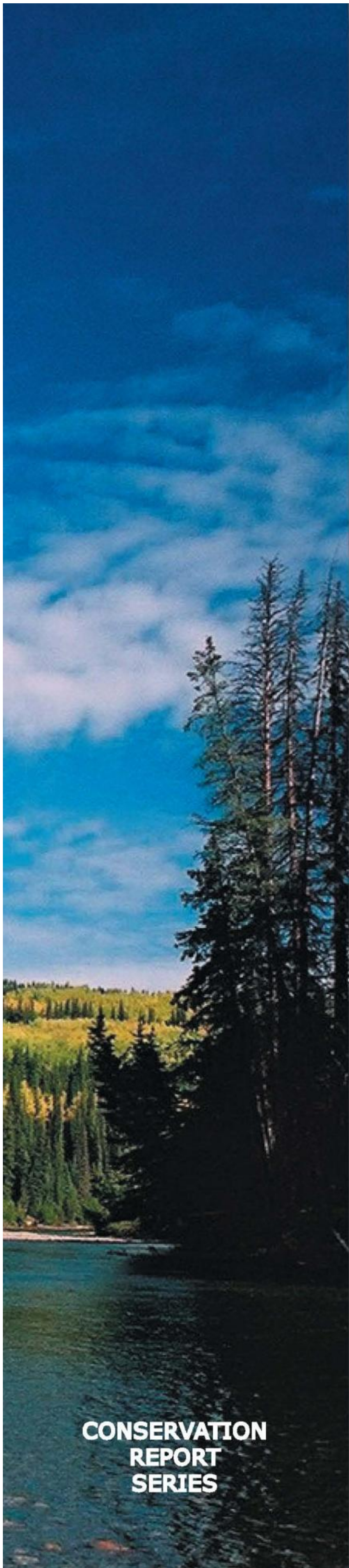

Delegated Aerial Ungulate Surveys 2010/2011 Survey Season

Alberta Conservation Association

Conserving Alberta's Wild Side

The Alberta Conservation Association is a Delegated Administrative Organization under Alberta's Wildlife Act.

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Delegated Aerial Ungulate Surveys,
2010/2011 Survey Season

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EXECUTIVE SUMMARY

Alberta Conservation Association (ACA) uses levies on hunting and fishing licenses to collect and analyze population inventory data that can be used by Alberta Sustainable Resource Development (ASRD) in setting hunting and fishing seasons and regulations. Aerial ungulate surveys (AUS) are the primary method used to determine the population status and trends for ungulates in Alberta, and therefore are an integral component for setting hunting guidelines. Beginning in 2007, ACA became an active partner in delivering the AUS program, and now works collaboratively with ASRD to plan and conduct surveys and to summarize survey data. ASRD continues to set provincial priorities for survey locations and rotations, and uses these data in the management of ungulate populations. A portion of the overall survey plan is delegated to ACA for delivery (D-AUS) in collaboration with ASRD. During the 2010/2011 fiscal year, ACA funded and delivered 26[1] AUS across Alberta. These surveys included summer range trend surveys for pronghorn antelope (*Antilocapra americana*) and mountain goats (*Oreamnos americanus*), winter range trend surveys for bighorn sheep (*Ovis canadensis*), elk (*Cervus elaphus*) and bison (*Bison bison*), and random stratified block surveys for elk, moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*) and mule deer (*Odocoileus hemionus*). This document summarizes the methods used to conduct these surveys, as well as the survey results.

Key words: Alberta, aerial survey, ungulates, pronghorn antelope, mountain goats, bighorn sheep, bison, elk, moose, white-tailed deer, mule deer, population estimates.

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[1] All Antelope Management Areas (AMAs) are counted as individual surveys.

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The Alberta Conservation Association (ACA) – Alberta Sustainable Resource Development (ASRD) Wildlife Program Agreement clarifies that ACA is delegated the responsibility to deliver a significant portion of the aerial ungulate survey program in Alberta. Toward this end, ACA and ASRD work collaboratively to plan surveys, collect and analyze data, and complete written summaries for the surveys conducted. We thank the following ACA and ASRD staff and volunteers who were involved in the planning and delivery of surveys in 2010/2011:

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1.0 INTRODUCTION

Alberta Conservation Association (ACA) is a non-profit, non-governmental organization that has been designated as a Delegated Administrative Organization by Alberta Sustainable Resource Development (ASRD) to assist with the responsibilities of conserving Alberta's fish and wildlife resources. A component of this partnership is the use of hunting and fishing levies to collect and analyze inventory data to better understand population trends, composition and status, which can then be used by ASRD to set hunting and fishing regulations. Aerial ungulate surveys (AUS) are an important method for estimating population data that is used both to set hunting allocations, and to keep the general public, and hunters in particular, informed of population trends.

Prior to 2007, ACA's role in the AUS program was limited primarily to funding survey flights, while ASRD determined the species and areas to be surveyed, conducted the surveys, and analyzed data to estimate populations, trends and demographic parameters. In 2007, ACA became an active partner in the AUS program, and now works collaboratively with ASRD to plan and conduct surveys and to analyze and report on survey results. ASRD continues to set provincial priorities for survey locations and rotations, and uses these data to manage ungulate populations. A portion of the overall survey plan is delegated to ACA for delivery (D-AUS) in collaboration with ASRD.

ACA is committed to providing detailed annual reports that describe the outcome of these surveys. Annual reports condense and combine all delegated survey information into one document, streamlining access to ungulate population estimates for the general public, hunters, ASRD, and ACA staff. The following annual report summarizes the surveys conducted by ACA from 1 April 2010 to 31 March 2011.

During the 2010/2011 survey cycle, the Wildlife Management Branch of ASRD delegated 26 aerial ungulate surveys to ACA. Additional surveys were conducted by ASRD as part of their internal survey activities. In some cases, ACA staff participated in the delivery of these additional surveys. ACA conducted at least one survey for every harvestable ungulate within the province, including moose (*Alces alces*), elk (*Cervus elaphus*), white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), bighorn sheep (*Ovis canadensis*), mountain goats (*Oreamnos americanus*), pronghorn antelope (A*ntilocapra americana*), and bison (*Bison bison*). Details for each individual survey[2] are described in the following sections.

2.0 SELECTING SURVEY PRIORITIES

As the government agency responsible for managing ungulates within Alberta, ASRD sets the long-term AUS priorities for ungulates. In many cases, wildlife management units (WMUs) are surveyed on a three to five year rotational basis to enhance management decisions. Surveys may also be prioritized in order to assess the effectiveness of specific management actions, determine the effects of harsh winters, or in response to unique information requirements for a specific species or area of the province. ACA works collaboratively with ASRD to develop short-term (three year) plans for the implementation of surveys to ensure that they fall within budget constraints. In addition, because of the rarity of good survey conditions (complete snow cover coupled with low winds and high visibility) in some areas of the province, several condition-dependent surveys are identified each year that are given priority if weather conditions are favourable.

3.0 SURVEY METHODS

The techniques used to survey Alberta's ungulate herds vary across the province according to the habits and habitats of the species of interest, weather conditions that may affect animal movement or sightability, and the safety features of various aircraft. In general, three main approaches are used, each with its own advantages and limitations.

[2] Some related surveys have been grouped into a single report section to facilitate comparison (e.g., all antelope management area surveys are in Section 4.1).

3.1 Summer range trend surveys

For some species, including mountain goats and pronghorn antelope, the contrast between their coat colour and vegetation, coupled with the openness of their habitats, allows population surveys to be conducted during summer months. Summer surveys are ideal from a harvest management perspective because they allow the population status to be assessed immediately prior to the hunting season and inherently incorporate over-winter mortality, unlike traditional winter surveys. While useful for monitoring long-term changes in ungulate populations, summer range trend surveys do not necessarily allow the complete enumeration of population numbers, and therefore are most useful when compared to counts from previous years to estimate trend. However, trend surveys do not provide a measure of precision around the estimate and therefore do not enable a robust comparison of population estimates among years or regions.

Mountain goat summer ranges are intensively searched by rotary-winged aircraft (helicopter) during the cool parts of the day when goats are most active and visible. In addition to recording the total number of goats seen on each mountain range complex, surveyors enumerate the number of adults, yearlings, and kids, whenever possible.

Pronghorn antelope surveys are conducted by surveying 1-mi wide transects within long-term census blocks that have been established across pronghorn range. Counts of pronghorn observed in these blocks are extrapolated across the antelope management area (AMA) to estimate the total population within the AMA. In addition, classification by sex and age allows for estimation of buck/doe/kid ratios for each herd. In 2008, 2009, 2010, and 2011 ACA and ASRD staff tested a distance sampling survey approach for estimating pronghorn numbers (Webb et al. 2008; Grue and Morton 2011; unpublished ACA reports). In contrast to trend estimates, the distance sampling method provides a measure of precision which allows robust comparisons of population estimates among years and regions. Data from both trend surveys and distance sampling methods have been collected for the past three years.

3.2 Winter range trend surveys

For some species, including elk, bighorn sheep and bison, the presence of distinct winter ranges that are predictably occupied year-after-year provides the opportunity to conduct annual minimum population counts. These counts are used to estimate the population trend (increasing, decreasing or stable) and key demographic information, including male/female/young ratios and the per cent of males in various size categories. As with summer range surveys, winter range surveys are useful for monitoring long-term changes in ungulate populations, but inevitably do not provide a complete enumeration of the population, and therefore are most useful when compared to counts from previous years to estimate trend. Trend surveys also do not provide a measure of precision around the estimate and therefore do not enable a robust comparison of population estimates among years or regions.

Trend surveys are typically conducted by helicopter during ideal weather conditions, such as after a recent snowfall when winds are low. In some cases, fixed-wing aircraft may be used to locate groups of animals for subsequent counting by helicopter. The navigator directs the pilot to known traditional winter ranges, where the area is searched intensively to determine if animals or tracks are present. When animals are seen, the pilot maneuvers the aircraft so that surveyors can estimate a total count and enumerate the numbers of males, females and offspring. These classifications may not be possible for all species, especially during late winter when many male ungulates have dropped their antlers. On ranges with large herds, the survey team may take photographs to allow for more accurate counts.

3.3 Random stratified block surveys

When possible, ACA and ASRD strive to implement aerial survey approaches that provide statistically rigorous estimates of ungulate population numbers and densities within each WMU. In most cases, this is facilitated by using the 'Gasaway Method' (Gasaway et al. 1986) to design and implement counts in a random selection of survey blocks. This approach has widespread application for moose and deer in areas where the forest cover is sparse enough to allow good sightability. In addition to providing accurate population estimates, this approach often allows estimates of male/ female/young ratios, as well as the relative number of small, medium, and large-antlered males, if surveys are conducted prior to antler drop.

The Gasaway Method divides a WMU or group of adjacent WMUs into smaller survey blocks that are approximately equal in size, and then classifies each block into a stratum that describes the relative number of animals that are expected to be present within that block. Stratification can be based on counts from fixed-wing aircraft immediately prior to the intensive portion of the survey, previous knowledge of ungulate distribution within the WMU, or habitat features within each survey block. Following stratification, a portion of the blocks within each stratum are randomly selected for intensive searching via helicopter. During surveys, each block is thoroughly searched and surveyors classify each animal observed as an adult male, adult female or young, whenever possible. A series of calculations allow the number of animals observed in the survey blocks to be converted to a population estimate for the entire WMU, and the error associated with the estimate is determined. Additional blocks are surveyed until the error is deemed acceptable (typically error is below 20% for a 90% confidence interval).

3.4 Population recruitment surveys

Total population estimates are used in conjunction with estimates of reproduction and mortality to model how a population of ungulates may be changing throughout the year or during intervening periods between population surveys. These models can be used to track the population's rate of change, to identify appropriate harvest levels, or to predict how changes in harvest level might influence the overall population in the short and long-term. The D-AUS program contributes information to these modeling exercises by providing information on the number of offspring recruited into a population in a given year. These data may be collected by three general means. The first method involves intensively searching areas of known ungulate distribution and good sightability to find females. The number of offspring observed with these females is used to calculate a reproductive rate. The second method involves locating radio-collared females and recording the number of offspring observed with the associated group. This method provides more reliable data, but is less common as it is generally only associated with larger studies that have deployed radio collars for other purposes. The third method records the number of offspring observed during random stratified block or trend surveys. Although this method provides an efficient use of resources, it is usually only a secondary objective of the survey and may not provide an adequate level of data collection in all cases.

3.5 Classification by antler size

Beginning in the 2008/2009 survey cycle, ACA and ASRD survey crews across the province began using a standardized classification system for adult male ungulates (Table 1). This system allows comparisons among WMUs of the relative number of small, medium, and large-antlered ungulates of various species. However, because of variability in the timing of antler drop by age class across years, comparisons of the percentage of large, medium, and small males may not be possible for surveys that are conducted during mid to late winter.

Table 1. Standardized classification system used to determine antler size class of male ungulates in Alberta.

Size Class	Moose	Deer	Elk
Small	Antler pole type, usually a spike or fork; if palmated, does not extend beyond ear tip.	Spike or 2 points on one or both antlers.	Spike antlers or with light 1 to 2 point antlers.
Medium	Antlers palmated, with spread < ½ of body length.	Small to medium size antlers with 3 or more points/antler; antlers inside ears.	Small antlers with 3 to 5 points/antler.
Large	Antlers palmated, with spread > ½ of body length.	Large antlers with 4 or more points/antler; antlers outside of ears.	Large antlers with 6 to 7 points/antler, massive.

4.0 SUMMER RANGE TREND SURVEYS

4.1 Pronghorn antelope

Section Authors: Mike Grue, Kim Morton, and Andrew Somerville

Aerial surveys for pronghorn antelope are conducted annually to provide information on population density, distribution and composition within a series of long-term trend survey blocks. This information is used by ASRD to extrapolate an estimate of population size for each antelope management area (AMA), which in turn influences harvest objectives for the upcoming fall hunting seasons. In Alberta, recreational hunting opportunities for pronghorn antelope are highly sought after, making the information collected during the annual aerial survey an important component of the decision process. This summary describes data collected during the 2010 survey conducted in AMAs A to H, and CFB Suffield (Area S) (Figure 1).

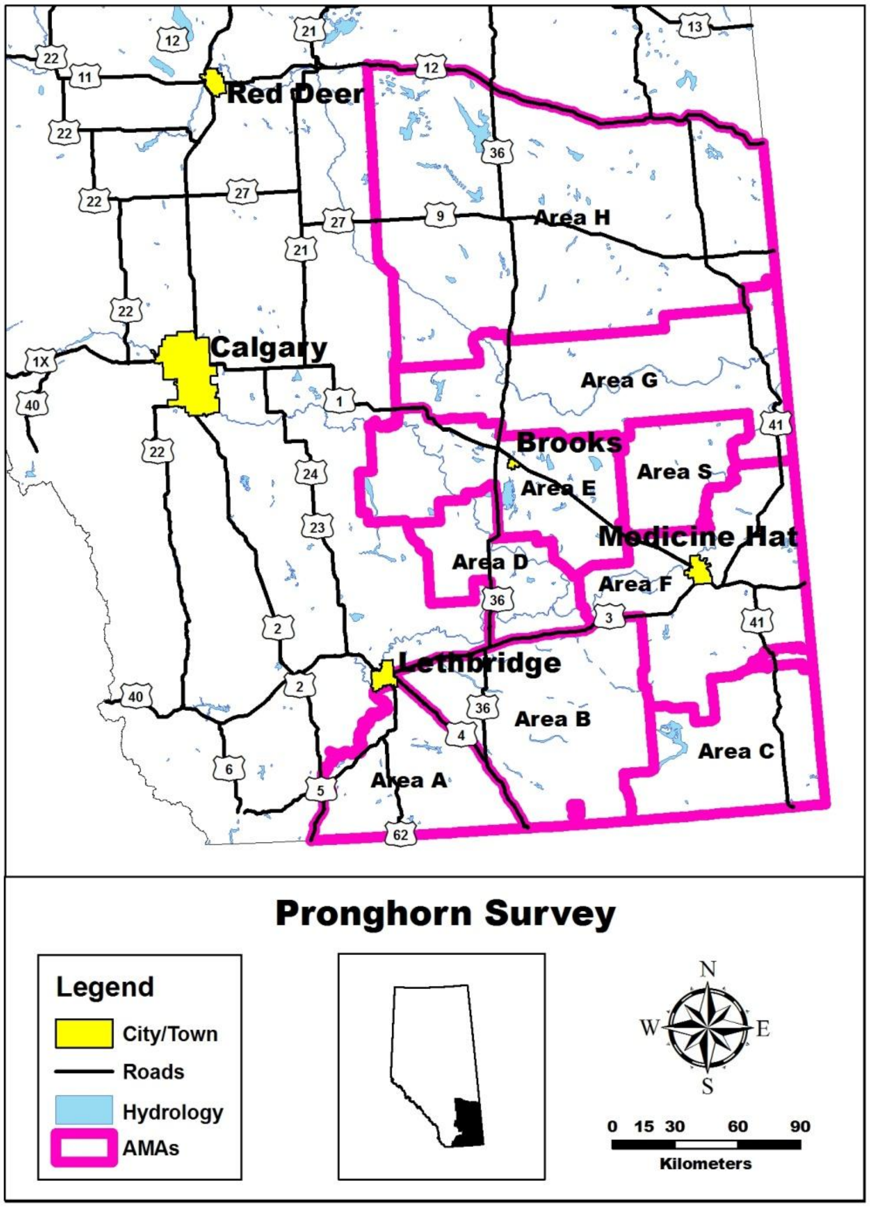

Figure 1. Location of pronghorn antelope management areas (AMA) in Alberta.

4.1.1 Survey methods

We conducted pronghorn antelope surveys from 13 - 21 July 2010 following our standard trend survey methods. Each AMA contains designated survey blocks with fixed strip transects, which we surveyed from rotary-winged aircraft. To reduce survey costs, we conducted non-stop, 3 hour flights with the support of strategic fuel cache locations. We divided each survey day into two periods, with the first flight commencing at approximately 0800 h and the second flight beginning toward evening, after the heat of the day. The survey crew consisted of the pilot, navigator, and two rear seat observers in a Bell 206L helicopter. Primary observers maintained constant observation of the ground out to a distance of 0.8 km perpendicular to the flight line on each side of the aircraft. The navigator kept the aircraft on course, recorded observations, and assisted with ground observation and herd classification, whenever possible. Observers counted all pronghorn seen on the transect, and classified the number of bucks, does and kids, whenever possible. Counts also include individuals seen while off the center of the flight line but still within the 1.6 km strip width. This likely biased our result by placing more effort in areas with higher pronghorn density. The GPS location of all observed individuals and groups was recorded.

4.1.2 Observed pronghorn density

We calculated a minimum estimate of pronghorn density (# animals/km^2) for the survey blocks in each AMA by dividing the number of animals observed by the total area (km^2) of the strip transects that were flown. We did not correct for sightability; therefore, overall counts should be considered as minimum estimates. We are testing a distance sampling approach for surveying pronghorn that incorporates a sightability correction (Webb et al. 2008; Grue and Morton 2011; unpublished ACA reports), and allows for robust statistical comparisons of population density among years and regions. Until this preliminary work is completed and incorporated into a revised survey format, overall counts will continue to be considered as minimum estimates that are extrapolated across pronghorn habitat to calculate a population estimate. Direct comparison of trend survey results among years should be interpreted as an indication of a trend rather than a robust comparison of the actual population number.

4.1.3 *Results*

During the 2010 survey, we counted 992 bucks, 2,033 does and 475 kids. Observed pronghorn density (pronghorn/km^2), buck to doe ratios and kid to doe ratios, calculated by AMA, are presented in Table 2.

Table 2. Comparison of pronghorn antelope survey results from 2007 - 2010.

	Antelope Management Area								
	A	B	C	D	E	F	G	H	S
2010 Survey									
Observed pronghorn density (pronghorn/km^2)	0.39	0.54	0.68	0.36	0.63	0.42	0.43	0.19	1.12
Bucks/100 Does	47	45	48	45	48	53	50	43	54
Kids/100 Does	20	33	15	17	12	26	29	37	20
2009 Survey									
Observed pronghorn density (pronghorn/km^2)	0.63	0.39	0.93	0.62	0.89	0.50	0.44	0.27	0.95
Bucks/100 Does	38	66	43	60	39	35	62	35	66
Kids/100 Does	39	58	22	42	42	35	34	29	47
2008 Survey									
Observed pronghorn density (pronghorn/km^2)	0.50	0.43	0.98	0.95	0.90	0.38	0.50	0.25	--
Bucks/100 Does	40	47	59	44	50	32	52	65	--
Kids/100 Does	21	42	28	30	27	43	47	31	--
2007 Survey									
Observed pronghorn density (pronghorn/km^2)	0.48	0.44	0.96	0.93	0.65	0.53	0.37	0.19	--
Bucks/100 Does	24	46	42	24	48	30	45	68	--
Kids/100 Does	30	67	30	52	37	37	50	39	--

4.2 Wildlife Management Unit 402 mountain goats

Section Authors: Mike Jokinen and Greg Hale

Counts to estimate the trends for mountain goat populations in WMU 402 have been sporadically carried out since the late 1960s, and in some cases done in conjunction with surveys for bighorn sheep. The most recent mountain goat counts include surveys in 1994, 1997, 2006, and 2009. Many mountain complexes in WMU 402 overlap the boundary of Alberta and British Columbia, and as a result contain a trans-boundary population which is best assessed by surveying on both sides of the continental divide. In the previous two surveys of this WMU (2006 and 2009) an area from Tecumseh Mountain following the Continental Divide north to Mt. O'Rourke, at the headwaters of the Oldman River, including Crowsnest Mountain and the Livingstone Range (Figure 2), were surveyed. In 2010, this area was again surveyed, with the exception of the British Columbia side of Mt. Ward, as well as the entire Livingstone Range, due to poor weather conditions.

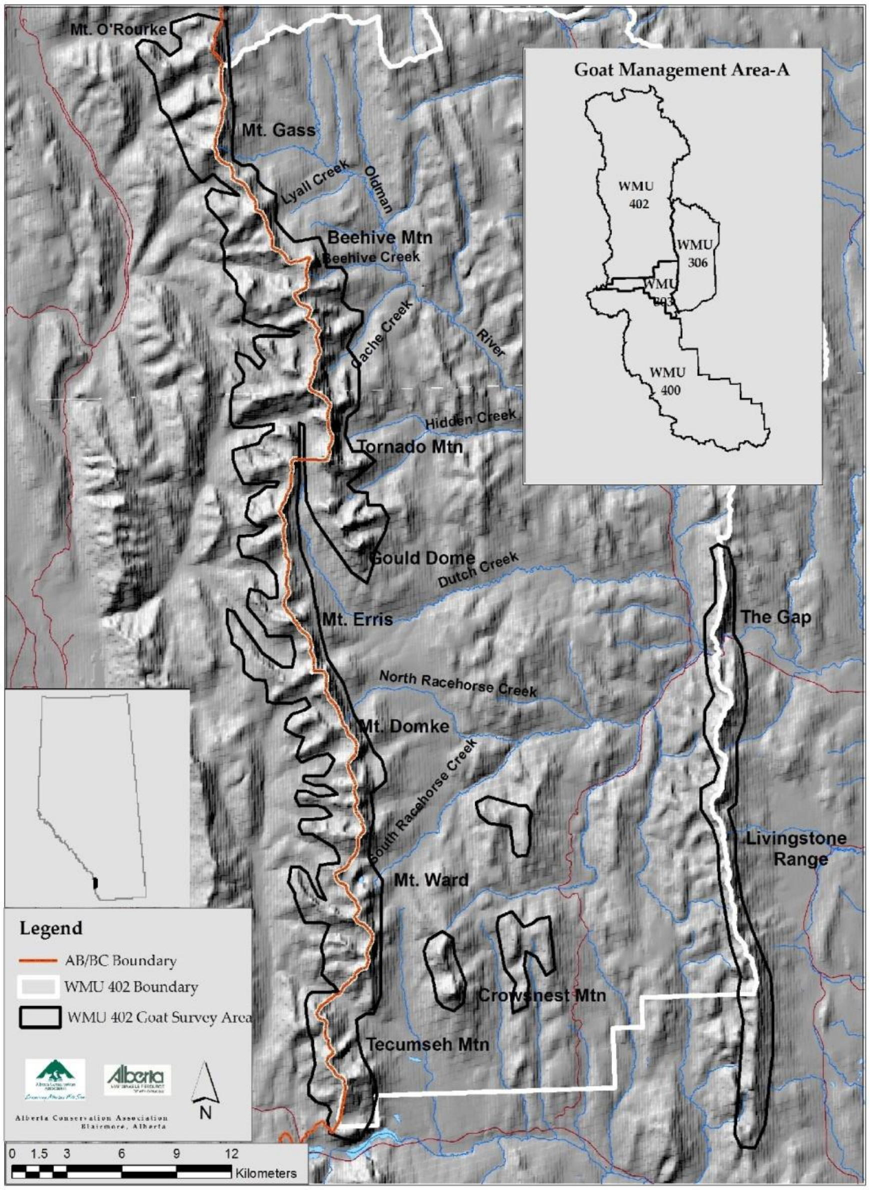

Figure 2. Location of the Wildlife Management Unit 402 mountain goat survey area in Alberta and British Columbia.

The 2010 survey provides count data that may be used to refine Goat Population Areas within Goat Management Area A of WMU 402. Currently there is no established Goat Hunting Area or hunting season for mountain goats in WMU 402. Our survey objectives were to obtain a minimum count of goats to determine population status and trend, classify goats by age to assess herd structure and recruitment, and to map sightings that describe regional distribution. Additionally, these data will be compared to the ASRD goat management plan to assess the viability of a mountain goat harvest in this WMU in the future.

4.2.1 Survey methods

We searched mountain complexes in WMU 402 (Figure 2) over an extended period in July, with the initial day of surveys occurring on 14 July 2010. The remainder of the survey was completed on 26, 28, and 29 July 2010 following nearly two weeks of poor weather. All surveys occurred during the morning hours to take advantage of peak animal activity, using a Bell 206B helicopter flown at air speeds ranging from 80 to 100 km/h. In some instances, coverage of the goat range was accomplished by conducting a single flight above timberline, but a large portion of the survey area required a second flight line at a higher elevation to provide more complete coverage of mountain faces, particularly in high goat density areas.

The left front passenger (navigator) maintained the proper flight course and assisted with classification of goats to age categories. Two observers occupying the rear seat provided continuous side observation, with the right passenger recording wildlife numbers and GPS locations. We classified all goats observed into standard age categories of adult, yearling or kid. We did not correct for sightability; therefore, overall counts should be considered as minimum estimates. These counts do not have estimates of precision, and therefore direct comparisons of survey results among years or regions is difficult.

Weather conditions during the month of July were repeatedly unstable and unpredictable, and we were unable to complete the full survey. However, we were able to work within limited windows when weather conditions were acceptable. During the survey days, average temperatures were 11 degrees Celsius, cloud cover ranged from 0 - 75% and wind speeds averaged 21 km/h.

4.2.2 *Results*

We observed 148 mountain goats during the 2010 survey, including 120 adults, 15 kids, 13 yearlings, and 0 unclassified goats (Table 3). Classification of age classes resulted in reproduction and recruitment rates of 13 kids/100 adults and 11 yearlings/100 adults.

The 2010 survey count of 148 goats was 20% lower than the 2009 survey (Table 4); however, the 2010 survey does not include the Livingstone Range which typically contains approximately 12 goats. The 2010 reproduction estimate of 13 kids/100 adults was down from 2009 when 37 kids/100 adults were observed. The number of yearlings per adult (11 yearlings/100 adults) was also lower than in 2009 (19 yearlings/100 adults), but similar to 2006 (9 yearlings/100 adults). The weather in June 2010 was cooler and wetter than in 2006 and 2009, possibly influencing the number of surviving kids.

Table 3. Mountain goat population trend counts within each mountain complex of Wildlife Management Unit 402 in 2010.

Complex	Adult	Yearling	Kid	Total
Crowsnest	45	4	9	58
Divide - AB	31	4	3	38
Divide - BC	44	5	3	52
Livingstone[a]	--	--	--	--
Total	**120**	**13**	**15**	**148**

[a] Livingstone Range was not surveyed due to continual high winds.

Table 4. Total mountain goat population trend counts for all mountain complexes surveyed in Wildlife Management Unit 402 from 2006 - 2010.

	Number of mountain goats			
Year	Adults	Yearling	Kid	Total
2010[a]	120	13	15	148
2009	119	23	44	186
2006	98	9	35	142

[a] All four mountain complexes were not surveyed in 2010, so combined trend counts are not comparable.

4.3 Wildlife Management Units 439 - 446 mountain goats

Section authors: Jeff Kneteman, Shevenell Webb, and Mike Ranger

Extensive annual surveys for mountain goats have been conducted in Willmore Wilderness Park and adjacent areas since 1974. With permission from the Superintendent of Jasper National Park, the survey area was expanded (beginning in 1979) to include mountain complexes straddling the Jasper Park boundary. The objectives of annual goat surveys in WMUs 439 - 446 (Figure 3) are to collect data on population trends, distribution, and herd composition, and to monitor the status of these mountain goat herds.

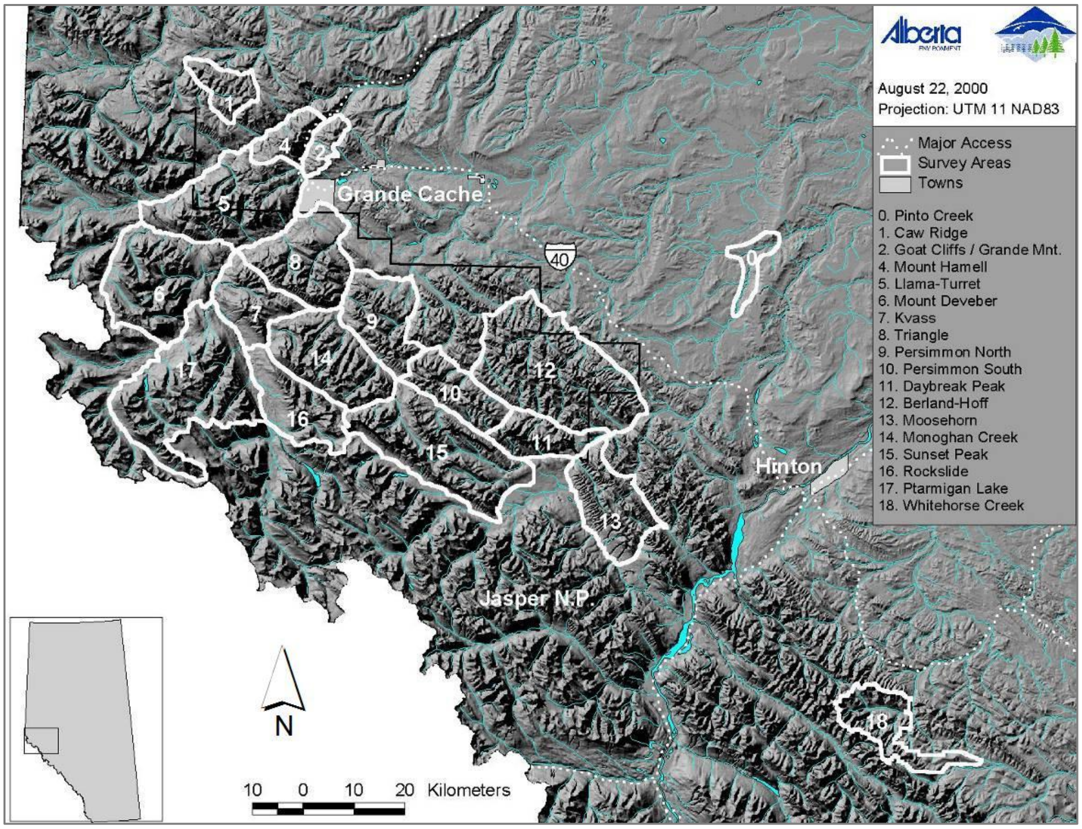

Figure 3. Location of the Wildlife Management Units 439 - 446 mountain goat survey area in Alberta.

4.3.1 Survey methods

The survey area is comprised of seventeen mountain complexes and one canyon complex in the forested foothills of WMUs 439 - 446 (Figure 3). We surveyed 11 complexes from 8 - 11, and 14 July 2010 using a Bell 206B helicopter flown counter-clockwise around each mountain complex between timberline and ridge top. Air speed ranged from 120 - 150 km/h. The left front passenger navigated, observed and plotted checkpoints on a 1:250,000 scale topographic map. GPS locations were recorded for each group of goats. The two rear passengers observed and recorded species classifications and counts onto field data sheets. When herd size and/or location made classification difficult for observers or dangerous for mountain goats, the helicopter landed at a distance of approximately 0.8 km and we classified goats using a 20 - 45X variable spotting scope. Flights typically occurred between 0600 - 1100 h and 1600 - 2200 h during the goats' most active periods. Exact survey flight paths vary from year to year; thus, comparison of overall counts between years is cautioned and should only be considered as a long term trend. We did not correct for sightability; therefore, overall counts should be considered as minimum estimates. These counts do not have estimates of precision, and therefore direct comparisons of survey results among years or regions is difficult.

4.3.2 Results

In 2010, we observed a total of 471 goats (381 adults, 31 yearlings, 59 kids, and 0 unclassified) with ratios of 15 kids/100 adults and 8 yearlings/100 adults (Table 5). Kid to adult ratios were less than the average and yearling to adult ratios were above average, for the six mountain complexes surveyed most frequently between 1979 and 2010 (Table 6).

Total counts of goats on individual complexes in 2010 exceeded long-term averages on 1 of 11 complexes surveyed (Caw Ridge); were less than long term averages on 6 complexes (Daybreak, Kvass, Monaghan, Moosehorn, Mt. Hamel and Rockslide); and approximated the long-term average on 4 complexes (Deveber, Goat Cliffs, Llama-Turret and North Persimmon).

In 2010, four complexes (Daybreak, Deveber, Goat Cliffs and Moosehorn) exceeded total goats counted in 2009, while total goat counts were less than the 2009 survey on five complexes (Caw Ridge, Llama-Turret, Mt. Hamel, North Persimmon and Rockslide), and approximated the 2009 survey on one complex (Kvass).

Table 5. Mountain goat population counts within each mountain complex of Wildlife Management Units 439 - 446 in 2010.

Complex	Adult	Yearling	Kid	Unclassified	Total
Caw Ridge	85	3	4	0	92
Daybreak	17	1	3	0	21
Deveber	44	3	14	0	61
Goat Cliffs	42	2	3	0	47
Kvass	5	0	0	0	5
Llama-Turret	66	8	9	0	83
Monaghan	22	2	7	0	31
Moosehorn	5	3	3	0	11
Mt. Hamel	45	1	3	0	49
North Persimmon	36	3	9	0	48
Rockslide	14	5	4	0	23
Total	**381**	**31**	**59**	**0**	**471**

Table 6. Total mountain goat population counts for six mountain complexes (Caw Ridge, Daybreak, Goat Cliffs, Llama-Turret, Moosehorn and Mt. Hamel) flown on a consistent basis in Wildlife Management Units 439 - 446 from 1979 - 2010.

	Number of mountain goats				
Year	Adults	Yearling	Kid	Unclassified	Total
Jul. 2010	260	18	25	0	303
Jul. 2009	192	13	36	81	322
Jul. 2008	221	11	51	0	283
Jul. 2007	236	21	40	9	306
Jul. 2005	269	31	63	5	368
Jul. 2004	299	17	63	5	384
Jul. 2002	302	15	75	9	401
Jul. 2001	223	20	70	43	356
Jul. 1999	230	27	79	34	362
Jul. 1998	245	21	79	11	375
Jul. 1997	227	14	56	8	305
Jul. 1996	260	32	75	0	367
Jul. 1995	248	26	76	0	350
Jul. 1994	205	19	76	0	300
Jul. 1993	214	11	66	10	301
Jul. 1990	194	20	67	40	321
Jul. 1989	160	31	64	0	255
Jul. 1986	219	19	45	3	286
Jul. 1984	214	25	75	0	314
Jul. 1983	245	38	80	12	375
Jul. 1980	160	28	66	0	254
Jul. 1979	219	72	91	3	385

5.0 WINTER RANGE TREND SURVEYS

5.1 Hay-Zama bison

Section Author: Ryan Hermanutz and Lyle Fullerton

The Hay-Zama wood bison population was established in 1983 and has been reported on in three previous survey reports (Morton 2003; Moyles 2007, 2008). In 2008, a seven month hunting season was initiated for bison in the Hay-Zama complex from 1 September 2008 to 31 March 2009. Hunting continued in the area in the 2009/2010 and 2010/2011 hunting seasons. The objectives of the introduction of a hunting season was to reduce bison numbers and their range, due to growing concerns over disease transmission among herds, with bison moving west from Wood Buffalo National Park. There has also been concern for public safety with conflicts in communities and risks associated with road collisions in the region. We monitored the Hay-Zama bison population in March 2011 using aerial surveys.

5.1.1 Study area

The Hay-Zama wood bison herd established itself in the area west of High Level, east of Rainbow Lake and north to Zama City (Moyles 2008). The limits of this distribution are roughly North 58 degrees 30 minutes in the south, North 59 degrees 30 minutes in the north, West 117 degrees 30 minutes to the east, and West 119 degrees 30 minutes to the west (Figure 4). The herd distribution has changed in recent years, expanding to the south along Highway 58 and easterly along the Zama Highway. Expansion to these northerly and westerly areas appears to be seasonal, occurring during the summer. Six townships (Township 112, 113 and 114, Range 2 and 3) have been established as a "No Hunting Area" to provide a refuge of important winter habitat for the bison.

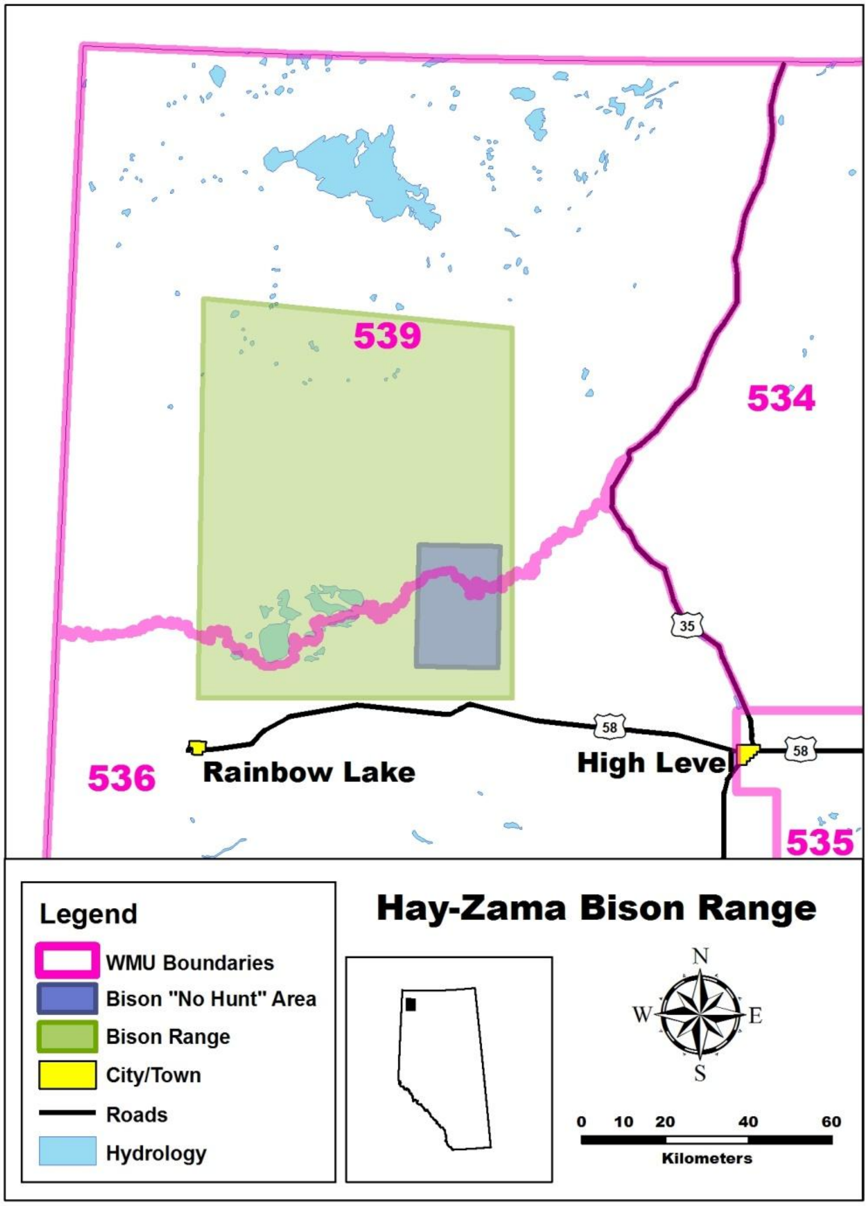

Figure 4. Location of the Hay-Zama bison herd range in Alberta.

5.1.2 Survey methods

From 15 - 17 March 2011, a two-person crew in a Cessna 206 airplane performed pre-flight surveys for bison in the Hay-Zama area. The pre-flight surveys consisted of transect lines flown in an east/west direction along lines of latitude spaced 1 minute apart, covering an area of approximately 6,900 km^2. Included in this area were flight lines not previously flown, north of the preferred bison range, to investigate a reported bison sighting. Bison sightings and areas of bison tracks were recorded, and a GPS waypoint was taken using a handheld unit. Although the light was flat, overall weather and sightability conditions were acceptable for the pre-flight surveys, with fresh snow having fallen on 14 March.

On 19 - 20 March 2011, the same two-person crew flew intensive surveys in a Bell 206B helicopter to locate and count the bison observed during the pre-flight surveys. All observed bison were counted and calves/adults delineated. Photos were taken of herds to confirm the number of calves, which were identified by their smaller body size and absence of horns. Yearlings were included in the adult age class because of the difficulty in distinguishing between these two age categories in an aerial survey. We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

In general, survey conditions were excellent. Fresh snow covered much of the survey area and winds were light, ranging from 0 - 20 km/h. Skies were 80 - 100% overcast on 15 - 17 March and then mainly clear for the remainder of the survey. Temperatures ranged from -17 to -10 degrees Celsius.

5.1.3 Results

A total of 561 bison (500 adults and 61 calves) were found at 31 sites throughout the area surveyed (Table 7). A significant number of bison were located within the Hay-Zama Wildland Provincial Park. A total of 11 bison were located in the Shekilie Oilfield area (Township 116 Range 6 and Township 118 Range 8). North of Zama City (Township 119 Range 3), a total of 3 bison were located and one herd of 26 bison was located within 5 km of the Zama Highway (Township 117 Range 3). The remaining bison were observed in traditional wintering areas throughout their range. No bison were located near Highway 58 in the southern portion of their former range.

Table 7. Comparison of aerial survey results for bison in the Hay-Zama area from 1994 - 2011.

Year	# of Groups	Number of bison			% Calves[b]
		Adults[a]	Calves	Total	
Mar. 2011	31	500	61	561	11
Mar. 2010	39	452	75	527	14
Feb. 2009	59	547	50	597	8
Mar. 2008	63	593	59	652	9
Mar. 2007	41	499	66	565	12
Feb. 2006	41	499	23[c]	522	4
Mar. 2005	33	365	59	424	14
Mar. 2004	30	267	53	320	17
Feb. 2003	23	236	26	262	10
Feb. 2002	21	200	33	233	14
Mar. 2001	12	158	27	185	15
Mar. 2000	12	132	21	153	14
Mar. 1999	14	81	16	97	17
Feb. 1998	12	106	6[d]	112	5
Mar. 1997	7	75	14	89	16
Mar. 1996	7	61	15	76	20
Nov. 1995	4	62	12	74	16
Mar. 1995	4	48	15	63	24
Dec. 1994	3	41	17	58	29

[a] Adults includes yearlings.
[b] % Calves = calves/total population x 100.
[c] This is a minimum count due to difficulties in distinguishing calves from yearlings.
[d] This is a minimum count.

5.2 Wildlife Management Unit 212 elk

Section Authors: Pat Young and Mike Jokinen

The elk population in WMU 212 has been increasing over the past two decades as determined by aerial surveys, incidental reports, field counts, and anecdotal landowner observations. This WMU was restricted to archery hunting; however, rifle hunts have been introduced recently in an attempt to reduce the elk population to comply with the social carrying capacity of local landowners. An aerial survey of elk in WMU 212 was conducted in January 1996, just prior to an antlerless elk rifle quota hunt. At 560 elk, counts exceeded desired levels, thus additional measures were taken to reduce the elk population through live trapping and relocation, which was deemed the preferred method for population management by the local community. In January 2002 another aerial survey was implemented, following several winters of successful elk relocations, which revealed a reduction in the elk count to 391. While the trapping program was successful in the first five years (422 elk relocated), more recently trapping success had been poor and consequently the elk population had again increased.

A third aerial survey was conducted in January 2008, following a second antlerless elk rifle quota hunt held in December 2007. The elk count then totaled 913. In December 2008 a primitive weapons antlerless elk hunt was held and another aerial survey was completed in February 2009. The number of elk observed totaled 914. This represented a 234% increase in the elk count since the 2002 survey. Following the 2009 survey, 169 elk were captured and relocated to an area west of Rocky Mountain House. This successful trapping effort together with an ongoing annual primitive weapon hunt have reduced the population; however, it may be necessary to continue reducing elk numbers in this WMU through a combination of trapping, quota hunts, special license draws, and other methods in order to meet the social carrying capacity.

The results of the 2011 WMU 212 aerial survey will be used by ASRD to determine hunter permit allocations, translocation goals and other potential management options for elk population control.

5.2.1 Study area

Elk range in WMU 212 is limited to an area southwest of the City of Calgary (Figure 5). Occasional movements of elk from adjacent WMUs into the area, or movements of elk into normally unoccupied range may occur, but the majority of wintering elk are located within an area south of Highway 22X and west of secondary Highway 552 towards the WMU western boundary. This area consists of considerable tree cover interspersed amongst farmland, rangeland, acreages and subdivision developments. All areas offering suitable cover were surveyed, however the area is populated with many acreages and landowners that have horses, and it was necessary to avoid these areas. Most of the elk tend to be in large groups during the winter months, and are thus readily observed. There are smaller groups of bulls that often split off from the main herds and disperse into more isolated locations. However, it is expected that most of these smaller groups of bull were observed during this survey as all suitable forested cover was surveyed.

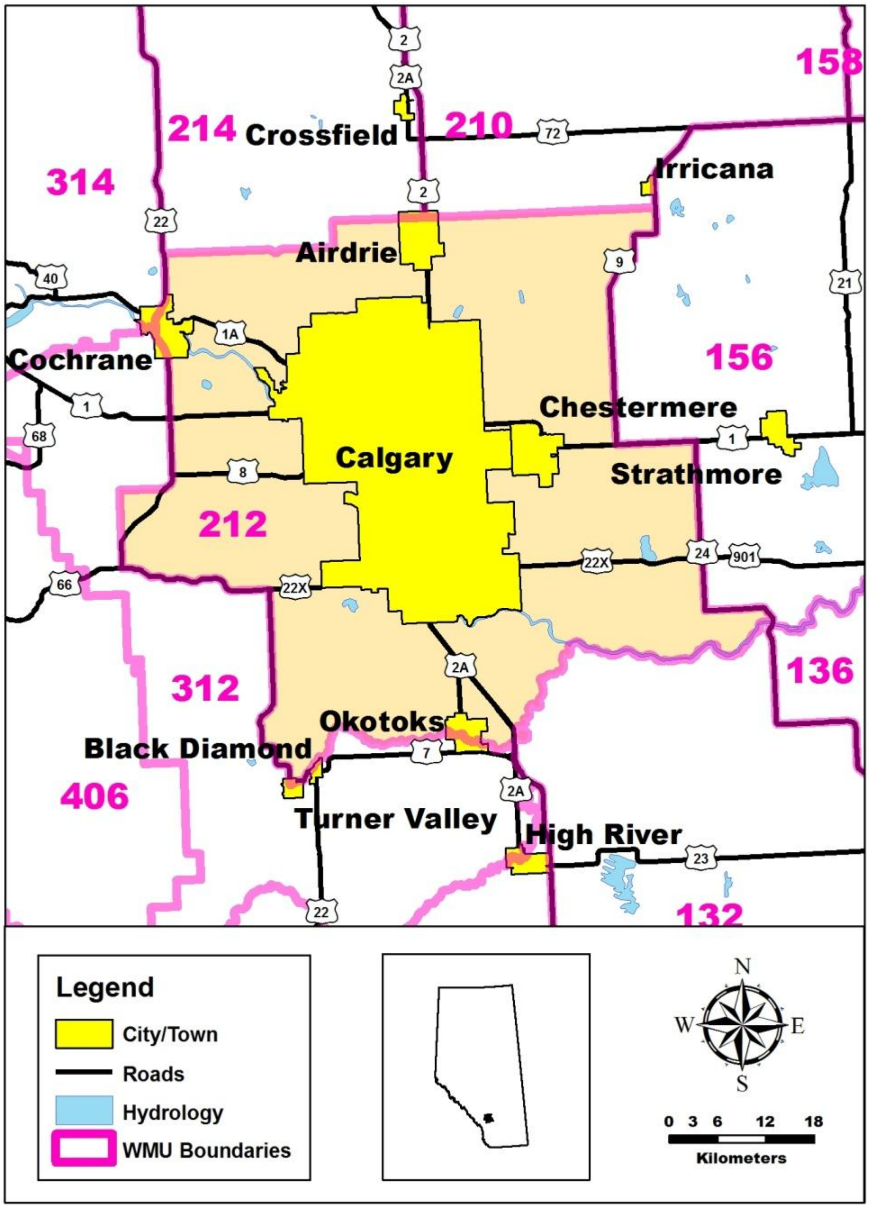

Figure 5. Location of Wildlife Management Unit 212 in Alberta.

5.2.2 Survey methods

The aerial survey was conducted on 3 February 2011 using a Bell 206B helicopter. The crew was based out of the Ann and Sandy Cross Conservation Area (ASCCA) with refueling taking place at the Elbow Ranger Station. The survey proceeded to the west, south, and east of the base on the ASCCA, with transects flown in an appropriate orientation to ensure complete coverage of the area. The crew was comprised of one navigator in the front seat of the helicopter, who ensured that all suitable elk range was covered, and two observers in the back seat on each side of the helicopter. The observers took photos, tallied large groups of elk and took GPS locations for each of the groups encountered. When a large group of elk was observed, a total count was estimated by breaking the group into smaller sub-groups by terrain, landscape changes, or natural divisions within the herd. These smaller groups were then tallied as the pilot circled at an elevation high enough to avoid disturbing the elk. Elk were classified into cows, calves and bulls where possible. The bulls were further classified as small, medium or large, based on antler size (ASRD 2010). Some of the larger groups were tallied as unclassified if they were not clearly visible or were too large to accurately assess.

Survey conditions were very good with overcast but bright skies, which provided excellent visibility through the forested areas. Temperatures ranged from +4 to +6 degrees Celsius. Winds were low to moderate during the survey with the highest wind speeds estimated at about 15 km/h. We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

5.2.3 *Results*

Elk observations were recorded at 20 sites, during the 2011 survey, ranging from a single cow to a large group of 179 individuals. The elk were generally in smaller groups than observed during the 2008 survey, and were more widely dispersed throughout the survey area. The total number of elk observed during the 2011 survey was 710 (Table 8). This represents an approximate 182% increase in the elk count since the 2002 survey (391 elk counted), but a 22% reduction in the count when compared with the 2009 survey.

Table 8. Total elk population counts in Wildlife Management Unit 212 from 1996 - 2011.

	Number of elk				
Year	Males	Females	Juveniles	Unclassified	Total
2011	36	413	60	201	710
2009	66	17	2	829	914
2008	37	355	81	440	913
2002	32	--	--	359	391
1996	94	--	--	466	560

"--" All antlerless elk were recorded as unclassified.

5.3 Wildlife Management Units 344, 437 - 446 elk

Section Authors: Andy Murphy and Jeff Kneteman

Aerial trend counts allow biologists to estimate population trends, sex ratios and recruitment rates. Large portions of remote traditional wintering ranges can be surveyed during a period when elk are concentrated and snow conditions make them relatively easy to observe. The last survey of this elk wintering range occurred in 2009. Data from the 2011 winter trend survey will be used to calculate the allowable harvest for the hunting season and to assess whether current methods of management are sufficient to sustain elk populations.

5.3.1 Study area

The WMUs 344, 437 - 446 survey area is located northeast of Jasper National Park and includes all or parts of these 11 WMUs, along with Willmore Wilderness Park (Figure 6). Most of the study area falls within the Rocky Mountain Natural Region, with the eastern edge of the study area in the Foothills Natural Region (Natural Regions Committee 2006). Most of the traditional wintering range surveyed is adjacent to the Smoky, Berland, Wildhay, Athabasca and McLeod rivers. The Willmore Wilderness Park is largely undisturbed wilderness. Forestry cut blocks and linear disturbances are common outside of the park, and there are both active and reclaimed mines near Grande Cache and Cadomin. Agricultural land and "Fire Smart Areas" are rare, and are concentrated in the vicinity of Hinton and Cadomin.

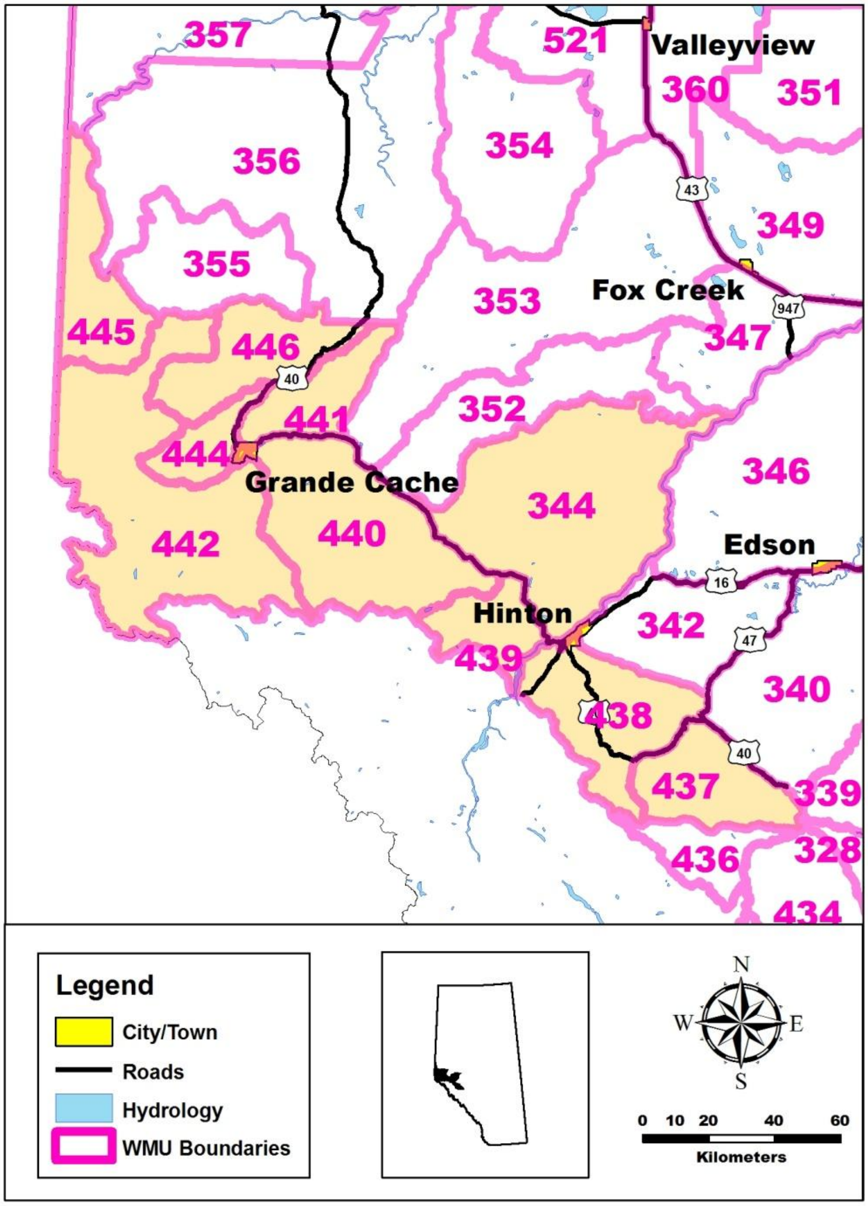

Figure 6. Location of Wildlife Management Units 344, 437 - 446 in Alberta.

5.3.2 Survey methods

The aerial survey was conducted on 6, 8, 9, 24 February and 7 March 2011 using a Bell 206B helicopter. Transects were flown in appropriate orientations to ensure coverage of the traditional wintering range and other areas where elk had been recently reported or observed. Observations of elk made during concurrent days of bighorn sheep surveys were also used to direct our search effort. We flew at approximately 190 m above ground level at ground speeds of 100 - 130 km/h. The search grid was intensified when fresh elk tracks and/or craters were observed. The flight crew consisted of a pilot and navigator in the front seat and two observers in the rear seat. When elk were observed, a total count was made by one of the observers and a GPS location was recorded. The navigator classified the elk as cows, calves, bulls or unclassified. Bulls were further classified into small, medium, large or unclassified based on antler size.

Snow cover was excellent and winds were light throughout the survey period. Cloud cover varied from 0 to 100%. Visibility was excellent throughout the survey; however, shadows associated with clear sky conditions may have reduced elk sightability (Allen 2005). We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

5.3.3 Results

A total of 719 elk were observed in the 2011 aerial survey. Of this total, 283 were in the vicinity of Grande Cache, 37 were in the vicinity of the Berland and Wildhay rivers, and 399 were in the vicinity of Hinton and Cadomin (Table 9). An additional 365 elk were counted from a ground survey on the Cardinal River Coal (CRC) and Greg River Mine (GRM) leases by a mine contractor (Bighorn Wildlife Technologies). The combined counts result in a total of 1,084 elk. This is less than the total count from a similar survey in 2009 (n = 1,246); however, the 2009 survey recorded 74 elk at "Chases Flats", a site that was not surveyed in 2011. Additionally, the 2009 total was compiled from the highest counts recorded during multiple observations.

In 2008, only four sites in the Hinton - Cadomin vicinity were surveyed on a single day, resulting in a total of 290 observed elk. The comparable total from the same four sites

(Athabasca Ranch, Brule Pasture, Camp 1 and Hinton-Town) in 2011 was slightly higher at 315 elk.

The regional total of 1,084 from the 2011 survey was more than twice the number of elk counted by Smith and Edmonds in 1987 (n = 509).

There was a ratio of 13 bulls/100 cows observed throughout the entire survey area in 2011; however, this ratio varied substantially across the survey area (Table 9). The overall bull/cow ratio was substantially lower in 2011 than in 2009 (26 bulls/100 cows). However, the sightability of bulls can be substantially lower than the sightability of cows and calves (Allen 2005), so the 2011 ratio may simply reflect lower sightability of bulls during the 2011 survey.

The calf to cow ratio throughout the entire survey area was 31 calves/100 cows, and this ratio also varied across the survey area (Table 9). The overall calf/cow ratio in 2011 was identical to the 2009 survey, and was higher than the 1987 and 2008 ratios, which were 16 and 26 calves/100 cows, respectively.

The snow pack was deeper than average in 2011. This may have caused some elk to avoid traditional wintering sites, especially in the Berland - Wildhay vicinity. Elk sign was observed more frequently on this survey, than during other years, throughout exposed areas such as scattered high-ground cutblocks and windblown south facing slopes and knolls.

Table 9. Total elk population counts in Wildlife Management Units 344, 437 - 446 from 1987 - 2011.

Area/Year	Males	Females	Juveniles	Unclassified	Total Elk	Ratio to 100 Females	
						Males	Juveniles
Grande Cache							
2011	13	209	57	4	283	6	27
2009	24	172	25	29	250	14	15
2008	--	--	--	--	--	--	--
1987[a]	57	254	41	0	352	22	16
Berland - Wildhay							
2011	5	27	5	0	37[b]	19	19
2009	19	72	48	0	139	26	67
2008	--	--	--	--	--	--	--
1987[a]	1	13	2	0	16	8	15
Hinton - Cadomin							
2011	60	374	128	202	764[c]	16	34
2009	112	358	112	276	858	31	31
2008	18	216	56	0	290[d]	8	26
1987[a]	10	109	22	0	141[e]	10	20

[a] Smith and Edmonds, 1987

[b] Chases Flats was not surveyed.

[c] CRC and GRM coal mine leases were counted from the ground by Bighorn Wildlife Technologies (365 of the 764 elk).

[d] Only the Hinton vicinity (excluding Cadomin) was surveyed.

[e] The Hinton vicinity was not surveyed.

5.4 Wildlife Management Units 436 - 446 bighorn sheep

Section Author: Jeff Kneteman, Dave Hobson, and Corey Rasmussen

Aerial surveys for counts of bighorn sheep populations in the Eastern Slopes of Alberta have been conducted since the 1970s. Since 1978, surveys have focused on selected mountain complexes (traditional winter ranges) where concentrations of bighorn sheep have been observed. These mountain complexes are located within WMUs 437 - 440, 442, and 444 - 446 (Figure 7). The most recent complete survey of these complexes was conducted in the winter of 2008 (Hobson 2008). In 2009, five complexes with low productivity in 2008 were again surveyed, along with the winter range complexes in WMU 444. In 2011, a complete survey of all winter ranges took place, with the exception of complexes in WMU 445. Additionally, three new complexes were surveyed; one in WMU 436 and two in WMU 440. This report summarizes observations of bighorn sheep populations in the winter of 2011 with results being compared to previous surveys.

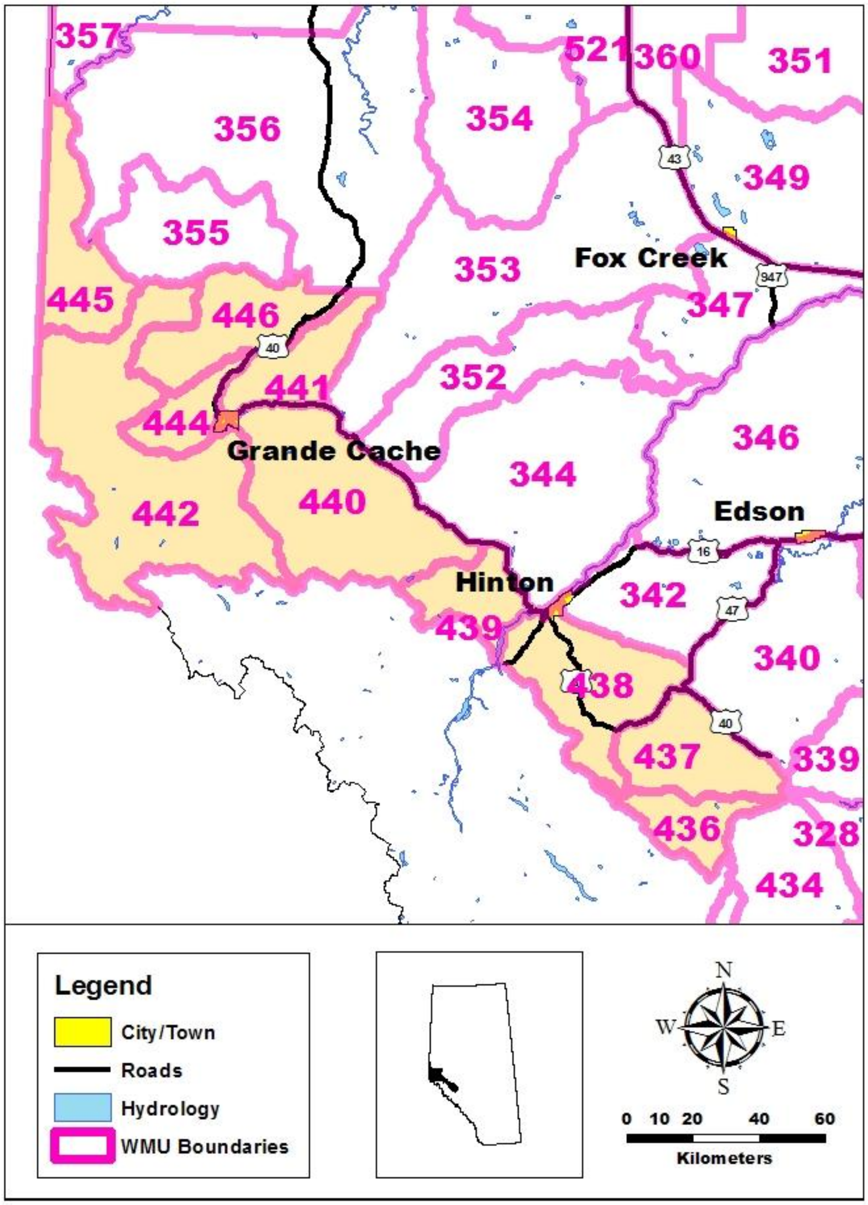

Figure 7. Location of the bighorn sheep survey area in Wildlife Management Units 436 - 446 in Alberta.

5.4.1 *Study area*

All selected mountain complexes within WMUs 437 - 446 were surveyed including: Folding Mountain, Hayden Ridge, Horn and Swift, Monoghan, Moon and Planet, Mount Stern, Mumm and Collie, North Berland, Redcap, Rocky Pass, SRC/Caw, Solomon Creek, Triangle and Whitehorse. With supplemental funding from ASRD, three new complexes were surveyed to assess additional areas of sheep wintering range; Deneor (WMU 440), North Persimmon (WMU 440), and Ruby-Thistle (WMU 436). A number of these mountain complexes have areas that lie within the boundaries of Willmore Wilderness Park and Jasper National Park. The study area is located within the alpine and subalpine natural subregions of Alberta (Natural Regions Committee 2006). The area is dominated by non-treed alpine landscapes, with alpine shrubs and grasses as the dominant vegetation.

5.4.2 *Survey methods*

Aerial surveys of the mountain complexes began on 19 and 21 January 2011, but were then postponed due to poor weather. Following the improvement of weather, surveys continued on 1, 6, 7, 8, 16, and 24 February 2011. Surveys were flown using a Bell 206B helicopter. Mountain contours were flown in a counter-clockwise direction at a height to ensure visibility of open slopes on all ridges. The four person crew consisted of a pilot, a navigator/observer, an observer and a recorder/observer. The navigator was responsible for classifying each group of sheep observed, while the observer provided a total count. The recorder/observer recorded all data and provided supplemental observations. The location of each animal or group of animals was taken with a GPS. All sheep were classified according to sex and age. Adult sheep were considered as greater than one year old. Rams were further classified according to horn-size categories: ¼ curl, ½ curl, ¾ curl, or legal ($^4/_5$ curl or greater) (ASRD 2010). Unclassified sheep were either rams (horn size could not be determined) or sheep that could not be identified based on either sex or age.

Conditions for the surveys were good with the majority of ridges snow covered. Temperatures ranged from -27 to -5 degrees Celsius. Winds were generally low, but it is worth noting that high winds were relatively common throughout the survey period and caused delays on many occasions. We believe that sheep in these areas do not commonly move among ranges during a specific winter. All of the traditional winter ranges were surveyed between 21 January and 8 February 2011, such that if any winter movements did occur, they would likely be nominal. We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

5.4.3 Results

A total of 1,864 bighorn sheep were counted during the aerial survey of WMUs 436 - 446 (Table 10, 11). The number of sheep observed in WMU 437 was very similar to the count obtained in 2009, approaching the maximum count of 200 sheep observed in this WMU over the past 10 surveys (Table 12). The WMU 438 count was well below the maximum count in 1994, but consistent in composition and abundance with the three previous surveys. WMU 439, which has had some significant variation among surveys, possibly due in part to its smaller population and the resulting large effect that missing one or two groups can have on the results, was found to have the largest count of the past 10 surveys. Survey results from WMUs 440, 442 and 444 suggest relatively stable populations since the late 1980s. WMUs 436 and 446 have only recently been added to the survey program, making it difficult to determine a population trend. Overall classification of rams by horn size for the entire survey area, was 129 ¼ curl, 111 ½ curl, 75 ¾ curl, 91 legal and 2 unclassified rams.

Table 10. Total counts and sex/age distribution of bighorn sheep in Wildlife Management Units 437 - 446 in 2011.

WMU	Rams	Ewes	Lambs	Unclassified	Total Sheep
437	62	80	43	0	185
438	96	134	75	11	316
439	16	30	7	1	54
440[a]	45	164	89	5	303
442	84	198	98	0	380
444	53	148	63	0	264
445[b]	--	--	--	--	--
446	52	120	22	1	195

Table does not include counts from Ruby-Thistle (WMU 436), see Table 11.

[a] Does not include counts from Deneor and North Persimmon, see Table 11.

[b] Not surveyed in 2011.

Table 11. Total counts and sex/age distribution of bighorn sheep in three mountain complexes not previously surveyed in Wildlife Management Units 436 and 440 in 2011.

Complex (WMU)	Rams	Ewes	Lambs	Unclassified	Total Sheep
Deneor (440)	21	21	18	0	60
North Persimmon (440)	3	11	6	0	20
Ruby-Thistle (436)	16	52	19	0	87

Table 12. Total counts of bighorn sheep in Wildlife Management Units 437 - 446 from 1988 - 2011.

	Total number of bighorn sheep by WMU							
Year	437	438	439	440[a]	442	444	445	446
2011	185	316	54	303	380	264	--	195
2009	178	297	--	--	153	297	123	192
2008	96	276	25	313	255	--	--	--
2002	150	330	37	286	481	296	--	--
1999	118	168	31	322	315	--	46	--
1998	132	--	--	--	--	--	--	--
1997	153	--	--	--	--	--	--	--
1996	158	331	43	338	--	--	--	--
1994	200	437	50	317	341	271	99	--
1988	185	316	54	303	380	264	--	195

Table does not include counts from Ruby-Thistle (WMU 436).

[a] Does not include counts from Deneor and North Persimmon.

"--" Not surveyed.

6.0 RANDOM STRATIFIED BLOCK SURVEYS

6.1 Wildlife Management Unit 102 mule deer

Section Author: Mike Grue and Andrew Somerville

Aerial surveys flown on a consistent basis provide information that is used to set hunting allocations, although budget constraints and lack of favourable weather have often delayed surveys in WMU 102. The last survey of this unit was in 2004. In 2010, weather related time constraints led to the decision to stratify WMU 102 only for mule deer population counts. These survey results will be used to estimate changes in population numbers and herd composition over time.

6.1.1 Study area

WMU 102 is located in the grasslands region of Alberta, in the extreme southeast corner of the province (Figure 8). A legal description of the WMU is found in Schedule 9, Part 1 of the Wildlife Act - Wildlife Regulation (Province of Alberta 1999). The Milk River bisects the southwest corner of the WMU, while Pakowki Lake occupies the northwest corner. The area is approximately 12 per cent cultivated land with the remaining 88 per cent consisting of a mix of native upland, riparian and wetland habitat (GVI 2009). Most of the mule deer habitat in the WMU is within the coulees and draws associated with the various drainage systems, including the Milk River.

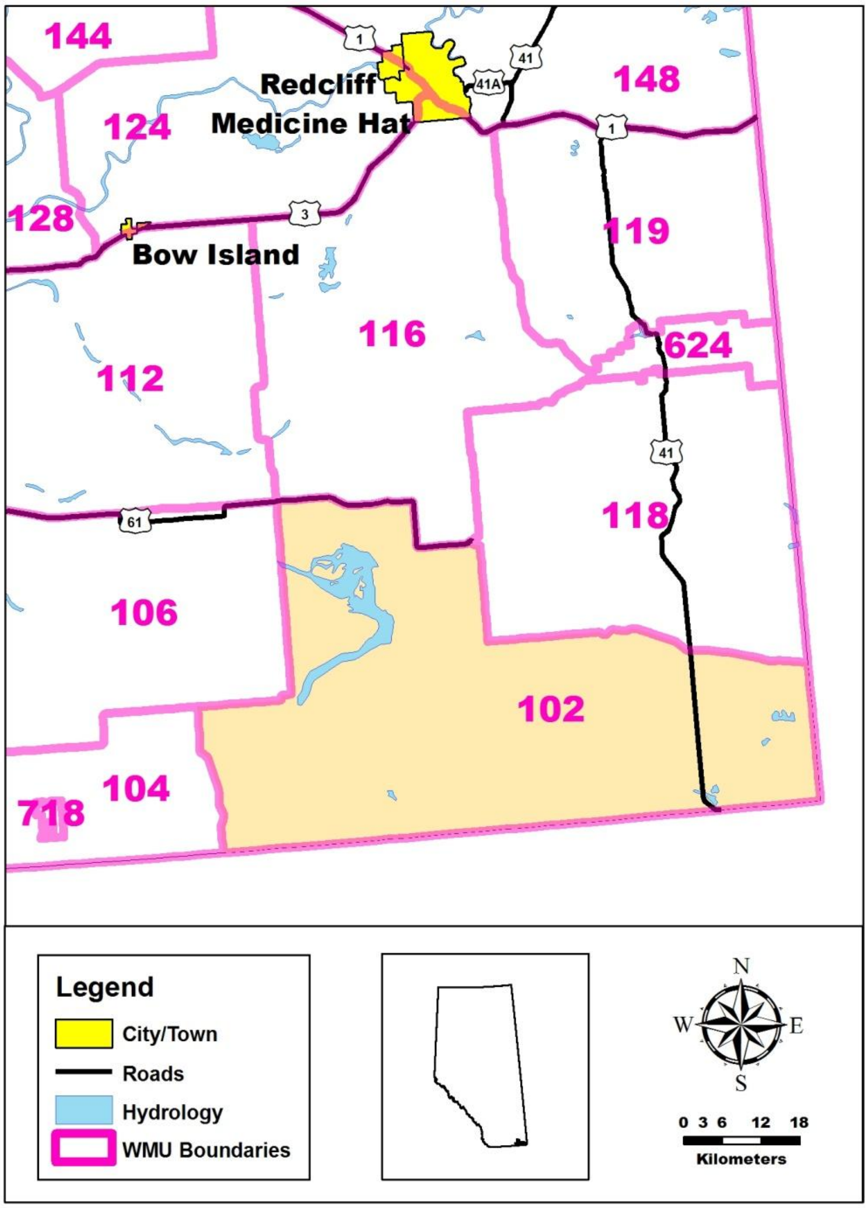

Figure 8. Location of Wildlife Management Unit 102 in Alberta.

6.1.2 Survey methods

The study area was stratified for mule deer (Gasaway et al. 1986; ASRD 2010), using a Bell 206B helicopter from 7 - 9 December 2010. Air speed during the survey stratification was approximately 180 km/h and altitude above ground was approximately 100 m. Height and speed of the aircraft varied depending on wind speed and direction, the amount of vegetation cover and topography of the area. Stratification flight lines were approximately 2 kilometers apart. Survey crews for both the stratification flight and the following intensive survey flight were comprised of one navigator/recorder/observer in the front seat beside the pilot and two observers in the back seat, one on each side of the aircraft.

While the entire study area was flown for stratification purposes, not all animals in the WMU were observed. Mule deer observed during the stratification flight provided a representation of distribution within the unit and allowed for stratifying of survey blocks (3 min latitude x 5 min longitude) as per Shumaker (2001a). The assignment of survey blocks to three strata was based on the number of deer seen within each block. The usual method of assigning survey blocks to the appropriate strata is to have approximately 60% in the middle stratum and the remaining 40% split between the high and low stratum (Shumaker 2001b). A large percentage of survey blocks (66%) had 0 deer observed and these survey blocks made up the low stratum for mule deer. The remaining survey blocks were then stratified based on deer numbers observed during the stratification flight.

Nine survey blocks (3 blocks x 3 strata) were randomly selected, using the RAND function in Microsoft Excel (Shumaker 2001c). Each survey block was searched intensively with a Bell 206B helicopter. Results were incorporated into the Quadrat Survey Method Program developed for WMU 102 as per Lynch (1997). We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Survey conditions over the three day period were variable. Snow conditions were excellent at the beginning of the survey but deteriorated rapidly by the final day. Temperatures ranged from -10 to +4 degrees Celsius and winds varied from 5 - 70 km/h.

Visibility was excellent at the beginning of the survey but worsened to fair by the end of the survey. With weather conditions forecasted to deteriorate beyond 9 December 2010, the decision was made to not fly additional survey blocks to improve confidence levels.

6.1.3 Results

We observed 685 mule deer during the stratification flight. During the intensive survey flight, 9 survey blocks were surveyed (3 low, 3 medium, 3 high). A total of 306 mule deer were observed (61 bucks, 142 does, 79 fawns, 24 unclassified). From this, a population estimate of 2,923 ± 935 mule deer was calculated (Table 13).

During the stratification flight, a total of 235 white-tailed deer were observed. However, the decision was made to not stratify WMU 102 for white-tailed deer, so a population estimate was not calculated. Herd composition data was not collected for white-tailed deer.

Table 13. Comparison of aerial mule deer survey results in Wildlife Management Unit 102 from 2001 - 2010.

Year	Population estimate (90% confidence limits)	Mule deer/km^2	Ratio to 100 Females	
			Males	Juveniles
2010	2,923 (±32.0%)	0.82	43	56
2004	2,659 (--)	0.75	24	58
2001	3,060 (--)	0.86	10	58

"--" Flown as a trend survey, thus confidence limits could not be derived.

6.2 Wildlife Management Unit 160 mule deer

Section Author: Ed Hofman and Mike Grue

WMU 160 is a popular hunting zone in south central Alberta. Ideally, WMUs in the prairie region would be surveyed on a 3 year rotation, although this frequency is often delayed due to funding constraints, and occasionally by inadequate weather conditions (lack of snow cover). The emergence of Chronic Wasting Disease in 2005 in eastern Alberta caused further delays, due to higher priority given to WMUs with the disease. As such, WMU 160 was last flown, using Gasaway survey techniques (Gasaway et al. 1986), in January 2000. Budget and time constraints led to the decision to stratify WMU 160 only for mule deer population counts during the 2010 survey. Survey results will be used to estimate changes in population numbers and herd composition over time. These data will also be used by ASRD to establish harvest allocations.

6.2.1 Study area

WMU 160 is located in the grasslands region of Alberta. It lies east of Drumheller, Alberta and is quite large in size, covering an area of about 3,954 km^2 (Figure 9). A legal description of the unit is found in Schedule 9, Part 1 of the Wildlife Act - Wildlife Regulation (Province of Alberta 1999). The WMU is bisected diagonally by the Red Deer River which is oriented northwest/southeast. The WMU is predominantly a mix of native prairie and cultivated fields. Most of the mule deer wintering range in this WMU is associated with the Red Deer River.

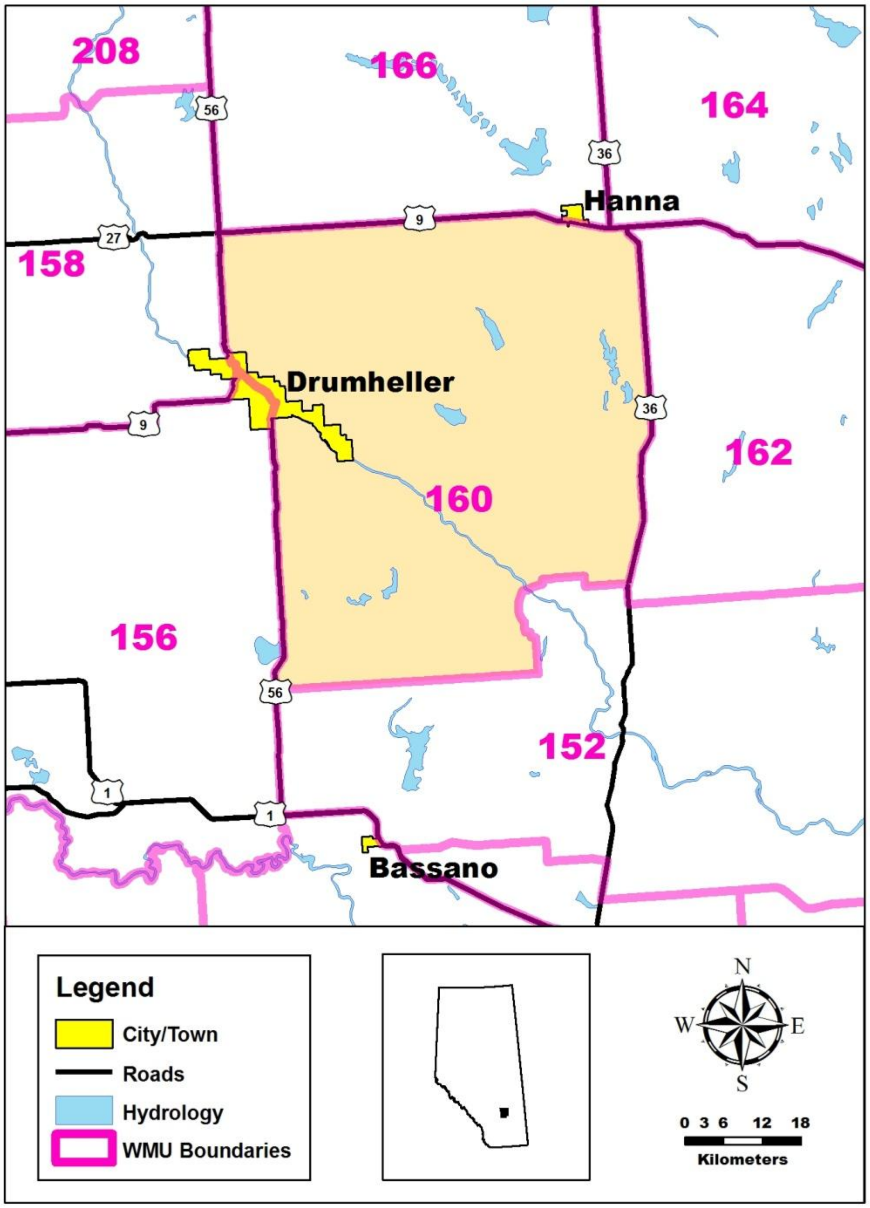

Figure 9. Location of Wildlife Management Unit 160 in Alberta.

6.2.2 *Survey methods*

The study area was stratified and surveyed for mule deer (Gasaway et al. 1986; ASRD 2010), using a Bell 206B helicopter from 30 November to 4 December 2010. During the stratification portion of the survey, air speed was approximately 120 km/h and altitude above ground was approximately 120 m. Height and speed of the aircraft varied depending on wind speed and direction, as well as the amount of vegetation cover and topography of the area. Stratification flight lines were approximately 2 kilometers apart in areas of sparse vegetative cover. Survey crews for both the stratification flight and the following intensive survey flight were comprised of one navigator/recorder/observer in the front seat beside the pilot and two observers in the back seat, one on each side of the aircraft.

While the entire study area was flown for stratification purposes, not all animals in the WMU were observed. Mule deer observed during the stratification flight provided a representation of distribution within the unit and allowed for stratifying of survey blocks (3 min latitude x 5 min longitude) as per Shumaker (2001a) into one of four stratum (low, medium, high or very high). The assignment of blocks was based on the number of mule deer seen within each survey block. The usual method of assigning survey blocks to the appropriate strata is to have approximately 60% in the middle stratum and the remaining 40% split between the high and low stratum (Shumaker 2001b). We used four strata in this case because of the large amount of variability in the number of mule deer seen among survey blocks.

Twelve survey blocks (3 blocks x 4 strata) were randomly selected, using the RAND function in Microsoft Excel (Shumaker 2001c). Each survey block was searched intensively with a Bell 206B helicopter. Results were incorporated into the Quadrat Survey Method Program developed for WMU 160 as per Lynch (1997). We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Survey conditions over the five day period were challenging with fog creating visibility issues on most days, especially in river valleys and coulees. Snow conditions were very good for this time of year, with plenty of snow having fallen just prior to the survey. As a result of poor weather and a forecast for conditions to deteriorate further, the decision was made to not fly additional survey blocks to improve confidence levels.

6.2.3 Results

We observed 1,675 mule deer during the stratification flight. During the intensive survey flight, 12 survey blocks were flown (3 low, 3 medium, 3 high and 3 very high). A total of 705 mule deer were observed (117 bucks, 380 does, 208 fawns and 0 unclassified). From this, a population estimate of 3,596 ± 1,064 mule deer was calculated (Table 14).

During the intensive survey flight, a total of 86 white-tailed deer were observed. However, WMU 160 was not stratified for white-tailed deer and so we were unable to provide a population estimate.

Table 14. Comparison of aerial mule deer survey results in Wildlife Management Unit 160 in 2000 and 2010.

Year	Population estimate (90% confidence limits)	Mule deer/km^2	Ratio to 100 Females	
			Males	Juveniles
2010	3,596 (±29.7%)	0.91	31	55
2000	5,330 (±24.1%)	1.35	35	76

6.3 Wildlife Management Unit 316 moose

Section Authors: Mike Jokinen and Jon Jorgenson

Moose population surveys began in WMU 316 in 1989 due to concerns from local hunting groups that moose numbers were declining in the area. Additional surveys were conducted in 1997, 2001, and 2007. This WMU is a high priority on the provincial survey rotation, but surveys have been delayed numerous times over the past four years. Unfavourable survey conditions, mainly attributed to chinook winds, commonly occur in this area. Survey results from 2011, along with information from previous efforts, assist in identifying trends in moose population, productivity and sex structure. The 2011 estimated moose population counts will be used by ASRD staff to make management decisions and to establish harvest allocations.

6.3.1 Study area

WMU 316 is a small WMU (574 km^2) located within the foothills of Alberta, northwest of Cochrane (Figure 10). The WMU extends along the Forestry Trunk Road at the western boundary, the Red Deer River at the northern boundary and the Rocky Mountain Forest Reserve boundary on the south and east sides. The west half of the WMU is slightly more rugged providing fragmented moose habitat. The east half of the WMU is composed of mixedwood forest, providing a more desirable lowland habitat for moose.

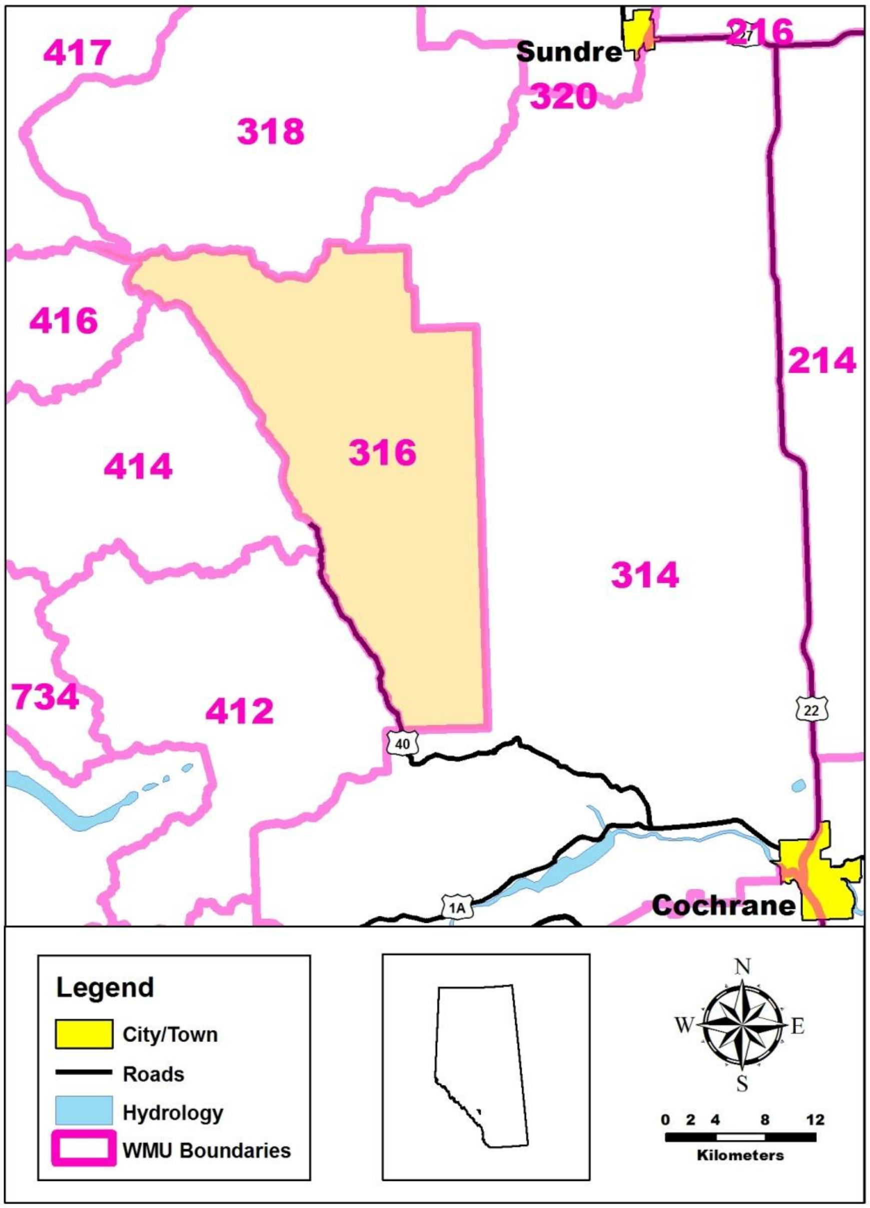

Figure 10. Location of Wildlife Management Unit 316 in Alberta.

6.3.2 *Survey methods*

The stratification process for this WMU was described in the 1997 survey report (Shumaker and Jorgenson 1997) and involved the use of 1988 Wildlife Habitat Inventory maps to assign moose habitat values to survey units (SU) based on forest cover type. For the 2001 and 2007 surveys, the WMU was divided into smaller SU (2 min latitude x 3 min longitude) than used in 1997 (2 min latitude x 5 min longitude). A total habitat value for each SU was determined by calculating the area of each habitat type present in the SU and then multiplying by the habitat value number assigned to each habitat type. The habitat values within each SU were then summed to establish a total habitat value for the SU. SUs were then ranked according to their total habitat value; values less than 45, between 45 and 55, and greater than 55 were assigned to three strata of low, medium, and high, respectively.

Forest cover types in WMU 316 have been modified over the years, primarily due to logging and oil and gas development, which could alter the total habitat value of a particular SU. To assess these changes, aerial photography from 2005 was compared with 2002 imagery to decide whether the habitat value for some SUs should be adjusted. Although some SUs have undergone significant changes, largely a result of forest cover removal by logging, the decision was made to not change any SU ratings. During the aerial survey, strata classifications of low, medium and high were reassessed through observation, and it was confirmed that no changes were required.

SUs were selected through a computer randomized list. A minimum of three SU in each strata (low, medium, high) were surveyed. Strata were evaluated based on variation associated with moose density. Strata having greater variance were assigned additional SUs that were randomly selected and flown. A Bell 206B helicopter was used for the survey with a navigator/observer seated in the front and two observers in the rear seat. A hand held Garmin GPS unit was used to log observation points. Moose were classified as cows, calves or bulls with the aid of Canon Image Stabilizer binoculars. Data were recorded on survey sheets and later condensed into digital format. We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Weather conditions for this survey were good with fresh snowfall and clear skies on 18 January 2011 and slightly better conditions on 19 January 2011 with overcast skies reducing glare off the snow and allowing for better visibility. Winds were calm for the duration of the survey.

6.3.3 Results

We flew 13 SUs during the survey (4 low, 6 medium and 3 high) with a total of 92 moose observed (30 bulls, 50 cows, 10 calves and 2 unclassified). From this a population estimate of 248 ± 65 was calculated (Table 15). The bull:cow ratio was the highest recorded over the past four surveys of this WMU, while the calf:cow ratio was the lowest recorded (Table 15). Due to time constraints, the decision was made to not fly additional SUs to improve confidence levels.

Table 15. Comparison of aerial moose survey results in Wildlife Management Unit 316 from 1989 - 2011.

Year	Population estimate (90% confidence limits)	Animals/km^2	Ratio to 100 Females	
			Males	Juveniles
2011	248 (±26.2%)	0.43	60	20
2007	161 (±32.6%)	0.28	56	56
2001	205 (±29.0%)	0.36	14	25
1997	321 (±22.8%)	0.56	50	30
1989	218 (±18.4%)	0.38	24	50

6.4 Wildlife Management Unit 332 moose

Section Authors: Anne Hubbs and Corey Rasmussen

WMU 332 is a desirable unit for moose hunters and receives high pressure from recreational and aboriginal hunters. To improve moose management, ASRD replaced the general hunting season in this WMU in the late 1990s, with a special license draw system for both antlered and antlerless moose during both the archery and general seasons. The harvest goal for antlered and antlerless moose is presently 4% and 1%, respectively, of the estimated pre-season populations. Moose hunter success according to hunter harvest questionnaires has averaged 33% for antlered moose and 61% for antlerless moose over the last five years. WMU 332 was last surveyed for moose in 2007.

Regular population inventories are required to assist in managing losses due to hunter harvest, predation, and severe winters. The objectives of the 2011 survey were to estimate the total population and herd composition for moose in this WMU.

6.4.1 Study area

WMU 332 is located northeast of Rocky Mountain House and is approximately 2,904 km^2 in size (Figure 11). Highway 12 forms the southern boundary; Highways 766 and 20 are the eastern boundary; Highway 616 is northern boundary; and the North Saskatchewan River, along with HWY 22 and Wolf Creek are the western border. WMU 332 straddles the Lower Foothills, Central Mixedwood and Dry Mixedwood Natural Subregions of Alberta (Natural Regions Committee 2006).

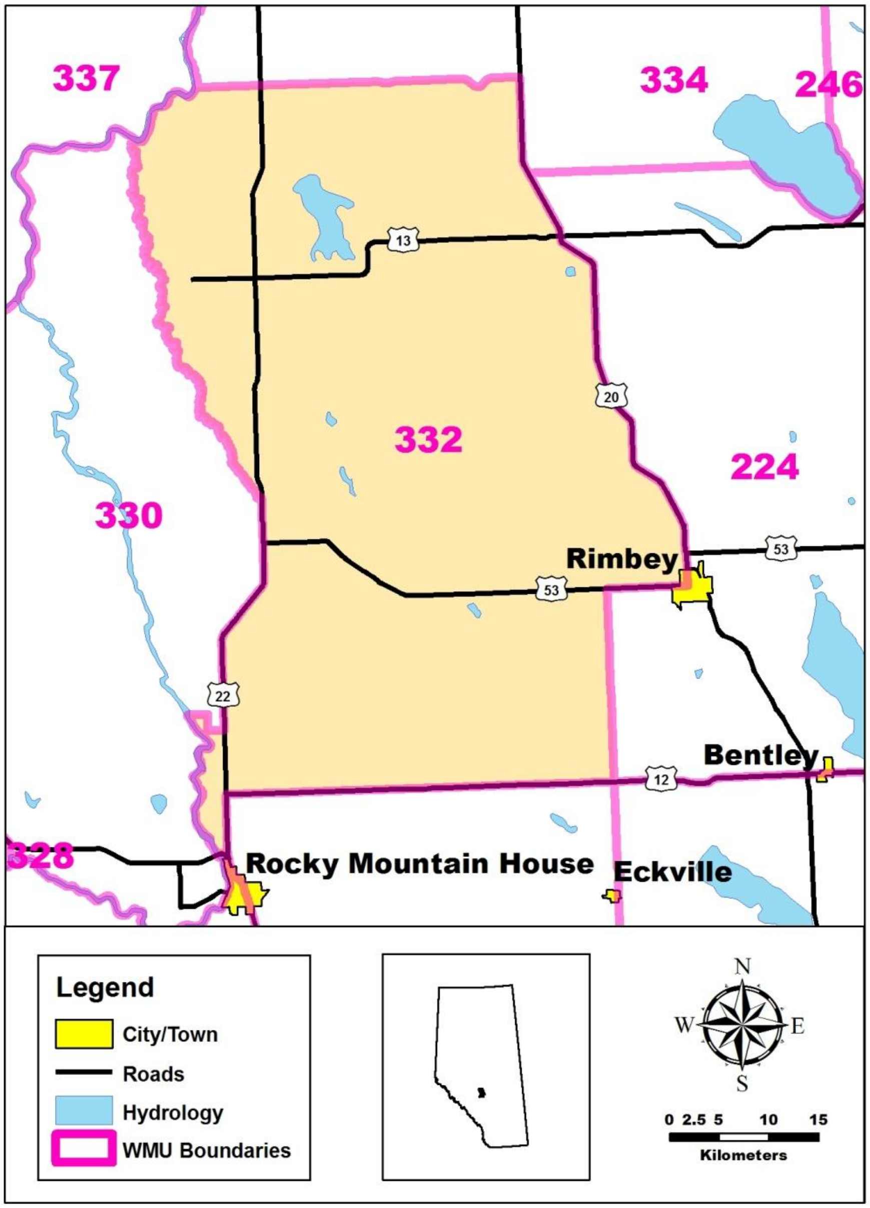

Figure 11. Location of Wildlife Management Unit 332 in Alberta.

6.4.2 *Survey methods*

We stratified WMU 332 for moose using a Cessna 185 airplane on 10 - 12 January 2011 (Gasaway et al. 1986). The aircraft flew at approximately 100 - 130 km/h, approximately 150 - 200 m above the ground, depending on vegetation cover and topography (higher elevation in dense forest and greater topography). We flew stratification flight transects in an east/west direction at 1 minute longitude intervals (1800 m apart) (Lynch and Shumaker 1995; Lynch 1997). Observers scanned approximately 400 m out from each side of the aircraft and recorded moose locations found along each transect. Temperatures were -24 to -19 degrees Celsius and snow conditions were good to excellent.

After the stratification survey flight, moose counts and GPS locations were uploaded into a GIS and intersected with a fishnet grid overlaid onto a map of WMU 332. The grid divided the WMU into 106 survey blocks (3 min latitude x 5 min longitude). We classified survey blocks into strata according to the density of moose counted during the stratification flight. Low blocks had 0 moose/km^2, medium blocks had 0.01 - 0.15 moose/km^2 and high blocks had $\geq$ 0.16 moose/km^2. Overall, 24 blocks (23%) were classified as low, 53 (50%) as medium, and 29 (27%) as high density blocks. We then randomly selected survey blocks for inclusion in the intensive rotary-wing survey flight, using the Excel Seed file methods (Shumaker 2001b).

We searched survey blocks with a Bell 206B helicopter from 13 - 15 January 2011. We surveyed a total of 16 blocks: 5 low, 6 medium and 5 high. We flew approximately 120 km/h, 30 - 50 m above the ground, at 400 m flight line spacing to ensure full coverage of each survey block. A navigator sat next to the pilot and observed and recorded animal locations, while 2 observers sat in the back of the aircraft. Each observer was responsible for observing approximately 200 m from each side of the aircraft.

We counted and recorded locations of moose, elk, deer (white-tailed and mule deer were combined), wolves, and coyotes. We determined age, sex, and total counts of moose; circling the animals if necessary. Most bulls at this time had shed their antlers, but cows were easily distinguishable by the white vulva patch below their tails. Light brown or grey patches, typically occurring on the shoulders and back, indicated winter tick (*Dermacentor albipictus*) infestation and were noted.

Moose counts per survey block were summed and entered into separate Excel Quad files to determine population estimates (Lynch 1999). We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

The intensive survey flights were flown during partially cloudy, calm days with average temperatures ranging from -24 to -20 degrees Celsius. Snow conditions were good to excellent throughout the survey area.

6.4.3 Results

During the intensive survey flight, 16 blocks (5 low, 6 medium and 5 high) were surveyed and a total of 153 moose were counted (33 bulls, 76 cows, 40 calves and 4 unclassified). From this, we estimated the total moose population to be between 730 and 1,178 (Table 16). Population estimates for moose in WMU 332 had progressively declined from 2000 to 2007, but appear to have rebounded in 2011. Other observations include; two cows were observed with twins, and two moose were observed to have slight tick related hair loss.

Table 16. Comparison of aerial moose survey results in Wildlife Management Unit 332 from 2000 - 2011.

Year	Population estimate (90% confidence limits)	Moose/km^2	Ratio to 100 Females	
			Males	Juveniles
2011	954 (±24.0%)	0.33	43	53
2007	480 (±27.0%)	0.23	43	68
2002	800 (±25.0%)	0.30	47	73
2000	1,077 (±17.0%)	0.40	34	55

6.5 Wildlife Management Unit 339 moose

Section Authors: Dave Hobson and Karl Zimmer

Moose surveys began in WMU 339 in 1980 using a random search methodology. To gain increased confidence in estimating moose populations, the survey methodology was altered in 1984, and the random square mile quadrat method (Smith et al. 1984) was used. A third survey was flown in 1989 using the habitat-stratified method (Smith and Edmonds 1989). In 1994, a fourth survey was flown using the modified Gasaway method (Gasaway et al. 1986), which has been the method of choice through additional surveys in 1996, 2005, and 2011. Survey observations from 2011, along with information from previous surveys, assist in identifying trends in population, productivity and sex structure. The 2011 moose population estimate will be used by ASRD to make management decisions and establish harvest allocations.

6.5.1 Study area

WMU 339 is located in Townships 44 - 48 and Ranges 10 - 18, west of the 5th Meridian (Figure 12). It is bound by the Pembina River to the north and the Brazeau River to the south. This WMU is characterized by moderate to high levels of oil and gas development (roads, wellsites, large and small gas plants, and pipelines), and has an extensive but moderate density of all-weather roads. Forest clear cuts in various stages of activity and early regeneration are dispersed throughout the WMU. The habitat is largely coniferous forest (predominately lodgepole pine), black spruce and tamarack muskegs, along with dwarf shrub bogs in the west and central portions, and mixed wood and pure deciduous stands in the eastern portion. Some large grass and willow flats occur along the Brazeau River.

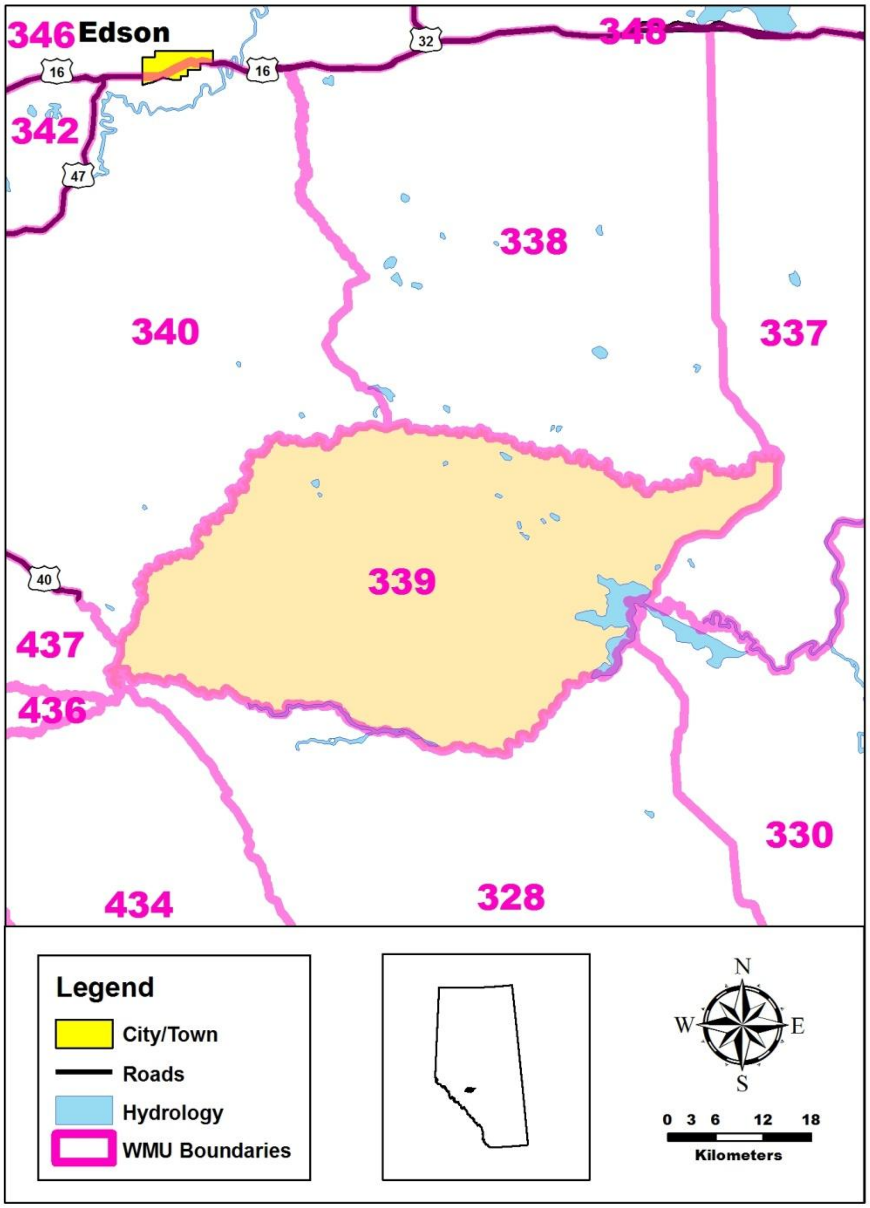

Figure 12. Location of Wildlife Management Unit 339 in Alberta.

6.5.2 *Survey methods*

WMU 339 was surveyed for moose populations using the modified Gasaway method (Gasaway et al. 1986; Lynch and Schumaker 1995; Lynch 1997). The WMU was divided into 68 survey blocks (3 min latitude x 5 min longitude) and classified into low, medium and high strata by a fixed-wing stratification flight flown on 22 February 2011. Survey blocks were stratified based on the number of moose observed in each block during the fixed-wing flight. The stratification flight was followed by intensive survey flights of randomly selected survey blocks on 23 - 24 February 2011 using a Bell 206B helicopter. Five blocks from each of the three strata were flown and data were analyzed to determine confidence limits for the population estimate. The goal, to produce a population estimate with 90% confidence limits and a confidence level ≤ 20%, was obtained. We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Survey conditions were good, with complete snow cover, temperatures averaging -25 degrees Celsius, and skies varying between sunny and partially cloudy.

6.5.3 *Results*

During the intensive survey flights, 15 blocks were flown (5 low, 5 medium and 5 high) and a total of 80 moose were observed (25 bulls, 39 cows, 15 calves, and 1 unclassified). This resulted in a moose population estimate ranging from 298 to 396 (Table 17).

In 2005, the moose population was estimated to be 64% lower than in 1996. However, the 1996 survey was probably an over estimate of population size, as it was a combined survey with WMU 340 and the population estimate was calculated based on the size of each WMU (Ficht and Smith 2005). When comparing the 2005 survey to the 1994 survey (both used the same method and survey area), the 2005 moose population was estimated to be 37% lower than in 1994. Moose populations appear to have stabilized since 2005, however, the 2005 survey had much more variance around the estimated mean than the 2011 survey. Data from 1980 has not been included due to the random nature of the survey.

Table 17. Comparison of aerial moose survey results in Wildlife Management Unit 339 from 1984 - 2011.

Year	Population estimate (90% confidence limits)	Moose/km^2	Ratio to 100 Females	
			Males	Juveniles
2011	347 (±14.1%)	0.17	64	39
2005	332 (±34.6%)	0.16	35	27
1996	934 (--)	0.45	15	46
1994	525 (±20.0%)	0.28	10	41
1989	553 (--)	0.56	15	65
1984	711 (--)	0.35	29	61

"--" Confidence limits not reported.

6.6 Wildlife Management Unit 348 moose, mule deer, and white-tailed deer

Section Authors: Curtis Stambaugh and Mike Ranger

WMU 348 is a medium sized unit, located approximately 100 km northwest of Edmonton. Several communities including the towns of Whitecourt, Mayerthorpe, Sangudo, and Evansburg/Entwistle border this WMU. This WMU has been surveyed three times for moose (1998, 2000, and 2007) using the modified Gasaway method (Gasaway et al. 1986; Lynch 1997; ASRD 2010). This is the first time that both mule deer and white-tailed deer were systematically surveyed in this WMU.

6.6.1 Study area

WMU 348 is located southeast of Whitecourt and is bounded by Highway 43 on the north, the McLeod River and Highway 32 on the west, the Pembina River on the east, and Highway 16 on the south (Figure 13). This 2,990 km^2 unit has moderate to high levels of oil and gas development (roads, well sites, large and small gas plants, and pipelines). Forest clear cuts at various stages of activity and regeneration are dispersed through the WMU. The southern and eastern portions are a mix of farmland and rural residential, while the remainder of the WMU is Crown land made up of relatively rugged terrain. The forested habitat is largely pure deciduous forest, mixed wood forest and muskeg. An extensive network of high-density all-weather roads exist, allowing industry and hunters ease of access throughout the majority of the WMU.

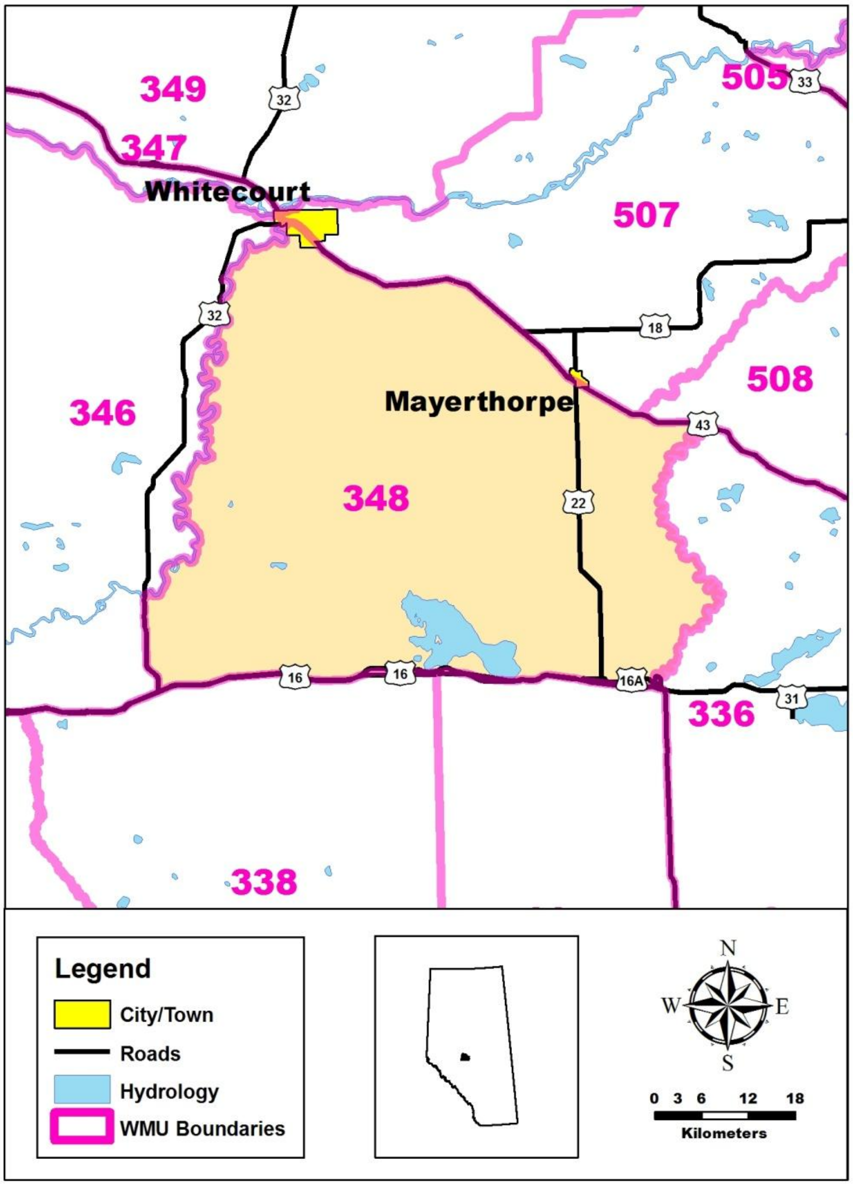

Figure 13. Location of Wildlife Management Unit 348 in Alberta.

6.6.2 Survey methods

Survey methodology followed the modified Gasaway technique (Gasaway et al. 1986; Lynch 1997; ASRD 2010). The WMU was divided into 5 minute latitude x 5 minute longitude grids, resulting in 66 survey blocks. Survey block stratification flights were conducted using a Cessna 185 airplane on 30 - 31 January 2011. The crew consisted of a pilot, a navigator/observer and 2 full time observers. Stratification transects were flown every 1 minute of latitude, with the exception of survey block boundaries (every 5th minute), and all observations of moose, mule deer, and white-tailed deer on either side of the aircraft were recorded. All animal locations were recorded with a Garmin GPSMap 76CSx. The pilot attempted to maintain a consistent altitude of 100 m above ground level so an approximate distance to the animal could be consistently recorded. Aircraft speed was maintained at approximately 150 km/h.

Survey blocks for moose were then assigned to one of three strata; low, medium, or high, based on moose densities from the stratification flights. The stratification process for mule deer was based largely on habitat, topography, and local knowledge, as well as observations from the stratification flights. However, mule deer were only assigned two strata (low - medium and medium - high).

For the intensive survey flights, five survey blocks were chosen randomly from each of the low, medium and high strata for moose. In order to get a reasonable representation of mule deer and white-tailed deer survey blocks to coincide with the moose survey blocks, two randomly selected survey blocks were moved to adjacent cells to ensure strata representation and spatial distribution was maintained across all three species.

Intensive survey flights began on 31 January with a three person crew using a Bell 206B helicopter. Upon completing the stratification survey, a second crew joined the intensive survey, also employing a Bell 206B helicopter, from 1 - 2 February. Survey crews consisted of a pilot and at least two experienced observers; one in the front left seat (navigator/observer) and the other seated behind the pilot. A third observer was also seated behind the navigator/observer. North/south lines were flown every 0.170, 0.500, and 0.830 minutes longitude within each survey block resulting in an approximate 400 m line separation. Pilots flew approximately 30 m above the trees and at an average speed of 100 km/h, depending on cover type. Within the settled portions of the WMU, the pilot would increase altitude and/or veer off the transect when approaching houses and domestic livestock (which ever was most appropriate to the circumstances and to adhere to Transport Canada's over flight standards).

All moose, mule deer and white-tailed deer locations were recorded with a GPS. Every attempt was made to sex and age the animals unless forest cover and/or wind prevented safe or confident identification. Animals were classified as adults or calves/fawns based on body size and length of snout; all yearlings were classified as adults. All adult moose were classified as cows if a white vulva patch was present. All adult bulls that still possessed antlers were classified as having small, medium or large antlers (ASRD 2010). Deer with antlers were classified as males and assigned to a size category of small, medium or large (ASRD 2010), while non-antlered deer not attended by a fawn(s) (i.e., does) were left unclassified. We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Conditions were good throughout the duration of the survey; however, the week of warm weather in early January did melt snow from tree bowls making observation slightly more difficult. Temperatures ranged from -28 degrees Celsius in the mornings to -5 degrees Celsius in the afternoons. On the final day of surveys the afternoon temperature climbed to +3 degrees Celsius, due to a warming trend. Winds were calm and turbulence was negligible throughout the survey.

6.6.3 Results

During the intensive survey, 15 survey blocks were flown for moose (5 low, 5 medium and 5 high) resulting in an estimated moose population ranging from 1,368 to 2,012 (Table 18). Although this represents a slight decrease in moose numbers (12%) from 2007, statistically no change between estimates occurred. A total of 67 bulls were observed, with 87% having already shed their antlers. Of those still carrying antlers, six were yearlings and three were classified as medium.

For the two strata that mule deer were assigned, 10 low - medium survey blocks and 5 medium - high survey blocks were flown, resulting in an estimated mule deer population ranging from 449 to 935 (Table 18). Unfortunately, most mule deer were unclassified (87%) as a result of being observed in close proximity to farm yards and domestic livestock, limiting our ability to maneuver the helicopter close enough to sex and age animals. Demographic ratios could not be accurately obtained from the small sample size collected. However, from the 12 antlered males observed, 9 were yearlings and 3 were classified as medium. Previous surveys of WMU 348 did not dedicate effort into calculating a population estimate for mule deer, therefore comparison among survey years is not possible.

During the intensive survey, 15 blocks were flown for white-tailed deer (6 low, 5 medium and 4 high) resulting in an estimated white-tailed deer population ranging from 1,126 to 1,978 (Table 18). Most white-tailed deer were unclassified (74%) as most male deer lacked antlers, making sex and age classification particularly difficult. From the sampled population, 7 bucks per 100 does and 102 fawns per 100 does were observed. However, demographic ratios presented must be interpreted cautiously, particularly as the male cohort would be drastically under represented as males with shed antlers would have been recorded as unclassified. In addition, only 3 antlered males were observed; 1 yearling and 2 were classified as medium. Previous surveys of WMU 348 did not dedicate effort into calculating a population estimate for white-tailed deer, therefore comparison among survey years is not possible.

Table 18. Comparison of aerial survey results for moose, mule deer, and white-tailed deer in Wildlife Management Unit 348 from 1998 - 2011.

			Ratio to 100 Females	
Species/Year	Population estimate (90% confidence limits)	Animals/km^2	Males	Juveniles
Moose				
2011	1,690 (±19.1%)	0.57	27	56
2007	1,913 (±20.1%)	0.66	37	52
2000	1,068 (±16.2%)	0.37	13	44
1998	1,965 (±19.5%)	0.66	26	57
Mule deer				
2011[a]	692 (±35.1%)	0.23	--	--
White-tailed deer				
2011[a]	1,552 (±27.4%)	0.52	7	102

[a] No data from previous years is available for comparison.
"--" Demographic ratios could not be accurately obtained due to the small sample size collected.

6.7 Wildlife Management Unit 516 moose and white-tailed deer


Photo: Mike Ranger

Section Authors: Kristina Norstrom and Mike Ranger

Moose, a highly sought after ungulate species from both a hunter and "Watchable Wildlife" perspective, are one of the primary game species in Alberta. Ecologically, moose can exert a significant impact on wildlife habitat and are an important component of predator-prey systems (Arsenault 2000). Moose range commonly overlaps with that of white-tailed deer, mule deer, elk and woodland caribou. Provided food and cover are available, moose are well-adapted to boreal climate patterns (Franzmann and Schwartz 2007), although moose in the boreal area of northeast Alberta typically occur at low population densities (Lynch 1999). This, combined with hunting pressure, predator pressure and habitat change, make understanding their population dynamics and distribution essential to the management of these populations.

White-tailed deer are also a primary game species with aesthetic value and have historically been found in low densities in the boreal forest (Fish and Wildlife 1995).

Recruitment has been low, with harsh climatic conditions likely being the primary limiting factor on white-tailed deer populations. Hunting pressure has historically been low because of limited access in northern boreal areas. Human caused habitat alterations favouring early seral forest stages, along with linear development and relatively mild winters, have allowed white-tailed deer numbers to increase in recent years (Latham et al. 2011).

Aerial surveys for moose in this area are generally conducted on a 5 - 7 year rotation when possible. These surveys are designed to gather population data on the density, distribution, and age/sex classification of moose and other game species (ASRD 2010). Although surveys for white-tailed deer in this area have not historically been conducted, their increasing density and distribution and potential effects on wolf and woodland caribou populations make quantifying these changes important.

6.7.1 Study area

WMU 516 covers 3,980 km^2 of diverse habitat and landforms, situated in the northern boreal mixed-wood forest of Alberta (Figure 14). The WMU is bordered by the Athabasca River to the east, Secondary Highway 813 to the west, the Calling River to the south, and its northern border is the latitude of 55 degrees 59 minutes. WMU 516 includes portions of the communities of Calling Lake, Sandy Lake and Wabasca-Desmarais. The area along the Athabasca River falls within a "Key Wildlife and Biodiversity Zone", while much of the mid to northern portions of the WMU fall within the West Side of the Athabasca (WSAR) caribou range.

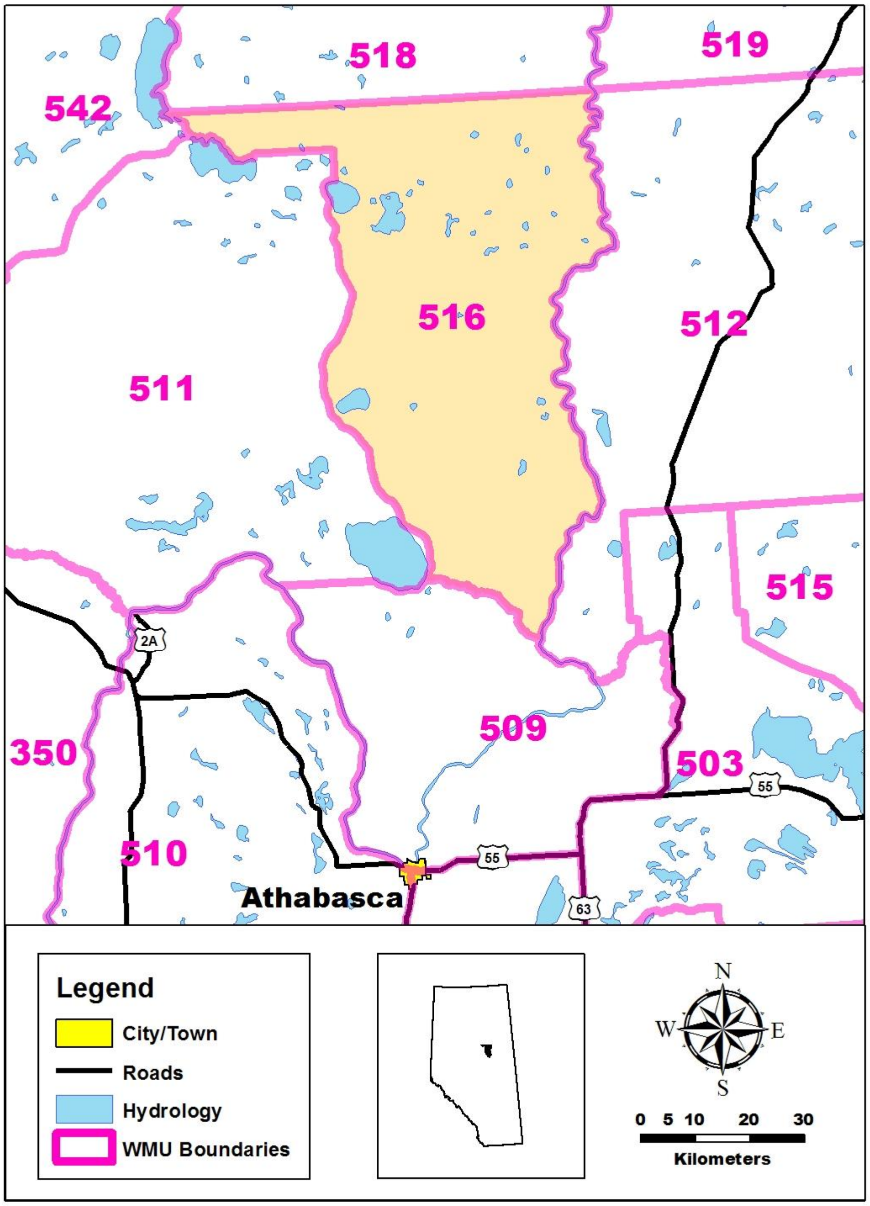

Figure 14. Location of Wildlife Management Unit 516 in Alberta.

6.7.2 Survey methods

Survey protocols are based on the modified Gasaway method (Gasaway et. al. 1986) and are outlined in the provincial "Aerial Ungulate Survey Protocol Manual" (ASRD 2010) which was followed for both the stratification and intensive survey block portions of the survey.

The WMU was stratified with a Cessna 185 fixed-wing aircraft for moose and white-tailed deer on 5, 7, 9, 10 January 2011. Wind conditions prohibited flying on 6 January, while snow and low ceilings grounded flights on 8 January and the morning of 9 January. All flights employed four crew members, including a pilot, a navigator in the front passenger seat, and two observers in the rear seat.

Data from the stratification flights were used to categorize the animal density of the WMU into 83 sampling blocks (5 degrees latitude x 5 degrees longitude) classified into low, medium, or high strata. This classification was based on moose and deer density, with water features omitted from the land area. The assignment of the survey blocks into strata was based on natural breaks in the data, with roughly 20% of the blocks in each of the low and high categories, with adjustments made according to results for individual species.

Fifteen of the survey blocks, 5 from each stratum, were randomly selected for the intensive survey block flights. Survey blocks were flown in an east/west direction on 11 - 13 January in a Bell 206B helicopter. Following the helicopter survey, these data were compiled and entered in the Quadrat Survey Method Program (Lynch 1999), and a population estimate and confidence intervals determined.

Age (juvenile vs. adult) and sex classification were obtained wherever possible for all moose and white-tailed deer encountered. Bulls and bucks were identified by the presence of antlers; cows were confirmed by the presence of a white vulva patch or calf at foot; while does and fawns were assumed to be those animals without antlers and were classified according to their size. Antler classification (ASRD 2010) was also recorded. All other wildlife sightings were recorded during the survey and a GPS waypoint taken. We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Snow conditions were good with fresh snow having fallen in the 3 days prior to the survey, although a fairly thick layer of snow was present on most trees. Temperatures ranged from -2 to -20 degrees Celsius during the stratification flights and -21 to -24 degrees Celsius during the intensive survey block flights. Wind speeds were generally calm, ranging from 13 - 32 km/h for both portions of the survey.

6.7.3 Results

For the intensive survey block flights, 15 blocks were flown for moose (5 low, 5 medium and 5 high) and the total moose population estimate was calculated to range from 671 to 1,195 (Table 19). Although the population variance (28.1%) was fairly high, it is not uncommon for northern WMUs, with less dense populations, to be in this range. The results of this survey suggest that the moose population in WMU 516 is increasing to a stable population (Table 19). The mean population estimate is higher than the previous survey but the difference is not statistically significant as the confidence intervals overlap. While the results of the 2011 survey are similar to the 1994 results, the population trend appears to have decreased sharply in 1998 and then increased in 2003. Caution should be used in interpreting these trends, as the population variance for each survey is large enough that results of all surveys overlap.

For the intensive survey block flights, 15 blocks were flown for white-tailed deer (5 low, 5 medium and 5 high) and the total white-tailed deer population estimate was calculated to range from 1,401 to 2,311 (Table 19). The sex/age classification is not reported for white-tailed deer as only a very small proportion of animals were observed with antlers. This was likely due to significant antler drop and not necessarily low buck numbers, as this was also the case in survey blocks with low hunting pressure (limited road access). If antler drop is indeed the reason for low buck counts, then does would be significantly overestimated (some bucks classified as does), which would underestimate the ratio of fawns to does.

The delays that occurred during the stratification flights and the temperature changes (-24 to -2 degrees Celsius) may have contributed to animal movement between survey blocks and/or differences in animal behavior. This may have resulted in differences in sightability between the stratification flights and the intensive survey block flights. The decision was made not to fly additional survey blocks in an attempt to reduce the variability, because of the time delay.

Table 19. Comparison of aerial survey results for moose and white-tailed deer in Wildlife Management Unit 516 from 1994 - 2011.

Species/Year	Population estimate (90% confidence limits)	Animals/km²	Ratio to 100 Females	
			Males	Juveniles
Moose				
2011	933 (±28.1%)	0.26	32	45
2003	751 (±15.5%)	0.19	86	76
1998	493 (±43.0%)	0.12	50	41
1994	919 (±30.4%)	0.28	44	46
White-tailed deer				
2011[a]	1,856 (±24.5%)	0.49	--	--

[a] No data from previous years is available for comparison.
"--" Demographic ratios could not be accurately obtained due to the small sample size collected.

6.8 Wildlife Management Unit 518 moose

Section Authors: Traci Morgan and Velma Hudson

Moose are the primary big game species in WMU 518, providing recreational hunting opportunities and subsistence for many residents. White-tailed deer and mule deer are also harvested within the WMU but occur at low densities. The objective of this survey was to obtain a moose population estimate for WMU 518 and compare the results with past estimates and surrounding WMUs. Aerial game surveys provide population and density estimates, distribution patterns, and habitat-use data that are used in determining hunting license allocations. When conducted at regular intervals of every 5 - 7 years (ASRD 2010), aerial surveys also offer valuable data for assessing wildlife population trends, in addition to providing an appraisal of natural and anthropogenic changes occurring on the landscape. WMU 518 has not been surveyed using the Gasaway technique (Gasaway et al. 1986) since 1999.

6.8.1 Study area

WMU 518 is located west of Fort McMurray and lies within the central mixedwood subregion of the boreal forest natural region (Natural Regions Committee 2006). It has an area of approximately 11,860 km^2, extending from Township 81 to Township 92, and is bordered by the Athabasca River on the east and the Wabasca River on the west (Figure 15). Fort McMurray is located on the northeast border of the WMU, and Wabasca Lake First Nations Reserve is located in the southwest corner. Chipewyan Lakes, in the northwest corner, is the only other community in the WMU. The Athabasca Oil Sands extend under most of the WMU. Open pit mine operations and upgrading facilities are located in the northeast corner of WMU 518, and steam assisted gravity drainage (SAGD) operations are scattered throughout. Access roads, pipelines and utility corridors dissect the WMU. WMU 518 is characterized by extensive open and treed fens, interspersed with mixedwood uplands and numerous small lakes. The Athabasca River valley is steep and rugged, while the Wabasca River is serpentine and features many oxbows. Riparian areas along both rivers provide key summer and winter ungulate habitat.

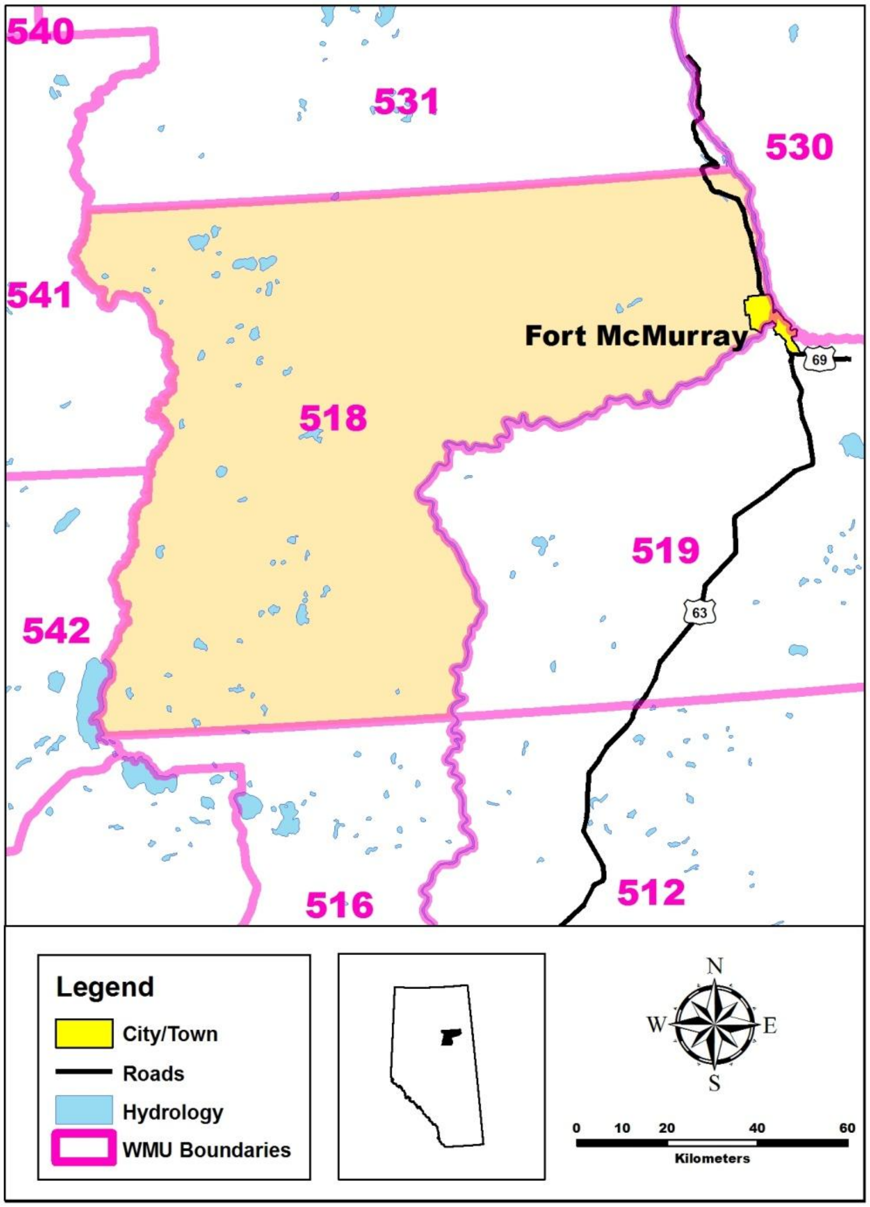

Figure 15. Location of Wildlife Management Unit 518 in Alberta.

6.8.2 *Survey methods*

WMU 518 was stratified for moose densities (Gasaway et al. 1986; ASRD 2010) using stratification flights with three fixed-wing aircraft (one Cessna 180 and two Cessna 185) from 7 - 10 February 2011. The following intensive survey block flights on 11 - 12 February 2011 were flown with two Bell 206B helicopters. Each crew consisted of a pilot, a navigator and two observers. All flights were flown in an east/west orientation. Stratification data were used to determine the stratum for each survey block based on moose density. WMU 518 was divided into 259 survey blocks (5 min latitude x 5 min longitude) of approximately 45.8 km^2 each. Areas that were less than half of a full survey block were combined with adjacent blocks to ensure sampling units of fairly uniform size. Normally, approximately 20% of the blocks are classed as low, 60% as medium, and 20% as high; however, based on the stratification results only two strata (low and high) were employed for WMU 518. Survey blocks which contained moose were classified as high, while those with no observed moose were classified as low.

Seventeen survey blocks were randomly selected to be intensively searched; thirteen of the seventeen blocks were actually sampled. Following the intensive survey block flights, data was compiled and entered in the Quadrat Survey Method Program developed as per the Gasaway population model (Lynch 1999), and a population estimate and confidence interval was determined. Moose were classified into age and sex using four criteria: presence of antlers or pedicel scars, presence of vulva patch, face, body shape and pigmentation, and behaviour. All wildlife observations were recorded on data forms with animal locations recorded using a GPS. We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Snow conditions were rated as excellent in the northern portion of the WMU and good to poor in the southern portion. Temperatures ranged from -3 to -29 degrees Celsius during the stratification flights and +1 to -14 degrees Celsius during the intensive survey block flights. The warmest temperatures were in the southern half of the WMU during the intensive survey block flights, with a mean temperature of -1 degrees Celsius occurring over the two day period. Wind speeds ranged from calm to 30 km/h for both portions of the survey.

6.8.3 Results

A total of 208 moose were observed during the stratification portion of the survey. The intensive search of 13 survey blocks (7 low and 6 high) resulted in the observation of 52 moose, which resulted in a total population estimate of between 326 and 1,567 moose. However, a precise population estimate and confidence intervals were not obtained (Table 20).

Additional survey blocks were not flown to reduce our confidence intervals for several reasons. Foremost, the forecast for the next several days indicated a projected rise in temperatures above -5 degrees Celsius, which would make moose more difficult to detect as they would be seeking thermal cover beneath conifers. Additionally, surveying moose in these warm temperatures would put undue stress on the animals. Finally, after surveying 13 blocks with a resulting confidence interval of ±65.5%, it did not appear practical or effective to continue the survey. The amount of additional effort required would have put us significantly over our original budget and time and weather constraints may have ultimately prevented us from reaching our intended goal of a ≤ 20% confidence interval.

Table 20. Comparison of aerial moose survey results in Wildlife Management Unit 518 from 1999 - 2011.

Year	Population estimate (90% confidence limits)	Animals/km^2	Ratio to 100 Females	
			Males	Juveniles
2011	--	--	48	19
2004[a]	1,685	0.14	--	--
1999	1,471(±35.6%)	0.13	66	38

"--" A precise estimate was not obtained.

[a] Survey was late in the season with insufficient funds to complete a standard modified Gasaway survey. A trend survey was conducted to provide an indication of population health and an understanding of surface disturbance from industrial use. Demographic ratios were not obtained.

6.9 Wildlife Management Unit 520 moose

Section Authors: Dave Moyles and Robb Stavne

WMU 520 is an important unit for providing moose hunting opportunities to hunters in Alberta. Aboriginal moose hunters routinely hunt this area throughout the year, as there are several First Nation and Metis communities in and adjacent to this WMU. During the recreational hunt, demand for the 'calling season' hunting season (1 September - 31 October) has exceeded the supply of licences for the past few years. The moose hunting outfitting industry is also active in this WMU. In order to make informed management decisions on moose populations in this WMU, aerial surveys are fundamental in understanding population dynamics and distribution.

6.9.1 Study area

WMU 520 lies northeast of Peace River, Alberta (Figure 16) in the boreal forest natural region (Natural Regions Committee 2006). A legal description of the WMU is found in Schedule 9, Part 1 of the Wildlife Act - Wildlife Regulation (Province of Alberta 1999). The entire WMU is Crown land and there are three First Nations communities located in WMU 520; Wood Land Cree, Lubicon Cree, and Loon Lake Creek. Peace River is the largest nearby community and Red Earth Creek is a small community located on the eastern edge of the WMU. Mixedwood forests of aspen and spruce dominate much of this WMU, with pockets of peatlands. Industrial development has been extensive during the past several decades and has intensified in recent years, with rapid expansion of in-situ oil sands production in the southwest portion of this unit. There has been considerable conventional oil and gas development throughout the remainder of the WMU. Forestry activity has been intensive in past years with large cutblocks in the northwest and central areas of this WMU. Industrial development has increased both the quantity and quality of road access in recent years. Attempts to regulate access have generally been ineffective, with the exception of access management efforts in the northwest portion of this WMU. Much of this WMU is accessible in frozen ground conditions.

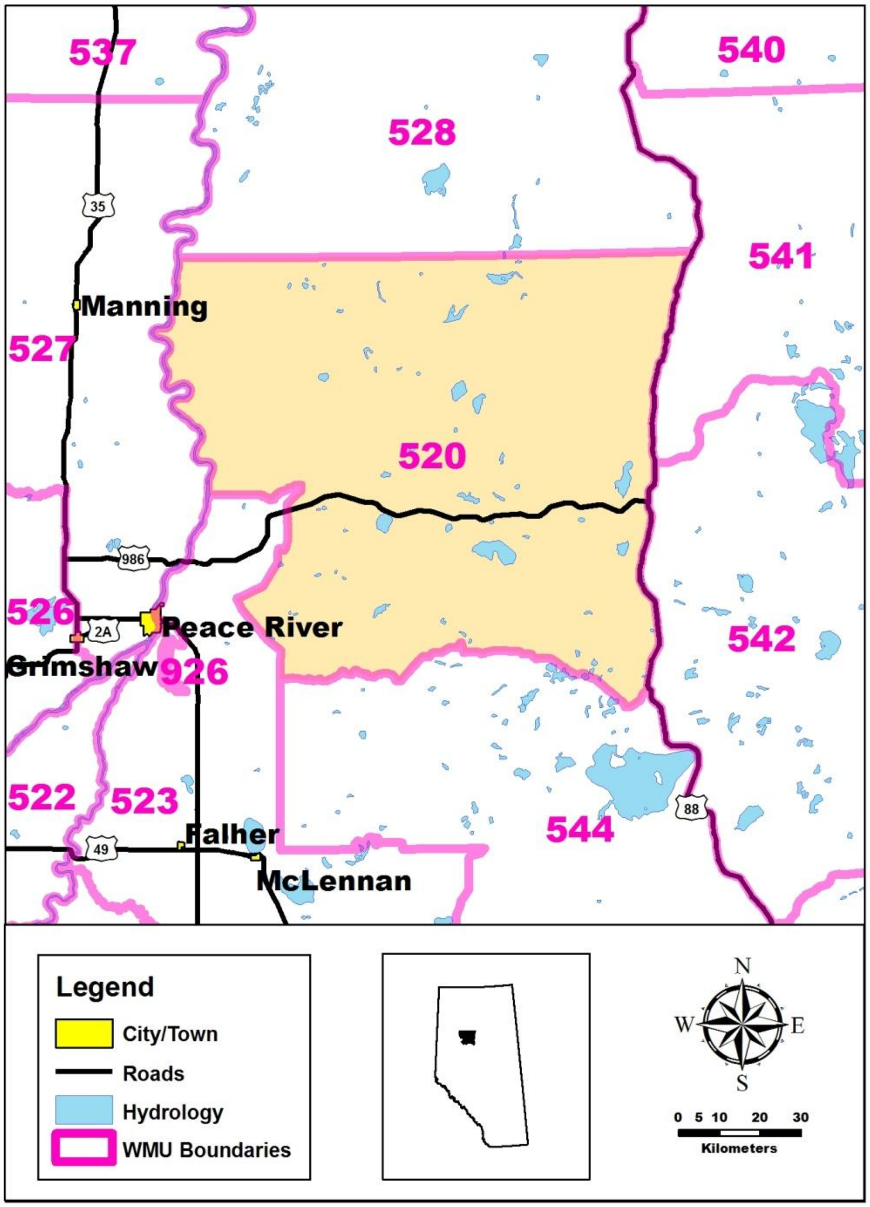

Figure 16. Location of Wildlife Management Unit 520 in Alberta.

6.9.2 *Survey methods*

All aerial surveys for moose in WMU 520 were conducted as per Lynch (1997). The stratification surveys were flown on 6 - 7 February 2011. We used three fixed-wing aircraft, (one Cessna 185 and two Cessna 206) and flew transects one nautical mile apart in an east/west direction. Air speed during stratification flights was approximately 160 km/h, and flight altitude was maintained at approximately 90 m above ground level (AGL). Each crew consisted of a pilot and two observers, one seated in the front and one seated in the back behind the pilot. For each wildlife observation the front observer took a waypoint using a hand held Garmin GPS (models 60Cx or 76Cx) and recorded the sighting. All waypoints were downloaded using Minnesota DNR Garmin ver. 5.03 and plotted using ArcMap 9.3.1. Stratification of survey blocks was based on a combination of information, including moose counts from stratification flights, past survey results, local knowledge of access, landuse patterns and habitat changes, and 2009 aerial imagery.

We used two three-person crews in Bell 206B helicopters to conduct intensive searches of survey blocks from 8 - 10 February 2011. In total we searched 17 survey blocks with varying classifications of low, medium or high moose density. Crews flew transects orientated east/west that were spaced 0.25 minute of latitude apart. Air speed was 100 - 140 km/h, at an altitude of approximately 30 m AGL. All moose observed were classified as either adults or calves, based on body size and length of the nose; all yearling moose were considered as adults. All adult moose were classified as cows if a vulva patch was present. Of the bull moose that were observed, 86% had dropped their antlers and were classified as males because of absence of a vulva patch. Bulls still retaining their antlers were classified as either small, medium or large (ASRD 2010). We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Survey conditions for the first three days of the survey were excellent with temperatures ranging from -25 to -15 degrees Celsius and clear skies. Temperatures rose from -18 degrees Celsius on 9 February to +4 degrees Celsius on 10 February and there were flurries through parts of both days. Winds were mostly calm throughout the entire five day survey.

6.9.3 Results

We flew 17 survey blocks during the intensive survey (6 low, 6 medium and 5 high) with a total of 353 moose observed (66 bulls, 197 cows, 86 calves and 4 unclassified). We estimated the total moose population to range between 1,884 and 2,768 (Table 21). Moose distribution has changed since the last survey of WMU 520 in 1999, which is likely due to increased road access resulting from industrial activities. Although moose are still relatively abundant in the northwest portion of this unit, there have been obvious declines in abundance of moose in the southwest and south-central areas of this WMU.

Table 21. Comparison of aerial moose survey results in Wildlife Management Unit 520 from 1999 and 2011.

Year	Population estimate (90% confidence limits)	Moose/km^2	Ratio to 100 Females	
			Males	Juveniles
2011	2,326 (±19.0%)	0.21	34	44
1999	2,785 (±14.7%)	0.27	38	48

6.10 Wildlife Management Unit 521 moose, white-tailed deer and elk

Section Author: Robb Stavne and Dave Stepnisky

Aerial ungulate surveys are invaluable for setting hunter harvest allocations, along with providing information for ungulate depredation discussions and habitat protection efforts. Big game populations in WMU 521 were last surveyed in 2005. Since the 2005 survey, the area experienced a very hard winter (2006 - 2007), with reports of high levels of moose mortality due to winter ticks. A 2011 detailed aerial survey to determine the effect that recent winters have had on populations of moose, deer and elk was required to ensure that harvest levels remain sustainable in this WMU.

6.10.1 Study area

WMU 521 is bordered to the east by Highways 43 (south of Valleyview) and 49 (north of Valleyview), to the south by the Simonette Road, and the Simonette River, and to the west and north by the Smoky and Little Smoky rivers (Figure 17). This WMU is comprised of the central mixedwood and dry mixedwood subregions, as described by the Natural Regions Committee (2006). Mixedwood forests of aspen and white spruce dominate the Crown land portions of the WMU, the Puskwaskau Hills in the north, and along the rivers. Considerable fragmentation within the forested areas has resulted from substantial forestry, and oil and gas activity. The remaining portions of the WMU are dominated by agriculture, including annual cereal and perennial crops, and livestock operations.

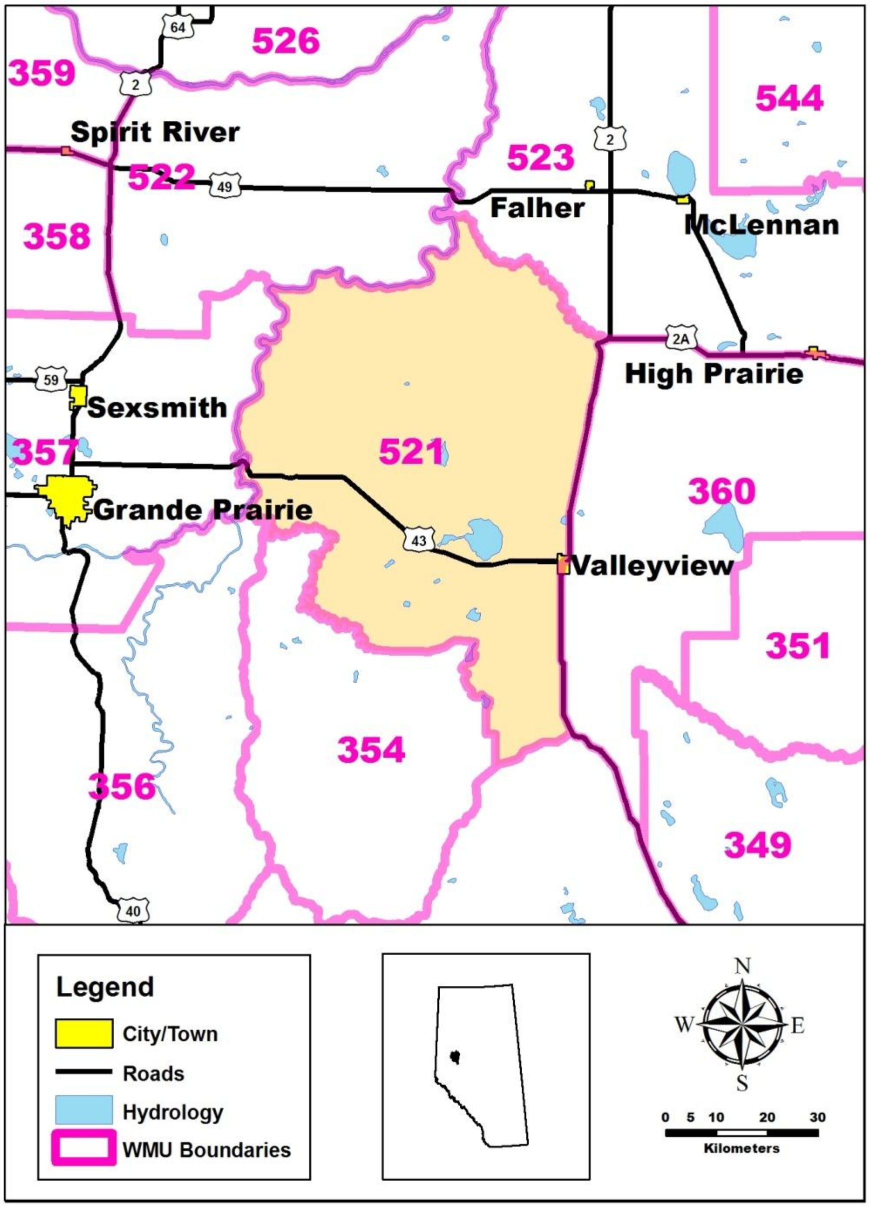

Figure 17. Location of Wildlife Management Unit 521 in Alberta.

6.10.2 *Survey methods*

Transects were flown across WMU 521 by fixed-wing aircraft on 11 and 13 January 2011 to stratify the distribution of moose and deer, in preparation for intensive survey block flights using rotary-wing aircraft. Two Cessna 206 airplanes were used to fly along transects spaced every 1 degree latitude (except for every 5th line, which fell on survey block borders) within the WMU. Air speed during stratification flights was approximately 160 km/h, and flight altitude was maintained at approximately 90 m. Locations of moose, elk, deer and other wildlife were recorded using a Garmin 60CSx GPS.

Survey blocks were classified according to the number of moose and deer observed during stratification flights, following a modified Gasaway technique (Gasaway et al. 1986; Lynch 1997), into low, medium and high density strata. Survey blocks were 5 minutes latitude x 5 minutes longitude in area. Fifteen survey blocks were randomly selected for intensive search by helicopter. Five of the survey blocks were classed as low, five as medium and five as high.

A Bell 206B helicopter was used to survey the number of moose and deer within each of the 15 randomly selected survey blocks on 14 - 21 January 2011. Each survey block was flown in an east/west orientation on flight lines spaced approximately 400 m apart, at 100 - 140 km/h, and at an altitude of approximately 30 m above treeline. Flight crews consisted of a pilot, a navigator/recorder/observer in the front seat, with two observers located in the back seat. Observers on each side of the helicopter were responsible for a field of view approximately 200 m wide. Animals were identified by sex and age using physical characteristics that were easily observed from the air (e.g. presence of white vulva patch on cow moose, or antlers on males). Following the moose and deer surveys, we surveyed elk on 22 January 2011 in areas where damage complaints or prior knowledge of elk locations (gained through the stratification flights) guided efforts to find large or dispersed herds. Adult males of all ungulate species with antlers present, were classed as either small, medium or large (ASRD 2010). All data was compiled and entered in the Quadrat Survey Method Program developed as per the Gasaway population model (Lynch 1999). We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Heavy snow flurries and ice fog throughout mid-January impeded our ability to survey on consecutive days. Snow flurries during stratification flights kept crews grounded on 12 January and for portions of 13 January. Cloud cover was between 50% and 60% providing flat light conditions. Temperatures averaged between -20 and -27 degrees Celsius. Ground temperatures at the start of the intensive survey block flights averaged -20 degrees Celsius; however, conditions warmed throughout the week to +2 degrees Celsius near the survey's end. Winds were generally calm throughout the moose and deer portions of the survey, but were gusting between 30 - 50 km/h during elk surveys. Snow conditions were excellent, with an average of 90 cm of fresh snow. Sightability was generally good throughout the farmland and mixed conifer/deciduous forest.

6.10.3 Results

We flew 15 survey blocks during the intensive survey (5 low, 5 medium and 5 high), resulting in a moose population estimate between 2,513 and 3,406 in WMU 521 (Table 22). Most bulls (54.8%) had already shed their antlers at the time of the survey. The remaining bulls were classed as small (37.6%) or medium (7.5%). Given the timing of the survey, it is likely that the large bulls had already dropped their antlers.

Deep snow conditions and variable weather during the survey (preventing surveying on consecutive days) resulted in a great deal of variability and questionable accuracy of results for mule deer and white-tailed deer. In particular, we suspect that large groups of mule deer moved between the stratification and intensive surveys. As a result, a precise population estimate for mule deer in WMU 521 was not obtained. White-tailed deer populations were estimated to range between 941 and 1,795 (Table 22), but these results must be interpreted with caution.

A total of 1,588 elk were observed, with 17 bulls and 39 calves per 100 cows. Note that this is only a minimum population count of elk in this WMU. Elk data have only been collected on an opportunistic basis during previous surveys, thus historical comparisons cannot be made for elk in this WMU.

Table 22. Comparison of aerial survey results for moose, white-tailed deer and elk in Wildlife Management Unit 521 from 1998 - 2011.

Species/Year	Population estimate (90% confidence limits)	Animals/km²	Ratio to 100 Females	
			Males	Juveniles
Moose				
2011	2,959 (±15.1%)	0.23	26	48
2005	4,782 (±11.0%)	1.02	33	48
1998	4,306 (±17.7%)	0.93	16	109
White-tailed deer				
2011	1,368 (±31.2%)	0.29	8	52
2005	4,490 (±15.6%)	0.24	35	126
1998	1,099 (±30.7%)	0.96	27	114
Elk				
2011[a]	--	--	17	39

[a] No data from previous years is available for comparison.
"--" A precise estimate was not obtained.

6.11 Wildlife Management Unit 523 moose, mule deer and white-tailed deer

Section Author: Dave Moyles, Al Fontaine, and Ryan Hermanutz

The modified Gasaway method (Gasaway et al. 1986) has been used since the winter of 1993 - 1994 to estimated moose populations in Alberta. This technique has been employed three times to estimate moose populations in WMU 523. In the late 1990s, the technique was adapted for mule deer and white-tailed deer and since then, WMU 523 has been surveyed twice, using this technique, to estimate deer populations.

6.11.1 Study area

WMU 523 is shaped like an upper case "L", with the top half in Northern Sunrise County No. 133, the central and southwest portion within the M.D. of Smoky No. 130 and the southeastern extension within the M.D. of Big Lakes (Figure 18). Peace River and High Prairie are the largest towns in this WMU, and there are numerous smaller communities. The aboriginal communities of Cadotte Lake and Peavine Metis Settlement are near to this unit, accounting for significant hunting pressure, particularly along the eastern and southeastern portions of the WMU. WMU 926, the Green Valley

Provincial Park, is enclosed by WMU 523. The bulk of WMU 523 is classified into the boreal forest dry mixedwood subregion, while the eastern boundary lies within the central mixedwood subregion (Natural Regions Committee 2006). This WMU is dominated by agriculture and is primarily deeded land, with some Crown land along river valleys and WMU boundaries. There is oil and gas development throughout the farmland and fringe areas. The majority of the WMU is accessible to hunting pressure, dependant on permission from landowners.

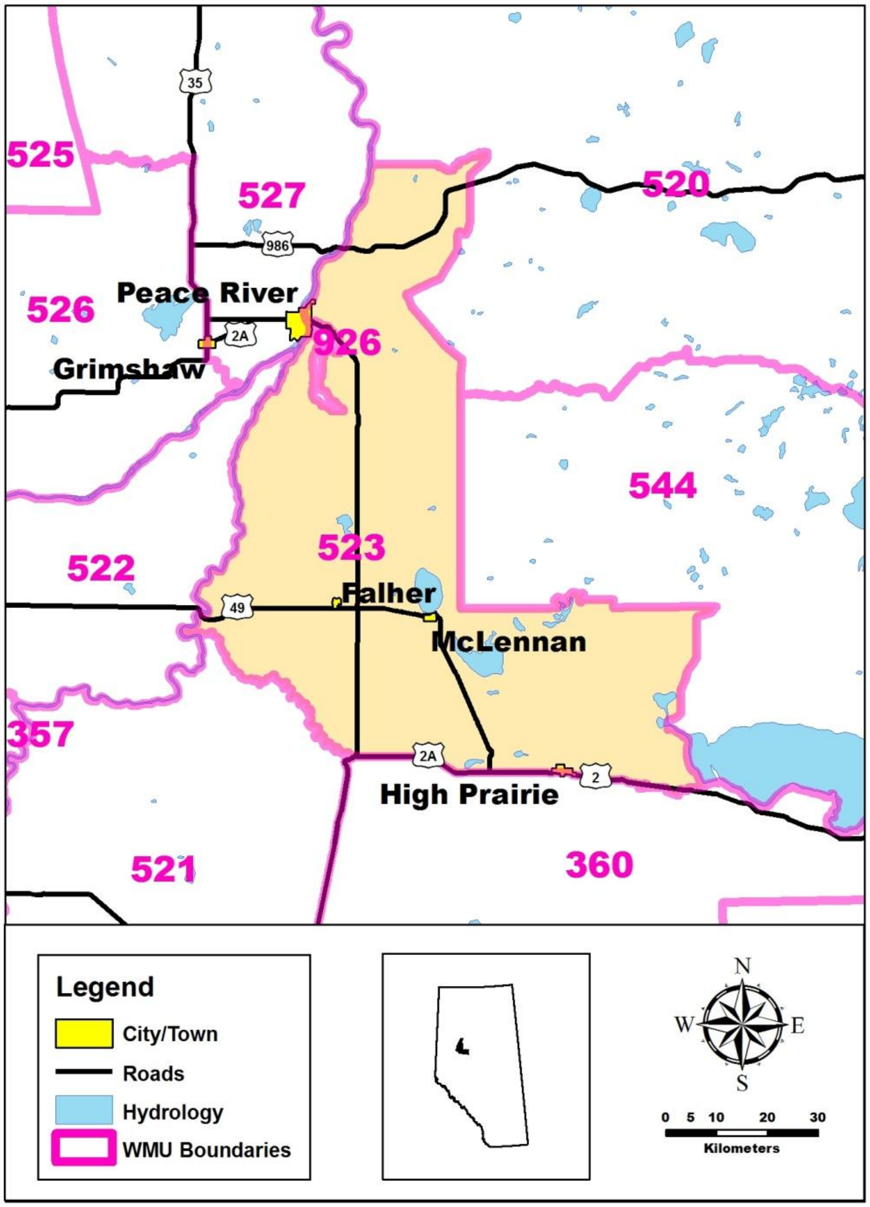

Figure 18. Location of Wildlife Management Unit 523 in Alberta.

6.11.2 Survey methods

All surveys were conducted following the modified Gasaway method as per Lynch (1997). Using two Cessna 206 fixed-wing aircraft on 9 - 10 January 2011, we flew stratification transects orientated in an east/west direction on every minute of latitude. Each crew consisted of a pilot and three observers; a navigator/observer in the front and two observers in the rear seat. For each wildlife observation, the front observer took a waypoint using a hand-held Garmin 60Cx or 76Cx GPS and recorded the sighting. All waypoints were downloaded using Minnesota DNR Garmin ver. 5.03 and plotted using ArcMap 9.3. Stratification of survey blocks was based on a combination of factors, including numbers of moose and deer observed during the stratification flights, past survey results, local knowledge of access, landuse patterns and habitat changes, and 2009 aerial imagery.

Intensive survey block flights were flown from 11 - 17 January 2011 using two Bell 206B helicopters. In total, we searched 23 survey blocks with varying classifications of low, medium or high density strata. Crews flew east/west transects that were spaced approximately 0.25 minute of latitude apart. All moose observed were classified as adults or calves, based on body size and length of the nose; all yearling moose were considered as adults. Adult moose were classified as cows if a vulva patch was present. Occasionally the antler bases could be seen on antlerless bulls. Bull moose with antlers were classified as small, medium or large, as per ASRD protocol (ASRD 2010). Deer were classified as to species, then to age, based on body size and length of the muzzle. Male adult deer with antlers were classified as small, medium or large, as per ASRD protocol (ASRD 2010). Some adult deer without antlers were not classified to gender. We did not correct for sightability; therefore, overall counts should be considered as minimum population estimates and direct comparisons of survey results among years may be difficult.

Conditions for the stratification flights were fair to poor with ice fog, low cloud cover and snow squalls interfering with flight lines and visibility. Temperatures ranged from -24 to -17 degrees Celsius and winds were calm. During the intensive survey block flights, conditions varied greatly from clear skies to near white-out conditions, mixed with ice fog. Temperatures ranged from -30 to -22 degrees Celsius. Winds varied from calm to 20 km/h.

6.11.3 Results

We flew 23 survey blocks (6 low, 7 medium and 10 high) during the intensive survey flights, with a total of 855 moose observed (153 bulls, 487 cows, 199 calves and 16 unclassified). The moose population was estimated to be between 2,913 and 3,677 in WMU 523 (Table 23). The ratio of bulls to cows improved over earlier years, although the ratio of calves to cows appears to have declined. There is now a limited-entry hunt for calf moose in WMU 523.

The mule deer population estimate was lower than the previous survey; however, the confidence intervals in 2011 (1,800 - 2,272) overlap the 2001 confidence intervals (2,067 - 2,599) (Table 23). The 2001 survey was conducted about halfway through a period of relatively mild winters and increasing deer populations, and likely would not have documented mule deer numbers at their peak. During the 2011 survey, antler drop had commenced and only one of the 103 males had antlers.

The white-tailed deer population estimate has increased since 2001, to between 3,167 and 4,671 (Table 23); however, again the confidence intervals overlap with the 2001 survey. It does appear as though white-tailed deer have finally recovered from population declines suffered during the severe winters between 1995 and 1997 (ASRD unpublished data). During the 2011 survey, antler drop had commenced and only two of the 135 males had antlers.

Table 23. Comparison of aerial survey results for moose, mule deer and white-tailed deer in Wildlife Management Unit 523 from 1999 - 2011.

Species/Year	Population estimate (90% confidence limits)	Animals/km^2	Ratio to 100 Females	
			Males	Juveniles
Moose				
2011	3,295 (±11.6%)	0.58	31	41
2001	2,833 (±11.8%)	0.51	19	67
1999	2,612 (±12.2%)	0.46	21	73
Mule deer				
2011	2,036 (±11.6%)	0.36	41	88
2001	2,333 (±11.4%)	0.42	39	72
White-tailed deer				
2011	3,919 (±19.2%)	0.70	30	84
2001	2,853 (±16.2%)	0.51	27	87

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