2018 Forest Fire Burns In Arrow Lakes Watershed

Introduction

Wildfires are common in western watersheds and are a natural form of disturbance in forests. Although low and moderate severity fires can provide long-term benefits to forest and watershed health, high intensity fires can result in significant increases in runoff and erosion which increases the sediment load. This can negatively impact water quality in the streams, lakes and rivers within a watershed. This project focused on the delineation of Arrow Lakes watershed and identifies the extent and severity of forest fire burn areas in 2018.The delineation was created in order to define the study area and to indicate the areas of concern should a water quality issue arise. Forest burn data was used to determine if there were large areas of high severity burns as this could indicate water quality concerns. BEC zones in this basin were used to determine whether vegetation type influenced extent and severity

Problem Statement

What is the extent and severity of forest fire burns in the Arrow Lakes watershed?

Objectives

1) Define the watershed of Arrow Lakes in order to identify forest fire burns that occurred within the basin
2) Organize geospatial data and summarize the extent and severity of forest fire burns
3) Define BEC zones in order to examine whether vegetation type influence forest fire extent and severity

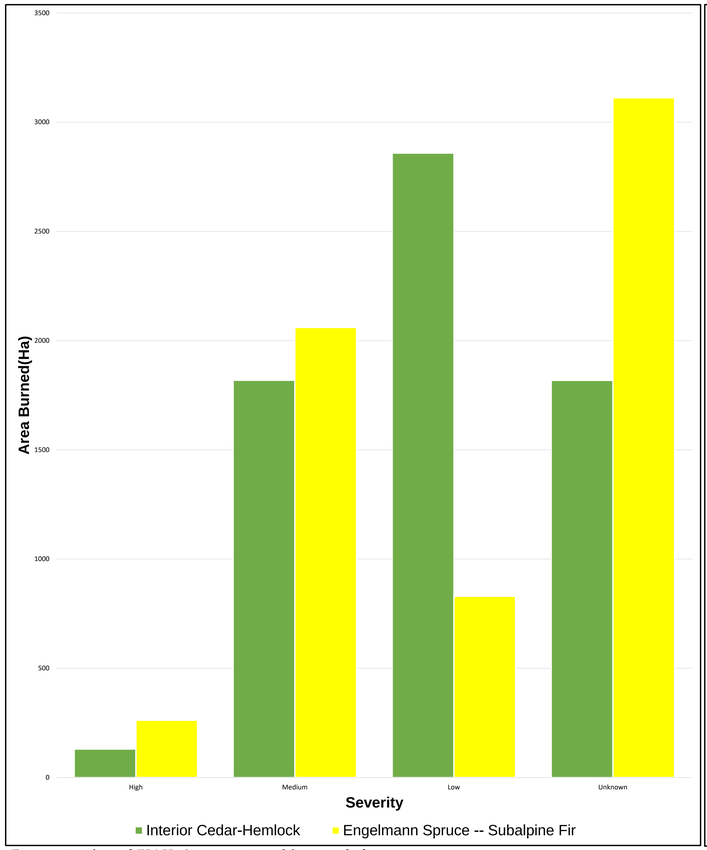

Figure 4. Area burned (Ha) Vs. Severity in Arrow lakes watershed

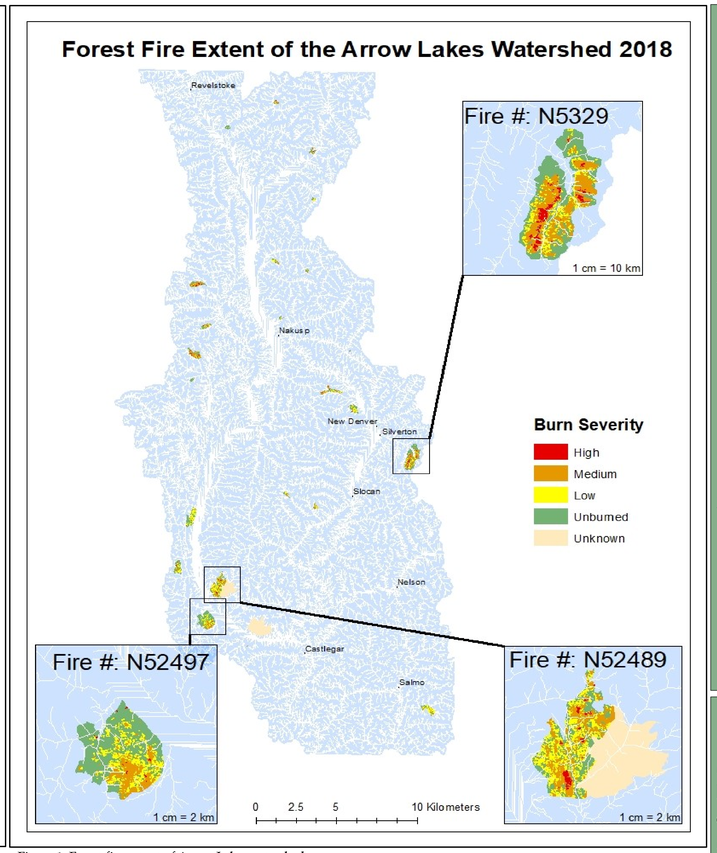

Figure 1. Forest fire extent of Arrow Lakes watershed

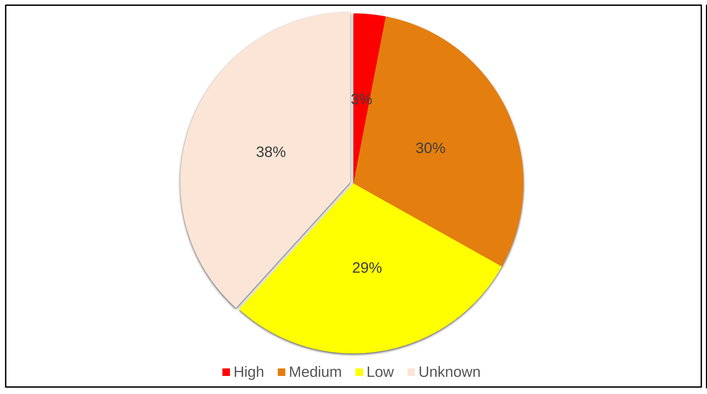

Figure 2. Percentage of area burned in Arrow Lakes watershed

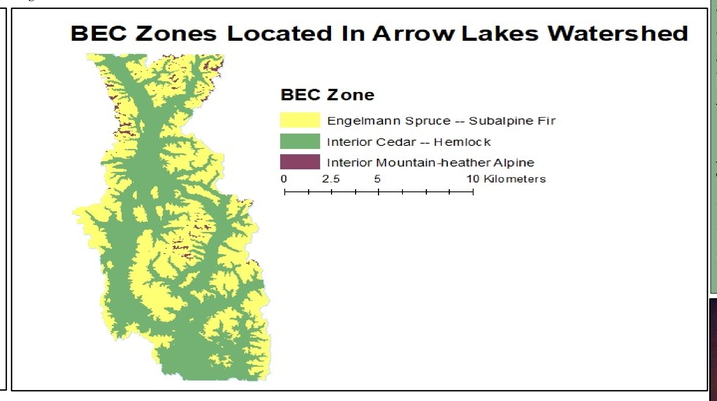

Figure 3. BEC zones located in Arrow Lakes watershed

Results and Discussion

The watershed spans from Revelstoke to the north, Selkirk mountains to the east, south to the southern BC border and west to Monashee mountains. The burn severity is categorized into 5 categories: high, medium, low, unburned and unknown. The extent of the fire burns covers all directions of the watershed (north, east, south and west) in which 128880 Ha were burned . The three largest fire burns were N51329 ,N52489 and N52497. N51329 fire is located south east of Silverton while N52489 and N52497 are located in the southern portion of Arrow Lakes near Castlegar.(figure 1)

Overall the burns were mostly low(29%) to medium(30%) with very few high severity areas(3%). The highest percentage of area burned was defined as unknown severity (38%).This makes it challenging to interpret how severe these fires were and it is recommended that these sites be revisited in the future. The low severity forest burns indicates that there is likely not a concern for high sediment yields.(figure 2) .

The BEC zones found in the basin were Engelmann Spruce-Subalpine Fir(ESSF) , Interior Cedar-Hemlock(ICH), and Interior Mountain-Heather Alpine(IMA). ESSF and ICH dominate and very little IMA can be found in the basin(figure 3)

The graph looks at area burned(Ha) vs. severity in which only BEC zones that had forest fires were included. IMA areas had no forest fires in 2018 and therefore were not included in the analysis. ICH and ESSF had similar total area burned. ESSF had slightly larger total area burned in high and medium severities and a greater unknown severity. ICH had the greatest area burned in the low severity category. Overall there are no significant patterns to determine whether vegetation influences the extent and severity of forest fire burns.(figure 4)

Recommended Further Research

Continual pushes to suppress wildfires have resulted in more tree and dead debris on the ground which adds fuel to forest fires. Prescribed fire is one of the most effective tools in preventing wildfires and managing the intensity and spread of wildfires. If this analysis were to continue, it is recommended that historical prescribed burns and forest fires be identified to indicate how affective this forest management practice is influencing forest fire severity and extent overtime. Although prescribed burns have been implemented in this basin (i.e. Syringa Park), it is recommended that the analysis of this watershed continue, and more forest stands are studied in order to scout stands that may need fire treatment. By doing this, it is likely that there will be improvements in forest management and lower the intensity of forest fires.

Methods

1) *Delineation of watershed*
   - Obtained 2 DEM(digital elevation model) from GéoGratis Mosaic to new raster tool
   - Hydrological toolbox for sink, flow direction, flow accumulation and basin
   - Raster calculations for flow accumulation
     - >500 indicates that each cell of the drainage network has a minimum of 500 contributing cells
   - Raster to polyline(stream formation)

2)Fire burn data
   - New data frame
   - Obtained fire burn data using "same year classification" from BC Data Catalogue
   - Major cities , minor cities and fire burn data were clipped to the delineated watershed
   - Percentage of areas burned were organized based on the severity (high, medium, low, unburned) and compiled into a pie chart in excel

3) BEC zone data
   - New data frame
   - Obtained through Data BC Catalogue
   - Clipped to the delineated watershed
   - Forest burn layer was added
   - Spatial join tool
   - Table and graph were created from the attribute table(burn and BEC zone data)

Limitation and Assumptions

Limitation: "same year classification"

Due to the fact that this data was from 2018, "same year classification" data had to be used for the analysis. This means that imagery was taken immediately post-fire, rather than one growing season later. As a result, two of the largest forest burn areas were classified as unknown because they were available too late in the season for usable burn severity analysis. This limits the analysis because we cannot determine how severe these two fires were and whether there are water quality concerns.

Assumption:

The watershed that I delineated is quite large. I believe this is a result of the raster calculation I created in the stream networks process. If I would have used flow accumulation < 500 I presume there would have been more dense stream networks and more internal watersheds.

Data Sources:
- Data BC Catalogue
- Geogratis

* All maps and graphs created by Katie Swinwood (2019)

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