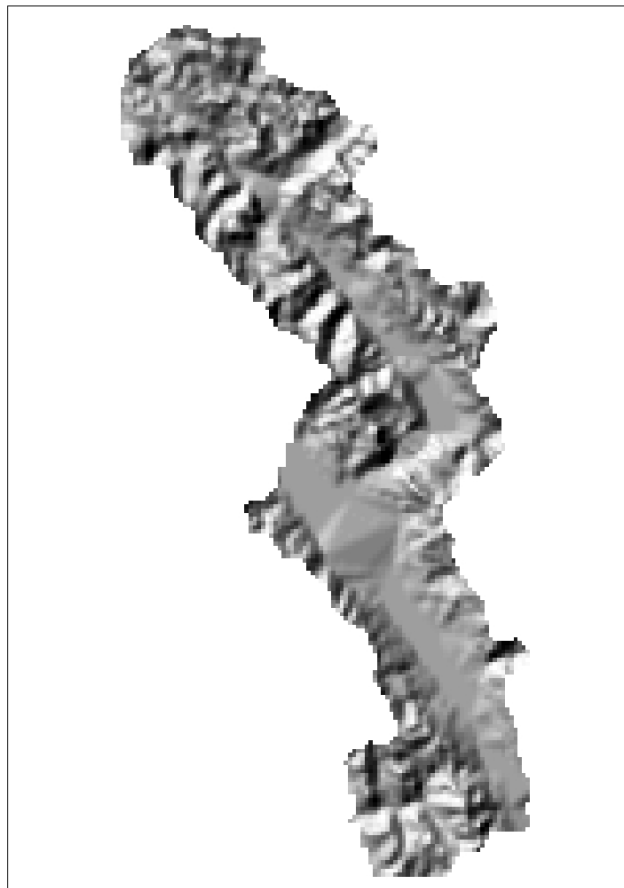


**Information Request I:** Kootenay National Park is located in the Rocky Mountain region of Canada. It is home to a diverse range of animal as well as vegetative species. The elevation varies significantly throughout the park which allows for many different types of environments. The national park is 372.6 square kilometers the maximum elevation is 3280m while the minimum is 740m. This implies an elevation range of 2540m. The average elevation within the park is 1760.5m with a standard deviation of 406m. This information is useful in determining the amount of change in elevation that occurs in the park. The elevation statistics as well as the hill shade output can be found as **figure 1** and **figure 2**, respectively.

MIN	MAX	RANGE	MEAN	STD	SUM	VARIETY	MAJORITY	MINORITY	MEDIAN
740	3280	2540	1761	406	16399600	115	1300	740	1760

**Figure 1. Elevation Statistics**

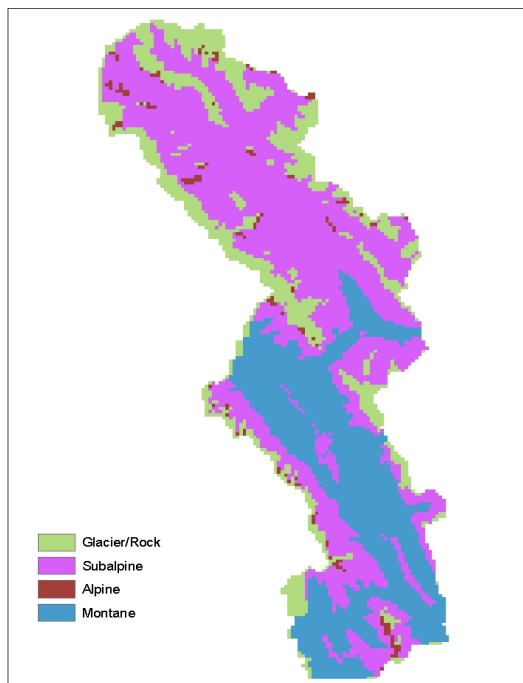


**Figure 2. Kootenay Park Hill Shade from 315 Degrees**

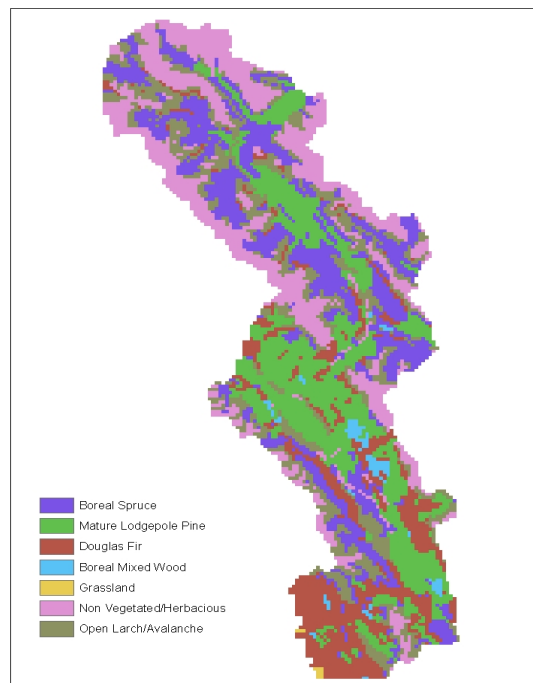
Upon examining the hill shade output of the park, it appears as though the northern part of the area contains more mountainous, rough terrain. There are two valleys that run through the middle areas of the park. These valleys are at similar elevations. There are few low elevation areas of the park suggesting that Kootenay National Park is located at mostly higher elevations.

There are a wide variety of vegetation types present in the National Park. The types of vegetation cover present include; Boreal Spruce, Mature Lodgepole Pine, Douglas fir, Boreal Mixed Wood, Grassland, Non Vegetated/Herbacious, and Open Larch/Avalanche. The low elevation areas contain a high presence of Boreal Spruce and Mature Lodgepole Pine. Along the edges of these valleys are some areas of Douglas Fir. There are few instances of Boreal Mixed Wood, and the high elevations contain a fair amount of Grasslands and Non Vegetated/Herbacious areas. The three vegetation types with the most area include Boreal Spruce, Mature Lodgepole Pine, and Non Vegetated/Herbacious areas. These three types of vegetation cover significantly more area than the other types.

The eco-regions present in the area include lots of Subalpine in the northern portion and Montane in the south. The high elevations include a fair amount of the Glacier type of eco-region. Vegetation types match eco-regions fairly accurately. For example, Boreal Mixed Wood does not exist outside of the Montane eco-region. Alpine regions only contain Non Vegetated/Herbacious and Open Larch/Avalanche vegetation types. These areas are also located at high elevations. Montane regions contain a significant amount of Mature Lodgepole Pine in the southern portion of the park, while Subalpine regions in the north contain a large amount of Boreal Spruce. The distribution of eco-regions and vegetation cover are displayed below in **figure 3** and **figure 4**, respectively.



**Figure 3: Eco-Regions**



**Figure 4: Vegetation Cover**

**Information request II:** Eco-regions in Kootenay National Park are related to elevation and vegetation. As described above, Boreal Mixed Wood can only be found in Montane areas, and Alpine regions only contain Non Vegetated/Herbacious and Open Larch/Avalanche vegetation types. The relationship between eco-region and vegetation is displayed in **figure 5**, below.

	Boreal Spruce	Mature Lodgepole Pine	Douglas Fir	Boreal Mixed Wood	Grassland	Non Vegetated/Herbacious	Open Larch/Avalanche
Glacier/Rock	1	.6	.4	0	.24	64.8	2.2
Subalpine	72.1	38.6	11.7	0	0	7.6	56
Alpine	0	0	0	0	0	6.3	.04
Montane	9.3	44.8	37.7	4.9	.24	2.6	7.8

**Figure 5: Cross-Tabulation of Vegetation and Eco-Region (sq. kilometers)**

The relationship between elevation and eco-region can be identified by looking at the table in **figure 6**, below.

Eco-Region	MIN	MAX	RANGE	MEAN	STD	SUM	VARIETY	MAJORITY	MINORITY	MEDIAN
Glacier/Rock	740	3,280	2,540	2,240	318	4,085,760	105	2,280	740	2,280
Subalpine	1,100	2,480	1,380	1,802	259	8,376,020	64	1,880	1,180	1,840
Alpine	2,020	2,480	460	2,252	96	358,100	22	2,280	2,020	2,280
Montane	800	1,880	1,080	1,334	180	3,579,720	53	1,300	800	1,300

**Figure 6: Zonal Statistics of Eco-region and Elevation (meters)**

The table suggests that Alpine eco-regions occur in a small range of relatively high elevations. Glacier/Rock regions have the greatest range of elevation at 2,540m, and are located almost entirely in Non-Vegetated areas. Subalpine has the same maximum elevation as Alpine, however it also occurs at almost half of the elevation that alpine does. This explains why there is significantly more area of the Subalpine region. Montane regions occur at slightly lower elevation than Subalpine, but have similar range. It also has the second lowest Standard Deviation; this means that the terrain does not vary much in the Montane eco-region. It appears, through this analysis, that vegetation cover, eco-regions, and elevations are all related to some degree. It would be fair to assume some vegetation will be present in a limited amount of eco-regions, and both of these variables would occur at specific elevations.

**Information Request III:** The coyote has a reasonably large area of high to very high density winter habitat. The species is located mostly in the southern portion of Kootenay National Park. However, some of this high density habitat area does venture into the northern portion. The coyote mostly sticks to the lower elevations in valleys, the high density areas do not extend higher than 1880m.

AREA	MIN	MAX	RANGE	MEAN	STD	VARIETY	MAJORITY	MINORITY	MEDIAN
54.6 km <sup>2</sup>	800	1880	1080	1289	186	53	1100	800	1300

**Figure 7: Zonal Statistics of High to Very High Density Coyote Habitat and Elevation**

The vegetation areas containing the greatest amount of high to very high density coyote habitat area is Douglas Fir and Mature Lodgepole pine. Although, the coyote does live in every type of vegetation, it is concentrated in the forested areas.

	Boreal Spruce	Mature Lodgepole Pine	Douglas Fir	Boreal Mixed Wood	Grassland	Non/Vegetated	Open Larch/Avalanche
High	9.2	16.8	21.4	1.3	0.0	2.6	2.2
Very High	0.0	0.0	0.8	0.0	0.2	0.0	0.0

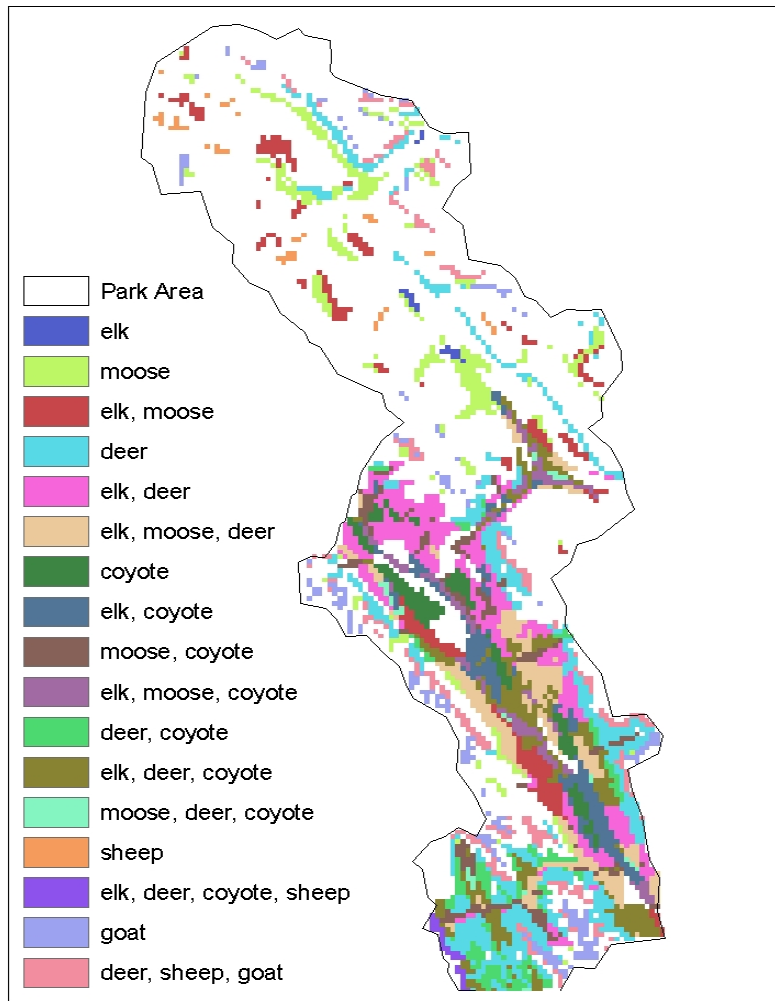
**Figure 8: Cross Tabulation of High to Very High Density Coyote Habitat and Vegetation Cover (sq. km)**

The coyote's high to very high density habitat is located almost exclusively in Montane eco-region areas. There is approximately 50 square kilometers of high to very high density coyote habitat in Montane eco-region areas in Kootenay National Park. These high density coyote habitat areas are also present in some Subalpine eco-region areas.

	Glacier/Rock	Subalpine	Alpine	Montane
Low	73	75.9	5.4	0
Low	0	58.8	.9	10.3
Medium	0	46.2	0	47.5
High	0	5.1	0	48.5
Very High	0	0	0	1.1

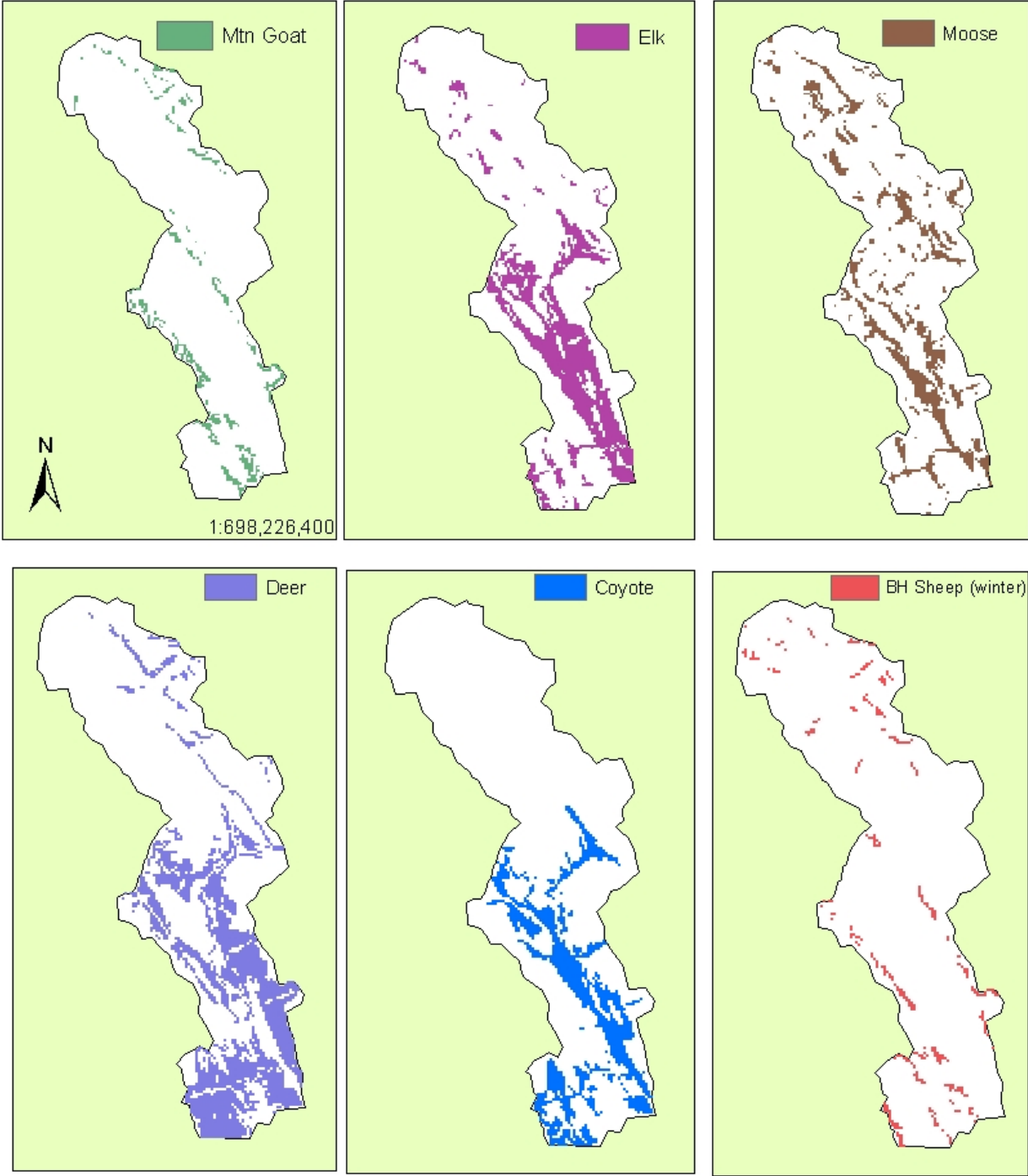
**Figure 9: Cross Tabulation of Coyote Habitat by Eco-Region (sq. km)**

**Information Request IV:** The species inhabiting Kootenay National Park live share habitats with each other in a variety of ways. For instance, the elk and deer share a large area of high to very high density habitat. This area is found in mostly low elevation, Montane or Subalpine areas. The coyote is also present in these areas to a significant degree. It appears as though the areas with the most variety of habitats are where the slope changes, along the edges of different eco-regions and vegetation coverage. Also, most of the high to very high density habitats are located in the southern portion of the National Park. The northern portion does contain a fair amount of moose, deer, and elk. Moose have quite a bit more habitat area in the northern portion of the park than any other species. **Figure 10** shows the distributions of high to very high density habitat areas for each species in the park. **Figure 11** shows the combined high to very high density habitat areas of all of the species in this study. The study includes elk, moose, deer, coyote, mountain goat, and big horn sheep.



**Figure 10: Combined High to Very High Density Habitat Areas**

# High to Very High Habitat Densities of Species in Kootenay National Park



# Procedures Flow Chart

