

# **Dall's Sheep Survey: Southern Lakes Region, 2009**

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**April 2011**

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## **Fish and Wildlife Branch**

### **Report No. TR-11-09**

#### **Acknowledgements**

Many individuals helped with this survey. Rosa Brown (Ta'an Kwäch'än Council), Corey Edzerza (Carcross Tagish First Nation), Elsabe Kloppers (YG), Aaron Koss-Young (YG), Doug Larsen (YG), John Meikle (Kwanlin Dün First Nation), Philip Merchant (YG), Shannon Stotyn, and Shawn Taylor (YG) all assisted with surveying efforts.

Jean Carey (YG) imparted her insight and knowledge regarding sheep in the study area and was an excellent teacher.

Tak Yamaguchi (Kluane Helicopters) piloted crews safely during the entire survey.

We acknowledge the Carcross Tagish First Nation, the Champagne-Aishihik First Nations, the Kwanlin Dün First Nation, and the Ta'an Kwäch'än Council, in whose traditional territories this survey occurred.

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RUSSELL, K. AND T. HEGEL. 2011. Dall's sheep survey: Southern Lakes Region, 2009. Yukon Fish and Wildlife Branch Report TR-11-09, Whitehorse, Yukon, Canada.

## Summary

An aerial survey of Dall's sheep in the Southern Lakes region was carried out June 26 to July 3, 2009. Environment Yukon staff and members of local First Nations and Renewable Resources Councils participated in the flights.

The total survey area was 15,792km<sup>2</sup> and covered subzones in Game Management Zones 5, 7, 8, and 9,

In total, 2689 sheep were observed (802 rams, 1470 nursery sheep, 401 lambs, 16 unclassified adults), representing a minimum population in the survey area.

Overall, the ram: nursery sheep ratio of the study area was 54.6 rams per 100 nursery sheep, and the lamb: nursery sheep ratio was 27.3 lambs per 100 nursery sheep. At a regional scale, the sex ratio and productivity of the sheep population is acceptable based on the 1996 Yukon Thinhorn Sheep Management Guidelines.

Subzones 7-14, 7-16, and 7-19 have harvest rates that are of concern, and indicate that harvest limitations may be required to ensure that harvest remains within sustainable limits for these populations.

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## INTRODUCTION

Dall's sheep (*Ovis dalli dalli*) are an important cultural and economic resource for Yukoners. Effective management of this resource requires demographic information be gathered periodically to assess the health of these populations and to determine the effects of management decisions and harvest pressure. Aerial surveys are the primary technique used to monitor sheep populations in Yukon. Most Yukon sheep ranges are remote and do not have road access, making aerial surveys the most efficient survey method. Some sheep populations of the Southern Lakes region have been surveyed several times in the past but this was the first comprehensive survey at a regional scale. By surveying all populations in one season we have a more complete picture of the overall status of sheep in the Southern Lakes region.

This survey was done to update baseline population and demographic information. In particular, this survey will provide information to inform a number of issues surrounding Dall's sheep management in the Southern Lakes, including:

- Coordinated management in the overlapping traditional territories of Kwanlin Dun, Ta'an Kwach'an, Champagne & Aishihik, Teslin Tlingit, and Carcross/Tagish First Nations via the Southern Lakes Wildlife Coordinating Committee.
- Increasing levels of human access into high elevation terrain in the Southern Lakes region. For example, the 2008 proposals submitted by the Laberge Renewable Resources Council (RRC) and the subsequent sheep permit hunt in Game Management Subzone (GMS) 5-50, triggered a broader discussion on sheep harvest and access management in the SW Yukon.
- Game Management Subzones (GMSs) in the Southern Lakes are some of the areas most heavily used by Dall's sheep hunters in Yukon. Increasing access into Dall's sheep ranges coupled with the large population of Whitehorse and its surrounding areas create harvest management challenges in this area. Information from this survey will be used to assess harvest sustainability of these populations.
- In addition to the heavy harvest pressure on Dall's sheep, the resumption of outfitting activities in Outfitting Area 17 could add to the existing harvest pressure.
- Results from this aerial survey will be compared to composition surveys collected from the ground for a broader evaluation of the effectiveness of these ground-based surveys.
- Given the broad geographic scope of this survey, these results may be used, in conjunction with other information, to evaluate the appropriateness of using GMSs as the Dall's sheep management units.
  - Current demographic information will be needed to inform any discussion about these issues as the last time broad-based surveys were

done in Game Management Zone (GMZ) 7 was 1994. GMZ 9 information dates to the 1980s, while the last comprehensive survey in GMZ 8 was 1976. This survey also contributes to Environment Yukon's goal of providing Yukoners with reliable and useful information about Dall's sheep populations, their distribution, and current management in support of meaningful participation in participatory processes.

## **METHODS**

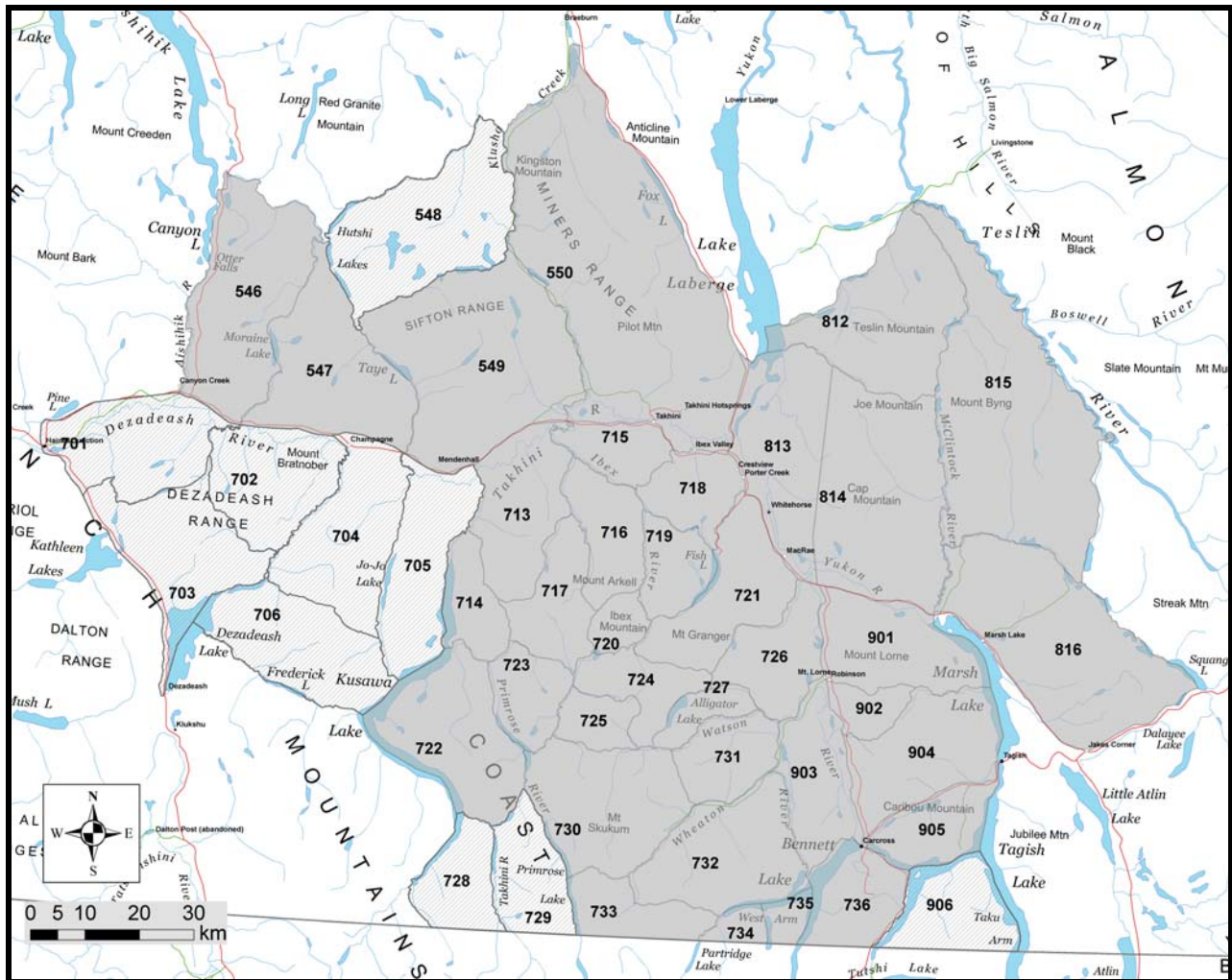
### ***Study Area***

With the communities of Whitehorse, Carcross, and Teslin, among others, the Southern Lakes is the most densely populated region in Yukon. The region encompasses all or part of the traditional territories of the Kwanlin Dün, Ta'an Kwäch'än, Champagne & Aishihik, Carcross/Tagish and Teslin Tlingit First Nations. Categorized as boreal cordillera, the landscape is dominated by mountains and plateaus separated by lowlands and valleys formed by glaciers. Sheltered from precipitation by large mountain ranges to the west, the region is dry with less than 300 mm of annual precipitation. Large mountains and low snowfall combine to create some of the best sheep habitat in Yukon, providing residents and visitors with abundant hunting and wildlife viewing opportunities.

We collected data within an area of approximately 15,800 km<sup>2</sup> of the southwest Yukon and northwestern British Columbia (Figures 1 and 2). The survey area was bounded by Kusawa Lake to the west, the Teslin River to the east, and from Lake Laberge south to the Yukon/BC border (Figure 1). For practical purposes GMSs were used as the survey units. Historically GMSs have been treated as proxy population ranges and the sheep found within them considered as distinct units. We had initially hoped to include GMSs 7-01 to 7-06 to the west of Kusawa Lake but we did not have sufficient time. For similar reasons, we could not include GMSs 5-48, 7-28, 7-29 and 9-06 in this survey.

Although some populations span jurisdictional borders, Dall's sheep are managed independently by British Columbia (BC) and Yukon. When feasible and reasonable (i.e., a mountain block extending unbroken across the border), we extended the survey into BC (Figure 2).

This survey encompassed Yukon GMSs 7-13 to 7-27, 7-30 to 7-36; 901 to 905; 8-12 to 8-16; and 5-46, 5-47, 5-49, and 5-50 (Figures 1 and 2).



**Figure 1** Proposed survey area for 2009 Southern Lakes regional Dall's sheep inventory (lightly shaded areas were initially identified but not flown due to budgetary constraints). Individual game management subzones are outlined in grey.

## Survey Methods

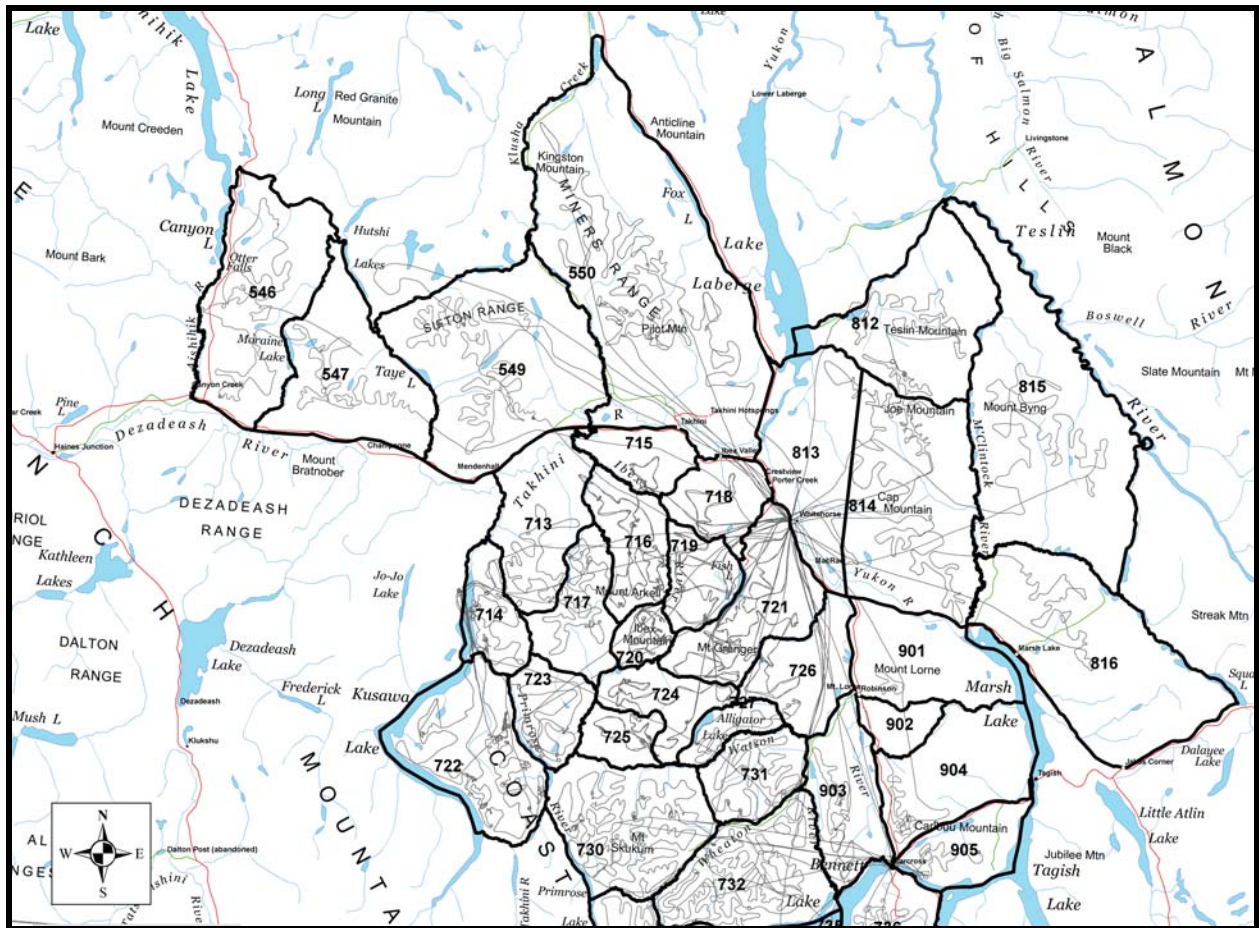
This was a standard post-lambing aerial survey. A Bell 206B helicopter (“Jet Ranger”) was flown in accordance with the guidelines as set out in the “surveys” section of the 1996 Yukon Sheep Management Guidelines. Survey crews consisted of the pilot, a navigator/observer, a recorder/observer and an additional observer. The navigator/observer and recorder/observer for the duration of the survey were Environment Yukon staff; the additional observer position was shared among local First Nations, RRCs, or Environment Yukon staff. For the duration of the survey the aircraft and survey team were based out of Whitehorse. Additional fuel was placed at Kusawa Campground, the heliport on the Annie Lake road and the Carcross airstrip.

Mountain blocks were surveyed systematically from the base of the mountain working upward in elevation in a counter-clockwise direction. Flight tracks and sheep locations were recorded with a GPS (map datum set to WGS

84). We did not rigorously survey low lying or heavily treed areas because they are traditionally not considered sheep habitat and have substantially reduced sightability. However, if we knew of a mineral lick in a low-lying area we included that location in the survey. When a large band of sheep was located and if a suitable viewpoint could be found, the aircraft landed and we used spotting scopes to classify animals. In almost all cases surveys were completed in a GMS before moving on or refuelling to minimize the chance of animals being either missed or double-counted. Daily flight times varied between 2 and 6 hours depending on weather and crew conditions. Flights did not go beyond 6 hours to avoid observer fatigue and the increased chance of missing sheep.

We classified animals as nursery sheep, lambs or rams. Nursery sheep were those groups consisting of ewes and young males generally indistinguishable from ewes. Animals with quarter-curl horns in a nursery group were not sexed, but were recorded as nursery animals to reduce the stress associated with prolonged helicopter presence. Rams were further categorized based on horn size and were classified as quarter-, half-, three-quarter-, or full curl. Rams were only classified as quarter curl if they were observed in a ram band. If we could not fully classify groups because of inaccessibility or safety issues we assigned them to “unknown” nursery or “unknown” ram groups. If it was impossible to determine if animals were nursery sheep or rams we recorded them as “unclassified”.





**Figure 2** Survey flight lines from the 2009 Southern Lakes regional Dall's sheep survey. Individual GMSs are outlined in black.

## RESULTS

For management purposes, we consider the number of sheep present in a GMS during the summer months (June, July) as a population. We assume that sheep have traditional, more or less unchanging distribution patterns, so any change in the observed number of sheep between surveys is an indication of a change in the population size (Yukon Sheep Management Guidelines p.3). We attempted to investigate all available sheep habitat (i.e., 100 % coverage) within a GMS and to count every sheep, but in practice this is not possible for several reasons. Sheep can be in non-traditional habitat (i.e., trees, lowlands), on unknown licks at low elevations, or simply overlooked. These surveys therefore provide a total minimum count rather than a true population census. Two key population indices, number of rams per 100 nursery sheep (R:N) and number of lambs per 100 nursery sheep (L:N) are used to assess the status of sheep populations. We consider a ratio of about 40 to 60 rams per 100 nursery sheep sufficient to maintain a stable population. A lower ratio suggests that additional consideration may be warranted. The lamb to nursery sheep ratio is a measure of productivity. A ratio of 25 to 35 lambs per 100 nursery sheep is deemed sufficient to ensure a stable population size.

Over the entire survey area we observed 2689 sheep, consisting of 1470 nursery sheep, 802 rams, 401 lambs, and 16 unclassified adults. Results of the survey are summarized by GMS within broader GMZs.

### ***Game Management Zone 5***

The surveyed portion of GMZ 5 included the Sifton and Miners ranges between the southern end of Aishihik Lake and the Klondike Highway west of Lake Laberge. In GMS 5-50, the Pilot Mountain block, there is concern that improved access and an accompanying increase in ORV use has led to increased disturbance and a potentially unsustainable harvest. Partially due to these concerns in 2009 a permit hunt to limit harvest was established. All other surveyed subzones in GMZ 5 are open (i.e., non-permit).

**Table 1.** Summary of Dall's sheep observations in GMZ 5 during the 2009 Southern Lakes regional sheep survey.

<b>GMS</b>	<b>Lambs: 100 Nursery</b>	<b>Rams:100 Nursery</b>
5-46	42.9	54.3
5-47	27.3	118.2
5-49	40.2	50.5
5-50	32.9	63.3
<b>All</b>	<b>37.5</b>	<b>58.6</b>

All subzones generally had robust L:N and R:N ratios. In GMS 5-46 we saw 52% more sheep compared to the last survey in 1999 and this GMS had the strongest ratios. We likely missed a portion of the sheep population in GMS 5-47, given the low number of nursery sheep classified (< 15). Survey results for this GMS should be interpreted with caution. In total, we observed 368 adult sheep (i.e., non-lamb) and 87 lambs in GMZ 5.

### **Game Management Zone 7**

GMZ 7 historically has the highest sheep densities in the Southern Lakes region and comprised the majority of the survey area (Figure 1). The surveyed portion of GMZ 7 was bounded by Kusawa Lake on the west, the Watson River and South Klondike Highway to the east, the Yukon - BC border to the south and the Alaska Highway to the north. This is one of the more popular sheep hunting areas due to its proximity to Whitehorse. There are several GMSs under permit to ensure harvest is sustainable and to manage overall harvest pressure: 7-21, 7-22, 7-23, 7-25, 7-27, 7-30, 7-31, and 7-32. GMSs 7-15, 7-18, 7-34, 7-35, and 7-36 are closed to harvest by licensed hunters.

**Table 2.** Summary of Dall's sheep observations in GMZ 7 during the 2009 Southern Lakes regional sheep survey.

<b>GMS</b>	<b>Lambs: 100 Nursery</b>	<b>Rams:100 Nursery</b>
7-13	7.1	61.9
7-14	16.4	63.6
7-15	35.3	111.8
7-16	10.3	56.7
7-17	38.9	138.9
7-18	-	-
7-19	35.7	0.0
7-20	19.4	103.2
7-21	28.6	38.8
7-22	28.9	43.3
7-23	36.3	30.8
7-24	33.0	2.2
7-25	5.6	108.3
7-26	-	-
7-27	30.8	146.2
7-30	25.6	68.6
7-31	36.6	51.2
7-32	28.9	28.9
7-33	24.1	20.7
7-34	-	-
7-35	-	-
7-36	100.0	1500.0
<b>All</b>	<b>25.3</b>	<b>52.7</b>

A number of GMSs (7-15, 7-17, 7-20, 7-24, 7-25, 7-27, 7-36) had population ratios, (particularly R:N) that we consider to be unreliable and implausible. These ratios were likely due to either nursery sheep being missed during the survey, or not present on the block, suggesting that the block should not be considered a “population”. In GMSs 7-19 and 7-36, fewer than 20 adult sheep were classified. In 7-19 we identified only a few nursery sheep and saw no ram bands. In 7-36 nearly all sheep observed were rams. In GMSs 7-15, 7-17, 7-20, and 7-27, we observed nearly equal numbers of rams and nursery sheep which likely inflated our R: N estimates. In 7-24 only a few rams (< 5) were observed resulting in a deflated R: N ratio.

Our survey is the first record of sheep in 7-26. We encountered a small band of half- and three-quarter-curl rams in the southern portion of the GMS, without finding a corresponding nursery group in the subzone. These rams may have been moving through the area, or expanding territory. Across GMZ 7, we saw 1667 adult sheep (i.e., non-lamb) and 276 lambs.

### ***Game Management Zone 8***

In GMZ 8, we surveyed GMSs 8-12 to 8-16 (inclusive) (Figure 1). Last surveyed in 1976, we found little evidence this zone supports sheep numbers similar to those found in the mountain ranges to the south and west. The peaks are generally lower with sparse escape terrain. This range is also separated from other mountain blocks by wide, deep, heavily forested glacial valleys which may limit sheep movement to neighbouring ranges.

We found sheep trails in many areas, but they did not appear heavily or recently used. Other observations and anecdotal reports such as sheep seen at the Grey Mountain rifle range, on Mount Laurier and from Joe and Byng mountains suggest there are more sheep in the area than we found on this survey.

We encountered a large ram group in GMS 8-12 but did not find a corresponding nursery group in this or any neighbouring subzones, suggesting that nursery sheep were missed. These rams were the first sheep noted on a survey of this subzone. Although ram bands do separate from nursery groups during this time of year, it seems likely that additional survey effort in GMZ 8 would allow a better assessment of population status. Because no nursery sheep were seen in these GMSs, we could not calculate demographic ratios.

No animals were observed in 8-13, 8-14 or 8-16. However these zones are typified by lower, rolling terrain and small isolated mountain blocks. It is possible that sheep were present in these areas but using lower elevation, more forested habitats and escaped detection by the survey crew. Two nursery sheep, likely yearlings, were seen in 8-15. The absence of a larger nursery group again suggests that we likely missed a number of animals.

## Game Management Zone 9

The surveyed portions of GMZ 9 were bounded by Tagish Lake to the east, Bennett Lake to the west, the Alaska Highway to the north, and the Yukon- BC border to the south (Figure 1). Most of the surveyed subzones in GMZ 9 are closed to licensed hunting with the exception of the 9-03 (bow hunting by permit holders only). We found 215 adult sheep (i.e., non-lamb) and 38 lambs in the surveyed subzones of GMZ 9.

**Table 3.** Summary of Dall's sheep observations in GMZ 9 during the 2009 Southern Lakes regional sheep survey.

GMS	Lambs:	
	100 Nursery	Rams:100 Nursery
9-01	-	-
9-02	-	-
9-03	12.6	54.7
9-04	68.8	50.0
9-05	23.5	17.6
<b>All</b>	<b>26.4</b>	<b>49.3</b>

We surveyed GMS 9-01 and 9-02 quickly because we had neither anecdotal nor survey information indicating sheep have been present there in recent times. We did several passes of the best looking habitat and found no evidence of sheep (i.e., no trails or animals). GMS 9-03 had an adequate R:N ratio but a lower than average L:N ratio.

We found a healthy population of sheep in GMS 9-04 (Caribou Mt.). The L:N and R:N ratios indicate a growing population. We did not survey the northeast portion of the subzone due to time and funding constraints; however there is no evidence that sheep have ever been present in that area.

In subzone 9-05 (Nares Mt.) we found an average L:N ratio but a low R:N ratio, likely indicative that rams were missed on the survey. We observed only one small (< 5) ram band.

## HARVEST

In Yukon, sheep are managed in part by a “full-curl rule”. For licensed hunters this means a ram can be legally harvested only if its horns complete a full curl past the eye when viewed from the side. Biologically this indicates that the ram is sexually mature and is probably close to at least 8 years of age. The full-curl rule assures that a ram has had a number of years to breed before it is subject to harvest. Because of this regulation, the proportion of full curl to below full curl rams in a population is an important metric for managers.

In this survey we classed 43% of all classified rams as full curl (350 of 802). This is a high proportion and suggests that the age structure in the ram

population may be skewing towards older animals. However, given that young rams are present in nursery groups, the actual proportion of full curl rams in the total ram population is lower than 43%.

**Table 4.** Summary of observed rams by GMS during the 2009 Southern Lakes regional sheep survey. The “%Full Curl” column indicates the proportion of the total rams that are of harvestable size.

<b>GMS</b>	<b>% Full Curl</b>
5-46	42.1
5-47	46.2
5-49	35.2
5-50	30.0
7-13	26.9
7-14	28.6
7-15	21.1
7-16	40.0
7-17	40.0
7-19	--
7-20	34.4
7-21	26.3
7-22	44.8
7-23	28.6
7-24	50.0
7-25	59.0
7-26	0.0
7-27	10.5
7-30	72.3
7-31	42.9
7-32	61.5
7-33	0.0
7-36	53.3
8-12	75.0
8-15	--
9-03	63.5
9-04	43.8
9-05	66.7

**Table 5.** 10-year summary of Dall's sheep harvest (number of rams/year) by game management subzone in the Southern Lakes survey area.

<b>GMS</b>	<b>Average Annual Harvest (2000-2004)</b>	<b>Average Annual Harvest (2005-2009)</b>	<b>% Change in Harvest</b>	<b>Status</b>	<b># Permits Issued in 2010 (if applicable)</b>
5-46	2.0	2.8	40	Open	
5-47	1.2	1.8	50	Open	
5-49	5.2	3.6	-30.8	Open*	
5-50	3.2	4.8	50	Permit	6
7-13	1.6	2.2	37.5	Open	
7-14	4.2	5.8	38.1	Open	
7-15	0	0	0	Closed	
7-16	2.0	6.2	210	Open	
7-17	1.4	1.8	28.6	Open	
7-18	0	0	0	Closed	
7-19	2.6	0.8	-69.2	Open	
7-20	2.2	2.0	-9.1	Open	
7-21	0.6	0.2	-66.7	Permit	2
7-22	5.4	6.4	18.5	Permit	20
7-23	3.0	1.6	-46.7	Permit	7
7-24	3.0	1.6	-46.7	Open	
7-25	2.2	1.2	-45.5	Permit	6
7-26	0.2	0	-100	Open	
7-27	0.2	0.4	100	Permit	4
7-30	4.6	5.2	13	Permit	15
7-31	1.5	0	-100	Permit	6
7-32	0.8	1.2	50	Permit	7
7-33	1.2	0.6	-50	Open	
7-34	0	0	0	Closed	
7-35	0	0	0	Closed	
7-36	0	0	0	Closed	
8-12	0	0.2	0	Open	
8-13	0	0	0	Open	
8-14	0.2	0	-100	Open	
8-15	0.4	0	-100	Open	
8-16	0	0	0	Open	
9-01	0	0	0	Closed	
9-02	0	0	0	Closed	
9-03	0.4	0.2	-50	Permit**	10
9-04	0	0	0	Closed	
9-05	0	0	0	Closed	

\* Permits first issued in 2009

\*\* Bow-hunting only

## Discussion

Within the Southern Lakes survey area, there were at minimum of 2288 non-lamb sheep during June - July 2009 (Tables 1 – 3). We do not consider these counts as population estimates because we cannot verify the assumption that we detected all sheep in every GMS. Variable levels of survey effort (i.e., flying time) as well as habitat factors (e.g., forest cover) make comparison of sheep numbers across GMSs problematic. Formal comparisons of population sizes among GMSs should not be made, nor should comparisons of minimum counts of sheep within a GMS be made across years.

We consider lamb recruitment for 2009 to be adequate to maintain a “stable” population across the regional study area. At the scale of individual GMSs, there was substantial variability in L:N ratios indicating that even with a common climatic signature influencing sheep productivity regionally (i.e., the Pacific Decadal Oscillation), there remain localized GMS-specific factors which result in varied recruitment rates. Typical of ungulate populations, lamb survival and productivity is a highly variable parameter. It is therefore difficult to compare L:N ratios, and hence estimate trends, within a GMS from only a few years of data.

R:N ratios, as with the L:N ratios, showed substantial variability across the survey area, with a number of ratios being biologically implausible (Table 2). These implausible ratios were likely the result of either the survey block not being used by nursery sheep, (indicating that block does not represent a “population”) or because we missed nursery and/or ram groups. R:N ratios represent a challenge for making inferences regarding population level parameters. Because rams and nursery sheep are spatially segregated during the summer, the numerator and denominator of the ratio represent two separate “processes”. That is, the detectability of ram and nursery sheep groups may be independent and therefore within a GMS, rams, for example, may be more or less detectable than nursery sheep. Depending on how detectable they (i.e., ram groups) are compared to nursery sheep, the ratio will be biased low or high. If equal detectability could be assumed, the subsequent ratio would be unbiased.

Among the GMSs surveyed in this survey, concern regarding harvest sustainability was identified for three: 7-14, 7-16, and 7-19. GMS 7-19 has seen a drop in harvest rate of about 69% from 2000-2004 to 2005-2009 (Table 5). This drop is likely due to a drop in ram use of this GMS. The 1994 survey observed 40 rams using this block, but we saw no rams in 2009. We do not know why rams may no longer be using this block but its proximity to Whitehorse and relative accessibility may be contributing factors. Easing harvest pressure may be required to promote ram occurrence in this subzone.

GMSs 7-14 and 7-16 have both seen considerable increases in harvest rates from 2000-2004 to 2005-2009 (Table 5). GMS 7-14 harvest has increased



about 38% and 7-16 has increased by 210%. Based on numbers of rams harvested, harvest rates in both GMSs may be at or exceed sustainable levels (i.e., 4% based on the 1996 Yukon Thinhorn Sheep Management Guidelines). Given their proximity to Whitehorse and/or their accessibility, and the increasing trend in harvest, harvest limitations may be necessary to ensure that harvest remains within sustainable limits for these populations.