# *Eco-Anthromes: Mapping unique ecosystems and anthropogenic disturbance in the Yellowhead*

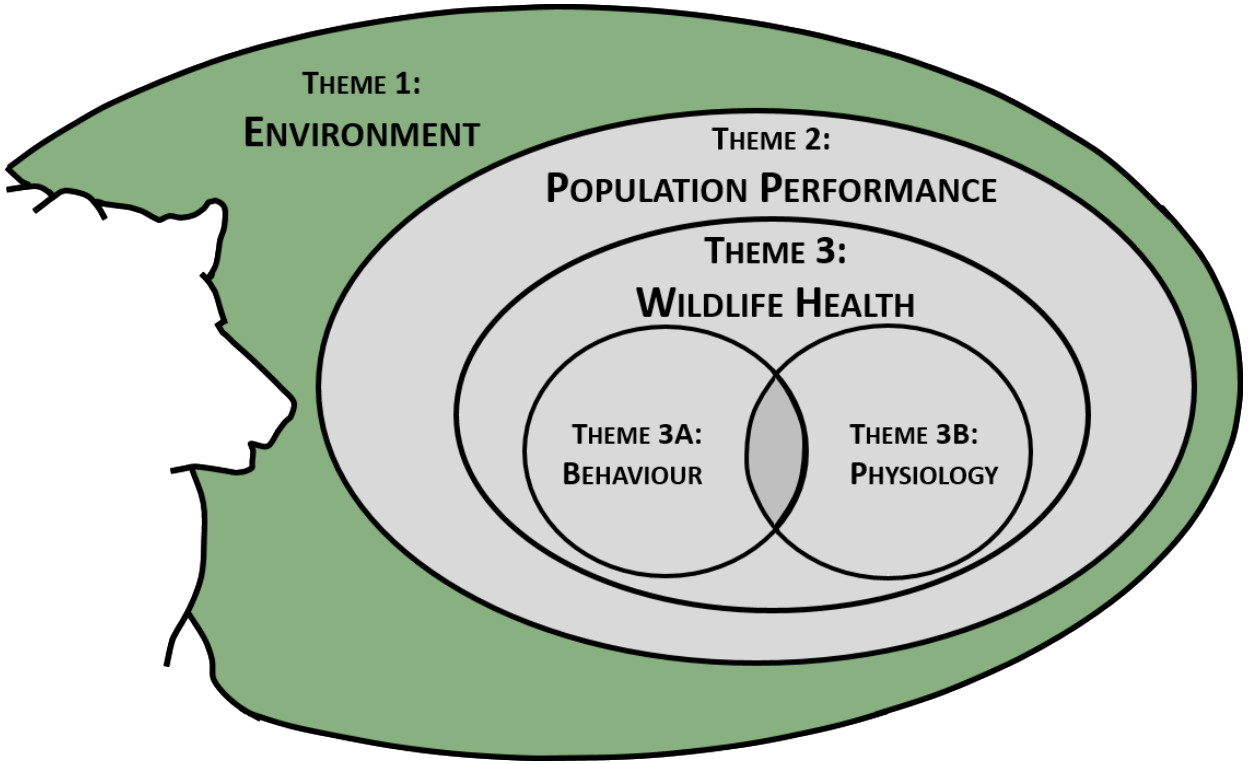

presented by

Sean Patrick Kearney


forestry
university of british columbia

Integrated Remote Sensing Studio

NSERC CRSNG




# Research question

Q1.1 What are the temporal and spatial dynamics of fine-scale anthropogenic and non-anthropogenic disturbances over the Yellowhead management area and can they be characterized across the region?

# First steps: mapping ‘Eco-Anthromes’

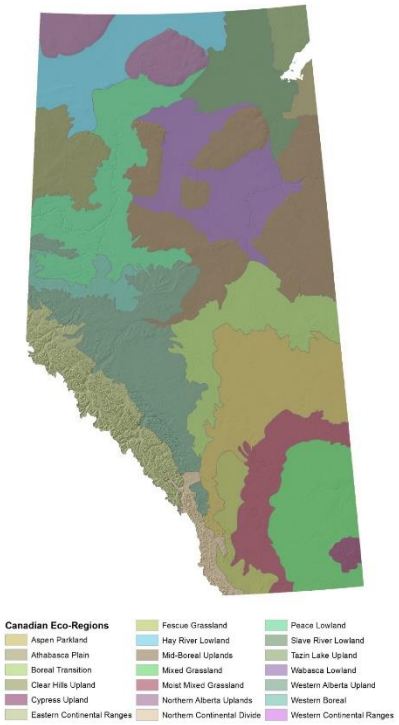
How do ecological and anthropogenic factors interact to influence bear health and behaviour?

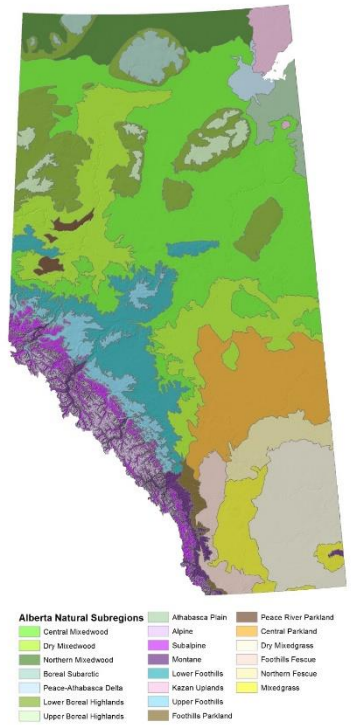
Have changing landscape conditions (natural and anthropogenic change) and structural configuration influenced the region’s grizzly bear population?

Have road density threshold approaches to landscape management influenced the abundance and distribution of grizzly bears?

# Mapping ecological regions

Goal: To identify unique areas with similar capacities to support ecosystem health and function




**Temperature**

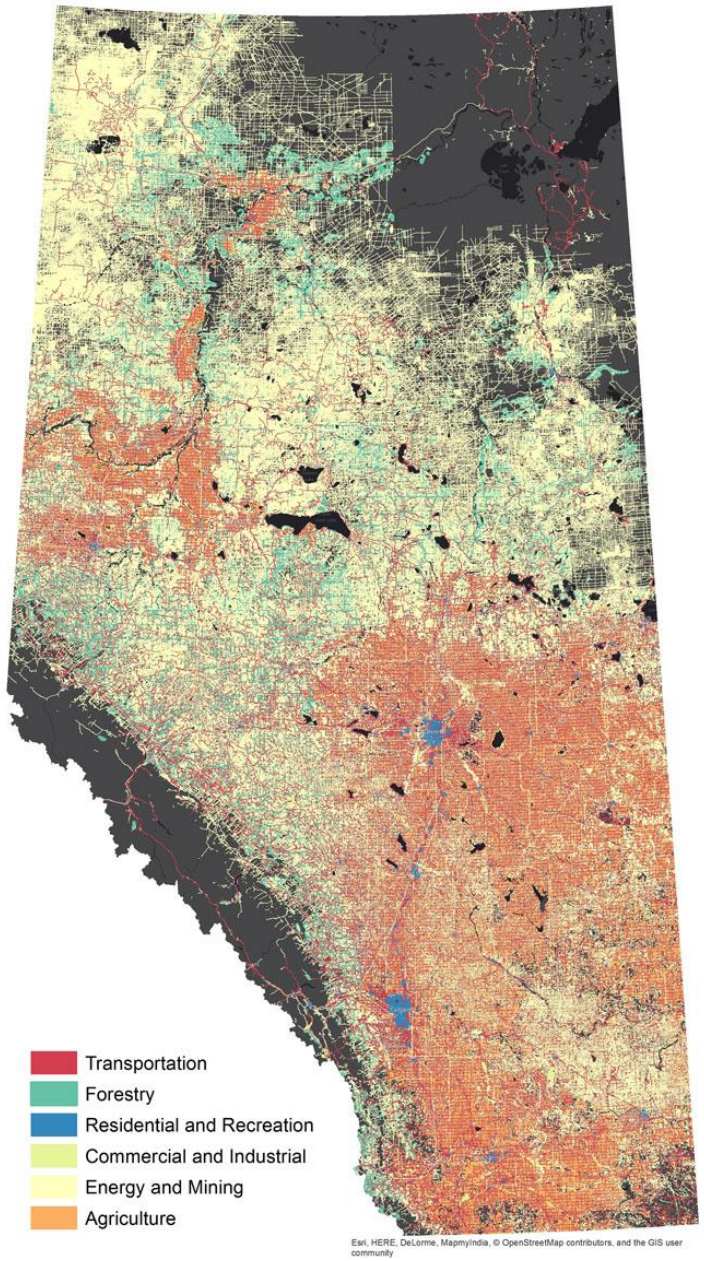
**Precipitation**

**Growing season (DD > 5)**

# **Eco-Anthromes:** a complementary approach

*People have emerged as a force of nature, rivaling climatic and geologic forces in shaping the earth and it's processes.*

-Ellis and Ramankutty (2008)




Source: ABMI Wall-to-Wall Human Footprint Inventory (scale 1:15,000)

# What we hope to achieve…

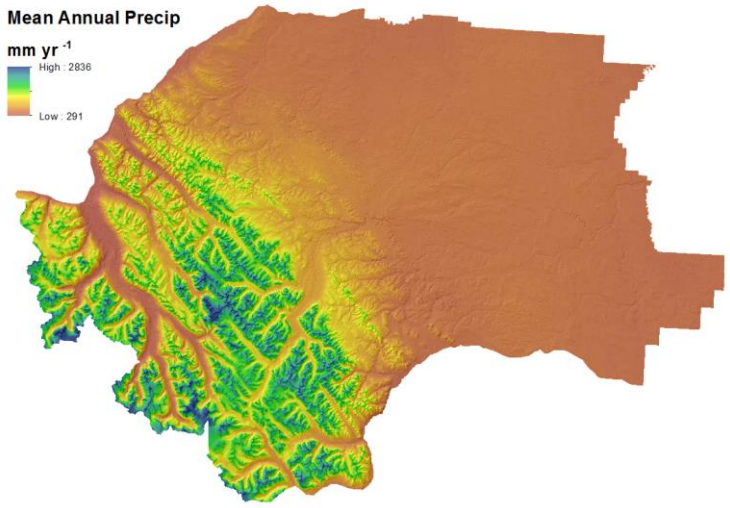
## An Eco-Anthrome mapping approach will:

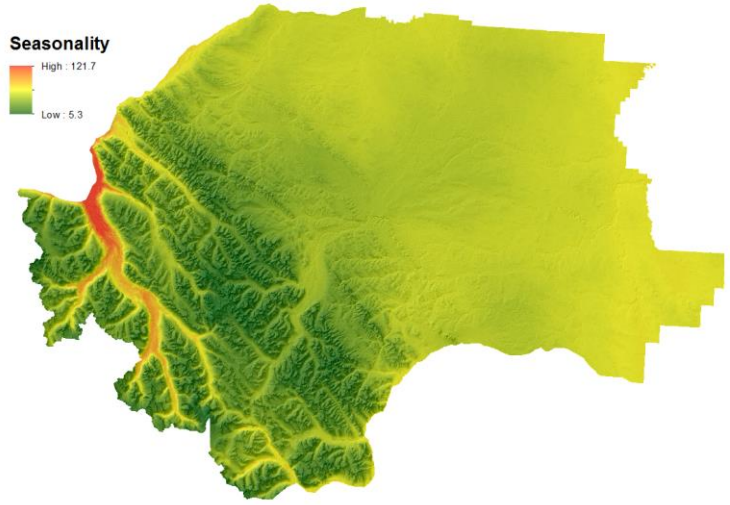
- include the extent and cumulative impacts of human activity
- be quantitative, reproducible and adaptable (using statistical clustering)
- help identify new and novel ecological potentials (e.g., managed vs. natural disturbances)

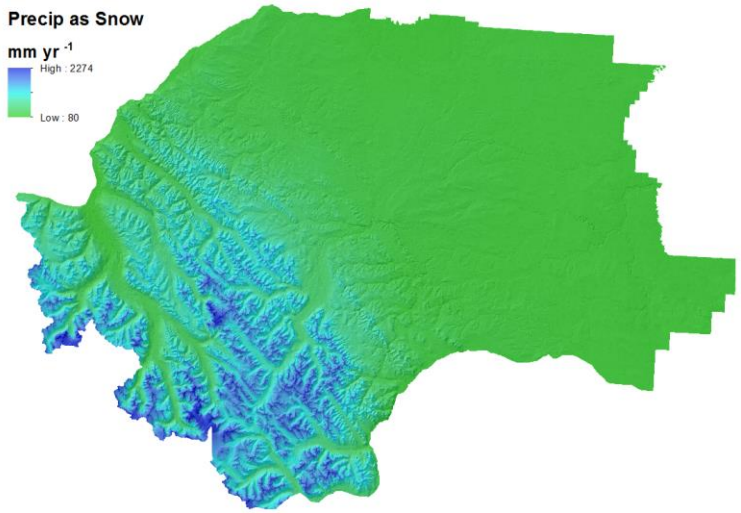
# Mapping Eco-Anthromes in the Yellowhead

| Variable | Interpretation | Source |
|---|---|---|
| **CLIMATE** | | |
| Mean annual precipitation (mm) | general rainfall | Climate NA |
| Mean annual temperature (°C) | general temperature | Climate NA |
| Temp difference from mean warmest and coldest months (°C) | seasonality | Climate NA |
| Summer heat : moisture index | productivity potential | Climate NA |
| Growing degree-days (°C × days > 5°C) | length of growing season | Climate NA |
| Chilling degree-days °C × days < 0°C) | chilling impact | Climate NA |
| Precipitation as snow (mm) | snow cover | Climate NA |

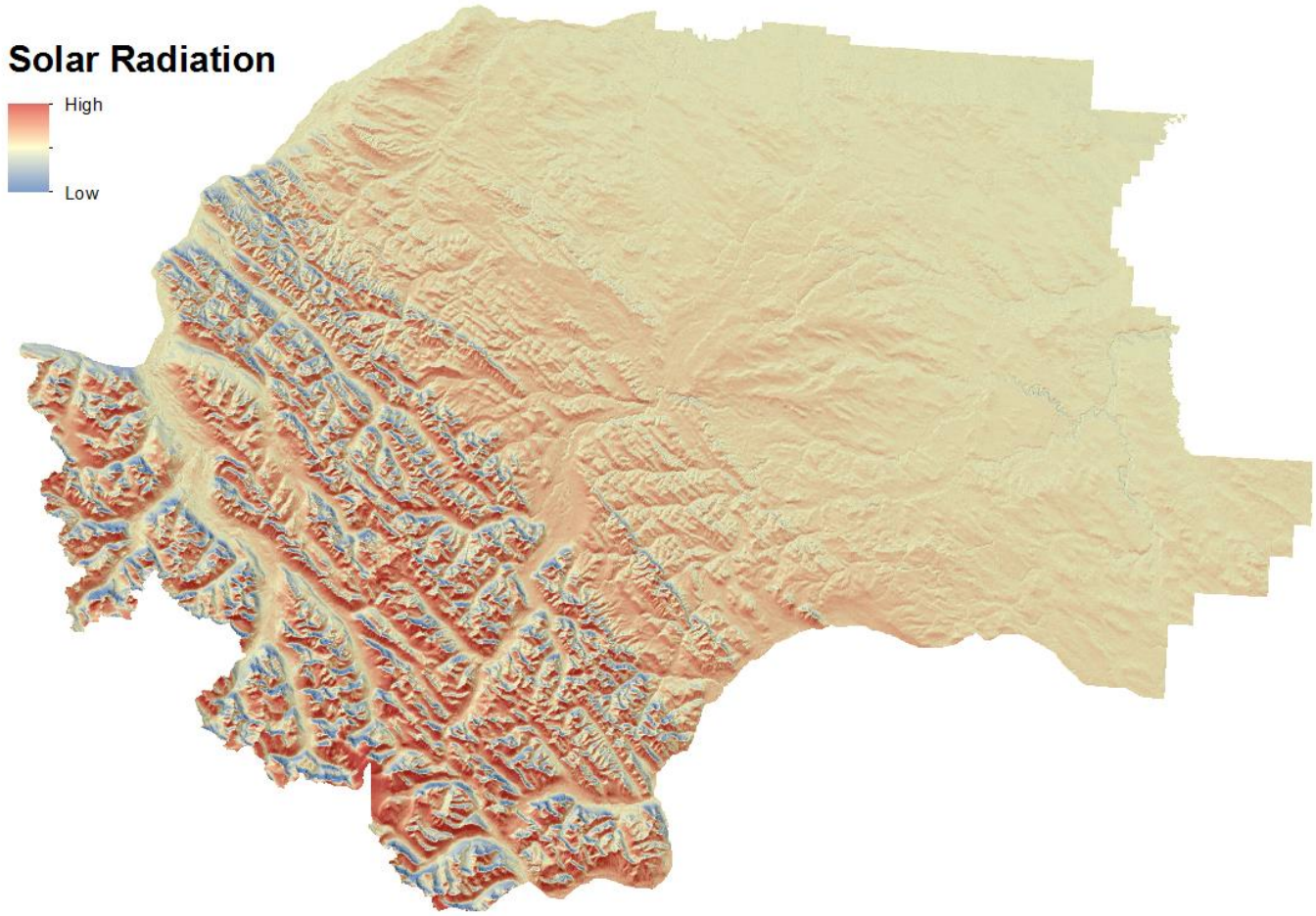
# Climate


Mean Annual Precip
mm yr -1
High : 2836
Low : 291

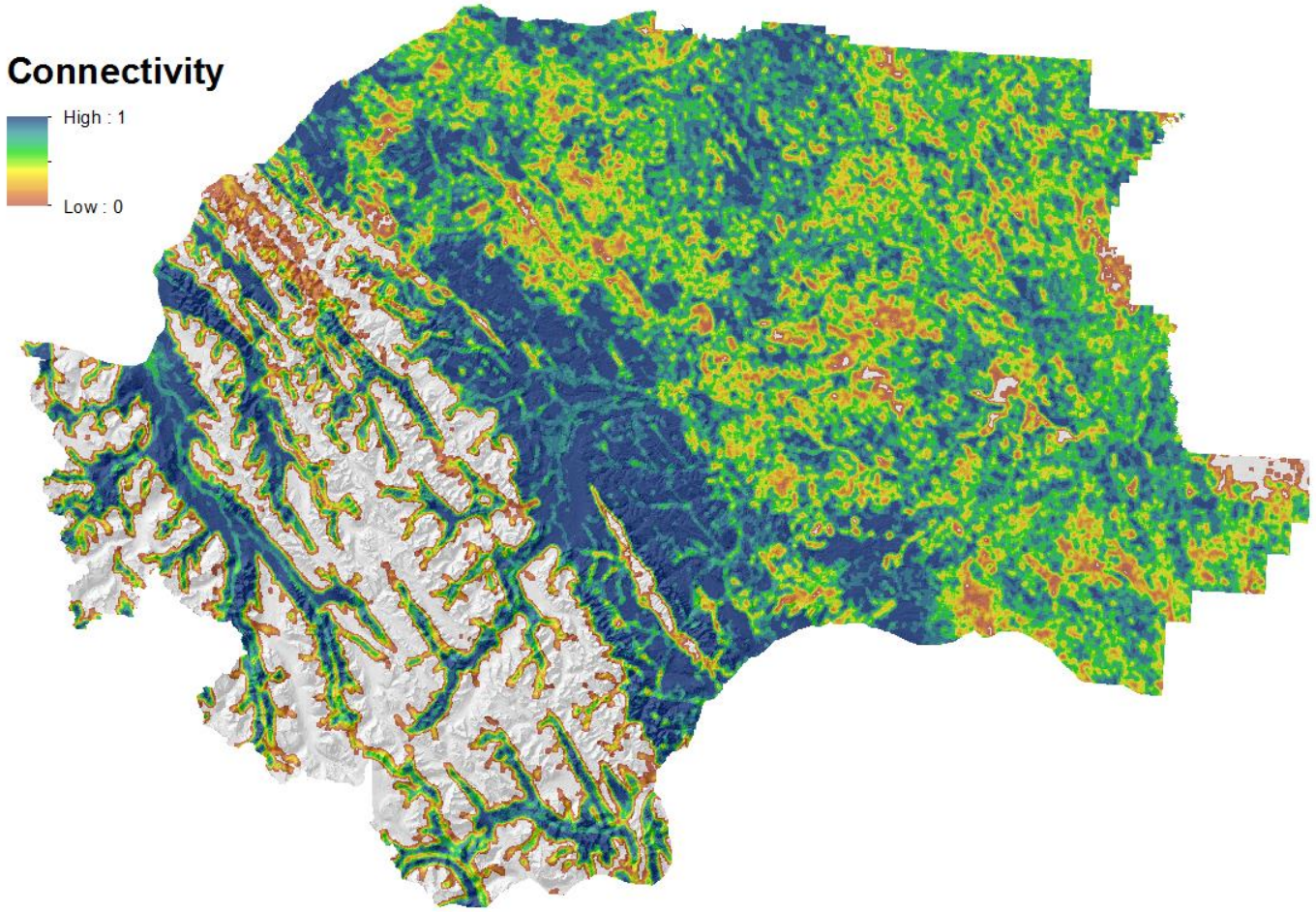

Seasonality
High : 121.7
Low : 5.3


Precip as Snow
mm yr -1
High : 2274
Low : 80

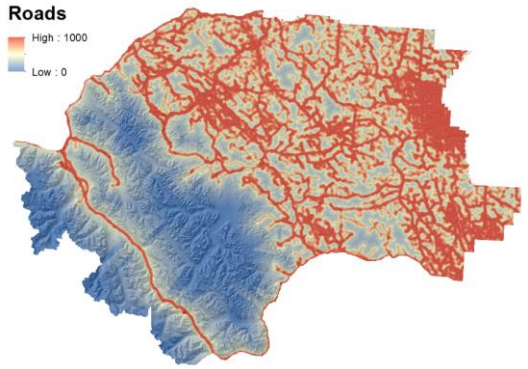
# Terrain

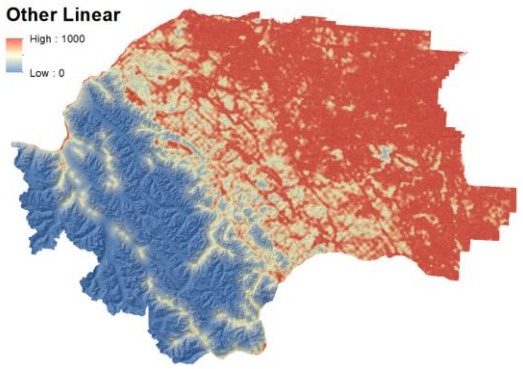


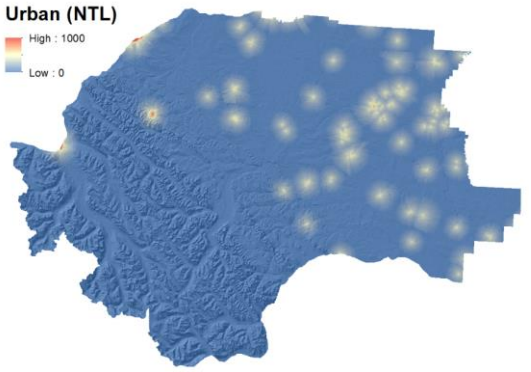
# Vegetation

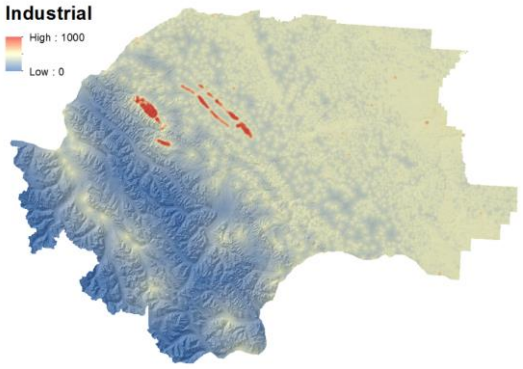


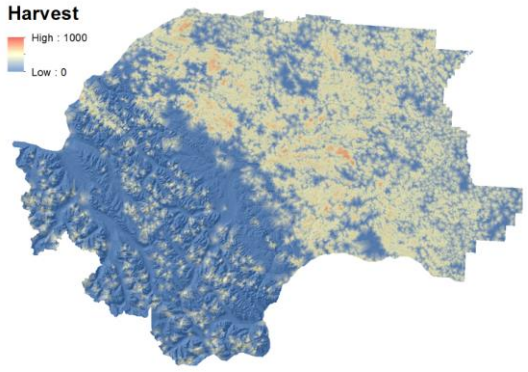
# Disturbance

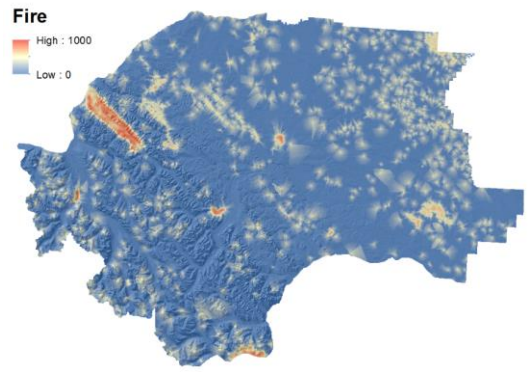


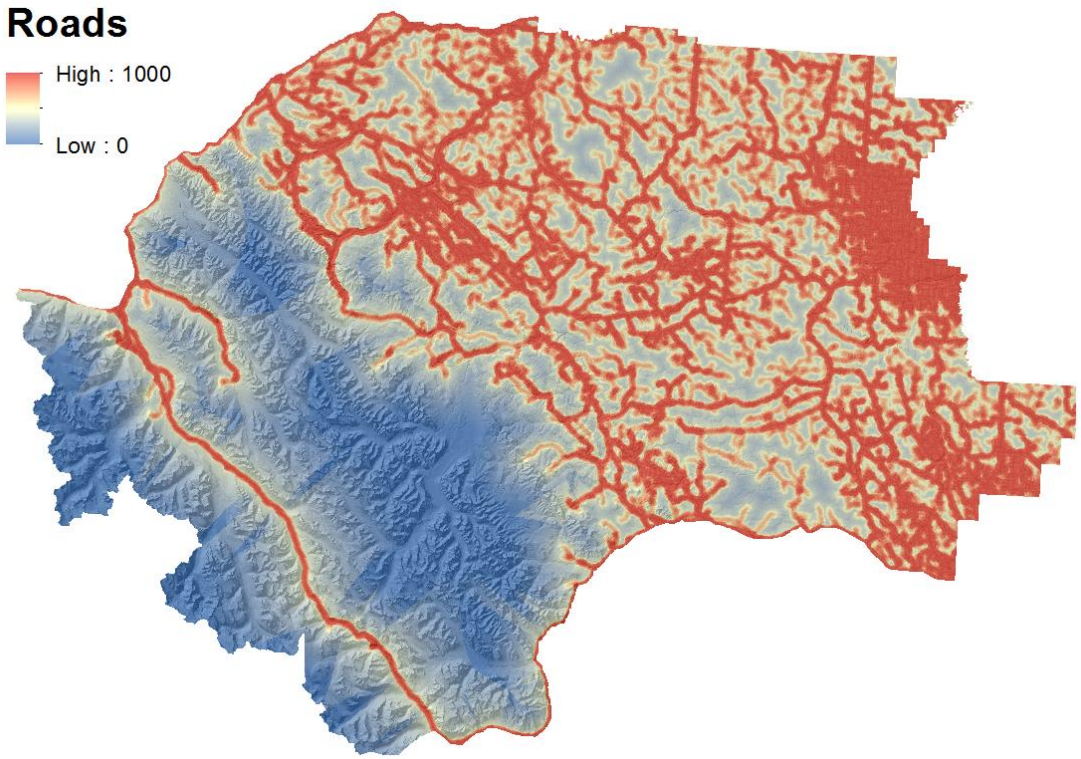



# Disturbance layers

**Index = Proximity × Density × Intensity**

**Linear features:**

- Density – scaled to 1.2 km per km$^2$ *(e.g., Boulanger et al., 2014)*
- Proximity – up to 25 km, exponential decline *(e.g., Boulanger et al., 2014; Rogala et al. 2011)*
- Intensity – weighted by type

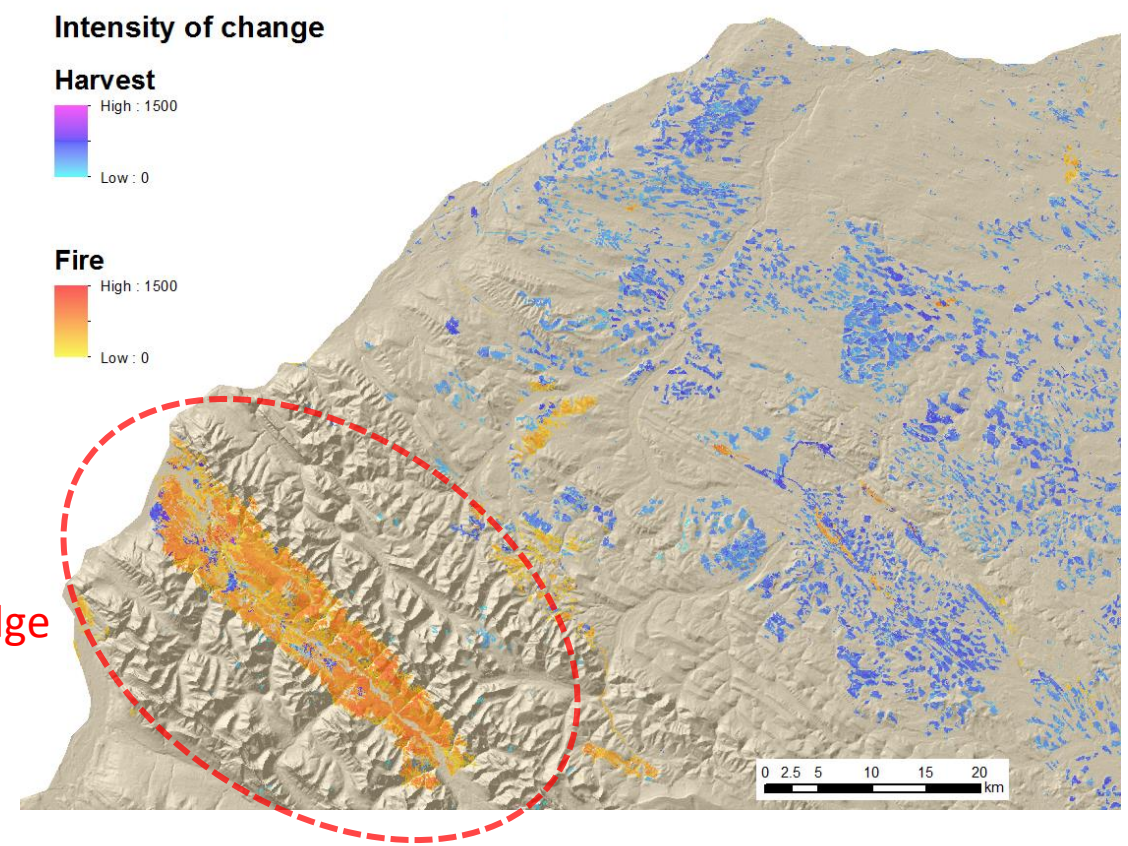


# Disturbance layers

**Index = Proximity × Density × Intensity**

**Other features:**

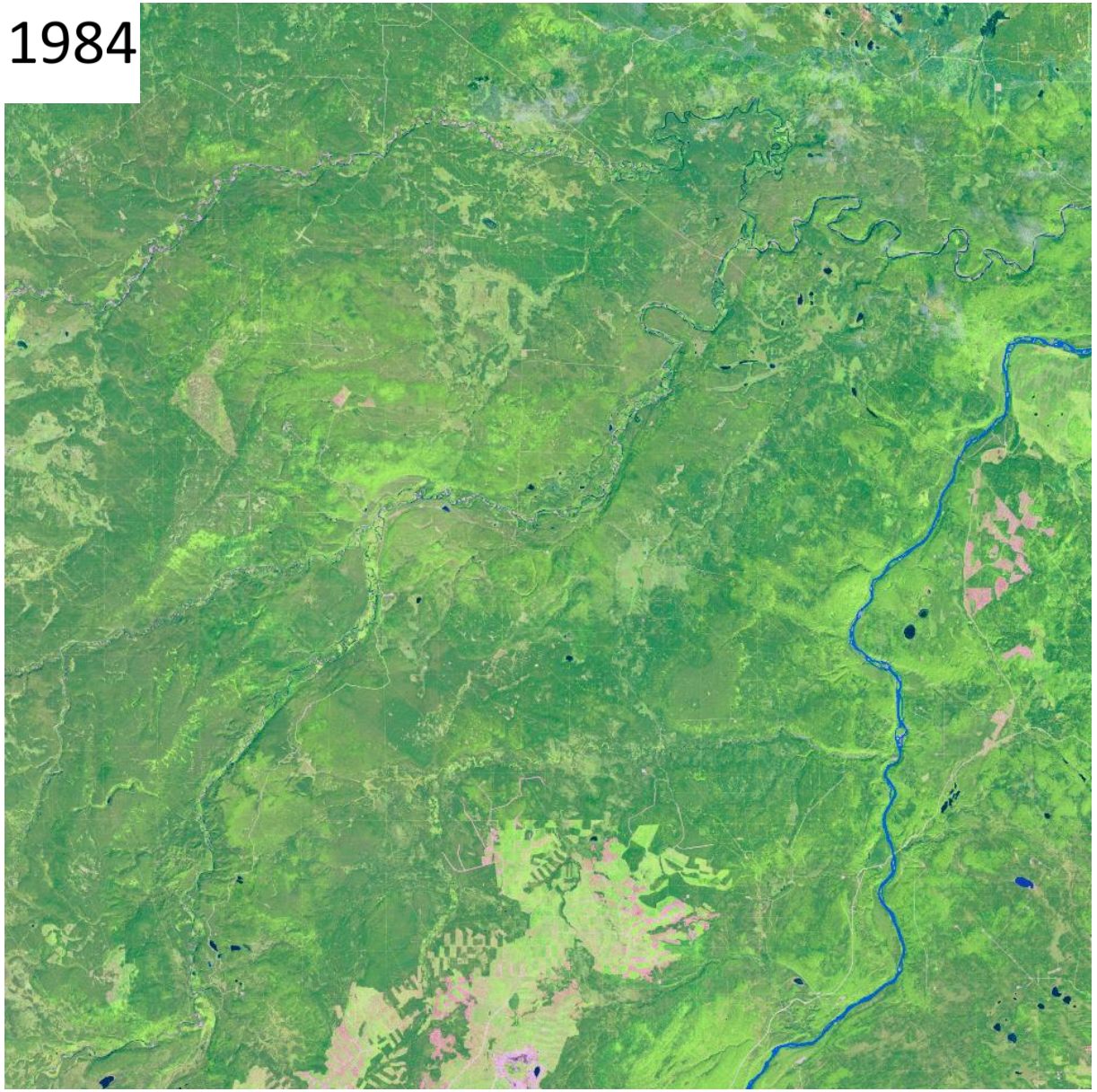
- Density – scaled to 99$^{th}$ percentile
- Proximity – up to 25 km, exponential decline
  *(e.g., Boulanger et al., 2014; Rogala et al. 2011)*
- ***Intensity – weighted with imagery***

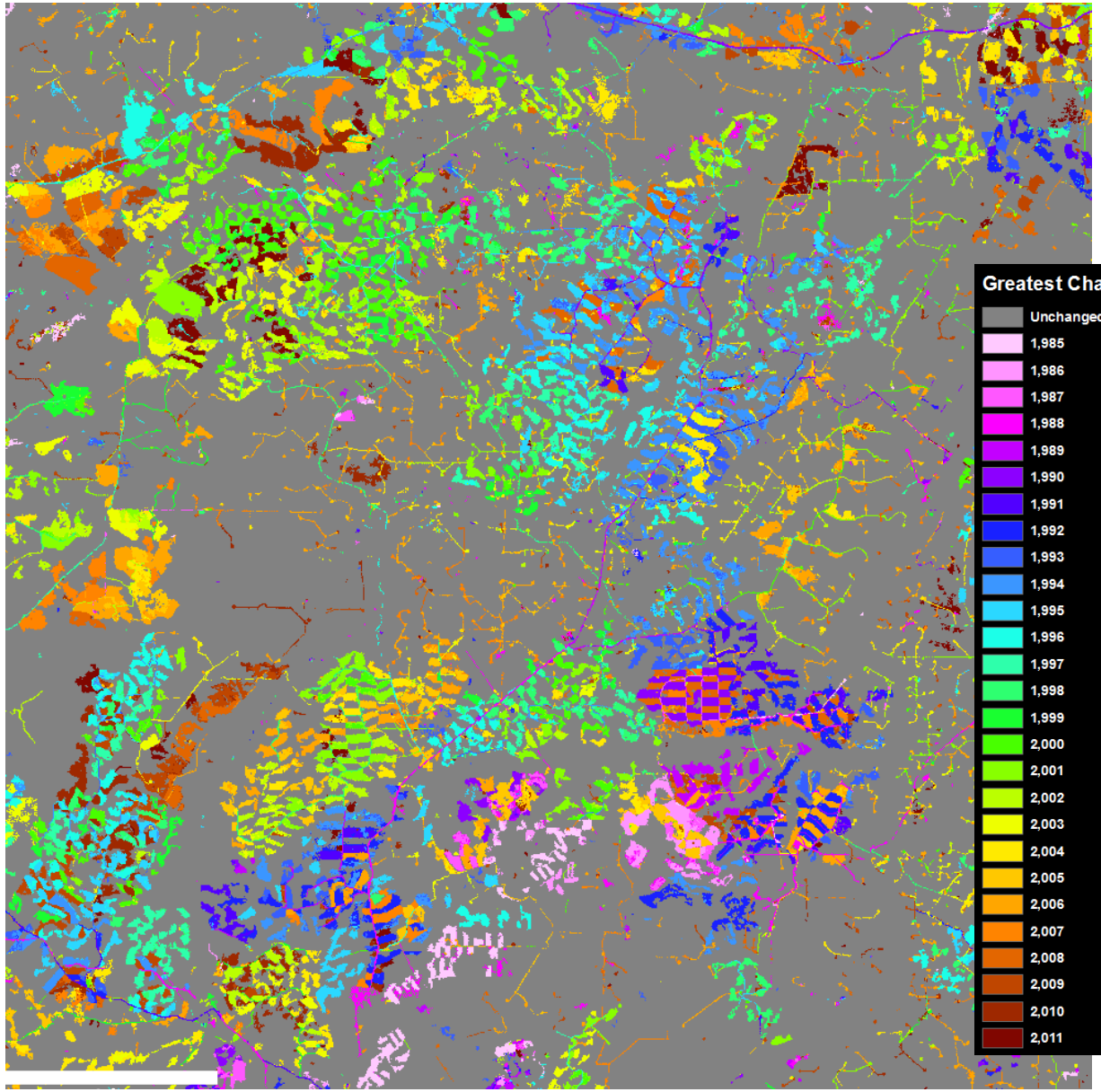



Syncline Ridge fire (2003)

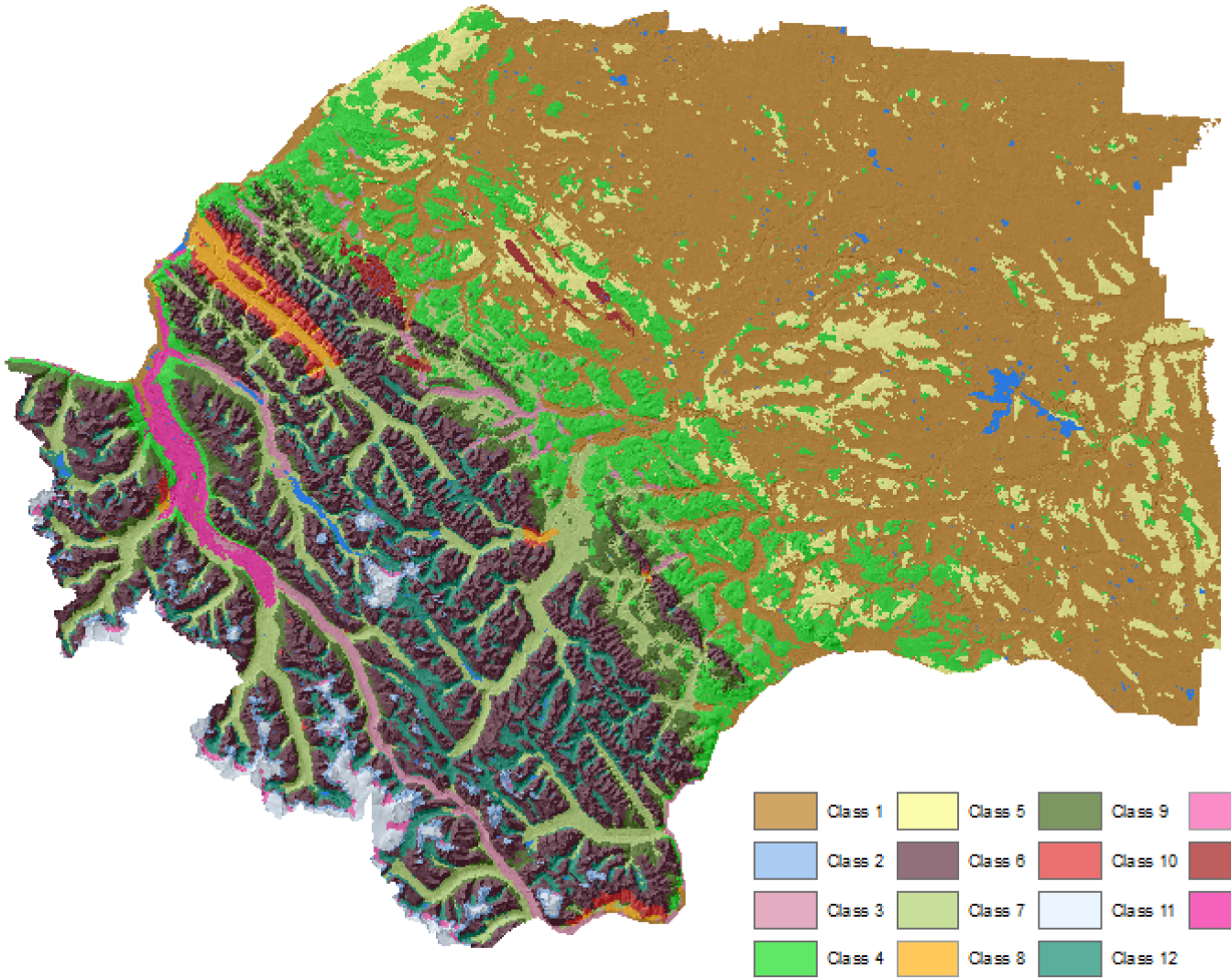
# Alberta

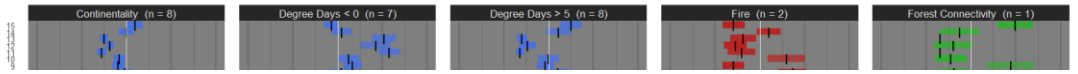
1984

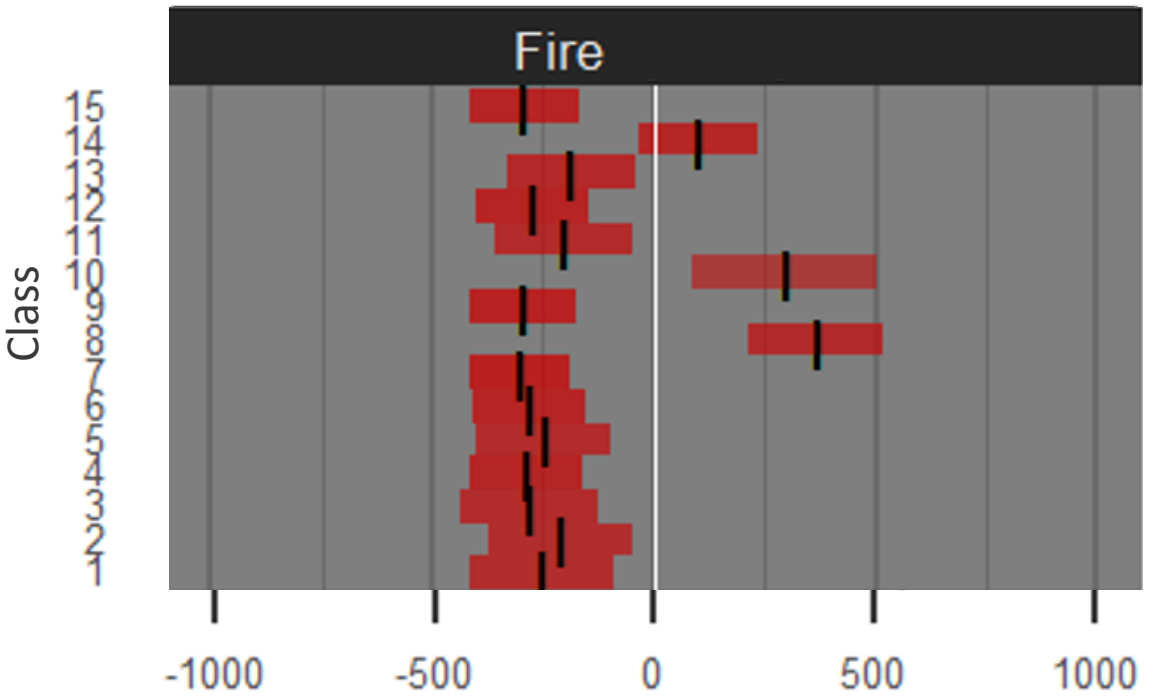




# **Preliminary Results:** 15-class map



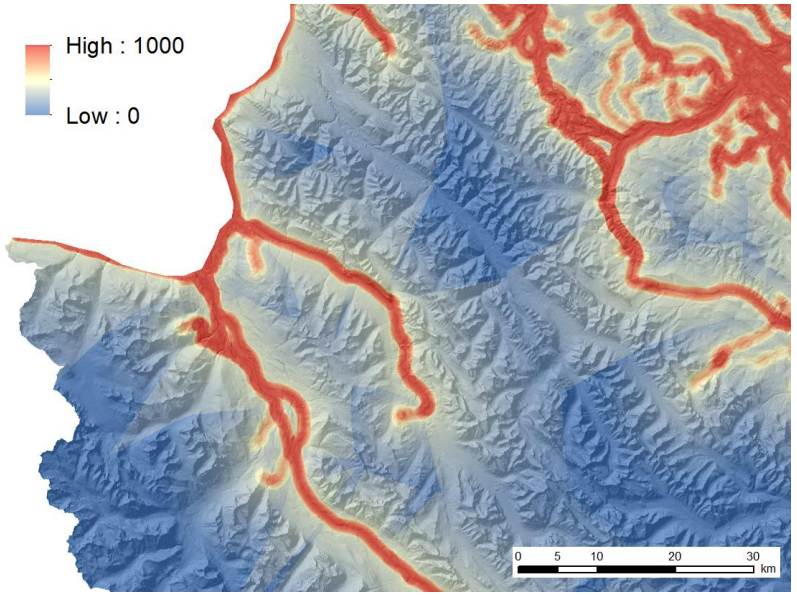



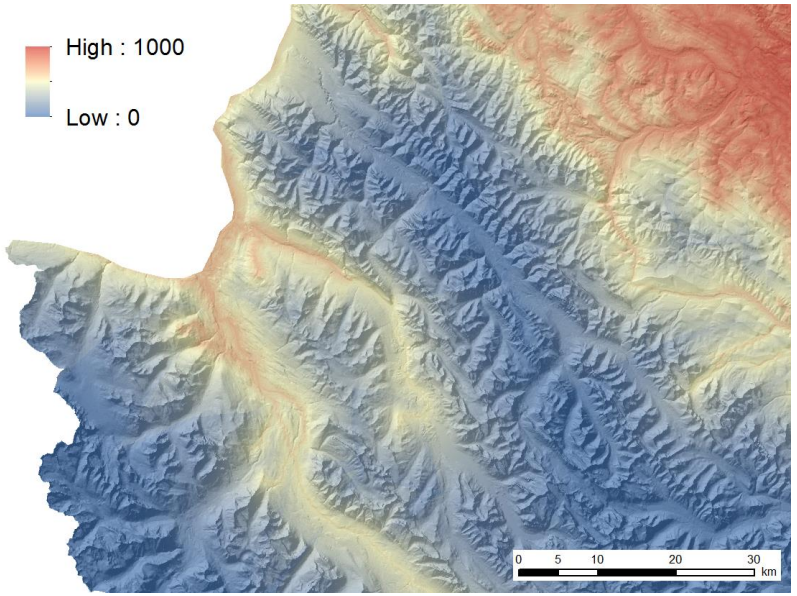
# Outstanding questions:

How many classes?

How to weight and map disturbances?

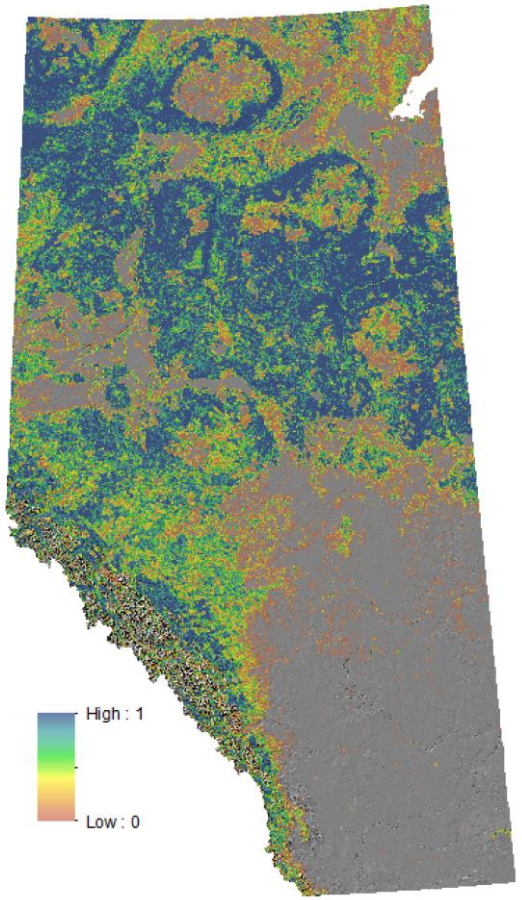
- Roads vs. other linear features
- Search windows and proximity



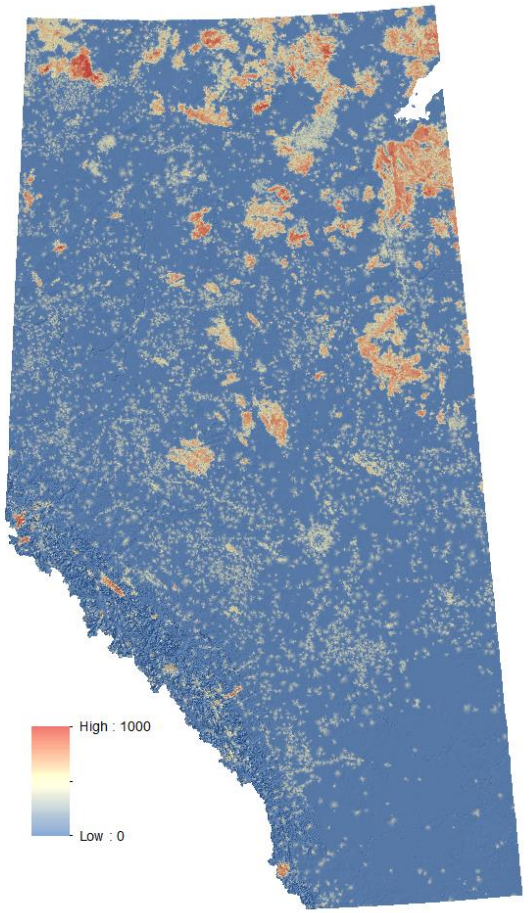



# Upcoming work– mapping Alberta

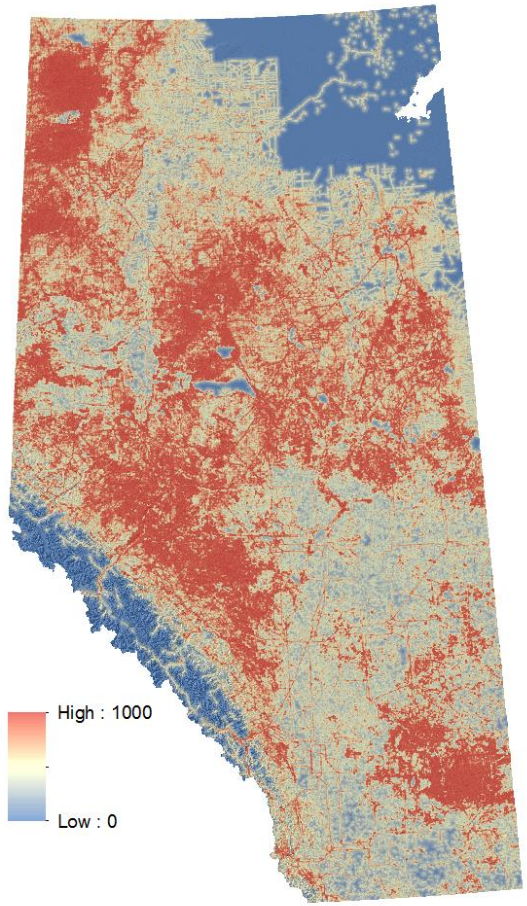
**Forest connectivity**




**Fire**




**Linear disturbance**



# Upcoming work – RapidEye for Yellowhead

Landsat (30 m)

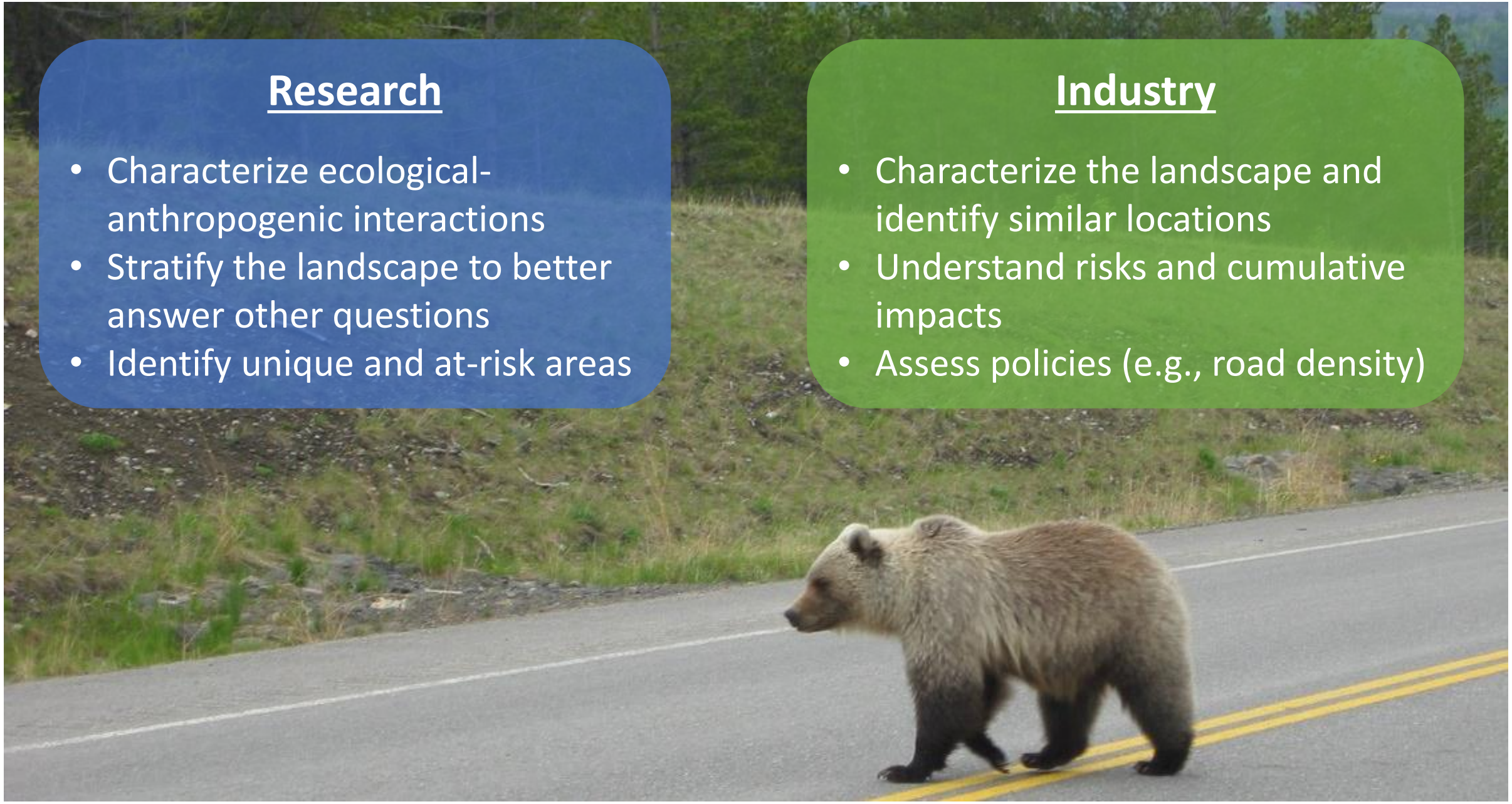
RapidEye (5 m)

## Research

- Characterize ecological-anthropogenic interactions
- Stratify the landscape to better answer other questions
- Identify unique and at-risk areas

## Industry

- Characterize the landscape and identify similar locations
- Understand risks and cumulative impacts
- Assess policies (e.g., road density)



# Thank you

Contact info:
Sean Kearney
Integrated Remote Sensing Studio, UBC
604-827-429 | sean.kearney@alumni.ubc.ca

forestry
university of british columbia

Integrated Remote Sensing Studio

NSERC CRSNG