

# **J. W. Gottstein Memorial Trust Fund**

The National Educational Trust of the Australian Forest Products Industries



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## **A REVIEW OF FOREST RESTORATION PROJECTS IN TASMANIA**

Michael Schofield

2017 GOTTSTEIN FELLOWSHIP REPORT

HOBART

# Joseph William Gottstein Memorial Trust Fund

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Bill Gottstein was an outstanding forest products research scientist working with the Division of Forest Products of the Commonwealth Scientific Industrial Research Organization (CSIRO) when tragically he was killed in 1971 photographing a tree-felling operation in New Guinea. He was held in such high esteem by the industry that he had assisted for many years that substantial financial support to establish an Educational Trust Fund to perpetuate his name was promptly forthcoming.

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Michael has an interest in the role forest restoration can play in demonstrating sound land stewardship and fostering partnerships with a range of interest groups.



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*All photographs are by the author except where specifically acknowledged.*

## **Abbreviations**

AFS – Australian Forestry Standard

CSIRO - Commonwealth Scientific and Industrial Research Organisation

DPIPWE – Department of Primary industries, Parks, Water and Environment

ET – Environment Tasmania

FPA – Forest Practices Authority

FPC – Forest Practices Code

FPO – forest practices officer

FPP – forest practices plan

FSC – Forest Stewardship Council

GA – Greening Australia

NEBN – North East Bioregional Network

NRM – Natural Resource Management

NS – Norske Skog

PFT – Private Forests Tasmania

PTPZL – Permanent Timber Production Zone Land

STT – Sustainable Timber Tasmania

TPPL – Timberlands Pacific

UTAS – University of Tasmania

# 1 Introduction

This report describes the research undertaken in a Gottstein Fellowship study of forest restoration projects in Tasmania. The aim of the study was to review and document the various Tasmanian projects and to gain an understanding of what motivated people to undertake them, and the scale and methods used, with the intent that this may lead to improved co-operation, knowledge and field outcomes.

Whilst the review provides a summary of individual projects, it is in no way a ranking or a critique of these. The report covers the organisations visited, forest restoration processes, summaries of individual projects, discussion and recommendations.

## 2 Context of the Study

Forest restoration is a broad topic and can be defined in a range of ways (Stanturf 2005). In the context of this review, it is defined as the restoration of native forest and native non-forest vegetation on a largely non-native site back to what might be considered the historical species mix, structure and function; the previous land-use was plantation or agricultural land. This includes the restoration of degraded remnant native forest and native non-forest vegetation within the plantation and agricultural landscape.

Forest restoration works are occurring in a range of environments throughout Tasmania that span the spectrum of sites from high inherent resilience to virtually no resilience. Silvicultural treatments, costs per hectare and timeframes vary considerably across projects.



Figure 1 – Ex *Pinus radiata* plantation restored to native forest in 2013, Lake Repulse (NS). Photo 2017.



Figure 2 – Ex-pasture ‘greenfield’ site restored to native forest-woodland in 2014, Ross (GA). Photo 2017.

There were several projects that were not considered in the review, specifically the joint project between Sustainable Timber Tasmania (STT) and Environment Tasmania (ET) to reforest native forest clear-cut coupes that were subsequently added to the World Heritage Area; the recent habitat enhancement work where arborists and conservation biologists drilled trees to artificially create hollows for the Swift parrot *Lathamus discolor* on Bruny Island; and small scale projects being undertaken by Landcare and associated groups. The reasons for not including the above projects was that they did not result in a change in land-use, while the Landcare projects tend to be scattered and small-scale.

### 3 Tasmanian forest practices system

To understand the operating environment in which forest restoration projects are being undertaken it is worthwhile providing a summary of the forest practices system.

Tasmania’s forest practices system came into effect in the mid-1980s with the enactment of the *Forest Practices Act 1985*. The objective of this legislation is to ‘achieve sustainable management of Crown and private forests with due care for the environment and taking into account social, economic and environmental outcomes’ (Schedule 7, Forest Practices Act 1985). Key characteristics of the forest practices system are a tenure-blind approach, the Forest Practices Code (FPC), forest practices plans (FPPs), forest practices officers (FPOs), and independent oversight and reporting by the regulator the Forest Practices Authority (FPA).

The tenure-blind approach operating in Tasmania is unique in Australia and uncommon globally (McDermott et al. 2007). It results in a uniform application of the legislation, the FPC and associated planning tools. The FPC sets out practical measures which aim to provide ‘reasonable protection’ for the environment and includes sections on planning, roading, harvesting, natural and cultural values and reforestation. Of particular relevance to this review, is the management of riparian zones alongside class 1, 2, 3 and 4 streams as defined by the FPC; class 1 streams being the largest and class 4 the smallest (FPC 2015). Forest practices are defined in the *Forest Practices Act 1985* and can



be summarised as establishing trees, harvesting timber, clearing trees, clearance and conversion of threatened native vegetation and any roading or quarrying associated with the prior listed practices (Forest Practices Act 1985).

All forest practices require a FPP, except for small-scale activities as defined in the *Forest Practices Regulations 2017*. FPPs are operational plans that set out the prescriptions for a specific operation and include detailed maps, and must be in accordance with the requirements of the FPC. The preparation of FPPs requires a large amount of background planning and evaluation of natural and cultural heritage values, including Aboriginal heritage (McIntosh and Ware 2008) and are certified by an FPO. FPOs are authorised by the FPA to carry out duties specified by the *Forest Practices Act 1985*, and are qualified, experienced and skilled forest planners and practitioners.

FPOs are required under the *Forest Practices Act 1985* to complete compliance reports for each operational phase in FPPs. These reports form an important part of the self-regulation of the forest practices system. The FPA is the independent regulator of forest practices across Tasmania, and the organisation provides advice, research, monitoring and enforcement in relation to the *Forest Practices Act 1985*, the FPC and its associated planning tools. The FPA is required under the *Forest Practices Act 1985* to assess the implementation and effectiveness of a representative sample of FPPs, and to report on the results in the FPA annual report. This assessment ensures that the FPA has sufficient oversight of FPO planning, implementation and reporting.

The key point in terms of what it means for forest restoration is that an FPP is required when carrying out forest restoration. As a result, there is a protocol for planning, implementation and compliance reporting. FPPs are implemented by FPOs and forest contractors who are familiar with the requirements of the FPC and are technically capable.

With administrative changes to the *Forest Practices Act 1985*, discussed later, there is the capacity for the FPA to accurately report on forest restoration being undertaken throughout the state. Further, the FPA in consultation with FPOs, forest companies and other individuals and organisations involved in forest restoration could consider developing a set of standards and technical guidelines for forest restoration, which could be incorporated into the next FPC review.

The capacity for the FPA to report on forest restoration in the FPA annual report, which is tabled in Parliament, and provide technical advice to FPOs on forest restoration should, in the future, be of value to the Tasmanian forest practices system. This is in contrast with my experience working on forest restoration in Victoria where there was no 'one stop shop' regulator and information on forest restoration was held internally by those organisations directly involved. Consequently, information was not available to the public nor was it easily summarised into State of the Forests reports. Further, companies were working in isolation with few inter-organisational links to set standards, provide advice or disseminate information.

## 4 Organisations visited

Organisation	Context
Australian Research Council, Centre for Forest Value, Hobart	Research and funding options.
Forest Practices Authority, Hobart	Regulation and information on research undertaken by the FPA on Timberlands Pacific forest restoration projects. Provided information to FPA on Norske Skog projects.
Forest Practices Officers	Several forest practices officers with expertise in forest restoration.
Forico Pty Ltd, Launceston	Information and field inspections at Armistead and Four Springs properties. Forest restoration program, including targeted forest restoration of threatened species habitat and Aboriginal cultural heritage sites.
Greening Australia, Hobart	Information and field inspection at multiple properties surrounding Ross, in the northern Midlands. Large scale forest restoration for biodiversity and improved connectivity in the agricultural environment. Technically challenging environment. Strong research and community education element.
Landcare Tasmania	Options for potential funding and promotion of works.
Norske Skog, Boyer	Field inspection of twelve sites as part of an internal review of forest restoration works completed by Norske Skog from 2010 - 2015.
North East Bioregional Network, St Marys	Information and field inspection at Skyline Tier, Scamander. Large scale catchment level forest restoration with substantial community input.
Private Forests Tasmania, Hobart	Information on forest restoration projects on independent private property.
Sustainable Timber Tasmania, Hobart	Field inspection on multiple sites as part of the Norske Skog internal review of forest restoration works. Information on future works.
Tasmanian Conservation Trust, Hobart	Provided information on forest restoration projects, specifically Norske Skog's work. Sought feedback on projects in general.
Timberlands Pacific Pty Ltd, Launceston	Information and field inspections at Branchs Creek and Badger Hills Forest blocks. Long-established, varied and large-scale forest restoration program, providing an invaluable benchmark.

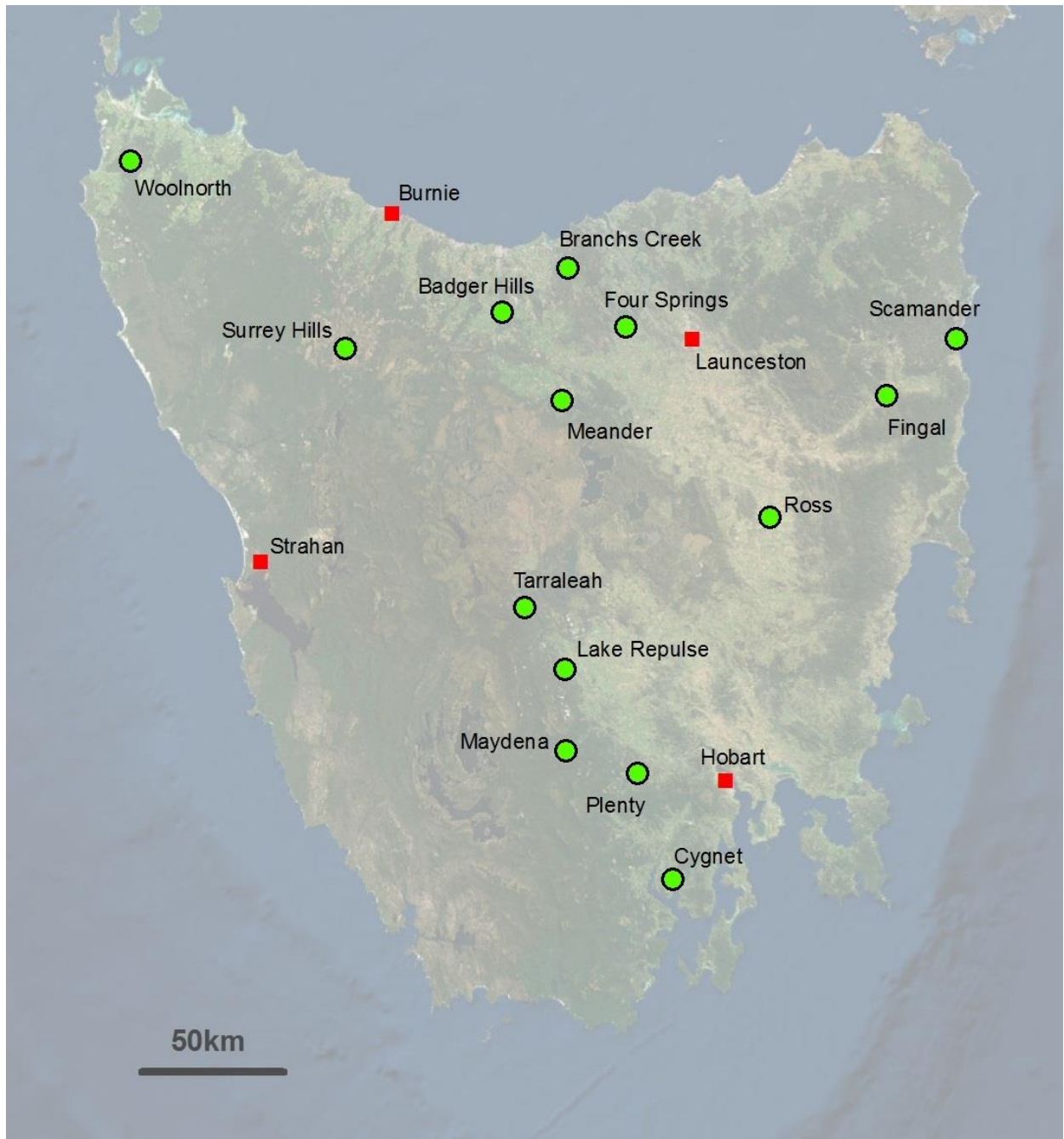


Figure 3 – Location of sites mentioned in the report.

## 5 Forest restoration

### 5.1 Why carry out forest restoration?

The motives for forest restoration can broadly be summarised as (i) financial (ii) environmental gain (iii) requirements under the FPC and (iv) forest certification.

#### *Financial considerations for plantation managers*

The plantation estate in Tasmania covers approximately 310,000 ha. There are 234,000 ha of eucalypt plantations, predominately Shining Gum *Eucalyptus nitens* (208,000 ha) and Blue Gum *E. globulus* (19,000) and 76,000 ha of *P. radiata* (ABARES 2017). The eucalypt plantations were established mainly for pulpwood, typically on a 12-15 year rotation length, except for the STT resource which was established for sawlog production on a 25-30 year rotation. The *P. radiata* plantations were established for longer rotation sawlog production, typically 25-30 years.

The eucalypt plantations were established very rapidly following the Regional Forest Agreement in 1997. In 1996 there were 73,600 ha of eucalypt plantation (FPB 2002) which increased to 233,200 ha by 2012, with the bulk of the increase by 2008 (FPA 2012). The eucalypt estate was established on cleared agricultural land and on harvested native forest sites that were subsequently cleared and converted. On both ex-agricultural and ex-native forest land plantations were established on sites where they have performed poorly and subsequently delivered poor financial return. As the eucalypt plantation estate reaches maturity and is harvested, or non-commercially cleared, it is highly probable that there will be a rationalisation of this estate based on financial realities. The poor sites on ex-agricultural land will be returned to pasture, as is already occurring, and are unlikely to contribute any areas toward forest restoration. On ex-native forest sites that are performing poorly, or on sites where harvest and ongoing management is costly or difficult e.g. steep slopes and isolated plantations, these are likely to be considered for *P. radiata*, forest restoration or a combination of both.

As is the case with the eucalypt plantation estate there are areas of the *P. radiata* estate where there was an overreach in terms of site productivity and in some instances pre-Code establishment. In the past decade, these sites have been targeted for forest restoration.

#### *Environmental gain*

Targeted and effective forest restoration has the potential to deliver environmental gain within the plantation estate, and in the agricultural environment at a range of scales.

In terms of native forest cover, reservation, forest planning and management the plantation estate in Tasmania is in good shape. For example, Forico manages an estate of 180,000 hectares of which nearly half is non-plantation and includes substantial reserves which are actively managed for conservation (Forico 2016). Nonetheless there is still a need for targeted forest restoration at a range of different scales. Where this has occurred in large contiguous areas it is likely that there has been a substantial positive effect on biodiversity; restoration of riparian zones is also likely to have improved soil and water outcomes and habitat for in-stream and riparian biota. In the long-term it is likely that there will be recruitment of important habitat features such as mature trees and an increase in coarse woody debris relative to current levels across the plantation estate.

This review found there are projects underway to target forest restoration in specific locations to restore and enhance threatened species habitat, including Wedge-tailed eagle *Aquila audax* nest buffers and riparian restoration for Giant freshwater crayfish *Astacopsis gouldi* habitat. These projects have the potential to deliver significant environmental gain with relatively small reductions in plantation area and should attract broad community support.



Figure 4 – Giant freshwater crayfish *A. gouldi*, a threatened species endemic to Tasmania, and found across northern river systems (Photo T. Walsh).

The potential for environmental gain from forest restoration within the agricultural landscape is obvious, and includes arresting accelerated rates of erosion, filtering run-off and improving wildlife habitat. Agricultural landscapes in Tasmania have the greatest rates of deforestation, have low levels of reservation (SOF 2012), and generally there is less capacity for management of natural and cultural heritage values. Greening Australia (GA) are undertaking forest restoration works in the agricultural environment and there is a tremendous opportunity to deliver environmental gain. At a smaller scale, Private Forests Tasmania (PFT) are also working in the agricultural environment and as with GA there is tremendous opportunity to deliver environmental gain.



Figure 5 – Degraded stream, Cygnet 2007 (PFT).



Figure 6 – Same stream as above, 2013 (PFT). (Photos R. Smith)

#### *Requirements under the Forest Practices Code*

There is no legal requirement in the FPC mandating forest restoration and as such forest companies are currently going above and beyond the legal requirements. Forest companies are pursuing 'best practice' and this demonstrates a high degree of professionalism in respect to land management.

While forest restoration is not mandatory under the FPC, the FPC does influence forest restoration. Under 'E 1.2.2 Plantation Development' the FPC sets out requirements in relation to the retention of existing native forest streamside reserves, conservation of riparian values, establishment of native vegetation and constraints on harvesting (FPA 2015).

In terms of forest restoration there is some debate regarding the merit of the constraints placed on future harvesting adjoining riparian zones, which prohibits harvesting within class 1, 2 and 3 native forest streamside reserves and 0-10m on class 1, 2 and 3 streamside reserves in plantations established post 2000. This constraint acts as a disincentive for forest restoration and/or plantation establishment adjoining riparian zones, particularly for PFT-style projects.

Apart from the FPC the key regulatory document is that known as the class 4 guidelines (FPA 2004). These are sensible and place the onus on FPOs to assess future management of class 4 streams, including the need or otherwise for forest restoration, based on identified physical features relating to environmental risk. The guidelines act as a support for implementing the FPC but are not legally binding. Future FPC reviews could look at including the class 4 guidelines into the FPC to give them legal status.

#### *Forest Certification*

All plantation companies operating in Tasmania are certified to either the Australian Forestry Standard and/or Forest Stewardship Council. Forest restoration is recognised under both standards across multiple principles and criteria, including soil and water, high conservation values (HCV) and stakeholder engagement.



Targeted and effective forest restoration is a clear winner for plantation companies. It demonstrates responsible forest management, projects go well beyond legal requirements, and restoration projects have the capacity to bring together a range of interests across industry, research and environmental advocacy groups.

## **5.2 Scale**

Organisations involved in forest restoration in Tasmania include the private forest management companies Forico and Timberlands Pacific (TPPL) and private forest company Norske Skog (NS), the Government Business Enterprise Sustainable Timber Tasmania (STT), non-government organisation Greening Australia (GA), environmental organisation the North East Bioregional Network (NEBN), and multiple private property landowners assisted by the government supported Private Forests Tasmania (PFT).

The scale of forest restoration being carried out in Tasmania is impressive and has increased from a base of virtually zero hectares in the early-2000s to an annual program of more than 400+ hectares per year over the past decade. Between 2005 and 2016 an estimated 4,250 ha has undergone forest restoration works. Based on the information gathered as part of this review, it is likely that over the next 5-10+ years there will be approximately 8,700 ha targeted for forest restoration. Forest restoration is set to become an increasingly visible part of forest management in Tasmania

Collecting data on forest restoration was not straight forward, and was only able to be collated by asking forest managers for their figures. How this data might be collected in the future is outlined in the discussion.

## **5.3 Methods**

The method used for forest restoration can be considered in two parts, site selection and silvicultural treatments.

### **5.3.1 Site selection**

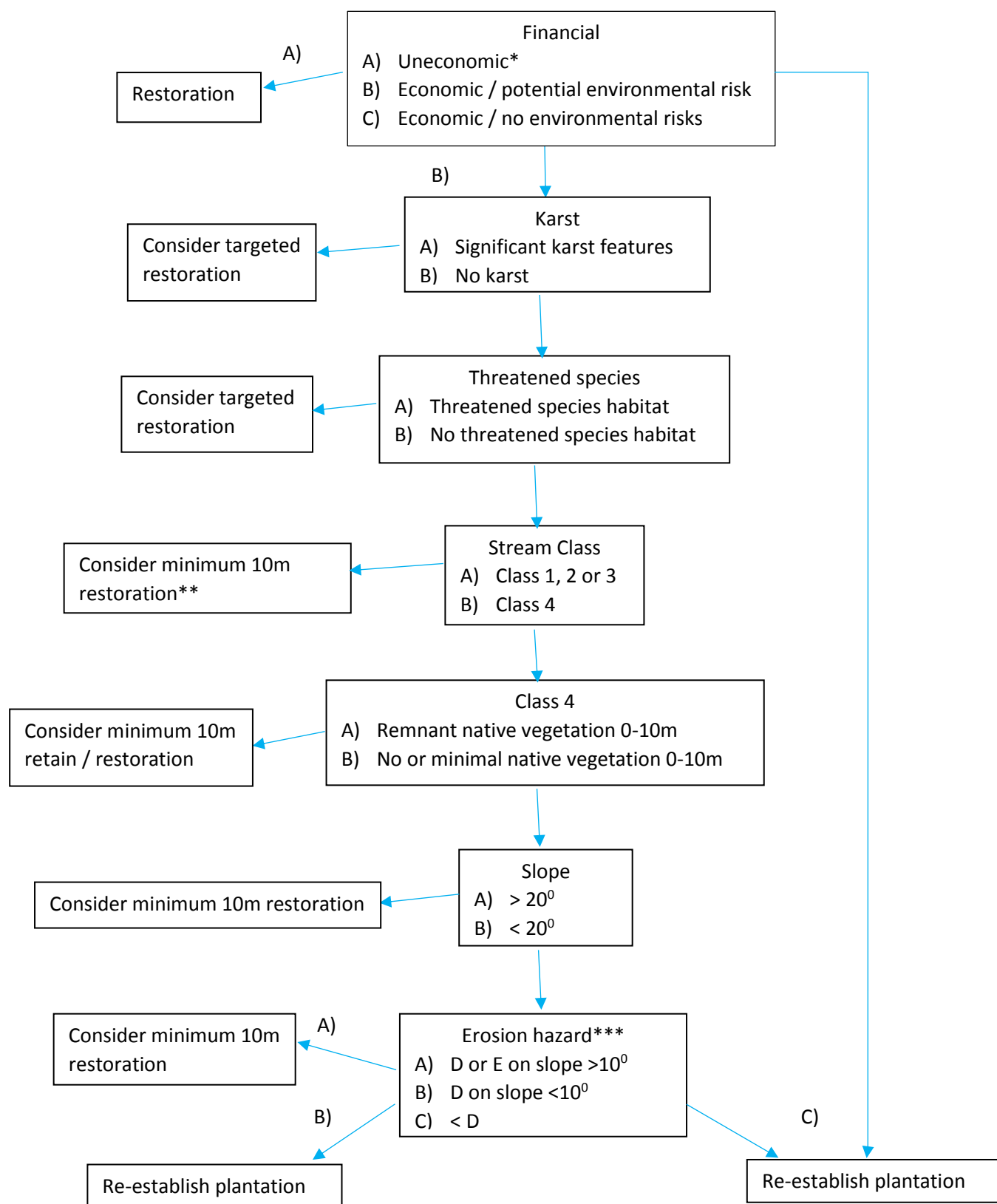
Site selection for GA is entirely within the agricultural environment. Specifically the northern Midlands where forest loss has been greatest and a disproportionate number of threatened forest and non-forest communities are present. The sites are identified to capture biodiversity values and improve connectivity.

Plantation companies are rationalising their estate based on an assessment of site productivity, and associated financial returns, environmental values, FPC and forest certification requirements.

The following flowchart is an example of the broad approach plantation companies are taking in assessing areas for forest restoration. It represents a potential guide for forest companies, noting that forest restoration is not a mandatory requirement.

In assessing the need for forest restoration FPOs should in the first instance prioritise the re-establishment of plantation, unless the site is of very low productivity or there is substantial environmental gain to be achieved via forest restoration i.e. forest restoration is targeted.

## A guide for plantation companies assessing the need for forest restoration



\* Where species is currently *E. nitens* or *E. globulus* consider establishing *P. radiata*. \*\* Where appropriate consider a wider buffer on class 1 and 2 streams. \*\*\* Defined in Class 4 guidelines (FPA 2004).



### 5.3.2 Silvicultural techniques

There are a wide range of silvicultural techniques used to achieve forest restoration and in most instances a combination of techniques is required, as summarized below.

#### *Retention of native vegetation*

Remnant vegetation is retained, as this is generally required by legal, FPC, or non-legal instruments such as company policy and forest certification.

Additionally, native trees within the plantation coupe that are effectively 'arisings' are identified and where warranted, safe and practical these areas are retained. Arisings refer to trees that are the same age as the plantation and have germinated and grown within the plantation operational area.

Prescriptions are included in the FPP to ensure the retention of native vegetation. This is achieved by directional felling, minimising or excluding machinery, and where fire is used by clearing harvest slash away from native vegetation. This is a low-cost and effective means of initiating and achieving forest restoration.

Note plantation managers should not be retaining individual trees or clumps of arisings within the plantation operational area where there is no environmental imperative and the future management is to restock the area with plantation. Nor should the arisings be retained where they pose a safety risk.



Figure 7 – Retained Black gum *E. ovata* remnant adjoining a class 2 stream (middle ground) following harvesting of *P. radiata* plantation. This threatened forest community was protected via directional felling, exclusion of machinery and fire management. Plenty 2017 (NS).



Figure 8 – ‘Arisings’ retained following harvesting of surrounding *P. radiata*. The area was targeted for forest restoration as it was a low productivity site and adjoins a class 3 stream. Plenty 2017 (NS).

#### *Unassisted natural regeneration*

Unassisted natural regeneration refers to regeneration in the absence of any burning, sowing or planting. Harvesting generally provides plenty of opportunity for scarification. Where there is existing remnant native vegetation and or ‘arising’ forest restoration can be achieved via unassisted natural regeneration. Typically, this will only occur where there is a high level of resilience i.e. sites with a high level of native species response potential. For example first rotation plantations on ex-native forest sites have much greater resilience compared to plantations on ex-pasture sites. The former have far greater seedbanks and typically there is surrounding native vegetation that can provide an ongoing seed source, providing a low-cost and effective means of initiating forest restoration. However, for it to be effective, it will require follow-up weed control.

Unassisted natural regeneration can also be achieved in the agricultural environment, among remnant native vegetation. For example, on GA sites (Figure 22) and within plantation sites, there was good natural regeneration, particularly where browsing is controlled and stock excluded.

#### *Scarification, burn and sow*

Harvesting followed by burning and sowing, typically aerial, of eucalypt seed is a long-established and highly effective means of achieving reforestation. The eucalypt seed used in sowing matches the species mix of the area and is in-zone i.e. locally sourced, in line with industry practice (Forestry Tasmania 2010).

This technique is widely practised by FPOs and is the most effective means of achieving forest restoration where the target area is large >10 ha in size, such as the NEBN-TPPL Scamander site. Where the treatment area is ex *P. radiata* fire is effective at reducing the seedbank and as such follow up weeding of pine seedlings is substantially reduced.





Figures 9 and 10 – Ex *P. radiata* site, scarification, burn and sow. Scamander 2007-2012 (NEBN-TPPL).  
(Photos T. Dudley).



### Planting

Planting is more widely used as a method of achieving forest restoration than I had anticipated prior to undertaking the review. It is generally used where there is low resilience in the environment, for example on farms, and where fire has not been used to initiate natural regeneration. For these reasons organisations like GA and PFT, working in the agricultural environment are using planting to achieve forest restoration.

GA are spot cultivating, spraying and planting into pasture sites, and using enhancement planting in remnant vegetation. The enhancement plantings are protected by large tree guards, as browsing by Fallow deer *Dama* and native species is severe. The technique of cultivate, spray and plant is identical to that used by plantation companies to establish plantations, however in the case of GA they schedule their operations to increase the lead time between cultivation and planting, in order to maximise the water holding capacity of the sites which typically have a mean annual rainfall of <500mm per annum.

Plantation companies, namely Forico and TPPL, are also using planting to achieve forest restoration. Planting is not occurring over large areas but rather to widen wildlife habitat corridors and to establish buffers in riparian zones. Guarding is also being used for protection against browsing. Forico pre-plant spray in some locations, typically ex-pasture sites, whilst TPPL do not do any pre-plant spraying as access into riparian zones is difficult.

Planting is a higher cost technique, than scarification, burn and sow, particularly when guarding is required.



Figure 11 – *E. obliqua* seedling as part of a mixed species planting within a streamside reserve. Fingal 2009 (TPPL).



Figure 12 – Mixed species planting including *E. ovata*, *E. pauciflora*, *E. amygdalina*, *E. viminalis*. Note the 1+ metre guards. Ross 2017 (GA).

I inspected plantings, between 5-10 years old, within riparian zones of class 4 streams in *P. radiata* plantations. Only a few sites were inspected, however there may need to be a re-assessment of the value or method of planting in some class 4 streams, as in some instances there appeared to be minimal environmental gain, competition from adjoining plantations is intense and ongoing management of *P. radiata* wildlings is costly. Further safety and windthrow could be an issue in the future. It is likely that forest restoration adjoining class 4 streams will need to be dealt with on a case by case basis and this is outlined in the discussion.



Figure 13 – Eucalypt plantings buffering a class 4 stream, 10 metres either side, within *P. radiata* plantation, Badger Hills 2017 (TPPL).

#### *Direct seeding*

This method involves spraying, cultivation and then seeding. The seeding machine is towed behind a quad bike, vehicle or tractor. This method was not observed during the review however. However, PFT have carried out small scale direct seeding projects. This method may have application on farms such as those on which GA are working, but is unlikely to have wider application in plantation environments where slash and the rugged terrain would be an impediment.

#### *Weed control*

Weed control is a massive challenge, particularly the control of *P. radiata* wildlings and the persistent nature of weeds on farms.

Weed control encompasses a range of techniques; spraying, manual and mechanised weed control. The spraying encompasses ‘cut and paste’ spraying i.e. *P. radiata* wildlings are cut and then herbicide applied to cut stumps, spot spraying and to a limited extent broadcast spraying. Manual



weed control includes hand pulling of small *P. radiata* seedlings, use of hand saws, loppers, brush-cutters and chainsaws, and in limited circumstances, machinery harvest of isolated large trees. Weed control is labour intensive, slow and expensive, but in many instances a mandatory requirement to achieve forest restoration.



Figures 14 and 15 – Ex *P. radiata* site, showing before and after photos of weeding within an extended class 4 stream reserve at Four Springs 2015 (Forico). (Photos A. Crook).

### *Browsing control*

Effective browsing control is critical for the success of forest restoration projects. The method of control is shooting.

Forest companies are sensibly synchronising forest restoration works with the establishment of the plantations to gain the maximum benefit from their respective shooting programs. GA is not inhibiting standard farm management practices, including shooting of game.

The review found that there was considerable concern about the impact of severe browsing by *D. dama* and there was a strong view that the populations had grown in recent years, possibly because of the reduction in 1080 usage (DPIPWE 2017). The organisations carrying out forest restoration were not advocating the use of 1080, but merely highlighting the increase in numbers and impact of deer. Forest restoration works will depend on effective shooting programs and the use of tree guards, although the latter come at considerably greater cost.

### *Fire*

Consideration is being given to using fire more extensively, specifically to control *P. radiata* wildlings in young native forest regrowth 10-15 years of age on sites that were previously low productivity *P. radiata* sites. Fire could also be introduced on farms to stimulate natural recruitment amongst remnant vegetation and to enhance habitat for threatened flora and fauna.

The wider application of fire will require skilled practitioners.



Figure 16 – Ex *P. radiata* site well stocked with eucalypts and understorey. Fire could be used to reduce *P. radiata* wildlings. Branches Creek 2017 (TPPL). (Photo D. Aruik).



## 5.4 Standards

Across all projects I found that there was considerable effort made to assess and document the reforestation standard achieved.

Typically, silvicultural treatments were prescribed in the FPPs or covered by standard operating procedures. The latter are becoming increasingly common feature in forest management processes, with the uptake of forest certification. The desired reforestation standard expressed as stems/ha of eucalypt seedlings 12-24 months after treatment and inevitable mortality are prescribed in FPPs. Eucalypt seedlings are a good surrogate for associated understorey species in ex-plantations sites where there is a high level of resilience; such as a seed bank of understorey of *Acacia* species and other woody shrubs. The sites were surveyed and mapped, and reported on as part of regular FPO compliance reporting. Overall in terms of technical assessment and reporting the process appears to be working well.

There is however a divergence in views as to what might be considered 'restored'. For example, do the *P. radiata* wildlings in Figures 16, 34 and 35 forfeit any claim that this area has been successfully restored back to native forest? Further should there be an area threshold that forest restoration projects must meet to be considered. For example, should small areas <1 ha be included in reporting on forest restoration?

These questions may be considered in a review of the FPC and are discussed in more detail in the discussion.



Figure 17 – Class 4 stream in 2<sup>nd</sup> rotation *P. radiata* plantation. Original vegetation would have included tall *E. regnans* forest. For practical and safety reasons, tall *E. regnans* forest would not be advisable in this location. The Manferns *Dicksonia antartica* are probably performing the function of sediment capture, mediation of stream temperature and peak flows. Is this restored and should it be included in figures reporting on forest restoration or is it 'rehabilitation'? Plenty 2016 (NS).



## 6 Company initiatives

### 6.1 Sustainable Timber Tasmania (formerly Forestry Tasmania)

Sustainable timber Tasmania (STT) is a Tasmanian Government Business Enterprise responsible under the *Forest Management Act 2013* for the management of approximately 812,000 ha of public production forest (Permanent Timber Production Zone Land (PTPZL)).

STT currently has ownership of and management responsibility for approximately 56,000 ha of hardwood plantation, predominately *E. nitens* (FT 2016). The hardwood plantation estate was established to make up for a shortfall in supply of high quality sawlog from the native forest estate, as large areas of native forest were set aside in reserves following the Regional Forest Agreement 1997 and a multitude of other reservation programs.

The hardwood plantation estate is young and as the rotation length required to meet commercial size is deemed to be 25-30+ years the estate will not come into production until 2025. As such there has been limited clearfell harvesting within this estate and minimal forest restoration. As discussed under *Financial considerations for plantation managers* it is likely that a portion of the eucalypt estate will be targeted for conversion to *P. radiata* plantation and/or forest restoration because a far greater commercial focus is likely to be placed on sites following harvest. Beyond financial considerations there are likely to be a number of areas targeted for environmental gain and those plantations that are within the expanded reserve system and/or isolated within what is otherwise contiguous native forest. For example, coupe Styx 13 located on Waterfall Creek Road in the Styx Valley, west of Plenty, is a 50 ha *E. nitens* plantation established in 2000. This coupe is in the Tasmanian Wilderness World Heritage Area, following the 2013 Tasmanian Forest Agreement, and is targeted for forest restoration.

STT has a long history of *P. radiata* plantation management, and approximately 54,000 ha have been established on PTPZL (FT 2016). Equity in this resource has been largely divested and is managed by external parties, namely NS and TPPL.

STT have considerable skills in fire and reforestation, and these have been utilised by NS, TPPL and NEBN-TPPL in their respective forest restoration work.

### 6.2 Forico

Forico is a forest management company established in 2014 and is responsible for the management of approximately 180,000 ha of land spread across Tasmania. The largest holdings are in the north-west of the state centred on the Surrey Hills and Woolnorth properties. The defined forest area consists of approximately 100,000 ha of plantation and 80,000 ha of native vegetation. The hardwood plantation, mainly consisting of *E. nitens*, makes up 96.5% of the plantation area with softwood *P. radiata* making up the balance (Forico 2016).

Forico's predecessors Gunns and North Forest Products had a long-history of conservation management of reserves, in particularly the native grassland reserves on Surrey Hills. Forico have committed to the ongoing management of their native vegetation estate. In conducting this review, it was evident that Forico have adopted a positive approach to forest restoration, having

completed several projects since 2014, with a total of 75 ha restored. To date the areas targeted have been riparian zones, and widening wildlife corridors and the enhancement of threatened species habitat following first rotation harvesting of plantations. The last mentioned has the potential of delivering substantial environmental gain for a relatively small investment in land area.

A range of silvicultural techniques have been used, specifically retention of native vegetation, unassisted natural regeneration, scarify, burn and sow, pre-plant spraying followed by planting, weeding and browsing control. Planting has been at a rate of 300 trees per ha. This is a lower planting density, compared to TPPL. Forico's planting sites are typically ex-pasture sites, they apply pre-plant spray, which improves survival, and are aiming for a lower stems/ha stocking rate. Forest restoration works are carried out in conjunction with re-establishment of adjoining plantations and benefit from the browsing control and pest and health inspections conducted by FPOs. Forico report on forest restoration to their parent company New Forests and in their annual report.

Forico have identified a range of sites where forest restoration will be considered including karst, landslip, threatened species habitat and Aboriginal cultural heritage sites. Approximately 100 ha per year will be targeted over the next five years. Forico have maintained research partnerships regarding the management of the grassland estate and are looking to build on these to encompass forest restoration works. Forico have not attracted external funding, but given the nature of some of these projects for example the restoration of threatened species habitat it is anticipated that these will attract funding, or at a least some partners, into the future.



Figure 18 – A slash burn prior to aerial sowing of seed to increase the size of the Wedge-tailed eagle *A. audax* nest reserve, shown in Figure 19. Meander 2017 (Forico). (Photo A. Crook).

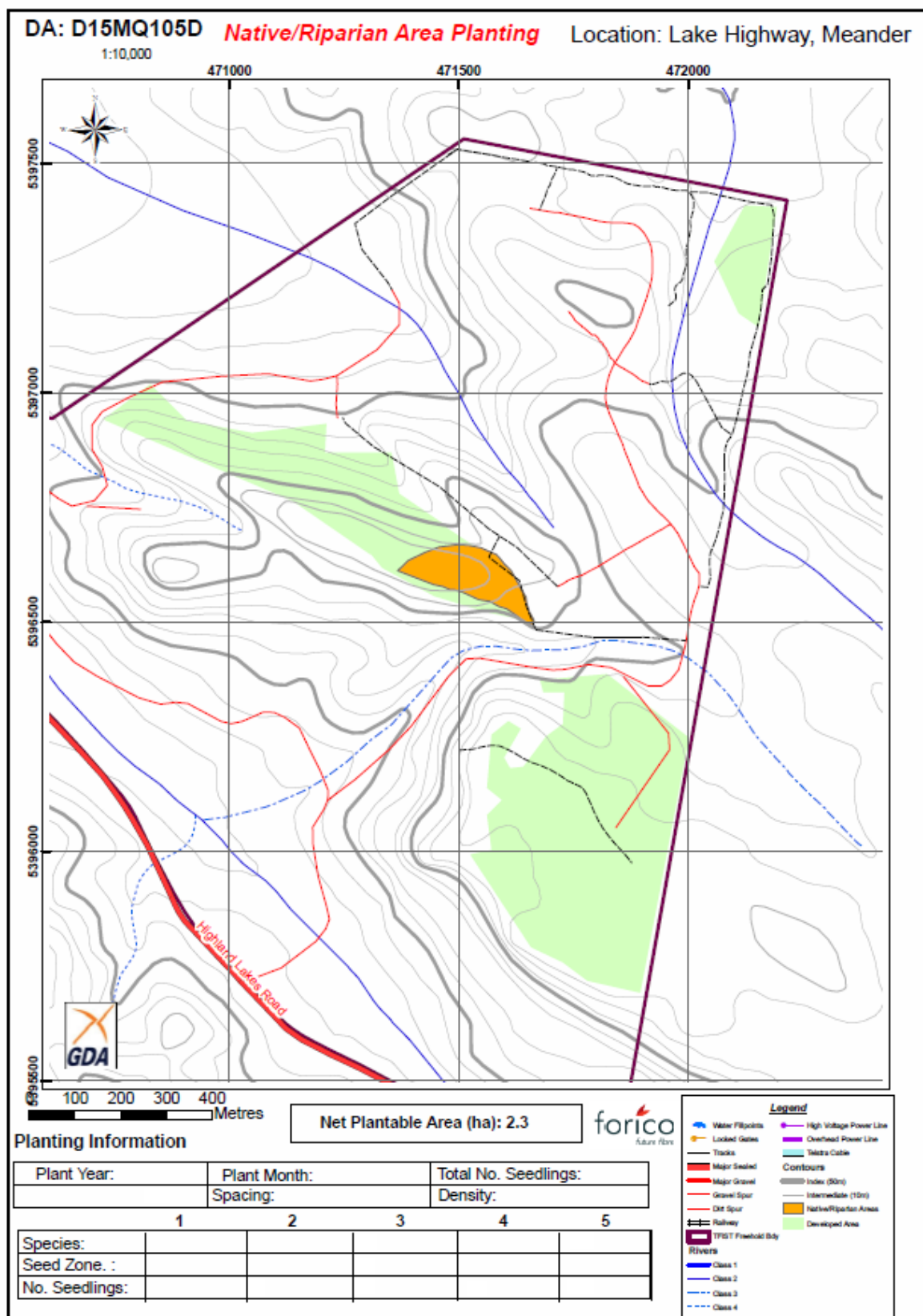


Figure 19 – Re-establishment of an *E. nitens* plantation site excludes approximately 2.5 ha (orange) to increase the buffer size on a Wedge-tailed eagle *A. audax* nest reserve. Apart from the environmental gain, projects of this nature should attract funding, and will be acknowledged under forest certification. Meander (Forico).

### 6.3 Greening Australia

Greening Australia (GA) is an independent not for profit organisation that operates Australia wide, with the goal of conserving and restoring landscapes. It was established in 1982 and has had a presence in Tasmania since 1983.

GA are undertaking an ambitious program of forest and woodland restoration in the northern Midlands. The northern Midlands, as is the case with the Midlands in general, has suffered a severe decline in forest and woodland as a consequence of deforestation to establish farmland, and has a disproportionate number of threatened forest and non-forest vegetation communities (FPA 2012).

GA have targeted the northern Midlands as this area is a priority for biodiversity conservation. The project seeks to improve connectivity by linking reserves, remnant vegetation and restored forest areas. The desired result being a series of landscape scale corridors and stepping stones to enable native plants and animals to cross the Midlands in response to climate change. The animals the project is focussing on are woodland birds and terrestrial mammals in the critical weight range (species of intermediate body mass between 35g and 5500g (Johnson and Isaac 2009)) including the Tasmanian bettong *Bettongia gaimardi*, Eastern barred bandicoot *Perameles gunnii*, Eastern quoll *Dasyurus viverrinus* and the Spotted-tailed quoll *D. maculatus*, and other threatened species such as the Tasmanian devil *Sarcophilus harrisii*.



Figure 20 – Tasmanian bettong *Bettongia gaimardi*, Eastern barred bandicoot *Perameles gunnii*, Eastern quoll *Dasyurus viverrinus* and Spotted-tailed quoll *D. maculatus*. These are all species which will benefit from forest restoration in the northern Midlands. (Photos DPIPWE).



CONNECTIVITY PROVIDED BY THE ROSS CORRIDOR

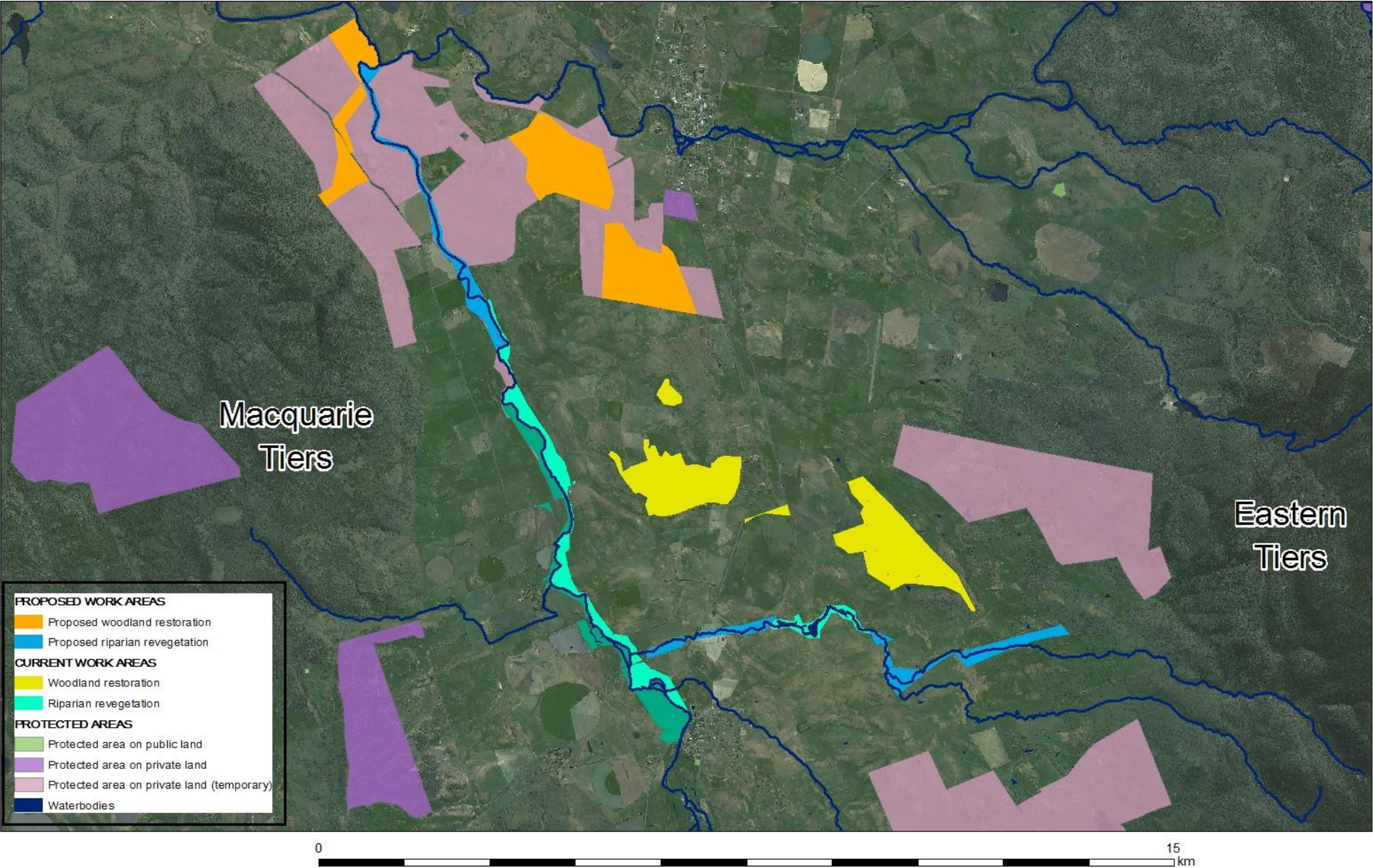


Figure 21 – Landscape scale forest restoration in the agricultural environment, targeting biodiversity and connectivity, northern Midlands (GA).



The project is well supported by researchers from the University of Tasmania (UTAS). Several PhD projects cover a range of topics, including the response of wildlife to forest restoration, the impact of Feral cats *Felis catus* on wildlife, and testing different species and provenance of trees to identify the most suitable, with an eye to changing climate.

The project has been, and continues to be, well marketed in the traditional news print media, on radio and on the GA website. There is also an active extension program that involves schools in the Midlands in the project. The research, marketing and education aspects set the GA project apart from the other projects that were reviewed, and these aspects could be incorporated into other forest restoration projects.

GA do not own the land they are working on but rather enter into a 100 year lease with private landholders, with the areas being registered on title as a conservation covenant. In total, approximately 1,300 ha of forest restoration has been undertaken in the northern Midlands over the past five years. Ex-pasture 'greenfield' sites make up approximately 1/3 of this area with the balance being enhancement planting within remnants.

Forest restoration in ex-pasture 'greenfield' sites (Figure 2) is particularly challenging given the low level of resilience in the environment, intense browsing and persistent weeds. Whilst this review only sampled a relatively small area it was evident that the timeframe to achieve forest restoration on ex-agricultural land will be substantially longer than on ex-plantation sites, possibly 20-30 years, and at a greater cost.

GA use the silvicultural technique of cultivate, spray and plant, often with tree guards and associated fencing, and the targeted areas are 'greenfield' pasture sites and enhancement planting within remnants. The technique of cultivate, spray and plant is the same as is commonly used in plantation forestry. The planting density varies between the two treatment areas with the initial planting density on 'greenfield' sites being around 400 stems per ha, whilst the enhancement planting within remnants ranges between 25-50 trees per ha. Unlike Forico and TPPL who manually plant i.e. shovel or pottiputki plant seedlings, GA use an excavator to spot cultivate the sites, including within remnants prior to planting. The use of machinery, particularly in remnants where there is a lower density of planting means the per ha cost is substantially higher, but given the scale of the plantings and the hostile environment, in these dry 'greenfield' sites it is likely the only feasible option. GA have indicated that they are planning to trial direct seeding technique. Direct seeding has been used successfully on GA projects in low rainfall areas in Western Australia and its application in the Midlands will be keenly watched as it could potentially reduce costs. Consideration is also being given to the wider application of fire as part of the forest restoration works.

In terms of funding GA have received around six million dollars for the northern Midlands project, and are actively pursuing additional funding to maintain the project and expand the works. The funding has come via Government grants, namely the 'Biodiversity Fund', which were won on open tender. Funding has also been received via philanthropic donors.

GA aim to restore 5,000 ha over the next five years. The sites include 'greenfield' sites and the enhancement of remnants.



Figure 22 – Enhancement planting within remnant vegetation, Ross 2017 (GA).



Figure 23 – Healthy remnant which forms part of the Midlands corridor. Stock exclusion is enabling unassisted natural regeneration, Ross 2017 (GA).

#### 6.4 Norske Skog

Norske Skog (NS) is a private forest company which manages a defined forest area of approximately 27,000 ha, including freehold land, PTPZL and joint ventures. The plantation estate totals 20,000 ha which is dominated by *P. radiata* of which there is 19,500 ha, with the balance being *E. nitens* plantation. The estate is virtually all in the south east of the state, with the largest area centred on the Plenty Valley west of Hobart.



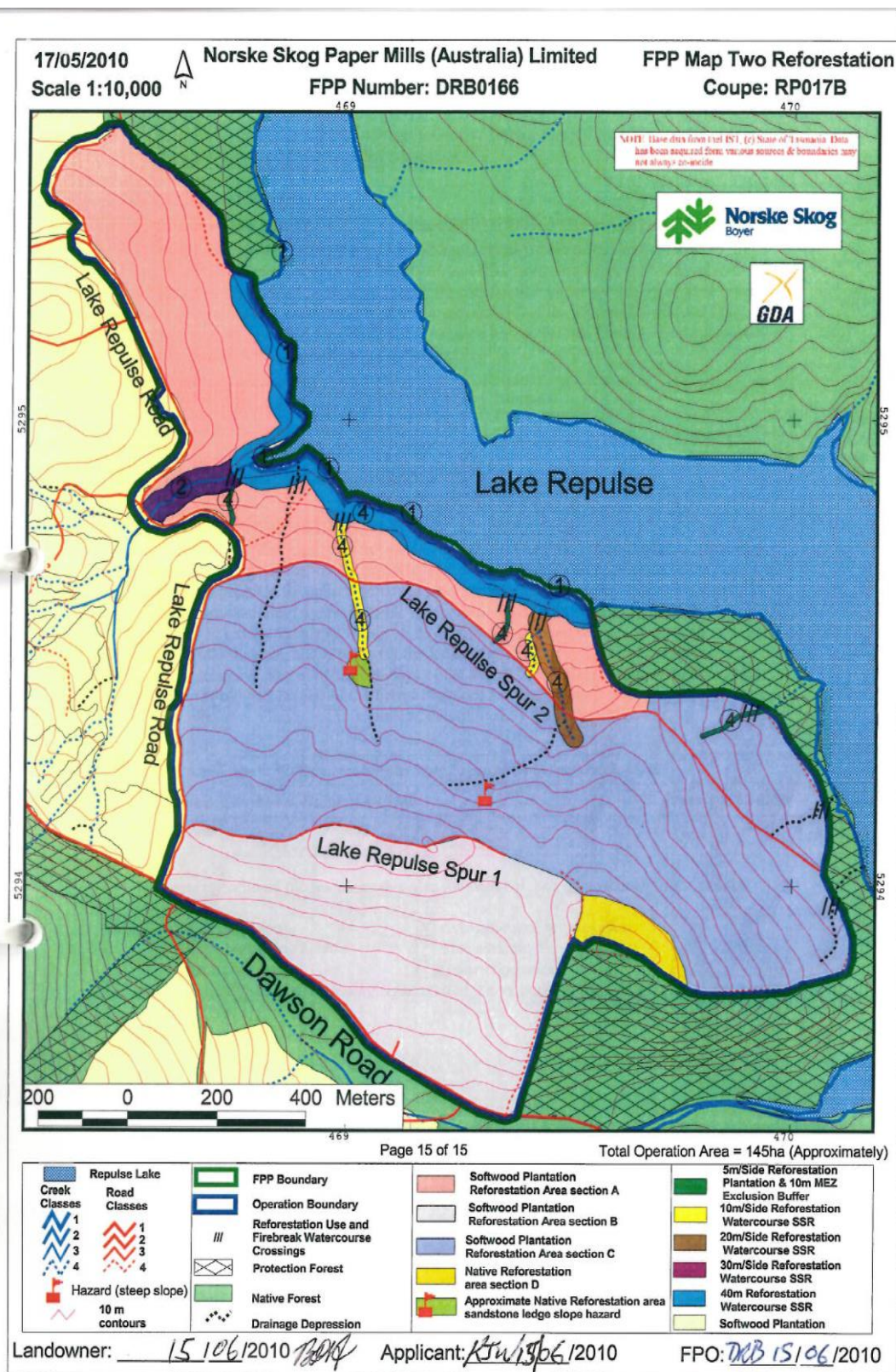


Figure 24 – Targeted forest restoration of pre-Code *P. radiata* plantation, resulting in a 40 m buffer on Lake Repulse (blue) (See Figure 1), 30m/side buffer on the class 2 (maroon) and buffers on the class 4 streams, varying from 10m-20m/side (yellow and brown). Machinery exclusion zone placed on the remaining class 4 streams. The buffer widths reflect the environmental risk.



In recent years NS have carried out forest restoration works on second rotation sites for a variety of reasons, including areas that have proven to be low productivity plantation sites, riparian zones and for aesthetic values. NS have also identified sites that target the restoration of threatened species habitat, including a Tasmanian devil *S. harrisii* maternal den site located in a mature *P. radiata* plantation, the enlargement of two Wedge-tailed eagle *A. audax* nest reserves and important karst sites located in the Florentine Valley. Over the past decade approximately 200 ha of plantation has been restored to native forest. The sites have been visited by environmental advocacy groups and forest certification auditors, and the works have been well received.



Figure 25 – Tasmanian devil *S. harrisii* maternal den site located in a mature *P. radiata* plantation. The site has been monitored for several years by the FPA and NS, and is targeted for forest restoration. Forest restoration will remove the potential for disturbance from future harvests. Maydena 2012 (NS).

NS use a range of silvicultural techniques including retention of remnant vegetation, unassisted regeneration, scarify, burn and sow, weeding and browsing control. The technical capacity to complete projects exists; however the scale and quality of the work has been constrained by the absence of any external funding. Opportunities for funding potentially exist with Natural Resource Management (NRM) South and the Derwent River Estuary Program, which are both active in the Derwent River Catchment.

NS is committed to a continuation of targeted forest restoration works and it is estimated that approximately 200 ha will be restored in the next five years.

### 6.5 North East Bioregional Network

The North East Bioregional Network (NEBN) is a non-government community based environmental group which has carried out substantial forest restoration work. The work has been undertaken on one site, Skyline Tier at Scamander. The land is PTPZL, but comes under TPPL management and is within their defined forest area.

The Scamander plantation was established in the late 1960–70s. The plantation block of approximately 1,800 ha of *P. radiata* has low productivity and is isolated from other plantation assets. TPPL have contributed to forest restoration at Scamander by contracting STT to conduct post plantation harvest burns and eucalypt sowing, and have assisted NEBN in supporting their applications for external funding. NEBN has carried out the forest restoration with the consent and in consultation with TPPL, with a total area of 600 ha of forest restoration achieved in the past ten years.

Across the 600 ha there have been a range of silvicultural techniques. Scarify, burn and sow, burn and no sowing, no burning and no sowing. The variation in treatments reflects the varied history of the site, which has been subject to arson fires, wildfires, planned fires and the trialling of different treatments by TPPL as the manager to see which technique was the least costly. Trial results clearly indicate that high intensity burning is the most cost-effective technique as it substantially reduces the *P. radiata* seed bank. NEBN indicate that a no-burn treatment requires 3-4 times the weeding effort compared to burnt sites. However, what sets the Scamander forest restoration project apart from others reviewed is the scale and thoroughness of the follow up weeding.

Weeding could be described as the main silvicultural technique used and is almost exclusively done manually. The scale and quality of the works is impressive. Manual weed control covers hand pulling, hand sawing and lopping of *P. radiata* wildlings with application of herbicide to cut stumps where required.

Manual weed control is expensive. The project has received approximately one and half million dollars of funding, principally from Government programs namely the 'Biodiversity Fund', Landcare Grants and Work for the Dole programs. The Government funding was won on open tender. Apart from Government funding NEBN have received funding from TPPL and philanthropic donors. Volunteers have also contributed to the success of the project.

The NEBN forest restoration has attracted wide interest and as with the GA project has been well marketed in the traditional news print media, on radio and on NEBN, Wilderness Society and Environment Tasmania websites. NEBN ran a symposium on forest restoration in Tasmania in 2014 and have presented their work at the 2016 Australian Forest Growers conference in Tasmania, 2016 Society for Ecological Restoration conference in Hamilton, New Zealand and the 2017 Restore, Regenerate, Revegetate Ecological Society of Australia conference in Armidale, New South Wales. There have been a series of reports prepared by Bushways Environmental Services and Environment Tasmania on behalf of NEBN to document the project and assess the benefits (Bushways Environmental Services 2011, Environment Tasmania 2016).

Given the scale and longevity of the project it is surprising that it has not attracted research interests from UTAS or other institutions.

Future work in the Scamander area is subject to plans for the remaining plantation, but it is anticipated a further 500 hectares will be restored over the next five years.





Figures 26 and 27 – Intensive manual weeding is a feature of the NEBN-TPPL project. Herbicide is applied if green shoots remain on cut stumps. Scamander 2013 (NEBN-TPPL). (Photos T. Dudley).





Figure 28 and 29 – Scarify, burn and sow followed by intensive manual weed control delivering high quality catchment level forest restoration, Scamander 2009 and 2013 (NEBN-TPPL). (Photos T. Dudley).



## 6.6 Private Forests Tasmania

PFT was established in 1994 as a statutory authority under the *Private Forests Act 1994* to promote and assist the private forest sector (Private Forests Act 1994). PFT is the only government funded authority established in Australia to specifically promote, foster and assist the private forestry sector.

Of the organisations reviewed PFT have had the least involvement in forest restoration, with approximately 50 ha the total land area restored; all of which is on farms. Of the two organisations PFT and GA that are working on farms, only PFT promotes the potential financial gain from future harvesting of the timber resource.

There is some debate as to whether PFT's forest restoration qualifies as forest restoration, as it is small scale and there is a greater focus on the potential for timber production into the future. The projects reviewed were not agro-forestry style projects, but rather unassisted regeneration and mixed species plantings, using manual and machinery cultivation techniques, typically in riparian zones. While it is not on the scale of other projects and the areas carry many weeds I would still consider it as forest restoration. The reason is that there has been a change in land-use and the sites are moving toward the mix of species, with the structure and function of the native vegetation in the area. PFT projects have been well supported by the CSIRO who have established research sites to monitor changes in sedimentation, peak flows and water temperature in response to forest restoration in riparian zones.

As outlined in *Requirements under the Forest Practices Code* there will need to be changes to the FPC for the full potential of PFT projects to be realised, as without the financial reward from a future harvest there is a disincentive to plant. For further information on reforestation in riparian zones see Gottstein Trust report (Smethurst 2004) and the Institute of Foresters of Australia / Australian Forest Growers article by Rowan Reid (Reid 2017). Both make a strong case for growing trees next to streams.





Figures 30 and 31 – Planting and unassisted regeneration adjoining a class 4 stream. Cygnet 2007 and 2012 (PFT). (Photos R. Smith).

### 6.7 Timberlands Pacific

Timberlands Pacific Pty. Ltd. (TPPL) is a forest management company which manages approximately 48,000 hectares *P. radiata* plantation on State forest (PTPZL) across northern Tasmania, with most of the estate being in the north-east. The Tasmanian estate is owned by The Trust Company (Australia) Limited ATF ANZFOF, a forestry investment fund, which is managed by New Forests Asset Management Pty. Ltd.

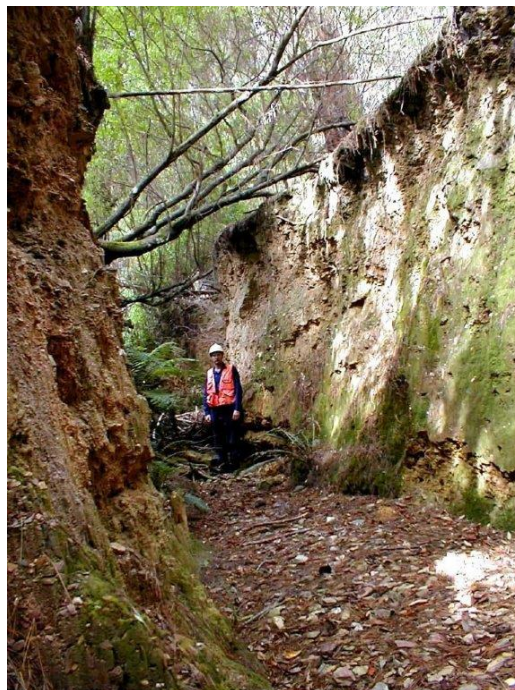


Figure 32 – Severe erosion resulting from pre-Code forest practices, sic late 1960s. Class 4 stream, Fingal 2006 (TPPL). (Photo P. McIntosh).



Most of the estate was established in the 1960s and 1970s, prior to the introduction of the FPC. In some areas, the native forests were cleared from hill top to stream bed, in line with the standards of the day and established in large even aged contiguous blocks. Steep slopes, minimal thinning and the high intensity rainfall, sometimes exceeding 100 mm in 24 hours from east coast lows, created significant problems after first rotation harvesting commenced in the early 2000s. Initial harvest planning attempted to deliver coupe dispersal, however there was substantial windthrow. This meant that large areas e.g. catchment of 250 ha, were opened up over a short period of time and there were impacts on soil and water values.



Figure 33 – Clearfall cable coupe showing a class 2 stream targeted for forest restoration. Note buffer is unsprayed. The photo illustrates the scale and intensity of the initial clearing, Fingal 2009 (TPPL).

TPPL have committed considerable time and money towards forest restoration projects, and have had dedicated and highly capable staff carrying out the works (FPA 2008). TPPL have been well supported by the FPA, with significant input on the management of soil and water values and research. The scale and quality of the works is impressive with approximately 2,500 ha of plantation restored to native forest across multiple sites. The breakdown of the 2,500 ha is approximately 80% seeded eucalypt forest and 20% planted riparian zones. TPPL report on forest restoration in their annual measuring and monitoring summary and the works have been well received by forest certification bodies.





Figures 34 and 35 – Ex *P. radiata* site, scarified, burnt and sown in 2007. The site is now well stocked with eucalypt and supports a diverse understorey, Branchs Creek 2017 (TPPL).





Figures 36 and 37 – High quality forest restoration of a class 2 stream. Fingal 2005 and 2009 (TPPL).  
(Photos C. Ringk).



The areas targeted for forest restoration are sites with very low site productivity, steep country, and riparian zones or of high visual landscape value. TPPL have indicated that over the next 15 years an area of approximately 3,000 ha will be restored. The areas include sites in the South Esk catchment which is a priority area for Natural Resource Management (NRM) North.

TPPL uses a range of silvicultural techniques. For broad-scale coupe level forest restoration scarify, burn and sow is used, whilst for riparian zones it is a combination of retention of remnant vegetation, unassisted natural regeneration, planting and follow up manual weed control using brush-cutters and application of herbicide on cut stumps. Planting is at 600-800 stems/ha.



Figure 38 – Manual weed control and herbicide application, adjoining riparian zone. NRM North have contributed toward funding, as part of the Upper Esk program. Fingal 2009 (TPPL). (Photo C. Ringk).

TPPL are considering using low intensity burns as a means of controlling *P. radiata* wildings in the large contiguous areas once the native forest regrowth reaches 10-15 years age. Should TPPL proceed with this approach it will be keenly watched by other forest managers as it would provide for a lower cost alternative to the labour-intensive manual weed control. However, the use of fire as a means of controlling *P. radiata* wildlings within the riparian zone is not practical nor desirable from soil and water management perspective. Manual weed control is the only option.

TPPL have been innovative in their approach to forest restoration. At a forest estate level, they have identified strategic areas where they have carried out forest restoration for the dual purpose of increasing connectivity and providing a windbreak to reduce the likelihood of windthrow in subsequent harvests. This approach in time will result in a mosaic of land-use and plantation age-classes, which should assist in mitigating soil and water impacts in subsequent harvests. At a coupe level, TPPL have trialled cutting higher stumps adjoining riparian zones to reduce the amount of harvest debris entering streams and trialled in-stream gabions. The latter delivering mixed success.

Debris build-up in streams can result in large dams that subsequently break and cause severe localised in stream erosion. To counter this, in 2011, TPPL trialled the placement of gabions using an excavator in order to trap the debris and enable the debris to be removed from the streams. The project was part funded by NRM North, Tamar Estuary and Esk River (TEER) Program (NRM 2012). The gabions were placed in a location where follow up access was possible and will stay in place until the streamside reserve is re-established and the stream channel stabilised. However, some gabions shifted during high stream flows and others were vandalised.



Figure 39 – Large debris dams following harvest, Fingal 2004 (TPPL). (Photo P. McIntosh).



Figure 40 – Gabions and high stumps, left side of stream. Fingal 2011 (TPPL). (Photo C. Ringk).

The scale and longevity of the forest restoration projects makes them an excellent reference point and TPPL have run several field days in conjunction with the FPA to transfer their knowledge to other plantation managers. These field days have been well attended by FPOs and representatives from NRM.

Given TPPL proven track record, the long-term association with the FPA in advisory and research, and an estimated 3,000 ha targeted for forest restoration the organisation is well placed to attract additional funding and partnerships into the future.

## A summary of the projects

Organisations	Sustainable Timber Tasmania (STT)	Forico	Greening Australia (GA)	Norske Skog (NSPM)	North East Bioregional Network (NEBN)	Private Forests Tasmania (PFT)	Timberlands Pacific (TPPL)
<i>Technical</i>							
When did the organisation commence forest restoration work?	10+ years	1-5 years	10+ years	6-10 years	10+ years	10+ years	10+ years
What areas are targeted <sup>1</sup> for forest restoration?	Non-commercial plantation and riparian zones	Non-commercial plantation, riparian zones and threatened species	Deforested agricultural land and associated remnant vegetation	Non-commercial plantation and riparian zones	Non-commercial plantation	Riparian zones	Non-commercial plantation and riparian zones
What are the main silvicultural treatments <sup>2</sup> used?	Retain remnant vegetation Unassisted regeneration Scarify, burn and sow	Retain remnant vegetation Unassisted regeneration Scarify, burn and sow Spray and plant Weed control	Cultivate, spray and plant	Retain remnant vegetation Unassisted regeneration Scarify, burn and sow Weed control	Intensive manual weed control	Cultivate, spray and plant Direct seeding	Retain remnant vegetation Unassisted regeneration Scarify, burn and sow Planting Weed control
How large in hectares are the individual treated sites?	0.5 – 10+	0.5 – 50+	10 – 250+	0.5 – 10+	300+	0.5 – 10+	0.5 – 300+
Approximate area in hectares treated in 2016?	-	75	420	40	100	10	100
Total area in hectares treated 2005-2016?	Figures unavailable <sup>3</sup>	Ex-Gunns management <200	1,300	200	600	50	2,500 <sup>4</sup>
Estimate <sup>5</sup> of the total additional forest restoration works over the next 5 years	-	500	5,000	200	500	-	3,000 <sup>6</sup>
<i>Regulatory</i>							
What are the regulatory requirements?	Forest Practices Plan	Forest Practices Plan	Forest Practices Plan	Forest Practices Plan	No regulatory oversight on manual weed control	Forest Practices Plan <sup>7</sup>	Forest Practices Plan
Should the regulatory requirements be modified <sup>8</sup> ?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Should restored areas be available for future harvest?	Yes, assessed on a case by case approach	No	No	Yes, assessed on a case by case approach	No	Yes	Yes, assessed on a case by case approach
<i>Social science</i>							
Have forest restoration works been promoted via media, field days, conferences and community groups?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Research and publications</i>							
Has the forest restoration work been published in journals?	No	No	No	No	No	No	No
Has the organisation partnered with research organisations?	No	No	Yes, University of Tasmania	Yes, Forest Practices Authority	No	Yes, CSIRO	Yes, Forest Practices Authority
<i>Funding and costs</i>							
Who funds the forest restoration work?	Organisation	Organisation	Public and substantial philanthropic donations	Organisation	Public and The Trust Company (Australia) Limited ATF ANZFOF <sup>9</sup>	Organisation	The Trust Company (Australia) Limited ATF ANZFOF, New Forests Asset Management Pty. Ltd. and public
Is there independent auditing of restoration works?	Yes, Forest Practices Authority via a forest practices plan	Yes, Forest Practices Authority via a forest practices plan	Yes, Forest Practices Authority via a forest practices plan	Yes, Forest Practices Authority via a forest practices plan	No auditing by FPA. NEBN have contracted Bushways Environmental Services to report on works.	Yes, Forest Practices Authority via a forest practices plan	Yes, Forest Practices Authority via a forest practices plan
What is the estimated costs per hectare?	<\$1,000 scarify, burn and sow	<\$1,000 scarify burn and sow <\$1,500 spray, plant and guard	\$2,500 - \$5,000+ cultivate, spray and plant	<\$1,000 scarify, burn and sow	\$2,500+ manual weed control	\$1,500 - \$2,500 cultivate, spray and plant, cost varies depending on size and topography	<\$1,000 scarify, burn and sow <\$2,000 plant and guard followed by manual weed control

1. For plantation companies the target for forest restoration works are non-commercial plantation and riparian zones. However, a range of other areas are treated e.g. NS restored *E. delegatensis* forest adjoining the Lyell Highway, Tarraleah for landscape purposes in conjunction with riparian protection.
2. Techniques listed are the main methods used, and other methods also employed e.g. NEBN have used harvest machinery to fell large isolated *P. radiata* within native forest areas and excavator scarification of landing sites.
3. STT *P. radiata* plantation estate managed by NS and TPPL. Restored areas listed under NS and TPPL. Limited harvesting in *E. nitens* and *E. globulus* plantations as these have not yet reached commercial size.
4. 600 hectares of the 2,500 ha is also listed under NEBN i.e. 600 ha double counted.
5. Open ended and dependent upon management decisions and funding. Has been included in the summary to highlight the scale of areas under consideration. Figures for STT and PFT to speculative to include.
6. 500 ha of the 3,000 ha is also listed under NEBN i.e. 500 ha is double counted. This 500 ha is work NEBN are doing under contract for TPPL. Note the 3,000 ha total listed under TPPL is estimated as a 15 year program.
7. Under the *Forest Practices Regulations 2017* up to 10 hectares of forest can be established without a forest practices plan, including land that is vulnerable land (See *Forest Practices Regulations 2017* for definition of vulnerable land). This exemption could be useful for independent private property landowners looking to minimise regulatory fees and charges. However, as discussed in Requirements under the Forest Practices Code the incentive for restoration is dulled by the lack of opportunity afforded to landowners for future harvest.
8. The FPP fee charged by the FPA for establishing native forest on pasture or native forest on ex-plantation is the same fee charged for pasture to plantation and plantation to plantation, currently \$24 per hectare. However, in the case of pasture to native forest restoration, such as that being undertaken by GA there may only be a couple of hundred trees established per ha (less for enhancement planting amongst remnants, 10s of trees per ha). As the FPP fee is charged by area this can be a substantial cost. For plantation companies, they are paying \$24 per ha to loss land and restore native forest on ex-plantation sites. The *Forest Practices Regulations 2017* need to be updated to include an 'Operation Type' and 'Fee' for forest restoration.
9. The Trust Company (Australia) Limited ATF ANZFOF. See 6.7 Timberlands Pacific.



## 7 Discussion

Forest restoration is occurring in Tasmania, with approximately 4,250 ha of forest restoration as of 2016, and planning of an additional 8,700 ha over the next 5-10+ years. While forest restoration is set to become an increasingly visible part of forest management in Tasmania it is worth re-iterating that forest restoration must remain targeted to those areas that warrant it, and that productive plantation ground is not lost.

The scale and quality of forest restoration work in Tasmania is impressive, and whilst I have had an interest in the subject for many years I was surprised by how much had occurred and the planning for future works. While the status quo is likely to continue to deliver positive results, it was evident that there would be value gained from a greater level of collaboration between organisations. There is a network to build on, with several projects already involving a wide range of organisations including the FPA, CSIRO, UTAS and NRM. A more co-ordinated approach including a wider field of individuals and organisations would provide a better opportunity to share expertise across technical, marketing and research disciplines. This could provide an opportunity to set forest restoration standards, improved silvicultural techniques, including the application of fire, conduct research across a wider range of sites and strengthen funding applications.

With respect to funding, plantation companies have struggled to attract financial support. This might be partly explained by the ad hoc nature in which potential projects come up i.e. projects are driven by harvest schedules which reflect the establishment history from 15-30 years ago. The random nature at which potential forest restoration projects come up, contrasts with the GA project that identified an area based on a specific need, and the project could be clearly defined. For an individual plantation company, they may have a site suitable for restoration such as the one shown in Figure 19 in one year, but not have a comparable project for several years. However, collectively there is likely a steady number of forest restoration projects of this nature across all plantation estates. Collectively plantation managers, STT, Forico, NS and TPPL could approach a potential funding source with multiple projects, for example to restore and enhance X number of Wedge-tailed eagle *A. audax* nest reserves over the next 10 years. This approach may have a greater impact and attract funding.

There was considerable divergence in opinions on what earned the tag of forest restoration, in terms of species, area, structure and function. While there will need to be some discussion, and consensus, on what constitutes forest restoration, I have not embraced the debate with the same level of enthusiasm as some of my peers. Interestingly one of the best examples of restoration in terms of environmental gain is shown in Figures 5 and 6. If one was to score environmental health Figure 5 starts at below zero, while the change evident in Figure 6 represents substantial environmental gain; and I remain optimistic about the *P. radiata* wildlings in Figures 16, 34 and 35. One must look at function and keep an eye on costs per hectare. Defining forest restoration, rehabilitation, revegetation, and mitigation could be a subject that is dealt with by a working group of FPOs, ecologists, environmental advocacy groups and regulators and this could then be used as a basis for informing the next FPC review. A useful reference might be the national standards for ecological restoration published by the Society for Ecological Restoration (McDonald 2016).

This review identified that the FPC will need to consider forest restoration in any future reviews. The FPC came into effect in 1987 and has undergone various reviews and updates in 1993, 2000 and

2015. The 2015 update resulted in an unchanged FPC, other than the addition of a 'Guiding policy for the operation of the Forest Practices Code'. As forest restoration was not occurring in Tasmania until the mid-2000s the current FPC contains few prescriptions governing forest restoration. Future reviews of the FPC will need to be flexible in prescribing the standards and location of forest restoration, and should at a minimum consider the constraints around harvesting near riparian zones and formally incorporate the class 4 guidelines. It is anticipated that the FPC will undergo a review in 2018.



Figures 41 to 44 – Class 4 streams. Class 4 streams are not born equal, and should be assessed on a case by case basis. In all instances trees are the answer; the species, the buffer width (if required) and on-going management will require further consideration. Photos Cygnet 2007 (PFT), Maydena 2017 (NS) and last two (pink and yellow markers) from Fingal 2007 (TPPL). Note the Fingal streams are deeply incised.



In some instances, forest restoration adjoining class 4 streams was occurring where it appeared unwarranted, with respect to environmental risk. This could result in unnecessary loss of plantation ground, costs associated with forest restoration and potentially constrain future harvesting of the surrounding plantation. Forest restoration should be targeted and it is important that companies do not lose viable plantation ground for little, or no, environmental benefit. The class 4 guidelines encourage, but do not prescribe, forest restoration based on environmental risk and these should be referenced when making decisions about whether forest restoration is warranted in class 4 streams.

One of the most positive forest restoration initiatives is the targeted restoration and enhancement of threatened species habitat, with several organisations undertaking these works. These projects have the potential to attract funding, are well received by forest certification bodies and should enjoy wide community support, including from environmental advocacy groups.



Figure 45 – A juvenile Wedge-tailed eagle *A. audax* that was GPS tagged, as part of a forest industry, FPA and UTAS supported research project. The restoration of eagle nest reserves would be a continuation of 30 years of forest industry management of this threatened species under the Tasmanian forest practices system. Plenty 2017 (NS).

Gathering information on forest restoration was not straightforward and as the program grows it will be important to accurately document and report on the restored areas. Currently there is no specific operational code that FPOs can use when certifying FPPs that identifies forest restoration. As an example, the forest restoration works being carried out by GA are recorded in FPPs as current land-use pasture, future land-use hardwood plantation. Clearly GA is not establishing hardwood plantation. A change to the *Forest Practices Regulations 2017* that add an operational code for forest restoration, will allow FPOs to document what's going on in the field, and provide the FPA with an opportunity to include forest restoration data in their annual report. This data can be included in the five yearly Tasmanian and National State of the Forests reports.

To encourage forest restoration the FPP fee schedule could be adjusted to reduce the application fees associated with the work. The fee as defined by the *Forest Practices Regulations 2017*, currently linked to an incorrect operational code, is at a ranking of 2. An FPP fee ranking of 2 attracts a charge of \$24/ha, which would see GA alone pay \$120,000 in FPP application fees over the next five years. A reduction in fees would reduce the financial burden on organisations pursuing forest restoration. The FPA by making these changes would be fostering forest restoration and be in sync with the objective of the Tasmanian forest practices system, which is to deliver sustainable forest management.

## **8 Recommendations**

1. Forest restoration should be targeted and not result in unnecessary loss of productive plantation.
2. Organisations carrying out forest restoration should consider drawing on a wider range of skills, across technical, marketing and research disciplines.
3. Consider forest restoration and associated guidelines in future revisions of the FPC.
4. Adopt a risk based 'case by case' approach to forest restoration adjoining Class 4 streams, and other riparian zones.
5. Add forest restoration as an operational code to the *Forest Practices Regulations 2017* to enable FPOs to identify forest restoration in FPPs, and set the FPP ranking to 0.

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