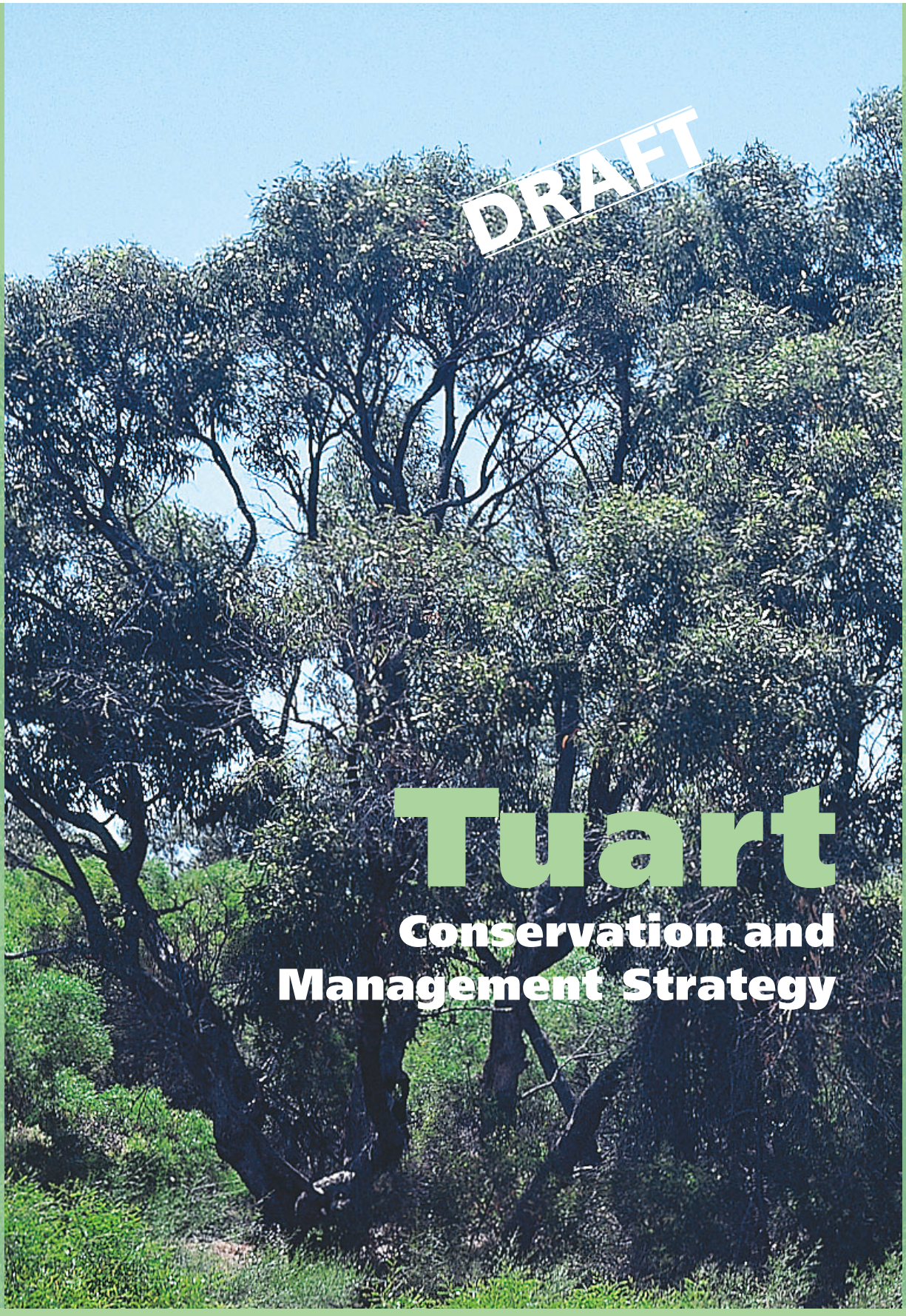


Tuart

Conservation and Management Strategy

Prepared by the Tuart Response Group on behalf of the Government of Western Australia.

GOVERNMENT OF WESTERN AUSTRALIA

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Tuart Response Group

D R A F T

TUART

CONSERVATION

AND

MANAGEMENT

STRATEGY

December 2004

Prepared by the Tuart Response Group on behalf of the Government of Western Australia.

How to participate

If you would like to provide written feedback, there are Community Response Forms at the back of this draft *Tuart Conservation and Management Strategy* to assist this process. These questions provide guidance for getting your thoughts and ideas down on paper. The Tuart Response Group encourages you to respond:

through the Department of Conservation and Land Management's NatureBase website at www.naturebase.net

Or

by email to drewh@calm.wa.gov.au

Or

by fax on 08 9386 6399

Or

by written submission to Drew Haswell at the Department of Conservation and Land management, Locked Bag 104, Bentley Delivery Centre, WA 6983

The Tuart Response Group will be holding workshops with stakeholder and community groups to obtain feedback on this draft 'tuart strategy'. The workshop will aim to have representation from a variety of organisations and groups who have an interest in the conservation and management of tuart woodlands.

Community consultation on this draft 'tuart strategy' will be for a period not less than three months, after which a final *Tuart Conservation and Management Strategy* and *Action Plan* will be completed and approved by the Government.

Contents

Foreword

FROM THE MINISTER FOR THE ENVIRONMENT

Since the mid 1990s there has been growing community concern about the noticeable decline in the health of tuart trees between Mandurah and Bunbury. Government and community-based action is now underway to investigate the causes behind the observed decline in tuart health, and to prepare a *Tuart Conservation and Management Strategy* and *Action Plan*. As an initial step I established the Tuart Response Group in November 2001 to coordinate the development of this work.

The Tuart Response Group has been very active over this period, meeting formally on 17 occasions, and initiating and completing work on a number of key projects. Of particular note is the development of an up-to-date and accurate *Atlas of Tuart Woodlands on the Swan Coastal Plain* that now provides new and improved information to guide future land use decisions. In addition the Response Group's collaborations with research institutions, industry and local authorities has resulted in the award of a three year Australian Research Council Linkage Grant from July 2003 to investigate tuart health at Yalgorup.

The Tuart Response Group has also been active in promoting increased community awareness about the importance of conserving and managing tuart woodlands. For example the August 2002 Status Report on *Tuart Conservation and Protection,* summarised the latest knowledge on tuart woodlands, and was widely distributed to stakeholders, special interest groups and the community. In September and October 2002 the Response Group conducted seven community and stakeholder workshops between Lancelin and Busselton to discuss ideas for the future conservation and management of tuart trees and woodlands.

This draft *Tuart Conservation and Management Strategy* refects the public inputs received so far, and provides an initial framework for the future development of joint Government and community-based stewardship of tuart woodlands. It proposes the following outcomes:

- enhanced conservation and management of remnant tuart trees and woodlands;
- research into tuart's biological value and tuart health;
- increased community awareness of the value and benefits of tuart and its ecosystems;
- effective tuart partnerships between community groups;
- land development that takes account of tuart conservation; and
- incentives for improved tuart management on private land.

This *Tuart Conservation and Management Strategy* is now released for public discussion and review to ensure that what has been proposed is sound, practical and relevant to the conservation and management of the State's remaining tuart woodlands. It is my intention to release a final 'tuart strategy and action plan' later in 2004 following due and proper consideration of all community discussions and formal submissions.

Judy Edwards

(Dr) Judy Edwards MLA
MINISTER FOR THE ENVIRONMENT

Executive Summary

This draft *Tuart Conservation and Management Strategy* has been developed by the Minister for the Environment's Tuart Response Group to encourage community feedback on the future conservation and management of tuart woodlands on the Swan Coastal Plain in Western Australia. In this strategy the Tuart Response Group makes suggestions about the vision, outcomes, aims, targets and strategies for conserving and managing tuart woodlands and asks for your comments on these proposals.

Tuart woodlands have been particularly affected, both directly and indirectly, by human beings. For example, tuart's occurrence as a vegetation community on the Swan Coastal Plain has been greatly reduced by urban, industrial and agricultural development. Also many remaining tuart woodlands have been disturbed due to grazing, altered fire regimes, management based on forest silviculture, and past timber harvesting. Some approved clearing of tuart woodlands continues for urban and industrial land uses, road construction and the development of public infrastructures. In recent years tuart trees at Yalgorup, between Mandurah and Bunbury, have suffered a significant decline in health from chronic insect infestation.

Extract from the Western Australian Royal Commission on Forestry. First Progress Report (1903)

"From evidence taken it will be observed that the value of tuart far exceeds that of many of our local timbers. The area of country suitable to this tree being very limited, the Commission urges the advisability of extreme caution being taken to prevent the alienation of any land of this nature".

The values of tuart woodlands include conserving biodiversity, protecting ecosystem functioning, and providing connectivity between remnant vegetation. Tuart woodlands also provide important landscape, cultural, social and economic values. Processes that threaten the integrity of these values include habitat loss, fragmentation and alteration, caused by changes in natural and human induced vegetation disturbance regimes.

The Vision contained in this draft *Tuart Conservation and Management Strategy* proposes that *tuart trees and their associated ecosystems will be valued by Western Australians for the range of benefits they can provide. They are to be conserved, protected and enhanced for current and future generations to enjoy*. The desired outcomes are as follows:

Conservation: Tuart and its ecosystems will be adequately conserved and sustainably managed in reserves and on private lands.

Research: Investigations will lead to a thorough knowledge of the biological value of tuart and its ecosystems, and a thorough understanding of what affects tuart health.

Community Awareness: The community will increase its awareness of tuart and its ecosystems, and their benefits to humankind. This awareness will be shared between different community groups.

Partnerships: Partnerships will be built or consolidated between community groups with differing interests in tuart trees or tuart ecosystems.

Development Plans: All plans and processes for developing land within tuart's natural range will take account of the need to conserve tuart and its ecosystems.

Incentives: Institutional arrangements will provide incentives and support to landowners and land managers for the conservation and management of tuart and its ecosystems.

Successful implementation of the *Tuart Conservation and Management Strategy* requires coordination mechanisms for, and Government agency and non-government organisation

commitments to, funding and implementing tuart conservation and management programs. This draft strategy proposes a number of implementation approaches and invites discussion on an appropriate way forward.

An *Action Plan* - that has yet to be developed - will accompany the approved *Tuart Conservation and Management Strategy*. The implementation work described in the *Action Plan* will depend on the comments received following the public submission phase of the draft 'tuart strategy', and the comments and ideas received during the earlier October-September 2002 stakeholder and community workshop series. The *Action Plan* will seek to identify responsible-support agencies, non-government organisations, existing and proposed funding commitments, and timelines and targets for the implementation of designated works.

Ludlow Tuart Forest National Park. Photo: Rick Sneeuwjagt

Extract from *The Forests of Western Australia and their Development* (1899) by J. Ednie Brown.

"Tuart. This is a handsome Eucalypt, and has a wonderful bright and cheerful appearance in the forest. The bark is of greyish-white colour, and is smoothly crinkled and persistent throughout… The tree is confined in its natural habitat to the limestone belts lying along the coast between Perth and Busselton…I think the tree is purely gregarious, and does not intermingle with any of our other timber trees, except perhaps in places sparsely with a stunted form of jarrah. With the banksias and melaleucas it is of course intimately associated, but these only form the undergrowth of the forest which it creates…The soil formation of the limestone belt referred to is a sandy loam of considerable fertility, with a subsoil of a rather retentive nature. Upon this the Tuart seem to feed and thrive well. Of course, from these natural proclivities, we must classify this tree as a purely coastal one".

SECTION 1

Introduction

1.1 Purpose of this draft strategy

This draft *Tuart conservation and management strategy* has been developed by the Minister for the Environment's Tuart Response Group to encourage your feedback on the future conservation and management of tuart woodlands on the Swan Coastal Plain in Western Australia. In this strategy the Response Group makes suggestions about the vision, outcomes, aims, targets and strategies for conserving and managing tuart woodlands and asks for your comments on these proposals.

This draft 'tuart strategy' will lead to the development of the Government's final *Tuart Conservation and Management Strategy* and *Action Plan*. The final 'tuart strategy' will differ from this draft 'tuart strategy' because it will reflect the responses received from public consultation and will designate actions, responsible and support organisations, budget implications and timeframes for meeting the agreed targets and outcomes.

1.2 Contributory processes

The development of this strategy has been informed by the following contributory processes:

- the workshop 'Tuart – the tree and the community in which it lives, and the published workshop proceedings *Tuart (Eucalyptus gomphocephala) and Tuart Communities* (Wildflower Society 2002);

- development and wide distribution of the brochure *Saving Our Tuart's* that aimed to increase community awareness about the need to conserve and protect remaining tuart woodlands on the Swan Coastal Plain;

- preparation and wide distribution of the status report for *Tuart Conservation and Protection* that aimed to promote a more informed community debate on: (i) the values of tuart woodlands, (ii) reserve and off-reserve conservation and protection issues, and (iii) future directions the Government might take in conserving and managing remnant tuart woodlands;

- publication of Department of Conservation and Land Management (CALM) *LANDSCOPE* articles *Cherish the Tuart* and *The Tenuous Tuart* in the autumn and winter 2003 magazine editions;

- submissions received at the seven community and stakeholder workshops between Lancelin and Busselton to seek views and comments on tuart conservation and management issues and approaches;

- establishing a sound scientific basis for future tuart conservation and management. This included: (i) developing the *Tuart Vegetation System Health Model* for targeting research and testing research findings, (ii) developing remote sensing techniques using LandSat TM for monitoring tuart decline at Yalgorup, (iii) convening the Tuart Science Workshop to canvas views on proposed research directions and priorities, and (iv) collaboration on the award of an Australian Research Council (ARC) Linkage Grant for research into tuart health;

- the development of the *Atlas of Tuart Woodlands on the Swan Coastal Plain* that provides up-to-date and fine scale mapping of tuart's extent, overstorey density and understorey condition relative to land categories and local authority areas;

- the development of the report *Tools for Identifying Indicative High Conservation Tuart Woodlands* (Ecoscape 2004) that was derived from 'tuart atlas' data by intersecting areas of low disturbance tuart woodlands with the factors that control tuart distribution, and the presence of uncommon taxa and ecological communities; and

- briefing local authorities, catchment councils, and special interest groups over the last two years to assist the integrated development of this draft 'tuart strategy'.

1.3 Why conserve and manage tuart woodlands?

The Australian landscape has a unique character and appearance. Native vegetation plays an important role in the Nation's diverse natural, cultural, social and economic systems and structures. The continent supports a wide array of vegetation communities including rainforests, dry and wet eucalypt forests, woodlands, healthlands, grasslands and wetlands. These have evolved over millions of years and are completely adapted to our soils and the Australian environment.

STATISTICS ON TUART WOODLANDS

Land category	Area (ha)	Per cent of total
Private land	19,078	63
Parks, reserves, forests	9,483	31
Other managed lands	1,756	6
Total area	**30,317**	**100**

Parks, reserves and forests are vested in the Conservation Commission of Western Australia. Other lands include (i) unallocated Crown land and unmanaged reserves managed by the Department of Conservation and Land Management, and (ii) other reserves managed by local authorities and Government agencies.

Human induced changes to the native vegetation came with the arrival of the first Australians, more than 60,000 years ago. In some situations, Aboriginal people used fire to thin-out the land and encourage regrowth – a process that suited hunting and gathering. When Europeans settled Australia over 200 years ago, they cleared the land for developing the new country. More recently, there has been an increasing awareness of the uniqueness and fragility of the Australian environment and a growing concern for its conservation and protection.

Bushland is central to Western Australians' 'sense of place' and is an integral part of our cultural identity. Kings Park, probably the State's best-known example of urban bushland, holds a prominent place in the 'hearts and minds' of Western Australians and is often used as an example of visionary urban planning that has accommodated our distinctive community spirit.

Tuart woodlands on the Swan Coastal Plain have also provided a unique natural setting for the expansion of the State's population. However, this growth has resulted in tuart communities being markedly reduced due to human impacts associated with urban, industrial and agricultural development. In addition, many remaining tuart woodlands have been further disturbed due to grazing, altered fire regimes, management based on forest silviculture and past timber harvesting. Some approved clearing of tuart woodlands continues for urban and industrial land uses, road construction and the development of public infrastructures.

In more recent years tuart trees at Yalgorup, between Mandurah and Bunbury, have suffered a significant decline in health, resulting in foliage and crown dieback, due to chronic insect infestation. The primary reason(s) for these attacks on tuart is/are not clear, as there are a number of contributing and inter-related factors involved. Potential influences include the ongoing reduction in winter rainfall, hydrologic and salinity factors, nutrient supply, altered fire regimes, changes in the ecological balance between insect wood borers and their predators, pathogens and competition with understorey species.

1.4 Vision for the future

The range of needs, interests and views on the conservation and management of tuart woodlands are broad and are held by a variety of organisations, groups and individuals in the community. Some are based on conserving biological diversity, while others are based on maintaining aesthetic values, protecting the soil and water, and promoting economic values. The Tuart Response Group seeks to integrate these divergent positions into an agreed community vision for the way tuart woodlands are conserved and managed in Western Australia. The proposed vision is:

> *Tuart trees, ecosystems and associated vegetation are valued by Western Australians for the range of benefits they can provide. They will therefore be conserved, protected and enhanced for current and future generations to enjoy.*

1.5 Values of tuart woodlands

1.5.1 Biological diversity

Biodiversity is grouped into three components namely: (i) genetic, (ii) species, and (iii) ecosystem diversity.

Yanchep National Park. Photo: Robert Powell

Genetic

Genetic diversity is the range of genetic information present within a species that is passed onto successive generations through reproduction. Genetic diversity increases the variety of form and behavior within a species, and provides the species with greater capacity to cope with threatening processes and environmental conditions. Information on the genetic diversity of tuart woodlands is poorly understood.

Species

The diversity of flora species in tuart woodlands is based on the information of tuart's regional floristic groupings. Floristic community types, in which tuart is found, were described by Gibson *et al.* (1994) and the Department of Environmental Protection (1996). These studies have also been used to assess the location of the natural populations of tuart communities (Keighery *et al.* 2002). Tuart occurs in a variety of floristic community types across its range including both wetlands and uplands. Only in the southern tuart and peppermint woodlands of the Spearwood dunes, and the tuart and/or peppermint woodlands of the Quindalup dunes is tuart a defining species.

The vertebrate fauna of tuart woodlands is poorly understood. Dell *et al.* (2002) reported on the data from 12 tuart woodland sites and assessed the impacts on the species and populations since European settlement. Key findings include 158 vertebrate species and of these 92 are bird species. Sixteen of the 35 Swan Coastal Plain's mammal species live in tuart woodlands, with the western ringtail possum (*Pseudocheirus occidentalis*) and the common brushtail possum (*Trichosurus vulpecula*) well represented in the tall tuart peppermint woodlands of the Ludlow area. There are also 43 reptile species and seven frogs species recorded in tuart woodlands.

The invertebrate animals, although studied for eucalypts such as jarrah (*E. marginata*), marri (*Corymbia calophylla*), wandoo (*E. wandoo*) and powderbark (*E. accedens*), are poorly known for tuart (Powell pers. comm. 2002). Invertebrates are the most diverse component of terrestrial ecosystems. They are also vital to the ecology, being the chief food of many birds, reptiles, amphibians and mammals. They also perform other essential functions such as recycling nutrients, pollinating plants, and keeping nature in balance by supporting many important predators and parasites.

Ecosystems

The diversity of tuart ecosystems have been described at a State scale as broad structural units of vegetation dominated by tuart mapped by Speck (1952, 1958), Smith (1973, 1974), Beard (1979a; b; c; 1981, Hopkins *et al.* 1996) and at a regional scale as vegetation complexes (Heddle *et al.* 1980). These projects also included defining the original extent of tuart's occurrence (pre-1750), through extrapolation from the existing occurrences, and the underlying determinants of vegetation such as landform, soils and climate. The floristic community types described above that reflect species diversity at a local scale, also reflect ecosystem diversity at a regional scale.

1.5.2 Ecosystem processes

Natural tuart woodlands function as important ecosystems on the Swan Coastal Plain. For example, by including many understorey plants and by supporting many different animals, such as insects, birds and reptiles, they contribute to species biodiversity. In addition the diversity of functional groups within tuart ecosystems may influence productivity, health and vitality. For example birds tend to feed on localised concentrations of naturally occurring insects[1]. Tuart woodlands are therefore vital for retaining habitat and natural resources that maintain appropriate predator and prey relationships.

Tuart woodlands improve the quality of soils by contributing to and retaining organic matter, maintain the soil's microbiological climate, and by protecting dune land surfaces from wind erosion. They also play an important role in protecting underground and coastal wetland water resources from the encroachment of salinity, and by intercepting nutrients and degrading and absorbing pollutants.

Isolated tuart trees are also significant for the conservation of tuart 'the species', and local ecosystem processes. In some situations dead trees may also be of value in: (i) providing habitat (eg. nest hollows) where there are no other live trees to do this, and in (ii) providing a structural component during regeneration of tuart woodlands.

1.5.3 Connectivity

As well as providing essential habitat, tuart woodlands - and even scattered individual trees - have an important role in providing connectivity across the landscape. Connectivity is about how easily the landscape allows plant and animal species to disperse through it. Adequate landscape connectivity results in reduced species dependence on small isolated pockets, and allows mobile species to access essential but dispersed resources. Connectivity needs to be considered on a whole-of-woodland basis.

Corridors are generally considered important for providing connectivity in highly cleared and fragmented landscapes (Fahrig and Merriam 1985, Downes *et al.* 1997) but may adversely affect some species through the increased transmission of diseases and disturbances (Saunders *et al.* 1991, Beier and Noss 1998). The degree of isolation and connectivity that results from clearing and fragmentation is not uniform for all species. A population becomes isolated if the gaps between the patches of remnant vegetation exceed the ability of the

[1] Note that the effectiveness of birds in controlling insects has only been demonstrated only in a few cases (Ford 1981).

species to cross them. For example a population of tuart woodland bird such as the purple-crowned lorikeet (*Glossopsitta porphyrocephala*) is not likely to be isolated if the distance between patches is small in comparison with its dispersal ability. Alternatively a population of a mammal species that depends on tuart woodlands, such as the western ringtail possum, is likely to be isolated by the removal of treed corridors between remnants.

1.5.4 Landscape

Powell and Emberson (1996) described the landscape importance of local tree species to include scenic beauty, linkages with history, value for wildlife, individuality of character and low management costs. Tuart has special significance as a local species, when growing in its area of natural occurrence, in providing a sense of place and for its ecological value (Powell and Keighery 2002). It is the largest naturally occurring tree on the Swan Coastal Plain, has rapid growth and is distinctively coloured, with glossy, grey-green foliage and grey-white bark. Its splitting growth habit - it tends to divide into several main branches, rather than having a central, dominant stem - and rounded, dense crown are well suited to tuart's occurrences near the coast and exposure to strong salt-laden winds.

Trigg Bushland Reserve. Photo: Robert Powell

Tuart varies in size and shape across its natural range. It occurs as a tall tree in southern parts, and as a low to medium tree in northern occurrences. Its vegetation formation is also variable, occurring as tall woodlands with sparse understorey, medium open woodlands with dense shrubby understorey, and as mosaics with other species. Tuart plays an important landscape role as remnant vegetation on the Swan Coastal Plain because of previous extensive clearing for urban development, agriculture and industry. It is also an important tree and feature of Perth's regional open space, parks and golf courses.

1.5.5 Cultural, social and economic

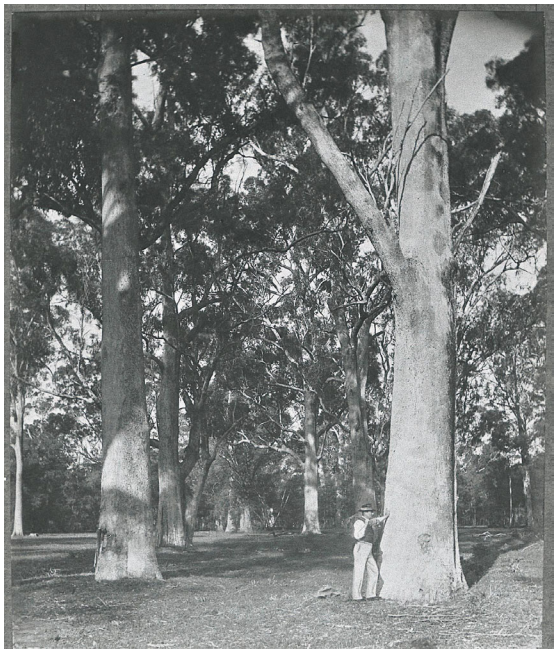
The cultural, social and economic values held by Western Australian communities, and their interactions, influence human relations with the land and its living things, and how tuart woodlands are therefore conserved and managed. Tuart woodlands have a variety of cultural and social benefits. These include places of scenic beauty and natural heritage, places of Aboriginal significance, sites for visitor use and tourism, locations for research, eco-education and scientific reference, and places for maintaining the distinctive Australian landscape of the Swan Coastal Plain.

These cultural and social values are interconnected and dynamic. For example places of Aboriginal significance are important links to traditional life, beliefs and spirituality. Again since the State's 1750 settlement by Europeans, community imperatives have moved from clearing tuart woodlands to make way for urban and industrial development and agriculture, to a more landscape-based understanding and value of natural resources.

The range of values in tuart woodlands also influence the communities' view of their natural lands. For example Aboriginal people see tuart vegetation providing for hunting, fishing and the right to gather food. City dwellers place an increasing importance on tuart vegetation for recreation and aesthetic reasons.

On the other hand rural residents and developers, that depend on their livelihood from the land, may place economic considerations above these natural values. These include 'use' values such as honey production, wildflowers and seeds, tourism, guided walks, and the maintenance of soils, and 'non-use' values such as options for using resources, bequests to future generations and knowing that economic values exist.

More information is required on the full range of costs and benefits for local authorities, landowners and developers to inform decisions on tuart conservation and management. This should be accompanied by adequate institutional arrangements to support the retention and re-vegetation of tuart woodlands.



Tuart near Ludlow 1896. Government Printing Office

1.6 Threatening processes

Clearing for urban development is the most significant threatening process affecting the conservation of the biological diversity of tuart woodlands.

1.6.1 Habitat loss, fragmentation and alteration

Habitat loss can be defined as the broad-scale removal of native vegetation resulting from human activity. Habitat loss has implications for the maintenance of genetic, population, and ecosystem function diversity. The full effects of habitat loss are not always apparent immediately after clearing or disturbance. This is particularly true for some mammals such as the western ring tailed possum and the common brush tailed possum, which while persisting in tall tuart woodland in the Ludlow area[3], could become threatened without 'recovery intervention'. The numbers of other mammal species occurring in or adjacent to tuart woodlands such as the woylie, tammar, quokka and numbat also continue to decline.

Habitat fragmentation is the cumulative process of habitat loss and isolation (Formam and Gordon 1986). Habitat loss and fragmentation are often considered to be the most significant threats to the conservation of biodiversity (Fahig 1997). It can lead to reduced population size and extinctions of sensitive biota, increases in 'weedy' species in remnant vegetation, increased predation on species surviving in remnant vegetation and increased competition from species favored by altered environmental conditions. Clearing and fragmentation can also lead to changes in 'microclimate' of the remnants, as well as in soil nutrient status, nutrient cycling and soil moisture balance (Saunders *et al.* 1991). Species also exist in a dynamic and competitive environment, so changes in habitat conditions through clearing and fragmentation, can also alter the balance of species interactions and compositions of an area.

Habitat alteration occurs when the broad structures of habitats remain the same but components are lost. The removal of native vegetation usually results in localised extinctions of plant and animal species dependent on that vegetation. Past heavy and long-term grazing in particular has removed, depleted and changed the structure of the understorey layer of tuart woodlands. Habitat alteration has occurred across all tuart woodlands and none could be considered unaffected by some form of degrading influence. Habitat modification has

[3] Western ring tailed and common brush tailed possums are also known to be present in northern tuart woodlands.

resulted from changes to natural disturbance regimes caused by grazing, past commercial timber harvesting, and altered fire regimes. Other habitat modifying disturbances include uncontrolled recreational activity, commercial flower picking and the 'mining' of other products such as limestone and sand.

1.6.2 Changes in natural vegetation disturbance regimes

While most native vegetation communities require some form of disturbance to enable continued regeneration, changes in these natural regimes, since the arrival of Europeans, have threatened the character of tuart communities. Altered disturbances typical of tuart woodlands include impacts from climate variability and change and sudden and severe impacts from wildfires. These disturbances pre-dispose communities to invasion by exotic plants (Hobbs and Huenneke 1992), changes in vegetation structure, and create conditions conducive to native insect attack and pathogen invasion. Existing research programs are contributing to the understanding of these impacts. They include research on climate variability and change (Indian Ocean Climate Initiative 2002), and collaborative research on tuart health funded through the Australian Research Council's Linkage Grants program (Government of Western Australia 2002).

Climate variability and change

Climate variability and change has recently emerged as having a potentially important and significant impact on the health and vitality of natural ecosystems, as southwestern Australia experiences a sustained and substantial shift to drier conditions (CSIRO 2001; Indian Ocean Climate Initiative 2001). The change has been characterised by below average winter rainfall, less rain days, less rain on extreme days, and higher temperatures.

There is now evidence that this climate shift may not simply be a random occurrence, but driven by: (i) natural variations in atmospheric circulation and ocean currents, compounded by (ii) increasing changes in temperatures associated with the accumulation of greenhouse gases. Reduced rainfall and increased temperatures impact the health and vitality of plants by affecting internal water relations and nutrient status of trees and shrubs, and by increasing the frequency and severity of wildfires.

Fire

There is a growing awareness of the role of fire regimes in maintaining the health and vitality of natural ecosystems. Altered fire regimes are likely to affect a wide range of ecosystem processes - including nutrient cycling, competition and regeneration - with consequential effects on the structure and floristic composition of plant communities, and on the population dynamics of vertebrate and invertebrate fauna.

For instance, countries that underwent colonisation by Europeans during the 19th century are now beginning to understand how changes in settlement patterns, land use and the activities of Aboriginal people have affected natural fire regimes. Such changes to fire regimes cover the full spectrum of effects ranging from increased frequency of fire and the associated encroachment of highly flammable annual weeds, through to the deliberate exclusion of fire from previously fire-prone communities. Examples of both extremes can be found within the environments where tuart communities occur on the Swan Coastal Plain (McCaw and Sneeuwjagt 2002).

Extract from the Handbook of the 1928 British Empire Conference on Forestry

"A further problem is introduced by the excessive regeneration of peppermints (*Agonis flexuosa*), a second -storey species which has regenerated and coppiced to such an extent, following repeated fires and over-grazing, that it has rendered the prospect of successful regeneration of Tuart being established on certain compartments, at reasonable cost, unlikely. At the present time consideration is being given to a proposal to introduce a rotation of *Pinus pinaster*, retaining only vigorously growing old Tuart as standards, with the object of restoring satisfactory forest conditions for future regeneration of Tuart".

Opinions vary on the role of altered fire regimes and the health and vitality of tuart woodlands. Reduced fire frequency and an associated increase in the density and dominance of understorey trees, principally peppermint (*Agonis flexuosa)*, have been suggested as contributing factors to the decline of mature tuart trees in the Yalgorup area over recent years (Ward 2000).

Old Coast Road. Photo: Rick Sneeuwjagt

These changes in the understorey structure of tuart woodland, leading to dense peppermint communities at Ludlow and Yalgorup, have been evident since the 1840s. They have been linked to the decline in the influence of regular Aboriginal burning from the 1850s, and the commencement of grazing in the Ludlow forest from the 1840s - with more extensive grazing from 1918 – and in the Yalgorup area from the 1860s that continued for 100 years. While these woodlands were afforded fire protection, the reduced frequency of planned burns increased the number of severe fires in ungrazed areas. There are few records of when peppermint became dominant as an understorey. Gardner (1923) reported that the density of peppermint understorey hindered the development of tuart regeneration in the southern portion of the woodland. Bradshaw (2000) concluded that while most data and observations of changed tuart understorey condition relate to Ludlow, similar patterns could apply at Yalgorup on comparable vegetation complexes.

One possible mechanism for the decline in tuart health resulting from changes in understorey structure is the increased competition for water and nutrients resulting from the presence of a dense intermediate layer of peppermint. At this stage there are no specific data that quantify the extent of these competitive effects (Bradshaw 2000). Though what is certain is that the absence of fire, and the presence of dense peppermint understorey, does pose a barrier to tuart recruitment due to insufficient receptive seed-beds (ash-beds) and the level of competition imposed on seedlings (Bradshaw 2000).

Mitchell (1999) and Longman & Keighery (2002) propose that competition from the understorey is not likely to be a stress factor contributing to tuart decline in the Yalgorup area because: (i) mature tuarts have also declined in parkland cleared areas where understorey competition is not a factor, and because (ii) peppermint thickets have been a significant component of tuart woodlands for a long period of time, rather than a development associated with recent declining fire frequencies and increased grazing. Longman & Keighery (2002) also suggest that the more frequent (pre-European) fire regimes would favour peppermint vegetation because the species regenerate from lignotubers, by epicormic growth and from seedlings.

Insects

While many species inflict damage on tuart, few insect species are considered a direct threat to tuart health (Wills 2002). While the suite of potential pest species is broad, three types of insect species are implicated in tuart health. The first is the potential threat to the canopy seed pool by the tuart bud weevil (*Haplonyx tibialis*). This is important in the context of regeneration after wildfire or use of fire to promote seedling regeneration. The second is the threat to young or regenerating tuarts by pasture-derived leaf feeders. This threat exists in old pastures or areas with poor weed control. The third threat is the undefined role played by the tuart longicorns as stem girdlers and cambium feeders in canopies under environmental stress such as is occurring at Yalgorup. For example a heavy infestation of *Phoracantha impavida* can ringbark the smaller branches of tuart trees, but most trees - except some small saplings - can survive, by producing epicormic shoots below the ringbarking. Another and

more destructive tuart longicorn (*P. semipunctata*) attacks the trunks of smaller trees and can in some circumstances kill them by ringbarking. The definition of the role of tuart longicorns in tuart decline requires suitably replicated population studies and definition of the interactions between tree vigour and feeding damage (Wills 2002). As an initial step, the 2003 Tuart ARC project seeks to: (i) determine the biodiversity of invertebrates on the canopy, bark and litter of healthy and declining tuarts and (ii) measure the incidence and severity of borer galleries within tuart stems.

Pathogens

There is a limited amount of information available on the pathology of tuart. Canker fungi and wood-rot fungi are known to be present, and tuart is relatively resistant to *Phytophthora cinnamomi* and *Armillaria luteobubalina*. It is considered unlikely that a "new" pathogen, such as the lethal tree-dieback disease 'Mundulla Yellows', is responsible for tuart decline. Tree declines from pathogens are complex interactions of environmental and biotic factors. An understanding of the role of pathogens therefore requires study of the individual and combined elements of the 'disease triangle' (ie. host, pathogen, environment). Disturbance to the balance and/or relationships of this triangle resulting from insect infestation, may lead to a predisposition of trees to attack, and to more severe diseases (Stukely 2002). As an initial step, the 2003 Tuart ARC project seeks to: (i) identify and isolate fungal pathogens associated with roots, stems and leaves of healthy and declining tuarts, (ii) identify and isolate fungal pathogens associated with beetles and borer galleries of tuart stems, and (iii) measure the incidence and severity of decay fungi both associated and not associated with borer galleries of tuart stems

1.6.3 Changes in hydrologic regimes

Water extraction for horticulture has the potential to impact the water tables supporting tuart woodlands (Government of Western Australia 2002). Alterations to hydrological regimes can affect how much water is available to plants and therefore affect the responses of species, populations and whole ecosystems (Froend 2002). These can be described as follows:

- *species responses:* due to changes in water source use, mechanisms for water conservation and thresholds to drought tolerance;
- *population responses:* due to increased mortality, reduced recruitment and altered population distribution; and
- *community/ecosystem responses:* due to reduced species importance, reduced support for other species (habitats), and altered ecosystem processes such as nutrient dynamics

Old Coast Road. Photo: David Mitchell

The decline in rainfall in the southwest of Western Australia during the last 20 years (Indian Ocean Climate Initiative 2002), and site-specific changes to hydrological conditions from neighbouring horticulture may be significant non-biological precursors to the decline in the health of tuart woodlands at Yalgorup (Froend 2002). As an initial step, the 2003 Tuart ARC project seeks to examine water table depth, plant water relations and root architecture of healthy and declining tuarts.

1.6.4 Rural tree decline

Tuart woodlands occur on a significant proportion of grazing land of the Swan Coastal Plain and have been thinned over time, thus creating a park-like landscape of trees and pasture. Livestock grazing on native grasses and/or cultivation and the sowing of exotic grass has destroyed tuart seedlings, crucial to the survival of these woodlands. Even when stock are excluded, establishment of tuarts in some heavily disturbed environments is challenging requiring heavy seed-fall into ash-beds free of competing vegetation, followed by adequate rainfall.

The normal life span of tuart trees is considered to be up to 350 years. Natural deaths of aging trees and the decline in tuart health at Yalgorup, combined with little tuart re-growth, has resulted in a general loss of tuart trees from many of these woodland landscapes This is further reduced by physical damage from compaction of the soil, injuries from repeated scarring by fires and chronic insect re-infestation. Larger, older trees have a reduced capacity to recover from these impacts and wood decay and the risk of windthrow has increased.

1.6.5 Other threatening processes

There are other possible threatening processes that may in combination with other factors, result in the decline of tuart health at Yalgorup. These could include industrial air pollution (Chilcott 1992), declining water quality, reduction in beneficial fungi (eg. mycorrhizal, litter decomposing), loss of natural biological control mechanisms (Longman and Keighery 2002), frost (CALM 2000) and feral animals.

1.6.6 Synergies of threatening processes on biodiversity

The conservation of tuart's remnant biodiversity is affected by: (i) woodland fragmentation, habitat loss and alteration, (ii) changes in natural disturbance regimes such as reduced winter rainfall, fire, and insect and pathogen status, and (iii) human induces changes such as water extraction, resource use, introduced competitors and predators, and public access.

To date only several studies (Prober and Thiele 1995) have attempted to look at two factor combinations (eg. grazing and fragmentation) of similar impacts. Studies that examine how these various factors interact in real environments are required. In highly fragmented environments the impacts of localised habitat modification can lead to the decline of species able to survive the initial impact of habitat removal.

1.6.7 Maintaining tuart trees in grassed parks

Many grassed parks within the urban areas of Perth, Mandurah and Bunbury contain remnant specimens of tuart. These trees are valuable for their beauty and their ability to give people a sense of place. However, they cannot reproduce in grassed areas, and are in danger of gradually disappearing, as the individual specimens eventually die. If tuart is to remain on such sites, there needs at least to be a plan to replace the trees that die - and it would be desirable in many cases not merely to maintain but to increase the number of tuart trees.

This can be done by planting, but a better approach can be to create garden beds to allow tuarts to reproduce naturally – and by weeding out seedlings of any non-local trees that may germinate. Natural regeneration gives a more attractive, natural result than plantings. Moreover, the beds can be used for re-establishing some of the plant species of the tuart understorey, which will increase biodiversity and create a pleasing visual harmony. The first step is to recognize and value tuart trees, and then to map and record their occurrence. Tuart trees will be most visible if the sites where they occur are planted only with tuarts or their understorey species, thus avoiding visual interference from non-local trees and shrubs.

1.7 Guiding principles for strategy development

Guiding principles for the development of this draft *Tuart Conservation and Management Strategy* are suggested by the Tuart Response Group as follows.

1.7.1 Meeting reserve targets for nominated under-represented tuart ecosystems

Nationally agreed criteria (JANIS[4]) for establishing a National Reserves System for forests in Australia provide for 15 per cent[5] of natural ecosystems to be protected in a comprehensive, adequate and representative (CAR) reserve system. The criteria also provide for flexibility in determining the level of formal reservation by: (i) allowing regional circumstances to be taken into account, and by (ii) ensuring the maximum extent of CAR reserves. The present reserve status for tuart woodlands (Government of Western Australia 2002) is shown in Table 1.

Extent of tuart woodlands in IUCN reserves (I) to (IV)

Tuart ecosystems (after Beard 1979 and Hopkins 1996)	Orig. Pre-1750 extent	Current extent		IUCN Reserve Categories (I) to (IV)	
		(ha)	(%)	(ha)	(%)
Tall woodland: tuart	3,155	2,088	66.2	1,451	46.0
Medium woodland: tuart	51,575	19,742	38.3	5,140	10.0
Medium woodland: tuart-jarrah	54,077	15,998	29.6	1,501	2.8
Medium open woodland: tuart	1,080	778	72/0	256	23.7
Medium open woodland: marri- tuart	1,213	78	6.4	0	0
Mosaic: medium woodlands, tuart with low woodland, banksia	509	145	28.5	0	0
Total	**111,609**	**38,829[6]**	**34.8**	**8,348**	**7.5**

Note that regionally significant bushland, including tuart woodlands, has also been identified on the basis of criteria relating to conservation values as part of the 'Bush Forever Program' (Government of Western Australia 2000). Important amongst these is the achievement of a comprehensive representation of the ecological communities originally occurring in the region through a protection target of at least 10 per cent of each vegetation complex.

[4] The JANIS "criteria apply to all forests, and associated woodlands, within each region for which an RFA is to be developed." (Commonwealth of Australia 1999). As the Swan Coastal Plain was not included in Western Australia's RFA agreement, the criteria would only apply to tuart woodlands after its dominant structural ecosystems (Hopkins *et al.* 1996) had been validated by rigorous scientific analysis of ecosystem values, health and vitality, and productive capacity. For example for an ecosystem to have 'high conservation value' it must exceed a certain threshold of disturbance.

[5] A reduction in CAR reserves may occur where the objectives for maintaining biodiversity are demonstrated to be met with a lesser area, or where it is impractical to purchase land because ecosystems occur largely on private lands. Alternatively, the 15 per cent formal reservation level of the pre-1750 distribution may be exceeded for rare and endangered forest ecosystems, where all remaining occurrences require reservation or protection. A rare ecosystem is one where its 'geographic distribution involves a total range of generally less than 10,000 hectares, a total area of generally less than 1,000 hectares or patch sizes of generally less than 100 hectares, where such patches do not aggregate to significant areas' (Commonwealth of Australia 1999).

[6] The estimate of remnant tuart woodlands mapped by Beard (1979) and Hopkins (1996) is 38, 829 hectares at a scale of 1:250,000 (Table 1). The estimate of remnant tuart woodlands as mapped by the Tuart Atlas (2003) is 30,317 hectares at a scale of 1:10,000 (Appendix 6.1).

1.7.2 Improving knowledge and understanding

Community knowledge and understanding means communicating ideas and feelings that help people enrich their understanding and appreciation of their world and their role within it. For example community education provides knowledge to better understand the natural environment and promote awareness and appreciation of its values. Effective interpretation and community education programs enhance positive attitudes towards the conservation and protection of the physical environment and native flora and fauna, and promote a greater understanding of the relationships between people and nature. Improving community knowledge and understanding is therefore important for the conservation and management of tuart woodlands as 19,078 hectares or 63 per cent of its total occurrence is located on private lands (Government of Western Australia 2003) where there are substantial threats from development and alternative landuses. For urban residents there is at least a need for people to be able to recognize some of their local tree species such as tuart.

1.7.3 Community participation

Effective citizen participation is aligned with the following four principles:

- that information provided by Government during strategic development be objective, relevant, complete and accessible. All citizens should have equal treatment when exercising their rights of access to information and participation;

- that the objectives for, and limits to, information consultation and active participation be defined at the out-set. The respective roles and responsibilities of citizens (in providing input) and governments (in making decisions for which they are accountable) must be clear to all;

- that public consultation and active participation be undertaken early in the strategic development process to allow a greater range of solutions to emerge and to raise the chances of successful implementation. Adequate financial, human and technical resources are needed if public information, consultation and active participation in strategic development are to be effective; and

- that leadership and commitment to information, consultation and active participation in strategic development is needed at all level – from Government, senior managers and public officials.

1.7.4 Conserving biodiversity

The conservation of biodiversity has become a major objective of most developed countries in the world in recent years. It deals with the combination of actions targeting the protection, restoration and sustainable use of native plants, animals and other native organisms. There are four main arguments for conserving living things and the ecosystems that they form.

- The first is ethical - the needs and desires of humans should not be the only basis for decisions on the preservation of non-human life.

- The second argument is based on aesthetics and cultural values. Plants and animals should be preserved because of their intrinsic interest. Most people would feel a loss if the world's beautiful and interesting plants and animals, and the wild places they inhabit, disappeared.

- The third argument, relates to the ability of the State's unique plants and animals to provide a financial return including attracting visitors to Western Australia. Plants, animals and micro-organisms also provide food, medicines, paper, leather, fuel and building materials.

- The fourth, and perhaps most important argument, is that living things provide the indispensable life-support systems of our planet. They provide oxygen, help to maintain the quality of the atmosphere, regulate freshwater supplies, generate and maintain the topsoil, dispose of wastes, generate and recycle nutrients, control pests and diseases, pollinate crops and provide a genetic store from which humans can benefit in the future.

Extinctions throughout the world resulting from human activity are part of a larger problem. Increasing populations and improving technologies mean that humans are now able to affect the environment in ways it cannot sustain. Conserving biological diversity is therefore a key community responsibility.

Other important considerations in conserving biodiversity include: (i) the impact of management activities on the conservation of biodiversity at a range of scales, (ii) that users of the environment pay fair value for that use, (iii) that the processes effecting adaptive management be a key component of management systems, and (iv) that management prescriptions be based on the best available scientific knowledge.

1.7.5 Integrating conservation and management across all tenures

The proportion of remnant tuart woodlands on private lands (63%) significantly exceeds the proportion in reserves, parks and forests (31%) vested in the Conservation Commission of Western Australia (Appendix 6.1). The management of tuart woodlands on private lands must therefore be sympathetic with and complementary to the State's formal conservation objections. This will require:

- participation of appropriate peak organisations, Natural Resource Management groups and community groups, in collaboration with statutory authorities, Government agencies and local authorities, to reach agreement on key strategies and actions;

- a comprehensive approach to ensure the successful implementation of strategies and actions dealing with the variety of public as well as private land management issues;

- an integrated approach to ensure strategies and actions on public and private lands are consistent with land management legislation, and other policies, strategies and management plans; and

- continuous improvement to ensure strategies and actions fulfil the vision, achieve outcomes, and meet the targets contained in the 'tuart strategy'.

1.7.6 Programs based on the precautionary approach and adaptive management

The 'precautionary principle' is concerned with decision-making where action should be taken to prevent damage even where there is no absolute certainty that damage will occur. It applies where there is a threat of serious or irreversible damage.

'Adaptive management' requires conservation and protection programs to be updated over time based on the dissemination of new information from research, monitoring and auditing.

1.8 Framework for strategy development

The strategy scope and purpose of this draft *Tuart Conservation and Management Strategy* is aligned with Government legislation, policies and strategies, and the Corporate plans and management functions, roles and responsibilities of Government agencies and local authorities.

1.8.1 Strategy scope and purpose

The strategy applies to the geographic areas defined by the natural distribution of tuart woodlands on the Swan Coastal Plain (see Map 1, Appendix 6.1). It includes all lands vested in the Conservation Commission of Western Australia, publicly owned land held in the name of CALM's Executive Director, and other Government agencies, other Crown reserves, *Bush Forever* sites and private land.

The purpose of this strategy is to give effect, and set out the manner in which tuart trees, tuart woodlands and tuart ecosystems will be managed on all categories of land. This plan, once approved, is proposed to operate for ten years from its date of adoption by the Government. Where other approved polices, strategies and plans are in place (Appendix 6.2), tuart management will be in accordance with those plans. The development of new polices, strategies and plans will be consistent with the priorities set by this *Tuart Conservation and Management Strategy*.

The structure of this draft 'Tuart Conservation and Management Strategy" is shown at Appendix 6.3.

1.8.2 Management functions, roles and responsibilities

CALM manages tuart woodlands on public lands according to area management plans in nature reserves, national parks, conservation parks, and regional parks. They are managed in State forest and timber reserves according to the *Forest Management Plan 2004-2013*. Significant tuart woodlands are also conserved in Bold Park and Kings Park and are managed by the Botanic Gardens and Parks Authority. Local authorities also manage important remnants of tuart woodlands according to assessed (and non-assessed) Town and District Planning schemes, and the Government's *Bush Forever* program.

A range of community groups also provide conservation services at a whole-of-tuart woodland level (eg. Wildflower Society, Urban Bushland Council) or at a local level (eg. Star Swamp and Neerabup Friends, Southern Estuary, and Scarborough District Progress Associations). Various Natural Resource Management groups (eg. regional catchment councils, land conservation district committees) coordinate tuart conservation and management work on private land. Approximately 63 per cent of remaining tuart woodlands occur on private land and are managed by landowners.

This strategy does not propose any changes to existing management functions, roles and responsibilities for tuart woodlands on the various categories of land. It does however seek to provide a more Government and community-based vision for tuart conservation and management that builds on relationships and improves current levels of integration. Section 3.2 identifies a number of approaches for coordinating the implementation of these programs by the Government agencies and non-government organisations, and invites more community discussion

1.8.3 Legislation

Legislation provides the first mechanism for conserving biodiversity and achieving the sustainable use of ecological values in tuart woodlands. Important legislation includes:

- The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* that contains provisions for protecting threatened species and ecological communities;

- the *Conservation and Land Management Act 1984* that prescribes the broad objectives for land management of the State's vested reserves, parks and forests;

- the *Wildlife Conservation Act 1950* that provides for the conservation of flora and fauna throughout Western Australia. CALM administers the Act;

- the *Environmental Protection Act 1986* that provides the Minister for the Environment with mechanisms to modify or not approve proposals where an activity is likely to have a significant impact on the environment; and

- the *Soil and Land Conservation Act 1945* that provides mechanisms for the protection of soil resources that are essential for the maintenance of ecological processes and the conservation of biodiversity.

Other relevant legislation indirectly providing for the conservation of biological diversity includes:

- the *Land Administration Act 1997* that contains provisions for the administration of Crown land in Western Australia relative to legislation, policy and strategic planning, and land disposition, acquisition, custodianship and enforcement;

- the *Local Government Act 1995* that provides for a system of local government in Western Australia';

- the *Regional Development Commissions Act 1993* that establishes Commissions responsible for fostering the economic development of regional Western Australia;

- the *Town Planning and Development Act 1928* that relates to the planning and development of land for urban, suburban, and rural purposes;

- the *Metropolitan Region Town Planning Scheme Act 1959* that provides for planning and development of land within the metropolitan region, and regulates the use and assessment of the Metropolitan Improvement Tax; and

- the *Bush Fires Act 1954* that provides regulations on the control of wildfires and the use of planned fire.

1.8.4 Government polices

Urban Bushland

The Government recognises that there is widespread community support for the protection of diminishing urban bushland. This support is highlighted by the thousands of voluntary hours contributed by the community to protect and manage bushland on the Swan Coastal Plain. The loss of urban tuart bushland is not confined to the metropolitan area, but affects communities in other urban centres such as Bunbury, Mandurah and Busselton.

There is a need to consolidate urban conservation estates to provide a greater representation of native vegetation communities. Urban bushland contains many species of rare and uncommon flora and fauna and provides islands of habitat that can be linked as 'green corridors' for the movement of fauna. Bushland ecosystems also provide carbon sinks for greenhouse gases, air filters, windbreaks and groundwater control. Urban bushland has significant social and aesthetic values as an educational resource and a passive recreational asset. Often remnant urban bushland has historical significance to Aboriginal and European cultures.

The *Bush Forever* Program (Government of Western Australia 2000) aims to identify, protect and manage regionally significant bushland in order to achieve a sustainable balance between bushland conservation and development in metropolitan Perth. Significant Government funds have been committed to this program, which is now proposed for the remainder of the Swan Coastal Plain in Western Australia.

Rivers and wetlands

The Government recognises that rivers, wetlands and related vegetation – including tuart woodlands - are valuable community assets that provide social, environmental and economic

benefits. However, without adequate protection the State's rivers and wetland heritage will continue to be lost to inappropriate development, deteriorating water quality and salinisation. Up to 80 per cent of wetlands on the Swan Coastal Plain have already been destroyed and what remains is often degraded or under threat.

Degradation of rivers and wetlands is in part due to pressures placed on their associated water catchments and underground aquifers. These pressures include hydrological changes due to urbanisation and agriculture and changes to natural drainage systems, high nutrient loads from urban and rural land uses, inadequate buffer zones, weed invasions and lack of recognition in planning processes. Efforts to conserve and safeguard river and wetland systems require effective and integrated catchment management.

Community participation

The Government recognises the importance of encouraging citizens to participate in public affairs. Participation helps create a more inclusive and equitable society and strengthens democratic institutions. An effective mechanism to achieve greater participation is community consultation. It promotes active citizenship by encouraging individuals and groups to provide real input into decision-making (Caddy and Vergez 2001).

Decisions that have been reached through consultative processes carry greater legitimacy and credibility in the community. Engaging the community in decision-making builds trust within communities and can lead to new partnerships between citizens and policy makers through a shared sense of ownership of the issues that affect communities.

Public participation is therefore both a means and an end. As a means it is a process whereby citizens and communities cooperate to provide input into programs and projects. As an end it empowers citizens and communities through the acquisition of skills, knowledge and experience.

Regional Development

The South West and Peel Development Commissions were established under the *Regional Development Commissions Act 1993.* Under the Act the Commissions are responsible for fostering the economic development of the South West Region and the Peel Region of Western Australia. The South West and Peel Development Commissions rotate annually to represent the Great Southern, Wheatbelt, South West and Peel Development Commissions on the South West Catchments Council.

Both Development Commissions are assisting in the completion of the draft *South West Regional Strategy for Natural Resource Management.* This will provide a coordinated whole-of-region approach for the long-term improvement of water and land resources, coastal environments, native vegetation and biodiversity. The South West and Peel Development Commissions are members of the Government's Tuart Response Group.

1.8.5 Community participation processes

Decision-making framework

Appendix 6.4 shows decision-making processes for the development and implementation of the 'tuart strategy'. Key stakeholders include: (i) the Minister for the Environment, (ii) statutory authorities such as the Conservation Commission of Western Australia and the Western Australian Planning Commission, (iii) Government agencies, (iv) local authorities, (v) industry, and (vi) community groups.

In November 2003 the Minister for the Environment established a Tuart Response Group to use its combined resources and knowledge to: (i) investigate the hierarchy of causes behind the observed decline in tuart at Yalgorup and elsewhere, (ii) devise a tuart conservation and management strategy, and (iii) compile educational material for improved management of

tuarts on private land. The Minister also requires the Response Group to provide expert advice to Government on land use and development proposals that affect tuart trees and ecosystems on the Swan Coastal Plain.

Important statutory processes affecting tuart conservation and management include region and local structure planning (Western Australian Planning Commission), environmental impact assessments (Environmental Protection Authority) and reserve, park and forest management planning (Conservation Commission of Western Australia). Core business decisions by Government agencies such as the Departments of Conservation and Land Management, Planning and Infrastructure, Environment, and Agriculture, the Water and Rivers Commission, and local authorities also influence decisions on tuart conservation and management. The successful integration of these decisions processes therefore requires active and informed Government and community-based participation.

1.8.6 Tools for identifying conservation values

Data from the *Atlas of Tuart Woodlands on the Swan Coastal Plain* on tuart occurrence and low disturbance understorey condition has been intersected with land categories, soil systems and rainfall zones to provide information on the size and location of areas of 'indicative high conservation' tuart woodlands (Ecoscape 2004, Appendix 6.5). This assessment is a contributory process in the development of the Government's final *Tuart Conservation and Management Strategy and Action Plan*. It will be used when 'workshopping' this draft 'tuart strategy' to guide community feedback on: (i) proposed additions to the secured reserve system, (ii) areas that warrant special protection management on private land, and (iii) locations for the development of wildlife corridors. The final 'tuart strategy and action plan' will reflect these Government and community-based decisions for enhancing the status of remnant tuarts. This will include processes for ground-truthing biodiversity values, quantifying natural-cultural heritage and socio-economic values, and nominating areas for formal conservation, freehold protection and linkage.

1.9 Relationship to legislation, strategies, plans and programs

1.9.1 National level

Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth Government is working in partnership with State, Territory and local authorities, non-government organisations, tertiary institutions and community groups to ensure the protection of native species. The legislative mechanism for national environment protection and biodiversity conservation is the *Environment Protection and Biodiversity Conservation Act 1999*. It provides for:

- identification and listing of 'threatened species and threatened ecological communities';
- development of 'recovery plans' for listed species and ecological communities;
- recognition of 'key threatening processes'; and where appropriate
- reducing these processes through 'threat abatement plans'.

The Natural Resource Management Ministerial Council

The Natural Resource Management Ministerial Council, on which Governments of all States and Territories and the Commonwealth are represented, has been established to develop a coordinated approach to issues affecting Natural Resource Management in Australia. The

Council has established national level documents that include: (i) a framework for the extension of the Natural Heritage Trust, (ii) a national *Natural Resources Management Monitoring and Evaluation Framework*, and (iii) a national *Framework for Natural Resource Management Standards and Targets*.

Natural Heritage Trust

The Natural Heritage Trust is a Commonwealth initiative for conserving Australia's native vegetation, land, biodiversity, water resources and seas, to which States and Territories have signed-up under respective bilateral agreements. Investments by both Commonwealth and State Governments under the Natural Heritage Trust is guided by regional Natural Resource Management strategies and investment plans developed by regional Natural Resource Management groups. Prior to funds being delivered to the regions, the strategies require accreditation by both Commonwealth and State Governments.

National Strategy for the Conservation of Australia's Biological Diversity (1996), and the National Objectives and Targets for Biodiversity Conservation 2001-05

These 'strategies' provide a framework for protecting biodiversity and maintaining ecological processes and systems. Key principles include:

- the establishment of *in situ* comprehensive, representative and adequate systems of ecologically viable protected areas integrated with sympathetic management of all other areas, including agricultural and other resource production systems;

- cooperative approaches between land managers, resource users, conservation groups, Aboriginal people, and the community in the conservation of biological diversity;

- the anticipation and prevention of processes that cause an irreversible reduction or loss of biological diversity; and

- the need to adapt the conservation and management of biodiversity based on new and traditional information and knowledge.

National Framework for the Management and Monitoring of Australia's Native Vegetation

Commonwealth, State and Territory Governments have committed themselves, through the Natural Heritage Trust, to reverse the long-term decline in the quality and extent of Australia's native vegetation cover. The *National Framework for the Management and Monitoring of Australia's Native Vegetatio*n provides a means for implementing this goal in a unified and consistent manner, against an agreed framework of best practice management and monitoring measures.

1.9.2 State level

A Proposed Biodiversity Conservation Act for Western Australia (2003)

It has long been recognised that the *Wildlife Conservation Act 1950* is out of date and in need of reform. The Government of Western Australia is committed to the introduction of modern biodiversity conservation legislation. It is intended that the new 'Biodiversity Conservation Act' will require the development of a 'State Biodiversity Conservation Strategy'. This will provide for more certain application of biodiversity conservation controls in tuart woodlands. (Appendix 6.2).

Environmental Protection Act (1986)

The *Environmental Protection Act 1986* provides the basis for Western Australia's environmental protection policies and environmental impact assessments. Amendments to the 'Environmental Protection Act', now before Parliament for the 'Protection of Native Vegetation in Western Australia', will provide stronger mechanisms and controls for the conservation and management of significant remnant tuart trees, stands, woodlands and ecosystems.

Natural Resource Management Council

The Natural Resource Management Council has been established in Western Australia to lead Natural Resource Management. Its Terms of Reference are to: (i) adopt a community leadership role for Natural Resource Management in Western Australia, (ii) provide high-level policy and strategic advice on Natural Resource Management to the Cabinet Standing Committee on Environmental Policy, and (iii) foster a consultative approach that ensures broad community involvement in Natural Resource Management policy development (Appendix 6.2). The Natural Resource Management Council supports the development of regional strategic plans for Natural Resource Management groups that include tuart woodlands.

Regional Natural Resource Management Groups

The Northern Agricultural, Swan, and the South West Catchments Councils are developing regional strategies for Natural Resource Management within the natural range of tuart woodlands from Lancelin to Busselton. These 25-year strategic plans aim to balance conservation of the environment, sustainable land and water use, and community development. They are the result of wide cooperation between community and catchment groups, local government, State agencies and federal bodies involved in Natural Resource Management.

Draft strategies require public consultation and accreditation by both State and Commonwealth Governments. When completed Investment Plans setting out and prioritising programs for implementing regional Natural Resource Management strategies will facilitate access to Natural Heritage Trust II funding for the next three years (Appendix 6.2). The draft *South West Regional Strategy for Natural Resource Management* (South West Catchment Council 2002) is currently undergoing the accreditation process. The Swan Catchment Council has prepared and released the *Swan Region Strategy for Natural Resource Management* (Swan Catchment Council 2004) for public consultation and discussion.

Tuart Response Group

In November 2001 the Minister for the Environment announced the formation of the Tuart Response Group to coordinate Government and community-based action for the conservation and management of tuart trees and woodlands. Key Response Group initiatives include:

- developing an up-to-date and accurate 'tuart atlas' that now provides new and improved information for guiding future land use decisions on the Swan Coastal Plain; and

- collaborating with research institutions, industry and local government in the award of a three year Australian Research Council Linkage Grant from July 2003 to investigate the decline of tuart health at Yalgorup and elsewhere.

The Tuart Response Group has also been active in promoting increased community awareness on the importance of protecting tuart trees and woodlands on private lands. For example, the Status Report for *Tuart Conservation and Protection* summarised the latest knowledge on tuart woodlands, and was widely distributed to stakeholders, special interest groups and the community. In September and October 2002 the Response Group conducted seven community and stakeholder workshops between Lancelin and Busselton to discuss

ideas for the development of the Government's *Tuart Conservation and Management Strategy and Action Plan*.

State Sustainability Strategy Government of Western Australia (2003)

The strategy *Hope for the Future: The Western Australia State Sustainability Strategy 2003* (Government of Western Australia 2003), provides goals and actions across governments to support an appropriate State sustainability framework. In particular the strategy values and protects the environment and ensures the sustainable management and use of natural resources, including tuart. It doing so it: (i) uses 'Statements of Planning Policy' to coordinate the actions of local governments, regional councils and State Natural Resource Management agencies to resolve key natural resource issues, such as biodiversity corridors and coastal planning, and (ii) builds community values into regulatory approaches to natural resources management (Appendix 6.2).

State Planning Strategy

The Western Australian Planning Commission Act 1985 requires the Western Australian Planning Commission to lead the preparation of a State planning strategy as the basis for: (i) coordinating and promoting regional land use planning and land development, and (ii) guiding Government departments and instrumentalities and local authorities (Appendix 6.2). The *State Planning Strategy* provides strategic guidance for land use planning in Western Australia through to the year 2029. The 'planning strategy' is aimed at developing a land use planning system to help the State achieve its economic, social and environmental goals. The latter has relevance for the conservation and management of tuart woodlands.

Statement of Planning Policy No. 2: Environment and Natural Resources Policy (2003)

'Policy No. 2' Sets out the broad environment and resource management policies for sustainability, including measures to: (i) safeguard and enhance areas of environmental significance on the coast including tuart woodlands and the marine environment, (ii) ensure use and development on or adjacent to the coast is compatible with its future sustainable use for conservation, recreation and tourism in appropriate areas, and (iii) take into account the potential for impacts from changes in climate and weather on human activities and cultural heritage including coastal and urban communities, natural systems and water resources. The Environment and Natural Resources Policy is consistent with the Coastal and Lakelands Planning Strategy (Appendix 6.2).

Forest Management Plan 2004-2013

The *Forest Management Plan 2004-2013* (Conservation Commission 2004) replaces the existing *Forest Management Plan 1994-2003* (Lands and Forest Commission 1994). It covers all land categories vested in the Conservation Commission of Western Australia[7], within the Department's Swan, South West and Warren Regions. The Conservation Commission's overall objective in formulating the plan is for biodiversity to be conserved, the health, vitality and productive capacity of ecosystems to be sustained, and the social, cultural and economic benefits valued by the community to be produced in a manner that takes account of the principles of ecologically sustainable forest management (Appendix 6.2). The Forest Management Plan has addressed improvements to the conservation reserve system on the Swan Coastal Plain (Appendix 6.6). When fully implemented the area of tuart woodlands in formal reserves (Map 1) will increase from 6,160 hectares to 8,690 hectares (ie. 20.3 to 28.7 per cent of the total remaining area).

[7] Includes private land that contains native vegetation held in the name of the Executive Director of the Department of Conservation and Land Management.

CALM Management Plans

The *Conservation and Land Management Act 1984* requires CALM to manage lands according to activities and programs prescribed in management plans. CALM's planning policy provides for a hierarchy of plans at: (i) strategic level - regional plans, (ii) local level - area plans where operations address the scale of individual or groups of parks and reserves, and (iii) issue level - plans for specific actions such as threatened species recovery. CALM management plans have been developed for the conservation of tuart woodlands at Yellagonga Regional Park[8] (CALM 2003), at Ludlow and the Leschenault Peninsular (CALM 1978, 1998) and at Yanchep and Yalgorup National Parks (CALM 1989, 1995). This strategic level plan for tuart woodlands is complementary to, and does no replace any aspect of these existing local level management plans.

Bush Forever

Bush Forever (Government of Western Australia 2000) identifies more than 50,000 hectares of regionally significant bushland for protection on the Perth Metropolitan Region part of the Swan Coastal Plain. Nearly two thirds of this land is already under some form of protection. Regionally significant bushland such as tuart woodlands, has been identified on the basis of conservation criteria. Important amongst these is the achievement of a comprehensive representation of the ecological communities originally occurring in the region through a protection target of at least 10 per cent of each vegetation complex. Up to $100 million over 10 years has been committed by the Western Australian Planning Commission to secure effective and timely implementation through acquisition and negotiated solutions (Appendix 6.2).

Western Australian Regional Initiatives Scheme

The primary objective of Western Australian Regional Initiative Scheme is to encourage, promote and support the sustainable development of regional Western Australia by funding projects to attract investment, increase jobs, improve skills and provide access to services in more than one of the nine regions in regional Western Australia. Eligible applicants include local government, State Government agencies, volunteer organisations, business groups, educational institutions, philanthropic foundations and community organisations. Funding priorities include environment and Natural Resource Management. The Western Australian Regional Initiatives Scheme provides financial assistance of between $5,000 and $250,000 for non-capital works projects. The Department of Local Government and Regional Development administer the scheme.

Regional Development Scheme

Under the Regional Investment Fund the Western Australian Government provided $400,000 to each Regional Development Commission during 2001-02, 2002-03 and 2003-04 to administer the Regional Development Scheme in their region. The scheme aims to improve the economic and social development of regional Western Australia. It provides financial assistance from $5,000 up to $150,000 for projects that will assist in attracting investment and increasing employment. It is anticipated that the State Government will provide $400,000 for 2004-05.

Peel Sustainable Development Strategy

The Peel Sustainable Development Strategy is based on the shared vision for a whole-of-Government and whole-of-community approach to sustainable economic, social and environmental development in the Peel region. Government agencies, community groups and the Peel Development Commission have been widely consulted on shared goals, objectives and strategies. Key elements for sustainable development in the Peel region include: (i)

[8] Draft plans have been completed for Beeliar, Woodman Point and Rockingham Lakes Regional Parks.

attracting businesses and ensuring economic and social development without endangering the area's natural assets, (ii) the efficient use of water resources, and (iii) the maintenance of the rural character of the area (Appendix 6.2).

SECTION 2

Targets and strategies

Many elements for an effective tuart conservation and management strategy are already in place (Appendix 6.8). The following sections therefore considers those strategies necessary to enhance the achievement of the vision that: *Tuart and its associated ecosystems are valued by Western Australians for the range of benefits they can provide. They will therefore be conserved, protected and enhanced for current and future generations to enjoy*.

The Tuart Response Group's key messages for achieving the 'tuart strategy's' vision are proposed as the following six outcomes.

1. **Conservation:** Tuart and its ecosystems will be adequately conserved and sustainably managed in reserves and on private lands.

2. **Research:** Investigations will lead to a thorough knowledge of the biological value of tuart and its ecosystems, and a thorough understanding of what affects tuart health.

3. **Community Awareness:** The community will increase its awareness of tuart and its ecosystems, and their benefits to humankind. This awareness will be shared between different community groups.

4. **Partnerships:** Partnerships will be built or consolidated between community groups with differing interests in tuart trees or tuart ecosystems.

5. **Development Plans:** All plans and processes for developing land within tuart's natural range will take account of the need to conserve tuart and its ecosystems.

6. **Incentives:** Institutional arrangements will provide incentives and support to landowners and land managers for the conservation and management of tuart and its ecosystems.

In this draft *Tuart Conservation and Management Strategy* the Tuart Response Group proposes strategy options necessary to meet quantified targets and agreed outcomes. Their associated key actions (*in italics*) are also included so as to reflect the full range of tuart conservation and management measures considered necessary at this time by the Government. The indicative targets in this 'tuart strategy' are quantified and scheduled over the ten-year life of this plan (Appendix 6.7).

The proposed strategies described in this 'tuart strategy' are not exhaustive but are intended to promote and stimulate discussion. Input on them will be sought via community workshops to be conducted at regional centres and in Perth over the next several months. You may also provide comment through the 'How to Participate' pages at the back of this 'draft strategy' or alternatively at CALM's NatureBase website located at www.naturebase.net

OUTCOME 1: CONSERVATION

Tuart and its ecosystems will be adequately conserved and sustainably managed in reserves and on private lands

AIM: Enhance tuart conservation and management across all land categories	
Targets	**Strategies**
1. By 2014 there is no-net-loss of tuart woodlands over tuart's natural range.	• Apply native vegetation clearing controls under the amended *Environmental Protection Act* [10] so as to fulfill the outcomes, aims and targets of this strategy. • Apply the powers of the *Environmental Protection Act* regarding the environmental assessment of development projects so as to fulfill the outcomes, aims and targets of this strategy. • Ensure that Crown land with significant areas of tuart woodlands, where retention results in a net improvement in tuart conservation, is not transferred to freehold title. • When considering the impacts of clearing apply the principle of 'compensatory habitat' and 'no-net-loss' habitat at a regional scale.
2. The area of tuart woodland's structural ecosystem types: (i) conserved in formal conservation reserves increases, and/or (ii) protected by special management agreements, increases by 50 per cent by Q4 2009.	• Identify and map tuart woodlands of 'indicative high conservation value'[11]. • Develop and implement strategies for increased reservation and special protection management of tuart woodlands. • *Investigate the concept of voluntary property appraisals at the point of sale that provides information on the conservation and protection requirements of tuarts.*

[10] The *Environmental Protection Act Amendment 2002* Bill seeks to repeal the current patchwork of different laws relating to land clearing - which vary depending upon arbitrary factors such as where clearing occurs, land tenure and the purpose of the clearing - and to implement a single land clearing regulatory system under the *Environmental Protection Act 1986*. The new clearing controls are intended to commence from 01 July 2004.

[11] Data from the *Tuart Atlas* on tuart occurrence and understorey condition has been intersected with land categories, soil systems and rainfall zones to provide information on the size and location of areas of 'indicative high tuart conservation value'. This assessment is a contributory process for developing the Government's final 'tuart strategy and action plan'. It will be used when work-shopping this draft 'tuart strategy' to guide community feedback on (i) proposed additions to the secured reserve system, (ii) areas that warrant special protection management on private land, and (iii) locations for the development of wildlife corridors.

OUTCOME 1: CONSERVATION

Tuart and its ecosystems will be adequately conserved and sustainably managed in reserves and on private lands

AIM: Enhance tuart conservation and management across all land categories	
Targets	**Strategies**
3. By Q1 2008 a network of effective habitat/wildlife corridors is in place.	• Develop corridor specifications, define an appropriate corridor network and nominate benefited species. • Develop and implement a strategy for linking tuart woodlands that builds on: (i) existing systems of reserves, parks and forests, and (ii) land protected through voluntary conservation agreements.
4. By Q1 2007 the rate of tuart re-establishment exceeds the rate of tuart clearing.	• Maintain a database of tuart clearing, regeneration, rehabilitation and restoration on former tuart woodland sites in a Geographic Information System. • Investigate mechanisms[12], for maintaining, regenerating and rehabilitating tuart woodlands as a condition of development approval on the Swan Coastal Plain.
5. By Q2 2005 appropriate conservation and management of tuart woodlands is identified as a high priority in all statutory, strategic and local land use development plans.	• Develop assessment approaches for tuart conservation relative to development planning and environmental approval processes. • Liaise with Natural Resource Management groups to ensure strategic/local plans address the conservation and management of tuart woodlands. • Liaise with Natural Resource Management groups to ensure Natural Heritage Trust grants address issues/areas of high priority for the conservation and management of tuart woodlands. • Establish 'agreements' with land, infrastructure and mining development proponents, on appropriate tuart conservation and management during the project phase, and rehabilitation and maintenance after project completion.

[12] Mechanisms include: (i) restrictive covenants, (ii) amending town planning schemes to require no clearing of tuarts trees without prior written approval of local authorities, and (iii) application of the *Environmental Protection Act Amendment 2002* legally binding all development (or land use change) involving tuart woodlands with conditions for development that ensures regeneration and rehabilitation of cleared tuart sites

OUTCOME 1: CONSERVATION

Tuart and its ecosystems will be adequately conserved and sustainably managed in reserves and on private lands

AIM: Maintain or improve biodiversity and ecological functioning in tuart woodlands	
Targets	**Strategies**
6. By 2010 at least 50 per cent of tuart woodland remnants show maintenance and/or improvement in condition	• Continue to identify threatened species, populations, ecological communities, and critical habitats and threatening processes. • Develop risk-based management, recovery plans, and threat abatement plans. • Plan fire regimes that integrate: (i) the conservation of tuart biodiversity, and (ii) the protection of threatened tuart ecological communities, habitats and species, and community assets. • Develop a Government-community based approach for management of degraded tuart woodlands at Yalgorup. • *Develop standards and continue developing remote sensing and ground-truthing methods to monitor the health of tuart woodlands*
7. Designated biodiversity elements of tuart woodlands are identified, conserved and/or protected by Q2 2008	• Ensure key elements of tuart biodiversity such as tuart ecosystems at the edge of range, threatened species and threatened ecological communities are conserved and protected.

AIM: Manage weeds and pests in tuart woodlands	
Targets	**Strategies**
8. By Q4 2008 designated weed and pest species have been reduced	• Prepare, adopt and implement guidelines for the best management of weed and pest species in tuart woodlands. • *Improve coordination of weed and pest control between agencies and land managers.*

OUTCOME 1: CONSERVATION

Tuart and its ecosystems will be adequately conserved and sustainably managed in reserves and on private lands

AIM: Integrate the protection and sustainable management of tuart occurrences off reserves	
Targets	**Strategies**
9. Guidelines for tuart protection and land management are introduced by Q1 2006	• Introduce best practice guidelines for land managers aimed at optimising both tuart retention and land productivity. • Undertake cost and benefit studies for retaining and managing tuart woodlands proposed for development. • *Ensure extension officers are available to promote the guidelines and provide implementation support.*
10. The number of private properties actively engaged in tuart conservation increases annually	• Increase the awareness of protection measures necessary for tuart conservation and management.
11. The number of enterprises operating with an integrated tuart conservation and commercial property plan is increased	• Undertake a study to quantify appropriate benchmarks. • Ensure environmental management systems implemented by agricultural, development and industry businesses address tuart conservation and management objectives. .
12. By Q4 2008 former tuart woodlands are re-established on 3,000 hectares	• Develop a strategy for the regeneration of former tuart woodland sites and the rehabilitation and restoration of degraded areas, including funding arrangements for community groups and integration with Natural Resource Management plans. • Develop a tuart genetic bank that reflects tuart's natural diversity and provides for long-term supply.
13. A policing capacity for tuart conservation and management is established by Q3 2006	• Develop Government and community-based protocols that support the application of the *Environmental Protection Act* amendments for the Protection of Native Vegetation in Western Australia.
14. Controls under the new 'Biodiversity Conservation Act' are implemented by Q1 2006[13].	• Undertake a study to quantify appropriate benchmarks. • Ensure the use of biological resources of tuart woodlands is ecologically sustainable.

[13] This target is dependent upon the development and passing of a new Biodiversity Conservation Act.

OUTCOME 1: CONSERVATION

Tuart and its ecosystems will be adequately conserved and sustainably managed in reserves and on private lands

Ensure that tuart trees in grassed parks are conserved	
Targets	**Strategies**
15. By Q4 2006 local authorities will have mapped and recorded all the tuart trees in their grassed parks within the tuart belt.	• Contact local authorities concerned, and where necessary conduct meetings with their representatives and instruct them in how to identify and record tuart trees.
16. By Q4 2008, all urban local authorities within the tuart belt will have an active program to conserve tuart trees in their grassed parks, favouring methods using natural regeneration.	• Instruct the local authorities concerned on suitable methods, especially the creation of garden beds for the natural regeneration of tuart and the planting of species of the tuart understorey.

OUTCOME 2: RESEARCH

Investigations will lead to a thorough knowledge of the biological value of tuart and its ecosystems, and a thorough understanding of what affects tuart's health

AIM: Undertake research that documents tuart's biological value	
Targets	**Strategies**
17. By Q3 2005 a business plan of key research projects, principal investigators and funding arrangements is completed for research into tuart's biological value.	• Develop programs and establish research priorities for documenting the full suites of invertebrate and vertebrate animals associated with tuart. • Develop programs and establish research priorities that address gaps in the knowledge of tuart's biology[15].

AIM: Undertake ecological research addressing tuart's health	
Targets	**Strategies**
18. By Q4 2006 a business plan of key research projects, principle investigators and funding arrangements is completed for research into tuart health	• Develop programs and establish priorities for tuart woodland research including: (i) ecosystem health, (ii) synergies between biodiversity conservation, land repair and agriculture, (iii) fragmentation of habitat and connectivity, (iv) critical thresholds, (v) habitat alteration impacts on the biota and ecosystem processes, and (vi) re-establishment techniques for disturbed and degraded tuart woodland sites. • Identify high disturbance areas (eg. Yalgorup decline), and implement specific research programs aimed at the management of protectable sites and the restoration and rehabilitation of disturbed sites. • Encourage and fund research and development projects that integrate the sustainable conservation and management of tuart woodlands with urban and industrial development and agriculture. • *Involve land managers in setting priorities and conducting research.* • *Ensure that research and information projects are relevant to tuart conservation and management problems and have clear implementation outcomes.* • *Ensure that integration process takes account of environmental risks.*

[15] Includes reproductive biology, phenology, seed-bank dynamics, seedling recruitment, and the effects of fragmentation and fire regimes on tuart and understorey vegetation species (Ruthrof *et al.* 2002).

OUTCOME 3: COMMUNITY AWARENESS

The community will increase its awareness of tuart and its ecosystems, and their benefits to humankind. This awareness will be shared between different community groups

AIM: Educate, provide information, share ideas and promote community participation in and desire for conserving tuart woodlands	
Targets	**Strategies**
19. By Q1 2007 a network of community information and education resources are available	• Educate, provide information and share ideas on tuart woodlands and their values with landowners. • Develop mechanisms that ensure that investigations of tuart biology translate to community awareness of the value of tuart trees and ecosystems. • Provide scientific and technical information to landowners and the community on tuart regeneration. • Improve linkages and coordination for tuart conservation and management with existing community groups such as the Tuart Response Group, Natural Resource Management groups, land conservation district committees and 'friends'. • Introduce community education programs through local authorities and TAFE to increase understanding of the social, economic and environmental roles of tuart woodlands. • Target financial institutions and land valuers to ensure they are informed about the significance of native vegetation. • Promote commercial tours based on tuart's conservation values. • Translate new information and adapted protection management methods into accessible forms for targeted community audiences. • Provide for a Government-employed tuart information and extensions officer. • Develop strategic information centres north and south of the Swan River. • Consider other site based tuart information and awareness tools (eg. Kings Park, Lake Clifton static display, Old Coast Road stopping points).
20. By Q4 2011 primary school children within the tuart belt will be readily able to recognize a tuart tree.	• Instruct teachers and promote excursions to places where tuart trees occur in school grounds or in parks. • Seek to amend school projects to incorporate learning to recognize local species of tree and shrub as an essential part of student education.

OUTCOME 3: COMMUNITY AWARENESS

The community will increase its awareness of tuart and its ecosystems, and their benefits to humankind. This awareness will be shared between different community groups

AIM: Educate, provide information, share ideas and promote community participation in and desire for conserving tuart woodlands	
Targets	**Strategies**
21. By Q2 2007 liaison with the Western Australia Department of Education and Training has resulted in tuart conservation and management strategies being incorporated into relevant school projects.	• Government agencies supported by the Geographical Association of Western Australia, to liaise with primary and secondary school curriculum developers to ensure tuart conservation and management principles, values and issues are addressed in general education. • Introduce programs to encourage school participation in tuart conservation and management initiatives.
22. By Q4 2005 designated Government agencies have linked websites to provide information on tuart vegetation species and communities, mapping, regional and local planning, research, and notes for conservation and management on private land.	• Improve coordination of tuart information provided by Government agencies. • Improve the provision of natural resource material on tuart to land managers, developers and community groups involved in Natural Resource Management.
23. By Q1 2007 a program is established to assist landowners to do creditable and practical biodiversity surveys.	• Develop guidelines for biological and biodiversity inventories principles, objectives, standards, and data capture methods. • Develop mechanisms for the transfer of biological and biodiversity inventory data to central CALM databases. • Provide for the dissemination of interpreted inventory data through the WALIS Atlas website.
24. By Q1 2008 a report is commissioned by Government that makes recommendations for including into the curricula of tertiary education, the role of healthy tuart ecosystems and sustainable land management.	• Ensure strategic policy and technical issues are addressed in relevant professional courses, particularly forestry, Natural Resource Management, geography, agriculture, biology and town planning.

OUTCOME 3: COMMUNITY AWARENESS

The community will increase its awareness of tuart and its ecosystems, and their benefits to humankind. This awareness will be shared between different community groups

AIM: Collect tuart vegetation data and undertake tuart woodland mapping

Targets	Strategies
25. By 2010 updated tuart woodland mapping is completed.	• Develop a mechanism for updating the 'atlas' of tuart occurrence, overstorey density and understorey condition.
26. By Q2 2007 an update of vegetation complex mapping of the Swan Coastal Plain is completed.	• Tender and coordinate to agreed standards, a multi-agency update of vegetation complexes of the Swan Coastal Plain, including the occurrence of animal species and regeneration capacity in tuart woodlands.
27. Fine scale mapping of tuart woodlands is progressively available from Q1 2007	• Examine the feasibility of mapping the floristics of tuart woodlands at a fine scale as a condition of sub-division or development approval, where significant areas of remnant tuart remain on private land.
28. By Q4 2007 Government has implemented processes for updating information on integrated tuart conservation and management.	• Develop a database integrating tuart woodland mapping updates, the results of clearing applications, and initiatives to protect tuart woodlands through property agreements. • *Undertake and make available literature reviews of published and unpublished data or reports on tuart's occurrence.*

AIM: Monitor the effect of changed land uses on tuart woodlands

Targets	Strategies
29. Every five years the Government publishes a report on the conservation and management status of tuart woodlands.	• Report on subdivision applications and development approvals for tuart woodlands. • Develop and implement approaches to monitor the **clearing** of tuart overstorey and/or understorey vegetation. • Develop and implement approaches to monitor the **health** and condition of tuart overstorey and/or understorey vegetation. • Develop mechanisms and monitoring technologies for assessing cumulative impacts from all threatening processes across tuart's natural range. • *Develop a database of tuart vegetation that is being protected, rehabilitated and restored.* • *Establish a process for adapting new information and knowledge into the sustainable management of tuart woodlands.*

OUTCOME 4: PARTNERSHIPS

Partnerships will be built or consolidated between community groups with differing interests in tuart trees or tuart ecosystems.

AIM: Build supportive links for the conservation and management of tuart woodlands	
Targets	**Strategies**
30. The Government coordinates a tuart woodlands forum by Q3 2006 involving both rural, urban and Aboriginal communities	• Facilitate information exchange between urban communities, rural landowners and Aboriginal groups on the different perspectives for the conservation and management of tuart woodlands. • Formalise partnerships that strengthen existing network linkages between groups with differing interests in tuart conservation and management. • *Hold a tuart woodlands forum to highlight appropriate vegetation management according to regional and local statutory planning processes and consistent with the Environmental Protection Act. The forum will develop mechanisms for best practice agreements for conserving and managing tuart woodlands*

AIM: Promote effective community involvement in the conservation and management of tuart woodlands	
Targets	**Strategies**
31. By Q1 2007 a process of land managers learning from land managers is established	• Ensure regional Natural Resource Management groups develop a full understanding of the range of tuart views held by the people and community groups they represent. • Investigate opportunities for Natural Resource Management groups, local communities and landowners to be involved in implementing tuart conservation programs identified in management plans. • Enhance the relationship between Aboriginal people and regional Natural Resource Management groups. • *Encourage the formation of multi-disciplinary problem-solving teams drawn from local communities to solve tuart conservation and management issues.*

AIM: Introduce tuart land stewardship	
Targets	**Strategies**
32. Community awareness and understanding of the value of tuart woodlands is improved as measured through surveys - benchmark survey completed by Q4 2005	• Develop an agreed position on tuart land stewardship through community forums using an accord or charter process. (eg. land custodianship, relations with neighbours across tenures, intergenerational responsibility, land stewardship principles).
33. By Q2 2007 an award system recognising innovative solutions for the conservation and management of tuart woodlands is established	• Investigate processes for implementing tuart stewardship. (eg. community education, extension programs, land title, local government rates, environmental management systems, stewardship payments, Regional Improvement Fund, other incentives).

OUTCOME 5: DEVELOPMENT PLANS

All plans and processes for developing land within tuart's natural range will take account of the need to conserve tuart and its ecosystems

AIM: Refine tuart conservation and management planning initiatives	
Targets	**Strategies**
34. By Q3 2005 a standard is developed for tuart woodland conservation and management relative to regional and local statutory planning processes	• Develop a shared vision of what the tuart woodland landscape (including rural and urban areas) should look like at local and regional scales, including retention and revegetation targets.

AIM: Provide for tuart conservation in regional and local management plans	
Targets	**Strategies**
35. Provision for the conservation and management of tuart woodlands over its natural range is provided in regional Natural Resource Management strategies, CALM management plans, local authority plans and other statutory plans.	• Identify priority areas over tuart's natural range for retaining and establishing tuart woodlands, taking account of high conservation value areas, fragmentation, land degradation, and synergies with adjacent land uses. • Ensure tuart woodland conservation and management plans are linked to other plans (eg. regional Natural Resource Management plans, water and wetlands management plans, and reserve, park and forest management plans. • Introduce tuart conservation and management targets into regional strategies and local plans. • *Ensure regional Natural Resource Management groups are provided with appropriate information on tuart conservation and management, including the costs and benefits of tuart woodland retention.* • *Ensure the principles, strategies and actions in tuart conservation and management plans are incorporated into bushfire fire prevention plans, and weed and pest management plans.* • *Integrate threat abatement plans for threatened species and threatened ecological communities, into tuart conservation and management plans.*
36. By 2010 a report to Government is completed on tuart conservation and management achievements and future directions.	• Update the status report for *Tuart Conservation and Protection* for the different tuart vegetation types including recommendations for improved conservation and management

OUTCOME 5: DEVELOPMENT PLANS

All plans and processes for developing land within tuart's natural range will take account of the need to conserve tuart and its ecosystems

AIM: Provide for tuart conservation in regional and local management plans	
37. Planning and Building Codes for urban development are amended to take account of tuart conservation by Q4 2008	• New structure plans for suburban development to be more site-responsive to both topography and existing vegetation. • Incorporate more site-sensitive codes and guidelines for the initial preparation of land, and the placement of infrastructure and buildings.

OUTCOME 6: INCENTIVES

Institutional arrangements will provide incentives[16] and support to landowners and land managers for the conservation and management of tuart and its ecosystems.

AIM: Improve existing incentive schemes for tuart conservation and management	
Targets	**Strategies**
38. By Q4 2005 identify the best means for ensuring income from tuart conservation and management incentives.	• Develop mechanisms to ensure dedicated budgets for the conservation and management of tuart woodlands. • *Undertake an audit of existing covenants and other incentives to assess whether measures to conserve and manage tuart have been implemented and funding has been spent effectively.*

AIM: Improve agency arrangements for tuart conservation and management	
Targets	**Strategies**
39. By Q3 2006 establish a 'one-stop-approach for Government agency information.	• Review agency arrangements so that proposals for tuart clearing are integrated with the delivery of information on tuart conservation and management, incentive schemes, education and extension services.
40. A conservation trust[17] is established for tuart woodlands by Q2 2005	• Establish a conservation trust that uses funds to covenant properties for conservation and management of tuart woodlands.

[16] These include:

- Restrictive covenants: The Transfer of Land Act(s. 129BA) may be used to restrict the clearing of land and can be entered into without requiring the transfer of land. A restrictive covenant is an agreement that restricts a landowner in the use or enjoyment of the landowner's land for the benefit of other land, or for the benefit of a public authority. They may apply to subdivision, development approval, soil and land conservation. CALM Conservation Covenants are designed to protect and enhance the nature conservation values of private land. National Trust Conservation Covenants are designed to protect and conserve the natural heritage values of land through a working partnership between the Trust and the owner.
- Grants to community groups and individuals: Grants for local vegetation conservation are within the power of local authorities.
- Rate rebates: Encourages the use of differential general rates to reduced rates payable on land held for conversation. Implement a rate rebate scheme, with land held for conversation exempt from, or charged a reduced level of rates.
- By-laws: Amend the *Local Government (miscellaneous Provisions) Act* (s202) to include the power to make by-laws for the protection of native vegetation on council owned and council managed land.
- Regional Local Government: Encourage the establishment of regional local government under the *Local Government Act* (s.3.61) to provide regional vegetation planning.
- Land stewardship payments: These aim to increase public benefits and services by providing adjustment assistance based on an analysis of whole property options and future prospects.

[17] Conservation trusts are community-based organisations established to raise funds through bequests and philanthropy. They buy land with conservation value, secure it under voluntary conservation agreements, and then sell it on to sympathetic owners.

OUTCOME 6: INCENTIVES

Institutional arrangements will provide incentives and support to landowners and land managers for the conservation and management of tuart and its ecosystems.

AIM: Develop new incentive schemes for tuart conservation and management	
Targets	**Strategies**
41. By Q1 2006 an 'incentives toolkit' for landholders is developed and implemented.	• Establish a threshold below which landholders meet land management obligations and above which landowners begin to provide public benefits and services. • Develop a tuart land stewardship payment scheme for tuart conservation and management on private land where public benefits and services are provides. • Pursue taxation reforms that reward tuart woodland conservation and management and encourages philanthropic support. • *Develop and implement an 'incentives toolkit' that provides a variety of mechanisms for increasing landholder motivation to conserve and manage tuart woodlands.* • *Introduce non-financial payments such as awards and accreditation systems* • *Work with local authorities to build on and progress options for council rebates and rate reductions.*

AIM: Develop markets for tuart conservation and management	
Targets	**Strategies**
42. The amount of corporate and private sector investment in tuart conservation and management grows by 5 per cent each year over the next decade.	• Establish commitments linked to incentive schemes for corporate and private sector investment in tuart conservation and management. • Investigate tradable clearing entitlements within the context of the 'no-net-loss' principles. • *Establish a target for private sector investment in tuart conservation and management.* • *Investigate, introduce and/or expand the system of 'carbon credits' for providing environmental benefits for tuart conservation and management.*

SECTION 3

I m p l e m e n t a t i o n

3.1 Coordination and making decisions

The implementation of the *Tuart Conservation and Management Strategy and Action Plan* will be the responsibility of a variety of Government and non-government organisations and individuals. The final details of the 'tuart strategy' will not be known until all community feedback is gathered and analysed. The Government and the community might decide for example, that some actions are more important than others and should be given higher priority. Coordination and making decisions will be consistent with the following criteria:

- **there will be a coordinated approach.** A 'coordination group' yet to be determined will be responsible for reviewing and reporting to the Minister for the Environment on whether the strategy has been effective in fulfilling the vision and reaching the designated targets for each outcome;

- **there will be a partnership approach.** This will require the participation of appropriate peak organisations, community groups, Natural Resource Management groups and other non-government organisations in collaboration with Government agencies to reach agreement on action plans;

- **there will be a comprehensive approach.** Because of the diversity of issues addressed in this strategy, a comprehensive approach will be required to ensure successful implementation. This is also necessary to ensure that actions have no negative or unintended effects and/or consequences;

- **there will be an integrated approach.** The successful implementation of this strategy will require integration with other planning and Natural Resource Management policies, strategies and plans; and

- **there will be continuous improvement.** The *Tuart Conservation and Management Strategy and Action Plan* is a dynamic document that will require ongoing monitoring, evaluation and improvement. Monitoring criteria and key performance indicators will need to be developed for this purpose.

3.2 Implementation approaches

Successful implementation of the *Tuart Conservation and Management Strategy and Action Plan* requires: (i) coordination mechanisms for, and (ii) Government agency and non-government organisation commitments to, funding and implementing tuart conservation and management programs. This draft strategy proposes a number of implementation approaches and invites discussions on an appropriate way forward.

Approach 1: Take the *Tuart Conservation and Management Strategy and Action Plan* to Cabinet for 'decision' that nominated agencies fund and implement actions within specified timeframes. This approach would require Government agency and non-government organisations to maintain their commitment to programs presently being funded, and to schedule and seek budget increases for unfunded programs.

Approach 2: Advisory groups such as the Natural Resource Management Council adopt the *Tuart Conservation and Management Strategy and Action Plan*. This approach would seek implementation through the polices, plans and strategies developed by Natural Resource Management groups covering the natural range of tuart woodlands.

Approach 3: Integrate the *Tuart Conservation and Management Strategy and Action Plan* into Government's 'Statements of Planning Policy' and Environmental Protection Policies. These key strategic planning instruments provide statutory and high level frameworks for the assessment and approval of conservation and development programs on the Swan Coastal Plain.

Approach 4: The Western Australian Planning Commission formally recognise the *Tuart Conservation and Management Strategy and Action Plan* as a key document in the development of statutory regional and town planning schemes and plans. This approach notes that land development involving clearing is a significant threat to the conservation of tuart remnants on the Swan Coastal Plain. It is also notes that the Western Australian Planning Commission consists of members representing local governments (metropolitan and country) the community and professions, regional development, and Chief Executives of infrastructure and environmental protection agencies. These members have a significant capacity to influence land use planning decisions affecting tuart conservation and management.

Approach 5: Provide for the development of incentive schemes for tuart conservation. This approach notes the success of the Government's *Bush Forever* programs. Others include the acquisition of high conservation areas through off-set and trade-off schemes with developers, creating awareness of no-net conservation (and consequence) losses through 'Statements of Planning Policy' and Environmental Protection Policies, and cost sharing though differential rating and covenants. This approach provides flexible levels of accountability based on the level of local threats.

3.3 Action Plan

A range of tuart conservation initiatives and programs are already underway (Appendix 6.8). The *Action Plan*, yet to be developed, will accompany the approved *Tuart Conservation and Management Strategy*. The implementation work described in the *Action Plan* will depend on the comments received following the public submission phase of the draft 'tuart strategy' and the comments and ideas received from the stakeholder and community workshops received in September 2002. The *Action Plan* will seek to identify responsible and support agencies, non-government organisations, existing and proposed funding commitments, and timelines and targets for completion of the designated implementation work.

Local authority tuart bush park in Scarborough. Photo: Robert Powell

SECTION 4

References

Beard, J. S. 1979a. *Vegetation Survey of Western Australia, 1 : 250 000 Series. The Vegetation of the Perth Area.* Vegmap Publications, Applecross.

Beard, J. S. 1979b. *Vegetation Survey of Western Australia, 1 : 250 000 Series. The Vegetation of the Pinjarra Area.* Vegmap Publications, Applecross.

Beard, J. S. 1979c. *Vegetation Survey of Western Australia, 1 : 250 000 Series. The Vegetation of the Moora and Hill River Areas. Vegmap Publications,* Applecross.

Beard, J.S. 1981. *Vegetation survey of Western Australia.* 1:1,000,000 Vegetation Services Explanatory Notes to Sheet 7 - The Vegetation of the Swan Area. University of Western Australia Press.

Beir, P. and Noss, R.F. (1998). *Do habitat corridors provide connectivity?* Conservation Biology **12** 1241-1252.

Bradshaw, F. J. (2000). *Recommendations for the regeneration and maintenance of Tuart forest in the Yalgorup National Park.* Consultants report to the Department of Conservation and Land Management. 21 pages.

Caddy, J and Vergez, J. (2001). *Citizens as partners: Information, consultation and public participation in policy making.* Report prepared fore the Organisation for Economic Development.

Chilcott, C. (1992) *Tuart (Eucalyptus gomphocephala DC.) decline in remnant bushland of the Kwinana area.* Honours Degree Thesis, Murdoch University, Western Australia. No. **29.**

Commonwealth of Australia (1999). *Australian Guidelines for Establishing the National Reserve System.* Environment Australia, Canberra. No. **38** Department of Conservation and Land

Conservation Commission (2004). *Forest Management Plan 2004 – 2013*. Conservation Commission of Western Australia.

CSIRO (2001). *Climate change projections for Australia.* Climate Impact Group. CSIRO Division of Atmospheric Research. Melbourne.

Dell, J., How, R. A. and Burbidge, A. H. (2002). *Vertebrate fauna of tuart woodlands*. In: Tuart (*Eucalyptus gomphocephla*) and tuart communities. Eds: B. J Keighery and V. M. Longman. A Perth Branch Wildflower Society of Western Australia (Inc.) publication.

Department of Conservation and Environment (1983). *Conservation reserves for Western Australia. The Darling System – System 6.* Parts 1 and 2, Report **13**.

Department of Conservation and Land Management (1978). *Ludlow Working Plan (1978-1985).*

Department of Conservation and Land Management (1989). *Yanchep National Park Management Plan 1989-1999. Management Plan No. **14.***

Department of Conservation and Land Management (1995). *Yalgorup National Park Management Plan 1995-2005. Management Plan No. **29**.*

Department of Conservation and Land Management (1998). *Leschenault Peninsula Management Plan 1998-2008. Management Plan No. **38.***

Department of Conservation and Land Management (2000). *Tuart decline at Lake Clifton and surrounds*. Briefing Note to the Environmental Protection Authority. March 2000.

Department of Conservation and Land Management (2003). *Yellagonga Regional Park Management Plan 2003-2013.*

Department of Environmental Protection (1996). *System 6 and Part System 1 Update Program Unpublished bushland plot and area records and analysis.*

Downes, S. J., Handasyde, K. A., and Elgar, M. A. (1997). *The use of corridors by mammals in fragmented Australian eucalypt forests.* Conservation Biology. **11(3)** 718-726.

Ecoscape (2004). *Tools for identifying 'indicative high conservation' tuart woodlands*. Report prepared for the Department of Conservation and Land Management on behalf of the Tuart Response Group.

Environmental Protection Authority (1976). *Conservation reserves for Western Australia Systems, 1,2 3 and 5.* Department of Conservation and Environment, Western Australia.

Environmental Protection Authority (1993). *Red Book Status Report on the implementation of Conservation Reserves for Western Australia - As recommended by the Environmental Protection Authority (1976 - 1984).* Environmental Protection Authority, Report 15. Perth, Western Australia.

Fahig, L. (1997). *Relative effects of habitat loss and fragmentation on popular extinction*. Journal of Wildlife Management **61(3)** 606-610

Fahrig, I. and Merriam, G. (1994). *Conservation of fragmented populations*. Conservation Biology **8(1)** 50-59.

Ford H. A. (1981). *Birds and eucalyptus dieback*. In: *Eucalypt dieback in forest and woodlands.* (Eds: G. A Old, G. A Kile and C. P Ohmart). CSIRO Melbourne.

Formam, R. T. T., and Gordon, M. (1986*). Landscape ecology.* Pub: John Wiley and Sons. New York.

Froend, R. (2002). *Characterisation of Tuart Woodland Hydrological Support Mechanisms and Predisposition to Decline: Future Research Directions.* Paper presented to the Tuart Response Group's *Tuart Science Workshop*. July 2002. Perth. Western Australia.

Gardner, C. A. (1923). *The forest formations of Western Australia. The tuart forest.* Australian Forestry Journal. **6(8)** 199-202

Gibson, N., Keighery, G. J., Burbidge, A. H. and Lyons, M.N. (1994). *A floristic survey of the southern Swan Coastal Plain.* Report of the Department of Conservation and Land Management and the Conservaiton Council of Western Australia.

Government of Western Australia (2000). *Bush Forever: Keeping the bush in the city. Volume 1: Policies, principles and processes.* Perth, Western Australia.

Government of Western Australia (2002). Status Report: *Tuart conservation and protection*. Prepared by the Department of Conservation and Land Management for the Tuart Response Group.

Government of Western Australia (2003). *A Tuart Atlas: Extent, density and condition of tuart woodlands on the Swan Coastal Plain*. Prepared by the Department of Conservation and Land Management for the Tuart Response Group.

Government of Western Australia (2003). *Hope for the Future: The Western Australia State Sustainability Strategy 2003*.
Heddle, E. M. ,Loneragan, O. W, and Havel, J. J. (1980). *Vegetation complexes of the Darling System Western Australia.* In "Atlas of natural resources Darling System Western Australia Explanatory Text". Department of Conservation and Environment Western Australia 1980.

Hobbs, R. J. and Huenneke, L. F. (1992). *Disturbance, diversity and diversity: implications for conservation.* Conservation Biology **6** 324-337

Hopkins, A, J. M., Coker, J., Beeston, G. R., Bowan, P., and Harvey, J. M., (1996). *Conservation status of vegetation types throughout Western Australia: Final Report.* Australian Nature Conservation Agency National Reserves System Co-operative Research Program. May 1996.

Indian Ocean Climate Initiative (2002). *Climate variability and change in south west Western Australia.* Perth. Western Australia.

Keighery, B.J., Keighery, G. J., and Shepherd, D. (2002). *The distribution and conservation of tuart and the communities in which it lives.* In: Tuart (*Eucalyptus gomphocephla*) and tuart communities. Eds: B. J Keighery and V. M. Longman. A Perth Branch Wildflower Society of Western Australia (Inc.) publication.

Lands and Forest Commission (1994). Forest Management Plan 1994 – 2003. Prepared by the Department of Conservation and Land Management.

Longman, V. M. and Keighery, B. J. (2002). *Tuart issues.* In: Tuart (*Eucalyptus gomphocephala*) and Tuart communities (Eds: B. J. Keighery & V. M. Longman), Perth Branch Wildflower Society of Western Australia, pp. 292-330.

Mitchell, D. S. (1999). *The decline of tuart at Lake Clifton/Yalgopup.* Unpublished report prepared by the Department of Conservation and Land Management.

McCaw. L. and Sneeuwjagt, R. J. (2002). *Altered fire regimes as a potential factor in decline of tuart forests and woodlands.* Paper presented to the Tuart Response Group's *Tuart Science Workshop*. July 2002. Perth. Western Australia.

Powell, R. and Emberson, J. (1996). *Growing locals: Gardening with local plants in Perth Western* Australian Naturalist' Club (Inc.), Perth Western Australia.

Powell, R. and Keighery, G. J. (2002). *Tuart in the landscape*. In: Tuart (Eucalyptus gomphocephala) and Tuart communities (Eds: B. J. Keighery & V. M. Longman), Perth Branch Wildflower Society of Western Australia, pp. 279-286.

Prober, S.M. and Thiele, K.R. (1995) *Conservation of grassy box woodlands: relative contributions of size and disturbance to floristic composition and diversity of remnants.* Australian Journal of Botany **43** 349-366.

Ruthrof, K. X., Yates, C.J., and Loneragan, W. A. (2002). *The biology of tuart*. In: Tuart (*Eucalyptus gomphocephala*) and Tuart communities (Eds: B. J. Keighery & V. M. Longman), Perth Branch Wildflower Society of Western Australia, pp. 108--122.

Saunders, D.A., Hobbs, R. A. and Margules, C.R. (1991). *Biological consequences of ecosystem fragmentation a review.* Conservation Biology **5(1)** 18-32.

Smith, F. G (1974). *Vegetation Map of Collie.* Western Australian Department of Agriculture, Perth.

Smith, F. G. (1973). *Vegetation Map of Busselton and Augusta. Western Australian* Department of Agriculture, Perth.

South West Catchments Council (2002). *South West Regional Strategy for Natural Resource Management.* Draft for State and Commonwealth Government accreditation.

Speck, N. H (1952.) *The ecology of the metropolitan sector of the Swan Coastal Plain*. Master of Science Thesis, University of Western Australia.

Speck, N. H. (1958). *The vegetation of the Darling-Irwin Botanical Districts and an investigation of the distribution patterns of the family Proteaceae, South Western Australia.* Doctor of Philosphy Thesis, University of Western Australia.

Stukely, M. (2002). *The role of pathogens in the decline of tuart.* Paper presented to the Tuart Response Group's *Tuart Science Workshop*. July 2002. Perth. Western Australia.

Swan Catchment Council (2004). *The Swan Region Strategy for Natural Resource Management.* Draft for public comment. April 2004.

Ward, D. (2000). *Trouble in the Tuart – a brief fire history.* Report to the Department of Conservation and Land Management. Available from the Forest Science Library, Kensington, Western Australia.

Wildflower Society (2002). *Tuart (Eucalyptus gomphocephala) and Tuart communities* (Eds: B. J. Keighery & V. M. Longman), Perth Branch Wildflower Society of Western Australia. Perth Branch of the Wildflower Society of Western Australia (Inc.)

Wills, A. (2002*). Insects and Tuart health: An outline of potential threats.* Paper presented to the Tuart Response Group's *Tuart Science Workshop*. July 2002. Perth. Western Australia.

SECTION 5

Definitions

Adaptive management: A process that requires conservation and management programs to be updated over time based on the dissemination of new information from research, monitoring and auditing.

Disturbance: Any range of conditions affecting the condition of a natural area. Disturbance may be natural (eg. wildfires) or human caused (eg. grazing).

Ecosystem: A community or an assemblage of communities of organisms, interacting with one another and the environment in which they live.

Environmental Management System: A framework for the systematic management of an organisation's environments obligations and targets to a given standard.

Fauna: The animals inhabiting an area, including mammals, birds, reptiles, amphibians and invertebrates. Restricted to animals occurring naturally and excludes feral or introduced animals.

Feral: An introduced or domestic animal now living in the wild.

Fire regime: The combination of season, intensity, interval, extent and patchiness of fire in a given area over a period of time.

Flora: the plant growing in as area, including flowering and non-flowering plants, ferns, mosses, lichens, algae and fungi. Restricted to plants occurring naturally and excludes weeds.

Floristic: Of or relating to flowers, a flora, or the phytogeographical study of plants.

Habitat: A component of an ecosystem providing food and shelter to a particular organism.

Hydrology: The study of water, its properties, distribution and utilisation on and below the earth's surface.

IUCN: Means International Union for the Conservation of Nature and Natural Resources (now World Conservation Union).

Landform: All the physical, recognisable, naturally formed features of land having a characteristic shape. Includes major forms such as a plain, mountain or plateau, and minor forms such as a hills, valleys or estuaries

Landscape: The visual elements of both the natural and the built environment and including landforms, vegetation, waterform, land-use and architecture.

Microclimate: The interaction of rainfall, temperature, and wind direction and speed at a local scale.

Monitoring: Regular assessment of a management program and the resources being managed, checking that desired outcomes are achieved, and adjusting the new plan where necessary.

Mycorrhizal fungi: Organisms on tree roots that promote mutually favourable conditions for tree growth (increases root surface area for improved absorption of water and nutrients) and fungal growth (receives carbohydrate assimilates from photosynthesis).

Natural Resource Management: The ecologically sustainable management of natural resources - soil, water, plants and animals - so as to maintain environmental health and conserve biodiversity, and provide productive benefits.

Precautionary principle: Concerned with decision-making where action should be taken to prevent damage even where there is no absolute certainty that damage will occur. It applies where there is a threat of serious or irreversible damage.

Recovery: The process of managing threatened species by simple protection and monitoring, through to controlling predators, grazers or competitors, through to more active measures including translocations or manipulation of habitat.

Rehabilitation: The process necessary to return disturbed land to a predetermined surface, vegetation cover, land use or productivity.

RFA: Means Regional Forest Agreement

Silviculture: The theory and practice of managing forest and woodland establishment, composition and growth to achieve a designated management objective.

Stand: A group of trees or patch of forest that can be distinguished from other groups on the basis of size, age, species composition, condition or other attribute

Structure: When applied to woodlands is the vertical and spatial distribution of the vegetation.

Threatening process: Those processes that may result in the long-term reduction of biodiversity. Examples include (i) predisposing factors such as climate variability, (ii) contributory factors such as altered fire regimes and changed hydrology, and (iii) inciting factors such as insect attack and invasion by pathogens.

Vegetation complex: A combination of distinct site vegetation types, usually associated with a particular geomorphic, climatic, floristic and vegetation structural association.

WALIS: Means Western Australian Land Information System.

Weed: A plant, often a self-sown exotic, growing where it is not wanted.

SECTION 6

A p p e n d i c e s

APPENDIX 6.1
TUART EXTENT BY LAND CATEGORY AND LOCAL GOVERNMENT AREA [19]

Local Government	NP[20]	NR[21]	CP[22]	Other Cons.[23]	SF[24]	UCL[25]	UMR[26]	Other Res.	F'hold	Total
	CALM managed lands (ha)							(ha)	(ha)	(ha)
Bunbury	0.0	0.0	0.0	0.0	0.0	57.8	5.1	33.8	170.6	267.3
Busselton	594.5	2.1	0.0	0.0	213.2	2.8	5.6	0.1	118.7	937.0
Cambridge	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.6	123.5	204.1
Capel	1331.6	0.0	0.0	0.0	311.2	0.6	27.8	37.7	2165.9	3874.8
Claremont	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cockburn	0.0	63.3	0.0	0.0	0.0	54.2	0.0	55.7	198.1	371.3
Dandaragan	0.0	10.6	0.0	0.0	0.0	0.0	0.0	2.4	25.4	38.4
Dardanup	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	50.0	50.7
Fremantle	0.0	0.0	0.0	0.0	0.0	0.0	0.3	45.5	6.1	51.9
Gingin	0.0	0.0	0.0	8.6	301.9	149.7	66.7	28.9	2640.7	3196.5
Harvey	225.0	23.2	84.3	0.0	1063.5	0.1	35.1	41.1	3148.1	4620.4
Joondalup	0.0	0.1	3.4	0.0	25.1	21.9	4.2	84.8	144.1	283.6
Kwinana	0.0	250.9	0.0	0.0	0.0	94.4	26.8	54.7	454.5	881.3
Mandurah	995.1	0.0	0.0	2.0	0.0	72.9	18.7	179.6	2526.5	3794.8
Melville	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Murray	0.0	190.9	0.0	0.0	0.0	0.3	2.0	0.0	1116.6	1309.8
Nedlands	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	28.3	28.5
Perth	0.0	0.0	0.0	0.0	0.0	0.0	23.8	0.0	0.0	23.8
Rockingham	0.0	0.0	0.0	0.0	0.2	4.0	64.7	60.1	2191.3	2320.3
South Perth	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0
Stirling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.1	19.4	43.5
Subiaco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vincent	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wanneroo	706.5	44.7	0.0	60.7	312.7	26.0	61.7	55.3	2091.0	3358.6
Waroona	1555.4	0.0	0.0	7.6	1094.3	74.8	1.9	66.9	1858.0	4658.9
Total (ha)	**5408.1**	**585.8**	**87.7**	**78.9**	**3322.1**	**559.7**	**344.4**	**852.0**	**19077.8**	**30316.5**
Total (%)	**17.8**	**1.9**	**0.4**	**0.3**	**11.0**	**1.8**	**1.1**	**2.8**	**62.9**	**100.0**

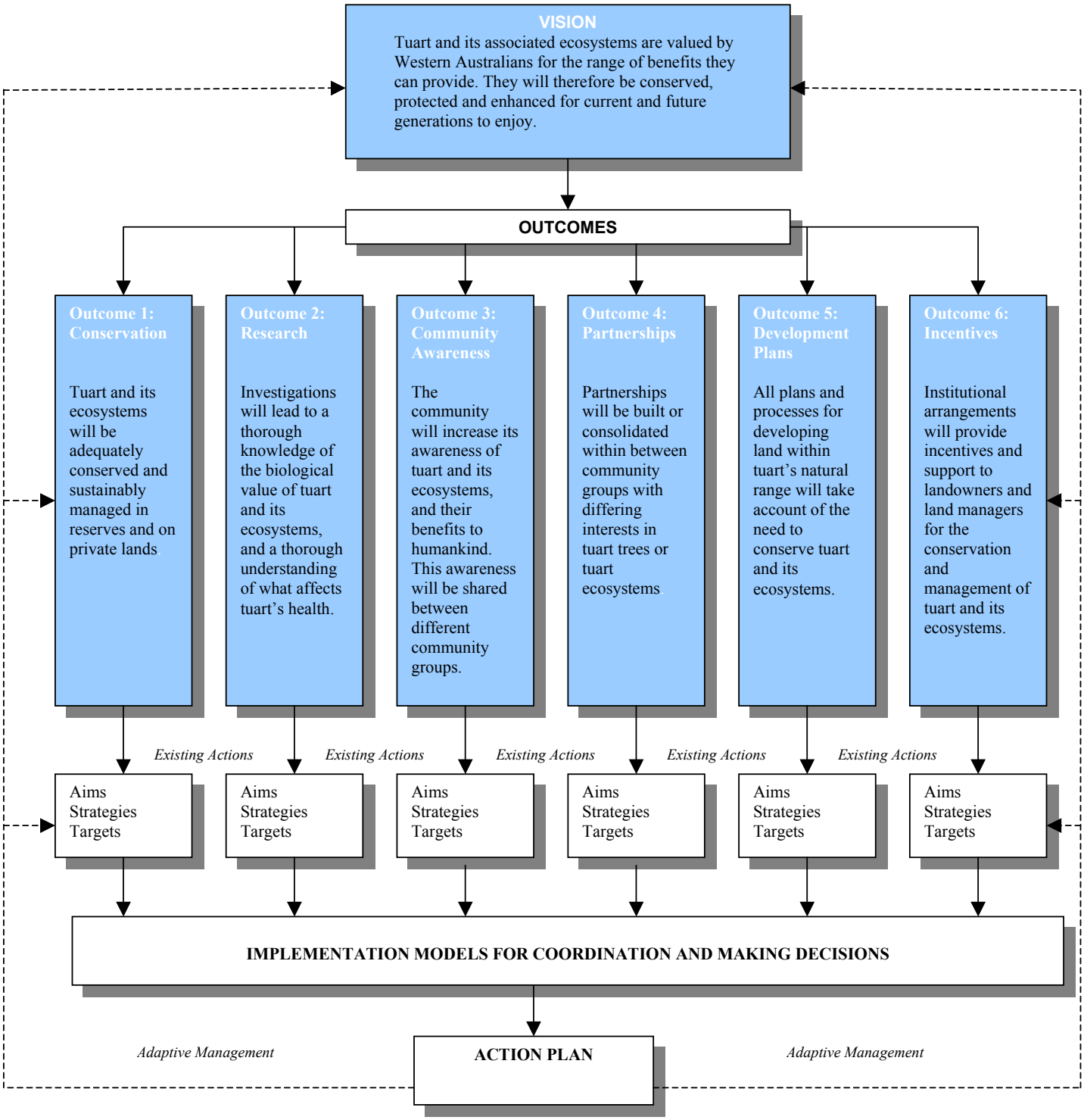
[19] Data sourced from the Atlas of *Tuart Woodlands on the Swan Coastal Plain (2003)*
[20] NP: National park
[21] NR: Nature reserve
[22] CP: Conservation park
[23] Other Cons: *CALM Act* s.5(1)(g) and s.5(1)(h) reserves
[24] SF: State forest, Executive Director private lands, miscellaneous reserves
[25] UCL: Unallocated Crown land
[26] UMR: Unmanaged reserve

APPENDIX 6.2
OTHER RELEVANT STRATEGIES, POLICIES AND PLANS

Policies, Plans and Programs	Agency	Status
Action Plan For Natural Resource Management 2002 - 2007	Peel-Harvey Catchment Council	Non-statutory (Draft)
Bush Forever	WA Planning Commission	Non-statutory
Clearing native vegetation	Environmental Protection Authority	Statutory (Draft)
Coastal and Lakelands Planning Strategy	WA Planning Commission	Non-statutory
Conservation of biodiversity legislation	Department of Conservation and Land Management	Statutory (Draft)
Statement of Planning Policy: Environment and natural resources policy	WA Planning Commission	Statutory (Draft)
Environmental Protection Plans	Environmental Protection Authority	Statutory
Greater Bunbury Region Scheme	WA Planning Commission	Statutory (in process)
Groundwater area management plans	Water and Rivers Commission	Statutory
Inner Peel Structure Plan	WA Planning Commission	Non-statutory
International Agreements (eg. RAMSAR)	Commonwealth of Australia	Statutory
Lake Clifton Policy	Environmental Protection Authority	Non-statutory
Metropolitan Region Scheme	WA Planning Commission	Statutory
Peel Bushland Plan		Draft
Statement of Planning Policy: Peel Harvey Coastal Plain Catchment Policy	WA Planning Commission	Non-statutory
Peel Region Scheme	WA Planning Commission	Statutory
Peel Sustainable Development Strategy	Peel Development Commission	Non-statutory
Public Drinking Water Source Policy	WA Planning Commission	Draft SPP[27]
Public drinking water source protection plans	Water and Rivers Commission	Statutory
Regional park management plans	Department of Conservation and Land Management	Statutory
Soil and land conservation	Department of Agriculture	Statutory
South West Regional Strategy for Natural Resource Management	South West Catchment Council	Non-statutory
Regional Development Schemes	Development Commissions	Non-statutory
State Planning Strategy	WA Planning Commission	Non-statutory
State Sustainability Strategy	Government of Western Australia	Non-Statutory
Town Planning and Development Act	All planning agencies (WA Planning Commission and Local Authorities)	Statutory
Town planning schemes	Specific local Governments	Statutory
Water resource allocation and protection plans	Water and Rivers Commission	Statutory

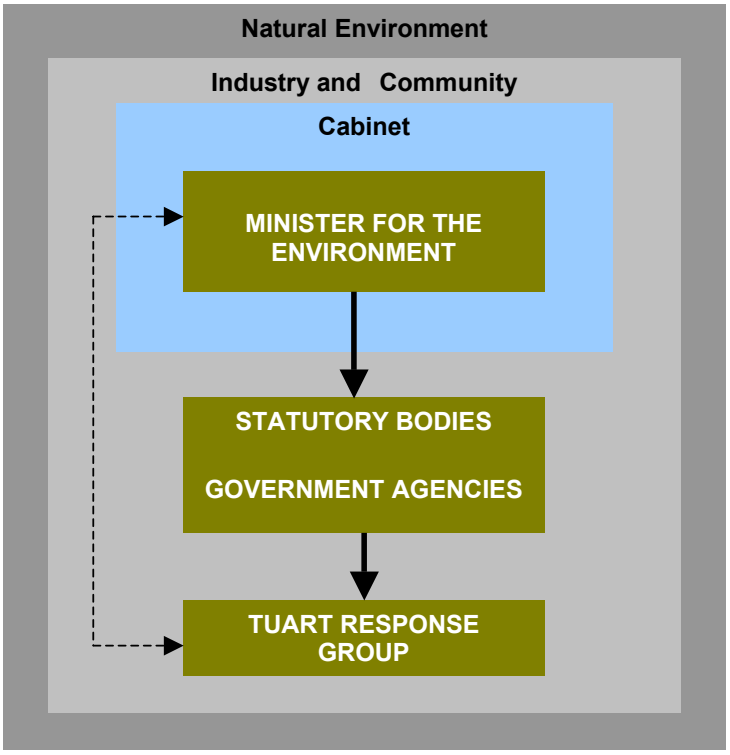
[27] Statement of Planning Policy

APPENDIX 6.3
STRUCTURE OF TUART CONSERVATION AND MANAGEMENT STRATEGY



APPENDIX 6.4
DECISION MAKING FRAMEWORK

Shows decision-making processes for the development and implementation of the *Tuart Conservation and Management Strategy and Action Plan*.



APPENDIX 6.5

TABLE OF 'INDICATIVE HIGH CONSERVATION' TUART WOODLANDS[28]

Soil System	Rainfall	Land Category				
		CALM-managed	Public	Private	Other	Total
	(mm)	(hectares)				
Abba	700 – 799	**5.9**	**0.0**	**0.3**	**0.0**	**6.2**
Bassendean	800 – 899	**156.9**	**55.0**	**34.9**	**4.5**	**251.3**
Moore River	600 – 699	**0.3**	**6.2**	**10.5**	**1.5**	**18.5**
	700 – 799	**0.0**	**2.1**	**31.4**	**1.4**	**35.0**
Pinjarra	800 – 899	**0.0**	**0.0**	**6.3**	**0.1**	**6.4**
Quindalup	500 – 599	**1.7**	**0.0**	**0.0**	**0.0**	**1.7**
	600 – 699	**0.0**	**10.4**	**25.4**	**27.9**	**63.7**
	700 – 799	**24.3**	**11.1**	**88.5**	**10.8**	**134.7**
	800 – 899	**27.2**	**33.7**	**155.0**	**3.1**	**219.1**
Spearwood	500 – 599	**3.4**	**0.00**	**0.0**	**0.0**	**3.4**
	600 – 699	**51.7**	**1.0**	**47.8**	**0.3**	**100.9**
	700 – 799	2,824.9	223.8	995.1	62.2	4,106.1
	800 – 899	3,680.4	163.2	1,461.5	100.6	5,405.7
	900 – 999	**77.1**	**0.0**	**59.2**	**3.4**	**139.7**
Vasse	800 – 899	**261.1**	**57.8**	**42.5**	**9.7**	**371.1**
Total		**7,114.9**	**564.4**	**2,959.5**	**225.5**	**10,864.3**

[28] The data was sourced from the report ' Tools for identifying indicative high conservation tuart woodlands' (Ecoscape 2004). It shows the areas of low visible disturbance understorey tuart woodlands intersected with soil systems, rainfall zones and land category. The areas **bolded and highlighted in grey tones** are tuart remnants: (i) occurring on uncommon soil systems and rainfall zones, that (ii) are likely to have unique vegetation communities and are therefore (iii) ranked as 'indicative high conservation' tuart woodlands.

APPENDIX 6.6
HISTORY OF CONSERVATION INITIATIVES ON THE SWAN COASTAL PLAIN

Appendix 6.1 shows that 9,483 hectares of tuart woodlands (31.3% of total remnant area) are vested in the Conservation Commission of Western Australia and managed by CALM. Of this amount 6,161 hectares (20.3% of total area) occurs in secured conservation reserves with the remainder occurring in State forest. A further 904 hectares (3.0% of total area) of tuart woodlands occur on unallocated Crown land and unmanaged reserves and are also managed by CALM.

The Forest Management Plan 2004 – 2013 (Conservation Commission 2004) has addressed, to the extent possible, the task of improving the conservation reserve system on the Swan Coastal Plain. When fully implemented the area of tuart woodlands in formal reserves (Map 1) will increase from 6,160 hectares to 8,690 hectares (28.7% of the total area[29]). The ability to further improve the representation of tuart in the formal conservation reserves through this mechanism is now limited as remaining tuart woodlands occur mainly on private land (19,078 hectares or 63% of total area) and outside the existing or proposed reserve system.

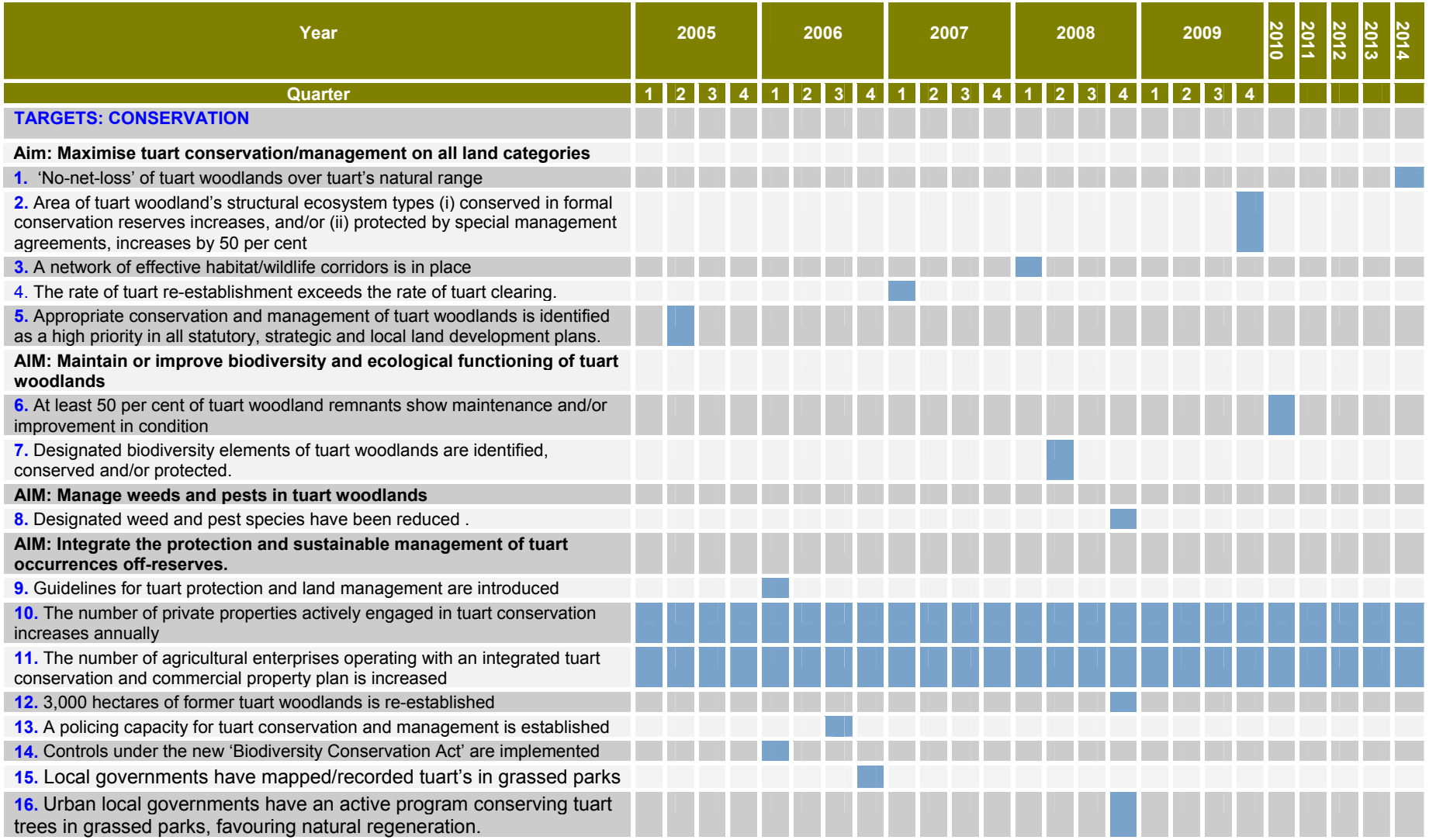
Establishing a comprehensive, representative and adequate reserve system on the Swan Coastal Plain has been addressed, in addition to CALM regional planning processes, through a number of programs and planning instruments. The Environmental Protection Authority initially identified suitable areas for reservation through the Conservation Through Reserves Committee Reports for System 1,2,3 and 5 (Environmental Protection Authority 1976) and System 6 (Department of Conservation and Environment 1983).

The Environmental Protection Authority (1993) began updating the 'system reports' for the Swan Coastal Plain. By 1996 the reserves program was 'exhausted' and re-focused again on the Perth Metropolitan Region. This resulted in *Bush Forever* (Map 1) which seeks to establish a conservation reserve system on the Swan Coastal Plain portion of the Perth Metropolitan Region that is, as far as is achievable, comprehensive adequate and representative (Western Government of Western Australia 2000).

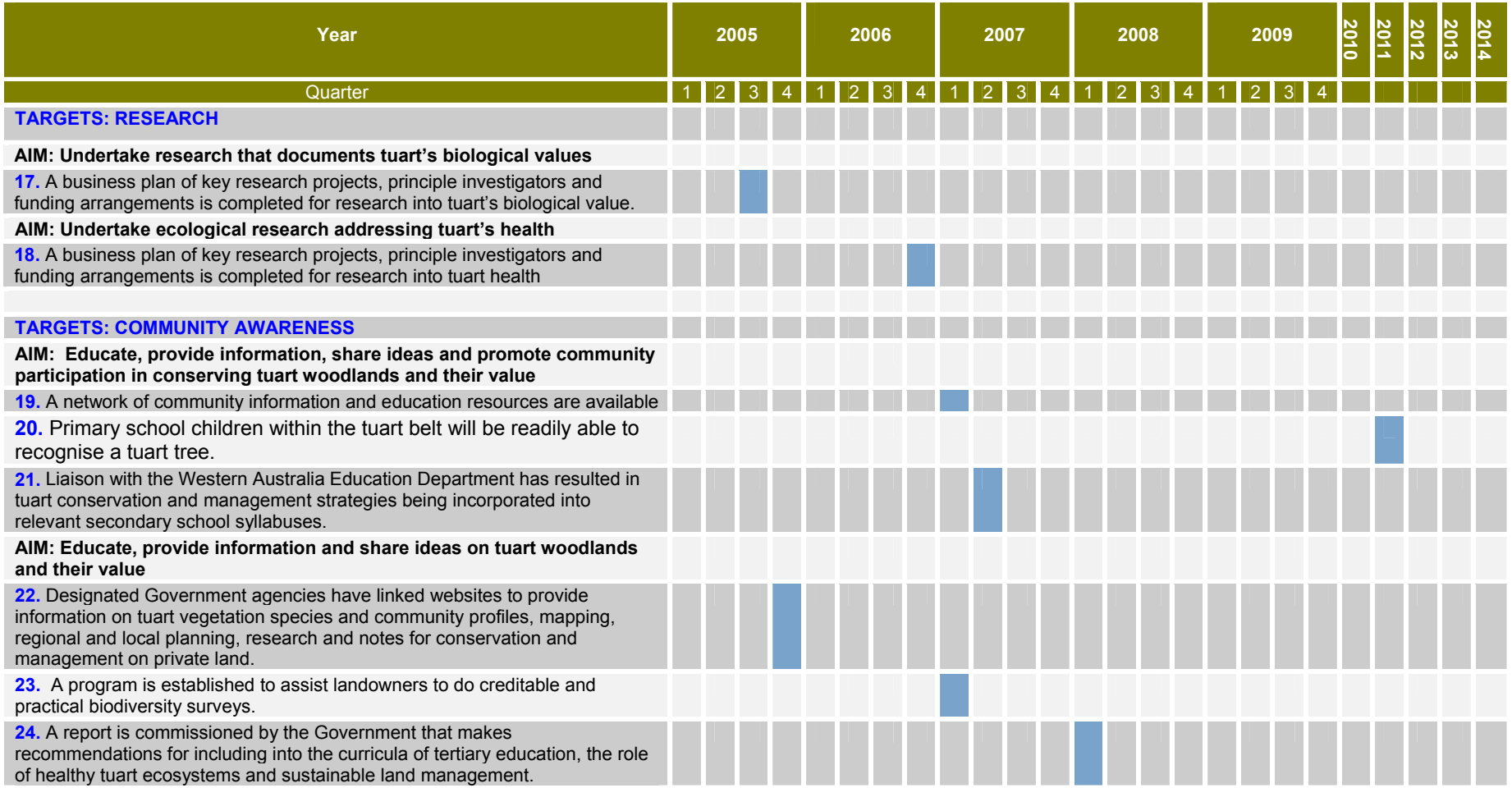
Bush Forever is a 10-year plan that seeks representation of at least 10 per cent of each of 26 vegetation complexes (Heddle *et al.* 1980) that occur within the Swan Coastal Plain portion of Perth metropolitan region. A number of criteria (eg. areas containing rare or threatened communities or species) have been used to select 287 *Bush Forever* sites to meet this aim. This equates to 51,200 hectares or almost 18 per cent of the 'metropolitan region'. Protection of identified areas is being sought through a range of options from purchase and reservation to negotiated planning solutions. Within metropolitan *Bush Forever* sites, 2,153 hectares of tuart woodlands - occurring outside existing and proposed additions to the CALM managed estate - is proposed for conservation and protection through these mechanisms.

[29] Additions are mostly State forest and IUCN Reserve categories I-IV

APPENDIX 6.7
INDICATIVE SCHEDULE FOR ACHIEVING TUART CONSERVATION AND MANAGEMENT TARGETS



APPENDIX 6.7
INDICATIVE SCHEDULE FOR ACHIEVING TUART CONSERVATION AND MANAGEMENT TARGETS



APPENDIX 6.7
INDICATIVE SCHEDULE FOR ACHIEVING TUART CONSERVATION AND MANAGEMENT TARGETS

Year	2005				2006				2007				2008				2009				2010	2011	2012	2013	2014
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4					
TARGETS: COMMUNITY AWARENESS																									
AIM: Collect tuart vegetation data and undertake tuart woodland mapping																									
25. Updated tuart woodland mapping is completed.																									
26. An update of vegetation complex mapping of the Swan Coastal Plain is completed.																									
27. Fine scale mapping of tuart woodlands is progressively available																									
28. CALM has implemented processes for updating information on integrated tuart conservation and management.																									
AIM: Monitor the land use impact on tuart woodlands																									
29. The Government publishes a report on the conservation and management status of tuart woodlands.																									
TARGETS: PARTNERSHIPS																									
AIM: Build supportive links for the conservation and management of tuart woodlands																									
30. Government coordinates community forums involving both rural and urban tuart woodlands.																									
AIM: Promote effective community involvement for tuart conservation and management																									
31. A process of land managers learning from land managers is established																									
AIM: Introduce tuart land stewardship																									
32. Community awareness and understanding of the value of tuart woodlands is improved as measured through surveys - benchmark survey completed.																									
33. An award system recognising innovative solutions for the conservation and management of tuart woodlands is established																									

APPENDIX 6.7
INDICATIVE SCHEDULE FOR ACHIEVING TUART CONSERVATION AND MANAGEMENT TARGETS

Year	2005				2006				2007				2008				2009				2010	2011	2012	2013	2014
Quarter	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4					
TARGETS: DEVELOPMENT PLANS																									
AIM: Refine planning initiatives for tuart conservation and management																									
34. A standard is developed for tuart woodland conservation and management relative to regional and local statutory planning processes			■																						
AIM: Provide for tuart conservation in regional/local management plans																									
35. Provision for the conservation and management of tuart woodlands is provided in Natural Resource Management strategies, CALM management plans, local authority plans and other statutory plans.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
36. A report to Government is completed on tuart conservation and management achievements and future directions.																					■				
37. Planning and building codes for urban development are amended to take account of tuart conservation.																■									
TARGETS: INCENTIVES																									
AIM: Improve existing incentive schemes for tuart conservation and management.																									
38. Identify the best means for ensuring on-going income from tuart conservation and management incentives.				■																					
AIM: Improve agency arrangements for tuart conservation and management																									
39. Establish a 'one- stop- approach for Government agency information.							■																		
40. A conservation trust is established for tuart woodlands		■																							
AIM: Develop new incentive schemes for tuart conservation and management																									
41. An 'incentives toolkit' for landholders is developed and implemented					■																				
AIM: Develop markets for tuart conservation and management																									
42. The amount of corporate and private sector investment in tuart conservation and management grows by 5 per cent each year over the next decade.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

APPENDIX 6.8
EXISTING INITIATIVES AND ACTIONS

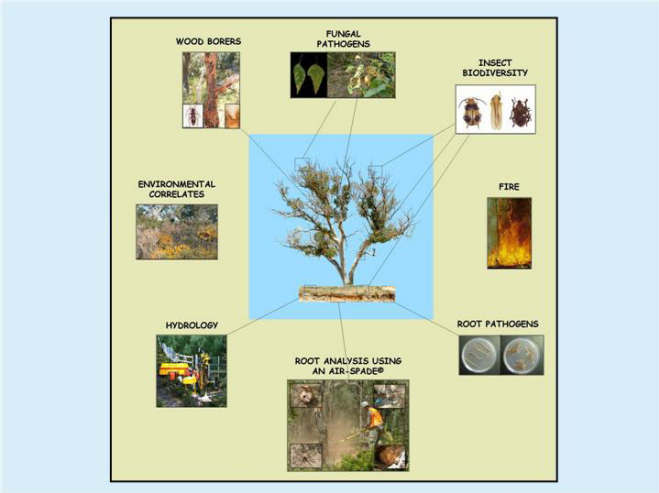
OUTCOME 1: CONSERVATION

Tuart and its ecosystems will be conserved and managed. Tuart trees and woodlands will be sustainably managed on private lands.

- Developed remote sensing techniques for evaluating and monitoring the extent and impact of tuart decline at Yalgorup.
- Developed the *Atlas of Tuart Woodlands on the Swan Coastal Plain* showing tuart occurrence, overstorey density and understorey condition.
- Prepared the report *"Tools for identifying Indicative High Conservation Assessment* for tuart woodlands from the 'tuart atlas'. Will be used to assess for: (i) new conservation reserves, (ii) to identify special protection needs on private lands, and (iii) to plan for appropriate wildlife corridors.
- Increased formal reservation of tuart woodlands by 2,530 hectares through the approval of the *Forest Management Plan 2004-1013.*

OUTCOME 2: RESEARCH

Investigations will lead to a thorough knowledge of the biological value of tuart and its ecosystems, and a thorough understanding of tuart's present decline in health



Graphic: Tuart ARC Steering Group

- Developed the *Tuart Vegetation System Health Model* to guide and target tuart decline investigations and to test research findings.
- Awarded a three year Australian Research Council Linkage grant to fund from July 2003, investigation into 'The possible cause(s) of the *Eucalyptus gomphecephala* decline epidemic in Western Australia'. Linkage partners are Murdoch University, Edith Cowan University, CALM, Alcoa World Alumina (Australia) and the City of Mandurah. Research includes eco-hydrology, eco-physiology, fire, competition, entomology and pathology.

OUTCOME 3: COMMUNITY AWARENESS

The community will increase its awareness of tuart and its ecosystems, and their benefits to humankind. This awareness will be shared between different community groups.

- Developed the brochure *Conserving Our Tuarts* and circulated it widely to stakeholders. Aimed to raise initial community awareness on tuart conservation and management issues.
- Prepared the Status Report *Tuart Conservation and Protection*. Aimed to provide information on tuart woodlands, protection issues and future conservation and management directions.
- Prepared and implemented a *Communications Plan for Tuart Conservation and Management*. Aimed to target community groups and stakeholders with ideas about tuart conservation and management.
- Conducted seven stakeholder and community workshops between Lancelin and Busselton to seek ideas on achieving the six *Tuart Conservation and Management Strategy* outcomes.
- Prepared an analysis of public tuart conservation comments and discussions derived from the stakeholder and community workshops (Appendix 6.9). Information will be used to assist the development of the *Tuart Conservation and Management Strategy*.
- Added tuart information to CALM's 'NatureBase' website.

APPENDIX 6.8
EXISTING INITIATIVES AND ACTIONS

OUTCOME 4: PARTNERSHIPS

Partnerships will be built or consolidated within and between community groups with differing interests in tuart trees and tuart ecosystems.

- Conducted the Tuart Science Workshop to consider priority areas for tuart health research. Involved Government agencies, research institutions, local government, companies and community groups. Summarised research findings in the Status Report for *Tuart Conservation and Protection*.
- Obtained external funding for tuart projects.
- Conducted tuart education workshops on hydrogeology, tuart vegetation ecosystems and communities, tuart decline, climate variability, tuart research framework, tuart in the landscape and planning for public involvement.

OUTCOME 5: DEVELOPMENT PLANS

All plans and processes for developing land within tuart's natural range will take account of the need to conserve tuart and its ecosystems.

- Briefed statutory authorities, local governments and Natural Resource Management groups on the need to consider tuart conservation and management in strategic plans and town and district town planning schemes.

OUTCOME 6: INCENTIVES

Institutional arrangements will provide incentives and support to land owners and land managers for the conservation and management of tuart trees and its ecosystems.

- Considered tuart protection incentive options for inclusion in the draft *Tuart Conservation and Management Strategy* at the stakeholder and community workshops.

APPENDIX 6.9
ANALYSIS OF 2002 WORKSHOP RESPONSES

In September and October 2002 the Tuart Response Group conducted seven stakeholder and community workshops at Yanchep, Lancelin, Bunbury, Busselton, Mandurah, Herdsman and Kensington. The workshops on 'Managing sustainable tuart ecosystems' sought ideas for achieving the six outcomes contained in this draft *Tuart Conservation and Management Strategy*. The summary results are shown below. They are an important checklist for ensuring relevant strategic topics are included in the draft strategy.

OUTCOME	RESULTS
Conservation	CAR reserves system
	On-going clearing
	Reserve management
	Specimen tree/zone conservation/register
	Future reserves/ fine scale mapping/'high conservation value' areas
	Protection of trees on private lands to complement reserves
	Regional Parks/Ocean to Preston River Regional Park
	Seed collection healthy trees
	No-net-loss principles
	Conserve 'rare' occurrences
	Education/awareness/skill/guidelines
	Fencing, weed control
	Lack of security and land tenure
	Legal authority for retaining, restoring and rehabilitating tuarts
	Sustainable units/sustainable management
	Management plans
	Variation in regulations/State and local governments
	No exotic plantings
	Fire regimes
	Understorey regeneration
	Tuart linkages with reserves
	Retain tuart in development areas
	Alternatives to limestone road-base
	Clumped/altered sub-division planning
	Commercial development
	Protection management of 'high conservation value' areas
Total	**29% of responses**
Research	Tuart decline/ industrial air pollution
	Management/regeneration/health
Total	**5% of responses**

APPENDIX 6.9
ANALYSIS OF 2002 WORKSHOP RESPONSES

OUTCOME	RESULTS
Community	Tuart/landform awareness and education
awareness	Education schools/businesses
	Newsletters/ Tuart book/poster/website
	Interpretive information in National Parks
	Preference for coastal living
	Decline in tuart health
	Field-days/open forums
	Understanding impacts and changes to tuart ecosystems
	Questionnaire private land use
	Tuart reputation
	Lack of space to grow
	Local media coverage
	Environmental care
	Cultural heritage
	Old Coast Road signage
	Information Centres
	Tuart festival, day, year of….
Total	**18% of responses**
Partnerships	Industry/companies/freehold partnerships
	Government – Commonwealth, State and Local
	Conservation/management models
	Monitoring/ reporting
	Land for Wildlife/volunteer work
	Funding/coordination/philanthropic
	Tuart Eco-tourism
	Government/equitable sharing/management costs
	Sympathetic development
	Agency communications
	Identify groups/ relationships
	Links with Natural Resource Management and landcare groups
Total	**19% of responses**

APPENDIX 6.9
ANALYSIS OF 2002 WORKSHOP RESPONSES

OUTCOME	RESULTS
Development	Education and awareness
Plans	Water extraction
	Planning and development processes
	Environmental assessments/protect dominant vegetation/outliers
	Integrated environmental planning/Natural Resource Management plans
	Industry levy/carbon credits related to climate change
	Regional strategies basis of local plans
	State response to tuart management
	Greater Bunbury Regional Scheme
	Legislation
	Threatened ecological communities
	Ministerial intervention
	Criteria for land use consistency
	Extension of Bush Forever
	Coastline management strategies
	High density housing plans
	Decision making at local government level
	Land use decisions in Metropolitan Region Scheme
	EPA guidelines
Total	**18% of responses**
Incentives	Compensation/incentives
	Bush Protection Officers/CALM extension service
	Recognise value of tuart ecosystems
	Legislation/landowner compliance
	Conservation covenants
	Reduced water rates
	Government assistance
	Increase land price of consolidated tuart areas
	Access Regional Improvement Fund
	Tuart and shrub species through local nurseries
Total	**11% of responses**

SECTION 7

Community Response Forms

PART A
The draft vision for the strategy is:

> *Tuart trees, ecosystems and associated vegetation are valued by Western Australians for the range of benefits they can provide. They will therefore be conserved, protected and enhanced for current and future generations to enjoy.*

Do you like this vision? Yes…. No…. **If no, how would you change it?**

PART B
DRAFT OUTCOMES

Draft Outcomes Tuart Conservation and Management Strategy	Please tick an appropriate box		
	Agree with the intent of the outcome	Agree with the intent of the outcome. Don't like some of the wording	Don't agree with the intent of the outcome
Conservation: Tuart and its ecosystems will be adequately conserved and sustainably managed in reserves and on private lands.			
Research: Investigations will lead to a thorough knowledge of the biological value of tuart, and its ecosystems, and a thorough understanding of what affects tuart health.			
Community Awareness: The community will increase its awareness of tuart and its ecosystems, and their benefits to humankind. This awareness will be shared between different community groups.			
Partnerships: Partnerships will be built or consolidated between community groups with differing interests in tuart trees or tuart ecosystems.			
Development Plans: All plans and processes for developing land within tuart's natural range will take account of the need to conserve tuart and its ecosystems.			
Incentives: Institutional arrangements will provide incentives and support to landowners and land managers for the conservation and management of tuart and its ecosystems.			

Are there other outcomes you would like included in the strategy?

……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……
……

PART C
AIMS

Draft Aims Tuart Conservation and Management Strategy	Please tick an appropriate box		
	Agree with the intent of the aim	Agree with the intent of the aim. Don't like some of the wording	Don't agree with the intent of the aim
Tuart Conservation			
Enhance conservation/management on all land categories			
Maintain or improve biodiversity and ecological functioning			
Manage weeds and pests			
Integrate the protection and sustainable management of tuart occurrences off-reserves			
Ensure that tuart trees in grassed parks are conserved			
Tuart Research			
Undertake research that documents tuart's biological values			
Undertake ecological research addressing tuart's health			
Tuart Community awareness			
Educate, provide information, share ideas and promote community participation in conserving tuart woodlands and their value			
Collect tuart vegetation data and undertake tuart woodland mapping			
Monitor the affect of land use on tuart woodlands			
Tuart Partnerships			
Build links			
Promote effective involvement			
Introduce land stewardship schemes			
Tuart Conservation in Development plans			
Refine planning initiatives			
Provide for tuart conservation in regional and local management plans			
Tuart Incentives			
Improve existing incentive schemes			
Improve agency arrangements			
Develop new incentive schemes			
Develop markets			

Are there other tuart aims you would like included in the strategy?

……
……...
……
……
……..

PART D
TARGETS

Are there any targets you disagree with?

Write the No. of the target you disagree with	I disagree with this target because: ……
eg. Target 13	More effort should be focused on community education and changing community attitudes.

What do you think are the top ten targets?

Priority	Target (Number and any comments)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

PART E
STRATEGY OPTIONS

Please make comments on any of the strategies you would like changed

Strategy	Comments

What do you think are the top ten strategies?

Strategy	Comments
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

PART E.
IMPLEMENTATION

The draft *Tuart Conservation and Management Strategy* proposes five approaches for achieving the targets and outcomes described in this plan (see Section 3 page 39).
What do you think is needed to ensure coordination mechanisms are in place so that the strategy is successfully implemented?

……
……
……
……
……
……
……
……
……
……

PART F
EVALUATION

For our evaluation purposes, could you please complete the following.
Which of the following best describes your interest in the conservation and management of tuart woodlands?

State Government

Local government

Natural Resource Management Group

Landowner

Aboriginal group

Research body

Business and industry

Coastal urban/town community

Service and infrastructure provider

Visitor

Other special interest group (Please specify)……..

PART G
YOUR CONTACTS

What is your post code? …….

Would you like to be added to our mailing list?

Name: ……...

Address:……

Town: ……..Postcode: …….

Please return to (no stamp required)

Drew Haswell
Department of Conservation and Land Management
Locked Bag 104
Bentley Delivery Centre, WA 6983

Local authority grassed tuart park in Scarborough. Photo: Robert Powell