Trajectories and drivers of landscape change and wildfire over a century in southeastern British Columbia

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Connecting historical & modern fire regimes

Study Area: Southern Rocky Mountain Trench, British Columbia

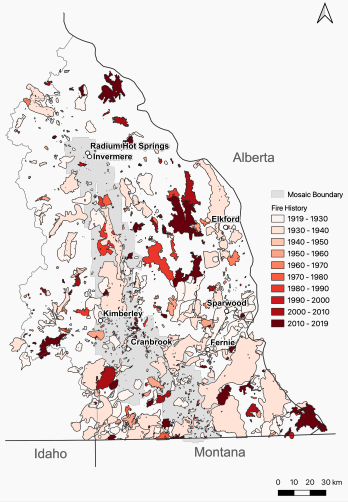
Context:

- Past 100 years marks **transition between historical & modern fire regimes**
- Historical fire regimes heterogeneous, **low- & mixed-severity**, **eco-cultural fire** & traditional burning
- **New era of wildfire**: Intense and frequent fire events, longer fire seasons, extreme fire weather conditions

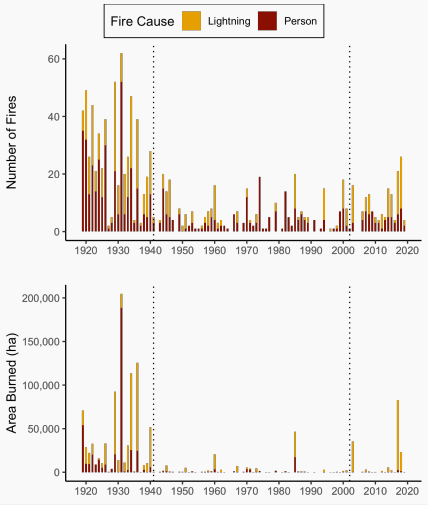
Objectives:

1. Map shifting fire regimes & identify key transitions
2. Quantify landscape change since 1950 & relate to fuels
3. Simulate fire under historical, modern, future conditions

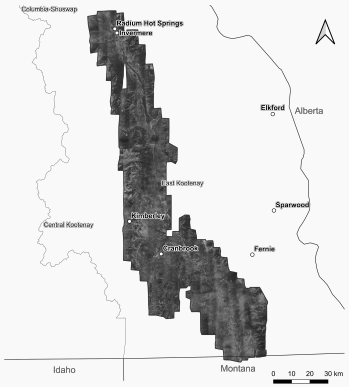
1. Fire perimeters: A century of fire suppression & altered fire regimes



- **Map a century of historical fire perimeters (1919–2019)** using BC Wildfire Service data
- Identify and illustrate phases & trajectories of wildfire
- Quantify **temporal dynamics in fire frequency, area burned, size, seasonality, cause**
- Phases of fire associated with shifting periods of fire suppression, industrial forestry, agriculture, urbanization, climate change



2. Aerial imagery: Highly modified landscape & shifting fuels



- Classify **historical (1950–1951) & modern (2016) orthorectified air photo mosaics** (625,000 ha) using multiscale object-based classification
- Relate landscape change to **Canadian Fire Behaviour Prediction System fuel types** (Table 1)
- Quantify landscape change and key indicators of homogenization
- Test for relationships with **topographic, biogeoclimatic, spatial drivers**

Table 1. Classification scheme and translation to Canadian Fire Behaviour Prediction System fuel types (Forestry Canada Fire Danger Group 1992, Taylor et al. 1998).

Cover class	Crown closure	FBP System fuel type
Dense forest	> 55%	C-4 Immature jack or lodgepole pine
Closed forest	41–55%	C-3 Mature jack or lodgepole pine
Open forest	16–40%	C-7 Ponderosa pine – Douglas fir
Treed grassland	6–15%	O-1B Standing dead grass
Grassland	0-5%	O-1B Standing dead grass
Agriculture	0%	NA
Urban	NA	NA

3. Simulation modelling: Fuels, climate, management scenarios

- Apply a **landscape-level wildfire simulation model** using historical data
- Account for partial mortality fire events & mixed-severity fire regimes, fire suppression, complex fuels and topography
- Represent **historical, modern, future fire regimes** using different **fuels, climate, management scenarios**
- Implications for management, conservation & restoration decisions **shaping next 100 years of wildfire**

References

Forestry Canada Fire Danger Group. (1992). *Development and structure of the Canadian Forest Fire Behavior Prediction System.*

Taylor, S. W., et al. (1998). *Modeling the effects of forest succession on fire behavior potential in southeastern British Columbia.*