The science of variable retention

By Al Mitchell, PhD

Changing attitudes about forest management have resulted in a move toward silvicultural systems that retain, create or maintain complex forest structures.

In coastal British Columbia, the term "variable retention" has come to describe retention silvicultural systems that retain trees representative of the pre-harvest stand condition. Design elements include what is retained, how much is retained and the spatial pattern of retention. However, the knowledge base for implementation is limited and little is known about the impacts such systems have on growth and yield, timber supply and environmental values.

In BC and elsewhere

Retention silvicultural systems are in use in Europe and Scandinavia, as well as in the Pacific Northwest and California. Although designs and practices differ, the idea is that by retaining or removing single trees or patches of trees—alone or in combination—biological legacies can be perpetuated, habitat carrying capacity can be maintained, connectivity can be conserved over the landscape and forest productivity can be sustained. Implementation of retention systems has been accelerated by forest certification initiatives that demand scientific proof of sound forest stewardship.

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Science forum

The Variable Retention Science Forum, held April 21-22, 2004 in Nanaimo, provided an opportunity for 130 forest researchers and practitioners from Western Canada and the United States to present and discuss their latest research findings and experiences with the effects of retention forestry on regeneration, nutrient cycling, biodiversity and the forest environment. The two-day conference also addressed questions related to the definition, application, risks and impacts of variable retention silvicultural systems, and the unique challenges they present.

The science forum focused on progress toward science-based forest stewardship. Studies were gathered under four values associated with retention systems:

- **Regeneration:** Impacts of retention systems on growth and yield, physiology, genetics and the modelling of long-term effects on site productivity.
- **Nutrient cycling:** Impacts of retention systems on soil physical and chemical properties, coarse woody debris and decomposition processes, and links between carbon and nutrient cycling.
- **Biodiversity:** Links between forest management at all levels and the conservation of plant, animal, arthropod and avian diversity—including forest health and indicators of changes in community ecology.
- **Forest environment:** Links between forest cover and microclimate, fire, water quality and quantity, and the influence of edges and gaps on key ecological processes and patterns.

Studies presented at the forum showed that regeneration, biodiversity, nutrient cycling and the forest environment are influenced to varying degrees—both positively and negatively—under different retention systems. The studies demonstrate the utility of scientific information for making decisions based on trade-offs among diverse values. Furthermore, they provide a rationale for site-specific retention silvicultural prescriptions. By manipulating the amount and distribution of retained stand structure, the studies show that a balance can be struck between timber and non-timber values.

The science forum also demonstrated that the concepts and application of partial cutting systems—including retention systems—are well established. To review the global perspective, plenary sessions addressed interdisciplinary aspects of applying retention systems:

- **Variable retention in British Columbia:** What is it and why is it being used? Defining variable retention systems, their application in coastal forests and implications for management under the *Forest Practices Code,* forest certification, and criteria and indicators.
- **Variable retention elsewhere:** What elements can be applied in BC? Continuous-cover forestry, adaptive management and regeneration protection as practised elsewhere in North America and overseas.
- **Variable retention and risk:** Where are the pitfalls? Economics, operations and harvesting, windthrow and forest health.

Techniques vary across the world and all the approaches share common elements. Risks are also universal and can be economic, social and ecological. It is less clear whether retention strategies work. In conclusion, scientists and practitioners will have to work together to develop efficient and effective lines of communication so that relevant information can be readily exchanged.

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