Hawkesbury City Council

attachment 1
to
item 122

Cumberland Plain Recovery Plan

date of meeting: 8 June 2010
location: council chambers
time: 6:30 p.m.

***Draft* NSW and National Recovery Plan**

Cumberland Plain Recovery Plan

Draft for Public Comment
November 2009

Department of
Environment, Climate Change and Water NSW

Australian Government

Department of Environment, Climate Change and Water (NSW)
59-61 Goulburn Street
(PO Box A290)
Sydney South NSW 1232
Phone: (02) 9995 5000 (switchboard)
Phone: 131 555 (information & publications requests)
TTY: (02) 9211 4723
Fax: (02) 9995 5999
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

Requests for information or comments regarding the recovery program for the Cumberland Plain are best directed to:

Cumberland Plain Recovery Plan Coordinator
EPRG Metro Branch
Department of Environment, Climate Change and Water
PO Box 1967
Hurstville
NSW 2220

This plan should be cited as follows:

Department of Environment, Climate Change and Water (NSW) 2009 *Draft Recovery Plan for the Cumberland Plain*, Department of Environment, Climate Change and Water (NSW), Sydney.

ISBN 978 1 74232 439 5
DECCW 2009/646

Printed on recycled paper

Draft Cumberland Plain Recovery Plan

Foreword

Conservation of the rich biodiversity of the Cumberland Plain in western Sydney is one of the most challenging issues facing natural resource management in NSW. Extensive loss and fragmentation of vegetation has occurred, land values are high, and competing land uses are placing extraordinary pressures on the remaining areas of bushland in the region. This document constitutes a draft of the formal National and New South Wales Recovery Plan for a suite of threatened species, populations and ecological communities that occur on the Cumberland Plain in western Sydney. It identifies the actions to be taken to ensure their long-term viability and the parties who will undertake these actions.

The overall objective of the recovery plan is to provide for the long-term survival of the threatened biodiversity of the Cumberland Plain. To achieve this, the plan advocates for preferential investment in the protection and management of identified regional conservation priorities ('priority conservation lands'). These priority conservation lands represent the best remaining opportunities to secure long-term biodiversity benefits in the region for the lowest possible cost.

The specific recovery objectives are:

1. To build a protected area network, comprising public and private lands, focused on the identified priority conservation lands
2. To deliver best practice management to remnant bushland across the Cumberland Plain on public lands where the primary management objectives are compatible with biodiversity conservation
3. To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the recovery program
4. To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these threats in a strategic and effective manner.

Actions are identified for implementation by local, State and Australian Government authorities and are grouped under the following themes:

- Building the protected area network
- Delivering best practice management
- Promoting awareness, education and engagement
- Enhancing information, monitoring and enforcement.

This draft recovery plan will be on public exhibition for a period of six weeks and submissions from the public are welcome.

LISA CORBYN
Director General

Table of Contents

Figures

Tables

1 Introduction

Conservation of the rich biodiversity of the Cumberland Plain in western Sydney is one of the most challenging issues facing natural resource management in New South Wales (NSW). Extensive loss and fragmentation of vegetation has occurred, land values are high, and competing land uses are placing extraordinary pressures on the remaining areas of bushland in the region.

To complement the NSW State Plan, the Metropolitan Strategy for Sydney and the recent biodiversity certification of the North West and South West Growth Centres[1], a strategic plan is needed to guide investment in the recovery of the threatened biodiversity of western Sydney, and to inform future urban planning decisions.

By focusing on a group of threatened entities within a defined landscape or geographical area, the recovery plan will deliver a more coordinated and targeted recovery program than could be achieved through the implementation of a number of single species plans. This approach has also enabled regional conservation priorities to be clearly identified for the preferential investment of finite resources. It constitutes the State and National recovery plan for the threatened species, populations and ecological communities that are listed in Table 1.

Given the magnitude of the threats operating in the region, the successful implementation of the proposed recovery program will require a broad partnership, involving all levels of government (Commonwealth, State and local) and the community.

2 Study area and scope

The area covered by the recovery plan is the broad shale basin of the Cumberland Plain in western Sydney (Figure 1). The vegetation of the Cumberland Plain is diverse, reflecting variations in soil type, landform, and drainage, and differs markedly from that of the surrounding landscape. The Cumberland Plain covers all or part of the following local government areas.

- Auburn Council
- Bankstown City Council
- Blacktown City Council
- Camden Council
- Campbelltown City Council
- Canterbury City Council
- Fairfield City Council
- Hawkesbury City Council
- Holroyd City Council
- Hornsby Shire Council
- Hurstville Council
- Liverpool City Council
- Parramatta City Council
- Penrith City Council
- Strathfield Council
- The Hills Shire Council
- Wollondilly City Council

The recovery plan focuses on the threatened species, populations and ecological communities that are endemic to the Cumberland Plain or have the vast majority of their populations in the Cumberland Plain (Table 1). The following threatened ecological communities will not be specifically addressed in the recovery plan, as only a small proportion of their distribution occurs within the study area, or a recovery plan already exists:

- Blue Gum High Forest
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions
- Freshwater wetlands on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Swamp Oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Sydney Turpentine Ironbark Forest.

Elderslie Banksia Scrub Forest will also be excluded from consideration in this recovery plan as the future of the remaining area of this threatened ecological community has already been determined through the land-use planning system.

[1] For more information go to http://www.environment.nsw.gov.au/biocertification/notcert.htm

It should be noted that recovery strategies for the threatened entities that are not covered by this plan are contained in the Department of Environment, Climate Change and Water's (DECCW) Priorities Action Statement (PAS)[1].
In addition, all threatened and native biodiversity is protected by existing legislation, including application of the NSW *National Parks and Wildlife Act 1974*, *Environmental Planning and Assessment Act 1979* (EP&A Act), and the *Threatened Species Conservation Act 1995* (TSC Act), as well as the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Table 1. Threatened biodiversity addressed in this recovery plan

Flora Species	**TSC Act Status**	**EPBC Act Status**
Allocasuarina glareicola	Endangered	Endangered
Dillwynia tenuifolia	Vulnerable	Vulnerable
Grevillea juniperina subsp. *juniperina*	Vulnerable	-
Micromyrtus minutiflora	Endangered	Vulnerable
Pterostylis saxicola	Endangered	Endangered
Pultenaea parviflora	Endangered	Vulnerable
Fauna Species		
Cumberland land snail (*Meridolum corneovirens*)	Endangered	-
Populations		
Dillwynia tenuifolia population in the Baulkham Hills LGA	Endangered	-
Dillwynia tenuifolia population at Kemps Creek	Endangered	-
Marsdenia viridiflora R. Br subsp. *viridiflora* population in the Bankstown, Blacktown, Camden, Fairfield, Holroyd, Liverpool and Penrith LGAs	Endangered	-
Pomaderris prunifolia (a shrub) population in the Parramatta, Auburn, Strathfield and Bankstown LGAs	Endangered	-
Ecological communities		
Agnes Banks Woodland	Endangered	-
Castlereagh Swamp Woodland	Endangered	-
Cooks River/Castlereagh Ironbark Forest	Endangered	-
Cumberland Plain Woodland	Endangered	Endangered
Moist Shale Woodland	Endangered	-
Shale Gravel Transition Forest	Endangered	-
Shale Sandstone Transition Forest	Endangered	Endangered
River-flat Eucalypt Forest (previously Sydney Coastal River Flat Forest)	Endangered	-
Western Sydney Dry Rainforest	Endangered	-

Descriptive profiles for each of the threatened entities in Table 1 are available on the NSW Threatened Species website at http://www.threatenedspecies.environment.nsw.gov.au. Detailed descriptions of each of the threatened ecological communities are also provided in NPWS (2002a) and Tozer (2003).

Recovery actions identified within the recovery plan will also potentially benefit a number of other TSC Act and EPBC Act listed species such as the Swift Parrot (*Lathamus discolour*), Regent Honeyeater (*Anthochaera phyrgia*) and Green and Golden Bell Frog (*Litoria aurea*).

[1] http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/home_PAS_new.aspx

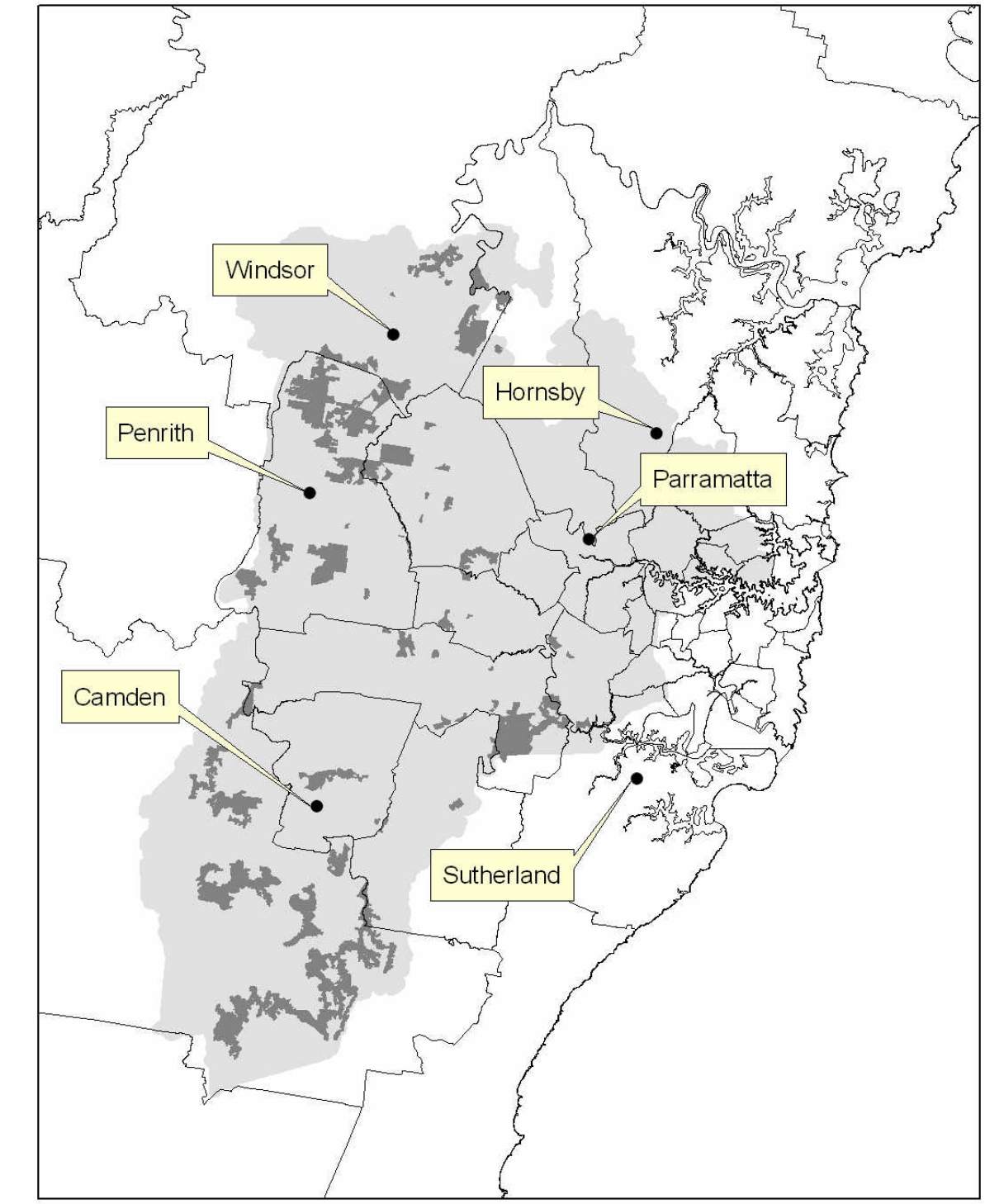

Figure 1: Cumberland Plain area and identified priority conservation lands

Legend

LGA Boundary
Priority Conservation Lands
Cumberland Plain

Figure 1. Cumberland Plain area and identified priority conservation lands

3 History of land use on the Cumberland Plain

The past – Aboriginal occupation and European settlement and land use

At the time of European settlement, the Cumberland Plain would have been immensely productive for Aboriginal people and would have supported abundant native fauna. Many hundreds of Aboriginal sites have been recorded across the Sydney region, indicating the significance of the whole landscape and its resources to Aboriginal people, in its material, social and spiritual dimensions.

Extensive grassy woodlands were present, as well as tall ironbark and turpentine forests, dry rainforests, and floodplain communities. Mammals such as echidnas, quolls, phascogales, bandicoots, koalas, possums and gliders, bettongs, wallabies and kangaroos would have all been common, along with emus and a vast array of woodland birds such as the Hooded Robin, Brown Treecreeper, Speckled Warbler and Diamond Firetail.

The gentle slopes and fertile soils of the region made it an early focus for agriculture following European settlement. Agricultural development was underway as early as 1792 and by the middle of the 19th century most of the region was either being grazed or was cultivated (DEC 2005). Clearing for agriculture was later supplemented by clearing for residential, commercial and industrial purposes.

The present – a legacy of past land-use pressures

Past and continuing land-use pressures have taken a major toll on the biodiversity of the Cumberland Plain. Only 13% of the pre-1750 extent of the region's vegetation remains as intact bushland, with an additional 12% occurring as scattered trees in disturbed areas (NPWS 2002b). Consequently, much of the region's biodiversity is listed as threatened under State and/or Commonwealth legislation.

The vast majority (76%) of the Cumberland Plain's remaining bushland is privately owned, and very little (7%) is protected within the formal reserve system (DEC 2005). The region's bushland is also highly fragmented, comprising 2,446 individual remnants (DECC 2008). Significantly, however, the 81 largest remnants (i.e. > 50 ha) contain 51% of the remaining bushland and many of these large, intact remnants occupy public land.

While some flora and fauna species will persist in small remnants with active management, evidence clearly suggests that larger remnants have a better prospect for long-term survival. Larger remnants are usually more diverse and resilient than smaller remnants, and are less susceptible to 'edge effects', catastrophic events, and the expected impacts of climate change. Contemporary research also suggests that biodiversity loss caused by habitat fragmentation significantly increases once clearing levels exceed 70% of the landscape (Freudenberger *et al.* 1997; WALGA 2004). This threshold has already been passed on the Cumberland Plain.

Clearing and fragmentation have had a profound effect on the fauna of the Cumberland Plain. Many mammal species declined to extinction in the decades after settlement. Today only the Eastern Grey Kangaroo, Common Brushtail Possum, Grey-headed Flying-fox and a number of microchiropteran bat species exist in any number in western Sydney.

Many bird species were relatively common until the 1950s when declines commenced. They persisted longer than many mammal species but finally collapsed across most of western Sydney in the 1970s and are no longer commonly seen. However, not all bird species were equally affected. Clearing and under-scrubbing have created suitable habitat for a number of large and aggressive native and introduced species including the Sulphur-crested Cockatoo, Australian Magpie and Noisy Miner. These species have all increased in western Sydney and now out-compete smaller woodland bird species in areas of fragmented vegetation.

While the general pattern has been one of fragmentation, habitat loss and species decline, some species, including threatened woodland birds such as the Brown Treecreeper and Hooded Robin have persisted in the larger, better connected remnants. These remnants are not dominated by large aggressive bird species

and retain the characteristic habitat requirements for woodland bird fauna. Similarly, a number of mammal species have been recorded from the larger connected remnants. The vulnerable Squirrel Glider was feared to be extinct in western Sydney but was found in the Castlereagh area, in the region's largest remaining patch of vegetation (DECC 2007). This and other species such as wombats, echidnas and the Common Wallaroo are not generally found in the smaller, degraded and isolated patches due to the severity of the threats operating, and the absence of opportunities to recolonise areas of remnant vegetation after fire or other disturbance events.

The consequences for flora have been similar, although not as dramatic. While many flora species are now at risk of extinction, populations have persisted in small and sometimes degraded remnants. There is evidence to support the view that small remnants remain important for flora species at least in the short to medium term (Tozer 2003). However, the future of small remnants must be considered in the context of increasing urbanisation and the expected impacts of climate change, which will place additional stresses on these remnants, further reducing their habitat value and viability.

Table 2 shows the current and pre-1750 extent of the threatened ecological communities that will be addressed in the recovery plan, and their current levels of formal protection. While some of these communities have fared slightly better than others, all have suffered a marked reduction in extent.

Table 2. Status of the threatened ecological communities addressed in the recovery plan

Name	Pre-1750 extent[2] (ha)	Current extent[3] (ha)	Current extent (% of pre-1750)	Area on NPWS estate (ha)	Current extent on NPWS estate (%)	Pre-1750 extent on NPWS estate (%)
Agnes Banks Woodland	627	184	29	39	21	6
Castlereagh Swamp Woodland	1,006	658	65	116	18	12
Cooks River/Castlereagh Ironbark Forest	12,211	1,419	12	337	24	3
Cumberland Plain Woodland	125,449	24,972	20	1,147	5	<1
Moist Shale Woodland	2,034	1,147	56	12	1	<1
River-flat Eucalypt Forest[4]	39,118	9,331	24	148	2	<1
Shale Gravel Transition Forest	5,427	2,963	55	232	8	4
Shale Sandstone Transition Forest	45,355	17,893	39	500	3	1
Western Sydney Dry Rainforest	1,282	570	44	2	<1	<1
TOTAL	**232,509**	**59,137**	**25**	**2,533**	**4**	**1**

Source: Tozer (2003), NPWS (2002b) and DECC (unpublished data)

Along with the loss of native vegetation, there has been significant loss of areas of Aboriginal cultural heritage significance. This includes many hundreds of archaeological sites. In spite of this, many areas of Aboriginal heritage value remain on the Cumberland Plain and there is often a clear overlap with areas of biodiversity conservation value. Many Aboriginal communities in western Sydney retain an interest in seeing the land and its biodiversity protected and managed.

The future – an enduring natural landscape amid urban development

There is no doubt that Sydney's natural environment is highly valued by the community. In the community forums that informed the preparation of the Metropolitan Strategy, people talked passionately about protecting Sydney's natural areas, and the natural environment was identified as Sydney's greatest

[2] Within the study area. Some communities extend beyond the study area and so have a greater total extent
[3] As mapped by NPWS (2002). Includes all condition classes except TXU (urban remnant trees)
[4] The figures given may include small areas of the Swamp Oak Floodplain Forest TEC

asset (Department of Planning 2005). In western Sydney, many community groups have been working over a long period of time to identify and protect the biodiversity values of the Cumberland Plain.

On average, Sydney now grows by about 780 people per week or around 40,000 people per year (Department of Planning 2005). The Cumberland Plain is absorbing much of this expansion and by 2019 will be home to 2.18 million people (i.e. an extra 510,000 people), increasing the region's share of the metropolitan population to 44% (WSROC 2005).

The Metropolitan Strategy provides the key directions for managing Sydney's population growth until 2030. The strategy emphasises the need to minimise the urban footprint and concentrate future growth in identified centres and corridors, thereby avoiding regionally and state-significant habitats. It contains environmental targets to 'maintain or improve regional biodiversity values across the region' and 'ensure 60–70% of future growth occurs within the existing urban footprint'[5]. It also requires that:

- land release be focused in the Growth Centres[6]; and
- specified 'sustainability criteria', including a 'maintain or improve' requirement for areas of regionally significant biodiversity, be applied to new land releases and new urban development outside the North West and South West Growth Centres[7].

The Metropolitan Strategy provides strong support for addressing biodiversity issues at the strategic planning stage, linking to recent reforms of threatened species legislation such as biodiversity certification and BioBanking.

The Growth Centres conservation fund, established by the biodiversity certification of the North West and South West Growth Centres, will provide $530 million over the next 30 years to secure the protection and management of high conservation bushland in western Sydney and surrounding areas. The fund has been established to offset the biodiversity impacts of the Growth Centres and must be invested in accordance with a biodiversity certification order[8]. The fund will be used to voluntarily purchase land for addition to the public reserve system and to establish perpetual conservation agreements, including BioBanking agreements, both within and outside the Growth Centres. Consequently, it provides an unprecedented opportunity to support recovery efforts in the region by securing the long-term future of some the most significant remaining bushland areas in western Sydney.

4 Threatening processes

The principal threat to the biodiversity of the Cumberland Plain is the further loss and fragmentation of habitat. Clearing for rural and residential developments, industry, and agricultural land uses has led to increasingly isolated small remnants which are more susceptible to degradation and provide less habitat values and support fewer species.

The plant communities of the Cumberland Plain are particularly vulnerable to weed invasion due to their grassy understorey, relatively fertile soils and past agricultural uses. Weeds such as African Olive (*Olea europea* subsp. *cuspidata*), African Lovegrass (*Eragrostis curvula*) and Bridal Veil Creeper (*Myrsiphyllum asparagoides*) have established themselves widely, displacing native plants and affecting the regeneration of the communities (Benson 1992).

Due to its urban setting, frequent fire due to arson is a major problem in the bushland remnants of western Sydney. This has resulted in a significant change to the bush, which has evolved over thousands of years to be dependant on a certain fire regime. Further information on fire regimes is contained in Appendix 3.

Urban run-off from impermeable surfaces such as roads and house blocks can escape drainage systems and end up in bushland. This water often carries high nutrient and sediment loads, which can encourage weed invasion in addition to the soil erosion caused by the run-off.

[5] E2.2 and E3.1 in Table 5 (Department of Planning 2005)
[6] E4.2 (Department of Planning 2005)
[7] E3.1 and E4.2c (Department of Planning 2005)
[8] Order to confer biodiversity certification on the State Environmental Planning Policy (Sydney Region Growth Centres) 2006, signed by the Minister Assisting the Minister for Climate Change, Environment and Water on 11 December 2007

Other threats include recreational impacts, grazing and mowing, altered hydrology, sedimentation, erosion, salinity and the expected impacts of climate change.

More detailed descriptions of all of these threats are provided in the best practice guidelines for recovering bushland on the Cumberland Plain (DEC 2005).

The actions proposed in this draft recovery plan are aimed at addressing these threats in a strategic and cost-effective manner.

5 The recovery strategy – constraints, principles and themes

Given the extent of existing disturbance and the ongoing land-use pressures on the Cumberland Plain, a tailored approach is required to achieve the long-term survival of the threatened biodiversity of the region.

The main constraints to the effective implementation of recovery efforts on the Cumberland Plain are:

- Limited funding and resources, which are significant
- Highly fragmented, and in many cases, poor condition vegetation
- Lack of active management, which may result in many bushland remnants degrading through weed invasion, inappropriate use and other 'edge effects'
- The high proportion of privately owned remaining bushland
- The largely voluntary participation of private landowners in the recovery program
- High land values
- The unavoidable impact of urban growth on some bushland remnants.

It is important that prioritisation and investment in the recovery program be guided by sound principles. These principles, based upon the best available ecological evidence, are that:

- The protection and management of large, intact remnants is more effective and efficient than for smaller, fragmented remnants
- Recovery efforts need to aim to ensure that a representative sample of biodiversity is conserved
- Active management to best practice standards is needed to prevent the degradation of bushland in a fragmented landscape
- Where impacts on biodiversity cannot be avoided, they should be offset using appropriate means.

This draft Cumberland Plain Recovery Plan seeks to focus recovery efforts on those lands which represent the best opportunities to secure viable, long-term conservation outcomes in the region. These lands, hereafter referred to as the priority conservation lands, have been identified by DECC (2008) and are described in the following section.

Following these principles, a suite of recovery actions are proposed for implementation by Commonwealth, State and local governments. The actions are grouped into the following themes:

- Building the protected area network
- Delivering best practice management
- Promoting awareness, education and engagement
- Enhancing information, monitoring and enforcement.

6 Priority conservation lands

An assessment has been undertaken using the best available information about biodiversity, its threats and proposed land use to identify the lands on the Cumberland Plain that can contribute most to the long-term maintenance and sustainability of threatened biodiversity (DECC 2008). The identified priority conservation lands (Figure 1) represent the best remaining opportunities in the region to maximise long-term biodiversity benefits for the lowest possible cost, including the least likelihood of restricting land

supply. DECCW considers these lands, which cover approximately 25,566 ha, to be the highest priority for future recovery efforts associated with the threatened biodiversity.

The assessment methodology used in the identification of these lands is described in *Report on the Methodology for Identifying Priority Conservation Lands* (DECC 2008). Consistent with the principles outlined in Section 5, considerations included size, shape, condition, and the landscape context of individual vegetation remnants, as well as the presence of threatened species. A minimum target to include 15% of the remaining area of each of the recovery plan's threatened ecological communities was also applied. This modest target is in recognition of the region's high land values, fragmentation levels and land-use pressures. Additional targets were applied for the inclusion of the recovery plan's threatened flora species and endangered populations. A total of 14,499 ha of the targeted threatened ecological communities are included in the priority conservation lands (Table 3).

Table 3. Area of threatened ecological communities in the priority conservation lands

Threatened Ecological Community (TEC)	Total extant area (ha)[9]	TEC in priority lands (ha)	% of extant TEC in priority lands
Agnes Banks Woodland	184	112	61
Castlereagh Swamp Woodland	658	566	86
Cooks River/Castlereagh Ironbark Forest	1,419	738	52
Cumberland Plain Woodland	24,972	5,471	22
Moist Shale Woodland	1,147	732	64
River-Flat Eucalypt Forest	9,331	1,562	17
Shale Gravel Transition Forest	2,963	1,138	38
Shale Sandstone Transition Forest	17,893	3,899	22
Western Sydney Dry Rainforest	570	281	49
Total	**59,137**	**14,499**	**25**

The priority conservation lands also contain 'other vegetation' and areas with no mapped vegetation. These vegetation types were included when they occurred at a site that was selected to meet a threatened flora target, or when they were part of a larger remnant that was selected to meet a threatened ecological community target. Also included were areas with no mapped vegetation. These include roads, rivers, and derived native grasslands[10].

Non-vegetated areas were also included if they were part of the existing DECCW estate (excluding Western Sydney Regional Park) or were needed to establish practical management boundaries.

The priority conservation lands contain a far broader suite of threatened and regionally significant species and ecological communities than those addressed in the recovery plan. These additional species include the vulnerable Squirrel Glider, declining woodland birds such as the Brown Treecreeper, Speckled Warbler, Hooded Robin, Black-chinned Honeyeater and Diamond Firetail, as well as threatened flora species with distributions that extend beyond the Cumberland Plain, or for which a recovery plan has already been prepared. Conservation activities focused on the priority conservation lands will therefore have greater biodiversity benefits than just for the threatened biodiversity addressed in the recovery plan.

The priority conservation lands are integrated with existing land-use planning strategies. The vast majority of these lands are identified in the Growth Centres Biodiversity Certification Order as being 'first preference' locations for actions, including land purchase and/or the establishment of conservation agreements, to offset the biodiversity impacts of the Growth Centres. The majority of the priority conservation lands are also mapped as Western Sydney Priority Areas or Regional Biodiversity Corridors in the Hawkesbury Nepean Catchment Action Plan (HNCMA 2006).

[9] As mapped by NPWS (2002b). Includes all condition classes except urban remnant trees (TXU)

[10] Derived native grasslands are grasslands that were once grassy woodlands where the tree or shrub cover has been removed.

The local government areas that contain identified priority conservation lands include:

- Bankstown City Council
- Camden Council
- Fairfield City Council
- Liverpool City Council
- The Hills Shire Council
- Blacktown City Council
- Campbelltown City Council
- Hawkesbury City Council
- Penrith City Council
- Wollondilly City Council

While the priority conservation lands are considered to represent the regional conservation priorities for the Cumberland Plain, it is recognised that areas of local conservation significance (such as council reserves) can complement and enhance these regional conservation priorities. Areas of local conservation significance will include buffers, corridors and ecological linkages for the priority conservation lands. The implementation of best practice management on these and other areas of local conservation significance will contribute to long-term viability of biodiversity.

About 58% of the identified priority conservation lands are privately owned, and these are primarily rural-zoned lands on Sydney's fringes (Table 4). Areas that are zoned for residential and industrial purposes were excluded from consideration in the assessment, as were areas that have been identified for future urban growth (i.e. the certified areas of the North West and South West Growth Centres).

Table 4. Summary statistics for the priority conservation lands

Tenure	**Estimated area (ha)**	**Percentage of total (%)**
Freehold	14,887	58
National Park	3,973	16
Australian Government	3,602	14
Crown (reserve, leased, licensed, other)	1,732	7
State Government (non-Crown)	1,130	4
Council	242	<1
Zoning		
Rural	11,715	46
Special Uses	4,627	18
National Park	3,474	14
Environmental Protection	2,333	9
Open Space	2,060	8
Subject to condition 12 of GCBCO*	1,089	4
Other**	268	<1
Total	**25,566**	

* Land marked with red hatching on the maps accompanying the Growth Centres Biodiversity Certification Order where the native vegetation will be retained pursuant to condition 12 of the order

** Includes rivers, roads and other unzoned areas, as well as proposed roads and lands reserved for other purposes, including open space

In identifying the priority conservation lands, the largest intact bushland remnants were targeted in the first instance. Many of these 'jewels in the crown' for conservation management are public landholdings. Key examples include the Department of Defence sites at Orchard Hills and Holsworthy, and the Air Services Australia site at Shanes Park.

It should be noted that the priority conservation lands mapping identifies lands with conservation values as priority locations for implementation of recovery actions. The mapping does not, in itself, imply or guarantee conservation outcomes. Such outcomes are dependent on the primary purpose of the land and the ability of land managers to implement recovery actions. As a result, the map cannot be static through time, but must be able to be reviewed and amended in response to the effects of existing or emerging threats, the development of more up-to-date mapping of vegetation extent and condition, or changes in legislative listing or definition of biodiversity. An action has been identified for DECCW that provides for the review of the methodology and the identified areas of priority conservation lands within 5 years.

7 Species-specific actions

The overall strategy of the recovery plan is to provide for the long-term survival of the threatened biodiversity of the Cumberland Plain, including the threatened species populations and ecological communities listed in Table 1. In addition to the list of actions under the four themes of the recovery strategy, species-specific actions have also been identified as necessary for the ongoing recovery of two plants, *Pterostylis saxicola* and the endangered population of *Pomaderris prunifolia*, following a targeted threatened flora survey in late 2007. These actions (5.1 through to 5.7) are required due to the very small number of known sites containing these species.

8 Previous recovery actions

Programs have been undertaken by a number of authorities, organisations and individuals over many years that have contributed significantly to the implementation of conservation actions for threatened biodiversity on the Cumberland Plain. Examples of these programs include:

- *Council projects and council reserves*: Local councils have developed management plans and carry out restoration and rehabilitation works in many council reserves containing fragments of EECs and threatened biodiversity. Similarly, many councils have developed education campaigns for specific EECs that occur in their council areas.
- *Cumberland Plain best practice management demonstration sites*: Four demonstration sites have been developed to provide land managers with practical on-ground examples of many of the restoration techniques outlined in the best practice management guidelines (DEC 2005), www.environment.nsw.gov.au/threatenedspecies/CumberlandPlainManagementGuidelines.htm.
- *Conservation Incentives Program:* A project involving, DECC, the Hawkesbury Nepean and Sydney Metropolitan Catchment Management Authorities (CMAs), targeted the on-ground implementation of priority actions for the Cumberland Plain EECs, threatened species and populations on private property (DECC 2009).
- *Threatened Species Demonstration Sites Project:* The Department of Environment and Climate Change and Sydney Metropolitan CMA developed the Threatened Species Demonstration Sites Project to provide guidance to community volunteers and land managers by demonstrating best practice management of threatened species and ecological communities. One of the sites dealt with protecting and restoring the Cumberland Plain Woodland community at Campbell Hill West Reserve, Chester Hill, http://www.environment.nsw.gov.au/resources/threatenedspecies/08639cumbplnwl.pdf.
- *Catchment Action Plans*: Targets and programs are in place in both the Hawkesbury Nepean and Sydney Metropolitan CMA Catchment Action Plans, which focus on a number of the issues affecting Cumberland Plain Woodland.
- *Greening Western Sydney:* Since 1992, the Department of Planning has been involved in Sydney's largest ongoing vegetation restoration project, *Greening Western Sydney*. In association with project partners Greening Australia, the project has seen 800,000 trees and shrubs established in Western Sydney, 700,000 of which are planted within the Western Sydney Parklands area, http://www.greeningaustralia.org.au/index.php?nodeId=86.

9 Proposed recovery objectives, actions and performance criteria

The overall objective of this recovery plan is to provide for the long-term survival and protection of the threatened biodiversity of the Cumberland Plain. The specific recovery objectives are:

1. To build a protected area network, comprising public and private lands, focused on the identified priority conservation lands
2. To deliver best practice management to remnant bushland across the Cumberland Plain on priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation
3. To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the proposed recovery program

4. To increase knowledge of the threats to the survival of the Cumberland Plain's threatened biodiversity, and thereby improve capacity to manage these in a strategic and effective manner.

Specific Recovery Objective 1: To build a protected area network, comprising public and private lands, focused on the identified priority conservation lands

Securing land to be actively managed for conservation purposes will underpin long-term recovery efforts on the Cumberland Plain. Actions under this objective seek to build a protected area network, focused on the identified priority conservation lands, that is viable and sustainable into the future.

A protected area network can include both public and private lands, provided that secure agreements are in place to achieve biodiversity conservation. The acquisition of land for the formal reserve system provides the highest level of security but can also involve high costs for purchase and ongoing management. In recognition of this, and the fact that not all landholders will be willing to enter perpetual agreements, the recovery plan will use a range of mechanisms to secure biodiversity outcomes within the priority lands (see Table 5).

The voluntary acquisition of private land and the establishment of conservation covenants will be driven by the investment of the Growth Centres Conservation Fund, in accordance with the biodiversity certification order. The recovery plan also establishes the priority lands as being 'first preference' locations for proponents seeking to offset other unavoidable biodiversity impacts in the region.

Table 5. Potential mechanisms for including land within the protected area network

Type of land	Conservation mechanism	
	Preferred	**Other**
Freehold	• Voluntary acquisition (reservation) • BioBanking agreements • Conservation covenants	• Voluntary acquisition (open space) • Environmental protection zoning with provisions for active management • Property vegetation plan under the Native Vegetation Act 2003 (Wollondilly LGA only)
Australian Government land	• Reservation • BioBanking agreements • Conservation covenants	• Environmental protection zoning with management provisions • Memorandum of Understanding
Local Government land	• BioBanking agreements • Conservation covenants	• Local open space classified as 'natural area' • Environmental protection zoning with management provisions • Joint Management Agreement • Memorandum of Understanding
Other public land	• BioBanking agreements • Conservation covenants • Crown reserves dedicated for environmental protection	• Environmental protection zoning with management provisions • Joint Management Agreement • Memorandum of Understanding

Future planning decisions concerning the scale and location of urban development in western Sydney, and the identification of environmental protection and open space areas, will influence the success of efforts to build the protected area network. The identification of the priority conservation lands in this recovery plan is intended to inform land-use planning decisions and to maximise conservation outcomes for threatened biodiversity. Specifically, it will assist strategic planners in determining:

- where planning protection measures can most effectively be applied to conserve the areas of greatest significance for threatened biodiversity in the region
- where corridors and other ecological linkages (such as stepping-stone reserves) can be protected and/or established in order to support these areas.

Recovery actions : Building the protected area network

Action 1.1 DECCW will negotiate with the relevant Australian Government authorities to seek the highest level of protection for priority conservation lands managed by the Australian Government, via options such as conservation agreements or the transfer of lands into the formal reserve system

Responsibility: DECCW

Action 1.2 DECCW will seek and encourage investment within the Cumberland Plain for the protection of the Cumberland Plain's threatened biodiversity, including via voluntary acquisition or conservation agreements, to be preferentially targeted to the priority conservation lands

Responsibility: DECCW

Action 1.3 DECCW will negotiate with other public authorities regarding the options for including the priority conservation lands that are under their care, control and management in the protected area network

Responsibility: DECCW

Action 1.4 Local councils will have regard to the priority conservation lands identified in the recovery plan in identifying areas for inclusion in environment protection and regional open space zones

Responsibility: Blacktown City Council, Camden Council, Campbelltown City Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Action 1.5 In circumstances where impacts on the Cumberland Plain's threatened biodiversity are unavoidable, as part of any consent, approval or license that is issued, ensure that offset measures are undertaken within the priority conservation lands where practicable

Responsibility: DECCW, Integral Energy, Sydney Water, Transgrid, Blacktown City Council, Camden Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Action 1.6 DECCW will review the identification methodology and identified areas of priority conservation lands within five years of the date of approval of the plan

Responsibility: DECCW

Key performance targets: Building the protected area network

Five years from the date of approval of the recovery plan:

Target 1.1 The area of the priority conservation lands that is the subject to conservation mechanisms (see Table 5) will have increased

Specific Recovery Objective 2: To deliver best practice management for threatened biodiversity across the study area, with a specific focus on the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation

Efforts to improve the extent and condition of native vegetation on the Cumberland Plain using assisted natural regeneration and revegetation techniques have been progressing for many years. These efforts have focused on individual sites, as well as identified local and regional corridors. Significant public funding has been invested in this work, as well as related programs including those identified in Section 8.

Actions under this objective seek to promote the adoption of best practice standards for bushland management (Appendix 2) on all tenures across the study area. However, particular emphasis is given to the priority conservation lands and public lands where the primary management objectives are compatible with biodiversity conservation.

These actions also seek to ensure that public funding for activities associated with the management of the region's threatened biodiversity is preferentially invested in the priority conservation lands. Having been identified as the 'regional priorities' for recovery efforts, it is appropriate that these lands be afforded the highest priority when allocating finite resources.

However, funding and the implementation of best practice management may not be limited to the priority conservation lands. The importance of efforts to improve the extent and condition of native vegetation outside these areas, or to establish corridors and other ecological linkages between these is also recognised. Such work will potentially provide a valuable complement to the priority conservation lands and assist in conserving biodiversity more generally.

Recovery actions : Delivering best practice management

Action 2.1 Preferentially target any future investment associated with the management of the Cumberland Plain's threatened biodiversity to the priority conservation lands where practicable

Responsibility: DECCW, Hawkesbury Nepean CMA, Sydney Metropolitan CMA, Blacktown City Council, Camden Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Action 2.2 Support and promote the adoption of best practice standards for bushland management and restoration (as specified in Appendix 2) on public and private lands within the Cumberland Plain

Responsibility: DECCW, Hawkesbury Nepean CMA, Sydney Metropolitan CMA, Blacktown City Council, Camden Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Action 2.3 State and Australian government agencies will manage, to best practice standards (as specified in Appendix 2), any lands which are under their ownership or for which they have care control and management, which:

- contain any of the threatened biodiversity addressed by the recovery plan
- are located within the identified priority conservation lands or, if located outside these lands, have primary management objectives that includes conservation

Responsibility: DECCW, Integral Energy, RailCorp, Sydney Water, Sydney Catchment Authority, Transgrid, University of Western Sydney, Western Sydney Parklands Trust

Action 2.4 Promote the inclusion of measures to protect and restore remnant vegetation, consistent with the best practice management guidelines, in the environmental management plans for schools in the study area

Responsibility: Department of Education and Training

Action 2.5 Local Government manage to best practice standards (as specified in Appendix 2) any lands which are under their ownership or for which they have care, control and management, which:

- contain any of the threatened biodiversity addressed by the recovery plan
- are located within the priority conservation lands, or if located outside these lands, have primary management objectives that are compatible with biodiversity conservation

Responsibility: Blacktown City Council, Camden Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Key performance targets: Delivering best practice management

From the date of approval of the recovery plan:

Target 2.1 Investment in conservation activities associated with the threatened biodiversity addressed in the recovery plan will be preferentially directed towards the priority conservation lands

Target 2.2 Relevant funding agreements and consent, approval and licence conditions include reference to the best practice bushland management standards endorsed in the recovery plan

Five years from the date of approval of the recovery plan:

Target 2.3 Public authorities endorsing the actions in this plan have adopted management plans or management approaches for the priority conservation lands consistent with the best practice standards for bushland management endorsed in the recovery plan

Target 2.4 Public authorities endorsing the actions in this plan have adopted management plans or management approaches consistent with best practice standards for bushland management endorsed in the recovery plan for lands outside the priority conservation lands that are under their care, control and management and for which conservation is compatible with the primary management objective

Specific Recovery Objective 3: To develop an understanding and enhanced awareness in the community of the Cumberland Plain's threatened biodiversity, the best practice standards for its management, and the proposed recovery program

Actions under this objective seek to improve the capacity of stakeholders to understand and effectively implement relevant parts of the recovery program. This will involve providing access to information, developing skills and knowledge, and providing support through advice, materials and funding.

DECCW will initiate communication with private landholders within the priority conservation lands who may be interested in voluntarily selling land or entering into perpetual conservation agreements. Other initiatives that will be developed or supported through the recovery program include:

- ongoing provision of information on threatened biodiversity through the DECCW website (e.g. recovery plans, species and threatened community profiles, management guidelines, vegetation maps etc.)
- guidance on urban stormwater management
- establishment and promotion of best practice demonstration sites, showcasing both rehabilitation projects and reference sites
- development of interpretive programs for key reserves
- promotion of key events in the implementation of the recovery plan.

DECCW will also work collaboratively with local government authorities to communicate the recovery plan's messages to local communities.

Recovery actions : Promoting awareness, education and engagement

Action 3.1 DECCW will review and update urban stormwater management guidelines, focusing on stormwater system designs that minimise impacts on sensitive receiving environments, such as remnant bushland

Responsibility: DECCW

Action 3.2 DECCW will provide access to information resources associated with the recovery program (such as the recovery plan, vegetation maps, best practice management guidelines, threatened species profiles) through the DECCW website

Responsibility: DECCW

Action 3.3 DECCW will initiate communication with private landholders within the priority conservation lands who may be interested in voluntarily selling land or entering into conservation agreements

Responsibility: DECCW

Action 3.4 Work collaboratively with local government authorities to inform communities about the value and role of remnant vegetation on the Cumberland Plain, the best practice standards for its management, and any opportunities to participate in the recovery program

Responsibility: DECCW, Blacktown City Council, Camden Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Action 3.5 Work with Aboriginal communities, landowners, community groups, and students to deliver best practice management in the priority conservation lands and other lands with conservation management outcomes, and to identify other opportunities for involvement in the recovery program

Responsibility: DECCW, Hawkesbury Nepean CMA, Sydney Metropolitan CMA, Blacktown City Council, Camden Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Action 3.6 Establish and promote best practice management demonstration sites for the Cumberland Plain's threatened biodiversity

Responsibility: DECCW, Hawkesbury Nepean CMA, Sydney Metropolitan CMA, Blacktown City Council, Camden Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Action 3.7 Develop interpretive programs for key local reserves that contain examples of the threatened biodiversity addressed in the recovery plan

Responsibility: DECCW, Blacktown City Council, Camden Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Key performance targets: Promoting awareness, education and engagement

Five years from the date of approval of the recovery plan:

Target 3.1 Urban stormwater management guidelines will have been promoted to key stakeholders in the region

Target 3.2 Key information resources associated with the recovery program will be accessible on the DECCW website

Target 3.3 A strategy for advising private landholders of the available voluntary options for protecting biodiversity on their land will be implemented

Target 3.4 Local government authorities will be implementing communication strategies associated with the recovery plan

Target 3.5 Demonstration sites for threatened biodiversity will be established and promoted

Specific Recovery Objective 4: To increase knowledge of the threats that are impacting on the recovery plan's threatened biodiversity, and improve our capacity to manage these in a strategic and effective manner

The biodiversity of the Cumberland Plain has been the focus of considerable research and survey effort. The existing information on the region's biodiversity, and particularly the regional native vegetation mapping, has served its purpose well by providing clear evidence of the extent of vegetation loss, the level of fragmentation, and by highlighting conservation significance. This information has had a major influence on decision-making processes and has provided a common basis for directing community action and on-ground restoration programs.

However, the data on which much of the original regional vegetation mapping was based are now ten years old. To remain relevant to future decision-making, this mapping needs to be reviewed and updated. In general, updates can largely be completed remotely with the use of contemporary, high quality aerial photography, although some site survey may be required, for example, at sites that were affected by fire during previous surveys or whose vegetation remains 'unclassified'.

Verification and updating of the regional vegetation maps is also needed to enhance monitoring, compliance and enforcement programs to tackle unauthorised land clearing and degradation activities.

DECCW will encourage and assist local government authorities to develop biodiversity strategies that are consistent with the priorities identified in the recovery plan. This would involve the identification and appropriate zoning of buffers, corridors and ecological linkages that would support the priority conservation lands and identification of other areas of local conservation significance.

The actions under this objective also promote research and monitoring priorities that are relevant to the management of the threatened biodiversity of the Cumberland Plain.

Recovery actions : Enhancing information, monitoring and enforcement

Action 4.1 Review the adequacy of the existing regional vegetation mapping, including information on the extent, condition and classification of the vegetation, to determine what requires updating and identify the gaps where further information is required

Responsibility: DECCW

Action 4.2 DECCW will seek resources to update the existing vegetation maps for the Cumberland Plain, and to provide for more regular ongoing monitoring and updates

Responsibility: DECCW

Action 4.3 Assess the potential role of emerging remote sensing technologies in the ongoing monitoring of the extent and condition of the study area's remnant vegetation

Responsibility: DECCW

Action 4.4 DECCW will encourage local councils to prepare or review biodiversity strategies to be consistent with the recovery plan and that guide protection, management and strategic investment in threatened biodiversity, both within and outside of the priority conservation lands

Responsibility: DECCW, Blacktown City Council, Camden Council, Campbelltown City Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Action 4.5 DECCW will work collaboratively with local councils to enhance the compliance and enforcement program with regard to the unauthorised clearing of bushland on the Cumberland Plain

Responsibility: DECCW, Blacktown City Council, Camden Council, Campbelltown City Council, Holroyd City Council, Strathfield Council, Wollondilly Shire Council

Action 4.6 DECCW will work with the Department of Planning to establish a statutory framework that enables DECCW to be notified when development activity under the EP&A Act occurs within and adjacent to priority conservation lands

Responsibility: DECCW, Department of Planning

Action 4.7 DECCW will support, promote and, where feasible, undertake research and monitoring that will assist future management decisions regarding the Cumberland Plain's threatened biodiversity, in accordance with the research priorities detailed in the recovery plan (Appendix 4)

Responsibility: DECCW

Key performance targets: Enhancing information, monitoring and enforcement

Five years from the date of approval of the recovery plan:

Target 4.1 The regional native vegetation mapping will have been updated using recent aerial photography

Target 4.2 The feasibility of using remote sensing technologies to regularly monitor the extent and condition of the region's remnant vegetation will have been assessed

Target 4.3 Local government authorities will be actively implementing biodiversity strategies which adopt an approach consistent with that of the recovery plan

Target 4.4 Enhanced compliance and enforcement programs will be established utilising updated vegetation mapping and remote sensing technologies where feasible

Target 4.5 Collaborative research and monitoring programs on the threatened biodiversity of the Cumberland Plain will be established to inform on-ground management decisions

Additional species-specific actions for the endangered population of *Pomaderris prunifolia* and *Pterostylis saxicola*

The overall strategy of the recovery plan is to provide for the long-term survival of the threatened biodiversity of the Cumberland Plain, including the threatened species populations and ecological communities listed in Table 1. In addition to the list of actions under the four themes of the recovery strategy, species-specific actions have also been identified as necessary for the ongoing recovery of two plants, *Pterostylis saxicola* and the endangered population of *Pomaderris prunifolia*, following a targeted threatened flora survey in late 2007. These actions are required due to site-specific threats and species-specific requirements and the low number of known sites for these species.

Recovery actions: Species-specific actions

Pomaderris prunifolia

Action 5.1 Using propagative material sourced from the Rydalmere site, seek to establish a viable self sustaining population of *Pomaderris prunifolia* in nearby habitat that is under secure tenure

Responsibility: Parramatta City Council

Action 5.2 Prepare a translocation plan for the *Pomaderris prunifolia* at the Rydalmere site to guide the implementation of these works and the long-term monitoring outcomes

Responsibility: Parramatta City Council

Action 5.3 Ensure that the Rydalmere *Pomaderris prunifolia* work is consistent with the *Guidelines for Translocation of Threatened Plants in Australia* (Vallee et al. 2004)

Responsibility: Parramatta City Council

Action 5.4 Implement an ecological burn at the Bankstown Crest Reserve site within 2 years of approval of the recovery plan to encourage seedling recruitment of this species

Responsibility: (endorsement still being sought)

Pterostylis saxicola

Action 5.5 Coordinate the implementation of monitoring program for *Pterostylis saxicola* in consultation with landholders to monitor population dynamics and response to management

Responsibility: DECCW

Action 5.6 Conduct additional targeted surveys for *Pterostylis saxicola* in Holsworthy and Wilton areas

Responsibility: DECCW

Action 5.7 Investigate flasking or seed banking of existing populations of *Pterostylis saxicola*

Responsibility: DECCW

10 Consideration of Aboriginal interests

With over 30,000 people, the greater Sydney region contains one of the largest Aboriginal populations in Australia (Attenbrow 2002). Land councils, which are significant landowners of native vegetation on the Cumberland Plain, represent the rights of these people. There are three Local Aboriginal Land Councils (LALC) with responsibility for areas in the Cumberland Plain: Deerubbin, Gandangara and Tharawal.

Local Aboriginal Land Councils and other groups representing Aboriginal people from the Cumberland Plain have been contacted during the writing of the draft plan, and consultation with these groups will be ongoing.

DECCW recognises that the LALCs may have social, cultural and economic interests for their lands that both compete and complement the biodiversity values. DECCW proposes to work closely with local aboriginal land councils to identify opportunities for multiple outcomes across these areas. Opportunities may exist through DECCW's *Land Alive* program to engage with land councils regarding biodiversity issues. *Land Alive* gives Aboriginal landowners a chance to create jobs and business opportunities, managing land for conservation through the BioBanking scheme[11].

11 Critical habitat

Critical habitat has not been declared for any of the threatened entities addressed by this recovery plan under the TSC Act. The declaration of critical habitat under the TSC Act is not considered to be a priority, as other measures will be implemented through the implementation of this plan that will seek to increase the security of the identified regional conservation priorities. For the purposes of the EPBC Act, the habitats critical to the survival of the entities addressed in this plan are identified as the Priority Conservation Lands (Figure 1).

12 Social and economic consequences of taking action

Implementation of the recovery plan will deliver a range of socioeconomic benefits including:

- the long-term survival of viable areas of conservation value for threatened biodiversity that are also the most cost effective for ongoing management
- the most effective and efficient use of available resources, ensuring that each available conservation dollar delivers the maximum investment return
- the delivery of ecological and human services, such as air and water quality, regulation of local climatic conditions, noise abatement, amenity and recreation
- meeting community expectations for the protection of biodiversity
- supporting provision of a safety-net for the biodiversity impacts of climate change
- streamlined planning processes and potential economic gains for private landowners protecting and managing biodiversity under new schemes such as BioBanking.

The recovery program has been designed to align with existing programs and commitments where possible. These include:

- The Growth Centres Conservation Fund which will drive actions to build the protected area network on the Cumberland Plain, consistent with the biodiversity certification order
- Land-use planning commitments under the Metropolitan Strategy and standard local planning practice requirements
- Current land-use zoning (i.e. avoiding areas that are zoned for urban development)
- Existing requirements for the preparation of management plans, either by State or local government authorities responsible for land management
- Existing programs to manage and control environmental weed and pest animal species
- Restoration and rehabilitation projects being delivered through the Hawkesbury–Nepean and Sydney Metropolitan CMAs, the Greening Western Sydney program, and local Landcare and Bushcare groups

[11] For more information visit the DECCW website at http://www.environment.nsw.gov.au/landalive/index.htm.

- Existing programs to establish best practice demonstration sites and develop educational and promotional material.

New or supplementary resources are required in some action areas, including:

- Verification and updating of the native vegetation maps of the Cumberland Plain and ongoing monitoring of the extent and condition of native vegetation
- The enhancement of compliance and enforcement programs targeting unauthorised clearing.

This draft recovery plan does not require that additional planning protections be placed over the priority conservation lands, as the socioeconomic implications of such a requirement have not been assessed. What the draft recovery plan does do, however, is inform land-use planning decisions by clearly identifying the priority conservation lands as being regional priorities for the conservation of threatened biodiversity. The socioeconomic implications of future rezoning or development proposals in the priority conservation lands will be addressed via the existing assessment processes of the *EP&A Act.*

Similarly, the actions in the Metropolitan Strategy provide clear direction regarding the NSW Government's commitment to the protection of Sydney's biodiversity values. The proposed recovery program directly reflects these commitments and in that context does not in itself generate any new socioeconomic impacts that have not already been contemplated by the NSW Government.

13 References

Attenbrow, V. (2002), *Sydney's Aboriginal Past.* UNSW Press, Sydney

Benson D.H. (1992), 'The natural vegetation of the Penrith 1:100,000 map sheet'. *Cunninghamia* **2**, 4:541-96

DEC (2005), *Recovering bushland on the Cumberland Plain: Best practice guidelines for the management and restoration of bushland*. NSW Department of Environment and Conservation, Sydney

DECC (2007) *Cumberland Plain Protected Areas Plan: An assessment of lands for future reservation and voluntary conservation activity on the shale plains of western Sydney*. Unpublished Report. Information& Assessment Section, Metro Region, Climate Change & Environment protection Group, Department of Environment and Climate Change, Hurstville

DECC (2008), *Report on the Methodology for Identifying Priority Conservation Lands on the Cumberland Plain.* Unpublished report prepared by the NSW Department of Environment and Climate Change, Hurstville

DECC (2009), *Conservation Incentives Program Final Report*. Unpublished report, Department of Environment and Climate Change, Hurstville

Department of Planning (2005), *Metropolitan Strategy for Sydney*. NSW Department of Planning, Sydney

Freudenberger, D., Noble, J. and Morton, S. (1997), *A Comprehensive, Adequate and Representative Reserve System for the Southern Mallee of NSW: Principles and Benchmarks.* A consultancy report prepared for the NSW Department of Land and Water Conservation and the Southern Mallee Regional Planning Committee

HNCMA (2006), *Hawkesbury–Nepean Catchment Action Plan*. Hawkesbury–Nepean Catchment Management Authority, Sydney

National Parks and Wildlife Service (2002a), *National Biodiversity Audit Biodiversity Strategy Case Study: Cumberland Plain Subregion, Sydney Basin Bioregion NSW. SB8: Cumberland*. Unpublished report prepared for the National Land and Water Resources Audit

National Parks and Wildlife Service (2002b), *The Native Vegetation of the Cumberland Plain*, Final Edition. NSW National Parks and Wildlife Service, Hurstville

Tozer, M (2003), 'The native vegetation of the Cumberland Plain, western Sydney: systematic classification and field identification of communities', *Cunninghamia* 8(1): 2003

Vallee, L, Hogbin, T, Monks, L, Makinson, B, Matthes, M & Rossetto, M (2004), *Guidelines for the*

Translocation of Threatened Plants in Australia, second edition, Australian Network for Plant Conservation, Canberra

WALGA (2004), *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region.* West Australian Local Government Association, Perth

Western Sydney Regional Organisation of Councils (2005), *FutureWest – Final report.* Sydney, WSROC

Appendix 1: Cost and implementation details

Action no	Action Title	*Priority	Cost Estimate ($'s/year)					Total Cost ($)	Funding sources	Responsible Party
			Year 1	Year 2	Year 3	Year 4	Year 5			
Building the protected area network										
1.1	DECCW will negotiate with the relevant Commonwealth authorities to seek the highest level of protection for priority conservation lands managed by the Commonwealth, via options such as conservation agreements or the transfer of lands into the formal reserve system	1	2,000	2,000	2,000	1,000	1,000	**7,000**	In kind	DECCW
1.2	DECCW will seek and encourage investment within the Cumberland Plain associated with the protection of the Cumberland Plain's threatened biodiversity, including via voluntary acquisition or conservation agreements, to be preferentially targeted to the priority conservation lands	2	2,000	2,000	2,000	2,000	2,000	**10,000**	In kind	DECCW
1.3	DECCW will negotiate with other public authorities regarding the options for including the priority conservation lands that are under their care, control and management in the protected area network	2	2,000	2,000	2,000	2,000	2,000	**10,000**	In kind	DECCW
1.4	Local councils will have regard to the priority conservation lands identified in the recovery plan in identifying areas for inclusion in environment protection and regional open space zones	2	#	#	#	#	#	#	In kind	BlCC, CC, CCC. HolCC, SC, WSC
1.5	In circumstances where impacts on the Cumberland Plain's threatened biodiversity are unavoidable, as part of any consent, approval or license that is issued, ensure that offset measures are undertaken within the priority conservation lands where practicable	1	#	#	#	#	#	#	Unsecured	DECCW, IE, RailCorp, SW, Transgrid, BlCC, CC, HolCC, SC, WSC
1.6	DECCW will review the identification methodology and identified areas of priority conservation lands within five years of the date of approval of the plan	3	#	#	#	1,000	2,000	**3,000**	Unsecured	DECCW
Delivering best practice management										
2.1	Preferentially target any future investment associated with the management of the Cumberland Plain's threatened biodiversity to the priority conservation land where practicable	1	*	*	*	*	*	*	Unsecured	DECCW, HNCMA, SMCMA, BlCC, CC, HolCC, SC, WSC
2.2	Support and promote the adoption of best practice standards for bushland management and restoration on public and private lands within the Cumberland Plain (as specified in Appendix 2)	2	*	*	*	*	*	*	Unsecured	DECCW, HNCMA, SMCMA, BlCC, CC, HolCC, SC, WSC
2.3	State and Australian government agencies will manage, to best practice standards (as specified in Appendix 2), any lands which are under their ownership or for which they have care, control and management and: - contain any of the threatened biodiversity addressed by the recovery plan - are located within the identified priority conservation lands or, if located outside these lands, have primary management objectives that are compatible with biodiversity conservation	1	*	*	*	*	*	*	Unsecured	DECCW, DoP, DPI, IE, RailCorp, SCA SW ,Transgrid, UWS, Western Sydney Parklands Trust
2.4	Promote the inclusion of measures to protect and restore remnant vegetation, consistent with the best practice management guidelines in the environmental management plans for schools in the study area	3	*	*	*	*	*	*	Unsecured	DET

Action no	Action Title	*Priority	Cost Estimate ($'s/year)					Total Cost ($)	Funding sources	Responsible Party
			Year 1	Year 2	Year 3	Year 4	Year 5			
2.5	Local Government manage to best practice standards (as specified in Appendix 2), any lands which are under their ownership or for which they have care control and management and: - contain any of the threatened biodiversity addressed by the recovery plan - are located within the priority conservation lands, or if located outside these lands, have primary management objectives that are compatible with biodiversity conservation	1	*	*	*	*	*	*	Unsecured	BlCC, CC, HolCC, SC, WSC
Promoting awareness, education and engagement										
3.1	DECCW will review and update urban stormwater management guidelines, focusing on stormwater system designs that minimise impacts on sensitive receiving environments, such as remnant bushland	2	2,000	2,000	1,000	1,000	1,000	**7,000**	In kind	DECCW
3.2	DECCW will provide access to information resources associated with the recovery program (such as the recovery plan, vegetation maps, best practice guidelines, threatened species profiles) through the DECCW website	2	#	#	#	#	#	#	In kind	DECCW
3.3	DECCW will initiate communication with private landholders within the priority conservation lands who may be interested in voluntarily selling land or entering into conservation agreements	2	#	#	#	#	#	#	In kind	DECCW
3.4	Work collaboratively with local government authorities to inform communities about the value and role of remnant vegetation on the Cumberland Plain, the best practice standards for its management, and any opportunities to participate in the recovery program	2	#	#	#	#	#	#	In kind	DECCW, BlCC, CC, HolCC, SC, WSC
3.5	Work with Aboriginal communities, landowners, community groups, and students to deliver best practice management in the priority conservation lands, and to identify other opportunities for involvement in the recovery program	2	*	*	*	*	*	*	Unsecured	DECCW, HNCMA, SMCMA, BlCC, CC, HolCC, SC, WSC
3.6	Establish and promote best practice demonstration sites for the recovery plan's threatened biodiversity	2	30,000	30,000	30,000	10,000	10,000	**110,000**	Unsecured	DECCW, HNCMA, SMCMA, BlCC, CC, HolCC, SC, WSC
3.7	Develop interpretive programs for key local reserves that contain examples of the threatened biodiversity addressed in the recovery plan	2	3,000	3,000	3,000	3,000	3,000	**15,000**	Unsecured	DECCW, BlCC, CC,CCC, HolCC, SC, WSC
Enhancing information, monitoring and enforcement										
4.1	Review the adequacy of the existing regional vegetation mapping, including information on the extent, condition and classification of the vegetation, to determine what requires updating and identify the gaps where further information is required	2	#	#	#	#	#	#	In kind	DECCW
4.2	DECCW will seek resources to update the existing vegetation maps for the Cumberland Plain, and to provide for more regular ongoing monitoring and updating	3	*	*	*	*	*	*	Unsecured	DECCW

Action no	Action Title	*Priority	Cost Estimate ($'s/year)					Total Cost ($)	Funding sources	Responsible Party
			Year 1	Year 2	Year 3	Year 4	Year 5			
4.3	Assess the potential role of emerging remote sensing technologies such as LIDAR in the ongoing monitoring of the extent and condition of the study area's remnant vegetation	3	#	#	#	#	#	#	In kind	DECCW
4.4	DECCW will encourage local councils to prep are or review biodiversity strategies to be consistent with the recovery plan and that guide protection, management and strategic investment in threatened biodiversity, both within and outside of the priority conservation lands	1	*	*	*	*	*	*	Unsecured	DECCW, BlCC, CC, CCC, HolCC, SC, WSC
4.5	DECCW will work collaboratively with local councils to enhance the compliance and enforcement program with regard to the unauthorised clearing of bushland on the Cumberland Plain.	2	*	*	*	*	*	*	Unsecured	DECCW, BlCC, CC, HolCC, SC, WSC
4.6	DECCW will work with the Department of Planning to establish a statutory framework that enables DECCW to be notified when development activity under the EP&A Act occurs within and adjacent to priority conservation lands	1	#	#	#	#	#	#	In kind	DECCW, DoP
4.7	DECCW will support, promote and, where feasible, undertake research and monitoring that will assist future management decisions regarding the recovery plan's threatened biodiversity, in accordance with the research and monitoring priorities detailed in the recovery plan	3	*	*	*	*	*	*	Unsecured	DECCW
Additional species-specific actions are proposed for *Pomaderris prunifolia* and *Pterostylis saxicola*										
Pomaderris prunifolia										
5.1	Using propagative material sourced from the Rydalmere site, seek to establish a viable self sustaining population of *Pomaderris prunifolia* in nearby habitat that is under secure tenure	2	*	*	*	*	*	*	Unsecured	ParraCC
5.2	Prepare a translocation plan for *Pomaderris prunifolia* at the Rydalmere site to guide the implementation of these works and the long term monitoring outcomes	2	2,000	2,000	2,000	2,000	2,000	**10,000**	Unsecured	ParraCC
5.3	Ensure that the Rydalmere *Pomaderris prunifolia* translocation work is consistent with the *Guidelines for Translocation of Threatened Plants in Australia* (Vallee et al. 2004).	2	*	*	*	*	*	*	Unsecured	ParraCC
5.4	Implement an ecological burn at the Bankstown Crest Reserve site within 2 years of approval of the Recovery Plan to encourage seedling recruitment of this species.	2	*	*	*	*	*	*	Unsecured	
Pterostylis saxicola										
5.5	Coordinate the implementation of a monitoring program for this species in consultation with landholders to monitor population dynamics and response to management	3	4,000	4,000	4,000	4,000	4,000	**4,000**	Unsecured	DECCW
5.6	Conduct additional targeted surveys for *Pterostylis saxicola* in Holsworthy and Wilton area	3	4,000	4,000	4,000	4,000	4,000	**4,000**	Unsecured	DECCW
5.5	Coordinate the implementation of a monitoring program for this species in consultation with landholders to monitor population dynamics and response to management	3	4,000	4,000	4,000	4,000	4,000	**4,000**	Unsecured	DECCW
5.7	Investigate flasking or seed banking of existing populations of *Pterostylis saxicola*	3	4,000	4,000	4,000	4,000	4,000	**4,000**	Unsecured	DECCW

* Priority ratings are: 1 - action critical to meeting plan objectives, 2 - action contributing to meeting plan objectives, 3 - desirable but not essential action
# 'In-Kind' Funds represent salary component of permanent staff and current resources
^ 'Cash' Funds represent the salary component for temporary staff and other costs such as the purchasing of survey and laboratory equipment

Abbreviations: DCS: Dept. of Correctives Services; DECCW: Department of Environment, Climate Change and Water; DET: Dept. of Education and Training; DoL: Department of Lands; DoP: Department of Planning; DPI: Department of Primary Industries; EA: Energy Australia; HNCMA: Hawkesbury Nepean Catchment Management Authority; IE: Integral Energy; RTA: Roads and Traffic Authority; SCA; Sydney Catchment Authority; SMCMA: Sydney Metro Catchment Management Authority; SW: Sydney Water; UWS: University of Western Sydney; WSPT: Western Sydney Parklands Trust; WSN: WSN Environmental Solutions

Local Government: BCC: Bankstown City Council, BHSC: Baulkham Hills Shire Council, BlaCC: Blacktown City Council, CC: Camden Council,
CCC: Campbelltown City Council, FCC: Fairfield City Council, HCC: Hawkesbury City Council, LCC: Liverpool City Council, PCC: Penrith City Council, WSC: Wollondilly Shire Council, AC: Auburn Council, CanCC: Canterbury City Council, HolCC: Holroyd City Council, HSC: Hornsby Shire Council, HuCC: Hurstville Council, ParraCC: Parramatta City Council, SC: Strathfield Council

Appendix 2: Best practice standards for bushland management

For the purposes of this recovery plan, DECCW has defined best practice standards for the management of bushland on **public lands within the identified priority conservation lands or public lands outside the identified priority conservation lands which have conservation as a primary management objective** as follows:

- an adopted plan of management, management system or biodiversity strategy (or similar planning document), which addresses management of the threatened biodiversity that is present and is consistent with the recovery plan
- the implementation of the plan is funded such that its objectives are met, or the land is managed such that the objectives of the policy are met
- details of the implementation of the plan are publicly reported
- monitoring is undertaken periodically to determine the status of any ecological communities and threatened flora and fauna populations that are present, or to assess the effectiveness of any threat abatement measures that are being implemented
- management is consistent with the following documents, and any additional best practice documents that DECCW may promote at a later date:
  - *Recovering bushland on the Cumberland Plain – Best practice guidelines for the management and restoration of bushland (DEC 2005)*
  - *the recommended fire regimes in the Appendix 3*

For the purposes of this recovery plan, DECCW has defined best practice standards for the management of bushland on **public lands outside the identified priority conservation lands and where conservation is not a primary management objective but is compatible with the primary management objective** as follows:

- an adopted plan of management, management system (or similar planning document) has been adopted which addresses management of the threatened biodiversity that is present and is consistent with the recovery plan
- the implementation of the plan is funded such that its objectives are met, or the land is managed such that the objectives of the policy are met
- details of the implementation of the plan are publicly reported
- monitoring is undertaken periodically to determine the status of any ecological communities and threatened flora and fauna populations that are present, or to assess the effectiveness of any threat abatement measures that are being implemented; and
- management is consistent with the following documents, and any additional best practice documents that DECCW may promote at a later date:
  - *Recovering bushland on the Cumberland Plain – Best practice guidelines for the management and restoration of bushland (DEC 2005)*
  - *the recommended fire regimes in the Appendix 3*

For the purposes of this recovery plan, DECCW has defined best practice standards for the management of bushland on **private lands within the identified priority conservation** lands as follows:

- a site action or management plan has been prepared or reviewed which addresses the management of the threatened biodiversity that is present; and is consistent with the recovery plan
- the land is managed in accordance with the site action or management plan; and
- management is consistent with the following documents, and any other best practice documents that DECCW may promote at a later date:
  - *Recovering bushland on the Cumberland Plain – Best practice guidelines for the management and restoration of bushland (DEC 2005)*
  - *the recommended fire regimes in Appendix 3*

Appendix 3: Recommended fire regimes for threatened biodiversity of the Cumberland Plain

Inappropriate fire regimes can alter the species composition and the structure of ecological communities. The key factors in fire regimes are the fire's frequency, intensity and season of occurrence. High fire frequency leads to a reduction in shrub diversity and abundance, particularly legumes (e.g. *Dillwynia* spp, *Pultenaea* spp). However, low fire frequency often leads to dominance of one shrub species, such as *Bursaria spinosa* or *Melaleuca nodosa*. Given the fragmented nature of Cumberland Plain remnants, an inappropriate fire regime can lead to local extinctions of species because recolonisation or perpetuation of the population elsewhere in the landscape may not be possible.

The recommended fire intervals (i.e. fire frequencies) for Cumberland Plain ecological communities will vary depending on their structure, with the grassy woodlands requiring a higher fire frequency than the shrubby woodlands to maintain their structure. There is need for further investigation of fire intervals for the Cumberland Plain, to determine more conclusively the required fire regimes for various ecological communities.

These intervals are largely based upon fire interval guidelines for broad vegetation types (NSW NPWS 2003) and the NSW Rural Fire Service's Threatened Species Hazard Reduction List, amended to include information based upon studies carried out specifically within Cumberland Plain ecological communities (Watson 2005).

It is important to note that when applying inter-fire intervals in planning, actual intervals, seasonality and fire intensity experienced at a site should be variable to ensure the greatest species diversity.

The figures in Table 5 and Table 6 are indicative and their implementation should be accompanied by ongoing monitoring of the effects on species richness and community structure. Site-specific plans should be adopted that take into consideration the overall management aims and the use of fire in the local context.

References:

NSW National Parks and Wildlife Service (2003), *Guidelines for Ecologically Sustainable Fire Management*. NSW Biodiversity Strategy. Unpublished Report

Watson, P. J. (2005), *Fire frequencies for Western Sydney's woodlands: indications from vegetation dynamics*, PhD thesis, University of Western Sydney

Table 6. General fire regimes for threatened ecological communities of the Cumberland Plain

Threatened Ecological Community	Suggested min fire interval (years)	Suggested max fire interval (years)
Agnes Banks Woodland	7	30
Castlereagh Swamp Woodland	7	30
Cooks River/Castlereagh Ironbark Forest	5	18
Cumberland Plain Woodland	5	12
Elderslie Banksia Scrub Forest	7	30
Moist Shale Woodland	Burning not recommended	Burning not recommended
Shale Gravel Transition Forest	5	15
Shale Sandstone Transition Forest	7	30
Sydney Coastal River-flat Forest	7	35
Western Sydney Dry Rainforest	Burning not recommended	Burning not recommended

Table 7. General fire regimes for threatened species of the Cumberland Plain

Species	Suggested min fire interval (years)	Suggested max fire interval (years)
Allocasuarina glairecola	7	25
Dillwynia tenuifolia	7	15
Grevillea juniperina	7	25
Marsdenia viridiflora endangered population	7	25
Micromyrtus minutiflora	7	15
Pomaderris prunifolia endangered population	7	15
Pterostylis saxicola	7	15
Pultenaea parviflora	7	15

Appendix 4: Research priorities for the threatened biodiversity of the Cumberland Plain

DECCW will liaise with research institutions to facilitate research relevant to the recovery of Cumberland Plain endangered ecological communities. Research priorities include:

Identifying impacts and management responses to threats to the community

Investigating impacts on the threatened ecological communities and species and management responses required to manage:

- invasive weed species, especially African Olive
- climate change
- salinity
- elevated soil nutrient levels
- fire regimes.

Ecological restoration

- Developing and refining revegetation techniques appropriate to Cumberland Plain threatened ecological communities that re-establish understorey diversity and structure
- Determining the role of pollination vectors in habitat restoration
- Undertake trials to establish the propagation requirements for key Cumberland Plain species (including threatened ecological communities and species) to assist with restoration
- research the seed storage requirements of key Cumberland Plain species (including threatened ecological communities and species)
- researching ecosystem dynamics, particularly in response to disturbance and the role of soil seed banks
- identify key species with tolerance to salinity for revegetation in riparian areas and affected areas.

Increasing our understanding of the threatened ecological communities

- gathering information on the distribution and ecology of threatened species and regionally rare species on the Cumberland Plain to improve management
- establishing the relationship between remnant size and ecological value
- understanding habitat requirements for sustainable fauna populations in the Cumberland Plain, including the bushland corridor requirements necessary to facilitate movement of fauna
- developing a system of target species/bioindicators to assess vegetation condition and ecological resilience of Cumberland Plain threatened ecological communities and remnants
- Investigating the impact of fire on the fauna values
  - For example, determining an appropriate fire frequency for Cumberland Land Snail (*Meridolum corneovirens*)
- Establishing long term monitoring sites to assess the long-term change in vegetation structure and required management regimes
  - For example, impact of dense, large shrub regrowth upon the long-term viability of specific threatened species within the Cumberland Plain (e.g. *Dillwynia tenuifolia* and *Pultenaea parvilflora*).

Improving management practices and responses

- Developing and refining revegetation techniques appropriate to Cumberland Plain threatened ecological communities that re-establish understorey diversity and structure
- Identifying domestic grazing management practices that allow the regeneration of threatened ecological communities and maintenance of biodiversity values
- Further refining appropriate fire management regimes to maintain ecological integrity of Cumberland Plain threatened ecological communities remnants
- Relationship between fire frequency and exotic weeds in the Cumberland Plain.

Appendix 5: Public submissions on the draft recovery plan

Recovery Plan Submission

Name Individual/ Organisation: ----------

Postal Address: ----------

Postcode: ---------- Contact Number(s): ----------

Date: ----------

Draft Cumberland Plain Recovery Plan

DECCW will consider all written submissions received during the period of public exhibition and must provide a summary report of those submissions to the Minister for the Environment prior to final approval of this recovery plan.

Please note that for the purposes of the NSW *Privacy and Personal Information Protection Act 1998*, any comments on this draft recovery plan, including your personal details, will be a matter of public record and will be stored in the DECCW records system for a period of up to 2 years from the closing date. The submission of personal information is voluntary. Copies of submissions will be available on request, at the DECCW Office responsible for the preparation of the recovery plan.

Should you not wish to have your personal details disclosed to members of the public, please indicate below why you wish your personal details to remain confidential to DECCW. Please note that access to the details may be requested under the *Freedom of Information Act 1989*. You will be consulted if this happens.

Further information on the *Privacy and Personal Information Protection Act 1998* and the *Freedom of Information Act 1989* may be obtained from the DECCW FOI/Privacy Contact Officer or the DECCW website: www.environment.nsw.gov.au

☐ **Yes, please keep my personal details confidential to DEC**

Submissions should be received no later than the advertised date. Submissions should be addressed to:

Director General
C/- Cumberland Plain Recovery Plan Coordinator
EPRG Metro Biodiversity Conservation Section
Department of Environment, Climate Change and Water
PO Box 1967
Hurstville
NSW 2220

Submission: