Glacier Retreat/ Developement in Glacier National Park

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Abstracts

My project is based on Glacier Retreats and developements in the Glacial Natoinal Park located here in British Columbia.

Introduction

- Representing the Columbia Mountains Natural Region of Canada, Glacier National Park encompasses part of the Selkirk and a small portion of the Purcell Ranges, along the southeastern border of British Columbia. There are more than 400 glaciers pouring over the mountain tops, covering over 12% of the total park areas with ice. Glacier National Park was designated in 1886, along with Yoho National Park, as a 76 square kilometre reserve around Mount Macdonland and Roger's' Pass. By 1930 the area had grown to a 1350 square kilometre national park.

- While doing this project I am trying to locate and indicate the glacier retreats in the area of Glacier National Park, as well as the developements of glaciers in the area. To come to a accurate conclusion several data sources were needed and several methods were used to help come to an accurate conclusion.

- Evidently from above the study area that I have chosen is Glacier Nation Park, which presents itslef in succession beside Highway 1, in the eastern reaches of the Southern Interior. Glacier National Park provides geographic diverse and nautrally preserved outdoor experiences, all within the borders of one great province. Glacier National Park carves the Columbia Mountains, and feeding crystal - clear rivers. Explorations range from a simple wooden boardwalk to a mulit-day glacier crossing trek.

- The objective of my project is to provide an illustration of where the glaciers within Glacier National Park are both retreating and developing, over a long period of time.

- The below map that I provided just gives a visual indication of where Glacier National Park is located.

Glacier
National Park

Data Source

- While working on my data collection for my project, there was a few different types of data that I needed. I needed both TRIM I, and TRIM II data, as well as data from about 20 years prior to TRIM I. For the data prior to TRIM I, I only needed data from map sheets 82n03-82n06. For the TRIM I and TRIM II data I needed the data from map sheet 82n001-82n004, 82n011-82n14, 82n021-024, 82n031-82n034, as well as 82n041-82n044. The problem that I ran into though was that TRIM II was not complete, therefore I could not obtain the data from all of those map sheets that I needed. THe only mapo sheets for TRIM II that were available were, 82n003, 82n012, 82n002, 82n023, 82n24, 82n033, 82n034, 82n041, 82n042, 82n043, and 82n044.

- Roger is who provided me with all of the water data that I needed to complete by data source collection. Some of the data that I recieved was e.00 files. Therefore, those files had to be converted into coverage files. The other file type that I recieved was some zip files. For the zip files I had to unzip the data files first, after the files are unzipped they then become e.00 files. Therefore, after doing the unzipping I then had to convert those data files to coverage files. After having all of the data, I then had to go into Lab 8: Data Assembling because I had to find out the FCODES for the features that I needed. I only needed to have glaciers, and icefeilds, so those were the only two data types that I took from the water data layers, which was done by creating a query in the attribute table.

Data Manipulation

- Data Preperation took a long time to get it all completed. The computers were extremely slow. First, I had to convert the e.00 files that I had into converage files , which was done by using Import from Interchange file in Arctoolbox. I also had some files that were zip files, so I had to unzip them which now they contain the e.00 files, and lasty then I had to covert those files to coverage files, which again was using Import from Interchange file in Arctoolbox.

- Appending all of my layers was not to hard, it was pretty straight forward, due to using the Append Wizard which is located in the Arctoolbox. When appending, I did have to be sure that all of my attribute tables still had FCODE as an item in the table. If the FCODE was not present in the attribute tables, my queries would not have worked out properly.

- One of the most tedious, most time consuming issue that I ran into while doing my data manipulation, was deleting all of the peieces of rock that are within the glaciers. While doing some queries, I noticed that the pieces of rock that are in the middle of the glaciers were being included in the total areas of the glacier, which was wrong. So, I had to create a rock item in the attribute table, then I had to select the pieces of rock all individually, and then calculate values in the attribute table, and type in 'rock'. That way that would minus the area of those rocks away from the glaciers due to perfomring a query as follows: "Rock" < > 'rock'.

- For all of my glacier layers, I had to build topology to create polygons, which was done by using Arctoolbox, and just simply selecting Topology, and then clean. This allows for all of my glaciers to be identifd as polygons therefore an areas, and no longer identified as lines.

- I had to get a DEM to perform a clip. First, I had to unzip the file. Then I had to go to Arctoolbox, Data Conversion Tools, and then use Ascii to Grid, under Import to Raster, this then allowed me to clip my DEM to my glacier layers. I clipped my DEM to my glacier layers in Command Prompt. After clipping the layers together that allowed me to make a 3D map, which

is done in ArcScene. I also created a hillshade 2D effect with my glaciers being transparent, therefore you can see the hillshading underneith the glacier layers.

Spatial Analysis Methods

- Procedures for problem solving the glacier data took several steps.

- I had to perform several different queries. The first query that had to be done was a query to remove all of the galciers and icefields from the rest of the water data, which was simply done by using the FCODE for both of those features. Once that was done, I then had to create a layer from the selected features. This allowed me to have only galcies and icefields present. THis had to be done for all of the data source, prior to TRIM I data, TRIM I data, as well as TRIM II data. I also had to query out rocks out of my glaciers so that the rock area was not included in the glaier area. This was done by creating a rock item in the attribute table, and then jusing calculate values to create rock sections within the glaciers.

- I had to build topology to create polygons, so that my glaciers were not indentifed as lines. The polygons then provided me with an area for all of my glaciers.

- I had to get a DEM, so that i could clip my TRIM data layers to my DEM. This allowed for a better visible view of what the glaciers looked like with regards to elevation.

- From here I created a 2D hillshade view of the glaciers, and I also created a 3D view of glacier orientions on Glacier National Park.

- The 2D and 3D images allowed for a excellent visual representation of what the glaciers look like in Glacier National Park.

Analysis Result

- This map is showing the glacier retreat and developement of the glaicers located in Glacier National Park. In this map the lightest blue with a light border colour is approximatly 20 years prior to TRIM I, the light blue with the darker blue border represents TRIM I data, and the dark blue represents TRIM II.
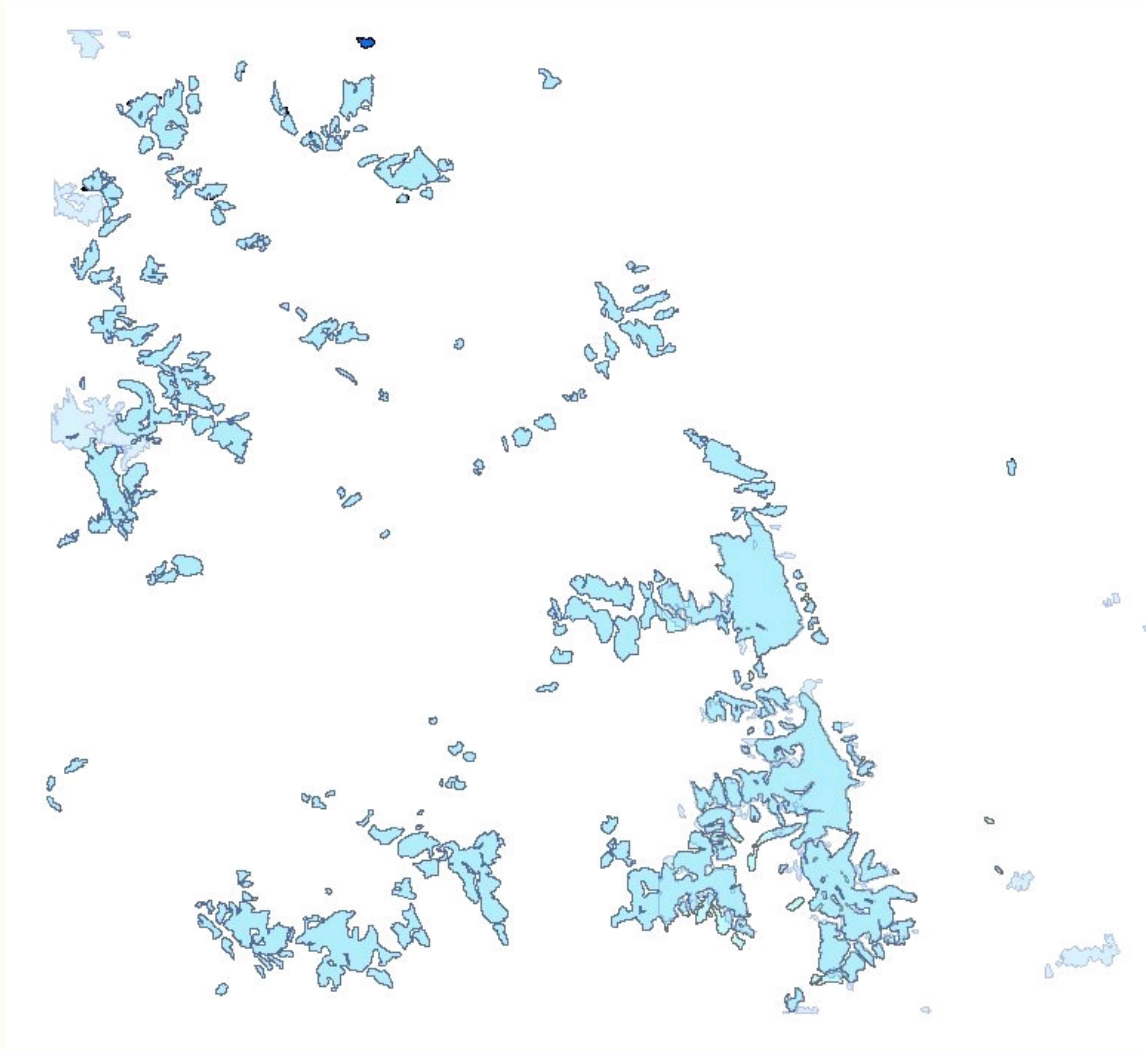
- The following map indicates the transparancy of the glaciers, over the hillshade that was created, which are located in Glacier National Park.
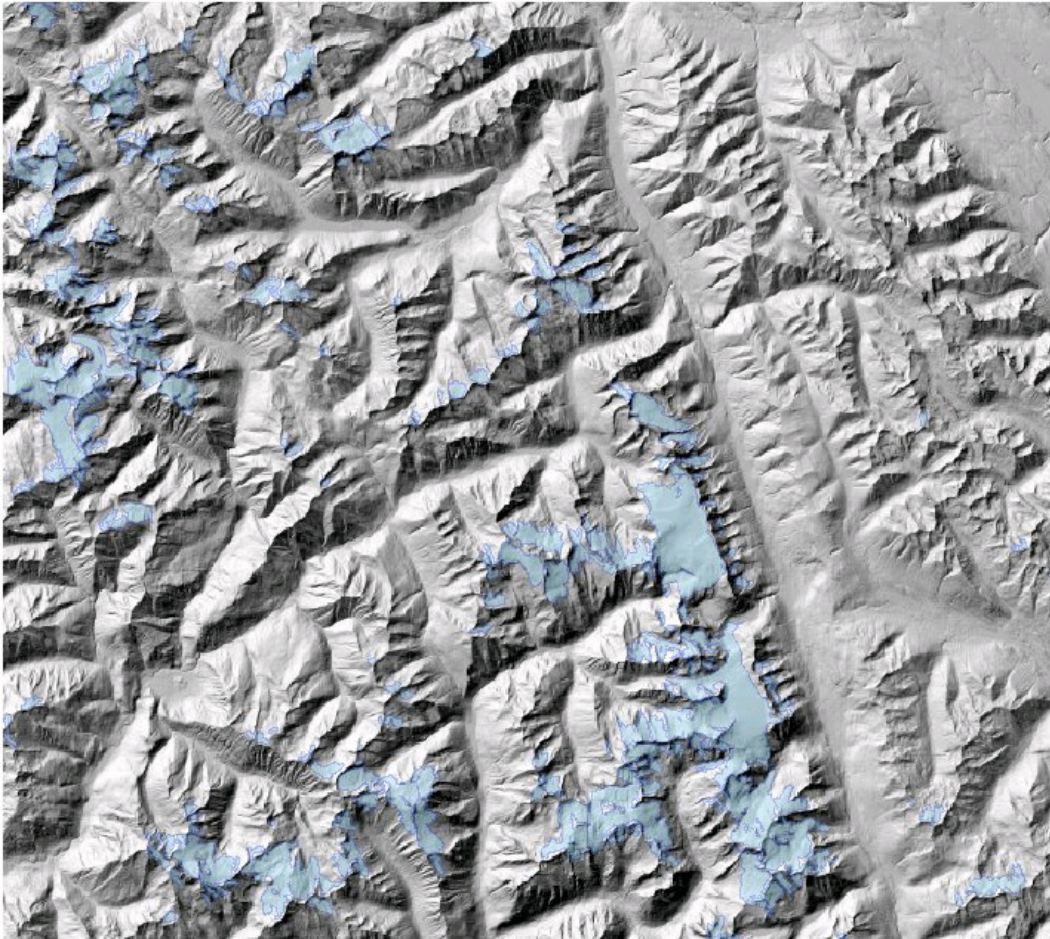
- The last map shown here, indicated a 3D dimension of how the glaciers are located/oriented on the mountains in the Glacier National Park.
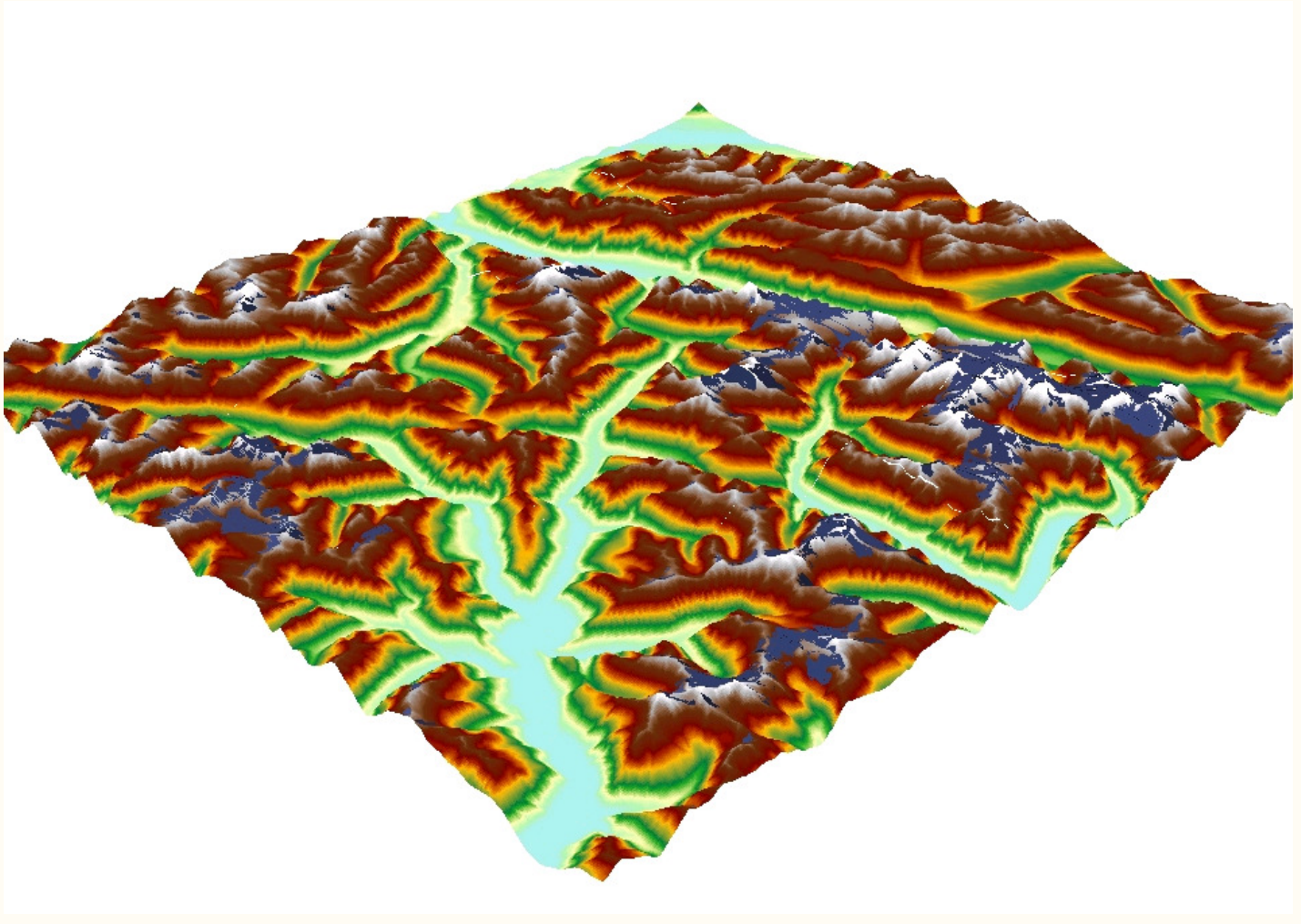
Conclusions

- Glaciers within Glacier National Park have changed relatively over time. Some of the glaciers have retreated, some of the glaciers have developed more, some of the glaciers are totally new as opposed to earlier years, as well as some of the glaciers were once one glacier and are now two separated glaciers.
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- For Example: Deville Glacier, 20 years prior to TRIM I had an area of 30628198m, and in TRIM I the area of the glacier had decreased to an area of 27357000m.

- Also, for Example: Durrand Glacier, 20 years prior to TRIM I had an area of 21199313.5m, and in TRIM I the same glacier was split into two different sections due to melting causing change over time. The area of the top section of the glacier is now 4854930m, and the bottom sections of the glacier now has an area of 5201230m.

Future Developments / works

- At the present time of doing the project on Glacier National Park, the data for TRIM II was not complete. Therefore, I was not really able to get a visual idea of how much that the glacier has changed from TRIM I to TRIM II. It would have been interesting to see the differences because it is closer to our present day, and therefore we would have a better idea of what Glacier National Park looks like right now

- Future developments for this project, simply would be to complete the data for TRIM II, therefore it would be possible to see the glacier retreats, and developments at a more recent year.

- Suggestions for this project was provided to me from Roger. In Remote Sensing 432, it would be possible for me to finish TRIM II in that class, and maybe further this project on into that class so that I can see the difference in the glacier from TRIM I to TRIM II.

- One other suggestion that I have, is that if anyone else decides to do glacier retreats and development in an area, I would highly recommend finding another way to be able to remove all if the rock sections out of the glaciers.

References

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