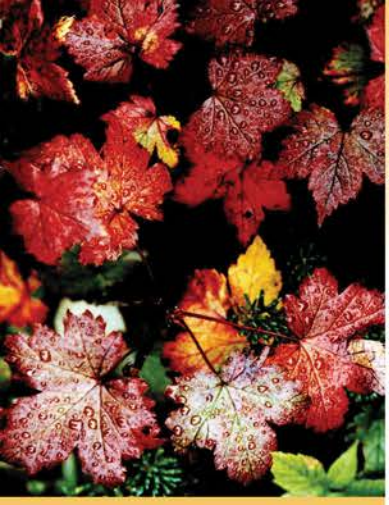

See also Northern Notes Issue # 4 on NoFC Labs

Insights

Canadian Forest Service

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The Northern Forestry Centre (NoFC) Tree-Ring Lab

Among the many fields of research pursued by Canadian Forest Service (CFS) scientists at Northern Forestry Centre (NoFC) is the field of dendrochronology. Ted Hogg, a research scientist with the CFS who focuses on the effects of climate change on Canadian forests, is happy to explain, "Dendrochronology, commonly known as tree-ring analysis, is the scientific study of annual growth rings in trees or wood." Wide tree rings are formed in years with good growing conditions, for example, lots of moisture and a long growing season; narrow tree rings are formed in years when the tree is under stress from things like drought or attacks by insects or diseases. This is a fascinating area of study and there are many questions that can be answered in this discipline: How old are our forests? What conditions did they endure during their development and life span, for example, fire, insects, drought? Under a warming climate, are Canada's forests growing faster or slower? CFS researchers have been using tree-ring analysis at the NoFC in Edmonton, Alberta, for several decades. In the past, studies were conducted using microscopes and hand lenses in multiple offices and labs scattered throughout the building. In 2010, under the Accelerated Infrastructure Program, a single modern laboratory was built where all the samples and digital information could be consolidated, housed, and analyzed.

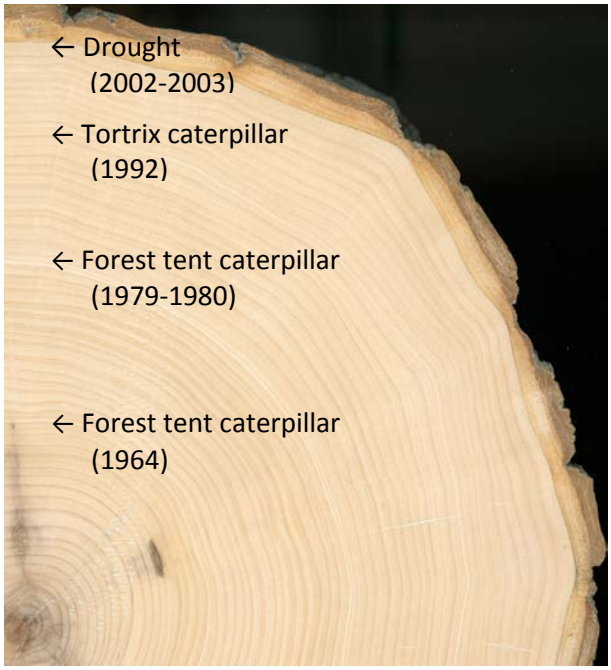

Figure 1: Aspen tree "cookie" sample with annotated growth history (Photo: Ray Darwent)

Today, the NoFC Tree-Ring Lab is a modern facility with 3 high-resolution scanners linked to computers, several dissecting microscopes, and a drying oven. The researchers are able to study an inventory of over 16 000 samples, with close to 1 000 samples, known as cookies (cross sections of tree stems), and more than 15 000 increment core samples, which are samples taken from trees using a metal boring tool that extracts a sample of wood from the bark (outside of the tree) to the centre of the tree or stem. Tree rings vary depending on growing conditions and in some trees the rings are so thin that it is impossible to see with the naked eye where one ring ends and another begins. This often happens in very old trees grown in poor sites, or grown during outbreaks of defoliating insects such as forest tent caterpillar. Using a program called CooRecorder, researchers and technical staff are able to scan a core sample and magnify it as a high-resolution image onto a computer screen so they can more easily count these minute rings, and detect any anomalies in the tree's growth due to natural disturbances such as droughts, insect infestations, or forest fires. All 15 000 increment core samples have been scanned so that they can be studied in greater detail.

The data collected from tree-ring samples contribute to several initiatives including the National Forest Inventory (NFI), Alberta's Biodiversity Monitoring Institute (ABMI), and the CFS-led research project called Climate Change Impacts on Productivity and Health of Aspen. The NFI is a collaborative partnership among the federal, provincial, and territorial governments that compiles detailed information and statistically reliable knowledge for tracking changes in Canada's forests.

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The NFI has a collection of increment cores from a network of about 1 000 ground plots representing all major forest types across Canada. These cores are sent directly to the NoFC Tree-Ring Lab where they are prepared, measured, and analyzed. The database from this work is being used by a team of CFS scientists to report on how climate change has been affecting the growth and carbon uptake of Canada's forests. All these initiatives contribute knowledge to regional and national reporting. These results are also being used to improve computer models for predicting future changes in Canada's forests.

The research scientist and coordinator of the Tree-Ring Lab, Jagtar Bhatti, explains that "Tree-ring analysis is an important tool that can show how our forests fared in the past during natural disturbances such as insect outbreaks and extreme climate events. Researchers can retrieve this information going back hundreds of years. By knowing how our forests responded during a drought cycle, for example, researchers can anticipate their resiliency in today's changing climate." Forest managers who plan for 60- to 100-year harvesting cycles can use tree-ring analysis data to help determine the best species of trees to plant in an effort to withstand drought or other adverse growing conditions, and thus better plan for future changes. As well as helping forest managers, this work helps scientists conduct national scientific research, and it is also useful in making policy decisions about climate change adaptation.

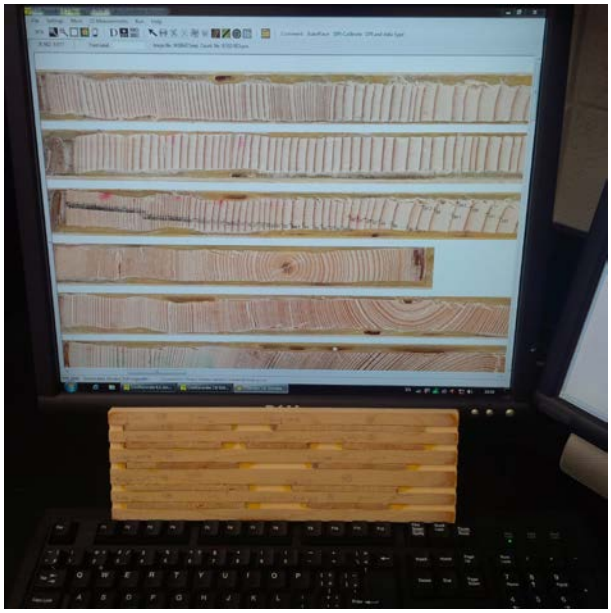

Figure 2: High resolution scan of increment core samples (Photo: Ray Darwent)

Figure 3: Catherine McNalty, Tree Ring Technician, (left) and Trisha Hook, Climate Change Impact Technician, (right) with large spruce "cookie" sample. (Photo: Ray Darwent)

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Aussi en français

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