Natural Resources Canada
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CANADIAN FOREST SERVICE

Science HIGHLIGHTS

NATURAL DISTURBANCES

What's the right harvesting balance to optimize regeneration in the western boreal forest?

Researchers are emulating natural disturbances to find the optimum balance between forest harvesting and ecosystem recovery

Canadian Forest Service researchers want to determine the best percentage of forest to retain during harvesting operations to optimize a forest's ability to regenerate. "Think of it as the tipping point below which leaving less residual structure makes it harder for the forest to come back," says Jan Volney, a research scientist with the Canadian Forest Service of Natural Resources Canada. Residual structure refers to the trees and other biomass that is left in the wake of a fire or other disturbance like harvesting.

Volney and his colleagues are working on the Ecosystem Management Emulating Natural Disturbance (EMEND) project. The project, co-led by Volney, is centered at the University of Alberta. It's a collaboration between numerous research agencies, forest companies and provincial and federal governments. EMEND gives researchers the chance to imitate what was originally produced by a natural disturbance and the chance to figure out ways to surpass what naturally regenerates after a disturbance.

The research site is in the western boreal forest about 90 kilometres northwest of Peace River, Alberta. Since 1997, EMEND has allowed researchers to advance the natural disturbance model for harvesting, which involves leaving behind un-harvested or residual trees—in much the same way that natural disturbances like fire do.

What is the best proportion of residual trees?

Volney is reluctant about putting an exact number on a recommended threshold for harvesting. "We hope to publish our research later in 2010," he says. He notes that the dominant school of thought says to remove 25% to 50%, as is common in thinning experiments. "But we're also seeing some quite reasonable results after going further. So far, we are finding things are coming back faster than we expected at these lower thresholds," says Volney.

Volney is also pleased that many forest companies are moving away from traditional clearcutting in favour of retaining residual trees as stand- and landscape-level elements—much like what is left behind by fire. This approach also serves as a solid basis for biodiversity conservation and forest regeneration.

Overview

Researchers want to find the tipping point below which leaving less residual structure makes it harder for a forest to regenerate after harvesting.

EMEND is an outdoor laboratory that gives researchers the opportunity to create and monitor natural disturbances like fire.

Leaving residual structures has the potential to become standard practice.

Assessing understory response in a variable retention harvest block

How is EMEND helping to establish guidelines for harvesting thresholds?

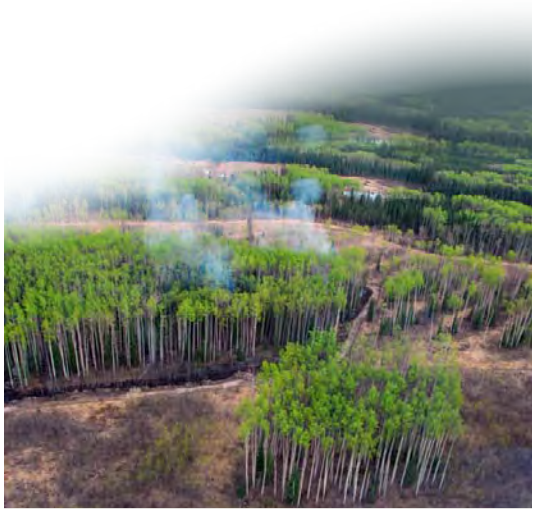
EMEND is an ideal research project to determine the best harvesting threshold. "Of course, fire can be a bad thing, but it is essential to maintain a healthy boreal forest. The boreal is a disturbance-driven forest, and EMEND lets us simulate that," says Volney. "We can simulate the effects of fire by leaving 2%, 10%, 20%, 50% and 75% unharvested—any percentage really."

EMEND researchers can run experiments in many ways—from burning selected forest stands using different kinds of fires to testing different silviculture approaches. "We are able to look at a surprising level of detail. We can monitor the difference between approaches that leave single trees or those that retain clumps of trees," says Volney.

EMEND's scale—it covers 1000 hectares—also means researchers have room to repeat experiments and qualify results. And EMEND allows for long-term monitoring of one complete forest cycle, which is equivalent to 120 years.

How is EMEND changing attitudes to forest harvesting?

EMEND is not the first project to study natural disturbance-based methods of harvesting. But today it is at the forefront of disturbance-based research. Learning how much residual forest structure is needed to protect ecosystems will go a long way to determining how forests can be managed economically without compromising their ecological integrity.



1) Prescribed burn in progress (left centre)
2) Harvested stand with 10% green retention (right centre)
3) Clear-cut with clumped tree retention (foreground)