8TH INTERNATIONAL WILDLAND FIRE CONFERENCE

GOVERNANCE PRINCIPLES:

Towards an International Framework

Porto - Portugal | May 16-19th, 2023

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GOVERNANCE PRINCIPLES: Towards an International Framework

Original Paper | Open Access | Published: 22 March 2023

Assessing directional vulnerability to wildfire

Jennifer L. Beverly & Air M. Forbes

Natural Hazards (2023) | Cite this article

UNIVERSITY OF ALBERTA
DEPARTMENT OF RENEWABLE RESOURCES

WILDFIRE ANALYTICS

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Presented May 18, 2023

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Assessing directional vulnerability to wildfire

Implications for community protection planning

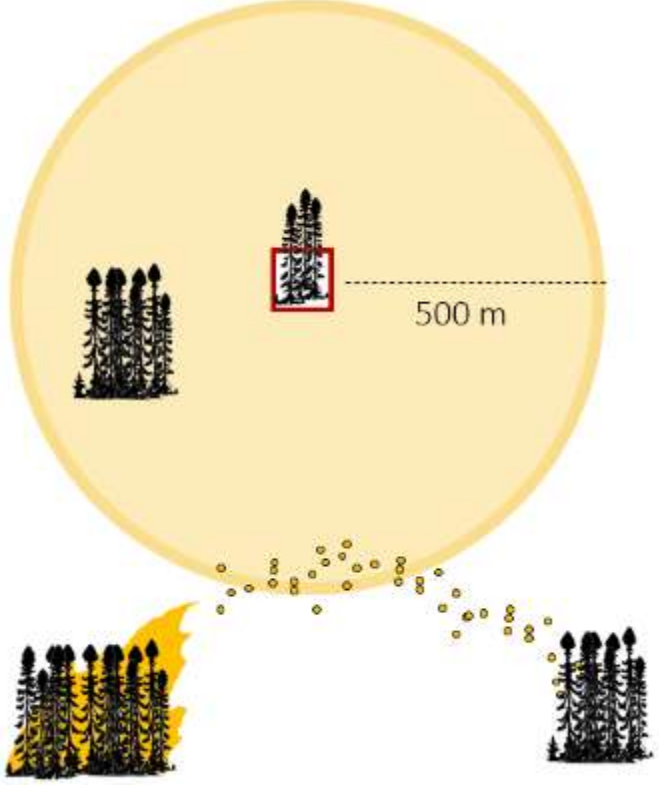
wildfireanalytics.org

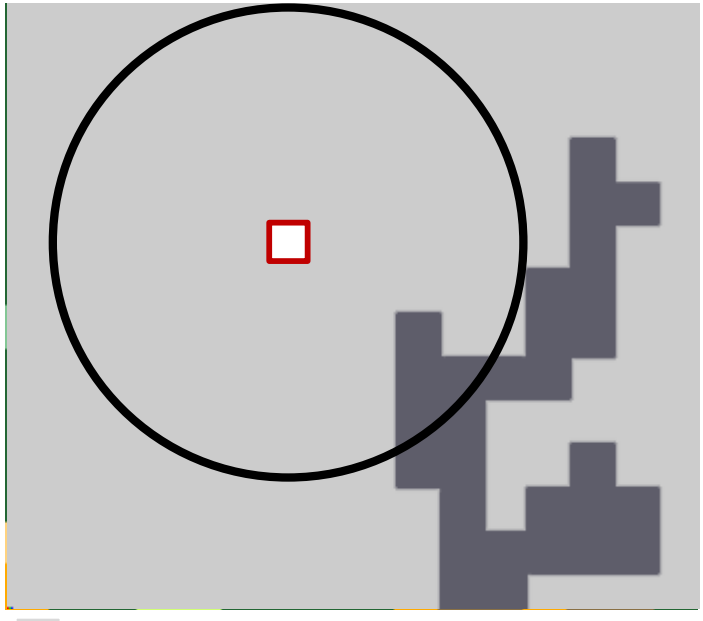
Most landscape fire assessments are complex –

But a fast, simple, cost-effective approach exists

A simple metric of landscape fire exposure developed in Alberta, Canada

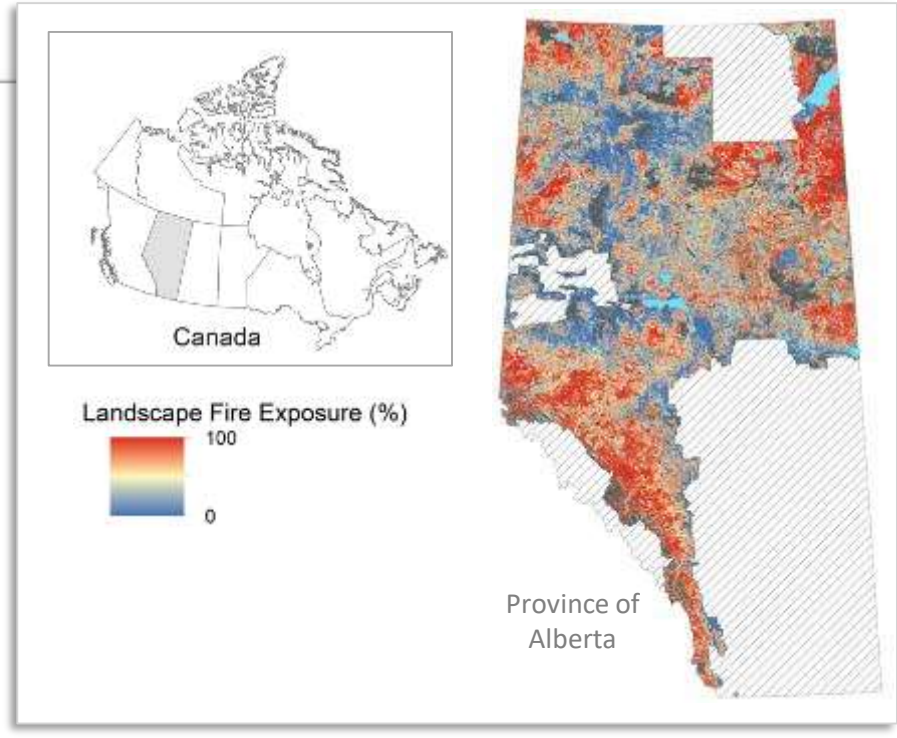
Landscape Ecology 36, 785-801 (2021)





Hazard Fuel (1)

Other land cover types (0)



There are 80 pixels within 500 m – how many can transmit fire to me?

$$\frac{\Sigma \text{ hazard fuel pixels}}{\text{total pixels}} = \frac{75}{80} = 0.94$$

☐ 94% exposure

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In Alberta, Canada, and Portugal – fires burn high exposure areas

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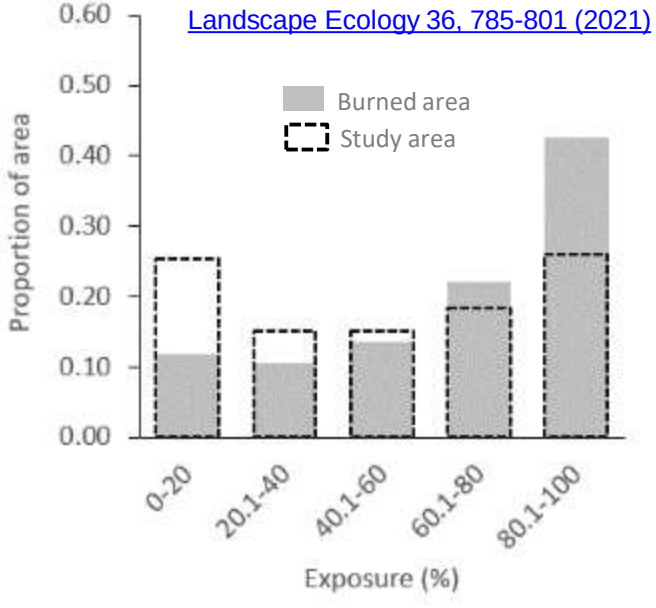
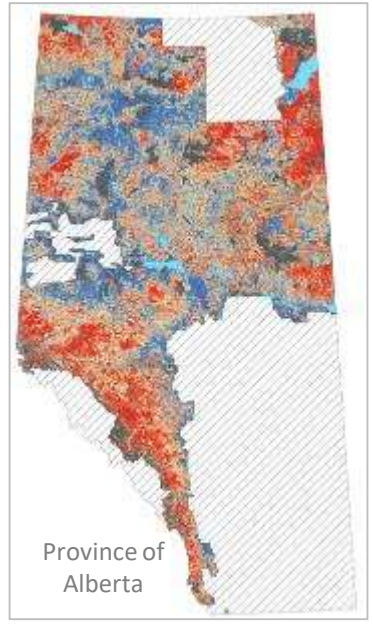
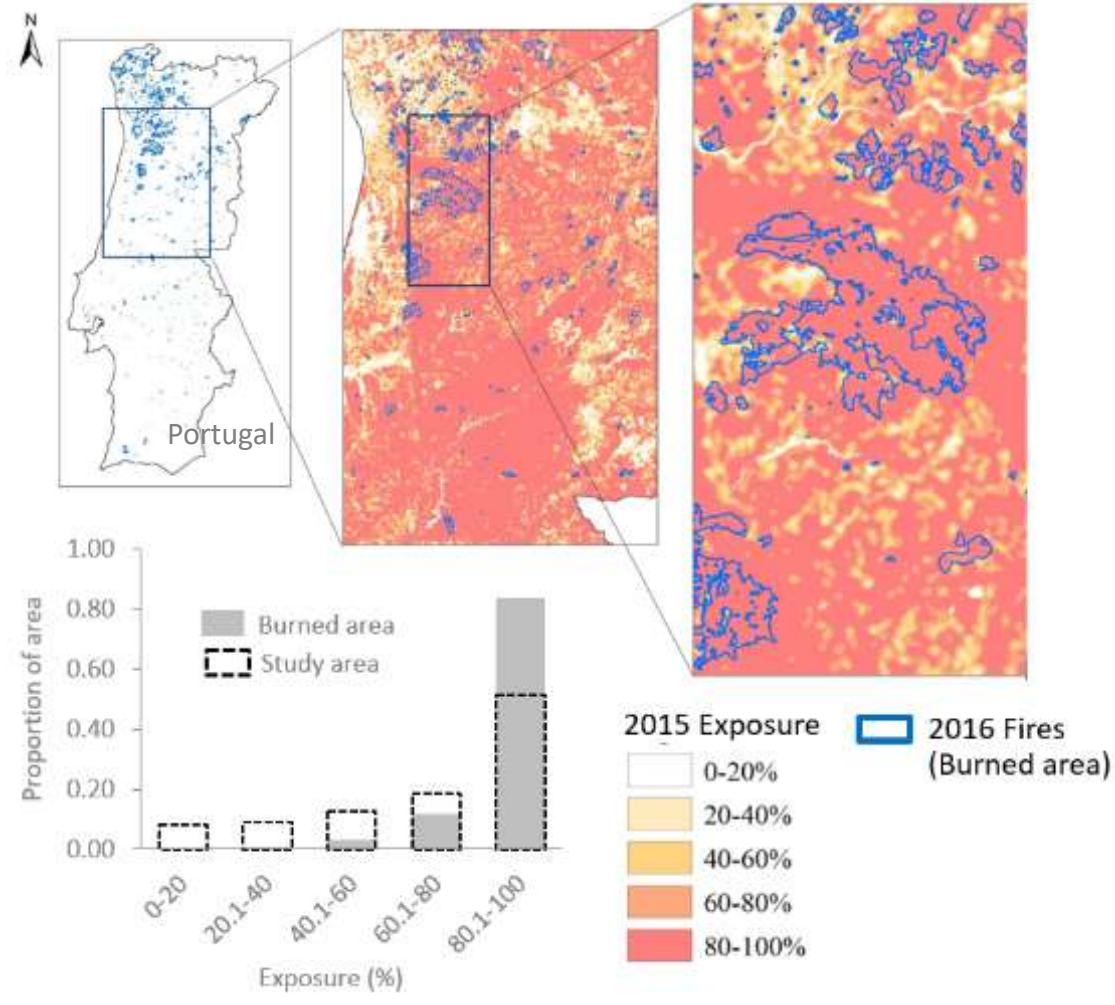
Validating a landscape fuel metric to map exposure to hazardous fuels in Portugal

Sidra Ijaz Khan[1], Ana Catarina Sequeira[1], Conceição Colaço[1], Francisco Castro Rego[1], Jennifer L. Beverly[2],
[1]Center for Applied Ecology (CEABN-INBIO), Instituto Superior de Agronomia (ISA), University of Lisbon, Tapada da Ajuda, Lisboa, Portugal.
[2]Faculty of Agricultural, Life and Environmental Science, Renewable Resources Department, University of Alberta, Edmonton, Alberta, Canada.

- Exposure based on 2007 fuel map
- Checked fires that followed (2007-2019)
- 2,331 fires that burned 2,606,387 ha







Configuration of exposure matters – wildfires travel along wind-driven trajectories

Fire disasters involve strong winds from a set direction, but most landscape fire susceptibility and risk assessments are omnidirectional

Kelowna, British Columbia 2003

60-70 km h^{-1} winds
27,000 evacuated
239 homes destroyed
$200M in damages

Slave Lake, Alberta 2011

80 km h^{-1} winds
7,000 evacuated
480 homes destroyed
$700M insured damages

Fort McMurray, Alberta 2016

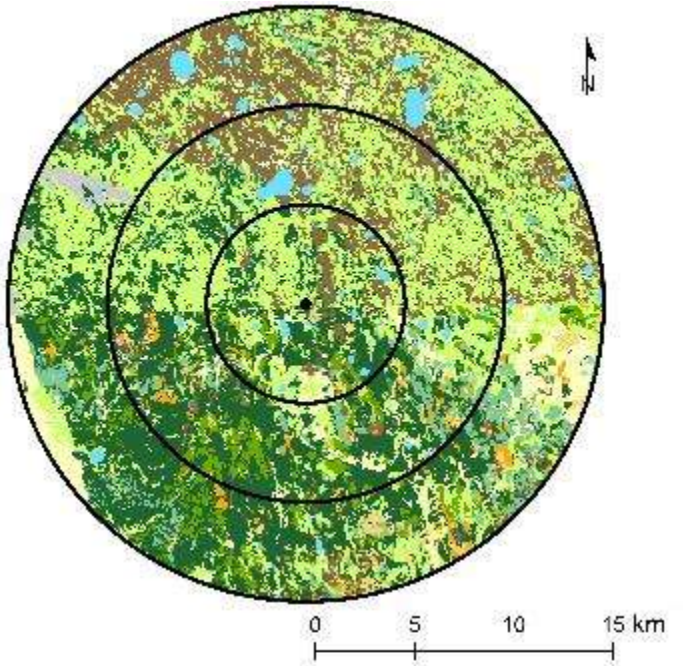
40 km h^{-1} winds
90,000 evacuated
2,500 dwelling units destroyed
$3.6B insured damages

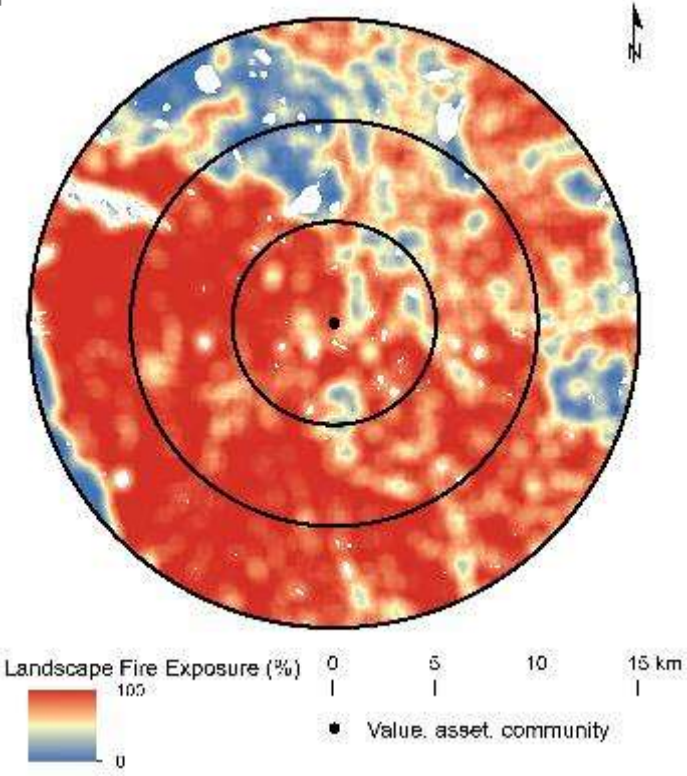
Lytton, British Columbia 2021

35 km h^{-1} winds gusting at 50 km h^{-1} or greater
1,000 evacuated
Village 90% destroyed
$78M insured damages

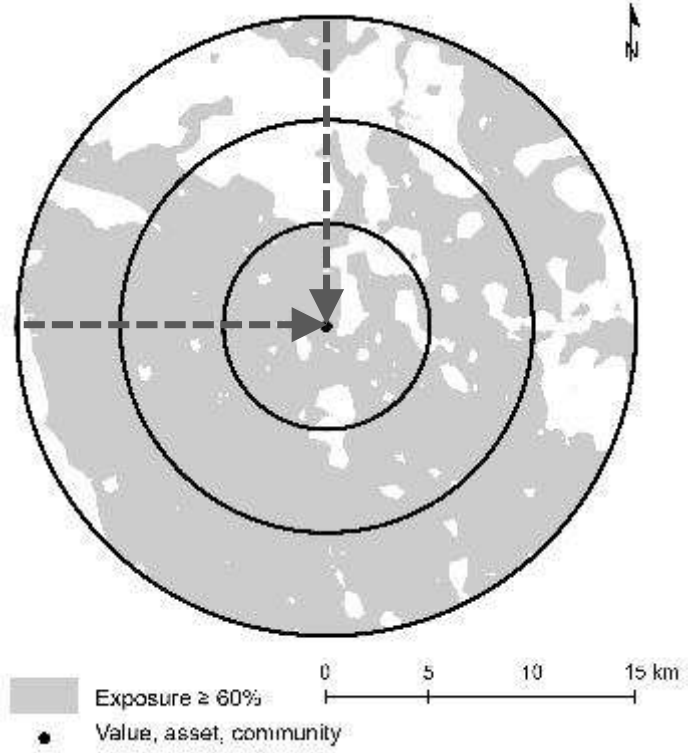
(Photo sources: Andy Clark/Reuters; Town of Slave Lake; Twitter.com/Jerome Garot/EPA; Edith Loring-

Assess configuration of exposure around a locale of interest



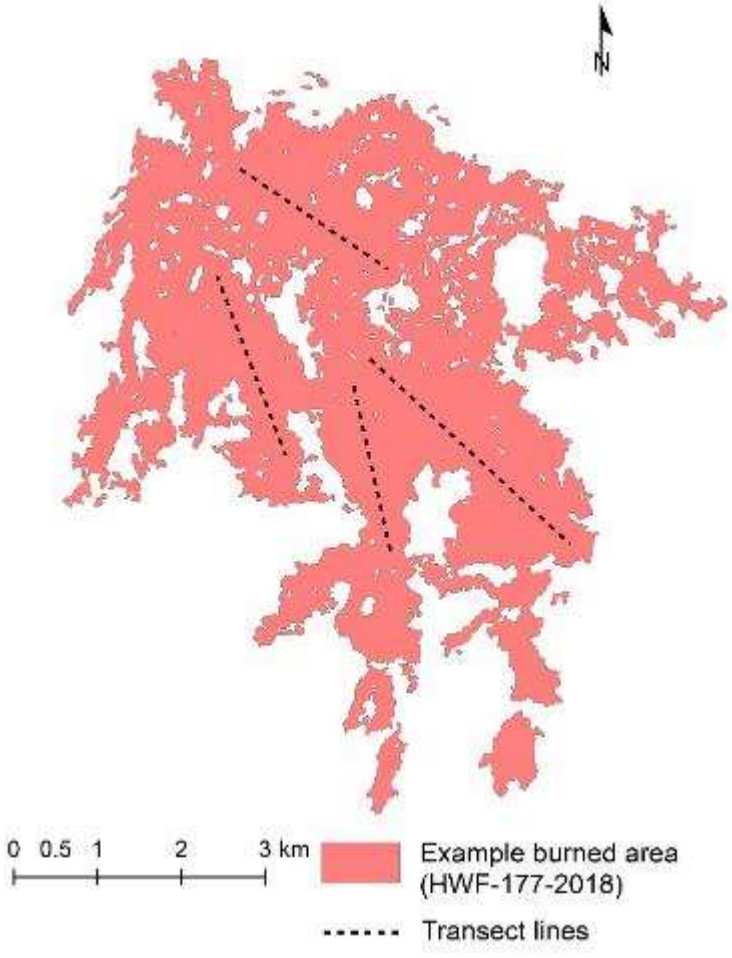


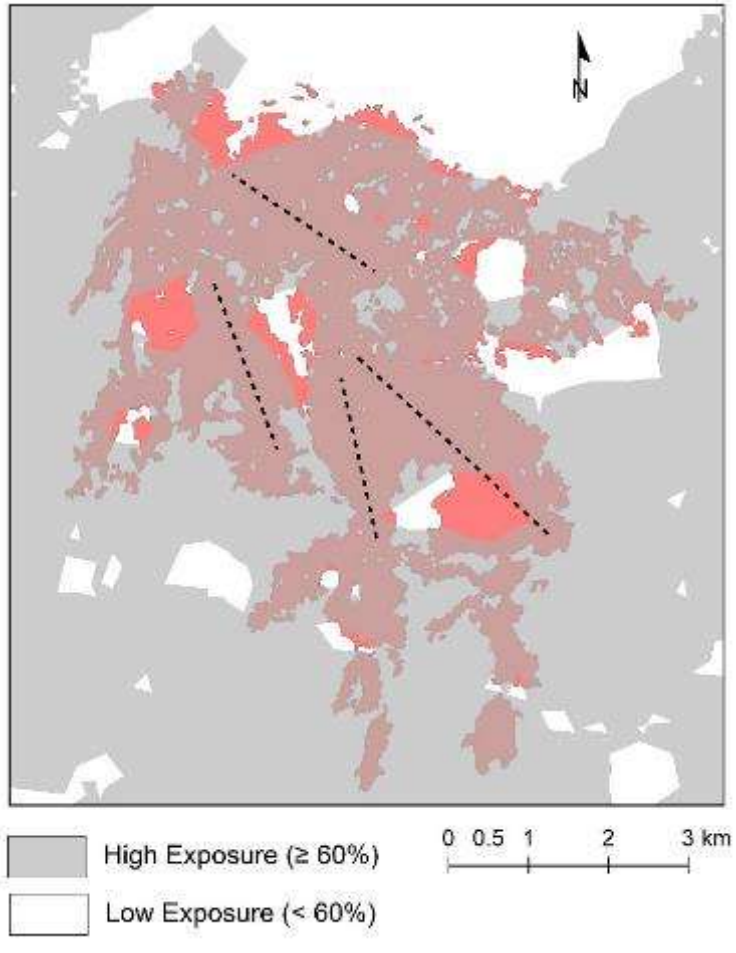
Calculate exposure from fuel layer



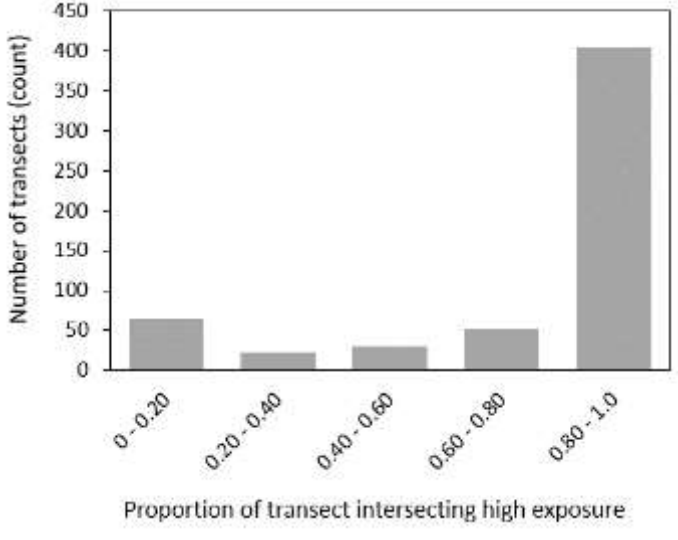
Simplify to map high exposure (≥ 60%)

Check overlap with real fire paths – define “viable” trajectory



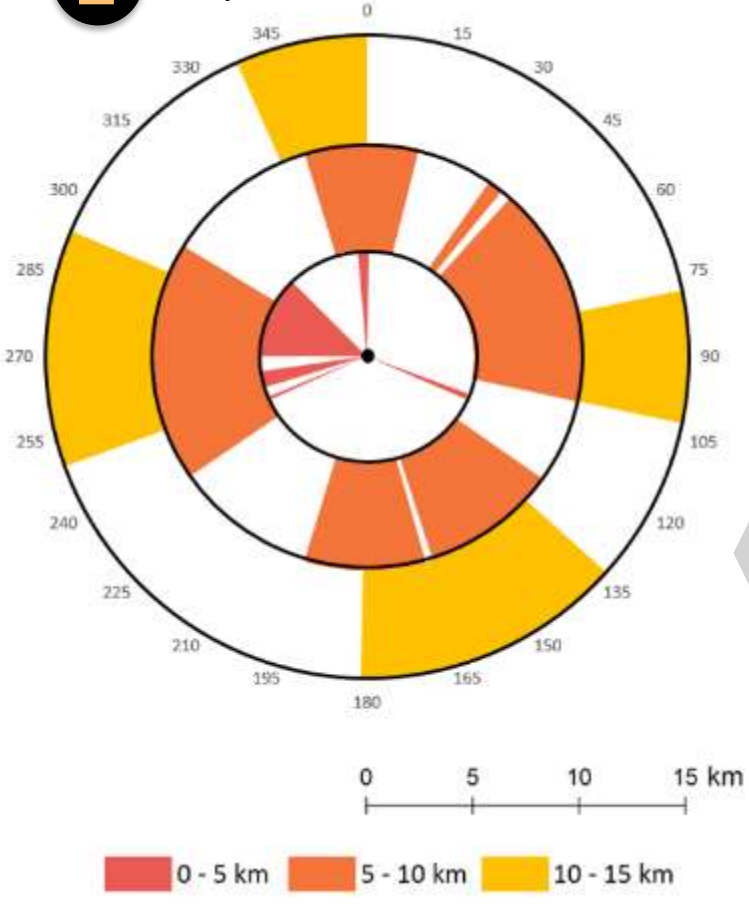


- Sampled 573 trajectories within wildfires
- Average intersection with high exposure = 79%
- Median intersection = 99%
- Viable trajectory defined as “at least 80% intersection with high exposure”

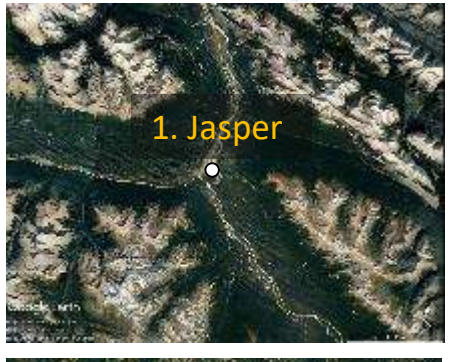


Map viable fire pathways with radial graphs – inform local scenarios, strategies

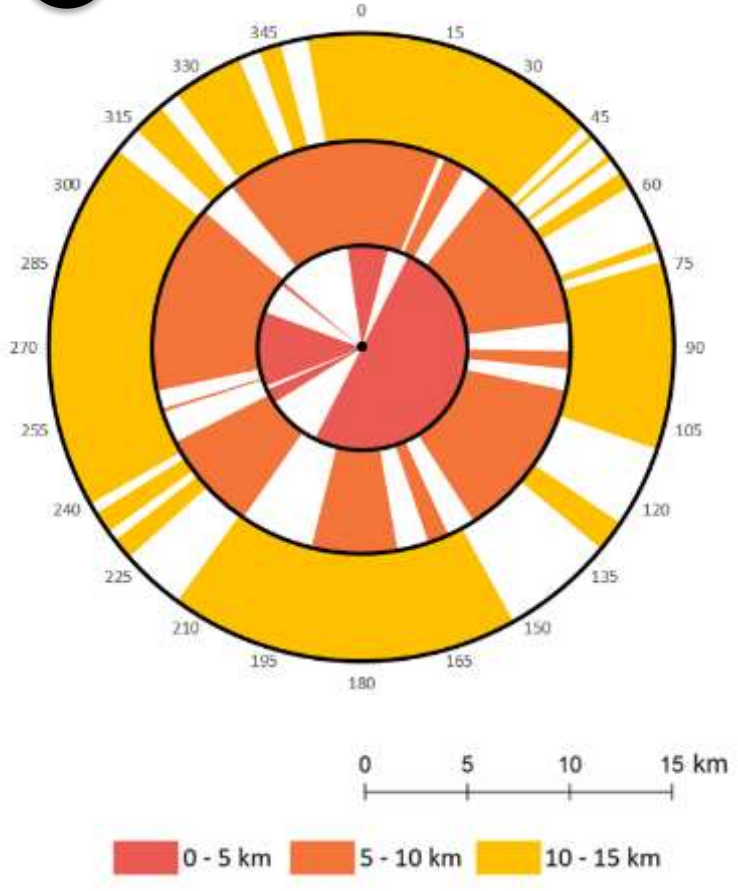
1 Jasper, Alberta



Viable Trajectories



2 Nordegg, Alberta



Viable Trajectories

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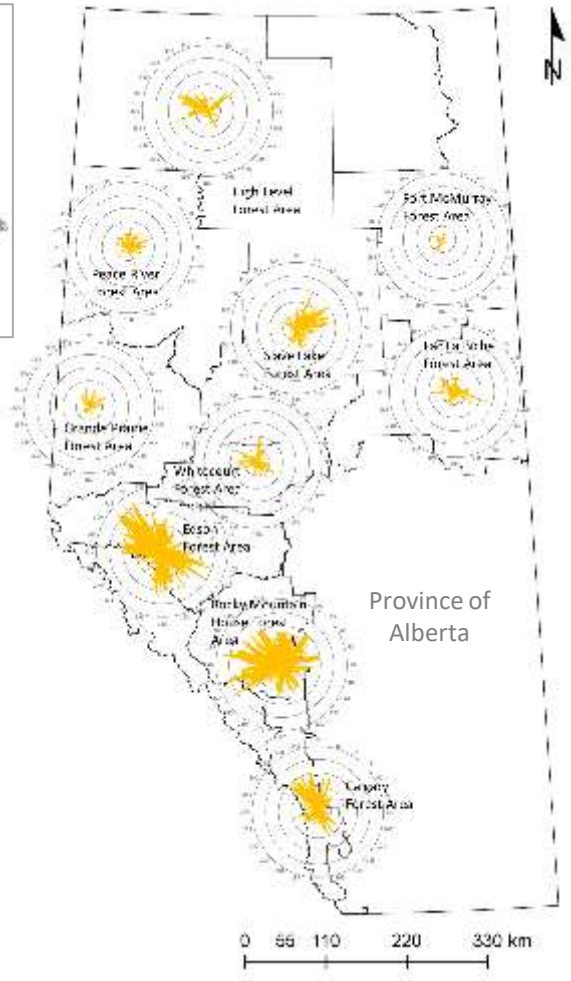
Summary

wildfireanalytics.org

- Map a simple metric of fire exposure based solely on proximity to hazardous fuels
- Define viable fie paths by sampling intersection of past fire trajectories with high exposure areas
- Use radial graphs to map viable trajectories around a point of interest (i.e., community, neighbourhood, asset, infrastructure etc…)
- Summarize for large regions, explore local scenarios, refine analysis
- Prioritize limited suppression resources
- Assess evacuation vulnerabilities
- Plan proactive mitigations (fuel reduction treatments; strategic containment lines)



Yellow shading shows the count of communities in a given Forest Area where the directional trajectory (5-15 km) aligns with high exposure.

Contributors

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WILDFIRE ANALYTICS

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Centro Ecologia Aplicada "Prof. Baeta Neves"

Funding

Alberta Wildfire — Government of Alberta

Forest Resource Improvement Association of Alberta (FRIAA)

Institute for Catastrophic Loss Reduction

NRC — National Research Council of Canada