SUMMARY OF THE ALSEK EARLY-WINTER 2008 MOOSE SURVEY

5-10, 12-13 NOVEMBER 2008

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SUMMARY

- We conducted an early-winter survey of moose in the Alsek area south of Haines Junction on November 5-10 and 12-13th, 2008. The main purpose of this survey was to estimate the abundance, distribution, and composition of the moose population.
- We attempted to count all moose in survey blocks covering about 30% of the area, and found a total of 395 moose, of which 101 were adult bulls, 221 were adult and yearling cows, 21 were yearling bulls, and 52 were calves.
- We calculated a current population estimate of 806 ± 18% moose for the area, which is equal to a density of about 147 moose per 1,000 km^2 of total area, or 191 per 1,000 km^2 in suitable moose habitat. This is below the Yukon-wide average of about 158 moose per 1,000 km^2 of total area.
- We estimated that there were about 27 calves and 18 yearlings for every 100 adult cows in the 2008 survey area. This suggests that survival of calves was average during the summer and fall of 2008, but low to moderate for calves born in 2007.
- We estimated that there were about 43 adult bulls for every 100 adult cows in the survey area. This is generally sufficient to ensure that all cows are bred during the rut, but is below the Yukon average of 67 adult bulls per 100 adult cows calculated from other areas surveyed.
- Moose abundance declined significantly in both the north and entire comparable survey areas between 1998 and 2008, and currently appears to be at or near historic recorded lows throughout the Alsek study area.
- Total reported moose harvest by First Nation and non-First Nation hunters in the Alsek survey area appears to be within normal allowable harvest limits. Current estimated harvest rates, however, are close to or exceed the normal limits in more accessible portions of the area, particularly in Game Management Subzones close to Haines Junction and along the Haines Road south of Dezadeash Lake.

INTRODUCTION

This report summarizes the results of the early-winter survey of moose in the Alsek survey area (see Map 1), conducted on November 5-10 and 12-13th, 2008. The main purpose of this survey was to estimate abundance, distribution and age and sex composition of the local moose population.

Previous Surveys

We have an extensive history of population surveys and management activities in the Alsek region. Early-winter intensive population surveys have been conducted in all or most of the entire area east of the Kluane Wildlife Sanctuary (Map 2) in 1981 and 1982 (Larsen 1982; Johnston and McLeod 1983), 1998 (LaRocque 1998) and 2000 (report not available, results data only). Population surveys flown in the northern portion of the study area (Map 3) were conducted in 1983 (Markel and Larsen 1987a), 1984 (Markel and Larsen 1987b), and 1990 (Larsen and Ward 1991a); and in the smaller Dezadeash Mountains area in the northwest in 1996 (Hayes and LaRocque 2001) and Jo-Jo Lake area in the northeast in 1997 (Hayes and LaRocque 2002). A larger Kloo Lake and Dezadeash Mountains survey that overlapped the northwest portion of the Alsek region was flown in early winter 2004 (LaRocque 2005). One late-winter population survey that extended over the western edge of the 2008 Alsek survey area, including the Kluane Wildlife Sanctuary (Map 2), was flown in late February and early March 1997 (Yukon Fish and Wildlife Branch 1997).

An intensive population survey was planned for the Alsek region in November 2007 but was cancelled due to poor snow conditions. We were able to do a less intensive stratification survey of the Kluane Wildlife Sanctuary and southern portion along the B.C. border in 2007, however, to help us classify these areas as having high or low moose abundance in preparation for the population survey in 2008.

Other less intensive surveys flown in the Alsek region include two early-winter trend surveys in the Frederick Lake area in 1990 (Larsen and Ward 1991b) and 1991 (Smits et al. 1992); and additional early-winter trend surveys were done in the northwest Dezadeash Mountains area in 2001 (report not available, results data only), 2003 (LaRocque 2004) and 2005 (LaRocque 2006). The less intensive surveys were done to provide information on relative abundance and age and sex composition to help predict and understand trends in moose numbers. A recruitment survey was also flown in the larger Alsek area in January 2000 to determine calf survival and moose distribution in a winter with unusually deep snow (report not available, results data only).

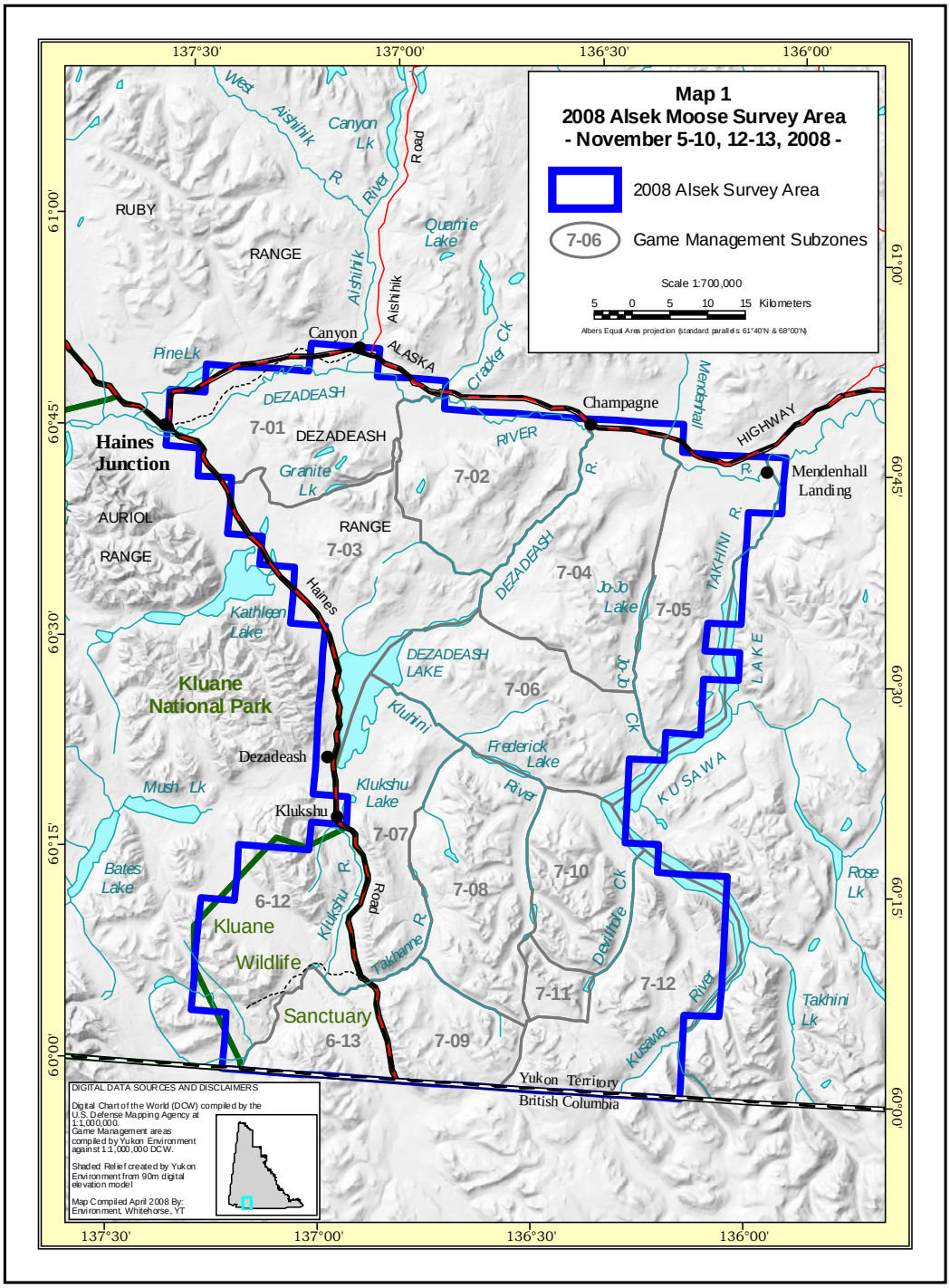

Figure 1. Map 1 2008 Alsek Moose Survey Area.

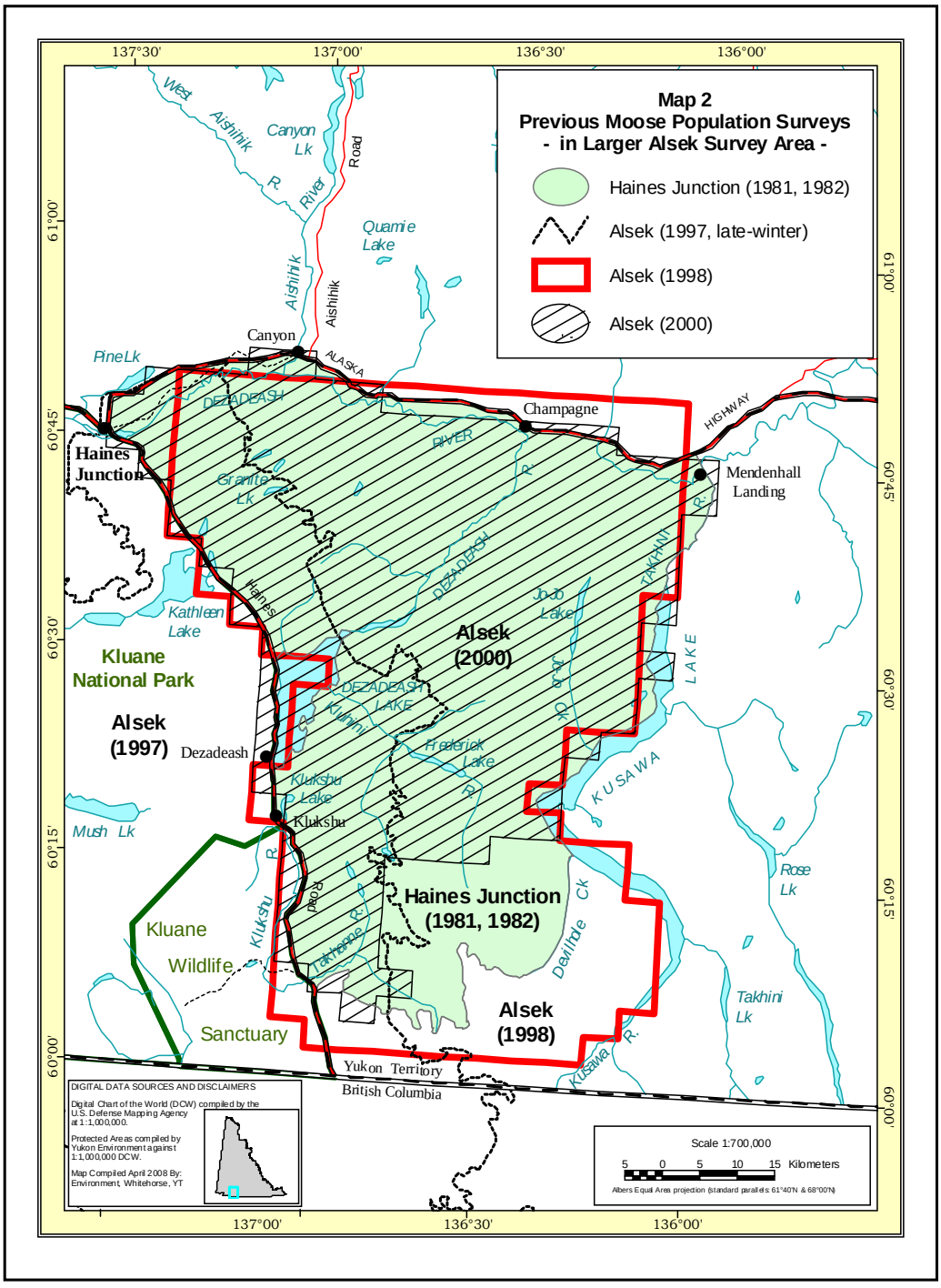

Figure 2. Map 2 Previous Moose Population Surveys.

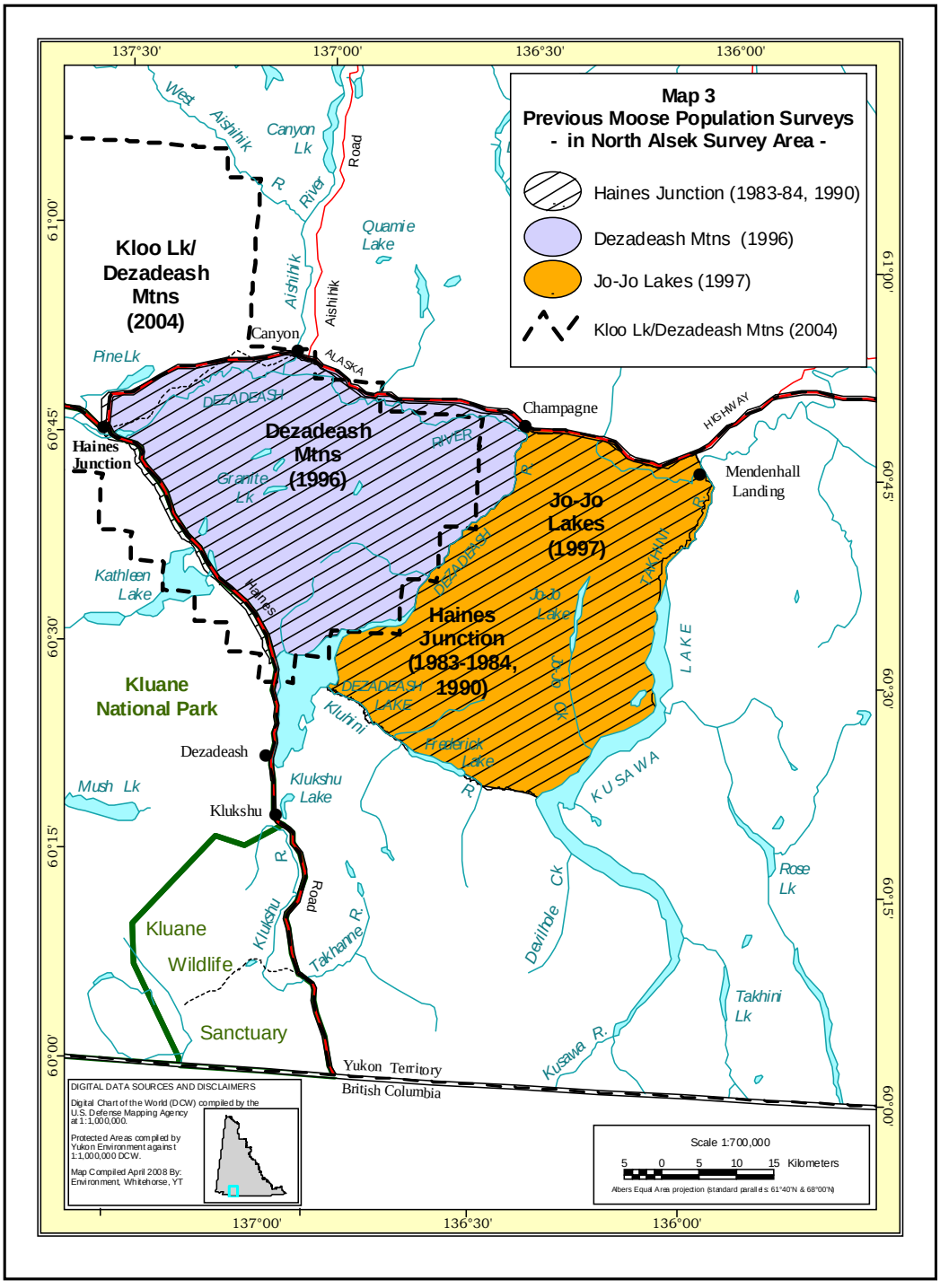

Figure 3. Map 3 Previous Moose Population Surveys.

More recently, two small late-winter habitat surveys were conducted near Haines Junction in March 2008 (LaRocque 2008) and March 2009 (Taylor and LaRocque 2009), to obtain late-winter and deep snow pack moose distribution and habitat use patterns to support land use planning and development impact assessment.

Kluane National Park has also been conducting annual early-winter trend surveys in moose concentration areas in the Auriol Range, just northwest of the Alsek survey area since 1974. The trend surveys are flown in early November in subalpine habitat where moose are known to aggregate after the rut, and are similar in timing to Yukon Government surveys. The purpose of these and other wildlife surveys that the park conducts is to monitor the health of the greater Kluane ecosystem. The moose population that summers in the Auriol Range migrates into the Alsek survey area in early winter, presumably in response to deep snow accumulations in the mountains. Although the Kluane National Park trend surveys do not provide estimates of moose density or total population within the Auriol range, information from the surveys help to provide a more complete regional picture of moose population trend and calf and yearling recruitment over time.

Community Involvement

The Haines Junction and Alsek district is an important moose harvesting area for Champagne and Aishihik hunters, and historically for non-First Nations hunters previous to the mid 1980s. As a result, the area has a long history of moose and harvest management. A summary of Alsek moose harvest regulation changes from 1976 to present is provided in Table 1. The following is a brief listing of community involvement in harvest regulations and moose management for this region.

1) The community was involved in the Alsek Moose Management Plan and is currently involved in the Champagne and Aishihik First Nation Traditional Territory (CAFN TT) Integrated Wildlife Plan. Moose management and population recovery figures prominently in these plans.
2) Champagne and Aishihik First Nation lands and resource staff are involved in moose surveys and management in the CAFN TT.
3) An extended hunt for licensed hunters was introduced in 1996 in response to the Alsek Renewable Resources Council request for more moose hunting opportunities in the Alsek area (Table 1).
4) Moose hunting by licensed hunters in the Alsek survey area is managed through a Permit Hunt Authorization (PHA) system. Nine permits are currently issued annually with the objective of harvesting a maximum of 5 moose per year. In years when less than 5 moose are harvested by resident non-First Nation hunters during the regular August 1 through October 31 season; an extended hunt is administered to provide licensed

hunters with additional opportunities. The extended winter hunt continues until the annual allowable harvest of 5 moose has been taken and all eligible hunters have finished their two week hunt period, or March 31, whichever is reached first.

5) Harvest by non-residents is managed through outfitter quotas negotiated between the affected outfitter, Yukon Government and the Alsek Renewable Resource Council.

Table 1. Summary of moose hunt regulation changes in the Alsek area: 1976 through 2008.

Year	Regulation Change
1976	Antlerless moose season in effect. Season September 10-24
1979	Antlerless moose season shortened; September 17-23
1984	Hunting of antlerless moose by licensed hunters prohibited
	Season for antlered moose shortened to 2 weeks: September 1-15
1989	Season for antlered moose extended: August 1-October 31
	Permit hunt implemented: 10 permits issued for GMS 7-01 through 9-07
1993	Number of permits issued increased to 20 for GMS 7-01 through 9-07
1996	Extended hunt provisions introduced for GMS 7-01 through 9-07.
	Extended hunt season runs to December 31
1998	9 permits issued for GMS 7-01 through 7-12
	Closing date for extended hunt extended to March 31
2001	Number of permits issued for GMS 7-01 through 7-12 increased to 15
2005	Number of permits issued for GMS 7-01 through 7-12 reduced to 9

STUDY AREA

The Alsek survey area covers about 5,473 km^2. The border runs south of the Alaska Highway to the British Columbia border; and from the Haines Road and southern portion of the Kluane Wildlife Sanctuary east to Kusawa Lake (Map 1). It includes Game Management Subzones (GMSs) 7-01 to 7-12, and encompasses the southern most portion of the Kluane Wildlife Sanctuary (GMSs 6-12 and 6-13) south of the Klukshu area.

The majority of the study area (about 4,219 km^2) is considered suitable moose habitat except for approximately 23% of the area, which includes large water bodies (more than 0.5 km^2) and in general, land over 1,524 m (5,000 feet)

in altitude, although some moose are observed at higher elevations. The survey region lies within the Boreal Cordillera ecozone and is comprised of three ecoregions (Yukon Ecoregions Working Group 2004). It is primarily a mix of dissected plateaus, rolling hills and broad valleys containing various lakes and rivers in the Yukon Southern Lakes ecoregion in the northern half; to the rugged mountain ranges, alpine glaciers and high snowfall of the south (Yukon-Stikine Highlands ecoregion). A small strip of the Ruby Ranges ecoregion occurs along the Haines road to south of Dezadeash Lake in the Shakwak Trench, which separates the rugged mountains to the west from the lower mountains and broad valleys of the east.

The climate is generally dry or arid, falling within the rain shadow of the St. Elias-Coast Mountains. The Yukon-Stikine Highlands ecoregion, however, is close enough to the Pacific Ocean to funnel moderate amounts of precipitation up the Haines Road and Kusawa Lake valley corridors. Open coniferous and mixed woodland boreal forest dominate valley bottoms, grading to shrub willow or birch in the subalpine and dwarf shrub and lichen tundra at elevations 1350 to 1400 m above sea level (Yukon Ecoregions Working Group 2004). Very few forest fires have been recorded in the study area. Most of these were relatively small older fires occurring primarily in the northeast between 1948 and 1951.

METHODS

We have adapted a relatively new survey technique, developed by Jay Ver Hoef with the Alaska Department of Fish and Game (Kellie and DeLong 2006), to survey moose. Field sampling portions of this new geospatial technique are similar to those used in the stratified random block method (Gasaway et al. 1986) we used prior to 1999, except that we count moose in square rather than irregularly shaped survey blocks. This new technique offers the ability to employ more current population estimation procedures.

The technique involves six steps:

1. The survey area is divided into uniform rectangular blocks about 17 km^2 in size.
2. Observers in fixed-wing aircraft fly over all the blocks, and classify (or "stratify") each block as having either high, medium, low, or very low expected moose abundance, based on local knowledge, number of moose seen, tracks, and habitat. This is called the "stratification" portion of the survey.
3. We combine these categories of blocks into high or low "strata", and then randomly select a sample of blocks in each stratum for inclusion in the following steps.

4. We try to count every moose within the selected blocks (the "census" part of the survey) using helicopters at a search intensity of about 2 minutes per km^2. We classify all moose seen by age (adult, yearling, or calf) and sex. Yearling cows are often difficult to distinguish from adults, so we classify all cows as adults, and later estimate the number of yearling cows that were present among the older cows based on the number of yearling bulls we saw.
5. To estimate the number of moose that we missed during step 4, we include a step from the stratified random block technique where we re-fly a portion of some of our selected survey blocks at twice the search intensity (about 4 minutes per km^2). This information is used to develop a "sightability correction factor" to be incorporated into our population estimate.
6. We use computer programs to estimate the total number of moose in each age and sex category in the entire survey area based on the numbers of moose counted in the blocks during the census. The "sightability correction factor" is applied to the total number to account for moose that we miss.

Generally, the more blocks that are searched during the census portion of the survey (step 4), the more precise and reliable the resulting population estimate.

The geospatial technique has the advantage of being easier operationally to fly, is flexible for small area estimation, and provides good population estimates, often with greater precision than the stratified random block method. The stratified random block technique, however, allows us to determine and apply a sightability correction factor to our estimated population data to allow for moose that are missed. The difference in precision of the population estimates developed using the two techniques, or if a sightability correction factor is calculated during the survey, will determine which population estimation technique is used and reported.

In the harvest section of this report, total moose abundance in each Game Management Subzone (see Table 7) is estimated by multiplying the average moose density in the high and low stratum blocks by the number of high and low stratum blocks per Game Management Subzone respectively. This is a change from past reports where survey area wide moose density was applied to each Game Management Subzone.

WEATHER AND SNOW CONDITIONS

Weather conditions were variable during the 2008 survey. Temperatures were moderate, ranging from -20°C to -1°C, and winds were mainly calm or low, with a few days of strong winds at the midpoint and last few days of the survey period. We were able to fly on all but one day due to snow, although half of the survey days were cut short due to visibility problems related to low ceilings and valley fog, icing conditions or snow.

Snow accumulations were greater throughout the study area than they have been in the past few years. Snow depths were generally low (<15 cm) to intermediate (30 to 60 cm) in the north half of the region, and intermediate in the south. We generally had complete snow coverage for good tracking and sighting of moose, with the exception of about 28% of the blocks surveyed which were wind blown or had some brown slopes, primarily in the northeast portion of the study area.

RESULTS AND DISCUSSION

Stratification (Identification of High and Low Moose Density Blocks)

In 2008, we used the most current strata classification data from past population surveys (1981-1984, 1990, 1996-1997) to designate high and low strata blocks for most of the entire study area (see Map 4).

We then stratified the remainder of the area along the southern border and in the Kluane Wildlife Sanctuary portion of the study area, using a 4-seat Maule M7 aircraft with pilot and 1 observer, on November 6th, 2007.

We classified 107 (33%) of the 321 survey blocks as having high expected moose abundance and 214 (67%) as having low expected abundance of moose (Map 4). Most of the blocks with higher expected moose numbers were located in the subalpine areas in the Dezadeash Range, southwest of Jo-Jo Lake, Kluane Wildlife Sanctuary and Klukshu River areas. Subalpine areas east of the Takhanne River, however, were primarily classified as having low expected moose abundance due to the steep terrain and generally deeper snow levels.

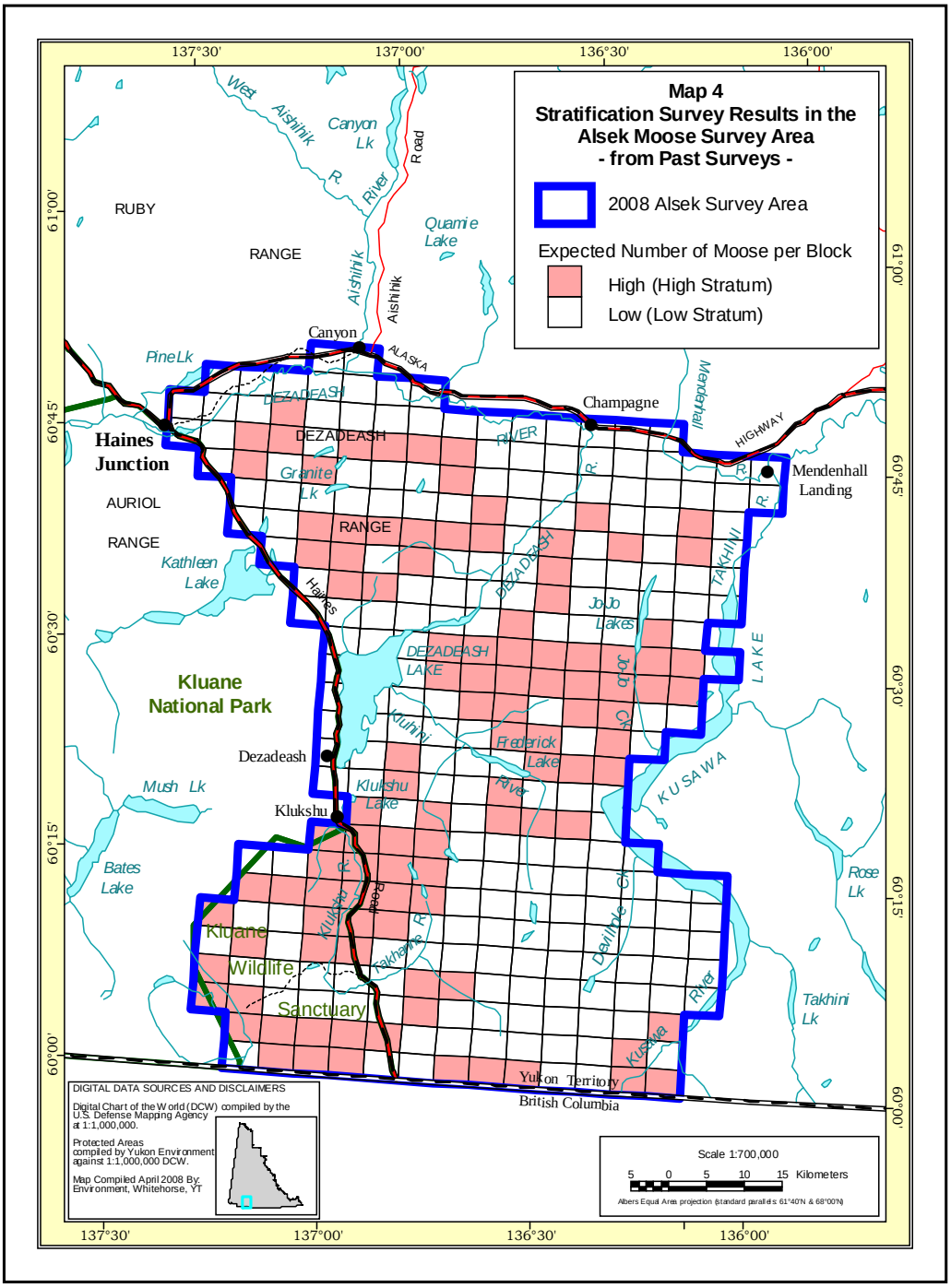

Figure 4. Map 4 Stratification Survey Results in the Alsek Moose Survey Area.

Coverage

We counted moose in 97 of the 321 blocks, or about 30% of the total area (see Map 5). Our original intention was to count about 70 blocks, so we randomly selected 43 blocks from the High stratum, and 27 from the Low stratum. After completing the majority of the 70 blocks, however, the precision of our population estimate was still fairly poor, so we selected another 20 Highs and 7 Low-stratum blocks to get a more precise estimate.

It took about 37.6 hours to count moose in these blocks, for a total search intensity of about 1.37 minutes per km². Survey intensity was lower in the low-abundance blocks (1.18 minutes per km²) than in the high-abundance blocks (1.47 minutes per km²). Overall search intensity was somewhat lower than normal for population surveys (2 minutes per km²), but the relatively large proportion of non-habitable terrain in the study area required less coverage and lower search time overall. We used an additional 5.2 hours to recount survey blocks to calculate our sightability correction factor. Another 21.8 hours of helicopter time was used in ferrying between survey blocks; to remote fuel caches near the Dezadeash and Champagne communities; and back and forth to Haines Junction. Total flight time (survey and ferry time combined) was 64.6 hours. Survey costs are summarised in Appendix 1.

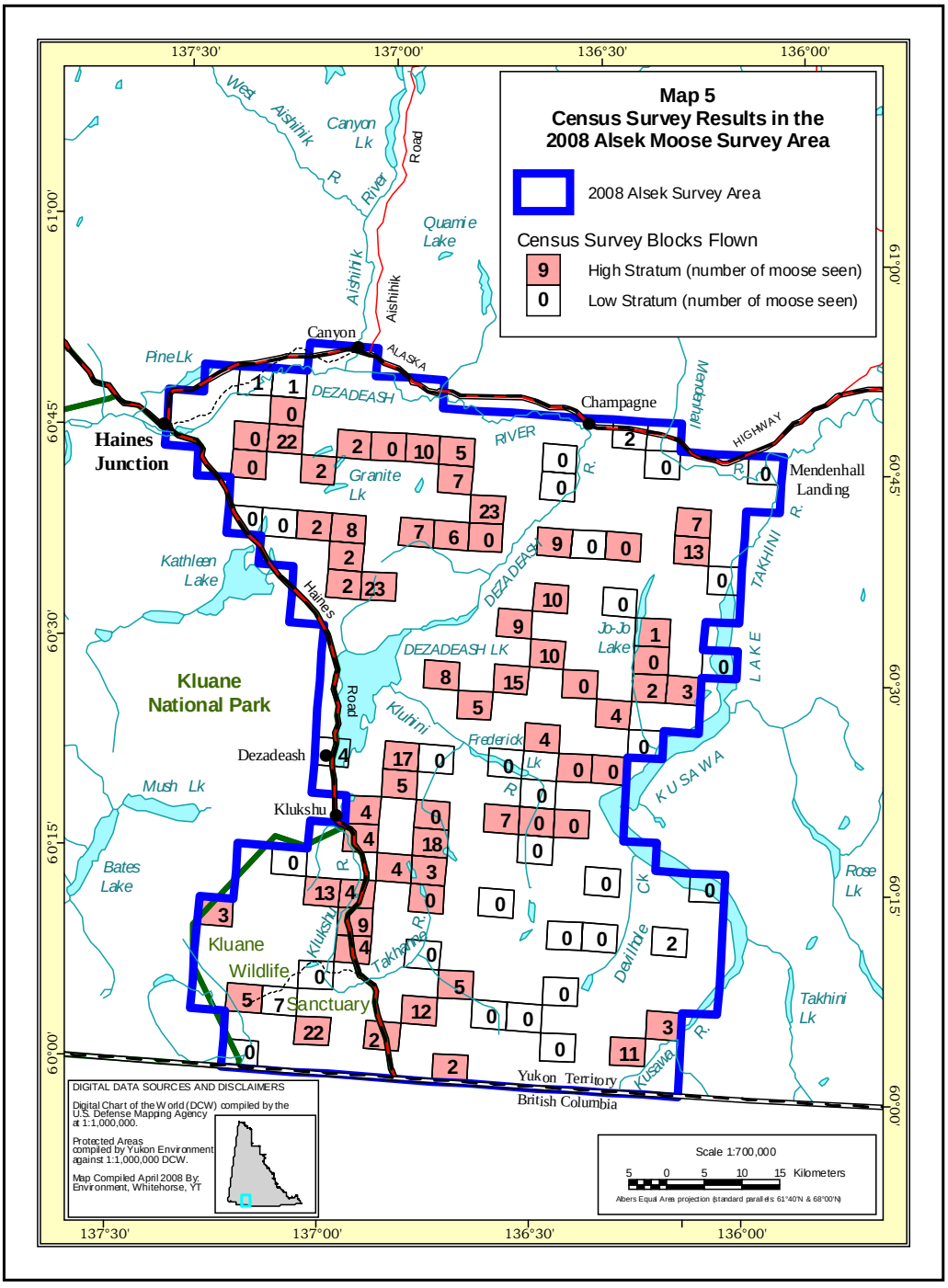

Figure 5. Map 5 Census Survey Results in the 2008 Alsek Moose Survey Area.

Observations of Moose

We counted a total of 395 moose, 101 of them adult bulls, 221 adult and yearling cows, 21 yearling bulls and 52 calves (see Table 2). We observed an average of 352 moose for every 1,000 km² in the high-abundance blocks, and 29 moose per 1,000 km² in the low blocks.

Table 2. Observations of moose during the November 2008 survey in the Alsek survey area.

	High Blocks	Low Blocks	Total
Number of Blocks Counted	63	34	97
Number of Adult Bulls Observed	101	0	101
Number of Adult and Yearling Cows Observed*	208	13	221
Number of Yearling Bulls Observed	21	0	21
Number of Calves Observed	48	4	52
Total Moose Observed	378	17	395

* Adult and yearling cows cannot always be reliably distinguished from the air, so they are counted together. Assuming that equal numbers of males and females are born and that they survive about equally well until they are yearlings, the number of yearling cows and bulls observed during the survey should be about equal. Note: we use this assumption to estimate the total number of adult cows in the survey area by subtracting the number of yearling bulls observed from the total number of cows counted; and use twice the number of yearling bulls counted as the estimated total number of yearlings observed during the survey. This estimate of adult cow and total yearling numbers is used in the calculation of data presented in Table 3 below.

Distribution and Abundance of Moose

As expected for early winter, shrub dominated communities and subalpine willow flats and creek draws with abundant willows generally had good numbers of moose in them. The exception was the lack of moose observed in the steep terrain and vast snow/ice fields of the Boundary Ranges located south of Frederick Lake and between the Takhanne River and Kusawa Lake. Although some moose concentrations were found at lower elevations in the southwest portion of the study area, forested lowlands and lower-elevation slopes typically had few moose in them.

Because the precision of population estimates derived using the geospatial and stratified random block population estimation techniques were similar, we decided to present the stratified random block results, with the pooled "sightability correction factor" (SCF) applied in this report. This technique allows us to more accurately account for moose that are not seen during the survey.

Based on our census counts, we estimate that there are a total of 806 ± 18% moose in the survey area (see Table 3). This includes a sightability

correction factor of 7% for moose missed during the census portion of the survey.

Table 3. Estimated abundance of moose in the Alsek survey area in November 2008.

	Best Estimate ± 90% Confidence Interval*	90% Confidence Interval*
Estimated Total Number of Moose**	806 ± 18%	659-954
Adult Bulls	185 ± 22%	144-225
Adult Cows	430 ± 22%	336-523
Yearlings	77 ± 34%	51-103
Calves	115 ± 27%	84-146
Density of Moose (per 1,000 km^2)		
Total Area	147	
Moose Habitat Only***	191	

* A "90% confidence interval" means that, based on our survey results, we are 90% sure that the true number lies within this range of numbers. Our best estimate is in the middle of this range.

** Estimated numbers provided are based on a pooled "sightability correction factor" or SCF. In this survey, a SCF of 1.07 was applied to correct estimates of moose abundance for animals that were missed by the survey crews (see step 5 of methods section for a description of how the SCF is calculated).

*** Suitable moose habitat is considered all areas at elevations lower than 1,524 m (5,000 ft), including water bodies < 0.5 km^2 in size.

The estimated density of moose in the survey area is 147 per 1,000 km² of total area, or 191 moose per 1,000 km² of suitable moose habitat (see Table 3). This is lower than the Yukon-wide average of 158 moose per 1,000 km² of total area, and lower than the average density of 207 moose per 1,000 km² of moose habitat from the most recent data available for previously surveyed areas throughout the Yukon.

Moose abundance in the southwestern corner of the survey area (i.e. Kluane Wildlife sanctuary and south of Takhanne River) was substantially higher (about 225 moose/1000 km²) than in the Alsek Entire Comparable area (118 moose/1000 km²: Map 6) and Alsek North Comparable area (130 moose/1000 km²: Map 7) described in the Population Status and Trend section below. The reason for the disparity in moose abundance between the south and the rest of the study area is uncertain, but may be associated with differences in habitat and/or harvest pressure.

Ages and Sexes of Moose

Calf survival to early winter was moderate in the survey area in 2008. Based on our survey results, there were an estimated 27 calves for every 100 adult cows (see Table 4). In general, about 25-30 calves per

Table 4. Estimated composition of the moose population in the Alsek survey area in November 2008.

	Best Estimate	90% Confidence Interval*
% Adult Bulls	23%	19-27%
% Adult Cows	53%	49-58%
% Yearlings	10%	7-12%
% Calves	14%	11-17%
Adult Bulls per 100 Adult Cows	43	33-53
Yearlings per 100 Adult Cows	18	12-24
Calves per 100 Adult Cows	27	21-32
% of Cow-Calf Groups with Twins	11%	6-15%

* A "90% confidence interval" means that, based on our survey results, we are 90% sure that the true number lies within this range of numbers, and that our best estimate is in the middle of this range.

100 adult cows are considered necessary to maintain stable moose populations in areas with typical adult mortality rates. Calves made up an estimated 14% of the population in 2008. Eleven percent of cow-calf groups contained twins (Table 4).

Yearlings represented about 10% of the estimated population in the survey area (Table 4). There were an estimated 18 yearlings per 100 adult cows, or about 11 per 100 adults. Depending on adult mortality rates, about 10-20 yearlings per 100 adults are required for maintaining stable populations (Yukon Fish and Wildlife Branch 1996).

Overall, calf and yearling recruitment in the Alsek survey area suggests a stable to slowly declining moose population.

We estimate that there were about 43 adult bulls for every 100 adult cows in the survey area (see Table 4). This is considerably lower than the Yukon-wide average of 67 adult bulls per 100 adult cows in areas that have been surveyed, but above the minimum acceptable level of 30 adult bulls per 100 adult cows set out in our Yukon Moose Management guidelines to ensure that the majority of adult cows are bred during the rut (Yukon Fish and Wildlife Branch 1996).

Population Status and Trend: 1981 to 2008

Early-winter population surveys were flown in varying portions of the 2008 Alsek survey area in 1981 to 1984, 1990, 1996 to 1998, 2000 and 2004 (Map 2 and Map 3). In order to effectively assess population trends between 1981 and 2008, we focused our comparison of moose abundance to two areas that have been repeatedly surveyed over time. The Alsek Entire Comparable area (see Map 6) encompasses a large portion of the 2008 study area and was previously surveyed in 1981, 1982, and 1998. A smaller subset of the 2008 survey area, called the Alsek North Comparable area (see Map 7) was surveyed annually between1981 and 1984, in 1990, 1998, 2000 and 2008. Discussions of long term moose population trends and current status in these areas are presented in the following sections.

Alsek Entire Comparable Survey Area

The majority of the 2008 Alsek survey area (Map 6) was previously surveyed in early winter 1981, 1982 and 1998. Results spanning 28 years for this smaller comparable subset of the entire 2008 survey area are given in Table 5. The estimated population declined significantly between 1981 and 1982 (793 to 643 moose) due to poor calf and yearling recruitment and to a lesser extent, by high mortality of adult bulls (see results in Johnston and McLeod 1983). A study was initiated in 1983 to determine the factors limiting moose population growth in southwestern Yukon. The results of the study found that predation by grizzly bears and wolves were the major cause of calf and adult mortality in this region (Larsen et al. 1989). In response to the decline, a wolf control program and harvest restrictions were implemented in the mid 1980s. Moose numbers appeared to increase between 1982 and 1998 ($P>0.1$, 2 tailed t Test) to a peak of 841 moose. This was followed by a sharp decline in moose abundance between 1998 and 2008 (significant decline from 841 to 472 moose; $P<0.005$; 2 tailed t Test; Table 5). This represents a 44% decrease in abundance and a drop in average density from 221 moose per 1000 km^2 observed in 1998, to 118 moose per 1000 km^2 in 2008 over the total area (Table 5).

The proportion of adult bulls in the population in 1981 and 1982 (35 and 32 adult bulls per 100 adult cows respectively) was very low and near to the minimum 30 adult bulls per 100 adult cows needed to ensure successful reproduction (Table 5). The adult bull ratio increased to above the Yukon average in 1998 (72 adult bulls per 100 adult cows), but dropped to 53 adult bulls/100 adult cows by 2008. This is a lower but sufficient ratio to ensure that all cows are bred during the rut (Yukon Fish and Wildlife Branch 1996).

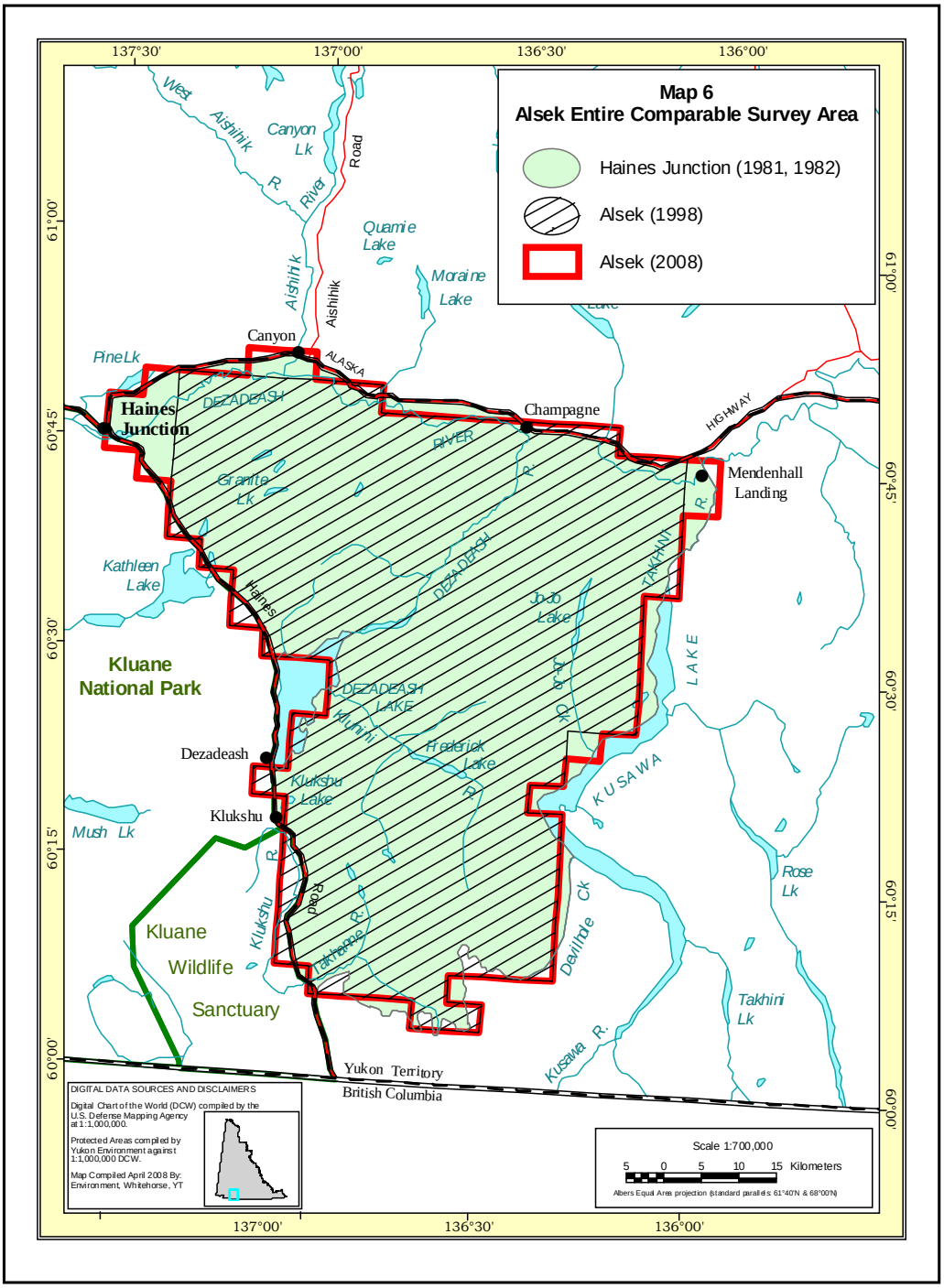

Figure 6. Map 6 Alsek Entire Comparable Survey Area.

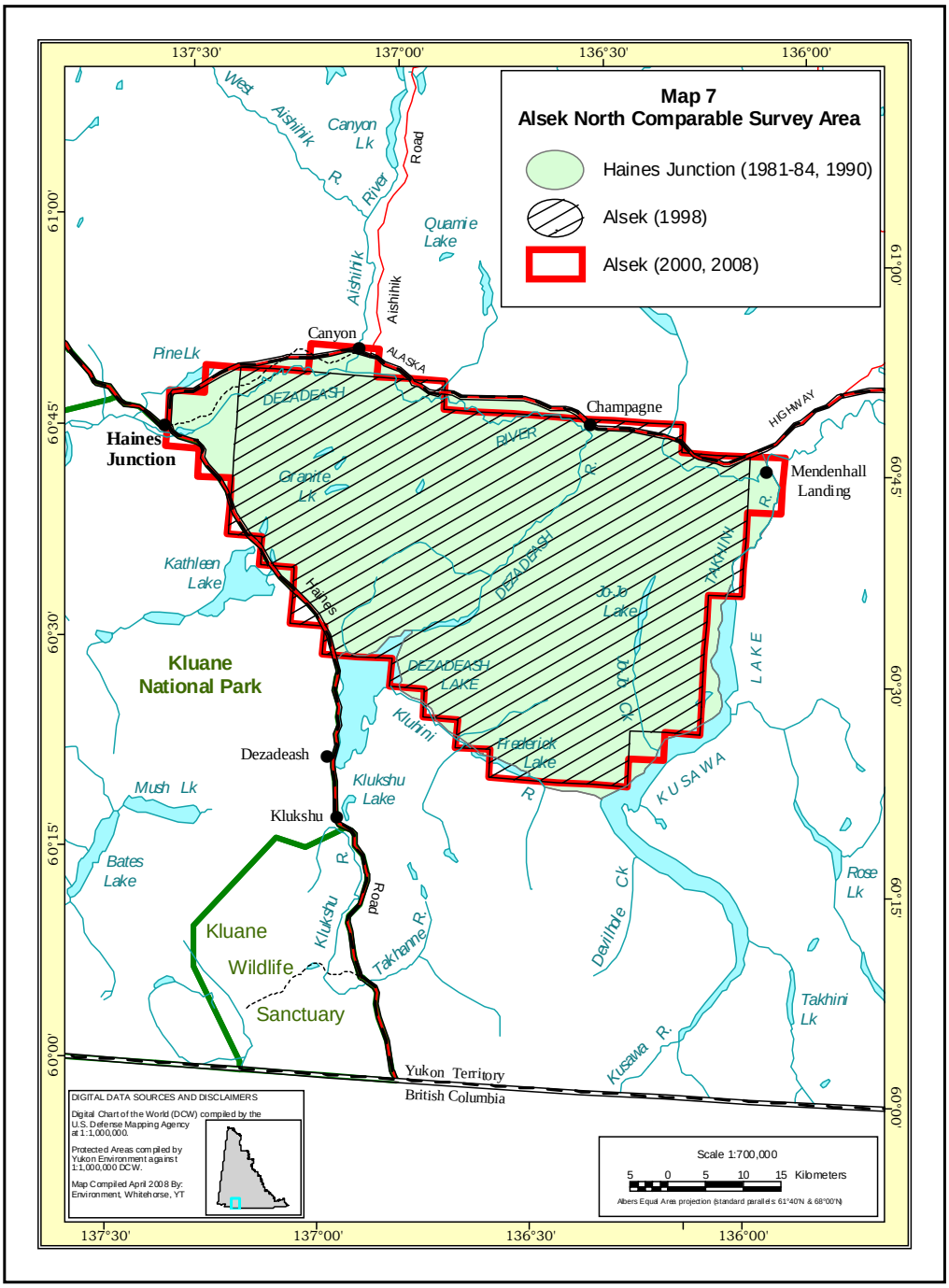

Figure 7. Map 7 Alsek North Comparable Survey Area.

Table 5. Results of the 1981, 1982, 1998 and 2008 early-winter moose population surveys of the Alsek Entire Comparable survey area. No sightability correction factors are included in results[1].

	Entire Comparison Area			
Survey Year	**1981**	**1982**	**1998**	**2008**
Estimated Abundance[1]				
(90% Confidence Range)[2]				
Total Moose	793 ± 16% (668-917)	643 ± 18% (528-758)	841 ± 23% (651-1031)	472 ± 14% (406-538)
Adult Bulls (≥ 30 months)	151 ± 20% (120-182)	143 ± 35% (93-192)	246 ± 30% (171-320)	124 ± 20% (100-149)
Adult Cows (≥ 30 months)	428 ± 14% (367-489)	442 ± 19% (358-525)	342 ± 26% (254-429)	233 ± 15% (198-269)
Yearlings (Approx. 18 months)[3]	95 ± 47% (50-140)	9 ± 24% (6-11)	118 ± 53% (56-181)	53 ± 32% (36-69)
Calves (≤ 12 months)	118 ± 37% (74-162)	50 ± 45% (28-72)	133 ± 30% (93-173)	62 ± 23% (48-76)
Unknown age/sex	-	-	3 ± 137% (0-7)	-
Estimated Population Ratios[1]				
(90% Confidence Range)[2]				
Adult Bulls per 100 Adult Cows	35 ± 20% (28-42)	32 ± 38% (20-45)	72 ± 29% (51-92)	53 ± 19% (43-63)
Yearlings per 100 Adult Cows	22 ± 48% (12-33)	2 ± 32% (1-2)	35 ± 57% (15-54)	23 ± 32% (15-30)
Calves per 100 Adult Cows	28 ± 29% (20-36)	11 ± 35% (7-15)	39 ± 22% (30-47)	27 ± 22% (21-32)
% of Cow-Calf Groups with Twins[4]	Not Available	Not Available	7 ± 168% (2-11)	10 ± 45% (6-15)
Density of Moose (per 1,000 km^2)[1]				
Total Area	~199[5]	162	221	118
Moose Habitat only[6]	255	207	279	148

[1] To allow for comparison across years, no sightability correction factor is included in estimates provided.
[2] This means that we are 90% sure that the true number of moose in the area lies within the range of moose numbers given in the brackets.
[3] To account for yearling cows that cannot be identified from the air, the total number of yearlings is assumed to equal 2x estimated number of yearling bulls in the population.
[4] Twinning Rate = the number of cows with 2 calves divided by the total number of cows with calves.
[5] The 1981 survey provided habitable area only. Total area (km^2) and resulting moose density were estimated for this survey.
[6] Suitable moose habitat is considered all areas at elevations lower than 1,524 m (5,000 ft), including water bodies < 0.5 km^2 in size.

As indicated above, the calf and yearling to adult cow ratio declined sharply between 1981 and 1982 (28 to 11 calves and 22 to 2 yearlings), but increased substantially in 1998 to more than the 25-30 calves and yearlings per 100 adult cows normally associated with stable to increasing moose populations (Table 5). Calf and yearling recruitment declined to a moderate level by 2008 (27 calves and 23 yearlings per 100 adult cows), similar to that observed in 1981. The estimated proportion of cows with calves that had twins, however, was slightly higher in 2008 (10%) than in 1998 (7%); and in conjunction with the current recruitment ratios suggests a stable population over the Alsek Entire Comparable survey area.

Alsek North Comparable Survey Area

Moose habitat tends to be better in the northern portion of the Alsek area and historically, moose abundance has also been higher. The majority of early-winter population surveys conducted in the Alsek region (annually 1981 through 1984, 1990, 1998, 2000, and 2008) have occurred in or encompassed the northern half of the study area (Map 7). The relatively frequent survey history in the north allows us to describe the changes in population trend over time. Results from these 8 surveys are given in Tables 6a and 6b below. Smaller surveys were conducted in the northeast (Jo-Jo Lake survey in 1997) and northwest portions of the area (Dezadeash Mountains survey in 1996 and southeast half of Kloo Lake/Dezadeash Mountains survey in 2004), but were too small to include in this review (see Map 3).

Moose abundance in the northern portion of the Alsek survey area showed a larger significant decline between 1981 and 1982 ($P<0.05$: 2 tailed t Test) than was seen over the Alsek Entire Comparable survey area (590 to 351 moose; Table 6.).

Numbers remained low but stable between 1982 and 1984, then increased significantly by 1990 (509 moose; $P<0.05$: 2 tail t Test) and to a peak of 607 moose in 1998 (Table 7.). Of the limited data we have available, no statistically significant change in moose abundance was recorded in the southern portion of the Alsek Entire Comparable area between 1981 and 1998.

Given the results of the Alsek North and Entire Comparable areas, the decline in moose numbers between 1981 and 1982 appears to have been focused in the northern portion of the Alsek study area. Likewise, the increase in abundance between the early 1980s and 1998 was more significant in the Alsek North than over the Entire Comparable area. The initial rebound of moose numbers in the early 1990s was thought to be in response to the wolf control program and continued harvest restrictions (Larsen and Ward 1991a).

Moose numbers in the Alsek North Comparable area have shown a downward trend and are now significantly lower (2008) than recorded in 1998 (607 to 363 moose; $P<0.05$: 2 tailed t Test). Moose abundance is now similar to that observed between 1982 and 1984 (Tables 6. and 7.). Moose density in the

Alsek North Comparable area is currently about 130 moose per 1000 km^2 of total area, lower than the Yukon wide average, but remains higher than the 118 moose per 1000 km^2 over the Alsek Entire Comparable survey area (Table 5). Between 1998 and 2008, moose abundance in the southern portion of the Alsek Entire Comparable area had also declined significantly ($P<0.10$: 2 tailed t Test).

The proportion of mature bulls in the Alsek North Comparable area was very low between 1981 and 1983, just above the minimum 30 adult bulls per 100 adult cows needed to ensure that cows are successfully bred (Table 6). The adult bull ratio increased to 47 bulls per 100 adult cows in 1984 (Table 6.) and remained at a similar level during the 1990 survey (49 bulls per 100 cows) to a peak of 86 adult bulls per 100 adult cows in 1998 (Table 7.). The adult bull ratio declined from 1998 to 2000 (77 bulls/100 cows) and continued to decline in 2008 to 58 bulls per 100 adult cows (Table 7.). The current adult bull ratio in the north is lower than the Yukon wide average of 67 adult bulls to 100 adult cows, but similar to the 53 bulls/100 cows observed in the Alsek Entire Comparable survey area (Table 5).

As in the Alsek Entire Comparable area, calf and yearling recruitment declined sharply between 1981 and 1982, and remained below the 25 to 30 calves and yearlings per 100 adult cows generally needed to maintain a stable moose population throughout the early 1980s (Table 6.). Calf and yearling ratios increased significantly in 1990 ($P<0.05$; Larsen and Ward 1991a) to 42 calves and 30 yearlings per 100 adult cows, and remained at a healthy level in 1998 (38 calves and 42 yearlings per 100 adults cows; Table 7.). Recruitment dropped considerably in 2000 (13 calves and 18 yearlings per 100 adults) but has since increased to a moderate 23 calves and 28 yearlings per 100 adult cows in 2008. This is similar to the calf and yearling recruitment observed in the Alsek Entire Comparable area and is indicative of a stable population. The twinning rate, however, dropped in the northern portion of the study area from 7% in 1998 to 0% in 2000, rising slightly to 4% in 2008 (Table 7.).

Table 6. Results of the 1981 to 1984 early-winter moose population surveys of the Alsek North Comparable survey area. No sightability correction factor is included in results[1].

	North Comparison Area			
Survey Year	**1981**	**1982**	**1983**	**1984**
Estimated Abundance[1]				
(90% Confidence Range)[2]				
Total Moose	590 ± 22% (461-720)	351 ± 26% (260-442)	347 ± 28% (251-442)	330 ± 20% (264-396)
Adult Bulls (≥ 30 months)	103 ± 28% (74-132)	86 ± 47% (45-126)	79 ± 42% (46-111)	93 ± 30% (65-121)
Adult Cows (≥ 30 months)	306 ± 20% (245-367)	233 ± 28% (167-299)	249 ± 30% (175-324)	200 ± 23% (153-247)
Yearlings (Approx. 18 months)[3]	65 ± 69% (20-109)	6 ± 0% (6)	2 ± 0% (2)	2 ± 0% (2)
Calves (≤ 12 months)	116 ± 39% (71-162)	26 ± 71% (8-45)	17 ± 55% (8-26)	35 ± 25% (26-44)
Unknown age/sex	-	-	-	-
Estimated Population Ratios[1]				
(90% Confidence Range)[2]				
Adult Bulls per 100 Adult Cows	34 ± 22% (26-41)	37 ± 54% (17-57)	32 ± 38% (20-44)	47 ± 29% (33-60)
Yearlings per 100 Adult Cows	21 ± 68% (7-36)	3 ± 28% (2-3)	1 ± 30% (0-1)	1 ± 23% (0-1)
Calves per 100 Adult Cows	38 ± 28% (27-49)	11 ± 56% (5-18)	7 ± 60% (3-11)	18 ± 29% (12-23)
% of Cow-Calf Groups with Twins[4]	Not Available	Not Available	0	0
Density of Moose (per 1,000 km^2)[1]				
Total Area	Not Available	Not Available	~117[5]	~111[5]
Moose Habitat only[6]	250	149	147	140

[1] To allow for comparison across years, no sightability correction factor is included in estimates provided.
[2] This means that we are 90% sure that the true number of moose in the area lies within the range of moose numbers given in the brackets.
[3] To account for yearling cows that cannot be identified from the air, the total number of yearlings is assumed to equal 2x estimated number of yearling bulls in the population.
[4] Twinning Rate = the number of cows with 2 calves divided by the total number of cows with calves.
[5] The 1983 and 1984 surveys provided habitable area only. Total area (km^2) and resulting moose density were estimated for these surveys.
[6] Suitable moose habitat is considered all areas at elevations lower than 1,524 m (5,000 ft), including water bodies < 0.5 km^2 in size.

Table 7. Results of the 1990, 1998, 2000 and 2008 early-winter moose population surveys of the Alsek North Comparable survey area. No sightability correction factor is included in results[1].

	North Comparison Area			
Survey Year	**1990**	**1998**	**2000**	**2008**
Estimated Abundance[1]				
(90% Confidence Range)[2]				
Total Moose	509 ± 13% (443-574)	607 ± 28% (440-774)	420 ± 30% (296-545)	363 ± 18% (298-427)
Adult Bulls (≥ 30 months)	113 ± 17% (93-132)	195 ± 36% (124-266)	155 ± 31% (106-204)	102 ± 23% (79-125)
Adult Cows (≥ 30 months)	231 ± 17% (193-270)	227 ± 31% (157-297)	202 ± 33% (136-268)	175 ± 21% (138-211)
Yearlings (Approx. 18 months)[3]	69 ± 28% (49-88)	97 ± 63% (36-158)	37 ± 56% (16-58)	45 ± 37% (28-62)
Calves (≤ 12 months)	96 ± 16% (81-112)	85 ± 32% (58-112)	26 ± 61% (10-43)	41 ± 36% (26-55)
Unknown age/sex	-	3 ± 140% (0-7)	-	-
Estimated Population Ratios[1]				
(90% Confidence Range)[2]				
Adult Bulls per 100 Adult Cows	49 ± 20% (39-58)	86 ± 35% (56-116)	77 ± 22% (60-94)	58 ± 24% (44-72)
Yearlings per 100 Adult Cows	30 ± 30% (21-39)	42 ± 67% (14-71)	18 ± 57% (8-29)	26 ± 38% (16-36)
Calves per 100 Adult Cows	42 ± 15% (35-48)	38 ± 27% (28-47)	13 ± 53% (6-20)	23 ± 34% (15-31)
% of Cow-Calf Groups with Twins[4]	12 ± 23% (10-15)	7 ± 93% (0-14)	0	4 ± 100% (0-8)
Density of Moose (per 1,000 km^2)[1]				
Total Area	~173[5]	233	150	130
Moose Habitat only[6]	218	276	177	152

[1] To allow for comparison across years, no sightability correction factor is included in estimates provided.
[2] This means that we are 90% sure that the true number of moose in the area lies within the range of moose numbers given in the brackets.
[3] To account for yearling cows that cannot be identified from the air, the total number of yearlings is assumed to equal 2x estimated number of yearling bulls in the population.
[4] Twinning Rate = the number of cows with 2 calves divided by the total number of cows with calves.
[5] The 1990 survey provided habitable area only. Total area (km^2) and resulting moose density were estimated for this survey.
[6] Suitable moose habitat is considered all areas at elevations lower than 1,524 m (5,000 ft), including water bodies < 0.5 km^2 in size.

Discussion of Population Trend in Alsek Entire and Alsek North Comparable survey areas: 1998 to 2008

Moose abundance declined significantly in both the Alsek Entire and Alsek North Comparable areas between 1998 and 2008, and currently appears to be at or near historic recorded lows throughout the Alsek study area. The current population decline may be the result of a combination of higher hunting pressure, particularly on bulls, and a decline in calf and yearling recruitment.

The estimated proportion of adult bulls to adult cows in the Alsek North and Alsek Entire Comparable areas decreased significantly from 1998 to 2008 (Table 5 and 7). The 2008 adult bull ratio for both areas (58 and 53 adult bulls per 100 adult cows in the Alsek North and Entire Comparable areas respectively) are lower than the Yukon-wide average, but above the minimum level considered sufficient to ensure that all cows are bred during the rut. Although the overall low bull ratio estimated in 2008 is not of immediate concern, it does highlight the need for ongoing monitoring.

Low bull numbers can be an indicator of a declining and/or heavily hunted moose population. One possible explanation is high harvest levels related to access. The Alaska Highway and the Haines Road provide easy year-round access to moose. In 1981 a mining road was built into the Dezadeash Range to access Granite Creek. This road provides access to important subalpine moose aggregation areas and was heavily hunted before restrictions were implemented. Other access routes for hunting in the Alsek survey area include the original Alaska Highway near Haines Junction; Quill Creek exploration trails and roads; Dezadeash Lake to Six Mile River and Red Squirrel Creek trail; Frederick Lake trails; and the Gopher Mountain trail south of Dezadeash. The Dalton Post road in the southwest portion of the study area is also hunted. These roads provide relatively easy access to important seasonal habitats and aggregation areas throughout the Alsek survey area.

Calf and yearling recruitment has also declined in the Alsek survey area since 1998 (Table 5 and 7). A sharp drop in recruitment ratios were noted during the 2000 survey in the Alsek North Comparable area (Table 7.). Calf and yearling ratios observed during early-winter trend surveys in the Dezadeash Range in the northwest corner of the survey area were also low to moderate in 2001 (19 calves and 28 yearlings per 100 adult cows; report not available, results data only) and 2003 (18 calves and 32 yearlings per 100 adult cows; LaRocque 2004), but increased to a relatively healthy level in 2005 (25 calves and 48 yearlings per 100 adult cows; LaRocque 2006). Recruitment has since decreased to a uniform low to moderate level throughout the study area. The proportion of cows with calves that had twins was about 7% in the Alsek North and Entire comparable areas in 1998, which increased over the Alsek Entire Comparable area (10%) but dropped in the North (4%) by 2008 (Table 5 and 7).

Lower overall recruitment rates could, in part, be a result of predation by increasing wolf or bear numbers since 1998. Information from Alsek Renewable Resource Council meetings (Lorne LaRocque personal communication) suggest there has been low trapping pressure on wolves and little hunting of bears; and many residents and Champagne and Aishihik First Nation members believe bear numbers have increased substantially in the area. Testing for wolf predation effects on calves in the Dezadeash Range during 2000 and 2001, however, seemed to show that weather and not wolf predation was the limiting factor during these two years (LaRocque 2005). Poor winters, starting with the very deep snow in early winter of 1999 and 2000 may have initiated a decline in recruitment. The following cold late springs of 2000, 2001 and 2002 may have kept calf and yearling numbers low, resulting in the lower recruitment level observed in 2008.

Access into moose aggregation areas in fall and winter with the resulting potential for increasing hunting pressure; combined with poor to modest recruitment and predation, are all likely contributing factors to low bull numbers and an overall declining moose population in the Alsek area.

Kluane National Park – 2008 Auriol Range moose survey

Kluane National Park (KNP) has flown moose surveys in the Auriol Range, northwest of the Alsek study area, since 1974. These annual trend surveys are done in November and focus on important post rut aggregation areas in KNP between Haines Junction and the Mush Lake Road.

In contrast to the significant decline in moose abundance observed in the Alsek survey area since 1998, moose abundance has continued to increase in the Auriol Range. In 2008, Kluane National Park recorded the highest total number of moose (301) seen on this survey (McKinnon draft report). Other population indicators from the 2008 Kluane National Park survey, however, are similar to the Alsek survey. Adult bull ratios were 48 per 100 adult cows, the calf ratio was 24 calves/100 adult cows and yearlings were at 18/100 adult cows.

Harvest

The Alsek region (Game Management Subzones 6-12 to 6-13, 7-01 to 7-12; see Map 1) was and remains an important moose hunting area for southwest Yukon hunters, and despite increased hunting restrictions remains so today. In 1979 over 80 moose were reported harvested in the area, and between 1979 and 1983 the average reported harvest was about 58 moose per year (see Figure 8). This represents 7% of the total estimated moose population in 1981 and 9% of the estimated 1982 moose population. These numbers do not include the harvest by First Nation members. Annual harvest rates in excess

of 5% of the total estimated moose population have been shown to carry a high risk of initiating a population decline (Gasaway et al 1992).

Moose surveys and traditional and local knowledge both indicate that moose abundance declined significantly in the area in the late 1970s and early 1980s (Table 5 and 6). This decline was the impetus for a wolf control program during the mid 1980s (Larsen et al. 1989) and the imposition of hunting restrictions on resident and non-resident hunters beginning in 1984 (see Table 1).

In response to declining moose numbers and increased hunting restrictions, the reported harvest dropped to an average of about 15 moose per year between 1984 to 1988 and has remained low, ranging from 1 to 11 moose per year since 1989 (Figure 8).

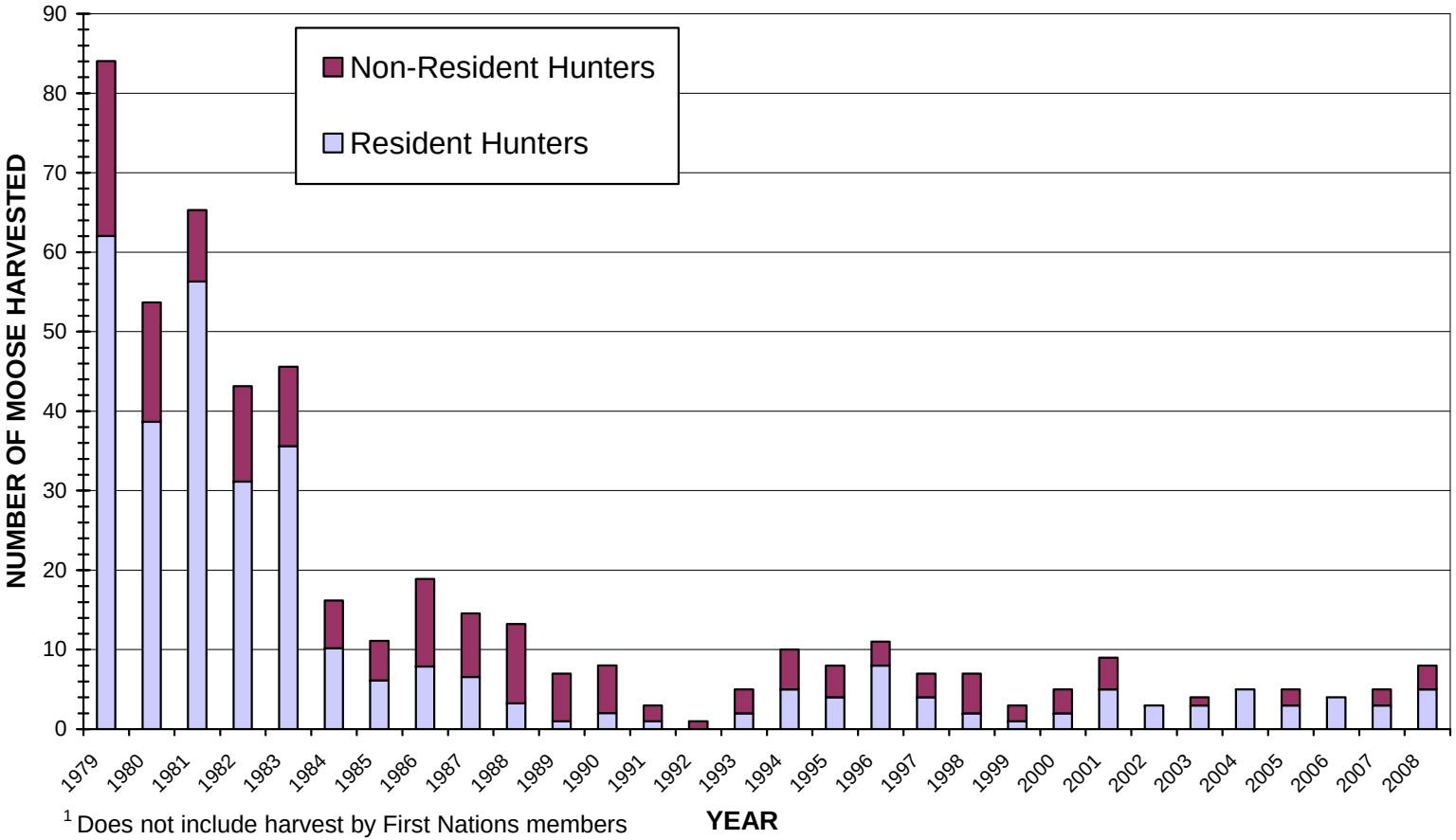

Figure 8. Annual Reported Moose Harvest (1979-2008) in the Alsek Moose Survey Area[1] (Game Management Subzones: 6-12 to 6-13, 7-01 to 7-12).

Harvest by resident and non-resident (or outfitted) licensed hunters is restricted through a combination of a permit hunt authorization (PHA) system and outfitter quotas respectively. Nine PHAs are issued annually to resident non-First Nation hunters. The current outfitter quota agreement for Devil Hole Outfitters allows for the harvest of a maximum of 6 moose over three years.

Resident non-First Nation moose harvest is distributed throughout the Alsek study area by allocating permits to specific Moose Management Units (MMUs; see Map 8). These MMUs were developed in the mid 1990's to reduce the risk of over harvest in areas of easy access to moose. The distribution of the non-resident harvest is governed by conditions of the outfitter quota agreement.

The current average total reported annual harvest in the 2008 Alsek survey area by all hunters is about 20 moose per year (Table 8). This represents an estimated average annual harvest rate of about 2.4% of the 805 moose estimated for Moose Management Units in this area (Table 8, Map 8). It includes the 2004 to 2008 average annual harvest by resident non-First Nations and non-residents, and the most recent available harvest from Champagne and Aishihik First Nation members (2003 to 2007). Harvest data for Carcross/Tagish or Kwanlin Dun First Nation hunters, who's Traditional Territories also overlap small portions the Alsek survey area, is not available.

The 2.4% estimated total harvest rate for the entire area is above the 2% maximum annual allowable harvest (AAH) rate identified in the now expired Alsek Wildlife Management Plan (Yukon Fish and Wildlife Branch 2000). Harvest rates in many of the more accessible portions of the Dezadeash River, Granite Creek and Takhanne River MMUs also exceed the 3% to 4% AAH rates generally set for stable moose populations of average density (Yukon Fish and Wildlife Branch 1996). Harvest rates in Game Management Subzone (GMS) 7-01 (5.2%) and 7-03 (6.5%) are of particular concern (Table 7; Map 8) because, as noted above, annual harvest rates in excess of 5% can carry an unacceptably high risk of precipitating a population decline (Gasaway et al 1992; Yukon Fish and Wildlife Branch 1996). Harvest rates in GMS 7-05 and 7-07 are also approaching the 4% upper allowable harvest limit (Table 8).

Despite apparently moderate overall total estimated harvest rates by all hunters since 1998, when moose abundance and recruitment were at their peak (Table 7.), moose numbers have declined significantly. The reasons for this decline are uncertain but over-harvest cannot be discounted as a contributing factor. High harvest rates observed in easily accessible portions of the northern MMUs and low adult bull: adult cow ratios provide support for this hypothesis.

Given that moose abundance in the 2008 Alsek survey area has declined substantially and is now below the Yukon average, and harvest data may not be complete, moose harvest should remain conservative.

Table 8. Average Annual Non-First Nation (2004-2008) and First Nation (2003-2007) Moose Harvest and Allowable Harvest Summary for the 2008 Alsek Moose Survey Area: by Moose Management Unit and Game Management Subzone (GMS) 6-12 to 6-13, 7-01 to 7-12

Game Management Area (GMA)	Moose Management Area (MMU)	Estimated Area of GMA (km^2)	Moose Density[1] per 1000 km^2	Total Estimated Moose in GMA	Average Resident Harvest (2004 to 2008)	Average Non-Resident Harvest (2004 to 2008)	Average Non-Resident (Special Guided) Harvest	Average First Nation (CAFN) Harvest (2003 to 2007)[2,3]	Average Total Harvest[4]	Current Harvest Rate (% of total population)	2% Allowable Annual Harvest	3% Allowable Annual Harvest	4% Allowable Annual Harvest
612	Tatshenshini R.	401.3	220	88.3	0.0	0.0	0.0	1.8	1.8	2.0	1.8	2.6	3.5
613	Tatshenshini R.	182.0	240	43.7	0.0	0.0	0.0	0.6	0.6	1.4	0.9	1.3	1.7
701	Dezadeash R.	469.2	115	54.0	1.0	0.0	0.0	1.8	2.8	5.2	1.1	1.6	2.2
702	Dezadeash R.	429.0	120	51.5	0.2	0.0	0.0	1.0	1.2	2.3	1.0	1.5	2.1
703	Granite Cr.	520.6	125	65.1	1.0	0.0	0.0	3.2	4.2	6.5	1.3	2.0	2.6
704	Dezadeash R.	519.0	125	64.9	0.2	0.2	0.0	1.6	2.0	3.1	1.3	1.9	2.6
705	Dezadeash R.	446.9	125	55.9	0.2	0.6	0.0	1.2	2.0	3.6	1.1	1.7	2.2
706	Takhanne R.	506.8	260	131.8	0.2	0.0	0.0	1.2	1.4	1.1	2.6	4.0	5.3
707	Takhanne R.	390.3	215	83.9	1.2	0.6	0.0	1.2	3.0	3.6	1.7	2.5	3.4
708	Takhanne R.	453.0	130	58.9	0.0	0.0	0.0	0.2	0.2	0.3	1.2	1.8	2.4
709	Takhanne R.	234.6	165	38.7	0.0	0.0	0.0	0.2	0.2	0.5	0.8	1.2	1.5
710	Takhanne R.	285.4	70	20.0	0.0	0.0	0.0	0.2	0.2	1.0	0.4	0.6	0.8
711	Takhanne R.	65.4	30	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
712	Takhanne R.	510.0	90	45.9	0.0	0.0	0.0	0.0	0.0	0.0	0.9	1.4	1.8
Grand Total[5]		**5413.5**	**145.0**	**804.6**	**4.0**	**1.4**	**0.0**	**14.2**	**19.6**	**2.4**	**16.1**	**24.1**	**32.2**

[1] Moose Density values based on 2008 Alsek moose survey results.
[2] 2008 Champagne and Aishihik First Nation (CAFN) harvest data was not available. Most current 5-year average CAFN harvest is based on 2003 to 2007 data.
[3] Average First Nation Harvest from Carcross/Tagish or Kwanlin Dun hunters, who's Traditional Territories overlap a small portion of the Alsek area, is not available.
[4] Includes non-First Nation Resident and Non-Resident reported harvest (2004 to 2008) and most recent Champagne and Aishihik First Nation harvest data (2003 to 2007)
[5] Small differences in total area, average moose density, and total number of moose presented in the report for the Alsek survey area, versus Table 7, are due to slight differences in game management subzone and survey area boundaries (see Map 1).

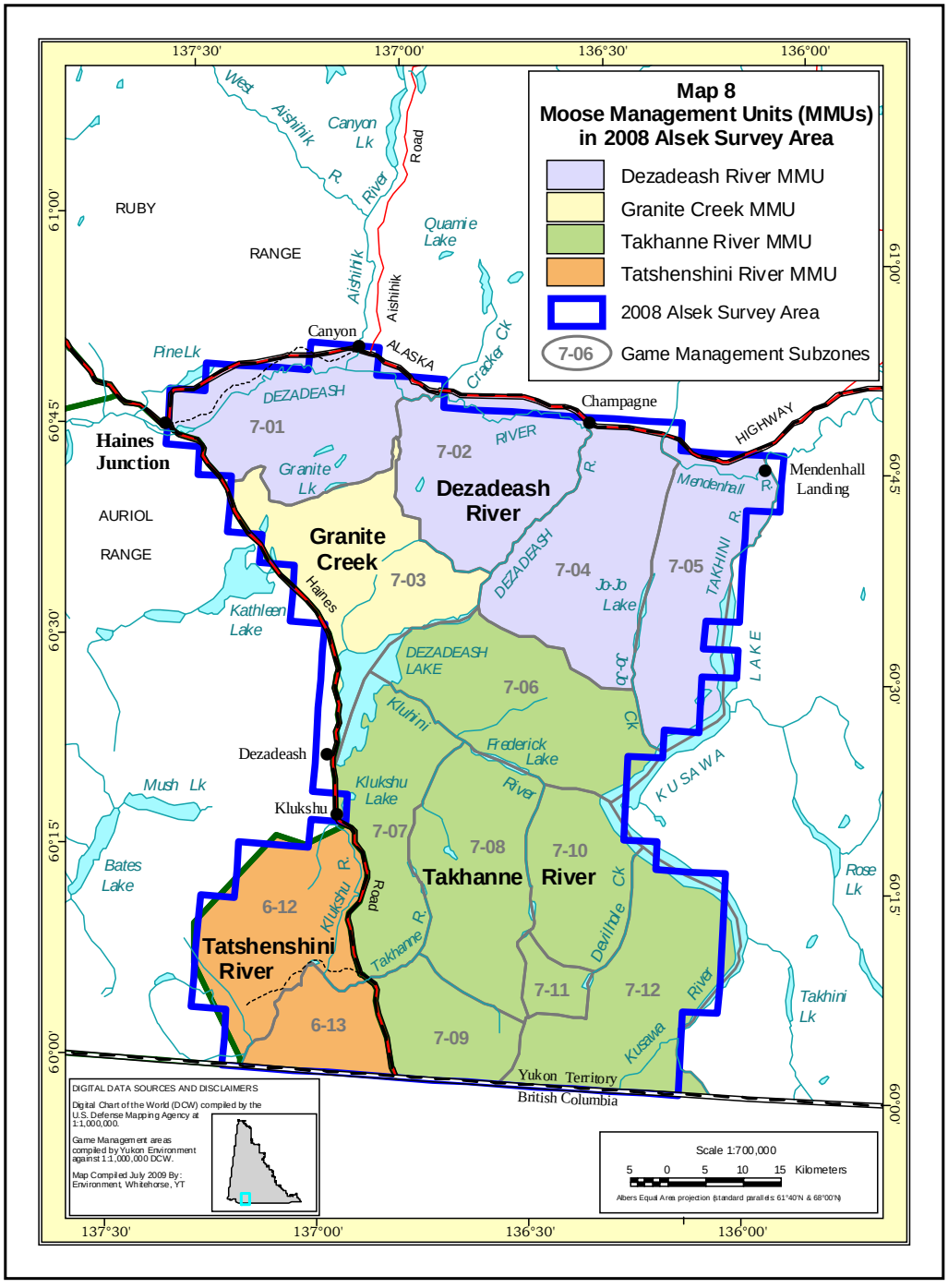

Figure 9. Map 8 Moose Management Units (MMUs) in 2008 Alsek Survey Area.

Other Wildlife Sightings

In addition to the 395 moose we counted during the 2008 survey, we also observed 25 moose outside of the sample units that were surveyed, or just outside of the survey boundary. The total number observed during the entire survey period was 420 moose.

Other ungulates recorded during the survey included a total of 36 bison; 21 near the west end of the Mendenhall River, 14 just north of the Alaska Highway east of Cracker Creek and 1 south of the Dezadeash River southwest of the Canyon community. One elk was located southwest of Mendenhall Landing, and 1 Mule deer was also seen on the hills southwest of the mouth of Jo-Jo Creek. A total of 109 Dall sheep were observed in the study area, primarily in the high ground between the east arm of the Dezadeash River and Kusawa Lake (75 sheep) and the northeast and northwest edges of the Dezadeash Range (17 sheep). Another 17 sheep were scattered at high elevation in the south end of the survey area, mainly south of Frederick Lake and the Klukshu area. Three Mountain goats were also observed in the hills west of Klukshu.

Other species observed included two wolves spotted southeast of Champagne and 1 grizzly bear located southeast of Klukshu. One lynx was seen east of Mendenhall Landing on the east bank of the Takhini River, and 6 swans (2 adults + 4 young) were also located on the same river just north of the landing.

CONCLUSIONS AND RECOMMENDATIONS

- We estimate that there are about 806 moose in the 2008 Alsek survey area for an average density of about 147 moose per 1,000 km^2 of total area. This is lower than the Yukon-wide average. Moose abundance in a previously surveyed portion of the entire area was considerably lower in 2008 than in 1981, 1982 and 1998.
- Moose numbers declined significantly (44%) between 1998 and 2008, and now appears to be at or near historic recorded lows throughout all portions of the Alsek survey area.
- Survival of calves appears to have been moderate in the survey area during the summer and fall of 2008, and low for calves born in 2007. Overall calf and yearling recruitment in the 2008 Alsek survey area suggests a stable to slowly declining moose population.
- The ratio of adult bulls to adult cows in the 2008 survey area was well below the estimated Yukon-wide average but remains above the minimum number generally considered sufficient to ensure that adult cows are bred during the rut. The reason for the significantly lower proportion of bulls observed in 2008 is unclear, but it does highlight the need for ongoing monitoring.
- The current total reported moose harvest by First Nation and non-First Nation hunters in the 2008 Alsek survey area is within the normal annual allowable limit (less than 3% to 4% of the total estimated moose population).
- There is a concern, however, that total harvest in the more accessible portions of the Alsek survey area may exceed sustainable limits, and careful monitoring of moose abundance and harvest will be needed to ensure the long term welfare of the local moose population.
- The Yukon Government, Champagne and Aishihik First Nation and Alsek Renewable Resource Council should meet to discuss ways to ensure moose harvest rates do not exceed sustainable levels, and to develop plans to address the current population decline.

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