



Variable Retention: maintaining biodiversity through planning and operational practices

by Rob D'Eon

Highlights

- Variable retention management strategies leave portions or components of forests unharvested at the stand or landscape scale.
- Variable retention of forests can take many forms.
- Variable retention has three essential features: composition, amount, and pattern.
- Species response to variable retention depends on circumstances.
- Managers are recommended to use a variety of variable retention strategies across the landscape.
- Variation of retention patterns is key to biodiversity conservation.

What is variable retention?

Variable retention is a relatively recent addition to forestry vocabulary. First introduced by the Clayoquot Scientific Panel in 1995, the term was subsequently and more fully described by Dr. Jerry Franklin and others at the University of Washington. The term has been widely used by ecologists in the Pacific Northwest region of North America, and has been implemented by several forest companies in central and western Canada. Retention strategies have also been incorporated into provincial forest management guidelines in several regions in Canada. This note provides an introduction to variable retention for foresters and practitioners.

Variable retention is a management approach or harvest system based on the concept of retaining stand structure following harvest, for at least one rotation, in order to achieve specific management

objectives. What distinguishes variable retention from generic partial cutting or other silvicultural practices that leave trees behind (e.g., shelterwood, seed tree) is primarily the objectives and the targeted, intentional long-term retention strategies.

The main rationale for using variable retention focuses on ecological objectives:

- (1) to increase stand structural complexity relative to clearcuts¹,
- (2) to better emulate natural disturbance patterns when harvesting,
- (3) to retain specific stand attributes (e.g., old growth forest attributes) for species of concern, and/or
- (4) to help a regenerating area attain a diversified stand structure (e.g., with large trees and snags) more quickly.

¹“Clearcut” in this note means 100% tree removal.



More recently, variable retention has also been advocated as a way of achieving visual and other social objectives such as aesthetics and social acceptability, often in combination with ecological objectives.

Essential features of a variable retention strategy

Variable retention, as the name suggests, can take on many forms. The word “variable” refers to the flexibility in its application. However, there are three essential features or design elements of variable retention:

- (1) composition of retention,
- (2) the amount retained, and
- (3) the retention pattern.

Composition

The elements retained depend on the management objectives and the natural characteristics of the stand. Variable retention can be applied to all forest ages and species.

Amount

The amount retained can vary from 0% to 100% of the original stand. However, studies in Canada show that post-fire residual levels (i.e. the area of unburned forest left after a fire) typically range from 1% to 13%. This is useful information for managers interested in emulating natural disturbance and could be helpful in determining stand retention levels.

Pattern

Retention patterns can vary from closely-spaced groups of trees and other vegetation (aggregated pattern) to widely-spaced individuals (dispersed pattern) or a combination of both (see Figure 1).



Figure 1. Two different variable retention patterns: (left) 12% group or aggregated retention, (right) 12% individual tree or dispersed retention. (Images courtesy of M. Meitner, University of British Columbia)

Wildlife response to variable retention

Ecological objectives are a key component of variable retention. Therefore it is important to understand how species respond to different variable retention strategies. Studies in Canada have looked at organism response to different variable retention strategies. As with most complex ecological phenomena, species' response to different levels and types of variable retention has been mixed:

- Some songbirds that rely on forest structure (e.g., cavity nesters, foliage feeders) benefit from as little as 10% retention.
- Other songbirds are greatly affected despite 75% retention.
- Representative leave areas are important for species sensitive to small amounts of forest removal.
- Some species such as red squirrels decline directly as a greater percentage of forest cover is removed (less retention) while others such as chipmunks increase directly as forest is removed.
- Some small organisms (salamanders, slugs, spiders, beetles) are well accommodated when 0.3-0.8 ha patches are retained within the harvest area.

There is no one universal variable retention prescription that is best for all species. It is important to prescribe a variety of variable retention patterns and levels across the landscape to maintain species diversity. Managers will want to consider which forest characteristics are desired both in the present and future forests.

Examples of variable retention practices in Canada

Variable retention is being implemented in several regions across Canada to meet a variety of management objectives.

- In western Canada, Weyerhaeuser Company and Tolko Industries have adopted variable retention strategies for many of their harvest operations.
- In Ontario, the Ministry of Natural Resources requires stand retention as a means to emulate the effects of fire and other natural disturbance patterns.
- In eastern Quebec, variable retention strategies have been tested by Abitibi-Consolidated in collaboration with the Ministry of Natural Resources and Wildlife and Laval University.
- In Nova Scotia, tree and patch retention is required for wildlife habitat and stream conservation on all public and private forest lands.



Figure 2. Variable retention harvesting in Alberta.
(Photo courtesy of L. Morgantini, Weyerhaeuser)



For more information

For more information on the content of this research note contact Dr. Rob D'Eon: rdeon@interchange.ubc.ca.

Further reading

Association of BC Forest Professionals FORUM: special issue on variable retention. On-line: http://www.abcfp.ca/publications_forms/BCFORmagazine/pdf/FORUM-2004-5.pdf

Nova Scotia Department of Natural Resources. *Wildlife Habitat and Watercourses Protection Regulations*. January 2002. http://www.gov.ns.ca/natr/wildlife/thp/wildl_hab.html

Ontario Ministry for Natural Resources. *Forest Management Guide for Natural Disturbance Pattern Emulation*. November 2001. <http://sit.mnr.gov.on.ca/spectrasites/internet/ontarioforests/ontariosforests.cfm>

Serrouya, R., and R.G. D'Eon. 2004. *Variable retention forest harvesting: research synthesis and implementation guidelines*. Sustainable Forest Management Network, University of Alberta, Edmonton, Canada.

Weyerhaeuser Coast Forest Strategy: http://www.forestry.ubc.ca/conservation/forest_strategy/vr/default.htm

Management Recommendations

- Use a variety of retention patterns and levels across the landscape.
- Don't try to manage for all species in all places.
- Retention systems using small (<1ha) patch cuts are generally more ecologically beneficial (i.e. have a lesser impact on biodiversity) than uniform individual tree harvest patterns.
- Openings larger than 1 ha tend to function as clearcuts (open forest conditions); smaller openings retain some interior forest conditions.
- Variability is key to biodiversity conservation: don't do the same thing everywhere.

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