

Forest Carbon and Climate Change Modelling

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We have developed a free computer simulation model that 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.

We designed ForCSv1 to simulate climate change impacts on forest carbon dynamics, including the feedback of changing vegetation on management and disturbances. Using the extension forest managers can explore what-if scenarios, assess management or offset project ideas, understand potential climate change impacts on wildlife habitat, and opportunities to reduce risks.

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

LANDIS-II is a popular forest modelling platform that simulates spatially-explicit forest succession, disturbance (including fire, wind, harvesting, 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. It uses an approach to software development that allows for rapid model improvements, easy distribution, and an online user community. LANDIS-II has been applied worldwide including Nova Scotia (Steenberg et al. 2011), Labrador (Sturtevant et al 2007), and Manitoba (Scheller et al 2007).

Rather than creating an entirely new set of algorithms, ForCSv1 relied on existing tested and peer-reviewed methods for the key components of the model. Specifically, the growth and reproduction algorithms follow the methods outlined in Scheller and Mladenoff (2004). The modelling of decay dynamics generally follows the methods of the Carbon Budget Model of the Canadian Forest Sector v3 (Kurz et al. 2009).

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

References:

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For more information:

<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>

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