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Landscapes
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Appendix

*Regional Biodiversity and
Natural Areas Snapshot*

Appendix F – Regional biodiversity and natural areas snapshot

Biodiversity (or biological diversity) is the variety of all life forms – the different plants animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part (Commonwealth of Australia 1996). Biodiversity can be recognised at three levels; genetic, species and ecosystems. Biological diversity provides cultural, economic, educational, scientific and social benefits for all members of the community, as well as being fundamental to the continuation of life on Earth.

The biodiversity of the Peel-Harvey Region, and greater south west of Western Australian is internationally significant, and part of a global biodiversity hotspot (Myers *et al*,2000) . Recognition as a biodiversity hotspot is due to the south west of Australian having a high species diversity, a large portion of which are found nowhere else on Earth (endemic) and the high level of threat under which this biodiversity is being placed.

The biodiversity of the Region can be described at both the species and ecosystem levels, using a number of different classification systems. The purpose of this appendix is to provide a selection of this information. It is by no means a comprehensive summary of information available on the Region’s biodiversity resources. It is also acknowledged that much of the information used in this appendix is focused on native vegetation, and does not provide a similar level of detail on fauna. See Appendices G and H for information on water-related and coastal biodiversity respectively.

Extent of native vegetation

The extent and distribution of native vegetation in an area can provide an initial indication of the state of biodiversity resources. Table 1 and Figures 1 and 2 provide information on the extent of native vegetation in the Peel-Harvey Region. This information is based on native vegetation mapping by the Department of Agriculture and Food Western Australia released in 2014 and analysed by consultants Gaia Resources for the Peel-Harvey Catchment Council (PHCC, 2014).

Table 1: Native vegetation extent in the Peel-Harvey Region (2014)

Peel-Harvey Regional Subsystem	Area of subsystem (Ha)	Native vegetation (ha)	Percentage native vegetation cover (%)	Native vegetation outside of DPaW managed estate (ha)	Native vegetation in DPaW managed Estate (ha)
Coastal Plain	188,337	27,722	15%	23,376	4,346
Forest and Scarp	349,178	306,359	88%	23,579	282,780
Hotham and Williams	573,349	186,550	33%	111,841	74,709
Ramsar Wetlands, Coastal and Nearshore	62,751	23,467	37%	12,898	10,569
Total	1,173,615	544,099	46%	171,694	372,404

(Peel-Harvey Catchment Council, 2014)

Table 1 shows the large extent to which the Coastal Plain and Hotham-Williams Subsystems have been cleared of native vegetation, and the large extent to which vegetation in the Forest and Scarp Subsystem has been retained.

While 37% of the Ramsar Wetlands Coastal and Nearshore subsystem is vegetated, a large part of this subsystem includes areas of open water (e.g. Peel-Harvey Estuary and Black and Goegrup Lakes). In total, 59% of the subsystem is either native vegetation or natural open water. This is an important part of maintaining the integrity and values of the Peel-Yalgorup Ramsar System and planning for future urban development in its vicinity.

Bioregions and type of native vegetation

Numerous classification systems of landscape scale regions and types of ecosystems and vegetation are available and can be applied to the Peel-Harvey Region.

At the national level, Australia has been divided in bioregions under the Interim Biogeographic Regionalisation for Australia (IBRA). Three terrestrial IBRA bioregions encompass the Peel-Harvey Region:

- Swan Coastal Plain (SWA2) includes:
 - all terrestrial portions of the Ramsar Wetlands, Coastal Nearshore Subsystem
 - all of the Coastal Plain Subsystem
- Jarrah Forest (JF1)
 - All of the Forest and Scarp Subsystem
 - western parts of the Hotham-Williams Subsystem
- Avon Wheatbelt (AW2).
 - Eastern parts of the Hotham-Williams Subsystem

Descriptions of the type of native vegetation, termed vegetation associations, have been prepared by J.S. Beard for Western Australia, and are shown in Figure 3 and Table 4 for the Peel-Harvey Region (Land Assessment, 2005). Mapping of vegetation associations are a valuable tool in NRM and biodiversity conservation planning and can be used as one source of information to identify gross biodiversity conservation priorities.

Condition of native vegetation

Knowledge of the condition of native vegetation is another important tool for NRM and biodiversity conservation planning. Vegetation condition can be assessed at numerous levels (Patch, catchment, or greater) using a number of different measures (vegetation vigour, level of weed cover, or percentage physical disturbance etc).

In the Peel-Harvey Region, a publicly available dataset of vegetation condition (vegetation extent, condition trend and change in condition) used by NRM professionals is that provided through Land Monitor Program and the Peel-Harvey Decision Support System. This dataset is a generated by the Department of Land Administration (Landgate) through the interpretation of Landsat Satellite imagery, and is updated each year.

Figure 5 shows the Vegetation Condition Trend dataset for the Peel-Harvey Region for the period 1988 to 2013. The different classes of vegetation condition trend indicate the change in condition over this long period (1988 to 2013). Changes in vegetation condition identified in the Landsat imagery reflect a change in the extent and vigour of vegetation growth in a given area.

Considerable work has been carried out to develop this information and approach for the Peel-Harvey Region. This is documented in the *Biodiversity in the Peel-Harvey Catchment* report (Hick, 2004). The Peel-Harvey Decision Support System and on-line vegetation mapping can be accessed through the following link:

<http://landmonitor.dli.wa.gov.au/peel-harvey.asp>

Use the following details to log in to the website:

Username: phdss_guest

Password: Semuha211638

Threatened species and ecological communities

Contemporary biodiversity conservation needs to focus on both ‘keeping the common, common’ and the ‘bringing back species and ecosystems from the brink of extinction’. This is an unfortunate , though necessary approach given that many species and ecological communities are now formally considered threatened (e.g. see lists of threatened species and communities kept by the Australian and Western Australian Governments:

- Australian Government website: <http://www.environment.gov.au/biodiversity/threatened>
- Western Australian Government website: <http://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities>

Keeping the common, common generally means protecting sufficient areas of each type of vegetation and ecosystem in sufficiently large and strategically distributed patches across the landscape, and with sufficient potential for movement between patches. In this manner, all species habitat requirements have a high chance of being met, and species may be able to move across the landscape if required to escape predators, clearing, fire, the effects of climate change or other threats. This approach is generally addressed through the protection of a Comprehensive, Adequate and Representative (CAR) conservation reserves system. It is also the most cost-effective means of conserving biodiversity and Australia’s natural heritage.

To complement the planning and protection of a CAR conservation reserves system, efforts are placed in the identification, assessment, listing and conservation planning for threatened species and ecological communities. Table 2 summarises the number of threatened flora and fauna species (highlighted in yellow) currently identified in the Peel-Harvey Region by subsystem, together with a selection of other statistics relevant to biodiversity conservation.

Table 2: Threatened flora and fauna by Regional Subsystem

	Ramsar	Coastal Plain	Forest and Scarp	Hotham and Williams	Total
Area of Subsystem (ha)	62751	188337	349178	573349	1173615
Area native vegetation cover or Estuary waterbody (ha)	36724	27722	306359	186550	557356
Percentage native vegetation cover or Estuary waterbody (%)	59%	15%	88%	33%	47%
Area of Subsystem in DPaW Estate (ha)	10569	4345	282780	74709	372404
Percentage of Subsystem in DPaW estate (%)	17%	2%	81%	13%	32%
Area of Subsystem in Conservation reserves (Conservation Pk, Nature Res. & National Park) (ha)	10205	1530	14986	4610	31330
Percentage of Subsystem in Conservation Reserves (%)	16%	1%	4%	1%	2.7%
Number of threatened flora species (no.)	25	102	17	27	120
Number of recorded populations of threatened flora (No.)	83	229	127	100	539
Notable threatened flora (species either Critically Endangered or Vulnerable)	<i>Diuris purdiei</i> , <i>Drakaea elastica</i> , <i>Eucalyptus argutifolia</i>	<i>Caladenia huegelii</i> , <i>Diuris purdiei</i> , <i>Drakaea elastica</i> , <i>Verticordia plumosa</i> var. <i>pleiobotrya</i>	<i>Anthocercis gracilis</i> , <i>Lasiopetalum pterocarpum</i> , <i>Banksia cuneata</i>	<i>Caladenia</i> sp. Quindanning (K. Smith & P. Johns 231), <i>Darwinia carnea</i> , <i>Eleocharis keigheryi</i> , <i>Pultenaea pauciflora</i>	0
Recorded number of threatened fauna species or species protected under International Agreement (no.)	75	56	26	40	109

There are also a significant number and occurrence of threatened ecological communities (TEC) in the Region, mostly identified on the Swan Coastal Plain. Known TECs in the Region are listed in Table 3 with their formal threat status as listed by the Australian or Western Australian Government

Table 3: Threatened ecological communities in the Peel-Harvey Region (PHCC, 2014)

TEC Code	Threatened ecological community	Threat status
SCP20b	<i>Banksia attenuata</i> and/or <i>Eucalyptus marginata</i> woodlands of the eastern side of the Swan Coastal Plain	Endangered
Mound Springs SCP	Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain)	Critically Endangered
SCP09	Dense shrublands on clay flats	Vulnerable
SCP3b	<i>Eucalyptus calophylla</i> - <i>Eucalyptus marginata</i> woodlands on sandy clay soils of the southern Swan Coastal Plain	Vulnerable
SCP3a	<i>Eucalyptus calophylla</i> - <i>Kingia australis</i> woodlands on heavy soils, Swan Coastal Plain	Critically Endangered
SCP3c	<i>Eucalyptus calophylla</i> - <i>Xanthorrhoea preissii</i> woodlands and shrublands, Swan Coastal Plain	Critically Endangered
SCP15	Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain	Vulnerable
SCP07	Herb rich saline shrublands in clay pans	Vulnerable
SCP08	Herb rich shrublands in clay pans	Vulnerable
Limestone ridges (SCP 26a)	<i>Melaleuca huegelii</i> - <i>Melaleuca acerosa</i> (currently <i>M. systena</i>) shrublands on limestone ridges (Gibson et al. 1994 type 26a)	Endangered
SCP10a	Shrublands on dry clay flats	Endangered
SCP02	Southern wet shrublands, Swan Coastal Plain	Endangered
Granite communities of the northern Jarrah Forest	Granite communities of the northern Jarrah Forest	Priority 3
Elongate Fluvial Delta System	Elongate Fluvial Delta System - Peel-Harvey inlet	Priority 1
SCP24	Northern Spearwood shrublands and woodlands	Priority 3
SCP18	Shrublands on calcareous silts of the Swan Coastal Plain	Vulnerable
Clifton-microbialite	Stromatolite like freshwater microbialite community of coastal brackish lakes	Critically Endangered

Ecological connectivity

Work conducted by various organisations to identify potential regional ecological linkages has been compiled to form a guide for the Peel-Harvey NRM community (Figure 6). The Regional Ecological Linkages shown in Figure 6 are a synthesis of the work of the South West Regional Ecological Linkages Project (Molloy *et al*, 2009), the Perth Biodiversity Project (WALGA & PBP, 2004) and the Peel-Harvey Regional Ecological Linkages Project (Greenskills, 2007).

Conservation planning

A number of conservation prioritisation and planning exercises have been carried out which include the Peel-Harvey Region, or large parts of the Region. These include:

- Biodiversity Sub Strategy for the South West Catchment Council (Ecosystem Solutions Pty Ltd, 2009)
- Regional Framework for Biodiversity Conservation Planning (Perth Biodiversity Project, 2012)
- Swan Bioplan (Peel Sector) (Environmental Protection Authority, 2010)
- Peel-Harvey Decision Support System (Biodiversity Toolbox) (Hick, 2004).

Each of these can contribute to the planning and implementation of NRM projects in the Region.



Figure 1: Regional NRM Planning subsystems and native vegetation

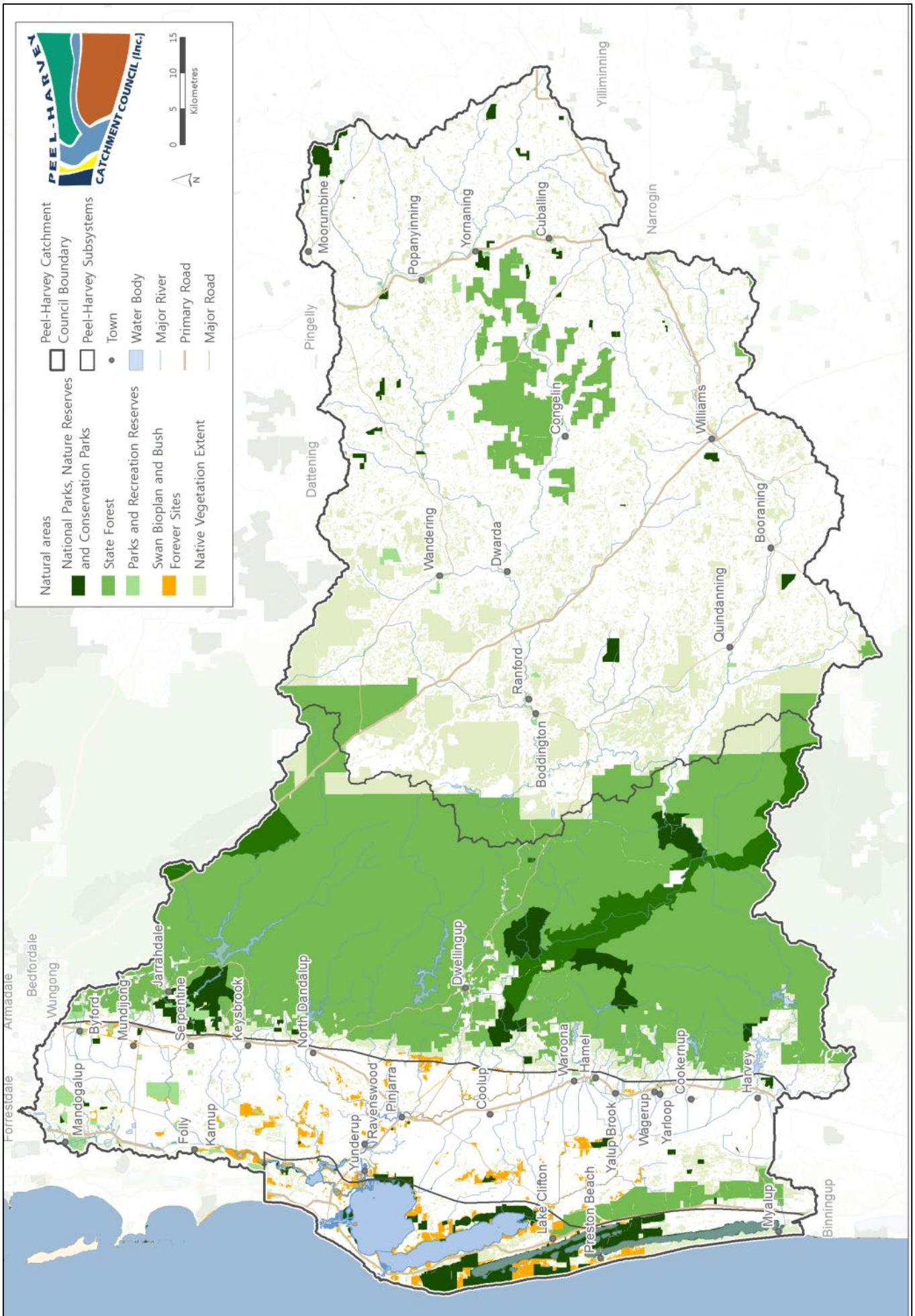


Figure 2: DPaW estate, Bush Forever Sites and Swan Bioplan sites

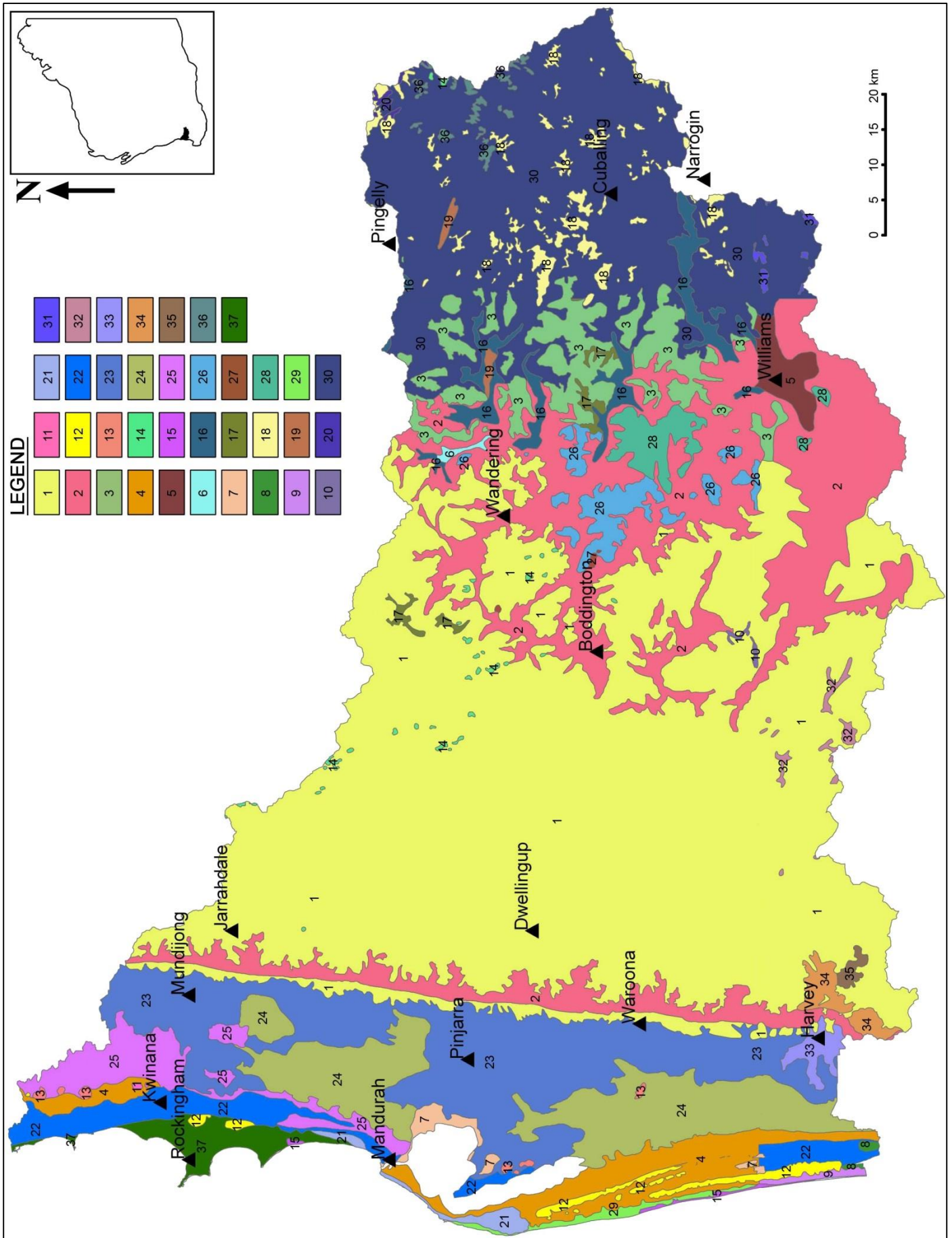


Figure 3: Vegetation associations in the Peel-Harvey Region (Beard, 1979, 1980)

Table 4: Vegetation associations of the Peel-Harvey Region (adapted from Beard, 1979, 1980)

Association		Association	
No.	Description	No.	Description
1	Medium forest; jarrah-marri – grading to jarrah-marri-wandoo inland	20	Shrublands; dryandra heath (minor only)
2	Medium woodland; marri & wandoo	21	Shrublands; melaleuca heath
3	Medium woodland; wandoo & powderbark (<i>Eucalyptus accedens</i>)	22	Medium woodland; tuart
4	Medium woodland; tuart & jarrah	23	Medium woodland; marri
5	Medium woodland; York gum (<i>Eucalyptus loxophleba</i>) & wandoo	24	Mosaic: Medium forest; jarrah-marri / Low woodland; banksia / Low forest; teatree (<i>Melaleuca spp.</i>)
6	Medium open woodland; wandoo	25	Medium very sparse woodland; jarrah, with low woodland; banksia & casuarina
7	Low woodland; paperbark (<i>Melaleuca sp.</i>)	26	Medium forest; jarrah, marri & wandoo
8	Shrublands; teatree thicket	27	Low woodland; <i>Allocasuarina huegeliana</i> (minor only)
9	Shrublands; scrub-heath	28	Medium woodland; jarrah, wandoo & powderbark
10	Shrublands; mixed heath	29	Shrublands; coastal heath and thicket
11	Sedgeland; reed swamps, occasionally with heath	30	Medium woodland; York gum, wandoo & salmon gum (<i>Eucalyptus salmonophloia</i>)
12	Bare areas; salt lakes	31	Medium woodland; wandoo & mallet
13	Bare areas; freshwater lakes	32	Shrublands tree-heath; paperbark over teatree thickets
14	Bare areas; rock outcrops	33	Medium woodland; <i>Eucalyptus rudis</i> & <i>Melaleuca raphiophylla</i>
15	Bare areas; drift sand	34	Medium woodland-fringing; jarrah, marri, <i>Eucalyptus rudis</i> & <i>Agonis flexuosa</i>
16	Medium woodland; York gum	35	Medium woodlands; jarrah, marri and blackbutt
17	Medium woodland; wandoo	36	Low woodland; <i>Allocasuarina huegeliana</i> and jam around granite rocks
18	Medium woodland; powderbark & mallet	37	Shrublands; scrub heath on the Swan Coastal Plain
19	Low woodland; banksia		

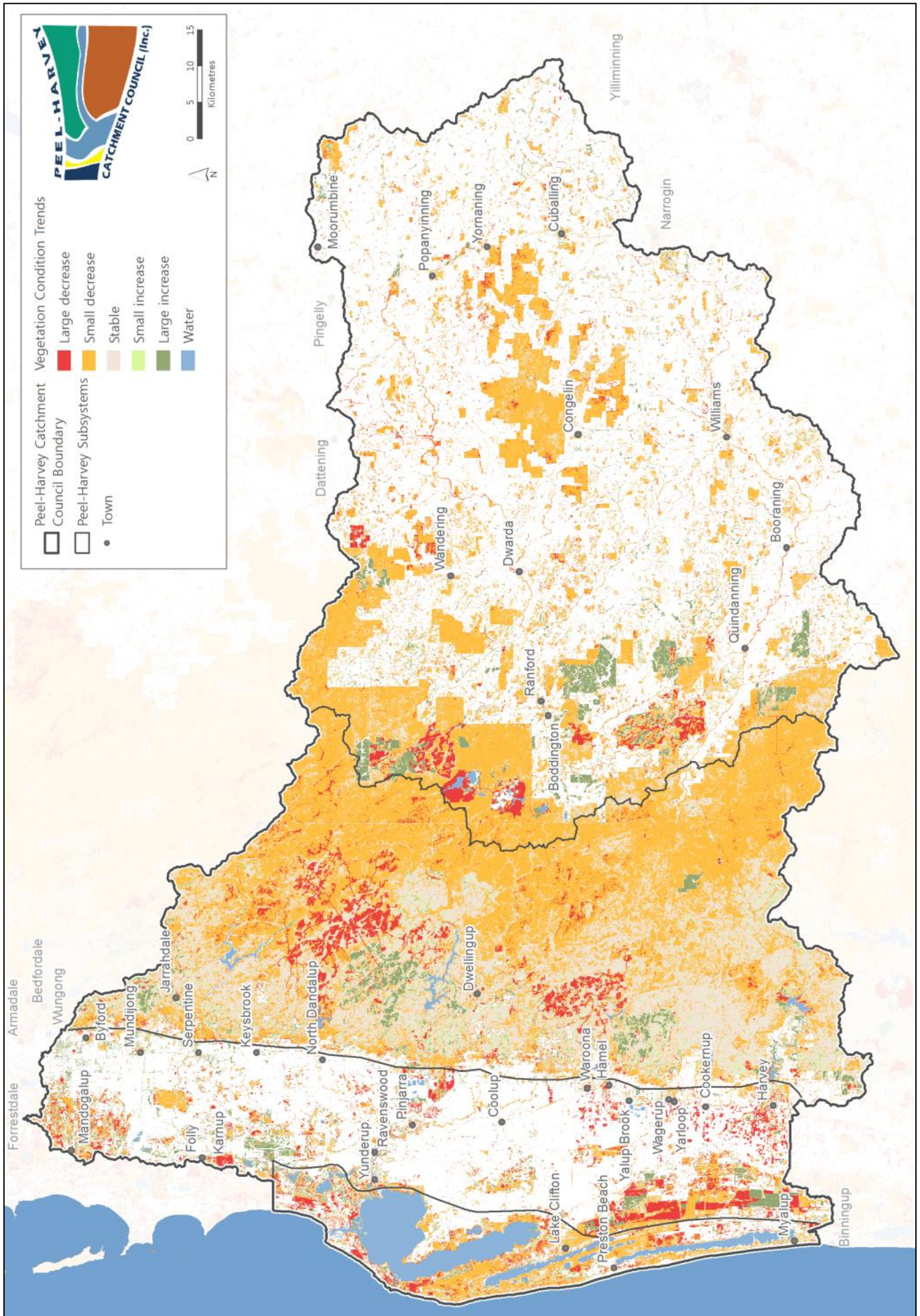


Figure 4: Vegetation Trend Classes (1988 - 2013, Land Monitor)

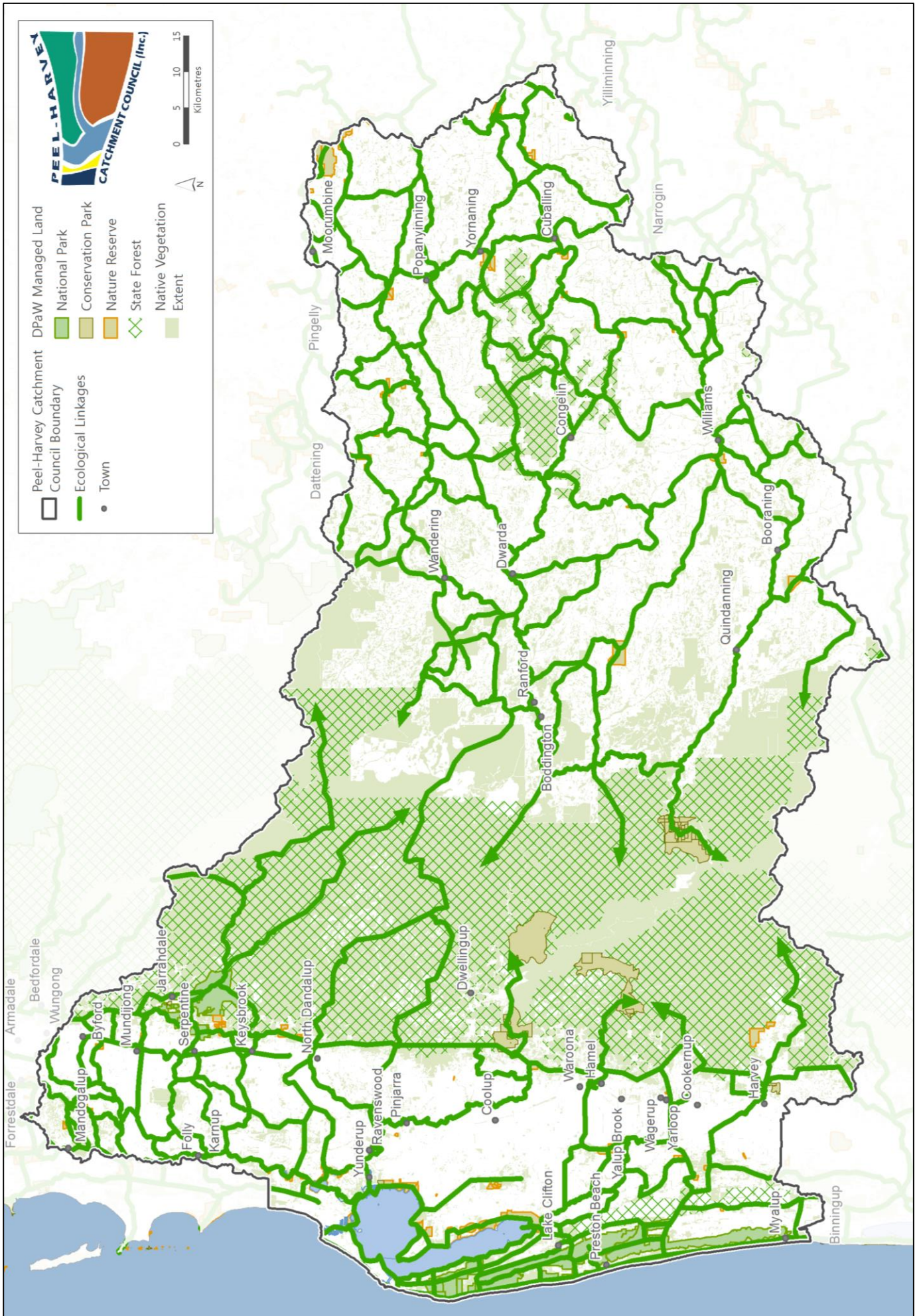


Figure 5: Regional Ecological Linkages

References used in Appendix F:

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