

NEARIE LAKE NATURE RESERVE

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

November 2008

This plan of management was adopted by the Minister for Climate Change and the Environment on 28th November 2008.

Acknowledgments

This plan of management is based on a draft plan prepared by staff of the Lower Darling Area of NPWS.

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FOREWORD

Nearie Lake Nature Reserve is situated in south-western NSW approximately 80 kilometres north of Wentworth. The reserve, which is 4,347 hectares in size, is located on the Great Anabran of the Darling River.

The most significant feature of the reserve is Nearie Lake, which makes up approximately 2,140 hectares (44%) of the reserve. It is one of the deepest lakes in the Darling Anabran, an ancestral channel of the Darling River, and provides an important refuge for waterbirds as floodwaters dry up in the system and is an important waterbird breeding area.

Nearie Lake Nature Reserve contains one vegetation community that is considered endangered, and three communities that are uncommon and poorly reserved. It also protects part of a threatened aquatic ecological community, and one threatened plant and six threatened animal species.

Aboriginal heritage of the area dates back to at least 36,000 years. A number of Aboriginal sites have been recorded in and around Nearie Lake Nature Reserve, including burials, stone arrangements, open camp sites and middens.

The New South Wales *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each nature reserve. A plan of management is a legal document that outlines how an area will be managed in the years ahead.

A draft plan of management for Nearie Lake Nature Reserve was placed on public exhibition from 20th July until 29th October 2007. The submissions received were carefully considered before adopting this plan.

This plan contains a number of actions to achieve “Better environmental outcomes for native vegetation, biodiversity, land, rivers, and coastal waterways” (Priority E4 in the State Plan) including monitoring of native flora and fauna, control of introduced plants and animals, and working with government and other agencies to protect and restore natural/environmental flows in the Darling Anabran.

This plan of management establishes the scheme of operations for Nearie Lake Nature Reserve. In accordance with section 73B of the *National Parks and Wildlife Act 1974*, this plan of management is hereby adopted.

Carmel Tebbutt MP

1. MANAGEMENT CONTEXT

1.1 LEGISLATIVE AND POLICY FRAMEWORK

The management of nature reserves in NSW is in the context of a legislative and policy framework, primarily the *National Parks and Wildlife Act 1974* (NPW Act), the NPW Land Management Regulation, the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the National Parks and Wildlife Service (NPWS). Section 72AA of the NPW Act lists the matters to be considered in the preparation of a plan of management. The policies are a compilation of policies arising from the legislative background and internationally accepted principles of park management. They relate to nature conservation, Aboriginal and historic heritage conservation, recreation, commercial use, research and communication.

Other legislation, international agreements and charters may also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* (EPA Act) requires the assessment and mitigation of the environmental impacts of any works proposed in this plan.

A plan of management is a statutory document under the NPW Act. Once the Minister has adopted a plan, no operations may be undertaken within Nearie Lake Nature Reserve except in accordance with the plan. The plan will also apply to any future additions to Nearie Lake Nature Reserve. Where management strategies or works are proposed for the nature reserve or any additions that are not consistent with the plan, an amendment to the plan will be required.

1.2 MANAGEMENT PURPOSES AND PRINCIPLES

Nature reserves are reserved under the NPW Act to protect and conserve areas containing outstanding, unique or representative ecosystems, species, communities or natural phenomena.

Under the Act, nature reserves are managed to:

- conserve biodiversity, maintain ecosystem functions, and protect geological and geomorphological features and natural phenomena;
- conserve places, objects, features and landscapes of cultural value;
- promote public appreciation, enjoyment and understanding of the reserve's natural and cultural values; and
- provide for appropriate research and monitoring.

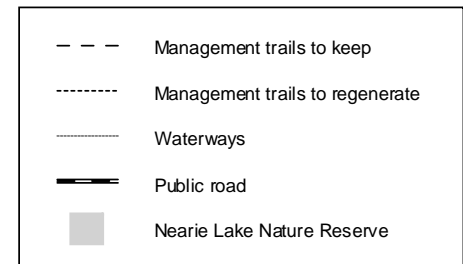
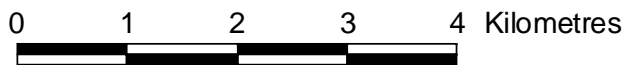
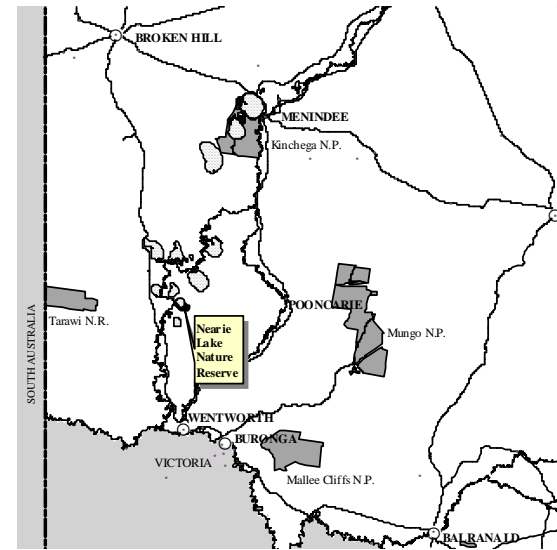
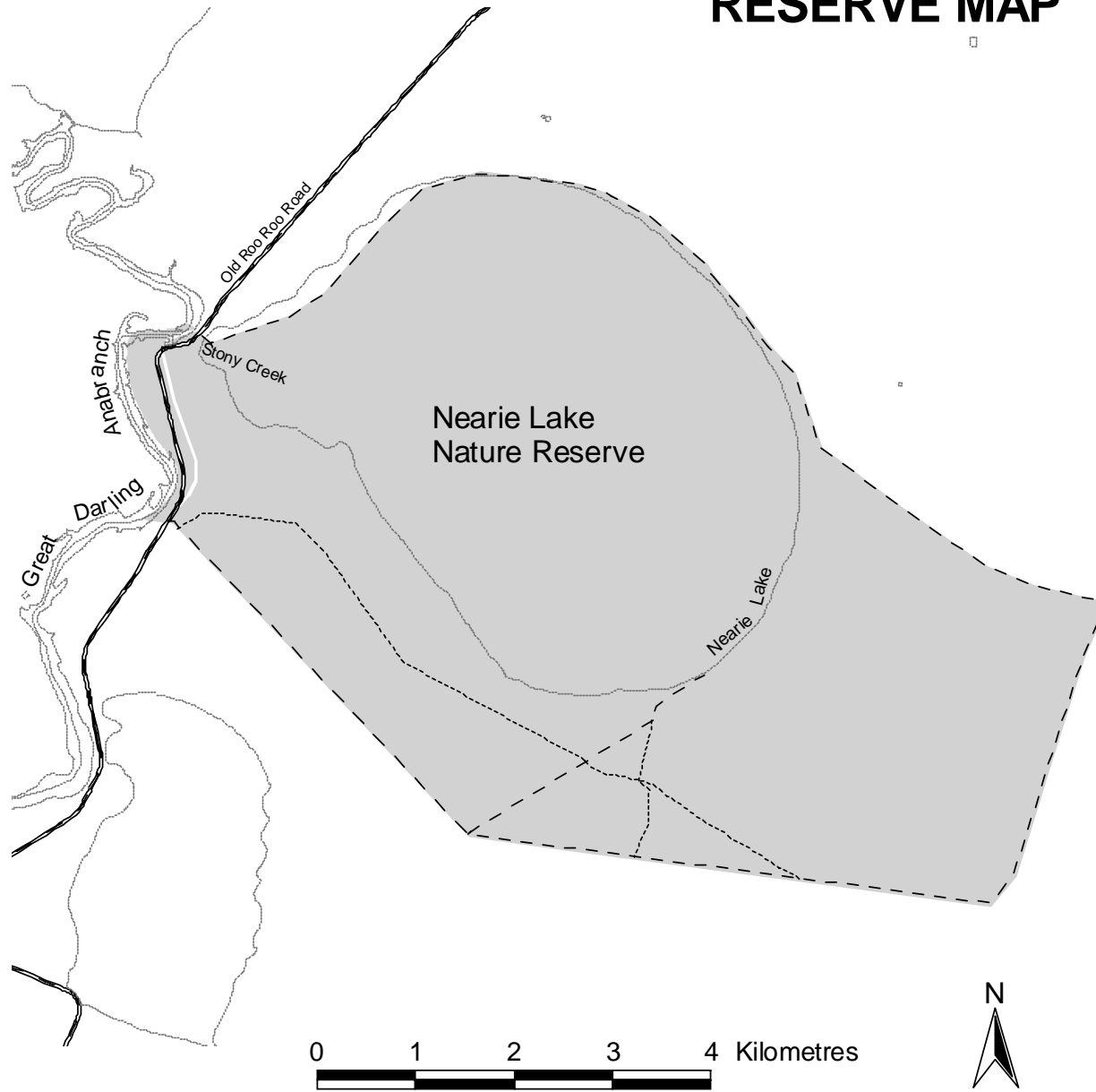
Nature reserves differ from national parks in that they do not have as a management principle to provide for visitor use.

1.3 MANAGEMENT DIRECTIONS

In addition to those general management objectives the following specific objectives apply to Nearie Lake Nature Reserve:

- The protection and restoration of natural river flows in the Great Anabranh of the Darling River and Darling River systems.
- To maintain as far as possible natural flow regimes in and out of the lake to protect wetlands and waterbird breeding areas in the reserve.
- The protection of indigenous aquatic and terrestrial plants and animals.
- The protection of Aboriginal burial sites and potential megafauna sites.
- The provision of opportunities for scientific research and environmental education use which are compatible with the conservation of the area.

RESERVE MAP



2. NEARIE LAKE NATURE RESERVE

2.1 LOCATION, GAZETTAL AND REGIONAL SETTING

Nearie Lake Nature Reserve is situated in south-western NSW approximately 80 kilometres north of Wentworth within the Wentworth Shire. The reserve is located on the Great Anabranche of the Darling River (herein referred to as the Darling Anabranche). The region is predominantly made up of Western Lands leases with sheep and some cattle grazing. Large scale flow regulation and irrigation works occur along the Murray and upstream reaches of the Darling River. Opportunistic cropping occurs on most of the lakes of the Darling Anabranche when floodwaters recede.

The reserve was gazetted on 13th May 1973 and is 4,347 hectares in size. It was once part of the Avoca-Para holding and became a nature reserve after the western lands lease for the property expired.

The most significant feature of the reserve is Nearie Lake, which makes up approximately 2,140 hectares (44%) of the reserve. This ephemeral lake only fills after moderate to major flooding of the Darling Anabranche, an ancestral channel of the Darling River. This occurs approximately one or two times every seven to ten years. The Darling Anabranche and its lakes are a significant ephemeral wetland system and are listed in the Directory of Important Wetlands in Australia. Nearie Lake Nature Reserve represents the only protected area on the Darling Anabranche system and is listed on the Register of National Estate. Its importance lies in being the only protected area along the Darling Anabranche and by providing an important refuge for waterbirds as floodwaters dry up in the system. Nearie Lake, although by no means a large lake, is one of the deepest lakes in the Darling Anabranche system (2 - 3 metres compared with 1 – 2 metres for the other lakes) and holds water for 3 to 4 years after flooding. Natural floodwaters have entered the lake on approximately 19 occasions between 1864 and 2008.

The area is within the traditional lands of the Barkantji people and is within the Dareton Local Aboriginal Land Council area. Although there has been no formal surveying of cultural sites within the reserve a number of Aboriginal sites have been recorded including burials, stone working sites, hearths and stone arrangements. The region is known to have had human occupation for more than 36,000 years and there is a very high probability that more sites are located within the reserve.

There is also a likelihood that megafauna sites occur on the reserve. Megafauna have been found on other Darling Anabranche lakes including Lakes Tandou, Popiltah, Nialia and Nitchie.

2.2 LANDSCAPE

Natural and cultural heritage and on-going use are strongly inter-related and together form the landscape of an area. Much of the Australian environment has been influenced by past Aboriginal and non-Aboriginal land use practices, and the activities of modern day Australians continue to influence bushland through recreational use,

cultural practices, the presence of introduced plants and animals and in some cases air and water pollution and altered river flow patterns.

The geology, landform, climate and plant and animal communities of the area, plus its location, have determined how humans have used it. Evidence of Aboriginal occupation dates to more than 36,000 years ago and the area would have been utilised by Aboriginal people when water and food resources were present. The lake is one of the deepest of the Darling Anabranh lakes and holds water for longer than most Anabranh lakes. This allows waterbirds and other biota that rely on water to persist for a longer period.

European settlement occurred in the area around 1846 soon after Sturt's 1844 expedition, and grazing by domesticated stock and other introduced animals has continued throughout the far west of the state since. The area, now Nearie Lake Nature Reserve, was grazed from the mid 1800's. Some timber was also cut from the area, mainly black box (*Eucalyptus largiflorens*) for use in fencing and for other farm purposes. One of the largest changes to the lake and Darling Anabranh has been altered water regimes and water quality. Water regimes describe the volume, depth, area, duration, frequency, variability and season of river flows and wetland flooding. Dams, channels and block banks were constructed along the Darling Anabranh from 1869 and changes have occurred on several occasions since then. One of the more significant changes occurred after 1961 when the Menindee Lakes Storage Scheme was implemented and regular managed flows were released along the Darling Anabranh. Water movement within the Darling catchment has also changed during this time due to dams, weirs, floodplain clearing and extraction for domestic and agricultural use including irrigation.

Both Aboriginal and non-Aboriginal people place cultural values on natural areas, including aesthetic, social, spiritual, recreational and other values. Cultural values may be attached to the landscape as a whole or to individual components, for example to plant and animal species used by Aboriginal people. This plan of management aims to conserve both natural and cultural values. For reasons of clarity and document usefulness natural and cultural heritage, non-human threats and on-going use are dealt with individually, but their inter-relationships are recognised.

2.3 NATURAL AND CULTURAL HERITAGE

Landform, Geology and Soils

Nearie Lake Nature Reserve straddles the southern end of the Darling Riverine Plains Bioregion and the Murray Darling Depression. The Darling Riverine Plains Bioregion is an inland drainage system that encompasses most of the Barwon and Darling River catchments in northern New South Wales and southern Queensland as well as the channels and floodplains of the lower Darling River (downstream of Bourke). The bioregion is made up of extensive alluvial deposits overlying sedimentary rocks that contain marine sediments of an inland sea from the cretaceous period (144 to 65 million years ago). The landscape is flat with the floodplains and river channels the dominant features. The features of the Darling

Anabranche are the river channel and floodplain and the large shallow overflow lakes, one of which is Nearie Lake. The Murray Darling Depression is an extensive gently undulating sand and clay plain frequently overlain with Aeolian dunes. Vegetation consists of semi-arid woodlands, mallee shrublands and heathlands, and savanna woodlands. The eastern section of the reserve is within this bioregion.

Three major landsystems are present within the reserve (Walker, 1991). These are: Anabranche, which is the Darling Anabranche channel and floodplain in the west of the reserve not including the lake bed; Roo Roo, which comprises the areas to the south and east of the lake; and Travellers, which is the lake bed. Geomorphology, soils and erosion potential of these landsystems are outlined below.

Anabranche

Geomorphology - floodplain of grey fine-textured quaternary alluvium with sinuous perennial river channels, riverside swamps and billabongs; slightly elevated plains and backplains; riverside lunettes of cemented sands; relief to 10 metres. Irregularly inundated by controlled flooding.

Soils - Plain with grey cracking and compact clays, brown texture contrast soils on levees.

Erosion – moderate scalding of levees; minor gullying of river banks.

Roo Roo

Geomorphology – gently undulating sandplain of quaternary alluvial and aeolian material with circular depressions and isolated rises; restricted predominantly to sloping margins of anabranche lakes system.

Soils – plains of loamy red texture-contrast soils and solonised brown soils; grey cracking clays in depressions and deep brownish and siliceous sands on dunes and rises.

Erosion – moderate to severe scalding on plain; slight drift on dunes.

Travellers

Geomorphology – large subcircular lakes to 15 kilometres in diameter; partially stabilised lunettes, best developed on the eastern margins; relief to 20 metres; feeder channels from the anabranche to 100 metres wide.

Soils– lake beds margins and channels of grey cracking clays; lunette of cemented siliceous sands.

Erosion – moderate windsheeting and gullying of lunettes.

Native Vegetation

The vegetation of the reserve was surveyed and mapped by Westbrooke *et al*, 1997. They mapped five vegetation communities outlined below. A total of 187 flora species have been recorded in the reserve, of which 51 are introduced. More species are likely, particularly on the lake, as plant composition changes considerably depending on local rainfall, river flows and time since flooding. Many ephemeral and annual plants also respond to seasonal changes. Species names follow the Flora of New South Wales (Harden, 1991-1993), common names follow Cunningham *et al*. (1981); introduced species are preceded with an asterisk, status is from Benson *et al* (2006).

Lake bed low open-herbland

The composition of this community is subject to change during and after periods of flooding. The persistent dominant however is spiny lignum (*Muehlenbeckia horrida*). Associated species include chenopods such as eastern flat-top saltbush (*Atriplex lindleyi*), pale poverty bush (*Scleroleana divaricata*) and black rolypoly (*S. muricata*). Various native and exotic grasses and herbs such as barley grass (**Hordeum leporinum*), red brome (**Bromus rubens*) and burr medic (**Medicago* spp.) may also cover the ground. During the drying of Nearie Lake in 1995 the lakebed was dominated by dense Australian Hollyhock (*Malva preissiana*). The shrub native liquorice (*Glycyrrhiza acanthocarpa*) occurs along Stony Creek. This community is considered as near threatened and poorly reserved.

Black Box (*Eucalyptus largiflorens*) open-woodland

Around the edge of Nearie Lake is a semi continuous open-woodland dominated by black box with a variable shrubby understorey including nitre goosefoot (*Chenopodium nitrariaceum*), spiny lignum and ruby saltbush (*Enchyleana tomentosa*). The herb layer consists largely of exotic weeds including burr medic's, Hexam scent (*Melilotus indicus*), smooth mustard (**Sisymbrium erysimoides*) and *barley grass. High proportions of black box are carrying the mistletoe *Amyema miquelii*. Black box open woodland is considered as near threatened and poorly reserved.

Old Man Saltbush (*Atriplex nummularia*) low open-shrubland

In depressions across the undulating plains to the south of Nearie Lake are areas dominated by old man saltbush to 2 metres. Associated shrubs to 1 metre include cottony saltbush (*Chenopodium curvispicatum*), dillon bush (*Nitraria billardieri*), salt copperburr (*Scleroleana ventricosa*) and ruby saltbush. The ground layer includes chenopods like eastern flat-top saltbush and water weed (*Osteocarpum acropterum* var. *deminuta*). Introduced species include Arabian grass (**Schismus barbartus*), *barley grass, * red brome and *burr medic. This community is considered as critically endangered and poorly reserved.

Black Bluebush (*Maireana pyramidata*) low open-shrubland

On the undulating plains to the south of Nearie Lake are extensive areas of black bluebush low open-shrubland to 2 metres. Associated shrubs include the chenopods cottony saltbush, *Maireana appressa* and eastern flat-top saltbush. Following rains, the ground cover layer has numerous native and exotic grasses and herbs such as variable plantain (*Plantago varia*), smooth minuria (*Minuria integerrima*), tall groundsel (*Senecio runcinifolius*), New Zealand Spinach (*Tetragonia tetragonioides*) and hard-headed daisy (*Brachyscome lineariloba*). This community is considered near threatened and poorly reserved.

Dillon Bush (*Nitraria billardieri*) low open-shrubland

To the east of Nearie Lake are extensive areas dominated by dillon bush to 2 metres with associated shrubs including black bluebush, *M. turbinata*, pale poverty bush and eastern flat top saltbush. Exotic herbs dominate the ground layer following rain. Dillon bush low open-shrubland community has little conservation concern and is adequately protected.

The threatened species Menindee nightshade (*Solanum karsense*) has been recorded in the reserve within the lake bed low open-herbland community.

Native Animals

Fauna surveys were conducted within the reserve in 2006 and 2007 and several bird surveys by various bird watching groups have been undertaken in the past. Other species have been recorded opportunistically and on an ad hoc basis. Twenty four reptiles, 11 native mammals and 126 bird species have been recorded on the reserve.

Six threatened fauna species have been recorded in the reserve, these are the freckled duck (*Stictonetta naevosa*), black-breasted buzzard (*Hamirostra melanosternon*), brolga (*Grus rubicunda*), pink cockatoo (*Cacatua leadbeateri*), redthroat (*Pyrrholaemus brunneus*) and pied honeyeater (*Certhionyx variegatus*). Several other threatened species are likely to occur including the striped-faced dunnart (*Sminthopsis crassicaudata*), blue-billed duck (*Oxyura australis*) and little pied bat (*Chalinolobus picatus*). Four migratory bird species covered by international agreements, the Japan-Australia Migratory Birds Agreement (JAMBA) and the China-Australia Migratory Birds Agreement (CAMBA) occur in the reserve. These are the great egret (*Ardea alba*), glossy ibis (*Plegadis falcinellus*), Caspian tern (*Sterna caspia*) and common sandpiper (*Actitis hypoleucos*). The JAMBA and CAMBA agreements provide for cooperation between the governments of these countries to protect birds which migrate between the countries and their environment.

The river, floodplain and lakes of the Darling Anabranh are a significant inland wetland system in New South Wales and form part of the Lowland Darling River aquatic ecological community under the *Threatened Species Conservation Act 1995*. Ephemeral wetlands in semi-arid New South Wales substantially enhance the biodiversity of the region, providing habitats significantly different to those surrounding them. Many terrestrial and aquatic plants and animals are supported by such wetlands. Ephemeral wetlands such as Nearie Lake are significantly more diverse than permanent wetlands as the act of drying is integral to the productivity of such lakes. During floods the lake supports high numbers of waterbirds particularly pelicans, cormorants and spoonbills. In one study of the Darling Anabranh lakes, Nearie Lake had a significant diversity and density of less common invertebrate species. Nearie Lake is one of the deeper lakes on the Darling Anabranh. This provides a refuge for waterbirds in the region once the other lakes have dried.

Aboriginal Heritage

Aboriginal communities have an association and connection to the land. The land and water biodiversity values within a landscape are central to Aboriginal spirituality and contribute to Aboriginal identity. Aboriginal communities associate natural resources with the use and enjoyment of foods and medicines, caring for the land, passing on cultural knowledge and strengthening social bonds. Aboriginal heritage and nature are inseparable from each other and should to be managed in an integrated manner across the landscape.

Aboriginal heritage of the area dates back to at least 36,000 years. Numerous sites indicate that Aboriginal people used the area over a very long period of time utilising both aquatic and terrestrial resources. Contemporary sites show that activity was

focused around the river, lakes and floodplains. The Darling Anabranh and Talyawalka river systems were the main Darling River channel during the late Pleistocene and by 10,000 years ago the existing Darling River channel was established. Evidence of Aboriginal occupation on these channels dates to about 27,000 years ago but there are also many recent sites.

Recorded sites in and around Nearie Lake Nature Reserve include burials, stone arrangements, open camp sites and middens. No comprehensive surveys have been undertaken and it is expected that many more sites exist on the reserve.

Accounts of the Aboriginal inhabitants from contact with Europeans confirm that populations were concentrated along the rivers. Much of the traditional organisation and lifestyle of these groups has been damaged through social dispossession caused by European occupation and pastoral development of the land. Pastoralist had set up stations in most parts by the 1880's and the only way many Aboriginal people could survive and live on their lands was by working on the pastoral properties. The men often working as stock hands, shearers and fencers and the women domestic duties. Major dislocation of people from their traditional camping areas occurred in the 1930's when people were forcibly moved into missions.

Nearie Lake Nature Reserve is within the traditional lands of the Barkantji people. Aboriginal communities currently reside in Menindee, Broken Hill, Wentworth/Dareton/Buronga, Balranald and Ivanhoe.

Non-Aboriginal Heritage

The first records of Europeans along the Darling Anabranh are from 1844 when Charles Sturt travelled with his party up the western side of the lower Darling Anabranh on his expedition into the interior of Australia. Earlier expeditions by Mitchell along the Darling River reached as far south as Menindee in 1835.

European settlement and sheep grazing followed soon after Sturt's return in 1846 and in 1848 surveyor Francis P. McCabe surveyed the Murray River to its junction with the Darling and then up the Darling as far as the Talyawalka Creek. He mapped the river, the road and reserves for travelling stock and future wharves but it wasn't until 1860 that surveyor Edward Twynam began the first survey on the Darling Anabranh from the Murray to Wilparea 480km upstream of the junction. Surveying of the upper Darling Anabranh was commenced by James Wood in 1862 and completed by Henry McCormack in 1865. Squatters took up land along the river systems in the late 1840's to 1850's and settlement over much of the rest of the western division took place well into the 1880's.

Settlers who occupied the river frontages towards Menindee and upstream found the Darling Anabranh, when it contained water, a more direct route to the Adelaide markets. Substantial increases in sheep numbers occurred with improved fencing and watering facilities, which with heavy rabbit infestation resulted in substantial degradation of saltbush and grassland pastures in the western division.

Nearie was originally part of the south-west corner of the large Cuthero Leasehold Area No. 174. This leasehold was later divided and the establishment of the nature reserve resulted from the disposal of the Avoca-Para property in the early 1970's.

Remains of rural development within Nearie Lake Nature Reserve include remnants of wells, yards and fences as well as many of the roads.

2.4 PUBLIC USE

Nature reserves allow for research and monitoring and to promote public appreciation, enjoyment and understanding of the reserves natural and cultural values. Research has been undertaken in the past into restoration and management of environmental flows, vegetation communities and bird species. Research and monitoring currently being proposed or undertaken includes Ecosystem Function Analysis, commercial harvesting and impact of pests, pitfall trapping, bird census and Darling Anabran condition and intervention monitoring program. Research and long term monitoring that is relevant to the conservation and management of the reserve will be encouraged including:

- ecological processes including relationships among river flow, rainfall and lake flooding
- impacts of altered flow regimes
- comprehensive fauna surveys
- monitoring of research programs that extend through wet and dry periods to determine responses of dependant biota
- research on the impacts of introduced species of plants and animals
- comprehensive archaeological surveys of Aboriginal sites

There are no visitor facilities within the reserve. Birdwatchers and people yabbing are known to access the reserve along the Old Roo Roo Road when the lake and Darling Anabran are full. Vehicle access by visitors is not permitted on management tracks and the reserve will allow for day use only. Yabbing is managed under the *Fisheries Management Act 1994*.

2.5 OTHER USES

The Old Roo Roo Road passes through the western part of the reserve between the Darling Anabran and Nearie Lake. This road, which is located slightly off the road easement (refer map), is owned and maintained by the Wentworth Shire Council and is used as an access road to properties in the vicinity.

The Stony Creek regulator controls water in and out of the lake and is situated on this road directly between the Darling Anabran and Stony Creek. It is managed by the Anabran Water Trust. Opening and closing of the regulator is done under a Memorandum of Understanding (MOU) signed in 1995 between the National Parks and Wildlife Service (NPWS), Anabran Water Trust (AWT) and Department of Water Resources (DWR) and aims to allow a natural flow regime in and out of the lake. The MOU is currently being updated to reflect changes to the names and

responsibilities of the three signatories and proposed changes in managed flows in the Darling Anabranh.

Commercial fishing for carp and yabbies on NSW inland waters including Nearie Lake is licensed under the *Fisheries Management Act 1994* and administered by the Department of Primary Industries. Commercial activities and vehicle access are not permitted on the reserve. Access to the lake is therefore only possible via Old Roo Roo Road or via private property with permission from the owner.

2.6 THREATS TO RESERVE VALUES

Altered Flow Regimes

Changes to the natural flow regime of the Darling Anabranh and associated lakes is the most significant threat to the reserve. The majority of the reserve is made up of ephemeral wetlands (lake and anabranh) which depend on natural wetting and drying cycles to maintain their ecological health. If flows, which are already severely impacted by existing regulation, are cut off then the lake will cease to function as a wetland. 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands' is listed as a key threatening process under the TSC Act.

The Darling Anabranh Pipeline and Environmental Flows Project was instigated in 2004 to save approximately 47000 ML of water and improve the environment along the Darling Anabranh. The project involves providing a pipeline to landholders along the Darling Anabranh for stock and domestic water that would have previously been provided by yearly managed flows of water from the Menindee lakes into the Darling Anabranh. The proposal supports providing managed environmental flows into the Darling Anabranh. DECC is involved in the project as a member of the environmental flows committee.

The MOU between the NPWS, AWT and DWR was established in 1995 to allow for a more natural regime of wetting and drying of the lake. The MOU was the result of research conducted into natural flow regimes of Nearie Lake which found black box trees within the reserve were dying from water stress as a result of manipulation of water flow into Nearie Lake.

The Darling Anabranh and lakes form part of the endangered Lowland Darling River aquatic ecological community. Some of the major threats to this community are the modification of natural river flows, altered inundation due to instream structures, degradation of the riparian zone and the presence of introduced fish species.

Introduced plants and animals

Introduced plants and animals pose a significant threat to values of the reserve. Grazing by domestic stock and feral animals since European settlement has had a significant impact on the native vegetation and subsequently the native fauna of the region. Competition and habitat degradation from rabbits continue to impact on the values of Nearie Lake Nature Reserve. Competition and grazing by the feral European rabbit is listed as a key threatening process under the TSC Act.

Predation by feral animals including cats, foxes, and to a lesser extent dogs and pigs, impact on the native animals of the reserve. This may be particularly an issue when waterbirds are breeding on the lake. Predation by the European red fox and by feral cats are listed as key threatening processes under the TSC Act, as is 'predation, habitat degradation, competition and disease transmission by feral pigs'.

Predation, competition, diseases and habitat modification associated with introduced fish species, such as carp, goldfish, redfin perch and mosquito fish and the snail *Physa acuta* impact on the waterways of the Darling Anabranch including Nearie Lake.

More than a quarter of the flora species recorded in the reserve are introduced. Of these the following five are declared noxious within Wentworth Shire and their spread off the reserve must be controlled: onion weed (*Asphodelus fistulosus*), Bathurst burr (*Xanthium spinosum*), noogoora burr (*Xanthium occidentale*), horehound (*Marrubium vulgare*) and African boxthorn (*Lycium ferocissimum*). The majority of the introduced plants are considered agricultural weeds or weeds of disturbed sites.

Fire Management

There has been no recorded wildfire within the reserve since it was gazetted in 1973.

Fire is a natural feature of many environments and is essential to the survival of some plant communities. Inappropriate fire regimes however can lead to loss of particular plant and animal species and communities. Fire can also damage cultural heritage sites, management facilities and can threaten visitors and neighbouring land. Fire is not considered necessary to maintain the natural vegetation of Nearie Lake Nature Reserve.

The NPWS Strategy for Fire Management (NPWS, 2003) uses a system of bushfire management zones for bushfire management in NPWS reserves. These zones are compatible with the system adopted by the Bushfire Coordinating Committee for use in District Bushfire Management Committee (DBFMC) bushfire risk management plans.

NPWS has assessed Nearie Lake Nature Reserve for fire management planning purposes and has zoned the entire reserve as a Heritage Management Zone (HAMZ). It is considered that there is a low risk of fire in the reserve. The primary fire management objectives within this zone are to prevent the extinction of all species that are known to occur naturally within the reserve, and to protect culturally significant Aboriginal and non-Aboriginal sites. The reserve has been designated as a HAMZ because it is not adjacent to built assets which would be exposed to a high level of bushfire risk, does not have a history of bushfire ignitions or known areas of high bushfire behaviour potential. The HAMZ does not require intensive management and focuses on those actions appropriate to conserve biodiversity and cultural heritage.

NPWS maintains cooperative arrangements with surrounding landowners and RFS brigades and is actively involved in the Lower Western Zone Bush Fire Management

Committee. Cooperative arrangements include approaches to fuel management, support for neighbours fire management efforts and information sharing.

Other

Disturbance of areas adjacent to the public road as a result of road works and the maintenance of Stony Crossing, which includes soil and gravel removal, has been an issue in the past. Liaison with the local council will continue to ensure that road works do not impact on the reserve's values.

Stony Crossing and the associated regulator impede the natural flow of the Darling Anabranh into Nearie Lake. The regulator allows for the manipulation of the regulated water flows of the Darling Anabranh into and out of the lake.

A 35,000L tank on the southern boundary of the reserve is used for management operations such as fire fighting and weed control. NPWS is licensed to use 2ML of water per year from the Darling Anabranh Pipeline via this tank.

References

Benson, J.S., Allen, C.B., Togher, C. & Lemmon, J. (2006). New South Wales Vegetation Classification and Assessment: Part 1 Plant Communities of the NSW Western Plains. *Cunninghamia*. 9(3):329 – 450.

Bonhomme Craib & Associates and PPK Environment & Infrastructure. (2001). Darling Anabranh Cultural Heritage and Social Values Study.

Briggs, S.V., Sneddon, J.A. & Thornton, S.A. (2000). Wildlife in Dry Lake and Associated Habitats in Western New South Wales. *Rangel. J.* 22(2) 2000, 256 – 71.

Briggs, S. & Townsend, G. (1993). Restoration and Management of Nearie Lake. Report to National Parks and Wildlife Service, Sydney.

Cunningham, G.M., Mulham, W.E., Milthorpe, P.L. & Leigh, J.H. (1992). Plants of Western New South Wales. Inkata Press North Ryde.

DEC. (2005). Threatened species found in Great Darling Anabranh CMA sub-region. www.threatenedspecies.environment.nsw.gov.au.

Environment Australia (2001). A Directory of Important Wetlands in Australia, Third Edition. Environment Australia, Canberra.

Harden, G.J. (ed) (1991 – 1993) Flora of New South Wales. Vols 1-4. NSW University Press: Kensington.

Lawler, W. (1991). Conserving Lake Nearie and Aboriginal Sites on the Great Anabranh of the Darling River. Report to National Parks and Wildlife Service, Sydney.

Lloyd, P. (1992). An Environmental Study of Nearie Lake Nature Reserve and the Great Anabranh of the Darling River: Development of Hydrological Management Guidelines for Nearie Lake Nature Reserve. Report to National Parks and Wildlife Service, Sydney.

McGlynn, T., Harriss, D. & Everson, D. (eds) (1991). Great Darling Anabranh Forum, Proceedings. Department of Water Resources, Dareton.

Markotis, K. (ed) (1999). The Lower Murray Darling Rangeland Management Action Plan. Prepared by the Rangeland Management Action Plan Steering Committee for The Lower Darling Catchment Management Committee.

Nias, D. (2002). Draft The Darling Anabranh Management Plan: A Proposal for the Future of the Darling Anabranh. Darling Anabranh Water Trust, Wentworth.

NPWS (1988) Interim Management Guidelines for Nearie Lake Nature Reserve. National Parks and Wildlife Service, Sydney.

NSW National Parks and Wildlife Service. (2003) *Strategy for Fire Management*. NSW National Parks and Wildlife Service, Sydney.

Walker, P.J. (1991). Land Systems of Western New South Wales. Soil Conservation Service of NSW Technical Report No. 25.

Westbrooke, M.E., Miller, J.D. & Kerr, M. (1997). Vegetation and flora of Nearie Lake Nature Reserve, far western New South Wales. *Cunninghamia* **5**, 129-137.

Withers, M. (1994). Flooding and Water Conservation in the Great Anabranh of the Darling River. Report to National Parks and Wildlife Service, Sydney.

Witter, D.C. (2004). Regional Variation of the Archaeology in Western New South Wales. *Rangel.J.* **26**(2) 2004,129-149

3. MANAGEMENT ISSUES AND STRATEGIES

Current Situation	Desired Outcomes	Strategies	Priority
<p>Soil and Water Conservation</p> <p>Water in the Darling Anabranh catchment is managed for agriculture/irrigation and domestic purposes, which results in artificial flows/change in flow regime.</p> <p>Water quality in the Darling Anabranh is poor (including salinity and algal blooms).</p> <p>Drainage patterns of the Darling Anabranh and lakes have been changed by the construction of weirs, regulators and block banks (183 dam holds water back, including into Nearie Lake and the Stony Crossing regulator disrupts natural water flows into the lake).</p> <p>-----</p> <p>There is soil erosion into waterways from the public road and management trails.</p> <p>-----</p> <p>Road material for the maintenance of the public road has been sourced from areas adjacent to the road.</p>	<p>Maintenance of a natural flow regime (or simulation of such if necessary) including wetting and drying cycles.</p> <p>Removal of unnatural obstructions in the Darling Anabranh.</p> <p>Cleaner water, less erosion, improved vegetation cover, and maintenance of ecological processes.</p> <p>-----</p> <p>Minimal erosion from roads into waterways.</p> <p>-----</p> <p>Soil is not removed from the reserve.</p>	<p>Continue to work with government and other agencies to protect and restore natural/environmental flows in the Darling Anabranh.</p> <p>Comment on any proposed development activities to ensure it will not compromise hydrology on the Darling Anabranh.</p> <p>-----</p> <p>Ensure that correct road forming techniques are used to minimise erosion, assess need for management trails (allow to regen/reveg if required), liaise with Wentworth Shire Council in relation to the public road.</p> <p>-----</p> <p>Liaise with Wentworth Shire Council to ensure road materials not sourced from the reserve.</p>	<p>High</p> <p>High</p> <p>Medium</p> <p>Medium</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Native plant and animal conservation</p> <p>Knowledge of native fauna on the reserve needs to be improved.</p> <p>-----</p> <p>There is limited knowledge about changes to vegetation over time in relation to lake flooding.</p>	<p>Natural ecological processes are maintained.</p>	<p>Continue fauna surveys and monitor and evaluate changes overtime and the effects of pest control programs.</p> <p>-----</p> <p>Monitor vegetation to assess impacts and changes over time (with respect to flooding and total grazing pressure).</p>	<p>High</p> <p>Low</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Introduced species</p> <p>Rabbits impact on native vegetation and remove ground cover.</p> <p>Foxes and cats predate on native animals.</p> <p>Five noxious weeds are present on the reserve.</p> <p>Other pests include dogs, pigs, introduced fish such as carp and 50 other introduced plants, which are weeds of pasture, cultivated land and disturbed sites.</p> <p>-----</p> <p>Although the reserve boundary is fenced to a stock-proof standard, domestic stock sometimes enter the reserve.</p>	<p>Control introduced species to minimise impacts on native species and ecological processes.</p> <p>Habitat for native animals is conserved.</p> <p>-----</p> <p>Domestic stock does not enter the reserve.</p>	<p>Control and where possible eradicate introduced species with priority to rabbits, foxes and noxious weeds.</p> <p>Monitor feral animal and weed control works and evaluate change in impact/s where feasible.</p> <p>Where possible, undertake pest and weed control with other agencies and neighbours.</p> <p>-----</p> <p>In conjunction with neighbours, maintain boundary fences and determine strategies to exclude stock where boundary fencing is difficult.</p>	<p>High</p> <p>High</p> <p>High</p> <p>Medium</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Fire management</p> <p>There has been no recorded wildfire within the reserve since its gazettal in 1973.</p> <p>The reserve is considered to have a very low risk of bushfire.</p> <p>Natural and artificial barriers inhibit the likelihood and spread of fire from and into the reserve.</p>	<p>Fire is excluded from the reserve.</p>	<p>Manage the reserve as a Heritage Area Management Zone in accordance with the NPWS Strategy for Fire Management.</p>	<p>Low</p>
	<p>Life, property and natural and cultural values within and adjacent to reserve are protected from fire.</p>	<p>Suppress all unplanned fires and where possible, exclude fire from the reserve.</p>	<p>Low</p>
	<p>The endangered vegetation within the reserve is protected from fire.</p>	<p>Actively participate in the local District Bush Fire Management Committee.</p>	<p>Ongoing</p>
	<p>The potential for spread of bushfires on, from, or into the reserve is minimised.</p>	<p>Maintain coordinated and cooperative arrangements with Rural Fire Service brigades and neighbours with regard to fuel management and fire suppression works outside the reserve.</p>	<p>Ongoing</p>
		<p>Support neighbours' efforts to contain fire on their own properties, protect their own assets and report unplanned ignitions.</p>	<p>Low/ Ongoing</p>
		<p>Provide information and advice to neighbours regarding the ecological impact of fire and fire management issues.</p>	<p>Medium</p>
		<p>Consider potential impacts on the reserve's values when locating firebreaks.</p>	<p>Medium</p>
		<p>Research fire regimes and fire requirements for vegetation communities within the reserve, including the effects of fire intensity, frequency and seasonality.</p>	<p>Low</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Cultural heritage</p> <p>There is limited knowledge about the cultural significance of the reserve and how it relates to the significance of the broader area.</p> <p>Stone arrangements in Nearie Lake have been recorded but their significance is unknown. Very few other Aboriginal sites have been recorded despite the very high probability of sites.</p> <p>There has been damage to some Aboriginal sites from past land practises and some impacts such as erosion are continuing to affect Aboriginal sites.</p> <p>Resources at Nearie Lake and the Darling Anabranh that where utilised by Aboriginal people are not formally recorded.</p> <p>There are a few relics of past use of the reserve as a pastoral property, such as wells, yards and fences.</p>	<p>Understanding of the cultural significance is improved.</p> <p>Aboriginal and historic features/values are identified and protected.</p> <p>Aboriginal people are involved in the management of their heritage.</p>	<p>Conduct an archaeological survey within the reserve.</p> <p>Undertake/encourage further recording of the stone arrangement and investigate its significance.</p> <p>Protect sites where damage has occurred and where burials are exposed. Re-cover burial sites.</p> <p>Record the resources used by Aboriginal people.</p> <p>Consult with the Barkantji Aboriginal community regarding the significance of the reserve, how it relates to the significance of the broader area, and management of the Aboriginal heritage of the reserve.</p> <p>Retain the wells, yards and fences.</p>	<p>High</p> <p>Medium</p> <p>High</p> <p>Low</p> <p>Medium</p> <p>Low</p>
<p>Visitor use</p> <p>There are no visitor facilities in the reserve and none are considered necessary.</p> <p>Birdwatchers, campers and people yabbing are known to visit the reserve when the lake and Darling Anabranh are full.</p>	<p>Visitor use is appropriate and ecologically sustainable.</p>	<p>Provide signs at the entrances to the reserve on the Old Roo Roo Road identifying that walking is permitted in the nature reserve but that driving and camping are not permitted.</p> <p>Identify alternative locations for visitor facilities off-reserve in order to protect the values of the nature reserve.</p>	<p>Medium</p> <p>Low</p>

Current Situation	Desired Outcomes	Strategies	Priority
<p>Research</p> <p>Further research will improve the understanding of the reserve's natural and cultural heritage, the processes that affect them and the requirements for management of particular species.</p>	<p>Research enhances the management information base and has minimal environmental impact.</p>	<p>Undertake and encourage research to improve knowledge and management of natural and cultural heritage.</p> <p>Prepare a prospectus to encourage and guide research by educational organisations and others.</p>	<p>Medium</p> <p>Low</p>
<p>Management operations</p> <p>Management trails in the reserve are in a poor condition.</p>	<p>Management trails are maintained to serve management needs.</p>	<p>Maintain trails to be retained for management purposes (see reserve map).</p> <p>Close all other trails.</p> <p>Rehabilitate closed trails if required.</p>	<p>High</p> <p>Low</p> <p>Low</p>

High priority activities are those imperative to achievement of the objectives and desired outcomes. They must be undertaken in the near future to avoid significant deterioration in natural, cultural or management resources.

Medium priority activities are those that are necessary to achieve the objectives and desired outcomes but are not urgent.

Low priority activities are desirable to achieve management objectives and desired outcomes but can wait until resources become available.