

British Columbia Ungulate Species Regional Population Estimates and Status - Preseason 2014.

Admin. Region No.	Region Name	MOOSE		ELK ¹		CARIBOU		THINHORN SHEEP ²		BIGHORN SHEEP ³		MOUNTAIN GOAT		BLACK-TAILED DEER ¹		MULE DEER		WHITE-TAILED DEER		BISON ⁴	
		Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend
1	Vancouver Island	10-20	S	4,800- 5,800	S-I	0	n/a	0	n/a	0	n/a	1,500- 2,600	S-D	44,000- 65,000	S	0	n/a	0	n/a	0	n/a
2	Lower Mainland	75-150	S	1300- 1500	I	0	n/a	0	n/a	0	n/a	1500- 2300	S-I	17,000- 29,000	S	3,000- 5,000	S	20-50	S - I	0	n/a
3	Thompson	8,000- 10,000	I-D	200-300	S-I	120-140	D	0	n/a	2,500- 2,700	I-D	1,550- 1,750	I-D	1,000- 2,000	S	35,000- 55,000	I-D	6,500- 9,000	I	0	n/a
4	Kootenay	4,000 - 7,000	S-D	15,000- 24,000	S	270-290	S-D	0	n/a	2100- 2300	S-D	7,200- 7,900	S-D	0	n/a	10,000- 20,000	D	38,000 - 62,000	S	0	n/a
5	Cariboo	15,000- 23,000	S-D	200-400	I	1800- 2100	D	0	n/a	500-800	S-D	4,000- 5,000	S-D	1,000- 6,000	S	15,000- 30,000	S-D	500- 1,000	I	0	n/a
6	Skeena	25,000- 45,000	S	200-500	S-I	6,000- 12,000	S	4,000- 6,500	S-D	0	n/a	18,000- 35,000	S	35,000- 55,000	D	2,000- 3,000	D	500- 1,500	S	5-10	I
7A	Omineca	15000- 35000	D	500-2000	I	1900- 2100	D	600-900	S	0	n/a	3,000- 4,000	S	0	n/a	3,000- 6000	S	1,000	I	0	n/a
7B	Peace	50,000 - 80,000	I-D	15,000- 35,000	I-D	3500- 4300	D	6,000 - 9,000	S-I	60-130	S	3000- 5000	S-I	0	n/a	4000- 7000	S-D	4000- 10000	S-D	1,300 - 2,000	S-D
8	Okanagan	3,500- 4,500	S	2500- 3500	I	5-15	D	0	n/a	900- 1,200	S	200-300	S-D	0	n/a	28,000- 42,000	S	31,000- 44,000	S	0	n/a
PROVINCIAL TOTAL		120,000- 205,000	I-D	40,000- 73,000	I-D	13,500- 21,000	S-D	10,500- 16,500	I-D	6100- 7,100	I-D	40,000- 64,000	I-D	98,000- 157,000	S-D	100,000- 168,000	I-D	81,000- 129,000	S-D	1,300- 2,000	S-D

Estimates are for early fall preharvest populations and are based on information supplied by Regional Wildlife Biologists. Values include both plausible minimum and maximum estimates of population size.

Estimates should be considered general approximations based on limited, but best available information. Minimum and maximum estimates are rounded as follows: <100 to nearest 5; 100-499 to nearest 10; 500-1,999 to nearest 50; 2,000 to 9,999 to nearest 100; 10,000-39,999 to nearest 500; 40,000-99,999 to nearest 1,000; >100,000 to nearest 5,000. Totals may not add because of rounding.

Population Trend is from 2008 - 2011: D = Declining (> 20% decline over last 3 years), S = Stable (< 20% change over last 3 years), I = Increasing (> 20% increase over last 3 years)

¹ Region 6 estimates includes Elk and Black-tailed Deer on Haida Gwaii.

² Includes Stone Sheep in Region's 6 and 7, and Dall Sheep (350-550) in Region 6.

³ Includes California Bighorn Sheep in Region's 3, 5 and 8 (3000-3700); and Rocky Mountain Bighorn Sheep in Region's 3, 4 and 7 (2660-3030).

⁴ Includes both Plains Bison (1000-1400) and Woods Bison (300-600).

2014 Provincial Ungulate Numbers

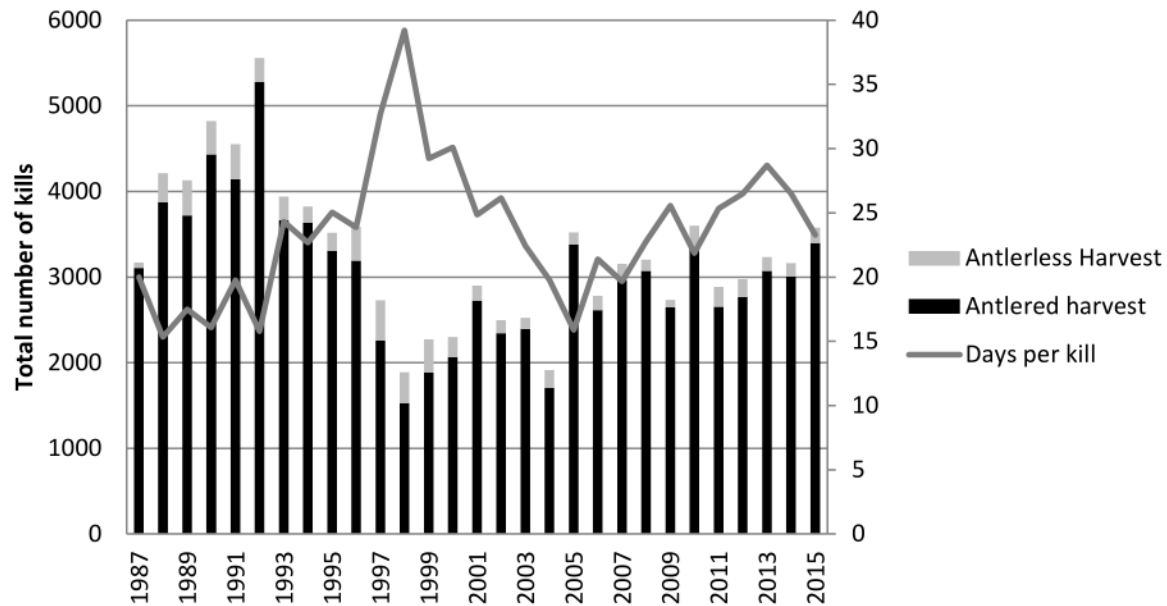
Provincial ungulate numbers are based on the best available information compiled by regional wildlife staff. While these estimates are useful to assess broad population levels and trends, they are not the primary source of information used in setting hunting seasons. Rather, area-specific inventories, harvest data and analyses are used to determine sustainable hunting opportunities.

Reliable population census data for deer in the Okanagan area are limited. There is no affordable technique currently available to precisely estimate population sizes within the Southern Interior of BC at this time. The often closed canopy forests, make sightability of mule and white-tailed deer unreliable, thereby precluding any statistically valid population estimate. Any populations estimates that do exist are simply 'best-guesses', based almost entirely on empirical information. Winter carry-over counts have been conducted. Such data however, provide an indication of adult sex ratios and herd productivity, which are important to monitoring herd viability but even with large sample sizes do not provide a population estimate. The only data currently available to indicate population trend in the Southern Interior of BC, are hunter harvest data and collared doe and fawn data when and where available.

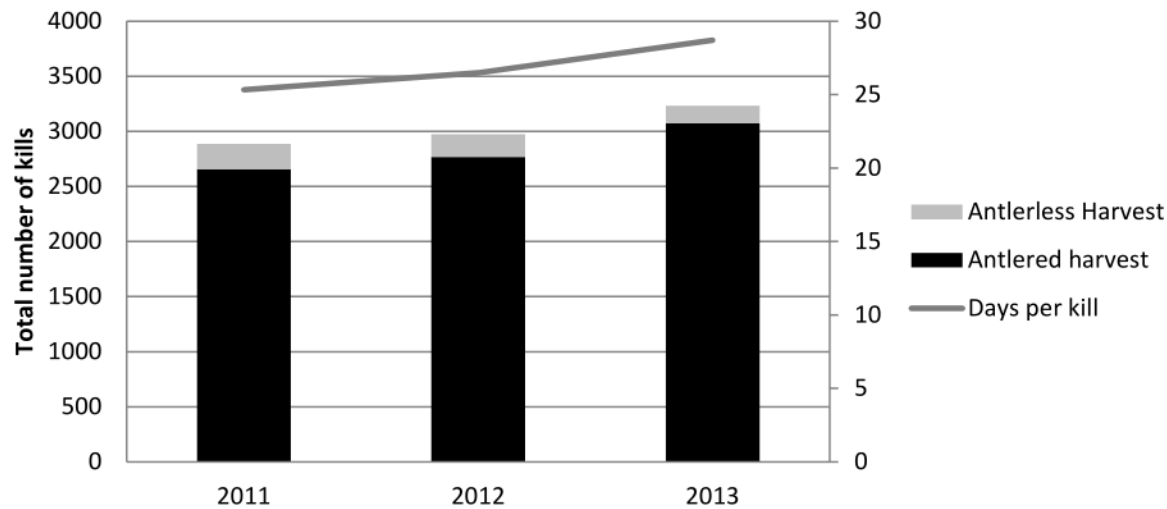
Hunter harvest data, specifically the annual harvest and the annual kill per unit effort, can be used to indicate trends in population size. Nevertheless, the hunter harvest data is the only 'hard' data available, and is therefore the primary database for deriving estimates of regional deer numbers and current population trends.

The 2014 estimates of deer numbers in the Okanagan were derived from the 2011 estimate with an assessment of trend in harvest and catch per unit effort (days per kill). Population size and trend from 2011-2013 were unadjusted from the 2011 estimate based on changes of <20% over the three-year period for both deer species in regards to hunter harvest and mule deer for days per kill: D = Declining (> 20% decline over last 3 years), S = Stable (< 20% change over last 3 years), I = Increasing (> 20% increase over last 3 years). Days per kill for white-tailed deer exceeded the 20% threshold but estimates were kept stable as both counts conducted in the Christian Valley by Wildlife Biologists and Sportsmen over the 2011-2013 time period showed stable numbers.

Okanagan Mule Deer Harvest 1987-2015

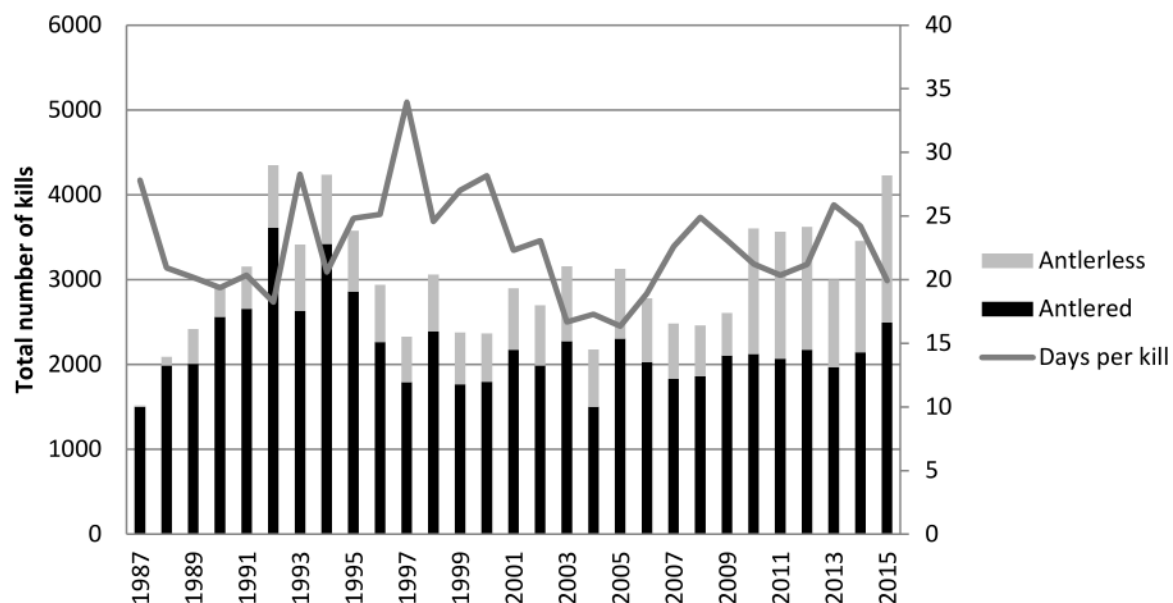


Mule Deer Harvest 2011-2013

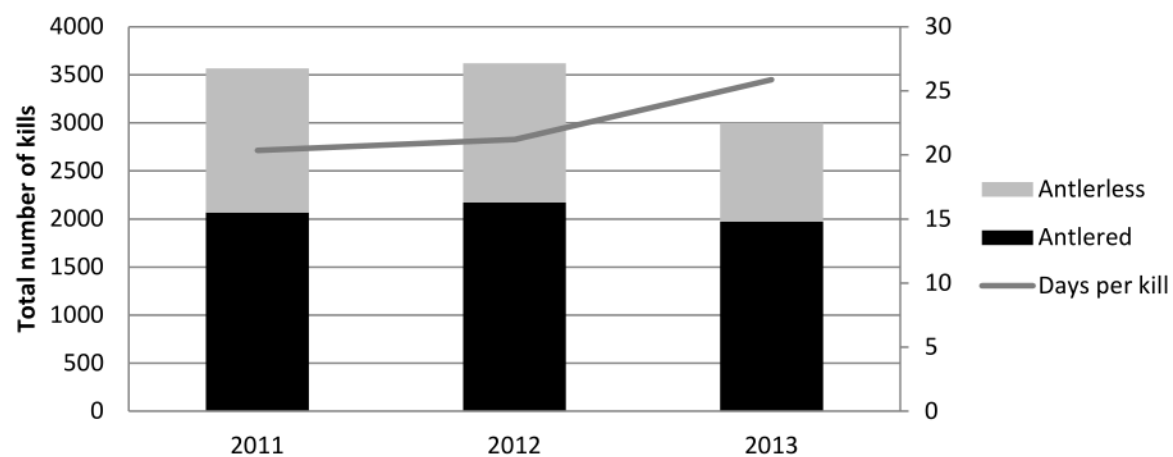


SPECIES	REGION	YEAR	HUNTERS	DAYS	KILLS	MALE RATIO	Antlered	FEMALE RATIO	JUVENILE RATIO	Antlerless Harvest	Days/kill
DEMU	8	1987	9525	63484	3171	98	3107.58	2	0	63.42	20.02018291
DEMU	8	1988	8909	64613	4213	92	3875.96	7	1	337.04	15.33657726
DEMU	8	1989	10596	71525	4088	91	3720.08	9	1	408.8	17.49633072
DEMU	8	1990	11856	77460	4820	92	4434.4	8	0	385.6	16.07053942
DEMU	8	1991	12880	89952	4551	91	4141.41	9	0	409.59	19.7653263
DEMU	8	1992	13663	87719	5557	95	5279.15	5	0	277.85	15.78531582
DEMU	8	1993	13600	95784	3939	93	3663.27	7	0	275.73	24.31683168
DEMU	8	1994	12375	86769	3825	95	3633.75	5	0	191.25	22.68470588
DEMU	8	1995	11536	87156	3481	95	3306.95	5	1	208.86	25.03763286
DEMU	8	1996	12170	85591	3586	89	3191.54	11	0	394.46	23.86809816
DEMU	8	1997	11630	90165	2756	82	2259.92	17	0	468.52	32.7158926
DEMU	8	1998	9607	74065	1889	81	1530.09	18	1	358.91	39.20857597
DEMU	8	1999	9267	66407	2272	83	1885.76	17	0	386.24	29.2284331
DEMU	8	2000	9242	69206	2299	90	2069.1	9	1	229.9	30.10265333
DEMU	8	2001	9030	72823	2930	93	2724.9	6	0	175.8	24.85426621
DEMU	8	2002	9085	65956	2521	93	2344.53	6	0	151.26	26.16263388
DEMU	8	2003	8071	57172	2548	94	2395.12	5	0	127.4	22.43799058
DEMU	8	2004	5665	37504	1894	90	1704.6	10	1	208.34	19.80147835
DEMU	8	2005	8611	55952	3521	96	3380.16	4	0	140.84	15.89094007
DEMU	8	2006	9007	59555	2781	94	2614.14	6	0	166.86	21.41495865
DEMU	8	2007	9268	62045	3155	94	2965.7	6	0	189.3	19.66561014
DEMU	8	2008	10121	72905	3202	96	3073.92	4	0	128.08	22.76858214
DEMU	8	2009	9568	70574	2759	96	2648.64	3	0	82.77	25.57955781
DEMU	8	2010	10800	78701	3601	93	3348.93	6	1	252.07	21.85531797
DEMU	8	2011	10429	73142	2887	92	2656.04	8	0	230.96	25.33494977
DEMU	8	2012	10862	78786	2975	93	2766.75	7	0	208.25	26.48268908
DEMU	8	2013	11963	92831	3233	95	3071.35	5	0	161.65	28.71357872
DEMU	8	2014	11590	83836	3163	95	3004.85	5	0	158.15	26.50521657
DEMU	8	2015	12758	84109	3614	94	3397.16	5	0	180.7	23.27310459

Okanagan White-tailed Deer Harvest 1987-2015

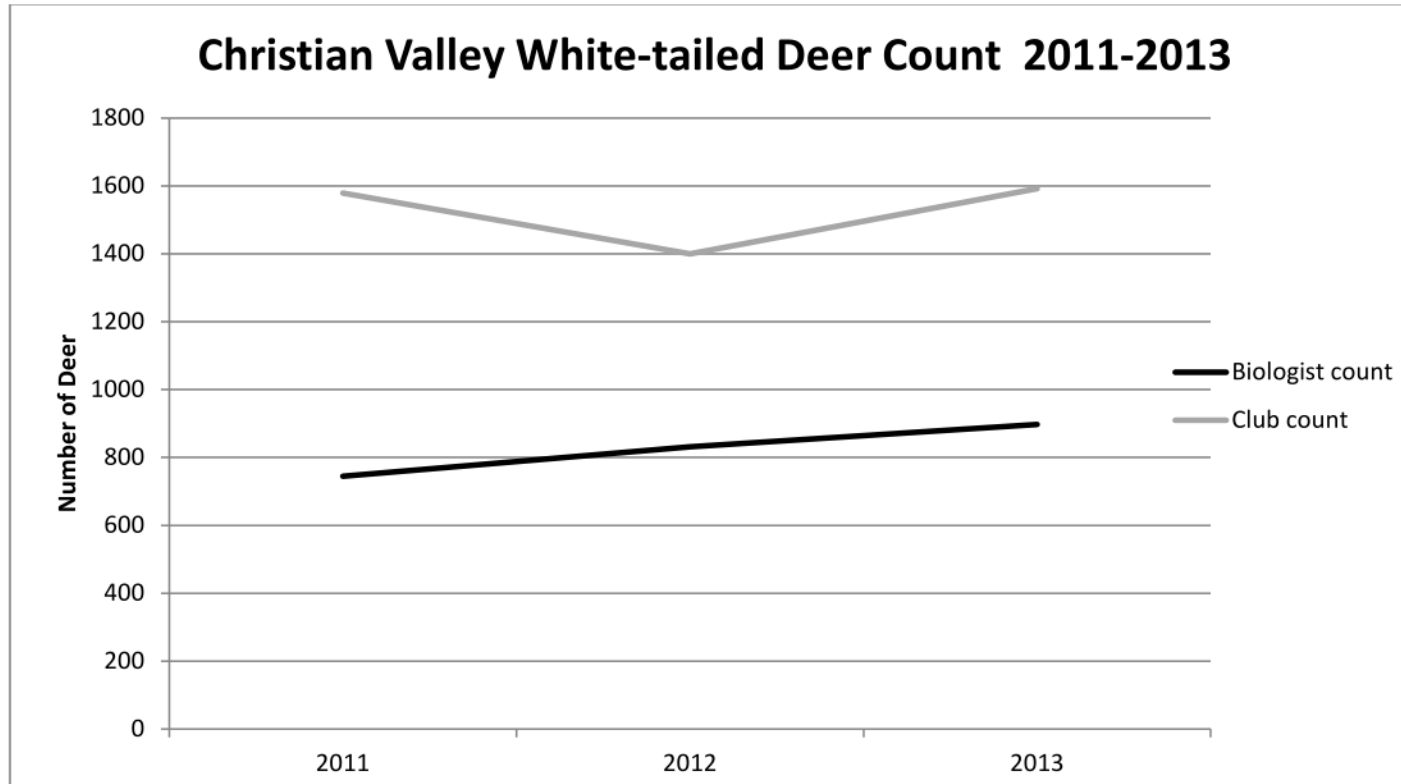


Okanagan White-tailed Deer Harvest 2011-2013

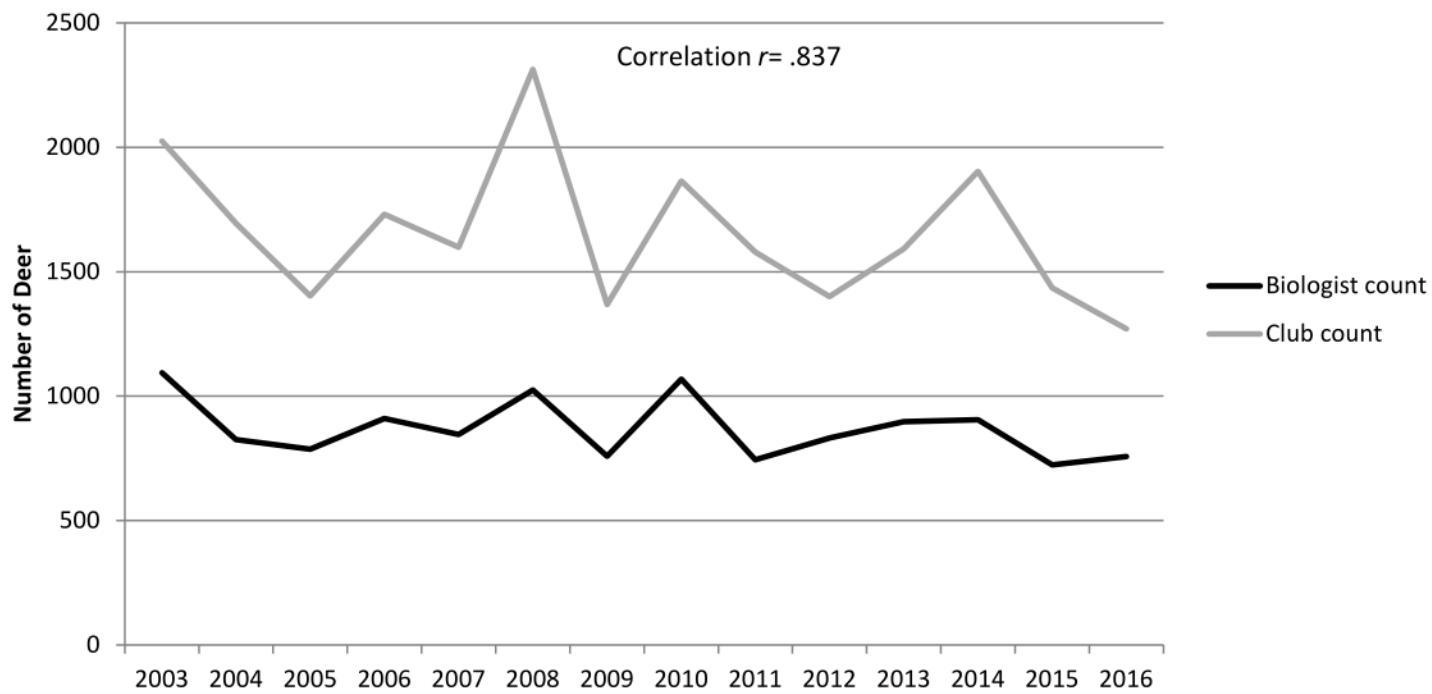


SPECIES	REGION	YEAR	HUNTERS	DAYS	KILLS	MALE RATIO	Antlered	FEMALE RATIO	JUVENILE RATIO	Antlerless	Days/kill
DEWT	8	1987	5361	42215	1518	99	1502.82	1	0	15.18	27.81
DEWT	8	1988	6221	43346	2071	96	1988.16	4	1	103.55	20.93
DEWT	8	1989	7057	48801	2419	83	2007.77	14	3	411.23	20.17
DEWT	8	1990	7689	56481	2914	88	2564.32	10	2	349.68	19.38
DEWT	8	1991	8875	63618	3125	85	2656.25	14	2	500	20.36
DEWT	8	1992	10713	79348	4351	83	3611.33	15	2	739.67	18.24
DEWT	8	1993	12243	96636	3415	77	2629.55	20	3	785.45	28.30
DEWT	8	1994	11049	88183	4279	80	3423.2	17	2	813.01	20.61
DEWT	8	1995	10904	88830	3576	80	2860.8	18	2	715.2	24.84
DEWT	8	1996	9005	73867	2939	77	2263.03	21	2	675.97	25.13
DEWT	8	1997	9085	79106	2330	77	1794.1	22	1	535.9	33.95
DEWT	8	1998	9225	75239	3062	78	2388.36	20	2	673.64	24.57
DEWT	8	1999	8640	63600	2354	75	1765.5	24	2	612.04	27.02
DEWT	8	2000	8770	66635	2365	76	1797.4	23	1	567.6	28.18
DEWT	8	2001	8301	64687	2900	75	2175	24	1	725	22.31
DEWT	8	2002	8729	62912	2727	73	1990.71	25	1	709.02	23.07
DEWT	8	2003	7655	52746	3160	72	2275.2	26	2	884.8	16.69
DEWT	8	2004	5594	37642	2179	69	1503.51	29	2	675.49	17.27
DEWT	8	2005	7840	51684	3161	73	2307.53	25	1	821.86	16.35
DEWT	8	2006	7873	52610	2780	73	2029.4	25	2	750.6	18.92
DEWT	8	2007	8047	56749	2509	73	1831.57	25	1	652.34	22.62
DEWT	8	2008	8378	61840	2484	75	1863	23	1	596.16	24.90
DEWT	8	2009	8359	60894	2634	80	2107.2	19	0	500.46	23.12
DEWT	8	2010	10242	76564	3604	59	2126.36	38	3	1477.64	21.24
DEWT	8	2011	9740	72637	3567	58	2068.86	40	2	1498.14	20.36
DEWT	8	2012	10482	76799	3621	60	2172.6	38	2	1448.4	21.21
DEWT	8	2013	10339	78471	3032	65	1970.8	33	1	1030.88	25.88
DEWT	8	2014	10350	83749	3457	62	2143.34	37	1	1313.66	24.23
DEWT	8	2015	11554	84325	4230	59	2495.7	39	2	1734.3	19.93

SPECIES	% CHANGE IN HARVEST 2011-2013	% CHANGE IN EFFORT (i.e. Days per Kill) 2011-2013
Mule Deer	12.0	13.3
White-tailed Deer	-15.0	27.1



Christian Valley White-tailed Deer 2003-2016



British Columbia Ungulate Species Regional Population Estimates and Status - Preseason 2011.

Admin. Region	Region	MOOSE		ELK ¹		CARIBOU		THINHORN SHEEP ²		BIGHORN SHEEP ³		MOUNTAIN GOAT		BLACK-TAILED DEER ¹		MULE DEER		WHITE-TAILED DEER		BISON ⁴	
No.	Name	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend
1	Vancouver Island	10-20	S	4,600- 5,600	S-I	0	n/a	0	n/a	0	n/a	1,900- 3,100	S-D	45,000- 65,000	S-I	0	n/a	0	n/a	0	n/a
2	Lower Mainland	75-150	S	1300- 1500	I	0	n/a	0	n/a	0	n/a	1500- 2300	S-I	17,000- 29,000	S	3,000- 5,000	S	20-50	S - I	0	n/a
3	Thompson	8,000- 12,000	I	300-400	S-I	200-300	D	0	n/a	2,000- 2,500	I	1,400- 2,000	D	1,000- 2,000	I	35,000- 55,000	I	5,000- 8,000	I	0	n/a
4	Kootenay	7000- 9000	S	21,000- 32,000	S-I	290-350	D	0	n/a	2300- 2500	S	9,200- 9,900	S	0	n/a	25,000- 51,000	S-I	44,000- 72,000	I	0	n/a
5	Cariboo	20,000- 28,000	S	100-250	I	1600- 1700	S-D	0	n/a	500-800	S-D	4,000- 5,000	S	1,000- 6,000	S	15,000- 30,000	S-D	500- 1,000	I	0	n/a
6	Skeena	25,000- 45,000	S-D	200-500	S	6,000- 12,000	S	4,000- 6,500	S	0	n/a	18,000- 35,000	S-I	35,000- 55,000	D	2,000- 3,000	D	500- 1,500	S	5-10	I
7A	Omineca	30,000- 50,000	S	500-2000	I	3,000 - 4,000	D	600-900	S	0	n/a	3,000- 4,000	S	0	n/a	3,000- 6000	I	500- 1,000	I	0	n/a
7B	Peace	52,000 - 87,000	I-D	15,000- 35,000	I-D	4,600 - 8,600	S-D	5,250 - 7,500	S-D	50-150	S	2,000- 4,000	S-I	0	n/a	6,000- 11,000	S-D	5,000- 12,000	S-I	1,500 - 2,400	S-I
8	Okanagan	2,000- 3,000	S	1000- 1500	I	5-15	S	0	n/a	1,000- 1,200	S	200-300	S	0	n/a	28,000- 42,000	S	31,000- 44,000	I	0	n/a
PROVINCIAL TOTAL		140,000- 235,000	S-D	44,000- 79,000	S-D	16,000- 27,000	S-D	9,900- 15,000	S-D	5,900- 7,200	I-D	41,000- 66,000	I-D	99,000- 155,000	I-D	115,000- 205,000	I-D	87,000- 140,000	S-I	1,500- 2,400	S-I

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Estimates should be considered general approximations based on limited, but best available information. Minimum and maximum estimates are rounded as follows: <100 to nearest 5; 100-499 to nearest 10; 500-1,999 to nearest 50;

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⁴ Includes both Plains Bison (1100-1800) and Woods Bison (400-600).

**Princeton Mule Deer Composition Surveys:
December 2012**



Produced By Aaron Reid

**Ministry of Forests, Lands and Natural Resource Operations
Fish & Wildlife Section
Penticton, BC
January 2013**

Executive Summary

Two survey days, December 7th and 8th, were completed to assess composition ratios for mule deer in MUs 8-04, 8-05 and 8-06 in 2012. Winter ranges surveyed included Allenby, Jura, Hembrie Mtn, Lorne Lk, Mount Miner, Whipsaw Ck and Willis Ck.

A total sample size of 693 mule deer was counted and classified during the survey. The total survey time was approximately 12.7 hrs. I calculated the total buck to doe ratio for all MUs at 12 bucks: 100 does ([CI 90%] 9-16), 9 < 4pt bucks: 100 does (CI 7-12) and 2 > 4pt bucks: 100 does (CI 0-4). I calculated 49 fawns: 100 does (CI 46-52). For observations where bucks were recorded there was at least one doe in the group 78% of the time.

Mule deer ranged between 640 m and 1600 m elevation during the surveys. Bucks, > 4pt and < 4pt, were observed throughout this elevation range. There was no significant difference in elevation between buck and doe observations during the survey ($P=0.3$).

In addition to mule deer, a total of 336 elk were classified in MU 8-04, 8-05 and 8-06 including 254 cows, 54 calves, 12 spike bulls, 5 raghorn bulls, 9 5pt bulls, 1 6pt and 1 unclassified. Sufficient sample sizes were collected to run sightability models for elk. The survey coverage for elk was not complete but the sample size ($n=336$) was sufficient to analyse bull, calf, and 6pt ratios using an incomplete sightability model.

The primary target for this survey was mule deer. Therefore, we did not have complete survey coverage of the study area for elk. Sightability corrected bull ratios were 11 bulls: 100 cows (CI 10-12) and estimated calf ratios were 21 calves: 100 cows (CI 20-22). We observed mature bulls away from cow calf groups during the time of survey. As well, several large elk groups were observed at the end of the survey when the light was poor. Classification in the air and from photos was not ideal. For these reasons, we need to use caution when interpreting the bull and calf ratios for this survey.

This survey suggests that mule deer buck ratios are lower than Ministry targets across all three MUs. Therefore, buck ratio should be re-sampled in 2013. It is recommended to survey in mid-November, during peak rut, regardless of snow level to maximize sightability of bucks.

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Introduction

In 2010, Region 8 applied the new Southern Interior Mule Deer Harvest Strategy (MOE Mule Deer Harvest Strategy, 2010) to: align hunting seasons with adjacent Regions, simplify hunting regulations, and increase mule deer hunting opportunity in the Okanagan Region. The most significant change of the new harvest strategy was an increase to the “any buck” season through the entire month of October across all Management Units (MU). This change increased the “any buck” season by 10 days from previous years.

Mule deer populations in the Southern Interior peaked in the mid 1950s and we have not seen populations as high since (Hatter et al. 1998). The latest peak in mule deer numbers in the Okanagan occurred in the early 1990s but by 1998 mule deer numbers had declined by as much as 50% since the peak in 1992 (Harper 1998). Harvest statistics suggest that mule deer are recovering from the population declines of the mid 1990s; however, this recovery has not been uniform across the Region.

Currently, information on sex ratios of mule deer populations is limited and managers are uncertain how current hunting season changes will affect population composition and population growth, as well as hunter success and satisfaction. Maintaining ratios of 20 bucks: 100 does is the management objective set by the Mule Deer Harvest Strategy (2010). (MOE Mule Deer Harvest Strategy, 2010). Recent changes in mule deer seasons will require reliable composition data to assess the effects of the hunting regimes on mule deer demographics.

Study Area

We focused our surveys on winter ranges near Princeton (Figure 1). The study area winter ranges occur primarily in dry climatic zones but parts extend into moist climatic regions at higher elevation. Lower elevations, between 650 and 900m, are in the Ponderosa Pine (PPxh1) biogeoclimatic zone (BEC) Okanagan Very Dry Hot subzone/variant. The PPxh1 is characterised by grassland and open forest conditions with climax stands of ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*), and a dominant understory of bluebunch wheatgrass (*Agropyron spicatum*).

Mid-slope winter range, between 900-1400m occurred in the Interior Douglas-fir (IDF) zone, Okanagan Very Dry Hot (xh1), Thompson Dry Cool (dk1) and Cascade Dry Cool (dk2) subzones/variants. The IDF is characterised by warm, dry climate, long growing seasons, and common moisture deficits. The IDF zone is distinguished by its climax stands of Douglas-fir and pinegrass (*Calamagrostis rubescens*) understory. The xh1 is the most common subzone/variant in the study area with open forest stands of Douglas-fir and Ponderosa Pine.

Shrub layer is sparse consisting mainly of birch-leaved spirea (*Spirea betufofoliata*), Saskatoon (*Amelanchier alnifolia*), and snowberry (*Symphoricarpos albus*).

At higher elevations, 1450-1650 m, the study area reaches into the Montane Spruce (MSxk) zone/subzone. These forests experience cold winters and fairly short, dry summers. Historically wildfires were common, limiting the occurrence of subalpine fir (*Abies lasiocarpa*) and hybrid white spruce (*Picea engelmannii x glauca*) as climax species. Instead mature seral logdepole pine (*Pinus contorta*) stands are the dominant overstory.

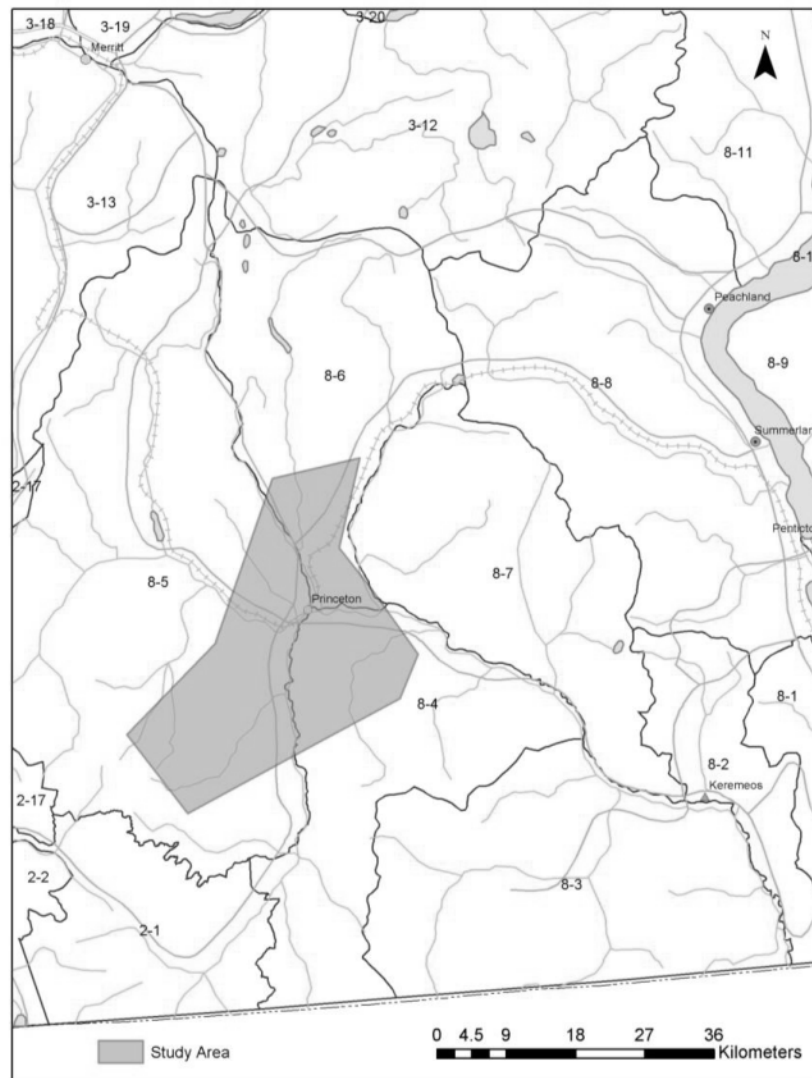


Figure 1: Map showing study area surveyed for mule deer composition in December, 2012

Methods

Survey Area Selection

Survey units or “blocks” were determined from analysis of provincial mule deer winter range mapping, previous winter mule deer aerial survey observations, and interviews with local hunters and guide outfitters.

Survey Procedures

General survey standards were adopted from aerial-based inventory techniques for selected ungulates (RISC, 2002). Surveys were conducted with a Bell 206 Jet Ranger equipped with rear bubble observation windows. Encounter transects were used to locate mule deer with transects spaced at approximately 400 m in open habitats and 300 m in more closed forested habitats. Transects typically followed contours from either low elevation to high or vice versa. Speeds of 50-80 km/hour were targeted while maintaining a distance of 20-100 m above the tree tops.

We used three people on survey at all time: one navigator in the front seat and two observers in the rear. The navigator used the track log function and real time navigation feature on a Garmin 60Cx handheld GPS to maintain transect width, monitor survey coverage, and mark waypoints of animal locations. The navigator took pictures of larger doe/fawn groups and mature bucks whenever possible and recorded data. The observer’s main tasks were to spot and classify animals. Generally, once groups of animals were observed the animals would be put on the navigator’s side of the helicopter to be counted, classified, and photographed. Each group of animals was circled and in areas with high crown closure, deer were sometimes herded into openings until classification was possible. In cases where mule deer were lost in forests with high crown closure, they were recorded as “unclassified”. We surveyed to the height of land in each block or to the elevation where deer tracks were no longer present in the snow.

Classification

In 2010, Regions decided to standardize mule deer classification methods by collecting buck data in two categories: < 4pt and > 4pt buck. The 4pt buck definition reads: any buck having at least 4 tines, excluding brow tine, on one antler. Antlerless deer were classified as adult female (less than 1.5 years old) and fawns (young of the year). We completed the survey in early December to maximize sightability of bucks (Reid 2010; 2011) and to ensure bucks were classified before antler drop. We used a digital SLR camera with a 70-300 mm anti-vibration zoom lens to photograph buck observations.

Data Analysis

Mule Deer

An incomplete sightability model was not used in this analysis. We calculated buck ratio confidence intervals (90%) using the binomial variance estimator in the programs distributed with Ecological Methodology (Krebs 1999).

Elk

A sightability model was used to correct elk observations for incomplete sightability in program Aerial Survey (Unsworth et al. 1999). I used the Hiller 12-e elk model to correct elk observations for incomplete sightability. The Hiller 12-e model was developed in Idaho and has been used extensively for elk surveys in the Kootenay Region.

Results

Composition

Two survey days, December 7th and 8th, were completed in MUs 8-04, 8-05 and 8-06 in 2012. Winter ranges surveyed included Allenby, Jura, Hembrie Mtn, Lorne Lk, Mount Miner, Whipsaw Ck and Willis Ck. Automated Snow Pillow data from Blackwell Peak (1900 m), suggest high elevation snowpack was at the 45 year average during the time of survey.

All MUs (8-04, 8-05, 8-06)

A total sample size of 693 mule deer was counted and classified during the survey (Figure 2, Table 1). The total survey time was approximately 12.7 hrs. I calculated the total buck to doe ratio for all MUs at 12 bucks: 100 does ([CI 90%] 9-16), 9 < 4pt bucks: 100 does (CI 7-12) and 2 > 4pt bucks: 100 does (CI 0-4). I calculated 49 fawns: 100 does (CI 46-52). For observations where bucks were recorded there was at least one doe in the group 78% of the time.

8-04

In MU 8-04 a sample size of 340 mule deer was counted and classified during the survey (Figure 2, Table 1). I calculated the buck to doe ratio at 14 bucks: 100 does (9- 18), 10 < 4pt bucks: 100 does (CI 6-15) and 2 > 4pt bucks: 100 does (CI 1-5). The fawn ratio was calculated at 46 fawns: 100 does (CI 39-51) in MU 8-04.

8-05

In MU 8-05 a sample size of 120 mule deer was counted and classified during the survey (Figure 2, Table 1) I calculated the buck to doe ratio at 11 bucks: 100 does (5- 20), 8 < 4pt bucks: 100 does (CI 3-16) and 3 > 4pt bucks: 100 does (CI 0-9). The calculated fawn ratio was 47 fawns: 100 does (CI 36-59) in MU 8-05.

8-06

In MU 8-06 a sample size of 233 mule deer was counted and classified during the survey (Figure 2, Table 1) I calculated the buck to doe ratio at 12 bucks: 100 does (7-18), 9 < 4pt bucks: 100 does (CI 5-15) and 1 > 4pt bucks: 100 does (CI 0-5). I calculated 56 fawns: 100 does (CI 51-61) in MU 8-06.

Table 1: Classification of mule deer observed during composition surveys in MU 8-04, 8-05, 8-06 on December 7th and 8th, 2012.

Management Unit	Fawns	Does	<4pt Bucks	>4pt Bucks	Unclass. Buck	All Bucks	Unclass	Total
8-04	91	200	20	4	3	27	22	340
8-05	36	76	6	2	0	8	0	120
8-06	78	139	12	2	2	16	0	233
Total	205	415	38	8	5	51	22	693

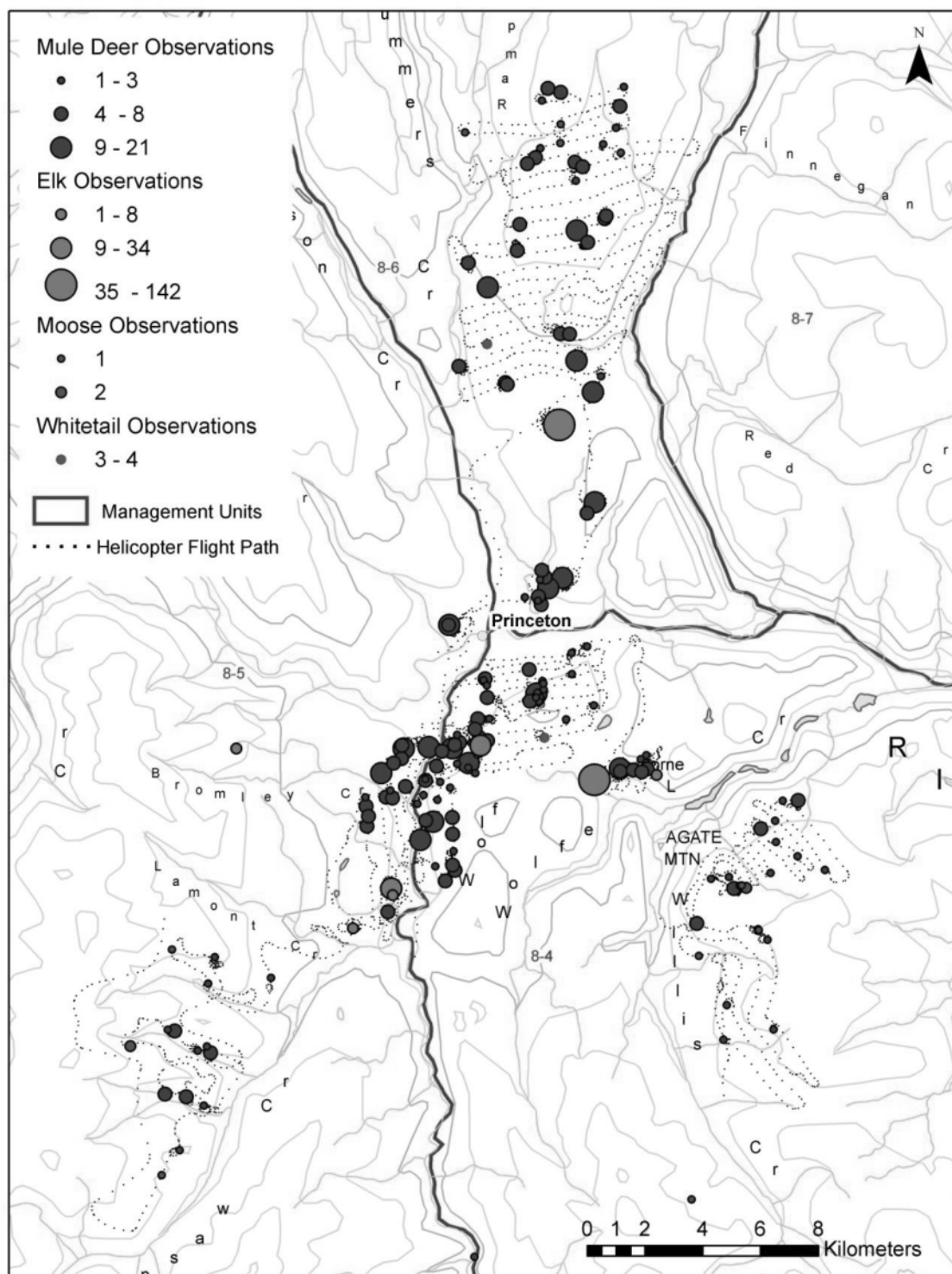


Figure 2: Map showing ungulate observations scaled to group size and flight path during the composition surveys in MU 8-04, 8-05 and 8-06 on December 7th and 8th, 2012.

Elevation

Mule deer ranged between 640 m and 1600 m elevation during the surveys. Bucks, > 4pt and < 4pt, were observed throughout this elevation range (Figure 3). There was no significant difference in elevation between buck and doe observations during the survey ($P=0.3$).

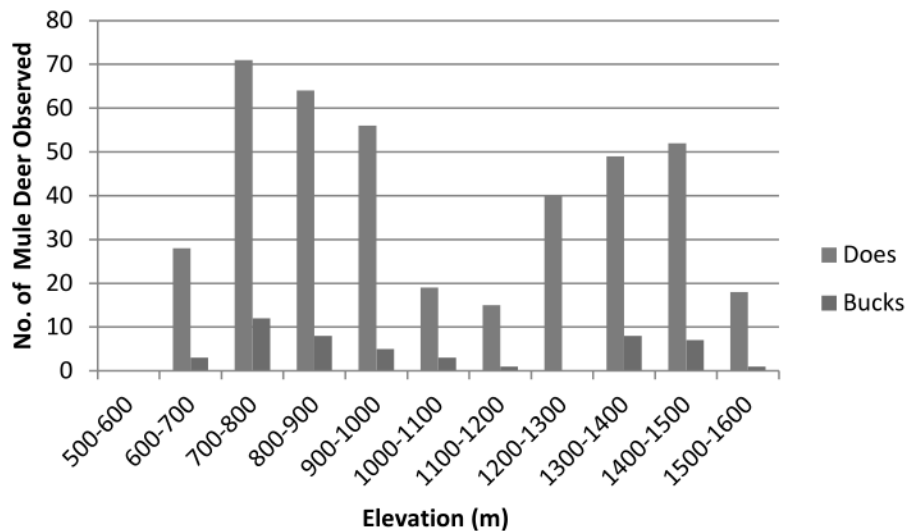


Figure 3: Distribution of mule deer does and bucks observations by elevation during the December 7th and 8th survey in MU 8-04, 8-05 and 8-06.

Other Species

We encountered multiple species during surveys in both MUs including elk, moose and white-tailed deer (Table 2). Sufficient sample sizes were collected to run sightability models for elk. The survey coverage for elk was not complete but the sample size ($n=336$) was sufficient to analyze bull, calf, and 6pt ratios using an incomplete sightability model.

Table 2: Other species observed during mule deer surveys in MU 8-04, 8-05 and 8-06 on December 7th and 8th, 2012.

Species	MU	Unclass.	Juvenile	Adult Female	Adult Male	Total
Elk	8-04	1	19	161	7	188
	8-05	0	0	0	6	6
	8-06	0	35	94	13	142
Moose	8-04	1	1	4	0	6
	8-05	0	0	3	1	4
	8-06	0	1	3	0	4
White-tailed Deer	8-04	4	0	0	0	4
	8-05	0	0	0	0	0
	8-06	2	0	1	0	3

Elk

A total of 336 elk were classified in MU 8-04, 8-05 and 8-06 including 254 cows, 54 calves, 12 spike bulls, 5 raghorn bulls, 9 5pt bulls, 1 6pt and 1 unclassified. Sightability corrected bull ratios were 11 bulls: 100 cows (CI 10-12) and estimated calf ratios were 21 calves:100 cows (CI 20-22).

Discussion

Sightability

Differential sightability of bucks and does has been an important topic of discussion amongst southern interior mule deer managers since 2010 and the introduction of ratio targets. To maximize the sightability of bucks it is felt that surveys should be complete before bucks form bachelor groups and segregate away from does. We summarized data from the Okanagan, Boundary and Kootenay regions over the past 3 years and looked at the percent of bucks observed with at least one doe during composition surveys (Reid 2011, Stent 2010; Table 3). The data suggests that number of bucks observed with does begins to drop after November and that mule deer composition surveys should be completed before December 7th, preferably in mid November.

For this survey we delayed our survey till December 7th and 8th because of a lack of snow at high and low elevations. We desired more snow to drive the mule deer to lower elevation as well as increase sightability of mule deer on the ground. We received snow in the days prior to the survey creating ideal conditions for spotting mule deer. However, our final buck ratios are below the southern interior mule deer strategy target of 20 bucks: 100 does across the study area. We now need to determine if we are indeed hunting too many bucks or if the low buck ratio is a result of survey timing.

Hunting can influence mule deer population parameters, including sex ratios, age structure, and abundance (Erickson et al. 2003). Research, however, has shown that pregnancy and fawn recruitment are not related to the number of bucks per 100 does (Erickson et al. 2003) and buck harvest has little effect on overall population trend (Bowden et al. 2000, Gaillard et al. 2000). Small changes in doe survival can have a significant influence on the population trend (Bowden et al. 2000, Gaillard et al. 2000). The regional doe harvest has been small with an estimated harvest of 335 female deer between 2000 and 2010 from all of MU's 8-04, 8-05 and 8-06. Currently there are only 65 antlerless deer tags issued annually among all MU's 8-04, 8-05 and 8-06. Nutritional condition is likely the ultimate cause of mortality for adult females and fawns in this study area which currently lacks wolves. Nutrition appears to set the population equilibrium for similar mule deer populations (Forrester and Wittmer 2013) and enhanced nutrition of deer has been shown to reduce coyote (*Canis latrans*) and mountain lion (*Puma concolor*) predation rates of 6-month-old fawns and adult females (Bishop et al. 2009).

Table3: The percent of bucks observed with at least one doe during composition surveys across the Okanagan and Kootenay Regions in 2010, 2011 and 2012.

MU	Survey Year	Survey Dates	% of bucks with does	Sample Size
4-02, 4-03 4-21 and 4-22	2011	Nov. 19th and 20th	92	784
4-02, 4-21 and 4-22	2010	Nov. 22nd and 23rd	92	596
8-15	2011	Nov. 25th and 26th	87	147
8-23	2011	Nov. 30th and Dec. 1st	78	318
8-23	2010	Dec. 2nd and 3rd	79	384
4-06 and 4-07	2011	Dec. 5th and 7th	82	335
815	2011	Dec. 6th	70	64
8-04, 8-05, 8-06	2012	Dec. 7 th and 8th	78	693
4-03, 4-06 and 4-07	2010	Dec. 15th and 22nd	52	246
8-12, 8-14 and 8-15	2010	Dec. 10th, 11th and 15th	40	390
4-26	2011	Dec. 13th	75	72
4-06 and 4-07	2009	Dec. 31st	91	146
8-23	2010	Jan. 6th	35	233
4-02, 4-21 and 4-22	2009	Jan. 6th and 7th	68	864

Composition

According to this survey results, early winter fawn ratios look healthy with results ranging from 46 - 56 fawns: 100 does. Therefore, the does are being breed by the remaining bucks. A late winter ground count could confirm carry over ratios for this population. This survey suggests that buck ratios are lower than Ministry targets across all three MUs surveyed.

Management Recommendation

Buck ratio should be re-sampled from the ground in spring 2013 in an attempt to verify low buck ratios as well as by further aerial surveys in winter 2013. It is recommended to survey in mid-November, during peak rut, regardless of snow level to maximize sightability of bucks.

Elk

The primary target for this survey was mule deer. Therefore, we did not have complete survey coverage of the study area for elk. We observed mature bulls away from cow calf groups during the time of survey. In addition, several large elk groups were observed at the end of the survey

when the light was poor. Classification in the air and from photos was not ideal. For these reasons, we need to use caution when interpreting the bull and calf ratios for this survey.

Gyug (2008) surveyed MU 8-04, 8-05 and 8-06 for elk and covered much of the same area as this survey. In 2008, 375 elk were counted and classified. Ratios were down from the 2008 survey, which documented 15.3 bulls: 100 cows and 27.9 calves: 100 cows. Gyug (2008) suggested populations were up from survey in 1999 where only 119 elk were observed. However, survey intensity and coverage from the 1999 survey are unknown, so direct comparison is not possible.

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Shuswap and Boundary Mule Deer Composition Surveys: November/December 2011



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Executive Summary

In 2010, Region 8 applied the new Southern Interior Mule Deer Harvest Strategy to: align hunting seasons with adjacent Regions, simplify hunting regulations, and increase mule deer hunting opportunity in the Okanagan Region. Harvest statistics suggest that mule deer are recovering from a population decline in the mid 1990s; however, this recovery has not been uniform across the Region. Hunter harvest and success in MUs 8-13, 15, 24, and 25 have lagged behind the rest of Region 8.

Currently, information on sex ratios of mule deer populations is limited and managers are uncertain how current hunting season changes will affect population composition and population growth, as well as hunter success and satisfaction. The objective of this project is to collect buck ratio data from the Shuswap and Boundary areas where population numbers are felt to be in recovery and may be more vulnerable to the new hunting season changes.

A sample size of 318 mule deer in MU 8-23 was counted and classified during the survey. I calculated the total buck to doe ratio for MU 8-23 at 26 bucks: 100 does ([CI 90%] 21-31), 18 < 4pt bucks: 100 does (CI 13-23) and 8 > 4pt bucks: 100 does (CI 5-13). I calculated 58 fawns: 100 does (CI 52-63) in MU 8-23. A sample size of 211 mule deer in MU 8-15 was counted and classified during the survey. I calculated the total buck to doe ratio for MU 8-15 at 35 bucks: 100 does (27- 43), 13 < 4pt bucks: 100 does (CI 8-20) and 13 > 4pt bucks: 100 does (CI 8-20). I calculated 54 fawns: 100 does (CI 46-62) in MU 8-15.

All buck ratios were above the desired harvest strategy target of 20 bucks: 100 does. Confidence intervals from this survey overlap with previous composition surveys for MU 8-23 suggesting there was no change in buck ratios between survey years. However, we did observe a significant increase in buck ratios from previous year's surveys in MU 8-15. The increased buck ratio was likely a result of increasing winter range coverage and survey effort.

To minimize any potential difference in sightability between bucks and does, we attempted to complete the surveys early in December before bucks disperse into bachelor groups. Our distribution data in 2010 supported this strategy and we recommend completing mule deer composition surveys in November or by early December at the latest. This report presents data from the second year of a Habitat Conservation Trust Foundation funded project.

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Introduction

In 2010, Region 8 applied the new Southern Interior Mule Deer Harvest Strategy (MOE Mule Deer Harvest Strategy, 2010) to: align hunting seasons with adjacent Regions, simplify hunting regulations, and increase mule deer hunting opportunity in the Okanagan Region. The most significant change of the new harvest strategy was an increase to the “any buck” season through the month of October across all Management Units (MU). This change increased the “any buck” season by 10 days from previous years.

Mule deer populations in the Southern Interior peaked in the mid 1950s and we have not seen populations as high since (Hatter et al. 1998). The latest peak in mule deer numbers in the Okanagan occurred in the early 1990s but by 1998 mule deer numbers had declined by as much as 50% since the peak in 1992 (Harper 1998). Harvest statistics suggest that mule deer are recovering from the population declines of the mid 1990s; however, this recovery has not been uniform across the Region.

In the Shuswap drainage, MU 8-23 supports the majority of harvest compared to neighbouring MUs 8-13, 24, and 25 (Figure 1). However, for several years now anecdotal reports from local hunters and the guide outfitter have expressed concerns that mule deer numbers are down in MU 8-23.

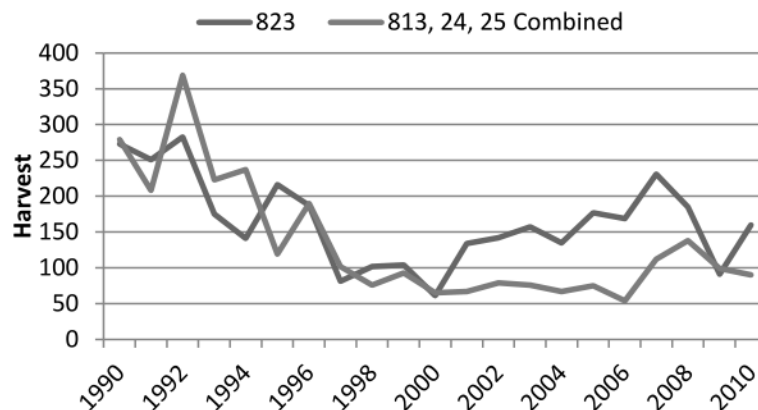


Figure 1: Mule deer harvest in MU 8-23 compared to 8-13, 24 and 25 (combined) in Region 8 from 1990 to 2008.

Hunter harvest and success rates have improved in the Boundary, since the mule deer population decline in the mid 1990s, and are close to the regional average with the exception of MU 8-15, which has been slower to recover (Figure 2). Local resident hunters and guide outfitters have expressed concerns for several years now about low mule deer numbers and reduced harvest in MU 8-15 compared to the 1990s (Figure 2).

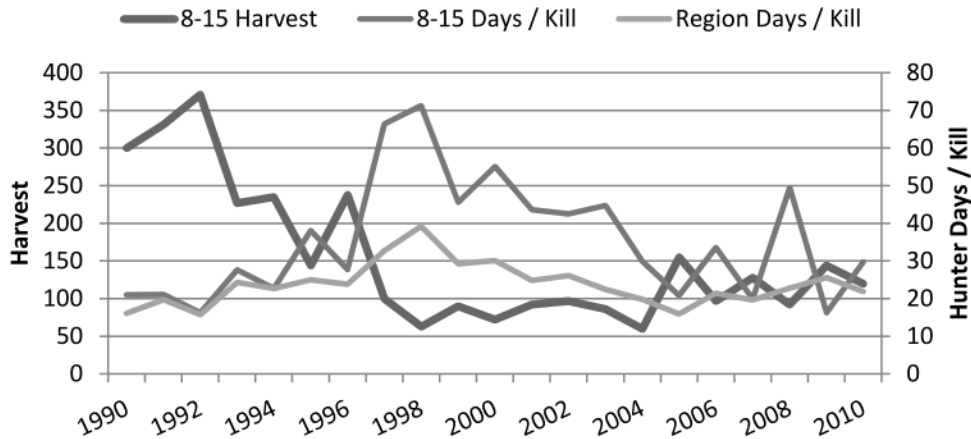


Figure 2: Region 8 and MU 8-15 hunter days / kill and mule deer harvest for MU 8-15 from 1990 to 2010.

Currently, information on sex ratios of mule deer populations is limited and managers are uncertain how current hunting season changes will affect population composition and population growth, as well as hunter success and satisfaction. Maintaining ratios of 20 bucks: 100 does post-hunt is recommended to ensure the breeding success and a diversity of hunting opportunities of hunted mule deer populations (MOE Mule Deer Harvest Strategy, 2010). Recent changes in mule deer seasons will require reliable composition data to assess the effects of the hunting regimes on mule deer demographics.

Some Resident hunters and guide outfitters have expressed concerns that the new hunting regulations will reduce already low mule deer populations and buck numbers in the MUs discussed above. The objective of this project is to collect buck ratio data from the Shuswap and Boundary areas where it is felt that new hunting regulations may have the greatest impact on mule deer populations. This report presents data from the second year of a Habitat Conservation Trust Foundation funded project.

Study Areas

Shuswap MU 823

We focused our surveys on winter ranges near Lumby and Cherryville north of Highway 6 (Figure 1). The Shuswap winter ranges occur primarily in a dry climatic zones but parts do extend into a moist climatic region at higher elevation. Lower elevations, between 500 and 1300 m, are in the Interior Douglas-fir (IDF) biogeoclimatic zone (BEC), the Kettle Dry Mild (dm1), and Shuswap Moist Warm (mw1) subzones/variants. The ICHdm1 near Montgomery is slightly drier than the ICHmw1 to the east. Both zones support climax stands of Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*) and a dominant understory of

bluebunch wheatgrass (*Agropyron spicatum*) (dm1), Saskatoon (*Amelanchier alnifolia*), falesbox (*Paxistima myrsinites*, and bluebunch wheatgrass (mw1) on dry winter ranges.

Mid-slope winter range, between 1100 -1500 m, occurred in the Interior Cedar-Hemlock (ICH) zone, Kootenay Moist Cool (mk1) and Thompson Moist Cool (mk2) subzones/variants. In summer the ICHmk1 is slightly warmer and drier than the mk2. On dry sites both support stands of Douglas-fir and lodgepole pine (*Pinus contorta*); western larch (*Larix occidentalis*) only occurs in the mk1. Juniper (*Juniperus communis*) and pinegrass (*Calamagrostis rubescens*) are common understory plants in each variant.

At higher elevations, 1450-1650 m, the study area reaches into the Engelmann Spruce-Subalpine Fir (ESSF) zone, Columbia Wet Cold (wc1) subzone/variant. These forests are typically colder, wetter and receive more snow than the ICH. Typical vegetation includes climax stands of subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*) and understory of western redcedar (*Thuja plicata*), hemlock (*Tsuga heterophylla*), black huckleberry (*Vaccinium membranaceum*) and white-flowered rhododendron (*Rhododendron albiflorum*).

A mixture of open forest, shrub dominated slopes, and deciduous forests are common on lower elevation winter ranges in the Shuswap. Higher elevation areas are typically closed canopy forests with logging as the primary disturbance type. The Shuswap winter ranges receive more moisture than the Boundary and have greater vegetative cover, especially at lower elevations. The 29 year average annual precipitation for Lumby is 628 mm vs 509 for Grand Forks (Environment Canada Climate Data).

Boundary MU 815

We surveyed winter ranges from the Granby River to Christina Lake on the north side of Highway 3 (Figure 1). These winter ranges occur primarily in a dry climatic region. Low elevations, between 500-950 m, are in the Ponderosa Pine (PP) zone, Kettle Dry Hot (dh1) subzone/variant. The climate is characterized by very hot, dry summers, and mild winters with little snow fall. Vegetation is dominated by open ponderosa pine forests and grasslands.

Mid-elevation winter ranges, up to 1370 m, are within the IDF zone, Kettle Dry Mild (dm1) subzone/variant. Typical climate conditions for the IDFdm1 are hot, dry summers and cool winters with light snowfall. Closed canopy Douglas-fir forests are common with moderate shrub cover and a pinegrass dominated understory.

Upper elevations occur within the ICH zone, Columbia Moist Warm (mw2) subzone/variant. The MSdm1 has warm, dry summers, and cold winter with light snowfall and light snowpacks, whereas the ICHmw2 has hot, moist summers, and mild winters with light snowfall and moderate snowpacks. Mixed seral species such as Douglas-fir, lodgepole pine, and western larch

are found throughout both zones but climax species in the MS are white spruce subalpine fir, whereas the climax species in the ICH are western redcedar and western hemlock (*Tsuga heterophylla*).

Lower elevations winter ranges are dominated by open grassland habitats with infrequent patches of thicker vegetation in areas that maintain moisture (e.g. gullies). Mid-to high elevation transition into close forest conditions quickly. Most open habitats at high elevation are created from logging disturbance.

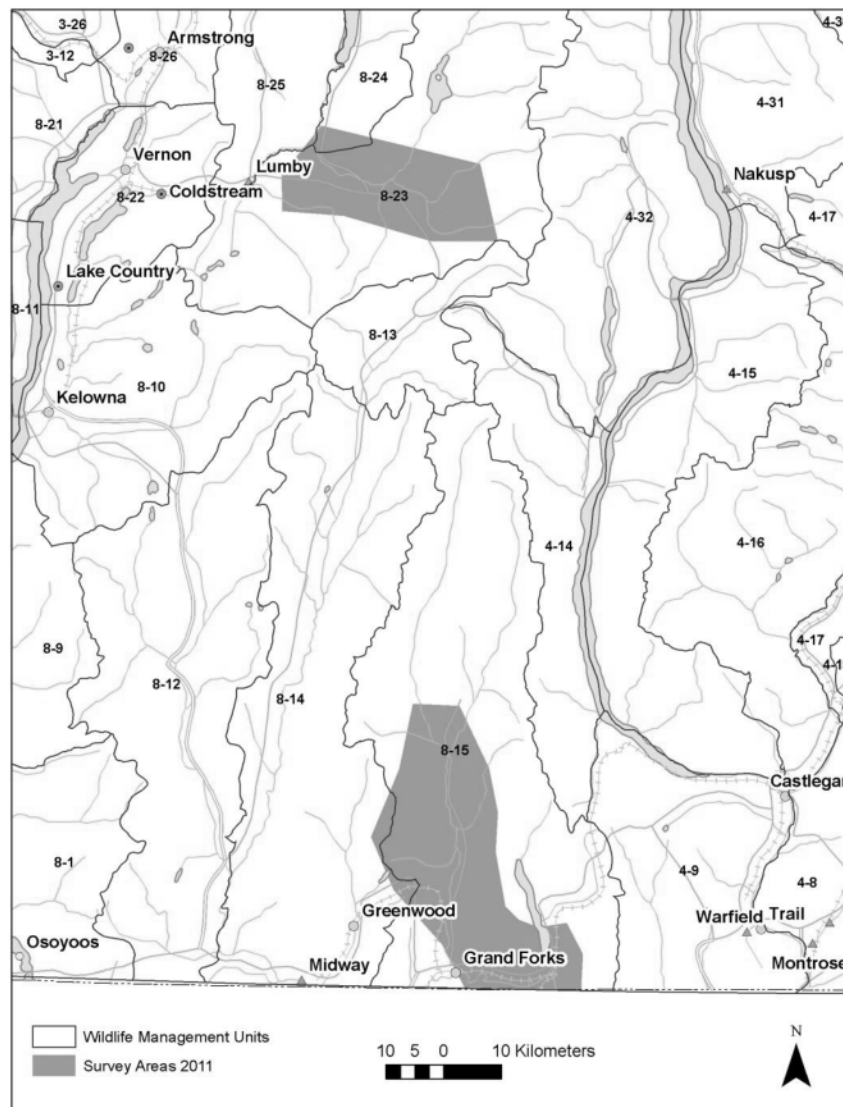


Figure 3: Map showing areas surveyed for mule deer composition in November and December, 2011

Methods

Survey Area Selection

Survey units or “blocks” were determined from analysis of provincial mule deer winter range mapping, previous winter mule deer aerial survey observations, and interviews with local hunters and guide outfitters. Block boundaries ranged from rivers and roads in the valley bottom up to 1700 m elevation with a focus on solar aspects.

In 2011, we decided to focus our survey efforts in MU 8-15 rather than surveying MUs to the west. Last winter’s (2010) survey data suggested MU 8-15 had lower buck ratios and densities relative to neighbouring MUs to the west. As well, stakeholder groups expressed strong concern regarding mule deer populations in this MU; therefore, we wanted to obtain a stronger sample to increase our knowledge of distribution and composition of mule deer in the MU.

Survey Procedures

General survey standards were adopted from aerial-based inventory techniques for selected ungulates (RISC, 2002). Surveys were conducted with a Bell 206 Jet Ranger equipped with rear bubble observation windows. Encounter transects were used to locate mule deer with transects spaced at approximately 400 m in open habitats and 300 m in more closed forested habitats. Transects typically followed contours from either low elevation to high or vice versa. Speeds of 50-80 km/hour were targeted while maintaining a distance of 20-100 m above the tree tops.

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In 2010, Regions decided to standardize mule deer classification methods by collecting buck data in two categories: < 4pt and > 4pt buck. The 4pt buck definition reads: any buck having at least four tines, excluding brow tine, on one antler. Antlerless deer were classified as adult female (less than 1.5 years old) and fawns (young of the year). We completed the survey in late November to early December to maximize sightability of bucks (Reid 2010) and to ensure bucks

were classified before antler drop. We used a digital SLR camera with a 70-300 mm anti-vibration zoom lens to photograph buck observations.

Data Analysis

Mule Deer

An incomplete sightability model was not used in this analysis. We calculated buck ratio confidence intervals (90%) using the binomial variance estimator in the programs distributed with Ecological Methodology (Krebs 1999).

Bighorn

A Sightability model was used to correct bighorn observations for incomplete sightability in program Aerial Survey (Unsworth et al. 1999). I used the Bell 223 model for sheep developed in southern Idaho. All population and ratio data are expressed with 90% confidence intervals, generated in the program Aerial Survey.

The Sightability model corrects for the proportion of animals within survey area that went undetected during surveys. Logistic regressions used in sightability models incorporate a combination of variables known to affect the probability of animal detection from the air. Variables affecting detection probability generally include a combination of group size, animal activity, snow cover on the ground, oblique vegetation cover and habitat type surrounding the animal(s).

Data for each model parameter was collected during the survey including percent oblique vegetation cover around the first bighorn observed in each group. We used sketches depicting various vegetation classes in 5% increments (5-90%) to help assign cover. Other model parameter data collected included activity, moving or not moving, and habitat codes (e.g. timber, dissected cliff, open slope).

Elk

A sightability model was used to correct elk observations for incomplete sightability in program Aerial Survey (Unsworth et al. 1999). I used the Hiller 12-e elk model to correct elk observations for incomplete sightability. The Hiller 12-e model was developed in Idaho and has been used extensively for elk surveys in the Kootenay Region. Model parameters similar to those collected for bighorn sheep were also collected for elk.

Results

Shuswap

Two survey days, November 30th and December 1st, were completed in MU 8-23 in 2011. Winter ranges surveyed included Montgomery, Bear Creek, Echo Lake, South Fork, Cherry Ridge,

Currie Ridge and Byers Range. Snow pillow data from Park Mountain (1857 m) recorded high elevation snow packs of approximately 64% of the 23 year average for early December, 2011.

A sample size of 318 mule deer in MU 8-23 was counted and classified during the survey (Figure 2 and 3, Table 1). The total survey time in MU 8-23 was approximately 9.4 hrs. I calculated the total buck to doe ratio for MU 8-23 at 26 bucks: 100 does ([CI 90%] 21-31), 18 < 4pt bucks: 100 does (CI 13-23) and 8 > 4pt bucks: 100 does (CI 5-13). I calculated 58 fawns: 100 does (CI 52-63) in MU 8-23.

Table 1: Classification of mule deer observed during composition surveys in MU 8-23 on November 30th and December 1st.

MU 8-23	Unclass.	Fawns	Does	<4pt Bucks	>4pt Bucks	Unclass. Buck	All Bucks	Total
Montgomery/Bear Creek/Echo Lake	12	45	71	9	7	1	16	145
South Fork/Cherry Ridge/Currie Ridge	4	10	20	9	2	0	11	45
Byers Range	8	37	69	10	4	0	14	128
Total	24	92	160	28	13	1	42	318

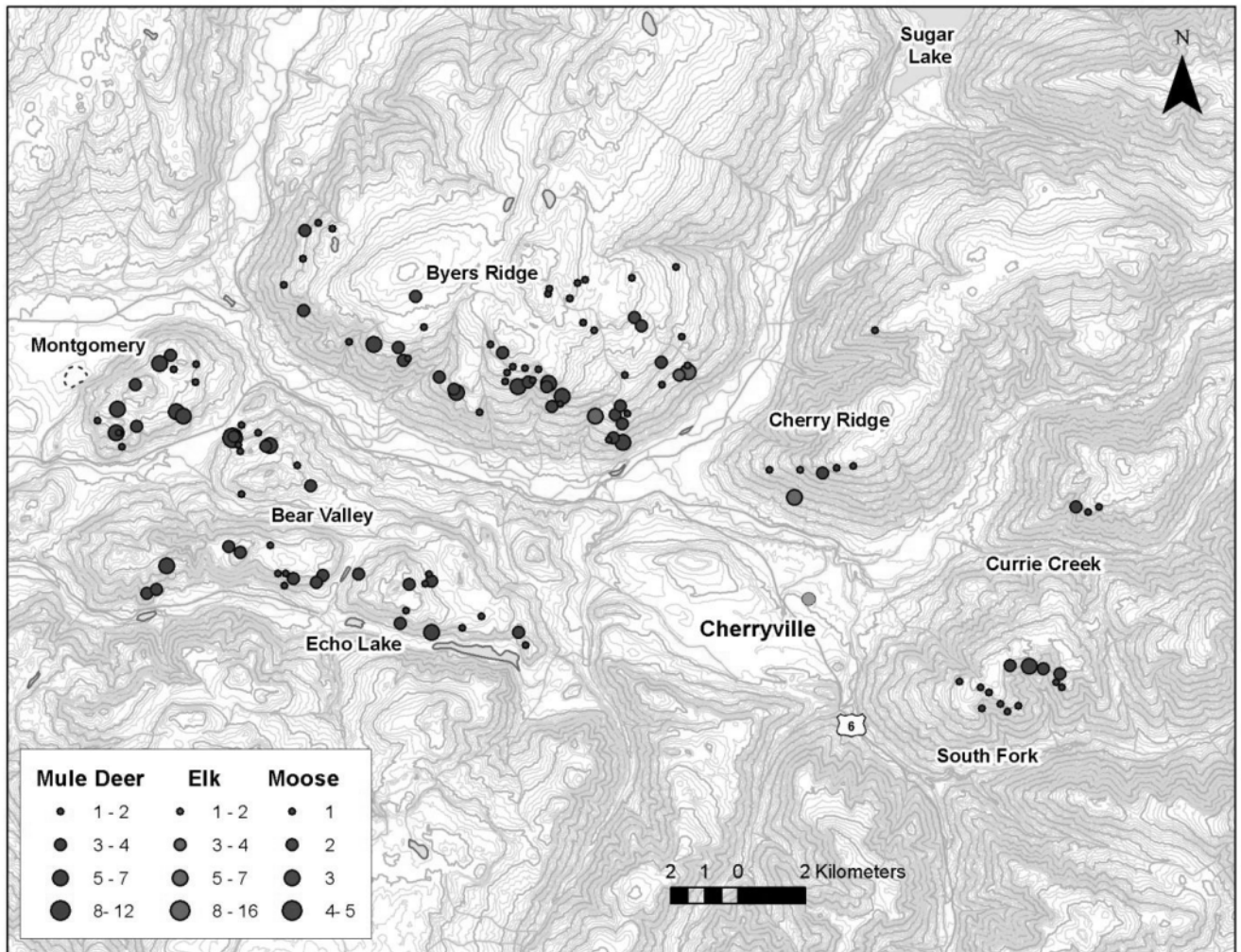


Figure 4: Map showing ungulate observations scaled to group size during the Shuswap survey November 30th and December 1st, 2011.

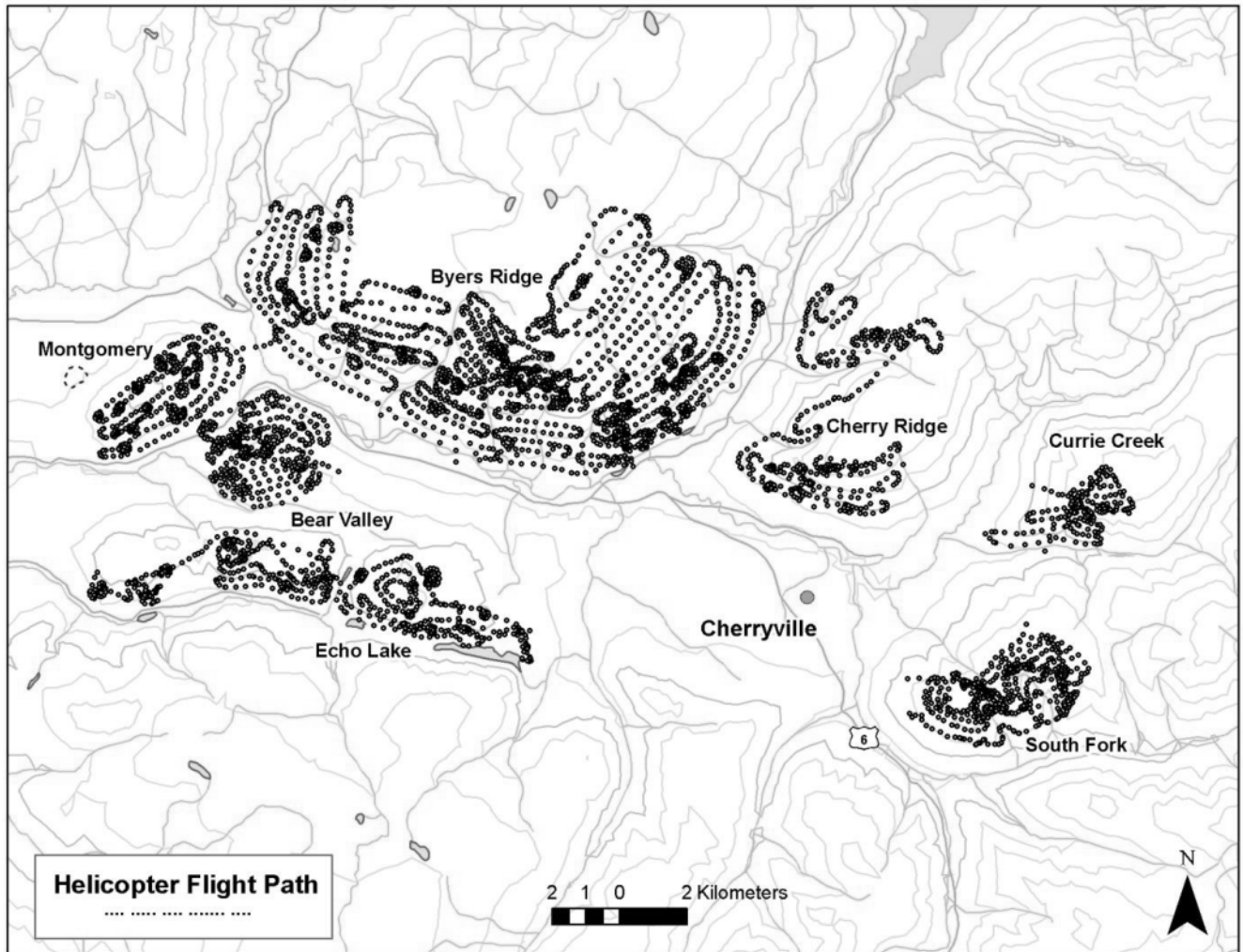


Figure 5: Map showing flight paths for the mule deer composition survey in the Shuswap survey on November 30th and December 1st, 2011.

Boundary

Three survey days, November 25th, 26th and December 6th were completed in MU 8-15. Winter ranges surveyed included Snowball Creek to Spooner Creek, Lynch Creek, Rock Candy Creek, Bunch Grass Hill, Bitter Creek to Sutherland Creek, and Almond Creek. Snow pillow data from Grano Creek (1874m) recoded high elevation snow packs of approximately 55% and 82% of the 13 year average for November 25th and December 6th, respectively. Survey conditions were good with high overcast cloud and no precipitation. All low elevation (below 800 m) south facing slopes were snow free during the surveys.

A sample size of 211 mule deer in MU 8-15 was counted and classified during the survey (Figure 4 and 5, Table 2). The total survey time in MU 8-15 was approximately 12.7 hrs. I calculated the total buck to doe ratio for MU 8-15 at 35 bucks: 100 does (27- 43), 13 < 4pt bucks: 100 does (CI 8-20) and 13 > 4pt bucks: 100 does (CI 8-20). I calculated 54 fawns: 100

does (CI 46-62) in MU 8-15. We observed a significant increase in buck ratio in MU 8-15 from 16 bucks: 100 does (CI 10-25) in 2010 to 37 bucks: 100 does (CI 27-43) in 2011. The lowest buck ratio calculated in MU 8-15 was on the Snowball Creek to Spooner Creek winter ranges at 19 bucks: 100 does (CI 10-31).

Table 2: Classification Mule deer observed during composition surveys in MU 8-15 on November 25th, 26th and December 6th.

MU 8-15	Unclass.	Fawns	Does	<4pt Bucks	>4pt Bucks	Unclass. Buck	All Bucks	Total
Snowball Ck to Spooner Ck	5	28	47	4	5	2	9	91
Lynch Ck /Bunch Grass	1	12	32	5	6	4	11	60
Rock Candy/Almond Ck	3	12	21	5	3	3	8	47
Bitter Ck to Sutherland Ck	0	6	7	0	0	0	0	13
Total	9	58	107	14	14	9	37	211

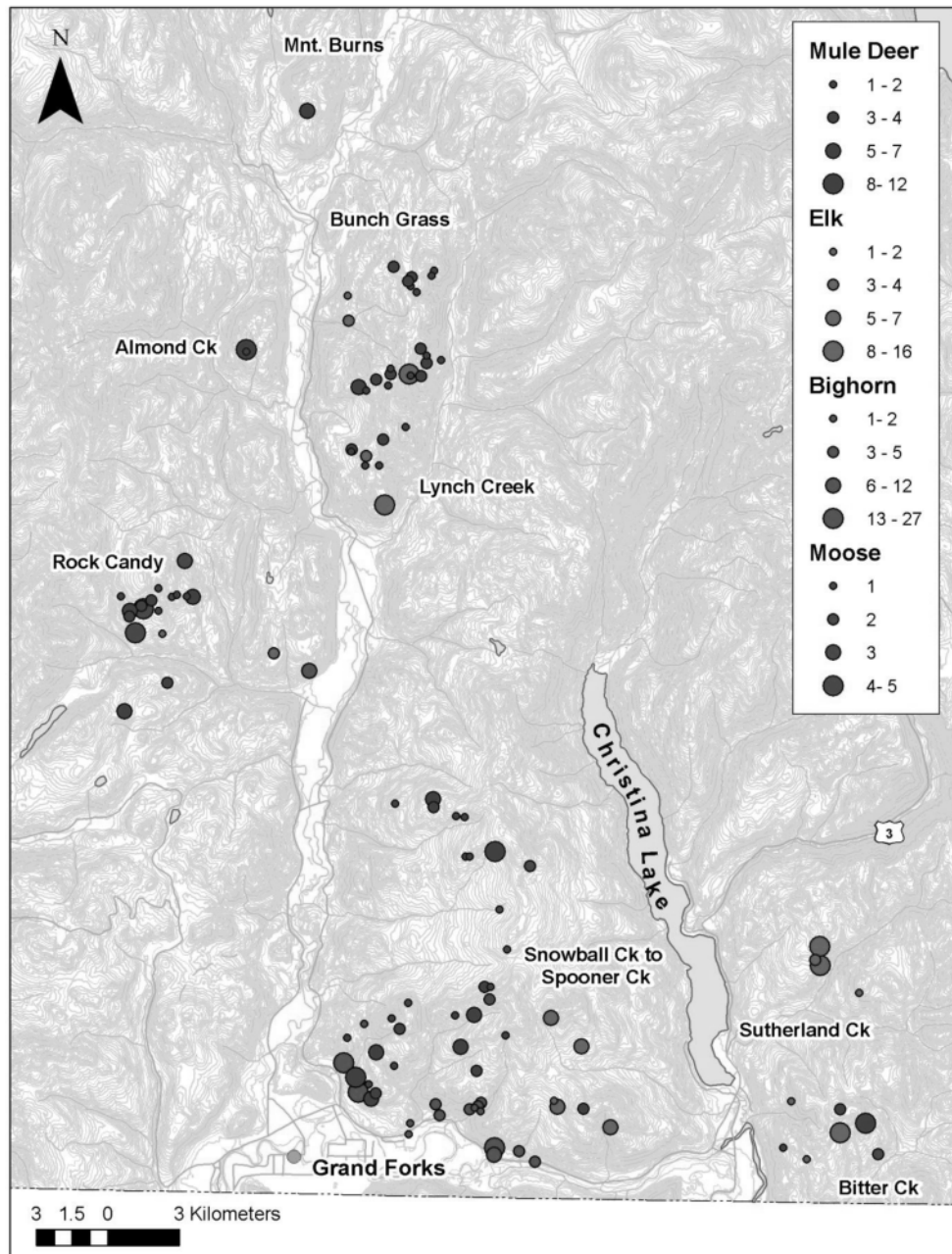


Figure 6: Map showing ungulate observations scaled to group size during the Boundary survey November 25th, 26th and December 6th, 2011.

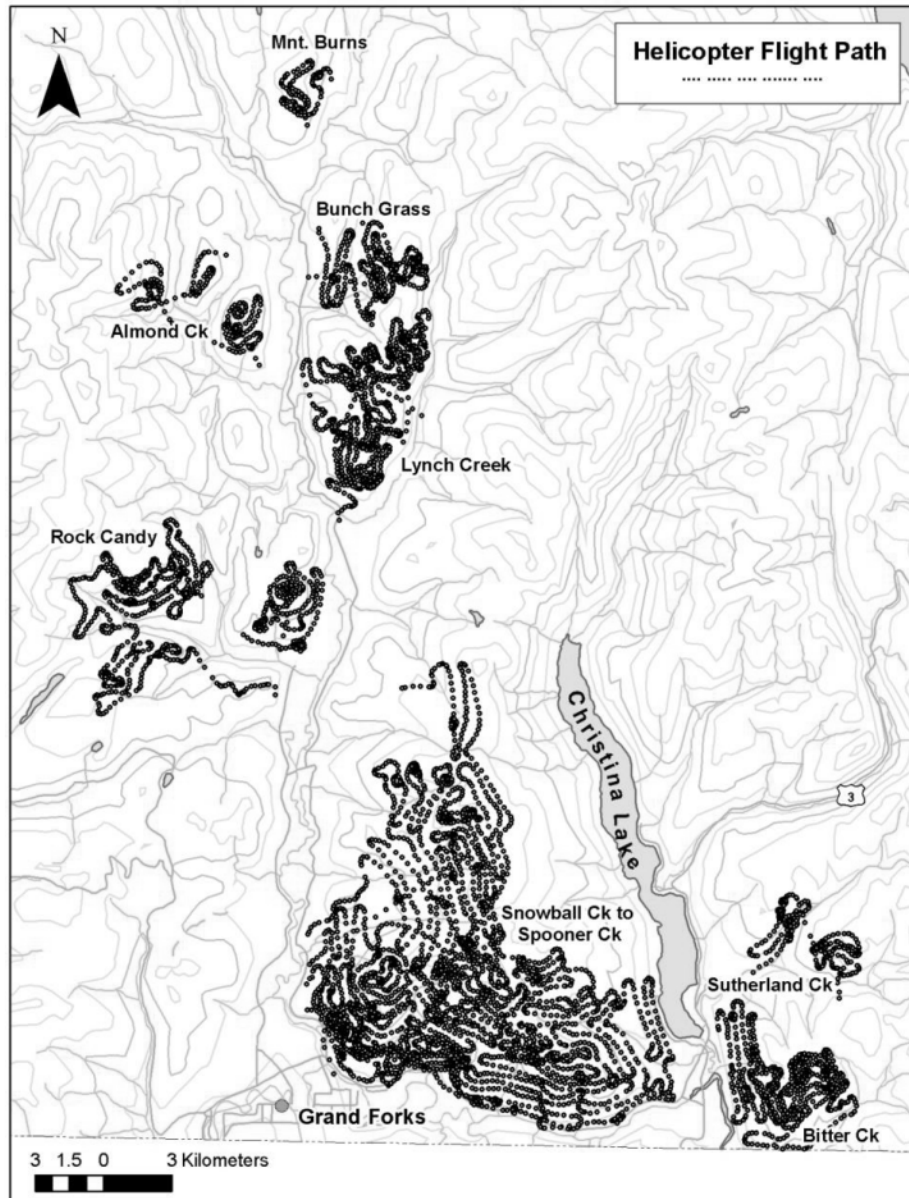


Figure 7: Map showing flight paths for the mule deer composition survey in the Boundary survey on November 25th, 26th and December 6th, 2011.

Other Species

We encountered multiple species during surveys in both MUs including bighorn sheep, elk, moose and white-tailed deer (Table 3). Sufficient sample sizes were collected to run sightability models for elk and bighorn sheep in MU 8-15. Survey coverage for bighorn can be considered a complete census and therefore a population estimate was derived. The survey coverage for elk was not complete but the sample size ($n=115$) was sufficient to analyse bull, calve, and 6pt ratios using an incomplete sightability model.

Table 3: Other species observed during mule deer surveys in the Boundary and Shuswap in November and December 2011.

Species	MU	Unclass.	Juvenile	Adult Female	Adult Male	Total
Elk	815	5	17	59	34	115
	823	0	6	12	5	23
Bighorn Sheep	815	22	18	60*	29	129
White-tailed Deer	815	71	0	0	0	71
	823	66	0	0	0	66
Moose	815	0	5	10	10	25
	823	0	3	7	2	12

* includes yearlings

Elk

A total of 115 elk were classified in MU 8-15 including 59 cows, 17 calves, 6 spike bulls, 11 raghorn bull, 8 six point bulls, 9 unclassified bulls, and 5 unclassified. Estimated sex ratios (i.e. corrected for incomplete sightability) are listed in Table 4.

Table 4: Incomplete sightability corrected elk ratios from aerial surveys of MU 8-15 in November and December 2011.

Survey Area	Calves:100 Cows	90% C.I.	Bulls:100 Cows	90% C.I.	≥6-points: 100 Cows	90% C.I.	<6-points: 100 Cows	90% C.I.
MU 8-15	33	20-46	63	43-83	16	10-22	30	21-39

Bighorn

We observed at total of 129 bighorn in MU 8-15 (Table 5). I calculated the estimated population size for MU 8-15 at 179 (CI 120-236). The total correction factor was 1.39. The model precision resulted in confidence intervals within 33% of the estimate. Observed and estimated lamb: ewe ratios were 41 and 42 (CI: 20-64), respectively and the observed and estimated ram: ewe ratios were 65 and 70 (CI: 38-102), respectively.

Table 5: Detailed composition for bighorn sheep observed during aerial surveys of MU 8-15 in November and December 2011.

Observed	Total	Ewe	Lamb	Yearling	Class I	Class II	Class III	Class IV	Unclass.
	129	43	18	10	7	12	5	4	30

Discussion

Distribution

Differential sightability of bucks and does was discussed amongst southern interior mule deer managers prior to the 2010 surveys. Experience in other regions suggested that mule deer bucks begin to separate from does and move into bachelor groups after the 10th of December (Pat Dielman Personal Com.). Data collected in 2010 in the Boundary, Shuswap, and Kootenays suggested that bucks remain with does until early December and therefore should have similar sightability. The analysis was based on the percent of bucks observed with at least one doe during composition surveys. This analysis was updated with 2011 data from the Boundary, Shuswap and Kootenays (Table 6). Again data suggests that mule deer composition surveys should be completed before December 7th, preferably in the third week of November.

Table 6: Table 7: The percent of bucks observed with at least one doe during composition surveys across the Okanagan and Kootenay Regions in 2010 and 2011.

MU	Survey Year	Survey Dates	% of bucks with does	Sample Size
4-02, 4-03 4-21 and 4-22	2011	Nov. 19th and 20th	92	784
4-02, 4-21 and 4-22	2010	Nov. 22nd and 23rd	92	596
8-15	2011	Nov. 25th and 26th	87	147
8-23	2011	Nov. 30th and Dec. 1st	78	318
8-23	2010	Dec. 2nd and 3rd	79	384
4-06 and 4-07	2011	Dec. 5th and 7th	82	335
815	2011	Dec. 6th	70	64
4-03, 4-06 and 4-07	2010	Dec. 15th and 22nd	52	246
8-12, 8-14 and 8-15	2010	Dec. 10th, 11th and 15th	40	390
4-26	2011	Dec. 13th	75	72
4-06 and 4-07	2009	Dec. 31st	91	146
8-23	2010	Jan. 6th	35	233
4-02, 4-21 and 4-22	2009	Jan. 6th and 7th	68	864

Buck Ratio

A performance measure of the Southern Interior Mule Deer Harvest Procedure (MOE Mule Deer Harvest Strategy, 2010) is to “*provide a variety of hunting opportunities by endeavouring to*

maintain a minimum buck: doe ratio of 20 bucks:100 does after the hunting season (post-hunt) within most Population Management Units". This measure was the primary objective for our composition surveys. In 2011, we observed greater than 20 bucks: 100 does in both MU 8-23 and 8-15.

Shuswap

We calculated a ratio of 26 bucks: 100 does (CI 21-31) in November/December 2011. This is an increase from last year's 22 bucks: 100 does (CI 18-26) and an increase from the January 2010 survey of Byers Range and Cherry Ridge of 24 bucks: 100 does (CI 17-31) (Harris, 2010). However, the confidence intervals for all three surveys overlap suggesting there is no significant change in buck ratios between surveys (Figure 6). Several bucks were observed with only one antler during the January 2010 survey. If antlerless bucks were classified as does, bucks could have been under represented during this survey. The overall sample size was greater in December 2010 (n= 369) and November/December 2011(n=318) than January 2010 (n=195), resulting in more precise estimates.

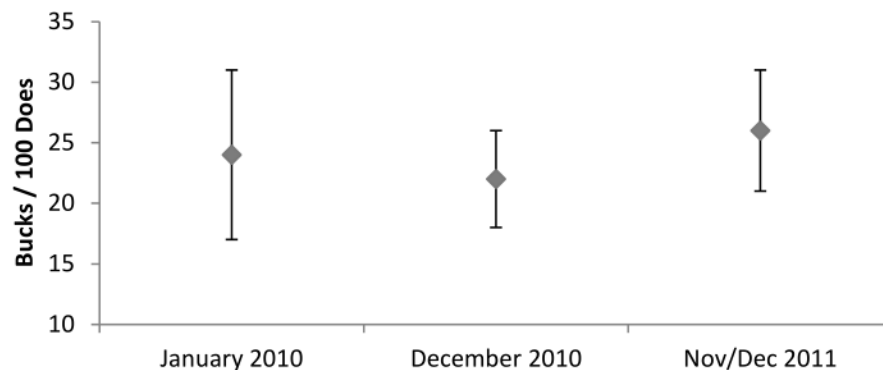


Figure 8: Bucks / 100 does (buck to doe ratio) with 90% confidence intervals for January 2010, December 2010 and November/December 2011 MU 8-23.

Post-hunt composition data collected in MU 8-23 since 2010 confirms that we are meeting our hunting regulations objectives of 20 bucks: 100 does and hunting bucks is not negatively impacting the mule deer population in this MU.

Boundary

In 2010, I reported that the buck ratio has likely been below 20 for nearly a decade (Reid 2010) and that Sand Creek to Spooner Creek likely supported the bulk of the mule deer in MU 8-15. In 2011 we decided to focus our survey effort inside MU 8-15 and to survey other winter ranges. The intent was to increase sample size and obtain a greater understanding of mule deer winter range distribution in the MU. As a result, we did not sample other MU in the Boundary in 2011.

Previous composition surveys in MU 8-15 in December 2000, 2002, 2008, and 2010 found 12 (7-19), 15 (CI 8-24), 13 (CI 8-20), and 16 (CI 10-25) bucks: 100 does, respectively. Confidence intervals suggest there has been no change in buck ratios since 2000. However, the majority of surveys focused on winter ranges from Sand to Spooner Creek (i.e. Gilpin). In 2011, we increased our survey area and sample size and observed a buck ratio of 35 bucks: 100 does (CI 27-43). The result was a dramatic increase in the buck ratio from past surveys (Figure 7).

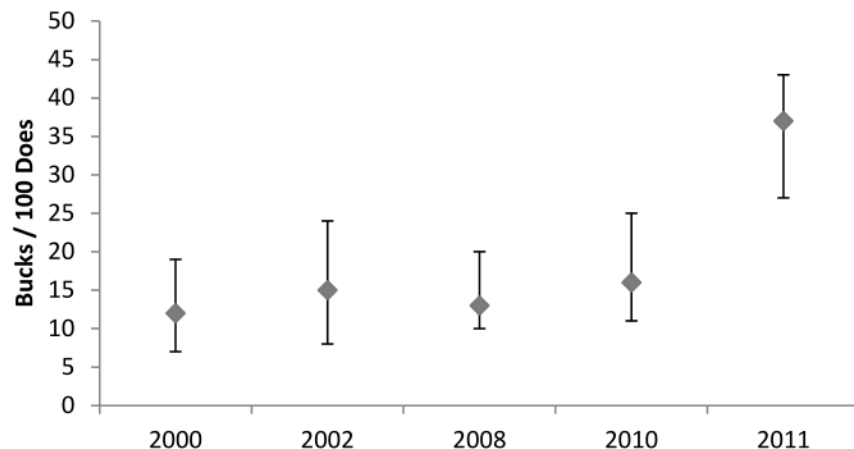


Figure 9: Bucks/ 100 does (buck to doe ratio) with 90% confidence intervals for 2000, 2002, 2008, 2010 and 2011 in MU 8-15. All but the 2010 and 2011 data were surveyed in January; antler drop may bias the buck ratio lower.

The increased buck ratio in 2011 was a likely a result of expanding the survey area to more winter ranges in the MU, which I believe is a more representative sample of the MU.

If we would have limited our survey to the southern winter ranges in 2011, the buck ratio would not have changed from previous years. When breaking down the winter ranges within the MU by area, as in Table 2, we observed higher buck ratios on the northern winter ranges: Rock Candy/Almond Ck 38 bucks: 100 does (CI 21-58; n=47), Lynch Ck/Bunch Grass 34 bucks: 100 does (CI 21-50; n=60), and Snowball to Spooner Ck 19 bucks: 100 does (CI 10-31; n=91). The lower buck ratio in the south is to be expected since the southern winter ranges likely receive higher pressure from their close proximity to urban centres and greater access. Regardless, 19 bucks: 100 does is close to the target considering buck ratios are typically biased low.

Low encounter rates during our surveys and harvest data support anecdotal information from residents and guide outfitters that MU 8-15 mule deer populations are low relative to the peak in the early 1990s. However, post-hunt composition suggests that hunting bucks is not the cause of low mule deer numbers in the MU. Literature suggests that buck ratio is unrelated to the fawn recruitment the following year (Erickson et al. 2003); all does get bred except at very low buck ratios. Therefore, buck harvest is unlikely to be limiting population recovery. Over the past decade the MU has experienced stable harvest levels and hunter success has modestly improved

(Figure 10). In addition, two years of survey data suggests buck ratios are improving and fawn recruitment is healthy.

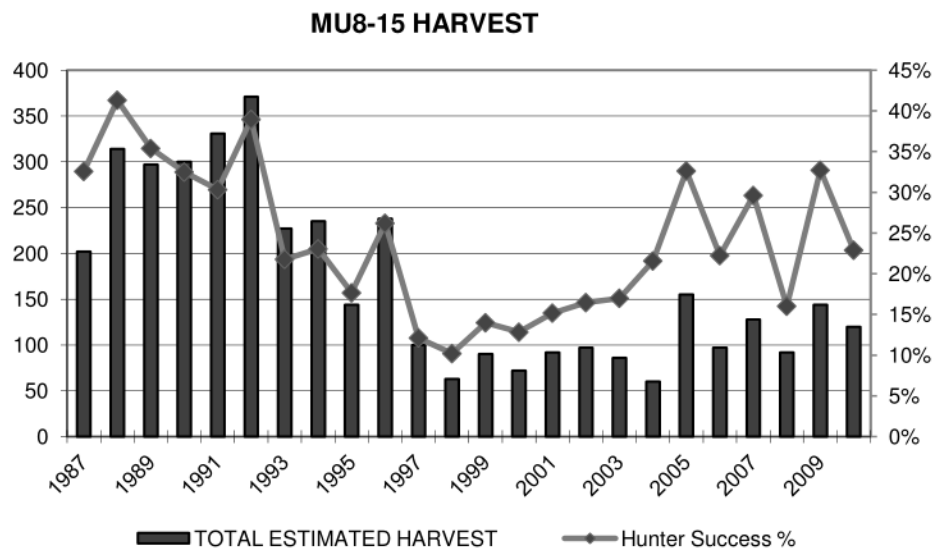


Figure 10: Mule deer harvest (buck and doe) and hunter success for Management Unit 8-15 from 1987 to 2010.

Post-hunt composition data collected in MU 8-15 since 2010 confirms that we are meeting our hunting regulations objectives of 20 bucks: 100 does and buck hunting is not negatively impacting the mule deer population in this MU.

Recommendations

Methods

- Photographs should be taken at high resolution, fast shutter speeds and in drive mode so multiple photographs per second are captured. Stent (2010) recommended photographing profiles of bucks to maximize visibility of antler branches and tines. Photos of bucks looking at the camera and running directly away should be avoided. Profile pictures of does and fawns are also recommended for comparing rostrum lengths.
- Continue photographing all bucks > 2 pt. Ensure classification from the helicopter is completed since photographs are not always reliable (e.g. out of focus, poor angle, obscured by vegetation).
- Photograph large doe and fawn groups when possible to verify fawn classification.

- Surveys should be conducted in late November or early December, providing snow levels are sufficient to move deer onto the winter range.
- Survey to the height of land in each block or, to the elevation where deer tracks are no longer present in the snow.

Management

Currently, there are 7 completed ecosystem restoration prescriptions, mechanical and prescribed burn, ready and waiting for operational funding in the Boundary. Four of these prescriptions are within MU 8-15: Ben Stubbs Creek, Volcanic Creek, Miller Creek, and Lynch Creek. Funding proposals for the completed prescriptions have been submitted to potential funding sources including the Habitat Conservation Trust Foundation. One prescribed burn has been funded and is scheduled for spring 2012 at Morrissey Creek, weather pending. In addition, the Selkirk District ecosystem restoration committee is in process of developing a 5 year strategic plan to guide and support future work in the Boundary.

Consider implementing research projects that look at survival rates and migration patterns of mule deer in MU 8-15 to better understand factors limiting population growth. As well as begin monitoring carryover of fawns in spring with annual ground counts.

Acknowledgments

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British Columbia Ungulate Species Regional Population Estimates and Status - Preseason 2011.

Admin. Region No.	Region Name	MOOSE		ELK ¹		CARIBOU		THINHORN SHEEP ²		BIGHORN SHEEP ³		MOUNTAIN GOAT		BLACK-TAILED DEER ¹		MULE DEER		WHITE-TAILED DEER		BISON ⁴	
		Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend
1	Vancouver Island	10-20	S	4,600- 5,600	S-I	0	n/a	0	n/a	0	n/a	1,900- 3,100	S-D	45,000- 65,000	S-I	0	n/a	0	n/a	0	n/a
2	Lower Mainland	75-150	S	1300- 1500	I	0	n/a	0	n/a	0	n/a	1500- 2300	S-I	17,000- 29,000	S	3,000- 5,000	S	20-50	S-I	0	n/a
3	Thompson	8,000- 12,000	I	300-400	S-I	200-300	D	0	n/a	2,000- 2,500	I	1,400- 2,000	D	1,000- 2,000	I	35,000- 55,000	I	5,000- 8,000	I	0	n/a
4	Kootenay	7000- 9000	S	21,000- 32,000	S-I	290-350	D	0	n/a	2300- 2500	S	9,200- 9,500	S	0	n/a	25,000- 51,000	S-I	44,000- 72,000	I	0	n/a
5	Cariboo	20,000- 28,000	S	100-250	I	1600- 1700	S-D	0	n/a	500-800	S-D	4,000- 5,000	S	1,000- 6,000	S	15,000- 30,000	S-D	500- 1,000	I	0	n/a
6	Skeena	25,000- 45,000	S-D	200-500	S	6,000- 12,000	S	4,000- 6,500	S	0	n/a	18,000- 35,000	S-I	35,000- 55,000	D	2,000- 3,000	D	500- 1,500	S	5-10	I
7A	Omineca	30,000- 50,000	S	500-2000	I	3,000 - 4,000	D	600-800	S	0	n/a	3,000- 4,000	S	0	n/a	3,000- 6000	I	500- 1,000	I	0	n/a
7B	Peace	52,000 - 87,000	I-D	15,000- 35,000	I-D	4,600 - 8,600	S-D	5,250 - 7,500	S-D	50-150	S	2,000- 4,000	S-I	0	n/a	8,000- 11,000	S-D	5,000- 12,000	S-I	1,500 - 2,400	S-I
8	Okanagan	2,000- 3,000	S	1000- 1500	I	5-15	S	0	n/a	1,000- 1,200	S	200-300	S	0	n/a	28,000- 42,000	S	31,000- 44,000	I	0	n/a
PROVINCIAL TOTAL		140,000- 235,000	S-D	44,000- 79,000	S-D	16,000- 27,000	S-D	9,800- 15,000	S-D	5,900- 7,200	I-D	41,000- 66,000	I-D	99,000- 155,000	I-D	115,000- 205,000	I-D	87,000- 140,000	S-I	1,500- 2,400	S-I

Estimates are for early fall preharvest populations and are based on information supplied by Regional Wildlife Biologists. Values include both plausible minimum and maximum estimates of population size.

Estimates should be considered general approximations based on limited, but best available information. Minimum and maximum estimates are rounded as follows: <100 to nearest 5; 100-499 to nearest 10; 500-1,999 to nearest 50; 2,000 to 9,999 to nearest 100; 10,000-39,999 to nearest 500; 40,000-99,999 to nearest 1,000; >100,000 to nearest 5,000. Totals may not add because of rounding.

Population Trend is from 2009 - 2011: D - Declining (> 20% decline over last 3 years); S = Stable (< 20% change over last 3 years); I = Increasing (> 20% increase over last 3 years)

¹ Region 6 estimates includes Elk and Black-tailed Deer on Haida Gwaii.

² Includes Stone Sheep in Region's 6 and 7, and Dall Sheep (400-600) in Region 6.

³ Includes California Bighorn Sheep in Region's 3, 5 and 8 (3100-3900); and Rocky Mountain Bighorn Sheep in Region's 3, 4 and 7 (2750-3250).

⁴ Includes both Plains Bison (1100-1800) and Woods Bison (400-600).

British Columbia Ungulate Species Regional Population Estimates and Status - Preseason 2008.

Admin. Region No.	Region Name	MOOSE		ELK		CARIBOU		TRINHOORN SHEEP		BIGHORN SHEEP		MOUNTAIN GOAT		COAST BLACK- TAILED DEER		MULE DEER		WHITE- TAILED DEER		BISON	
		Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend
1	Vancouver Island	10-20	S	3,500-4,900	S-I	0	n/a	0	n/a	0	n/a	1,600-3,100	S-D	45,000-65,000	S-I	0	n/a	0	n/a	0	n/a
2	Lower Mainland	80-100	S	800-1,200	I	0	n/a	0	n/a	0	n/a	1,000-1,700	S-D	17,000-29,000	S	3,000-5,000	S	10-30	S-I	0	n/a
3	Thompson	5,000-10,000	I	300-600	I	500-600	S-D	0	n/a	1,500-2,000	S	1,500-2,500	D	500-1,000	S-I	25,000-45,000	I	2,000-3,000	I	0	n/a
4	Kootenay	500-600	S	2,700-33,500	S-I	315-370	D-I	0	n/a	2,200-2,400	S	9,200-9,900	S	0	n/a	24,000-48,000	I	40,000-66,000	I	0	n/a
5	Columbia	20,000-28,000	S	100-200	I	3,000-3,500	S-D	0	n/a	500-600	D	4,000-5,000	S	1,000-6,000	S	15,000-30,000	S-I	500-1,000	I	0	n/a
6	Stikine	38,000-47,000	S	150-250	S-I	6,500-8,000	S	4,000-5,500	S	0	n/a	16,000-35,000	S	35,000-65,000	S	4,000-6,000	S	500-1,000	I	0	n/a
7A	Omineca	30,000-50,000	S	300-500	I	3,000-4,000	S	600-900	S	0	n/a	3,000-4,000	S	0	n/a	3,000-6,000	I	500-1,000	I	5-10	I
7B	Pesado	40,000-80,000	D-I	15,000-35,000	S-I	4,300-9,600	D-S	5,000-7,000	D-S	50-150	D-S	2,000-4,000	S	0	n/a	5,200-12,000	S	7,000-18,000	I	1,300-2,300	S
8	Okanagan	2,300-3,000	I	650-900	S-I	5-15	S	0	n/a	1,300-1,200	I	200-300	D	0	n/a	28,000-42,000	S	31,000-44,000	I	0	n/a
PROVINCIAL TOTAL		137,000-275,000	S	48,000-77,000	S-I	17,500-26,000	S-D	9,900-13,400	D-S	6,900-6,600	D-I	39,000-69,500	S-D	98,500-168,000	S-I	108,000-194,000	S-I	61,500-128,000	I	1300-2300	S

Estimates are for early fall pre-harvest populations and are based on information supplied by Regional Wildlife Biologists. Values include both plausible minimum and maximum estimates of population size. Estimates should be considered general approximations based on limited but best available information.

BRITISH COLUMBIA UNGULATE SPECIES REGIONAL POPULATION ESTIMATES* AND STATUS** - PRESEASON 2003

Admin. Region No.	Region/ Subregion Name	MOOSE		ELK		CARIBOU		THINHORN SHEEP***		BIGHORN SHEEP****		MOUNTAIN GOAT		COAST BLACK- TAILED DEER		MULE DEER		WHITE- TAILED DEER		BISON*****	
		Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend
1	Vancouver Island	10-20	S	2700- 4300	S-I	0	n/a	0	n/a	0	n/a	1900- 3100	S	59,000- 99,000	S-I	0	n/a	0	n/a	0	n/a
2	Lower Mainland	60-100	S	250-350	I	0	n/a	0	n/a	0	n/a	1000- 1700	S	17,000- 29,000	S	3000- 5000	S	0	n/a	0	n/a
3	Thompson-Nicola	6000- 10000	I	250-350	I	300-600	S-D	0	n/a	1500- 2000	D	2000- 3000	S-D	500-1000	S-I	25,000- 45,000	I	1000- 2000	I	0	n/a
8	Okanagan	2300- 3000	I	650-900	D	5-15	S	0	n/a	600-750	I	200 - 300	D	0	n/a	28,000- 42,000	S	31,000- 44,000	I	0	n/a
	Regional Total	8300- 13000	I	900-1250	D-I	300-600	S-D	0	n/a	2100- 2800	D-I	2200- 3300	S-D	500-1000	S-I	53,000- 87,000	I-S	32,000- 46,000	I	0	n/a
4	East Kootenay	4500- 5500	S	23,000- 25,000	I	20-30	D	0	n/a	1500- 2000	S	7000- 7500	S	0	n/a	20,000 - 25,000	I	25,000 - 30,000	I	0	n/a
	West Kootenay	1500 - 2400	I	2000- 4000	I	400 - 500	S	0	n/a	60 - 90	S	1200- 2300	S	0	n/a	1800- 4100	S	6000- 10,000	I	0	n/a
	Regional Total	6000- 7900	S-I	25,000- 29,000	I	420-550	S-D	0	n/a	1550- 2100	S	8200- 9800	S	0	n/a	22,000- 29,000	I-S	31,000- 40,000	I	0	n/a
5	Cariboo	20,000- 28,000	S	100-250	I	3000- 3500	S-D	0	n/a	700-900	D	4000- 5000	S	1000- 6000	S	15,000- 30,000	S-I	100-500	I	0	n/a
6	Skeena	28,000- 47,000	S	150-250	S-I	6500 - 8000	S	4000- 5500	S	0	n/a	16,000 - 35,000	S	35,000 - 65,000	S	4000 - 6000	S	100-400	I	0	n/a
7A	Omineca	30,000- 50,000	S	300-500	I	3000 - 4000	S	600 - 900	S	0	n/a	3000 - 4000	S	0	n/a	3000 - 6000	I	500 - 1000	I	5-10	I
7B	Peace	40,000- 80,000	D-I	10,000- 20,000	D-I	3000- 6000	D-S	4000- 6000	D	50-100	D	3000- 5000	S	0	n/a	5000- 10,000	S	1500- 3000	S	900-1200	S
	Regional Total	70,000- 130,000	D-I	10,500- 20,500	D-I	6000- 10,000	D-S	4600- 6800	D-S	50-100	D	6000- 9000	S	0	n/a	8,000- 16,000	S-I	2000- 4000	S	900-1200	S
PROVINCIAL TOTAL		130,000- 225,000	S	39,500- 56,000	S-I	16,000- 20,500	S-D	8600- 12,500	D-S	4400- 5800	D-S	39,000- 67,000	S-D	115,000- 200,000	S-I	105,000- 175,000	S	65,000- 91,000	I	900-1200	S

n/a= not available

* Estimates are for early fall preharvest populations and are based on information supplied by Regional Wildlife Biologists. Values include both plausible minimum and maximum estimates of population size.

Estimates should be considered general approximations based on limited, but best available information. Minimum and maximum estimates are rounded as follows: <100 to nearest 5; 100-499 to nearest 10; 500-1,999 to nearest 50; 2,000 to 9,999 to nearest 100; 10,000-39,999 to nearest 500; 40,000-99,999 to nearest 1,000; >100,000 to nearest 5,000. Totals may not add because of rounding.

** Population Trend is from 2000 - 2003: D = Declining (> 20% decline over last 3 years), S = Stable (< 20% change over last 3 years), I = Increasing (> 20% increase over last 3 years)

*** Includes Stone Sheep in Region's 6 and 7, and Dall Sheep (400-600) in Region 6.

**** Includes California Bighorn Sheep in Region's 3, 5 and 8 (2400-3300); and Rocky Mountain Bighorn Sheep in Region's 3, 4 and 7 (2000-2500).

***** Includes both Plains Bison (900) and Woods Bison (300)

BRITISH COLUMBIA UNGULATE SPECIES REGIONAL POPULATION ESTIMATES* AND STATUS** - PRESEASON 2000

Admin. Region No.	Region/ Subregion Name	MOOSE		ELK		CARIBOU		THINHORN SHEEP***		BIGHORN SHEEP****		MOUNTAIN GOAT		COAST BLACK-TAILED DEER		MULE DEER		WHITE-TAILED DEER		BISON	
		Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend	Estimated Number	Estimated Trend
1	Vancouver Island	10-20	S	2400-4000	S	0	n/a	0	n/a	0	n/a	1900-3100	S	40,000-67,000	D	0	n/a	0	n/a	0	n/a
2	Lower Mainland	60-100	S	250-350	I	0	n/a	0	n/a	0	n/a	1000-1700	S	17,000-29,000	S	3000-5000	S	0	n/a	0	n/a
3	Thompson-Nicola	5500-9500	S-D	200-300	S-I	300-600	S-D	0	n/a	1500-2500	S	2000-3400	S-D	300-700	S	25,000-45,000	S	1000-2000	I	0	n/a
8	Okanagan	2300-3000	I	650-900	D	5-15	S	0	n/a	600-750	D	450-600	D	0	n/a	28,000-42,000	S	31,000-44,000	I	0	n/a
	Regional Total	8000-12500	S	850-1200	S-D	300-600	S-D	0	n/a	2100-3300	S-D	2500-4000	S-D	300-700	S	53,000-87,000	S	32,000-46,000	I	0	n/a
4	East Kootenay	4300-6700	D	18,000-20,000	I	20-30	D	0	n/a	2500-3000	S	4000-5000	D	0	n/a	15,000-20,000	S	16,000-23,000	I	0	n/a
	West Kootenay	700-1200	I	2000-4000	I	600-1000	S	0	n/a	40-70	S	1200-2300	S	0	n/a	1800-4100	S	3700-9000	I	0	n/a
	Regional Total	5000-7900	S	20,000-24,000	I	600-1050	S-D	0	n/a	2500-3100	S	5200-7300	S-D	0	n/a	17,000-24,000	S	19,500-32,000	I	0	n/a
5	Cariboo	18,000-21,000	S	50-150	I	2200-2400	S-D	0	n/a	800-1000	D	3500-4500	D	1000-6000	S	10,000-30,000	S-I	100-500	I	0	n/a
6	Skeena	28000-47000	S-D	150-250	S-I	6500-8000	S	4000-5500	S-D	0	n/a	16,000-35,000	S	35,000-65,000	S	4000-6000	S	100-400	I	0	n/a
7	Omineca	30,000-50,000	S	300-500	I	3000-4000	S	600-900	S	0	n/a	3000-4000	S	0	n/a	3000-6000	I	500-1000	I	5-10	I
	Peace	20,000-30,000	S	1500-2500	S	500-1000	D	200-300	S	100-150	S	400-500	S	0	n/a	5000-10,000	S	1500-3000	S	800-1200	n/a
	Liard	20,000-30,000	D	10,000-14,000	S	2500-3500	D	6000-7000	S	0	n/a	2000-2500	S	0	n/a	1000-1500	S	250-500	S	20-80	S
	Regional Total	70,000-110,000	S-D	12,000-17,000	S	6000-8500	S-D	6800-8200	S	100-150	S	5400-7000	S	0	n/a	9,000-17,500	S	2300-4500	S	850-1300	S
PROVINCIAL TOTAL		130,000-200,000	S-D	35,500-47,000	S-I	16,000-20,000	S-D	11,000-14,000	S-D	5500-7500	S-D	35,000-63,000	S-D	93,000-168,000	S-D	96,000-170,000	S	54,000-83,000	I	850-1300	S

* Estimates are for early fall preharvest populations and are based on information supplied by Regional Wildlife Biologists. Values include both plausible minimum and maximum estimates of population size. Estimates should be considered general approximations based on limited, but best available information. Minimum and maximum estimates are rounded as follows: <100 to nearest 5; 100-499 to nearest 10; 500-1,999 to nearest 50; 2,000 to 9,999 to nearest 100; 10,000-39,999 to nearest 500; 40,000-99,999 to nearest 1,000; >100,000 to nearest 5,000. Totals may not add because of rounding.

** Population Trend is from 1997 - 2000: D = Declining (> 10% decline over last 3 years), S = Stable (< 10% change over last 3 years), I = Increasing (> 10% increase over last 3 years)

*** Includes Stone Sheep in Region's 6 and 7, and Dall Sheep (400-600) in Region 6.

**** Includes California Bighorn Sheep in Region's 3, 5 and 8 (2500-3800); and Rocky Mountain Bighorn Sheep in Region's 3, 4 and 7 (3000-3700).

BRITISH COLUMBIA UNGULATE SPECIES REGIONAL POPULATION ESTIMATES* AND STATUS** - PRESEASON 1997

Admin. Region No.	Region/ Subregion Name	MOOSE		ELK		CARIBOU		THINHORN SHEEP***		BIGHORN SHEEP****		MOUNTAIN GOAT		COAST BLACK- TAILED DEER		MULE DEER		WHITE- TAILED DEER		BISON	
		Est #	Trend	Est #	Trend	Est #	Trend	Est #	Trend	Est #	Trend	Est #	Trend	Est #	Trend	Est #	Trend	Est #	Trend	Est #	Trend
1	Vancouver Island	15	S	3,200	S	0	n/a	0	n/a	0	n/a	2,500	S	86,000	D	0	n/a	0	n/a	0	n/a
2	Lower Mainland	80	S	200	I	0	n/a	0	n/a	0	n/a	1,350	S	23,000	S	4,000	S	0	n/a	0	n/a
3	Thompson-Nicola	7,900	S	250	I	550	S	0	n/a	2,100	S,I	2,900	S	500	S	50,000	S	1,300	I	0	n/a
8	Okanagan	1,550	I	1,100	D	20	S	0	n/a	750	S	600	S	0	n/a	35,000	D	30,000	D	0	n/a
	Regional Total	9,500	S	1,350	S	550	S	0	n/a	2,900	S	3,500	S	500	S	85,000	S	31,500	S	0	n/a
4	East Kootenay	6,700	S	16,500	D	100	S	0	n/a	2,700	S	8,500	S-D	0	n/a	18,000	D	20,000	D	0	n/a
	West Kootenay	950	I	3,500	S	800	S	0	n/a	55	S	1,850	D	0	n/a	7,000	D	9,000	D	0	n/a
	Regional Total	7,700	S	20,000	D	900	S	0	n/a	2,800	S	10,500	S	0	n/a	25,000	D	29,000	D	0	n/a
5	Cariboo	16,000	S	80	I	2,000	S	0	n/a	1,250	D	4,900	S	6,400	S	25,500	S-I	100+	I	0	n/a
6	Skeena	36,500	S-D	200	S-I	6,300	S	4,900	S	0	n/a	20,000	S	65,000	S	6,000	S	100	S-I	0	n/a
7	Omineca	40,000	S	300	S	2,700	S	800	S	0	n/a	3,100	S	0	n/a	4,100	S	700	S	0	n/a
	Peace	26,000	S	2,100	S	1,100	S	260	S	130	S	500	S	0	n/a	11,500	S	2,500	S	0	n/a
	Liard	33,000	D	15,500	S	3,000	S	6,500	S	0	n/a	2,500	S	0	n/a	2,000	S	500	S	1,500	S
	Regional Total	99,000	S-D	18,000	S	6,800	S	7,600	S	130	S	6,100	S	0	n/a	17,500	S	3,700	S	1,500	S
PROVINCIAL TOTAL		170,000	S-D	43,000	S-D	16,500	S	12,500	S	7,000	S	49,000	S	180,000	S-D	165,000	S-D	64,000	D	1,500	S

* Estimates are for early fall preharvest populations and are based on information supplied by Regional Wildlife Biologists. Where a numerical range was provided, the mid-point was used for the tabulation above. Estimates should be considered general approximations based on limited, but best available information. Individual estimates and totals are rounded as follows: <100 to nearest 5; 100-499 to nearest 10; 500-1,999 to nearest 50; 2,000 to 9,999 to nearest 100; 10,000-39,999 to nearest 1,000; >100,000 to nearest 5,000. Totals may not add because of rounding.

** D = Declining, S = Stable, I = Increasing

*** Includes Stone Sheep (12,000) in Region's 6 and 7, and Dall Sheep (500) in Region 6.

**** Includes California Bighorn Sheep (3700) in Region's 3 (1700), 5 and 8; and Rocky Mountain Bighorn Sheep (3300) in Region's 3 (400), 4 and 7. In Region 3, some herds are decreasing while others are increasing.

BRITISH COLUMBIA UNGULATE SPECIES REGIONAL POPULATION ESTIMATES- PRESEASON 1994*

Admin. Region No.	Region/ Subregion Name	MOOSE		ELK		CARIBOU		THINHORN SHEEP		BIGHORN SHEEP		MOUNTAIN GOAT		COAST BLACK- TAILED DEER		MULE DEER		WHITE- TAILED DEER		BISON		BLACK BEAR	GRIZZLY BEAR
		Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %		
		Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %		
1	Vancouver Island	15	<1%	3,200	7%	0	0%	0	0%	0	0%	2,500	5%	125,000	57%	0	0%	0	0%	0	0%		
2	Lower Mainland	80	<1%	180	<1%	0	0%	0	0%	0	0%	1,350	3%	23,000	10%	4,000	2%	0	0%	0	0%		
3	Thompson-Nicola	7,600	5%	240	<1%	550	3%	0	0%	2,400	30%	2,900	6%	0	0%	37,500	22%	1,300	1%	0	0%		
	Okanagan	1,550	1%	1,100	2%	20	0%	0	0%	1,150	15%	600	1%	0	0%	46,000	27%	53,000	55%	0	0%		
	Regional Total	9,200	6%	1,350	3%	550	3%	0	0%	3,600	46%	3,500	7%	0	0%	84,000	49%	54,000	56%	0	0%		
4	East Kootenay	6,700	4%	23,000	47%	130	1%	0	0%	2,700	34%	8,900	18%	0	0%	23,500	14%	23,000	24%	0	0%		
	West Kootenay	950	1%	3,500	7%	500	3%	0	0%	55	1%	1,850	4%	0	0%	10,500	6%	13,500	14%	0	0%		
	Regional Total	7,600	5%	26,500	54%	650	4%	0	0%	2,800	35%	11,000	22%	0	0%	34,000	20%	36,000	37%	0	0%		
5	Cariboo	15,500	10%	80	<1%	2,000	11%	0	0%	1,400	18%	4,900	10%	6,400	3%	26,500	16%	0	0%	0	0%		
6	Skeena	36,500	23%	170	<1%	7,200	39%	4,900	34%	0	0%	20,000	40%	65,000	30%	5,600	3%	100	<1%	0	0%		
7	Omineca	21,000	13%	300	1%	2,100	11%	800	6%	0	0%	3,100	6%	0	0%	4,100	2%	700	1%	0	0%		
	Peace	25,000	16%	2,100	4%	1,350	7%	260	2%	130	2%	600	1%	0	0%	11,500	7%	5,000	5%	0	0%		
	Liard	42,000	27%	15,500	32%	4,800	26%	8,600	59%	0	0%	3,300	7%	0	0%	2,000	1%	1,050	1%	1,100	100%		
	Regional Total	88,000	56%	18,000	37%	8,300	45%	9,700	67%	130	2%	7,000	14%	0	0%	17,500	10%	6,800	7%	1,100	100%	124,000 160,000	14,000 13,000
PROVINCIAL TOTAL		157,000	100%	48,000	100%	18,500	100%	14,500	100%	7,900	100%	50,000	100%	220,000	100%	170,000	100%	97,000	100%	1,100	100%		

* Estimates are for early fall preharvest populations and are based on information supplied by Regional Wildlife Biologists. Where a numerical range was provided, the mid-point was used for the tabulation above. Estimates should be considered general approximations based on limited, but best available information. Individual estimates and totals are rounded as follows: <100 to nearest 5; 100-499 to nearest 10; 500-1,999 to nearest 50; 2,000 to 9,999 to nearest 100; 10,000-39,999 to nearest 500; 40,000-99,999 to nearest 1,000; >100,000 to nearest 5,000. Totals may not add because of rounding.

COWARD: 4000
WOLF: 8000

British Columbia Big Game Species Regional Population Estimates - August 1990*

Admin Region No.	Region/ Subregion Name	MOOSE		ELK		CARIBOU		THINHORN SHEEP		BIGHORN SHEEP		MOUNTAIN GOAT		BLACK- TAILED DEER		WHITE- TAILED DEER		GRIZZLY BEAR		BLACK BEAR		COUGAR		WOLF	
		Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %	Est. #	Prov. %
		30	<0.1	2500	6.2	Nil	0	Nil	0	Nil	0	380	0.7	125000	35.6	Nil	0	240	1.6	13000	10.9	550	16.7	600	7.5
1	Vancouver Island	30	<0.1	2500	6.2	Nil	0	Nil	0	Nil	0	1500	2.7	31500	9.0	Nil	0	100	0.7	6300	5.3	300	9.1	100	1.2
2	Lower Mainland	85	<0.1	40	<0.1	Nil	0	Nil	0	Nil	0	1500	2.7	31500	9.0	Nil	0	100	0.7	6300	5.3	300	9.1	100	1.2
3	Thompson Nicola	7500	4.3	200	0.5	500	3.6	Nil	0	2000	25.9	2000	3.6	39000	11.1	700	1.5	500	3.4	5000	4.2	600	18.2	100	1.2
	Okanagan	1000	0.6	1000	2.5	20	0.1	Nil	0	1600	20.7	600	1.1	21500	6.7	12500	25.9	160	1.1	3000	2.5	450	13.7	20	0.3
REGIONAL TOTAL		8500	4.9	1200	3.0	500	3.7	Nil	0	3600	46.6	2600	4.7	63000	17.8	13000	27.4	650	4.5	8000	6.7	1050	31.9	120	1.5
4	East Kootenay	6600	3.8	26500	65.9	100	0.7	Nil	0	2400	31.0	8100	14.5	25500	7.3	22000	45.6	1150	7.9	9200	7.7	550	16.7	120	1.5
	West Kootenay	750	0.4	3000	7.5	500	3.6	Nil	0	100	1.3	1750	3.1	8800	2.5	9600	19.9	800	5.5	7800	6.6	200	6.1	20	0.3
REGIONAL TOTAL		7300	4.2	29500	73.4	600	4.3	Nil	0	2500	32.3	9900	17.6	34500	9.8	31500	65.5	1950	13.4	17000	14.3	750	22.8	140	1.8
5	Cariboo	22000	12.7	200	0.5	1600	11.4	Nil	0	1500	19.4	2900	5.2	29000	8.3	100	0.2	1500	10.3	7200	6.1	430	13.1	800	10.0
	Omineca	23500	13.6	200	0.5	2100	15.0	750	6.3	Nil	0	2800	5.0	1400	0.4	200	0.4	3000	20.6	13000	10.9	75	2.3	1250	15.6
	Peace	27000	15.6	1500	3.7	2000	14.3	250	2.1	130	1.7	800	1.4	13000	3.3	3000	6.2	1150	7.9	10000	8.4	25	0.8	500	6.2
	Liard	24500	14.2	5000	12.4	2200	15.7	6500	54.2	Nil	0	2000	3.6	850	0.2	150	0.3	1650	11.3	4400	3.7	10	0.3	2500	31.2
REGIONAL TOTAL		97000	56.1	6900	17.1	7900	56.4	7500	62.5	1650	21.1	8500	15.2	43000	12.2	3500	7.1	7300	50.1	34500	29.1	550	16.5	5000	63.0
6	Skeena	60000	34.7	100	0.2	5000	35.7	4500	37.5	Nil	0	33000	59.1	55000	15.7	15000	0	4300	29.6	40000	33.6	100	3.0	2000	25.0
		60000	34.7	100	0.2	5000	35.7	4500	37.5	Nil	0	33000	59.1	55000	15.7	15000	0	4300	29.6	40000	33.6	100	3.0	2000	25.0
PROVINCIAL TOTAL		175000	100%	40000	100%	14000	100%	12000	100%	7700	100%	56000	100%	330000	100%	48000	100%	14500	100%	120000	100%	3300	100%	8000	100%

was supplied the mid-point was used for the tabulation

based on information supplied by Regional Wildlife Biologists. Where a numerical range only was supplied the mid-point was used for the tabulation

as follows: <100 to nearest 5; 100-499 to nearest 10;

*Estimates are for early fall preharvest populations and are based on information supplied by Regional Wildlife Biologists. Where a numerical range only was supplied the mid-point was used for the tabulation above. Estimates should be considered general approximations based on limited but best available information. Individual estimates and totals are rounded as follows: <100 to nearest 5; 100-499 to nearest 10; 500-1,999 to nearest 50; 2,000 to 9,999 to nearest 100; 10,000-39,999 to nearest 500; 40,000-99,999 to nearest 1,000; >100,000 to nearest 5,000. Totals may not add because of rounding.

March 1991 Draft - D. Blower/J. Hatter

wolf: 6.5
= 4900

Calif. R. 1850
1000
1500
4750

Wolf: 1500
2500
1000
+ 1000

3000

BRITISH COLUMBIA BIG GAME SPECIES REGIONAL POPULATION ESTIMATES - AUGUST 1987*

ADMIN. REGION NO.	REGION/ SUBREGION NAME	MOOSE		ELK		CARIBOU		THINHORN SHEEP		BIGHORN SHEEP		MOUNTAIN GOAT		MULE (BLACK- TAILED) DEER		WHITE-TAILED DEER		GRIZZLY BEAR		BLACK BEAR		MOUNTAIN LION		WOLF	
		Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.	Est. No.	% of Prov.
1	Vancouver Island	30	<0.1%	2500	6.7%	N11	0%	N11	0%	N11	0%	380	0.7%	115000	34.1%	N11	0%	240	1.9%	13000	10.8%	650	21.7%	750	10.1%
2	Lower Mainland	85	0.1%	30	<0.1%	N11	0%	N11	0%	N11	0%	1500	2.7%	31500	9.3%	N11	0%	80	0.6%	6300	5.3%	270	9.0%	90	1.2%
3	Thompson- Nicola Cariboo Okanagan	7000	4.1%	160	0.4%	300	2.2%	N11	0%	650	12.0%	1700	3.1%	39000	11.6%	700	1.6%	300	2.4%	4800	4.0%	310	10.3%	80	1.1%
		22500	13.2%	75	0.2%	2000	14.8%	N11	0%	1400	25.9%	2900	5.3%	28500	8.5%	N11	0%	1500	12.0%	7200	6.0%	400	13.3%	550	7.2%
		1000	0.6%	700	1.9%	30	0.2%	N11	0%	1100	20.4%	600	1.1%	23500	7.0%	12500	27.1%	160	1.3%	3000	2.5%	450	15.0%	20	0.3%
		REGIONAL TOTAL	30500	17.9%	950	2.5%	2300	17.0%	N11	0%	3200	59.3%	5200	9.5%	90000	27.0%	13000	30.2%	1950	15.6%	15000	12.5%	1150	38.3%	650
4	East Kootenay West Kootenay	6600	3.9%	25500	68.0%	90	0.7%	N11	0%	2000	37.0%	7600	13.8%	22500	6.7%	18500	43.0%	1050	8.4%	9200	7.7%	550	18.3%	120	1.6%
		650	0.5%	2400	6.4%	550	4.1%	N11	0%	80	1.5%	1650	3.0%	8500	2.5%	8300	19.3%	700	5.6%	7800	6.5%	200	6.7%	20	0.3%
	REGIONAL TOTAL	7300	4.3%	28000	74.7%	600	4.4%	N11	0%	2100	38.9%	9300	16.9%	31000	9.2%	27000	62.8%	1750	14.0%	17000	14.2%	750	25.0%	140	1.8%
5	Skeena Omineca Peace Liard	60000	35.3%	100	0.3%	5000	37.0%	4500	37.5%	N11	0%	33000	60.0%	55000	16.3%	N11	0%	3800	30.4%	40000	33.3%	100	3.3%	2000	26.3%
		23500	13.8%	100	0.3%	2100	15.6%	750	6.3%	N11	0%	2800	5.1%	1150	0.3%	60	0.1%	1700	13.6%	13000	10.8%	50	1.7%	1000	13.2%
		27000	15.9%	900	2.4%	1100	8.1%	250	2.1%	130	2.4%	800	1.5%	11500	3.4%	3000	7.9%	1150	9.2%	12000	10.0%	50	1.7%	500	6.6%
		24500	14.4%	5000	13.3%	2200	16.3%	6500	54.2%	N11	0%	2000	3.6%	850	0.3%	150	0.3%	1650	13.2%	4400	3.7%	10	0.3%	2500	32.9%
REGIONAL TOTAL	135000	79.4%	6100	16.3%	10500	77.8%	12000	100%	130	2.4%	38500	70.0%	69000	20.5%	3200	7.4%	8300	66.4%	69000	57.5%	210	7.0%	6000	78.9%	
PROVINCIAL TOTAL		170000	100%	37500	100%	13500	100%	12000	100%	5400	100%	55000	100%	337000	100%	43000	100%	12500	100%	120000	100%	3000	100%	7600	100%

* Estimates are for early fall preharvest populations and are based on information supplied by Regional Wildlife Biologists. Where a numerical range only was supplied, the mid point was used for the tabulation above. Estimates should be considered general approximations based on limited but best available information. Individual estimates and totals are rounded as follows: <100 to nearest 5; 100-499 to nearest 10; 500-1,999 to nearest 50; 2,000-9,999 to nearest 100; 10,000-39,999 to nearest 500; 40,000-99,999 to nearest 1,000; >100,000 to nearest 5,000. Totals may not add because of rounding.

B.C. BIG GAME SPECIES REGIONAL POPULATION ESTIMATES * - MARCH 1978

REGION NO.	MOOSE		ELK		CARIBOU		THINHORN SHEEP		BIGHORN SHEEP		MOUNTAIN GOAT		BLACK-TAILED DEER		WHITE-TAILED DEER		GRIZZLY BEAR		BLACK BEAR		COUGAR		WOLF	
	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total	Est. Number	% of Prov. Total
1	50	<1%	2700	15%	NIL	0%	NIL	0%	NIL	0%	1300	3%	200,000	43%	NIL	0%	200	3%	7000	12%	1200	34%	400	6%
2	100	<1%	10	<1%	NIL	0%	NIL	0%	NIL	0%	2500	5%	15,000	3%	NIL	0%	200	3%	5000	8%	200	5%	80	1%
3	6500	3%	400	2%	400	2%	NIL	0%	1000	30%	2500	5%	65,000	14%	2500	7%	400	5%	5500	9%	900	26%	70	1%
4	3500	2%	11000	59%	500	2%	NIL	0%	1500	45%	5000	11%	60,000	13%	33000	86%	800	10%	5500	9%	600	17%	20	<1%
5	30000	12%	20	<1%	600	3%	NIL	0%	750	22%	3000	6%	35,000	7%	NIL	0%	800	10%	5000	8%	400	11%	200	3%
6	80000	33%	100	1%	9500	40%	4000	40%	NIL	0%	24000	52%	80,000	17%	NIL	0%	3300	41%	14000	24%	100	3%	2500	40%
7	120000	50%	4400	24%	13000	54%	6000	60%	100	3%	8000	17%	15,000	3%	2500	7%	2300	29%	18000	30%	150	4%	3000	48%
Provincial Totals	240000	100%	18500	100%	24000	100%	10000	100%	3350	100%	46500	100%	470,000	100%	38000	100%	8000	100%	60000	100%	3500	100%	6300	100%

* Estimates are based on information supplied by Regional Wildlife Biologists and/or projections from average density categories shown on 1977-78 Big Game Distribution Maps. Reliability of estimates varies considerably by Region and by species. All figures should be considered general approximations based on limited, but best available, information.

D. Blower, April 7, 1978

The Wildlife Management Section of the British Columbia Fish and Wildlife Branch estimates the spring adult population of various wildlife species as of the mid 1970's are as follows:

Moose - 200,000 - stable
 Caribou - 40,000 - stable or decreasing
 Elk - 12,000 - stable or increasing
 White-tailed deer - 30,000 - stable or increasing
 Black-tailed deer - 500,000 - stable
 Mule deer - 100,000 - stable or decreasing
 Rocky Mountain Bighorn sheep - 1,500 - stable
 California Bighorn sheep - 2,000 - stable
 Dall sheep - 500 - stable
 Stone sheep - 8,000 - stable or decreasing
 Mountain goat - 20,000 - decreasing
 Black bear - 75,000 - increasing
 Grizzly bear - 6,500 - stable or decreasing
 Cougar - 4,000 - stable or increasing
 Wolf - 7,000 - stable or increasing
 Willow ptarmigan - 3,000,000 - stable
 White-tailed ptarmigan - 1,500,000 - stable
 Rock ptarmigan - 500,000 - stable
 California Quail - 200,000 - stable
 Mountain Quail - 500 stable
 Chukar Partridge - 10,000 - stable
 Hungarian Partridge - 3,000 - stable
 Blue grouse - 4,000,000 - increasing
 Ruffed grouse - 4,000,000 - increasing
 Sharp-tailed grouse - 100,000 - declining
 Spruce grouse - 5,000,000 - increasing
 Pheasant - 15,000 - decreasing
 Mallard - 500,000 - stable
 Pintail - 34,000 - stable
 Wigeon - 70,000 - stable
 Gadwall - 8,000 - stable
 Green-winged teal - 14,000 - stable
 Blue-winged teal - 120,000 - stable
 Cinnamon teal - 8,000 - stable
 Shoveler - 6,000 - stable
 Redhead - 6,000 - decreasing
 Canvasback - 4,000 - decreasing
 Ring-necked Duck - 26,000 - stable
 Lesser Scaup - 50,000 - stable or decreasing
 Barrow's goldeneye - 80,000 - decreasing
 Common goldeneye - 34,000 - decreasing
 Bufflehead - 90,000 - stable or decreasing
 Ruddy duck - 18,000 - stable or decreasing
 Wood duck - 4,000 - increasing
 Harlequin duck - 6,000 - stable
 Hooded Merganser - 4,000 - stable
 Red-breasted Merganser - 50,000 - stable
 Common Merganser - 10,000 - stable
 Surf Scoter - 4,000 - decreasing
 White-winged Scoter - 10,000 - decreasing

Canada geese - 25,000 - increasing
 Sandhill cranes - 25,000 - decreasing
 Band-tailed pigeons - 6,000 - stable
 or decreasing
 Mourning Doves - 20,000 - stable
 Wilson's snipe - 50,000 - stable

Information Section
 Fish & Wildlife Branch
 Parliament Buildings
 Victoria, B. C.

