**DOCUMENT TRACKING**

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1 Introduction

The Australian Wetlands Database aims to provide an Australia wide listing of all internationally and nationally important wetlands in order to provide information about the different wetland types including wetland dependent flora and fauna. The database has been formed through collaboration of the States and Territories to provide data and is maintained by the Department of the Environment, Water, Heritage and the Arts.

The number of listed wetlands varies greatly across Australia, with high densities along the coasts and fewer listings inland (Figure 1). Of particular note is the low number of listings (1 in total) within the Namoi Catchment Management Authority (CMA).

![Figure 1 Location of listed wetlands across Australia](image)

This report aims to discuss and present data to develop a case to address the shortfall in the Australian Wetlands Database on the location, extent and nature of upland wetlands in the Namoi CMA.

2 Study Area

Upland wetlands occur in areas of greater than 700 metres Above Sea Level (ASL) (DEH 2005). As such, this report is focused on landscape above 700 metres elevation within Namoi CMA (Figure 2).
Figure 2 Study Area
Federal Criteria for Important Wetlands

In 1994, the ANZECC Wetlands Network agreed upon criteria for determining “nationally important” wetlands in Australia. Wetlands are identified as “nationally important” and listed in the Australian Wetlands Database if they meet at least one of the following criteria:

1. It is a good example of a wetland type occurring within a biogeographic region in Australia.

2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex.

3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.

4. The wetland supports 1% or more of the national populations of any native plant or animal taxa.

5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.

6. The wetland is of outstanding historical or cultural significance.

7. Application of the criteria to individual wetland sites involves a degree of subjectivity. Not only may certain aspects of a site's significance be interpreted differently by different investigators, but information gaps often exist which make it difficult to judge whether or not a site meets a particular criterion.
4 Federally Listed Wetlands within the Study Area

An online search of the Australian Wetlands Database on the 14th June 2009 revealed that no listed upland wetlands occur within the study area and only one listed wetland ‘Lake Goran’ is located within Namoi catchment. Lake Goran is at 300 m ASL and covers more than 6000 ha when full.

The Namoi catchment spans four separate bioregions. The number of listed wetlands within each bioregion is shown in Table 1 below:

<table>
<thead>
<tr>
<th>Bioregion</th>
<th>Number of Listed Wetlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Darling Riverine Plains</td>
<td>2 listed wetlands</td>
</tr>
<tr>
<td>Brigalow Belt South</td>
<td>5 listed wetlands (including Lake Goran)</td>
</tr>
<tr>
<td>Nandewar</td>
<td>No listed wetlands</td>
</tr>
<tr>
<td>New England Tablelands</td>
<td>3 listed wetlands</td>
</tr>
</tbody>
</table>

The nearest listed wetland complex to the study area is the ‘New England Wetlands’ which consists of 55 separate wetlands at elevations between 800-1400 m ASL. These wetlands include Llangothlin Lagoon, Little Llangothlin Lagoon and Billy Bung Lagoons, Mother of Ducks Lagoon, Barleyfields Lagoon, Racecourse Lagoon, Dumaresq Dam, Dangars Lagoon and Little Lagoon, located in the vicinity of Guyra, Armidale, and Uralla on the New England Tablelands (Figure 3).
Figure 3 Federally Listed Upland Wetlands
5 Upland Wetlands of the New England Tablelands and the Monaro Plateau

The Upland Wetlands of the New England Tablelands and the Monaro Plateau are a group of wetlands that are listed as endangered under the **EPBC Act 1999** as, in 2005, the Minister considered the Threatened Species Scientific Committee’s (TSSC) advice under section 189 of the EPBC Act and amended the list under section 184 to include the “Upland Wetlands of New England Tablelands and Monaro Plateau”. The TSSC determined that the ecological community met Criterion 2 of their eligibility criteria (TSSC, 2005). Criterion 2 requires demonstration of ‘small geographic distribution coupled with demonstrable threat’.

The New England Tablelands community is also listed as endangered as “Upland Wetlands of the Drainage Divide of the New England Tablelands Bioregion” under the **Threatened Species Conservation Act 1995 (NSW)**. The Monaro Upland Wetlands are not listed in NSW. Components of the New England Tablelands Upland Wetlands, such as Little Llangothlin Lagoon, are Ramsar-listed wetlands (Ramsar, 2004).

Although the New England Tablelands and the Monaro Plateau are spatially separated by over 600km, they share similar elevation, rainfall, climate, soil type and flora species.

Traits common to these Upland Wetlands include:

- They occur exclusively in upland areas of New South Wales (between 700-1400 m above sea level).
- They occur primarily on basalt plateaus and hence, on basalt derived soils but occasionally silcrete or granite.
- They are generally located in temperate climates with an annual rainfall of less than 1000 mm.
- The vegetation of the Upland Wetlands ranges from closed to mid-dense sedgeland and grasslands which occur on the shores of open water, or extend across shallow or dry wetlands.
- No shrub or tree species occur naturally within these wetlands.
- There is a lack of peat underlying the vegetation.

These Upland Wetlands occur as either near permanent (rarely dry), intermittent (often seasonally dry) or ephemeral (without free standing water for a majority of the year).

There are 55 Upland Wetlands on the New England Tableland covering approximately 1630 ha. On the Monaro Plateau there are 215 Upland Wetlands covering approximately 1565 ha. The majority (81%) of these wetlands are smaller than 10 ha in size and five wetlands (2%) are between 100-450 ha in size. (DEWHA,2008)
Known Upland Wetlands are listed in the Australian Wetlands Database by name only with no associated mapping. Broad scale mapping is provided by the DEHWA of areas in which the wetlands are likely to occur, not, known to occur (Figure 4). These areas have been derived from waterbodies referenced to 25k, 50k and 100k mapsheets. This mapping is not suitable for fine scale assessment.
ELA Mapping of Upland Wetlands in the Namoi CMA

In 2008 ELA conducted an extensive wetland mapping and identification process throughout the Namoi catchment using SPOT5 imagery (2.5m resolution). Wetlands were digitised on-screen in ArcGIS 9 (projection: MGA Zone 55 & Zone 56). All wetlands ≥1ha were mapped, along with some smaller wetlands that were easily identified (usually in close proximity to larger wetlands).

SPOT5 images of the Namoi catchment were searched systematically and wetlands were identified at a scale of at least 1:25,000. On-screen digitising of wetlands was generally performed at a scale of 1:18,000 in order to accurately capture wetland extent. Wetland classes were assigned and stored in the GIS attribute table as part of the mapping routine.

Wetlands were identified based on numerous factors including the surrounding landscape, landuse, presence of water, vegetation, and depressional features. Several reference datasets were utilised in addition to the SPOT5 images to identify potential areas of wetlands. These included:

- Existing mapping from Hale et al. (2006) covering only the upper-central and western regions of the CMA.
- Landsat imagery (LANDSAT2000_NSW_MOSAIC)
- Drainage (Namoi_Drainage_GDA94)
- River styles (na_river_styles)
- Murray Darling Basin Commission wetland mapping (mdbc_wetlands_clip)
- Draft Namoi vegetation mapping from ELA Coffs Harbour office (Namoi_interim_gap_wetland_subset_March08 and Namoi_API_wet_GDA94_GCS)

This process resulted in the mapping of 131 wetlands within four functional groups mapped within the upland (>700m ASL) areas of the Namoi Catchment, these wetlands cover a total area of 1436.5ha (Table 1 and Figure 5) and are predominantly within the New England Tablelands Bioregion (Table 2).

Table 2: Functional groups within the Namoi Catchment

<table>
<thead>
<tr>
<th>FUNCTIONAL GROUPS</th>
<th>NUMBER</th>
<th>SMALLEST AREA (ha)</th>
<th>LARGEST AREA (ha)</th>
<th>MEAN AREA (ha)</th>
<th>TOTAL AREA (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artificial with no ecological significance</td>
<td>24</td>
<td>0.352</td>
<td>32.0</td>
<td>4.5</td>
<td>43.8</td>
</tr>
<tr>
<td>Artificial with some ecological significance</td>
<td>11</td>
<td>0.241</td>
<td>13.2</td>
<td>4.0</td>
<td>107</td>
</tr>
<tr>
<td>Lacustrine, temperate inland, river-fed/floodplain</td>
<td>2</td>
<td>1.205</td>
<td>2.5</td>
<td>1.9</td>
<td>3.7</td>
</tr>
<tr>
<td>Palustrine, temperate inland, groundwater</td>
<td>94</td>
<td>0.615</td>
<td>110.1</td>
<td>13.6</td>
<td>1282</td>
</tr>
<tr>
<td>Total</td>
<td>131</td>
<td></td>
<td></td>
<td></td>
<td>1436.5</td>
</tr>
</tbody>
</table>
Table 2: Number of ELA Mapped Upland Wetlands per Bioregion

<table>
<thead>
<tr>
<th>Bioregion</th>
<th>Number of Mapped Wetlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>New England Tablelands</td>
<td>111</td>
</tr>
<tr>
<td>Nandewar</td>
<td>6</td>
</tr>
<tr>
<td>Brigalow Belt South</td>
<td>14</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>131</strong></td>
</tr>
</tbody>
</table>

During this mapping process it was identified that the unique ephemeral nature of upland wetlands made them difficult to map accurately using single date satellite imagery in particular. In addition, while the lowland regions of the CMA had existing mapping to guide the assessment, there was a paucity of existing data covering the upland regions.

A half-day field reconnaissance was undertaken over a small portion of the study area in May 2009 with the objective of checking the on-ground accuracy of the previous upland wetland mapping conducted by ELA. As expected, the reconnaissance revealed that while the mapped upland wetlands were generally accurate, a large number of good quality upland wetlands had been left unmapped. This mapping shortfall is primarily due to using a single date SPOT 5 image and a coarser scale Landsat image to visually inspect and manually digitise wetland boundaries. It was also noted that many wetlands less than 1 ha in size were unmapped as they didn’t fit the mapping criteria of being greater than 1 ha. This meant many smaller, discontinuous wetlands were not mapped.
Figure 5 ELA 2008 Upland Wetland Mapping
How Do Namoi Upland Wetlands Meet Federal Criteria

The major limitation discovered during the project was the lack of information on upland wetlands, particularly in the Namoi Catchment. Although there was some literature relating to upland wetlands, the majority of it was based on other areas with upland wetlands, such as the upland wetlands of the New England Tablelands or the Monaro Plateau. Due to their geographic similarities the Namoi CMA Upland Wetlands may share similar characteristics with the New England Wetlands.

Upland wetlands are important as they provide a vital habitat which supports a wide variety of animals including waterbirds, fish, frogs, invertebrates, as well as water-loving plants such as sedges, rushes and various tree species. The larger upland lakes/swamps provide habitat and drought refuge for water birds and other animals when large inland lakes have dried; with some also providing important breeding areas for threatened species.

Large upland lakes provide water storage / flood mitigation function within the catchment and the base flows of rivers can be sustained from these wetlands during times of dry weather.

Some of the other important values that upland wetlands attribute to:

- biodiversity conservation;
- improvement and maintenance of water quality;
- biological productivity and nutrient cycling;
- flood attenuation;
- groundwater recharge;
- a sink for greenhouse gases;
- scientific research;
- education;
- recreation and visual amenity; and cultural heritage and spiritual values

Geographically, the Namoi Upland Wetlands are unique because there are no listed upland wetlands within Namoi CMA. The federal criteria for listing of important wetlands takes a bioregional approach to determining the uniqueness of wetlands. The wetlands database important wetland criteria explains:

"Adoption of a bioregional approach to listing sites in the Directory is seen as one way of reducing the difficulty in applying the criterion relating to a system's uniqueness or representativeness."

As such, it may be useful to examine the mapped Namoi Upland Wetlands based on the bioregion they belong to.

7.1 UPLAND WETLANDS OF THE NEW ENGLAND TABLELANDS BIOREGION

Of the 131 Namoi Upland Wetlands mapped by ELA (2008), 111 are within this region. They range in size from 0.25ha up to 110ha with a mean size of 11ha.

Geographically, Namoi Upland Wetlands of the New England Tablelands bioregion are in close proximity to the listed New England Wetlands (some are within 20 km of the listed Racecourse Lagoon) which are also within the New England Tablelands Bioregion.
Threatened fauna species records within 2 km of mapped wetlands include: Barking Owl, Bell's Turtle, Border Thick-tailed Gecko, Brown Treecreeper, Diamond Firetail, Greater Broad-nosed Bat, Hooded Robin, Koala, Regent Honeyeater, Sooty Owl, Speckled Warbler, Spotted-tailed Quoll, Square-tailed Kite, Squirrel Glider and the Yellow-bellied Glider.

Threatened flora species records within 500m include: Eucalyptus nicholii (*Narrow-leaved Black Peppermint*), McKie's Stringybark (*Eucalyptus mckieana*) and *Homoranthus prolixus*.

It is likely that these wetlands could meet federal criteria one, three and five for listing as Nationally Important Wetlands.

7.2 UPLAND WETLANDS OF THE NANDEWAR BIOREGION

Six upland wetlands were mapped within the Nandewar Bioregion by ELA (2008). They ranged in size from 0.5ha to 11ha. These wetlands are potentially of high importance as there are currently no listed wetlands within the Nandewar bioregion.

Unfortunately, not much is known about these wetlands. No threatened species have been recorded within close proximity to these wetlands.

It is likely that these wetlands could meet federal criteria one, three and five for listing as Nationally Important Wetlands; however, further mapping and research would be required.

7.3 UPLAND WETLANDS OF THE BRIGALOW BELT SOUTH BIOREGION

A tight cluster of 14 groundwater-fed palustrine upland wetlands were mapped within Coolah Tops National Park where the Liverpool Range, the Warrumbungle Range and the Great Dividing Range meet within the Brigalow Belt South Bioregion (Figure 6). They ranged in size from 0.6ha to 84ha. The Coolah Tops National Park straddles the Hunter River and Namoi Catchments.

Located 180km from the nearest listed upland wetlands at the New England Tablelands. They are interesting because they are completely isolated from other upland wetlands. These wetlands share several key characteristics with the Upland Wetlands of the New England Tablelands in that they are formed on a relatively flat plateau with Basalt lithology. Although other wetlands are listed in this bioregion, these are the only examples of Upland Wetlands. Binns (1997) conducted a vegetation survey of the Coolah Tops in Feb – May 1993, with additional plots in September 1993 and May 1994. He found no flora of conservation significance in the swamp areas. However, his survey did not focus on the swamp areas and the survey timing is likely to be less than optimal to identify many of the small species in the community.

Unlike the majority of wetlands within the Namoi CMA, these wetlands are also isolated from human severe disturbance and are likely to be in good condition.

Threatened fauna within close proximity (2km) include the Black-chinned Honeyeater, Brown Treecreeper, Diamond Firetail, Eastern Bentwing-bat, Glossy Black-Cockatoo, Hooded Robin, Masked Owl, Powerful Owl and the Speckled Warbler. No threatened flora species have been found within 500m of these wetlands.
It is likely that these wetlands could meet federal criteria one, three and five for listing as Nationally Important Wetlands; however, further mapping and research would be required.
Figure 6 Coolah Tops Wetlands
8 Conclusions

Upland Wetlands play an important role in supporting biodiversity, regulating upper catchment water processes and supporting livestock in the Namoi Catchment. Due to the fen-like nature of these wetlands natural open pools of water are relatively rare and earlier mapping projects have either missed classified these features at not wetlands or been at too broad scale to map the relatively small and elongated wetland boundaries.

It is likely that these wetlands could meet three of the seven federally listed criteria for importance, but in most cases we have too little information to support a full case to present to the minister. However, it is likely that these wetlands:

- Provide good examples of a wetland type within a biogeographic region;
- Provide important habitat for animal taxa at a vital stage of their lifecycle; and
- Support native plants or animal taxa considered endangered or vulnerable at a national level.

Of particular note is the lack of any federally recognised wetlands (upland or lowland) in the Nandewar Ranges Bioregion and the geographically isolated wetland group in Coolah Tops National Park.

It is clear that further effort is required to provide basic information on these wetlands before effective management including conservation, if needed, can take place. There is a clear case for further work to be conducted to determine the:

- Location and extent of Upland Wetlands in the Namoi catchment;
- Water quality and quantity function of these wetlands;
- Flora and Fauna communities; and
- Wetland condition.
References


Department of the Environment and Heritage 2005 *Upland wetlands of New England Tablelands and Monaro Plateau Conservation Advice*

Department of the Environment, Water Heritage and the Arts 2008. *Upland Wetlands of the New England Tablelands (New England Tableland Bioregion) and the Monaro Plateau (South Eastern Highlands Bioregion) Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on amendments to the List of Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*