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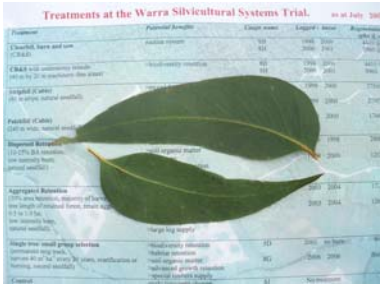
Observations and Recommendations on Applying Variable Retention Silviculture in Old-Growth Eucalypt Forests

Final Report



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Forestry Tasmania Science Panel

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Background

The Forestry Tasmania (FT) Board invited a 5-member international science panel to provide advice on FT's program of reduced reliance on clearfelling in old-growth forests. Jack Bradshaw (W. Australia) and I visited FT from July 30 to August 3, 2007. We were briefed on FT's progress on variable retention implementation and accompanying research efforts, visited the Warra LTER site, and viewed several operational aggregated retention coupes in the Huon, Derwent and Murchison Districts. Jürgen Bauhus (Germany), Tom Spies (USA) and Ivan Tomaselli (Brazil) visited FT from September 3 – 7, 2007. The entire panel met on February 21, 2008 in Hobart, following the "Old Forests – New Management" international conference. This report summarizes the observations and recommendations made to Hans Drielsma, John Hickey and FT Board Members Humphrey Elliott and Miles Hampton on August 3, 2007, updates the preliminary report submitted August 15 after review of documents provided by FT during the visit and provides additional recommendations following the conference and science panel meeting.

General observations on Forestry Tasmania's approach

Forestry Tasmania has taken a very comprehensive approach to seeking alternatives to clearfelling in old-growth eucalypt forests, as described in the final advice to the Tasmanian government (Forestry Tasmania 2005). FT staff have examined the literature from around the world, visited other regions to observe and discuss implementation of different approaches, convened a science panel to draw on varied experience with partial cutting systems and helped sponsor an international conference to bring together experts from around the world to present and discuss the state of the art of management approaches in late-seral native forests. FT has developed a well-reasoned approach to implementing variable retention (VR), primarily through aggregated retention (ARN) systems, supported by monitoring and research programs to examine achievement of goals.

I was impressed with the dedicated, sincere staff of Forestry Tasmania. There is obviously a strong commitment to applying variable retention in the best possible way. This commitment was seen through all levels of the organization. The field foresters and forest workers that we met expressed their views and concerns about VR openly, but generally regarded the move to VR in a positive way and felt that it was achievable. The Executive General Manager has an in-depth knowledge of the issues and technical challenges associated with VR implementation. Research and planning staff are doing a great job developing the necessary plans, guidelines, monitoring and research to support the phase-in of VR in old-growth wet eucalypt forests.

There is some uncertainty regarding whether or not VR will resolve social license issues over FT forest practices, specifically clearfelling and logging old growth forests. These are the

same issues that led forest companies to move away from clearfelling on the British Columbia (BC) coast. As in BC, some opponents of variable retention unfairly characterize it as "clearfelling by another name." Most of the general public, however, are receptive to the science behind VR. On the whole, members of community advisory groups for our company, formed as part of Canadian Standards Association (CSA) sustainable forest management certification, acknowledge the benefits of VR and accept it as different from clearfelling. I expect that FT will be able to gain acceptance from the portion of the public that does not hold the view that any logging of old-growth is unacceptable.

The environmental debate in Tasmania seems more polarized than the current climate in BC, or at least appears to be at the stage we were at in the mid-1990s during the controversy over logging in old-growth temperate rainforests of Clayoquot Sound on Vancouver Island. A government mandated science panel first defined the term variable retention (Clayoquot Sound Scientific Panel 1995) based on concepts and approaches developed to maintain attributes of old forests in the U.S. Pacific Northwest region (Franklin *et al.* 1997). Out of this period grew more widespread use of VR as an alternative to clearfelling and more cooperation among forest companies, environmental groups and First Nations. I hope a similar trend emerges for you. Tasmania is far ahead of most places in the world in total forests (47%) and old-growth forests (79%) in formal protected status.

An important point to bring to the attention of the public: the fundamental premise of VR is that it is more ecologically valuable to distribute mature forest elements throughout the production-forest landscape rather than to simply add an equivalent amount of mature forest to the large, existing reserve system. For some of BC's bird species, retaining 15 to 20% of the original forest distributed over a coupe can maintain half the population abundance of the uncut forest condition (Huggard and Bunnell 2007). In other words, the habitat for some species may be improved significantly over a wider area than simply the sum of the retention. This likely applies for some species in Tasmania. Much has been written about the value to biodiversity of managing the "matrix" between larger reserves (e.g., Lindenmayer and Franklin 2002, Bunnell *et al.* 2003).

Implementation of variable retention in old-growth wet eucalypt forests

Variable retention goal

There are many factors to be considered when choosing coupe-level practices to meet social, biological and economic goals. The final choice represents a balance among complementary and competing objectives. As such, it is not possible to determine precise and optimal figures for the proportion of different silvicultural systems, the amount of retention in each coupe or the spatial distribution of retained aggregates or single trees. Nevertheless, such standards must be chosen based on the best available information, theoretical concepts and practical considerations.

Given the proportion of old-growth forests in existing reserves, the FT target of 80% non-clearfell methods for old-growth coupes in State forests by 2010 seems reasonable. My experience from coastal BC with implementing VR for virtually all harvesting on our company's landbase of 1.1 million hectares and an annual harvest area of almost 10,000 hectares suggests that you are wise to keep some flexibility to allow for clearfelling on difficult sites. While we were able to apply VR across a full range of sites, the last 20% were the most costly to achieve (e.g., steep, cable-yarding coupes). With recent company mergers, we have revised our targets to allow for a range of emphasis on the retention

system based on windthrow potential and land-use plan management objectives. Economics and regeneration burning are challenges that make aggregated retention difficult for steep slopes; however, it may be important to leave retention on some cable-yarding sites for visual aesthetics or to meet local habitat needs for some species. Highly visible slopes present an opportunity to demonstrate variable retention to the public, particularly on sites within the viewscape of recreation attractions like the Tahune Airwalk.

Choice of aggregates

The FT emphasis on aggregated retention (ARN) rather than dispersed retention is supported by safety, cost-efficiency and habitat values. Implementation in coastal BC has favoured group or aggregated retention for these reasons (Beese *et al.* 2003). A recent review of the biodiversity aspects of retention from 214 studies concluded that aggregates provided better "lifeboating" than single tree retention for a number of organisms (Rosenvald and Lõhmus 2008). On the BC coast, group retention was found to be beneficial for forest birds typical of uncut forests, and bird occurrence was positively correlated with percent retention (Preston and Harestad 2007).

While retaining forest that is representative of the original stand is important, exceptions should be made for features of biological significance (e.g., wetlands, unique habitat). The recommended minimum size of 1 ha is appropriate, given the reliance on regeneration burning and the difficulty in achieving burning prescriptions around numerous small aggregates without burning much of the retention. Some areas with smaller aggregates and more dispersion of habitat attributes throughout the next stand would be desirable if burning was not an issue.

The practice of having the harvesting crew (fallers) choose the location of retention aggregates raises some concerns over achieving the desired prescription. Pre-marking provides more certainty that the right attributes are being captured in aggregates, the desired % retention is achieved, burning prescriptions are optimized and spatial distribution guidelines are met. It also frees the faller to concentrate on doing the job safely. Flexibility to adjust boundaries for safety or logistics can still be allowed. We observed both pre-marked and faller's-choice aggregates in operational coupes. A combination of both approaches could work well if some pre-marking ensured that specific locations of ecological value were captured. Experience should determine whether or not pre-marking is the most cost-effective practice.

Amount of retention

The goals for percent retention in coupes should be guided by a balance of economic and biological considerations. For the 11 ARN coupes harvested to date, internal (island) aggregates range from 6% to 31% of the felled + island area (21% average); however, the total "area discount" (% of the provisional coupe not harvested) including edge retention ranged from 36% to 78% (56% average) (Scott 2007). This is substantially higher than the average area discount for all native forest coupes from 2004-2007 (20-25%; Scott 2007). This is great for biodiversity values, but seems higher than desirable for an economic application of VR. [For comparison, in coastal BC coupe retention averaged 21% including island and edge retention, as well as stream buffers within coupes.] In addition, it appears that faller-choice tends to result in somewhat higher levels of retention than planned. The tendency is to be conservative in leaving aggregates because the consequences are irreversible. Several coupes we visited had very high levels of retention and narrow corridors of tree removal. Clear goals and standards will need to be set for the amount and

distribution of retention to meet both the biodiversity and silvicultural objectives (Mitchell and Beese 2002, Kremsater *et al*. 2003).

Layout and utilization of default retention

The provisional coupes define areas of potential harvest between MDC protection zones. Expansion of the concept of the coupe area to include a wider area (i.e., including default reserves for streams, big trees, wildlife, etc. that contribute to retention) would lower the amount needed as islands within coupes to meet overall targets. FT should be getting credit for all of the reserves on the landscape that contribute to old-forest attributes, regardless of the other reasons for leaving them. A system of accounting for long-term retention within coupes and across landscape units is needed to allow assessment of the true costs and benefits.

Forest influence

The initial guidelines for calculating forest influence are sound but conservative (e.g., excluding stands <15m, regrowth; Draft VR Manual, Version 8, June 2007). While it is prudent to design a coupe with an influence 'buffer' above the 50% minimum to allow for losses from fire or wind, I would be concerned about potential growth losses on regeneration from high levels of edge influence. For the 11 ARN coupes harvested to date, forest influence averages 84% including both internal (island) and edge retention (Scott 2007). Growth impacts of such high influence should be documented to ensure that future growth projections are realistic.

Awareness of terminology

Consistent application of VR requires a clear understanding of standards and guidelines. Some FT staff members were not aware that long-term retention (trees left for at least a rotation) was required to call a coupe VR. Short-term retention for visuals or other purposes is often appropriate but it needs to be identified separately from long-term retention. The VR Manual, VR Implementation Group and implementation monitoring will help FT achieve consistent standards.

Burning

The challenge of burning aggregated retention coupes is being addressed well by field staff. Some firebreak guards have been excessively wide, but this issue has been acknowledged by staff. Some edge scorching of aggregates will create habitat conditions that would result from wildfires; therefore, while the intent is to keep aggregates intact, some burning is consistent with the biological objectives. Retaining larger aggregates, orienting aggregates along 'fairways' to enable burning (Chuter 2007), and burning in stages were several of the strategies discussed in the field to facilitate burning. I do not have experience with the intensity of fire that is necessary or feasible for successful eucalypt regeneration but the impacts at several of the burned coupes seemed excessive relative to my experience with prescribed burning in coastal BC. We did not view burning on steep, cable-yarded sites but, based on the impacts we observed on burned coupes, soil erosion is likely a concern.

Big trees

Forestry Tasmania should be commended for its efforts to protect record-size trees, including establishment of the Tasmanian Giant Tree Consultative Committee (GTCC) "to provide independent advice on the protection, management and promotion of Giant Trees" (GTCC website). The policy to protect all trees >85m or 280m^3 in reserves achieves conservation of the very largest eucalypt specimens; however, this excludes many species that do not attain these dimensions. There are 5 species represented on the March 2007 registry of the GTCC (*Eucalyptus regnans, E. obliqua, E. globulus, E. delegatensis, E. viminalis)*, but most are *E. regnans.* A policy to reserve the largest known specimens of each major species should be considered. To be practical, this could begin with trees of commercial importance. The big tree registry for British Columbia, maintained by the BC Conservation Data Centre with a multi-sector committee to review nominees, aims to record the ten largest trees of each native species in BC (see: http://www.env.gov.bc.ca/bigtree/). Regardless of the listing criteria, of utmost importance is ensuring that reserves are adequate for protecting the record trees from human disturbances and minimizing increased risk from natural disturbances such as wind.

Involvement of field staff in guidelines

For effective implementation, it is important to include operational foresters in development of guidelines. FT's Variable Retention Implementation Group, which includes a VR "champion" from each District, is an excellent forum for discussing solutions to operational issues relating to VR implementation. The phase-in of aggregated retention in operations over the next three years is a prudent approach. Operations staff needs to gain experience and confidence with VR before it can be fully applied in a safe and productive manner. Operational "buy-in" to the goals of the program is very important and is best achieved through understanding and involvement. Our company's experience with an operations working group to develop or review guidelines, an emphasis on training and safety, and phase-in of variable retention over five years supports the idea that successful implementation can be achieved with the approaches adopted by FT.

Application of VR in regrowth areas

The scientific rationale for structure enhancement applies equally to regrowth forests as it does to old growth forests. In fact, if there is little old forest in a landscape, there may be greater need for retention. However, the large amount of old growth (and total forest) reserved in Tasmania overall makes the need for retention in regrowth for biodiversity conservation much less than if the reserve area was small. The main conservation issue is whether or not the full range of ecosystems in Tasmania is adequately represented in reserves. FT could examine landscapes or ecological zone units (such as Forest Blocks or IBRAs) to determine the amount of existing reserves (parks or other) and see if any are particularly deficient in reserves. Landscapes with little old growth and reserves would benefit from retention within regrowth coupes. The landscape metrics that Marie Yee is developing should help with this question. In any case, I would not recommend a blanket policy for regrowth areas. An analysis should be completed to determine whether or not a policy based on ecosystem representation within landscape units is needed.

Engaging ENGOs and communities

To help meet the social objectives of moving to variable retention, FT should continue to seek opportunities to engage in dialogue with moderate environmental, recreational and community groups. The visual impacts of harvesting are only partially improved through the application of VR (and in some cases, such as scorched aggregates, visuals may be worsened in the short term). As studies in both Tasmania and BC show, social acceptability of VR can be improved with information about the value of retention in aggregates (Ford *et al.* 2005, Sheppard and Meitner 2005). Although you are not likely to influence people with extremely negative views about any cutting in old forests, the majority of the public is liable to respond favourably to information on the ecological value of retention. Landscape simulation modeling can be a useful tool for showing the public what the forest landscape will look like over time.

Research and Monitoring

Warra LTER site

Warra is a flagship of long-term, multi-disciplinary research. There is a wealth of excellent research being undertaken at the Warra alternative Silvicultural Systems Trial (SST); however, FT researchers should be cautious to avoid a potential over-emphasis on the SST for answers about VR. The limited size and scope of the treatments, concentrated in one ecosystem type, means that results from Warra cannot be extrapolated to all of FT lands. Even though the most common forest type at Warra is wet *Eucalyptus obliqua* forest—the most widespread forest community in Tasmania—there is a need to have comparisons across a range of ecosystems. I'm sure FT researchers are quite aware of this, particularly in light of the experimental design limitations of the SST that are well described by Hickey, Neyland and Bassett (2001) (i.e., limited replication, non-random allocation of treatments, staggered harvesting timing).

Paired comparison coupes

Establishing paired operational coupes testing different approaches (e.g., aggregate size, retention level, dispersed, group selection, burned vs. unburned) would provide a wider range of monitoring sites. Stape *et al.* (2004) used a "twin-plot" approach to investigate fertilization response in *Eucalyptus* plantations across large landscapes. Their approach paired control and treated plots on many sites, which allowed extrapolation across a wide range of conditions--in contrast to concentrating replicated treatments at a few sites. Designed comparisons with random allocation of treatments will be more powerful and cost effective than passive monitoring of operational coupes—though such monitoring can also play an important role for some questions. Our company has used a combination of VR experimental comparison sites (with 3 retention alternatives, clearcut, and uncut treatments) and operational monitoring as a basis for an adaptive management monitoring program (Beese *et al.* 2005).

Plot sampling

Sampling aggregates and edge effects creates some unique problems. Studies should take into account the proportional area when extrapolating data from plots in aggregates or on edges to coupe-level response. This applies to all attributes; however, it is particularly

important for estimating the edge effects of retention on regeneration establishment and growth rates.

In BC, our company's growth and yield program is using an approach to sampling that may be worth considering. Permanent plots were established within experimental VR comparison areas as a basis for modeling growth impacts. In each treatment, "sector plots" were established to collect growth data for both the retained trees and regenerating trees (planted and natural). The approach utilizes a cluster of four sectors radiating from a central pivot point, the central axes of which are at right angles. For a 10% sample, each sector covers 9 degrees (i.e., a total of 36° out of 360°). To sample a retained group of trees and the surrounding cut area, sector plots are located by selecting an arbitrary location within the group (usually near the middle of the group), then orienting the sectors from a random compass bearing. With this approach, the probability of selecting each tree in a sample is the same irrespective of the position of the chosen pivot point. By orienting the four sectors at right angles, a balance of aspects are sampled for examining edge effects. This is, as far as the authors are aware, a new sampling system which collects information in an unbiased fashion from retained groups and surrounding areas, correctly accounting for edge effects (Iles and Smith 2006). At least three sets of sector plots are established in each treatment replicate. A slightly modified approach is taken in clearcut and uncut areas to reduce sampling effort. The four sector clusters are collapsed into single 36° sector plots that are oriented randomly from randomly selected points on a one hectare grid. (See: www.for.gov.bc.ca/hfd/library/FIA/2007/FSP_Y071001b.pdf)

Coarse woody debris removals for pulpwood or biomass energy

The panel discussed this topic at some length following the Old Forests – New Management conference in Hobart. Feasibility studies to assess the potential economic benefits of additional removal of post-harvest residues for increased pulpwood or energy production must also consider the potential negative effects on biodiversity. Grove and Meggs (2003) provide an excellent review of this topic, so there is no need to reiterate here the importance of retaining coarse woody debris for various ecological functions. Assessing the dead wood component of variable retention coupes and uncut benchmark stands is an important aspect of our company's biodiversity monitoring program (Huggard 2003). Suffice it to say that any program of increased residue utilization should include guidelines for retaining a suitable portion of this material based on the best available science.

Focus on questions of highest impact

Costs will always limit what can be done. It is important to focus research or monitoring on areas with the highest risk (i.e., the greatest uncertainty and consequences of not knowing). What would cause the greatest potential change in practices if you knew the answer?

Adaptive management approach

The framework for decision-making and tradeoffs was not discussed in detail during the visit, but is an important aspect of implementation as FT learns about the impacts of VR. How will FT make changes to guidelines and policy over time as knowledge is gained from monitoring and research? Adopting an adaptive management approach would define a process for feedback to management from new information. Adaptive management is mentioned several times in the final advice to government document without defining a specific framework or program for how it is to be carried out.

Conclusions

Forestry Tasmania has made significant progress on implementation of variable retention in tall wet eucalypt forests. FT staff has done an excellent job of adapting the principles and best practice standards from other areas of the world to develop practical guidelines for use of variable retention in Tasmania's forests. Combined with the substantial area of the State's old-growth and total forest area in parks and reserves, I believe that Tasmania has a world-class strategy for biodiversity conservation.

The commitment of FT to research is impressive. The efforts underway by FT scientists will support continual improvement of forest management and help resolve the challenges ahead. The sincerity and dedication of FT operational foresters is also apparent. Finally, I commend FT for your sincere efforts to increase meaningful dialogue with the public, to provide information on forest management through seminars and publications, and to support unique opportunities for public recreation in Tasmania's State forests.

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All views expressed in this report are my own and are not intended to represent the views of my current employer, Western Forest Products Inc., nor the other panel members.

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