Yukon

SR-19-03

Status of Dall's sheep and mountain goat in Game Management Zone 9 2017

May 2019

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Government of Yukon
Fish and Wildlife Branch
SR-19-03

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Acknowledgements
We thank Yukon Department of Environment staff (J. Goorts, L. Jessup, P. Knammiler, and C. McClelland) and D. Peters (Teslin Tlingit Council) for their assistance. Trans North Helicopters (Pilot I. Pitchforth) provided safe and efficient air transportation. Nicole McCutchen, Matt Clarke, and Christine Cleghorn reviewed this report.

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Suggested citation:
HEGEL, T. M, AND K. RUSSELL. 2019. Status of Dall's sheep and mountain goats in Game Management Zone 9, 2017 (SR-19-03). Government of Yukon, Whitehorse, Yukon, Canada.

Key findings

- A broad-scale survey of Dall's sheep and mountain goats in GMZ 9 was conducted during July 2017.
- Across GMZ 9, 261 sheep were observed, 218 of which were non-lambs.
- Across GMZ 9, 153 mountain goats were observed.
- Dall's sheep populations across GMZ 9 appear to be stable.
- Mountain goat populations in GMZ 9 appear to be increasing relative to previous surveys.
- Three sheep management units and three mountain goat management units were identified using information from this, and previous, surveys.
- Licensed harvest of sheep within the Gray Ridge management unit (GMS 9-03) is considered sustainable; the rest of GMZ 9 is closed to sheep and goat harvest.

Abbreviations

BC	British Columbia
CTFN	Carcross/Tagish First Nation
GMS	Game Management Subzone
GMZ	Game Management Zone
KDFN	Kwanlin Dün First Nation
OA	Outfitting Area
PHA	Permit Hunt Authorization
TKC	Ta'an Kwäch'än Council
TTC	Teslin Tlingit Council
TRTFN	Taku River Tlingit First Nation

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Introduction

GMZ 9 in southwest Yukon (Figure 1) is the smallest GMZ in Yukon. Sheep in this area are the Dall's subspecies (*Ovis dalli dalli*) of thinhorn sheep (Sim *et al*. 2016). Dall's sheep and mountain goats occur in several mountainous areas of GMZ 9. Due to several major highways in GMZ 9, accessibility to sheep and goats in the zone is generally high. The Southern Lakes Wildlife Coordinating Committee (2012) recommended that adequate information be available to support sheep and mountain goat management decisions and to ensure the long-term sustainability of any harvest. This work supports those recommendations (i.e., recommendations 2.28 and 2.32) and also contributes to our understanding of thinhorn sheep populations in Yukon.

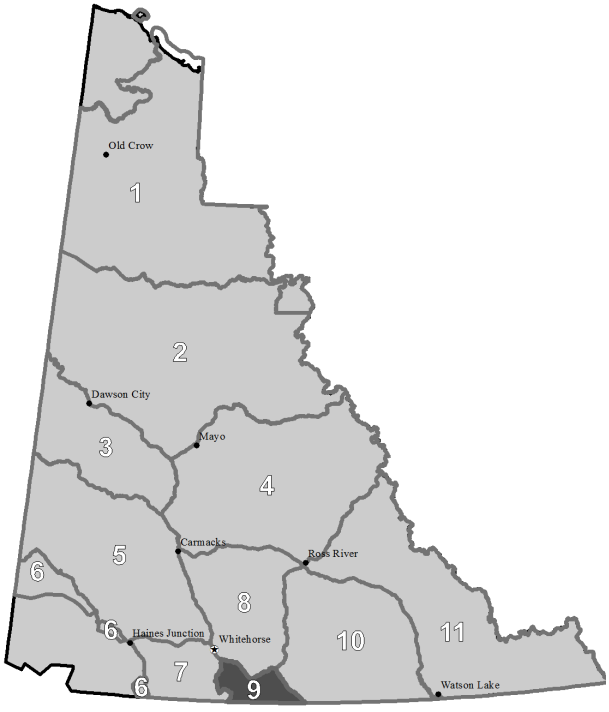

Figure 1. Distribution of Yukon's Game Management Zones. Game Management Zone 9 is shaded dark.

In 2017, Government of Yukon conducted a broad-scale survey of Dall's sheep and mountain goats to assess their status across GMZ 9. The objectives of this survey were to assess abundance, population productivity (i.e., lamb/kid production), adult sex ratio, and ram composition. Two additional objectives were to incorporate this broad-scale survey data into delineation of biologically meaningful management units in GMZ 9 and then assess harvest sustainability within these units. Previous survey efforts in GMZ 9 have typically been sporadic; this was the first broad-scale survey of sheep and goats in the zone since the late 1970s.

Game Management Zone 9

GMZ 9 (Figure 1), located in southern Yukon, is one of 11 GMZs distributed across Yukon. It encompasses approximately 5,540 km^2 and is roughly located between the Coast Mountains to the west and the Big Salmon Range to the east. It is bordered to the north and south by the Alaska Highway and the Yukon-BC border, respectively. To the west and east it is bordered roughly by the South Klondike Highway and Teslin Lake, respectively. GMZ 9 is bisected by the Atlin Road (Figure 2).

GMZ 9 is located in the traditional territories of CTFN, KDFN, and TTC, and the asserted Traditional Territory of the Taku River Tlingit First Nation (Figure 2). The traditional territory of TKC includes a very small portion of GMZ 9 in the northwest corner of the zone. Category A and B First Nation settlement lands are distributed throughout GMZ 9. Agay Mene Natural Environment Park is located roughly in the middle of GMZ 9 (Figure 2).

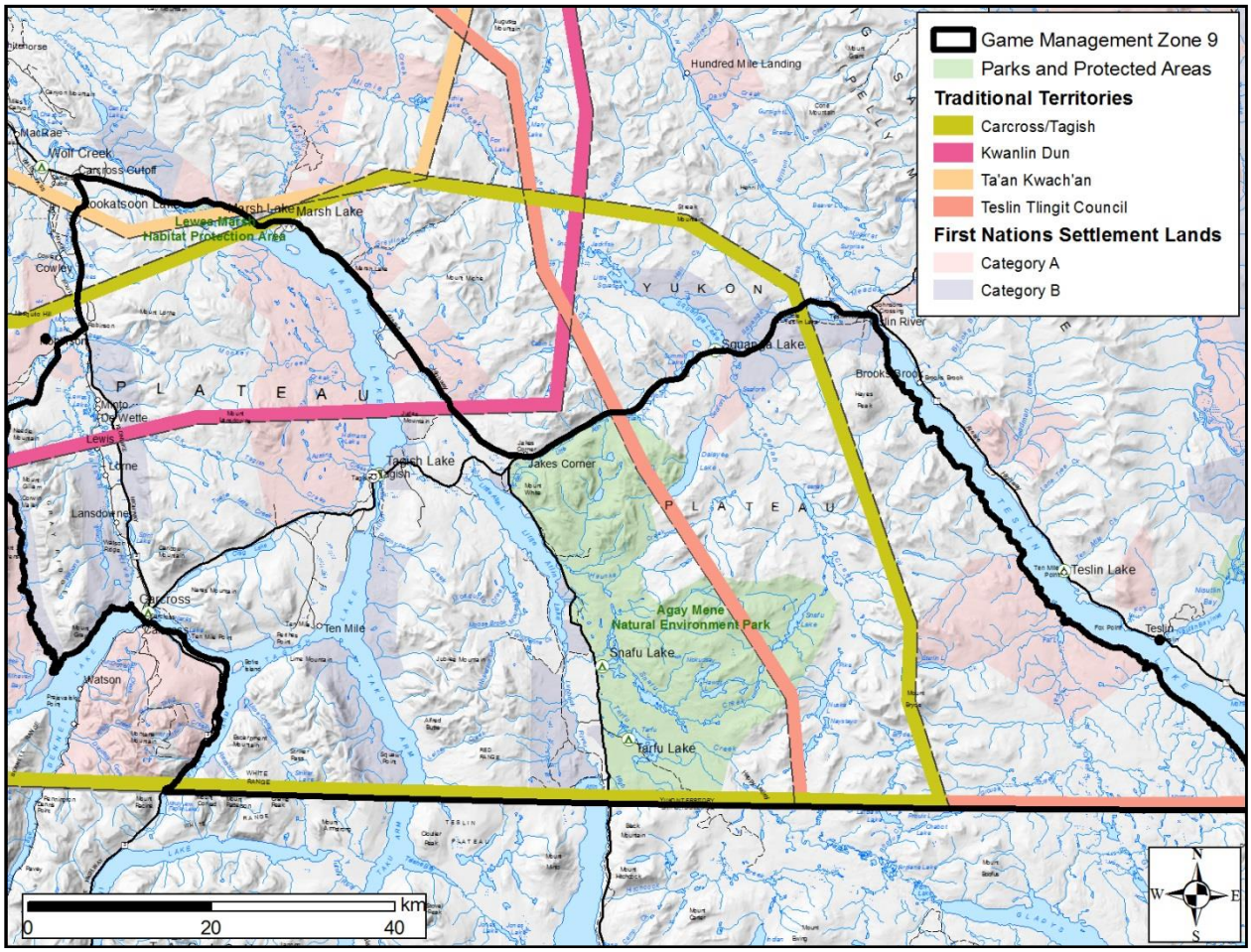

Figure 2. First Nations traditional territories, settlement lands, and parks and protected areas located in Game Management Zone 9.

There is one active OA in GMZ 9: OA 17 in the northwest corner. This portion of the OA is generally outside the distribution of sheep and goats in GMZ 9 and no non-resident harvest currently occurs in the zone. All licensed mountain goat harvest is closed in GMZ 9. Licensed resident sheep harvest is restricted to GMS 9-03, which is under a bow-only PHA.

Ecologically, GMZ 9 is located entirely within the Boreal Cordillera ecozone (Yukon Ecoregions Working Group 2004). The majority of GMZ 9 occurs within the Yukon Southern Lakes ecoregion while the southwest portion lies within the Boreal Mountains and Plateaus ecoregion. A small portion of GMZ 9-03 occurs in the Yukon-Stikine Highlands ecoregion. The entire GMZ is in the Yukon River watershed (Figure 3).

GMZ 9 maintains an intact multi-predator/multi-prey community with large mammals including moose (*Alces americanus*), mule deer (*Odocoileus hemionus*), grizzly (*Ursus arctos*) and black bear (*U. americanus*), wolves (*Canis lupus*), and coyotes (*Canis latrans*). The Atlin and Carcross northern mountain caribou (*Rangifer tarandus caribou*) herds occur here.

The average elevation of GMZ 9 is 986 meters above sea level (range: 578 to 2012 m). Fires are generally uncommon in the western portion of GMZ 9 (Figure 4). The eastern portion of GMZ 9 experienced a very large fire in 1958 (i.e., the Teslin burn) (Figure 4). While the northern and western periphery of GMZ 9 is within more intensive fire management zones (i.e., fires are generally extinguished), the majority of the zone is in a wilderness fire management area and

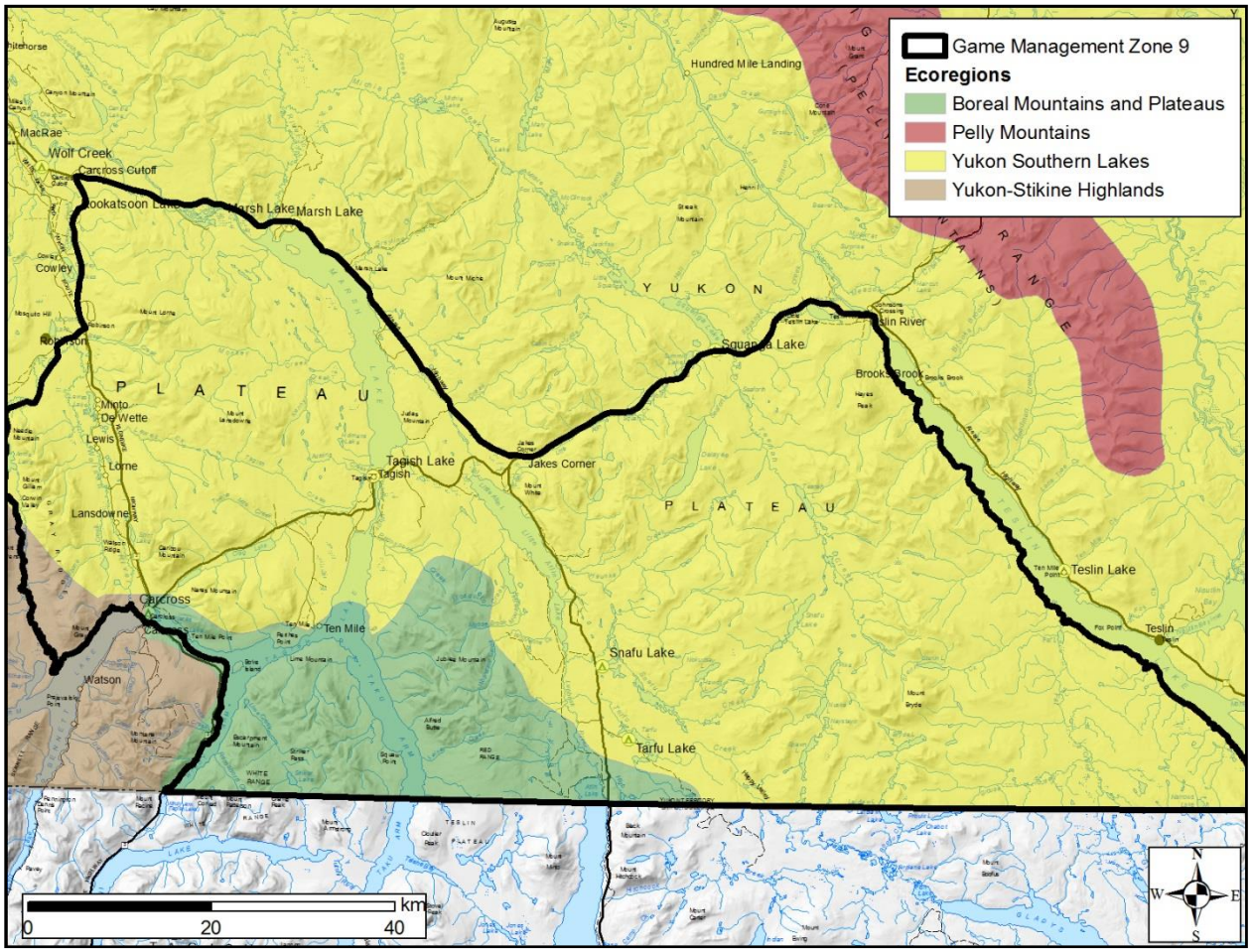

Figure 3. Ecoregions located within Game Management Zone 9.

natural fires are typically left to burn as per the 2003 Yukon Fire Management Zones Directive. The climate of GMZ 9 is generally arid with an average precipitation of roughly 200 to 325 mm, and mean January and July temperatures of -21 to -25°C and 12 to 14°C, respectively (Yukon Ecoregions Working Group 2004). Detailed descriptions of the vegetation, geology, and physiography of GMZ 9 can be found in Smith *et al.* (2004).

Human land use disturbance in GMZ 9 is generally low and localized to a few areas. Apart from human settlement in and around Whitehorse, Carcross, and Tagish, mineral exploration is limited to a few sites in GMSs 9-01, 9-07, and 9-08 (Figure 5).

Currently, **the only licensed harvest of sheep in GMZ 9 occurs in GMS 9-03** (Figure 5), where a bow-only PHA is in place for sheep with 10 permits issued annually since 1986. This is the only area in Yukon restricted to bow-only harvest. The remainder of GMZ 9 has been closed to licensed harvest of sheep and mountain goats since 1976. All of GMZ 9 is closed to licensed mountain goat harvest.

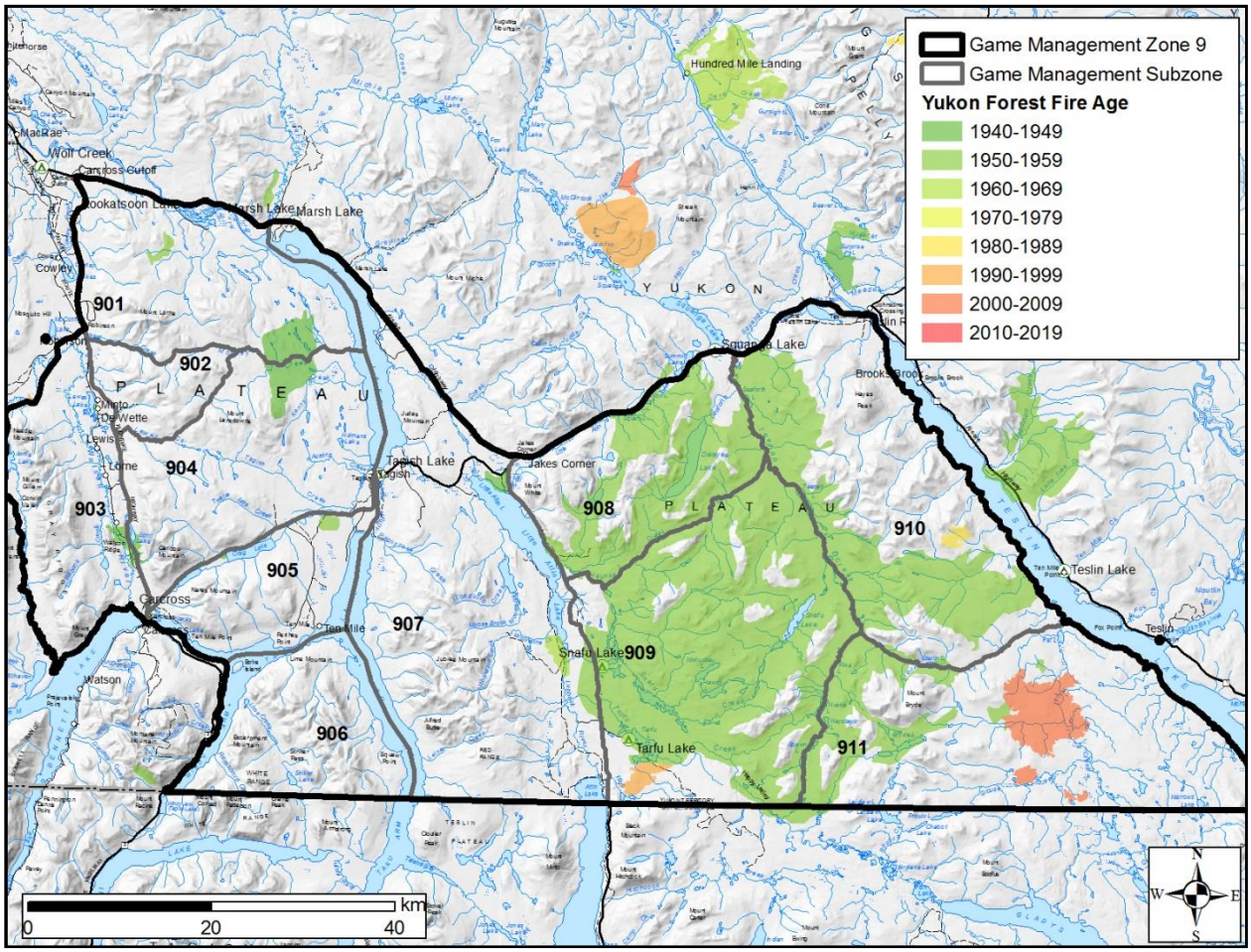

Figure 4. Distribution and ages of forest fires in Game Management Zone 9.

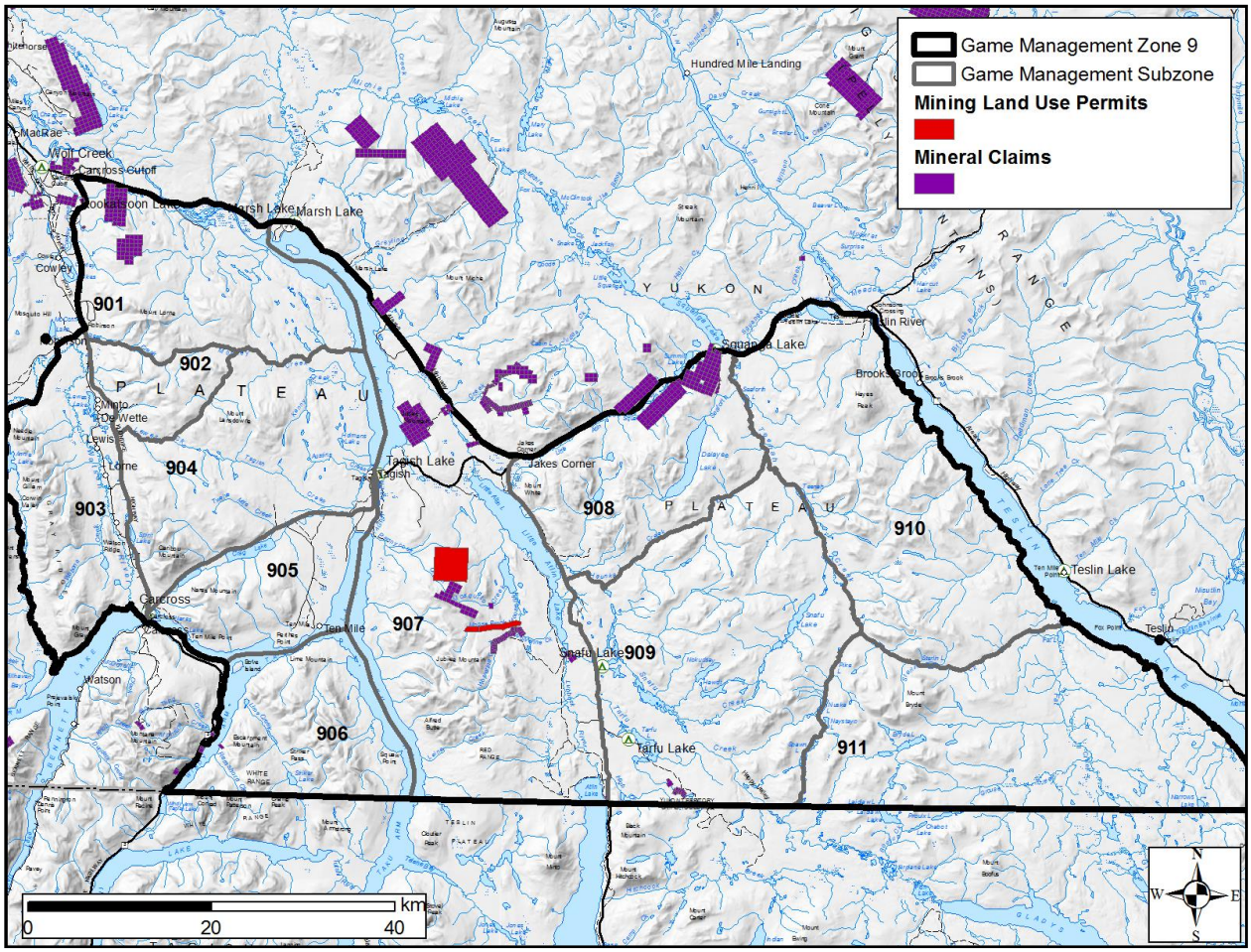

Figure 5. Distribution of active mining land use permits and mineral claims in Game Management Zone 9.

Methods

Aerial surveys

During 21 and 22 July 2017, sheep and mountain goats in GMZ 9 were aerially surveyed via helicopter (Bell 206L4) following methods described by Hoefs and Barichello (1985). The basic survey unit was typically a GMS (i.e., a relatively discrete mountain block) within which all high elevation habitat, typical sheep and mountain goat summer range was surveyed in an attempt to achieve complete coverage (Hoefs and Cowan 1979, Roffler et al. 2016a). Surveys were designed to ensure geographic closure so a single GMS could be surveyed within one trip to reduce the chance of double-counting or missing animals that may have moved while the helicopter was out of the survey area (when at all possible). Three observers were present on all surveys with the helicopter "contouring" a mountain block in a counter-clockwise direction. Aircraft speeds typically ranged from 100 to 120 km/hour, but this could vary depending on wind and terrain conditions. The altitude of the helicopter also varied depending on wind/terrain conditions.

The same navigator/primary classifier was present on all surveys. When a sheep or mountain goat group was located, its total size was tallied and animals classified. The survey method used here was a total minimum count, thus results are not corrected for sightability (Udevitz et al. 2006). Rams were classified based on their horn curl size into ½, ¾, or full curl categories. If present, younger ¼ curl rams were

also classified as such. While there is variability in the ages of rams having different horn curl sizes due to annual differences in horn growth (Hik and Carey 2000), roughly speaking ¼ curl rams are ages 1 to 2, ½ curl rams are ages 3 to 4, ¾ curl rams are ages 5 to 6, and full curl rams are ≥7 years of age (Barichello *et al.* 1987). The number of lambs was also recorded and yearlings, ewes, and young rams were classified as nursery sheep (i.e., ewe-like sheep). Young (¼ curl) rams are typically found in these nursery groups and are often indistinguishable from ewes when classified from the air and were not further distinguished to avoid added disturbance on these animals. Thus, the nursery sheep class does not solely represent reproductive females. Classifying nursery sheep in this manner is typical of management agencies elsewhere (e.g., Strickland *et al.* 1992, Marshall 2005, Mitchell *et al.* 2015). Mountain goats were only classified as adults and kids. Male and female mountain goats are challenging to classify from the air and thus were classified as adults to reduce disturbance on them.

Sheep data from each GMS were summarized to include a total count of all animals, a count of non-lambs, a ram:nursery sheep ratio, and a lamb:nursery sheep ratio. Because ¼ curl rams are typically found in nursery groups, all ¼ curl rams observed in a GMS were included in the nursery sheep category to ensure consistency in the calculation of demographic ratios. The ram:nursery sheep ratio is an index (i.e., an indicator but not a true measure) of the sex ratio of the population. Because nursery sheep include young males it cannot be interpreted as a true sex ratio and will be biased low relative to the true population sex ratio. Likewise, the lamb:nursery sheep ratio is an index of lamb productivity and is also biased low relative to, for example, a lamb:ewe ratio. Nevertheless, while these ratios do have biases associated with them (Festa-Bianchet 1992), they can still be useful for monitoring and comparative purposes. Mountain goat data were summarized as total count of all animals, the number of adults, the number of kids, and percent kids.

Sheep and goat management units

One of the objectives of this survey was to identify biologically meaningful management units (Moritz 1994, Funk *et al.* 2012), from which management and monitoring decisions can be applied (e.g., Zannèse *et al.* 2006). Historically, GMSs were typically used as the basic unit of management. However, in many situations a single GMS is not reasonable to consider as an appropriate management unit due to its small size, lack of geographic closure, or other knowledge of sheep or goat movements.

Two lines of evidence were used to identify **sheep management units**: survey data (i.e., demographics) and geographic closure (i.e., terrain features). From a population perspective, we considered an appropriate management unit as one in which variability in sheep numbers was primarily driven by births and deaths, rather than immigration and emigration (Murray 2002, Turchin 2003). While recognizing that immigration and emigration among identified management units may occur, units were delineated such that this movement (and changes in population size arising from it) were assumed negligible relative to births and deaths.

To begin, a GMS was considered the smallest unit and individual GMSs were not split. Adjacent GMSs were then assessed for possible grouping based on the lack of natural movement barriers across GMS borders (e.g., rivers, deep and long valleys; Roffler *et al.* 2016b) and on observed ram:nursery sheep ratios and non-lamb survey counts. Historical data were also considered in this assessment when available. Typical ram:nursery sheep ratios in unharvested sheep populations are >50 rams:100 nursery sheep (Hoefs and Bayer 1983) and lower in harvested populations (e.g., ~40 rams:100 nursery sheep). Given lower survival and longevity of males

(Toïgo and Gaillard 2003), there are generally always fewer males than females in ungulate populations. Large departures from these typical ram:nursery sheep ratios indicates either rams or nursery sheep were missed or a single GMS does not represent the population. Examples of large departures from expected ram:nursery sheep ratios (i.e., ratios reflective of a biologically realistic management unit) include situations with >80:100, or conversely, situations such as <30:100.

To rule out sheep being missed during the survey, results from previous surveys were assessed to examine historical consistency and a GMS was examined with respect to its degree of connectivity to adjacent GMSs. If a GMS was relatively isolated and previous surveys generally indicated higher sheep numbers, a departure from the expected ram:nursery sheep ratio may mean animals were missed during the survey. When deemed appropriate to group GMSs, adjacent subzones with a high degree of connectivity were grouped and the ram:nursery sheep ratio and total count of non-lamb sheep recalculated. Non-lambs were used due to the high annual variability in lamb productivity and survival (Jorgenson 1992, Gaillard *et al*. 1998), meaning non-lamb counts are more comparable over time. These recalculated values were then compared to previous survey results from the grouped GMSs. A group of GMSs was identified as a management unit if the grouping yielded a biologically realistic ram:nursery sheep ratio and provided generally similar numbers of non-lamb sheep (recognizing that some degree of annual fluctuation in non-lamb numbers is expected).

An example of how this approach was applied is well demonstrated with the Caribou/Nares management unit (described below) which consists of two GMSs. Individually, none of the individual GMSs have biologically realistic ram:nursery sheep ratios (i.e., 200:100 or 0:100 rams:nursery sheep in 1991 for individual GMS; Table 7). However, once data from both GMSs are pooled, the resulting ram:nursery sheep ratios are biologically realistic (e.g., 59:100 in 1991 when the GMSs are combined). The lack of any significant movement barriers among the two GMSs (Figure 11) provides further evidence that they should be considered as one management unit. Finally, non-lamb counts in the two GMSs have fluctuated (Table 7), but when those counts are pooled across the subzones the fluctuations are dampened considerably. This suggests that animals were moving across GMS boundaries but not necessarily out of the overall management unit. While population fluctuations are expected over time, very large fluctuations are not expected, particularly if those levels of fluctuations were not observed in nearby areas.

Management units were identified regardless of harvest management strategy or land tenure or administration. Survey results and harvest rates are presented by GMS and according to these newly identified management units, which are named based on local landmarks or features.

Delineation of **mountain goat management units** was based on terrain features and the broader distribution of goats on the landscape, as there was no demographic data similar to sheep (e.g., ram:nursery sheep ratios).

Sheep harvest rates for GMS 9-03

Average annual licensed harvest rate for sheep in GMS 9-03 was calculated for the 2013 to 2017 period. This is the only GMS where sheep harvest occurs; there is no licensed mountain goat harvest in GMZ 9.

A five-year period was used as it was deemed to represent current conditions while also accounting for annual variability in the number of sheep harvested. It is also consistent with recently updated sheep management guidelines (Environment Yukon 2017). Harvest rates are based on the number of sheep harvested by licensed hunters divided by the non-lamb count within a GMS or management unit. Non-lamb counts are used rather than total counts because of the high degree of annual variability in the

lamb cohort size and potential for considerable lamb mortality from the time of the survey to one year of age. Thus, non-lamb counts are a more stable indication of the size of a sheep population. Harvest rates do not include First Nation subsistence harvest, which is not required to be reported.

Results

All high elevation sheep and goat habitat was surveyed except for 9-07. This GMS is frequently surveyed during annual Carcross caribou fall composition surveys and no observations of sheep or goats have been recorded during those surveys or previous sheep and goat surveys. Approximately 1,170 km of survey tracks (Figure 6) were flown during approximately 12 hours. Overall, 261 sheep and 153 mountain goats were observed (Tables 1 and 2).

Table 1. Broad-scale Dall's sheep counts and population ratios for GMZ 9 (2017).

Parameter	GMZ 9
Total count	261
Non-lamb count	218
Lambs	43
Nursery sheep	138
Rams	80
Lamb:nursery sheep ratio	31:000
Ram:nursery sheep ratio	58:100

Table 2. Broad-scale mountain goat counts and population ratios for GMZ 9 (2017).

Parameter	GMZ 9
Total count	153
Adults	134
Kids	19
% Kids	12.4%

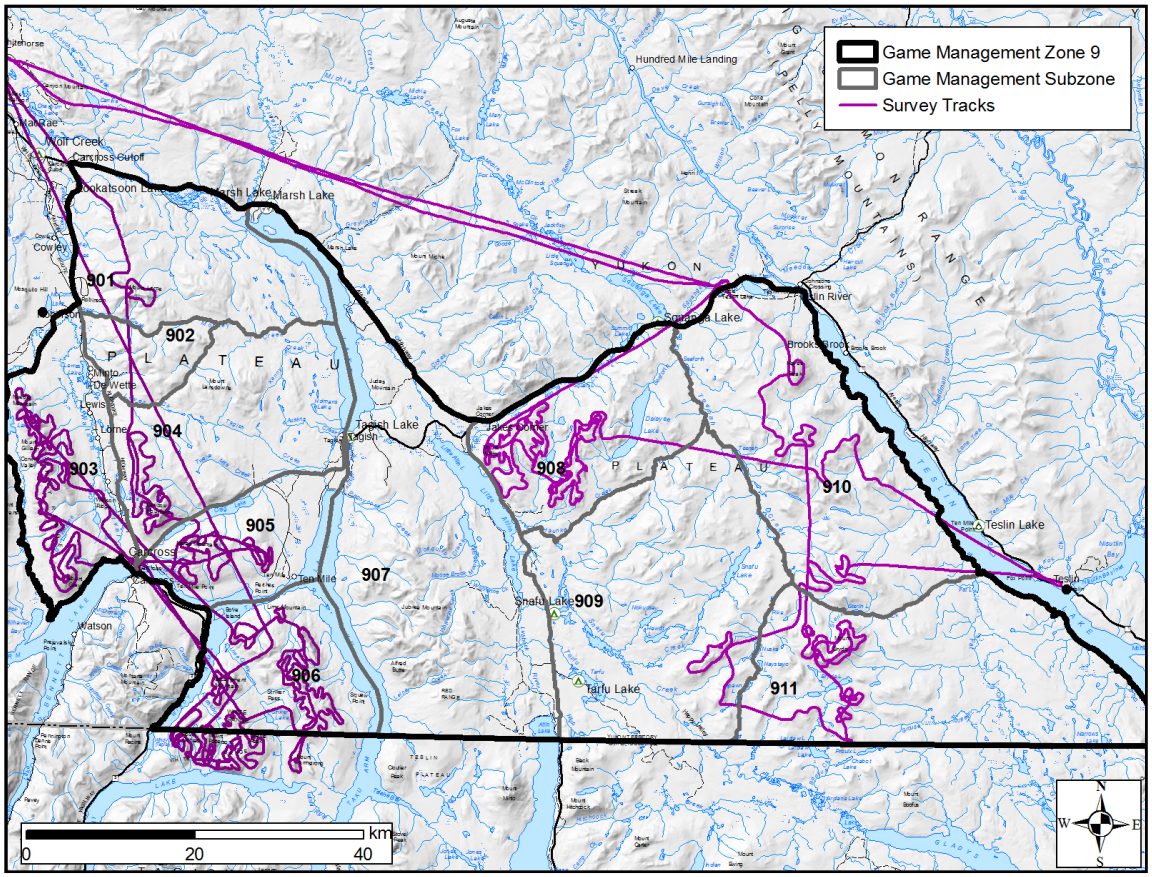

Figure 6. Flight tracks from the 2017 sheep and mountain goat survey in Game Management Zone 9.

Management units

Three sheep and three mountain goat management units were identified across GMZ 9 (Figures 7 and 8, respectively). Remaining areas across GMZ 9 were not assigned to a unit as there is little evidence that these subzones consistently maintain sheep or mountain goats.

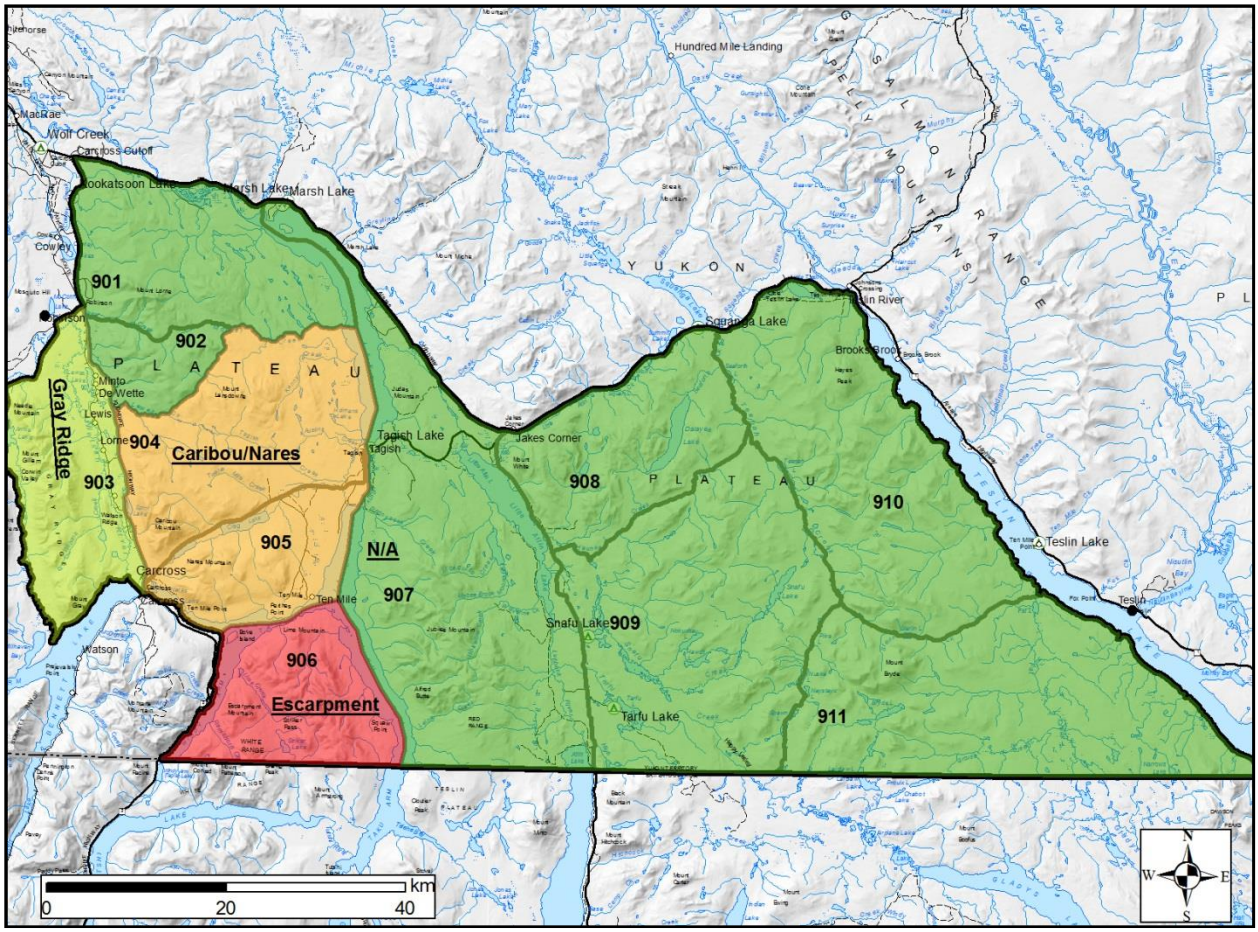

Figure 7. Three identified sheep management units in Game Management Zone 9. NA indicates an area does not maintain sheep and is not a management unit (dark green areas). Game Management Subzones across Game Management Zone 9 are also labelled.

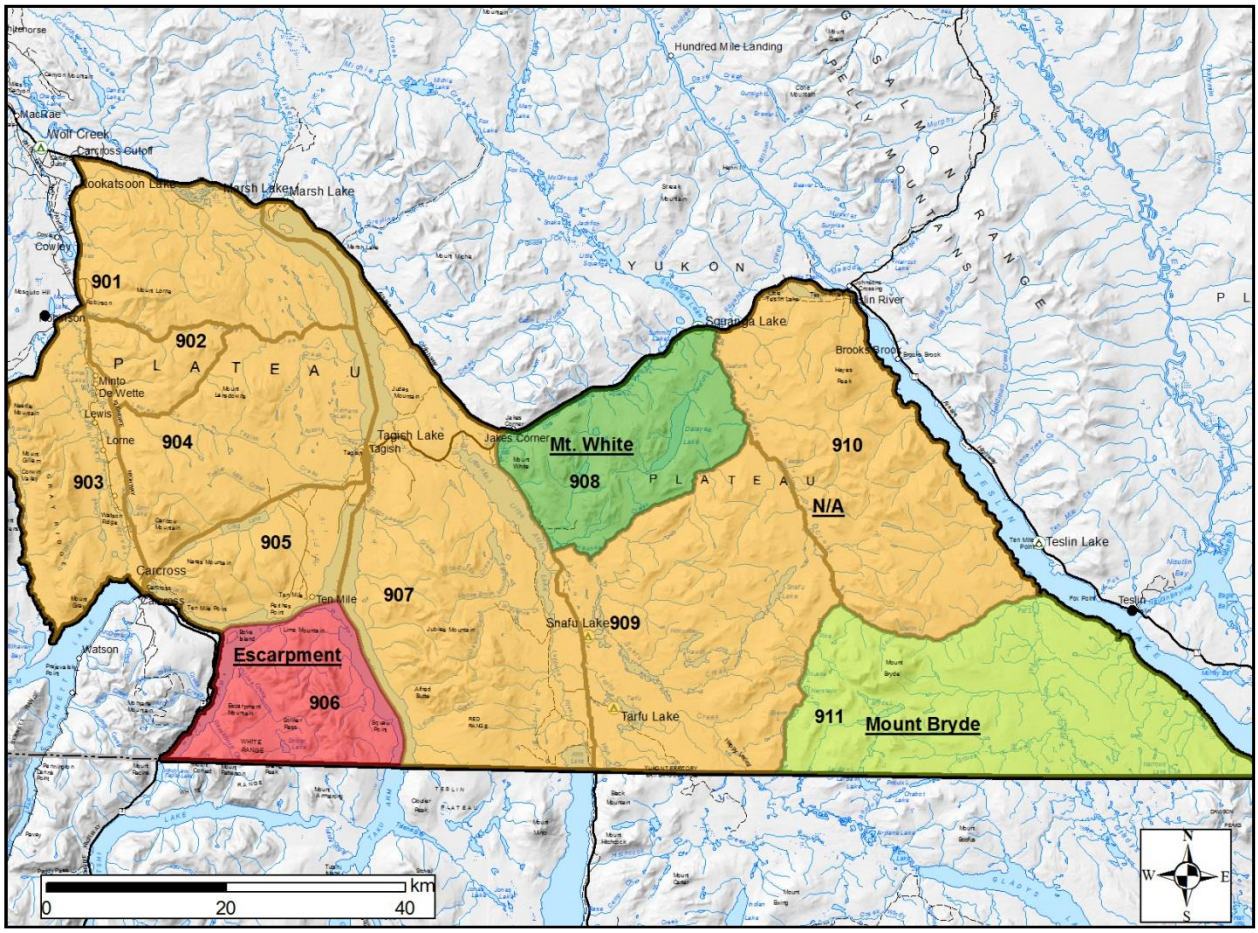

Figure 8. Three identified mountain goat management units in Game Management Zone 9. NA indicates an area does not maintain mountain goats and is not a management unit (orange areas). Game Management Subzones across Game Management Zone 9 are also labelled.

Gray Ridge (Game Management Subzone 9-03)

The Gray Ridge sheep management unit, named after its dominant north-south land feature, is the westernmost portion of GMZ 9 and is bisected from the remainder of the GMZ by the South Klondike Highway (Figure 9). Geographic closure of the unit is obtained by the Wheaton River valley to the west, the South Klondike Highway to the east, Bennett Lake to the south, and low elevation forested areas to the north. However, traditional knowledge indicates movement of sheep between GMS 9-03 and 9-04 in the vicinity of Spirit Lake. With the increase in vehicle traffic using the South Klondike Highway, it is unknown whether sheep continue to move between the two GMSs. There has been one mountain goat observation in the unit in 1983, but goats are not consistently found here.

There is limited human disturbance in the unit. In the early 1980s, a microwave transmission tower was installed in the southern portion of the unit. The Gray Ridge unit maintains the highest number of sheep in GMZ 9 and has had relatively frequent monitoring since the mid-1970s (Tables 3 and 4). Prior to 1986, GMS 9-03 was closed to licensed hunting, at which time a bow-only PHA was initiated. 10 permits are issued annually (Figure 10). The current 5-year annual average harvest in the unit is 1.8 sheep/year and a permit success rate of 18% (Table 5). Since the initiation of the PHA, the long-term permit success rate in the unit is 6.6%.

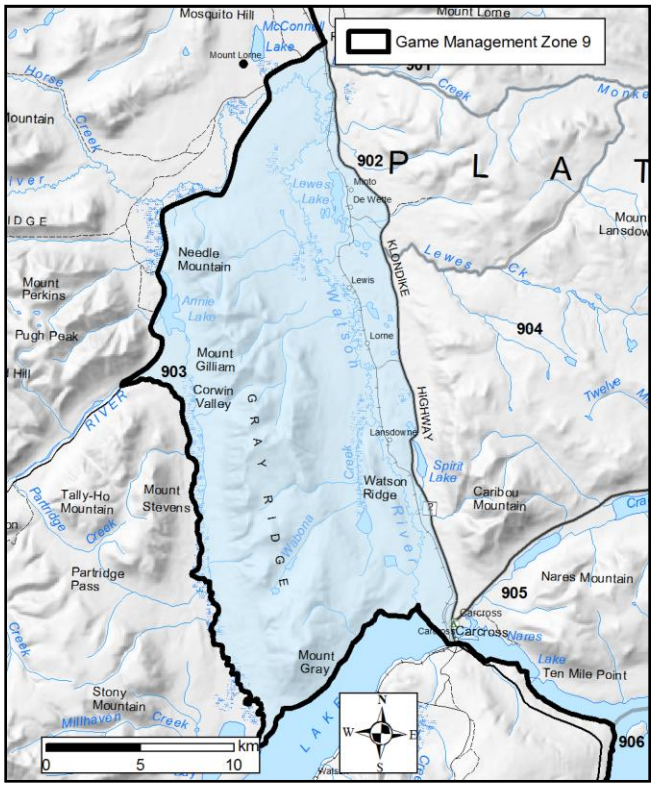

Figure 9. Location of the Gray Ridge sheep management unit (GMS 9-03).

The 2017 non-lamb count of 111 animals is slightly lower than counts observed in 2009 and 2013 (Table 4). Given the high ram:nursery sheep ratio in 2017, it is likely that some nursery sheep were missed during this survey. For example, the 2009 survey had a more biologically realistic sex ratio, with more animals observed. Nevertheless, even using the 2017 minimum count which may be biased low, the current average annual licensed harvest rate for sheep in this unit is 1.6%. Based on current survey results, an average annual harvest of 4 sheep is considered sustainable.

Table 3. 2017 survey results for the Gray Ridge sheep management unit.

Parameter	GMS 9-03
Non-lamb count	111
Lamb:nursery sheep ratio	41:100
Ram:nursery sheep ratio	73:100

Table 4. Historical summer survey results for the Gray Ridge sheep management unit.

	Non-lamb count	Ram:nursery sheep ratio
Year	GMS 9-03	GMS 9-03
2017	111	73:100
2016	100	45:100
2015	113	59:100
2014	51	76:100
2013	130	-
2009	147	52:100
1994	97	44:100
1984	72	76:100
1983	36	12:100
1982	92	64:100
1981	75	83:100
1980	61	97:100
1979	49	89:100
1978	48	50:100
1974	29	26:100

Table 5. Licensed sheep harvest in the Gray Ridge sheep management unit (2013 to 2017).

Area	2017	2016	2015	2014	2013
GMS 9-03	1	3	1	3	1

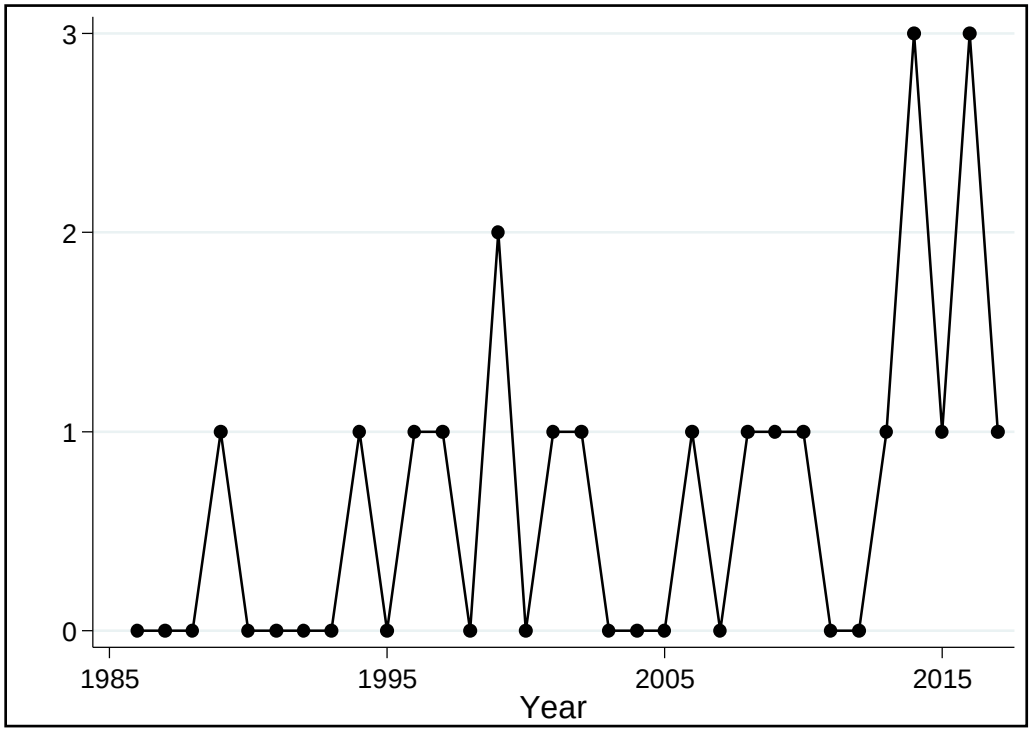

Figure 10. Long-term licensed sheep harvest in the Gray Ridge sheep management unit (1986 to 2017). Prior to 1986 licensed harvest in this area was closed. Ten permits are issued annually.

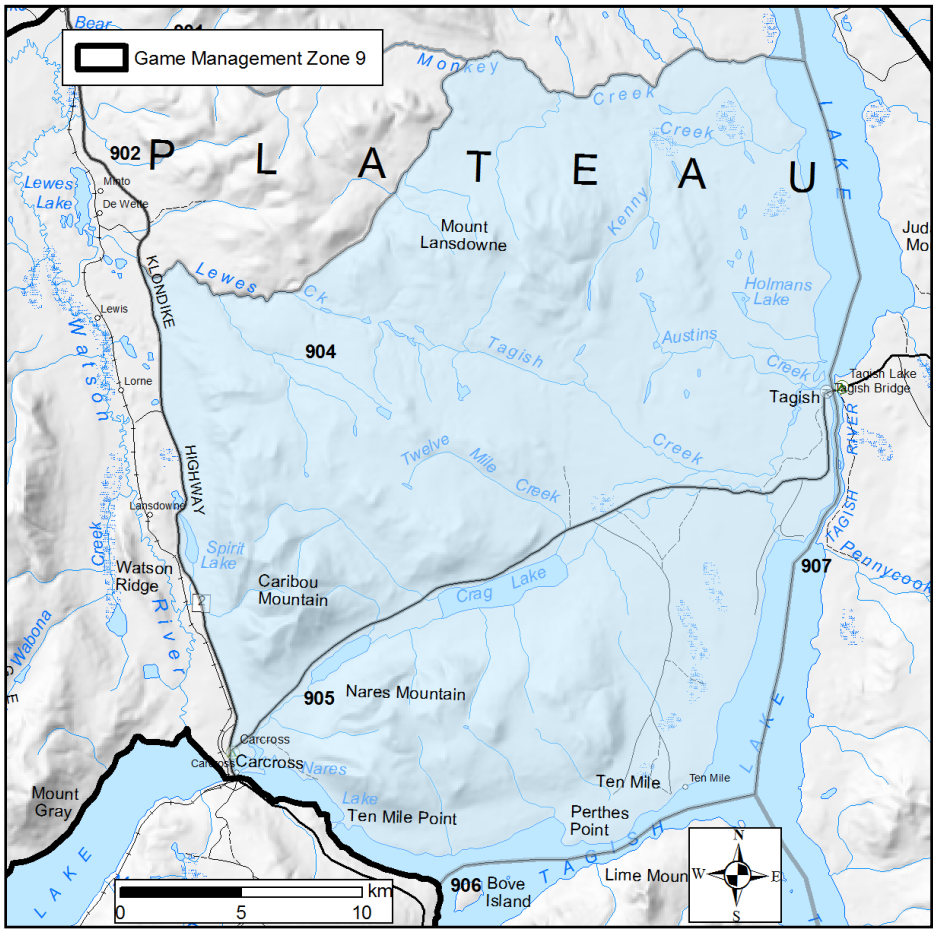

Figure 11. Location of the Caribou/Nares sheep management unit (GMS 9-04 and 9-05).

Caribou/Nares (Game Management Subzones 9-04 and 9-05)

The Caribou/Nares sheep management unit consists of GMSs 9-04 and 9-05 and is named after the dominant peaks in each subzone. The unit overlooks the community of Carcross. Sheep are generally distributed in the southwest corner of the unit where the highest elevations occur (Figure 11) with the majority in GMS 9-04 (Table 6). Geographic closure of the unit is obtained via the South Klondike Highway to the west, Tagish Lake to the south, Marsh Lake to the east, and lower elevation forested areas to the north. As noted previously, some movement between the Gray Ridge and Caribou/Nares management units may have historically occurred. Recreational trails provide ready access to the unit and it is bisected by the Tagish Road. Licensed harvest of sheep and goats is closed in this unit.

Sheep in the Caribou/Nares management unit disappeared in the early 1970s, possibly due to overharvest (Barichello and Carey 1991). In 1990 a translocation project was proposed to return sheep to this area. However, at this time sheep naturally recolonized the area either from Gray Ridge to the west or Montana Mountain to the south. The exact source of these colonizing individuals is unknown. Non-lamb counts have stabilized between 65 to 85 adults since recolonization (Table 7).

Mountain goat observations in the unit are restricted to Nares Mountain in GMS 9-05. In 1975, one lone individual was observed, two in 2013, and in 2015 and 2016, four adults were observed above Ten Mile Point. In 2017, no mountain goats were observed. Goats observed on Nares Mountain likely arrived from either Montana Mountain (GMS 7-36) or GMS 9-06 as these represent the nearest areas with any significant numbers of goats. Caribou/Nares is not identified as a mountain goat management unit as it is not considered to maintain a viable population.

Table 6. 2017 survey results for the Caribou/Nares sheep management unit.

Parameter	GMS 9-04	GMS 9-04	Combined
Non-lamb count	73	11	84
Lamb:nursery sheep ratio	20:100	29:100	21:100
Ram:nursery sheep ratio	35:100	57:100	38:100

Table 7. Historical summer survey results for the Caribou/Nares sheep management unit.

	Non-lamb count			Ram:nursery sheep ratio		
Year	**GMS 9-04**	**GMS 9-05**	**Combined**	**GMS 9-04**	**GMS 9-05**	**Combined**
2017	73	11	84	35:100	57:100	38:100
2016	53	13	66	43:100	44:100	43:100
2015	53	12	65	47:100	33:100	44:100
2013	71	13	84	27:100	44:100	29:100
2009	48	20	68	50:100	18:100	39:100
1994	33	16	49	200:100	7:100	88:100
1991	15	12	27	200:100	0:100	59:100

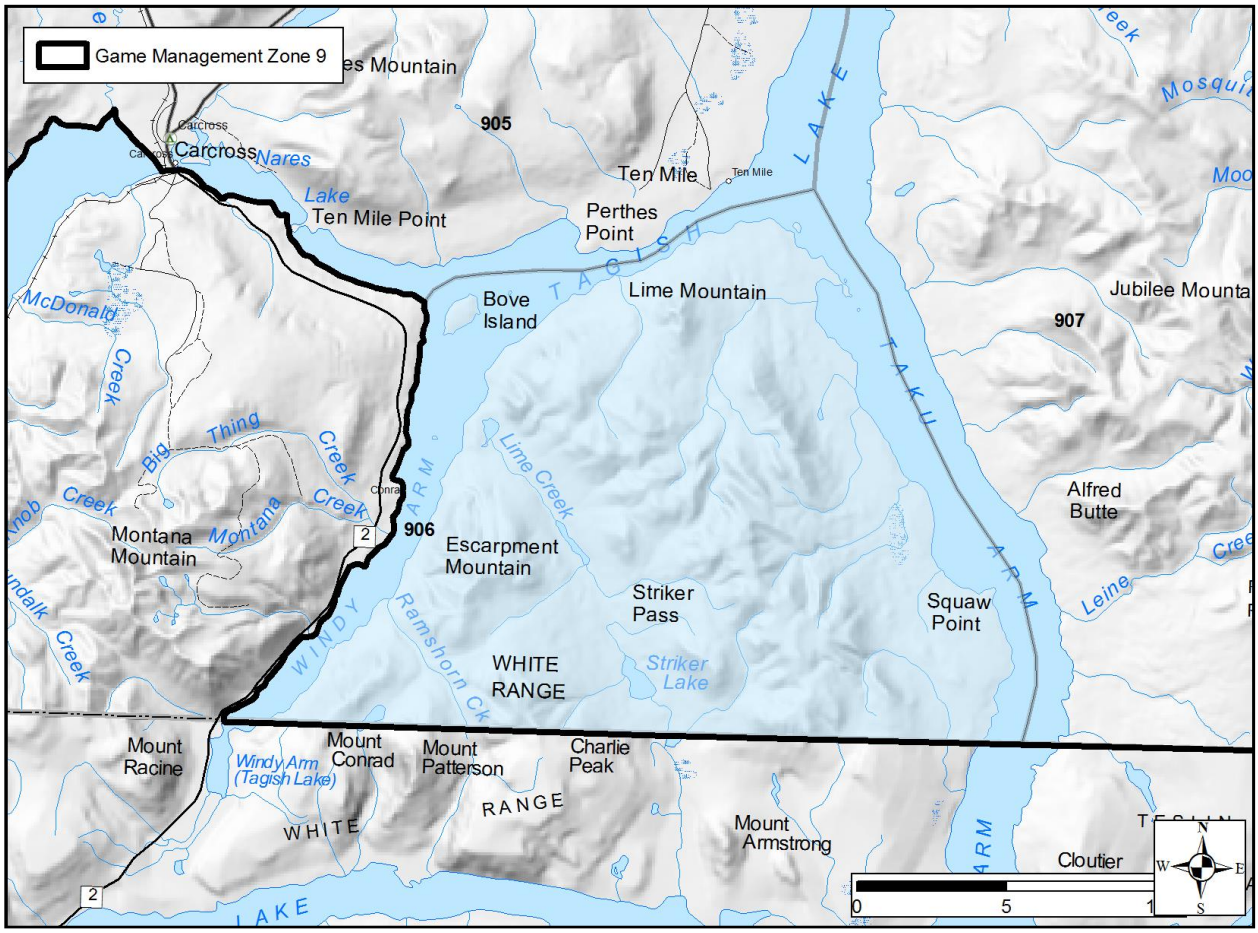

Figure 12. Location of the Escarpment sheep and goat management unit (GMS 9-06).

Escarpment (Game Management Subzone 9-06)

The Escarpment sheep and goat management unit, named after Escarpment Mountain on the western edge of the unit, consists of GMS 9-06 and the area across the border in BC to Tutshi Lake (Figure 12). The unit is almost entirely surrounded by lakes, providing geographic closure. There is very low human disturbance in the unit (Figure 5) and Category B settlement land is found in the eastern portion (Figure 2).

This 2017 survey was the first time sheep have been formally observed in GMS 9-06 (Table 8; Figure 12) and are a likely an extension of BC's Tutshi Dall's sheep herd. The total count of mountain goats was the highest on record by a considerable margin (Tables 9 and 10).

Table 8. 2017 survey results for Dall's sheep in the Escarpment management unit.

Parameter	GMS 9-06
Non-lamb count	23
Lamb:nursery sheep ratio	31:100
Ram:nursery sheep ratio	77:100

Table 9. 2017 survey results for mountain goats in the Escarpment management unit.

Parameter	GMS 9-06
Total count	81
Adults	74
Kids	7
% Kids	8.6

Table 10. Historical summer survey results (total counts) for mountain goats in the Escarpment management unit.

	Mountain goat total count
Year	GMS 9-06
2017	81
1987	34
1981	18
1980	20
1979	18
1978	17
1977	16
1976	14
1975	10
1974	8

Mount White (Game Management Subzone 9-08)

The Mount White goat management unit, named after the dominant mountain in the area, consists entirely of GMS 9-08 (Figure 13). Sheep are not present in this area. Mountain goats in this management unit are entirely found within Agay Mene Natural Environment Park. There is no human land-use disturbance within mountain goat distribution in the unit (Figure 5).

Goats historically occupied the area, but were last seen in the late-1960s. Mountain goats on Mount White were reintroduced in 1983 and 1984 from a source population in the Kluane Game Sanctuary (Carey and Barichello 1986). Twelve individuals (6 males, 7 females) were reintroduced during the project. Current survey results suggest higher numbers of goats than previously observed on Mount White (Tables 11 and 12), possibly indicating an increasing population.

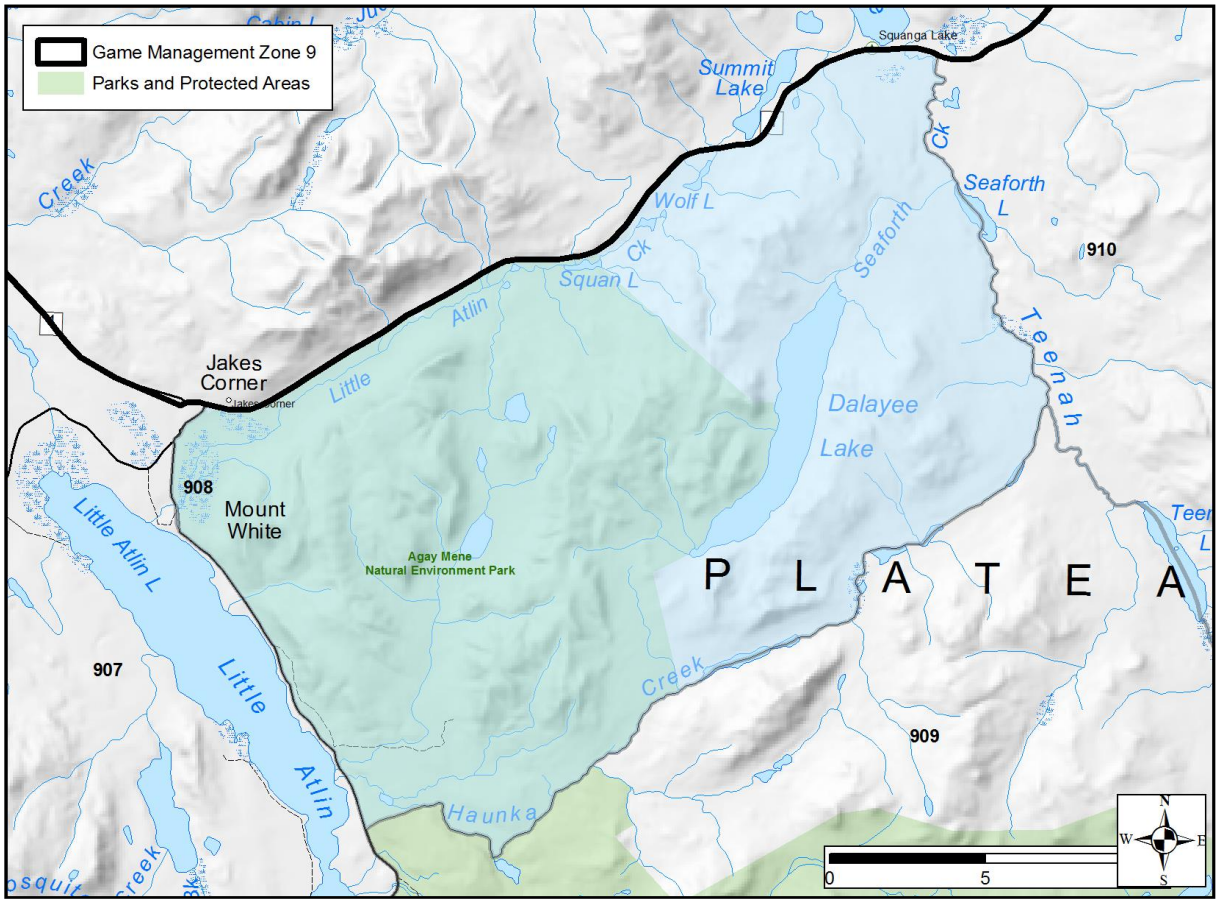

Figure 13. Location of the Mount White goat management unit (GMS 9-08).

Table 11. 2017 survey results for mountain goats in the Mount White goat management unit.

Parameter	GMS 9-08
Total count	49
Adults	42
Kids	7
% Kids	14.3

Table 12. Historical summer survey results (total counts) for mountain goats in the Mount White goat management unit.

	Mountain goat total count
Year	**GMS 9-08**
2017	49
2006	21
2004	11
2003	19
2002	23
2000	27
1992	24

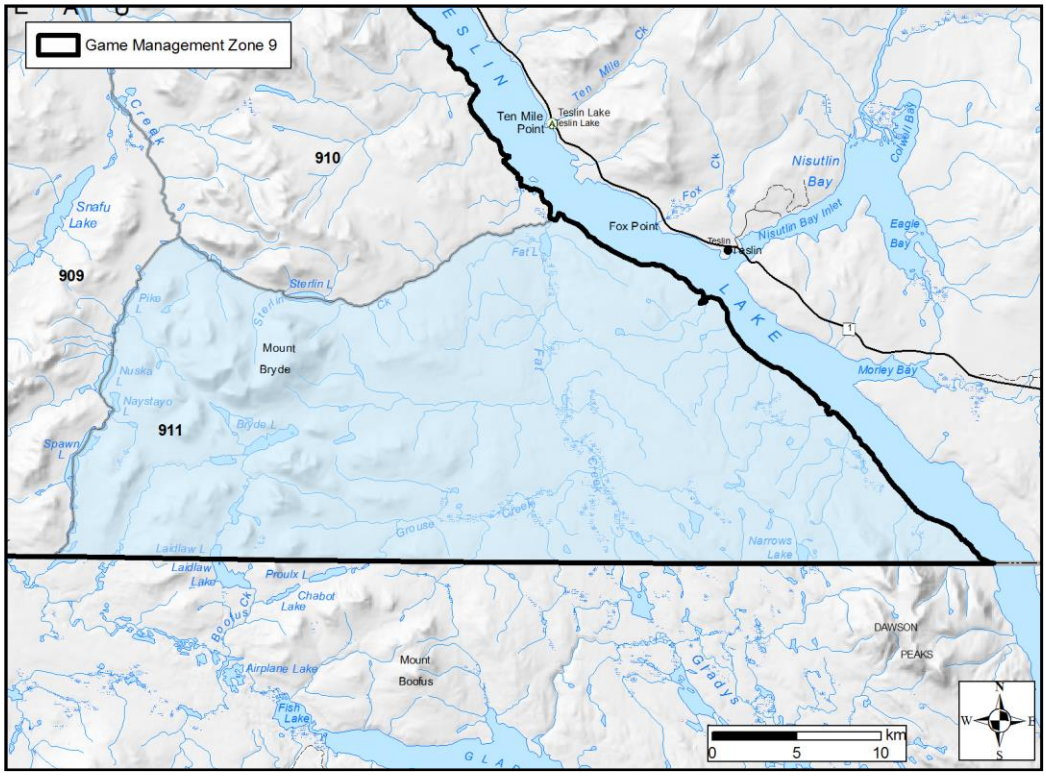

Figure 14. Location of the Mount Bryde goat management unit (GMS 9-11).

Mount Bryde (Game Management Subzone 9-11)

The Mount Bryde goat management unit is located entirely within GMS 9-11 (Figure 14). Mountain goat habitat is limited in this unit to Mount Bryde. Mountain goats here are relatively isolated with no human land-use disturbance (Figure 5). The population here is small and the total count from this 2017 survey represents the most goats ever observed (Tables 13 and 14), possibly indicating an increasing population.

Table 13. 2017 survey results for mountain goats in the Mount Bryde goat management unit.

Parameter	GMS 9-11
Total count	23
Adults	18
Kids	5
% Kids	21.7

Table 14. Historical summer survey results (total counts) for mountain goats in the Mount Bryde goat management unit.

	Mountain goat total count
Year	GMS 9-11
2017	23
2013	5
1979	1

Summary

Results from this survey indicate that Dall's sheep populations in GMZ 9 are generally stable, consistent with results from recent work in GMZ 7 to the west (Hegel and Russell 2018). However, mountain goat numbers in GMZ 9 appear to have increased since previous surveys. The sheep population in the Gray Ride sheep management unit has increased since the 1970s but has appeared to stabilize between 100 and 130 animals over the last few years (based on summer survey results). Since its recolonization in the 1990s, the sheep population in the Caribou/Nares management unit appears to have stabilized at between roughly 65 to 85 adults. For the first time in the Escarpment unit, sheep have been observed in Yukon. The reintroduced mountain goat population on Mount White is now at record high numbers and a small goat population appears to be established on Mount Bryde. Finally, the most mountain goats ever observed in the Escarpment unit was recorded during this survey, with numbers more than doubling since the 1980s.

Three management units were identified for both Dall's sheep and mountain goats, and may be used to guide future monitoring and management decision-making efforts. Licensed harvest is generally low across GMZ 9 given the near complete closure of the zone to licensed harvest of sheep and goats. Licensed harvest within GMS 9-03 is considered sustainable. First Nation harvest of sheep and goats in GMZ 9 is unknown.

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