Natural Resources Canada
Ressources naturelles Canada

Impact Note - CFS Atlantic - Making a difference

Clearing the Air on Forest Productivity

On November 2006, the Government of Canada announced its intent to address significant and long-term reductions in air pollution. Reducing emissions that cause ground-level ozone (O_3) is predicted to benefit Canada's forests. Results from a joint Natural Resources Canada and Environment Canada study on the impact of O_3 on our forests provide decision makers with preliminary estimates of the economic impact of O_3 pollution on forestry-related values.

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Canada's forest industry accounts, directly and indirectly, for 5% of the nation's jobs, contributing over $36 billon to our annual GDP. Any major change in forest productivity is likely to significantly affect Canada's economy. Scientists and policy makers have long known that decreases in air pollution can positively impact agricultural production and forest productivity, however, determining the value associated with forestry impacts has been difficult. Until now, even preliminary dollar values could not be attached to the forest productivity benefits provided by cleaner air because science-based information developed under realistic conditions was scarce.

To fill this gap, Dr. Kevin Percy, a scientist at the Canadian Forest Service - Atlantic Forestry Centre (CFS-AFC), led a Canada–US team that has developed O_3 exposure response functions for Canada's most widely distributed tree species, aspen (*Populus* sp.). The functions—essentially mathematical equations estimating the complex relationship between biomass, O_3 levels, and two key climate variables—are based on the results of 5 years of research at the world's largest forest–climate change experiment, the 32-ha Aspen Free Air Carbon Dioxide Enrichment (FACE) project in northern Wisconsin, USA. Aspen FACE is principally supported by the US Department of Energy and comprises 110 scientists from 10 countries. Dr. Percy has served on the five-member steering committee since 2000. This ecosystem-scale, state-of-the-art operation is examining the impacts of two important greenhouse gases affecting forests, namely atmospheric carbon dioxide (CO_2) and ground-level O_3.

Exposure response functions from the Aspen Face project are being used along with economic data to predict forestry benefits from O_3 reductions. Robyn Rittmaster, an economist with Environment Canada's Environmental Policy Analysis and Valuation Division, which co-funded Dr. Percy's exposure response function research, has used the functions to develop a rough estimate of the Canadian forest harvest increase related to a 5% reduction in O_3. This estimate was then used to prepare preliminary economic estimates of forestry benefits related to the increased available harvest. Initial results showed an increase of $6.7

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million per year in stumpage value and $300 million per year in sales. In terms of predicted sales, forestry impacts are in the same range as those impacts on the agricultural sector, which have been estimated at $120 million per year for a similar reduction in O_3.

The Canada Wide Standard (CWS) for Particulate Matter and Ozone has set a human health-based target level of 65 parts per billion (ppb) for O_3. Dr. Percy's work has also evaluated the efficacy of the CWS and has shown that the current CWS index and level may protect aspen from growth loss. More joint work is planned to validate these findings using 10 years of co-measured Aspen FACE O_3, climate, and tree growth data, with a link to estimates of potential O_3 offsets to carbon sequestration in Canada's forests.

Aerial view of Aspen FACE, Rhinelander, Wisconsin
(Aerial photo credit: Dr. David F. Karnosky, Director, Aspen FACE)

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The AspenFACE project is principally supported by the US Department of Energy-Office of Biological and Environmental Research (DOE-BER) through its Program for Ecosystem Research. Additional support has been provided by the USDA Forest Service Northern Global Change Program, Michigan Technological University, USDA National Research Initiatives Program, Canadian Federal Panel on Energy Research and Development (PERD), Natural Resources Canada-Canadian Forest Service, National Science Foundation, USDA Forest Service North Central Research Station, and Praxair Foundation. (http://www.aspenface.mtu.edu/)

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Percy, K.E., et Karnosky, D.F. 2007. Air quality in natural areas: interface between the public, science and regulation. *Environmental Pollution* **149**: 256–267.

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http://www.atl.cfs.nrcan.gc.ca