



Tree Growth Trends

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Murakami – collaborators welcome!**

Tree Increment Cores

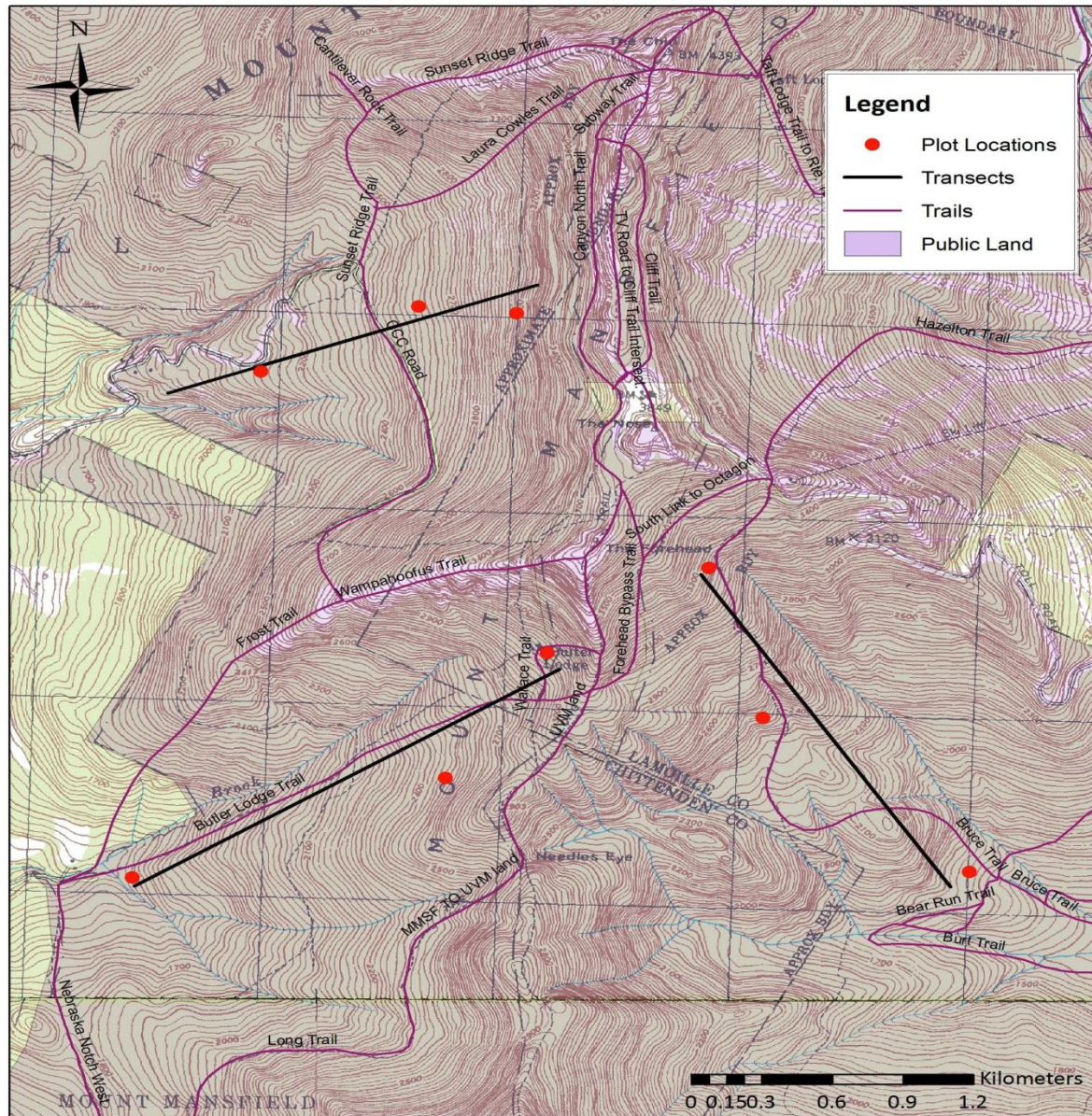


- Easy to collect
- Datable
- Annual resolution of growth
- Long-term record (decades to centuries)
- Includes average growth and changing conditions (trajectories)
- Documents “events” (damage and/or release – 1998 ice storm)
- Basal Area Increment (BAI) – area adjustment for increasing DBH

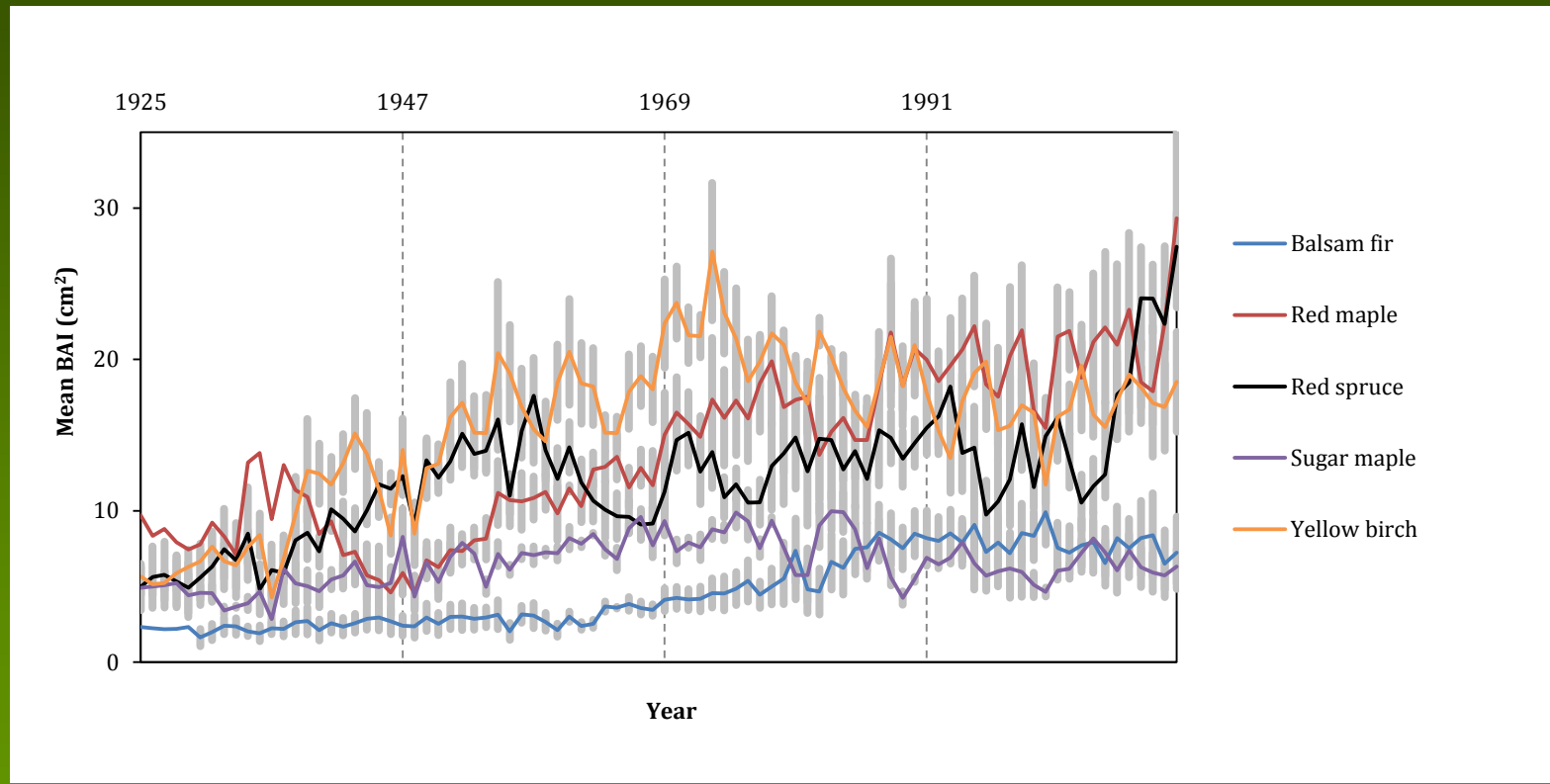
VMC Mt. Mansfield Study

- 3 transects – one up each undeveloped watershed
- 3 elevational zones per transect (low, mid, high)
- Species at each elevation zone:
 - High - red spruce & balsam fir
 - Mid – red spruce, sugar maple & yellow birch
 - Low – red spruce, sugar maple & red maple
- Per species & elevation – ~12 trees - 2 cores per tree

VMC Dendrochronology Project Study Plots

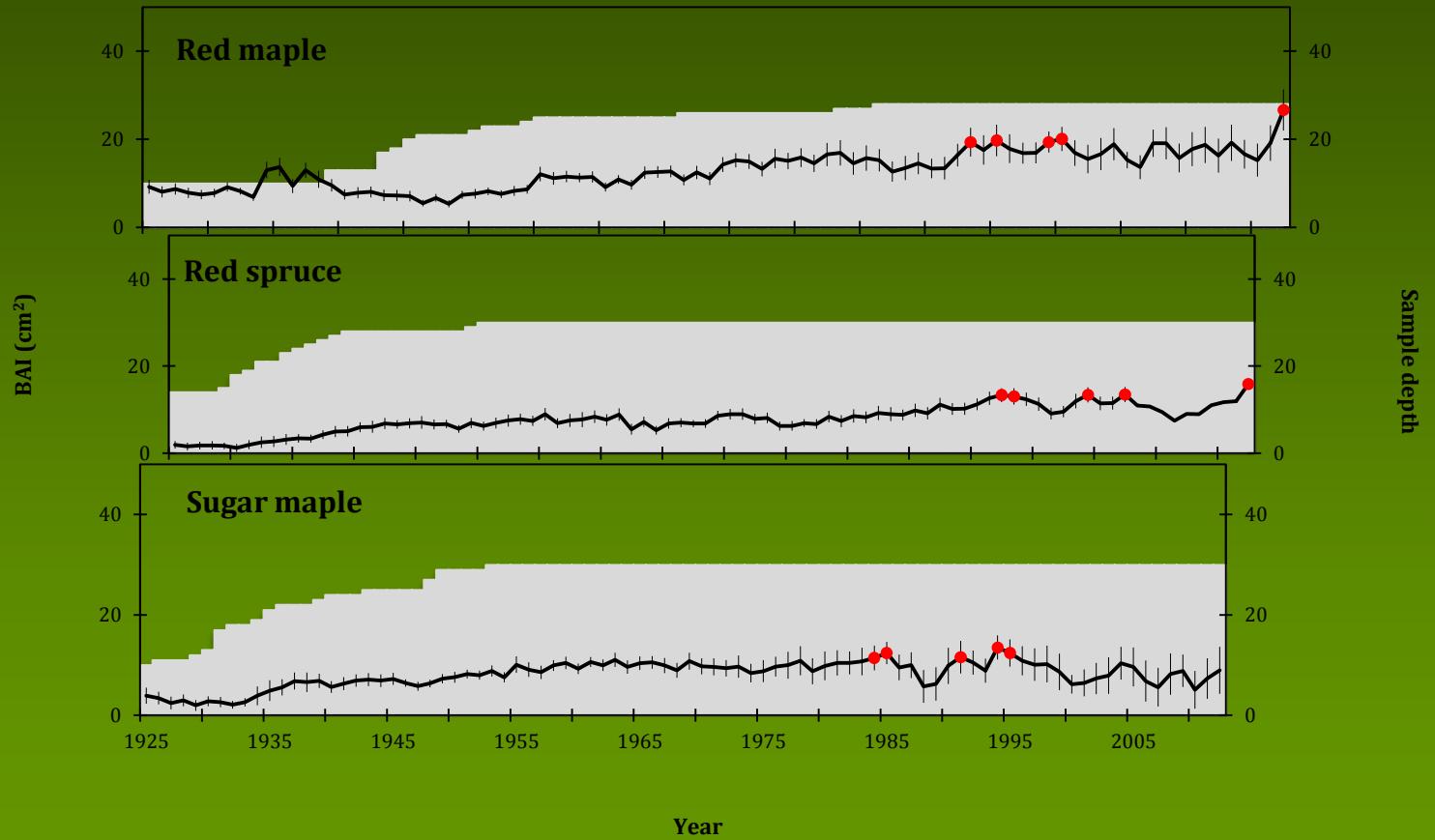


Mt Mansfield BAI Growth – Species



Mt Mansfield BAI Growth

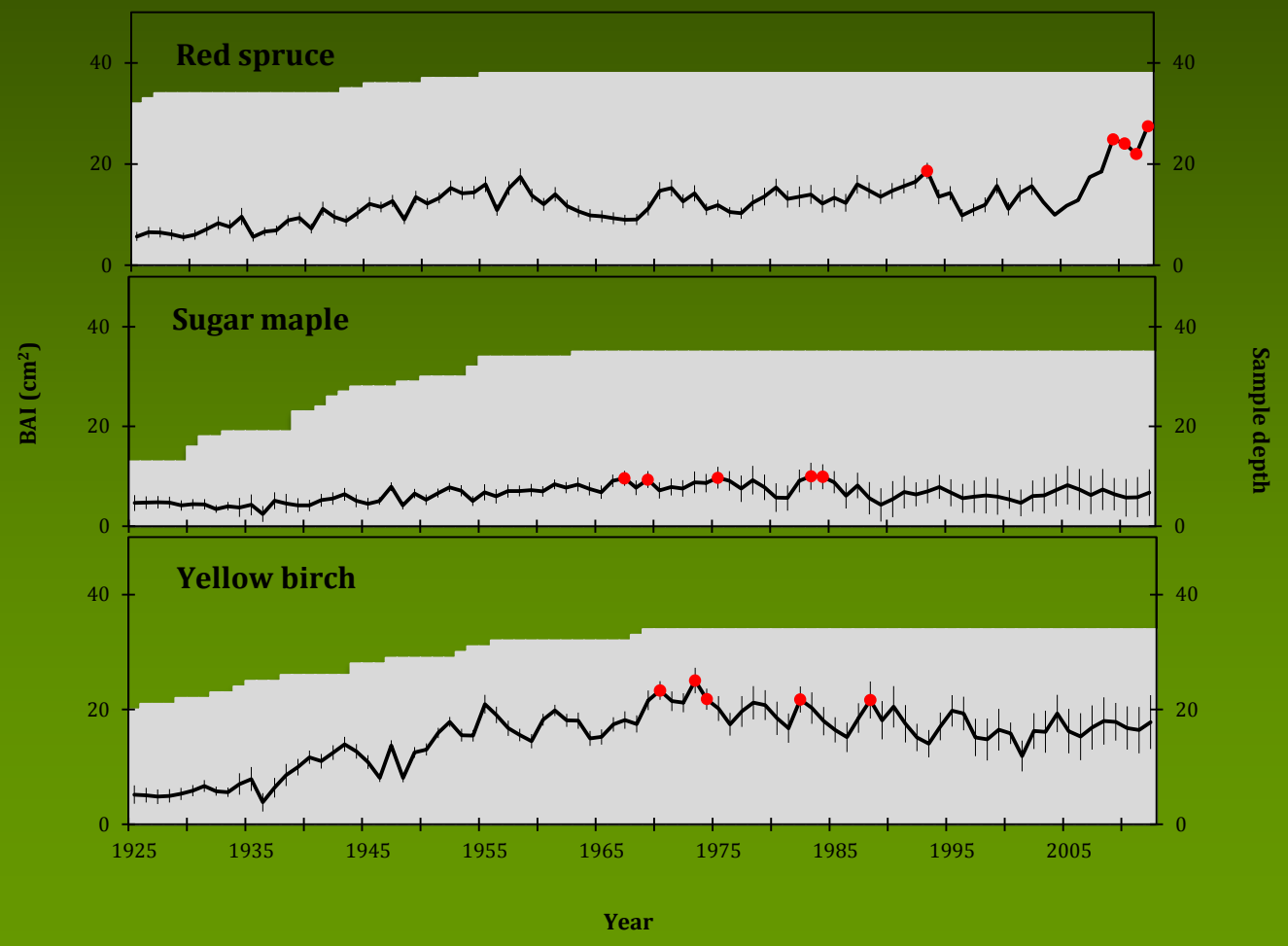
Low elevation



Mt Mansfield BAI Growth



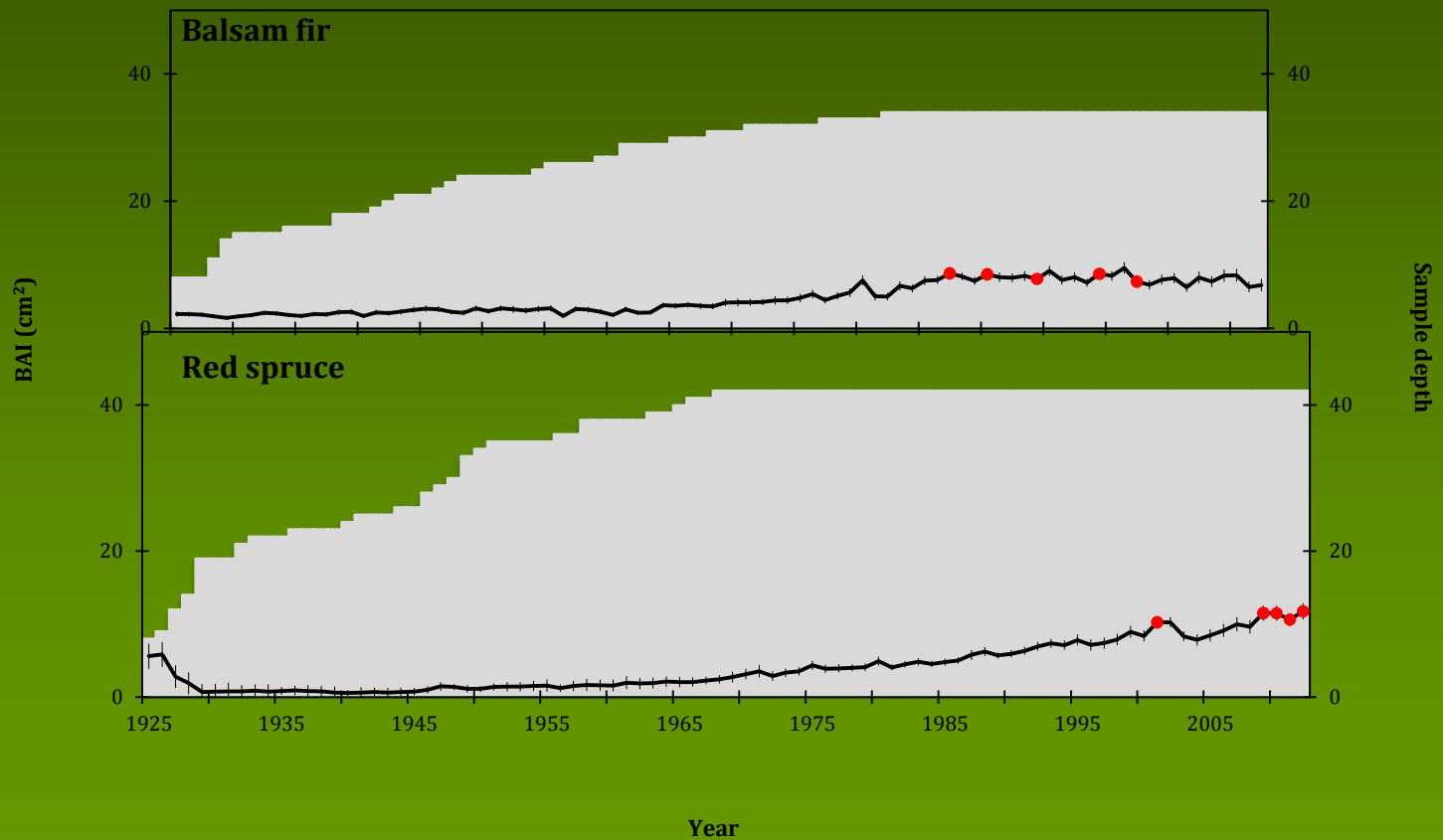
Mid elevation



Mt Mansfield BAI Growth



High elevation



Mt Mansfield Drivers of Growth

- Correlations and Principle Components Analysis
- Elevationally adjusted PRISM climate data – 1925-2012
- S & N deposition data 1965-2010
- Atmospheric CO₂ concentrations – 1945-2012
- Red spruce, balsam fir, red maple & yellow birch: positive relationships of growth with higher temps, especially indicators of an extended growing season
- Sugar maple: several negative relationships with temp, only positive relationship with precipitation



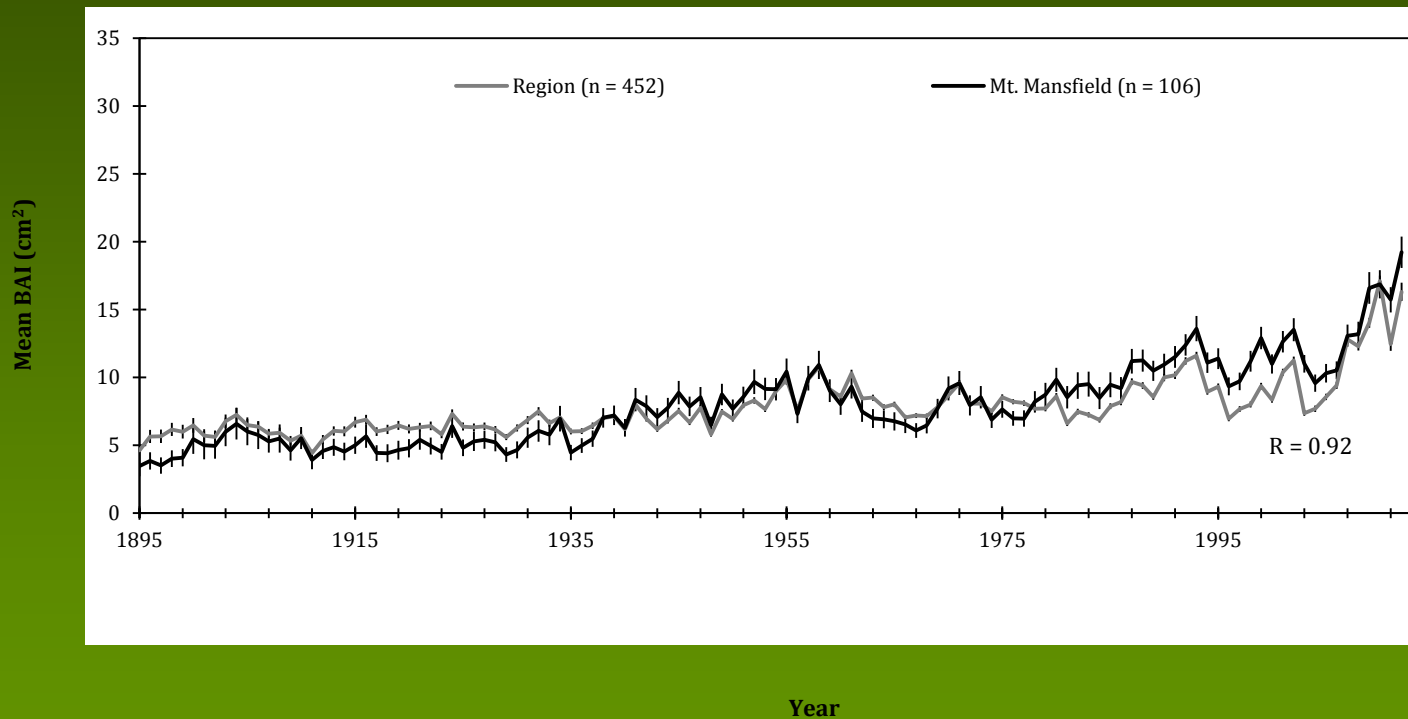
Dendrochronology database



- Many species (comparisons, interactions)
- Many locations (spatial trends)
- Combine with other spatial (e.g., elevation, nutrition) and temporal (e.g., weather, pollution) data

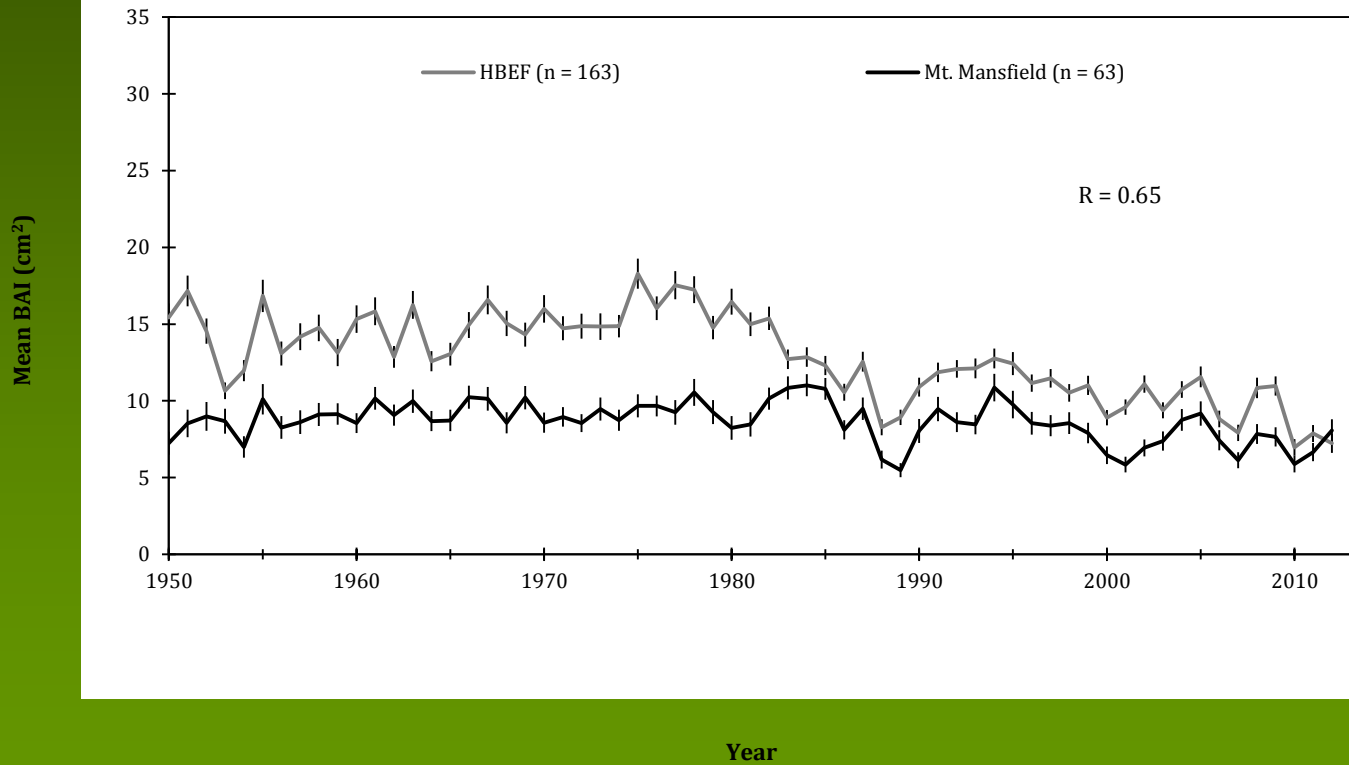
Comparative Analysis

Red Spruce



Comparative Analysis

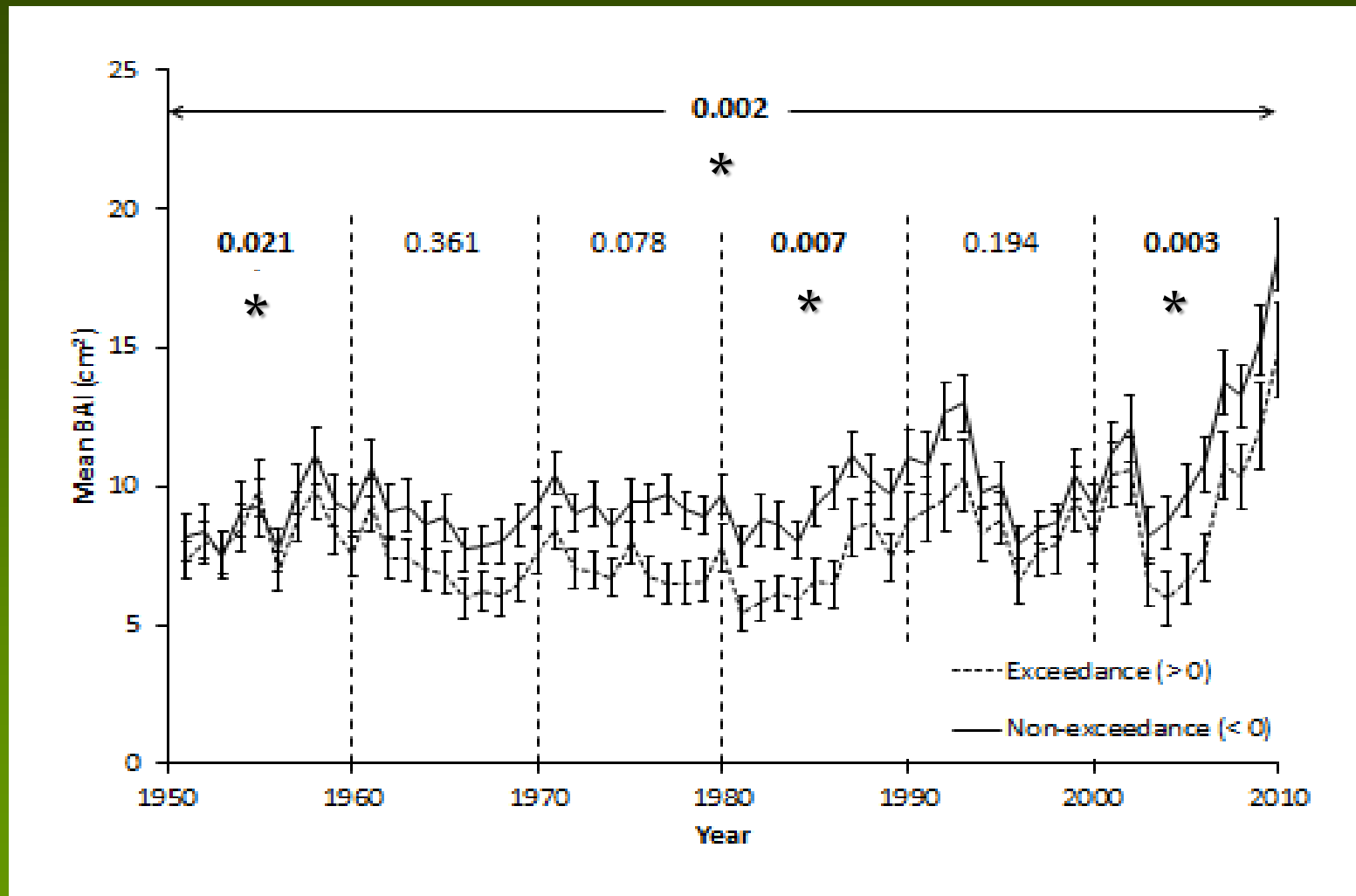
Sugar maple



Dendrochronology database

- Context for site-specific data
- Baseline information of regional productivity
- Species-specific changes over space & time
- Climate change
- Acid Deposition (Critical Load Exceedance)
- Atmospheric N fertilization?
- Atmospheric CO₂ fertilization?
- Changing competition with migration or invasives
- Etc.

Modeled S & N Pollution Critical Load Exceedance



37 red spruce plots in VT and NH (441 trees)

Engel et al. 2016

Questions?

