Australian Capital Territory

Planning and Development (Jerrabomberra Wetlands Nature Reserve) Plan of Management 2010

Disallowable instrument DI2010—280

made under the

Planning and Development Act 2007, Section 330 (Plans of management—notification, presentation, disallowance and date of effect)

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1 Name of instrument

This instrument is *Planning and Development (Jerrabomberra Wetlands Nature Reserve) Plan of Management 2010*.

2 Commencement

This instrument commences in accordance with the Act section 330 (2) (a).

3 Approval of plan of management

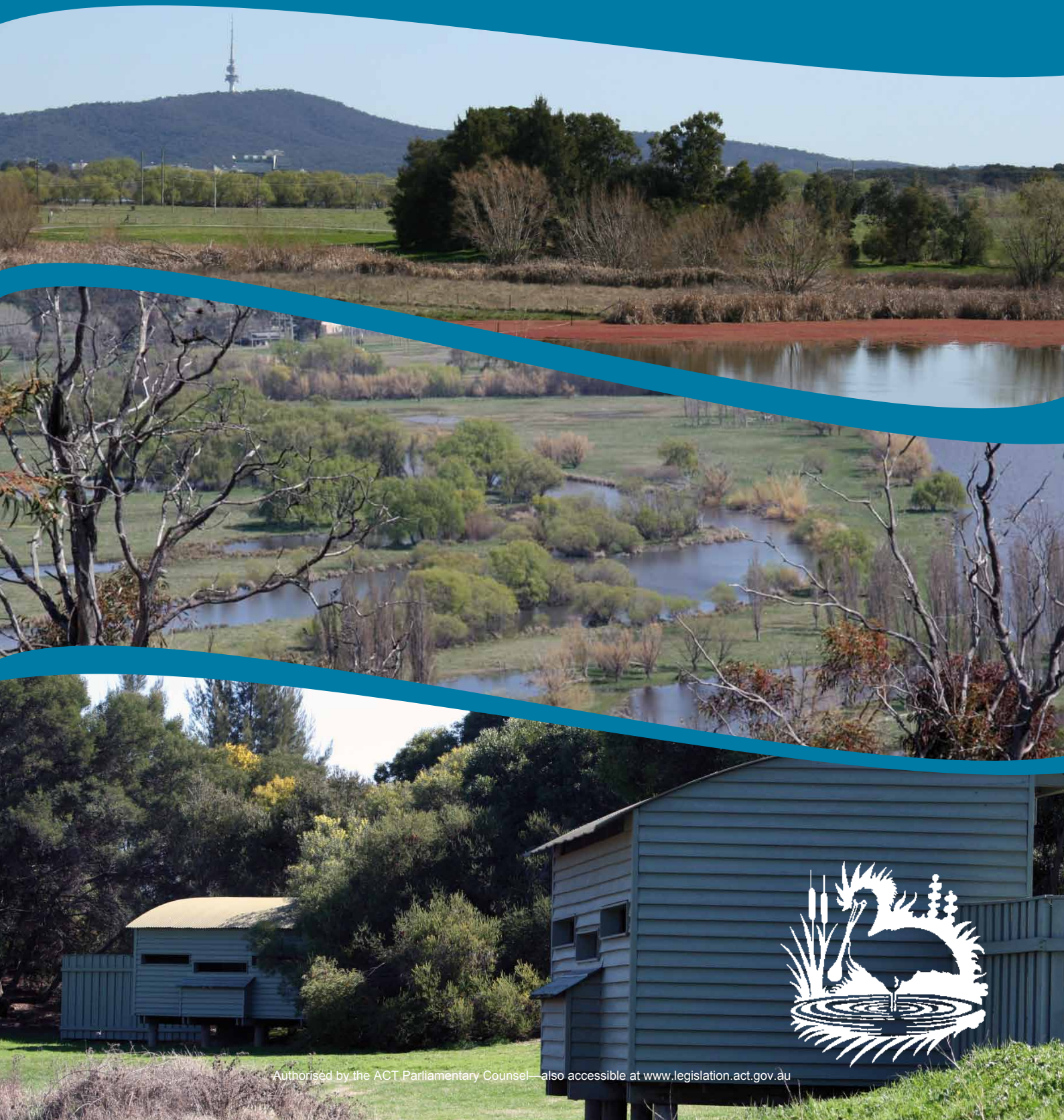
I approve the "Jerrabomberra Wetlands Nature Reserve Plan of Management 2010" attached to this instrument.

Andrew Barr MLA
Minister for Planning

21 October 2010

Jerrabomberra Wetlands Nature Reserve

PLAN OF MANAGEMENT 2010



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Particular thanks for comments, suggestions, review of draft content, and preparation of maps go to ACT Government staff, the Canberra Ornithologists Group, the ACT Natural Resource Management Advisory Committee, the Jerrabomberra Wetlands Nature Reserve Interim Board of Management and the Project Steering Committee.

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Jerrabomberra Wetlands Nature Reserve

Plan of Management
2010

Vision

The Jerrabomberra Wetlands Nature Reserve is a species-rich urban wetland that provides an important refuge for migratory and other birds and is a place where people can enjoy and learn about the special characteristics of wetlands and the birdlife within them.

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Ministerial Foreword

Nestled in the heart of Canberra is a wetland area of national importance—the Jerrabomberra Wetlands Nature Reserve. Each year, during the warmer months, the reserve hosts a number of international travellers. These are migratory birds that fly thousands of kilometres from the northern hemisphere and seek refuge in the wetlands.

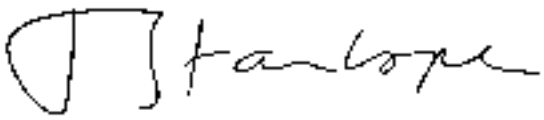
Although it is a largely artificial habitat created by the filling of Lake Burley Griffin, Jerrabomberra Wetlands has significant biodiversity values as it provides a permanent drought refuge for waterbirds in the region and seasonal habitat for migratory species.

Jerrabomberra Wetlands is listed in the Australian Directory of Important Wetlands for its significant bird habitat. The area is also recognised under Commonwealth legislation in relation to international agreements between Australia and Japan, the People's Republic of China and the Republic of Korea for the protection of migratory bird species.

The challenge for Canberra is to ensure that this special place is cared for and protected. Since the first plan for the reserve was prepared in 1994, many changes have occurred. Kingston Foreshore is well-progressed and at East Lake, adjacent to the south-western boundary of the reserve, an urban village of approximately 9000 residents is envisaged, incorporating a mix of land uses. These new developments and plans must take into account the long-term viability of the Jerrabomberra Wetlands.

Land managers must have in place policies to protect the values of the wetlands and, in particular, address the inevitable increase in visitor use of the reserve for recreation associated with adjacent developments. The plan provides such a framework in providing for suitable public use while protecting important habitats.

It is my aim to ensure that the Jerrabomberra Wetlands Nature Reserve continues to be valued for its wildlife and habitats, and as a place for the community to enjoy.



Jon Stanhope, MLA
Minister for Territory and Municipal Services

Preface

This plan of management has been prepared for the Jerrabomberra Wetlands Nature Reserve (herein referred to also as the 'reserve' or 'Jerrabomberra Wetlands'). A draft management plan released in 2006 attracted submissions from several organisations and individuals. The final plan incorporates changes derived from analysis of those comments and replaces the management plan for the reserve published in 1994 (ACT Parks and Conservation Service 1994). In accordance with the requirements of the *Planning and Development Act 2007*, this management plan sets out directions for the management of Jerrabomberra Wetlands Nature Reserve for the next 10 years.

The plan takes into account public expectations, new and proposed land uses on adjacent lands and waters, the need to maintain and enhance environmental quality, and statutory requirements relevant to the management of the reserve. Of major significance is urban redevelopment west and south of Jerrabomberra Creek: the Kingston Foreshore Development and the proposed East Lake Urban Renewal area (herein referred to also as 'East Lake'). The plan considers the potential effects on the reserve of this redevelopment, such as increased recreational use and habitat disturbance. It also considers the potential to create a parkland landscape between the reserve and the redevelopment that complements the values of the Jerrabomberra Wetlands and provides an appropriate buffer zone. Creation of such an interface is one of the important issues in relation to the developments that cannot be resolved in this management plan, but will be key considerations for land use planning over the next few years.

Planning is a process that considers the past and present but looks to the future. It is focused on determining 'what should be' (usually defined by a series of objectives) and selecting suitable approaches to achieve those objectives. Planning can occur at different scales. In the ACT, the *National Capital Plan* and the *Territory Plan* determine in a broad sense which areas of land will be used for what purpose. Once land use has been determined, area management plans such as this Jerrabomberra Wetlands Plan of Management set out how such areas will be managed. At a more detailed level, site planning deals with the design for a particular area or facility. This detailed planning may be done in a 'master plan', as is proposed for Jerrabomberra Wetlands, to provide a coordinated and strategic approach for capital works in the reserve.

The foundation of management planning for protected areas such as Jerrabomberra Wetlands is the assessment of the values of the area. Determining the values of the wetlands identifies the special characteristics that make the area worthy of being protected, and why people are inspired to visit, or consider it to be an important place. The values of the reserve, as defined in the management plan, form 'themes' for the chapters of the plan. Supporting this is a zoning system that expresses management objectives for particular areas, related to reserve values. The reserve is divided into three management zones that provide a gradation from habitat conservation with restricted public access to areas providing infrastructure and facilities for public access and enjoyment.

Jerrabomberra Wetlands is unusual in that the area has high biodiversity value in a largely artificial landscape, created by the filling of Lake Burley Griffin in 1964. The reserve provides habitat for a large number of species of land and water birds, including migratory species protected under international agreements. The central focus of the management plan is the conservation of wetland habitats, so important for these species.

Figure 1.1 Jerrabomberra Wetlands: in a Regional Context

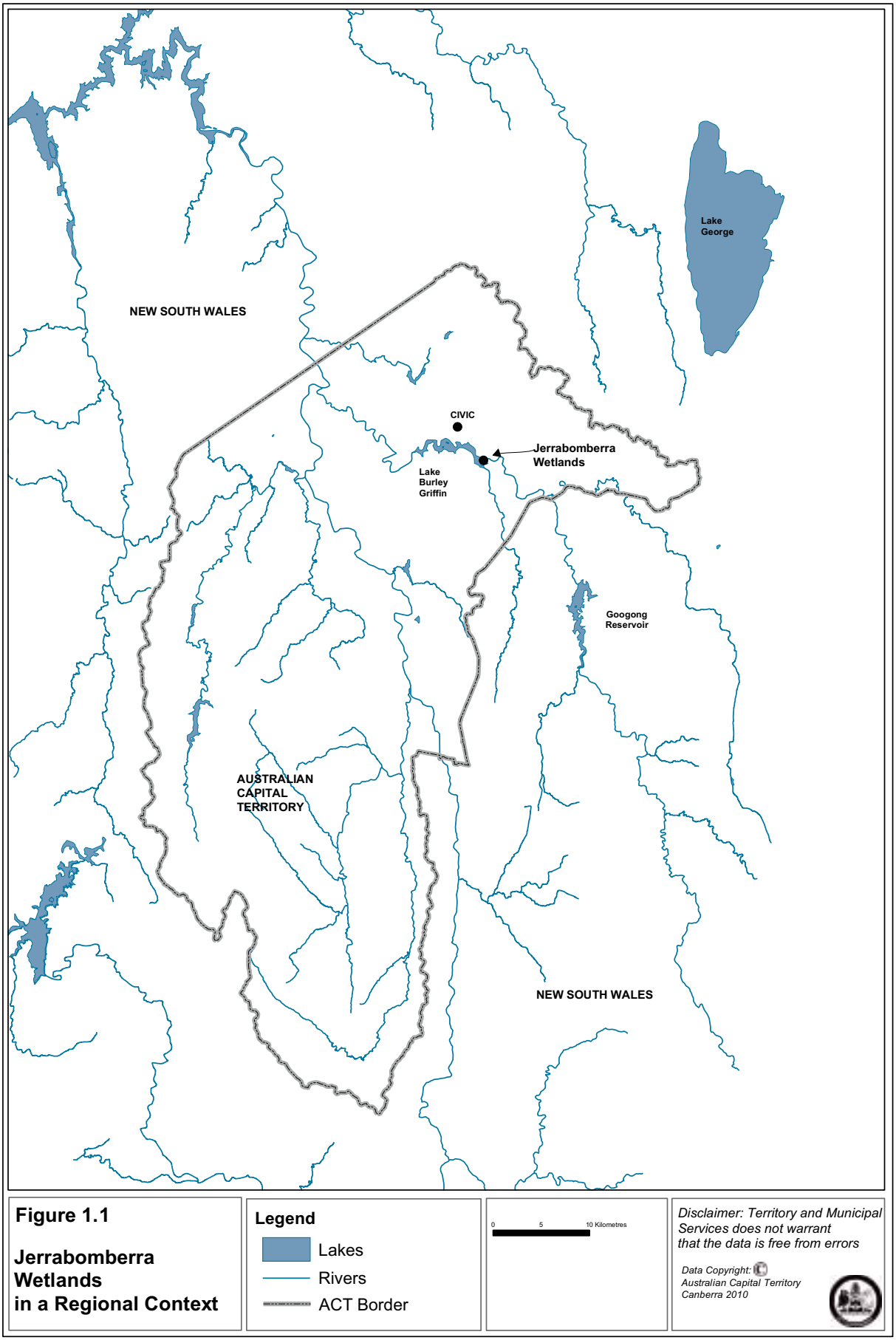


Figure 1.2 Jerrabomberra Wetlands: Boundary

1 Introduction

1.1 Jerrabomberra Wetlands

At the end of a flight of thousands of kilometres from their summer breeding grounds in the northern hemisphere, Latham's snipe, common greenshank, red-necked stint and the sharp-tailed sandpiper spend the northern winter in Australian wetlands, one of which is at Jerrabomberra. The permanent pools, waterways and wet grasslands draw not only these migrating visitors, but locally resident waterbirds and landbirds and, in drought times, waterbirds from elsewhere in Australia. The wetlands, so important for these species, are not a natural landscape but result from the filling in 1964 of Lake Burley Griffin, an integral part of the plan for the National Capital.

The ancient river channels, flooded by the lake to form the wetlands, testify to a river altering its course in the floodplain over millennia. Here, for thousands of years, Aboriginal people gathered in the sheltered valley rich in food resources. In the early 19th century, the European pastoral economy began a process of massive change to the landscape and the established patterns of use. The Campbells of Duntroon took advantage of the grassland of the river flats to graze their cattle, a practice that continues almost two centuries later.

The paddocks, pools, channels and streams that make up the Jerrabomberra Wetlands now sit amidst the landscapes of the national capital and urban Canberra. The reserve is only a few kilometres from central Canberra and the Parliamentary Zone. To the north and east are road transport arteries and the flight paths of Canberra Airport, while to the west, the Kingston Foreshore development is bringing higher-density urban development closer to the reserve. To the south-west, planning has commenced for the redevelopment of the East Lake area. These developments all point to more people and more activities that are likely to have an impact on the reserve and the importance of planning an appropriate buffer zone at the interface. In the face of these challenges, the *central focus of this management plan is the conservation of the wetland habitats of the reserve*, for it is upon these habitats that the waterbirds and many other animals depend.

Part of the Central National Area of Canberra, Jerrabomberra Wetlands is a distinctive landscape, important at scales from local to international for its waterbird habitat, and a counterpoint to the urbanised and formal landscapes that are its near neighbours in inner Canberra.

1.2 Location

Jerrabomberra Wetlands Nature Reserve is located on the Molonglo River floodplain, approximately four kilometres east of Canberra Civic Centre in the Australian Capital Territory Figure 1.1. The reserve forms the eastern foreshores of Lake Burley Griffin and includes Molonglo Reach, which contains the backed-up waters of the lake. The reserve is bounded on the east by Dairy Road, on which there is a car park (Dairy Road is terminated at this point by a locked gate). The south-western boundary takes in most of Jerrabomberra Reach and Jerrabomberra Creek, extending to the south of the silt trap before crossing to Dairy Road, south of the Jerrabomberra Billabongs (Figure 1.2).

1.3 Purpose and Scope of the Management Plan

The *Jerrabomberra Wetlands Nature Reserve Plan of Management* has been prepared under the *Planning and Development Act 2007* (ACT) and policies in the *National Capital Plan* (Commonwealth) and the *Territory Plan* (ACT). The reserve is managed in conjunction with Canberra Nature Park, for which there is a separate management plan (Environment ACT 1999). The management plan is a legal document that outlines how the precinct is to be managed for the next 10 years and until a new plan of management is prepared at that time.

From a *statutory perspective*, the primary purpose of a management plan is to meet the requirements of the Planning and Development Act (Part 10.3) that an area of Public Land must be managed in accordance with both the management objectives applying to the area (Schedule 3 of the Act) and a management plan prepared by the 'custodian' of the land. The 'custodian' is the administrative unit or other entity with administrative responsibility for the land.

From a *management and operational perspective*, a management plan outlines what is important about the Jerrabomberra Wetlands (its values), what is hoped to be achieved in the management of the area (objectives), and the means by which the objectives will be attained (policies and actions). A management plan is intended to provide direction and guidance to the custodian of the land, management staff, volunteers, visitors, proponents of particular activities and uses, neighbours, and others with an interest in the area. Many aspects of management require more detailed prescriptions and operational procedures than can be included in a management plan. These will be based on those currently in place or will be prepared as required. Implementation of the plan will be guided by the priority attached to particular actions as set out in Table 10.1.

The provisions of the plan are intended to fulfil all international, national, ACT, regional and local obligations that are relevant to the management of the natural environment, cultural heritage, important habitats, built facilities and infrastructure in the reserve. Detailed management prescriptions and operations may be referred to, but are not included in the plan. A range of planning and policy documents inform or are related to the management plan but are not, in detail, part of the plan. These documents are mainly of two types: *functional* plans (e.g. fire management plan, threatened species recovery plan) and *organisational* plans (e.g. corporate plan, business plan, incident plan).

The scope of this plan is limited to the *management* of the area reserved as the Jerrabomberra Wetlands Nature Reserve. Land use planning in areas adjacent to the reserve is the responsibility of the National Capital Authority (NCA) and the ACT Planning and Land Authority (ACTPLA), applying the provisions of the *National Capital Plan* and *Territory Plan* respectively. By identifying the values of the reserve and the objectives and policies for the conservation of those values, the management plan is intended to provide guidance for the planning, design and management of the Kingston Foreshore and East Lake areas. Of particular concern is the open space parkland along Jerrabomberra Creek that will separate the residential and commercial development in these areas from the reserve and provide an appropriate buffer zone at the interface.

1.4 Statement of Significance

Jerrabomberra Wetlands is significant as one of the most valuable freshwater wetland habitat areas in the ACT and adjacent region of NSW. The reserve makes an important contribution to the biological diversity of Lake Burley Griffin and Canberra Nature Park. The presence of permanent, shallow water bodies means that the wetlands are regionally important as a drought refuge. In periods when Lake Bathurst and Lake George are dry, large numbers of pelicans, cormorants and coots find shelter in the reserve. Over 80 species of waterbird have been recorded, representing most of the commonly occurring waterbird species in south-eastern Australia (ACT Parks and Conservation Service 1994). Of these, 15 to 25 species are thought to breed locally. Many other birds not specifically associated with water habitats also occur in the planted woodlands and nearby grasslands. In total, 170 bird species have been sighted in the reserve (COG 1987). The area also supports other terrestrial and aquatic fauna (s. 2.1.3).

Jerrabomberra Wetlands is one of 13 ACT wetlands included in *A Directory of Important Wetlands in Australia* (Environment Australia 2001). The area meets the following criteria for inclusion in the directory:

- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought, prevail.
- The wetland is of outstanding historical or cultural significance.

Internationally, Jerrabomberra Wetlands is important because the area provides reliable habitat for a number of migratory bird species protected under international agreements (see s. 1.5.1 and Chapter 4). However, the reserve does not meet the criteria for inclusion on the *List of Wetlands of International Importance* kept under the Ramsar Convention (1971) (DEWHA 2010a; James 1996; Ramsar 2010).

Jerrabomberra Wetlands Nature Reserve is an important part of the National Capital Open Space System (NCA 2007) and provides linking habitat between the woodland and open forest of Mt Pleasant and Mt Ainslie to the north and Jerrabomberra Creek catchment to the south. The location of the reserve close to Canberra City on the eastern edge of Lake Burley Griffin (East Basin) provides an opportunity for education and research activities related to wetland ecosystems (Chapter 7) and recreational activities linked to the area's natural and cultural values (Chapter 6).

1.5 Legislation and Policy

International agreements, and Commonwealth and ACT legislation, plans and strategies underpin or influence the management of the Jerrabomberra Wetlands. A wide range of ACT legislation is potentially applicable to the reserve and activities that occur there. Only the more significant legislation is referred to in this plan.

1.5.1 International Agreements

Australia is a signatory to bilateral agreements with the governments of Japan, China and Korea for the protection of migratory birds. These are the Migratory Bird Agreement between Japan and Australia (JAMBA), the Migratory Bird Agreement between the People's Republic of China and Australia (CAMBA), and the Migratory Bird Agreement between the Republic of Korea and Australia (ROKAMBA) (DEWHA 2010b). Species protected under these agreements use the wetlands on a seasonal basis. The agreements must therefore be considered in undertaking any development or management activities within the reserve or on adjoining land or water. The presence of these listed species potentially invokes the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (see below).

1.5.2 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary Commonwealth legislation for environment protection. Under the EPBC Act, an action will require approval from the (Commonwealth) Environment Minister if the action has, will have, or is likely to have a significant impact (DEH 2006) on a *matter of national environmental significance* and it is not subject to certain exceptions. Exceptions include actions taken in accordance with Commonwealth accredited management plans. Of relevance to the Jerrabomberra Wetlands, 'migratory species protected under international agreements' is defined as a *matter of national environmental significance*.

The EPBC Act provides for environmental impact assessment to be carried out under state or territory law and be accredited under the EPBC Act. The aim of this is to reduce duplication of environmental assessment and regulation. Subsection 47(1) of the EPBC Act provides that a bilateral agreement may declare that actions need not be assessed under the Act if the actions have been 'assessed in a specified manner'. The ACT has a bilateral agreement with the Commonwealth that a specified manner would include the preparation of an Environmental Impact Statement (EIS) with or without an associated inquiry panel report under the *Planning and Development Act 2007* (ACT) and the *Planning and Development Regulations 2008* (ACT) (DEWHA 2010c).

On 1 January 2004, a new national heritage system was established under the EPBC Act. Under the Act and following amendments to the *Australian Heritage Council Act 2003*, the Register of

the National Estate was 'frozen' on 19 February 2007 and will cease to have a statutory basis from February 2012, but will remain as a publically available archive. This transition period is to allow time to transfer places to other local, state, territory and Australian Government registers (DEWHA 2010d). *Jerrabomberra Wetlands, Dairy Rd, Fyshwick, ACT* (Place ID 13372) is an Indicative Place on the Register of the National Estate. This means that the place was nominated to the register but an assessment and decision on whether it should be entered in the register was not made. The ACT Heritage Register (see below) will be the only statutory heritage registration for the wetlands from February 2012.

1.5.3 ACT Legislation, Strategies and Plans

a) Legislation

Planning and Development Act 2007

The *Planning and Development Act 2007* is the main legislation governing the management of the Jerrabomberra Wetlands. The Act (s. 317, Schedule 3) provides for the identification of Public Land and defines management objectives for categories of Public Land. Jerrabomberra Wetlands is Public Land reserved for the purposes of Nature Reserve for which the management objectives are:

1. To conserve the natural environment.
2. To provide for public use of the area for recreation, education and research.

Important provisions relating to Public Land under the Planning and Development Act are:

- An area of Public Land must be managed in accordance with:

  (a) the management objectives in the Act that apply to the area

  (b) a plan of management for the area. (s. 316)
- The Conservator of Flora and Fauna may determine management objectives for an area of Public Land. (Note that if there is an inconsistency between these objectives and the ones stated in the Act, the ones stated by the Conservator must be read subject to those in the Act) (s. 317).
- If there is an inconsistency in the application of two objectives stated in the Act for an area of Public Land, the second objective is to be read subject to the earlier objective (s. 317).
- The custodian for an area of Public Land must prepare a draft plan of management for the area (s. 320) that sets out how management objectives prescribed in the Act (Schedule 3) are to be pursued.
- A plan of management must include a description of the area of Public Land to which it applies and how the management objectives for the area are to be implemented or promoted in the area (s. 319).
- The (final) plan of management is a statutory document, established under the Act, which must pass through the ACT Legislative Assembly (as a 'disallowable instrument') before it commences.
- The custodian of an area of Public Land must review the plan of management at least once every 10 years (s. 332).

Nature Conservation Act 1980

The Nature Conservation Act provides for the protection and conservation of native plants and animals, declaration of threatened species and ecological communities, and gives authority for the Conservator of Flora and Fauna to manage Public Land reserved for conservation of the natural environment, such as Jerrabomberra Wetlands.

Pest Plants and Animals Act 2005

The main objects of the Act are to protect the land and aquatic resources in the ACT from threats from pest plants and animals, to promote a strategic and sustainable approach to pest management, to identify pest plants and animals, and to manage pest plants and animals. The Act provides for the declaration of pest plants and animals and the preparation of management plans. Many of the weed species found in the reserve are declared pest plants in the ACT.

Heritage Act 2004

The Heritage Act establishes a system for the recognition, registration and conservation of natural and cultural heritage places and objects in the ACT, including Aboriginal places and objects. A list of these places and objects is maintained on a Heritage Register. Jerrabomberra Wetlands, Fyshwick is entered on the register.

Fisheries Act 2000

The Fisheries Act provides for the conservation of native fish species and their habitats, the sustainable management of fisheries, and regulates fishing in the ACT. Provisions of the Act cover fishers in waters of the reserve e.g. Molonglo Reach.

Lakes Act 1976

The Lakes Act provides for the management of the Territory's lakes and regulates the activities which may be engaged in upon the lakes. Molonglo Reach is declared a lake under the Lakes Act to ensure that activities that occur on the water can be managed.

The Commonwealth has complementary legislation in the *Lakes Ordinance 1976* for the control of Lake Burley Griffin which is classified as National Land.

Environment Protection Act 1997

The main purpose of the Environment Protection Act is to provide protection for the environment from pollution, and other forms of environmental harm such as sedimentation and erosion. The Act sets water quality standards and establishes the Environment Protection Authority. The Act is important in relation to protecting the waters of the reserve from pollution.

Water Resources Act 2007

This Act provides for the sustainable use and management of ACT water resources; the protection of aquatic ecosystems and aquifers from damage and, where practicable, reversal of past damage. The ACT water resources strategy and environmental flow guidelines for streams are established under the Act (ACT Government 2004, 2006).

Emergencies Act 2004

A primary object of this Act is to preserve life, property and the environment. The Act requires the preparation of a Strategic Bushfire Management Plan for the ACT (see s. 9.4).

Other Legislation

- *Crimes Act 1990*
- *Domestic Animals Act 2000*
- *Firearms Act 1996*
- *Litter Act 2004*
- *Animal Diseases Act 2005*
- *Public Health Act 1997*
- *Roads and Public Places Act 1937*
- *Stock Act 2005*

- *Trespass on Territory Land Act 1932*
- *Hawkers Act 2003*

b) Strategies and Plans

ACT Nature Conservation Strategy

The ACT Nature Conservation Strategy (ACT Government 1998) establishes a policy framework for the conservation of biodiversity in the ACT and is prepared under the provisions of the *Nature Conservation Act 1980*.

Bush Capital Legacy iconic city, iconic natural assets. Plan for Managing the Natural Resources of the ACT

This plan, prepared by the ACT Natural Resource Management Council, contains 16 targets to guide natural resource investment in the ACT. These are based on issues of concern under the categories of community, land, water and biodiversity (ACT NRM Council 2009).

ACT Weeds Strategy 2009–2019

This strategy aims to reduce the impact of weeds on the environment, the economy, human health and amenity. It recognises that weed management is an integral component of sustainable management of natural resources and the environment (ACT Government 2009).

Think water, act water

This is the ACT water resource management strategy, which aims to ensure that the ACT has a long-term adequate and secure water supply. Objectives and actions related to the management of Jerrabomberra Wetlands, including those covering catchment management, riparian zone management, and water sensitive urban design, are included in the Implementation Plan in *Think water, act water* (ACT Government 2004).

The ACT Climate Change Strategy 2007–2025

This provides an overview of climate change science, the predicted impacts on the ACT, and the ACT Government's vision and direction for responding to climate change. The climate change Action Plan 1 2007–2011 sets out measures to reduce emissions and a range of associated actions (ACT Government 2007a, 2007b).

ACT Aquatic Species and Riparian Zone Conservation Strategy

This strategy is focussed on the protection and management of the rivers and riparian areas in the ACT that support threatened species and ecological communities. The strategy is also the statutory Action Plan for six fauna and flora species declared threatened under the Nature Conservation Act (ACT Government 2007c).

1.6 Key Principles for Management

The management objectives, policies and actions contained in this management plan incorporate the following principles, which provide a guide to managers in changing circumstances and as new issues arise:

Precautionary principle: Planning and management decisions need to be made in line with the precautionary approach. In other words, where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

Inter-generational and intra-generational equity: The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations. Decisions affecting current generations should be socially equitable.

Environmental stewardship: Recognition and acceptance that responsibility for protecting the values of the reserve extends beyond the managing agency to include public and private agencies with responsibilities in and adjacent to the reserve, visitors, neighbours and the general community.

Limits of acceptable disturbance: Acknowledgement that all human activities and uses of the reserve result in some degree of impact, and recognition of the need to manage such disturbances within physical and social impact thresholds (though these may be difficult to determine). It is important to separate inconsequential or trivial impacts from those that are serious, irreversible or cumulative, and where necessary devise means to assist such determination e.g. by monitoring.

Adaptive/experimental management: Research, monitoring, new knowledge and the outcomes of performance evaluation should continually inform management, with policies adjusted accordingly.

Best practice: Knowledge, skills and management practices are continually improved by keeping up-to-date with new technology and ideas.

Community participation: Recognition that the public has a right to participate in the decision-making processes concerning the reserve and that partnerships and collaborative programs that support the management plan should be fostered.

Education and environmental stewardship: Recognition that education is essential to promote an understanding and appreciation of the reserve's values and encourages individuals to take personal responsibility for protecting those values. Interpretation is an important component of education.

Levels of significance: Understanding that reserve values have different levels of significance and this also varies throughout the reserve. This will need to be taken into account when making decisions.

Transparency and accountability: Recognition that decision-making processes and the environmental and organisational performance of land managers and other authorities are open to public scrutiny.

1.7 ACT Planning Framework

1.7.1 Australian Capital Territory (Planning and Land Management) Act 1988 (Cwlth)

The *Australian Capital Territory (Planning and Land Management) Act 1988* (Cwlth) establishes a planning framework for the ACT, involving considerations of national capital significance (*National Capital Plan*) and planning for the needs of ACT residents (*Territory Plan*). The Act defines two categories of land in the ACT: National Land managed by the Commonwealth and Territory Land managed by the ACT Government on behalf of the Commonwealth.

Jerrabomberra Wetlands is located in an area described in the *National Capital Plan* as 'The Central National Area' of Canberra. The reserve is Territory Land but is in Designated Area under the National Capital Plan and therefore subject to the planning controls of the NCA. This means that plans or 'works', as defined in the *Australian Capital Territory (Planning and Land Management) Act 1988* (see Appendix B of the *National Capital Plan*), must be approved by the NCA.

Jerrabomberra Wetlands is part of the National Capital Open Space System (NCOSS) that protects the open space framework, visual backdrop and landscape setting for the national capital. The *National Capital Plan* contains the following policy for the reserve:

> Jerrabomberra Wetlands will be protected as a wildlife refuge in a national capital and urban context, with facilities designed to realise the area's potential as a significant conservation and education resource for Canberra residents, tourists and international visitors.

The intent of this and other NCOSS policies in the *National Capital Plan* and General and Specific Area Conditions for the Jerrabomberra Wetlands (*National Capital Plan* Appendix I) are incorporated into the objectives, actions, programs and activities contained in this management plan.

The reserve has an integral relationship with Lake Burley Griffin, which is National Land managed by the NCA. This relationship is recognised in the *Lake Burley Griffin Management Plan* (NCPA 1995).

1.7.2 The Griffin Legacy

One of the aims of the *Griffin Legacy* project undertaken by the NCA is to 'appraise the Griffin Plan and its relevance to the planning and development of Canberra, the nation's capital, in the 21st century' (NCA 2004a, p. 12). The *Griffin Legacy* has now been incorporated into the *National Capital Plan* (Amendment 56). Outcomes of the project relevant to the Jerrabomberra Wetlands are discussed in s. 2.3.3.

1.7.3 Planning and Development Act 2007 (ACT)

The *Planning and Development Act 2007* (Chapter 5) establishes the *Territory Plan* (ACTPLA 2007). The *Territory Plan* sets out the strategic directions, planning principles, planning policies, and controls and codes for all land use zones for the ACT. The Act (s. 50) prevents the Territory, or a territory authority from doing anything inconsistent with the *Territory Plan* or the *National Capital Plan*.

1.7.4 Canberra Spatial Plan

The *Canberra Spatial Plan* (ACTPLA 2004) provides strategic direction for the development of Canberra over the next 30 years, but with the flexibility required to respond to change. The *Spatial Plan* does not replace the *Territory Plan*, but informs changes to both the *Territory Plan* and the *National Capital Plan*.

The *Spatial Plan* contains key principles to guide the future growth of Canberra. Protection of the natural environment is one of these key principles. The plan (p. 33) states that future residential development will ensure that areas with significant biodiversity values will be protected from development.

East Lake Urban Renewal Area

In accordance with the objectives of the *Canberra Spatial Plan* it is anticipated that the urban renewal of East Lake will occur over the next 30 years. The ACT Planning and Land Authority has initiated a planning framework to guide the implementation of this redevelopment (ACTPLA 2007). The project has significant implications for the southern part of the reserve (see s. 2.2.3).

1.8 Structure of this Management Plan

The following structure has been used in preparing this management plan:

VISION FOR JERRABOMBERRA WETLANDS NATURE RESERVE

↓

IDENTIFICATION OF THE VALUES OF THE JERRABOMBERRA WETLANDS
(Biodiversity, Landscape, Recreation, Education and Research, Cultural Heritage)

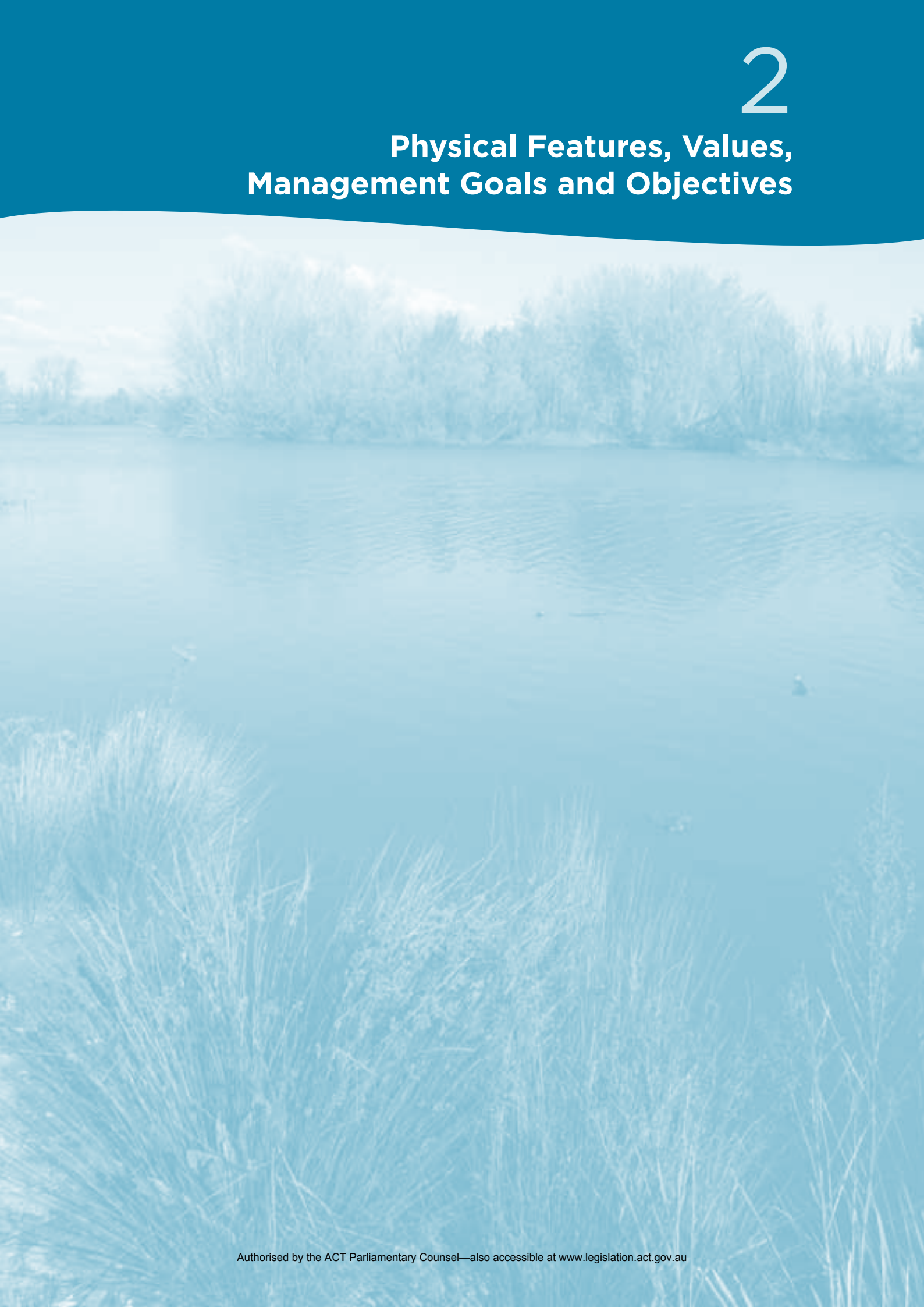
↓

MANAGEMENT FRAMEWORK		
	ENDS	**MEANS**
GENERAL	(a) Goals (s. 2.5.1) (b) Primary Management Objectives (s. 2.5.2 and beginning of Chapter 4–8)	Management Policy[1] (Chapter 4–10)
SPECIFIC	Detailed Objectives (Chapter 4–9)	Management Policy (Chapter 4–10) Management Actions (Chapter 4–10 and Summary Table 10.1)

1 Policies are guides to decision making and represent an underlying management position with regard to the achievement of objectives. Policies provide a consistent basis to respond to changing circumstances and new issues.

2

Physical Features, Values, Management Goals and Objectives



This chapter outlines the physical features and types of habitat within the Jerrabomberra Wetlands. It also outlines reserve and urban services infrastructure, the cultural landscape that characterises the reserve, the values that management seeks to protect, and the goals and objectives for the management plan as a whole. Key management issues are also summarised prior to being considered in more detail in later chapters.

2.1 Physical Features and Habitats

2.1.1 Physical Features and Hydrology

The physical features and hydrology of the reserve are summarised in Table 2.1.

Table 2.1 Physical Features and Hydrology of the Jerrabomberra Wetlands

Feature	Descriptions	Considerations for Management
Topography / Landform	The reserve covers 201 ha of land almost all below 560 m in altitude. Most of the wetland area is formed on an alluvial terrace (Dairy Flat) of the Molonglo River. Traces of former river channels (paleochannels) and levee banks are visible on the surface of the floodplain. These are connected on their western ends by a dredged channel (NCDC 1988a).	Paleochannels are uncommon in the ACT and are significant geomorphological features. The flooded channels provide a permanent drought refuge for waterbirds and seasonal habitat for migratory bird species. Any change to the existing landforms that results in a changed or fluctuating water level is inappropriate from a conservation viewpoint.
Soils	Soils in the floodplain component of the reserve are clay-dominant, formed from alluvial material deposited by the Molonglo River and Jerrabomberra Creek. In the mid-1980s a large quantity of building spoil from the site of the new Parliament House was deposited and shaped in the south-western edge of the reserve enabling the development of a dry eucalypt habitat. This occurred on the former Causeway Tip site. The material consists of a mix of topsoil, subsoil, boulders and building materials.	The clay-dominant soils provide an ideal base for wetlands, reducing seepage and retaining moisture during dry periods. Permanent moisture also provides suitable conditions for proliferation of moisture-tolerant introduced plants such as willows, poplars and blackberry. The imported clay fill material provides a harsh, dry soil environment, suitable for dry woodland plant species, but requiring irrigation to establish new plantings. Initial investigations of the former Causeway Tip site and landfill from Parliament House indicate that contaminants occur there but the areas are able to be remediated. This will be the subject of detailed investigation as part of the East Lake Urban Renewal project.
Hydrology	Water bodies in the wetlands are essentially part of Lake Burley Griffin. Most of the reserve is below the 1-in-100 year flood level, except for the Birrigai at Jerrabomberra site and its surrounds and some elevated land along the southern boundary of the reserve.	Intermittent flooding in the northern portion of the reserve encourages retention of grasslands rather than development of tree cover. Catchment hydrology also contributes to maintaining the wetlands and this may be affected by upstream development.
Climate	Mild to warm summers, cold winters with frequent frosts. Rainfall mean of 623 mm (high variability). Low elevation areas such as the wetlands are subject to cold air drainage.	Cold air drainage, cold winters and permanently wet soils favour growth of herbaceous species and limit establishment of trees and shrubs.

2.1.2 Water Bodies

Water bodies within or adjacent to the reserve are briefly listed here and are discussed in more detail in later chapters (see s. 4.2, s. 5.2 and s. 9.1).

a) Lake Burley Griffin and the Paleochannels

Lake Burley Griffin is one of the most important landscape features of Canberra in its role as the national capital. The system of old natural and artificial drainage channels at Jerrabomberra was fortuitously at the right level to create prime waterbird habitats when the lake filled. These relate functionally to wetland areas in other parts of the lake. Given its national capital role, the lake is maintained at a relatively constant level, but this may fall by a small amount during dry periods (see s. 9.1).

b) Molonglo River (Molonglo Reach)

The Molonglo River (Molonglo Reach) extends 1.5 km along the northern boundary of the reserve from the confluence with Lake Burley Griffin to the first road bridge (see s. 4.2.2 (c)).

c) Jerrabomberra Creek (Jerrabomberra Pool and Jerrabomberra Reach)

The catchment of Jerrabomberra Creek extends south to the Royalla area and is mainly rural, but includes urban areas of Queanbeyan and Canberra and the Hume industrial area. The channel form has been affected by erosion and incision (NSW DLWC 2000). Rapid urbanisation in the catchment has resulted in increased flows and continuing high levels of sedimentation. A silt trap has been constructed on the creek as part of works undertaken to protect Lake Burley Griffin from sedimentation and this is included in the reserve.

Where the creek joins Lake Burley Griffin, Jerrabomberra Reach and Jerrabomberra Pool are permanent deep water habitats that are important as part of the range of habitats in the reserve (see s. 4.2.2).

d) Kellys Swamp and Jerrabomberra Billabongs

Kellys Swamp is a semi-permanent water body surrounded by intermittently flooded mudflats. Water enters the swamp via a channel from Jerrabomberra Creek. During drought conditions in the early 1980s, Kellys Swamp was deepened and islands created. Jerrabomberra Billabongs, in the southern part of the reserve, receive water during high flows in Jerrabomberra Creek.

e) Shoveler Pool

Shoveler Pool was created by the excavation of soil to extend shallow water habitat and mudflats and is part of a series of depressions on the Molonglo River floodplain in the north-eastern sector of the reserve. During high flows, the pool and surrounding lands are inundated as water backs up from Lake Burley Griffin.

f) Fyshwick Sewage Treatment Ponds (outside the reserve)

These relatively large bodies of water of varying nutrient and organic loads attract a variety of waterbirds. Ducks are the most common bird type including some species that are seen infrequently in the reserve e.g. the blue-billed duck. Ducks also utilise the turf grass farmland to the north of the Sewage Treatment Ponds including the Goldenholm Pond area. The sewage ponds and irrigated turf farm are complementary to the habitat within the reserve and serve as a refuge area when parts of the wetlands dry out e.g. Kellys Swamp.

g) Water Bodies: Management Considerations and Issues

- The reserve provides a variety of wetland habitats ranging from permanent pools to intermittently flooded grasslands. Habitat variety is an important feature of the wetlands.
- The permanent water bodies are especially important for waterbirds during periods of drought and these birds are likely to be adversely affected by reductions in the level of Lake Burley Griffin.

- Increased urbanisation of the Jerrabomberra Creek catchment is likely to have negative impacts on the wetlands due to:
  - increased sedimentation and pollution
  - increased nutrient load in water courses
  - changes in the water flows to Kellys Swamp and the Jerrabomberra Billabongs.

2.1.3 Biological Features

a) Vegetation

The exact composition of pre-European vegetation cover of the Molonglo River flats in the Canberra area is not known as these areas were soon converted to agriculture or dairying following European settlement. However, given their landscape location, vegetation is likely to have comprised grassland, possibly some lowland woodland trees and shrubs, and riparian vegetation (woodland trees and fringing aquatic plants). Except for the aquatic plants, vegetation in the reserve has been transformed almost completely to comprise exotic species with some planted native species. No threatened plant species is known to occur in the reserve; however, it is the only known site in the ACT for a species of reed, *Schoenoplectus mucronatus*, which is listed as locally rare in the *Directory of Important Wetlands in Australia* (Australian Nature Conservation Agency 1996).

Most of the terrestrial parts of the reserve are exotic grassland dominated by phalaris (*Phalaris aquatica*) with a wide range of other grasses such as barley grass (*Hordeum* spp.) and exotic forbs. Thistles are particularly common and conspicuous. Native shrub plantings include species of Acacia, Banksia, Callistemon, Grevillea, Hakea and Leptospermum. These are mostly in the southern part of the reserve. Exotic shrub species, many of which are pest plants, are prevalent (s. 4.5). Native tree species (mainly eucalypts but also *Callitris* spp. and *Casuarina cunninghamiana*) have been planted in the landfill area south of Jerrabomberra Pool.

Exotic tree and shrub species dominate the banks of the Molonglo River and Jerrabomberra Creek, as well as the Lake Burley Griffin foreshore in the reserve. A program to remove problem species and to landscape the riparian area has been undertaken in Molonglo Reach. The main tree species are willows (*Salix* spp.), poplars (*Populus* spp.) and alders (*Alnus* spp.). Fringing aquatic vegetation is a very important habitat in the reserve comprising mainly common reed (*Phragmites australis*), bulrush (*Typha* spp.), rushes (*Juncus* spp.) and water couch (*Paspalum distichum*).

The reserve contains plant species included in the *Pest Plants and Animals (Pest Plants) Declaration 2005* made under the *Pest Plants and Animals Act 2005* (see s. 4.5).

b) Vegetation: Management Considerations and Issues

- Vegetation management is a key function and will require the development of a program that takes account of the values defined for the reserve and the need to control major weed species.
- The reserve is dominated by exotic vegetation including many ACT declared pest plant species. This provides a range of habitats for aquatic and terrestrial fauna, mainly birds. For this reason, removal of pest plant species should be accompanied by a replacement program, preferably with native species.
- The dominance of the grassland by exotic species, especially phalaris, would make it difficult and expensive to establish native grassland in the reserve.
- Exotic trees (golden upright willow *Salix alba* var. *vitellina*) along the reserve foreshore near Lake Burley Griffin impart a particular landscape character viewed across East Basin. The foreshore has national capital significance as it forms the eastern end of Griffin's Water Axis.

c) Fauna

The fauna of the reserve can be considered in three categories (Appendix 1 contains a list of waterbirds and landbirds associated with aquatic, wetland and riparian habitats):

Waterbirds: While most of the commonly occurring waterbirds of eastern Australia have been recorded in the reserve, of particular significance are those species protected under one, two or three of the migratory bird agreements (JAMBA, CAMBA, ROKAMBA see s. 1.5.1). These are: Latham's snipe (*Gallinago hardwickii*), common greenshank (*Tringa nebularia*), sharp-tailed sandpiper (*Calidris acuminata*), red-necked stint (*Calidris ruficollis*) bar-tailed godwit (*Limosa lapponica*), painted snipe (*Rostratula benghalensis*), cattle egret (*Ardea ibis*) and great egret (*Ardea alba*). The reserve is an important refuge for the rare freckled duck (*Stictonetta naevosa*).

Landbirds: Most of the landbirds found in the ACT and region have been recorded from the reserve. Species seeking out nectar and insect food sources are to be found in planted shrub cover and along Jerrabomberra Creek, while the grassland areas are favoured hunting areas for raptors including the white-bellied sea eagle (*Haliaeetus leucogaster*), little eagle (*Hieraaetus morphnoides*) and swamp harrier (*Circus approximans*). Of particular interest are the little grassbird (*Megalurus gramineus*), clamorous reed-warbler (*Acrocephalus stentoreus*) and golden-headed cisticola (*Cisticola exilis*). These species are commonly found in the reed beds along the shoreline.

Aquatic and terrestrial non-avian species: The small size of the reserve and its dominance by exotic vegetation result in limited habitat for native species. However, the wetlands support a number of frog, reptile and mammal species including platypus (*Ornithorhynchus anatinus*), eastern water rat (*Hydromys chrysogaster*), striped marsh frog (*Limnodynastes peronii*) and eastern snake-necked turtle (*Chelodina longicollis*) (NCDC, 1984). Foxes, rabbits and hares also inhabit the reserve. Alien carp (*Cyprinus carpio*) are the dominant fish biomass in Lake Burley Griffin and associated waters, which also contain other alien and native fish species (the latter regularly stocked in the lake).

d) Fauna: Management Considerations and Issues

- The presence of waterbirds protected under international bilateral agreements imposes important obligations for the protection and management of the reserve.
- Management activities and increased public access to habitat areas have the potential to disturb and disrupt waterbird feeding and behaviour (especially the more sensitive species).
- Predation or disturbance of birds by feral and uncontrolled domestic animals is an important issue, especially for waders.

2.1.4 Reserve Habitats

The reserve forms part of a vegetated wildlife corridor along the Molonglo River valley and through the parkland system that has developed around Lake Burley Griffin. The area also has an important relationship with aquatic and semi-aquatic habitats in the lake.

There are three main habitat types in the reserve, the most significant being the wetland habitats:

- Aquatic and wetland habitats related to the waters of Lake Burley Griffin. These comprise:
  - open water
  - reed bed
  - mudflat
  - riparian vegetation.
- Exotic grasslands (Dairy Flat grazing land, other grassy areas, marshland and wet grassland).
- Plantings (in particular the woodland that was created on building spoil as part of a landscaping for the reserve from the 1980s) and shrub cover near Kellys Swamp.

These habitats are described in more detail in Table 2.2.

Table 2.2 Jerrabomberra Wetlands: Description of Habitats

Habitat Type	Location/Description	Dominant Plant Species	Habitat Characteristics
Aquatic and Wetland			
Open Water	Jerrabomberra Backwaters, Jerrabomberra Reach, Molonglo Reach, East Basin and Jerrabomberra Creek silt trap.	Ribbon weed (*Vallisneria gigantea*) and water milfoil (*Myriophyllum* spp.) in waters to 4 m deep.	Used by fish-hunting birds (cormorants, darters, pelicans, herons, egrets), also surface feeders and diving birds. Ribbon weed is the major food source for black swans.
Reed Bed	Kellys Swamp, Jerrabomberra Pool, Jerrabomberra Backwaters. Dense reed stands up to approximately 2 m in height.	Bulrush (*Typha orientalis, T. domingensis*) and common reed (*Phragmites australis*).	Reeds provide shelter, food and nesting habitat for some elusive species, swamp hens, reed warblers and little grassbirds.
Mudflat	Located at margins of Kellys Swamp, Jerrabomberra Billabongs and ephemeral pools.	Vegetation absent.	Highly variable margins dependent on intermittent flooding. Attractive to migratory waders and marshland species for resting and feeding.
Riparian Vegetation	Located along the open water/reed beds throughout the reserve. Also occurs in some swales and ephemeral drainage lines.	**Canopy**: Dominant species include white willow (*Salix alba*), weeping willow (*S. babylonica*), crack willow (*S. fragilis*), basket willow (*S. rubens*), alder (*Alnus* spp.), silver poplar (*Populus alba*) and river oak (*Casuarina cunninghamiana*). Dominant shrub species are saplings of the canopy species. **Groundcover**: Dominant species include crowsfoot (*Dactylis glomerata*), cleavers (*Galium aparine*), soft tussock rush (*Juncus usitatus*), mint (*Mentha x piperita*), common reed (*Phragmites australis*), phalaris (*Phalaris aquatica*) and water couch (*Paspalum distichum*).	Provide habitat and movement corridors for terrestrial bird species and habitat for waterbirds such as cormorants.

Habitat Type	Location/Description	Dominant Plant Species	Habitat Characteristics
Exotic Grasslands			
Grassland, marsh, wet and drowned grassland	Exotic grassland dominates most of the reserve, particularly the northern section, and includes many pasture grasses and weeds. Trees and shrubs are generally absent. The groundcover is dense, reaching up to one metre in height. Marshland, wet and drowned grassland occur in abandoned meander channels, ephemeral pools, boggy areas and grassy areas in flood conditions (Peninsula bordering East Basin, parts of Jerrabomberra Backwaters, Shoveler Pool).	Dominant groundcover species (all exotic) include phalaris (*Phalaris aquatica*), curled dock (*Rumex crispus*), paspalum (*Paspalum dilatatum*), wild oats (*Avena* spp.), common couch (*Cynodon dactylon*), scotch thistle (*Onopordum acanthium*) and spear thistle (*Cirsium vulgare*).	Variable extent and condition depending upon lake level, rainfall, evaporation and grazing intensity. When available, drowned grasslands are one of the best waterbird habitats, used by many species including dabblers, filter feeders, and large waders such as herons, ibis and spoonbills. Marshland attracts some of the more seasonal and obscure species such as waders (including Latham's snipe), ibis and herons. Wet grassland is used by snipe, ibis, herons and lapwings. A range of grass birds and common waterbird species such as Australian wood ducks and Pacific black ducks use the broader grassland areas. Dryland grassland areas are also important feeding grounds for a number of predatory birds. Lack of tree cover and fallen timber means there is little suitable reptile habitat.
Plantings			
Woodland/ Shrub Cover	**Planted Woodland**: Located in the south-western sector of the reserve. Contains a variety of indigenous and exotic species (trees and shrubs) with gaps dominated by exotic grasses and woody weeds. Tree canopy is mostly less than 12 m high. Variable shrub layer to 5 m. **Shrub Cover**: Plantings of native shrubs have been undertaken on mounds near bird hides and in rectangular blocks in the Dairy Flat grasslands.	**Planted Woodland**: Dominant canopy species include river peppermint (*Eucalyptus elata*), yellow gum (*Eucalyptus leucoxylon*), red box (*Eucalyptus polyanthemos*) and other eucalypts, river oak (*Casuarina cunninghamiana*) and *Callitris* spp. Dominant shrub species include Cootamundra wattle (*Acacia baileyana*), wedge-leaved wattle (*Acacia pravissima*), bottlebrush (*Callistemon subulatus*) and blackthorn (*Bursaria spinosa*). **Shrub Cover**: Native, including species of *Acacia, Banksia, Callistemon, Grevillea, Hakea and Leptospermum.*	Woodland provides a variety of niches, but could be improved by the introduction of local flowering species. Shrubs provide cover, and nectar and insect food sources.

2.2 Infrastructure and Adjacent Land Uses

The outward presentation of the reserve has been adversely affected by the nearby presence of roadworks, disused land and buildings, and land that is often weed-infested and appears not to be managed. The Kingston Foreshore and proposed East Lake developments will bring a new western and south-western edge to the reserve, already evident for the Kingston Foreshore area. These redevelopments present both opportunities and challenges for management of the reserve. Of critical importance is the planning and design of the Jerrabomberra Creek open space corridor stretching from Jerrabomberra Reach to south of the silt trap, which will form the interface between the reserve and urban development.

It is proposed to prepare a master plan for the reserve for more detailed site planning and to provide a coordinated and strategic approach to capital works investment. This is a *high priority* action listed in s. 10.3.

2.2.1 Reserve Infrastructure

a) External Access and Parking

There are two entry points, neither of which contains high-quality signage (Figure 2.1). These are connected by the main visitor track across the reserve.

Eastern access: An off-road parking area is located near the termination of Dairy Road. This is close to the bird hides at Kellys Swamp. Visitors may find access off the Monaro Highway unclear. A bicycle path adjacent to the disused section of Dairy Road was extended in 2010 to pass the eastern car park and connect to Kingston Foreshore at Newcastle Street.

Western access: The western entry is near Newcastle Street, Kingston. The landscaped parking area has been closed following complaints about criminal activity in the area and is overgrown. The entry consists of a locked gate at the road with an adjacent squeeze post, allowing pedestrian and bicycle, but not wheelchair, access. Visitors usually park along Newcastle Street near where it currently terminates.

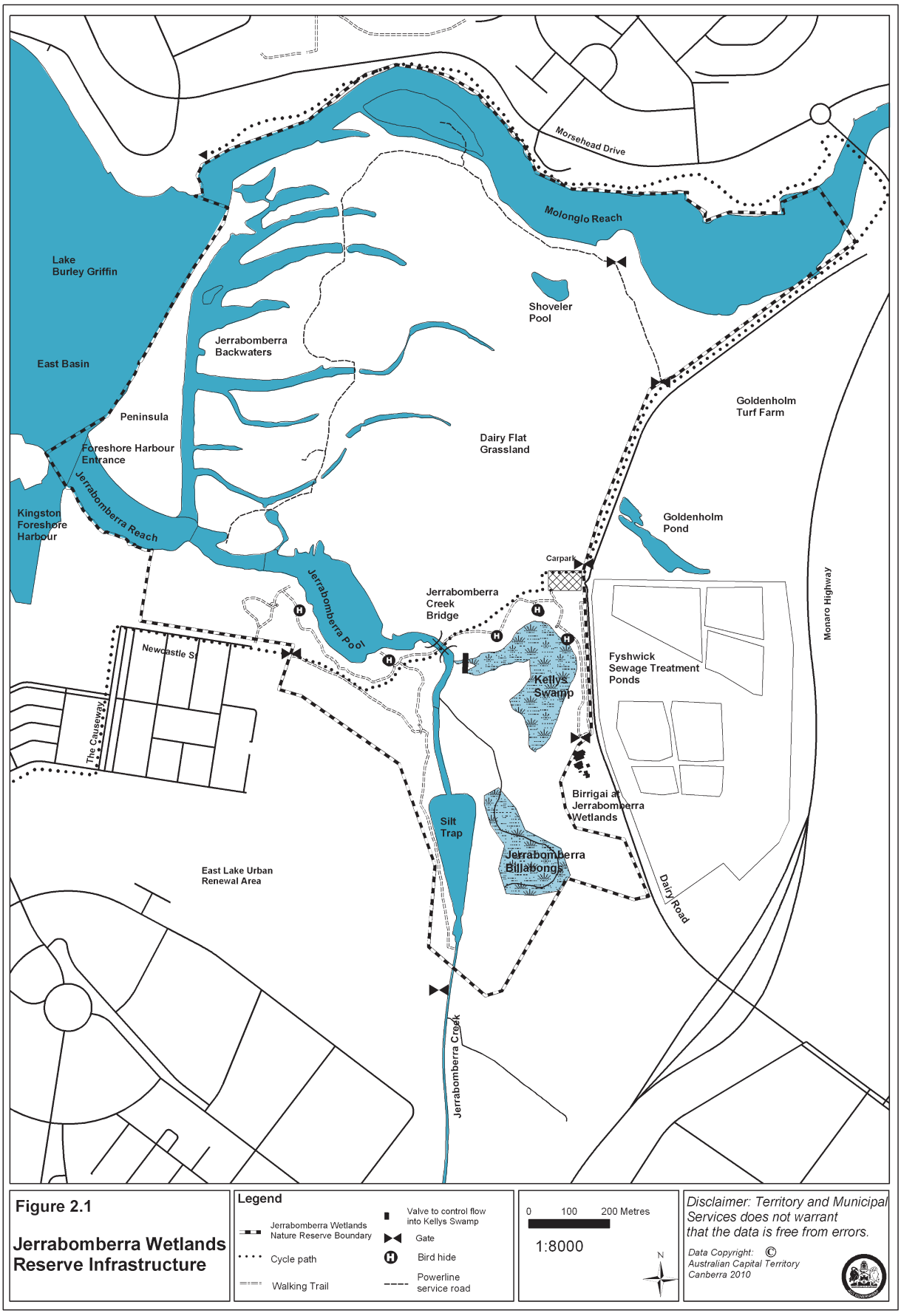
Water access: There are no facilities for direct access to the reserve from adjacent waters. Existing policy prohibits powerboat access to Jerrabomberra Creek (past the entry to Kingston Foreshore Harbour on Jerrabomberra Reach), except for management or emergency purposes; however, there is no signage to this effect. Landing from East Basin or Molonglo Reach in the Peninsula or Jerrabomberra Backwaters area is in contravention of the policies in this plan (see s. 4.2.2). There is currently no signage advising of these restrictions.

b) Signage

External: There are no external direction signs to the reserve. Canberra maps typically show the reserve as 'Jerrabomberra Wetlands' and indicate the Dairy Road parking area.

Internal: Signage is confined to the two main entry points. There is a large interpretative/directional sign at the Dairy Road entry. There is also a large, faded interpretative/directional sign at the start of the walking track from the (closed) Newcastle Street car park. The bird hides contain interpretative material in a fair to good condition.

Figure 2.1 Jerrabomberra Wetlands: Reserve Infrastructure



c) Walking/Cycling Tracks and Internal Access

Walking and cycling tracks are mainly confined to the southern part of the reserve (Figure 2.1). The main walking track connects from Newcastle Street to the Dairy Road car park. Short diversions from this track lead to the bird hides at Kellys Swamp and Jerrabomberra Pool. There are two bridges on this track—a large curved bridge over Jerrabomberra Creek which is shared with the bicycle path and a smaller timber bridge over a gully west of the creek. Views to Jerrabomberra Pool from this track may be obscured by dense vegetation. This track is of cement-strengthened gravel construction and has deteriorated into a loose and cracked surface with an effective width of about one metre. It is unsuitable for wheelchair use. A new cycleway (2010) is separate from the walking track except at the Jerrabomberra Creek bridge, which has been widened to 3 m in accordance with the Austroads guideline for a shared path.

From the locked gate at the end of Newcastle Street there is a vehicle track south to the silt trap. This management track is available to walkers. From the vehicle track, there is a connecting track that joins the main east-west track near one of the Jerrabomberra Pool bird hides. There is a timber bridge on this track.

A path near the south-eastern boundary fence links the Birrigai at Jerrabomberra site with the bird hides on Kellys Swamp.

A formed earth service road runs from the disused Dairy Road (closed to public traffic) in the north-eastern corner of the reserve, along Molonglo Reach and southward through the eastern edge of the Jerrabomberra Backwaters (Figure 2.1). Locked gates preclude unauthorised vehicle access. Shoveler Pool and part of the southern bank of Molonglo Reach may be accessed on foot by 'step-throughs' on the gates in the north-eastern corner. However, there are no signs advising of restrictions on access beyond Shoveler Pool (see s. 4.2.2).

d) Bird Hides

There are five bird hides: three at Kellys Swamp and two at Jerrabomberra Pool. These are in generally good condition though the ones at Jerrabomberra Pool have been subject to minor vandalism (carving of wooden fittings and graffiti). The hides contain interpretative information and are cleaned and maintained by parks staff at approximately fortnightly intervals.

e) Reserve Infrastructure: Management Considerations and Issues

- The lack of external direction signs does not facilitate visitor access to the area.
- There is scope for improved internal signage, especially of an interpretative nature. Restrictions on boating access should be signposted and advised in information on the reserve.
- Lack of a parking area and attractive entry point to the reserve off Newcastle Street is a significant issue. The Kingston Foreshore and East Lake developments will increase recreational pressure on the reserve, with Newcastle Street being the main entry point. This entry and associated parking need to be considered in the planning and design of the Jerrabomberra Creek open space corridor.
- The main east-west walking track requires upgrading to meet relevant guidelines. It is desirable that this be made suitable for wheelchairs.
- Older or disused structures should be removed or upgraded e.g. the old viewing platform in poor condition at the south-eastern end of Kellys Swamp.
- The bird hides are likely to require more active management with population growth near the reserve. However, the presence of more people, street and/or park lighting, and community group involvement with management of the reserve could lessen anti-social behaviour.

2.2.2 Urban Services Infrastructure

a) Major Services Infrastructure

Major services infrastructure for the city is located in the reserve (Figure 2.2), as provided for in the *National Capital Plan* (Jerrabomberra Wetlands General Conditions, Appendix I). The conditions specify that any future proposal for new or upgraded services be required to protect the nature conservation core area and be subject to full environmental assessment. The managing authority for these facilities is ACTEW Corporation Ltd. Service infrastructure comprises:

- Electricity: Power lines which cross the reserve include twin 132kV lines that connect to the Causeway switching station south of Jerrabomberra Creek. These power lines are maintained via a service road that exits the closed-off section of Dairy Road near Molonglo Reach.
- Sewerage:
  - (a) Fyshwick sewerage rising main (buried except at the bicycle path/footbridge over Jerrabomberra Creek).
  - (b) Duntroon irrigation rising main supplies treated effluent from the Fyshwick Sewage Treatment Plant for irrigation of playing fields at Duntroon.
- Water Supply: Googong bulk supply water main.

The maintenance of the Jerrabomberra Creek silt trap is the responsibility of the Department of Territory and Municipal Services.

b) Urban Services Infrastructure: Management Considerations and Issues

- Installation, relocation and maintenance of infrastructure may disturb waterbirds (more sensitive species and during the breeding season). Access should be minimised during the bird-breeding season from late winter to mid-summer.
- Appropriate maintenance, monitoring and reporting procedures should apply to infrastructure in the reserve.
- When infrastructure is relocated, new routes should avoid sensitive habitat areas and the main areas of recreational use. Power line routes should be aimed at minimising visual impact. Relocation of the Causeway switching station provides an opportunity to remove the 132kV power lines from the Refuge Area of the reserve, which is a visually prominent position.

2.2.3 Adjacent Land Uses

a) Kingston Foreshore Development

The Kingston Foreshore Development commenced in 2002 and is based on redevelopment of former light industrial and unused land west and south of Jerrabomberra Reach. The project involves the sequential development of higher density residential and commercial space and a new Kingston Foreshore Harbour near the mouth of Jerrabomberra Creek (Jerrabomberra Reach).

b) East Lake Urban Renewal Area

The East Lake Urban Renewal area complements the Kingston Foreshore Development and is included in the areas targeted for residential intensification in the *Canberra Spatial Plan* (ACTPLA 2004). It is expected that East Lake will eventually contain a mix of residential, commercial and clean industrial uses with supporting infrastructure and have a population of approximately 9000 (ACTPLA 2007). Redevelopment is intended to occur incrementally over the next 30 years.

The urban renewal area is located south and west of the reserve extending from Wentworth Avenue to the Monaro Highway and from the edge of the Kingston Foreshore Development (Cunningham Street and The Causeway) south to Canberra Avenue. Modifications are proposed to Jerrabomberra Creek, including reshaping of the existing silt trap. The purpose of this would be

to create: (a) an appropriate edge to development with attention to the interface zone between the urban area and the reserve; (b) a more 'natural' riparian environment in areas adjacent to the reserve; (c) a more 'natural' water body in Jerrabomberra Creek; and (d) pedestrian access to the creek (ACTPLA 2007). This is in accord with the *Griffin Legacy* proposals (see s. 2.3.3).

c) Railway

The East Lake Urban Renewal area contains Canberra Railway Station and a number of in-service and disused railway lines. These are all outside the reserve. It is proposed to rationalise this infrastructure into an integrated precinct (ACTPLA 2007).

d) Birrigai at Jerrabomberra Wetlands

The Birrigai Outdoor School was incorporated into the existing education centre on Dairy Road when the school near Tidbinbilla Nature Reserve was badly damaged in the 2003 bushfire. Birrigai at Tidbinbilla has been rebuilt and is fully operational. The management of the Dairy Road site has been transferred from the ACT Department of Education and Training to the Department of Territory and Municipal Services.

e) Goldenholm Lease

This is immediately north of the Fyshwick Sewage Treatment Plant. The lease contains Goldenholm Pond, which acts as an in-line pond connecting flood anabranches of the Molonglo River. Irrigated fields surrounding the pond are leased for turf farming and are grazed by large numbers of ducks. Application of fertilizer followed by flooding may result in some movement of nutrients into the reserve. However, these would most likely be assimilated by the phalaris-dominated grassland. There is a pump house for the lease located on Molonglo Reach within the reserve boundary.

f) Fyshwick Sewage Treatment Plant (outside the reserve)

The ponds in this plant provide an important complementary habitat to the reserve (s. 2.1.2). The ponds are currently accessible to bird watchers under a 'sign in' arrangement at the gate.

g) Lake Burley Griffin and Molonglo Reach

The East Basin foreshore contains habitat most suitable for Latham's snipe. This species is sensitive to disturbance, so access to the reserve from the waters of East Basin has been actively discouraged. Only limited power boating is allowed on Lake Burley Griffin (electrically powered boats and conventional powerboats for coaching, rescue and judging purposes) and East Basin has a very low level of boating use (e.g. sailing, rowing) compared to western sections of the Lake. Molonglo Reach Waterski Area, which is upstream of the Sylvia Curley Bridge on the Monaro Highway (outside the reserve), is the approved waterski area in the ACT. Waterskiing is not permitted in Molonglo Reach downstream of this bridge.

Rowing facilities and clubhouses are mostly located in the western sections of Lake Burley Griffin. A rowing club has operated from near the Kingston Foreshore Harbour, but will relocate to another site away from Jerrabomberra Reach as the Kingston Foreshore redevelopment proceeds. Until the relocation of the clubhouse is complete, boats used by this club will be permitted to use Jerrabomberra Reach between the clubhouse launching facilities and Lake Burley Griffin, but not waters further upstream in Jerrabomberra Reach or in the Jerrabomberra Backwaters.

Cruise boats traverse East Basin between Kingston Foreshore and the Molonglo Reach. These boats are relatively quiet and appear to have little impact on waterbirds in these areas. The new Kingston Foreshore Harbour will result in increased boating activity in the lake edge section of Jerrabomberra Reach. Provided vessels do not travel further up the reach or land on the shore at Jerrabomberra Peninsula, impacts on waterbirds should be minimal. Usage of the area should be monitored for such impacts and signage and other information provided on the restriction on access to Jerrabomberra Reach (Figure 2.2).

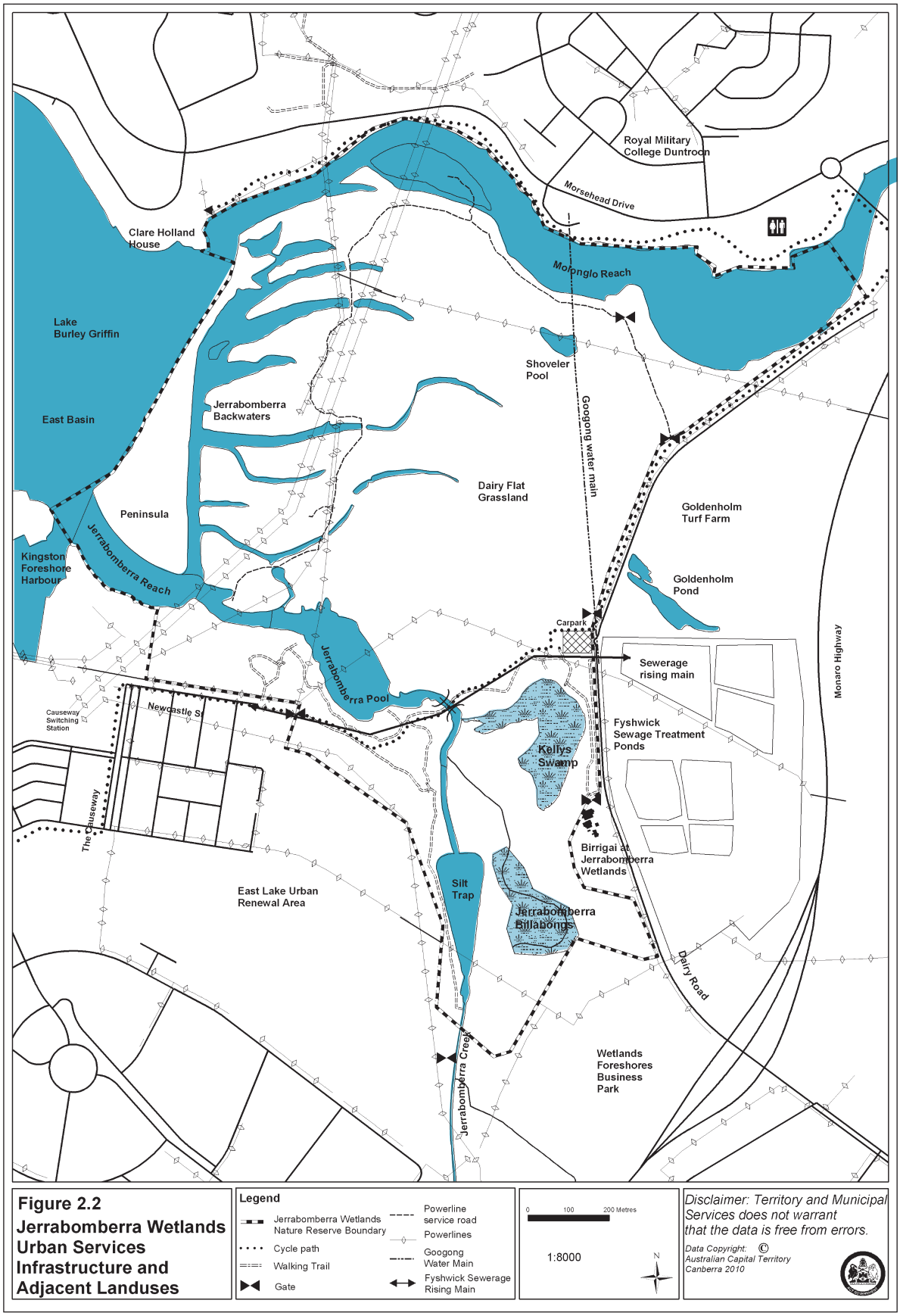
h) Canberra Airport

Canberra Airport is located 3 km east of the reserve. While the operation of the airport has minimal impacts on the reserve, the need to reduce the potential for bird strike on aircraft has been a longstanding concern.

i) Adjacent Land Uses: Management Considerations and Issues

- Development of the Kingston Foreshore and East Lake areas provides the opportunity to improve public access and create additional habitat as part of the planning and design process. This includes opportunities to reshape the existing silt trap and Jerrabomberra Billabongs, and upgrade and naturalise Jerrabomberra Creek, which is identified in the *Griffin Legacy* as an integrated linear park providing a recreation frontage to future development and a corridor to Lake Burley Griffin.
- Residential, commercial and associated infrastructure development adjacent to the wetlands has implications for management of the reserve, including:
  - the effects of changed hydrology on habitats
  - increased recreation use and expectation of improved facilities
  - the need for an appropriate open space interface between residential/commercial redevelopment and the reserve, that is suitable for passive recreational use and will also function as a buffer zone
  - habitat disturbance (e.g. noise, light, domestic animals)
  - a likely increase in commuter cycling through the reserve to connect with the cycle-path to Molonglo Reach (and the lake circuit) and to Dairy Road/Newcastle Street (to Fyshwick).
- Any recreational boating outside but adjacent to the Wetlands would require sensitive management of impacts.
- Use of the reserve for environmental education and any expansion of this use requires consideration of appropriate facilities, minimising disturbance to wildlife, and safety issues near water bodies.
- With regard to habitat enhancement, proximity of the reserve to Canberra Airport requires consideration of potential bird strike hazard.

Figure 2.2 Jerrabomberra Wetlands: Urban Services Infrastructure and Adjacent Land Uses



2.3 Cultural Landscape

2.3.1 A Landscape Timeline

The main elements of the human history that shaped the current reserve landscape and ideas about how it should be used, protected and managed are shown in Table 2.3.

Table 2.3 Jerrabomberra Wetlands: A Landscape Timeline

Time	Period/Event	Comment
Geological Past	Floodplain and paleochannels	The Molonglo River changed its course many times in the floodplain leaving the former channels as evidence. These areas of unconsolidated sediment provided a source of sand for the dunes in the Pialligo-Fyshwick area (NCDC 1988a).
C25 000ybp	Aboriginal	River valleys were favoured occupation sites in the Southern Tablelands and the Pialligo area was a gathering place for Aboriginal people.
Early 19th century	European	The European pastoral economy became established on the Limestone Plains with dairying on the river flats. These flats were also used by Aboriginal people.
1910s	National Capital	Griffin's plan contained an East Lake and Causeway connecting Hume Circle to a Market Centre at Russell. In 1917 Griffin prepared a lake plan study showing waterway levels and earthworks (including East Lake).
1922	Floods destroy Causeway railway bridge	Griffin's temporary railway line to Russell and City abandoned.
1950	Change to Canberra Plan	Griffin's East Lake was formally deleted from *Gazetted Plan* for Canberra.
1964	Lake Burley Griffin fills	Lake water filled the former river channels in the floodplain at Jerrabomberra.
1977–86	Ecological value of area recognised, also development threats	Ecological study group formed and reported in 1982. Seddon (1977) and NCDC (1984) emphasised value of the area. Development threats included proposals for major arterial roads, sand and gravel extraction and associated facilities, and a cycle path through Jerrabomberra Backwaters. Jerrabomberra Advisory Group of ACT Parks and Conservation Consultative Committee (formed 1986) reviewed conservation values and management requirements. These formed basis for first management plan (1994).
1990–1993	Reserve declared	The Jerrabomberra Wetlands Nature Reserve was declared under the *Nature Conservation Act 1980* in 1990 and under the *Land (Planning and Environment) Act 1991* in 1993.
1988–1994	Management plans	The first draft plan was released in 1988. The first plan was finalised in 1994.
From late 1990s	Kingston Foreshore Development	Higher density residential and commercial development commenced on disused industrial land west of the reserve. Redeveloped interface with the reserve.
2004	*Griffin Legacy*	Reappraisal of the Griffin Plan in a 21st century context.
2004	East Lake Urban Renewal Area	Residential intensification area in the *Canberra Spatial Plan*. Proposed redevelopment south and west of the reserve, changes to Jerrabomberra Creek and reserve interface.

2.3.2 Human Use

An extensive and varied stone assemblage collected from the Pialligo area (which includes the land now in the reserve) suggests that it was one of three large lowland campsites for Aboriginal people in the ACT region (Bindon 1973; Flood 1980, p.162). Flood interprets the site as a fishing camp, occupied seasonally at a time of plenty, when social gatherings such as corroborees could be held. Being a frost hollow, it would have been unsuitable for winter occupation. The first European settlers in the 1820s and 1830s recorded these gatherings. It is likely that stone

tools and other artefacts remain buried near the surface in the reserve and could be exposed by disturbance such as earthworks or scouring by floodwaters.

The river flats at Jerrabomberra have been used for agriculture (cropping and dairying) since the early 1800s. However, there is little if any significant archaeological evidence related to these uses. As part of his plan for Canberra, Walter Burley Griffin had a temporary railway line constructed across the Molonglo River on what is now the north-western side of the reserve. Stumps on the northern bank of Molonglo Reach on be the remains of the railway bridge that was washed away in a flood in 1922.

As a whole, Jerrabomberra Wetlands is a cultural landscape with three main visible components: the 'rural' grassland landscape, the dominant exotic vegetation, and the 'artificial' wetland environments created by the filling of Lake Burley Griffin.

2.3.3 The *Griffin Legacy*

Two distinctive features of the Griffin Plan for Canberra (1912, 1913, 1918) were proposals for a large East Lake and a Causeway separating it from the formal East Basin of the lake. The Causeway was aligned directly from Hume Circle to a Market Place at Russell. Neither East Lake nor the Causeway was subsequently built. After the destruction of the temporary Causeway railway bridge over the Molonglo River in 1922, the concept of a connection of the NSW rail line to Russell and the City was abandoned (though it remained in the *1925 Gazetted Plan*). In the *1950 Gazetted Plan* both East Lake and the 'railway through central areas' were deleted (NCA 2004a).

Jerrabomberra Wetlands is part of the Central National Area of Canberra and has been considered in the *Griffin Legacy* project. In reviewing the key elements of the Griffin Plan, the study concluded that the Causeway and East Lake are 'no longer relevant or not recoverable' but proposes as a 21st century opportunity: 'Griffin's East Lake and its Lake Park as a large-scale wetlands park to enhance the ecology of the Molonglo River system' (NCA 2004a, p. 113). The Jerrabomberra Wetlands Park is defined in relation to Proposition 5 of the project, *Extend the City to the Lake*:

> Develop a wetlands recreation park and eco-tourism destination in the location of Griffin's (unbuilt) East Lake – of metropolitan scale (similar to Millennium and Centennial Parks in Sydney) – in the degraded areas of the Jerrabomberra Wetlands (Dairy Road). Enhance wetlands habitat, and include interpretation, boardwalks and picnic grounds (NCA 2004a, p. 190).

The project also identifies the East Lake Urban Renewal Area (southern side of the wetlands) as a Principal Urban Improvement Area. It puts forward a proposal to 'upgrade Jerrabomberra Creek as an integrated linear park, serving an important recreation corridor to Lake Burley Griffin, and as recreation frontage for adjoining future development (Causeway/Hume Circle – Kingston Foreshore extension)' (NCA 2004a, p. 173).

The *Griffin Legacy – Principles and Policies* have been incorporated into the *National Capital Plan* (Amendment 56) and are derived from the 'propositions' in the *Griffin Legacy* project. The principle and policies that apply to Jerrabomberra Wetlands are:

Extend the City to the Lake by:

(a) developing a variety of waterfront activities on Lake Burley Griffin which are diverse in urban, recreational and ceremonial character and are accessible to the public along the waterfront

(b) enhancing lake-based tourist facilities and experiences

(c) maintaining and enhancing the ecological integrity of the lake shore through environmental management requirements for any new development adjacent to or on the lake

(d) developing natural drainage corridors as linear parks and pedestrian/cycle paths to connect with the lake parklands.

The *Griffin Legacy* principles and policies are conceptual and would require translation into

planning proposals and options, informed by more detailed studies of land use capability, engineering and landscape design analysis, and consideration of ecological information and management objectives as outlined in this management plan. For example, this plan identifies very important habitat in the Peninsula area of the reserve (Wildlife Refuge Zone 1, Ch. 3) with a policy of limited access (s. 4.2.2). This habitat should be conserved and the restricted access policy maintained. Preliminary investigation suggests that the area around the silt trap pond and Jerrabomberra Billabongs, rather than the Jerrabomberra Backwaters area, is more suitable for remodelling the terrain to create ponds and walking tracks as part of the reserve.

2.4 Defining the Values of the Jerrabomberra Wetlands

The identification of the values attached to a place is an essential step in formulating management requirements. In broad terms, these values relate to *natural significance*[1] or *cultural significance*[2], though the two may be inter-related and considered inseparable by some people. Jerrabomberra Wetlands Nature Reserve is important for its natural values even though the landscape is largely a cultural one, as previously discussed.

From the 1970s (prior to the area being reserved), the values of the Jerrabomberra Wetlands have been identified and discussed in a range of documents including: ACT Parks and Conservation Service (1994), Anway *et al*. (1975), Lintermans and Ingwersen (1996), NCA (2007), NCDC (1982), NCDC (1984), NCDC (1988a), NCDC (1988b), NCDC (1988c), Seddon (1977), Taylor (1989). These values were also reconsidered as part of community consultation in the preparation of this management plan. The full list of values may be grouped as follows:

1. Biodiversity	The primary value and the main reason for establishing the nature reserve is the range of wetland habitats and the diversity of waterbirds sustained by that habitat. This has been recognised in all the studies referred to above and in community consultation. For waterbirds, the reserve has local, regional, and international significance. Of particular importance is habitat for migratory birds protected by international agreements.
2. Landscape	The reserve is part of the Central National Area of Canberra. Landscape value includes geomorphology (paleochannels), national capital setting, rural and floodplain character, visual characteristics and aesthetic appeal.
3. Recreation	Recreational value derives from the reserve being part of the National Capital Open Space System and is related to other values (e.g. presence of waterbirds).
4. Education and Research	The reserve provides opportunities for education about, and research into, wetland ecosystems, their management in an urban context, and their enhancement and creation. This value is increased by the close proximity of the reserve to educational institutions and research organisations.
5. Cultural Heritage	The reserve is largely a cultural landscape, resulting from past land uses, works undertaken to shape the national capital, and more recent management activities related to improvement of waterbird habitat.

Management requirements for the conservation of these values are discussed in Chapter 4 to Chapter 8.

1 Natural significance means the importance of ecosystems, biodiversity and geodiversity for their existence value or for present or future generations, in terms of their scientific, social, aesthetic and life-support value.

2 Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations.

Australian Natural Heritage Charter. 2nd edition (Australian Heritage Commission 2002)

2.5 Management Goals and Objectives

2.5.1 Management Goals

Considering the prescribed management objectives for nature reserves in the ACT (see s. 1.5.3) and the particular features of the Jerrabomberra Wetlands, the following goals are defined for management of the reserve:

1. **Wetland habitats, waterbird populations and the landscape character of the Jerrabomberra Wetlands are conserved and maintained in perpetuity.**
2. **Canberra residents and visitors value the Jerrabomberra Wetlands for the recreational, educational and research opportunities that derive from the natural and cultural values of the area.**

These goals accord with the Key Objective defined in the Jerrabomberra Wetlands Conditions of the *National Capital Plan* (NCA 2007, Appendix I):

To define and maintain the Jerrabomberra Wetlands as a protected wildlife refuge, in a national capital and urban context, with facilities designed to realise the area's potential as a significant conservation and education resource for Canberra residents, tourists and international visitors.

2.5.2 Management Objectives

Related to the above goals and in order to protect the values identified in s. 2.4, a small number of primary objectives are identified for the management of the reserve. More specific objectives are included in Chapters 4 to 8. Primary management objectives are:

(a) Biodiversity (Chapter 4)

- The diversity of wetland and other habitats is conserved[1].
- Habitats suitable for migratory bird species protected under international agreements are conserved.
- The reserve supports diverse waterbird populations, including migratory species.

(b) Landscape (Chapter 5)

- Distinctive features of the landscape are conserved, in particular, the rural and floodplain character and geomorphological features.
- Management of the reserve takes account of the national capital significance of the area and its role as a significant part of the Lake Burley Griffin foreshore.

(c) Recreation (Chapter 6)

- The reserve is used for recreation activities that are compatible with the conservation values and objectives of the area, and facilities are provided for this purpose.

(d) Education and Research (Chapter 7)

- The reserve is used for education about wetland ecosystems, their management and enhancement, and facilities are provided for this purpose.
- Wetland research is facilitated and supported.

(e) Cultural Heritage (Chapter 8)

- Cultural heritage values of the reserve are identified and conserved.

1 Conservation means all the processes and actions of looking after a place so as to retain its natural significance and always includes protection, maintenance and monitoring. It may also involve actions to repair degradation. It includes conserving natural processes of change (Australian Heritage Commission 2002). For the artificially created Jerrabomberra Wetlands, intervention to manage or create habitats for particular purposes is appropriate.

2.6 Key Management Issues

The most significant management issues for the reserve derive from its inner-city location and the substantial re-development underway or proposed in adjacent areas. These issues include:

- impacts of the Kingston Foreshore Development and the intended redevelopment of the area to the south and south-west of the reserve (East Lake Urban Renewal area), including provision of new infrastructure and changes to existing infrastructure
- the planning, design and development of an appropriate interface with the reserve, in particular, the provision of open space that will provide recreational opportunities for nearby residents and reduce pressure on the reserve (referred to in the *Griffin Legacy* as an 'integrated linear park'). Much of this landscape is currently in a degraded state and some forms part of the 'construction site' for adjacent works
- re-design of the silt trap and associated area to provide visual amenity and recreational opportunity for future residents of the area, waterbird habitat, and water quality control functions in relation to Jerrabomberra Creek and Lake Burley Griffin
- conservation of the habitat for migratory waterbirds protected under international agreements
- access to and through the reserve, in particular, the planning, design and development of a western car park and entry points to the reserve
- weed management
- impacts of boating/water based activities on waters outside and adjacent to the reserve
- opportunities and potential impacts arising from the *Griffin Legacy* project, in particular the proposal to expand and enhance wetland habitats in the reserve (the 'Lake Park'). (This is more likely to be in the silt trap and Jerrabomberra Billabongs area than the northern part of the reserve as presented in the *Griffin Legacy* conceptual diagrams.)

3
Reserve Zoning

3.1 Purpose of Zoning

Zoning is a system of defining areas within a reserve (such as a nature reserve or national park) based on the values that management aims to protect and the types of activities that will be permitted related to the protection of those values. It is a means of expressing management priorities for particular areas related to management objectives. To be useful, zoning must reflect real and significant differences in management emphasis (Worboys et al. 2005).

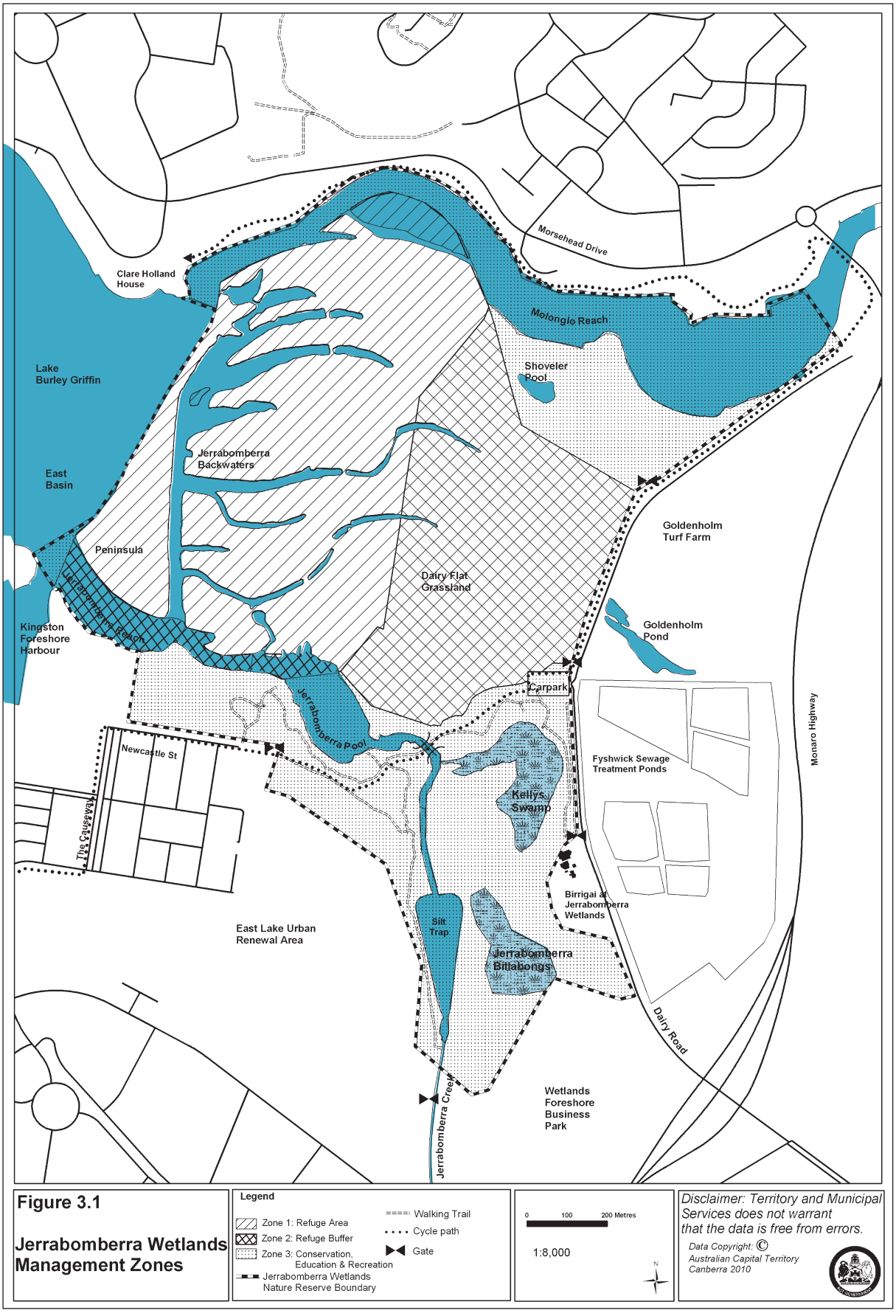
3.2 Management Zones

Three management zones have been defined for the reserve related to the goals defined in s. 2.5.1 (Table 3.1, Figure 3.1). Zones 1 and 2 give priority to the goal of conserving wetland habitats, waterbird populations and landscape character, with controlled and limited public access. Zone 3, while still retaining the conservation goal, provides for a range of public access.

Table 3.1 Jerrabomberra Wetlands Nature Reserve Management Zones

Zone	Location	Values
1 Wildlife Refuge Zone (70.2 ha)	North-western area of reserve: includes the Peninsula, Jerrabomberra Backwaters and exotic grassland.	Contains diverse habitat for aquatic wildlife, particularly wetland birds. Includes permanently flooded paleochannels. Contains habitat for migratory birds such as Latham's snipe. Exotic grassland provides habitat for grassland birds and for waterbirds when flooded.
2 Refuge Buffer Zone (50.0 ha)	Includes Jerrabomberra Reach and exotic grassland in the north-eastern and central area of the reserve.	Contains diverse habitat, including deep water habitat for aquatic wildlife, particularly wetland birds. Includes exotic grassland and ephemeral wetland which provides habitat for smaller birds and wetland species including Latham's snipe, and hunting areas for raptors. The rural and floodplain character of Dairy Flat has important landscape value.
3 Conservation, Education and Recreation Zone (86.5 ha)	Includes Molonglo Reach, Shoveler Pool, Jerrabomberra Creek, Jerrabomberra Pool and Kellys Swamp, the silt trap and Jerrabomberra Billabongs.	Contains diverse habitat, including deep water habitat, for waterbirds and other aquatic wildlife. Contains some (planted) woodland suitable for terrestrial bird species. Provides a range of educational and recreational opportunities.

Figure 3.1 Jerrabomberra Wetlands: Management Zones



Zoning in this plan is slightly simplified from the former management plan and largely accords with Specific Policy Areas defined in Appendix I of the *National Capital Plan* (Table 3.2).

Table 3.2 Jerrabomberra Wetlands Nature Reserve Management Zones: Comparison with *National Capital Plan* and previous (1994) Management Plan

Zone (this Plan)	1994 Management Plan	*National Capital Plan*
1 Wildlife Refuge Zone	Refuge Area (Parts one and two), Controlled Access	A1: Nature Conservation Core Area (Jerrabomberra Backwaters)
2 Refuge Buffer Zone	Buffer Area Notes no entry to Jerrabomberra Reach for boats, canoes, etc	B1: Wetland Buffer Zone (Dairy Flat West: rural buffer zone)[1] No Specific Area Conditions are specified for Jerrabomberra Reach (up to the Jerrabomberra Pool)
3 Conservation, Education and Recreation Zone	Public Access, Bird Viewing (Shoveler Pool)	A2: Nature Conservation Core Area (Jerrabomberra Pool, Kellys Swamp) C1: Molonglo Reach Recreation (Shoveler Pool, Molonglo Reach) E2: Newcastle Street Extension (south of Kellys Swamp) No Specific Area Conditions are specified for the silt trap and Jerrabomberra Billabongs

1 The boundaries of the Dairy Flat Grassland (Zone 2) may be modified to increase the area of Zone 3 e.g. to provide a continuous open space connection between the southern and northern areas of the reserve for an increased range of conservation, education and recreation purposes.

4
Biodiversity

4.1 Primary Management Objectives

Primary management objectives (s. 2.5.2) for biodiversity are:

- **The diversity of wetland and other habitats is conserved and enhanced.**
- **Habitats suitable for migratory bird species protected under international agreements are conserved and enhanced.**
- **The reserve supports diverse waterbird populations, including migratory species and rare or uncommon species.**

Biological diversity (biodiversity) is the variety of all life forms (plants, animals, micro-organisms, their genes) and the ecosystems of which they form a part (Commonwealth of Australia 1996).

As noted previously, Jerrabomberra Wetlands is unusual in that the area has high biodiversity value in a largely artificial landscape. This biodiversity value is based around wetland habitats, the conservation of which is a goal of this management plan (s. 2.5.1). The small size of the reserve, its location amidst a range of urban land uses, its wetland habitats created by and maintained by the presence of a large urban lake, and its vegetation cover of mostly introduced and planted species mean that it cannot be considered from a biodiversity perspective in the same terms as a large natural area such as Namadgi National Park. In relation to biodiversity conservation, the following attributes of the reserve are significant:

- **Bioregional context**: The reserve is one of a number of wetlands in south-eastern NSW. Even though there are now well established permanent populations of many waterbird species on Lake Burley Griffin, waterbirds move between wetlands depending on seasonal conditions and may migrate considerable distances. The reserve is a 'drought refuge' habitat when large regional wetlands dry up and may become more important if some wetlands are drier for longer periods due to climate change.
- **Connectivity**: Wetland habitats at Jerrabomberra have a complementary relationship with the waters of Lake Burley Griffin, in particular, but also the Molonglo River and Jerrabomberra Creek. At the largest scale, they have connectivity to the northern hemisphere habitats of migratory species. Jerrabomberra Wetlands is part of the National Capital Open Space System (Lake Burley Griffin) in the *National Capital Plan* and connects to other reserves in Canberra Nature Park (*Territory Plan*).
- **Habitat diversity**: The reserve contains areas of drowned grassland, mudflat, shallow water and marshland. These types of habitat are not widespread in the ACT and at Jerrabomberra Wetlands vary in size or are ephemeral depending on seasonal conditions.
- **Created habitats**: There are opportunities to create and enhance habitat in the reserve, within certain constraints, and in relation to the planning and design of adjacent redevelopment areas.
- **Pest plants**: The mainly exotic vegetation of the reserve contains many ACT declared pest plants and other problem weed species. These provide habitat but require ongoing control.

Components of biodiversity at Jerrabomberra Wetlands are considered below: wetlands and other habitats (s. 4.2), vertebrate fauna (s. 4.3), vegetation (s. 4.4) and pest plants and animals (s. 4.5).

4.2 Wetlands and Other Habitats

The reserve comprises mainly wetlands, grassy floodplains, tree and shrub covered riparian areas, and open waters that merge into Lake Burley Griffin. There is some planted woodland and shrub cover (Table 2.2). Much of the aquatic and wetland habitat of the reserve is maintained by the relatively stable water level of the lake and does not experience the seasonal and episodic fluctuations in water level typical of many naturally occurring Australian wetlands. During high

flows, water overtops the banks of the Molonglo River and Jerrabomberra Creek to enter the surrounding floodplain and create valuable ephemeral habitat. An important attribute of the wetlands is the 'drought refuge' habitat they provide when large regional wetlands such as Lake Bathurst and Lake George dry up. Sedimentation and the effects of high volume flows, which may become more frequent with urbanisation of the Jerrabomberra Creek catchment are discussed in Chapter 9.

Reserve habitats are outlined below in three categories: aquatic and wetland (including riparian) (s. 4.2.2), exotic grasslands (s. 4.2.3) and plantings (s. 4.2.4).

4.2.1 Objectives for Wetlands and Other Habitats

- Aquatic and wetland habitats are conserved and enhanced so as to maintain the diversity of waterbird species occurring in the reserve.
- Habitats suitable for migratory bird species protected under international agreements are conserved and enhanced where appropriate.
- Aquatic and wetland habitats that are suitable for education and to promote appreciation and understanding of wetlands are conserved and/or developed.
- Terrestrial habitats are managed to maintain and enhance the diversity of terrestrial birds and non-avian fauna in the reserve.

4.2.2 Aquatic and Wetland Habitats (including riparian zones)

The presence of important wetland habitats was the main rationale for the establishment of the Jerrabomberra Wetlands Nature Reserve and these habitats warrant management priority.

(a) Peninsula and Jerrabomberra Backwaters (Zone 1)

These areas in the north-western part of the reserve (Figure 3.1) provide habitat for species or individual birds that are sensitive to disturbance. They also provide habitat to which waterbirds may retreat if flushed from other areas. Latham's snipe can be found throughout the wetlands but favours the Peninsula area. It is most frequently seen from August to October but may be present until March. The most sensitive period in the life cycle of most waterbirds is the breeding season (generally July to December). Although the Peninsula and Backwaters are not the main local breeding area for many species, they are the least disturbed high-quality waterbird habitat associated with the lake. The level of Lake Burley Griffin maintains the wetland habitat in this area and the main management consideration is control of access.

Policies

- There will be no general access. Access will be subject to the approval of the manager of the reserve who may determine the size and number of parties entering the Refuge Zone and the times of year such parties may enter.
- Access from the water will not be permitted except for management, research and emergency purposes.

Peninsula

- Access will be strictly limited from August to October. Authorised access will be only for essential management tasks or research that cannot be conducted elsewhere or at other times. Access will be conducted in a way that minimises disturbance to Latham's snipe.
- During the remainder of the year (November to July), access may be approved for educational, scientific or ornithological purposes. However, the conditions for the August to October period may be extended in some years.

Jerrabomberra Backwaters

- Access may be approved for educational, scientific or ornithological purposes throughout the year. However, disturbance will be minimised in the period July to January. Activities may not be permitted if they can be undertaken elsewhere in the reserve or on urban lakes.
- Where possible, routine maintenance of urban services infrastructure (e.g. power lines) should be carried out at the time of the year when there will be minimal disruption to wetland birds.

Actions

- Include advice on access restrictions to the Peninsula and Jerrabomberra Backwaters (Refuge Zone) in information about the reserve and in signage.
- Provide advice to ActewAGL and other relevant agencies on minimising disturbance to wetland birds in undertaking routine maintenance of urban services infrastructure.

(b) Jerrabomberra Reach (Zone 2) and Jerrabomberra Pool (Zone 3)

Jerrabomberra Reach and Jerrabomberra Pool are permanent deep water habitats maintained by the backed up of water from Lake Burley Griffin. The waters and associated riparian zone provide importanedt habitats for waterbirds, landbirds, and non-avian species e.g. eastern water rat. The area provides sheltered habitat for bird species, including fish-feeders, that prefer relatively open and deeper water e.g. cormorants, grebes, ducks, and pelicans. Fringing reeds and riparian vegetation provide habitat for both waterbirds and landbirds. Jerrabomberra Pool is one of the two main public waterbird viewing areas in the reserve and has two bird hides (s. 2.2.1). Riparian vegetation in this area needs to be managed to retain habitat, control pest plants, and maintain views from bird hides.

It is inevitable that the Kingston Foreshore development and the proposed East Lake redevelopment will increase substantially the recreational pressure on Jerrabomberra Reach and Jerrabomberra Pool. Redevelopment of the Kingston Foreshore Harbour will increase boating activity in the north-western part of Jerrabomberra Reach. The Kingston Foreshore development is aimed at increasing the level of human activity, associated with harbour-side restaurants and a redesigned parkland edge to Lake Burley Griffin and Jerrabomberra Reach. This activity is likely to encourage some waterbird species, in particular, those species that are attracted to feeding by visitors, such as swans, ducks and seagulls. As part of these developments it is desirable that visitors be discouraged from feeding the birds by signage and other information. This plan retains the policy of prohibiting power boat access to Jerrabomberra Reach past the entry to the Kingston Boat Harbour (except for management and emergency purposes).

Crucial to the maintenance of the habitat value of this area is the future design of the landscape between the new urban development and Jerrabomberra Creek. This landscape should serve the following functions:

- a ‘buffer’ or transitional zone between urban redevelopment and the reserve, that combines aesthetic, recreational and ecological values
- passive or low key recreational opportunities
- riparian habitat that complements the aquatic habitat
- opportunities to observe wildlife (especially waterbirds) in an unobtrusive way using the bird hides.

Policies

- Boats (all types) are prohibited from entry to Jerrabomberra Reach past the access to Kingston Foreshore Harbour (except for management or emergency purposes). Note: Rowing club access to Lake Burley Griffin, via Jerrabomberra Reach, will cease when the club facilities are relocated.
- Riparian vegetation in this area will be managed to retain habitat, control pest plants, and maintain views from bird hides.

- Landscape design for the area between new urban development and Jerrabomberra Creek that functions as an appropriate buffer, provides low key recreational opportunities, maintains and improves riparian habitat, and provides opportunities to observe wildlife will be supported.

Actions

- Provide advice on the prohibition of boating access to Jerrabomberra Reach (past the entry to Kingston Foreshore Harbour) in information about the reserve and in signage.
- Undertake management of riparian vegetation in relation to the policy (above).
- Provide advice as required on the design of the landscape between adjacent urban development and Jerrabomberra Creek.
- Provide advice discouraging the feeding of wildlife (especially waterbirds) in information about the reserve and in signage.

(c) Molonglo Reach and Shoveler Pool (Zone 3)

Molonglo Reach is a stretch of open water habitat with a shoreline of trees and open parkland. Waters of the reach are used for canoe training but are otherwise relatively undisturbed. Sections of the southern bank of Molonglo Reach are of local interest as breeding sites for great cormorants, little pied cormorants and darters. The latter two species are known to also breed elsewhere in the ACT (COG 2005). The area is used for roosting by these species and rufous night herons and disturbance should be avoided, especially over the September to May breeding season. The reach is also a refuge area for freckled ducks. Shoveler Pool is an artificially created ephemeral water feature near the cormorant breeding site and attracts a variety of waterbirds. Foot access to this area is along the powerline service road from the (closed) Dairy Road. This could be a suitable location for another bird hide.

Policies

- Foot access along the powerline service road will be permitted as far as Shoveler Pool.
- Access advice will be provided at the reserve boundary (service road gate).
- Bird hides are not proposed currently for Shoveler Pool/Molonglo Reach. However, the provision of a hide may be considered in the future.

Actions

- Erect an access advisory sign at the reserve boundary (service road gate) near Shoveler Pool.

(d) Kellys Swamp (Zone 3)

Kellys Swamp is a focal point for the reserve. It provides a range of environments for waterbirds and is the main waterbird observation area. The swamp receives water along a channel from Jerrabomberra Creek. A valve has been installed on the channel that can be closed to stop inflow of water and therefore isolate the swamp. Without inflow, as water evaporates from the swamp, mud flats (a restricted habitat in the reserve) become exposed. However, this facility has not been used and the water level in the swamp has been allowed to fluctuate with lake levels and seasonal conditions. In drought periods, with falls in lake level and no other inflows, the swamp has dried up.

There is a need for a more complete understanding of the habitat impacts of flows into and out of the swamp, particularly if urbanisation in the catchment results in increased flow in Jerrabomberra Creek. Unseasonal rises in water levels may result in nest flooding.

Policies

- Kellys Swamp will be conserved and managed as the main public waterbird observation area in the reserve.

- While, in general, natural water level fluctuations will be allowed to occur in Kellys Swamp, the capacity to manipulate water levels will be retained.
- The effects of urbanisation in the Jerrabomberra Creek catchment on inflows to Kellys Swamp will be monitored and, if required, the flows controlled via the inlet valve.

Actions

- Review the potential to manipulate water levels in Kellys Swamp (in particular to expose mud flats).
- Monitor the effects of urbanisation in the Jerrabomberra Creek catchment and evaluate the need to control inflow to the swamp.
- Investigate and where appropriate undertake habitat enhancement activities at Kellys Swamp. As part of this, evaluate: (a) placement of emergent logs in the water; and (b) extra plantings or screen fences on the eastern side of the swamp between the bird hides so as to reduce disturbance by visitors.

(e) Jerrabomberra Billabongs (Zone 3)

The pattern of waterbird use of the Jerrabomberra Billabongs is related to water level with generally higher numbers in winter and spring and following rain events. The area around the billabongs is exotic grassland managed as a buffer zone and grazed by cattle to reduce fuel load. Cattle grazing is also used to provide diversity of habitat within the reserve by maintaining mud flats which are of benefit to a number of small wading bird species.

As part of the proposed East Lake redevelopment, the area encompassing the billabongs and the silt trap will be considered from a number of perspectives, in particular, recreational amenity, habitat enhancement, habitat value and protection of the reserve, water flow, water quality and ecological connectivity (see s. 4.2.2(h)). Planning, design and redevelopment of the area will take many years and extend beyond the life of this management plan.

Policies

- The Jerrabomberra Billabongs and surrounding area will be managed as a buffer zone between the southern reserve boundary and Kellys Swamp. The use of the area will be kept under review and considered as part of the planning and design for the East Lake area. Opportunities will be taken as part of this redevelopment to improve the ecological and recreational values of the area, as well as its water quality management function.
- Public access (e.g. a walking track and possibly boardwalks), including disabled access, to the Jerrabomberra Billabongs area, will be considered as part of the future design of the area.

Actions

- Continue grazing of the Jerrabomberra Billabongs area for fuel reduction purposes as necessary and to provide diversity of habitat for wading bird species.
- Use the opportunity presented by the intended East Lake redevelopment to enhance the ecological and recreational values of the billabongs area, as well as its water quality management function.

(f) Jerrabomberra Creek Silt Trap (Zone 3)

The silt trap functions as an area of open water habitat in the reserve, surrounded by phalaris-dominated grassland. The trap is popular with carp fishers. As the redevelopment of East Lake proceeds, the silt trap and surrounding area will assume much greater importance as a recreational and aesthetic resource for nearby residents, as well as serving its hydrological, water quality and ecological functions. There is potential to improve the waterbird habitat provided by the silt trap by reshaping the pool to include shallow water, marsh and mudflat areas in its eastern sections away from the more intensively used western foreshores, which will be more formalised due to the relationship with future urban development. Consideration needs to be given to which

waterbird species might be encouraged in relation to the operation of Canberra Airport. Habitat enhancement, recreational amenity, water quality control and flood flow management are multiple objectives for the area as part of the redevelopment.

Policies

- In conjunction with the primary purpose of the Jerrabomberra Creek silt trap, the area will be managed as complementary habitat to other habitats in the reserve.
- Investigation of the potential to improve the range of habitats provided by the silt trap area, especially habitat that is less common in the reserve, will form part of the planning and design of the area.

Actions

- Use the opportunity presented by the intended East Lake redevelopment to enhance the ecological and recreational values of the silt trap area, as well as its water quality management function.

(g) Fyshwick Sewage Treatment Ponds and Goldenholm Pond (outside the reserve)

These areas provide complementary habitat to the reserve (see s. 2.1.2 and s. 2.2.3).

(h) Enhancement of Aquatic and Wetland Habitat

It is desirable to undertake habitat creation and enhancement in the reserve in accordance with the goals and objectives of this plan. Examples of habitat enhancement are manipulation of vegetation, variation to hydrology to create particular types of wetland habitat (see, for example, discussion of the Jerrabomberra Billabongs and silt trap, s. 4.2.2(e) and (f) above), placement of habitat features (e.g. logs and roosting posts), and planting to create shelter or screening. Management of reserve vegetation is included in s. 4.4.

Redevelopment in the Kingston Foreshore and East Lake areas (s. 2.2.3) presents opportunities for habitat creation and enhancement, including complementary habitat to that within the reserve. The density of development underway or proposed is such that the main opportunity for this is in the Jerrabomberra Creek riparian zone and the southern part of the reserve. The appropriate context in which to consider habitat creation and enhancement is in planning for: (a) the hydrological effects of these developments; (b) the recreational pressures on open space likely to be created by residents; and (c) an interface with the reserve that is cognisant of its wetland habitat and biodiversity values.

The following are specific examples of habitat enhancement that would be desirable in the reserve:

- swamps, marshes, reed beds and shallow lagoons to improve variety and provide more habitat for uncommon and threatened species such as bitterns (Australasian bittern, little bittern) and painted snipe
- islands in open water (e.g. if the open water area was expanded around the current silt trap as part of the East Lake redevelopment) to provide resting and breeding sites inaccessible to predators such as foxes
- fencing of areas where waterbirds regularly breed or have young, in order to exclude predators such as foxes.

The potential at Jerrabomberra Wetlands to create new wetland habitats, particularly in the extensive grassland area, has been considered since before the reserve was declared. Most recently the idea was included in conceptual diagrams for the wetlands as a 'Lake Park' in the *Griffin Legacy* (NCA 2004a). However, any new water bodies created would be less extensive than shown in the *Griffin Legacy* concept plan due to the need to consider carefully which waterbird species would be attracted to the area, as well as the need to avoid disturbance to the paleochannels. An important consideration is the proximity of the Canberra Airport, and the likelihood that expanded habitats would attract a larger number and variety of waterbirds. Previously, concern has been raised by the airport operator about the risk posed by large-bodied spiralling species

(e.g. Australian pelican, spoonbills, herons, ibis), some of which are often seen at high altitudes in summer over the eastern end of Lake Burley Griffin. The emergency flight path for Canberra Airport is over Lake Burley Griffin and Jerrabomberra Wetlands. There is also a high level of general aviation movements at a relatively low altitude in the vicinity of the airport for which bird strike is a hazard. However, an expansion of some types of wetland habitat (e.g. swamps, reed beds, marshes, mud flat) is unlikely to have a significant impact on airport operations due to the types of waterbirds that would be attracted.

Existing policy for the reserve is to not encourage high-flying species, nor to increase the number of birds of individual species that may be a hazard to aircraft. However, bird-strike data for the airport indicates that most strikes are with common terrestrial species that occur at the airport. It is not possible to quantify bird strike risk associated with the wetlands, and a continuation of the current policy is prudent until new information becomes available. In considering the options for habitat creation and enhancement, for example in the Jerrabomberra Billabongs area, it would be useful to review information such as bird strike data, bird behaviour, and aircraft movement patterns and numbers to enable a more accurate assessment of the bird strike risk.

Policies

- Habitat enhancement activities will be undertaken in accordance with the objectives of this management plan. Particular attention will be given to: (a) those areas that are the focus of recreational and educational activities in Zone 3 of the reserve (s. 3.2); (b) habitats for rare and threatened species; and (c) habitat that is limited in the reserve such as mudflat.
- The need to retain areas of undisturbed habitat will be considered as part of habitat enhancement proposals and access to such areas (e.g. paths) will not be provided.
- Proposals for creation or enhancement of wetland habitat will be subject to environmental assessment, including the bird-strike risk for Canberra Airport.

Actions

- Evaluate and undertake habitat creation and enhancement activities in the reserve including opportunities associated with urban redevelopment in the Kingston Foreshore and East Lake areas (including outside of the reserve).
- Prior to carrying out any habitat enhancement, review information such as bird strike data, bird behaviour and aircraft movement patterns and numbers to enable a more accurate assessment of the bird strike risk.

4.2.3 Exotic Grasslands

The large area of exotic grassland in the reserve reflects its history of agricultural use (Table 2.2) and the grassland is still managed by cattle grazing (see s. 4.4.4). When available, drowned grasslands are favoured waterbird habitat. The grassland is dominated by the introduced pasture species phalaris (*Phalaris aquatica*), which thrives in moist, nutrient-rich sites and withstands seasonally dry conditions. Phalaris is tall (flowering stems to 1.5 m), tussocky, and retains dried leaves for many months (Muyt 2001). This provides suitable habitat for Latham's snipe, which readily uses modified or artificial habitats (Higgins and Davies 1996). The exotic grasslands around Kellys Swamp and the silt trap area are feeding grounds for some birds of prey and double-barred finches (*Taeniopygia bichenovii*) and red-browed finches (*Neochmia temporalis*) forage in the eco-tone between shrub land and grassland.

The grasslands contain many weed species of concern (s. 4.5.2) including thistles, and weed control is an important management issue. Grassland management is discussed in s. 4.4.

Policies

- Public access (primarily for bird watching) will be permitted to grassland in the Refuge Buffer Zone (Zone 2) (s. 3.2), but will not be actively encouraged, nor will facilities be provided.

Actions

- Undertake weed control in grassland areas without unduly disturbing the wildlife.

4.2.4 Plantings

Planted woodland and shrub plantings (Table 2.2) add to the habitat diversity of the reserve and are discussed further in s. 4.4.2. There is potential for new plantings in the Jerrabomberra Creek corridor (including areas outside the reserve) to contribute to habitat values and ecological connectivity.

Policies

- Woodland and shrub plantings will be undertaken to improve habitat diversity and ecological connectivity and complementary plantings will be encouraged in the Jerrabomberra Creek corridor, outside the reserve.

4.3 Vertebrate Fauna

The main focus of this plan is on vertebrate fauna, in that there are no specific provisions for invertebrates. However, many types of terrestrial and aquatic invertebrates are important food sources for birds and find suitable habitats in the reserve. The three main components of the vertebrate fauna of the reserve are waterbirds, landbirds, and a limited number of aquatic and terrestrial non-avian species (s. 2.1.3 and Appendix 1). Seasonal migration of birds, especially waterbirds, is an important feature of the reserve.

4.3.1 Objectives for Vertebrate Fauna Conservation

- The reserve supports diverse waterbird, terrestrial bird and non-avian fauna populations.
- The diversity of fauna occurring in the reserve is conserved and enhanced, where this is appropriate and feasible.

The most significant management actions for fauna conservation involve the protection and management of habitat (s. 4.2), and avoidance of habitat disturbance by activities such as recreation and infrastructure maintenance. Assessing the state of biodiversity conservation requires data on species and/or ecological communities derived from survey, monitoring and research. Records of the Canberra Ornithologists Group and other data (e.g. surveys by reserve managers) provide information on the birds of the wetlands, but there is limited knowledge of the presence and abundance of other fauna in the area.

Policies

- Fauna conservation will be a primary consideration in the management of the reserve, in planning reserve facilities, and in arrangements for infrastructure maintenance.

Actions

- Collect biological and ecological information on the fauna of the reserve to assess conservation needs through survey, monitoring, use of existing records and other information sources.
- Evaluate and undertake appropriate management actions in support of fauna conservation (especially in relation to migratory waterbirds) on the basis of biological and ecological information.
- Pursue fauna conservation and enhancement objectives as part of the planning for the interface between the reserve and the Kingston Foreshore and East Lake areas.
- Undertake feral animal control, particularly during the bird-breeding season.

4.4 Vegetation

4.4.1 Objective for Vegetation Management

- Manage vegetation to provide habitat for a diverse range of waterbirds, terrestrial birds and non-avian fauna populations, to control declared and other problem weed species, and to maintain the other values of the reserve.

4.4.2 Reserve Vegetation

Reserve vegetation is also discussed in s. 2.1.3 and related to habitats in Table 2.2.

(a) Reed Beds

Open shallow waters are important for waterbird feeding but may be colonised by bulrush (*Typha* spp.) and common reed (*Phragmites australis*). These plants contribute to the sedimentation of such areas. Bulrush has been controlled around Kellys Swamp to retain open views from the hides.

Management considerations and issues: Reeds provide important habitat in the wetlands but their growth may need to be controlled on a site-specific basis.

(b) Riparian Vegetation

Riparian vegetation is a very important habitat in the reserve but contains many weed species (especially woody weeds) (see s. 4.5).

Management considerations and issues: Ongoing control of woody weeds is required with particular attention to ACT declared pest plant species. Because of their habitat importance, woody weed control programs should always consider replacement planting of desirable species. The reserve contains dense riparian willow growth.

(c) Exotic Grassland

Exotic grassland dominates most of the reserve and only a few small areas of indigenous grassland remain. The exact composition of vegetation cover of the area at the time of European settlement is not known (s. 2.1.3). Currently, there is little justification, and it is not practicable, to attempt to establish native grassland across the reserve. While it has become a practicable and economic proposition to establish native grass swards in particular circumstances (e.g. landscape buffers to native grassland), large-scale establishment of native grasslands is not feasible with current knowledge, technology and funding (ACT Government 2005; Ross 1999). However, the use of native grasses will be evaluated as part of landscaping and vegetation management in the reserve. Grassland in the reserve is managed mainly by cattle grazing (see s. 4.4.4) with slashing and mowing of high-use areas such as near the bird hides, eastern car park and main east–west walking track.

Management considerations and issues: It is appropriate to retain the extensive exotic grassland areas in the reserve (in particular, Dairy Flat (Zone 2)) and manage the biomass by controlled cattle grazing. Ongoing control of herbaceous weed species (both forbs and grasses) is required, in particular, ACT declared pest plant species.

(d) Plantings

Woodlands: The eucalypt dominated planted woodlands in the south-west of the reserve were established on imported clay fill between 1992 and 1999. Shrubs and groundcovers were originally selected to mimic sandstone heath habitat and attract insectivorous and nectar-feeding species of small birds. In the absence of active management, many of the plantings have died and not been replaced. The large openings have become weed dominated and carry thick phalaris stands. While parts of the planted woodlands with intact structural integrity provide good habitat for a range of small birds and other fauna, sites without understorey have fewer habitat values. There is potential to enhance the Jerrabomberra Creek corridor, building on the existing planted woodlands to provide ‘stepping stones’ for mobile fauna. This would also improve the connectivity

with woodland and open forest to the north-east (Mt Pleasant northward) and south-east (along Jerrabomberra Creek), especially if some planting clusters are established in the reserve north of Jerrabomberra Creek and south of Molonglo Reach.

Management considerations and issues: Planted woodlands contribute to the habitat diversity of the reserve, but need active management to fill gaps and control woody weeds. The woodlands provide the basis for an enhancement of habitat along Jerrabomberra Creek and ecological connectivity beyond the reserve.

Shrubs: Native shrub species have been planted in parts of the reserve (near bird hides, the planted woodland, and in four rectangular blocks on the Dairy Flat grassland). These provide cover and food sources for insectivorous and nectar-feeding birds.

Management considerations and issues: Biodiversity benefits should be used to help guide future species selection in the Jerrabomberra Creek corridor (including outside of the reserve). More native shrub plantings would provide habitat in the reserve and contribute to ecological connectivity beyond the reserve.

4.4.3 Vegetation Management

Vegetation management is a key issue for the reserve, which is atypical for a nature reserve in that the area contains no semblance of its indigenous vegetation cover. Vegetation comprises mainly sown and naturalised exotics and some planted native trees and shrubs (Table 2.2). The presence of many weed species (see s. 4.5) poses particular dilemmas for management, especially when these form part of important habitat. Management of the vegetation in the reserve since its declaration has been based on:

- continuation of the predominantly exotic vegetation cover
- control of weed species, in some instances balanced against their habitat value (e.g. riparian willows)
- planting of native tree and shrub species as part of new developments e.g. screen plantings adjacent to the Kellys Swamp bird hides, on the shaped spoil south of Jerrabomberra Pool, around the silt trap and along Jerrabomberra Creek
- a program of native planting following willow removal that has been in place since 2004.

This raises the question of what should be the long-term objective for vegetation in the reserve, in particular, should the predominantly exotic cover be maintained or should greater attention be given to re-establishing native vegetation. There is little practicable alternative but to maintain the predominantly exotic vegetation cover over most of the reserve; however, it is appropriate that native species be progressively introduced in activities such as landscaping and site rehabilitation, particularly following willow removal. Principles to guide vegetation management are set out below in which habitat enhancement ('creative conservation') is emphasised over a focus on 'restoration'.

Ecological restoration is a growing scientifically based discipline and may involve regeneration, restoration or reinstatement (often in combination), that represent progressively greater degrees of human intervention. Definitions adopted for this plan are from the *Australian Natural Heritage Charter*, 2nd edit. (AHC 2002a):

- **Regeneration** means the natural recovery of natural integrity following disturbance or degradation.
- **Restoration** means returning existing habitats to a known past state or to an approximation of the natural condition by repairing degradation, by removing introduced species or by reinstatement.
- **Reinstatement** means to introduce to a place one or more species or elements of habitat or geodiversity that are known to have existed there naturally at a previous time, but that can no longer be found at that place.

At Jerrabomberra Wetlands the changes to vegetation have been so profound and longstanding that a return to some pre-European state, in terms of the above definitions, is not possible. As noted previously, the vegetation present at that time is not known (though it could be modelled to give some approximation). It is also important to recognise that the current vegetation cover in much of the reserve provides suitable habitat for waterbirds.

The following principles will guide vegetation management in the reserve for the life of this plan:

- Given that the reserve comprises artificially created wetland habitats in an essentially rural landscape, 'creative conservation' opportunities (new and enhanced habitat) will guide vegetation management rather than a focus on 'restoration'.
- Control of weed species will be given high priority, with particular attention to:
  - declared pest plants
  - the maintenance of habitat (both habitat provided by existing species and the maintenance of continuity of habitat following pest plant removal)
  - riparian areas where woody weeds are a particular problem and there is the opportunity to replace these with non-invasive native species.
- Habitat creation and ecological connectivity will be given high priority in plantings associated with the planning and design of the Jerrabomberra Creek corridor (including areas outside of the reserve) related to redevelopment of the Kingston Foreshore and East Lake areas.
- Native species (including local species) will generally be used in landscaping and site rehabilitation following works or weed removal within the reserve, unless there are specific reasons why these are unsuitable.

Vegetation management requires more detailed programs than it is possible to specify in a management plan. The principles (above) and the vegetation management policy (below) provide the context to develop priorities, programs and procedures for vegetation management in the reserve (see also management considerations and issues in s. 4.4.2 above).

Policies

- Vegetation management will be based on a vegetation management plan that includes consideration of:
  - the vegetation management principles outlined above
  - reed beds: site specific management procedures
  - riparian areas: specific attention to habitat protection, ACT declared pest plant species, other weed species, and other reserve values
  - exotic grassland: maintenance of broad scale exotic grassland using cattle grazing for biomass control and habitat manipulation. Control of herbaceous weeds and consideration of where native grasses could be used in landscaping and vegetation management
  - plantings: use of planted woodlands and shrubs to increase habitat diversity, to contribute to ecological connectivity and provide cover and food sources for birds
  - pest plant species (see s. 4.5)
  - visual and aesthetic effects of plantings.

Actions

- Prepare a vegetation management plan for the differing vegetation types in the reserve and in the context of the vegetation management principles and policies outlined above.
- Undertake vegetation management according to the vegetation management plan and monitor the results.

4.4.4 Cattle Grazing

Grazing of cattle in the reserve is a continuation of the main land use of the area since early European settlement and contributes to the rural landscape character. Exotic grasses in the reserve, especially phalaris, create a large biomass in their spring growing season and dry off during the summer months to create a fire hazard, though the risk is less than in many other parts of the ACT (s. 9.4). Cattle are currently grazed under agistment in the Dairy Flat grasslands and around the Jerrabomberra Billabongs.

The reasons for using cattle grazing to manage grassland biomass include the following:

- Grazing provides a cost-effective means of reducing grassland biomass and fire fuel load in summer, without apparent detrimental affects on the biodiversity of the reserve.
- Grazing reduces the height and leafiness of grass species such as phalaris making the pasture more useful habitat for some bird species.
- The presence of cattle and lack of tracks in the grazed areas discourage public entry to the Wildlife Refuge Zone.
- Cattle are able to graze areas where access by tractors and slashers would be difficult and damaging.
- Cattle trample and eat bulrush (*Typha* spp.), reducing the extent to which this species dominates the ponds.
- Cattle reduce the quantity of water couch (*Paspalum distichum*), thereby creating habitat for ground dwelling birds.
- Cattle muddy the edges of water bodies, maintaining mud flats which are of benefit to a number of small wading bird species.

However, cattle grazing may have the following negative impacts:

- Cattle influence species diversity/abundance by selectively grazing on more palatable herbs (water couch, for example, is an important component of the swamp edge flora, providing significant competition to weeds. Grazing intensity should not be at a level that results in the elimination of this species).
- Cattle encourage weed establishment by selective grazing and spreading seeds.
- Cattle trample or destroy riparian vegetation, excrete in waterways and riparian areas and create tracks and erosion along creek banks.

Access by cattle to riparian areas and wetlands is an important contributor to the declining condition of riparian zones (Commonwealth of Australia 2002) and a major riparian zone management issue nation-wide (MacLeod 2002). However, grazing of cattle in the Jerrabomberra Wetlands area has a long history, preceding the establishment of the wetlands (following the filling of the lake) and the reserve, and contributes to habitat diversity. The impacts of the cattle on the southern bank of Molonglo Reach need attention to improve the condition of the riparian zone.

Policies

- Controlled cattle grazing will continue as the main means of biomass reduction in exotic grassland in the reserve.
  - Grazing location, season and intensity will be monitored to ensure that negative effects are minimised and that there is maximum net benefit to the ecology of the wetlands.
  - Cattle will be excluded from sensitive wetland and the riparian areas using fencing. Alternative water sources will be provided where necessary.

Actions

- Continue selective, controlled cattle grazing in accordance with the management policy.
- Monitor and assess the impact of cattle in sensitive wetland and riparian areas, including Molonglo Reach and take action to protect such areas, as required.

4.5 Pest Plants and Animals

The reserve contains a large number of weed species. Many of these are declared Pest Plants in the ACT and others, while not declared, are invasive of native ecological communities. Similarly, some ACT declared Pest Animals inhabit the reserve along with non-declared species such as mallard ducks. Control of pest plants and animals needs to be considered in the context of:

- the *Pest Plants and Animals Act 2005* and the declarations of pest species in the *Pest Plants and Animals (Pest Plants) Declaration 2005* and *Pest Plants and Animals (Pest Animals) Declaration 2005*
- the *ACT Weeds Strategy 2009–2019* (ACT Government 2009) and the *ACT Vertebrate Pest Management Strategy* (ACT Government 2002)
- ACT Weed Management Plans and the objectives and priorities outlined in the annual ACT Weed Control Program developed by land management agencies in the ACT.

4.5.1 Objectives for Pest Plants and Animals

- Pest plants and animals are controlled, contained and, where feasible, eradicated through the implementation of appropriate management programs.
- The occurrence of pest plant species is significantly reduced over the longer term.

4.5.2 Pest Plants

Management of pest plants is a significant issue for the wetlands. Many species are present in large numbers and occur where control work is difficult and likely to impact on important habitat (wet riparian areas). Some species have spread from the planted woodlands or from nearby lands, while others have colonised widely in the grassland and woodland. Woody weeds are prevalent in riparian areas and the planted woodland and adjacent areas south and west of Jerrabomberra Creek. Woody weeds of particular concern are:

- willows (including white willow (*Salix alba)*, crack willow (*S. fragilis)*, golden upright willow (*S. alba* var. *vitellina)*, basket willow (*S. rubens* and hybrids); all ACT declared pest plants). Under the Pest Plants and Animals Act 2005, all species of willow except the permitted species weeping willow (*Salix babylonica)*, pussy willow (*S. x calodendron)* and sterile pussy willow (*S. x reichardtii)* must be suppressed
- poplars (white poplar (*Populus alba)*, Lombardy poplar (*P. nigra)* 'Italica', both ACT declared pest plants)
- black alder (*Alnus glutinosa)* (ACT declared pest plant)
- false acacia (*Robinia pseudoacacia)* (ACT declared pest plant).

Other woody weeds include Cootamundra wattle (*Acacia baileyana**), cotoneaster (*Cotoneaster* spp.*), fennel (*Foeniculum vulgare*[#]), hawthorn (*Crataegus monogyna**), broad-leaf privet (*Ligustrum lucidum**), narrow-leaf privet (*L. sinense**); firethorn (*Pyracantha angustifolia**), briar rose (*Rosa rubiginosa**), blackberry (*Rubus fruticosus* (agg.)*), gorse (*Ulex europaeus**), boxthorn (*Lycium ferocissimum)*.

(* ACT declared pest plant, [#] major weed of the wetlands)

Woody weeds are a particular problem in riparian areas where they form dense thickets. This vegetation provides habitat for many types of native wildlife, so removal should be staged, with replanting of more desirable species to maintain habitat. Many of the exotic herbaceous species occurring in the reserve are invasive of native grasslands and grassy woodlands. Some are declared pest plants in the ACT, for example, Scotch thistle (*Onopordum acanthium)*, St John's wort (*Hypericum perforatum)*, fireweed (*Senecio madagascariensis)*, serrated tussock (*Nassella trichotoma)* and African Lovegrass (*Eragrostis curvula)*.

Basic weed control is undertaken in the reserve. This comprises periodic herbicide application to herbaceous weeds along the walking track and on the perimeters of the planted woodlands, and some *in situ* poisoning of willows and other woody weeds. Some dead trees have been left standing to provide habitat perching sites and retain stream bank structure.

Given the dominance of exotic species in the reserve and the prevalence of declared pest plant species and other weeds, management of pest plants and revegetation of treated areas are the most important tasks for vegetation management in the reserve. The history of disturbance to land in the reserve and on adjoining areas means that suppression and containment of weed species is more likely to be achieved than eradication, though the latter remains a desirable objective. ('Suppression', 'containment' and 'eradication' are defined in the *ACT Weeds Strategy 2009–2019* (ACT Government 2009)).

Willow Removal

Willows are the dominant woody weed species of riparian areas in the ACT. As well as vegetative reproduction, many willows are now reproducing from seed and hybridisation (Cremer 1996). In the ACT there is an ongoing removal program for problem willows along all the rivers and major creeks and this has included Jerrabomberra Creek and Molonglo Reach.

Dominant (>50%) and secondary dominant (<50%) willows in the reserve are:

- Jerrabomberra Reach (northern shore), dense: crack willow (dominant) and basket willow (secondary dominant)
- Lake Burley Griffin foreshore, scattered: golden upright willow (dominant) and crack willow (secondary dominant)
- Molonglo Reach (both shores), formerly dense: crack willow (dominant) and basket willow (secondary dominant) were the main species in this area but a removal and landscaping program was undertaken in 2008. Cormorants and darters use willows in this area for nesting.

(Data from Molonglo Catchment Group 2006.)

The following are relevant considerations for willow control:

- There is a legislative requirement in the ACT to suppress all but the permitted willow species.
- A tree and shrub replacement program should always be considered to follow a willow removal program where habitat values are important, in the context of broader management objectives. Where black alder is also present it should be removed so that it does not colonise areas cleared of willow.
- The removal program should be based on the selective removal of undesirable species, using techniques that minimise opportunities for vegetative reproduction (e.g. sprouting from scattered live branches).
- Riparian areas should be regularly surveyed to identify willow seedling recruitment, and the seedlings removed. High-risk species should be removed or poisoned promptly.
- It may be appropriate to retain some individual trees or small groups of mature willows that have become significant habitat (e.g. nesting sites for waterbirds). Seedling establishment or other regeneration associated with these trees should be monitored and, if necessary, controlled.

Policies (pest plants)

- Management of pest plants will be undertaken in accordance with the vegetation management plan for the reserve (s. 4.4.3).
- Management programs for pest plants will be designed and undertaken in accordance with relevant ACT legislation (e.g. *Environment Protection Act 1997*, *Pest Plants and Animals Act 2005*) and strategies (e.g. *ACT Weeds Strategy*).
- Where possible, willow removal will be coordinated with willow management in the wider Lake Burley Griffin catchment.
- Management programs for woody weeds (especially willows) will include both removal of pest plants and replacement with desirable species, in the context of wider management objectives.
- The effects on habitat will be considered in all pest plant control programs. Removal and replacement may be staged over time to maintain habitat continuity.

Actions

- Undertake pest plant management in accordance with the vegetation management plan and the policies (above).

4.5.3 Pest Animals

Vertebrate pest species occurring in the reserve include the European rabbit *Oryctolagus cuniculus*, European red fox *Vulpes vulpes*, hare *Lepus capensis*, common myna *Acridotheres tristis*, common starling *Sturnus vulgaris* and house sparrow *Passer domesticus.* Stray domestic dogs, feral or stray domestic cats and mallard ducks also occur. Mallard ducks are controlled as part of an ACT program to reduce their potential impact on the genetic integrity of the native Pacific black duck *Anas superciliosa* through inter-breeding.

The Kingston Foreshore and East Lake developments are likely to result in an increase in the numbers of dogs and cats in close proximity to the reserve, though the higher density of the housing will limit pet ownership, especially dogs. It would be desirable to have a domestic animal containment policy in these areas.

Policies (Pest Animals)

- Pest animal control will be undertaken in the reserve as required.
- Management programs for pest animals will be designed and undertaken in accordance with relevant ACT legislation (e.g. *Environment Protection Act 1997*, *Pest Plants and Animals Act 2005*) and strategies (e.g. *ACT Vertebrate Pest Management Strategy*).
- The threat to wildlife in the reserve from stray domestic dogs and cats will be considered in planning for the East Lake Urban Renewal area and the interface with the Kingston Foreshore. A domestic animal containment policy is the preferred approach. Domestic animals are not permitted in the reserve.

Actions

- Undertake pest animal control as required and in accordance with ACT legislative requirements and strategies. Monitor the results.
- If necessary, evaluate means by which particular habitats may be made safer from predation (e.g. refuge islands, use of dead trees and logs in open water to create perching sites, fencing).
- Install ‘no dogs’ signs at reserve entry points.

5
Landscape

5.1 Primary Management Objectives

Primary management objectives (s. 2.5.2) for landscape are:

- **Distinctive features of the landscape are conserved, in particular, the rural and floodplain character and geomorphological features.**
- **Management of the reserve takes account of the national capital significance of the area and its role as a significant part of the Lake Burley Griffin foreshore.**

5.2 Geomorphology: Paleochannels of the Molonglo River

Identified as critical habitat in the reserve (s. 4.2.2), the ancient meander channels (paleochannels) of the Molonglo River are also a regionally significant geomorphological feature (Site LBG 15 in NCDC 1988a). They are the only extensive landform of this type in the ACT and warrant protection and appropriate management. The main threats to the paleochannels are sedimentation and any activities that might affect their configuration or increase sedimentation, for example, work associated with urban infrastructure or habitat enhancement.

Establishment of Lake Burley Griffin permanently flooded the paleochannels, effectively reducing the channel gradients and encouraging sediment deposition. There is potential for the rate of sedimentation to increase with urbanisation in the Jerrabomberra Creek catchment, including that in NSW. Key factors will be the standard of erosion control and stormwater management in new urban areas and the capacity of the Jerrabomberra Creek silt trap to retain sediment.

Policies

- Management of the area containing the paleochannels of the Molonglo River will give recognition to their regional geomorphological significance.

Actions

- Include the paleochannels in the Canberra Nature Park central register of sites of significance.
- Ensure that water sensitive urban design measures are incorporated into the planning and design of urban redevelopment adjacent to the reserve to achieve effective erosion and sediment control in the Jerrabomberra Creek catchment.
- Control access and activities that have the potential to adversely affect the paleochannels (including infrastructure maintenance and cattle grazing) (see s. 4.2.2, s. 4.4.4, and s. 9.2).
- Monitor the condition of the channels (sedimentation rates, changes in cross-sectional geometry) as a basis for determining whether further actions are required to maintain the channels.

5.3 Visual and Aesthetic

Visual and aesthetic values of the reserve relate to perceptions of its physical, biological and cultural attributes viewed from both within and outside the reserve. An important part of this valuation is the landscape contrast that derives from the location of the reserve in the central part of Canberra, close to the city centre, Parliamentary Zone and urban areas.

Exotic species are a significant component of the vegetation of the reserve. However, maintenance of visual and aesthetic values does not imply that particular species (e.g. pest plants) cannot be replaced by more desirable ones, which have certain attributes such as a similar shape and height. Landscape character can be conserved following woody weed control programs by choice of appropriate species for replanting and density and pattern of planting.

The following elements are important within the reserve:

- the rural, floodplain vistas across the grassland towards the paleochannels—vistas that may contain grazing cattle
- vistas that incorporate the surrounding hills and significant elements of the national capital landscape e.g. Parliament House, Captain Cook Memorial Water Jet and the Carillon
- the tree and open parkland lined watercourses (Molonglo Reach, Jerrabomberra Creek)
- the sense of isolation, space and naturalness that derives from the informality of the vegetation cover rather than its origin i.e. exotic not native
- more densely vegetated areas (e.g. around Kellys Swamp and along Jerrabomberra Creek) provide contrast and background to open areas.

The following elements are important outside the reserve:

- views (e.g. from the elevated Monaro Highway or Mt Pleasant) that incorporate the rural, floodplain character, surrounding hills, and significant elements of the national capital landscape
- views across East Basin towards the Jerrabomberra Wetlands where the vegetation of the reserve forms an important backdrop to Lake Burley Griffin.

The following are discordant elements:

- powerlines.
- the eastern Dairy Road car park (used for vehicle burnouts).
- the poor condition of the north-eastern section of the reserve near Molonglo Reach
- the presence of weeds, including thistles, stands of phalaris and fennel, and woody weed thickets
- the condition of the degraded riparian landscape, west and south of Jerrabomberra Creek.

Policies

- The rural, flood plain vistas of the reserve will be retained as well as the foreshore setting for Lake Burley Griffin.
- Replanting following removal of pest plants (see s. 4.5.1) will aim to enhance the landscape character.
- Siting of pedestrian paths and other amenities will take advantage of views and vistas, while being consistent with habitat protection.
- Removing the twin 132kV power lines from the Refuge Zone will be implemented when the Causeway switching station is relocated.

Actions

- Maintain views and vistas by removal of woody weeds and appropriate replanting in riparian areas.
- Include planting for visual and aesthetic purposes (including screening) in vegetation management programs for the reserve. Design such plantings to contribute also to habitat creation and ecological connectivity.
- Participate in planning processes for the removal of the power lines and switching station with the aim of minimising the visual impact of electrical infrastructure on the reserve.

5.4 National Capital Significance

Jerrabomberra Wetlands is included in the 'Central National Area' of Canberra and is part of the National Capital Open Space System (s. 1.7.1). Appendix I of the *National Capital Plan* (NCA 2007,) contains the following 'General Condition' related to landscape:

> To maintain and enhance the rural and floodplain landscape character and strengthen the perception and appreciation of the Jerrabomberra Wetlands and its surroundings as an integral part of the landscape of Lake Burley Griffin and the setting for the national capital.

In this context, the Lake Burley Griffin (East Basin) and Molonglo Reach boundaries of the reserve are significant landscape features. The reserve is Designated Area under the *National Capital Plan* and the NCA is able to influence landscape character in the reserve through the requirement for works approval for specified activities, which include landscaping and tree-felling (see s. 1.7.1). The future landscape character of the reserve will also be influenced by the *Griffin Legacy* principles and policies of the *National Capital Plan*.

Policies

- Landscaping, vegetation management, and the construction of amenities will take into account the national capital significance of the reserve.

Actions

- Obtain works approval from the National Capital Authority for landscaping and construction activities in the reserve and include consideration of national capital significance in vegetation management.

6
Recreation

6.1 Primary Management Objective

The primary management objective (s. 2.5.2) for recreation is:

- **The reserve is used for recreation activities that are compatible with the conservation values and objectives of the area, and facilities are provided for this purpose.**

Given that the main purpose of the reserve is to protect wetland habitats and waterbirds/landbirds using those habitats, it is appropriate that the main focus of recreational activity in the reserve should be observation or study of birds in those habitats and provision of appropriate facilities. While not precluding other low-key recreation activities, this is a more limited focus than other reserves in the ACT such as those in Canberra Nature Park.

6.2 Recreational Use

There are no data on recreational use of the reserve. However, the types and patterns of use are fairly well known. There are two categories of recreational use, which for individuals may overlap to varying degrees: (a) activities related specifically to the values of the wetlands (e.g. bird watching); and (b) those activities for which the particular attributes of the reserve may simply form a backdrop (e.g. jogging, lake circuit cycling, canoe fitness training (Molonglo Reach)).

As noted in s. 2.2 the outward presentation of, and access to, the reserve has been affected for some years by the adjacent presence of disused land and facilities (under redevelopment) and major road construction (Monaro Highway). As discussed previously, planning and design of the interface between the reserve and both the Kingston Foreshore Development and the East Lake Urban Renewal area to the south (s. 2.2.3) is a significant issue that has important implications for future management of the reserve (s. 2.6).

The current and proposed adjacent mixed use development with its large residential component is likely to result in increased recreational use of the reserve and the expectation of improved facilities. Increased use as recreational open space is very likely to conflict with the biodiversity value of the reserve. One way to ameliorate the potential recreational impact on the reserve is to create open space recreational opportunities along the western and southern side of Jerrabomberra Creek. This may include the provision of facilities (e.g. tables, barbecues, shelter, toilets).

Desirable features of this landscape from a habitat protection perspective are outlined in s. 4.2.2(b).

6.2.1 Objectives for Recreational Use

- The reserve is used for recreation activities that relate to and complement its values, in particular wetland habitat.
- Visitor access and facilities are provided that support recreational activities and enhance visitor experiences consistent with the protection of the values of the reserve.
- Threats to the values of the reserve deriving from visitor impacts are identified and managed.
- Open space recreational opportunities e.g. for picnics, barbecues, are developed mainly in the Jerrabomberra Creek corridor south of Jerrabomberra Pool.

6.2.2 Recreational Activities

Recreational use of the reserve is currently focused in three areas, related to access and facilities: parts of Jerrabomberra Creek including the silt trap; Molonglo Reach and adjacent northern river bank parkland (the latter outside of the reserve); and along the east–west track and bird hides.

The main recreational activities occurring in the reserve are:

- **Bird watching**: the wetlands and nearby sewage treatment ponds are a focal point for ornithologists.
- **Walking**: southern part of the reserve along the east–west track and to the silt trap.
- **Running**: along the east–west track and the cycleway to Molonglo Reach.
- **Cycling**: along the cycleway from Kingston Foreshore to Molonglo Reach (lake circuit). This is also used by commuter cyclists.
- **Fishing**: Molonglo Reach, Jerrabomberra Reach and the silt trap.
- **Canoeing/kayaking**: Molonglo Reach, Jerrabomberra Reach (entry to Kingston Boat Harbour only).
- **Boating**: Small electrically powered boats usually associated with fishing (Molonglo Reach and Jerrabomberra Reach as far as entrance to Kingston Boat Harbour only). Conventional powerboats may be used in association with aquatic sports (e.g. rescue, judging). Permits are required for both types of boats (see Table 6.1).

The compatibility of the various recreation activities and user groups is an important consideration for management. For example, there is potential for accidents between commuting cyclists and sightseers if they are using the same path. Bird watching is facilitated and encouraged via bird hides throughout the reserve. However, visitors strolling in front of the hides or into bird resting and feeding areas will scare birds away and diminish bird watching opportunities. Careful design of facilities, the installation of natural or built barriers and signage will help to address compatibility issues.

Policies for recreational activities and the permitted activities in reserve management zones (s. 3.2) are shown in Table 6.1.

Table 6.1 Policies for Recreational Activities and the Permitted Activities in Reserve Management Zones

Recreational Activity and Policy	Zone 1 Wildlife Refuge	Zone 2 Refuge Buffer	Zone 3 Conservation, Education and Recreation
Bird Watching Bird watching will be actively encouraged as a key recreational and educational activity in the reserve. Management policies for access to management zones are contained in Chapter 4.	Yes (restricted, no facilities)	Yes (encouraged, limited facilities)	Yes (encouraged, facilities provided)
Camping Not permitted.	No	No	No
Picnicking Permitted	No	No	Yes
Walking Permitted (restricted). Walking tracks and signs (information, interpretation and safety) will be provided. Seats may be provided in some locations in Zone 3.	No	Yes (limited to defined trails)	Yes
Swimming Not permitted in Jerrabomberra Creek or Jerrabomberra Backwaters. There is no prohibition on swimming in Molonglo Reach, however, swimming is not encouraged and no facilities are provided, due to potential health risks related to water quality. Molonglo Reach may also contain aquatic plant growth and submerged obstacles near the shore (e.g. logs, tree branches).	No	No	No (not recommended and waters not managed for swimming use)

Recreational Activity and Policy	Zone 1 Wildlife Refuge	Zone 2 Refuge Buffer	Zone 3 Conservation, Education and Recreation
Running Permitted on cycle path only. For organised running events that pass through the reserve, see **Events** below.	No	No	Yes
Cycling Permitted on cycle path only. For organised cycling events that pass through the reserve, see **Events** below.	No	No	Yes
Trail bikes Not permitted.	No	No	No
Wheelchairs Permitted (restricted). Wheelchair access will be provided to some, but not necessarily all areas. Priority for wheelchair access will be to bird hides.	No	Yes (facilities permitting)	Yes
Horse riding Not permitted.	No	No	No
Pets (dogs, cats) Not permitted except for guide dogs.	No	No	No
Fishing Permitted (restricted) and subject to the provisions of the *Fisheries Act 2000*.	No	Yes	Yes
Power Boating Permitted (restricted). **Recreation**: Conventional (petrol-powered) boats (that may only be used as support boats for aquatic sports) and electrically-powered boats. A boat permit under the *Lakes Act 1976* (issued by ACT Government) is required for Molonglo Reach and Jerrabomberra Reach. A permit under the *Lakes Ordinance 1976* (issued by the National Capital Authority) is required to operate on Lake Burley Griffin. **Other**: Boats such as Lake Burley Griffin cruise boats and boats used for lake management will use the Kingston Foreshore Harbour.	No	No (management and emergency purposes only)	Yes, Molonglo Reach and Jerrabomberra Reach as far as entrance to Kingston Boat Harbour only. Landing on Jerrabomberra Peninsula prohibited.
Non-power boating: Canoes, kayaks, rowboats, sailboats, rafts Permitted (restricted).	No	No (management and emergency purposes only)	Yes, Molonglo Reach and Jerrabomberra Reach, as far as entrance to Kingston Boat Harbour only. Landing on Jerrabomberra Peninsula prohibited.
Events Small, low-key events only, with the written approval of the reserve manager, which may contain specific conditions. Approval will only be given if the event does not have a significant impact on reserve values and other reserve users and cannot reasonably be conducted elsewhere.	No	No	Yes
Commercial guided activities May be permitted with written approval of the reserve manager, subject to other management policies in this plan (especially Biodiversity Conservation (Chapter 4)) and current ACT Government policies for commercial operators in ACT parks and reserves.	Conditional, restricted. No general public access.	Yes.	Yes

Recreational Activity and Policy	Zone 1 Wildlife Refuge	Zone 2 Refuge Buffer	Zone 3 Conservation, Education and Recreation
Non-commercial groups May be permitted with approval of the reserve manager, subject to other management policies in this plan (especially Biodiversity Conservation (Chapter 4)).	Conditional, restricted. No general public access.	Yes	Yes
Education tours and activities Encouraged, subject to other management policies in this plan (especially Biodiversity Conservation (Chapter 4)). Approval for tours is required from the reserve manager.	Conditional, restricted. No general public access.	Yes	Yes

6.2.3 Recreational Facilities

The main facilities provided for recreational use are parking, walking tracks and bridges, a cyclepath, signs and bird hides (described in s. 2.2.1). Facilities are currently not provided for picnicking (e.g. tables, barbecues, rubbish bins) nor are there toilet facilities. The nearest picnicking and toilet facilities are on the northern side of Molonglo Reach. These types of facilities would be appropriate in Zone 3 along the Jerrabomberra Creek corridor, mainly south of Jerrabomberra Pool. Lighting should be provided in this area around such facilities and the car park. Lighting will need to be carefully designed and located so that it does not impact on water bird habitat, in particular Jerrabomberra Creek and its margins.

Policies

- Visitor facilities will be provided that (a) support recreation activities that are consistent with the protection of the values of the reserve, and (b) enhance visitor experiences.
- The compatibility of the various recreation activities permitted in the reserve will be maximised through the design of recreation facilities and supporting infrastructure.
- Consideration of visitor facilities (e.g. walking tracks, boardwalks, picnic tables, viewing platforms and hides) will be addressed in the preparation of a master plan for the reserve.
- Where practicable, access will be provided for people with a disability and the elderly.

(a) Parking

The location and dimensions of the Dairy Road gravel car park are adequate for current levels of visitation. From the car park there is a vista across the grasslands towards Black Mountain and Canberra City. However, the location of the car park near the termination of Dairy Road means the area is vulnerable to anti-social behaviour at night. The size of the car park allows it to be used regularly for circular burnouts which scatter the gravel. Choke-points have been placed on the 'dead-end' Dairy Road (and the eastern section of Newcastle Street) to make the road less attractive for drag racing. If the latter continues to be a problem, night-time closure of the road may need to be evaluated.

As noted in s. 2.2.1, the Newcastle Street car park has been closed and is overgrown with weeds. Car parking for the reserve is an important consideration in the planning and design of the landscape between the reserve and the Kingston Foreshore and East Lake areas.

Actions

- Ensure that the Newcastle Street car park and associated entry to the reserve is part of the planning and design of the landscape between the reserve and the Kingston Foreshore and East Lake areas.
- Evaluate whether there is a need to close off access to the eastern car park at night by a gate on Dairy Road (to be kept under review).

(b) Walking Tracks, Bridges, Cycle Path

The main east–west walking track is sub-standard (s. 2.2.1). The track linking the Dairy Road car park to the Birrigai at Jerrabomberra site is narrow and unsuitable for bicycle traffic. The provision of bicycle racks should be considered in facilities for the open space areas in the Jerrabomberra Creek corridor (outside the reserve).

Actions

- Construct and maintain a well-designed track network with views that encourage visitors to follow the paths. Tracks will include the following:
  - an east–west walking track between the car parks
  - a track to Shoveler Pool for birdwatchers (along existing vehicle track)
  - tracks to bird hides (Kellys Swamp, Jerrabomberra Pool), connecting to the east–west track
  - a track to the silt trap (through planted woodland)
  - access tracks from the Birrigai at Jerrabomberra site.
- Include consideration of tracks and other access suitable for both students and other visitors in the redesign of the Jerrabomberra Billabongs and silt trap area as part of the redevelopment of East Lake.

(c) Signage

Signs are limited and some are in poor condition (s. 2.2.1). Three types of signage need consideration: reserve information (including permitted activities, restrictions and a high quality map), interpretation, and safety information. Signs advising that dogs are not permitted are necessary at all entry points.

Actions

- Review signs in the reserve and develop a signage plan that considers information, interpretation and safety requirements, including:
  - directional signage at both entry car parks
  - 'No dogs' signs at entry points
  - track and access signage
  - high quality maps at entry points
  - exclusion areas e.g. Jerrabomberra Reach for watercraft, past the Kingston Boat Harbour entrance (recreational boats).

(d) Bird Hides

There are five bird hides in the reserve (s. 2.2.1), which are in generally good condition and contain interpretative information. In the short term, construction of new hides is not proposed, but they may be provided in the future for the Shoveler Pool area and at the south-eastern end of Kellys Swamp (overlooking a shallow mud flat area). Possible locations for new hides should be included in the suggested redesign of the Jerrabomberra Billabongs and silt trap area associated with the East Lake redevelopment. Early consideration of the siting of hides is beneficial in relation to visitor approach routes (to avoid disturbance to birds), fields of view and sun location, and bird movement paths.

The hides are constructed of timber, with front windows, a solid back wall, and entrances behind the wall to prevent birds seeing back-lit human silhouettes. Hides in places open to the public and left unguarded or unlocked can suffer from vandalism, criminal activity and represent a public

safety concern (see also s. 6.2.5) (Birds Australia 2002). This needs to be monitored as urban settlement comes closer to the reserve. Monitoring use of and maintaining the bird hides is an example of where a local community group could be actively involved in management of the reserve.

Actions

- Maintain interpretation information in the bird hides and update as required.
- Maintain hides in a good, clean condition.
- Ensure that the future location of hides is considered in the redesign of the Jerrabomberra Billabongs and silt trap area as part of the East Lake redevelopment.
- Monitor use of the bird hides and take appropriate action should there be vandalism, criminal activity or threats to public safety.
- Encourage the local community to become involved with the management of the bird hides.
- Evaluate the need for and provide further hides if warranted.
- Remove the old viewing platform (concrete base, timber seats and rail) at the south-eastern end of Kellys Swamp.

(e) Recreational Boating

Provisions for recreational boating are outlined in s. 6.2.2 and in Table 6.1.

Actions

- Provide advice to boat operators using Kingston Boat Harbour on the restrictions to entering Jerrabomberra Reach.
- Erect a sign advising that Jerrabomberra Reach is closed to recreational boating beyond the entrance to the Kingston Boat Harbour and that access to the Jerrabomberra Backwaters is prohibited.

6.2.4 Visitor Impacts

All visits to the reserve potentially have an impact. An important role of management is to assist visitors in making that impact negligible. Impacts may be physical (e.g. disturbance to the environment and/or wildlife) and/or social (effects on the enjoyment of other visitors). Visitor behaviour and purpose of visit, numbers, frequency of use, and site characteristics are factors that influence impacts and the necessary management response. The proximity of the reserve to major new urban redevelopment means that a significant increase in visitor use is likely. This may have both negative impacts (e.g. disturbance to wildlife) and positive impacts (e.g. create opportunities for enhancing wetland habitats and providing new facilities for recreation and education to encourage visitors to learn about the value of wetlands).

Policies

- Visitor impacts that diminish the values of the reserve will be identified and managed.

Actions

- Visitor impacts and management responses are shown in Table 6.2.

Table 6.2 Visitor Impacts and Management Actions

Visitor impacts	Management Actions
Rubbish dumping and littering	(a) Include 'carry in – carry out' policy in signage. (b) Remove illegally dumped material promptly. (c) Seek assistance of other ACT agencies if warranted by scale of problem.
Inappropriate disposal of human waste	(a) Advise location of nearest public toilets in reserve signage. (b) Advise that the reserve contains no toilets in other information about the reserve and in approvals for events, commercial and non-commercial group visits. (c) Ensure that toilets are included in the open space recreational facilities of the Jerrabomberra Creek corridor.
Trampling of vegetation	(a) Ensure tracks take advantage of vistas and desire lines. (b) If required, establish hardened or grassed areas that allow visitors to stop and view in the open. (c) Where required, discourage off-track activity by increasing density of vegetation, signs or other means.
Erosion of tracks	(a) Ensure tracks are properly constructed and drained, relative to anticipated use.
Domestic animals	(a) Provide advice on signs that domestic animals are not permitted. (b) Caution persons found with domestic animals. Apply provisions of the *Nature Conservation Act 1980* and *Domestic Animals Act 2000*, including fines where appropriate.
Vandalism of bird hides and other facilities	(a) Report activities to ACT police and seek their assistance. (b) Repair vandalised facilities promptly.
Deliberate disturbance or harm to wildlife	(a) Report activities to ACT police and seek their assistance. (b) If likely to achieve results in relation to specific activities, increase ranger presence.

6.2.5 Visitor Safety

There will always be some risk attached to visitor activity. In recent times, management of this risk has increased in importance for park managers. The duty of park managers is to identify foreseeable risks and take reasonable steps to reduce them or advise users. However, some risks are beyond the control of managers. Potential hazards include drowning, bites or stings from native and introduced animals (e.g. snakes, European wasp), injury or death from falling tree branches and injury related to facilities (e.g. tripping on paths). Risks also derive from the actions of other users (e.g. collisions between cyclists and pedestrians, bites from unrestrained dogs) and deliberate malicious acts (e.g. theft from cars, robbery and assault). The relatively dark and enclosed nature of bird hides, with little ability to see anyone approaching, means that they are potential entrapment spaces. More open designs (e.g. screens) are less effective for bird watching, provide little or no weather protection, and give little opportunity to display interpretative material. Public safety in the hides should be monitored and appropriate action taken should this be necessary. An important consideration for management of the reserve is the use by school students.

Policies

- Visitors to the reserve will be made aware of the more significant risks associated with their visit. Usage of the reserve or particular areas may be restricted or prohibited in some circumstances, for example when the reserve is flooded, or during construction or maintenance of facilities.

Actions

- Provide contact/emergency phone numbers in the bird hides, on signs and other information material.
- Potential hazards to visitors and management responses are shown in Table 6.3.

Table 6.3 Potential Hazards to Visitors and Management Actions

Potential Hazards	Management Actions
Drowning	(a) Close the reserve if dangerous flood levels are predicted. (b) Maintain flood warning signs near the silt trap and at reserve entry points. (c) Maintain Molonglo Reach free of items (e.g. flood debris) that may be a hazard to recreational users. (d) In designing paths, avoid locations close to, and parallel to, deeper water.
Falling tree limbs/trees, fallen trees	(a) Regularly inspect condition of trees near visitor use areas and along tracks and apply tree surgery as required. (b) Remove fallen trees and until this is done, provide warning signs/barriers if the trees are a danger to users (e.g. cyclists).
Animal bites and stings (e.g. snakes, spiders, European wasp)	(a) Where possible, maintain a clear area either side of paths (e.g. by slashing or mowing). (b) Provide information on snakes and any other animal likely to be a hazard to visitors. If the level of risk becomes of concern, undertake suitable control measures.
Tripping/falling on paths	(a) Construct and maintain paths to appropriate standards and guidelines.
Effects of chemicals used for pest plant and animal control.	(a) Install warning signs and if necessary, close affected parts of the reserve when control work is being undertaken. (b) Place warning signs when baiting programs are undertaken. (c) Ensure contractors follow appropriate occupational health and safety procedures when undertaking control work.
Criminal behaviour (e.g. theft from vehicles, illicit drug taking, assault, robbery)	(a) Report activities to ACT police and seek their assistance. (b) If warranted, evaluate measures such as car park lighting, retaining open vegetation in car parks and along tracks, and closing off car parks to vehicles at night. (c) Monitor public safety in bird hides and take appropriate action if there are public safety concerns.
Offensive or intimidating behaviour towards reserve visitors	(a) Report activities to ACT police and seek their assistance. (b) If likely to achieve results in relation to specific activities, increase ranger presence.

6.2.6 Waterbird Displays and Bird Feeding

The previous management plan (ACT Parks and Conservation Service 1994) canvassed the possibility of displaying captive (wing-clipped or pinioned) waterbirds to increase the likelihood that birds would be observed, compared with the more unpredictable behaviour of wild birds. The feeding of waterbirds and terrestrial birds was also canvassed. None of these activities has been undertaken, and they are contrary to current management philosophy for areas such as nature reserves.

The feeding of waterbirds (especially swans and ducks) by nearby residents is likely to increase as urban redevelopment proceeds. The lack of need for and the undesirability of feeding waterbirds (especially the use of bread) should be outlined in information/interpretation signs and other materials. For terrestrial birds a more appropriate approach to attracting these species is to plant a diversity of locally indigenous plants that provide cover, and nectar and insect food sources.

Policies

- Captive waterbirds will not be displayed in the reserve.
- Feeding of waterbirds and terrestrial birds by visitors will not be permitted in the reserve.

Actions

- Provide information and interpretation signs and other materials advising of food sources for birds and the lack of need for and undesirability of feeding (especially the use of bread).
- Include species in plantings that contribute to food sources for birds.

6.2.7 Entry Fees

There is no entry fee for any part of Canberra Nature Park (CNP) or the Jerrabomberra Wetlands and collection of such fees would be impracticable. The ACT does not have a licensing and fees system for commercial tour operators. There is scope to charge a fee for ranger guided walks or other activities in the reserve where these form part of the interpretation program.

Policies

- Fees will not be charged for entry to the Jerrabomberra Wetlands, however, a fee may be charged for ranger guided interpretation activities.

Actions

- Charge a fee for ranger guided interpretation activities where appropriate, in accordance with the approach adopted for CNP as a whole.

6.3 Tourism

Tourism refers to visits to the ACT from other parts of Australia or other countries that are social, cultural or recreational in nature. Tourists to the ACT are most likely to visit the reserve if they have an interest in ornithology. However, while the reserve supports a diversity of waterbirds, not all of these will be seen from easily accessible sites such as the bird hides and not at all times. Many of the common waterbirds that occur in the reserve can be observed also in wetlands elsewhere or in open water areas, such as Lake Burley Griffin.

The creation of the wetland habitat following the filling of Lake Burley Griffin and links to the building of the national capital would be of interest to some visitors. Waterbird diversity in created habitat is the central theme that could be developed in promotion of the wetlands aimed at the tourism market and in associated interpretative material.

An appropriate strategy for the reserve is to gradually develop its tourist potential once major urban planning issues on its western and southern perimeters are resolved, and facilities such as car parks, signage and walking tracks have been upgraded.

Policies

- The tourism potential of the reserve will be developed over time, however, the low-key nature of visitation will be retained with facilities appropriate to this approach.

Actions

- Liaise with Australian Capital Tourism to consider ways in which the reserve may contribute to tourism to the ACT, commensurate with the protection of wetland habitats and the biodiversity values of the reserve.

6.4 Lake Circuit Bicycle Path

Proposals to construct a cycle path circuit around Lake Burley Griffin and provide a connection to Fyshwick by a path through the Jerrabomberra Wetlands date from the early 1980s. This path is included in the Jerrabomberra Wetlands Conditions in the *National Capital Plan* (NCA 2007). As noted in s. 2.2.1 a cycle path connecting Dairy Road and Newcastle Street, including a widened Jerrabomberra Creek bridge, was constructed in 2010. Increased urbanisation west and south of the reserve is likely to increase recreational and commuter bicycle traffic on this path. In addition to the lake circuit cycle link, the *Griffin Legacy* proposals include a possible future cycleway extension to the south along Jerrabomberra Creek, as part of the linear park concept that links the East Lake area with Kingston and Narrabundah.

7

Education and Research

7.1 Primary Management Objectives

The primary management objectives (s. 2.5.2) for education and research are:

- **The reserve is used for education about wetland ecosystems, their management and enhancement, and facilities are provided for this purpose.**
- **Wetland research is facilitated and supported.**

7.2 Education

Educational opportunities exist in relation to all the values defined for the Jerrabomberra Wetlands (s. 2.4). In particular, there are opportunities for education about wetland ecosystems, their management in an urban context and enhancement activities. Other opportunities relate to the life cycles of migratory bird species, geomorphology (paleochannels), water quality, weed invasion and control, and the history of human occupation of the Molonglo River floodplain.

Policies

- Educational activities at the wetlands will be supported and suitable facilities developed.

Actions

- Include consideration of educational opportunities and access in future redesign of the silt trap and Jerrabomberra Billabongs area associated with the East Lake redevelopment.
- Investigate opportunities to further develop environmental education facilities and programs with a focus on wetlands.

7.3 Interpretation

Interpretation is an experiential educational activity that involves 'expert guidance' and can take a number of forms e.g. a ranger or volunteer guide; signs that explain what is being observed; and explanatory brochures, field guides and self-guiding information. For many visitors, an important part of interpretation is the interaction with the guide, while others prefer to explore at their own pace. A comprehensive interpretation program offers a range of options tailored to a place and the types of visitors that come there. Interpretation involves translating stories of places, the biota and people in terms that motivate and inspire visitors to greater understanding and care. Outstanding interpretive experiences are likely to be remembered long after the event.

Policies

- Interpretative activities and facilities will be developed aimed at promoting an appreciation of the values of the reserve.
- Interpretation will include wetland and other habitat, aquatic habitats and their plant and animal life, biodiversity (especially waterbirds), Aboriginal and European cultural heritage, landscape characteristics (including the paleochannels) and national capital setting.

Actions

- Develop an interpretation strategy that identifies target audiences, features of the reserve to be interpreted and suitable materials and facilities.
- Provide succinct introductory information at entry car parks that leads into more detailed interpretative materials and associated facilities within the reserve.
- Encourage community involvement in developing and implementing interpretative programs.

7.4 Research

Aspects of the Jerrabomberra Wetlands environment and its management may be of interest to tertiary and other institutions in the ACT.

Policies

- Research into aspects of the reserve environment and management issues will be encouraged, consistent with the protection of the values identified in this management plan.
- Research projects should be discussed with the reserve manager and depending on their scale may require written approval. All projects must demonstrate a sound structure, be appropriately supervised and minimise disturbance to important habitat areas. The results of all research projects will be required to be lodged with the reserve manager.

Actions

- Encourage research projects that investigate aspects of the wetlands environment and management issues.

7.5 Monitoring

Monitoring provides a basis for assessing condition (e.g. water quality) or simply providing numerical data on activities (e.g. number of walkers using a track). Monitoring of environmental variables may provide a basis for determining management actions and priorities. However, quantitative monitoring data are not a prerequisite for many management actions, which can be quite adequately based on qualitative assessments and knowledge of the reserve.

Two established monitoring programs relevant to the management of the Jerrabomberra Wetlands are: (a) water quality monitoring in East Basin (Site 529) and Molonglo Reach (Site 601 Environment Protection Authority (EPA)); and (b) waterbird sightings recorded in the database held by the Canberra Ornithologists Group and included in the Annual Bird Report published in *Canberra Bird Notes*.

Policies

- Systematic monitoring of environmental variables and user activities will be undertaken where necessary to support reserve management.

Actions

- Evaluate the need for monitoring in the reserve and implement where required.
- Apply the results of monitoring to management policies and actions contained in this management plan.

8
Cultural Heritage

8.1 Primary Management Objective

The primary management objective (s. 2.5.2) for cultural heritage is:

- **Cultural heritage values of the reserve (including Indigenous heritage) are identified and conserved.**

8.2 Cultural Heritage Conservation

As noted in s. 2.3 the reserve is largely a cultural landscape with three main visible components: 'rural' grassland, exotic vegetation and 'artificial' wetlands. Evidence of the significance for Aboriginal occupation exists in the stone assemblages collected from the area, and other artefacts may remain buried near the surface (Bindon 1973; Flood 1980, p.162). This plan provides for limited access and low intensity use (primarily bird watching) in the grassland and paleochannels where artefacts might still remain. The most likely cause of disturbance is any change in the routes followed by urban services infrastructure, for example, powerlines.

There is little if any archaeological evidence related to early European use. However, immediately north of the reserve, both Duntroon House (in the grounds of the Royal Military College) and the former Duntroon Dairy (on the lower slopes of Mt Pleasant) are reminders of the early 19th century pastoral settlement and the use of the river flats for dairying. They provide a physical presence that could be linked to the interpretation of the cultural heritage of the Jerrabomberra grassland as part of 19th century pastoralism on the Limestone Plains.

Jerrabomberra Wetlands, Fyshwick is on the ACT Heritage Register established under the *Heritage Act 2004*. The provisions of the Act, covering both places and objects, apply to the management of the reserve. Specific requirements for heritage places are included also in the *Planning and Development Act 2007.* Works undertaken in the reserve (e.g. reserve and urban infrastructure) require a Development Application, and as part of the approval process, the application will be referred to the Heritage Council for advice on the effect of the proposal on heritage significance (s. 165 Planning and Development Act). 'Works', as defined in the *National Capital Plan*, also require Works Approval from the National Capital Authority.

Policies

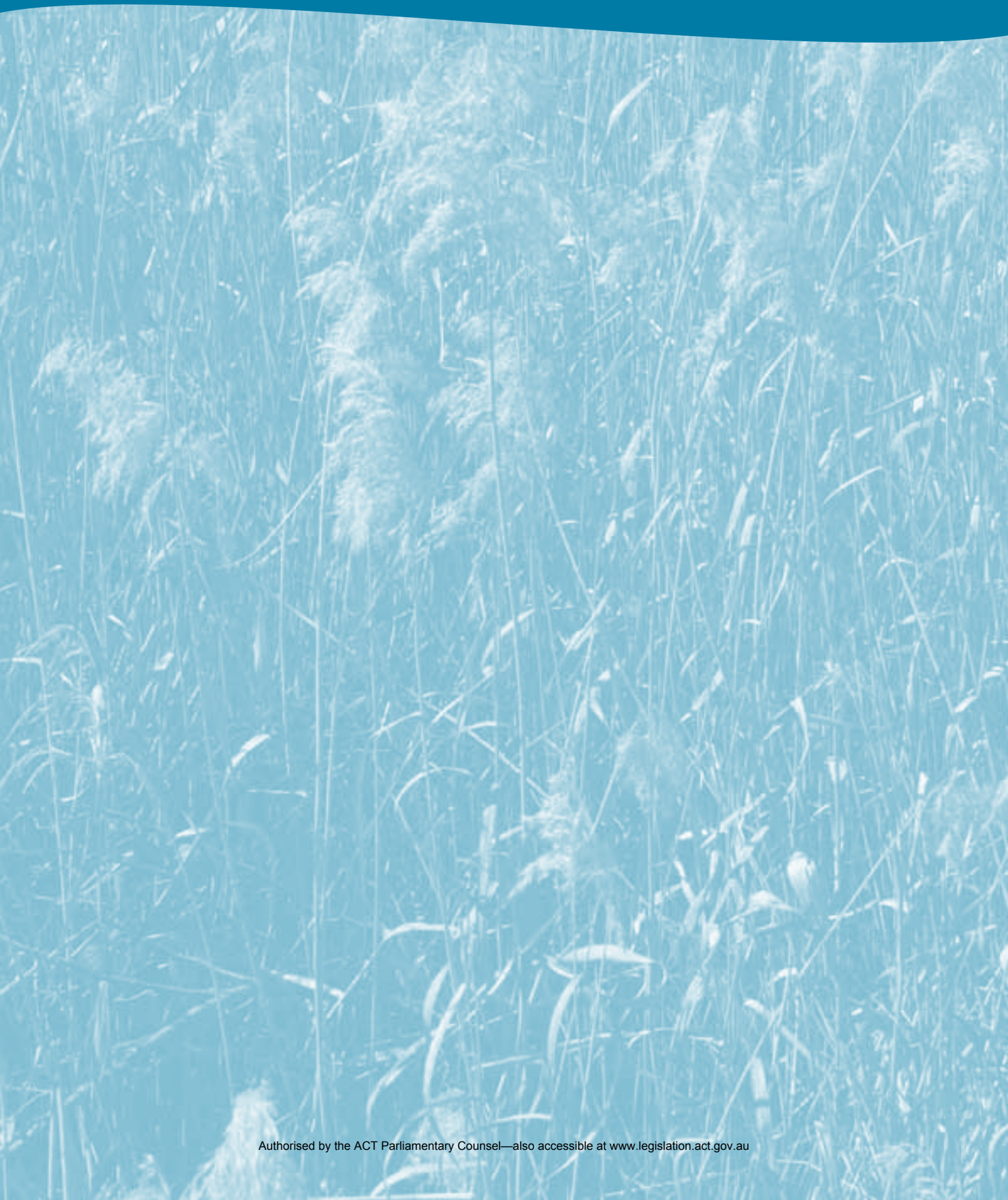
- The cultural heritage of the Jerrabomberra Wetlands will be identified, conserved and interpreted for its educational value and to foster historical understanding of the area.

Actions

- Ensure that all works proposed for the reserve fulfil legislative requirements related to heritage protection.
- Include both Aboriginal and European cultural heritage in the interpretation strategy for the reserve (see s. 7.3).
- Recognise prior Aboriginal occupation on reserve entry signs and in relevant interpretative material.
- Encourage Aboriginal people and descendants of European settler families with local knowledge to be involved in identifying, conserving and interpreting heritage.

9

Environmental Planning, Protection and Management



Chapter 4 to Chapter 8 have outlined management of the reserve to conserve the values identified in section 2.4. Chapter 9 considers a number of other management issues and requirements. These also support the conservation of reserve values to varying degrees.

9.1 Hydrology and Water Management

9.1.1 Objectives

- The reserve is not negatively affected by the quantity and quality of water flows from upstream.
- The beneficial influence of the wetlands on downstream flood risk and water quality is maximised.

The reserve largely consists of open water, wetlands and associated flood plains located where two streams with degraded catchments (Molonglo River and Jerrabomberra Creek) enter Lake Burley Griffin. Extensive structural rehabilitation works have been undertaken in the rural parts of these catchments (NSW DLWC 2000). More recently, willow removal and native vegetation restoration work has been undertaken, for example, along Jerrabomberra Creek (Molonglo Catchment Group *et al.* 2004) and Molonglo Reach. The quality of water and many aspects of water flow including quantity, timing and duration are of fundamental importance to the functioning of ecosystems in the wetlands. In turn, the wetlands provide hydrological and water quality functions in relation to Lake Burley Griffin.

The water level in Lake Burley Griffin is normally maintained at Australian Height Datum (AHD) 555.93 m by balancing inflows into the lake and abstraction from the lake. The level of the lake may fall in dry periods and during such periods, limits may apply to abstraction from the lake (NCA 2005). Low flow conditions are not necessarily detrimental to the reserve, as aquatic habitat remains in Jerrabomberra Creek, Molonglo Reach and the Jerrabomberra Backwaters and drying out of Kellys Swamp exposes important mud flat habitat (s. 4.2.2). However, the role of Jerrabomberra Wetlands as a regional 'drought refuge' may be reduced in these circumstances.

During high flows, water overtops the banks of the Molonglo River and Jerrabomberra Creek and enters the surrounding floodplain, increasing the extent of wetland habitat. The distribution of water across the floodplain attenuates downstream flow, reducing potential for flooding. Loss of water from the main channel of the streams reduces opportunity for scouring flows, so the wetlands assist in reducing erosion. There is a marked fall in velocity once water enters the wetlands. This facilitates settlement of suspended particles. Additionally, water moving through the wetlands comes in contact with vegetation and leaf litter, resulting in filtration of particulate matter and sorption of dissolved material. It is important for the wetlands that these waters not be polluted or carry large sediment loads.

The quantity and quality of water flowing through the reserve are largely beyond the control of reserve management. However, there are opportunities to influence upstream planning and management, even though much of each catchment is in NSW. Under the *Seat of Government Acceptance Act 1909*, NSW is obligated to not pollute and to protect from pollution the waters of the Queanbeyan River for its whole course above the Territory. There is also a protective framework of ACT legislation, in particular, the *Environment Protection Act 1997* and the *Water Resources Act 2007* (s. 1.5.3). Established under the latter are the *ACT Environmental Flow Guidelines* and the Water Resources Management Plan (*Think water, act water* (ACT Government 2004)).

Policies

- Management of upstream catchments to protect the values of the Jerrabomberra Wetlands will be pursued with relevant planning and management agencies in NSW and the ACT, especially when new developments are proposed.
- Management activities in the reserve, especially the construction of reserve infrastructure, will take into account likely affects on floodplain dynamics and downstream flows and water quality.

Actions

- Participate in planning and management processes relevant to the management of upstream catchments of the wetlands.
- Include the likely effects on downstream flows and water quality in assessment of the impacts of proposed reserve management activities.
- Include the requirements of ACT environmental protection and resource management legislation and associated guidelines in the planning, design and carrying out of activities in the reserve.

9.1.2 Water Quality

The East Basin of Lake Burley Griffin, adjacent to the Jerrabomberra Wetlands is recognised as having generally poorer water quality than other parts of the lake. This is reflected in use designations—categories of uses that can be applied to zones of the lake based on water quality (NCPA 1995, p. 22). It is also apparent in benchmark levels for water quality that have been set at different levels for some variables in East Basin compared with West Lake (turbidity, suspended solids, total nitrogen) (NCA 2004b). However, while East Basin (and the nearby Molonglo Reach and Jerrabomberra Reach) may not be recommended for contact recreation, the high level of suspended solids, nutrients and organic matter typical of inlet zones provides the basis for the high productivity of these ecosystems. In providing a filter for catchment outflows, the wetlands complement the role of East Basin in the settling of sediments, uptake of nutrients and die-off of micro-organisms.

Water quality monitoring including chemical, biological and physical variables is undertaken in East Basin (National Capital Authority, Site 529) and Molonglo Reach at the Dairy Road Bridge (EPA, Site 601). There has also been some monitoring in Jerrabomberra Reach.

Policies

- Maintenance of, and improvement in, the quality of the water entering and leaving the reserve will be pursued in accordance with contemporary standards and techniques for undeveloped areas like the Jerrabomberra Wetlands.

Actions

- Participate in planning and management processes relevant to the maintenance and improvement of upstream water quality.
- Consider the effects on water quality of reserve management activities including provision of facilities, access and event approvals, and maintenance (e.g. mowing and cattle grazing) (see s. 4.4.3 and s. 4.4.4).

9.1.3 Catchment Contamination and Sedimentation

Increased urbanisation of the Jerrabomberra Creek catchment, including NSW, will result in greater stormwater runoff, with increased mobilisation of sediments and contaminants such as those from roads. The silt trap has the ability to remove course sediments and contaminants from Jerrabomberra Creek. However, the more efficient it is in retaining sediments the shorter will be its effective life. Sediment removal efficiency will decline as the trap fills, leading to sediment transfer

and deposition downstream. Sedimentation of the trap needs to be monitored and a maintenance program determined. The silt trap is ideally shaped to allow capture and subsequent removal of floating contaminants such as oil. Its presence should be included in local spill management plans. The design and operation of the silt trap will be evaluated as part of the planning for the East Lake Urban Renewal area. Additional upstream protection may be necessary if significant development eventuates within the upstream catchment.

Redevelopment of areas adjacent to the reserve presents an opportunity to improve the quality of stormwater flows to Jerrabomberra Creek and Lake Burley Griffin. The Kingston Foreshore Development contains an artificial wetland to treat 150 megalitres per annum of stormwater from Kingston, Griffith and Red Hill that previously flowed untreated into Lake Burley Griffin.

As noted in Table 2.1, initial investigation of potential ground contamination from rubbish tips and landfill in the East Lake area has identified some areas of concern. Preliminary investigations indicate that the sites can be remediated or made safe for redevelopment. A development requirement for East Lake is that a detailed Contamination Assessment and Remediation Action Plan be prepared (ACTPLA 2007).

Policies

- Improved control over catchment contamination and sedimentation will be pursued, especially in relation to planning for redevelopment adjacent to the reserve and new urban areas upstream of the reserve.

Actions

- Participate in planning and management processes relevant to:
  - improving control over catchment contamination and sedimentation (e.g. East Lake area)
  - reviewing the operation of the Jerrabomberra Creek silt trap and its habitat potential.
- Ensure that the assessment of potential contamination includes those areas of environmental concern currently within the reserve boundaries.
- Encourage adoption of Water Sensitive Urban Design principles in redevelopment adjacent to the reserve and new urban developments upstream of the reserve.
- Establish a riparian vegetation buffer along Jerrabomberra Creek, including restoration and reinstatement of suitable indigenous species.

9.1.4 Pollution, Chemical Spills

The accidental spillage or deliberate release of industrial chemicals and other hazardous substances or pollutants is a potential threat to the biological integrity of the Jerrabomberra Wetlands. There are a number of potential entry points (e.g. road crossings, drainage lines, storm water outlets) on the Molonglo River and Jerrabomberra Creek including the road bridges across Molonglo Reach. There is also a storm water outlet and gross pollutant trap for storm water entering the reserve from Fyshwick via Jerrabomberra Creek south of the reserve. The ACT Fire Brigade and Australian Federal Police have responsibility for management of chemical spills in the urban area. There is a Memorandum of Understanding (MOU) for the coordination of ACT Government agencies in the event of a spill of hazardous material in the ACT involving the ACT Fire Brigade, ACT Workcover, Environment Protection Authority and the Health Protection Service. This details protocols, procedures and agency responsibilities in the event of a spill.

Policies

- The manager of the Jerrabomberra Wetlands will participate in inter-agency processes to coordinate responses to spills of hazardous materials likely to affect the wetlands.

Actions

- In the event of a spill of hazardous material affecting the wetlands, take action according to the MOU between ACT Government agencies.

- Participate in planning and management processes for areas adjacent to, and upstream of, the reserve with the aim of reducing the threat of spills of hazardous materials that may affect the wetlands.

9.1.5 Flooding

The ability to discharge flood flows in Lake Burley Griffin up to approximately the 1:100 AEP (annual exceedance probability) with minimal rise in lake level has been included in the design of Scrivener Dam and the operating procedures for the dam. Under the current operating procedures, the flap gates are used to maintain a constant water level of AHD (Australian Height Datum) 555.93 m within Central Basin up to flows of 2250 m^3/sec after which the gates cannot be opened further and the lake level in Central Basin begins to rise. In 2000, the 1:100 AEP peak flow for Lake Burley Griffin at Scrivener Dam was revised downward to 2060 m^3/sec (ECOWISE Environmental 2000). Assuming the dam gates are operated correctly, the 1:100 AEP flood event will result in flood levels below normal lake level from Scrivener Dam to Central Basin with a rise upstream of this point to match the modelled flood levels in the Molonglo River. For a 1:100 AEP flood event, the flood level at the Kingston Foreshore is 557.89 m or almost two metres above normal lake level (ECOWISE Environmental 2000).

In a 1:100 AEP flood event, floodwaters entering the lake from Jerrabomberra Creek and the Molonglo River would back up to submerge most of the reserve. Only the Birrigai at Jerrabomberra site (outside the reserve) and elevated land in the south-west of the reserve are above the 1:100 AEP. Raised structures, plantings and paths have the potential to affect flood patterns by diverting flows. Raised paths across flood-prone areas should have culverts to allow passage of floodwater. Developments adjacent to, and upstream of, the reserve, may also modify flood effects in the reserve.

Policies

- Design and placement of reserve infrastructure, urban service infrastructure, and reserve plantings will take into account both the protection of these items from the effects of flooding and their impact on the flow of floodwaters in the reserve.
- Protection of the reserve from adverse flood effects related to redevelopment of areas adjacent to, and upstream of, the reserve will be pursued in the planning and design of these areas.

Actions

- Ensure impacts of, and effects upon, flood waters are taken into account when designing and locating facilities, structures and plantings in the reserve.
- Ensure that protection of the reserve from adverse flood effects is considered in the planning and design of areas adjacent to, and upstream of, the reserve.
- Maintain and enhance riparian vegetation cover to protect stream banks from scouring by floodwaters.
- Maintain flood warning signs.

9.2 Urban Services Infrastructure

It is a General Condition in the *National Capital Plan* (NCA 2007, Appendix 1) that the Jerrabomberra Wetlands provide for the continuation of current essential urban services infrastructure and that any proposal for new or upgraded services be required to protect nature conservation core areas (as defined in the *National Capital Plan*) and be subject to a full environmental assessment. Services infrastructure contained within the reserve is listed in s. 2.2.2. As discussed in s. 2.2.2, related to redevelopment of the Kingston Foreshore and East Lake areas, the Causeway switching station is to be moved with consequent removal of the twin 132 kV powerlines.

9.2.1 Objective

- Installation and maintenance of urban services infrastructure has the minimum possible impact on the values of the reserve.

Policies

- Established procedures for the maintenance, monitoring and reporting on infrastructure facilities will be continued and reviewed where necessary.
- Proposals for new services or relocation of existing facilities will be subject to an appropriate level of environmental impact assessment.

Actions

- As required, provide ActewAGL with advice aimed at minimising the impact of infrastructure installation and maintenance on reserve values, especially waterbird habitat. Where possible minimise access during the bird-breeding season from late winter to mid-summer.
- Ensure that proposals for new services or relocation of existing facilities are subject to an appropriate level of environmental impact assessment.
- Ensure that works associated with urban services infrastructure in the reserve are followed up with adequate rehabilitation.

9.3 Adjacent Land Uses and Future Developments

The implications for the reserve of adjacent residential and commercial redevelopment have been referred to throughout this plan (see in particular s. 2.2.3, s. 4.2.2 and s. 6.2). Many land use and other planning decisions are yet to be made for these areas, in particular the East Lake Urban Renewal area. The *Griffin Legacy* also contains a number of propositions (s. 2.3.3) relevant to planning for the reserve and surrounding areas. As noted in s. 1.3, this management plan can assist these planning processes.

Completion of the Kingston Foreshore development and redevelopment of East Lake will increase the number of people living adjacent to the reserve and subsequently the use and interaction with the area (ACTPLA 2007). The planning process can create opportunities to increase awareness of the values of the reserve and incorporate measures to protect and enhance the wetlands. These include application of water sensitive urban design techniques, the creation and enhancement of habitat (including redesign of the silt trap and Jerrabomberra Billabongs area), design of high quality urban open space riparian parkland west and south of Jerrabomberra Creek which also functions as a buffer zone between new developments and the reserve, and wetland education and interpretation.

As noted in s. 2.2.3 the Birrigai at Jerrabomberra Wetlands site is now managed by the Department of Territory and Municipal Services. It is proposed to include the site into the Jerrabomberra Wetlands Nature Reserve to utilise the facilities for complimentary activities.

9.3.1 Objective

- Redevelopment of land adjacent to the reserve for residential and commercial purposes and for public open space is planned, designed and managed to complement the values of the reserve and minimise adverse impacts.

Policies

- Conservation of the values of the reserve will be pursued with agencies responsible for the planning, design and management of land adjacent to the reserve (in particular the Kingston Foreshore development and East Lake area).

- Ecological advice and information relevant to the conservation of the values of the reserve will be provided as required to inform planning decisions made in relation to the *Griffin Legacy* and the East Lake area.
- Any proposals to establish infrastructure or increase visitor access to sensitive habitat areas (e.g. the Peninsula) will not be supported.

Actions

- Participate in planning, design and management processes for land adjacent to the reserve relevant to the conservation of reserve values.
- Provide advice and information relevant to the proposals contained in the *Griffin Legacy* and in planning for the East Lake area.
- As part of the master planning process (s. 9.7) consider the use of the Birrigai facilities for enhancing visitor experiences at the nature reserve.

9.4 Fire Management

Jerrabomberra Wetlands is generally less subject to bush or grass fires than many other parts of the ACT, though fires still occur. In most bushfire seasons much of the pasture in the reserve retains a proportion of green uncured material due to the combined effects of the high water table, pasture type and grazing. However, exotic phalaris grassland within the reserve does provide a high pasture biomass and presents a fire risk, particularly when dry. The risk of ignition by fires spreading from surrounding areas is comparatively low because of water barriers on all sides except the eastern side, which is partly bordered by irrigated and ploughed fields.

The *Emergencies Act 2004* is the primary legislative authority for bushfire management in the ACT and provides for development of a Strategic Bushfire Management Plan (SBMP) (ACT ESA 2009a). As far as practicable, land managers must ensure that land is managed in accordance with the SBMP. Where there is inconsistency between the SBMP and a management plan in force under the *Planning and Development ACT 2007*, the management plan shall prevail.

Under the SBMP, a Canberra Regional Fire Management Plan has been prepared (ACT ESA 2009b), which establishes the major fire fuel management, fire access management and fire infrastructure management actions for 10 years (2009–2019). More detailed Bushfire Operational Plans, also required under the Emergencies Act, are the means by which land managers put in place bushfire management arrangements for particular land areas. These plans are reviewed every two years. Jerrabomberra Wetlands is in the *Land Management* Fuel Management Zone with fuel management by slashing along Dairy Road and in the vicinity of the eastern car park and Kellys Swamp.

9.4.1 Objective

- Fire is managed at the Jerrabomberra Wetlands so that reserve values, and life and property within and adjacent to the reserve are protected.

Policies

- The Canberra Regional Fire Management Plan (2009–2019) and the Bushfire Operational Plan provide the basis for the management of bushfire risk in the Jerrabomberra Wetlands.
- Lighting of fires is prohibited in the reserve.

Actions

- Carry out fire management works and activities in accordance with the Canberra Regional Fire Management Plan and the Bushfire Operational Plan.
- Continue programs of mowing, slashing and controlled grazing to reduce potential fire fuel loads, especially in the southern part of the reserve.

9.5 Sand and Gravel Extraction

The floodplain area of the reserve contains significant deposits of sand and gravel. Prior to the declaration of the area as Nature Reserve, there were proposals to exploit these deposits (ACT Parks and Conservation Service 1994). The Policies for River Corridors in the *National Capital Plan* (NCA 2007) state that sand and gravel extraction may be considered in order to maintain stream channel and flood plain stability, protect aquatic habitats and recreation areas and to control flooding. Experience to date has shown no need to extract sand and gravel for these purposes.

Policies

- Sand and gravel extraction will not be permitted in the reserve unless it can be clearly demonstrated that it is necessary to maintain biodiversity or cultural heritage values.

9.6 Environmental Impact Assessment

Requirements for environmental impact assessment of works or developments on land in the ACT are contained in the *Planning and Development Act 2007*. The *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) may also have applicability to the reserve due to the presence of migratory species protected under international agreements and Commonwealth planning control over the area (see s. 1.5.2 and s. 1.7).

Works or developments include projects associated with capital works, grants funding, community projects and urgent works. While it is appropriate in the reserve to assess the potential environmental impact of all works, many will be minor activities that may not require a formal assessment process. Current practice is to conduct an environmental impact evaluation that allows for the identification of suitable measures to counter potential impacts of minor works or alternatively, may clarify the need for a fuller environmental assessment as required by legislation.

Policies

- All proposed works and developments in the Jerrabomberra Wetlands will be assessed for their potential impact on the values of the reserve as defined in this management plan.
- An initial environmental impact evaluation will be undertaken to: (a) determine suitable measures to counter potential impacts of minor works; or (b) clarify the need for a fuller environmental assessment as required by legislation.

Actions

- Undertake assessment of the potential environmental impact of proposed works and developments in the reserve, based on an initial environmental impact evaluation, and referral to a fuller environmental assessment as required by legislation, where required.

9.7 Master Plan

This management plan sets out how the Jerrabomberra Wetlands Nature Reserve will be managed. It is proposed that the detailed planning for the wetlands, including site planning and concept design for a particular area or facility, will be set out in a master plan. This will provide the basis for a coordinated and strategic approach for capital works in the reserve.

Actions

- Prepare a master plan to detail site planning, including facilities, for Jerrabomberra Wetlands Nature Reserve.

10 Implementation

10.1 Implementation

Management policies and actions outlined in this management plan form the basis for its implementation. Table 10.1 contains a consolidated list of the actions to which priorities have been attached. Primary responsibility for implementation of the policies and actions contained in the plan will rest with the reserve management agency. However, many of the policies and actions are collaborative undertakings that will involve other government agencies, utility providers, commercial interests, adjacent residents and community groups.

As outlined in the *Purpose and Scope* (s. 1.3), a management plan for Public Land is a legislative requirement and provides structured guidance for the custodian of the land and all those with an interest in the area. The policies and actions comprise a mix of those that tend to be prescriptive and those that recognise the need and allow for varying levels of management flexibility.

10.2 Community Involvement

Residents of the ACT have been actively involved in the management of parks and reserves for many years especially through the formation of Park Care groups. Park Care is one of a range of groups involved in environmental management activities in the ACT and region. Funding support is provided by the ACT Government or jointly with Commonwealth programs. For the Jerrabomberra Wetlands, a major contribution to the knowledge about birdlife using the area has been derived from the surveys and database records of the Canberra Ornithologists Group.

The establishment of a substantial urban population in the Kingston Foreshore and East Lake areas provides the opportunity to nurture community involvement in the management of the reserve and Jerrabomberra Creek open space corridor. This may take some years to evolve as the communities become established and identify with these areas.

Policies

- Community involvement in the management of the Jerrabomberra Wetlands will be encouraged.

Actions

- Identify opportunities for and encourage community involvement in the management of the reserve.
- Encourage and give recognition to survey and monitoring by community groups of components of the reserve environment.

10.3 Management Actions and Priorities

Table 10.1 contains the actions listed in Chapter 4 to Chapter 10 of this plan. The substantial tasks with a *high priority* are:

- participation in planning and design processes for adjacent areas (especially the Kingston Foreshore and East Lake areas) as the outcomes of these processes are critical to the future of the reserve. This task will be ongoing for some years. Important issues are:
  - planning and design of the Jerrabomberra Creek corridor to provide open space recreational opportunities, habitat and ecological connectivity, and a buffer between the reserve and urban redevelopment
  - redesign of the Jerrabomberra Billabongs and silt trap area and provision of associated infrastructure and facilities to create a more 'natural' wetland area that provides recreational, water quality and ecological functions (e.g. creation and enhancement of habitat)
  - implementation of water sensitive urban design principles and objectives into the design of the East Lake redevelopment, including measures to improve the quality of stormwater entering Jerrabomberra Creek
  - creation of an attractive and appropriately designed entry to the reserve south-west of Jerrabomberra Creek with associated car park and bike path.
- preparation of a master plan for the reserve for more detailed site planning and to provide a coordinated and strategic approach to capital works investment
- preparation of a management plan for vegetation in the reserve. Particularly important is the control of woody weeds and follow-up replacement with desirable species.

Substantial tasks with a *medium priority* are:

- construction and maintenance of a well-designed track network including access for the disabled and elderly. This will involve upgrading of existing tracks or constructing new tracks and will be integrated with the planning and design of the Jerrabomberra Creek corridor
- development and implementation of a signage program for the reserve
- development and implementation of an interpretation strategy for the reserve
- investigation of opportunities to enhance environmental education facilities and programs based upon the wetlands
- participation in planning and management processes relevant to the management of upstream catchments of the reserve, in relation to water quality, catchment contamination, sedimentation and rehabilitation.

Table 10.1 Management Actions and Priorities

Notes for the following table:

Priority – High, Medium, Low are used in two ways in this table:

Category 1. For some actions, it indicates the priority that should be given to *undertaking and completing* the action (for example, a High priority action of this type should be undertaken early in the life of the management plan);

Category 2. For many actions it indicates the priority that should be given to an action *that will remain current across the life of the plan* (in the context of all management activities). These are shown as **Ongoing (O)**.

Time scales for actions – as a guide the following time scales are appropriate for actions in Category 1:

High (H): Undertaken/completed within three years of completion of this plan.

Medium (M): Undertaken/completed within five years of completion of this plan.

Low (L): Undertaken/completed more than five years after completion of this plan.

Chapter/ Section	Actions	Priority
Chapter 4 Biodiversity		
4.2.2 Aquatic and Wetland Habitats	**(a) Peninsula and Jerrabomberra Backwaters (Zone 1)** – Include advice on access restrictions to the Peninsula and Jerrabomberra Backwaters (Refuge Zone) in information about the reserve and in signage. – Provide advice to ActewAGL and other relevant agencies on minimising disturbance to wetland birds in undertaking routine maintenance of urban services infrastructure.	HO MO
	(b) Jerrabomberra Reach (Zone 2) and Jerrabomberra Pool (Zone 3) – Provide advice on the prohibition of boating access to Jerrabomberra Reach (past the entry to Kingston Foreshore Harbour) in information about the reserve and in signage. – Undertake management of riparian vegetation in relation to the policy (above). – Provide advice as required on the design of the landscape between adjacent urban development and Jerrabomberra Creek. – Provide advice discouraging the feeding of wildlife (especially waterbirds) in information about the reserve and in signage.	MO HO HO HO
	(c) Molonglo Reach and Shoveler Pool (Zone 3) – Erect an access advisory sign at the reserve boundary (service road gate) near Shoveler Pool.	M
	(d) Kellys Swamp (Zone 3) – Review the potential to manipulate water levels in Kellys Swamp (in particular to expose mud flats). – Monitor the effects of urbanisation in the Jerrabomberra Creek catchment and evaluate the need to control inflow to the swamp. – Investigate and where appropriate undertake habitat enhancement activities at Kellys Swamp. As part of this, evaluate: (a) placement of emergent logs in the water; and (b) extra plantings or screen fences on the eastern side of the swamp between the bird hides so as to reduce disturbance by visitors.	M MO MO

Chapter/ Section	Actions	Priority
	(e) Jerrabomberra Billabongs (Zone 3) – Continue grazing of the Jerrabomberra Billabongs area for fuel reduction purposes as necessary and to provide diversity of habitat for wading bird species. – Use the opportunity presented by the intended East Lake redevelopment to enhance the ecological and recreational values of the billabongs area, as well as its water quality management function.	O MO
	(f) Jerrabomberra Creek silt Trap (Zone 3) – Use the opportunity presented by the intended East Lake redevelopment to enhance the ecological and recreational values of the silt trap area, as well as its water quality management function.	MO
	(h) Enhancement of Aquatic and Wetland Habitat – Evaluate and undertake habitat creation and enhancement activities in the reserve including opportunities associated with urban redevelopment in the Kingston Foreshore and East Lake areas (including outside of the reserve). – Prior to carrying out any habitat enhancement, review information such as bird strike data, bird behaviour and aircraft movement patterns and numbers to enable a more accurate assessment of the bird strike risk.	HO MO
4.2.3 Exotic Grasslands	– Undertake weed control in grassland areas without unduly disturbing the wildlife.	MO
4.3.1 Vertebrate Fauna	– Collect biological and ecological information on the fauna of the reserve to assess conservation needs, through survey, monitoring, use of existing records and other information sources. – Evaluate and undertake appropriate management actions in support of fauna conservation (especially in relation to migratory waterbirds) on the basis of biological and ecological information. – Pursue fauna conservation and enhancement objectives as part of the planning for the interface between the reserve and the Kingston Foreshore and East Lake areas. – Undertake feral animal control, particularly during bird breeding season.	LO LO HO HO
4.4.3 Vegetation Management	– Prepare a vegetation management plan for the differing vegetation types in the reserve and in the context of the vegetation management principles and policies outlined above. – Undertake vegetation management according to the vegetation management plan and monitor the results.	H HO
4.4.4 Cattle Grazing	– Continue selective, controlled cattle grazing in accordance with the management policy. – Monitor and assess the impact of cattle in sensitive wetland and riparian areas, including Molonglo Reach and take action to protect such areas, as required.	O MO
4.5.2 Pest Plants	– Undertake pest plant management in accordance with the vegetation management plan and the policies (above).	HO
4.5.3 Pest Animals	– Undertake pest animal control as required and in accordance with ACT legislative requirements and strategies. Monitor the results. – If necessary, evaluate means by which particular habitats may be made safer from predation (e.g. refuge islands, use of dead trees and logs in open water to create perching sites, fencing). – Install 'no dogs' signs at reserve entry points.	M O H

Chapter/ Section	Actions	Priority
Chapter 5 Landscape		
5.2 Geomorphology: Paleochannels of the Molonglo River	– Include the paleochannels in the Canberra Nature Park central register of sites of significance. – Ensure that water sensitive urban design measures are incorporated into the planning and design of urban redevelopment adjacent to the reserve to achieve effective erosion and sediment control in the Jerrabomberra Creek catchment. – Control access and activities that have the potential to adversely affect the paleochannels (including infrastructure maintenance and cattle grazing) (see s. 4.2.2, s. 4.4.4, and s. 9.2). – Monitor the condition of the channels (sedimentation rates, changes in cross-sectional geometry) as a basis for determining whether further actions are required to maintain the channels.	M MO HO LO
5.3 Visual and Aesthetic	– Maintain views and vistas by removal of woody weeds and appropriate replanting in riparian areas. – Include planting for visual and aesthetic purposes (including screening) in vegetation management programs for the reserve. Design such plantings to contribute also to habitat creation and ecological connectivity. – Participate in planning processes for the removal of the power lines and switching station with the aim of minimising the visual impact of electrical infrastructure on the reserve.	MO MO H
5.4 National Capital Significance	– Obtain works approval from the National Capital Authority for landscaping and construction activities in the reserve and include consideration of national capital significance in vegetation management.	MO
Chapter 6 Recreation (see also Table 6.2 and Table 6.3)		
6.2.3 Recreational Facilities	**(a) Parking** – Ensure that the Newcastle Street car park and associated entry to the reserve is part of the planning and design of the landscape between the reserve and the Kingston Foreshore and East Lake areas. – Evaluate whether there is a need to close off access to the eastern car park at night by a gate on Dairy Road (to be kept under review).	H MO
	(b) Walking Tracks, Bridges, Cycle Path – Construct and maintain a well-designed track network with views that encourage visitors to follow the paths. Tracks will include the following: – an east–west walking track between the car parks – a track to Shoveler Pool for birdwatchers (along existing vehicle track) – tracks to bird hides (Kellys Swamp, Jerrabomberra Pool), connecting to the east–west track – a track to the silt trap (through planted woodland) – access tracks from the Birrigai at Jerrabomberra site. – Include consideration of tracks and other access suitable for both students and other visitors in the redesign of the Jerrabomberra Billabongs and silt trap area as part of the redevelopment of East Lake.	MO MO

Chapter/ Section	Actions	Priority

	(c) Signage
	– Review signs in the reserve and develop a signage plan that considers information, interpretation and safety requirements, including:
	  – directional signage at both entry car parks
	  – 'No dogs' signs at entry points
	  – track and access signage
	  – high quality maps at entry points
	  – exclusion areas e.g. Jerrabomberra Reach for watercraft, past the Kingston Boat Harbour entrance (recreational boats).
		M

	(d) Bird Hides – Maintain interpretation information in the bird hides and update as required. – Maintain hides in a good, clean condition. – Ensure that the future location of hides is considered in the redesign of the Jerrabomberra Billabongs and silt trap area as part of the East Lake redevelopment. – Monitor use of the bird hides and take appropriate action should there be vandalism, criminal activity or threats to public safety. – Encourage the local community to become involved with the management of the bird hides. – Evaluate the need for and provide further hides if warranted. – Remove the old viewing platform (concrete base, timber seats and rail) at the south-eastern end of Kellys Swamp.	MO HO MO MO M MO M
	(e) Recreational Boating – Provide advice to boat operators using Kingston Boat Harbour on the restrictions to entering Jerrabomberra Reach. – Erect a sign advising that Jerrabomberra Reach is closed to recreational boating beyond the entrance to the Kingston Boat Harbour and that access to the Jerrabomberra Backwaters is prohibited.	HO H
6.2.4 Visitor Impacts	– See Table 6.2 Visitor Impacts and Management Actions	HO
6.2.5 Visitor Safety	– Provide contact/emergency phone numbers in the bird hides, on signs and other information material. – See Table 6.3. Potential Hazards to Visitors and Management Actions	M
6.2.6 Waterbird Displays and Bird Feeding	– Provide information and interpretation signs and other materials advising of food sources for birds and the lack of need for and undesirability of feeding (especially the use of bread). – Include species in plantings that contribute to food sources for birds.	M MO
6.2.7 Entry Fees	– Charge a fee for ranger guided interpretation activities where appropriate, in accordance with the approach adopted for CNP as a whole.	O
6.3 Tourism	– Liaise with Australian Capital Tourism to consider ways in which the reserve may contribute to tourism to the ACT, commensurate with the protection of wetland habitats and the biodiversity values of the reserve.	M

Chapter/ Section	Actions	Priority
Chapter 7 Education and Research		
7.2 Education	– Include consideration of educational opportunities and access in future redesign of the silt trap and Jerrabomberra Billabongs area associated with the East Lake redevelopment. – Investigate opportunities to enhance environmental education facilities and programs with a focus on wetlands.	M M
7.3 Interpretation	– Develop an interpretation strategy that identifies target audiences, features of the reserve to be interpreted and suitable materials and facilities. – Provide succinct introductory information at entry car parks that leads into more detailed interpretative materials and associated facilities within the reserve. – Encourage community involvement in developing and implementing interpretative programs.	M M LO
7.4 Research	– Encourage research projects that investigate aspects of the wetlands environment and management issues.	LO
7.5 Monitoring	– Evaluate the need for monitoring in the reserve and implement where required. – Apply the results of monitoring to management policies and actions contained in this management plan.	LO LO
Chapter 8 Cultural Heritage		
8.2 Cultural Heritage Conservation	– Ensure that all works proposed for the reserve fulfil legislative requirements related to heritage protection. – Include both Aboriginal and European cultural heritage in the interpretation strategy for the reserve (see s. 7.3). – Recognise prior Aboriginal occupation on reserve entry signs and in relevant interpretative material. – Encourage Aboriginal people and descendants of European settler families with local knowledge to be involved in identifying, conserving and interpreting heritage.	HO M M M
Chapter 9 Environmental Planning, Protection and Management		
9.1 Hydrology and Water Management	– Participate in planning and management processes relevant to the management of upstream catchments of the wetlands. – Include the likely effects on downstream flows and water quality in assessment of the impacts of proposed reserve management activities. – Include the requirements of ACT environmental protection and resource management legislation and associated guidelines in the planning, design and carrying out of activities in the reserve.	MO LO HO
9.1.2 Water Quality	– Participate in planning and management processes relevant to the maintenance and improvement of upstream water quality. – Consider the effects on water quality of reserve management activities including provision of facilities, access and event approvals, and maintenance (e.g. mowing and cattle grazing) (see s. 4.4.3 and s. 4.4.4).	MO MO

Chapter/ Section	Actions	Priority

9.1.3 Catchment Contamination and Sedimentation	– Participate in planning and management processes relevant to:
	  – improving control over catchment contamination and sedimentation (e.g. East Lake area)
	  – reviewing the operation of the Jerrabomberra Creek silt trap and its habitat potential.
	– Ensure that the assessment of potential contamination includes those areas of environmental concern currently within the reserve boundaries.
	– Encourage adoption of Water Sensitive Urban Design principles in redevelopment adjacent to the reserve and new urban developments upstream of the reserve.
	– Establish a riparian vegetation buffer along Jerrabomberra Creek, including restoration and reinstatement of suitable indigenous species.
		MO
		
		H
		
		MO
		
		MO

9.1.4 Pollution, Chemical Spills	– In the event of a spill of hazardous material affecting the wetlands, take action according to the MOU between ACT Government agencies. – Participate in planning and management processes for areas adjacent to, and upstream of, the reserve with the aim of reducing the threat of spills of hazardous materials that may affect the wetlands.	HO MO
9.1.5 Flooding	– Ensure impacts of, and effects upon, flood waters are taken into account when designing and locating facilities, structures and plantings in the reserve. – Ensure that protection of the reserve from adverse flood effects is considered in the planning and design of areas adjacent to, and upstream of, the reserve. – Maintain and enhance riparian vegetation cover to protect stream banks from scouring by floodwaters. – Maintain flood warning signs.	MO MO MO MO
9.2.1 Urban Services Infrastructure	– As required, provide ActewAGL with advice aimed at minimising the impact of infrastructure installation and maintenance on reserve values, especially waterbird habitat. Where possible minimise access during the bird-breeding season from late winter to mid-summer. – Ensure that proposals for new services or relocation of existing facilities are subject to an appropriate level of environmental impact assessment. – Ensure that works associated with urban services infrastructure in the reserve are followed up with adequate rehabilitation.	MO HO MO
9.3.1 Adjacent Land Uses and Future Developments	– Participate in planning, design and management processes for land adjacent to the reserve relevant to the conservation of reserve values. – Provide advice and information relevant to the proposals contained in the *Griffin Legacy* and in planning for the East Lake area. – As part of the master planning process (s. 9.7) consider the use of the Birrigai facilities for enhancing visitor experiences at the nature reserve.	HO MO H
9.4.1 Fire Management	– Carry out fire management works and activities in accordance with the Canberra Regional Fire Management Plan and the Bushfire Operational Plan. – Continue programs of mowing, slashing and controlled grazing to reduce potential fire fuel loads, especially in the southern part of the reserve.	HO HO
9.6 Environmental Impact Assessment	– Undertake assessment of the potential environmental impact of proposed works and developments in the reserve, based on an initial environmental impact evaluation, and referral to a fuller environmental assessment as required by legislation, where required.	HO
9.7 Master Plan	– Prepare a master plan to detail site planning, including facilities, for Jerrabomberra Wetlands Nature Reserve.	H

Chapter/ Section	Actions	Priority
Chapter 10	***Implementation***	
10.2 Community Involvement	– Identify opportunities for and encourage community involvement in the management of the reserve. – Encourage and give recognition to survey and monitoring by community groups of components of the reserve environment.	M LO

Appendices

Appendix 1

Waterbirds and Landbirds Associated with Aquatic, Wetland and Riparian Habitats in the Jerrabomberra Wetlands Nature Reserve

*(Common names follow Barrett et al. 2003. Note that some species occur in more than one habitat but are listed here only once. * Indicates landbirds.*

(V-NSW) Indicates species declared as vulnerable under the Threatened Species Conservation Act 1995 (NSW).)

OPEN WATER

coot, Eurasian	duck, Pacific black	duck, Australian wood (maned)
duck, pink-eared	duck, blue-billed (V-NSW)	duck, hardhead
duck, mallard	duck, musk	goose, domestic
grebe, Australasian	grebe, great crested	grebe, hoary-headed
moorhen, dusky	pelican, Australian	swan, black
teal, grey		

SHALLOW SECTIONS AT WATER'S EDGE (including reed beds and mudflats)

avocet, red-necked	bittern, little	cisticola, golden-headed*
crake, Australian spotted	crake, Baillon's	crake, spotless
dotterel, black-fronted	dotterel, red-kneed	duck, freckled (v-nsw)
egret, great	egret, intermediate	egret, little
greenshank, common	heron, white-necked	plover, Pacific golden
plover, red-capped	sandpiper, curlew	sandpiper, marsh
sandpiper, pectoral	sandpiper, sharp-tailed	sandpiper, wood
shoveler, Australasian	spoonbill, royal	spoonbill, yellow-billed
stilt, black-winged	stint, long-toed	teal, chestnut
tern, Caspian	tern, whiskered	

RIPARIAN AREAS and EXOTIC GRASSLANDS
(including grassland, marsh, wet and drowned grassland)

cormorant, great	cormorant, little black	cormorant, little pied
cormorant, pied	darter	eagle, little
egret, cattle	grassbird, little*	gull, silver
harrier, swamp	heron, nankeen night	heron, white-faced
ibis, Australian white	ibis, glossy	ibis, straw-necked
lapwing, masked	native hen, black-tailed	plover, double-banded
rail, buff-banded	rail, Lewin's	reed warbler, clamorous*
sea eagle, white-bellied	shelduck, Australian	snipe, Latham's
snipe, painted	swamphen, purple	whistling duck, plumed

Appendix 2

Common Weed Species in the Jerrabomberra Wetlands Nature Reserve

TREES		
Alnus glutinosa	black alder	ACT Pest Plant[4]
Populus alba	silver poplar	ACT Pest Plant[4]
Populus nigra 'Italica'	Lombardy poplar	ACT Pest Plant[4]
Robinia pseudoacacia	false acacia, black locust	ACT Pest Plant[4]
Salix alba	white willow	ACT Pest Plant[2,4]
S. rubens	basket willow	ACT Pest Plant[2,4]
S. alba var. *vitellina*	golden upright willow	ACT Pest Plant[2,4]
S. fragilis	crack willow	ACT Pest Plant[2,4]
SHRUBS		
Acacia baileyana	Cootamundra wattle	ACT Pest Plant[4]
Cotoneaster spp.	cotoneaster	ACT Pest Plant[4]
Foeniculum vulgare	fennel	
Ligustrum lucidum	broad-leaf privet, large-leaved privet	ACT Pest Plant[4]
Ligustrum sinense	narrow-leaf privet, small-leaved privet	ACT Pest Plant[4]
Pyracantha angustifolia	firethorn	ACT Pest Plant[4]
GROUNDCOVERS		
Cirsium vulgare	spear thistle	
Hypericum perforatum	St John's wort	ACT Pest Plant[3]
Onopordum acanthium	Scotch thistle	ACT Pest Plant[3]

A wide range of exotic grasses, including those declared as pest plants in the ACT e.g. African love grass *Eragrostis curvula*[3], serrated tussock *Nasella trichotoma*[3,4].

VINES/SCRAMBLERS		
Rubus fruticosus (agg.)	blackberry	ACT Pest Plant[3]

Note: ACT Pest Plants are declared under the *Pest Plants and Animals (Pest Plants) Declaration 2005 (No 1)* made under the *Pest Plants and Animals Act 2005*.

The following categories apply to pest plants in the declaration:

1 A pest plant whose presence must e notified.
2 A pest plant that must be suppressed.
3 A pest plant that must be contained.
4 A pest plant whose supply is prohibited.

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