Stand dynamics in even-aged lodgepole pine stands following mountain pine beetle outbreaks

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Objectives

- Study effect of mountain pine beetle (MPB) outbreaks on stand dynamics:
  - Characterize current stand structure using mensuration data
  - Reconstruct long-term temporal patterns of outbreaks and other disturbances using dendrochronology
  - Develop models of stand dynamics in even-aged stands
Study Area
Methodology

- Establish subplots in selected stands
- Collect mensuration data, increment cores, and discs from living and dead trees
A dendroecological approach

- Tree rings maintain a record of the canopy disturbance history for a locality, and are useful indicators of ecosystem function.

- Tree rings have been used to examine historical outbreaks of bark beetles.

- Trees that survive beetle outbreaks show a release in the rings as a result of canopy disturbance.
Results

- Characterized current stand structure
- Developed tree ring chronologies for host and non-host species
- Developed disturbance chronologies from scarred material
- Identified historical mountain pine beetle outbreaks in tree-ring record
- Developed conceptual model of stand dynamics for even-aged lodgepole pine
Current Stand Structure

![Graph showing the number of trees per hectare by DBH class before and after a current outbreak.]
Example of scarred lodgepole pine disc
Stand dynamics cycle

Mixed multi-story stand → Stand replacement fire

Stand replacement fire → Open-canopy even-aged stand

Open-canopy even-aged stand → Closed-canopy even-aged stand

Closed-canopy even-aged stand → Residual overstory and regeneration

Residual overstory and regeneration → beetle outbreak

beetle outbreak → tree mortality

Tree mortality → CWD

CWD → Residual overstory and regeneration

growth release → Mixed multi-story stand

fire suppression → Mixed multi-story stand

stand initiation → Stand replacement fire
Conclusions

- Historical ecology approaches (i.e., dendrochronology) combined with stand mensuration data illustrates the role stand disturbances play on the ecology of lodgepole pine

- Stand replacing fires initiate even-aged lodgepole pine stands; multiple MPB disturbances create stand that have variable canopy and cohort structure

- In the absence of fire disturbance the MPB plays a more frequent role in directing stand dynamics and structure in the southern interior of BC

- Frequency and severity of MPB outbreaks determines the structure and composition of the residual stand
Ongoing work

- Sample uneven-aged stands on the Chilcotin Plateau
  - plots established in 1987/88 (T. Shore)
- Study historical fire frequency and relationship to possible mountain pine beetle outbreaks
- Determine relationship between outbreak patterns and varying climate conditions
- Compare stand structure and disturbance history between even and uneven aged stands
- Develop conceptual models of stand dynamics in both even and uneven aged stands in the IDF subzone
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