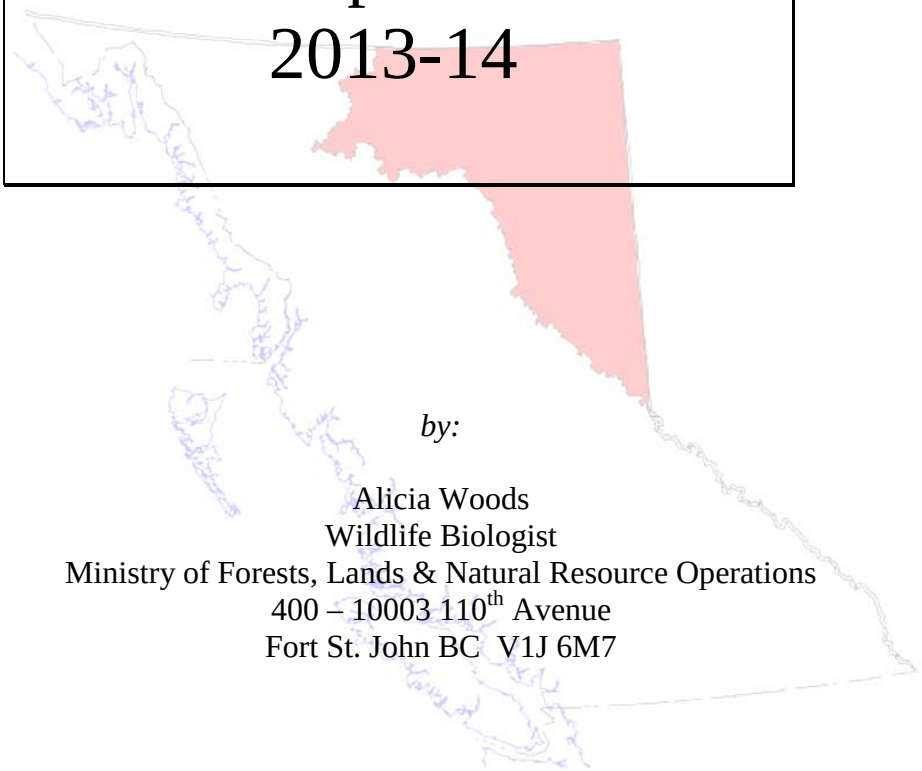
Agriculture Zone Winter Replicate Count 2013-14



by:

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BRITISH COLUMBIA

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Executive Summary

The winter of 2006-2007 was more severe than average in terms of snow depths, temperatures, and a delayed spring. The severe winter coincided with the liberalization of hunting regulations for mule deer in the agricultural area of the Peace Region by the Ministry of Environment. In order to quantify the immediate effects of these two factors on ungulate populations and to monitor changes in ungulate populations over time, four survey blocks that had been counted for a mule deer survey in 2005 were identified and re-surveyed from 2007-2010, 2012, and again in 2013-14, and will be surveyed annually when funding is available. The four blocks are in management unit 7-33. The count focussed on number and classification by age and sex of mule deer, white-tailed deer, elk and moose, and recorded observations of incidental species (primarily wolves, coyotes and sharp-tailed grouse). The total number of mule deer observed in 2013-14 was 270, representing an overall decrease of 60% in mule deer numbers from 2005, prior to the severe winter of 2006-2007. White-tailed deer numbers have fluctuated since 2005, and the number observed in 2013-14 was comparable to that observed in 2005. A total of 99 moose were observed in the four replicate blocks in 2013-14, which is the lowest count of moose since 2005, representing a decrease of 24% from 2005 and a decrease of 28% from 2012. Overall elk numbers have appeared to increase from 2005 and 2012; however, this type of survey does not provide reliable results indicative of elk populations in the agricultural area.

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1 Introduction

1.1 Background

The winter of 2006-07 was more severe than average in terms of snow depths, temperatures, and a delayed spring. Coincident with the severe winter, hunting regulations for mule deer in the agricultural area of the Peace Region were liberalized by the Ministry of Environment. In order to quantify the immediate effects of the winter and change in hunting regulations on ungulate population numbers and demographics, as well as to monitor future changes, four survey blocks that had been counted for a mule deer survey in 2005 were identified to be re-surveyed annually. Annual funding for wildlife surveys is highly variable based on availability and priorities, so the survey was designed to be inexpensive and feasibly conducted in less than two days. With additional funding, extra survey blocks have been added to the survey each year to provide additional data and comparisons between years.

1.2 Objectives

The objectives of the continuing project are to:

1. Conduct an inexpensive survey to measure a relative index of change in ungulate populations in the main agricultural area of the Peace Region following the severe winter of 2006-07;
2. Design survey methodology and define area that could be used annually to track relative changes in ungulate populations in the agricultural area of the Peace Region.

2 Methods

2.1 Study Area

Block boundaries were chosen based on approximately 50 km^2 blocks delineated for the winter 2005-06 mule deer count in the agricultural area of the Peace Region. Each block is half of a township and the boundaries follow surveyed road allowances, which are often visible from the air as roads, fence lines, or linear features through forest. Blocks were chosen to represent land north (1 block) and south (2 blocks) of the Peace River, and to include a portion of the banks of the Peace River (1 block; Figure 2.1 & 2.2).

Additional survey blocks were added to the Ungulate Winter Replicate Block Count to further provide information on trends of ungulate populations in the Agriculture Zone (Figure 2.2). Three of the additional blocks were used during the 2005 mule deer inventory and resemble the replicate blocks in size and shape (5 km x 10 km), whereas the other additional blocks are smaller in size (5 km x 5 km). Additional blocks have been surveyed during the Ungulate Winter Replicate Block Count as funding has been available (Table 2.1).

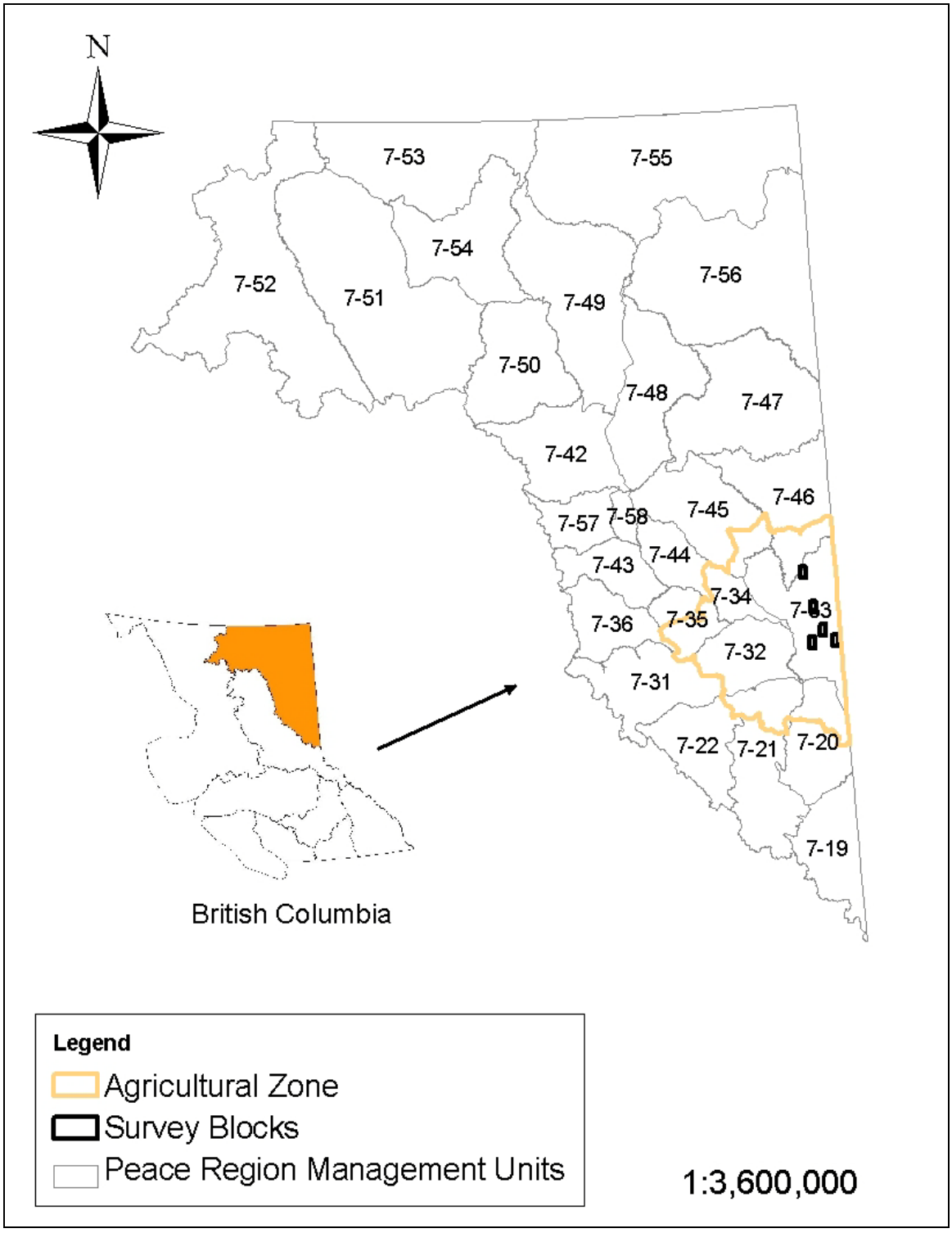

Figure 2.1. Location of the four replicate blocks, and Block 25, surveyed in the Peace Region for the 2013-14 Agriculture Zone ungulate winter replicate count.

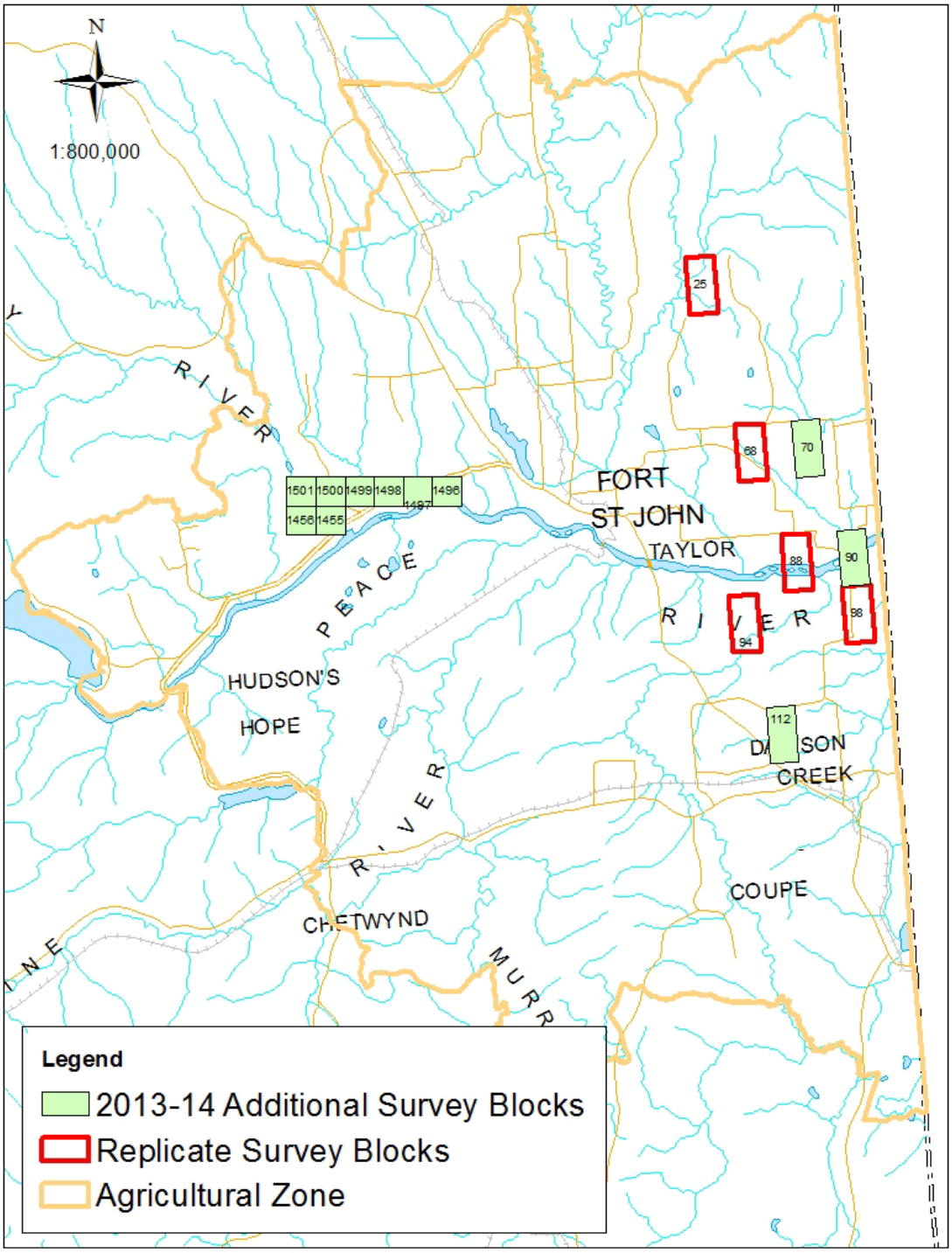

Figure 2.2. Location of the four replicate blocks, Block 25, and eleven additional survey blocks counted in 2013-14 Agriculture Zone ungulate winter replicate counts.

Table 2.1. Summary of the blocks surveyed in the Agriculture Zone since 2005.

Block Number	2005-06 Dec 2005	2007-08 Dec 2007	2008-09 Dec 2008	2009-10 Feb 2010	2010-11 Dec 2010	2012-13 Dec 2012	2013-14 Feb 2014
25	x			x	x	x	x
70							x
68	x	x	x	x	x	x	x
88	x	x	x	x	x	x	x
90	x						x
94	x	x	x	x	x	x	x
98	x	x	x	x	x	x	x
112	x						x
1455				x		x	x
1456				x			x
1496				x		x	x
1497				x		x	x
1498				x			x
1499				x		x	x
1500				x			x
1501				x			x
1594				x			
1637				x		x	
1726				x		x	
Total Blocks Counted	7	4	4	16	5	11	16

2.2 Inventory

Flights were conducted with three observers and one pilot in a Bell 206B Jet Ranger helicopter. The forward observer also acted as navigator and recorded flight lines on a Garmin GPSmap 60Cx hand held GPS unit. Survey blocks and satellite image maps were viewed digitally on an iPad2 (IOS 6.1.3), using the application GIS Pro. Real-time tracking and flight lines were shown and recorded in GIS Pro during surveying to ensure full coverage of the block and to confirm animals as inside or outside block boundaries. One observer in the rear acted as data recorder (data sheet included in Appendix A). All individuals were responsible for spotting animals, including the pilot.

On average 10 passes were made over each block, requiring observers on either side of the helicopter to view a transect approximately 300 meters wide from the helicopter. The helicopter flew at approximately 80 km/h, except when circling to count and classify a group. Large, snow-covered fields were not flown as intensely where adequate visibility allowed the observers to rule out the presence of ungulates from a large distance.

During the inventory all species (elk, mule deer, moose, white-tailed deer, coyote, wolf, and sharp-tailed grouse) were counted. Other incidental species observed were also recorded. Due to the late winter timing of the 2013-14 survey, deer and elk were classified as young of year (YOY), antlerless adult (AA), and males were classified as unclassified males, yearling males or Class I-IV males based on antler configuration, when available. Moose were classified as cow, bull (unclassified) and young of year.

2.3 Weather

To illustrate the effects of winter weather conditions on ungulate populations, a Winter Severity Index (WSI) was generated from the mean air temperatures and the total snow precipitation during the period of November to April for each year. Wildlife Severity Index values were plotted against the replicate block count results of the following year (e.g., weather from 2004-05 plotted for 2005-06 winter replicate count results), to illustrate the lag effect of adverse winter weather on ungulate populations. Greater WSI values represent more harsh, severe winter weather conditions. Methods used to generate the WSI incorporated measures of monthly snowfall and mean monthly air temperatures, including a temperature-dependent multiplier used to scale the effect of snowfall (Baccante & Woods 2010). The following formulas were used to calculate WSI:

- if TEMP $\leq$ -25^{o}C, then WSI = 4 × SNOW
- if TEMP > -25^{o}C and $\leq$ -15^{o}C, then WSI = 3 × SNOW
- if TEMP > -15^{o}C and $\leq$ -5^{o}C, then WSI = 2 × SNOW
- if TEMP > -5^{o}C, then WSI = 1 × SNOW

3 Results

The survey took place on February 28, March 1 and 2, 2014 for a total cost of $21,470, all of which was spent on helicopter charter. All blocks had complete snow cover for the duration of the survey, and the last snowfall occurred 4 days before the first survey day. The temperature fluctuated between -20 and -30°C. The average time spent searching in each of the blocks was 72 minutes (Block 68 = 60 minutes, Block 88 = 104 minutes, Block 94 = 68 minutes, Block 98 = 60 minutes, and Block 25 = 68 minutes). Skies were clear on all survey days, and wind speed was negligible (< 8 km/hr) on all days.

3.1 Mule Deer

In 2013-14, a total of 270 mule deer were counted in the four replicate blocks surveyed. This is a 35% decrease from 2012-13, and is only slightly higher than the lowest recorded count of 231 in 2009 (Table 3.1). Compared to 2012-13, all replicate blocks experienced a decline in the number of mule deer observed. However, due to the survey being conducted in February, as opposed to December, a more direct comparison of late winter numbers can be made with the 2009-10 survey. Block 68 increased from 12 mule deer in 2009-10 to 27 mule deer in 2013-14

and Block 88 also increased from 136 to 227 mule deer (2009-10 and 2013-14, respectively). All other blocks saw declines (Block 94 and Block 98; Figure 3.1)

Table 3.1. Total count and classification of mule deer observed in the four replicate blocks over seven survey years (2005-2013).

Year	Fawns	Antlerless Adults	Yearling Males	Mature Males	Total
2005	190	370	54	47	661
2007	85	184	16	48	333
2008	143	251	9	35	438
2009	80	117	12	22	231
2010	148	213	27	42	430
2012	131	232	13	40	416
2013	37	227	2	4	270

The ratio of fawns per 100 does in 2013-14 was the lowest observed since the winter replicate count began in 2007 (16.3 fawns:100 does). In 2007, the fawn:doe ratio was 46.2 fawns:100 does, and in 2009 (comparable survey timing) the fawn:doe ratio was 68.4 fawns:100 does. The ratio of bucks:100 does could not be calculated with any certainty for the 2013-14 survey year due to antler loss associated with the late season survey. It is possible that the low fawn:doe ratio may be biased low due to the higher number of antlerless adults observed that would have included a portion of the bucks in the population. However, this would have also been a concern in the 2009-10 survey, which was conducted during February, and did not report low fawn:doe ratios.

Mule deer populations are susceptible to fluctuate on a yearly basis from extreme winter weather conditions. Figure 3.2 and Figure 3.3 illustrate that mule deer populations tend to respond positively (greater number of mule deer observed) to mild winter conditions (such as observed in 2005, 2008, 2010, and 2012 survey years), and negatively when the previous year's weather conditions were more severe. In particular, the winter of 2006-2007 resulted in a decrease of the number of mule deer observed by nearly 50% from 2005 numbers. A similar decline in mule deer numbers was observed in 2009 and 2013, after harsh winter conditions were experienced in the previous (2008-09 and 2012-13) winter seasons. The winter of 2012-13 experienced cold temperatures and high snow accumulations during early winter (November and December), was relatively mild during January and February, and then had high snow accumulations again during late winter (March and April). The decline mule deer in each of the replicate blocks reflects these inclement winter conditions from the 2012-13 winter. Although winter conditions from the current winter season (2013-14) are not considered directly in the Winter Severity Index for this year's survey, record snowfall accumulations were experienced in December 2013 (135.6 cm snowfall, Environmental Canada, unpubl. data). This snowfall combined with a later survey date, may have further contributed to the declines observed in mule deer in each of the replicate blocks.

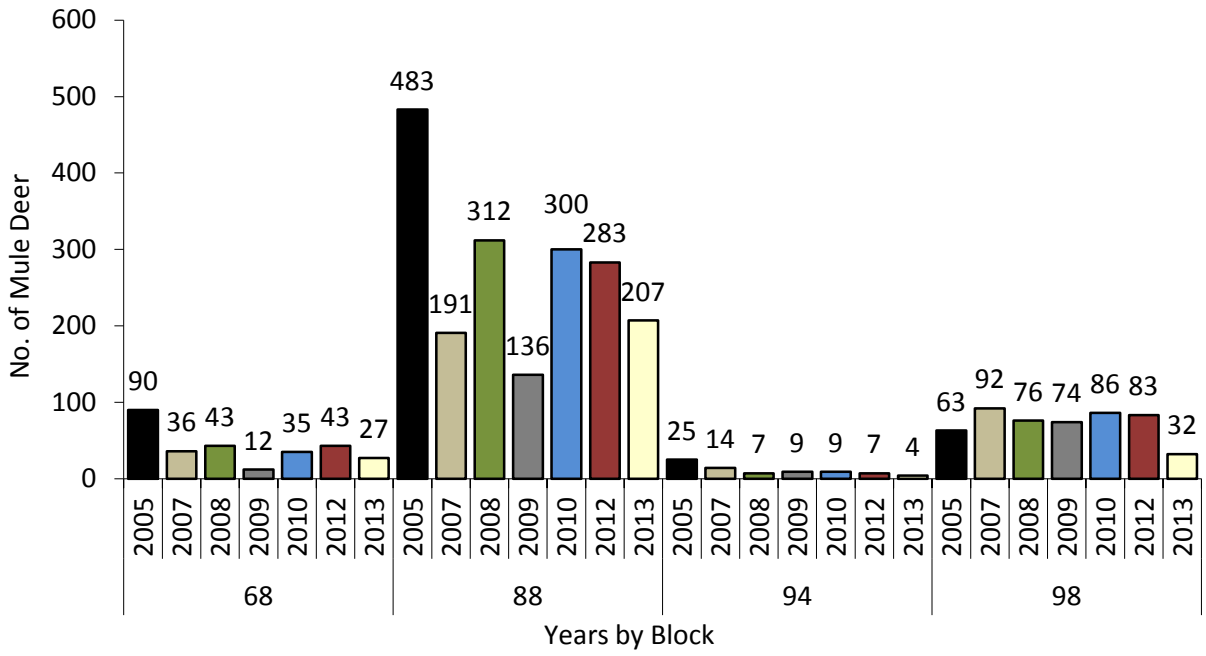

Figure 3.1 Number of mule deer observed in each replicate block over seven survey years (2005-2013).

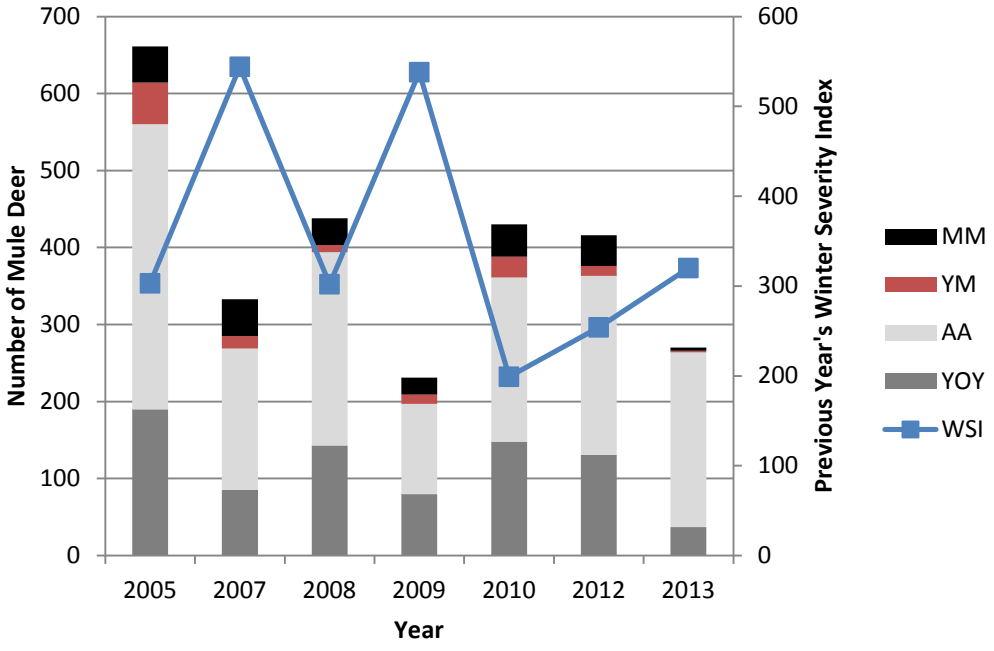

Figure 3.2. Comparison of classified counts of mule deer for four combined survey blocks over seven survey years (2005-2013). YOY = young of year, AA = antlerless adult, YM = yearling male, MM = mature male. The Winter Severity Index (WSI) represents winter conditions from the previous spring and winter to illustrate the lag effect of adverse winter weather conditions on deer populations. Greater WSI values indicate more inclement winter weather conditions.

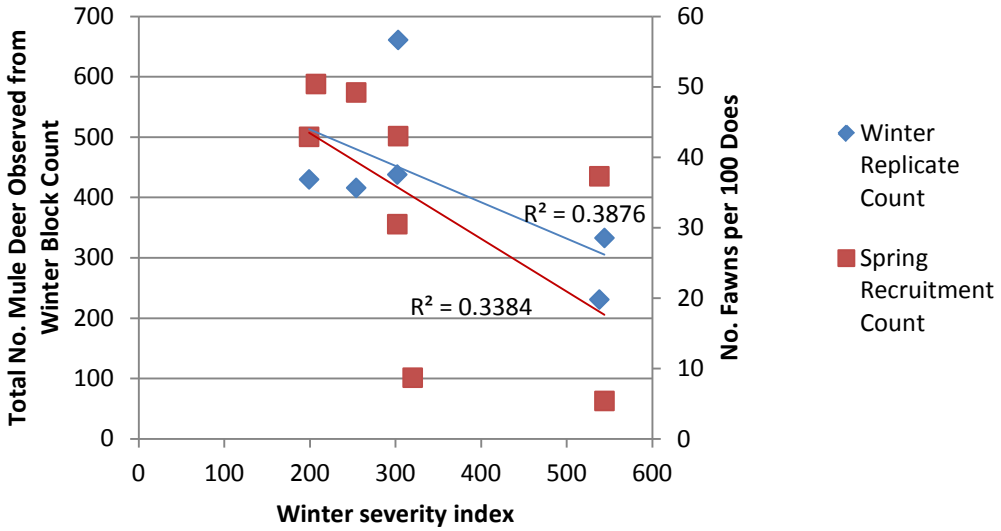

Figure 3.3. Regression of the total number of mule deer observed during the Winter Replicate Block Counts (2005-2013) and the ratio of fawns per 100 does counted during Spring Recruitment Counts (2005-2013; MFLNRO unpubl. data) against the Winter Severity Index (WSI). Greater WSI values indicate more inclement winter weather conditions.

3.2 White-tailed Deer

A total of 80 white-tailed deer were observed in the four replicate blocks in 2013-14. This is an increase from 2005 (n = 47) and is an increase from the number observed in the 2012 survey (n = 54; Table 3.2). The number of deer observed was lower in Blocks 68 and 94, but higher in Block 98 compared to previous years (Figure 3.4).

Table 3.2. Total count and classification of white-tailed deer observed in the four replicate blocks over seven survey years (2005-2013).

Year	Fawns	Does	Yearling Males	Mature Males	Total
2005	15	24	6	2	47
2007	21	48	5	8	82
2008	27	46	4	10	87
2009	15	31	5	3	54
2010	23	29	4	11	67
2012	15	31	2	6	54
2013	18	62*	0	0	80

*indicates antlerless adults, as does and bucks could not be distinguished due to antler loss

In the 2013-14 survey, the ratio of fawns per 100 does (29.0 fawns:100 does) was the lowest that has been observed since the start of the replicate surveys in 2005. The ratio may be biased low due to a larger number of antlerless adults observed due to the late season timing of the survey and increased antler loss. A total of 18 fawns were counted in 2013-14, which is comparable to 2009, which was also a late-season survey (Table 3.2).

Similar to mule deer, white-tailed deer numbers tend to fluctuate in response to the previous year's weather conditions (Figure 3.5). In particular, the 2008-09 winter resulted in a decrease in the number of white-tailed deer observed (greater WSI scores indicate harsher winter conditions), whereas more mild winter weather in 2009-10 and 2011-12 (lower WSI scores) were associated with greater number of deer observed during the 2010 and 2012 surveys. Inclement weather conditions in 2012-13 did not seem to impact the overall number of white-tailed deer observed in the replicate blocks, as numbers are comparable as to those observed in 2007 and 2008, and are higher than observed in recent survey years.

Population trends as a result of this survey should be interpreted with caution, as this type of survey method is not preferable for white-tailed deer due to poor visibility of animals from the air (RISC 2002). Further, populations of white-tailed deer in the Agriculture Zone during winter months are not evenly distributed across the landscape, as would be expected in more natural habitats, due to the varying availability of crops in the Agriculture Zone. Therefore, total numbers observed in the replicate blocks may fluctuate each year due to seasonal availability of crops within and adjacent to the survey blocks.

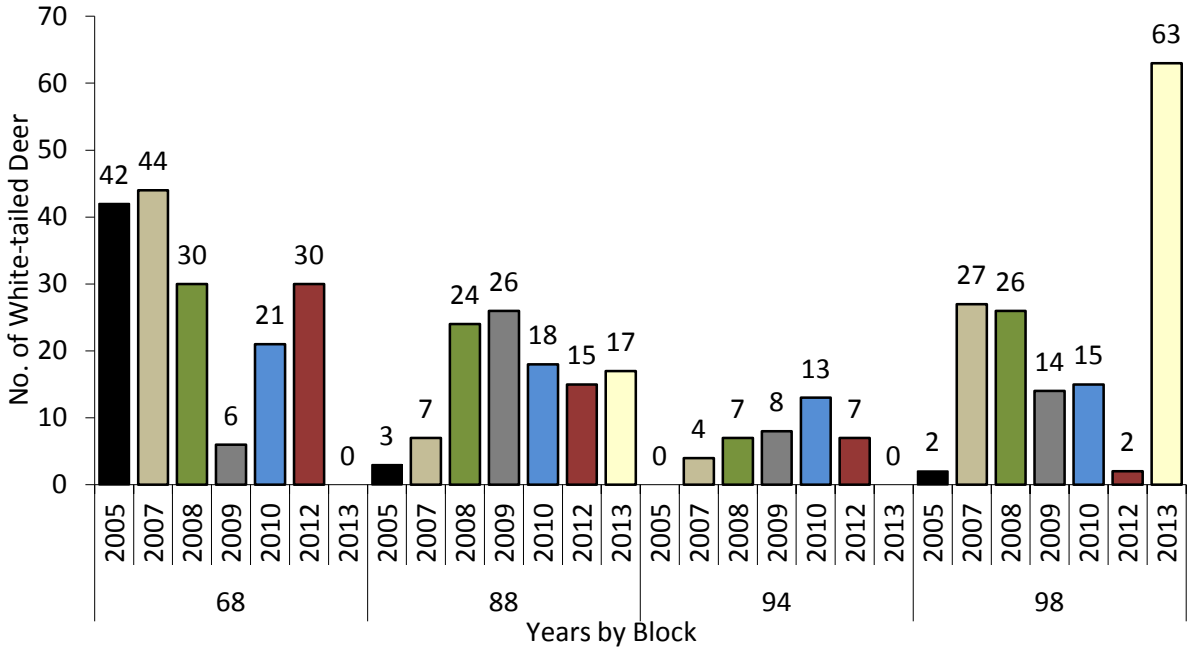

Figure 3.4. Number of white-tailed deer observed in each replicate block over seven survey years (2005-2013).

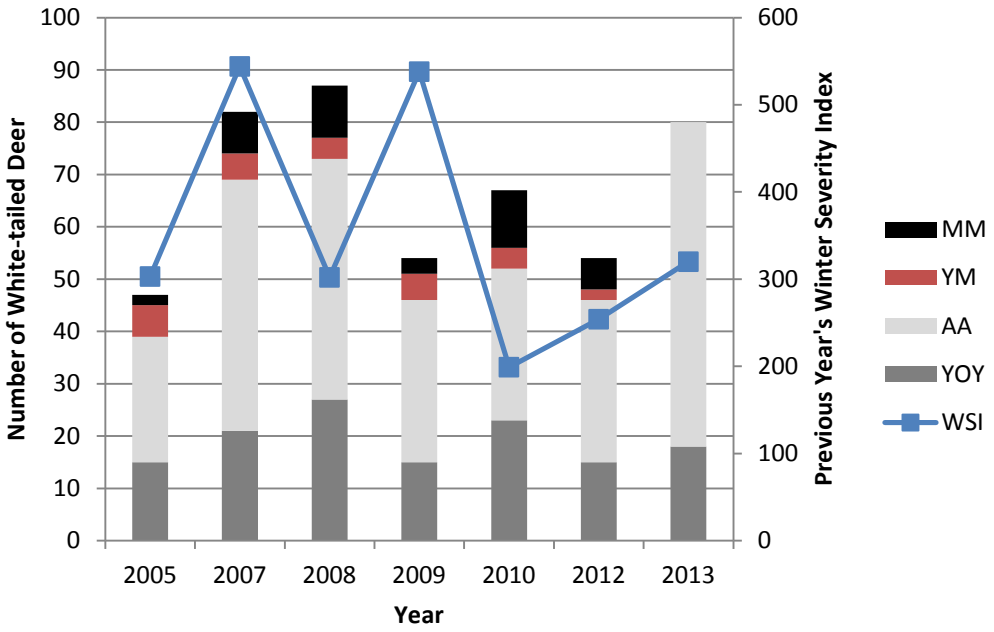

Figure 3.5. Comparison of classified counts of white-tailed deer for four combined survey blocks over seven survey years (2005-2013). YOY = young of year, AA = antlerless adult, YM = yearling male, MM = mature male. The Winter Severity Index (WSI) represents winter conditions from the previous winter to illustrate the lag effect of adverse winter weather conditions on deer populations. Greater WSI values indicate more inclement winter weather conditions.

3.3 Moose

A total of 99 moose were observed in the four replicate blocks counted in the 2013-14 survey. This is a 28% decrease from 2012 (n = 138) and a 24% decrease from 2005 (n = 130; Table 3.3). The number of moose observed in Block 68 has decreased from 55 moose in 2005 to 7 moose in 2013, and Block 88 saw declines from 52 to 36 in the same years. However, Blocks 94 and 98 have experienced increases in the number of moose observed since 2005 (Figure 3.6).

Table 3.3. Total count and classification of moose observed in the four replicate blocks over seven survey years (2005-2013).

Year	Calves	Cows	Yearling Males	Mature Males	Total
2005	27	79	22	2	130
2007	25	69	1	5	100
2008	33	62	3	7	105
2009	30	87	7	4	128
2010	47	84	4	15	150
2012	41	82	3	12	138
2013	29	63	0	7	99

The calf:100 cow ratio in the 2013-2014 survey (46.0 calves:100 cows) is higher than the ratio observed in 2005, but has been relatively consistent (~45-55 calves:100 cows) since 2010. The bull:100 cow ratio in 2013-2014, however, was 11.1 bulls:100 cows, which was lower than previous years, but comparable to the late season survey of 2009-2010. The highest bull:100 cow ratio was 30.4 bulls:100 cows in 2005, and the lowest was 8.7 bulls:100 cows in 2007. There does not appear to be any significant trends between weather conditions and the number of moose observed during replicate block counts (Figure 3.7). The number of moose observed was fairly consistent across all survey years, regardless of the previous year's winter weather conditions, and does not seems to show extreme population fluctuations in response to weather conditions, such as observed in mule deer.

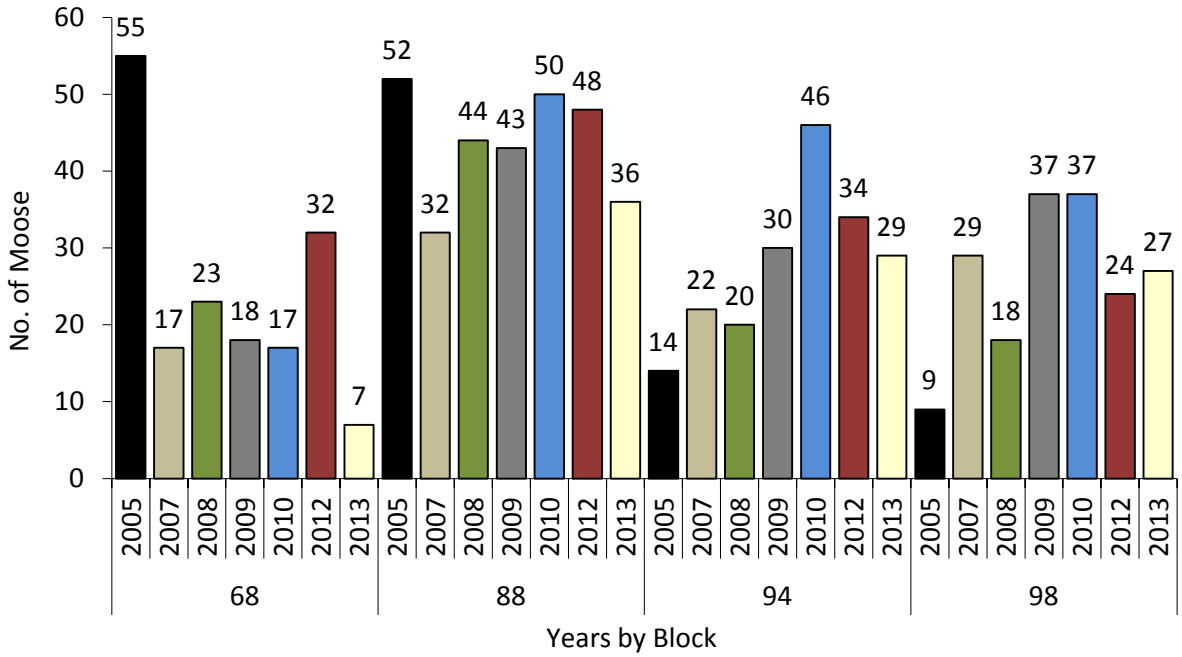

Figure 3.6. Number of moose observed in each replicate block over seven survey years (2005-2013).

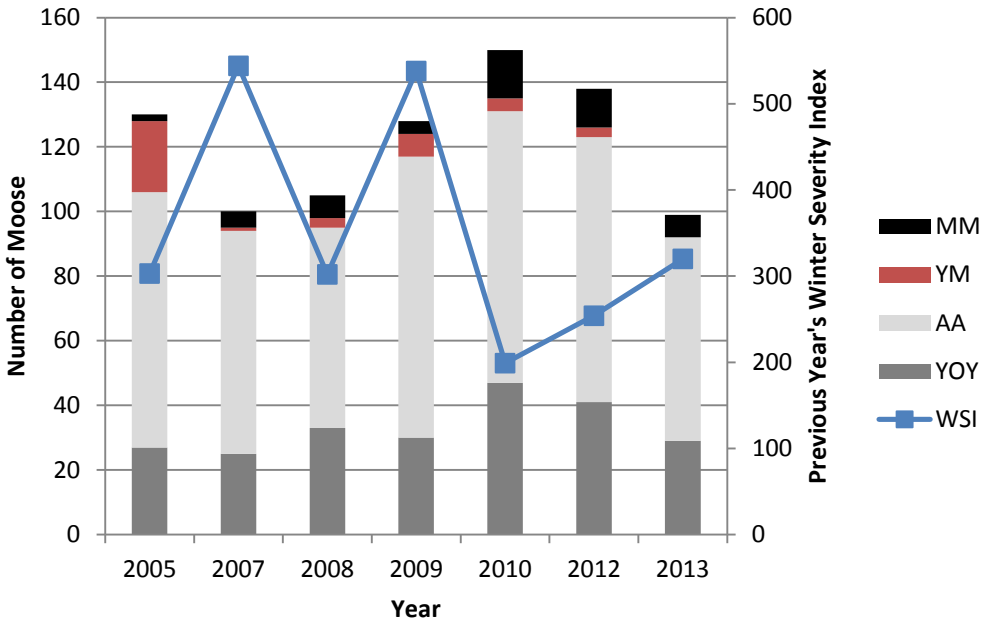

Figure 3.7. Comparison of classified counts of moose for four combined survey blocks over seven survey years (2005-2013). YOY = young of year, AA = antlerless adult, YM = yearling male, MM = mature male. The Winter Severity Index (WSI) represents winter conditions from the previous spring and winter to illustrate the effect of adverse winter weather conditions on moose populations. Greater WSI values indicate more inclement winter weather conditions.

3.4 Elk

During the 2013-14 survey, a total of 104 elk were counted in the four replicate blocks (Table 3.4). This represents over a 200% increase from the start of the replicate block survey in 2005 (n = 45) and an increase from the last survey conducted in 2012 (n = 68), but is still fewer than the 136 elk counted in 2007 (Figure 3.8). Block 88 and Block 94 have had the greatest number of elk of the four replicate blocks; however, both blocks have shown gradual decreases in the number of elk counted since 2007 (Figure 3.8).

Table 3.4. Total count and classification of elk observed in the four replicate blocks over seven survey years (2005-2013).

Year	Calves	Cows	Yearling Males	Mature Males	Total
2005	10	18	7	10	45
2007	30	85	9	12	136
2008	16	37	10	14	77
2009	25	55	5	11	96
2010	15	27	0	2	44
2012	24	40	2	2	68
2013	28	52	1	23	104

The ratio of calves per 100 cows was 53.8 calves:100 cows in 2013-14. The calf:cow ratio has been fairly consistent since the start of the survey in 2005, ranging from 35.3 calves:100 cows to 60.0 calves:100 cows. The ratio of bulls per 100 cows in 2013 was 46.2 bulls:100 cows, which is higher than the low bull ratios observed in both 2010 and 2012 (7.4 bulls:100 cows and 10.0 bulls:100 cows, respectively). This ratio is down significantly since 2005, where 94.4 bulls:100 cows were observed in the replicate blocks.

There does not appear to be a trend between the number of elk observed during the replicate counts, and the previous year's winter weather conditions. (Figure 3.9). It is important to recognize that the type of survey method used during the replicate block count does not provide the best representation of elk numbers due to their grouped distribution. Large groups of elk may move into and out of survey blocks frequently, and, therefore, may be counted in some years and missed in other years.

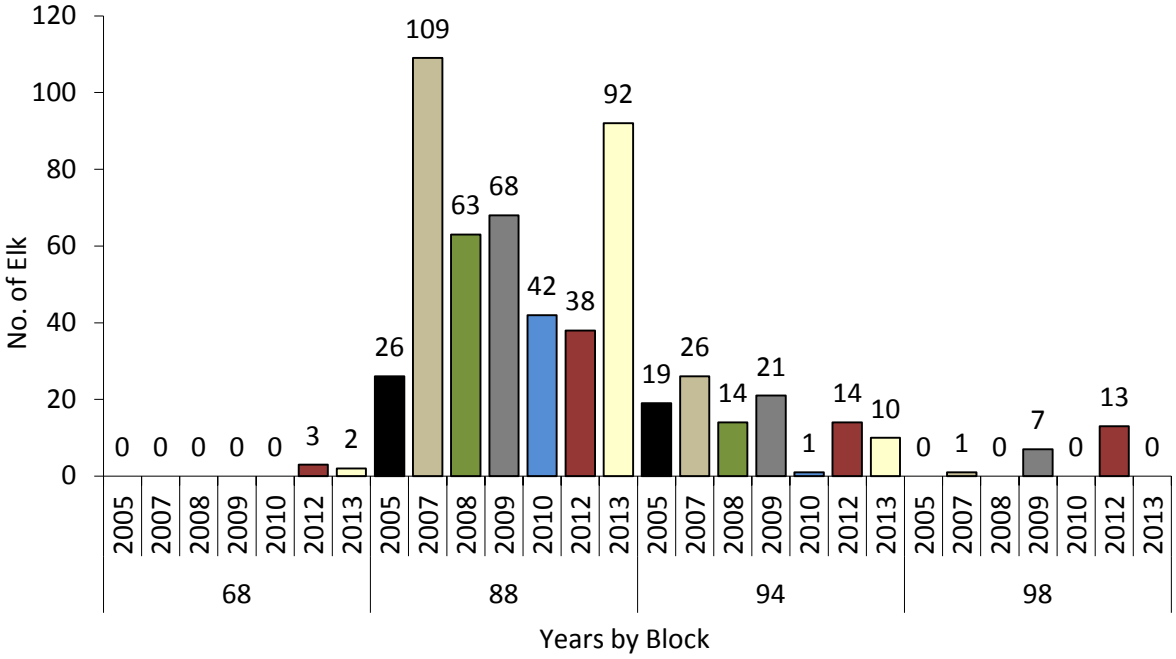

Figure 3.8. Number of elk observed in each replicate block over seven survey years (2005-2013).

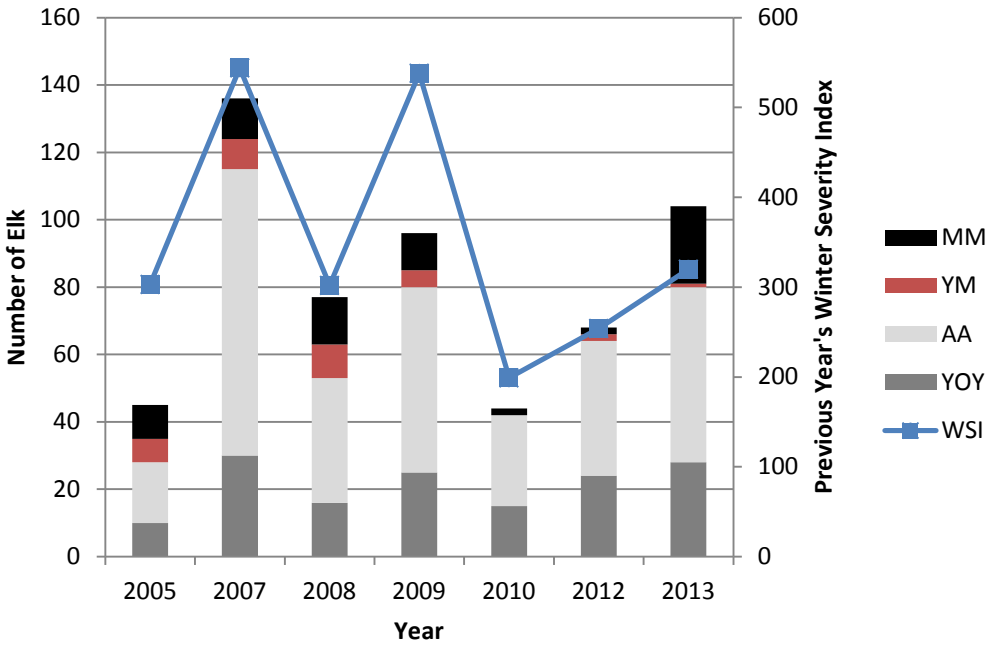

Figure 3.9. Comparison of classified counts of elk for four combined survey blocks over seven survey years (2005-2013). YOY = young of year, AA = antlerless adult, YM = yearling male, MM = mature male. The Winter Severity Index (WSI) represents winter conditions from the previous spring and winter to illustrate the effect of adverse winter weather conditions on elk populations. Greater WSI values indicate more inclement winter weather conditions.

3.5 Block 25 Results

Block 25 has been surveyed in 5 separate years (2005, 2009, 2010, 2012, and 2013). The number of moose observed has increased in each survey year; however a decrease of almost 50% was observed in 2013-14. When compared to the late-season survey of 2009-10, the number of moose observed are comparable (Figure 3.10). Block 25 does not have the habitat capable to support high mule deer numbers, and thus trends have been fairly low over the 5 survey years. In 2013-14, white-tailed deer numbers were the highest recorded in the 5 survey years (Figure 3.10).

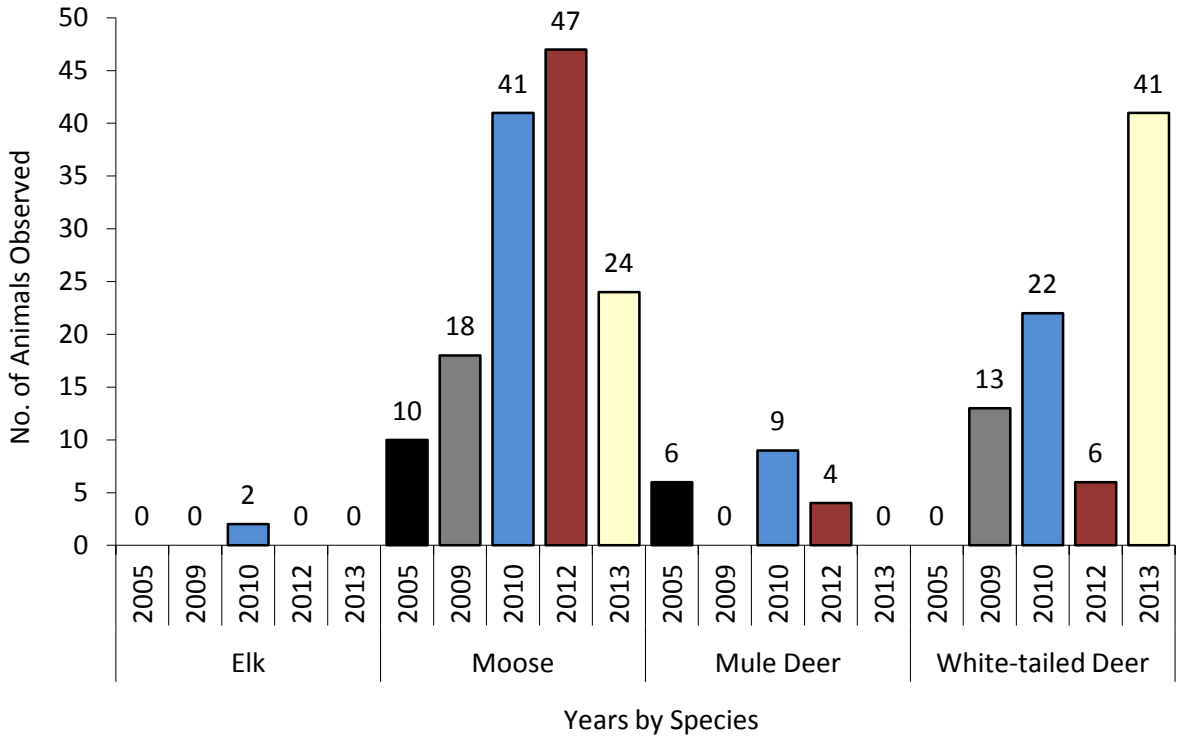

Figure 3.10. Number of elk, moose, mule deer and white-tailed deer observed in Block 25 in five survey years (2005, 2009, 2010, 2012, and 2013).

3.6 Additional Survey Blocks

In 2013-14, an additional eleven blocks (70, 90, 112, 1455, 1456, 1496, 1497, 1498, 1499, 1500, and 1501) were surveyed to further sample ungulate populations. These blocks were last surveyed in February 2010, representing a sample from the 2009-10 winter season (Table 3.5). Blocks 70, 90 and 112 are 5 km x 10 km blocks, and resemble the replicate blocks. Blocks 1455, 1456, and 1497-1501 are smaller in size (5 km x 5 km) than the replicate blocks, which may result in movement of large groups of animals (e.g. elk) between blocks, potentially skewing an accurate trend analysis. As these blocks have only been sampled for two years, it is difficult to

interpret trends; however, results have been reported here to provide additional information on the populations of ungulates across the Agriculture Zone.

Cumulative count of the additional blocks showed the number of mule deer and elk were higher in 2013-14 than in 2009-10 survey year. The number of mule deer observed in the additional blocks increased by 71% since 2009, and the number of elk increased by 42% since 2009. The number of moose observed decreased by 34%, and white-tailed deer numbers declined minimally (Figure 3.11).

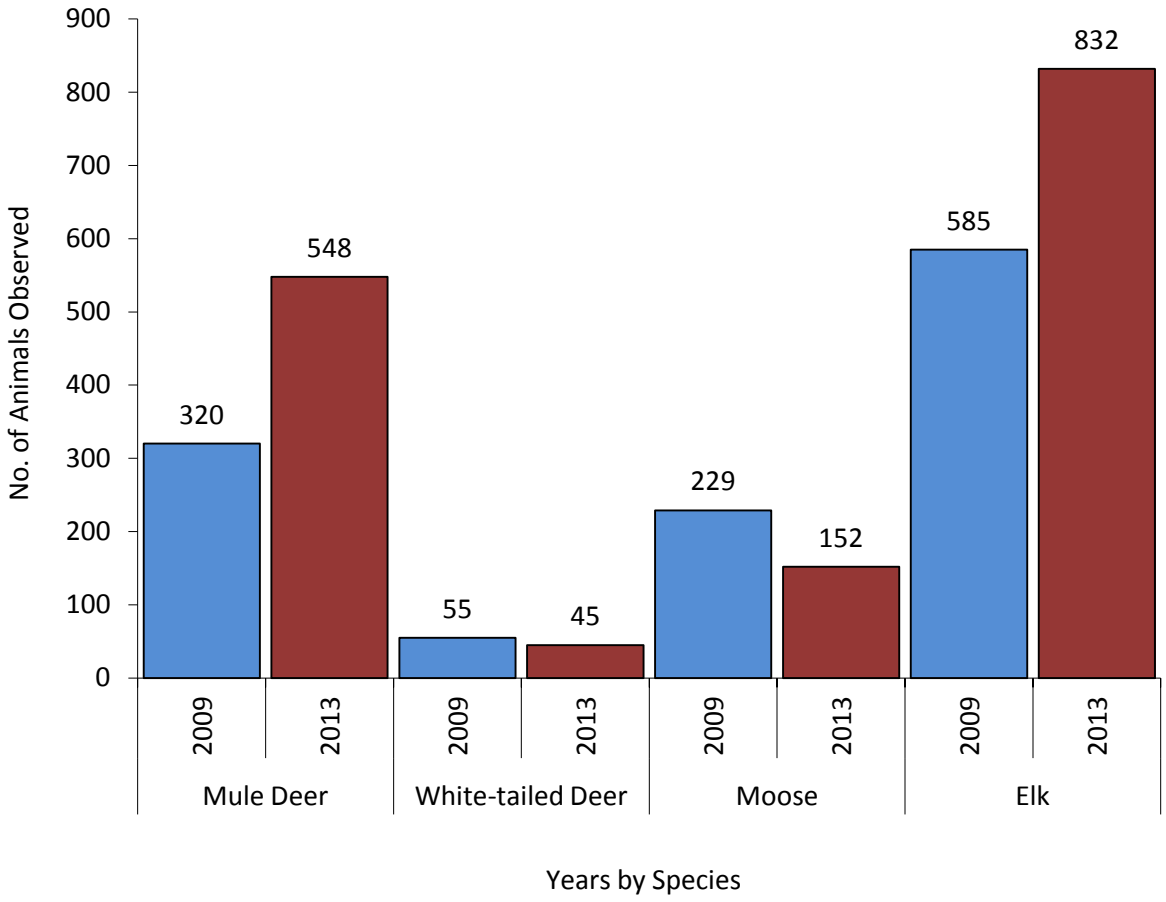

Figure 3.11. Number of mule deer, white-tailed deer, moose, and elk observed in additional survey blocks in 2009-10 and 2013-14.

Table 3.5. Summary of the total number of mule deer, white-tailed deer, moose, and elk observed in additional survey blocks since 2005.

		Species			
Block	**Year**	**MD**	**WTD**	**Moose**	**Elk**
1455	2009	11	0	5	1
	2012	92	6	11	210
	2013	60	0	6	127
1456	2009	0	0	5	0
	2013	0	0	10	77
1496	2009	107	0	36	92
	2012	165	1	40	41
	2013	139	24	16	87
1497	2009	24	8	22	83
	2012	118	2	45	75
	2013	39	5	30	14
1498	2009	24	8	22	83
	2013	46	7	7	147
1499	2009	8	6	14	122
	2012	34	9	6	72
	2013	7	0	18	40
1500	2009	8	6	14	122
	2013	0	0	6	255
1501	2009	7	0	26	82
	2013	5	0	8	62
1637	2009	14	1	25	49
	2012	8	6	22	5
1726	2009	0	0	6	0
	2012	0	0	4	0
70	2013	1	44	26	5
90	2005	78	0	44	0
	2009	118	10	41	0
	2013	252	9	34	23
112	2005	17	0	33	16
	2009	13	17	44	0
	2013	0	0	17	0

3.7 Incidental Species

In addition to ungulates, a number of other species were observed and recorded. A total of 24 coyotes were observed in the four replicate blocks. This is an increase in the number of coyotes in the replicate blocks from 2012 where only 9 coyotes were observed. General observation of all blocks surveyed indicated high coyote numbers in the Agriculture Zone. In addition, 9 wolves were observed in Block 1497.

A total of 6 sharp-tailed grouse were observed in the four replicate blocks (Figure 3.12). The total number of sharp-tailed grouse observed in 2013 is considerable lower than all previous counts. There was little consistency in trends of sharp-tailed grouse numbers across blocks (Figure 3.12). Similar to elk, this type of survey methodology does not provide an accurate index of sharp-tailed grouse population trends across the landscape, but may provide an indication of distribution over the long-term.

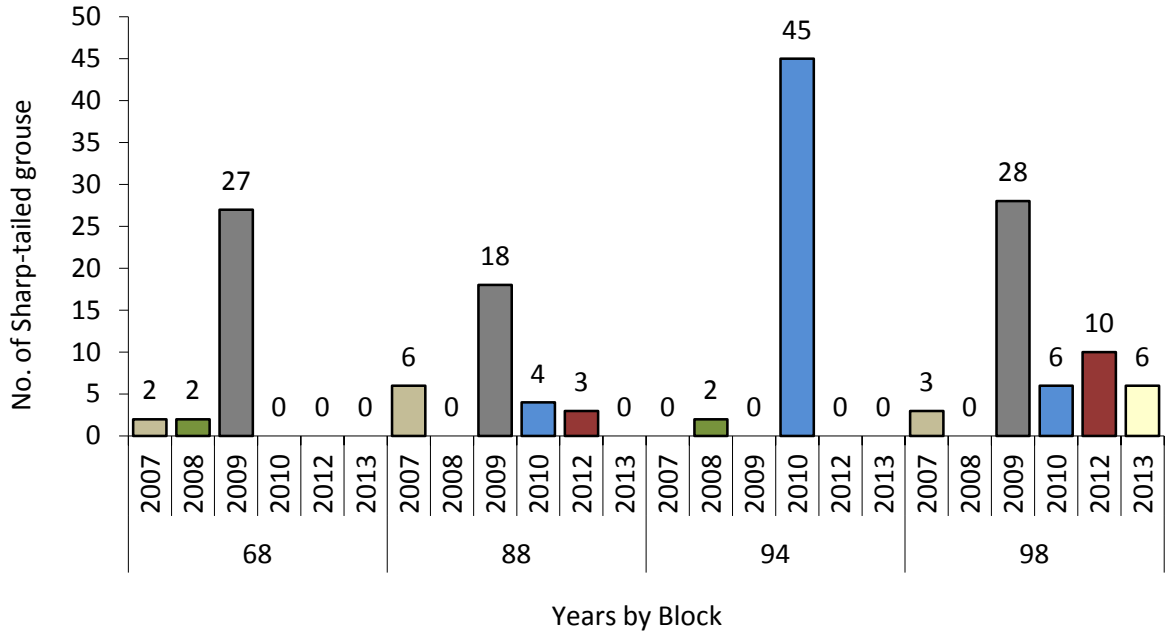

Figure 3.12. Number of sharp-tailed grouse observed in each replicate block in each of the six survey years (2007-2013). Note: Sharp-tailed grouse were not recorded during the 2005 survey.

3.8 Weather

The Winter Severity Index (WSI) was calculated separately for each winter period occurring prior to a replicate block count year. Since 2005, the Peace Region has experienced a wide range of winter weather conditions, which has the potential to impact ungulate populations. In particular, the 2006-07 and the 2008-09 winters had the highest WSI scores (i.e. severe winter weather conditions) recorded since 1997 (Table 3.7). Conversely, 2009-10 and 2011-12 winters

were fairly mild (lower WSI scores). The year with the greatest snow accumulations was the winter of 2008-09, which was also the coldest winter (Table 3.7).

Table 3.6. Summary of weather conditions experienced in the Peace Region between 2004 and 2013.

Year	Mean Temperature (^{o}C)	Total Snowfall (cm)	Winter Severity Index (WSI)
2004-05	-4.7	161.6	303
2006-07	-8.3	232.9	544
2007-08	-7.9	166.1	302
2008-09	-12.2	241	538
2009-10	-6.1	113.1	199
2010-11	-9.3	237.0	475
2011-12	-4.4	154.6	254
2012-13	-9.0	166.4	320

4 Discussion

Of the four ungulate species surveyed during this count, mule deer are the most susceptible to fluctuations in populations due to winter and early spring weather conditions; therefore, yearly trends are much more dynamic and unpredictable (Baccante and Woods 2010). Following some relatively harsh winter conditions and a liberalized harvest regime starting in 2007, mule deer populations in the Agriculture Zone showed a significant decrease from the high levels observed in 2005. In 2009, mule deer numbers had decreased by 65% from the populations observed in 2005. Two milder winters in 2009-10 and 2011-12, resulted in mule deer populations beginning to rebound from subsequent population declines following the severe winters in 2006-07 and 2008-09 (Woods 2013). However, after poor fawn recruitment in 2013 (8.7 fawns:100 does) and another harsh winter season in 2012-13 (WSI = 320), results from the 2013-2014 replicate survey suggest mule deer populations in the Agriculture Zone are still 59% lower than that reported in 2005. Each of the four replicate blocks has shown a decline in mule deer numbers from 2005, ranging from 49% in Block 98 to 84% in Block 94.

In February 2013, results of the 2012-13 Ungulate Winter Replicate Count and in anticipation of the low fawn recruitment in 2013, a mid-cycle regulation change was prompted to limit the number of mule deer susceptible to hunter harvest in the 2013-14 hunting season. As such, the 5-day general open season for antlerless mule deer was removed and the point restriction for mule deer bucks eligible for harvest was increased to bucks having greater than 4 points (from 3 points). To allow for reactive management of mule deer populations in the event of further severe winters or in the event of very high population levels in the future, a limited entry hunt (LEH) for antlerless animals was instituted for a 20-day period in December, whereas allowing for the number of permits to be increased or decreased quickly in response to survey data and

population information. Until populations recover to a level that can sustain an antlerless harvest, this season will be restricted to a low number of permits being authorized.

Although mule deer populations in the Agriculture Zone have been significantly reduced since 2005, comparisons made between this year's survey and past surveys must be made cautiously because of the late survey timing (February rather than December). Surveys conducted in February will typically show fewer animals because of the potential for greater over-winter mortality experienced from December to February, as opposed to a survey completed in December. The late winter survey conducted in 2009-10 can be compared to results obtained from this year's survey to eliminate potential bias of over-winter mortality. When the additional, non-replicate, blocks surveyed in 2013-14 are directly compared to those counted in 2009-10, mule deer numbers are higher by 71% compared to 2009.

Based on the results of the replicate blocks as well as the additional blocks surveyed in 2013-14, mule deer populations in the Agriculture Zone are still significantly lower than levels reported in 2005. Some of the decrease experienced may be attributed to the late season survey timing. Further influencing this year's survey results are the current year's winter conditions. Specifically, December 2013 experienced record-setting snowfalls for the Fort St. John area, and this has not been factored into the current year's results (Environment Canada 2014). It is anticipated that mule deer likely suffered some increased amount of mortality due to this snowfall, and this could be driving some of the low mule deer numbers observed during the 2013-14 survey.

The total number of moose observed in 2013-14 is lower than that observed in 2005, and the bull:cow ratio (11.1 bulls:100 cows) is the lowest observed since 2007 (8.7 bulls:100 cows). The calf:cow ratio, however, is higher than that observed in 2005. In the three of the four replicate blocks, moose numbers decreased, and only one block experienced a minimal increase. Overall, the replicate blocks saw a 28% decrease from last year, and a 23% decrease from 2009-10 (comparable survey timing). Further, the additional blocks surveyed report an overall decrease of 34% from 2009-10.

The total number of white-tailed deer observed in the replicate block survey has fluctuated significantly since 2005. The highest number of white-tailed deer was observed in 2007 and 2008, followed by a decline in 2009. In 2013-14, the number of white-tailed deer was similar to that observed in 2008, and it appears that since 2009, the number of white-tailed deer has remained relatively stable across the four replicate blocks.

Elk numbers in observed in 2013-14 are comparable to that observed in 2007, and are higher than original counts in 2005; however, this type of survey methodology is not well-suited for surveying elk. Unlike deer and moose, elk tend to remain in larger groups, and can move large distances between feeding areas; therefore being counted in the block in some years, and missed entirely in subsequent years. Therefore, a comparison of elk data between years is cumbersome and not truly indicative of elk populations. By surveying only a small number of sample blocks, it is unlikely that an accurate estimate of change, both to population numbers and demographics for elk, could be attained.

The blocks delineated for this comparison should be surveyed on an annual basis to develop an inexpensive index of demographic and population change for deer and moose in the agricultural area of the Peace Region. To properly assess elk populations in the Agriculture Zone of the Peace Region, an aerial inventory designed specifically for elk should be completed within the next few years.

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