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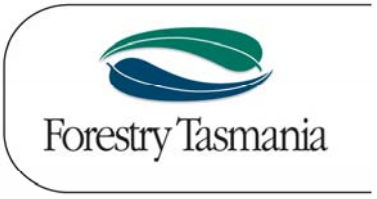

Final report on observations made on progress towards implementation of silvicultural alternatives in oldgrowth wet eucalypt forest in Tasmania

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Introduction

As part of the Tasmanian Community Forest Agreement, Forestry Tasmania has committed to examining alternatives to the clearfelling of old growth forest in tall wet eucalypt forest, for implementation by 2010.

In its 2005 Advice to Government, Forestry Tasmania recommended that for tall wet eucalypt coupes containing old growth forest (other than that managed in Specialty Timbers Management Units), 42,000 ha would be managed under a system of variable retention, while 23,000 ha (mostly steep forest) would continue to be managed under a system of clearfell, burn and sow (Forestry Tasmania 2005, Table 14).

Forestry Tasmania's goals for variable retention silviculture are:

- To more closely emulate natural ecological processes within managed tall oldgrowth forest by retaining late-successional species and structures (biological legacies) for at least a full rotation.
- To maintain a forest edge influence over the majority of the felled area thereby differentiating the regenerating stand ecologically from stands regenerating following clearfelling.
- To ensure that each coupe is an example of good forest stewardship.
- To achieve adequate productive regeneration of both eucalypts and other species.
- To ensure safety of forest operations

As part of the transition to alternative silvicultural methods, Forestry Tasmania has convened a Science Panel to report to the Board of Forestry Tasmania on various aspects of its progress towards that commitment. This report represents part of that process and is based on observations made and discussions held with Forestry Tasmania staff and a harvesting contractor during the week of 30th July to 4th August 2007. Field visits included the Warra LTER site and operational coupes in the Geeveston, Styx Valley and Murchison Districts in the company of FT staff and Science Panel member Bill Beese. Further opportunity to consider these issues were provided by the Old Forest, New Management Conference held in Hobart in February 2008 and a meeting of the full Science Panel on 22nd February. The emphasis of the following comments is on the application of the variable retention system. Group selection systems proposed for the management of Specialty Timbers Management Units were not reviewed and are not discussed here.

The operational coupes that have been harvested to date have been done in the context of a developing system with changing rule-sets. Forestry Tasmania staff has already considered many of the issues raised in the following discussion and some are already being acted upon. I have not attempted to separate those issues. The views expressed here are my own and are not intended to represent the views of any other panel member.

Appropriateness of aggregated retention

The creation of conditions that suit the development of early succession eucalypts while maintaining late succession elements in the same coupe is an extremely demanding objective. In my view the most appropriate and practical means of achieving these somewhat conflicting goals is through the use of aggregated retention. The system has clear advantages over alternatives such as group selection, dispersed retention or increased rotation lengths for the joint objectives of timber production and the maintenance of biodiversity values.

While the use of fire poses considerable risk to the retained groups, it is important to retain fire in the regeneration process, for both regeneration effectiveness and for ecological integrity.

The distinction between clearfelling and non-clearfelling based on the percentage of the harvested area under the influence of the adjacent forest is an appropriate basis for determining the design of retained groups. I also agree that the generally accepted cut-off of 50% be accepted at this stage. While influence is currently interpreted as being exerted to a distance of one tree height, I would urge that this limit not be too firmly locked in at this stage of system development. Influence is exerted over a variety of distances and varies according to the type of influence. At this stage of development there should be a greater emphasis on trying to evaluate the production and biological outcome of various options rather than being too prescription-driven. If the emphasis is on attempting to more closely emulate natural structure then a broader interpretation can be considered. See the discussion below.

In this report I have used the term ‘aggregated retention’, since only a part of the broader spectrum of ‘variable retention’ is being used. However care is needed in the use of these terms to ensure that while the intent is clear, the Tasmanian system is not too rigidly bound by the specifications used elsewhere (e.g. Canada) where the term is well established. The critical element of the system is the retention of ‘legacies’ for at least the full rotation, rather than the shorter term expectation of traditional selection systems.

Ecological values

While the impact of these proposals on wood production is relatively easy to evaluate, the ecological benefits are more difficult to determine. The broad objective is to maintain late succession biological legacies for at least a full rotation. The extent that this is done is determined by a definition of non-clearfelling. However in practice to date, considerably more forest has been retained than is required to meet that definition. It would be highly desirable if the value of these biological legacies could be more clearly enunciated so that the ecological value of various retention rates and patterns can be more clearly understood. This would need to be done at the coupe level but also within the broader landscape context which includes the already existing formal and informal reserves.

There is a need to clarify whether the retained groups are primarily intended to provide long term refuge for certain organisms or to provide a source of propogules to `regenerate' the harvested areas. This will influence the size, the separation, the type of the retained group, the extent of the `influence', and the level of concern about protection from burning. Different aggregates may have different objectives.

While the government requirement and the current objective is to restrict the use of this system to coupes containing old growth, the logical extension to that is its application to regrowth forest, and there is a scientific view that this should in fact be a higher priority. Application to regrowth is already happening in practice where retained aggregates are not restricted to old growth patches.

It may be desirable to examine the implications of this possibility, in particular with a view to setting priorities appropriate to different landscape zones.

Impact on wood production

The estimated impact of edge suppression on regrowth development indicated in the Advice to Government seems small compared to that which has been observed in wet forest in Victoria (Bassett & White 2001, Lutze & Faunt 2006, van der Meer & Dignan 2007). Because of the potential significance of this I strongly recommend that edge influence data be collected for the range of types and edge preparation that is relevant. This data will not be very meaningful until the regrowth is about 15 years old and more but there are excellent opportunities to collect this data from mature/regrowth edges in past clearfelled areas up to at least 50 years of age.

The application of the system to date has been driven with a focus on maintaining an adequate amount of protected aggregates. This focus, combined with multiple targets for spacing, percentage retained and aggregate size have inevitably led to the retention of a much higher retention rate than expected or which has been accounted for in the expected impact on yield.

In my view the driving target should be the percentage under influence and the minimum size of the aggregate. This will take appropriate account of the influence of the forest on the coupe edge and can accommodate any specified differences in aggregate size and influence zone as discussed above. The proportion retained would then be an outcome rather than a target. However if 50% under influence is the target then the aim should be to achieve that figure, not a minimum of 50%.

Unnecessarily high proportions under influence (and therefore retained) reduces current and future yield, increases the gross area requiring annual regeneration burning, increases disturbance (visual and ecological) at the landscape level, increases roading costs and increases the gross area requiring browsing control.

Recent modeling has indicated that yield is highly sensitive to the area retained in aggregates since it has an effect on immediate log supplies for which there is no alternative. However yield is relatively insensitive to the productivity of the regrowth when it is harvested in 90 years time because the volume sourced from aggregated coupes is relatively small compared to other log sources such as plantations. However because these areas remain a part of the estate that is required to produce timber supplies in the long term, Forestry Tasmania intends to retain the ‘production standard’ for regeneration in aggregated retention coupes.

Evaluating trade-offs

Unlike plantations or formal and informal reserves, the forest under discussion here is required to produce wood products as well as maintain ecological values. Neither can be expected to be produced at optimum levels and trade-offs are necessary. It is important that these trade-offs are determined as objectively and transparently as possible.

Once the suppression data described above is available and ecological values have been more clearly stated, I suggest that attempts be made to model the impacts of aggregate size, spacing, percentage and shape on wood production, ecological and aesthetic values and on fire management issues, based on the magnitude and extent of edge effects. While it is true that much of the data to undertake this exercise does not exist in a suitable form, the reality is that assumptions are already being made about these issues and are being expressed in prescriptions. The system envisaged would be a relatively simple expert system using whatever data or expert opinion is available and using key species to represent each group of organism. The exercise proposed will serve to enunciate the assumptions being made and in the process should highlight knowledge gaps. It

should also help to indicate the most appropriate form in which data might be collected to facilitate the expression of the trade-offs between competing values.

The objective should be to optimize the competing values or at least provide objective information on the impact on production and ecological values of various options.

In the planning and execution of the system I believe there needs to be a strong representative for each of the values (production, ecological, fire management, aesthetics) to ensure that no interest is adversely impacted beyond that which has been planned for or expected.

Landscape context

The tacit assumption behind variable retention is that the retention of late succession elements at the coupe scale will contribute towards the broader objective of maintaining improved ecosystem function. Extrapolation of the outcomes of this prescription to the landscape level is the critical measure of success in terms of biodiversity and production. For example in determining the relative net benefit to conservation of concentration versus dispersal of harvesting activity or retention of mature forest. It is important that the expert system mentioned above has the capacity to be extended to the landscape.

Recent work on the development of appropriate landscape metrics (Yee *et al.* 2008) has concentrated on the location, size and influence of mature forest in various blocks of forest. The assumption is that the greater the influence of mature forest, the better the conservation outcome. While this undoubtedly provides some insight, there is as yet insufficient information to provide guidance on threshold values or to determine the relative merits of different levels of influence. While the existence of mature forest is clearly an important element of landscape function, the current approach seems to ignore the equally important role of early succession forest in the landscape. Although these stands may be less diverse than mature stands, they are nevertheless an important component of diversity at the landscape scale and are an essential component of long term stability.

I therefore suggest that the approach be broadened to describe all stages of forest development (including those of mixed structural stages) and their relationship to one another in the context of a dynamic forest landscape. It would be possible, for example, to illustrate changes that might occur over time as mature forest proceeds to rainforest, and as young regeneration develops towards maturity in different parts of the landscape. This would provide the basis for the dynamic modeling of diversity (based on the key species mentioned above) at the landscape scale and demonstrate the changing suitability of different landscapes for different organisms.

Fire and regeneration

The use of high intensity fire to achieve satisfactory eucalypt regeneration while at the same time protecting retained aggregates from fire damage is the most problematic aspect of a non-clearfelling system. Alternatives to the use of broad-acre intense fire, such as heaping of debris, burning heaps, mechanically disturbing the ground and planting or seeding are not considered satisfactory in this situation. I am advised that the planting of ash type eucalypts has been unsatisfactory despite many previous attempts. In any event the use of more intense mechanical disturbance to avoid the use of fire is an illogical response if the principal goal is to more closely emulate natural disturbance events.

While high intensity regeneration burns in the presence of retained aggregates is a very difficult task it has been achieved on a limited basis with satisfactory results. While it is technically achievable, it is more difficult to determine whether an operational program can be fully achieved. There are a number of factors that make the achievement of the regeneration program more difficult to achieve than it has been in the past. These include:

- The gradual reduction in coupe size, regardless of any change to silvicultural practice, has increased the number of burns required per year.
- Aggregated retention will increase the number of burns by about 25% relative to same area harvested by CBS, but increase the perimeter requiring protection by about 2.5 times. However I have been unable to determine the significance of this in the overall burning program for tall wet forest (including the areas of non-old growth coupes that are clearfelled).
- The number of days suitable for regeneration burning of clearfelled coupes is estimated to be 8-10 days per year. It is expected that there will be fewer days suited to burning coupes with retained aggregates.

However, it appears that reducing coupe size will have a greater impact on achieving the overall regeneration program than will the area harvested under variable retention.

The likely outcome of the increased difficulty of achieving the burning program is that:

- The full program will not be achieved every year and there will be a higher proportion of carry-over coupes. This is a particular problem in these forests since the consequences of delayed regeneration are severe and the options for remedial action are limited.
- There will a higher proportion of failed or marginal regeneration results and there will be an increased reliance on second and third year regeneration to achieve satisfactory results. This is likely to apply in particular to the more difficult-to-burn aggregated retention coupes. Possible options to increase the likelihood of satisfactory regeneration include simplifying the design of aggregates to facilitate burning; less reliance on natural seed fall and increasing the amount of seed that is used to achieve higher regeneration rates in the first year; and increasing browsing control efforts.

  In my view a greater allowance for sub-standard stocking will need to be made in estimates of the future yield from aggregated retention coupes, though this is unlikely to have a major impact on the total yield.

- A proportion of the aggregates will be burnt in the process of regeneration burning. In my opinion the extent of the damage done to aggregates in the operational trials done to date is as good as can reasonably be expected. I understand that the coupe with the most severe damage occurred as a result of unforecasted weather conditions, a situation that will inevitably occur from time to time. Efforts to prevent this damage are likely to result in burns that are too ‘cool’ for satisfactory regeneration. Excessive firebreak construction aimed at protecting the aggregates will also have undesirable impacts.

In my opinion the burning of a reasonable number of aggregates should not be regarded as a matter of concern and is well within the range of what could be expected in wildfire conditions. While unburnt 'legacies' are a common occurrence in wildfires at the landscape level, it would be surprising if these were as frequent or as extensive at the coupe level as that planned for aggregated retention. An examination of post-wildfire aerial photography would provide an insight into this issue. I would not recommend leaving additional aggregates to compensate for those that might be burnt in the regeneration burn. Nevertheless identifying the principal purpose of the aggregates would provide fire managers with protection priorities.

The development of a biofuel industry has been suggested as a means of reducing the fire intensity in regeneration burns. However a biofuel harvesting operation that is conducted after the main harvesting operation may exacerbate the problem by separating the fuel and crushing the available flash fuels. This may result in poor or patchy burns or require drier conditions to achieve a satisfactory burn. Delays in undertaking the secondary harvest will also allow understorey to develop and provide further competition for regeneration. I would suggest that trials be undertaken to integrate the removal of biofuel with the main harvest operation.

Ensuring that the regeneration burning program is not unnecessarily increased by excessive retention will assist in achieving the program.

Selection of aggregates

The selection of aggregates in operational coupes presents considerable difficulties. We have been advised that the demarcation of the aggregates prior to the harvesting operation is difficult because of poor GPS performance in dense forest and safety concerns with leaning or unsafe trees at aggregate edges. There is also no doubt that the demarcation of the aggregates by the fallers has given them a much greater sense of ownership of the safety issues and led to greater operator acceptance.

However a concern by the fallers not to exceed spacing prescriptions together with the fact that they can only see the area in their immediate vicinity has led to the retention of a much greater proportion of the coupe than intended. Most aggregates are closer than necessary resulting in excessive overstorey influence. The method of operation means that once the aggregates are created it is very difficult to correct if the outcome is not as predicted. If spacing is too large it cannot be corrected; if it is too small it is difficult to correct by removing an aggregate without then creating too wide a gap.

If aggregates cannot be demarcated in advance then it will be necessary to have a much closer relationship between the FT supervisor and the faller as the operation progresses on a day-to-day basis if a satisfactory outcome is to be achieved. It is difficult to envisage how a faller can adequately place and adjust aggregates without the benefit of GPS plotting. This should be feasible once some harvesting has been done. In my view this aspect is the least satisfactory part of the operation and to date has resulted in much greater reduction in current and future yield than has been planned or expected.

Aesthetics

While the aesthetics of clearfelling has been a strong motivation for change, there appears to have been little explicit attention given to the placement of aggregates and their impact on aesthetics. I should point out that this may be a false assumption and it may have been considered in the initial coupe planning, but it was not discussed during our visit.

In my view it is unlikely that retained aggregates will be seen as a significant improvement in the aesthetics in the early stages of harvesting and regeneration. The burnt debris will still attract attention and the sharp definition of the aggregates can represent a somewhat discordant visual feature. However where roads through coupes are likely to become future public thoroughfares, there are advantages in placing aggregates adjacent to these roads. While this may make little difference in the early stages they will provide visual diversity for the remainder of the rotation; unlike aggregates away from roads which have little visual advantage once the regrowth is above head height.

Conclusion

A great deal of progress has already been made towards implementing the proposed silvicultural changes in both a research and an operational sense. In my view the program is well structured, comprehensive and well resourced. The proposals seem to be well accepted by contractors and there appears to be good co-operation between staff and harvesting contractors in developing the system.

Operational trials conducted to date have provided considerable insight into the issues involved and form a valuable basis for ongoing work. It is evident that considerable refinement has occurred even in the last six months and progress is expected to accelerate as biodiversity monitoring begins to yield results.

In my view the achievement of successful operational regeneration burning program remains the area of greatest uncertainty and is not easily solved simply by the application of greater resources. The increased difficulty of burning aggregated retention coupes comes on top of the increase in the number of burns as a result of reducing coupe size. However a great deal has been learned about the new techniques that are required and these will be further refined over the next two years by which time it should be possible to form a more definite conclusion.

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