Taking account of special values in the coupe planning process - an example from the southern forests of Tasmania

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Abstract

Although hundreds of forestry coupe plans are prepared each year in Tasmania, little information is made public about the complexity of the planning process. In this paper we detail the steps taken to design the harvest plan for a coupe in the wet southern forests of the Huon River catchment, Tasmania. The plan was designed not only to protect streams at risk of erosion, but also to protect the nesting site of wedge-tailed eagles. The coupe plan changed from an initial concept of clearfelling 57 ha to a proposal to harvest four separate areas, the largest of which was 32 ha and the smallest 3 ha. Informal reserves reduced the originally proposed harvest area by 29%, and the harvest area was extended by adding area from adjacent coupes to restore a viable operation. The proposed conversion of native forest to plantation was changed to native forest harvest followed by regeneration to native forest in order to minimise risks to a fish farm downstream. Although the revised harvest plan was designed to produce a better long-term environmental outcome for streams and fauna, it made fire management for regeneration more difficult and increased the risk of fire escape, as the fragmentation of harvest areas doubled the perimeter:harvest area ratio compared to the original coupe plan. The overall result of the harvest was a patchwork of harvested and unharvested areas resembling the forest 'islands' resulting from the aggregated retention harvest technique proposed as an alternative method for harvesting old-growth wet eucalypt forests in Tasmania.

Introduction

Careful planning of forest harvest operations is required if forest production is to be sustainable. In the improved national regulatory framework developed in the late 1980s and early 1990s (Commonwealth of Australia 1992), planning was specified as one of the five principles that should govern wood production in native forests; the others were a legislation-based forest practices system, safety, environmental care, and monitoring and review (Wilkinson 1999). The requirement for good planning has been formalised in the interim Australian Forestry Standard (Australian Forestry Standard Steering Committee 2003), which specifies that a forest manager shall ensure that plans, procedures, controls and guidelines are in place to provide for protection and maintenance of environmental, economic, social and cultural values. All major forest-production States in Australia (Tasmania, Western Australia, Queensland, New South Wales and Victoria) require that plans be produced for forest harvest operations, although there is considerable variation between States regarding application of planning legislation to public forests, private harvests and plantations (Wilkinson 1999).

In practice, the basic unit for forest harvest planning in Tasmania is the coupe. In native forests this is a block of land that usually has an area of 50–100 ha. In regional 3-year plans, coupes are simply designated in outline (Figure 1). Planning for actual harvest is preceded by a detailed assessment of a coupe's characteristics (e.g. vegetation type, soils and slopes) so that the Forest Practices Code[1] (Forest Practices Board 2000) can be applied, thereby minimising adverse environmental effects.

Planning also considers 'special values'. This term refers to fauna, flora, landscape, soil and water, cultural heritage or geoscience issues that may require consideration and prescriptions in addition to those specified in the Code.

With increasing knowledge about the effects of forest harvesting on physical and biological landscape processes, the number of regulations and guidelines governing forest operations has increased. For example, although the Code does not require streamside reserves to be established routinely on headwater streams (Class 4 streams as defined in the Code), the correlation of stream erosion with an erosion hazard rating based on riparian slope and soil erodibility (McIntosh and Laffan 2005) has led to new measures to provide additional protection to headwater streams judged to be at risk of erosion during or after forestry operations (McIntosh 2004). Much of this risk is derived from increased stream flow after harvest (Vertessy 1999), which can have long-term effects on the characteristics of headwater streams (Davies *et al.* 2005) and the larger streams into which they flow (Davies and Nelson 1993; McIntosh and Richards 2004). The primary aim of the newly introduced measures is to protect morphology and habitat in headwater streams in which these physical attributes are judged to be at risk, by maintaining the stabilising influence of vegetation (Zimmerman *et al.* 1967). The traditional streamside reserve function of trapping sediment in buffers (Croke *et al.* 1999) is of secondary importance. The assumption behind the guidelines is that, if pre-harvest morphology and habitat in headwater streams are maintained, the water quality and habitat in these streams, as well as in the higher-order streams into which they flow, are more likely to be protected.

Several hundred coupe plans are prepared each year in Tasmania. Apart from the recent account of the planning of a Southport coupe (Davies *et al.* 2006), little information has been made public about the complexity of the coupe planning process. Further, the result of applying the new stream guidelines (McIntosh 2004) is that many headwater streams now require protection by means of streamside reserves during forestry operations. Such reserves constrain forest operations, in particular by creating longer harvest boundaries and by requiring more complex coupe burning strategies. This paper describes how a coupe was assessed for special values relating to soil and stream characteristics, how other special values were also incorporated into the harvest plan, and how operations were affected.

Coupe planning and procedures

Coupe DN019D is situated south of the Little Denison River in the Huon River catchment of southern Tasmania (Figure 1) and is centred on the GDA grid coordinates 479060 5241040 (Nevada mapsheet 4624). It is one of a number of coupes provisionally delineated in the area. Not all of the coupes shown in regional planning maps are harvested, as some may be uneconomic and others may require protection, in whole or in part, for their special values.

The outline plan of the coupe (Figure 1) shows a 57 ha area bounded on its north-western side by a wildlife habitat strip

[1] Referred to as 'the Code' in this paper.

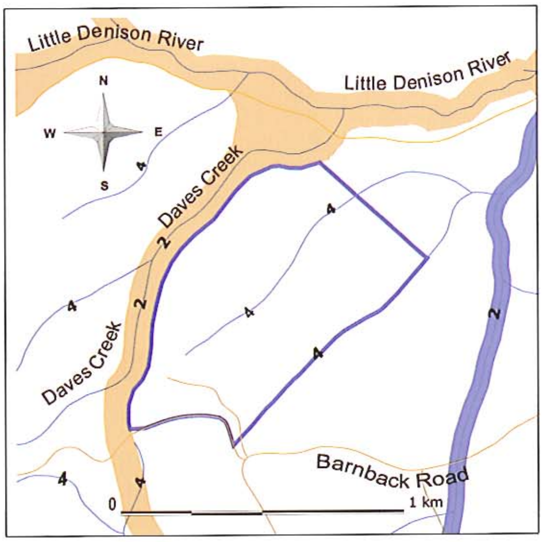


Figure 1. The outline of coupe DN019D (bold blue line), as shown on regional planning maps on 02 March 2005, before detailed coupe planning had started. The coupe boundary on the northwest side is a wildlife habitat strip (coloured brown) coinciding with Daves Creek. One Class 4 stream flows from southwest to northeast through the centre of the coupe. Streams are represented by fine blue lines, and the streamside reserve on the eastern Class 2 stream by a broad blue line. Numbers on streams represent stream order.

running along Daves Creek, and on its south-eastern side by an unnamed Class 4 stream. Its north-eastern and south-western boundaries are other unharvested coupes.

Photo-interpretation indicated that the vegetation within the coupe consisted primarily of regrowth forest (ER4b, ER4c and ER4d; see Stone (1998) for details of photo-interpretation codes), with areas of old-growth (E1d) trees along its western and south-eastern boundary. *Eucalyptus obliqua* and *E. regnans* trees predominated. Initial field observations indicated that the soil was formed in dolerite talus, which is colluvium (material accumulating on a slope) formed from dolerite, a rock type that occurs *in situ* to the west (upslope), where a dolerite sill caps hills (Mineral Resources Tasmania 1998). Soils, productivity assessments and climate considerations (Laffan 1997) indicated that this coupe was suitable, in principle, for conversion to a hardwood (*E. nitens*) plantation.

In January 2005 field surveys commenced in order to assess the coupe in more detail. A notification for planned roads was received by the Forest Practices Authority[2]. The Forest Practices Officer[3] in charge of the road planning did not detect any instability in the slope colluvium on the proposed roadline and the FPA endorsed the roading operation on 21 January 2005. In March 2005 the Forest Practices Officer and Forestry Tasmania Senior Planner in charge of planning (T. W.) surveyed the coupe by walking the coupe in a clockwise direction from a starting point near Barnback Road (Take Off Point, Figure 2). Four observations relevant to harvest and land management were made: (1) the soils were formed in three rock types (sandstone, siltstone and dolerite), rather than in dolerite alone; (2) sedimentary sandstone and siltstone rocks were more prevalent than dolerite, an observation consistent with the geological map, which shows Permian siltstone and sandstone as the predominant underlying rocks (Mineral Resources Tasmania 1998); (3) a wedge-tailed eagle nest was present in the coupe near the central Class 4 stream; and (4) the coupe contained two Class 4 streams not indicated on the 1:25000 topographical map, and the course of Daves Creek was found to differ from that shown on the 1:25000 map (Figure 2).

Further field visits were made in April 2005, one with the FPA Ecologist to check the activity of the eagle nest within the coupe and formulate prescriptions, and another by T.W. alone to mark boundaries

[2] The Forest Practices Authority (FPA) was known as the Forest Practices Board before July 2005. It is referred to as the Forest Practices Authority throughout this account.

[3] Forest Practices Officers are generally employees of forestry companies, who have been accredited by the Forest Practices Authority in key elements of the forest practices system, e.g. certifying of forest practices.

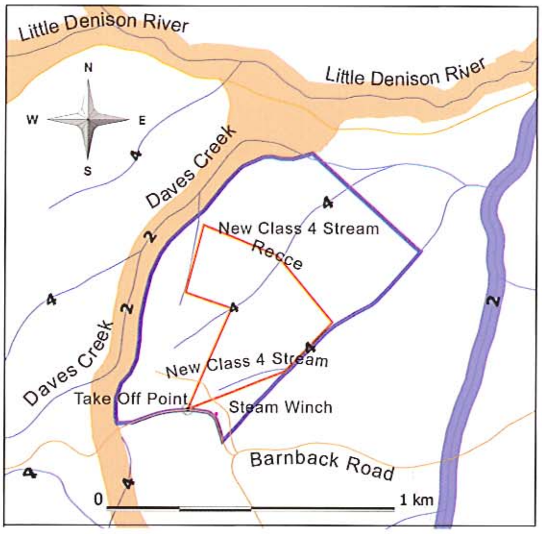


Figure 2. Field surveys conducted between January and March 2005. These surveys were undertaken to establish the forest types present, to assess soils and geology, to establish whether streams were correctly mapped on 1:25000 maps, and to check for other special values including faunal and cultural heritage issues (note the location of the steam winch). The survey track is shown by the red line beginning at 'Take Off Point'. Significant features affecting planning are two previously unmapped Class 4 streams and two eagle nests, the approximate positions of which are shown in Figure 4.

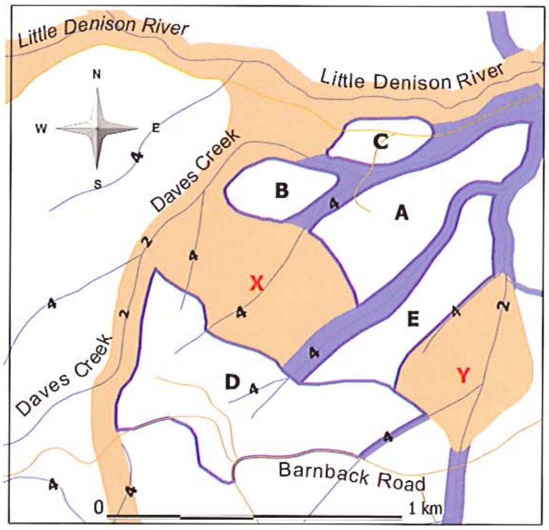


Figure 4. The formal draft planning map developed from field observations. The informal reserves (X and Y) to protect the eagle nests are shown (brown), as are the 20 m streamside reserves around those Class 4 streams which have been upgraded to Class 3 status (broad blue lines). Roadlines were reconfigured to give improved stream-crossing geometry. As a result of the stream and faunal issues, the coupe has been subdivided into four sections, labelled A, B, C and D. Section E was considered for inclusion but harvest of this area was deferred (see text). This plan was endorsed by the Forest Practices Authority as meeting the Forest Practices Code and special value requirements. Subsequently a late decision was taken to defer harvest of section D, to further protect the eagle nest between sections D and B.

and assess streams for erosion features as required by the FPA 'New Guidelines for the Protection of Class 4 Streams' (McIntosh 2004) being trialled by the forest industry.

Subsequently a helicopter search located a second eagle nest in the adjacent coupe DN019C, east of the nest in coupe DN019D. The approximate positions of these nests are shown by the red symbols X and Y in Figure 4.

As a result of the surveys in coupe DN019D, the soil erodibility rating across most of the coupe was upgraded from low (which was appropriate for soils formed in dolerite under wet sclerophyll forest) to moderate (for the areas with soils formed in sedimentary rocks), and the original coupe plan and shape were revised as follows:

Figure 3. The wedge-tailed eagle nest in coupe DN019D.

1. Both the internal Class 4 stream and the stream on the south-eastern boundary had one or more of the following erosion features defined by McIntosh (2004): tunnel-gully erosion, stream banks >1 m high, boulder movement in the channels, significant sediment accumulation, and a channel >4 m wide. Consequently they were upgraded to Class 3 status and required 20 m streamside reserves. Only in the upper reaches of these streams were erosion features absent. In these upper reaches, 10 m machinery-exclusion zones were considered sufficient to protect streams.
2. The eagle nest within the coupe was active and required a reserve of minimum size of 10 ha around it.
3. The proposed alignment of a road accessing the coupe from the north was inappropriate as it did not cross the stream at right angles. The alignment required reassessment.
4. Actual and potential erosion in streams and soils formed in sandstone meant that the planned plantation development could have adversely affected water quality in the Snowy River Trout Farm, 9 km downstream.

These revisions resulted in the original planned coupe harvest area of 57 ha being provisionally split into three sections, on account of the eagle nest reserve required in the centre of the coupe (X in Figure 4) and the internal stream with its associated 20 m streamside reserve, and a reduction in planned harvest area of about 16.5 ha or 29% of the originally planned harvest area of 57 ha. Discussions were then held between the Forestry Tasmania Senior Planner (T.W.) and a peer review group of senior Forestry Tasmania foresters to decide whether harvest of the coupe was still viable. The outcome of this discussion was a further change to coupe design to protect environmental values while preserving an economic harvest operation:

1. The harvest area would be extended into the area of coupe DN019J to the north, and into coupe DN019I to the south, to maintain the harvest area at close to the originally proposed 57 ha (Section A 18.9 ha, B 4.5 ha, C 3.0 ha, D 32.0 ha) with a new total harvest area of 58.5 ha (Figure 4).
2. The addition of section E (Figure 4) to the harvest area was considered. The addition was approved in principle, but harvest was deferred until after regeneration of sections A–D, to reduce the effect of increased run-off after harvesting on the Class 4 stream shared with section A.
3. The harvested area (sections A–D) would be regenerated to native forest rather than being converted to plantation. This would reduce the risk of contaminating the water supply of the Snowy River Trout Farm because (a) no cultivation would be required; (b) the harvest interval would be approximately 80 to 110 years rather than approximately 15 to 25 years for a plantation coupe; and (c) fewer chemicals (fertilisers, herbicides and insecticides) are used in native forest production than in plantations - in fact, for most native forest operations no chemicals are used at all.
4. The northern road access was redesigned to cross Daves Creek below the junction of the Class 4 stream, and approximately at right angles.
5. Each section of the coupe would be separately burnt for regeneration purposes.

These changes substantially increased the forest perimeter:harvest area ratio. The original coupe plan had a harvest area of 57 ha with a perimeter of 3200 m (giving 56 m of boundary per hectare harvested). The revised harvest area of 58.5 ha has a perimeter of 6800 m (giving 117 m of boundary per hectare harvested).

The final plan incorporating these changes (Figure 4) was sent to the FPA soil, water and ecological specialists for comment on 14 April 2005, with draft prescriptions to protect the eagle nest and the Class 4 streams. The FPA endorsed the prescriptions and plan on 28 April 2005. The Forest Practices Plan was certified on 5 May 2005 and harvest commenced on 9 May 2005.

Harvest was partly completed in May 2005 (Figure 5A) but was delayed by wet winter weather, to meet the Code requirement of protecting soils and streams from damage and erosion. It resumed in the summer of 2006. Harvest of sections A, B and C was completed by July 2006 (Figure 5B). After harvest of section C, it was decided that harvest of section D would be deferred to limit disturbance around the eagle nest (X).

Because actual features on the ground (e.g. stream positions) in sections A, B and C differed slightly from features marked on maps, the final harvest area was slightly larger than the planned area for these sections. When section D is harvested, a further adjustment to the total harvested area may result.

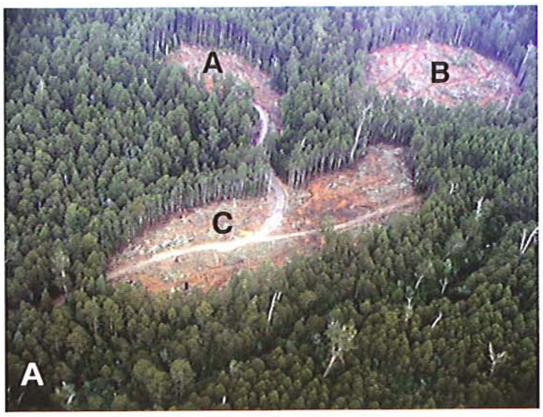
Discussion

The four-month development of the Forest Practices Plan for harvest of coupe DN019D demonstrates how potential physical and biological constraints are assessed before coupe designs are finalised and harvesting plans certified. In this case, the constraints (the requirements to protect the riparian areas of the streams judged to be at risk of erosion, and the eagle nest) contributed to the harvest area within the original coupe boundary being reduced by about 16.5 ha (29% of the original coupe area of 57 ha). Reduction of about 10 ha (18%) was attributed to the eagle nest reserve, and reduction of 6.5 ha (11%) was attributed to stream protection measures, but these figures are approximate as the areas designated for stream and eagle protection overlap. The immediate loss of harvest area was compensated for by the extension of the harvest area into neighbouring coupes, returning the harvest area to 58.5 ha. The harvest plan was also changed so that the large coupe was split into four harvest sections A - D, which are essentially small coupes.

The issues identified over the four-month planning period affected not only coupe area and design, but also long-term management. Identification of risks associated with soil types and geology, and with streams judged to be at risk of erosion and potential off-site effects, resulted in regeneration to native forest being preferred to conversion to plantation.

Harvesting of coupe DN019D in sections according to the final plan is likely to achieve a better environmental outcome than harvesting according to the original concept of a single, 57 ha clearfelled coupe. However, the modifications made in the planning process have increased the risk of regeneration burns escaping, because the revised design has doubled the forest perimeter: harvest area ratio of the original coupe design. The cost of separate regeneration burns in the four harvested sections is also greater than that for one burn in a single large area, because each burn has to be lit separately, firebreaks are longer, and more staff and machines (e.g. water tankers and excavators) are required on-site when patrolling the burns. In addition, because organising many small regeneration burns takes longer than organising a single large burn of similar area, it can be difficult for planning staff to schedule the increased numbers of burns within the limited 'window of opportunity' for safe and effective burning in autumn.

The planning process, by fragmenting harvest areas, has produced a harvest mosaic similar to the aggregated retention techniques experimentally employed in old-growth forests at the Warra Long-Term Ecological Research (LTER) site (Hickey *et al.* 2001; Neyland 2004), i.e. a patchwork of



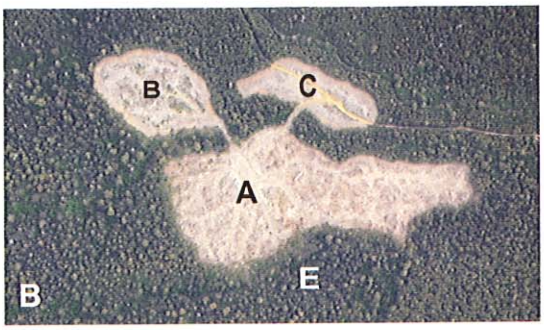


Figure 5. A. View of the partly completed harvest (May 2005), taken from the northeast. Sections C (foreground) and B (right) have been harvested, and a start has been made on section A (top left). Daves Creek runs between section C and the other two sections, and is protected by a 30 m streamside reserve on both banks. The Little Denison River is visible in the lower right of the photograph; it is a Class 2 stream within a wildlife habitat strip and has a 50 m unharvested streamside reserve between it and Section C. B. The completed harvest (July 2006). The retained streamside reserves between harvested sections A, B and C, and between harvested section A and unharvested section E, are visible. Daves Creek, with a wider wildlife habitat strip doubling as a streamside reserve, is at the top right of the photograph.

harvested and unharvested areas. Because the unharvested reserve areas in coupe DN019D are next to streams, or are large areas forming faunal reserves, the harvest areas have boundaries that are easier to protect from fire and are more resistant to windthrow than dispersed standing trees, or small aggregates within coupes. The informal reserves so retained are therefore more likely to survive any fire and wind damage than isolated aggregates and trees. We suggest that the long-term result will be a multi-aged forest eventually containing old-growth stands, and that the spatial forest structure after harvest will be similar to that produced by the aggregated retention harvest technique and will mimic the spatial forest structure produced by natural regeneration after occasional fires.

Conclusion

This account of the planning and harvest history of coupe DN019D demonstrates the importance of field surveys for identifying key issues and special values that can have a significant effect on operations: different soil types, unmapped streams, wrongly mapped streams, erosion-prone streams, two eagle nests, correct positioning of road crossings, and the necessity to protect water quality in a downstream trout farm. Although the environmental outcomes of the detailed planning are likely to be positive (greater stream protection, protection of eagle nesting sites, maintenance of water quality, and more acceptable visual effects), there are also negative or potentially negative economic effects (loss of productive area, greater costs of regeneration burns, greater risks of fire escape during regeneration burns, and greater time spent on coupe management).

The overall result of harvest according to the modified plan is a pattern of harvest not dissimilar to the outcome achieved by the aggregated retention harvest technique trialled as an alternative to clearfelling in old-growth forests at the Warra LTER site (Hickey *et al.* 2001; Neyland 2004).

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