A Biodiversity Planning Assessment for the Gulf Plains Bioregion

Landscape Expert Panel Report

Version 1.1

Queensland Government

Prepared by: Biodiversity Assessment, Department of Environment and Heritage Protection

Citation

EHP. 2015. Biodiversity Planning Assessment Gulf Plains Bioregion v1.1. Landscape Expert Panel Report: Department of Environment and Heritage Protection, Queensland Government.

May 2015

Contents

List of tables

List of figures

1 Introduction

This report summarises the proceedings and the output of expert panels convened in Townsville on 29th June 2011, Atherton on 15th August 2011, and Townsville on the 26th September 2011 to discuss the biodiversity values of the Gulf Plains Bioregion (GUP) study area (Figure 2). This report documents the panel's findings using the regional ecosystem (RE) mapping Version 8 (released 2/12/2013).

In order to fully capture biodiversity values and to accommodate local knowledge, the following three sets of values were considered for the GUP study area:

- fauna
- flora
- landscape.

Appendix 1 details the abbreviations included in the report.

The Biodiversity Assessment and Mapping Methodology (BAMM, version 2.1) (EPA 2002) has been prepared to provide a consistent approach for assessing biodiversity values at the landscape scale in Queensland using vegetation mapping data from the Queensland Herbarium as a fundamental basis. It is being used by the Department of Environment and Heritage Protection (EHP) to generate Biodiversity Planning Assessments (BPAs) for bioregions in Queensland.

The BAMM is continually being refined and is published on the EHP website at www.ehp.qld.gov.au. The methodology was developed from a similar method initially devised by Chenoweth EPLA (2000), and can be used by agency staff, other government departments, local governments or members of the community to advise on a range of planning or decision making processes.

The methodology is applied in two stages (Figure 1). The first stage uses existing data to assess seven diagnostic criteria, which are relatively uniform and reliable across a bioregion. These account for ecological concepts including rarity, diversity, fragmentation, habitat condition, resilience, threats, and ecosystem processes. They are diagnostic in that they are used to filter available data and provide a 'first-cut' determination of significance. This initial assessment is generated on a geographic information system (GIS) and is then refined using a second group of expert panel criteria. These criteria rely more upon expert opinion than on quantitative data, and focus on data that may not be available uniformly across the bioregion.

Expert panels are convened to review and refine diagnostic criteria and to assess the expert panel criteria (Figure 1). A generalised terms of reference for expert panels is provided in the BAMM version 2.1.

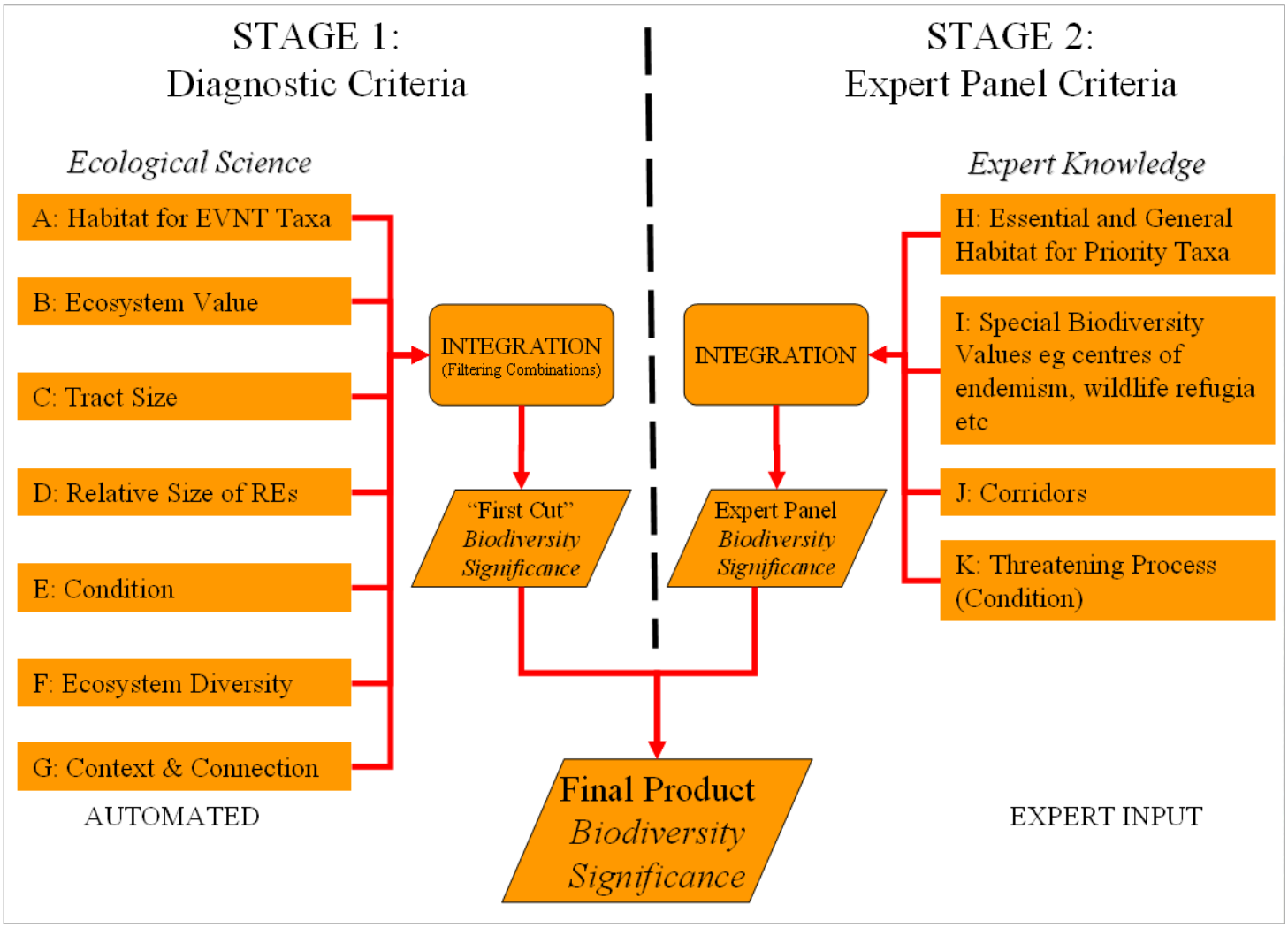


Figure 1 Biodiversity Assessment and Mapping Methodology (BAMM) process

2 Method

2.1 Study area

Stretching from the Northern Territory border east to the base of Cape York Peninsula, the Gulf Plains Bioregion encompasses approximately 211,000km^2 of low-lying country and offshore islands of north-west Queensland. Major river systems dissect the broad alluvial plains – the Nicholson, Gregory and Leichhardt drain from the North West Highlands; the Cloncurry, Flinders and Norman from the Mitchell Grass Downs; the Gilbert, Staaten, Nassau and Mitchell from the Einasleigh Uplands.

The coastal edge is dominated by marine plains of clay, silt and sand with mangroves, saltpans and mudflats. Further inland, grasslands and woodlands of eucalypts, melaleuca and acacia cover the landscape of plains and river channels comprising clay and alluvial soils. Similar vegetation dominates the dissected plateau surfaces of sandstones and siltstones that abut the surrounding bioregions (Sattler & Williams 1999).

Fauna of the Gulf Plains has been little studied (e.g. Dames & Moore 1994; Vanderduys & Kutt 2011). One of the few iconic animals is the eastern subspecies of the purple-crowned fairy-wren *Malurus coronatus macgillivrayi* which is restricted to the riparian fringe of major rivers in the western part of the bioregion (Rowley 1993). The general impression of the fauna is one of resilience but relatively limited diversity, as one might expect in a landscape prone to extensive flooding with few refugia for dryland species. However the Gulf Plains is critical for wetland taxa. The south-east Gulf of Carpentaria is an internationally important site, and the third most significant site in Australia, for migratory shorebirds using the East Asian-Australasian Flyway (Bamford et al 2008). On the land, the bioregion holds 15 important wetlands (Blackman 2001) which play a vital role as ecological refugia for waterbirds – waterfowl, herons and ibis.

A major environmental pressure on the bioregional biota is the combination of generally flat country and the monsoonal climate that can result in alternating periods of inundation over much of the region during the summer wet season followed by a long dry season in winter. These conditions restrict access both spatially and temporally – limiting any flora and fauna surveys to dry, cooler times of year.

Landuse in the sparsely populated bioregion is primarily cattle grazing and infrastructure support for mines and Gulf of Carpentaria fisheries. The beef industry is based on native grassland pastures and consequently the region has experienced very little clearing of native vegetation compared to more eastern bioregions. Apart from the Staaten River National Park and two small protected areas, the majority of conservation lands are located on or near the periphery of the bioregion.

There are 10 sub-regions within the Gulf Plains Bioregion (Figure 2). The Department of Science, Information Technology, Innovation and Arts (DSITIA) has mapped and classified regional ecosystems (RE) to a peer reviewed and published mapping and classification methodology . These RE maps were used as a platform for the conservation assessments reported here. BPAs accept the released RE maps unmodified and therefore, are limited by inherent mapping and classification accuracy. Issues regarding RE mapping or classification errors are dealt with by DSITIA's mapping update processes and are not part of a BPA.

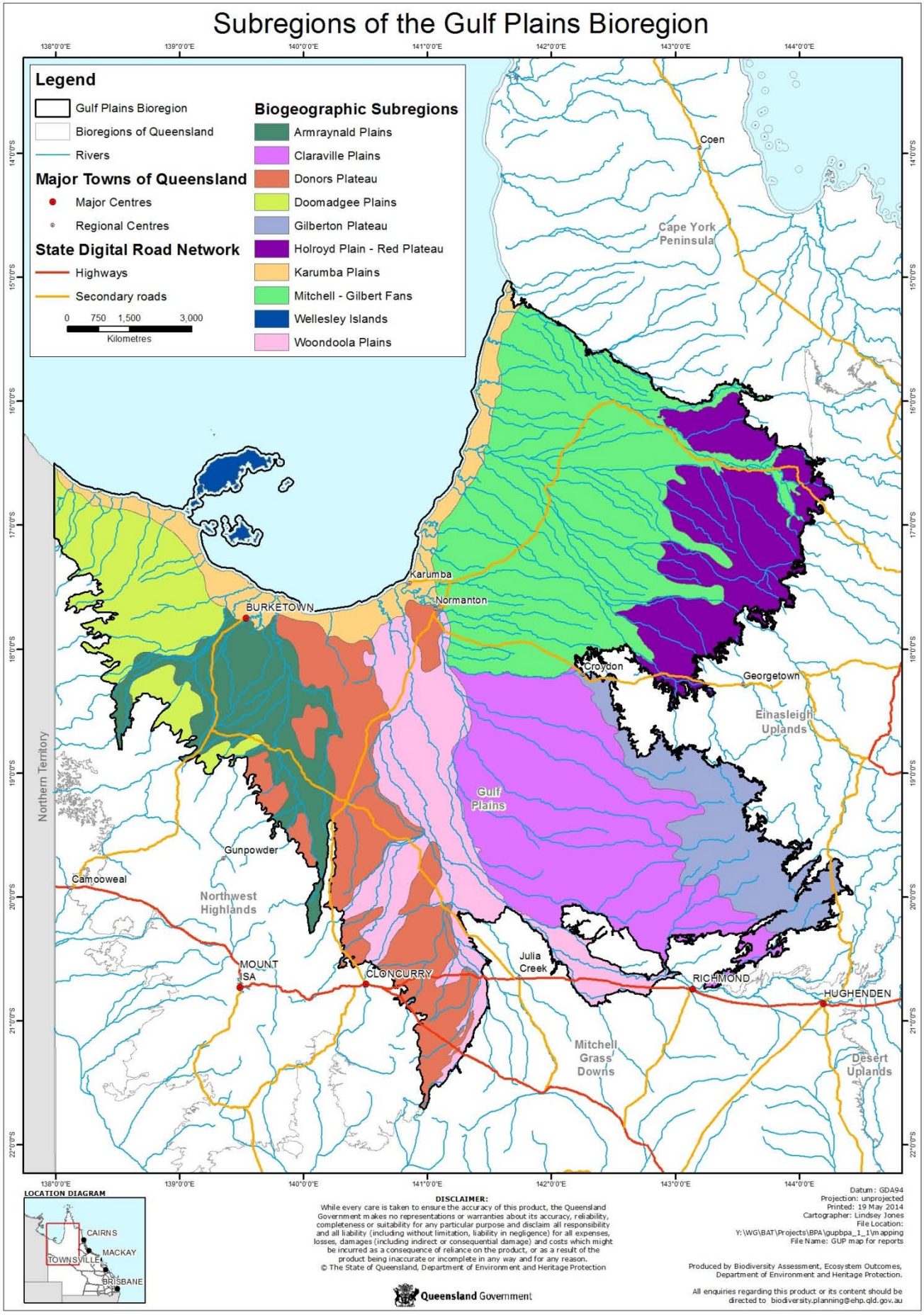


Figure 2 The Gulf plains Bioregion and its subregions

2.2 Expert Panel

The expert panel plays a significant role in the development of a BPA through:

- reviewing the suitability of data used in and arising from the GIS analysis
- identifying other information sources including expert and local knowledge, technical reports and papers, and modelled maps
- providing expert opinion where quantitative data is not available uniformly across the bioregion.

Specifically for flora and fauna, the biodiversity issues addressed at panel workshops are:

- evaluating point records for endangered (E), vulnerable (V) and near threatened (NT) taxa to improve spatial accuracy and precision
- capturing any additional records available from expert panel members for subsequent use in criteria A and H
- identifying areas with special biodiversity values (criteria I) important for the bioregion's fauna
- identifying non-EVNT taxa to be treated as 'priority species' under criteria H
- identifying data gaps.

The GUP study area expert panel comprised invited persons with knowledge of the biodiversity and/or special biodiversity values of the GUP Bioregion, as well as a sound understanding of ecological conservation and management principles. As far as possible, the combined expertise of participants covered the whole GUP Bioregion and a range of planning and assessment processes (e.g. local government, regional Natural Resource Management (NRM) bodies, state government). The terms of reference for expert panels are provided in Appendix 6 of the BAMM documentation on the EHP website. Additional experts were consulted after the panel workshop and all panel participants are listed in Table 1.

The output of the panel process aims to be justifiable and transparent. Data that is captured digitally and mapped is a result of consensus within the panel and ratified by the Manager, Biodiversity Assessment & Analysis, EHP and the relevant regional manager.

Further, significance ratings of State or Regional are attributed to the decisions produced at the expert panels. In general ratings were only given by the panel to areas of remnant REs, however some small areas of non-remnant vegetation have been given a biodiversity significance rating as part of corridors to improve landscape connectivity.

The ratings used by the panel were described as:

State significance—areas assessed as being significant for biodiversity at the bioregional or state scales. They also include areas assessed as being significant at national or international scales

Regional significance—areas assessed as being significant for biodiversity at the sub-bioregional scale. These areas have lower significance for biodiversity than areas assessed as being of State significance.

Table 1 **Expert panel participants and additional persons consulted in Townsville on 29th June 2011.**

Name	**Organisation**
Steve Malone	ex Southern Gulf NRMG
Mike Digby	Northern Gulf NRMG
Kelly Gardner	Carpentaria Land Council
Chris Appelman	DERM – Queensland Herbarium
Bruce Wannan	DERM – Northern Region
Gethin Morgan	DERM – Northern Region
Gary Wilson	DERM – Northern Region
Tony Morrison	DERM – Northern Region
Lana Little	DERM - QPWS
Support Staff	
Michelle Richards	DERM – Northern Region
Andrew Jolly	DERM – Northern Region
Lindsey Jones	DERM – Head Office
Shane Chemello	DERM – Head Office
Steven Howell	DERM – Head Office

Table 2 Expert panel participants consulted in Atherton on 15th August 2011 and in Townsville on the 26th September 2011.

Name	**Organisation**
Atherton	
Keith McDonald	QPWS – Northern Region
Alistair Freeman	QPWS – Northern Region
Noel Preece	Fauna Consultant
Alf Hogan	Fisheries Consultant
Mike Digby	Northern Gulf NRMG
Debbie Hansen	Northern Gulf NRMG
Charles Curry	Southern Gulf NRMG
Gethin Morgan	DERM – Northern Region
Tony Morrison	DERM – Northern Region
Townsville	
Alex Kutt	CSIRO
Gethin Morgan	DERM – Northern Region
Tony Morrison	DERM – Northern Region

2.3 Expert panel format

The landscape expert panel workshop used an interactive approach of GIS software, spreadsheets, reports, laptops and data projectors. Prior to the panel being convened, relevant information was collated and disseminated to the workshop participants.

The resources made available to the participants during the workshop proceedings were:

- copy of the BAMM
- available regional ecosystem mapping and 1:100 000 topographic maps
- information from databases such as HERBRECS, CORVEG, WILDNET and the Queensland Museum
- published surveys
- informal sources
- ancillary GIS layers provided for local reference included roads and cadastral information drainage, State forests and national parks and Landsat Thematic Mapper imagery; digital topographic maps where available.

Appendix 2 provides a full list of the resources made available to the panel at the workshop.

2.3.1 Special biodiversity values (criteria I)

The panel reviewed the criteria I decisions of the flora and fauna panels and nominated other areas of special biodiversity value for inclusion under criteria I. The panel assigned State or Regional significance to the nominated areas on the basis of presence of at least one of the following features:

- Criterion Ia—the area supports a number of taxa endemic to the GUP bioregion
- Criterion Ib—wildlife refugia; natural wetland that is in good condition or continues to function as a major wildlife habitat when seasonal conditions permit
- Criterion Ic—the area supports a number of taxa that are present in other bioregions and have a limited number of occurrences in the GUP bioregion (outliers/disjunct populations)
- Criterion Id—the area supports a number of taxa at or near the limits of their respective geographical ranges
- Criterion Ie—the area supports a high species diversity
- Criterion If—the area supports concentrations of relictual (ancient and primitive) taxa
- Criterion Ig—the area contains a regional ecosystem or regional ecosystems that exhibit variation in species composition
- Criterion Ih—an artificial waterbody or managed/manipulated wetland of ecological significance
- Criterion Ii—the area contains a high density of hollow-bearing trees that provide animal habitat
- Criterion Ij—the area is used by significant numbers of individuals for roosting or breeding.

The panel took into account combinations of the features present in deciding on an overall rating of State or Regional significance. The diagnostic criteria in BAMM use prescribed thresholds for determining the relative importance of individual criteria and standard rules for assigning significance based on combinations of values present. However, BAMM version 2.1 provides limited guidance on how expert panels are to assess criteria. The GUP bioregion landscape expert panel used a consensus approach in assigning overall significance.

2.3.1.1 Review of fauna and flora expert panels criteria I decisions

The panel reviewed the criteria I decisions of the flora and fauna panels and either accepted the decisions as they stood, recommended that additional values be added, recommended that certain decisions be combined into one landscape decision, or recommended that already identified areas be consolidated. The consolidation of already identified areas was achieved by including enclosed and other closely associated areas so as to increase the diversity of values present, increase habitat connectivity, or improve the long term viability of the area and its values.

2.3.1.2 Special biodiversity areas (criteria I)

The panel then considered areas not already identified by the fauna or flora expert panels for potential addition as special biodiversity areas. Members of the expert panel nominated areas for inclusion under criteria I based on an analysis of the above data sets and personal knowledge. Where there was consensus that an area was of State or

Regional biodiversity significance the values were identified and the area mapped. Where there was uncertainty or further work needed, tasks were assigned for follow-up. In some cases the areas were specifically identified by RE polygons, in others a bounding box was drawn as a shape file to indicate the general location of the area, and specific instructions given for the area to be more accurately mapped using RE polygons, geology, landform or some combination of these. Subsequently the areas were mapped, distributed to the expert panel for review, and then finalised.

2.3.2 Corridors (criteria J)

Landscape scale corridors have been defined and mapped at a statewide level for most of the state. The network is being expanded as BPAs are completed for additional bioregions. Their broad purpose is to provide for ecological and evolutionary processes at a landscape scale by:

- maintaining long term evolutionary/genetic processes that allow the natural change in distributions of species and connectivity between populations over long periods of time
- maintaining landscape/ecosystems processes associated with geological, altitudinal and climatic gradients, to allow for ecological responses to climate change
- maintaining seasonal migrations and movement of fauna
- maximising connectivity between large tracts/patches of remnant vegetation
- identifying key areas for rehabilitation and offsets.

Corridors have been selected to reflect:

- major watershed and catchment boundaries
- intact river systems
- major altitudinal/geological/climatic gradients
- connectivity between remnant vegetation in good condition
- linkages between bioregions
- linkages between permanent waterholes.

The methods used to identify bioregional terrestrial and riparian corridors, and gaps and critical weaknesses in terrestrial corridors, are outlined in Attachment 4 in EPA (2008). Corridors that form part of the statewide network are assigned State significance. Other corridors providing connectivity at a sub-regional scale are assigned Regional significance.

The landscape expert panel workshop reviewed the proposed network of statewide conservation corridors affecting the GUP bioregion, provided advice on extending the network, and discussed whether there was a role for regional corridors in the GUP bioregion.

2.3.3 Threatening processes: condition (criteria K)

The predominant threatening processes on the condition of remnant vegetation in the GUP bioregion are total grazing pressure, soil erosion, weeds, feral animals and burning regime. In some areas salinity and mining are also significant processes, and climate change has the potential to affect the entire bioregion.

The expert panel considered condition at two scales: the landscape scale, where extensive areas have minimal grazing infrastructure, due to their remoteness or the rugged nature of the landscape, and show little impact from grazing over most of their area, and the ecosystem scale, where small areas of particular ecosystems that are otherwise relatively degraded over most of their range, remain in good condition.

2.3.4 Regional ecosystems threatened by grazing

The Ground Cover Disturbance Index (GCDI) was developed by the Biodiversity Assessment unit of EHP to assess the level of historic ground cover disturbance associated primarily with grazing and fire, and has been used in a number of BPAs to inform criteria K: threatening processes (condition). The Groundcover Index from EHP has been used in developing this product. The Groundcover Index time series is derived from Statewide Landcover and Trees Study (SLATS) Landsat TM imagery, and provides an estimated percentage of ground cover. The GCDI analyses levels of ground cover within each RE, as different REs naturally have different ground cover percentage. Within each RE, within each subregion, the mean and trend of the Groundcover Index is calculated since 1988, with different combinations of mean and trend indicating different levels of disturbance (very low to very high). The

GCDI is inapplicable in areas with foliage projective cover (FPC) greater than 20 per cent, and also identifies low change areas which are likely to be naturally bare (e.g. bare rock, scalded areas). The GCDI results in the classification of the landscape to sixteen levels of disturbance at the resolution of the 25 metre pixel of Landsat satellite imagery (see Figure 3).

Disturbance level	High ground cover	Above mean ground cover	Below mean ground cover	Low ground cover
Increasing trend	1—Very Low (benchmark)	5—Low	9—Medium	13—High
Slight increase in trend	2—Very Low (benchmark)	6—Low	10—Medium	14—High
Slight decrease in trend	3—Low	7—Medium	11—High	15—Very High
Decreasing trend	4—Low	8—Medium	12—High	16—Very High

Figure 3 Ground Cover Disturbance Index showing the 16 levels of disturbance

The panel discussed and considered the findings of the GCDI and how it may be used effectively in relation to implementation of criteria K: threatening processes.

Individuals from the expert panels were consulted following the workshops to clarify some recommendations.

3 Results and discussion

Specific recommendations from the panel are recorded in several tables within the following sections.

3.1 Special biodiversity values (criteria I)

The panel reviewed the criteria I decisions of the flora and fauna panels and recommended that certain decisions be combined into one landscape decision, and that certain already identified areas be consolidated. The consolidation of already identified areas was achieved by including enclosed or other closely associated areas so as to increase the diversity of values present, increase habitat connectivity, or improve the long term viability of the area and its values. All panel comments and recommendations relating to areas of special biodiversity value are outlined in Table 5.

The ratings used for diversity of species of conservation significance (EVNT and priority species) are:

- very high (>25 per cent of GUP bioregion species)
- high (10–25 per cent of GUP bioregion species)
- medium (>10 per cent of GUP bioregion species)
- low (no data).

Only EVNT and priority species are specified for each decision.

3.2 Bioregional corridors (criteria J)

Expert panel members reviewed existing corridor networks identified in the GUP bioregion and made recommendations on new corridors. Corridors forming part of the state-wide network were assigned State significance.

The panel acknowledged corridors are less meaningful in relatively intact landscapes such as the GUP bioregion than in fragmented landscapes, however, they also agreed it was important to identify corridors to align with state-wide planning processes and to connect through to corridors identified in neighbouring bioregions. They also acknowledged that though the GUP is intact in terms of vegetation, it may be fragmented from a condition perspective. Part of the value of corridors in intact landscapes is to identify areas important for connectivity so that future land-use intensification can be directed elsewhere, or managed to maintain ecosystem continuity. The corridors selected reflect:

- major watershed/catchment boundaries
- intact river systems
- major altitudinal/geological/climatic gradients
- linkages between bioregions.

3.2.1 Terrestrial corridors

Using the functions and principles described in the previous section of this report, the panel reviewed the existing state-wide conservation corridor network in the GUP bioregion, provided advice on extending the network, and discussed whether there was a role for regional corridors in the GUP bioregion. These discussions resulted in the addition of a terrestrial linkage along the Staaten and Red River, joining the Gulf Coast Link to the Great Artesian Basin Rim state-wide conservation corridors. The final corridor network is listed in Table 3 and displayed in Figure 4.

Table 3 Terrestrial bioregional corridors identified by the GUP bioregion landscape expert panel

Corridor Number	Corridor description	Significance (width)
01	State-wide Conservation Corridor - Gulf Coast Link	State (5 kilometres)
02	State-wide Conservation Corridor - Gulf to Grasslands	State (5 kilometres)
03	State-wide Conservation Corridor - Great Artesian Basin Rim	State (5 kilometres)
04	Eastern Gulf Plains Link	State (5 kilometres)

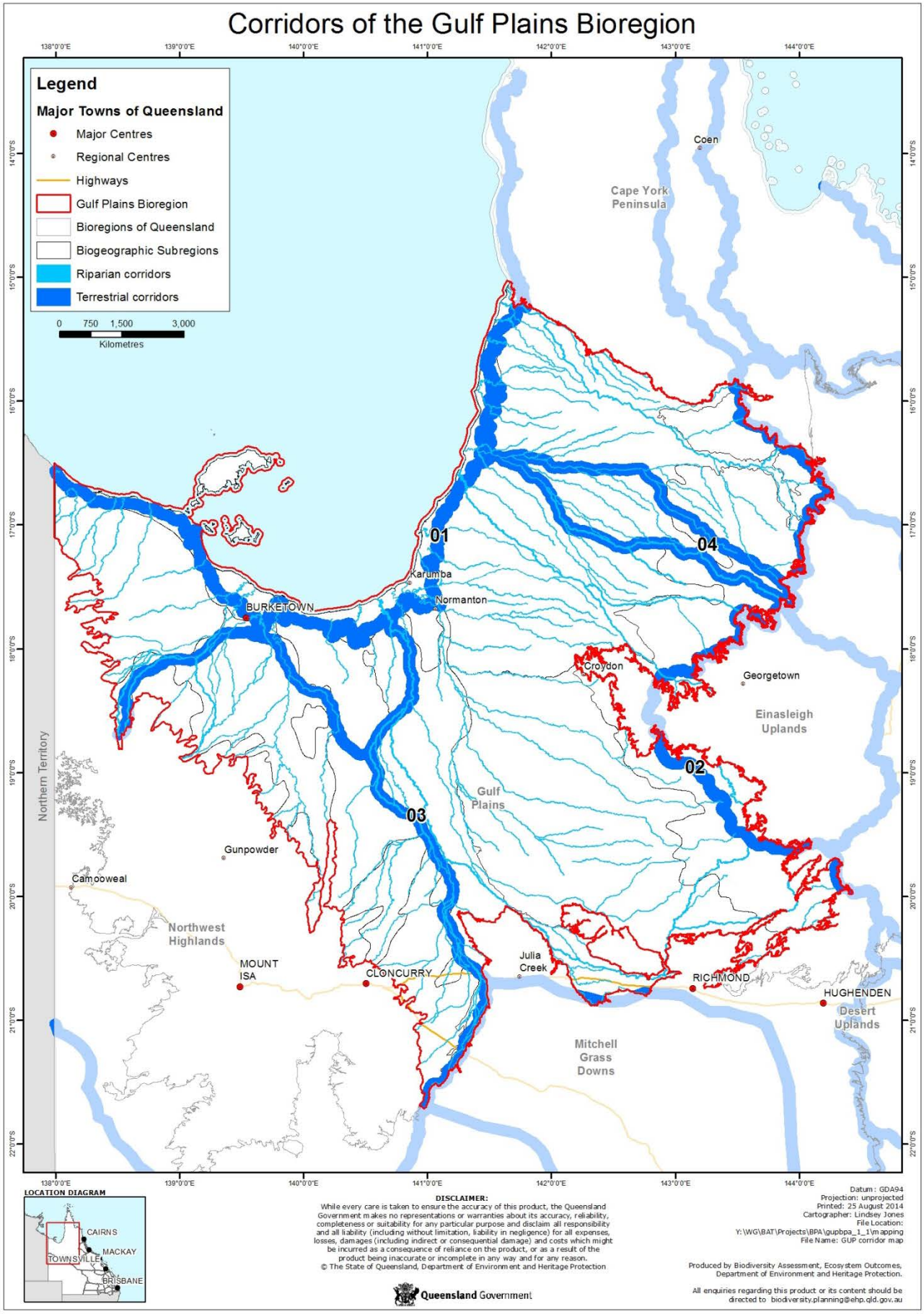


Figure 4 Gulf Plains terrestrial bioregional corridors

3.2.2 Riparian corridors

Riparian corridors in the Gulf Plains are particularly significant for biodiversity, both as a climatic refuge and as a major element of habitat continuity. Watercourses provide extra cover in arid areas and major movement of fauna will be along riparian corridors but there will be some lateral movement into adjoining habitat. This decision is based on the bioregional corridor values of major riparian areas. The refugial and other values of riparian areas are covered by decision gup_l_41. There were several larger watercourses identified by the panel as the most significant, and these were recommended to be given a larger buffer (Table 4). These watercourses were given a 500m buffer, and all others were given a 200m buffer.

Table 4 Larger watercourses in the GUP bioregion relevant for GUP riparian corridor decision gup_l_47

The following watercourses were given a buffer of 200 metres and State significance		
Accident Creek	Albert River	Alexandra River
Alice River	Alick Creek	Archie Creek
Armstrong Creek	Back Creek	Barkly River
Beames Brook	Belmore Creek	Big Bloodwood Creek
Boorabin Creek	Bosworth Creek	Bottle Creek
Branch Creek	Brannigan Creek	Brown Creek
Bynoe River	Cabbage Tree Creek	Caroline Creek
Carron River	Cartrige Creek	Cattle Creek
Chasm Creek	Clara River	Clarina Creek
Clark Creek	Cliffdale Creek	Cloncurry River
Cockburn Creek	Coleman River	Cooradine Creek
Corella Creek	Corella River	Courtenay Creek
Diamond Creek	Dismal Creek	Dugald River
Dutton River	Eastern Creek	Echo Creek
Eight Mile Creek	Elizabeth Creek	Emu Creek
Etheridge River	Express Creek	Far Creek
Fiery Creek	Fish Hole Creek	Fitzmaurice Creek
Forest Creek	Forty Mile Creek	Fullarton River
Giddery Creek	Gidya Creek	Gilliat River
Gin Arm Creek	Gunpowder Creek	Hann Creek
Hazlewood Creek	Holy Joe Creek	Julia Creek
King River	L Creek	Lagoon Creek
Langdon River	Leichhardt River	Lily Creek
Little River	Little Wyaaba Creek	Lynd River
M Creek	Macadam Creek	Maddigans Creek

Magnificent Creek	Mailman Creek	Massie Creek
Maxwell Creek	Mckinlay River	Mentana Creek
Middle Creek	Millar Creek	Millers Creek
Mimosa Creek	Miranda Creek	Mistake Creek
Mitchell River North Arm	Mittigudi Creek	Moonlight Creek
Mottle Creek	Mundjuro Creek	Musselbrook Creek
Myally Creek	Nassau River	Nevertire Creek
Nicholson River	Norman River	O'connell Creek
One Mile Creek	Palmer River	Pandanus Creek
Patience Creek	Percy Creek	Pine Tree Creek
Poison Creek	Redbank Creek	Rocky Creek
Rosser Creek	Running Creek	Sandy Creek
Saxby River	Scrubby Creek	Scrutton River
Settlement Creek	Smithburne River	South Mitchell River
Spear Creek	Spring Creek	Staaten North Branch
Staaten River	Stawell (Cambridge Creek) River	Surprise Creek
Swan Creek	Tate River	Topsy Creek
Vanrook Creek	Walker Creek	Walsh River
Williams River	Williamstown Creek	Wills Creek
Wyaaba Creek	Yambore Creek	Yaningerry Creek
Yanko Creek	Yappar River	
The following watercourses were given a buffer of 500 metres and State significance as they are seen to be the most important		
Einasleigh River	Flinders River	Gilbert River
Gregory River	Lawn Hill Creek	Mitchell River
Pelican Creek	Red River	Widdallion Creek
Woolgar River		

3.3 Wetlands

Given the highly dynamic nature of the Gulf Plains bioregion, with alternating periods of inundation over much of the region during the summer wet season followed by a long dry season in winter, wetlands play a vital role in maintaining biodiversity. Wetlands have a range of biodiversity values, both in their own right, and for the role they play in maintaining water quality, protecting downstream aquatic ecosystems, and as part of the wetland ecosystem continuum where they are periodically connected with other aquatic ecosystems. Wetlands act as refugia for many species, and play a vital role in the life cycle of others. Wetlands are a defining characteristic of the bioregion, in their extent, diversity, and condition.

Many of the Directory of Important Wetland Australia (DIWA) sites have been included as State significant special areas under criterion I (eg Southern Gulf Aggregation in gup_l_02,), as recognition of their biodiversity values within the Gulf Plains. In addition to these nationally recognised wetlands, all palustrine and lacustrine wetlands were buffered by 200m and included in Regional decision gup_l_45, to acknowledge the biodiversity values of all wetlands in the GUP.

The expert panel also recognised that the wetland complexes in the GUP are so significant that they particularly need to be addressed at the landscape scale. They stressed that landscape elements that directly relate to wetlands and contribute to their values need to be identified in association with the wetland itself. These were identified in State significant decision gup_l_33, which includes all DIWA complexes, including those that had not been identified in other decisions.

3.4 Ground Cover Disturbance Index

The Ground Cover Disturbance Index (GCDI) (Figure 3) for the bioregion was viewed by the panel focussing on areas where panel members had a detailed knowledge of past land management practices and therefore disturbance history, so as to gauge the accuracy of the GCDI.

The panel recognised the potential of the tool as a measure of landscape condition provided it was used in conjunction with other data sets that identify and make it possible to exclude fire scars and areas of low change such as natural scalds. The panel recommended that the GCDI should not be used over floodplains as these are considered too ephemeral for the GCDI to be reliable.

In other bioregions where the GCDI has been applied, the presence of introduced pasture buffel grass has made it difficult to reliably associate low disturbance with high biodiversity condition. In the GUP bioregion, the panel agreed that due to only limited occurrences of the introduced pasture buffel grass in the GUP bioregion, less disturbed areas identified by the GCDI are likely to reliably indicate high biodiversity condition.

A review of the results in areas known to the panel gave mixed results. Some areas, like the high disturbance areas showing on the Gilbert River, were felt to be accurate. Fence effects, saline seeps and piezospheres could clearly be seen in many areas of the GUP, which correlated with expert knowledge. However, due to the highly dynamic nature of the bioregion, fence line differences due to grazing are less easy to see here than in in other bioregions. Given the significant issues with the RE mapping in the western GUP, there is little confidence in the GCDI results in this area. The panel commented that where there are areas for which condition is important, the GCDI results should be used on a case by case basis. However the panel did not feel that the dataset was suitable for use as a broad modifier to the BPA results.

A general recommendation from the panel was to rerun the GCDI analysis once the RE mapping for the GUP had been reviewed, and to circulate the results to the panel for comment. In particular they were interested to see the Of Concern REs within Landzone 9.

Due to lack of time and the limited application of the GCDI in the highly dynamic systems of the Gulf Plains, the analysis was not included in the final biodiversity assessment.

3.5 Climate change

This threat at a bioregional scale would be difficult to measure, map and incorporate into a BPA. Three major issues were raised in expert panels.

- the inundation and loss of wetlands on the marine plains
- rapid change over large areas due to the relatively large uniform geomorphic surfaces
- more frequent and extended inundation of low lying areas.

The predicted temperature increase under a climate change scenario is 3.2 °C up to a possible 4.4 °C by 2070 and the number of days exceeding 35 °C may increase substantially (Low 2011). Annual rainfall is predicted to decline

by 2% but estimates have variation of around 25% higher or lower. While cyclone frequency may decline, the number and duration of severe (category 3-5) cyclones is predicted to increase. Prolonged flooding and its interactions with high cattle numbers and fire management seriously impact ground cover plants and fauna, including permanent shifts in vegetation. Weed encroachment promoted by flooding is threatening seasonal wetlands in the floodplains. Floods kill fauna that cannot escape to trees or higher ground. Also, on higher ground, the fauna compete for space and resources with high cattle numbers will mean high mortality resulting from the physical impact of trampling. Recommendations for destocking after floods aim to promote recruitment of both fauna and flora.

There may be increases in drought severity and occurrences of heat waves that may result in mass mortality of birds and macropods have dramatic impacts on fauna.

The Gilberton Plateau (elevation of 1080m) is an extension of the Einasleigh Uplands on the eastern margin of the bioregion. This area has disjunct populations of some plant species and is the western limit of others. Species that do not occur in the lowland plains can be found at higher elevations in the east and west. The higher areas are potential climate refugia but will still be subject to extreme temperatures and weather and the Gilberton Plateau has many plant species highly vulnerable to the impacts of climate change. These species have good prospects of persistence in more eastern bioregions.

Sea level rise will inundate large areas of the Gulf Plains but evidence suggest land is accreting along parts of the eastern side of the Gulf so the overall impact on the lowland plains is yet unclear.

Fire regimes will also change but because of the high grazing intensity in the bioregion, fuel loads may not be high enough to result in a significant increase. If the African grasses, including Gamba Grass, prevalent in the Northern Territory colonise the bioregion, then fuel loads will change significantly.

3.6 Special Areas

The panel was asked to identify areas with special biodiversity values within the GUP bioregion under the BAMM supplementary criterion I. Areas with special biodiversity value are important because they contain multiple taxa in unique ecological and often highly biodiverse environments. Values can include centres of endemism, wildlife refugia, disjunct populations, geographic limits of species distributions, high species richness, relictual populations, high densities of hollow-bearing trees and breeding sites. Using expert knowledge and available information (records, maps, GIS derived datasets), panel members were able to identify eleven areas and describe their collective values. The special areas proposed by the panel are described in Table 5.

In relation to the following flora, fauna and landscape special feature tables:-

A to J refers to sub criteria under Criteria I: Special Biodiversity Values :-

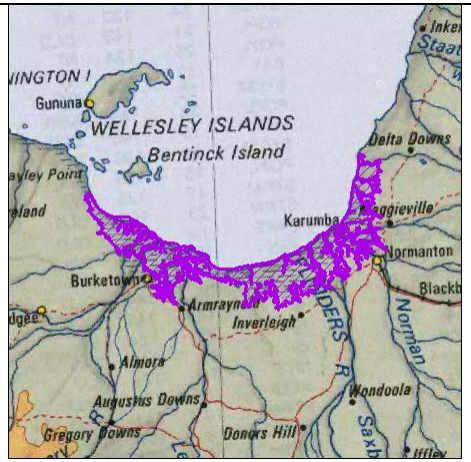
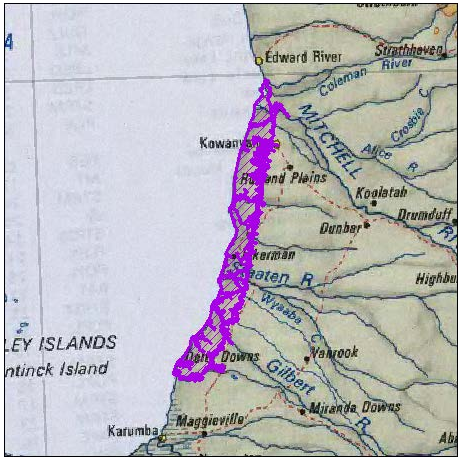
- Ia – Centres of endemism – areas where concentrations of taxa are endemic to a bioregion or subregion are found.
- Ib – Wildlife refugia (Morton et al. 1995), for example, islands, mound springs, caves, wetlands, gorges, mountain ranges and topographic isolates, ecological refuges, refuges from exotic animals, and refuges from clearing.
- Ic – Areas with concentrations of disjunct populations.
- Id – Areas with concentrations of taxa at the limits of their geographic ranges.
- Ie – Areas with high species richness.
- If – Areas with concentrations of relictual populations (ancient and primitive taxa).
- Ig – Areas containing REs with distinct variation in species composition associated with geomorphology and other environmental variables.
- Ih – An artificial waterbody or managed/manipulated wetland considered by the panel/s to be of ecological significance.
- Ii – Areas with a high density of hollow-bearing trees that provide habitat for animals.
- Ij – Breeding or roosting sites used by a significant number of individuals.

Significance is the overall level of biodiversity significance:-

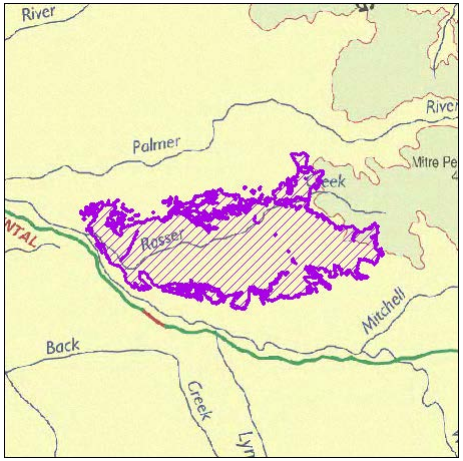
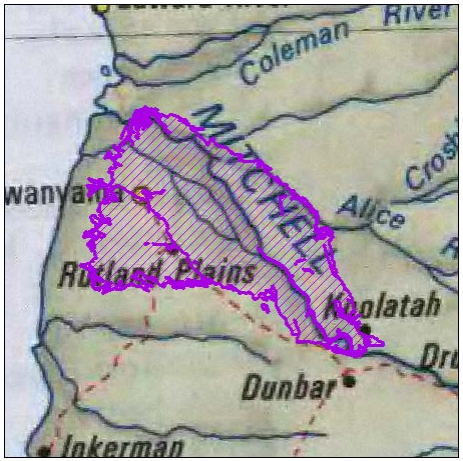
- State is equivalent to Very High and the special feature is significant at the bioregional scale.
- Regional is equivalent to High and the special feature is significant at the subregional scale.

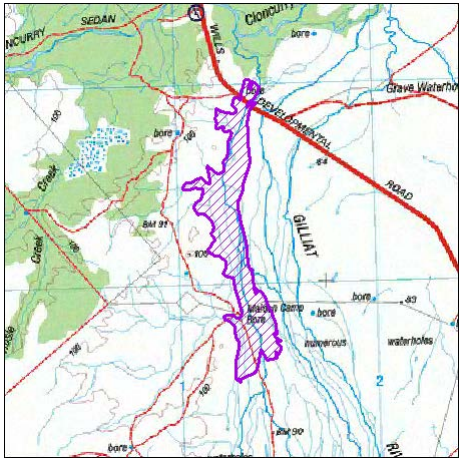
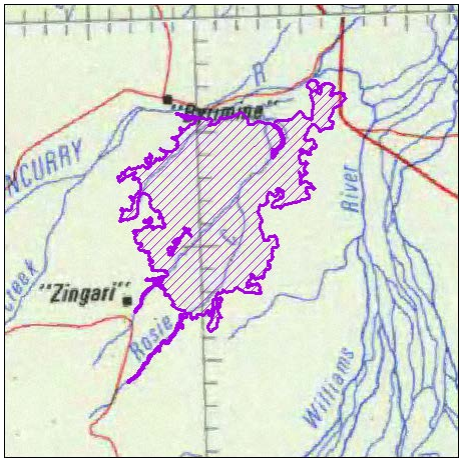
Table 5 Comments and recommendations relating to areas of special biodiversity values

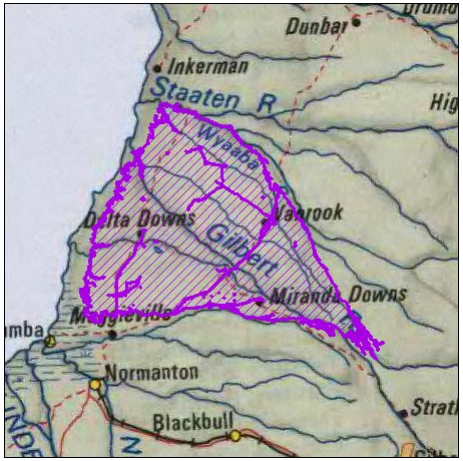
Decision number	Description	Panel recommended significance	Identified values in BPA	Criteria values
gup_l_01	Gangalidda (western Karumba Plains subregion and adjoining areas) 	State	Take over gup_fa_09 decision and western part of gup_fl_07. Dunes and swales, highly variable landform, seasonal swamps, lagoons, complex wetlands. Part of DIWA Wentworth Aggregation wetland (Blackman 2001). Tremendous coastal complexes on land zones 1, 2 and 3, with seasonal and permanent wetlands discharging into area. Relatively undisturbed with best examples of *Phragmites* dominated wetlands and *Pandanus* closed forest, vine thicket patches and coastal dune grasslands which are unusual for this part of the landscape. Significant cultural sites. Name based on local indigenous group. Habitat for turtles, beach thick-knees *Burhinus grallarius*, large pelican *Pelecanus conspicillatus* populations, magpie geese *Anseranas semipalmata* and breeding black-neck storks *Ephippiorhynchus asiaticus*. Migratory wader aggregation (Garnett and Taplin 1990; Driscoll 2001). High turtle nesting (greens *Chelonia mydas*) from about Massacre Inlet to NT border. On offshore flats and intertidal areas - presence of inshore cetaceans, sea snakes and dugongs *Dugong dugon* and nursery area for a range of fish and crustaceans with commercial and recreational values (Living Planet Analysis 1993).	Ib (wildlife refugia): VERY HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ij (significant breeding or roosting sites):VERY HIGH
gup_l_02	Southern Gulf coastal plains	State	Takes over central part of gup_fl_07 and gup_fa_13. Part of the Southern Gulf Aggregation contains very diverse landscapes including saltpans, freshwater swamps, stands of significant forests with tall eucalypts and casuarina wetlands, different to adjacent coastline. It has the largest continuous estuarine wetland aggregation of its type in northern Australia (Blackman 2001). Includes other DIWA areas – Stranded Fish Lake (example of shallow lagoon on saline clay plains) and Buffalo Lake aggregation (good example of shallow lacustrine system), both with notable flora and/or fauna (Blackman 2001). Internationally important concentrations of migratory wader species and is one of the three most important areas for shorebirds in Australia (Watkins 1993, Dutson et al 2009; Jaensch and Richardson 2014).	Ib (wildlife refugia): VERY HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ij (significant breeding or roosting sites):VERY HIGH

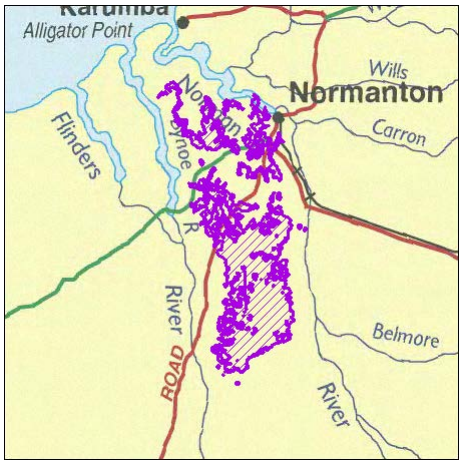
			Dry season refuge waterbirds (Blackman 2001; Driscoll 2001) and critical roost areas for waders (Driscoll 2001). Major concentrations of little curlew *Numenius minutus* recorded on plains and presence of major waterbird rookeries along channels (Garnett 1989; Jaensch and Richardson 2013). On offshore flats and intertidal areas – presence of inshore cetaceans, sea snakes and dugongs *Dugong dugon* and nursery area for a range of fish and crustaceans with commercial and recreational values (Living Planet Analysis 1993). Includes areas in the lower Flinders and Norman rivers and adjacent floodplains recognised as having fauna (fl_nr_fa_02, nn_nr_fa_01, fl_e_fa_01, nn_e_fa_01 and nn_e_fa_03), flora (fl_nr_fl03, gi_nr_fl_02, nn_nr_fl_02, fl_e_fl_01, gi_e_fl_01 and nn_e_fl_01) and landscape (fl_nr_ec_10, fl_nr_ec_13, nn_nr_ec_01, nn_nr_ec_11, fl_r_ec_08, fl_r_ec_10 and nn_e_ec_01) special features (conservation rating of high - 3 or very high - 4) in the southern Gulf of Carpentaria ACA (Rollason and Howell 2010).	
gup_l_03	Mitchell-Gilbert coastal plains 	State	Takes over from gup_fa_01, and eastern part of gup_fl_07. Southeast Karumba Plain Aggregation is significant for the extent and continuity of the estuarine wetlands, the high area of seasonally inundated grasslands present, and the extent of seasonally rich post-breeding habitat for many waterbird species (Blackman 2001). In this respect the site has particularly good examples of shallow seasonal wetlands typical of the coastal systems associated with the high alluvial Mitchell-Gilbert Fans province of the Gulf Plains in south western Cape York Peninsula Includes other DIWA site – Macaroni Swamp – good example of shallow semi-permanent lacustrine wetland with notable flora and fauna (Blackman 2001). Some of this area is of international significance for birds (Dutson et al 2009). Beach area which hosts 40 % of Australia's winter wader population. (Driscoll 2001). The site, being the largest Queensland summer wader site and second largest in Australia, supports ~ 50% of the state wader total. Great knot *Calidris tenuirostris* and red knot *C. canutus* contribute 43% of this site's summer wader population (Driscoll 2001). Key resource areas for frugivores. Heavily dissected by water, this provides roosting and nesting sites for waterbirds, waders and raptors (Blackman 2001, Driscoll 2001). Dry season refugia with very high species richness relative to surrounding habitats. Distinct variation in species composition. Contains taxonomically distinct dragons. Large number of species at the limits of their range in this community.	Ib (wildlife refugia): VERY HIGH Id (species at geographic range limit): VERY HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH

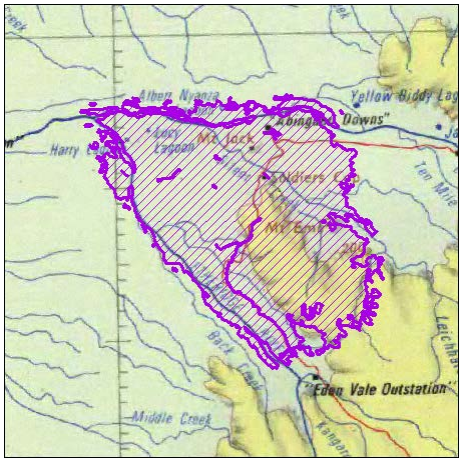
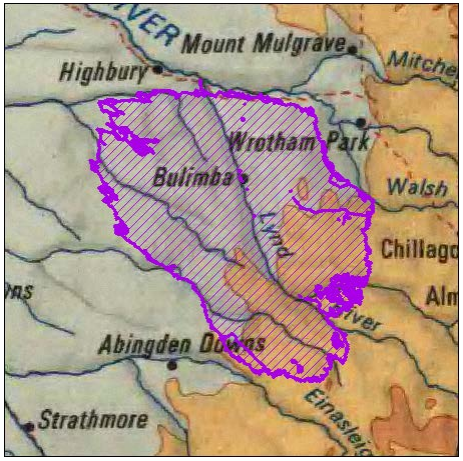
			Turtle breeding area but very little mainland sea turtle nesting records from air survey of tracks. The 1999-2000 and 2009 air surveys found no or little evidence south of the Nassau River on the western CYP (GHD 2010). Possible northern hopping mouse *Notomys aquilo* habitat in fore-dune area (Smith et al 1990). All coastal country from Mitchell through to Flinders one big system during wet – nutrients that drive the system derived from inundated floodplain. This nutrient/productivity pulse important in the saline waters (estuaries, coastal wetlands and inundated floodplain) that act as nursery sites for many estuarine/marine fish species, e.g. barramundi *Lates calcarifer*, black jewfish *Protonibea dicanthus* and mullet *Liza* and *Mugil* spp. On offshore flats and intertidal areas - presence of inshore cetaceans, sea snakes and dugongs *Dugong dugon* and nursery area for a range of fish and crustaceans with commercial and recreational values (Living Planet Analysis 1993). Includes areas in the lower Gilbert River and adjacent floodplain recognised as having fauna (gi_nr_fa_02) and landscape (gi_nr_ec_01, gi_nr_ec_06 and gi_nr_ec_09) special features (conservation rating of high - 3 or very high - 4) in the southern Gulf of Carpentaria ACA (Rollason and Howell 2010). Finally a significant proportion of the site has high wilderness quality (Lesslie et al 1992).	

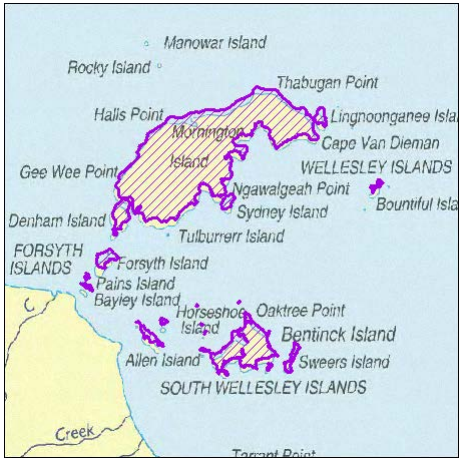
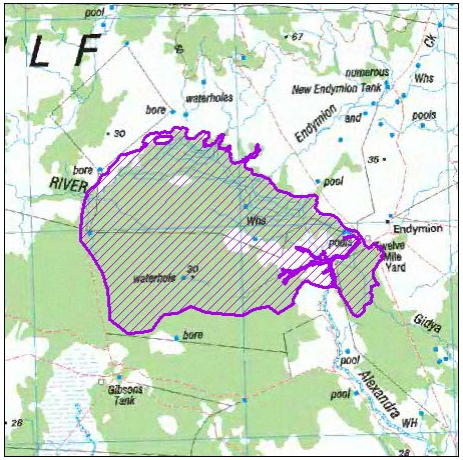
gup_l_04	Rosser Creek 	State	Takes over gup_fl_08. Contains rare REs with limited extent, floral range extensions from both the east and west. *Asteromyrtus* shrublands unusual. Impressive riparian vegetation, e.g. vine thickets/flying fox scrub near Horse Creek. Based on Strathhallan block. Landscape residuals of land zone 5 overlying laterized mudstone. Not subject to flooding. Little affected by grazing environment is in good condition.	Ib (wildlife refugia): HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ij (significant breeding or roosting sites):VERY HIGH
gup_l_05	Mitchell River delta 	State	The Mitchell River Fan Aggregation is an outstanding example of a diverse and rich array of alluvial plain wetlands and deep water habitats which characterise the northern portions of the Mitchell-Gilbert Fan province of the Gulf Plains bioregion. It provides extensive areas of seasonal, semi-permanent and permanent habitat which is used particularly as breeding, roosting, feeding and moulting habitat for a wide range of waterbirds and habitat for estuarine crocodiles *Crocodylus porosus* (Taplin 1991; Blackman 2001). A range of landform elements occur throughout; closed depressions (lakes, oxbows, swamps), and open depressions (drainage depression, stream channel, stream bed, swamp) within a flat upland comprising plains, fans, back plains and floodouts. Decision picks up the functional system. High amount of wetlands, dynamic wetlands, highly active system, important breeding sites for aquatic species. High floral species diversity. High nutrient status. Contains wetter Cape York species that reach the limit of their extent. High species diversity is due to high soil diversity. Mitchell River acts as a conduit for migratory species transitioned across the Cape. Delta gallery rainforest and contains the best example of this ecosystem. Current younger delta system of particular interest being most active. Both the Mitchell and Gilbert River deltas are the largest landform feature of this type to occur in the state and should be highlighted as such.	Ib (wildlife refugia): VERY HIGH Id (species at geographic range limit): HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ij (significant breeding or roosting sites):VERY HIGH

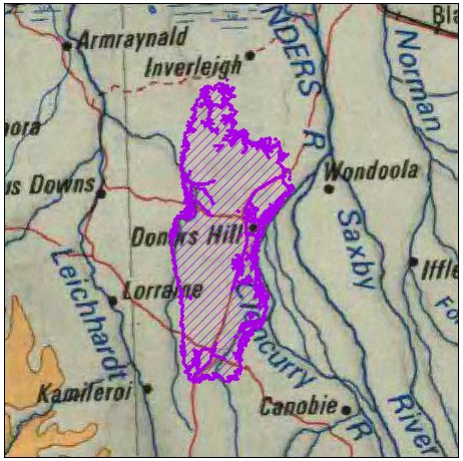
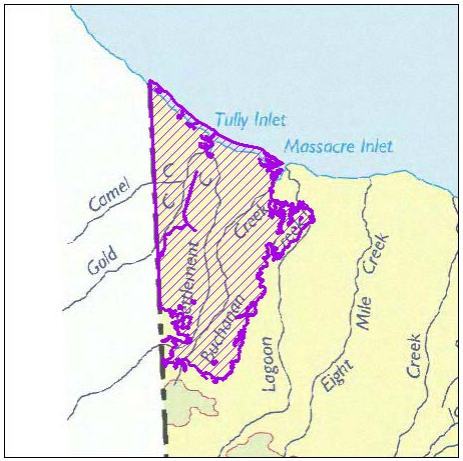
gup_l_06	Dalgonally Swamps 	Regional	Replaces gup_fl_11 Very wet grassland which is atypical for the system. Confined floodplain. The lowest part in the area and the water pools here is a refuge and stays wet for a long period. Most of the other wetlands in this area dry out quickly. Not so much standing water as it is just staying damp for extended periods. Area is used by a variety of waterbirds including black-necked stork *Ephippiorhynchus asiaticus*, as well as threatened grey falcon *Falco hypoleucos* (Birdlife Australia Atlas data). Significant pig populations.	Ib (wildlife refugia): HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ih (artificial waterbody or managed/manipulated wetland of ecological significance): HIGH
gup_l_07	Lignum swamps 	State	Lignum Swamp is a unique ecosystem and a particularly good example of a large semi-permanent emergent, persistent wetland of unusual formation in the Gulf Plains (Blackman 2001). It is an important refuge for waterbirds, e.g. freckled duck *Stictonetta naevosa*, and other fauna. A palustrine wetland dominated by emergent and persistent communities with areas of shallow water in serpentine channels fringed by areas of shallow swamp dominated by emergent non persistent communities. Catchment of Rosie and Lake creeks and un-named creek to the north. Back plain swamps fed from mainly clay catchments and overflows from the Cloncurry river. Catchment includes silver-leaved box on sand sheet and gidgee on clays. Together with Cat Creek Swamp (gup_l_35) these are the best developed and most northerly lignum *Muehlenbeckia florulenta* swamps in the GUP and Queensland. Major extent of this type of wetland. There are blue bushes around the margins but not in the centre. Near the distributional extent of lignum. Possibly spring fed. Also noted as a special flora decision (fl_nr_fl_01) with a very high rating (4) in southern Gulf of Carpentaria ACA (Rollason and Howell 2010).	Ib (wildlife refugia): VERY HIGH Id (species at geographic range limit): HIGH Ig (REs show distinct variation in species composition): HIGH Ij (significant breeding or roosting sites):VERY HIGH

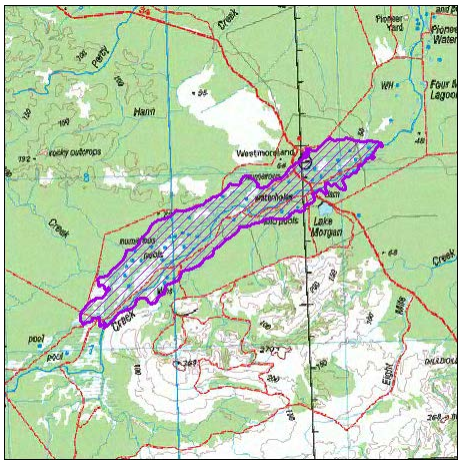
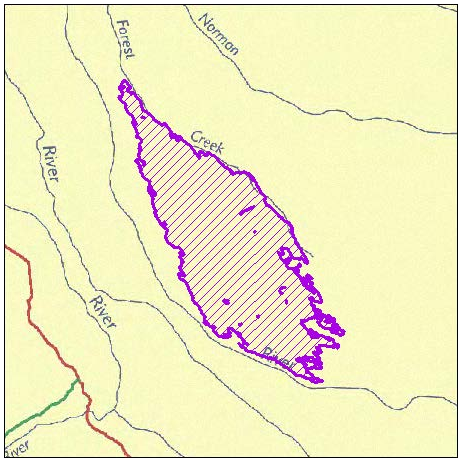
gup_l_08	Gilbert River delta 	State	The Smithburne-Gilbert Fan Aggregation contains the best examples of alluvial plain wetlands characteristic of the southern portions of the Smithburne-Gilbert Fans Province of the Gulf Plains bioregion (Blackman 2001). The site contains the greatest concentration of coastal floodplain lagoonal wetlands in the western Cape York Peninsula. Great variety of soil types. Fan does not extend to the coast as the coastal plain is covered by separate decision. gup_l_03. The unique delta system provides important dry season habitat, especially for species such as the green pygmy goose *Nettapus pulchellus* and wandering whistling-duck *Dendrocygna arcuata*. The seasonally rich shallow wetlands provide important breeding and post breeding habitat for cranes and several waterfowl species, for instance it is thought to be the most important breeding area for the sarus crane *Grus antigone* in Australia. A breeding rookery on the Smithburne River is one of the largest in the western Cape York Peninsula. Southern part has a number of REs at the limits of their extent. Feeding and breeding areas during floods, nutrient pulse drives system for rest of year. Both the Mitchell and Gilbert River deltas are the largest landform feature of this type to occur in the state and should be highlighted as such. Area identified as a riverine and non-riverine special feature (gi_nr_ec_02 and gi_r_ec_09) with a very high conservation rating (4) in southern Gulf of Carpentaria ACA (Rollason and Howell 2010).	Ib (wildlife refugia): VERY HIGH Id (species at geographic range limit): HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ij (significant breeding or roosting sites):VERY HIGH

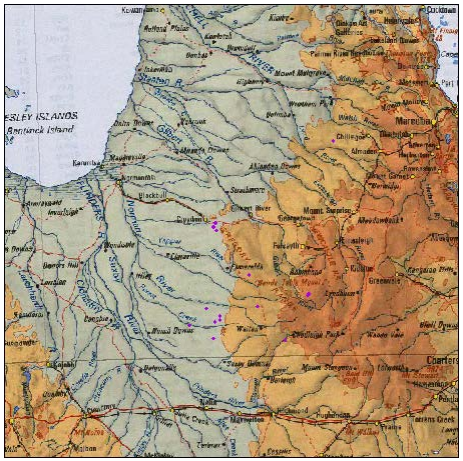
gup_l_09	Glenore land system 	Regional	Distribution of 2.5.5c and/or 2.5.6x3c. Both of these vegetation types are restricted to the area, and a third (2.3.10d) is restricted to Glenore Land System. 2.5.5c is a disjunct population and the eastern extent of the range of *Eucalyptus tectifica*. The other sub-units of 2.5.6x3 (a and b) are a few hundred kilometres away to the north-east. 2.3.10d is *Eucalyptus microtheca* low open woodland on old alluvial plains. This area also includes part of the distribution of 2.5.12x7. The only land zone 5 RE in the GUP dominated by *Eucalyptus microtheca*.No specific fauna list available for land system but records exist for a variety of reptile and bird species for the area, including Gouldian finch *Erythrura gouldiae* and pictorella mannikin *Heteromunia pectoralis*.	Ic (disjunct populations): HIGH Id (species at geographic range limit): HIGH Ig (REs show distinct variation in species composition): HIGH
10	Waukanaka outflow channel		Floodplain evolutionary processes are happening very rapidly in the area. Vanrook Creek – Waukanaka ocean outflow channel have been formed based on something that happened in the 70s. Nesting birds. Broader decision gup_l_03 picks up the values. Part of Staaten Wild Rivers declaration. Insufficient information to implement. Hold over to next GUP BPA. Brannigan Creek and Fitzmorris creeks, just NE of Karumba. Unable to implement in this version and should be considered in the next version. Values and issues associated with this area not noted. This should include Dinah Island if it does not already due to the diversity of ecosystems.	

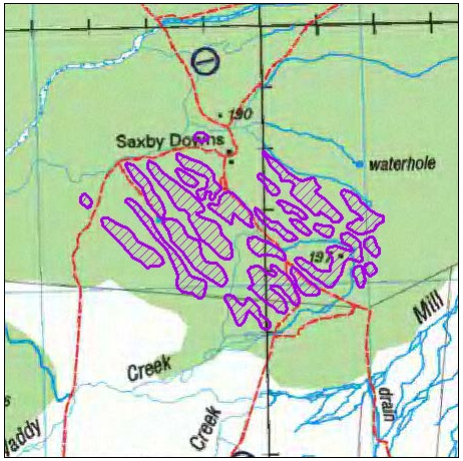
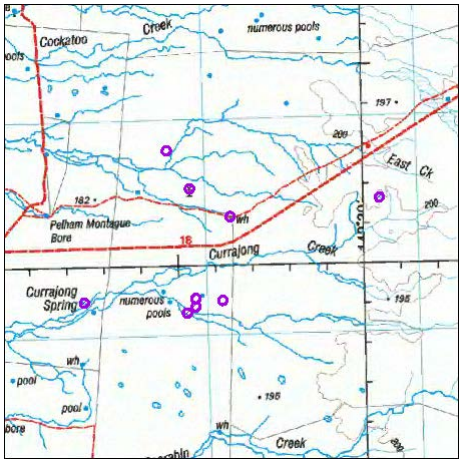
gup_l_11	Confluence of Etheridge and Einasleigh Rivers 	Regional	Diverse surface. A few very unusual and very large wetland areas with diverse veg/land types/RE's. Very large and best example of coolabah woodland swamp. Clay soils, including black soil section which is rare in this part of the Gulf. Exposed duricrust north of the Einasleigh River. Most southern extent of flying fox scrub type ecosystem. Western limit of *Macropteranthes montana* which is Vulnerable. Diverse fauna recorded in the area including a range of waterbirds, *Ctenotus zebrilla* and north-eastern range limit of long-haired rat *Rattus villosissimus*.	Id (species at geographic range limit): HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH
gup_l_12	Lower Lynd River area 	State	Take over gup_fl_03 as a landscape decision. Provides corridor between the two national parks. Breeding area for southern population of golden shouldered parrot *Psephotus chrysopterygius* (Preece et al 2009). Need rocky country to act as refugia. Lower Lynd also habitat for vulnerable freshwater sawfish *Pristis pristis.*	Ia (centre of endemism): VERY HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations):VERY HIGH Id (species at geographic range limit): VERY HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH

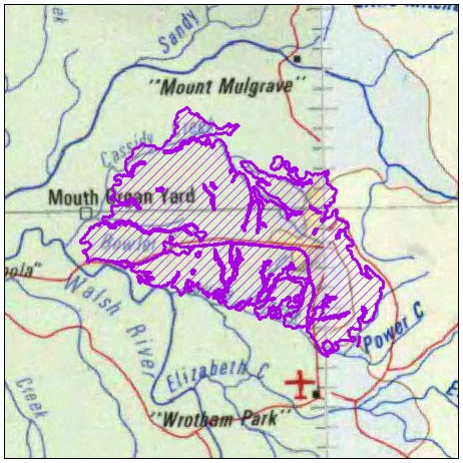
gup_l_13	Wellesley Islands 	State	Significant stand of Pisonia, and turtle and bird rookeries (Walker 1991). Bountiful and Rocky islands listed as Important Bird Areas (Dutson et al 2009) with large breeding populations of crested tern *Thalasseus bergii* and roseate tern Sterna dougallii, and brown booby *Sula leucogaster* and lesser frigatebird *Fregata ariel* respectively. Also major nesting sites for green *Chelonia mydas* and flatback *Natator depressus* turtles (Limpus 2007a, b). Relictual populations of mammals that used to be extensive on the mainland. Acting like Arks for mainland species. Refugia from grazing, although now small numbers of cattle and some brumbies on Mornington Is. Mammals are declining rapidly in many areas, therefore if they're in these islands the populations may have greater resilience than the mainland ones. Similarities with Donors Plateau, but there are some unusual landscapes and they are slightly more humid and vegetation is slightly different. Value Ig as High based on current knowledge of ecosystems. Note the role of flood processes compared to arid islands of WA. Flooding in the Gulf provides the opportunity for exotic species to colonise the Gulf islands that is not present in WA. Frogs on islands are Gulf Plains species rather than Northwest Highlands ones but data are limited.	Ib (wildlife refugia): VERY HIGH Ic (disjunct populations):VERY HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition): HIGH Ij (significant breeding or roosting sites):VERY HIGH
gup_l_14	Neumayer Valley 	Regional	Extensive flood out area with water course incising back into the area from its downstream side. Levee system associated with feeder channels from Alexandra River. Seasonal swampy area. Not many wetlands of this type in the bioregion. A large part is comparable to the gilgai plains of the Channel Country. Something of this extent is very unusual. Major colonially nesting waterbird rookery on large ponded system (Jaensch and Richardson 2013).	Ib (wildlife refugia): VERY HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition): VERY HIGH

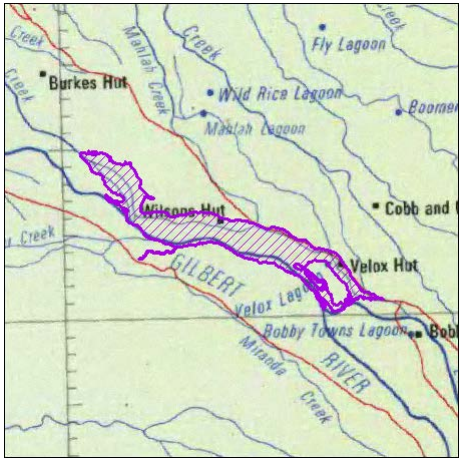
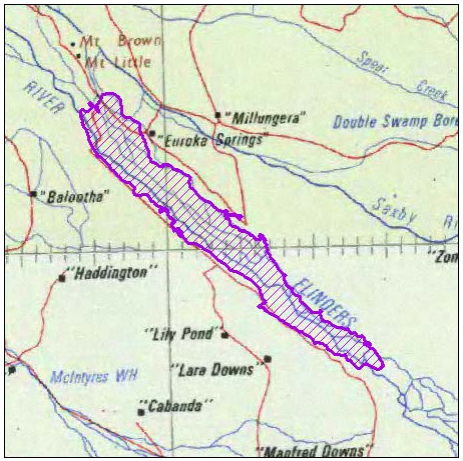
gup_l_15	Bang Bang Jump Up 	State	Take over gup_fl_01. Expand to include representative suite of REs and surfaces for that part of the Donors Plateau and adjacent areas. Best example of those landscapes. Murgulla sheet includes restricted REs 2.5.1d and 2.5.2x4. Diversity of waterbirds including sarus crane *Grus antigone*, using wetlands (e.g. Paradise Swamp). Area also has numerous herptile taxa at edge of distribution or disjunct populations, e.g. *Notaden nichollsi, Tympanocryptis intima, Delma borea, D. nasuta* and *Ctenotus helenae*.	Ia (centre of endemism): VERY HIGH Ib (wildlife refugia): VERY HIGH Id (species at geographic range limit): HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ij (significant breeding or roosting sites): HIGH
gup_l_16	Wentworth area 	State	Boundary area extends inland to pick up high diversity of landscapes. Good representation of the north western part of bioregion. The Wentworth Aggregation is one of the best examples of the full range of wetland types characteristic of hydrologically related alluvial and estuarine systems, occurring in the Doomadgee and Karumba plain provinces of the Gulf Plains bioregion in the far northwest of Queensland. It provides seasonally rich waterbird habitat and extensive wader habitat (Blackman 2001). Riverine systems, some with permanent pools, extend throughout the site. Seasonally rich palustrine and lacustrine wetlands dominate the alluvial plain sections of the aggregation. The estuarine sections are dominated by mangrove forest and scrub-shrub wetlands, some extensive unvegetated salt pans and some emergent wetlands. Tidal channels intersect the coastal sections. Longstanding National Park proposal. Also includes part of Settlement Creek Wild River declaration. Contains numerous flora and fauna taxa at limit of their range, e.g. bilingual froglet *Crinia bilingua* and floodplain gungan *Uperoleia inundata*. Also presence of threatened taxa, e.g. freshwater sawfish *Pristis pristis*, estuarine crocodile *Crocodylus porosus* and purple-crowned fairy-wren *Malurus coronatus*.	Ia (centre of endemism): VERY HIGH Ib (wildlife refugia): VERY HIGH Id (species at geographic range limit): VERY HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ii (high density of hollow-bearing habitat trees): HIGH Ij (significant breeding or roosting sites): HIGH

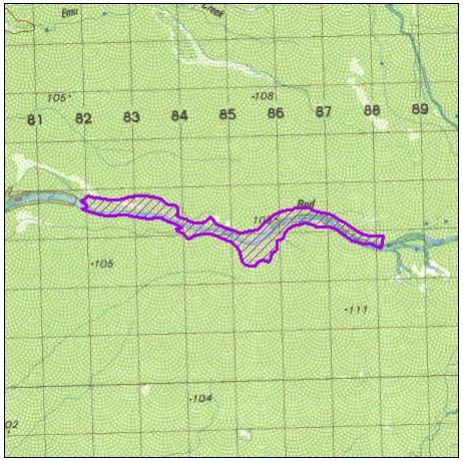
gup_l_17	Lagoon Creek 	Regional	Wetland aggregation. Braided system of levees and billabongs. Best development of braided systems in this subregion. Wetlands support an array of waterbirds, e.g. cormorants, pelicans, egrets, sarus crane *Grus antigone*, black-necked stork *Ephippiorhynchus asiaticus*, as well as large raptors, e.g. white-bellied sea-eagle *Haliaeetus leucogaster* and wedge-tailed eagle *Aquila audax*. Contains numerous flora and fauna taxa at limit of their range, e.g. floodplain gungan *U. inundata* and giant rocketfrog *Litoria wotjulumensis*. Contains the only Queenland occurrence of some species. Not in very good condition.	Ia (centre of endemism): HIGH Ib (wildlife refugia): HIGH Id (species at geographic range limit): HIGH Ie (high species diversity): HIGH
gup_l_18	Bylong Sands 	Regional	Extensive system but the best developed area identified. Red sands overly shales giving good groundwater. Reasonably extensive system, most intact, these sands have been broken up in other areas. A lot of deflation hollows with windows to the underlying shale. Support gidgee communities and seasonal wetlands. Red earths with well-developed eucalypt and softwood communities. Loose aeolian sands. Could contain endemics and refugial values. Priority area for fauna survey. Identified as a non-riverine (fl_nr_ec_16 and nn_nr_ec_02) special feature with a high conservation rating (3) in the southern Gulf of Carpentaria ACA (Rollason and Howell 2010).	Ia (centre of endemism): HIGH Ib (wildlife refugia): HIGH Id (species at geographic range limit): HIGH Ie (high species diversity):VERY HIGH Ii (high density of hollow-bearing habitat trees): HIGH

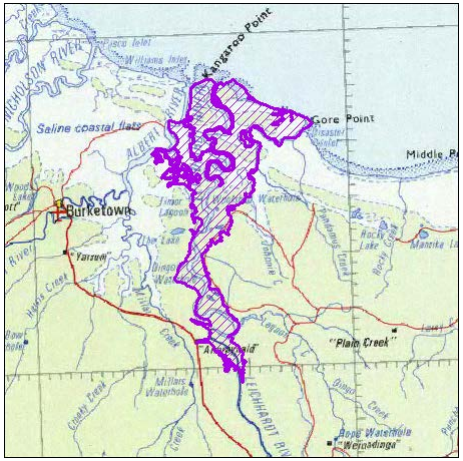
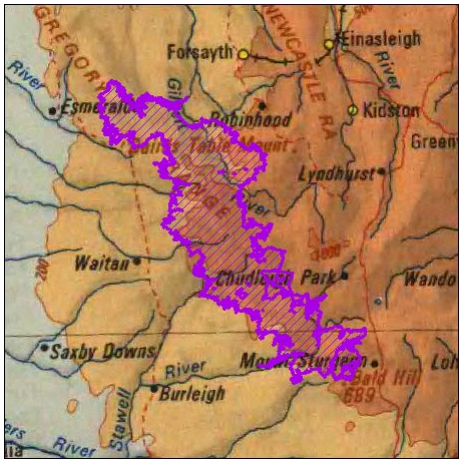
gup_l_19	Springs – high conservation value 	State	GAB springs with conservation rank of 1 or 2 (Fensham and Fairfax 2005). Includes permanent springs with endemic species, e.g. Eriocaulon carsonii and Fimbristylis blakei. Other flora and fauna of significance include Adenostemma lavenia, Alocasia macrorrhizos, Cyperus laevigatus, Paraplea sp. and Rhynchospora gracillima. Most are listed EPBC community (Fensham and Fairfax 2005). Artesian species do not go much further north. Springs within the Flinders, Norman and Gilbert river catchments identified as a non-riverine (fl_nr_ec_08, gi_nr_ec_04, gi_nr_ec_07 and nn_nr_ec_06) special features with a very high conservation rating (4) in the southern Gulf of Carpentaria ACA (Rollason and Howell 2010).	Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): HIGH Id (species at geographic range limit): HIGH
gup_l_20	Springs – general conservation value 	Regional	GAB springs with conservation rank of 3 or 4 (Fensham and Fairfax 2005). Most are listed EPBC community (Fensham and Fairfax 2005). Springs within the Flinders, Norman and Gilbert river catchments identified as a non-riverine (fl_nr_ec_09, fl_nr_ec_12, gi_nr_ec_05, gi_nr_ec_11 and nn_nr_ec_07) special features with a high conservation rating (3) in the southern Gulf of Carpentaria ACA (Rollason and Howell 2010).	Ib (wildlife refugia): HIGH

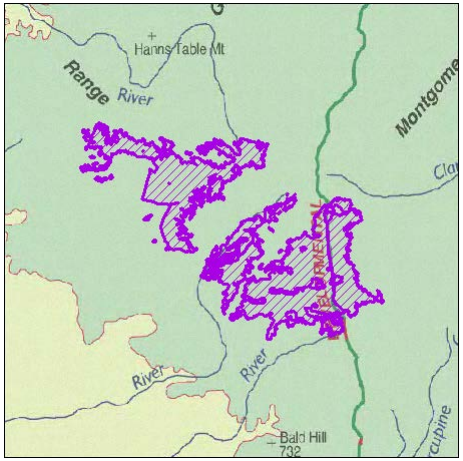
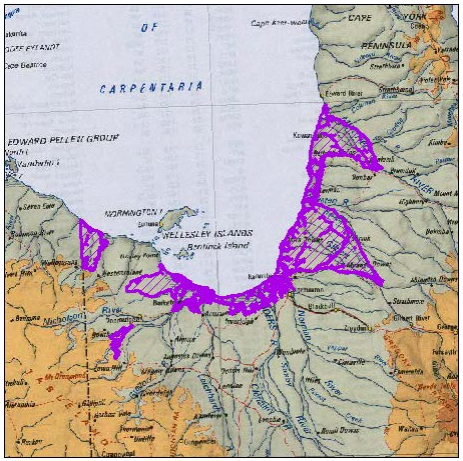
gup_l_21	Saxby Downs spring-fed complex 	State	Associated with nearby artesian springs. Springs are a small part of the complex landscape with low linear ridges interspersed with wetlands and springs. Unique RE 2.5.14x1 and RE 2.3.39 are associated with just that location. Distinctive landscape pattern with restricted REs and springs. Shale outcrop or at a shallow depth, with ironstone capping with extant and extinct springs. Unique RE. State significance as nothing else like it in the bioregion. Scattering of wetlands across area.	Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): HIGH Ie (high species diversity):VERY HIGH Ig (REs show distinct variation in species composition): VERY HIGH
gup_l_22	Pelham springs 	State	Concentration of active and high priority springs for the subregion. Poor sandy country. Best artesian springs in a cluster in the bioregion. Springs used by a range of frogs and waterbirds – ducks, egrets and ibis. Little red flying-fox *Pteropus scapulatus* recorded in vegetation bordering springs. A number of these have been fenced off based on funding from Envirofund.	Ia (centre of endemism): HIGH Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): HIGH Id (species at geographic range limit): HIGH Ie (high species diversity): HIGH Ig (REs show distinct variation in species composition): HIGH Ij (significant breeding or roosting sites): HIGH

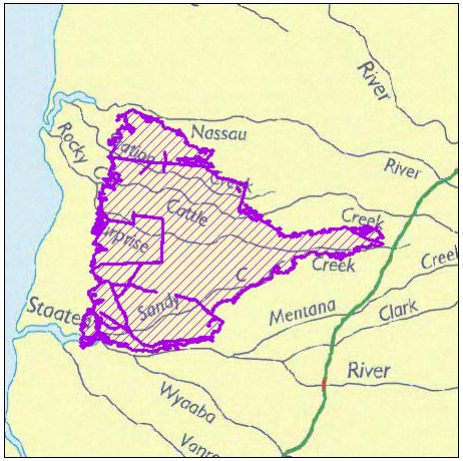
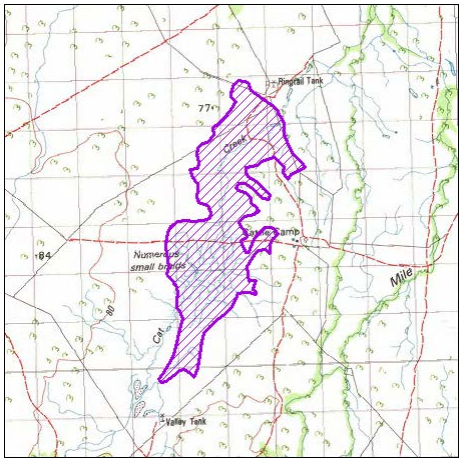
23	Bird, bat and turtle rookeries	Based on number of individuals May split into two decisions based on Regional or State significance	Implemented as gup_fa_11. Egrets *Egretta* spp., ibis *Threskiornis* spp., spoonbills *Platalea* spp., cormorants *Phalacrocorax* spp. and herons *Ardea* spp. recorded in major rookeries. Significant sites of colonially nesting waterbirds (up to 10,000 pairs), all of which are considered of international importance (Criterion 4 under Ramsar, with two sites also meeting Criterion 6) (Jaensch and Richardson 2013). Further survey work undertaken in western part of bioregion. Major threat from altered river flow/flooding due to proposed development (dams, reservoirs and irrigation schemes - Jaensch and Richardson 2013). Generally little turtle nesting on mainland in southern part of Gulf of Carpentaria (Living Planet Analysis 1993), with significant rookeries of green *Chelonia mydas* and flatback *Natator depressus* confined to islands in the Wellesley Group (Limpus 2007a, b).	Ij (significant breeding or roosting sites):VERY HIGH
gup_l_24	Shale-based ecosystems, Wrotham Park 	Regional	Most of GUP is sandstone or sandy depositional country from sandstones. Few areas of fertile soils. Wrotham Park has significant extents of clay based and restricted ecosystems, including deciduous scrub and grassland complex (2.9.3). This area is in very poor condition.	Ie (high species diversity): HIGH Ig (REs show distinct variation in species composition): HIGH

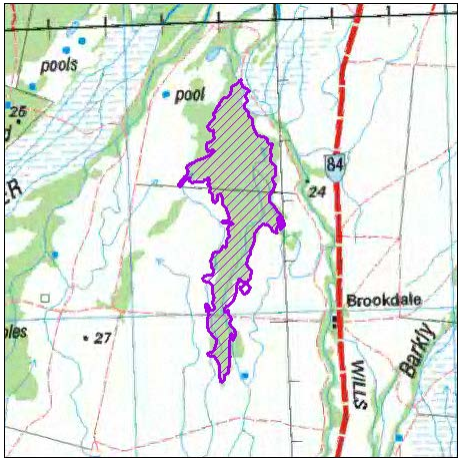
gup_l_25	Below Gilbert Einasleigh Rivers junction 	Regional	Constriction point with concentrations of large in-stream water bodies. Flood has most likely affected wetlands in this area. Well-developed frontage woodlands. Changes following recent flooding need to be investigated. Freshwater crocodiles *Crocodylus johnstoni* present. Major rookeries of cormorants and ibis occur along river (Jaensch and Richardson 2013) and occurrence of radjah shelduck *Tadorna radjah*. Identified as a riverine (gi_r_ec_01) special feature with a very high conservation rating (4) in the southern Gulf of Carpentaria ACA (Rollason and Howell 2010).	Ib (wildlife refugia):VERY HIGH Ie (high species diversity):HIGH Ii (high density of hollow-bearing habitat trees): HIGH
gup_l_26	Washpool Lagoon complex, Flinders River 	Regional	Venturi system, constriction has led to a lot of scouring. Large concentration of off-stream waterholes, including large permanent waterholes, which are important for water birds and aquatic species. Also permanent in-stream waterholes. Significant aquatic values. High concentrations of threatened freshwater sawfish *Pristis pristis* and presence of freshwater crocodiles *Crocodylus johnstoni*. Boundary to include sand ridges to make a functional unit. Need surrounding context for functioning, and for non-aquatic fauna. Sand sheets compliment the riverine system. Identified as a riverine and non-riverine (fl_nr_ec_06 and fl_r_ec_03) special feature with a very high conservation rating (4) in the southern Gulf of Carpentaria ACA (Rollason and Howell 2010).	Ib (wildlife refugia): HIGH Ie (high species diversity):HIGH Ii (high density of hollow-bearing habitat trees): HIGH
27	“Croc Hole”, Saxby River	Regional	Implemented as gup_fa_15 One of the last major waterholes with freshwater crocodiles *Crocodylus johnstoni* in the area. On Bunda Bunda property, on an anabranch of the Saxby River.	Ib (wildlife refugia): HIGH

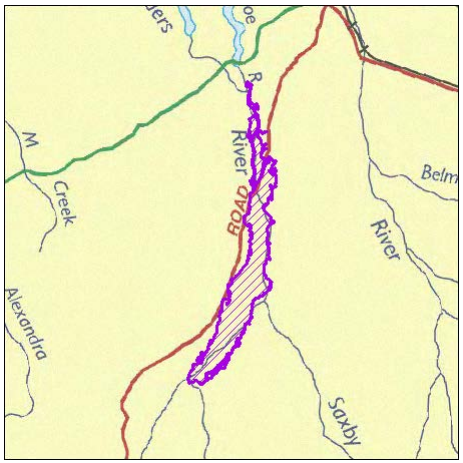
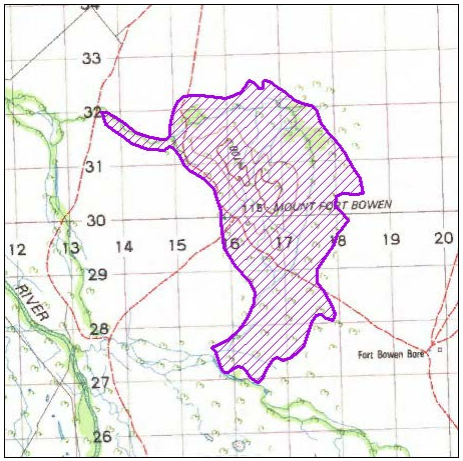
gup_l_28	Red River Gorge 	Regional	Gene pool reserves. Big chain of waterholes containing freshwater sawfish *Pristis pristis*. Act as refugia during the dry, being the largest and most permanent waterhole on the system.	Ic (disjunct populations): HIGH Id (species at geographic range limit): HIGH
29	Northern Gregory Range	Regional	Combined with other SR 9 decisions to make gup_l_31 Isolated tableland and dissected plateau system at the northern part of subregion. Most northerly plateau of the subregion, up to 150m above the surrounding plains. Very little grazing, no water points or fencing. No data and therefore any vegetation types are a guess. Potential species refugia. Believed to have interesting fauna. No access. Contains permanent water, suspected swamp wallabies *Wallabia bicolor* at the limit of its range. Other areas have been picked up elsewhere as State.	Ib (wildlife refugia): HIGH Id (species at geographic range limit): HIGH Ig (REs show distinct variation in species composition): HIGH

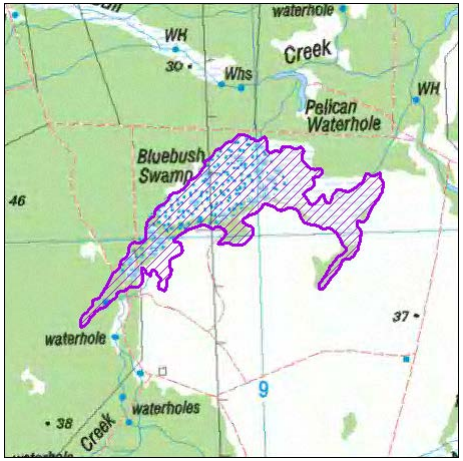
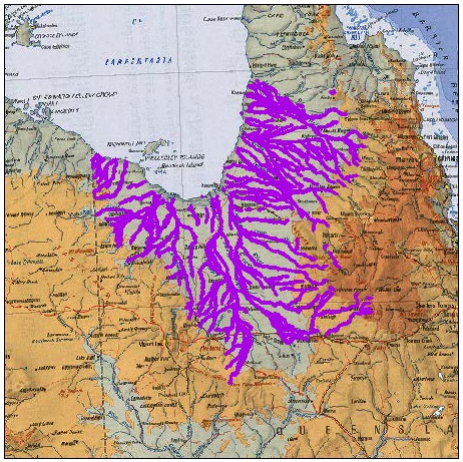
gup_l_30	Leichhardt River scroll belt 	Regional	Most well developed scrollbelt in Queensland. River is very active, lots of parallel movement, billabongs and ox bows. Vegetation is dominated by rubber vine in parts, mainly in north. In the absence of condition information there are still geomorphic values. Wetland values associated with the oxbows. Refugial values associated with billabongs and lagoons, particularly for waterbirds (Driscoll 2001). Very surprised if unusual communities don't appear in this area. Possible State significance pending further information. Presence of threatened freshwater sawfish *Pristis pristis* and estuarine crocodile *Crocodylus porosus* (Peverell 2005).	Ib (wildlife refugia): HIGH Ig (REs show distinct variation in species composition): HIGH Ii (high density of hollow-bearing habitat trees): HIGH
gup_l_31	Gregory Range 	State	Isolated tableland and dissected plateau system at the northern part of the subregion. Most northerly plateau of the subregion, up to 150m above the surrounding plains. Very little grazing, no water points or fencing. Refugia from grazing, fire and climate. No data and therefore any vegetation types are a guess. Believed to have interesting fauna. No access. Contains permanent water, suspected swamp wallabies *Wallabia bicolor* at the limit of its range. Most fauna surveys in areas along eastern margin in adjoining Einasleigh Uplands bioregion.	Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): HIGH Id (species at geographic range limit): VERY HIGH Ie (high species diversity): HIGH Ig (REs show distinct variation in species composition): HIGH

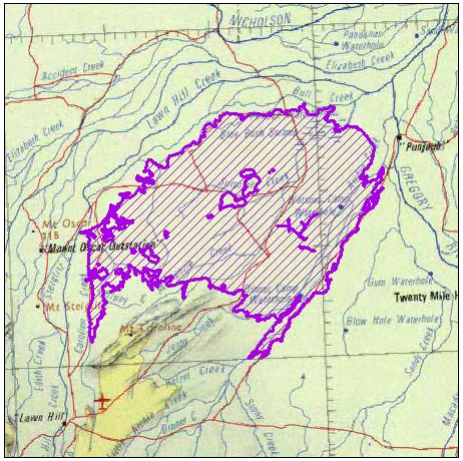
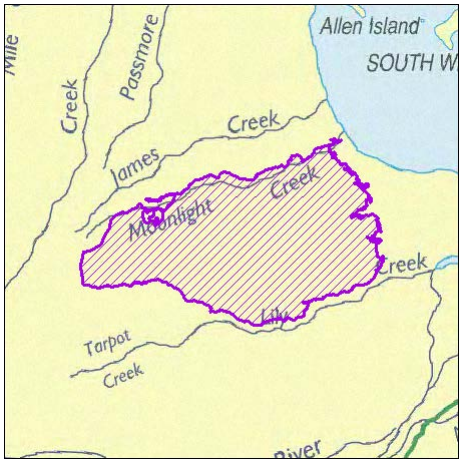
gup_l_32	Chudleigh-Juntala plateaus 	State	Altitudinal refugia covering highest part of bioregion and complementing Einasleigh Uplands BPA decision eiu_fa_17. Extensive area of forests and woodlands on ranges and plateau areas mainly above 800 meters ASL. Although predominantly basalt, it includes extensive areas of metamorphic and granite ranges, sand sheets and areas of residual sandstone capping. Springs are common. The area is a climatic isolate and includes a number of disjunct populations of both plants and animals. Disjunct fauna species include a very high density of greater gliders *Petauroides volans*, the Mount Cooper striped lerista *Lerista vittata*, *Lerista cinerea* and chestnut dunnart *Antechinus archeri*. Other significant fauna include the brown bandicoot *Isoodon macrourus*, the yakka skink *Egernia rugosa* and the spectacled hare-wallaby *Lagorchestes conspicillatus* (Kutt et al 2005; DERM 2009).	Ib (wildlife refugia): VERY HIGH Ic (disjunct populations):VERY HIGH Id (species at geographic range limit): VERY HIGH Ie (high species diversity): HIGH Ig (REs show distinct variation in species composition): HIGH
gup_l_33	Wetland complexes 	State	One of the primary concerns for biodiversity assessment and planning in undeveloped regions is that biodiversity conservation and management be pursued at a landscape scale. This is particularly so for wetlands. In undeveloped landscapes the aim is to retain wetlands within their landscape context, not to restrict the focus to the wetland body itself. In these landscapes there is the opportunity to ensure that landscape elements that directly relate to wetlands and contribute to their values are identified in association with the wetland itself. The wetland complexes identified in the GUP are so significant that they particularly need to be addressed at the landscape scale.	Ib (wildlife refugia): VERY HIGH Id (species at geographic range limit): HIGH Ie (high species diversity): VERY HIGH Ig (REs show distinct variation in species composition): HIGH Ii (high density of hollow-bearing habitat trees):VERY HIGH Ij (significant breeding or roosting sites): HIGH

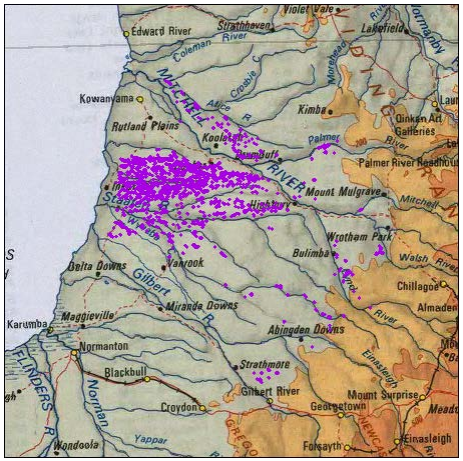
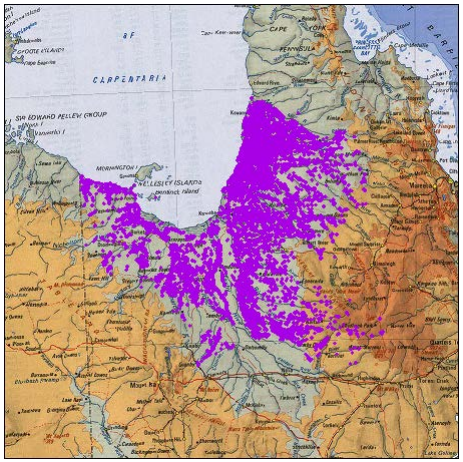
gup_l_34	Inkerman-Surprise Creek 	State	Extensive system of old sandy levees interspersed with box and melaleuca flats, grasslands, incised watercourses and seasonal swamps. Includes greatest concentration of closed wetlands and sandy levees on the old high level fan of the Mitchell River. Includes vine thickets, open woodlands and grassland complexes. Used by numerous waterbird and fish species (Taplin 1991; AQEIS data; Blackman unpublished data). Range limit for *Ramphotyphlops chamodracaena*.	Ib (wildlife refugia): VERY HIGH Ic (disjunct populations): HIGH Id (species at geographic range limit): HIGH Ie (high species diversity): VERY HIGH Ig (REs show distinct variation in species composition): HIGH Ii (high density of hollow-bearing habitat trees):VERY HIGH
gup_l_35	Cat Creek swamp 	State	Back plain swamp fed from adjacent clay catchment and by overflows from the Cloncurry River. Lignum *Muehlenbeckia florulenta* swamp important refuge for birds (Blackman 2001). Largest of this type of wetland. Near the distributional extent of lignum. Identified as a riverine and non-riverine (fl_nr_ec_07 and fl_r_ec_05) special feature with a high conservation rating (3) in the southern Gulf of Carpentaria ACA (Rollason and Howell 2010). Also noted as a special flora decision (fl_nr_fl_01) with a very high rating (4) (Rollason and Howell 2010).	Ib (wildlife refugia): VERY HIGH Id (species at geographic range limit): HIGH Ig (REs show distinct variation in species composition): HIGH Ij (significant breeding or roosting sites):VERY HIGH

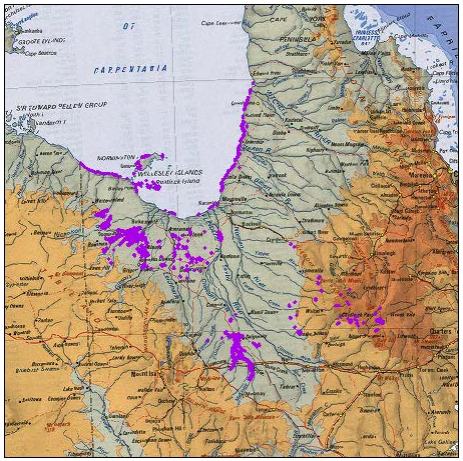
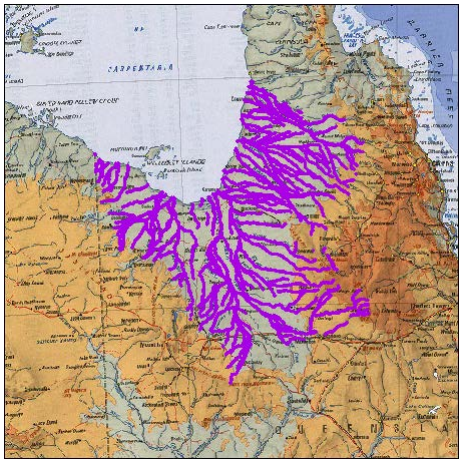
gup_l_36	Running Creek swamp 	State	Permanent swamp fed by Beames Brook. Presence in area of typical Gulf birds, e.g. sarus crane *Grus antigone*, varied lorikeet *Psitteuteles versicolor*, buff-sided robin *Poecilodryas cerviniventris* and paperbark flycatcher *Myiagra inquieta nana*.	Ib (wildlife refugia): VERY HIGH Ie (high species diversity): HIGH Ig (REs show distinct variation in species composition): HIGH Ij (significant breeding or roosting sites): HIGH
37	Flinders River near Richmond	Regional	Maximum developed of coolabah on braided alluvial plains on the Flinders River, together with well-developed red gum riparian ecosystems due to sandy influence from Dutton River. Includes concentration of off-stream wetlands. Not implemented, as most of the area is not in the GUP nor is it associated with GUP REs.	Ib (wildlife refugia): HIGH Ie (high species diversity): HIGH Ig (REs show distinct variation in species composition): HIGH Ii (high density of hollow-bearing habitat trees):VERY HIGH

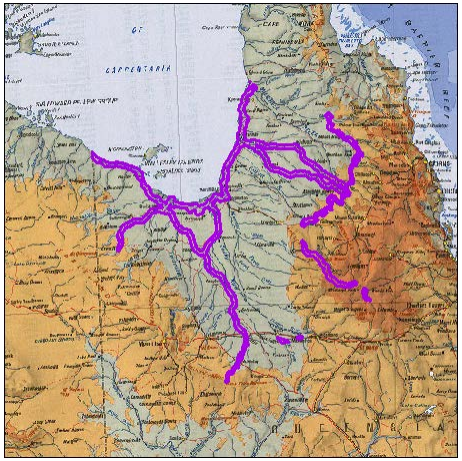
gup_l_38	Lower Flinders River floodplain 	Regional	Concentration of off-stream wetlands on scoured floodplain and extensive water holes associated with lower Flinders River. High fauna diversity, particularly of frogs (e.g. northern waterfrog *Litoria dahlii*) and birds (e.g. radjah shelduck *Tadorna radjah*) (Queensland Museum data, Birdlife Australia Atlas data). Recorded presence of threatened green sawfish *Pristis zijsron* and pictorella mannikin *Heteromunia pectoralis*, and uncommon freshwater whipray *Himantura dalyensis*.	Ib (wildlife refugia): HIGH Ie (high species diversity): HIGH Ii (high density of hollow-bearing habitat trees):HIGH
gup_l_39	Mount Fort Bowen 	Regional	Biogeographic outlier of Pre Cambrian basement rocks forming an inselberg rising abruptly up to 40m above the surrounding clay plains. Metasediment range surrounded by spring fed alluvial systems. Status of springs and condition of surrounding plains uncertain.	Ib (wildlife refugia): VERY HIGH Ic (disjunct populations):VERY HIGH Id (species at geographic range limit): HIGH Ie (high species diversity): HIGH Ig (REs show distinct variation in species composition): HIGH

gup_l_40	Bluebush swamp 	State	Bluebush Swamp is a good example of a palustrine scrub-shrub wetland in an alluvial back plain of the Armraynald Plain province of the Gulf Plains bioregion. Feeding, nesting and breeding habitat for waterfowl and waterbirds in late wet season, autumn and spring (Blackman 2001). One of a number of scrub- shrub wetlands dominated by *Acacia stenophylla*. It is a palustrine wetland dominated by scrub-shrub wetland with areas of shallow open water in serpentine channels and shallow swamps fringed by aquatic bed and emergent wetland.	Ib (wildlife refugia): VERY HIGH Id (species at geographic range limit): HIGH Ie (high species diversity): VERY HIGH Ig (REs show distinct variation in species composition): HIGH Ij (significant breeding or roosting sites): HIGH
gup_l_41	Riparian ecosystems and associated areas 	State	Riparian ecosystems in the Gulf Plains provide a refuge in otherwise seasonally droughty and sparsely vegetated landscapes that dominate non-riparian areas. See also gup_fa_08 for specific values of western riparian systems.	Ib (wildlife refugia): VERY HIGH Ie (high species diversity): VERY HIGH Ig (REs show distinct variation in species composition): VERY HIGH Ii (high density of hollow-bearing habitat trees):VERY HIGH Ij (significant breeding or roosting sites): VERY HIGH

gup_l_42	Surprise Creek area. 	State	Replaces gup_fl_10. Very high flora and landscape significance and diversity. Extremely diverse area on Doomadgee plains outlier, diverse shrub-lands and contains a rare RE that's entire distribution is contained in this area. Northern nailtail wallaby *Onychogalea unguifera*, spectacled hare-wallaby *Lagorchestes conspicillatus* and purple-crowned fairy-wren *Malurus coronatus* recorded in the area. Contains only land zone 6 (inland dunes) in Gulf Plains, but mainly land zone 5. Archie creek may receive discharge/overflow from mine – dewatering. Archie Creek is heavily infested with rubber-vine *Cryptostegia grandiflora*. Southern Gulf NRM trying to control but no interest. Rubber-vine extends into plains. Condition unknown, potential high grazing pressure.	Ie (high species diversity): VERY HIGH Ig (REs show distinct variation in species composition): VERY HIGH
gup_l_43	Marless Wetlands on Doomadgee Stn 	State	The Marless Lagoon Aggregation is a unique wetland complex on elevated tertiary lateritic surface characterised by a complex of discrete seasonal and semi-permanent forested and emergent freshwater wetlands within the Doomadgee Plain province of the Gulf Plains bioregion (Blackman 2001). Extensive seasonally rich lacustrine and palustrine wetlands occur as isolated characteristically circular to semicircular wetlands, which together with numerous smaller palustrine wetlands dominate the aggregation. Riverine wetlands are less extensive with some permanent pools. It has a seasonally abundant waterbird fauna and provides rich aquatic habitat and dry season refugia for species such as Pacific black duck *Anas superciliosa*, grey teal *A. gibberifrons* and hardhead *Aythya australis*. Freshwater sawfish *Pristis pristis* recorded in area. Area has experienced low level of disturbance.	Ia (centre of endemism): VERY HIGH Ic (disjunct populations):VERY HIGH Ie (high species diversity): HIGH If (relictual populations):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ih (artificial waterbody or managed/manipulated wetland of ecological significance): VERY HIGH Ii (high density of hollow-bearing habitat trees): HIGH

gup_l_44	Closed depressions of the Nth Dunbar land system 	State	Magnets for wildlife during the wet season particularly waterbirds. Fauna refugia during times of drought as some water bodies last long into the dry season. May be important for the variety of birds and microbats known for the area (Birdlife Australia Atlas data; Reardon et al 2010). Geomorphic origin unknown. Good examples include Blackfellow Swamp on Dunbar Station used by waterbirds (Morgan unpublished data). High diversity of waterbirds recorded throughout the area on lagoons and wetlands (Taplin 1991; Birdlife Australia Atlas data). Heavily grazed, some depressions have been dug out to increase water capacity and longevity.	Ia (centre of endemism): VERY HIGH Ic (disjunct populations):VERY HIGH Ie (high species diversity): VERY HIGH If (….):VERY HIGH Ig (REs show distinct variation in species composition):VERY HIGH Ih (artificial waterbody or managed/manipulated wetland of ecological significance): VERY HIGH
gup_l_45	Wetlands 	Regional	Wetlands have a range of biodiversity values, both in their own right, and for the role they play in maintaining water quality, protecting downstream aquatic ecosystems, and as part of the wetland ecosystem continuum where they are periodically connected with other aquatic ecosystems. Wetlands act as refugia for many species, and play a vital role in the life cycle of others. Wetlands are a defining characteristic of the bioregion, in their extent, diversity, and condition. Wetlands were given a 200m buffer with the same significance rating to ensure that all areas adjacent to them, and the areas most likely to have higher values, were also included. Numerous decisions in southern Gulf of Carpentaria ACA relate to wetlands within the Flinders, Norman and Gilbert river catchments (Rollason and Howell 2010).	Ib (wildlife refugia): HIGH Ie (high species diversity):HIGH Ii (high density of hollow-bearing habitat trees): HIGH Ij (significant breeding or roosting sites): HIGH

gup_l_46	Ecosystems with a current extent of less than 10,000ha 	State	Regional ecosystems with a remaining extent that is less than 10,000ha are rare or have a naturally restricted distribution. They are susceptible to what would normally be viewed as local threats or impacts, and are therefore most vulnerable of all ecosystems to rapid loss of natural values. In most cases their restricted distribution relates to geomorphic, hydrogeological and/or micro-climatic settings that are also restricted and these areas therefore have particular ecological and scientific values. These values relate to the unique combination of ecological characteristics, and to the unusual habitat conditions they provide for particular species or genotypes. Where the status has been upgraded to Endangered due to the impact of threatening processes their susceptibility to further loss of values is extreme.	Ib (wildlife refugia): HIGH Ic (disjunct populations): HIGH Id (species at geographic range limit): HIGH Ie (high species diversity): HIGH Ig (REs show distinct variation in species composition): VERY HIGH
gup_l_47	Riparian corridors 	State	Riparian corridors in the Gulf Plains are particularly significant for biodiversity, both as a climatic refuge and as a major element of habitat continuity. This decision is based on the bioregional corridor values of major riparian areas. The refugial and other values of riparian areas are covered by decision gup_l_41.	Criterion J (corridors): State

gup_l_48	**Terrestrial corridors** 	**State**	**This decision identifies major themes of habitat connectivity across the bioregion as identified in the existing state-wide corridors network.**	**Criterion J (corridors): State**

3.7 Data collection

Data collection has not been spatially uniform with regards to species records. Many areas are undersurveyed relative to areas with high densities of records and known values. Poorly sampled areas can be identified relatively easily using species record datasets. Areas such as roads are clearly more heavily sampled, while ranges and escarpments and interior parts of major floodplain wetland systems are underrepresented and should be the focus of future survey effort. Access to private lands may be more achievable in the future by forming joint projects with the Northern and Southern Gulf NRM Groups.

3.8 Data access and conditions

The public will be able to access the information contained in the BPA on the Queensland Government Spatial Catalogue website at http://qldspatial.information.qld.gov.au. Specific details for point records will not be included, thus end users will need to seek further advice from EHP when this detail is required.

4 Summary

The landscape expert panel has made a significant contribution to biodiversity assessment and planning in the GUP bioregion. Defining terrestrial and riparian corridor networks and special biodiversity areas could not have been achieved without the cooperation of these experts and their local expert knowledge.

The resulting planning assessment is now a useful basis for a variety of applications including the protection and management of areas of high conservation value, development assessment, local government planning, vegetation management and internal EHP directions.

The landscape expert panel process will be revisited on a regular basis. An appropriate review timeframe would be approximately every two years to coincide with a new release of Queensland Herbarium RE mapping.

5 References

Bamford, M, Watkins, D, Bancroft, W, Tischler, G, Wahl, J 2008, *Migratory Shorebirds of the East Asian-Australasian Flyway: Population Estimates and Internationally Important Sites*, Wetlands International – Oceania, Canberra, Australia.

Blackman, JG 2001, *Queensland. In, A Directory of Important Wetlands in Australia*, Third Edition. Pp.55-69. Environment Australia, Canberra, http://www.environment.gov.au/wetlands/wet2.html

Chenoweth Environmental Planning and Landscape Architecture (EPLA) Ltd 2000, *Common Conservation Classification System, Version 99709, December 2000*, Chenoweth EPLA and the Western Subregional Organisation of Councils (WESROC).

Dames & Moore 1994, *The Century Project – Draft Impact Assessment Study Report*, Report to Century Zinc.

Department of Environment and Resource Management [DERM] 2009, *Biodiversity Planning Assessment. Einasleigh Uplands Bioregion Fauna Expert Panel Report, Version 1.1*, Environmental Planning, Department of Environment and Resource Management, Townsville.

Driscoll, PV 2001, *Gulf of Carpentaria Wader Surveys 1998-9*, Report to Queensland Environmental Protection Agency. Queensland Wader Study Group of Birds Queensland.

Dutson G, Garnett, S, Gole, C 2009, *Australia's Important Bird Areas - key sites for bird conservation*, Birds Australia (RAOU) Conservation Statement No. 15.

Fensham, R, Fairfax, R 2005, *Great Artesian Basin Water Resource Plan – Ecological Assessment of GAB springs in Queensland*, Report to Department of Natural Resources and Mines, Queensland Environmental Protection Agency, Brisbane.

Garnett, S 1989, *Wading bird abundance and distribution - south-eastern coast of the Gulf of Carpentaria*, Report to Queensland National Parks and Wildlife Service, Report No. 58, RAOU, Moonee Ponds.

Garnett, S, Taplin, A 1990, *Wading bird abundance and distribution during the wet season on the Queensland coast of the Gulf of Carpentaria*, Report to Queensland National Parks and Wildlife Service, RAOU, Moonee Ponds.

GHD 2010, *Overview of marine turtle nesting on western Cape York*, Queensland NRM, Report for Caring for Our Country.

Hogan, A, Vallance, T 2005, *Rapid assessment of fish biodiversity in southern Gulf of Carpentaria catchments*, Project report No. QI04074, Queensland Department of Primary Industries & Fisheries, Walkamin.

Jaensch, R, Richardson, P 2013, *Waterbird breeding colonies in the Gulf Plains*, 2009-2013, Sunbird 43, 45-64.

Jaensch, R, Richardson, P 2014, *South-East Gulf of Carpentaria: Karumba-Smithburne (Delta Downs) section*, Information Sheet on EAA Flyway Network Sites.

Kutt, AS, Van Dyck, S, Christie, SJ 2005, *A significant range extension for the Chestnut Dunnart Sminthopsis archeri (Marsupialia: Dasyuridae) in north Queensland*, Australian Zoologist 33, 265-268.

Lesslie, R, Abrahams, H, Maslen, M 1992, *Wilderness quality on Cape York Peninsula*, Report to the Australian Heritage Commission.

Limpus, C 2007a, *A biological review of Australian marine turtle species. 2. Green turtle, Chelonia mydas (Linnaeus)*, Environmental Protection Agency, Brisbane.

Limpus, C 2007b, *A biological review of Australian marine turtle species. 5. Flatback turtle, Natator depressus (Garman)*, Environmental Protection Agency, Brisbane.

Living Planet Analysis 1993, *Marine Biota Atlas for the Gulf of Carpentaria,* Report prepared for Comalco Aluminium Ltd.

Low T. 2011 *Climate Change and Terrestrial Biodiversity in Queensland*. Department of Environment and Resource Management, Queensland Government, Brisbane.

Peverell, SC 2005, *Distribution of sawfishes (Pristidae) in the Queensland Gulf of Carpentaria, Australia, with notes on sawfish ecology*, Environmental Biology of Fishes 73, 391-402.

Preece, N, Shephard, S, Shephard, T, Garnett, S 2009, *Re-assessment of the status of the Golden-shouldered Parrot Psephotus chrysopterygius*, Report to Queensland Department of Environment & Resource Management, and Cape York Peninsula Biodiversity Technical Advisory Group. Biome5, Atherton.

Reardon, TB, Robson, SKA, Parsons, JG, Inkster, T 2010, *Review of the threatened status of microchiropteran bat*

species on Cape York Peninsula, Final report for CY TSAM 01, South Australian Museum, Adelaide and James Cook University, Townsville.

Rollason, SN, Howell, S 2010, *Aquatic Conservation Assessments (ACA) using AquaBAMM for the non-riverine, riverine and estuarine wetlands of Southern Gulf of Carpentaria (version 1.1 draft)*, Department of Environment and Resource Management, Brisbane.

Rowley I 1993, *The Purple-crowned Fairy-wren Malurus coronatus. I. History, distribution and present status*, Emu 93, 220-234.

Sattler, PS, Williams, RD (eds) 1999, *The Conservation Status of Queensland's Bioregional Ecosystems*, Environmental Protection Agency, Brisbane.

Smith, AP, Hoye, G, Taplin, A 1990, *Some new records of mammals, reptiles and amphibians in south west Cape York*, Report on Australian Geographic Expedition, June 1990.

Taplin A 1991, *Distribution and abundance of selected waterbird species in the Gulf Plains and western Cape York*, Report to Queensland National Parks and Wildlife Service.

Vanderduys, E, Kutt, A 2011, *Biodiversity Condition in the Northern Gulf*, Report by CSIRO Ecosystem Sciences, Townsville.

Walker, T 1991, *The Wellesley Islands, Gulf of Carpentaria*, Report to Queensland National Parks and Wildlife Service.

Appendix 1 Acronyms and Abbreviations

ACA	Aquatic Conservation Assessment
BAMM	Biodiversity Assessment and Mapping Methodology
BPA	Biodiversity Planning Assessment
BVG	Broad Vegetation Group
CAMBA	Agreement between the Australian Government and the government of the People's Republic of China for the Protection of Migratory Birds and their Environment
CORVEG	The site survey database maintained by the Queensland Herbarium
DCDB	Digital Cadastral Database—a spatial database of Queensland property boundaries.
DERM	Department of Environment and Resource Management (former Queensland Government department)
EHP	Department of Environment and Heritage Protection
EVNT	Endangered, vulnerable or near threatened under the Queensland Nature Conservation Act (1992) and Commonwealth Environment Protection and Biodiversity Conservation Act (1999).
EPA	Environmental Protection Agency (former Queensland Government department)
EPBC	Environmental Protection and Biodiversity Conservation Act 1999
GAB	Great Artesian Basin
GCDI	Ground Cover Disturbance Index
GIS	Geographic information system
GUP	Gulf Plains
HERBRECS	Specimen based register of plants held by Queensland Herbarium
JAMBA	Agreement between the Australian Government and the Japanese Government for the protection of migratory birds in danger of extinction and their environment
MGD	The Mitchell Grass Downs bioregion—a bioregion within the Interim Biogeographic Regionalisation for Australia (IBRA) framework
NCA	Nature Conservation Act 1992
NPRSR	Department of National Parks, Recreation, Sport and Racing
QPWS	Queensland Parks and Wildlife Service (an agency within Department of National Parks, Recreation, Sport and Racing)
RE	Regional ecosystem
REDD	Regional Ecosystems Description Database
SDRN	State Digital Road Network

SLATS	State-wide Landcover and Trees Study
WARLUS	Western Arid Region Land Use Study
WILDNET	Department of Science, Information Technology, Innovation and the Arts (DSITIA)'s corporate wildlife application containing records and other information on Queensland flora and fauna

Appendix 2 Datasets available to the expert panel during the workshop

GIS

Geographic data

Catchment boundaries

Contours (10m interval)

Ttopographic maps (1:100 000).

Cadastral, government and locational data

Cadastral data (DCDB) for GUP study area local government areas

Local government boundaries

Pastoral holdings database

Places

Towns

State Digital Road Network (SDRN)

Stockroutes.

Vegetation

Regional Ecosystem Description Database (REDD)

Draft pre-clearing vegetation

Draft remnant (RE07) RE mapping

Certified updates to remnant mapping.

Species

All fauna species records were obtained from Queensland Historical Fauna database. Flora species records were obtained from Herbrecs, WildNet and Corveg databases

BriMapper (Herbrecs species records viewer).

Wetlands

Queensland Wetland Mapping

Directory of Important Wetlands

Drainage network—rivers

Drainage network—creeks.

Biodiversity Planning Assessment data

Queensland bioregion and subregion boundaries

Terrestrial and riparian state bioregional corridors

Draft results from GUP bioregion BPA v1.1.

Results from EIU bioregion BPA v1.1.

Protected areas

EPA estates

Nature refuges

Coordinated conservation areas.

Imagery

2009 Landsat mosaic of the GUP bioregion

SPOT imagery (10 metres).

Documents available electronically

EPA (2002) Biodiversity Assessment and Mapping Methodology version 2.1 July 2002.

Hard copy maps

Landsat 7 mosaic of GUP bioregion

GUP bioregions and subregions (Queensland).