CENTRE FOR ENHANCED FOREST MANAGEMENT

ADVANCES IN FORESTRY RESEARCH

DEPARTMENT OF RENEWABLE RESOURCES

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An integrated forest-watershed planning & assessment model: "ECA-Alberta".

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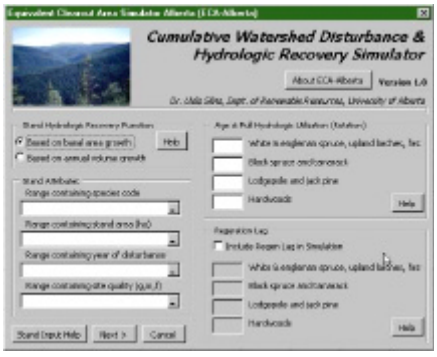
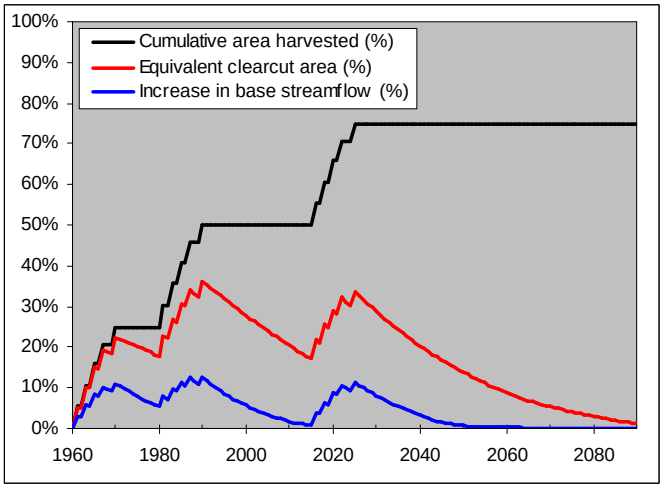
Effects of forest disturbance on watershed hydrology are not static over time because the effects diminish as the forest vegetation regenerates and the landscape recovers from the disturbance. ECA or "Equivalent Clearcut Area" describes a recovering disturbance in terms of what it would currently represent as an equivalent area of new disturbance. For example: if we wished to describe the hydrologic recovery of a 100 ha stand in the year 2003 that was originally harvested in 1970; the juvenile stand might now use 75% of the water that a mature stand uses. Thus, the 100 ha juvenile stand is now roughly equivalent (in terms of water use) to a new 25 ha clearcut.

The above concept can be used to express the recovery after disturbance of individual forest stands, or can be scaled up to the cumulative disturbance condition of large landscapes or watersheds over long periods of time. This provides for a powerful cumulative disturbance effects assessment tool for integrated forest-watershed planning. The original ECA procedures developed by the U.S.D.A forest service have undergone considerable revision since the early 1970's, and are currently used as the watershed assessment frameworks in several jurisdictions in the U.S.A. and Canada (primarily B.C.).



The ECA-Alberta version of the ECA model is a hybrid model based on the original ECA concepts with revisions related to hydrologic recovery of Alberta stand & site types. The revised system for generating streamflow estimates also includes incorporation of many components of the U.S. EPA WRENSS procedures for simulation of annual water yield.

The model provides a relatively simple framework for evaluation of hydrologic effects of forest practices with modest input data requirements. The main application of the model is to evaluate the effect of past disturbances on streamflow in a watershed, and to project the cumulative effect (net combined effect) of both past and future forest harvesting and/or natural disturbances on streamflow. Reliability of model output depends on accurate information on hydrologic recovery of forest stands after disturbance, and availability of regional streamflow and precipitation data.



Example sample output for a mixed pine/spruce watershed where 75% of the watershed was harvested in 3 entries. Note separation of cumulative area harvested and ECA trajectories during & after the 2nd entry (1980's). Peak streamflow during the 3rd entry (2015-2025) is lower than during the 1960's entries reflecting higher water use of early-mid rotation stands established after the entry in the 1980's. Recovery of annual streamflow to within 5% of baseline flows is projected by 2036, with complete recovery by 2072.

The ECA-Alberta model is currently being used by forest companies in Alberta and Alberta Sustainable Resource Development as part of their integrated forest-watershed planning efforts. Several EFM graduate student research projects are currently helping to fine-tune the hydrologic recovery functions for Alberta climatic conditions and forest species. The model is available free of charge from Uldis Silins at the Centre for Enhanced Forest Management, Dept. of Renewable Resources.

Further Information:

Silins, U., 2002, Streamflow models in integrated forest-watershed planning: how much complexity is warranted?, 2002 Interior Watershed Conference, Mar. 13-14, 2002, Kamloops, B.C.

http://www.rr.ualberta.ca/forest_hydrology
http://www.rr.ualberta.ca/Research/EFM/index.html

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