

Natural Resource Management information guide

for the

Moore River catchment Shires



Rowes road roadside native vegetation, Shire of Dandaragan

A useful information guide to help Shires manage the natural resources in the Moore River catchment



Salmon Gum road reserve, Shire of Moora

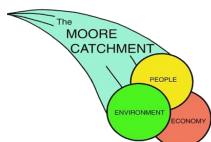


Carnaby's Black Cockatoo, Shire of Gingin



Mia Moon reserve, Shire of Dalwallinu

Version March 2020



Researched and designed by the Moore Catchment Council
Funded by the Western Australian Government's State
Natural Resource Management Program



natural resource
management program



Moore River catchment Shires

The Moore River catchment has a total area of 13,800 square kilometres (5,328 sq mi). The River and tributaries flow through 8 Shires. The headwaters of the Moore River commence in the Perenjori, Carnamah and Dalwallinu Shires and drain southwards through Coorow, Dandaragan and Moora Shires. The East Moore River originates in the Victoria Plains Shire and joins the main branch near Mogumber. The Moore River is eventually met by the Gingin Brook, in the Gingin Shire, about 19 km in from the coast and then meets the Indian Ocean at Guilderton, 75 km north of Perth.

The Moore Catchment Council, a community Landcare/Coastcare group, services the entire Moore River catchment, and also pushes out to the Moora, Victoria Plains and Gingin Shire boundaries in the East and South.



This guide aims to:

- highlight some of the environmental threats, issues and considerations affecting the Shires of the Moore River catchment;
- offer and provide pathways to mitigation strategies and ideas to reducing impact of threats;
- detail groups who can offer natural resource help and services;
- give links to up-to-date online information, research and documents to help better manage natural resources in the Moore River catchment Shires.

[Click on the highlighted links to explore more information](#)

[All links are up-to-date as of March 2020](#)

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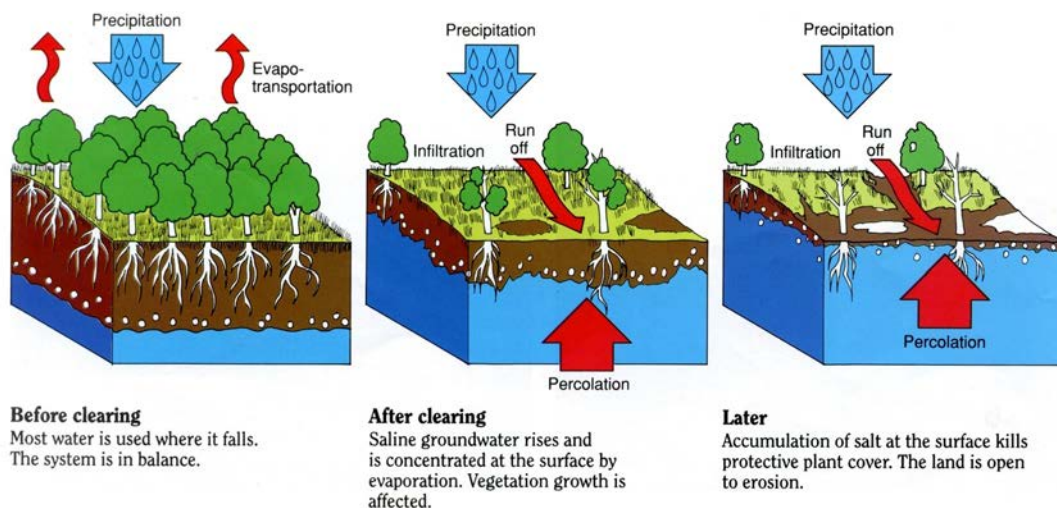
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1) Environmental Threats and Mitigation Strategies

A) SALINITY

Land use changes, seasonal weather variations and long-term changes in climate all have an impact on surface water, groundwater, flow between them, and their salt content. The term '**salinity**' refers to the **concentrations of salt** found in water and soil. There are three types of salinity, each with different causes and impacts:

- Primary salinity (or natural salinity) - caused by natural processes such as weathering rocks and the accumulation of thousands of years of rain.
- Secondary salinity (or [dryland salinity](#)) - caused by changes in land use and management. The most significant contributor is **land clearing of deep-rooted, perennial native vegetation** and replacement with shallow-rooted, annual crops and pastures. This has allowed the groundwater to recharge and dissolve salt concentrations near the soil surface, which has consequently reduced plant growth and water quality, and damaged infrastructure.
- Tertiary salinity (or irrigated salinity) - caused by irrigation when water is reapplied to crops or horticulture over many cycles. With each application some of the water evaporates, leaving the remaining water with a higher salt concentration.



For further information, see [Understanding Salinity](#) by the Department of Water and Environmental Regulation (DWER).

Salinity mitigation strategies include:

- Adopt low-recharge farming systems:
 - Improve annual crop and pasture agronomy.
 - Use perennial pastures.
- Engineering solutions:
 - Manage surface water.
 - Manage groundwater.
 - Salt harvesting and evaporation basins.



Mixed saltbush perennial planting

For further information on dryland salinity mitigation strategies, and their effectiveness, see [Natural Resource Management Issues in the Avon River Basin](#) by the Department of Primary Industries and Development (DPIRD).

B) ACID SULPHATE SOILS

Acid sulphate soils are classed into two categories:

- Potential Acid Sulphate Soils (PASS):
 - This soil contains **iron sulphide** that has not yet been oxidised.
- Actual Acid Sulphate Soils (AASS):
 - The iron sulphide in this soil has been oxidised, producing sulfuric acid and resulting in a soil pH of less than 4.

For information on their impacts, see [Acid Sulphate Soils](#) by the DWER, and [Natural Resource Management Issues in the Avon River Basin](#) by the DPIRD. Use [Regional Lands Partnership APP map](#) to locate soil acidity risk areas.

Acid sulphate soils mitigation strategies include:

- Efficient water and drainage management systems.
- Careful pasture species selection.
- Effective pasture management.
- Fence off compromised areas.
- Use of perennial pastures as well as revegetating groundwater recharge areas.



Acid sulphate soil

Photo: <http://www.water.wa.gov.au/>

C) EUTROPHICATION

Eutrophication is related to **excess nutrients and sediments** that enter waterways from modified agricultural landscapes. As a result, algal growth accelerates and produces harmful blooms.

Eutrophication impacts include:

- Algal blooms and algal mats on water surface.
- Depleted oxygen levels due to decomposing algal matter, thus killing fish etc.
- Death of livestock, fish and birds due to toxins from blue-green algae.

For more information on the impacts of eutrophication, see the [DWER](#) website.

Eutrophication mitigation strategies include:

- Monitoring of waterways, especially at known pollution points.
- Use of alternative fertilisers.
- Use of perennial crops.
- Use of nutrient stripping basins.



Nutrient rich waterway

Photo: <http://www.water.wa.gov.au/>

For more information on eutrophication, see [Natural Resource Management Issues in the Avon River Basin](#) by the DPIRD.

D) WATERLOGGING

Waterlogging in the Wheatbelt is a major factor in reduced crop yields, especially in wet seasons. Factors that affect susceptibility include:

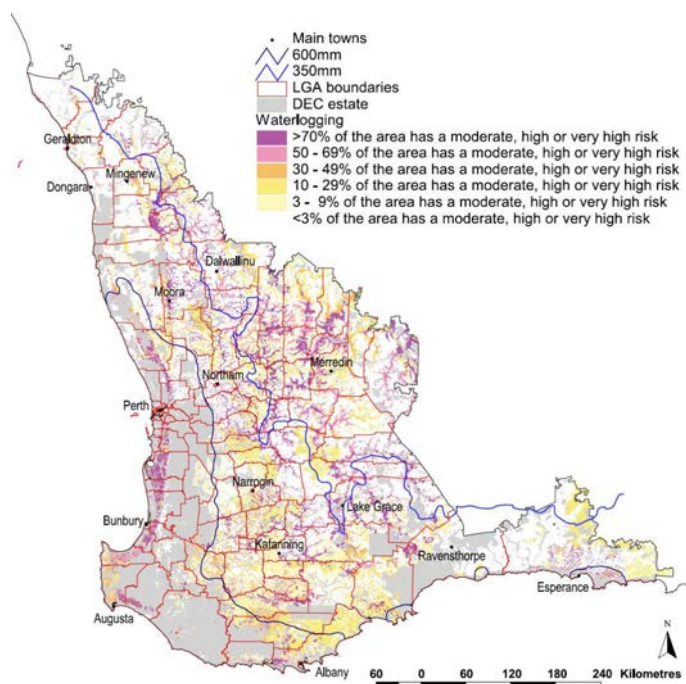
- Climate (high rainfall areas that receive more than 450mm).
- Position of the landscape (valley floors, foot slopes on concave slopes, level plains etc.).
- Soil characteristics.

For further information, see [Waterlogging in Western Australia](#) by the DPIRD.

Waterlogging mitigation strategies include:

- High water use farming systems.
- Tolerant crops and pastures.
- Soil management.
- Shallow surface drains.
- Bedding and mounding.
- Interceptor drains and banks.

For further information on waterlogging mitigation strategies, and their effectiveness, see [Natural Resource Management Issues in the Avon River Basin](#) by the DPIRD.



Mapping of waterlogging risk is based on landform and soil characteristics.
<https://www.agric.wa.gov.au/waterlogging/waterlogging-western-australia>

E) CLIMATE CHANGE

Whilst our climate naturally varies, the Western Australian government has recognised that **climate change** is currently occurring.

Climate change impacts include:

- Changes in rainfall.
- Increasing temperatures.
- Rising sea levels.

Climate change mitigation strategies include:

- Prevent/reduce greenhouse gas emissions.
- Use of new technologies and renewable energies.

For more information on climate change, see [Climate Change and Waterways](#) by the DWER, and [Australian Government](#)



Dry degraded waterway

F) INTRODUCED SPECIES

Introduced species (feral animals & plants) often have a damaging effect on biodiversity and agriculture. Each year, millions of dollars are spent to manage their impacts.

Introduced species have the potential to:

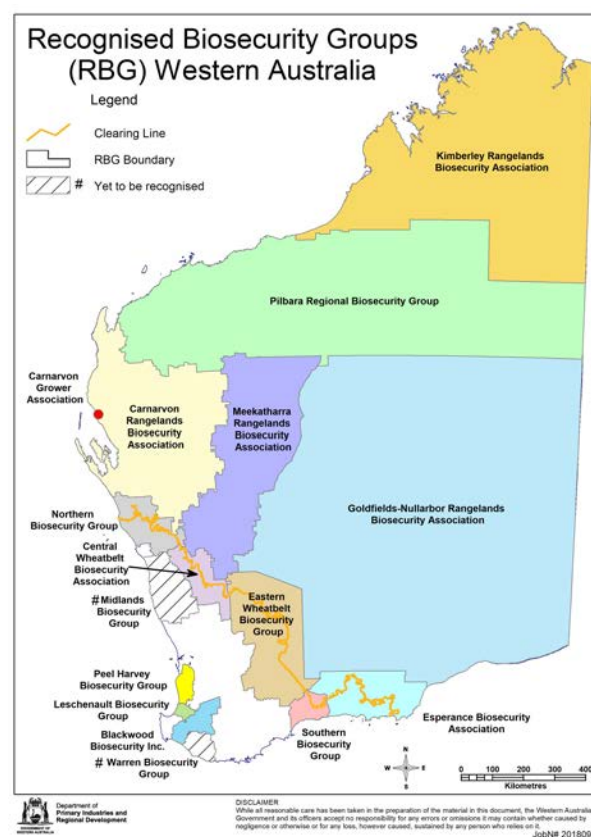
- Outcompete native species.
- Destroy agricultural productions.
- Damage infrastructure.

For more information on the impacts of introduced species, see the [DPIRD website](http://www.dpiird.gov.au).

Mitigation strategies for introduced species include:

- Prevent further introductions.
- Eradicate newly introduced species.
- Control measures.

For more information on mitigation strategies for introduced species, see the [Invasive Species Council website](http://www.invasivespeciescouncil.gov.au).



<https://www.agric.wa.gov.au/biosecurity-quarantine/biosecurity/invasive-species>

G) REMNANT NATIVE VEGETATION DECLINE

The **decline of remnant native vegetation** occurs for a number of reasons:

- Livestock trampling and grazing.
- Salinity and Acid Sulphate Soils.
- Introduced species outcompeting native species.
- Illegal clearing.
- Unsuitable burning regimes.
- Destructive recreational activities.
- Poor management of remnants around agricultural areas (spray drift, fertiliser influx etc.)

Mitigation measures include:

- Corridors to connect existing remnants.
- Adequate fencing of remnants.
- Buffer planting to reduce effects of normal farming activities.
- Controlling weeds and other invasive species.
- Revegetating degraded remnant areas.



Poorly managed roadside reserve vegetation

For more information on remnant native vegetation decline, see [Natural Resource Management Issues in the Avon River Basin](#) by the DPIRD. For roadside reserve conservation, see [Guidelines for Bush Corridors](#)

2) Native Vegetation Clearing

Clearing native vegetation is an offence under the *Environmental Protection Act 1986* (EP Act), unless carried out under a clearing permit or the clearing is for an exempt purpose (clearing permit [fact sheet](#)).

There are **two types of exemptions**:

1. Exemptions for clearing (that are a requirement of a written law or authorised under certain statutory processes) are listed in Schedule 6 of the EP Act.
2. Exemptions for prescribed low impact day-to-day activities are listed in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (EP Regulations), but do not apply in environmentally sensitive areas (environmentally sensitive areas [fact sheet](#)) declared by the Minister. Environmentally sensitive area locations are shown in the [clearing permit system map](#).

The Department of Water and Environmental Regulation (DWER) regulates the granting and administration of **clearing permits** under the EP Regulations ([application form](#)). Prior to lodging a clearing permit application, appropriate flora and fauna surveys need to be completed. Once lodged, the estimated timeframe for clearing approval is a 12 to 16 weeks due to two periods of mandatory public consultation.

For further information on native vegetation clearing, phone the DWER on 08 6467 5000, or visit the clearing permit section of the DWER website to find clearing permit application forms, fee information, and guidelines:

<https://www.der.wa.gov.au/our-work/clearing-permits/>

‘Clearing’ as defined in s 51A of the EP Act:

- (a) the killing or destruction of;
 - (b) the removal of;
 - (c) the severing or ringbarking of trunks or stems of; or
 - (d) the doing of any other substantial damage to,
- some or all of the native vegetation in an area, and includes the draining or flooding of land, the burning of vegetation, the grazing of stock, or any other act or activity that causes -
- (e) the killing or destruction of;
 - (f) the severing of trunks or stems of; or
 - (g) any other substantial damage to,
- some or all of the native vegetation in an area.

Principles for clearing native vegetation
under Schedule 5 of the EP Act:

Native vegetation should not be cleared if –

- (a) it comprises a high level of biological diversity; or
- (b) it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia; or
- (c) it includes, or is necessary for the continued existence of, rare flora; or
- (d) it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community; or
- (e) it is significant as a remnant of native vegetation in an area that has been extensively cleared; or
- (f) it is growing in, or in association with, an environment associated with a watercourse or wetland; or
- (g) the clearing of the vegetation is likely to cause appreciable land degradation; or
- (h) the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area; or
- (i) the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water; or
- (j) the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

3) Conservation Significant Flora, Fauna and Ecological Communities

A) THREATENED FLORA AND FAUNA

If native flora and fauna is deemed '**under identifiable threat of extinction, rare, or otherwise in need of special protection**' it can be specially protected and listed as '**Threatened**' under:

- WA State *Biodiversity Conservation Act 2016* (BC Act) and/or
- Australian Government *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC)

A 'Threatened' species or subspecies has a ranking of:

- ⇒ Critically Endangered (CR)
- ⇒ Endangered (EN) or
- ⇒ Vulnerable (VU)

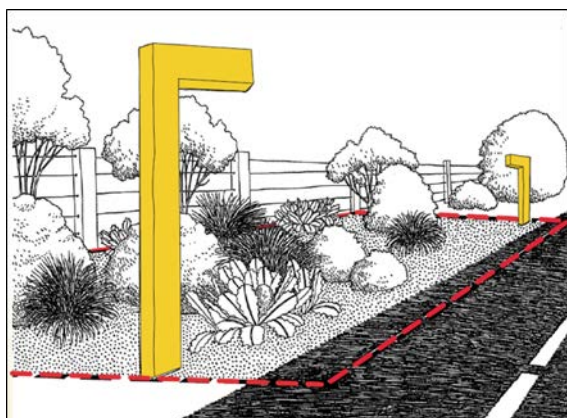
WA State [ranking definitions](#)

Australian Government [ranking definitions](#)

- WA State Threatened species information and strategies: <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities>
- Australian Government Threatened Species information and strategies: <http://environment.gov.au/biodiversity/threatened>

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the WA State **Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3** (see page 3 of WA State [ranking definitions](#)). These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Threatened flora are also referred to as **Declared Rare Flora (DRF)**. Threatened flora/DRF ([fact sheet](#)) are often found in roadside vegetation, particularly in the Avon Wheatbelt, and are generally marked with two yellow 'hockey stick'- like markers, as shown below. The road manager (Shire or Main Roads) is responsible for erecting and maintaining markers in consultation with the Department of Biodiversity Conservation and Attractions (DBCA) .



(source: DBCA [website](#))



DRF marked in the Shire of Moora

- ⇒ Declared Rare Flora and road maintenance <https://www.dpaw.wa.gov.au/images/documents/conservation-management/off-road-conservation/rcc/Declared%20Rare%20Flora%20and%20road%20maintenance%202018.pdf>

The following resources can be used to obtain information pertaining to flora, fauna and ecological communities, including their conservation status, recorded locations, and likelihood of occurring within a designated area. WA State resources are highlighted in **GREEN**.

Search for recorded locations of threatened and priority flora and fauna by name or area

Department of Biodiversity Conservation and Attractions (DBCA)

NatureMap <https://naturemap.dpaw.wa.gov.au/>

Search for recorded locations of threatened and priority flora, fauna and ecological communities by area:

⇒ DBCA threatened and priority flora, fauna and ecological communities database (fee required):

<https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/database-search-request-information-sheet.pdf>

⇒ Department of the Agriculture, Water and the Environment Threatened Species Strategy priority species and threatened communities:

<https://www.arcgis.com/apps/MapSeries/index.html?appid=c2606f315ee74d899c4f7ae478c29ccc>

Search for federally listed flora, fauna and ecological communities likely to occur in an area

⇒ Department of the Agriculture, Water and the Environment EPBC Protected Matters Database Search Tool <http://environment.gov.au/epbc/protected-matters-search-tool>

Obtain federally listed flora and fauna information

⇒ Species Profile and Threats Database <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

⇒ Search Conservation Advices and Recovery Plans by NRM Region (Select: Northern Agricultural) <http://environment.gov.au/cgi-bin/sprat/public/conservationadvice.pl>



Thelymitra stellata Photos: A.P. Brown & I. & M. Greeve

Thelymitra stellata (Star Orchid) **Endangered** (EPBC & BCA) in Carnamah, Coorow, Dandaragan & Gingin Shires

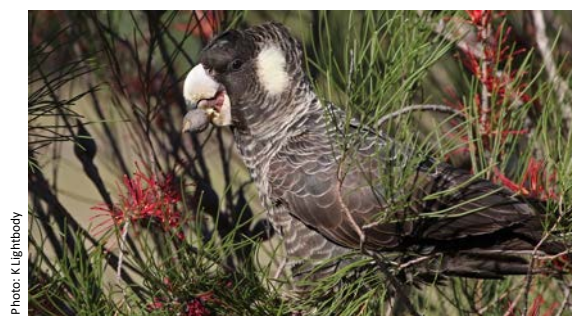


Eucalyptus pruiniramis Photo: S.F. Patrick

Eucalyptus pruiniramis (Midlands Gum, Jingymia Gum) **Endangered** (EPBC & BCA) in Moora, Victoria Plains Shires



Egernia stokesii badia (Western Spiny-tailed Skink) **Endangered** (EPBC), **Vulnerable** (BCA) in Carnamah, Coorow, Dalwallinu, Moora, & Perenjori Shires



Calyptorhynchus latirostris (Carnaby's Black-Cockatoo) **Endangered** (EPBC & BCA) in Carnamah, Coorow, Dandaragan, Gingin, Moora, & Victoria Plains Shires

Obtain flora information

- ⇒ FloraBase: produced by Western Australian Herbarium, Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions. <https://florabase.dpaw.wa.gov.au/>

List of threatened and priority flora, and a summary of recent updates:

- ⇒ Rare flora notice: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/flora_notice.pdf
- ⇒ Threatened & Rare Flora list (excel): <https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Threatened%20and%20Priority%20Flora%20List%205%20December%202018.xlsx>
- ⇒ Summary of changes to Flora list: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/summary_of_changes_to_rare_flora_notice.pdf

List of threatened fauna:

- ⇒ Threatened fauna list: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/fauna_notice.pdf

List of priority fauna:

- ⇒ Priority flora list: https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/threatened_and_priority_fauna_list.xlsx

Federal, State and Regional conservation targets and natural resource management strategies:

Northern Agricultural Catchments Council strategies and targets: <https://www.narvis.com.au/targets-regional-aspirations/>

WA State threatened species strategies: <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities>

Australian Government threatened species strategy: <http://environment.gov.au/biodiversity/threatened/publications/strategy-home>

Australian Government National Landcare Program: <http://www.nrm.gov.au/home>

WA State Natural Resource Management Program: <http://www.nrm.wa.gov.au/>

B) NATIVE SPECIES AND THE LAW

The Biodiversity Conservation Act 2016 and Biodiversity Conservation Regulations 2018 specifies **licences are needed for taking, disturbing, supplying, possessing, processing, dealing, importing and exporting activities in relation to flora and fauna**. Native flora (including flowers, seeds, whole plants, timber and firewood) is protected in Western Australia. For information about the licences required to take, supply, process and deal in native flora, see this [fact sheet](#)

Seek appropriate licence here ([application forms](#)).

For further information pertaining to flora, fauna and ecological communities, phone DBCA on 08 9219 9831, email wildlifelicencing@dbca.wa.gov.au or visit the DBCA website to find licence application forms, fee information, and guidelines:

<https://www.dpaw.wa.gov.au/plants-and-animals>

C) THREATENED AND PRIORITY ECOLOGICAL COMMUNITIES

A **Threatened Ecological Community (TEC)** is an ecological community which is ‘**presumed to be, or is at risk of becoming, totally destroyed**’.


The Australian Government Environmental Protection and Biodiversity Conservation Act 1999 (EPBC) and the WA State Biodiversity Conservation Act 2016 (BC Act) ranks Threatened Ecological Community (TEC) as:

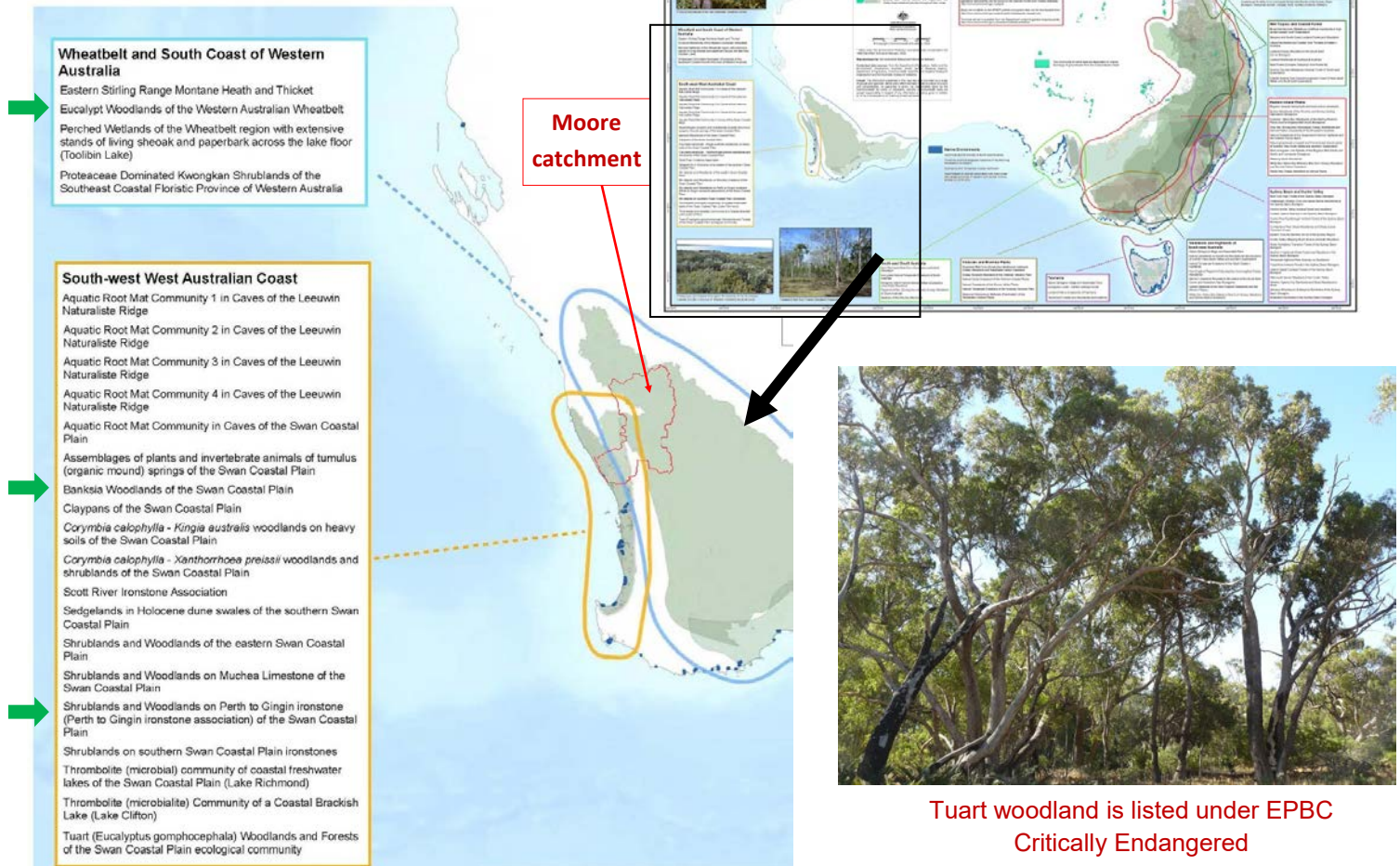
- ⇒ Critically Endangered (CR)
- ⇒ Endangered (EN)
- ⇒ Vulnerable (VU) or
- ⇒ Presumed Totally Destroyed (PD)

EPBC ([ranking definitions](#)) BC Act ([ranking definitions](#)).

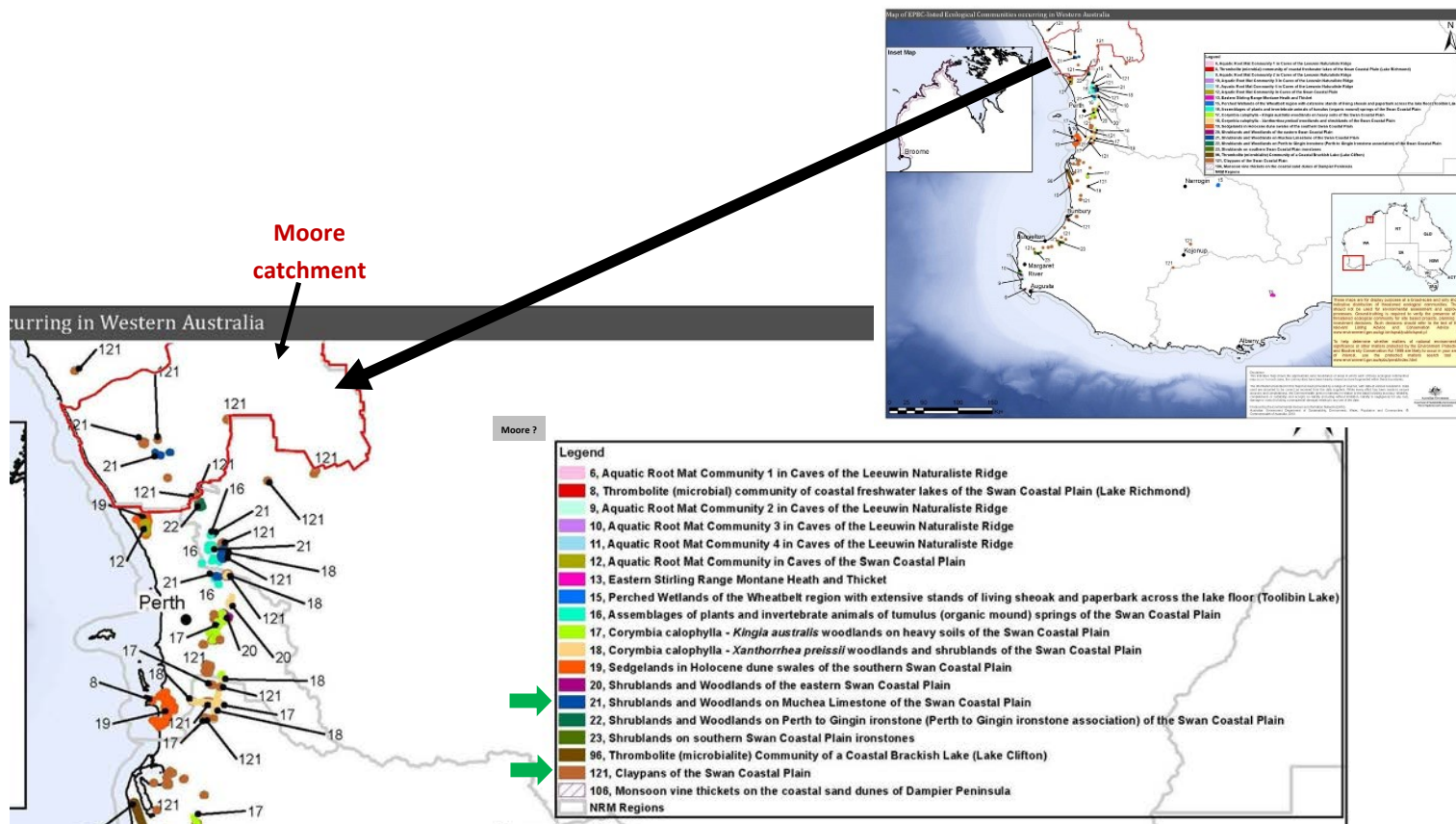
List of EPBC threatened ecological communities:

- ⇒ <http://environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl>

There are currently 5 TECs listed under the EPBC Act in the Moore River catchment - indicated by the 



Link to map here: <https://www.environment.gov.au/system/files/resources/2adf732c-54c5-4d98-90bb-44959b3e493e/files/full-tec->



Link to map here: <https://www.environment.gov.au/system/files/pages/7e5ca5ea-2c56-4dc3-9bb3-44e312cb37d6/files/wa-tec.pdf>

Under the Biodiversity Conservation Act 2016 (BC Act), Western Australia has **69** ecological communities as threatened in the following categories:

- 20 critically endangered
- 17 endangered
- 28 vulnerable
- 4 presumed totally destroyed.

25 of these are listed under the Commonwealth's [Environment Protection and Biodiversity Conservation Act 1999](#).

As at January 2019, an additional **393** ecological communities (community types and sub-types) with insufficient information available to be considered a TEC, or which are rare but not currently threatened, have been placed on the Priority list and referred to as **priority ecological communities (PECs)**.

BC Act list of threatened ecological communities (TECs):

⇒ https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/threatened_ecological_communities_endorsed_by_the_minister_for_the_environment_june_2018.pdf

BC Act list of priority ecological communities (PECs):

⇒ https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/priority_ecological_communities_list.pdf

4) Roadside Reserve Conservation

Roadside vegetation plays an important role in the conservation of Western Australia's plants and animals.

Roadside vegetation - what's the value?

- **Ecological**
 - continuous corridors linking native habitat;
 - habitat for rare/threatened fauna; inhibits weeds
- **Economic** (tourism)
 - visitors coming to look at wildflowers, majestic, stately trees, ecotourism on the rise
- **Hydrological**
 - prevents/inhibits salinity; slows down water to reduce erosion
- **Aesthetic**
 - Cathedral effect
- **Safety**
 - intercepts rising/setting sun; addresses monotony fatigue

In heavily cleared landscapes, the vegetation in the road reserve acts as a wildlife highway, enabling animal movement between large patches of bush. It also provides essential habitat. In some areas rare animals, such as the Carnaby's cockatoo, breed in the hollows of roadside trees. In addition, more than 50 per cent of threatened plants have at least one population on a roadside, and some species depend on roadside vegetation for their continued existence.

⇒ **Roadside values**

<https://www.dpaw.wa.gov.au/management/off-reserve-conservation/roadside-conservation>

⇒ **Guidelines for Bush Corridors for Shires and community**

<http://www.moorecatchment.org.au/wp-content/uploads/2018/12/Guidelines-for-Bush-Corridors.pdf>

Roadside reserve conditions

The Roadside Conservation Committee, in partnership with local volunteers, landcare, community groups and local government, has been coordinating roadside surveys for more than 20 years to assist shires in roadside management and weed control programs.

⇒ **Roadside conservation value mapping program data from surveyed shires**

<https://www.dpaw.wa.gov.au/management/off-reserve-conservation/roadside-conservation/132-roadside-conservation-value-mapping-program?showall=&start=2>

- Carnamah 2004-2005 roadside conservation value [map](#) and [report](#)
- Coorow 1996 roadside conservation value [map](#) and [report](#)
- Dalwallinu 2004-2006 roadside conservation value [map](#) and [report](#)
- Dandaragan 2009 roadside conservation value [map](#) and [report](#)
- Gingin roadside 1989-1994 conservation value [map](#) and [report](#)
- Moora Shire 2014 roadside conservation value [map](#) and [report](#)
- Perenjori roadside conservation value (not carried out)
- Victoria Plains 1994 roadside conservation value [map](#) (no report)



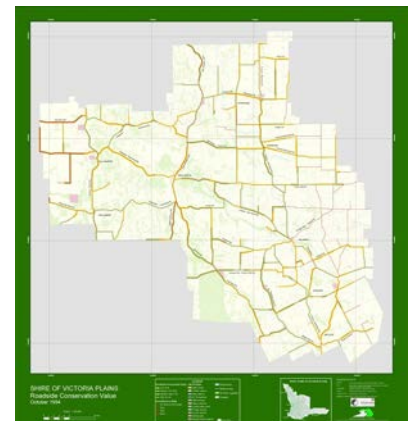
Shire of Perenjori road reserve - **high** ecological, hydrological and economic (tourism) values



Shire of Moora road reserve - **no** ecological, hydrological and economic (tourism) value, **high** biosecurity and land management threats



Shire of Perenjori Wreath flowers on road reserve. Good condition road reserves offer economic opportunities through tourism.



5) Aboriginal Heritage

Yued (or Juat) refers to the Noongar language group north of Perth, including the towns of Leeman, Jurien Bay, Cervantes, Two Rocks, Toodyay, Gingin, Calingiri, Dalwallinu, Coorow and Moora ([further information](#)). The Yued group have entered into a native title agreement ([South West Native Title Settlement](#)).

Yamaji (or Yamatji) is the name used to identify Aboriginal people in the Murchison and Gascoyne regions of Western Australia. 'Yamaji' comes from the Wajarri (or Wajarri) language and means 'man' or 'human being', Yamaji Country is in the Mid West region of Western Australia and stretches from Carnarvon in the north to Meekatharra in the east, to Jurien in the south. The Widi Mob in the north eastern Moore are part of the Yamaji.

A) HERITAGE SITES AND PLACES

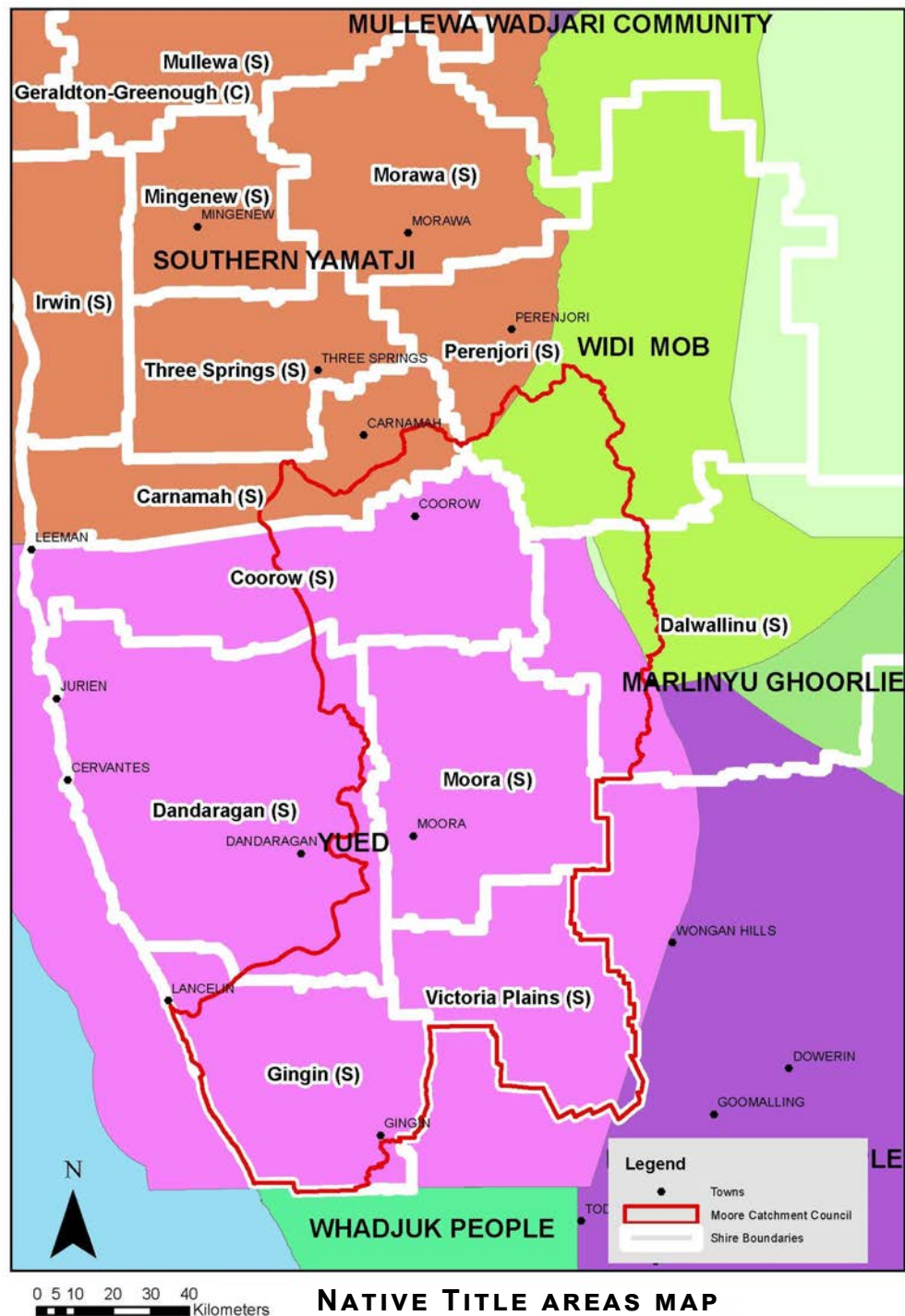
Aboriginal heritage sites and places are specially protected under the *Aboriginal Heritage Act 1972* (AH Act) ([detailed definitions](#)). The Aboriginal Heritage Inquiry System can be used to search for the recorded locations of Aboriginal sites and places within a designated area: <https://maps.daa.wa.gov.au/AHIS/>.

For further information on heritage sites and places, phone the Department of Planning, Lands and Heritage: <https://www.dplh.wa.gov.au/contact-us>

B) HERITAGE SITES AND PLACES LAWS

The **destruction of a heritage site or place is an offence** under the AH Act. There are numerous Aboriginal heritage sites and culturally significant places in the Yued and Yamaji regions. Prior to undertaking land disturbance activities, Shires should liaise with the Department of Planning, Lands & Heritage and the relevant Aboriginal group through the South West Aboriginal Land and Sea Council (SWALSC) or Yamatji Marlpa Aboriginal Corporation (YMAC) to arrange for appropriate heritage surveys to be undertaken by qualified archaeologists, with the assistance of the Aboriginal group members. The heritage consultant should provide advice and guidance regarding heritage related approvals.

- ⇒ Department of Planning, Lands & Heritage <https://www.dplh.wa.gov.au/>
- ⇒ South West Aboriginal Land and Sea Council (SWALSC) <http://www.noongar.org.au/>
- ⇒ Yamatji Marlpa Aboriginal Corporation (YMAC) <https://ymac.org.au/>



6) Landcare Groups Advice and Assistance

Advice and assistance regarding any of the information provided in this advice pack can be readily sought from the following land care groups stationed within the Avon Wheatbelt:

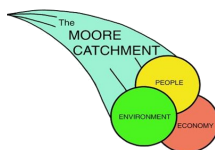


Northern Agricultural Catchments Council (Regional Natural Resource Management organisation)

Lotteries House 114 Sanford Street, Geraldton

08 9938 0100

<https://www.nacc.com.au/>



Moore Catchment Council (Community Natural Resource Management organisation)

20 Roberts Street, Moora

08 9653 1355

<http://www.moorecatchment.org.au/>



Yarra Yarra Catchment Regional Council (Community Natural Resource Management organisation)

Corner Fowler Street and Timmings Street, Perenjori

08 9973 1444

<http://yarrayarracatchment.org.au/>



Chittering Landcare Group (Community Natural Resource Management organisation)

175 Old Gingin Road, Muchea

08 9571 0400

www.chitteringlandcare.org.au

In addition, a range of other environmental groups may be able to help and are listed here:

<https://www.nacc.com.au/nrm-bodies-groups/>

Native Plant Nurseries

There are a number of good quality native plant nurseries accessible to the region. Also a good place to seek advice on species selection and care from knowledgeable nursery people. They include:

Greenoil Tree Nursery, Mingenew. Ian Pulbrook 9928 1381 or 0428 281 470.

Email: ianpulbrook@gmail.com Good variety of Wheatbelt trees and shrubs in cell trays approx. .50c per seedling. Also planting contractor.

Muchea Tree Nursery, Muchea. Natalie Vallance 9571 4090 .

Email: muchtrees@nw.com.au Website: www.muchteatreefarm.com.au Large variety of species, especially Banksias, Hakeas & Grevilleas in pots. Price range \$1.20 - \$4.50.

Wongan Tree Nursery, Wongan Hills. Denis & Ellen Mitchell 9671 1979 .

Email: wongantrees@westnet.com.au Good variety of Wheatbelt trees and shrubs in cell trays approx. .50c per seedling.

Chatfields Tree Nursery, Tammin. Dustin & Lisa McCreery 0427 371 075 .

Email: info@chatfields.com.au Website: www.chatfields.com.au Good variety of trees and shrubs in cell trays approx. .50c per seedling. Specialists in planting and site preparation equipment.

Westgrow Tree Nursery, Meckering. Andrew West 0417 978 475 .

Email: westgrow@activ8.net.au Website: www.westgrow.com.au Good variety of trees and shrubs in cell trays approx. .50c per seedling.

APACE Nursery, Fremantle. Community run. 9336 1262 .

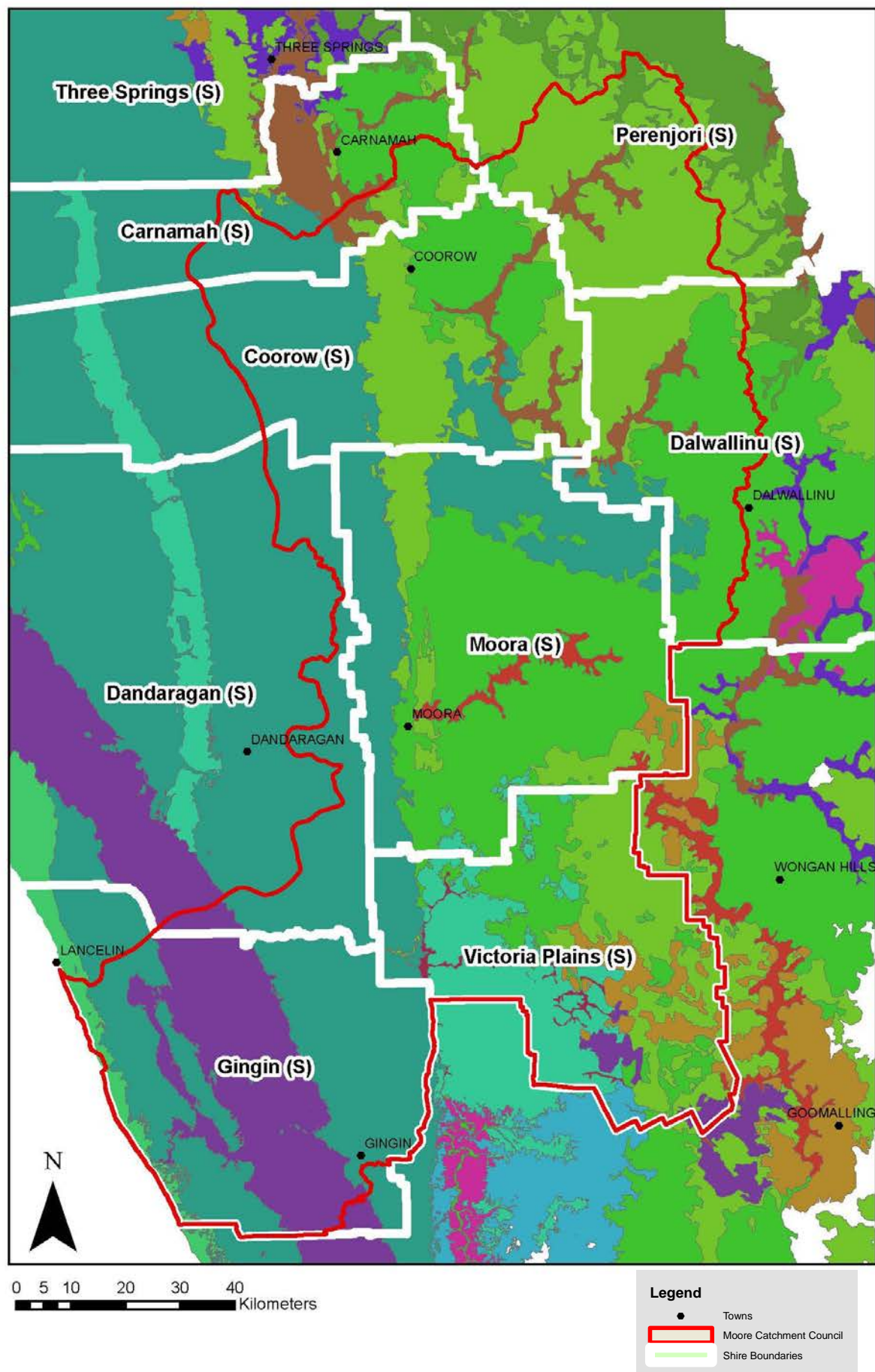
Email: admin@apacewa.org.au Website: www.apacewa.org.au Good variety of sandplain species \$1.60 - \$3.50. Other services including seed collection.

7) References




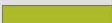















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- ⇒ Department of Conservation and Land Management. 2003. Managing Natural Biodiversity in the Western Australian Wheatbelt – A Conceptual Framework.
https://www.dpaw.wa.gov.au/images/documents/conservation-management/wetlands/recovery_catchments/managing_natural_biodiversity_in_the_WA_wheatbelt.pdf
- ⇒ Department of Water and Environmental Regulation. 2017. Managing Water Quality – Understanding Salinity.
<http://www.water.wa.gov.au/water-topics/water-quality/managing-water-quality/understanding-salinity>
- ⇒ Department of Water and Environmental Regulation. 2017. Waterways. Threats to our waterways. Acid Sulphate Soils.
<http://www.water.wa.gov.au/water-topics/waterways/threats-to-our-waterways/acid-sulphate-soils>
- ⇒ Department of Agriculture and Food. 2006. Natural resource management issues in the Avon River basin.
<https://researchlibrary.agric.wa.gov.au/cgi/viewcontent.cgi?article=1269&context=rmtr>
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- ⇒ Department of Primary Industries and Regional Development. 2018. Invasive Species.
<https://www.agric.wa.gov.au/biosecurity-quarantine/biosecurity/invasive-species>
- ⇒ Invasive Species Council. 2018. A strategy for dealing with invasive species in Australia.
<https://invasives.org.au/strategy-invasive-species-australia/>
- ⇒ Department of Environment and Heritage. 2004. Invasive species in Australia.
<https://www.environment.gov.au/system/files/resources/2bf26cd3-1462-4b9a-a0cc-e72842815b99/files/invasive.pdf>
- ⇒ Moore River Appraisal 2003 <https://researchlibrary.agric.wa.gov.au/rmtr/247/>

8) Appendix

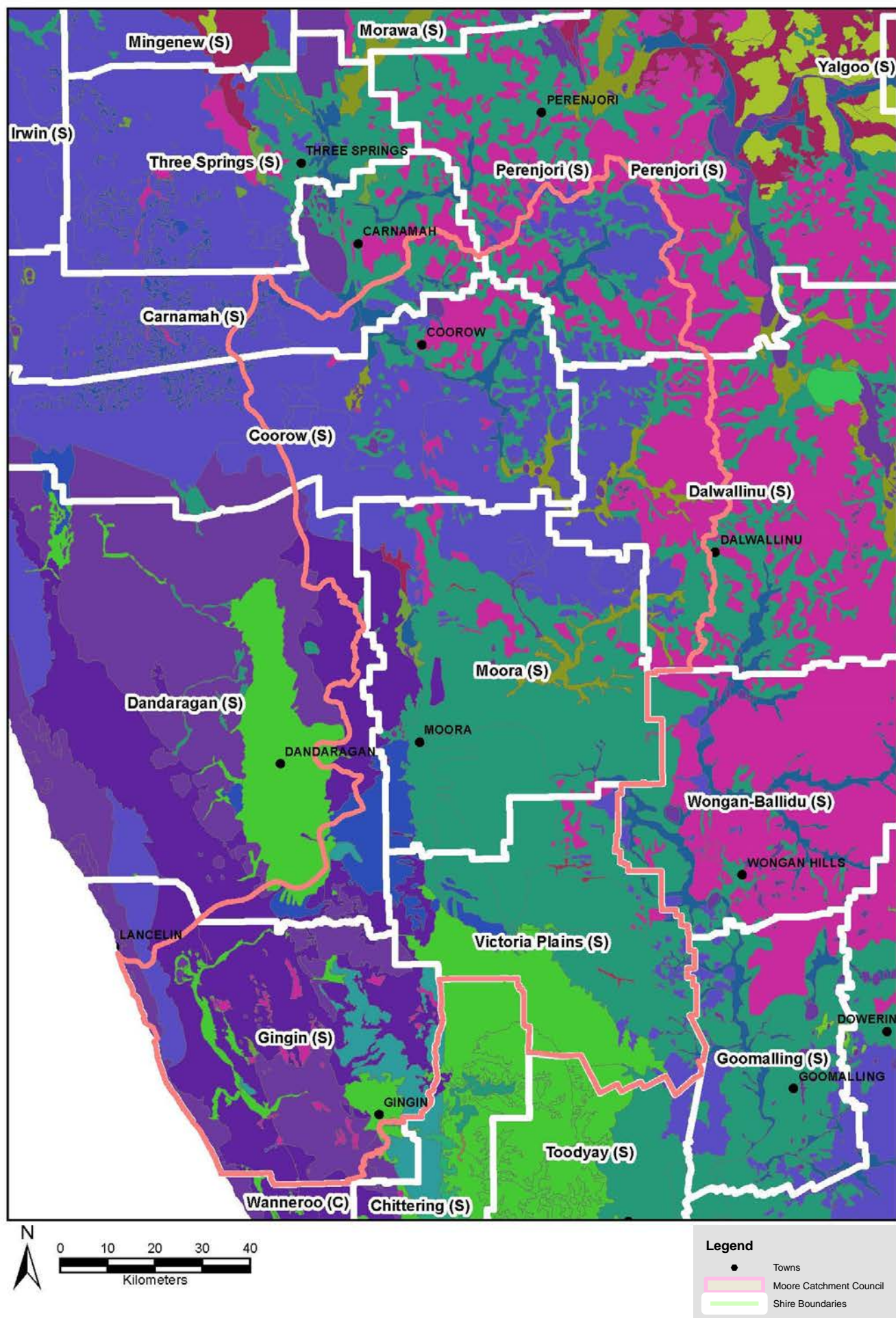
i) Soil types



Legend

	CLAYEY SOILS - Clays, some red and calcareous earths and red duplexes
	DEEP SANDY AND SANDY EARTH SOILS - Yellow deep sands, yellow and brown sandy earths (often with gravelly subsoil)
	DEEP SANDY SOILS - Calcareous - Calcareous deep sands
	DEEP SANDY SOILS - Non-calcareous (siliceous) - Coloured sands (yellow, brown and minor red), some gravelly soils
	DEEP SANDY SOILS - Non-calcareous (siliceous) - Coloured sands (yellow, brown and minor red), some gravelly soils
	DEEP SANDY SOILS - Non-calcareous (siliceous) - Pale sands (grey and yellow), some wet soils
	GRAVELLY SOILS - Gravels in a sandy or loamy matrix - Sandy gravels, loamy gravels and shallow gravels
	GRAVELLY SOILS - Gravels, usually in a loamy matrix - Loamy gravels, also duplex sandy gravels, loamy earths
	GRAVELLY SOILS - Gravels, usually in a sandy matrix - Duplex sandy gravels, deep sandy gravels, also deep sands, sandy duplexes and wet soils
	LOAMY EARTH SOILS - Calcareous - Calcareous loamy earths
	LOAMY EARTH SOILS - Non-calcareous - Non-calcareous brown to red loamy earths
	LOAMY EARTH SOILS - Shallow - Red shallow loams and red-brown hardpan soils
	ROCKY OR STONY SOILS - Mixed soils
	SOILS WITH SHALLOW WATERTABLES - Non-saline watertables - Wet and semi-wet soils, pale deep sands
	SOILS WITH SHALLOW WATERTABLES - Saline watertables - Saline and salt lake soils
	TEXTURE CONTRAST SOILS Subsoils usually sodic - Loamy duplexes - Red loamy duplexes
	TEXTURE CONTRAST SOILS Subsoils usually sodic - Sandy and loamy duplexes - Non-alkaline subsoils
	TEXTURE CONTRAST SOILS Subsoils usually sodic - Sandy duplexes - Complex of alkaline and non-alkaline (often highly sodic) subsoils
	TEXTURE CONTRAST SOILS Subsoils usually sodic - Sandy duplexes - non-alkaline subsoils

ii) Pre-European vegetation communities

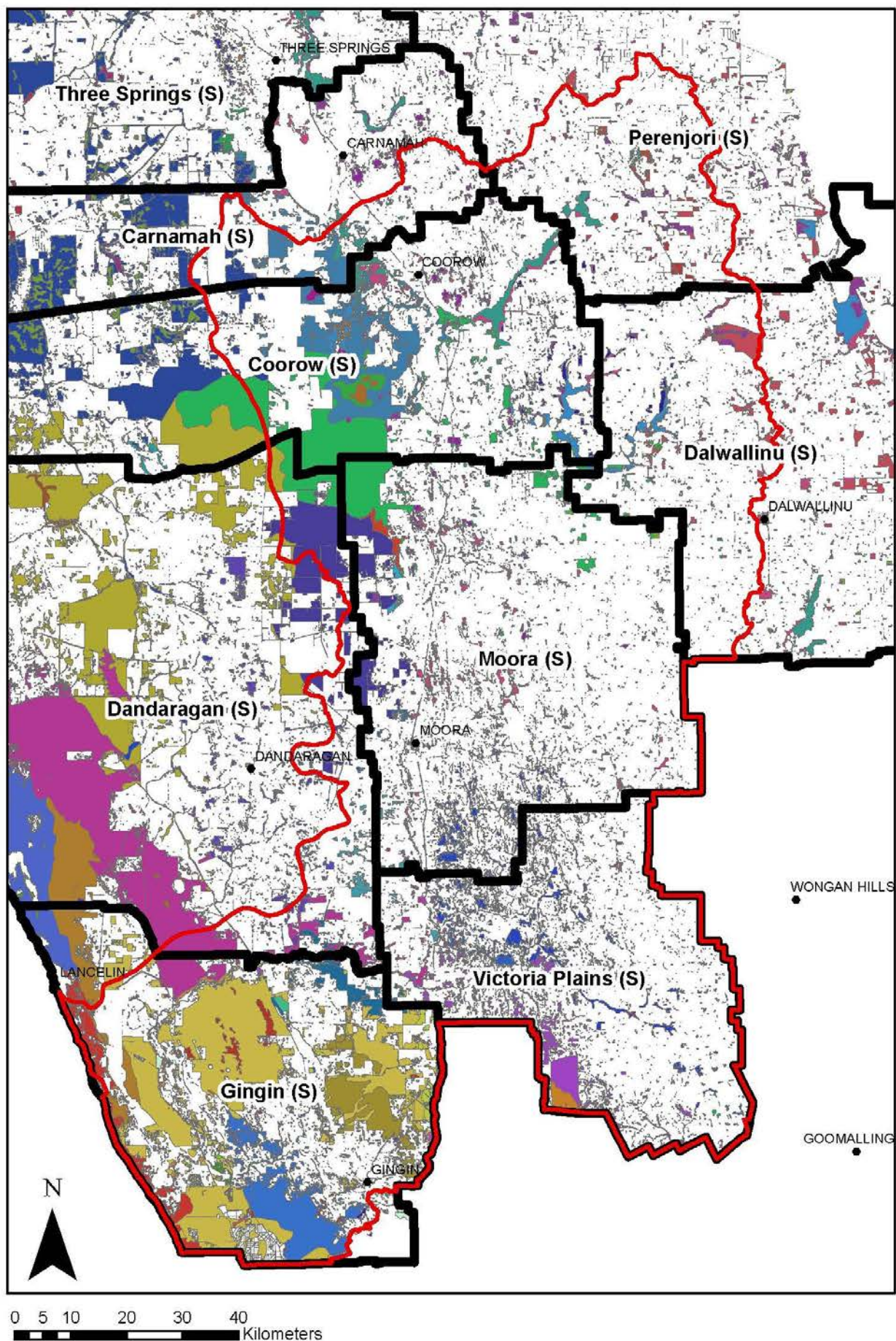


Legend

flor_desc

	Acacia spp., Eremophila spp., Senna spp.
	Acacia thicket with eucalypt woodland over spinifex Acacia tumida, Eucalyptus tectifica, Corymbia grandifolia, Triodia pungens, T. bitextura
	Acacia thicket with scattered low trees over spinifex Acacia enopoda, Corymbia dichromophloia, Triodia pungens, T. bitextura
	Acacia, Rottne pine, coastal moort or mixed tropical forest Acacia rostellifera, Callitris preissii, Eucalyptus lehmannii, E. comuta.
	Annual grasses Enneapogon spp. Aristida spp. etc on dry plains and salt water grasses Sporobolus virginicus on the coast
	Atriplex spp. Maireana spp. communities on alkaline soils
	Bloodwood, stringybark over curly spinifex and sorghum Corymbia dichromophloia, Eucalyptus tetrodonta over Triodia bitextura, Sorghum spp.
	CYPERACEAE, RESTIONACEAE, JUNCACEAE (mainly in the South-West)
	Coolibah over ribbon/blue grass (rivers) Eucalyptus microtheca, Chrysopogon spp., Dichanthium spp.
	Curly spinifex with woodland Triodia bitextura with Eucalyptus phoenicea, E. brevifolia, Corymbia ferruginea, C. dichromophloia.
	Desert oak with soft spinifex Allocasuarina decasneana over Triodia pungens
	Eucalypt shrubland Eucalyptus eremophila, E. redunca, E. spp.
	Grey box over ribbon grass Eucalyptus tectifica over Chrysopogon spp.
	Grey box, cabbage gum over white grass and ribbon grass Eucalyptus tectifica, Corymbia grandifolia over Sehima nervosum, Chrysopogon spp.
	Hummock grassland Triodia spp.
	Hummock grassland with scattered bloodwoods & snappy gum Triodia spp., Corymbia dichromophloia, Eucalyptus leucophloia
	Hummock grassland with scattered eucalypts over wattle scrub or mallee Triodia spp. Acacia spp. Corymbia dichromophloia, Eucalyptus leucophloia, E. youngiana
	Hummock grassland with scattered low trees over dwarf shrubs or mixed short grass and spinifex mixed species, Triodia spp.
	Hummock grassland with scattered shrubs or mallee Triodia spp. Acacia spp., Grevillea spp. Eucalyptus spp.
	Hummock grassland with sparse Eucalypts e.g. bloodwoods & snappy gum Triodia spp., Corymbia dichromophloia, C. opaca, Eucalyptus leucophloia
	Hummock grassland with sparse shrubs Triodia spp. Acacia spp.
	Jarraah, banksia or casuarina Eucalyptus marginata, Banksia spp., Allocasuarina spp.
	Jarraah, marri and wandoo Eucalyptus marginata, Corymbia calophylla, E. wandoo.
	Low forest (Kimberley) or thicket (Pilbara) mangroves Avicennia marina, Rhizophora stylosa, Bruguiera exaristata.
	Low shrubs of mixed composition.
	Mainly Mitchell grass Astrebla spp.
	Mainly jarraah and marri Eucalyptus marginata, Corymbia calophylla
	Mainly kari Eucalyptus diversicolor or Tuart E. gomphocephala.
	Mainly ribbon grass with low woodland or scattered trees e.g. Eucalyptus terminalis over Chrysopogon spp., Dichanthium spp.
	Mixed heath with low trees Banksia ashbyi.
	Mixed heath with scattered mallee e.g. tallerack Eucalyptus tetragona
	Mixed heath with scattered tall shrubs Acacia spp., PROTEACEAE and MYRTACEAE.
	Mulga Acacia aneura and associated species.
	Mulga, other wattle Atriplex spp. Maireana spp. with Acacia aneura & other Acacia spp.
	Mulga, other wattle, casuarina Atriplex spp. Maireana spp. with Acacia aneura, A. papyrocarpa, Allocasuarina cnstata
	Other acacia, banksia, peppermint, cypress pine, casuarina, York gum Acacia spp., Banksia spp., Agonis flexuosa, Callitris spp., Allocasuarina spp., Eucalyptus loxophleba.
	Rivergum, coolibah over mixed sedges Eucalyptus camaldulensis, E. microtheca, E. victrix
	Salmon gum & gimlet Atriplex spp., Maireana spp., Eucalyptus salmonophloia, E. salubris
	Short grasses with scattered trees e.g. Bauhinia and snappy gum Enneapogon spp., Aristida spp. with Lysiphyllum cunninghamii, Eucalyptus brevifolia
	Tea tree with York gum, casuarina Tecticornia spp. Melaleuca spp. Eucalyptus loxophleba, Casuarina obesa
	Teatree with York gum, wandoo or casuarina Melaleuca spp. with Eucalyptus loxophleba, E. wandoo, Allocasuarina spp.
	Tecticornia spp. communities in saline areas
	Tecticornia spp. with Melaleuca spp. Acacia spp.
	Wattle with York gum, casuarina, mulga Acacia spp. with Eucalyptus loxophleba, Allocasuarina spp. Acacia aneura.
	Wattle, casuarina and teatree acacia-allocasuarina-melaleuca alliance.
	Wattle, teatree & other species Acacia spp. Melaleuca spp.
	Wheatbelt, York gum, salmon gum etc. Eucalyptus loxophleba, E. salmonophloia. Goldfields; gimlet, redwood etc. E. salubris, E. oleosa. Riverine; rivergum E. camaldulensis. Tropical; messmate, woolyb
	York gum and cypress Eucalyptus loxophleba, Callitris columellaris.
	York gum, mulga, melaleuca or casuarina Tecticornia spp., Eucalyptus loxophleba, Acacia aneura, Melaleuca spp., Allocasuarina spp.

iii) Remaining native vegetation communities

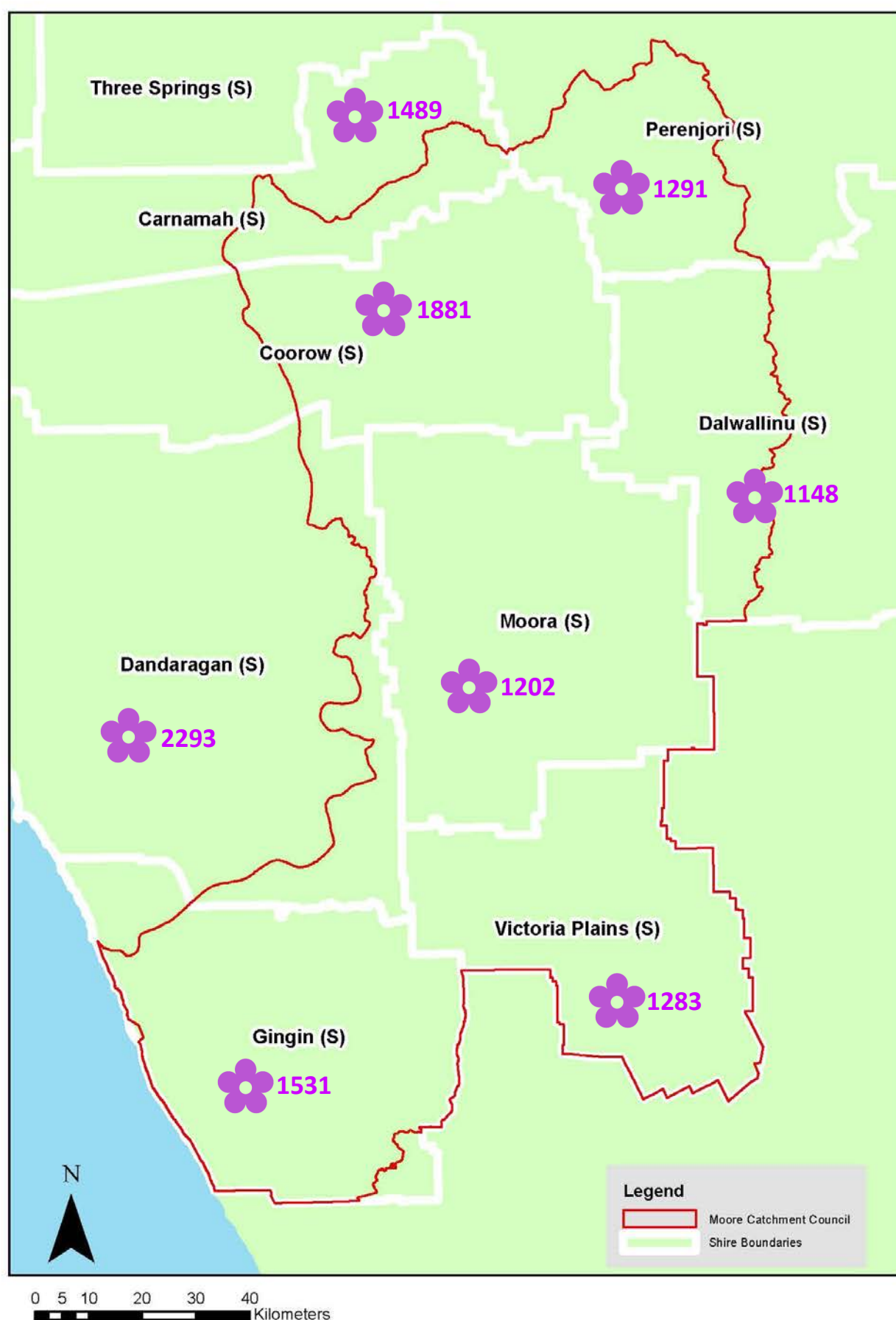


Legend

LABEL	
1007	Mosaic: Shrublands; Acacia lasiocarpa & Melaleuca acerosa heath / Shrublands; Acacia rostellifera
1008	Medium open woodland; marri
1009	Medium woodland; marri & river gum
1010	Medium open woodland; marri & tuart
1011	Medium open woodland; tuart
1012	Medium open woodland; tuart
1013	Medium open woodland; marri
1014	Mosaic: Low woodland; banksia / Shrublands; teatree thicket
1015	Mosaic: Mixed scrub-heath / Shrublands; dryandra thicket
1016	Mosaic: Low woodland; banksia / Shrublands; dryandra heath
1017	Medium open woodland; jarrah & marri, with low woodland; banksia
1018	Mosaic: Medium forest; jarrah-marri / Low woodland; banksia / Low forest; teatree / Low wood
1019	Medium sparse woodland; jarrah & marri
1022	Succulent steppe with woodland; Casuarina obesa & samphire
1023	Medium woodland; York gum, wandoo & salmon gum (Eucalyptus salmonophloia)
1024	Shrublands; mallee & casuarina thicket
1026	Mosaic: Shrublands; Acacia rostellifera, A. cyclops (in the south) & Melaleuca cardiophylla
1026	Shrublands; Acacia lasiocarpa & Melaleuca acerosa heath
1027	Mosaic: Medium open woodland; jarrah & marri, with low woodland; banksia / Medium sparse wo
1028	Medium woodland; river gum
1029	Shrublands; scrub-heath dryandra-calthamnis association with Banksia prionotes on limestone
1030	Low woodland; Banksia attenuata & B. menziesii
1031	Mosaic: Shrublands; hakea scrub-heath / Shrublands; dryandra heath
1032	Mosaic: Medium woodland; marri wandoo, powderbark / Shrublands; dryandra heath
1034	Medium woodland; marri, wandoo & powderbark
1035	Mosaic: Medium open woodland; marri / Shrublands; dryandra heath
1036	Low woodland; Banksia prionotes
1037	Medium woodland; York gum & river gum (incl e6,18Mr)
1038	Medium open woodland; eucalypts (e2), with low woodland; Banksia attenuata & B. menziesii
1039	Shrublands; mallee with scattered York gum
1040	Medium woodland; York gum & Casuarina obesa
1041	Low woodland; Allocasuarina huegeliana & Jam
1042	Succulent steppe with low woodland; sheoak over samphire
1043	Mosaic: Medium open woodland; wandoo & powderbark wandoo / Shrublands; dryandra heath
1044	Mosaic: Medium woodland; York gum & salmon gum / Shrublands; Melaleuca thyoides thicket
1046	Succulent steppe with woodland; york gum & samphire
1062	Succulent steppe with open woodland & thicket; york gum over Melaleuca thyoides & samphire
1141	Shrublands; jam, Acacia rostellifera & Melaleuca megacephala thicket
1142	Shrublands; Acacia ligulata & Melaleuca uncinata dominated thicket on dark brown loamy soil
1143	Shrublands; Allocasuarina campestris thicket with patches of heath
1149	Shrublands; scrub-heath Acacia-Ecdeiocolla association in the south-east Geraldton Sandplain
1154	Shrublands; Acacia thicket with patches of heath
1155	Mosaic: Medium woodland; York gum / Shrublands; Allocasuarina campestris thicket
1156	Shrublands; Allocasuarina campestris thickets with scattered jam & casuarina
1164	Mosaic: Shrublands; scrub-heath on sandplain (banksia-xylocarpus alliance) in the Geraldton
1198	Mosaic: Succulent steppe with thicket; Melaleuca thyoides over samphire / Shrublands; bowgada
125	Bare areas; salt lakes
126	Bare areas; freshwater lakes
128	Bare areas; rock outcrops
129	Bare areas; drift sand
141	Medium woodland; York gum, salmon gum & gimlet
1413	Shrublands; acacia, casuarina & melaleuca thicket
142	Medium woodland; York gum & salmon gum
17	Shrublands; Acacia rostellifera thicket
2081	Shrublands; bowgada and associated spp. scrub
221	Succulent steppe; saltbush
254	Shrublands; Melaleuca uncinata thicket with scattered wandoo and powderbark wandoo
255	Shrublands; mallee scrub, Eucalyptus dongarensis
31	Shrublands; Melaleuca thyoides thicket with scattered York gum

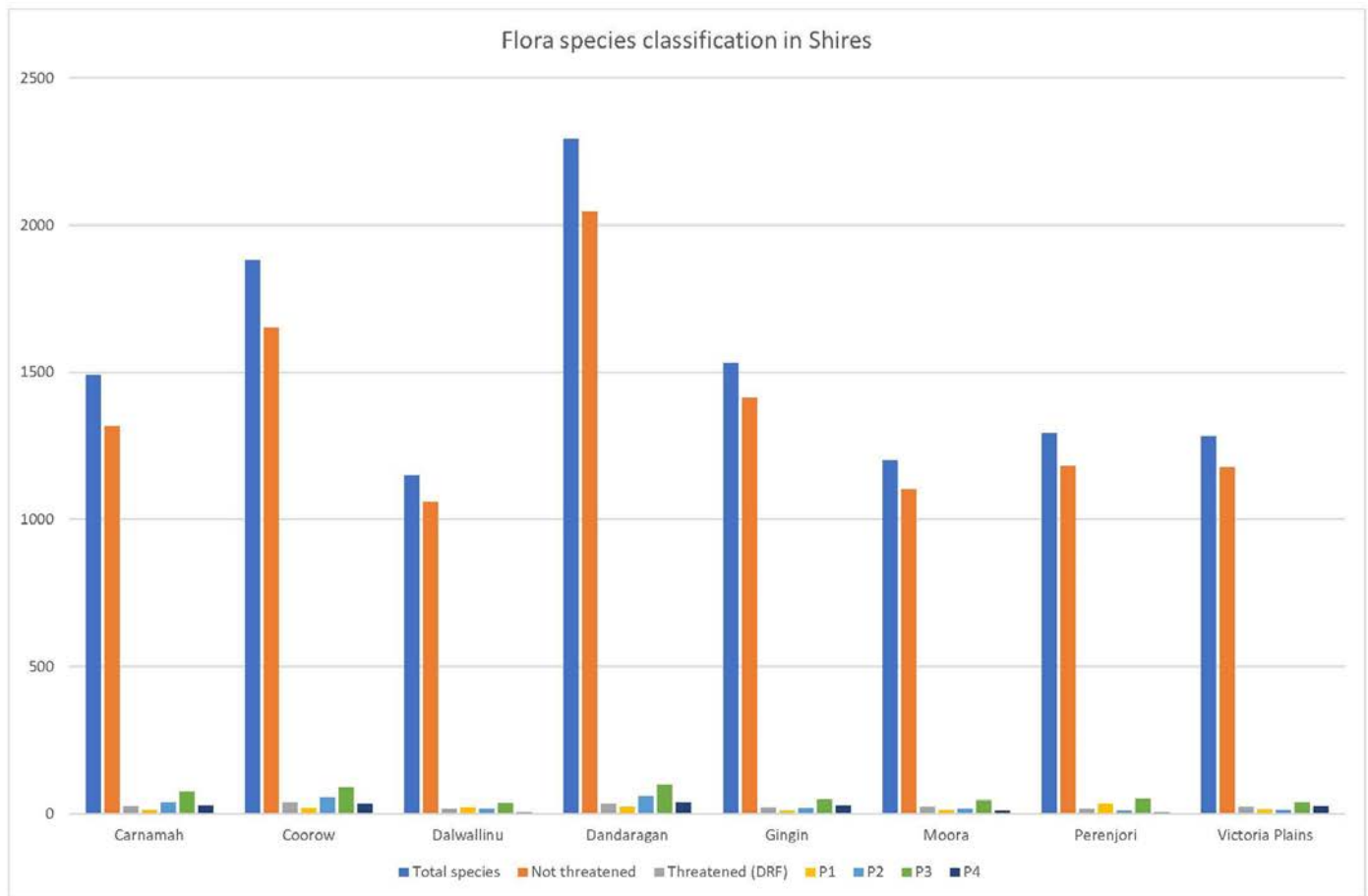
325	Succulent steppe; saltbush & samphire
35	Shrublands; jam scrub with scattered York gum
351	Shrublands; mallee & acacia scrub with scattered York gum & red mallee
352	Medium woodland; York gum
353	Shrublands; mallee & acacia scrub with scattered York gum
354	Shrublands; jam and Acacia rostellifera (+ hakea) scrub with scattered York gum
355	Shrublands; bowgada & jam scrub with scattered York gum & red mallee
358	Shrublands; bowgada & Acacia quadrimarginea on stony ridges
359	Shrublands; acacia & banksia scrub
36	Shrublands; thicket, acacia-casuarina alliance
364	Shrublands; bowgada scrub with scattered eucalypts & cypress pine
365	Shrublands; bowgada & jam scrub with scattered York gum & red mallee
37	Shrublands; teatree thicket
371	Low forest; Acacia rostellifera
372	Mosaic: Shrublands; scrub-heath on deep sandy flats / Shrublands; thicket, acacia-casuarina al
374	Shrublands; bowgada scrub with scattered York gum
377	Mosaic: Shrublands; scrub-heath on limestone in the northern Swan Region / Sparse low woodland
378	Shrublands; scrub-heath with scattered Banksia spp, Eucalyptus tottiana & Xylomelum angustifo
379	Shrublands; scrub-heath on lateritic sandplain in the central Geraldton Sandplain Region
380	Shrublands; scrub-heath on sandplain
383	Shrublands; Acacia rostellifera scrub-heath
385	Shrublands; bowgada & jam scrub with scattered York gum
387	Shrublands; Melaleuca cardiophylla thicket
391	Shrublands; Melaleuca uncinata thicket
392	Shrublands; Melaleuca thyoides thicket
393	Shrublands; Melaleuca thyoides thicket with scattered Casuarina obesa
4	Medium woodland; marri & wandoo
40	Shrublands; acacia scrub, various species
402	Shrublands; heath on coastal limestone
404	Shrublands; bowgada & Acacia murrayana scrub
405	Shrublands; Acacia sclerosperma, bowgada & jam scrub
406	Shrublands; acacia, casuarina, Eucalyptus eudesmioides, Banksia ashbyi & other mixed species t
407	Low woodland over scrub; Allocasuarina huegeliana over jam scrub
408	Shrublands; scrub-heath on coastal association, yellow sandplain
412	Succulent steppe with scrub, teatree (Melaleuca thyoides) over samphire
413	Shrublands; Acacia neurophylla & A. species thicket
419	Shrublands; bowgada, jam and Melaleuca uncinata thicket
420	Shrublands; bowgada & jam scrub
424	Shrublands; York gum mallee scrub
431	Shrublands; Acacia rostellifera open scrub
432	Shrublands; Acacia rostellifera & Melaleuca cardiophylla thicket
433	Mosaic: Shrublands; Acacia rostellifera & Melaleuca cardiophylla thicket / Sparse low woodland
435	Shrublands; Acacia neurophylla, A. beauverdiana & A. resinomarginea thicket
437	Shrublands; Mixed acacia thicket on sandplain
438	Shrublands; dodonaea scrub
440	Shrublands; Acacia ligulata open scrub
48	Shrublands; scrub-heath
49	Shrublands; mixed heath
551	Shrublands; Allocasuarina campestris thicket
619	Medium woodland; river gum (Eucalyptus camaldulensis)
631	Succulent steppe with woodland and thicket; York gum over Melaleuca thyoides & samphire
675	Shrublands; mixed thicket (melaleuca & hakea)
676	Succulent steppe; samphire
684	Mosaic: Shrublands; Shrublands; jam scrub with scattered York gum in the valleys / Allocasuar
686	Medium woodland; York gum & red mallee
687	Shrublands; bowgada & jam scrub with scattered Allocasuarina huegeliana & York gum
691	Shrublands; Dryandra quercifolia & Eucalyptus spp. thicket
692	Shrublands; casuarina & melaleuca thicket
693	Mosaic: Low woodland; Allocasuarina huegeliana over mallee and acacia scrub / Allocasuarina ca
694	Shrublands; scrub-heath on yellow sandplain banksia-xylocarpus alliance in the Geraldton Sand
695	Shrublands; Allocasuarina campestris scrub
696	Shrublands; casuarina & dryandra thicket with wandoo and powderbark wandoo
697	Shrublands; scrub-heath on lateritic sandplain in the southern Geraldton Sandplain Region
698	Mosaic: Shrublands; scrub-heath dryandra-calthamnis association with Banksia prionotes on lim
7	Medium woodland; York gum (Eucalyptus loxophleba) & wandoo
748	Shrublands; Melaleuca thyoides thicket with scattered river gum
772	Shrublands; Acacia lasiocarpa & Melaleuca acerosa heath
936	Medium woodland; salmon gum
946	Medium woodland; wandoo
949	Low woodland; banksia
952	Shrublands; dryandra heath
968	Medium woodland; jarrah, marri & wandoo
988	Succulent steppe with thicket; Melaleuca thyoides over samphire
998	Medium woodland; tuart
999	Medium woodland; marri
	DAFWA_VegetationExtent

iv) Number of native flora species in each Shire



Information gathered from Florabase <https://florabase.dpaw.wa.gov.au/>

v) Number of Threatened native flora species in each Shire



Shires	Total species	Total Threatened	% threatened	Threatened (DRF)	P1	P2	P3	P4
Carnamah	1489	173	12	24	10	38	75	26
Coorow	1881	230	12	38	17	53	89	33
Dalwallinu	1148	88	8	15	20	14	35	4
Dandaragan	2293	248	11	33	22	58	97	38
Gingin	1531	118	8	20	8	18	46	26
Moora	1202	102	8	23	10	15	45	9
Perenjori	1291	110	9	14	34	8	50	4
Victoria Plains	1283	107	8	22	13	10	38	24



Eucalyptus recta (Mt. Yule Silver Mallet)
Threatened (DRF) in Victoria Plains Shire



Hemianthra gardneri (Red Snakebush) Threatened (DRF)
in Coorow, Dandaragan, Dalwallinu & Moora Shires

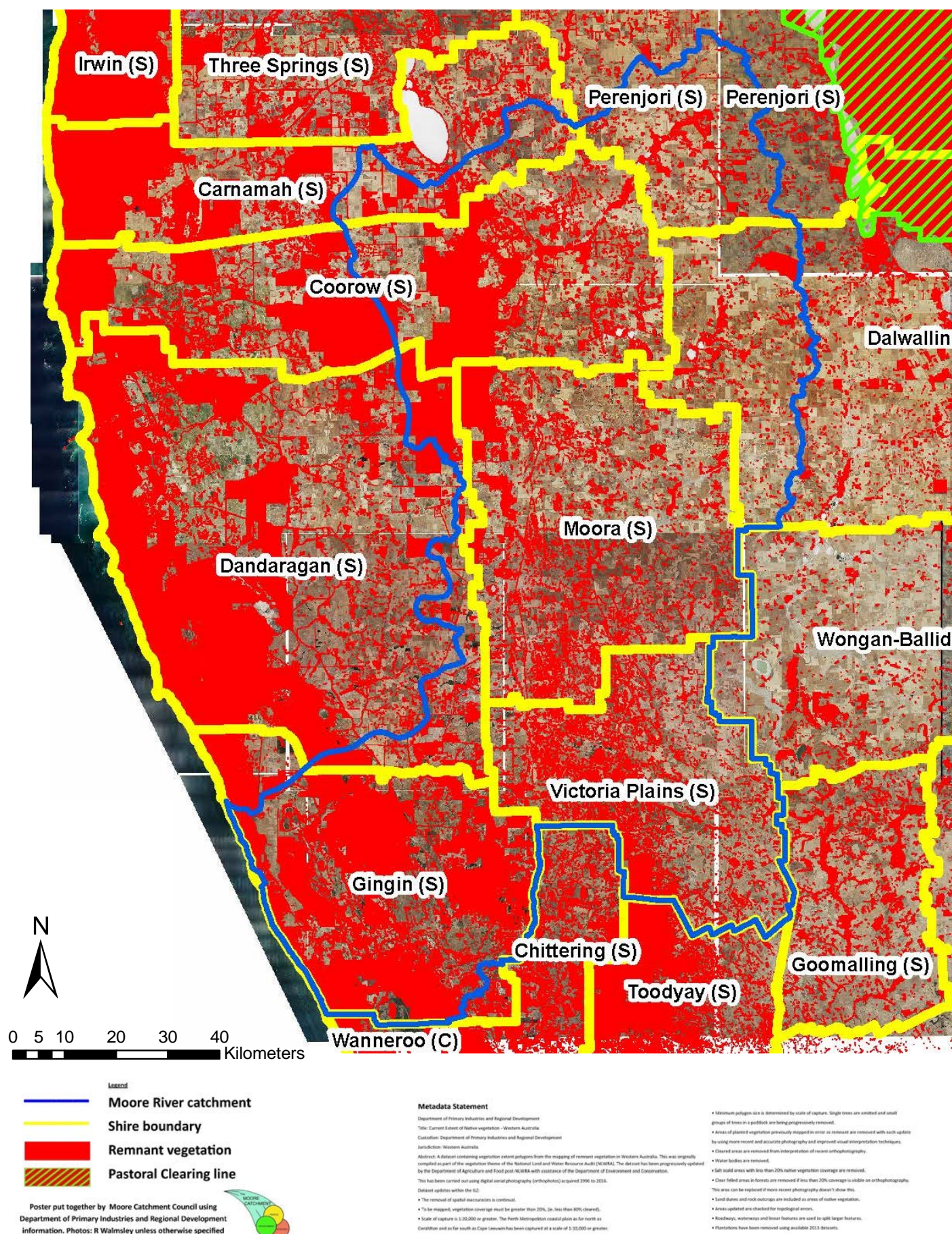
Photo: Florabase



Eremophila nivea (Silky Eremophila) Threatened (DRF)
in Carnamah & Perenjori Shires

Photo: Florabase

vi) Remaining remnant (native) vegetation in Moore River catchment Shires

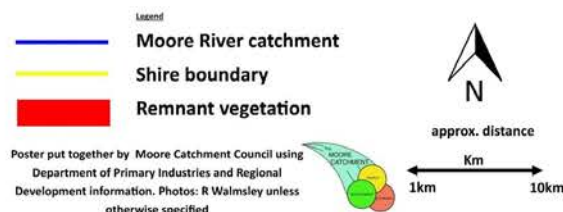
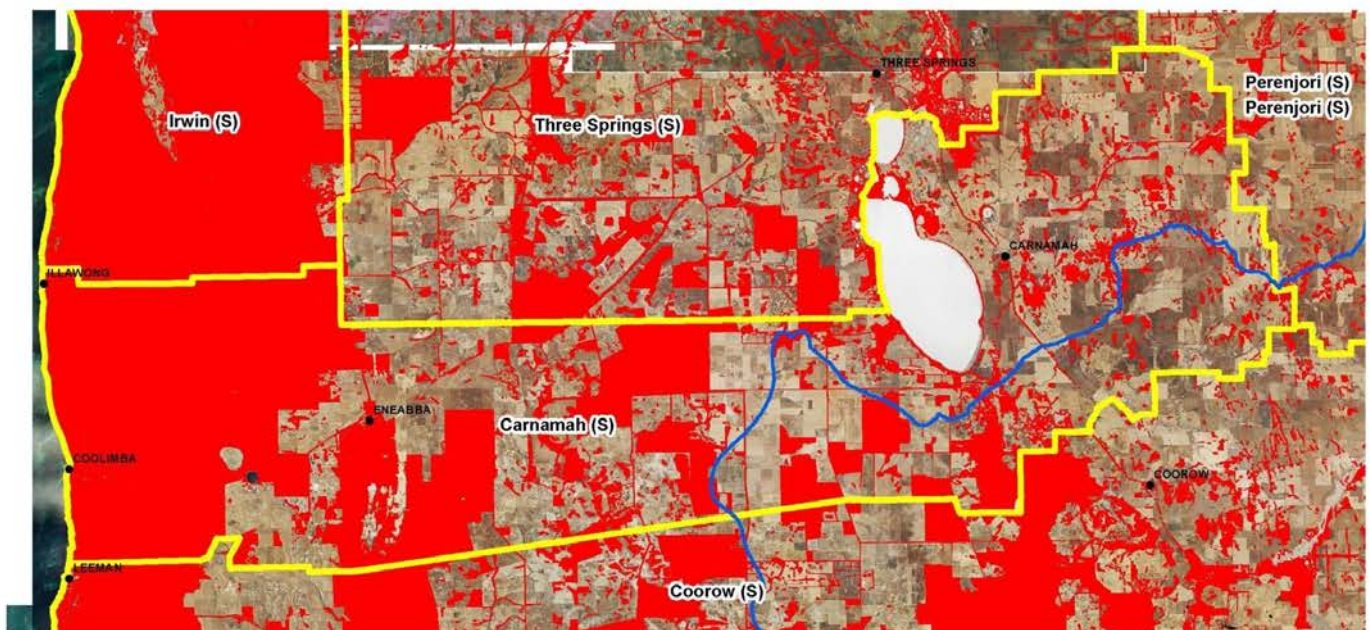


vii)

Carnamah shire

38.9%*
remaining remnant vegetation

*2002 figure DAFWA 'Native vegetation in WA: extent, type & status' report



Metadata Statement

Department of Primary Industries and Regional Development
Title: Current Extent of Native Vegetation - Western Australia
Custodian: Department of Primary Industries and Regional Development
Jurisdiction: Western Australia
Abstract: A dataset containing vegetation extent polygons from the mapping of remnant vegetation in Western Australia. This was originally compiled as part of the vegetation theme of the National Land and Water Resource Audit (NLWRA). The dataset has been progressively updated by the Department of Agriculture and Food (DAFWA) with assistance of the Department of Environment and Conservation. This has been carried out using digital aerial photography (orthophotos) acquired (2006 to 2016).
Dataset updates within the NLWRA:
• The removal of spatial resources is continued.
• To be mapped, vegetation coverage must be greater than 20% (or less than 80% density).
• Scale of capture is 1:25,000 or greater. The Perth Metropolitan coastal plain is far north as Geraldton and as far south as Cape Leveque has been captured at a scale of 1:10,000 or greater.

- Maximum polygon size is determined by state of capture. Single trees are omitted and small groups of trees in paddocks are being progressively removed.
- Areas of planted vegetation previously mapped in error as remnant are removed with each update by using more recent and accurate photography and improved visual interpretation techniques.
- Cleared areas are removed from interpretation of remnant orthophotography.
- Water bodies are removed.
- Soft soil areas with less than 10% native vegetation coverage are removed.
- Clear felled areas in forests are removed if less than 20% coverage is visible on orthophotography. This area can be replaced if more recent photography doesn't show this.
- Sand dunes and rock outcrops are included as areas of native vegetation.
- Areas updated are checked for topological errors.
- Boundaries, waterways and linear features are used to split larger features.
- Plantations have been removed using available 2013 datasets.

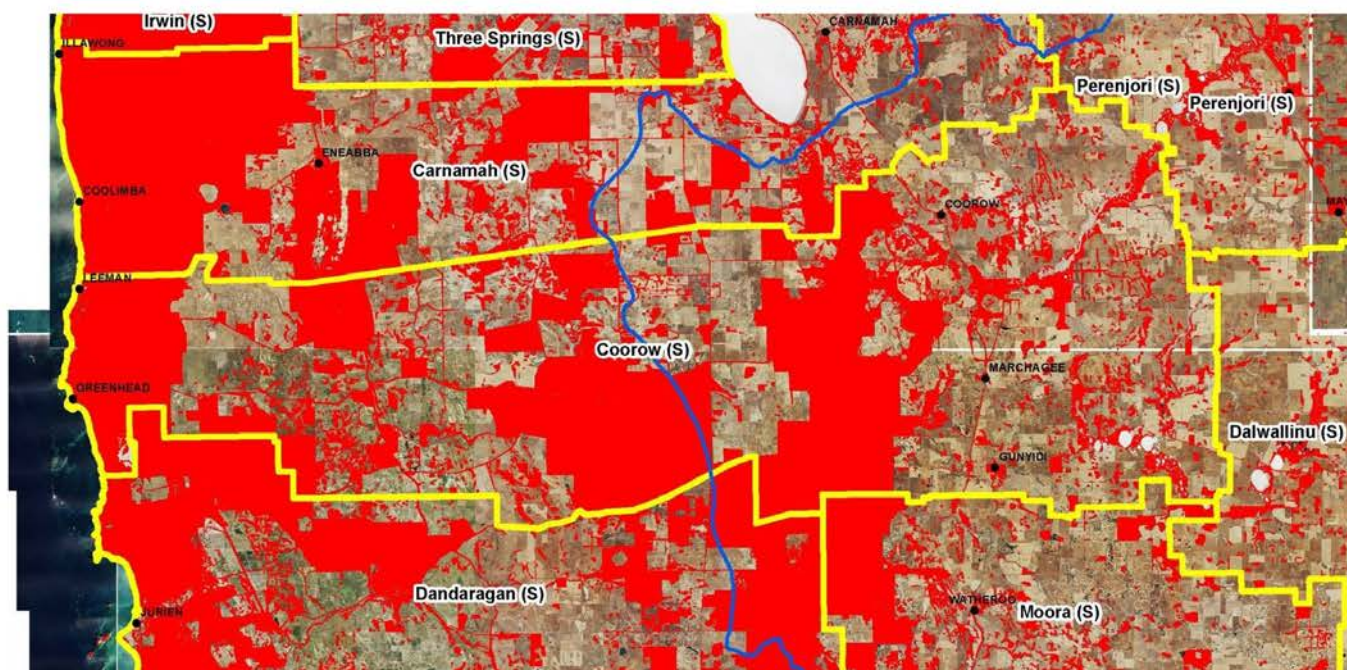
viii)

Coorow shire

38.8%*

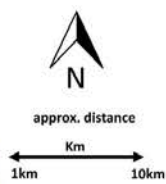
remaining remnant vegetation

*2002 figure DAFWA 'Native vegetation in WA: extent, type & status' report



Legend
 — Moore River catchment
 — Shire boundary
 ■ Remnant vegetation

Poster put together by Moore Catchment Council using
 Department of Primary Industries and Regional
 Development information. Photos: R Walmsley unless
 otherwise specified



Metadata Statement

Department of Primary Industries and Regional Development
 Title: Current Extent of Native Vegetation - Western Australia
 Custodian: Department of Primary Industries and Regional Development

Authorisation: Western Australia

Definition: A dataset containing vegetation extent polygons from the mapping of current vegetation in Western Australia. This was originally compiled as part of the vegetation theme of the National Land and Water Resource Audit (NLWRA). The dataset has been progressively updated by the Department of Agriculture and Food and the Department of Environment and Conservation.

This has been carried out using digital aerial photography (orthophotos) acquired 2009 to 2010.

Version updates within the dataset:

- The removal of spatial inaccuracies is continued.
- To be included, vegetation coverage must be greater than 20% (in this case, 40% cleared).
- Scale of capture is 1:25,000 or greater. The North Metropolitan coastal plain is far north as Guelph and as far south as Cape Levein has been captured at a scale of 1:25,000 or greater.

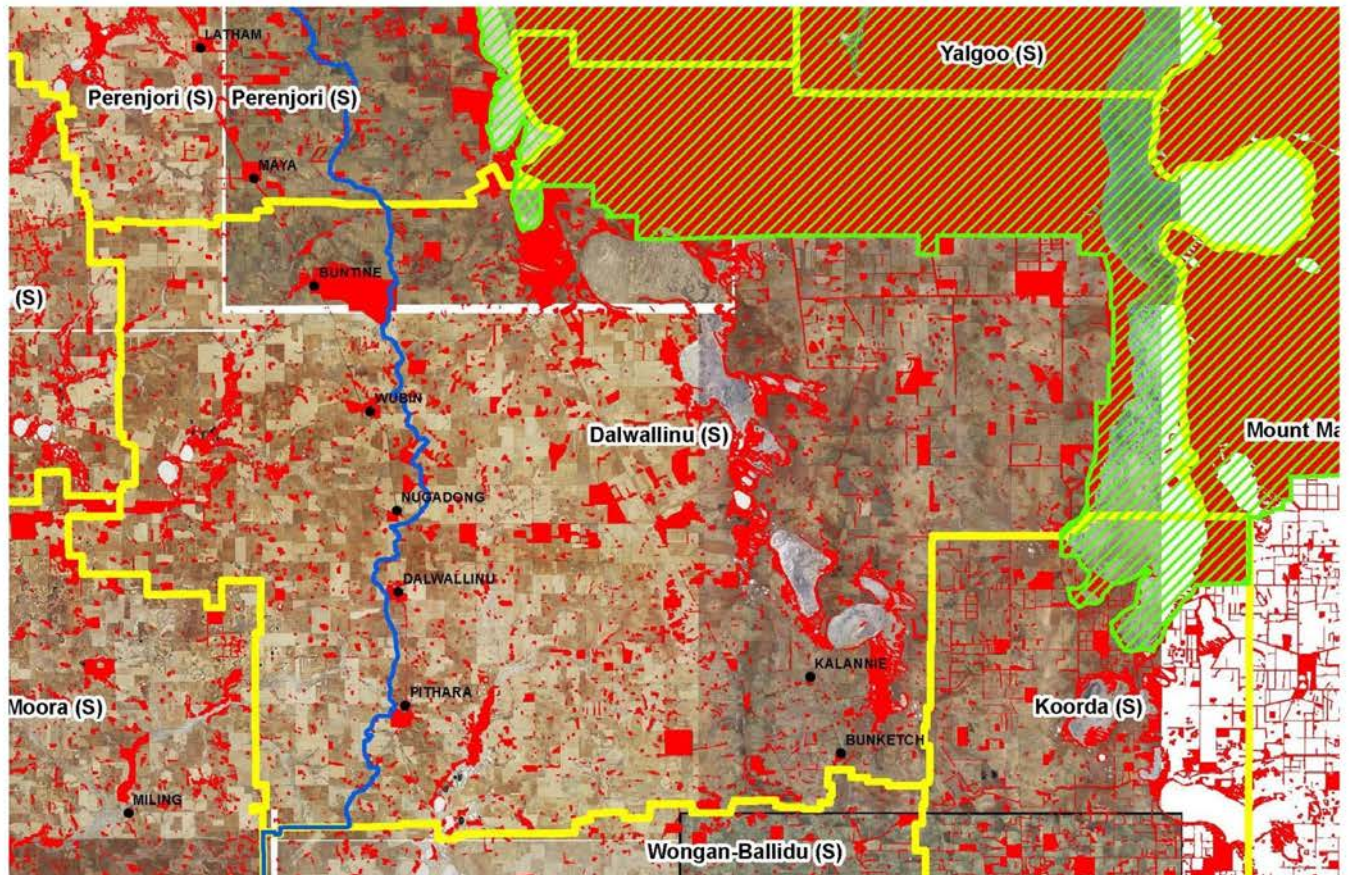
- Minimum polygon size is determined by scale of capture. Single trees are limited and small groups of trees in a paddock are being progressively removed.
- Areas of planted vegetation previously mapped to cover as remnant are removed with each update by using more recent and accurate photography and improved visual interpretation techniques.
- Cleared areas are removed from interpretation of recent orthophotography.
- Water bodies are removed.
- Laid out areas with less than 20% native vegetation coverage are removed.
- Small field areas in forests are removed if less than 20% coverage is visible on orthophotography. This area can be replaced if more recent photography doesn't show this.
- Sand dunes and rock outcrops are included as areas of native vegetation.
- Areas updated are checked for topological errors.
- Boundary, waterways, and some features are used to split larger features.
- Photographs have been corrected using available 2013 imagery.

ix)

Dalwallinu shire

12%* (inside clearing line)
remaining remnant vegetation

*2002 figure DAFWA 'Native vegetation in WA: extent, type & status' report



Metadata Statement

Department of Primary Industries and Regional Development
Title: Current Extent of Native Vegetation - Western Australia
Custodian: Department of Primary Industries and Regional Development
Jurisdiction: Western Australia
Abstract: & Abstract: A map showing the current extent of native vegetation in Western Australia. This map was originally compiled as part of the vegetation theme of the National Land and Water Resource Audit (NLWRA). The data has been progressively updated by the Department of Agriculture and Food (DAFWA) with assistance of the Department of Environment and Conservation. This has been carried out using digital aerial photography (orthophotos) acquired 2006 to 2010. Updates are made on an annual basis.
• The removal of spatial inaccuracies is continued.
• To be included, vegetation coverage must be greater than 10% (for this theme, 10% cleared).
• Scale of capture is 1:25,000 or greater. The North Magnetic meridian is shown as far south as Geraldton and as far north as Cape Leveque has been captured at a scale of 1:25,000 or greater.

- Minimum polygon size is determined by scale of capture. Single trees are omitted and small groups of trees in paddocks are being progressively removed.
- Areas of planted vegetation previously mapped as remnant are removed with each update by using more recent and accurate photography and improved visual interpretation techniques.
- Cleared areas are removed from interpretation of recent orthophotography.
- Water bodies are removed.
- All small areas with less than 10% native vegetation coverage are removed.
- Small isolated areas in forests are removed if more than 50% coverage is visible on orthophotography. This area can be included if more recent photography doesn't show this.
- Sand dunes and rock outcrops are included as areas of native vegetation.
- Areas updated are checked for topographical errors.
- Boundaries, waterways, and other features are used to split larger features.
- Photographs have been corrected using available 2013 datasets.

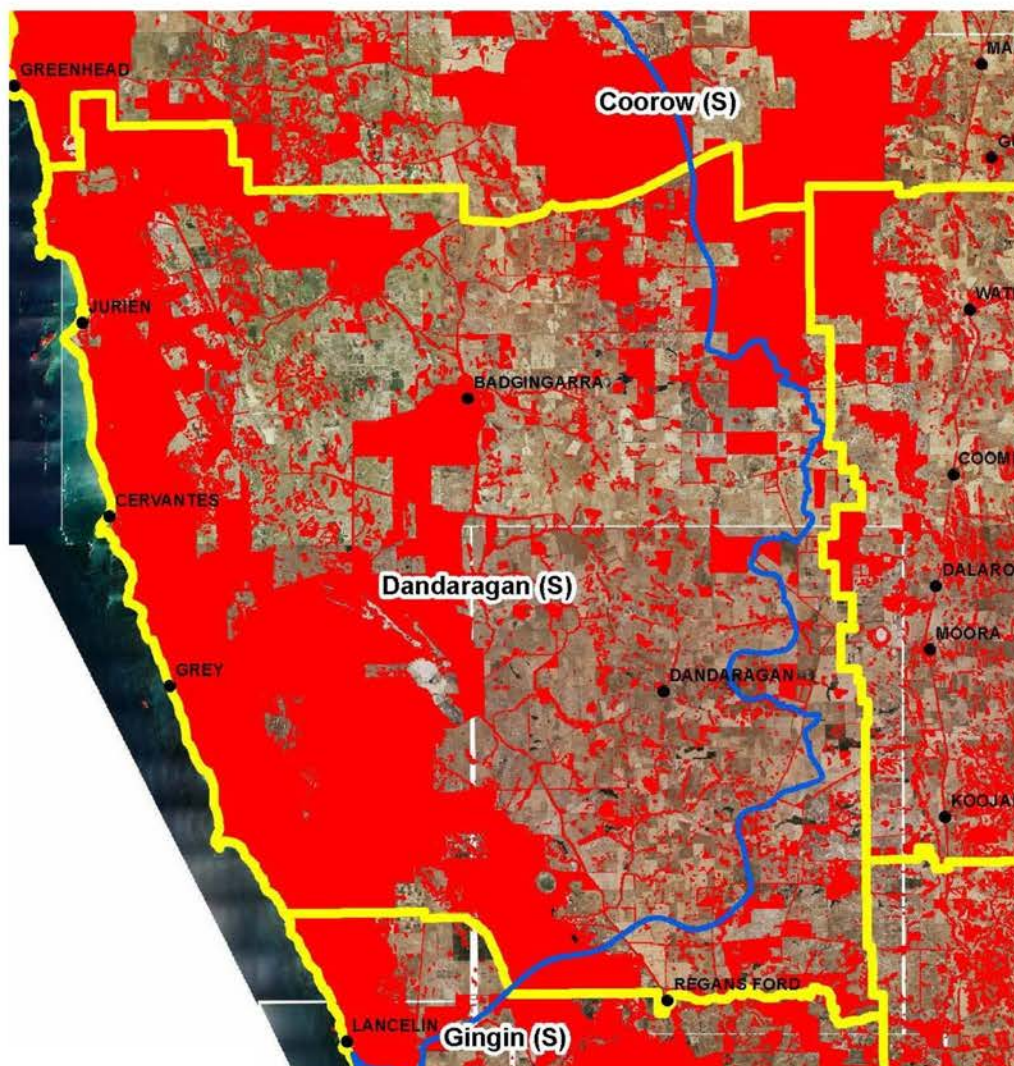
x)

Dandaragan shire

48.8%*

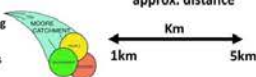
remaining remnant vegetation

*2002 figure DAFWA 'Native vegetation in WA: extent, type & status' report



Legend
 — Moore River catchment
 — Shire boundary
 ■ Remnant vegetation

Poster put together by Moore Catchment Council using Department of Primary Industries and Regional Development information. Photos: R Walmsley unless otherwise specified



Metadata Statement

Department of Primary Industries and Regional Development
 Title: Current Extent of Native Vegetation - Western Australia
 Custodian: Department of Primary Industries and Regional Development
 Jurisdiction: Western Australia
 Abstract: A dataset containing digitised extent polygons from the mapping of remnant vegetation in Western Australia. This was originally compiled as part of the vegetation theme of the National Land and Water Resource Audit (NLWRA). The dataset has been progressively updated by the Department of Agriculture and Food (DAFWA) with assistance of the Department of Environment and Conservation. This has been carried out using digital aerial photography (orthophotos) acquired 2004 to 2010.
 Dataset captures within the S.A.
 • The dataset of spatial measurements is continuous.
 • To be included, vegetation coverage must be greater than 20% (in this case 80% cleared).
 • Scale of capture is 1:20,000 or greater. The North Melbourne coastal plain is far north of Geraldton and as far south as Cape Lancelin has been captured at a scale of 1:20,000 or greater.

- Minimum polygon size is determined by scale of capture. Single trees are limited and small groups of trees in a paddock are being progressively removed.
- Areas of planted vegetation previously mapped to cover as remnant are removed with each update by using more recent and accurate photography and improved visual interpretation techniques.
- Cleared areas are removed from interpretation of recent orthophotography.
- Water bodies are removed.
- Built up areas with less than 20% native vegetation coverage are removed.
- Clear felled areas in forests are removed if more than 20% coverage is visible on orthophotography. This can be replaced if more recent photography doesn't show this.
- Sand dunes and rock outcrops are included as areas of native vegetation.
- Areas updated are checked for topological errors.
- Boundary, waterway, and forest features are used to split large features.
- Plantations have been removed using available 2013 imagery.

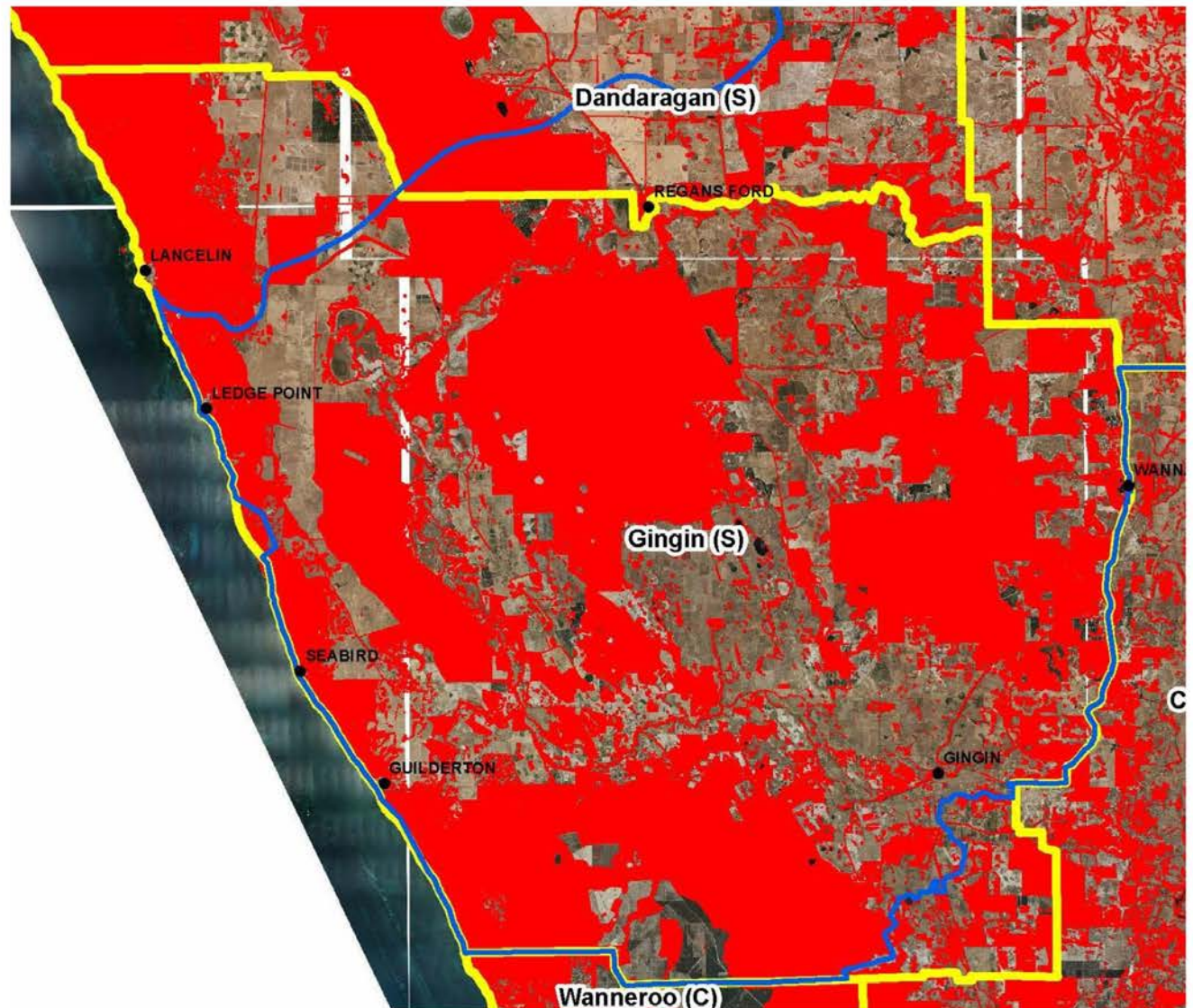
xi)

Gingin shire

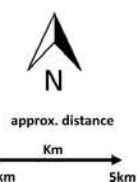
56.3%*

remaining remnant vegetation

*2002 figure DAFWA 'Native vegetation in WA: extent, type & status' report



Poster put together by Moore Catchment Council using Department of Primary Industries and Regional Development information. Photos: R Walmsley unless otherwise specified



Metadata Statement

Department of Primary Industries and Regional Development

Title: Current Extent of Native Vegetation - Western Australia

Geographic Information System and Regional Development

Geographic Information System

Abstract: A dataset containing vegetation extent polygons from the mapping of remnant vegetation in Western Australia. This was originally compiled as part of the vegetation theme of the National Land and Water Resources Audit (NLWRA). The dataset has been progressively updated by the Department of Agriculture and Food (DAFWA) with assistance of the Department of Environment and Conservation.

This has been carried out using digital aerial photography (orthophotos) acquired 2006 to 2008.

Dataset updates within the 6.0:

- The removal of spatial inaccuracies to continue.
- To be mapped, vegetation coverage must be greater than 10%, for less than 80% cleared.
- Scale of capture is 1:25,000 or greater. The Perth Metropolitan coastal plain to the north of Geraldton and as far south as Cape Levecke has been captured at a scale of 1:50,000 or greater.

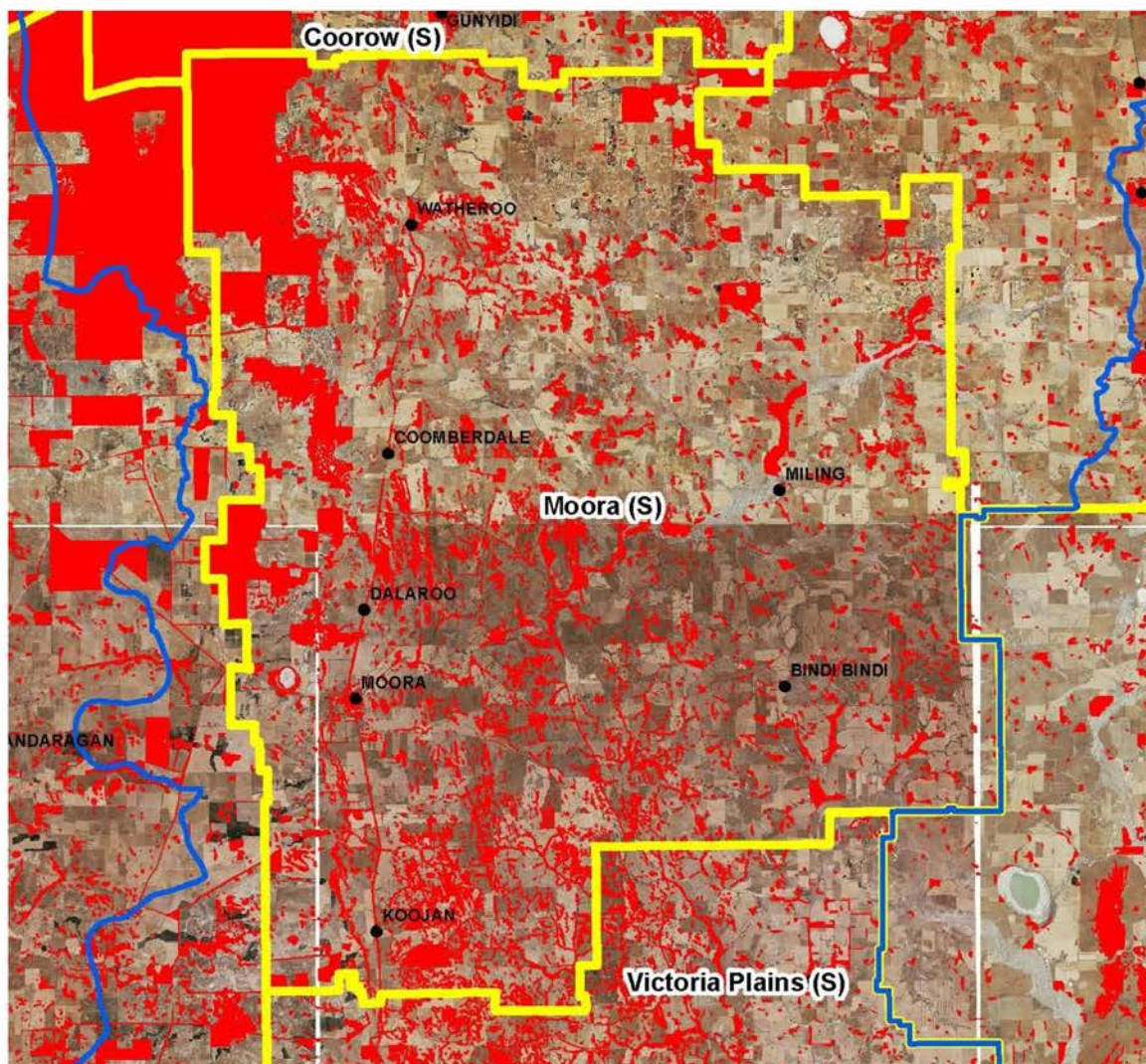
- Minimum polygon size is determined by scale of capture. Single trees are omitted and small groups of trees in a paddock are being progressively removed.
- Areas of planted vegetation previously mapped in error as remnant are removed with each update by using more recent and accurate photography and improved visual interpretation techniques.
- Cleared areas are removed from integration of recent orthophotography.
- Water bodies are removed.
- Full scale areas with less than 10% native vegetation coverage are removed.
- Clear filled areas in forests are removed if less than 10% coverage in study on orthophotography.
- This area can be replaced if more recent photography doesn't show this.
- Land drains and rock outcrops are included as areas of native vegetation.
- Areas updated are checked for topological errors.
- Rectangles, waterways and fence features are used to split large features.
- Projections have been remapped using available 1913 datasets.

xii)

Moora shire

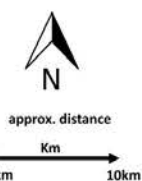
13.5%*
remaining remnant vegetation

*2002 figure DAFWA 'Native vegetation in WA: extent, type & status' report



- Legend
- Moore River catchment
 - Shire boundary
 - Remnant vegetation

Poster put together by Moore Catchment Council using Department of Primary Industries and Regional Development information. Photos: R Walsley unless otherwise specified



Metadata Statement

Department of Primary Industries and Regional Development
This Current Extent of Native Vegetation - Western Australia
Custodian: Department of Primary Industries and Regional Development
Jurisdiction: Western Australia
Abstract: A dataset containing vegetation native polygons from the mapping of remnant vegetation in Western Australia. This was originally compiled as part of the vegetation theme of the National Land and Water Resource Audit (NLWRA). The dataset has been progressively updated by the Department of Agriculture and Food (DAFWA) with assistance of the Department of Environment and Conservation. This has been carried out using digital aerial photography (orthophotos) acquired 1996 to 2016.
Dataset updates within the NLW:
• The removal of spatial inaccuracies is ongoing.
• To be included, vegetation coverage must be greater than 70% (or less than 80% in some cases).
• Scale of capture is 1:50,000 or greater. The first NLWRA dataset was for the south of Geraldton and as far south as Cape Leeuwin has been captured at a scale of 1:25,000 or greater.

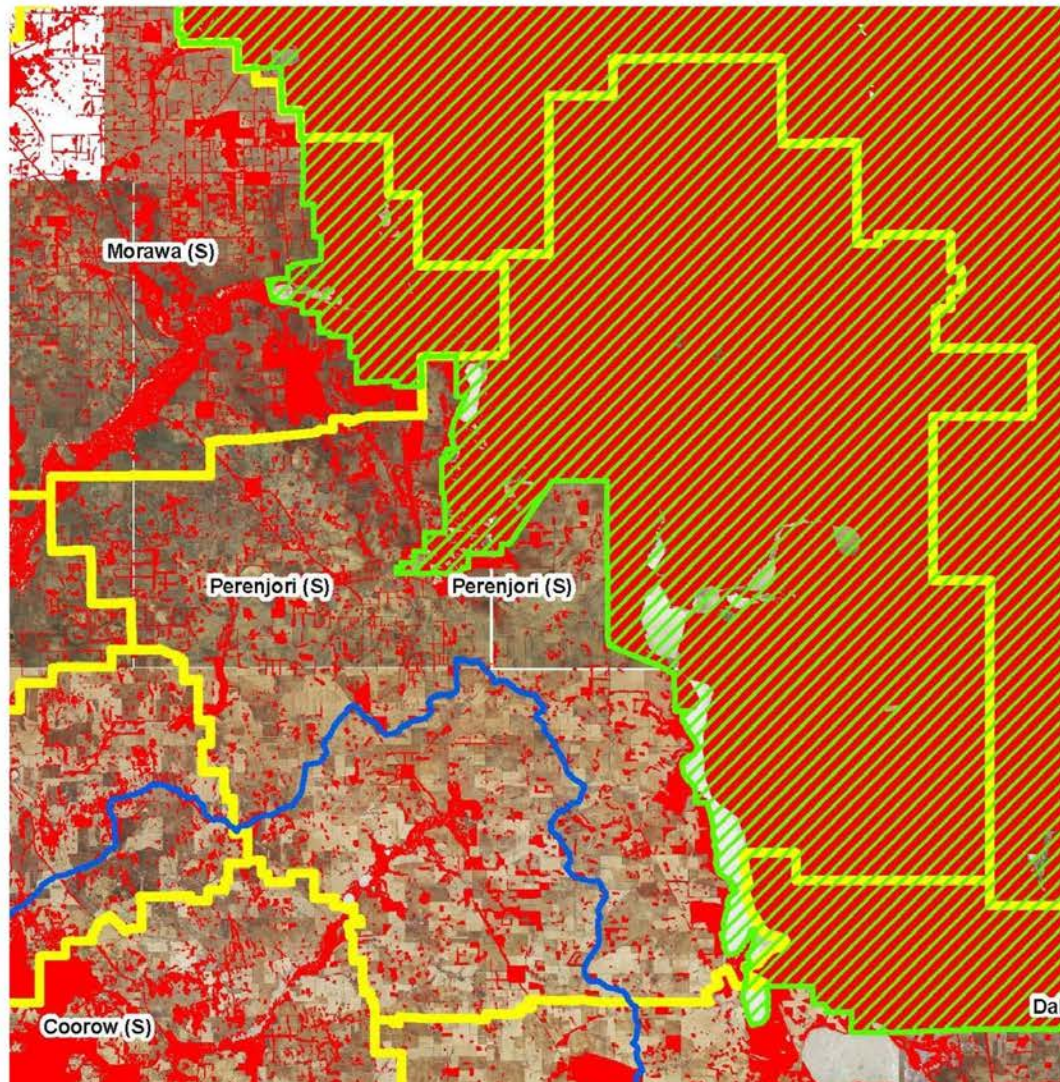
- Minimum polygon size is determined by scale of capture. Single trees are omitted and small groups of trees in a paddock are being progressively removed.
- Areas of planned vegetation previously mapped as remnant are removed with each update by using more recent and accurate photography and improved visual interpretation techniques.
- Cleared areas are removed from interpretation of recent orthophotography.
- Water bodies are removed.
- Salt-tolerant areas with less than 70% native vegetation coverage are removed.
- Clear-felled areas in forests are removed if less than 20% coverage is visible on orthophotography. This area can be replaced if more recent photography doesn't show this.
- Sand dunes and rock outcrops are included as areas of native vegetation.
- Areas updated are checked for mapping errors.
- Bushfires, windbreaks and fence footings are used to split large features.
- Photochemical haze is removed using available 2013 datasets.

xiii)

Perenjori shire

8.4%* (inside clearing line)
remaining remnant vegetation

*2002 figure DAFWA 'Native vegetation in WA: extent, type & status' report



Metadata Statement

Department of Primary Industries and Regional Development
Title: Current Extent of Native Vegetation - Western Australia
Contributors: Department of Primary Industries and Regional Development
Surrendered: Western Australia
Abstract: A dataset containing vegetation extent polygons from the mapping of remnant vegetation in Western Australia. This was originally compiled as part of the vegetation theme of the National Land and Water Assessment (NLWA). The dataset has been progressively updated by the Department of Agriculture and Food (DAFWA) with assistance of the Department of Environment and Conservation. The data has been compiled and using digital aerial photography (orthophotographs) acquired 1998 to 2008. (Dataset updates within the D.J.)
• The removal of spatial inaccuracies is confirmed.
• To be mapped, vegetation coverage must be greater than 10%, for this class 80% cleared.
• Scale of capture is 1:25,000 or greater. The North Magnetic line could also be as far north as Geraldton and as far south as Cape Leveque has been captured at a scale of 1:25,000 or greater.

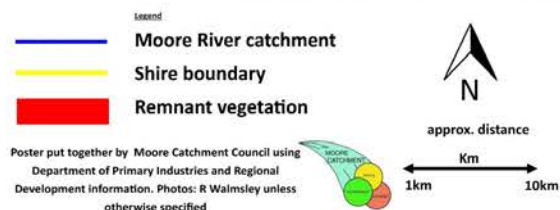
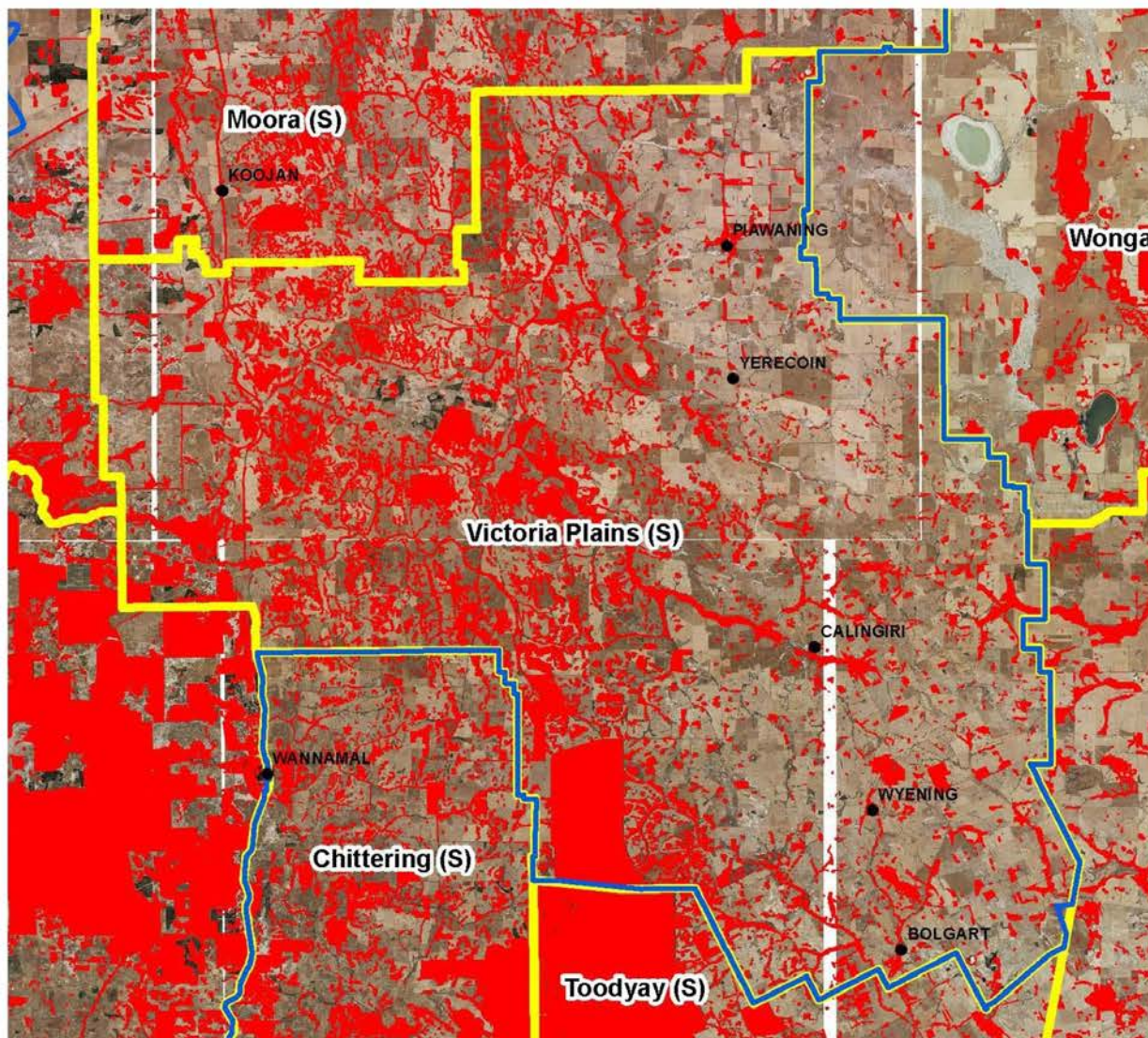
- Maximum polygon size is determined by scale of capture. Single trees are limited and small groups of trees in a paddock are being progressively removed.
- Areas of planned vegetation previously mapped as remnant are removed with each update by using more recent and accurate photography and improved visual interpretation techniques.
- Cleared areas are removed from interpretation of recent photography.
- Water bodies are removed.
- Low value areas with less than 10% native vegetation coverage are removed.
- Cleared areas in forests are removed from 10% coverage to within an orthophotograph. This area can be replaced if more recent photography doesn't show this.
- Sand dunes and rock outcrops are included as areas of native vegetation.
- Areas updated are checked for topological errors.
- Blackberry, wattle, and other invasive species are used to flag larger features.
- Photographs have been corrected using available 2013 imagery.

xiv)

Victoria Plains shire

13.6%*
remaining remnant vegetation

*2002 figure DAFWA 'Native vegetation in WA: extent, type & status' report



Metadata Statement

Department of Primary Industries and Regional Development

Title: Current Extent of Native Vegetation - Western Australia

Custodian: Department of Primary Industries and Regional Development

jurisdiction: Western Australia

Abstract: A dataset containing vegetation extent polygons from the mapping of remnant vegetation in Western Australia. This was originally completed as part of the vegetation theme of the National Land and Water Resource Audit (NLWRA). The dataset has been progressively updated by the Department of Agriculture and Food (DAFWA) with assistance of the Department of Environment and Conservation.

This has been carried out using digital aerial photography (orthophotos) acquired 2016 to 2018.

Dataset updates within the NLWRA

• The removal of spatial inaccuracies is continued.

• To be included, vegetation coverage must be greater than 10% (or less than 80% cleared).

• Scale of capture is 1:10,000 or greater. The Perth Metropolitan coastal plain is less than 1:10,000 and as far south as Cape Leveque has been captured at a scale of 1:10,000 or greater.

• Wetland polygons are determined by scale of capture. Single trees are omitted and small groups of trees in paddocks are being progressively removed.

• Areas of planted vegetation previously reported to cover no comment are removed with each update.

By using more recent and accurate photography and improved visual interpretation techniques,

• Cleared areas are removed from interpretation of recent orthophotography.

• Water bodies are removed.

• Low rainfall areas with less than 10% native vegetation coverage are removed.

• Other small areas in forests are removed if less than 10% coverage is visible on orthophotography.

This area can be replaced if more recent photography shows it above this.

• Land uses and rock outcrops are included as areas of native vegetation.

• Areas updated are checked for topographical errors.

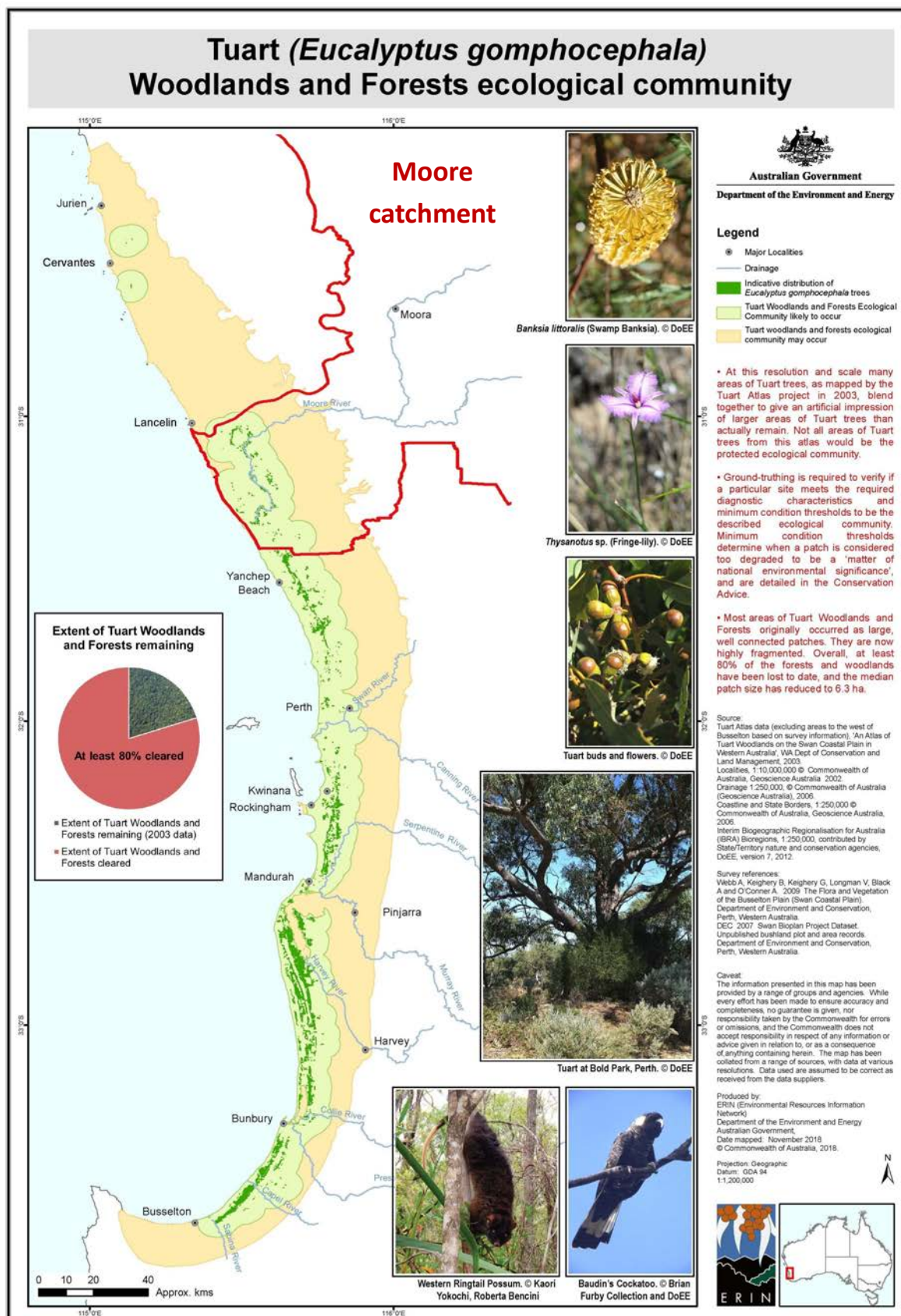
• Roadways, waterways and fence features are used to split larger features.

• Roadlines have been retained using available 2013 datasets.

Threatened ecological communities listed under Environment Protection and Biodiversity Conservation Act 1999

XV) A) TUART WOODLAND

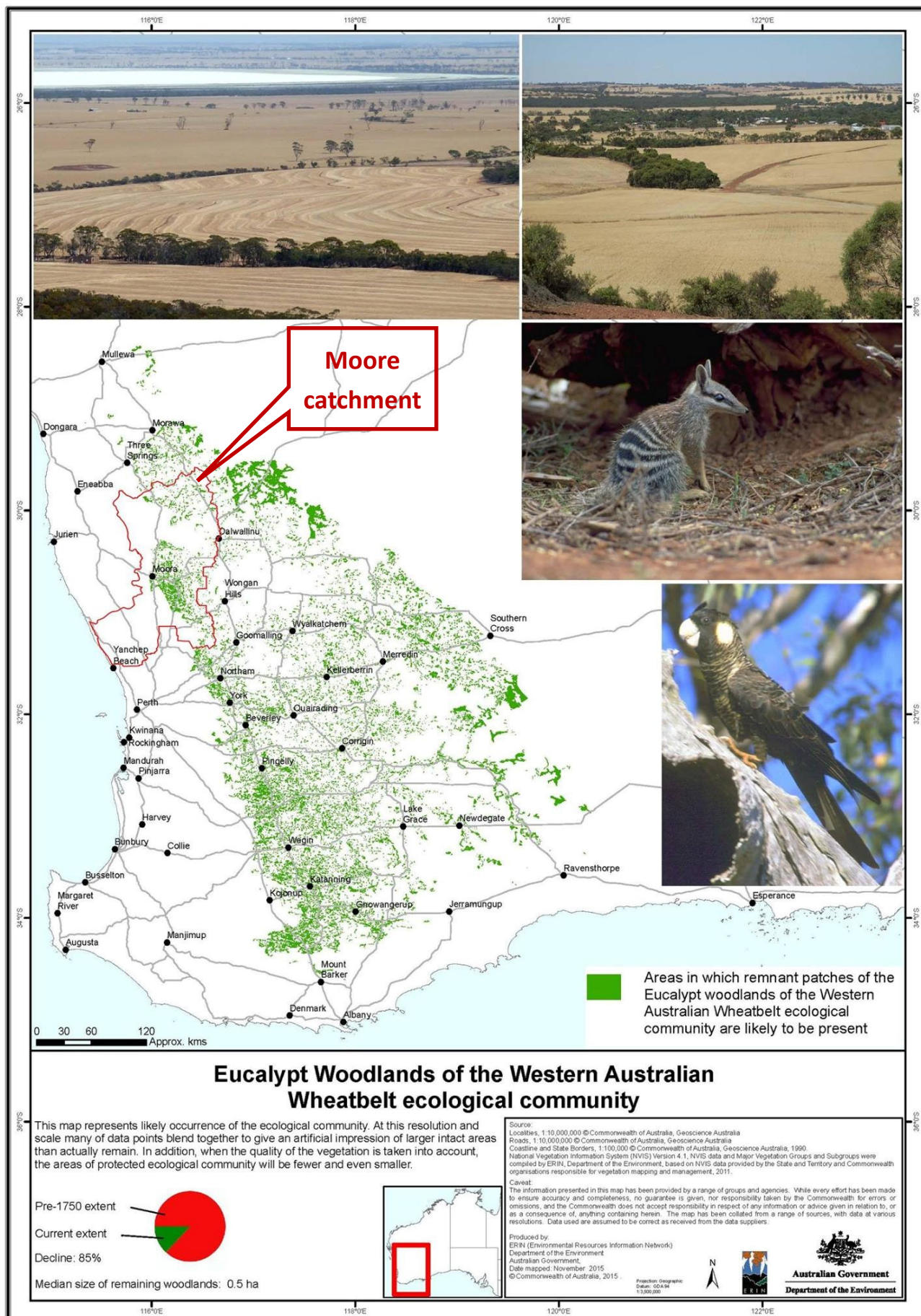
<https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=153&status=Critically+Endangered>



xvi)

B) EUCALYPT WOODLAND

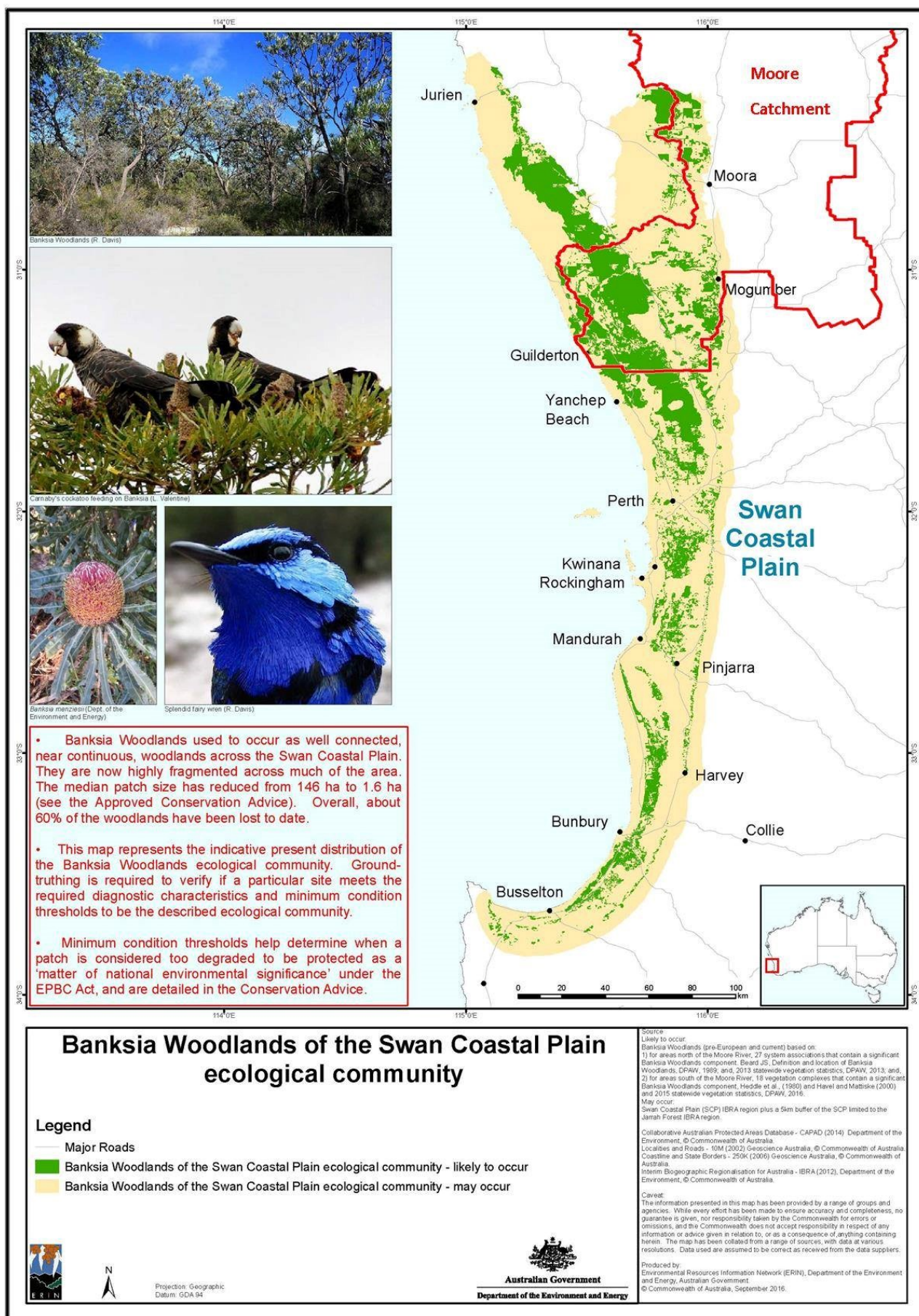
<http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=128&status=Critically+Endangered>



xvii)

C) BANKSIA WOODLAND

<https://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=131&status=Endangered>



xviii) Threatened birds in the Moore River catchment

A) CARNABY'S BLACK COCKATOO & MALLEEFOWL



Moore on...

Moore on...

..Carnaby's Black Cockatoo



Important Bird Areas for Carnaby's in the Moore Catchment



CONSERVATION STATUS

Australian Government: ENDANGERED
 Environment Protection and Biodiversity Conservation Act 1999

Western Australia: RARE OR LIKELY TO BECOME EXTINCT
 Biodiversity Conservation Act 2016

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) are a bird species endemic to WA but are rapidly in decline due to habitat destruction. Estimates put total population to be below 60,000.

Key recovery strategies are:

- ✓ Protect and conserve known nesting and feeding habitat by fencing or excluding stock;
- ✓ Protect habitat by controlling weeds and preventing removal of vegetation and spread of diseases;
- ✓ Revegetate around known feeding and nesting habitat with appropriate local species;
- ✓ Help monitor populations of Carnaby's ie annual Birdlife Australia Great Cocky Count in April;
- ✓ Help control competitive species such as galahs and feral honeybees.

Important Bird Areas (IBAs). The Moore River catchment contains 7 of the 34 Birdlife Australia Important Bird Areas. All 7 are important areas for Carnabys - forage and breeding habitat.




A past familiar sight all too rare nowadays.
How many black cockies can you see??

These artificial nesting logs are an effective and proven tool to help with cockie breeding.



..Malleefowl

CONSERVATION STATUS

Australian Government: VULNERABLE
 Environment Protection and Biodiversity Conservation Act 1999

Western Australia: RARE OR LIKELY TO BECOME EXTINCT
 Biodiversity Conservation Act 2016

Malleefowl (*Leipoa ocellata*) are a ground dwelling bird species unique to the arid and semi-arid regions of Australia. Once common, their numbers have seriously declined over the last 100 years.

Key recovery strategies are:

- ✓ Protect and conserve known Malleefowl habitat, reduce fragmented habitat by creating native vegetation corridors;
- ✓ Control feral pests especially foxes and cats;
- ✓ Monitoring of populations and mounds;
- ✓ Increase public awareness through media and signage.

Malleefowl Distribution






Malleefowl habitat restoration in Shire of Perenjori

protecting the natural resources in the Moore River Catchment

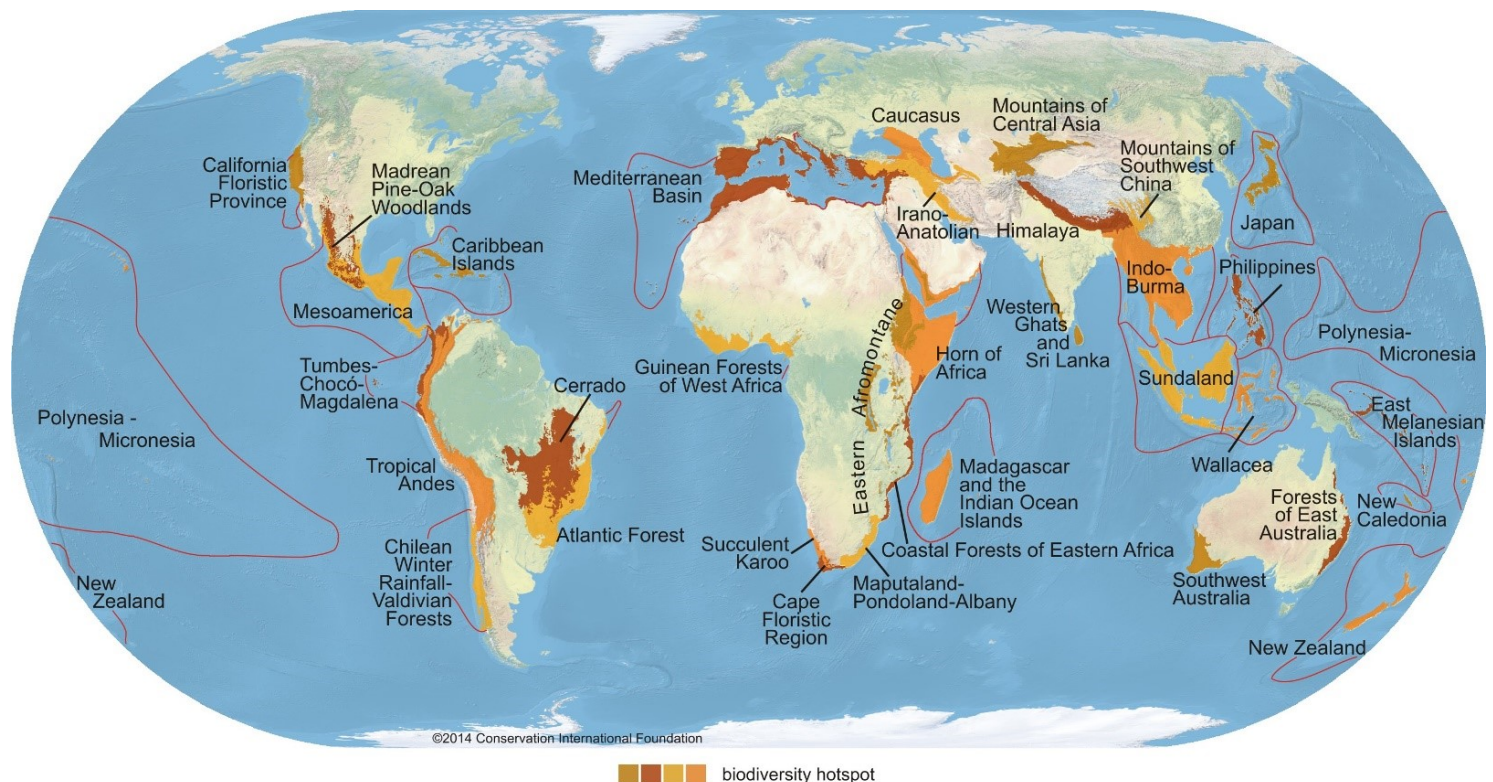
- ⇒ Carnaby's info & Recovery plan: <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/black-cockatoos>
- ⇒ Malleefowl info & Recovery plan: <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities/threatened-animals/malleefowl>
- ⇒ Victoria Plain Shire Carnaby information brochure <http://www.moorecatchment.org.au/wp-content/uploads/2017/10/Carnabys-Victoria-Plains-info-flyer.pdf>
- ⇒ Gingin Shire Carnaby information brochure <http://www.moorecatchment.org.au/wp-content/uploads/2019/03/Carnabys-Gingin-shire-info-flyer.pdf>

38

xix) Global Biodiversity Hotspots

Southwest Western Australia is recognised as 1 of 36 **global biodiversity hotspots** (1 of 2 in Australia). **The Moore River catchment is part of this biodiversity hotspot.**

A biodiversity hotspot is a region with a high amount of biodiversity that experiences habitat loss by human activity. In order to qualify as a biodiversity hotspot, according to [Conservation International](#), “a region must contain at least **1500 species of vascular plants** (>0.5% of the world’s total) as **endemics**, and it has to have lost at least **70% of its original habitat**.”



Southwest Western Australia

The **unique biogeographic region of Southwest Australia**, stretching from Shark Bay in the north to Israelite Bay in the south, covers over 300 000 square kilometers and is recognised as an international biodiversity hotspot. Separated from the rest of the continent by desert, the plants and animals in the hotspot have evolved in isolation for millions of years. As a result, the area is teeming with life - it is home to **over 1500 plant species**, most of which are endemic. These include the majestic marri and karri eucalypt trees that can grow to over 30 and 70 metres respectively. The hotspot is home to the **endangered western swamp turtle** - possibly the most threatened fresh water turtle species in the world. There are also **several endemic mammals** in the hotspot, including the numbat, which is a rabbit-sized marsupial anteater now endemic to the hotspot having disappeared from the rest of its range in Australia, and the Dibbler which had been thought extinct for 83 years. Land clearing, salinity, feral animals, weeds and the root-rot fungus *Phytophthora cinnamomi* threaten the biodiversity values of the hotspot.

- ⇒ Australian Government National & Global biodiversity hotspots <https://www.environment.gov.au/biodiversity/conservation/hotspots/national-biodiversity-hotspots>
- ⇒ Critical Ecosystem Partnership fund <https://www.cepf.net/our-work/biodiversity-hotspots/southwest-australia>
- ⇒ Western Australian Biodiversity Science Institute <https://wabsi.org.au/our-work/was-unique-biodiversity/>
- ⇒ WWF https://www.panda.org/knowledge_hub/where_we_work/southwest_australia/

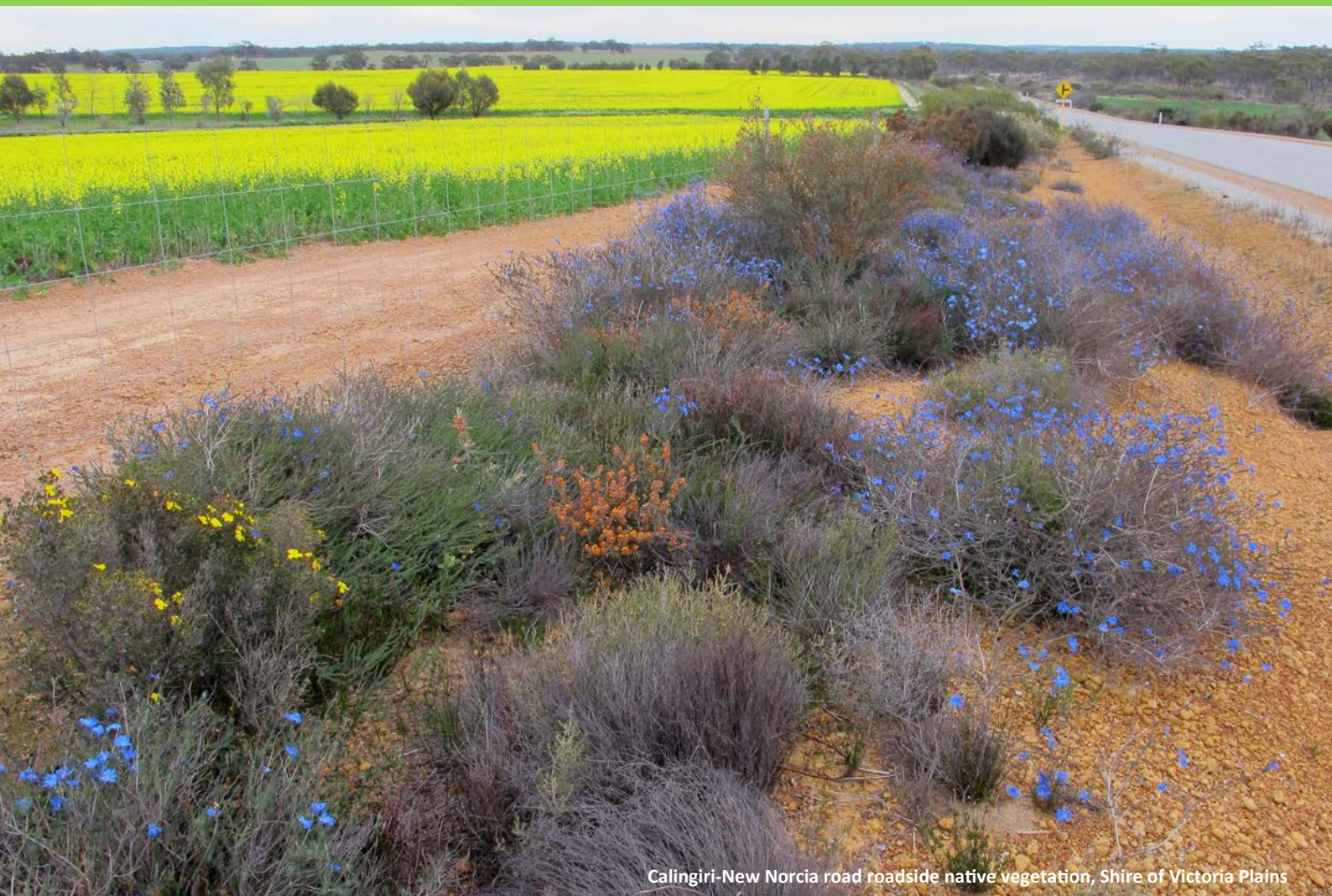
Natural Resource Management information guide for the Moore River catchment Shires
is a 'living' document.

Web links, laws, advice and guidelines will alter over time.

Moore Catchment Council will do its best to keep up and update this guide
as and when needed.

***Is there anything you wish to see in the next updated guide?
Do you have any comments about content?***

If so, please send comments or suggestions to moorecc@bigpond.com

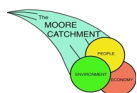


Calingiri-New Norcia road roadside native vegetation, Shire of Victoria Plains

This guide was created in 2019 to help Shires within the Moore River catchment make more informed decisions regarding natural resource management

For more information, please contact Moore Catchment Council on 9653 1355 or moorecc@bigpond.com

www.moorecatchment.org.au



Researched and designed by Moore Catchment Council. To be used as guidance only. All photos by R Walmsley unless otherwise indicated.

Funded by the Western Australian Government's State Natural Resource Management Program



natural resource
management program

