6 Ecological Community Assessment of the Bunda Bunda organic mound springs of the west Kimberley

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6.1 Introduction

Assemblages of Bunda Bunda organic mound springs of the west Kimberley was endorsed as Vulnerable threatened ecological community (TEC) by the WA Minister for the Environment on 8 May 2002. There are two known occurrences totaling 27 ha that occur over a range of 1.2 km. They represent one of the most southerly occurrences of rainforest in Western Australia. The rainforest species of this community are common to rainforest patches across northern Australia, many of which have much greater species diversity, but are unusual in such a seasonally arid environment.

6.1.1 Setting

These coastal springs are located on tidal mudflats in Carnot Bay on the Dampier Peninsula north of Broome (Figure 36). The mound springs lie on a shallow aquifer of surficial sediments, over a major unconfined freshwater aquifer in the Broome Sandstone which meets a saltwater wedge along the coast. The mound springs were identified by Department of Water (2017) as ecosystems with high probability of groundwater-dependence.

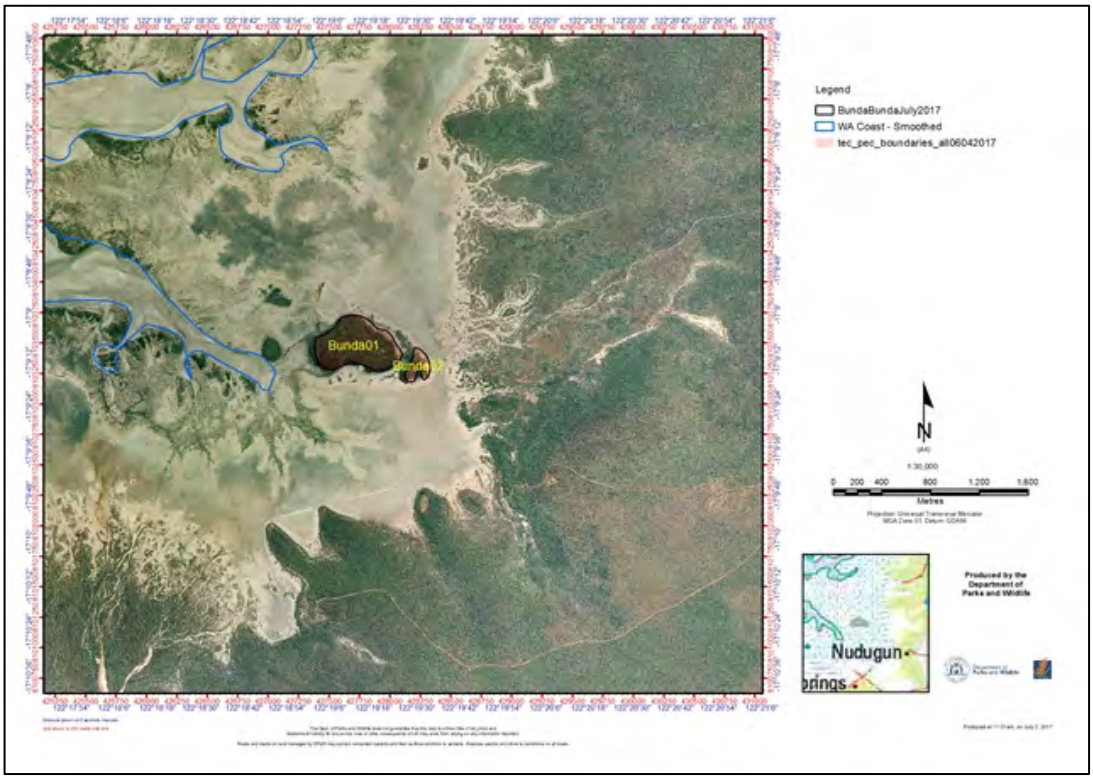

Figure 36. Current mapped boundaries of Bunda Bunda mound springs TEC.

6.1.2 Current description:

The two known occurrences of these peaty mounds rise above the surrounding tidal flats (Figure 37) and are composed of accumulated leaf litter and living vegetation, supporting a dense rainforest (closed forest - Figure 38) and a tall shrubland respectively, each with mangroves in concentriform arrangement. The smaller mound is dry in the centre, but encircled by a moat, fed by permanent freshwater seepage. The larger mound is wet and incompletely enclosed by a leptoscale channel or moat of variable depth which broadens to a microscale saline lake (300 m long, 50 m wide) on the north side. The moats and pools are saline and occasionally inundated during large tides.

Figure 37. View of mudflats mostly devoid of vegetation – photo Jill Pryde.

Figure 38.Edge of dense rainforest patch – photo Mike Lyons.

The western end of the larger mound is covered by a very dense (closed) forest dominated by evergreen *Carallia brachiata* trees to 20 m and a bracken-like layer of the fern *Cyclosorus interruptus* (to 1 m) (Figure 38). This is the most southerly population of *Carallia* in Western Australia. A few *Timonius timon* and dragon trees *Sesbania formosa* occur. The east end of the island is slightly lower, moister and the leaf litter forms a 'spongier' substrate. It is covered by tall closed forest (< 20m) of *Melaleuca cajuputi, T. timon, S. formosa* with fewer *C. brachiata* and an understory of *C. interruptus.* Creepers including *Cassytha filiformis* and the broadleaved *Secamone elliptica*, drape from trees, and climbing maidenhair ferns *Lygodium microphyllum* form a curtain which filters the light. In the moat-like channel surrounding the

large mound are mangroves and the mangrove fern *Acrostichum speciosum*, with an occurrence of the uncommon mangrove *Lumnitzera racemosa* on the eastern side. An endemic (Kimberley) mistletoe, *Amyema dolichopoda* also occurs on the site. The two mounds differ from each other and there is considerable spatial variation in vegetation within each site. There is a clear zonation in the vegetation around the smaller south-western mound spring. It is fringed by a ring of mangroves, predominantly *Rhizophora stylosa* and *Avicennia marina*. Within this lies a band of *A. speciosum* and trees of *M. cajuputi* and *T. timon* to 12 m.

In the dry centre of the island is a tall shrubland dominated by *Acacia neurocarpa* (<5m), over grasses and sedges. The mudflats around the two mounds are mostly bare of vegetation, however a *Sporobolus* sp. grassland occurs closer to the shore.

6.1.3 2017 survey

A survey of the Bunda Bunda organic mound springs was undertaken on 7 August 2017 by a team with expertise in TEC identification and inventory, biological survey including flora and vegetation, aquatic invertebrate fauna identification and wetland inventory. The survey was coordinated by the Kimberley District Nature Conservation Coordinator, with cooperation and assistance of Traditional Owner group, Djaberadjabera and Nyul Nyul Rangers.

Bunda Bunda mound springs are surrounded by coastal tidal mudflats north of Broome on unallocated Crown land (UCL). Access to the springs is via Crown Reserve 22615 Carnot Bay, with permission of the Traditional Owners. Site visits are recommended during low tide at which time crocodiles are less likely to be present in the area.

The aim of the survey was to update TEC baseline information, including description, condition and threats to the TEC and to establish permanent quadrats to record flora and vegetation and inventory of aquatic invertebrates, soils and water chemistry and to update boundaries of the wetland communities as required.

This section covers the TEC aspect of the survey, will assist with the development of a recovery plan, and provides recommendations for management.

6.2 Methods

6.2.1 Bunda 01 (Occurrence 01)

The following was recorded:

- general vegetation description, condition and structure across the mapped community;
- A flora list (refer to Mike Lyons' lists) for vegetation within the quadrat and at random locations throughout the mound spring community;
- threatening processes; and
- management recommendations compiled.

In conjunction with the above, one site was selected to establish a permanent $50x50^2$ m quadrat upland from a seepage zone in the north west of the occurrence in tall dense rainforest community over a dense undergrowth of ferns, thick leaf litter, climbing vines and

ferns. The quadrat was permanently marked with one 1.6 m star picket at NE corner site id KMS017A. Quadrat data (held by M. Lyons) for site include:

- GPS location;
- vegetation description, stratum and structure;
- soil and landform;
- flora specimens were taken from the mound springs seepage areas and damplands surrounding the springs. Flora specimens were collected by Mike Lyons and Jill Pryde. Additional flora collected by M. Coote and A. Turnbull;

and

- Aquatic invertebrate survey, peat core and water chemistry in an area of standing water, located in the south east portion of the occurrence by A. Pinder, K. Quinlan and T. Sonneman.
- Assessment and mapping by the Wetlands group (M. Coote and A. Turnbull) using a handheld GPS in conjunction with aerial photography.
- Photographs of occurrence and surrounding landscape.

These data will be added to the corporate TEC/PEC database when available.

6.2.2 Bunda 02 (Occurrence 02)

No survey undertaken of flora and vegetation, aquatic invertebrates, peat core or water chemistry, however

- A brief edge survey was undertaken to assess vegetation condition and threats.
- Photographs taken.

6.2.3 Potential new occurrence

A vegetated mound that lies 215 m west of Bunda01, not recorded on the TEC database, is likely to align with TEC database identifier Bunda02 (Occurrence2) and appears to have been incorrectly documented on TEC database.

Wetlands group assessed and mapped the “potential new” mound spring using a handheld GPS in conjunction with aerial photography.

6.3 Limitations

One day was allocated to survey Bunda Bunda organic mound springs TEC and as a result limited the capacity to conduct a full assessment on status and condition across the entire community.

6.4 Results

Survey at Bunda Bunda organic mound springs TEC was undertaken to coincide with low tide. The TEC comprised two mapped occurrences (Bunda01 and Bunda02) which are situated about 300 m from the shoreline, approximately 30 m apart. The larger mound (Bunda01) occupies (~22.8ha), with the smaller mound (Bunda02) (~3.6ha) and occurs lower in the landscape. The vegetated mound that lies west of Bunda01 was briefly surveyed for consideration of addition to the TEC database. This spring occupies ~3.8 ha.

6.4.1 Bunda01 (Occurrence01)

Bunda01 is a large vegetated mound surrounded by moats, stream channels and standing pools of water of variable depth. The outlier saline mudflats comprise occasional mangroves, sedges, grasses including *Sporobolus* sp. and chenopods. A shrubland-woodland that encircles the mound includes *Melaleuca cajuputi*, mangroves, and mangrove fern *A. speciosum* as well as the occasional *S. formosa*. In the north west portion of the mound, rising from the mudflats, vegetation transforms into a dense, closed rainforest, dominated by *C. brachiata* (>20m), *T. timon* and *Mallotus nesophilus* over a dense stratum of *C. interruptus* >1 m and thick accumulated leaf layer (Figure 39). The climbing fern, *Stenochlaena palustris* and climbers, *Gymnanthera oblonga* wrap around trees. The eastern and southern portion of the mound is lower in the landscape and has standing water <50 cm in depth, contains scattered leaf litter, aquatic herbs, and ferns. Saturated peaty black soils and thick leaf litter combine to form a quaking substrate. This portion of the community is covered by a tall closed forest (>20m) of *C. brachiata, T. timon, S. formosa* and *M. cajuputi* over *C. interruptus*, climbing maidenhair fern, *L. microphyllum* and vines.

Figure 39. Dense rainforest patch quadrat (KMS017A) site and Traditional owner Preston Cox – Photo Jill Pryde.

General condition was excellent (Bush Forever scales). The total number of weed species was low, however the stinking passion vine (*Passiflora foetida* var. *hispida*) is likely to become a major threat to the community (Figure 40). In exposed patches it has smothered native vegetation. In the quadrat it was recorded at low density. Introduced fruit trees, including bananas plants (*Musa acuminata*), which occur in the south east portion of the occurrence (Figure 41), are likely to spread if not contained and likely to outcompete native plant species. Damage by cattle is evident where they have encroached wetter areas of the mound springs, primarily in the seepages in the south east and north west.

Figure 40. The weed *Passiflora foetida* var. *hispida* is likely to become a major threat - photo Mike Coote.

Figure 41. Banana plants in south east portion of mound spring – photo Mike Lyons.

Findings of the August 2017 survey in regard to flora and vegetation description and component flora species is mostly consistent with the historical TEC database record. Flora species previously recorded were found across the mound springs, however additional flora

recorded will be added to the TEC database. No DRF or Priority flora was found. Range extensions for flora taxa were documented. Plant species considered useful indicators of rainforest communities and associated mound springs were present. The key threats identified for the mound springs are grazing, weed invasion, altered fire regimes, feral animals, potential hydrological changes (e.g. groundwater extraction) and tourism development.

6.4.2 Bunda 02 (Occurrence 02)

(Bunda02 on Figure 19)

A brief edge survey of Bunda02 (Figure 42) recorded a vegetation community with open structure which appears much dryer with no apparent moat or standing water. Based on observations from this partial survey, no mounding was evident. Vegetation comprised a woodland of *M. cajuputi, T. timon* and *A. neurocarpa* with little understory. The periphery of the community contained mangroves, predominantly *Rhizophora stylosa* and *Avicennia marina*. Records indicate that this occurrence was burnt in October 1995, which may account for the open canopy and lack of peat mounds. Vegetation remained in Good condition (Bush Forever scales).

The key threats identified for the mound springs are grazing, weed invasion, altered fire regimes, feral animals and potential hydrological changes (e.g. groundwater extraction) and tourism development.

Following the survey, mapping of the Bunda Bunda organic mound springs boundaries will be refined. Based on records from previous surveys the area identified as Bunda02, located east of Bunda01 appears to be incorrect. S. Black (2002) noted this area as "*Melaleuca* island". Survey is required to clarify if Bunda02 and the potential new occurrence constitute the TEC. This issue was raised by Environs Kimberley [email dated 22 May 2017].

Once all results of the August 2017 survey are available, the TEC database will be updated and include amendment and refinement of TEC boundaries, taxonomic flora list updates and other biota.

Figure 42. View of Bunda02. Photo Jill Pryde.

6.5 Conclusions

The most significant threats to the integrity of Bunda Bunda mound springs are disturbance from cattle, weed invasion and too frequent fire. Cattle utilise water surrounding the community and vegetation for protection. Damage can be seen in the understory, especially in the areas of ponding water and wetter sites where trampling impacts are evident (Figure 43). Cattle also cause damage to soil structure and provide unwanted nutrients affecting water quality. The stinking passion flower is likely to become a major threat if not managed. In some locations of the community the stinking passion flower is forming dense mats, smothering vegetation. This is likely to limit growth of native vegetation and modify the structure. The historically planted fruit trees, including banana plants, which occur in Occurrence01, should be removed. However, this action is likely to necessitate negotiation with Traditional Owners.

Figure 43. Trampling by cattle evident in the understory – photo Jill Pryde

6.6 Management Recommendations:

- Seek funds to fence the mound springs complex to restrict cattle entering the TEC;
- Map *Passiflora foetida* var. *hispida* across the community and seek ways to control or eradicate the highly invasive weed;
- Seek ways to remove fruit trees, particularly banana plants within Occurrence01;
- Design and implement a project to determine the hydrological drivers of the mound spring ecosystem;
- Design and implement a monitoring program that utilises quadrats established during the current survey. This will probably require establishment of a more comprehensive network of quadrats, and should be designed to provide information about the success of land management in the sensitive environment of the mound spring ecosystem;
- Determine whether Occurrence02 constitutes the TEC and if the vegetated mound to the west of Occurrence01 constitutes a new occurrence of the TEC. This would require hydrological investigation and vegetation survey.