Keystone Wildlife Research Ltd.
1268 Salsbury Dr
Vancouver, B.C. V5L 0B2

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Moose population trends within the Burns Lake Community Forest (Bulkley Valley Lakes District)

Objective

This memo provides a review of moose population around the Burns Lake Community Forest portion of the Bulkley Valley Lakes District.

Background

Moose are an icon of the Canadian landscape and are highly valued as a big game species to be seen, and to be hunted for food. Populations have declined significantly in the central interior regions of British Columbia during the last decade, and stakeholders are concerned in other areas as well (Gorley 2016). The moose population trend for the Skeena is currently stable with about 25,000-45,000 moose but was about 60,000 in the late 80s (Kuzyk 2016). The recent moose population trend for MUs 6-04 to 6-06, 6-08, 6-09 showed a 20% decrease between 2003/04 and 2011/12 (MFLNRO 2015). There are previous inventories which will be reviewed to determine the long term trend. Trends in hunting harvest will also be reviewed. This review may also provide suggestions for the next proposed moose survey of the area during the winter of 2017/18 (MFLNRO 2015).

Inventories Study Area

The Survey Area (SA) consisted of 442 Sample Units (SUs) and located predominately in the Babine Upland and Babine Basin Eco-sections, centred on the Bulkley Valley/Lakes District area and generally extends to Ootsa Lake in the south, Endako in the east, Trout Creek in the west and Babine Lake in the north and northeast. The Sub-Boreal Spruce Biogeoclimatic zone occurs over most of the area with a few SUs occurring in the Engelmann-Spruce Sub-alpine Fir Biogeoclimatic zone. Elevations range from about 520 metres in elevation in the valley bottoms to about 3300 metres elevation at mountain peaks. The SA is found within MU's 6-4, 6-5, 6-6, 6-8 and 6-9. In total the SU's encompass about 13,000 km². The same overall survey area was used in 1988, 1992, 1997, 2004 and 2012, although some SU boundary changes were made in the various years. For the purposes of tracking population and ratio trends since 1992, the "Bulkley Valley" (MU 6-8 & 6-9) and "Lakes District" (MUs 6-4 to 6-6) areas, data for those areas were analyzed separately (**Figure 1**). The majority of the Burns Lake Community Forest (BLCF) overlaps with the "Lakes District" portion of the Survey Area, MUs 6-4, 6-5, 6-6 and 6-9, and 49 of the SUs (**Figure 1**).

Figure 1 Management Units and Sample Units that overlap the Burns Lake Community Forest.

Inventories

There have been stratified random block (SRB) moose surveys of the BVLD area since 1983. The objectives were to assess moose distribution, density and sex ratios within the moose population. These surveys were repeated in 1988, 1992, 1997, 2004, and 2012, with composition counts completed in 2001, 2003, and 2010.

Stratification

McLean (2003) used broad ecosystem attributes and elevation classes at the broad scale in the BVLD as criteria for interpretation of moose winter habitat. Generally, survey units above 1200 metres were treated as nil stratum; survey units with >=40% riparian were treated as high stratum; survey units with >=50% seral stages 1-3 (cumulative percentage as well as stand alone seral stages) were treated as high stratum; and survey units that were below 1200 metres and did not meet the above criteria were treated as low stratum (**Figure 2**).

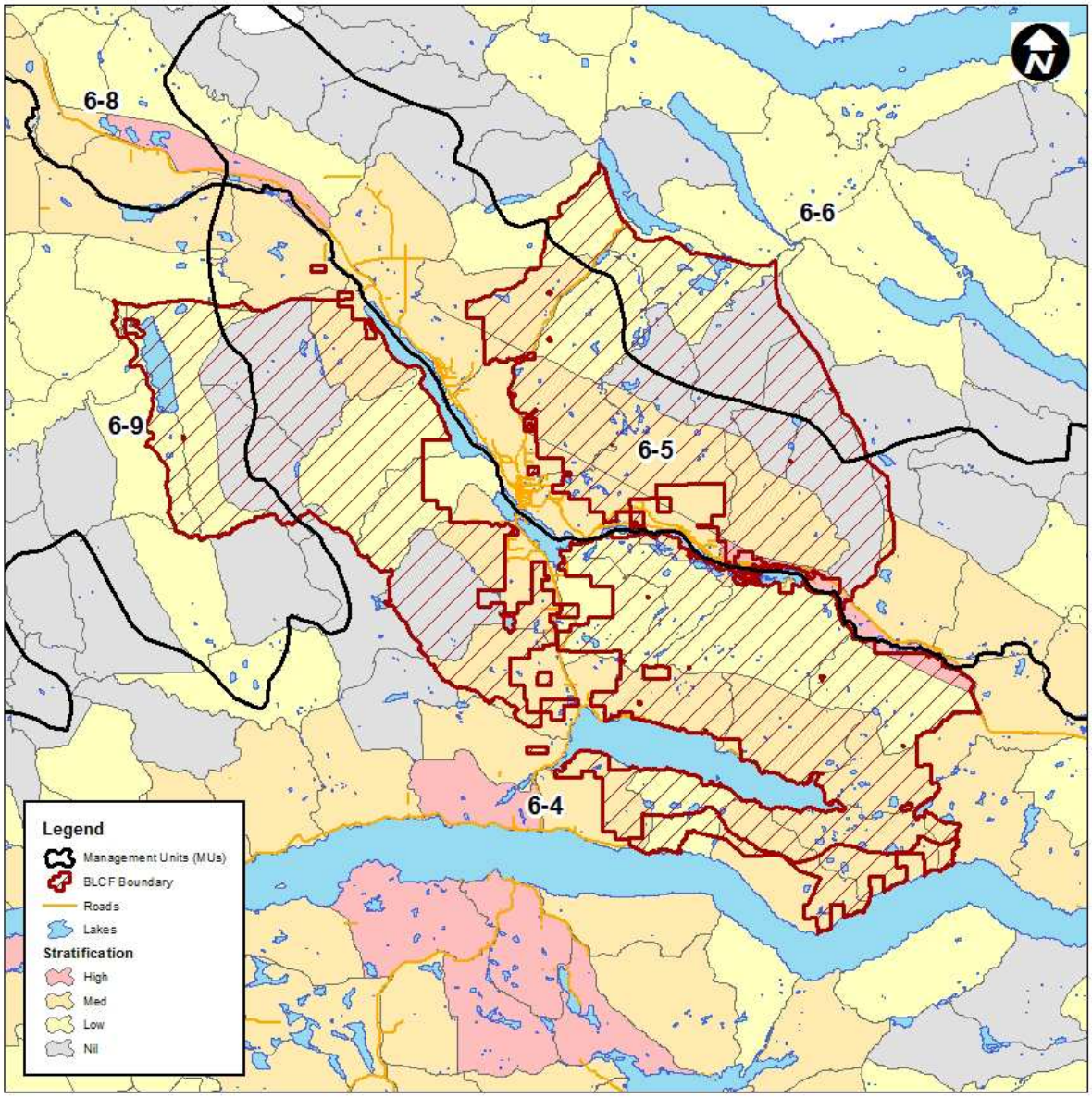

Figure 2 Stratification of Sample Units around the Burns Lake Community Forest.

Previous sampled survey units were used to update the stratification based on the number of moose counted.

The survey design followed the stratified random block sampling method developed by Gasaway et al. (1986), with some modification (RIC 2002).

Classification Counts

Classification counts have been completed nine times since 1983 (**Table 1**). Previous classification data (1968-1980) indicates an average of 36 bulls: 100 cows: 43 calves (van Drimmelen 1985). Results from classification counts are within management objectives.

Table 1 Moose classification surveys within the Bulkley Valley Lakes District (BVLD).

Survey Year	Moose count	Bulls	Cows	Calves	Unc	Bulls: 100 cows	Calves: 100 cows
1983	266	51	143	62	9	36	43
1988	1322	330	649	292	51	51	45
1992	2446	461	1397	530	58	33	38
1997	1153	219	665	219	50	33	33
2001	172					38	34
2003	302	66	167	66	3	39	39
2004	1901	375	938	360	224	39	38
2010	909	177	490	226	16	43	46
2012	1342	230	742	287	83	32	37

The age structure of the herd is another important factor in population dynamics since it greatly influences the potential reproductive rate. Harvest tooth returns are the only long term data available that give a reflection of changes to age structure, and inferences can be made through modelling.

Population Estimates

Moose inventories for the Bulkley Valley and Lakes District have been completed six times since 1985 (**Table 2**). Estimated density has been around 1 moose per square kilometer. Bergerud (1992) indicated that the carrying capacity for moose in food limited systems is 1/5 moose/km^2, or greater.

Table 2 SRB Moose surveys within the Bulkley Valley Lakes District (BVLD).

Survey Report	SUs (% area)	Population Estimate	SCF	Total Est. Moose	Area (km2)	Density
Van Drimmelen 1985	38	6385 +/- 35%	1.09		6900	0.88
Steventon 1988	36 (14%)	9098 +/- 16%	1.1		8472	1.07
Marshall 1993	53 (16%)	9817 +/- 11%	1.1	10,799	9140	1.18
Marshall 1998	97 (31%)	5671 +/- 12%	1.3&1.54	7728	8578	0.901
Marshall 2004	53 (16%)	8819 +/- 12%	1.3	11,465	9138	1.25
Marshall 2012	58 (19%)	5989 +/- 13%	1.47	8804	9195	0.96

There are a number of complicating factors in attempting to ascertain the long term trend in the BVLD moose population. The overall survey area boundaries changed between 1983 and 1987 and changed again in 1992. Arbitrary SCFs were used in those 3 years to account for missed moose (**Table 2**). Although an attempt was made to measure moose sightability in 1997, the population estimate is considered to be unreliable due to a perceived dramatic change in moose behaviour (caused by a change in weather) that negatively affected their sightability. Lastly, the moose SCF in 2012 is an average of SCFs found elsewhere; rather than being calculated from % Vegetative Cover, as was done in 2004.

For the entire BVLD Moose Population Unit there was a 20% decline (from 15794 moose to 12637 moose) in the population between 2004 and 2012 (Marshall 2012, MFLNRO 2015, **Figure 3**). However the 2012 estimate was within the long term range of 11,000-16,000 moose (**Figure 3**). The 1992 objectives were to attempt to stabilize the moose population at about 15,000. The population has fluctuated but remained stable with over 12,000 moose (**Figure 3**).

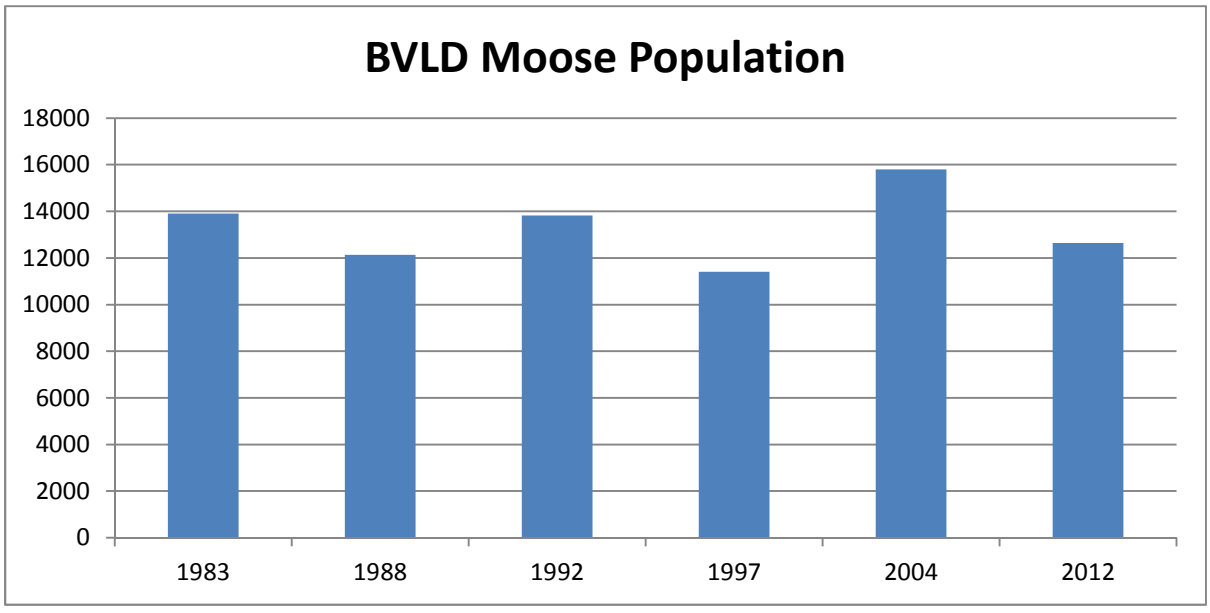

Figure 3 Estimated moose population for the entire Bulkley Valley Lakes District from 1983-2012.

The recent moose decline may have coincided with a mountain pine beetle epidemic (Chan-McLeod 2006) which led to increased salvage logging and associated road building. This type of landscape change can presumably alter the spatial dynamics of moose, predators, and hunters, ultimately influencing moose abundance and harvest rate. Although moose should benefit from salvage logging through increased forage production (Janz 2006), those benefits are not immediate and may be offset by higher harvest and predation due to easier access afforded by high density of roads and cutblocks (Ritchie 2008).

Harvest statistics

Moose harvest has varied as well as result of population numbers and regulations changes. Restrictive regulations were put in place in 1981. Resulting from the 1992 survey and public input, the bull moose hunting season in 1993 was reduced from 28 days (Oct 19 to Nov 15) to 10 days (Oct 26 to Nov 5). The result was an initial substantial reduction in the bull harvest which subsequently increased in 1994, 1995 and 1996. Between 1988 and 1992 the bull:100 cow ratio declined from about 50 bulls:100 cows to about 33 bulls:100 cows (**Table 1**). Although recommendations for the 1997 fall hunting season called for a small increase in the length of the bull open season, an immediate result of the 1997 survey was to maintain a length of 12 days (Oct. 20 to Oct. 31) for the bull open season, the early cow season was eliminated and the number of calf authorizations was cut by 50% (**Table 3**).

Table 3 Resident and Non-resident moose harvest in BLVD 1988 to 1997

Year	Tot Res Harv	Tot Res Cows	Tot Res Calf	Tot Res Bulls	Tot N-Res Bulls	Tot Bulls
1987	1036	0	0	1036	152	1188
1988	1040	95	0	945	109	1054
1989	1330	181	0	1149	128	1277
1990	1426	181	0	1245	124	1369
1991	1255	211	0	1044	101	1145
1992	1146	201	0	945	90	1035
1993	689	218	110	361	107	468
1994	734	296	154	384	105	489
1995	950	306	186	458	128	586
1996	1043	280	100	663	137	800
1997	796	106	67	623	133	756
1998	624	0	0	624	164	788

The mean annual harvest since 2005 is about 600 moose which is below the long term average of 900 moose (**Figure 4**).

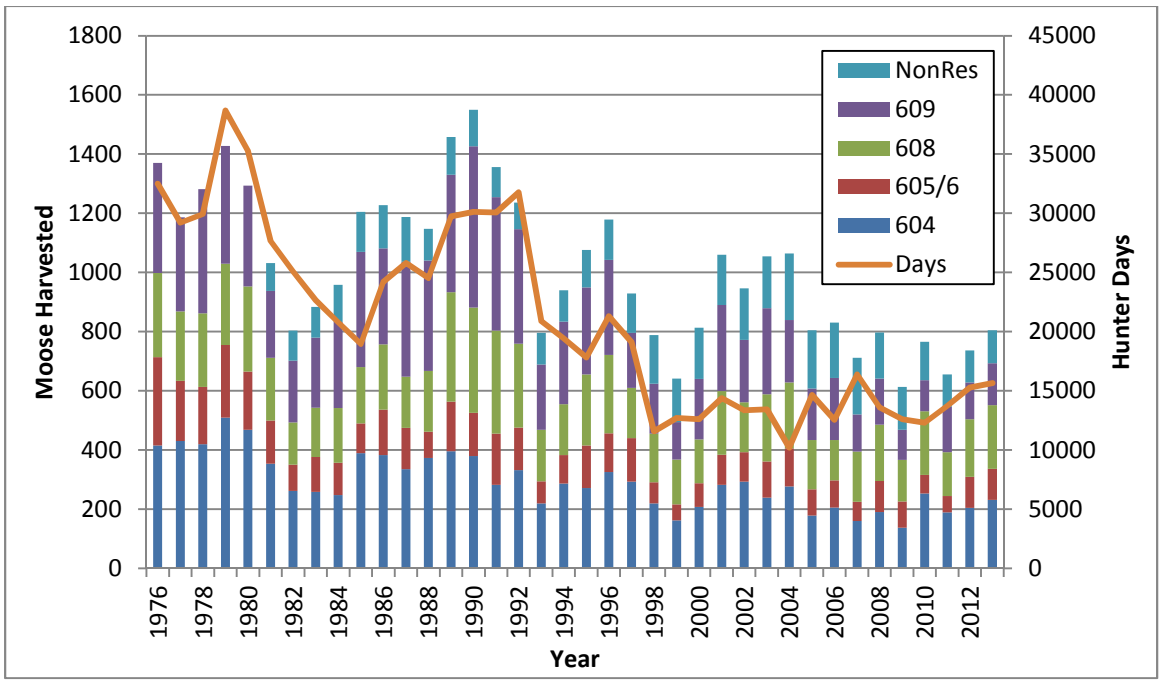

Figure 4 Moose harvest and hunter days in MUs 6-04 to 6-06, 6-08 and 6-09.

Success (days/kill) has remained around 23 days (12-35) which is below the Provincial target of 30 days.

Weather

The winter of 1996/97 generally had the highest accumulation of snow as measured in the end of February of each year (**Figure 5**). In addition, the warm temperatures that occurred during the survey raised the density of the snow significantly. Other winters with deep snow (>80 cm) were 1971, 1974, 1982, and 2007 (**Figure 5**). Deep snow inhibits the movement of moose and reduces available forage.

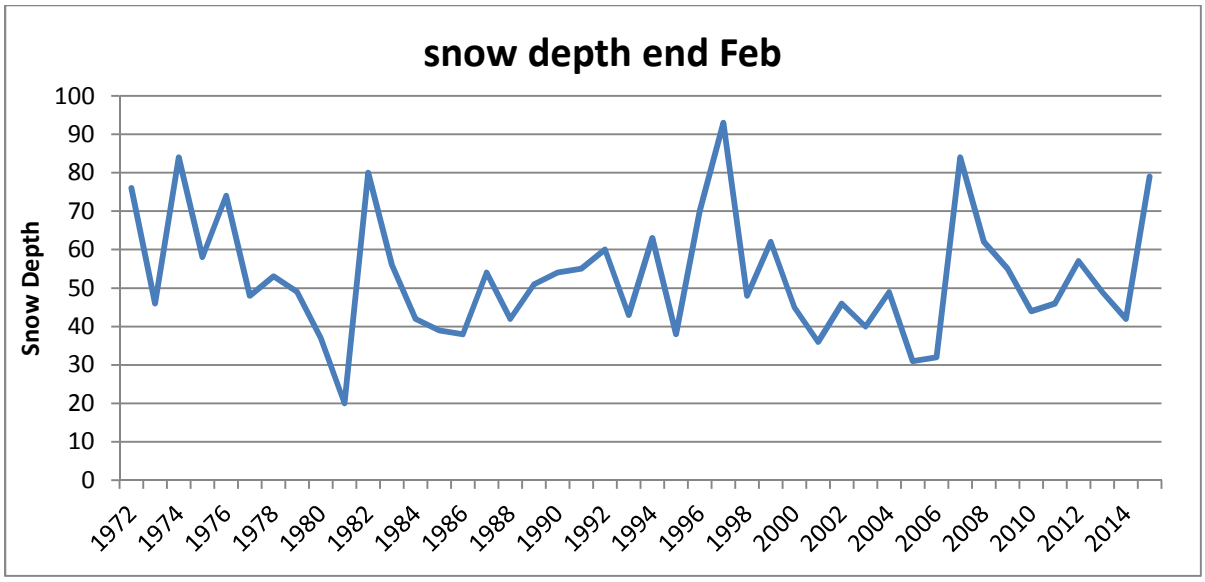

Figure 5 End of February snow depth at the Burns Lake snow station from 1972-2015.

Discussion

The moose population for the Bulkley Valley Lakes District appears to be stable, but below the regional target of 15,000. Reliable estimates of moose population size and composition and their rates of change are required in order to effectively manage local moose populations on a sustainable basis. Although SRB surveys can provide unbiased, accurate and precise estimates of population parameters, the level of confidence (of the wildlife manager), in the survey results, can be positively or negatively influenced by a number of factors (eg. survey timing, temperature, wind speeds, snow cover, snow depth, search intensity, survey crew experience and moose sightability). Ideally, and to increase the level of confidence that wildlife managers have in a survey, there should be little difference in those factors between years.

There is a repeat survey proposed for the BVLD area in 2017/1028 (MFLNRO 2015). Possible suggestions include updating the stratification as it was last calculated in 2004 and there has been extensive salvage logging in response to the pine beetle.

Forest harvesting and associated road access can affect moose populations and are therefore must be considered when developing moose harvest strategies. Forest harvesting reduces the amount of security cover for moose and makes them more vulnerable to harvest, but also can have a positive effect on a moose population by increasing the abundance and nutritional quality of food. Roads provide hunters with increased access to moose populations. Salvage logging associated with the mountain pine beetle epidemic in central BC has dramatically affected forest environments and has produced a vast network of roads. Many of these roads now allow access to previously lightly hunted populations.

In order to avoid overharvesting moose, harvest strategies include LEH or adjusted GOS seasons (e.g. shortened or outside of rut), which enables wildlife managers to control hunting activity. The Lower

Skeena surveys confirmed that the population estimates being used to establish harvest rates and quotas is appropriate, and no changes are planned. In order that the cumulative moose harvest by the three consumptive user groups (First Nations, resident hunters, guide outfitters) is sustainable, it is imperative that all users participate and cooperate in moose management. A major gap in information is a reliable estimate for First Nation's requirements and harvest. It is also important that all users share in the harvest and abide by sustainable management practices, including harvest allocations, including sex and age components, and restrictions when harvest objectives are exceeded.

Moose are well adapted to snowy regions because of their long legs, which help them to travel through deep snow. Field studies have shown that moose have little or no difficulty moving around in snow up to 60 cm deep and only slight difficulty in snow depths of 60 to 90 cm deep. The density of snow can also affect their ability to move around. Snow levels in the BVLD are generally not limiting (<60 cm) however in more severe winters and the presence of forest cover adjacent to foraging areas is important.

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