Office of Environment & Heritage
NSW National Parks & Wildlife Service

Plan of Management

Cumbebin Swamp Nature Reserve

CUMBEBIN SWAMP NATURE RESERVE

PLAN OF MANAGEMENT

NSW National Parks and Wildlife Service

February 2012

This plan of management was adopted by the Minister for the Environment on 1 February 2012.

Acknowledgments
The NSW National Parks and Wildlife Service (NPWS) acknowledges this reserve is in the traditional country of the Bundjalung of Byron Bay (Arakwal) people.

This plan of management is based on a draft plan prepared by the staff of the Byron Coast Area, Northern Rivers Region of the NSW National Parks and Wildlife Service, part of the Office of Environment and Heritage, Department of Premier and Cabinet. Valuable information, input and comments were provided by Bundjalung of Byron Bay (Arakwal) people, ecologist David Milledge and botanist Annette McKinley.

FRONT COVER: Cumbebin Swamp Nature Reserve by Dianne Mackey, NPWS.

For additional information or any inquiries about this reserve or this plan of management, contact the NPWS, Byron Coast Area Office, PO Box 127, Byron Bay 2481 or by telephone on (02) 6620 9300.

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FOREWORD

Cumbebin Swamp Nature Reserve is located adjacent to Byron Bay on the far north coast of New South Wales. It has an area of 91 hectares and was established in 1999 to protect a significant component of the Belongil-Cumbebin wetland.

Cumbebin Swamp Nature Reserve is an important part of Country to the Bundjalung of Byron Bay (Arakwal) people and is subject to an Indigenous Land Use Agreement (ILUA), signed in 2008, which more than doubled the size of Cumbebin Swamp Nature Reserve from its original 40 hectares. Under the ILUA the reserve will be jointly managed with the Bundjalung of Byron Bay (Arakwal) people through a management committee.

Cumbebin Swamp Nature Reserve also conserves wetlands of state significance, sensitive coastal dunes, coastal swamp forests and riparian areas. It contains three endangered ecological communities, which provide habitat for a wide range of native animals including threatened species.

The New South Wales *National Parks and Wildlife Act 1974* requires that a plan of management be prepared for each nature reserve. A draft plan of management for the Cumbebin Swamp Nature Reserve was placed on public exhibition from 5 November 2010 to 7 February 2011. The submissions received were carefully considered before adopting this plan.

The plan contains a number of actions to achieve the NSW 2021 goal to protect our natural environment, including actions to assist the recovery of threatened species and endangered ecological communities, and to improve water quality. A pest management plan will be prepared for the reserve. The plan also provides for continued low impact nature-based activities, such as bushwalking and bird watching, within the reserve.

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

Robyn Parker MP
Minister for the Environment

Jingi wahlu widtha.... Welcome to Country

This plan talks about a special part of the Country of the Bundjalung of Byron Bay (Arakwal) people known as Cumbebin Swamp Nature Reserve situated adjacent to the township of Byron Bay.

In 2008 the second Indigenous Land Use Agreement (ILUA 2) between the Bundjalung of Byron Bay (Arakwal) people and the State government was registered as part of resolving a native title claim. This resulted in significant additions to parks and reserves in the NPWS Byron Coast Area, including doubling the size of Cumbebin Swamp Nature Reserve.

ILUA 2 requires the establishment of a Management Committee to enable joint management of the ILUA 2 additions to the reserve by the Bundjalung of Byron Bay (Arakwal) people and the NPWS. Joint management provides a continuing role for the Bundjalung of Byron Bay (Arakwal) people in looking after Country.

D. Nicholls

Dulcie Nicholls
Bundjalung of Byron Bay (Arakwal) Elder

Y. Stewart

Yvonne Stewart
Bundjalung of Byron Bay (Arakwal) Member

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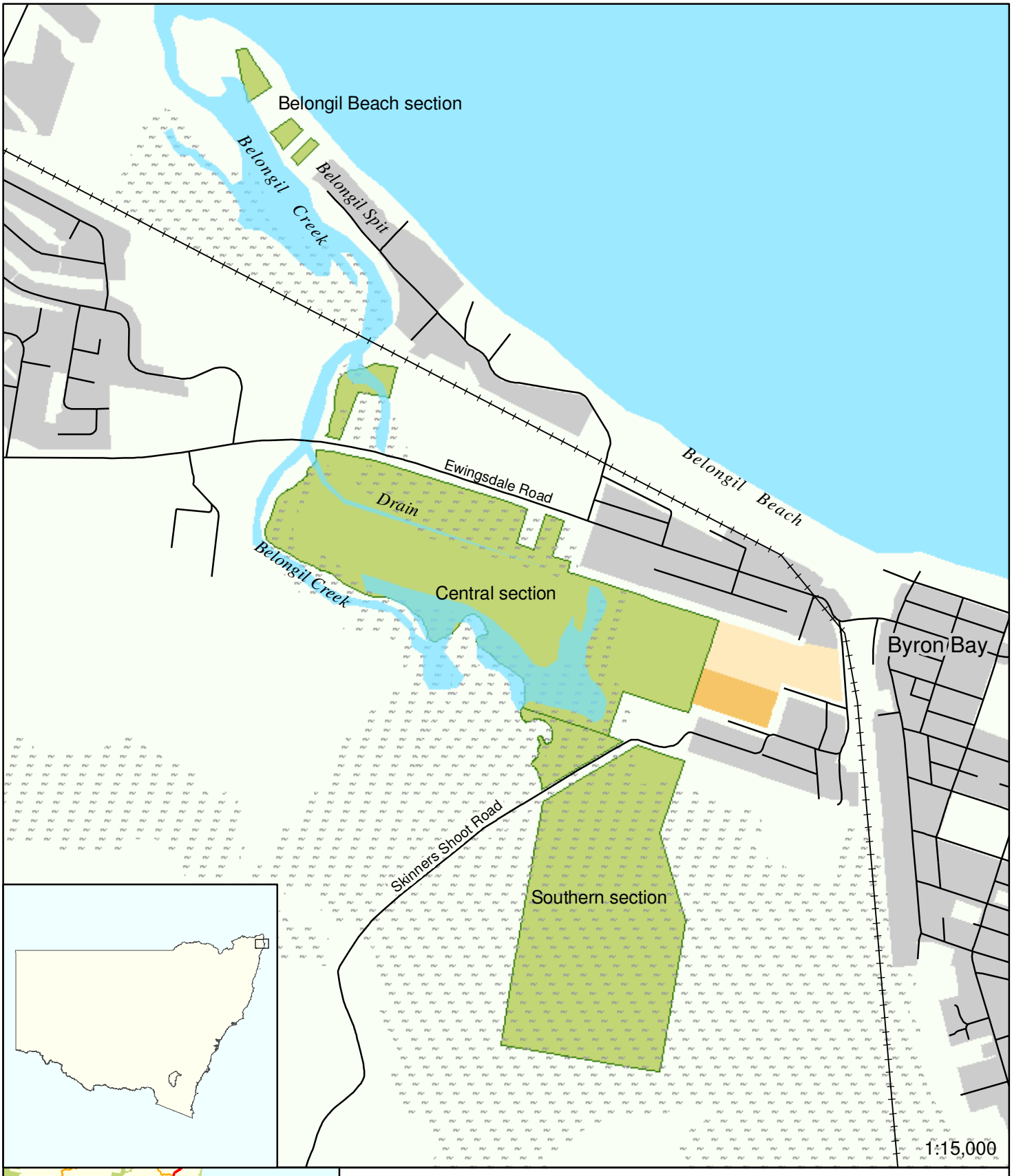

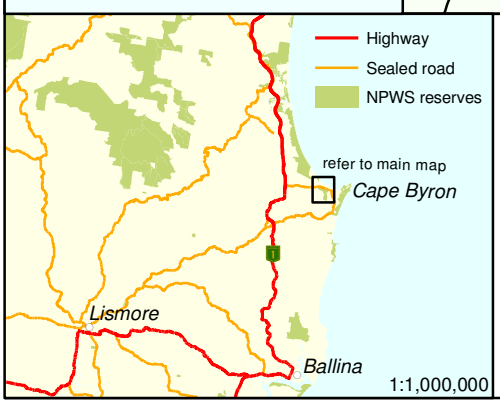

Cumbebin Swamp NR
Cape Byron Marine Park
Butler Street Reserves (Crown land)
Cumbebin Wetland Reserve (Crown land)
SEPP 14 wetland
Builtup area
Sealed road
Railway

N
W E
S

0 250 500
Meters

Cape Byron Marine Park boundaries are a representation only and should not be relied on as accurate

1. CUMBEBIN SWAMP NATURE RESERVE

1.1 Location, Gazettal and Regional Context

Cumbebin Swamp Nature Reserve (hereafter referred to as 'the reserve') is located adjacent to the township of Byron Bay on the far north coast of New South Wales (NSW). The reserve is approximately 91 hectares and comprises three sections (see Map). The original southern section of the reserve is 40 hectares and was gazetted in 1999. An additional 49.6 hectares of Crown land was added to the reserve in 2009-2010 as an outcome of an Indigenous Land Use Agreement (ILUA) between the Bundjalung of Byron Bay (Arakwal) people and the State government (refer to Section 2.3). This area forms the central section of the reserve. In 2010 a small area of 1.4 hectares at Belongil Beach, which was acquired by the State government under the Coastal Lands Protection Scheme, was added to the reserve.

The Bundjalung of Byron Bay (Arakwal) people and other Bundjalung people have a long and ongoing cultural association with the coastal landscape around Byron Bay, including the reserve. Research into the Bundjalung lands of south east Queensland date their occupation to at least 22,000 years ago (Neal & Stock 1986).

The reserve is a significant component of the Belongil-Cumbebin wetland. Extensive areas of wetlands protected under State Environmental Planning Policy No. 14 (SEPP 14) occur adjacent to or nearby the reserve (see Map). The reserve also complements other wetland and coastal reserves on the NSW far north coast including Ukerebagh, Cudgen, Billinudgel, Brunswick Heads, Marshalls Creek, Tyagarah, Tuckean, Tabbimoble Swamp and Ballina Nature Reserves.

The central section of the reserve is bordered on the east by reserves administered by the Crown Lands Division of the Department of Primary Industries: the Cumbebin Wetland Reserve and the Butler Street Reserves (see Map). The Byron Environment Centre is the corporate manager of the Reserve Trust for the Cumbebin Wetland Reserve. Byron Shire Council is the corporate manager of the Reserve Trust for the Butler Street Reserves.

Sections of Belongil Creek and its tributaries are within the reserve. The majority of Belongil Creek and its tributaries to mean high water mark are part of the Cape Byron Marine Park which is managed by the Marine Parks Authority. The zoning plan for the marine park came into effect on 1 May 2006. Belongil Creek and its tributaries within the marine park are managed as a special purpose zone for the protection and rehabilitation of Belongil Creek (refer to Map and Section 5.2).

The reserve is located within the geographical area of Byron Shire Council, the Northern Rivers Catchment Management Authority and the Tweed Byron Local Aboriginal Land Council.

1.2 Relationship to Country – Cultural landscape context of the Reserve

The idea of 'Country' to Aboriginal people

To Aboriginal people, the 'landscape' is made up of many features that are inter-related. These include the lands and waters, plants and animals, special places and stories, historical and current uses, and people and their interactions with each other and place. These features are seen as inseparable and make up what is known as 'Country' to Aboriginal people. While these inter-relationships are recognised, this plan addresses many of these topics individually for clarity and ease of use.

"People talk about Country, speak and sing to Country, visit and worry about Country, feel sorry for Country, long for Country. People say Country knows best, hears, smells, takes notice, takes care, is sorry or happy. It is consciousness and a will towards life. Because of this richness, Country is love and peace, nourishment for body, mind and spirit."

Source: Interpretation Australia (2003)

The Country of the Bundjalung of Byron Bay (Arakwal) People

In 1994 the Bundjalung of Byron Bay (Arakwal) people lodged a Native Title Application (NC95/1 - Byron Bay Bundjalung People) over the land and adjoining waters extending from the Brunswick River to the north, past Julian Rocks to the east, Broken Head to the south and around the hinterland areas of Mullumbimby, Coorabell and Bangalow to the west. This native title claim included all lands within the reserve.

A series of Indigenous Land Use Agreements (ILUAs) registered under the *Commonwealth Native Title Act 1993* have been made between the State government and the native title claimants. These ILUAs acknowledge that the Bundjalung People of Byron Bay are descendants of indigenous people who lived and/or held native title in the area at the time of first contact with European settlers in the 1820s-30s and have a strong cultural association with the area.

The second ILUA (ILUA 2) doubled the size of Cumbebin Swamp Nature Reserve and included additions to Broken Head Nature Reserve and Arakwal National Park. ILUA 2 also provided for the establishment of a Management Committee to be responsible for the care, control and management of the ILUA 2 additions to the reserve (refer to Section 2.3).

The reserve is an important part of Country to the Bundjalung of Byron Bay (Arakwal) people as homelands where hunting and gathering occurred associated with separate men's and women's business. Men would go to the swamp to catch food such as birds, eels, turtles and snakes. Women would obtain bush tucker and materials from the swamp including ferns for making baskets and paperbark to build their homes.

The reserve adjoins part of the Cape Byron Marine Park. Boundaries such as those between the marine park and the reserve are artificial concepts to the Bundjalung of Byron Bay (Arakwal) people. The NPWS, the Marine Parks Authority and the Bundjalung of Byron Bay (Arakwal) people will endeavour to ensure these protected areas are managed in a way that recognises that they are all part of Country.

2. LEGAL RULES

2.1 Government laws and National Parks and Wildlife policies

The management of nature reserves in NSW is in the context of the legislative and policy framework, primarily the NPW Act, NPW Regulation, the *Threatened Species Conservation Act 1995* (TSC Act) and the policies of the NPWS.

Other legislation and international agreements also apply to management of the area. In particular, the *Environmental Planning and Assessment Act 1979* (EPA Act) may require the assessment and mitigation of the environmental impacts of any works proposed in this plan. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) also applies in relation to actions that may impact on threatened and migratory species listed under that Act.

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 Cumbebin Swamp Nature Reserve except in accordance with this plan. This plan will also apply to any future additions to the reserve. Should management strategies or works be proposed for the reserve or any additions that are not consistent with the plan, an amendment to the plan or a new plan will be prepared and exhibited for public comment.

2.2 Management Principles for Nature Reserves in NSW

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 (section 30J), 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 the provision of recreation as a management principle.

2.3 Bundjalung People of Byron Bay Indigenous Land Use Agreement (ILUA 2)

In 2008 an Indigenous Land Use Agreement (ILUA 2) between the Bundjalung of Byron Bay (Arakwal) people and the State Government was registered. ILUA 2 builds on an earlier agreement reached between the Bundjalung People of Byron Bay and the NSW government in 2001, under which the nearby Arakwal National Park was created with employment, training and joint management opportunities for the native title claimants.

ILUA 1 and 2 recognise that the Bundjalung of Byron Bay (Arakwal) people are descendants of indigenous people who lived and/or held Native Title over Country that includes the reserve at the time of first contact by European settlers and have a strong cultural association with Country.

The ILUA 2 area comprises approximately 245 hectares of Crown land in and around Byron Bay. ILUA 2 provides for joint management with NPWS of 14 parcels of land amounting to approximately 72 hectares, including additions to the reserve, through the establishment and operation of a Management Committee. ILUA 2 also provides employment, training, economic development and meaningful involvement in management (refer to Section 4.1).

3. THE IMPORTANCE AND MANAGEMENT OF CUMBEBIN SWAMP NATURE RESERVE

3.1 Respecting Country- Key values associated with the Reserve

The reserve has many values that are important to the Bundjalung of Byron Bay (Arakwal) people and the wider community, including:

Values associated with 'looking after Country'- reserve conservation and management

- The reserve provides an opportunity for recognition of the long and ongoing traditional association of the Bundjalung of Byron Bay (Arakwal) people with the landscape and recognises their rights and responsibilities to Country.

- The reserve protects part of Country and allows the Bundjalung of Byron Bay (Arakwal) people and other Bundjalung people to continue their connection to Country.

- The reserve protects cultural and historical heritage values, including special places and cultural stories of the Bundjalung of Byron Bay (Arakwal) people and other Bundjalung people.

- The reserve protects a regional wildlife corridor, sensitive coastal dunes, wetlands of state significance, coastal swamp forests and riparian areas supporting a range of native plants and animals, including endangered ecological communities and threatened species.

- The reserve provides employment and training for Bundjalung of Byron Bay (Arakwal) people with the NPWS to look after Country.

Values associated with 'using and knowing about Country' – cultural use of the reserve and information, research and monitoring

- The reserve will provide opportunities for the Bundjalung of Byron Bay (Arakwal) people to undertake cultural activities and cultural renewal associated with the sustainable use of wild resources; the transfer of cultural knowledge, customs and stories; and ceremonial and other cultural practices.

- Opportunities for visitors and the wider Byron Bay community to understand and respect the culture and heritage of the Bundjalung people, and the importance of this special place, will be provided off-site.

- Environmental education opportunities relating to Aboriginal cultural values, coastal processes, wetlands and riparian forests, rehabilitation of degraded

areas, endangered ecological communities and threatened species will be provided off-site.

- The reserve will provide visitors with opportunities for low key nature-based recreation including nature study, however, visitor facilities such as walking tracks will not be provided.

- Opportunities will be provided for appropriate research and monitoring, especially to identify and record Aboriginal cultural sites.

4. LOOKING AFTER COUNTRY

4.1 Joint Management by the Bundjalung of Byron Bay (Arakwal) people and the NPWS

"Joint management ensures that our people have a say in the management of the land. Everyone at a meeting sits here at the same level. It's a two way process."

Yvonne Stewart, Bundjalung of Byron Bay (Arakwal) Member

An important part of Aboriginal culture is looking after and caring for Country. This is an obligation of past, present and future generations of Bundjalung of Byron Bay (Arakwal) people. The right of Bundjalung of Byron Bay (Arakwal) people to be involved in the management and protection of their Country and heritage is acknowledged. The Bundjalung of Byron Bay (Arakwal) people wish to exercise their custodial responsibilities for Country in partnership with the NPWS under joint management arrangements for the reserve.

ILUA 2 provides for the establishment and operation of a Management Committee to be responsible for the care, control and management of the ILUA 2 additions to the reserve. The Committee will carry out its role within the framework of the ILUA 2, the NPW Act and this plan of management. The Management Committee may make recommendations to the Director-General of National Parks and Wildlife regarding the management of the reserve.

Joint management provides a continuing role for the Bundjalung of Byron Bay (Arakwal) people in looking after Country and allows NPWS to better integrate Aboriginal cultural values into conservation and management programs.

As well as the Management Committee, the role of Bundjalung people in caring for Country will be achieved through working on the reserve on a day-to-day basis. ILUA 2 provides for employment within the NPWS Byron Coast Area to work on Country, including the reserve. ILUA 2 also provides for the Bundjalung of Byron Bay (Arakwal) people to inspect any improvements to the reserve.

Joint management of the reserve will be undertaken through the Management Committee.

Management Response

4.1.1 Procedures and protocols will be developed for the operation of the Management Committee consistent with ILUA 2, the NPW Act and cultural protocols. Issues and proposals relating to the care, control and management of the reserve will be referred to the Management Committee for their consideration and recommendations.

4.2 The Story of Country that is now the Reserve

A living ancestry and culture

The Bundjalung of Byron Bay (Arakwal) people are part of the Bundjalung Nation and their history in the area predates the arrival of non-Aboriginal people. Their ancestors, Bobby and Alice, Harry and Clara Bray, and Linda and Jimmy Kay lived and raised families in and around the Byron Bay area. The landscape that includes the reserve is an important part of this history.

People would move through Country using the swamp for its food and medicinal resources and camped in the dunes obtaining food from both the beach and the creek. Favoured foods included fish, pipis, crabs, prawns, cobras (wood borers) and ducks. Paperbark in the swamp was used for cooking and carrying food and other materials for camp life. The swamp is an integral part of Country which contains a variety of special areas including pathways, middens, stone arrangements, ceremonial sites and burials (Stewart, Y. 2009, pers. comm.).

Despite the changing natural, socio-economic and political environment bought about since European settlement of the area, the Bundjalung of Byron Bay (Arakwal) people have maintained their links with Country that includes the reserve. The Bundjalung of Byron Bay (Arakwal) people, as descendents of the traditional owners, are responsible for looking after the land, waters, plants and animals of their Country. It is important to the Bundjalung of Byron Bay (Arakwal) people that their cultural traditions and associations are maintained. Maintenance of cultural traditions and associations contributes to identity and well-being and shows respect to their ancestors.

Evidence of Aboriginal occupation and use has been recorded at numerous sites around the reserve and one site is known within the reserve. Many plants still found in the reserve were traditionally used by the Bundjalung of Byron Bay (Arakwal) people and are culturally important. Appendix 1 lists plants known to be of cultural value. Some common animals in the reserve such as porcupine (echidna), goanna (monitors), carpet python, swamp wallaby and brush turkey were also important food sources for the Elders, their families and their ancestors. All these animals are important to the Bundjalung of Byron Bay (Arakwal) people for their conservation, totemic, wild resource and other cultural values.

ILUA 2 provides for access by Bundjalung of Byron Bay (Arakwal) people to the reserve for cultural purposes as well as a program to identify and record Aboriginal cultural sites. It also proposes studies into any threat to threatened species from the exercise of rights to use wild resources or to gather traditional foods in the reserve (refer to Section 5.1).

Story of land use

Some of the earliest accounts of Byron Bay refer to areas which are now part of the reserve. Staff Commander Howard's 1883 survey map of 'Cape Byron Bay' includes a dotted line described as the 'Track to Tintenbar' originating on Belongil Beach and running south through Cumbebin Swamp. The Track to Tintenbar linked with the

'Beach Highway' - a term used to highlight the importance of beaches as transport corridors providing easy access along the coastal fringe. Howard (1884) noted that the mail track to Tintenbar initially led to Coopers Shoot and was also used to transport hoop pine (*Araucaria cunninghamiana*) logs to the beach and from there to ships waiting in the bay. The survey map notes 'thick scrub' on the Belongil Beach section of the reserve, 'open grassy swamp' in the central part of the reserve and 'tea tree swamp' (paperbark swamp) in the southern part of the reserve.

Clearing and draining of the Cumbebin-Belongil wetlands, including Cumbebin Swamp began in the late 1800s when European settlers moved permanently into the area to establish agriculture, particularly dairying. In the central part of the reserve, a drain which runs west to Belongil Creek located south of and parallel to Ewingsdale Road is shown on maps from 1912 onwards. It is not known who constructed this drain. Draper (2002) notes that at the time (1890s – early 1900s) the government offered early settlers incentives to drain their land. The expansion of the Byron Bay township westwards led to further drainage works in the Cumbebin Swamp (refer to Section 4.5).

During the 1950s to 1970s large scale clearing of paperbark in Cumbebin Swamp was undertaken to fuel Byron Bay's abattoir, piggery, butter factory and whaling station and was used as a base for roads through the swamp (Draper 2002).

Sand mining on beaches and dunes at Belongil Beach and nearby areas occurred during the 1880s and 1890s intensifying in the 1930s and continuing until the late 1960s when the resource was largely exhausted. Sand mining, particularly the commercial mechanised extraction process of the later decades of the 20th century, caused major alterations to the landscape and the natural environment including in the Belongil Beach section of the reserve (refer to Section 4.5). Extensive clearing of native vegetation, filling and stabilising mined areas with invasive species such as bitou bush (*Chrysanthemoides monilifera*) significantly changed the landscape.

Town and parish maps from the late 19th and early 20th centuries provide additional information about early uses of the reserve. A historic track running north east through the southern section of the reserve appears on maps from the 1890s until 1958. The location of the historic crossing of Belongil Creek, directly south of the existing road bridge on Ewingsdale Road and bordering the central part of the reserve, appears on an 1890s map.

The Byron Bay meatworks, under successive owners, leased various parts of the central section of the reserve from 1930 for grazing. The meatworks also disposed of waste close to Belongil Creek. These uses resulted in impacts on the wetland communities and the creek (BEACON 1981).

The reserve will be managed to protect its biodiversity and Aboriginal and European cultural values.

Aboriginal knowledge, insights, values and involvement will be incorporated in efforts to conserve and protect the reserve's cultural and biodiversity values.

Management Response

4.2.1 Develop and implement a program to identify and record Aboriginal cultural sites within the reserve as provided for under the terms of the ILUA.

4.2.2 Record the location of any sites of historic heritage in the reserve, such as historic tracks.

4.3 Native Plants and Animals

Native Animals

The reserve forms part of a regional north-south wildlife corridor along the coast and a sub-regional south-west corridor which links the coast to the escarpment (Scotts 2003). The vegetation communities of the reserve support a range of sedentary, nomadic and migratory native animals. The longer growing, flowering and fruiting season on the NSW north coast during autumn-winter provides a reliable and plentiful supply of food for migratory and nomadic birds, flying-foxes and micro-bats at a time of year when food is often in short supply elsewhere (Scotts 2003).

Four threatened fauna species have been recorded on the reserve: the black-necked stork (*Xenorhynchus asiaticus)*; koala (*Phascolarctos cinereus*); large-footed myotis (*Myotis macropus);* and little bent-wing bat (*Miniopterus australis*).

The reserve provides a diversity of habitats suitable for a wide range of threatened and protected animals and is documented as being particularly significant for a number of threatened microbats. Adjoining inter-tidal areas outside the reserve also provide significant habitat for threatened birds and bats. Forty-three threatened animal species are known or likely to occur, or have potential habitat, in the reserve (refer to Appendix 2). Five of the shorebirds listed in Appendix 2 are protected under international migratory bird agreements. Six species are also listed as threatened under the EPBC Act, including the critically endangered Mitchell's rainforest snail (*Thersites mitchellae)* which has been recorded from adjacent swamp forest and is likely to occur on the reserve based on the presence of suitable contiguous habitat.

The reserve is also potential habitat for the endangered laced fritillary *(Argyreus hyperbius)*, southern sedge-darter *(Telicota eurychlora)* and chocolate argus *(Junonia hedonia)* which are a suite of wetland butterflies deemed to be of national conservation concern (Sands & New 2002; Braby 2000). The larva of each species of butterfly is dependent on specific wetlands plants to survive.

Actions are included in the NSW Threatened Species Priorities Action Statement (PAS) for threatened species known or likely to occur, or with potential habitat, in the reserve. Recovery Plans, under the TSC Act, have been prepared for the little tern *(Sterna albifrons)*, koala (*P. cinereus*), and Mitchell's rainforest snail (*T. mitchellae)*. Commonwealth recovery plans, under the EPBC Act, have been prepared for the following species: green turtle (*Chelonia mydas)*, leathery turtle (*Dermochelys coriacea)* and loggerhead turtle (*Caretta caretta)*, olongburra frog (*Litoria olongburensis)*, wallum froglet (*Crinia tinnula)* and Mitchell's rainforest snail (*T. mitchellae).*

A Belongil Estuary Seabird and Shorebird Management Plan prepared by Byron Bird Buddies (2007) guides actions for the protection of seabirds and shorebirds at Belongil Estuary adjoining the reserve and in a small area in the north of the reserve.

Native Plants

The reserve protects three endangered ecological communities in the north coast bioregion listed under the TSC Act: coastal saltmarsh; swamp sclerophyll forest; and swamp oak floodplain forest. It supports important remnant and regrowth wetlands of the Belongil-Cumbebin wetland system, banksia/casuarina woodlands on the peninsula between Belongil Beach and Belongil Creek and mangroves and saltmarsh on Belongil Creek.

The reserve is centrally located within a broader landscape of extensive wetlands protected under SEPP 14 which comprise swamp sclerophyll forests, mangroves, sedgelands, fernlands and grasslands. The majority of the reserve's vegetation communities are endangered, rare or vulnerable and are below their reservation targets[1].

The reserve's swamp sclerophyll forests and woodlands are dominated by broad-leafed paperbark (*Melaleuca quinquenervia)* and swamp oak (*Casuarina glauca*). Rainforest species, including figs (*Ficus* spp.), umbrella cheese tree (*Glochidion sumatranum)* and pink-flowered doughwood *(Melicope elleryana),* colonise the less saline parts of swamp forests where fire has been excluded for some time.

Mangroves on the reserve are dominated by grey mangrove (*Avicennia marina)* and river mangrove *(Aegiceras corniculatum).* The area of mangroves and saltmarshes adjoining Belongil Creek has increased over recent decades (Parker & Pont 2001; Patterson Britton & Partners 2006) and this is attributed to more frequent mechanical opening of the creek (refer to Section 4.5).

Other significant wetland communities in the reserve include sedgelands, fernlands and grasslands. Further investigation of these vegetation communities is warranted to determine whether freshwater wetlands, an endangered ecological community, occur on the reserve and to develop knowledge of the distribution and reservation status of sedgeland, fernland and grassland communities at a regional and local level.

No flora survey of the reserve has been undertaken, however, Lady Tankerville's swamp orchid (*Phaius tankervilleae*) has been recorded on the reserve and is listed as endangered under the TSC Act and the EPBC Act. Other plants of significance with potential habitat on the reserve (McKinley, A. 2009, pers. comm.) include: the spider orchid (*Dendrobium melaleucaphilum*), which is listed as endangered under the TSC Act; scented acronychia (*Acronychia littoralis*), which is listed as endangered under the TSC Act and EPBC Act; and narrow-leaved palm lily (*Cordyline congesta)*, which is listed as rare (Briggs & Leigh 1996).

[1] Derived from DECCW application of criteria developed by Joint ANZECC / MCFFA National Forest Policy Statement Implementation Sub-committee (1997).

Actions for scented acronychia *(A. littoralis)* and endangered ecological communities are included in the NSW Threatened Species Priorities Action Statement (PAS). Recovery information for land managers is included in species profiles for other threatened species known or likely to occur in the reserve.

Threats to Native Animals and Plants

Major threats to native animals and plants in the reserve are fragmentation and degradation of habitat. A range of introduced plants and animals occur in the reserve and compete for habitat and resources and/or prey on native species (refer to Section 4.4). Other threats to native species in the reserve include: illegal clearing, camping and dumping; exposure to runoff from acid sulfate soils and stormwater (refer to Section 4.5); inappropriate fire regimes (refer to Section 4.6); and climate change (refer to Section 4.7).

The reserve will be managed to conserve native plants and animals and minimise impacts from introduced species, acid sulfate soils, stormwater runoff, inappropriate fire regimes and climate change (refer to Sections 4.4, 4.5, 4.6 and 4.7).

Research will be encouraged into plants in the reserve that are culturally important.

Management Response

4.3.1 Implement relevant actions in the PAS and Recovery Plans for threatened species and ecological communities in the reserve.

4.3.2 Continue to liaise with Byron Bird Buddies in regard to implementation of the Belongil Estuary Seabird and Shorebird Management Plan relevant to the reserve.

4.3.3 Encourage flora and fauna surveys of the reserve to establish baseline information on the reserve's flora and fauna, including threatened and migratory species and ecological communities.

4.3.4 Remove illegal camps and dumps from the reserve and rehabilitate these areas.

4.3.5 Investigate opportunities to include the inter-tidal zone to mean low water mark in the reserve to protect the habitat of migratory and threatened shorebirds.

4.4 Pests Plants and Animals

Introduced plants

A variety of noxious and environmental weeds occur in the reserve (refer to Appendix 3). Weed infestations are primarily on the reserve's frontal dunes, boundaries and along tracks due to the dumping of garden refuse, the spread of garden escapees and past sandmining, grazing and drainage. Run-off from surrounding urban and

agricultural lands flowing through the reserve and into Belongil Creek creates pathways for the spread of weeds. Close proximity to residential gardens increases the amount of weed seed spread into the reserve by birds.

A noxious weed survey (Ecological Assessment & Restoration Services 2006) of the southern section of the reserve includes recommendations for weed control. To date weed control activities have primarily focussed on the control of the noxious weed groundsel bush (*Baccharis halimifolia)* in the southern section of the reserve, as the central and Belongil Beach sections have only recently been added to the reserve.

Weeds pose a serious threat to threatened species, populations and ecological communities in the reserve. Key threatening process (KTP) declarations under the TSC Act relevant to the reserve include: invasion and establishment of exotic vines and scramblers; invasion of native plant communities by bitou bush and boneseed; invasion of native plant communities by exotic perennial grasses; and invasion, establishment and spread of *lantana camara*.

At the regional level the Northern Rivers Region Pest Management Strategy (DECC 2007) broadly identifies the distribution of pests and their associated impacts across the NPWS Northern Rivers Region reserve system. It details priorities, including actions listed in the PAS and threat abatement plans and other actions to protect neighbouring properties, and directs resource allocation to high priority programs. The regional pest management strategy gives direction at a regional level, however, a reserve specific plan is desirable to provide more detailed strategies and work programs.

Introduced animals

A survey of pest animals has not been undertaken, however, fox (*Vulpes vulpes*) and cane toad (*Bufo marinus*) have been recorded on the reserve. Dogs (*Canis lupus familiaris)*, rats (*Rattus rattus*), cats (*Felis catus*), pigs (*Sus scrofa*), plague minnow (*Gambusia holbrooki)*, rabbits (*Oryctolagus cunicullus)* and the feral honeybee (*Apis mellifera*) are also likely to occur. Dogs, cats and rabbits on the reserve may be either feral populations (wild) or domestic animals that have escaped or roam freely. The reserve is potential habitat for the Indian myna (*Acridotheres tristis*) due to its proximity to Byron Bay. An Action Plan has been developed for the control of Indian mynas across land tenures in the region (Northern Rivers Indian Myna Collaborative Committee 2009).

The regional pest management strategy identifies fox, cane toad, wild dog, feral pig and cat as the priority pest species for the reserve. Wild dogs and feral pigs are declared pest animals under the *Rural Lands Protection Act 1998* (RLP Act) which requires land managers to eradicate pest animals 'to the extent necessary to minimise the risk of the pest causing damage to any land'.

Introduced pest animals cause significant impacts on animals and plants through predation, competition and habitat destruction or modification. Those pest animals with the potential to threaten the survival or evolutionary development of species, populations or ecological communities listed under the TSC Act may be declared KTPs under the TSC Act and/or the EPBC Act. Table 1 lists the declared KTPs for

pest animals known or likely to occur on the reserve. The TSC Act provides for Threat Abatement Plans to be prepared for KTPs. Threat Abatement Plans have been prepared for predation by the plague minnow and red fox.

Table 1 Pest animals declared as key threatening processes.

Key Threatening Process	TSC Act	EPBC Act
Competition and grazing by the feral European rabbit	X	X
Competition from feral honeybees	X	
Invasion and establishment of the cane toad	X	X
Predation by feral cats	X	X
Predation by the European red fox	X	X
Predation by the plague minnow	X	
Predation, habitat degradation, competition and disease transmission by feral pigs	X	X
Predation and hybridisation by feral dogs	X	

Pest plant and animals will be managed to minimise impacts on native plants and animals in accordance with the Northern Rivers Region Pest Management Strategy and other relevant strategies and plans such as the Northern Branch Cane Toad Management Strategy and the Northern Rivers Region Indian Myna Action Plan.

Development of a Pest Management Strategy for the reserve will consider neighbour education and awareness programs and the potential for any additional native vegetation buffering on lands adjacent to the reserve.

Management Response

4.4.1 Prepare and implement a Pest Management Strategy for the reserve.

4.5 Repairing the Land and Water

The reserve is located on flat to slightly undulating terrain. A dune system runs from the coast through the reserve adjacent to the Belongil Creek lagoon and a low-lying estuarine/alluvial plain. The reserve's dominant geology is Quaternary in origin and overlays a Palaeozoic Metamorphic bedrock. Soil types in the reserve range from deep, infertile coastal Holocene beach sands to the coastal plain's black and grey clays derived from a combination of alluvial materials originating from basalts, sandstones, metamorphic rocks, marine sediments and beach sands. Acidic peat deposits occur in some areas of the reserve.

The reserve includes remnant core habitats within the larger Cumbebin-Belongil wetland system which encompasses approximately 1000 hectares (Wetland Care Australia & Australian Wetlands 2005). A report by local environment group, BEACON (1981), states that by 1981 the Cumbebin-Belongil wetland system had been reduced to 400 hectares. Despite extensive past clearing, some parts of the reserve support relatively undisturbed examples of the formerly extensive wetland.

These areas retain water in underlying peat and sand during the wet season and release it slowly over the drier winter and spring seasons (Wetland Care Australia & Australian Wetlands 2005).

Past land uses of the reserve include grazing, logging, drainage and sandmining (refer to Section 4.2). While the reserve's natural systems are still recovering from these past activities there are also ongoing impacts on soils and water in the reserve.

(a) Acid sulfate soils, Flooding, Drainage and Water Quality Issues

Acid Sulfate Soil (ASS) risk mapping by Byron Shire Council in 2005 indicates that ASS are likely to occur throughout the reserve except in the Belongil Beach section. Any event that lowers the water table, such as severe droughts or drain construction, exposes the iron sulfide layer in ASS to air which results in the production of acid that is released in subsequent rain events or floods. Excavated soil dumped adjacent to drains in the reserve is likely to contain ASS and will also generate acid runoff.

The release of sulphuric acid and other toxic heavy metals into estuarine systems can result in serious impacts on vegetation and animals including fish kills, reduced fish hatching and a decline in growth rates (Lines-Kelly & Sammut 2004). This combination of conditions in 1997 resulted in a large fish kill in the Belongil Estuary known as the 'red estuary' event (Parker & Pont 2001). Fish kills and a decline in fish health also have implications for birds and bats that feed on estuarine fish.

Acid sulfate soils should not be disturbed, however, it may be necessary to undertake remediation works where acid sulfate soils have been exposed or disturbed by past activities, such as through drainage. Any proposed disturbance to ASS would require environmental assessment.

Belongil Creek is one of many intermittently closed and open lakes and lagoons (ICOLLs) located along the NSW coast. During periods of low flow in the creek a build-up of the sand beach berm closes the creek's entrance which is located directly adjacent to the reserve. The entrance becomes blocked due to high longshore sand transport within the embayment combined with onshore winds blowing sand into the entrance and the creek's low flushing capacity due to its relatively small catchment (Parker & Pont 2001). Natural events such as storms, floods and large high tides occasionally open the creek to the sea. The issues of flooding, opening the creek to the sea and water quality in Belongil Creek are closely related and directly affect the reserve's natural systems.

Byron Shire Council is licensed by Crown Lands (Department of Primary Industries) to mechanically open Belongil Creek to the sea when it reaches a specified water level to reduce flooding potential in developed areas upstream. The licence also permits the creek to be opened below the set level between June and December if there is a serious reduction in water quality (Patterson Britton & Partners 2006). The Council is preparing an entrance management strategy and associated environmental impact assessments to address environmental and other issues associated with opening Belongil Creek (WBM Oceanics Australia 2003; Australian Wetlands 2009). NPWS is represented on Byron Shire Council's Environmental

(Coastal and Estuary) Project Reference Group which provides advice on the implementation of the Belongil Estuary Management Plan (Parker & Pont 2001).

Byron Shire Council is also developing a Floodplain Risk Management Plan for the Belongil Creek catchment in accordance with the Government's Floodplain Development Manual (2005). NPWS is represented on the Belongil Creek Floodplain Risk Management Project Reference Group which oversees and advises the Council on the development and implementation of the plan. The Floodplain Risk Management Plan will provide a strategic approach to manage the identified flood risk and development of the floodplain. It may propose flood mitigation works and measures.

Byron Shire Council is also the prescribed authority for an easement created under the *Conveyancing Act 1919* over a drain running east-west through the central section of the reserve and into Belongil Creek, south of Ewingsdale Road. This drain connects to Council's Butler Street drain which forms part of the urban stormwater drainage system for Byron Bay.

Water sampling undertaken by Byron Shire Council in 2007-2008 indicated very poor water quality in the Butler Street drain. Nutrient and human/animal waste inputs entering the drain, as well as leachates from the former tip site on the Butler Street Council Reserve, contribute to the drain's poor water quality (Parker & Pont 2001; PPK Environment and Infrastructure 1998). Consequently, water quality in the drain on the reserve that connects to Council's Butler Street drain is also likely to be poor.

Byron Shire Council sampling of Belongil Creek where it borders the central section of the reserve also indicates very poor water quality, including at a sample point where a tidal tributary in the reserve connects to the creek. The Office of Environment and Heritage's Water and Coastal Science Section (Scanes, P 2009, pers. comm.) considers Belongil Creek among the most severely disturbed estuarine systems in NSW based on the results of water quality sampling by Australian Wetlands (2009). The water quality of Belongil Creek is affected by similar inputs as Council's Butler Street drain.

Drains connecting adjacent agricultural and urban lands to Belongil Creek are also located in the southern section of the reserve. It is possible that these drains are also polluted with runoff from adjacent lands. The Belongil Swamp Drainage Union maintains a drainage system in other areas of the Belongil Swamp but does not maintain the drains in the reserve.

The Byron Shire Urban Stormwater Management Plan (PPK Environment and Infrastructure 1998) which includes the Byron Bay township is being reviewed by Byron Shire Council. Upgrading of the Byron Bay stormwater discharge system is planned including a wetland treatment system for the Butler Street drain. The wetland treatment system is a high priority in the Belongil Estuary Management Plan (Parker & Pont 2001) and is included as a priority action in Council's Management Plan (BSC 2009).

Wetland drainage has generally lowered the water table in the reserve and surrounding wetlands. The cycle of artificially opening the Belongil estuary at a level

lower than its natural peak to mitigate flooding potential upstream may also be affecting water tables. Tulau (2002) notes that in a natural system entrance opening would have occurred less frequently and at a higher level resulting in water tables in the Belongil ASS 'hot spot' being maintained higher for longer.

Draper (2002) and Wetland Care Australia & Australian Wetlands (2005) note that fires and drainage have removed or seriously decreased peat layers in the Belongil catchment and that this has resulted in land subsidence. This has affected drainage patterns and vegetation cover and further complicates remediation of water quality issues associated with ASS. In some parts of the reserve, during dry periods, peat topsoils dry out to the extent that large hollow pockets form under the surface roots of paperbarks and swamp oaks. The drying of the peat layer has also weakened the root systems of many trees leaving them unstable and prone to falling in strong winds (Draper 2002). This instability is evident in the collapse of extensive areas of swamp oak (*Casuarina glauca*) in the reserve in a severe storm in winter 2009.

Drainage works in the reserve will only be permitted where they are consistent with the NPW Act and NPWS policy.

Areas of the reserve which are degraded due to past or current land use practices, for example grazing, sand-mining etc., will be investigated and options for restoration considered.

Disturbance of ASS will only be undertaken if associated with works to improve environmental outcomes for the reserve.

Research will be encouraged into the reserve's hydrology including the man-made drainage system; its history and linkages to adjacent drainage systems; water quality, including potential and actual acid generation; impacts on surrounding vegetation communities and habitats; alternatives to open drains; and mitigation and rehabilitation strategies required.

Management response

4.5.1 Liaise with Byron Shire Council regarding improving water quality in Council's Butler Street Drain which drains through the reserve to Belongil Creek and the feasibility of piping essential drains in the reserve to reduce acid generation and runoff.

4.5.2 Continue to participate on Byron Shire Council's Belongil Creek Floodplain Risk Management and Environmental (Coastal and Estuary) Project Reference Groups.

4.5.3 Map all the drains in the reserve and investigate closing and rehabilitating drains which are non-essential or which adversely impact on the reserve.

4.5.4 Ensure that maintenance of essential drains in the reserve is in accordance with the NPW Act and NPWS Policy including any requirements for permits/licensing and environmental impact assessment.

4.5.5 Encourage Byron Shire Council to erect signage adjacent to the boundary of the reserve, in conjunction with relevant agencies, advising the public of health risks associated with entering or fishing in the drain in the central section of the reserve which connects to Council's Butler Street drain, due to poor water quality.

(b) Coastal Erosion

The Belongil Beach section of the reserve is significantly affected by coastal erosion. The processes operating include storm bite, long term recession and potential breakthroughs of the peninsula (WBM Oceanics Australia 2003). The Belongil Beach section of the reserve is located mainly within Precinct 1 (from the beach escarpment to the immediate impact line) in Byron Shire Council's Development Control Plan 2002.

The best estimates of coastal erosion hazard zones for the Belongil Beach section of the reserve for the immediate period (post storm), 50 years and 100 years are 30, 85 and 145 metres landward, respectively (WBM Oceanics Australia 2000, p.137). These estimates indicate that this section of the reserve would be lost within 50 years. Hazard zone estimates are based on historical trends and are influenced by the numerous protection structures that have been constructed over the past 30 years. Future rates of shoreline recession will depend on the management strategy adopted and implemented but WBM Oceanics Australia (2000) has assumed that the ad-hoc structures along Belongil Spit in the vicinity of the reserve lands will fail and become outflanked.

WBM Oceanics Australia (2000 & 2003) states that the construction of beach protection structures on Belongil Beach is likely to accelerate the long term rate of recession on unprotected sections of the beach. If existing beach protection structures south east of the reserve on Belongil Beach are upgraded and maintained it is likely that beach erosion north west of the structures, including in the reserve, will accelerate and lead to Belongil Creek breaking through the narrow Belongil Spit south east of its current location and the loss of land north west of the breakthrough.

Belongil Creek and nearby areas are also susceptible to oceanic inundation during storm events when low lying areas of the narrow frontal dune, including some areas of the reserve, may be overtopped by wave action (WBM Oceanics Australia 2003, p.2-20). A small part of the Belongil Beach section of the reserve was overtopped in winter 2009 during an east coast low pressure system characterised by elevated sea levels and wave heights, intense, heavy rainfall and gale-force winds. Also in 2009, Belongil Beach was identified by the State government as one of nineteen 'hotspots' on the NSW coast where erosion is severe and the coastline is actively receding. Councils with 'hotspots' are required to prepare coastal erosion emergency management plans.

Council is currently finalising a Coastal Zone Management Plan for the Byron Shire coastline. The plan is based on Council's preferred coastline hazard management strategy for Belongil Beach of planned retreat. Planned retreat involves the removal of threatened structures rather than their protection and for the beach to recede naturally. There are no structures within the Belongil Beach section of the reserve.

Coastal processes in the reserve, including shoreline fluctuation and dune erosion, will be allowed to continue unimpeded.

(c) Sandmining Tailings

During 1930s-1970s waste from sand mining, known as 'tailings', was used as fill and dumped in numerous locations in and around Byron Bay. It was subsequently determined that these tailings posed a radiation health risk and a major investigation was undertaken by the then Health Commission in the 1980s which resulted in radioactive tailings being removed from urban areas and reprocessed.

There are no official records to indicate that tailings were dumped in the reserve, however, anecdotal reports suggest that tailings may have been dumped in the vicinity of Skinner's Shoot Road which borders the southern part of the reserve. Additionally, annotations on a 1958 Byron Bay parish map referring to the southern section of the reserve indicate the involvement of 'Zircon Rutile Mining Coy', a sandmining company operating in the Byron Bay area at the time. Further investigation is required to determine whether tailings were dumped in the reserve and the need for any remediation works because of the potential health risks associated with sandmining tailings. Action will only be taken if it is determined that there is a public health or environmental issue and will be in accordance with the NPWS Contaminated Land Policy Statement.

Management response

4.5.6 Investigate whether sandmining tailings were disposed of in the reserve and, if so, determine if there are any associated health or environmental risks or any remediation works required consistent with the NPWS Contaminated Land Policy Statement.

4.6 *Fire*

The primary fire management objectives of the NPWS are to protect life and property and community assets from the adverse impacts of fire, while managing fire regimes to maintain and protect cultural heritage and biodiversity.

Fire is a natural feature of many environments and is essential for the survival of some plant communities. However, inappropriate fire regimes can lead to loss of particular plant and animal species and communities, and high frequency fires have been listed as a key threatening process under the TSC Act.

While detailed fire history information for the reserve is limited, available records and anecdotal information suggests a relatively low to moderate frequency of major bushfires in the recent past. Vegetation communities in the reserve such as swamp sclerophyll forest, sedgelands and banksia/casuarina woodlands on the frontal dune are sensitive to fire. Managing the impact of fire, especially high intensity fire, in the reserve's wetlands is also important for maintaining populations of threatened frogs.

A Reserve Fire Management Strategy was adopted for the southern section of the reserve in 2008 (NPWS 2008). It designates this area as a Land Management Zone. Apart from the over riding legislative objective of protecting life and property, the

primary fire management objectives of a Land Management Zone are to conserve biodiversity and to protect cultural heritage. The Fire Management Strategy outlines the fire history of the reserve, key assets within and adjoining the reserve, including sites of cultural and natural heritage value, fire management zones which may include asset protection zones, and fire control advantages such as management trails and water supply points. Hazard reduction programs, ecological burning proposals and fire trail works are submitted annually to the Far North Coast Bush Fire Management Committee. The Fire Management Strategy will need to be reviewed to incorporate recent additions to the reserve and to identify and assess trails in the reserve additions required for management purposes. Trails not required will be closed and rehabilitated.

Fire in the reserve will be managed to protect biodiversity in accordance with the identified fire regimes/thresholds in the Fire Management Strategy.

The use of heavy machinery for fire suppression will be avoided in areas where culturally significant sites, rare or threatened plants and endangered ecological communities occur; in riparian areas and on the frontal dune.

Areas disturbed by fire suppression operations will be rehabilitated as soon as practical after the fire, particularly where acid sulfate soils occur.

Visitors to the reserve will not be permitted to light fires.

Management Response

4.6.1 Implement the reserve's Fire Management Strategy and review and update the strategy to include recent additions to the reserve.

4.6.2 Close and rehabilitate trails not required for management purposes.

4.7 Climate Change

Climate change has been listed as a key threatening process under the TSC Act. Projections of future climate changes in NSW include higher temperatures, increasing sea levels and water temperatures, elevated CO_2, more intense but possibly reduced annual average rainfall, increased temperature extremes and higher evaporation. These changes are likely to lead to greater intensity, duration and frequency of fires, more severe droughts and increased regional flooding.

Climate change may significantly affect biodiversity by changing population size and distribution of species, modifying species composition, and altering the geographical extent of habitats and ecosystems. Species most at risk are those unable to migrate or adapt, particularly those with small population sizes or with slow growth rates. The potential impact of climate change is difficult to assess since it depends on the compounding effects of other pressures, particularly barriers to migration and pressure from weeds and feral animals. Programs to reduce pressures arising from such threats will help reduce the severity of the effects of climate change.

DECCW has recently mapped climate change corridors along climatic gradients for native animals occupying coastal, dry and moist habitats on the NSW north coast.

These corridors are predicted to be important for wildlife adapting to the threatening processes of climate change. Corridors for fauna occupying moist and coastal habitats overlap in the southern section of the reserve. The corridor for fauna of moist habitats links to the escarpment and also south towards Broken Head. The coastal corridor parallels the coast north and south of the reserve.

Apart from the coastal erosion impacts detailed in Section 4.5 and large scale predicted climate change impacts, local level potential impacts on the reserve include more frequent and intense storms combining with sea level rise to accelerate coastal erosion and alter the hydrological processes of Belongil Creek; increased growth of woody weeds; accelerated erosion on steeper slopes in the upper catchment increasing sedimentation on the floodplain; and acid sulfate soil problems worsening in the short term but improving over the longer term (DECC 2008).

The *NSW Sea Level Rise Policy Statement* (DECCW 2009) notes that exactly how the coast and estuaries will respond is complex and often driven by local conditions but in general higher sea levels will lead to: increased or permanent tidal inundation of land by seawater; recession of beach and dune systems; changes in the way that tides behave within estuaries; saltwater extending further upstream in estuaries; higher saline water tables in coastal areas; and increased coastal flood levels.

Management of the reserve will aim to improve the ecological resilience of native plants and animals to climate change by managing fire (refer to Section 4.6), controlling weeds and vertebrate pests (refer to Section 4.4) and repairing the reserve's land and water (refer to Section 4.5).

5. USING AND KNOWING ABOUT COUNTRY

5.1 Keeping Connected with Country- Cultural renewal

Aboriginal people have adapted and sustained their cultural identity despite the impacts bought about by European settlement. The links Aboriginal people maintain with Country continue to be expressed through stories, lineage, occupation and use. Aboriginal people maintain their cultural identity and links with Country through cultural learning passed on by Elders to the following generations.

Access to most of the reserve is difficult due to the seasonally high water table and lack of tracks and this may limit opportunities for cultural activities compared to nearby Country such as Arakwal National Park. However, the NPWS recognises that the Bundjalung of Byron Bay (Arakwal) people and other Bundjalung people may want to undertake cultural activities in the reserve and that these are important to transfer knowledge and to maintain, renew or repair cultural associations with Country.

ILUA 2 provides for access by Bundjalung of Byron Bay (Arakwal) people to the reserve for cultural purposes. ILUA 2 also provides for studies into any threat to threatened species from the exercise of rights to use wild resources to hunt or gather traditional foods in the reserve.

Cultural activities may be undertaken in the reserve as long as they do not threaten natural values and are in accordance with the ILUA and NPWS consent.

Management Response

5.1.1 Conduct studies into any threat to reserve values, including to threatened species, from the exercise of rights to use wild resources and manage activities accordingly.

5.2 Managing Visitor Use of the Reserve and Talking About Country

Visitor use of the reserve is minimal as there are no visitor facilities and the predominantly swampy terrain makes access difficult. Access to the reserve has also not been promoted due to the potential environmental impacts of the provision of visitor facilities on the reserve's significant vegetation communities. There are occurrences of homeless people using the reserve. The NSW Government Protocol for Homeless People and NPWS Statewide Homeless People Policy Directive guides management of homeless people and is based on the principle that homeless people are to be treated appropriately and with sensitivity.

Other nearby areas managed by NPWS provide a diverse range of recreation opportunities, information and visitor facilities including Cape Byron Headland Reserve, Arakwal National Park and Broken Head Nature Reserve. In addition the Cumbebin Wetland Reserve, located approximately 500 metres from the reserve on Crown land adjacent to the Byron Bay township, contains a raised boardwalk and information about the natural and cultural values of the Cumbebin Swamp. It is managed by the Byron Environment Centre on behalf of the Cumbebin Wetland Reserve Trust.

The Cape Byron Marine Park within Belongil Creek and its tributaries are a Special Purpose Zone for the protection and rehabilitation of Belongil Creek and recreational fishing is not permitted (refer to map). A permit from the Marine Park Authority is required for any harvesting activity and will only be issued for Aboriginal ceremonial and cultural events (refer also to Section 1.1).

No visitor facilities will be developed in the reserve.

Management of homeless people will be in accordance with the NSW Government Protocol for Homeless People and NPWS Statewide Homeless People Policy Directive.

Low impact nature-based activities, such as bird watching and bush walking, will be allowed in the reserve but activities such as recreational camping, cycling and horse riding will not be permitted.

Community understanding of the reserve's Aboriginal cultural and biodiversity values will be developed through off-site information programs.

Management Response

5.2.1 Consult and involve the Bundjalung of Byron Bay (Arakwal) people in the development and delivery of information programs on the reserve's Aboriginal cultural and biodiversity values, including producing an information booklet on the reserve's cultural values.

5.2.2 Encourage the preparation of a plan of management for the Cumbebin Wetland Reserve in accordance with ILUA 2.

5.3 Understanding Country – Research and Monitoring

The Bundjalung of Byron Bay (Arakwal) people have a broad knowledge of Country as told by the Elders through oral history. The NPWS respects this intellectual property and wishes to add to this body of knowledge. Research is an important part of 'Looking After Country' (refer to Section 4) as it ensures reserve values are clearly identified and managed as well as possible.

Research and monitoring assists in assessing the success of the reserve management programs and may trigger specific management actions (refer to Section 4.4). In particular, monitoring of plant and animal communities, species and habitats is important to identify changes in their distribution and abundance due to

human impacts and the impacts of introduced species, management activities, climate change and responses to natural phenomenon.

A survey and study of the reserve's pest plants was undertaken in 2006 by a Southern Cross University student. No other research is known to have been undertaken on the reserve.

Research and monitoring will be encouraged which assists management of the reserve into topics such as climate change, hydrology, acid sulfate soils, water quality, environmental repair, threatened species and their habitats, endangered ecological communities, pest species and their impact on native plants and animals and coastal erosion (refer to Sections 4.4 & 4.5).

Research and monitoring which assists management of the reserve, including research into Aboriginal cultural heritage values, will be encouraged (refer to Sections 4.2, 4.4 & 4.5).

Proposals for research and monitoring that enhance management of the reserve and have minimal impact on the reserve's natural and cultural values will be permitted subject to NPWS licensing/consent requirements.

6. PLAN IMPLEMENTATION

Section Number	Management Response	Priority
4.1	**Joint Management by the Bundjalung of Byron Bay (Arakwal) people and the NPWS**	
4.1.1	Procedures and protocols will be developed for the operation of the Management Committee consistent with ILUA 2, the NPW Act and cultural protocols. Issues and proposals relating to the care, control and management of the reserve will be referred to the Management Committee for their consideration and recommendations.	High
4.2	**The Story of Country that is now the Reserve**	
4.2.1	Develop and implement a program to identify and record Aboriginal cultural sites within the reserve as provided for under the terms of the ILUA.	High
4.2.2	Record the location of any sites of historic heritage in the reserve, such as historic tracks.	Medium
4.3	**Native Plants and Animals**	
4.3.1	Implement relevant actions in the PAS and Recovery Plans for threatened species and ecological communities in the reserve.	High
4.3.2	Continue to liaise with Byron Bird Buddies in regard to implementation of the Belongil Estuary Seabird and Shorebird Management Plan relevant to the reserve.	High
4.3.3	Encourage flora and fauna surveys of the reserve to establish baseline information on the reserve's flora and fauna, including threatened and migratory species and ecological communities.	High
4.3.4	Remove illegal camps and dumps from the reserve and rehabilitate these areas.	High
4.3.5	Investigate opportunities to include the inter-tidal zone to mean low water mark in the reserve to protect the habitat of migratory and threatened shorebirds.	Medium
4.4	**Pest Plants and Animals**	
4.4.1	Prepare and implement a Pest Management Strategy for the reserve.	High
4.5	**Repairing the Land and Water**	
4.5.1	Liaise with Byron Shire Council regarding improving water quality in Council's Butler Street Drain which flows through the reserve to Belongil Creek and the feasibility of piping essential drains in the reserve to reduce acid generation and runoff.	Medium
4.5.2	Continue to participate on Byron Shire Council's Belongil Creek Floodplain Risk Management and Environmental (Coastal and Estuary) Project Reference Groups.	Medium
4.5.3	Map all the drains in the reserve and investigate closing and rehabilitating drains which are non-essential or which adversely impact on the reserve.	Medium

Section Number	Management Response	Priority
4.5.4	Ensure that maintenance of essential drains in the reserve is in accordance with the NPW Act and NPWS Policy including any requirements for permits/licensing and environmental impact assessment.	High
4.5.5	Encourage Byron Shire Council to erect signage adjacent to the boundary of the reserve, in conjunction with relevant agencies, advising the public of health risks associated with entering or fishing in the drain in the central section of the reserve which connects to Council's Butler Street drain, due to poor water quality.	Medium
4.5.6	Investigate whether sandmining tailings were disposed of in the reserve and, if so, determine if there are any associated health or environmental risks or any remediation works required consistent with the NPWS Contaminated Land Policy Statement.	High
4.6	**Fire**	
4.6.1	Implement the reserve's Fire Management Strategy and review and update the strategy to include recent additions to the reserve.	High
4.6.2	Close and rehabilitate trails not required for management purposes.	Medium
5.1	**Keeping Connected with Country - Cultural renewal**	
5.1.1	Conduct studies into any threat to reserve values, including to threatened species, from the exercise of rights to use wild resources and manage activities accordingly.	Medium
5.2	**Managing Visitor Use of the Reserve and Talking About Country**	
5.2.1	Consult and involve the Bundjalung of Byron Bay (Arakwal) people in the development and delivery of information programs on the reserve's Aboriginal cultural and biodiversity values, including producing an information booklet on the reserve's cultural values.	Medium
5.2.2	Encourage the preparation of a plan of management for the Cumbebin Wetland Reserve in accordance with ILUA 2.	High

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.

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Appendix 1 Plants important for wild resource use.

Culturally significant plants based on information from Elders Lorna Kelly (dec.), Linda Vidler (dec.) and Dulcie Nicholls (EPM Consulting et al. 2003).

Plants of high cultural significance	Uses
midjem (Austromyrtus dulcis) *	Edible fruit
wallum banksia *(Banksia aemula)*	Edible nectar, fuel, combs
coast banksia *(Banksia integrifolia)* *	Edible nectar, fuel, combs
lawyer cane *(Calamus muelleri)*	Canes for weaving
pigface *(Carpobrotus glaucescens)* *	Edible fruit
strangler fig *(Ficus watkinsiana)* *	Edible fruit
supplejack *(Flagellaria indica)* *	Canes for weaving
coast pandanus *(Pandanus tectorius)* *	Edible fruit
geebung *(Persoonia adenantha)*	Edible fruit
wallum geebung *(Persoonia virgata)*	Edible fruit
molucca bramble *(Rubus moluccana)* *	Edible fruit
five corners *(Styphelia viridis)*	Edible fruit
blue lillypilly *(Syzygium oleosum)* *	Edible fruit
native parsnip *(Trachymene incisa)*	Edible taproot
grasstree *(Xanthorrhoea latifolia)*	Edible nectar, firewood
Plants of lower cultural significance	**Uses**
mushrooms *(Agaricus sp.)* *	Edible
cunjevoi *(Alocasia brisbanensis)* *	Medicine
bangalow palm (*Archontophoenix cunninghamiana*) *	Sled, etc.
bush lemon *(Citrus limon)* *	Edible fruit
sandpaper fig *(Ficus coronata)* *	Leaves for sandpaper
blady grass *(Imperata cylindrica)* *	Leaves for mattress, pillow
beach morning glory *(Ipomoea pes-caprae)* *	Skipping rope
vasey grass *(Paspalum urvillei)* *	Base of stem sucked
gooseberry *(Physalis sp.)* *	Edible fruit
roseleaf raspberry *(Rubus rosifolius)* *	Edible fruit
paddy's lucerne *(Sida rhombifolia)* *	Leaves chewed
chocolate flowers *(Sowerbaea juncea)* *	Flowers gathered

* Plants recorded or likely to occur on the reserve.

Appendix 2 Threatened fauna.

Common Name	Scientific Name	Legal Status*	Known/Likely to Occur or with Potential Habitat
Invertebrates			
coastal petaltail dragonfly	*Petalura litorea*	Endangered	Potential
giant dragonfly	*Petalura gigantea*	Endangered	Likely
laced fritillary	*Argyreus hyperbius*	Endangered	Likely
Mitchell's rainforest snail #	*Thersites mitchellae*	Endangered	Likely
Amphibians			
olongburra frog #	*Litoria olongburensis*	Vulnerable	Potential
wallum froglet	*Crinia tinnula*	Vulnerable	Likely
Birds			
barred cuckoo-shrike	*Coracina lineata*	Vulnerable	Potential
black-tailed godwit ^	*Limosa limosa*	Vulnerable	Potential
beach stone-curlew	*Esacus neglectus*	Critically Endangered	Likely
black bittern	*Ixobrychus flavicollis*	Vulnerable	Likely
black-necked stork	*Xenorhynchus asiaticus*	Endangered	Known
brolga	*Grus rubicunda*	Vulnerable	Likely
bush hen	*Amaurornis olivaceus*	Vulnerable	Likely
collared kingfisher	*Todiramphus chloris*	Vulnerable	Likely
grass owl	*Tyto capensis*	Vulnerable	Likely
greater sand-plover ^	*Charadrius leschenaultii*	Vulnerable	Potential
lesser sand-plover ^	*Charadrius mongolus*	Vulnerable	Likely
great knot ^	*Calidris tenuirostris*	Vulnerable	Potential
little tern	*Sterna albifrons*	Endangered	Likely
mangrove honeyeater	*Lichenostomus fasciogularis*	Vulnerable	Potential
osprey	*Pandion haliaetus*	Vulnerable	Likely
pied oystercatcher	*Haematopus longirostris*	Endangered	Likely
red-backed button-quail	*Turnix maculosa*	Vulnerable	Likely
rose-crowned fruit-dove	*Ptilinopus regina*	Vulnerable	Likely
sanderling ^	*Calidris alba*	Vulnerable	Potential
sooty oystercatcher	*Haematopus fuliginosus*	Vulnerable	Potential
square-tailed kite	*Lophoictinia isura*	Vulnerable	Potential
superb fruit-dove	*Ptilinopus superbus*	Vulnerable	Potential
white-eared monarch	*Monarcha leucotis*	Vulnerable	Likely
wompoo fruit-dove	*Ptilinopus magnificus*	Vulnerable	Potential
Mammals			
common blossom-bat	*Syconycteris australis*	Vulnerable	Likely
common planigale	*Planigale maculata*	Vulnerable	Likely
eastern bent-wing bat	*Miniopterus schreibersii oceanensis*	Vulnerable	Potential
eastern long-eared bat	*Nyctophilus bifax*	Vulnerable	Likely
greater broad-nosed bat	*Scoteanax rueppellii*	Vulnerable	Likely
koala	*Phascolarctos cinereus*	Vulnerable	Known
large-footed myotis	*Myotis macropus*	Vulnerable	Known
little bent-wing bat	*Miniopterus australis*	Vulnerable	Known
grey-headed flying-fox#	*Pteropus poliocephalus*	Vulnerable	Likely

Common Name	Scientific Name	Legal Status*	Known/Likely to Occur or with Potential Habitat
Mammals cont.			
yellow-bellied sheathtail-bat	*Saccolaimus flaviventris*	Vulnerable	Potential
Reptiles			
green turtle # ^	*Chelonia mydas*	Vulnerable	Potential
leathery turtle # ^	*Dermochelys coriacea*	Vulnerable	Potential
loggerhead turtle # ^	*Caretta caretta*	Endangered	Potential

Source: Atlas of NSW Wildlife; Milledge, D. 2009, pers. comm.

* Status under TSC Act

# Denotes species also listed as nationally threatened under the EPBC Act

^ Denotes migratory species listed under the EPBC Act

Appendix 3 Weeds in the reserve.

Common Name	Scientific Name	Location
annual ragweed	*Ambrosia artemisiifolia*	Beach
asparagus fern*	*Asparagus aethiopicus*	Southern, Central
barner grass	*Pennisetum purpureum*	Southern, Central
bitou bush [n4]	*Chrysanthemoides monilifera*	Beach
blackberry nightshade	*Solanum nigrum*	Southern, Central, Beach
blue morning glory	*Ipomoea indica*	Southern, Central
Brazilian cherry [#]	*Eugenia uniflora*	Southern
broad-leaved paspalum*	*Paspalum wettsteinii*	Southern, Central
broad-leaved pepper tree [n3]	*Schinus terebinthifolius*	Southern, Central
camphor laurel [n4]	*Cinnamomum camphora*	Southern, Central, Beach
cherry guava*	*Psidium cattleianum*	Southern
climbing asparagus fern*	*Asparagus plumosus*	Beach
crofton	*Agenratina adenophora*	Southern
devils apple	*Solanum capsicoides*	Southern
farmers friends	*Bidens pilosa*	Beach
five-leaved morning glory *	*Ipomoea cairica*	Southern, Central, Beach
flaxleaf fleabane	*Conyza bonariensis*	Beach
glory lily *	*Gloriosa superba*	Beach
groundsel bush [n3]	*Baccharis halimifolia*	Southern, Central
guinea grass	*Panicum maximum*	Southern, Central
lantana [n5]	*Lantana camara*	Southern, Central, Beach
mickey mouse plant*	*Ochna serrulata*	Southern, Central, Beach
molasses grass*	*Melinis minutiflora*	Southern
pigeon grass	*Setaria sphacelata*	Southern, Central
purple top	*Verbena bonariensis*	Southern
resurrection plant [#]	*Bryophyllum pinnatum*	Beach
silver-leaved desmodium	*Desmodium uncinatum*	Southern
Singapore daisy*	*Sphagneticola trilobata*	Beach
small-leaved privet [#]	*Ligustrum sinense*	Southern, Central
sourgrass	*Paspalum conjugatum*	Southern, Central
tropical chickweed	*Drymaria cordata* subsp. *cordata*	Southern
umbrella sedge	*Cyperus eragrostis*	Southern
umbrella tree*	*Schefflera actinophylla*	Southern, Central, Beach
white passionflower	*Passiflora subpeltata*	Southern
wild tobacco	*Solanum mauritianum*	Southern, Central
winter senna*	*Senna pendula var. glabrata*	Southern, Central, Beach

* Priority Weeds for Coastal Landscapes (Oakwood 2008).

[#] Serious ranking - Ecological Assessment & Restoration Services (2006).

Declared under the *Noxious Weeds Act 1993:*

[N3] Class 3: The plant must be continuously suppressed and destroyed.

[N4] Class 4: The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the Local Control Authority.

[N5] Class 5: The presence of the weed on land must be notified to the local control authority (Far North Coast Weeds) and the weed must be fully and continuously suppressed and destroyed.