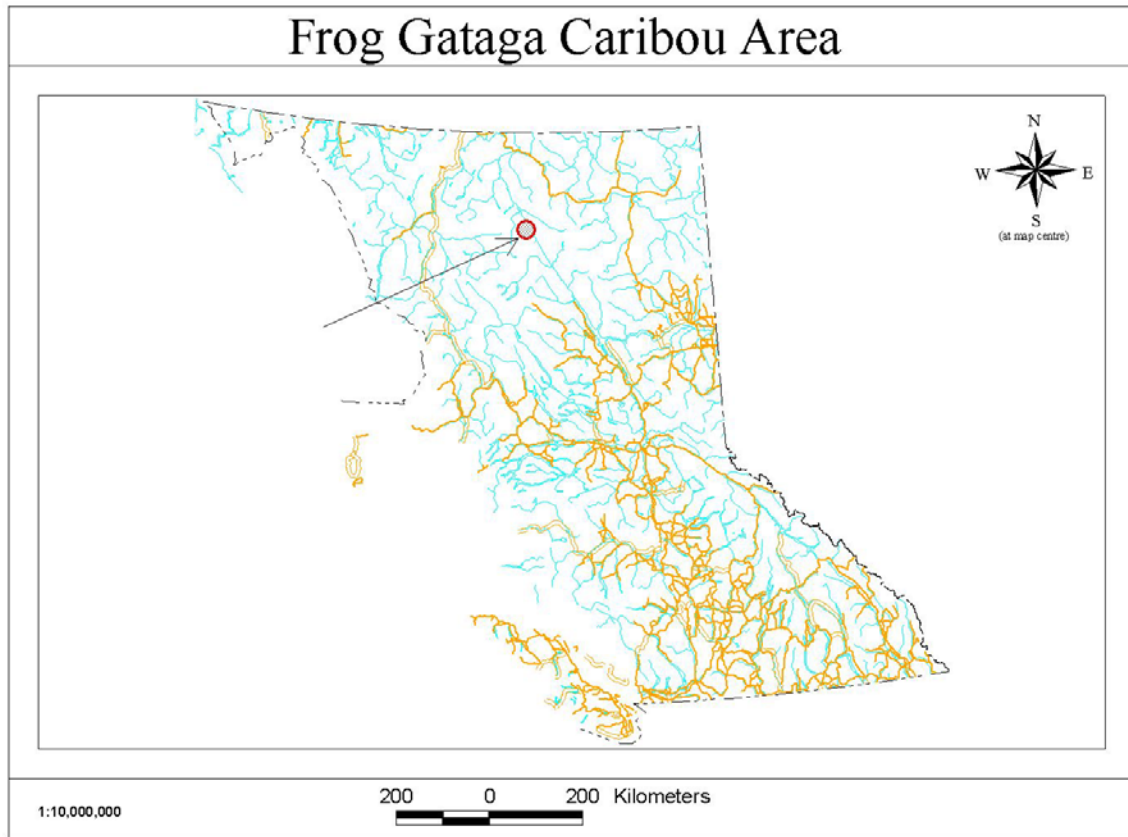


## Frog Gataga Caribou

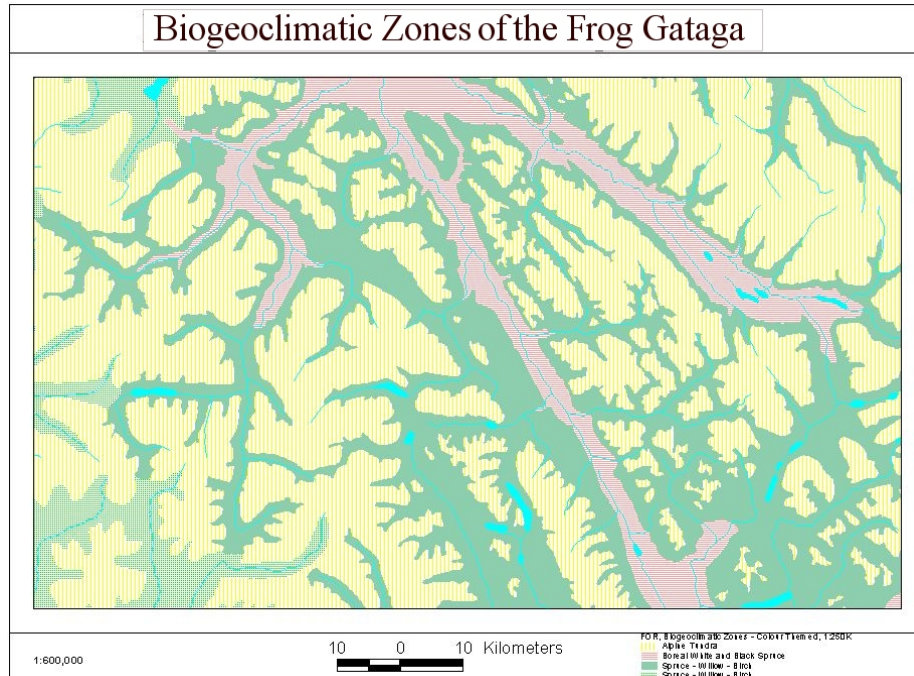
The Frog Gataga area is located in the upper Kechika River drainage and is about as remote from roads as can be found in British Columbia (figure1). In consequence knowledge of the herd has been minimal. Bergerud (1978) indicated 150+ animals in 1978, down from earlier numbers. It was speculated (Heard and Vagt, 1998) that there were about 400 animals in the herd in the mid nineties. Present numbers are 2-3 times that, probably both apparent increases are primarily as a result of animal range shifts from the so called Spatsizi herd.



**Figure 1. The Frog Gataga caribou area.**

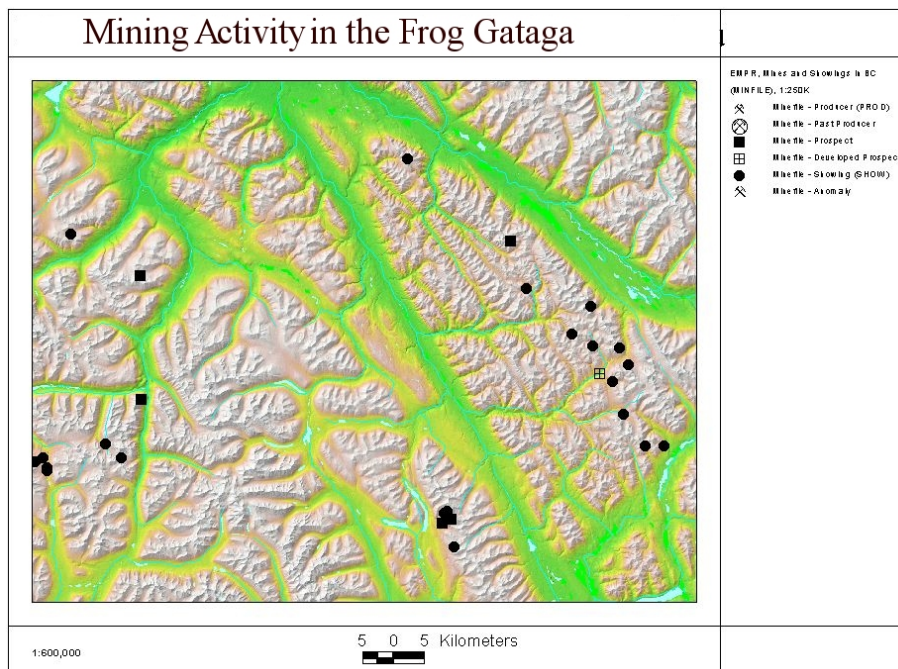
The Frog Gataga caribou live in rugged country ranging in elevation from about 750m to 2200m. Figure 2 presents the broad lay of the country. Boreal White and Black Spruce, Spruce Willow Birch, and Alpine Tundra are all represented in significant amounts.





**Figure 2. Biogeoclimatic zonation of the Frog Gataga.**

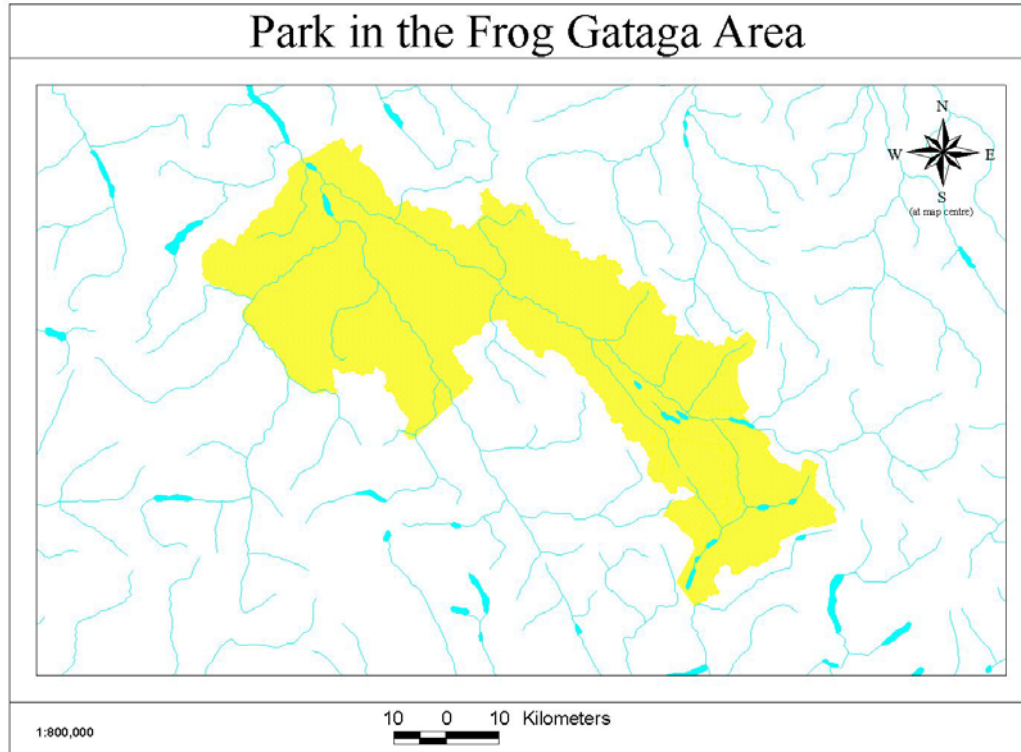
While the land of Frog Gataga caribou is remote and so far unaffected by roads, agriculture, or timber harvest; portions of the area are being considered for hard rock mining and include areas of bulldozer ripping. Figure 3 indicates the present status of mining in the land.



**Figure 3. Frog Gataga mineral exploration claims.**



There is a provincial park in the vicinity of the Frog Gataga (figure 4).



**Figure 4. Provincial park in the Frog Gataga.**



## Methodology

Fifty five adult caribou cows in the Frog Gataga wore VHF radio collars at the start of this project. These caribou were then periodically relocated during summer 2000 through summer 2003 for the purpose of determining at a coarse scale how the caribou utilized the area during that period.

Relocates were usually undertaken from a Cessna 206 fixed wing aircraft utilizing wing mounted yagi antennae. Signals were usually tracked until an animal was visual however in a few cases the animal position was fixed by careful interpretation of signal strength during over transects. The location was georeferenced by means of a high quality GPS.

Seasonal use was examined by dividing the year into five (5) seasons (Table 1).

<u>Season</u>	<u>Dates</u>
Calving	25 May to 15 June
Summer	16 June to 30 August
Rutting	1 September to 31 October
Winter	1 November to 31 March
Precalving	1 April to 14 May

**Table 1. Temporal intervals for the analysis of seasonal use.**

Relocates were categorized as to season.

Herd seasonal ranges or individual home ranges were determined utilizing a minimum convex polygon (mcp) calculation. Home ranges were only calculated when there was a minimum of eight (8) relocates for an animal.

Habitat utilization was determined by assuming each siting represented a 200m radius of use. That was compared to the available habitat in the herd seasonal home range (minimum convex polygon) plus a 10km buffer beyond that range. Habitat attributes were defined utilizing the British Columbia Vegetation Resource Inventory Data (as available July 2003). However the nonforest vegetation is commonly designated as bedrock in that system. Since this above treeline vegetation is a high component of the caribou use, this was a major failure of the database chosen. In order to add some complexity to that unclassified category; that portion which matched the Biogeoclimatic Zone classification of Alpine Tundra, was categorized as Alpine Tundra while that portion below that was classified Subalpine Tundra.



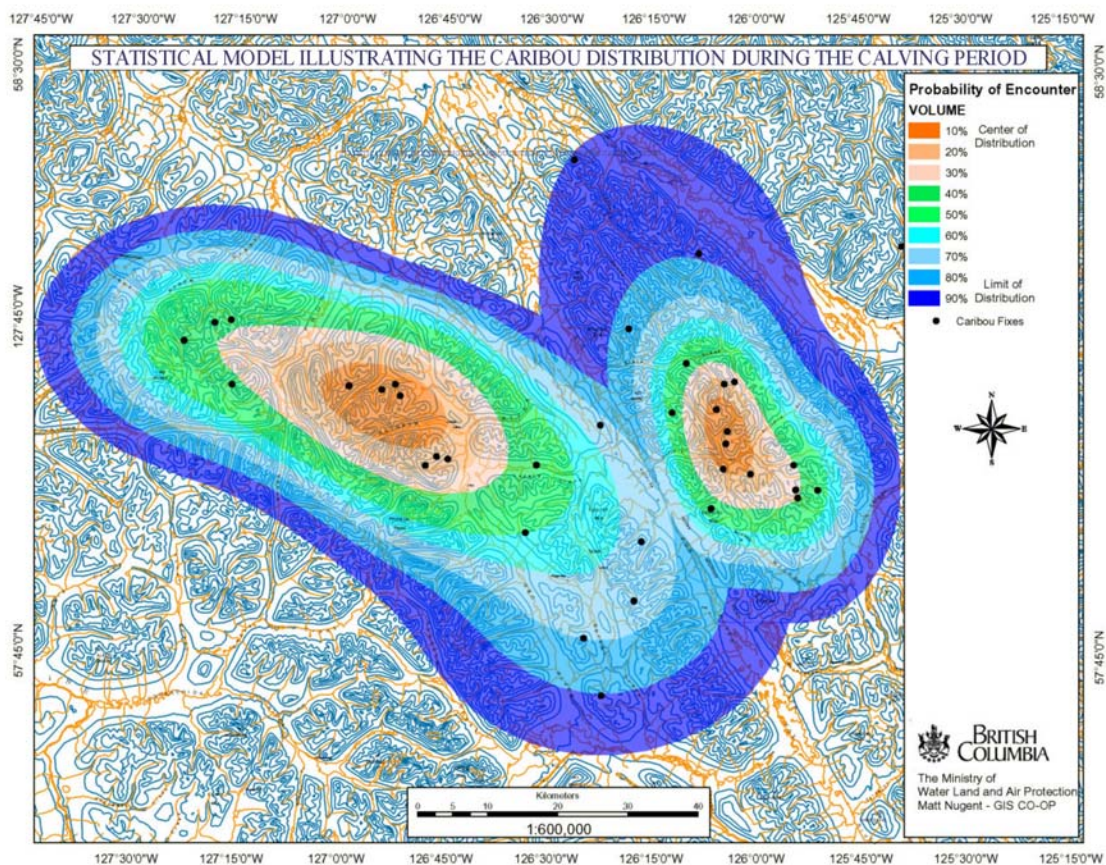


## Results and Discussion

Forty one (41) of the caribou in this low wolf area were still alive at the end of the 3 year period, yielding a 10% annual adult mortality rate.

Utilization of the land varied by season.

Figure 5 indicates where the caribou were located during the calving period. It



**Figure 5. Probability contours for Frog Gataga caribou during calving**

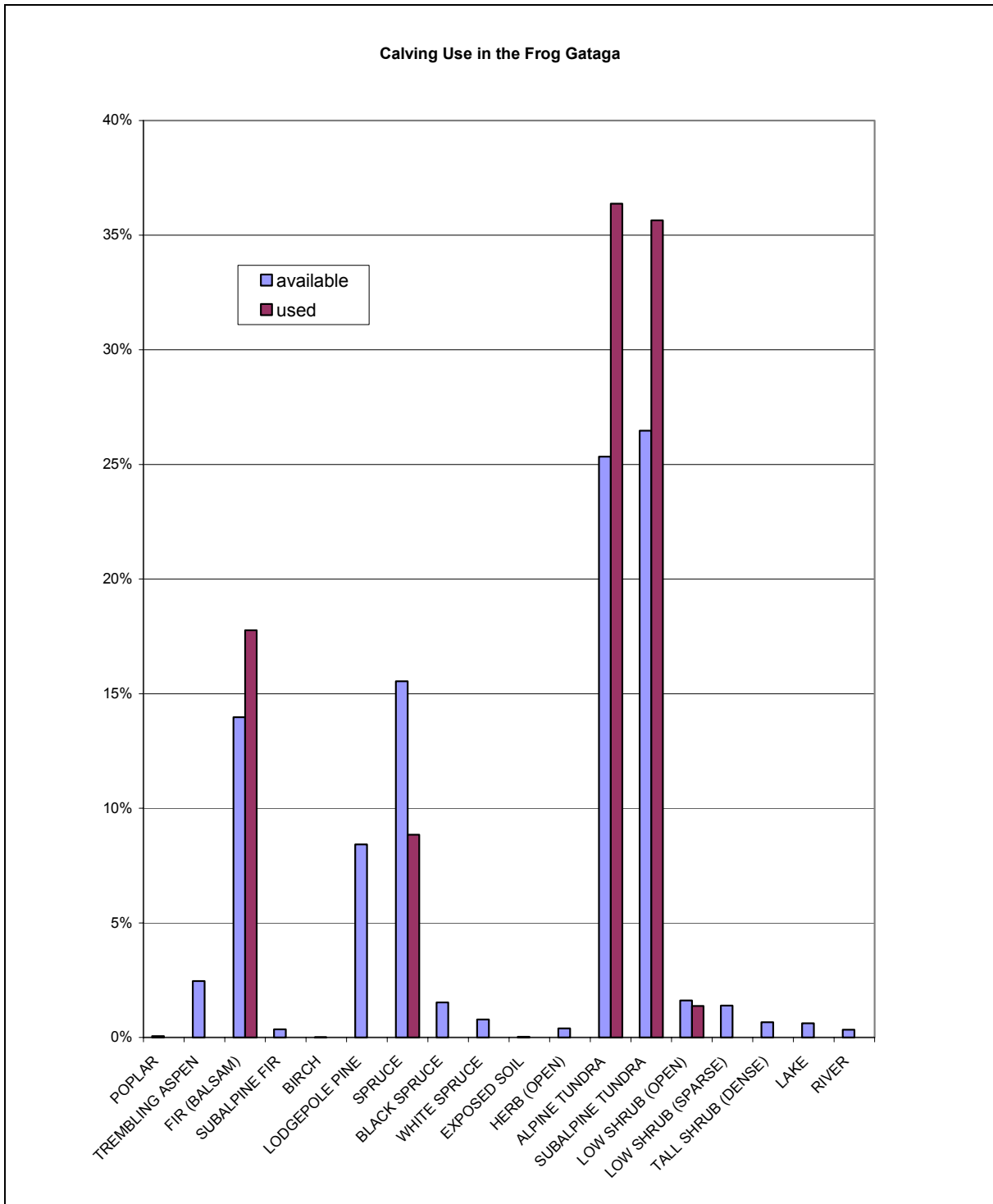


was expected and found that the individual animals were widely scattered to reduce predation risk with a total land area utilized (mcp) of 4328 km<sup>2</sup>. Ten per cent (10%) of the caribou utilized provincial park for this life phase. Table 2 and figure 6 present the habitat utilization for the calving period. It can be seen that the two tundra categories and adjacent balsam fir are receiving about 90% of the use at that time and are positively selected relative to their abundance. In other words the caribou are calving in the alpine.

<b>Landscape type</b>	<b>available Proportion</b>	<b>used proportion</b>	<b>selection index</b>	<b>standardized index</b>
POPLAR	0.06%	0.00%	0.000	0.000
TREMBLING ASPEN	2.46%	0.00%	0.000	0.000
FIR (BALSAM)	13.97%	17.76%	1.271	0.232
SUBALPINE FIR	0.36%	0.00%	0.000	0.000
BIRCH	0.01%	0.00%	0.000	0.000
LODGEPOLE PINE	8.42%	0.00%	0.000	0.000
SPRUCE	15.54%	8.85%	0.569	0.104
BLACK SPRUCE	1.53%	0.00%	0.000	0.000
WHITE SPRUCE	0.79%	0.00%	0.000	0.000
EXPOSED SOIL	0.03%	0.00%	0.000	0.000
HERB (OPEN)	0.40%	0.00%	0.000	0.000
ALPINE TUNDRA	25.33%	36.37%	1.436	0.262
SUBALPINE TUNDRA	26.47%	35.65%	1.347	0.246
LOW SHRUB (OPEN)	1.62%	1.37%	0.849	0.155
LOW SHRUB (SPARSE)	1.39%	0.00%	0.000	0.000
TALL SHRUB (DENSE)	0.67%	0.00%	0.000	0.000
LAKE	0.62%	0.00%	0.000	0.000
RIVER	0.34%	0.00%	0.000	0.000
<b>TOTAL</b>	<b>100.00%</b>	<b>100.00%</b>	<b>5.472</b>	<b>1.000</b>

**Table 2. Landscape Selection During the Calving Period**

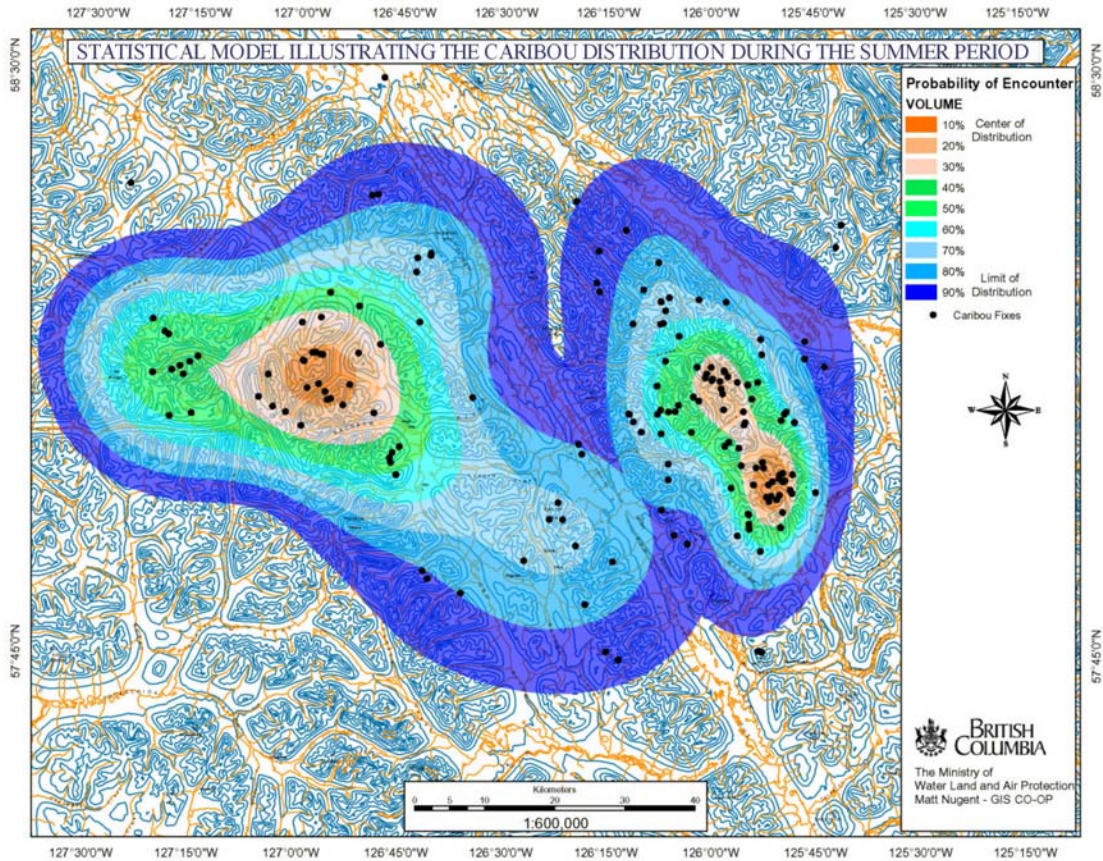




**Figure 6. Landscape selection during the calving period**



The summer season, following calving, sees the caribou distributed as in figure 7.



**Figure 7. Probability contours for Frog Gataga caribou during summer**

The caribou herd occupies the largest land area at this period of the year with some 6692 km<sup>2</sup> utilized (mcp). This is facilitated by snowpack being at its least at this season and also it gives a lowered density confounding searching by predators. Thirteen per cent of the animals were found in provincial park. Table 3 and figure 8 present the habitat utilization for the summer period. It can be seen

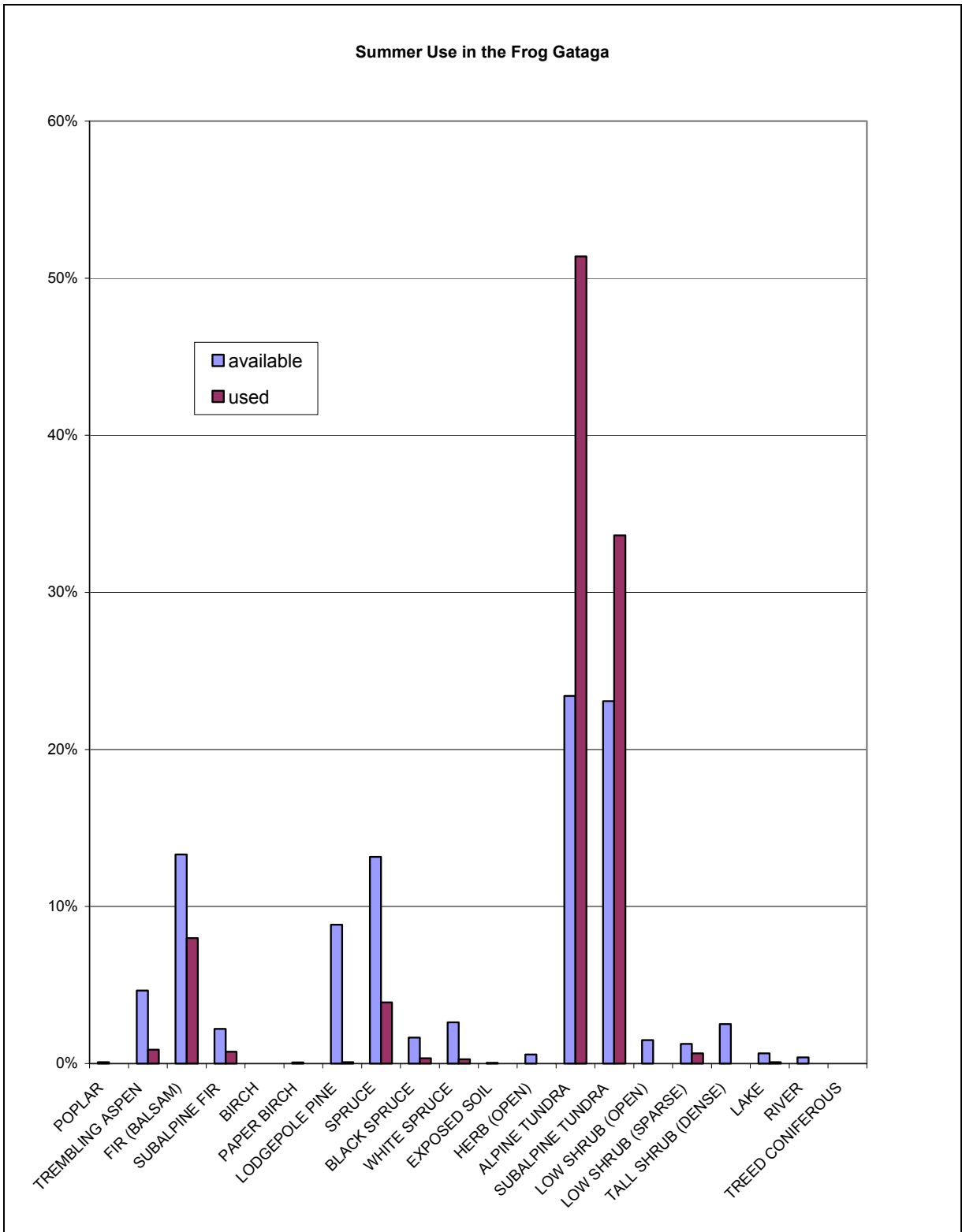




<b><u>Landscape type</u></b>	<b><u>available proportion</u></b>	<b><u>used proportion</u></b>	<b><u>selection index</u></b>	<b><u>standardized index</u></b>
POPLAR	0.08%	0.00%	0.000	0.000
TREMBLING ASPEN	4.65%	0.89%	0.192	0.032
FIR (BALSAM)	13.31%	7.98%	0.600	0.099
SUBALPINE FIR	2.20%	0.75%	0.341	0.056
BIRCH	0.00%	0.00%	0.000	0.000
PAPER BIRCH	0.07%	0.00%	0.000	0.000
LODGEPOLE PINE	8.84%	0.09%	0.011	0.002
SPRUCE	13.15%	3.90%	0.296	0.049
BLACK SPRUCE	1.65%	0.33%	0.199	0.033
WHITE SPRUCE	2.63%	0.28%	0.107	0.018
EXPOSED SOIL	0.04%	0.00%	0.000	0.000
HERB (OPEN)	0.58%	0.00%	0.000	0.000
ALPINE TUNDRA	23.41%	51.39%	2.195	0.362
SUBALPINE TUNDRA	23.08%	33.63%	1.457	0.240
LOW SHRUB (OPEN)	1.50%	0.00%	0.000	0.000
LOW SHRUB (SPARSE)	1.25%	0.66%	0.527	0.087
TALL SHRUB (DENSE)	2.51%	0.00%	0.000	0.000
LAKE	0.65%	0.09%	0.144	0.024
RIVER	0.38%	0.00%	0.000	0.000
TREED CONIFEROUS	0.00%	0.00%	0.000	0.000
sums	100.00%	100.00%	6.070	1.000

**Table 3. Landscape Selection During the Summer Period**



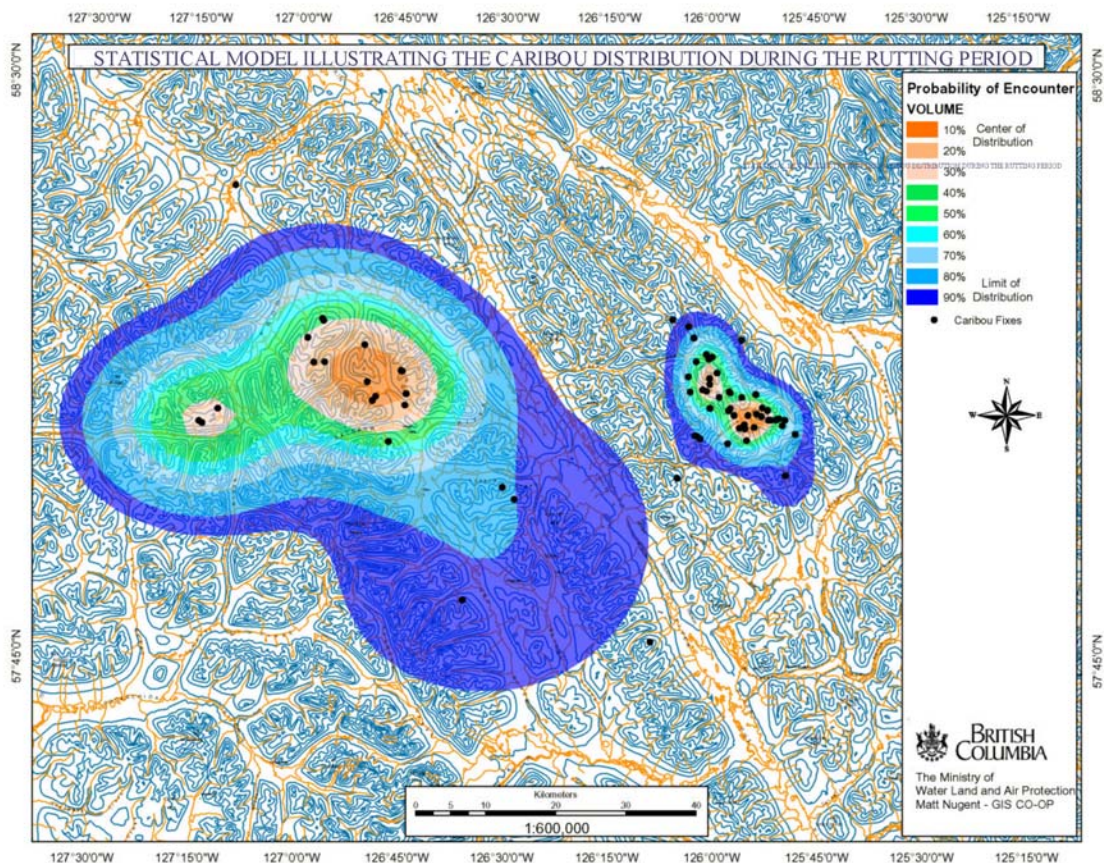


**Figure 6. Landscape selection during the calving period**



that 85% of the use at that time is restricted to the tundra zones which are strongly selected relative to their abundance.

The rut period sees the caribou distributed as in figure 9. The caribou are most



**Figure 9. Probability contours for Frog Gataga caribou during the rut**

concentrated at this season, utilizing only 3386 km<sup>2</sup> (mcp). Three percent of those caribou are found in provincial park. Table 4 and figure 10 present the

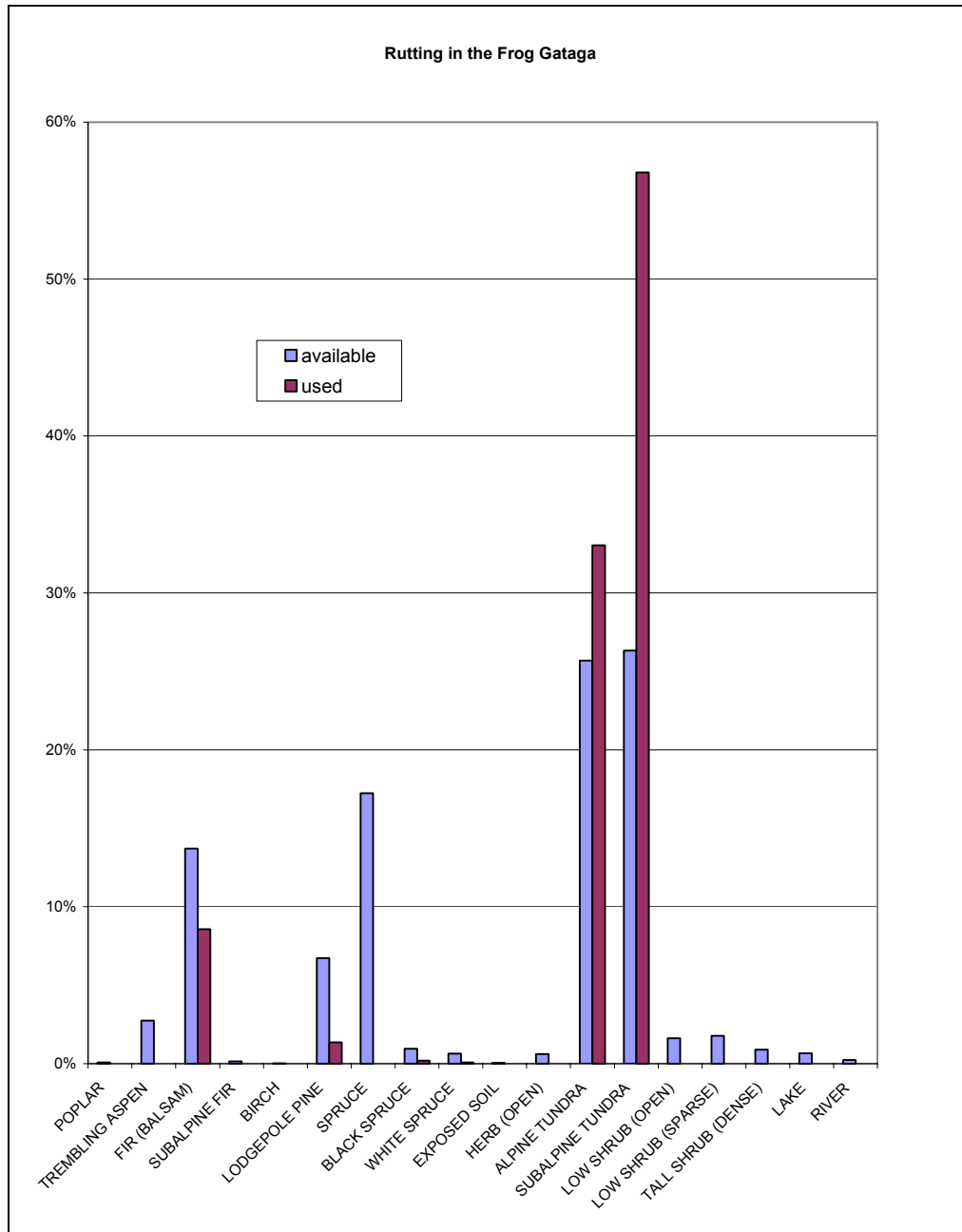


<b>Landscape type</b>	<b>available Proportion</b>	<b>used proportion</b>	<b>selection index</b>	<b>standardized index</b>
POPLAR	0.07%	0.00%	0.000	0.000
TREMBLING ASPEN	2.74%	0.00%	0.000	0.000
FIR (BALSAM)	13.70%	8.56%	0.625	0.136
SUBALPINE FIR	0.14%	0.00%	0.000	0.000
BIRCH	0.01%	0.00%	0.000	0.000
LODGEPOLE PINE	6.73%	1.35%	0.201	0.044
SPRUCE	17.24%	0.00%	0.000	0.000
BLACK SPRUCE	0.94%	0.19%	0.205	0.045
WHITE SPRUCE	0.63%	0.07%	0.118	0.026
EXPOSED SOIL	0.04%	0.00%	0.000	0.000
HERB (OPEN)	0.61%	0.00%	0.000	0.000
ALPINE TUNDRA	25.68%	33.03%	1.286	0.280
SUBALPINE TUNDRA	26.32%	56.78%	2.157	0.470
LOW SHRUB (OPEN)	1.62%	0.00%	0.000	0.000
LOW SHRUB (SPARSE)	1.76%	0.00%	0.000	0.000
TALL SHRUB (DENSE)	0.88%	0.00%	0.000	0.000
LAKE	0.65%	0.00%	0.000	0.000
RIVER	0.23%	0.00%	0.000	0.000
sums	100.00%	100.00%	4.593	1.000

**Table 4. Landscape Selection During the Rut**







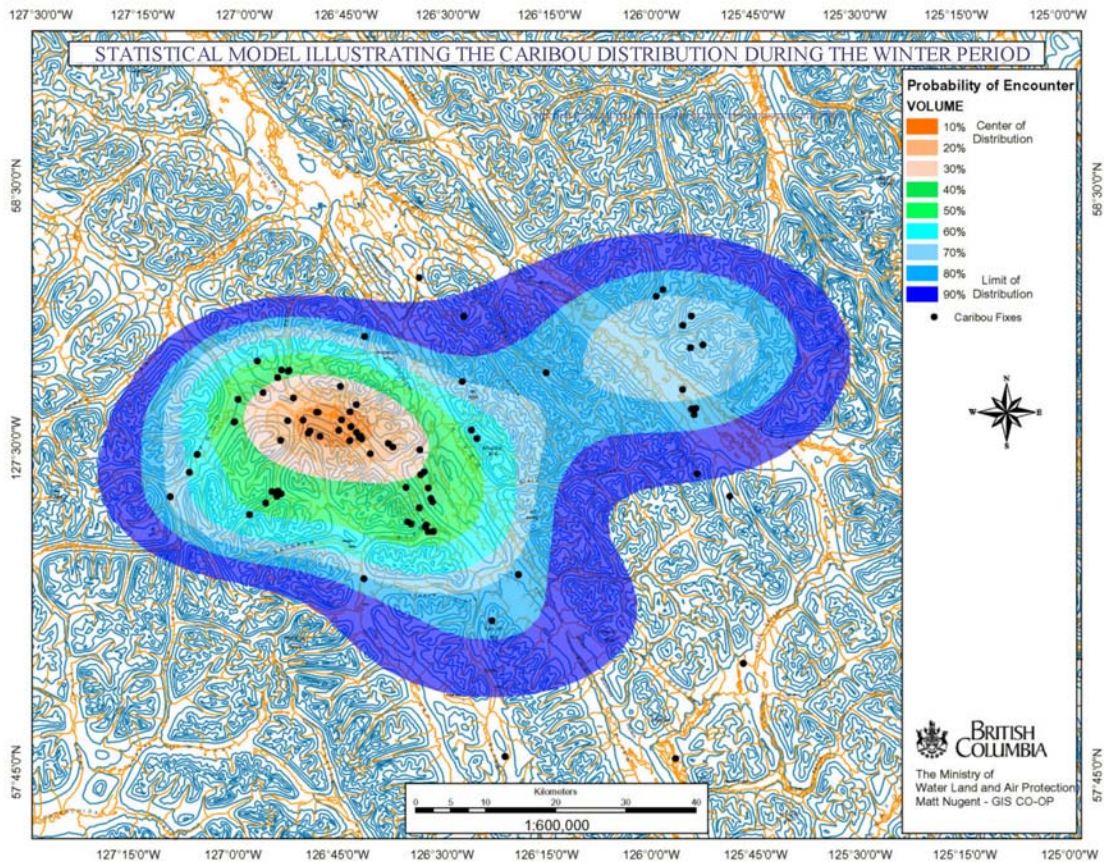
**Figure 10. Landscape selection during the rut**

habitat utilization for the rut. It can be seen that 90% of the use at that time is restricted to the tundra zones which are strongly selected relative to their abundance. In contrast to summer however, the animals have shifted down in elevation to primarily favour the subalpine tundra. During the rut season the alpine tundra tends to be under accumulating snowpack and to lack the broader



expanses of food and flatter land attractive for energy accumulation before winter as well as rut activity.

The winter period sees the caribou distributed as in figure 11. The distribution of



**Figure 11. Probability contours for Frog Gataga caribou during the winter**

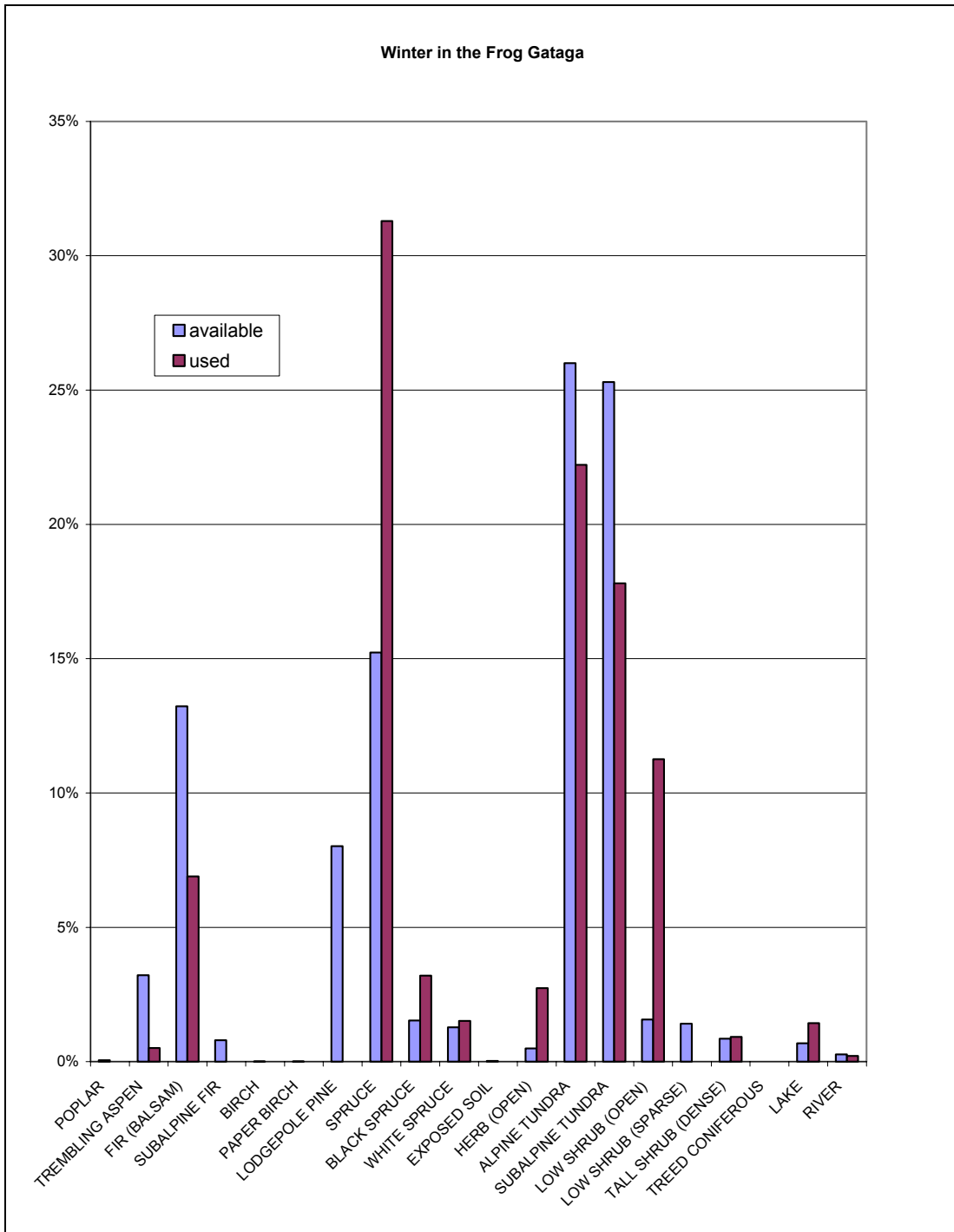
caribou (4789 km<sup>2</sup> (mcp)) is quite different at this season from what was seen for the 3 previous time periods. Approximately 1/3 of the herd utilizes provincial park. Table 5 and figure 12 show how these animals were distributed across the



<b>Landscape type</b>	<b>available Proportion</b>	<b>used proportion</b>	<b>selection index</b>	<b>standardized index</b>
POPLAR	0.05%	0.00%	0.000	0.000
TREMBLING ASPEN	3.22%	0.51%	0.158	0.007
FIR (BALSAM)	13.23%	6.90%	0.521	0.021
SUBALPINE FIR	0.79%	0.00%	0.000	0.000
BIRCH	0.01%	0.00%	0.000	0.000
PAPER BIRCH	0.01%	0.00%	0.000	0.000
LODGEPOLE PINE	8.02%	0.00%	0.000	0.000
SPRUCE	15.23%	31.29%	2.054	0.085
BLACK SPRUCE	1.54%	3.20%	2.087	0.086
WHITE SPRUCE	1.28%	1.51%	1.184	0.049
EXPOSED SOIL	0.02%	0.00%	0.000	0.000
HERB (OPEN)	0.49%	2.73%	5.543	0.228
ALPINE TUNDRA	26.00%	22.22%	0.854	0.035
SUBALPINE TUNDRA	25.30%	17.80%	0.704	0.029
LOW SHRUB (OPEN)	1.56%	11.26%	7.201	0.297
LOW SHRUB (SPARSE)	1.42%	0.00%	0.000	0.000
TALL SHRUB (DENSE)	0.85%	0.93%	1.084	0.045
TREED CONIFEROUS	0.00%	0.00%	0.000	0.000
LAKE	0.69%	1.43%	2.089	0.086
RIVER	0.27%	0.21%	0.791	0.033
sums	100.00%	100.00%	24.272	1.000

**Table 5. Landscape Selection During the Winter**





**Figure 12. Landscape selection during the winter**

Landscape types. Fifty percent of the utilization was of the various spruce and in particular open herb and shrub lowland landscapes, with these favoured over their





abundance. Lakes also show positive selection (presumably resulting from their use for slushing). With a bit of grouping the relationships can be examined statistically (Table 6). The Chi-square statistic is 44.6, with 7 degrees of freedom, which is highly significant; although three of the expected frequencies are less than 5 which weakens the analysis. Using the Bonferroni adjustment, the Z value for 95% confidence limits is then 2.73 giving confidence limits as shown in the table (6). It can be seen that with this conservative method of comparison only

<u>Landscape type</u>	<u>used</u>				
	<u>available</u>	<u>proportion</u>	<u>Bonferroni confidence</u>		
			<u>limits</u>		
	<u>proportion</u>		<u>lower</u>		<u>upper</u>
deciduous trees	3%	1%	0%		3%
fir	14%	7%	0%		15%
pine	8%	0%	0%		0%
spruce	18%	36%	21%		51%
alpine tundra	26%	22%	9%		35%
subalpine tundra	25%	18%	6%		30%
deciduous shrubs/ herb	4%	15%	4%		26%
water	1%	2%	0%		6%

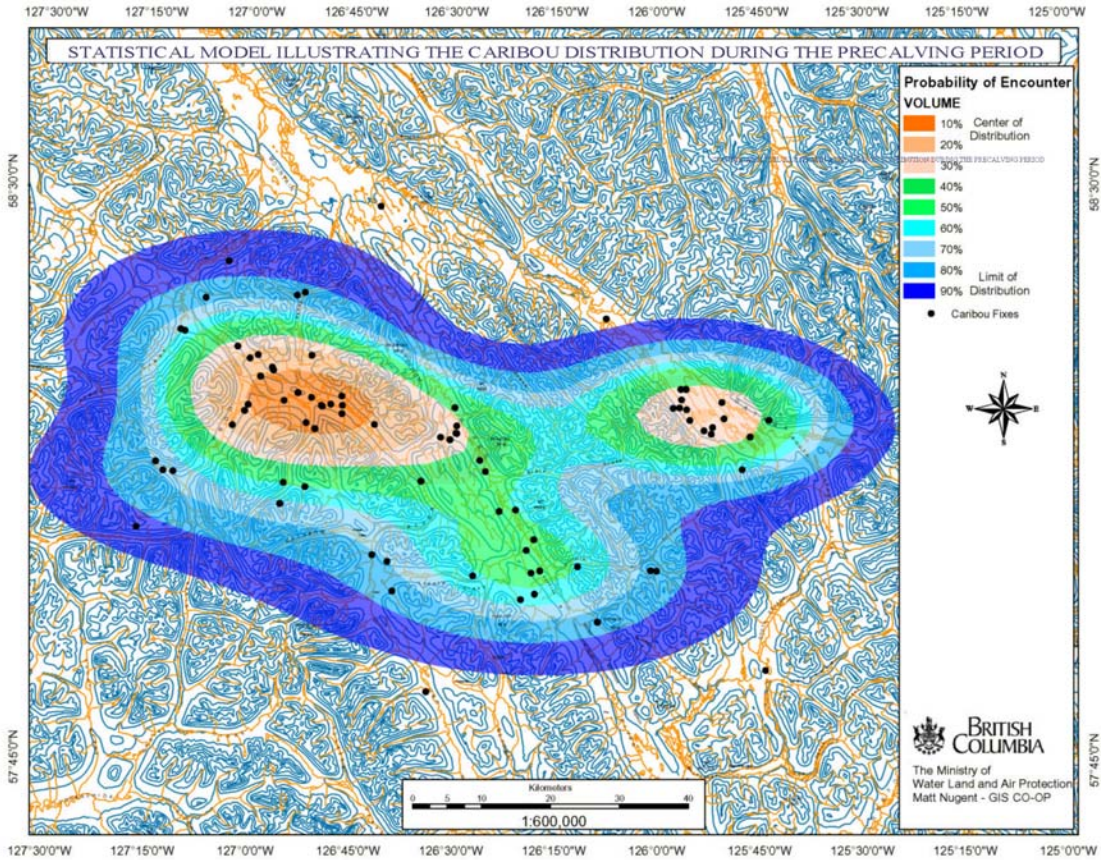
**Table 6. Bonferroni Confidence Intervals for Proportions of Landscape Units Used by Frog Gataga Caribou in winter.**

the avoidance of pine and the selection for spruce can be confirmed as highly probable.

The precalving period saw the caribou distributed as in figure 13, utilizing some 4668 km<sup>2</sup> (mcp). This period sees the caribou at their lowest average elevations of the year, which would give them access to the first new growth. Approximately 37 per cent of the herd use at this season is in provincial park.

Table 8 and figure 14 provide the habitat utilization for the precalving life phase. This life period shows substantially the annual low of tundra zone usage and high of conifer zone usage, with negative and positive selection respectively relative to their abundance.





**Figure 13. Probability contours for the Frog Gataga caribou during precalving**

Forty two (42) of the caribou had 8 or more relocates allowing determination of MCP home ranges. The mean of these was 808 km<sup>2</sup> (standard deviation of 581 and +/- confidence interval at 95% of 176) ranging from a maximum of 2594 km<sup>2</sup> to a minimum of 118 km<sup>2</sup>. The average caribou then, is utilizing 12% of the herd range.



<u>Landscape type</u>	<u>available Proportion</u>	<u>used proportion</u>	<u>selection index</u>	<u>standardized index</u>
POPLAR	0.06%	0.00%	0.000	0.000
TREMBLING ASPEN	5.05%	5.66%	1.122	0.050
FIR (BALSAM)	12.91%	10.35%	0.801	0.036
SUBALPINE FIR	0.33%	0.00%	0.000	0.000
LOGEPOLE PINE	8.16%	18.85%	2.310	0.103
SPRUCE	16.12%	38.16%	2.368	0.105
BLACK SPRUCE	1.67%	5.61%	3.360	0.149
WHITE SPRUCE	0.72%	0.91%	1.262	0.056
EXPOSED SOIL	0.04%	0.00%	0.000	0.000
HERB (OPEN)	0.58%	1.08%	1.861	0.083
ALPINE TUNDRA	25.44%	1.02%	0.040	0.002
SUBALPINE TUNDRA	23.52%	6.70%	0.285	0.013
LOW SHRUB (OPEN)	1.72%	6.24%	3.623	0.161
LOW SHRUB (SPARSE)	1.54%	2.57%	1.663	0.074
TALL SHRUB (DENSE)	1.12%	1.53%	1.363	0.060
LAKE	0.61%	0.96%	1.571	0.070
RIVER	0.40%	0.36%	0.901	0.040
sums	100.00%	100.00%	22.530	1.000

**Table 7. Landscape Selection During the Precalving Period**

This is a species that may show substantial range shift over time. For example in winter 2003-2004 a couple of dozen animals utilized an area upstream of the South and main Gataga forks, an area not utilized in the previous 3 winters. They will however be seeking the same elements from their surroundings; that is food, minerals, and freedom from predation. The mineralization and generally high elevations and high precipitation in the Gataga Frog area provide those elements.



Precalving in the Frog Gataga

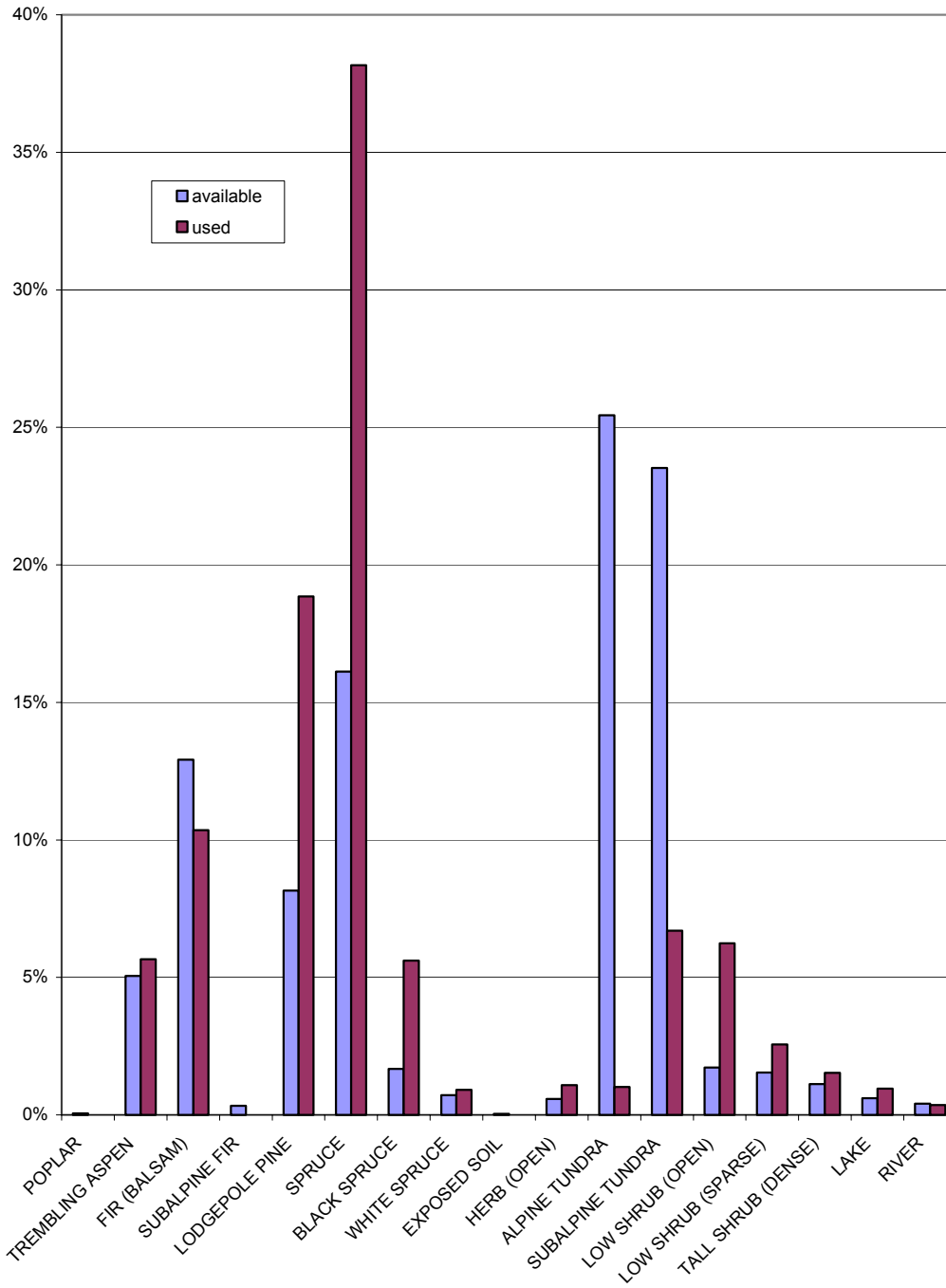


Figure 14. Landscape selection for the precalving period

