

Tree Fern Management Plan for the Sustainable Harvesting, Transporting or Trading of *Dicksonia antarctica* in Tasmania 2012

Environment Protection and Biodiversity Conservation Act 1999
(Section 303FO)

Overview

This Tree Fern Management Plan outlines a system to facilitate and regulate the sustainable harvesting of *Dicksonia antarctica* tree ferns in Tasmania. Conditions of this plan are consistent with the long term conservation of *Dicksonia antarctica* in its natural habitat.

This Tree Fern Management Plan meets the Wildlife Trade Guidelines, under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

This Management Plan has been prepared by the Tasmanian Government in consultation with the Australian Government to meet the requirements of the Tasmanian *Forest Practices Act 1985* and *Environment Protection and Biodiversity Conservation Act 1999*. It supersedes the Tree Fern Management Plan that was approved by the Australian Government in 2007.

Table of Contents

1. Introduction	3
2. Aims of this management plan	5
3. Outcomes from this management plan	5
4. Definitions	5
4. Context of tree fern harvesting in Tasmania	7
5. Regulation of forest practices (and tree fern harvesting)	8
5.1 Terms and conditions relating to tree fern harvesting	8
5.2 Tree fern harvesting under the tree fern management plan	9
5.3 Tree fern harvesting principles	9
5.4 Situations where tree fern harvesting may occur	9
5.4.1 Native forest to be converted to another land use	10
5.4.2 Native forest to be intensively logged and regenerated	10
5.4.3 Timber plantations	10
5.4.4 Tree fern plantations or nursery sites	10
5.5 Monitoring of tree fern harvesting	10
5.6 Tree Fern Tags	11
5.7 Legislation and penalties	12
6. Threats to conservation status of tree ferns	13
7. Issues relating to the conservation and harvesting of tree ferns	14
7.1 Environmental	14
7.2 Social	14
7.3 Economic	15
7.4 Political	15
8. Monitoring of management plan implementation	15
8.1 Harvesting operations and retail outlets	15
8.2 Interstate distribution of tree ferns	16
8.3 Overseas exports of tree ferns	16
9. Liaison and education of stakeholders	17
10. Evaluation of performance under this Management Plan	17
11. Reporting of management plan implementation	18
12. Review of the management plan	18
12. References	19
Appendix 1: Background information on Tasmanian tree ferns	20
Characteristics of Tasmanian tree ferns	20
Life cycle of <i>Dicksonia antarctica</i>	22
Epiphytes and <i>Dicksonia antarctica</i>	22
Ecology and distribution of <i>Dicksonia antarctica</i>	23
Appendix 2: Research on survival and regeneration of <i>Dicksonia</i>	28
<i>Dicksonia</i> survival and regeneration following disturbances	28
<i>Dicksonia</i> and associated biodiversity	29
Current research – <i>Dicksonia</i> survival and regeneration	29

1. Introduction

Dicksonia antarctica Labill. (manfern or soft tree fern) is a common and widely distributed tree fern found in Tasmanian wet forests. (**Note:** *For the purpose of this Management Plan the use of the terms 'tree fern' and 'Dicksonia' will refer to Dicksonia antarctica unless otherwise stated*). The population of trunked tree ferns in Tasmania is estimated to exceed 130 million, with in excess of 50% of the population occurring in Formal and Informal Reserves.

Tree ferns have been long sought after for their aesthetic properties and have many horticultural applications. *Dicksonia* is a robust tree fern that can be cut, stored, transported and replanted. Cut stems will continue to grow successfully if the crown is intact. The primary use of this species is as a live trunked tree fern planted in gardens providing a 'palm-like' appearance. The trunk may be used for secondary horticultural products, such as plant pots, garden steps and mulch. Fronds are also used in floristry.

Forestry operations in Tasmania occur extensively in wet forests that support large populations of tree ferns. Integration of tree fern harvesting with logging operations undertaken under Tasmania's Forest Practices System, provides an opportunity to utilise a resource that is widespread, well reserved and is maintained at a landscape level under current forest management. Peacock and Duncan (1995) reported high tree fern mortality associated with forestry operations in wet forests. Chuter (2003) demonstrated that there is good regeneration of the species following such events. An ongoing research project by the Forest Practices Authority (FPA) is assessing the effects of different wet forest silvicultural practices on health and survival of tree ferns.

A detailed description of the distribution, conservation status, biology and regenerative properties of *Dicksonia* is given in Appendices 1 and 2. Appendix 1 also includes information about other species of trunked ferns in Tasmania – they include two species (*Cyathea cunninghamii* Hook. f. and *Cyathea Xmarcescens* Wakefield) which are considered to be threatened in Tasmania. Appendix 2 details research on the effects of logging operations on the survival and regeneration of *Dicksonia*.

The majority of tree ferns harvested in Tasmania are exported to Victoria and overseas, primarily to Europe and Asia. They are particularly suitable for Europe's temperate climate. Tree ferns fill a niche market as many other fern species available on the world market are tropical species.

Commercial harvesting and export of tree ferns has been taking place for many decades in Tasmania. Under provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), exports of specimens for commercial purposes must be from an approved source. (**Note:** *Any references to specific Acts, Codes, Policies etc. applies to any subsequent amendments or versions*). One such source is a Wildlife Trade Management Plan, approved by the Australian Government Minister for Sustainability, Environment, Water, Population and Communities. In 2001, the *Tree Fern Management Plan for the Harvesting, Transporting or Trading of Dicksonia antarctica in Tasmania* was developed by the Forest Practices Board (now the Forest Practices Authority), in consultation with Environment Australia (now the Australian Government Department of Sustainability, Environment, Water, Population and Communities); the Tasmanian Department of Primary Industries, Water and Environment [now the Department of Primary Industries, Parks, Water and Environment (DPIPWE)] and other stakeholders.

The introduction of the 2001 Tree Fern Management Plan and amendments to the Tasmanian *Forest Practices Act 1985* and Tasmanian *Forest Practices Regulations*

incorporated commercial tree fern harvesting into the Forest Practices System. This process was accompanied by the introduction of a tagging system for harvested tree ferns and led to the complete regulation of tree fern harvesting in Tasmania.

The Tree Fern Management Plan was subsequently revised in 2005 and 2007.

This Tree Fern Management Plan applies to all land tenures in Tasmania. Tree fern harvesting prescriptions must be in accordance with the principles detailed in this plan and must be conducted under a certified Forest Practices Plan.

The sustainable harvesting of tree ferns under the terms of this Management Plan will be permitted as follows:

- Salvage harvesting from native forest to be cleared permanently or converted to another use in accordance with Tasmania's legal and policy framework.
- Harvesting from native forest to be intensively logged and regenerated, where harvesting prescriptions will be applied to maintain local and regional populations.
- Harvesting in existing softwood and hardwood plantations.
- Harvesting of tree fern plantations or nursery sites.

2. Aims of this management plan

The aims of this Management Plan are to:

- Facilitate the sustainable harvesting of tree ferns from native forest subject to intensive forestry operations (where permitted by the landowner/manager and in accordance with the terms of this Management Plan) or tree fern plantations and nursery sites.
- Provide effective and efficient regulation of harvesting of tree ferns in Tasmania.
- Educate all stakeholders on the regulation of tree fern harvesting in Tasmania.
- Foster research into the distribution, ecology and sustainable harvesting of tree ferns.

3. Outcomes from this management plan

The anticipated outcomes of this Management Plan are to:

- Ensure that tree fern harvesting is undertaken in a sustainable manner, and in accordance with current policies and legislation.
- Reduce the incidence of illegal harvest of tree ferns from public and private land in Tasmania.
- Ensure that all stakeholders are aware of regulatory, operational and conservation requirements, so that tree ferns are managed sustainably.
- Integrate research findings into the management and conservation of Tasmania's tree fern populations.

4. Definitions

The following terms are used throughout this Management Plan:

- **Commercial tree fern harvesting** – Harvesting of tree ferns for the purposes of trade, or harvesting when more than six tree ferns are taken from applicable land in a year (see *Forest Practices Regulations 2007*).
- **Formal Reserve** – A reserve equivalent to IUCN Protected Area Management Categories I, II, III, IV, or VI as defined by the IUCN Commission for National Parks and Protected Areas (1994).
- **Informal Reserve** – A reserve on State Forest comprising an area identified as a Protection Zone under the Management Decision Classification System or other administrative reserve on Public Land which is managed to protect comprehensive, adequate and representative (CAR) reserve values.
- **Landscape** – A conceptual planning unit or view field, generally of 200 – 1000 ha in area, which typically comprises a catchment of a class 2 stream (i.e. as defined by the Forest Practices Code), and occupies a topographic range from an upland landform (e.g hills and mountains) to lowland landforms (e.g valleys and basins).
- **Salvage harvesting** – Harvesting of a resource that would otherwise be destroyed.
- **Tree fern** – *Dicksonia antarctica*.



Tall *Dicksonia* growing in Southern Tasmania



Tall wet eucalypt forest with a dense *Dicksonia* understorey



Live *Dicksonia* being harvested



Dicksonia tagged and packed into a refrigerated container ready for export. **Note:** Some tags are not visible due to stacking.



Tasmanian *Dicksonia* for sale in the United Kingdom



Tasmanian Tree Fern Tag number 258301

4. Context of tree fern harvesting in Tasmania

The distribution and attributes of tree ferns, and the context of tree fern harvesting in Tasmania, must be considered in assessing the sustainability of harvest and the prescriptions detailed in this plan.

Under this Management Plan, tree fern harvesting will generally be integrated with forestry activities in wet forests – either in areas that will be converted to another land use, or in areas that will be regenerated to native forest. In the latter case, logging and subsequent establishment of regeneration causes the physical removal of patches of vegetation, including tree ferns. This is followed by a succession of regeneration and growth of dominant and understorey species, including tree ferns. In either scenario, tree fern harvesting allows for utilisation of tree ferns without compromising the maintenance of the species in the landscape.

It has been estimated that there are approximately 130 million trunked tree ferns in Tasmania (see Appendix 1 – ‘Ecology and Distribution of *Dicksonia antarctica*’). Trunked tree ferns are those that have progressed from an immature stage to a trunk-forming stage. Approximately 74 million of these trunked tree ferns are reserved in Formal and Informal Reserves. This figure includes ferns within Tasmania's public reserve system and reserves on private land. There are also substantial areas of wet forest outside reserves that are not available for logging because of requirements under the Forest Practices Code e.g. topographic constraints.

In areas subject to forestry operations, tree ferns are retained through existing requirements and prescriptions, including streamside reserves, habitat clumps, wildlife habitat strips, aggregates and ‘tree fern islands’ (areas with high densities of tree ferns that may be subject to constraints in Forest Practices Plans). Reservation and retention of tree ferns provides a substantial source of spore for regenerating the species in the logged area. Tree ferns produce copious amounts of spore that are widely distributed by wind and readily develop into sporophytes that colonise regenerating forests. Tree ferns in retained patches support late-successional epiphytes, hence contributing to the maintenance of biodiversity and providing a resource of propagules for recolonisation of the regenerating forests by these species.

The harvesting of tree ferns for the period 30/6/2002 to 30/6/11 is summarised below (source Annual Reports of the FPA).

Year	Total no. of forest practices plans certified	No. (%) of plans that permit the harvesting of tree ferns	No. of tree fern tags issued by the FPA
2002-03	940	39 (4%)	64,182
2003-04	1,001	26 (3%)	54,886
2004-05	942	32 (3%)	61,368
2005-06	897	33 (4%)	45,131
2006-07	906	18 (2%)	54,802
2007-08	924	36 (4%)	35,352
2008-09	838	35 (4%)	17,529
2009-10	847	25 (3%)	19,905
2010-11	660	29 (4%)	10,729

5. Regulation of forest practices (and tree fern harvesting)

Most forestry operations exceeding one hectare in Tasmania (on public or private land) require a Forest Practices Plan (FPP) under the Forest Practices Act (**Note:** the exceptions are detailed in the Forest Practices Regulations). The Forest Practices Act is monitored and enforced by a statutory authority, the Forest Practices Authority (FPA). Forest Practices Plans are prepared in accordance with the Forest Practices Code, which details provisions for the protection of natural and cultural values. These values include flora, fauna, geomorphology, soils and water, cultural heritage and visual amenity. The FPA employs a team of specialists to provide advice in relation to natural and cultural values.

Harvesting must also take account of issues relating to hygiene and quarantine. The risk of introducing pests and diseases into the proposed harvesting area must be assessed, and hygiene measures implemented if a risk is identified. Tree fern harvesting procedures also need to take account of quarantine requirements associated with the export of ferns.

All FPPs must be certified by a Forest Practices Officer (FPO) prior to the commencement of a forestry operation. Forest Practices Officers are trained and accredited by the FPA to identify and manage natural and cultural values. Compliance reports must be prepared by a FPO and lodged with the FPA within 30 days of the completion of the operation. Independent random audits are conducted on a representative sample of FPPs each year, to assess compliance with the FPP and identify problems that require corrective action.

5.1 Terms and conditions relating to tree fern harvesting

Terms and conditions relating to tree fern harvesting were inserted into the Forest Practices Act in 2001, as part of the approval process for the 2001 Tree Fern Management Plan. These terms and conditions are summarised below:

- ‘Tree ferns’ are defined as *Dicksonia antarctica* and harvesting is restricted to this species.
- Harvesting operations must be covered by a certified FPP that includes a suitable prescription for tree fern harvesting (see Page 8 - ‘Situations where Tree Fern Harvesting May Occur’).
- All harvested tree ferns must have a Tasmanian Tree Fern Tag securely attached at the point of harvest.

The Forest Practices Regulations prescribe that the requirements for a forest practices plan and the tagging of tree ferns do not apply where:

- No more than 6 tree ferns are harvested on an area of applicable land during one year; and
- The owner of this land has given consent; and
- The tree ferns are only for personal use (they must not be traded or used for commercial purposes).

5.2 Tree fern harvesting under the tree fern management plan

This Tree Fern Management Plan applies across all land tenures in Tasmania. Tree fern harvesting operations are regulated and enforced under the Forest Practices Act, as described above.

5.3 Tree fern harvesting principles

- Extraction of tree ferns should not be the catalyst for forestry operations. Tree fern harvesting must not occur prior to a final land use decision being confirmed and the approval of a forestry operation on the site.
- Tree ferns may be salvage harvested where they would otherwise be destroyed by logging activities and land clearing (this includes harvesting from existing hardwood and softwood plantations).
- Tree ferns may be harvested from other native forest operations if all of the following conditions apply:
 - the harvesting of tree ferns and the forestry operation itself comply with appropriate regulations
 - tree ferns are retained at the landscape level and in the vicinity of the coupe (e.g. in streamside reserves, habitat clumps and other sites managed by prescription)
 - tree ferns will regenerate adequately on the site.
- Tree ferns and their associated biodiversity should be retained at the coupe and landscape levels in Formal Reserves (e.g. National Parks and Forest Reserves), Informal Reserves (e.g. wildlife habitat strips) and areas subject to management prescriptions through the Forest Practices System (e.g. streamside reserves, relict rainforest).
- Forest Practices Officers will be responsible for ensuring that areas permitted for tree fern harvesting, and reserved areas, are clearly defined and marked prior to harvesting in accordance with the Forest Practices Code.
- Tree fern harvesting operations should be managed and monitored by the responsible FPO in conjunction with the FPA. It is the responsibility of tree fern harvesters, generally through the land manager, to familiarise themselves with regulations and prescriptions applying to any tree fern harvesting operation (e.g. location of boundaries of harvesting areas).
- Tree fern harvesting should be undertaken in a manner that protects or maintains other forest values (e.g. soils, biodiversity, forest health, water quality), recognising that in many cases the primary determinant of prescriptions and constraints in the harvest area will be the regulation of forestry activities.

5.4 Situations where tree fern harvesting may occur

Under this Tree Fern Management Plan, commercial harvesting of tree ferns may only occur if prescribed in FPPs that cover forestry activities in the following situations:

- Native forest to be converted to another land use
- Native forest to be intensively logged and regenerated
- Existing softwood and hardwood plantations

- Tree fern plantations or nursery sites.

Situations where tree fern harvesting will be permitted under this Management Plan are discussed below.

5.4.1 Native forest to be converted to another land use

Salvage harvesting of tree ferns will continue to be permitted from areas of native forest to be cleared for plantations, agriculture or infrastructure (e.g. dams, roads, powerlines, pipelines and other service facilities). This also includes areas cleared for roads, landings and primary snig tracks as part of logging operations.

5.4.2 Native forest to be intensively logged and regenerated

This Tree Fern Management Plan permits tree fern harvesting from areas which will be logged and regenerated back to native forest, under certain conditions. Wet eucalypt forest silviculture in Tasmania typically involves intensive harvesting operations that cause significant disturbance to overstorey and understorey species (including tree ferns) in the timber harvesting area. Operations can comprise:

- Clearfell, burn and sow (using cable-logging equipment on steep terrain, or conventional logging equipment elsewhere)
- Aggregated retention, with patches of forest (normally 0.5–3 ha, which typically represents 10-20% of the operational area) retained within the intensively logged areas.

Forest Practices Officers will notify the FPA about any proposed tree fern harvesting operations in native forest to be logged and regenerated. The FPA, in consultation with the FPO, will provide advice on the harvesting prescriptions to be applied. Research findings and knowledge of native forest logging and regeneration techniques will be used to develop these prescriptions. For example, no harvesting of tree ferns would be permitted in areas that are retained in aggregated retention coupes.

5.4.3 Timber plantations

In some instances, established softwood and hardwood plantations contain populations of tree ferns that have either survived the plantation establishment process or have regenerated from spore. There are no restrictions on the harvesting of tree ferns in plantations other than the normal provisions of the Forest Practices Code. Harvesting of tree ferns may be undertaken as a separate operation to the timber harvesting (e.g. harvesting tree ferns ‘mid-rotation’ may be safer and more efficient than integrating timber and tree fern harvesting operations).

5.4.4 Tree fern plantations or nursery sites

Tree fern plantations or nursery sites dedicated to the production of trunked tree ferns may be harvested in accordance with the provisions of the Forest Practices System. Tree fern harvesters should consult with a FPO and the FPA prior to the establishment or harvest of such sites.

5.5 Monitoring of tree fern harvesting

Prior to commencement of tree fern harvesting, FPOs must ensure that:

- Areas designated for harvesting of tree ferns must be clearly demarcated.
- All other relevant marking has been completed in the coupe.

- Tree fern harvesters receive an appropriate briefing on the FPP.

The FPO must undertake regular inspections of tree fern harvesting sites and report to the FPA any breaches or concerns about the application of the FPP or Tree Fern Management Plan. At the completion of tree fern harvesting, the FPO will inspect the operational area and report to the FPA (through a certificate of compliance) on whether the operation is compliant with the conditions in the FPP.

The FPA undertakes random audits of FPPs and harvesting operations to assess the standards of FPPs and associated operations. Forest Practices Plans for tree fern harvesting are subject to such auditing and review.

Selective tree fern harvesting operations and a proportion of salvage operations will be specifically assessed by the FPA to assess compliance with conditions of the FPP and Tree Fern Management Plan. This process is to obtain data for research purposes, to discuss with stakeholders the effectiveness of prescriptions and if necessary to refine prescriptions in FPPs and subsequent Tree Fern Management Plans. This will provide a means of adaptive management for the Tree Fern Management Plan by refining prescriptions.

5.6 Tree Fern Tags

All harvested tree ferns must have a Tasmanian Tree Fern Tag securely attached at the point of harvest. Attachment of tags is the responsibility of the tree fern harvester, who must ensure that tags are attached to ferns before they are transported from the harvesting site (as specified in the FPP). Tree Fern Tags must remain attached throughout the retail chain to the end consumer.

Forest Practices Plans proposed for tree fern harvesting must have tree fern numbers estimated by the FPO, in order that an appropriate number of Tree Fern Tags are issued to the tree fern harvester for that FPP area. Tree ferns are counted in sample plots located in different botanical communities within the FPP area, and then these numbers extrapolated to estimate the number of tree ferns in the FPP area. The methods for sample plot counts are covered in FPO training.

Tree fern harvesters must apply to the FPA for sufficient Tree Fern Tags for the tree ferns to be harvested up to the estimated number, which is prescribed on the FPP coversheet. A copy of a certified FPP prescribing tree fern harvesting, along with a Tree Fern Tag Request form (available from the FPO or FPA) and prescribed payment for the Tree Fern Tags, must be supplied to the FPA in order for Tree Fern Tags to be issued. Information required on the Tree Fern Tag Request form includes:

- Unique FPP identification number for the area from which the tree ferns will be harvested.
- Number of tree ferns which the FPO estimates can be harvested.
- Name of certifying FPO.
- Name of the tree fern harvester and their current address.
- Business names, contact names and addresses for each other party in the supply chain.
- Date that compliance certification will be undertaken for tree fern harvesting operational phase.

- Person responsible for arranging for FPO to undertake checking, and signature of responsible person.

Issued tags must only be attached to tree ferns harvested from the area covered by the FPP against which the tags were obtained. Any tags that may be left over from a particular FPP area must either be transferred to another FPP (via a Tree Fern Tag Request Form) or returned to the FPA for a refund.

Tree Fern Tags are issued sequentially for each FPP and will not exceed the prescribed number of tree ferns identified on the FPP. Once the FPA has received a request for tags and clears payment, the required number of tags are provided to the tree fern harvester. Tags are issued under section 18A(b) of the Forest Practices Act and can be obtained for two size classes of fern :

- 1) Tree fern stem greater than 30 cm in length (priced at one fee unit or \$1.44 as of 1 July 2012)
- 2) Tree fern stem 30 cm or less in length (priced at 0.5 fee units or 72c as of 1 July 2012)

The pricing of tags is adjusted annually by the Tasmanian Treasury.

Proceeds from the sale of the tags pay for:

- Administration of the tree fern management system
- Database and record keeping;
- Monitoring and enforcement
- Research into sustainable management of tree ferns in Tasmania.

Tree Fern Tags are printed on strong waterproof material with sequential numbers. This enables suitable monitoring, recording and reporting and minimises the risk of tags being re-used. The colour of tags is also changed regularly to prevent re-use or copying. The format of the tags is reviewed regularly to ensure that the information is appropriate and the material and method of attachment is suitable.

5.7 Legislation and penalties

Under the terms of the Forest Practices Act, the FPA may certify, refuse to certify, vary or revoke a FPP. The FPA may direct persons to comply with the Forest Practices Code and make good any breach or environmental harm. Alternatively, the FPA may fine or prosecute any person who does not comply with the Act or provisions of a FPP. Thus the FPA has considerable powers under the Act to control tree fern harvesting to ensure that such harvesting meets the objectives of this Tree Fern Management Plan.

The harvesting of tree ferns or possession of untagged ferns outside an approved harvest area is a contravention of the Forest Practices Act and can attract substantial fines.

The harvesting situations, requirements and constraints for tree ferns are summarised in Table 1.

Table 1: Summary of Regulatory System for Tree Fern Harvesting in Tasmania under this Tree Fern Management Plan

Type of Tree Fern Harvesting	Source of Tree Ferns	Forestry Operation	Conditions for Tree Fern Harvesting	FPA Notification Required	FPP Req'd	Tree Fern Tags Req'd	Compliance Report Required
Commercial	Native forest	Native forest to be converted or cleared	As per harvesting prescriptions	Yes, prior to harvesting	Yes	Yes	Yes
Commercial	Native forest	Native forest to be regenerated	Consultation with FPA prior to harvesting	Yes, prior to harvesting	Yes	Yes	Yes
Commercial	Existing timber plantations	Future harvesting of plantation timber	Consultation with FPA prior to harvesting	Yes, prior to harvesting	Yes	Yes	Yes
Commercial	Tree fern plantations or nursery sites	Tree fern harvesting	Consultation with FPA prior to establishment and harvesting	Yes, prior to harvesting	Yes	Yes	Yes
Non-commercial	Native forest or other	None	Six or less ferns harvested for non-commercial purposes*	No	No	No	No

*Consult the *Forest Practices Regulations 2007* for clarification.

6. Threats to conservation status of tree ferns

Dicksonia antarctica is a common and widespread species throughout Tasmania and is not at risk from any current or future management activities. It is not listed as threatened under the *Tasmanian Threatened Species Protection Act 1995* or *Environment Protection and Biodiversity Conservation Act 1999*. *Dicksonia antarctica* is not listed under the Convention on International Trade in Endangered Species (CITES) for restrictions on trade from Australia.

Dicksonia occurs in most National Parks throughout the State, as well as in numerous State and other reserves. Additional Formal and Informal reservation of some forest communities containing *Dicksonia* has occurred or will continue to occur, as a result of policy requirements (e.g. *Tasmanian RFA* and *Tasmanian Community Forest Agreement*) and provisions of the Forest Practices Code. Such reservation will also result in the protection of other species of tree ferns.

The security of Formal Reserves in Tasmania is high. All Formal Reserves, including National Parks, State Reserves, Game Reserves, Nature Reserves and Forest Reserves, are equivalent to IUCN Protected Area Management Categories I, II, III IV, or VI as defined by the IUCN Commission for National Parks and Protected Areas 1994. The status of Formal Reserves is secure, requiring approval by the Tasmanian Parliament for dedication or revocation.

Only a small proportion of the Tasmanian population of *Dicksonia* is available for commercial harvesting. Harvesting of *Dicksonia* is effectively restricted to parts of the

State where the species is common, and where the species will be maintained at a landscape level. There are practical reasons for this:

- Most wet forest communities often have a relatively high density of *Dicksonia*. Such forests are well represented in Formal and Informal Reserves (e.g. streamside reserves) and other sites generally unavailable for logging (e.g. steep shaded slopes).
- The Tasmanian RFA and subsequent policies preclude forestry operations in several forest communities on public land and in some instances preclude their conversion on private land. These include wet forest communities (e.g. *E. brookeriana* forest, *E. viminalis* wet forest) that often contain large populations of *Dicksonia*.
- There are additional constraints through the Tasmanian Forest Practices System, on operations in some other *Dicksonia*-rich forest communities in regions where such communities are uncommon (typically drier regions of the State). An example is the complete protection of rainforest in the Freycinet and Midlands Bioregions and drier parts of Ben Lomond, Woolnorth and D'Entrecasteaux Bioregions.
- Commercial tree fern harvesters have little interest in undertaking salvage harvesting from environments and forest types where *Dicksonia* is uncommon.

This Tree Fern Management Plan will not result in a change in the conservation status of *Dicksonia* at national, State or regional levels.

7. Issues relating to the conservation and harvesting of tree ferns

7.1 Environmental

The sustainable harvesting of tree ferns from native forest, as described in this Tree Fern Management Plan, will have a negligible impact on the environment or ecology of a particular area, relative to the ecological changes resulting from the logging and regeneration practices. The retention of tree ferns in Formal and Informal Reserves ensures that ecological values are maintained in the vicinity of operational areas and at the landscape level. This also ensures that there is adequate potential for the re-colonisation of the regenerating forest by tree ferns and associated epiphytes.

The current regulatory system, including requirements for the preparation of FPPs and the Tree Fern Tagging System, ensure that appropriate harvesting constraints are prescribed and monitored in FPP areas. This severely limits the potential for illegal harvesting activities or availability of untagged ferns in the marketplace.

7.2 Social

The harvesting of tree ferns from native forest is a sustainable practice which supports employment in an export oriented business sector, improves resource use and reduces the incentive for illegal harvesting from other areas with high conservation value. Application of previous Tree Fern Management Plans has significantly reduced illegal harvesting of the species, and placed the industry on a regulated footing. This has translated into market acceptability for the product.

The harvesting of tree ferns provides full-time and part-time employment in rural and regional areas. Whilst the number of people employed in this industry is relatively small, it is significant for the individuals concerned, their families and the community as a

whole. Such employment can be important in rural areas with restricted alternative employment opportunities.

7.3 Economic

The vast majority of FPPs currently prepared are not within forest areas suitable for the harvesting of tree ferns due to: legislative restrictions; absence or few tree ferns present; or logistical/economic issues that make tree fern harvesting unviable. In many coupes, time and safety constraints mean that only a fraction of the total available ferns are removed.

The tree fern industry faces the normal supply and demand risks associated with any economic enterprise. However, the rapid phasing out of the only current source of supply will lead to a collapse in the industry. This will result in the loss of regional employment opportunities, unless alternative sources of tree ferns can be sustainably utilised in accordance with this Tree Fern Management Plan.

Inconsistency of legislation and fees between Victoria and Tasmania has resulted in higher regulatory costs for Tasmanian operators.

7.4 Political

Currently, each State with tree fern harvesting or distribution operations has its own Tree Fern Management Plan and regulations. The inconsistencies between approaches threaten some operations due to differences in regulatory costs and compliance regimes. Implementation of a national approach to tree fern harvesting, using the draft National Tree Fern Harvesting Guidelines as a basis, would result in a more consistent approach to tree fern management in the different jurisdictions.

The primary source of tree ferns was previously through conversion of native forest to plantation. Under the Tasmanian *Permanent Native Forest Estate Policy 2011* the broadscale clearing and conversion of forest is not permitted on public land and will end on private land by 2015.

8. Monitoring of management plan implementation

8.1 Harvesting operations and retail outlets

Since the inception of the 2001 Tree Fern Management Plan, auditing and nursery inspections undertaken by the FPA(B) has revealed a decrease in illegally harvested tree ferns in the market place. However, there are still infrequent, minor instances of non-compliance and illegal activity despite the efforts made to educate all stakeholders on the requirements for management and legal trading of tree ferns. Therefore, continuation of monitoring and education is required. The following monitoring will be undertaken:

- Checks of tree fern harvesting operations by FPOs as part of normal FPP implementation and inspections, to ensure that tree fern harvesting complies with conditions in the FPP.
- Spot checks of tree fern harvesting operations by FPA staff; this will show that the FPA is active and can also perform an educational role.
- Forest Practices Officers will inspect the FPP area at completion of tree fern harvesting, as part of the issuing compliance checking (prior to issuing of a certificate of compliance).

- Forest Practices Authority auditing of a representative sample of FPPs each year (as part of reporting requirements to the Tasmanian parliament).
- Spot checks of nurseries and retail outlets by the FPA to check that required tagging procedures are being followed.
- Tree fern harvesters are required to keep records of the Tree Fern Tag numbers and the names and addresses of retail outlets that are supplied with tree ferns. Under the Forest Practices Act, a FPO can request that this information be provided by anyone trading in tree ferns.

8.2 Interstate distribution of tree ferns

According to data obtained from the FPA's and the Department of Sustainability, Environment, Water, Population and Communities databases, the majority of Tasmanian tree ferns are either shipped to Victoria or exported overseas directly. The FPA liaises with the Victorian Department of Sustainability and Environment (DSE) on the movement of Tasmanian tree ferns into Victoria. Comparison of information from the Department of Sustainability, Environment, Water, Population and Communities and DSE with the FPA's FPP and Tree Fern Tag databases is used to highlight any anomalies within the regulatory system. Limited checking is done by authorities in other States on the imports of Tasmanian tree ferns.

Although not within their typical ambit, the Australian Customs Service and the Australian Quarantine Inspection Service (AQIS) may undertake 'spot' inspections of containers for the FPA.

8.3 Overseas exports of tree ferns

International export of tree ferns requires an export permit from the Department of Sustainability, Environment, Water, Population and Communities. The Department of Sustainability, Environment, Water, Population and Communities needs to receive a copy of the relevant documentation i.e. the receipt for Tree Fern Tags and the FPP number or copy of the approved FPP. The process of the Department of Sustainability, Environment, Water, Population and Communities issuing an export permit involves the recording of the basic details of the exporter, number of tree ferns, FPP number and Tree Fern Tags issued. The FPA and the Department of Sustainability, Environment, Water, Population and Communities exchange information on Tree Fern Tag numbers issued to harvesters/exporters.

The international export of tree ferns requires a phyto-sanitary certificate to be issued by AQIS prior to export. Attention should be paid to phyto-sanitary requirements for pests and diseases and movement of plants with soil – this needs to be considered by harvesters and exporters at the harvesting stage, when tree ferns are in storage and (particularly) in fumigation or other treatments prior to export in containers.

Detailed inspection of tree ferns is required for AQIS certification, which also allows for a cursory inspection for tagging compliance. This is the last opportunity for an inspection for tagging compliance prior to the 'sealing' of the container for shipment. There is scope for AQIS to report on tagging compliance as part of the phyto-sanitary certification procedure.

9. Liaison and education of stakeholders

The implementation of the Tree Fern Management Plan should involve liaison with and education of stakeholders. The following commitments have been adapted from the draft National Tree Fern Harvesting Guidelines:

- The FPA will produce technical information on tree ferns including regulation of tree fern harvesting. These will be provided to harvesters, industry associations, retailers and other stakeholders.
- Regular liaison will occur between various stakeholders (FPA, DPIPWE, Department of Sustainability, Environment, Water, Population and Communities, AQIS, land managers, tree fern harvesters and retailers) to ensure that the regulations for tree fern harvesting and trading in Tasmania are understood, implemented and reviewed as appropriate. In addition to this, regular sharing of information between stakeholders on tree fern harvesting, trading and exports.
- Development of an industry association will be encouraged to facilitate: good harvesting practices; good storage and quarantine practices; and appropriate policy development to maintain a viable and sustainable industry.

10. Evaluation of performance under this Management Plan

The following evaluation of performance will be undertaken against the Management Plan.

- Feedback from landowners/managers, tree fern harvesters and other stakeholders will provide a means of adaptive management working within the constraints of this Tree Fern Management Plan to improve the process.
- Areas where tree fern harvesting has taken place will be monitored by FPOs for compliance with the FPP. Examination of harvest areas also provides a means of assessing the application of management prescriptions. This provides another means of applying the adaptive management principle based on actual experiences.
- The checking of harvest returns by harvesters to the landowner/manager against the number of Tree Fern Tags issued by the FPA will be an indicator of compliance.
- The exclusion of tree fern harvesting from reserves or areas excluded by prescription represents compliance with this Tree Fern Management Plan at the coupe level. This can be applied to the broader environment to ascertain levels of illegal harvesting.
- Long-term monitoring of regenerated native forest sites where tree fern harvesting has taken place will provide an assessment of the survival and regeneration of tree ferns and the maintenance of the species relative to the management prescriptions applied.
- Research examining the sustainable management of tree ferns will continue and the results of this work will be delivered to stakeholders and integrated into future reviews of the Tree Fern Management Plan. This may also serve to provide information for adaptive management during the life of the Tree Fern Management Plan.

- The Tree Fern Project will continue to deliver information on tree fern management to stakeholders. The success of this information delivery will be reflected in particular by nursery and harvester knowledge and public enquiries about tree ferns.

11. Reporting of management plan implementation

The FPA will report on the implementation of this Tree Fern Management Plan to the Tasmanian Parliament and to the Australian Government through its Annual Report, as required under s.4X of the Forest Practices Act. Annual reports will include details on the:

- Number of FPPs that include tree fern harvesting.
- Number of Tree Fern Tags issued.
- Monitoring and investigations of tree fern harvesting compliance.
- Research projects and outcomes.

12. Review of the management plan

This Management Plan shall remain in force for a maximum period of five years or until amended or replaced by a plan approved by the Tasmanian and Australian Governments prior to this. Several research programs are currently being undertaken in relation to the management and sustainable harvesting of tree ferns (as detailed in Appendix 2). These programs will continue to provide important information to improve the effectiveness and sustainability of tree fern management in Tasmanian forests, and to integrate such information and procedures into future revisions of the Tasmanian Tree Fern Management Plan.

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Appendix 1: Background information on Tasmanian tree ferns

Characteristics of Tasmanian tree ferns

There are five Tasmanian fern species that regularly form trunks over one metre in height and that are referred to as tree ferns. These species are: *Todea barbara* (L.) T. Moore (king fern), *Dicksonia antarctica* Labill. (manfern or soft tree fern), *Cyathea australis* (R. Br.) Domin (rough tree fern), *Cyathea cunninghamii* Hook. f. (slender tree fern) and *Cyathea Xmarcescens* Wakefield (skirted tree fern). *Cyathea Xmarcescens* is a natural hybrid between *C. cunninghamii* and *C. australis*. Three other species of fern [*Polystichum proliferum* (R. Br.) Presl, *Blechnum nudum* (Labill.) Mett. ex Luerss. and *Diplazium australe* (R. Br.) Wakefield] may also form trunks, but these rarely exceed 30 cm in height.

Tree ferns are an integral part of the ecology of Tasmanian wet forests. They often dominate the understorey, and help to create a sheltered and moist forest floor, providing ideal habitat for many non-vascular plants and invertebrate animals. *Dicksonia* trunks are formed by persistent frond bases and layers of aerial roots that connect the crown to the ground. These trunks offer a substrate for epiphytes such as mosses and filmy ferns, and a nursery site for the germination of many species.

The harvesting of tree ferns in Tasmania is limited to *Dicksonia*. The inclusion of a description of the other tree ferns is solely for identification purposes and understanding the distribution and ecology of these ferns.

The following key will assist identification based on characters of the frond. It is important to examine the base of the stipe (the basal part of the frond).

Key to Tasmanian tree ferns (adapted from Duncan and Neyland 1986)

- ❶ Stipe smooth near base
 - ❷ Stipe base hairless *Todea barbara*
 - ❷ Stipe base covered with soft reddish hairs *Dicksonia antarctica*
- ❶ Stipe rough and rasp-like near base
 - ❷ Trunk of mature plant more than 20 cm diameter; scales at base of stipe varnished
 - ❸ Stipe base brown; scales brown *Cyathea australis*
 - ❸ Stipe base black; scales dark brown *Cyathea marcescens**
 - ❷ Trunk of mature plant less than 20 cm diameter; scales at base of stipe often streaked (stipe base black; scales fawn to brown) *Cyathea cunninghamii*
 - ❷ Trunk of mature plant absent or not determined
 - ❸ Most pinnules joined to rhachis; scales at base of stipe varnished
 - ❹ Stipe base brown; scales brown *Cyathea australis*
 - ❹ Stipe base black; scales dark brown *Cyathea marcescens**
 - ❸ Most pinnules petiolate; scales at base of stipe often streaked (stipe base black; scales fawn to brown) *Cyathea cunninghamii*

**Cyathea marcescens* will only be found where both *C. australis* and *C. cunninghamii* co-occur. This hybrid is more correctly written as *Cyathea Xmarcescens*.

General information pertaining to the Tasmanian tree ferns not prescribed for harvest under the Tasmanian Tree Fern Management Plan is presented below. The Tasmanian distribution of these species (and *Dicksonia*) is represented in Figure 2. None of the five species of Tasmanian tree ferns are endemic to the State. *Cyathea australis* is found in

each of the eastern mainland States. *Cyathea cunninghamii* is found in each of the eastern mainland States and in New Zealand. *Cyathea Xmarcescens* occurs in Victoria. *Dicksonia* is found in each of the eastern mainland States and in South Australia (where it may be extinct in the wild). *Todea barbara* is found in all the mainland States except Western Australia, as well as in New Zealand and South Africa.

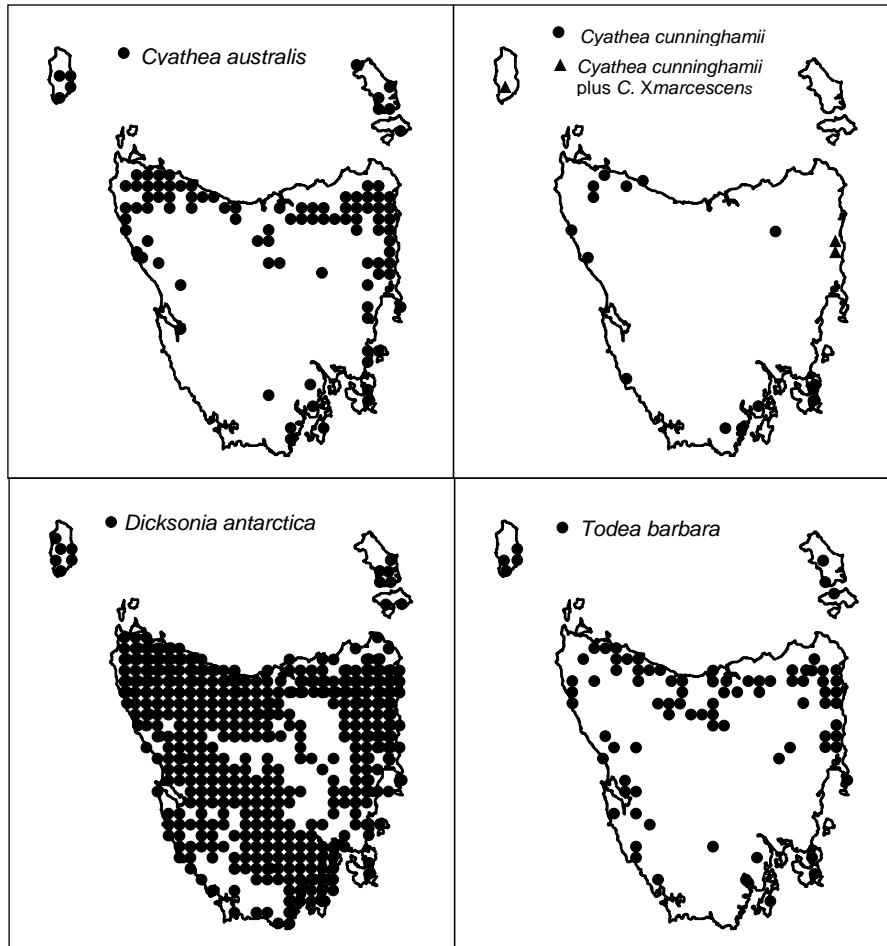


Figure 2: Distribution of tree fern species in Tasmania (taken from Garrett 1996).

Cyathea australis occurs at low altitudes (0–500 m) throughout northern and eastern Tasmania. It is also found at a few scattered locations along the West Coast. The species is common but not abundant. It mainly occurs in wet eucalypt forest, extending to rainforest margins and dry sclerophyll forest. *Cyathea australis* prefers fertile, well-drained sites. It responds well to site disturbance and its clustered distribution is often a relic of past disturbance. The species is more tolerant of full sunlight than *Dicksonia*, although the two species often occur together. *Cyathea australis* is tolerant of fire. The species is unsuited to harvesting due to its relative inability to establish adventitious roots.

Cyathea cunninghamii mainly occurs at low altitudes (0–150 m) and is known from less than twenty sites around Tasmania, mainly in coastal and hinterland areas. The species is uncommon. It occurs in mixed forest (*Eucalyptus obliqua*/*Eucalyptus regnans* overstorey with callidendrous rainforest understorey) and in gallery scrub. *Cyathea cunninghamii* is found only at sites that have apparently been protected from fire, alongside permanently flowing streams. *Cyathea cunninghamii* is listed as an endangered species on the Tasmanian *Threatened Species Protection Act 1995*.

Cyathea Xmarcescens is known from only three locations in Tasmania, with few plants at these sites. The species occurs alongside *C. australis* and *C. cunninghamii* and is recognised as a hybrid between them. *Cyathea Xmarcescens* appears to have similar ecological requirements to *C. cunninghamii*. *Cyathea Xmarcescens* is listed as a vulnerable species on the *Tasmanian Threatened Species Protection Act 1995*.

Todea barbara is largely restricted to the rivers and creeks of Tasmania's coastal and hinterland regions, reaching its best development in the north-east of the State. The species is common but not abundant. *Todea barbara* is found on infertile soils, apparently being unable to compete with the other species of tree fern on more fertile sites. The species is typically found growing adjacent to watercourses that contain running water for at least part of the year.

Life cycle of *Dicksonia antarctica*

The tree fern life cycle for *Dicksonia* and the other species of Tasmanian tree ferns is well understood in terms of the sequence of four development stages. The sequence of developmental stages described below has been taken from Neyland (1986).

In the first stage of tree fern development the spores germinate to produce a small structure called the prothallus. After a few weeks the prothallus produces male and female organs. In the presence of water the male organs (antheridia) release sperm cells that fertilise ova within the female organs (archegonia). Dehydration of the prothallus stops this process.

The second stage of development is known as the early sporophyte stage. The fertilised ova (zygotes) develop into miniature ferns that are parasitic on the prothallus until they develop their own chlorophyll and root system. The early sporophyte stage lasts for up to two years, during which time the fronds get progressively larger. During this stage the plants are highly susceptible to inadequate moisture and to either inadequate or excessive light.

The third stage of development is known as the rosette stage. During this stage, lasting for one or two years, the root system develops more fully and the base of the trunk forms.

The fourth stage of development involves the development of the trunk into the familiar tree fern. This stage is thought to commence between four and six years after spore germination. The rate of height growth depends on site conditions. *Dicksonia* has been estimated to grow at between 3.5 and 5.0 centimetres in height per year on average.

Reproduction occurs for the first time at an average age of 23 years. Spore production in all five species is prolific, occurring mainly in late summer. Distribution of the five species is not limited by spore dispersal so much as by the effects of environment conditions on the first two stages of tree fern development. One of these environmental conditions is the proximity of other tree ferns, evidenced by the fact that young tree ferns developing beneath the crowns of larger specimens are unlikely to grow to maturity.

Dicksonia is tolerant of fire and re-shoots readily following burning. When the top part of a plant is cut off, the lower part dies, but the top has a vigorous ability to produce adventitious roots and to resume growth, especially if the mature fronds are pruned.

Epiphytes and *Dicksonia antarctica*

The trunk of *Dicksonia* is particularly dense and fibrous compared to other tree fern species and is excellent at holding moisture. *Dicksonia* can host a high diversity of

epiphytic species. Most epiphytes are bryophytes (mosses and liverworts) and ferns, but lichens are also frequent. Some of these epiphytic species show strong preferences for *Dicksonia* trunks over other available substrates. A recent study into ferns and bryophytes occurring on *Dicksonia* trunks recorded 101 different species across just ten study sites in southeastern Tasmania (Roberts, 2002). This is a remarkably high diversity to be associated with a single host species.

While it is clear that *Dicksonia* trunks offer habitat to many species, variation in epiphytic diversity and composition from site to site suggests the ecological importance of the host is variable. Thus, the conservation value of *Dicksonia* may be greater at some sites than others – depending on how many species are using it as habitat, and whether or not it is supporting rare species. There is a complex range of factors underlying variation in epiphytic diversity, many of which are connected with microclimate or disturbance history.

Epiphytes tend to be sensitive to subtle microclimatic factors, such as humidity. This can be seen from the preference of individual species for a certain height on the trunk. Changes to microclimatic conditions, such as increased light or wind or aspect, are likely to have a great impact on the suitability of *Dicksonia* trunks as habitat.

Age of trunks, and the length of time since disturbance, will also influence the diversity and composition of epiphytes on *Dicksonia*. The oldest and least disturbed trunks are more likely to support late-colonising epiphytic species, and therefore may have higher conservation value. The age and extent of the dominant vegetation is also an important factor, as it influences microclimatic conditions (e.g. wind and light).

Ecology and distribution of *Dicksonia antarctica*

Dicksonia has a broad distribution range across southeastern Australia with natural populations occurring in Tasmania, Victoria, New South Wales and Queensland. It had a very restricted distribution in South Australia, possibly extinct in the wild (Duncan and Isaac 1986, Jones and Clemesha 1977).

In Tasmania, *Dicksonia* is the most common tree fern and is a member of a wide range of plant communities. The altitudinal range for *Dicksonia* is from sea level to 1000 metres. It has been reported to prefer fertile soils, requiring regular moisture and a degree of shading (Neyland 1986). The species becomes uncommon when the canopy is dense and reaches its best development in wet gullies and forests where the canopy is partly broken (Neyland 1986).

The distribution and population size of *Dicksonia* is very much restricted by annual rainfall (see Table 1).

Table 1: Tasmanian distribution of *Dicksonia* based on rainfall (from Neyland 1986).

Average rainfall (mm/year)	Distribution of <i>Dicksonia antarctica</i>
<600	Populations are rare, generally found in isolated stands of a few plants occurring only in the most sheltered sites.
600 – 750	Largely restricted to deeply incised south facing gullies.
750 – 1000	Restricted to moist gullies and sheltered southerly slopes.
>1000	Common where rainfall and other site factors (e.g. soil fertility) are favourable.

Forestry Tasmania estimated the Tasmanian population of trunked *Dicksonia* (i.e. specimens with established trunks) for their 1989 Tree Fern Management Plan. The estimate was based on limited sampling of *Dicksonia* in some favoured forest communities, then extrapolation to determine State totals using 1984 vegetation mapping (Kirkpatrick and Dickenson 1984). This estimate was re-assessed in 2001 using forest communities identified under the Tasmanian *Regional Forest Agreement 1997* (RFA). The 2001 assessment estimated that there were approximately 63 million trunked *Dicksonia* in Tasmania. This was considered to be an under-estimation of the number of trunked *Dicksonia* in the State.

For the purposes of this revision of the Tree Fern Management Plan, the number of trunked *Dicksonia* in Tasmania was re-estimated with the assistance of Forestry Tasmania's Conservation Planning section. This process was undertaken due to the availability of new research data on *Dicksonia* numbers and advances in GIS mapping capabilities. The process of re-estimating the number of trunked *Dicksonia* in Tasmania was undertaken in three stages:

- Identification of RFA forest communities known to be favoured *Dicksonia* habitat and calculation of the extent of these communities using GIS and mapping tools.
- Review of past research and surveys of *Dicksonia* habitat to estimate density of trunked *Dicksonia* for these forest communities.
- *Dicksonia* numbers were generated using the density estimates multiplied by the extent of that forest community mapped for the state.

The determination of suitable *Dicksonia* habitat was initially identified via personal communication with the FPA's Senior Botanist, Fred Duncan, and Forestry Tasmania's Principal Research Officer, Mark Neyland. Seven RFA forest communities (see Table 2) were identified as favoured *Dicksonia* habitat. Forestry Tasmania's Conservation Planning Branch determined the 2006 extent of favoured habitat as follows, using GIS and mapping tools:

- TASVEG mapping units encompassing the identified RFA forest communities were selected and used to calculate the extent of each favoured RFA forest community. A single RFA forest community may correspond to more than one TASVEG mapping unit. TASVEG mapping was used over RFA forest community mapping because it is more recent and is at a finer scale (1:25,000 instead of 1:250,000 for RFA mapping).
- Area analysis was run for each of the TASVEG communities by selected tenures.
- Regenerated forest that was less than 30 years old (i.e post 1977) was excluded from the analysis. This was done due to the results presented by Chuter (2003) and anecdotal evidence that trunked *Dicksonia* is rarely found in regrowth forest less than 30 years old.
- Plantations established in recent years by conversion of favoured communities on State forest and private land were excluded based on the 2006 data.
- Rainforest on Precambrian substrates was excluded because *Dicksonia* is not typically found as an understorey species on this substrate.

There have been many studies that have directly or indirectly generated density estimates of trunked *Dicksonia* in various forest communities. Studies providing cover and abundance data for *Dicksonia* in quadrat or transect samples were used to generate density estimates based on conservative assumptions regarding the number of trunked ferns occurring within the sample area for a given cover/abundance value. The lower values of range data were used.

Published information or field data from the following studies were used to determine densities of trunked *Dicksonia*:

- Blackwood-dominated communities – cover/abundance data from field information collected by Pannell (1992)
- Rainforest communities – a synthesis of cover/abundance data collected by Neyland (1991 plus unpublished data) and frequency data from Kirkpatrick and Moscal (1987).
- Eucalypt communities – figures were derived from the basal area data from Turner (2003), which was collected from 87 sites in wet eucalypt forest more than 30 years old in north-western, central and southern Tasmania.

A summary of the estimates of average number of trunked *Dicksonia* per hectare for equivalent RFA forest communities is given in Table 2. Other available data on *Dicksonia* density within wet eucalypt forest indicates densities can be much greater than the figures given in this table; with more than 1000 trunks per hectare being suggested by data from some sites (FPA research project as outlined in Appendix 2, and Barker 1988).

Table 2: Estimates of average trunked *Dicksonia* per hectare in favoured forest communities.

Equivalent RFA Forest Community	Trunked <i>Dicksonia</i> per Hectare (ha)
Tall Rainforest	180
<i>Acacia melanoxylon</i> on flats and <i>A. melanoxylon</i> on rises	170
<i>Eucalyptus regnans</i> forest	150
Wet <i>E. viminalis</i> on Basalt	150
Tall <i>E. obliqua</i> forest	105
<i>E. brookeriana</i> wet forest	105
Tall <i>E. delegatensis</i> forest	90

Using the parameters and methods described above, it was estimated that there is in excess of one million hectares of forest in Tasmania considered to be favoured *Dicksonia* habitat (see Table 3). An estimate of approximately 130 million trunked *Dicksonia* in Tasmania has been derived from the extent of known suitable habitat (see Table 3). It can be seen from Table 3 that a small proportion (13%) of *Dicksonia* state-wide occur on private land. Most occur on State Forest (48%) or other public land (39%). The extent of favoured *Dicksonia* habitat, and the corresponding estimate for number of trunks, has been broken down by tenure and reservation status in Table 3. The total area of favoured habitat occurring in reserved areas (including informal reserves on private land, state forest and other public land) is approximately 655,000 hectares, and corresponds to approximately 74 million trunked *Dicksonia* (57% of the estimated total).

Table 3: Estimated numbers of trunked *Dicksonia antarctica* occurring in Tasmania, broken down by land tenure and reservation status.

Tenure	Reserve Status	Total Area	Total Stems
Private	Informal Reserves	1,616.00	189,000
	Other	145,906.00	16,766,895
Private Total		147,522.00	16,956,050
Other public	Formal Reserves	453,134.00	48,616,330
	Informal Reserves	3,094.00	373,900
	Other	10,899.00	1,408,520
Other public Total		467,127.00	50,398,935
State forest	Formal Reserves	91,297.00	11,961,700
	Informal Reserves	105,645.00	12,795,065
	Other	337,744.00	38,318,285
State forest Total		534,685.00	63,074,735
Totals		1,149,334.00	130,429,645

A more detailed summary of the extent of favoured *Dicksonia* habitat areas and trunked *Dicksonia* numbers can be seen in Tables 4 and 5.

Table 4: Area of forest types known to provide suitable habitat for *Dicksonia* by land tenure in Tasmania (as at 2006).

Tenure	Reserve Status	Other Wet Forest		Wet Eucalypt Forest					Total
		Rainforest	<i>A. melanoxylon</i>	<i>E. regnans</i>	<i>E. obliqua</i>	<i>E. brookeriana</i>	<i>E. delegatensis</i>	<i>E. viminalis</i>	
Private	Informal Reserves	158	78	47	620	74	327	253	1,616
	Other	13,941	7,461	5,461	78,275	3,340	32,738	4,360	145,906
Private Total		14,100	7,540	5,508	78,895	3,413	33,064	4,613	147,522
Other public	Formal Reserves	186,170	4,706	4,792	64,797	309	74,737	163	453,134
	Informal Reserves	96	626	117	1,412	482	282	56	3,094
	Other	1,801	1,798	722	4,875	25	1,542	114	10,899
Other public Total		188,066	7,131	5,631	71,084	817	76,562	333	467,127
State forest	Formal Reserves	39,510	2,567	6,040	23,963	841	9,376	395	91,297
	Informal Reserves	27,039	2,332	7,791	40,212	65	23,003	424	105,645
	Other	34,579	9,346	34,936	165,344	1,203	85,244	703	337,744
State forest Total		101,129	14,245	48,766	229,519	2,108	117,622	1,521	534,685
TOTALS		303,294	28,916	59,905	379,499	6,338	227,248	6,467	1,149,334

Table 5: Estimates of trunked *Dicksonia* in favoured forest communities by land tenure in Tasmania.

Tenure	Reserve Status	Other Wet Forest		Wet Eucalypt Forest					Total
		Rainforest	<i>A. melanoxylon</i>	<i>E. regnans</i>	<i>E. obliqua</i>	<i>E. brookeriana</i>	<i>E. delegatensis</i>	<i>E. viminalis</i>	
Private	Informal Reserves	28,440	13,260	7,050	65,100	7,770	29,430	37,950	189,000
	Other	2,509,380	1,268,370	819,150	8,218,875	350,700	2,946,420	654,000	16,766,895
Private Total		2,538,000	1,281,800	826,200	8,283,975	358,365	2,975,760	691,950	16,956,050
Other public	Formal Reserves	33,510,600	800,020	718,800	6,803,685	32,445	6,726,330	24,450	48,616,330
	Informal Reserves	17,280	106,420	17,550	148,260	50,610	25,380	8,400	373,900
	Other	324,180	305,660	108,300	511,875	2,625	138,780	17,100	1,408,520
Other public Total		33,851,880	1,212,270	844,650	7,463,820	85,785	6,890,580	49,950	50,398,935
State forest	Formal Reserves	7,111,800	436,390	906,000	2,516,115	88,305	843,840	59,250	11,961,700
	Informal Reserves	4,867,020	396,440	1,168,650	4,222,260	6,825	2,070,270	63,600	12,795,065
	Other	6,224,220	1,588,820	5,240,400	17,361,120	126,315	7,671,960	105,450	38,318,285
State forest Total		18,203,220	2,421,650	7,314,900	24,099,495	221,340	10,585,980	228,150	63,074,735
TOTALS		54,592,920	4,915,720	8,985,750	39,847,395	665,490	20,452,320	970,050	130,429,645

Appendix 2: Research on survival and regeneration of *Dicksonia*

Dicksonia antarctica is widespread and abundant in Tasmanian wet forests. Public and private forest managed for wood production and containing suitable habitat for *Dicksonia* is potentially suitable for tree fern harvesting. The impact of logging operations on *Dicksonia* depends on the type of logging operation, forest type, timber volumes etc. However, logging operations are known to impact upon *Dicksonia*: what proportion of *Dicksonia* survives, and what determines their survival? The potential destruction of tree ferns in logged areas raises the question of whether these plants could be harvested without compromising regeneration of the species.

Research in Tasmania and Victoria has investigated the survival and regeneration of *Dicksonia* associated with logging. This has greatly improved our knowledge of the impact of logging on *Dicksonia* and has enabled prescriptions for tree fern harvesting to be developed. We are continuing to undertake research to further our knowledge and refine these prescriptions. The following details some of the findings as they relate to the survival and regeneration of *Dicksonia* associated with wet forest logging.

Dicksonia survival and regeneration following disturbances

The survival of *Dicksonia* is known to be affected by the logging and regeneration process associated with native forest silviculture. Results from two Tasmanian studies indicate that logging and regeneration practices in wet forests have a severe impact on *Dicksonia* populations, but over time, the species regenerates in the regrowth forest.

Peacock and Duncan (1995) reported 70% *Dicksonia* survival after a cable logging operation in wet eucalypt forest, but after the regeneration burn survival had fallen to 42% at 3 months and 30% at 8 months. This figure has remained stable for the following 10 years. The interaction between various silvicultural techniques and survival of *Dicksonia* over the broader timber harvesting area is relatively unknown. The Forest Practices Authority is currently undertaking research examining this.

Wet eucalypt forests studied by Chuter (2003) are typical of production forests which are favoured for harvesting of *Dicksonia*. The forest regrowth sites surveyed (15-through to 45-year-old regrowth) were representative of forest harvesting and regeneration techniques that have been used for the past 45 years, and are currently still practiced. Old-growth forest sample sites were used as controls and were defined as forests not disturbed for greater than 250 years.

Chuter (2003) recorded the density of mature *Dicksonia* and recruits in forests of various age classes, as summarised in Table 1. This research found no significant ($P < 0.05$) difference in the density of mature *Dicksonia* between old-growth forest, 45- and 30-year-old wet eucalypt regrowth forest, however each of these forest-ages had significantly ($P < 0.05$) more dense mature *Dicksonia* than the 15 year old regrowth.

The relatively uniform density reported by Chuter (2003) of mature *Dicksonia* in eucalypt regrowth forest 30 years and older suggests that a carrying capacity is reached. This notion is supported by the observed dramatic decrease in *Dicksonia* recruits in old-growth forests compared with 45-year-old regrowth (Table 1). Chuter (2003) also found the 30- and 45-year-old regrowth sites to support significantly ($P < 0.05$) greater densities of recruits than 15-year-old regrowth.

Chuter (2003) found the average density of *Dicksonia* recruits exceeded the average density of mature plants in the 30- and 45-year-old wet eucalypt regrowth forests (Table 1). The proliferation of recruits in these forest age-classes suggests that the

logging/regeneration disturbance has stimulated recruitment and conditions are suitable for recruitment 'mid' rotation period (typically 80 – 85 years as reported by Peacock and Duncan, 1995).

Table 1: Summary of results from Chuter (2003). The average densities of mature tree ferns or recruits in different aged native forests are displayed.

Tree Ferns	Density stems/ha			
	15 yr old regrowth	30 yr old regrowth	45 yr old regrowth	Old growth (250+ yrs)
Mature	97	308	313	381
Recruits	133	442	430	130
Total	230	750	743	511

Chuter (2003) reported that 41-year-old wet eucalypt regrowth forests contained a range of *Dicksonia* heights, ranging from 0.60 m through to 2.1m. Approximately half of all *Dicksonia* measured were 1.0 m or taller. Surveys of 15, 28 and 41 year wet eucalypt regrowth forest indicated a range of height classes, with the average height increasing with forest age. The average height of *Dicksonia* in 41-year-old wet eucalypt regrowth forest was 1.40 m, which was significantly ($P < 0.05$) greater than 28- and 15-year-old wet eucalypt regrowth forests (0.79 m and 0.27 m respectively). These results showed a positive relationship between the age of the regenerating forest and the size of *Dicksonia*, suggesting that both survival and regeneration has occurred following the intensive logging and regeneration treatments.

***Dicksonia* and associated biodiversity**

Chuter (2003) reported no significant ($P < 0.05$) difference in species richness of vascular epiphytes on *Dicksonia* between 15, 30 and 45 year-old wet eucalypt regrowth forest. However, epiphytic richness in the regrowth forests was significantly ($P < 0.05$) less than that of old-growth forests. The data presented by Chuter (2003), indicates that typical forestry operations reduce the *Dicksonia* population and epiphytic diversity in wet eucalypt regrowth forests. However, over time, *Dicksonia* survival and recruitment returns the population size to that of old-growth forest.

Ough and Murphy (1996) noted that epiphytes are rarely seen on *Dicksonia* trunks that are less than 2 m in height. The height ranges and averages of *Dicksonia* recorded in regenerating wet eucalypt forests indicate that structural diversity is maintained. These results indicate that *Dicksonia* are suitable for colonisation by late-successional epiphytes within the timber harvesting rotation period (typically 80–85 years). Maintenance of *Dicksonia* at the landscape level provides a source of *Dicksonia* spores and propagules of late-successional epiphytes.

Current research – *Dicksonia* survival and regeneration

The introduction of the Tasmanian Tree Fern Management Plan and tagging system generated funding for the implementation, monitoring and enforcement of the plan by the Forest Practices Authority. These funds were also to be used for undertaking research into the sustainable management of tree ferns. In 2004 the FPA established a tree fern project and employed a Project Officer (*Tree Fern Research*) to undertake this research.

The tree fern project has developed a major project that builds upon the work undertaken by Peacock and Duncan (1995) and Chuter (2003) in examining the survival and regeneration of tree ferns following logging operations. This major project has been designed to examine the impact of three silvicultural prescriptions commonly applied in Tasmanian wet forests: ground based clearfell, burn and sow; cable harvesting clearfell, burn and sow; and aggregated retention. All of these silvicultural practices involve intensive logging and regeneration processes in areas of native forest. This project aims to determine the impact of logging and regeneration in native forest on the survival and regeneration of tree ferns and to what extent can tree ferns be harvested on a sustainable basis.

In consultation with Forestry Tasmania, three coupes to be logged and regenerated back to native forest were selected for this project: Florentine 26A (FO026A – ground-based harvest; clearfell, burn and sow); Ben Nevis 117E (BS117E - cable harvest, clearfell, burn and sow); and Styx 18E (SX018E – ground-based, aggregated retention). All of the coupes have a population of *Dicksonia* throughout and were planned for harvesting, burning and sowing during the 2005-2007 period.

In each coupe, 30+ permanent plots measuring 10m x 10m (0.01 ha) have been located using methods for random distribution. Tree ferns located in each plot have been tagged with metal tags and their height, diameter, conformation, epiphytic cover and health recorded. The surrounding features of each plot (i.e. timber volume, plant species, canopy structure and topography) have also been detailed.

The establishment of permanent plots enables the monitoring of these plots following logging, the regeneration burn and into the future. Tagging of each *Dicksonia* allows for the survival of individuals to be monitored. The regeneration of the species within plot areas can also be evaluated over time.

All three coupes have been logged and are planned to be burnt and aurally sown in the autumn of 2007. The post-logging assessments have been completed in FO026A and BS117E, with SX018E to be undertaken early in 2007. The following tables (2 and 3) summarise some general data collected from these sites:

Table 2: Tree ferns assessed and tree ferns per unit area.

Coupe	Tree Ferns Assessed	Average stems per plot (0.01 ha.)	Average stems per ha.
FO026A	457	13	1306
BS117E	181	6	603
SX018E	156	4	390

The estimated stems per hectare based on plot assessments indicate why in many respects the figures generated by Neyland (1986) are considered to be conservative (see Table 2). The coupes included in this experiment are typical of those subject to logging operations with the potential to be considered for tree fern harvesting under conditions in this Plan.

Table 3: Tree fern characteristics before and after logging

Coupe	Ferns relocated post logging (%)	Relocated ferns lying on ground post logging (%)	Average health score pre logging	Average health score post logging
FO026A	26	53	Good	Poor
BS117E	37	35	Good	Average
SX018E	29	57	Good	Poor

***Note:** Health of ferns was scored as good, average, poor or dead.

The percentage of ferns relocated in the FO026A, BS117E and SX018E coupes indicated the level of disturbance that has occurred in these logged areas and the impact upon the ferns (see Table 3). In most instances the fact that the tree ferns were not relocated in the plots indicates that the ferns have been physically disturbed and are either buried underneath logging slash or have been moved some distance from the plot. However, some tree ferns lost their tag or untagged ferns were moved into plots during logging. In both coupes, the number of relocated ferns that remained upright was greatly reduced. Assessment of fern health post logging identified a decrease in the average health scoring of all ferns. This indicated the impact of the logging disturbance and exposure on tree fern health and the likelihood these factors will contribute to tree fern mortality. The fact that ferns were not relocated does not necessarily mean that the ferns have been destroyed, but the relative disturbance combined with changes in health will increase their chance of mortality from further exposure and being burnt during the regeneration burn.

Assessment of these plots following the regeneration burn and into the future will provide a great deal of information on the survival of these ferns during the logging and regeneration process. In addition to this, how the species regenerates with the regenerating forest and how this resource can be managed more efficiently. Results from this research will be used for future revisions of the Tree Fern Management Plan.

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1.0	2007	FPA Biodiversity Program	Original document
1.1	Feb 2011	Nina Roberts	Updated FPA logo and added document control information.
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Stages required for release outside FPA

Category of advice		A1
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Specialist	Required	2007
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¹Not required for minor updates in 2012