USING LIDAR TO EVALUATE OLD-GROWTH ATTRIBUTES IN OGMAs

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Outline:

- Introduction
- Research Question
- Materials and Methods
- Preliminary results
- Conclusions
- Questions

The beginning of the project:

- ✓~90% of the Pine over 70-80 years old were killed;
- ✓OGMAs as fire hazards;
- ✓OGMAs might not carry old-growth attributes.
- ✓Tracking old growth attributes in CCF;

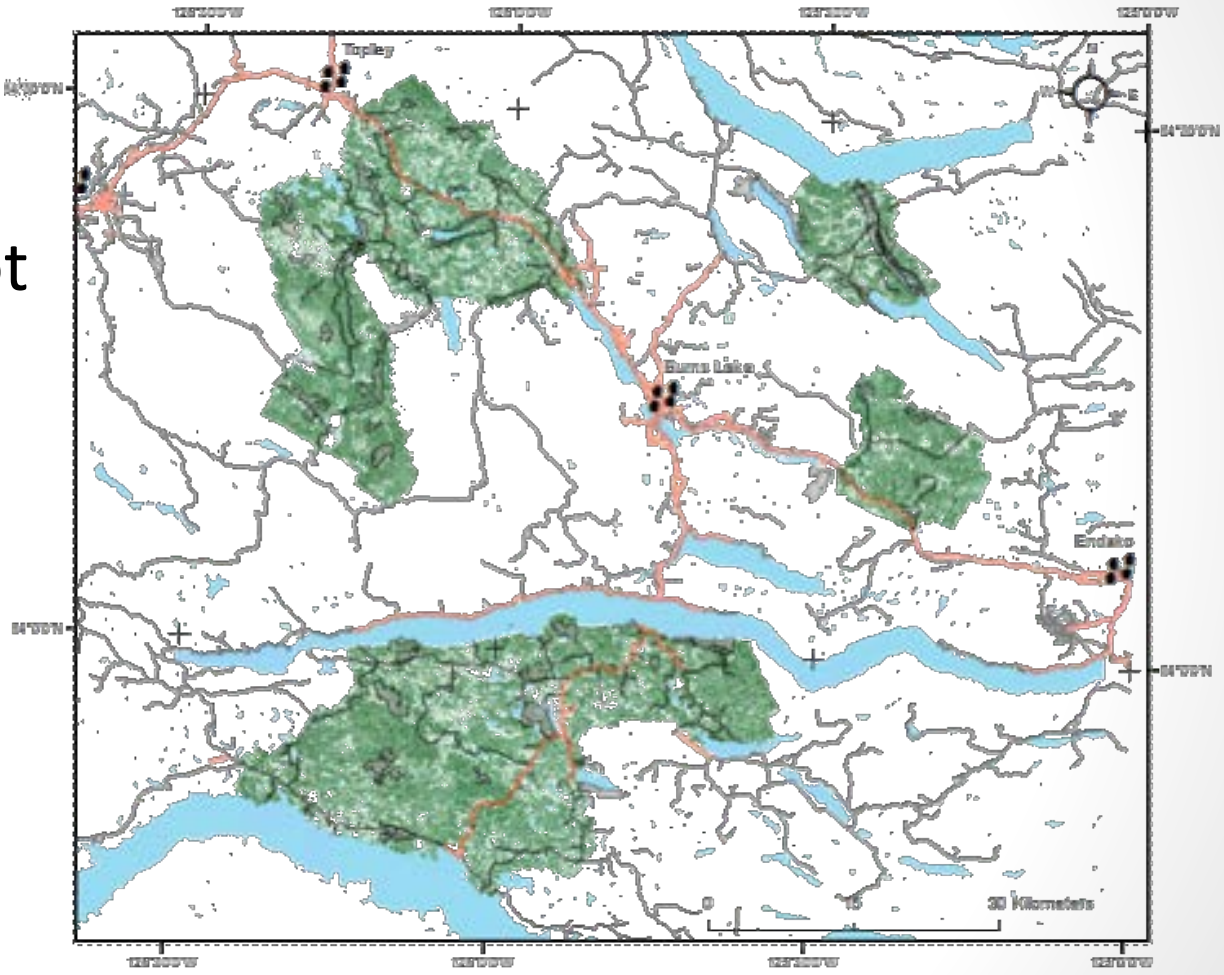


Figure 2 Chinook Community Forest tenure areas (unpublished L. Barros, UNBC, 2018).

Are OGMAs in CCF retaining old-growth attributes?

- What are old-growth attributes?

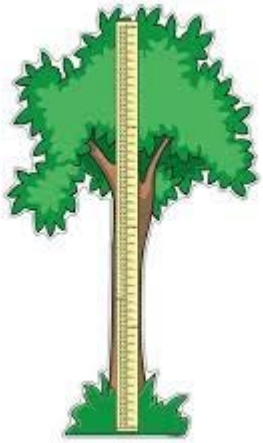
Old-Growth Structural Attributes

1. High number of large trees;
2. Stand age;
3. High stand volume of biomass;
4. Large number / basal area of dead/dying standing trees;
5. Large amount/mass of downed CWD;
6. Wide decay class distribution of logs and /or snags;
7. Several canopy layers/vertical variability;
8. High number/cover of late successional/shade-tolerant species;
9. High variation in tree sizes, presence of several cohorts;
10. High canopy cover and distribution of gaps;
11. …

(Bauhus et al., 2009)

Are OGMAs in CCF retaining old-growth attributes?

- What are old-growth attributes?



Tree Height

Vertical Complexity

Canopy Cover

Why should we care about OGMAs and Old-growth forests?

Old-growth forests values:

- ✓ Biodiversity (Spies 2004, Bauhus et al. 2009);
- ✓ Pools of genetic resources (Mosseler et al. 2003b);
- ✓ carbon storage (Luyssaert et al. 2008);
- ✓ And other ESs such as water, carbon sequestration, and ecotourism (FAO 2016) .

Introduction:

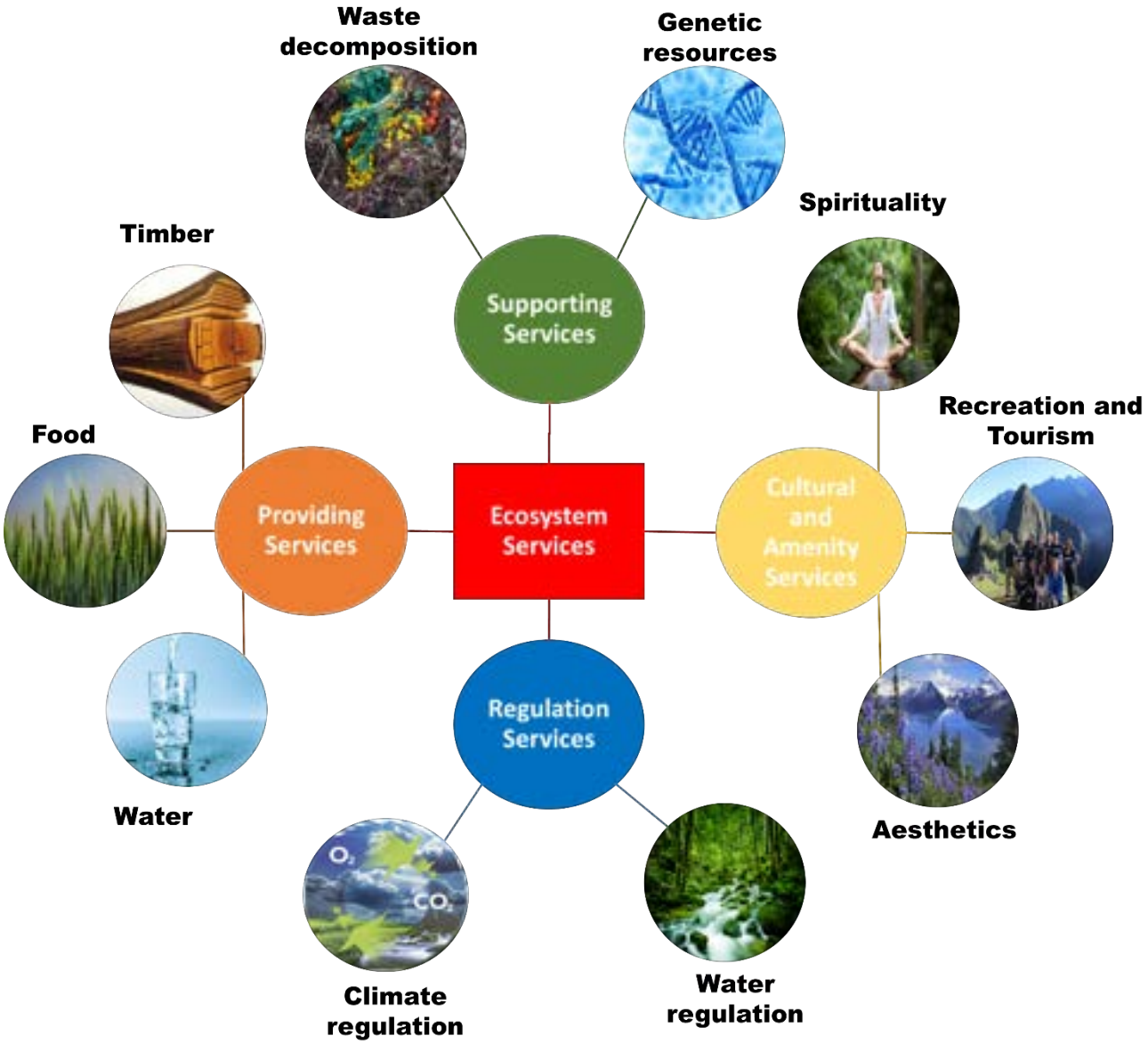


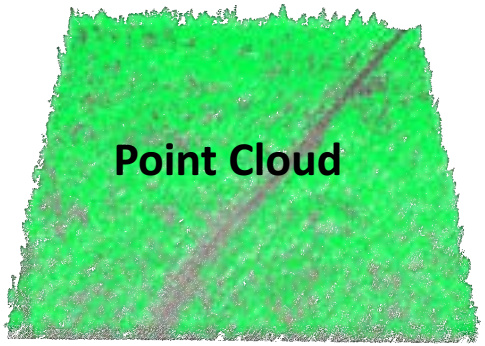
Figure 2: Examples of Ecosystem Services distributed into four categories (adapted from Crossman et al., 2013)

- OGMAs are meant to retain old-growth forest in the landscape
- Old-growth forest have measurable attributes
- How can we track those attributes and answer the question …

Are OGMAs in CCF retaining old-growth attributes?

Materials and Methods:

1. LiDAR raw dataset



2. Classification

LAS Classification

3. Processing

LAS2dem

LAS2dem

LAScanopy

4. Outputs

DEM

CHM

AVG

STD

COV

Materials and Methods:

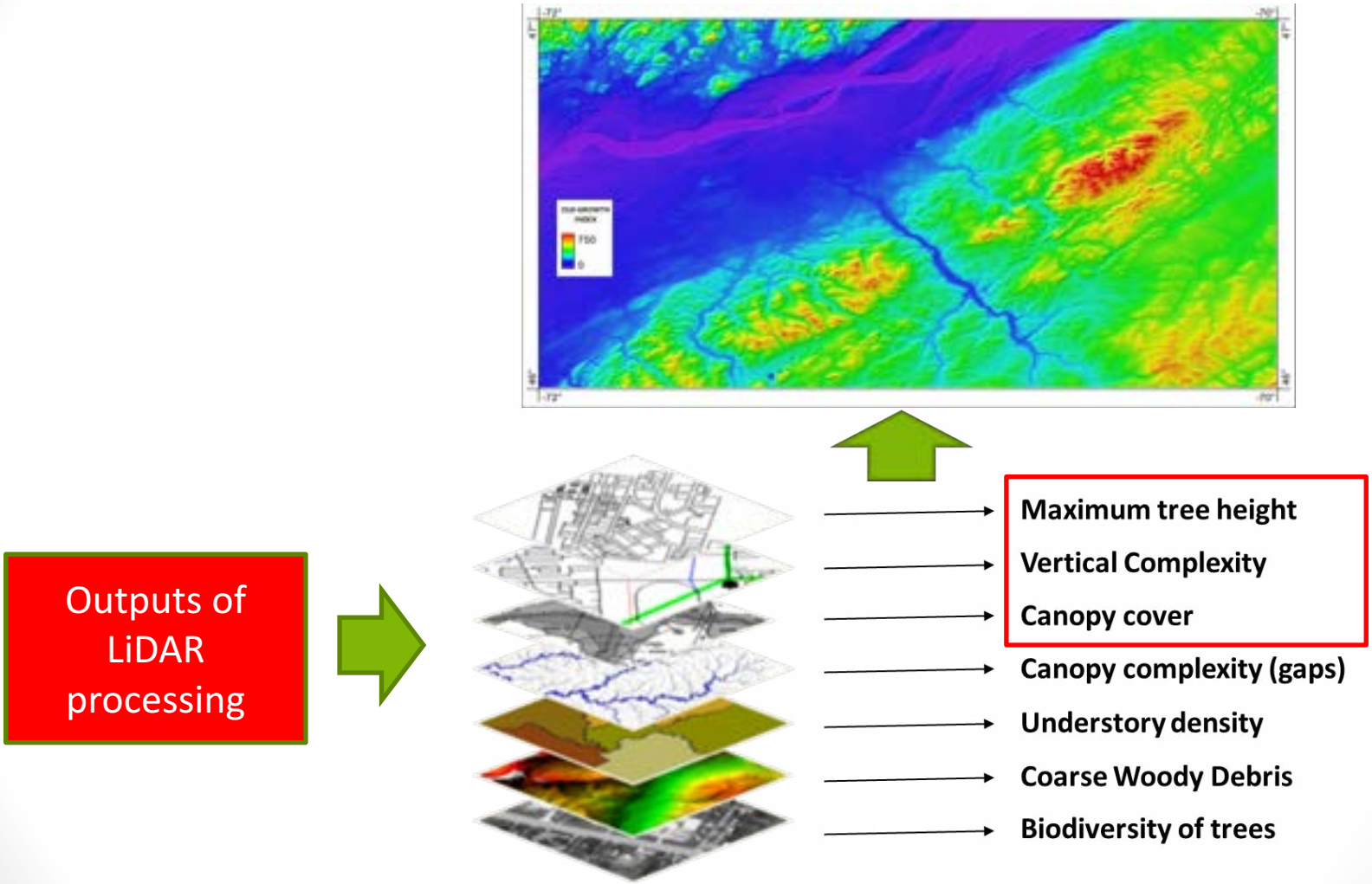
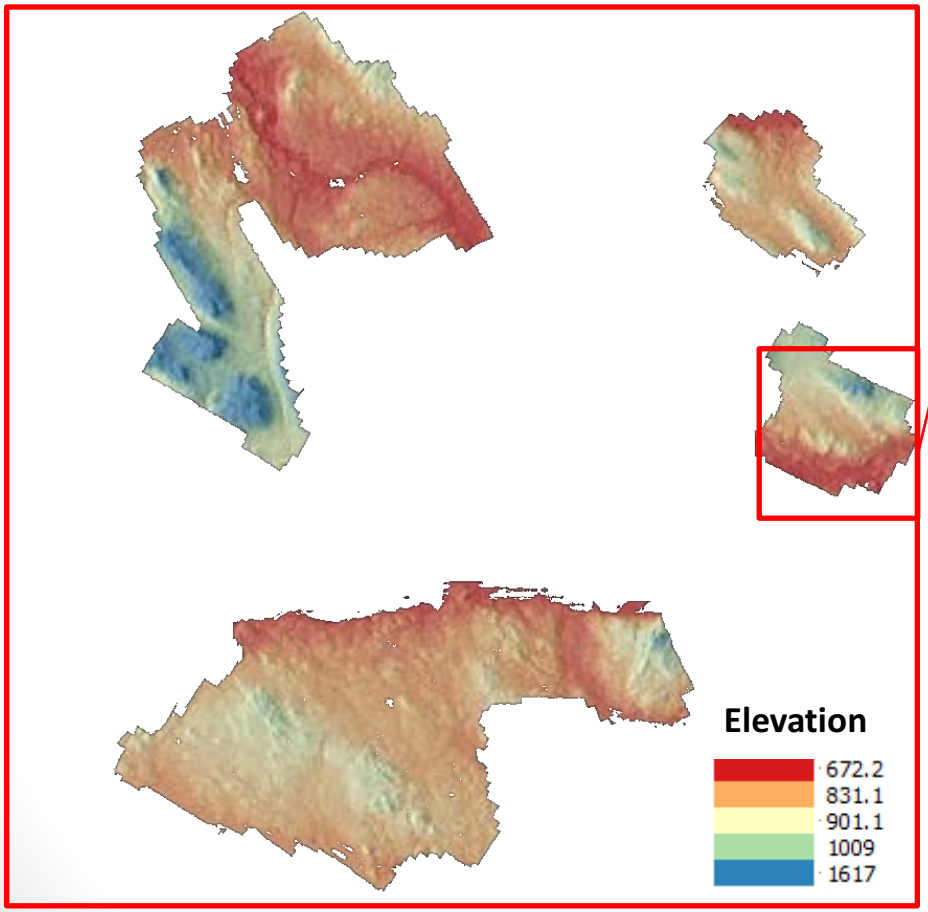
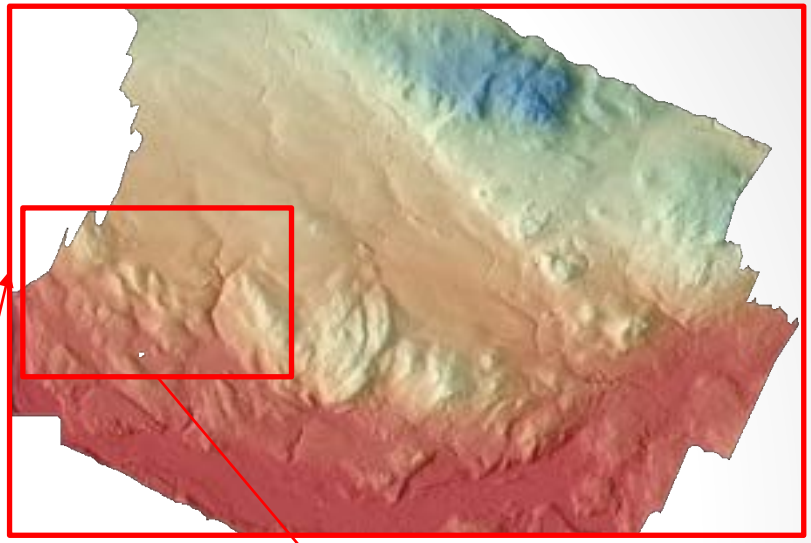


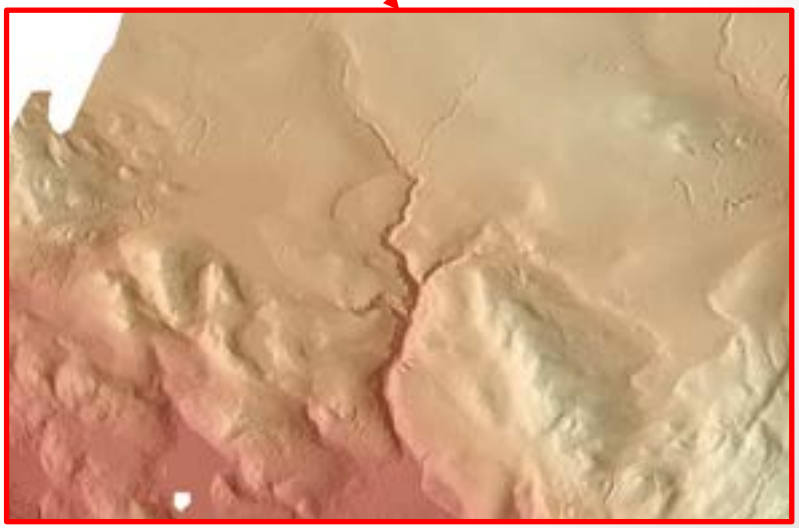
Figure 5 Overlay of three normalized metrics to generate a preliminary old-growth index.

Preliminary Results:

DEM

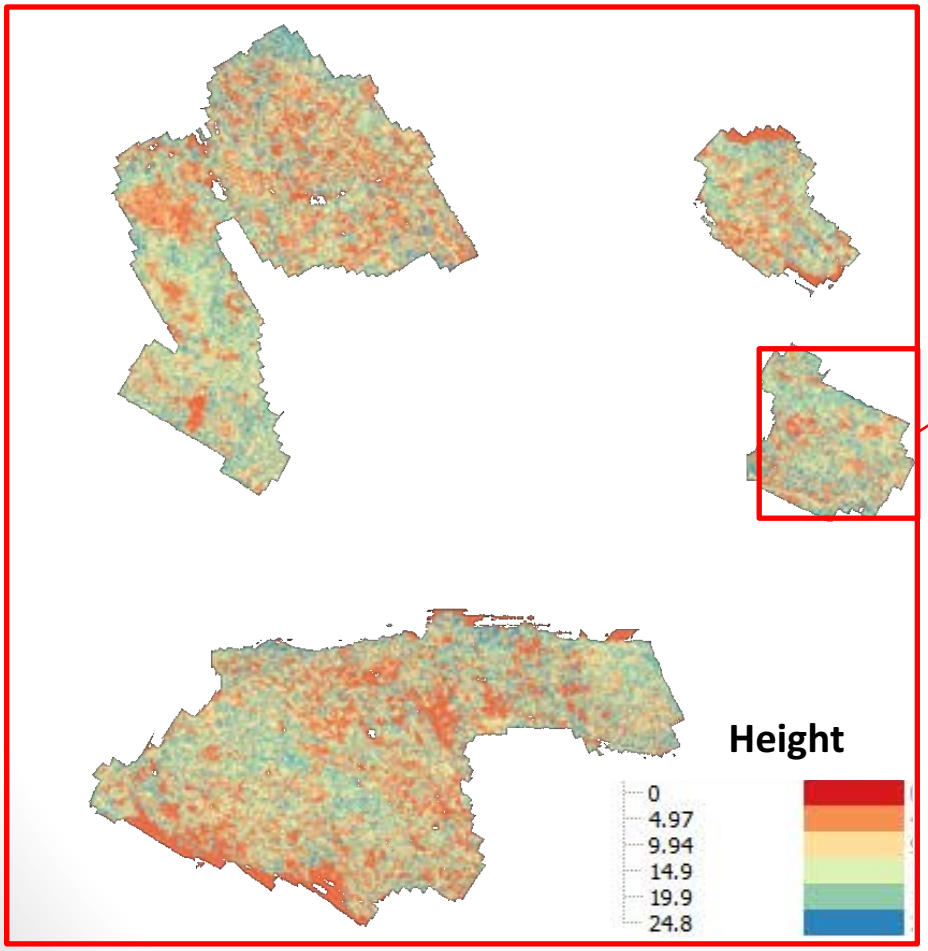


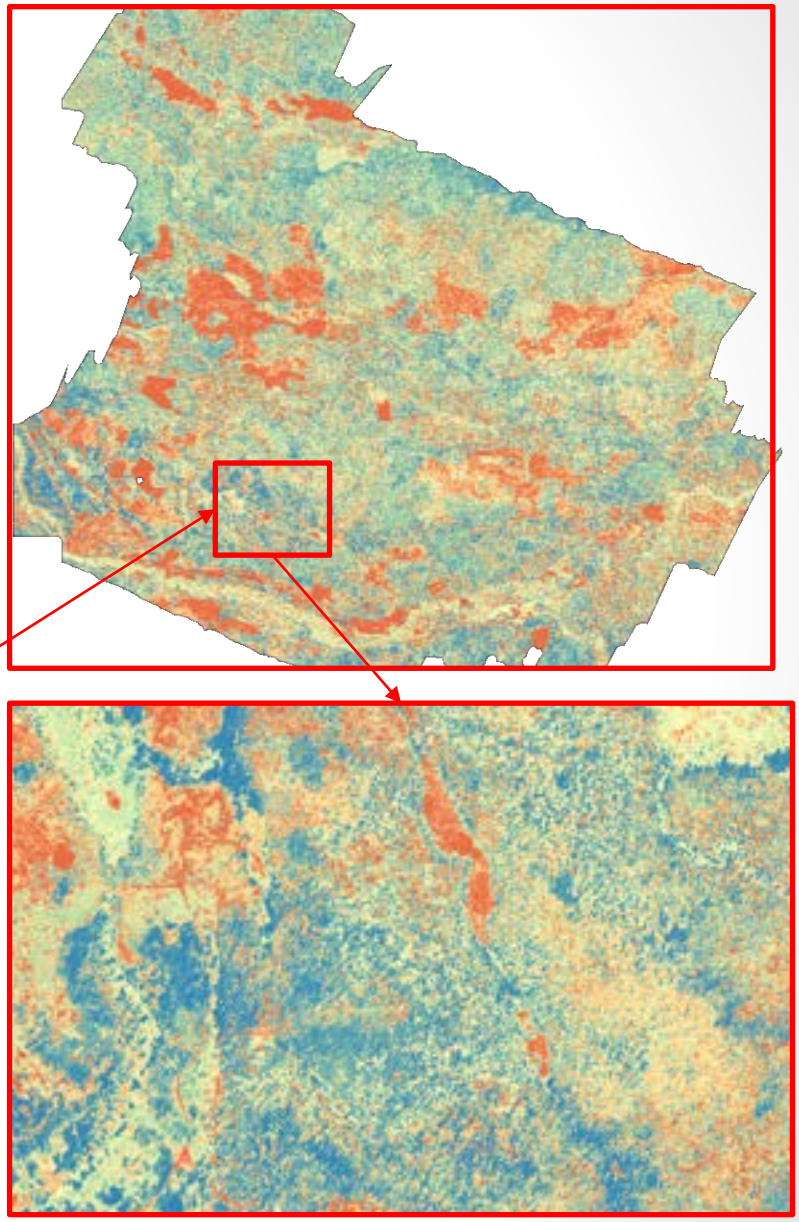




Preliminary Results:

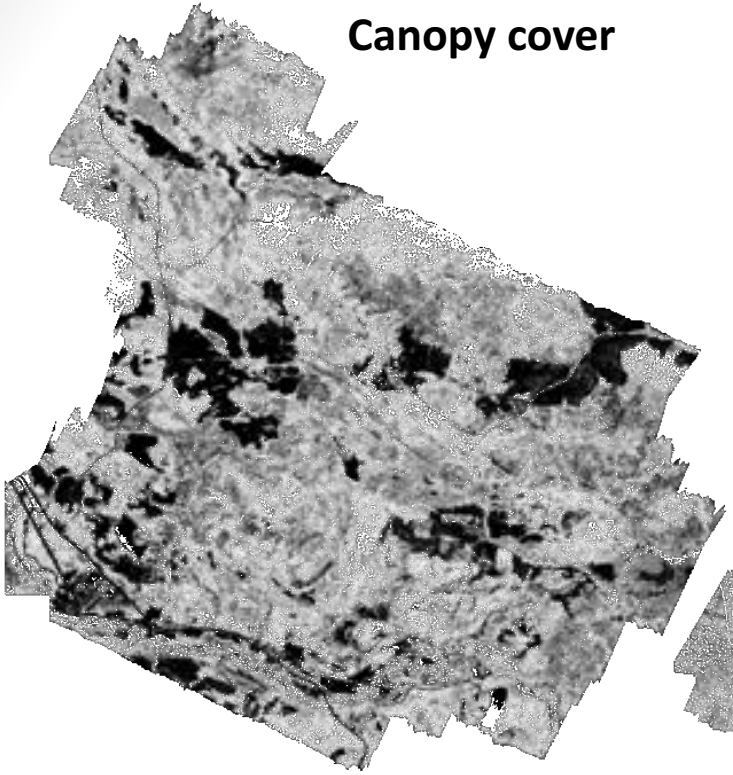
Canopy Height Model (CHM)



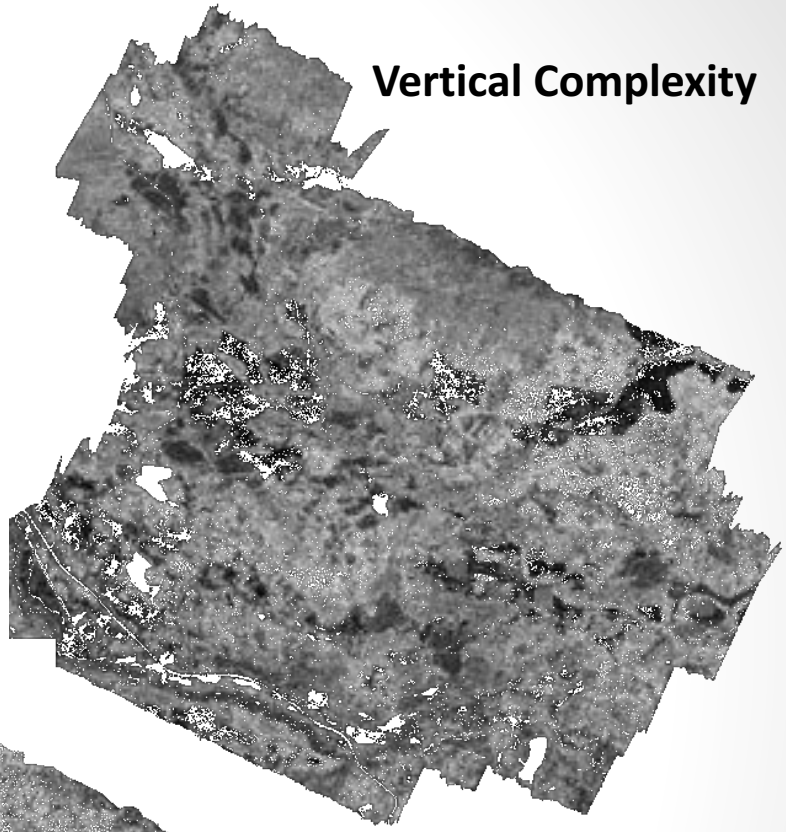


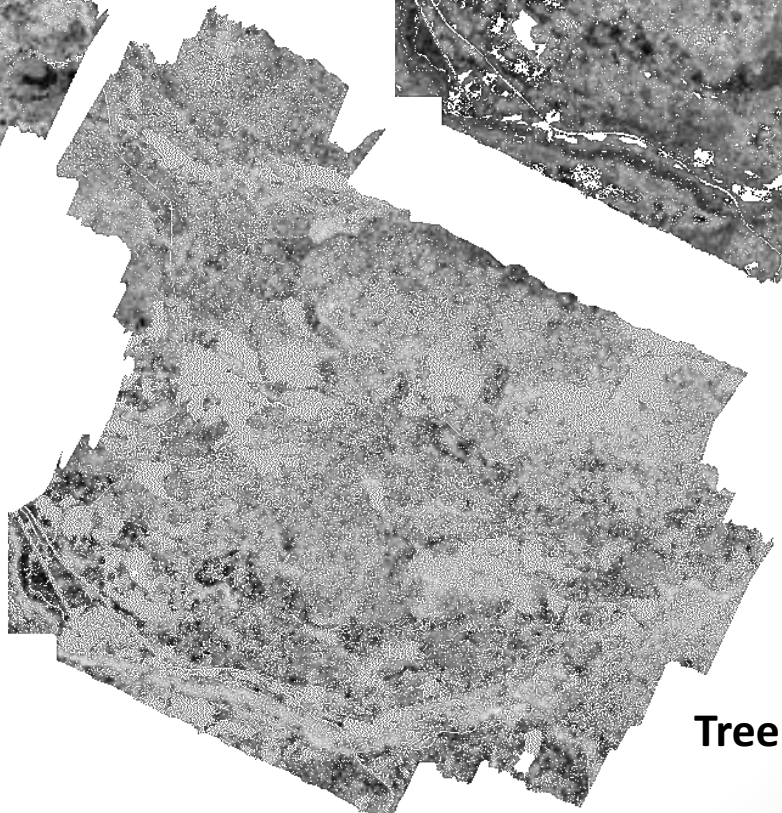
Preliminary Results:

Canopy cover



Vertical Complexity

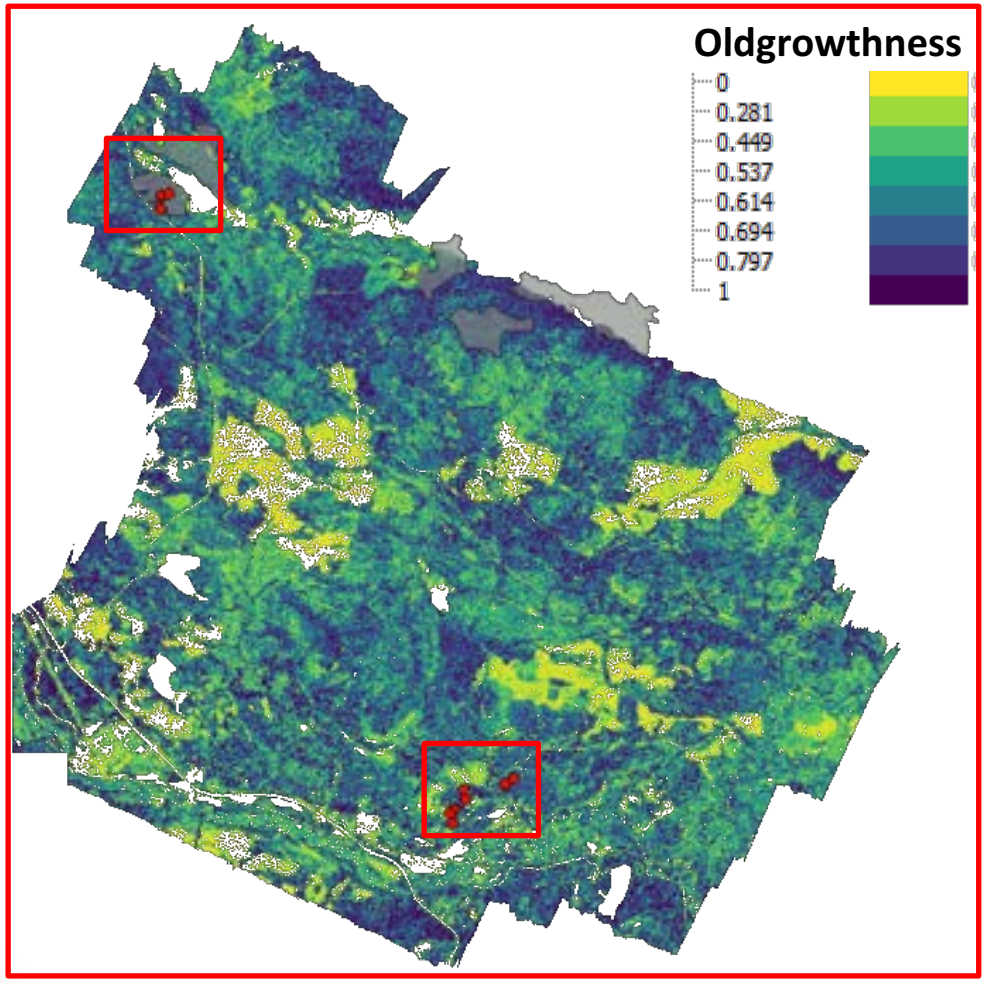


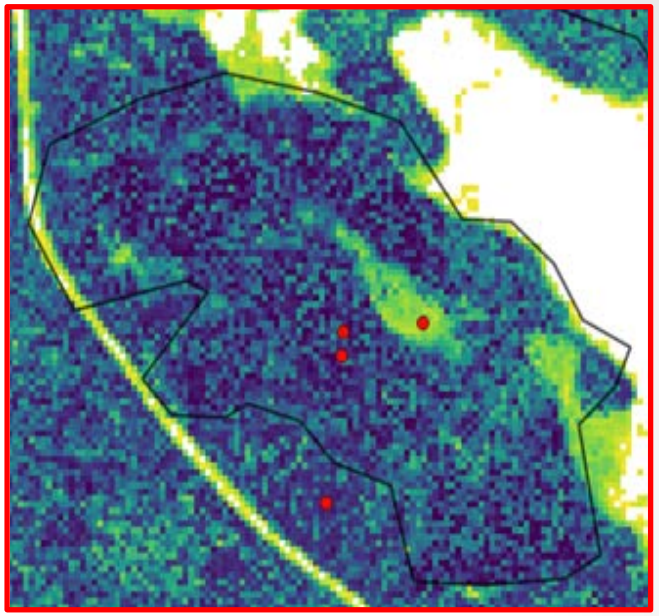


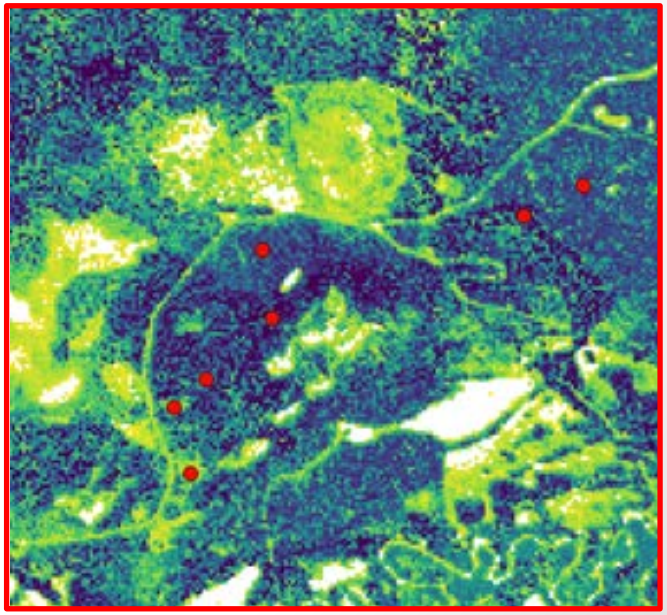
Tree Height

Note: Block 4 only

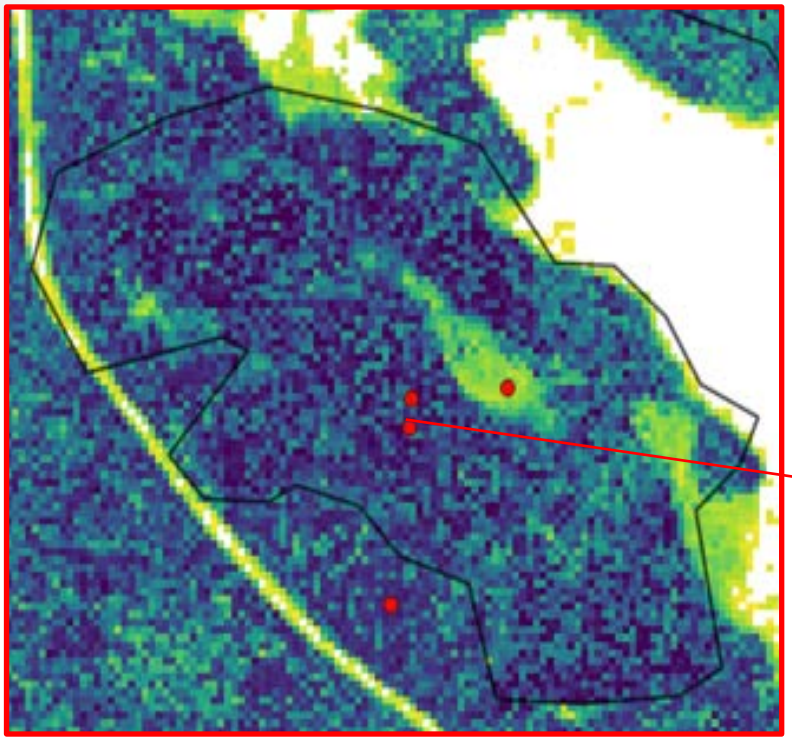
Preliminary Results:

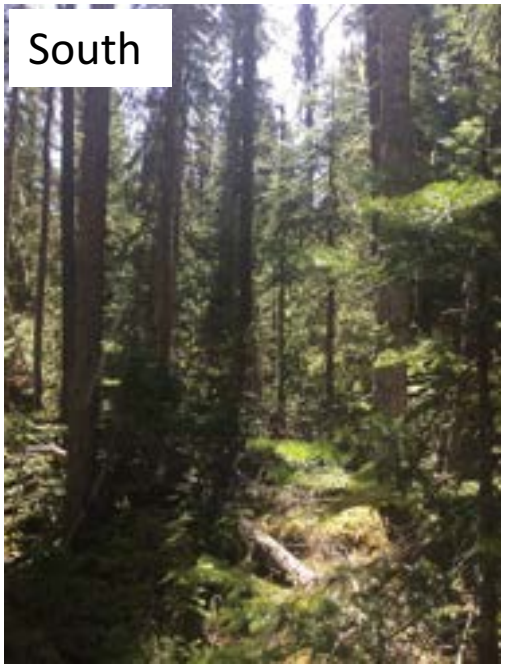






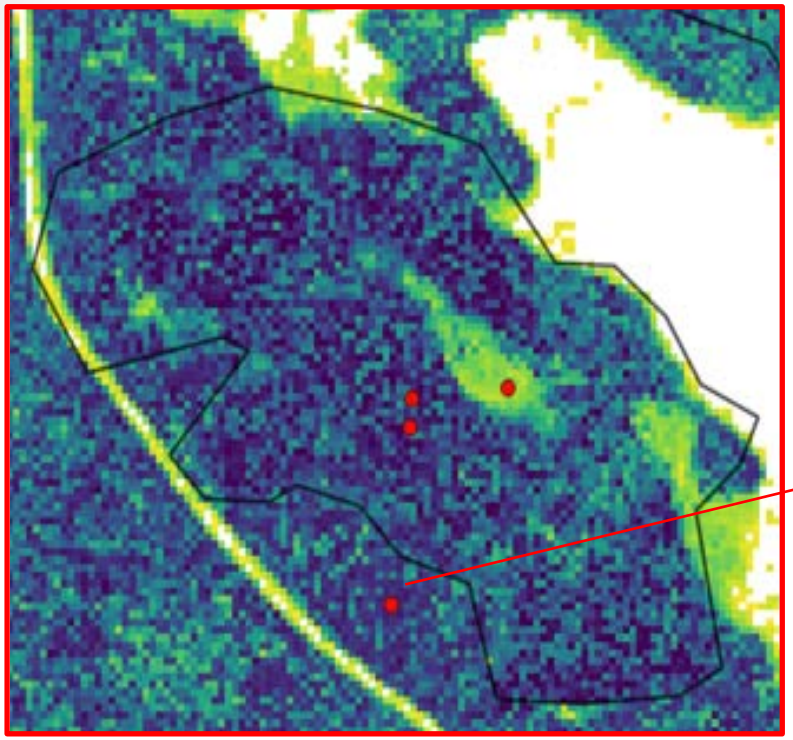
Old-Growth

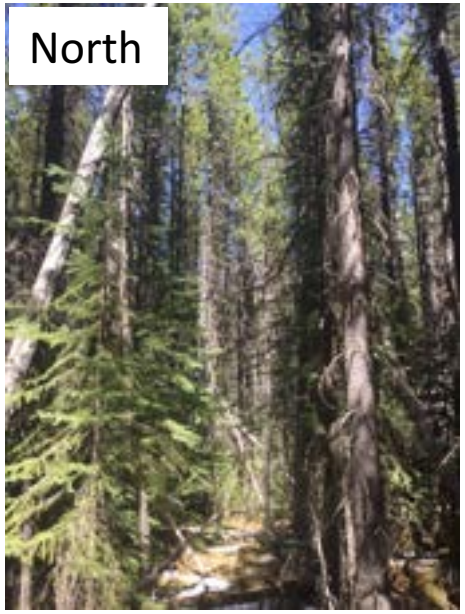


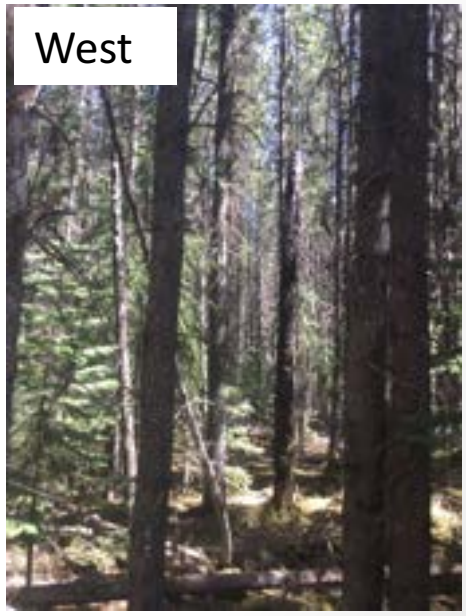


Index value	Canopy Cover (%)
0.93	88.80
Vertical Complexity	**Average Height (m)**
0.42	15.81

Mature

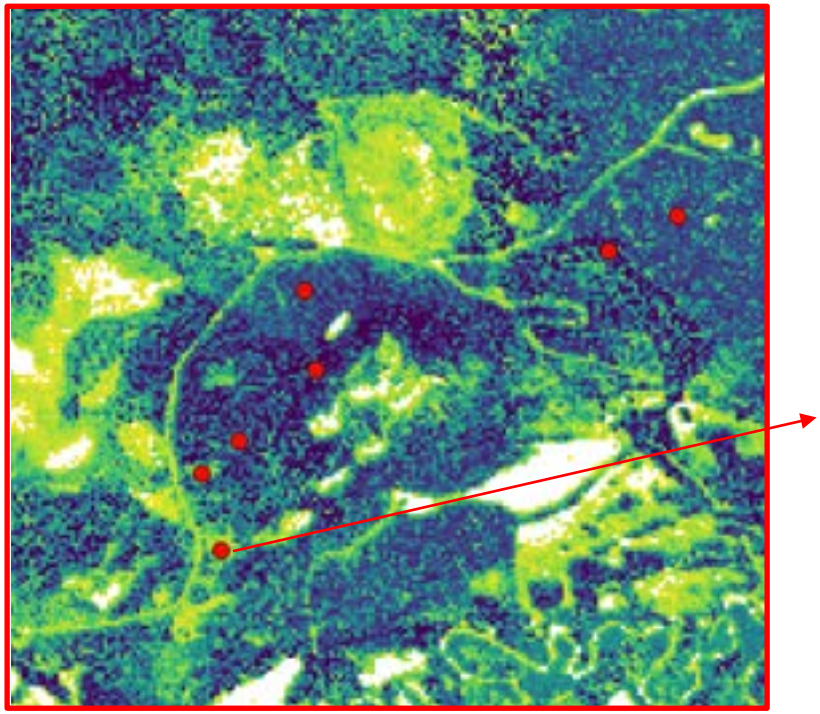




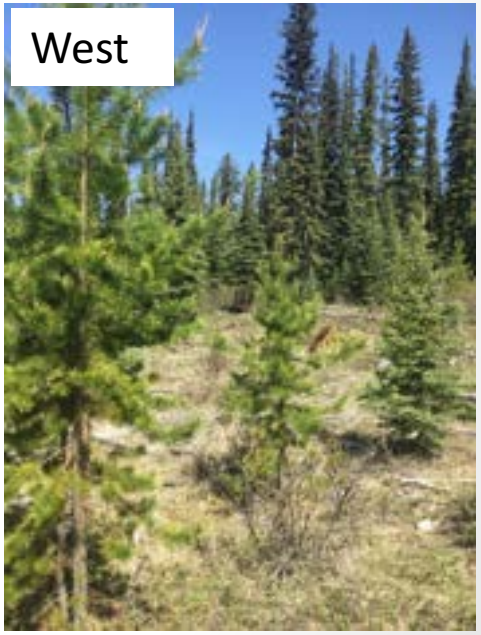


Index value	Canopy Cover (%)
0.72	88.00
Vertical Complexity	**Average Height (m)**
0.34	8.21

Young

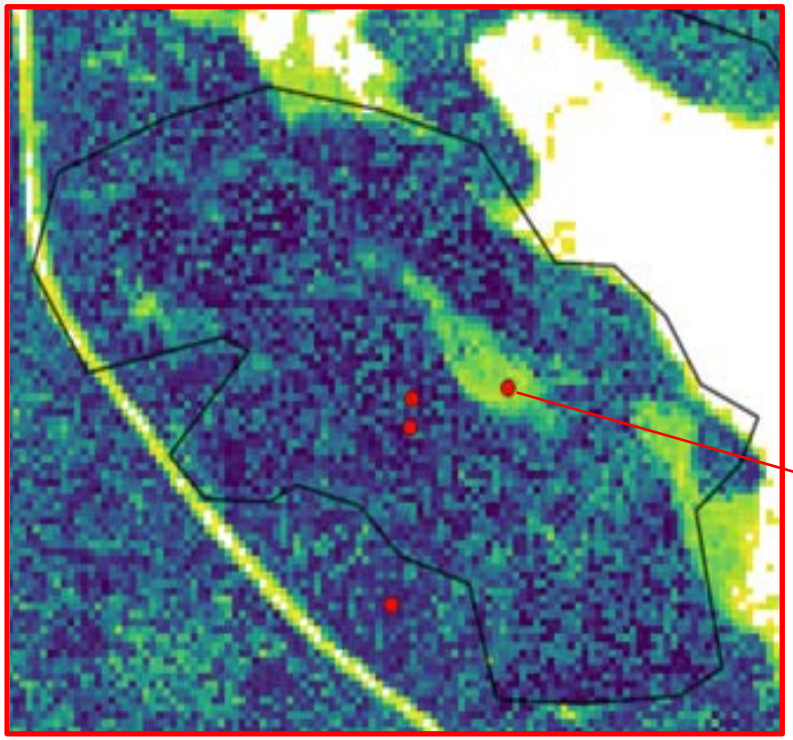


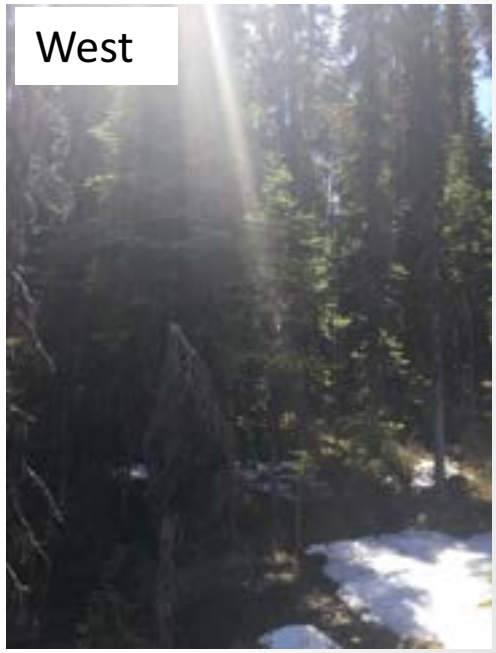
Index value	Canopy Cover (%)
0.31	26.30
Vertical Complexity	**Average Height (m)**
0.46	0.00



Note: Possibility a cut block with natural regeneration

Young



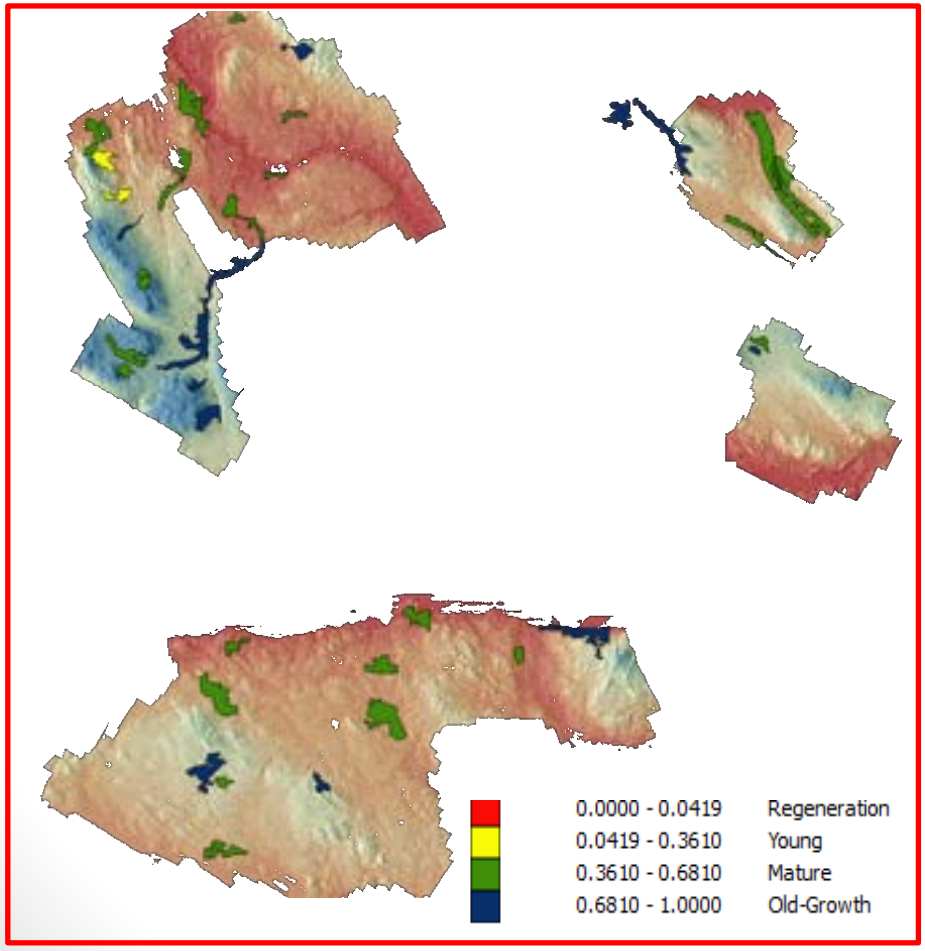


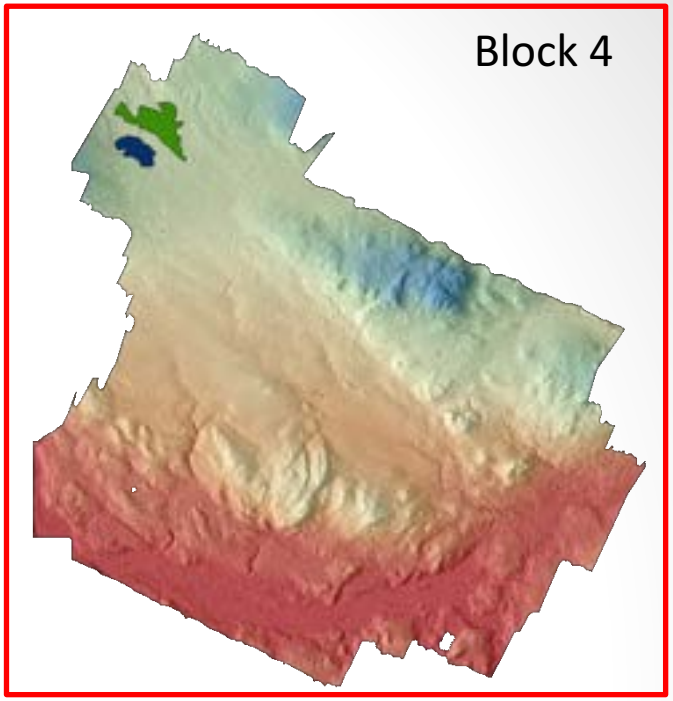
Index value	Canopy Cover (%)
0.22	10.50
Vertical Complexity	**Average Height (m)**
0.41	0.00

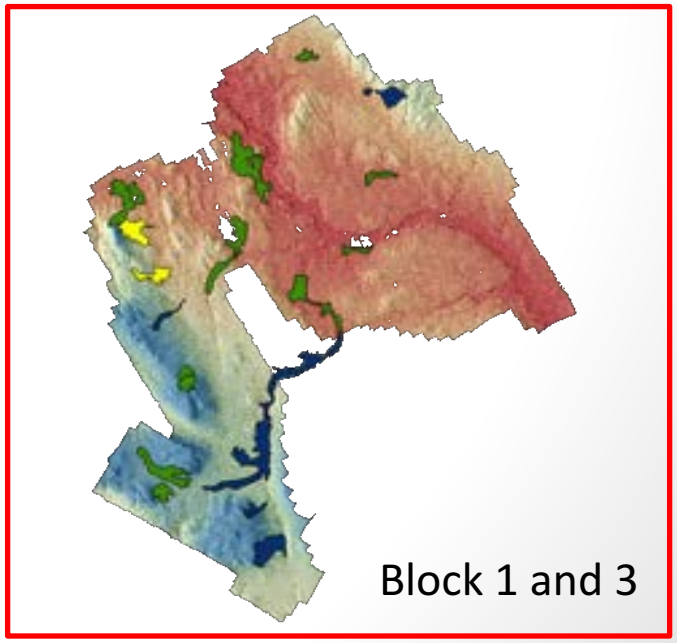
Note: Wet area

OGMAs in CCF:

- 12.5% Young;
- 56.3 % Mature;
- 31.2% Old-growth.







Final Thoughts:

- The preliminary old-growth index worked relatively well (70% accuracy);
- Other old-growth attributes have still to be developed and included in the index;
- LiDAR metrics and Index have to undergo validation with field measurements and surveys;
- 87.5% of the OGMAs that intersect with CCF were classified as either mature or old-growth;
- By mapping old-growth, we have a better chance to retain them in the landscape and keep the provision of ecosystem services they provide us.

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Introduction:

- Old-growth forests values:
- Meeting with Chinook Community Forest:
- How are OGMAs selected? (Holt et al, 2008; not-published)
  - ✓ Forest age estimates;
  - ✓ Structural or biological attributes within stands,
- What are the old-growth attributes?

Materials and Methods:

- LiDAR;
- Ground survey (tree inventory);

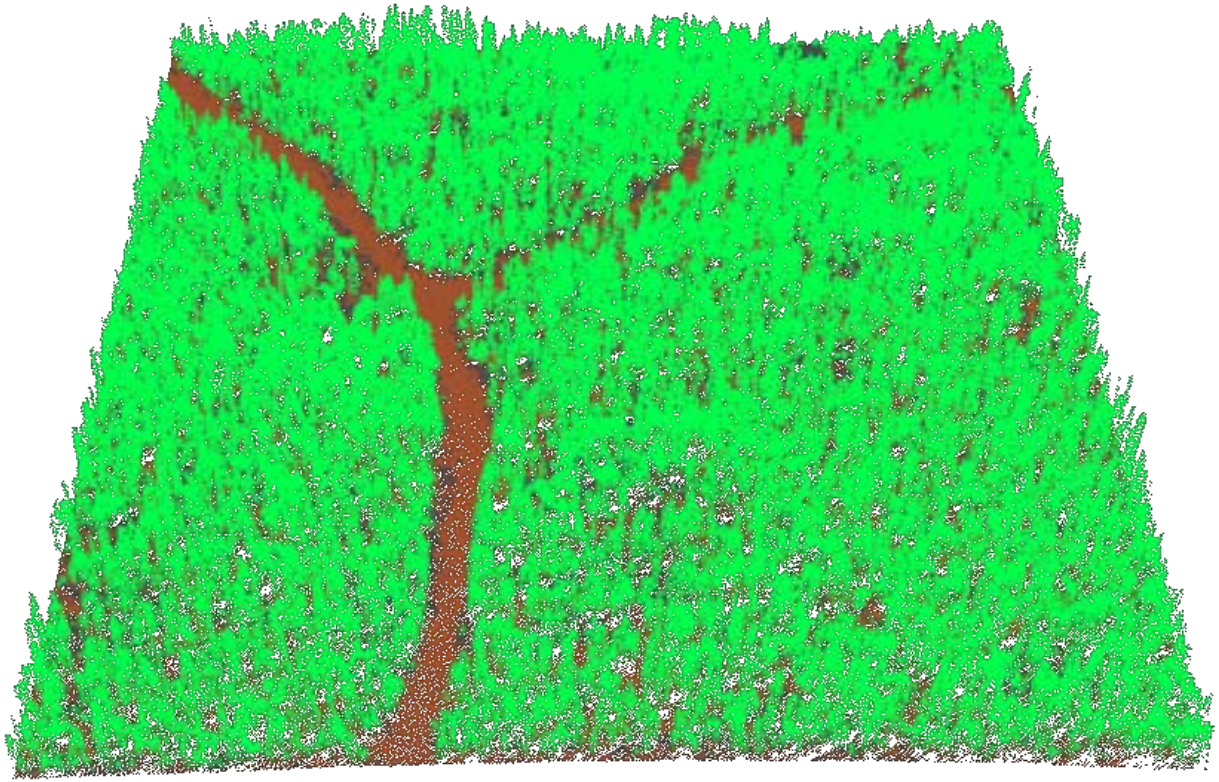

Figure 3 LiDAR point cloud for a 200x200m tile.

Preliminary Results:

- From the 10 points qualitatively evaluated in the field, 7 were correctly classified;
- 2 young stands were incorrectly classified as “mature”;
- 1 young/mature stand was incorrectly classified as old-growth;