Ramsar Information Sheet

Published on 1 July 2022
Update version, previously published on : 1 January 2012

Australia

Little Llangothlin Nature Reserve

Designation date	17 March 1996
Site number	798
Coordinates	30°05'10"S 151°46'54"E
Area	257,60 ha

Color codes

Fields back-shaded in light blue relate to data and information required only for RIS updates.

Note that some fields concerning aspects of Part 3, the Ecological Character Description of the RIS (tinted in purple), are not expected to be completed as part of a standard RIS, but are included for completeness so as to provide the requested consistency between the RIS and the format of a 'full' Ecological Character Description, as adopted in Resolution X.15 (2008). If a Contracting Party does have information available that is relevant to these fields (for example from a national format Ecological Character Description) it may, if it wishes to, include information in these additional fields.

1 - Summary

Summary

Little Llangothlin Ramsar site, located in the northern tablelands region of New South Wales, comprises all the Little Llangothlin Nature Reserve (LLNR). LLNR contains the 105 hectare, permanent, Little Llangothlin Lagoon and 7.7 hectare of the 17 hectare, intermittent, Billy Bung Lagoon. Both of these are examples of the nationally threatened ecological communities 'upland wetlands of the Monaro Plateau and New England Tablelands', with Little Llangothlin Lagoon being particularly significant for its large area, permanency, function as a drought refuge for fauna, including numerous species of waterbirds such as the Pacific black duck (Anas superciliosa).

The site also contains a total of 16 hectares of fen, a non-forested peat wetland, (Hunter 2011) including a large 7.9 hectare Carex fen in the main inlet watercourse at Little Llangothlin Lagoon (Hunter and Bell 2009), and additional very small groundwater-fed seepage wetlands (freshwater springs), all of which add to the overall wetland values of the site. Due to the presence of permanent and intermittent lakes and the surrounding native vegetation, the Little Llangothlin Nature Reserve provides habitat for many species of waterbirds, some of which, in particular the Black swan (Cygnus atratus), Blue-billed duck (Oxyura australis), White-bellied sea eagle (Haliaeetus leucogaster) and possibly the nationally threatened Australasian bittern (Botaurus poiciloptilus), nest in the reserve.

In addition, the site supports terrestrial habitat including about 44 hectares of eucalypt woodland with grass understorey (including patches of the nationally threatened ecological community 'New England peppermint (Eucalyptus nova-anglica) grassy woodlands') and cleared areas that are predominantly grasslands containing kangaroo grass (Themeda australis) and exotic pasture species (Benson and Ashby 2000). The grasslands support the nationally endangered Austral toadflax (Thesium australe), a small plant which parasitises the roots of kangaroo grass.

Little Llangothlin Ramsar site has the following critical components and processes: hydrology, flora and fauna. The critical services for the site include the support of representative near-natural wetlands and the provision of refuge for water birds and other migratory birds during drought conditions. These features underpin the listing of the site as a wetland of International Importance for Criteria 1, 2 and 3 under the Ramsar convention.

2 - Data & location

2.1 - Formal data

2.1.1 - Name and address of the compiler of this RIS

Responsible compiler

Institution/agency	NSW Office of Environment and Heritage
Postal address	PO Box A290 Sydney South, NSW, 1232 Australia

National Ramsar Administrative Authority

Institution/agency	Department of Agriculture, Water and the Environment
Postal address	GPO 858 Canberra ACT 2601 Australia

2.1.2 - Period of collection of data and information used to compile the RIS

From year	1998
To year	2020

2.1.3 - Name of the Ramsar Site

Official name (in English, French or Spanish)	Little Llangothlin Nature Reserve

2.1.4 - Changes to the boundaries and area of the Site since its designation or earlier update

(Update) A. Changes to Site boundary	Yes ○ No ◉
(Update) B. Changes to Site area	No change to area
(Update) For secretariat only: This update is an extension	☐

2.1.5 - Changes to the ecological character of the Site

(Update) 6b i. Has the ecological character of the Ramsar Site (including applicable Criteria) changed since the previous RIS?	Yes (likely)
(Update) Are the changes	Positive ○ Negative ○ Positive & Negative ◉
(Update) Positive %	50
(Update) Negative %	50
(Update) No information available	☐

(Update) Optional text box to provide further information

Not evaluated - please disregard the percentages above.

(Update) Changes resulting from causes operating within the existing boundaries?	☐
(Update) Changes resulting from causes operating beyond the site's boundaries?	☑
(Update) Changes consequent upon site boundary reduction alone (e.g., the exclusion of some wetland types formerly included within the site)?	☐
(Update) Changes consequent upon site boundary increase alone (e.g., the inclusion of different wetland types in the site)?	☐

(Update) Please describe any changes to the ecological character of the Ramsar Site, including in the application of the Criteria, since the previous RIS for the site.

While there have been no notifiable changes to ecological character, the site is subject to a changing climate. Australia has warmed by just over 1 °C since 1910, with most warming since 1950 (Bureau of Meteorology (BOM), State of Climate 2018). Australia is projected to experience further increase in temperatures, with more extremely hot days and fewer extremely cool days over the coming decades. Warming over Australia is expected to be slightly higher than the global average (BOM, State of the Climate 2018).

According to the BOM Regional Weather and Climate Guide 2019 for the Northern Tablelands the region has, over the last 30 years, seen changes to the climate and weather including:

• A decrease in rainfall in the winter and spring months.
• Summer rainfall has been reliable; winter has been unreliable.
• Annual rainfall has been relatively reliable.
• Dry years (lowest 30% rainfall) have occurred seven times and wet years. (highest 30% rainfall) eight times.
• Three-monthly rainfall averages leading into spring have decreased affecting stored soil moisture.
• There have been more hot days, with more consecutive days above 30 °C.

As the global climate continues to warm the Northern Tablelands are projected to experience further increases in air temperatures, with more hot days and fewer cool nights, and decreases in rainfall in winter with possible changes to summer and autumn rainfall. Increased intensity of extreme rainfall events are projected. Severe fire weather is projected to increase across region (NSW, New England North West Climate change snapshot; CCIA, Central Slopes Projection Summaries).

These conditions will inherently affect the critical components, processes and service of the Ramsar site and the adaptive capacity and resilience of the site will be tested.

(Update) Is the change in ecological character negative, human-induced AND a significant change (above the limit of acceptable change) Yes ○

2.2 - Site location

2.2.1 - Defining the Site boundaries

b) Digital map/image
<1 file(s) uploaded>

Former maps: 0

Boundaries description

The LLNR Ramsar site is located between Armidale and Glen Innes on the New England Tablelands in north-eastern NSW, Australia, and is situated approximately 18 kilometres north-east of the small town of Guyra and 5 kilometres east of the New England Highway.

The Ramsar approximately 10 degrees east of grid north in line with the magnetic north south axis. The boundarsite boundary follows the boundary of the gazetted Little Llangothlin Nature Reserve. The gazetted area of the LLNR is 257.6 hectares (NSW Govt. 1979). It contains all of Little Llangothlin Lagoon and almost half of Billy Bung Lagoon as well as a large part of the catchments of both lakes. LLNR Ramsar site is square in shape, positioned y of the Ramsar site is situated about 200-300 metres from the outermost points of Little Llangothlin Lagoon on each side. The southern portion of the western boundary intersects Billy Bung Lagoon across the middle of the lake.

2.2.2 - General location

a) In which large administrative region does the site lie? New South Wales

b) What is the nearest town or population centre? Guyra (approximately 18 kilometres north east)

2.2.3 - For wetlands on national boundaries only

a) Does the wetland extend onto the territory of one or more other countries? Yes ○ No ◉

b) Is the site adjacent to another designated Ramsar Site on the territory of another Contracting Party? Yes ○ No ◉

2.2.4 - Area of the Site

Official area, in hectares (ha): 257.6

Area, in hectares (ha) as calculated from GIS boundaries: 254.324

2.2.5 - Biogeography

Biogeographic regions

Regionalisation scheme(s)	Biogeographic region
Other scheme (provide name below)	South-East Coast Drainage Division: Clarence River

Other biogeographic regionalisation scheme

Australian Drainage Divisions (Commonwealth of Australia, Bureau of Meteorology 2012). Australian Hydrological Geospatial Fabric Topographic Drainage Divisions and River Regions: (Commonwealth of Australia, Bureau of Meteorology 2012). http://www.bom.gov.au/water/geofabric/documents/BOM002_Map_Poster_A3_Web.pdf

3 - Why is the Site important?

3.1 - Ramsar Criteria and their justification

☑ Criterion 1: Representative, rare or unique natural or near-natural wetland types

Other reasons: Little Llangothlin Lagoon and Billy Bung Lagoon are part of the larger New England Lagoons system which includes 57 lakes and swamp depressions extending along 100 kilometres of the Great Dividing Range. Only 39 of these lakes and swamp depressions occur within the South-East Coast Drainage Division (Haworth 1998). At 105 hectares, Little Llangothlin Lagoon is one of the largest examples of these high altitude lakes in the drainage division. It is also rare due to its near-natural condition, as the majority of the lakes have been severely degraded through hydrological modification, grazing and cropping. Little Llangothlin Nature Reserve Ramsar site is one of only two reserves in the New England Tablelands which contain examples of these lakes, and which are protected under the National Parks and Wildlife Act 1974.

☑ Criterion 2 : Rare species and threatened ecological communities

☑ Criterion 4 : Support during critical life cycle stage or in adverse conditions

3.2 - Plant species whose presence relates to the international importance of the site

Phylum	Scientific name	Criterion 2	Criterion 3	Criterion 4	IUCN Red List	CITES Appendix I	Other status	Justification
Plantae								
TRACHEOPHYTA / MAGNOLIOPSIDA	*Eucalyptus nova-anglica*	☑	☐	☐	VU	☐	Part of a threatened ecological community	This species forms part of the New England peppermint grassy woodlands ecological community, which is nationally listed as critically endangered under the EPBC Act.
TRACHEOPHYTA / LILIOPSIDA	*Themeda triandra*	☐	☐	☑		☐		Provides a host for the threatened Austral toadflax.
TRACHEOPHYTA / MAGNOLIOPSIDA	*Thesium australe*	☑	☐	☐		☐	Nationally listed threatened species - listed as vulnerable under the EPBC Act.	Austral Toadflax is nationally listed threatened species. It is semi-parasitic on roots of a range of grass species (including kangaroo grass).

The nationally threatened herb Austral toadflax (Thesium australe) parasitizes the roots of kangaroo grass (Themeda australis) in the understorey of Eucalypt woodlands on the slopes to the east of Billy Bung Lagoon.

3.3 - Animal species whose presence relates to the international importance of the site

Phylum	Scientific name	Species qualifies under criterion				Species contributes under criterion				Pop. Size	Period of pop. Est.	% occurrence 1)	IUCN Red List	CITES Appendix I	CMS Appendix I	Other Status	Justification
		2	4	6	9	3	5	7	8								
Birds																	
CHORDATA / AVES	*Anas gracilis*	☐	☑	☐	☐	☐	☐	☐	☐	1800			LC	☐	☐		The site provides refuge habitat for this species (particularly during drought).
CHORDATA / AVES	*Anas rhynchotis*	☐	☑	☐	☐	☐	☐	☐	☐	184			LC	☐	☐		The site provides refuge habitat for this species (particularly during drought).
CHORDATA / AVES	*Anas superciliosa*	☐	☑	☐	☐	☐	☐	☐	☐	600			LC	☐	☐		The site provides refuge habitat for this species (particularly during drought).
CHORDATA / AVES	*Ardea pacifica*	☐	☑	☐	☐	☐	☐	☐	☐				LC	☐	☐		The site provides refuge habitat for this species (particularly during drought).
CHORDATA / AVES	*Botaurus poiciloptilus*	☑	☐	☐	☐	☐	☐	☐	☐				EN	☐	☐	EPBC Act - endangered	Nationally listed threatened species.
CHORDATA / AVES	*Bubulcus ibis*	☐	☑	☐	☐	☐	☐	☐	☐				LC	☐	☐		The site provides refuge habitat for this species (particularly during drought).
CHORDATA / AVES	*Calidris acuminata*	☐	☑	☐	☐	☐	☐	☐	☐				LC	☐	☐		Uses the site for non-breeding habitat. This species migrates between Australia and Artic Siberia and/or Alaska through the East Asian-Australasian flyway.
CHORDATA / AVES	*Calidris ruficollis*	☐	☑	☐	☐	☐	☐	☐	☐				NT	☐	☐		Uses the site for non-breeding habitat. This species migrates between Australia and Artic Siberia and/or Alaska through the East Asian-Australasian flyway.
CHORDATA / AVES	*Egretta novaehollandiae*	☐	☑	☐	☐	☐	☐	☐	☐				LC	☐	☐		The site provides refuge habitat for this species (particularly during drought).
CHORDATA / AVES	*Fulica atra*	☐	☑	☐	☐	☐	☐	☐	☐	722			LC	☐	☐		The site provides refuge habitat for this species (particularly during drought).
CHORDATA / AVES	*Gallinago hardwickii*	☐	☑	☐	☐	☐	☐	☐	☐				LC	☐	☐		Uses the site for non-breeding habitat. This species migrates between Australia and Artic Siberia and/or Alaska through the East Asian-Australasian flyway.
CHORDATA / AVES	*Oxyura australis*	☐	☑	☐	☐	☐	☐	☐	☐	180			NT	☐	☐		The site provides refuge habitat for this species (particularly during drought).
CHORDATA / AVES	*Plegadis falcinellus*	☐	☑	☐	☐	☐	☐	☐	☐				LC	☐	☐		The site provides refuge habitat for this species (particularly during drought). This species may migrate between mainland Australia and Tasmania.
CHORDATA / AVES	*Tringa nebularia*	☐	☑	☐	☐	☐	☐	☐	☐				LC	☐	☐		Uses the site for non-breeding habitat. This species migrates between Australia and Artic Siberia and/or Alaska through the East Asian-Australasian flyway.
CHORDATA / AVES	*Tringa stagnatilis*	☐	☑	☐	☐	☐	☐	☐	☐				LC	☐	☐		Uses the site for non-breeding habitat. This species migrates between Australia and Artic Siberia and/or Alaska through the East Asian-Australasian flyway.

1) Percentage of the total biogeographic population at the site

Little Llangothlin Ramsar site provides important habitat, including breeding habitat and as a drought refuge for a range of waterbirds. It known to support the nationally threatened Australasian bittern (Botaurus poiciloptilus) and five migratory waterbird species.

A small number of systematic ornithological studies were conducted within Little Llangothlin Nature Reserve in the 1970s and 1980s, prior to its listing as a Ramsar site (Briggs 1976, White 1986a). Since the time of listing in 1996 no similar scientific studies have been conducted. However, local bird watchers visit the reserve regularly, providing additional and more recent records of waterbirds within the site and a single aerial survey of the site was conducted in 2008 (Kingsford et al. 2011). As the earlier studies yielded comprehensive data, they provide the best available indication of the types and numbers of waterbirds which likely occurred at the site at the time of listing.

Since 2015 seasonal bird surveys aimed at recording species diversity and approximate numbers are conducted by NPWS staff and experienced qualified volunteers. Recent surveys have recorded all species except the cattle egret. The Australian Acoustic Observatory placed 2 acoustic monitors in the reserve to monitor for the Australasian bittern and any other Call records in 2019.

3.4 - Ecological communities whose presence relates to the international importance of the site

Name of ecological community	Community qualifies under Criterion 2?	Description	Justification
New England peppermint (Eucalyptus nova-anglica) grassy woodlands	☑	Patches of the Critically Endangered ecological community 'New England peppermint (Eucalyptus nova-anglica) grassy woodlands' occur at the site, including on the slopes to the north of Little Llangothlin Lagoon and on the lunette.	Critically endangered (National Environment Protection and Biodiversity Conservation (EPBC) Act), Critcially endangered (NSW, Biodiversity Conservation Act)
Upland wetlands of the New England Tablelands and the Monaro Plateau	☑	The current composition and distribution of aquatic vegetation (which represents the 'upland wetlands of the New England Tablelands and the Monaro Plateau' TEC) has been mapped in the reserve, totalling a 118.5 ha in the reserve.	Endangered (National Environment Protection and Biodiversity Conservation Act), Endangered (NSW, Biodiversity Conservation Act)

Optional text box to provide further information

Upland wetlands of the New England Tablelands and the Monaro Plateau:

The basalt plateau lagoon community (Benson and Ashby 2000) which includes aquatic and semi-aquatic vegetation within and surrounding Little Llangothlin and Billy Bung Lagoons is representative of the Threatened Ecological Community 'upland wetlands of the New England Tablelands and the Monaro Plateau'.

This community was listed as endangered under the EPBC Act in 2005 and is comprised of moderately dense to closed sedgeland and grassland occurring on the shores of open water or extending across shallow or intermittent wetlands. This community is characterised by native ground cover species including water plants, sedges, forbs and grasses, such as those that occur around the lakes in LLNR. Trees and shrubs are usually not found within this community.

During the 2019/2020 fire season, while LLNR was not directly affected, <10% of the estimated distribution of the wider ecological community were within fire affected areas, increasing the importance of protecting communities in unaffected areas like LLNR.

New England peppermint (Eucalyptus nova-anglica) grassy woodlands:

LLNR Ramsar site contains examples of New England peppermint (Eucalyptus nova-anglica) grassy woodlands.

New England peppermint (Eucalyptus nova-anglica) grassy woodlands were listed in 2011 as a critically endangered community under the EPBC Act. This community is a temperate grassy eucalypt woodland or open forest in which the tree canopy is dominated or co-dominated by Eucalyptus nova-anglica (DSEWPaC, 2011a). The understorey is usually made up of a dense, species-rich ground layer comprised of a wide variety of grasses and herbs often including Poa sieberiana and Themeda australis. This community usually lacks a substantial shrub layer. This community usually occurs on flat fertile soils and has been extensively cleared or degraded for agricultural purposes. The majority of the remaining patches of this listed threatened ecological community are small and scattered and continue to be threatened by further clearing and fragmentation, grazing, altered hydrology, dieback and weed invasion. During the 2019/2020 fire season 30-50% of the estimated distribution of the wider ecological community were within fire affected areas, increasing the importance of protecting communities in unaffected areas like LLNR.

4 - What is the Site like? (Ecological character description)

4.1 - Ecological character

Hydrology:

Hydrology plays a significant role in the ecology of the LLNR Ramsar site, both in relation to the two lakes and other wetlands, and in supporting terrestrial flora and fauna that contribute to the ecological character. Site hydrology is driven by climate, topography, landforms, and geology and is also influenced by human activities.

The four wetland types at the site are representative of the diverse upland wetlands of the region. Little Llangothlin Lagoon and Billy Bung Lagoon are two of only 39 upland lakes in the New England Tablelands within the South-East Coast Drainage Division. Eighty per cent of lakes in the New England Tablelands have been seriously degraded since European settlement. Compared with the other 37 upland lakes in the region, these two lakes are in near-natural condition because of their protection within the LLNR (Brock et al. 1999).

Little Llangothlin Lagoon contains water in all but times of extreme drought, and the much shallower Billy Bung Lagoon dries out every 20 years or so. The occurrence of permanent water contributes significantly to the site's ecology and function as a drought refuge. Lake water levels are supplemented by groundwater flows, both in the soil above the underlying basalt and granite, and in basalt aquifers which may discharge at seepage areas in the local catchment. As climate change continues to put additional pressure on wetlands, sites like Little Llangothlin will continue to be important areas of refuge for waterbirds and fish during drought.

Flora:

The diverse wetland vegetation within Little Llangothlin and Billy Bung Lagoons underpins the wetlands' primary production and is representative of the national listed threatened ecological community 'upland wetlands of the New England Tablelands and the Monaro Plateau'. About 113 ha of this community (Benson and Ashby 2000) usually occurs within the site but long-term data on the variation in the extent of the threatened ecological character has not been recorded. Native wetland species identified in Little Llangothlin Lagoon numbered 29 in 1976 (Briggs 1976) and 34 in 1998 (D. Bell, UNE, Pers. Comm. 2011). The intermittent Billy Bung Lagoon contained slightly more native wetland species with 39 species recorded in 1998 (D. Bell, UNE, Pers. Comm. 2011). A survey in 2019, under one the new Regional Land Partnership projects found a total of 254 taxa at the site with 47 from exotic origins. Further monitoring will occur at the site over the next 4 years.

Remnant and recruiting patches of Eucalyptus nova-anglica occur within the site, representing the national listed threatened ecological community 'New England peppermint (Eucalyptus nova-anglica) grassy woodlands'. This threatened ecological community comprises 119.8 ha of remnant and recruiting patches with the Ramsar site. At least one population of the nationally threatened Austral toadflax is supported by kangaroo grass within eucalypt woodland, which occurs on the slopes adjoining Billy Bung Lagoon. The flora at the site is a result of the distinct geomorphological and hydrological characteristics of the site.

Fauna:

At least 51 species of waterbirds, including seven migratory species ((marsh sandpiper (Tringa stagnatilis), glossy ibis (Plegadis facinellus), Latham's snipe (Gallinago hardwickii), red-necked stint (Calidris ruficollis), sharp-tailed sandpiper (Calidris acuminata), Cattle Egret (Ardea ibis) and common greenshank (Tringa nebularia)) utilise the site. The unique hydrological and vegetation characteristics of the site also supports breeding by at least 21 waterbirds, by providing ideal habitat and may support the nationally threatened Australasian Bittern. This habitat is especially important as drought refuge, supporting an increase in waterbirds utilizing the site during times of drought.

4.2 - What wetland type(s) are in the site?

Inland wetlands

Wetland types (code and name)	Local name	Ranking of extent (1: greatest - 4: least)	Area (ha) of wetland type	Justification of Criterion 1
Fresh water > Lakes and pools >> O: Permanent freshwater lakes	Little Llangothlin	1	100	Representative
Fresh water > Lakes and pools >> P: Seasonal/ intermittent freshwater lakes	Billy Bung Lagoon	3	7.7	
Fresh water > Marshes on peat soils >> U: Permanent Non-forested peatlands	Carex Fen	2	16	Rare
Fresh water > Flowing water >> Y: Permanent Freshwater springs; oases	Freshwater Springs	4	0.1	

(ECD) Habitat connectivity: See attachment A.

4.3 - Biological components

4.3.1 - Plant species

Other noteworthy plant species

Phylum	Scientific name	Position in range / endemism / other
TRACHEOPHYTA/MAGNOLIOPSIDA	*Asperula conferta*	
TRACHEOPHYTA/LILIOPSIDA	*Carex gaudichaudiana*	
TRACHEOPHYTA/MAGNOLIOPSIDA	*Eucalyptus pauciflora*	
TRACHEOPHYTA/MAGNOLIOPSIDA	*Eucalyptus stellulata*	
TRACHEOPHYTA/LILIOPSIDA	*Glyceria australis*	
TRACHEOPHYTA/MAGNOLIOPSIDA	*Stellaria angustifolia*	

Invasive alien plant species

Phylum	Scientific name	Impacts	Changes at RIS update
TRACHEOPHYTA/MAGNOLIOPSIDA	*Carduus nutans*	Actual (minor impacts)	unknown
TRACHEOPHYTA/LILIOPSIDA	*Juncus articulatus*	Actual (minor impacts)	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Leucanthemum vulgare*	Actual (minor impacts)	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Ranunculus sceleratus*	Potential	unknown
TRACHEOPHYTA/MAGNOLIOPSIDA	*Rubus ulmifolius*	Actual (minor impacts)	unknown

Optional text box to provide further information

At least 59 exotic plant species have been recorded within LLNR Ramsar site (see Appendix 2 (Hunter 2011)). Hunter (2011) reported that weeds are widespread in many areas of the site. He noted that introduced species comprise up to 50 per cent of the total species richness in the eucalypt woodlands, up to 30 per cent in Carex fen and 15 per cent in upland wetland vegetation. This indicates that weeds are currently a threat to the TECs at the site. Most of these weeds are introduced pasture grasses. National Parks has been managing these weed species by planting 5000 trees to try and restore the canopy within the Ramsar site. The drought has had a dramatic negative effect, but it is estimated that there has been a 30-50% success rate of these 5000 trees planted.

The mapping and management of weeds both in and surrounding the Ramsar site are the focus of two new Regional Land Partnership projects which commenced in 2019 and will run until 2023. An initial survey, undertaken while both Billy Bung and Little Llangothlin lagoons were dry in 2019 found 47 exotic plant species (Hunter, 2019).

Under these projects there will be 10 hectares of revegetation and bushland maintenance in the nationally listed threatened ecological community 'New England peppermint (Eucalyptus nova-anglica) grassy woodland', treatment of weed invasion in 26 hectares surrounding the site by 2023, engagement with upland wetland land managers on the threat posed by invasive weeds to this ecological community, education on the identification, removal and prevention introduction of weeds in the local area and an incentive program for weed treatment within wider upland wetland catchment areas.

4.3.2 - Animal species

Invasive alien animal species

Phylum	Scientific name	Impacts	Changes at RIS update
CHORDATA/ACTINOPTERYGII	*Carassius auratus*	Actual (minor impacts)	unknown
CHORDATA/MAMMALIA	*Felis catus*	Actual (major impacts)	unknown
CHORDATA/ACTINOPTERYGII	*Gambusia holbrooki*	Actual (major impacts)	unknown
CHORDATA/MAMMALIA	*Lepus europaeus*	Actual (minor impacts)	unknown
CHORDATA/MAMMALIA	*Oryctolagus cuniculus*	Actual (minor impacts)	unknown
CHORDATA/MAMMALIA	*Sus scrofa scrofa*	Actual (minor impacts)	decrease
CHORDATA/MAMMALIA	*Vulpes vulpes*	Actual (major impacts)	unknown

Optional text box to provide further information

European red fox and feral cat predate fauna including waterbirds, frogs, reptiles, and invertebrates, possibly reducing populations of these species. The National Parks and Wildlife Service carry out a 1080 fox baiting program which occurs between 2 to 4 times per year (depending on resources). This program has a secondary objective of targeting cat populations. Little Llangothlin currently has a pig trapping program (continuously monitoring and activating traps when required). Due to drought and previous successful and aggressive trapping, no pigs have been detected in the reserve for over 12 months now.

Grazing and soil disturbance by rabbits can displace the sensitive herb Austral toadflax which is nationally endangered.

Gold fish and gambusia can displace native fish and frog species through aggression and predation; they both predate on frog spawn and tadpoles. Both gold fish and gambusia have been found in the lagoon, and will be impacting frog numbers. There is currently no practical control method available.

One of the new Regional Land Partnership projects will include specific targets to reduce the pest numbers recorded in the LLNR through application of pest control measures applied to 350 hectares of land surrounding LLNR; a 10% reduction by June 2021 and a 20% reduction by 2023. The impact of pest control measures will be monitored using landholder reports and NPWS recordings of pig captures and fox bait uptake. The launch of NSW Northern Tablelands Local Land Services Feral Fighters program will also help support 4 years of landholder pest control training, supply of baits and equipment and technical support.

4.4 - Physical components

4.4.1 - Climate

Climatic region	Subregion
C: Moist Mid-Latitude climate with mild winters	Cfa: Humid subtropical (Mild with no dry season, hot summer)

Please refer to section 2.1.5

4.4.2 - Geomorphic setting

a) Minimum elevation above sea level (in metres): 1355

a) Maximum elevation above sea level (in metres): 1380

- Entire river basin ☐
- Upper part of river basin ☑
- Middle part of river basin ☐
- Lower part of river basin ☐
- More than one river basin ☐
- Not in river basin ☐
- Coastal ☐

Please name the river basin or basins. If the site lies in a sub-basin, please also name the larger river basin. For a coastal/marine site, please name the sea or ocean.

LLNR Ramsar site is located in the Clarence Basin within the South-East Coast Drainage Division according to the Australian Drainage Divisions System.

4.4.3 - Soil

Mineral ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

No available information ☐

Are soil types subject to change as a result of changing hydrological conditions (e.g., increased salinity or acidification)? Yes ○ No ◉

Please provide further information on the soil (optional)

Billy Bung Lagoon and most of the local catchment of the two lakes occur on basalt which produces shallow but fertile soils, however the eastern portion of the site (and probably the eastern part of Little Llangothlin Lagoon) occurs on granite which produces infertile soils and probably contributed the sand which comprises most of the lunette* material to the south of Little Llangothlin Lagoon.

*Lunettes are crescent-shaped, fixed dunes along the edges of playas and river valleys in arid and semi-arid lands.

4.4.4 - Water regime

Water permanence

Presence?	Changes at RIS update
Usually permanent water present	
Usually seasonal, ephemeral or intermittent water present	

Source of water that maintains character of the site

Presence?	Predominant water source	Changes at RIS update
Water inputs from groundwater	☐	No change
Water inputs from surface water	☑	No change

Water destination

Presence?	Changes at RIS update
Feeds groundwater	No change

Stability of water regime

Presence?	Changes at RIS update
Water levels largely stable	No change

Please add any comments on the water regime and its determinants (if relevant). Use this box to explain sites with complex hydrology:

Little Llangothlin Lagoon contains water in all but times of extreme drought, and the much shallower Billy Bung Lagoon dries out every 20 years or so. The occurrence of permanent water contributes significantly to the site's ecology and function as a drought refuge.

Lake water levels are supplemented by groundwater flows, both in the soil above the underlying basalt and granite, and in basalt aquifers which may discharge at seepage areas in the local catchment.

(ECD) Connectivity of surface waters and of groundwater	The contribution of groundwater flows to the water balance of wetlands at the site is unknown. Groundwater contributes to water levels in the lakes, including possibly at the basalt granite interface underneath Little Llangothlin Lagoon (Haworth 1994).
(ECD) Stratification and mixing regime	Currently not monitored

4.4.5 - Sediment regime

Sediment regime unknown ☑

Please provide further information on sediment (optional):

Haworth (1998) reports that radiocarbon dating of the peat in lake sediment from the New England Tablelands indicates that the present cycle of sedimentation commenced about 15 000 years ago at the close of the last Ice Age, with lake basin deposition and deflation (from wind erosion) cycles likely to occur over tens of thousands of years. Tertiary period coal deposits have been found approximately 30 metres below the surface in the same locality as some lakes suggesting that similar lakes may have existed for at least 20 million years.

The geochemical conditions at Little Llangothlin Lagoon have been described as stable for millennia prior to the arrival of Europeans (Gale et al. 2004).

Present sediment accumulation rates are unknown but are presumed to continue at levels above natural background rates. However, since 1996 no significant change to the depth of water in Little Llangothlin Lagoon has occurred as a result.

(ECD) Water turbidity and colour	Currently not monitored
(ECD) Light - reaching wetland	Currently not monitored
(ECD) Water temperature	Currently not monitored

4.4.6 - Water pH

Alkaline (pH>7.4) ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Unknown ☐

Please provide further information on pH (optional):

Currently not monitored. There have been no changes to the functioning of the critical components, processes or services of the site that could be attributed to changes in pH, therefore it is unlikely that the pH will have changed since the last RIS.

4.4.7 - Water salinity

Fresh (<0.5 g/l) ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Unknown ☐

Please provide further information on salinity (optional):

Water quality testing in 1976 and 2010 found the mean conductivity of Little Llangothlin lagoon water to be <300 µS/cm but towards the upper limit (278 µS/cm and 282 µS/cm respectively) (ECD).

Water quality testing in 2012 recorded the salinity levels in Little Llangothlin lagoon as 233 µS/cm in the Northern Bay of Little Llangothlin lagoon and 211 µS/cm in Billy Bung lagoon (Bower, 2019).

(ECD) Dissolved gases in water

Currently not monitored

4.4.8 - Dissolved or suspended nutrients in water

Eutrophic ☑

(Update) Changes at RIS update: No change ◉ Increase ○ Decrease ○ Unknown ○

Unknown ☐

Please provide further information on dissolved or suspended nutrients (optional):

Little Llangothlin Lagoon is slightly eutrophic. This may be a result of fertiliser use within the catchment.

(ECD) Dissolved organic carbon	Not currently monitored
(ECD) Redox potential of water and sediments	Not currently monitored
(ECD) Water conductivity	Not currently monitored

4.4.9 - Features of the surrounding area which may affect the Site

Please describe whether, and if so how, the landscape and ecological characteristics in the area surrounding the Ramsar Site differ from the site itself: i) broadly similar ○ ii) significantly different ◉

Surrounding area has greater urbanisation or development ☐

Surrounding area has higher human population density ☐

Surrounding area has more intensive agricultural use ☑

Surrounding area has significantly different land cover or habitat types ☐

Please describe other ways in which the surrounding area is different:

LLNR is surrounded by high intensity grazing of cleared fertile grasslands. This intensity in agriculture has not changed since the Ramsar declaration. Since 2015 the National Parks and Wildlife Service (NWPS) together with WetlandCare Australia planted 5000 trees in an attempt to restore the canopy cover of the existing but depleted North East Peppermint and Snow gum Woodland ecological communities. A reduction of introduced pasture grasses and a slow return towards a more natural situation is anticipated. Monitoring projects have been instigated to record any future changes (10+ years).

The 4-year Regional Land Partnership program ‘Conserving Upland Wetlands of the Northern Tablelands’, which started in 2019, aims to deliver priority actions for Upland Wetlands that address key threats to this Threatened Ecological Community within the Northern Tablelands Management Unit area, including the LLNR. Through a combination of awareness raising events and an incentive program funded under the Regional Land Partnership program, the project will target improvements in Upland Wetland condition on a catchment scale. The project will work with land managers and the wider community to implement improved land management practices that address key threatening processes such as the alteration of wetland hydrological regimes, grazing and trampling of wetlands by stock, pollution from agricultural chemicals, weed invasion and fire. Ongoing monitoring of Upland Wetland condition will enable evaluation of the success of changes in land management practice, while also improving our understanding of these important ecosystems and informing their management into the future.

4.5 - Ecosystem services

4.5.1 - Ecosystem services/benefits

Provisioning Services

Ecosystem service	Examples	Importance/Extent/Significance
Wetland non-food products	Other	not relevant for site

Regulating Services

Ecosystem service	Examples	Importance/Extent/Significance
Hazard reduction	Flood control, flood storage	Medium

Cultural Services

Ecosystem service	Examples	Importance/Extent/Significance
Recreation and tourism	Nature observation and nature-based tourism	Medium
Recreation and tourism	Picnics, outings, touring	Medium
Spiritual and inspirational	Cultural heritage (historical and archaeological)	Medium
Scientific and educational	Educational activities and opportunities	Medium
Scientific and educational	Important knowledge systems, importance for research (scientific reference area or site)	Medium

Within the site: 5000

Outside the site: 1000

Have studies or assessments been made of the economic valuation of ecosystem services provided by this Ramsar Site? Yes ○ No ○ Unknown ◉

4.5.2 - Social and cultural values

i) the site provides a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland ☐

ii) the site has exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland ☐

iii) the ecological character of the wetland depends on its interaction with local communities or indigenous peoples ☐

iv) relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland ☐

<no data available>

4.6 - Ecological processes

(ECD) Primary production	Lake vegetation underpins the wetlands' primary production. Aquatic invertebrates are an important part of the fauna within the site as they play a vital role in productivity and nutrient cycling and provide a significant food source for the waterbirds.
(ECD) Nutrient cycling	The successive proliferation and submergence of aquatic vegetation plays an important role in nutrient cycling, ensuring the availability of resources for aquatic plants and animals, including waterbirds.
(ECD) Carbon cycling	The presence of peat soils in this wetland suggests that it may have a carbon storage benefit, however this has not yet been investigated.
(ECD) Animal reproductive productivity	Little Llangothlin Nature Reserve provides breeding habitat for water and bush bird species, including hundreds of Black Swans.
(ECD) Vegetational productivity, pollination, regeneration processes, succession, role of fire, etc.	The relationship between vegetation communities and water depth results in a change in vegetation communities over time as water levels in the lake rise or fall. In a severe drought plant species survive as a persistent soil seed bank (Bell 2000).
(ECD) Notable species interactions, including grazing, predation, competition, diseases and pathogens	Little Llangothlin Nature Reserve provides habitat for birds which prey on pest species which negatively impact production of adjoining farm land.
(ECD) Notable aspects concerning animal and plant dispersal	LLNR Ramsar site is an important habitat, breeding site and drought refuge for a range of waterbirds.
(ECD) Notable aspects concerning migration	LLNR Ramsar site supports eight internationally important migratory waterbird species.
(ECD) Pressures and trends concerning any of the above, and/or concerning ecosystem integrity	As with upland bogs, fens and sod tussock grasslands (Hunter & Bell 2007; Hunter & Bell 2009; Hunter & Hunter 2016), 'lagoons' are at their northern limits in the New England Tablelands Bioregion and are thus susceptible to long-term changes in climate.

5 - How is the Site managed? (Conservation and management)

5.1 - Land tenure and responsibilities (Managers)

5.1.1 - Land tenure/ownership

Public ownership

Category	Within the Ramsar Site	In the surrounding area
National/Federal government	☑	☑

Private ownership

Category	Within the Ramsar Site	In the surrounding area
Other types of private/individual owner(s)	☐	☑

5.1.2 - Management authority

Please list the local office / offices of any agency or organization responsible for managing the site: National Parks and Wildlife Service, Office of Environment and Heritage

Provide the name and/or title of the person or people with responsibility for the wetland: District Manager

Postal address: National Parks and Wildlife Service,
PO Box 281, Glen Innes NSW 2370

E-mail address: npws.ntab@environment.nsw.gov.au

5.2 - Ecological character threats and responses (Management)

5.2.1 - Factors (actual or likely) adversely affecting the Site's ecological character

Human settlements (non agricultural)

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Unspecified development		Medium impact	☐	No change	☑	No change

Water regulation

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Water abstraction		Medium impact	☐	No change	☑	No change

Energy production and mining

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Renewable energy		Medium impact	☐	No change	☑	No change
Mining and quarrying		Medium impact	☐	No change	☑	No change

Transportation and service corridors

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Roads and railroads		Medium impact	☐	No change	☑	No change

Human intrusions and disturbance

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Unspecified/others	Low impact		☐	unknown	☑	No change

Natural system modifications

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Vegetation clearance/ land conversion	Medium impact	Medium impact	☑	No change	☑	No change
Dams and water management/use	Low impact	Medium impact	☐	unknown	☑	increase

Invasive and other problematic species and genes

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Invasive non-native/ alien species	Medium impact	Medium impact	☑	No change	☑	No change

Climate change and severe weather

Factors adversely affecting site	Actual threat	Potential threat	Within the site	Changes	In the surrounding area	Changes
Unspecified	Medium impact	Medium impact	☑	No change	☐	No change

Please describe any other threats (optional):

Water abstraction is mainly for agricultural purposes.
Invasive non-native/ alien species: please refer to section 4.3.2
Climate change and severe weather: please refer to section 2.1.5 on likely changes to ecological character and section 3.4 on threatened ecological communities.

5.2.2 - Legal conservation status

National legal designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site
Nature Reserve	Little Llangothlin Nature Reserve	https://www.nationalparks.nsw.gov.au/visit-a-park/parks/little-llangothlin-nature-reserve	whole

Non-statutory designations

Designation type	Name of area	Online information url	Overlap with Ramsar Site
Important Bird Area	Little Llangothlin Nature Reserve	https://www.nationalparks.nsw.gov.au/visit-a-park/parks/little-llangothlin-nature-reserve	whole

5.2.3 - IUCN protected areas categories (2008)

- Ia Strict Nature Reserve ☐
- Ib Wilderness Area: protected area managed mainly for wilderness protection ☑
- II National Park: protected area managed mainly for ecosystem protection and recreation ☐
- III Natural Monument: protected area managed mainly for conservation of specific natural features ☐
- IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention ☐
- V Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation ☐
- VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems ☐

5.2.4 - Key conservation measures

Legal protection

Measures	Status
Legal protection	Implemented

Habitat

Measures	Status
Catchment management initiatives/controls	Implemented
Land conversion controls	Implemented
Re-vegetation	Partially implemented

Species

Measures	Status
Control of invasive alien plants	Implemented
Control of invasive alien animals	Implemented

Human Activities

Measures	Status
Research	Implemented
Regulation/management of recreational activities	Implemented
Livestock management/exclusion (excluding fisheries)	Implemented
Communication, education, and participation and awareness activities	Implemented

Other:

In Australia, the ecological character of a designated Ramsar site is protected as a Matter of National Environmental Significance (MNES) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This means that developments which have or are likely to have a significant impact on the ecological character of the site must be referred for assessment and approval by from the Australian Government Minister for the Environment.

5.2.5 - Management planning

Is there a site-specific management plan for the site? Yes

Has a management effectiveness assessment been undertaken for the site? Yes ○ No ◉

If the site is a formal transboundary site as indicated in section Data and location > Site location, are there shared management planning processes with another Contracting Party? Yes ○ No ◉

5.2.6 - Planning for restoration

Is there a site-specific restoration plan? Yes, there is a plan

Further information

The Little Llangothlin Lagoon Ramsar Site- Restoring Critically Endangered Woodland Site Action Plan was implemented in 2015. The project aims at restoring 45 ha of critically endangered New England Peppermint Woodland within the Nature Reserve Ramsar Site through revegetation with native species of that community (Little Llangothlin 20 Million Trees Revegetation Plan).

The 'Protecting Little Llangothlin Lagoon (Ramsar Site) for future generations' project commenced in 2019. Under this project there will be 10 hectares of revegetation and bushland maintenance in the nationally listed threatened ecological community New England Peppermint (Eucalyptus nova-anglica) grassy Woodland over 3 years to 2023, complimenting the work under previous projects.

5.2.7 - Monitoring implemented or proposed

Monitoring	Status
Plant species	Implemented
Birds	Implemented
Animal species (please specify)	Implemented

There is a monitoring and control strategy for the following weed species: blackberry (Rubus fruticosus), hemlock (Conium maculatum), nodding thistle (Carduus nutans subsp. nutans), willow (salix) and sweet briar (Rosa rubiginosa). Monitoring for new incursion of other weeds including: Coolatai grass (Hyparrhenia hirta), African love grass (Eragrostis curvula), whiskey grass (Andropogon virginicus), giant Parramatta grass (Sporobolus fertilis). A new incursion of willows has been removed, and will continue to be monitored.

There is a monitoring and control strategy for the following pest species: European fox (Vulpes vulpes), cats (Felis catus), feral pig (Sus scrofa), and European rabbit (Oryctolagus cuniculus).

A bird survey is undertaken seasonally (4 times per year), to monitor species diversity and abundance.

Monitoring terrestrial flora in the threatened ecological community New England Peppermint (Eucalyptus nova-anglica) grassy woodland is part of the 'Protecting Little Llangothlin Lagoon (Ramsar Site) for future generations' project, which will complement the bush regeneration activities planned.

6 - Additional material

6.1 - Additional reports and documents

6.1.1 - Bibliographical references

1. Bell, D.M. and Clarke, P.J., 2004. Seed-bank dynamics of Eleocharis: can spatial and temporal variability explain habitat segregation? Australian Journal of Botany 52: 119–131.

2. Bureau of Meterology (2012). Australian Hydrological Geospatial Fabric (Geofabric): Topographic Drainage Divisions and River Regions: http://www.bom.gov.au/water/geofabric/documents/BOM002_Map_Poster_A3_Web.pdf

3. Bureau of Meterology and CSIRO (2018). State of the Climate 2018 https://www.csiro.au/~/media/OnA/Files/State-of-the-Climate-2018-CSIRO-BOM-Dec2018.pdf

4. Ekström, M et al., 2015, Central Slopes Cluster Report, Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports, eds. Ekström, M et al., CSIRO and Bureau of Meteorology, Australia

5. Bower, D.S et al., 2019. Little Llangothlin Biological Monitoring Report 2019. A report to the Glen Innes Natural Resources Advisory Committee, NSW

6. Briggs, S.V., 1976. Comparative ecology of four New England wetlands. M. Nat. Res. Thesis, University of New England, Armidale.

7. Haworth, R.J., 1994. European impact on lake sedimentation in upland eastern Australia: case studies from the New England Tablelands of NSW. PhD Thesis, University of New England, Armidale.

8. Haworth, R.J., 1998. Preliminary report on An Inventory of Wetlands in the New England Region and an Assessment of their Environmental Health, Past History and Present Status. Report to Severn Shire Council, Glen Innes, NSW.

9. Hunter, J. T., 2011. Vegetation and Floristics of Little Llangothlin Nature Reserve. A report to the Parks and Wildlife (DRAFT), NSW.

10. Hunter, J. T., 2011. Vegetation and Floristics of Little Llangothlin Nature Reserve. A report to the Parks and Wildlife (DRAFT), NSW.

11. Hunter, J. T., 2019. Little Llangothlin Nature Reserve. Review of Flora, Monitoring & Survey. A review for the Northern Tablelands Local Land Services, NSW

12. Kingsford, R.T., Porter, J.L. and Halse, S.A., 2011. National waterbird survey: a tool for water resource assessment and management. National Water Commission, 95 Northbourne Avenue, Canberra ACT 2600

13. Office of Environment and Heritgate, NSW, 2015, New England North West Climate change snapshot. https://climatechange.environment.nsw.gov.au/-/media/NARCLim/Files/Regional-Downloads/Climate-Change - Snapshots/NENWsnapshot.pdf?la=en&hash=0762A2210868D34A39114B00B96EA2950ABC2624

14. White, J.M., 1986a. The management of the New England Lagoons for Waterbirds. Masters Natural Resources Thesis, University of New England.

15. White, J.M., 1987. The New England Lagoons as Drought Refuges for Waterbirds, Emu 87 (4) 253-255

6.1.2 - Additional reports and documents

i. taxonomic lists of plant and animal species occurring in the site (see section 4.3)
<9 file(s) uploaded>

ii. a detailed Ecological Character Description (ECD) (in a national format)
<1 file(s) uploaded>

iii. a description of the site in a national or regional wetland inventory
<no file available>

iv. relevant Article 3.2 reports
<no file available>

v. site management plan
<1 file(s) uploaded>

vi. other published literature
<no file available>

6.1.3 - Photograph(s) of the Site

Please provide at least one photograph of the site:


Bird survey at LLNR (*Koen Dijkstra, 15-03-2015*)


Bird survey at LLNR (*Koen Dijkstra, 15-03-2015*)


Bird survey at LLNR (*Koen Dijkstra, 18-02-2018*)


Re-vegetation works at LLNR (*Koen Dijkstra, 23-07-2016*)

Re-vegetation works at LLNR (*Koen Dijkstra, 23-07-2016*)

6.1.4 - Designation letter and related data

Designation letter

<1 file(s) uploaded>

Date of Designation 1996-03-17