

MOUNTAIN GOAT SURVEYS IN YHO  
NATIONAL PARK, BRITISH COLUMBIA

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**Abstract:** About 570 mountain goats occur in Yoho National Park, an area of 1313km<sup>2</sup> on the west slope of the Main Ranges of the Rocky Mountains at latitude 51° 30'. In contrast to the east slopes of the Rockies at this latitude, goats are the most common ungulate. Most goats occur between 1524m (5000 ft.) and 2516m (8250 ft.) elevations. About 30 percent of the park, or 370km<sup>2</sup> is potential goat habitat with an unevenly distributed density of about 1.5 goats per km<sup>2</sup>. Aerial and ground methods of estimating numbers of goats are compared. The most reliable census method combines intensive ground surveys over a period of several years with occasional helicopter surveys. Population density in five regions of the park varies considerably. Observations on productivity, mortality, seasonal habitat selection and other habitat relationships are presented.

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This study was part of a two-year inventory of all mammals in Yoho National Park, initiated for Parks Canada in April, 1975. The objective of this report is to provide baseline population information for unhunted goat herds in a pristine environment. Goats were hunted in Yoho until 1919 when the Federal Government gained jurisdiction from the province of British Columbia. The Park is adjacent to large areas on which goats are or have been harvested. Thus it was felt that the park population could provide a valuable baseline against which to compare densities and structures of hunted herds.

#### METHODS

Field methods combined systematic ground surveys, random sightings and aerial surveys. Ground surveys were done with a 20X spotting scope, usually from the Trans-Canada Highway, fire roads or trails. Cross country skis and snowmobiles were used as access to the back country in the winter. Random sightings were recorded by Park Wardens and Naturalists on Observation Cards.

Aerial surveys were conducted in the falls of 1975 and 1976 covering potential goat habitat throughout the park. A Bell Jet Ranger was used with three observers. The flight path followed mountain contours just above treeline, but when necessary more than one pass was made of an area at varying elevations.

Potential goat habitat was determined by planimetric estimation of most of the mountain mass in the park between 1524m (5000 ft.) and 2516m (8250 ft.) elevations. A few areas of known goat range below 1524m were also included. Total area of potential goat habitat was determined with a dot grid on a 1:126,720 topographic map with 76m contours. The park was divided into five major goat ranges made up of mountain masses separated by forested valleys.

#### THE STUDY AREA

Yoho National Park, an area of 1313km<sup>2</sup>, lies on the west slope of the Main Ranges of the Rocky Mountains at latitude 51° 30' N. It is bordered by national parks and provincial lands. The mountains in the park are steep, deeply etched, with narrow glaciated valleys and are predominantly of sedimentary origin. Elevations vary from 1006m to about 3568m and 28 peaks exceed 3000m.

The park has three Biogeoclimatic Zones: Alpine, Interior Subalpine and Interior Douglas Fir (Krajina, 1965). Coniferous forest is the predominant plant cover (50 percent of the total park

area); 30 percent is bare rock; 10 percent glacial ice; and 10 percent non-forest vegetation.

About 30 percent of the park, mainly between 1524m and 2515m elevations, is considered potential goat habitat although some of this is very sparsely vegetated and has been classified as bare rock. There is no true grassland in the park and no extensive scrub area. Kuchar (1974) described 21 "Vegetation Types" in the park. Non-forested types of importance to goats include Chionophilic Meadow, Mountain Heather, Dryas Tundra, Avalanche Chutes (slide paths), and Lichen Tundra. Of these, the Chionophilic Meadow type is most important in summer and fall. It is best developed around timberline, and contains a large number of communities. The "Grassy Alpine Meadow" is an important community within the Chionophilic type. Open or scrubby coniferous stands near timberline or at the edges of Avalanche Chutes are also used by goats. Those habitats are largely encompassed by Kuchar's Ribbon Forest vegetation type - a biotic landscape organized into a series of narrow lateral bands of coniferous forest, alternating with Mountain Heather Tundra. Other high elevation coniferous types occasionally used by goats include Whitebark Pine and Alpine Larch. Goats also frequent broken fringes of typical subalpine forest dominated by white spruce, lodgepole pine or even Douglas fir.

## RESULTS

**Population Size** - Two methods were used to arrive at an estimate of the total numbers of goats in Yoho Park. Both methods involved a subjective estimate of the numbers of goats possibly missed during the counts used.

The first method combined the best aerial counts for each of the five regions of the park (Table 1) for a total of 287 goats. Assuming that 10 percent of the population was missed in each of the helicopter surveys, the estimated total population is 316 goats. The 10 percent was an arbitrary figure chosen at the time of each survey.

The second method combined the best ground and aerial counts for each separate herd or group of goats in the park. Separation of herds was based on association with winter and spring ranges and in some cases, summer ranges. Care was taken not to allow overlap of counts. A total of 453 goats was determined using this method. A subjective correction factor was added for each herd based on observability of the goats, and size and quality of the range on which they were observed. In some drainages the best counts made were during the winter. A correction factor was sometimes used in isolated areas where no goats were observed, but goat sign was present. The correction factor varied from herd to herd but amounted to about 26 percent of the total, giving a population estimate of 570 goats for the park.

Table 1. Densities of mountain goats in five regions of Yoho National Park.

Region	Potential Habitat (km <sup>2</sup> )	Aerial		Ground and Aerial (1974 - 1977)		Goats per km <sup>2</sup>
		Sept. 1975	Oct. 1976	Counts	Est. Tot.	
1. Ottertail Range (Ice E.)	72	107	133	178	220	3.1
2. Cathedral - McArthur	67	19	33	84	116	1.7
3. Van Horne - Amiskwi	101	35	70	106	130	1.3
4. President - Waputik	114	23	19	53	68	0.6
5. Burgess - Wapta	18	28	7	32	36	2.0

As shown in Table 1, the population density on potential goat habitat varied considerably from region to region in the park. While an in-depth analysis of goat habitat from region to region was not done, regional differences in goat densities seem to be related to the quantity and quality of winter range. Two of the regions with lower densities (Cathedral - McArthur and President - Waputik) border the Continental Divide where most goats winter on sparsely vegetated slopes from about 1823m to 2432m in elevation. In the two regions of highest densities (Ottertail Range and Burgess - Wapta) goats winter on timbered slopes well below treeline as well as in the alpine zone. The area with the highest density (Ottertail Range) also has winter ranges with a much greater forage biomass such as broad, grassy slopes above and below treeline. While this area has about 20 percent of the total potential goat habitat in the park, it has about 40 percent of the total goat population.

The density of goats, for the whole park (1313km<sup>2</sup>) and potential habitat (370km<sup>2</sup>) was .45/km<sup>2</sup> and 1.5km<sup>2</sup>, respectively.

Population Structure - Young:adult ratios were determined from ground surveys with little or no duplication of counts (Table 2). The "adult" class includes yearlings (12 - 24 months old), other subadults and billies. Young:adult ratios were similar for both years with an average of 29 kids:100 adults (includes yearlings) and 19 yearlings:100 adults. Approximately 36 percent of the kid crop of June 1975 did not survive the winter. An adult sex ratio of 62.5 males per 100 females was determined for this unhunted herd based on 286 animals classified as either adult male or adult female during 1975 and 1976.

Table 2. Ratios of young to adult mountain goats in Yoho National Park, 1975 and 1976.

Month	Total	Adults	Yearlings	Kids	Kids or Yearlings as % of Totals	Young:Adult Ratio
May 1975	110	92	18		16.4%	20:100
June 1975	143	113		32	22.0%	28:100
May 1976	71	60	11		15.5%	18:100
June 1976	188	144		44	23.4%	30:100

Mortality causes were difficult to determine but the main ones, based mainly on park reports over the years, were starvation, avalanches, and predation. Lynx and wolverine frequented some of the goat winter ranges and there was some evidence (observations by Park Wardens) of predation or scavenging on goats weakened by starvation or killed in accidents. There is one record of a goat having been killed by a cougar at the Ottortail lick, based on circumstantial evidence (Cowan 1945). There are no records of grizzlies preying on goats although they both co-habit some alpine areas. Signs noted during the study indicated that grizzlies travelled some of the valley bottoms in spring seeking goats that were killed by avalanches.

Habitat Relationships (Seasons) - Winter range was found from windswept alpine slopes at 2438m down to timbered bluffs at about 1371m elevation. These slopes were generally on west and south facing aspects. Where both high and low elevation winter habitats were available, goats utilized both. For example, in the Porcupine Valley, goats wintered on the brushy slopes and bluffs in an old burn as well as in the alpine.

In early May, some goat herds descended to low elevation bluffs, gullies and slide paths which were not utilized during the winter. Some of these bluffs were north and east facing and were only utilized by goats from early May to late June. In some areas, goats moved some distances over extensive snowfields from their winter range to low elevation bluffs. The movement onto spring range has several advantages: new spring growth is available; the bluffs provide safety from avalanches (the avalanche "season" is usually over at low elevations at this time); and, the steep bluffs afford maximum escape terrain for the kidding period. Low elevation bluffs were not available in all valleys so some goat populations remained on wintering areas for the kidding period where they sought out more rugged areas.

Movement to summer ranges, generally areas of lush alpine growth, was more of a drift or dispersal. However, some goat herds remained on the same general slopes all year round. Most goats drifted back to their wintering areas by late October.

These seasonal movements by goats in the park cannot be considered migrations but are more shifts from one preferred seasonal habitat to another. Seasonal changes in elevation are shown in Table 3. Goats utilized the lowest elevations during spring when about 60 percent were below 1829m and when only 10 percent were above 2134m. There was a progressive movement upward through summer into fall, when the highest elevations were reached. In fall, only 8 percent were below 1829m whereas 80 percent were above 2134m and 23 percent above 2438m. Various elevations were used in winter when factors such as steepness of terrain and exposure to wind seemed more important than elevation.

Table 3. Percent of goats observed at different elevation ranges in the park in each season (1975 - 1977).\*

Elevation	----- % of all goats observed -----			
	Winter (131)	Spring (486)	Summer (262)	Fall (578)
<1524	26	24	2	1
1524 - 1798	41	34	19	7
1829 - 2103	28	31	18	13
2134 - 2408	41	10	52	57
2438+	3	41	10	23

\*Numbers in parentheses refer to the total numbers of goats observed.

Goats in Yoho Park did not show strong seasonal changes in their selection of slope aspect (Table 4). South through west exposures were occupied by 80 percent of goats seen in the winter compared to 63 percent in spring, 64 percent in summer and 72 percent in fall. A slightly greater predilection for southeast and east orientations was shown in spring and summer than at other seasons. Northeast through northwest slopes were little utilized at any season.

Table 4. Aspects of mountain slopes used by goats in various seasons (1975 - 1977).\*

Aspect	----- % of all goats observed -----			
	Winter (115)	Spring (484)	Summer (259)	Fall (342)
SW	28	29	28	22
S	28	8	6	19
SE	8	15	2	12
E	4	9	28	9
NE	0	2	1	6
N	0	4	2	0
NW	10	8	4	0
W	23	26	30	31

\*Numbers in parentheses are sample sizes, including some duplication.

Natural licks - There are four known natural licks used by goats in the park. All four are at lower elevation (1246 - 1371m). To use the licks, goats must travel for some distances along well-worn trails through forests from their alpine summer range. All four licks are susceptible to human interference as two have fire roads built near them and two have well used hiking trails built through them.

The location of three, as well as a moose lick, within a 3km radius of the only known prehistoric Indian campsite in the park (Loy, 1971), suggests that goats using the licks may have been a food source for early Indian inhabitants.

Use of old mines - Goats make regular use of old mine portals, abandoned in 1952, on Mt. Field and Mt. Stephen. These extensive workings are located on traditional goat winter and spring range

and occasional summer range, at about 1371m elevation in the Kicking Horse Valley. Goats appear to use the mine portals for water and to lick white deposits from the walls, but the main use appears to be for shelter from inclement weather, particularly during rain and snow storms. For example, in January, 1972, a herd of 24 goats were observed (Stachera, pers. observ.) wading through deep snow on Mt. Field and entering a mine portal prior to a three day snow storm.

The heaviest use by goats of each of the mines on Mt. Field and Mt. Stephen is about 25m inside the main portals where the aerial tramway assemblies are located. The most preferred areas at this location are under the large winch drums where goat droppings are 5 to 8cm deep. Only a few goat tracks were noted more than 100m inside the portals.

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