted, their mode of transportation, whether they killed a moose, where and when they killed a moose, the antler spread and number of brow tines on bull moose killed, and the type of weapon used to kill the moose. Hunters who participated in permit hunts provided the same information via permit report forms. Harvest data were summarized by regulatory year (RY), which begins 1 July and ends 30 June (e.g., RY11 = 1 July 2011–30 June 2012). One reminder letter was sent to holders of harvest tickets who did not report. Hunters who had permits received 1 or 2 reminder letters and usually an e-mail and telephone calls if we did not receive timely permit reports.

RESULTS AND DISCUSSION

POPULATION STATUS AND TREND

Population Size

2011. The GSPE survey in southern Unit 20D during 2–23 November 2011 cost $9,490. This survey area included 320 SUs and covered 1,890.2 mi^2 averaging 5.9 mi^2/SU. The high-density stratum had 186 SUs totaling approximately 1,098.2 mi^2 and the low-density stratum had 134 SUs totaling 792.0 mi^2. We searched 64 SUs including 44 high-density (73%) and 20 low-density (31%), meeting the objective of surveying 60% high-density SUs. Search effort during this survey did not meet the objective. Search effort averaged 42.7 min/SU (7.1 min/mi^2) in high density SUs and 39.7 min/SU (6.60 min/mi^2) in low density SUs.

The southern Unit 20D population estimate was 4,134 observable moose (without an SCF applied, Table 1) with a 90% confidence interval of 3,162–5,106. Applying a 1.21 SCF to the estimate resulted in an SCF-corrected estimate of 5,002 moose (2.6 moose/mi^2).

Southwestern and Southeastern Unit 20D — The southern Unit 20D GSPE survey results were subdivided into 2 analysis areas of 1) southeastern Unit 20D, south of the Tanana River and east of the Johnson River; and 2) southwestern Unit 20D, south of the Tanana River and west of the Johnson River.

The southeastern Unit 20D analysis area had a population estimate of 791 observable moose (Table 2) and 957 with a 1.21 SCF applied, resulting in 1.6 moose/mi^2.

The southwestern Unit 20D population estimate was 3,343 observable moose (Table 3) and 4,045 with a 1.21 SCF applied, resulting in a density of 2.7 moose/mi^2.

Aerial twinning surveys in southwestern Unit 20D were flown during 28 May–2 June 2012 in 14.1 hours of survey time and cost $4,900. We spotted 20.5 moose/hr, with 300 moose observed including 59 cow–calf groups with 8 (13.6%) being cows with twins (Table 4).

2012. The southern Unit 20D (south of the Tanana River) GSPE survey was flown during 5 November–12 December 2012 and cost $8,960. This survey area included 320 SUs and covered 1,890 mi^2 averaging 5.9 mi^2/SU. The high-density stratum had 189 SUs totaling approximately 1,116 mi^2 and the low density stratum had 131 SUs totaling 775 mi^2. Fifty SUs

were searched including 30 high-density (60%) and 20 low-density (43%), meeting the objective of surveying 60% high density SUs. Search effort during this survey met the objective in high density SUs and averaged 46.1 min/SU (7.7 min/mi^2) but did not meet the objective in low density SUs that averaged 44.1 min/SU (7.4 min/mi^2).

The population estimate was 4,450 observable moose (without an SCF applied, Table 1) with a 90% confidence interval of 3,618–5,284 moose. Applying an SCF of 1.21 to the estimate resulted in a sightability-corrected estimate of 5,385 moose for a density of 2.8 moose/mi^2.

Southwestern and Southeastern Unit 20D — The southern Unit 20D GSPE survey results were subdivided into 2 analysis areas of 1) southeastern Unit 20D, south of the Tanana River and east of the Johnson River; and 2) southwestern Unit 20D, south of the Tanana River and west of the Johnson River.

The southeastern Unit 20D analysis area had a population estimate of 1,164 observable moose (Table 2) and 1,408 moose with a 1.21 SCF applied, resulting in 2.3 moose/mi^2.

The southwestern Unit 20D analysis area had a population estimate of 3,286 observable moose (Table 3) and 3,976 with a 1.21 SCF applied, resulting in a density of 3.2 moose/mi^2.

Aerial twinning surveys in southwestern Unit 20D were flown during 28–30 May 2013 for a total of 9.1 hours of survey time and cost $2,580. We saw 26.0 moose/hr, with 246 moose observed including 54 cow-calf groups with 14 (25.9%) being cows with twins (Table 4).

Northern Unit 20D — Habitat stratification and GSPE surveys were flown in northern Unit 20D in 2012. The last stratification survey in northern Unit 20D prior to this occurred in the late 1990s, and the last northern Unit 20D GSPE survey was flown in 2004.

The northern Unit 20D (north of the Tanana River) stratification survey occurred during 1–12 November. Two hundred fifty-eight SUs were stratified as high density and 288 were stratified as low density.

The northern Unit 20D GSPE survey was flown during 17 November–11 December 2012 and cost $13,360. This survey area included 546 SUs and covered 3,174 mi^2 averaging 5.8 mi^2/SU. The high-density stratum had 262 SUs totaling approximately 1,520 mi^2 and the low density stratum had 284 SUs totaling 1,653 mi^2. Fifty-three SUs were searched including 32 high-density (60%) and 21 low-density (40%), meeting the objective of surveying 60% high-density SUs. Search effort during this survey met the objective in high density SUs and averaged 45.4 min/SU (7.8 min/mi^2) but did not meet the objective in low density SUs that averaged 43.8 min/SU (7.6 min/mi^2).

The population estimate was 2,406 observable moose (without an SCF applied, Table 5) with a 90% confidence interval of 1,811–3,001 moose. Applying an SCF of 1.25 to the estimate resulted in a sightability-corrected estimate of 3,008 moose for a density of 0.9 moose/mi^2.

Unitwide Population Estimate — The 2012 southern and northern Unit 20D population estimates were combined to calculate a Unit 20D total population estimate of 6,856 observable moose.

Population Composition

2011. The southern Unit 20D population composition from the fall 2011 GSPE survey was 35 calves:100 cows (range = 31–40) and 30 bulls:100 cows (range = 22–38; Table 1).

The southeastern Unit 20D analysis area had composition of 35 calves:100 cows (range = 31–40) and 31 bulls:100 cows (range = 16–46; Table 2).

The southwestern Unit 20D analysis area had composition of 37 calves:100 cows (range = 32–41) and 30 bulls:100 cows (range = 22–38; Table 3).

2012. The southern Unit 20D population composition from the fall 2012 GSPE survey was 30 calves:100 cows (range = 24–38) and 37 bulls:100 cows (range = 27–47; Table 1).

The southeastern Unit 20D analysis area had composition of 30 calves:100 cows (range = 24–38) and 39 bulls:100 cows (range = 21–56; Table 2).

The southwestern Unit 20D analysis area had composition of 34 calves:100 cows (range = 28–40) and 36 bulls:100 cows (range = 27–45; Table 3).

The northern Unit 20D population composition from the fall 2012 GSPE survey was 13 calves:100 cows (range = 8–19) and 59 bulls:100 cows (range = 35–84; Table 5).

Distribution and Movements

In RY10 ADF&G staff initiated a project to monitor moose movements. Twenty-five moose were radiocollared in Unit 20D for this study (K. A. K. Seaton, Wildlife Research Biologist, ADF&G, unpublished data, Fairbanks). This project continued through this reporting period.

MORTALITY

Harvest

Season and Bag Limit. Hunting seasons and bag limits during RY11–RY12 are listed in Table 6.

Alaska Board of Game Actions and Emergency Orders.

2012 — In March 2012 the Alaska Board of Game adopted proposal 201 to reauthorize antlerless moose hunting in southwestern Unit 20D. No emergency orders were issued in RY11 or RY12.

Harvest by Hunters.

RY11 — Estimated moose mortality from all human causes in RY11 was 376 moose (Table 7). This total included 279 moose reported killed by hunters in fall 2011, an estimated unreported harvest of 49 moose, no estimate for illegal harvest, and an estimated 48 moose killed in vehicle collisions (the average of the last 2 years of known vehicle collision mortality). Illegal harvest is undocumented. The total reported hunting mortality of 279 did not meet the harvest objective for Unit 20D.

RY12 — Estimated moose mortality from all human causes in RY12 was 360 moose (Table 7); however this did not include an estimate of illegally taken moose, which is thought to be high but

is undocumented. This total included 265 moose reported killed by hunters in fall 2012, an estimated unreported harvest of 47 moose, and an estimated 48 moose killed by highway vehicles (the average of the last 2 years of known vehicle collision mortality). The total reported hunting mortality of 265 did not meet the harvest objective for Unit 20D.

Southwestern Unit 20D Harvest — In RY11, reported harvest totaled 169 moose. Hunters reported taking 148 moose during the general season (Table 8), 11 during Delta Junction management area hunt DM790, 2 during the Delta Junction management area hunt DM795 for qualified disabled veterans (Table 9), and 8 during the Bison Range youth hunt DM792 (Table 10). Hunter success was 29% during the general season, 69% for DM790 (Table 9), 50% for DM795 (Table 9), and 89% for DM792 (Table 10).

In RY12, reported harvest in southwestern Unit 20D totaled 152 moose. Hunters reported taking 135 moose during the general season (Table 8), 10 during the Delta Junction management area hunt DM790, 0 during the Delta Junction management area hunt DM795 for qualified disabled veterans (Table 9), and 7 in the Delta Junction Bison Range youth hunt DM792 (Table 10). Hunter success was 24% for the general season, 71% for DM790, 0% for DM795, and 70% for DM792.

Southeastern Unit 20D Harvest — Moose harvest in southeastern Unit 20D continued to be low, with a 2-year average harvest for RY11 and RY12 of 33 moose/year (35 in RY11 and 31 moose in RY12; Table 8). The 2-year average hunter success was 38%.

Northwestern Unit 20D Harvest — During RY11, harvest was 49 moose, with a success rate of 27%. In RY12, reported harvest by hunters totaled 53 moose (Table 8) and hunter success was 29%. There were no permit hunts in northwestern Unit 20D.

Northeastern Unit 20D Harvest — The number of hunters and harvest remained low in northeastern Unit 20D during the RY11 and RY12 general seasons. In RY11, reported harvest by hunters totaled 18 moose (Table 8), with a success rate of 35%. In RY12, hunters reported taking 20 moose, with a success rate of 34%.

In RY11 and RY12, no moose were reported to be harvested during the August hunting season in the Healy River drainage (Table 11).

Hunter Residency. Based on harvest reports, the majority of Unit 20D hunters were Alaska residents who resided outside of Unit 20D (Table 12). The proportion of nonresident hunters continued to be low.

Hunter Effort. Successful hunters averaged 5.4 hunting days in RY11 and 5.7 days in RY12 (Table 13).

Permit Hunts. Permit hunt DM790 (DJMA) had 19 drawing permits issued in RY11 and RY12 (Table 9). The number of applicants for DM790 was 686 in RY11 and 1,132 in RY12.

Permit hunt DM792 (Bison Range youth hunt management area) had 10 permits in RY11 and in RY12 (Table 10). The number of applicants for DM792 was 206 in RY11 and 300 in RY12.

Drawing permits for hunt DM795 were issued to 6 (65 applicants) qualifying disabled veterans in RY11 and RY12. Permit hunts DM795 and DM790 had the same hunt area, season dates, and bag limit in RY11 and RY12.

Harvest Chronology. In RY11 and RY12, general season harvest chronology remained similar to previous years, with most harvest occurring during the first 5 days of the general season (Table 14).

Transport Methods. In RY11 and RY12, 3- or 4-wheelers, highway vehicles, and boats continued to be the most common modes of transportation used by successful hunters (Table 15).

Natural Mortality

No estimates of natural mortality were calculated in RY11 or RY12. However, predation by wolves, grizzly bears, and black bears is believed to be significant in Unit 20D.

HABITAT

Assessment

No habitat assessment was conducted in RY11 or RY12. However, the relationship between biomass removal estimates and the nutritional condition of moose in southwestern Unit 20D is being analyzed. This analysis is based on biomass removal estimates from Unit 20D browse sampling in RY99, RY00, RY06, and RY09 (T. Paragi, ADF&G, unpublished data, Fairbanks).

Enhancement

No habitat enhancement was conducted in RY11 or RY12.

CONCLUSIONS AND RECOMMENDATIONS

Population estimates from the 2012 GSPE survey indicated the northern Unit 20D moose population increased since 2004. The calf:cow ratio was low, suggesting increased calf mortality compared to 2004. However, the calf:cow ratio is likely not an indicator of long-term population trend. We need to collect northern Unit 20D population data on an annual basis to assess population trend.

Northwestern Unit 20D continued to have the second highest harvest in the unit (after southwestern Unit 20D). Reported harvest and the number of hunters were stable during the reporting period.

In northeastern Unit 20D the number of hunters and harvest remained low during the RY11 and RY12 general seasons. This area is difficult to access during the hunting season except along the Tanana River, a few small creeks and rivers flowing into the Tanana River, and at a few ridge top airstrips. The number of hunters and harvest is likely to remain low in northeastern Unit 20D.

The 2012 northern Unit 20D population estimate and the stability of the reported harvest in RY11 and RY12 suggest hunting opportunity is being sustained in this portion of the unit. No changes to northern Unit 20D hunting season or bag limits are recommended.

Harvest in southeastern Unit 20D during the general hunting season remained low, primarily because motorized access restrictions in the Macomb Plateau controlled use area make moose hunting difficult, and motorized access to the remainder of the area is limited.

In southwestern Unit 20D, the general bull season moose harvest and the number of hunters has continued to increase since the mid-1990s (DuBois 2004), although bull harvest has stabilized since RY07 and RY08 (Table 8). Additional harvest in southwestern Unit 20D occurred with implementation of cow moose permit hunts in RY06 which continued through RY09 (Table 16).

Antlerless moose hunts during RY06–RY09 contributed to a decreased moose density in southwestern Unit 20D. The goals of these hunts were to stabilize population growth, and to address concerns about range degradation and reduced nutritional condition and reduced reproductive success of moose. By the end of RY12, most of these goals had been met. Moose density was reduced from 5.6 moose/mi^2 (pre-antlerless hunts) to 3.2 moose/mi^2 (post-antlerless hunts). Overwinter browse utilization decreased from 25% in 2007 to 15% in 2010. The average weight of 9-month-old calves increased from 340 lb in 2010 to 366 lb in 2012 (K. A. K. Seaton, unpublished data, Fairbanks).

Twinning rates increased in 2011, but decreased in 2012. A spike in twinning rates was documented throughout a significant portion of Interior Alaska in 2011 (K. A. K. Seaton, personal communication), and may not have been indicative of a trend in Unit 20D. I recommend continued aerial twinning surveys to determine trend in this measurement of population status.

The antlerless moose hunts and their effect on moose density and population growth should continue to be evaluated. Three indices of density-dependent moose nutritional condition: biomass removal of current annual growth on winter browse; proportion of females with twin calves; and late-winter calf weights, will be evaluated in relation to changes in moose density. Future antlerless moose hunts for Unit 20D will be implemented, as needed, based on this evaluation.

In RY11 and RY12 the Unit 20D moose population did not meet the population objective of 8,000–10,000 moose set by the Board of Game. The harvest objective of 500–700 moose was also not met. To meet this harvest objective it will be necessary to harvest moose at a rate that cannot be sustained with the current population. We are currently managing for a stable population, as indicated by an average of 20% twinning rate during spring 2012 and 2013, and no additional harvest is warranted. No changes are planned for the general season hunt. Antlerless moose hunts will not be recommended for RY13, other than retaining a cow (not accompanied by a calf) in the bag limit for DM792 in the Bison Range youth hunt management area.

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Table 1. Results of population estimates of observed moose for southern Unit 20D using geospatial population estimator (GSPE) surveys, 2005–2012.

Year/Method	Total population estimate	Total cows	Total calves	Total bulls	Calves: 100 cows	Bulls:100 cows
2005	5,553	3,473	1,219	817	33	24
(LCI–UCI)[a]	4,513–6,593	2,757–4,188	984–1,453	560–1,075	28–38	17–31
2006	7,243	4,494	1,815	929	41	21
(LCI–UCI)[a]	5,659–8,827	3,485–5,501	1,386–2,244	696–1,162	36–45	17–24
2008	5,006	3,071	1,049	915	34	30
(LCI–UCI)[a]	3,938–6,074	2,348–3,794	823–1,275	715–1,116	23–45	20–39
2009	4,633	2,823	966	862	34	30
(LCI–UCI)[a]	3,864–5,401	2,341–3,305	822–1,110	650–1,073	30–39	21–39
2010	4,574	2,888	755	968	26	33
(LCI–UCI)[a]	3,734–5,414	2,310–3,466	610–900	753–1,182	19–32	23–43
2011	4,134	2,497	888	757	35	30
(LCI–UCI)[a]	3,162–5,106	1,940–3,055	686–1,091	497–1,016	31–40	22–38
2012	4,450	2,640	805	975	30	37
(LCI–UCI)[a]	3,618–5,284	2,112–3,167	590–1,019	708–1,242	24–38	27–47

[a] LCI = lower confidence interval at 90% and UCI = upper confidence interval at 90%.

Table 2. Results of population estimates of observed moose for southeastern Unit 20D using geospatial population estimator (GSPE) surveys, 2005–2012.

	Year						
Parameter	2005	2006	2008	2009	2010	2011	2012
East of Johnson River (southeastern Unit 20D)							
Total pop estimate	690	998	602	997	976	791	1,164
LCI[a]	290	328	408	632	594	374	816
UCI[b]	1,090	1,668	795	1,360	1,357	1,208	1,512
Total cows	402	625	542	575	608	494	687
LCI	130	198	288	348	346	254	442
UCI	676	1,051	796	802	869	734	932
Total calves	97	267	152	224	165	155	150
LCI	6	90	67	153	100	67	46
UCI	189	443	237	296	231	243	255
Total bulls	205	128	229	186	220	159	267
LCI	117	36	167	99	132	62	167
UCI	292	225	292	118	307	257	368
Bulls:100 Cows	51	20	42	32	35	31	39
LCI	19	10	19	12	15	16	21
UCI	84	30	65	51	55	46	56
Calves:100 Cows	24	41	28	40	28	35	30
LCI	10	28	8	26	8	31	24
UCI	38	54	49	53	49	40	38

[a] LCI = Lower confidence interval.
[b] UCI = Upper confidence interval.

Table 3. Results of population estimates of observed moose for southwestern Unit 20D using geospatial population estimator (GSPE) surveys, 2005–2012

	Year							
Parameter	2005	2006	2007	2008	2009	2010	2011	2012
West of Johnson River (southwestern Unit 20D)								
Total pop estimate	4,863	6,245	5,926	4,065	3,637	3,599	3,343	3,286
LCI[a]	3,933	4,931	4,525	3,189	2,986	2,957	2,559	2,690
UCI[b]	5,792	7,559	7,327	4,940	4,286	4,239	4,127	3,882
Total cows	3,070	3,869	3,767	2,530	2,248	2,280	2,003	1,952
LCI	2,432	3,033	2,697	1,936	1,838	1,838	1,555	1,586
UCI	3,708	4,705	4,837	3,123	2,657	2,722	2,452	2,310
Total calves	1,121	1,549	1,128	897	741	589	733	654
LCI	913	1,195	805	709	620	478	571	498
UCI	1,330	1,902	1,450	1,086	862	699	896	810
Total bulls	613	801	1,351	686	676	748	597	707
LCI	396	608	940	529	501	583	392	514
UCI	829	994	1,762	844	851	912	802	901
Bulls:100 Cows	20	21	36	27	30	32	30	36
LCI	13	17	21	18	20	23	22	27
UCI	27	24	51	36	39	42	38	45
Calves:100 Cows	34	41	30	35	33	25	37	34
LCI	29	36	18	24	28	19	32	28
UCI	39	45	42	47	97	32	41	40

[a] LCI = Lower confidence interval.
[b] UCI = Upper confidence interval.

Table 4. Results of moose twinning surveys in southwest Unit 20D, 2005–2013.

Year	Cows w/single calves	Cows w/twin calves	% Cows w/twins	Moose per hour	Total moose
2005	39	11	22.0	19.5	217
2006	40	14	25.9	24.5	297
2007	40	8	16.7	18.9	312
2008	48	9	15.8	33.1	420
2009	48	6	11.1	21.9	355
2010	52	7	11.9	23.7	303
2011	49	17	25.8	29.0	325
2012	51	8	13.6	20.5	300
2013	40	14	25.9	26.0	246

Table 5. Results of northern Unit 20D moose geospatial population estimation surveys, 2004 and 2012.

Parameter	2004 GSPE[a]	2012 GSPE[a]
Total estimate	1,929	2,406
LCI[b]	1,443	1,811
UCI[c]	2,415	3,001
Total bulls	515	828
LCI	351	524
UCI	679	1,133
Total cows	1,202	1,393
LCI	776	1,052
UCI	1,426	1,733
Total calves	338	184
LCI	189	114
UCI	486	255
Bulls:100 cows	47	59
LCI	28	35
UCI	66	84
Calves:100 cows	31	13
LCI	19	8
UCI	43	19

[a] GSPE is a geospatial population estimator survey conducted with a higher search intensity than the Gasaway method, but without a sightability correction factor applied to the observable moose estimate. Northern Unit 20D was surveyed in its entirety each GSPE survey.
[b] LCI = Lower confidence interval.
[c] UCI = Upper confidence interval.

Table 6. Unit 20D moose hunting seasons and bag limits, regulatory years[a] 2011 and 2012.

Regulatory year	Area	Season		Bag limit
2011 and 2012	South of Tanana River and west of Johnson River, except the Delta Junction management area and the Bison Range youth hunt management area.	RESIDENT:	1 Sep–15 Sep	1 bull with spike-fork or 50-inch antlers or 4 or more brow tines on at least one side.
		NONRESIDENT:	5 Sep–15 Sep	1 bull with 50-inch antlers or 4 or more brow tines on at least one side.
	Within Delta Junction management area.	RESIDENT:	1 Sep–15 Sep	1 bull with spike-fork or 50-inch antlers or 4 or more brow tines on one side by drawing permit DM790.
		NONRESIDENT:	5 Sep–15 Sep	1 bull with 50-inch antlers or 4 or more brow tines on one side by drawing permit DM790.
	Within Delta Junction management area.	RESIDENT QUALIFIED DISABLED VETERANS ONLY:	1 Sep–15 Sep	1 bull with spike-fork or 50-inch antlers or 4 or more brow tines on one side by drawing permit DM795.
		NONRESIDENT QUALIFIED DISABLED VETERANS ONLY:	5 Sep–15 Sep	1 bull with 50-inch antlers or 4 or more brow tines on one side by drawing permit DM795.
	Within the Bison Range youth hunt management area.	RESIDENT AND NONRESIDENT:	1 Sep–30 Sep	1 bull with spike-fork or 50-inch antlers or 4 or more brow tines on at least 1 side, or 1 antlerless moose, per lifetime (taking calves or cows accompanied by calves is prohibited) by permit DM792.

Regulatory year	Area	Season		Bag limit
	South of Tanana River and east of Johnson River except within the Robertson River drainage south of the confluence of east and west fork, and within 1 mile west of the west fork.	RESIDENT:	1 Sep–15 Sep	1 bull.
		NONRESIDENT:	No open season	
	Within the Robertson River drainage south of the confluence of east and west forks, and within 1 mile of the west fork.	RESIDENT:	1 Sep–15 Sep	1 bull.
		NONRESIDENT:	5 Sep–15 Sep	1 bull with 50-inch antlers, or at least 4 brow tines on at least one side.
	Within the Healy River drainage.	RESIDENT:	15 Aug–28 Aug	1 bull with spike-fork antlers.
			1 Sep–20 Sep	1 bull.
		NONRESIDENT:	1 Sep–20 Sep	1 bull.
	North of the north bank of the Tanana River and draining into the Volkmar River east to and including the Billy Creek drainage, excluding the Healy River drainage	RESIDENT AND NONRESIDENT:	1 Sep–20 Sep	1 bull.
	Remainder of Unit 20D (north of Tanana River).	RESIDENT AND NONRESIDENT:	1 Sep–15 Sep	1 bull.
2012 and 2013	South of Tanana River and west of Johnson River, except the Delta Junction management area and the Bison Range youth hunt management area	RESIDENT:	1 Sep–15 Sep	1 bull with spike-fork or 50-inch antlers or 4 or more brow tines on at least one side.
		NONRESIDENT:	5 Sep–15 Sep	1 bull with 50-inch antlers or 4 or more brow tines on at least one side.

Regulatory year	Area	Season		Bag limit
	Within Delta Junction management area.	RESIDENT:	1 Sep–15 Sep	1 bull with spike-fork or 50-inch antlers or 4 or more brow tines on at least one side by drawing permit DM790.
		NONRESIDENT:	5 Sep–15 Sep	1 bull with 50-inch antlers or 4 or more brow tines on one side by drawing permit DM790.
	Within Delta Junction management area	RESIDENT QUALIFIED DISABLED VETERANS ONLY:	1 Sep–15 Sep	1 bull with spike-fork or 50-inch antlers or 4 or more brow tines by drawing permit DM795.
		NONRESIDENT QUALIFIED DISABLED VETERANS ONLY:	5 Sep–15 Sep	1 bull with 50-inch antlers or 4 or more brow tines on at least one side.
	Within the Bison Range youth hunt management area.	RESIDENT AND NONRESIDENT:	1 Sep–30 Sep	1 bull with spike-fork or 50-inch antlers or 4 or more brow tines on at least one side, or 1 antlerless moose per lifetime (taking calves or cows accompanied by calves is prohibited) by permit DM792.
	South of Tanana River and east of Johnson River except within the Robertson River drainage south of the confluence of east and west fork, and within 1 mile west of the west fork.	RESIDENT:	1 Sep–15 Sep	1 bull.
		NONRESIDENT:	No open season	

Regulatory year	Area	Season		Bag limit
	Within the Robertson River drainage south of the confluence of east and west forks, and within 1 mile of the west fork.	RESIDENT:	1 Sep–15 Sep	1 bull.
		NONRESIDENT:	5 Sep–15 Sep	1 bull with 50-inch antlers, or at least 4 brow tines on at least one side.
	Within the Healy River drainage.	RESIDENT:	15 Aug–28 Aug	1 bull with spike-fork antlers.
			1 Sep–20 Sep	1 bull.
		NONRESIDENT:	1 Sep–20 Sep	1 bull.
	North of the north bank of the Tanana River and draining into the Volkmar River east to and including the Billy Creek drainage, excluding the Healy River drainage	RESIDENT AND NONRESIDENT:	1 Sep–20 Sep	1 bull.
	Remainder of Unit 20D (north of Tanana River)	RESIDENT AND NONRESIDENT:	1 Sep–15 Sep	1 bull.

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

Table 7. Unit 20D moose harvest and accidental death, regulatory years[a] 2005–2012.

Regulatory year	Harvest by hunters							Accidental death		Combined total
	Reported				Estimated					
	M	F	Unk	Total	Unreported[b]	Illegal	Total	Road	Total	
2005	232	0	0	232	41	14	55	52	52	339
2006	296	58	2	356	63	15	78	66	66	500
2007	284	514	2	800	142	Unk	142	54[c]	54	996
2008	297	386	1	684	120	Unk	120	37	37	841
2009	299	117	0	416	73	Unk	73	52[c]	52	541
2010	239	6	0	245	43	Unk	43	52[c]	52	340
2011	272	7	0	279	49	Unk	49	48[d]	48	376
2012	257	8	0	265	47	Unk	47	48[d]	48	360

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2005 = 1 July 2005–30 June 2006).
[b] Based on 17.7% unreported harvest estimated by Gasaway et al. (1992).
[c] Three-year average of the last 3 known years.
[d] Two-year average of the last 2 known years.

Table 8. Southwestern (SW), southeastern (SE), northwestern (NW), and northeastern (NE) Unit 20D reported moose harvest and number of hunters during general seasons, regulatory years[a] 2005–2012.

Regulatory year	Moose harvest						Hunters					
	SW	SE	NW	NE	Unk	Total	SW	SE	NW	NE	Unk	Total
2005	126[b]	19[c]	61[c]	13[d]	0	219	407[b]	56[c]	206[c]	30[d]	22	721
2006	155[b]	26[c]	82[c]	19[d]	4	286	517[b]	49[c]	279[c]	44[d]	26	915
2007	164[b]	23[c]	68[c]	12[d]	6	273	553[b]	63[c]	305[c]	39[d]	35	995
2008	149[b]	22[c]	62[c]	20[e]	2	255	425[b]	59[c]	221[c]	36[e]	20	761
2009	153[b]	21[c]	63[c]	15[e]	0	252	543[b]	67[c]	252[c]	44[e]	114	1,020
2010	130[b]	28[c]	51[c]	17[e]	7	233	515[b]	78[c]	215[c]	34[e]	72	914
2011	148[b]	35[c]	49[c]	18[e]	8	258	502[b]	78[c]	184[c]	52[e]	63	879
2012	135[b]	31[c]	53[c]	20[e]	9	248	556[b]	105[c]	185[c]	58[e]	57	961

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2005 = 1 July 2005–30 June 2006).

[b] Resident season 1–15 Sep; 1 bull with spike-fork or 50-inch antlers or 4 brow tines on 1 antler. Nonresident season 5–15 Sep; 1 bull with 50-inch antlers or 4 brow tines on 1 antler.

[c] Season 1–15 Sep; 1 bull.

[d] Resident season 1–15 Sep; 1 bull. Within Healy River drainage: resident season 15–28 Aug, 1 bull with spike-fork antlers; 1–15 Sep, 1 bull; nonresident season, 1–15 Sep; 1 bull. Remainder area is resident and nonresident 1–15 Sep, 1 bull.

[e] Resident season 1–15 Sep; 1 bull. Within Healy River drainage: resident season 15–28 Aug, 1 bull with spike-fork antlers; 1–20 Sep, 1 bull; nonresident season, 1–20 Sep; 1 bull. Remainder area is resident and nonresident 1–15 Sep, 1 bull.

Table 9. Unit 20D Delta Junction management area moose drawing permit harvest, regulatory years[a] 2005–2012.

Hunt	Regulatory year	Permits issued	Percent successful hunters	Percent unsuccessful hunters	Percent did not hunt	Percent bulls	Percent cows	Unk	Harvest
DM790	2005	10	89	11	10	100	0	0	8
DM790	2006	10	88	13	20	100	0	0	7
DM790	2007	10	60	40	0	100	0	0	6
DM790	2008	27	50	50	25	50	50	0	10
DM790	2009	25	57	43	8	100	0	0	13
DM790	2010	18	46	54	28	100	0	0	6
DM795	2010	6	40	60	17	100	0	0	2
DM790	2011	19	69	31	16	100	0	0	11
DM795	2011	6	50	50	33	100	0	0	2
DM790	2012	19	71	29	26	90	10	0	10
DM795	2012	6	0	100	50	0	0	0	0

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2005 = 1 July 2005–30 June 2006).

Table 10. Unit 20D Delta Junction Bison Range youth hunt management area moose drawing permit harvest, regulatory years[a] 2005–2012.

Hunt	Regulatory year	Permits issued	Successful hunters (%)	Unsuccessful hunters (%)	Did not hunt (%)	Percent bulls	Percent cows	Unk	Harvest
DM792	2005	24	25	75	17	100	0	0	5
DM792	2006	10	80	20	0	0	100	0	8
DM792	2007	10	70	30	0	14	86	0	7
DM792	2008	10	100	0	0	20	80	0	10
DM792	2009	10	80	20	0	50	50	0	8
DM792	2010	10	60	40	0	0	100	0	6
DM792	2011	10	89	11	10	13	87	0	8
DM792	2012	10	70	30	0	14	86	0	7

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2005 = 1 July 2005–30 June 2006).

Table 11. Unit 20D Healy River (Uniform Coding Unit 501) reported moose harvest, regulatory years[a] 2005–2012.

Regulatory year	Unit 20D Healy River			
		Harvest month		
	Hunters	Aug	Sep	Jan
2005[b]	14	0	6	n/a
2006[b]	22	0	8	n/a
2007[b]	16	0	5	n/a
2008[c]	19	0	9	n/a
2009[c]	17	0	5	n/a
2010[c]	15	1	5	n/a
2011[c]	25	0	11	n/a
2012[c]	23	0	6	0

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2005 = 1 July 2005–30 June 2006).
[b] Resident moose hunting season: 15–28 Aug, 1 spike-fork bull; 1–15 Sep, 1 bull.
[c] Resident moose hunting season: 15–28 Aug, 1 spike-fork bull; 1–20 Sep, 1 bull.

Table 12. Unit 20D general hunting season moose hunter residency and success[a], regulatory years[b] 2005–2012.

Regulatory year	Successful						Unsuccessful						Total hunters
	Local[c] resident	Nonlocal resident	Nonresident	Unk	Total	(%)	Local[c] resident	Nonlocal resident	Nonresident	Unk	Total	(%)	
2005	73	138	21	2	234	(26)	233	381	46	4	664	(74)	898
2006	84	176	27	2	289	(31)	236	364	45	7	652	(69)	941
2007	81	164	24	11	280	(27)	250	420	46	33	749	(73)	1,029
2008	159	104	13	6	282	(27)	447	241	48	16	752	(73)	1,034
2009	78	144	28	2	252	(27)	214	440	35	79	768	(75)	1,020
2010	66	159	15	2	242	(27)	192	428	33	13	666	(73)	908
2011	69	166	18	5	258	(30)	156	408	29	12	605	(70)	863
2012	67	153	23	5	248	(26)	184	472	34	20	710	(74)	958

[a] Excludes hunters in permit hunts.
[b] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2005 = 1 July 2005–30 June 2006).
[c] Local means reside in Unit 20D.

Table 13. Southwestern (SW), southeastern (SE), northwestern (NW), and northeastern (NE) Unit 20D general season moose and mean days hunted[a], regulatory years[b] 2005–2012.

Regulatory	Successful hunters					Unsuccessful hunters				
year	SW	SE	NW	NE	Total	SW	SE	NW	NE	Total
2005	5.3	3.8	5.9	4.9	5.3	6.4	6.3	7.0	6.1	6.5
2006	5.3	7.4	5.3	4.3	5.4	6.4	5.4	6.8	3.4	6.6
2007	5.0	6.5	5.7	4.9	5.3	6.4	6.6	7.0	4.9	6.7
2008	4.8	4.6	5.1	5.6	4.9	6.6	6.4	7.4	5.3	6.8
2009	5.2	6.0	6.3	6.9	5.9	6.7	6.1	6.6	6.1	6.6
2010	5.7	5.7	5.9	5.1	5.7	6.8	5.5	7.3	7.6	6.9
2011	5.1	5.5	6.0	8.5	5.4	7.0	6.2	7.6	7.7	7.1
2012	5.8	6.3	5.8	4.7	5.7	6.7	6.5	7.4	8.1	6.8

[a] Excludes permit hunt harvest.
[b] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2005 = 1 July 2005–30 June 2006).

Table 14. Unit 20D general season moose harvest[a] chronology percent by month/day, regulatory years[b] 2005–2012.

Regulatory	Harvest chronology percent by month/day					
year	9/1–9/5	9/6–9/10	9/11–9/15	9/16–20	Unk	*n*
2005	50	21	27	0	2	230
2006	45	27	23	0	4	288
2007	43	26	27	0	4	275
2008	44	26	25	3	2	282
2009	45	25	27	1	2	252
2010	42	26	28	2	2	232
2011	41	32	21	3	2	258
2012	43	28	27	1	1	244

[a] Excludes permit hunt harvest.
[b] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2005 = 1 July 2005–30 June 2006).

Table 15. Unit 20D moose harvest percent[a] by transport method, regulatory years[b] 2005–2012.

Regulatory year	Harvest percent by transport method									
	Airplane	Horse	Boat	3- or 4-wheeler	Snowmachine	Other ORV	Highway vehicle	Airboats	Unknown	*n*
2005	5	2	18	45	0	4	22	0	5	235
2006	7	2	20	37	0	4	27	1	1	289
2007	5	3	16	49	1	4	19	0	3	280
2008	5	2	18	39	0	5	26	3	2	282
2009	5	2	20	44	0	4	23	0	2	252
2010	5	2	19	42	0	4	25	1	2	232
2011	5	2	17	44	0	4	21	3	4	258
2012	6	2	18	45	0	4	19	3	3	248

[a] Excludes permit hunt harvest.
[b] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2005 = 1 July 2005–30 June 2006).

Table 16. Unit 20D antlerless moose hunt harvest, regulatory years[a] 2006–2009.

Hunt	Regulatory year	Permits issued	Percent successful hunters	Percent unsuccessful hunters	Percent did not hunt	Percent bulls	Percent cows	Unk	Harvest
DM793	2006	75	87	13	20	4	96	0	52
DM797	2007	541	77	23	23	3	97	0	321
DM798	2007	180	74	26	30	0	100	0	93
DM799	2007	180	70	30	26	2	98	0	93
RM797	2008	725	25	75	58	1	99	0	73
DM798	2008	390	65	35	20	2	98	0	201
DM799	2008	200	76	25	28	4	96	0	108
DM797	2009	50	70	30	24	4	96	0	26
DM798	2009	100	81	19	20	3	97	0	64
DM799	2009	50	87	13	40	0	100	0	26

[a] Regulatory year begins 1 July and ends 30 June (e.g., regulatory year 2006 = 1 July 2006–30 June 2007).