Wetlands of the Western Davenports Water Control District

By

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Northern Territory Government
Department of Natural Resources, Environment, the Arts and Sport
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Executive Summary

The Western Davenports Water Control District has various wetland types. Surface inundation in virtually all of these wetlands is temporary; i.e. there are few if any permanent natural surface waters. There are two or three known springs, which may be permanent but only create very small water pools. All other wetlands depend on rainfall runoff to create inundation. Once full, surface waterbodies in the district do not generally last more than 12 months without further rainfall topping them up. Areas of shallow groundwater may be important in sustaining some of the larger woody plant species in some of the swamp wetlands. However, further scientific research is required to test this and quantify the relationship between wetland vegetation and groundwater discharge.

The main wetland types are:

- drainage channels (creeks and rivers);
- water holes in the channels;
- swamps (with emergent trees or shrubs, including wooded coolabah swamps and bluebush swamps);
- clayspans (predominantly unvegetated);
- flood-prone flats (short lasting inundation only);
- isolated rockpools and shallow pans on outcropping rock;
- springs;
- underground aquatic ecosystems (none known in the district).

Many of the larger and longer lasting wetlands occur in the floodouts of the major creeks. These are areas where the main drainage channels dissipate and stream flows are spread over relatively flat terrain, sometimes with minor channels in some parts. These floodouts are depicted on the topographic maps (1:250,000 scale) as being prone to inundation. Some are very large such as ‘Thring Swamp’ (about 11 km by 4 km) and ‘Algoolgoora Swamp’ (about 20 km by up to 6 km). These correspond to the area in which vegetation is influenced by water flooding out from the creeks. However, only small parts of these retain surface water for longer than days or weeks. The areas of longer lasting water correspond with the broad wetland types ‘swamp’ and lake (includes claypans). The use of the word ‘swamp’ in the names for the large floodouts on the topographic maps can cause confusion and false expectations.

Underground aquatic ecosystems are known to occur in central Australia and scientific investigation has only started in the past decade and has only been of a preliminary nature. Underground aquatic macro-invertebrates (visible to the naked eye) are called stygofauna. In central Australia they have been found in unconsolidated sediments and in calcretes (in cracks and cavities). There may be stygofauna in some aquifers of the western Davenports.

The conservation significance of wetlands in the district can be assessed according to various criteria but is limited by a lack of biological data. None of the individual wetlands is currently listed in the Directory of Important Wetlands in Australia. However, in the 2005 report on wetlands in the arid NT, one group of wetlands was identified as suitable for inclusion in the Directory with a recommendation that another be assessed (Wycliffe Creek floodout and Warrabri swamp). Despite this, it is unlikely that any wetlands from the district will be listed in the new national register of high conservation value aquatic ecosystems which is focused on nationally significant sites. However, most of the wetlands have not been surveyed for plants or aquatic fauna and some may be more significant than existing data would indicate. For example, one large claypan is the type location for a new species of Nardoo (recently described), and that species is only known from one other site in the NT. This species is potentially both rare and threatened and the claypan where it is known may be regarded as important accordingly. One swamp (within Thring Swamp) is the only known site of three species of ‘water lily’ within hundreds of kilometers. The presence of these species may indicate relatively frequent and long-lasting inundation.

Many of the plants and animals of the water control district only occur in the wetlands. Thus the wetlands make an important contribution to the diversity of habitats and species in the district, even though they make up a small part of the area. In arid landscapes it may be more appropriate to focus on the conservation values of groups of wetlands rather than on individual wetlands which can be quite small.
Acknowledgments

Jason Barnetson processed satellite imagery to detect surface water. Graham Ride provided information on groundwater systems and flooding of Warrabri swamp. David Albrecht reviewed the list of plants with a preference for wetland habitats. Anna Sheridan provided timely access to digital data for land resource maps. Various landholders assisted by providing information on their properties (listed in Appendix 2). Anne Pye initiated this report and commented on the draft, and also partook in field survey (24 & 25 August 2009). Several Parks and Wildlife Rangers helped with orientation to the area (fire reconnaissance trips in 2003 and 2004): Paul O’Neil, Michael Heywood, Wayne Gaskon, Steve Nicholson and Jason Barnetson. Several scientific staff of Parks and Wildlife assisted with wetland survey work in the area (24&25 July 2000, 24&25 July 2001): Roger Jaensch (consultant), Dave Albrecht, Jeff Cole, Megan McNellie.
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1. Introduction

1.1 Overview

This report summarises existing knowledge about wetlands in the area declared as the Western Davenport Water Control District. It also includes new information derived from satellite imagery.

This assessment of wetlands was prepared to provide information for the draft Water Allocation Plan being prepared for the Water Control District.

Wetlands are defined under the international treaty to which Australia is a signatory (Ramsar Treaty) and include natural and human-made surface waterbodies, areas of long-lasting water-logged soils and subterranean aquatic ecosystems. This assessment for the Western Davenport Water Control District mainly considers ‘naturally occurring’ wetlands. These include all areas where water collects above ground and persists as pools or waterlogged soils for sufficient duration to be important for dependent plants and animals. Such areas are known as wetlands or aquatic ecosystems, even though they may be dry much of the time. The focus here is on naturally occurring wetlands, although human-made water storages can also be important for native species.

The main emphasis of the allocation plan will be sustainable management of the groundwater resource. However, water allocation plans in the Northern Territory also cover surface water resources and any interaction between groundwater and dependent ecosystems.

1.2 Scope

This assessment includes:

- description of the main wetland types in the district;
- description of where these occur including their relationship to the drainage (creek) systems and including information about abundance and size of the various wetland types (non-quantitative);
- biological characteristics of wetlands in the district;
- assessment of the relationship between wetlands (surface waters) and aquifer recharge and discharge;
- assessment of conservation significance of wetland types and individual wetlands;
- information compiled for individual wetlands (in an Appendix 3)

Human-constructed wetlands can be important for wetland dependent plants and animals. They include water storages created for stock watering and for road and rail construction, typically involving excavation of earth tanks below the surrounding ground level, mounding of elevated earth tanks (turkeys nests) and creation of earth banks impounding water that flows in drainage lines or across floodplains. Waste water disposal areas such as sewage ponds and mining tailings can also be significant in some districts. However, the emphasis of this report is naturally occurring wetlands.

1.3 Geography of the Water Control District

The geography of the water control district is discussed in the draft water allocation plan (NRETAS 2009) and the groundwater technical review (Rooke 2009). A brief summary is provided here to give context to the rest of this report.
The water control district is located on the south-west side of the Davenport Range. It is 195 km from north to south, and 165 km from east to west. The northern boundary is about 75 km south of Tennant Creek. The only large community in the district is Ali Curung. There are several smaller communities and cattle station homesteads plus the roadhouses at Barrow Creek, Wauchope and Wycliffe Well.

Figure 1. Water Control District and surrounding areas (shading indicates rocky ranges)

Figure 2. Map of the Water Control District with property and river names (shading indicates rocky ranges)
The water control district is predominantly within the Wiso Drainage Basin; one of the nationally defined drainage basins and divisions.

A small part of the Barkly Basin is included on the north side of the Davenport Range but is regarded here as an accidental artefact of the course resolution with which the water control boundary has been defined. Accordingly wetlands of the Barkly Basin are only given cursory treatment here. Figure 2 shows the overlap with the Barkly Basin.

![Map of Wetlands of Western Davenports Water Control District](image)

**Legend**
- **drainage basin**
  - BARKLY
  - WISO
- **Water Control District**
- **flats prone to inundation (250K Geodata 3)**
- **property boundaries**
- **springs (NRETAS database)**
- **roads**
- **drainage (subset of 250K Geodata 3)**

*Figure 3. Overlap of Water Control District with Barkly Drainage Basin*

**North-western Boundary**

The north-east edge of the district is the Davenport Range. The range sheds several creeks that initially run west or south-west before turning to run north-west. The entire catchment of the following creeks are within the district, from south to north:
- Murray Creek (including South Creek, Amelia Creek and Skinner Creek);
- Wycliffe Creek;
- Hurst creek (a small creek shown on figure 4, in Appendix 1);
- Wauchope Creek (a small creek shown on figure 4);
- Bonney Creek.
The district boundary is a series of straight lines and encompasses part of the headwaters of creeks that run north and north-east from the Davenport Range: the Frew River (including Lennee Creek) and Whistleduck Creek (including Blackfellow Creek). A small part of the catchment of the Elkedra River is included, which runs east from the range and a very small part of the catchment of Kurundi Creek which runs north. These catchments have not been systematically considered in this wetland assessment. In terms of landscape and ecosystem function these are regarded as relatively separate from the western Davenports, being in the Barkly Drainage Basin (see figure 3.).

**Northern Boundary**

The northern boundary of the district is a straight line aligned east-west. It is roughly between Bonney Creek and McLaren creek and a small part of McLaren Creek and its catchment are within the district. The catchment of McLaren Creek is in the Murchison Range to the north of and abutting the Davenport Range.

**Western Boundary**

The western boundary of the district is a straight line aligned north-south. The north-east corner of the district is within the terminal floodout of the Hanson River. The western boundary roughly follows the long, lower (downstream) section of the Hanson River, along the west side and including all of the main channel of the Hanson River but not all of the floodplain which contains some floodout swamps. A large and sometimes long-lasting wooded swamp called Mud Hut Swamp is outside of the water control district near the south-west corner of the district.

**Southern Boundary**

The southern boundary of the district is an irregular line which follows the edge of the Ti Tree Water Allocation District to the south. It runs to the south of Mount Stirling and north of Stirling Station homestead and Stirling Swamp. However, it does include much of the headwaters of Stirling Creek. All of the headwaters of Taylor Creek are within the Western Davenports Water Control District. The southern boundary extends to the south-east to include various short creeks that run off ranges such as: the Watt Range; the hills at the north and east of Stirling Station; and Spring Range on Mount Skinner Station.

**Eastern Boundary**

The eastern boundary cuts through Mount Skinner Station to the north of the Tomahawk Range, through the Alayawarra Aboriginal Land Trust, through Annangara Aboriginal Corporation, and through Murray Downs Station. This area has generally un-coordinated drainage (no substantial creeks).

**Land Tenure and Land Use**

The larger properties are named on figure 1. The majority of the water control district (WCD) is pastoral lease (cattle station):

- Elkedra (very small portion in the WCD)
- Mt Skinner (only the northern-most portion in the WCD)
- Murray Downs (mostly in the WCD)
- Neutral Junction (virtually all within the WCD)
- Singleton (virtually all within the WCD)
- Stirling (northern part of station in the WCD)

A large part is Aboriginal land:

- Alayawarra Aboriginal Land Trust (ALT) (partly in the WCD)
- Annangara Aboriginal Corporation (partly in the WCD)
- Karlantijpa South Aboriginal Land Trust (partly in the WCD)
- Mungkarta Aboriginal Land Trust (partly in the WCD)
• Warrabri Aboriginal Land Trust (all within the WCD).

A relatively small part of the area is national park/conservation reserve/historical reserve. The two larger parks are jointly managed (Aboriginal land leased for conservation):
• the proposed Davenport Range National Park (on the north-east boundary of the water control district);
• The Devils Marbles Conservation Reserve (a small area abutting the highway and on the south side of Mungkarta A.L.T.

1.4 Context for Describing Wetland Types

In the arid southern part of the Northern Territory, wetlands have been broadly inventoried and a list of the main wetland types described by Duguid et al. (2005). These provide a framework for this assessment of the water control district.

1.5 Context for Assessing Conservation Significance of Wetlands

It is not easy to assess the conservation significance of an individual wetland such as a swamp due to gaps in our knowledge. Critical knowledge gaps include:
- not knowing which plant and animal species occur at individual wetlands;
- not knowing how often particular wetlands are inundated or how long the water lasts;
- not knowing how an individual wetland contributes to sustaining regional or national populations of individual species;
- not knowing whether individual plant species use groundwater for transpiration and to what extent species and vegetation assemblages (communities) depend on groundwater.

The Directory of Important Wetlands in Australia (Environment Australia 2001) is a national list of important wetlands. It is maintained by the Commonwealth Government. The criteria for including sites in the Directory include being a good example of a wetland type in a bioregion. This and some of the other criteria give considerable flexibility in determining whether or not a wetland should be considered important. The full criteria can be found in the overview document for the third edition of the Directory (available online - see References). A discussion about assessing conservation significance of wetlands in the arid NT can be found in Duguid et al., 2005, pp.227-228).

The Australian Government is developing a new framework for assessing the conservation importance of wetlands and related environments, using the term aquatic ecosystems. Under this system, wetlands of national significance for nature conservation may be listed as High Conservation Value Aquatic Ecosystems. This will in some regards replace A Directory of Important Wetlands in Australia (DIWA) as the national list of important wetlands.

The water control district overlaps with a small portion of the Davenport and Murchison Ranges site of conservation significance (Harrison et al. 2009). The listed values of the site of conservation significance do not include wetlands of the water control district.
2. Information Sources

Information from various sources has been used in this assessment. Much of the information was compiled from existing sources. New information and understanding was obtained using remote sensing (satellite) data.

The main sources used were:

A. personal communications: information supplied from people who live or have lived in the district (see Appendix 2);
B. survey data from field survey of wetlands in 2000 and 2001, undertaken as part of the inventory of wetlands of the arid NT;
C. subsequent field inspections, some specifically for this wetland appraisal;
D. NT Herbarium specimen records using the Holtze database;
E. 1:250,000 scale topographic mapping – paper maps and digital (GIS) data (including Geodata 3 from Geoscience Australia);
F. land resource maps and reports (land unit mapping) for Murray Downs Station and Neutral Junction Station;
G. mapping of extensions of river flows beyond the channels shown on 1:250,000 scale topographic maps;
H. mapping of surface water detectable on Landsat TM imagery;
I. inspection of individual wetlands with high resolution imagery available through Google Earth.

Summary and Appraisal of Some Information Sources

A. Personal Communications

People living on stations and in Aboriginal communities often have the best insights into key aspects of wetlands. In particular they have knowledge of how water moves through the landscape and how often individual wetlands are filled and how long the water lasts.

Discussions with people were very valuable in informing this wetland appraisal, but there is scope for obtaining much more information this way.

B. Survey Data from 2000 and 2001

Twelve sites were visited during the wetland inventory of 2000 to 2001 (Duguid et al. 2005, Duguid 2005). Most were on Singleton Station, a few on Stirling Station, a few on Murray Downs Station, and one on Neutral Junction Station. These were far from comprehensive assessments of wetlands of any one station but provide useful data on the range of wetlands.

C. Subsequent Field Inspections

Some additional sites were visited as part of fire management planning work by the author in 2003 and 2004. Wetland observations on these trips were opportunistic and were made on Murray Downs, Neutral Junction, Singleton and Stirling stations and the Devils Marbles Conservation Reserve. Some others sites were visited in 2009 in preparation for this report, on Murray Downs, Singleton and Neutral Junction stations and at Piggery Swamp on the Warrabri land trust. There are still large areas of the district for which no field based wetland assessment information is available and this is a significant deficiency in this document.

D. NT Herbarium Specimen Records

Botanical collections often have valuable descriptive information recorded as part of the specimen label details. These are all data-based for specimens in the NT Herbarium. The collection locations for specimens were reviewed using a geographic information system (GIS – a computer mapping system). Data on the conservation significance of plants species and information such as common name, life-form and whether native or not were obtained from the checklist of plants in the southern
region of the NT (Albrecht et al. 2007). An area of relative intensive botanical collecting is the Mungkarta Aboriginal Land Trust, where botanist Peter Latz collected widely in June 2007.

E. **Topographic Maps and Digital Data**

Topographic maps at scale of 1:250,000 are the most uniform set of mapping of wetlands across the study area and the wider area of the arid NT. Paper copies of these maps are invaluable in the field and in office planning and review tasks. Digital data are now even more useful due to the ability to easily overlay information from various sources in a geographic information system (GIS). The digital data have two main forms: (i) raster based images of the published paper maps; and (ii) vector and point data of specific features in the topographic maps.

The water allocation district spans 4 topographic maps sheets: Lander River (SF53-1); Bonney Well (SF 53-2); Mount Peake (SF 53-5); and Barrow Creek (SF53-6).

The vector and point data (Geodata Series 3) delineate drainage lines, waterholes, waterbodies such as lakes and claypans and sometimes swamps. Depiction of swamps is often quite variable in accuracy. The way in which features are interpreted/classified is likewise highly varied. The areas of floodouts of the major creeks are depicted as land subject to inundation. In the water control district three of these are named as swamps; yet the areas of longer lasting water are only small areas within the floodout mapped as land subject to inundation (see figures 5 & 6 in Appendix 1). The topographic maps covering the water control district all depict waterholes as point locations (some map sheets depict waterholes with polygons). In some areas with numerous small claypans this is indicated with text on the map rather than by delineating each individual pan. There are examples of this in the water control district.

F. **Land Resource Mapping of Stations**

The land resource maps and reports (land unit mapping) for Murray Downs Station (Grant 1989) and Neutral Junction Station (Edgoose & Lehmann 1996) provided useful insights into the nature of some wetlands already marked on the 1:250,000 topographic maps. In other places they show the presence of wetlands not shown on other published maps. Digital data for these land unit maps were obtained and incorporated into the GIS of the district. On Neutral Junction station there are two small isolated coolabah swamps mapped on the land unit map and two claypans. The claypans are both depicted on the topographic map while the coolabah swamps are not. On Murray Downs Station the unit mapping distinguishes several types of swamp separated on landform and vegetation. This is a valuable supplement to the topographic mapping. However, comparison with remotely sensed waterbodies shows that areas within the Murray Creek floodout with longer lasting water are not effectively distinguished within the land resource (land unit) map.

G. **Mapping of Extensions of River Flows**

The extensions of river flows beyond the channels shown on 1:250,000 scale topographic maps were mapped by Bretan Clifford (reported in Duguid et al. 2005, see pp. 34-35 & pp. 219-221). Mapping was done by inspection of TM images (including ‘quicklooks’), often from several dates during wet periods. These are useful for indicating connectivity among drainage systems; of particular interest for understanding fish species distributions and habitat. They also assist in understanding hydrology of individual wetlands. The mapped ‘extensions’ are shown in figure 1. Where a broad floodout occurs, the ‘extension’ is typically located along the midpoint.

H. **Mapping of Surface Water on TM Images**

Images from a wet period in 2000 were used to detect surface water. Mapping was done in three separate work periods but all using images form the year 2000. In 2001, Bretan Clifford used a combination of full Landsat TM images and where these weren’t available, Quicklook images (see Duguid et al. 2005). In 2008, for the Lake Eyre Basin part of the Northern Territory, the mapping was revised using fine-tuned methodology and replacing Quicklook images with full TM images (Barnetson & Duguid 2008). Additional images were obtained and the remainder of the water control district remapped for surface water in 2009. The image dates for each TM scene are listed below, and approximate scene extents are shown in figure 3:

- 26 March 2000: Scenes 102 /74 & 102/75;
- 8 September 2000: Scene 103/74;
Some areas have remote sensing from two dates due to scene overlap.

In some hilly areas, pixels in deep shade were included in the set of pixels mapped as surface water due to spectral similarities. These have not yet been removed from the mapping. Due to this issue, the range of dates involved, and the overlap between images, it was not straight forward to list the total area of surface water mapped. However, inspection of the images indicates that a significant proportion of the area mapped as water was in river channels (i.e. water holes).

J. Google Earth

Individual wetlands were inspected with high resolution imagery available through Google Earth. In general these were sites that had been identified on either topographic maps, TM water mapping or pastoral station resource assessment mapping. In some cases, the Google Earth imagery allows the wetland type to be estimated (e.g. separating wooded swamps from open claypans). In many cases the resolution (pixel size) of the image allows individual trees to be distinguished, but in some cases it is less detailed. In some cases water can be discerned in the wetland (often based on colour and uniformity of colour and texture). Google – Earth provides indicative dates for images but these are treated with caution when trying to ascertain inundation dates.

Figure 4. Approximate extents of Landsat TM images used to detect water
3. Collated Wetland Information

3.1 Description of the Main Wetland Types in the District

In this section the main wetland types are described. Examples of individual wetlands corresponding to most of these types are listed in Appendix 3.

Overview of Surface Hydrology

The district has few if any permanent natural surface waters.

The majority wetlands of the district are associated with (and include) the rivers and creeks which emanate from rocky ranges. The deeper waterholes in major channels are the places that hold water the longest, although few if any are permanent. Most of the larger wetlands in the area are associated with the river floodouts, being places where water spreads out from a defined channel. These wetlands can be filled from water that has fallen as rain many kilometres away and travelled down the river channels before flooding out. They can also receive some water from more local rainfall and flooding.

Other swamps and claypans are not obviously associated with major river channels. These are filled by local rainfall, by runoff from nearby elevated areas and from sheet-flow across the landscape. These are presumed to fill less frequently than those associated with floodouts. In some places there are swamps and pans in the vicinity of river floodouts but which are not obviously connected by a floodway or channel. They may be the result of clay sediments deposited by infrequent very large floods and may only rarely be filled by flooding from the creeks.

Classification into Wetland Types

As part of the inventory of wetlands in the arid NT, a classification of wetlands into wetland types was devised. The classification distinguishes types on various criteria including landform, vegetation and water permanency (see Duguid et al. 2005) for details. Table 1 (below) lists all the wetland types which are thought to possibly occur in the Western Davenports Water Control District.

<table>
<thead>
<tr>
<th>Arid NT Code</th>
<th>Arid NT Wetland Type / Broad Type</th>
<th>Occurrence in WDWCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1211</td>
<td>Large Freshwater Lakes and Pans</td>
<td>✓</td>
</tr>
<tr>
<td>B1221</td>
<td>Small Freshwater Lakes and Pans</td>
<td>✓</td>
</tr>
<tr>
<td>B1222</td>
<td>Isolated Rock Holes</td>
<td>✓ (may be few)</td>
</tr>
<tr>
<td>B2211</td>
<td>Wooded Swamps (Non-linear)</td>
<td>✓</td>
</tr>
<tr>
<td>B2212</td>
<td>Wooded Swamps (Linear/Riverine)</td>
<td>?</td>
</tr>
<tr>
<td>B2221</td>
<td>Bluebush Swamps</td>
<td>✓</td>
</tr>
<tr>
<td>B2223</td>
<td>Other Shubby Freshwater Swamps</td>
<td>? (may just be elements within a wetland; e.g. lignum)</td>
</tr>
<tr>
<td>B2231</td>
<td>Grassy Freshwater Swamps</td>
<td>? (may just be elements within a wetland)</td>
</tr>
<tr>
<td>B2232</td>
<td>Herbaceous Swamps (non-grassy)</td>
<td>?</td>
</tr>
<tr>
<td>F0001</td>
<td>Bare Flood-prone Flat</td>
<td>✓</td>
</tr>
<tr>
<td>F0002</td>
<td>Wooded Flood-prone Flat</td>
<td>✓</td>
</tr>
<tr>
<td>F0003</td>
<td>Shrubby Flood-prone Flat</td>
<td>✓</td>
</tr>
<tr>
<td>F0004</td>
<td>Grassy Flood-prone Flat</td>
<td>? (may just be elements within a wetland)</td>
</tr>
</tbody>
</table>
Unfortunately, many of the wetlands identified from remote sensing or shown on topographic maps cannot be allocated to one of the types due to a lack of survey data or other information (e.g. water longevity). For this reason, wetlands of the district are given summary descriptions using an alternative (but related) classification. Also, because the floodouts of the major creeks are such a dominant feature of the landscape and wetland hydrology in this district, a distinction is made between floodout and non-floodout wetlands, as listed below.

**Wetlands of Drainage Channels and Floodouts:**
1. Waterholes in River and Creek Channels
2. River and Creek Channels
3. Floodout Swamps and Lakes
4. Springs

**Other Wetlands:**
5. Isolated Lakes/claypans and Swamps
6. Isolated Rock Holes and Pans
7. Possible Subterranean Ecosystems (Stygofauna)
8. Artificial Wetlands

**Floodprone Areas Intermediate Between Wetland and Dryland:**
9. Briefly Inundated Floodouts (Flood-prone Flats) and Floodplains
Description of Broad Wetland Types

Waterholes in River and Creek Channels

Waterholes in the district are varied in character, however, only a few have been described with regard to longevity of water, length, width, depth, substrate, position in landscape, turbidity, and vegetation.

Few of the waterholes are permanent although some may last for several years when they are refilled by repeated stream flows. Most dry out before one year without follow-up flows.

Field observations were only available for parts of some creeks; notably the Hanson River, Murray Creek, Skinner Creek and Wycliffe Creek and places where the Stuart Highway crosses creeks and floodouts. The banks and river bed of waterholes in the district are variably rocky, stony or earthy. This can influence the vegetation, turbidity of water and presumably also the aquatic animal life. There are also variations in the type of fringing vegetation around waterholes and in adjacent terrain. There are few deep long-lasting waterholes longer than 100 to 200 metres long.

It is known that creeks can provide an important component of aquifer recharge, although there is little data to determine the relative importance of waterholes, the generally dry river sections between waterholes and the various floodout types. There is no data to indicate that any of the waterholes in the district are windows on the local watertable, but this has been demonstrated for one waterhole on the north side of the Davenport Range.

Some examples of water holes are given brief descriptions in Appendix 3.

River and Creek Channels

The sections of creek and river channels between water holes can also be regarded as wetlands even though they only hold water briefly and mostly only during flow events. In the district there is considerable variation in vegetation and soil of banks and beds. Distinctive types include: wide channels lined by River Red Gums (with sandy, stony or earthy soils and with minimal gradient); narrow channels in hills (typically rocky and unvegetated or sparsely vegetated); and stony shrubby channels dominated by Melaleuca dissitiflora.

Floodout Swamps and Lakes

Low lying areas within the floodout areas of creeks and rivers can hold water for weeks and months. In the arid NT such areas typically have clay rich soils that at least partially prevent loss of water into the soil profiles. However, some sites may have semi-permeable soils and be important for aquifer recharge. It is possible that local watertables may be temporarily at the surface at such times.

Floodout swamps and lakes may be regarded as shallow lakes, or as swamps dependin on the density of emergent coolabah trees (Eucalyptus victrix), lignum (Muehlenbeckia florulenta) and other plants (e.g. Eleocharis pallens the pale spike-rush). Some can have predominantly bare clay beds and may be regarded as claypans, but typically with a fringing zone of wooded or shrubby vegetation (typically coolabahs and/or lignum and ti-tree (Melaleuca spp.)).

A majority of swamps in the district are associated with the rivers/creeks that flow west from the Davenport Range: lower Murray Creek, Wycliffe Creek, Hurst Creek, Wauchope, Bonney Creeks, Dixon Creek and McLaren Creek. Most of these are about 500 m across or less. There are some larger ones around 1 to 2 km long, notably Warrabri Swamp (including Piggery Swamp) on Warrabri Land Trust, a swamp west of Bottom Bore on Murray Downs Station, and some of those in the Wycliffe Creek floodouts (including part of Thring Swamp).

The Taylor Creek does not have known large coolabah floodout swamps, but there may be some swamp areas (e.g. around Bottom Bore on Neutral Junction Station).
There are several floodout swamps/lakes scattered along the floodplain of the Hanson River, mostly around 500m wide (or shorter). Some are larger (up to 2km). The terminal floodout is thought to be a large but short-lasting coolabah swamp but is not well known (possibly > 15 km long by about 0.5 – 1 km wide).

Much more extensive floodout swamps occur outside the water control district on the north-east and east of the Davenport Ranges: on the Elkedra River; and on the Frew River.

**Springs**

Only three confirmed instances of groundwater discharge at a spring or seep are known in the water control district. One of these is in the Whistleduck Creek catchment (Barkly Basin). Both the others may be sites of permanent or at least long-term surface discharge but neither is thought to sustain distinctive communities of plants and animals. One is a seepage spring in a lowland river bed (Skinner Creek) close to the Davenport Range which can produce small shallow pools (see Duguid 2005, p. 18). Following large river flows this site is probably inundated as a waterhole and groundwater discharge may contribute to its longevity. The other spring is even less known and occurs on Spring Range in the south of the control district (see Duguid 2005, p. 9). The variations through time in volumes of water discharged are not known for either site.

**Isolated Lakes/claypans and Swamps**

Swamps and pans that are isolated from rivers and their floodouts and floodplains may typically be filled less often than those associated with rivers. This suggestion is made because they are usually filled from relatively local rain and runoff or sheet-flow. Thus they rely on heavy local rain which is less likely to occur than heavy rain somewhere in the catchment of a major creek. Nevertheless, it is likely that some of these hold water for weeks and months. Some pans and swamps are within the vicinity of rivers and floodouts but are not obviously connected.

There is very little field survey information for known examples in the district. This is one of the reasons that pans (unvegetated) have been combined here with swamps (vegetated), even though they are treated separately in the classification by Duguid *et al.* (2005) as presented in table 1.

Two examples on Murray Downs Station are Chabalowe Bore and Bluebush Bore. Areas within these two swamps are dominated by northern bluebush. They appear to be part of a sparse chain of swamps along low lying land that extends to a large swamp outside the water control district, on the station boundary near the south-east corner of the station. This may be a paleo-channel that previously flowed up to Murray Creek around Warrabri Swamp. Bluebush can be dominant and densely spaced in many swamps of central Australia and the Barkly Tablelands. However, apart from this chain, Bluebush swamps are not known from the water control district and are certainly not abundant. Some, but not all bluebush swamps have scattered emergent coolabah trees. Bluebush can also occur as a minor element of swamps.

Some areas of the ‘Chabalowe drainage chain’ are mapped on the land resources (land unit) map of the station as flood-prone Mulga or Mulga swamp (with silky brown top – a typical wetland grass). Depending on frequency and duration of flooding these may be regarded as wetlands or alternatively as flood-prone/floodout areas (see below). It is likely that the ‘Chabalowe drainage chain’ is an important recharge area for groundwater.

Other parts of the water control district have isolated claypans and swamps. Most of these are widely scattered and occur in varying landscape settings, including sand dunes, adjacent to low elevation rocky rises and hills, and on floodplains (with possible but uncertain water inflow from major rivers. There are no particularly large concentrations (compared to central Australia in general where some distinct clusters are known). There are several scattered in the south of the district (east and southeast of the Watt Range) and in the south west of the district (near the Hanson River, west of Mt Stirling). On Neutral Junction station there are two small isolated coolabah swamps mapped on the land unit map and two claypans. One of these claypans is very large with a distinctive stony floor (west of Claypan Bore)
A substantial chain of claypans occurs on Mungkarta Land Trust adjacent to low rocky country at the north-west end of the Younghusband Range. This chain extends along about 10 km. It lies along the lowland that may occasionally carry flood waters from various creeks/rivers to the south and south-east; e.g. Murray Creek, Wycliffe Creek, Hurst Creek, Wauchope Creek, Sutherland Creek (and maybe sometimes Taylor Creek). The claypans probably also receive more local runoff from adjacent rocky ground. At the north-west end of the chain, the pans appear to be part of the floodout of Bonney Creek, named on topographic maps as Algooolgoora Swamp. Remote sensing imagery from 2000 indicates that these pans can hold large areas of water for many months, with continuous water in the three largest pans extending 2.4 km, 1.5 km and 1 km long respectively. It is presumed that at that time, they may have received water from the major creeks, but apart from the northern section that is connected to the Bonney Creek floodout (Algooolgoora Swamp), these pans may typically fill in isolation from major creeks.

**Isolated Rock Holes**

Water can be stored in shallow to relatively deep depressions in rock outcrops. Shallow basins on granite outcrops such as at the Devils Marbles are known. These can support aquatic invertebrates and occasionally aquatic plants. The aquatic plant *Elatine gratioloides* can occur even in very shallow rock pans (recorded from Devils Marbles). Deeper isolated rockholes such as gnamma holes may also occur in the water control district but none are recorded.

**Possible Subterranean Ecosystems (Stygofauna)**

Australian government policy and the international wetland treaty (Ramsar Treaty) both recognise that small aquatic animals can occur in wet caves and in some aquifers. Macroscopic (visible without magnification) stygofauna (underground animals) have been found in calcrete and unconsolidated aquifers in the southern NT. Although stygofauna have not been recorded for the Western Davenport Water Control District, they may occur.

**Artificial Wetlands**

There is a substantial ponded storage created for aquiculture and recreation/amenity at the Wycliffe Well tourist park. The waterhole in Wycliffe Creek on the up-stream side of the Stuart Highway may have been modified many decades ago to improve its water storage capacity. Other dams in the water control district may have also been used to supply water for small-scale horticulture in the past. The Home of Bullion dam on Neutral Junction Station is a moderately big water body with fringing woodland. It may provide valuable habitat for native wetland species. An aquatic plant species, *Potamogeton crispus* is only known in the district from a single bore (possibly a raised earth tank). This indicates how artificial wetlands can provide habitat for native species.

**Briefly Inundated Floodouts (Floodprone Flats) and Floodplains**

The floodouts of the major creeks can influence vegetation over large areas. For example, a large area where Wycliffe Creek floods out is named Thring Swamp on the 1:250,00 topographic map. However, only a very small proportion of this area is thought to hold water for more than a few days or weeks. Thring Swamp is shown as ‘land subject to inundation’ on the legend of the topographic map, which matches understanding of this site and the classification used here (e.g. flood prone flat in table 1). The use of the word swamp for this area may be misleading. Other examples include Algooolgorra Swamp and Gilbert Swamp. Site descriptions in Appendix 3 and maps in Appendix 1 illustrate the depiction of these sites on the topographic maps. compared to information on where water sits longer, obtained from satellite imagery (figures 5 & 6 in Appendix 1).

Floodouts in the region include a range of vegetation types, probably due to variations in both soil and topography. Where a depression occurs, water can sit on the surface and have an associated influence on the vegetation. The higher the clay content, the less water can ‘leak’ down into the ground.
Whether flood-prone areas should be considered as wetlands is debatable. Some are intermediate between wetland and dryland. The extent of the larger floodouts can often be discerned by the density of vegetation, even where the plant species are not typical of wetlands. These areas may not warrant description as wetland but are certainly strongly influenced by surface water flows and may be very important recharge sites for groundwater. Vegetation can be dominated by Acacia species such as Mulga (*Acacia aneura*), a mixture of shrubby species, including *Acacia cowleana* and a range of sand plain species. Taller emergent trees often include ghost gum/cabbage gum (*Corymbia flavescens* / *Corymbia aparrerinja* – possibly intergrading). Following brief inundation various herbaceous wetland plants can occur.

### 3.2 Biological Values of Wetlands

Only limited biological survey has been done in wetlands of the water control district. Therefore the information presented below should not be regarded as comprehensive.

**Fish**

This assessment of fish fauna of the Western Davenports Water Control District is focussed on fishes of the Wiso Drainage Basin. The headwaters of rivers running north/east from the Davenports are in the Barkly Basin and their fish fauna are only given a brief treatment.

Fish have been recorded from several of the creeks which flow south and west from the Davenport Ranges (museum specimens, personal observations and published record):
- Amelia Creek
- Murray Creek
- Skinner Creek
- Wycliffe Creek
- Bonney Creek

They are also known from the Hanson River, where they were reportedly translocated from elsewhere (see Appendix 2).

All recent records are of spangled grunter (*Leiopotherapon unicolor*). Two other species were recorded as occurring in Bonney Creek in 1898 (Davidson 1904: Central Australian Exploration Syndicate) with descriptions clearly matching to *Neosilurus hyrtlii* and *Amniataba percoides* which occur in rivers on the north side of the Davenport Range. Bonney Creek was surveyed for fish by staff from the NT Museum in the 1980s and only spangled grunters were recorded (Bishop and Moses 1983).

Fish in central Australia are thought to need permanent water holes to persist in small drainage systems such as those on the southern and western side of the Davenport Ranges (Unmack 2001). However, there is anecdotal evidence that spangled grunter can survive for a while in saturated sediments after surface waters have dried out. Although there are numerous waterholes marked on 1:250,000 scale topographic map for these creeks there is no information to indicate that any are permanent. Fish may recur in those creeks due to recolonisation from the Frew River and Whistleduck Creek systems which do have permanent waterholes. There are places in the headwaters where channels from separate creek systems are in close proximity (50-200m) on flat terrain of some watersheds (visible on satellite imagery and aerial photographs). Spangled grunters are very good colonisers (see Wager & Unmack 2000; and Duguid *et al.* 2005) and it is likely that some swim from one catchment to another at these places when heavy downpours create local flooding. Other fish species can probably also do this but it is likely that this occurs less often. That may explain an apparent absence of banded grunter and catfish from Bonney Creek where they have been previously recorded.

Floodwaters from all the creeks that flow from the west side of the Davenports may join up in big flood events. Therefore it is likely that spangled grunter sometimes also occur (and may regularly occur) in other drainages such as McLaren Creek, Dixon Creek, Wauchope Creek and Hurst Creek. No records of
Fish in the Taylor Creek have been found but if the Taylor connects to Wycliffe Creek in very large floods then spangled grunter may periodically occur there.

Fish (unknown species) were introduced to Wycliffe Creek in 1989 (D. Debney pers. comm.) and may persist. Likewise, golden perch and silver perch may have occurred in the Hanson River due to past introductions to dams (M. Lines pers. comm.). Spangled grunters probably persist in the Hanson River due to artificial waterbodies as there are probably no permanent natural waterholes (see Appendix 2).

The Whistleduck Creek and Frew River drainage systems have respectively seven and five naturally occurring fish species recorded. Both systems have permanent waterholes that support this diversity. It is uncertain which of the waterholes in these systems are permanent. It is unknown how many permanent or nearly permanent waterholes there are in each system. There are certainly long-lasting waterholes in the major water courses, including at substantial distances from the main range. Some are thought to be windows on regional watertables (e.g. Woodenjerrie Waterhole at Epenarra, Bob Read pers. comm.). At least one of the rockpools in gorges of the upper Whistleduck Creek are believed to be spring-fed and very long-lasting or permanent (Johnson et al. 1984; Jason Barnetson pers. comm.).

The fishes of the Whistleduck Creek and Frew River are listed in Table 2.

**Table 2. Fishes of Barkly Basin portion of Davenport Ranges**

<table>
<thead>
<tr>
<th>Fish</th>
<th>Whistleduck Creek</th>
<th>Frew River</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ambassis</em> sp. (central Australia)</td>
<td>Glassfish</td>
<td>√</td>
</tr>
<tr>
<td><em>Nematalosa erebi</em></td>
<td>Bony Bream</td>
<td>√</td>
</tr>
<tr>
<td><em>Mogurnda</em> sp. (Davenport Ranges)</td>
<td>Davenport /Gulf of Carpentaria Gudgeon</td>
<td>√</td>
</tr>
<tr>
<td><em>Melanotaenia splendida</em> subsp. <em>tatei</em></td>
<td>Desert Rainbowfish</td>
<td>√</td>
</tr>
<tr>
<td><em>Neosilurus hyrtlii</em></td>
<td>Hytl's Catfish</td>
<td>√</td>
</tr>
<tr>
<td><em>Amniataba percoides</em></td>
<td>Banded Grunter</td>
<td>√</td>
</tr>
<tr>
<td><em>Leioptherapon unicolor</em></td>
<td>Spangled Grunter</td>
<td>√</td>
</tr>
</tbody>
</table>

**Wetland Birds**

There is very little bird survey data from wetlands in the district. However, some inferences can be drawn from other parts of central Australia in 2001.

In the district, the most important wetland type for birds is probably wooded swamps. The closest comparable swamps with waterbird data are Mud Hut Swamp and Woodduck Swamp to the south and swamps of the Elkedra River and the Frew River to the north east. Although these are broadly similar they are considerably larger than most of the wooded swamps in the Western Davenports Water Control District. However, the larger and longer-lasting wooded swamps in the district (> 1km across) are likely to support similar bird species.

Table 3 lists wetland birds recorded at 6 wooded swamps in the north of central Australia in 2001. The bird numbers are tallied across the swamps. Survey effort varied between swamps so numbers of birds are only indicative of abundance (i.e. not counts of all birds present).

Various duck species are common and abundant in these wetlands, as are cormorants. Some species may only be abundant when fish are present (e.g. cormorants and pelicans). Various waders can be present, some more abundant than others (e.g. 25 straw necked ibis recorded compared to only yellow-billed spoonbills).
Table 3. Waterbirds at wooded swamps similar to those in the district (data from 2001)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Number of Swamps Where Recorded</th>
<th>Total Numbers Recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Pelican</td>
<td>2</td>
<td>35</td>
</tr>
<tr>
<td>Australian Wood Duck</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Banded Lapwing</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Black Swan</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Black-tailed Native-hen</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Black-winged Stilt</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Brolga</td>
<td>1</td>
<td>few</td>
</tr>
<tr>
<td>Cormorants (unidentified)</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td>Darter</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ducks (unidentified)</td>
<td>2</td>
<td>106</td>
</tr>
<tr>
<td>Egrets (unidentified)</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Eurasian Coot</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Glossy Ibis</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>Great Cormorant</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Great Egret</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Grebes (unidentified)</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Grey Teal</td>
<td>5</td>
<td>344</td>
</tr>
<tr>
<td>Hardhead</td>
<td>4</td>
<td>76</td>
</tr>
<tr>
<td>Heron (unidentified)</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Little Black Cormorant</td>
<td>3</td>
<td>120</td>
</tr>
<tr>
<td>Masked Lapwing</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>Pacific Black Duck</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Pied Cormorant</td>
<td>5</td>
<td>59</td>
</tr>
<tr>
<td>Pink-eared Duck</td>
<td>5</td>
<td>190</td>
</tr>
<tr>
<td>Plumed Whistling-Duck</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Red-kneed Dotterel</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>Royal Spoonbill</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Spoonbills (unidentified)</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Straw-necked Ibis</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>Whiskered Tern</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>White-faced Heron</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>White-necked Heron</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>Yellow-billed Spoonbill</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>

Waterbirds will also use other wetland types such as claypans, waterholes in creeks and dams. Many of the same species may occur as at the wooded swamps.

Invertebrates

Redclaw yabbies (*Cherax quadricarinatus*) have been recorded at Wycliffe Creek, where it has apparently formed a self sustaining population since introduction over 10 years ago (D. Debney pers. comm.).

Inland crabs (*Holthusiana transversa*) are native to the district and occur along creeks, particularly around waterholes and holes in the dried banks where their holes are common.

Little data exists for smaller aquatic macro-invertebrates.
The floodplains and floodout areas of the rivers seem to be important for some species of termites. Above ground termittaria (termite mounds) seem to be much more abundant in floodprone areas and particularly in the vicinity of the longer lasting swamps.

**Plants**

Nearly 800 plant species have been recorded from the control district (determined by combining wetland survey records with Herbarium specimen records from any habitat).

Over 300 species of plants have been recorded from wetlands in the Western Davenports Water Control District. A significant number of these can be considered as wetland plants and have been listed in Appendix 4 (294 species, including some plants that are common in wetlands but which are also common in drylands). Most of these species are native (14 introduced species and 280 native). Of these, there are 104 native species with a high fidelity to wetlands (unlikely to occur in other habitats). Thus, wetlands appear to make a significant contribution to plant species diversity in the district (>12% of species), even though wetlands are a very small proportion of the landscape.

Only a small number of the wetland plants grow in water for a substantial part of their life-cycle (i.e. semi-aquatic or aquatic plants). The main examples from the district are:

- *Pseudoraphis spinescens* (floating grass; amphibious; recorded at Thring Swamp and Bonny Creek).
- *Chenopodium auricomum* (Northern Bluebush)
- *Elatine gratioloides* (Waterwort)
- *Myriophyllum verrucosum* (Red Water-milfoil)
- *Rotala diandra*
- *Rotala mexicana*
- *Rotala occultiflora*
- *Marsilea costulifera* (Narrow-leaf Nardoo)
- *Marsilea crenata*
- *Marsilea cryptocarpha*
- *Marsilea exarata* Swayback Nardoo
- *Marsilea hirsuta* (Short-fruit Nardoo)
- *Marsilea mutica* (Smooth Nardoo)
- *Nymphoides crenata* (Wavy Marshwort)
- *Nymphoides indica* (Fringed Waterlily)
- *Nymphaea immutabilis* subsp. *immutabilis* (Black-soil Waterlily)
- *Muehlenbeckia florulenta* (Lignum)

The presence of some of these species may indicate that inundation is relatively long-lasting and relatively frequent. Three examples are ‘water lilies’ (in the broad sense) which have only been recorded from one of the swamp areas within Thring Swamp. Two of these water lilies have been observed at widely spaced time intervals indicating they are established residents that probably grow with each flood event.

**The black-soil waterlily**

*Nymphaea immutabilis* subsp. *immutabilis* is classified as data deficient because there is not enough information to determine if it is threatened in the Northern Territory. There is no doubt that it is highly restricted with few localities known for the southern NT and the one at Thring Swamp is more than 180 km from the nearest other known collection to the north. Collected at Thring Swamp in 1963, 1975 and 1979 and probably observed in about 2006 (see Appendix 2 – pers. comms. from Peter Bartlett).

**Fringed waterlily** (also called water snowflake)

*Nymphoides indica* is a marshwort (not a true water lily). It is highly restricted in the southern NT. It is only known from 2 other places in the southern region of the Northern Territory; both over 300 km away from Thring Swamp. Collected at Thring Swamp in 1975 and 1979 and probably observed in about 2006 (see Appendix 2 – pers. comms. from Peter Bartlett).
Wavy marshwort
(*Nymphoides crenata*) is a marshwort (not a true water lily). It is highly restricted in the southern NT (about 10 locations) with nearest being just north of Tennant Creek. Collected at Thring Swamp in 1979.

There are other wetland species which are highly characteristic of wetlands and can be used as indicators that an area is a wetland even if it is dry when seen. Examples include gum-barked coolabah (*Eucalyptus victoria*), some of the tea-tree species (e.g. *Melaleuca glomerata* and *Melaleuca dissitiflora*), and budda pea (*Aeschynomene indica*).

Some wetland plants mainly occur in particular wetland types or parts of wetlands. Many herbaceous species specialise in the wet soil on the banks of waterholes and rivers and the beds of swamps, after the surface waters have receded. Some species mainly grow around the main waterholes such *Ludwigia octovalvis* (Willow Primrose), a large shrubby herb with showy yellow flowers.

At least one of the plants in the formal boundary of the Western Davenports is only known from the upper catchment of creeks running north/east from the range: *Fimbristylis blakei*, which is only known from a single site in the southern NT: a seepage spring in the Whistleduck Creek catchment.

### 3.3 Wetland Mapping

Wetland mapping of the Western Davenports Water Control District is still at an interim stage. Many new wetlands have been identified using remote-sensing, compared to what is depicted on 1:250,000 scale topographic maps. However, most of these do not have meaningful wetland boundaries mapped. That kind of mapping needs to be done on a case-by-case basis using remotely sensed imagery such as aerial photography or very high resolution satellite imagery (Google Earth imagery is often adequate).

Judgments about the extent of a wetland can be difficult to make and satellite imagery from a range of inundation events can be helpful. It can also be difficult to allocate a wetland to a wetland type or group of types, without detailed imagery coupled with ground survey. Allocating wetland type is also difficult in many instances where different parts of a wetland correspond to different types.

This current review was limited in scope and detailed wetland mapping was not possible. Therefore, many of the wetlands that have been identified can only be depicted as a point and with much uncertainty over wetland type. It is not yet possible to present meaningful numerical data about the number of wetlands of a particular type or their aggregate area.

An important aspect of wetland mapping in any arid area is mapping the location of waterholes and determining or estimating size and persistence of the area of surface water. The topographic maps show the location of many waterholes on creeks on the west side of the Davenport ranges, plus quite a few in the head waters of the Taylor. However, there is very little information on size and longevity.

### 3.4 Condition and Impacts of Land-use

Land condition and the impacts of contemporary land-use can be hard to assess. They can have an important influence on water movement across landscapes and on erosion and deposition of soil. Soil structure and patterns of vegetation and leaf litter all influence infiltration of rainfall and therefore rates of run-off and sediment transport. Both erosion and deposition are natural processes that can alter wetland ecology. Over long periods of time wetlands can disappear in some places, whilst new ones are created elsewhere. Where the processes are changed by modern land-use, including the effects of stock and feral animals, then the consequences may be undesirable. Wetlands may be silted up or cease to hold much water if levee banks are cut (H. Pringle pers. comm.).

Stock and feral animals may reduce the longevity of surface water by drinking it and impacting water quality by defecation and stirring up sediment. The consequences of such impacts for aquatic fauna are largely unknown. Grazing and trampling of wetland plants is often evident at most wetlands in central Australia, but there is little quantification of impacts on individual plant species. There is virtually no information about possible secondary impacts such as reduced availability of food and shelter for native fauna.
Introduced fish and crustaceans both occur in natural wetlands of the district (see invertebrates section above) and may have adverse effects on native aquatic fauna but there is no data that measures effects. Introduced plant species are known to grow prolifically in some wetland habitats. Although the displacement of native species has rarely been quantified, comparisons with less-infested wetlands indicate that some native species are being displaced and have declining populations. The consequences of this for long-term population viability of plant species and dependent fauna are unknown. Examples of introduced plants include the thorny bush *Parkinsonia aculeata* that can form dense thickets that are a nuisance for stock management and may displace native plants. Rubberbush (*Calotropis procera*) is likewise regarded as noxious and is known from floodplain areas in the district. Introduced grass species such as buffel grass (*Cenchrus ciliaris*) and couch grass (*Cynodon dactylon*) probably have more impacts on native species but are also valued as stock feed and for stabilizing soil. These species can out-compete native groundcover plants and also influence fire regimes by increasing fuel loads.

### 3.5 Conservation Significance of Wetlands

There are some wetlands and wetland aggregates (groups of wetlands) that may be more important for conservation than others. This is based on combinations of:

- relatively large areas of water and/or long lasting water with an associated benefit for wetland dependent plants and animals, including water birds;
- presence of plant species that are rare (or appear to be rare) in central Australia;
- presence of plant species that appear to be rare in the water control district and surrounding areas (e.g. 50-100 km);
- high diversity of wetland plant species

Some of the river floodout wetland aggregates have a notable diversity of plant species due to the diversity of habitats.

The following wetlands/aggregates have been identified as relatively significant. There are descriptions for each in Appendix 3.

1. **Wycliffe Creek Floodout system** (aggregate) including ‘lily swamp’ (Singleton Station).
2. **Algoolgoora Swamp** (aggregate of several swamps within floodprone flats) (Mungkarta Land Trust). Only location in water control district for the wetland plant *Coleocoma centaurea*. Also includes several waterholes on channels of Bonney Creek, shown on topographic map, which presumably add to species diversity of the aggregation. Various swamp areas are noted in Appendix 3.
3. **Chain of claypans** (Mungkarta Land Trust) Area of significantly extensive and long lasting water, adjacent to low rocky country at the north-west end of the Younghusband Range. May be the only location in the control district of the wetland plant *Nesaea repens* (IUCN code Data Deficient), although one record may be from part of the Algoolgoora Swamp aggregation.
4. **Piggery Swamp and the broader Murray Creek – Warrabri Swamp floodout** (Warrabri Land Trust & Murray Downs Station). An area with several large swamps and extensive areas of flood-prone flats. Piggery Swamp is probably the area of deepest and longest lasting water but not necessarily the highest plant diversity.
5. **Claypan Bore Claypan** (Neutral Junction Station) A large stony claypan, most notable as the type location of *Marsilea cryptocarpha* and one of only 2 known locations of the species in the NT.
6. **Swamps, pans and terminal floodout of the Hanson River floodplain** (Stirling Station & Karlantija South Aboriginal Land Trust). Relatively poorly known but with some significant plant records and mapping of water from TM imagery indicates some moderately large swamps, possibly comparable to those of Wycliffe Creek, Bonney Creek and Murray Creek. The only record of *Dysphania sphaerosperma* from the district and general area is from a swamp on the Hanson floodplain.

Areas of bluebush swamp are uncommon in the control district but are common in other parts of central Australia. In the absence of records of rare/significant species they are not currently regarded as particularly significant.
3.6 Groundwater and Wetlands

The water allocation process aims to ensure that rates of water extraction are sustainable and will not adversely effect the natural environment. Assessing the potential for such impacts is hampered by significant gaps in scientific knowledge and relies on assumption and speculation. Information below on groundwater is summarised from the report by Rooke (2009).

There are no long-term river gauging stations so surface flows can only be estimated. However, it can be estimated with confidence that only a small proportion of surface flows generated by rain are diverted into artificial storages or pumped from waterholes in the control district. Accordingly, it may be assumed that surface flows to natural wetlands are in a largely natural condition. Some broad-scale changes may have occurred due to the introduction of hoofed grazing animal. Various changes to soil structure and patterns of vegetation and leaf litter cover can potentially change run-off and infiltration rates compared to pre-European conditions across arid and semi-arid rangelands.

Hydrogeological investigations provide some understanding of recharge into the higher level aquifers in Cainozoic deposits of the water control district. Substantial fluctuations have been recorded in standing water levels in some monitoring bores, associated with major rainfall events. Flow rates and directions in the Cainozoic aquifers and deeper Cambrian aquifers have been estimated and in some places flow directions are believed to fluctuate due to recharge and discharge dynamics. However, very little has been quantified for water exchange between Cainozoic and Cambrian aquifers. Likewise there is little more than speculation regarding natural discharge processes to the surface. Some of the Cainozoic aquifers are close to the surface and may lose water to evaporation and transpiration through plants and/or soils. However, understanding of the ecophysiology of the vegetation is insufficient to either support or contradict that hypothesis. It is possible that periods of falling standing water levels in bores in Cainozoic aquifers may be mainly due to ‘leakage’ of water to deeper Cambrian aquifers which may be partially confined (separated by less permeable rocks). There is even less known about natural discharge from the relatively deep Cambrian aquifers. Possibly discharge occurs north-west of the water control district, possibly in association with saline playas (salt lakes that are only inundated by local rain).

Improved understanding of the role of wetlands of the district in aquifer discharge will need scientific research (as opposed to general survey and inventory) into plant physiology and the relationship with soil water dynamics (unsaturated soils) and watertables (saturated soils).

There is preliminary evidence that trees can access groundwater in unconfined aquifers at various depths (see Cook et al. 2005; O’Grady et al. 2007; O’Grady et al. 2009). Preliminary results from work in the Ti Tree Water Control District come from drylands such as spinifex sandplain and from wetlands such as riparian River Red Gum woodland. More work is needed to understand important aspects such as:

- the depths at which ground water is available to vegetation;
- the use of groundwater via root access to the watertable versus the vadose zone (unsaturated soil) above it;
- importance of vegetation as a component of aquifer discharge;
- quantifying the impact of vegetation on groundwater recharge (how much rainfall can be intercepted in the root zone);
- whether and to what extent some vegetation types are dependent on groundwater.

Apart from springs, most wetlands in the district rely on surface water flows from rainfall for any inundation. It is currently regarded that most elements of the vegetation are totally reliant on this surface water. For example, Lignum is a long lived perennial shrub, but during dry conditions it loses most of its leaves and appears to minimise photosynthesis. Within the districts, gum-barked coolabah trees (Eucalyptus victrix) may be the main species that often uses groundwater. Research from the Ti Tree WCD has shown that these can use shallow groundwater (e.g at about 6 m below surface). Such shallow groundwater areas are widespread on the western side of the Davenport Ranges and may explain the occurrence of gum-barked coolabahs on plains at considerable distances from river channels and obvious floodout zones. It is unknown to what extent the coolabahs depend on the groundwater.

There is insufficient information to predict whether groundwater extractions will have a negative effect on gum-barked coolabah woodland. However, it is likely that impacts, if they occur, would be relatively localised compared to the wide extent of the species and wetlands where it occurs.
There are only two springs documented for the Wiso Drainage Basin part of the district. Both occur in close proximity to rocky ranges and are likely to be discharging water that is stored in fractured rocks of the ranges. It is regarded as unlikely that these will be impacted by any current or future bores (e.g. Brim Box et al 2008).

4. Recommendations

Improved understanding of the connectivity between the various creek systems would assist in understanding the ecology of the wetlands in the district. Further investigation of satellite imagery from large flooding events should provide new insights. Difficulties in getting cloud-free images close to the times of peak flooding may reduce the amount of information that can be gained that way. Survey flights in fixed-wing aircraft at the time of large flood events would be very beneficial.

Further botanical survey and invertebrate survey would rapidly improve understanding of the ecological characteristics of the district’s wetlands. This would be most effective in a period of 2 – 6 months after a large flooding event. Helicopter survey to various remote areas would allow these to be surveyed efficiently (e.g. the Hanson River floodout).

Survey and documentation of the ecological characteristics of individual wetlands in the district will add to understanding of wetlands and improve the ability to assess conservation importance. Further and more systematic consultation with landholders will be an efficient first step. Discussion should involve exchanging information on where wetlands occur, how long the water lasts and the presence of key species such as water lilies.

Botanical survey of the swamp areas on the north side of ‘Thring Swamp’ (e.g. latitude 20 47 22, longitude 134 15 45) during and following inundation is one of the highest priorities. Other botanical priorities are determining localities (if any) of Cullen leucanthum and Cullen walkingtonii in the Murray Downs floodout country and their prevalence; and survey of the Murray Creek / Warrabri floodout areas, Bonney Creek floodout and Hanson River floodout following big river flows.

Further scientific research into the use of groundwater by woody wetland plants will be important to better understanding the recharge and discharge dynamics of aquifers in the district. Diffuse discharge also merits further research. Hydrogeological research into the nature and location of discharge from the deeper (Cambrian age) aquifers of the district may raise new research questions for wetland ecology.

References


Bishop, K. and Moses, R. (1983) Fish survey of the Bonnie and Kurundi Creek catchments of the Western Davenport and Murchison Ranges, Northern Territory, central Australia, Supervising Scientist for the Alligator Rivers Region Research Institute, Jabiru, Northern Territory.


Google Earth (internet site) http://earth.google.com


Northern Territory Government Department of Natural Resources, Environment, the Arts and Sports. (in prep., 2009). *Water Allocation Plan for the Western Davenport Water Control District*. Department of Natural Resources, Environment, the Arts and Sports, Alice Springs.


Appendices

Appendix 1: Wetland Maps

Figure 5. Wetlands of north-east area as named and depicted on 1:250,00 scale topographic maps (note:
- river floodout extensions are not shown on the 1:25,000 scale topographic maps
- shading indicates hills from a cell based digital elevation model)
Figure 6. Surface water mapped from TM satellite data, north-east portion

(notes
1. area of surface water exaggerated slightly for display
2. remotely sensed water polygons among the ranges are mostly not water but shade)
Figure 7.  Point locations in Water Control District
(note:
1. remotely sensed water polygons among the ranges are mostly not water but shade)
2. *wetland points – miscellaneous* are those listed with prefix ‘WMD’ in Appendix 2)
Figure 8. Point locations in the Algoolgoora Swamp area
(note: shading indicates hills from a cell based digital elevation model)
Figure 9.  Point locations in the Wycliffe Creek area
(note: shading indicates hills from a cell based digital elevation model)
Figure 10. Point locations in the north of Murray Downs Station
(note:
1. that remotely sensed water polygons among the ranges are mostly not water but shade
2. shading indicates hills from a cell based digital elevation model
3. the Skinner Creek seepage spring is marked by a green square)
Figure 11. Point locations in the south-east of the Water Control District
(note: 1. that remotely sensed water polygons among the ranges are mostly not water but shade) 2. shading indicates hills from a cell based digital elevation model 3. the Spring Range spring is marked by a green square)
Figure 12. Point locations in the south-west of the Water Control District
(note:
1. that remotely sensed water polygons among the ranges are mostly not water but shade)
2. shading indicates hills from a cell based digital elevation model)
Figure 13. Point locations in the north-west of the Water Control District (note: shading indicates hills from a cell based digital elevation model)
2001, Mr Dorsey Debney, previous manager of Singleton Station.
Indicated that the floodwaters of the Taylor may sometimes reach those of Wycliffe Creek (corroborated by K.Bethel pers. comm.). Dorsey indicated that there is at least one permanent or semi-permanent waterhole near the Davenport Range and a large long lasting/permanent in-channel dam at the Stuart Highway (Wycliffe Waterhole). According to Dorsey the numerous waterholes marked on 1:250,000 scale topographic map in the upper catchment are typically shallow and not long lasting. Fish (unknown species) were introduced in 1989.
Redclaw (Cherax quadricarinatus) were introduced to Wycliffe Creek in the 1980s.

5 April 2001, Mr Grant Barber, Mt Skinner Station
Mr Barber showed us a photo of a spring he found at the base of the range which he believed to be the spring that caused the range to named Spring Range. The photo and Grant’s description indicated a minor spring with only shallow pools associated with it.

30 May 2001, Mr Sean Leigh, Murray Downs Station.
General discussions about wetland occurrence and type on the station.

24 July 2001 Mr Greg Vidler & Mrs Jo Vidler, Singleton Station.
General discussions about wetland occurrence and type on the station.

24 August 2009, Mrs Joan Parton, Murray Downs Station
Currently very dry conditions. Amelia Waterhole the only waterhole still with water. Large floods occurred in February 2008 event, starting with several weeks of rainy weather before the big flows happened and with relatively long lasting subsequent flow of the river. Adjacent to the homestead the river level was up to the bottom rail of the yards on the opposite back (>4m above river bed).

24 August 2009, Mr Graham Ride.
Piggery Swamp at Warrabri was full in early 2008, following river flows in February. Depth was estimated at about 2 metres.

15 June 2001, Mr Gil Bowman, Pine Hill Station, regarding semi-permanent water in the Hanson River catchment. On Pine Hill Station, spring fed pools may last for years but are not permanent (the dam in a natural claypan near Claypan Bore may be kept permanently inundated by pumping from the bore – not discussed with Mr Bowman).

18 June 2001, Mr Max Lines, Conniston Station, (discussions regarding fishes in the Hanson River system).
Spangled grunters (Leiopotherapon unicolor) were translocated to the Hanson River; probably with fish originating from Napperby Creek. Spangled grunter and also golden perch and silver perch were introduced to Mount Esther Dam on Anningie Station in the 1980s, and the dam has not been dry since (M.Lines pers. comm.). The dam probably connects to the Hanson River at times, but it is unlikely that either Golden Perch or Silver Perch persist in the Hanson River due to the lack of appropriate habitat (Duguid et al. 2005). These two introduced species are assumed to have been Macquaria sp. and Bidyanus bidyanus respectively (Duguid et al. 2005). There are no natural permanent waters, but a number of dams now allow the species to persist (M.Lines pers. comm.).

8 September 2003, Mr Sean Leigh, Murray Downs Station.
Described a seepage spring on Skinner Creek. Also mentioned Gastralobium Waterhole, notable for presence of flowing water in relatively dry time with below average rains the previous summer on the S side of the Davenport Ranges.

approx 2006, Mr Peter Bartlett, Alice Springs.
Peter reported visiting an area of Thring Swamp with a substantial waterbody with two species of ‘water lily’ (personal communications to both Peter Latz and to Angus Duguid). Peter was travelling with traditional Aboriginal owners of the area. It is likely that the species include one or more of Nymphaea immutabilis, Nymphoides indica and Nymphoides crenata. Possible locations may be (latitude 20 47 22,
longitude 134 15 45) which is about 3km NNE of Wycliffe Well (based on inspection of Google Earth imagery and Herbarium specimen labels, not on detailed location information from Peter Bartlett).

25 August 2009, Mr Will Stankey, Singleton Station.
The only waterhole still with any water on Singleton at this time was Ridgewall which was reduced to a small puddle a few metres across. However, Greg Vidler (previous manager c. 1998-2004) reported that Ridgewall Waterhole hadn’t dried out while he was managing the station.
Appendix 3: Preliminary wetland assessment for some individual wetlands

For ease of use, information is presented by property (e.g. Station or Land Trust). Information is presented from various sources, with a heading for each source.

Spatial coordinates for the wetland inventory sites from years 2000 and 2001 can be found in Duguid (2005). Additional information on these sites exists in the inventory database. Other miscellaneous sites are presented (site codes with the letters WDM, for Western Davenports Miscellaneous). These sites were located using a combination of:

- remote sensing of surface water indicated on Landsat TM images from the year 2000;
- wetland features shown on 1:250,000 scale topographic maps;
- with supplementary information obtained by inspecting areas using Google Earth imagery;
- some of the miscellaneous sites (not many) had been visited by the author, sometimes following information from landholders and other people.

Information presented for most sites is brief. A more comprehensive systematic set of information is presented for one wetland area: Wycliffe Creek Floodout Swamps because it was identified previously for possible inclusion in *A Directory of Important Wetlands in Australia*.

### Alayawarra Aboriginal Land Trust

#### Miscellaneous Site Information

**WDM24  (no name known)**  
GDA94 134.64555, -21.61638  
Waterbody detected on TM image (26 Mar 2000) about 10 km N of Indaringinya community; about 300m across, not on topo map; two nearby places shown on topo map as waterbodies were not inundated at this time. Google imagery indicates a pan/swamp collecting run-off from low rocky ground to SE.

**WDM25  (no name known)**  
GDA94 134.56055, -21.68444  
Waterbody detected on TM image (26 Mar 2000); about 16.5 km W of Indaringinya community; not mapped on topographic maps but various waterbodies in sparse dune field are mapped in the area (scattered across about 11 km by 17 km); Google imagery indicates this site is a pan but with a swamp near.

**WDM26  (no name known)**  
GDA94 134.56194, -21.72888  
Various small pans visible on Google imagery, some showing inundation on TM image (26 Mar 2000) and some mapped on topo maps.

**WDM27  (no name known)**  
GDA94 134.34138, -21.63861  
A small isolated waterbody detected on TM image (26 Mar 2000); Google imagery indicates a claypan about 200m long.

### Davenport Range National Park and adjacent station areas

The northern section of Murray Downs Station and the west of Singleton Station abut the proposed Davenport Range National Park. These areas are the upper catchment of Wycliffe Creek and the Murray Creek system where many waterholes are marked on the 1:250,000 topographic maps. There is minimal information about how long individual waterholes last. Dorsey Debney (pers. comm.) advised that those on Wycliffe Creek are not long lasting.
Karlantijpa South Aboriginal Land Trust

Miscellaneous Site Information

**WDM2**  ‘oxbowish swamp’
GDA94 133.45388, -20.518611
Hanson River Catchment. A wooded swamp connected to Hanson and possibly an old oxbow (cut-off river meander path); about 450 m long. Other swamps/pan in vicinity would fill in a major flood.

**WDM3**  ‘Hanson River floodplain pan’
GDA94 133.4625, -20.60944
Hanson River Catchment; similar to ‘oxbowish swamp’ (WDM2) but appearing to be unwooded - claypan?

**WDM4**  ‘possible discharge area’
GDA94 133.08138, -20.38916
Outside the Western Davenports Water Control District
Sandy (sand-dune) desert with area of pans/saline lakes about 17 km by 10 km; in dune fields; more than mapped and some of those on the topo map not with water detected from TM in year 2000 images; could this be a discharge area for deeper aquifers of western Davenports?

**WDM5**  Possible Swamp in outer Hanson River Floodplain
GDA94 133.49805, -20.3925
Hanson River Catchment. Substantial but possibly short-lasting swamp about 8 km east of lower Hanson River; Bretan Clifford delineated water from Quicklook TM image of 21 June 2000, but not detected on TM image of 8 Sept 2000; lower quality image in Google Earth and not discernable if this is a wooded swamp.

**WDM6**  Hanson River Floodout
133.39722, -20.39166
GDA94 Hanson River Catchment
Delineated on 250K topo map; and in Geodata 3 as 'Flats', Bretan Clifford delineated water from Quicklook TM image of 21 June 2000, but not detected on TM image of 8 Sept 2000. Bretan Clifford mapped the extension of surface water in the floodout to about 12 km longer than the area depicted as floodout on the topographic mapping.

Mt Skinner Station

Miscellaneous Site Information

**Spring Range Spring**
Information from Volume 2 of ‘*Wetlands of the arid NT*’ (Duguid 2005, p 9).
There is a spring on Spring Range in the north of Mt Skinner Station. The range is named on the Barrow Creek 1:250,000 topographic map but the location of the spring not shown. It may be in the vicinity of features marked as ‘Spring Bore’ and ‘Spring Range Waterhole’. Spring range rises about 150 m above the surrounding plain. Mr Grant Barber, lessee of Mt Skinner Station showed us a photo of a spring he found at the base of the range which he believed to be the spring. The photo and Grant’s description indicated a minor spring with only shallow pools associated with it.

Mungkarta Aboriginal Land Trust

Miscellaneous Site Information

**WDM28**  ‘McLaren Creek floodout swamp’
GDA94 134.18722, -20.35083
McLaren Creek Catchment. South side of wide dense wooded/shrubby floodway; relatively small area of surface water detected on TM image (26 Mar 2000) about 850 m x 150 m; vegetation and landform not distinct on Google Earth (medium resolution).
Bonney Creek floodout (Algoolgoora Swamp). Surface water detected on TM image (26 Mar 2000) about 220m x 90m; Google Earth (high res) shows wooded swamp with some open bare clay areas and connected to broad bare clay area (200m wide).

Bonney Creek floodout (Algoolgoora Swamp). Surface water detected in several small patches on TM image (26 Mar 2000) across about 450m x 200m; Google Earth (high res) shows sparsely wooded swamp.

Bonney Creek floodout (Algoolgoora Swamp). Surface water detected on TM image (26 Mar 2000) in linear pattern about 550m long; Google Earth (high res) shows bare clay channel like depression with high ground rising to SW; a bare clay 'pan' with scattered trees extends to the east and also shows water on the TM image.

Bonney Creek floodout (Algoolgoora Swamp). Surface water detected on TM image (26 Mar 2000) in two main patches, larger one about 720m x 600m; Google Earth (high res) wooded area with well formed channels on both the upstream and 'downstream' side.

Bonney Creek floodout (Algoolgoora Swamp). Surface water detected on TM image (26 Mar 2000) about 550m x 210m; Google Earth (high res) sparsely wooded swamp with bare clay area on SW sides, connected by narrow drainage depression to main swamp to south.

Most northerly section of a chain of large waterbodies aligned on the path by which floodwaters from Wycliffe Creek and other creeks may connect to Bonney Creek. This waterbody is not depicted on the 1:250,000 topographic map but is within the area marked as Algoolgoora swamp (land subject to inundation). TM imagery from 26 March 2000 shows water extending 2.4 km long, 1.5 km and 1 km long. It is presumed that at that time, they may have received water from the major creeks, but apart from the northern section that is connected to the Bonney Creek floodout (Algoolgoora Swamp), these pans may typically fill in isolation from major creeks. In all 9 waterbodies identified from TM data, of which 3 are mapped on the topographic map (mapped area much smaller than remotely sensed areas). The 3 largest are noted separately here (WDM42-44). The area is notably for the size and duration of water and also as the location of three records of the wetland plant *Nesaea repens* which is not known elsewhere in the water control district and is somewhat rare in the southern NT. Google Earth imagery shows large bare clay areas and some areas with milky-turbid water. Fringing areas are well vegetated, possibly with *Melaleuca glomerata*.

Middle of the three large waterbodies in chain, detected on TM image of 26 March 2000, at which time water extended 1.2 km long. A much smaller area within this area is mapped on the 1:250,000 topographic map,
presumably corresponding to a bare pan area. In the large inundation it is likely that several adjacent bare areas are inundated including areas of shrubland (possibly *Melaleuca glomerata*). No water detected here on image of 8 September 2000.

**WDM43** ‘most southerly of larger waterbodies in claypan chain on Mungkarta Land Trust’
GDA94 134.0275, - 20.46777
Most southerly of the three large waterbodies in chain, detected on TM image of 26 March 2000, at which time water extended 1.5 km long and up to 600m wide. A much smaller area within this area is mapped on the 1:250,000 topographic map, presumably corresponding to a bare pan area. Water also detected in an image of 8 September 2000 , measuring over 500m across. Peter Latz collected *Nesaea repens* here and described the location for this specimen as: “Annual with bright pink flowers. Infrequent, clay loam edge of seasonal swamp with *Melaleuca glomerata* and *Eragrostis falcata*”.

### Murray Downs Station

**Wetland inventory site descriptions for Murray Downs Station** *(from years 2000 & 2001)*

<table>
<thead>
<tr>
<th>Sitecode: MD1</th>
<th>Location: Murray Downs Station: Arabulja Waterhole, 15km ESE of homestead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary Description:</td>
<td>A temporary, shallow waterhole in a minor drainage line. Waterhole fringed by River Red Gums and Bean Trees with a good diversity of wetland herbs and grasses. Adjacent sections of creek dominated by Creek Teatree.</td>
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</table>

<table>
<thead>
<tr>
<th>Sitecode: MD2</th>
<th>Location: Murray Downs Station: Johnson's Waterhole, 16km ESE of homestead</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summary Description:</td>
<td>A temporary, shallow waterhole in a minor drainage line. Waterhole fringed by River Red Gums and Bean Trees with a good diversity of wetland herbs and grasses. Adjacent sections of creek dominated by Creek Teatree.</td>
</tr>
</tbody>
</table>

**Miscellaneous Site Information**

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<thead>
<tr>
<th>WDM10</th>
<th>‘Horse Paddock Swamps’</th>
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</thead>
<tbody>
<tr>
<td>Skinner/Murray Creek</td>
<td></td>
</tr>
<tr>
<td>swamps (&amp;?pans) NNW of Horse Paddock Bore; mapped on topo 250 and by land-unit mapping.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WDM37</th>
<th>‘swamp in Murray Creek floodout’</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDA94 134.52420, -20.99745</td>
<td></td>
</tr>
<tr>
<td>Murray Creek (floodout). Murray Downs station between Bottom Bore and No.8 Bore. Most flood-prone (?longest lasting water) of this traverse across the floodout: dense small E. victrix 5-8m tall, scattered <em>Erythrina vespertilio</em> (bean tree) and some red gums along a minor channel.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WDM38</th>
<th>‘swamp in Murray Creek floodout SE of No. 8 Bore’</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDA94 134.543057, -20.96796</td>
<td></td>
</tr>
<tr>
<td>Murray Creek (floodout). Murray Downs station, swamp about 1.5 km SE of No.8 Bore; persistent water detected on TM image (26 March 2000) about 300m across; central area of the swamp was <em>E. victrix</em> and <em>M. florulenta</em> with areas of abundant <em>Eleocharis pallens</em>, and patches of large <em>Glinus lotoides</em>; filled from branch of channels.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WDM7</th>
<th>‘Chabalowe Bore Swamp’</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDA94 134.64638, -21.22944</td>
<td></td>
</tr>
<tr>
<td>Land units 7.2 (seasonally flooded swamp, gilgaied grey clays, coolabah &amp; bluebush); 7.3 (closed depression, sheet-flow, yellow earth, mulga woodland and Eulalia); two distinct basins discernable on Google-Earth: one about 2 km WSW of the bore and one about 2km NNE of the bore and extending up to the bore as bare pan; topo map delineates the bare area but not the actual swamps; TM imagery of 26 Mar 2000 shows water mostly in the swamp to the NE &amp; NNE of the bore.</td>
<td></td>
</tr>
</tbody>
</table>
**WDM8  ‘Bluebush Bore Swamp’**
GDA94 134.49805, -21.10888
Land units 7.2 (seasonally flooded swamp, gilgaied grey clays, coolabah & bluebush); 7.3 (closed depression, sheetflow, yellow earth, mulga woodland and Eulalia); 3.4 open woodland of coolabah and mulga, with *Eragrostis eriopoda*; TM imagery of 26 Mar 2000 shows no water.

**WDM9  ‘Murray Creek - large floodout swamp west of Bottom Bore’**
GDA94 134.4725, -20.98666
Murray Creek Catchment. Largest area of long lastimg water on Murray Downs Station part of Murray Creek floodout; TM image of 26 March 2000 shows water covering a similar area to that marked as a waterbody on the 1:250,000 scale topo map – about 1 km by 500m. Mapped on 250K topo maps but not delineated in landunit mapping as separate from very extensive mulga-coolabah woodland (unit 3.4) and general floodout swamp, (unit 7.1 coolabah sometimes with lignum). A large part of this is fenced as a small paddock. There are no obvious banks and the area appears to be a broad shallow low point in the extensive floodout plain. The area appears to be heavily utilised by stock. It has a characteristic vegetation of *E. victrix* and *M. florulenta* over bare clay soil and some areas of *Eleocharis pallens*. A track heads east from the north side into a woodland of *Corymbia sp.* (either *C. aparrerinja* or *C. flavescens*) over *E. victrix, ?E. pallens*, occasional bean trees and *Fimbristylis sp.* (*F. littoralis*), with distinctive abundant termite mounds (MGA Z53: 445900E, 7678800N).

**Skinner Creek Seepage Springs**
Information from Volume 2 of ‘Wetlands of the arid NT’ (Duguid 2005, p 18).
470030 E, 7698900 N (AMG GPS)
6 km NE of Mudhole Yard on Skinner Creek, Murray Downs Station
Visited 8 September 2003 (A. Duguid). Series of small seepage springs over 50 m length of rocky/muddy lowland creek line. Minimal amounts of surface water. Heavily cattle impacted. Various wetland herbs and sedges (creek bed: *Centipeda minima, Lipocarpha microcephalus, Glinus oppositifolius*) were present but sparse and mainly in shelter of a few rocks and logs.

**Waterhole at Murray Downs Homestead** (marked on 1:250,000 topographic map but not named)
This is a long, waterhole in a very deep channel (approximately 4 m). However it typically lasts less than one year after filling without subsequent river flows (Joan Parton pers. comm.).

**Amelia Waterhole** (named on 1:250,000 topographic map)
This is one of the longest lasting waterholes on Murray Downs (Joan Parton pers. comm.).

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**Neutral Junction Station**

**Miscellaneous Site Information**

**WDM11  (no name known)**
Floodout/swamp areas running towards towards the south of Murray Downs station; adjacent to low hills. Seen on Google Earth.

**WDM12  ‘coolabah swamp north of Claypan Bore’**
GDA94 133.98666, -21.09861

**WDM13  ‘coolabah swamp NNW of Home of Bullion Dam’**
GDA94 133.98666, -21.09861
Coolabah swamp, 5.5 km NNW of Home of Bullion Dam (land-unit 7.9: coolabah, nardoo, budda pea, *Eragrostis cummingii*); inundation shown on TM image (26 Mar 2000).

**WDM14  ‘Claypan Bore claypan’**
GDA94 133.91555, -21.110277
Stony claypan. Type locality for *Marsilea cryptocarpa* (land-unit 7.8); inundated at west end in July 2000 (ground survey).

**WDM15  ‘claypan NNW of Home of Bullion Dam’**
Claypan, 10 km NNW of Home of Bullion Dam (land-unit 7.8); inundation shown on TM image (26 Mar 2000).

WDM16  Home of Bullion Dam
GDA94 135.54805, -21.574722
Dam, appears to have emergent woodland in parts on Google-Earth image (date 2 Jan 2006) with water extending about 230 x 320m.

WDM39  Taylor Creek outer floodout
GDA94 134.09663, -20.949107
Outer edge of Taylor floodout influence with Corymbia flavescens, visited on. Bretan Clifford mapped surface water extending 24 km north of channels marked on the 1:250,000 topographic map, using ‘quicklook’ Landsat TM images. This is within about 18 km of the floodout of Wycliffe Creek. A monitoring bore was visited on 25 August 2009, on the edge of thickened vegetation associated with the Taylor Creek (based on imagery). Based on inspection of imagery this area is deemed unlikely to hold surface water for long enough to be considered a wetland. The location visited was intermediate between the general sandplain and the floodout of the Taylor. Soils were sandy with sandplain species such as Triodia pungens, Acacia adsurgens and Acacia stipuligera, whilst the overstorey of Eucalyptus victrix and Corymbia flavescens (?X C. aparrerinja) indicated the influence of flood waters. Time did not permit walking into apparently denser vegetation to the SW (approx 200-500m distance based on imagery).

Taylor Creek floodout
Inspection of imagery for the Taylor floodout indicates that there is a substantial swamp area about 1.3 km NE of Bottom Bore on Neutral Junction Station, and extending about 1.5 km N-S. The TM imagery indicates that there was not standing water at 26 March 2000. Therefore, while the area warrants botanical survey, it is not of very high priority.

Singleton Station

Wetlands of the Wycliffe Creek Floodout and Floodplain
In the inventory of wetlands in the arid NT (Duguid et al. 2005), the wetlands of the Wycliffe Creek floodout and floodplain were assessed as meeting the criteria for possibly including them in A Directory of Important Wetlands in Australia (DIWA). The wetland aggregate was regarded as meeting criterion 1 – a good example of a wetland type in a biogeographic region. This was a subjective decision regarding a qualitative criterion. Reasons included the size of the area influenced by surface flooding in the floodout, the diversity of wetland types and the records of poorly collected plant species (possibly rare) in the district.

A draft description of the wetland was included in volume 2 of the inventory report (Duguid 2005) and is reproduced below, with some amendments.

Draft Description of ‘Wycliffe Creek Floodouts’ (in DIWA format)
Reference Number: NT-potential-31
Location:
Area: 0ha  Elevation: 0 m ASL
Wetland type: B10  Criteria for inclusion: 1
Site description: An aggregation of various wetland types associated with the floodplain and floodout of Wycliffe Creek. A number of small to medium sized freshwater swamps, lakes and ponds are inundated by overflow from Wycliffe Creek. Areas of longer lasting water include claypans (e.g. south side of Thring Swamp); swamps with emergent woodland of coolabah (gum barked coolabah - Eucalyptus victrix); swamps with emergent lignum (Muehlenbeckia florulenta) and scattered coolabah (e.g. on the north west side of Thring Swamp); and areas of intermediate type with open areas and fringing coolabah and or lignum. These areas of longer lasting water typically support a post-inundation herb-field of diverse herbaceous plant species which can be abundant in the saturated and damp soils. Most of the area of the floodplains and floodouts do not hold water long due to either flat topography or permeable somewhat sandy soils. However, because they are flood-prone these areas support distinctive vegetation types including some species typical of wetlands. Within the area shown on topographic maps as ‘Thring swamp’ these flood-prone areas include relatively rare areas of clay soil, areas of scattered coolabah trees and areas of shrubland dominated by mulga (Acacia aneura). In the areas west of the Stuart highway there are areas of loamy soil adjacent to minor creek channels with a diverse range of shrubs and herbs, open
areas of grassland/herbland where the channels disperse and areas of dense mixed shrubland where the floodwaters spread along shallow depressions to the north-west.

**Hydrological features:** The typical longevity of surface water in the swamps and pans has not been determined but is probably less than three months in most events but with some areas remaining for 6 months or longer. A monitoring bore in Thring Swamp has shown saturated groundwater at shallow depths of around 6 metres. It is not known how extensive such shallow aquifers are in the floodout system of Wycliffe Creek. It is likely that coolabah trees can maintain vigour by accessing this groundwater but it is not yet possible to determine how dependent the vegetation in general is on the groundwater, which is part of a perched aquifer system. Further work is required to understand the pathways by which surface water reaches some of the swamps and pans. It is possible that most of the water originates in the catchment of Wycliffe Creek during rain events. Local rainfall and runoff may also be important. Also, in large flood events, waters from Murray and Skinner creeks probably reaches Thring Swamp and connects with Wycliffe Creek. In very large flood events, water from Taylor Creek is presumed to reach the lower floodout of Wycliffe Creek which in turn may extend a long way north to join with other creeks draining from the west end of the Davenport Ranges. These may then terminate around Porcupine Swamp.

**Ecological features: Significance:** Several uncommon and disjunct wetland plants occur.

**Notable flora:** *Nymphoides indica* (Fringed Waterlily, Water Snowflake) is only known from here in the district and from 2 other places in the southern region of the Northern Territory both over 300 km away. *Nymphaea immutabilis* subsp. *immutabilis* (Black-soil Waterlily) is only known from here in the district and is about 180 km from the nearest other known collection to the north. *Nymphoides crenata* is also highly restricted in the southern NT. These water lilies have been observed at widely spaced time intervals indicating they are established residents that probably grow with each flood event. Plants were moderately well surveyed in 2001 with a high diversity of species recorded. However, an area of Coolabah swamp on the north of Thring Swamp has not been systematically surveyed but is the likely location for the ‘water lilies’. Several other somewhat uncommon plants are recorded from the floodout, none of which now has an official rare or threatened status: *Bergia occultipetala*, *Isotoma luticola*, *Marsilea crenata*, *Rotala occultiflora*, *Velleia macrocalyx*.

**Land tenure:** Singleton Station (pastoral lease)

**Current land use:** cattle production

**Disturbances or threats:** Potential: weeds, fire, domestic stock and feral herbivores

**Management authority and jurisdiction:** lessee

**Compiler and date:** Angus Duguid, December 2002, minor revision October 2009

**Site Description Preparation Status:** preliminary

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**Wetlands inventory site description for Singleton Station**

*(from years 2000 & 2001)*

Sitecode: W6
Location: Singleton Station: Wycliffe Waterhole, 200m E of Roadhouse
Summary Description: Artificially modified large and long-lasting waterhole in Wycliffe Creek.

Sitecode: Sing1
Location: Singleton Station: clay flats adjacent to Wycliffe Creek, 3 km North West of Wycliffe Well
Summary Description: Floodprone flats, with bare clay areas, on the floodplain of Wycliffe Creek.

Sitecode: Sing2
Location: Singleton Station: Wycliffe Creek, 500m North West of Wycliffe Well
Summary Description: Minor creek channel with Smooth-barked Coolabah trees.

Sitecode: Sing3
Location: Singleton Station: swamp and claypan 4km WNW of Wycliffe Well Roadhouse
Summary Description: Clay pan/ Lignum swamp with Smooth-barked Coolabahs on fringe and occasionally on the pan.

Sitecode: Sing4
Location: Singleton Station: minor flood plain adjacent to Wycliffe Creek, 2km South East of West Bore
Summary Description: Creek and adjacent floodplain. The creek and floodplain are dominated by
Smooth-barked Coolabahs. There are various distinct vegetation types on the floodplain, including bare heavy clay patches and a rich herb-field.

Sitecode: Sing5
Location: Singleton Station: 2km NW of West Bore
Summary Description: Open woodland of Smooth-barked Coolabah with grassy understorey. Trees very sparse in parts. Understorey included abundant *Isotoma luticola* in places.

Sitecode: Sing6
Location: Singleton Station: lower Wycliffe Creek floodout, 5km NW of Stockwell Bore
Summary Description: One of several parallel swamps in the lower floodout of Wycliffe Creek. Swamp areas are separated by sandplain (very low dunes). The swamps are dominated by Smooth-barked Coolabah trees with tall clumps of native grass (Silky Browntop) and various wetland understorey species.

Sitecode: Sing7
Location: Singleton Station: Waterhole on upper Wycliffe Creek
Summary Description: A relatively long-lasting lowland waterhole in area of rock outcrop outlying from the Davenport Range. Introduced Redclaw Yabbies were recorded here.

**Miscellaneous Site Information**

**WDM19** *(no name known)*
GDA94 133.93555, -20.797222
Possible small shallow swamp about 3 km W of Gost Gum Rise; water detected on TM image of 26 Mar 2000 but no distinct corresponding landform or vegetation discernable on Google-Earth

**WDM20** *(no name known)*
GDA94 133.93666, -20.83972
Possible small shallow swamp about 9 km SW of Ghost Gum Rise; water detected on TM image of 26 Mar 2000 but no distinct corresponding landform or vegetation discernable on Google-Earth.

**WDM21** *(no name known)*
GDA94 134.0225, -20.595
‘Paleo Wycliffe extension’. Largest in group of three small waterbodies detected on TM image of 26 Mar 2000; about 300 m across; located about 400m W of Gas Pipeline and 22 km S of Bonney Creek; no distinct corresponding landform or vegetation discernable on Google-Earth.

**WDM22** *(no name known)*
GDA94 134.00722, -20.59333
‘Paleo Wycliffe extension’. Small waterbody detected on TM image of 26 Mar 2000; one of group of 3; located about 2 km W of Gas Pipeline and 22 km S of Bonney Creek; no distinct corresponding landform or vegetation discernable on Google-Earth.

**WDM23** *(no name known)*
GDA94 134.00277, -20.57888
‘Paleo Wycliffe extension’. Small waterbody detected on TM image of 26 Mar 2000; one of group of 3; located about 2.5 km W of Gas Pipeline and 20 km S of Bonney Creek; no distinct corresponding landform or vegetation discernable on Google-Earth.

**WDM34** *‘small ti-tree swamp within Thring Swamp’*
GDA94 134.26775, -20.826687
Wycliffe Creek
Thring Swamp, track through south side from Wycliffe Well to Ali Curung. Low lying area with Melaleuca glomerata

**WDM35** *‘small coolabah swamp within Thring Swamp’*
GDA94 134.289418599, -20.83942
Thring Swamp, track through south side from Wycliffe Well to Ali Curung. Low lying swamp basin next to bore RN18338. Soil seemed to be heavier clay and was heavily pugged from stock. Dead remains of a perennial grass were abundant in parts (possibly Beetle Grass, *Leptochloa fusca*). *E. victrix* and *M. glomerata* were the dominant species.
WDM40  Thring - Possible Lily - Swamp
GDA94 134.275, -20.78944
Likely area from which lilies and *Pseudoraphis spinescans* have been recorded; on north side of 'Thring Swamp'.
Wooded swamp area consisting of 3 lobes, measuring about 400 m long, 230m long and 580 m long; about 3km NNE of Wycliffe Well roadhouse.

### Stirling Station

**Wetlands inventory site descriptions for**
**(from years 2000 & 2001)**

Sitecode: Stir1
Location: Stirling Station: 1km downstream of Illoquara Waterhole on main track
Summary Description: A residual waterhole in a creek fringed by River Red Gums - mostly dry. Above and below the waterhole the creek has a loose rocky bed.

Sitecode: Stir2
Location: Stirling Station: Illoquara Waterhole
Summary Description: A waterhole in a creek, fringed by River Red Gums, with water confined by outcropping rock.

Sitecode: Stir5
Location: Stirling Station: waterhole on Stirling Creek, 1km West of large waterhole marked on topographic map as 9 Mile (Hanson River system)
Summary Description: Shallow residual waterhole in River Red Gum lined creek, used as a water supply for road works.

Sitecode: Stir6
Location: Stirling Station: waterhole on Stirling Creek marked as 9 Mile Waterhole (Hanson River system)
Summary Description: Large mostly dry waterhole with banks about 2m high and river bed of pebbles with sandy area, lined by large River Red Gums. Small shallow residual pools with numerous fish.

Sitecode: Stir8
Location: Stirling Station: indistinct claypan/swamp, 2 km south of Browns Yard (Hanson River system)
Summary Description: Floodprone flats or swamp with areas of bare cracking clay, scattered Smooth-barked Coolabah trees, Swamp Canegrass, Lignum and Nardoo. Some adjacent areas are more densely wooded. This is part of much larger floodout flats from Murray Creek, a tributary of the Hanson River.

Sitecode: Stir10
Location: Stirling Station: Gum barked Coolibah Swamp 4km NW of Wollagalong Bore, on East side of track to North West Bore (Hanson River system)
Summary Description: A small dry wooded swamp of Smooth-barked Coolabah.

Sitecode: Stir11
Location: Stirling Station: small swamp 1km East North East of North West Bore (on the Hanson River floodplain)
Summary Description: A small dry swamp with dense Budda Pea and Nardoo with occasional Smooth-barked Coolabah and Acacia aneura.  
(Stir11 is on the boundary of the Western Davenports Water Control District)

Sitecode: Stir12
Location: Stirling Station: minor floodout channel from Hanson River, 3km SE of North West Bore on track to Wollagalong Bore (Hanson River system)
Summary Description: Dominant plants include Budda Pea and Smooth-barked Coolabah.

Sitecode: Stir13
Location: Stirling Station: small vegetated pan, approximately 4.5km S of Wollagalong Bore (Hanson River system)
Summary Description: A grassy pan/swamp surrounded by Mulga shrubland.
Sitecode: Stir14
Location: Stirling Station : Hanson River, 7km S of Wollagalong (Hanson River system)
Summary Description: At this point the river consists of a series of several minor sandy channels with the largest on the east side with Inland Teatree and Smooth-barked Coolabah trees.

**Miscellaneous Site Information**

**WDM1**  ‘wooded swamp in lower Hanson River area’
GDA94 133.57694, -20.88944
Hanson River Catchment. Sparse wooded swamp in lower Hanson River area. Over 2 km long.

**WDM17**  ‘claypan west of Mt Stirling’
GDA94 133.611666, -21.6730555
Hanson River floodplain. Claypan west of Mt Stirling, adjacent to Hanson River. Mapped on topographic map (inundated on 22 Mar 2004 Google-Earth Image - milky grey water with scattered emergent trees)

**WDM18**  ‘claypans on west side of Hanson River and west of Mt Stirling’
GDA94 133.56666, -21.673055
2 Claypans, close together, west side of Hanson River & west of Mt Stirling, both about 200m across, both inundated - coffee brown - on 22 Mar 2004 Google-Earth Image (coords for more northerly pan).

**Warrabri Aboriginal Land Trust**

**Miscellaneous Site Information**

**WDM36**  Piggery Swamp / Warrabri Swamp
GDA94 134.421607, -20.98092
Murray Creek/Warrabri Swamp. Piggery Swamp (probably the longest lasting part of Warrabri Swamp); about 300m E-W x 250m N-S; predominantly bare with fringing coolabah and lignum, some large coolabah trees in centre, northern end of swamp with scattered coolabah and lignum; estimated about 2m deep in 2008 when filled. There is a distinct bank on the south-east side of the swamp. Filled from north where a much larger but possibly shorter lasting part of the swamp occurs. The floodout influence continues to the north west with other swamp areas discernable on Google-Earth imagery.

Additional notes on the Warrabri Swamp.
The larger area (to the north and north east) appears on Google Earth to have scattered small trees &/or shrubs which are probably a combination of *E. victrix* and *M. florulenta*.
A smaller area of water/saturated soil is evident on the TM image (102/75 on 26 March 2000) about 4km WNW of piggery swamp along the floodway towards Thring Swamp. Dark tones on the TM imagery (RGB 741) indicates dense vegetation and/or damp soil while Google Earth indicates only moderately dense vegetation. The imagery indicates longest lasting water and patches of dense vegetation at the NE end of this area, which extends for about 1 km from NE to SW and is around 600 m wide. Vegetation and soil characteristics are hard to discern with the intermediate detail of imagery currently available on Google Earth. This swamp straddles the boundary between Murray Downs and Warrabri Land Trust and is roughly 2km east of monitoring bores RN 18444 and RN 18452. Another area of apparently less long-lasting water (TM imagery indicates dense vegetation and/or damp soil while Google Earth indicates only moderately dense vegetation) occurs about 1.5 km to the SW in a terminal ‘finger’ of the floodout. This can be accessed by a track that extends from the boundary towards the production bore road. Another area of apparently less long-lasting water on the Land Trust is 2 km to the SE of Piggery Swamp in what appears to be a separate terminal ‘finger’ of the floodout. Google Earth imagery indicates some similarity to the shallower swamp country on the north side of Piggery Swamp and a minor vehicular track can be seen skirting the swamp.
Appendix 4: Wetland Plant Species Known from the Western Davenports Water Control District

Explanatory notes follow the list of species.

- **Abutilon otocarpum** MALVACEAE [Keeled Lantern-bush] Lfmr:SLP/P-Fb/Ss {no wetland fidelity but common in some wetland types}
- **Acacia aneura** MIMOSACEAE [Mulga] Lfmr:P-Sh/Tr {no wetland fidelity but common in some wetland types}
- **Acacia cowleana** MIMOSACEAE [Halls Creek Wattle] Lfmr:P-Sh/Tr {occurs in drylands and wetlands - slight fidelity to wetlands}
- **Acacia estrophiolata** MIMOSACEAE [Ironwood] Lfmr:P-Tr {no wetland fidelity but common in some wetland types}
- **Acacia georginae** MIMOSACEAE [Georgina Gidgee] Lfmr:P-Tr/Sh {no wetland fidelity but common in some wetland types}
- **Acacia neurocarpa** MIMOSACEAE Lfmr:P-Sh/Tr {typically in wetlands (high fidelity)}
- **Acacia tetragonophylla** MIMOSACEAE [Dead Finish] Lfmr:P-Sh {no wetland fidelity but common in some wetland types}
- **Achyranthes aspera** AMARANTHACEAE [Chaff-flower] Lfmr:A/SLP~Fb {occurs in drylands and wetlands - slight fidelity to wetlands}
- **Aeschynomene indica** FABACEAE [Budda Pea] Lfmr:A/SLP-Fb/Ss {typically in wetlands (high fidelity)}
- **Alternanthera angustifolia** AMARANTHACEAE [Narrow-leaf Joyweed] Lfmr:A/SLP-Fb {typically in wetlands (high fidelity)}
- **Alternanthera denticulata** AMARANTHACEAE [Lesser Joyweed] Lfmr:A/SLP-Fb {typically in wetlands (high fidelity)}
- **Alternanthera denticulata var. denticulata** AMARANTHACEAE [Lesser Joyweed] Lfmr:A/SLP~Fb {typically in wetlands (high fidelity)}
- **Alternanthera nana** AMARANTHACEAE [Hairy Joyweed] Lfmr:A/SLP-Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}
- **Amaranthus cochleitepalus** AMARANTHACEAE Lfmr:A~Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}
- **Ammannia multiflora** LYTHRACEAE [Jerry Jerry] Lfmr:A-Fb {typically in wetlands (high fidelity)}
- **Aristida contorta** POACEAE [Bunched Kerosene Grass] Lfmr:A/SLP-MHb {no wetland fidelity but common in some wetland types}
- **Aristida holothera** var. holathera POACEAE [Erect Kerosene Grass] Lfmr:A/SLP-MHb {no wetland fidelity but common in some wetland types}
- **Atalaya hemiglauca** SAPINDACEAE [Whitewood] Lfmr:P-Tr {no wetland fidelity but common in some wetland types}
- **Atriplex elachophylla** CHENOPODIACEAE [Annual Saltbush] Lfmr:A/SLP-P-Fb/Ss {no wetland fidelity but common in some wetland types}
- **Bacopa floribunda** SCROPHULARIACEAE Lfmr:A/SLP-Fb {occurs in drylands and wetlands - moderate fidelity to wetlands; apparently rare in general district}
- **Bergia ammannioides** ELATINACEAE [Water-fire] Lfmr:A-Fb {typically in wetlands (high fidelity)}
- **Bergia henshallii** ELATINACEAE Lfmr:P-Fb/Ss {typically in wetlands (moderate/high fidelity)}
- **Bergia occuliptetala** ELATINACEAE Lfmr:P/SLP/A-Fb {typically in wetlands (high fidelity)}
- **Bergia pedicellaris** ELATINACEAE Lfmr:A-Fb {typically in wetlands (high fidelity)}
- **Bergia perennis** ELATINACEAE [Desert Mat] Lfmr:P-Fb {typically in wetlands (high fidelity)}
- **Bergia triglomerata** ELATINACEAE [Small Water-fire] Lfmr:SLP/P-Fb {typically in wetlands (high fidelity)}
- **Blumea diffusa** ASTERACEAE Lfmr:2A/SLP-Fb {occurs in drylands and wetlands - seems to have moderate fidelity to wetlands; apparently rare in general district}
- **Blumea integrigolia** ASTERACEAE Lfmr:2A/SLP-P-Fb {occurs in drylands and wetlands - slight fidelity to wetlands}
- **Blumea saxatilis** ASTERACEAE Lfmr:2A/SLP-Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}
- **Blumea tenella** ASTERACEAE Lfmr:2A/SLP-Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}
- **Boerhavia coccinea** NYCTAGINACEAE [Tar Vine] Lfmr:P-Fb {occurs in drylands and wetlands - slight fidelity to wetlands}
- **Boerhavia repleta** NYCTAGINACEAE Lfmr:P-Fb {occurs in drylands and wetlands - slight fidelity to wetlands}
- **Boerhavia schomburgkiana** NYCTAGINACEAE [Yipa] Lfmr:P-Fb {occurs in drylands and wetlands - slight fidelity to wetlands}
- **Bothriochloa bladhii** subsp. bladhii POACEAE [Forest Bluegrass] Lfmr:P-MHb {typically in wetlands (high fidelity); apparently rare in general district}
Bothriochloa ewartiana  POACEAE  [Desert Bluegrass]  Lfrm:P–MHb
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Brachychne convergens  POACEAE  [Spider Grass]  Lfrm:A/SLP–MHb
{occurs in drylands and wetlands - moderate fidelity to wetlands}

§ Brachyscome ciliaris complex  ASTERACEAE  [Variable Daisy]  Lfrm:A/SLP/P–Fb
{occurs in drylands and wetlands - slight fidelity to wetlands; apparently rare in general district}

Bulbostylis barbata  CYPERACEAE  [Short-leaved Rush]  Lfrm:A–MHb
{occurs in drylands and wetlands - slight fidelity to wetlands}

§ Bulbostylis turbinata  CYPERACEAE  Lfrm:A–MHb
{occurs in drylands and wetlands - moderate fidelity to wetlands; apparently rare in general district}

Calandrinia ptychosperma  PORTULACACEAE  [Creeping Parakeelya]  Lfrm:A–Fb
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Calandrinia pumila  PORTULACACEAE  [Tiny Parakeelya]  Lfrm:A/SLP–Fb  {typically in wetlands (high fidelity)}

Calandrinia stagnensis  PORTULACACEAE  Lfrm:A–Fb  {occurs in drylands and wetlands - moderate fidelity to wetlands}

§ Calotis breviseta  ASTERACEAE  Lfrm:P–Fb/Ss
{occurs in drylands and wetlands - moderate fidelity to wetlands; apparently rare in general district}

Calotis hispidula  ASTERACEAE  [Bogan Flea]  Lfrm:A–Fb  {occurs in drylands and wetlands - slight fidelity to wetlands}

§ Calotis plumulifera  ASTERACEAE  [Woolly-headed Burr-daisy]  Lfrm:A–Fb
{occurs in drylands and wetlands - moderate fidelity to wetlands; apparently rare in general district}

Calotis porphyroglossa  ASTERACEAE  [Channel Burr-daisy]  Lfrm:A–Fb
{occurs in drylands and wetlands - moderate fidelity to wetlands; apparently rare in general district}

Carissa lanceolata  APOCYNACEAE  [Conkerberry]  Lfrm:P–Sh  {occurs in drylands and wetlands - slight fidelity to wetlands}

Cassytha filiformis  LAURACEAE  [Hairy Dodder-laurel]  Lfrm:P–HP
{occurs in drylands and wetlands - slight to moderate fidelity to wetlands}

* Cenchrus ciliaris  POACEAE  [Buffel Grass]  Lfrm:P–MHb  {occurs in drylands and wetlands - slight fidelity to wetlands}

* Cenchrus echinatus  POACEAE  [Mossman River Grass]  Lfrm:A/SLP–MHb
{occurs in drylands and wetlands - moderate fidelity to wetlands}

* Chloris virgata  s.lat.  POACEAE  [Feathertop Rhodes Grass]  Lfrm:A/SLP–MHb
{occurs in drylands and wetlands - slight to moderate fidelity to wetlands}

Chrysopogon fallax  POACEAE  [Golden Beard Grass]  Lfrm:P–MHb
{occurs in drylands and wetlands - slight fidelity to wetlands}

* Citrullus colocynthis  CUCURBITACEAE  [Bitter Paddy Melon]  Lfrm:P–Fb/Cl
{occurs in drylands and wetlands - slight fidelity to wetlands}

* Citrullus lanatus  CUCURBITACEAE  [Paddy Melon]  Lfrm:A–Fb/Cl  {occurs in drylands and wetlands - slight fidelity to wetlands}

Cleome viscosa  CAPPARACEAE  [Tickweed]  Lfrm:A–Fb  {occurs in drylands and wetlands - slight fidelity to wetlands}

§ Coleocoma centaurea  ASTERACEAE  Lfrm:SLP/P–Ss  {typically in wetlands (high fidelity); apparently rare in general district}

Convulvulus clementii  CONVOLVULACEAE  [Australian Bindweed]  Lfrm:A/SLP/P–Fb/Cl
{occurs in drylands and wetlands - slight fidelity to wetlands}

Corchorus tridens  TILIACEAE  Lfrm:A/SLP–Fb  {occurs in drylands and wetlands - slight to moderate fidelity to wetlands}
Corymbia flavescens MYRTACEAE Lfrm:P~Tr {occurs in drylands and wetlands - moderate fidelity to wetlands}
Cressa australis CONVOLVULACEAE Lfrm:P~Fb {typically in wetlands (high fidelity)}
Crinum flaccidum LILIACEAE [Sandover Lily] Lfrm:P~MHb {occurs in drylands and wetlands - slight to moderate fidelity to wetlands}
Crotalaria ramosissima FABACEAE Lfrm:?A/SLP/P~Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}
Crotalaria smithiana FABACEAE [Yellow Rattlepod] Lfrm:SLP/P~Fb/Ss {occurs in drylands and wetlands - slight fidelity to wetlands}
Cullen australasicum FABACEAE [Tall Verbine] Lfrm:?A/SLP/P~Fb/Ss {occurs in drylands and wetlands - high fidelity}
Cullen cinereum FABACEAE [Annual Verbine] Lfrm:?A/SLP~Fb {typically in wetlands (high fidelity)}
Cullen leucanthum FABACEAE [White Verbine] Lfrm:?SLP/P~Ss {occurs in drylands and wetlands - moderate fidelity to wetlands}
Cullen walkingtonii FABACEAE Lfrm:?SLP/P~?Ss {occurs in drylands and wetlands - moderate fidelity to wetlands; a rare species listed as Near Threatened but only record from WDWAD is from Lenee Creek catchment; further survey required}
Cymbopogon ambiguus POACEAE [Native Lemon Grass] Lfrm:P~MHb {occurs in drylands and wetlands - slight fidelity to wetlands}
Cynodon dactylon POACEAE [Couch Grass] Lfrm:P~MHb {typically in wetlands (high fidelity)}
Cyperus betchei CYPERACEAE subsp. commiscens CYPERACEAE Lfrm:P~MHb {occurs in drylands and wetlands - high fidelity}
Cyperus bifrax CYPERACEAE [Downs Nutgrass] Lfrm:P~MHb {occurs in drylands and wetlands - high fidelity}
Cyperus blakeanus CYPERACEAE Lfrm:P~MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}
Cyperus bulbosus CYPERACEAE [Yalka] Lfrm:P~MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}
Cyperus carinatus CYPERACEAE Lfrm:P~MHb {typically in drylands and wetlands - moderate fidelity to wetlands}
Cyperus castaneus CYPERACEAE Lfrm:A~MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}
Cyperus centralis CYPERACEAE Lfrm:A~MHb {typically in wetlands (high fidelity)}
Cyperus concinnus CYPERACEAE [Trim Sedge] Lfrm:P~MHb {typically in wetlands (high fidelity)}
Cyperus conicus CYPERACEAE [Cone Umbrella Rush] Lfrm:P~MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}
Cyperus dactylotes CYPERACEAE Lfrm:P~MHb {typically in wetlands (high fidelity)}
Cyperus dactyloides CYPERACEAE Lfrm:A~MHb {typically in wetlands (high fidelity)}
Cyperus exaltatus CYPERACEAE [Giant Sedge] Lfrm:A~MHb {typically in wetlands (high fidelity); apparently rare in general district}
Cyperus hamulosus CYPERACEAE Lfrm:A~MHb {typically in wetlands (high fidelity)}
Cyperus holoschoenus CYPERACEAE [Umbrella Sedge] Lfrm:P~MHb {typically in wetlands (high fidelity)}
Cyperus iria CYPERACEAE Lfrm:A~MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}
Cyperus nervulosus CYPERACEAE Lfrm:A~MHb {typically in wetlands (high fidelity)}
Cyperus pulchellus CYPERACEAE [White Button Sedge] Lfrm:A/SLP~MHb {typically in wetlands (high fidelity)}
Cyperus pygmaeus CYPERACEAE [Dwarf Sedge] Lfrm:A~MHb {occurs in drylands and wetlands - moderate fidelity to wetlands; apparently rare in general district}
Cyperus squarrosus CYPERACEAE [Bearded Flat-sedge] Lfrm:A~MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}
Dactyloctenium radulans POACEAE [Button Grass] Lfrm:A~MHb {occurs in drylands and wetlands - slight fidelity to wetlands}
Dentella asperata RUBIACEAE [Rough Mat-plant] Lfrm:P~Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}
Dichanthium fecundum POACEAE [Curly Bluegrass] Lfrm:P~MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}
Dichanthium sericeum subsp. sericeum POACEAE [Silky Bluegrass] Lfrm:SLP/P~MHb {occurs in drylands and wetlands - slight fidelity to wetlands}
Digitaria brownii POACEAE [Cotton Panic Grass] Lfrm:P/SLP~MHb {no wetland fidelity but common in some wetland types}
Digitaria longiflora POACEAE Lfrm:A/SLP~MHb {occurs in drylands and wetlands - slight fidelity to wetlands; apparently rare in general district}
Diplatia grandibractea LORANTHACEAE [Royal Mistletoe] Lfrm:P~Mt {occurs in drylands and wetlands - moderate fidelity to wetlands}
§ *Dodonaea viscosa* subsp. *mucronata* SAPINDACEAE [Hill Sticky Hopbush] Lfrm:P–Sh (typically in wetlands (high fidelity); apparently rare in general district)

*Drosera burmanni* DROSERACEAE [Tropical Sundew] Lfrm:A–Fb (typically in wetlands (high fidelity))

*Drosera indica* DROSERACEAE [Narrow-leaved Sundew] Lfrm:A–Fb (typically in wetlands (high fidelity))

§ *Dysphania sphaerosperma* CHENOPODIACEAE [Hill Sticky Hopbush] Lfrm:P–Sh (typically in wetlands (high fidelity); apparently rare in general district)

*Echinochloa colona* POACEAE [Awnless Barnyard Grass] Lfrm:A–MHb (occurs in drylands and wetlands - slight fidelity to wetlands)

*Ectrosia scabrida* POACEAE [Hares-foot Grass] Lfrm:A–Fb (occurs in drylands and wetlands - moderate fidelity to wetlands)

*Ectrosia schultzii* var. *annua* POACEAE [Hares-foot Grass] Lfrm:A/SLP–MHb (occurs in drylands and wetlands - moderate fidelity to wetlands)

*Einadia nutans* subsp. *eremaea* CHENOPODIACEAE [Climbing Saltbush] Lfrm:P–Ss/Sh (no wetland fidelity but common in some wetland types)

*Elacholoma hornii* SCROPHULARIACEAE [Elacholoma] Lfrm:A–Fb (occurs in drylands and wetlands - moderate fidelity to wetlands)

§ *Elatine gratioloides* ELATINACEAE [Waterwort] Lfrm:A/SLP–Fb (typically in wetlands (high fidelity); apparently rare in general district)

§ *Elatine macrocalyx* ELATINACEAE [Claypan Waterwort] Lfrm:A–Fb (typically in wetlands (high fidelity); a rare species listed as Near Threatened; 1 record in WDWCD in Wycliffe Creek floodout swamp)

*Eleocharis atropurpurea* CYPERACEAE Lfrm:A–MHb (typically in wetlands (high fidelity))

*Eleocharis pallens* CYPERACEAE [Pale Spike-rush] Lfrm:P–MHb (typically in wetlands (high fidelity))

*Elytrophorus spicatus* POACEAE [Spikegrass] Lfrm:A–MHb (typically in wetlands (high fidelity))

*Enneapogon acicularis* s.lat. POACEAE [Curly Windmill Grass] Lfrm:P–MHb (occurs in drylands and wetlands - slight to moderate fidelity to wetlands)

*Enteropogon ramosus* POACEAE [Creek Windmill Grass] Lfrm:P–MHb (occurs in drylands and wetlands - moderate fidelity to wetlands)

*Eragrostis australasica* POACEAE [Swamp Canegrass] Lfrm:P–MHb (typically in wetlands (high fidelity))

*Eragrostis bissetiana* POACEAE [Near Lovegrass] Lfrm:A–MHb (occurs in drylands and wetlands - slight to moderate fidelity to wetlands)

*Eragrostis confertiflora* POACEAE [Spike Lovegrass] Lfrm:A–MHb (occurs in drylands and wetlands - moderate fidelity to wetlands)

*Eragrostis cumingii* POACEAE [Cummings Lovegrass] Lfrm:A–MHb (occurs in drylands and wetlands - moderate fidelity to wetlands)

*Eragrostis dielsii* POACEAE [Mallee Lovegrass] Lfrm:A/SLP–MHb (occurs in drylands and wetlands - moderate fidelity to wetlands)

*Eragrostis elongata* POACEAE [Clustered Lovegrass] Lfrm:P–MHb (typically in wetlands (high fidelity))

*Eragrostis falcata* POACEAE [Sickle Lovegrass] Lfrm:P/SLP–MHb (occurs in drylands and wetlands - moderate fidelity to wetlands)

*Eragrostis kennedyae* POACEAE [Small-flowered Lovegrass] Lfrm:SLP/P–MHb (typically in wetlands (high fidelity))

*Eragrostis leptocarpa* POACEAE [Drooping Lovegrass] Lfrm:A/SLP–MHb (typically in wetlands (high fidelity))

§ *Eragrostis parviflora* POACEAE [Weeping Lovegrass] Lfrm:A/SLP–MHb (typically in wetlands (high fidelity); apparently rare in general district)

*Eremophila longifolia* MYOPORACEAE [Weeping Emu Bush] Lfrm:P–Sh/Tr (common in some wetland types, possibly some fidelity to wetlands)
Eremophila maculata subsp. maculata  MYOPORACEAE  [Spotted Fuchsia]  Lfrm:P–Sh  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

{no wetland fidelity but common in some wetland types}

Eriachne armittii  POACEAE  [Longawn Wanderrie]  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Eriachne benthamii  POACEAE  [Swamp Wanderrie]  Lfrm:P–MHb  
{typically in wetlands (high fidelity)}

Eriachne nervosa  POACEAE  [Plains Wanderrie]  Lfrm:P–MHb  
{occurs in drylands and wetlands - slight fidelity to wetlands}

{typically in wetlands (high fidelity); listed as Data Deficient (poorly known) but unlikely to be truly rare}

Eriachne armitii  POACEAE  [Longawn Wanderrie]  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Eriachne benthamii  POACEAE  [Swamp Wanderrie]  Lfrm:P–MHb  
{typically in wetlands (high fidelity)}

{typically in wetlands (high fidelity); listed as Data Deficient (poorly known) but unlikely to be truly rare}

Eriachne armitii  POACEAE  [Longawn Wanderrie]  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Eriachne benthamii  POACEAE  [Swamp Wanderrie]  Lfrm:P–MHb  
{typically in wetlands (high fidelity)}

{typically in wetlands (high fidelity); listed as Data Deficient (poorly known) but unlikely to be truly rare}

Eriocaulon cinereum  ERIOCALUACEAE  Lfrm:A~MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Eriocaulon pyrgmaeum  ERIOCALUACEAE  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Erythrina vespertilio  FABACEAE  [Bean Tree]  Lfrm:P–Tr  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Eucalyptus camaldulensis var. obtusa  MYRTACEAE  [River Red Gum]  Lfrm:P–Tr  
{typically in wetlands (high fidelity)}

Eucalyptus victrix  MYRTACEAE  [Gum-barked Coolibah]  Lfrm:P–Tr  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Eulalia aurea  POACEAE  [Silky Browntop]  Lfrm:A~MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Euphorbia biconvexa  EUPHORBIACEAE  Lfrm:SA/SLP/P–Fb/Ss  
{occurs in drylands and wetlands - slight fidelity to wetlands}

Evolvulus alsinoides  CONVOLVULACEAE  [Tropical Speedwell]  Lfrm:SA/SLP/P–Fb/Ss  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Fimbristylis aestivalis  CYPERACEAE  [Summer Fringe-rush]  Lfrm:A–MHb  
{typically in wetlands (high fidelity)}

§ Fimbristylis blakei [Summer Fringe-rush]  Lfrm:A–MHb  
{seems to have high wetland fidelity in the district; a rare species listed as Near Threatened - only known from one spring in the Whistleduck Creek catchment}

Fimbristylis caespitosa  CYPERACEAE  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Fimbristylis depauperata  CYPERACEAE  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands; listed as Data Deficient (poorly known)}

Fimbristylis dichotoma  CYPERACEAE  Lfrm:A–MHb  
{occurs in drylands and wetlands - slight fidelity to wetlands}

Fimbristylis littoralis var. littoralis  CYPERACEAE  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Fimbristylis signata  CYPERACEAE  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands; disjunct in southern NT and apparently rare in general district}

§ Fimbristylis tetragona  CYPERACEAE  Lfrm:A–MHb  
{typically in wetlands (high fidelity); apparently rare in general district}

§ Fimbristylis velata  CYPERACEAE  Lfrm:A–MHb  
{typically in wetlands (high fidelity); listed as Data Deficient (poorly known)}

Frankenia cordata  FRANKENIACEAE  [Salty Heath]  Lfrm:P–Sh  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Fuirena ciliaris  CYPERACEAE  [Small Club Rush]  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Fuirena incrassata  CYPERACEAE  Lfrm:A–MHb  
{typically in wetlands (high fidelity)}

Glinus lotoides  MOLLUGINACEAE  [Hairy Carpet Weed]  Lfrm:A/SLP–Fb  
{typically in wetlands (high fidelity)}

Glinus oppositifolius  MOLLUGINACEAE  [Slender Carpet-weed]  Lfrm:A–Fb  
{typically in wetlands (high fidelity)}

§ Glinus orygioideus  MOLLUGINACEAE  Lfrm:A/SLP/P–Fb/Ss  
{typically in wetlands (high fidelity)}

Glossostigma diandrum  SCROPHULARIACEAE  Lfrm:A–Fb  
{typically in wetlands (high fidelity)}

Glycine canescens  FABACEAE  [Silky Glycine]  Lfrm:P–Cl  
{occurs in drylands and wetlands - slight fidelity to wetlands}

Gnaphalium diantinum  ASTERACEAE  Lfrm:A–Fb  
{typically in wetlands (high fidelity)}

Goodenia hirsuta subsp. Run-on areas (P.K.Latz 1216)  GOODENIACEAE  Lfrm:P–Fb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}

Goodenia lamprosperma  GOODENIACEAE  Lfrm:A–MHb  
{occurs in drylands and wetlands - moderate fidelity to wetlands}
Goodenia lunata GOODENIACEAE [Heavy-soil Hand-flower] Lfrm:P–Fb {occurs in drylands and wetlands - slight fidelity to wetlands}

Goodenia maideniana GOODENIACEAE [Salt Hand-flower] L frm:P–Fb {occurs in drylands and wetlands - slight fidelity to wetlands; apparently rare in general district}

Goodenia modesta GOODENIACEAE L frm:SLP/P–Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}

Gossypium bickii MALVACEAE [Low Desert Rose] L frm:P–Ss/Sh {occurs in drylands and wetlands - slight fidelity to wetlands; apparently rare in general district}

Gymnanthera cunninghamii ASCLEPIADACEAE L frm:P–Sh {typically in wetlands (high fidelity); a rare species listed as Near Threatened; occurs in rocky creeks with several records in area between Stirling Swamp and Barrow Creek}

Hakea arborescens PROTEACEAE [Yellow Hakea] L frm:P–Tr/Sh {occurs in drylands and wetlands - slight fidelity to wetlands}

Heliotropium curassavicum BORAGINACEAE [Smooth Heliotrope] L frm:A–Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}

Heliotropium ovalifolium BORAGINACEAE L frm:P–Fb/Ss {occurs in drylands and wetlands - moderate fidelity to wetlands}

Heteropogon contortus POACEAE [Bunch Speargrass] L frm:?P/SLP–MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}

Hibiscus merauluksis MALVACEAE L frm:?SLP/P–Fb/Ss {occurs in drylands and wetlands - moderate fidelity to wetlands}

Hypericum gramineum s.lat. CLUSIACEAE [Small St.Johns Wort] L frm:?A/SLP/P–Fb {typically in wetlands (high fidelity)}

Indigofera colutea FABACEAE [Sticky Indigo] L frm:A–SLP/Fb {no wetland fidelity but common in some wetland types}

Indigofera linifolia FABACEAE [Native Indigo] L frm:A–SLP/Fb {occurs in drylands and wetlands - slight fidelity to wetlands}

Indigofera linnaei FABACEAE [Birdsville Indigo] L frm:?SLP/P–Fb {occurs in drylands and wetlands - slight fidelity to wetlands}

Ipomoea coptica CONVOLVULACEAE L frm:A–Fb/Cl {occurs in drylands and wetlands - moderate fidelity to wetlands}

Ipomoea muelleri CONVOLVULACEAE [Native Morning Glory] L frm:P–Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}

Ipomoea racemigera CONVOLVULACEAE L frm:A/SLP–Fb/Cl {typically in wetlands (high fidelity)}

Isotoma luticola CAMPANULACEAE L frm:A–Fb {occurs in drylands and wetlands - moderate to high fidelity to wetlands}

Leptochloa fusca subsp. fusca POACEAE [Small-flowered Beetle Grass] L frm:P–Fb {occurs in drylands and wetlands - high fidelity; apparently rare in general district}

Leptochloa fusca subsp. muelleri POACEAE [Brown Beetle Grass] L frm:SLP/P–MHb {typically in wetlands (high fidelity)}

Lipocarpha microcephala CYPERACEAE [Button Rush] L frm:A–MHb {typically in wetlands (high fidelity)}

Lotus cruentus s.lat. FABACEAE [Red-flower Trefoil] L frm:A/SLP–Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}

Ludwigia octovalvis ONAGRACEAE [Willow Primrose] L frm:A–Fb/Ss {typically in wetlands (high fidelity)}

Ludwigia perennis ONAGRACEAE L frm:A–Fb {typically in wetlands (high fidelity)}

Lysiana spatulata LORANTHACEAE [Flat-leaved Mistletoe] L frm:P–Mt {no wetland fidelity but common in some wetland types}

Malvastrum americanum MALVACEAE [Malvastrum] L frm:SLP/P–Fb/Ss {occurs in drylands and wetlands - moderate fidelity to wetlands}

Marsilea costulifera MARSILEACEAE [Narrow-leaf Nardoo] L frm:P/SLP/A–Fp {typically in wetlands (high fidelity); listed as Data Deficient (poorly known); 2 records in WDWC}

Marsilea crenata MARSILEACEAE L frm:P/SLP/A–Fp {typically in wetlands (high fidelity); disjunct in southern NT and apparently rare in general district}

Marsilea cryptocarpa L frm:?P/SLP/A–Fp {typically in wetlands (high fidelity); poorly known and apparently rare}

Marsilea exarata MARSILEACEAE [Swayback Nardoo] L frm:P/SLP/A–Fp {typically in wetlands (high fidelity)}

Marsilea hirsuta MARSILEACEAE [Short-fruit Nardoo] L frm:P/SLP/A–Fp {typically in wetlands (high fidelity)}

Marsilea mutica MARSILEACEAE [Smooth Nardoo] L frm:P/SLP/A–Fp {typically in wetlands (high fidelity); rare in southern NT}

Melaleuca dissitiflora MYRTACEAE [Creek Tea-tree] L frm:P–Sh/Tr {typically in wetlands (high fidelity)}

Melaleuca glomerata MYRTACEAE [Inland Teatree] L frm:P–Sh/Tr {occurs in drylands and wetlands - moderate fidelity to wetlands}
Melaleuca viridiflora MYRTACEAE [Green Paperbark] Lfrm:P~Tr/Sh {occurs in drylands and wetlands - moderate fidelity to wetlands}

* Melinis repens POACEAE [Red Natal Grass] Lfrm:?A/SLP/P–MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}

Mimulus prostratus SCROPHULARIACEAE [Monkey Face] Lfrm:?SLP–Fb {typically in wetlands (high fidelity)}

§ Mitrastigma micrantha LOGANIACEAE Lfrm:A–Fb {probably moderate fidelity; southern NT population disjunct, may be rare in WDWC}

Muehlenbeckia florulenta POLYGONACEAE [Lignum] Lfrm:P–Sh {typically in wetlands (high fidelity)}

Muelleranthus trifoliatus FABACEAE [Spinifex Pea] Lfrm:?A/SLP–Fb {occurs in drylands and wetlands - slight fidelity to wetlands}

Myriophyllum aconitifolium ASTERACEAE [Spreading-Leaf Daisy] Lfrm:A~Fb {typically in wetlands (high fidelity); population in WDWC is from an artificial environment, no in the wild records}

Myriophyllum verticillatum ASTERACEAE [Winged Daisy] Lfrm:A~Fb {typically in wetlands (high fidelity); population in WDWC is from an artificial environment, no in the wild records}

Nelumbo nucifera PORTULACACEAE [Water Lettuce] Lfrm:A~Fb {typically in wetlands (high fidelity); population in WDWC is from an artificial environment, no in the wild records}

Nihoa ciliata CRASSULACEAE [Nipple Plant] Lfrm:A~Fb {typically in wetlands (high fidelity); population in WDWC is from an artificial environment, no in the wild records}

Pavonia hirsuta ASTERACEAE [Hairy Pavonia] Lfrm:A~Fb {typically in wetlands (high fidelity); population in WDWC is from an artificial environment, no in the wild records}

Petricola serpyllifolia EUPHORBIACEAE [Slender Pigweed] Lfrm:A~Fb {typically in wetlands (high fidelity); population in WDWC is from an artificial environment, no in the wild records}

Pterocaulon serrulatum ASTERACEAE [Fruit-salad Bush] Lfrm:A~Fb {typically in wetlands (high fidelity); population in WDWC is from an artificial environment, no in the wild records}

Pterocaulon sphacelatum ASTERACEAE [Apple Bush] Lfrm:A~Fb {typically in wetlands (high fidelity); population in WDWC is from an artificial environment, no in the wild records}
Wetlands of the Western Davenport's Water Control District

**Rhodanthe charlesleyae** ASTERACEAE [Charles Daisy] Lfrm:A–Fb {no wetland fidelity but common in some wetland types}

**Rhynchosia minima** FABACEAE [Native Pea] Lfrm:P–Fb/C1 {occurs in drylands and wetlands - slight fidelity to wetlands}

**Rostellaria ascendentis** ACANTHACEAE Lfrm:?SLP/P–Fb/Ss {occurs in drylands and wetlands - slight fidelity to wetlands}

**Rotala diandra** LYTHRACEAE Lfrm:A–Fb {typically in wetlands (high fidelity)}

**Rotala mexicana** LYTHRACEAE Lfrm:A–Fb {typically in wetlands (high fidelity)}

**Rotala occultiflora** LYTHRACEAE Lfrm:A–Fb {typically in wetlands (high fidelity)}

**Ruppia maritima** RUPPIACEAE [Sea Tassel] Lfrm:?A/SLP–MHb {typically in wetlands (high fidelity)}

**Santalum lanceolatum** SANTALACEAE [Plumbush] Lfrm:P–Sh/Tr {no wetland fidelity but common in some wetland types}

**Sauropus trachyspermus** EUPHORBIACEAE [Slender Spurge] Lfrm:P/SLP–Fb/Ss {occurs in drylands and wetlands - slight fidelity to wetlands}

**Schenkia australis** GENTIANACEAE Lfrm:A–Fb {typically in wetlands (high fidelity)}

**Schoenoplectus dissachanthus** CYPERACEAE Lfrm:A–MHb {typically in wetlands (high fidelity)}

**Schoenoplectus laevis** CYPERACEAE Lfrm:A–MHb {typically in wetlands (high fidelity)}

**Sclerolaena cornishiana** CHENOPODIACEAE [Cartwheel Burr] Lfrm:SLP/P–Fb/Ss {no wetland fidelity but common in some wetland types}

**Senna artemisioides** subsp. *filifolia* CAESALPINIACEAE [Desert Cassia] Lfrm:P–Sh {no wetland fidelity but common in some wetland types}

**Sida fibulifera** MALVACEAE [Silver Sida] Lfrm:P–Fb/Ss {occurs in drylands and wetlands - slight fidelity to wetlands}

**Sida rohelenae** subsp. *rohelenae* MALVACEAE [Shrub Sida] Lfrm:P–Fb/Ss {occurs in drylands and wetlands - slight fidelity to wetlands}

**Sonchus oleraceus** s.lat. ASTERACEAE [Milk Thistle] Lfrm:A–SLP–Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}

**Sphaeromorphaea australis** ASTERACEAE [Spreading Nut Heads] Lfrm:A–SLP–Fb {typically in wetlands (high fidelity)}

**Sporobolus actinolalus** POACEAE [Katoora] Lfrm:?SLP/P–MHb {occurs in drylands and wetlands - slight fidelity to wetlands}

**Sporobolus australasicus** POACEAE [Australian Dropseed] Lfrm:A–MHb {occurs in drylands and wetlands - slight fidelity to wetlands}

**Sporobolus caroli** POACEAE [Fairy Grass] Lfrm:?A/SLP–MHb {occurs in drylands and wetlands - slight fidelity to wetlands}

**Stemodia florulenta** SCROPHULARIACEAE [Blue-rod] Lfrm:P–Fb/Ss {occurs in drylands and wetlands - moderate fidelity to wetlands}

**Stemodia sp. Manners Creek (T.S. Henshall 1779)** SCROPHULARIACEAE Lfrm:A–Fb {typically in wetlands (high fidelity)}

**Stemodia sp. Tanami (P.K. Latz 8218)** SCROPHULARIACEAE Lfrm:P–Fb {occurs in drylands and wetlands - moderate fidelity to wetlands; apparently rare in general district - no vouchedered records}

**Stemodia viscosa** SCROPHULARIACEAE [Sticky Blue-rod] Lfrm:?A/SLP/P–Fb/Ss {occurs in drylands and wetlands - moderate to high fidelity to wetlands}

**Streptoglossa adscendentis** ASTERACEAE Lfrm:A–SLP–Fb {occurs in drylands and wetlands - slight fidelity to wetlands}

**Streptoglossa bubakii** ASTERACEAE Lfrm:A–SLP–Fb {occurs in drylands and wetlands - slight fidelity to wetlands}

**Streptoglossa odorata** ASTERACEAE [Aromatic Daisy] Lfrm:SLP/A–Fb {occurs in drylands and wetlands - slight fidelity to wetlands}

**Styliodium desertorum** STYLIDIACEAE [Desert Triggerplant] Lfrm:A–SLP–Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}

**Stylidium desertorum** SCROPHULARIACEAE [Desert Triggerplant] Lfrm:A–SLP–Fb {occurs in drylands and wetlands - moderate fidelity to wetlands}

**Stylosanthes hamata** FABACEAE [Verano Stylo] Lfrm:?A/SLP/P–Fb/Ss {occurs in drylands and wetlands - moderate fidelity to wetlands}

**Synaptantha tillaeacea** RUBIACEAE [Synaptantha] Lfrm:A–SLP–Fb {occurs in drylands and wetlands - slight fidelity to wetlands}

**Tephrosia brachyodon** s.lat. FABACEAE [Red Pea-bush] Lfrm:P–Ss {occurs in drylands and wetlands - moderate fidelity to wetlands}

**Themeda avenacea** POACEAE [Tall Oat Grass] Lfrm:P–MHb {occurs in drylands and wetlands - moderate fidelity to wetlands}

**Themeda triandra** POACEAE [Kangaroo Grass] Lfrm:P–MHb {occurs in drylands and wetlands - slight fidelity to wetlands}
Tragus australianus  POACEAE  [Small Burr-grass]  Lfrm:A–MHb  {no wetland fidelity but common in some wetland types}

Trianthema triquetra  AIZOACEAE  [Red Spinach]  Lfrm:A/SLP–Fb  {occurs in drylands and wetlands - slight fidelity to wetlands}

Trichodesma zeylanicum  BORAGINACEAE  [Cattle Bush]  Lfrm:A/SLP/P–Fb/Ss  {no wetland fidelity but common in some wetland types}

Trigonella suavissima  FABACEAE  [Cooper Clover]  Lfrm:A/SLP–Fb  {occurs in drylands and wetlands - moderate fidelity to wetlands}

Triodia pungens  POACEAE  [Soft Spinifex]  Lfrm:P–MHb  {no wetland fidelity but common in some wetland types}

Triraphis mollis  POACEAE  [Purple Plumegrass]  Lfrm:A/SLP–MHb  {no wetland fidelity but common in some wetland types}

* Typha domingensis  TYPHACEAE  [Bullrush]  Lfrm:P–MHb  {typically in wetlands (high fidelity); not confirmed from area but may occur in bore tanks for instance}

§ Uranthoecium truncatum  POACEAE  [Flat-stem Grass]  Lfrm:A/SLP–MHb  {occurs in drylands and wetlands - slight fidelity to wetlands; apparently rare in general district - no vouchered records}

Urochloa gilesii  POACEAE  [Hairy-edged Armgrass]  Lfrm:A–MHb  {occurs in drylands and wetlands - slight fidelity to wetlands}

* Urochloa mosambicensis  POACEAE  [Sabi Grass]  Lfrm:P–MHb  {occurs in drylands and wetlands - moderate fidelity to wetlands}

Urochloa piligera  POACEAE  [Hairy Armgrass]  Lfrm:A–MHb  {occurs in drylands and wetlands - slight fidelity to wetlands}

Urochloa praetervisa  POACEAE  [Large Armgrass]  Lfrm:A–MHb  {occurs in drylands and wetlands - slight fidelity to wetlands}

§ Velleia macrocalyx  GOODENIACEAE  [Pale Velleia]  Lfrm:P–Fb  {occurs in drylands and wetlands - moderate fidelity to wetlands; apparently rare in general district}

Vigna lanceolata  FABACEAE  [Pencil Yam]  Lfrm:P–Fb  {occurs in drylands and wetlands - slight fidelity to wetlands}

Wahlenbergia tumidifructa  CAMPANULACEAE  [Turgid-fruited Bluebell]  Lfrm:A/SLP–Fb  {no wetland fidelity but common in some wetland types}

Waltheria indica  STERCULIACEAE  Lfrm:P–Ss/Sh  {occurs in drylands and wetlands - slight fidelity to wetlands}

§ Wedelia verbesinoides  ASTERACEAE  Lfrm:P–Ss/Sh  {occurs in drylands and wetlands - moderate fidelity to wetlands; southern NT population disjunct, may be rare in WDWCD}

Whiteochloa cymbiformis  POACEAE  Lfrm:A/SLP–MHb  {occurs in drylands and wetlands - slight fidelity to wetlands}

*= not native, i.e. an introduced (weed) species

§ = indicates species of conservation significance and poorly known specis that may be significant. None are currently listed as threatened in the Northern Territory.

**Life Form Codes**

Life form is given in a two part code with the prefix “Lfrm:”. The data and codes are based on the southern NT plant checklist1

A = annual; SLP = short lived perennial; P = Perennial

CI = climber/twiner; Fb = Forb; Fu = fern; HP = herbaceous parasite; Mt = mistletoe; Pm = palmoid (palm/cycad)

Sh = shrub; Ss = subshrub (intermediate between forbs and shrubs with a semi-woody stem); Tr = tree

“?” indicates uncertainty.

**Wetland Fidelity**

Each species is assigned one of four categories concerning likelihood of finding it in a wetland or dryland situation:

**high fidelity**  = rarely occurs outside of wetlands (includes species of river channels and floodouts with occasional brief flooding);

**moderate fidelity**  = known to occur outside of wetlands but much more often in a wetland (includes species that also occur in non-wetland saline areas, or non-wetland run-on areas or black-soil plains);

**slight fidelity**  = often occurs outside of wetlands but slightly more often found in wetlands;

**no wetland fidelity but common**  = often occurs in wetlands and can be abundant, but is widespread across the landscape and with no preference for wetlands.