Wet spruce subalpine-fir forests:

Spatially explicit model predicts deadwood habitat

by Craig DeLong, B.C. Ministry of Forests and Range, Prince George, B.C.; Andrew Fall, Gowlland Technologies Ltd.; and Glenn Sutherland, Cortex Consultants Inc.

Developing strategies to maintain deadwood in forests is a growing concern in British Columbia as more forested area is harvested and subjected to intensive management such as site preparation, planting, and thinning. In Scandinavia, where forests have been intensively managed for decades, many species that rely on deadwood (e.g., woodpeckers and non-vascular plants) are now rare or endangered. In British Columbia, an estimated 150 wildlife species, including cavity-nesting birds, birds of prey, mammals, and amphibians, rely on various forms of deadwood.

A spatially explicit model for forecasting the long-term implications of forest management alternatives on deadwood amount and habitat quality has recently been developed for wet forests in east-central British Columbia. The model is designed to examine changes in patterns of deadwood types and abundance over large landscapes such as tree-farm licences, while also permitting operational rules specified at much smaller scales.

The model projects hybrid white spruce and subalpine fir snag densities and downed log volumes into the future in response to treatment scenarios specified by the operator. Densities and volumes are tracked by decay class, and remnant "stubs" (created by management or from snapped-off snags) are also tracked. The model simulates harvesting, road-building, and snag-felling along road and block edges related to worker safety regulations, and the establishment of different types and amounts of within-block reserves.

The model is comprised of submodels for harvesting, access management, snag removal, and deadwood state transition; these are implemented within the Spatially Explicit Landscape Event Simulator (SELES) modelling framework (Fall and Fall 2001). A cell resolution of 20 m by 20 m is used in an attempt to capture fairly fine-scale aspects of harvesting and access management activities, and their impact on deadwood distribution across the landscape. Details of the harvesting, access management, and snag removal submodels can be found in DeLong *et al.* (2004).

The model represents deadwood in different "guilds" or groups of tree species that have similar decay rates. For each guild and size class of deadwood (small: 17.5–27.5 cm DBH, medium: 27.5–47.5 cm dbh, and large: > 47.5 cm DBH), the decay and dynamics of different types of deadwood (snags, "stubs," and downed wood) in each cell are modelled using a set of discrete stages representing classes of increasing decay rates. For example, snags or stumps are tracked as a population of individuals and as a pool of volume, and their fates (decay and/or fall) are followed through time. Downed wood is tracked as volume in each decay class.

To develop parameters for this submodel, a two-year field study collected data on snag and downed wood amounts, and dated year of death for snags and logs, and year of fall for logs in different stages of decay. Year of death was established by comparing a core or cross-section of the snag or log to a master chronology developed for live trees. Year of fall was established by dating scars on live trees caused by tree fall. Relationships between deadwood habitat quality according to the classification of Keisker (2000) and snag or log attributes, such as size and decay state, were also developed to help interpret the impact of results on deadwood users.

Initial results indicate that average snag density remains reasonably stable across the landscape with some reduction of larger snags; however, downed log volumes are drastically reduced to levels of about 18% of those in the current test landscape (TFL 30), and approximately 10% of the level estimated to be present in an unmanaged landscape over a 50-year period. Of particular concern are log habitats associated with freshly downed wood, such as elevated runways. The volume of these habitats can be reduced to 10% of their present level in as little as 20 years.

The model is currently being used to test various deadwood management practices that can be implemented at relatively low operational cost to help reduce long-term deadwood deficits.

For further information, please contact: Craig DeLong at ***Craig.Delong@gems1.gov.bc.ca****; Andrew Fall at* ***fall@cs.sfu.ca****; or Glenn Sutherland at* ***gsutherland@cortex.ca***

More Information

Funding for this project was provided in part by Canfor Corp. Ltd. and by the Province of British Columbia through the Forest Investment Account, Forest Science Program.

Fall, A. and J.Fall. 2001. A domain-specific language for models of landscape dynamics. Ecological Modelling, 141(1-3): 1-18.

DeLong, S.C., S.A. Fall, and G.D. Sutherland. 2004. Estimating the impacts of harvest distribution on road building and snag abundance. Canadian Journal of Forest Research, 34:323-331.

Keisker, D.G. 2000. Types of wildlife trees and coarse woody debris required by wildlife of north-central British Columbia. B.C. Ministry of Forests, Victoria, B.C. Work. Pap. 50.

To learn more about SELES, please visit: ***www.ncgia.ucsb.edu/conf/SANTA_FE_CD-ROM/sf_papers/fall_andrew/fall.html*** or ***www.gowlland.ca/***

For more information on the role of deadwood in forests: ***www.for.gov.bc.ca/hre/deadwood/index.htm*** or ***www.panda.org/downloads/forests/deadwoodwithnotes.pdf***