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Report to Operations on Implementation of Variable Retention by Forestry Tasmania - Symmetree Consulting Group

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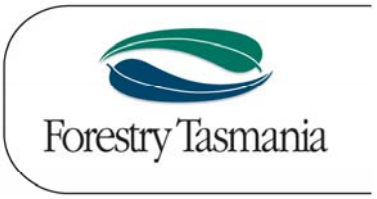

Symmetree Consulting Group

General Report to Operations

Implementation of Variable Retention by Forestry Tasmania:

Some Observations

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Introduction:

In 2004, an Australian federal election resulted in commitments to reserve more oldgrowth in Tasmania. Emerging results from experimental work conducted by Forestry Tasmania in the mid-1990's helped them to advise the State government on feasible clearfelling alternatives in 2005. This advice included a recommendation for a use of variable retention in some old growth harvesting (Forestry Tasmania, 2005).

Later in 2005, the Tasmanian Regional Forest Agreement was signed, including a commitment to achieve non-clearfelling on a minimum of 80% of the annual harvest of couped old growth state forests by 2010. This commitment is expected to be achieved using variable retention in wet forests (dominated by *Eucalyptus obliqua* and *E. regnans*), and a mix of traditional partial-cutting systems (shelterwoods and selection systems) in dry forests (dominated by *E. delegatensis* and *E. dalrympleana*).

To fit with government direction and the Tasmanian Regional Forest Agreement, FT set the objectives for their VR strategy which have been summarized as follows (Mark Neyland, pers. comm., October, 2006):

Social

- Maintain social license to harvest in native forests (oldgrowth).
- Maintain forestry employment (expected to be reduced by ~10-30%?).

Economic

- Maintain minimum sustainable annual supply of 300,000 m^3 of high-quality sawlogs and veneer.
- Recognizing that VR will reduce harvestable volumes, offset that volume loss with additional plantations (by converting native forests to plantations on a maximum 5% of public state forest lands).
- Explore high-value and niche markets for oldgrowth eucalypt timber, in recognition that wet eucalypt forests produce more high-quality logs and veneer logs than other native forest types.

Ecological

- Maintain/protect biodiversity.
- Retain enough trees on coupe edges and in aggregates to supply sufficient seed to regenerate the stand.

By 2006 twelve variable retention (VR) coupes were harvested by Forestry Tasmania (FT), with an additional 16 coupes planned for 2007/2008. FT plans to assemble a group of science advisors in 2007 and host a major variable retention conference in 2008 to focus international scientific attention on their VR efforts and promote valuable discussion.

In late 2006 it was felt that the time was right to garner advice from a group of experienced VR professionals. Bryce Bancroft RPBio and Ken Zielke RFP of Symmetree Consulting Group were asked to tour operations and provide feedback on

Tasmanian applications. Ken and Bryce helped MacMillan Bloedel Limited design a variable retention approach in 1997-98, and helped train and monitor implementation of this strategy over a five-year period. They have also assisted with retention strategies in the BC interior, Idaho, and the Canadian boreal forest.

This report summarizes their observations, which they discussed in a series of presentations to Forestry Tasmania staff and others during early December, 2006.

Coupes Visited and Staff Involvement

On November 27th to December 1, 2006, Bryce Bancroft and Ken Zielke toured all FT districts with Mark Neyland and Robyn Scott to see the present examples of VR implementation within the Forestry Tasmania's working area. In each District they met with a number of contact personnel who provided helpful onsite implementation details, answered questions and contributed ideas for discussion. These people included: Huon District- Don Riddell; Derwent District - Craig Patmore, Peter Marriott; Mersey District - Bob Knox, Gary Siely and Tony Allwright; Murchison District- Nigel Foss, Michael Mahoney and Heath Ralston; and in Bass District - Paul Rosevear, Peter Williams, Adrian Walls and Chris Schneider. As well several logging and forestry contractors were on site to add further to the discussions. Many of the ideas and suggestions in this report directly stem from these people or the discussions they contributed to.

The following coupes were observed:

Huon	o AR023E – A coupe with large aggregates, *E. obliqua* dominated, and rainforest patches (unburned).
	o Warra ARN - single-tree selection (heaped) and aggregate coupes (burned).
	o Picton PC007C - large aggregates, with rainforest patches – (unburned).
Derwent	o Styx River - several coupes mostly with large aggregates in obliqua and regnans – including SX018E (all unburned).
Mersey	o Huntsman HU322L - Many aggregates with a mix of large and small (successfully heaped and burned).
Murchison	o SR037C and TE14A – Many aggregates in narrow coupes following small patches of *E. obliqua* in a rainforest matrix (unburned).
	o Additional aggregate coupe near Rebecca Creek (unburned).
Bass	o Mt Barrow BW121E – preharvest dry forest – *E. delegatensis* (*E. dalrympleana*).
	o Harvested and successfully regenerated shelterwood in dry forest – *E. delegatensis* (*E. dalrympleana*).

Observations:

Coupe Design and Layout

1. The clearfell, burn and sow (CBS) silvicultural system is well developed – VR should be just a small adjustment.

The silvicultural system designed over thirty years for use in wet Eucalypt forests by FT is highly successful for regeneration of these stand types because it fits well with the silvics of the native species and the natural disturbance patterns in wet forest ecosystems. The lessons learned over this period should not be discarded with the introduction of VR, rather, VR should be incorporated into the CBS system as a subcomponent. Burning to prepare a seedbed, sowing, providing sufficient open space for good growth, and control of browsing animals are all components of the CBS silvicultural system that should not be lost. The challenge is to determine how long term retention of structural elements can best fit with those components, and still meet the goals set for VR.

2. **We noted that original FT guidelines for VR were well-followed (e.g., leave aggregates between 0.5 to 1 ha at approximately 2 tree heights between aggregates).**

Planners, logging contractors and those conducting burning operations followed the direction provided.. For most coupes the goal was to achieve the guidelines for retention levels and spatial direction first, and then work out how to deal with costs and other implementation questions afterwards. This is a healthy approach to initial operational implementation, allowing operational coupes to become experimental trials in a sense.

The results on the ground are what VR is intended to achieve ecologically at the stand level – good distribution throughout the coupe of biological legacies and habitat elements as intact island remnants. The island remants within the coupes are visually appealing which, in some cases is a significant local objective. As sucessive iterations of VR coupes are designed and harvested, challenges from previous experiences should be documented, discussed, and new ideas proposed and tested to encourage continuous improvement in efficiencies and effectiveness (for implementation goals).

3. Consider focusing retention in "biological anchors" as much as possible to design VR coupes. Some marking may be useful.

Biological anchors are defined as points or zones within a coupe with biological significance within the forest matrix. These may be areas with unique characteristics or attributes that lead to higher levels of biological activity – nesting, roosting, feeding, breeding for one or a number of species, or they may simply be forest patches that are less common, and therefore potentially more important for diversity across the landscape (Fig 1).

Fig 1. A patch within a stand with scattered large old myrtle (*Nothofagus cunninghamii*) makes a good biological anchor.

Within the two training sessions conducted by Symmetree for FT, participants brainstormed potential biological anchors for Tasmanian wet Eucalypt forests. These biological anchors included the following characteristics, some of which may overlap:

- Patches with a diversity of plant species and/or structure. Some examples include:
  - Concentrations of rainforest understory species. While the intent would be for long term retention of these species there is an understanding that losses should be expected to some extent on the *edge* of the patches (e.g., windthrow in celery-top pine, myrtle wilt or windthrow in myrtle)
  - High levels of Leatherwood (*Eucryphia lucida*)– for honey production.
  - Patches of late successional forests with trees and logs that will persist.
  - Giant tree patches.
- Less common, rare (or threatened) forest communities, such as King Billy pine (*Athrotaxis selaginoides*).

- Special known habitats, including but not limited to: current or potential future nest trees for wedge-tail eagles or grey goshawk (Blackwood swamps); iant Freshwater Crayfish.
- Significant occurrence of habitat trees (as is currently sought for wildlife habitat patches) – with hollows in them for parrots, owls, devils, quolls, bats and other species.
- Snags (dead, hazardous trees) if they can be protected safely.
- Patches of Swampy ground.
- Geomorphologic sites – sinkholes, karst and others.
- Class 4 streams.
- Trees (patches) that are good seed sources.

Although not technically "biological" anchors, areas with the following characteristics will also make good anchors for retention:

- Patches that are less fire-prone.
- Rocky knobs with poorer quality timber.
- Steep inoperable ground.
- Sites protected with existing regulatory requirements.
- Sites of cultural heritage.
- Sensitive visual patches.
- Regrowth areas that are not yet merchantable or areas of high levels of craftwood (may be available for earlier harvest if above minimum retention threshold.)

Optimizing the use of biological and other anchors during harvesting may help to reduce costs and maximize the ecological value of the retention. During coupe design it is important to walk the coupe area thoroughly to locate potential biological and other anchors and then incorporate these with other harvesting considerations for landing location, wood flow and silvicultural considerations for burning and sowing. A rough paper plan of the potential location of retention groups throughout the coupe should be drawn up and reviewed with the contractor on the ground.

Where the "loggers' choice" method may be preferred for final location of groups, it may be worthwhile in advance to mark key groups defined by a biological or other anchors. If the forest canopy permits, some GPS points may help locate these groups more accurately on the operational logging plan map.

4. **FT should explore more flexibility in their design criteria for forest influence**.

The minimum size of opening that constitutes a clearcut varies with the height of the surrounding forest, and is roughly equal to an area greater than about four tree heights in diameter (Keenan and Kimmins, 1993). The retention system, therefore (as a non-clearfell silvicultural system), must maintain greater than half of the original forest area

within the influence of surrounding trees, or trees retained within the harvested area, and create openings that are generally less than four tree heights across (Mitchell and Beese 2002). In British Columbia, the retention system is designed to maintain these influences on the majority (> 50%) of the cutblock area using one co-dominant tree height as a practical average.

FT promotes that "the vast majority of the coupe should be within one tree length of retained forest" (Forestry Tasmania 2006). While this guideline is open for interpretation, the implication is that much more than 50% influence is desired. In fact, FT also encourages aggregates "to be about 2 tree lengths apart", which would promote 100% influence. In fact, most of the FT coupes we examined were close to 100% influence (Fig 2).

Fig 2. An aerial view of Huntsman HU322L showing close to 90-100% forest influence (most harvested area within 1 tree length of a forest edge).

We suggest that FT consider more flexibility in their target for forest influence in VR coupes. A minimum of 51% would allow for some coupes with much more open space, coming closer to the four tree-length guideline utilized in BC. Also, a target average of 60 or 70% influence would allow for variation across cutblocks from 51% influence right up to 100%. We suggest that the target average is not something that FT should attempt to enforce strictly as this can become an unnecessary bureaucratic exercise in accounting, but something that is monitored over time with continual feedback to the District to encourage adjustments over time, where they make sense.

The increased open space in the VR coupes with a relaxed influence requirement should better facilitate harvesting, burning and growth of desired species. As well, it may provide flexibility to make better use of biological anchors and other suitable retention anchor points.

5. **Reliance on logging contractors to choose retention works well for ground-based harvesting. However, some other approaches might be worthwhile testing.**

FT avoids having planners mark group (aggregate) boundaries on the ground by relying on loggers to choose locations for groups as they harvest the coupe. All FT staff that we spoke with emphatically preferred the loggers to choose the locations of groups. This "loggers' choice" approach appears to be working well to meet management objectives. We are not sure that it is less costly than having planners mark the groups in advance (as in British Columbia), but rather just a different preference.

In BC, coupe planners use their knowledge and experience with harvesting equipment and engineering to optimize a retention design and then mark and GPS boundaries around the groups of retention when they establish the coupe backline boundary. This layout is reviewed preharvest with the logging contractor who occasionally suggests changes, or makes minor alterations as the coupe is logged to deal with safety concerns. In BC, this approach represents a significant investment in planning, which is considered worthwhile to reduce logging costs.

With FT's "loggers' choice" approach, planners only mark the blue backline and provide the loggers with a conceptual map of where they think the retention should go. It is up to the logging contractor to decide on final locations to fit with logging logistics and safety. Most loggers approach the coupe by building roads and a main landing first, then by working to a back corner and clearing a fairway back toward the landing, mindful of where adjacent groups will, or could be located. A fairway is often cleared for a distance along the blue backline, with retention groups determined when the contractor clears major snig tracks toward the landing. Logging contractors are always working with an initial conceptual design created by FT planners.

Most loggers felt this approach allows them to better see potential groups as the stand unfolds, and it provides them with the flexibility they need to make changes where required for safety or other unforeseen operational considerations. These are all good points, and we think they are worthwhile testing against a pre-marked scenario to see if it is indeed a more efficient approach.

Although the "loggers' choice" represents a savings in planning costs, it could increase logging costs as the loggers virtually have to feel their way through the stand to design something that comes close to the planner's intent on the conceptual map. As well, clearing significant portions of the backline boundary first may significantly lengthen skidding distances for a portion of the coupe. This might be why logging contractors in Tasmania seem more concerned about additional logging costs with ground-based VR coupes than in British Columbia.

It is apparent on sites with a dense understory of dogwood or wattle that marking groups or aggregates in advance of harvesting would be difficult, as GPS may not work well and anchors may not be readily apparent. However, it may be worthwhile to test out marking of retention groups in a few stands with open understories that afford better visibility for layout staff. It would be important that the design be discussed onsite with the loggers, to ensure major snig trails and other considerations are accommodated and sufficient flexibility should be allowed for the contractor to make suitable alterations during operations. This approach may be more suitable for coupes that will have widely- spaced retention groups (see observation # 4).

It would be interesting on such trial coupes to track the productive machine-hours and man-hours per cubic metre or tonne harvested and the planning costs associated with the coupes, and then compare them to similar blocks where the "logger's choice" method was used. As in any new approach, both planners and loggers would have to get comfortable with it before efficiencies could be achieved. Therefore, it may be worth trying the approach in one District over several coupes.

In the end FT may find that there is no one "right approach". The approach used will likely vary depending on the stand conditions, terrain conditions, and the preferences of individual Districts and logging contractors. As well, a mixture of both approaches may afford a third option for FT planners and loggers (see observation #3).

6. If steep cable coupes must utilize VR, they will require marking of retention groups. Also, choose cable equipment carefully, relegating less suitable machines to the 20% clearfell ground.

If FT chooses in the future to use VR on steep terrain with cable systems to meet their 80% non-clearfell target (which is presently not their intent), marking in advance of harvesting will be imperative to ensure proper deflection and to optimize the amount of wood logged in each set-up. Experimenting with a marking approach in ground-skidding operations (as suggested in #5 above), may facilitate the transition to cable harvesting by helping to identify the most suitable stand conditions for preharvest marking of retention groups.

More difficult stand types (and/or cable terrain) could be relegated to the 20% of annual harvesting that can be clearfelled. Also, clearfelled coupes would be best reserved for contractors with equipment less suited to VR, such as two-drum towers that utilize a high-lead set-up with butt-rigging. Swing yarders that can operate with an elevated running skyline (unlike a scab-line with a two drum tower), or three-drum towers in a standing skyline set-up are more suitable for yarding in VR blocks.

7. Use clearfelling strategically.

As indicated for point #6, careful consideration should be given to where the 20% clearfell ground will be planned. This should be strategically placed where objectives do not require partial-cutting, and stand types or terrain make retention systems difficult.

8. Keep the attitude positive toward VR.

The attitude for VR has to be encouraged to be positive. If 80% VR is embraced by all as a basic principle for sustainable forestry moving forward, then the playing field changes, challenges are not insurmountable, and success usually follows. We are encouraged by the trend that we see in FT staff.

Burning for Site Preparation and Fuel Reduction

9. Several burning options are available – until fine details of operations can be worked out, innovation should be encouraged.

We have no experience with burning in VR coupes, as most variable retention in Coastal BC is done without burning, but instead with planting directly into logging debris. Our

burning experience mostly occurred over 20 years ago, since burning as a site preparation tool is limited across British Columbia due to liability and smoke issues. Tasmanian experience with burning for site preparation is well developed and continues to evolve. Most of the observations and suggestions that follow flow from discussions with FT personnel.

As FT moves forward and attempts to deal with challenges for burning in VR coupes to reduce fuels and prepare an appropriate seedbed, two schools of thought are emerging: spread fuels (with pullback from edges of groups) and use a moderate-to-high intensity burn; or heap fuels and burn heaps. We think that the choice is not necessarily one or the other. That is, some coupes may better suit one or the other approach, depending on the species harvested, fuel loading, the design for VR, and the complete package of objectives for the coupe (Fig 3).

Fig 3. An view of Huntsman HU322L showing a successful use of the heaping and burning approach. This coupe may be well suited for such an approach since it required a relatively high level of retention and influence to help with local non-timber objectives for visuals and other values. Note the 10-15% edge scorch.

We also see a third option between these two very different approaches – a rough heaping or bunching of fuels to create indistinct accumulations with significant fuels spread between accumulations (beyond pulling back from the groups). These indistinct heaps are then ignited in a prearranged sequence to allow for some burning between heaps, but also to help control the direction of spread.

Another point identified by staff is that layout can be organized to facilitate fire spread and intensity. Thus, along with location of biological anchors and harvesting logistics, fire logistics should be considered at the layout stage. This may be another advantage to marking retention groups preharvest, although fire considerations may be incorporated with loggers choice if planners spend a considerable amount of time with the contractors in the field.

10. Guidance for fire damage to retention groups (aggregates) is good – it may even boost ecological value in some cases. Social concerns however may be important – these should be tested.

The draft FT aggregate retention quality standards (Forestry Tasmania, July 2006) for fire damage is "< 1/3 of the aggregates or coupe edges scorched or burnt (crowns, understory and ground cover." We think this is reasonable, and in some cases may actually encourage more structural diversity in groups or aggregates. This may be particularly true in stands with a very dense understory of dogwood, wattles and other species (Fig 4). Scorching 20-25% of some groups may help introduce a greater variety of understory species contributing to more structural diversity over the long term.

Fig 4. A dense understory dominated by dogwood (*Pomoderris apetala*) in a *Eucalyptus obliqua* retention patch (AR023E in the Huon District). Edge scorching from burning in such a patch may actually improve biological diversity locally.

This consideration must be balanced with other objectives and considerations, particularly social objectives for the visual landscape. FT staff were concerned that visual objectives are not compromised, as they do not believe that the public wants to see

scorched retention. Since complete protection of retention groups is expensive, and perhaps not necessary for ecological objectives, this social concern should be tested with the public – perhaps using focus groups and pictures of retention patches with a varying degrees of scorch.

11. Reliance on groups or aggregates should be continued, with options to leave smaller clumps or individual trees where feasible or desirable.

To facilitate maintaining the range of habitats and structures a range of retention sizes is desirable. To facilitate harvesting efficiency and saftety groups or aggregates are recommended for the majority of the retained structure. Larger groups are easier to work with as they approximate edge. However, there may be cases where individual trees or clumps can be safely left, and managed to avoid undue fire scorch, to provide internal influence and overall structural diversity. This form of 'variable' retention also may be useful to maintain visual objectives within selected coupes.

Windthrow and Browsing Damage

12. Windthrow does not appear to be a major challenge.

Windthrow is a major consideration for coupe design in Coastal BC. In retained groups or aggregates less than one hectare, more than 98 coupes reported average losses to windthrow after two years of 29% (Rollerson et al 2005). On all of the FT coupes we visited we did not see windthrow in a significant amounts. The most windthrow observed was approximately 5-10 trees, mostly celery-top pine and *Eucalyptus obliqua* with significant heartrot (Fig 5).

Larger Eucalyptus generally have a very good architecture to avoid windthrow, with a high degree of taper, basal buttresses, and very open flexible crowns that minimize drag forces. The understory celery-top pine has a relatively high height:diameter ratio with little taper or butt-flare, making it highly susceptible to windthrow on exposed edges. Even so, we did not observe overturned celery-top rootwads much further than 10 m into a group, and as previously mentioned this occurred infrequently. Although we did not see it, FT utilized understory species (such as myrtle) as dispersed individuals or as islands of retention on some sites, with high levels of windthrow post harvest. Such a strategy should therefore be used carefully, perhaps combined with other types of retention if the intent is for these trees to help maintain structure over the long term.

Fig 5. Little windthrow was observed on the coupes examined – only the occasional understory tree, such as the celery-top pine (Phyllocladus aspleniifolius) above or overstory eucalypts with significant heartrot.

In BC windthrow losses are usually ignored for salvage, unless the level of retention is significantly above minimum levels for the planning zone. This is likely not a major issue for FT with the low levels of windthrow experienced on most coupes.

13. Animal control is challenging, but is well-understood, with innovative approaches being considered.

Lack of 1080 as a pest control tool, is a significant challenge when coupled with the introduction of VR, since the increased edge tends to encourage presence of browsing animals throughout VR coupes. A number of control methods, including trapping and shooting, are currently in the process of being perfected by FT staff. FT has considerable experience with pest control and appear to be on-track to optimizing a non-chemical regime.

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