Managing a high-profile biodiversity asset: Identifying habitat and hotspots for occurrence of Grey Grasswren in the Bulloo Lakes system

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Cover image

Lignum swamp habitat occupied by Grey Grasswrens in northern wetlands of the Bulloo Lakes system, Bulloo Downs, October 2013.

Photo by R. Jaensch

Acknowledgments

Funding for the project was provided by South West NRM Ltd, Charleville, QLD. The assistance of SWNRM staff in project development and administration (Neil Judd, Gary Butler and Craig Allison) is gratefully acknowledged. The managers and employees of Bulloo Downs station gave full cooperation in regard to access to sites including advice on best routes. Julian Reid provided advice on satellite imagery in the planning stage.
Summary

In order to inform property management planning for Bulloo Downs station, south-western Queensland, a survey to identify habitat and hotspots for Grey Grasswren *Amytornis barbatus barbatus* was conducted in the Bulloo Lakes wetland system during 7-11 October 2013. Although known to occur in south-central parts of the system, mainly south of the NSW State border, there have been few if any previous records of Grey Grasswren from northern parts of the system. This nominate subspecies of Grey Grasswren is listed as Vulnerable under the Commonwealth EPBC Act 1999 and is considered to be declining in NSW.

The survey was funded by South West NRM Ltd and conducted by two ornithologists with extensive experience of this highly secretive bird from floodplains of south-western Queensland and adjacent South Australia and New South Wales.

Focussing on shrublands of lignum *Muehlenbeckia florulenta* in dried wetlands in the far north and north-east of the Bulloo River’s terminal wetlands, 38 sites were searched. Characteristics of vegetation and substrate at each site were documented and examples of habitat were photographed.

Grey Grasswrens were seen and/or heard at nine (9) sites within five (5) localities widely spread across the study area on Bulloo Downs. Grasswrens were detected in communities that varied in cover, height, diameter and greenness of lignum shrubs. In most cases they were found where some lignum occurred as joined clumps and commonly where short plants occupied some of the substrate. No grasswrens were detected in massive lignum clumps in and around the dried lakes; in these sites, water persists longest and once dry the ground is mostly bare. Belalie *Acacia stenophylla* shrubs were present at some of the sites where grasswrens were recorded. Old man saltbush *Atriplex nummularia*, a habitat sometimes used by Grey Grasswrens, is widespread in lowlands immediately surrounding these northern Bulloo Lakes wetlands.

The survey results increase the known extent of occurrence of the subspecies by over 600 km² and extend its range 26 km northwards. Together with enhanced knowledge of its habitat preferences and abundance, this greatly improves its conservation prospects. Presence of the Grey Grasswren places responsibility on landholders and NRM practitioners to wisely manage its lignum swamp habitat. No immediate conservation action has been identified. But it is recommended that suitable graded firebreaks be maintained and added, to minimise loss of habitat for Grey Grasswrens, especially around a cluster of five sites in Jerridah Channel occupied by grasswrens. Reduction of likely predation by feral cats may be desirable if cost effective control can be achieved. Recognising the preliminary scope of the project, other recommendations call for follow-up surveys to consolidate the present findings, determine site fidelity of the grasswrens, and develop deeper understanding of their ecological requirements and threats to survival in the Bulloo Lakes system.

Head view of a Grey Grasswren of the South Australian population: Photo by Lynn Pedler
Introduction

The Bulloo Lakes system is an extensive and complex network of temporary and semi-permanent wetlands at the terminus of Bulloo River, south-western Queensland, continuing across the border into NSW. The wetland area when fully inundated is in the order of 250,000 hectares (Department of the Environment 2013a). With its diverse wetland habitats and abundant fauna, it is rightly considered one of Australia’s High Conservation Value Aquatic Ecosystems (HCVAE).

Notably, the Bulloo Lakes system provides the only known habitat of a population of endemic bird: the Bulloo subspecies of Grey Grasswren *Amytornis barbatus barbatus* (Garnett et al. 2011). The subspecies is listed as Vulnerable under the Commonwealth EPBC Act 1999 and is considered to be declining in NSW (Department of the Environment 2013b). Only discovered in 1967, the Bulloo Grey Grasswren is a small secretive bird that inhabits shrubs of *Muehlenbeckia florulenta* and old man saltbush *Atriplex nummularia* and sometimes nearby tussocks of swamp canegrass *Eragrostis australasica* (Garnett et al. 2011; Department of the Environment 2013b). The other subspecies *A. b. diamantinensis* and populations of undetermined subspecific status occur in the Channel Country (SAALNRM 2013).

Originally discovered close to the State border, further investigations on the Bulloo subspecies have defined an extent of occurrence over several properties on the NSW side and one or two close by sites in Queensland (Garnett et al. 2011). However, from our own experience (e.g. Black et al. 2011, 2013), review of State-wide vegetation mapping of the Queensland Herbarium and interpretation of satellite imagery we concluded that extensive areas of potentially suitable habitat occurred well beyond that range, in the northern and NE parts of the Bulloo Lakes system. Apparently, little if any effort had been invested by scientists in systematic searching for Grey Grasswren there and surveys were needed (Garnett et al. 2011).

Meanwhile, South West NRM had been working with Bulloo Downs station, to progress a strategy for natural resource management. In particular, this work has focused on establishing greater control of feral pigs and cats. Prevalence or increase of pigs and cats is among the factors suggested (Hardy 2010; Garnett et al. 2011) as possibly limiting Grey Grasswren populations and probably contributing to the documented decline in the NSW population.

In order to identify appropriate land management strategies that will ensure survival of Grey Grasswrens in the Bulloo catchment, the authors conducted a preliminary search for the subspecies in northern parts of the Bulloo Lakes wetlands, in October 2013. Information gained on hotspots of occurrence was to be used to inform management programs on pigs and cats being undertaken by SWNRM and the landholder, and may inform NRM activities in other regions.

Objectives of the proposed work at Bulloo Downs were:

1. To determine if the Bulloo Grey Grasswren occurs in northern parts of the Bulloo Lakes wetland system;
2. To provide NRM practitioners and landholders with spatial information that will enhance their management of landscapes in which the grasswren may occur;
3. To further develop guidance that will enable NRM practitioners and landholders to optimally manage the grasswren, thereby contributing to survival of a bird that is endemic to the Bulloo catchment.
Activities conducted and methods applied

We visited the study area during 7-11 October 2014. This date was selected mainly to suit our availability and allowed sufficient preparation after funding had been secured. It also enabled one of us (DW), the feral animals and weed control officer of South West NRM, to join and support the expedition and was an acceptable date to the property managers. Additionally, weather on a date later in the year could have been very hot and may have suppressed activity and calling by grasswrens.

With a vast area of lignum shrubland to search, we applied several principles to selection of sites to survey:

- We would maximise the geographical spread of sites across the northern parts of the wetland system
- We would include areas of variable inundation regime
- We would include lignum communities of varied structure and composition and on differing substrates.

Ultimately, our selection of sites was greatly influenced by accessibility for vehicles and accordingly many areas could not be reached.

Our method for finding grasswrens was based on our extensive first-hand experience of searching for and finding other Grey Grasswren subspecies elsewhere in Queensland (Black et al. 2013) and South Australia (Black et al. 2011). Though exceptionally shy and thus rarely seen, the grasswrens commonly give alarm calls when observers or vehicles enter their vicinity. Our familiarity with those calls enabled us to search likely habitat simply by walking around sample areas (at least about 100 m but often more than 300 m in diameter) and listening for calls, over at least a 15 minute period. Careful watching of the ground between shrubs also enabled us to sometimes see grasswrens hopping quickly between dense shrub cover. Given the limited time available for the work and to optimise coverage, we conducted surveys throughout the day though based on past experience, less effort was made in the late afternoons.

Grasswrens were recorded as present at a site if at least one bird was seen or calling but not seen. Given the broad similarity between some calls of the Grey Grasswren and some calls of fairy-wrens *Malurus* spp. also found in the same habitat, extra care was exercised in recording presence based only on calls. Fortunately, the lead observers (LP and RJ) both have substantial experience with finding the Grey Grasswren, including recognition of calls that were subsequently confirmed by sightings.

The surveys did not include attempts to capture (e.g. mist-net) grasswrens. Given the birds’ secretive habits, photographic records of grasswren sightings were not part of the methodology.

Characteristics of habitat at each survey site were documented, regardless of whether or not grasswrens were recorded. Time did not permit formal transects or quadrats to be used for quantitative assessment of habitat; instead subjective descriptions were taken for several parameters describing lignum shrubs, associated vegetation and substrate (see below).
Results of the fieldwork

Coverage of the study area and survey conditions

Despite limited vehicular access, our design principles for coverage were well met: 38 sites were surveyed across northern and NE parts of the Bulloo Lakes system (Figure 1). Dry conditions enabled vehicle access on all tracks established by cattle station managers on and around the floodplain, however risk of tyre damage from shrub stakes restricted our willingness, in the time available, to explore some likely habitat areas remote from these tracks. Nevertheless representative habitat samples were searched within each of the main areas of lignum swamp.

Weather during our five survey days varied from warm to very hot, with light breeze to strong hot (northerly) wind. Cloud was mostly absent.

Localities where grasswrens were recorded

We recorded Grey Grasswrens at nine (9) sites during our October 2013 survey (Figure 1, Figure 2, Table 1). Five of those sites were clustered 190 m to 980 m apart in one locality in Jerridah Channel; thus we consider the nine records to be from five widely spaced localities, 6 km to 15 km apart.

A total of 14 or possibly 16 individual Grey Grasswrens was accounted for in our survey (Table 1). Up to two, possibly three birds were detected at any one site. Presence was recorded only from calls (none seen) at just one of the nine sites.

In terms of property management, the spread of sites searched and grasswrens recorded across the various paddocks is shown in Table 2:

These results partly reflect major differences between size of paddock and position in relation to wetlands, as well as ease of access via station tracks.

Extension of known range

Based on information in the most recent accounts (Garnett et al. 2011; Department of the Environment 2013b), the northernmost sites for Grey Grasswren in the Bulloo Lakes system as known before our survey are all within 7 to 11 km north of the NSW border. Our northernmost record (site 7) is 37 km north of the border, representing a range extension of 26 km northwards. The southernmost of our records (site 20) is 21 km north of the border and at least 14 km NW of the nearest previously-known locality, Jerrira Swamp (Garnett et al. 2011).

The extent of occurrence (EOO) of a threatened species is measured as the convex polygon that encloses the sites at which the bird has been recorded (Garnett et al. 2011). For records of Grey Grasswren obtained by us in the northern part of the Bulloo Lakes system in October 2013, this amounts to about 200 km². If we consider all known localities of the subspecies in the system, regardless of present status, addition of these northern records increases the total EOO by about 650 km² (this also assumes that the EOO stated in Garnett et al. (2011) had not presumed occurrence of the bird in northern parts of the system). We consider the extension to EOO to be realistic because although the calculations include areas of unsuitable habitat, those areas are mostly matched by areas of suitable habitat outside the EOO polygons.
Figure 1. Sites surveyed for Grey Grasswren on Bulloo Downs in October 2013.
Green pins = grasswrens recorded; yellow pins = none recorded. See Figure 2 for more detail.

Note: Site 7 (green) is near site 8; Site 24 (green) is near site 22.
Figure 2. Greater detail of some of the sites surveyed for Grey Grasswren on Bulloo Downs in October 2013. Green pins = grasswrens recorded; yellow pins = none recorded.
Table 1. Coordinates and locations of sites at which Grey Grasswrens were found on Bulloo Downs in October 2013.

<table>
<thead>
<tr>
<th>site number</th>
<th>date of survey</th>
<th>location</th>
<th>paddock name</th>
<th>latitude dec. deg. S.</th>
<th>longitude dec. deg. E.</th>
<th>Grey Grasswrens recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>08-Oct 13</td>
<td>2.7 km SSW of Yandacoopa WH.</td>
<td>Lake</td>
<td>28.66483</td>
<td>142.50519</td>
<td>At least 2 birds.</td>
</tr>
<tr>
<td>07</td>
<td>08-Oct-13</td>
<td>4.0 km NNE of Big Lake.</td>
<td>Bullagurry</td>
<td>28.66245</td>
<td>142.41534</td>
<td>At least 1 bird.</td>
</tr>
<tr>
<td>18</td>
<td>09-Oct-13</td>
<td>in far northern part of Jerridah Channel, 2.5 km SW of Woonaboota Waterhole.</td>
<td>Lake</td>
<td>28.76188</td>
<td>142.49377</td>
<td>2 birds seen.</td>
</tr>
<tr>
<td>19</td>
<td>09-Oct-13</td>
<td>in north-central part of Jerridah Channel, 6.9 km S of Woonaboota Waterhole.</td>
<td>Bullagurry</td>
<td>28.80620</td>
<td>142.53306</td>
<td>At least 1 bird.</td>
</tr>
<tr>
<td>22</td>
<td>09-Oct-13</td>
<td>in north-central part of Jerridah Channel, 7.3 km S of Woonaboota Waterhole.</td>
<td>Bullagurry</td>
<td>28.80883</td>
<td>142.53510</td>
<td>At least 2, possibly 3 birds present.</td>
</tr>
</tbody>
</table>
Table 2. Spread of sites searched and Grey Grasswrens recorded across paddocks, Bulloo Downs, October 2013.

<table>
<thead>
<tr>
<th>paddock name</th>
<th>number of sites searched</th>
<th>Number of sites at which grasswrens were recorded</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yandacoopa</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Lake</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Yandacoopa and Lake</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Bullagurry</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>Bullagurry and Lake</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Homefield</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

Characteristics of habitat

Table 3 summarises the habitat characteristics at each of the sites at which Grey Grasswrens were recorded in the northern Bulloo Lakes system in October 2013 (reference to sites at which grasswrens were not recorded is clearly indicated):

**LANDFORM:**
- There was some variation: six sites were in a ‘linear’ corridor of floodplain several kilometres wide, two were in irregularly shaped back-swamps, and one was on extensive floodplain (the bed of the greater lake basin).
- All sites included micro-relief of varied width and height, appearing in some cases as sandy low ridges, or gilgai-like features.
- Other data showed that no grasswrens were recorded in or near the semi-permanent lakes (Big Lake, Little Lake) or tree-fringed waterholes.
- No grasswrens were recorded from 7 sites upriver of a line between Yandacooopa Waterhole and Jerridah Waterhole; those sites were in isolated swamps that were not broadly connected to the main blocks of contiguous lignum habitat.

**DISTANCE TO EDGE OF WETLAND:**
- Two sites were around 500 m or less from the wetland edge.
- Distance varied from 230 to 1600 m (mean = 1230 m).

**SUBSTRATE:**
- Whereas some sites were in deeply-cracked grey clay (wetland ‘blacksoil’), two thirds of sites were in harder paler-coloured clay – sometimes this seemed to be due to a sand component.

**LIGNUM SHRUBS:**
- Only one site had a high percentage cover of lignum whereas two-thirds of sites had low or low-medium cover.
• Diameter (width) of individual lignum shrubs was variable but mainly in the mid-range (around 2 m), it was much larger or smaller at a few sites.
• Joined lignum shrubs (clumps) were present at all sites except one; mainly the grasswren sites had a few joined shrubs rather than numerous shrubs forming massive clumps.
• At all sites except one, lignum was over 2 m tall and reached 3 m at three sites.
• At date of survey, lignum at all grasswren sites was leafless; some lignum at a few of the OTHER sites had some green leaves.
• At most grasswren sites, lignum stems were partly green; at no site was the lignum fully green or fully dry/grey.
• Lignum seedlings were present at all sites except one but tended to be uncommon.
• Many of the sites at which grasswrens were NOT recorded were in areas (notably Big Lake, Little Lake) subject to longest inundation and characterised by sparse, wide, massively-clumped lignum.

BELALIE (RIVER COOBA, NATIVE WILLOW) & COOLIBAH:
• Belalie Acacia stenophylla shrubs were absent at more than half of the sites and was uncommon at the 4 sites where it was noted.
• At those 4 sites, belalie was as tall or taller than the lignum and partly green (leafy) or mostly leafless/dead.
• Many of the sites at which grasswrens were NOT recorded included belalie and some (especially upriver of the Yandacoopa to Jerridah Waterhole line), though containing much lignum, were dominated by belalie in tree form up to 5 m tall.
• Coolibah Eucalyptus coolabah trees were present in some surveyed sites but in none where grasswrens were recorded.

GROUND COVER:
• Only one site was totally bare between the lignum shrubs, apart from a few dried aquatic plants.
• Partial ground cover was the norm at the grasswren sites and was near-continuous at three sites.

ASSOCIATED NON-WOODY PLANTS:
• 11 non-woody plants were identified as occurring in the grasswren sites; some sites had just one such species, others up to 7.
• No one associated species occurred in all grasswren sites.
• The meadow- or crop-like spike-rush Eleocharis plana was at 4 sites, as was an unidentified, small prostrate plant. Swamp canegrass Eragrostis australasica and nutheads Epaltes cunninghamii were each at three sites.
• Though not usually present in frequently inundated areas, old man saltbush Atriplex nummalaria was common in sandier margins and in sandy rises beyond the wetland edge, over much of the study area. This moderately-large perennial shrub has been identified as a plant associated with Grey Grasswren habitat elsewhere, e.g. in the other subspecies’ stronghold in Goyder Lagoon, South Australia (Black et al. 2011). Possibly its abundance in the Bulloo Lakes surrounds is a
Table 3. Characteristics of each of site at which Grey Grasswrens were found on Bulloo Downs in October 2013. Part 1.

<table>
<thead>
<tr>
<th>site number</th>
<th>landform (in wetland context)</th>
<th>distance (from coordinates) to outer edge of wetland</th>
<th>A type of substrate &amp; type of ground cover</th>
<th>B cover of lignum (high, medium or low per cent)</th>
<th>C height, colour, leaves &amp; diameter of lignum shrubs</th>
<th>D were some lignum shrubs joined? (shrub clumps)</th>
<th>E occurrence of lignum seedlings</th>
<th>F prevalence, height &amp; condition of belalie shrubs</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>broad flat in backswamp of floodplain; substantial gutter nearby</td>
<td>870 m</td>
<td>GC, PG</td>
<td>H (near continuous in places, some open patches)</td>
<td>2.5-3.0 m, FG--MG, NL, MD--LD</td>
<td>MJ</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>07</td>
<td>broad flat in backswamp of floodplain; site interspersed with low ridges &amp; mounds of soft white clay or sandy clay, often encircling small depressions; an open basin lies 650 m to S.</td>
<td>230 m</td>
<td>SC, PG</td>
<td>M--L</td>
<td>2.5-3.0 m, PG, NL, SD--LD</td>
<td>NJ?</td>
<td>U</td>
<td>U, S--T, P--D</td>
</tr>
<tr>
<td>18</td>
<td>floodplain corridor between zones of sandy upland, with complex pattern of micro-relief (numerous low rises).</td>
<td>1200 m</td>
<td>GC, BG</td>
<td>M</td>
<td>2.0--3.0 m, PG--MG, NL, MD</td>
<td>FJ</td>
<td>U--X</td>
<td>U, T, P</td>
</tr>
<tr>
<td>19</td>
<td>floodplain corridor between areas of sandy upland.</td>
<td>1300</td>
<td>WC, PG--CC</td>
<td>L--M</td>
<td>2.0--2.5 m, PG, NL, SD--MD</td>
<td>FJ</td>
<td>U</td>
<td>X</td>
</tr>
<tr>
<td>20</td>
<td>floodplain corridor between areas of sandy upland.</td>
<td>1600</td>
<td>WC, PG</td>
<td>L (10%)</td>
<td>2.0--2.5 m, PG, NL, SD--MD</td>
<td>FJ</td>
<td>U</td>
<td>X</td>
</tr>
<tr>
<td>21</td>
<td>floodplain corridor between areas of sandy upland.</td>
<td>1400</td>
<td>WC, PG--CC</td>
<td>L (10%)</td>
<td>2.0--2.5 m, PG--DR, NL, SD</td>
<td>FJ</td>
<td>U</td>
<td>X</td>
</tr>
<tr>
<td>22</td>
<td>floodplain corridor between areas of sandy upland.</td>
<td>1300</td>
<td>WC, PG</td>
<td>L</td>
<td>2.0--2.5 m, PG, NL, MD</td>
<td>FJ</td>
<td>U</td>
<td>X</td>
</tr>
<tr>
<td>24</td>
<td>floodplain corridor between zones of sandy upland, with complex pattern of micro-relief (some low sandy rises, some hummocky).</td>
<td>560</td>
<td>SC, PG</td>
<td>L--M</td>
<td>1.5--2.0 m, PG--DR, NL, SD</td>
<td>FJ</td>
<td>U--C</td>
<td>U--C, S, P--D</td>
</tr>
<tr>
<td>31</td>
<td>at edge of broad wetland flat within greater floodplain, next to broad area slightly raised/drier; group of gutters traversing the site.</td>
<td>1600 m</td>
<td>GC, PG--CC</td>
<td>M</td>
<td>2.0--2.5 m, PG, NL, MD</td>
<td>FJ</td>
<td>X</td>
<td>U, S, P</td>
</tr>
</tbody>
</table>
Table 3. Characteristics of each of site at which Grey Grasswrens were found on Bulloo Downs in October 2013. Part 2.

<table>
<thead>
<tr>
<th>site number</th>
<th>G other plants present</th>
<th>condition of site (recent fire; pig diggings)</th>
<th>comments on habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Many large patches of dry nardoo mat; a few Juncus tussocks; patches of dry forb? Ammannia.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>Old Man Saltbush common at edge of flat and in sand above it; ground cover sparse and mostly of prostrate plants; low samphire shrubs on white clay ridges.</td>
<td>Many of belalie burnt and appeared to be dead.</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Some patches of dry Persicaria sp. (former floating mat).</td>
<td></td>
<td>Rises similar to gilgai but at larger scale (wider apart).</td>
</tr>
<tr>
<td>19</td>
<td>Eleocharis plana more extensive than at site 20.</td>
<td></td>
<td>Clay grey-white but hard and only slightly cracked.</td>
</tr>
<tr>
<td>20</td>
<td>many patches of very dry meadow of Eleocharis plana; a few tussocks and some stubs of canegrass Eragrostis australasica; some prostrate plants (some succulent).</td>
<td></td>
<td>Clay grey-white but hard and only slightly cracked.</td>
</tr>
<tr>
<td>21</td>
<td>Eleocharis plana more extensive than at site 20.</td>
<td></td>
<td>Clay grey-white but hard and only slightly cracked.</td>
</tr>
<tr>
<td>22</td>
<td>some prostrate plants (some succulent).</td>
<td></td>
<td>Clay grey-white but hard and only slightly cracked.</td>
</tr>
<tr>
<td>24</td>
<td>Many tussocks of dense Paspalidium jubiflorum, especially in lignum at edges of rises; scattered tussocks of canegrass Eragrostis australasica on pans; some nutheads Epaltes cunninghamii inside lignum on rises; hummocky rises with 100% ground cover including nardoo mat, Eleocharis pallens tussocks, other tussock grass, nutheads, seedling lignum, some seedling belalie.</td>
<td></td>
<td>Part of a cluster of 5 sites.</td>
</tr>
<tr>
<td>31</td>
<td>Extensive but variable cover of Eleocharis plana (dry meadow); some tussocks of Juncus sp., some nutheads Epaltes cunninghamii.</td>
<td></td>
<td>Pronounced difference in ground cover on each side of the fence.</td>
</tr>
</tbody>
</table>

**substrate:** GC = grey clay, often deeply cracked, often soft near the surface; SC = grey clay (hard) with sandy component, e.g. near sandy upland; WC = hard white clay, usually not deeply cracked; BG = ground mostly bare; PG = patchy ground cover; CC = continuous or extensive ground cover.

**per cent of ground covered by lignum:** H = high; M = medium; L = low.

**lignum shrubs:** average height given in metres; FG = fully green; MG = mostly green; PG = partly green; DR = dry, not green; SL = some leaves; NL = no leaves; LD = large diameter; MD = medium diameter; SD = small diameter.

**lignum clumps:** MJ = many joined; FJ = a few joined; NJ = none joined.

**lignum seedlings:** C = common; U = uncommon; X = absent.

**belalie shrubs:** C = common; U = uncommon; X = absent; T = much taller than lignum; S = similar height as lignum; L = much shorter than lignum; V = vigorous, green; P = partly green; D = dead or leafless.
key factor in grasswren survival but no surveys have been conducted specifically in the saltbush communities to test this theory. Old man Saltbush may provide suitable alternative habitat for grasswrens at times when lignum floodplains are extensively inundated.

HABITAT CONDITION:
- No remarks were recorded about negative aspects of habitat condition at most of the grasswren sites.
- At one site (10) it was noted that many belalie had been burnt some years previously and appeared to be dead.
- At one site (31), where grasswrens were on both sides of a fenceline, ground cover had been greatly reduced by grazing on one side.
- Sites at which grasswrens were NOT recorded were not necessarily on poorer condition than sites where they were recorded.

Photos of the five localities where Grey Grasswrens were recorded in our October 2013 survey are in Appendix 1.

A comprehensive spreadsheet of the characteristics of each site surveyed and grasswrens recorded and a compilation of photographs of many of the sites, have been copied to SWNRM.

Conclusions and recommendations

Interpretation of our results

We consider that our survey constituted a meaningful and systematic assessment of Grey Grasswren status and habitat in the northern Bulloo Lakes system. The number of sites surveyed (n = 38) is a significant sample size and we sampled a wide variety of sub-types of the known preferred habitat (lignum shrub swamp) of the species.

The species can be difficult to find and it is certainly possible that we may have missed birds at some sites. But we have also found that Grey Grasswrens can be immediately responsive (sharp alarm or contact calls uttered) when observers, or even vehicles, pass close to shrubs where birds are located. On several occasions during our survey we (initially LP) found grasswrens immediately after hearing calls as we drove into the site. Also, we found 14 birds at nine sites despite weather that typically is considered unsuitable for finding secretive birds, or birds of any type; seven of the grasswren sites were surveyed on the two hottest and most windy days.

Substantial gaps in coverage occurred inside the extremities of the area actually surveyed. Most notably the area of wetland between the Bullo Downs – Tickalara boundary fence and the main sandy peninsula (i.e. S to SSW of Big Lake) could not be accessed by vehicle.

Improvement in knowledge base

For a population with such limited geographical range, the northward extension of range and increase in total extent of occurrence arising from our surveys are highly significant outcomes. Importantly, they provide much greater confidence in the conservation prospects of the Bulloo Grey Grasswren. Gaps in survey coverage of likely suitable grasswren habitat, within the northern part of the system and larger gaps between where we surveyed and the previously-known sites near the State
border, potentially raise these encouraging prospects even further. Wider occurrence at a higher number of sites should increase chances of the population being severely reduced by a major wildfire, for example.

However, it must be remembered that we did not find the grasswrens at 29 of the 38 sites surveyed and six of our nine records were clustered in Jerridah Channel. This suggests that the grasswrens do not occur uniformly throughout the apparently suitable habitat. Thus, they may be vulnerable to major loss of numbers if wildfire or other extensive loss of habitat was to occur in an area where the birds are presently clustered or where a high proportion of the total population size occurs.

**Perceived threats and implications for landscape management**

If we had found no, or very few, Grey Grasswrens in our survey there would be limited consequential implications for landscape management. But as we did find good numbers of this nationally-threatened bird at a substantial number of sites, the managers of Bulloo Downs have a responsibility to factor its conservation into property management planning and action.

Furthermore, if no threats to the viability of this sub-population had been identified, the managers would possibly not need to make special considerations for Grey Grasswren in their planning. Our ‘snapshot’ survey is not an adequate basis for identifying or understanding all existing and potential threats. We did not identify any immediate threats but the following medium to long term and potential threats should be considered:

**CONTROL OF EXTENSIVE WILDFIRE:**

- Fires presumably are mostly or all started by lightning strikes on Bulloo Downs although – based on our personal observations and discussions with landholders – some Channel Country properties deliberately burn lignum swamps to facilitate mustering, reduce pig habitat and encourage growth of palatable feed in the wetter parts of floodplains. This practice was formerly encouraged by the Department of Primary Industries (e.g. Pressland *et al.* 1989).
- Evidence of past fire in the Bulloo Lakes system was noted at many sites and generally across the landscape. Blackened stumps of belalie were commonplace and in some surveyed sites it was clear that former large shrubs/clumps of lignum had been burnt to a few short stakes at ground level (Figure 3).
- At present, the remaining area of good lignum habitat might seem more than adequate. However, if the low number of grasswrens found and small number of localities are truly indicative of overall sub-population size and distribution, one or two major fires could destroy a large portion of the sub-population’s habitat and numbers. Although we believe Grey Grasswrens may have greater mobility than other grasswren species (Black *et al.* 2013), we suspect they may be unable to move quickly enough to escape major fires; re-colonisation may thus depend of survival of other groups of birds not too far away.
Both lignum and belalie do regrow from below ground level but this requires adequate moisture, probably inundation by floods over at least several years, and sufficiently low grazing pressure on lignum seedlings. If fires are too frequent, too severe and/or too widespread, or major droughts follow serious fire events, then large parts of the wetland system may be without lignum habitat for many years if not permanently. This could be disastrous for some local groups of grasswrens.

The impacts and wise management of fire in arid-zone floodplain shrublands is poorly understood, having received almost no scientific investigation with respect to both grazing land management and biodiversity conservation.

For the meantime, a basic strategy for fire control in Grey Grasswren habitat on Bulloo Downs could be implemented by ensuring that firebreaks are maintained, while accepting that firebreaks may not contain all major fires. Existing tracks and cleared fencelines provide one form of firebreak.

Additionally, 'hotspots' for occurrence of Grey Grasswren could be given special attention by encirclement with firebreaks. The cluster of five sites (19-22 and 24) located in the north-central part of the Jerridah Channel already is bounded on the north and east by tracks. It may be appropriate to consider creating firebreaks to the west and south as well.

CONTROL OF FERAL ANIMALS:

- Feral pigs and rabbits are cited as threats to Grey Grasswren habitat, and feral cats as a predator, at least in southern parts of the Bulloo Lakes system (Hardy 2010; Garnett et al. 2011).
The October 2013 survey was not designed to determine systematically if these animals have seriously impacted, or may in future impact, Grey Grasswrens on Bulloo Downs.

Damage to wetland substrate by pigs (e.g. digging for bulbs and rhizomes) was evident in some sites that we surveyed but was not as widespread as can be the case in some other wetland systems. Furthermore, any actual impacts on grasswrens are not easily deduced.

Programs to control rabbit numbers on Bulloo Downs have been operating for some years, apparently with some success (D. Wingett pers. com.).

Feral cats are known to be abundant throughout inland Australia and may boom in numbers following wet years when prey also becomes abundant. Suppression of dingo numbers may also impact cat populations. Actual impacts of cats specifically on Grey Grasswrens, if any, are not well known, if at all; however, the ground feeding habits of grasswrens make them especially vulnerable to cat predation.

Assuming that cats may kill some grasswrens, a limited-scale program of cat trapping could be undertaken in an area where both grasswrens and cats occur. This would need to be highly cost-effective because of the lack of evidence of direct predation and the difficulty in monitoring of grasswrens to assess success of the program.

Spotlight shooting of cats, particularly in targeted areas, may be a more efficient technique than trapping and could be carried out in conjunction with monitoring and/or control of other feral animals (pigs, rabbits).

IMPACT OF CATTLE GRAZING:

- The October 2013 survey was not designed to determine systematically if recent or present practices for cattle grazing have negatively impacted habitat for Grey Grasswrens on Bulloo Downs.
- However, we consider that grazing impacts – if any exist – may be less significant than other threats. Given the persistence of relatively rich and abundant biodiversity in the Channel Country over past decades, and more than 100 years of grazing (sometimes at higher stocking rates than today), ecologically sustainable grazing conceivably may be sufficiently compatible with maintenance of grasswren habitat in regularly inundated wetland systems in this region.

LOSS OF RIVER FLOWS:

- Arguably the most serious of the potential threats is possible future regulation, reduction or cessation of flows in the Bulloo River system. Should present floods, minor through to major, cease to reach the lignum swamps inhabited by the grasswrens, it is most likely that the lignum will gradually die and not be replaced.
- There are countless examples elsewhere in Australia and around the world where huge wetland systems, or at least their original wetland plant communities, have died or otherwise changed due to changes to river flows.
Recommendations

1. Further searches for presence of Grey Grasswren, using similar methods, should be conducted on Bulloo Downs to fill gaps in coverage, consolidate the knowledge of which sites are occupied and to determine site fidelity. PRIORITY = High.

2. To adequately inform management of habitat for the Bulloo Grey Grasswren, sophisticated studies of the ecological requirements of the subspecies and local threats to its survival in the northern part of the system should be undertaken. PRIORITY = Medium.

3. SWNRM should contribute where possible to overall efforts to systematically investigate the impact and wise management of fire in lignum shrublands. PRIORITY = Low.

4. Subject to securing resources, in order to contribute to long term viability of Grey Grasswrens on Bulloo Downs the managers should consider adding and maintaining firebreaks (where none presently exist) that would enhance the resilience of grasswren hotspots to wildfire. First priority would be the cluster of grasswren sites in north-central Jerridah Channel. PRIORITY = High.

5. Based on assumptions on impacts of feral animals on grasswrens elsewhere, it would be beneficial to sustain present control programs on Bulloo Downs as these may also benefit grasswrens and their habitat. PRIORITY = Medium.

6. New activities to reduce numbers of feral cats where cats and grasswrens are proved to co-exist, particularly at grasswren hotspots, may be worthwhile if they are highly cost effective. PRIORITY = Medium.

7. SWNRM, landholders and conservation groups should continue to lobby the State and Federal Governments to guarantee no loss of river flows in the Bulloo River catchment. PRIORITY = High.
References


Appendix 1. Photos of localities where Grey Grasswrens were recorded on Bulloo Downs in October 2013

Site 4
Site 7
Site 18
Sites 19-21
Site 24