

A basic approach to determining roads and trails at high risk for avalanches

Dave Barrett

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Summary

Using basic, easily attainable data, a basic analysis of potential avalanche risk was undertaken for the Sugarbowl-Grizzly Den Provincial Park Area.

Study Area and Data Source

- The study area is the Sugarbowl-Grizzly Den Provincial Park Area. The park is located approximately 70Km East of Prince George (fig. 1) and covers an area of approximately 22,000ha. The area is popular among hikers and has numerous access roads as well as trails. There are also a large number of peaks, passes and gullies in the area which that it ideal avalanche territory.

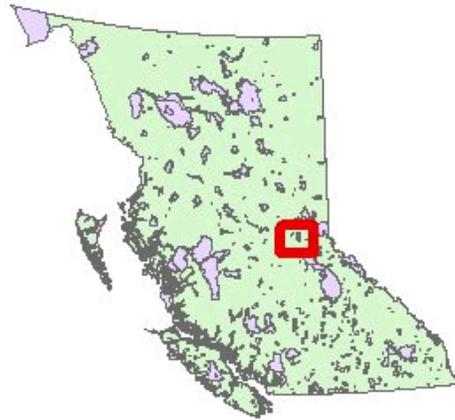


Figure 1. The location of Sugarbowl-Grizzly Den Provincial Park

- All of the data needed to complete this project was obtained from the UNBC GIS data download center. All of the information was accessible through the following TRIM map sheets: 93H072, 93H073, 93H082, 93H083, 93H092 and 93H093. The trails and oads sections were used in conjunction with provincial data found on the Ninkasi server. A Landsat 7 satellite image, obtained from Geobase.ca of the area was also used.

Data methods and analysis

- The TRIM data (in .saf format) was transformed using FME translator to ESRI shape files and then reprojected into UTM coordinates. In hindsight, there were very few advantages to reprojecting the data into UTM coordinates. All of the TRIM data was projected in Albers natively and a DEM was also available projected in albers coordinates.
- Using [this](#) website, it was determined that slopes with angles between 30 and 50 degrees have the highest risk of producing avalanches. This was then used to create a new raster layer by which only the desired 30-50 degree slope area was output (fig 2). The areas that met the desired range of angles were then exported to vector file so that the intersect function could later be used.

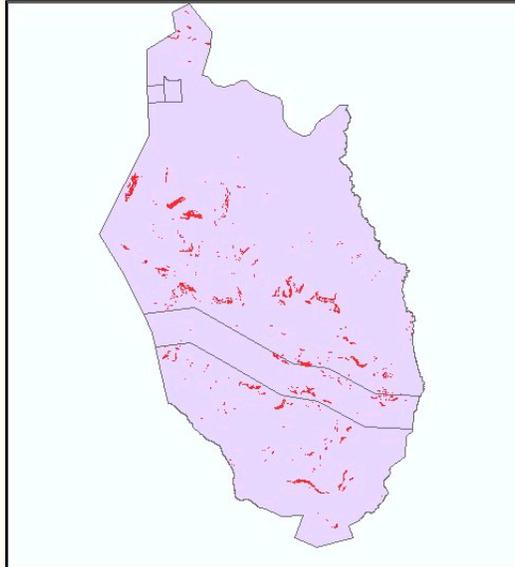


Figure 2. A raster layer illustrating areas where the slope is greater than 30 degrees and less than 50 degrees

- A buffer of 500m was applied to both the road and trail layers to simulate the distance even the smallest avalanche would advance (fig3 and fig4).

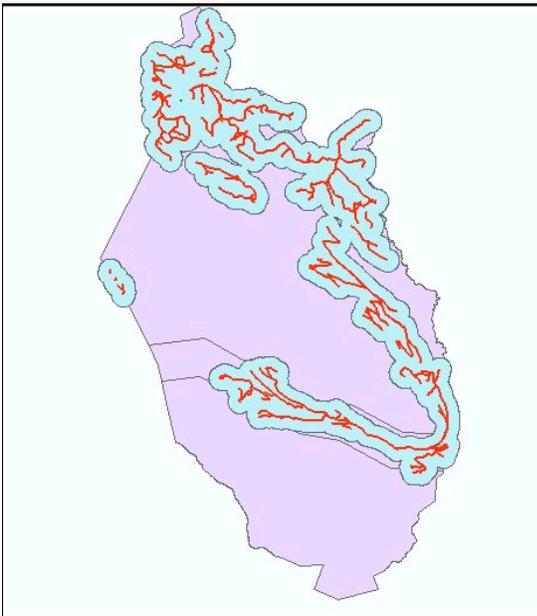


Figure 3. A 500m buffer of the roads present in the study area

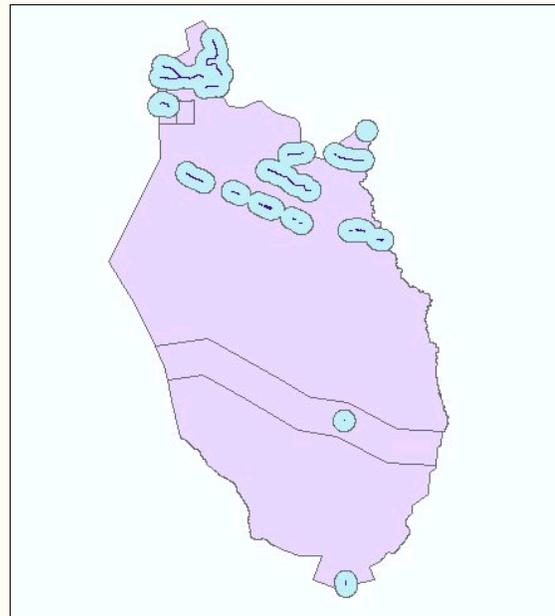


Figure 4. A 500m buffer of trails present in the study area

- Next, the buffers of the roads and trails layers were intersected with the previously created ideal slope layer. The result (fig5 and fig6) is areas that have a high risk of avalanches and are within a 500m distance of either roads or trails.

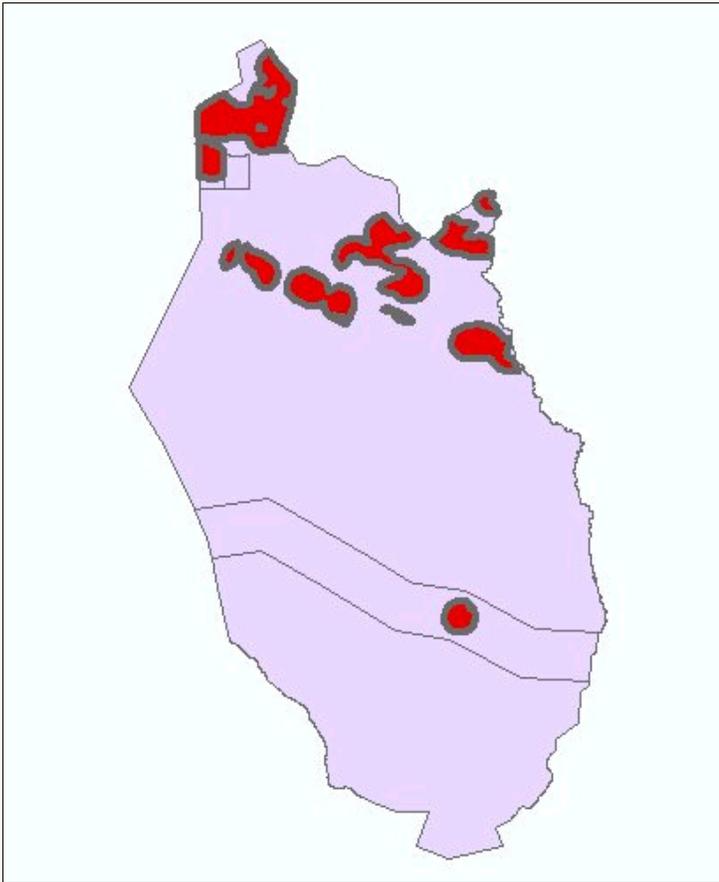


Figure 5. An output of the intersect of the previously stated buffers and specified slope areas



Figure 6. An overlay of the high risk avalanche locations that are close to roads and trails in the park area

Results

- The methods above provide a very simple analysis on the possible areas of avalanche risks that could impact preexisting roads and trails in the Sugarbowl-Grizzly Den Provincial Park. The method would be greatly improved if snow depth and quality data was available and could be used in conjunction with the already completed analysis.

As is evident with the above images, specifically figure 4, the trails data is not complete as the data is not continuous and could benefit from a better mapping of the trails in the park.

The overall usefulness of this project at the stage it is currently in is limited, however it could be developed considerably further with more data. Projects like this could be, in future, used when creating future trails in parks. The trails and roads could be placed in areas that have the lowest avalanche risk to therefore minimize the damage done by any avalanches that do occur.

References

- Moynier, J. 1998. <http://pweb.jps.net/~prichins/avalan.htm>. Avalanche Awareness by John Moynier.