New Acacia Species of the Greenstone Ranges of the North-Eastern Goldfields.

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Western Botanical

Acacia's endemic to Greenstones of the north-eastern Goldfields

Introduction – *Acacia* in the Landscape

- *Acacia* is one of the dominant genera in Western Australia with 909 current published species including 71 current informal (phrase named) species.
- Found in all regions, on the majority of landforms and soil types (excluding saline lake beds) and are one of the most important structural components of our vegetation with immense habitat value.
- Within the Murchison biogeographic region there are 145 current species of *Acacia* including 11 phrase names (excluding those proposed here).

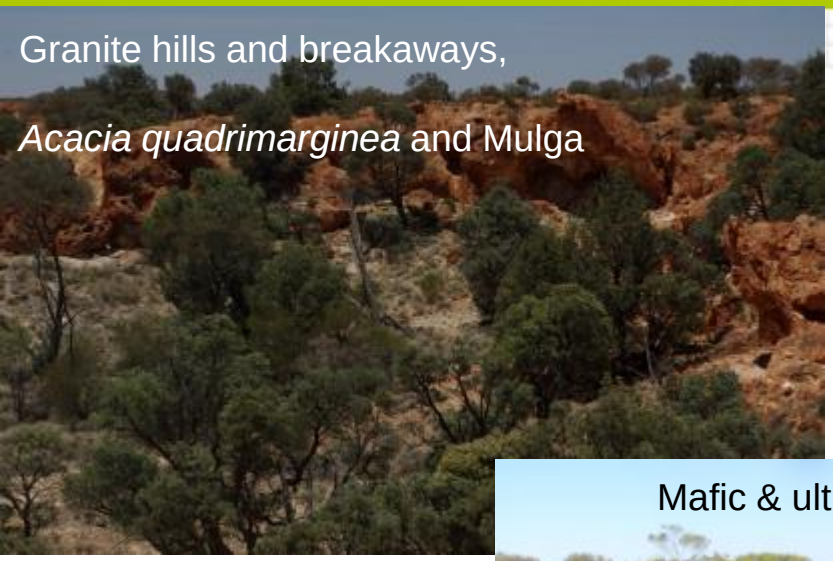
Landscapes of the Murchison biogeographic region 1

Sandplains – generally *Acacia* species other than Mulga

Colluvial and Alluvial plains with Mulga

Salt Lake margins with Mulga on sandy hardpan plains and *Acacia burkittii* on calcrete

Landscapes of the Murchison biogeographic region 2



Why are we looking at *Acacia* species on Greenstones?

- **EIA Studies for exploration and mining between Leonora and Wiluna over the past 20 years.**
- **Confusing combinations of characters in species found on schistose greenstones….**
- **Led to a more detailed investigation within and adjacent to Study Areas which showed likely new species….**
- **Led to a limited regional survey, confirming new species and expanding the known distributions of the new taxa….**
- **Led to the question as to why these species are restricted to greenstone geologies (basalts, gabbros and schists).**

Greenstones – geology and economic value

Basic, igneous, mafic and ultramafic plutonic rocks, ~2 billion years old.

Dark, fine grained = basalt >> coarse grained = gabbro;

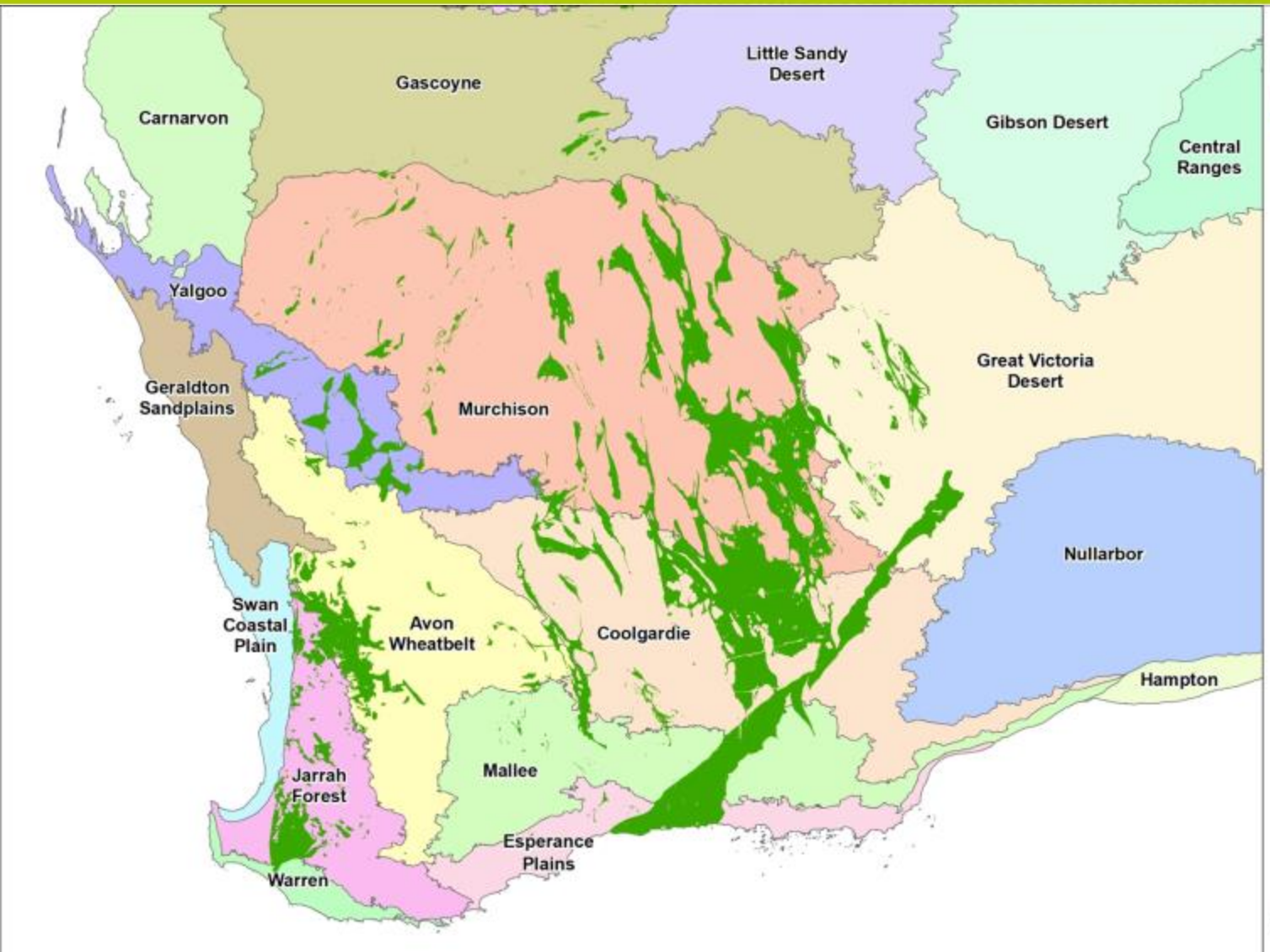
often altered, metamorphosed or sheared (schist).

Most abundant rock on the earth's surface, particularly on ocean floors, on the Moon and Mars.

Used as a building stone, paving stones in Europe, a common aggregate used in concrete.

Can include economic Nickel, Gold, Silver, Copper, Cobalt ….

Greenstones in WA – The Yilgarn Craton



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Legend

500k Geology - Greenstone

Greenstone geology both above and below surface, often with substantial depths of cover.

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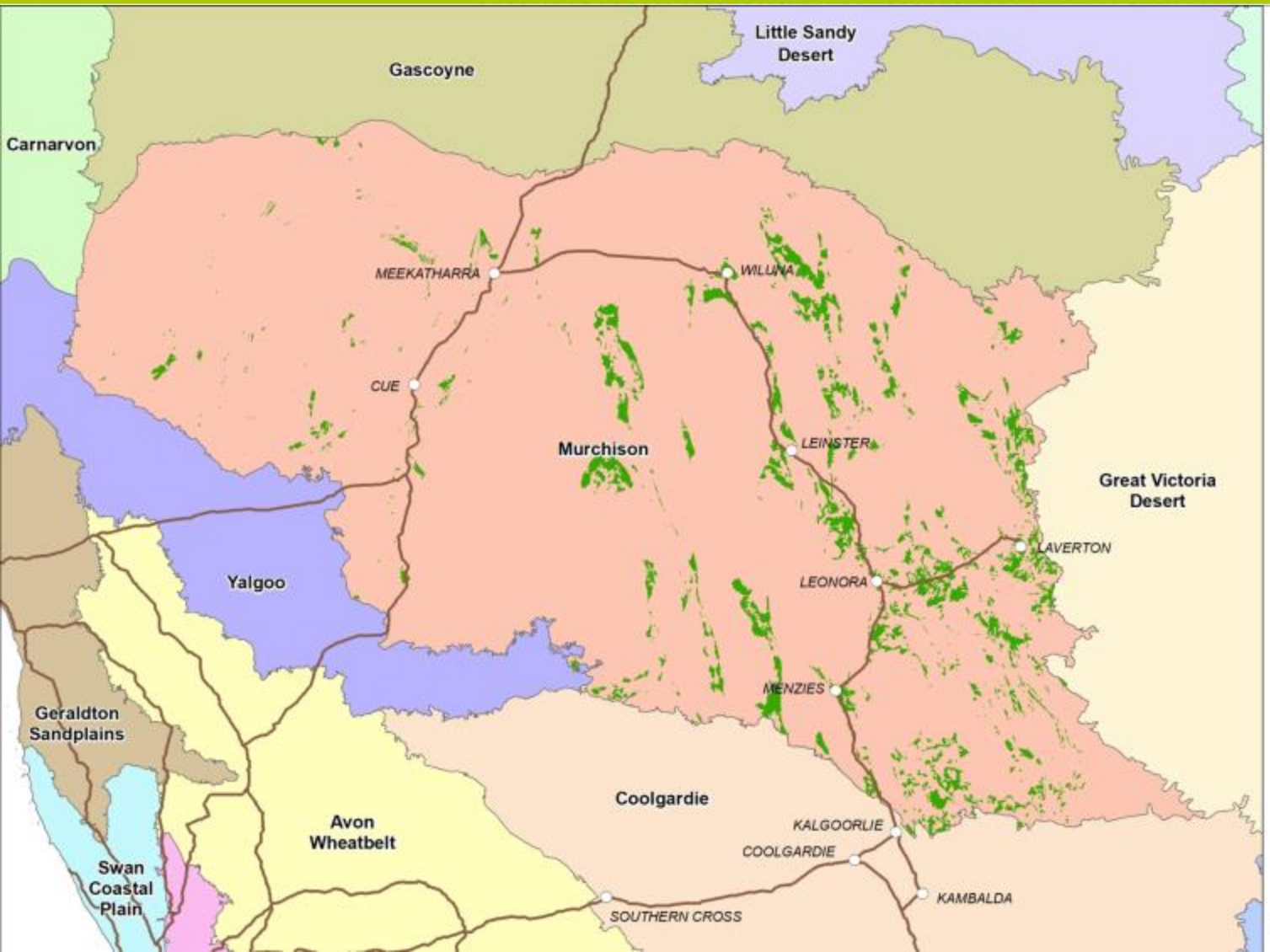
Land Systems, Murchison BGR

15 of the 128 AGWA Land Systems within the Murchison represent Rocky Uplands with Greenstone geology

Murchison, Land Systems and Greenstone Geology – Stony Uplands



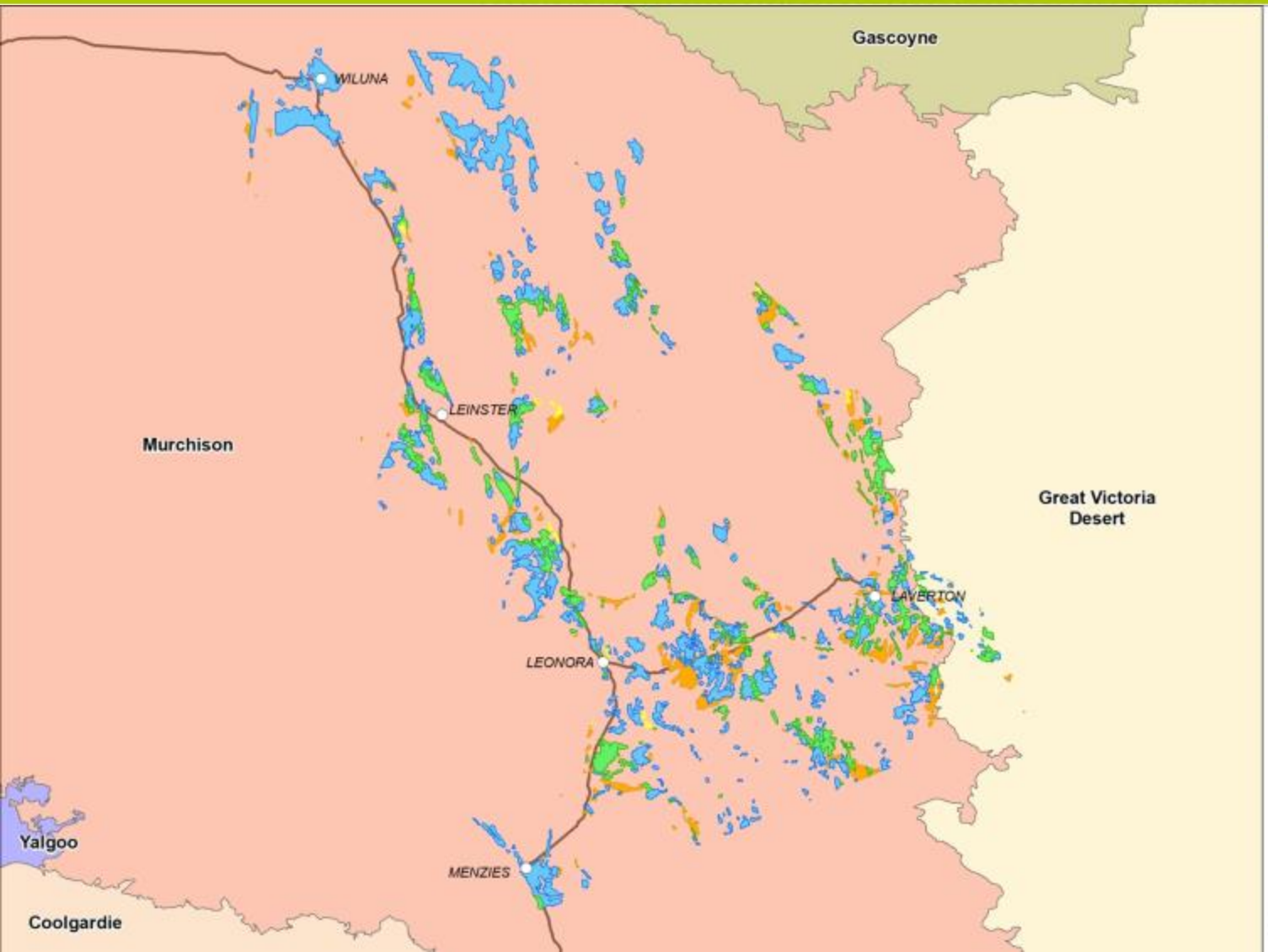
Legend

500k Geology - Greenstone above surface

Murchison Biogeographic Region.

Merging the Greenstone Geology with Land Systems mapped by Department of Agriculture (WA) defines areas where Greenstones are emergent, forming low to moderate rocky outcrops to ranges.

Rocky Landforms, four Geologies, Eastern Murchison



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Legend

- Granite
- Greenstone / Basalt
- Ironstone / BIF
- Volcanics

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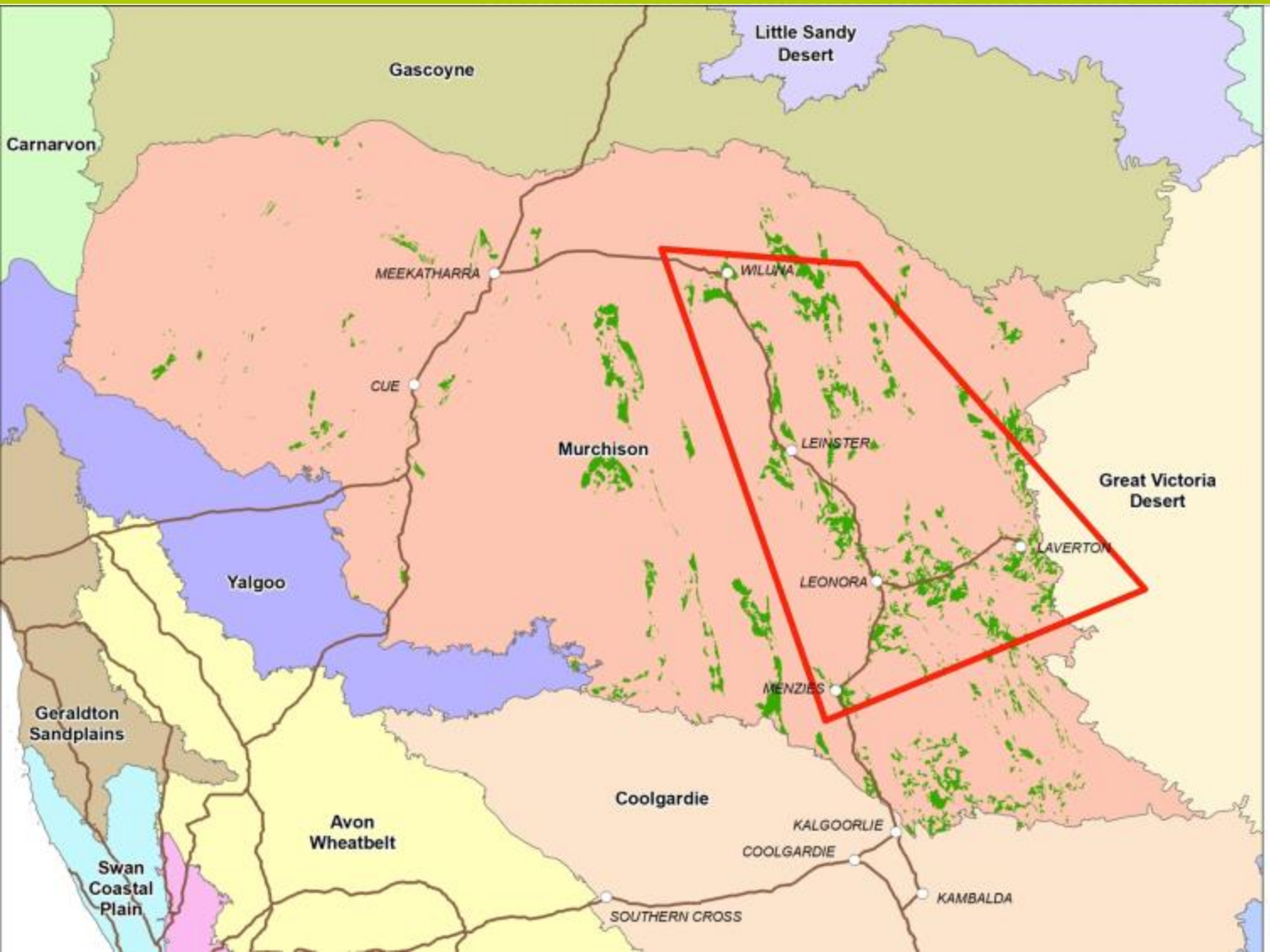
Greenstone Geology – Wiluna to Laverton – Regional Surveys



Legend

- Investigation Area
- 500k Geology - Greenstone above surface

Summary of Findings

Species Complexes

- *Acacia quadrimarginea* Group (non-hairy pods)
    - ***Acacia quadrimarginea* sens. str.**
    - ***Acacia collegialis***
    - ***Acacia lapidosa* P1**
    - ***Acacia umbraculiformis***
    - ***Acacia* sp. Mt Jackson (B. Ryan 176)**
    - ***Acacia* sp. Marshall Pool (G. Cockerton 3024)**
    - **Acacia sp. Barwidgee Station (G. Cockerton & J. Warden WB39910) has affinities to *A. lapidosa***
    - ***Acacia* sp. East Murchison Basalt (G. Cockerton & J. Warden WB39701)**

- *Acacia xanthocarpa* Group (hairy pods)
    - ***Acacia xanthocarpa* sens. str. (subterete phyllode form)**
    - ***Acacia xanthocarpa* flat phyllode form (G. Cockerton & J. Warden WB39702)**
    - ***Acacia* sp. Weld Range (A. Markey & S. Dillon 2994)**

Acacia quadrimarginea complex

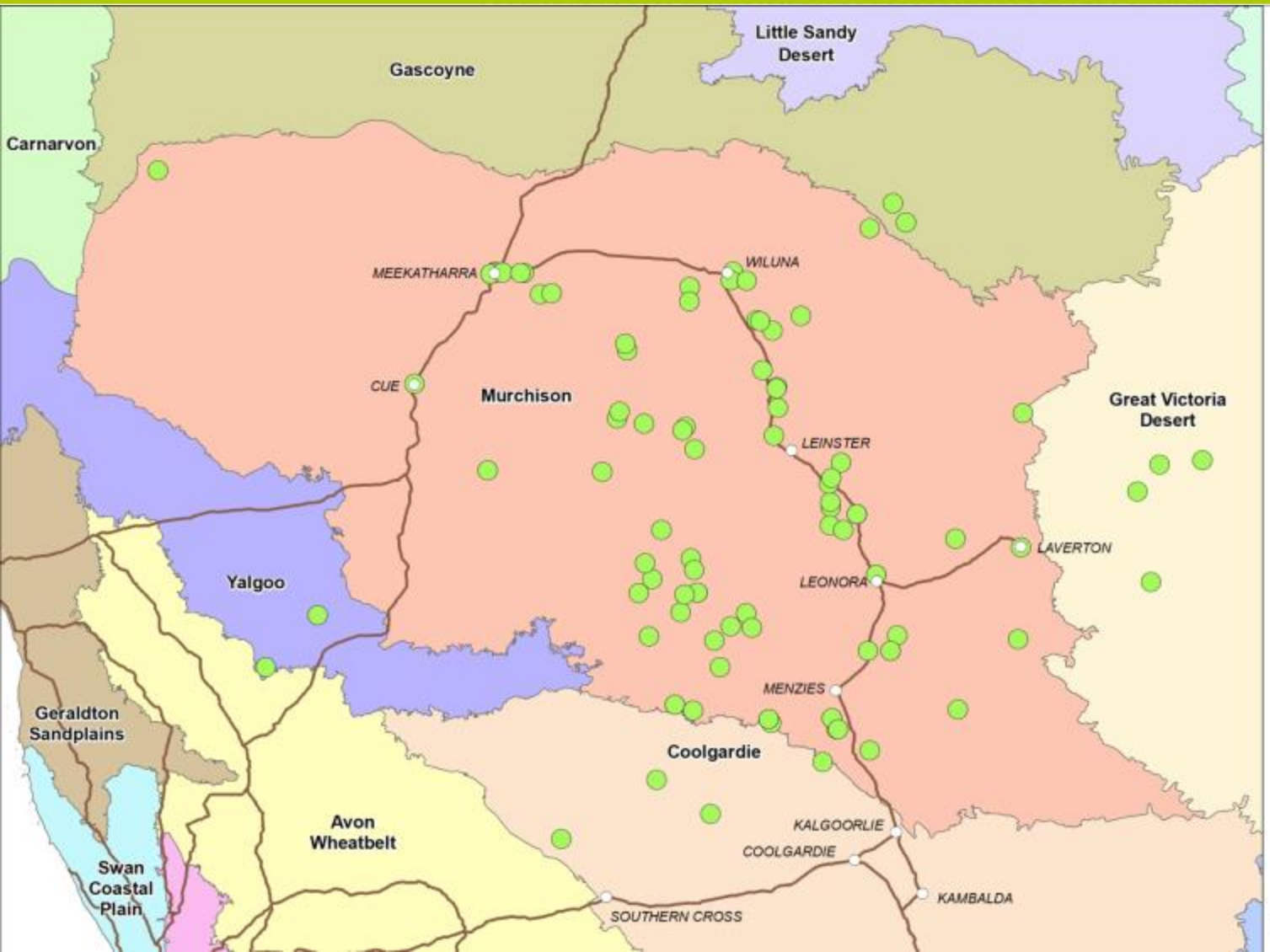
Key characters

- Single stemmed trees, 2 to 6 m high to 8 m wide, rough grey fibrous bark below, smooth grey upper.
- Foliage may be glossy dark green, glaucous (blue-green) or lime green.
- Phyllodes may be flat, falcate, 2 to 6 mm wide or subterete linear 1mm wide, leaf tips are hooked.
- One or more main margins may have prominent yellow to red resin.
- Pods apparently not hairy, however, on closer examination may have minute simple white hairs or more commonly have tiny (need hand lens) appressed red resinous hairs and a discontinuous, deciduous resinous covering.
- Pods 5 to 10mm wide, 60 to 150 mm long, 3 to 6 mm thick, constricted between seeds, may have a slightly thickened margin or have a prominently flattened margin perpendicular to the flat surface.

Well known species – *Acacia quadrimarginea*, Granite Wattle

Phyllodes dark green to glaucous, flat, falcate, 4 to 6 mm wide x 60 to 120 mm long with prominent red resinous margins. Pods are very distinctive, having broad, flat margins perpendicular to the flat surface of the pod.

Well known species – Acacia quadrimarginea, Granite Wattle



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Legend

Species

Acacia quadrimarginea sens. str

A widespread species of granite geology primarily, also seen on some lateritised duricrusts and ferricrete, not found on greenstones

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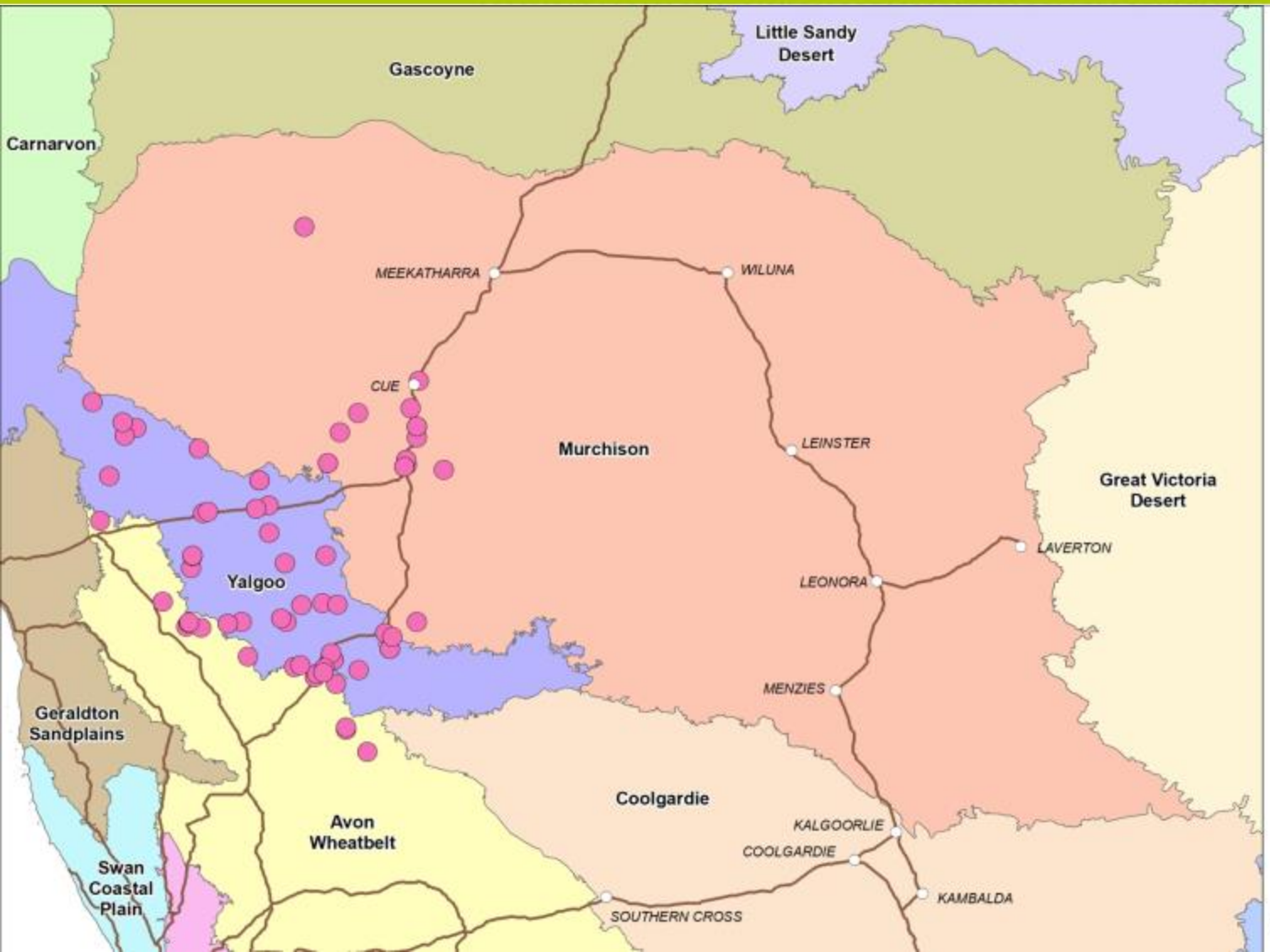
Well known species – *Acacia umbraculiformis*

Well known species – *Acacia umbraculiformis*



Legend

Species

- *Acacia umbraculiformis*

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Well known species – *Acacia collegialis*

Phyllodes flat, falcate, glossy dark green to glaucous, red resinous margins.
Pods 50 to 80 mm long x 5 to 6 mm wide, surfaces convex, slightly constricted between seeds, margins not prominent, surface covered in red resinous hairs

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Well known species – *Acacia collegialis*

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Legend

Species

- *Acacia collegialis*

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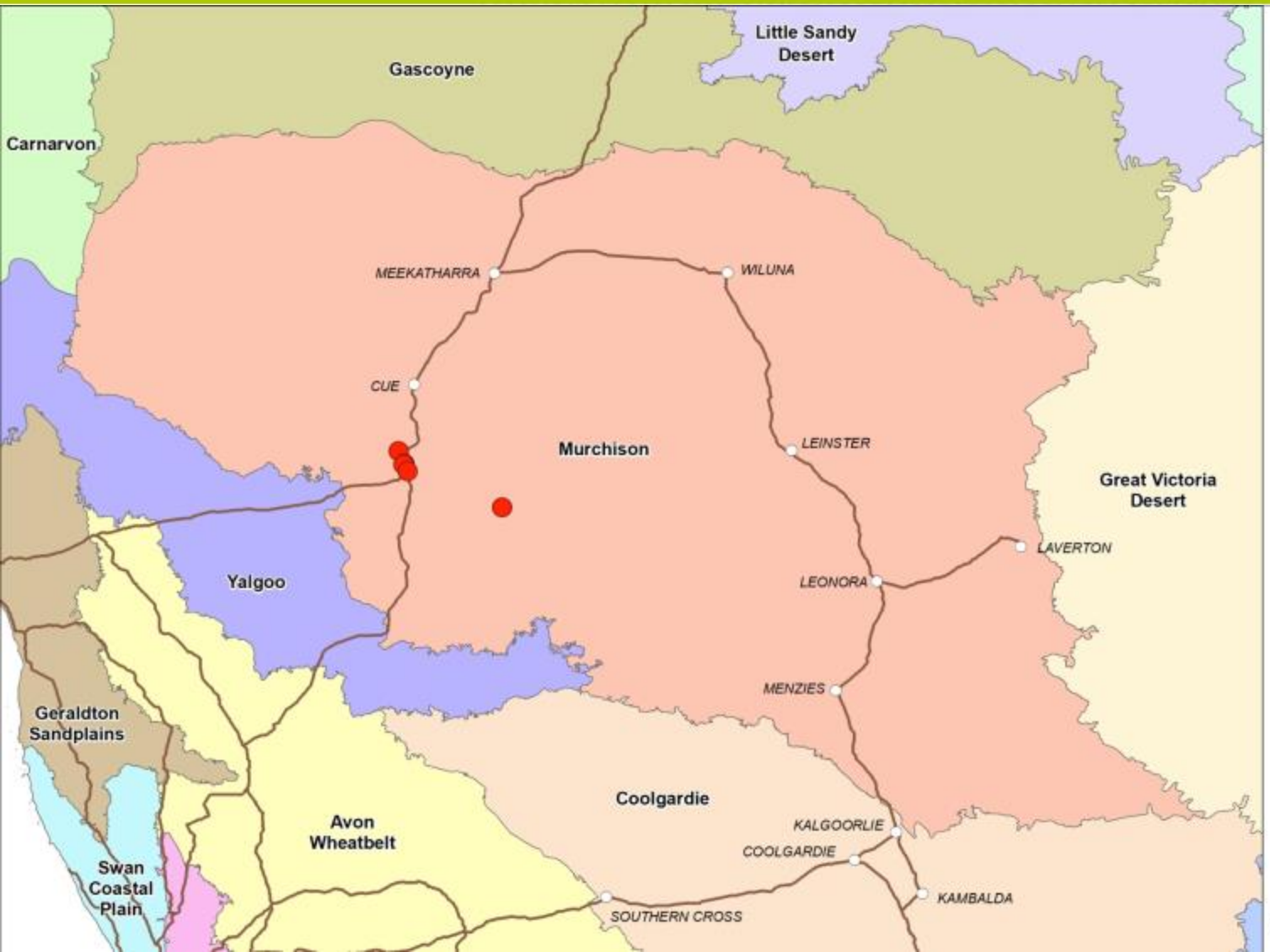
Poorly known species – *Acacia lapidosa* P1



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Legend

Species

Acacia lapidosa (P1)

Phyllodes flat or subterete, shiny green, narrow linear, 1.5mm wide x 6 to 9.5mm long.
Pods 7 to 9.5 mm wide to 130 mm long, rounded over seeds, margin not prominent, with tiny white simple hairs covering surface, deciduous with age.

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Poorly known species – *Acacia* sp. East Murchison Basalt (G. Cockerton & J. Warden WB39701)

aka: *Acacia quadrimarginea* narrow phyllode form.
Phyllodes 2 to 3 mm wide, flat, dark green, held upright, yellow to red resinous margins.
Pods 5 to 6 mm wide, 50 to 80 mm long, 2.5 to 3.5mm thick, margins not flattened forming ridges, surface covered in appressed red glandular resinous hairs.

Poorly known species – *Acacia* sp. East Murchison Basalt (G. Cockerton & J. Warden WB39701)

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Species

Acacia sp. East Murchison Basalt (G. Cockerton and J. Warden WB39701)

Also known as *Acacia quadrimarginea* narrow phyllode form, widespread and likely more abundant than data indicates

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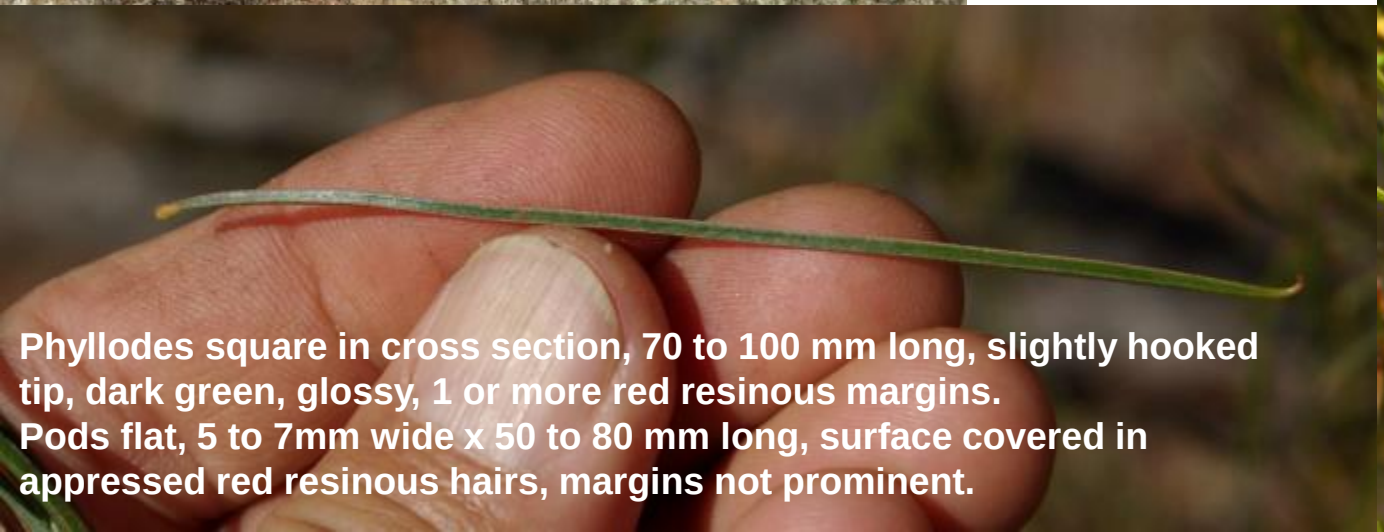
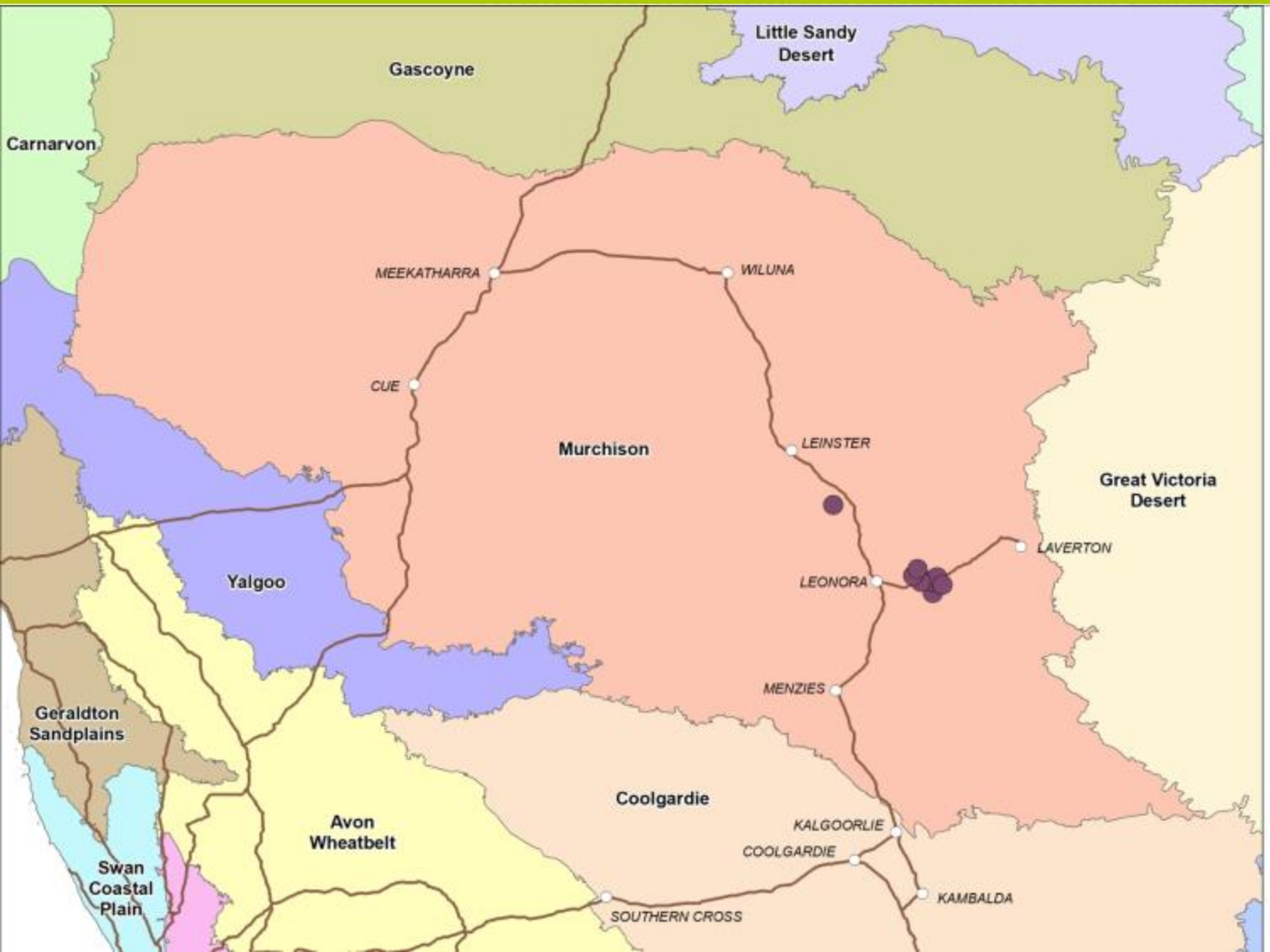
Comparison: Acacia quadrimarginea sens. str. vs. *Acacia* sp. East Murchison Basalt

Poorly known species – *Acacia* sp. Marshall Pool (G. Cockerton 3024)



Phyllodes square in cross section, 70 to 100 mm long, slightly hooked tip, dark green, glossy, 1 or more red resinous margins.
Pods flat, 5 to 7mm wide x 50 to 80 mm long, surface covered in appressed red resinous hairs, margins not prominent.

Poorly known species – *Acacia* sp. Marshall Pool (G. Cockerton 3024)



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Species

- *Acacia* sp. Marshall Pool (G. Cockerton 3024)

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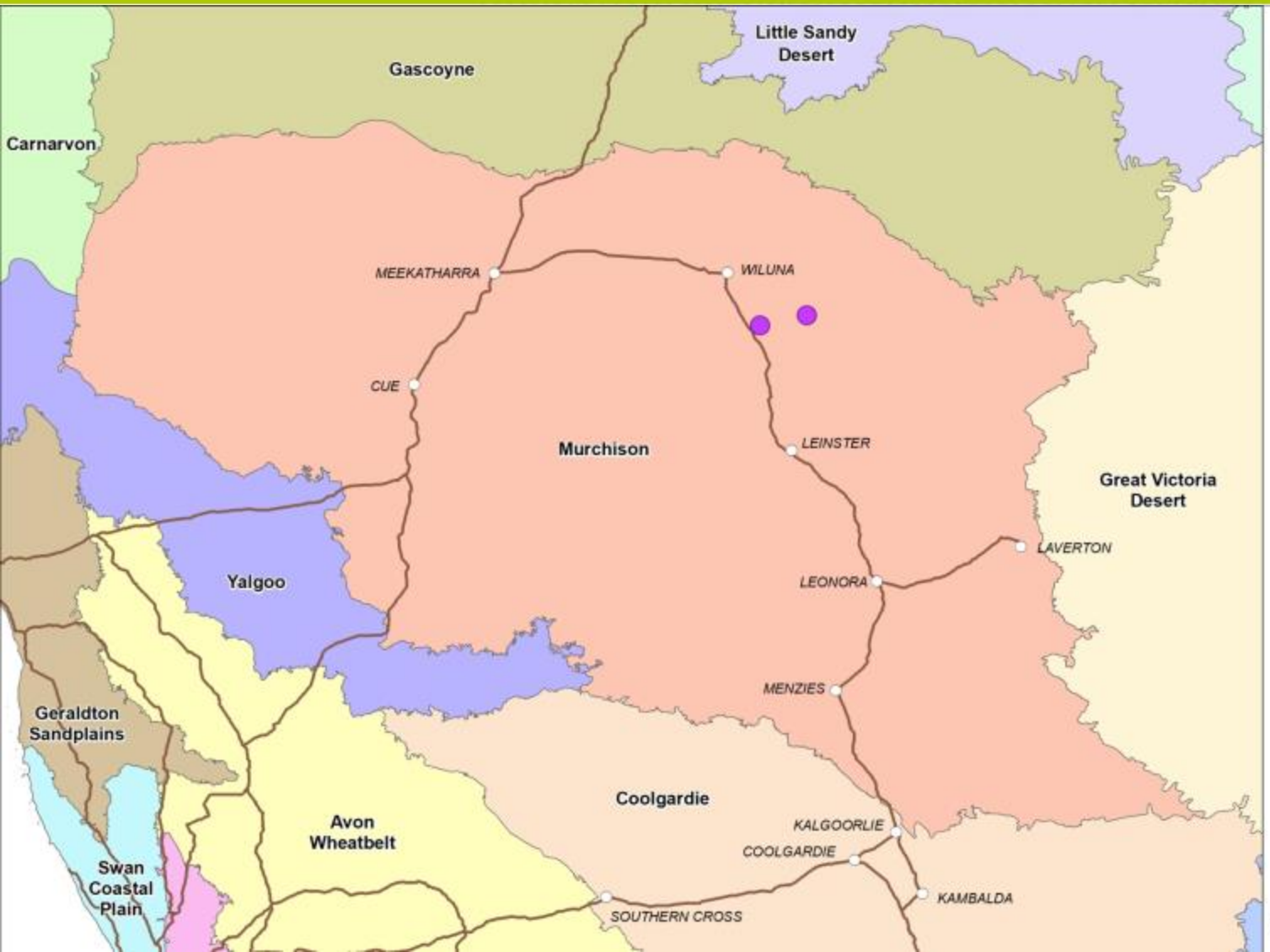
Poorly known species - Acacia sp. Barwidgee Station (G. Cockerton & J. Warden WB39910)

Phyllodes lime green, subterete, 1.5 x 120 mm long.
Pods (immature) covered in short white simple hairs, deciduous, 7 to 9 mm wide x 70 to 120 mm long.

Poorly known species - Acacia sp. Barwidgee Station (G. Cockerton & J. Warden WB39910)



Legend

Species

- *Acacia* sp. Barwidgee Station (G. Cockerton and J. Warden WB39910)

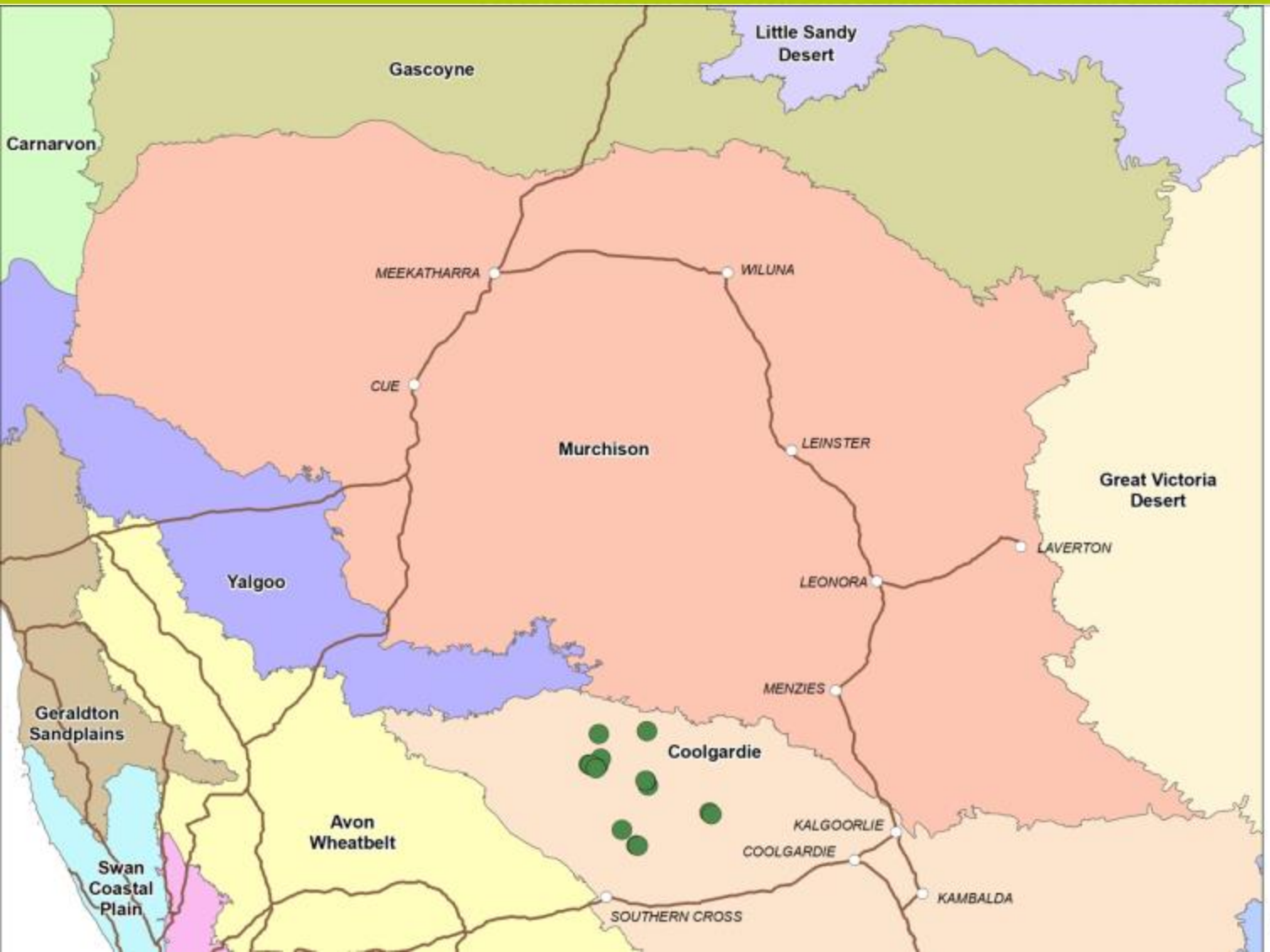
Has affinities with *Acacia lapidosa* P1 (Mt Magnet), fits within the description of *A. lapidosa*; however, represents a major disjunction and requires further investigation

Poorly known species – *Acacia* sp. Mt Jackson (B. Ryan 176)

Phyllodes falcate, flat, dark green, glossy, prominent red margins, mid vein prominent, red, 6 to 8 mm wide x 50 to 90 mm long.
Pods flat, slightly constricted between seeds, margins not prominent, covered in appressed red glandular resinous hairs (hand lens needed).


Acacia sp. Mt Jackson (B. Ryan 176) – a BIF endemic,
one of two species in the group to not occur on Greenstones

Poorly known species – *Acacia* sp. Mt Jackson (B. Ryan 176)



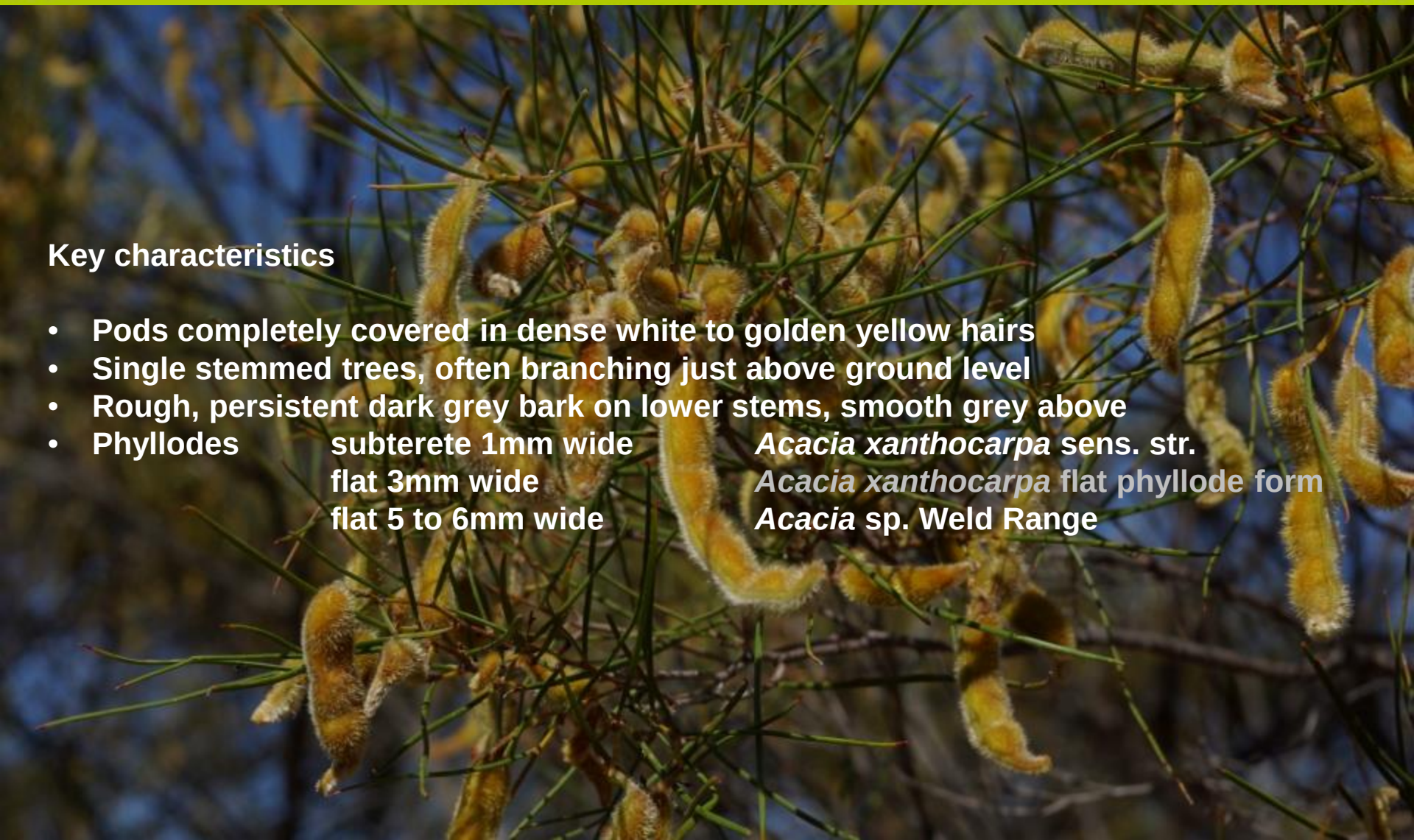
Legend

Species

- *Acacia* sp. Mt Jackson (B. Ryan 176)

A Banded Ironstone Formation and associated duricrust endemic of the western Coolgardie BGR

Acacia xanthocarpa complex



Key characteristics

- Pods completely covered in dense white to golden yellow hairs
- Single stemmed trees, often branching just above ground level
- Rough, persistent dark grey bark on lower stems, smooth grey above
- Phyllodes
  - subterete 1mm wide — *Acacia xanthocarpa* sens. str.
  - flat 3mm wide — *Acacia xanthocarpa* flat phyllode form
  - flat 5 to 6mm wide — *Acacia* sp. Weld Range

Well known species – *Acacia xanthocarpa* sens. str.

Phyllodes are subterete to quadrangular, ~1mm wide x 60 to 110 mm long, glossy dark green, numerous fine veins with 4 yellow to red resinous marginal veins

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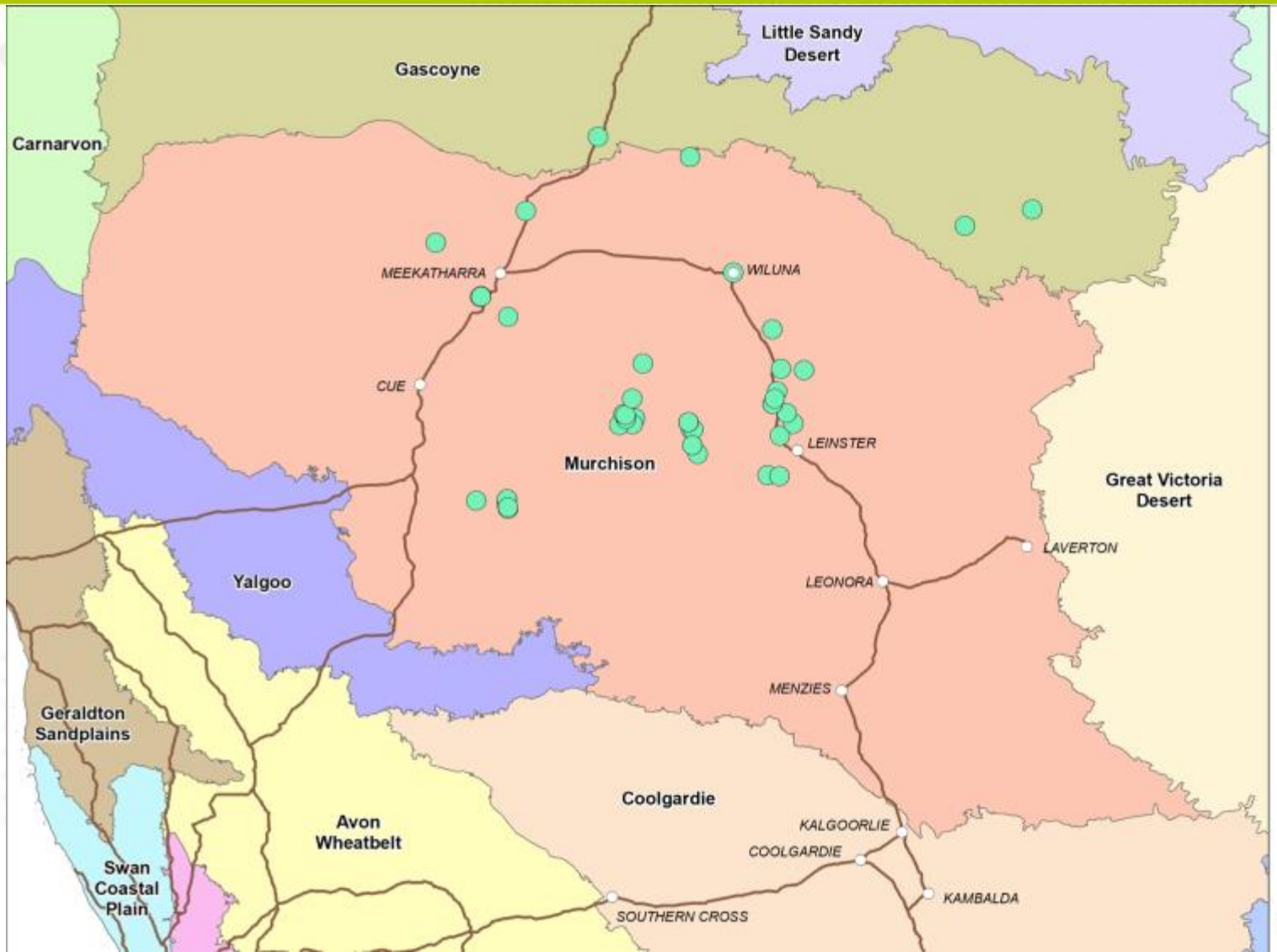
Acacia xanthocarpa flat phyllode form **(G. Cockerton & J. Warden WB39702)**

Phyllodes flat, dark glossy green, 2 to 3 mm wide x 60 to 110 mm long, with two resinous yellow to red marginal veins and a prominent mid vein on each flat face.

Well known species – *Acacia xanthocarpa* sens. lat.



Legend

Species

Acacia xanthocarpa

Sub-terete phyllode form is predominant over the range.

Flat narrow leaf (3mm) form between Leinster, Wiluna and Sandstone.

Poorly known species – Acacia sp. Weld Range (A. Markey & S. Dillon 2994)

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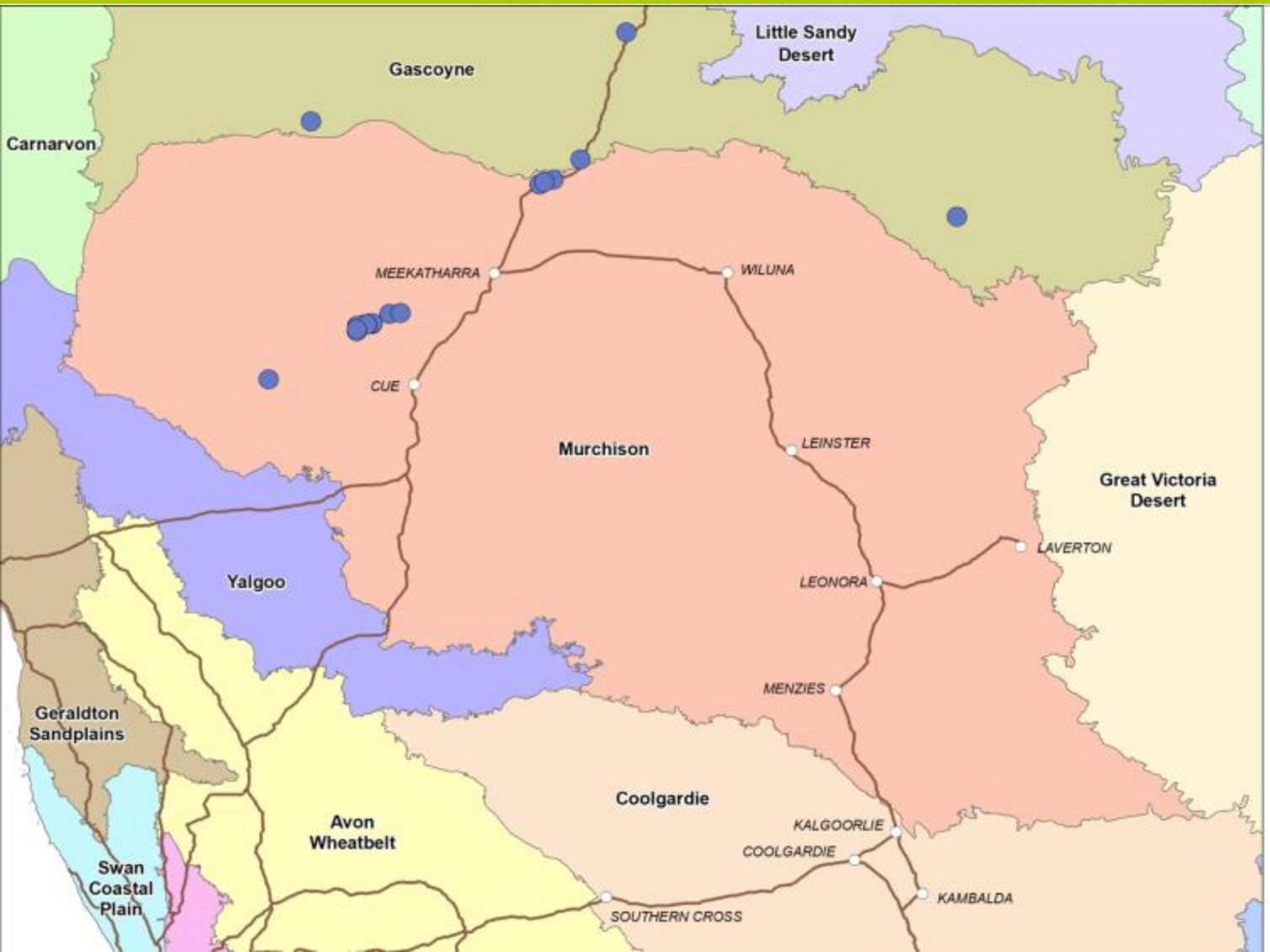

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Legend

Species

- *Acacia* sp. Weld Range (A. Markey and S. Dillon 2994)

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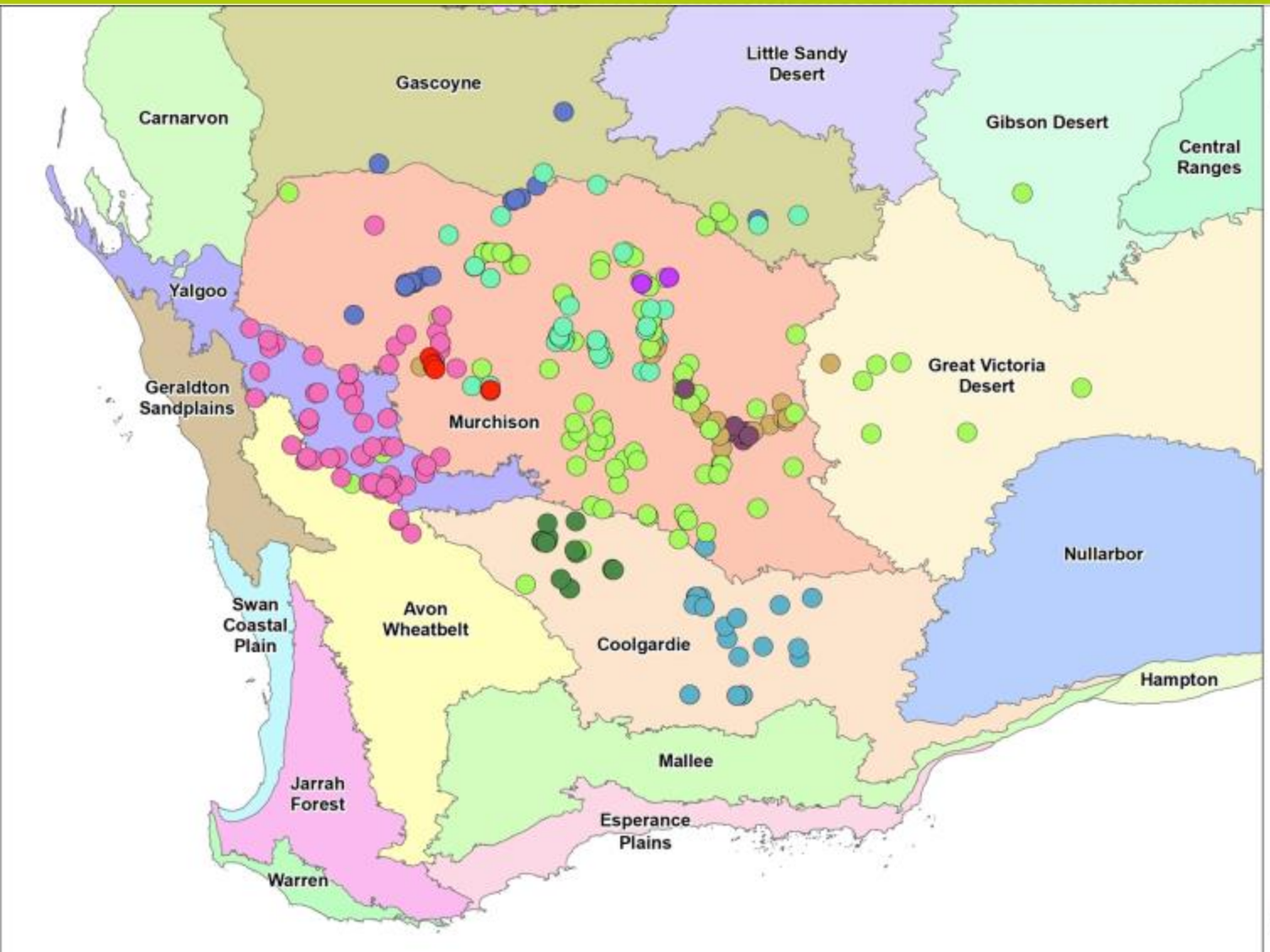
Summary: Acacia on Greenstone geologies



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Legend

Species

- *Acacia lapidosa* (P1)
- *Acacia collegialis*
- *Acacia quadrimarginea* sens. str
- *Acacia* sp. East Murchison Basalt (G. Cockerton and J. Warden WB39701)
- *Acacia* sp. Marshall Pool (G. Cockerton 3024)
- *Acacia* sp. Mt Jackson (B. Ryan 176)
- *Acacia* sp. Weld Range (A. Markey and S. Dillon 2994)
- *Acacia umbraculiformis*
- *Acacia xanthocarpa*
- *Acacia* sp. Barwidgee Station (G. Cockerton and J. Warden WB39910)

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Summary characteristics of these *Acacia*

- Fruit pods are essential for identification – survey in October ideal.
- Variation in the cross-sectional shape of pods is an important character.
- Variation in the surface characteristics of pods: long golden hairs vs short white hairs vs appressed red resinous hairs is an essential character
- Variation in phyllode shape and size is noted between species and within species: subterete – quadrangular – flat narrow – flat broad are useful characters, with / without red resinous marginal veins.
- Geographic distributions are a good indicator based on information available to date.

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Where greenstones outcrop at the surface, or where cover is minimal, the geology and derived soils directly influence the species within the vegetation.

Here *Acacia xanthocarpa, Grevillea inconspicua* and *Calytrix desolata* dominate. All absent from adjoining landscapes.

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Where there is sufficient cover of soils derived from adjacent landscapes, Mulga and other species not endemic to greenstone geologies dominate.

These species are representative of the vegetation on the adjacent colluvial and alluvial landscapes.

Why are these species restricted to Greenstone geologies (mostly)?

The greenstone hills represent a unique sub-group of the landscapes of the NE Goldfields.

- Rocky, metamorphosed, highly fractured;
- Previously developed below the land surface but now exposed uplands.
- Historically, connected to significant paleo-groundwater.
- Demonstrate extensive intrusion by groundwater calcretes to the modern surface.
- Not subject to inundation or waterlogging.
- *Soils are moderately alkaline (pH 8-8.5) fine- to medium-grained sandy loams with low clay content (10-15%)*.

- Greenstone outcrops may be locally extensive in area, but are disjunct from other low ranges.
- Species richness is generally low with a correspondingly high endemism.
- Geographical isolation probably plays a part in speciation.

- Less than 10% of the extent of the Greenstones are well assessed for these *Acacia* varieties.
- Could be other entities yet to be found or elucidated.

Acknowledgements

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- CAD Resources Pty Ltd

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