

National
Recovery Plan

Acacia terminalis
subsp. *terminalis*
(Sunshine Wattle)



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April 2010



Australian Government

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Note: This recovery plan sets out the actions necessary to stop the decline of, and support the recovery of, the listed threatened subspecies.

The plan has been developed with the involvement and cooperation of a broad range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

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Draft Recovery Plan for the Sunshine Wattle (*Acacia terminalis* subsp. *terminalis*)

Foreword

This document constitutes the formal National and NSW State Recovery Plan for *Acacia terminalis terminalis*, an endangered subspecies of the Sunshine Wattle (*Acacia terminalis*). It considers the conservation requirements of the subspecies across its known range, and identifies the actions to be taken to ensure the long-term viability of the Sunshine Wattle in nature and the parties who will undertake these actions.

Acacia terminalis terminalis is listed as endangered on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, and endangered on the NSW *Threatened Species Conservation Act 1995*. It is an erect or spreading shrub, 1-5 metres tall, with a very limited distribution that extends for approximately 23 km from the northern shores of Sydney Harbour to Botany Bay, in the local government areas of Manly, Mosman, Woollahra, Waverley, Randwick, and Rockdale.

The overall objective of this recovery plan is to ensure the long-term survival of the subspecies in the wild by promoting *in situ* conservation. The recovery actions detailed in this plan include:

- to identify and manage the threats operating at sites that contain the subspecies;
- to increase the legislative protection afforded to the subspecies at all sites;
- to conduct surveys and research that will assist with the management of the subspecies; and
- to raise awareness about the threats to the subspecies and involve the community in the recovery program.

It is intended that the recovery plan will be implemented over a five year period. The actions in this plan will primarily be undertaken by the Department of Environment, Climate Change and Water.

LISA CORBYN
Director-General

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1 Introduction

Acacia terminalis terminalis is an erect or spreading shrub, 1- 5 metres tall, with pale yellow flower heads. It occurs only in New South Wales (NSW), and is currently only known from 27 populations within an area that extends for 23 km from the northern shores of Sydney Harbour to Botany Bay.

This document constitutes the formal National and State Recovery Plan for *A.t.terminalis* and, as such, considers the requirements of the subspecies across its known range. It identifies the actions to be taken to ensure the long-term viability of *A.t.terminalis* in nature and the parties who will undertake these actions. The attainment of the objectives of this recovery plan are subject to budgetary and other constraints affecting the parties involved.

This plan has been prepared by the Department of Environment, Climate Change and Water (NSW) (DECCW) in consultation with Phillip Kodela from the Royal Botanic Gardens. The information in this recovery plan was accurate to the best available knowledge on the date it was approved.

2 Legislative Context

2.1 Legal status

A.t.terminalis is listed as endangered on the NSW *Threatened Species Conservation Act 1995* (TSC Act) and as endangered on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

2.2 Responsibilities under the Threatened Species Conservation Act 1995

Recovery plan preparation, exhibition and implementation

The TSC Act and the NSW *Threatened Species Conservation Amendment Act 2002* (hereafter referred to jointly as the TSC Act) provide a legislative framework to protect and encourage the recovery of endangered and vulnerable species, endangered populations and endangered and vulnerable ecological communities in NSW. Under this legislation, the Director General of DECCW must prepare a Threatened Species Priorities Action Statement, which outlines a strategy for the recovery of each listed threatened species in NSW. The strategy for any

particular species may include the requirement for a recovery plan to be prepared, however this is no longer a mandatory requirement for every threatened species. The TSC Act includes specific requirements for both the matters to be addressed by recovery plans and the process for preparing recovery plans. This recovery plan satisfies these provisions.

The TSC Act requires that a government agency must not undertake actions inconsistent with a recovery plan. The actions identified in this plan for the recovery of *A.t.terminalis* in NSW are primarily the responsibility of DECCW. Other public authorities may have statutory responsibilities relevant to the conservation and protection of *A.t.terminalis*. Public authorities with core legislative responsibilities relevant to the protection and management of *A.t.terminalis* and its habitat are listed in Appendix 1.

Consultation with Aboriginal people

Involvement of Aboriginal communities in the development of the recovery plan has been sought by DECCW. None of the currently known locations where *A.t.terminalis* occurs is on land managed by Local Aboriginal Land Councils. Should new sightings of this subspecies occur on such land, DECCW will identify and consult with the responsible Local Aboriginal Land Council(s), Elders or other groups representing Aboriginal people in the area on implementation of the plan. Aboriginal participation in the implementation of recovery actions will be encouraged.

Critical Habitat

The TSC Act makes provision for the identification and declaration of critical habitat for species, populations and ecological communities listed as endangered.

To date, critical habitat has not been declared for the species under the TSC Act. The declaration of critical habitat in NSW is not considered to be a priority for this subspecies at this stage, as other mechanisms provide for its protection. However, this recovery plan identifies (in section 4.5) the habitat features that would contain habitat that is critical to the survival of the subspecies, as required by the EPBC Act. Action 2.4 of this Recovery Plan provides a mechanism for reconsidering the need for critical habitat nomination under the TSC Act

for one of the high priority sites for the conservation of the subspecies.

Key Threatening Processes

A key threatening process (KTP) is a process listed under the TSC Act or the EPBC Act that threatens, or has the capability to threaten, the survival or evolutionary development of species, populations, or endangered ecological communities.

Clearing of native vegetation has been observed to affect *A.t.terminalis*. The Final Determination for this KTP defines clearing as ‘the destruction of a sufficient proportion of one or more stratae (layers) within a stand or stands of native vegetation so as to result in the loss, or long term modification, of the structure, composition and ecological function of a stand or stands (NSW Scientific Committee 2001).

Other KTPs that may affect *A.t.terminalis* are:

- Ecological consequences of high frequency fires (NSW Scientific Committee 2000);
- Invasion, establishment and spread of *Lantana camara* (NSW Scientific Committee 2006).
- Infection of native plants by *Phytophthora cinnamomi* disease (NSW Scientific Committee 2002).

In addition to these KTPs, a number of other threats to the survival of *A.t.terminalis* exist (see Section 6.1).

Licensing

Any activity not requiring development consent under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) or the NSW *Native Vegetation Conservation Act 2003* (NV Act), which is likely to impact on *A.t.terminalis*, or damage its habitat, requires a licence from DECCW under the provisions of the TSC Act or NSW *National Parks and Wildlife Act 1974* (NPW Act) as a defence against prosecution. If the impact is likely to be significant, an SIS is required.

Other conservation measures

The TSC Act includes provision for other measures that may be taken to conserve *A.t.terminalis* and its habitat, including the making of a Stop Work Order or Joint Management Agreement.

2.3 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legislative framework for the protection of threatened species across Australia. In preparing a Commonwealth Recovery Plan, consideration must be given to the role and interests of Aboriginal people in the conservation of Australia’s biodiversity. The Act also seeks to impose the obligation (arising from the listing) for responsible agencies (particularly Commonwealth) to adopt protective measures.

As *A.t.terminalis* is listed nationally under the EPBC Act, any person proposing to undertake actions likely to have a significant impact on this subspecies should refer the action to the Commonwealth Minister for the Environment, Heritage and the Arts for consideration. The Minister will then decide whether the action requires EPBC Act approval. This is in addition to any State or Local Government approval required.

Administrative guidelines are available from the Australian Government Department of the Environment, Water, Heritage and the Arts to assist proponents in determining whether their action is likely to have a significant impact.

Other legislation relevant for the conservation and recovery of *A. t. terminalis* is listed in Appendix 5.

3 Description and Taxonomy

3.1 Description

A.t.terminalis is an erect or spreading shrub, 1-5 metres tall, with pale yellow flowers and seed pods 3-11 cm long. The small branches (branchlets) are angled and have longitudinal ridges. The leaves including stalks (petioles) are 0.5-2.1 cm long, and contain between 2 and 5 pairs of pinnae (=leaflets; World Wide Wattle 2006).

3.2 Taxonomy

There are four recognised subspecies of *Acacia terminalis* (Figures 1a-d; Kodela & Harden 2002). World Wide Wattle (2006) describes the distribution and distinguishing characteristics of each subspecies and describes those of *A. t. terminalis* as follows:

A.t.terminalis occurs mainly in near coastal areas from the northern shores of Sydney Harbour

south to Botany Bay, and it flowers from March to July. Compared to the other subspecies, it has denser short hair on branchlets, leaf stalks, and flower stalk, and is of white or pale yellow colour. Its flower stalks are thicker and contain smaller glands.

Appendix 6 and Figure 1a-d provide more details that aid in identifying the different subspecies of *A.terminalis*, including *A.t.terminalis*.

4 Distribution and Habitat

In this recovery plan, *A.t.terminalis* records within 300 metres of each other have been defined as one population as dispersal of the subspecies is unlikely to exceed this distance. Populations may consist of a number of sites, as sites have been defined on the basis of tenure or management boundaries.

4.1 Current distribution

A.t.terminalis has a very restricted distribution that extends for approximately 23 km from the northern shores of Sydney Harbour to Botany Bay (Figure 2). Within this distribution, it is known from 27 populations, which are subdivided into 53 sites. All sites occur in the local government areas of Manly, Mosman, Warringah, Woollahra, Waverley, Randwick, and Rockdale. The subspecies has an extent of occurrence of approximately 200 km². A site at Dobroyd Head in Sydney Harbour NP may also contain *A.t.terminalis*, although this requires confirmation (A. Duque-Portugal, pers. comm.).

Outside of this distribution, intermediates between *A.t.terminalis* and other subspecies of *A. terminalis* have been recorded in nearby local areas including Lane Cove and on Lyly Road, Warringah (P. Kodela, pers. comm.). These intermediates are not afforded statutory protection under the TSC Act and subsequently are not addressed in this recovery plan.

4.2 Historical distribution

Acacia t. terminalis was first collected by Sir Joseph Banks between 28 April and 5 May 1770 at Botany Bay. A number of subsequent collections of the subspecies were made in the

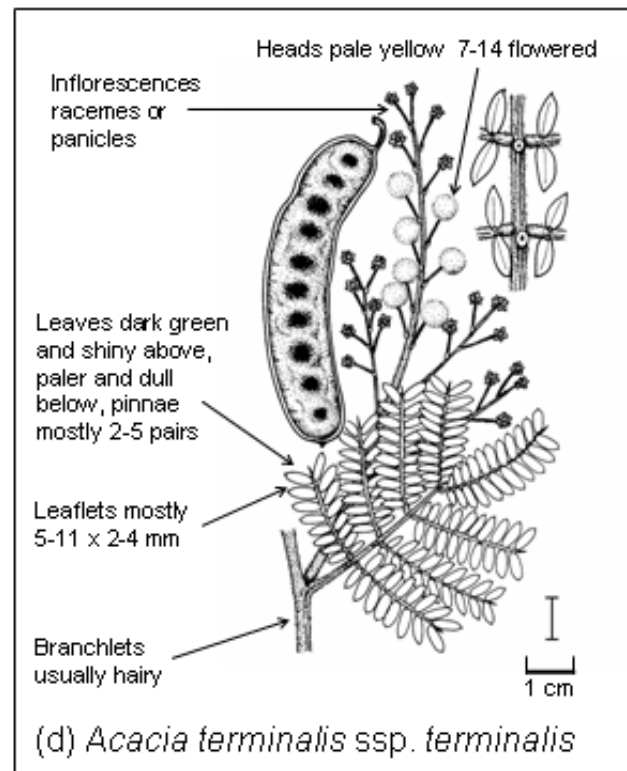
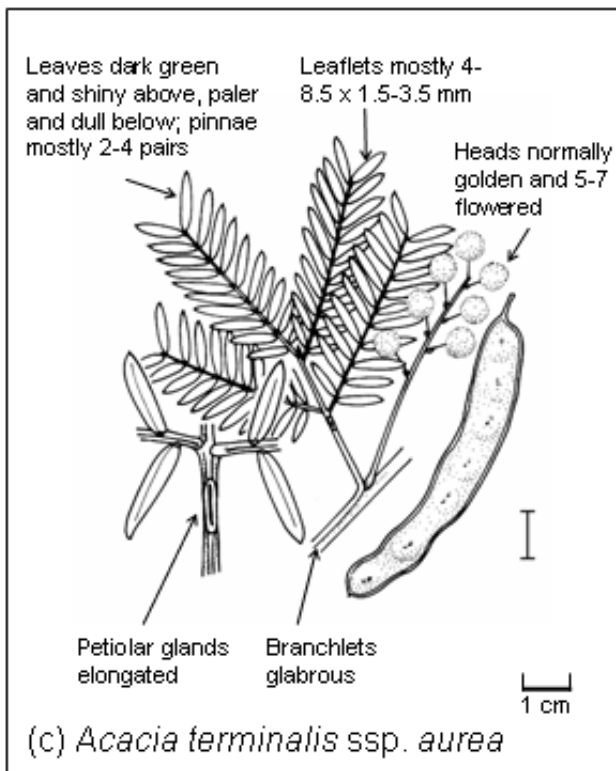
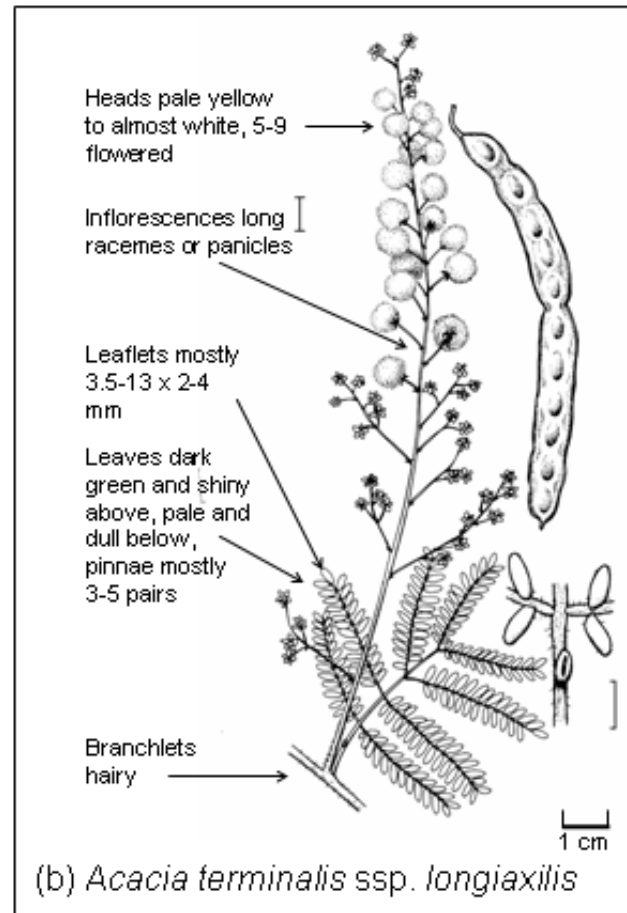
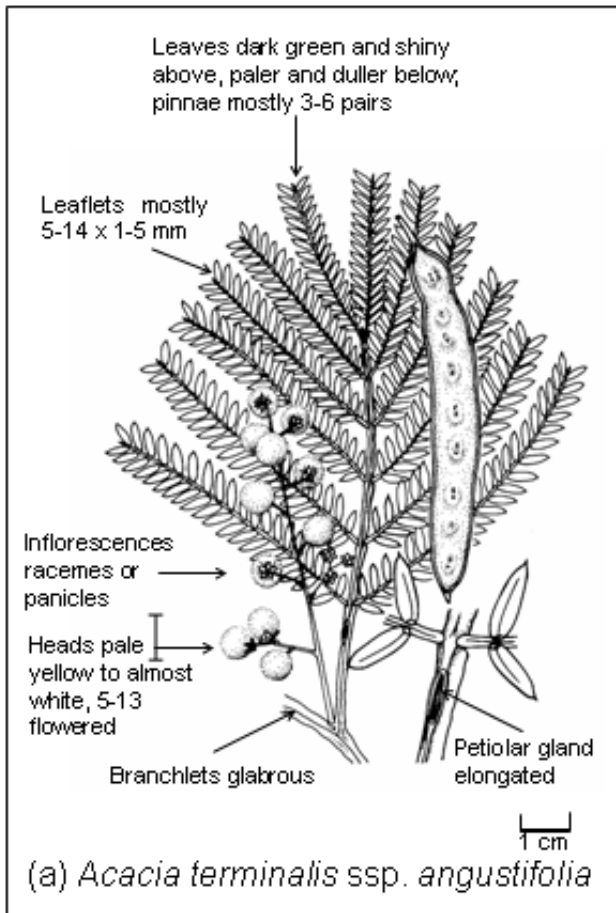
19th and early 20th centuries in nearby suburbs including South Coogee, Matraville, Vaucluse, Rose Bay, Botany, La Perouse, North Bondi and Maroubra. The locations from which many of these early collections were made were subsequently developed.

Sites at Matraville and North Head were cleared for development in 1997 and 2005, respectively (Anne Clements & Associates 2001; Total Earth Care 2004). The subspecies has been planted on Goat Island using propagative material sourced from North Head (R. Newton, pers. comm.) but these plants are believed to have subsequently died (P. Ibbetsen, pers. comm.). The subspecies was also reportedly planted in Centennial Park in 1913 (RBG herbarium).

4.3 Population size

The total population size of a taxon is taken to be the total number of mature individuals i.e. individuals that are capable of reproduction (IUCN 2000). The total number of mature *A. t. terminalis* individuals across all 27 known populations is estimated to be less than 500.

The size of individual populations varies from a few individuals to hundreds of mature plants, although only six populations contain more than 10 mature plants (Table 1).



Figures 1a-d. Characteristic features of the four subspecies of *Acacia terminalis*. Illustrations by Marion Westmacott and reproduced from "Flora of Australia" (Volume 11A), with permission from the Australian Biological Resources Study and Marion Westmacott

Table 1 Populations by size class

Population size class	<10	11-50	51-100	>100	Not Recorded
Number of populations	14	4	1	1	7

Significant fluctuations in the number of plants at individual sites have been observed for the subspecies, and this is thought to be primarily a consequence of the subspecies requiring disturbance to trigger recruitment. At least six sites have experienced drastic declines in population numbers (At1a, 1b, 9d(i), 9e(i); 9f, 22; all site details in Appendix 2). At four sites, plants had been recorded previously, but could not be found during the preparation of this recovery plan (At1i, 15b, 19a, 21). On the contrary, significant recruitment (i.e. hundreds of seedlings germinating) was observed at six sites during the preparation of this recovery plan (At1d, 4, 8a-b, 18a(i)).

Recent ecological burns appear to have been the trigger for the significant recruitment events, whilst the sites with significant declines in plant numbers generally contained long unburnt vegetation (M. Bremner, pers. comm.).

4.4 Land tenure and zoning

Table 2 shows tenures for the land on which *A.t.terminalis* occurs. Fifteen sites occur within Sydney Harbour National Park and are zoned as National Park (At1a, 1d, 1g-l, 8a-b, 9f, 11, 12, 15b, 18a(i)). The Sydney Harbour Federation Trust manages seven sites zoned 'Special Uses' (5a), four at Georges Heights (At9c-e, 9g) and three at the former School of Artillery at North Head (At2a-c).

Table 2. Land tenures for 53 *Acacia terminalis* sites.

Landmanager	Sites (%)
DECCW	15 (28%)
Mosman Council	13 (24%)
Sydney Harbour Federation Trust	7 (13%)
Department of Defence	2 (4%)
Woollahra Council	3 (6%)
Private	4 (7%)
Sydney Water	2 (4%)
Randwick Council	2 (4%)
Waverley Council	1 (2%)
Dept of Lands/RTA	1 (2%)
Rockdale Council	1 (2%)
Warringah Council	2 (4%)

The Department of Defence manages two sites (At9b & 15a zoned 5(a) Special Uses). This Department also currently manages a third site

(At22), but this site will in the future be transferred to the ownership of Randwick Council.

Sydney Water owns two sites, at the North Head Sewage Treatment Plant (STP), which is zoned 5(a) Special Uses. One site occurs on a bushland remnant that is owned by the Department of Lands and RTA and partly zoned 2(a) Residential and Road Reserve (At24).

Mosman Council manages a large number of sites, both on crown and road reserves. Seven of these sites on crown reserves are zoned 7(a) Environment Protection (Bushland): (At3a-b, 4-6, 10, 13c), while four others are zoned 6(a) Public Recreation (At3c, 9a, 13a, 14). The two sites on road reserves are also zoned 6(a) Public Recreation (At7, 13b).

Woollahra Council is responsible for three sites on either crown reserves (At16 & 17a) or council reserves (At21), all zoned 6(a) Public Recreation. Waverley Council manages two sites on road reserves (At19a & 20), both zoned as 2(a) Residential.

Randwick Council manages two sites, one within a council work depot zoned 5(a) Special Uses (At23); the second site is currently being transferred to Randwick Council from the Department of Defence. Rockdale Council manages one site, located in a reserve zoned 6 General Recreation (At25).

Warringah Council manages two sites (At 26&27), both located on council reserve and zoned as Public Open Space. One of these (At26) is presently managed by both Warringah Council and the Department of Lands.

Only four sites occur on private land, in the Waverley LGA (At19b & 20, zoned Residential) and Manly LGA (At1e-f). The latter two sites are owned by St. Patricks College, and at site At1f, the majority of plants (90%) and habitat (95%) will be removed as part of an approved residential development. Site At1e is zoned 5(s) Special Uses – Seminary (Heritage) Zone.

4.5 Habitat

4.5.1 Landform, Climate, Geology and Soils

A.t.terminalis usually occupies sandy soil on creek banks, hillslopes or in shallow soil in rock

crevices and sandstone platforms on cliffs (World Wide Wattle 2006).

Some sites containing the subspecies occur on rock outcrops, which are associated with skeletal sandy soils, while others are located on hillslopes, which generally have deeper soils with high proportions of outcropping sandstone (M. Bremner, pers. comm.). A small number of sites at North Head and Randwick Environment Park occupy deep aeolian dune sands (M. Bremner, pers. comm.). At Randwick Environment Park, this may be the result of human related soil movement (D. Hirschfeld, pers. comm.).

The subspecies has been recorded from five soil landscape units, although the vast majority of populations occur on the Hawkesbury and Lambert soil landscape units (Table 3).

Table 3 *Acacia terminalis terminalis* populations by soil landscape unit (Chapman et al 1989)*

Landscape	Soil landscape unit	Substrate	Populations (%)
Colluvial	Hawkesbury (ha)	Hawkesbury Sandstone	18 (60%)
Erosional	Lambert (la)	Hawkesbury Sandstone	5 (17%)
Aeolian	North Head (nh)	Sand	3 (10%)
Aeolian	Newport (np)	Sand	2 (7%)
Aeolian	Tuggerah (tg)	Sand	2 (7%)

*where populations occupy two or more soil landscape units they have been recorded as two or more populations. The total number of populations is thus 30 instead of 27.

All sites described in this recovery plan occur below 100 metres. Annual precipitation in the distribution area (at Sydney Airport climatic station) is 1100 mm, while the mean daily maximum/minimum temperature is 26.3/18.7° in January and 16.9/6.9° C in July.

4.5.2 Associated Vegetation

A.t.terminalis is described by World Wide Wattle (2006) as being scattered or locally common in scrub and open eucalypt woodland or forest.

Populations visited for the purpose of this recovery plan occurred in the following broad vegetation types, following Specht (1981):

- Forest, open forest, woodland and open woodland associations of *Angophora costata*, *Eucalyptus botryoides*, *E. gummifera*, *E. resinifera*, *E. piperita*, *E. scias*, *E. haemastoma*, *E. punctata*, *E. pilularis* and/or *Banksia integrifolia*;
- Low open forest, low woodland and low open woodland associations of *Eucalyptus*

botryoides, *E. gummifera*, *E. robusta*, *Banksia integrifolia*, *B. ericifolia*, *Ficus rubiginosa*, *Glochidion ferdinandi*, and/or *Elaeocarpus reticulatus*;

- Closed scrub, scrub, open scrub and tall shrubland associations of *Leptospermum laevigatum*, *Kunzea ambigua*, *Melaleuca nodosa*, *M. armillaris*, *Banksia integrifolia*, *B. ericifolia*, *B. aemula*, *Pittosporum undulatum*, *Hakea dactyloides*, *Allocasuarina distyla*, *Ceratopetalum gummiferum*, *Callicoma serratifolia*, *Glochidion ferdinandi*, *Notolaea longifolia* and/or *Elaeocarpus reticulatus*; and
- Heathland, open heathland and shrubland associations of *Melaleuca nodosa*, *Allocasuarina distyla*, *Lepto laevigatum*, *Banksia spinulosa*, *B. integrifolia*, *B. ericifolia*, *Monotoca elliptica*, *Acacia longifolia*, *Hakea teretifolia*, *Grevillea buxifolia*, and/or *Epacris longiflora*.

Table 4 shows the distribution of populations in relation to the vegetation mapping of Benson & Howell (1994) and Tindall *et al* (2003) respectively. Please note, however, that many of the vegetation remnants that the subspecies inhabits were not mapped in these projects as a consequence of their small size.



Figure 2. Known distribution of *Acacia terminalis terminalis* in NSW.

Table 4 Populations by vegetation map unit following (a) Benson & Howell (1994) and (b) Tindall *et al.* (2003).*

(a) Vegetation Map Unit Benson & Howell 1994	Populations (%)*
Not mapped	12 (44%)
Sydney Sandstone Gully Forest (10ag)	10 (37%)
Coastal Sandstone Heath (21g)	3 (11%)
Sydney Sandstone Ridgetop Woodland (10ar)	1 (4%)
Coastal Dune Heath (21b)	1 (4%)
(b) Vegetation Map Unit Tindall <i>et al.</i> 2003	Populations (%)
Not mapped	12 (36%)
Coastal Sandstone Gully Forest	5 (15%)
Coastal Sandstone Ridgetop Woodland	5 (15%)
Littoral Thicket	4 (12%)
Coastal Sandstone Plateau Heath	3 (9%)
Eastern Suburbs Banksia Scrub	3 (9%)
Sandstone Headland Scrub	1 (3%)

*where populations occupy two or more vegetation map units they have been recorded as two or more populations

4.5.3 Habitat Critical to Survival

Habitat critical to the survival of *A.t.terminalis* includes:

- the area of occupancy of populations;
- areas of similar habitat surrounding and linking populations; and
- additional occurrences of similar habitat that may contain undiscovered populations of the species or be suitable for future translocations.

Apart from the area of occupancy of known populations, the location of habitat critical to survival has not been mapped.

5 Biology and Ecology

Very little is known about the biology and ecology of *Acacia terminalis* or the extent to which this varies between subspecies. Unless specifically stated as otherwise, the information in this section refers to observations of unspecified subspecies of *Acacia terminalis* and may not strictly apply to *A.t.terminalis*. This information has been provided as a guide in the absence of more specific information and should be applied with caution.

5.1 Habit and life cycle

A.t.terminalis is an erect or spreading shrub, 1 - 5 metres tall. *A. terminalis* has a lifespan of between 8 and 20 years, and a primary juvenile period of between 2 and 4 years (T. Auld, pers.

comm.). So far, no other information is available on the life cycle of this species, or any of the subspecies. For example, it is unknown at what age the plants first start to produce flowers or seed.

5.2 Pollination, flowering and seed production

Acacia terminalis is self incompatible, i.e. pollen transfer from plant to plant is essential for seed set (Knox *et al* 1985). The flowers are protogynous, that is they first function in the female phase (only the stigmas are exerted) and later in the male phase (the filaments are elongated and the anthers split open; Knox *et al.* 1985).

World Wide Wattle (2006) describes the flowering period of *A.t.terminalis* as March to July. However, plants at a number of sites were observed to be in bud in early January 2006, and flowering by mid-February (M. Bremner, pers. comm.).

The natural pollinators of *A. terminalis* appear to be small birds (including Thornbills, Silvereyes, and Spinebills) which collect pollen on their head feathers as they probe for nectar, which is released by extra floral nectaries on the petioles of each leaf (Knox *et al* 1985). However, during the summer months, honeybees (*Apis mellifera*) may share pollination with small birds, as they sometimes feed from the extra floral nectaries and visit flowers for pollen (Kenrick *et al* 1985, cited in Benson & McDougall 1996).

5.3 Seed dispersal and seed bank dynamics

The seed pods of *A. terminalis* mature and release their hard coated seed in November (Benson & McDougall 1996; Auld & O'Connell 1991). Initially, seeds are dispersed via gravity. Secondly, ants may also disperse the seed, but this is likely to be limited to a distance of a few metres (Rice and Westoby 1981; Auld 1996).

Acacia species generally have high seed dormancy and long-lived persistent seedbanks (Auld 1996). *A. terminalis* has a persistent soil seedbank which may last for up to 50 years. Seed viability of greater than 95% has been recorded for *A. terminalis* (Auld & O'Connell 1991).

Germination of the species occurs mainly after fire, when it is triggered by heat (D. Keith, pers. comm.). A fire temperature of >60°C is required for maximum germination of *A. terminalis* (D.

Keith pers. comm. in Benson & McDougall 1996).

5.4 Disturbance ecology

Seedlings often grow on the edge of roads and tracks in long unburnt vegetation, which may indicate that physical disturbance triggers recruitment (M. Bremner, pers. obs.). It has also been suggested that drought conditions assist in breaking the seed coat and thus dormancy (S. Smith, pers. comm.).

A.t.terminalis should be considered a fire sensitive obligate seeder. It is killed by high intensity fire and does not seem to resprout after fire (T. Auld pers. comm. in Conacher Travers 2004). The interval between fires should thus be long enough to allow post-fire seedlings to mature and sufficiently replenish the seedbank.

As a rough guide for the minimum fire interval for this subspecies, at least 3 times the primary juvenile period are required to achieve a good replenishment of the soil seed bank after fire (T. Auld, pers. comm.). The primary juvenile period is at the age of 2-4 years. Hence, a minimum fire-free interval of 6-12 years is appropriate for *A.t.terminalis*. The shorter interval of 6 years should only be applied when the primary juvenile period following the previous fire has been 2 years.

The maximum fire-free interval for the subspecies is not known. However, based on the estimated longevity of the subspecies, a maximum period of 20 years would seem appropriate.

Germination after fires is highest if the fire temperature is $>60^{\circ}\text{C}$ (D. Keith pers. comm. in Benson & McDougall 1996) or of 'moderate intensity' (Auld & O'Connell 1991). The latter is based on the fact that only a small proportion (6-9%) of *A. terminalis* seed is expected to germinate in the top 1 cm of soil following a low intensity burn ($<500\text{kW m}^{-1}$), whereas under a moderate intensity burn (1500kW m^{-1}), up to 96% of *A. terminalis* seed is expected to germinate to a soil depth of 5 cm (Auld & O'Connell 1991).

Depending on the available seedbank in the top few centimetres of the soil, the application of low intensity burns may lead to population declines in species such as *Acacia terminalis* (Auld & O'Connell 1991). Accordingly, it is

recommended that moderate intensity fires be applied in habitat of *A.t.terminalis*, in preference to low intensity fires. In such fires, a greater proportion of seeds in the top few centimetres of soil will be killed, but germination will occur of seeds below that depth (Auld & O'Connell 1991). However, fires may have to be of lower intensity at *A.t.terminalis* sites with shallow soils, as otherwise, all seeds will be killed.

Recent research also suggests that the temperature reached during the passage of a fire is more critical (in terms of its effect on germination) than the duration of the heating, at least for temperatures up to and including 100°C (Auld & O'Connell 1991).

The most appropriate season to burn *A.t.terminalis* sites has not been examined. As the subspecies has a persistent seed bank it is not necessary for fires to occur immediately following the fruiting season. It is assumed that late summer and autumn fires would be preferable, since the seedlings at these times should encounter favourable moisture conditions for growth (Auld 1996). In addition, such fires are more likely to produce the higher intensity fires that are required for germination.

6 Threats and Management Issues or Management Considerations

6.1 Current threats

6.1.1 Habitat loss and fragmentation

A.t.terminalis occurs in a highly urbanised part of eastern Sydney and it is likely that much of the original habitat of the subspecies has been lost to development. Today, the subspecies generally occupies small and fragmented bushland remnants.

The clearing of habitat for *A.t.terminalis* continues and, in the last 10 years, two important sites have been destroyed for residential development (at Matraville comprising 71 individuals and North Head comprising 87 individuals; Anne Clements & Associates 2001; Total Earth Care 2004).

All but 4 of the 53 known sites occur on public land, however only 15 sites occur on DECCW estate and only 7 other sites are zoned for Environment Protection. All other sites are not zoned specifically for conservation, and so are potentially at risk of development.

6.1.2 Weed invasion

One of the main consequences of habitat fragmentation and urbanisation is weed invasion. The viability of several populations of *A.t.terminalis* are threatened by direct competition by weeds, as well as the disruption to life cycle processes (including recruitment) that results from the associated habitat degradation (Table 5).

Table 5 The major environmental weeds invading the habitat of *Acacia terminalis terminalis*

Scientific name	English name
<i>Chrysanthemoides monillifera</i> subsp. <i>rotundata</i>	Bitou Bush
<i>Lantana camara</i>	Lantana
<i>Rubus fruticosus</i>	Blackberry
<i>Coreopsis lanceolata</i>	Coreopsis
<i>Andropogon virginicus</i>	Whiskey Grass
<i>Ipomoea indica</i>	Morning Glory
<i>Ageratina adenophora</i>	Crofton Weed
<i>Cotoneaster</i> sp.	Cotoneaster
<i>Phytolacca octandra</i>	Ink Weed
<i>Cortaderia selloana</i>	Pampas Grass
<i>Cinnamomum camphora</i>	Camphor Laurel
<i>Asparagus densiflorus</i>	Asparagus Fern
<i>Nephrolepis cordifolia</i>	Fishbone Fern
<i>Lonicera japonica</i>	Honeysuckle
<i>Pennisetum clandestinum</i>	Kikuyu
<i>Ligustrum sinense</i>	Small-leaved Privet
<i>Ligustrum lucidum</i>	Broad-leaved Privet
<i>Pittosporum undulatum</i> *	Native Daphne
<i>Glochidion ferdinandi</i> *	Cheese Tree

* native species that contribute to a mesic shift in the absence of fire

Different sites are affected by different weed species and the degree of weed invasion varies significantly between (and within) sites. In the absence of fire, some native species (including *Pittosporum undulatum* and *Glochidion ferdinandi*) can act in a 'weedy' manner and contribute to a mesic shift in the vegetation that is occupied by *A.t.terminalis*. This mesic shift is likely to suppress recruitment of the subspecies and should be managed through the application of fire, or where this is not possible, through the selective culling of the weed species.

The management of weeds at *A.t.terminalis* sites requires targeted bush regeneration efforts that aim to restore and maintain areas of suitable habitat for the subspecies. However, it is important that land managers are aware that weed control measures have the potential to impact negatively on the subspecies and caution should be used when applying herbicides within or near habitat for the subspecies.

The long term success of bush regeneration efforts at *A.t.terminalis* sites will rely on the

successful mitigation and/or amelioration of the factors that are contributing to the degradation of the bushland remnants of which they are a part. These factors include:

- altered hydrological flows (including associated problems with erosion and sedimentation);
- altered soil pH and nutrient levels;
- green waste dumping;
- inappropriate access; and
- the importation of fill material.

The measures to address these factors (including stormwater management devices, walking trail upgrades, fencing, community awareness programs) will be most efficiently coordinated through a plan of management, or similar. The preparation of such a document for each bushland remnant that the subspecies inhabits will assist in ensuring that the appropriate measures are implemented in a coordinated and strategic manner, and that the causes of degradation are addressed, as well as the symptoms (i.e. the weeds).

6.1.3 Dieback from *Phytophthora cinnamomi*

Infection of native plants with *Phytophthora cinnamomi* has been listed as a Key Threatening Process under State (TSC Act) and Commonwealth legislation (EPBC Act). *P. cinnamomi* is a fungus like soil-borne organism that infects a large range of species. Infected species can display a range of symptoms; some are killed, some are damaged but endure, and others show no apparent symptoms (NSW Scientific Committee 2002).

P. cinnamomi disperses independently through very moist but well aerated soil, with annual rates of downslope spread ranging from a few to hundreds of metres, depending on the hydrology of substrates. Propagules may also be dispersed by vehicles, walkers and the movement of soil (NSW Scientific Committee 2002).

P. cinnamomi has been identified extensively at Middle Head and Georges Heights in close proximity to *A.t.terminalis* sites (P. Jensen, pers. comm.). It is not known whether *A.t.terminalis* is susceptible to *P. cinnamomi*. However, even if it is not susceptible to direct attack, the subspecies will potentially be affected by habitat degradation should the vegetation at a site become infected with the pathogen and experience dieback.

The Sydney Harbour Dieback Working Group was established in 2003 to protect bushland on the Sydney Harbour foreshores from the spread and impact of *P. cinnamomi*. The working group has produced draft Best Practice Management Guidelines to assist in management for *P. cinnamomi* prone areas (SHDWG 2005). These address issues including:

- Hygiene protocols for bushland contractors;
- Detection, diagnosis and mapping of infected areas;
- Guidelines for tree injection;
- Guidelines for the use of mulch;
- Guidelines for track construction; and
- Recommended signage.

These guidelines can be viewed at www.harbourtrust.gov.au. It is recommended that managers of sites that are at risk of *P. cinnamomi* infection consult these guidelines before undertaking work in, or upslope of, *A.t.terminalis* sites. The appropriate measures to mitigate and/or ameliorate habitat degradation by *P. cinnamomi* infection are best addressed through the preparation and implementation of a plan of management, or similar.

6.1.4 Access & visitation issues

Formal and informal track creation causes disturbance at a number of *A.t.terminalis* sites. Initially, track creation may trigger recruitment of the subspecies along the edges of tracks, potentially through seed coat scarification and increased light levels. However, at a later stage, it usually leads to weed invasion and associated habitat degradation through physical damage, soil compaction, and an increase in 'edge effects'. The presence of tracks through sites will also potentially encourage dumping, arson and the spread of pathogens including *Phytophthora cinnamomi*.

For the above reasons, land managers should seek to avoid the construction of walking tracks that pass in close proximity to *A.t.terminalis* sites, unless they plan to address weed invasion and the other threats mentioned above once seedlings have been established. Land managers should also seek to discourage the creation and use of informal tracks. Measures to achieve this could include the use of informal physical barriers (such as logs and branches), signs and, where feasible, the construction of alternative tracks that avoid the site in question.

Many *A.t.terminalis* sites occur on publicly-owned foreshore land with very high public visitation levels. This location also places the subspecies at risk from disturbances associated with the construction and maintenance of visitor infrastructure including board-walks, look-outs, and car parks.

6.1.5 Fire and other disturbance

As an obligate seeder with a seed coat-imposed dormancy, *A.t.terminalis* is susceptible to population declines (and potentially local extinctions) as a result of inappropriate disturbance regimes.

Section 5.4 identifies fire as the primary trigger for recruitment of the subspecies, and the discussion below focuses on the reinstatement of appropriate fire regimes at *A.t.terminalis* sites. At some sites, ecological burns may not be possible (e.g. due to the small size of bushland remnant), or seedling recruitment may not occur for unknown reasons. Here, other methods to break the seed coat imposed dormancy could be trialed in an experimental manner. Such methods could include the use of pile burns or the raking of topsoil.

It appears that fire exclusion is a greater threat to the subspecies than too frequent fire, as many of the sites visited during the preparation of this recovery plan had not been burnt for very long periods (generally > 50 years). These sites were characterised by thick leaf litter and/or senescent vegetation, and many of them had experienced considerable decreases in the number of *A.t.terminalis* plants.

In order to maintain viable populations of plants, land managers should seek to apply the following fire management recommendations (as discussed in Section 5.4):

- a minimum fire-free interval of between 6 and 12 years, with the shorter interval applied only in instances when the primary juvenile period following the previous fire is known to have been 2 years;
- a maximum fire-free interval of 20 years;
- burns should be of moderate to high intensity (>1500kW m⁻¹); and
- burns should occur in late summer or autumn, where possible.

6.1.6 European rabbits

European rabbits *Oryctolagus cuniculus* feed on *A.t.terminalis* and seem to prefer this species over other plants in the same area. They

predominantly feed on seedlings, to the extent that whole plants are stripped leafless, but do also browse on mature plants.

Browsing by rabbits can be greatly reduced by installing plastic tree guards around seedlings and leaving these in place until the trees have grown out of reach of rabbits. This measure has been very effective in increasing population size at North Head (S. Waythe, pers. comm.). Tree guards have the additional benefit of protecting seedlings from being slashed or trampled upon, as they often grow in recently disturbed areas (see 6.1.4 above). In addition, rabbit control programs should focus on areas where *A.t.terminalis* is found.

6.1.7 Hybridisation

Hybridisation with other *A. terminalis* subspecies is potentially a major threat to *A.t.terminalis*. Such hybridisation will potentially occur if other *A. terminalis* subspecies are planted in close proximity to *A.t.terminalis* sites. This could eventually lead to the loss of true *A.t.terminalis* at affected sites, and its replacement with intermediates.

The distance within which pollen exchange between *A. terminalis* subspecies is likely to occur is not known, although given that pollination by small birds is suspected, this distance could be considerable. However, a 'pure' population of *A.t.terminalis* at Bunnerong Road, Chifley has been recorded within 700 metres of a 'pure' *A. t.* subsp *angustifolia* population at Bunnerong Power Station (D. Hirschfeld, pers. comm.). This suggests that the risk of hybridisation occurring over long distances, and between isolated bushland remnants, may be low.

In order to reduce the risk of hybridisation at *A.t.terminalis* sites, it is strongly recommended that land managers refrain from planting other *Acacia terminalis* subspecies in or near bushland remnants that are contiguous with *A.t.terminalis*. At sites such as HMAS Watson and the Sydney Harbour Federation Trust (SHFT) land at Georges Heights where other *A. terminalis* subspecies have been planted in close proximity to *A.t.terminalis*, these plantings should be removed as a priority.

A community awareness raising program to inform nearby residents of the risks of hybridisation from planted *A. terminalis* subspecies is also required.

6.2 Limits to current knowledge

Several aspects of the biology and ecology of *A.t.terminalis* are currently unknown. Table 6 details the specific research areas that are considered to be a priority for the subspecies. The potential benefits of increasing knowledge in these areas is that land managers would have greater information to enable determination of management actions and assign priority to these actions. In addition, consent and determining authorities would have greater information to enable them to effectively determine the impact of any proposals on the subspecies.

6.3 Translocation and ex situ conservation

Translocation is the deliberate transfer of plants or regenerative plant material from an *ex-situ* collection or natural population to a location in the wild, including existing or new sites or those where the subspecies is now locally extinct (Vallee *et al.* 2004). Translocation is often raised as a possible method of conserving threatened flora. However, given the high cost and risk associated with the technique, translocation should only be considered as a last resort when all other management options are deemed inappropriate or have failed. As stated by Vallee *et al.* (2004), 'where possible, resources will be more effective when directed towards conserving existing populations *in-situ* through habitat protection and/or habitat rehabilitation measures and through the control of threatening processes'.

Translocation is not currently considered necessary for the survival of *A.t.terminalis* as the *in-situ* conservation measures proposed in this recovery plan are expected to meet the conservation needs of the subspecies. Further, primarily due to the uncertainty of success and the risks associated with translocation, the technique should not be considered by consent or determining authorities to be an appropriate means of ameliorating the impact of a proposal on threatened species (Vallee *et al.* 2004). In short, translocation does not decrease the significance of an impact.

Table 6 Priority research areas for *Acacia terminalis terminalis*

Knowledge Gap	Justification	Potential Methodologies	Potential benefits of increased knowledge
The impact of different disturbance methods on recruitment and survivorship	The application of moderate to high intensity ecological burns may not be possible at all sites	Experimental investigation of different disturbance methods (including low intensity ecological burns, pile burns and soil disturbance) and their effect on recruitment and survivorship	Land managers provided with access to a wider range of tools in order to encourage recruitment Potential prevention of local extinction
The period of seed bank longevity and extent of the loss of seed viability over time The proportion of the seedbank that remains following low, moderate and high intensity fire	The subspecies is a fire sensitive obligate seeder and so a sound knowledge of seed bank dynamics is essential to its conservation management	Seedbank sampling, seed storage and germination trials	Land managers provided with Information regarding the appropriate thresholds for fire and other disturbances
Susceptibility of the subspecies to <i>Phytophthora cinnamomi</i> (Pc)	Pc is active in at least part of the range of the subspecies	Monitoring of plants grown in contaminated soil. Soil testing of sites across the subspecies' range.	Land managers aware of actual degree of threat and able to implement appropriate threat abatement measures
Susceptibility to hybridisation with other <i>A. terminalis</i> subspecies	Hybridisation with planted <i>A. terminalis</i> subspecies is potentially a major threat	Investigate the level and spatial extent of pollen transfer within the species	Community informed of a 'safe' distance at which other <i>A. terminalis</i> subspecies can be planted

However, 're-stocking' or 're-introduction' should be considered at sites that experience a substantial decline in population size and are subject to efforts aimed at triggering recruitment, such as the application of disturbance, including fire. At such sites, 're-stocking' should be from seed previously collected at those sites. In addition, if there are threats causing the local decline of populations, these should be managed prior to re-introduction.

There are currently no plans to establish an *ex-situ* collection of this subspecies, and this is not listed as a priority action for its survival. However, the establishment of an *ex-situ* seed collection is considered to be a prudent contingency measure to protect against the loss of genetic material that may result from unexpected local extinctions. The criteria that will be applied when assessing a site's priority for seed collection include:

- distance from nearest conserved population;
- tenure; and
- number of extant plants.

7 Previous Recovery Actions

7.1 In-situ protection

On ground works to restore and maintain habitat for the *A.t.terminalis* have been undertaken at a number of sites that are managed by the DECCW, Sydney Harbour Federation Trust (SHFT), Woollahra Council, and Mosman Council. These works include the implementation of bush regeneration and ecological burn programs. The SHFT has also recently installed board-walks to control public access through sites at North Head and Georges Heights.

Randwick City Council has undertaken bush regeneration works at the Bunnerong Road Chifley site since 2003 and has prepared a weed management plan for the site.

7.2 Threatened species data collection and audit

The DECCW has conducted a literature review, and an audit of RBG NSW Herbarium, NSW NPWS Atlas of Wildlife, Forests NSW record, and other records prior to the preparation of this recovery plan. A total of 36 of the 53 known sites that contain the subspecies were subsequently visited to obtain information relating to the status of the subspecies at these sites and the threats to its survival.

7.3 Profile and environmental impact assessment guidelines

A species profile and environmental impact assessment guidelines have been prepared for *A.t.terminalis* (Appendix 3). The aim of these documents is to assist the assessment of potential impacts on the subspecies and community during the preparation and review of assessments under Parts 4 and 5 of the EP&A Act and Part 6 of the TSC Act.

7.4 Establishment of a recovery team

A recovery team has not been established for *A.t.terminalis*. However, consultation has occurred with members of a recovery plan reference group, comprising representatives of relevant public authorities that will be responsible for the planning and/or management of this subspecies and scientists who have special knowledge of it.

7.5 Working group to combat *Phytophthora*

The Sydney Harbour Federation Trust has established a “Sydney Harbour Dieback Working Group”, which aims to minimise the spread and impact of *Phytophthora cinnamomi*. This Working Group has developed Draft Best Practice Guidelines (SWDWG 2005) and has held two forums to update stakeholders on newest developments in the combat of this disease. The dieback disease is likely to impact on *A.t.terminalis* sites.

8 Proposed Recovery Objectives, Actions and Performance Criteria

The overall objective of this recovery plan is to prevent the status of *A.t.terminalis* from becoming critically endangered by reducing the further loss of populations and by implementing in-situ management regimes aimed at maintaining representative populations of the subspecies’ across its natural range.

Specific objectives of the recovery plan for the subspecies are listed below. For each of these objectives a number of recovery actions have been developed, each with a performance criterion.

Specific objective 1: Coordinate the recovery of *A.t.terminalis*

A coordinated approach is essential to oversee and assist in the implementation of the recovery

actions in a timely, cost-effective and efficient manner. Some of the tasks (e.g. liaison with other public authorities) will overlap with other identified actions.

Action 1.1: DECCW will coordinate the implementation of the actions outlined in this recovery plan.

Performance Criterion 1.1: DECCW has coordinated the recovery actions included in this recovery plan for the life of the plan.

Action 1.2: DECCW will integrate recovery actions of the *A.t.terminalis* recovery plan with actions for other threatened species, populations and communities.

Species with similar management requirements may benefit from the *A.t.terminalis* recovery program. Such species may be subject to a recovery plan in the future and by integrating recovery actions, limited resources can provide better conservation benefits for a range of threatened species.

Performance Criterion 1.2: Where practicable, recovery actions have been integrated with those of other threatened species, endangered populations or endangered ecological communities.

Specific objective 2: Conserve *A.t.terminalis* using land-use and conservation planning mechanisms

Only 43 % of *A.t.terminalis* sites (= 22 sites) occur within conservation reserves. Of these 22 sites, 15 are in National Parks, and the remaining 7 in land managed by Mosman Council and zoned as 7(a) Environment Protection (Bushland). Hence, the majority of sites outside DECCW estate are currently not zoned for conservation. This objective aims to increase the legislative protection for high priority sites through the following mechanisms:

- Conservation agreements and covenants under the NPW Act and *Conveyancing Act 1919*;
- Joint management agreements and property management plans under the TSC Act;
- Environmental planning instruments under Part 3 of the EP&A Act;
- Classification of land as community land under the *Local Government Act* and

subsequent consideration of the subspecies in plans of management for such land.

Action 2.1: *DECCW will advise relevant public authorities of the presence of *A.t.terminalis* on lands under their control or management and provide advice on modifications that may need to be made to maintenance procedures to ensure the subspecies is not adversely affected by them.*

Performance Criterion 2.1: *Advice given to relevant public authorities on modifications that may need to be made to maintenance procedures to ensure *A.t.terminalis* is not adversely affected by them.*

Action 2.2: *Councils and the Department of Planning will ensure that all relevant Environmental Planning Instruments (prepared under Pt 3 of the EP&A Act) are prepared, or reviewed, with reference to this recovery plan and any further advice from the DECCW regarding this subspecies.*

Action 2.3: *All relevant consent and determining authorities (under Pt 4 & 5 of the EP&A Act) will assess developments and activities with reference to this recovery plan, environmental impact assessment guidelines (Appendix 3) and any further advice from the DECCW regarding the subspecies.*

For the purpose of Action 2.3, consent and determining authorities include:

- the DECCW;
- the Department of Lands;
- the RTA;
- the Sydney Harbour Federation Trust;
- Sydney Water; and
- the local governments of Manly, Mosman, Randwick, Rockdale, Waverley, and Woollahra.

Performance Criterion for actions 2.2 and 2.3: *The level of protection afforded *A.t.terminalis* populations and habitat is increased through conservation planning and land-use decisions.*

Action 2.4: *The DECCW will undertake negotiations with the Department of Planning, RTA, the Department of Lands, and Randwick Council to increase the legislative protection afforded to *A.t.terminalis* on site At24 at Bunnerong Road in Chifley.*

The Bunnerong Rd site is the largest stand outside the DECCW estate and it represents the southern limit of distribution for the subspecies. The site is presently zoned for residential and/or road reserve. No sites south of Nielsen Park are currently on DECCW estate or zoned for Environmental Protection. Negotiations should consider the full range of protection strategies available to increase the level of legislative protection for the subspecies on this site.

Performance Criterion 2.4: *The level of legislative protection afforded the population at site At24 is increased through land-use and conservation planning agreements and controls.*

Specific objective 3: To identify and minimise the threats operating at sites where *A.t.terminalis* occurs.

Threats operating at *A.t.terminalis* sites (in addition to land clearing) are described in Section 6.1. Actions under this objective aim to minimise these threats through: (1) the provision of information regarding the management of *A.t.terminalis* to selected land managers and public authorities; (2) the incorporation of appropriate threat abatement measures into relevant management plans; and (3) the implementation of appropriate *in situ* abatement measures.

Threat abatement measures should include (but not be restricted to):

- weed control and bush regeneration;
- adhering to the Best Practice Management Guidelines for *P. cinnamomi* when implementing *in situ* management activities, as discussed in Section 6.1.3;
- restricting access, informal tracks and green waste dumping through fencing and bollards, informal barriers and/or signs;
- construction of alternative tracks in more appropriate areas;
- the application of appropriate fire regimes, as outlined in Section 6.1.5;
- installing tree guards around seedlings and ensuring that rabbit control programs are aimed at areas where *A.t.terminalis* seedlings are found;
- avoiding planting other subspecies of *A. terminalis* in close proximity to *A. t. terminalis* sites; and

- regular monitoring to assess the status of the population and the effectiveness of threat abatement measures. In some areas, this is best done by tagging mature plants to help management staff identify the species and to avoid unintended slashing.

Sites that contain *A.t.terminalis* should receive a high priority when allocating resources for on-ground works (including bush regeneration, installation of drainage control structures etc). Management issues at sites are best addressed in a strategic and coordinated manner through the preparation and implementation of site management statements (following the proforma in Appendix 4) that detail any specific threat abatement measures required, and a timetable to implement these measures.

Management of threats to *A.t.terminalis* on DECCW estate:

Action 3.1: *The DECCW will prepare site management statements for populations located on DECCW estate.*

The DECCW will survey all known sites located on DECCW estate. Where existing plans do not address the in-situ protection of the subspecies, and where such plans will not be revised within two years of the commencement of this recovery plan, then a site management statement will be prepared (following the template in Appendix 4) and implemented. The following sites occur on DECCW estate: At1a, 1d, 1g-1, 8a-b, 9f, 11, 12, 15b, 18a(i) (See Appendix 2 for site details).

Performance Criterion 3.1: *Site management statements for relevant populations on DECCW estate prepared within three years.*

Action 3.2: *The DECCW will implement any necessary threat abatement measures in accordance with the site management statements prepared under Action 3.1.*

Performance Criterion 3.2: *On-site threat abatement measures implemented for *A.t.terminalis* on DECCW estate as required.*

Action 3.3: *The DECCW is to ensure that any Plan of Management or Fire Management Plan for DECCW estate supporting *A.t.terminalis* provides for the species' conservation (see Action 3.10).*

Performance Criterion 3.3: *Plans of Management for DECCW estate supporting *A.t.terminalis* provide for the conservation of this subspecies.*

Management of threats to *A.t.terminalis* on community land managed by local government

Action 3.4: *Local governments will incorporate site specific threat abatement measures for *A.t.terminalis* into Plans of Management for community land.*

Rockdale Council (At25) and Woollahra Council (At21) currently manage community land that supports *A.t.terminalis* (see Appendix 2 for site details).

These councils, and other councils subsequently found to manage *A.t.terminalis*, will incorporate site specific *in situ* protection measures for the subspecies into Plans of Management for community land where the subspecies occurs. Where existing plans do not address the protection of the subspecies, and will not be revised within 2 years of the commencement of this recovery plan, a site management statement will be prepared (see Appendix 4) by the relevant council.

Performance Criterion 3.4: *In situ protection measures for the subspecies incorporated into Plans of Management for land managed by local governments within 3 years.*

Action 3.5: *Councils, as listed for Action 3.4, will implement threat abatement measures in accordance with the site-specific recommendations incorporated into the Plan of Management prepared under 3.4.*

Performance Criterion 3.5: *Threat abatement measures for relevant sites implemented in accordance with Plan of Management by year 5.*

Management of threats to *A.t.terminalis* on land managed by other public authorities:

Action 3.6: *DECCW will liaise with other public authorities that manage land that supports *A.t.terminalis* to prepare site management statements (following the proforma in Appendix 4) for *A.t.terminalis* habitat under their management.*

In particular, DECCW will liaise with:

- Sydney Harbour Federation Trust (At2a-c, 9c, 9d(i), 9e(i), 9g)
- Sydney Water (At1b-c)
- Department of Defence (At9b, 15a)
- Mosman Council (At3a-c, 4-7, 9, 10, 13a-c, 14);
- Waverley Council (At20)
- Woollahra Council (At16 & 17a)
- Department of Lands and RTA (At24)

(See Appendix 2 for site details)

The following three sites are not considered high priority for the *A.t.terminalis* recovery program, due to their extremely small size and highly degraded nature: At19a (Waverley Council), At22 (Department of Defence) and At23 (Randwick Council). Hence, they are not subject to the implementation of this action.

Performance Criterion 3.6: *Site management statements for relevant populations prepared within 3 years.*

Action 3.7: *Public authorities (as identified in Action 3.6) will implement any necessary and feasible threat abatement measures within the habitat of *A.t.terminalis* to mitigate against threats, in accordance with the site management statements prepared under Action 3.6.*

Performance Criterion 3.7: *Threat abatement measures implemented in accordance with the site management statements by year 5 of the plan.*

Management of threats to *A.t.terminalis* on private property:

Action 3.8: *The DECCW will encourage and assist private landholders in the preparation of site management statements (following the proforma in Appendix 4) for sites on freehold land.*

Currently, only four sites are known to occur on private land (At1e-f, 19b, 20). At site 1f, owned by St. Patricks College, the majority of plants (90%) and habitat (95%) will be removed as part of an approved residential development.

Performance Criterion 3.8: *Site management statements prepared for all four known sites on freehold land within 3 years, subject to landholder approval.*

Action 3.9: *The DECCW will encourage landholders to implement threat abatement measures on freehold land in accordance with the site management statements prepared under Action 3.8.*

The DECCW will liaise with interested private landholders of sites that support *A.t.terminalis*, to identify actual and potential threats and to negotiate the implementation of on-ground works to mitigate or reduce threats. Where possible and appropriate, the DECCW will encourage landholders to enter into Voluntary Conservation Agreements. The sites will also be monitored by the DECCW on a regular basis to assess the success of any on-ground works that have been implemented.

Performance Criterion 3.9: *Threat abatement measures for relevant sites implemented in accordance with site management statements within 5 years, subject to landholder approval.*

Strategic management of frequent fire:

Action 3.10: *DECCW and the NSW Rural Fire Service (RFS) will review the conditions for *A.t.terminalis* in the Threatened Species Hazard Reduction List of the Bush Fire Environmental Assessment Code.*

DECCW will use available biological and ecological information to reassess the immediate and cumulative impact of bush fire hazard reduction works on *A.t.terminalis*, and in conjunction with RFS will reassess the adequacy of the mitigative conditions in the Threatened Species Hazard Reduction List. DECCW will also use available biological and ecological information to reassess the impacts of wildfires on *A.t.terminalis*, and, if appropriate, develop preferred mitigative measures in conjunction with RFS to minimise the potential impact of wildfires and/or wildfire suppression operations.

If appropriate, measures for the protection of *A.t.terminalis* are to be included in relevant Bush Fire Risk Management Plans and Operation Maps (pursuant to section 52 of the *Rural Fires Act 1997*).

Performance Criterion 3.10: *Bush Fire Risk Management Plans and Operations Maps include measures (as appropriate) for the protection of *A.t.terminalis*, and the mitigative conditions for *A.t.terminalis* on the Threatened Species Hazard Reduction List are reviewed by*

year 5 of the implementation of this recovery plan or as relevant information becomes available.

Action 3.11: *DECCW will liaise with Bush Fire Management Committees and other public authorities to ensure that the fire requirements of *A.t.terminalis* are taken into consideration when relevant Bush Fire Management Plans are drafted and reviewed.*

For the purpose of this action, 'other public authorities' include:

- Sydney Harbour Federation Trust
- Sydney Water
- Department of Defence
- Department of Lands
- RTA
- The local governments of Manly, Mosman, Rockdale, Randwick, Waverley, and Woollahra.

Performance Criterion 3.11: *Relevant Bush Fire Management plans take into account the fire requirements of *A.t.terminalis*.*

Action 3.12: *The DECCW will provide updated Atlas of NSW Wildlife data to the RFS for incorporation into relevant datasets (including the Threatened Species Hazard Reduction List of the Bush Fire Environmental Assessment Code) and make this data available to the other approval or public authorities listed in Action 3.11.*

Performance Criterion 3.12: *Updated Atlas of NSW Wildlife data is incorporated and used by approval and certifying authorities in decision making.*

Specific objective 4: To promote surveys, research and monitoring that will assist with the management of *A.t.terminalis*

Action 4.1: *The DECCW will undertake surveys of known but recently unsurveyed sites to confirm the presence or absence of *A.t.terminalis*, and will continue to monitor known sites.*

The DECCW will undertake surveys to confirm *A.t.terminalis* presence at all sites not surveyed during the preparation of this recovery plan. These surveys will document the size, habitat characteristics and threats present at these sites.

Material for identification should be submitted to the NSW Herbarium. The DECCW will also continue to monitor known *A.t.terminalis* sites and will analyse any monitoring data that was collected during threat abatement or other on-ground activities. This information can then be used to enter site specific actions for the species into the Priorities Actions Statement (PAS).

Performance Criterion 4.1: *Information regarding population size (number of plants and area occupied), habitat characteristics and threats collected for all known sites within 5 years.*

Action 4.2: *The DECCW will facilitate surveys of potential habitat for *A.t.terminalis* and to promote community involvement in the survey.*

It is likely that our current understanding of the distribution of *A.t.terminalis* is not complete. It is important to establish the full extent of the distribution of potential habitat for *A.t.terminalis*, through both on-ground surveys and predictive modelling. Priority for on-ground surveys should be given to the following areas in which *A.t.terminalis* is likely to occur: Boatharbour Reserve, Kurnell Peninsula, and above Reef Beach, Dobroyd Head. Material for identification should be submitted to the NSW Herbarium.

Performance Criterion 4.2: *At least one survey conducted annually for *A.t.terminalis*. Predictive modelling carried out by year 5, to establish the full extent of potential habitat for the species.*

Action 4.3: *The DECCW will promote the priority research projects identified in this recovery plan.*

As outlined in Section 6.3, there are a number of potential research projects that could assist with the conservation management of *A.t.terminalis*. However, given the absence of funds, this plan advocates the promotion of these priority research projects rather than funding the research. The DECCW will encourage tertiary and research institutions to conduct research that is consistent with the priorities outlined in section 6.3. Where possible, the DECCW will undertake components of this research program.

Performance Criterion 4.3: *All major tertiary and research institutions within the*

Sydney/Illawarra regions have been contacted regarding potential research areas within 2 years.

Specific objective 5: To provide stakeholders with information to assist in conserving *A.t.terminalis*

The prompt and effective distribution of information on *A.t.terminalis* is important in ensuring that the conservation requirements of the subspecies are appropriately considered in decisions regarding land-use planning and field management. Actions under this objective aim to aid the dissemination of information regarding the subspecies to stakeholders including land managers, consent and determining authorities, environmental consultants, bushland contractors, and community groups.

Action 5.1: *The DECCW will provide public land managers with the site information collected during the preparation of this recovery plan.*

Performance Criterion 5.1: *Relevant public land managers have received site information within 6 months of publishing this plan and are able to incorporate this information in relevant land-use and planning decisions.*

Action 5.2: *The DECCW will promptly distribute site records through the NPWS Wildlife Atlas.*

Performance Criterion 5.2: *Location records available on the NPWS Wildlife Atlas within 6 months of verification.*

Action 5.3: *The DECCW will update the profile and environmental impact assessment guidelines for the subspecies to incorporate information acquired during the implementation of the recovery plan.*

Performance Criterion 5.3: *Profile and environmental impact assessment guidelines for the subspecies updated as required.*

Specific objective 6: To raise awareness about the threats to the subspecies and involve the community in the recovery program.

In order to enhance the social benefits of the recovery program and to assist in its implementation, actions under this objective aim

to raise awareness of the recovery program and encourage community involvement in its implementation. A potential area of involvement of the community is in the implementation of threat and habitat management programs and the monitoring of their success, which is an action that public authorities will undertake. Community groups can use the Site Management Statement (Appendix 4) to monitor sites supporting *A.t.terminalis*.

Action 6.1: *The DECCW will distribute information on the progress of the recovery program to raise awareness of the program and encourage community involvement in its implementation.*

The DECCW will prepare an annual newsletter on threatened species recovery planning in Sydney and will include information on the progress of the *A.t.terminalis* recovery program. The newsletter will be distributed to public authorities, community groups, interested individuals and selected affected landholders.

Performance Criterion 6.1: *Newsletter produced and distributed annually.*

Action 6.2: *The DECCW will liaise with local governments, landcare groups and regional bodies such as Catchment Management Authorities to incorporate the implementation of recovery actions (including bush regeneration and site monitoring) into existing bushcare programs*

Performance Criterion 6.2: *Recovery actions implemented into existing bushcare programs and at least four bushcare groups involved in the recovery program annually.*

Action 6.3: *The DECCW will liaise with the Sydney Harbour Dieback Working Group to complete and promote the use of the Draft Best Practice Guidelines for *Phytophthora cinnamomi* prone sites.*

Phytophthora cinnamomi is likely to impact on *A.t.terminalis* sites, either by directly affecting the plants or by degrading their habitat. The "Draft Best Practice Guidelines" (SHDWG 2005) are available under <http://www.harbourtrust.gov.au/downloads/acrobat/events/diebackdraftguidelines.pdf>

Performance Criterion 6.3: *The Best Practice Guidelines completed within 2 years and their use promoted via a media release and community forum within 3 years.*

Action 6.4: *The DECCW will coordinate a campaign to raise awareness of the risk of hybridisation to the recovery of the subspecies and encourage the removal of inappropriate *Acacia terminalis* plantings.*

Hybridisation with other subspecies of *A. terminalis* is potentially a major threat to *A.t.terminalis*.

Performance Criterion 6.4: *Previous inappropriate plantings removed and no further inappropriate plantings undertaken.*

Specific Objective 7: To coordinate an ex-situ conservation program to safeguard genetic material from extinction

As discussed in Section 6.4, the establishment of a comprehensive ex-situ seed collection for *A.t.terminalis* is not considered necessary for the survival of the subspecies. However, to provide protection against the unexpected loss of genetic material, it would be prudent to maintain an *ex-situ* collection of seed collected from priority sites. Using the assessment criteria listed in Section 6.4, the priority sites for seed collection and storage are: At19b, 20, 21, 23, & 25.

Seed has already been collected from sites At22 & 24 and is being held at Randwick City Council's nursery. This seed bank should be maintained as a potential source of seed for restocking in case of unexpected loss of genetic material from this area and potentially from sites in the vicinity of this area.

Action 7.1: *The DECCW will coordinate the collection of a representative sample of seed from each priority site and place these in long-term seed storage.*

Performance Criterion 7.1: *A representative sample of seed collected from each priority site and placed in long-term storage within three years, subject to landholder approval.*

9 Implementation

Appendix 1 outlines the Public Authority statutory responsibilities in relation to this subspecies. Table 7 outlines the costs and parties

responsible for implementation of recovery actions specified in this recovery plan.

10 Social and economic consequences

10.1 Social consequences

Negative social impacts are not envisaged as the implementation of this recovery plan is not expected to affect responsible public land usage to any great extent, and modification of private land management patterns will occur at the land manager's discretion. Liaison with the local community, affected landholders and government agencies will address and minimise any unforeseen negative social impacts arising from the conservation of *A.t.terminalis*.

It is expected that the implementation of this recovery plan will have positive social impacts. The main social benefit of conserving *A.t.terminalis* habitat is in meeting the desire of many in the community that further loss of remnant bushland and threatened species should be prevented. The involvement of the local communities in the implementation of recovery actions (including site monitoring, surveys and site protection measures) will provide benefits for the environment and/or enhance the general well being of the community and individuals involved.

10.2 Economic consequences

The economic consequences of this recovery plan are those costs that are associated with its implementation. Actions involving on-ground management programs and the long-term monitoring of sites will have the greatest economic consequences for land managers.

These costs can be off-set and minimised by:

- seeking funding from external sources;
- implementing a long-term strategic framework for managing the subspecies and its habitat; and
- adopting a co-operative approach to management, which involves the DECCW, other relevant landholders and the community.

The improved environmental impact assessment that will result from mechanisms established in this recovery plan will assist consent and determining authorities to meet their statutory responsibilities. Land managers are increasingly required to provide funding for on-ground

management programs, both through policies and legislation and through community pressure. Such actions will increasingly be seen as the core business of land managers, particularly Councils and other public authorities.

11 Biodiversity Benefits

Increased awareness of *A.t.terminalis* resulting from the implementation of this recovery plan will raise the profile in the community of all threatened species. This in turn will lead to greater opportunities for the conservation of threatened species and increased protection of biodiversity.

The conservation and study of *A.t.terminalis* will benefit other threatened flora species that share the same habitat, particularly the Nielsen Park She-Oak (*Allocasuarina portuensis*), Nettled Bottle Brush (*Callistemon linearifolius*), Bynoe's Wattle (*Acacia bynoeana*), Tetratheca (*Tetratheca glandulosa*) and Heart-leaved Stringybark (*Eucalyptus camfieldii*). It will also benefit threatened fauna, such as the Grey-headed Flying Fox (*Pteropus poliocephalus*), Long-nosed Bandicoot (*Perameles nasuta*), Powerful Owl (*Ninox strenua*), Swift Parrot (*Lathamus discolor*) and Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), as well as other animals and plants that utilise the same habitat as *A.t.terminalis*.

12 Preparation Details

This recovery plan has been prepared by Martin Bremner and Ann Goeth. The information in this recovery plan was accurate to the best available knowledge on the date it was approved.

13 Review Date

This recovery plan will be reviewed and updated by DECCW within 5 years of the date of its publication.

14 References

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TSC Act NSW *Threatened Species Conservation Act 1995*

15 Abbreviations Used in this Document

- DECCW** Department of Environment, Climate Change and Water (NSW)
- EP&A Act** NSW *Environmental Planning and Assessment Act 1979*
- EPBC Act** Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
- IUCN** International Union for the Conservation of Nature and Natural Resources
- LEP** Local Environmental Plan
- NPW Act** NSW *National Parks and Wildlife Act 1974*
- NPWS** National Parks and Wildlife Service
- RTA** Roads and Traffic Authority, NSW
- SEPP** State Environmental Planning Policy

Table 7 Estimated costs, funding source and responsible parties for implementing the actions identified in the Recovery Plan.

Action No.	Description	Responsible party ¹	Priority ²	Fund source ³	Estimated cost/yr ⁴					Total Cost
					Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	
1.1	Co-ordinate recovery program	DECCW	1	In-kind	\$8340	\$8340	\$8340	\$8340	\$8340	\$ 41700
1.2	Integrate with recovery actions for other threatened species	DECCW		#						
2.1.	Advice to public authorities	DECCW	1	#						
2.2	Reference to this plan when preparing Planning Instruments	Councils ⁵ , other authorities ⁶	1	#						
2.3	Reference to this plan when assessing developments & activities	As in 2.2	1	#						
2.4	Increase legislative protection to site At24	DECCW, DoP, RTA, DoL, Randwick Council	2	In-kind	-	\$4170	-	-	-	\$ 4170
3.1	Site management statements for DECCW land	DECCW	2	Unsecured	\$4170	\$4170	\$4170	\$4170	\$4170	\$ 20850
3.2	DECCW Implementation of threat abatement measures	DECCW	2	Unsecured	-	-	\$8340	\$8340	\$8340	\$ 25020
3.3	Review of Plans of Management or Fire Management Plans	DECCW	2	In-kind	-	\$4170	-	\$4170	-	\$ 8340
3.4	Incorporate threat abatement measures into management plans for community land	Rockdale and Woollahra Councils	1	#						
3.5	Local Government Implementation of threat abatement measures	As in 3.4	1	#						
3.6	Site Management Statements for public authority land	DECCW	1	#						
3.7	Public authorities Implementation of threat abatement measures	Public authorities ⁶	1	#						
3.8	Site management statements for private landholders	DECCW	2	In-kind	-	\$4170	-	-	-	\$ 4170
3.9	Encourage private landholders to implement threat abatement measures	DECCW	2	In-kind	-	-	\$4170	-	\$4170	\$ 8340
3.10	Review Bush Fire Environmental Assessment Code	DECCW, RFS	2	#						
3.11	Consider fire requirements in Bush Fire Management Plans	DECCW, Councils ⁵ , other public authorities ²	2	#						
3.12	Provide updated NSW Atlas data to other relevant datasets	DECCW	2	Unsecured	-	\$4170	-	\$4170	-	\$ 8340
4.1	Survey previously unsurveyed sites	DECCW	1	In-kind	\$4170	-	\$4170	-	-	\$ 8340
4.2	Facilitate survey of potential habitat	DECCW	1	In-kind	\$4170	\$4170	-	-	-	\$ 8340
4.3	Promote priority research projects	DECCW	2	In-kind	-	\$4170	-	-	-	\$...4170
5.1	Provide public land managers with site information	DECCW	1	In-kind	\$4170	-	-	-	-	\$ 4170
5.2	Distribute site records through Wildlife Atlas	DECCW	2	#						
5.3	Update profile & Environmental Impact Assessment guidelines	DECCW	2	#						
6.1	Raise awareness of recovery program in the community	DECCW	3	#						
6.2	Liaise with councils regarding bushcare programs	DECCW	3	#						
6.3	Promote best practice guidelines for <i>Phytophthora cinnamomi</i>	DECCW	2	In-kind	-	-	\$4170	-	-	\$ 4170
6.4	Raise awareness of risk of hybridisation	DECCW	2	In-kind	-	-	-	\$4170	-	\$ 4170
7.1	Collect and store seed	DECCW	3	Unsecured	-	\$4170	-	\$4170	-	\$ 8340
	Annual and total cost			Unsecured						\$ 62550
				In-kind						\$100080
				TOTAL						\$162630

¹ **DECCW** : Department of Environment, Climate Change and Water, **RFS** = Rural Fire Service, **DoL** = Department of Lands; **DoP** = Department of Planning² **Priority ratings are: 1** - Action critical to meeting plan objectives, **2** - Action contributing to meeting plan objectives, **3** – Desirable but not essential action.; ³ **In kind** funds represent the salary component of permanent staff and recurrent resources. Salary for in-kind contributions is calculated at \$350 per day, which includes officer salary and on-costs, provision of office space, vehicles, administration support and staff management. **Unsecured** funds will be sought from sources including DECCW annual provisions for the implementation of threatened species programs, Caring for Our Country, Environmental Trust, industry sponsors, the NSW State Biodiversity Program, Threatened Species Appeal and DECCW annual provisions for implementation of threatened species programs. ⁴ # - No direct cost (either cost of action is negligible or action is a statutory responsibility of the responsible party), ⁵ Councils in this recovery plan are the local governments of: Mosman, Randwick, Rockdale, Waverley, and Woollahra. ⁶ Other public authorities, in this recovery plan, are the Department of Lands, the RTA, the Sydney Harbour Federation Trust and Sydney Water programs.

Appendix 1 Public Authority responsibilities under NSW legislation

Public authority	Relevant responsibilities
Department of Environment, Climate Change and Water	<ul style="list-style-type: none"> • Assessment of section 91 licence applications under the TSC Act • Assessment of section 132C licence applications (e.g. for bushland regeneration activities) under the NPW Act • Assessment of proposed activities on DECCW estate. • Consideration of objectives and actions of a recovery plan when undertaking assessment of significance under section 5A of EP&A Act • Advice to consent and determining authorities, with a possible concurrence role under the EP&A Act • Preparation of priority action statements and co-ordination of implementation. • Preparation of plans of management for DECCW estate.
Relevant local governments	<ul style="list-style-type: none"> • Preparation of local environmental plans (LEPs) under Part 3 of EP&A Act. Consultation with DECCW is required if the LEP will or may affect threatened species, populations, communities or their habitats. • Assessment of development applications under Part 4 of EP&A Act. • Assessment of council works under Part 5 of EP&A Act. • Consideration of objectives and actions of a recovery plan when undertaking assessment of significance under section 5A of EP&A Act • Consideration of conditions in Threatened Species Hazard Reduction List when issuing Bush Fire Hazard Reduction Certificates under <i>Rural Fires Act 1997</i>. • Plans of management for community land must be prepared or amended to take into account council's obligations under a recovery plan.
Department of Planning	<ul style="list-style-type: none"> • Development of policy and strategies, including SEPPs, for land use planning and environmental assessment. • Assessment of major development applications. • Determination of certain development proposals under Part 4 of the EP&A Act. • Approval of certain activities under Part 5 of EP&A Act. • Consideration of objectives and actions of a recovery plan when undertaking assessment of significance under section 5A of EP&A Act
Department of Lands/Roads and Traffic Authority	<ul style="list-style-type: none"> • Environmental protection principles must be observed in relation to management of Crown land. • Plans of management may be prepared for Crown land. • Approval of activities on Crown land under Part 5 of EP&A Act • Consideration of objectives and actions of a recovery plan when undertaking assessment of significance under section 5A of EP&A Act
Rural Fire Service	<ul style="list-style-type: none"> • Consideration of impacts on threatened species, populations, communities and their habitats when exercising functions and when preparing Bush Fire Risk Management Plans and Plans of Operations. • Approval authority for works under Part 5 of EP&A Act • Consideration of objectives and actions of a recovery plan when undertaking assessment of significance under section 5A of EP&A Act • Consideration of conditions in Threatened Species Hazard

Public authority	Relevant responsibilities
	Reduction List when issuing Bush Fire Hazard Reduction Certificates. <ul style="list-style-type: none"> • Consideration of objectives and actions of a recovery plan when undertaking assessment of significance under section 5A of EP&A Act
Sydney Harbour Federation Trust	<ul style="list-style-type: none"> • Appropriate management of lands with known or potential habitat.
Sydney Water	<ul style="list-style-type: none"> • Appropriate management of lands with known or potential habitat.

Appendix 2 Site details for the 27 known populations and 53 known subpopulations of *Acacia terminalis terminalis*

Given concerns that the publication of exact location details for populations of *Acacia terminalis* subsp *terminalis* may compromise conservation, specific location information is excluded from this appendix. Land managers or other parties with genuine reasons for requiring the data, may obtain location information via the NPWS Wildlife Atlas.

Site Code	Location	Tenure	Land manager	LGA	Zoning	Original count	Count during preparation of this plan	First Date	Atlas Code	Herbarium specimen
At1a	Sydney Harbour NP (North Head)	NPWS Estate	DECCW (Harbour North)	Manly	8(a) National Park	15	2 (m) in 2005/06	2002	SJJTI0049543	499789
At1b	North Head STP	Sydney Water	Sydney Water	Manly	5(a) Special Uses Existing	60	18 (m) 4 (im) in 2005/06	1998	SVGJ9809290F	-
At1c	North Head STP	Sydney Water	Sydney Water	Manly	5(a) Special Uses Existing	-	3 (m) 7 (im) in 2005/06	2006	-	-
At1d	Sydney Harbour NP (North Head)	NPWS Estate	DECCW (Harbour North)	Manly	8(a) National Park	-	Several hundred mature & immature 2005	1986	SDMPI0067705; SDMPI0067710; SDMPI0067714	-
At1e	St. Patricks Estate, Manly	Freehold	St Patricks College	Manly	5(s) Special Uses Seminary (Heritage) Zone	-	3 (m) in 2005/06	2006	-	-
At1f	St Patricks Estate, Manly	Freehold	St Patricks College	Manly	2 (Residential)	87 (10 to be retained post development)	Not inspected	2004	SDMPI0067772; SDMPI0067788	717179; 717182
At1g	Sydney Harbour NP (North Head)	NPWS Estate	DECCW (Harbour North)	Manly	8(a) National Park	2	2 (m) in 2005/06	2004	SDMPI0067698; SDMPI0067699	-
At1h	Sydney Harbour NP (North Head)	NPWS Estate	DECCW (Harbour North)	Manly	8(a) National Park	5	8 (m) 1 (im) and 9 dead in 2005	2004	-	-
At1i	Sydney Harbour NP (North Head) – Quarantine Station	NPWS Estate	DECCW (Harbour North)	Manly	8(a) National Park	2	Unrecorded number in 2001, no plants 2006	2000	-	420659
At1j	Sydney Harbour NP (North Head) – Quarantine Station	NPWS Estate	DECCW (Harbour North)	Manly	8(a) National Park	-	5 (m) 27 (im) in 2005/06	2000	-	439851
At1k	Sydney Harbour NP (North Head) – Quarantine Station	NPWS Estate	DECCW (Harbour North)	Manly	8(a) National Park	2	No extant plants observed 2005	2004	SDMPI0067694; SDMPI0067695	NSW439851
At1l	Sydney Harbour NP (North Head) – Quarantine Station	NPWS Estate	DECCW (Harbour North)	Manly	8(a) National Park	-	2 (im) in 2005/06	2006	-	-
At2a	Former Military School, North Head	SHFT	SHFT	Manly	5(a) Special Uses Existing	-	2 (m) 11 (im) in 2005/06	2006	-	-
At2b	Former Military School, North Head	SHFT	SHFT	Manly	5(a) Special Uses Existing	-	8 (m) 11 (im) in 2005/06	2006	-	-
At2c	Former Military School, North Head	SHFT	SHFT	Manly	5(a) Special Uses Existing	-	7 (m) 6 (im) in 2005/06	2006	-	-
At3a	Parriwi Park, Mosman	Public Recreation Reserve – Crown	Mosman Council	Mosman	7(a) Environment Protection (Bushland)	-	8 (m) 40 (im) in 2005/06	2001	-	722845
At3b	Parriwi Park, Mosman	Public Recreation Reserve – Crown	Mosman Council	Mosman	7(a) Environment Protection (Bushland)	1	1 (m) in 2005/06	2001	-	710668
At3c	The Spit Reserve, Mosman	Public Recreation Reserve - Crown	Mosman Council	Mosman	6(a) Public Recreation	-	1 (m) 2 (im) in 2005/06	2001	SDMPI0033373	NSW491022

Site Code	Location	Tenure	Land manager	LGA	Zoning	Original count	Count during preparation of this plan	First Date	Atlas Code	Herbarium specimen
At4	Quakers Hat Park, Mosman	Public Recreation Reserve - Crown	Mosman Council	Mosman	7(a) Environment Protection (Bushland)	3	2 (m) 328 (im) in 2005/06	2001	SDMPI0033376	NSW491021
At5	Quakers Hat Bay Reserve (1), Mosman	Public Recreation Reserve - Crown	Mosman Council	Mosman	7(a) Environment Protection (Bushland)	1	2 (m) in 2005/06	2001	SDMPI0033377	NSW491070
At6	Quakers Hat Bay Reserve (2), Mosman.	Public Recreation Reserve - Crown	Mosman Council	Mosman	7(a) Environment Protection (Bushland)	Small population	Not inspected	2001	-	722848
At7	Road Reserve 29, Mosman Local Government Area	Road Reserve	Mosman Council	Mosman	6(a) Public recreation	-	Not inspected	2001	-	710666
At8a	Sydney Harbour NP	NPWS Estate	DECCW (Harbour North)	Mosman	8(a) National Park	-	304 (im) in 2005/06	2006	-	-
At8b	Sydney Harbour NP	NPWS Estate	DECCW (Harbour North)	Mosman	8(a) National Park	>10	214 (im) in 2005/06	2002	SJJI0049554	499788
At9a	Balmoral Oval, Mosman	Crown Reserve	Mosman Council	Mosman	6(a) Public recreation	-	Not inspected	2001	SDMPI0033371	NSW461299
At9b	HMAS Penguin	DOD	DOD	Mosman	5(a) Special Uses - Military Reserve	-	3 (m) 10 (im) in 2005/06	2006	-	-
At9c	Walkway to Balmoral Oval	SHFT	SHFT	Mosman	5(a) Special Uses - Military Reserve	-	2 (m) in 2005/06	2006	-	-
At9d(i)	Georges Heights	SHFT	SHFT	Mosman	5(a) Special Uses - Military Reserve	>79	7 (m) 6 (im) in 2005/06	2003	-	-
At9e(i)	Georges Heights	SHFT	SHFT	Mosman	5(a) Special Uses - Military Reserve	22 (m) 4 (im)	13 (m) in 2005/06	2003	-	-
At9f	Sydney Harbour NP	NPWS Estate	DECCW (Harbour North)	Mosman	8(a) National Park	>16	2 (m) in 2005/06	2002	-	606950
At9g	Georges Heights	SHFT	SHFT	Mosman	5(a) Special Uses - Military Reserve	-	13 (m) 5 (im) in 2005/06	2003	-	-
At10	Bradley Bushland Reserve, Mosman	Public Recreation Reserve - Crown	Mosman Council	Mosman	7(a) Environment Protection (Bushland)	1 (possibly planted)	Not inspected	2001	-	710665
At11	Sydney Harbour NP	NPWS Estate	DECCW (Harbour North)	Mosman	8(a) National Park	locally occasional	2 (m) 7 (im) in 2005/06	1992	SDMP99070502	60140
At12	Sydney Harbour NP	NPWS Estate	DECCW (Harbour North)	Mosman	8(a) National Park	11	3 (m) 5 (im) in 2005/06	1997	SDMP99070500	414922
At13a	Sirius Cove, Mosman	Public Recreation Reserve - Crown	Mosman Council	Mosman	6(a) Public Recreation	-	Not inspected	2001	SDMPI0033370; SDMPI0033375	NSW461301; NSW491073
At13b	Road Reserve 47.	Road reserve	Mosman Council	Mosman	6(a) Public Recreation	1	Not inspected	2001	-	722842
At13c	Curaghbeena Park, Mosman	Other Reservation - Dedication - Crown	Mosman Council	Mosman	7(a) Environment Protection (Bushland)	-	Not inspected	2001	SDMPI0033374	NSW491072
At14	Reid Park, Mosman	Public Recreation Reserve - Crown	Mosman Council	Mosman	6(a) Public Recreation	-	Not inspected	2001	SDMPI0033372	NSW461302
At15a	HMAS Watson, Watsons Bay	Military	DOD	Woollhara	5 Special Uses (Military Reserve)	71	Not inspected	1998	-	NSW4183756 ; 605702
At15b	Sydney Harbour NP	NPWS Estate	DECCW (Harbour South)	Woollhara	8 National Park	2	No extant plants observed in 2005	1998	-	-
At16	Gap Park, Watsons Bay	Crown Reserve	Woollhara Council	Woollhara	6 Open Space (General	4 mature (and	Not inspected	1997	SJEH98050102	nsw414836

Site Code	Location	Tenure	Land manager	LGA	Zoning	Original count	Count during preparation of this plan	First Date	Atlas Code	Herbarium specimen
					Recreation)	10 planted from local seed)				
At17a	Parsley Bay Reserve, Vaucluse	Crown Reserve	Woollahra Council	Woollahra	6 Open Space (General Recreation)	8 mature (and 6 planted)	30 seedlings in 2009	1997	-	nsw432693 nsw432694 nsw432695 nsw432696 nsw432697 nsw432698
At18a(i)	Sydney Harbour NP	NPWS Estate	DECCW (Harbour South)	Woollahra	8 National Park	2	10 (m) 252 (im) in 2005/06	1991	SDMP99070506	nsw248401 nsw414923
At19a	Rose Bay	Road Reserve	Waverley Council	Waverley	Road closed to vehicular traffic	1	No extant plants observed in 2005 and 2009	1997	SDMP99070501	414922
At19b	Dover Heights	Freehold	Private	Waverley	2(a) residential	3	No extant plants observed 2009	1999	-	-
At20	North Bondi	Freehold/Road Reserve	Private/Waverley Council	Waverley	2(a) residential	1	No extant plants observed 2005 and 2009	1996	SDMP99070505	412580
At21	Cooper Park, Bellevue Hill.	Council Reserve	Woollahra Council	Woollahra	6 Open Space (General Recreation)	10 to 15	16(m) 16 (im) in 2005/06	1984	SJEH98050401	NSW266772 to 5
At22	Bundock Street, Kingsford	Public Open Space	Dept. of Defence ¹	Randwick	7	26	3 (m) 3 (im) in 2005/06	2001	-	414465; 455259; 414465
At23	Randwick Council Works Depot	Crown Reserve (other reservation)	Randwick City Council	Randwick	Special Uses (Depot)?	-	1 (mat) in 2005/06	2005	-	-
At24	Bunnerong Rd, Chifley	Vacant Crown?	Dept of Lands, RTA, Randwick Council ²	Randwick	Residential 2(a)	64 (m) 178 (im) in 2004	8 (m), 20 (im) in 2009	1994	SJEH98051802	nsw278634 to nsw278636 nsw295478 to 295481
At25	Frys Reserve, Kogarah	Council Reserve	Rockdale Council	Rockdale	6 Open Space (General Recreation)	?	Not inspected	2000	-	433051
At26	Ronald Reserve, Harbord	Council Reserve	Warringah Council	Warringah	Public Open Space (Reserve)	4	4 (m) in 2009	2009		
At27	Quarry Reserve, Amourin Street	Council Reserve & Crown reserve	Warringah Council Dept of Lands	Warringah	Public Open Space (Recreation & Bushland)	17 & seedlings	17 (m) in 2009	2009		

¹ Site At22 is currently under Department of Defence ownership, but Randwick City Council will in the future be the land manager for this site

² Site At24 is currently managed by Randwick City Council under a voluntary arrangement, but the land is owned by the Department of Lands and RTA

Appendix 3: Species profile and environmental impact assessment guidelines

THREATENED SPECIES INFORMATION*Acacia terminalis* (Salisb.)**J.F.Macbr. subsp. *terminalis*****Common Name:** Sunshine Wattle**Conservation Status**

Acacia terminalis terminalis is listed as endangered on the NSW *Threatened Species Conservation Act 1995* (TSC Act) and as endangered on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

**Description**

A.t.terminalis is an erect or spreading shrub, 1-5 metres tall, with pale yellow flowers and seed pods 3-11 cm long. The small branches (branchlets) are angled and have longitudinal ridges. The leaves including stalks (petioles) are 0.5-2.1 cm long, and contain between 2 and 5 pairs of pinnae (=leaflets; World Wide Wattle 2006). There are four recognised subspecies of *Acacia terminalis* (Kodela & Harden 2002), and the key below helps to identify them. In summary, *A.t.terminalis* has denser short hair on branchlets, leaf stalks, and flower stalks, and the flowers are whiter or paler yellow colour. Its flower stalks are thicker and contain smaller glands.

Kodela & Harden (2002) provide the following key to the subspecies of *Acacia terminalis* in NSW:

1A Branchlets sparsely to densely hairy, occasionally without hair; petiole (leaf stalk) and rachis (axis of the pinnately compound leaf) usually hairy; flower heads pale yellow or cream-coloured to almost white (**go to 2**) **OR**

1B Branchlets with no or sparse hairs; petiole and rachis usually without hair; flower

heads dark to bright yellow or cream-coloured to almost white (**go to 3**)

2 Peduncles (flower stems) 0.7-1.5 cm long, 0.5-1 mm diam.; heads 7-14-flowered; calyx (outer ring of the flower) 0.8-1.4 mm long; main axis of panicle or raceme to 16.5 cm long; flowering axes without glandular axillary shoots (**subsp. *terminalis***) **OR**

2B Peduncles 0.5-2.1 cm long, 0.3-0.5 mm diam.; heads 5-9-flowered; calyx 0.6-0.9 mm long; main axis of panicle or raceme to 33 cm long; flowering axes occasionally with glandular axillary shoots (**subsp. *longiaxialis***)

3. Flower heads pale yellow or cream-coloured to almost white, 5-13-flowered, 5-12 mm diam; petiolar gland 2-12 mm long; shrub to small tree to 6 metres high (**subsp. *angustifolia***) **OR**

3B Flower heads dark to bright yellow or sometimes pale yellow, 5-7-flowered or occasionally up to 11-flowered, 4-10 mm diam.; petiolar gland 1.5-6.7 mm long; shrub to 2 or rarely 3 metres high. (**subsp. *aurea***).

Distribution

A.t.terminalis is endemic to the Sydney Basin Bioregion. It has a very restricted distribution that extends for approximately 23 km from the northern shores of Sydney Harbour to Botany Bay (Figure 1). Within this distribution, it is currently known from 27 populations, in the local government areas of Manly, Mosman, Woollahra, Waverley, Randwick, and Rockdale.

Recorded occurrences in conservation reserves

Only 43 % of *A.t.terminalis* sites (= 22 sites) occur within conservation reserves. Of these 22 sites, 15 are found within National Parks, the remaining 7 in land managed by Mosman Council and zoned as 7(a) Environment Protection (Bushland).

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Habitat

A.t.terminalis usually occupies sandy soil on creek banks, hillslopes or in shallow soil in rock crevices and sandstone platforms on cliffs (World Wide Wattle 2006). A small number of sites occupy deep aeolian dune sands (M. Bremner, pers. comm.). The subspecies has been recorded from five soil landscape units, although the vast majority of populations occur on the Hawkesbury and Lambert soil landscape units.

All sites described in this recovery plan occur below 100 m. Annual precipitation in the distribution area (at Sydney Airport climatic station) is 1100 mm.

Ecology

Acacia terminalis is self incompatible, i.e. pollen transfer from plant to plant is essential for seed set (Knox et al 1985).

World Wide Wattle (2006) describes the flowering period of *A.t.terminalis* as March to July, but plants surveyed recently were observed to be flowering in mid-February (M. Bremner, pers. comm.). The natural pollinators of *A. terminalis* appear to be small birds, but during the summer months, honeybees may also pollinate the subspecies. The seed pods release their hard coated seed in November (Benson & McDougall 1996).

The soil seedbank of *A. terminalis* is long lived and persistent and may last for up to 50 years. Seed viability of greater than 95% has been recorded for *A. terminalis* (Auld & O'Connell 1991). Germination occurs mainly after fire, when it is triggered by heat (D. Keith, pers. comm.). A fire temperature of $>60^{\circ}$ is required for maximum germination of *A. terminalis* (D. Keith pers. comm. in Benson & McDougall 1996).

Seedlings often grow on the edge of roads and tracks in long unburnt vegetation, which may indicate that physical disturbance triggers recruitment (M. Bremner, pers. obs.). It has also been suggested that drought conditions assist in breaking the seed coat and thus dormancy (S. Smith, pers. comm.).

A.t.terminalis should be considered a fire sensitive obligate seeder. It is killed by high intensity fire and does not seem to resprout after fire (T. Auld pers. comm. in Conacher Travers

2004). The interval between fires should thus be long enough to allow post-fire seedlings to mature, and sufficiently replenish the seedbank.

As a rough guide for the minimum fire interval for this subspecies, at least three times the primary juvenile period is required to achieve a good replenishment of the soil seed bank after fire (T. Auld, DECCW, pers. comm.). The primary juvenile period is at the age of 2-4 years. Hence, a minimum fire-free interval of 6-12 years is appropriate for *A.t.terminalis*. The shorter interval of six years should only be applied when the primary juvenile period following the previous fire has been two years.

The maximum fire-free interval for the subspecies is not known. However, based on the estimated longevity of the subspecies, a maximum period of 20 years would seem appropriate.

Threats

The main threat to the survival of *A.t.terminalis* is habitat loss and habitat fragmentation, and most of the original habitat of the subspecies has already been lost to development. Today, the subspecies occupies small and fragmented bushland remnants. The subspecies is also threatened by weed invasion, dieback from *Phytophthora cinnamomi*, inappropriate fire regimes, hybridisation with other *A. terminalis* subspecies planted outside their range, and disturbance caused by formal and informal track creation.

Management

The recovery plan for *A.t.terminalis* (DECCW 2010) identifies a range of actions required to effectively conserve the subspecies. Management should be aimed at protecting known sites, minimising habitat loss and fragmentation, adjusting fire frequency in areas prone to frequent fire, and reducing the impacts of weeds, *Phytophthora cinnamomi*, hybridisation and human visitation. Other management initiatives should include: survey and monitoring; community education and awareness; and also conducting research that will assist future management decisions.

Recovery Plans

A recovery plan has been prepared for *Acacia terminalis terminalis* (DECCW 2010).

For Further Information contact

Threatened Species Unit, Metropolitan Branch, NSW DECCW, PO Box 1967, Hurstville NSW 2220. Phone 02 9585 6678.
www.environment.nsw.gov.au

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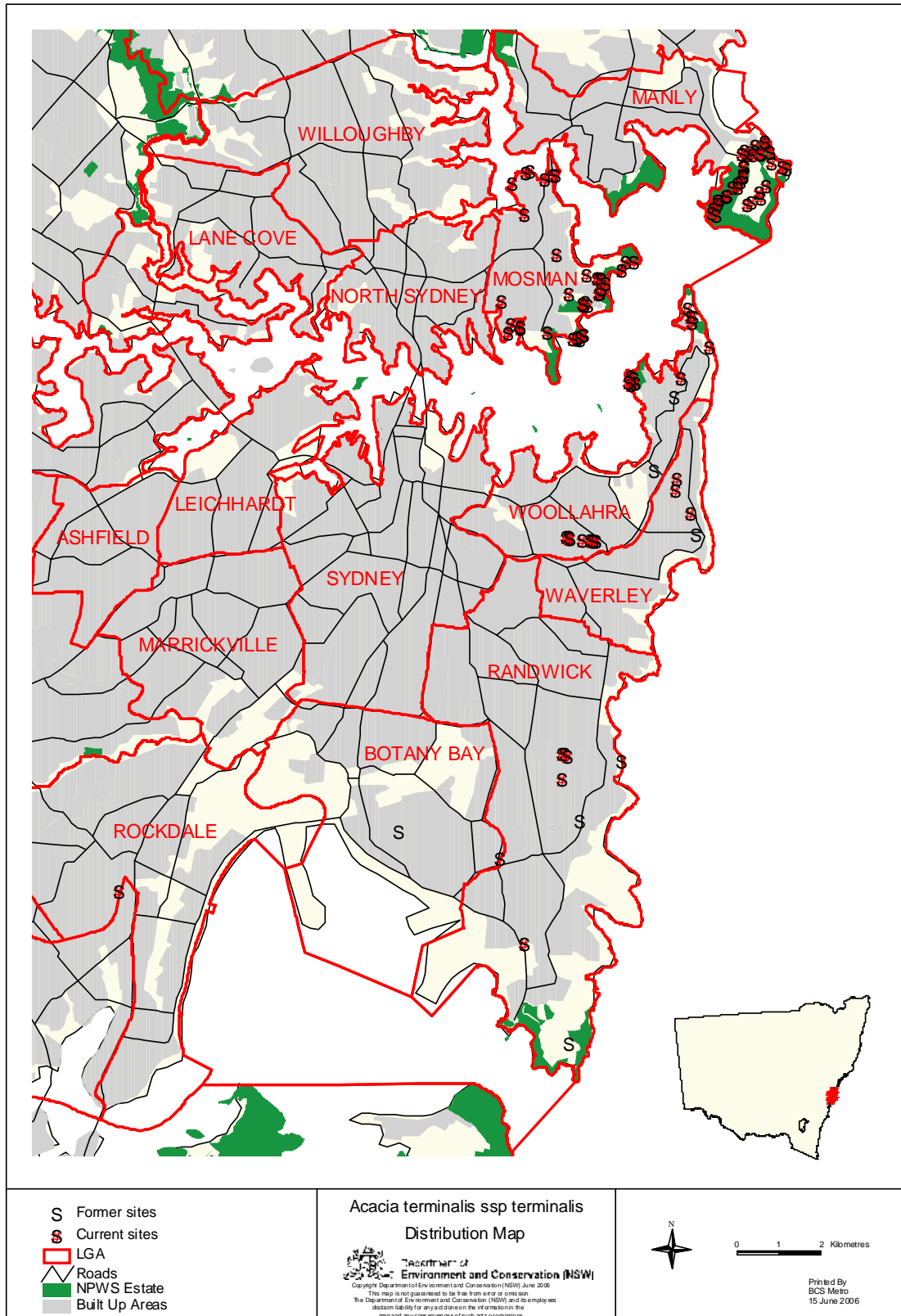


Figure 1. Known distribution of *Acacia terminalis terminalis* in NSW

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES*Acacia terminalis* (Salisb.)**J.F.Macbr. subsp. *terminalis*****Sunshine Wattle**

The following information is provided to assist authors of Species 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* (EP&A Act) 1979. These guidelines should be read in conjunction with the accompanying 'Threatened Species Information' profile and guidelines for the '8 Part Test of Significance', which must be carried out in accordance with Section 5A of the EP&A Act 1979.

Survey

Acacia terminalis terminalis flowers between March and July, sometimes also in January or February. These months are thus the best time to survey for the plants. Identification of the subspecies *terminalis* should be based on the key provided in the 'Threatened Species Information' profile and recovery plan for this species.

A. terminalis terminalis has a persistent soil seedbank which may last for up to 50 years. Attention should thus be paid to the presence of new seedlings, even in areas with few mature plants or little recruitment during previous years. Germination of the species occurs mainly after fire, when it is triggered by heat (D. Keith, pers. comm.).

Life cycle of the species

The life cycle of the species is not well understood. One factor that is likely to impact on the life cycle is fire. If a proposal is likely to result in frequent fires, then this may lead to declines in the population. *A.t.terminalis* is considered a fire sensitive obligate seeder. It is killed by high intensity fire and does not seem to resprout after fire (T. Auld pers. comm. in Conacher Travers 2004). The interval between fires should thus be long enough to allow post-fire seedlings to mature, and sufficiently replenish the seedbank.

Proposals which are likely to impact on the life cycle of the species, such that a local population is put at risk of extinction, would include proposals that:

- result in total destruction of habitat;
- result in a partial destruction or modification of habitat (including changes to hydrology and nutrification of the soil substrate) which may result in changes to vegetation community structure;
- result in increased fragmentation of *A.t.terminalis* habitat;
- result in a requirement for frequent fire (<6-12 years, depending on the length of the primary juvenile period), preventing establishment of juvenile plants;
- results in increased weed invasion;
- suggest to plant other subspecies of *Acacia terminalis* close to a population, thus increasing the risk of hybridisation;
- results in the introduction of *Phytophthora cinnamomi* into a population; or
- increase rubbish dumping and associated weed invasion.

Threatening processes

Four key threatening processes listed under the *TSC Act 1995* (as of December 2005) are likely to, or potentially, threaten *A.t.terminalis*:

- 'Clearing of native vegetation', has reduced and fragmented the habitat of *A.t.terminalis*.
- 'Ecological consequences of high frequency fires' is highly likely to threaten the persistence of *A.t.terminalis* populations.
- 'Invasion, establishment and spread of *Lantana camara*' is also likely to threaten *A.t.terminalis*.
- 'Infection of native plants by *Phytophthora cinnamoni* disease' could affect *A.t.terminalis* populations, either directly by causing dieback in the plants, or indirectly by degrading their habitat.

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Threatening processes that have been identified as being relevant to this species should also be considered (see recovery plan; DECCW 2010). These include habitat loss, hybridisation with other *Acacia terminalis* subspecies, habitat degradation through weed invasion, unrestricted access and the creation of informal tracks.

Viable local population

Little information is available as to the viability of known populations of *A.t.terminalis*. In the absence of such information, DECCW considers that all populations should be considered viable.

A significant area of habitat

Factors that can be used to determine the significance of a site include whether the population is setting seed, the size and connectivity of the habitat, the security of the site, the quality of the habitat (i.e. level of weed infestation) in comparison to other sites in the locality, the number of other sites in the locality, and whether the site is at the edge of the range of the species.

Isolation/fragmentation

Habitat fragmentation may be a significant issue for the species, as the current distribution is highly fragmented. Management of *A.t.terminalis* habitat and any proposals should aim to maintain the continuity of habitat between individuals within sub-populations, and avoid artificially creating new sub-populations.

Regional distribution of the habitat

A.t.terminalis occurs within the Sydney Basin Bioregion, in a highly urbanised part of eastern Sydney. The species is currently known from 53 sites comprising 27 populations, with an estimated total number of less than 500 plants. The size of individual populations varies from a few individuals to hundreds of mature plants, although only five populations contain more than ten mature plants.

Limit of known distribution

The current known distribution of *A.t.terminalis* extends for approximately 23 km from the northern shores of Sydney Harbour to Botany Bay. Further surveys may identify additional sites outside these areas.

Adequacy of representation in conservation reserves or other similar protected areas

Only 43 % of *A.t.terminalis* sites (= 22 sites) occur within conservation reserves. Of these 22 sites, 15 are found within National Parks, the remaining 7 in land zoned as 7(a) Environment Protection (Bushland). Hence, the majority of sites outside DECCW estate are currently not zoned for conservation.

Critical habitat

Critical habitat has not been declared for *A.t.terminalis*.

For Further Information contact

Biodiversity Conservation Section, Metropolitan Branch, NSW DECCW, PO Box 1967, Hurstville NSW 2220. Phone 02 9585 6678. www.environment.nsw.gov.au

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Appendix 4 Site Management Statement Proforma**Site Management Statement for *Acacia terminalis* ssp. *terminalis***

Prepared by:

Date:

Site details:

Site Name:

Site Code:

Location:

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Easting: Northing: AMG Zone:

1:25 000 Mapsheet:

Landowner/Landmanager contact details

Name:

Phone number:

Postal address:

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Parcel details:

LGA:

Portion/Lot:

Street address:

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Zoning:

Tenure:

Current landuse:.....

Population details:

No. of mature plants: Count: [] Estimate: []

Lowest estimate = Best estimate = Upper estimate =

No. seedlings: Count: [] Estimate: []

Lowest estimate = Best estimate = Upper estimate

Area of Occupancy: Accurate: [] Estimate: []

Detailed site map attached: Yes/No

Photographs taken: Yes/No

Reproduction: Buds: [] Flowers: [] Fruit: []

Plant height(s):

Extent of Survey: complete/incomplete/unknown

Habitat (consider aspect, slope, altitude, geology):

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Dominant Associated species (consider canopy, understorey, groundcover, vines/climbers):

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Soil texture: sand/loam/clay

Soil depth: skeletal/shallow/deep

Drainage: waterlogged/damp/well drained dry/well drained moist

Fire history for the site:

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Existing and potential threats (consider trampling/grazing, isolation/fragmentation, erosion, inappropriate fire regimes, inappropriate access, rubbish dumping, weed invasion):

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Predominant weed species and abundance:.....

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Previous management actions (describe apparent success):

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Recommended threat abatement actions:

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Recommended monitoring and evaluation program:

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Timetable for implementation of actions and monitoring:

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Appendix 5 Additional legislation relevant to the conservation and recovery of *Acacia terminalis terminalis*

Additional legislation relevant to the conservation and recovery of *A.t.terminalis* in NSW includes the following:

- *Environmental Planning and Assessment Act 1979*;
- *Local Government Act 1993*;
- *Native Vegetation Act 2003*;
- *Forestry and National Park Estate Act 1998*;
- *Rural Fires Act 1997*;
- *Rural Fires and Environmental Assessment Legislation Amendment Act 2002*;
- *Rural Lands Protection Act 1998*.
- *National Parks and Wildlife Act 1974*;

The most significant implications of the above legislation with regard to *A.t.terminalis* are described below, and the major existing obligations of public authorities in relation to *A.t.terminalis* are outlined in Appendix 1.

Environmental Planning & Assessment Act 1979

Consent and determining authorities are required to consider potential impacts *A.t.terminalis* and its habitat when considering development or activity proposals under parts 4 and 5 of the EP&A Act.

Part 3 of the EP&A Act provides for the preparation of environmental planning instruments (EPIs) and this presents opportunities to conserve important habitat for *A.t.terminalis* at the landscape level. For example, important sites that contain *A.t.terminalis* can be protected under an appropriate environmental zoning when councils prepare or review local environment plans (LEPs). This is a more effective means of providing for the conservation requirements of a species than through the assessment of individual development applications.

An action that does not require a consent or approval under the EP&A Act and which is likely to affect *A.t.terminalis*, requires a licence to be issued by the Director General of DECCW under s91 of the TSC Act.

Forestry & National Park Estate Act 1998

In NSW, an Integrated Forestry Operations Approval (IFOA) granted under Part 4 of the FNPE Act regulates the carrying out of certain forestry operations, including logging, in the public forests of a region. The terms of the Threatened Species Licence of the IFOA outline the minimum protection measures that are required to limit the impact of forestry activities on threatened species and their habitats, and forms the basis for DECCW regulation of those activities.

Rural Fires Act 1997

The RF Act requires all parties involved in fire suppression and prevention to have regard to the principles of ecologically sustainable development when exercising their functions and when preparing plans of operation or bush fire risk management plans. Within this, consideration must be given to the impact on threatened species and their habitats.

Under the RF Act, certain public authorities can authorise bush fire hazard reduction work (including prescribed burning and mechanical vegetation clearance) in habitat for a threatened species by issuing a Bush Fire Hazard Reduction Certificate (BFHRC). These certificates can only be issued for works that comply with the Bush Fire Environmental Assessment Code (BFEAC), and occur on land that is subject to a Bush Fire Risk Management Plan. The Threatened Species Hazard Reduction List forms part of the BFEAC and contains specific conditions for sites that support threatened species. The specific conditions in the list that relate to *A.t.terminalis* are detailed in Section 8.

Where proposed bush fire hazard reduction activities do not meet the criteria necessary to allow a BFHRC to be issued, then an approval under Parts 4 or 5 of the EP&A Act or s91 of the TSC Act is required.

Local Government Act 1993

The LG Act defines the powers, duties and functions of all local councils in NSW. Section 8(1) of the Act requires councils 'to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of sustainable development'. This includes the integration of biodiversity considerations into the decision-making process.

Chapter 6 of the Act requires councils to prepare plans of management for community land that take into account council's obligations under approved recovery plans.

Crown Lands Act 1989

Part 3 of the CL Act sets out the process for assessing Crown land against prescribed land evaluation criteria. This leads to an assessment of the land's use for community or public purposes, environmental protection, nature conservation, water conservation, or other purposes. In identifying uses for Crown land, the Minister is to have regard to the views of any government department.

Under the Act, the Minister for Lands may place restrictions on the transfer or use of Crown land or impose a public positive covenant on Crown land for the purposes of protecting the environment or natural resources, and/or protecting other significant values of the land.

Appendix 6 Identification key for the four subspecies of *A. terminalis*, including *Acacia terminalis terminalis*

A. t. terminalis occurs mainly in near coastal areas from the northern shores of Sydney Harbour south to Botany Bay, and it flowers from March to July. Compared to the other subspecies, it has denser short hair on branchlets, leaf stalks, and flower stalk, and is of white or pale yellow colour. Its flower stalks are thicker and contain smaller glands.

A .t. angustifolia occurs in NSW (from the Central Tablelands southwards), Victoria (Gippsland) and Tasmania. It flowers from February to September. In Sydney, this subspecies tends to occur on deeper sands than *A.t.terminalis* (P. Kodela, pers. comm.) and has been recorded from three sites within Randwick LGA (D. Hirschfeld, pers. comm.). The branchlets and leaves contain no hair, the leafstalk bears a conspicuous gland, and the ultimate leaflets (pinnulets) have a distinct midnerve.

A .t .aurea occurs in NSW on the Central West Slopes, Central and South Coast as well as the North, Central and Southern Tablelands and in the Blue Mountains. It usually occurs on sandstone, between 500 metres and 1100 metres above sea level, and thus at higher altitudes than the other subspecies. It flowers from February to October, with the flowers being more golden yellow compared to the pale yellow in the other subspecies. Its leaves and branchlets are without hair, the leafstalks bear conspicuous glands, and the axis of its flowers have a gland near their apex.

A.t.longiaxialis occurs from the Toronto area to the far North Coast of NSW, where it grows on sandy soil, sandstone or clay loam. It flowers from March to October, with the pale flower heads comparatively larger than in the other subspecies. Its branchlets and leaf axes are covered in soft, short hair. The racemes (clusters of stalked flowers) are very elongated and unbranched.

Kodela & Harden (2002) provide the following key to the subspecies of *Acacia terminalis* in NSW:

1A Branchlets sparsely to densely hairy, occasionally without hair; petiole (leaf stalk) and rachis (axis of the pinnately compound leaf) usually hairy; flower heads pale yellow or cream-coloured to almost white (**go to 2**) **OR**

1B Branchlets with no or sparse hairs; petiole and rachis usually without hair; flower heads dark to bright yellow or cream-coloured to almost white (**go to 3**)

2 Peduncles (flower stems) 0.7-1.5 cm long, 0.5-1 mm diam.; heads 7-14-flowered; calyx (outer ring of the flower) 0.8-1.4 mm long; main axis of panicle or raceme to 16.5 cm long; flowering axes without glandular axillary shoots (**subsp. terminalis**) **OR**

2B Peduncles 0.5-2.1 cm long, 0.3-0.5 mm diam.; heads 5-9-flowered; calyx 0.6-0.9 mm long; main axis of panicle or raceme to 33 cm long; flowering axes occasionally with glandular axillary shoots (**subsp. longiaxialis**)

3. Flower heads pale yellow or cream-coloured to almost white, 5-13-flowered, 5-12 mm diam; petiolar gland 2-12 mm long; shrub to small tree to 6 m high (**subsp. angustifolia**) **OR**

3B Flower heads dark to bright yellow or sometimes pale yellow, 5-7-flowered or occasionally up to 11-flowered, 4-10 mm diam.; petiolar gland 1.5-6.7 mm long; shrub to 2 or rarely 3 m high. (**subsp. aurea**)