

Recovery Plan for the Giant Fern (*Angiopteris evecta*)



October 2001

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NSW National Parks and Wildlife Service
43 Bridge Street
(PO Box 1967)
Hurstville NSW 2220
Tel: 02 95856444
www.npws.nsw.gov.au

Requests for information or comments regarding the recovery program for *Angiopteris evecta* are best directed to:
Threatened Species Unit, Northern Directorate.
NSW National Parks and Wildlife Service
Locked Bag 914
Coffs Harbour NSW 2450

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Illustrator: Frances Blines

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Recovery Plan for the Giant Fern (*Angiopteris evecta*)

Foreword

This document constitutes the formal New South Wales State recovery plan for the Giant Fern (*Angiopteris evecta*) and, as such, considers the conservation requirements of the species in NSW. It identifies the actions to be taken to ensure the long-term viability of the Giant Fern in nature and the parties who will undertake these actions.

The Giant Fern is included as endangered under the NSW *Threatened Species Conservation Act 1995*. This species of fern can form a massive, woody trunk up to 1 metre in diameter and 3 metres in height, and can grow fronds up to 8 metres in length. Only one individual is known from NSW, and this occurs on private land in north-eastern NSW.

The future recovery actions detailed in this recovery plan include: (i) developing and implementing a management strategy that consists of fire management, habitat rehabilitation, long-term protection and site security, (ii) determining whether further populations of this species exist in NSW (iii) research into the ecological requirements of the species, and (iv) developing a contingency plan.

It is intended that this recovery plan will be implemented over a three year period. The NSW National Parks and Wildlife Service will undertake the actions included in this recovery plan.



Michael Wright
A/Director-General



Bob Debus MP
Minister for the Environment

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1 Introduction

Angiopteris evecta Hoffm., (the Giant Fern) is an ancient species with reputedly the largest fronds of any fern on earth (Jones and Clemesha 1993). The species was thought to be extinct in the wild in New South Wales (NSW) until a single specimen was recorded in the far north-east of the State in 1978. The Giant Fern is the only species of the genus *Angiopteris* found in Australia.

This document constitutes the formal State recovery plan for the Giant Fern in NSW. It identifies the actions to be taken to ensure the long-term viability of the Giant Fern in nature and the parties who will undertake these actions. The attainment of this recovery plan's objectives are subject to budgetary and other constraints affecting the parties involved. It may also be necessary to amend this plan in the event of new information. The information in this recovery plan is accurate to September 2001.

This plan has been prepared by the New South Wales National Parks and Wildlife Service (NPWS).

2 Legislative Context

2.1 Legal Status

Individuals of the Giant Fern recorded from NSW are listed as endangered under the NSW *Threatened Species Conservation Act 1995* (TSC Act).

Consequences of a species being listed under the TSC Act include:

- a recovery plan must be prepared;
- consideration must be given to the species in assessing the impacts of developments and activities with the aim of minimising adverse impacts; and
- other actions that are likely to result in the harming or picking of that species or damage its habitat are licensed.

2.2 Recovery Plan Preparation

The TSC Act provides a legislative framework to protect and encourage the recovery of threatened species, endangered populations and endangered ecological communities in NSW. Under this legislation the Director-General of the National Parks and Wildlife has a responsibility to prepare recovery plans for all species, populations and ecological communities listed as endangered or vulnerable on the TSC Act schedules. Similarly, the Commonwealth *Environment Protection and*

Biodiversity Conservation Act 1999 (EPBC Act) requires the Commonwealth Minister for the Environment to ensure the preparation of a recovery plan for nationally listed species and communities, or adopt plans prepared by others, including those developed by State agencies. Both Acts include specific requirements for the matters to be addressed by recovery plans and the administrative process for preparing recovery plans.

This recovery plan has been prepared to satisfy the requirements of the TSC Act, but since it does not cover the full range of the species within Australia it may not meet all the requirements of the EPBC Act.

2.3 Recovery Plan Implementation

The TSC Act requires that a public authority must take any appropriate measures available to implement actions included in a recovery plan for which they have agreed to be responsible. Public authorities and councils identified as responsible for the implementation of recovery plan actions are required by the TSC Act to report on measures taken to implement those actions. In addition, the TSC Act specifies that public authorities must not make decisions that are inconsistent with the provisions of the recovery plan. The government agency relevant to this plan is the NPWS. Consequently, the actions outlined for this agency must be implemented as described in the recovery plan.

2.4 Relationship to Other Legislation

The site from which the Giant Fern was recorded in NSW is held under private ownership. Relevant legislation includes:

- NSW *National Parks and Wildlife Act 1974*;
- NSW *Environmental Planning and Assessment Act 1979*;
- NSW *Rural Fires Act 1997*;
- NSW *Native Vegetation Conservation Act 1997*.

The interaction of the above legislation with the TSC Act is varied. The most significant implications are described below and in Section 2.6.

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) requires that a licence must be obtained to propagate and sell specimens propagated from material sourced from individuals of the Giant Fern occurring in NSW. The NPW Act and TSC Act are administered by the NPWS.

These Acts require that any proposal to 'pick' or 'damage the habitat of' a threatened plant species

must be approved by the NPWS unless: the activity, has been granted consent or approval under the *Environmental Planning and Assessment Act 1979* (EP&A Act), is a routine agricultural activity, is subject to a Property Management Plan approved by the NPWS or is conducted with approval under the *Rural Fires Act 1997* (RF Act). If a proposal is likely to have a significant impact on the Giant Fern then a Species Impact Statement (SIS) must be prepared. Landowners may also enter into Voluntary Conservation Agreements (VCAs) with the NPWS which, although not removing the requirement for approval to 'pick' or 'damage the habitat of' a threatened plant, can result in land management assistance and rate exemptions.

Rural Fires Act 1997

The RF Act requires that all parties involved in fire suppression and prevention must have regard to the principles of Ecologically Sustainable Development (ESD) when exercising their functions and when preparing Draft Operational Plans and Draft Bush Fire Risk Management Plans. Consideration of the principles of ESD must include the conservation of biological diversity and ecological integrity. Within this, consideration must be given to the impact on threatened species and their habitats.

Native Vegetation Conservation Act 1997

The clearing of native vegetation in NSW is subject to consent from the Department of Land and Water Conservation (DLWC) in accordance with the NSW *Native Vegetation Conservation Act 1997* (NVC Act). The NVC Act is integrated with the EP&A Act, and requires that threatened species are taken into account when considering clearing applications under Part 4 of the EP&A Act. There are, however, a series of exemptions and the NVC Act does not apply to certain types of land including land zoned as 'residential', 'township', 'village', 'industrial', or 'business'. The private land supporting the Giant Fern is zoned Rural 1a and thus the NVC Act applies.

The purpose of the NVC Act is the conservation and sustainable management of native vegetation and, in particular, the protection of native vegetation of high conservation significance. Under this Act, approval from the DLWC is a prerequisite for vegetation clearance unless a vegetation management plan has been approved or unless the clearance is of an exempt nature. The NVC Act requires that the Director General of National Parks and Wildlife be consulted in the matter of threatened species and their habitat. Landholders may voluntarily enter into property agreements with DLWC, whereby government assistance can be provided to protect native vegetation.

The NVC Act provides for the strategic and regional based management of native vegetation in NSW through the preparation of Regional Vegetation Management Plans (RVMPs). The NVC Act requires that certain matters be considered when preparing a RVMP, including 'the conservation of native vegetation and native species (particularly threatened species) and their habitat'. The provisions of the NVC Act have regard to the TSC Act. No RVMP or property agreements relating to the habitat of the Giant Fern have yet been prepared.

The NVC Act states that where a recovery plan applies to land which is the subject of a RVMP, the RVMP must provide for 'at least the same level of protection and conservation in relation to native vegetation to that provided by the instrument or recovery plan', consistent with the objectives of the NVC Act.

2.5 Critical Habitat

The TSC Act makes provision for the identification and declaration of critical habitat. Under the TSC Act, critical habitat may be identified for any endangered species, population or ecological community occurring on NSW lands. Once declared, it becomes an offence to damage critical habitat (unless the action is exempted under the provisions of the TSC Act) and a SIS is mandatory for all developments and activities proposed within declared critical habitat.

To date, critical habitat has not been declared for this species under the TSC Act. The declaration of critical habitat in NSW is not considered to be a priority for this species at this stage, as other mechanisms provide for its protection.

2.6 Environmental Assessment

The EP&A Act requires that consent and determining authorities, and the Director-General of the National Parks and Wildlife, as a concurrence authority, consider relevant recovery plans when exercising a decision-making function under Parts 4 and 5 of the EP&A Act. Decision-makers must consider known and potential habitat, biological and ecological factors and the regional significance of individual populations.

The following public authorities currently have a decision making function in relation to the Giant Fern in NSW:

- Tweed Shire Council;
- DLWC; and
- the NPWS where a concurrence role under the EP&A Act is required, or where a Section 91

Licence (under the TSC Act), a Section 132 or 120 Licence (under the NPW Act) is required.

Additional authorities may have responsibilities if the species is located in other areas in the future.

3 Species Information

3.1 Description and Taxonomy

The Giant Fern (*Angiopteris evecta*) has either leaves tufted near ground level, or an erect rhizome forming a massive, woody trunk up to 1 metre in diameter and 3 metres in height in older specimens (Jones and Clemesha 1993, P. Bostock pers comm.). The stipes (leaf stalks) are green, smooth and swollen at the base where a pair of ear-like stipules enclose the stipe base. These stipules are dark with large, sunken white spots.

The bi-pinnate fronds are massive, up to 8 metres in length, and are reputedly the largest fronds of any fern on earth (Jones and Clemesha 1993). The pinnae and pinnules are attached by swollen bases and the lower pinnules have an ear-like lobe at their base. Pinnae are up to 1.2 metres long and 40 centimetres wide (Harden 1990). The pinnules are 4 to 20 centimetres long and 15 to 25 millimetres wide, with serrulate margins and free veins. False veins occur between the true veins of the pinnules; these are believed to be an evolutionary relic from a time when the pinnules were more deeply divided and they may represent the junction of pinnule edges.

The Giant Fern is a member of the Family Marattiaceae (order Marattiales). The genus *Angiopteris* contains approximately 100 species, which occur in Madagascar, south-east Asia, Japan, Australia and the south-west Pacific. *Angiopteris evecta* is the only species in this genus that occurs in Australia.

Angiopteris is a primitive genus and represents an ancient flora of Gondwanan origin. Fossilised *Angiopteris*-like ferns dating from the early Mesozoic, some 200 million years ago, have been found at Lune River in Tasmania when Australia was still part of Gondwana and a warm, wet climate prevailed (White 1986). During the slow drift north, the species was confined to warm and wet refugia. Jay (1998) suggests that the species is now found only in fire-free relict locations.

3.2 Distribution

The Giant Fern is found in Australia, Malaysia, Polynesia and New Guinea (Cronin 1989). In Australia it occurs in the Northern Territory and along the east coast from the Queensland wet tropics

to north-eastern New South Wales. While the species is common in the wet tropics of north-eastern Queensland, south of this region it occurs only as disjunct isolates of populations, which may be relics of previous favourable climates.

The Giant Fern was thought to be extinct in NSW until it was recorded from the Tweed Valley in the far north-east of the State in 1978. The National Herbarium in Sydney has a single specimen from the Tweed Valley rainforest collected in 1909. Although little is known of the original distribution within NSW, it is possible that the species occurred sporadically in the Tweed and Brunswick Valleys, maybe as far south as Byron Bay prior to European settlement.

The population of the Giant Fern recorded from the Tweed region consists of a single known individual. For the purposes of this recovery plan this individual is referred to the Tweed Giant Fern.

There are unconfirmed reports of occurrences of the Giant Fern in the upper Tweed Valley, Round Mountain, Burringbar, and the Byron Bay and Broken Head areas. Detailed searches of the Broken Head area have failed to locate any individuals (I. Matthias pers. comm.). Locality maps and precise location details have not been included in this recovery plan due to the potential threat of inappropriate collection, introduction of pathogens to the site and soil compaction from fern collectors, and other interested parties.

The historic distribution of the Giant Fern in NSW is currently unknown. Therefore, the reasons for the current status of the species in NSW are difficult to determine. This species may have only ever occurred at restricted locations within NSW, or may once have been more plentiful and has since undergone population declines.

3.3 Land Tenure

The site from which the Tweed Giant Fern was recorded is held under private ownership.

3.4 Habitat

The microhabitat of the Tweed Giant Fern consists of a north-facing gully on a narrow floodplain. The individual is growing about 5 metres from a creek, against the base of a slope. Damp soil conditions observed during a severe summer drought in March 1998 indicate the Tweed Giant Fern is growing on sub-surface groundwater seepage discharging from the slope to the creek at this point.

The Tweed Giant Fern forms part of a rainforest community. The rainforest is currently represented by a simplified community dominated by Red Ash

(*Alphitonia excelsa*), Possumwood (*Quintinia verdonii*) and Camphor Laurel (*Cinnamomum camphora*). Many other rainforest species are recolonising the area. Two other scheduled TSC Act species occur near the Tweed Giant Fern site - Queensland Nut (*Macadamia tetraphylla*) and Red Bopple Nut (*Hicksbeachia pinnatifolia*).

Vegetation types surrounding the gully in which the Tweed Giant Fern occurs consists of remnant stands of rainforest, surrounded by Brush Box (*Lophostemon confertus*) and other types of wet sclerophyll forest. These gully rainforests generally have a dry-subtropical composition, which is probably closest to the Floyd (1990) sub-alliances 5 (*Castanospermum australe* - *Dysoxylum muelleri*) and 21 (*Araucaria cunninghamii*). Species diversity is very high and includes many rainforest species approaching the southern limits of their range in the Tweed-Brunswick district.

The Tweed Giant Fern is growing in a humus-enriched, clay-loam soil developed on alluvium and colluvium. Surrounding soils on the hillslopes are red-yellow, podzolic clay-loams formed on deeply weathered metasediments, mainly greywacke and chert.

The far north coast of NSW experiences a warm, wet, subtropical climate. The average annual rainfall of the Tweed-Brunswick lowlands is around 1700 millimetres increasing to over 3000 millimetres in the ranges of the Mount Warning caldera a short distance inland (Bureau of Meteorology 1972).

In Queensland, the Giant Fern occurs on a wide range of substrates, including marine-aeolian sands, metamorphics and basalt. The species occurs in rainforest and wet sclerophyll forest to about 600 metres altitude on the banks of streams or in gullies with high moisture content (Williams 1979, Cronin 1989).

3.5 Life cycle

The Giant Fern has the two-phase lifecycle of all true ferns. This species is not known to carry out vegetative recruitment in the wild, and depends solely on spores for recruitment. Environmental conditions necessary for establishment of new individuals in the NSW population of the Giant Fern are unknown, as no recruits have been recorded.

The spore-producing sori form a submarginal band around the pinnules and are made up of oblong groups of four to six pairs of sporangia. Each sporangium is round and splits along a central line. The dynamics of spore dispersal in the Giant Fern is not known, however wind and water are considered to be the most likely controlling vectors.

Little is known about the growth rate and longevity of the Giant Fern in the wild.

4 Threats and Management Issues

4.1 Current Threats

Current threats to the Tweed Giant Fern are the small population size, fire, inappropriate collection, site visitation and displacement by exotic plants.

Small Population Size

The only known population of the Giant Fern in NSW comprises one plant that is not currently reproducing, resulting in a population that is highly susceptible to stochastic events.

Fire

The response of the Giant Fern to fire is currently unknown. The Giant Fern is likely to be extremely fire sensitive and easily killed by exposure to flames or heat. The Tweed Giant Fern is restricted to a permanently damp site within rainforest that may represent a refuge from fire.

The Tweed Giant Fern occurs in an area of rainforest regrowth, surrounded by disturbed sclerophyll forest where the potential for wildfire, given a source of ignition, is high. In 1980 a deliberately lit fire burnt across the gully where the Tweed Giant Fern occurs (Landholder pers. comm.).

Site Visitation

Site visitation is currently minimal. A protective barrier has been constructed a short distance from the Tweed Giant Fern to lessen the chances of physical damage. Soil compaction, particularly around the base of the specimen and accidental introduction of pathogens are possible as a result of site visitation. An increase in visitor access would also increase the chances of accidental damage to the fern, or illegal collection.

Displacement by Exotic Plant Species

The Tweed Giant Fern site has a history of invasion by exotic species such as Lantana (*Lantana camara*), Indian Coral Tree (*Erythrina crista-galli*) and Camphor Laurel. Exotic species such as these compete with, suppress growth and interrupt the recruitment of juvenile and adult plants. Exotic species have previously been removed from the site, however reinvasion has occurred.

Plant Removal or Inappropriate Collection

Plant removal or destruction through inappropriate collection techniques are threats to the Tweed Giant

Fern. Due to the rarity of this species within NSW, the Giant Fern is potentially a species of high value to fern enthusiasts. Inappropriate collection of plant material has the potential to kill the only known individual in the Tweed population.

5 Previous Recovery Actions

5.1 Site Management

The following actions, identified in previous management plans, were carried out at the site of the Tweed Giant Fern during the late 1980s:

- construction of a wire fence to exclude livestock from the immediate area;
- clearing of Lantana from the gully bank to the south prior to planting of appropriate native species; and
- planting of fast-growing shade providing trees on the roadside cutting to the south, and between the creek and the road.

Site maintenance carried out during 1999 included:

- replacement of the wire fence with a post and rail fence;
- removal of an overtopping Indian Coral Tree in midwinter of 1999; and
- stabilisation of fallen log immediately upslope of the Giant Fern.

The cutting back of competing Indian Coral Tree limbs is believed to have contributed to an increase in the number of fronds on the Tweed Giant Fern. The stump of the Indian Coral Tree was not poisoned and has since re-shot, as have several lopped limbs.

5.2 Systematic Survey

Limited targeted survey work has been undertaken in the vicinity of the Tweed Giant Fern. Recent flora surveys in the Brunswick-Tweed district carried out as part of regional vegetation surveys by the NPWS, shire wide vegetation surveys by Tweed and Byron Shire Councils and environmental impact studies by the NSW Roads and Traffic Authority and State Forests of NSW, did not detect any new populations of this species. Detailed searches of suitable habitat in the Broken Head area were unsuccessful in locating any individuals (I. Matthias pers. comm.)

5.3 Propagation

The Giant Fern has been propagated using material from Queensland and the Northern Territory. Despite trials involving a variety of methods, no material

from the Tweed Giant Fern is known to have been successfully propagated.

5.4 Environmental Impact Assessment Guidelines

The NPWS has developed Environmental Impact Assessment Survey Guidelines for the Giant Fern (*Angiopteris evecta*) (see Appendix 1).

6 Proposed Recovery Objectives, Actions and Performance Criteria for August 2001 – August 2004

The overall objective of this recovery plan is to manage and protect the Giant Fern and its habitat in NSW based on current knowledge.

Specific objectives are listed below. For each of these objectives a number of recovery actions have been developed, each with a performance criterion. Specific objectives of this recovery plan are to:

Objective 1: manage and protect the Tweed Giant Fern and associated habitat from human induced threatening processes.

Objective 2: determine whether further wild populations exist in NSW, and implement protective measures as appropriate.

Objective 3: gain a better understanding of the ecological requirements of the Giant Fern in NSW.

Objective 4: develop a contingency plan to ensure the long-term survival of the Tweed Giant Fern.

Objective 1:

Manage and protect the Tweed Giant Fern and associated habitat from human induced threatening processes.

Action 1.1

The NPWS will coordinate and implement the following management strategy for the Tweed Giant Fern. This strategy addresses the actions required to carry out threat abatement at the site of the Tweed Giant Fern and areas immediately adjacent, and comprises four main tasks: fire management, habitat rehabilitation, long-term protection and security of the population. These are discussed below. All protective measures applied to the site will be developed in conjunction with, and require the endorsement of, the landowner.

Fire Management

1. The NPWS, in conjunction with the landowner, will establish a fire management plan for the area around the Tweed Giant Fern and areas immediately adjacent; and
2. The NPWS will provide information to relevant public authorities concerning the potential distribution and ecological requirements of the Giant Fern in NSW, so that this species is considered in the planning and implementation of hazard reduction proposals (including burning, slashing, “turbo-mowing”, trail maintenance and construction) and other activities which may impact on the Giant Fern. Relevant public authorities include Tweed and Byron Shire Councils, as well as the Rural Fire Service.

Habitat Rehabilitation

The NPWS, in conjunction with the landowner, will develop and implement a habitat rehabilitation and maintenance program. This program will be implemented to ensure that the Tweed Giant Fern is not suppressed or displaced by exotic species such as Lantana, Indian Coral Tree and Camphor Laurel.

Long-term Protection

The current owner of the land on which the Tweed Giant Fern occurs is sympathetic to the conservation of the species, and has voluntarily contributed to its protection by maintaining a general firebreak, excluding livestock, and assisting with other threat abatement works. These measures have been crucial for the survival of the specimen over the short-term. Options for ensuring the long-term protection of the specimen must also be considered and an appropriate course of action implemented. Options available for facilitating long-term protection include:

- the development of a VCA under the NPW Act;
- consideration of the identification and nomination of critical habitat under the NSW TSC Act; and
- the development of a Property Agreement under the NVC Act.

All protective measures applied at the site will be developed in conjunction with, and require the consent of, the landowner.

Security

Locality maps and precise location details have not been included in this recovery plan due to the potential threat of inappropriate collection, introduction of pathogens to the site and soil compaction from fern collectors, and other interested parties.

The need for site confidentiality will be impressed upon all the relevant public authorities.

Performance Criteria 1

- The Tweed Giant Fern persists at the site;
- the habitat is rehabilitated and favourable conditions exist for the Giant Fern and other native species; and
- the Tweed Giant Fern population is protected in the long-term.

Objective 2:

To determine whether further wild populations of the Giant Fern exist in NSW, and implement protective measures as appropriate.

Action 2.1

The NPWS will coordinate systematic surveys in the Tweed and Brunswick Valleys. Should any new populations be recorded, an assessment of the threats to the new population will be undertaken to ensure that appropriate management actions are developed and implemented as soon as possible. As a matter of course, propagated specimens or genetic material from all newly recorded populations will be lodged with appropriate herbaria or research institutions to ensure that material is available at a future date for any research and verification. The NPWS Plant Collection Guidelines will be followed and collection undertaken by a licenced collector.

Performance Criteria 2.1

- Comprehensive surveys of potential habitat are undertaken in the Tweed and Brunswick Valleys;
- threats to any new populations are assessed and appropriately managed; and
- specimens or genetic material from any new populations are lodged with appropriate herbaria and appropriate research institutions.

Action 2.2

The NPWS will provide Tweed and Byron Shire Councils with Environmental Impact Assessment Survey Guidelines for the Giant Fern (*Angiopteris evecta*) (see Appendix 1), and the Species Profile for the Giant Fern (*Angiopteris evecta*) (see Appendix 2) to utilise when undertaking environmental assessments in the Tweed and Brunswick Valleys.

Performance Criterion 2.2

The NPWS will provide the Tweed and Byron Shire Councils with the Environmental Impact Assessment Survey Guidelines and the Species Profile for the

Giant Fern when undertaking environmental assessments in the Tweed and Brunswick Valleys.

Objective 3

To increase current levels of knowledge concerning the ecological requirements of the Giant Fern in NSW.

Action 3.1

The NPWS will summarise information currently available on the ecological requirements of the Giant Fern, and identify any knowledge gaps that exist. A sound knowledge base on the ecological requirements of this species is essential to carry out effective and appropriate management.

Performance Criterion 3.1

Knowledge gaps that exist in the current knowledge base on the ecological requirements of the Giant Fern are identified.

Action 3.2

Based on the findings of Action 3.1, the NPWS will support research to fill identified gaps in the current knowledge on the ecological requirements of the Giant Fern.

Performance Criterion 3.2

Research to fill identified knowledge gaps on the ecological requirements of the Giant Fern is underway or complete.

Objective 4

To develop a contingency plan that ensures the long-term survival of the Tweed Giant Fern.

Action 4.1

The NPWS will coordinate the propagation of specimens utilising material collected from the Tweed Giant Fern. This will be done in order to establish *ex situ* collections in botanic gardens and possibly for population enhancement (subject to research). Propagation of the fern will occur from spore, as the resultant juveniles may be genetically variable.

Performance Criterion 4.1

The Tweed Giant Fern is propagated from spore for use in *ex situ* collections, and possibly for population enhancement.

Action 4.2

The NPWS will establish *ex situ* populations of the Tweed Giant Fern, and individuals from any populations subsequently recorded from NSW, at the

Tweed and Coffs Harbour Botanic Gardens. Establishment of *ex situ* conservation sites for the Giant Fern will reduce the potential for extinction of the known NSW population through stochastic events such as fire, flood or cyclonic storm.

Performance Criterion 4.2

Ex situ populations, generated from the Tweed Giant Fern, exist within botanic gardens.

Action 4.3

The NPWS will coordinate the storage of genetic material from the Tweed Giant Fern, as this individual may be genetically distinct from the populations of the species in Queensland. In the event that the individual dies, storage of the genetic material will ensure information on the genetics of the individual is still available for research purposes.

Performance Criterion 4.3

Genetic material for the Tweed Giant Fern is in storage.

Action 4.4

The NPWS will coordinate a research program to assess the evolutionary origin of the Tweed Giant Fern. The main aim of such research would be to investigate if the NSW plant can be distinguished as a distinct evolutionary unit from the Queensland plants.

Performance Criterion 4.4

Research to assess the evolutionary origins of the Tweed Giant Fern is underway or complete.

Action 4.5

The NPWS will develop and coordinate an assessment process to establish the need for population enhancement. As there has been no reproduction recorded in the Tweed Giant Fern population, there may be a need to artificially increase the population size through a re-introduction program. Such a program should only be implemented following a thorough assessment of the long-term implications and validity of undertaking such a program.

Performance Criterion 4.5

An assessment of the need for, and the viability of, a population enhancement program to maintain the Tweed Giant Fern is conducted.

7 Implementation

The implementation of recovery actions specified in this recovery plan will be the responsibility of the

NPWS Tweed Area for the period of three years from publication.

8 Social and Economic Consequences

The total cost of implementing the recovery actions will be \$33100 over the three year period covered by this plan.

The recovery plan may have social benefits for local communities, through increasing general public awareness of natural heritage values of the Tweed Valley and surrounding areas.

9 Biodiversity Benefits

As the only known representative of its genus in NSW, the Tweed Giant Fern has high biodiversity value.

In NSW, threatened plants such as the Giant Fern represent those species most likely to go extinct due to human-induced causes. Consequently, the Giant Fern is a priority species to consider in conservation efforts aimed at arresting further loss of biodiversity from our natural ecosystems.

Preservation of the Tweed Giant Fern and management of its habitat will benefit several other threatened and rare plant species. These include *Macadamia tetraphylla* (TSC Act Schedule 2), *Hicksbeachia pinnatifolia* (TSC Act Schedule 2), *Acacia bakeri* (TSC Act Schedule 2), *Endiandra globosa* (Rare or Threatened Australian Plant (ROTAP)), *Rhodamnia maideniana* (ROTAP), *Cupaniopsis newmanii* (ROTAP) and *Archidendron muellerianum* (ROTAP).

The Giant Fern is one of many rare and threatened plant species found in the Tweed-Brunswick region

of far north-eastern NSW (Hunter 1991; Department for the Arts, Sport, Environment and Territories (DASET) 1992). This region supports the highest concentration of threatened plant species in Australia (Leigh and Briggs 1992), the great majority being species of lowland subtropical rainforest which has been drastically reduced in area by clearing of native vegetation. By protecting and ensuring the future survival of the Giant Fern and its habitat in NSW, an important contribution will be made towards the preservation of a component of lowland rainforest ecosystem of the Tweed-Brunswick region, which is of outstanding national significance for biodiversity conservation in Australia.

10 Preparation Details

This recovery plan was prepared for the NPWS by Pamela Gray and Maria Matthes, Threatened Species Officers, NPWS. This recovery plan is based on a draft prepared by consultant botanists Stephanie Horton and Andrew Benwell with the assistance of Nigel Cotsell (the NPWS Northern Directorate, Threatened Species Unit).

11 Review Date

In relation to its status as the State endorsed recovery plan for the Giant Fern, any major changes to this recovery plan will require the revised plan to be placed on public exhibition in NSW and re-approval by the NSW Minister for the Environment. The NPWS should be contacted if it is believed any change to the recovery plan or recovery program should be considered.

A major review of this recovery plan will occur within three years of the date of its publication.

12 References

Bureau of Meteorology. (1972). *Climatic Survey Richmond-Tweed Region New South Wales*. Australian Government Public Service, Canberra.

Cronin, L. (1989). *Key Guide to Australian Palms, Ferns and Allies*. Reed Books, Sydney.

Department for the Arts, Sport, Environment and Territories. (1992). *Nomination of the Central Eastern Rainforests of Australia by the Government of Australia for Inscription in the World Heritage List*. Commonwealth of Australia, Canberra.

Floyd, A.G. (1990). *Australian Rainforests in New South Wales*. Surrey Beatty & Son, Chipping Norton.

Harden, G.J. (1990). *Flora of NSW*. Volume 1. New South Wales University Press, Kensington.

Hunter, R.J. (1991). The role of remnants in the conservation of rare and threatened rainforest plants.

In Philips, S. (Ed.) *Rainforest Remnants*. Proceedings of a Workshop on Rainforest Rehabilitation held at North Coast Agricultural Institute, 17-18 November, 1988. NSW National Parks and Wildlife Service, pp. 36-37.

Jay, A. (1998). The Last Frond Here. A Management Plan for *Angiopteris evecta* (The Giant Fern). Unpublished Report to the NSW National Parks and Wildlife Service.

Jones, D.L. and Clemesha, S.C. (1993). *Australian Ferns and Fern Allies*. Currawong Press, Sydney.

Leigh, J.H. and Briggs, J.D. (1992). *Threatened Australian Plants*. Australian National Parks and Wildlife Service, Canberra.

White, M.E. (1986). *The Greening of Gondwana*. Reed Books, Sydney.

13 Acronyms Used in this Document

DASET – Department for the Arts, Sport, Environment and Territories

DLWC – Department of Land and Water Conservation

EP&A Act – NSW *Environmental Planning and Assessment Act 1979*

EPBC Act – Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

ESD – Ecologically Sustainable Development

NPW Act – NSW *National Parks and Wildlife Act 1974*

NPWS – NSW National Parks and Wildlife Service

NSW – New South Wales

NVC Act – NSW *Native Vegetation Conservation Act 1997*

RF Act – NSW *Rural Fires Act 1997*

ROTAP – Rare or Threatened Australian Plant

RVMP – Regional Vegetation Management Plan

SIS – Species Impact Statement

TSC Act – NSW *Threatened Species Conservation Act 1995*

VCA – Voluntary Conservation Agreement

Table 1: Costing Table. Estimated costs of implementing the actions identified in the Giant Fern recovery plan are provided below.

Action No:	Action Title	Priority	Estimated Cost/yr (\$)			Total Cost (\$)	Responsible Party/ Funding Sources	In-Kind (\$)	Cash (\$)
			Year 1	Year 2	Year 3				
1.1	Management strategy:								
	• fire management;	1	500	500	500	1500	NPWS	1500	2400
	• habitat rehabilitation;	1	800	800	800	2400	NPWS		
	• long-term protection;	2	500		1000	1500	NPWS	1500	
• security.	1	200		200	400	NPWS	400		
2.1	Systematic surveys	1	2000	2000		4000	NPWS		4000
2.2	Provision of EIA guidelines	1	400			400	NPWS	400	
3.1	Recruitment research	3	1000	1000	1000	3000	NPWS		3000
4.1	Plant propagation from spore	1	800	200	200	1200	NPWS	600	600
4.2	<i>Ex situ</i> conservation	1	800	800		1600	NPWS		1600
4.3	Storage of genetic material	1	100			100	NPWS		100
4.4	Assessment of evolutionary origin	3	15000			15000	NPWS		15000
4.5	Assessment for population enhancement	2		1000	1000	2000	NPWS		2000
Total			22100	6300	4700	33100		4400	28700

Priority ratings are: 1- action critical to meeting plan objectives, 2-action contributing to meeting plan objectives, 3-desirable but not essential actions

'In-Kind' Funds represent salary component of permanent staff and current resources

'Cash' Funds represent the salary component for temporary staff and other costs such as the purchasing of survey and laboratory equipment

Appendix 1: Environmental Impact Assessment and Survey Guidelines for the Giant Fern (*Angiopteris evecta*).

The following information is provided to assist authors of Environmental Impact Statements, development and activity proponents, and determining and consent authorities, who are required to prepare or review assessments of likely impacts on threatened species pursuant to the provisions of the *Environmental Planning and Assessment Act 1979* (EP&A Act). These guidelines should be read in conjunction with the NPWS *Information Circular No. 2: Threatened Species Assessment under the EP&A Act: The '8 Part Test' of Significance* (November 1996), the State Recovery Plan for the Giant Fern (*Angiopteris evecta*), and the Species Profile for the Giant Fern (*Angiopteris evecta*).

Survey

For information on the known habitat types associated with the Giant Fern in NSW, see the description of habitat in the recovery plan for the species (NPWS 2001) and the accompanying Species Profile for the Giant Fern (*Angiopteris evecta*).

There is a detailed description of *Angiopteris evecta* in the recovery plan. This should be utilised when surveying for this species.

The broad habitat type of *Angiopteris evecta* in other states and countries is varied and, as the NSW habitat type is being determined from one specimen, surveys for *Angiopteris evecta* should not be limited to areas within the existing distributional limits (Tweed region) but should cover all areas in the Brunswick region, and should have two objectives:

1. to determine presence/absence of the species; and
2. if the plant is determined to be present, assess and record the spatial distribution and age classes (seedlings, juvenile, adults) of individuals at the site.

If a gully or side slope is being searched, all contours should be traversed. Creeklines up to the first escarpment bench, and intermittent drainage lines should be intensively searched, particularly where pools of water sit at the base of drainage lines.

Where *Angiopteris evecta* is present, the area of occupancy, microhabitat details, and trunk and frond width of the plant should be recorded.

Viable, but dormant *Angiopteris evecta* spores may be present in the soil, particularly where there are mature individuals within 1kilometre.

Life cycle of the species

There is a description of the species, and basic taxonomical and lifecycle details included in the 'Recovery Plan for the Giant Fern (*Angiopteris evecta*)' (NSW 2001). The lifecycle of the Giant Fern in NSW is likely to be disrupted should any of the following occur:

1. **Habitat clearing** – The continuation of habitat clearing for urban development and agricultural practices poses a potential threat to unrecorded populations of the Giant Fern in NSW. The loss of the individual specimen of the Giant Fern in the Tweed Valley would effectively constitute the extinction of the species in NSW.
2. **Habitat modification** – Habitat modification may include factors such as weed invasion, reduced water quality, altered hydrological regime and compaction of soil by domestic stock or from increased visitation rates. Sudden changes in surrounding habitat, leading to an increase in levels of wind or sunlight, may disrupt an individual of this species, and lead to its death. As previously mentioned, this would effectively mean extinction of the species in NSW.
3. **Fire** – The response of the Giant Fern to fire is unknown. Many ferns are killed by fire, whilst others survive by reproducing vegetatively. As there are currently no records of the Tweed Giant Fern reproducing vegetatively, this individual may be killed by fire.

- 4. Destruction/collection of plants/plant material** – Ferns are often highly desired in landscaping, and the Tweed Giant Fern may be subject to threat from collectors. The removal of material for propagation from this individual may affect the species ability to sustain itself on the site.

Threatening processes

Identified threats to the known population of *Angiopteris evecta* in NSW consist of small population size, fire, collection (plant removal or destruction through inappropriate collection techniques), site visitation (introduction of pathogens and soil compaction) and displacement by exotic plants.

A significant area of habitat

As there is only one recorded *Angiopteris evecta* in NSW, all habitat occupied by this species in NSW is significant.

Limit of known distribution

Angiopteris evecta occurs in the Northern Territory and along the east coast of Queensland to north-eastern NSW. The species is common in the wet tropics of north eastern Queensland. South of this, *Angiopteris evecta* occurs only as disjunct isolates of less than fifty plants. In NSW, the only known population is located in the Tweed Valley.

Regional distribution of habitat

There is only one known individual of *Angiopteris evecta* in NSW, which is known from the Tweed Valley, north-eastern NSW. There are currently no records of this species occurring further south. Knowledge of the required habitat of *Angiopteris evecta* in NSW is limited, and the parameters determining the preferred habitat for this species not yet fully understood.

Adequacy of representation in conservation reserves or other similar protected areas.

There are currently no known occurrences of *Angiopteris evecta* in conservation reserves or similar protected areas in NSW.

Critical habitat

Critical habitat has not yet been declared for *Angiopteris evecta*.

For further information contact:

Threatened Species Unit, Northern Directorate, NSW NPWS, Locked Bag 914, Coffs Harbour, NSW 2450.
Phone: 026651 5946

www.npws.nsw.gov.au

Reference

NSW NPWS (2001) *Recovery Plan for the Giant Fern* (*Angiopteris evecta*). NPWS, Hurstville, NSW

Appendix 2 : Species Profile for the Giant Fern (*Angiopteris evecta*)

Conservation status

The Giant Fern (*Angiopteris evecta*) has been listed as an endangered species on Schedule 1 of the *Threatened Species Conservation Act* 1995. The Giant Fern is considered secure in Queensland, and is therefore not considered Nationally threatened.

Description

The Giant Fern has fronds that are reputed to be the largest of any known fern. The fronds of adult plants can reach up to 8 metres in length (Jones and Clemesha 1993). The trunk of this fern can reach up to one metre diameter and 3 metres in height in older specimens.

Distribution

The Giant Fern is found in Australia, Malaysia, Polynesia and New Guinea (Harden 1990). Within Australia, the Giant Fern is found in the Northern Territory and along the east coast from the wet tropics in north Queensland to north-eastern NSW.

The Giant Fern may have once occurred in sporadic populations in forested lowlands and foothills of the Tweed-Brunswick region, and may have occurred as far south as Byron Bay. Only one population of this species is known from NSW, and this consists of a single individual.

Tenure

In NSW, the Giant Fern is known only from one site, which is held under private ownership.

Habitat

The Giant Fern is a rainforest species associated with rainforest gullies and wet sclerophyll forests. The one site from which this species is known in NSW has alluvial soils and a warm, wet subtropical climate. The region in which the known individual occurs has a history of clearing, however remnant stands of rainforest exist in gullies surrounded by Brush Box (*Lophostemon confertus*) and other types of wet sclerophyll forest.

Ecology

The Giant Fern has the two-phase lifecycle of all true ferns. This species is not known to carry out vegetative recruitment in the wild, and depends solely on spores for recruitment. Environmental conditions necessary for establishment of new individuals in the New South Wales population of the Giant Fern are unknown, as no recruits have been recorded.

Little is known about the growth rate and longevity of the Giant Fern in the wild.

Threats

Current threats to the Giant Fern in NSW are thought to include small population size, fire, collection (plant removal or destruction through inappropriate collection techniques), site visitation (introduction of pathogens and soil compaction) and displacement by exotic plants.

Management

Management actions for the Giant Fern consist of four main tasks. These include: (i) developing and implementing a management strategy that comprises of fire management, habitat rehabilitation, long-term protection and security of the population, (ii) determining whether further populations exist in NSW, (iii) research into ecological requirements, and (iv) developing a contingency plan.

Recovery Plan

There is an approved recovery plan for the Giant Fern (*Angiopteris evecta*).

For further information contact:

Threatened Species Unit, Northern Directorate, NSW NPWS, Locked Bag 914, Coffs Harbour, NSW 2450.
Phone: 026651 5946

www.npws.nsw.gov.au

References

Harden, G.J. (1990) *Flora of NSW*. Volume 1. New South Wales University Press, Australia.

Jones, D.L. and Clemesha, S.C. (1993). *Australian Ferns and Fern Allies*. Currawong Press, Sydney.



NSW
NATIONAL
PARKS AND
WILDLIFE
SERVICE

43 Bridge Street

Hurstville 2220

(02) 9585 6444