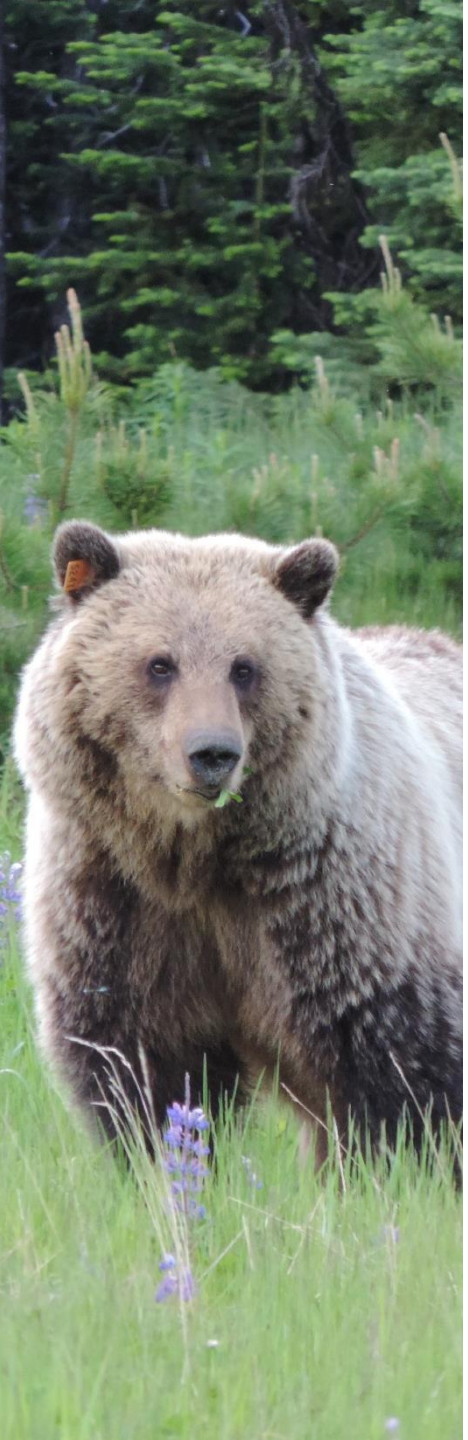

Habitat, Movement, and Mortality

presented by

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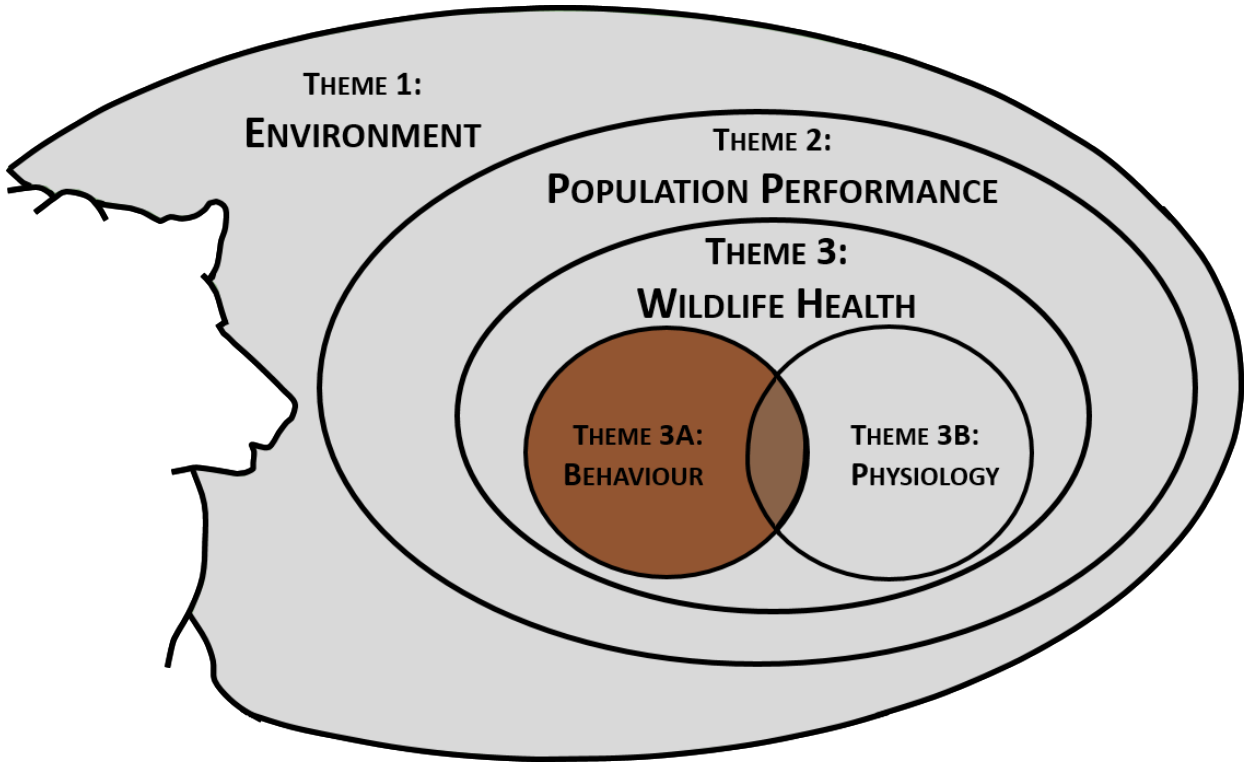
NSERC CRSNG



Research question

Q3A2: Can grizzly bear movements be related to fine scale changes in forest structure, such as openings, gaps, and vegetation patterns?

- How have natural resource extraction activities impacted movement patterns, and what are the effects of access restriction?

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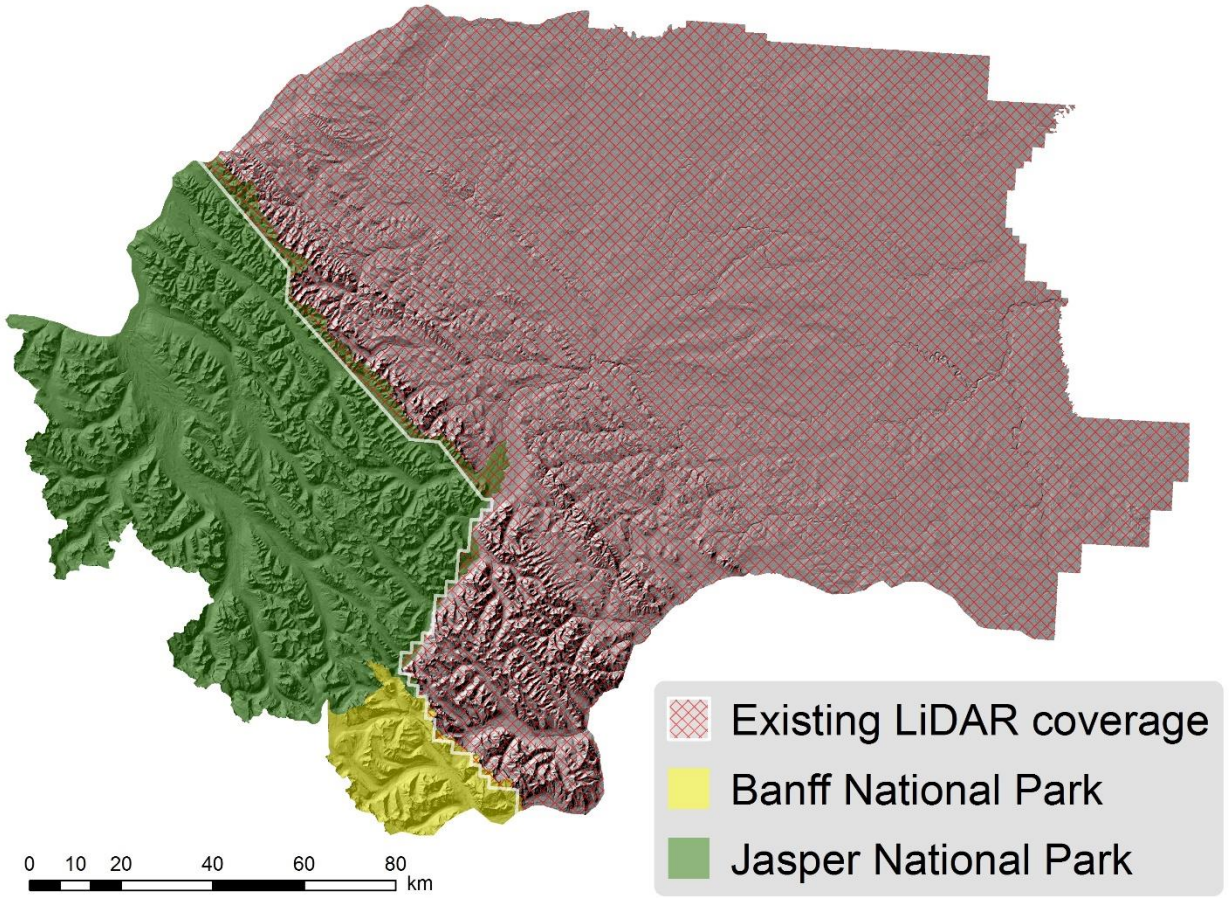
Are movement patterns of grizzly bears being impacted by natural resource extraction activities?

- Jasper NP, Banff NP (protected areas)
- Upper Foothills
  - Forestry operations (lodgepole pine in mixed coniferous (with associated spruce) or pure stands
  - Mining activity
  - Legacy seismic lines

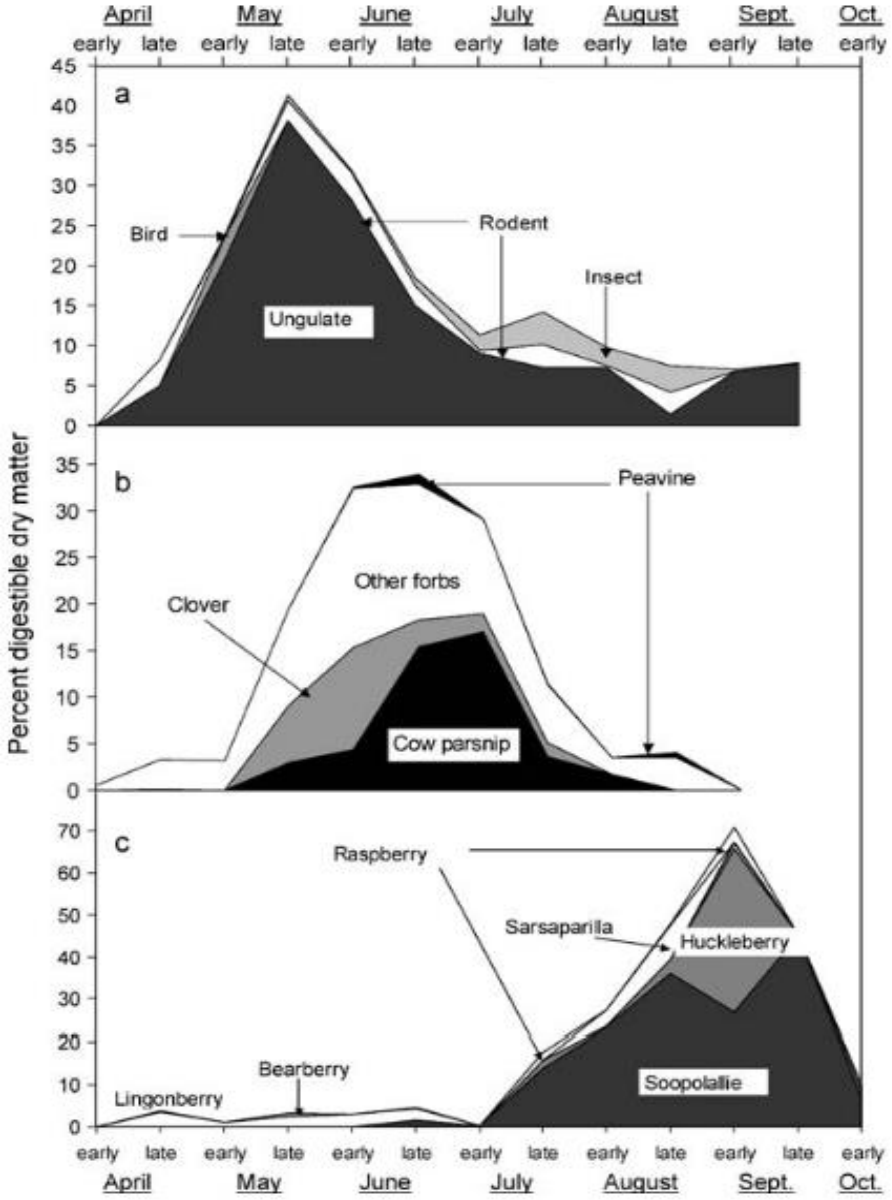


Yellowhead bears are especially well suited for analysis within this framework:

Bears in the Yellowhead area are more tightly linked to vegetation phenology on the landscape than coastal bears

Mean Adult Mass (kg)	Interior Alaska	Yellowstone	Interior BC	Jasper
Male	243	193	117	92
Female	117	135	58	55

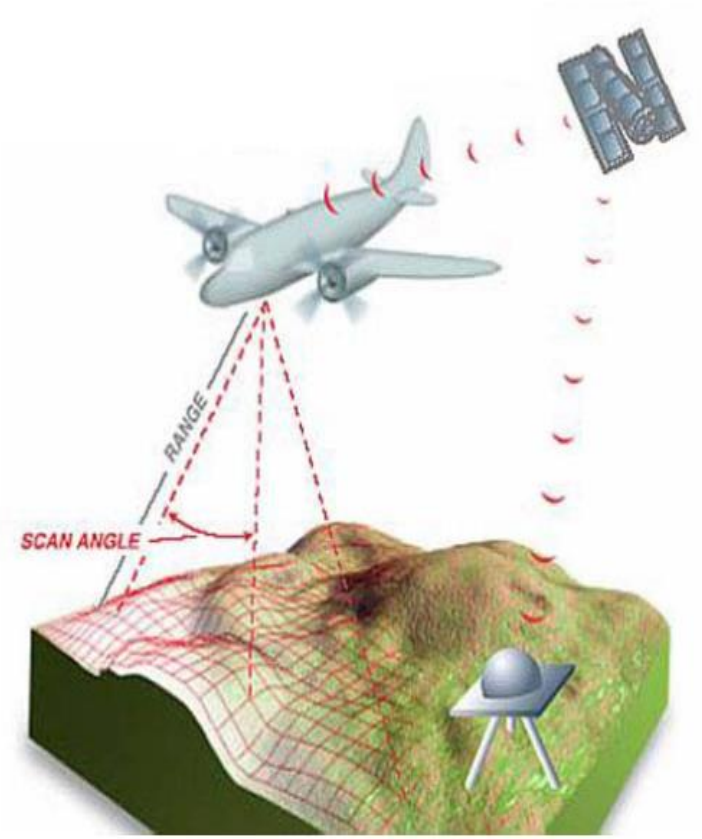
Pasitschniak-Arts, 1993



Munro et al., 2006

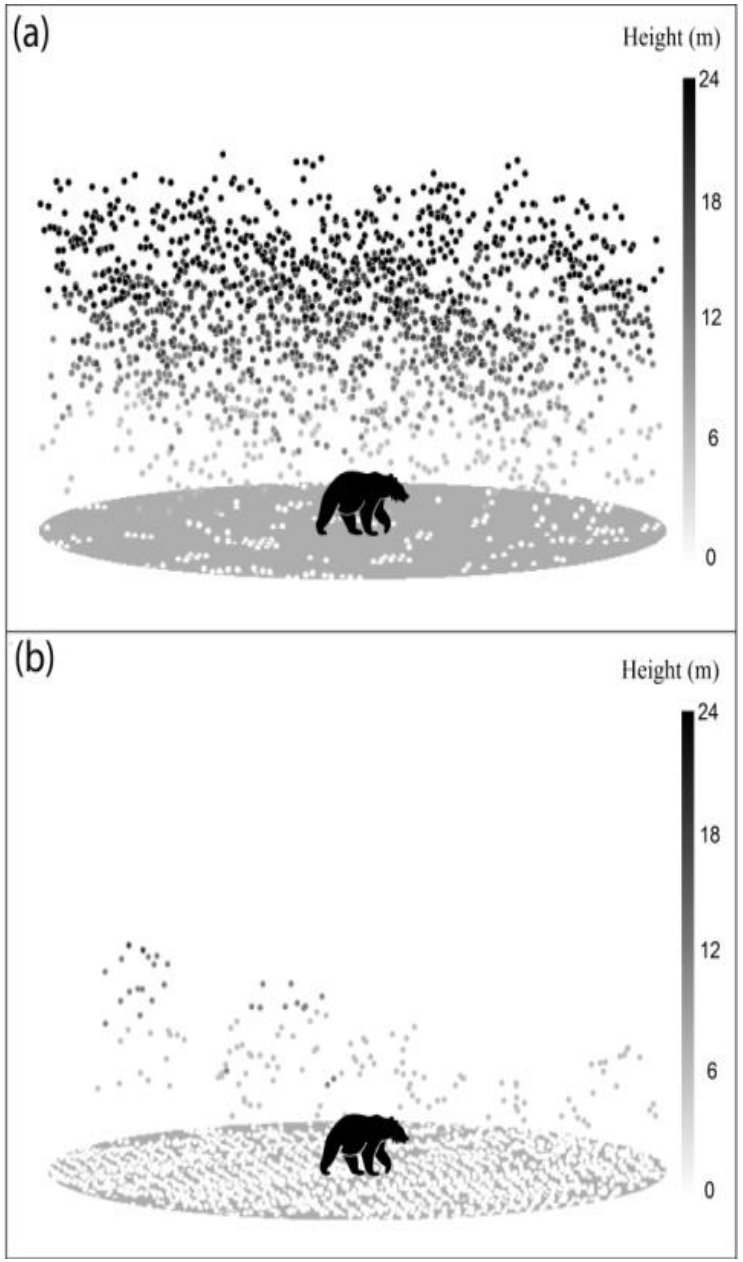
• Light Detection And Ranging

- Active remote sensing technology
- Measures the distance to target surfaces using narrow beams of near-infrared light
  - Laser beam penetrates the canopy to give multiple distance measurements
  - Forest structure can be estimated from the distribution of these return points

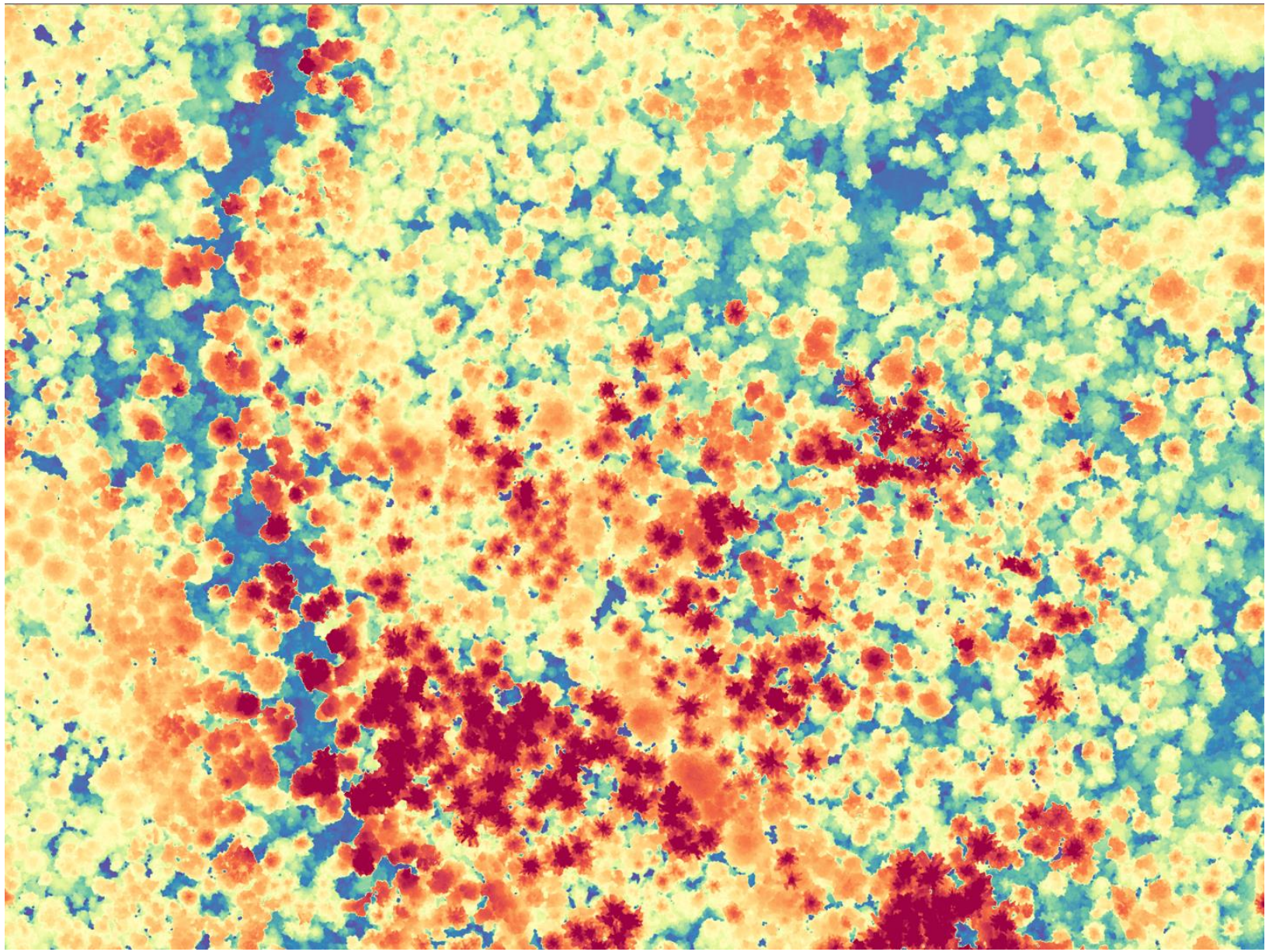


What does LiDAR tell us about forest structure?

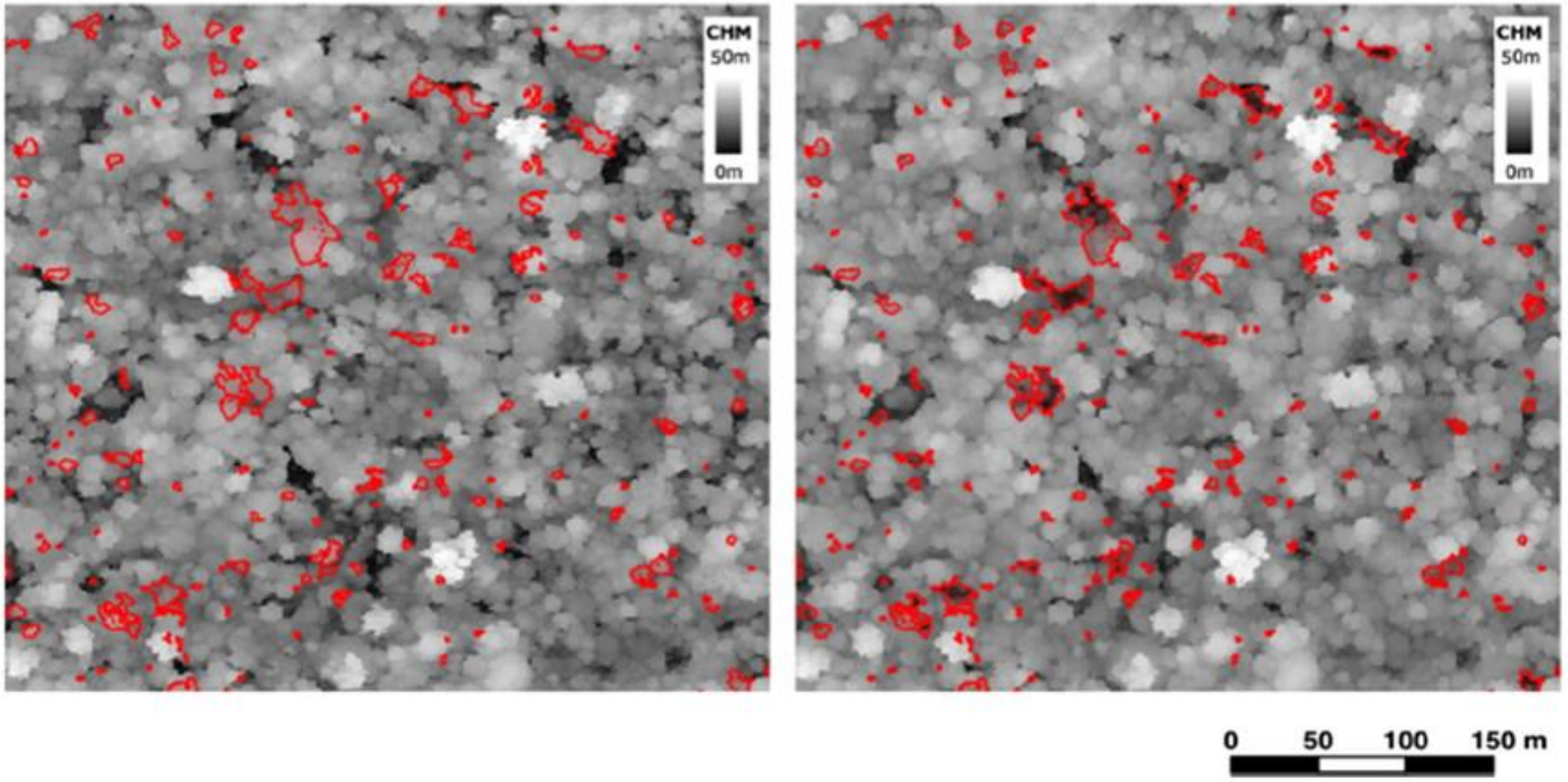
- Individual tree and area-summarized means, for example:
  - Tree heights (99th percentile, mean, 10th percentile, etc)
  - Canopy cover
  - Variance & standard deviation of heights



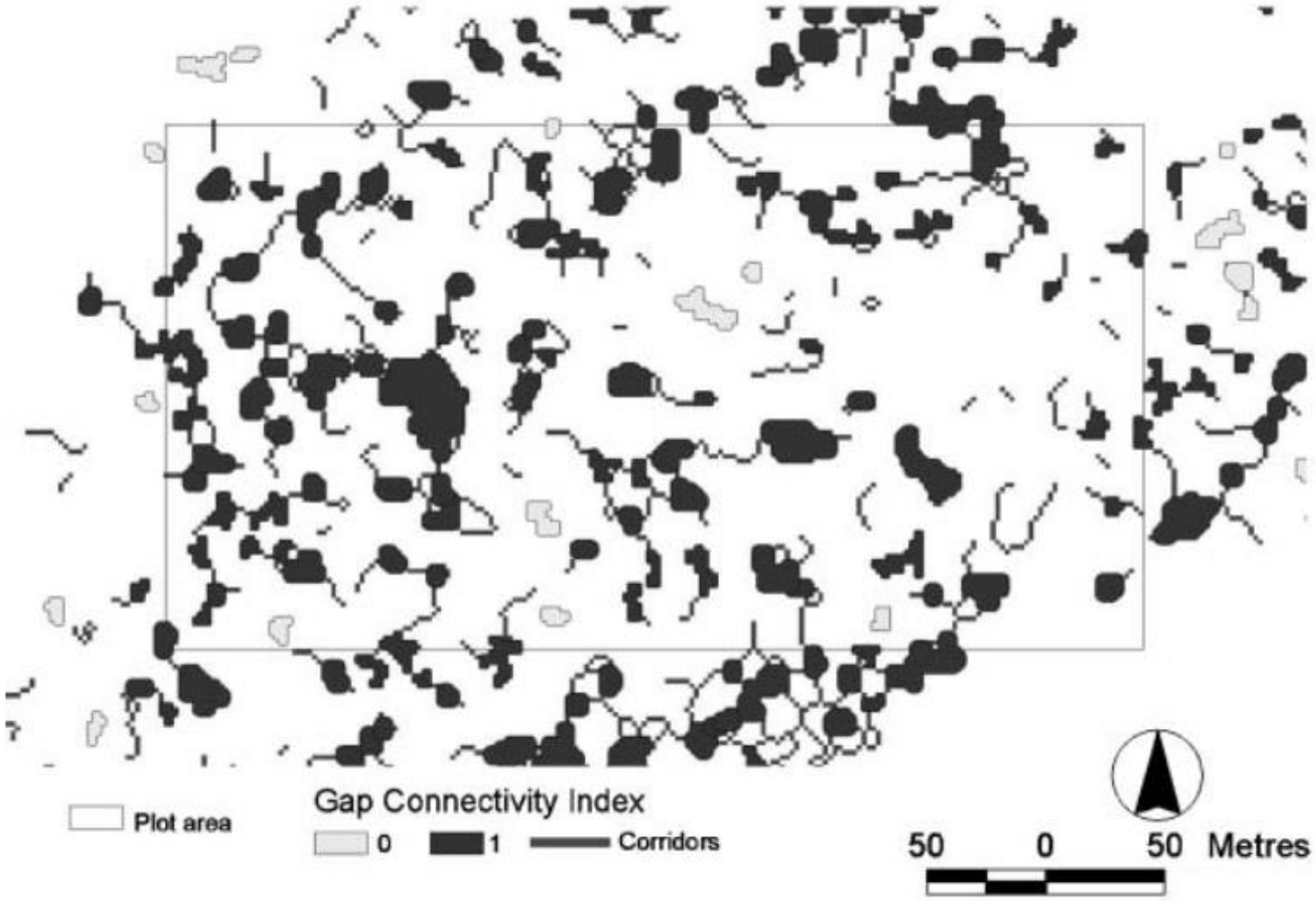
- **Detailed gap, corridor and edge information**
- **Stand density**
- **Micro-terrain features**



Treefall & Gap Detection



Eitel et al., 2016

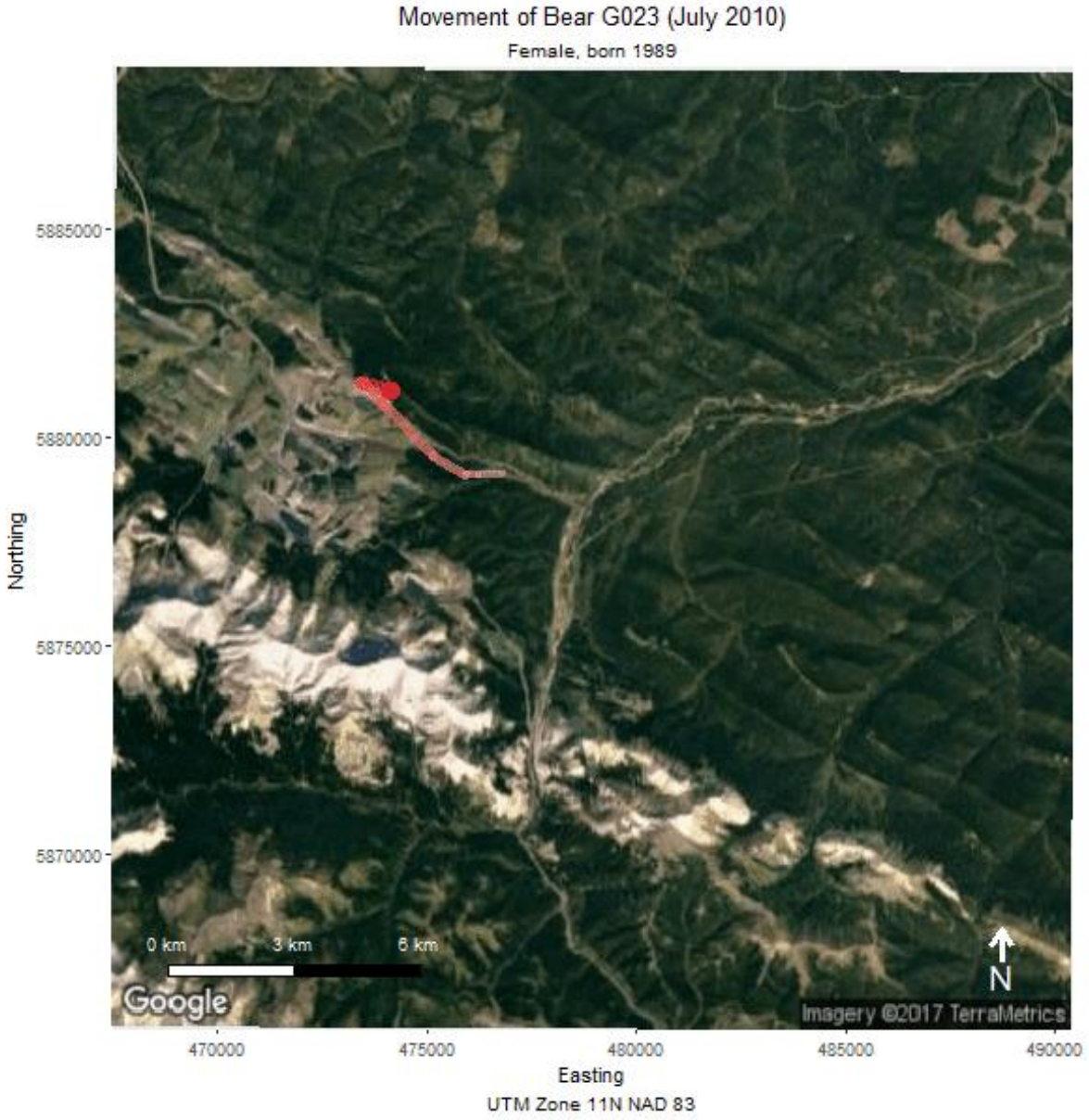


Koukoulas & Blackburn, 2004

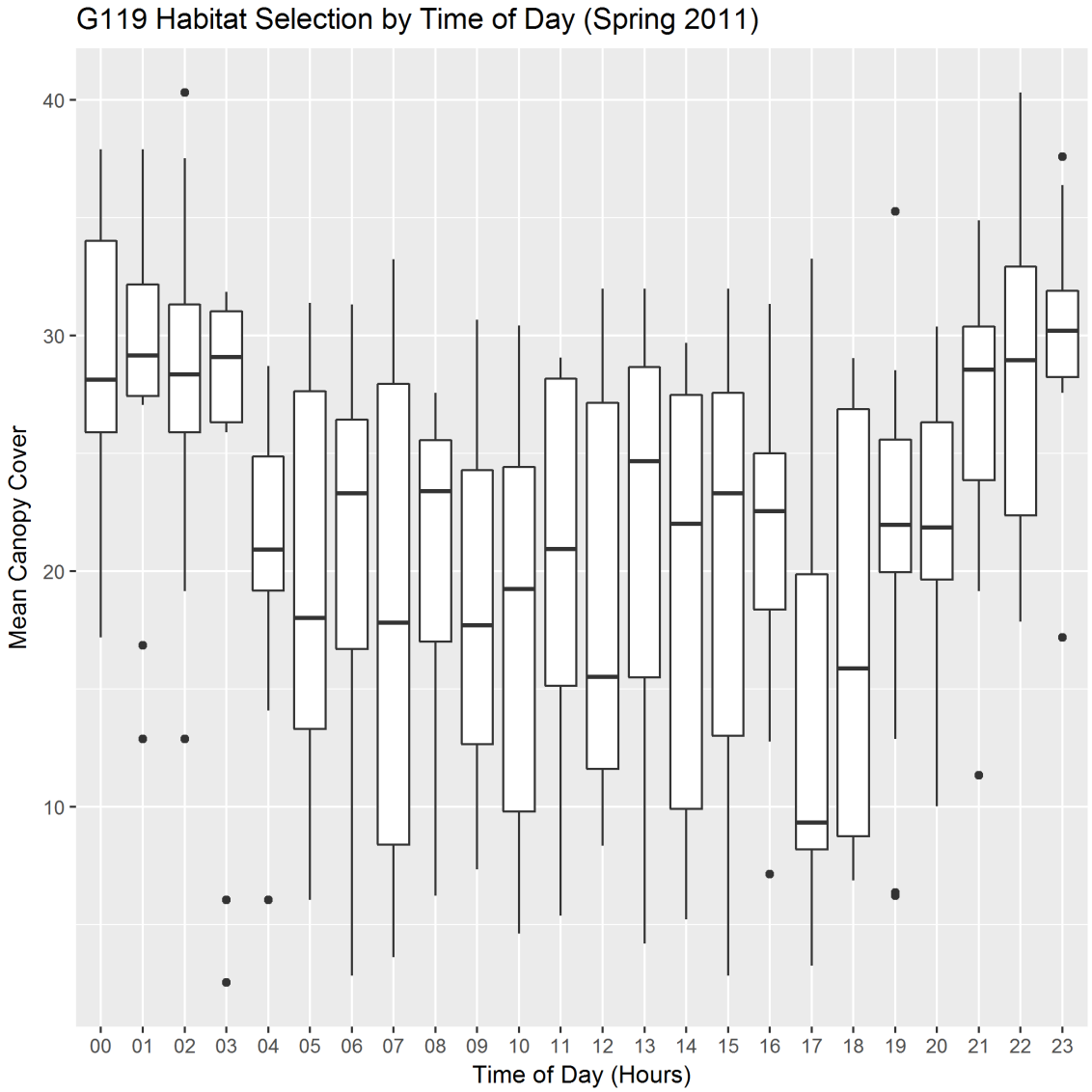
Linking structure to movement

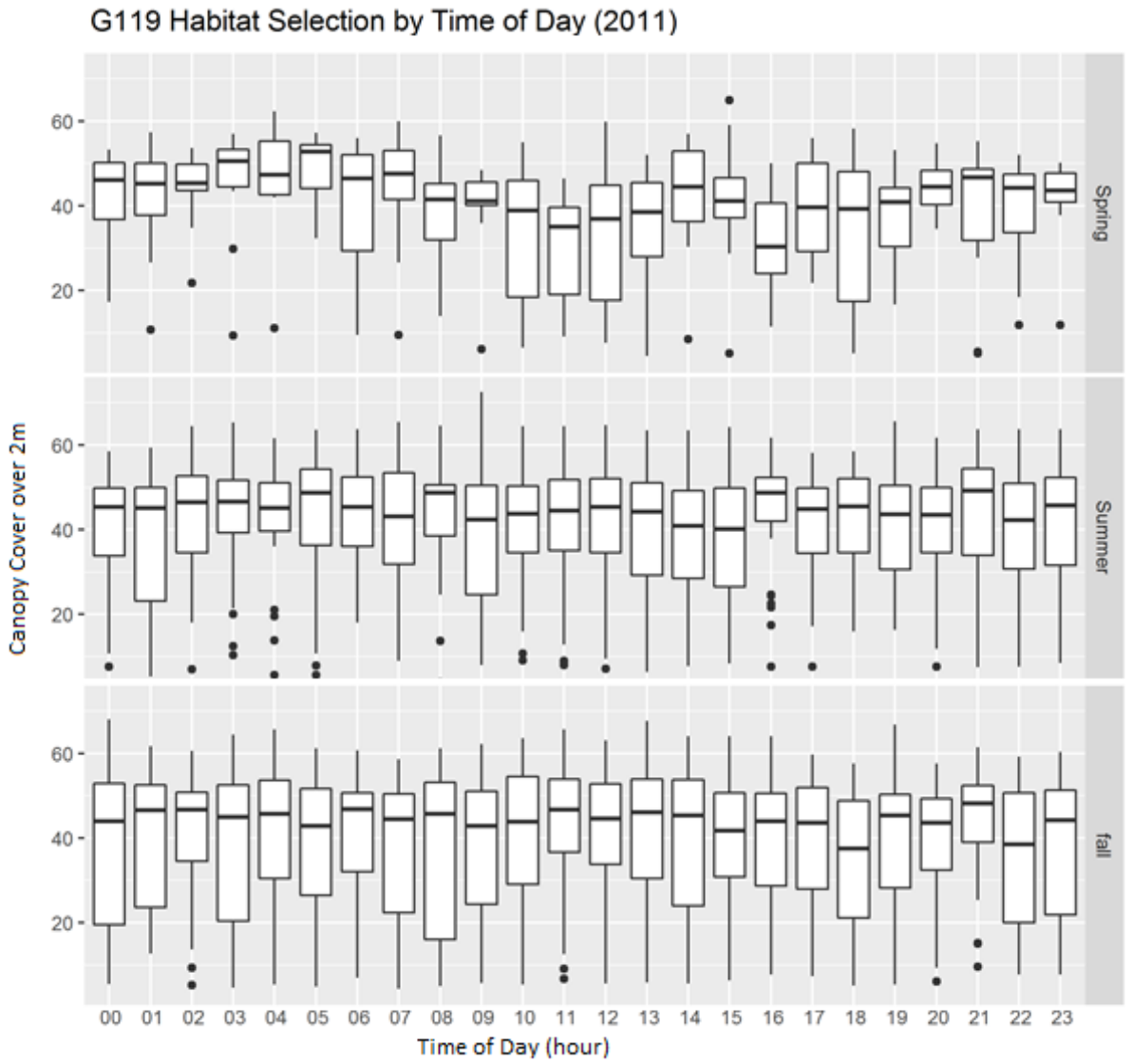
We will use a two-fold approach:

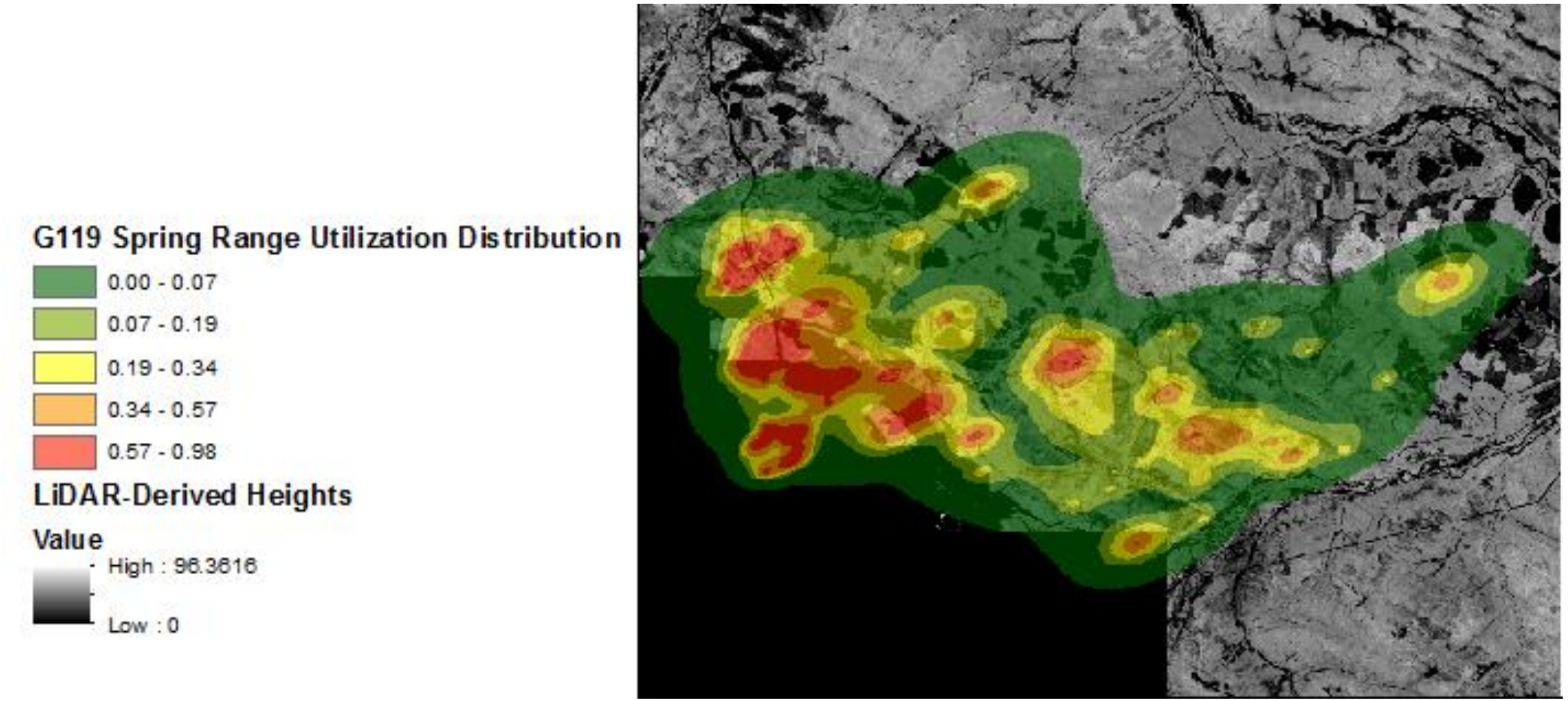
- **Trajectory-based**: how are patterns of dispersal related to the structure metrics surrounding GPS fix locations?
- **Likelihood-based**: how is vegetation structure at the home-range scale different than at a representative landscape scale?

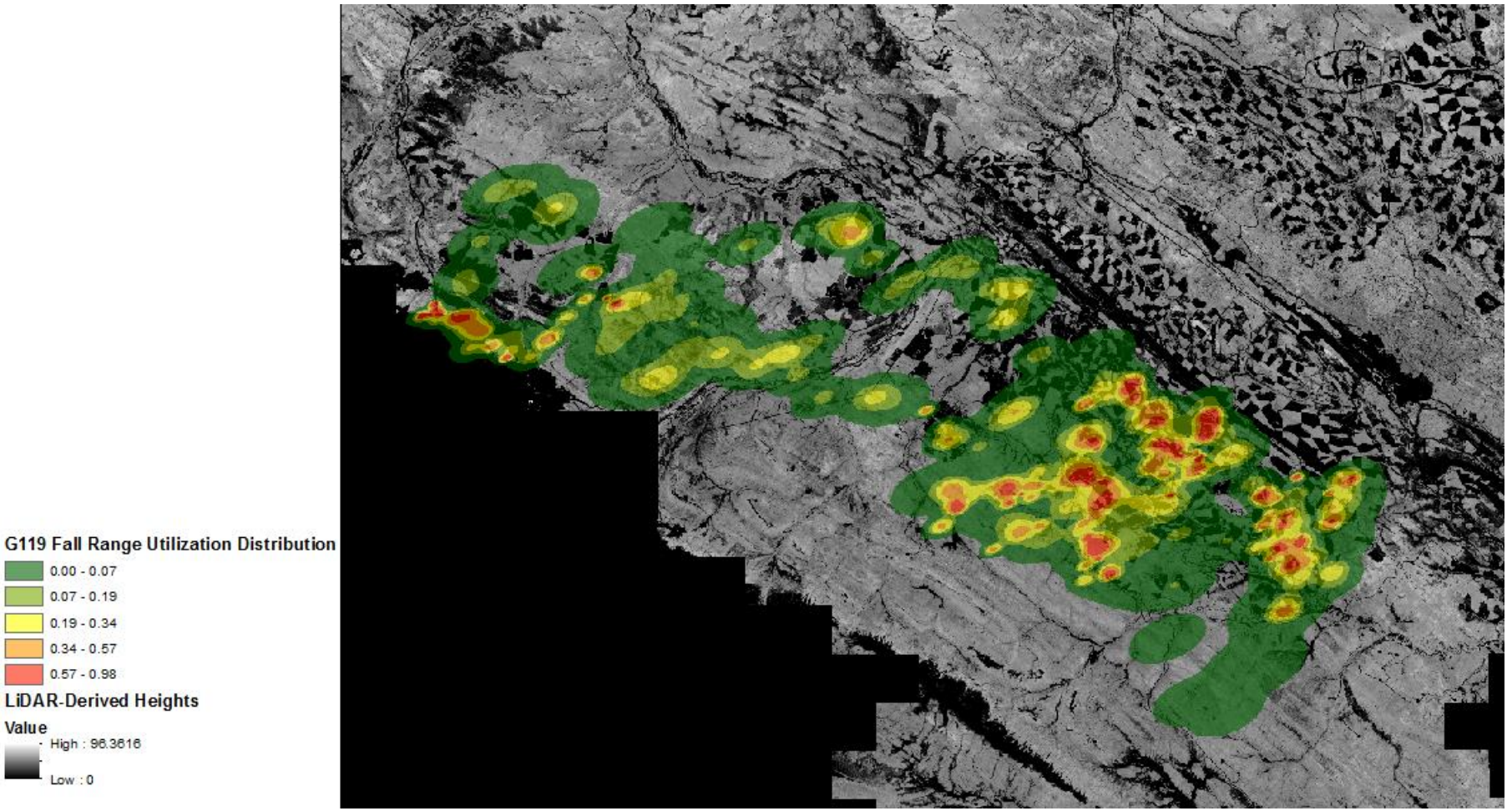


Preliminary Results






G119 Spring Range Utilization Distribution
0.00 - 0.07
0.07 - 0.19
0.19 - 0.34
0.34 - 0.57
0.57 - 0.98
LiDAR-Derived Heights
Value
High : 96.3616
Low : 0


G119 Fall Range Utilization Distribution
0.00 - 0.07
0.07 - 0.19
0.19 - 0.34
0.34 - 0.57
0.57 - 0.98
LiDAR-Derived Heights
Value
High : 96.3616
Low : 0

Next Steps

- Process LiDAR point cloud
- Trajectory-based analysis of bear movement
- Spatial analysis of habitat selection
- Plan summer 2018 LiDAR acquisition
  - fRI has spent the last field season collecting data on bedding, scavenging, & kill sites
    - How are these behaviors related to forest structure?

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