NEW HOT PAPERS - 2009

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Werner A. Kurz talks with *ScienceWatch.com* and answers a few questions about this month's New Hot Paper in the field of Environment & Ecology.

Article Title: Mountain pine beetle and forest carbon feedback to climate change
Authors: Kurz, WA;Dymond, CC;Stinson, G;Rampley, GJ;Neilson, ET; Carroll, AL;Ebata, T;Safranyik, L
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* Nat Resources Canada, Canadian Forest Serv, Pacific Forestry Ctr, Victoria, BC V8Z 1M5, Canada.
(addresses have been truncated)

SW: Why do you think your paper is highly cited?

Our team's publication on the impacts of a mountain pine beetle outbreak on the carbon balance of the forests of British Columbia has received international attention because it highlights the magnitude of the impact and the feedbacks to climate change of a natural disturbance type that is not considered in other models of the forest carbon cycle.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

To estimate the net greenhouse gas balance of the study area, we combined detailed data on the scale and impacts of a forest insect outbreak that covers over 13 million hectares, with data on forest inventory, growth and yield, wildfires, and harvesting. We used the Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3) to simulate forest dynamics and the impacts of the beetle. We conducted analyses of the likely course of the insect outbreak to 2020, and compared the greenhouse gas balance with and without the beetle impacts.

SW: Would you summarize the significance of your paper in layman's terms?

The mountain pine beetle rapidly kills its host trees, reduces the update of carbon from the atmosphere and increases the release of carbon as beetle-killed trees decompose. Our analyses demonstrate that, compared to a model run without the impacts of the bark beetle, nearly one billon tons of carbon dioxide (CO_2) are added to the atmosphere over the 21-year analysis period.

The current mountain pine beetle outbreak is unprecedented in its geographic

range and scale and is in part a response to climate change. Because the beetle contributes to additional increases of atmospheric carbon dioxide, the insect disturbance provides feedback between future climate change and the carbon cycle.

"Understanding and quantifying the response of natural systems to global climate change is therefore essential for the development of climate change mitigation strategies."

SW: How did you become involved in this research, and were there any problems along the way?

Over the past twenty years we have developed the CBM-CFS3 and applied the tool to analyses that advance the understanding of the contribution of Canada's forests to the global carbon cycle. The team for this paper brought together expertise on the carbon cycle, forest dynamics, and the mountain pine beetle. This interdisciplinary approach allowed us to overcome several scientific challenges, to synthesize existing data, and to develop projections for the near future.

SW: Where do you see your research leading in the future?

Our team continues to research the impacts of forest management and natural disturbances on the carbon balance of Canada's forests. A second large insect outbreak (eastern spruce budworm) is just starting in central Canada and it too will have impacts on the carbon balance.

Our research also seeks to identify mitigation options in the forest sector. For example, can we improve the greenhouse gas balance by salvaging the logging of trees killed by insects or wildfire and using the biomass for bioenergy to offset fossil fuel emissions? Can we identify mitigation options with the greatest benefits to the atmosphere? And how can we facilitate and accelerate the rates of carbon uptake in forests affected by natural disturbances?

SW: Do you foresee any social or political implications for your research?

Our analyses documented one example in which early impacts of global climate change on Canada's forests increased the extent of a natural disturbance. Higher temperatures and more frequent droughts are predicted to increase the area annually burned by wildfires more than three-fold in Western Canada and Alaska in the course of this century.

Large-scale natural disturbances, tree mortality from drought and other extreme events, and the increased release of soil carbon due to higher temperatures are all examples of ecosystem responses that contribute to higher atmospheric greenhouse gas concentrations.

Such ecosystem responses would greatly increase the level of human efforts required to meet atmospheric greenhouse gas stabilization targets. Understanding and quantifying the response of natural systems to global climate change is therefore essential for the development of climate change mitigation strategies.

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KEYWORDS: BRITISH-COLUMBIA; DISTURBANCE; ECOSYSTEM; OUTBREAK; INSECTS; BALANCE.

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