Geog 357

Final Project: Analysis of Wildfires Around Kelowna, 2023

Introduction

Wildfires were at a record high for BC this summer, with most of the province burning. Certain areas experience a more severe wildfire season than others, specifically in the Okanagan. With the Central Interior region drier than other parts of the province, most of the fires that occur here have the capacity to spread far and wide at a fast rate. This project aimed to examine the burn severity of the fires around the Kelowna area and get a better understanding of how large they were by determining the area of the different severity classes.

Study Area and Dates

The focus area of this project was confined to the greater Kelowna area, with emphasis on the 2023 McDougall Creek Wildfire. The fire caused many to evacuate and led to destruction of much of the area. Other fires around the Kelowna region were included in the overview as well, to display fires occurring all around the city. The goal of this project was to identify areas of higher severity, as well as to get a better understanding of the area these fires were consuming. A comparison of pre and post wildfire views will be conducted to assist with understanding the severity throughout the fires.

Two images were used for the comparison and analysis of the McDougall Creek fire. The pre fire comparison was taken May 31st, 2023, and the post fire comparison taken September 19th, 2023. Both images had low cloud coverage, however the May image had a few clouds scattered. Though there were no visible clouds in the September image, there was visible smoke from one of the fires still burning. May 31st, 2023 was chosen due to a time of year still unaffected by wildfire season. September 19th, 2023 was selected due to the closeness of the fires burning with most of the fires having burned through already. An August image was originally selected however the McDougall Creek fire was still burning into September, as shown by the visible smoke in the colour composite image.

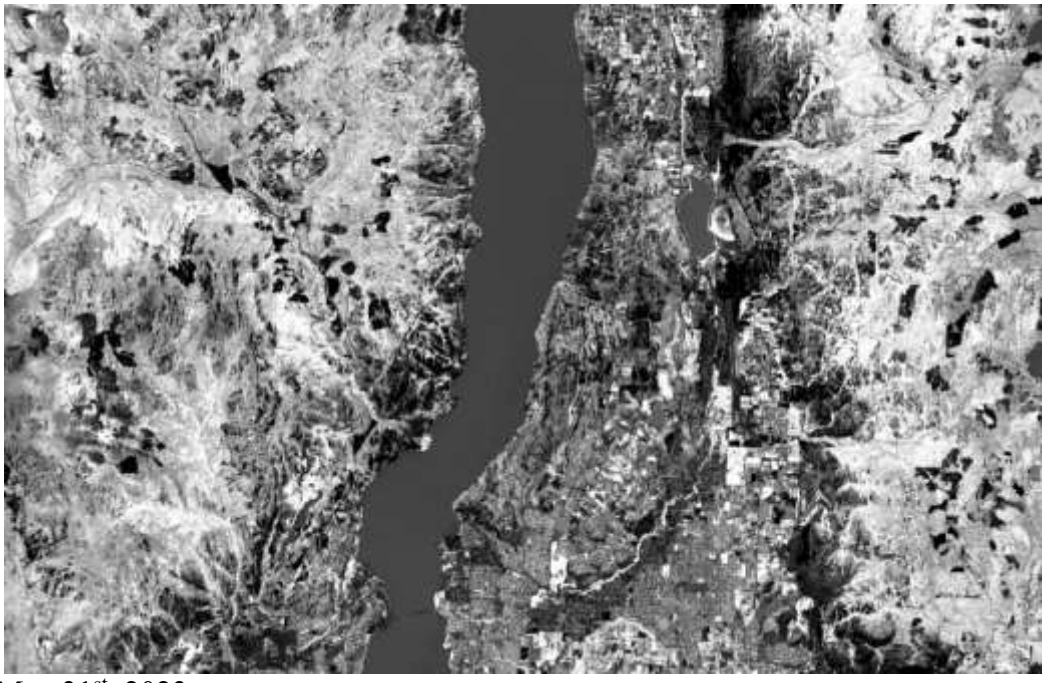
May 31st, 2023

September 19th, 2023

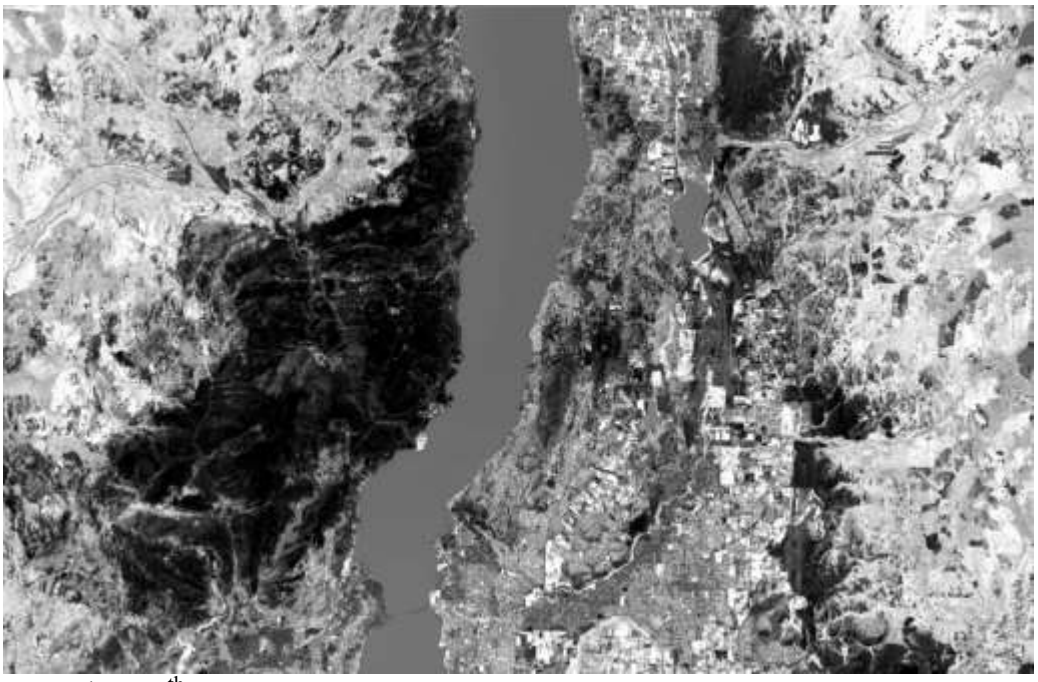
Data Methods and Analysis

To better examine the extent of the wildfire, a few analyses were conducted. Once the location was determined, the Landsat 8/9 images were downloaded. The images were clipped to get a

better overview of the focus area. The normalized burn ratio (NBR) for both May and September was determined by taking (Near-IR – SWIR)/(Near IR + SWIR). Once the NBR was displayed, the dNBR was determined. This was done by subtracting the pre-fire NBR (May) from the post-fire NBR (September) to show the difference in DNs between the two.

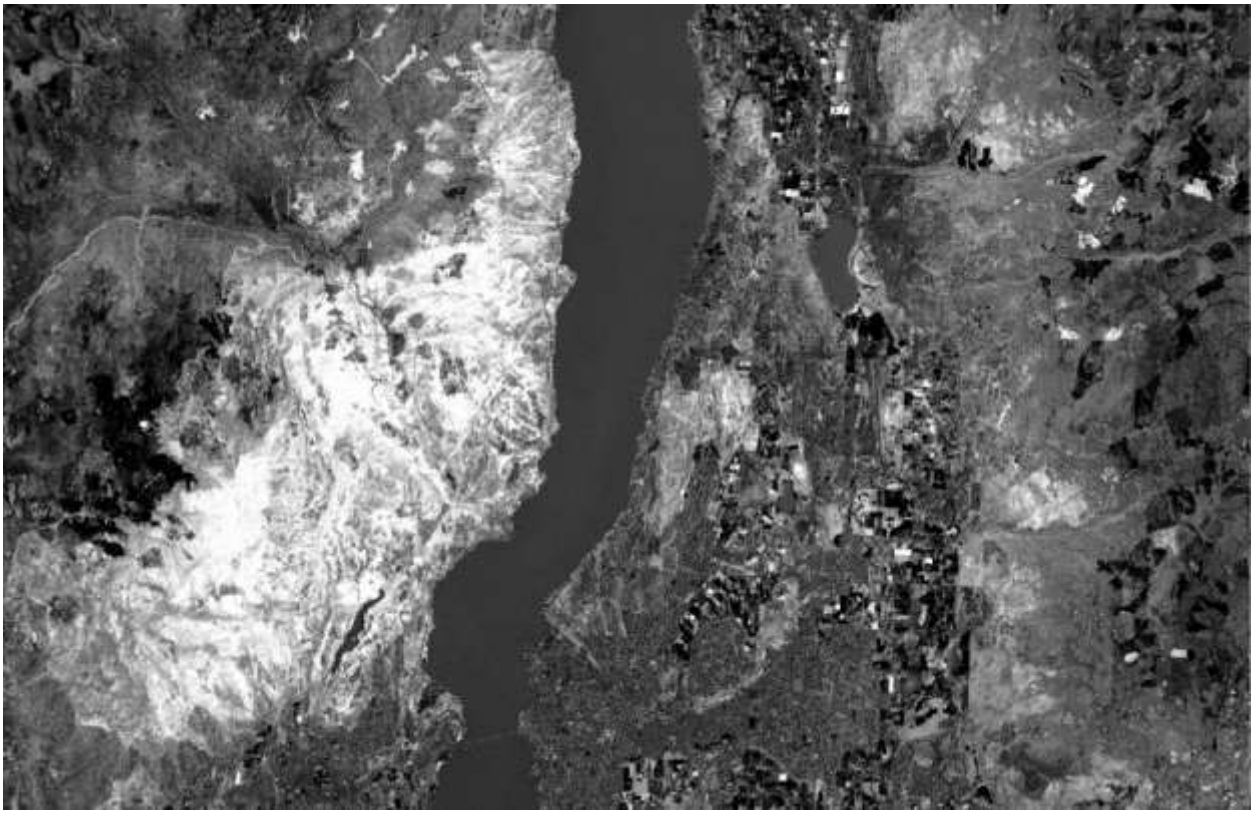


May 31st, 2023



September 19th, 2023

Using the dNBR, a comparison between low, moderate, and high severity burns was conducted. This was done with the threshold tool in algorithm librarian. A table of values was used to separate the DNs into different severity classes. With the threshold classes determined, bit2poly was used to show the outline of the severity classes. The polygon of each severity class was then used to determine the area of the burn classes through the attributes table.



dNBR

Results

The results of the dNBR were beneficial for showing the severity of burns within the wildfires around Kelowna. A table of DN values to differentiate severity was used as a guideline for separation (Wasser & Cattau, 2017). The low, moderate, and high severity was divided with help from the threshold.

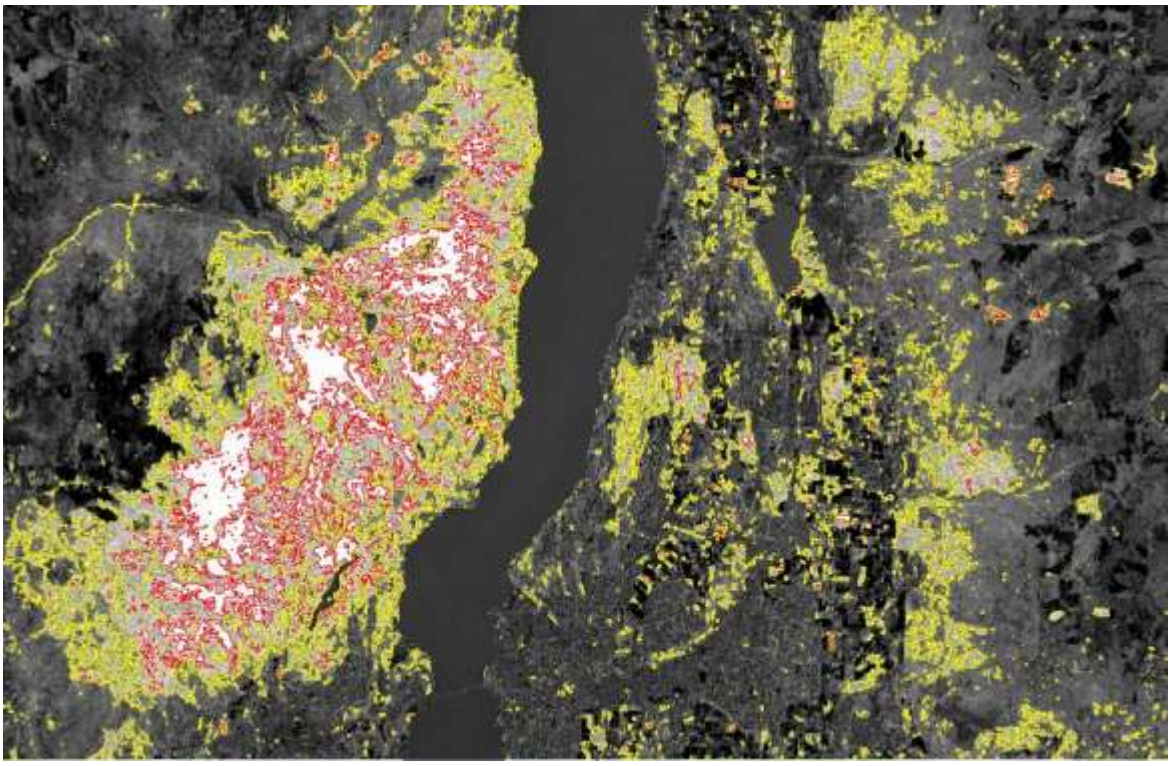
Severity	DN range

Low severity	0.1 – 0.27
Moderate severity	0.27 – 0.66
High severity	0.66 +

With each of the burn classes determined, the bit2poly tool was used to obtain a burn polygon that could assist in determining the area for the various severity. The sum of the area column in the attribute table for each polygon layer.

Severity	Area (ha)
Low severity	10903.58
Moderate severity	3278.08
High severity	0.87
Total	14,182.53

There was less land that fell within the high severity burn except for an area that was too small to see from the overview of the focus area. The high severity burn location was reflective of the smoke found in the September colour composite image. The low severity seemed to capture most of the areas around the fire perimeters, which accurately represents the area at which the fire did not spread. Most of the areas within the fire boundary were classified within the moderate severity classification.



dNBR with Polygon of different burn severity classifications

The main challenge throughout the analysis of the project was trying to keep the focus on just the McDougall Creek fire. Since the whole area was on fire over the summer, it was difficult to contain the results in just a single fire. Other urban structures also appear to be contained within the burn severity classification, as some parts of the bridge are selected. In hindsight, an area that had experienced one big fire as opposed to many fires throughout the season might have been better. Deciding which tools to run was challenging at first, however going through each of the previous labs made the project much clearer. Overall, a greater understanding of how to analyze changes from wildfire using remote sensing was gained and the project became quite fun.

Sources

Wasser, L., & Cattau, M. (2017). Retrieved from https://www.earthdatascience.org/courses/earth-analytics/multispectral-remote-sensing-modis/normalized-burn-index-dNBR/