Wildfire Hazard Assessment

Columbia Shuswap Regional District (CSRD)

INTRODUCTION

Forest fire are common occurrence in British Columbia, especially in the dry interior, although no parts of the province are immune from this hazard. Fire management plans can support wildfire management decisions by identifying the values on the landscape and the objectives of the land manager, including where fire might be wanted and where it is not. This project seeks to highlight the importance of fire management planning because it is neither possible nor desirable to actively suppress every wildfire and knowing where and when fire might be beneficial means that limited suppression resources can be used efficiently.

The study area in this project is Columbia-Shuswap Regional District (CSRD) in British Columbia, Canada. The region had one of British Columbia's worst wildfires, occurred in Salmon Arm in 1998. It damaged over 6,000 hectares, caused the evacuation of approximately 7,000 people, destroyed 40 buildings, and cost over $10 million to extinguish.

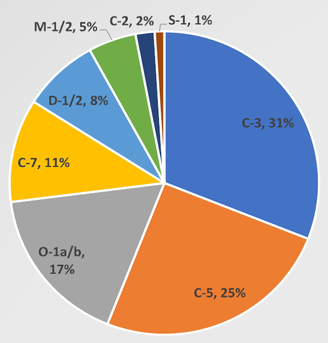
METHODOLOGY

The fire risk map was developed by GIS-based Analytic Hierarchy Process method that spatially quantifies and analyzes the relationships that exist between the critical factors affecting wildfire risk. The overall rating spatially expresses wildfire risk by incorporating four key components as follow:

- Fuel (vegetation) types.
- Risk of Ignition.
- Values at Risk.
- Suppression Constraints.

Component #1 Fuel (vegetation) type :-

Forest vegetation structures considered in this study were tree species and crown closure. According to The Canadian Fire Behavior Prediction System (FPB), the fuel types in the study area were classified into four categories as shown in (Table 1), and the fuel type vector layer was used to generate fuel types raster as shown in (Figure 1).



Factors	Max. Weight per Factor	Classes	Fuel Type -Crown Fire/Spot Potential	Sub. Weight per Class
Fuel Types	10	C1,C2,C4, M3 -M4 (>50% C/DF)	High	10
		C3,C7,M3-M4(<50% C/DF) M1-M2>50% Conifer	Moderate	7
		C5, C6, O1a/b, S1-S3 M1-M2 (26-49% Conifer)	Low	2
		D1,D2,M1-M2 (<26% Conifer)	Very Low	1

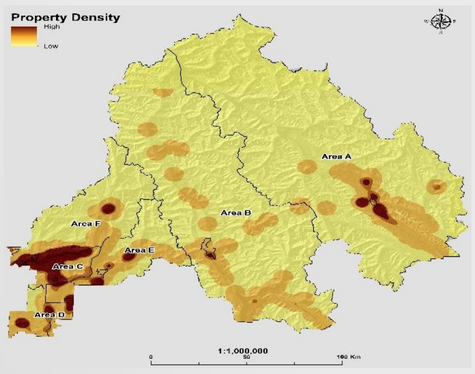
Component #2 Risk of Ignition :-

A 30-meter buffer has been established around populated places, roads, hydro lines, Trails, and railways. Where these areas run through fuel types that are likely to sustain a fire ignition, the area has been assigned a high-risk ranking. Although lightning is the primary cause of fire, it is difficult to predict the risk of the lighting striking across a landscape. Therefore, all fuel types that are likely to sustain a fire ignition have been identified and assigned a moderate risk as shown in (Table 2).

Factors	Max. Weight per Factor	Classes	Fuel Type -Crown Fire/Spot Potential	Sub. Weight per Class
Risk of Human Caused Ignition	13	Areas within 30 meter of (Roads,Trails,Hydro Transmission lines,Railways)	High	13
Risk of Lighting Caused Ignition	7	All fuel types except deciduous or non-fuels (C2,C3,C4,C7,M2)	Moderate	7
		All Deciduous fuels(D1/D2)	Low	2
		All non-fuels (W,N)		0

Component #3 Values at Risk :-

Wildfire result in important economic losses and even threaten human lives. All structures within the wildland interface were identified and multiple buffer zones with 30m, 100m, and 2 km were created around these structures. Weightings were assigned to these buffers as shown in (Table 3).



Factors	Max. Weight per Factor	Classes	Sub. Weight per Class
Threat to Infrastructures	40	Areas within 30 meters of any structures	40
		Areas within 100 meters of any structures	30
		Areas within 2 km of any structures	8

Figure (1) - Fuel Types (Crown Fire/Spot Potential)

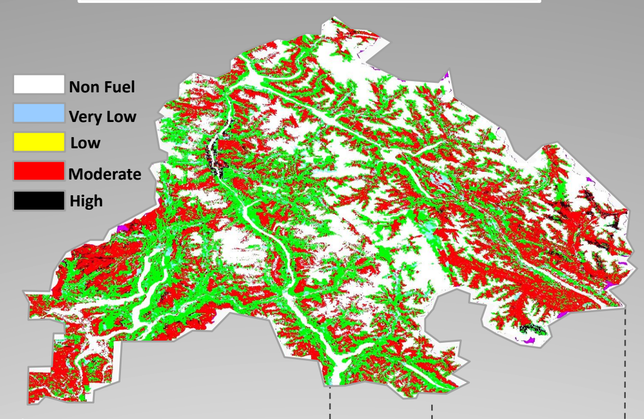


Figure (2) - Risk of Ignition

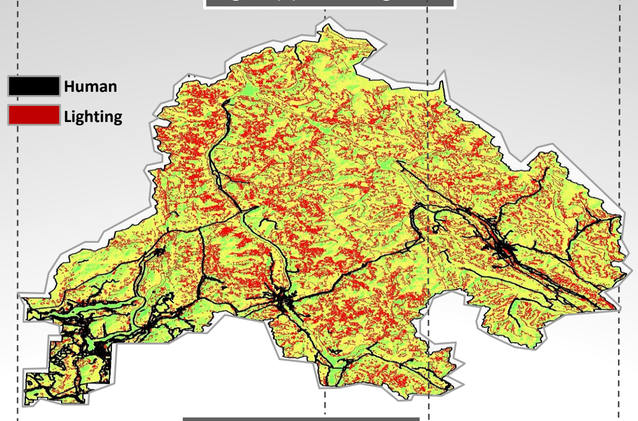


Figure (3) - Values at Risk

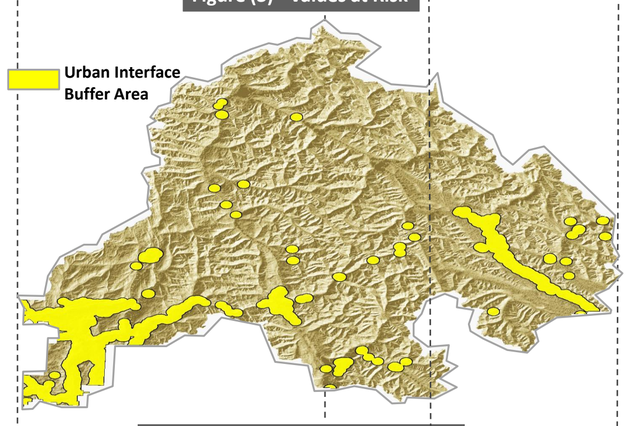
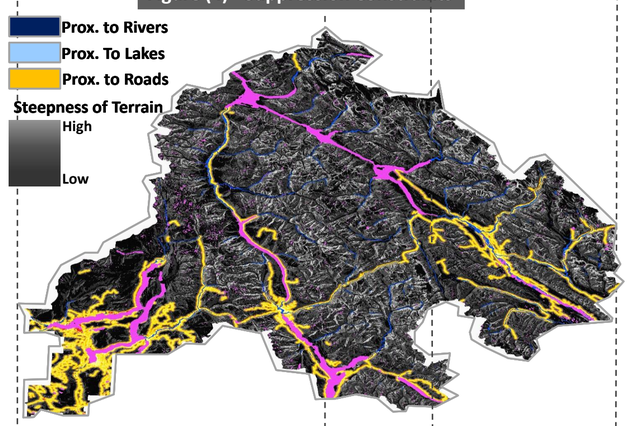
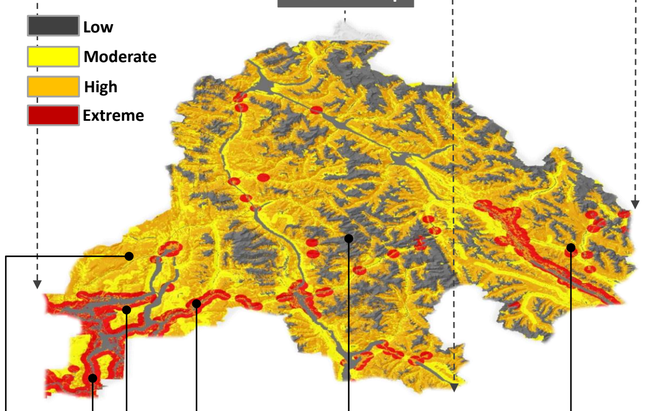
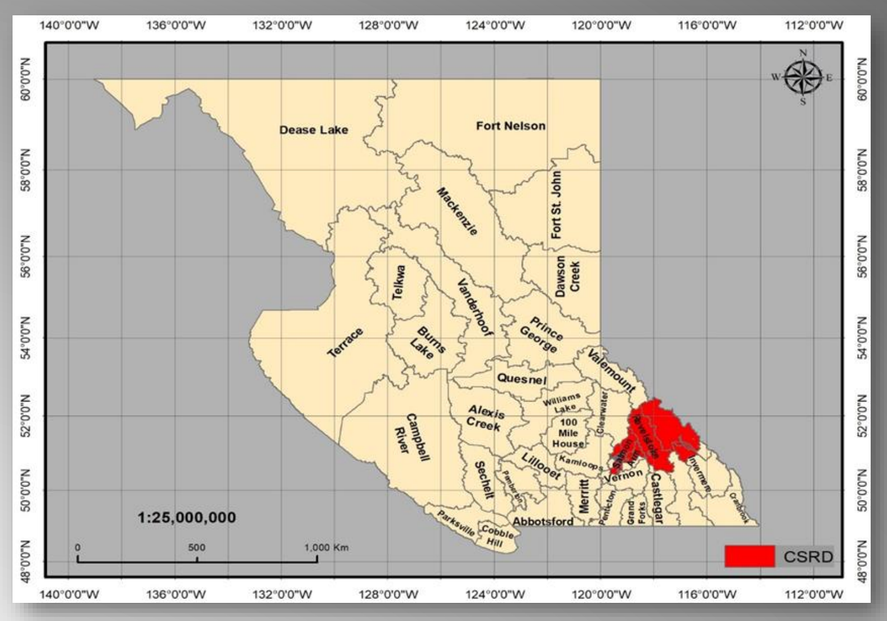


Figure (4) - Suppression Constraints



Fire Risk Map





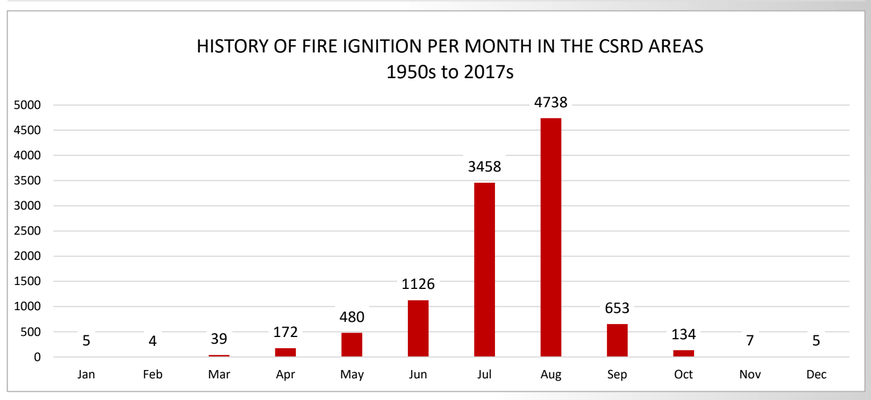
Component #4 Suppression Constraints :-

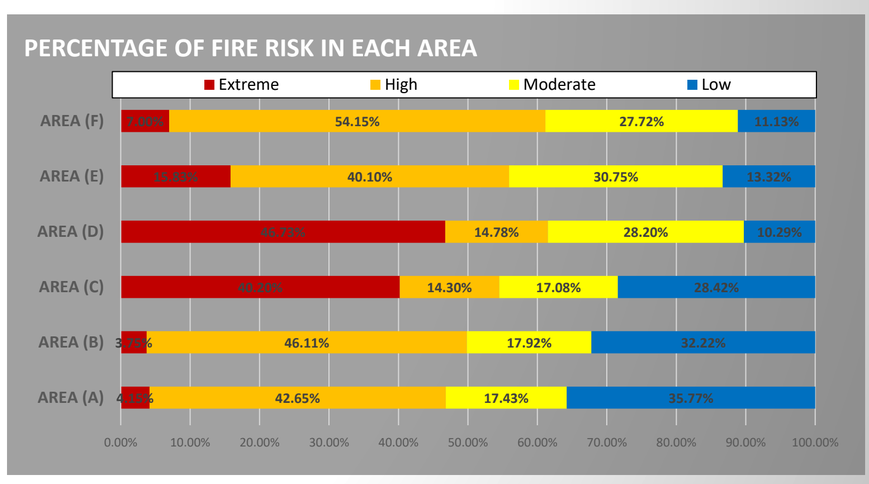
Identifying distance to roads in the area can be useful in locating possible paths used for fire suppression. For this study, multiple buffers with four zones were created starting with 100m, 500m, 1 km , and more than 1 km. The buffers were assigned threat weightings that decreased with their proximity to roads as shown in (Table 4).

Factors	Max. Weight per Factor	Classes	Sub. Weight per Class
Proximity to Roads	10	Distance withing 100 meters	1
		Distance between 101-500 meters	3
		Distance between 501-1000 meters	6
		Distance more than 1 Km	10

CONCLUSION

In this study GIS was used to integrate varying layers of data for use in wildfire hazard assessment modeling. From the total area of 33 km2 included in this study, 0.1 % occurred in areas of extreme hazard, 0.2% occurred in areas of high hazard, 8.11% in medium hazard, 61.32% in low hazard areas, and 30.27% of non-fire areas.

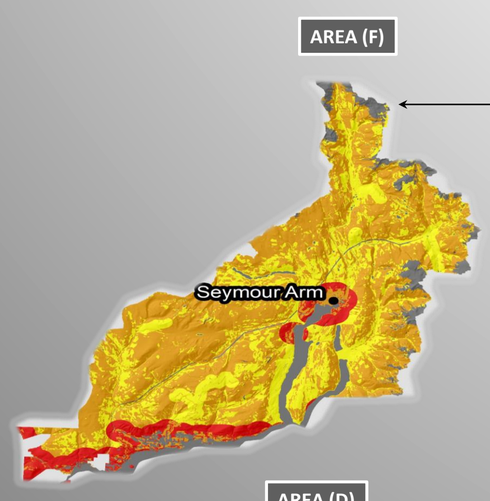




RECOMMENDATION

Possible future studied may include considering adding climatic parameters in developing Wildfire risk map.

AREA (F)



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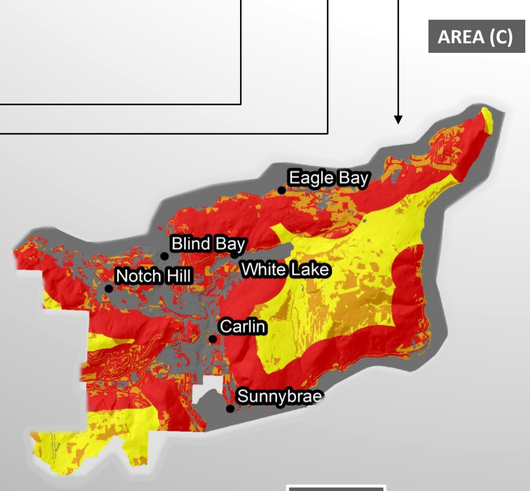

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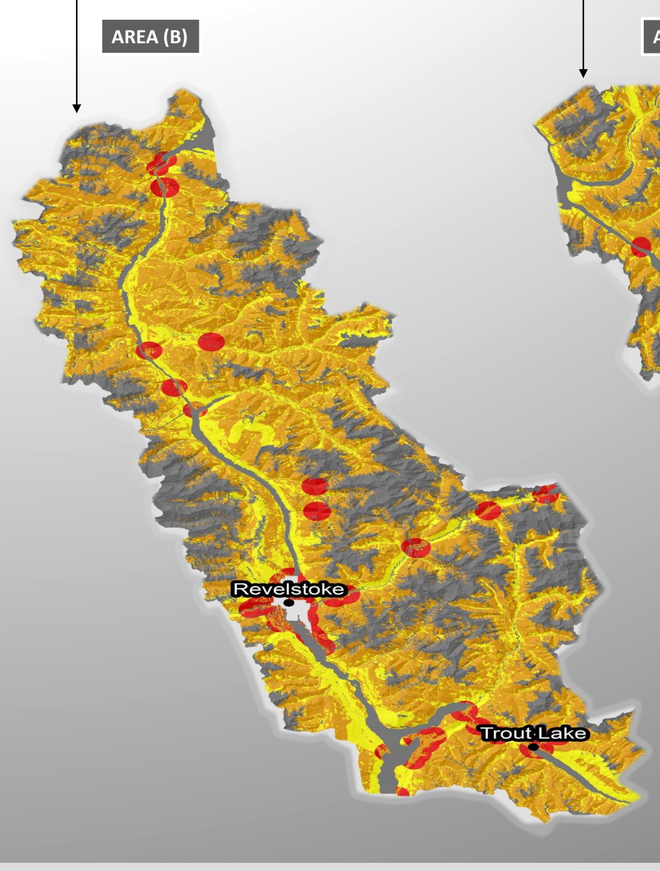
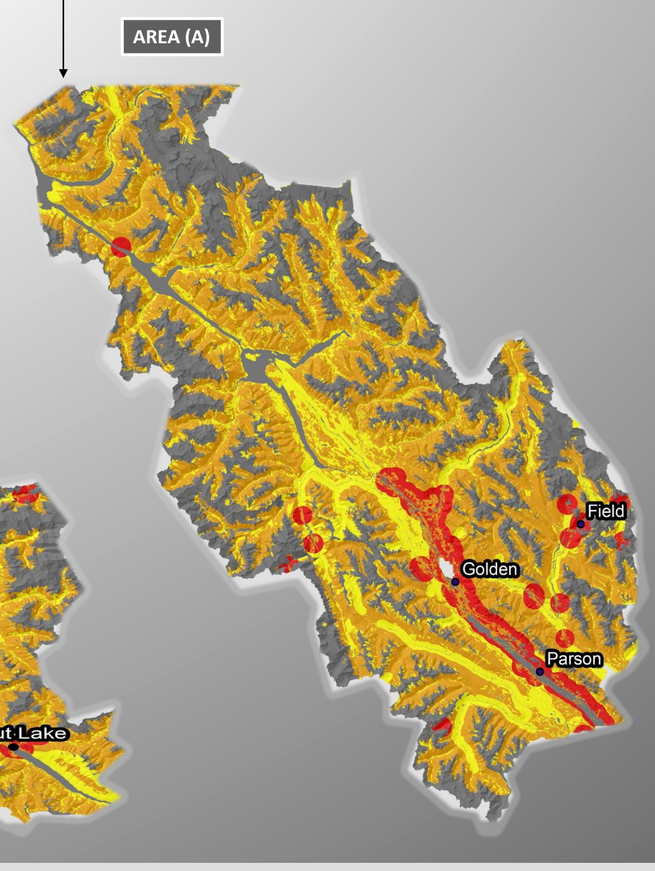
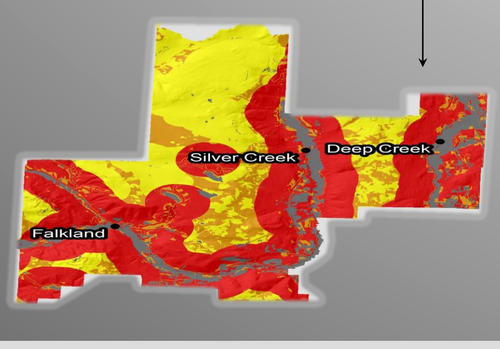


AREA (A)



AREA (D)



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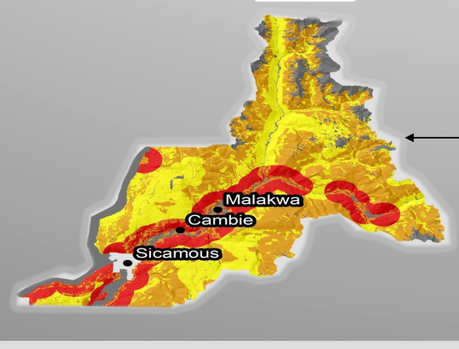

GIS Data Sources:
1) Columbia Shuswap Regional District, 2) DataBC https://data.gov.bc.ca/

Literature Sources:
1) The Canadian Forest Fire Behaviour Prediction (FBP) system. 1996. Taylor, S.W.; Pike, R.G.; Alexander, M.E. First edition. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC. FRDA Handbook 012, copublished by the BC Ministry of Forests

Coordinate System: NAD_1983_UTM_Zone_11N
Projection : Transverse Mercator
Datum : North American 1983
Units : Meters

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