Wildfire Dynamics in Jasper National Park, Alberta: a Dendroecological Approach
Project Update June 2013

Theresa Dinh, M.Sc. Candidate
Climate and Ecosystem Dynamics Research Lab @ the University of Guelph

Wildfire is a fundamental, yet complex and poorly understood natural disturbance process. Due to variability in the causes, controls and scales of wildfire disturbances, the landscape impacts of wildfire are variable on both spatial and temporal scales. As well, wildfire activity is also shaped by land use history, fire exclusion, and climatic change. Recognizing these complexities, it is important to understand how disturbance processes and landscape patterns interact (and how these relationships may have changed through time). Paleoecological research, especially fire history studies, provides an improved understanding of natural disturbance patterns and its variability resulting in effective science-based management to support present-day and future forest management decisions.

Historically, fire regimes have either been characterized as low- or high-severity (e.g., Rocky Mountain Parks). However, new evidence suggests that management according to a mixed-severity fire regime is more appropriate in landscapes with complex topography and vegetation patterns. Therefore, a dendroecological (tree-ring) approach is needed to reconstruct a fine-scale temporal and spatial wildfire history. Samples with both pith and fire scars evidence will aid in the reconstruction of a mixed-severity fire regime such that; high-severity fires will be dated using cohort establishment years and low- to moderate-severity fires will be dated using fire scars.

In this study, modern analytical techniques such as cross-dating and pith correction will be used to reanalyze Gerald Tande's (1979) published reconstruction of "Fire History and Vegetation Pattern of Coniferous Forests in Jasper National Park, Alberta". This approach will yield an accurate reconstruction of wildfire history and thus allow for robust inferences about the history of climate, vegetation, and controls on wildfire dynamics at a range of temporal and spatial scales - which were not previously possible.

The 435 km^2 study area around the Jasper townsite covers a complex degree of topographic relief including the Athabasca, Maligne, and Miette River valleys, as well as, mountains forests and alpine meadows. As reflected by the species sampled, the vegetation community was dominated by fire-adapted species such as lodgepole pine (*Pinus contorta*) and Douglas-fir (*Pseudotsuga menziesii*). In total, 428 cross-section samples (two of which are pictured) will be re-surfaced, scanned and processed through a modern digital imaging program, WinDendro.

This fire history reconstruction will add to other studies in the Rocky Mountains including adjacent regions in both Alberta and British Columbia. Specifically, by characterizing the fire-climate-landscape interactions around the Jasper townsite, it will allow for comparisons associated with other closely-located human-dominated landscapes (e.g., Foothills region of Alberta). As well as adding to the scholarship of wildfire ecology, this work will also inform land management practices through, a site visit with Parks Canada managers, a final report to collaborators at the Foothills Research Institute (FRI) and Jasper National Park, and a manuscript for submission to a peer-reviewed journal.

Research Question:

- What are the controls on wildfire dynamics in Jasper National Park?

Objectives:

- To re-analyze Tande's 1979 fire history reconstruction of Jasper National Park using modern dendrochronological techniques
- To identify and understand the mechanisms for variability mechanisms in wildfire dynamics, especially human-climate-landscape controls
- To inform effective land management practices (e.g., fire-return intervals)

Project Milestones as of June 2013:

- Processed and counted 304 (of 428) cross-section samples
- Transcribed and digitized all field notes
- Preliminary geospatial analysis