



Site Restoration. Step 1: Looking Back to the Past

Because natural resources development causes landscape disturbance, post-development site restoration requires an in-depth knowledge of previous conditions. What did the landscape look like before? What were the soil and vegetation conditions?

As part of a unique collaborative scientific project within Natural Resources Canada, researchers from the Canadian Forest Service and Geological Survey of Canada are contributing their expertise to find solutions for these issues associated with the restoration of oil sands mining sites.

What shapes the forest landscape?

The forest landscape is shaped over the centuries and influenced by site conditions (geology, topography, surface deposits, etc.), climate trends and natural disturbances. Human activity also has a



Photo: NRCan

considerable impact; for example, industrialization has an impact on land occupancy and atmospheric chemistry. It is therefore important to be familiar—both temporally and spatially—with landscape characteristics and forest dynamics resulting from natural processes, climate change and human activity.

Alberta: a mine of information

Canadian Forest Service and Geological Survey of Canada researchers are analysing data from the oil sands mining area in northeast Alberta in order to study the relationships between site and soil characteristics, chemical composition of foliage, wood chemistry and tree growth. For their study sites, they selected conifer stands more than 90 years old located at various distances from industrial operations. They collected samples at the sites, including soil samples taken at various depths, tree trunk sections and tree foliage samples.



Photo: NRCan

Branching Out

from the Canadian Forest Service - Laurentian Forestry Centre

Isotopes: tools for going back in time

Hydrogen, oxygen, nitrogen, carbon and sulphur are key chemical elements in the biosphere and have stable isotopes. Isotopes are natural variations of a chemical element, particularly in terms of their atomic mass. The relative quantities of isotopes in these elements fluctuate from year to year because they are influenced by environmental conditions. However, once these elements are fixed in organic material (wood, leaves, etc.), they remain stable over time. Thus, the quantity of carbon isotopes measured in an annual tree ring is the same as it was at the time of fixation and will remain the same in 50 years' time.

The analysis of stable isotopes in carbon and nitrogen in tree growth rings and tree foliage makes it possible to detect environmental changes in both time and space. The researchers can thus distinguish between changes attributable to industrial activity (for example, air pollution) and those caused by climatic variations.



Photo: NRCan



Photo: NRCan

Landscapes, a key part of restoration

The first step in site restoration is to establish reference conditions prior to resource extraction. It then becomes possible to establish restoration targets as well as indicators for determining the structure and functions of site and landscape ecosystems and monitor their development over time. These indicators can be used to assess the progress achieved in restoration activities.

The upcoming results will be helpful in harmonizing operational forest landscape uses and in maintaining these landscapes. This project will improve the environmental performance of Canada's natural resource sectors by developing and harnessing knowledge to facilitate integrated natural resource development.

For more information, please contact:

Evelyne Thiffault

Natural Resources Canada
Canadian Forest Service
Laurentian Forestry Centre
1055 du P.E.P.S.

P.O. Box 10380, Stn. Sainte-Foy
Quebec City, Quebec G1V 4C7

Phone: 418-648-5835

Fax: 418-648-5849

E-mail: evelyne.thiffault@nrcan.gc.ca

Web site: nrcan.gc.ca/forests