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A New Model For Simulating Climate Change and Carbon Dynamics in Forested Landscapes

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A New Model For Simulating Climate Change and Carbon Dynamics in Forested Landscapes

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The forest science community welcomed a new simulation model on August 1, 2012. The model will help natural resource managers understand the effects of a changing environment on forests, including carbon dynamics and the availability of dead wood habitat. Forest Carbon Succession v1.0 (ForCSv1—nicknamed "Forks") is an extension within the LANDIS-II family of models. ForCSv1 maintains all the functionality of LANDIS-II, while adding the calculations of forest carbon dynamics. Using the model, forest managers can explore what-if scenarios, assess management or offset project ideas, and identify opportunities to reduce risks.

LANDIS-II is a popular forest modelling platform that simulates spatially-explicit forest succession, disturbance (including fire, wind, harvesting, and insects), climate change, and seed dispersal across large landscapes. It tracks the spatial distribution of tree and shrub species and simulates multi-species and multi-age stands. Its approach to software development allows for rapid model improvements, easy distribution, and an online user community. LANDIS-II has been applied worldwide, including in Canada, such as in Nova Scotia (Steenberg et al. 2011) and Labrador (Sturtevant et al. 2007).

In 2008, Caren Dymond identified a need for a freely available model to simulate climate change impacts on forest carbon dynamics, including the feedback of changing vegetation on management and disturbances. She assessed the available options and realized that there was an opportunity to bring together the existing forest ecosystem models of LANDIS-II (Scheller and Mladenoff 2004) and the Carbon Budget Model of the Canadian Forest Sector v3 (Kurz et al. 2009). The gurus of the two models (Dr. Rob Scheller and Dr. Werner Kurz) were willing to collaborate with Dymond on the project. After obtaining funding from the BC Forest Service, Dymond was able to hire Sarah Beukema and ESSA Technologies to provide both programming and scientific expertise. The release of the model did not occur until 2012 as the project required more work than was anticipated.

ForCSv1 will help forest managers better understand the effects of a changing environment, including carbon dynamics.

The ForCsv1 program includes growth, mortality, decay, and disturbance impacts. ForCsv1 allows users to track carbon in five pools for each living age-species cohort, plus nine dead organic matter and soil pools for each species. In addition to the carbon storage in pools, the extension reports on Total Net Primary Productivity, Heterotrophic Respiration, Net Ecosystem Productivity, Net Biome Productivity, and transfers to the forest prod-

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ucts sector caused by harvesting. The extension allows the user considerable flexibility in adjusting the disturbance impacts on carbon pools.

ForCSv1 has been tested successfully on a site on Vancouver Island, with other sites in British Columbia currently in progress. The model is freely available for download at http://www.landis-ii.org.

Websites

http://www.landis-ii.org
https://groups.google.com/forum/?fromgroups#!forum/landis-ii-users
https://sites.google.com/a/pdx.edu/dynamic-ecosystems-landscape-lab/home

References

Kurz, W.A., C.C Dymond, T .M. White, G. Stinson, C. H. Shaw, G. J. Rampley, C. Smyth, B. N. Simpson, E. T. Neilson, J. A. Trofymow, J. Metsaranta, & M. J. Apps. 2009. CBM-CFS3: A model of carbon-dynamics in forestry and land-use change implementing IPCC standards. Ecological Modelling 220:480–504.

Scheller, R. M. & D. J. Mladenoff. 2004. A forest growth and biomass module for a landscape simulation model, LANDIS: Design, validation, and application. Ecological Modelling 180(1):211–229.

Steenberg, J.W.N., P.N. Duinker, & P.G. Bush. 2011. Exploring adaptation to climate change in the forests of central Nova Scotia, Canada. Forest Ecology and Management 262: 2316–2327. doi:10.1016/j.foreco.2011.08.027

Sturtevant, B. R., A. Fall, D. D. Kneeshaw, N. P. P. Simon, M. J. Papaik, K. Berninger, F. Doyon, D. G. Morgan, & C. Messier. 2007. A toolkit modeling approach for sustainable forest management planning: Achieving balance between science and local needs. Ecology and Society 12(2):7.

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