

## ***Treefern 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 *Treefern management plan* outlines a system to facilitate and regulate the sustainable harvesting of *Dicksonia antarctica* treeferns in Tasmania. Conditions of this plan are consistent with the long term conservation of *Dicksonia antarctica* in its natural habitat.

This *Treefern management plan* meets the Wildlife Trade Guidelines, under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. The revision of this plan also meets requirements set out in the draft *National treefern harvesting guidelines* endorsed by the members of the National Flora Network and Department of Primary Industries, Parks, Water and Environment.

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 *Treefern management plan* that was approved by the Australian Government in 2007.

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## 1. Introduction

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

Treeferns have been long sought after for their aesthetic properties and have many horticultural applications. *Dicksonia* is a robust treefern 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 treefern 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 treeferns. Integration of treefern 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 treefern 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 treeferns.

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

Commercial harvesting and export of treeferns 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 the Environment and Water Resources. In 2001, the *Treefern 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 Primary Industries, Parks, Water and Environment); the Tasmanian Department of Primary Industries, Water and Environment [now the Department of Primary Industries and Water (DPIPWE)] and other stakeholders.

The introduction of the 2001 *Treefern management plan* and amendments to the Tasmanian *Forest Practices Act 1985* and Tasmanian *Forest Practices Regulations*

incorporated commercial treefern harvesting into the forest practices system. This process was accompanied by the introduction of a tagging system for harvested treeferns and led to the complete regulation of treefern harvesting in Tasmania.

The *Treefern management plan* was subsequently revised in 2005 and 2007.

This *Treefern management plan* applies to all land tenures in Tasmania. Treefern 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 treeferns 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 treefern plantations or nursery sites.

## 2. Aims of this management plan

The aims of this management plan are to:

- Facilitate the sustainable harvesting of treeferns 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 treefern plantations and nursery sites.
- Provide effective and efficient regulation of harvesting of treeferns in Tasmania.
- Educate all stakeholders on the regulation of treefern harvesting in Tasmania.
- Foster research into the distribution, ecology and sustainable harvesting of treeferns.

## 3. Outcomes from this management plan

The anticipated outcomes of this management plan are to:

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

## 4. Definitions

The following terms are used throughout this management plan:

- **Commercial treefern harvesting** – Harvesting of treeferns for the purposes of trade, or harvesting when more than six treeferns 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.
- **Treefern** – *Dicksonia antarctica*.



Tall *Dicksonia* growing in Southern Tasmania



Tall wet eucalypt forest with a dense *Dicksonia* understorey



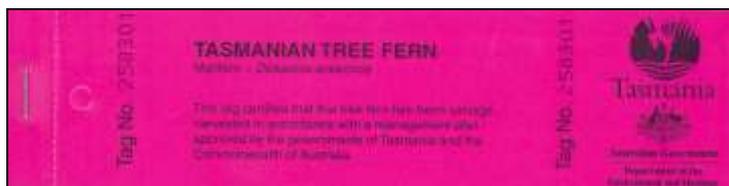
Live *Dicksonia* being harvested



*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 treefern harvesting in Tasmania

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

Under this management plan, treefern 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 treeferns. This is followed by a succession of regeneration and growth of dominant and understorey species, including treeferns. In either scenario, treefern harvesting allows for utilisation of treeferns without compromising the maintenance of the species in the landscape.

It has been estimated that there are approximately 130 million trunked treeferns in Tasmania (see Appendix 1 – ‘Ecology and Distribution of *Dicksonia antarctica*’). Trunked treeferns are those that have progressed from an immature stage to a trunk-forming stage. Approximately 74 million of these trunked treeferns 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, treeferns are retained through existing requirements and prescriptions, including streamside reserves, habitat clumps, wildlife habitat strips, aggregates and ‘treefern islands’ (areas with high densities of treeferns that may be subject to constraints in forest practices plans). Reservation and retention of treeferns provides a substantial source of spore for regenerating the species in the logged area. Treeferns produce copious amounts of spore that are widely distributed by wind and readily develop into sporophytes that colonise regenerating forests. Treeferns 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 treeferns 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 treeferns | No. of treefern 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 treefern 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. Treefern 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 an 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 treefern harvesting

Terms and conditions relating to treefern harvesting were inserted into the Forest Practices Act in 2001, as part of the approval process for the 2001 *Treefern management plan*. These terms and conditions are summarised below:

- ‘treeferns’ 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 treefern harvesting (see Page 8 – ‘Situations where treefern harvesting may occur’)
- all harvested treeferns must have a Tasmanian treefern 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 treeferns do not apply where:

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

### 5.2 Treefern harvesting under the *Treefern management plan*

This *Treefern management plan* applies across all land tenures in Tasmania. Treefern harvesting operations are regulated and enforced under the Forest Practices Act, as described above.

This *Treefern management plan* has taken into account the principles in section 5.3, taken from the draft *National treefern harvesting guidelines* for the sustainable harvesting of treeferns in states where commercial harvesting occurs. These guidelines were developed in 2006 and involved liaison between representatives of the Australian Government (Department of Primary Industries, Parks, Water and Environment), and state and territory agencies involved in regulation of wild flora harvesting. Some of the principles have been modified to fit within Tasmania's legislation and regulatory framework.

### 5.3 Treefern harvesting principles

- Extraction of treeferns should not be the catalyst for forestry operations. Treefern harvesting must not occur prior to a final land use decision being confirmed and the approval of a forestry operation on the site.
- Treeferns 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).
- Treeferns may be harvested from other native forest operations if all of the following conditions apply:
  - the harvesting of treeferns and the forestry operation itself comply with appropriate regulations
  - treeferns 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)
  - treeferns will regenerate adequately on the site.
- Treeferns 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 treefern harvesting, and reserved areas, are clearly defined and marked prior to harvesting in accordance with the *Forest Practices Code*.
- Treefern harvesting operations should be managed and monitored by the responsible FPO in conjunction with the FPA. It is the responsibility of treefern harvesters, generally through the land manager, to familiarise themselves with regulations and prescriptions applying to any treefern harvesting operation (e.g. location of boundaries of harvesting areas).
- Treefern 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 treefern harvesting may occur

Under this *Treefern management plan*, commercial harvesting of treeferns 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
- treefern plantations or nursery sites.

Situations where treefern 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 treeferns 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 *Treefern management plan* permits treefern 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 treeferns) 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 treefern 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 treeferns 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 treeferns that have either survived the plantation establishment process or have regenerated from spore. There are no restrictions on the harvesting of treeferns in plantations other than the normal provisions of the *Forest Practices Code*. Harvesting of treeferns may be undertaken as a separate operation to the timber harvesting (e.g. harvesting treeferns ‘mid-rotation’ may be safer and more efficient than integrating timber and treefern harvesting operations).

#### **5.4.4 Treefern plantations or nursery sites**

Treefern plantations or nursery sites dedicated to the production of trunked treeferns may be harvested in accordance with the provisions of the forest practices system. Treefern harvesters should consult with an FPO and the FPA prior to the establishment or harvest of such sites.

## 5.5 Monitoring of treefern harvesting

Prior to commencement of treefern harvesting, FPOs must ensure that:

- areas designated for harvesting of treeferns must be clearly demarcated
- all other relevant marking has been completed in the coupe
- treefern harvesters receive an appropriate briefing on the FPP.

The FPO must undertake regular inspections of treefern harvesting sites and report to the FPA any breaches or concerns about the application of the FPP or *Treefern management plan*. At the completion of treefern 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 treefern harvesting are subject to such auditing and review.

Selective treefern harvesting operations and a proportion of salvage operations will be specifically assessed by the FPA to assess compliance with conditions of the FPP and *Treefern 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 *Treefern management plans*. This will provide a means of adaptive management for the *Treefern management plan* by refining prescriptions.

## 5.6 Treefern tags

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

Forest practices plans proposed for treefern harvesting must have treefern numbers estimated by the FPO, in order that an appropriate number of treefern tags are issued to the treefern harvester for that FPP area. Treeferns are counted in sample plots located in different botanical communities within the FPP area, and then these numbers extrapolated to estimate the number of treeferns in the FPP area. The methods for sample plot counts are covered in FPO training.

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

- unique FPP identification number for the area from which the treeferns will be harvested
- number of treeferns which the FPO estimates can be harvested
- name of certifying FPO
- name of the treefern 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 treefern harvesting operational phase
- person responsible for arranging for FPO to undertake checking, and signature of responsible person.

Issued tags must only be attached to treeferns 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 treefern tag request form) or returned to the FPA for a refund.

Treefern tags are issued sequentially for each FPP and will not exceed the prescribed number of treeferns 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 treefern harvester. Tags are issued under section 18A(b) of the Forest Practices Act and can be obtained for two size classes of fern:

- 1) treefern stem greater than 30 cm in length (priced at one fee unit or \$1.44 as of 1 July 2012)
- 2) treefern 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 treefern management system
- database and record keeping
- monitoring and enforcement
- research into sustainable management of treeferns in Tasmania.

Treefern 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 treefern harvesting to ensure that such harvesting meets the objectives of this *Treefern management plan*.

The harvesting of treeferns 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 treeferns are summarised in Table 1.

**Table 1:** Summary of regulatory system for treefern harvesting in Tasmania under this *Treefern management plan*

| Type of Treefern Harvesting | Source of Treeferns                   | Forestry Operation                       | Conditions for Treefern Harvesting                          | FPA Notification Required | FPP Req'd | Treefern 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                  | Treefern plantations or nursery sites | Treefern 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 treeferns

*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 treeferns.

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 treefern harvesters have little interest in undertaking salvage harvesting from environments and forest types where *Dicksonia* is uncommon.

This *Treefern 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 treeferns**

### **7.1 Environmental**

The sustainable harvesting of treeferns from native forest, as described in this *Treefern 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 treeferns 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 treeferns and associated epiphytes.

The current regulatory system, including requirements for the preparation of FPPs and the treefern 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 treeferns 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 *Treefern 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 treeferns 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 treeferns due to: legislative restrictions; absence or few treeferns present; or logistical/economic issues that make treefern harvesting unviable. In many coupes, time and safety constraints mean that only a fraction of the total available ferns are removed.

The treefern 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 treeferns can be sustainably utilised in accordance with this *Treefern 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 treefern harvesting or distribution operations has its own *Treefern 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 treefern harvesting, using the draft *National treefern harvesting guidelines* as a basis, would result in a more consistent approach to treefern management in the different jurisdictions.

The primary source of treeferns 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 *Treefern management plan*, auditing and nursery inspections undertaken by the FPA(B) has revealed a decrease in illegally harvested treeferns 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 treeferns. Therefore, continuation of monitoring and education is required. The following monitoring will be undertaken:

- Checks of treefern harvesting operations by FPOs as part of normal FPP implementation and inspections, to ensure that treefern harvesting complies with conditions in the FPP.
- Spot checks of treefern 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 treefern 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.
- Treefern harvesters are required to keep records of the treefern tag numbers and the names and addresses of retail outlets that are supplied with treeferns. Under the Forest Practices Act, an FPO can request that this information be provided by anyone trading in treeferns.

## **8.2 Interstate distribution of treeferns**

According to data obtained from the FPA's and the Department of Primary Industries, Parks, Water and Environment's databases, the majority of Tasmanian treeferns 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 treeferns into Victoria. Comparison of information from the Department of Primary Industries, Parks, Water and Environment and DSE with the FPA's FPP and treefern 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 treeferns.

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 treeferns**

International export of treeferns requires an export permit from the Department of Primary Industries, Parks, Water and Environment. The Department of Primary Industries, Parks, Water and Environment needs to receive a copy of the relevant documentation i.e. the receipt for treefern tags and the FPP number or copy of the approved FPP. The process of the Department of Primary Industries, Parks, Water and Environment issuing an export permit involves the recording of the basic details of the exporter, number of treeferns, FPP number and treefern tags issued. The FPA and the Department of Primary Industries, Parks, Water and Environment exchange information on treefern tag numbers issued to harvesters/exporters.

The international export of treeferns 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 treeferns are in storage and (particularly) in fumigation or other treatments prior to export in containers.

Detailed inspection of treeferns 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 *Treefern management plan* should involve liaison with and education of stakeholders. The following commitments have been adapted from the draft National Treefern Harvesting Guidelines:

- The FPA will produce technical information on treeferns including regulation of treefern harvesting. These will be provided to harvesters, industry associations, retailers and other stakeholders.
- Regular liaison will occur between various stakeholders (FPA, DPIPWE, Department of Primary Industries, Parks, Water and Environment, AQIS, land managers, treefern harvesters and retailers) to ensure that the regulations for treefern harvesting and trading in Tasmania are understood, implemented and reviewed as appropriate. In addition to this, regular sharing of information between stakeholders on treefern 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, treefern harvesters and other stakeholders will provide a means of adaptive management working within the constraints of this *Treefern management plan* to improve the process.
- Areas where treefern 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 treefern tags issued by the FPA will be an indicator of compliance.
- The exclusion of treefern harvesting from reserves or areas excluded by prescription represents compliance with this *Treefern 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 treefern harvesting has taken place will provide an assessment of the survival and regeneration of treeferns and the maintenance of the species relative to the management prescriptions applied.
- Research examining the sustainable management of treeferns will continue and the results of this work will be delivered to stakeholders and integrated into future reviews of the *Treefern management plan*. This may also serve to provide information for adaptive management during the life of the *Treefern management plan*.
- The Treefern Project will continue to deliver information on treefern management to stakeholders. The success of this information delivery will be

reflected in particular by nursery and harvester knowledge and public enquiries about treeferns.

## **11. Reporting of management plan implementation**

The FPA will report on the implementation of this *Treefern 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 treefern harvesting
- number of treefern tags issued
- monitoring and investigations of treefern 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 treeferns (as detailed in Appendix 2). These programs will continue to provide important information to improve the effectiveness and sustainability of treefern management in Tasmanian forests, and to integrate such information and procedures into future revisions of the Tasmanian *Treefern management plan*.

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## Appendix 1: Background information on Tasmanian treeferns

### Characteristics of Tasmanian treeferns

There are five Tasmanian fern species that regularly form trunks over one metre in height and that are referred to as treeferns. These species are: *Todea barbara* (L.) T. Moore (king fern), *Dicksonia antarctica* Labill. (manfern or soft treefern), *Cyathea australis* (R. Br.) Domin (rough treefern), *Cyathea cunninghamii* Hook. f. (slender treefern) and *Cyathea Xmarcescens* Wakefield (skirted treefern). *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.

Treeferns 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 treeferns in Tasmania is limited to *Dicksonia*. The inclusion of a description of the other treeferns 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).

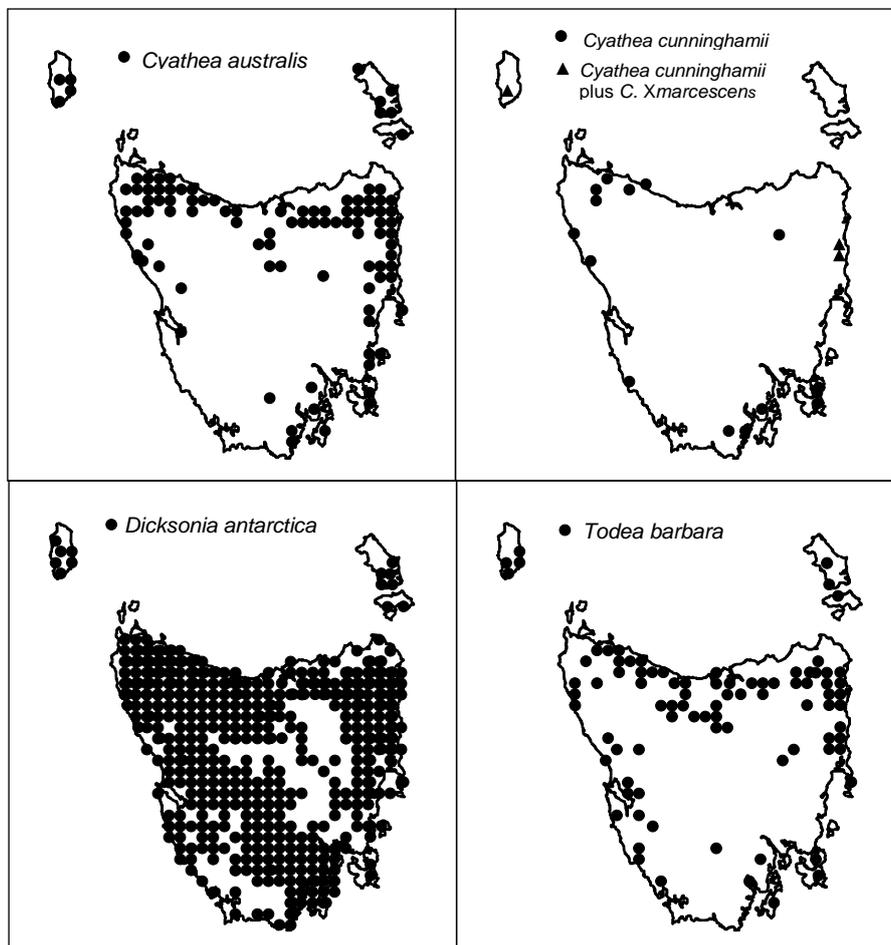
### Key to Tasmanian treeferns (adapted from Duncan and Neyland 1986)

- 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 treeferns not prescribed for harvest under the Tasmanian *Treefern 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 treeferns 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 treefern 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 treefern 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 treefern life cycle for *Dicksonia* and the other species of Tasmanian treeferns 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 treefern 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 treefern. 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 treefern development. One of these environmental conditions is the proximity of other treeferns, evidenced by the fact that young treeferns 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 treefern 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 treefern 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).

| <b>Average rainfall<br/>(mm/year)</b> | <b>Distribution of <i>Dicksonia antarctica</i></b>   |
|---------------------------------------|--|
| <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 *Treefern management plan*. The estimate was based on limited sampling of *Dicksonia* in some favoured forest communities, then extrapolation to determined 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 *Treefern 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.

| <b>Tenure</b>             | <b>Reserve Status</b> | <b>Total Area</b>   | <b>Total Stems</b> |
|---------------------------|-----------------------|---------------------|--------------------|
| Private                   | Informal Reserves     | 1,616.00            | 189,000            |
|                           | Other                 | 145,906.00          | 16,766,895         |
| <b>Private Total</b>      |                       | <b>147,522.00</b>   | <b>16,956,050</b>  |
| Other public              | Formal Reserves       | 453,134.00          | 48,616,330         |
|                           | Informal Reserves     | 3,094.00            | 373,900            |
|                           | Other                 | 10,899.00           | 1,408,520          |
| <b>Other public Total</b> |                       | <b>467,127.00</b>   | <b>50,398,935</b>  |
| 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         |
| <b>State forest Total</b> |                       | <b>534,685.00</b>   | <b>63,074,735</b>  |
| <b>Totals</b>             |                       | <b>1,149,334.00</b> | <b>130,429,645</b> |

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

**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         |
| <b>Private Total</b>      |                   | <b>2,538,000</b>  | <b>1,281,800</b>      | <b>826,200</b>      | <b>8,283,975</b>  | <b>358,365</b>        | <b>2,975,760</b>       | <b>691,950</b>      | <b>16,956,050</b>  |
| 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          |
| <b>Other public Total</b> |                   | <b>33,851,880</b> | <b>1,212,270</b>      | <b>844,650</b>      | <b>7,463,820</b>  | <b>85,785</b>         | <b>6,890,580</b>       | <b>49,950</b>       | <b>50,398,935</b>  |
| 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         |
| <b>State forest Total</b> |                   | <b>18,203,220</b> | <b>2,421,650</b>      | <b>7,314,900</b>    | <b>24,099,495</b> | <b>221,340</b>        | <b>10,585,980</b>      | <b>228,150</b>      | <b>63,074,735</b>  |
| <b>TOTALS</b>             |                   | <b>54,592,920</b> | <b>4,915,720</b>      | <b>8,985,750</b>    | <b>39,847,395</b> | <b>665,490</b>        | <b>20,452,320</b>      | <b>970,050</b>      | <b>130,429,645</b> |

## **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 treefern 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 treeferns 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 treefern 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 treeferns or recruits in different aged native forests are displayed.

| Treeferns    | 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                   |
| <b>Total</b> | <b>230</b>         | <b>750</b>         | <b>743</b>         | <b>511</b>            |

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 *Treefern 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 treeferns. In 2004 the FPA established a treefern project and employed a Project Officer (*Treefern Research*) to undertake this research.

The treefern 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 treeferns 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 treeferns and to what extent can treeferns 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. Treeferns 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 aerially 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:** Treeferns assessed and treeferns per unit area.

| Coupe         | Treeferns Assessed | Average stems per plot<br>(0.01 ha.) | Average stems per ha. |
|---------------|--------------------|--------------------------------------|-----------------------|
| <b>FO026A</b> | 457                | 13                                   | 1306                  |
| <b>BS117E</b> | 181                | 6                                    | 603                   |
| <b>SX018E</b> | 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 treefern harvesting under conditions in this Plan.

**Table 3:** Treefern 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 treeferns 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 treeferns 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 treefern health and the likelihood these factors will contribute to treefern 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 *Treefern management plan*.

## Document Control Log Table

### Document Summary Information

|                            |   |
|----------------------------|---|
| <b>Document name</b>       | <i>Treefern management plan</i> for Tasmania 2012 |
| <b>Version</b>             | 1.2   |
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### Version Control

| Version | Date     | Author(s)                  | Summary of changes                                       |
|---------|----------|----------------------------|--|
| 1.0     | 2007     | FPA Biodiversity Program   | Original document  |
| 1.1     | Feb 2011 | Nina Roberts               | Updated FPA logo and added document control information. |
| 1.2     | May 2012 | Tim Leaman and Chris Grove | Minor revisions to the 2007 version and style edit.      |

### Stages required for release outside FPA

| Category of advice          |                                    | A1               |
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| Stages                      | Required/not required <sup>1</sup> | Completed (date) |
| Specialist                  | Required                           | 2007             |
| Line Manager                | Required                           | 2007             |
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| CFPO                        | Required                           | 2007             |
| FPAC                        | Required                           | 2007             |
| Board                       | Required                           | 2007             |

<sup>1</sup>Not required for minor updates in 2012