FORCYTE and FORECAST: Ecosystem-level Management Mode with Which to Examine the Yield, Economic, Energy and Wildlife Implications of Vegetation Management as a Component of Rotation-Length Silvicultural Systems

J.P. Kimmins[1], C. Caza[1], C. Messier[1], J. Karakatsoulis[1], K.A Scoullar[2], and M.J. Apps[3]

[1]Department of Forest Sciences, UBC
Vancouver, B.C.
V6T 1W5

[2]Life Science Programming
RR1, S5, C25
Naramata, B.C.

[3]Forestry Canada,
Northern Forestry Experiment Station
Edmonton, Alta.
T6H 3S5

Rotation-length stand management involves the manipulation of secondary succession over the stand cycle. Non-crop vegetation can play an important role in this successional cycle, a role which can vary from positive to negative. Non-crop plants can: reduce nutrient leaching or denitrification losses; provide symbiotically fixed nitrogen; reduce soil erosion losses; afford microclimatic protection to crop seedlings; protect seedlings from browsing damage; and provide both food and cover for desirable wildlife species. Conversely, non-crop vegetation can compete with crop seedlings for nutrients, water, and light; delay crop canopy closure; create unfavourable microclimatic conditions; and harbour species of wildlife that may damage or kill crop trees.

Management of non-crop vegetation can result in major gains in early tree growth and a rotation length improvement in volume and value. However, much of the gain may be lost over medium (60 yr) to long (100 yr) rotations if there are no intermediate harvests. In some cases, removal of such vegetation may adversely affect rotation length value and volume. For example, the removal of one non-crop species which is adversely affecting crop seedlings may permit another species to develop, which has even more negative effects on the crop trees. Investment in vegetation management should, therefore, be based on rotation-length evaluation of stand-level yield, economics, wildlife, and other considerations, as well as on the more traditional short-term "free-growing" evaluations.

Comprehensive rotation-length evaluation of vegetation management requires the use of ecosystem-level management simulation models that include production, yield, economics, energy, and wildlife-related predictions. Such models should represent the ecological role of all the plant life forms that are significant in the area in question, and should be capable of representing all silvicultural practices. The yield, economics, and other consequences of vegetation management cannot be evaluated independently. They must be considered as a component of a rotation-length system of silvicultural activities.

The ecosystem-level management simulation model FORCYTE-11 (FORest Nutrient Cycling and Yield Trend Evaluator)[1] gives foresters the opportunity to perform deterministic simulations of several vegetation management options within a framework of simulated rotation-length silvicultural systems. It

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provides an economic and energy-use analysis, in addition to predictions of total production and yield, by species; of the site capitals of organic matter and nutrients; and of the soil fertility and biogeochemical budget.

FORECAST (FORestry and Environmental Change ASsessmenT) is a new model being developed at UBC. Borrowing heavily from the modeling strategy used in FORCYTE, it will have additional vegetation management simulation capabilities (mechanical site preparation, spot weeding and fertilization, moisture competition, improved representation of allelopathy, and climate-change effects). FORECAST will also include some stochastic simulations to improve its representation of the variability of early secondary succession, and the response of minor vegetation to tree stocking control.

FORCYTE-11 will soon be available for field evaluation through Forestry Canada, Edmonton. Anyone interested in establishing a co-operative field test of the model should contact Dr. M.J. Apps at Forestry Canada.

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Evelyn Hamilton

Research Branch
Ministry of Forests
31 Bastion Square
Victoria, B.C.
V8W 3E7

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