



The Irvinebank Wattle
(*Acacia leptoloba*)

***REVEGETATION
GUIDELINES
&
RECOMMENDATIONS
FOR
GIBBS CREEK,
IRVINEBANK***

Report to the
Irvinebank Landcare Group
&
Mitchell River Watershed
Management Group

Compiled by Simon Gleed
August 2005

REVEGETATION GUIDELINES AND RECOMMENDATIONS FOR GIBBS CREEK, IRVINEBANK

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IRVINEBANK LANDCARE GROUP

Vision Statement

The Irvinebank Landcare Group is dedicated to promoting and implementing current best management landcare practices to improve the health of the natural resources in the Greater Irvinebank area.

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INTRODUCTION

Scope and Purpose of Report

The Mareeba Environmental College (MEC) was approached by Deborah Eastop of the Mitchell River Watershed Management Group (MRWMG) on behalf of the Irvinebank Landcare Group to provide a supporting technical document for a collaborative revegetation project being undertaken in township of Irvinebank, Queensland. (The college is part of the Australian Agricultural College Corporation).

A job brief was provided by the Landcare group and the MRWMG, and was followed by a preliminary site inspection on the 4th May 2005 of a site on Gibbs Creek, situated on the outskirts of the Irvinebank township. The principal intention of the revegetation project (stage 2 of a broader project) is to remove a major infestation of the weedy succulent *Agave sisalana* (Sisal) and later revegetate the site using a range of suitable native plants to meet both aesthetic and environmental objectives.

The Irvinebank Landcare Group is dedicated to the promotion and implementation of current best management Landcare practices to improve the health of natural resources in the greater Irvinebank area. To achieve this vision, the group is funded through various grants, charitable donations, local community volunteers, and includes the guidance and support from the MRWMG. The group currently has 25 members, and has rallied to undertake small revegetation projects on degraded sites near Gibbs Creek and adjacent to the Herberton-Petford Road. Revegetation of these sites will greatly enhance the aesthetic nature of entry points into the township, as well as provide some amelioration of bank erosion occurring on the creek.

As part fulfillment of the Diploma of Conservation and Land Management (Dip. CALM) students of MEC are required to complete several subjects with direct relevance to natural resource management (NRM) projects in the region. In addressing this, the college openly seeks collaborative NRM projects with industry, community groups and key stakeholders in the region. The diploma subject *Conduct Vegetation Surveys* aligns well with requests from the Irvinebank Landcare Group and the MRWMG for the compilation of floristic and vegetation information relating to the revegetation site in Irvinebank.

This report provides brief data and an analysis of field surveys conducted in May and June 2005 of vegetation occurring on Gibbs Creek, Irvinebank, Queensland. The information and data herein relates to the outcomes requested by the Irvinebank Landcare Group and the MRWMG, and is summarized with brief recommendations directed at the revegetation project on Gibbs Creek. The findings of the surveys presented in this report are intended to provide advice and supplementary information to be used by the Landcare group in achieving ecologically and aesthetically appropriate outcomes for the project. See Appendices for further information.

Information in the report is limited to a provisional species list of vascular plants recorded from the revegetation site, and a brief description of the vegetation adjacent to Gibbs Creek. The latter information is based on field observations and contemporary vegetation classification data held by the Queensland Herbarium (Environmental Protection Agency) and subsequently presented in Sattler & Williams (1999).

This work does not attempt to define a complete and exhaustive analysis of the floristic composition of the region's immediate flora, but merely offers supporting information to guide revegetation practitioners in their selection and use of plants for the site.

A Snapshot of Irvinebank's History

Irvinebank is located approximately 28 km west of Herberton, and is in the Einasleigh bioregion of north Queensland (Fig. 1). The once productive tin mining town, established in 1882, is today a 'living museum' of a bygone era, when it is reported that the population stood at 3 000 (a stark contrast with the current residency of about 100 people).

The town was named by John Moffat (touted as Queensland's greatest mining entrepreneur), and was originally called Gibbs Camp by the mining party of Gibbs, McDonald and Eales. Moffat migrated from Loudoun, a small town on the banks of the Irvine River in Scotland, and soon after his arrival he renamed the town Irvinebank in recollection of his Scottish birthplace.

As a consequence of years of intensive mining around the hills of Irvinebank, the landscape was altered from its original condition by small tunnel and open-cut mines. Evidence of old mining activity can still be found today, where mineshaft entrances, scrapes and even old tools and machinery are scattered about the area.

Close to the centre of Irvinebank at the junction of Gibbs Creek and McDonald Creek is the location of the town's first dam. The Alliance Dam was constructed in 1884 at the same time when the Loudoun Mill opened and is a picturesque setting - where freshwater crocodiles and turtles are often seen basking on old tree limbs protruding from the water.

The water in the Alliance Dam is not potable; however, the Ibis Dam, located approximately 1 km south of the town, continues to supply water almost 100 years after its construction in 1906.

The town's amenity services are centred around the Irvinebank Tavern, which hosts the post office, fuel station and camping ground. Another important service feature of the town is the school - perched on a small hill, where the small class groups enjoy views over the township.

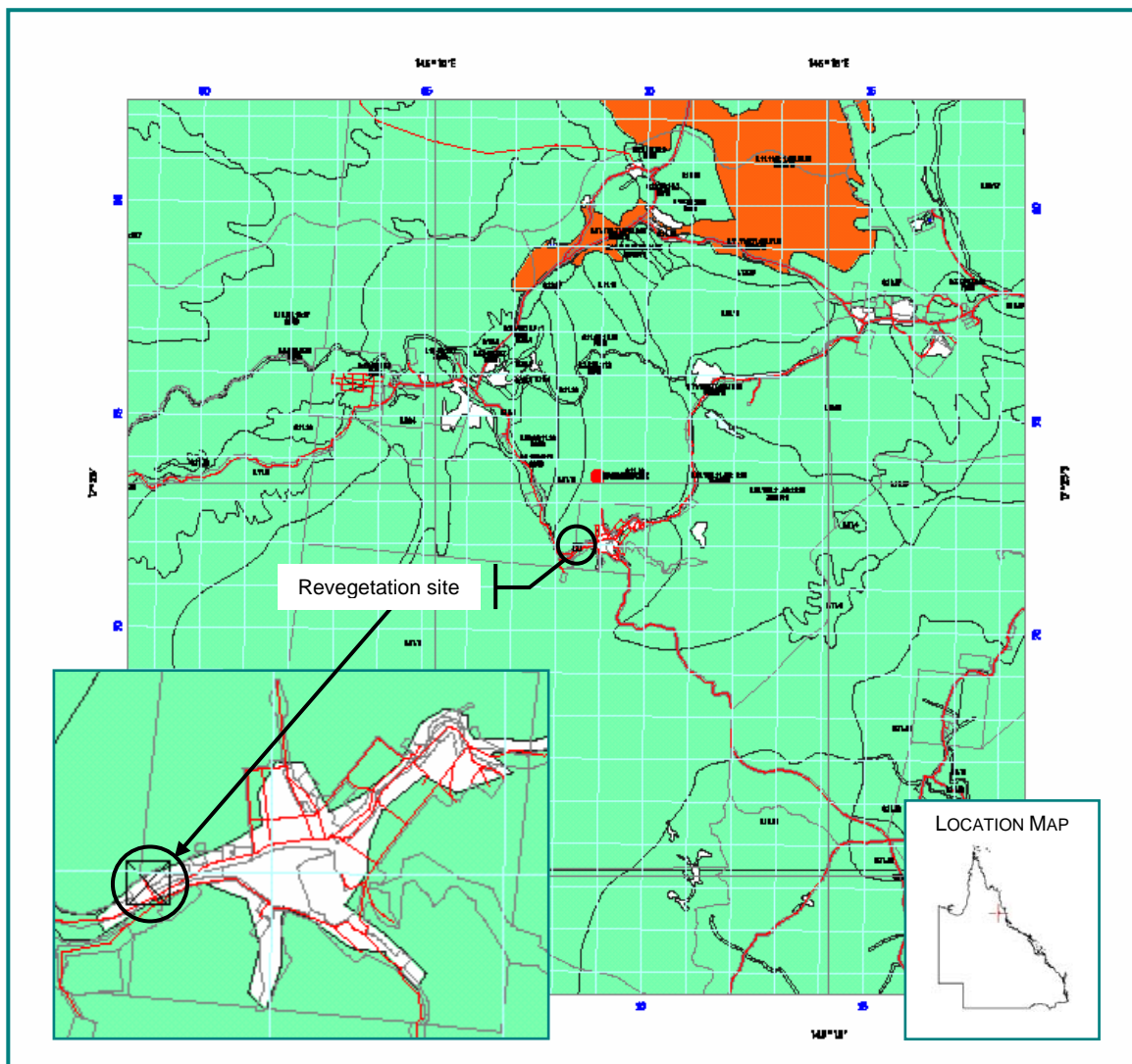


Figure 1. Location of Irvinebank and the revegetation site.

Climate

A record of climate averages recorded from Irvinebank was unobtainable; however, Herberton Post Office (station 031029) maintained records from 1886 to 1991 (Bureau of Meteorology, 2005). In considering the climate figures given in this report for Herberton, it should be noted the difference in elevation above sea level of the two towns, *viz* Herberton 899 m and Irvinebank 750 m. Climate averages for Herberton are shown in Table 1.

Table 1. Climate averages recorded for Herberton.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Av. max (deg C)	28	27.3	26.3	24.6	22.9	21.6	21.4	22.7	24.9	27.5	28.6	28.9	25.4
Av. min (deg C)	18.2	18.3	17.5	15.6	13.2	10.6	9.7	10.1	12	14.3	16.2	17.5	14.4
Av. rainfall (mm)	238.4	229.7	214.4	86	46.9	33.3	22	18.2	16.5	26.2	77.3	137.9	1147

Site Description

The proposed revegetation site is triangular-shaped and sits between the Herberton-Petford Road and Gibbs Creek. Its longest sides run parallel with the road and the bank of the creek (158 m and 167 m long respectively); the shortest side of 41 m is formed by the access road to Bob Atkinson’s property (rural property #2726). The longest sides converge at a concrete causeway where Gibbs Creek crosses the Petford-Irvinebank Road. The area of the site is approximately 3 200 m² (0.32 ha). The orientation of the site and the conspicuous landscape features present along its boundaries are shown in Figure 2.

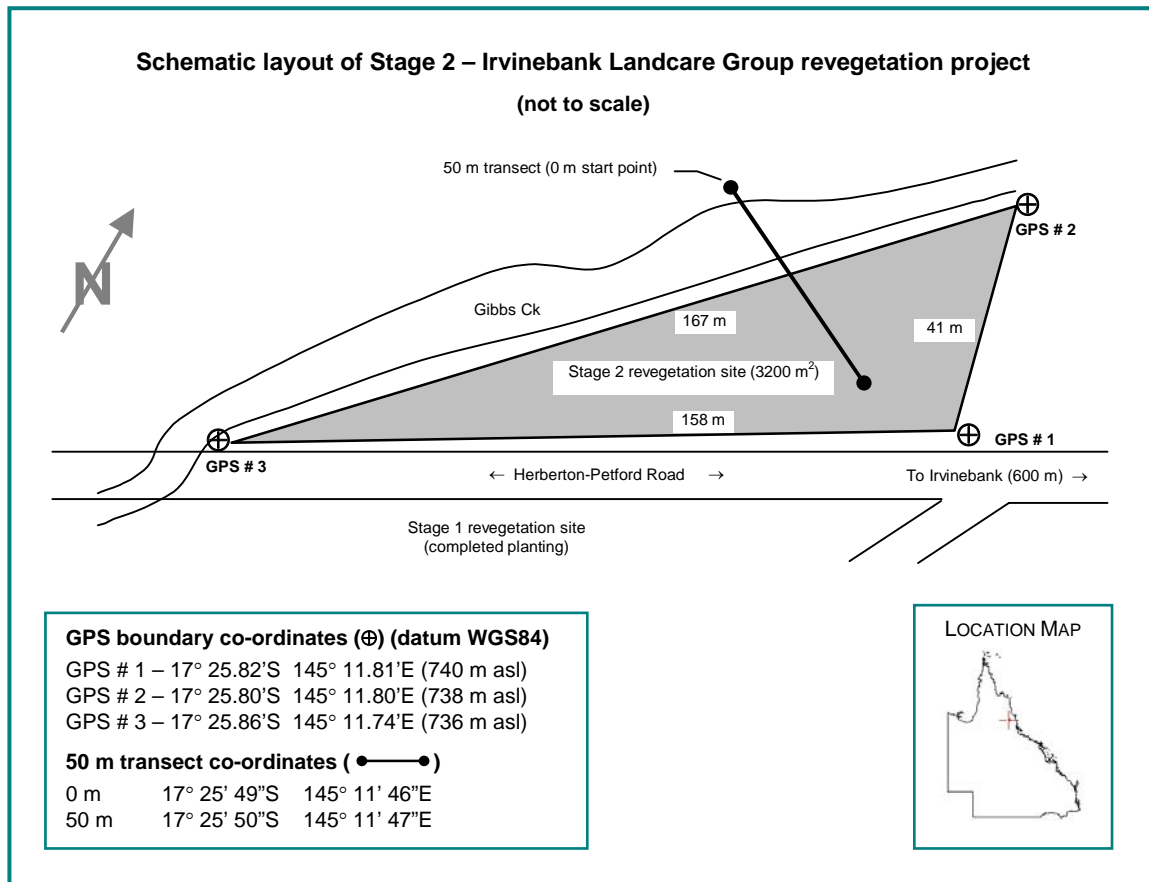


Figure 2. Schematic representation of the revegetation site (Stage 2).

The site is more or less flat and characterised along one side by a near-vertical creek bank of consolidated rocky material ranging in height from between 0.6-1.6 m (see Fig. 3). Evidence of prior erosion can be seen in exposed tree roots and scattered fallen trees - presumably a legacy of flood events and the consequent softening of the bank substrate. River Sheoak trees (*Casuarina cunninghamiana*) almost exclusively occupy the immediate creek bank and in built-up relic channels within the creek bed (Fig. 4). Rocks, small boulders and dead woody matter are scattered throughout the groundlayer.



Figure 3. The exposed bank profile of Gibbs Creek.



Figure 4. *Casuarina cunninghamiana* (River Sheoak) trees lining Gibbs Creek.

The area between the creek and the road supports highly disturbed vegetation with scattered trees and densely established Sisal plants (*Agave sisalana*). Sisal appears to have favoured areas where a weakly defined tree canopy (mostly *Acacia aulacocarpa*) has formed. Areas where trees have not established, are colonised by dense Guinea grass (*Panicum maximum*). Figure 5 (below) shows the general height and structure of vegetation on the site. The main tree canopy is made up of the pioneer wattle *Acacia aulacocarpa*. Guinea grass (*Panicum maximum*) forms the major component of the groundlayer, particularly along edges. Farther in the interior of the site, Sisal (*Agave sisalana*) replaces grasses to form almost impenetrable thickets. Gibbs Creek is located in the background of the picture and supports some healthy River Sheoak trees (*Casuarina cunninghamiana*).



Figure 5. *Acacia aulacocarpa* (Brown Salwood) trees with Guinea grass understorey.

METHODS

A limited number of field trips to the site precluded an opportunity to thoroughly investigate the entire floristics and physiognomy of the site. Subsequently it was determined that a single belt transect of 50 m length was adequate to capture descriptive information and data that would support the revegetation project. A summarised list of methods used at the site is given below.

1. Obtain work brief from representatives of the Irvinebank Landcare Group and the Mitchell River Watershed Management Group.
2. Preliminary walk-through survey and species observations of the site. See Appendix 1.
3. Peg out and mark boundary of site. Record GPS coordinates for each corner point.
4. Observe and record vegetation on the perimeter of site. Partial assessment of weed status.
5. Determine position of 50m transect; mark and record start (0 m) and end (50 m) points.
6. Record plant species that touch transect (used to compile vegetation profile) - Fig. 6.
7. Observe and record all vascular plants within 2.5 m each side of transect line.
8. Draft compilation of vegetation profile (50 m). See Appendix 2.
9. Collection of herbarium specimens for determination.
10. Survey and record riparian vegetation 100 m upstream of site (east).
11. Survey and record surrounding dominant remnant vegetation on hillslope, up to approximately 400 m north-west adjacent to site.
12. Photos taken of site and surrounding area.
13. Research regional ecosystem status and match with field observations and data.
14. Make general observations regarding fauna and wildlife sightings (not recorded in this report).



Figure 6. Students collecting transect data.



Figure 7. The exposed roots of a *Eucalyptus camaldulensis* tree on the bank of Gibbs Creek.

RESULTS

Remnant Vegetation of the Surrounding Area

Surveys were undertaken of two areas nearby to the revegetation site to identify remnant vegetation typical of relatively undisturbed areas. Note, that the Gibbs Creek site is considered to be highly disturbed - indicated by regrowth vegetation with a thin band of remnant vegetation following the creek bank. The term *remnant vegetation* in this context refers to the definition given by the Queensland Herbarium, and is quoted from Nelder *et. al.* (2004) below.

"Remnant woody vegetation is defined as vegetation where the dominant canopy has >70% of the height and >50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy."

Traverses were made on foot to determine the common tree species present in the canopy, and match these observations with landscape features such as rock type, topographical relief and watercourses. Information gathered during the surveys was used to determine a relevant regional ecosystem for the respective vegetation communities.

Regional ecosystem codes and descriptions given in this report follow Sattler and Williams (1999) and the Environmental Protection Agency (2005).

Remnant vegetation was surveyed randomly and observations were made of the character and structure of vegetation in order to elucidate a clearer picture of what type of vegetation community might be emulated through revegetation practices at the Gibbs Creek site.

At the very least, species of plants, which may not be present in the degraded revegetation site, could be determined from examining the floristic structure of appropriate communities occurring on similar soils and growing under similar edaphic conditions.

Remnant Vegetation Description – Hillslopes of Metamorphic Rock

The revegetation site is backed on the north-western side by low hills of metamorphic rock and supports woodland with a grassy groundlayer. The understorey is poorly developed with few shrubs present. The shrub density increases with canopy openness and with the degree of disturbance. These hills have been extensively worked by localised mining activity; where soil disturbance coincides with small canopy gaps and low, shrubby regrowth vegetation. See Fig. 8.

The regional ecosystem representing remnant woodland on the hill is RE 9.11.10 - a full description is reproduced below with minor modifications (Environmental Protection Agency, 2005).

Regional Ecosystem: 9.11.10. **Vegetation Management Act status (September 2003):** Not of concern. **Biodiversity Status:** Of concern. Disturbed and fragmented due to mining activities. Under review. **Subregion:** 6. **Estimated Extent:** In September 2000, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained. **Extent in Reserves:** No representation.

Short Description: *Eucalyptus cullenii* or *E. atrata*, *Corymbia citriodora* woodland to open forest on steep dissected hills on highly metalliferous metamorphic rocks (predominantly around Irvinebank).

Description: *Eucalyptus cullenii* or *E. atrata* and *Corymbia citriodora* woodland to open forest ± *E. portuensis* ± *C. clarksoniana* ± *E. cloeziana* ± *C. leichhardtii* ± *C. erythrophloia*. The mid layer varies from scattered plants to a mid-dense shrub layer of *Lophostemon suaveolens*, *Acacia* spp., *Petalostigma pubescens*, *Grevillea glauca*, *Melaleuca* spp. and *Alphitonia obtusifolia*. *Callitris intratropica* occasionally occurs in distinct patches in the mid layer. The grassy ground layer is mid-dense to dense and often dominated by *Themeda triandra*. Occurs on steep dissected hills and flats on highly metalliferous metamorphic rocks, often with shallow soils.

Values: Habitat for geographically restricted flora including *Goodenia stirlingii* (rare), *Acacia purpureopetala* (vulnerable), *Homoranthus porteri* (vulnerable), *Grevillea glossadenia* (vulnerable), *Eucalyptus pachycalyx* (rare) and *E. lockyeri*. **Comments:** Occurs predominantly in the Irvinebank area.

Remnant Vegetation Description – Creek Levees and Channels

A section of vegetation lining Gibbs Creek and upstream of the revegetation site was examined to check the consistency by which the commonest canopy trees occurred. The section examined was in marginally better condition (i.e. larger trees and lower weed presence) than that adjacent to the revegetation site. See Fig. 9.

From field observations and cross-referencing with the Regional Ecosystem Description Database - REDD (Environmental Protection Agency, 2005) it was determined that a matching regional ecosystem for the vegetation lining similar creeks in the area is RE 9.3.13. The descriptive extract from the database is reproduced below.

Regional Ecosystem: 9.3.13 **Vegetation Management Act status (September 2003):** Not of concern. **Biodiversity Status:** Of concern. Rubber vine (*Cryptostegia grandiflora*) infestation, total high grazing pressures and alluvial mining are leading to degradation. **Subregion:** 1,2,4. **Estimated Extent:** In September 2000, remnant extent was > 10,000 ha and >30% of the pre-clearing area remained. **Extent in Reserves:** Medium.

Short Description: *Melaleuca fluviatilis* and/or *M. argentea* ± *Eucalyptus camaldulensis* fringing woodland on channels and levees. Generally on western flowing rivers.

Description: *Melaleuca fluviatilis* and/or *M. argentea* and *Eucalyptus camaldulensis* ± *Casuarina cunninghamiana* fringing woodland. There can be a scattered mid layer including *Lysiphyllum* sp., *Terminalia platyphylla*, *Lophostemon grandiflorus*, *Ficus* spp., *M. bracteata* and/or *M. linariifolia*. The ground layer on the steep banks can be grassy but it's presence is seasonally dependent. Occurs on stream and channel banks.

Protected Areas: Chillagoe Mungana NP, Bulleringa NP. **Values:** Significant habitat as drought refuge, wildlife corridors and for arboreal animals. **Comments:** Generally occurs on western flowing rivers. Subject to minor clearing. Often only one crown width wide. *Casuarina cunninghamiana* occurs in small areas of rocky river beds.



Figure 8.

Remnant vegetation of regional ecosystem 9.11.10 woodland on hill behind Gibbs Creek.

Figure 9.

Disturbed remnant vegetation of regional ecosystem 9.3.13 fringing woodland with *Casuarina cunninghamiana* on Gibbs Creek.



Transect Data

The results of the data collected from the 50 m transect are given below in Table 2. These data represent only vascular plants and do not account for lichens, fungi, mosses or liverworts. Other species recorded within a 2.5 m width each side of the transect line are shown in Table 3. The height and distance along the transect for this data set were not recorded - only their occurrence within a 50 x 5 m belt area of 250 m². The purpose of this method was to provide a clearer picture of the occurrence of species generally rather than a spatial distribution.

A provisional checklist of vascular plants recorded from the site is given in Appendix 1.

Table 2. Data collected from 50 m transect.

Dist.	Name & (Family)	Common Name	Height (m)	Habit
0 m	START OF TRANSECT			
0-9	* <i>Panicum maximum</i> (Poaceae)	Guinea Grass	1.5	Grass
1.7	<i>Acacia aulacocarpa</i> (Mimosaceae)	Brown Salwood	10.0	Tree
4.6	<i>Acacia aulacocarpa</i> (Mimosaceae)	Brown Salwood	10.0	Tree
16.7	<i>Casuarina cunninghamiana</i> (Casuarinaceae)	River Sheoak	4.0	Tree
18.4	<i>Casuarina cunninghamiana</i> (Casuarinaceae)	River Sheoak	2.2	Tree
19.0	<i>Casuarina cunninghamiana</i> (Casuarinaceae)	River Sheoak	15.0	Tree
23.5	<i>Casuarina cunninghamiana</i> (Casuarinaceae)	River Sheoak	3.2	Tree
27.5	<i>Casuarina cunninghamiana</i> (Casuarinaceae)	River Sheoak	1.7	Trees x2
29.5	<i>Eucalyptus camaldulensis</i> (Myrtaceae)	River Red Gum	22.0	Tree
31.0	* <i>Agave sisalana</i> (Agavaceae)	Sisal	0.5	Succulent
31.5	<i>Acacia flavescens</i> (Mimosaceae)	Red Wattle	1.5	Tree
32.4	<i>Eucalyptus camaldulensis</i> (Myrtaceae)	River Red Gum	-	Tree (dead)
32.7	* <i>Agave sisalana</i> (Agavaceae)	Sisal	1.0	Succulent
33.5	* <i>Agave sisalana</i> (Agavaceae)	Sisal	1.4	Succulent
34.0	<i>Acacia aulacocarpa</i> (Mimosaceae)	Brown Salwood	4.0	Tree
34.6	* <i>Brachiaria decumbens</i> (Poaceae)	Signal Grass	1.0	Grass
35-40	* <i>Agave sisalana</i> (Agavaceae)	Sisal	1.5	Succulent
36.7	<i>Eucalyptus camaldulensis</i> (Myrtaceae)	River Red Gum	9.0	Tree
40.5	<i>Lomandra longifolia</i> (Xanthorrhoeaceae)	Mat Rush	0.5	Grass-like
40.8	* <i>Agave sisalana</i> (Agavaceae)	Sisal	0.4	Succulent
41.1	<i>Acacia aulacocarpa</i> (Mimosaceae)	Brown Salwood	7.0	Tree
42.3	<i>Acacia aulacocarpa</i> (Mimosaceae)	Brown Salwood	5.0	Tree
42.4	<i>Acacia aulacocarpa</i> (Mimosaceae)	Brown Salwood	5.0	Tree
42.4	<i>Eustrephus latifolius</i> (Smilacaceae)	Wombat Berry	1.2	Vine
42.8	* <i>Cascabela thevetia</i> (Apocynaceae)	Yellow Oleander	1.2	Shrub
43.2	<i>Acacia aulacocarpa</i> (Mimosaceae)	Brown Salwood	3.5	Tree
45.5	* <i>Agave sisalana</i> (Agavaceae)	Sisal	1.5	Succulent
46.4	<i>Acacia aulacocarpa</i> (Mimosaceae)	Brown Salwood	7.0	Tree
46.4	* <i>Passiflora foetida</i> (Passifloraceae)	Stinking Passion Flower	3.0	Vine
46.6	* <i>Agave sisalana</i> (Agavaceae)	Sisal	1.5	Succulent
47.5	Dead tree (fallen)	-	-	Tree (dead)
50 m	END OF TRANSECT			

Note: *Acacia aulacocarpa* trees are ~ 4 m wide. *Agave sisalana* plants are ~ 1.5 m wide. Asterisk (*) denotes weed/exotic.

Table 3. Data collected from within 2.5 m each side of transect (250 m²).

Name & (Family)	Common Name	Habit	Notes
* <i>Asparagus plumosus</i> (Liliaceae)	Climbing Asparagus Fern	Vine	
* <i>Catharanthus roseus</i> (Apocynaceae)	Periwinkle	Shrub	
<i>Cynodon</i> sp. (Poaceae)	Couch Grass	Grass	
* <i>Euphorbia cyathophora</i> (Euphorbiaceae)	Dwarf Poinsettia	Shrub	
<i>Ficus opposita</i> (Moraceae)	Sandpaper Fig	Tree	
* <i>Mangifera indica</i> (Anacardiaceae)	Mango	Tree	
* <i>Praxelis clematidea</i> (Asteraceae)	Praxelis	Herb	
* <i>Senna pendula</i> var. <i>glabrata</i> (Caesalpinaceae)	Easter Cassia	Shrub	Syn. <i>Cassia bicapsularis</i>
* <i>Thunbergia alata</i> (Acanthaceae)	Black-eyed Susan	Vine	
* <i>Urena lobata</i> (Malvaceae)	Urena Burr	Shrub	

DISCUSSION

The site on Gibbs Creek is conspicuously weed infested, notably with the robust plant *Agave sisalana* (Sisal). Other weeds of prominence are *Panicum maximum* (Guinea Grass) and the garden escapee *Cascabela thevetia* (Yellow Oleander), which frequently occurs in loose thickets. These species combined with other weeds of lesser prominence, have rendered the site prone to further weed infestation in its current state (see Fig. 10 and 11).



Figure 10. Manually removing Sisal.



Figure 11. A thicket of *Cascabela thevetia*.

The alien groundlayer of *P. maximum* effectively suppresses the recruitment and establishment of native trees and groundlayer plants that would otherwise occupy the site at a greater recruitment rate. This observation was correlated by surveys of nearby remnant vegetation where the groundlayer nearly always contains swards of the native Kangaroo grass (*Themeda triandra*), and the canopy consists of low to medium woodland trees of various species of *Eucalyptus* and *Corymbia*. Furthermore, the presence on the Gibbs Creek site of the pioneer wattle *Acacia aulacocarpa* is indicative of a high disturbance history (*A. aulacocarpa* is the commonest tree on the site).

The vegetation immediately occupying the banks of Gibbs Creek is in better condition than that described above. This is due in part to the reasonably well-established canopy of River Sheoak trees (*Casuarina cunninghamiana*). The roots of these trees play a significant and important role in binding the rocky soil substrate, and subsequently reducing bank slumping and erosion during flood events. Of particular note regarding *C. cunninghamiana* trees and also future revegetation efforts, is their ability to suppress weed growth - particularly invasive species such as Guinea grass. Observations of areas where these trees have been removed in the past clearly demonstrates their utility and the natural role they serve in creek vegetation communities. For example, where Sheoak trees have been removed (even saplings), weeds quickly colonise the site leaving the exposed area susceptible to erosion, and also devaluing the ecological function of the stream or creek.

The imposing Sisal plant - *Agave sisalana* (see Fig. 12) - with its stiffly pointed leaf apices is a serious weed, which in its current abundance and density per unit area, has virtually arrested any form of plant development within the periphery of its succulent foliage. Compounding the problem is the fecundity of the plant due to its viviparous reproductive nature: where plantlets develop in massed heads aloft a tall inflorescence that grows in excess of 3 m above the base of the plants. From observations made in the 50 m transect, it was noted that the density of Sisal plants reduced as light levels increased and also where Guinea grass had entirely established in an area. Therefore, Sisal abundance was at its densest in the partial canopy offered by trees. This observation was further corroborated by the almost complete absence of Sisal in the creek channel and toe of the bank. However, it is highly probable that plantlets would be washed away during flood pulses, which in part would account for the paucity of individuals along water-exposed and eroded sections of the bank.

SUMMARY

The native vegetation of the site is poorly developed in both abundance and floristic composition. Thickly established weeds, most of which would have passed through several fruiting-maturation stages, have stagnated native plant succession to a point where a disclimax community of Guinea grass and Sisal will, if left untreated, preclude any significant advancement of native vegetation, and will continue to ecologically degrade the site.



Figure 12. Injecting herbicide into Sisal plants.

Removal and eradication of the major weed species will enhance the site to some degree in the short-term; however, ecological rehabilitation of the site is a long-term commitment that requires support by a revegetation program that should aim at replacing exotic species with native species. Plants that are known to establish quickly and provide some semblance of canopy structure, as well as species that naturally occur in the Irvinebank district would ideally be selected in the first instance. A brief list of suitable species is given in Appendix 4.



Figure 13. Total removal and later burial of Sisal plants may be required to reduce the chance of re-infestation.

In addition to the supplementary information presented in the appendices, a summary of recommendations relating to rehabilitation of the Gibbs Creek site is given below. The recommendations are not intended as an inclusive solution to revegetating the site, but rather as guidelines that should be adjusted to suit the physical and human resource requirements, and importantly, the aspirations of the Irvinebank Landcare Group.

RECOMMENDATIONS

1. Retention of Existing Native Trees

The River Sheoak trees (*Casuarina cunninghamiana*) are retained along the banks of Gibbs Creek - specifically for the purpose of bank stabilisation. Removal of these trees may significantly increase rates of bank erosion and collapse in the event of water surges during the rainy season. The added benefit of retaining these trees is the partial suppression of weeds that will render the site displeasing in the context of 'town beautification' work. Also, the Brown Salwood trees (*Acacia aulacocarpa*) that form the majority of the canopy over the site might be considered for retention - especially during the early establishment phase of the revegetation planting. If deemed appropriate at a later stage, some of these trees could be thinned to improve the visual character of the site.

2. Weeds

Removal of weeds from the site should be thorough and ongoing to diminish the chances of further infestations, and for revegetation works to become effective in the shortest possible timeframe. Focus should also be placed on removing the physically largest species first, for example, Sisal (*Agave sisalana*), thereafter working progressively towards controlling relatively benign species such as grasses along the road verge. Concurrent control of Guinea grass, followed by revegetation work is recommended. Sisal plants may have to be removed from the site and buried.

3. Plant Selection

The selection of plants to be used for revegetation and amenity purposes should be suited to the site conditions and the drier climate of Irvinebank. A partial list of recommended species is given in the Appendix.

The planting location of individual species should be considered in the context of their original purpose. For example, decorative wattles such as the Irvinebank Wattle - *Acacia leptoloba*, with its distinctive and aesthetic leaf flush, should be planted adjacent to the road and in open situations where a canopy is unlikely to overtop the plants. Some thought given to planting location will considerably improve the overall visual appeal and ecological function, as well as the establishment time in which the site can recover from its former weedy state.

4. Maintenance

Follow-up maintenance of weeds and growth-suppressing exotic grasses is paramount. Scheduled weed control events are strongly recommended in order to successively deplete the soil seedbank reserve of weed species. Theoretically, seed reserves could be significantly reduced within 18 to 24 months, but the site's road edge boundary will continually attract various suites of weeds due to the increased disturbance factor and the maximised light level.

Pre-emergent herbicides are not recommended due to their residual nature in the soil and the close proximity of the site to a watercourse. If herbicides are to be used, then their application should be directed at spot-treatment of individual plants rather than broad-area foliar sprays; the exception to this being the control of road verge weeds. It is further recommended that workers become familiar with native species that may establish in the site, and to allow these plants to contribute to the composition of the site's vegetation if deemed appropriate.

5. Amenity-Specific Planting

Consideration might be given to establishing a small semi-cleared area within the revegetation site, which could include a picnic table or other seating arrangements. It is recommended that this is maintained as a 'theme' area - where specific plant forms could be planted amongst a rockery-type garden. Plants for use in this area would typically be small shrubs, prostrate forms and other species of similar stature with a range of flower types and colours.

The theme area could ideally showcase key endemic species from the Irvinebank district such as *Acacia purpureopetala*, *Grevillea glossadenia* and the Irvinebank Wattle *Acacia leptoloba* (cover photo). A concept such as this could be quite easily accompanied by simple interpretative literature, and adopted as a sub-project of the broader revegetation project; and undertaken as a collaborative initiative involving the local school, Landcare group and other interested parties.

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Poison Pea - *Gastrolobium grandiflorum*



Irvinebank Wattle - *Acacia leptoloba*

APPENDIX 1. Provisional list of vascular plants recorded from the revegetation site (Stage 2).

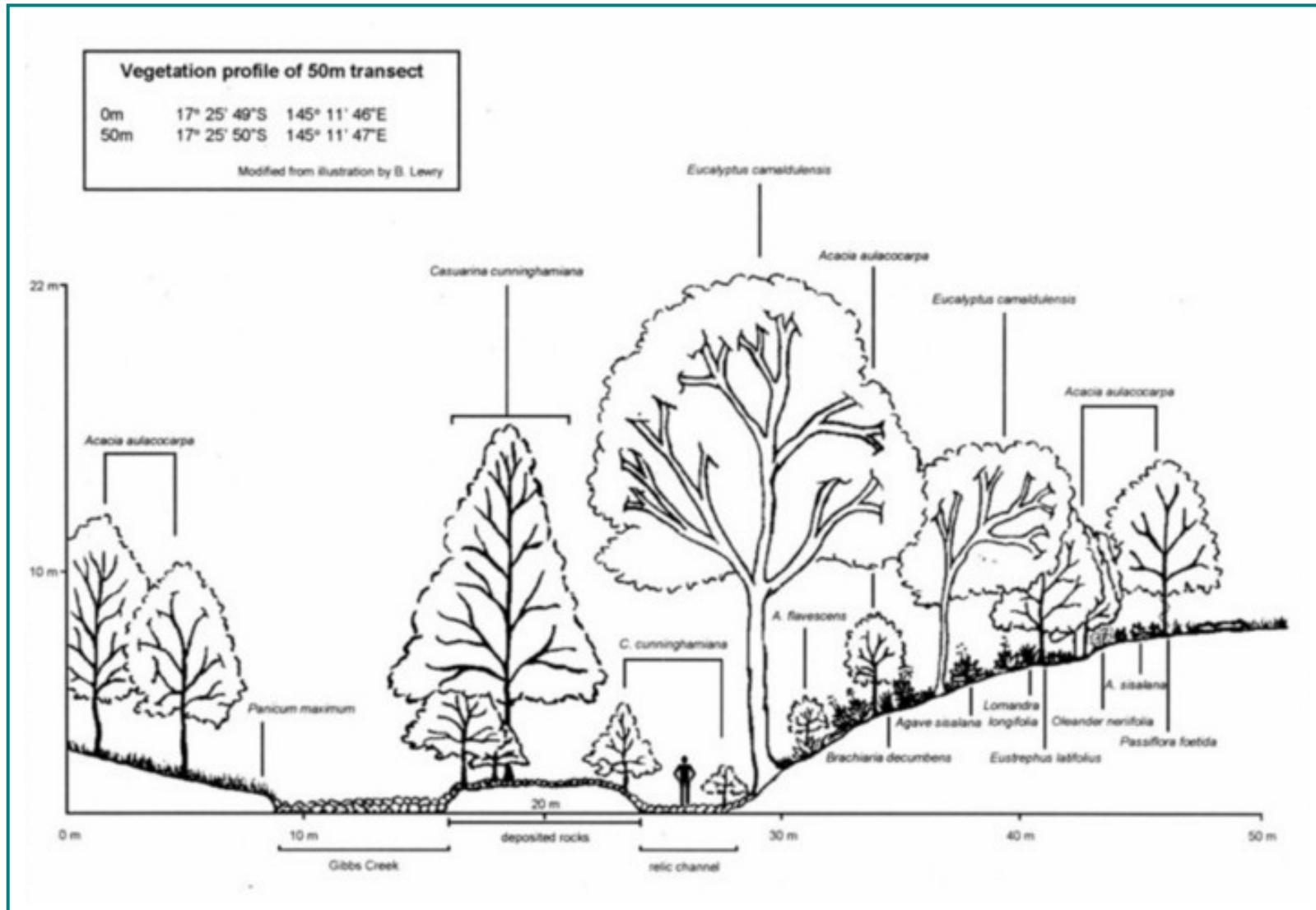
Name & (Family)	Common Name	Habit
<i>Acacia aulacocarpa</i> (Mimosaceae)	Brown Salwood	Tree
<i>Acacia flavescens</i> (Mimosaceae)	Red Wattle	Tree
* <i>Agave sisalana</i> (Agavaceae)	Sisal	Shrub - succulent
* <i>Asparagus plumosus</i> (Liliaceae)	Climbing Asparagus Fern	Vine
* <i>Brachiaria decumbens</i> (Poaceae)	Signal Grass	Grass
<i>Breynia oblongifolia</i> (Euphorbiaceae)	Coffee Bush	Shrub
* <i>Bryophyllum</i> sp. (Crassulaceae)	Mother-of-Millions	Herb - succulent
<i>Bursaria tenuifolia</i> (Pittosporaceae)	Sweet Blackthorn	Tree
<i>Casuarina cunninghamiana</i> (Casuarinaceae)	River She Oak	Tree
* <i>Cascabela thevetia</i> (Apocynaceae)	Yellow Oleander	Shrub
* <i>Catharanthus roseus</i> (Apocynaceae)	Periwinkle	Shrub
* <i>Cosmos caudatus</i> (Asteraceae)	Cosmos	Shrub
<i>Eucalyptus camaldulensis</i> (Myrtaceae)	River Red Gum	Tree
<i>Eustrephus latifolius</i> (Smilacaceae)	Wombat Berry	Vine
<i>Ficus opposita</i> (Moraceae)	Sandpaper Fig	Tree
<i>Grevillea robusta</i> (Proteaceae)	Silky Oak (southern species)	Tree
* <i>Ipomoea hederifolia</i> (Convolvulaceae)	Scarlet Creeper	Vine
<i>Ludwigia octovalvis</i> (Onagraceae)	Willow Primrose	Shrub
* <i>Macroptilium atropurpureum</i> (Fabaceae)	Sirat	Vine
* <i>Mangifera indica</i> (Anacardiaceae)	Mango	Tree
* <i>Mitracarpus hirtus</i> (Rubiaceae)	Mexican White-eye	Herb
* <i>Neonotonia wightii</i> (Fabaceae)	Glycine	Vine
* <i>Opuntia stricta</i> (Cactaceae)	Prickly Pear	Cactus - succulent
* <i>Panicum maximum</i> (Poaceae)	Guinea Grass	Grass
* <i>Passiflora foetida</i> (Passifloraceae)	Stinking Passion Flower	Vine
<i>Pleiogynium timorense</i> (Anacardiaceae)	Burdekin Plum	Tree
* <i>Polygala paniculata</i> (Polygalaceae)	Polygala	Herb
<i>Pouteria sericea</i> (Sapotaceae)	Mangarr	Tree
* <i>Praxelis clematidea</i> (Asteraceae)	Praxelis	Herb
* <i>Senna pendula</i> var. <i>glabrata</i> (Caesalpiniaceae)	Easter Cassia	Vine/shrub
* <i>Sphagneticola trilobata</i> (Asteraceae)	Singapore Daisy	Herb
* <i>Stachytarpheta jamaicensis</i> (Verbenaceae)	Snakeweed	Shrub
* <i>Themeda quadrivalvis</i> (Poaceae)	Grader Grass	Grass
<i>Themeda triandra</i> (Poaceae)	Kangaroo Grass	Grass
* <i>Thunbergia alata</i> (Acanthaceae)	Black-eyed Susan	Vine
* <i>Tithonia diversifolia</i> (Asteraceae)	Japanese Sunflower	Shrub
* <i>Urena lobata</i> (Malvaceae)	Urena Burr	Shrub

An asterisk (*) preceding a name indicates a non-native or weed species.

Summary

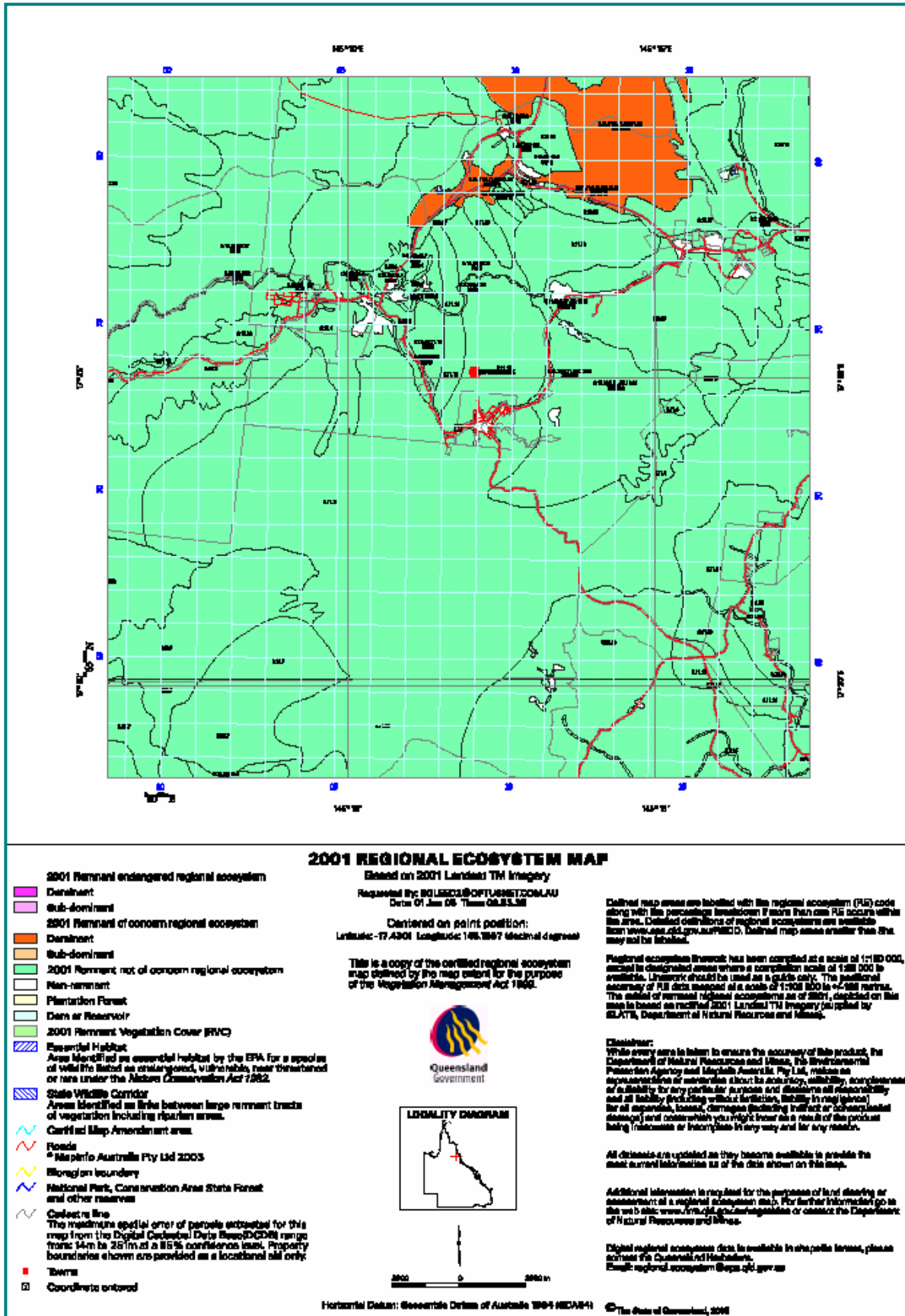
Native plants:	13 species (including <i>Grevillea robusta</i>)
Non-native plants:	24 species
Total:	37 species
Trees: 10 species	Grasses: 4 species
Shrubs: 10 species	Herbs: 5 species
Vines: 8 species	Succulents: 3 species

APPENDIX 2. Vegetation profile of transect in revegetation site (Stage 2).



APPENDIX 3. Regional ecosystem map for the Irvinebank region.

(The regional ecosystem map reproduced below is available separately as an electronic *portable document file* [.pdf] from the author or the MRWMG).



APPENDIX 4. A selection of plants suitable for revegetation & amenity planting

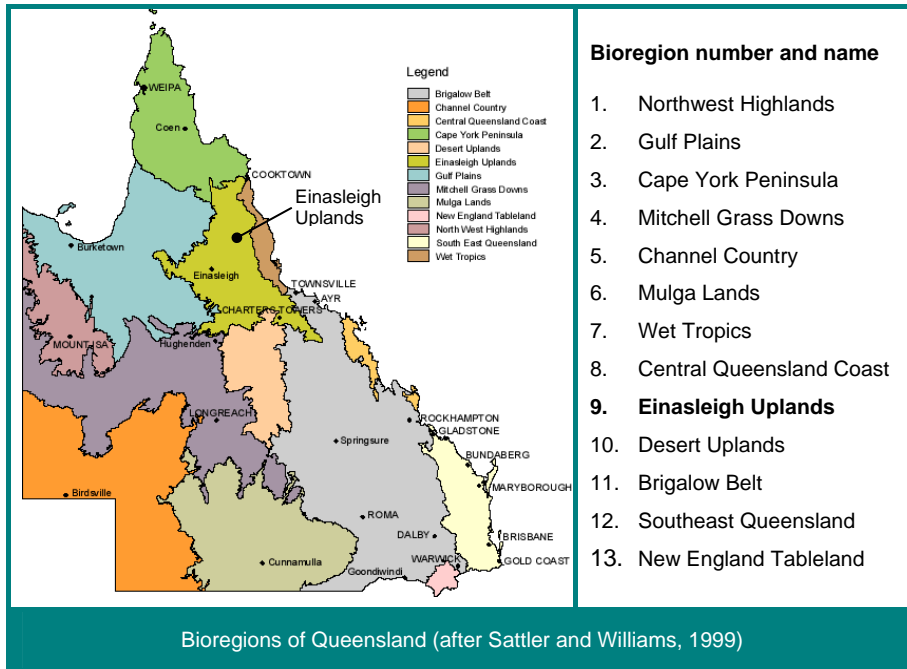
Name	Common Name	Comments
<i>Abelmoschus moschatus</i>	Native Rosella	Trailing/scrambling plant with pink (occasionally white) Hibiscus-like flowers.
<i>Acacia aulacocarpa</i>	Brown Salwood	Small tree for revegetation work on higher bank areas.
<i>Acacia calyculata</i>		Shrub, somewhat open branching. Cream-coloured flowers.
<i>Acacia holosericea</i>	Silky Wattle	Large shrub with attractive, felt-like foliage. Yellow flowers. General revegetation work.
<i>Acacia leptoloba</i>	Irvinebank Wattle	Shrub with highly attractive leaf flush – worth exhibiting alone.
<i>Acacia nuperrima</i> ssp. <i>cassitera</i>	Tabletop Wattle	Interesting, low wattle with a ‘flat top’.
<i>Acacia purpleopetala</i>	Purple-flowered Wattle	Prostrate shrub restricted to Irvinebank district, with tiny purple flowers. Interesting for amenity planting.
<i>Acacia simsii</i>	Sim’s Wattle	Shrub with narrow leaves (phyllodes) and globular yellow flowers. Suitable for planting in thickets.
<i>Bracteantha bracteata</i> (formerly <i>Helichrysum bracteatum</i>)	Golden Everlasting Daisy	Herb with long-lasting, bright yellow flowers. Could be used to add some colour to amenity areas.
<i>Breynia oblongifolia</i>	Coffee Bush	Small shrub for general revegetation planting.
<i>Casuarina cunninghamiana</i>	River Sheoak	Tree suited to creek revegetation of sandy and stony soils. Soil-binder.
<i>Corymbia citriodora</i>	Lemon-scented Gum	Tall tree with lemon-scented foliage, attractive, smooth and colourful bark. Occasional planting.
<i>Eucalyptus camaldulensis</i>	River Red Gum	Tree with whitish (sometimes reddish tinged) bark suitable for the top of the bank area.
<i>Eucalyptus cloeziana</i>	Gympie Messmate	Tree for general revegetation work. Steady grower that has its place.
<i>Ficus opposita</i>	Sandpaper Fig	Tree for general revegetation work.
<i>Gastrolobium grandiflorum</i>	Poison Pea	Small shrub with striking dark red-purple flowers. Poisonous to stock.
<i>Grevillea dryandri</i>		Low shrub with attractive fern-like foliage and pink flowers.
<i>Grevillea glossadenia</i>		Shrub with orange, red or yellow flowers. Amenity use.
<i>Grevillea pteridifolia</i>	Golden Grevillea	Small tree or large shrub with orange flowers, attractive foliage.
<i>Haemodorum coccineum</i>	Scarlet Bloodroot	Rockery-type plant with deep red flowers.
<i>Lomandra longifolia</i>	Matt Rush	Grass-like plant, hardy, suitable near creek.
<i>Lophostemon grandiflorus</i>	Northern Swamp Mahogany	Tree for creek edge plantings, bank stabilising.
<i>Pandorea pandorana</i>	Wonga Vine	Vine with attractive cream/white flowers. Could be used to add interest to an area where it has a climbing host.
<i>Themeda triandra</i>	Kangaroo Grass	Common grass, attractive in massed planting. Useful in understory of revegetation section to replace exotic grasses.

APPENDIX 5. Definitions

The following definitions are taken and modified from The State of Queensland [Environmental Protection Agency] (2005) and Accad, *et al.* (2003). They are intended as supplementary and explanatory information to accompany this report.

Bioregion

Queensland is divided into 13 bioregions as illustrated below. A bioregion is a delineated biogeographic region that a regional ecosystem is found in. The bioregions recognised in Queensland are numbered from 1-13. Irvinebank is in the Einasleigh Uplands bioregion (9).






Land Zone

The second number in a regional ecosystem code refers to the land zone that the regional ecosystem occurs on. The land zone is a simplified geology/substrate-landform classification for Queensland. Twelve different land zone types are recognised in Queensland:

1. Deposits subject to periodic tidal inundation.
2. Quaternary coastal sand deposits.
3. Quaternary alluvial systems.
4. Flat to gently undulating Tertiary clay plains.
5. Plains and plateaus on Tertiary land surfaces, generally with medium to coarse textured soils.
6. Quaternary inland dunefields.
7. Exposed or shallowly covered duricrusts.
8. Plains and hills on Cainozoic flood basalts.
9. Gently undulating landscapes on more or less horizontally bedded fine grained sedimentary rocks.
10. Plateaus, scarps and ledges with shallow soils on more or less horizontally bedded medium to coarse-grained sedimentary rocks.
11. Hills and lowlands on metamorphosed sedimentary rocks.
12. Hills and lowlands on granitic and other pre Cainozoic igneous rocks.

The land zones relevant to the Irvinebank general region are shown below in schematic form.

Land zone	Description	Schematic Land zone ¹
Land zone 3	Alluvium (river and creek flats)	
Land zone 11	Hills and lowlands on metamorphic rocks	
Land zone 12	Hills and lowlands on granite rocks	

Schematic representation of land zones in the Einasleigh Uplands bioregion.

Regional Ecosystems

Regional ecosystems are defined by Sattler and Williams (1999) as vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. Each regional ecosystem is given a unique three-number code. An example of the numbers used is given below for regional ecosystem 9.11.10 (i.e. *Eucalyptus cullenii* or *E. atrata*, *Corymbia citriodora* woodland to open forest in the Einasleigh Uplands bioregion, hills and lowlands on metamorphic rocks).

- 9. refers to the bioregion (Einasleigh Uplands)
- 11. refers to the land zone type (Hills and lowlands on metamorphic rocks)
- 10. refers to the ecosystem vegetation type (*Eucalyptus cullenii* or *E. atrata*, *Corymbia citriodora* woodland to open forest)

Remnant

Remnant woody vegetation is defined as vegetation where the dominant canopy has >70% of the height and >50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.

Vegetation

The third part of the regional ecosystem code denotes different vegetation. Rainforest vegetation is classified and described using Webb's classification (Webb, 1978). Non-rainforest vegetation structural classes follow a modified Specht (1970) system (Nelder, 1991). Plant names follow Henderson (2002) or subsequent updates from the Queensland Herbariums HERBRECS database.

In the modified Specht (1970) system, the Herbarium describes the vegetation by the predominant strata, which is the one that is assessed as contributing the most above-ground biomass. The tallest strata is regarded as the emergent layer if it does not form the most above-ground biomass, regardless of its canopy cover, e.g. *E. populnea* trees above a low woodland of mulga. The Herbarium measures the height and cover of each layer independently, ie. separate height and cover values for the emergent (where present) and canopy layers.

Vegetation Management Act 1999 Status Categories (Accad, et al., 2003)

The *Vegetation Management Act 1999* defines regional ecosystems status in three categories: *endangered*, *of concern* and *not of concern* regional ecosystems.

An *endangered* regional ecosystem is a regional ecosystem that has either (a) less than 10% of its pre-clearing extent remaining; or (b) 10-30% of its pre-clearing extent remaining and the remnant remaining vegetation is less than 10,000 ha.

¹ Land zone illustrations taken from Environmental Protection Agency (2005).

An *of concern* regional ecosystem is a regional ecosystem that has either (a) 10-30% of its pre-clearing extent remaining and is greater than 10,000 ha; or (b) more than 30% of its pre-clearing extent remaining and the remnant remaining vegetation is less than 10,000 ha.

A *not of concern* regional ecosystem is a regional ecosystem that has greater than 30% of its pre-clearing extent remaining and the remnant remaining vegetation is more than 10,000 ha.

Regrowth

Native vegetation is dynamic. This means that areas which have been cleared may, given enough time, return to remnant status. Recognising the high degree of variability of capacity to regrow, Queensland's vegetation legislation does not establish arbitrary time limits to define 'regrowth' and 'remnant' vegetation.

Regional ecosystem maps and remnant maps show areas classified as remnant vegetation. Areas of native vegetation outside the areas shown as remnant are considered to be regrowth (that is, the white areas on the maps).

Weed Images



NOTES



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