ecological consultants

AN INVESTIGATION OF HABITAT SUITABILITY FOR THE ORNAMENTAL SNAKE - PROPOSED QR RAIL CORRIDOR BETWEEN GOONYELLA RIVERSIDE AND NEWLANDS MINES

Final Submission

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1. INTRODUCTION

It is proposed to instate a new rail link between the Goonyella-Riverside Mine (to the near north of Moranbah) and the Newlands Mine, to the near north of the township of Glenden. As part of the review of environmental issues associated with the proposed rail link, a field survey was undertaken to assess the known or likely occurrence of rare and threatened flora species and general vegetation characteristics, including the remapping of regional ecosystems (LAMR 2005). As a result of those field investigations, potential habitat for the threatened Ornamental Snake *Denisonia maculata* was noted.

Subsequently, DEH issued a request for further information in relation to the potential occurrence of the Ornamental Snake. In response, GHD Pty Ltd commissioned ECOServe to investigate potential habitat suitability for the Ornamental Snake throughout the proposed rail easement and to provide recommendations in relation to the study findings.

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7661840 7651840 7641840 7631840 7621840 7611840 7601840

REDCLIFFE TABLELAND

Queensland Rail
Northern Missing Link

Study Area

Figure 1

2. STUDY METHODOLOGY

2.1. Nomenclature and Terminology

2.1.1. Geographic

For the purposes of this report, the *study site* refers to the rail easement as identified in Figure 1-1. The term *study area* refers generally to the lands surrounding the *study site*, i.e. the area bounded by Mount Coolon (west), Moranbah (south), Nebo and Glenden (east) and Collinsville in the north.

The *study site* is located within the *Brigalow Belt Bioregion* which is defined as one of 13 biogeographical areas of Queensland, which extends from the Queensland-New South Wales border to Townsville. It encompasses approximately 3.6 million hectares of sub-humid and semi-arid environments (see Sattler and Williams 1999) and is encompassed almost entirely within the 500 to 750 isohyets (Covacevich *et al.* 1997).

2.1.2. Legislation

Within this report, conservation status is described in accordance with the provisions of Queensland's *Nature Conservation Act 1992* (NC Act) and its regulations and amendments, and/or the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). For the purposes of this report, relevant NC Act regulations and amendments refer to the *Nature Conservation (Wildlife) Regulation 1994* reprinted as in force on 17 December 2004 (includes commenced amendments up to 2004 SL No. 316). *Threatened* is a common term used to collectively describe endangered and vulnerable species.

2.1.3. Fauna

Nomenclature used for this study follows Cogger (2000) for reptiles and amphibians. The common names for frogs follow the nomenclature of Ingram *et al*. (1993).

2.2. Desk-based Assessments

A comprehensive range of information was reviewed to determine known occurrence of the Ornamental Snake and the distribution of potential habitat within the general area relevant to the *study site* and *study area*. Information sources included, but were not limited to the following:

- National, State and regional fauna/flora databases, i.e. Environment Australia, Qld Museum QEPA WildNet.
- Vegetation cover, ecosystem and community mapping, i.e. QEPA RE and BPA mapping and previous vegetation mapping for the *study site* and *study area* (EPA 2003; DNRM 2004; LAMR 2005).
- 2005 aerial photography in order to identify vegetation in the local area, comparing patterns observed with existing vegetation mapping.
- Previous studies of relevance undertaken in the vicinity of the *study site*, i.e. Melzer *et al.* 1996; Morton *et al.* 1998; Aridis & Agnew 1999; Tucker *et al.* 1999; Agnew & Young 2000a & b; Agnew & Low 2000; Agnew *et al.* 2001, 2002 & 2004; GHD 2004; and EcoServe and LAMR 2005b & e;
- Previous studies of relevance undertaken by the study team at other sites throughout Central Queensland, e.g. Agnew & Veary 1999 & 2003; EcoServe 2004 & 2005; and EcoServe & LAMR 2005a, c, & d.

- Regional assessments which have relevance to the ecological values of the *study site*, i.e. Covacevich *et. al.* 1997; McDonald *et. al.* 1991; Young *et. al.* 1999; McFarland *et. al.* 1999; and Agnew *et. al.* 2003.

2.3. Field Investigations

The entire rail corridor route was traversed by vehicle over a three-day period, i.e. 11th to the 13th of November 2005. All field investigations were undertaken by Andrew Veary, a senior terrestrial ecologist with extensive experience with the terrestrial fauna of central Queensland and with the Ornamental Snake.

In general, the route was followed using GPS tracks provided by GHD and marked-up aerial photography. Where potential habitat was encountered, it was annotated on the aerial photography, photographed, ground searches were undertaken and field notes completed on habitat characteristics (e.g. presence and degree of Gilgai formation, abundance of ground timber, vegetation cover, etc.) and any notable observations. Ground searches focussed primarily on investigating the potential of ground timber as refuge for Ornamental Snakes and searches for potential prey around water bodies within or adjacent to the corridor.

3. SPECIES PROFILE

The Ornamental Snake *Denisonia maculata* is listed as *Vulnerable* under the provisions of the NC Act and EPBC Act. It is also listed vulnerable by Cogger *et al.* (1993). It has a small, well-defined distribution range, located only in mid-eastern Queensland, and confined to the Brigalow belt and primarily within the Fitzroy River drainage system (McDonald *et al.* 1991; Cogger *et al* 1993; DEH 2005a).

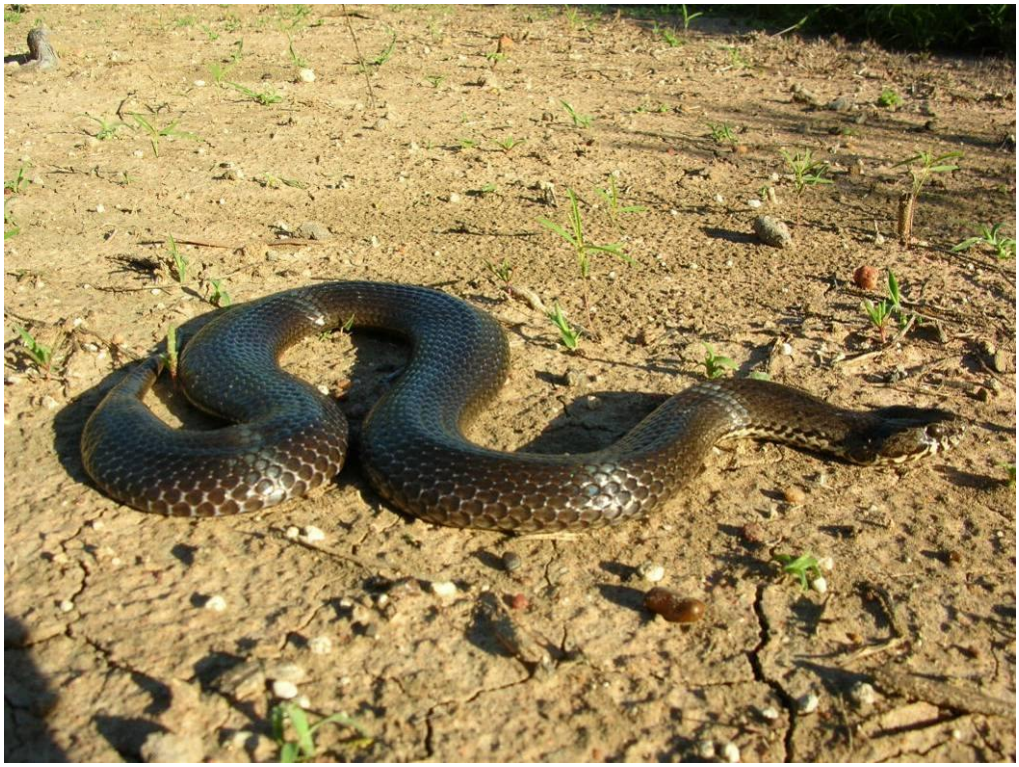
The biology and ecology of the Ornamental Snake is considered to be poorly known (Cogger *et al.* 1993; DEH 2005a; *pers. comm.* R. Shine, Sydney University 2005). Currently, it is known from a variety of seasonally inundated habitats (especially gilgai in Brigalow) with deep cracking soils of woodland, shrubland and natural levees (Wilson & Knowles 1988; Ehmann 1992; Cogger 2000; Wilson 2005; DEH 2005a; *pers. obs*. authors 1998-2005).

Records of the Ornamental Snake collected from previous surveys by the authors within the general area have all been associated with habitats that support Brigalow together with an extensive network of Gilgai's and deep-cracking clay soils (e.g. Agnew & Young 2000b; Agnew & Veary 1999 & 2003; Agnew *et al.* 2004; EcoServe & LAMR 2005d). This is also reflected in the observations of Melzer *et al.* (1996) and DEH (2005a). Personal communications provided by Steve Wilson (Queensland Museum, 2005) indicate that Gilgai's and deep-cracking clay soils (associated with both *Acacia harpophylla* and *Dicanthium* spp. communities) were important habitat attributes in predicting the occurrence of the Ornamental Snake in relation to surveys undertaken in association with the development of the Moranbah to Townsville gas pipeline.

This cryptic snake is regarded as nocturnal, live-bearing and a specialist predator of native frogs (Shine 1981 & 1983). Recorded prey items include the frogs *Litoria caerulea*, *L. fallax*, *L. latopalmata*, *Limnodynastes tasmaniensis* and *Limnodynastes ornatus* (Shine 1983). Ornamental snakes are also known to feed on *Cyclorana alboguttata* and *C. brevipes* (*pers. obs.* authors).

Peak activity levels, and hence highest potential for Ornamental Snake detection, are typically restricted to periods following suitable summer rainfall events which create optimum conditions for its favoured prey to be most active and concentrated around its breeding sites (*pers. obs*. authors 1998-2005; *pers. comm.* R. Shine, Sydney University 2005). Thus, the main opportunity to detect the Ornamental Snake is seasonally constrained. During warmer months, this species can be found during the day sheltering under litter and fallen timber (Cogger 2000).

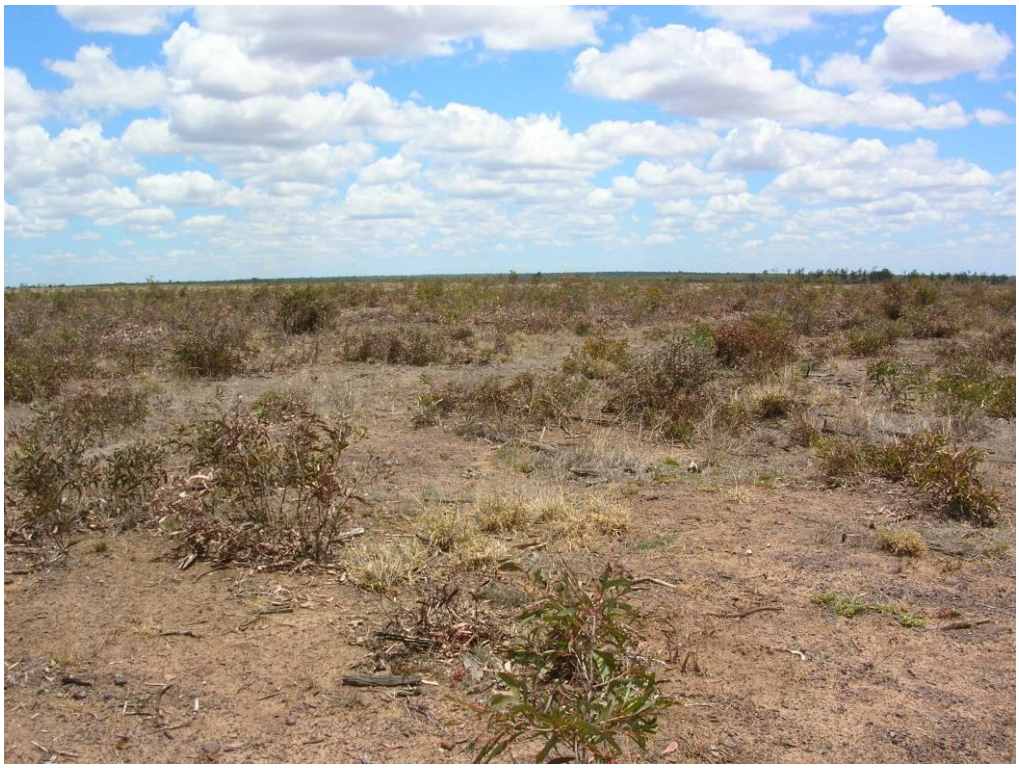
The distribution and abundance of this species is not known to have declined, but this animal thought to be threatened by overgrazing, habitat alteration/clearing for agriculture, pastoral improvement, urban development and possibly poisoning by Cane Toad ingestion (Cogger *et. al* 1993; DEH 2005a). Currently, the biological effects, including lethal toxic ingestion, caused by Cane Toads is being considered as an amendment to the *List of Key Threatening Processes* under the EPBC Act (DEH 2005b).



An adult Ornamental Snake *Denisonia maculata* (Moranbah district).

Quality habitat where Ornamental Snakes have previously been recorded (Moranbah district).

Quality habitat where Ornamental Snakes have previously been recorded (Nebo district)



An area within the rail corridor which is representative of the heavily degraded habitat (*Acacia harpophylla* on cracking clays with gilgai development) which may have previously represented suitable habitat for Ornamental Snake.

4. FINDINGS AND CONCLUSIONS

The fauna habitat values within the *study site* (see habitat mapping in Figure 4-1) have been strongly influenced by a history of vegetation clearing, cattle grazing and to a lesser extent, invasion of exotic flora, especially *Cenchrus ciliaris* and *Parthenium hysterophorus*. This is a reflection of the past and current landscape/habitat modification processes operating throughout the surrounding area.

The widespread removal of native vegetation, pasture improvement activities and cattle grazing has resulted in a significant simplification of fauna habitat structure throughout the *study site*. This is manifest throughout the corridor (and vicinity) in extensive, cleared areas over the extent of the clay plains, with only small nodes that support native vegetation (remnant and regrowth) which occurs mainly associated with rises and jump-ups. Within the latter, more open ground cover conditions with little or no recruitment of shrubs and trees being characteristic.

The decline in the structural integrity of the original, more complex habitat is likely to have impacted on all native fauna groups. The current, more simple-structured habitats would also allow greater access and more favourable conditions for introduced weeds, and fauna such as toads, cats and foxes. The long history of unrestricted cattle access throughout the *study site* has resulted in further simplification of ground cover microhabitat diversity (e.g. removal of fallen timber; native tussock grasses; and to a lesser extent, leaf litter) required by a wide variety of ground-dwelling fauna (especially small-ground mammals, reptiles and frogs).

Given the levels and history of disturbance evident across the *study site*, it is expected that the *study site* is likely to only support a low diversity of native taxa. The majority of this assemblage is likely to be comprised of taxa considered to be common and widespread in the *study area* and bioregion and characterised by adaptable, disturbance-tolerant and cosmopolitan species.

The same processes that have diminished habitat values for fauna in general, have also resulted in a significant diminution of potential habitat values for the Ornamental Snake. As noted previously, Gilgai and deep-cracking clay soils have been associated with the occurrence of the Ornamental Snake, though these elements alone do not constitute quality Ornamental Snake habitat (see preceding photographs and discussion).

Whilst the corridor landscape (and adjacent environs) supports areas of deep cracking clays and Gilgai formation, these habitats have been cleared of woody native vegetation cover (e.g. *Acacia harpophylla*). Habitat variables influenced by the composition and structure of the tree canopy and understorey vegetation include the level of leaf litter and fallen timber, and in turn, soil moisture and thermal conditions. These resources and conditions, as a contribution to ground habitat diversity, are important for invertebrate diversity/abundance and in turn, frogs which feed on them. Impacts to frog abundance and diversity will in turn impact on the habitat suitability for the Ornamental Snake, thought to feed exclusively on frogs.

Additionally, fires (presumably to remove cleared vegetation) and the on-going impact of cattle grazing and trampling have simplified ground cover and microhabitat structure. Of particular relevance here, is the removal of ground timber which may provide diurnal refuge for the Ornamental Snake and its frog prey, especially when ground conditions are wet and soil cracks are non-existent due to soil expansion.

Structurally simple ground cover conditions may also favour the introduced Cane Toad, particularly around waterbodies. All waterbodies observed within or adjacent to the rail corridor were heavily degraded by cattle. These were all characterised by turbid waters, sparsely vegetated or bare margins which were heavily pugged by cattle. Within the region, these conditions typically support an amphibian fauna numerically dominated by Cane Toads (Agnew *et. al.* 2003; *pers. obs.* authors).

As noted previously, one threat to the Ornamental Snake is thought to be poisoning by Cane Toad ingestion (Cogger *et. al* 1993; DEH 2005a) and that the biological effects, including lethal toxic ingestion, caused by Cane Toads is currently being considered as an amendment to the *List of Key Threatening Processes* under the EPBC Act (DEH 2005b). The Cane Toad may also impact indirectly

on the Ornamental Snake populations as it has the capacity to impact on a range of native species, particularly amphibians that compete with the Cane Toad for food, shelter and breeding sites (Covacevich & Archer 1975; Phillips *et al.* 2003).

It is reasonable to assume that a large part of the corridor (and adjacent areas) which supported Brigalow and deep, cracking clays would have, prior to European intervention, supported good quality habitat for Ornamental Snakes. The subsequent land degradation has now reduced much of this area to a state where it can only be regarded as potentially poor quality, marginal habitat for this species.

As a result of the findings of the field investigations, one section of the proposed alignment (approximately 1.5klm in length) is considered to support habitat values for the Ornamental Snake which may warrant (on the basis of implementing the precautionary principle), a minor realignment of approximately 500-600m to the east. This section extends from points 108 to 111 inclusive (see Figure 1-1 and Figure 4-1). Whilst the potential impedance of surface flows as a result of developing the rail structure within this and other parts of the rail corridor are unlikely to be significant (given the generally flat nature of the landscape), the inclusion of culverts may mitigate any potential impacts and have the additional benefit creating potential access for movement for some smaller-sized ground dwelling fauna (including amphibians) between either side of the railway structure. The benefit of culverts for movement of Ornamental Snakes is unknown, though other snake species are know to utilise such structures (*pers. obs.* authors).

With the implementation of the abovementioned recommendations and best management practices (as directed by an environment management plan), it is considered that no adverse or significant effect on local Ornamental Snake populations is likely as a result of changes within the *study site* (or adjacent environments) resulting from the development of the proposed rail link.

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Newlands

Maddern
Lot 689 PH2015

Perry
Lot 1 CP905226

Pini
Lot 2 DK176

Mason
Lot 3388 PH2112

Kemp
Lot 3 CP852527

Glenden

North Goonyella

GHD
CLIENTS | PEOPLE | PERFORMANCE

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Meters

1:200,000

Queensland Rail Northern Missing Link

Ornamental Snake Habitat

Figure 2

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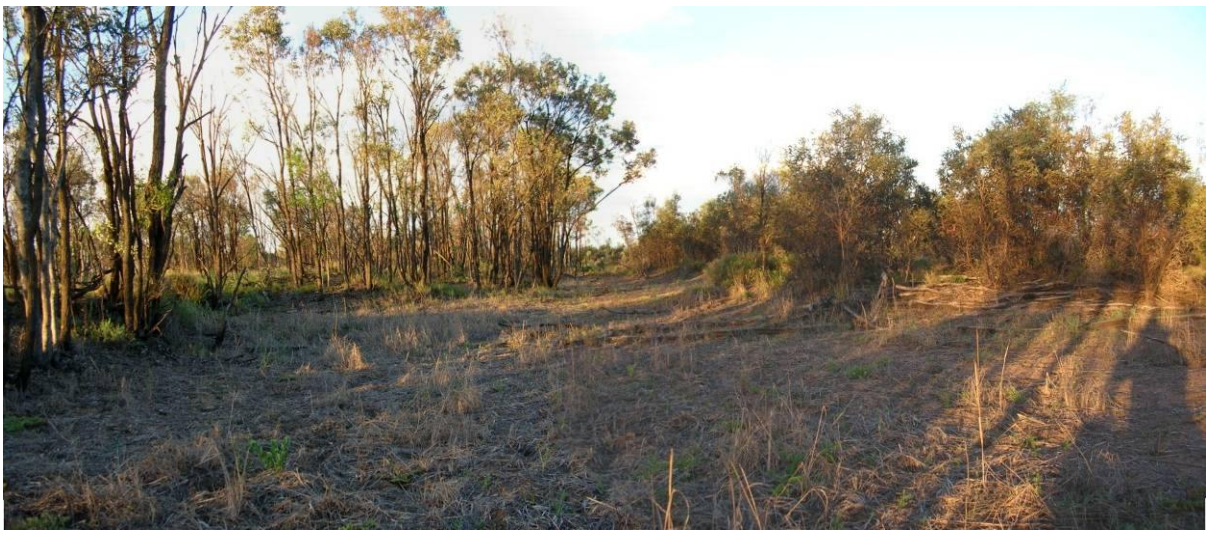
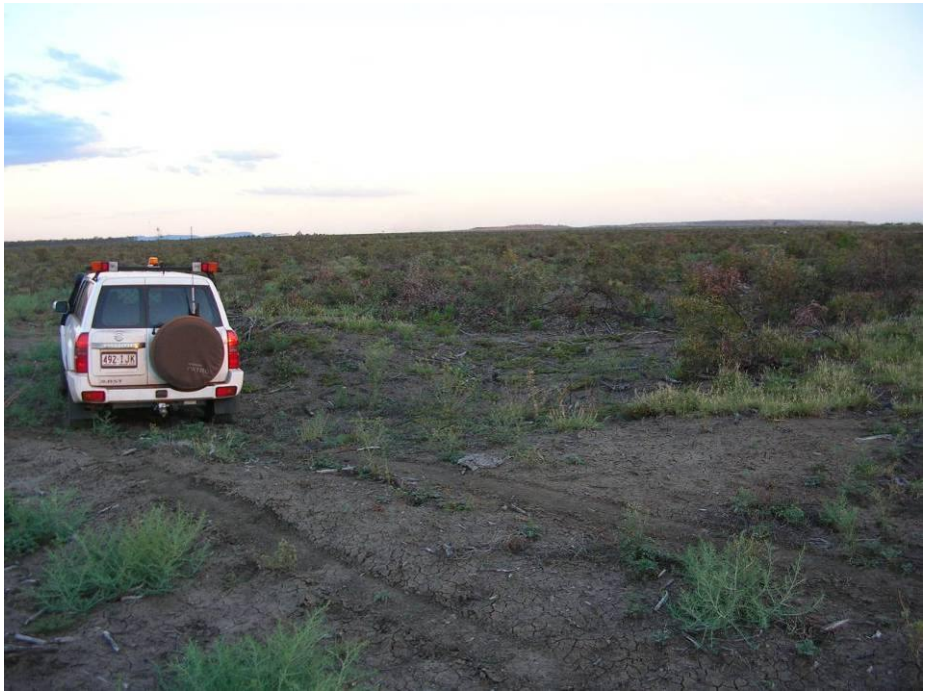
Appendix A: Photographic Record of the Proposed Rail Corridor.

Points 3 to 18





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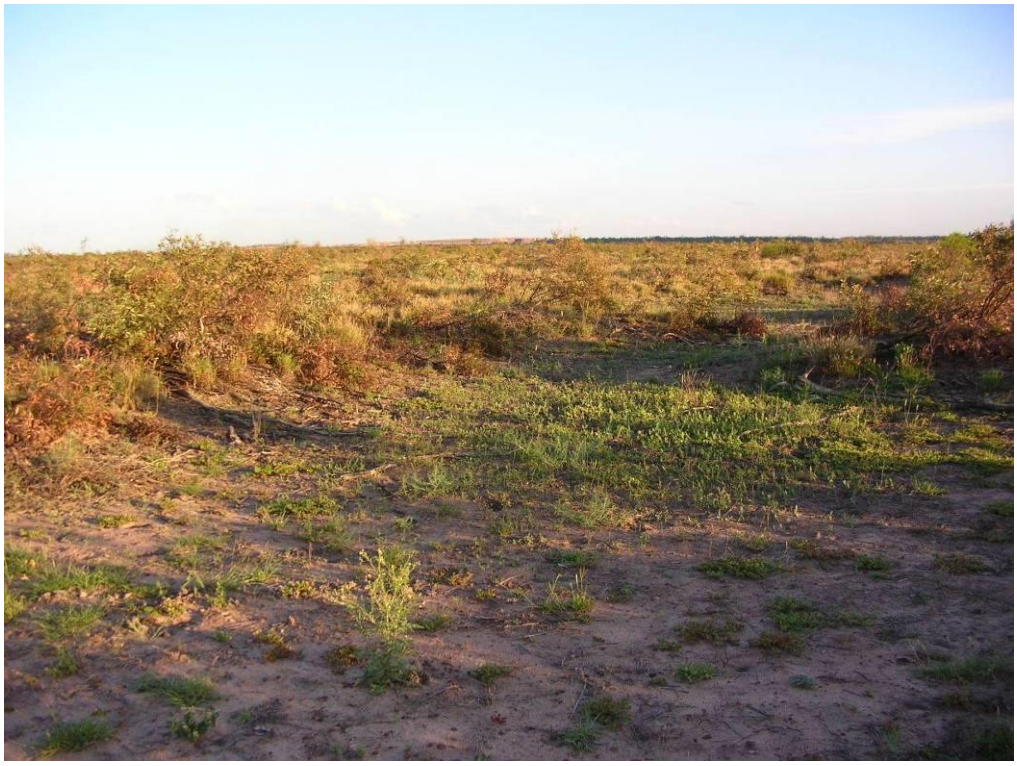
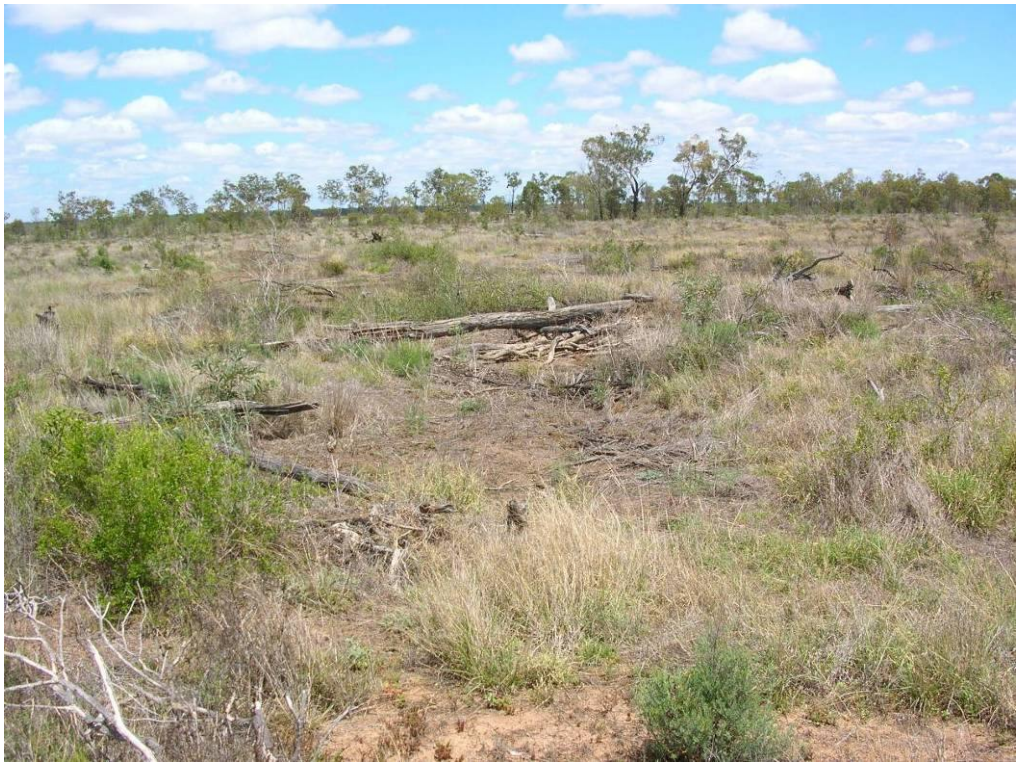
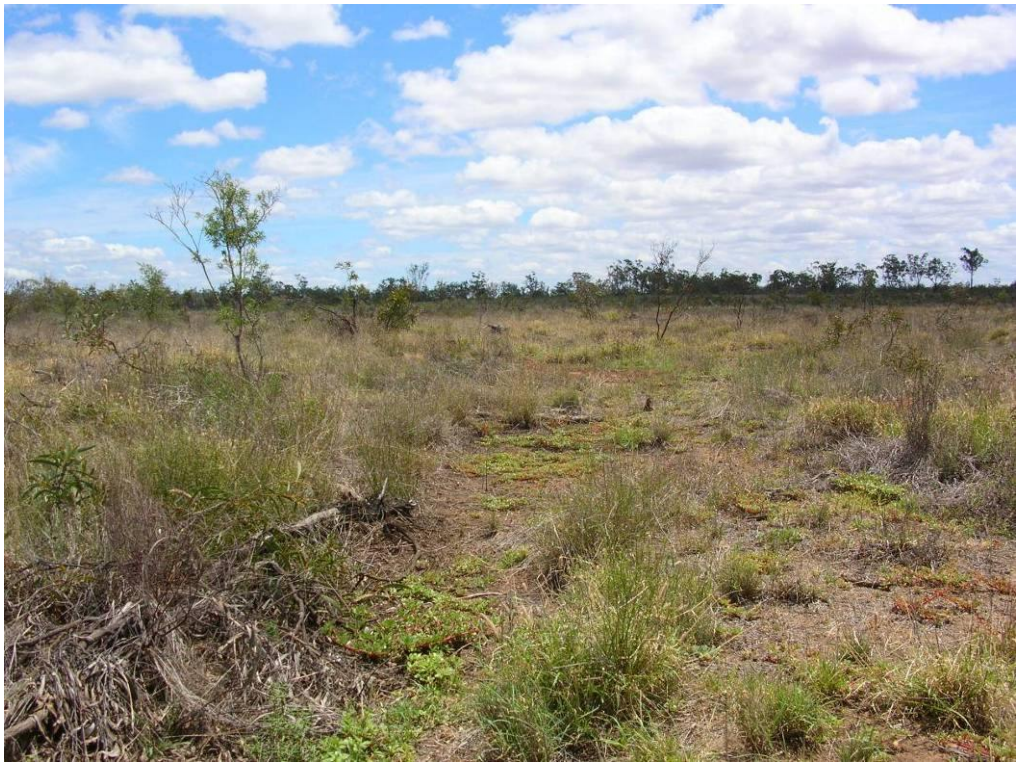
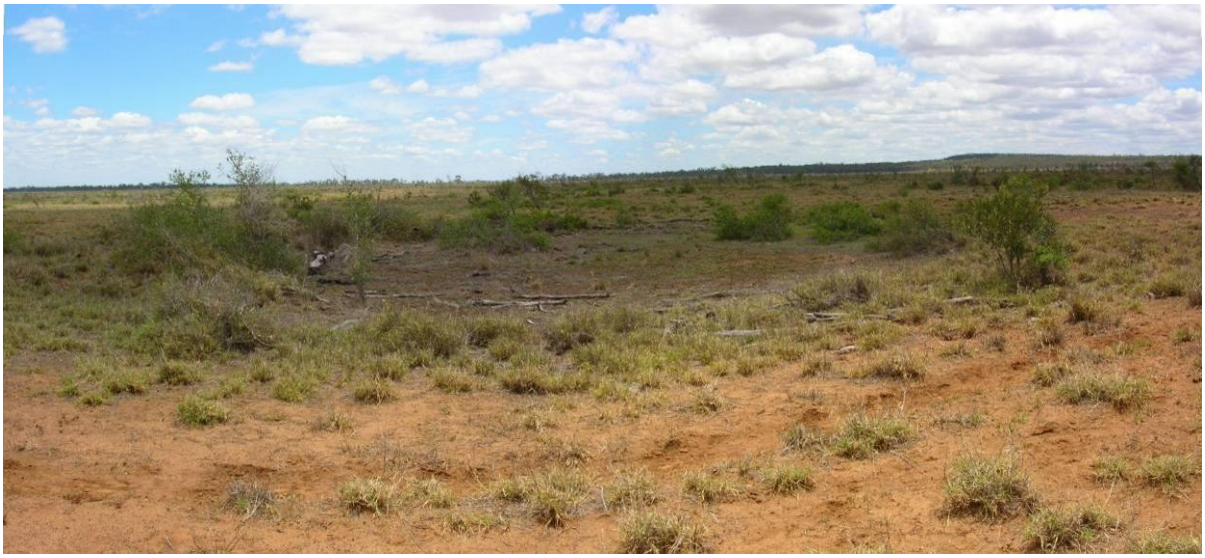


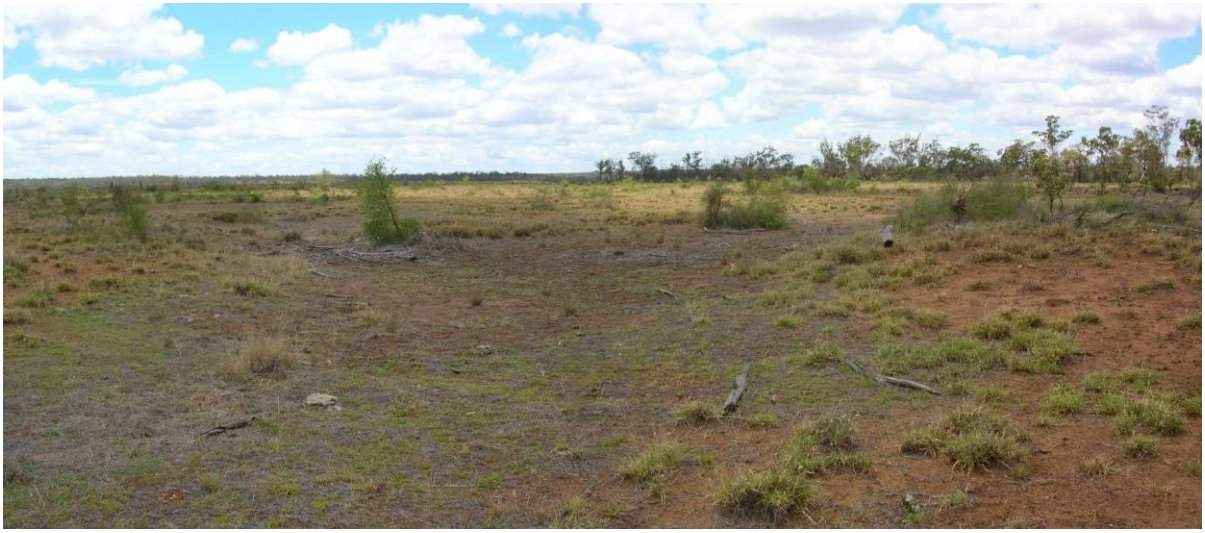
Points 53 - 54



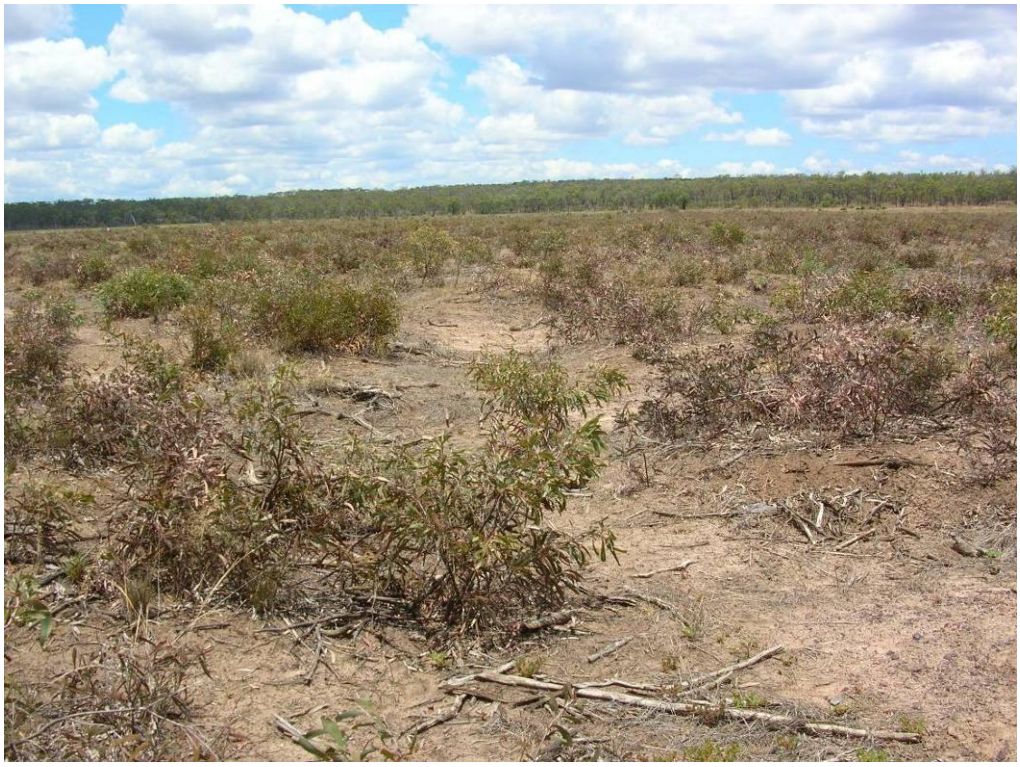


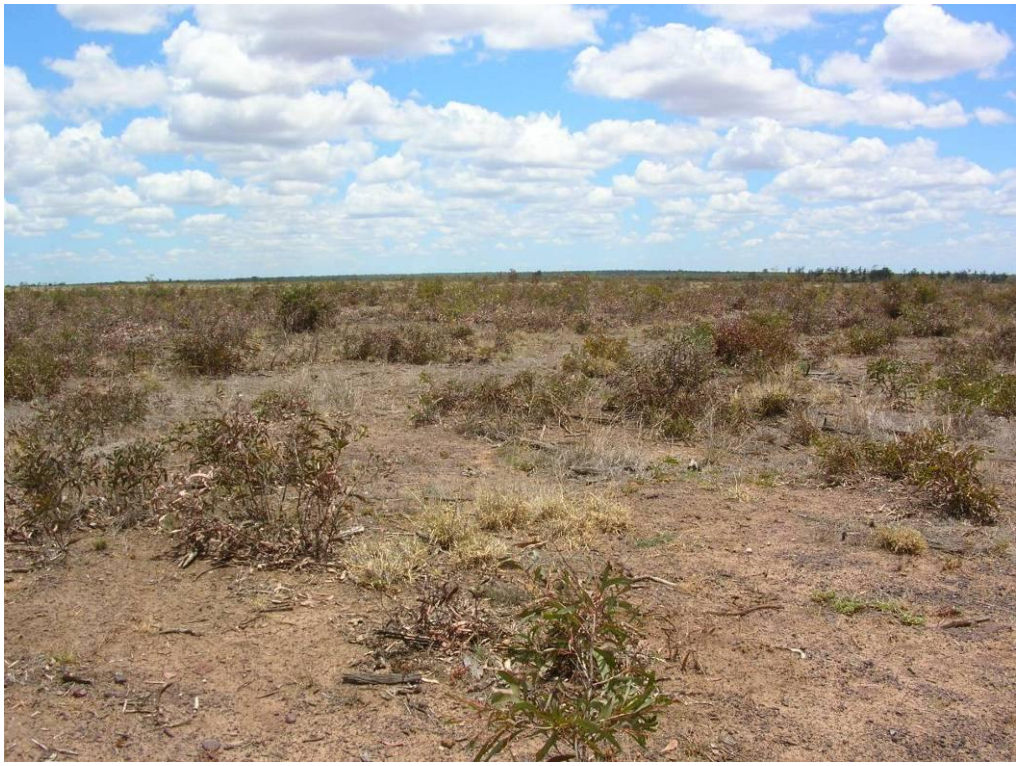
Points 59½ - 60



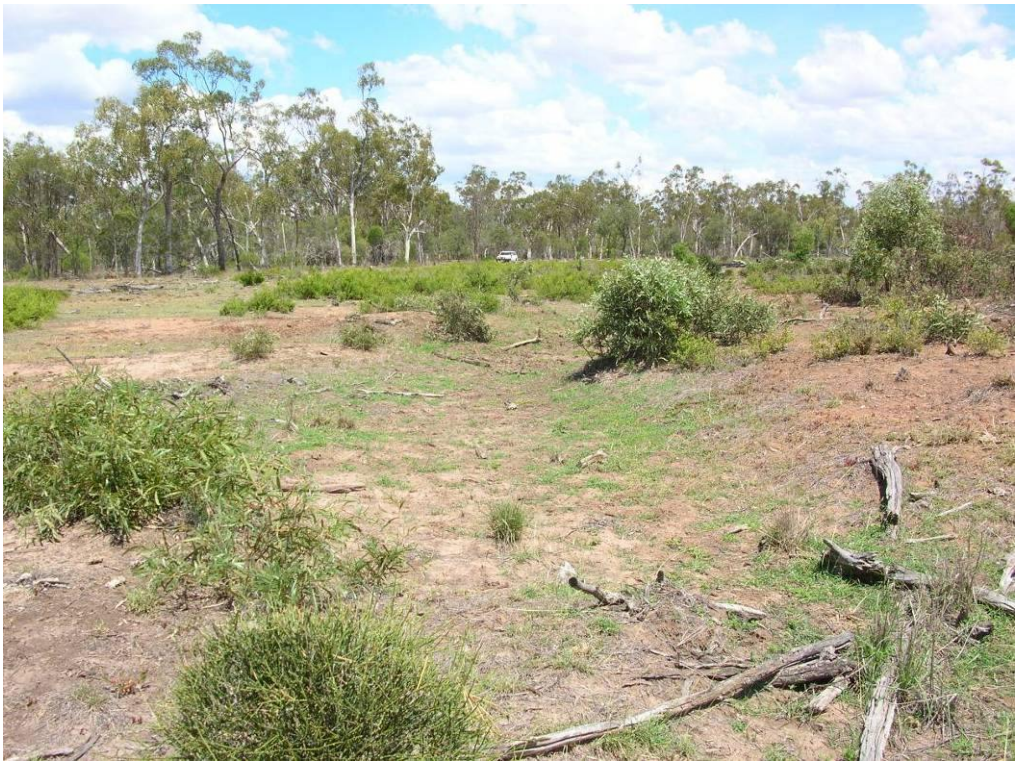


Points 63 – 65.



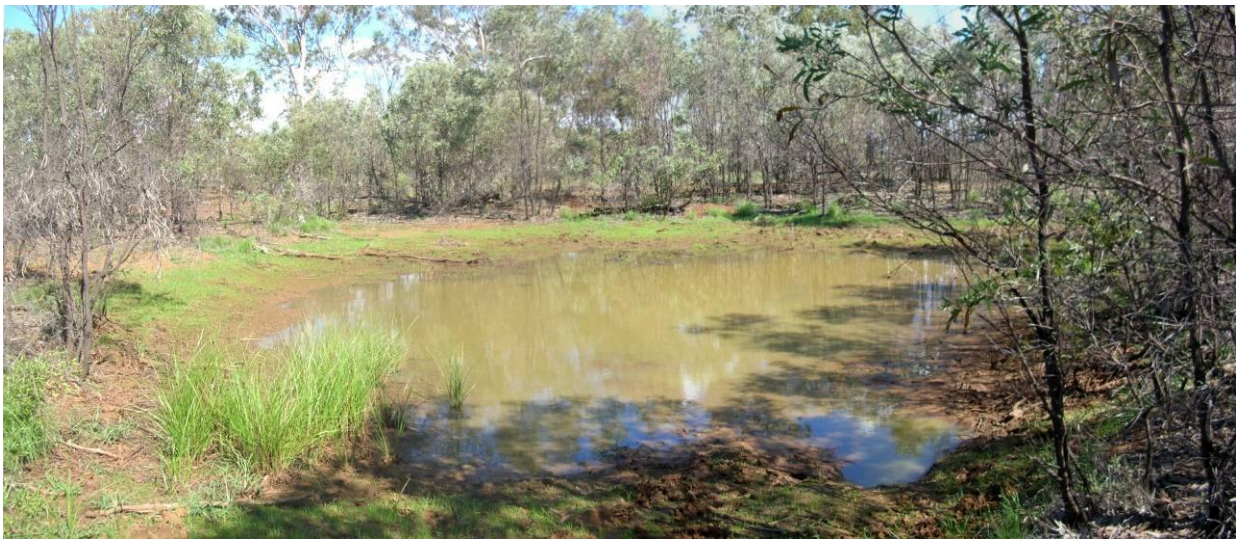


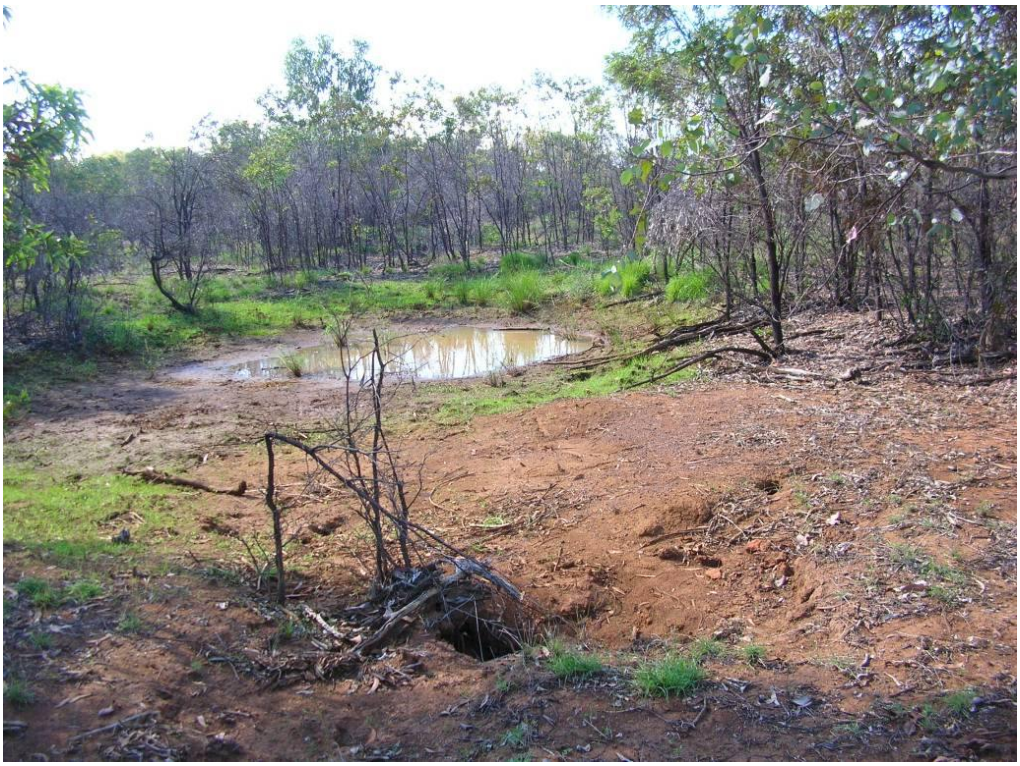
Points 81 – 83



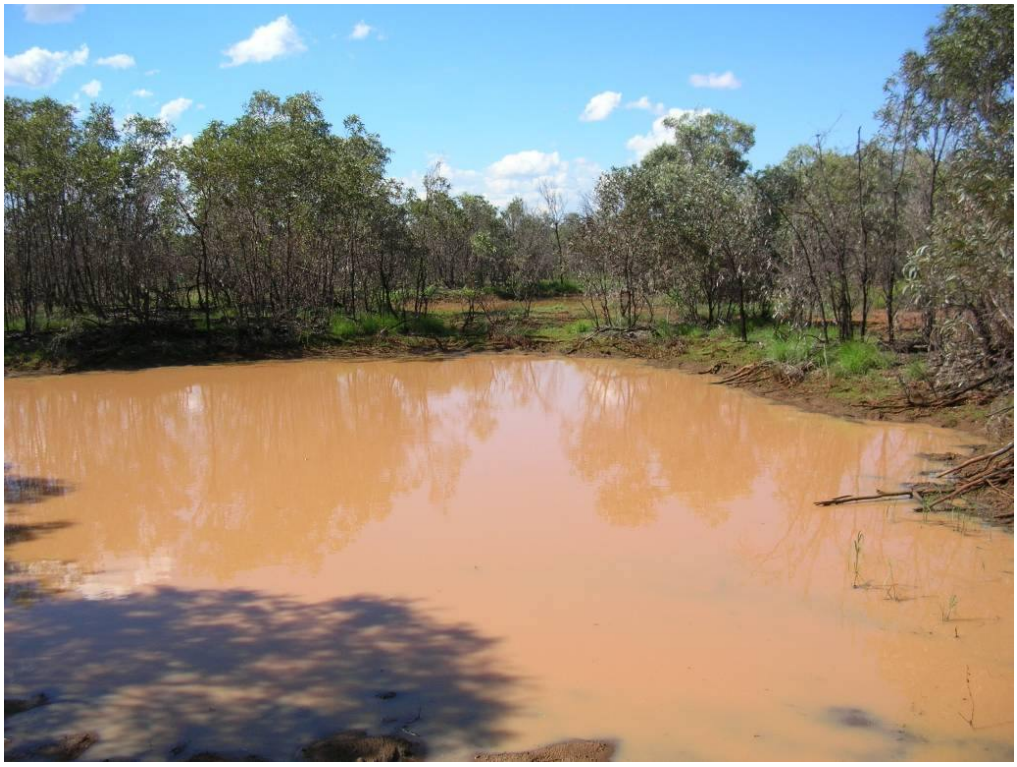
View to the west-northwest from Point 81

Points 100 – 102

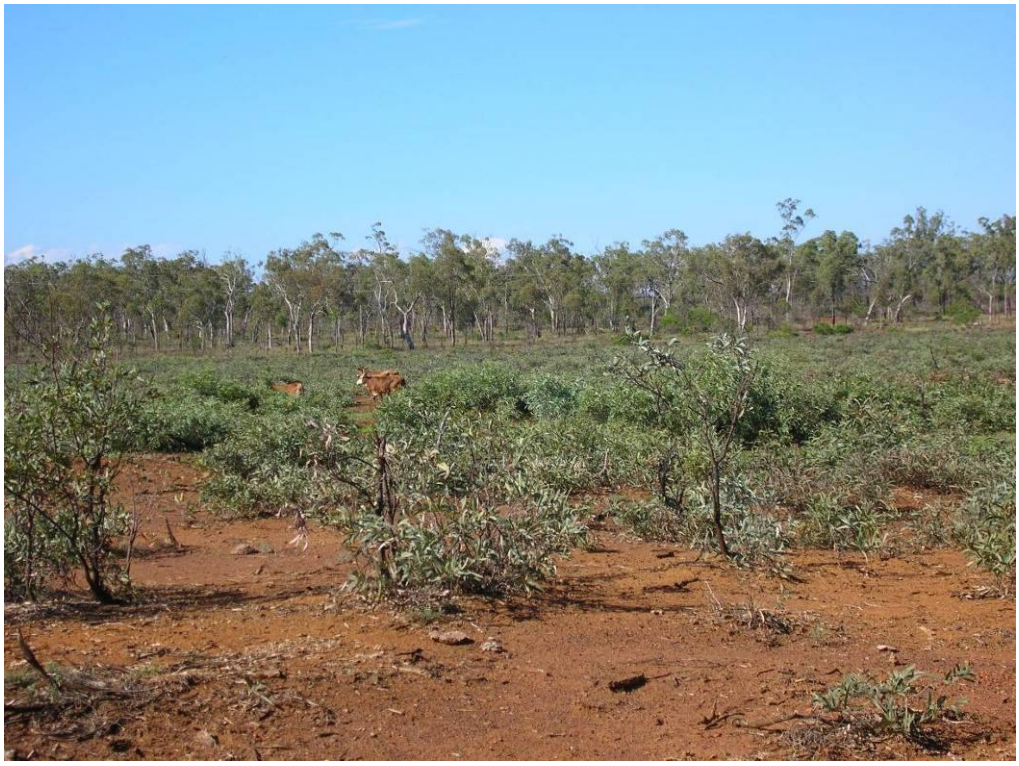




Points 100 – 102 (cont'd)

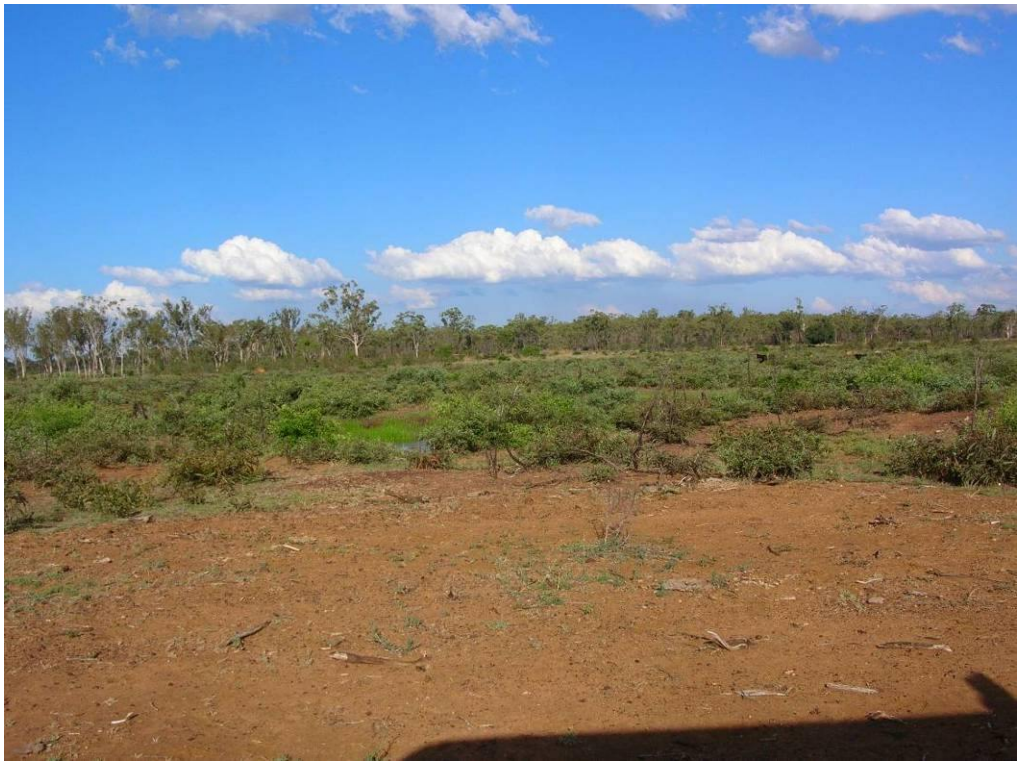


Points 103 – 104

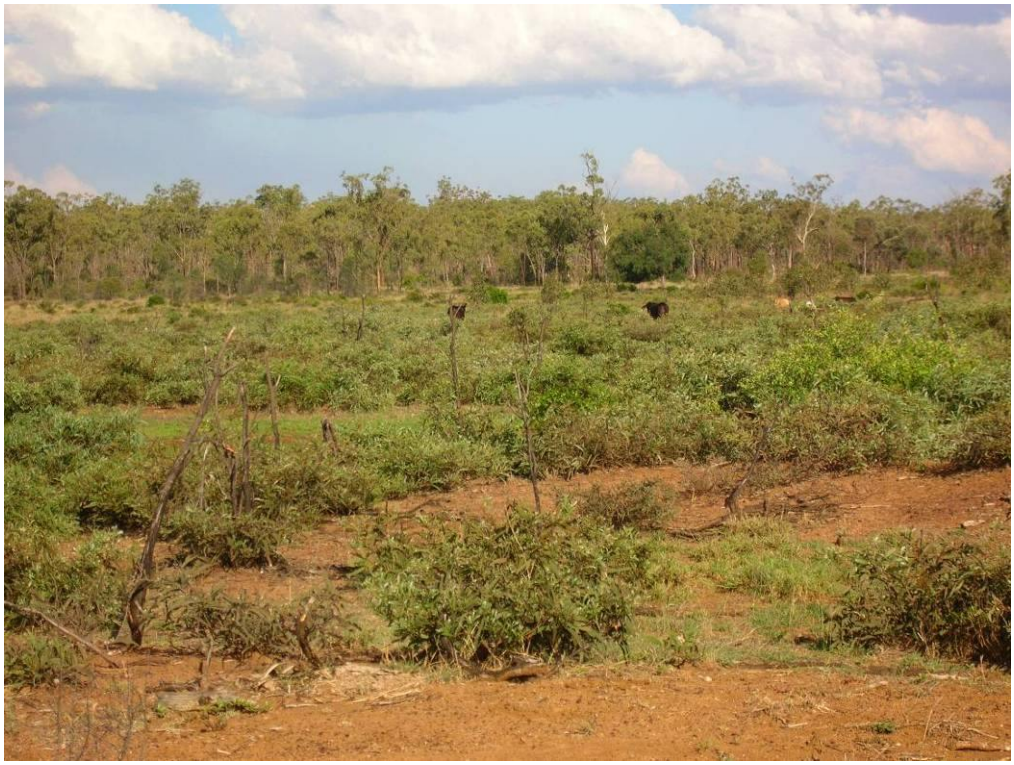


View northwest from 103 on fence line

Points 106½ - 109



View northeast to Point 107



View southeast to Point 107

Points 113½ - 115