Aquatic Conservation Assessment using AquaBAMM

for the riverine and non-riverine wetlands of the Cape York catchments

#30331

Disclaimer

Information in this document does not necessarily represent Government policy. While this publication has been prepared with care, the Queensland Government accepts no liability for any decisions or actions taken on the basis of this document.

Citation

EHP. 2012. Aquatic Conservation Assessment Cape York Catchments v1.1. Riverine and non-riverine Summary Report: Department of Environment and Heritage Protection, Queensland Government.

Prepared by:

Steven Howell[1] Manager, Biodiversity Assessment
Erin Kenna[1] Principal GIS Analyst

[1] Ecosystem Outcomes Branch, Conservation and Sustainability Services Division, Queensland Department of Environment and Heritage Protection, GPO Box 2454 BRISBANE QLD 4001

Acknowledgements

The authors wish to thank Shane Chemello, Simon Goudkamp, Chamendra Hewavisenthi, Lindsey Jones, David McFarland, Heidi Millington, Bruce Wannan.

Cover photograph – Lakefield National Park (DERM_080712_AC_0073lakefield) from Margot Warnett.

Version	Data Release Date	Report Release Date
1.1	9th December 2012	9th December 2012

Contents

List of tables

List of figures

Acronyms and abbreviations

ACA	Aquatic Conservation Assessment
AquaBAMM	Aquatic Biodiversity Assessment and Mapping Methodology
ASL	above sea level
BAMM	Biodiversity Assessment and Mapping Methodology
BPA	Biodiversity Planning Assessment
CYP	Cape York Peninsula
DERM	Department of Environment and Resource Management
EHP	Queensland Department of Environment and Heritage Protection
GIS	Geographic Information System
QWP	Queensland Wetlands Program
Ramsar	Ramsar Convention on Wetlands

1 Introduction

1.1 Aquatic Conservation Assessments

The Aquatic Biodiversity Assessment and Mapping Method (AquaBAMM) (Clayton et al. 2006), was developed to assess conservation values of wetlands in Queensland, and may also have application in broader geographical contexts. It is a comprehensive method that uses available data, including data resulting from expert opinion, to identify relative wetland conservation/ecological values within a specified study area, usually a catchment. The product of applying this method is an Aquatic Conservation Assessment (ACA) for the study area.

An ACA using AquaBAMM is non-social, non-economic and identifies the conservation/ecological values of wetlands at a user-defined scale. It provides a robust and objective conservation assessment using criteria, indicators and measures that are founded on a large body of national and international literature. The criteria, each of which may have variable numbers of indicators and measures, are: naturalness (aquatic); naturalness (catchment); diversity and richness; threatened species and ecosystems; priority species and ecosystems; special features; connectivity and representativeness. An ACA using AquaBAMM is a powerful decision support tool that is easily updated and simply interrogated through a geographic information system (GIS).

AquaBAMM is focused on the assessment of aquatic conservation values. Terrestrial conservation values are assessed through application of the Biodiversity Assessment and Mapping Methodology (BAMM) to create Biodiversity Planning Assessments (BPA).

Where they have been conducted, ACAs can provide a source of baseline wetland conservation/ecological information to support natural resource management and planning processes. They are useful as an independent product or as an important foundation upon which a variety of additional environmental and socio-economic elements can be added and considered (i.e. an early input to broader ‘triple-bottom-line’ decision-making processes). An ACA can have application in:

- determining priorities for protection, regulation or rehabilitation of wetlands and other aquatic ecosystems
- on-ground investment in wetlands and other aquatic ecosystems
- contributing to impact assessment of large-scale development (e.g. dams)
- water resource and strategic regional planning processes
- providing input to broader social and economic evaluation and prioritisation processes.

To date, ACAs have contributed to the following:

- State Planning Policy (04/11) for Protecting Wetlands of High Ecological Significance in the Great Barrier Reef.
- Water Resource Management and Planning.
- Identification of significant ecological values on State Rural Leasehold Land Strategy leases which are pastoral/agricultural leases, comprising most of the leasehold land in Queensland.
- Identification of significant aquatic values when assessing possible additions to the protected area estate.
- Identification of significant aquatic values when assessing development applications.
- Habitat mapping of wetlands species across Queensland.
- Areas of Ecological Significance (AES) mapping.
- Wetlands State Planning Policy through the AES process.
- Queensland Wetlands Program.(QWP)
- Identification of assets for the Queensland side of the Murray Darling Basin, which were then supplied to the MDB Authority as the Queensland contribution to the QMDB Plan.
- Wide Bay-Burnett Regional Plan.
- Regional plans.

The AquaBAMM criteria are consistent with the High Ecological Value Aquatic Ecosystems (HEVAE) process which is the result of a joint project between the Australian Government and all jurisdictions. One outcome from the HEVAE report was that Queensland is the most advanced state for the mapping, classification and valuing of wetlands.

The Department of Environment and Heritage Protection (EHP) has conducted ACAs for the freshwater non-riverine (i.e. palustrine and lacustrine) and riverine wetlands in each of the 17 Cape York (CYP) catchments. Estuarine values (special features and species) have been included in the riverine assessments.

Data for three of the AquaBAMM criteria are primarily derived by expert elicitation (Criterion 5 Priority Species and Ecosystems, Criterion 6 Special Features and Criterion 7 Connectivity). To consider the measures within these criteria, an expert panel was conducted to address aquatic fauna, aquatic and riparian flora and wetland ecology for the 17 CYP catchments. The panel, held in Cairns during August 2012, involved invited departmental experts with expertise in aquatic fauna, aquatic and riparian flora and/or wetland ecology. Experts were presented with ecological data relevant to their area of expertise and asked to make decisions relevant to the respective measures, such as which aquatic species should be included in the assessment or whether there were special features in the landscape that contained ecological significance. The expert panel reports contained within Attachment A present the findings and recommendations from the panel.

Results from the non-riverine and riverine CYP ACAs are intended for use under the proposed Bioregion Framework and Statutory Plan for the CYP.

Due to time constraints this version (1.1) of the CYP ACA for riverine and non-riverine freshwater wetlands does not include all components of the full process normally undertaken. A fuller process would include external experts on the panels, a separate assessment of estuarine values and field-truthing. Complete expert panels would serve to further inform the special features and their values and explicitly define the weights and ranks to be applied to measures and indicators. There are also a number of other datasets and special features that may have been included with more time. Additional components unable to be implemented due to time constraints include: consideration of stratification; weighting of measures and ranking of indicators by expert panels; consideration of species habitat models and pest habitat mapping from DAFF

A Biodiversity Planning Assessment (BPA) has been completed for the CYP Heritage Area. The BPA is focused on the identification and significance of primarily terrestrial values, although some riparian values are included (EHP 2012b). The results from the BPA should be considered in conjunction with ACA results presented in this report.

1.2 The Cape York study area

Cape York Peninsula is a diverse and important region of tropical Australia covering approximately 13,720,000 hectares. The bioregion has a tropical humid/maritime climate, with rainfall varying from 1000–1600 mm. It is a place of special heritage, containing vast and relatively undisturbed landscapes with extraordinary biological significance and diversity, and is rich with Aboriginal traditions and customs.

The bioregion has a complex geomorphology including low hills, plains, dunefields, boulder-fields, coral cays, continental islands, and alluvial areas (Sattler and Williams 1999). The region also has geological complexity. It is dominated by the Torres Strait Volcanics in the north. The metamorphic rocks and acid intrusive rocks of various ages of the Coen-Yambo Inlier run north-south along the eastern margin of the region and encompass the high-altitude/high-rainfall areas of Iron Range and McIlwraith Range. The deeply dissected sandstone plateaus and ranges of the Battle Camp Sandstones lie in the southern part of the region adjacent to the undulating Laura Lowlands composed of residual weathered sands and flat plains of colluvial and alluvial clays, silts and sands. The western part of the region is dominated in the south by the extensive Tertiary sand sheets dissected by the intricate drainage systems of the Holroyd Plain, the Tertiary laterite of the undulating Weipa Plateau and the low rises of Mesozoic sandstones. The northern extension of the Weipa Plateau and extensive coastal plains adjoin the Gulf of Carpentaria. Extensive aeolian dunefields lie in the east associated with Cape Bedford/Cape Flattery in the south and the Olive and Jardine Rivers (Sattler and Williams, 1999).

There are 9 sub-regions within the Cape York Peninsula Bioregion. All sub-regions have high ecosystem diversity and endemism. The ecosystem diversity encompasses rainforests, woodlands, shrublands heaths, sedgelands, grasslands and mangroves, all in a relatively intact condition (Sattler and Williams, 1999). This high habitat diversity comprises over 3000 flora species and supports a substantial proportion of Australia's native fauna (>50% of all butterfly, 50% bird, 33% mammal, 25% reptile and 25% frog species) (Earth Tech 2005). A considerable number of these taxa are threatened and/or restricted to the bioregion (Abrahams et al. 1995).

One of the significant values of the bioregion is its relative intactness. The overall condition of Cape York Peninsula is good with some declines in ecosystems, wetlands, riparian vegetation and species. Only limited clearing of vegetation has occurred in the bioregion. A main potential agent of change in the bioregion is the impact of altered fire regimes on vegetation (Sattler and Williams, 1999).

The project region considered in this assessment includes 17 study areas for assessment. The southern boundary of the study area is as defined under the *Cape York Peninsula Heritage Act 2007* (Figure 1), which incorporates parts of the Gulf Plains, Einasleigh Uplands, and Wet Tropics bioregions. However, it will exclude the Queensland Wet Tropics World Heritage area in the south-east.

For the purposes of this assessment, the Mitchell catchment was split in order to coincide with the CYP Heritage boundary. This split was made along the Mitchell River sub basin boundary with a slight deviation to follow the CYP Heritage boundary at around Dinnertime Lagoon on the Mitchell River. The exact split was based on the on subsections layer so it does not follow the CYP Heritage boundary exactly.

EHP has mapped and classified wetlands according to a peer reviewed and published mapping and classification methodology[1]. These wetland maps were used as a platform for the conservation assessments reported here. ACAs accept the released wetland maps unmodified and therefore, are limited by inherent mapping and classification accuracy. Issues to do with wetland mapping or classification errors are dealt with by EHP mapping update processes and are not part of an ACA.

The CYP ACA is made up of 17 individual catchments (Figure 1). EHP has applied AquaBAMM separately to the non-riverine (i.e. palustrine and lacustrine) and riverine wetlands within each of the CYP catchments. Estuarine values were considered and where appropriate included as part of the riverine results. In effect, there are 34 ACAs for the riverine and non-riverine wetlands in the CYP study area. Table 1 shows the catchments/study areas for which ACAs were undertaken and the number of mapped non-riverine wetlands and riverine spatial units within each catchment.

[1] EHP wetland mapping and classification methodology is available at http://wetlandinfo.ehp.qld.gov.au/wetlands/facts-maps/wetland-background/

Table 1. CYP catchments subject to an ACA using AquaBAMM.

ACA study areas	Catchment	Catchment	Number of freshwater	Area of freshwater	Number of
Archer	ar	1,381,980	1779	34,009	126
Coleman	cl	1,286,148	5211	47,610	164
Ducie	du	674,544	899	30,009	261
Embley	em	462,209	785	14,756	222
Endeavour	en	218,243	85	1868	151
Holroyd	ho	1,028,654	1978	17,511	75
Islands	ic	98,344	185	1933	961
Jacky Jacky	jj	296,330	832	21,531	320
Jardine	ja	328,166	576	26,198	145
Jeannie	je	363,752	471	12,354	366
Lockhart	lo	288,329	110	3127	301
Mitchell West	mw	3,442,238	7750	178,585	167
Normanby	nb	2,439,490	2961	30,115	196
Olive-Pascoe	op	417,950	327	6251	195
Stewart	sw	274,279	93	3239	248
Watson	wt	467,925	228	3590	52
Wenlock	we	752,540	1367	15,010	83
	Total	**14,221,120**	**25,637**	**447,695**	**4033**

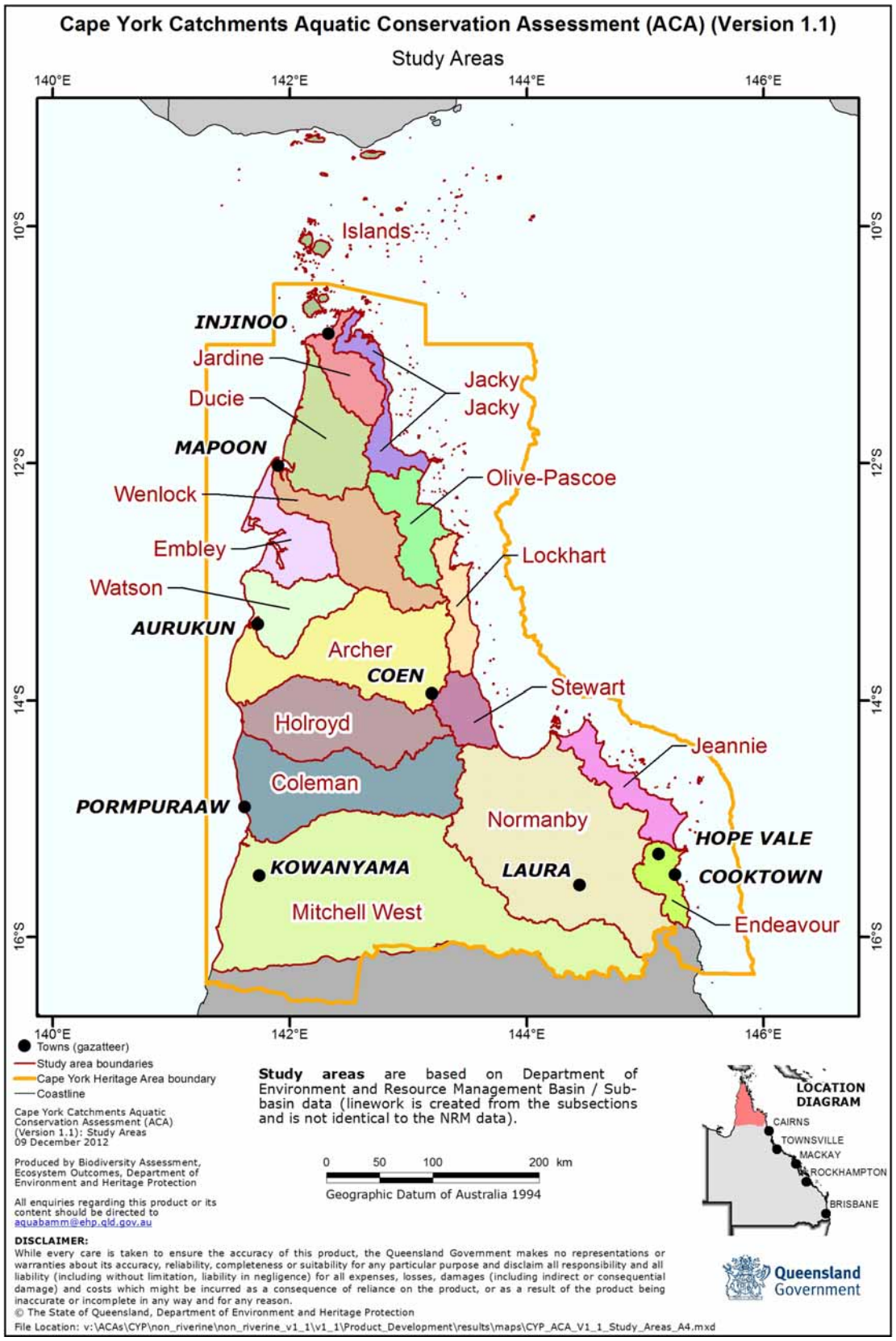


Figure 1. The CYP catchments where ACAs have been conducted.

2 Methods and Implementation

2.1 AquaBAMM

The CYP ACAs were undertaken using AquaBAMM (Clayton et al. 2006). The method as published in 2006 was revised to incorporate non-riverine wetlands measures, and minor changes made to the AquaBAMM tool.

2.2 Spatial units

In implementing an ACA, spatial units need to be defined in order to assign conservation/ecological values when they are calculated. This issue is dealt with in detail in the published methodology (Clayton et al. 2006).

For a non-riverine ACA a map of the palustrine and lacustrine wetlands is normally used and the individual mapped wetlands are employed as the ACA spatial units. Clearly, this way of defining spatial units is dependent on an accurate map of classified wetlands being available for the study area. In Queensland, EHP is producing wetland maps statewide which define wetland location, extent and attributes by applying the *Wetland Mapping and Classification Methodology* (EPA, 2005). These maps, where available, are used as the platform for ACAs using AquaBAMM.

The number of spatial units included in an ACA can vary greatly between study areas. For the CYP study area, there were 25,637 non-riverine spatial units (mapped palustrine or lacustrine wetlands) drawn directly from EHP's wetland mapping v3.0. Only natural (H1) or slightly modified (H2M1 and H2M2) wetlands were included (see the Wetland Mapping and Classification Methodology 2005 for more information on these hydrological modifier codes).

For the riverine ACA the spatial units were based on the subsections from level 5 of the Pfafstetter dataset from the Australian Hydrological Geospatial Fabric (Geofabric) (http://www.bom.gov.au/water/geofabric). This layer was clipped to the coastline. Polygons smaller than 64ha were dissolved into the surrounding polygons with the largest shared boundary. A number of hydrologically inconsistent polygons were also dissolved based on a visual inspection of the GIS layer. The riverine ACAs included 4033 spatial units (or subsections) these subsections are also used in a number of non-riverine measure calculations.

2.3 Assessment parameters

The criteria, indicators and measures (CIM) list outlined in Table 2 outlines the CIM that were implemented as part of the riverine and non-riverine ACAs in the CYP catchments. The list has been developed from a default list of criteria, indicators and measures that may be considered for an ACA. The default CIM list is not mandatory for any particular ACA; however, it provides a 'starter set' for consideration in setting the assessment parameters for each ACA.

Table 2: CIM list for the CYP catchments.

Criteria and Indicators	Measures		Riverine	Non-riverine
1 Naturalness aquatic				
1.1 Exotic flora/fauna	1.1.1	Presence of 'alien' fish species within the wetland	Y	
	1.1.2	Presence of exotic aquatic and semi-aquatic plants within the wetland	Y	Y
	1.1.3	Presence of exotic invertebrate fauna within the wetland		
	1.1.4	Presence of feral/exotic vertebrate fauna (other than fish) within the wetland	Y	Y
1.3 Habitat features modification	1.3.4	Presence/absence of dams/weirs within the wetland	Y	
	1.3.7	% area of remnant wetland relative to pre-clear extent for each spatial unit	Y	Y
1.4 Hydrological modification	1.4.5	Hydrological disturbance/modification of the wetland (e.g. as determined through EHP wetland mapping and classification)		Y
2 Naturalness catchment				
2.1 Exotic flora/fauna	2.1.1	Presence of exotic terrestrial plants in the assessment unit	Y	Y
2.2 Riparian disturbance	2.2.1	% area remnant vegetation relative to pre-clear extent within buffered riverine wetland or watercourses	Y	
	2.2.2	Total number of regional ecosystems relative to pre-clear number of regional ecosystems within buffered riverine wetland or watercourses	Y	
	2.2.5	% area of remnant vegetation relative to pre-clear extent within buffered non-riverine wetland: 500m buffer for wetlands >= 8Ha, 200m buffer for smaller wetlands		Y

Criteria and Indicators	Measures		Riverine	Non-riverine
2.3 Catchment disturbance	2.3.1	% "agricultural" land-use area (i.e. cropping and horticulture)	Y	Y
	2.3.2	% "grazing" land-use area	Y	Y
	2.3.3	% "vegetation" land-use area (i.e. native veg + regrowth)	Y	Y
	2.3.4	% "settlement" land-use area (i.e. towns, cities, etc.)	Y	Y
2.4 Flow modification	2.4.1	Farm storage (overland flow harvesting, floodplain ring tanks, gully dams) calculated by surface area	Y	Y
3 Diversity and richness				
3.1 Species	3.1.1	Richness of native amphibians (riverine wetland breeders)	Y	
	3.1.2	Richness of native fish	Y	Y
	3.1.3	Richness of native aquatic dependent reptiles	Y	Y
	3.1.4	Richness of native waterbirds	Y	Y
	3.1.5	Richness of native aquatic plants	Y	Y
	3.1.6	Richness of native amphibians (non-riverine wetland breeders)		Y
	3.1.7	Richness of native aquatic dependent mammals	Y	Y
3.2 Communities/ assemblages	3.2.1	Richness of macroinvertebrate taxa	Y	Y
	3.2.2	Richness of regional ecosystems along riverine wetlands or watercourses within a specified buffer distance	Y	
3.3 Habitat	3.3.2	Richness of wetland types within the local catchment (e.g. SOR sub-section)	Y	Y
	3.3.3	Richness of wetland types within the sub-catchment	Y	Y
4 Threatened species and ecosystems				
4.1 Species	4.1.1	Presence of rare or threatened aquatic ecosystem dependent fauna species— NC Act[1], EPBC Act[2]	Y	Y
	4.1.2	Presence of rare or threatened aquatic ecosystem dependent flora species—NC Act1, EPBC Act[2]	Y	Y

Criteria and Indicators	Measures		Riverine	Non-riverine
4.2 Communities/ assemblages	4.2.1	Conservation status of wetland Regional Ecosystems—Herbarium biodiversity status, NC Act1, EPBC Act[2]	Y	Y
5 Priority species and ecosystems				
5.1 Species	5.1.1	Presence of aquatic ecosystem dependent 'priority' fauna species (expert panel list/discussion or other lists such as ASFB[3], WWF, etc.)	Y	Y
	5.1.2	Presence of aquatic ecosystem dependent 'priority' flora species	Y	Y
	5.1.3	Habitat for, or presence of, migratory species (Expert Panel list/discussion and/or JAMBA[4] / CAMBA[5] agreement lists and/or Bonn Convention)	Y	Y
	5.1.4	Habitat for significant numbers of waterbirds		Y
6 Special features				
6.1 Geomorphic features	6.1.1	Presence of distinct, unique or special geomorphic features	Y	Y
6.2 Ecological processes	6.2.1	Presence of (or requirement for) distinct, unique or special ecological processes	Y	Y
6.3 Habitat	6.3.1	Presence of distinct, unique or special habitat (including habitat that functions as refugia or other critical purpose)	Y	Y
	6.3.2	Significant wetlands identified by an accepted method such as Ramsar, Australian Directory of Important Wetlands, Regional Coastal Management Planning, World Heritage Areas, etc.	Y	Y
6.4 Hydrological	6.4.1	Presence of distinct, unique or special hydrological regimes (e.g. Spring fed stream, ephemeral stream, boggomoss)	Y	Y
	6.4.2	Hydrological diversity within the estuary/ marine area	Y	
7 Connectivity				
7.1 Significant species or populations	7.1.1	The contribution (upstream or downstream) of the spatial unit to the maintenance of significant species or populations, including those features identified through Criteria 5 and/ or 6	Y	
7.2 Groundwater dependent ecosystems	7.2.1	The contribution (upstream or downstream) of the spatial unit to the maintenance of groundwater ecosystems with significant biodiversity values, including those features identified through Criteria 5 and/or 6 (e.g. karsts, cave streams, artesian springs)	Y	

Criteria and Indicators	Measures		Riverine	Non-riverine
8 Representativeness				
8.1 Wetland protection	8.1.1	The per cent area of each wetland type within Protected Areas.		Y
	8.1.2	The per cent area of each wetland type within a coastal/estuarine area subject to the Fisheries Act, Coastal Management Act or Marine Parks Act.		Y
8.2 Wetland uniqueness	8.2.1	The relative abundance of the wetland management group to which the wetland type belongs within the catchment or study area (management groups ranked least common to most common)		Y
	8.2.2	The relative abundance of the wetland management group to which the wetland type belongs within the sub-catchment or estuarine/marine zone (management groups ranked least common to most common)		Y
	8.2.3	The size of each wetland type relative to others of its management group within the catchment or study area		Y
	8.2.4	The size of each wetland type relative to others of its type within a sub-catchment (or estuarine zone)		Y
	8.2.6	The size of each wetland type relative to others of its type within the catchment or study area		Y

[1] NC Act—Nature Conservation Act 1992 (Queensland legislation)

[2] EPBC Act—Environmental Protection and Biodiversity Conservation Act 1999 (Commonwealth legislation)

[3] ASFB—Australian Society of Fish Biology

[4] JAMBA—Japan-Australia Migratory Bird Agreement

[5] CAMBA—China-Australia Migratory Bird Agreement

2.4 Stratification

Study area stratification for application to relevant measures of AquaBAMM is a user decision and is not mandatory for a successful assessment. However, AquaBAMM makes provision for data to be stratified in any user-defined manner that is determined to be ecologically appropriate. Stratification mitigates the effects of data averaging across large study areas, and is particularly important where ecological diversity and complexity is high. An example where stratification may be appropriate is fish diversity where fewer species inhabit the upland zone compared to lowland floodplains. For measure datasets where there is an equal probability of scoring across a range of values throughout the study area, stratification is unwarranted. To date, the use of strata in completed ACAs has been based on elevation (e.g. 150m ASL for coastal catchments and 400 m ASL for catchments west of the Great Dividing Range in the Murray-Darling Basin) or bioregional boundaries.

Stratification was not considered for the *CYP ACA version 1.1* (see section 1.1).

2.5 Datasets

Typically, an ACA using AquaBAMM draws on a wide range of datasets with a wide range of formats. This will generally include published scientific documents, unpublished data (grey literature) and officially collated data from various Queensland Government sources including data from the Queensland Museum; Queensland Herbarium; Department of Science, Information Technology, Innovation and Arts; and Department of Natural Resources and Mines.

In addition, data derived from one or more expert elicitation processes is included for every ACA for a number of measures. Expert advice and data is sought through an expert panel process. For the CYP ACAs, an expert panel was conducted to address aquatic and riparian flora, aquatic fauna and wetland ecology. The report for the expert panel is presented in Attachment A of this report.

ACA expert panels involve a range of internal and external experts. Although external experts were not able to be consulted for the *CYP ACA version 1.1*, external reports were utilised where available.

2.6 Implementation

Each ACA may have a different combination of assessment parameters (refer to section 2.3), and is likely to draw on a different combination of datasets thus having a different set of criteria, indicators and measures. Implementation to complete the assessment can be complex and comprehensive implementation tables are maintained by EHP throughout each ACA. A description of how each measure was implemented as part of the ACA is provided in Table 3 and Table 4.

Table 3. Non-riverine implementation table for the CYP ACA.

Measure	Description	Implementation	Primary data sets used	Threshold type	Stratified
1.1.2	Presence of exotic aquatic and semi-aquatic plants within the wetland	An expert panel list of exotic aquatic plants was used to calculate this measure. A subsection that had one or more exotic species recorded (point records or site based lists, >=1950, precision <= 2000 m) from within its boundaries received a score of 1, which was then attributed to all spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of exotic species (i.e. they were treated as a missing value).	WildNet, CORVEG, Herbrecs, ParkInfo	Presence negative	
1.1.4	Presence of feral/exotic vertebrate fauna (other than fish) within the wetland	An expert panel list of feral/exotic vertebrate fauna found in non-riverine freshwater wetlands was used to calculate this measure. A subsection that had one or more feral/exotic vertebrate species recorded (point records or site based lists, precision <= 3600 m) from within its boundaries received a score of 1, which was then attributed to all spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of exotic species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Presence negative	
1.3.7	% area of remnant wetland relative to preclear extent for each spatial unit	Based on regional ecosystem (RE) pre-clear and remnant mapping the total summed area, per spatial unit, of palustrine (P) and lacustrine (L) wetlands was calculated. RE polygons can contain more than one RE so a polygon was considered to be riverine or estuarine if >50% of its extent was of palustrine or lacustrine type REs. The value of a unit is expressed as the percent of remnant relative to pre-clear.	Regional ecosystem mapping (V7 2009), subsections	Quartile - continuous ascending	
1.4.5	Hydrological disturbance/modification of the wetland (e.g. as determined through EPA wetland mapping and classification)	Spatial units were scored according to their hydrological modifier (HydroMod). H1/H2M8 = 4; H2M1, H2M2 and H2M3 = 2; H2M5 = 1	EHP Queensland Wetlands Mapping (V3, 2012)	Categorical	

2.1.1	Presence of exotic terrestrial plants in the assessment unit	An expert panel list of exotic plants found within the riparian zone of streams and wetlands was used to calculate this measure. A subsection that had one or more exotic species recorded (point records or site based lists, >=1950, precision <=2000 m) from within its boundaries received a score of 1, which was then attributed to all spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of exotic species (i.e. they were treated as a missing value).	WildNet, CORVEG, Herbrecs, ParkInfo	Presence negative	
2.2.5	% area of remnant vegetation relative to preclear extent within buffered non-riverine wetland: 500m buffer for wetlands >= 8Ha, 200m buffer for smaller wetlands	Spatial units were buffered based on size (500m buffer for spatial units >=8ha, 200m buffer for smaller spatial units). Within these buffers the remnant and pre-clear area of vegetation was calculated and expressed as a percentage.	EHP Queensland Wetlands Mapping (V3, 2012), Regional ecosystem mapping (V7, 2009)	Quartile - continuous ascending	
2.3.1	% “agricultural” land-use area (i.e. cropping and horticulture)	Agricultural land-use included (QLUMP secondary categories) Intensive animal production, Intensive horticulture, Irrigated perennial horticulture, Plantation forestry, Irrigated cropping, Cropping, Channel/aqueduct, Reservoir/dam, Perennial horticulture. The total area of agricultural land-use is expressed as a percentage of the subsection and assigned to the spatial unit.	QLUMP (1999, 2009), subsections	Quartile - continuous descending	
2.3.2	% “grazing" land-use area	Grazing land-use included (QLUMP secondary categories) grazing natural vegetation and livestock grazing. The total area of grazing land-use is expressed as a percentage of the subsection and assigned to the spatial unit.	QLUMP (1999, 2009), subsections	Quartile - continuous descending	
2.3.3	% "vegetation" land-use area (i.e. native veg and regrowth)	Vegetation land-use included (QLUMP secondary categories) Production forestry, Lake, Other minimal use, Nature conservation, Marsh/wetland, Managed resource protection, River, Estuary/coastal waters. The total area of vegetation land-use is expressed as a percentage of the subsection and assigned to the spatial unit.	QLUMP (1999, 2009), subsections	Quartile - continuous ascending	
2.3.4	% "settlement" land-use area (i.e. towns, cities, etc.)	Settlement land-use included (QLUMP secondary categories) Manufacturing and industrial, Mining, Residential, Services, Transport and communication, Utilities, Waste treatment and disposal. The total area of settlement land-use is expressed as a percentage of the subsection and assigned to the spatial unit.	QLUMP (1999 and 2009), subsections	Quartile - continuous descending	
2.4.1	Farm storage (overland flow harvesting, floodplain ring tanks, gully dams) calculated by surface area	The total surface area of artificial wetlands (H2M6, H2M7, H2C1, H2C2, H2C3, H3C1 and H3C2) within each subsection was calculated, and subsequently applied to all spatial units in the subsection.	Modified wetlands from EHP Queensland Wetlands Mapping (V3, 2012)	Continuous descending logarithmic	

3.1.2	Richness of native fish	An expert panel list of fish dependent on freshwater wetlands (non-riverine) for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600 m were included. A subsection was attributed with the number of species records it contained; this value was then attributed to all the spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Department of Primary Industries and Fisheries (DPIF), Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.1.3	Richness of native aquatic dependent reptiles	An expert panel list of reptiles dependent on streams for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600 m were included. A subsection was attributed with the number of species records it contained; this value was then attributed to all the spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.1.4	Richness of native waterbirds	An expert panel list of waterbirds dependent on streams for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600 m were included. A subsection was attributed with the number of species records it contained; this value was then attributed to all the spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.1.5	Richness of native aquatic plants	An expert panel list of aquatic and semi-aquatic plants (macrophytes) was used to calculate this measure. Records >=1950 and a precision <=2000 m were included. A subsection was attributed with the number of species records it contained; this value was then attributed to all the spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of species (i.e. they were treated as a missing value).	WildNet, CORVEG, Herbrecs	Quartile - continuous ascending	
3.1.6	Richness of native amphibians (non-riverine wetland breeders)	An expert panel list of amphibians dependent on non-riverine wetlands for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600 m were included. A subsection was attributed with the number of species records it contained; this value was then attributed to all the spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	

3.1.7	Richness of native aquatic dependent mammals	An expert panel list of mammals dependant on non-riverine wetlands for all or part of their lifecycles was used to calculate this measure. Records >=1975 and a precision <2000 m were included. A subsection was attributed with the number of species records it contained; this value was then attributed to all the spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.2.1	Richness of macroinvertebrate taxa	An expert panel list of macroinvertebrate taxa dependant on non-riverine wetlands for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600 m were included. A subsection was attributed with the number of species records it contained; this value was then attributed to all the spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of species (i.e. they were treated as a missing value). Due to the low number of records the threshold was made presence positive.	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.3.2	Richness of wetland types within the local catchment (e.g. SOR sub-section)	The total number of unique wetland habitat types, based on TYPE_RE field (a concatenation of wetland class, water regime, salinity modifier and wetland regional ecosystem fields from the Queensland Wetland Mapping data), was calculated for each subsection. Each spatial unit in the subsection is assigned this total as its score.	EHP Queensland Wetlands Mapping (V3, 2012)	Quartile - continuous ascending	
3.3.3	Richness of wetland types within the sub-catchment	The total number of unique wetland habitat types, based on TYPE_RE field (a concatenation of wetland class, water regime, salinity modifier and wetland regional ecosystem fields from the Queensland Wetland Mapping data), was calculated for each sub-catchment. Each spatial unit within the sub-catchment is assigned this total as its score.	EHP Queensland Wetlands Mapping (V3, 2012)	Quartile - continuous ascending	
4.1.1	Presence of rare or threatened aquatic ecosystem dependent fauna species—NC Act, EPBC Act	A list of threatened fauna species dependent on wetlands for all or part of their lifecycles was used to calculate this measure. Subsections that had one or more threatened fauna species recorded (point records or site based lists, precision <= 3600 m) from within its boundaries received a score of 4; this score was then attributed to all mapped and classified spatial units associated with that subsection. No score was allocated to spatial units within subsections where there was an absence of threatened species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Department of Primary Industries and Fisheries (DPIF), Queensland Historical Fauna Database (QHFD)	Presence positive	
4.1.2	Presence of rare or threatened aquatic ecosystem dependent flora species—NC Act, EPBC Act	A list of threatened flora species dependent on wetlands for all or part of their lifecycles was used to calculate this measure. Subsections that had one or more threatened flora species recorded (point records or site based lists >=1950, precision <=2000m) from within its boundaries received a score of 4; this score was then attributed to all mapped and classified spatial units associated with the subsection. No score was allocated to spatial units within subsections where there was an absence of threatened species (i.e. they were treated as a missing value).	WildNet, CORVEG, Herbrecs	Presence positive	

4.2.1	Conservation status of wetland Regional Ecosystems—Herbarium biodiversity status, NC Act, EPBC Act	Biodiversity status (BD status): E = 4, OC = 3, NOC = 2, noRE = <no score> EPBC community status: CE = 4, E = 4. Score was derived based on the highest threatened status of a regional ecosystem (RE) within each spatial unit.	EHP Queensland Wetlands Mapping (V3, 2012), REDD database (V7, 2009), EPBC community status	Categorical	
5.1.1	Presence of aquatic ecosystem dependent 'priority' fauna species (expert panel list/discussion or other lists such as ASFB, WWF, etc.)	An expert panel list of priority fauna species dependent on streams for all or part of their lifecycles was used to calculate this measure. A subsection that had one priority fauna species recorded (point records or site based lists, precision <= 3600m) from within its boundaries received a score of 3. Where two or more priority fauna species were recorded from within a subsection, it received a score of 4. These scores were then attributed to all the spatial units the subsection contained. No score was allocated to any spatial unit where the subsection it was in had an absence of priority species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Department of Primary Industries and Fisheries (DPIF), Queensland Historical Fauna Database (QHFD)	User defined: number of species (1 = 4, >1 = 3)	
5.1.2	Presence of aquatic ecosystem dependent 'priority' flora species	An expert panel list of priority flora species dependent on streams for all or part of their lifecycles was used to calculate this measure. A subsection that had one priority flora species recorded (point records or site based lists >=1950, precision <=2000m) from within its boundaries received a score of 3. Where there were two or more priority flora species recorded from within a subsection, it received a score of 4. These scores were then attributed to all the spatial units the subsection contained. No score was allocated to any spatial unit where the subsection it was in had an absence of priority species (i.e. they were treated as a missing value).	WildNet, CORVEG, Herbrecs	User defined: number of species (1 = 4, >1 = 3)	
5.1.3	Habitat for, or presence of, migratory species (expert panel list/discussion and/or JAMBA/CAMBA agreement lists and/or Bonn Convention)	An expert panel list of migratory species dependent on freshwater streams for all or part of their lifecycles was used to calculate this measure. A subsection that had one migratory species recorded (point records or site based lists, precision <= 3600m) from within its boundaries received a score of 3. Where there were two or more migratory species recorded from within a subsection, it received a score of 4. These scores were then attributed to all the spatial units the subsection contained. No score was allocated to any spatial unit where the associated subsection had an absence of migratory species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	User defined: number of species (1 = 4, >1 = 3)	
5.1.4	Habitat for significant numbers of waterbirds	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panels	Categorical	
6.1.1	Presence of distinct, unique or special geomorphic features	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panels	Categorical	

6.2.1	Presence of (or requirement for) distinct, unique or special ecological processes	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panels	Categorical	
6.3.1	Presence of distinct, unique or special habitat (including habitat that functions as refugia or other critical purpose)	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panels	Categorical	
6.3.2	Significant wetlands identified by an accepted method such as Ramsar, Australian Directory of Important Wetlands, Regional Coastal Management Planning, World Heritage Areas, etc.	Spatial units where at least 50% of their extent occurred within the Ramsar or WHA (world heritage areas) were given a score of 4. Spatial units that had at least 50% of their extent within a *Directory of Important Wetlands* (DOIW) wetland were given a score of 3. Otherwise spatial units receive no score.	DOIW, Ramsar, WHA	Categorical	
6.4.1	Presence of distinct, unique or special hydrological regimes (e.g. spring fed stream, ephemeral stream, boggomoss)	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panels	Categorical	
8.1.1	The percent area of each wetland type within Protected Areas.	Wetland habitat type refers to the TYPE_RE attribute; a concatenation of wetland class, water regime, salinity modifier and wetland regional ecosystem fields from the QWM data. The Queensland Parks and Wildlife Estates feature class (all areas except "Other Lands" tenures) and EHP's nature refuge data were used to calculate the percent area of each wetland habitat type represented within these protected areas. The thresholds from Sattler & Williams (1999). <1% = 4; >1% = 3; >4% = 2; >10% = 1 were applied. For wetlands with more than one habitat type the lowest score of any of the types is assigned to the wetland to account for habitats less protected.	EHP Queensland Wetlands Mapping (V3, 2012) with calculated TYPE_RE attribute, Estates version 2012.2, Nature Refuges version 2012.2	Continuous descending (Sattler & Williams 1999)	

8.1.2	The percent area of each wetland type within a coastal/estuarine area subject to the Fisheries Act, Coastal Management Act or Marine Parks Act.	The DAFF Fish Habitat data was used to calculate the percent area of each wetland habitat type (based on TYPE_RE field - a concatenation of wetland class, water regime, salinity modifier and wetland regional ecosystem fields from the Queensland Wetland Mapping data) located within these protected areas. The thresholds from Sattler & Williams (1999). <1% = 4; >1% = 3; >4% = 2; >10% = 1. For wetlands with more than one habitat type the lowest score of any of the types is assigned to the wetland to account for habitats less protected.	EHP Queensland Wetlands Mapping (V3, 2012) with calculated TYPE_RE attribute, DAFF Fish Habitat July 2012.	Continuous descending (Sattler & Williams 1999)	
8.2.1	The relative abundance of the wetland management group to which the wetland type belongs within the catchment or study area (management groups ranked least common to most common)	Wetland management group (WMG) refers to the Wetland Habitat Typology or [HAB] attribute in the wetlands mapping. The frequency of each WMG is calculated across the study area. A spatial unit is scored by the lowest frequency (across the study area) of any habitat type within it.	EHP Queensland Wetlands Mapping (V3, 2012)	Continuous descending logarithmic	
8.2.2	The relative abundance of the wetland management group to which the wetland type belongs within the sub-catchment or estuarine/marine zone (management groups ranked least common to most common)	Wetland management group (WMG) refers to the Wetland Habitat Typology or [HAB] attribute in the wetlands mapping. The frequency of each WMG is calculated across the sub-catchment. A spatial unit is scored by the lowest frequency (across the sub-catchment) of any habitat type within it.	EHP Queensland Wetlands Mapping (V3, 2012)	Continuous descending logarithmic	
8.2.3	The size of each wetland type relative to others of its management group within the catchment or study area	Wetland management group (WMG) refers to the Wetland Habitat Typology or [HAB] attribute in the wetlands mapping. The area values for each wetland habitat polygon are quartiled (i.e. thresholded into 4 classes based on average of three highest values) across each study area for each WMG. This is the rating for a wetland habitat polygon. A spatial unit may contain more than one wetland habitat polygon. A spatial unit score is the highest rating of any wetland habitat polygon it contains.	EHP Queensland Wetlands Mapping (V3, 2012)	Categorical	

8.2.4	The size of each wetland type relative to others of its type within a sub-catchment (or estuarine zone)	Wetland management group (WMG) refers to the Wetland Habitat Typology or [HAB] attribute in the wetlands mapping. The area values for each wetland habitat polygon are quartiled (i.e. thresholded into 4 classes based on average of three highest values) across each sub-catchment for each WMG. This is the rating for a wetland habitat polygon. A spatial unit may contain more than one wetland habitat polygon. A spatial unit score is the highest rating of any wetland habitat polygon it contains.	EHP Queensland Wetlands Mapping (V3, 2012)	Categorical	
8.2.6	The size of each wetland type relative to others of its type within the catchment or study area	Wetland habitat type refers to the TYPE_RE attribute; a concatenation of wetland class, water regime, salinity modifier and wetland regional ecosystem fields from the QWM data. The area values for each wetland habitat polygon are quartiled (i.e. thresholded into 4 classes based on average of three highest values) across each study area for each wetland habitat type. Wetland habitat polygons are classed according to these thresholds. This is the rating for a wetland habitat polygon. A spatial unit may contain more than one wetland habitat polygon. A spatial unit score is the highest rating of any wetland habitat polygon it contains.	EHP Queensland Wetlands Mapping (V3, 2012) with calculated TYPE_RE attribute	Categorical	

Table 4. Riverine implementation table for the CYP ACA.

Measure	Description	Implementation	Primary data sets used	Threshold type	Stratified
1.1.1	Presence of 'alien' fish species within the wetland	An expert panel list of alien fish species found in riverine freshwater wetlands was used to calculate this measure. A subsection that had one or more alien fish species recorded (point records or site based lists, precision <= 3600m) from within its boundaries received a score of 1. No score was allocated to any spatial unit (subsection) that had an absence of exotic species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Department of Primary Industries and Fisheries (DPIF), Queensland Historical Fauna Database (QHFD)	Presence negative	
1.1.2	Presence of exotic aquatic and semi-aquatic plants within the wetland	An expert panel list of exotic aquatic plants was used to calculate this measure. A subsection that had one or more exotic species recorded (point records or site based lists, >=1950, precision <= 2000 m) from within its boundaries received a score of 1. No score was allocated to any spatial unit (subsection) that had an absence of exotic species (i.e. they were treated as a missing value).	WildNet, CORVEG, Herbrecs, ParkInfo, Wetland Information Capture Project	Presence negative	
1.1.4	Presence of feral/exotic vertebrate fauna (other than fish) within the wetland	An expert panel list of feral/exotic vertebrate fauna found in non-riverine freshwater wetlands was used to calculate this measure. A subsection that had one or more feral/exotic vertebrate species recorded (point records or site based lists, precision <= 3600m) from within its boundaries received a score of 1, which was then attributed to all spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of exotic species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Presence negative	
1.3.4	Presence/absence of dams/weirs within the wetland	A subsection containing one or more in-stream dams or weirs received a score of 1. Subsections without in-stream dams or weirs received no score.	DERM (xNRW) Dams, Weirs, Barrages dataset (Damweir 100K)	Presence negative	
1.3.7	% area of remnant wetland relative to pre-clear extent for each spatial unit	Based on regional ecosystem (RE) pre-clear and remnant mapping the total summed area, per spatial unit, of riverine (R) and estuarine (E) wetlands was calculated. RE polygons can contain more than one RE so a polygon was considered to be riverine or estuarine if >50% of its extent was of riverine or estuarine type REs. The value of a unit is expressed as the percent of remnant relative to pre-clear.	Regional ecosystem mapping (V7, 2009), subsections	Quartile - continuous ascending	

2.1.1	Presence of exotic terrestrial plants in the assessment unit	An expert panel list of exotic plants found within the riparian zone of streams and wetlands was used to calculate this measure. A subsection that had one or more exotic species recorded (point records or site based lists, >=1950, precision <=2000m) from within its boundaries received a score of 1. No score was allocated to any spatial unit (subsection) that had an absence of exotic species (i.e. they were treated as a missing value).	WildNet, CORVEG, Herbrecs, ParkInfo, Wetland Information Capture Project	Presence negative	
2.2.1	% area remnant vegetation relative to pre-clear extent within buffered riverine wetland or watercourses	Watercourse features were buffered according to hierarchy and perenniality (1:250,000) (major & minor perennial = 100m, major non-perennial = 100m, minor non-perennial = 50m (buffer distances are for each side)). Within the buffer the percent area of remnant versus non-remnant vegetation was calculated for each spatial unit.	Stream network 250K Geodata watercourse lines & areas layers, Regional Ecosystem mapping (V7, 2009)	Quartile - continuous ascending	
2.2.2	Total number of REs relative to pre-clear number of REs within buffered riverine wetland or watercourses	Watercourse features were buffered according to hierarchy and perenniality (1:250,000) (major & minor perennial = 100m, major non-perennial = 100m, minor non-perennial = 50m (buffer distances are for each side)). Within the buffer the percent count of remnant versus non-remnant vegetation was calculated for each spatial unit.	Stream network 250K Geodata watercourse lines & areas layers, Regional Ecosystem mapping (V7, 2009)	Quartile - continuous ascending	
2.3.1	% "agricultural" land-use area (i.e. cropping and horticulture)	Agricultural land-use included (QLUMP secondary categories) Intensive animal production, Intensive horticulture, Irrigated perennial horticulture, Plantation forestry, Irrigated cropping, Cropping, Channel/aqueduct, Reservoir/dam, Perennial horticulture. The total area of agricultural land-use is expressed as a percentage of the spatial unit.	QLUMP (1999, 2009), subsections	Quartile - continuous descending	
2.3.2	% "grazing" land-use area	Grazing land-use included (QLUMP secondary categories) grazing natural vegetation and livestock grazing. The total area of grazing land-use is expressed as a percentage of the spatial unit.	QLUMP (1999, 2009), subsections	Quartile - continuous descending	
2.3.3	% "vegetation" land-use area (i.e. native veg + regrowth)	Vegetation land-use included (QLUMP secondary categories) Production forestry, Lake, Other minimal use, Nature conservation, Marsh/wetland, Managed resource protection, River, Estuary/coastal waters. The total area of vegetation land-use is expressed as a percentage of the spatial unit.	QLUMP (1999, 2009), subsections	Quartile - continuous ascending	
2.3.4	% "settlement" land-use area (i.e. towns, cities, etc.)	Settlement land-use included (QLUMP secondary categories) Manufacturing and industrial, Mining, Residential, Services, Transport and communication, Utilities, Waste treatment and disposal. The total area of settlement land-use is expressed as a percentage of the spatial unit.	QLUMP (1999 and 2009), subsections	Quartile - continuous descending	

2.4.1	Farm storage (overland flow harvesting, floodplain ring tanks, gully dams) calculated by surface area	The total surface area of artificial wetlands (H2M6, H2M7, H2C1, H2C2, H2C3, H3C1 and H3C2) within each subsection was calculated.	Modified wetlands from EHP Queensland Wetlands Mapping (V3, 2012)	Continuous descending logarithmic	
3.1.1	Richness of native amphibians (riverine wetland breeders)	An expert panel list of amphibians dependent on streams for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600m were included. No score was allocated to any spatial unit that had an absence of amphibians (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.1.2	Richness of native fish	An expert panel list of fish dependent on freshwater streams for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600 m were included. A subsection was attributed with the number of species records it contained. No score was allocated to any subsection that had an absence of species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Department of Primary Industries and Fisheries (DPIF), Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.1.3	Richness of native aquatic dependent reptiles	An expert panel list of reptiles dependent on streams for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600m were included. A subsection was attributed with the number of species records it contained; this value was then attributed to all the spatial units in the subsection. No score was allocated to any spatial unit where the associated subsection had an absence of species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.1.4	Richness of native waterbirds	An expert panel list of waterbirds dependent on streams for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600 m were included. No score was allocated to any spatial unit that had an absence of waterbirds (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.1.5	Richness of native aquatic plants	An expert panel list of aquatic and semi-aquatic plants (macrophytes) was used to calculate this measure. Records >=1950 and a precision <=2000m were included. A subsection was attributed with the number of species records it contained. No score was allocated to any spatial unit (subsection) that had an absence of species (i.e. they were treated as a missing value).	WildNet, CORVEG, Herbrecs, Wetland Information Capture Project	Quartile - continuous ascending	
3.1.7	Richness of native aquatic dependent mammals	An expert panel list of mammals dependant on freshwater streams for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600m were included. A subsection was attributed with the number of species records it contained. No score was allocated to any spatial unit (subsection) that had an absence of species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	

3.2.1	Richness of macroinvertebrate taxa	An expert panel list of macroinvertebrate taxa dependant on freshwater streams for all or part of their lifecycles was used to calculate this measure. Records with a precision <= 3600m were included. A subsection was attributed with the number of species records it contained. No score was allocated to any spatial unit (subsection) that had an absence of species (i.e. they were treated as a missing value). Due to the low number of records the threshold was made presence positive.	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	Quartile - continuous ascending	
3.2.2	Richness of REs along riverine wetlands or watercourses within a specified buffer distance	Watercourse features were buffered according to hierarchy and perenniality (1:250,000) (major & minor perennial = 100m, major non-perennial = 100m, minor non-perennial = 50m (buffer distances are for each side)). The number of remnant regional ecosystems was calculated for each spatial unit.	Stream network 250K Geodata watercourse lines & areas layers, Regional ecosystem mapping (V7, 2009)	Quartile - continuous ascending	
3.3.2	Richness of wetland types within the local catchment (e.g. SOR sub-section)	The total number of unique wetland habitat types, based on TYPE_RE field (a concatenation of wetland class, water regime, salinity modifier and wetland regional ecosystem fields from the Queensland Wetland Mapping data), was calculated for each spatial unit (i.e. each riverine spatial unit).	EHP Queensland Wetlands Mapping (V3, 2012)	Quartile - continuous ascending	
3.3.3	Richness of wetland types within the sub-catchment	The total number of unique wetland habitat types, based on TYPE_RE field (a concatenation of wetland class, water regime, salinity modifier and wetland regional ecosystem fields from the Queensland Wetland Mapping data), was calculated for each sub-catchment. Each spatial unit within the study area is assigned this total as its score.	EHP Queensland Wetlands Mapping (V3, 2012)	Quartile - continuous ascending	
4.1.1	Presence of rare or threatened aquatic ecosystem dependent fauna species—NC Act, EPBC Act	A list of threatened fauna species dependent on freshwater streams for all or part of their lifecycles was used to calculate this measure. Subsections that had one or more threatened fauna species recorded (point records or site based lists, precision <= 3600m) from within its boundaries received a score of 4. No score was allocated to subsections where there was an absence of threatened species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Department of Primary Industries and Fisheries (DPIF), Queensland Historical Fauna Database (QHFD)	Presence positive	
4.1.2	Presence of rare or threatened aquatic ecosystem dependent flora species—NC Act, EPBC Act	A list of threatened flora species dependent on freshwater streams for all or part of their lifecycles was used to calculate this measure. Subsections that had one or more threatened flora species recorded (point records or site based lists >=1950, precision <=2000m) from within its boundaries received a score of 4. No score was allocated to subsections where there was an absence of threatened species (i.e. they were treated as a missing value).	WildNet, CORVEG, Herbrecs, Wetland Information Capture Project	Presence positive	

4.2.1	Conservation status of wetland Regional Ecosystems—Herbarium biodiversity status, NC Act, EPBC Act	Biodiversity status (BD status): E = 4, OC = 3, NOC = 2, no RE = <no score> EPBC community status: CE = 4, E = 4. Riverine and estuarine wetlands (including estuarine and riverine 51-80% polygons) from the QLD wetland mapping were intersected with the subsections. Score was derived based on the highest threatened status of an RE within the subsection.	EHP Queensland Wetlands Mapping (V3, 2012), REDD database (V7, 2009), EPBC community status	Categorical	
5.1.1	Presence of aquatic ecosystem dependent 'priority' fauna species (expert panel list/discussion or other lists such as ASFB, WWF, etc.)	An expert panel list of priority fauna species dependent on streams for all or part of their lifecycles was used to calculate this measure. A spatial unit that had one priority fauna species recorded (point records or site based lists, precision <= 3600m) from within its boundaries received a score of 3. Where two or more priority fauna species were recorded from within a spatial unit, it received a score of 4. No score was allocated to any spatial unit that had an absence of priority species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Department of Primary Industries and Fisheries (DPIF), Queensland Historical Fauna Database (QHFD)	User defined: number of species (1 = 4, >1 = 3)	
5.1.2	Presence of aquatic ecosystem dependent 'priority' flora species	An expert panel list of priority flora species dependent on streams for all or part of their lifecycles was used to calculate this measure. A spatial unit that had one priority flora species recorded (point records or site based lists >=1950, precision <=2000m) from within its boundaries received a score of 3. Where there were two or more priority flora species recorded from within a spatial unit, it received a score of 4. No score was allocated to any spatial unit that had an absence of priority species (i.e., they were treated as a missing value).	WildNet, CORVEG, Herbrecs, Wetland Information Capture Project	User defined: number of species (1 = 4, >1 = 3)	
5.1.3	Habitat for, or presence of, migratory species (expert panel list/discussion and/or JAMBA / CAMBA agreement lists and/or Bonn Convention)	An expert panel list of migratory species dependent on freshwater streams for all or part of their lifecycles was used to calculate this measure. A spatial unit that had one migratory species recorded (point records or site based lists, precision <= 3600m) from within its boundaries received a score of 3. Where there were two or more migratory species recorded from within a spatial unit, it received a score of 4. No score was allocated to any spatial unit that had an absence of migratory species (i.e. they were treated as a missing value).	WildNet, Queensland Museum, Queensland Historical Fauna Database (QHFD)	User defined: number of species (1 = 4, >1 = 3)	
6.1.1	Presence of distinct, unique or special geomorphic features	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panel	Categorical	
6.2.1	Presence of (or requirement for) distinct, unique or special ecological processes	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panel	Categorical	

6.3.1	Presence of distinct, unique or special habitat (including habitat that functions as refugia or other critical purpose)	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panel	Categorical	
6.3.2	Significant wetlands identified by an accepted method such as Ramsar, Australian Directory of Important Wetlands, Regional Coastal Management Planning, World Heritage Areas, etc.	Spatial units where at least 50% of their extent occurred within the Ramsar or WHA (world heritage areas) were given a score of 4. Spatial units that had at least 50% of their extent within a Directory of Important Wetlands (DOIW) wetland were given a score of 3. Otherwise spatial units receive no score.	DOIW, Ramsar, WHA	Categorical	
6.4.1	Presence of distinct, unique or special hydrological regimes (e.g. Spring fed stream, ephemeral stream, boggomoss)	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panels	Categorical	
6.4.2	Hydrological diversity within the estuary/ marine area	The expert panels identified these special features. The assigned conservation ratings for this measure were attributed. There was no need to apply thresholds as conservation ratings represent the final score for this measure.	Expert panels	Categorical	
7.1.1	The contribution (upstream or downstream) of the spatial unit to the maintenance of significant species or populations, including those features identified through Criteria 5 and/ or 6	Spatial units upstream of a unit that received a score of 4 for expert panel measures 5.1.4 or 6.3.1 are scored based on their order relative to that unit. The first order upstream units receive a score of 4, second order a 3, third order a 2 and every other upstream unit to the top of the headwaters receives a 1. If an upstream unit is associated with multiple downstream special features it receives the highest score it can based on the relative order scores.	Riverine Expert Panel decisions that scored a 4 for measures 5.1.4 or 6.3.1.	Categorical	

7.2.1	The contribution (upstream or downstream) of the spatial unit to the maintenance of groundwater ecosystems with significant biodiversity values, including those features identified through Criteria 5 and/or 6 (e.g. karsts, cave streams, artesian springs)	Spatial units upstream of a unit that received a score of 4 for expert panel measure 6.4.1 are scored based on their order relative to that unit. The first order upstream units receive a score of 4, second order a 3, third order a 2 and every other upstream unit to the top of the headwaters receives a 1. If an upstream unit is associated with multiple downstream special features it receives the highest score it can based on the relative order scores.	Riverine expert panel decisions that scored a 4 for measure 6.4.1.	Categorical	

2.7 Transparency of results

ACAs produce results at a number of levels despite its initial presentation as a single score called AquaScore. After running the AquaBAMM tool, ACA results are available at AquaScore, criterion, indicator, measure or raw data levels. The results are also available through the use of user-defined queries that may interrogate one or more levels within the assessment in an almost infinite number of possible combinations. This transparency of results provides the ACA end user (e.g. scientists, resource managers and conservation organisations) with a unique level of flexibility for ACA interrogation, interpretation and presentation. Links between the ACA results and a geographic information system (GIS) facilitate this interrogation and provide a means and visualising the ACA results (Figure 2 and Figure 3).

This data access and interrogation flexibility is important and enables investigation of the influence of different data contributions to the overall conservation value, investigation of missing data, and an ability to tailor the ACA output for a particular purpose.

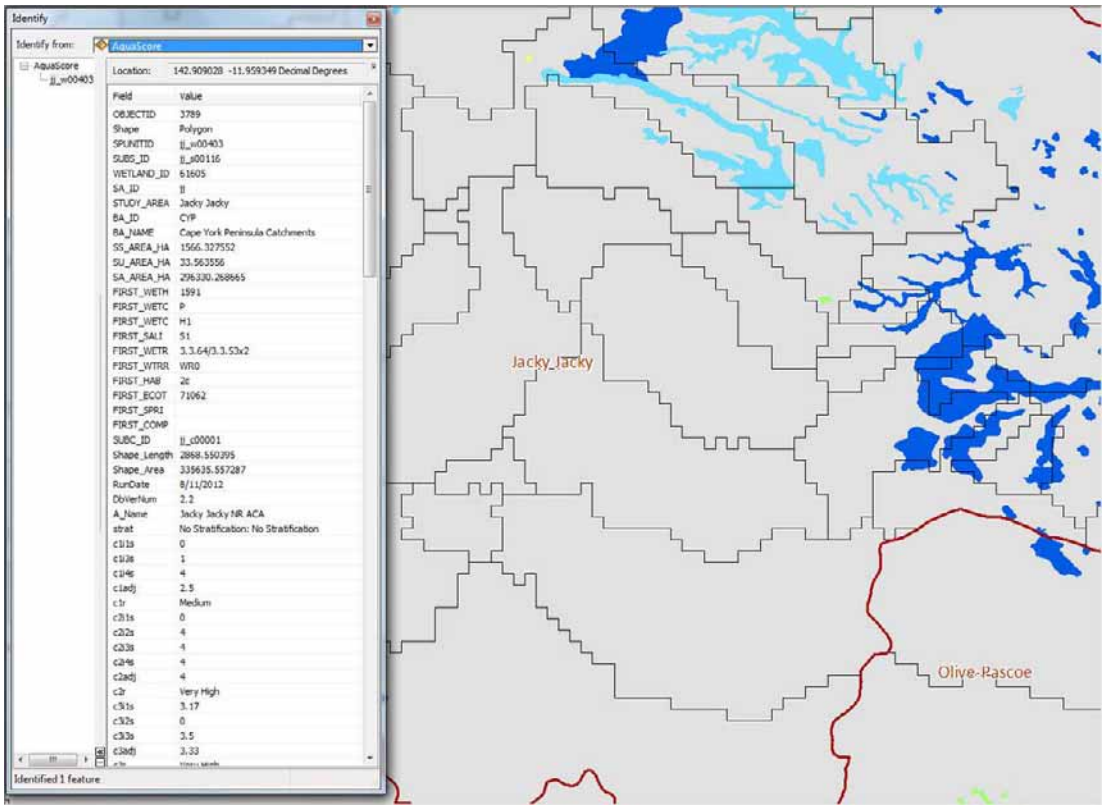


Figure 2. Interrogating the non-riverine ACA results for a spatial unit in the GIS environment.

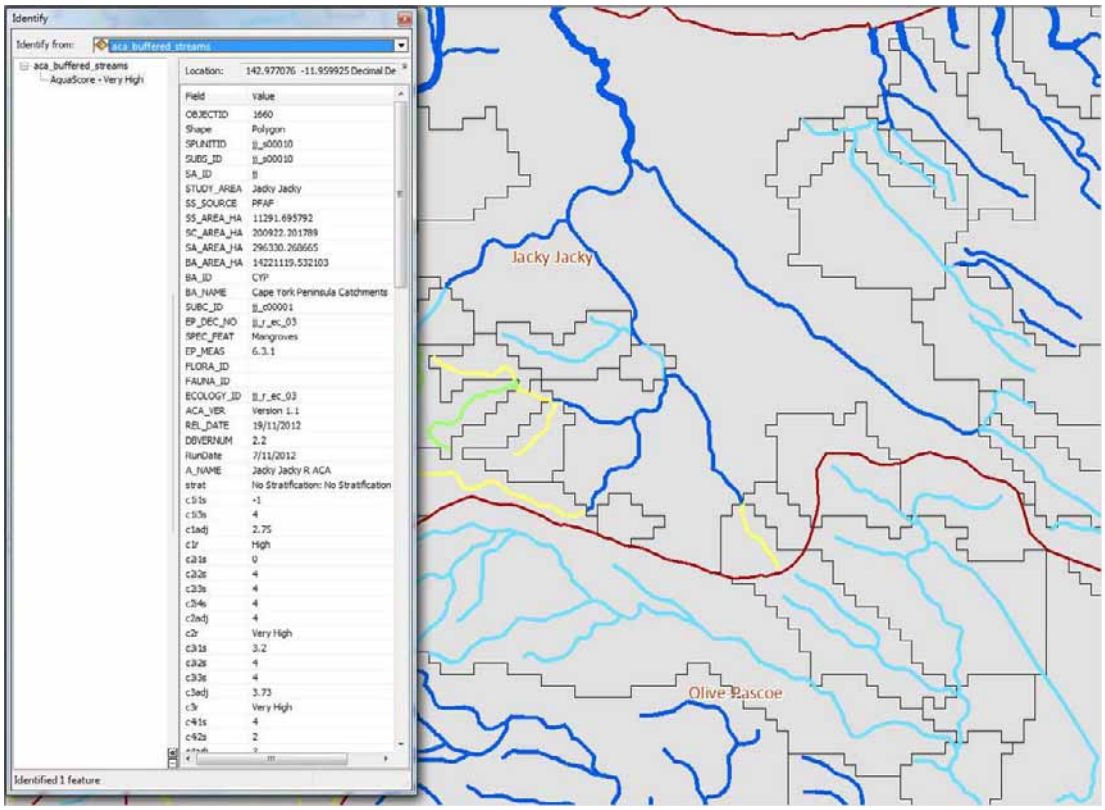


Figure 3. Interrogating the riverine ACA results for a spatial unit in the GIS environment.

2.8 Weighting of measures

As part of the AquaBAMM methodology, the panel members and project officers that attended the ACA expert panel workshop were asked to weight the measures within each indicator. Measures were weighted according to their importance to an indicator and based on the following rules:

1. At least one measure within each indicator must be weighted 10 which is the highest weighting.
2. The other measures within each indicator were weighted compared to the weighting of 10 assigned in the first step.
3. It was okay to have different measures with the same weight (i.e. all measures could be weighted 10).
4. Some indicators only had one measure and had already been given a weighting of 10.
5. Measures shouldn't be weighted down because of the quality or lack of data for that measure.

The individual weights were then averaged and reviewed with particular attention to averages having a high variance.

Due to time constraints at the expert panel, the question of weighting the measures was not able to be considered.

The use of weighted measures allows for expert knowledge of the relative importance of the measures to be integrated into the AquaScore calculations. The impact of not being able to implement weights in this release is considered minimal. It is worth noting that a similar decision process was undertaken in deciding which measures would be implemented for this release of the CYP ACA. For example, measure 1.3.9 (the percentage of waterway channel length that is concrete lined) was determined to be a less informative measure for the CYP ACA v1.1 and preference was given to calculating more relevant measures.

2.9 Ranking of indicators

Panel members and project officers that attended the ACA expert panels workshops were asked to rank the indicators within each criterion. Indicators were ranked according to their importance to a criterion and based on the following rules:

1. At least one indicator within each criterion must be ranked one which is the highest ranking.
2. The other indicators were ranked within each criterion relative to the ranking of one assigned in the first step.
3. It was okay to have different indicators with the same ranking (i.e. all indicators may be ranked 1).
4. Indicator shouldn't be ranked down because of the quality or lack of data for that indicator.

The individual rankings were averaged and reviewed with particular attention to averages having a high variance.

The question of ranking the indicators was not able to be considered (see section 1.1).

The use of ranks for indicators is similar, though generally more influential than the use of weights for measures (discussed above), however not implementing ranking at this time does not detract from the overall results of biodiversity significance.

2.10 Filter tables

For each spatial unit, a single summary score is derived by combining all of the final criteria scores/ratings. This summary score is called AquaScore.

A series of arithmetic techniques are used to bring data from their raw form through to scores for each criterion. To combine the Criterion scores/ratings in this final step, however, arithmetic techniques were considered to mask a number of important effects (as perceived by expert opinion) or to simply not provide sufficient discrimination between spatial units. Other authors (e.g. Chessman 2002) also discuss this issue.

Rather than a final arithmetic combination, AquaBAMM uses a criterion rating combination table (or filtering decision table) that provides an ordered series of decisions that are tested against the final criterion ratings for each spatial unit (Table 5). Each decision is a unique combination of criterion ratings that is associated with a final AquaScore category. The decisions are effectively a number of 'if-then' statements and are tested in sequence for each spatial unit. An AquaScore is assigned immediately when a match is achieved between the criterion rating combination of the decision and that of the 'spatial unit'. This filtering table technique has previously been used successfully in EPA's terrestrial BAMM (EPA 2002).

It is important to note that, unlike previous steps through the AquaBAMM tool, the AquaScore may be one of five categories (i.e. Very Low, Low, Medium, High or Very High). This increased level of discrimination at the AquaScore level provides for a more useful conservation assessment tool and enables more informed management decisions.

The filtering table is that same as that used for the *Wide Bay-Burnett riverine and non-riverine ACAs v1.1* (EHP 2012a).

Table 5. Criteria rating combination table (filter table) as used for the CYP riverine ACA.

Decision	Order	1 Naturalness Aquatic	2 Naturalness Catchment	3 Diversity and Richness	4 Threatened Species and Ecosystems	5 Priority Species and Ecosystems	6 Special Features	7 Connectivity	Additional Criteria	AquaScore
0	0	equal to (No data) and	equal to (No data) and	equal to (No data) and	equal to (No data) and	equal to (No data) and	equal to (No data) and	equal to (No data)		No data
1	1	equal to (Very High) and	equal to (Very High) and	equal to (Very High) and	equal to (Very High) and	equal to (Very High) and	equal to (Very High) and	equal to (Very High)		Very High
2	2	equal to (Very High) and			equal to (Very High) and	equal to (Very High) and		equal to (Very High)		Very High
3	3	equal to (Very High or High)							and number of Criteria with Very High >= 4	Very High
4	4						equal to (Very High)			Very High
5	5	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low)		Very Low
6	6	equal to (Low) and	equal to (Medium) and	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low)		Very Low
7	7	equal to (Very High) and			equal to (Very High)					High
8	8	equal to (Very High) and				equal to (Very High)				High
9	9		equal to (Very High) and		equal to (Very High)					High
10	10			equal to (Very High) and				equal to (Very High)		High
11	11	equal to (Very High) and	equal to (Very High) and	equal to (Very High)						High

12	12	equal to (High) and		equal to (Very High)						High
13	13	equal to (Very High or High) and						equal to (Very High)		High
14	14			equal to (Very High) and	equal to (Very High) and	equal to (Very High)				High
15	15					equal to (High) and		equal to (Very High)		High
16	16		equal to (Very High) and	equal to (Very High) and			equal to (High)			High
17	17		equal to (Very High) and				equal to (High)			High
18	18	equal to (High) and	equal to (Very High) and				equal to (High)			High
19	19		equal to (Very High) and		equal to (High) and		equal to (High)			High
20	20		equal to (Very High) and			equal to (High) and	equal to (High)			High
21	21	equal to (High) and			equal to (High) and	equal to (High)				High
22	22					equal to (Very High or High) and	equal to (High)			High
23	23	equal to (Very High or High) and		equal to (High) and	equal to (High)					High
23a	24						equal to (High)			High
24	25				equal to (Very High or High)					Medium

25	26					equal to (Very High or High)				Medium
26	27			equal to (High) and				equal to (High)		Medium
27	28	equal to (Medium) and		equal to (High)						Medium
28	29	equal to (Very High or High or Medium) and	equal to (Very High or High or Medium) and					equal to (High)		Medium
29	30			equal to (High) and		equal to (Medium)				Medium
30	31					equal to (Medium) and		equal to (High)		Medium
31	32		equal to (High) and	equal to (High) and			equal to (High)			Medium
32	33		equal to (High) and				equal to (High) and	equal to (High)		Medium
33	34	equal to (Medium) and	equal to (High) and				equal to (High)			Medium
34	35		equal to (High) and		equal to (Medium) and		equal to (High)			Medium
35	36		equal to (High) and			equal to (Medium) and	equal to (High)			Medium
36	37	equal to (Medium) and			equal to (Medium) and	equal to (Medium)				Medium
36a	38						equal to (Medium)			Medium
37	39	equal to (Very High or High or Medium) and	equal to (Very High or High or Medium) and	equal to (Very High or High or Medium) and				equal to (Very High or High or Medium)		Medium

38	40	not equal to (Very High) and	not equal to (Very High)						and number of Criteria with Low or No data >= 4	Very Low
1000	41	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data)		Low

Table 6. Criteria rating combination table (filter table) as used for the CYP non-riverine ACA.

Decision	Order	1 Naturalness Aquatic	2 Naturalness Catchment	3 Diversity and Richness	4 Threatened Species and Ecosystems	5 Priority Species and Ecosystems	6 Special Features	8 Representativeness	Additional Criteria	AquaScore
0	0	equal to (No data) and	equal to (No data) and	equal to (No data) and	equal to (No data) and	equal to (No data) and	equal to (No data) and	equal to (No data)		No data
1	1	equal to (Very High) and	equal to (Very High) and	equal to (Very High) and	equal to (Very High) and	equal to (Very High) and	equal to (Very High) and	equal to (Very High)		Very High
2	2	equal to (Very High) and			equal to (Very High) and	equal to (Very High) and		equal to (Very High)		Very High
3	3	equal to (Very High) and	equal to (Very High) and					equal to (Very High)		Very High
4	4	equal to (Very High or High or Medium) and	equal to (Very High or High or Medium) and		equal to (Very High) and			equal to (Very High)		Very High
5	5						equal to (Very High)			Very High
6	6	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low)		Very Low
7	7		equal to (Medium or Low) and	equal to (Low) and	equal to (Low) and	equal to (Low) and	equal to (Low or No data) and	equal to (Medium or Low)		Very Low
8	8	equal to (Very High) and			equal to (Very High or High) and			equal to (High)		High
9	9	equal to (Very High) and				equal to (Very High) and		equal to (High)		High
10	10	equal to (Very High) and	equal to (Very High) and			equal to (Very High)				High
11	11			equal to (Very High) and				equal to (Very High)		High

12	12	equal to (Very High) and				equal to (Very High or High) and		equal to (Very High)		High
13	13	equal to (High) and	equal to (Very High) and		equal to (Very High or High)					High
14	14	equal to (High) and	equal to (Very High) and			equal to (Very High)				High
15	15	equal to (High) and	equal to (High) and	equal to (Very High) and				equal to (High)		High
15a	16						equal to (High)			High
16	17		equal to (High) and	equal to (Very High)						Medium
17	18			equal to (Very High) and				equal to (High)		Medium
18	19	equal to (High) and	equal to (High or Medium) and					equal to (Very High or High)		Medium
19	20				equal to (High)					Medium
20	21					equal to (High)				Medium
21	22	equal to (Medium) and	equal to (High) and				equal to (Medium)			Medium
22	23		equal to (High) and	equal to (High) and		equal to (Medium)				Medium
23	24		equal to (High) and		equal to (Medium) and		equal to (Medium)			Medium
24	25	equal to (Medium) and			equal to (Medium) and			equal to (Medium)		Medium
25	26	equal to (High or Medium) and	equal to (Very High)							Medium

26	27	equal to (Very High or High or Medium) and	equal to (Very High or High or Medium) and	equal to (Medium) and				equal to (Medium)		Medium
26a	28						equal to (Medium)			Medium
26b	29	equal to (Very High) and	equal to (Very High) and	equal to (Very High)						Medium
27	30	equal to (Very High or High)							and number of Criteria with Very High >= 4	Very High
28	31								and number of Criteria with Low or No data >= 4	Very Low
29	32								and number of Criteria with High >= 3	Medium
30	33								and number of Criteria with Medium >= 4	Medium
1000	34	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data) and	equal to (Very High or High or Medium or Low or No data)		Low

3 Results

3.1 Conservation value categories

The conservation value results for wetlands are referential within each study area, but each value category has characteristics in common. AquaBAMM uses combinations of criterion level scores to determine a wetland's final AquaScore and based on these combinations, the following descriptions provide context for each AquaScore value category.

"very high" wetlands

These wetlands have very high values across all criteria (aquatic naturalness, catchment naturalness, diversity & richness, threatened species, special features and representativeness), or they have very high representativeness values in combination with very high aquatic naturalness, catchment naturalness or threatened species values. They may also be wetlands nominated as a special feature by an expert panel for their very high flora, fauna and/or ecological values, regardless of values across other criteria.

"high" wetlands

These wetlands are mainly those that have very high aquatic naturalness or representativeness values in combination respectively with very high/high threatened species values or very high diversity and richness values. Other combinations of very high or high values amongst the criteria may also indicate one of these wetlands.

"medium" wetlands

These wetlands have varied combinations of high and medium values amongst the criteria.

"low" wetlands

These wetlands have limited aquatic and catchment naturalness values. They have varied combinations of medium and low values amongst the other criteria.

"v**ery low" wetlands**

These wetlands have very limited or no aquatic and catchment naturalness values and they lack any other known significant value. They may also be wetlands that are largely data deficient.

3.2 Accuracy and dependability

Wetland data is the core dataset that this ACA is built upon. This data is mapped at a scale of 1:100,000 with a positional accuracy of ±100 metres, except for areas along the east coast that may be mapped at a scale of 1:50,000 with a positional accuracy of ±50 metres. Wetlands smaller than 1 hectare are not delineated in the wetland data.

The dependability score is a percentage of how many measures, out of those calculated, have data. The dependability does not influence or change the final AquaScore. The ACA results should be interpreted in conjunction with the dependability score. For example, where spatial units with very low AquaScore values have low dependability, the results should be used with caution as the AquaScore may be due to the inherent lack of values or the lack of data. In the case of missing data, further survey work may add more data which may, or may not, change the AquaScore.

The interpretation, accuracy and use of the ACA results is discussed further in section 2.7

3.3 CYP catchment overall results—riverine

An ACA was conducted for the riverine wetlands in each of the catchments of the CYP region. The results outlined below are a summary of the results for all study areas. Table 7 summarises the overall AquaScore results for the riverine subsections. Table 8 provides charts of the summary information along with dependability results and further summaries for each study area. Figure 4 and Figure 6 present the overall AquaScore results by subsection and buffered stream respectively. Figure 5 and Figure 7 represent the scores for each criterion contributing to the overall AquaScore.

Table 7. AquaScore summary for riverine wetlands.

AquaScore	Number of spatial units	Per cent of spatial units (%)	Area (ha)	Area (%)
Very high	2088	51.8%	7,276,155	51.2%
High	626	15.5%	4,953,476	34.8%
Medium	255	6.3%	1,006,197	7.1%
Low	692	17.2%	975,255	6.9%
Very Low	372	9.2%	10,037	0.1%
Total	4033	100.0%	1,422,1120	100.0%

A few broad trends in wetland conservation values were shown in the results:

- Overall, approximately 67% of all riverine units (subsections) scored a very high or high for overall AquaScore.
- The Cape York catchments exhibit a high degree of naturalness (criterion 2). This is not unexpected given the limited clearing and development that has occurred in Cape York when compared to the remainder of Queensland. Still high, but scoring lower than the rest of Cape York, are the agricultural districts in the south-east catchments (Endeavour and Mitchell West) and units to the south and west of Princess Charlotte Bay on the east coast.
- Generally, the south of Cape York has higher values for threatened species and ecosystems (criterion 4). It is important to acknowledge and recognise the influence of survey intensity in these results given the distribution and abundance of records available for analysis.
- The distribution of scores for diversity and richness (criterion 3) is broadly similar to that of criterion 4 (threatened species and ecosystems).
- A high percentage (36%) of the Islands study area units had an overall score of very low. This divergence in results from other study areas is best explained by the overall low dependability, with an average rate of 30.8% over 961 units i.e. on average a unit had data from 30% of the measures calculated available to derive an overall AquaScore. Most of the individual criteria for the islands' catchments had an average dependability consistent with the variation in average dependability across the other study areas with the exception of criterion 3 (diversity and richness) and criterion 7 (connectivity) which were much lower. For criterion 3 this result is due to the dearth of species records on the numerous islands included for assessment. For criterion 7 this result is due to the scale of the analysis and the extent of special features identified by the expert panel. Most small islands were considered to be one subsection and, as such, connectivity measure calculations have no effect. In addition, expert panel knowledge of the values on islands was sparser than for the rest of Cape York.

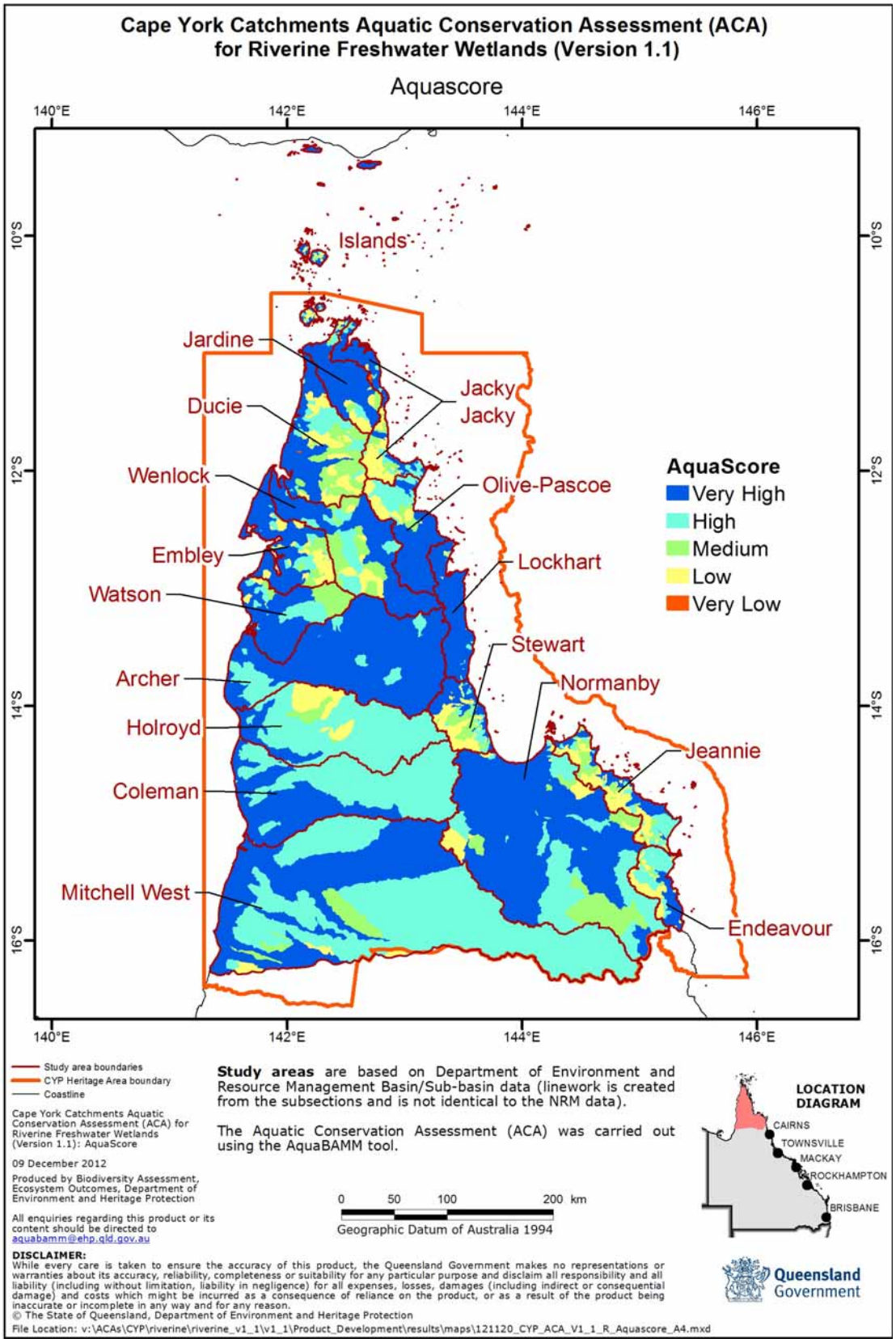


Figure 4. Riverine AquaScore for all catchments shown by riverine subsection.

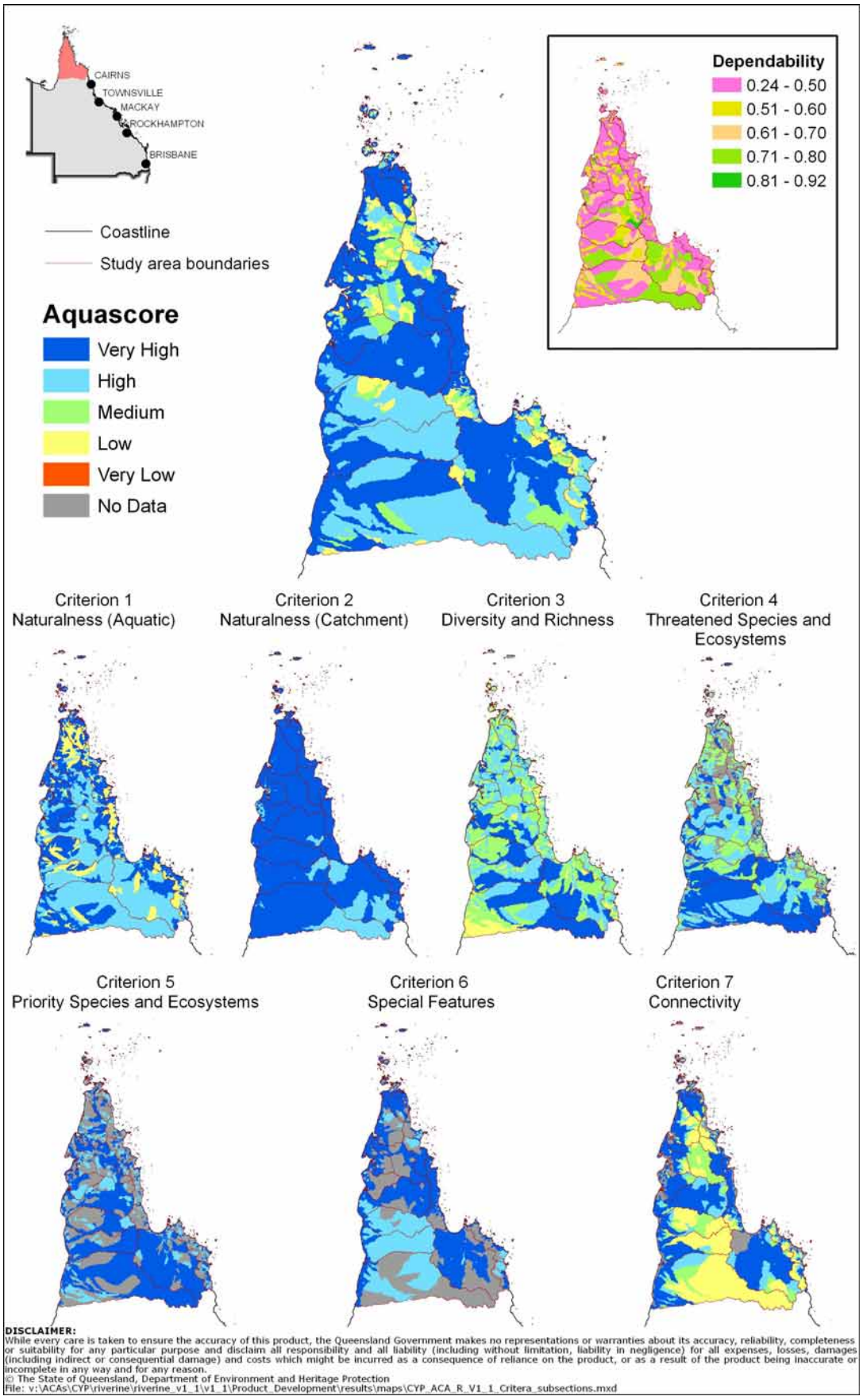


Figure 5. Riverine AquaScore criteria for all catchments shown by riverine subsection.

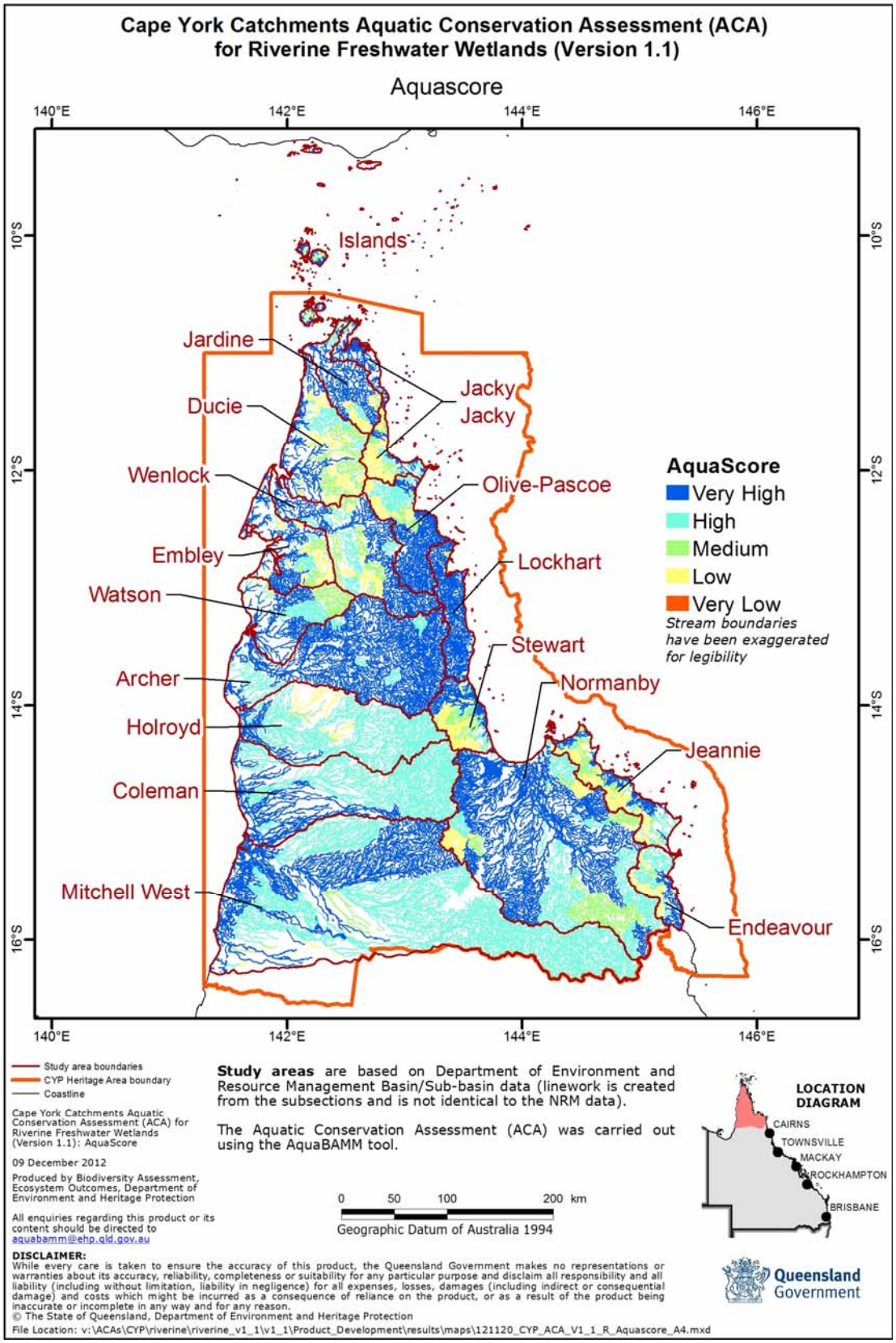


Figure 6. Riverine AquaScore for all catchments shown by buffered stream.

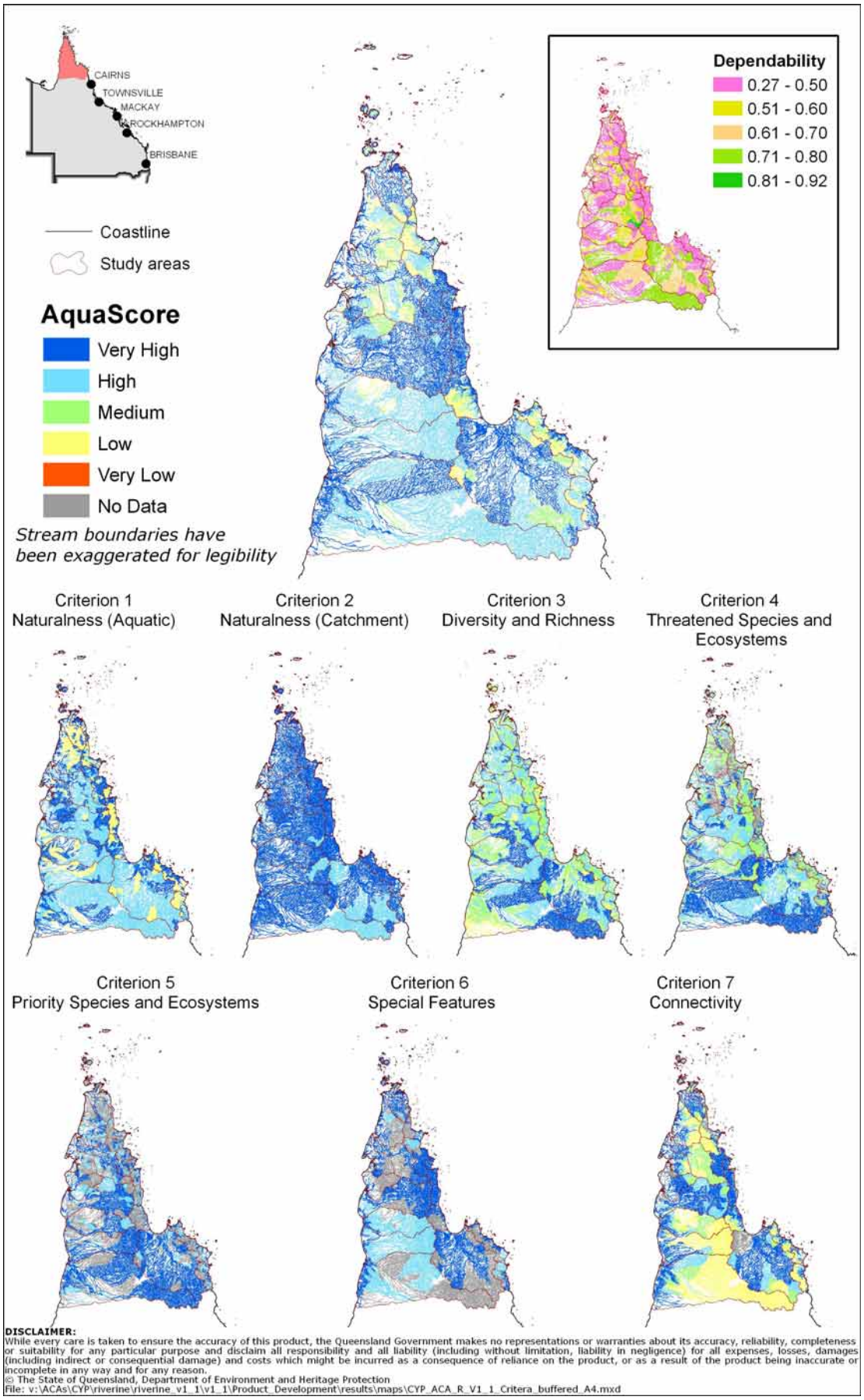
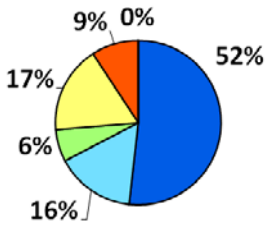
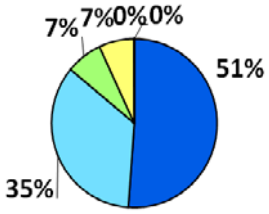
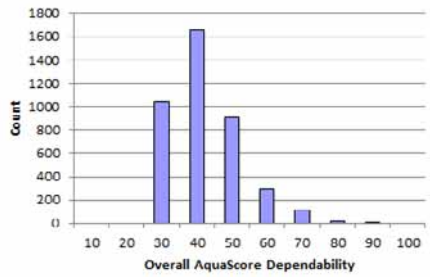
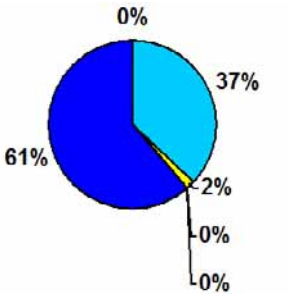
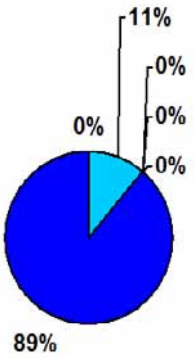
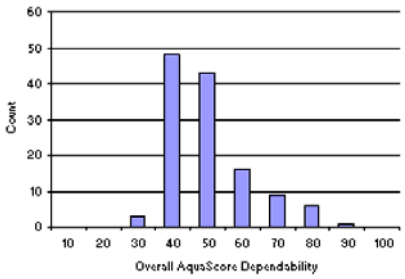
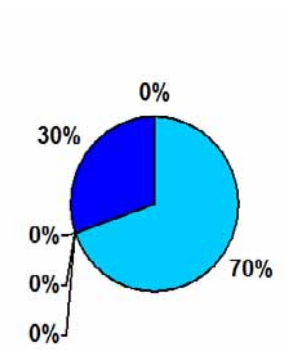
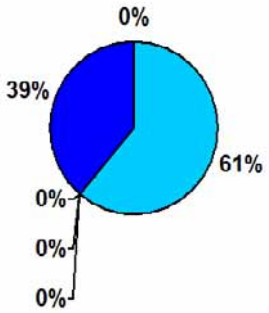
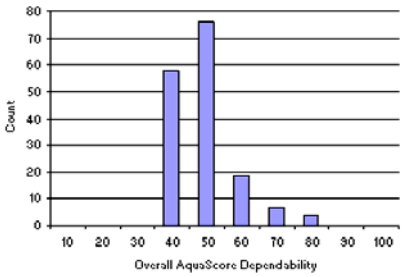


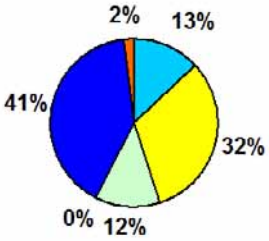
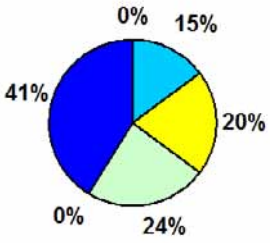
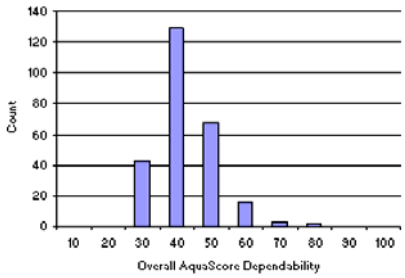
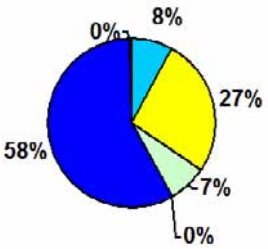
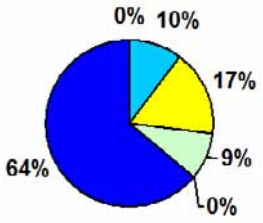
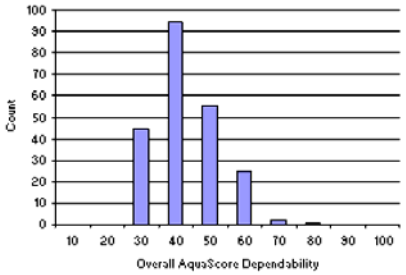
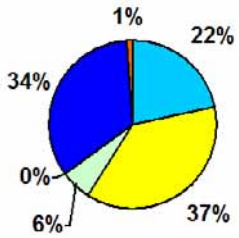
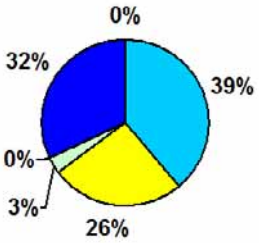
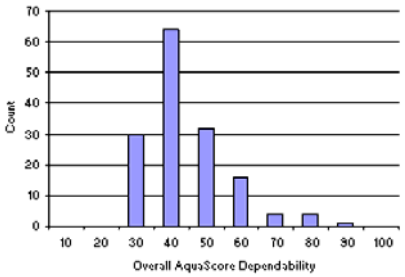
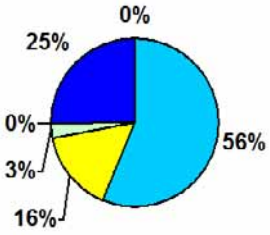
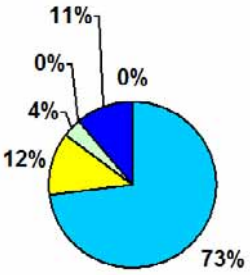
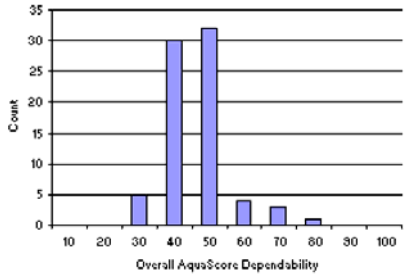
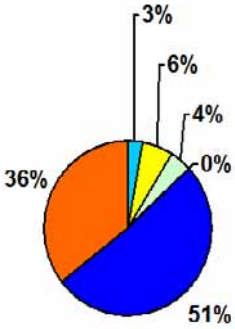
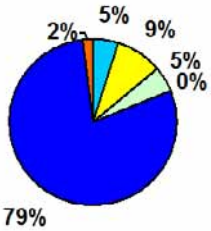
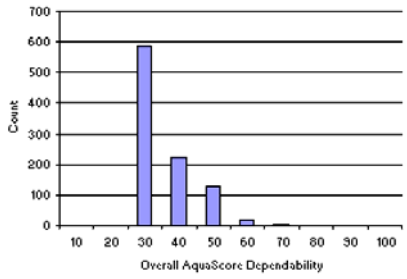
Figure 7. Riverine AquaScore criteria for all catchments shown by buffered stream.

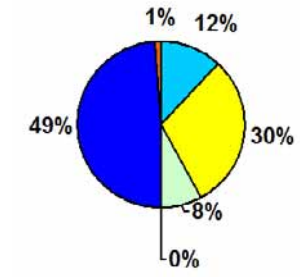
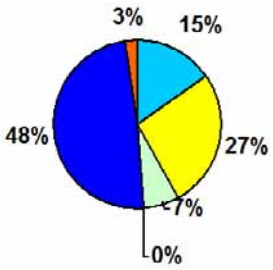
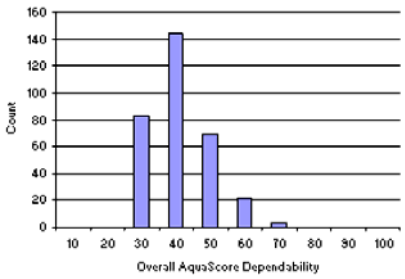
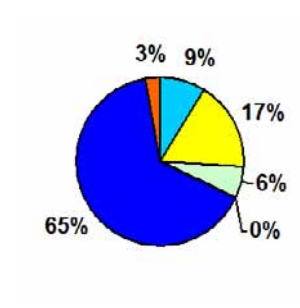
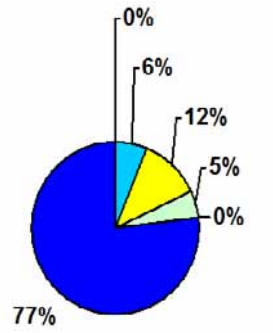
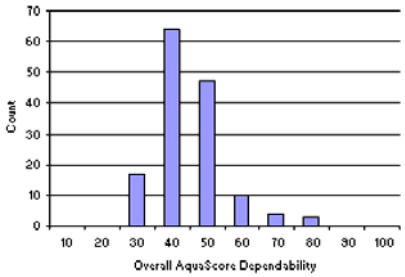
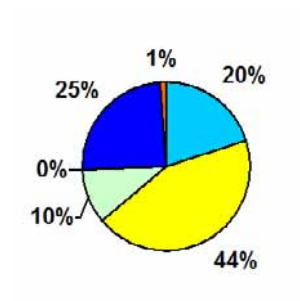
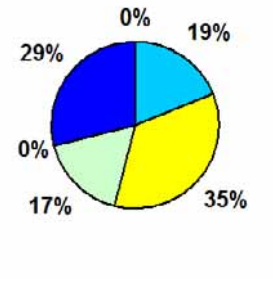
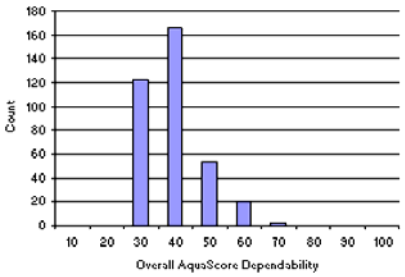
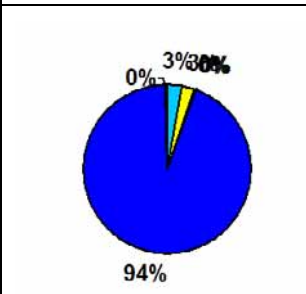
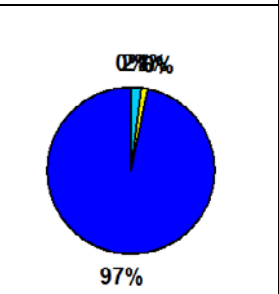
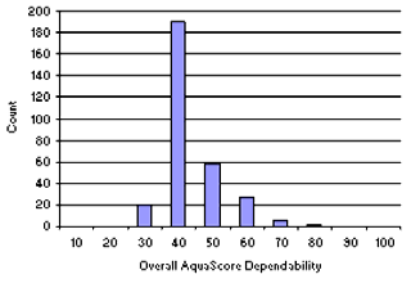
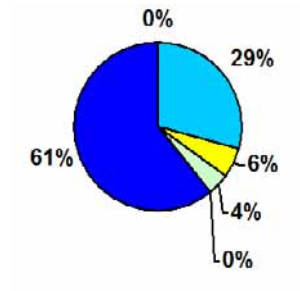
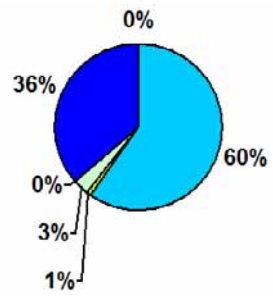
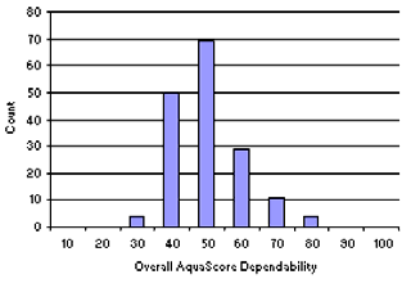
Table 8. Riverine AquaScore and dependability summary for all study areas.

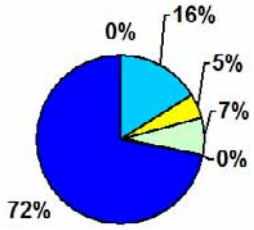
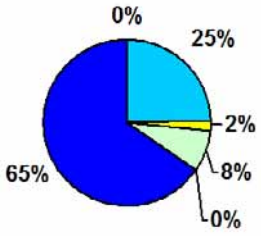
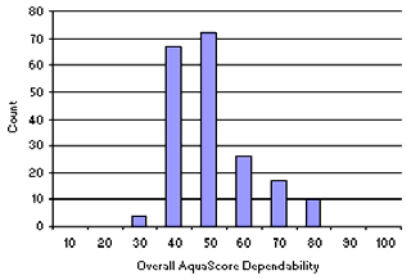
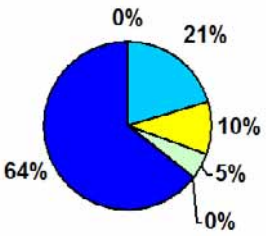
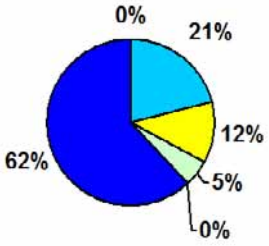
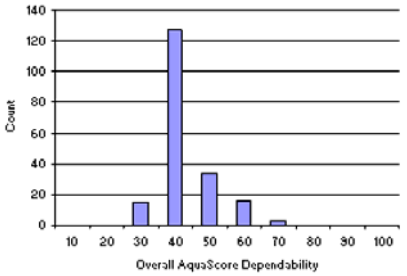
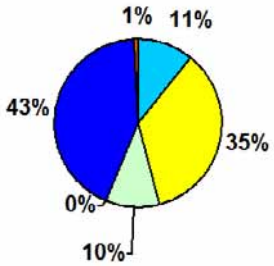
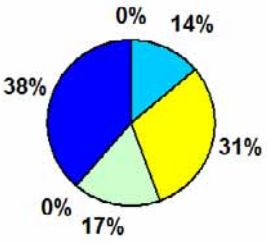
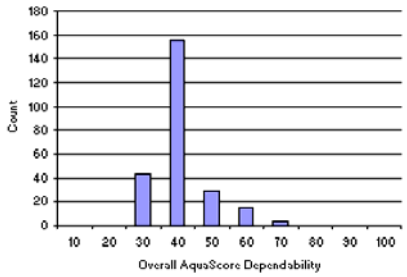
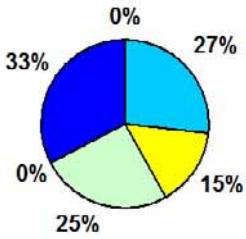
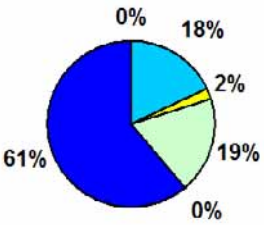
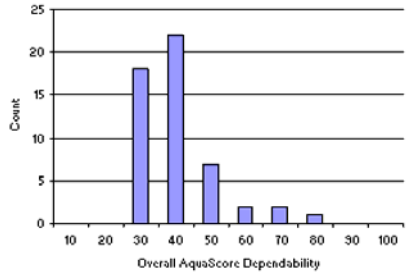
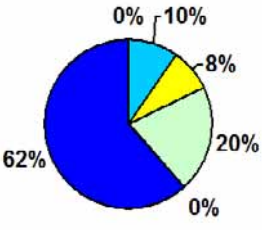
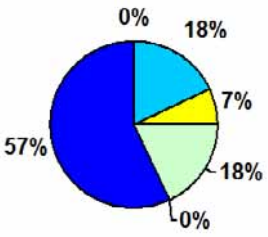
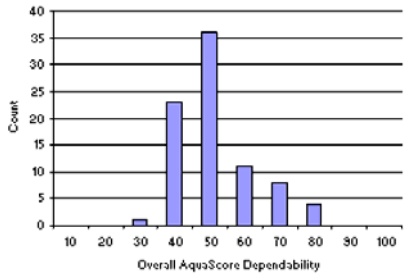
Key to charts

- Very High
- High
- Medium
- Low
- Very Low
- No Data

Catchment	AquaScore by number of spatial units	AquaScore by total area of spatial units	AquaScore dependability
All catchments (riverine)			
Archer			
Coleman			

Ducie			
Embley			
Endeavour			
Holroyd			
Islands			

Jacky Jacky			
Jardine			
Jeannie			
Lockhart			
Mitchell West			

Normanby			
Olive-Pascoe			
Stewart			
Watson			
Wenlock			

3.4 CYP catchment overall results—non-riverine

An ACA was conducted for the non-riverine wetlands in each of the catchments of the CYP region. The results outlined below are a summary of the results for six study areas. Table 9 summarises the overall AquaScore results for the riverine subsections. Table 10 provides charts of the summary information along with dependability results and further summaries for each study area. Figure 8 presents the overall AquaScore results for non-riverine wetlands. Figure 9 represents the scores for each criterion contributing to the overall AquaScore.

Table 9. AquaScore summary for non-riverine wetlands.

AquaScore	Number of spatial units	Per cent of spatial units (%)	Area (ha)	Area (%)
Very high	11,741	45.8%	328,012	73.3%
High	11,858	46.3%	106,096	23.7%
Medium	1847	7.2%	11,788	2.6%
Low	189	0.7%	1795	0.4%
Very Low	2	0.01%	4	0.001%
Total	25,637	100.0%	447,695	100.0%

A few broad trends in wetland conservation values were shown in the results:

- Overall, approximately 92% of all non-riverine wetlands scored a very high or high for AquaScore. This equates to 97% of the wetland area. Most of these wetlands are adjacent to the coast (within 50km) with the notable exception of the Mitchell West catchment which is dominated (98% of all units) across its entire extent by very high scores.

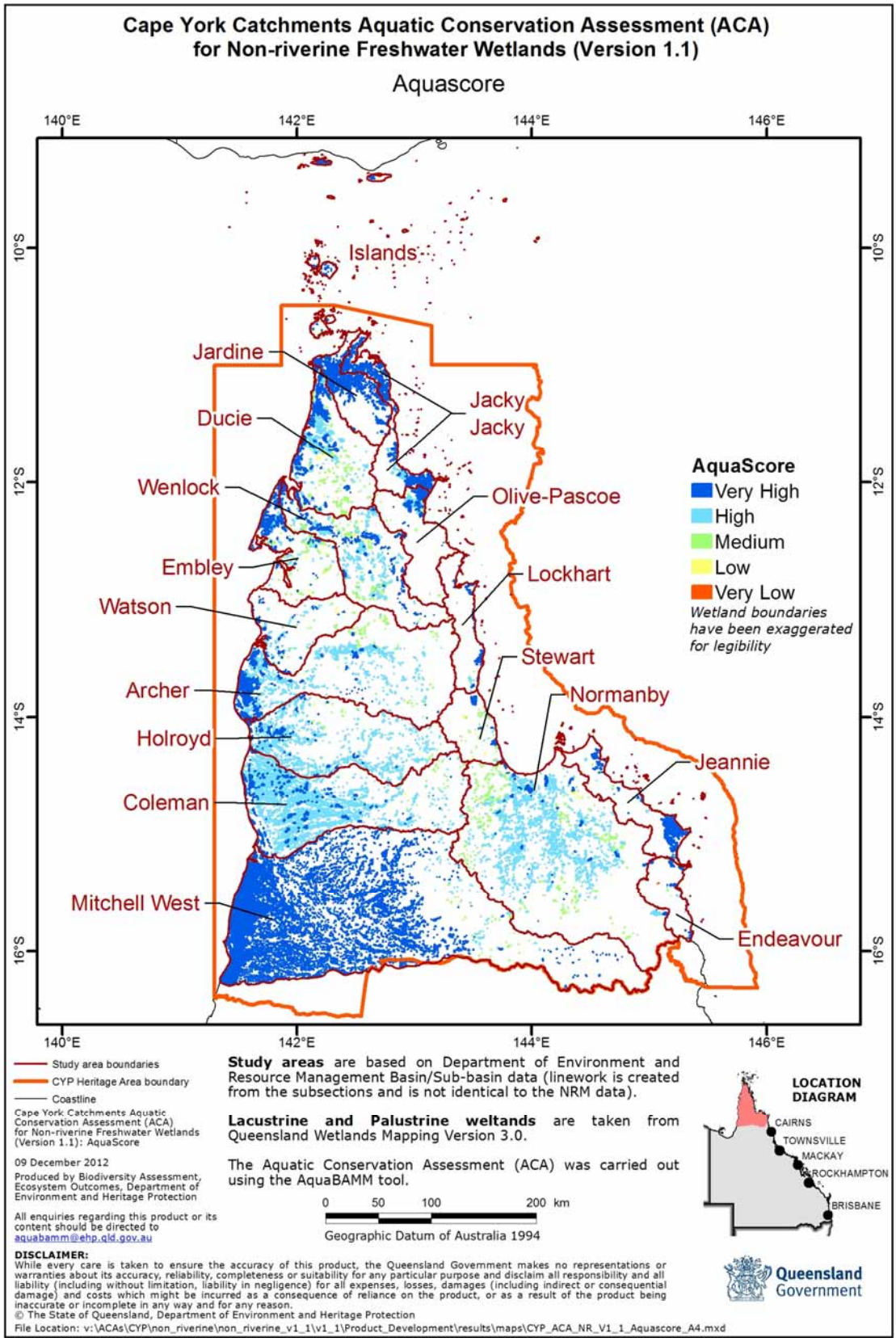


Figure 8. Non-riverine AquaScore for all catchments.

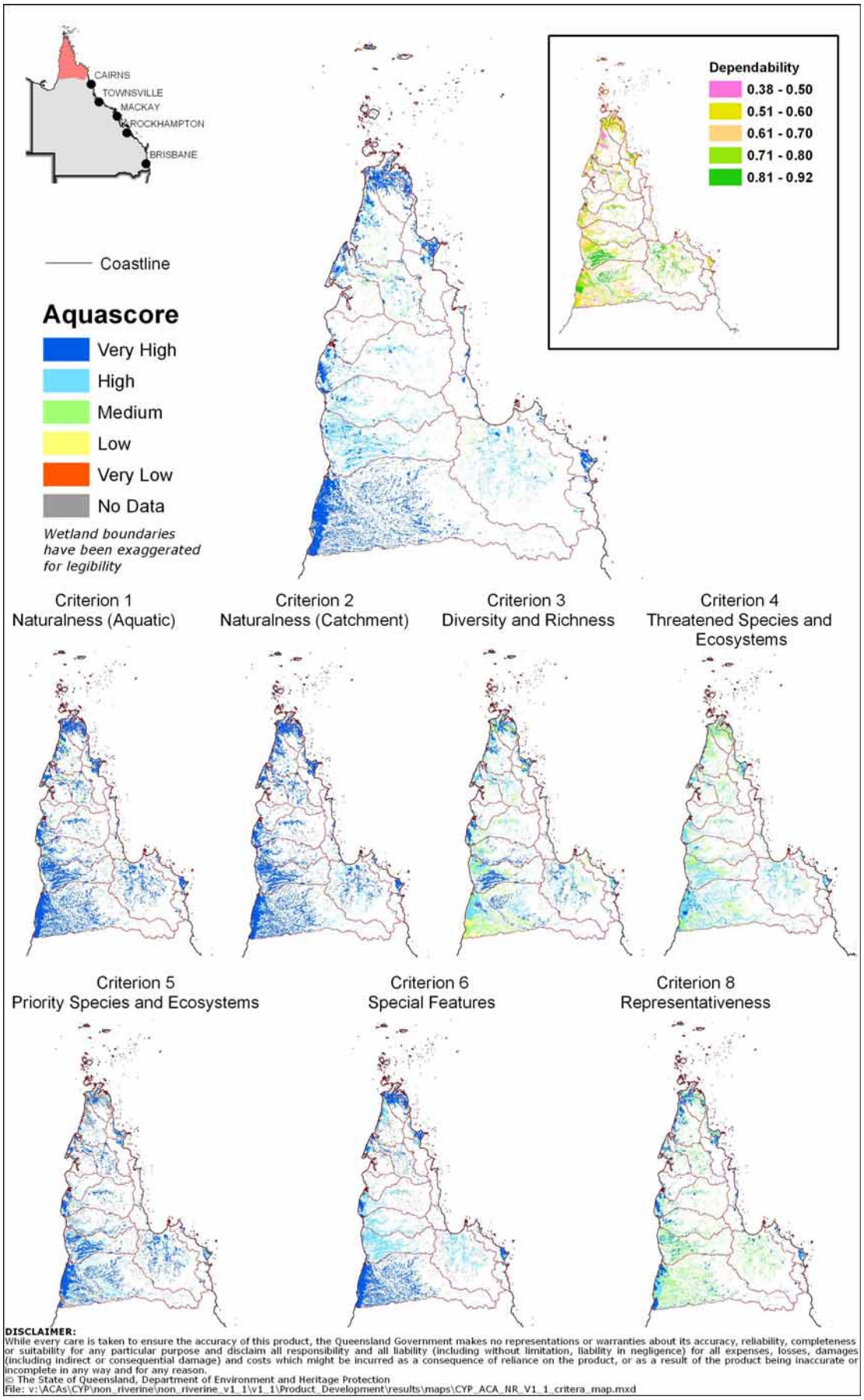
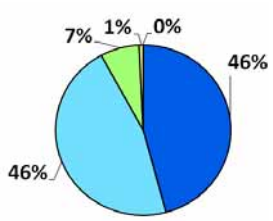
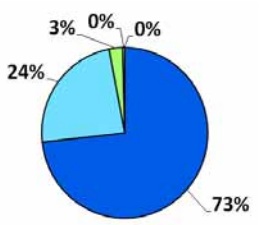
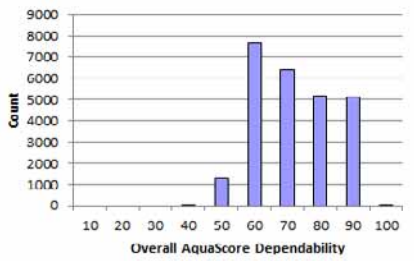
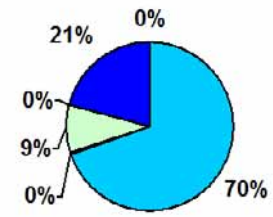
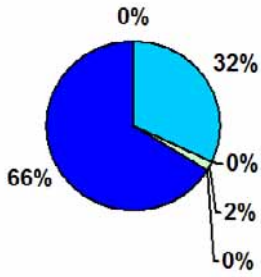
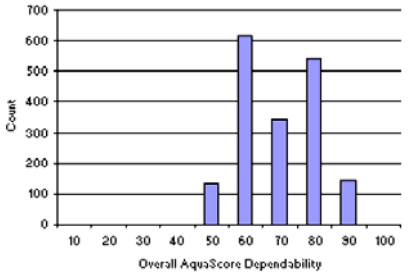
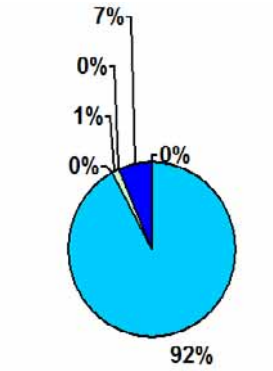
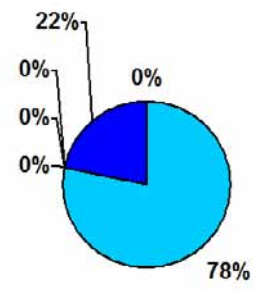
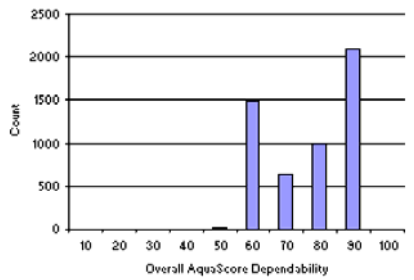
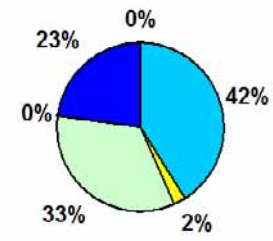
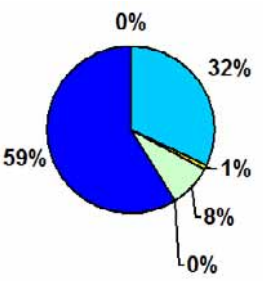
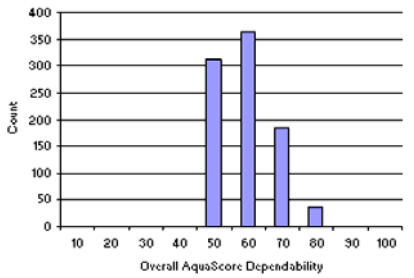


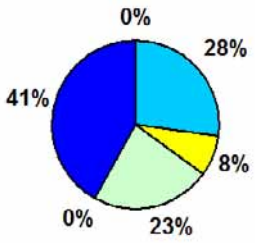
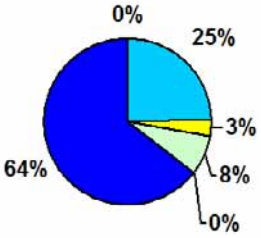
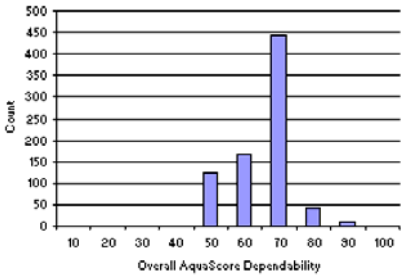
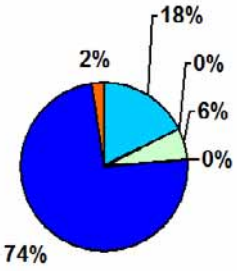
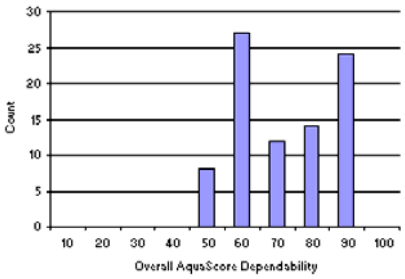
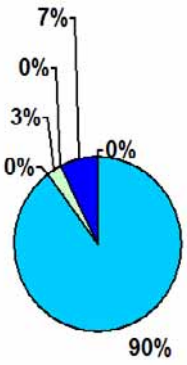
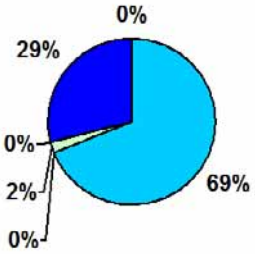
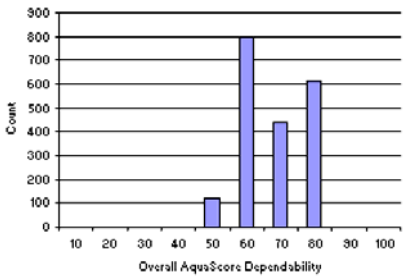
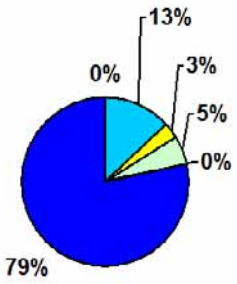
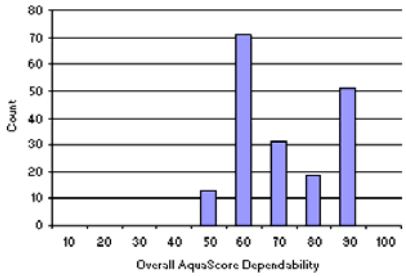
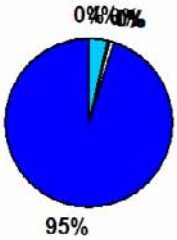
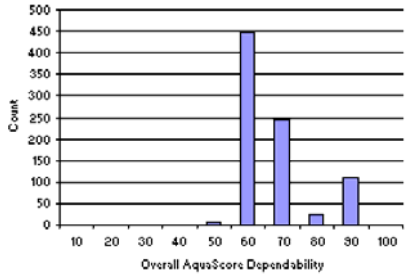
Figure 9. Non-riverine AquaScore criteria for all catchments.

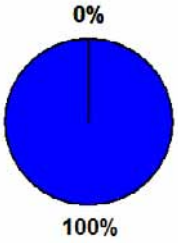
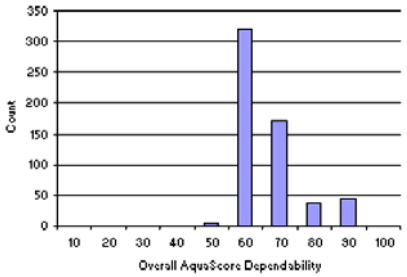
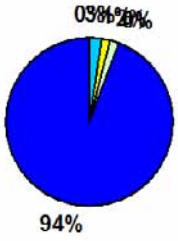
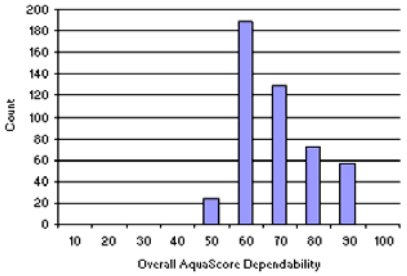
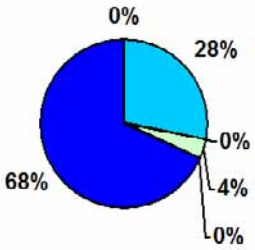
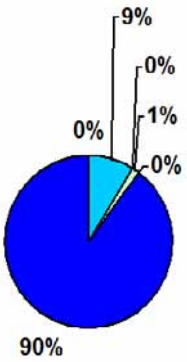
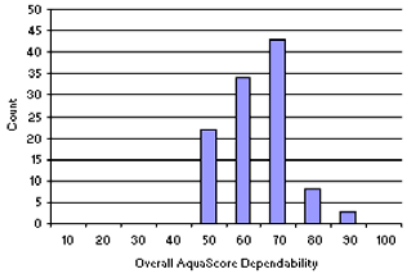
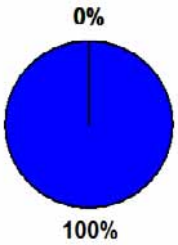
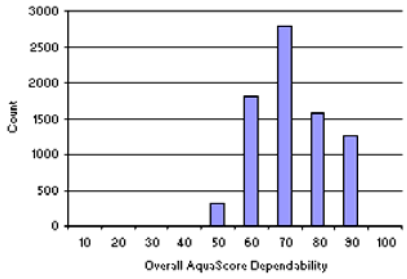
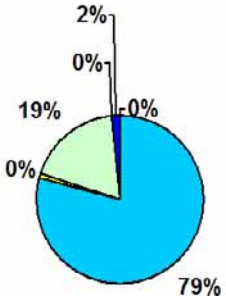
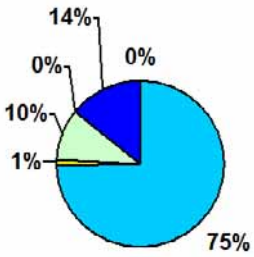
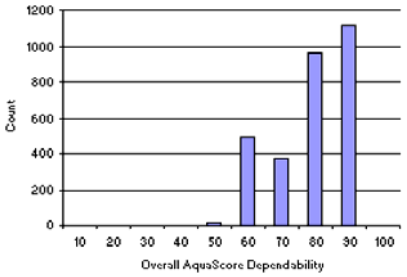
Table 10. Non-Riverine AquaScore and dependability summary for all study areas.

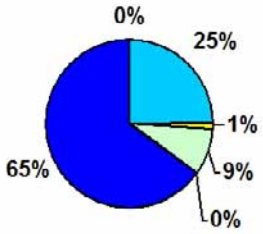
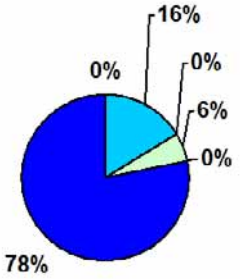
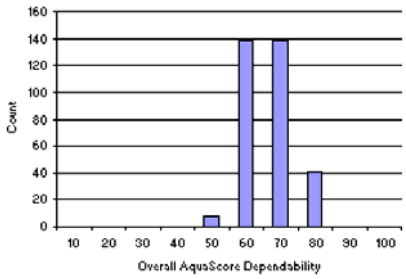
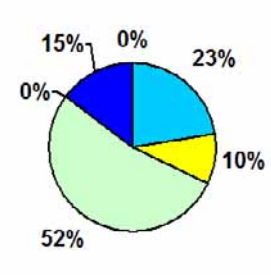
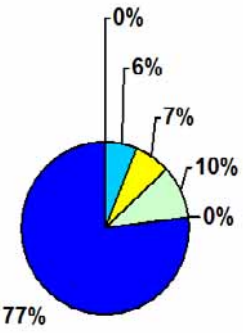
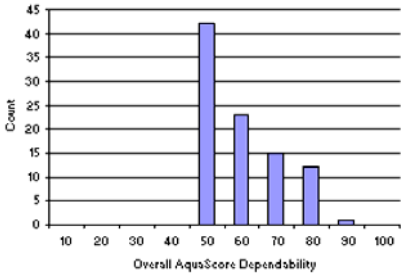
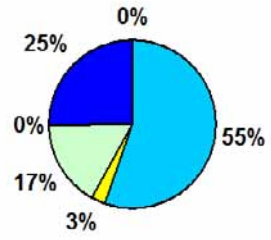
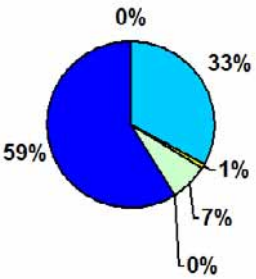
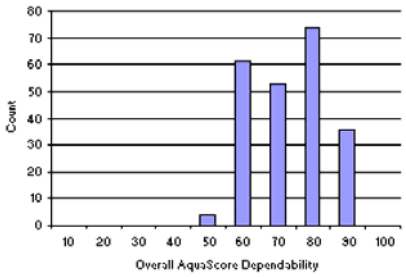
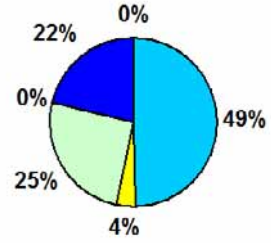
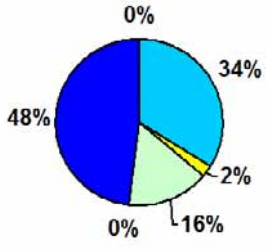
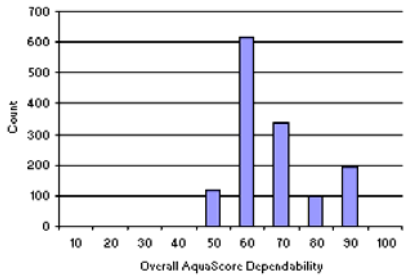
Key to charts

- Very High
- High
- Medium
- Low
- Very Low
- No Data

Catchment	AquaScore by number of spatial units	AquaScore by total area of spatial units	AquaScore dependability
All catchments (non-riverine)			
Archer			
Coleman			
Ducie			

Embley			
Endeavour			
Holroyd			
Islands			
Jacky Jacky			

Jardine			
Jeannie			
Lockhart			
Mitchell West			
Normanby			

Olive-Pascoe			
Stewart			
Watson			
Wenlock			

3.5 Field-truthing

Field validation of the ACA results is important to test the accuracy of the wetland values attributed. Field-truthing is a critical step in any ACA using AquaBAMM and it precedes final data corrections, resulting from the field work, and a final re-run of the assessment.

The outcomes from field-truthing are regularly:

- minor changes to the filtering table and/or
- missing datasets identified and implemented.

In general the field-truthing will:

- Check spatial units across the range of values from very low to very high. There is usually a focus on the very low and very high valued spatial units as these are considered to have the most influence to reduce the potential of a false negative (type I error) or a false positive (type II error) result.
- Check spatial units where there is a very low right next to a very high.
- Check stratification.
- Preference for field-truthing spatial units is given to units in the coastal areas as this is where the regulations will impact the most. There is also a preference to validate the medium and high spatial units as this is the borderline between whether they will be included in the regulations (i.e. the difference between wetlands of general ecological significance (GES) and high ecological significance (HES)).
- Field-truthing is not an attempt to confirm individual measure data (e.g. there is no effort to confirm the presence of a particular threatened species).

Field-truthing was not able to be completed for the *CYP ACA version 1.1* (see section 1.1).

3.6 General summary

Significant environmental features (or geographic areas) that are nominated by agreements or instruments such as Ramsar, *Directory of Important Wetlands* and World Heritage Area, influence conservation value results through the ACA process. These features/areas are not evenly distributed throughout the CYP catchments and are especially focused in the coastal areas. Wetlands in these areas usually score very high or high with respect to their conservation values and due to the distribution of the significant environmental areas, the wetlands are often spatially concentrated. For these reasons catchments such as Normanby, for example, have large numbers of very high value wetlands.

The dependability score is a percentage of how many available measures have data. The dependability does not influence or change the final AquaScore. The ACA results should be interpreted in conjunction with the dependability score. For example, where spatial units with very low AquaScore values have low dependability, the results should be used with caution as the AquaScore may be due to the inherent lack of values or the lack of data. In the case of missing data, further survey work may add more data which may, or may not, change the AquaScore.

When compared with catchments throughout Queensland the catchments of the CYP are generally slightly richer in data, as is reflected in the dependability values which are often 50% or greater.

Data availability is never equal for all wetlands in a study area. In the same way, expert knowledge is not usually available for every wetland in a study area. Dataset completeness is influenced spatially by research effort, enthusiast search effort, political focus, etc. AquaBAMM is designed to cope with data deficiencies, however wetlands with complete datasets are more likely to show an accurate final conservation value and they are more likely to have a species record of significance or other special feature (most likely due to increased investigative effort or functional understanding) that results in a very high or high conservation value score.

Whenever lines are drawn on a map (e.g. from the expert panels or *Directory of Important Wetlands* etc.), there is a risk that the boundary may be approximate at the scale of the individual spatial unit. For these types of decisions the boundary should always be considered at the appropriate scale. The wetlands mapping is the fundamental spatial input into this ACA and the wetlands are mapped at a scale of 1:100,000, except for areas along the east coast which are mapped at the 1:50,000 scale.

There was considerable variation in the size of subsections used in the assessments which may affect the results of some measure calculations. The subsection units in this ACA followed a trend of being smallest at the coast with units getting progressively larger upstream relative to the hierarchy and ordering of the stream network. The subsections were generally of an appropriate scale with the exception of a few inland units in the southern sections. It is recommended that, in future versions, these outliers be separated into units more consistent with the size of similar units i.e. units with a similar landscape complexity, ruggedness and variation in elevation.

In previous riverine ACAs in coastal areas the predominantly estuarine subsections were excluded from the riverine assessment. The exclusion rule does not apply to non-riverine ACAs and the subsections are still used for the calculations. The impact of not excluding the riverine subsections that are predominately estuarine is minimal. These subsections have remained in the riverine ACA (see section 1.1).

4 Recommendations

The results of an ACA, or AquaBAMM assessment output, may be used in a number of ways and for a number of purposes. Well-founded ecological or conservation values for aquatic ecosystems are a useful input to many natural resource management decision making processes including, for example, regional planning, development assessment, tenure negotiations or protected area estate review. In addition to the use of final AquaBAMM analysis scores, subordinate elements from each assessment may also be used for management and planning purposes. For example, prioritising natural resource management actions within a catchment (or other spatial unit) for rehabilitation, protection of high ecological value areas or other on-ground works may be achieved through the use of data from individual measures within AquaBAMM.

Interpretation of the CYP ACA results for the purposes of management priority or for development of management actions has not been undertaken as part of this project.

An analysis of the filtering table and how many spatial units triggered at each decision was performed. There does not appear to be any major inconsistencies in the hit analysis. In the longer term the hit analysis for all the ACAs should be compared to see if there are any redundant decisions or decisions that are inconsistent.

Species habitat models and pest habitat mapping from DAFF were available but were unable to be implemented (see section 1.1) and species records were used as an alternative. Habitat models usually provide a more ecologically realistic indication of habitat and are the preferred avenue for including species information in the ACAs. Future ACA versions should incorporate these habitat models, where possible.

The ACA was based on the stream network from the QWP and the subsections. Riverine wetlands as mapped by the QWP were not included in the riverine ACA. The ACA values are assigned to the subsection and the assumption is that all riverine wetlands (regardless of mapping source) have the relevant values. Further work is required to incorporate the excluded riverine wetlands into the riverine ACA.

Recommendations for next ACA version:

- Move the estuarine special features and species to a separate estuarine ACA. Completion of a separate estuarine ACA will depend on the availability of suitably attributed estuarine mapping.
- Complete a marine ACA depending on availability of suitably attributed marine mapping.
- Include external experts in the expert panels.
- Consider whether stratification, weighting and ranking should be applied.
- Field-truthing of the results.
- Review the subsections.

5 References

Abrahams, H., Mulvaney, M., Glasco, D. and Bugg, A. (1995). *Areas of Conservation Significance on Cape York Peninsula*. Report by Australian Heritage Commission and the Environmental Resources Information Network. Australia Government Publishing Service, Canberra.

Chessman, B. (2002). Assessing the conservation value and health of New South Wales rivers. The PBH (Pressure-Biota-Habitat) Project, New South Wales Department of Land and Water Conservation, Parramatta.

Clayton, P.D., Fielder, D.F., Howell, S. and Hill, C.J. (2006). *Aquatic biodiversity assessment and mapping method (AquaBAMM): a conservation values assessment tool for wetlands with trial application in the Burnett River catchment,* Published by the Environmental Protection Agency, Brisbane, ISBN 1-90928-07-3.

Earth Tech (2005). *Cape York Peninsula Natural Resources Management Plan*. Final draft to Cape York Interim Advisory Group.

EHP (2012a). Aquatic Conservation Assessment Wide Bay-Burnett Catchments v1.1. Riverine and non-riverine: Department of Environment and Heritage Protection, Queensland Government.

EHP (2012b). Biodiversity Planning Assessment Cape York Heritage Area v1.1. Summary Report: Department of Environment and Heritage Protection, Queensland Government.

Environmental Protection Agency (EPA) (2002). *Biodiversity Assessment and Mapping Methodology. Version 2.1, July2002,* (Environmental Protection Agency, Brisbane), <www.derm.qld.gov.au/services_resources>

Environmental Protection Agency (EPA) (2005). *Wetland Mapping and Classification Methodology – Overall Framework – A Method to Provide Baseline Mapping and Classification for Wetlands in Queensland, Version* 1.2, Queensland Government, Brisbane. ISBN 0 9757 344 6 6.

Sattler, P.S. and Williams, R.D. (Eds) (1999). *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

6 Attachments

6.1 Attachment A Aquatic flora, fauna and ecology riverine and non-riverine expert panel report

An Aquatic Conservation Assessment for the riverine and non-riverine wetlands of the Cape York catchments

Flora, fauna and ecology expert panel report

Prepared by:

Steven Howell[1] Manager, Biodiversity Assessment

Erin Kenna[1] Principal GIS Analyst

[1] Ecosystem Outcomes Branch, Conservation and Sustainability Services Division, Queensland Department of Environment and Heritage Protection, GPO Box 2454 BRISBANE QLD 4001

Citation

EHP. 2012. An Aquatic Conservation Assessment for the riverine and non-riverine wetlands of Cape York catchments. Flora, fauna and ecology expert panel report. Department of Environment and Heritage Protection, Queensland Government.

Acknowledgements

The authors wish to thank Shane Chemello, Simon Goudkamp, Chamendra Hewavisenthi, Lindsey Jones, David McFarland, Heidi Millington, Bruce Wannan.

Cover photograph – Wetland on Dixie Station, CYP from Bruce Wannan.

Version	Data Release Date	Report Release Date
1.1	9th December 2012	9th December 2012

Contents

List of tables

List of figures

1 Introduction

The Department of Environment and Heritage Protection (EHP) conducted an Aquatic Conservation Assessment (ACA) for the riverine, non-riverine and estuarine wetlands in the Cape York region using the Aquatic Biodiversity Assessment and Mapping Method (AquaBAMM) (Clayton et al. 2006).

AquaBAMM provides a robust and easily accessible analysis of wetland conservation values associated with a catchment or other defined study area. The AquaBAMM is a decision support tool that utilises existing information, with moderation by expert panels (e.g. flora, fauna and wetland ecology expert panels) to ensure scientific rigour and accountability, resulting in an ACA for a nominated geographic area—in this case, the Cape York region.

The potential for adding additional data into the system as it becomes available, with consequent updates to planning outcomes, is not limited. The AquaBAMM tool is a map/data output in a geographic information system (GIS) environment based on spatial mapping units that describe conservation significance or value for planning and assessment purposes.

The Cape York region ACA is made up of 17 individual catchments. EHP is applying AquaBAMM separately to the riverine, non-riverine (palustrine and lacustrine) and estuarine wetlands within each of the 17 Cape York catchments. In effect, there are 17 ACAs for the area—covering riverine, non-riverine and estuarine wetlands in each of the catchments. A map of the Cape York region showing each study area is provided in Figure 1.

Three expert panels were conducted to address aquatic fauna, aquatic and riparian flora and wetland ecology for the 17 Cape York catchments. The panels, held in Cairns on 7 and 8 August 2012, involved invited experts internal to the government with expertise in aquatic and riparian flora, aquatic fauna and/or wetland ecology.

This report documents the findings and recommendations of the expert panel and includes follow up information provided post panel by panel members and other experts. The report presents supporting information and panel input that addresses riverine, non-riverine and estuarine wetland systems. Terms of reference for the panel are provided in Attachment A.

For the purposes of this assessment, the species and special features identified as estuarine have been included in the ACA riverine results.

2 Method

2.1 Study area

Cape York Peninsula is a diverse and important region of tropical Australia covering approximately 13,720,000 hectares. The bioregion has a tropical humid/maritime climate, with rainfall varying from 1000 millimetres (mm) to 1600mm. It is a place of special heritage, containing vast and relatively undisturbed landscapes with extraordinary biological significance and diversity, and rich in Aboriginal culture.

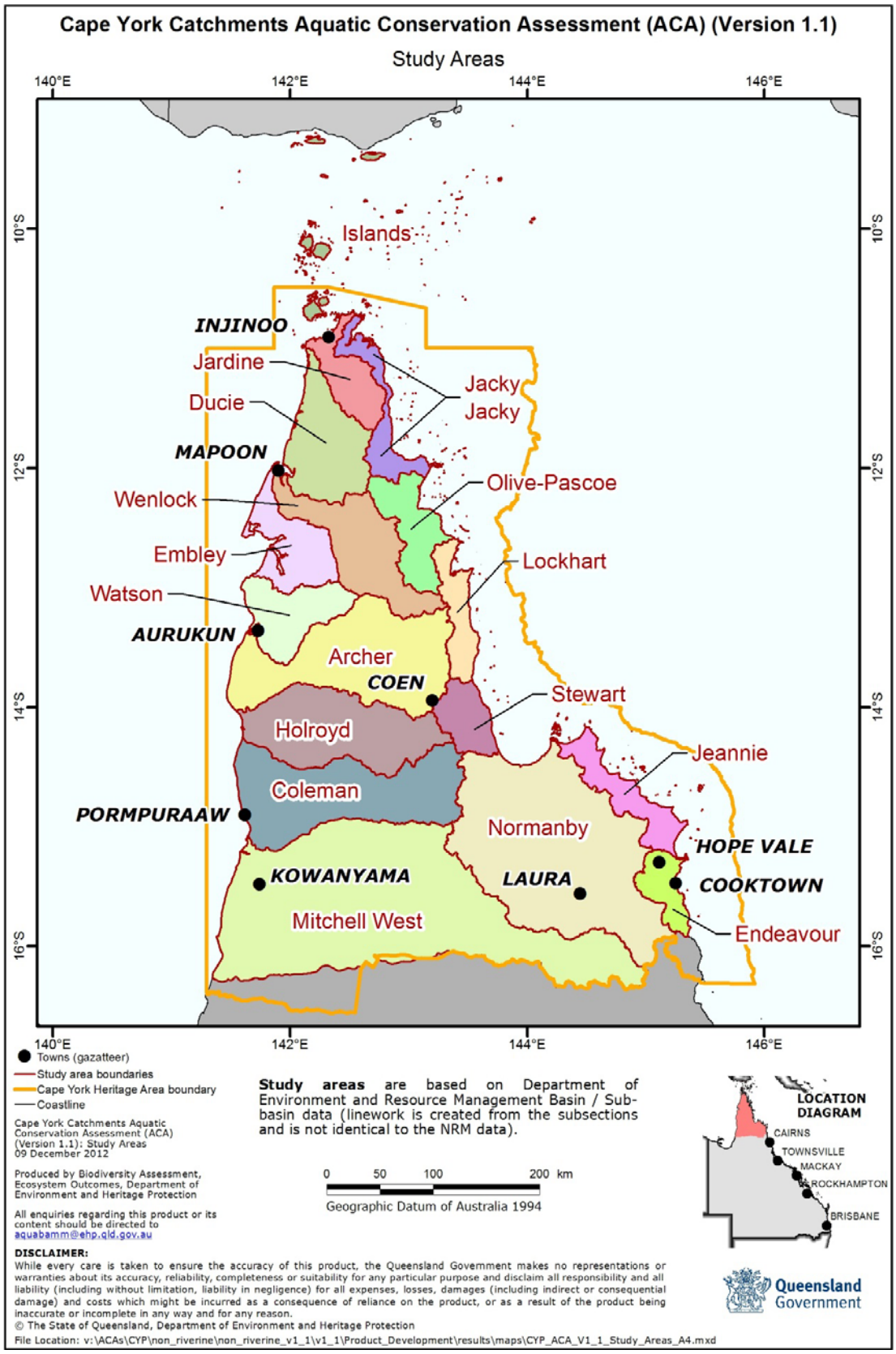
The bioregion has a complex geomorphology including low hills, plains, dunefields, boulder-fields, coral cays, continental islands, and alluvial areas (Sattler and Williams 1999). The region also has geological complexity. It is dominated by the Torres Strait Volcanics in the north. The metamorphic rocks and acid intrusive rocks of various ages of the Coen-Yambo Inlier run north–south along the eastern margin of the region and encompass the high-altitude/high-rainfall areas of Iron Range and McIlwraith Range. The deeply dissected sandstone plateaus and ranges of the Battle Camp Sandstones lie in the south of the region adjacent to the undulating Laura Lowlands composed of residual weathered sands and flat plains of colluvial and alluvial clays, silts and sands. The west of the region is dominated in the south by the extensive Tertiary sand sheets dissected by the intricate drainage systems of the Holroyd Plain, the Tertiary laterite of the undulating Weipa Plateau and the low rises of Mesozoic sandstones. The northern extension of the Weipa Plateau and extensive coastal plains adjoin the Gulf of Carpentaria. Extensive aeolian dunefields lie in the east associated with Cape Bedford/Cape Flattery in the south and the Olive and Jardine Rivers (Sattler and Williams 1999).

There are 9 sub-regions within the Cape York Peninsula bioregion. All sub-regions have high ecosystem diversity and endemism. The ecosystem diversity encompasses rainforests, woodlands, shrublands heaths, sedgelands, grasslands and mangroves, all in a relatively intact condition (Sattler and Williams 1999). This high habitat diversity comprises over 3000 flora species and supports a substantial proportion of Australia's native fauna (> 50% of all butterfly, 50% bird, 33% mammal, 25% reptile and 25% frog species) (Earth Tech 2005). A considerable number of these taxa are threatened and/or restricted to the bioregion (Abrahams et al. 1995).

One of the significant values of the bioregion is its relative intactness. The overall condition of Cape York Peninsula is good with some declines in ecosystems, wetlands, riparian vegetation and species. Only limited clearing of vegetation has occurred in the bioregion. A main potential agent of change in the bioregion is the impact of altered fire regimes on vegetation (Sattler and Williams 1999).

The project region considered in this assessment includes 17 study areas for assessment. The southern boundary of the study area is as defined under the *Cape York Peninsula Heritage Act 2007* (Figure 1), which incorporates parts of the Gulf Plains, Einasleigh Uplands, and Wet Tropics bioregions. However, it will exclude the Queensland Wet Tropics World Heritage area in the south-east.

Figure 1: The Cape York study area



2.2 Panel composition

The expert panel comprised of the persons listed in Table 1 who are familiar with aquatic fauna, flora and ecology in the Cape York region. Some members who were unavailable to attend the workshop were consulted prior to, or after, the workshop.

Table 1: Panel members

Participants	**Organisation**	**Attendance day**
Bruce Wannan	EHP, RSD	1 and 2
Eda Addicott	SITIA, Herbarium	1 and 2
Mark Newton	SITIA, Herbarium	1 and 2
John Clarkson	NPRSR, QPWS	1 and 2
Keith McDonald	EHP, Threatened Species	1 and 2
Alastair Freeman	EHP, Threatened Species	1 and 2
Ashley Field	SITIA, Herbarium	1 and 2
Mike Trenerry	EHP, RSD	1 and 2
Lyn Wallace	EHP, CYP	1
Colin Dollery	NPRSR, QPWS	1 and 2
Daryn Storch	NPRSR, QPWS	1 and 2
Kerryn Oconor	EHP, EO	1
Buzz Symonds	EHP, CYP	1
Simon Thompson	EHP, Nature Refuges	1 and 2
Steven Howell	EHP, EO – Chair	1 and 2
Lindsey Jones	EHP, EO – co-chair	1 and 2
Robert Hughes	EHP, EO	1
Additional persons consulted		**Via**
Niall Connolly	EHP, RSD	email
John Winter	EHP, Threatened Species	email
Gethin Morgan	EHP, RSD	email
John Neldner	SITIA, Herbarium	email
Rod Fensham	SITIA, Herbarium	email
Paul Forster	SITIA, Herbarium	email
Col Limpus	EHP, Threatened Species	In person

Lindsey Jones (Principal Biodiversity Planning Officer) from EHP provided technical support for the panel workshops with Steven Howell (Manager, Biodiversity Assessment) as the workshop facilitator.

2.3 Workshop format

The workshop used an interactive approach of ArcView GIS software to display point records of species and their spatial distributions. Where necessary, a background of topographic maps, roads, rivers and other relevant datasets were used to identify areas of interest. Additional supporting information on flora, fauna and ecology in the Cape York region was also sourced from various technical reports.

3 Flora

3.1 Near threatened and threatened flora

The panel identified 27 threatened flora taxa in the Cape York region (Table 2). This list of flora will be used as the basis for identifying areas of significance for 'Criterion 4 Threatened species and ecosystems' (4.1.2).

Table 2: Aquatic, semi-aquatic and riparian flora species listed under Queensland or Commonwealth legislation

This list was used to generate the values for the AquaBAMM measure 4.1.2.

Scientific name	Common name	R[1]	NR	ES	NCA[2]	EPBC[3]	Comments
Arthraxon hispidus		Y	Y		V	V	
Astonia australiensis			Y		E		
Caesalpinia hymenocarpa		Y			NT		
Crepidium lawleri			Y		E	E	
Cyathea exilis		Y	Y		E	E	
Cyathea felina		Y	Y		E		
Dallwatsonia felliana			Y		NT		
Ectrosia blakei		Y	Y		V	V	
Eleocharis retroflexa		Y	Y		V	V	
Garnotia stricta var. *longiseta*			Y		NT		
Germainia capitata			Y		V	V	
Hedyotis novoguineensis			Y		E		
Lindsaea walkerae			Y		NT		
Livistona concinna		Y			NT		
Lycopodiella limosa			Y		NT		
Myriophyllum coronatum		Y	Y		V	V	
Paramapania parvibractea			Y		NT		
Rhamphicarpa australiensis			Y		NT		
Schoenus scabripes			Y		NT		
Sesbania erubescens			Y		NT		
Spathoglottis paulinae		Y	Y		NT		
Spathoglottis plicata	New Guinea ground orchid		Y		V	V	
Sticherus milnei			Y		NT		
Stylidium longissimum			Y		V		
Stylidium trichopodum			Y		NT		
Syzygium aqueum	water apple	Y			NT		
Syzygium malaccense	Malay apple	Y			NT		
Tectaria siifolia		Y			NT		

[1] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)
[2] Queensland *Nature Conservation Act 1992* (E – endangered, V – vulnerable, NT – near threatened, LC – least concern)
[3] *Environment Protection and Biodiversity Conservation Act 1999* (E – endangered, V – vulnerable)

3.2 Priority flora

Due to time constraints the panel was not able to fully deliberate on all aquatic, semi-aquatic and riparian species within the Cape York region to identify 'priority flora' (excluding the rare or threatened species listed in Table 2). We have adopted a revised version of the earlier definition of a priority species from the Wide Bay-Burnett ACA namely that a priority species must exhibit one or more of the following significant values:

1. It forms significant macrophyte beds (in shallow or deep water).
2. It is an important/critical food source.
3. It is important/critical habitat.
4. It is implicated in spawning or reproduction for other fauna and/or flora species.
5. It is at its distributional limit or is a disjunct population.
6. It provides stream bank or bed stabilisation or has soil-binding properties.
7. It is a small population and subject to threatening processes.

Post panel, a number of riverine, non-riverine and estuarine priority flora species have been identified (Table 3). These species are to be included as part of 'Criterion 5 Priority species and ecosystems' (5.1.2).

Table 3: Identified priority flora species and their significant values

This list was used to generate the values for the AquaBAMM measure (5.1.2).

Scientific name	Common name	R[4]	NR	ES	Priority number[5]	Comments
Acrostichum speciosum	mangrove fern	Y	Y	Y	1	
Azolla filiculoides	red azolla	Y	Y		1,2,3,4	
Azolla pinnata	ferny azolla	Y	Y		1,2,3,4	
Banksia robur	broad-leaved banksia		Y		2,6	
Baumea rubiginosa	soft twigrush		Y		2,3,4,6	
Baumea teretifolia		Y	Y		2,3,4,6	
Casuarina cunninghamiana		Y			2,3,6	
Casuarina cunninghamiana subsp. *cunninghamiana*		Y			2,3,6	
Ceratophyllum demersum	hornwort	Y			1,2,3,4	
Ceratopteris thalictroides		Y	Y		2,3,4	
Commelina agrostophylla			Y		3	
Crinum pedunculatum	river lily	Y	Y		2,3,4,6	
Cyperus exaltatus	tall flatsedge	Y	Y		2,3,4,6	
Eleocharis atropurpurea			Y		7	
Eleocharis brassii			Y		7	
Eleocharis dulcis		Y	Y	Y	1,6,7	
Eleocharis equisetina			Y		2,3,4,6	
Eleocharis geniculata			Y		2,3,4,6	
Eleocharis minuta			Y		7	
Eleocharis nuda		Y	Y		7	
Eleocharis philippinensis		Y	Y		2,3,4,6	
Eleocharis sphacelata	tall spikerush	Y	Y		2,3,4,6	
Eleocharis spiralis			Y		7	
Eucalyptus camaldulensis		Y	Y		2,3,6	
Eucalyptus tereticornis		Y	Y		3,6,7	
Ficus racemosa var. *racemosa*		Y			2,3,6	
Gahnia sieberiana	sword grass		Y		2,3,4	
Hymenachne acutigluma		Y	Y		3	
Leersia hexandra	swamp rice grass	Y	Y		2,3,4,6	
Lemna aequinoctialis	common	Y	Y		2,3,4	

[4] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

[5] The priority numbers are the values that a species must exhibit to be a priority species as listed in dot points above Table 3

Scientific name	Common name	R[4]	NR	ES	Priority number[5]	Comments
	duckweed					
Lepidosperma laterale		Y	Y		1,2	
Lepironia articulata		Y	Y		2,3,4,6	
Limnophila aromatica		Y	Y		1	*Limnophila aromatica*
Limnophila brownii		Y	Y		1,2	
Lindernia tenuifolia			Y		7	
Lomandra longifolia		Y			1	
Ludwigia adscendens		Y	Y		1,2,5	
Ludwigia peploides subsp. *montevidensis*		Y	Y		2,3,4,6	
Marsilea crenata			Y		2,3,4,6	
Marsilea drummondii	common nardoo	Y	Y		2,3,4,6	
Marsilea mutica	shiny nardoo	Y	Y		2,3,4,6	
Melaleuca bracteata		Y	Y		2,3,4,6	
Melaleuca dealbata	swamp tea-tree	Y	Y		2,3,4,6	
Melaleuca fluviatilis		Y			2,3,4,6	
Melaleuca leucadendra	broad-leaved tea-tree	Y	Y		2,3,6	
Melaleuca quinquenervia	swamp paperbark	Y	Y		2,3,4,6	
Melaleuca trichostachya		Y	Y		2,3,4,6	
Melaleuca viminalis		Y	Y		2,3,4,6	
Melaleuca viridiflora			Y		5	
Monochoria cyanea			Y		2,3,4	
Myriophyllum verrucosum	water milfoil	Y	Y		1,2,3,4,6	
Najas tenuifolia	water nymph	Y	Y		1,2,3,4	
Nelumbo nucifera	pink waterlily	Y	Y		1,2,3	
Nitella tasmanica		Y	Y		1,2,3,4	No valid records available at time of implementation.
Nymphaea alexii		Y			1	No valid records available at time of implementation.
Nymphaea atrans			Y		1	
Nymphaea carpentariae			Y		1	
Nymphaea elleniae		Y	Y		1	
Nymphaea immutabilis		Y	Y		2	
Nymphaea macrosperma		Y	Y		1	
Nymphaea nouchali		Y			1	No valid records available at time of implementation.
Nymphaea noelae			Y		1	
Nymphaea violacea		Y	Y		1	
Nymphoides exiliflora		Y	Y		2,3,4	
Nymphoides indica	water snowflake	Y	Y		2,3,4	
Nypa fruticans		Y		Y	2,3,6	
Oryza australiensis			Y		2,3	
Oryza meridionalis			Y		2,3	
Oryza rufipogon		Y	Y		2,3	
Ottelia ovalifolia	swamp lily	Y	Y		2,3,4	
Pandanus cookii		Y			3	
Pandanus spiralis		Y	Y		4	
Paspalum distichum	water couch	Y	Y		2,3,4,6	No valid records available at time of implementation.
Persicaria attenuata		Y	Y		2,3,4,6	
Persicaria barbata		Y	Y	Y	2,3,4,6	
Persicaria decipiens	slender knotweed	Y	Y		2,3,4,6	
Persicaria orientalis	princes feathers	Y	Y		2,3,4,6	
Phragmites australis	common reed	Y	Y	Y	2,3,4,6	
Potamogeton crispus	curly pondweed	Y	Y		1,2,3,4	
Potamogeton octandrus		Y	Y		1,2,3,4	
Potamogeton tricarinatus	floating pondweed	Y	Y		1,2,3,4	
Pseudoraphis spinescens	spiny mudgrass		Y		2,3,4,6	
Schoenoplectus mucronatus		Y	Y		2,3,4,6	
Schoenoplectus subulatus		Y	Y	Y	2,3,4,6	
Scleria mackaviensis		Y	Y		2,3	
Sphenoclea zeylanica		Y	Y		1	
Tapheocarpa calandrinioides			Y		1,2,3,5,7	
Typha domingensis		Y	Y		2,3,4,6	

Scientific name	Common name	R[4]	NR	ES	Priority number[5]	Comments
Typha orientalis	broad-leaved cumbungi	Y	Y		2,3,4,6	
Utricularia aurea	golden bladderwort	Y	Y		1,2,3,4	
Utricularia caerulea	blue bladderwort	Y	Y		1,2,3,4	
Utricularia gibba	floating bladderwort	Y	Y		1,2,3,4	
Utricularia lateriflora	small bladderwort		Y		1,2,3,4	
Utricularia stellaris		Y	Y		1,2,3,4	
Utricularia uliginosa		Y	Y		1,2,3,4	
Vallisneria nana		Y	Y		1,2,3,4	

3.3 Species richness

Species richness (total number of species) was scored for wetland indicator species. Stratifying the catchments is important to describe variability in richness. The catchments of the Cape York region have a number of non-riverine, riverine and estuarine plants that are referred to in this report as 'wetland indicator species' (Table 4). The datasets for these species were accessed from EHP corporate databases of WildNet and Herbrecs and from panel member records.

Wetland indicator species are defined as those species that are adapted to and dependent on living in wet conditions for at least part of their life and are found either within or immediately adjoining a riverine, non-riverine or estuarine wetland.

This definition of a wetland indicator species extends beyond the more traditional definition of submerged and floating aquatic plants to include plants inhabiting the littoral zone (waters edge) and plants that usually have 'wet feet' on the toe of the bank. This meaning best captures the intent of the AquaBAMM indicator and measure of species richness 'Richness of wetland dependent plants' (3.1.5). The indicator is a measure of floristic richness of a particular spatial unit's aquatic environment, and hence, a broad definition will better depict the flora richness value at a given location.

Table 4: Wetland-dependent native flora species including priority species

This list will be used to calculate an aquatic and riparian flora richness score (3.1.5), threatened flora species (4.1.2) and priority flora species (5.1.2).

Scientific name	Common name	R[6]	NR	ES	NCA[7]	EPBC[8]	Comments
Abildgaardia ovata			Y		LC		
Abildgaardia vaginata			Y		LC		
Acrostichum speciosum	mangrove fern	Y	Y	Y	LC		
Actinoscirpus grossus			Y		LC		
Aegialitis annulata	club mangrove			Y	LC		
Aegiceras corniculatum	river mangrove			Y	LC		
Aeschynomene indica	budda pea		Y		LC		
Alternanthera nodiflora	joyweed			Y	LC		
Ammannia multiflora	jerry-jerry	Y	Y		LC		
Aponogeton queenslandicus		Y	Y		LC		
Aponogeton vanbruggenii		Y	Y		LC		
Arthraxon hispidus		Y	Y		V	V	
Arthropodium strictum		Y	Y		LC		
Arthrostylis aphylla			Y		LC		
Astonia australiensis			Y		E		
Avicennia marina		Y		Y	LC		
Avicennia marina subsp. *eucalyptifolia*				Y	LC		
Azolla filiculoides	red azolla	Y	Y		LC		
Azolla pinnata	ferny azolla	Y	Y		LC		
Baeckea frutescens			Y		LC		

[6] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

[7] Queensland *Nature Conservation Act 1992* (E – endangered, V – vulnerable, NT – near threatened, LC – least concern)

[8] *Environment Protection and Biodiversity Conservation Act 1999* (E – endangered, V – vulnerable)

Scientific name	Common name	R[6]	NR	ES	NCA[7]	EPBC[8]	Comments
Baloskion tetraphyllum			Y		LC		
Banksia robur	broad-leaved banksia		Y		LC		
Barringtonia racemosa		Y	Y		LC		
Batis argillicola				Y	LC		
Baumea rubiginosa	soft twigrush		Y		LC		
Baumea teretifolia		Y	Y		LC		
Bergia ammannioides		Y	Y		LC		No valid records available at time of implementation.
Bergia pusilla			Y		LC		
Blechnum indicum	swamp water fern	Y	Y		LC		
Blyxa aubertii		Y			LC		
Blyxa octandra		Y			LC		
Bruguiera gymnorhiza	large-fruited orange mangrove	Y		Y	LC		
Bulbostylis barbata			Y		LC		
Bulbostylis densa		Y	Y		LC		
Byblis liniflora			Y		LC		
Caesalpinia bonduc	nicker bean			Y	LC		
Caesalpinia hymenocarpa		Y			NT		
Caldesia acanthocarpa		Y	Y		LC		
Caldesia oligococca			Y		LC		
Cartonema brachyantherum			Y		LC		
Castanospermum australe	black bean	Y			LC		
Casuarina cunninghamiana		Y			LC		
Casuarina cunninghamiana subsp. *cunninghamiana*		Y			LC		
Centella asiatica		Y	Y		LC		
Centipeda borealis			Y		LC		
Centipeda minima			Y		LC		
Centrolepis banksii		Y	Y		LC		
Centrolepis exserta		Y	Y		LC		
Centrolepis strigosa		Y	Y		LC		
Ceratophyllum demersum	hornwort	Y			LC		
Ceratopteris thalictroides		Y	Y		LC		
Ceriops tagal	yellow mangrove			Y	LC		
Clerodendrum inerme	coastal lolly bush			Y	LC		
Commelina agrostophylla			Y		LC		
Corymbia tessellaris	Moreton Bay ash	Y			LC		
Crepidium lawleri			Y		E	E	
Crinum pedunculatum	river lily	Y	Y		LC		
Cyanotis axillaris			Y		LC		
Cyathea exilis		Y	Y		E	E	
Cyathea felina		Y	Y		E		
Cyperus alopecuroides		Y	Y		LC		
Cyperus aquatilis		Y	Y		LC		
Cyperus bowmannii		Y	Y		LC		
Cyperus bulbosus		Y	Y		LC		
Cyperus castaneus		Y	Y		LC		
Cyperus conicus		Y	Y		LC		
Cyperus conicus var. *conicus*		Y			LC		
Cyperus cyperinus		Y	Y		LC		No valid records available at time of implementation.
Cyperus cyperoides		Y	Y		LC		
Cyperus decompositus		Y	Y		LC		
Cyperus difformis	rice sedge	Y	Y		LC		
Cyperus digitatus		Y	Y		LC		
Cyperus distans		Y			LC		
Cyperus enervis		Y			LC		
Cyperus exaltatus	tall flatsedge	Y	Y		LC		
Cyperus flaccidus		Y	Y		LC		

Scientific name	Common name	R[6]	NR	ES	NCA[7]	EPBC[8]	Comments
Cyperus flavidus		Y	Y		LC		
Cyperus fulvus		Y	Y		LC		
Cyperus gracilis		Y	Y		LC		
Cyperus haspan		Y	Y		LC		
Cyperus haspan subsp. *haspan*		Y	Y		LC		
Cyperus holoschoenus		Y	Y		LC		
Cyperus iria		Y	Y		LC		
Cyperus javanicus		Y	Y		LC		
Cyperus leiocaulon		Y	Y		LC		No valid records available at time of implementation.
Cyperus lucidus		Y	Y		LC		
Cyperus nervulosus		Y	Y		LC		
Cyperus nutans var. *eleusinoides*	flatsedge	Y	Y		LC		
Cyperus polystachyos		Y	Y		LC		
Cyperus polystachyos var. *polystachyos*		Y			LC		
Cyperus procerus			Y		LC		
Cyperus pulchellus		Y	Y		LC		
Cyperus pygmaeus	dwarf sedge	Y	Y		LC		
Cyperus scariosus			Y	Y	LC		
Cyperus squarrosus	bearded flatsedge	Y	Y		LC		
Cyperus subulatus			Y		LC		
Cyperus tetracarpus		Y	Y		LC		
Cyperus trinervis		Y	Y		LC		
Dallwatsonia felliana			Y		NT		
Dicranopteris linearis var. *linearis*			Y		LC		
Drosera angustifolia			Y		LC		
Drosera burmanni			Y		LC		
Drosera indica		Y	Y		LC		
Drosera peltata	pale sundew		Y		LC		
Drosera spatulata		Y	Y		LC		
Echinochloa telmatophila	swamp barnyard grass	Y	Y		LC		
Echinochloa turneriana	channel millet	Y	Y		LC		
Eclipta platyglossa				Y	LC		
Eclipta prostrata	white eclipta		Y		LC		
Ectrosia blakei		Y	Y		V	V	
Elatine gratioloides	waterwort	Y	Y		LC		
Eleocharis atropurpurea			Y		LC		
Eleocharis brassii			Y		LC		
Eleocharis dulcis		Y	Y	Y	LC		
Eleocharis equisetina			Y		LC		
Eleocharis geniculata			Y		LC		
Eleocharis minuta			Y				
Eleocharis nuda		Y	Y		LC		
Eleocharis ochrostachys		Y	Y		LC		
Eleocharis philippinensis		Y	Y		LC		
Eleocharis retroflexa		Y	Y		V	V	
Eleocharis setifolia subsp. *setifolia*			Y		LC		
Eleocharis sphacelata	tall spikerush	Y	Y		LC		
Eleocharis spiralis			Y		LC		
Enchylaena tomentosa			Y	Y	LC		No valid records available at time of implementation.
Epaltes australis	spreading nutheads		Y		LC		
Eriocaulon athertonense		Y	Y		LC		
Eriocaulon australe			Y		LC		
Eriocaulon cinereum			Y		LC		
Eriocaulon nanum			Y		LC		
Eriocaulon odontospermum			Y		LC		
Eriocaulon pygmaeum			Y		LC		

Scientific name	Common name	R[6]	NR	ES	NCA[7]	EPBC[8]	Comments
Eriocaulon scariosum			Y		LC		
Eriocaulon setaceum			Y		LC		
Eucalyptus acroleuca	Lakefield coolibah	Y	Y		LC		
Eucalyptus camaldulensis		Y	Y		LC		
Eucalyptus camaldulensis subsp. *acuta* Brooker and M.W.McDonald x *E.platyphylla*		Y	Y		LC		
Eucalyptus camaldulensis subsp. *simulata*		Y	Y		LC		
Eucalyptus microtheca	coolibah	Y	Y		LC		
Eucalyptus platyphylla	poplar gum		Y		LC		
Eucalyptus tereticornis		Y	Y		LC		
Excoecaria agallocha	milky mangrove			Y	LC		
Excoecaria ovalis				Y	LC		
Ficus coronata	creek sandpaper fig	Y	Y		LC		
Ficus racemosa		Y			LC		
Ficus racemosa var. *racemosa*		Y			LC		
Fimbristylis aestivalis		Y	Y		LC		
Fimbristylis aestivalis var. *aestivalis*			Y		LC		
Fimbristylis bisumbellata		Y	Y		LC		
Fimbristylis depauperata		Y			LC		
Fimbristylis dichotoma	common fringe-rush	Y	Y		LC		
Fimbristylis ferruginea		Y	Y		LC		
Fimbristylis littoralis		Y	Y		LC		
Fimbristylis microcarya		Y	Y		LC		
Fimbristylis neilsonii		Y	Y		LC		
Fimbristylis nuda		Y	Y		LC		
Fimbristylis nutans		Y	Y		LC		
Fimbristylis pauciflora		Y	Y		LC		
Fimbristylis polytrichoides			Y	Y	LC		
Fimbristylis velata		Y	Y		LC		
Fuirena ciliaris		Y	Y		LC		
Fuirena incrassata		Y	Y		LC		
Fuirena umbellata		Y	Y		LC		
Gahnia aspera		Y			LC		
Gahnia sieberiana	sword grass		Y		LC		
Garnotia stricta var. *longiseta*			Y		NT		
Germainia capitata			Y		V	V	
Gleichenia dicarpa	pouched coral fern	Y	Y		LC		
Glinus lotoides	hairy carpet weed			Y	LC		
Gonocarpus chinensis		Y	Y		LC		
Hedyotis novoguineensis			Y		E		
Hibiscus tiliaceus	cotton tree	Y		Y	LC		
Hydrocotyle grammatocarpa			Y		LC		
Hydrolea zeylanica			Y		LC		
Hygrophila angustifolia		Y	Y		LC		
Hymenachne acutigluma		Y	Y		LC		
Ipomoea aquatica			Y		LC		
Isachne confusa			Y		LC		
Isachne globosa	swamp millet		Y		LC		
Ischaemum australe var. *australe*			Y		LC		
Ischaemum fragile			Y		LC		
Leersia hexandra	swamp rice grass	Y	Y		LC		
Lemna aequinoctialis	common duckweed	Y	Y		LC		
Lepidosperma laterale		Y	Y		LC		

Scientific name	Common name	R[6]	NR	ES	NCA[7]	EPBC[8]	Comments
Lepidosperma laterale var. *laterale*			Y		LC		
Lepironia articulata		Y	Y		LC		
Leptochloa fusca	brown beetle grass	Y	Y		LC		
Leptochloa fusca subsp. *fusca*			Y		LC		
Limnophila aromatica		Y	Y		LC		
Limnophila brownii		Y	Y		LC		
Limnophila fragrans		Y	Y		LC		
Lindernia anagallis			Y		LC		
Lindernia antipoda			Y		LC		
Lindernia aplectra		Y	Y		LC		
Lindernia sp. (Violet Vale B.S.Wannan+ 1865)			Y		LC		
Lindernia tenuifolia			Y		LC		
Lindsaea walkerae			Y		NT		
Liparophyllum exaltatum			Y		LC		No valid records available at time of implementation.
Lipocarpha microcephala		Y	Y		LC		
Livistona concinna		Y			NT		
Lomandra longifolia		Y			LC		
Lomandra multiflora		Y			LC		No valid records available at time of implementation.
Lophostemon grandiflorus		Y			LC		
Lophostemon grandiflorus subsp. *riparius*		Y			LC		
Lophostemon suaveolens	swamp box	Y	Y		LC		
Ludwigia adscendens		Y	Y		LC		
Ludwigia octovalvis	willow primrose	Y	Y		LC		
Ludwigia peploides		Y	Y				
Ludwigia peploides subsp. *montevidensis*		Y	Y		LC		
Lycopodiella cernua			Y		LC		
Lycopodiella limosa			Y		NT		
Lygodium microphyllum	snake fern	Y	Y		LC		
Marsilea crenata			Y		LC		
Marsilea drummondii	common nardoo	Y	Y		LC		
Marsilea mutica	shiny nardoo	Y	Y		LC		
Melaleuca argentea	silver tea-tree	Y			LC		
Melaleuca bracteata		Y	Y		LC		
Melaleuca dealbata	swamp tea-tree	Y	Y		LC		
Melaleuca fluviatilis		Y			LC		
Melaleuca leucadendra	broad-leaved tea-tree	Y	Y		LC		
Melaleuca polandii		Y			LC		
Melaleuca quinquenervia	swamp paperbark	Y	Y		LC		
Melaleuca trichostachya		Y	Y		LC		
Melaleuca viminalis		Y	Y		LC		
Melaleuca viridiflora			Y		LC		
Melaleuca viridiflora var. *viridiflora*			Y		LC		
Melastoma malabathricum subsp. *malabathricum*			Y		LC		
Millettia pinnata		Y			LC		
Monochoria australasica		Y	Y		LC		
Monochoria cyanea			Y		LC		
Monochoria vaginalis			Y		LC		
Muehlenbeckia rhyticarya		Y	Y		LC		No valid records available at time of implementation.
Murdannia gigantea			Y		LC		
Murdannia graminea	murdannia		Y		LC		
Myriophyllum coronatum		Y	Y		V	V	
Myriophyllum dicoccum		Y	Y		LC		
Myriophyllum filiforme			Y		LC		

Scientific name	Common name	R[6]	NR	ES	NCA[7]	EPBC[8]	Comments
Myriophyllum implicatum			Y		LC		
Myriophyllum muricatum		Y	Y		LC		
Myriophyllum verrucosum	water milfoil	Y	Y		LC		
Najas tenuifolia	water nymph	Y	Y		LC		
Nauclea orientalis	Leichhardt tree	Y			LC		
Nelumbo nucifera	pink waterlily	Y	Y		LC		
Nepenthes mirabilis	tropical pitcher plant		Y		LC		
Nitella tasmanica		Y	Y		LC		No valid records available at time of implementation.
Nymphaea alexii			Y		LC		No valid records available at time of implementation.
Nymphaea atrans			Y		LC		
Nymphaea carpentariae			Y		LC		
Nymphaea elleniae		Y	Y		LC		
Nymphaea immutabilis		Y	Y		LC		
Nymphaea macrosperma		Y	Y		LC		
Nymphaea noelae			Y		LC		
Nymphaea nouchali			Y		LC		
Nymphaea violacea		Y	Y		LC		
Nymphoides aurantiaca			Y		LC		
Nymphoides crenata	wavy marshwort	Y	Y		LC		
Nymphoides exiliflora		Y	Y		LC		
Nymphoides geminata			Y		LC		
Nymphoides indica	water snowflake	Y	Y		LC		
Nymphoides parvifolia			Y		LC		
Nymphoides triangularis		Y			LC		
Nypa fruticans		Y		Y	LC		
Ornduffia reniformis			Y		LC		
Ornduffia sp. (Laura C.Dalliston CC18)			Y		LC		
Oryza australiensis			Y		LC		
Oryza meridionalis			Y		LC		
Oryza rufipogon		Y	Y		LC		
Ottelia ovalifolia	swamp lily	Y	Y		LC		
Pandanus cookii		Y			LC		
Pandanus spiralis		Y	Y		LC		
Panicum larcomianum		Y	Y		LC		
Panicum paludosum	swamp panic		Y		LC		
Paramapania parvibractea			Y		NT		Suggested inclusion - Bruce Wannan 08/2012
Paspalum distichum		Y	Y		LC		No valid records available at time of implementation.
Paspalum vaginatum	saltwater couch		Y	Y	LC		
Pemphis acidula				Y	LC		
Persicaria attenuata		Y	Y		LC		
Persicaria attenuata x *Polygonum glabrum*		Y	Y		LC		
Persicaria barbata		Y	Y	Y	LC		
Persicaria decipiens	slender knotweed	Y	Y		LC		
Persicaria orientalis	princes feathers	Y	Y		LC		
Philydrum lanuginosum	frogsmouth		Y		LC		
Phragmites australis	common reed	Y	Y	Y	LC		
Phragmites karka		Y	Y		LC		
Phyla nodiflora	carpetweed	Y	Y		LC		
Platyzoma microphyllum	braid fern	Y	Y		LC		
Polygonum plebeium	small knotweed	Y	Y		LC		
Potamogeton crispus	curly pondweed	Y	Y		LC		
Potamogeton octandrus		Y	Y		LC		
Potamogeton tricarinatus	floating pondweed	Y	Y		LC		
Pseudoraphis spinescens	spiny mudgrass		Y		LC		
Rhamphicarpa australiensis			Y		NT		
Rhizoclonium implexum		Y	Y		LC		

Scientific name	Common name	R[6]	NR	ES	NCA[7]	EPBC[8]	Comments
Rhizophora stylosa	spotted mangrove			Y	LC		
Rhynchospora brownii	beak rush	Y	Y		LC		
Rhynchospora corymbosa		Y	Y		LC		
Rhynchospora heterochaeta		Y	Y		LC		
Rhynchospora rubra		Y	Y		LC		
Rotala mexicana			Y		LC		
Rotala occultiflora			Y		LC		
Rotala tripartita			Y		LC		
Sacciolepis indica	Indian cupscale grass		Y		LC		
Salsola kali	soft roly-poly			Y	LC		
Schoenoplectus lateriflorus		Y	Y		LC		
Schoenoplectus mucronatus		Y	Y		LC		
Schoenoplectus subulatus		Y	Y	Y	LC		
Schoenoplectus validus		Y	Y		LC		
Schoenus apogon var. *apogon*		Y	Y		LC		
Schoenus falcatus		Y	Y		LC		
Schoenus scabripes			Y		NT		
Schoenus sparteus			Y		LC		
Scirpodendron ghaeri			Y		LC		
Scleria brownii		Y	Y		LC		
Scleria mackaviensis		Y	Y		LC		
Scleria rugosa		Y	Y		LC		
Scleria sphacelata		Y	Y		LC		
Sesbania cannabina		Y	Y		LC		
Sesbania erubescens			Y		NT		
Sesuvium portulacastrum	sea purslane			Y	LC		
Sonneratia alba				Y	LC		
Spathoglottis paulinae		Y	Y		NT		
Spathoglottis plicata	New Guinea ground orchid		Y		V	V	
Sphenoclea zeylanica		Y	Y		LC		
Sporobolus virginicus	sand couch			Y	LC		
Sticherus flabellatus var. *flabellatus*		Y	Y	Y	LC		
Sticherus milnei			Y		NT		
Stylidium graminifolium	grassy-leaved trigger-flower		Y		LC		
Stylidium longissimum			Y		V		
Stylidium schizanthum		Y	Y		LC		
Stylidium trichopodum			Y		NT		
Suaeda australis		Y	Y		LC		
Syzygium angophoroides		Y			LC		
Syzygium aqueum	water apple	Y			NT		
Syzygium malaccense	Malay apple	Y			NT		
Syzygium oleosum	blue cherry	Y			LC		
Syzygium tierneyanum	river cherry	Y			LC		
Tapheocarpa calandrinioides			Y		C		
Tectaria siifolia		Y			NT		
Tecticornia australasica				Y	LC		
Tecticornia indica				Y	LC		
Tecticornia indica subsp. *indica*				Y	LC		
Tecticornia indica subsp. *leiostachya*				Y	LC		
Tecticornia pergranulata				Y	LC		
Tecticornia pergranulata subsp. queenslandica				Y	LC		
Terminalia sericocarpa	damson	Y			LC		
Thespesia populnea				Y	LC		
Thespesia populneoides				Y	LC		
Trachystylis stradbrokensis			Y		LC		
Trentepohlia abietina		Y			LC		

Scientific name	Common name	R[6]	NR	ES	NCA[7]	EPBC[8]	Comments
Trentepohlia arborum		Y			LC		No valid records available at time of implementation.
Trentepohlia bossei var. *samoensis*		Y			LC		No valid records available at time of implementation.
Trentepohlia effusa		Y			LC		No valid records available at time of implementation.
Trentepohlia peruana		Y			LC		
Trentepohlia rigidula		Y			LC		
Trianthema triquetra	red spinach			Y	LC		
Triglochin dubia			Y		LC		
Triglochin procera		Y	Y		LC		
Tristaniopsis exiliflora	kanuka box	Y			LC		
Typha domingensis		Y	Y		LC		
Typha orientalis	broad-leaved cumbungi	Y	Y		LC		
Utricularia albiflora			Y		LC		
Utricularia aurea	golden bladderwort	Y	Y		LC		
Utricularia australis	yellow bladderwort	Y	Y		LC		No valid records available at time of implementation.
Utricularia bifida		Y	Y		LC		
Utricularia caerulea	blue bladderwort	Y	Y		LC		
Utricularia chrysantha			Y		LC		
Utricularia gibba	floating bladderwort	Y	Y		LC		
Utricularia lateriflora	small bladderwort		Y		LC		
Utricularia limosa			Y		LC		
Utricularia minutissima			Y		LC		
Utricularia muelleri			Y		LC		
Utricularia quinquedentata			Y		LC		
Utricularia stellaris		Y	Y		LC		
Utricularia uliginosa	asian bladderwort	Y	Y		LC		
Utricularia terrae-reginae			Y		LC		
Vallisneria annua			Y		LC		
Vallisneria caulescens			Y		LC		
Vallisneria nana		Y	Y		LC		
Viola hederacea		Y	Y		LC		
Wolffia angusta	tiny duckweed	Y			LC		
Xyris complanata	yellow-eye		Y		LC		
Xyris juncea	dwarf yellow-eye		Y		LC		
Zygogonium ericetorum		Y	Y		LC		

3.4 Exotic flora

Exotic flora are plants that cause, or have the potential to cause, significant detrimental impact on natural systems within a non-riverine, riverine or estuarine landscape within the Cape York region. A number of non-riverine, riverine and estuarine taxa that are known to occur within the Cape York region were nominated (Table 5). The presence of aquatic and semi-aquatic flora species was recorded under 'Criterion 1 Naturalness (aquatic)' (1.1.2). Riparian exotic flora species were recorded under 'Criterion 2 Naturalness (catchment)' (2.1.1).

The degree of infestation and abundance of an exotic plant at a particular locality is an important factor in determining the level of impact to a natural ecosystem. Where available, information and mapping of exotic species extent (sourced from EHP, regional bodies etc) will be used instead of point records to flag the spatial units that have an exotic species present. Where only a point record is available for a location, then the record was used to identify the spatial units as having an exotic species present. Hence, an individual point record may or may not correspond to localities of dense weed infestations.

Table 5: Exotic flora species

This list was used to calculate the measures for 1.1.2 and 2.1.1 in the AquaBAMM assessment.

Scientific name	Common name	R[9]	NR	ES	1_1_2	2_1_1	Comments
Aeschynomene villosa			Y			Y	
Agave sisalana	sisal hemp	Y	Y			Y	
Ageratum conyzoides	billygoat weed		Y			Y	
Ageratum conyzoides subsp. *conyzoides*			Y			Y	
Ageratum houstonianum	blue billygoat weed		Y			Y	
Allamanda cathartica		Y	Y			Y	
Annona glabra			Y		Y		
Arundo donax		Y			Y		
Asystasia gangetica subsp. *gangetica*		Y				Y	
Bauhinia monandra		Y				Y	
Agave vivipara var. *vivipara*		Y	Y			Y	No valid records available at time of implementation.
Bryophyllum pinnatum	resurrection plant	Y	Y			Y	
Calopogonium mucunoides			Y			Y	
Calotropis procera		Y				Y	
Cardiospermum halicacabum		Y	Y			Y	
Cardiospermum halicacabum var. *halicacabum*		Y	Y			Y	
Cascabela thevetia	yellow oleander	Y	Y			Y	
Catharanthus roseus	pink periwinkle	Y	Y			Y	
Cenchrus ciliaris		Y	Y			Y	
Centrosema molle		Y	Y			Y	
Chrysopogon aciculatus	Mackie's pest		Y			Y	
Cryptostegia grandiflora	rubber vine	Y	Y			Y	
Cynodon dactylon				Y	Y		
Cyperus aromaticus		Y	Y			Y	
Cyperus brevifolius	Mullumbimby couch	Y	Y		Y		
Cyperus compressus		Y	Y		Y		
Cyperus eragrostis		Y	Y		Y		
Cyperus esculentus	yellow nutgrass	Y	Y		Y		
Cyperus metzii		Y	Y		Y		
Cyperus rotundus	nutgrass	Y	Y		Y	Y	
Dolichandra unguis-cati		Y	Y			Y	
Duranta erecta	duranta	Y	Y			Y	
Echinochloa colona	awnless barnyard grass	Y	Y		Y		
Echinochloa crus-galli	barnyard grass	Y	Y		Y		
Eichhornia crassipes	water hyacinth	Y	Y		Y		
Eleusine indica	crowsfoot grass		Y			Y	
Eleutheranthera ruderalis		Y	Y			Y	
Eugenia uniflora	Brazilian cherry tree	Y	Y			Y	
Flacourtia jangomas		Y	Y			Y	
Heliotropium indicum			Y			Y	
Hymenachne amplexicaulis cv. Olive		Y	Y		Y		
Hyparrhenia rufa			Y			Y	
Hyptis capitata		Y	Y			Y	
Ipomoea indica	blue morning-glory	Y	Y			Y	
Jatropha gossypiifolia	bellyache bush	Y	Y			Y	
Lantana camara		Y	Y			Y	
Leonotis nepetifolia		Y	Y			Y	
Leucaena leucocephala		Y	Y			Y	

[9] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

Scientific name	Common name	R[9]	NR	ES	1_1_2	2_1_1	Comments
subsp. *glabrata*							
Leucaena leucocephala subsp. *leucocephala*		Y	Y			Y	
Lippia alba var. alba		Y	Y		Y		
Ludwigia hyssopifolia		Y				Y	
Macroptilium atropurpureum	siratro	Y	Y			Y	
Macroptilium lathyroides			Y			Y	
Macroptilium lathyroides var. *semierectum*			Y			Y	
Macrotyloma uniflorum var. *stenocarpum*		Y	Y			Y	
Macrotyloma uniflorum var. *uniflorum*		Y	Y			Y	
Malvastrum americanum		Y				Y	
Mangifera indica	mango	Y	Y			Y	
Megathyrsus maximus		Y	Y			Y	
Megathyrsus maximus var. *coloratus*		Y	Y			Y	
Megathyrsus maximus var. *maximus*		Y	Y			Y	
Megathyrsus maximus var. *maximus cv. Hamil*		Y	Y			Y	
Megathyrsus maximus var. *pubiglumis*		Y	Y			Y	
Melinis minutiflora	molasses grass	Y	Y			Y	
Mimosa pudica			Y			Y	
Mimosa pudica var. *unijuga*			Y			Y	
Momordica charantia	balsam pear		Y			Y	
Neonotonia wightii var. *wightii*		Y	Y			Y	
Opuntia stricta		Y	Y			Y	
Parkinsonia aculeata	Jerusalem thorn	Y	Y			Y	
Parthenium hysterophorus	parthenium weed	Y	Y			Y	
Praxelis clematidea		Y	Y			Y	
Psidium guajava	guava	Y	Y			Y	
Ricinus communis	castor oil bush	Y	Y			Y	
Rivina humilis		Y	Y			Y	
Salvinia molesta	salvinia	Y	Y		Y		
Sanchezia parvibracteata		Y	Y			Y	
Sauropus androgynus			Y			Y	
Schinus terebinthifolius		Y	Y			Y	
Schoenus apogon		Y	Y		Y		
Selaginella willdenovii			Y			Y	
Senna obtusifolia		Y	Y			Y	
Senna occidentalis	coffee senna	Y	Y			Y	
Senna tora		Y	Y			Y	
Sida rhombifolia			Y			Y	
Solanum nigrum subsp. *nigrum*		Y	Y			Y	
Solanum nodiflorum		Y	Y			Y	
Solanum seaforthianum	Brazilian nightshade	Y	Y			Y	
Solanum torvum	devil's fig	Y	Y			Y	
Sphagneticola trilobata		Y	Y			Y	
Sorghum halepense	Johnson grass	Y	Y			Y	No valid records available at time of implementation.
Sporobolus africanus	Parramatta grass		Y			Y	
Sporobolus jacquemontii			Y			Y	
Sporobolus natalensis			Y			Y	
Sporobolus pyramidalis			Y			Y	
Stachytarpheta jamaicensis	Jamaica snakeweed		Y			Y	
Synedrella nodiflora			Y			Y	
Syngonium podophyllum		Y	Y			Y	
Tecoma stans	tecoma	Y	Y			Y	

Scientific name	Common name	R[9]	NR	ES	1_1_2	2_1_1	Comments
Tecoma stans var. *stans*		Y	Y			Y	
Thunbergia alata	black-eyed Susan		Y			Y	
Thunbergia grandiflora	sky flower	Y	Y			Y	
Tithonia diversifolia	Japanese sunflower		Y			Y	
Tradescantia fluminensis		Y	Y			Y	
Tradescantia spathacea		Y	Y			Y	
Urena lobata	urena weed		Y			Y	
Urochloa humidicola			Y			Y	
Urochloa mutica		Y	Y		Y	Y	
Xanthium occidentale		Y	Y		Y	Y	
Ziziphus mauritiana	Indian jujube	Y	Y			Y	

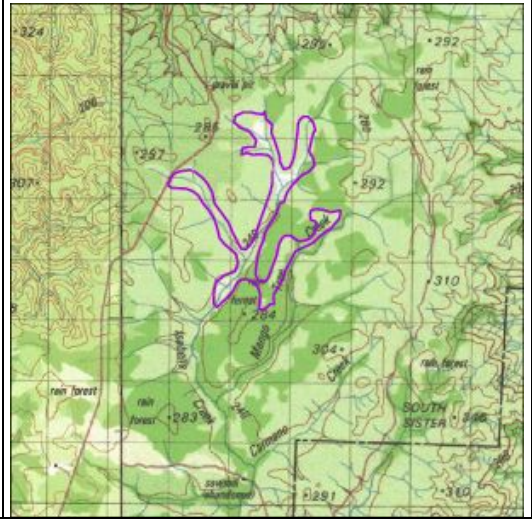
3.5 Special features

The panel identified several riverine, non-riverine and estuarine special features in the Cape York region known to contain flora values (Table 6) Where flora special features were also considered to have additional values (e.g. fauna, ecology), the special area was implemented as a wetland ecology special feature.

Each spatial unit that intersected with a feature in Table 6 was given a score equal to the conservation rating.

Decisions listed by catchment. These features were intersected with the spatial units to identify the values for ‘Criterion 6 Special features’. All implemented special features were given a conservation rating of between 1 and 4. Decisions that were not able to be implemented due to a lack of readily available data or unconfirmed values, are indicated as ‘_not_implemented’ in the decision implementation number column. Decisions that have ‘to be implemented’ in the implementation column are in the process of being implemented assuming available and suitable data and time. Where a single decision crosses a number of study areas, the decision has been duplicated for each study area. Decisions sorted by study area.

Table 6: Identified priority ecosystems, or flora special features, and their values

Decision number	Special features (name)	Location	Study area	NR [10]	R	ES	Values	CIM [11]	Con. rating [12]
en_nr_fl_01	Wetland mosaic on Isabella Creek		Endeavour	y			Intact wetlands. Habitat for *Melaleuca polandii* (northern limit of distribution) and *Banksia robur* (disjunct population in Cape York)—both found in 'of concern' wetland regional ecosystems in the Cape York bioregion.	6.3.1	3

[10] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

[11] Number refers to the values from the generic CIM list in Table 21.

[12] 4 is the highest value.

Decision number	Special features (name)	Location	Study area	NR [10]	R	ES	Values	CIM[11]	Con. rating[12]
jj_nr_fl_01	Sach Waterhole		Jacky Jacky	y			Sand-dune lake only known location in CYP that supports floating mats of vegetation dominated by *Lepironia auriculata* but also includes pitcher plants *Nepenthes mirabilis* and mangrove fern *Acrostichum speciosum* (Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fl_14	6.3.1	4

Table 7: Flora special features not implemented

Decision number	Special features (Namename)	Location	Study area	NR	R	ES	Values	CIM[13]	Con. rating[14]
03_not_implemented	Escape River Estuary		Jacky Jacky, possible Jardine also			y	Large area of diverse and well developed mangroves, including some of the tallest in Australia. Extensive low-gradient estuarine complex at river mouth (Cook et al.2011). No implementation required as values covered by jj_r_ec_01.	6.3.1, 6.4.2	3, 3

[13] Number refers to the values from the generic CIM list in Table 21.

[14] 4 is the highest value.

4 Fauna

4.1 Near threatened and threatened fauna

The panel identified a number of threatened fauna taxa within the riverine, non-riverine and estuarine wetlands of the Cape York region (Table 8). Only threatened taxa listed either on a schedule of the Queensland *Nature Conservation Act 1992* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, and considered to be wetland dependent by the panel were included in Table 8.This list of fauna was used as the basis for identifying areas of significance for 'Criterion 4 Threatened species and ecosystems' (4.1.1). A spatial unit with one or more of these species present was scored the highest category of 4.

Table 8: Aquatic, semi-aquatic and riparian fauna species listed under Queensland or Commonwealth legislation

Taxa marked with an asterisk (*) were recorded in areas within the CYP Aquatic Conservation Assessment area but outside the CYP catchments study area.
This list was used to generate the values for the AquaBAMM measure 4.1.1.

Scientific name	Common name	R[15]	NR	ES	NCA[16]	EPBC[17]	Comments
Caretta caretta	Loggerhead turtle			Y	E	E	No nesting on CYP
Chelonia mydas	Green turtle			Y	V	V	Major breeding concentration on islands outer edge of northern reef Raine-Moulter Cay No 7 and 8, minor breeding patchy along coastal mainland west and east coast
Cisticola juncidis normani	Zitting cisticola (Normanton subsp.)		Y	Y	NT		More Gulf Plains
Crocodylus porosus	Estuarine crocodile	Y	Y	Y	V		
Dermochelys coriacea	Leatherback turtle			Y	E	E	Very rare sightings, no nesting on CYP
Dugong dugon	Dugong			Y	V		
Emydura subglobosa subglobosa	Jardine River turtle	Y	Y		NT		Not recorded in river since 1996; middle reaches of Jardine River. Work in New Guinea shows it abundant in freshwater swamps and seasonally inundated grasslands and wetlands (Georges 2005) so maybe more a species of Jardine swamps than main channel of Jardine river on CYP
Ephippiorhynchus	Black-necked stork	Y	Y	Y	NT		

[15] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)
[16] Queensland *Nature Conservation Act 1992* (E – endangered, V – vulnerable, NT – near threatened, LC – least concern)
[17] *Environment Protection and Biodiversity Conservation Act 1999* (CE – critically endangered, E – endangered, V – vulnerable, EX - extinct)

Scientific name	Common name	R[15]	NR	ES	NCA[16]	EPBC[17]	Comments
asiaticus							
Eretmochelys imbricata	Hawksbill turtle			Y	V	V	Milman Island major rookery, islands of Torres Strait western CYP north of Cotterell River
Esacus magnirostris	Beach stone-curlew			Y	V		
Glyphis glyphis	Speartooth shark	Y		Y		CE	
Haematopus fuliginosus	Sooty oystercatcher			Y	NT		
Hypochrysops apollo apollo	Apollo jewel (Wet Tropics subsp.)	Y	Y	Y	V		Coastal paperbark (*Melaleuca viridiflora*) swamps, *Lophostemon suaveolens* and mangroves with ant-plants (*Myrmecodia beccarii*) present
Lepidochelys olivacea	Olive Ridley turtle			Y	E	E	Low density nesting along western coast of CYP Holroyd River area to Bamaga
Lewinia pectoralis	Lewin's rail		Y		NT		No valid records available at time of implementation.
Litoria andiirrmalin	Melville Range treefrog	Y			V		Restricted to Cape Melville, CYP endemic
Litoria longirostris	Long-snouted treefrog	Y			NT		Restricted to McIlwraith Range, CYP endemic
*Litoria lorica**	Little waterfall frog	Y			E	CE	Wet Tropics taxon
*Litoria nannotis**	Waterfall frog	Y			E	E	Wet Tropics taxon
*Litoria nyakalensis**	Mountain mistfrog	Y			E	CE	Wet Tropics taxon
*Litoria rheocola**	Common mistfrog	Y			E	E	Wet Tropics taxon
*Litoria serrata**	Tapping green-eyed treefrog	Y			NT		Wet Tropics taxon
*Melanotaenia eachamensis**	Lake Eacham rainbowfish	Y				E	Wet Tropics taxon
Natator depressus	Flatback turtle			Y	V	V	Crab and Deliverance island major nesting NE Gulf of Carpentaria and west Torres Strait. Crab Island has the highest concentration nesting area for this species in world

Scientific name	Common name	R[15]	NR	ES	NCA[16]	EPBC[17]	Comments
Neochmia phaeton evangelinae	Crimson finch (white-bellied subsp.)	Y	Y		E	V	Disjunct populations on CYP (Good population at Lakefield along Normanby River)
Nettapus coromandelianus	Cotton pygmy-goose	Y	Y		NT		
Numenius madagascariensis	Eastern curlew		Y	Y	NT		
*Nyctimystes dayi**	Australian lacelid	Y			E	E	Wet Tropics taxon
Orcaella heinsohni	Australian snubfin dolphin			Y	NT		
Pristis clavata	Dwarf sawfish			Y		V	
Pristis microdon	Freshwater sawfish	Y		Y		V	
Pristis zijsron	Green sawfish			Y		V	
Rostratula australis	Australian painted snipe	Y	Y		V	V	No valid records available at time of implementation.
Sousa chinensis	Indopacific humpback dolphin			Y	NT		
Sternula albifrons	Little tern			Y	E		
Sternula nereis	Fairy tern			Y		V	
Tadorna radjah	Radjah shelduck	Y	Y	Y	NT		
*Taudactylus acutirostris**	Sharp snouted dayfrog	Y			E	EX	Wet Tropics taxon
*Taudactylus rheophilus**	Northern tinkerfrog	Y			E	E	Wet Tropics taxon

4.2 Priority fauna

Due to time constraints the panel was not able to fully deliberate on all aquatic, semi-aquatic and riparian species within the Cape York region to identify 'priority flora' (excluding the rare or threatened species listed in Table 8). We have adopted a revised version of the earlier definition of a priority species from the Wide Bay-Burnett ACA namely that a priority species must exhibit one or more of the following significant values:

1. It is endemic to the study area (> 75% of its distribution is in the study area/catchment).
2. It has experienced, or is suspected of experiencing, a serious population decline.
3. It has experienced a significant reduction in its distribution and has a naturally restricted distribution in the study area/catchment.
4. It is currently a small population and threatened by loss of habitat.
5. It is a significant disjunct population.
6. It is a migratory species (other than birds).
7. A significant proportion of the breeding population (>one per cent for waterbirds, > 75% other species) occurs in the waterbody (see Ramsar criterion 6 for waterbirds).
8. Limit of species range.

4.2.1 Priority species

Post panel, a number of riverine, non-riverine and estuarine priority flora species have been identified (Table 9). These species are to be included as part of 'Criterion 5 Priority species and ecosystems' (5.1.1).

Table 9: Identified priority fauna species, and their significant values

This list was used to generate the values for the AquaBAMM measure (5.1.1).

Scientific name	Common name	R[18]	NR	ES	Comments
Anoxypristis cuspidata	Narrow sawfish			Y	Declining due to mortality associated with gill-netting
Arenaria interpres	Ruddy turnstone		Y	Y	Near Threatened (Garnett et al. 2011)
Brachirus selheimi	Freshwater sole	Y			Disjunct population, elsewhere in northern Australia
Calidris canutus	Red knot		Y	Y	Vulnerable (Garnett et al. 2011)
Calidris ferruginea	Curlew sandpiper		Y	Y	Vulnerable (Garnett et al. (2011)
Calidris tenuirostris	Great knot		Y	Y	Vulnerable (Garnett et al. 2011)
Charadrius leschenaultii	Greater sand plover		Y	Y	Vulnerable (Garnett et al. 2011)
Charadrius mongolus	Lesser sand plover		Y	Y	Endangered (Garnett et al. 2011)
Cherax cartalacoolah		Y	Y		Restricted to Cape Flattery dune lakes/creeks, CYP endemic
Cherax quadricarinatus	Redclaw crayfish	Y	Y		Abundance declining in CYP due to fishing pressure
Cisticola juncidis	Zitting cisticola		Y	Y	Disjunct population; elsewhere in northern Australia
Cyclorana cryptotis	Earless frog		Y		Widely separated populations in northern Australia, recorded near Cape Melville, disjunct
Denariusa australis	Pennyfish	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea
Dendrocygna guttata	Spotted whistling-duck	Y	Y		Disjunct population in Australia confined to CYP; also New Guinea
Glossogobius concavifrons	Concave flathead goby	Y			Disjunct population in Australia confined to CYP; also New Guinea
Glossogobius sp. 3 - dwarf	Dwarf goby	Y			Disjunct population in Australia confined to CYP; also New Guinea

[18] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

Scientific name	Common name	R[18]	NR	ES	Comments
Guyu wujalwujalensis	Tropical nightfish	Y			Restricted to Bloomfield River, CYP endemic?
Hephaestus carbo	Coal grunter	Y	Y		Disjunct population, elsewhere in northern Australia
Hydrophis donaldi	Rough scaled sea snake			Y	Shallow estuarine shale, mud and sea grass bottom mouth of Mission River and Hey Creek where they connect to Albatross Bay, CYP endemic
Iriatherina werneri	Threadfin rainbowfish	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea
Kuhlia marginata	Spotted flagtail	Y		Y	Restricted and specialised, possibly sensitive to habitat disturbance
Kuhlia rupestris	Jungle perch	Y			Restricted and specialised, possibly sensitive to habitat disturbance
Limnodromus semipalmatus	Asian dowitcher			Y	Near Threatened (Garnett et al. (2011)
Limosa lapponica	Bar-tailed godwit	Y	Y	Y	Vulnerable (Garnett et al. 2011)
Limosa limosa	Black-tailed godwit	Y	Y	Y	Near Threatened (Garnett et al. 2011)
Litoria eucnemis	Growling green-eyed treefrog	Y			Disjunct population in Australia confined to CYP; also New Guinea
Macrobrachium rosenbergii	Giant river prawn	Y			Abundance declining in CYP due to fishing pressure
Melanotaenia maccullochi	McCulloch's rainbowfish	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea
Melanotaenia nigrans	Blackbanded rainbowfish	Y	Y		Disjunct population, elsewhere in northern Australia
Melanotaenia trifasciata	Banded rainbowfish	Y			Disjunct population, elsewhere in northern Australia
Neochmia ruficauda	Star finch		Y		Near threatened (Garnett et al. 2011) as *N. r. clarescens*. Lakefield population very important

Scientific name	Common name	R[18]	NR	ES	Comments
Neosilurus ater	Black catfish	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea
Neosilurus brevidorsalis	Shortfin catfish	Y			Disjunct population in Australia confined to CYP; also New Guinea
Numenius phaeopus	Whimbrel		Y	Y	Near threatened (Garnett et al. 2011)
Ophisternon bengalense	One-gilled eel	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea
Oxyeleotris fimbriata	Fimbriate gudgeon	Y	Y		Disjunct population in Australia confined to CYP; also New Guinea
Oxyeleotris nullipora	Poreless gudgeon	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea
Pingalla lorentzi	Lorentz grunter	Y			Disjunct population; elsewhere in northern Australia and New Guinea
Pluvialis squatarola	Grey plover			Y	Near Threatened (Garnett et al. 2011)
Porochilus obbesi	Obbe's catfish	Y			Disjunct population; elsewhere in northern Australia and New Guinea
Porochilus rendahli	Rendahl's catfish	Y	Y		Disjunct population, elsewhere in northern Australia
Pristis pectinata	Wide sawfish			Y	Declining due to mortality associated with gill-netting
Pseudomugil gertrudae	Spotted blue eye	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea
Pseudomugil tenellus	Delicate blue eye	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea
Rallina tricolor	Red-necked crake		Y		Disjunct population; elsewhere in northern Australia and New Guinea

Scientific name	Common name	R[18]	NR	ES	Comments
Scleropages jardinii	Northern saratoga	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea; sparse and targeted for sport fishing
Sicyopterus lagocephalus	Blue stream goby	Y			Disjunct population – only found in Bloomfield River, elsewhere in Indo-Pacific
Thryssa scratchleyi	Freshwater thryssa	Y	Y		Very rare and localised
Tringa brevipes	Grey-tailed tattler		Y	Y	Near Threatened (Garnett et al. 2011)
Zenarchopterus novaeguineae	Fly River garfish	Y			Disjunct population in Australia confined to CYP; also New Guinea

4.2.2 Migratory species

In addition to the priority species identified above, migratory species listed under the Japan–Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA), the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) or the Convention on the Conservation of Migratory Species of Wild Animals (CMS; also known as the Bonn Convention) are identified as priority fauna. A number of riverine, non-riverine and estuarine migratory species (Table 10) were included in the AquaBAMM assessment in 'Criterion 5 Priority species and ecosystems' (5.1.3). A spatial unit containing one species record scored a three.

Table 10: A list of migratory species

This list was used to generate the values for the AquaBAMM Measure (5.1.3). These lists were sourced from JAMBA, CAMBA, ROKAMBA and CMS and are found on the Department of Sustainability, Environment, Water, Population and Communities website at www.environment.gov.au (search for biodiversity migratory waterbirds).

Scientific name	Common name	R[19]	NR	ES	Comments
Acrocephalus australis	Australian reed-warbler	Y	Y		
Acrocephalus orientalis	Oriental reed-warbler	Y	Y		
Actitis hypoleucos	Common sandpiper	Y	Y		
Anas querquedula	Garganey	Y	Y		
Ardea ibis	Cattle egret	Y	Y		
Ardea modesta	Eastern great egret	Y	Y		
Arenaria interpres	Ruddy turnstone		Y	Y	Near threatened (Garnett et al. 2011)
Calidris acuminata	Sharp-tailed sandpiper	Y	Y	Y	
Calidris alba	Sanderling		Y	Y	
Calidris alpina	Dunlin		Y	Y	
Calidris canutus	Red knot		Y	Y	Vulnerable (Garnett et al. 2011)
Calidris ferruginea	Curlew sandpiper		Y	Y	Vulnerable (Garnett et al. (2011)
Calidris melanotos	Pectoral sandpiper	Y	Y	Y	
Calidris ruficollis	Red-necked stint		Y	Y	
Calidris subminuta	Long-toed stint		Y	Y	
Calidris tenuirostris	Great knot		Y	Y	Vulnerable (Garnett et al. 2011)
Caretta caretta	Loggerhead turtle			Y	No nesting on CYP
Charadrius bicinctus	Double-banded plover		Y	Y	

[19] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

Scientific name	Common name	R[19]	NR	ES	Comments
Charadrius hiaticula	Ringed plover			Y	
Charadrius leschenaultii	Greater sand plover		Y	Y	Vulnerable (Garnett et al. 2011)
Charadrius mongolus	Lesser sand plover		Y	Y	Endangered (Garnett et al. 2011)
Charadrius veredus	Oriental plover		Y		
Chelonia mydas	Green turtle			Y	Major breeding concentration on islands outer edge of northern reef Raine-Moulter Cay No 7 and 8, minor breeding patchy along coastal mainland west and east coast
Chlidonias leucopterus	White-winged black tern	Y	Y	Y	
Crocodylus porosus	Estuarine crocodile	Y	Y	Y	
Dermochelys coriacea	Leatherback turtle			Y	Very rare sightings, no nesting on CYP
Dugong dugon	Dugong			Y	
Egretta sacra	Eastern reef egret			Y	
Eretmochelys imbricata	Hawksbill turtle			Y	Milman Island major rookery, islands of Torres Strait western CYP north of Cotterell River
Gallinago hardwickii	Latham's snipe	Y	Y		
Gallinago megala	Swinhoe's snipe		Y		
Glareola maldivarum	Oriental pratincole		Y		
Grus antigone	Sarus crane		Y		
Haliaeetus leucogaster	White-bellied sea-eagle	Y	Y	Y	
Hydroprogne caspia	Caspian tern	Y	Y	Y	
Lepidochelys olivacea	Olive ridley turtle			Y	Low density nesting along western coast of CYP Holroyd River area to Bamaga
Limicola falcinellus	Broad-billed sandpiper		Y	Y	
Limnodromus semipalmatus	Asian dowitcher			Y	Near threatened (Garnett et al. (2011)
Limosa lapponica	Bar-tailed godwit	Y	Y	Y	Vulnerable (Garnett et al. 2011)
Limosa limosa	Black-tailed godwit	Y	Y	Y	Near Threatened (Garnett et al. 2011)
Natator depressus	Flatback turtle			Y	Crab and Deliverance island major nesting NE Gulf of Carpentaria and west Torres Strait. Crab Island has the highest concentration nesting area for this species in world
Numenius madagascariensis	Eastern curlew		Y	Y	
Numenius minutus	Little curlew		Y	Y	
Numenius phaeopus	Whimbrel		Y	Y	Near threatened (Garnett et al. 2011)
Orcaella heinsohni	Australian snubfin dolphin			Y	
Pandion cristatus	Eastern osprey	Y	Y	Y	
Philomachus pugnax	Ruff		Y	Y	
Plegadis falcinellus	Glossy ibis	Y	Y		
Pluvialis fulva	Pacific golden plover		Y	Y	
Pluvialis squatarola	Grey plover			Y	Near threatened (Garnett et al. (2011)
Sousa chinensis	Indopacific humpback dolphin			Y	
Sterna dougallii	Roseate tern			Y	
Sterna hirundo	Common tern		Y	Y	
Sternula albifrons	Little tern			Y	
Thalasseus bengalensis	Lesser crested tern			Y	

Scientific name	Common name	R[19]	NR	ES	Comments
Tringa brevipes	Grey-tailed tattler		Y	Y	Near threatened (Garnett et al. (2011)
Tringa erythropus	Spotted redshank		Y		
Tringa flavipes	Lesser yellowlegs		Y	Y	
Tringa glareola	Wood sandpiper	Y	Y	Y	
Tringa incana	Wandering tattler			Y	
Tringa nebularia	Common greenshank	Y	Y	Y	
Tringa ochropus	Green sandpiper			Y	
Tringa stagnatilis	Marsh sandpiper	Y	Y	Y	
Tringa totanus	Common redshank		Y	Y	
Xenus cinereus	Terek sandpiper		Y	Y	

4.3 Species richness

Species richness (i.e. total number of species) was scored for each class of fauna (amphibians (frogs), fish, reptiles, and waterbirds).

4.3.1 Fish richness

There are a number of riverine, non-riverine and estuarine native fish species identified in the Cape York region. Table 11 lists fish species that were used under the 'Criterion 3 Diversity and richness' measure (3.1.2).

Table 11: Native fish

Taxa marked with an asterisk (*) were recorded in areas within the CYP Aquatic Conservation Assessment area but outside the CYP catchments study area. This list was used to generate the values for the AquaBAMM measure (3.1.2).

Scientific name	Common name	R[20]	NR	ES	Comments
Acanthopagrus australis	Yellowfin bream	Y		Y	
Acanthopagrus berda	Pikey bream	Y		Y	
Ambassis agassizii	Agassiz's glassfish	Y	Y		
Ambassis agrammus	Sailfin glassfish	Y	Y		
Ambassis elongatus	Elongate glassfish	Y			
Ambassis interruptus	Longspine glassfish	Y		Y	
Ambassis macleayi	Macleay's glassfish	Y	Y		
Ambassis miops	Flagtail glassfish	Y			
Ambassis nalua	Scalloped glassfish		Y		
Ambassis sp. 'Northwest' *(mulleri)*	Northwest glassfish	Y	Y		
Ambassis vachellii	Vachell's glassfish	Y		Y	
Amniataba caudavittata	Yellowtail grunter	Y		Y	
Amniataba percoides	Barred grunter	Y	Y		
Anguilla obscura	Pacific shortfin eel	Y	Y		
Anguilla reinhardtii	Longfin eel	Y	Y		
Anodontiglanis dahli	Toothless catfish	Y			
Anoxypristis cuspidata	Narrow sawfish			Y	Declining due to mortality associated with gill-netting
Arrhamphus sclerolepis	Snubnose garfish	Y	Y		
Awaous acritosus	Roman-nose goby	Y			
Brachirus salinarum	Saltpan sole	Y			
Brachirus selheimi	Freshwater sole	Y			Disjunct
Bunaka gyrinoides	Greenback gudgeon	Y	Y		
Butis butis	Crimsontip gudgeon	Y		Y	
Caranx sexfasciatus	Bigeye trevally	Y		Y	
Carcharhinus leucas	Bull shark	Y		Y	
Chanos chanos	Milkfish	Y	Y	Y	
Chlamydogobius ranunculus	Tadpole goby		Y		
Craterocephalus stercusmuscarum	Flyspecked hardyhead	Y	Y		
Denariusa australis	Pennyfish	Y	Y		Disjunct
Eleotris fusca	Brown spine-cheek gudgeon	Y		Y	
Eleotris melanosoma	Black spine-cheek gudgeon	Y		Y	
Elops machnata	Australian giant herring	Y		Y	

[20] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

Scientific name	Common name	R[20]	NR	ES	Comments
Gerres filamentosus	Threadfin silverbiddy	Y		Y	
Gerres subfasciatus	Common silverbiddy	Y			
Giurus margaritacea	Snakehead gudgeon	Y	Y		
Glossamia aprion	Mouth almighty	Y	Y		
Glossogobius aureus	Golden flathead goby	Y			
*Glossogobius bellendenensis**	Mulgrave goby	Y		Y	
Glossogobius bicirrhosus	Bearded flathead goby	Y		Y	
Glossogobius circumspectus	Mangrove flathead goby	Y		Y	
Glossogobius concavifrons	Concave flathead goby	Y			Disjunct
Glossogobius giurus	Tank goby	Y			
Glossogobius sp. 1 cf. *celebius*	False celebes goby	Y			
Glossogobius sp. 2 - munro	Square-blotch/Munro's goby	Y			
Glossogobius sp. 3 - dwarf	Dwarf goby	Y			Disjunct
Glyphis glyphis	Speartooth shark	Y		Y	
Guyu wujalwujalensis	Tropical nightfish	Y			Bloomfield River endemic
Gymnothorax polyuranodon	Freshwater moray	Y		Y	
Hephaestus carbo	Coal grunter	Y	Y		Disjunct
Hephaestus fuliginosus	Sooty grunter	Y	Y		
Hephaestus tulliensis	Khaki grunter	Y			
Herklotsichthys castelnaui	Southern sprat	Y		Y	
Himantura dalyensis	Freshwater whipray	Y			
Himantura granulata	Mangrove whipray			Y	
Hippichthys heptagonus	Madura pipefish	Y		Y	
Hippichthys penicillus	Beady pipefish	Y		Y	
Hippichthys spicifer	Bellybar pipefish	Y		Y	
Hypseleotris compressa	Empire gudgeon	Y	Y		
Hypseleotris sp. 1	Midgley's carp gudgeon	Y	Y		
Iriatherina werneri	Threadfin rainbowfish	Y	Y		Disjunct
Kuhlia marginata	Spotted flagtail	Y		Y	Restricted and specialised, possibly sensitive to habitat disturbance
Kuhlia rupestris	Jungle perch	Y			Restricted and specialised, possibly sensitive to habitat disturbance
Lates calcarifer	Barramundi	Y	Y	Y	
Leiognathus equulus	Common ponyfish	Y		Y	
Leiopotherapon unicolor	Spangled perch	Y	Y		
Liza subviridis	Greenback mullet	Y		Y	
Lutjanus argentimaculatus	Mangrove Jack	Y	Y	Y	
Megalops cyprinoides	Oxeye herring/tarpon	Y	Y	Y	
*Melanotaenia eachamensis**	Lake Eacham rainbowfish	Y			Wet Tropics taxon
Melanotaenia maccullochi	McCulloch's rainbowfish	Y	Y		Disjunct
Melanotaenia nigrans	Blackbanded rainbowfish	Y	Y		Disjunct
Melanotaenia splendida	Eastern rainbowfish	Y	Y		
Melanotaenia trifasciata	Banded rainbowfish	Y			Disjunct
Mesopristes argenteus	Silver grunter	Y		Y	
Microphis brachyurus	Short-tailed pipefish	Y		Y	
Microphis leiaspis	Freshwater pipefish			Y	
Mogurnda adspersa	Southern purplespotted gudgeon	Y	Y		
Mogurnda mogurnda	Northern purplespotted gudgeon	Y			
Monodactylus argenteus	Diamondfish	Y	Y	Y	
Monopterus albus	Belut	Y			
Mugil cephalus	Sea mullet	Y	Y	Y	
Nematalosa erebi	Bony bream	Y	Y		
Neoarius berneyi	Highfin catfish	Y			
Neoarius graeffei	Blue catfish	Y	Y	Y	
Neoarius leptaspis	Boofhead catfish	Y			
Neoarius paucus	Shovelnose catfish	Y	Y		
Neopomacentrus taeniurus	Freshwater demoiselle	Y			
Neosilurus ater	Black catfish	Y	Y		Disjunct
Neosilurus brevidorsalis	Shortfin catfish	Y			Disjunct
Neosilurus hyrtlii	Hyrtl's catfish	Y	Y		
Notesthes robusta	Bullrout	Y	Y		

Scientific name	Common name	R[20]	NR	ES	Comments
Nuchequula decorus	Ornate ponyfish			Y	
Ophiocara porocephala	Spangled gudgeon	Y	Y	Y	
Ophisternon bengalense	One-gilled eel	Y	Y		Disjunct
Ophisternon gutturale	Swamp eel	Y	Y		
Oxyeleotris aruensis	Aru gudgeon	Y			
Oxyeleotris fimbriata	Fimbriate gudgeon	Y	Y		Disjunct
Oxyeleotris lineolata	Sleepy cod	Y	Y		
Oxyeleotris nullipora	Poreless gudgeon	Y	Y		Disjunct
Oxyeleotris selheimi	Blackbanded gudgeon	Y	Y		
Periophthalmus argentilineatus	Silverlined mudskipper			Y	
Periophthalmus novaeguineaensis	New Guinea mudskipper			Y	
Periophthalmus weberi	Weber's mudskipper			Y	
Pingalla gilberti	Gilbert's grunter	Y			
Pingalla lorentzi	Lorentz grunter	Y			Disjunct
Porochilus argenteus	Silver catfish	Y			
Porochilus obbesi	Obbe's catfish	Y			Disjunct
Porochilus rendahli	Rendahl's catfish	Y	Y		Disjunct
Prionobutis microps	Smalleye gudgeon	Y		Y	
Pristis clavata	Dwarf sawfish			Y	
Pristis microdon	Freshwater sawfish	Y		Y	
Pristis pectinata	Wide sawfish			Y	Declining due to mortality associated with gill-netting
Pristis zijsron	Green sawfish			Y	
Psammogobius biocellatus	Sleepy goby			Y	
Pseudomugil gertrudae	Spotted blue eye	Y	Y		Disjunct
Pseudomugil signifer	Pacific blue eye	Y	Y		
Pseudomugil tenellus	Delicate blue eye	Y	Y		Disjunct
Redigobius bikolanus	Speckled goby	Y	Y	Y	
Redigobius chrysosoma	Spotfin goby	Y		Y	
Rhinobatos typus	Giant shovelnose ray			Y	Ranked High by Northern Gulf NRM
Scatophagus argus	Spotted scat	Y		Y	
Schismatogobius sp. A*/insignum*	Scaleless goby	Y			
Scleropages jardinii	Northern saratoga	Y	Y		Disjunct population; elsewhere in northern Australia and New Guinea; sparse and targeted for sport fishing
Scortum ogilbyi	Gulf grunter	Y	Y		
Selenotoca multifasciata	Striped scat	Y	Y	Y	
Sicyopterus lagocephalus	Blue stream goby	Y			Disjunct
Stenogobius psilosinionus	Teardrop goby	Y			
Stiphodon sp. cf*. alleni**		Y			Wet Tropics taxon
Strongylura krefftii	Freshwater longtom	Y	Y		
Tandanus sp. Wet Tropics*	Wet Tropics catfish sp.	Y	Y		
Tandanus tandanus	Freshwater catfish	Y	Y		Include any *Tandanus* records
Terapon jarbua	Crescent grunter	Y		Y	
Thryssa hamiltoni	Hamilton's thryssa			Y	
Thryssa scratchleyi	Freshwater thryssa	Y	Y		Very rare and localised
Toxotes chatareus	Sevenspot archerfish	Y	Y		
Toxotes jaculatrix	Banded archerfish	Y		Y	
Zenarchopterus buffonis	Northern River garfish	Y		Y	
Zenarchopterus novaeguineae	Fly River garfish	Y			Disjunct

4.3.2 Reptile richness

There were a number of riverine, non-riverine and estuarine native reptile species identified in the Cape York region. Table 12 lists the wetlands-dependant reptiles that were considered in the AquaBAMM under 'Criterion 3 Diversity and richness' (3.1.3).

Table 12: Freshwater reptiles

This list was used to generate the values for the AquaBAMM Measure (3.1.3). Taxa marked with an asterisk (*) were recorded in areas within the CYP Aquatic Conservation Assessment area but outside the CYP catchments study area.

Scientific name	Common name	R[21]	NR	ES	Comments
Acrochordus arafurae	Arafura file snake	Y	Y		
Acrochordus granulatus	Little file snake			Y	
Caretta caretta	Loggerhead turtle			Y	No nesting on CYP
Carlia jarnoldae		Y	Y		
Cerberus rynchops	Bockadam			Y	
Chelodina canni	Cann's longneck turtle	Y	Y		
Chelodina rugosa	Northern snake-necked turtle	Y	Y		
Chelonia mydas	Green turtle			Y	Major breeding concentration on islands outer edge of northern reef Raine-Moulter Cay No 7 and 8, minor breeding patchy along coastal mainland west and east coast
Crocodylus johnstoni	Australian freshwater crocodile	Y	Y		
Crocodylus porosus	Estuarine crocodile	Y	Y	Y	
Dermochelys coriacea	Leatherback turtle			Y	Very rare sightings, no nesting on CYP
*Elseya irwini (Johnstone)**	Johnstone River snapping turtle	Y			
Emydura macquarii krefftii	Krefft's River turtle	Y	Y		
Emydura subglobosa subglobosa	Jardine River turtle	Y	Y		Not recorded in river since 1996; middle reaches of Jardine River. Work in New Guinea shows it abundant in freshwater swamps and seasonally inundated grasslands and wetlands (Georges, 2005) so maybe more a species of Jardine Swamps than main channel of Jardine river on CYP
Emydura tanybaraga	Northern yellow-faced turtle	Y	Y		
Eretmochelys imbricata	Hawksbill turtle			Y	Milman Island major rookery, islands of Torres Strait western CYP north of Cotterell River
Fordonia leucobalia	White-bellied mangrove snake			Y	
Hemiaspis signata	Black-bellied swamp snake	Y	Y		Queensland Museum records from Helensvale and Windsor Tableland
Hydrophis donaldi	Rough scaled sea snake			Y	Shallow estuarine shale, mud and sea grass bottom mouth of Mission River and Hey Creek where they connect to Albatross Bay, CYP endemic

[21] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

Scientific name	Common name	R[21]	NR	ES	Comments
Intellagama lesueurii	Eastern water dragon	Y	Y		Annan-Endeavour River range limit
Lepidochelys olivacea	Olive ridley turtle			Y	Low density nesting along western coast of CYP Holroyd River area to Bamaga
Liasis mackloti	Water python	Y	Y		
Natator depressus	Flatback turtle			Y	Crab and Deliverance island major nesting NE Gulf of Carpentaria and west Torres Strait. Crab Island has the highest concentration of flatback nests in the world
Pseudechis porphyriacus	Red-bellied black snake	Y	Y		Shipton's Flat, Big Tableland and Windsor Tableland
Pseudoferania polylepis	Macleay's water snake	Y	Y		
Stegonotus cucullatus	Slaty-grey snake	Y	Y		
Tropidechis carinatus	Rough-scaled snake	Y	Y		Queensland Museum record from Windsor Tableland
Tropidonophis mairii	Freshwater snake	Y	Y		
Varanus indicus	Mangrove monitor			Y	
Varanus mertensi	Mertens' water monitor	Y	Y		Also non-riverine in waterholes and lagoons
Varanus semiremex	Rusty monitor	Y	Y	Y	
Wollumbinia latisternum	Saw-shelled turtle	Y	Y		

4.3.3 Waterbird richness

There were a number of riverine, non-riverine and estuarine native waterbird species identified in the Cape York region. Table 13 lists the wetland-dependant waterbirds that were considered in the AquaBAMM under 'Criterion 3 Diversity and richness' (3.1.4).

Table 13: Native waterbirds

This list was used to generate the values of the AquaBAMM measure (3.1.4).

Scientific name	Common name	R[22]	NR	ES	Comments
Acrocephalus australis	Australian reed-warbler	Y	Y		
Acrocephalus orientalis	Oriental reed-warbler	Y	Y		
Actitis hypoleucos	Common sandpiper	Y	Y		
Amaurornis cinerea	White-browed crake	Y	Y	Y	
Amaurornis moluccana	Pale-vented bush-hen		Y		
Anas castanea	Chestnut teal	Y	Y		
Anas gracilis	Grey teal	Y	Y		
Anas querquedula	Garganey	Y	Y		
Anas rhynchotis	Australasian shoveler	Y	Y		
Anas superciliosa	Pacific black duck	Y	Y		
Anhinga novaehollandiae	Australasian darter	Y	Y	Y	
Anseranas semipalmata	Magpie goose	Y	Y		
Ardea ibis	Cattle egret	Y	Y		
Ardea intermedia	Intermediate egret	Y	Y	Y	
Ardea modesta	Eastern great egret	Y	Y		
Ardea pacifica	White-necked heron	Y	Y		
Ardea sumatrana	Great-billed heron	Y		Y	
Arenaria interpres	Ruddy turnstone		Y	Y	Near threatened (Garnett et al. 2011)

[22] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

Scientific name	Common name	R[22]	NR	ES	Comments
Aythya australis	Hardhead	Y	Y		
Butorides striata	Striated heron	Y	Y	Y	
Calidris acuminata	Sharp-tailed sandpiper	Y	Y	Y	
Calidris alba	Sanderling		Y	Y	
Calidris alpina	Dunlin		Y	Y	
Calidris canutus	Red knot		Y	Y	Vulnerable (Garnett et al. 2011)
Calidris ferruginea	Curlew sandpiper		Y	Y	Vulnerable (Garnett et al. 2011)
Calidris melanotos	Pectoral sandpiper	Y	Y	Y	
Calidris ruficollis	Red-necked stint		Y	Y	
Calidris subminuta	Long-toed stint		Y	Y	
Calidris tenuirostris	Great knot		Y	Y	Vulnerable (Garnett et al. 2011)
Ceyx azureus	Azure kingfisher	Y	Y	Y	
Ceyx pusillus	Little kingfisher	Y		Y	
Charadrius bicinctus	Double-banded plover		Y	Y	
Charadrius hiaticula	Ringed plover			Y	
Charadrius leschenaultii	Greater sand plover		Y	Y	Vulnerable (Garnett et al. 2011)
Charadrius mongolus	Lesser sand plover		Y	Y	Endangered (Garnett et al. 2011)
Charadrius ruficapillus	Red-capped plover	Y	Y	Y	
Charadrius veredus	Oriental plover		Y		
Chenonetta jubata	Australian wood duck	Y	Y		
Chlidonias hybrida	Whiskered tern	Y	Y	Y	
Chlidonias leucopterus	White-winged black tern	Y	Y	Y	
Chroicocephalus novaehollandiae	Silver gull	Y	Y	Y	
Circus approximans	Swamp harrier		Y		
Cisticola exilis	Golden-headed cisticola		Y		
Cisticola juncidis	Zitting cisticola		Y	Y	Disjunct
Cisticola juncidis normani	Zitting cisticola (Normanton subsp.)		Y	Y	
Cygnus atratus	Black swan	Y	Y		
Dendrocygna arcuata	Wandering whistling-duck	Y	Y		
Dendrocygna eytoni	Plumed whistling-duck	Y	Y		
Dendrocygna guttata	Spotted whistling-duck	Y	Y		Disjunct
Egretta garzetta	Little egret	Y	Y		
Egretta novaehollandiae	White-faced heron	Y	Y	Y	
Egretta picata	Pied heron		Y	Y	
Egretta sacra	Eastern reef egret			Y	
Elseyornis melanops	Black-fronted dotterel	Y	Y		
Ephippiorhynchus asiaticus	Black-necked stork	Y	Y	Y	
Erythrogonys cinctus	Red-kneed dotterel	Y	Y		
Esacus magnirostris	Beach stone-curlew			Y	
Fulica atra	Eurasian coot	Y	Y	Y	
Gallinago hardwickii	Latham's snipe	Y	Y		
Gallinago megala	Swinhoe's snipe		Y		
Gallinula tenebrosa	Dusky moorhen	Y	Y		
Gallirallus philippensis	Buff-banded rail	Y	Y	Y	
Gavicalis versicolor	Varied honeyeater	Y		Y	
Gelochelidon nilotica	Gull-billed tern	Y	Y	Y	
Gerygone levigaster	Mangrove gerygone		Y	Y	
Gerygone magnirostris	Large-billed gerygone	Y		Y	
Glareola maldivarum	Oriental pratincole		Y		
Grus antigone	Sarus crane		Y		
Grus rubicunda	Brolga	Y	Y		
Haematopus fuliginosus	Sooty oystercatcher			Y	
Haematopus longirostris	Australian pied oystercatcher			Y	
Haliaeetus leucogaster	White-bellied sea-eagle	Y	Y	Y	
Haliastur indus	Brahminy kite	Y	Y	Y	
Himantopus himantopus	Black-winged stilt	Y	Y	Y	
Hydroprogne caspia	Caspian tern	Y	Y	Y	
Irediparra gallinacea	Comb-crested jacana	Y	Y		
Ixobrychus dubius	Australian little bittern	Y	Y		
Ixobrychus flavicollis	Black bittern	Y	Y		

Scientific name	Common name	R[22]	NR	ES	Comments
Larus dominicanus	Kelp gull			Y	
Larus pacificus	Pacific gull			Y	
Leucophaeus atricilla	Laughing gull			Y	
Limicola falcinellus	Broad-billed sandpiper		Y	Y	
Limnodromus semipalmatus	Asian dowitcher			Y	Near Threatened (Garnett et al. 2011)
Limosa lapponica	Bar-tailed godwit	Y	Y	Y	Vulnerable (Garnett et al. 2011)
Limosa limosa	Black-tailed godwit	Y	Y	Y	Near Threatened (Garnett et al. 2011)
Lonchura castaneothorax	Chestnut-breasted mannikin	Y	Y		
Malacorhynchus membranaceus	Pink-eared duck	Y	Y		
Microcarbo melanoleucos	Little pied cormorant	Y	Y	Y	
Myiagra alecto	Shining flycatcher	Y		Y	
Myiagra inquieta nana	Paperbark flycatcher	Y			
Myiagra ruficollis	Broad-billed flycatcher	Y		Y	
Neochmia phaeton evangelinae	Crimson finch (white-bellied subsp.)	Y	Y		Disjunct populations on CYP (Good population at Lakefield along Normanby River)
Neochmia phaeton phaeton	Crimson finch	Y	Y		
Neochmia ruficauda	Star finch		Y		Near threatened (Garnett et al. 2011) as *N. r. clarescens*. Lakefield population very important
Nettapus coromandelianus	Cotton pygmy-goose	Y	Y		
Nettapus pulchellus	Green pygmy-goose	Y	Y		
Ninox connivens	Barking owl	Y			
Numenius arquata	Euasian curlew			Y	
Numenius madagascariensis	Eastern curlew		Y	Y	
Numenius minutus	Little curlew		Y	Y	
Numenius phaeopus	Whimbrel		Y	Y	Near Threatened (Garnett et al. 2011)
Nycticorax caledonicus	Nankeen night-heron	Y	Y	Y	
Pachycephala lanioides	White-breasted whistler			Y	
Pachycephala melanura	Mangrove golden whistler			Y	
Pandion cristatus	Eastern osprey	Y	Y	Y	
Pelecanus conspicillatus	Australian pelican	Y	Y	Y	
Peneonanthe pulverulenta	Mangrove robin			Y	
Phalacrocorax carbo	Great cormorant	Y	Y	Y	
Phalacrocorax sulcirostris	Little black cormorant	Y	Y	Y	
Phalacrocorax varius	Pied cormorant	Y	Y	Y	
Philomachus pugnax	Ruff		Y	Y	
Platalea flavipes	Yellow-billed spoonbill	Y	Y		
Platalea regia	Royal spoonbill	Y	Y		
Plegadis falcinellus	Glossy ibis	Y	Y		
Pluvialis fulva	Pacific golden plover		Y	Y	
Pluvialis squatarola	Grey plover			Y	Near Threatened (Garnett et al. 2011)
Podiceps cristatus	Great crested grebe	Y	Y		
Poephila cincta	Black-throated finch	Y	Y		Disjunct populations
Poliocephalus poliocephalus	Hoary-headed grebe	Y	Y		
Porphyrio porphyrio	Purple swamphen	Y	Y		
Porzana pusilla	Baillon's crake	Y	Y		
Porzana tabuensis	Spotless crake	Y	Y		
Rallina tricolor	Red-necked crake		Y		Disjunct
Ramsayornis modestus	Brown-backed honeyeater	Y	Y		
Recurvirostra novaehollandiae	Red-necked avocet	Y	Y	Y	
Rhipidura dryas	Arafura fantail	Y		Y	
Rhipidura phasiana	Mangrove grey fantail			Y	
Sterna dougallii	Roseate tern			Y	
Sterna hirundo	Common tern		Y	Y	
Sternula albifrons	Little tern			Y	
Sternula nereis	Fairy tern			Y	
Stiltia isabella	Australian pratincole		Y		

Scientific name	Common name	R[22]	NR	ES	Comments
Tachybaptus novaehollandiae	Australasian grebe	Y	Y		
Tadorna radjah	Radjah shelduck	Y	Y	Y	
Thalasseus bengalensis	Lesser crested tern			Y	
Thalasseus bergii	Crested tern	Y		Y	
Threskiornis molucca	Australian white ibis	Y	Y	Y	
Threskiornis spinicollis	Straw-necked ibis	Y	Y		
Todiramphus chloris	Collared kingfisher	Y		Y	
Tringa brevipes	Grey-tailed tattler		Y	Y	Near threatened (Garnett et al. 2011)
Tringa erythropus	Spotted redshank		Y		
Tringa flavipes	Lesser yellowlegs		Y	Y	
Tringa glareola	Wood sandpiper	Y	Y	Y	
Tringa incana	Wandering tattler			Y	
Tringa nebularia	Common greenshank	Y	Y	Y	
Tringa ochropus	Green sandpiper			Y	
Tringa stagnatilis	Marsh sandpiper	Y	Y	Y	
Tringa totanus	Common redshank		Y	Y	
Vanellus miles	Masked lapwing	Y	Y	Y	
Vanellus tricolor	Banded lapwing		Y		
Xenus cinereus	Terek sandpiper		Y	Y	

4.3.4 Frog richness

There a number of riverine, non-riverine and estuarine amphibian species identified within the Cape York region. Table 14 lists frog species that were used in the AquaBAMM under 'Criterion 3 Diversity and richness' (3.1.1 and 3.1.6).

Table 14: Native frogs

Taxa marked with an asterisk (*) were recorded in areas within the CYP Aquatic Conservation Assessment area but outside the CYP catchments study area. This list was used to generate the values of the AquaBAMM measures (3.1.1 and 3.1.6).

Scientific name	Common name	R[23]	NR	ES	Comments
Crinia deserticola	Chirping froglet	Y	Y		
Crinia remota	Northern froglet		Y		
Cyclorana alboguttata	Greenstripe frog		Y		
Cyclorana brevipes	Superb collared frog		Y		
Cyclorana cryptotis	Earless frog		Y		
Cyclorana manya	Little collared frog		Y		
Cyclorana novaehollandiae	Eastern snapping frog		Y		
Hylarana daemeli	Australian woodfrog	Y	Y		
Limnodynastes convexiusculus	Marbled frog		Y		
*Limnodynastes peronii**	Striped marshfrog		Y		
Limnodynastes terraereginae	Scarlet sided pobblebonk		Y		
Litoria andiirrmalin	Melville range treefrog	Y			
Litoria bicolor	Northern sedgefrog		Y		
Litoria caerulea	Common green treefrog	Y	Y		
Litoria dahlii	Northern waterfrog	Y	Y		
Litoria eucnemis	Growling green-eyed treefrog	Y			
Litoria gracilenta	Graceful treefrog	Y	Y		
Litoria inermis	Bumpy rocketfrog		Y		
Litoria infrafrenata	White lipped treefrog	Y	Y		
Litoria jungguy	Northern Stony Creek frog	Y	Y		
*Litoria latopalmata**	Broad palmed rocketfrog		Y		
Litoria longirostris	Long snouted treefrog	Y			
*Litoria lorica**	Little waterfall frog	Y			Wet Tropics taxon
Litoria microbelos	Javelin frog	Y	Y		
*Litoria nannotis**	Waterfall frog	Y			Wet Tropics taxon
Litoria nasuta	Striped rocketfrog	Y	Y		
Litoria nigrofrenata	Tawny rocketfrog	Y	Y		
*Litoria nyakalensis**	Mountain mistfrog	Y			Wet Tropics taxon
Litoria pallida	Pallid rocketfrog	Y	Y		

[23] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

Scientific name	Common name	R[23]	NR	ES	Comments
*Litoria rheocola**	Common mistfrog	Y			Wet Tropics taxon
Litoria rothii	Northern laughing treefrog	Y	Y		
Litoria rubella	Ruddy treefrog	Y	Y		
*Litoria serrata**	Tapping green-eyed treefrog	Y			Wet Tropics taxon
*Litoria xanthomera**	Orange thighed treefrog	Y	Y		Wet Tropics taxon
Mixophyes spp. complex* (*M. schevilli, M. coggeri* and *M. carbinensis)*	Northern barred-frog complex	Y	Y		Wet Tropics taxa
Notaden melanoscaphus	Brown shovelfoot		Y		
Nyctimystes dayi	Australian lacelid	Y			Wet Tropics taxon
Platyplectrum ornatum	Ornate burrowing frog	Y	Y		
*Taudactylus acutirostris**	Sharp snouted dayfrog	Y			Wet Tropics taxon
*Taudactylus rheophilus**	Northern tinkerfrog	Y			Wet Tropics taxon
Uperoleia lithomoda	Stonemason gungan		Y		
Uperoleia mimula	Mimicking gungan		Y		

4.3.5 Mammal richness

There were a number of riverine, non-riverine and estuarine species of mammal identified in the Cape York region. Table 15 lists the mammal species that was used in the AquaBAMM under 'Criterion 3 Diversity and richness' (3.1.7).

Table 15: Native mammals

This list was used to generate the values of the AquaBAMM measure (3.1.7)

Scientific name	Common name	R[24]	NR	ES	Comments
Dugong dugon	Dugong			Y	
Hydromys chrysogaster	Water rat	Y	Y		
Miniopterus orianae/schreibersii oceanensis	Eastern bentwing bat	Y	Y		
Myotis macropus	Large-footed myotis	Y	Y		
Orcaella heinsohni	Australian snubfin dolphin			Y	
Ornithorhynchus anatinus	Platypus	Y	Y		Big Tableland and Windsor Tableland
Pipistrellus westralis	Northern/mangrove pipistrelle	Y		Y	
Sousa chinensis	Indopacific humpback dolphin			Y	

4.3.6 Macroinvertebrate richness

There were a number of riverine, non-riverine and estuarine species of macroinvertebrates identified in the Cape York region. Table 16 lists macroinvertebrate species that were used in the AquaBAMM under 'Criterion 3 Diversity and richness' (3.2.1).

[24] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

Table 16: Native macroinvertebrates

This list was used to generate the values of the AquaBAMM measure (3.2.1)

Scientific name	Common name	R[25]	NR	ES	Comments
Austrothelphusa agassizi		Y			
Austrothelphusa angustifrons		Y			
Austrothelphusa raceki		Y			
Austrothelphusa tigrina		Y			
Austrothelphusa valentula		Y			
Austrothelphusa wasselli		Y			
Caridina gracilirostris		Y	Y		
Caridina indistincta	Indistinct caridina	Y	Y		
Caridina longirostris		Y	Y		
Caridina nilotica		Y	Y		
Caridina serratirostris		Y	Y		
Caridina spinula		Y	Y		
Caridina typus		Y	Y		
Caridinides wilkinsi		Y	Y		
Cherax bicarinatus		Y	Y		
Cherax cartalacoolah		Y	Y		Restricted to Cape Flattery dune lakes/creeks
Cherax depressus		Y	Y		
Cherax quadricarinatus	Redclaw crayfish	Y	Y		Abundance declining in CYP due to fishing pressure
Cherax rhynchotus		Y	Y		
Fenneropenaeus merguiensis	White banana prawn			Y	
Hypochrysops apollo apollo	Apollo jewel (Wet Tropics subsp.)	Y	Y	Y	Coastal paperbark (*Melaleuca viridiflora*) swamps, *Lophostemon suaveolens* and mangroves with ant-plants (*Myrmecodia beccarii*) present
Junonia hedonia zelima	Brown argus		Y		
Macrobrachium auratum		Y			
Macrobrachium australiense	Common Australian river prawn	Y	Y		
Macrobrachium equidens	Rough river prawn	Y			
Macrobrachium handschini	Handschins river prawn	Y			
Macrobrachium idae		Y			
Macrobrachium lar		Y			
Macrobrachium latidactylus		Y			
Macrobrachium mammillodactylus		Y			
Macrobrachium novaehollandiae	New Holland river prawn	Y	Y		
Macrobrachium rosenbergii	Giant river prawn	Y			Abundance declining in CYP due to fishing pressure
Macrobrachium tolmerum	Eastern river prawn	Y			
Uca polita	Pink fiddler crab			Y	
Uca seismella	fiddler crab			Y	
Uca signata	fiddler crab			Y	
Velesunio sp.	freshwater mussel	Y			

4.4 Exotic fauna

A number of species were nominated (Table 17) as being exotic wetland fauna in the Cape York region. The presence of aquatic exotic fauna species was recorded under 'Criterion 1 Naturalness aquatic' (1.1.1, 1.1.3, 1.1.4).

Where available, information and mapping of exotic species extent (sourced from EHP, regional bodies etc.) will be used instead of point records to flag the spatial units that have an exotic species present. Where only

[25] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

a point record is available for a location, then the record was used to identify the spatial units as having an exotic species present. Hence, an individual point record may or may not correspond to localities of dense alien fauna infestations.

Table 17: Alien fauna species

This list was used to generate the values of the AquaBAMM measure (1.1.1, 1.1.3, 1.1.4).

Scientific name	Common name	R[26]	NR	ES	Comments
Bos indicus	Zebu	Y	Y		
Bos spp.	cattle spp.	Y	Y		
Bos taurus	European cattle	Y	Y		
Canis familiaris	Dog	Y	Y		
Cervus timorensis	Rusa deer	Y	Y		
Chinemys reevesi	Asian pond turtle		Y		Listed as threatened species elsewhere. Most likely a translocation
Columba livia	Rock dove	Y	Y		
Equus caballus	Horse	Y	Y		
Felis catus	Cat	Y	Y		
Hemidactylus frenatus	House gecko	Y	Y		
Lonchura punctulata	Nutmeg mannikin	Y	Y		
Mus musculus	House mouse	Y	Y		
Oreochromis mossambicus	Mozambique tilapia	Y	Y		Found over 9km of Endeavour River near Cooktown (J. Carroll *pers. comm.*)
Passer domesticus	House sparrow		Y		
Poecilia reticulata	Guppy	Y	Y		
Ramphotyphlops braminus		Y	Y		
Rattus norvegicus	Brown rat	Y	Y		
Rattus rattus	Black rat	Y	Y		
Rhinella marina	Cane toad	Y	Y		
Streptopelia chinensis	Spotted dove	Y	Y		
Sturnus tristis	Common myna	Y	Y		Pajinka, Bamaga and south of Cooktown
Sturnus vulgaris	Common starling		Y		
Sus scrofa	Pig	Y	Y		
Vulpes vulpes	Red fox	Y	Y		Near Cooktown, Lakeland Downs and Windsor Tableland

[26] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

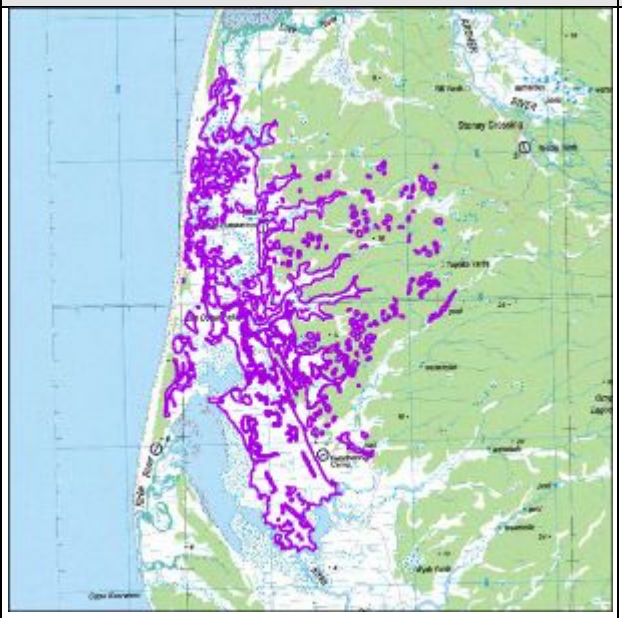
4.5 Special features

The panel identified several riverine, non-riverine and estuarine special features in the Cape York region known to contain fauna values (Table 18). Where fauna special features were also considered to have additional values (e.g. flora, ecology), the special area was implemented as a wetland ecology special feature. CYPLUS information derived from Abrahams et al. (1995) and Herbert et al. (1995).

Each spatial unit that intersected with a particular ecosystem or feature in Table 18 was given a score equal to the conservation rating. Decisions are listed alphabetically by catchment. These features were intersected with the spatial units to identify the values for 'Criterion 6 Special features'. All implemented special features were given a conservation rating of between 1 and 4 assigned by the panel. Decisions that were not able to be implemented due to a lack of readily available data or unconfirmed values, are indicated with '_not_implemented' in the decision implementation number column. Decisions that have 'to be implemented' in the implementation column are in the process of being implemented assuming available and suitable data and time. Where a single decision crosses a number of study areas, the decision has been duplicated for each study area. Decisions sorted by study area.

Table 18: Identified fauna special features and their values

Table sorted by decision number which equates to alphabetically by study area then non-riverine/riverine.

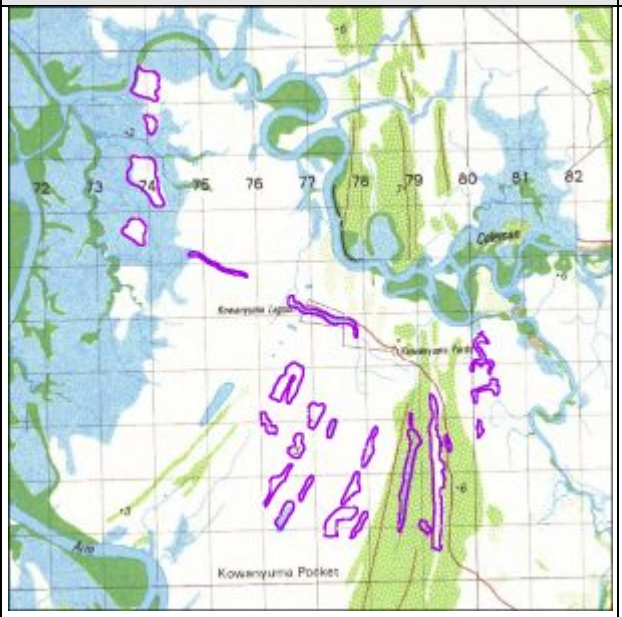
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ar_nr_fa_02	Migratory wader and waterbird roost, feeding and breeding area		Archer	y			Significant wader and waterbird roost/feeding sites (Garnett 1989; Driscoll 1995, 1996, 2001). Also implemented as BPA decision(s): cyp_fa_05	5.1.4, 6.3.1	4, 4

[27] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)
[28] Number refers to the values from the generic CIM list in Table 21.
[29] 4 is the highest value.

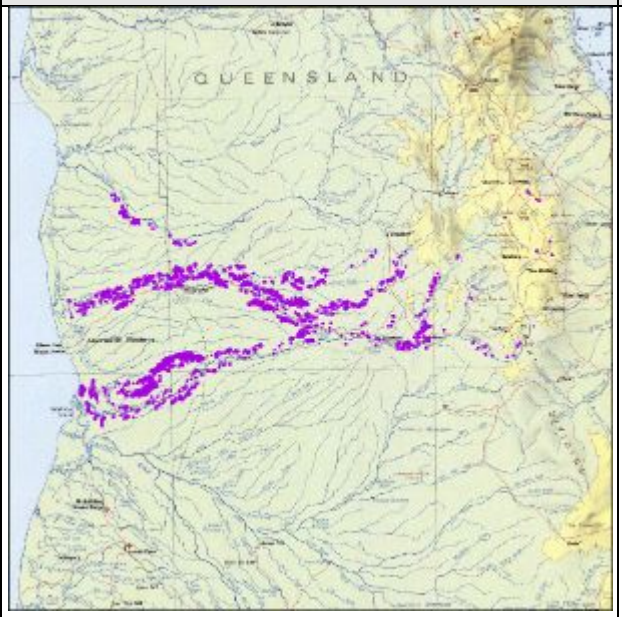
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ar_nr_fa_03	Migratory wader, waterbird and seabird roost, feeding and breeding areas		Archer	y			Significant wader and waterbird roost/feeding sites (Garnett 1989; Driscoll 1995, 1996, 2001). Also implemented as BPA decision(s): cyp_fa_05	5.1.4, 6.3.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ar_r_fa_01	McIlwraith and Iron ranges		Archer		y		High endemism and richness of frog species. Also implemented as BPA decision(s): cyp_l_17	6.3.1	4

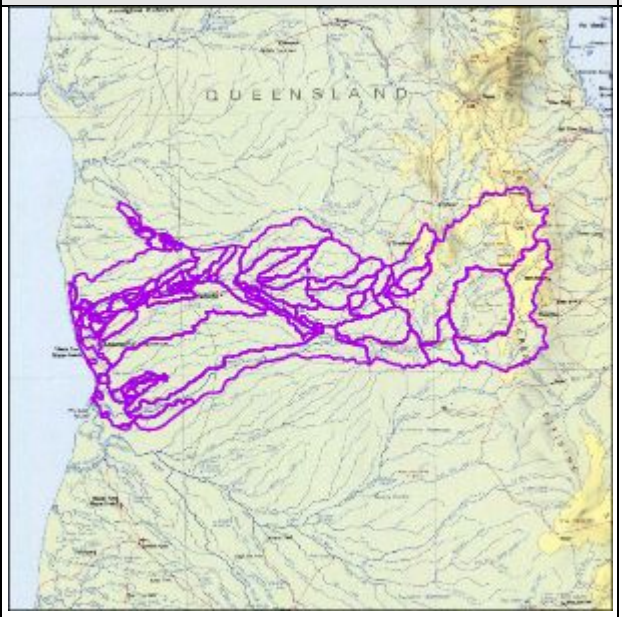
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ar_r_fa_02	Turtle nesting—west coast. Olive Ridleys and flatback		Archer		y		Significant locations for nesting by threatened sea turtle taxa, particularly flatback (*Natator depressus*), olive ridley (*Lepidochelys olivacea*) and hawksbill turtles (*Eretmochelys imbricata*) (GHD 2010). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	3

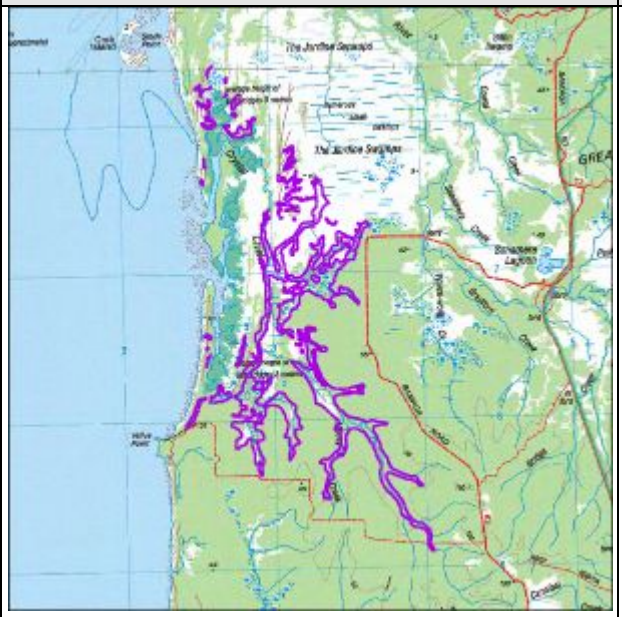
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
cl_nr_fa_01	Important Bird Areas (IBA)		Coleman	y			Part of the Gulf Plains Important Bird Area. Large breeding population of sarus crane (*Grus antigone*) and brolga (*G. rubicunda*), and supports large numbers of migratory waders, e.g. black-tailed godwit (*Limosa limosa*), great knot (*Calidris tenuirostris*), little curlew (*Numenius minutus*) and eastern curlew (*N. madagascariensis*) (Dutson et al. 2009). Related to BPA decision(s): cyp_l_07 and gup_l_03	6.3.1	4

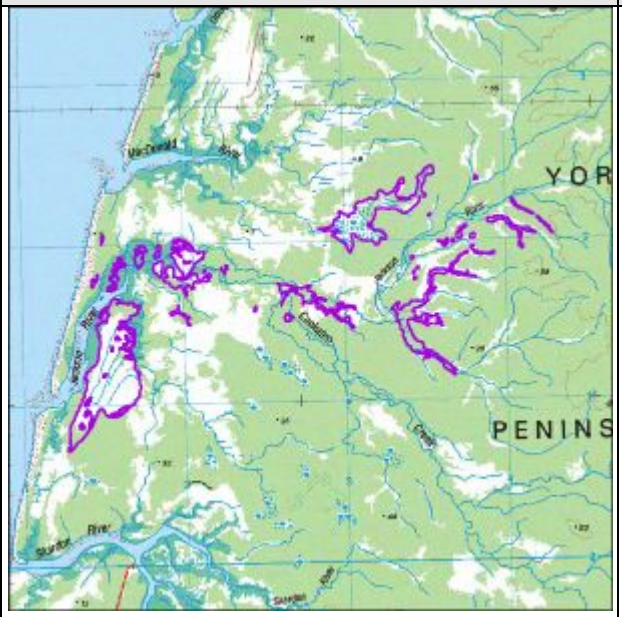
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
cl_nr_fa_02	Migratory wader and waterbird roost, feeding and breeding area		Coleman	y			Significant roost sites for waders (Driscoll 1995). Part of the Gulf Plains Important Bird Area. Large breeding population of sarus crane (*Grus antigone*) and brolga (*G. rubicunda*), and supports large numbers of migratory waders, e.g. black-tailed godwit (*Limosa limosa*), great knot (*Calidris tenuirostris*), little curlew (*Numenius minutus*) and eastern curlew (*N. madagascariensis*) (Dutson et al. 2009). Also implemented as BPA decision(s): cyp_fa_05, cyp_l_07 and gup_l_03	5.1.4, 6.3.1	3, 3

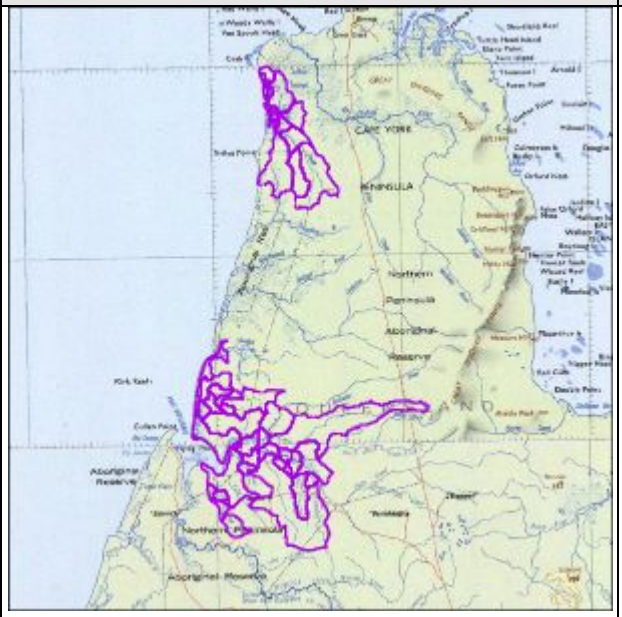
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
cl_nr_fa_03	Fish habitat		Coleman	y			Exhibits significant faunal change between Cape and lower Peninsula/Gulf fish assemblages (Herbert et al. 1995). Presence of *Scortum* spp. and *Porochilus argenteus.* Also implemented as BPA decision(s): cyp_fa_06 (f)	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
cl_r_fa_01	Turtle nesting—west coast. Olive ridleys and flatback		Coleman		y		Significant locations for nesting by threatened sea turtle taxa, particularly flatback (*Natator depressus*), olive ridley (*Lepidochelys olivacea*) and hawksbill turtles (*Eretmochelys imbricata*) (GHD 2010). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
cl_r_fa_02	Fish habitat		Coleman		y		Exhibits significant faunal change between Cape and lower Peninsula/Gulf fish assemblages (Herbert et al. 1995). Presence of *Scortum* spp. and *Porochilus argenteus*. Also implemented as BPA decision(s): cyp_fa_06 (f)	6.3.1	3

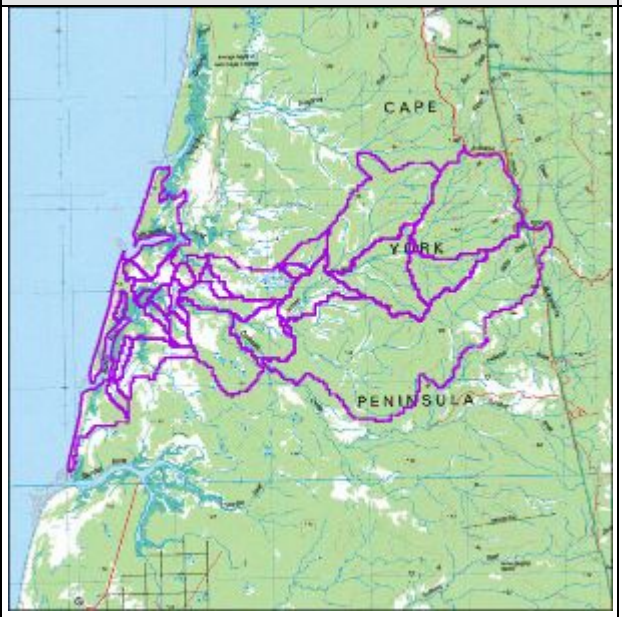
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
du_nr_fa_01	Jardine River turtle habitat (Crystal Creek section)		Ducie	y			Presence of *Emydura subglobosa subglobosa* (Jardine River turtle) habitat. Based on its habitat in Papua New Guinea (Georges 2005) this species is both riverine and non-riverine. On the Fly River, the most likely source of the Australian population, it is found throughout the river system but is most abundant in the freshwater swamps and seasonally inundates grasslands and wetlands (Georges 2005; Georges et al. 2006). This would mean that despite the only records we have being found in the main channel of the Jardine River, if still present, it is likely to occur throughout the Jardine Swamp area except those parts that are saline. Crystal and Cowal creeks can be included despite there being no records from this waterway as it would be linked to the Jardine during the wet season.	6.3.1	3

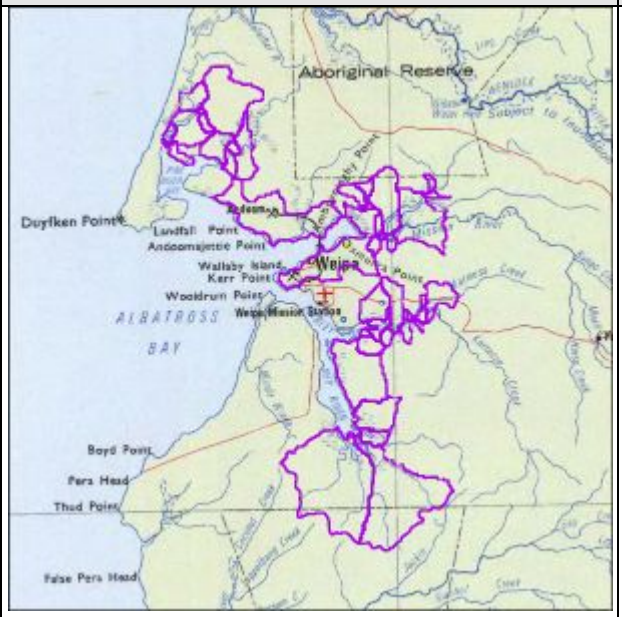
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
du_nr_fa_02	Fish habitat		Ducie	y			Rivers containing rare and uncommon fish taxa and fish communities (Abrahams et al. 1995; Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06(c)	6.3.1	3

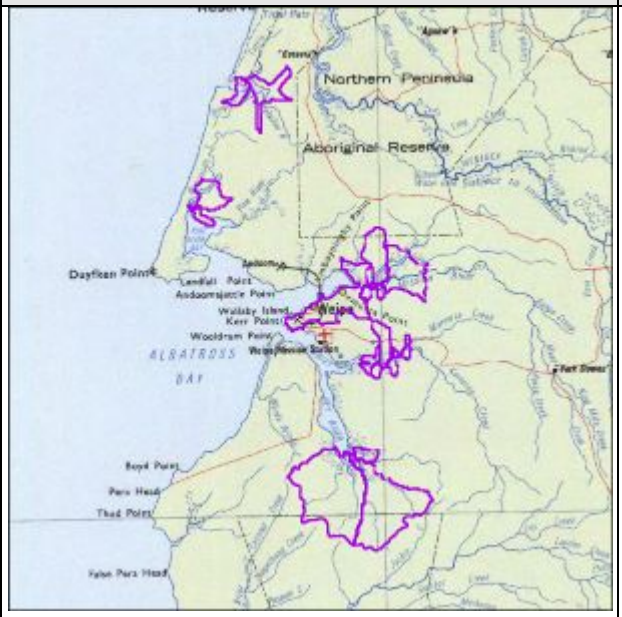
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
du_r_fa_01	Crocodile habitat		Ducie			y	Important breeding area for estuarine crocodile (*Crocodylus porosus*) (Krieger 1990; Abrahams et al. 1995; Read 1998, 2001). Also implemented as BPA decision(s): cyp_fa_07	6.3.1	4

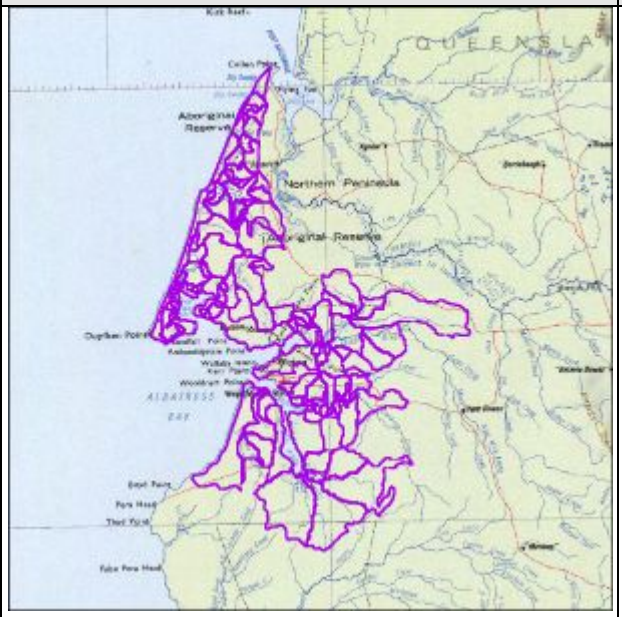
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
du_r_fa_02	Jardine River Turtle habitat		Ducie		y		Presence of *Emydura subglobosa subglobosa* (Jardine River turtle) habitat. Based on its habitat in Papua New Guinea (Georges 2005) this species is both riverine and non-riverine. On the Fly River, the most likely source of the Australian population, it is found throughout the river system but is most abundant in the freshwater swamps and seasonally inundates grasslands and wetlands (Georges 2005; Georges et al. 2006). This would mean that despite the only records we have being found in the main channel of the Jardine River, if still present, it is likely to occur throughout the Jardine Swamp area except those parts that are saline. Crystal and Cowal creeks can be included despite there being no records from this waterway as it would be linked to the Jardine during the wet season.	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
du_r_fa_03	Turtle nesting—west coast. Olive ridleys and flatback		Ducie		y		Significant locations for nesting by threatened sea turtle taxa, particularly flatback (*Natator depressus*), olive ridley (*Lepidochelys olivacea*) and hawksbill turtles (*Eretmochelys imbricata*) (GHD 2010). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
du_r_fa_04	Fish habitat		Ducie		y		Rivers containing rare and uncommon fish taxa and fish communities (Abrahams et al. 1995; Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06(c)	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
em_r_fa_01	Embley estuary (shallow)		Embley			y	Shallow estuarine—only known habitat for rough-scaled sea snake (*Hydrophis donaldi*) (Ukuwela et al. 2012). Record of near threatened indo-pacific humpback dolphin (*Sousa chinensis*) 2km upstream from intersection of Embley and Mission rivers indication that the shallow estuarine area used by this species.	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
em_r_fa_02	Embley estuary (deeper)		Embley			y	Habitat for near threatened Australian snubfin dolphin (*Orcaella heinsohni*).	6.3.1	3

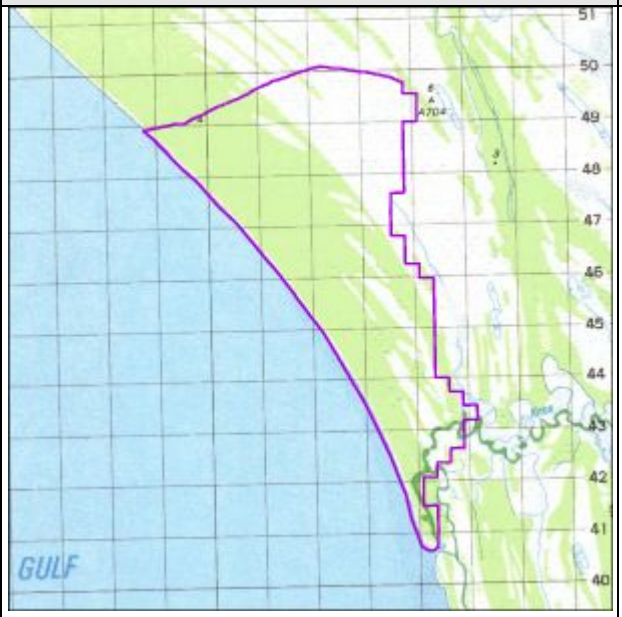
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
em_r_fa_03	Crocodile habitat		Embley			y	Major successful breeding area for estuarine crocodile (*Crocodylus porosus*) (Krieger 1990; Abrahams et al. 1995; Read 1998, 2001). Also implemented as BPA decision(s): cyp_fa_07	6.3.1	4

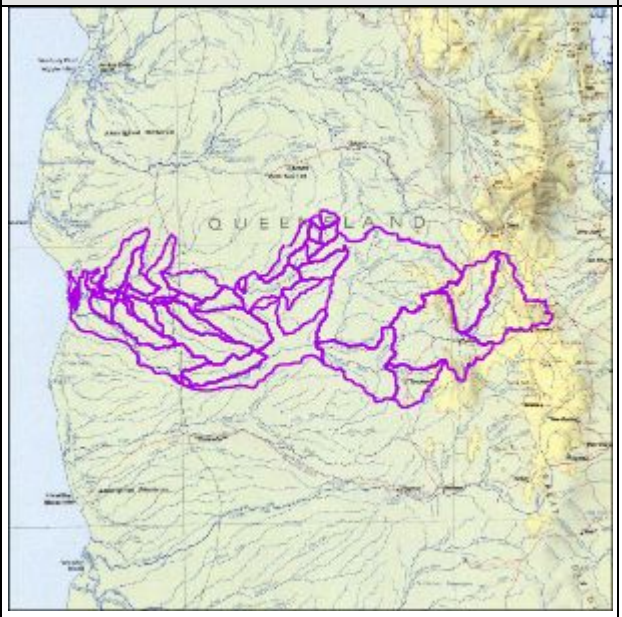
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
em_r_fa_04	Turtle nesting—west coast. Olive ridleys and flatback		Embley		y		Significant locations for nesting by threatened sea turtle taxa, particularly flatback (*Natator depressus*), olive ridley (*Lepidochelys olivacea*) and hawksbill turtles (*Eretmochelys imbricata*) (GHD 2010). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
en_nr_fa_02	Fish habitat		Endeavour	y			Sand-dune lakes between Shadd Point and Cooktown—unique fauna assemblages that vary across the lakes, including disjunct/relictual populations of certain fish taxa (Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06 (h)	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ho_nr_fa_01	Migratory wader and waterbird roost, feeding and breeding area		Holroyd	y			Significant roost sites for waders (Driscoll 1995). Part of the Gulf Plains Important Bird Area. Large breeding population of sarus crane (*Grus antigone*) and brolga (*G. rubicunda*), and supports large numbers of migratory waders, e.g. black-tailed godwit (*Limosa limosa*), great knot (*Calidris tenuirostris*), little curlew (*Numenius minutus*) and eastern curlew (*N. madagascariensis*) (Dutson et al. 2009). Also implemented as BPA decision(s): cyp_fa_05, cyp_l_06, cyp_l_07 and gup_l_03	5.1.4, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ho_nr_fa_02	Fish habitat		Holroyd	y			Exhibits significant faunal change between Cape and lower Peninsula/Gulf fish assemblages (Herbert et al. 1995). Presence of *Scortum* spp. and *Porochilus argenteus*. Also implemented as BPA decision(s): cyp_fa_06 (f)	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ho_r_fa_01	Turtle nesting—west coast. Olive ridleys and flatback		Holroyd		y		Significant locations for nesting by threatened sea turtle taxa, particularly flatback (*Natator depressus*), olive ridley (*Lepidochelys olivacea*) and hawksbill turtles (*Eretmochelys imbricata*) (GHD 2010). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ho_r_fa_02	Fish habitat		Holroyd		y		Exhibits significant faunal change between Cape and lower Peninsula/Gulf fish assemblages (Herbert et al. 1995). Presence of *Scortum* spp. and *Porochilus argenteus*. Also implemented as BPA decision(s): cyp_fa_06 (f)	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ic_r_fa_01	Crocodile habitat		Islands			y	Minor habitat used by estuarine crocodiles (*Crocodylus porosus*) - mostly for feeding, generally unsuitable for breeding (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fa_07	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ic_r_fa_02	Turtle nesting—eastern coast and off-shore islands		Islands		y		Significant nesting area for hawksbill turtles (*Eretmochelys imbricata*) and green turtles (*Chelonia mydas*) on east coast and islands off east coast (Abrahams et al. 1995). Crab Island off north-west coast contains the highest concentration of flatback nests in the world (Limpus et al. 1993). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ja_nr_fa_01	Jardine River turtle habitat		Jardine	y			Only known location for *Emydura subglobosa subglobosa* (Jardine River turtle) in Australia. Based on its habitat in Papua New Guinea (Georges 2005) this species is both riverine and non-riverine. On the Fly River, the most likely source of the Australian population, it is found throughout the river system but is most abundant in the freshwater swamps and seasonally inundates grasslands and wetlands (Georges 2005; Georges et al. 2006). This would mean that despite the only records we have being found in the main channel of the Jardine River, if still present, it is likely to occur throughout the Jardine Swamp area except those parts that are saline. Also implemented as BPA decision(s): cyp_fa_06 (a) and cyp_fa_07	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ja_nr_fa_03	Fish habitat		Jardine	y			Rich fish fauna including rare and uncommon species, with close affinities to Papua New Guinea (Abrahams et al. 1995; Herbert et al. 1995). Presence of restricted threatened turtle *Emydura subglobosa subglobosa*. Also implemented as BPA decision(s): cyp_fa_06 (a)	6.3.1	4, 3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ja_r_fa_01	Jardine River turtle habitat		Jardine		y		Only known location for *Emydura subglobosa subglobosa* (Jardine River turtle) in Australia. Based on its habitat in Papua New Guinea (Georges 2005) this species is both riverine and non-riverine. On the Fly River, the most likely source of the Australian population, it is found throughout the river system but is most abundant in the freshwater swamps and seasonally inundates grasslands and wetlands (Georges 2005; Georges et al. 2006). This would mean that despite the only records we have being found in the main channel of the Jardine River, if still present, it is likely to occur throughout the Jardine Swamp area except those parts that are saline.	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ja_r_fa_02	Crocodile habitat		Jardine			y	Important breeding area for estuarine crocodile (*Crocodylus porosus*) (Krieger 1990; Abrahams et al. 1995; Read 1998, 2001). Also implemented as BPA decision(s): cyp_fa_07	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ja_r_fa_03	Turtle nesting—west coast. Olive ridleys and flatback		Jardine		y		Significant locations for nesting by threatened sea turtle taxa, particularly flatback (*Natator depressus*), olive ridley (*Lepidochelys olivacea*) and hawksbill turtles (*Eretmochelys imbricata*) (GHD 2010). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
ja_r_fa_04	Fish habitat		Jardine		y		Rich fish fauna including rare and uncommon species, with close affinities to Papua New Guinea (Abrahams et al. 1995; Herbert et al. 1995). Presence of restricted threatened turtle *Emydura subglobosa subglobosa*. Also implemented as BPA decision(s): cyp_fa_06 (a)	6.3.1	4, 3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
je_nr_fa_01	Fish habitat		Jeannie	y			Sand-dune lakes between Shadd Point and Cooktown – unique fauna assemblages that vary across the lakes, including disjunct/relictual populations of certain fish taxa (Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06 (h)	6.3.1	4, 3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
je_r_fa_01	Cape Melville streams		Jeannie		y		Perennial streams running off boulder fields, frogs, gobies and fish in lower reaches. Highly restricted, only in a few streams. Habitat for endemic and threatened Cape Melville frog (*Cophixalus zweifeli*).	6.3.1, 6.4.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
jj_nr_fa_02	Migratory wader and seabird roost, feeding and breeding area		Jacky Jacky	y			Significant roosting area for migratory waders (Driscoll 1995, 1996). Also implemented as BPA decision(s): cyp_fa_05	6.3.1	4

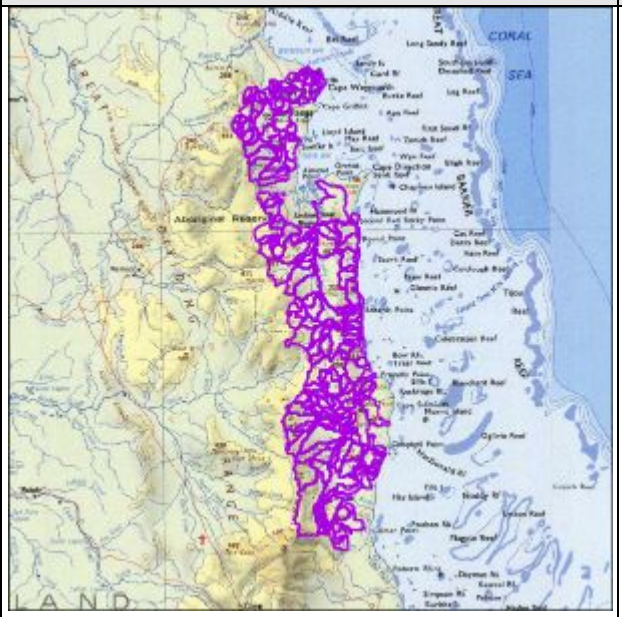
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
jj_nr_fa_03	Fish habitat		Jacky Jacky	y			Limited but distinct fish fauna in isolated dune lakes (Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06	6.3.1	3

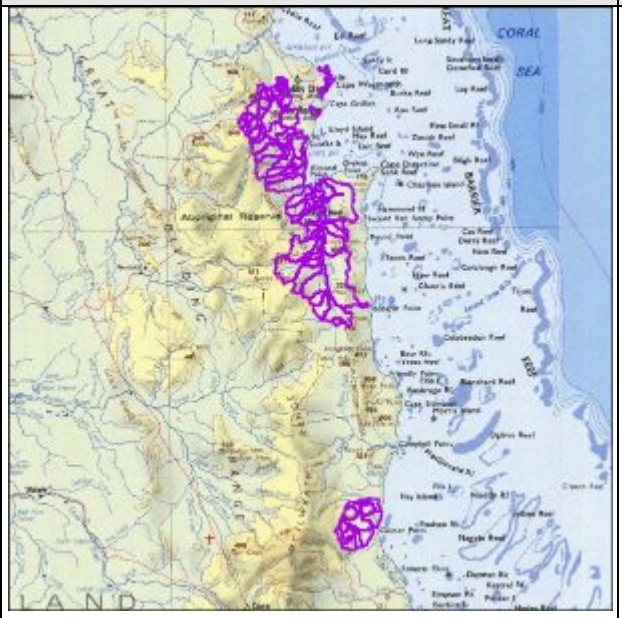
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
jj_r_fa_01	Crocodile habitat		Jacky Jacky			y	Important breeding area for estuarine crocodile (*Crocodylus porosus*) (Krieger 1990; Abrahams et al. 1995; Read 2001). Also implemented as BPA decision(s): cyp_fa_07	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
jj_r_fa_02	Turtle nesting - West coast. Olive Ridleys and flatback		Jacky Jacky		y		Significant locations for nesting by threatened sea turtle taxa, particularly hawksbill turtles (*Eretmochelys imbricata*) (Abrahams et al. 1995). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
lo_nr_fa_03	Fish habitat		Lockhart	y			Diverse fish fauna for relatively small catchment; southernmost distribution of *Hephaestus carbo* and *Neosilurus brevidorsalis* (Herbert et al. 1995). Also local population of *Macrobrachium rosenbergii* unusually large. Also implemented as BPA decision(s): cyp_fa_06 (e)	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
lo_r_fa_01	Crocodile habitat		Lockhart			y	Important breeding area for estuarine crocodile (*Crocodylus porosus*) (Krieger 1990; Abrahams et al. 1995; Read 2001). Also implemented as BPA decision(s): cyp_fa_07	6.3.1	4

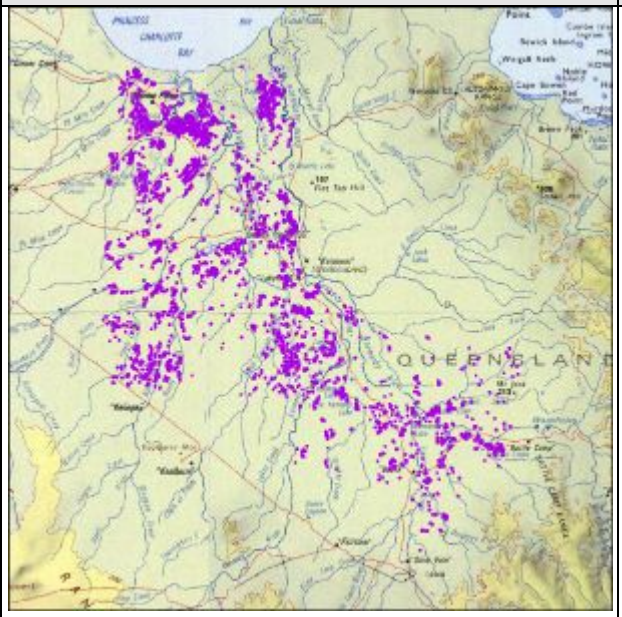
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
lo_r_fa_02	McIlwraith and Iron Ranges		Lockhart		y		High endemism and richness of frog species. Also implemented as BPA decision(s): cyp_l_17	6.3.1	4

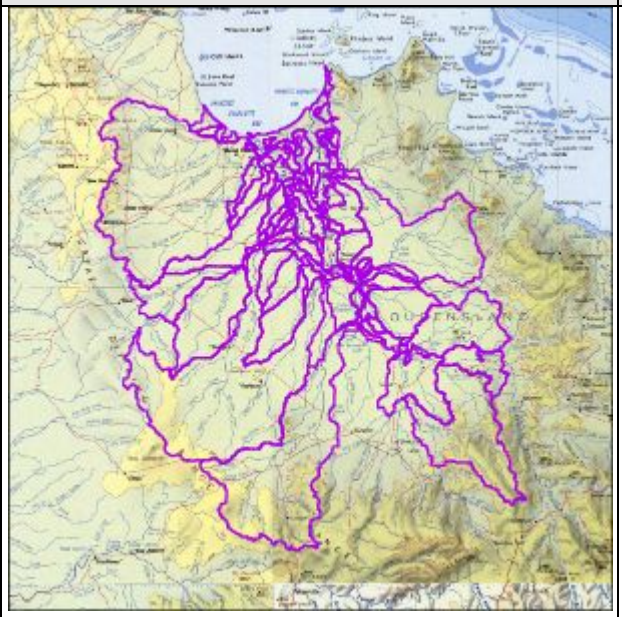
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
lo_r_fa_03	Fish habitat		Lockhart		y		Diverse fish fauna for relatively small catchment; southernmost distribution of *Hephaestus carbo* and *Neosilurus brevidorsalis* (Herbert et al. 1995). Also local population of *Macrobrachium rosenbergii* unusually large. Also implemented as BPA decision(s): cyp_fa_06 (e)	6.3.1	3

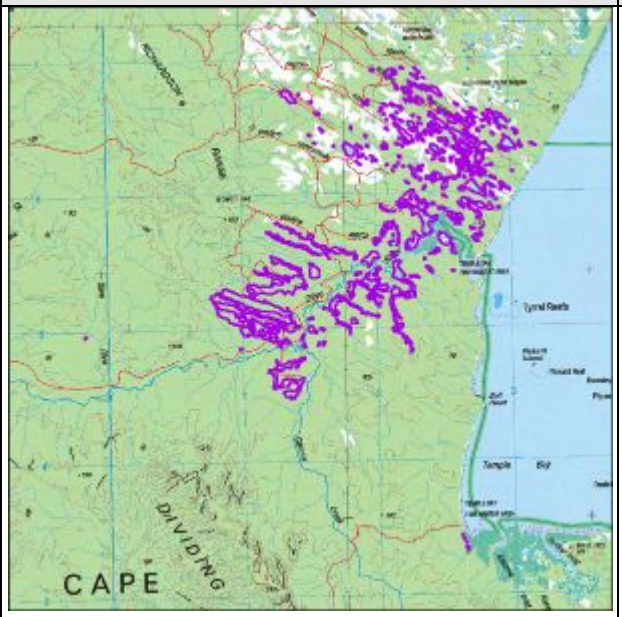
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
mw_nr_fa_01	Important Bird Areas (IBA)		Mitchell West	y			Part of the Gulf Plains Important Bird Area. Large breeding population of sarus crane (*Grus antigone*) and brolga (*G. rubicunda*), and supports large numbers of migratory waders, e.g. black-tailed godwit (*Limosa limosa*), great knot (*Calidris tenuirostris*) little curlew (*Numenius* minutus) and eastern curlew (*N. madagascariensis*) (Dutson et al. 2009). Related to BPA decision(s): cyp_fa_05, cyp_l_07 and gup_l_03	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
mw_nr_fa_02	Migratory wader and waterbird roost, feeding and breeding area		Mitchell West	y			Significant roost sites for waders (Driscoll 1995). Part of the Gulf Plains Important Bird Area. Large breeding population of sarus crane (*Grus antigone*) and brolga (*G. rubicunda*), and supports large numbers of migratory waders, e.g. black-tailed godwit (*Limosa limosa*), great knot (*Calidris tenuirostris*) little curlew (*Numenius minutus*) and eastern curlew (*N. madagascariensis*) (Dutson et al. 2009). Also implemented as BPA decision(s): cyp_fa_05, cyp_l_07 and gup_l_03	5.1.4, 6.3.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
mw_r_fa_01	Turtle nesting - West coast. Olive Ridleys and flatback		Mitchell West		y		Significant locations for nesting by threatened sea turtle taxa, particularly flatback (*Natator depressus*), olive ridley (*Lepidochelys olivacea*) and hawksbill turtles (*Eretmochelys imbricata*) (GHD 2010). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
nb_nr_fa_02	Waterbird roost, feeding and breeding areas		Normanby	y			Important area for waterbirds (both numbers and species diversity) using diverse wetland habitats (Driscoll 1995, 2001). Also implemented as BPA decision(s): cyp_fa_05	5.1.4, 6.3.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
nb_r_fa_01	Crocodile habitat		Normanby			y	Major feeding area for estuarine crocodile (*Crocodylus porosus*) (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fa_07	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
op_nr_fa_02	Fish habitat		Olive-Pascoe	y			Diverse fish fauna for relatively small catchment; southernmost limit of Jardinean fish fauna (Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06 (d)	6.3.1	3

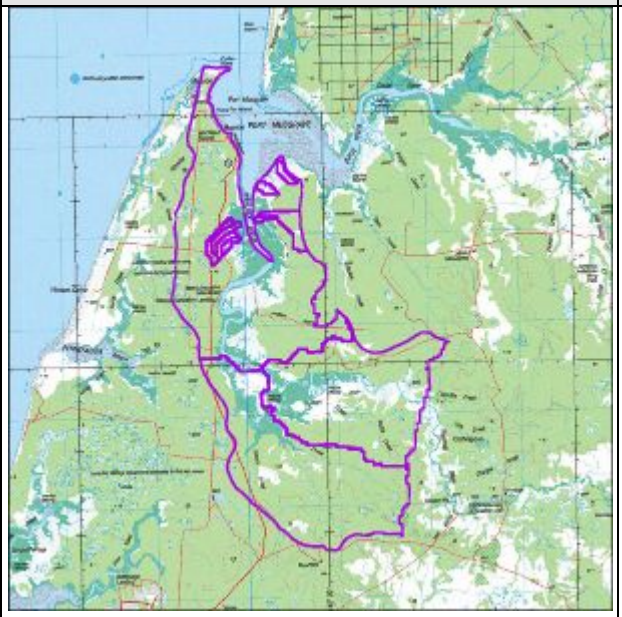
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
op_r_fa_01	McIlwraith and Iron Ranges		Olive-Pascoe		y		High endemism and richness of frog species. Also implemented as BPA decision(s): cyp_l_17	6.3.1	4

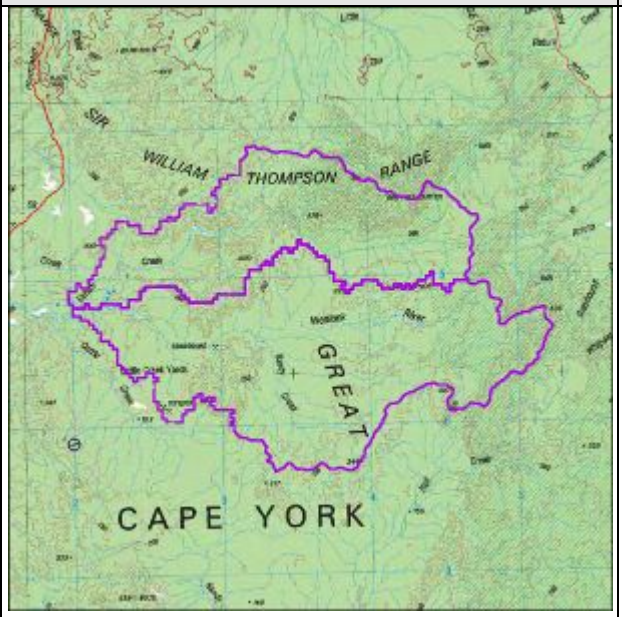
Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
op_r_fa_02	Fish habitat		Olive-Pascoe		y		Diverse fish fauna for relatively small catchment; southernmost limit of Jardinean fish fauna (Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06 (d)	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
sw_nr_fa_02	Fish habitat		Stewart	y			Disjunct populations of fish species *(Pseudomugil tenellus* and *Porochilus rendahli*) in dune lakes (Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06 (g)	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
sw_r_fa_01	McIlwraith and Iron Ranges		Stewart		y		High endemism and richness of frog species. Also implemented as BPA decision(s): cyp_l_17	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
we_nr_fa_03	Fish habitat		Wenlock	y			Richest known freshwater fish fauna in Australia, including presence of threatened taxa (Abrahams et al. 1995; Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06 (b)	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
we_r_fa_01	Crocodile habitat		Wenlock			y	Largest successful breeding area for estuarine crocodile (*Crocodylus porosus*) in Queensland (Krieger 1990; Abrahams et al. 1995; Read 1998, 2001). Also implemented as BPA decision(s): cyp_fa_07	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
we_r_fa_02	McIlwraith and Iron Ranges		Wenlock		y		High endemism and richness of frog species. Also implemented as BPA decision(s): cyp_l_17	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[27]	R	ES	Values	CIM[28]	Con. rating[29]
wt_r_fa_01	Turtle nesting - West coast. Olive Ridleys and flatback		Watson		y		Significant locations for nesting by threatened sea turtle taxa, particularly flatback (*Natator depressus*), olive ridley (*Lepidochelys olivacea*) and hawksbill turtles (*Eretmochelys imbricata*) (GHD 2010). Across the Cape York, those study areas that are north of Weipa are assigned a conservation rating of 4 and those study areas south of Weipa (lower density) are assigned a conservation rating of 3. Also implemented as BPA decision(s): cyp_fa_02	6.3.1	4

5 Ecology

5.1 Special Features

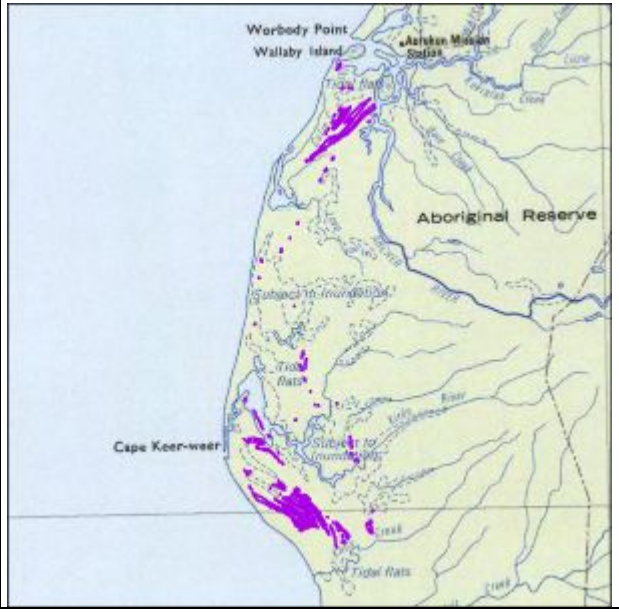
The panel identified several non-riverine and riverine special features in the Cape York region (Table 19). These were identified for their ecological values. Some special features nominated by either the aquatic flora and/or the aquatic fauna expert panels that were considered to have additional values (e.g. geomorphological or hydrological) were implemented as wetland ecology special features instead.

Each spatial unit that intersected with a particular ecosystem or feature in Table 19 was given a score equal to the conservation rating.

Decisions are listed alphabetically by catchment. These features were intersected with the spatial units to identify the values for ‘Criterion 5 Priority species’ and ecosystems and ‘Criterion 6 Special features’. All implemented special features were given a conservation rating of between one and four as assigned by the panel. Decisions that were not able to be implemented due to a lack of readily available data or unconfirmed values are indicated with ‘_not_implemented’ in the decision implementation number column. Decisions that have ‘to be implemented’ in the Implementation column are in the process of being implemented assuming available and suitable data and time. Where a single decision crosses a number of study areas, the decision has been duplicated for each study area. Decisions sorted by Study Area.

Table 19: Identified ecology special features and their values

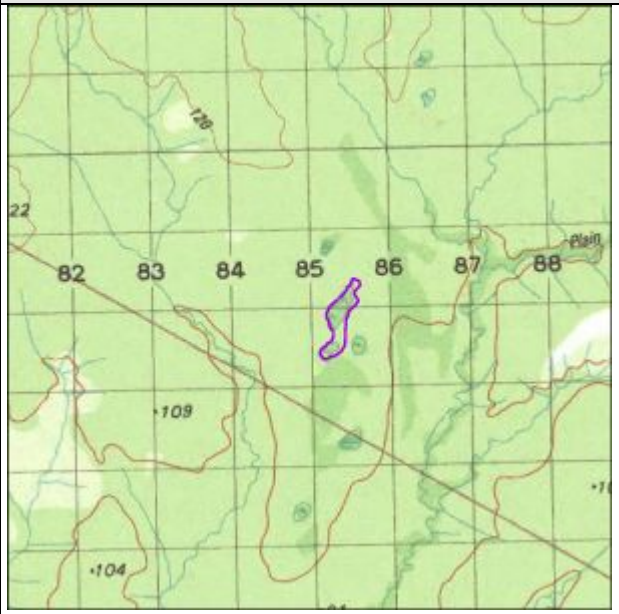
Table sorted by decision number which equates to alphabetically by study area then non-riverine/riverine.

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ar_nr_ec_03	West coast dunefields on Quaternary surfaces		Archer	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

[30] Assessment type (NR – non-riverine, R – riverine, ES – estuarine)

[31] Number refers to the values from the generic CIM list in Table 21.

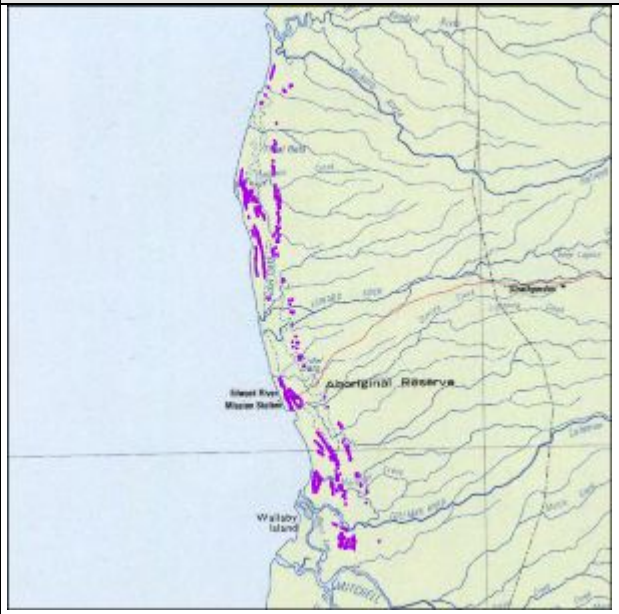
[32] 4 is the highest value.

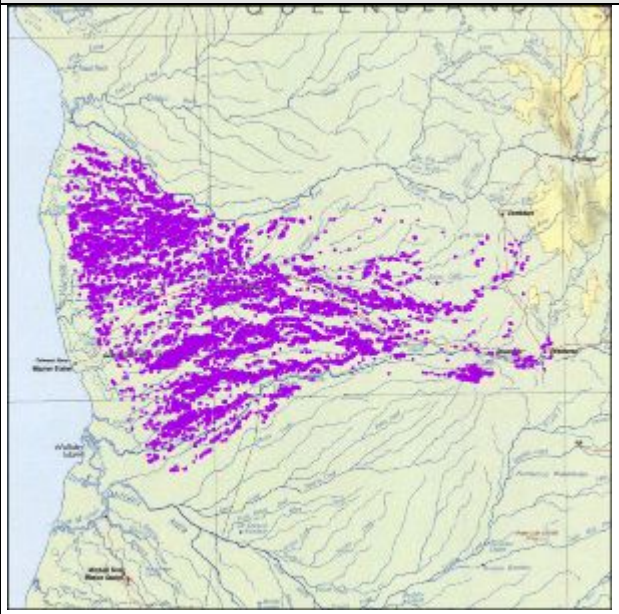
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ar_nr_ec_04	Batavia sinkholes		Archer	y			Rare and restricted habitat mostly confined to this locality. A dense low tree/tall shrub layer (5-8m tall) is dominant and forms a fairly continuous, dense canopy. This layer is composed of a variety of semi-deciduous species with no species showing clear dominance. *Melaleuca clarksonii* (hard-barked teatree) and *M. saligna* (a paperbark) are frequent emergent trees (12-15m tall). A sparse low shrub layer (1-2m tall) is present. The ground layer is very sparse. Occurs in sinkholes. (Broad Vegetation Group (1M): 7b). Endemic *Melaleuca clarksonii* and rich frog fauna. Also implemented as BPA decision(s): cyp_l_15	6.2.1	3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ar_r_ec_01	Spring-fed riverine wetlands		Archer		y		Spring-fed riverine wetlands, some of which are on the edges of Tertiary surfaces support plant species of conservation significance, regional ecosystems of conservation significance and ecological function. Ecological functions include refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007; Covacevich 2010).	6.3.1, 6.4.1	4, 4

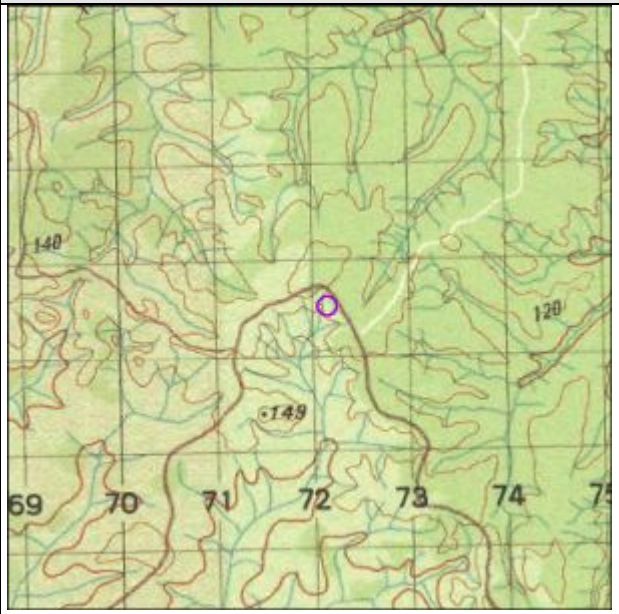
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ar_r_ec_02	Archer wetlands		Archer		y		Contains some of the best quality wetlands in western Cape York, supports abundant wetland fauna (breeding, roosting and dry season refugia), and has several major wader roosts (Abrahams et al. 1995). Related to BPA decision(s): cyp_fa_05 and cyp_l_34	6.3.1	4

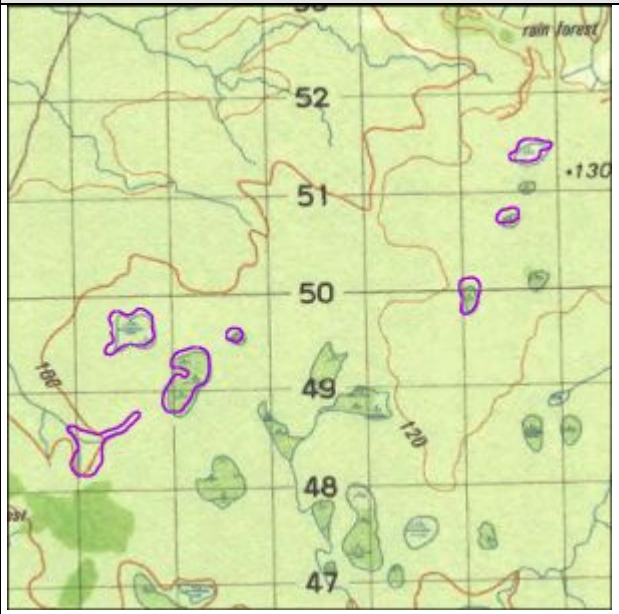
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ar_r_ec_03	Mangroves		Archer			y	Significant marine vegetation - high species diversity (30spp.). Important ecological role (eg fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
cl_nr_ec_02	West coast dunefields on Quaternary surfaces		Coleman	y			Dunefield rise – prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
cl_nr_ec_03	Perched lakes on Tertiary surface		Coleman	y			Important refuge for a range of wetland species. Also implemented as BPA decision(s): cyp_l_06	6.1.1, 6.3.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
cl_r_ec_01	Mangroves		Coleman			y	Significant marine vegetation - high species diversity (30spp.). Important ecological role (eg fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
du_nr_ec_01	Springs		Ducie	y			Springs are ground water influenced ecosystems that provide habitat refugial values for wildlife and often contain threatened species. Also implemented as BPA decision(s): cyp_l_09 and cyp_l_16	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
du_nr_ec_02	Bramwell		Ducie	y			Good example of ecosystem mosaic of swamps, *Eucalyptus tetrodonta* woodland and vine thickets on remnant Tertiary surface with deep red earths. Presence of threatened species. Also implemented as BPA decision(s): cyp_l_13	6.2.1	3

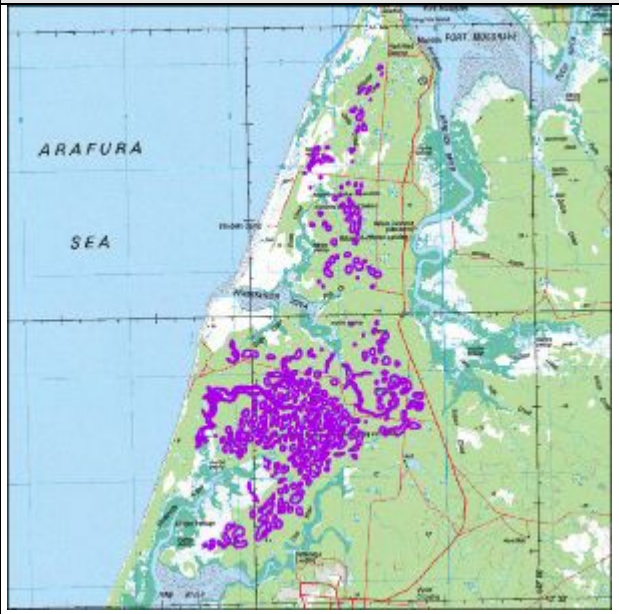
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
du_nr_ec_04	Springs		Ducie	y			Springs are ground water influenced ecosystems that provide habitat refugial values for wildlife and often contain threatened species. Also implemented as BPA decision(s): cyp_l_09 and cyp_l_16	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
du_nr_ec_05	West coast dunefields on Quaternary surfaces		Ducie	y			Dunefield rise – prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
du_r_ec_01	Intertidal area of Port Musgrave		Ducie			y	Related to decision "du_r_ec_03 - Mangroves" but exhibits a significant large well developed area of very high productivity, excellent example of shallow estuary showing delta development and supports a large population of estuarine crocodile (*Crocodylus porosus*) in Queensland (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_l_27	6.3.1, 6.4.2, 6.1.1	4, 4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
du_r_ec_02	Spring-fed riverine wetlands		Ducie		y		Plant species of conservation significance. Regional ecosystems of conservation significance. Ecological function including refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

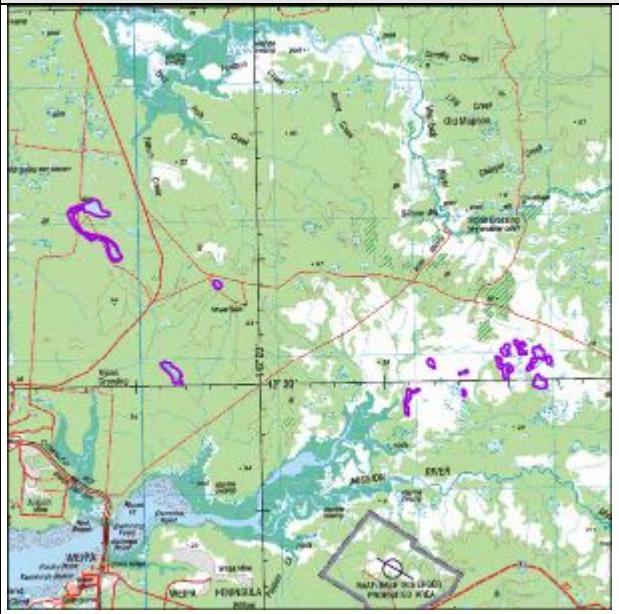
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
du_r_ec_03	Mangroves		Ducie			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (eg fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
em_nr_ec_01	Perched lakes on Tertiary surfaces between Mapoon and Weipa		Embley	y			Large complex. Perched lacustrine systems, spring-fed river. Refuge in dry system.	6.4.1	3

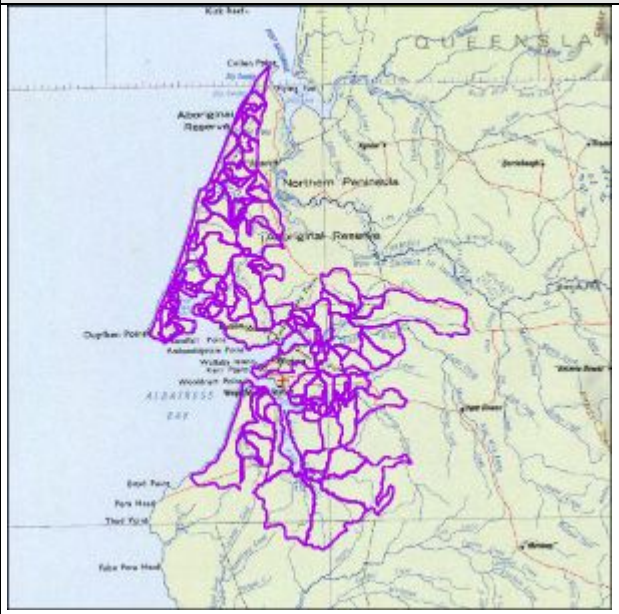
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
em_nr_ec_02	West coast dunefields on Quaternary surfaces		Embley	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Threatened species. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
em_nr_ec_03	Mapoon and Weipa dune complexes		Embley	y			Mapoon has unique ecosystem complexity of beach, dunes, vine thickets, spectacular swamps (drainage runs parallel to coast), melaleuca forests and hardwood forests. This habitat complexity is in a small area and is home to huge number of birdlife. In places the ecosystems are quite narrow. The entire system needs to be recognised as a single entity. Similar complex at Aurukun (decisions "em_nr_ec_04" and "wt_nr_ec_02") of lower significance. Also implemented as BPA decision(s): cyp_l_36	6.2.1, 6.1.1	4, 4

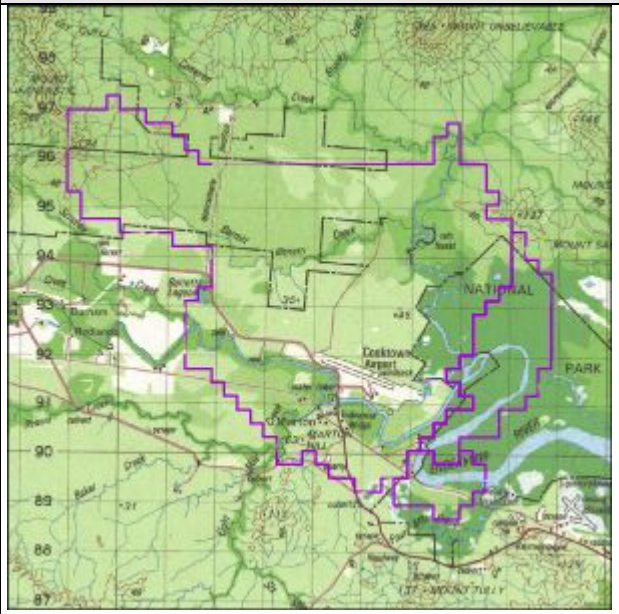
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
em_nr_ec_04	Aurukun dune complexes		Embley	y			Unique ecosystem complexity of beach, dunes, vine thickets, spectacular swamps (drainage runs parallel to coast), melaleuca forests and hardwood forests. This habitat complexity is in a small area and is home to huge number of birdlife. In places the ecosystems are quite narrow. The entire system needs to be recognised as a single entity. Similar complex in Mapoon/Weipa region (decisions "em_nr_ec_03" and "we_nr_ec_06") of higher significance. Also implemented as BPA decision(s): cyp_l_36	6.2.1, 6.1.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
em_nr_ec_05	Batavia sinkholes		Embley	y			Rare and restricted habitat mostly confined to this locality. A dense low tree/tall shrub layer (5-8m tall) is dominant and forms a fairly continuous, dense canopy. This layer is composed of a variety of semi-deciduous species with no species showing clear dominance. *Melaleuca clarksonii* (hard-barked teatree) and *M. saligna* (a paperbark) are frequent emergent trees (12-15m tall). A sparse low shrub layer (1-2m tall) is present. The ground layer is very sparse. Occurs in sinkholes. (Broad Vegetation Group (1M): 7b). Endemic *Melaleuca clarksonii* and rich frog fauna. Also implemented as BPA decision(s): cyp_l_15	6.2.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
em_r_ec_01	Spring-fed riverine wetlands		Embley		y		Plant species of conservation significance. Regional ecosystems of conservation significance. Ecological function including refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

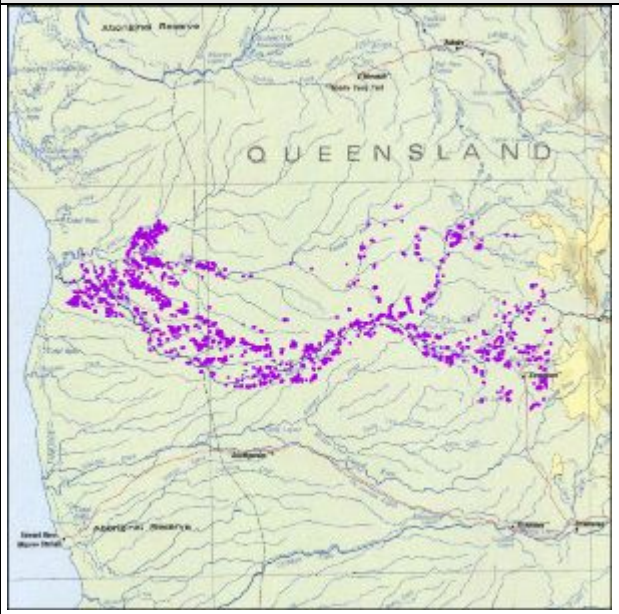
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
em_r_ec_02	Mangroves		Embley			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (eg fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
en_nr_ec_01	East coast dunefields on Holocene surfaces		Endeavour	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Threatened species. Also implemented as BPA decision(s): cyp_l_07 and cyp_fa_06 (h)	6.1.1, 6.3.1	4, 3

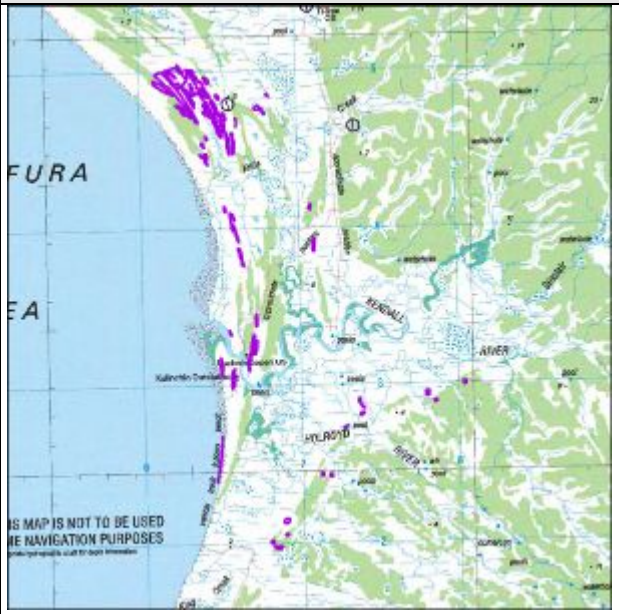
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
en_r_ec_01	Endeavour Loop		Endeavour		y		Very tall mangroves, species associations with relatively rich frog fauna, presence of threatened taxa—estuarine crocodile (*Crocodylus porosus*), black-necked stork (*Ephippiorhynchus asiaticus*), eastern curlew (*Numenius madagascariensis*) and beach stone-curlew (*Esacus neglectus*) (Bunt et al. 1991; Abrahams et al. 1995; Hines and McDonald 2007). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

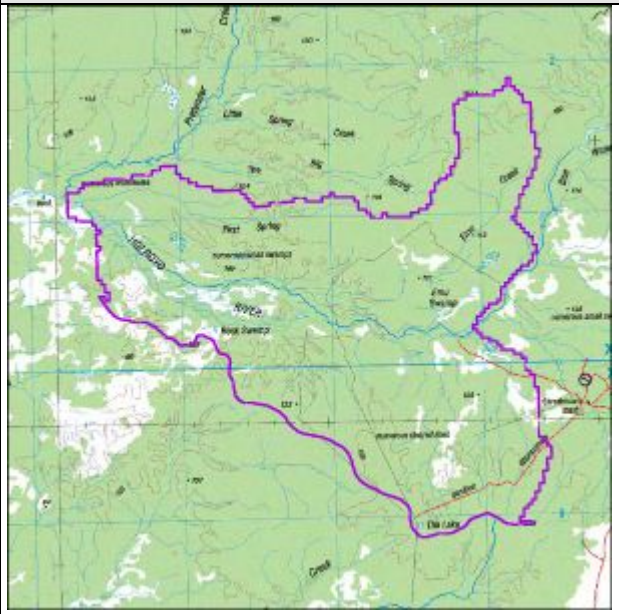
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
en_r_ec_02	Spring-fed riverine wetlands		Endeavour		y		Plant species of conservation significance. Regional ecosystems of conservation significance. Ecological function including refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

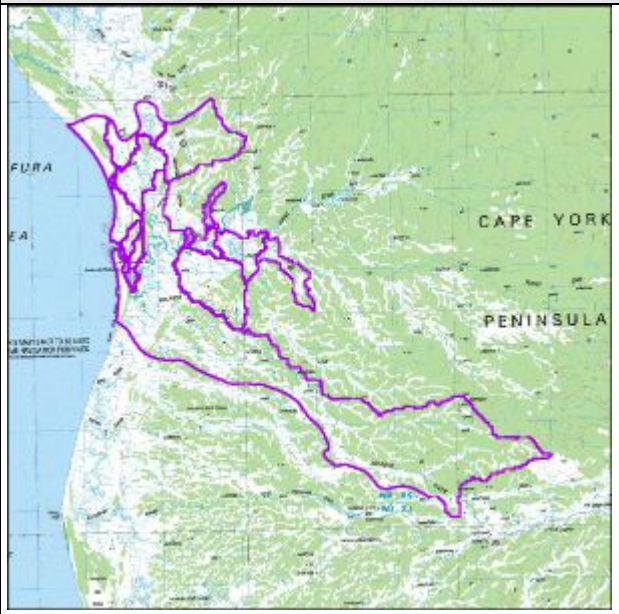
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
en_r_ec_03	Mangroves		Endeavour			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (eg fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

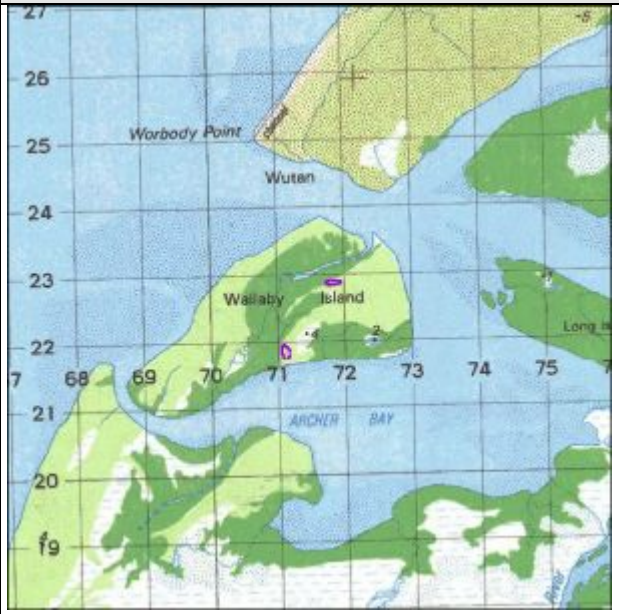
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ho_nr_ec_01	Perched lakes on Tertiary surface		Holroyd	y			Important refuge for a range of wetland species. Also implemented as BPA decision(s): cyp_l_06	6.1.1, 6.3.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ho_nr_ec_02	Springs		Holroyd	y			Springs are ground water influenced ecosystems that provide habitat refugial values for wildlife and often contain threatened species. Also implemented as BPA decision(s): cyp_l_09, cyp_l_16 and cyp_l_37	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ho_nr_ec_03	West coast dunefields on Quaternary surfaces		Holroyd	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

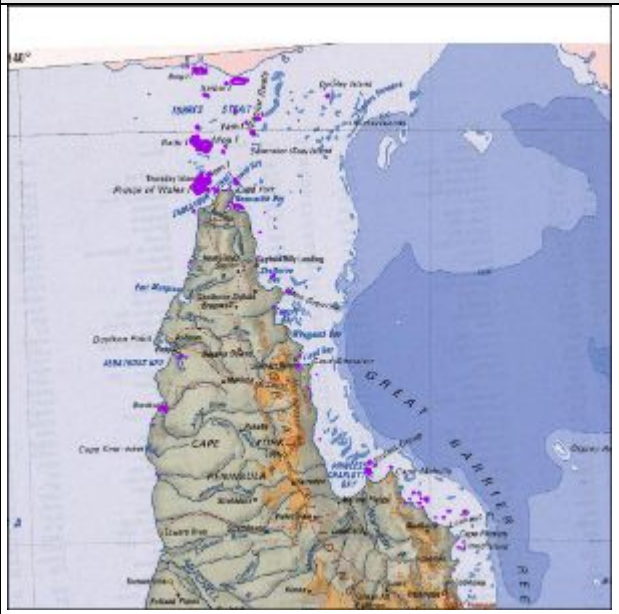
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ho_r_ec_01	Spring-fed riverine wetlands		Holroyd		y		Plant species of conservation significance. Regional ecosystems of conservation significance. Ecological function including refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

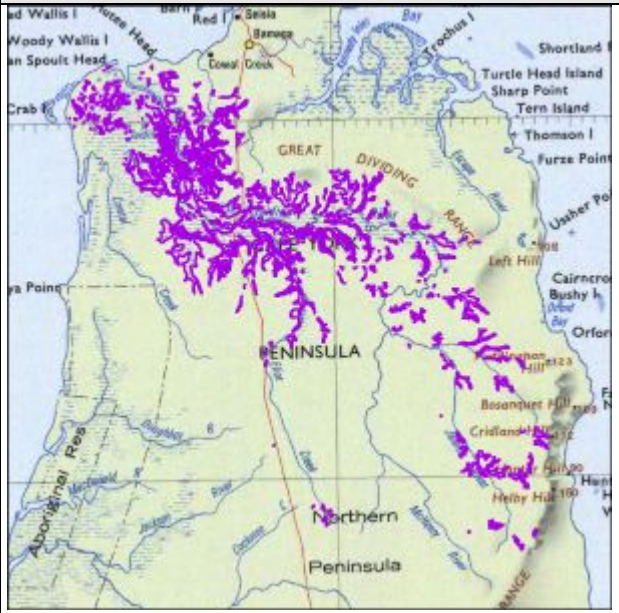
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ho_r_ec_02	Mangroves		Holroyd			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (eg fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

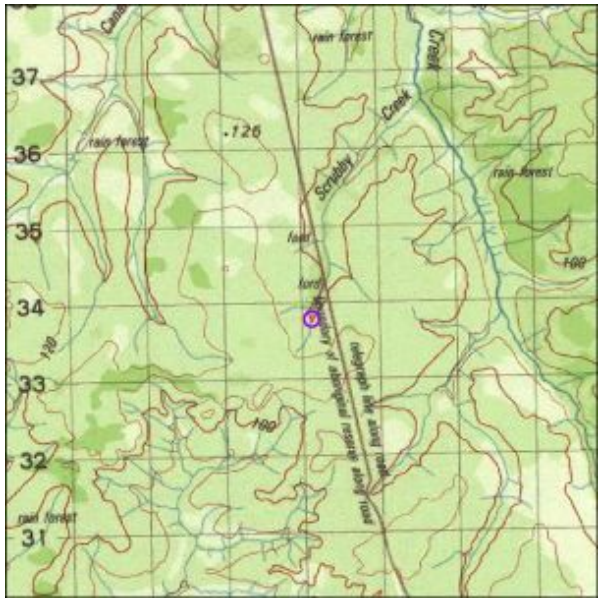
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ic_nr_ec_01	West coast dunefields on Quaternary surfaces		Islands	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Also implemented as BPA decision(s): cyp_I_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ic_nr_ec_02	East coast dunefields on Holocene surfaces		Islands	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Also implemented as BPA decision(s): cyp_I_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ic_nr_ec_03	Torres Strait Island non-riverine wetlands		Islands	y			Non-riverine wetland communities of Boigu, Saibai, Badu and Moa Islands include regional ecosystems (REs) such as 3.1.7 *(Schoenoplectus* spp. sedgelands), 3.3.66, 3.10.20 and others that provide habitat for threatened species, exhibit distinct and unique geomorphic features and in some cases exhibit distinctive estuarine connection. Some of these REs also provide habitat for waterbirds. Also implemented as BPA decision(s): cyp_fl_20 and cyp_fl_21	6.1.1, 6.3.1, 6.4.1	4, 4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ic_r_ec_01	Mangroves		Islands			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (eg fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ja_nr_ec_01	Jardine Wetland complex		Jardine	y			High diversity of freshwater fish and known breeding area for estuarine crocodile (*Crocodylus porosus*). Indicative of former connectivity with Papua New Guinea. Heath and sedges. Geomorphologically unique and river system in near natural condition (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_l_08, cyp_fa_06 (a), and cyp_fa_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ja_nr_ec_02	Springs		Jardine	y			Springs are ground water influenced ecosystems that provide habitat refugial values for wildlife and often contain threatened species. Also implemented as BPA decision(s): cyp_l_09 and cyp_l_16	6.3.1	4

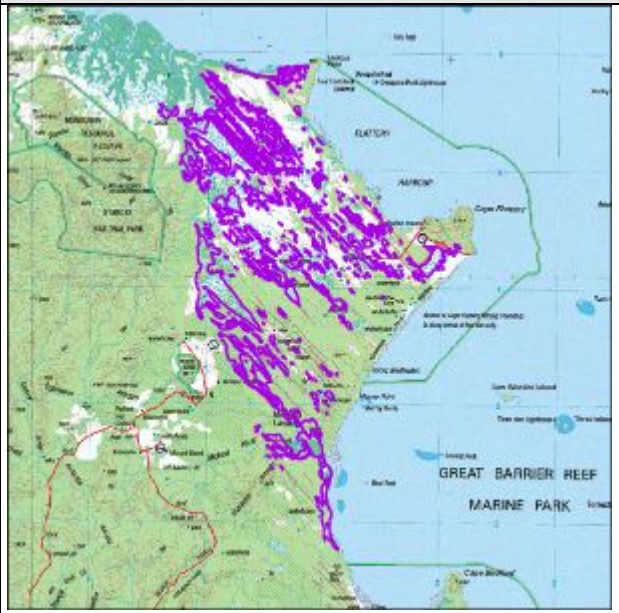
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ja_nr_ec_03	Springs		Jardine	y			Springs are ground water influenced ecosystems that provide habitat refugial values for wildlife and often contain threatened species. Also implemented as BPA decision(s): cyp_l_09 and cyp_l_16	6.3.1	3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ja_nr_ec_04	West coast dunefields on Quaternary surfaces		Jardine	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Threatened species. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ja_r_ec_01	Spring-fed riverine wetlands		Jardine		y		Spring-fed riverine wetlands, some of which are on the edges of Tertiary surfaces support plant species of conservation significance, regional ecosystems of conservation significance and ecological function. Ecological functions include refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ja_r_ec_02	Jardine River Catchment		Jardine		y		Catchment with biotic links to Papua New Guinea, unique sandstone lithology, high diversity of water-dependent habitat types, and mostly undisturbed. Long-term refugia with high levels of endemism among aquatic fauna, and know breeding area for estuarine crocodile (*Crocodylus porosus*) (Cook et al. 2011). Also implemented as BPA decision(s): cyp_l_08	6.2.1	3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
ja_r_ec_03	Mangroves		Jardine			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (eg fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

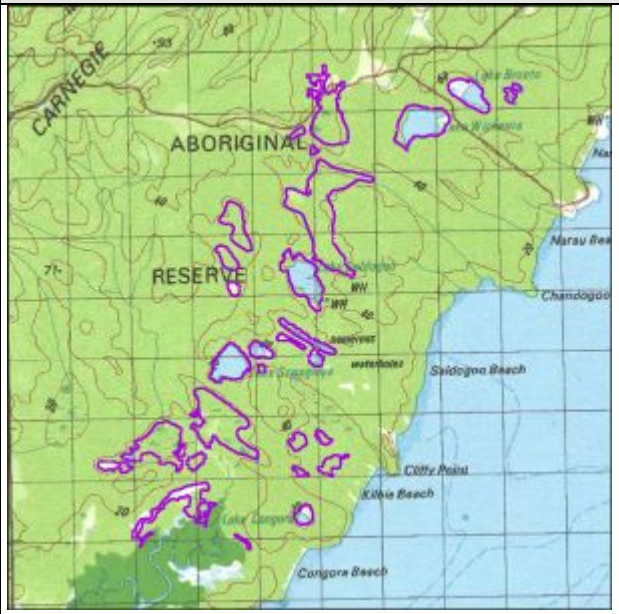
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
je_nr_ec_01	Cape Flattery and Cape Bedford dune systems		Jeannie	y			Wetlands within quaternary dunefields. Dune lakes contain unique fauna assemblages, occasionally estuarine crocodiles (*Crocodylus porosus*) (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fa_06 (h) and cyp_l_07 and cyp_l_29	6.1.1, 6.3.1	4, 4

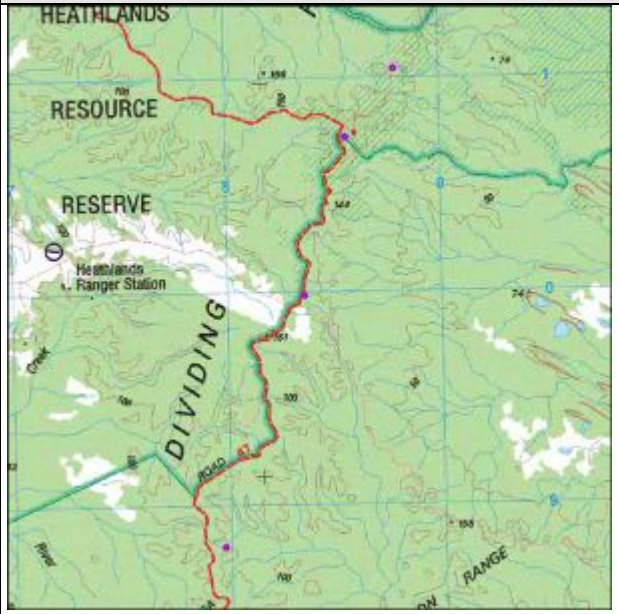
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
je_nr_ec_02	East coast dunefields on Holocene surfaces		Jeannie	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Threatened species. Also implemented as BPA decision(s): cyp_l_07 and cyp_fa_06 (h)	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
je_r_ec_01	Spring-fed riverine wetlands		Jeannie		y		Spring-fed riverine wetlands, some of which are on the edges of tertiary surfaces support plant species of conservation significance, regional ecosystems of conservation significance and ecological function. Ecological functions include refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

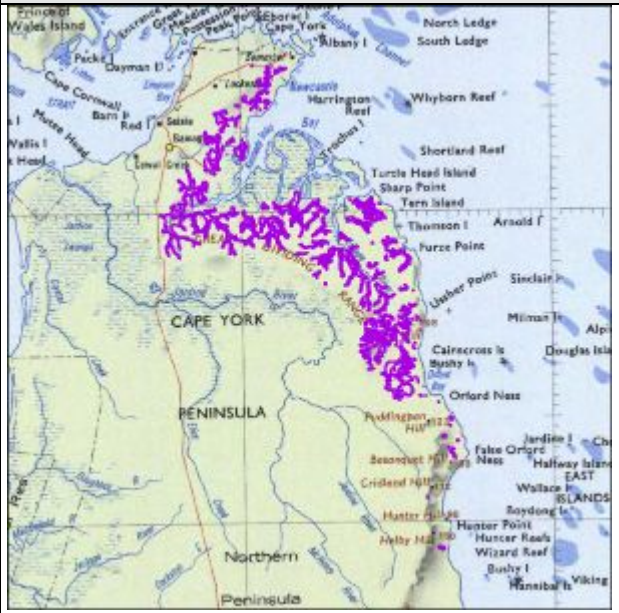
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
je_r_ec_02	Mangroves		Jeannie			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (e.g. fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

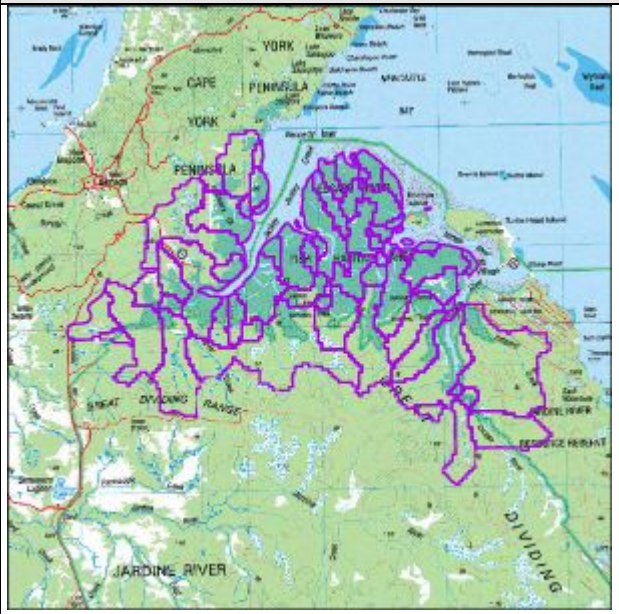
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
jj_nr_ec_01	Lakes within Quaternary dunefields		Jacky Jacky	y			Rare perched lakes on a white sand dune system. Contains a high diversity of hydrosystem types. Relictual populations of freshwater fish often in unique assemblages (Cook et al. 2011). High species richness with many threatened species. Rainforest and heathlands. Also implemented as BPA decision(s): part of cyp_l_07 and cyp_fa_06 (h)	6.3.1, 6.4.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
jj_nr_ec_02	Northern Lakes		Jacky Jacky	y			Perched lake complex. Perennial waterbodies, species diversity, and wetland plants only found in these lakes. Richness and diversity. Endemic earthworms.	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
jj_nr_ec_03	Springs		Jacky Jacky	y			Springs are ground water influenced ecosystems that provide habitat refugial values for wildlife and often contain threatened species. Also implemented as BPA decision(s): cyp_l_09 and cyp_l_16	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
jj_nr_ec_04	East coast dunefields on Holocene surfaces		Jacky Jacky	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Threatened species. Also implemented as BPA decision(s): cyp_l_07 and cyp_fa_06 (h)	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
jj_nr_ec_05	Jardine Wetland complex		Jacky Jacky	y			High diversity of freshwater fish and known breeding area for estuarine crocodile (*Crocodylus porosus*). Indicative of former connectivity with Papua New Guinea. Heath and sedges. Geomorphologically unique and river system in near natural condition (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_l_08 and cyp_fa_06 (a)	6.1.1, 6.3.1	4, 4

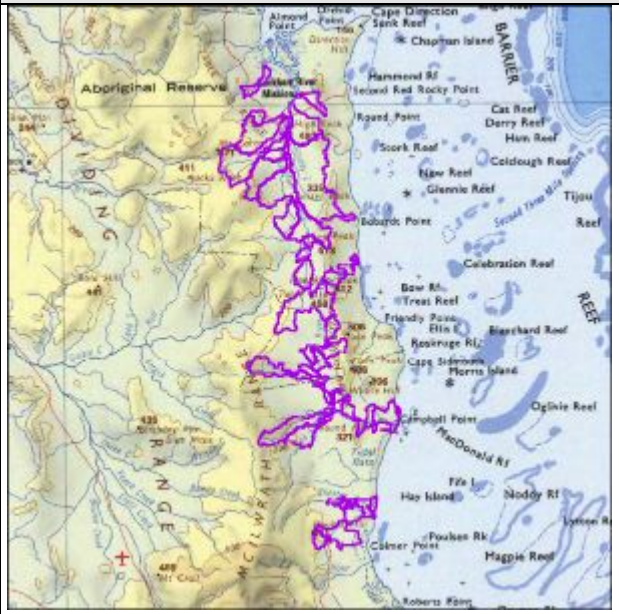
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
jj_r_ec_01	Intertidal area of Escape		Jacky Jacky			y	Related to decision 'du_r_ec_03 – Mangroves' but exemplifies a significant, highly productive, extensive and diverse estuarine area. Supports a large population of estuarine crocodile (*Crocodylus porosus*) in Queensland (Abrahams et al. 1995).	6.3.1, 6.4.2	4, 4

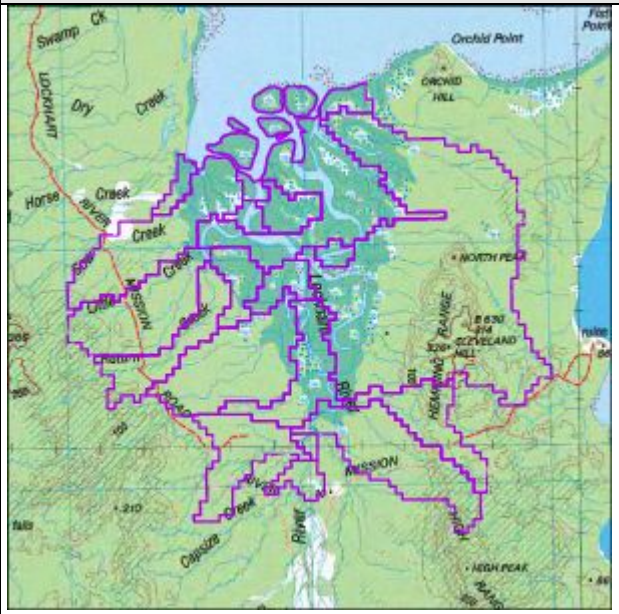
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
jj_r_ec_02	Spring-fed riverine wetlands		Jacky Jacky		y		Spring-fed riverine wetlands, some of which are on the edges of tertiary surfaces, supports plant species of conservation significance, regional ecosystems of conservation significance and ecological function. Ecological functions include refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
jj_r_ec_03	Mangroves		Jacky Jacky			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (eg fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

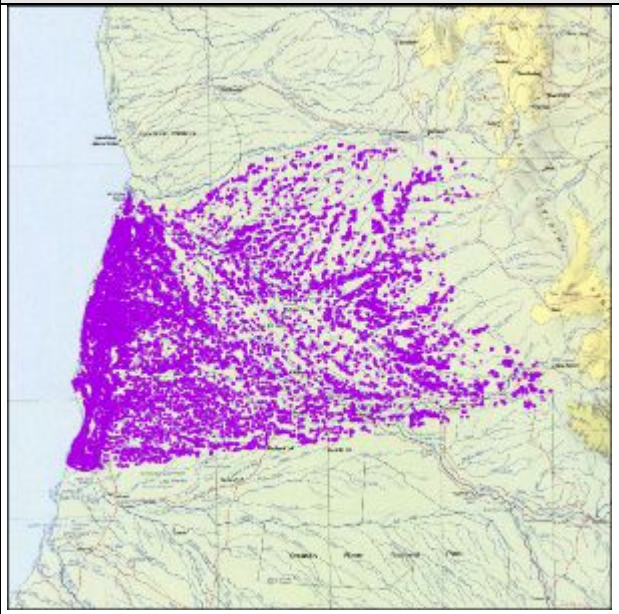
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
lo_nr_ec_01	Three Quarter Mile Lake		Lockhart	y			Holocene palaeoclimate reference site and cultural story site. Additional values from Luly Grindrod and Penny 2006. Also area of special interest based in unique fish assemblage (Herbert et al. 1995). Also implemented as BPA decision(s): cyp_fa_06 (g)	6.2.1	3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
lo_nr_ec_02	East coast dunefields on Holocene surfaces		Lockhart	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Threatened species. Also implemented as BPA decision(s): cyp_l_07 and cyp_fa_06 (h)	6.1.1, 6.3.1	4, 4

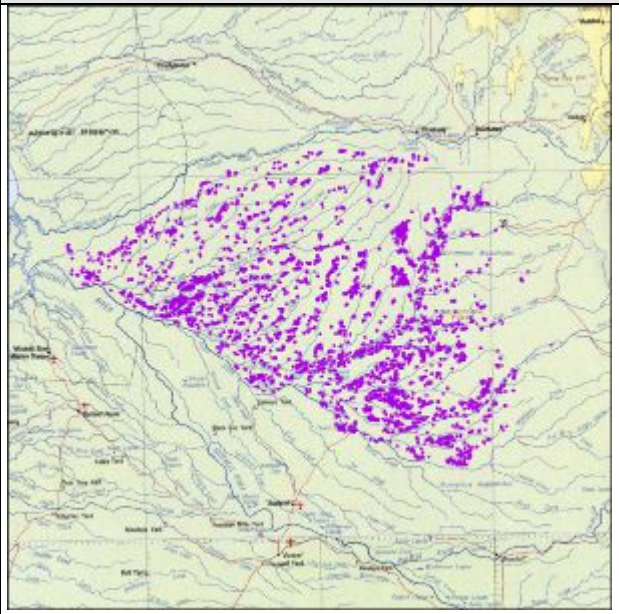
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
lo_r_ec_01	Silver Plains and eastern fall of McIlwraith Range		Lockhart		y		High endemism, gallery forests, intact, low level of disturbance.	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
lo_r_ec_02	Intertidal area of Lockhart		Lockhart			y	Related to decision 'du_r_ec_03 – Mangroves' but exemplifies a significant, highly productive, extensive and diverse estuarine area. Supports a large population of estuarine crocodile (*Crocodylus porosus*) in Queensland (Abrahams et al. 1995).	6.3.1, 6.4.2	4, 4

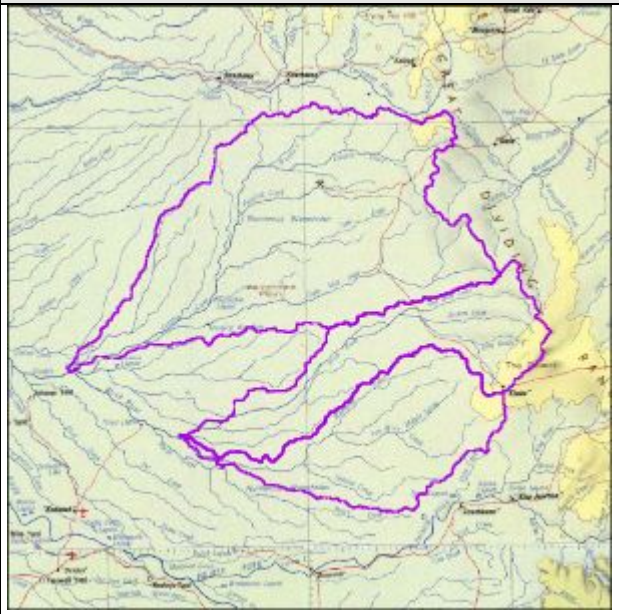
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
lo_r_ec_03	Mangroves		Lockhart			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (e.g. fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
mw_nr_ec_01	Mitchell wetlands		Mitchell West	y			High diversity, area, density and connectivity of wetland systems (lacustrine and palustrine), including high range of transparency/turbidity regimes, and important waterbird habitat, e.g. great-billed heron (*Ardea sumatrana*) (Cook et al. 2011). Also implemented as BPA decision(s): gup_l_03 and gup_l_05	6.3.1	4

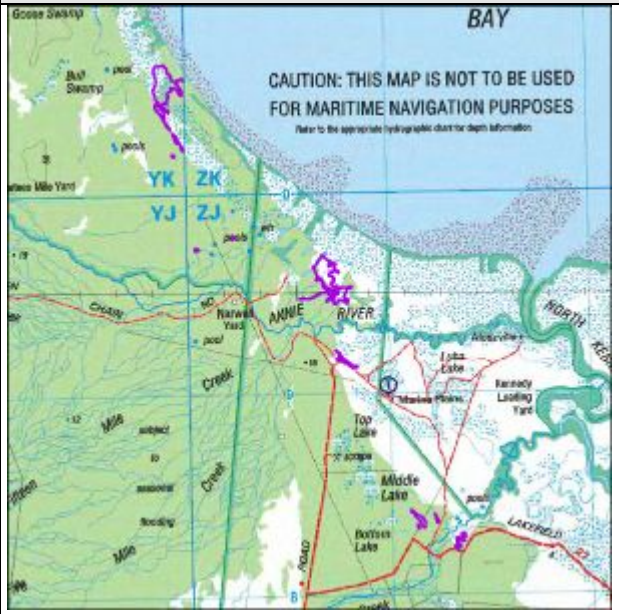
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
mw_nr_ec_03	West coast dunefields on Quaternary surfaces		Mitchell West	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
mw_nr_ec_04	Perched lakes on Tertiary surface		Mitchell West	y			Important refuge for a range of wetland species. Also implemented as BPA decision(s): cyp_l_06	6.1.1, 6.3.1	3, 3

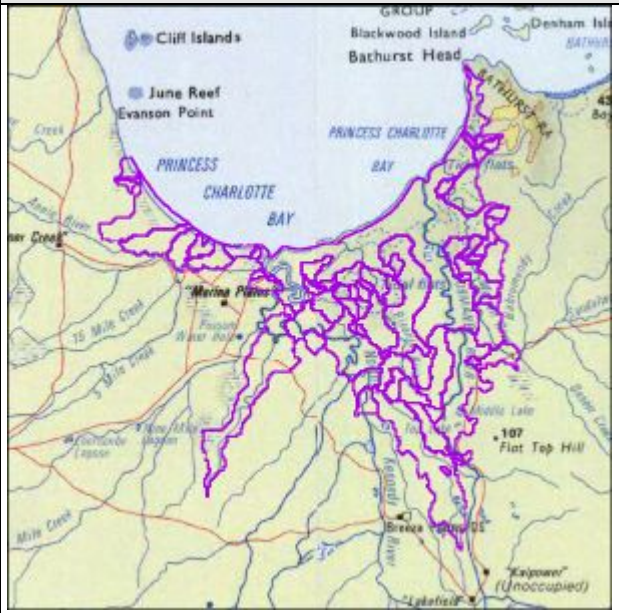
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
mw_nr_ec_05	Crosbie Mud Springs		Mitchell West	y			No other springs like these on Cape York. Intermittent flow and area covers an aggregation of springs. Also implemented as BPA decision(s): cyp_l_37	6.3.1, 6.4.1	4, 4

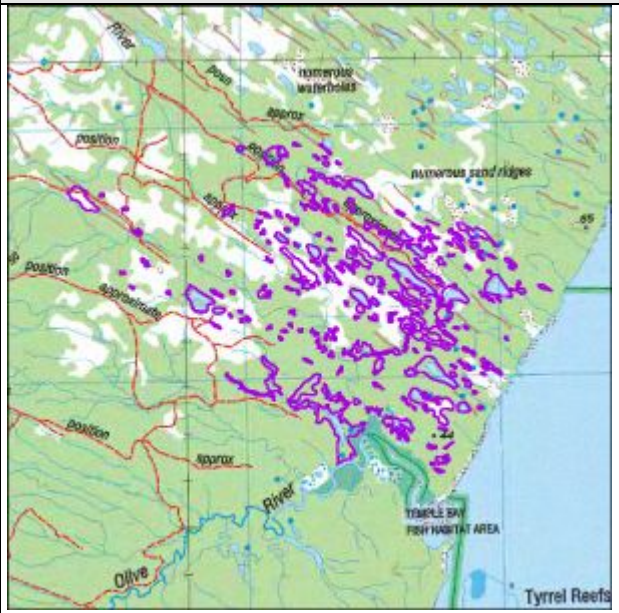
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
mw_r_ec_01	Spring-fed riverine wetlands		Mitchell West		y		Spring-fed riverine wetlands, some of which are on the edges of Tertiary surfaces support plant species of conservation significance, regional ecosystems of conservation significance and ecological function. Ecological functions include refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
mw_r_ec_02	Mangroves		Mitchell West			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (e.g. fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

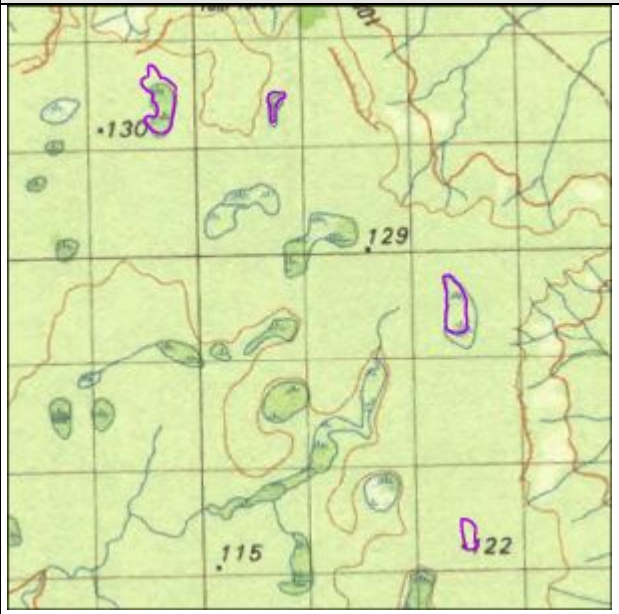
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
nb_nr_ec_01	Dunefields on Holocene surfaces		Normanby	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Threatened species. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

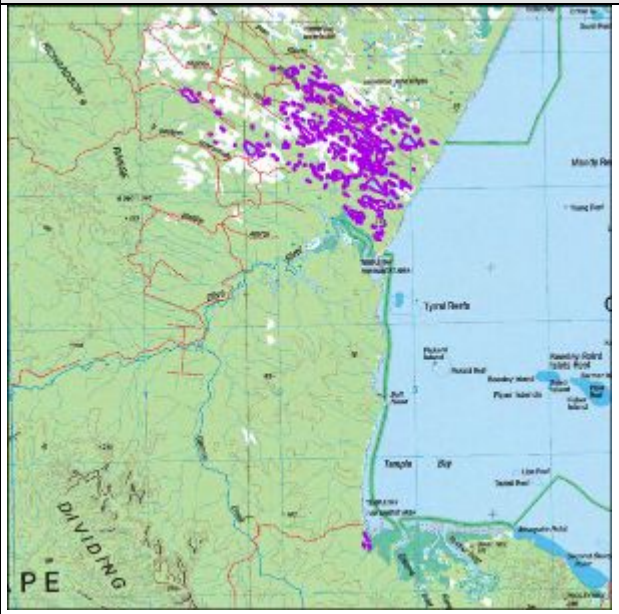
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
nb_r_ec_01	Spring-fed riverine wetlands		Normanby		y		Spring-fed riverine wetlands, some of which are on the edges of Tertiary surfaces support plant species of conservation significance, regional ecosystems of conservation significance and ecological function. Ecological functions include refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

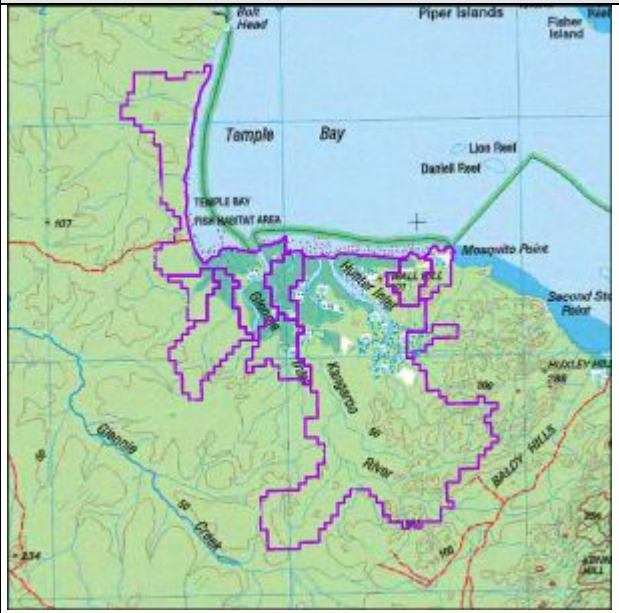
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
nb_r_ec_02	Mangroves		Normanby			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (e.g. fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

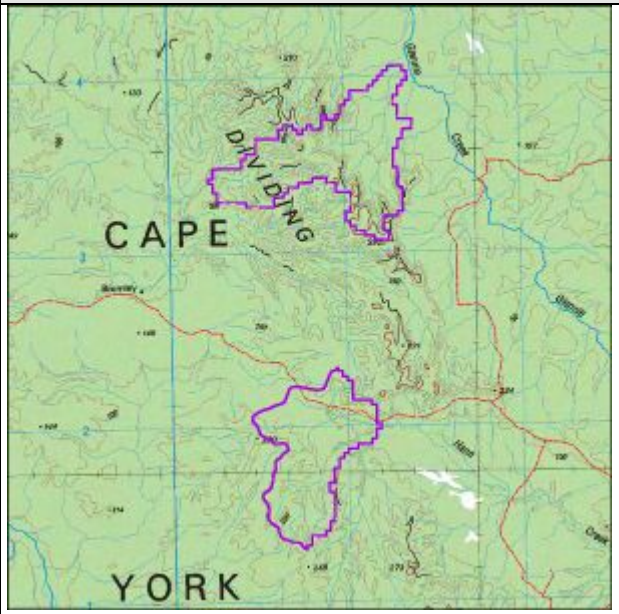
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
op_nr_ec_01	Lakes within Quaternary dunefields		Olive-Pascoe	y			Rare perched lakes on a white sand dune system. Contains a high diversity of hydrosystem types. Relictual populations of freshwater fish often in unique assemblages (Cook et al. 2011). High species richness with many threatened species. Rainforest and heathlands. Also implemented as BPA decision(s): part of cyp_l_07 and cyp_fa_06 (h)	6.3.1, 6.4.1	3, 3

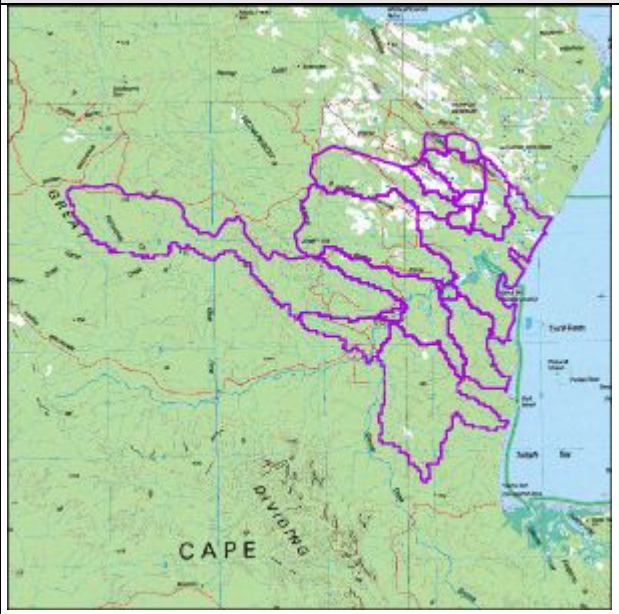
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
op_nr_ec_03	Springs		Olive-Pascoe	y			Springs are ground water influenced ecosystems that provide habitat refugial values for wildlife and often contain threatened species. Also implemented as BPA decision(s): cyp_l_09 and cyp_l_16	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
op_nr_ec_04	Bramwell		Olive-Pascoe	y			Good example of ecosystem mosaic of swamps, *Eucalyptus tetrodonta* woodland and vine thickets on remnant Tertiary surface with deep red earths. Also implemented as BPA decision(s): cyp_l_13	6.2.1	3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
op_nr_ec_05	East coast dunefields on Holocene surfaces		Olive-Pascoe	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Threatened species. Also implemented as BPA decision(s): cyp_l_07 and cyp_fa_06 (h)	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
op_r_ec_01	Intertidal area of Olive-Pascoe		Olive-Pascoe			y	Related to decision 'du_r_ec_03 – Mangroves' but exemplifies a significant, highly productive, extensive and diverse estuarine area. Supports a large population of estuarine crocodile (*Crocodylus porosus*) in Queensland (Abrahams et al. 1995).	6.3.1, 6.4.2	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
op_r_ec_02	Spring-fed riverine wetlands		Olive-Pascoe		y		Spring-fed riverine wetlands, some of which are on the edges of Tertiary surfaces support plant species of conservation significance, regional ecosystems of conservation significance and ecological function. Ecological functions include refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
op_r_ec_03	Olive River Catchment		Olive-Pascoe		y		High diversity of coastal streams, displaying biotic links to the western cape (unusual freshwater fish assemblage) and wet tropics. Rainforest rivers with perennial flow (Cook et al. 2011).	6.2.1	3

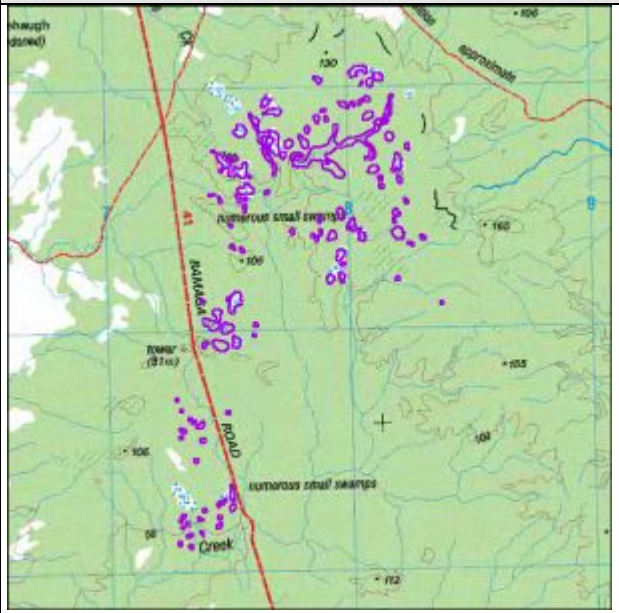
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
op_r_ec_04	Mangroves		Olive-Pascoe			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (e.g. fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

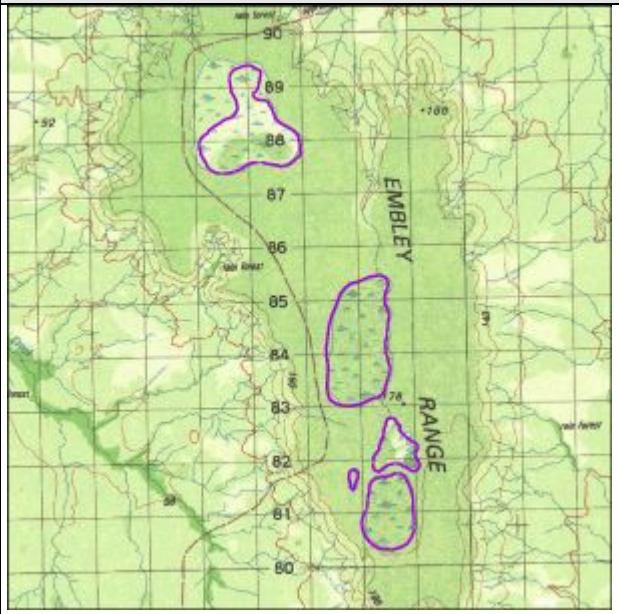
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
sw_nr_ec_02	Dunefields on Holocene surfaces		Stewart	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Threatened species. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

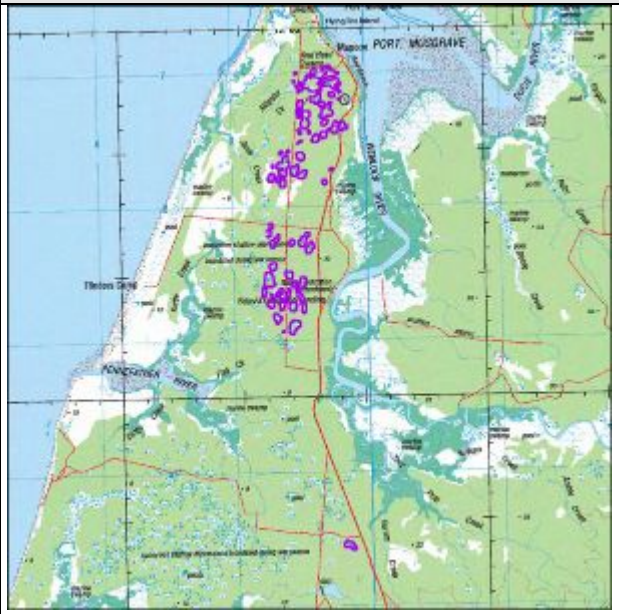
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
sw_r_ec_01	Silver Plains and eastern fall of McIlwraith Range		Stewart		y		High endemism, gallery forests, intact, low level of disturbance.	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
sw_r_ec_02	Mangroves		Stewart			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (e.g. fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

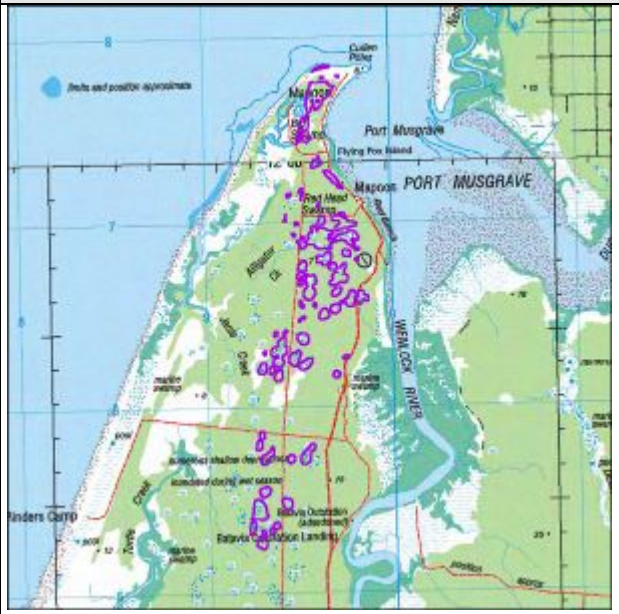
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_nr_ec_01	Springs		Wenlock	y			Springs are ground water influenced ecosystems that provide habitat refugial values for wildlife and often contain threatened species. Also implemented as BPA decision(s): cyp_l_09, cyp_l_16 and cyp_l_39	6.3.1	4

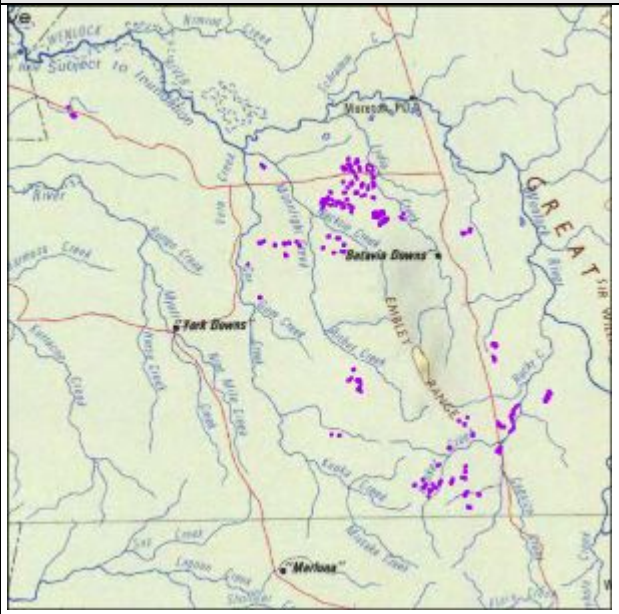
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_nr_ec_02	Bramwell		Wenlock	y			Good example of ecosystem mosaic of swamps, *Eucalyptus tetrodonta* woodland and vine thickets on remnant Tertiary surface with deep red earths. Also implemented as BPA decision(s): cyp_l_13	6.2.1	3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_nr_ec_03	Embley Range		Wenlock	y			Good example of ecosystem mosaic of major swamps in *Eucalyptus tetrodonta* woodland on remnant Tertiary surface with deep red earths. Also implemented as BPA decision(s): cyp_l_14	6.2.1	3

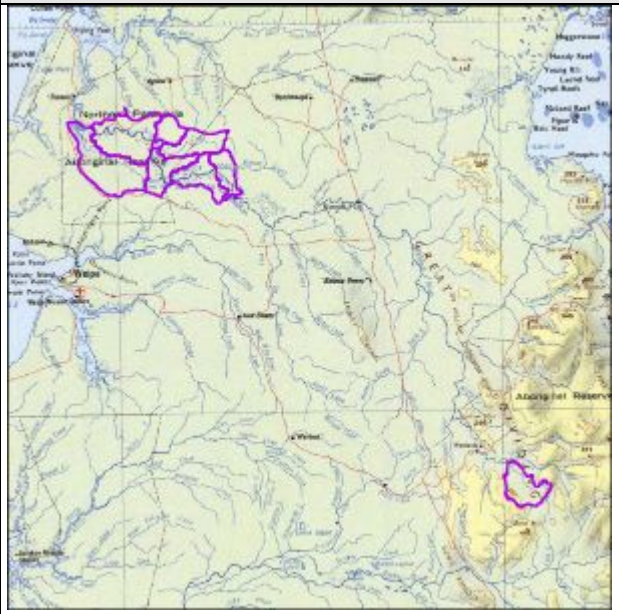
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_nr_ec_04	Perched lakes on Tertiary surfaces between Mapoon and Weipa		Wenlock	y			Large complex. Perched lacustrine systems, spring-fed river. Refuge in dry system.	6.4.1, 6.1.1	3, 3

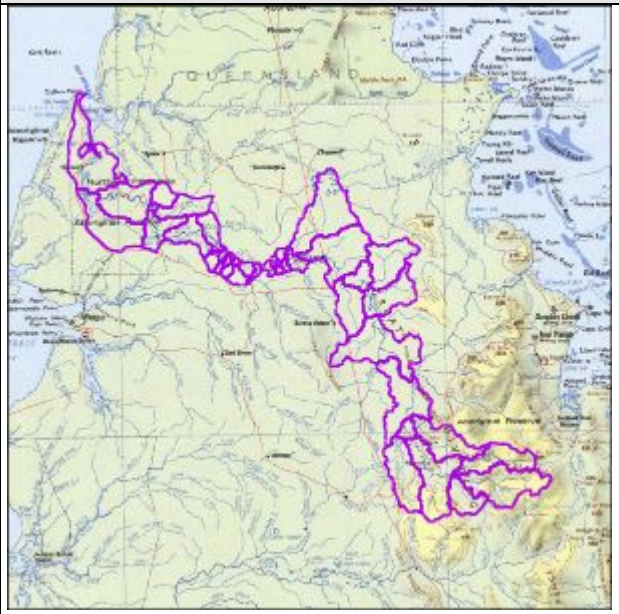
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_nr_ec_05	West coast dunefields on Quaternary surfaces		Wenlock	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Threatened species. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_nr_ec_06	Mapoon and Weipa dune complexes		Wenlock	y			Mapoon has unique ecosystem complexity of beach, dunes, vine thickets, spectacular swamps (drainage runs parallel to coast), melaleuca forests and hardwood forests. This habitat complexity is in a small area and is home to huge number of birdlife. In places the ecosystems are quite narrow. The entire system needs to be recognised as a single entity. Similar complex at Aurukun (decisions 'em_nr_ec_04' and 'wt_nr_ec_02') of lower significance. Also implemented as BPA decision(s): cyp_l_36	6.2.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_nr_ec_07	Batavia sinkholes		Wenlock	y			Rare and restricted habitat mostly confined to this locality. A dense low tree/tall shrub layer (5-8m tall) is dominant and forms a fairly continuous, dense canopy. This layer is composed of a variety of semi-deciduous species with no species showing clear dominance. *Melaleuca clarksonii* (hard-barked teatree) and *M. saligna* (a paperbark) are frequent emergent trees (12-15m tall). A sparse low shrub layer (1-2m tall) is present. The ground layer is very sparse. Occurs in sinkholes. (Broad Vegetation Group (1M): 7b). Endemic *Melaleuca clarksonii* and rich frog fauna. Also implemented as BPA decision(s): cyp_l_15	6.2.1	3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_r_ec_01	Intertidal area of Port Musgrave		Wenlock			y	Related to decision 'du_r_ec_03 – Mangroves' but exhibits a significant large well developed area of very high productivity, excellent example of shallow estuary showing delta development and supports a large population of estuarine crocodile (*Crocodylus porosus*) in Queensland (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_l_27	6.3.1, 6.4.2	4, 4

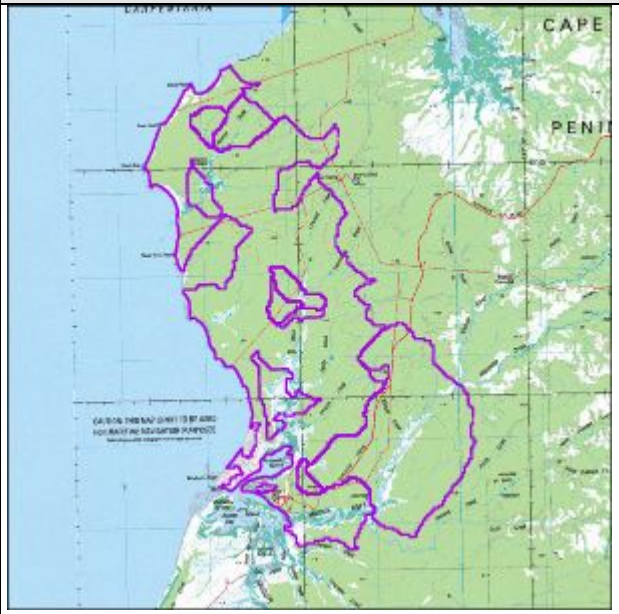
Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_r_ec_02	Spring-fed riverine wetlands		Wenlock		y		Spring-fed riverine wetlands, some of which are on the edges of Tertiary surfaces support plant species of conservation significance, regional ecosystems of conservation significance and ecological function. Ecological functions include refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_r_ec_03	Wenlock corridor		Wenlock		y		Stream and associated wetlands. Richest known freshwater fish fauna in Australia, including presence of threatened taxa (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fa_06 (b)	6.3.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
we_r_ec_04	Steve Irwin Wildlife Reserve Perched Bauxite Springs		Wenlock		y		Rare and unique type of spring supporting significant level of biodiversity including threatened flora and fauna. Only know occurrence of *Calophyllum bicolor* rainforest type. Important ecological function as dry season refuge and water source for wildlife, including high diversity of fish and amphibians (Lyon and Franklin 2009). Also implemented as BPA decision(s): cyp_l_39	6.3.1, 6.4.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
wt_nr_ec_01	West coast dunefields on Quaternary surfaces		Watson	y			Dunefield rise—prograding dune systems, associated vine scrubs and trapped wetlands. Bird rookeries. Also implemented as BPA decision(s): cyp_l_07	6.1.1, 6.3.1	4, 4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
wt_nr_ec_02	Aurukun dune complexes		Watson	y			Unique ecosystem complexity of beach, dunes, vine thickets, spectacular swamps (drainage runs parallel to coast), melaleuca forests and hardwood forests. This habitat complexity is in a small area and is home to huge number of birdlife. In places the ecosystems are quite narrow. The entire system needs to be recognised as a single entity. Similar complex in Mapoon/Weipa region (decisions 'em_nr_ec_03' and 'we_nr_ec_0'6) of higher significance. Also implemented as BPA decision(s): cyp_l_36	6.2.1	4

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
wt_r_ec_01	Spring-fed riverine wetlands		Watson		y		Spring-fed riverine wetlands, some of which are on the edges of Tertiary surfaces support plant species of conservation significance, regional ecosystems of conservation significance and ecological function. Ecological functions include refugial areas, critical habitat for plants and key resources for birds, frogs and reptiles (Wannan 2007, Covacevich 2010).	6.3.1, 6.4.1	3, 3

Decision number	Special features (name)	Location	Study area	NR[30]	R	ES	Values	CIM[31]	Con. rating[32]
wt_r_ec_02	Mangroves		Watson			y	Significant marine vegetation—high species diversity (30spp.). Important ecological role (e.g. fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4

Table 20: Ecology special features not implemented

Decision number	Special Features (Name)	Location	Study Area	NR	R	ES	Values	CIM[33]	Con. Rating[34]
01_not implemented	Mangroves		All	y			Significant marine vegetation—high species diversity (30spp.). Important ecological role (e.g. fish nursery areas) that supports local and off-shore fisheries (Abrahams et al. 1995). Implemented as riverine decisions ar_r_ec_03, cl_r_ec_01, du_r_ec_03, em_r_ec_02, en_r_ec_03, ho_r_ec_02, ic_r_ec_01, ja_r_ec_03, je_r_ec_02, jj_r_ec_03, lo_r_ec_03, mw_r_ec_02, nb_r_ec_02, op_r_ec_04, sw_r_ec_02, wt_r_ec_02. Also implemented as BPA decision(s): cyp_fl_08	6.3.1	4
02_not_implemented	Dune Lake Systems—Bamaga		Jacky Jacky	y			Rare perched lakes on a white sand dune system. Contains a high diversity of hydrosystem types. Relictual populations of freshwater fish often in unique assemblages (Cook et al. 2011). No implementation required as values covered by jj_nr_ec_04,j j_nr_ec_02 and jj_nr_ec_01.	6.4.1	4
04_not_implemented	Dune Lake Systems—Shelbourne Bay		Jacky Jacky and Olive-Pascoe	y			Rare perched lakes on a white sand dune system. Contains a high diversity of hydrosystem types—dune lakes among the best examples of their type in the world (Cook et al. 2011). No implementation required as values covered by jj_nr_ec_01 and jj_nr_ec_04.	6.4.1	4

[33] Number refers to the values from the generic CIM list in Table 21.

[34] 4 is the highest value.

Decision number	Special Features (Name)	Location	Study Area	NR	R	ES	Values	CIM[33]	Con. Rating[34]
05_not_implemented	Dune Lake Systems—Cape Flattery		Jeannie, possible Endeavour also	y			Rare perched lakes on a white sand dune system. Contains a high diversity of hydrosystem types. Several endemic aquatic fauna (Cook et al. 2011). No implementation required as values covered by je_nr_ec_01 and je_nr_ec_02.	6.4.1	4
06_not_impletmented	Normanby River Floodplain		Normanby		y		High diversity of wetland habitats, important waterbird and crocodile habitat. Extensive intertidal mudflats (Cook et al. 2011). No implementation required as values covered by lo_r_ec_01 and lo_r_ec_02.	6.3.1, 5.1.4	4, **4**
07_incomplete	Trapped lakes behind dunes		Archer	y			No values or extent recorded. Follow up for the next ACA version.	6.3.1, 6.4.1	3, 3
08_incomplete	Glennie tableland wetlands		Olive-Pascoe	y			No values or extent recorded. Follow up for the next ACA version.	6.3.1	3
09_incomplete	Running Creek wetlands		Stewart	y			No values or extent recorded. Follow up for the next ACA version.	6.3.1	3

5.2 Connectivity

Due to time constraints the panel was not able to specifically develop and/or identify a set of principles that could be applied to determine relative connectivity scores of riverine, non-riverine and estuarine spatial units within the Cape York region.

Connectivity measures will be considered post panel and implemented where information and time are available.

5.3 Stratification

Study area stratification for application to relevant measures of AquaBAMM is a user decision and is not mandatory for a successful assessment. However, AquaBAMM makes provision for data to be stratified in any user-defined way that is determined to be ecologically appropriate. Stratification mitigates the effects of data averaging across large study areas, and is particularly important where ecological diversity and complexity is high. An example where stratification may be appropriate is fish diversity where fewer species inhabit the upland zone compared to lowland floodplains. For measure datasets where there is an equal probability of scoring across a range of values throughout the study area, stratification is unwarranted. To date, the use of strata in completed ACAs has been based on elevation (e.g. 150m (ASL) for coastal flowing catchments and 400m ASL for catchments west of the Great Dividing Range in the Murray-Darling Basin) or bioregional boundaries.

Due to time constraints the panel was not able to discuss the question of stratification. Therefore, for the CYP ACA, no stratification was applied. Once the CYP ACA has been completed, the results will be investigated and the question of stratification will be revisited and implemented if appropriate.

5.4 Weighting of measures

Due to time constraints the panel was not able to consider the question of weighting the measures. Therefore, for the CYP ACA, all measures were weighted the same. Once the CYP ACA has been completed, the results will be investigated and the question of weighting the measures will be revisited and implemented if appropriate.

5.5 Ranking of indicators

Due to time constraints the panel was not able to consider the question of ranking the indicators. Therefore, for the CYP ACA, all indicators were ranked the same. Once the CYP ACA has been completed, the results will be investigated and the question of ranking the indicators will be revisited and implemented if appropriate.

6 References

Abrahams, H., Mulvaney, M., Glasco, D. and Bugg, A. (1995). *Areas of Conservation Significance on Cape York Peninsula.* Report by Australian Heritage Commission and the Environmental Resources Information Network. Australia Government Publishing Service, Canberra.

Bunt, J.S., Williams, W.T., Hunter, J.F. and Clay, H.J. (1991). Mangrove sequencing: analysis of zonation in a complete river system. *Marine Ecological Progress Series* **72**, 289-294.

Clayton, P.D., Fielder, D.F., Howell, S. and Hill, C.J. (2006). *Aquatic biodiversity assessment and mapping method (AquaBAMM): a conservation values assessment tool for wetlands with trial application in the Burnett River catchment.* Environmental Protection Agency, Brisbane, ISBN 1-90928-07-3.

Cook, B., Kennard, M., Ward, D. and Pusey, B. (2011). *The Hydroecological Natural Heritage Story of Cape York Peninsula.* Australian Rivers Institute, Griffith University, Nathan, Qld.

Covacevich, J. (2010). Introduction to Biodiversity Studies at the Steve Irwin Wildlife Reserve, Cape York, *Queensland Naturalist*, **48**(1-3), 3-5.

Driscoll, P.V. (1995). *Wetland Definition and Fauna Assessment of Cape York Peninsula*. Cape York Peninsula Land Use Strategy Project NR09. Queensland Department of Environment and Heritage: Brisbane.

Driscoll, P.V. (1996). *The Distribution of Waders along the Queensland Coastline.* Queensland Ornithological Society Inc and Queensland Wader Study Group: Brisbane.

Driscoll, P.V. (2001). *Gulf of Carpentaria Wader Surveys 1998-9.* Queensland Wader Study Group of Birds Queensland: Brisbane.

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

Earth Tech. (2005). *Cape York Peninsula Natural Resources Management Plan.* Final draft to Cape York Interim Advisory Group.

Garnett, S. (1989). *Wading Bird Abundance and Distribution – South-eastern Coast of the Gulf of Carpentaria.* Report No. 58. RAOU: Moonee Ponds, Victoria.

Garnett, S., Szabo, J. and Dutson, G. (2011). *The Action Plan for Australian Birds 2010.* CSIRO Publishing, Collingwood, Victoria.

Georges, A. (2005). *Freshwater turtles of the TransFly*. Unpublished report prepared by the Institute for Applied Ecology, University of Canberra.

Georges, A. and Thomson, S. (2010). Diversity of Australasian freshwater turtles, with annotated synonymy and keys to species. *Zootaxa* **2469**, 1-37.

Georges, A., Guarino, F. and Bito, B. (2006). Freshwater turtles of the Trans Fly region of Papua New Guinea-notes on diversity, distribution, reproduction, harvest and trade. *Wildlife Research* **33**: 373-384.

GHD. (2010). *Overview of Marine Turtle Nesting on Western Cape York.* Report for Caring for Our Country. GHD, Brisbane.

Herbert, B.W., Peeters, J.A., Graham, P.A. and Hogan, A.E. (1995). *Freshwater Fish and Aquatic Habitat Survey of Cape York Peninsula.* Final Report for NRAP Project NR10, Cape York Peninsula Land Use Strategy. Queensland Department of Primary Industries, Brisbane.

Hines, H.B. and McDonald, K.R. (2007). A survey of the terrestrial vertebrates of the Endeavour River National Park and Resources Reserve, north Queensland. *Queensland Naturalist* **45**, 32-51.

Krieger, G. (1990). *Distribution of Estuarine Crocodile Nesting Habitat in the Weipa Region – Cape York Peninsula.* Internal report to the Queensland National Parks and Wildlife Service.

Lyon, B. and Franklin, C.E. (2009). *Natural Values of the Perched Bauxite Springs, Steve Irwin Reserve, Cape York Peninsula.* Report by Australia Zoo for Department of Environment and Resource Management.

Read, M.A. (1998). *Distribution and abundance of the estuarine crocodile (*Crocodylus porosus *Schneider) in Queensland. 3. Western and northwestern Cape York Peninsula*. Internal report to Conservation Strategy Branch, Queensland Department of Environment.

Read, M.A. (2001). *Report on the distribution and abundance of the estuarine crocodile* Crocodylus porosus *in Queensland*. Internal report to the QPWS, Environmental Protection Agency.

Sattler, P.S. and Williams, R.D. (eds) (1999) *The Conservation Status of Queensland's Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

Stanton, D.J., Fell, D.G. and Gooding, D.O. (2008). *Vegetation Communities and Regional Ecosystems of the Torres Strait Islands, Queensland, Australia*. 3D Environmental, Cairns.

Ukuwela, K.D.B., Sanders, K.L. and Fry, B.G. (2012). *Hydrophis donaldi* (Elapidae, Hydrophiinae), a highly distinctive new species of sea snake from northern Australia. *Zootaxa* **3201**, 45-57.

Wannan, B. (2007). Internal Memorandum. Department of Environment and Resource Management.

7 Acronyms and abbreviations

ACA	Aquatic Conservation Assessment
ASL	above sea level
BPA	Biodiversity Planning Assessment
CAMBA	China-Australia Migratory Birds Agreement
CMS	Convention of Migratory Species of Wild Animals (also known as the Bonn Convention)
CYP	Cape York Peninsula
DERM	Department of Environment and Resource Management
DIWA	Directory of Important Wetlands Australia
EHP	Department of Environment and Heritage Protection
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
HEV	High ecological value (under a water quality improvement plan)
JAMBA	Japan–Australia Migratory Birds Agreement
MRCCC	Mary River Catchment Coordinating Committee
NC Act	*Nature Conservation Act 1992*
NPRSR	Department of National Parks, Recreation, Sport and Racing
QPWS	Queensland Parks and Wildlife Service
Ramsar	Ramsar Convention on Wetlands
RE	Regional ecosystem
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
SITIA	Department of Science, Information Technology, Innovation and the Arts
SOR	State of the Rivers

8 Attachments

Attachment A—Terms of reference

Aquatic flora expert panel

The terms of reference presented below are to be read in conjunction with the AquaBAMM report that requires expert panel workshops to be run to gain information for a number of AquaBAMM criteria and their associated indicators and measures (Clayton et al. 2006).

Members of the panel were experts in scientific disciplines relevant to freshwater ecosystems, processes and species. Panel members were required to have professional or semi-professional standing in their fields of expertise and have direct knowledge and experience with the Cape York region. Experience in the identification and assessment of non-riverine and riverine values including natural processes, species and places of significance was an important factor in the selection process; the panel included members with experience in these areas, as well as in their areas of specialist technical expertise. Panel members were appointed on the basis of their individual standing rather than as representatives of a particular interest group or organisation.

Aquatic flora

The tasks to be undertaken by the panel include, but are not limited to, the following:

- review relevant existing spatial data (species point records) and available information
- provide advice on non-riverine and riverine ecosystem threatened flora species, habitat and localities
- provide advice on non-riverine and riverine ecosystem priority flora species, habitat and localities
- identify priority ecosystems or areas important for significant floral communities or species
- provide advice on non-riverine and riverine ecosystem exotic flora species, localities and abundance
- weight measures relative to their importance for an indicator
- rank indicators relative to their importance for a criterion.

Aquatic fauna expert panel

The terms and reference presented below are to be read in conjunction with the AquaBAMM report that requires expert panel workshops to be run to inform a number of AquaBAMM criteria and their associated indicators and measures (Clayton et al. 2006).

Members of the expert panel were experts in scientific disciplines relevant to freshwater and estuarine ecosystems, processes and species. Panel members were required to have professional or semi-professional standing in their fields of expertise and have direct knowledge and experience of the Cape York region. Experience in the identification and assessment of non-riverine and riverine values including natural processes, species and places of significance was an important factor in the selection process; the panel included members with experience in these areas, as well as in their areas of specialist technical expertise. Panel members were appointed on the basis of their individual standing rather than as representatives of a particular interest group or organisation.

Aquatic fauna

The aquatic fauna expert panel was established to provide expert advice on priority species, special features and/or ecosystems that are of ecological significance to the non-riverine and riverine wetlands of the Wide Bay-Burnett region. The panel consisted of professionals with expertise relating to aquatic fauna values.

The tasks undertaken by the panel included, but were not limited to, the following:

- review relevant existing spatial data (species point records) and available information
- provide advice on riverine and non-riverine threatened fauna species, habitat and localities
- provide advice on riverine and non-riverine priority fauna species, habitat and localities
- identify priority ecosystems or areas important for significant faunal communities or species
- provide advice on riverine and non-riverine ecosystem exotic fauna species localities and abundance
- weight measures relative to their importance for an indicator
- rank indicators relative to their importance for a criterion.

Aquatic ecology expert panel

The terms of reference presented below are to be read in conjunction with the AquaBAMM report that requires expert panel workshops to be run to inform a number of AquaBAMM criteria and their associated indicators and measures (Clayton et al. 2006).

Members of the expert panel were experts in scientific disciplines relevant to freshwater ecosystems, processes and species. Panel members were required to have professional or semi-professional standing in their fields of expertise and have direct knowledge and experience with the Cape York region. Experience in the identification and assessment of non-riverine and riverine values including natural processes, species and places of significance was an important factor in the selection process. The panel included members with experience in these areas, as well as in their areas of specialist technical expertise. Panel members were appointed on the basis of their individual standing rather than as representatives of a particular interest group or organisation.

Wetland ecology

The wetland ecology expert panel was established to provide expert advice based on experience and demonstrated scientific theory on natural ecological, geological or geo-morphological and hydrological processes, and issues of connectivity between aquatic systems within the non-riverine and riverine wetlands of the Wide Bay-Burnett region. The panel consisted of professionals in fields of expertise relating to wetland ecology, water quality, geomorphology, fisheries and hydrological processes.

The tasks undertaken by the panel included, but were not limited to, the following:

- identify areas of significant geomorphological, ecological or hydrological processes, or priority areas—special features
- provide advice on biodiversity ‘hot-spots’ or areas of particular significance for species or communities
- establish principles for applying the connectivity criterion (bi-directional, unidirectional and lateral directions) in the wetland ecosystems
- consider whether to stratify the study areas
- weight measures relative to their importance for an indicator
- rank indicators relative to their importance for a criterion.

Attachment B—Criteria, indicators and measures for the Cape York region

The criteria, indicators and measures (CIM) list outlines the CIM that were implemented as part of the ACA using AquaBAMM for the riverine and non-riverine wetlands of the Cape York region.

The list has been developed from a default list of criteria, indicators and measures that may be considered when an ACA is conducted using AquaBAMM. The default CIM list is not mandatory for any particular ACA however it provides a 'starter set' for consideration in setting the assessment parameters for each ACA.

AquaBAMM does not allow criteria change, addition or deletion. However, AquaBAMM does allow the addition or deletion of indicators and/or measures for each ACA when its assessment parameters are set. Generally modification of the default set of indicators is discouraged because the list has been developed to be generic and inclusive of all aquatic ecosystems. Modification of the default set of measures may or may not be necessary but full flexibility is provided in this regard. In particular, measures may need to be added where unusual or restricted datasets are available that are specific to an ACA or study area.

Table 21: CIM list for the Cape York region

Criteria and Indicators	Measures		Riverine	Non-riverine
1 Naturalness aquatic				
1.1 Exotic flora/fauna	1.1.1	Presence of 'alien' fish species within the wetland	Y	
	1.1.2	Presence of exotic aquatic and semi-aquatic plants within the wetland	Y	Y
	1.1.3	Presence of exotic invertebrate fauna within the wetland		
	1.1.4	Presence of feral/exotic vertebrate fauna (other than fish) within the wetland	Y	Y
1.3 Habitat features modification	1.3.4	Presence/absence of dams/weirs within the wetland	Y	
	1.3.7	Percentage area of remnant wetland relative to pre-clear extent for each spatial unit	Y	Y
1.4 Hydrological modification	1.4.5	Hydrological disturbance/modification of the wetland (e.g. as determined through EHP wetland mapping and classification)		Y
2 Naturalness catchment				
2.1 Exotic flora/fauna	2.1.1	Presence of exotic terrestrial plants in the assessment unit	Y	Y
2.2 Riparian disturbance	2.2.1	Percentage area remnant vegetation relative to pre-clear extent within buffered riverine wetland or watercourses	Y	
	2.2.2	Total number of regional ecosystems relative to pre-clear number of regional ecosystems within buffered riverine wetland or watercourses	Y	
	2.2.5	Percentage area of remnant vegetation relative to pre-clear extent within buffered non-riverine wetland: 500m buffer for wetlands >= 8Ha, 200m buffer for smaller wetlands		Y
2.3 Catchment disturbance	2.3.1	Percentage 'agricultural' land-use area (i.e. cropping and horticulture)	Y	Y
	2.3.2	Percentage 'grazing' land-use area	Y	Y
	2.3.3	Percentage 'vegetation' land-use area (i.e. native veg + regrowth)	Y	Y
	2.3.4	Percentage 'settlement' land-use area (i.e. towns, cities, etc)	Y	Y
2.4 Flow modification	2.4.1	Farm storage (overland flow harvesting, floodplain ring tanks, gully dams) calculated by surface area	Y	Y

Criteria and Indicators	Measures		Riverine	Non-riverine
3 Diversity and richness				
3.1 Species	3.1.1	Richness of native amphibians (riverine wetland breeders)	Y	
	3.1.2	Richness of native fish	Y	Y
	3.1.3	Richness of native aquatic dependent reptiles	Y	Y
	3.1.4	Richness of native waterbirds	Y	Y
	3.1.5	Richness of native aquatic plants	Y	Y
	3.1.6	Richness of native amphibians (non-riverine wetland breeders)		Y
	3.1.7	Richness of native aquatic dependent mammals	Y	Y
3.2 Communities/ assemblages	3.2.1	Richness of macroinvertebrate taxa	Y	Y
	3.2.2	Richness of regional ecosystems along riverine wetlands or watercourses within a specified buffer distance	Y	
3.3 Habitat	3.3.2	Richness of wetland types within the local catchment (e.g. SOR sub-section)	Y	Y
	3.3.3	Richness of wetland types within the sub-catchment	Y	Y
4 Threatened species and ecosystems				
4.1 Species	4.1.1	Presence of rare or threatened aquatic ecosystem dependent fauna species—NC Act[1], EPBC Act[2]	Y	Y
	4.1.2	Presence of rare or threatened aquatic ecosystem dependent flora species – NC Act[1], EPBC Act[2]	Y	Y
4.2 Communities/ assemblages	4.2.1	Conservation status of wetland regional ecosystems—Herbarium biodiversity status, NC Act[1], EPBC Act[2]	Y	Y
5 Priority species and ecosystems				
5.1 Species	5.1.1	Presence of aquatic ecosystem dependent 'priority' fauna species (expert panel list/discussion or other lists such as ASFB[3], WWF, etc)	Y	Y
	5.1.2	Presence of aquatic ecosystem dependent 'priority' flora species	Y	Y
	5.1.3	Habitat for, or presence of, migratory species (Expert Panel list/discussion and/or JAMBA[4]/CAMBA[5] agreement lists and/or Bonn Convention)	Y	Y
	5.1.4	Habitat for significant numbers of waterbirds		Y
6 Special features				
6.1 Geomorphic features	6.1.1	Presence of distinct, unique or special geomorphic features	Y	Y
6.2 Ecological processes	6.2.1	Presence of (or requirement for) distinct, unique or special ecological processes	Y	Y
6.3 Habitat	6.3.1	Presence of distinct, unique or special habitat (including habitat that functions as refugia or other critical purpose)	Y	Y
	6.3.2	Significant wetlands identified by an accepted method such as Ramsar, Australian Directory of Important Wetlands, regional coastal management planning, world heritage areas, etc.	Y	Y

Criteria and Indicators	Measures		Riverine	Non-riverine
6.4 Hydrological	6.4.1	Presence of distinct, unique or special hydrological regimes (e.g. Spring fed stream, ephemeral stream, boggomoss)	Y	Y
	6.4.2	Hydrological diversity within the estuary/marine area	Y	
7 Connectivity				
7.1 Significant species or populations	7.1.1	The contribution (upstream or downstream) of the spatial unit to the maintenance of significant species or populations, including those features identified through criteria 5 and/or 6	Y	
7.2 Groundwater dependent ecosystems	7.2.1	The contribution (upstream or downstream) of the spatial unit to the maintenance of groundwater ecosystems with significant biodiversity values, including those features identified through criteria 5 and/or 6 (e.g., karsts, cave streams, artesian springs)	Y	
8 Representativeness				
8.1 Wetland protection	8.1.1	The percent area of each wetland type within protected areas.		Y
	8.1.2	The percent area of each wetland type within a coastal/estuarine area subject to the Fisheries Act, Coastal Management Act or Marine Parks Act.		Y
8.2 Wetland uniqueness	8.2.1	The relative abundance of the wetland management group to which the wetland type belongs within the catchment or study area (management groups ranked least common to most common)		Y
	8.2.2	The relative abundance of the wetland management group to which the wetland type belongs within the sub-catchment or estuarine/marine zone (management groups ranked least common to most common)		Y
	8.2.3	The size of each wetland type relative to others of its management group within the catchment or study area		Y
	8.2.4	The size of each wetland type relative to others of its type within a sub-catchment (or estuarine zone)		Y
	8.2.6	The size of each wetland type relative to others of its type within the catchment or study area		Y

[1] NC Act – *Nature Conservation Act 1992* (Queensland legislation)
[2] EPBC Act – *Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth legislation)
[3] ASFB – Australian Society of Fish Biology
[4] JAMBA – Japan-Australia Migratory Bird Agreement
[5] CAMBA – China-Australia Migratory Bird Agreement