



# Terrain Stability Analysis of Peace River Region between Hudsons Hope and Fort St. John

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## Introduction

The purpose of this project is to use the components of a GIS to analyze an area for locations of possible slope instability. Although terrain stability analysis has been completed using GIS before, it is an area of interest to me and it was a challenge to apply my own knowledge of the subject into a GIS project. Slope stability analysis is a very valuable tool in the prediction of hazardous slopes, as this tool can be applied in order to protect property and lives, as well as other aspects of the environment such as streams.

## Study Area

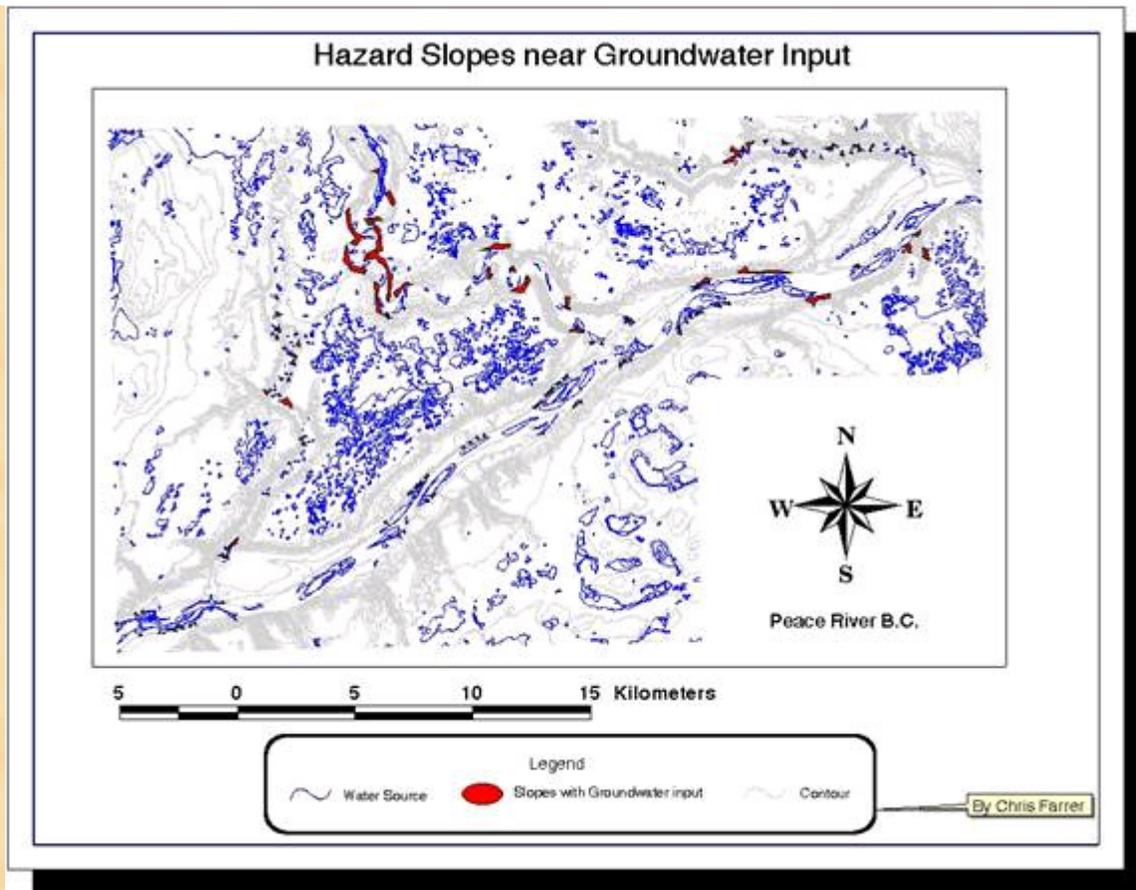
The area of study was the section of the Peace River between Hudsons Hope and Fort St John. The slopes in this area have been very active in the past with fast slides and slow creeps. The reason for such high activity of this area is that it is made up of glaciolacustrine and glaciofluvial material. The glaciolacustrine material has a lower slip angle in relation to most other materials, which makes this area good for studying.

## Data Sets

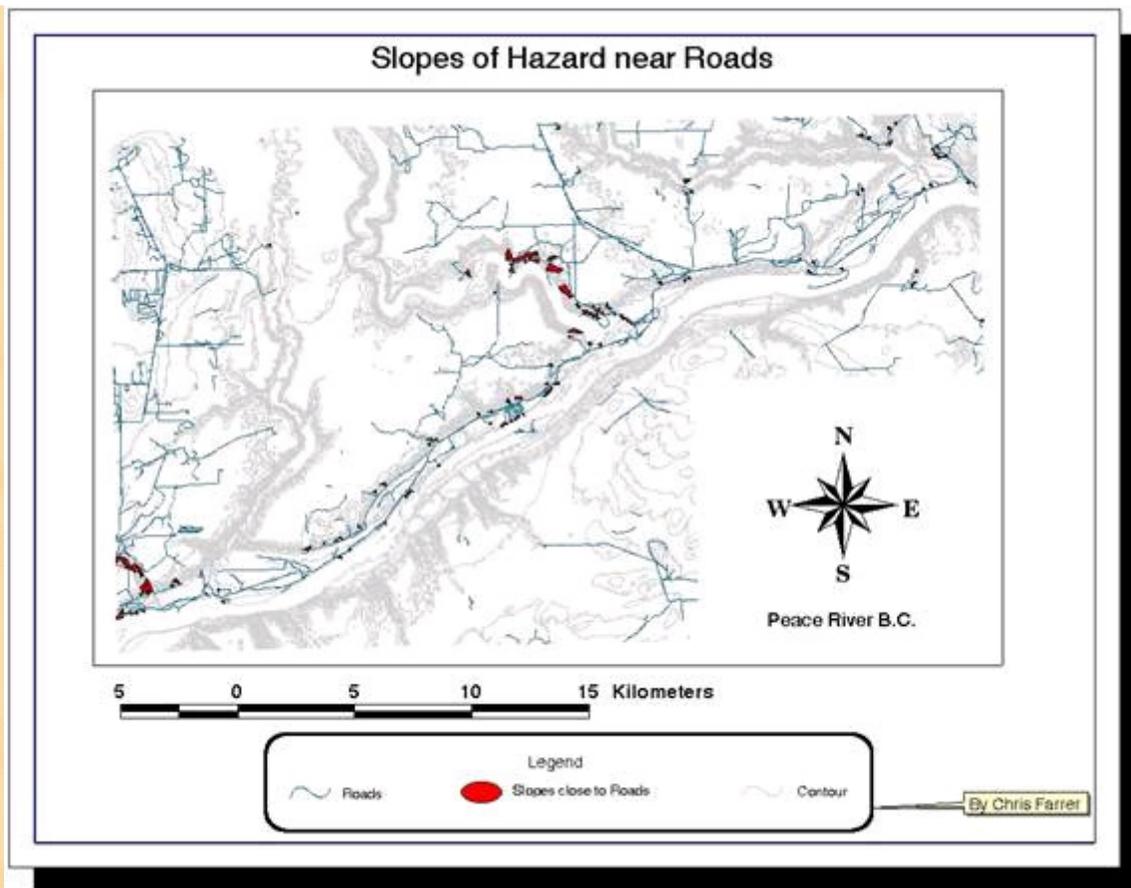
The data used was predominantly Trim II data and base thematic map data. The TRIM II data that was used, consisted of contour, lakes and river layers, while the base thematic map layer used was landform class.

## Procedures

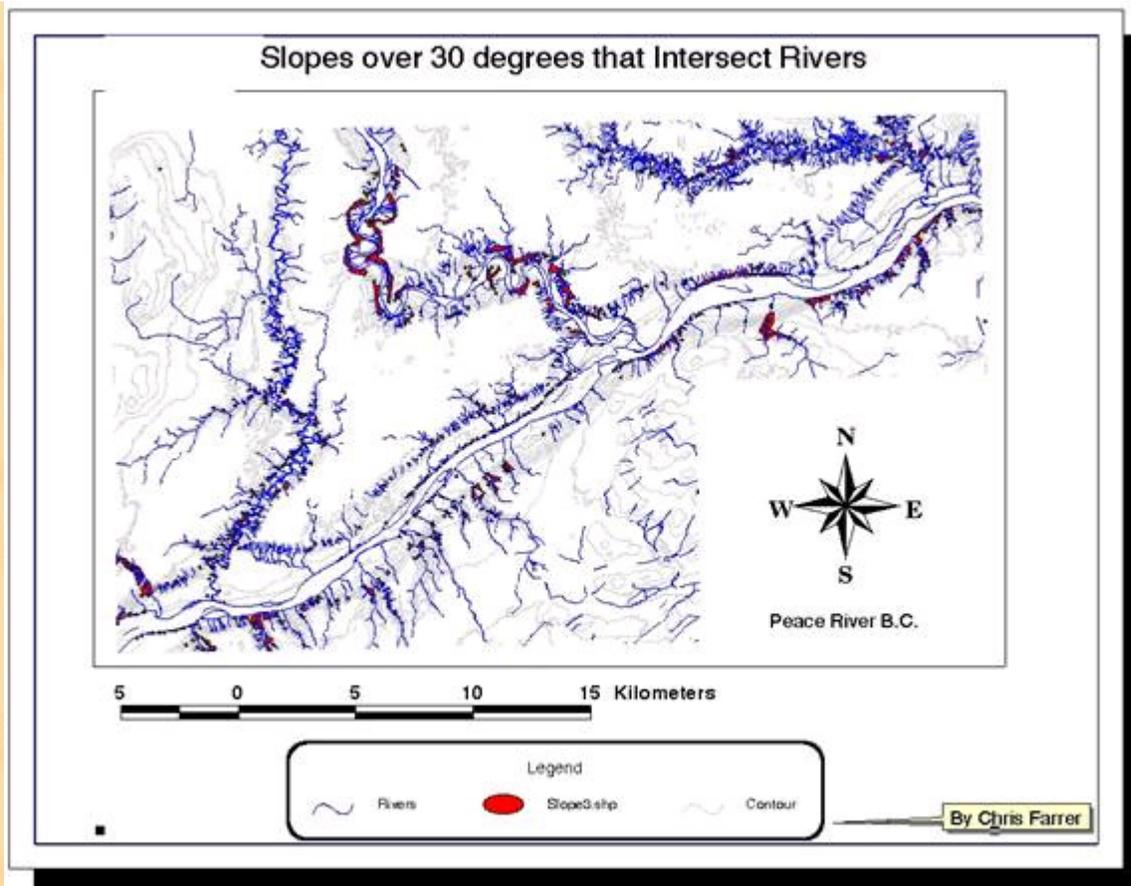
- Areas of slope greater than 30 degrees were identified using the query tool in Arcview.
- Areas of aspect facing southwest to southeast were selected. As well, areas of aspect facing northeast to northwest were also selected using the query tool. These areas are of interest because the south facing slopes may have snow on them that melts relatively fast and distributing a large amount of moisture through the soil fairly quickly, but possibly allowing the soil to become relatively dry during summer due to higher evaporation. While the north facing slopes may have more snow on them which may melt slower, which would maintain a higher level of moisture content through out the summer due to a lower amount of evaporation.
- However after doing this, I realized that there was an additional input of moisture to the south facing slopes from swampy and marshy land. In light of this, I decided to treat both slopes relatively equally in their moisture content.
- Next, out of all the slopes over 30 degrees, I selected the ones that were within 100 ft (30.5 metres) of a water source (not including the rivers). The reason for this is because the more moisture there is in the ground, the lower the angle of friction is. As well the weight added to the slope can cause it to slowly slump or rapidly fail.



- Also from the slopes over 30 degrees, I selected the slopes that were within 100 ft (30.5 metres) of roads. This was done for two reasons: one, to show areas that may be impacted by roads and two, to show areas where roads are in possible danger due to slope instability.

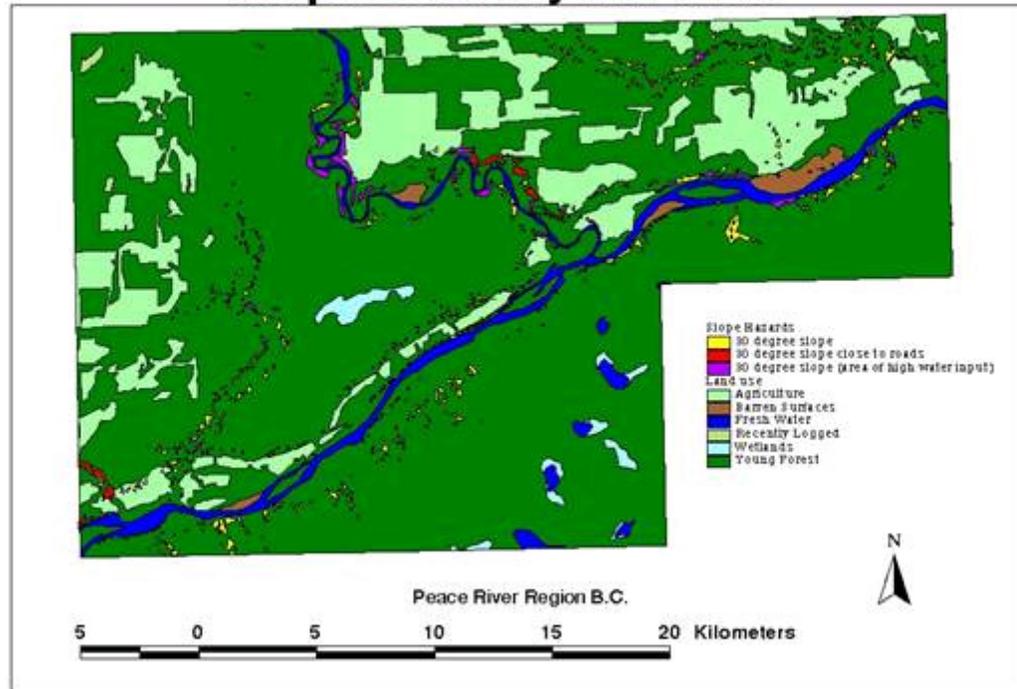


- Slopes over 30 degrees are also checked to see if any of the slopes intercept any of the smaller rivers flowing into the Peace River. This is checked because these areas may be locations for debris flows in times of high precipitation.



- The slopes of suspect are compared to their proximity to agricultural land use. This is done because of increased activity that may trigger slope failure and increased drainage due to ploughing of fields.

## Slope Stability Hazards



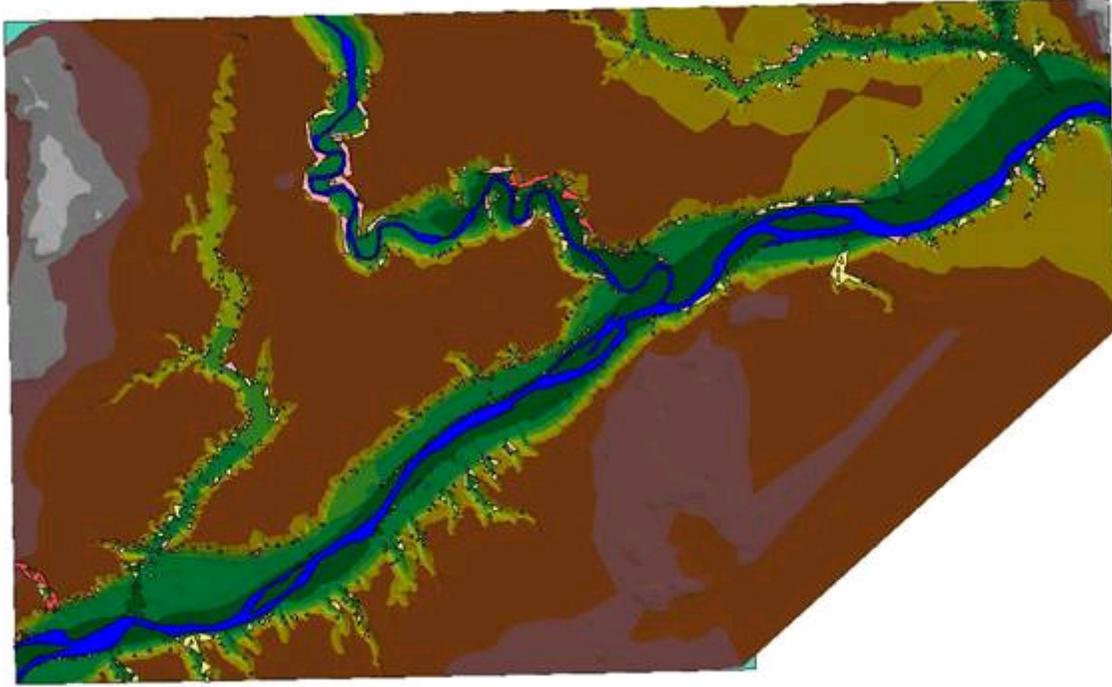
## Problems

The largest problem with this project was the limitation of the data in the area of study. Data that include soil type would have been useful, although there are soil maps of the area, I was unable to find any in digital format. I considered digitizing them myself, but did not have enough time. Another layer that would have been helpful is a detailed (or even some info) on the vegetation types such as primary and secondary species. As well, an orthophoto would have been useful in the overall output of the data.

## Conclusion

From this project, I believe I have isolated some areas of concern. There is no guarantee that these areas are of slope instability; however, it is conceivable that they may be problematic.

The true objective of this project was to achieve a self-reliant understanding of Arc/Info and Arcview. Although there is still much more for one to learn, I believe that I have learned a great deal about these two software packages.



## Future work

As more information is gathered there is a great deal of analysis that could be done. I would like to evaluate each slope of suspect for the amount of pressure that is placed on it by the overlaying mass. As well it would be interesting to get weekly precipitation rates over a year. This could be applied to see the amount moisture influx into the system and see if there are any slides of mass movements that can be associated with it.

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