

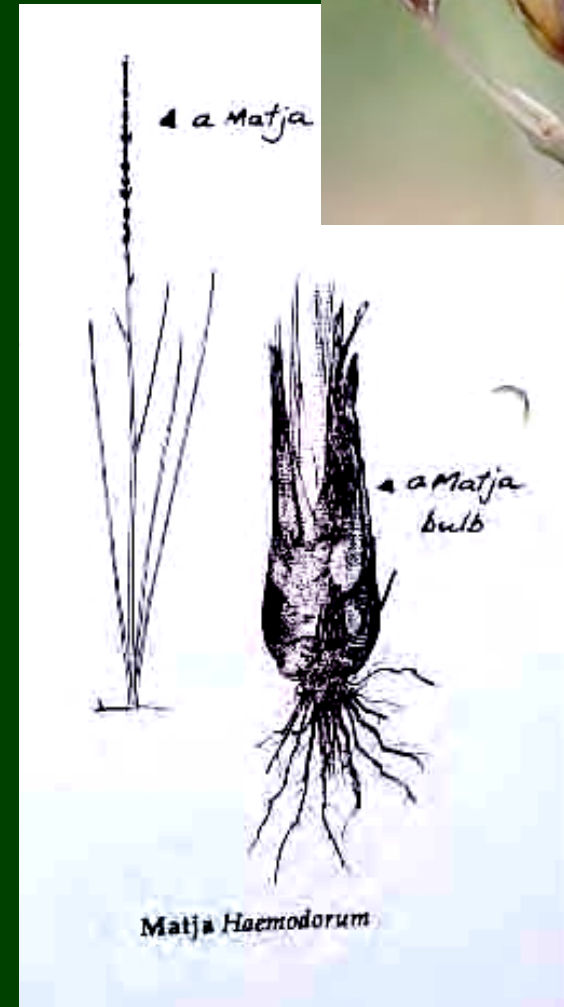
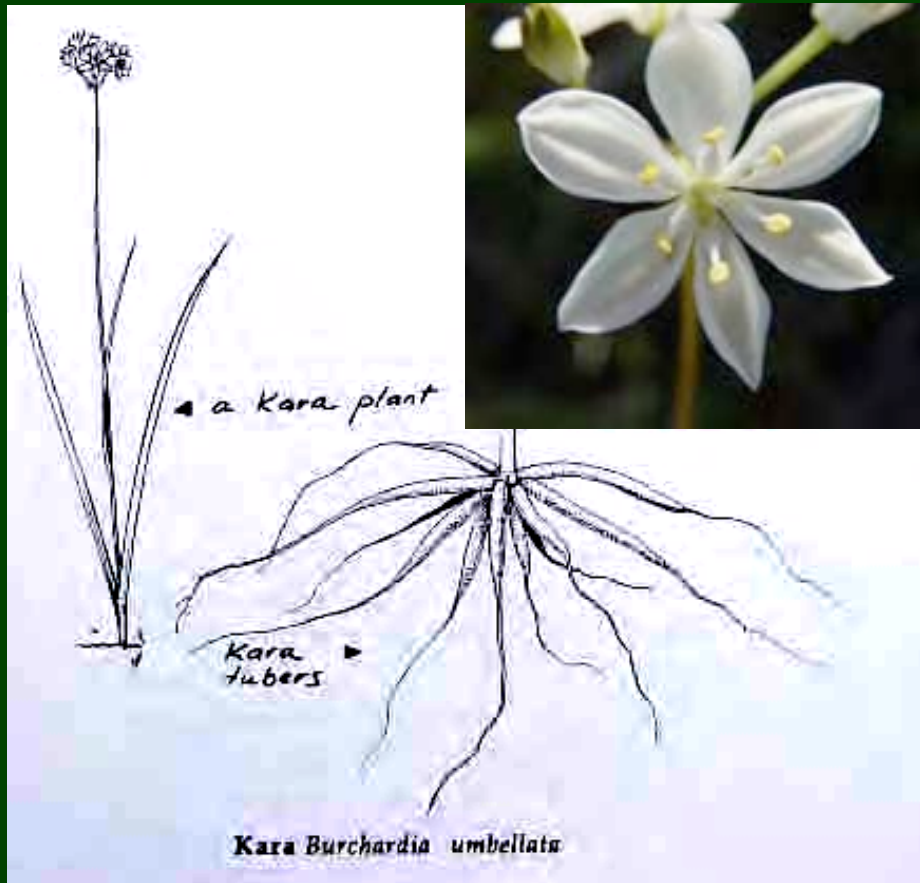
# Plant Patterning across the Swan Coastal Plain

Bronwen Keighery



Department of Environment and Conservation  
Government of Western Australia

# Aboriginal people: living with the land



Photos: Bronwen Keighery  
Drawings : Margaret Pieroni



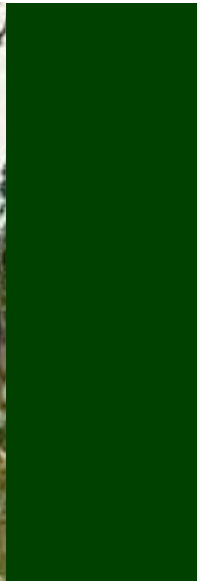
# Selling the Swan 1827

## Stirling and Fraser



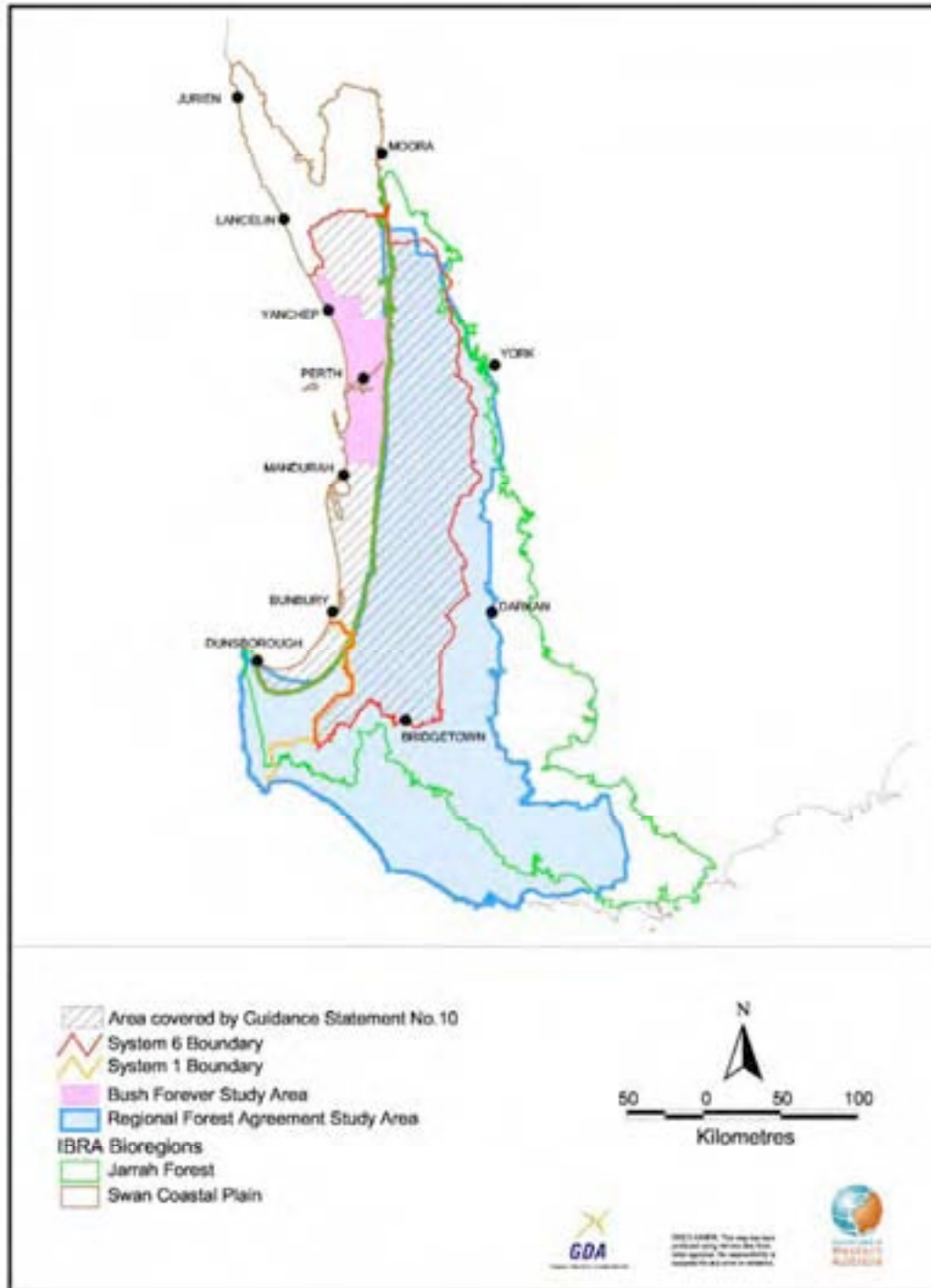
A version of Stirling's map





# Marri Woodlands

Photos: Bronwen Keighery



# Setting context

## 'Regional' Boundaries

- biodiversity
- planning
- administrative

## Study Area

Swan Coastal Plain, south Moore River

Perth Metropolitan Region



# Natural Regions


Swan Coastal Plain

Jarrah Forest: Darling Scarp

Photo: Bronwen Keighery







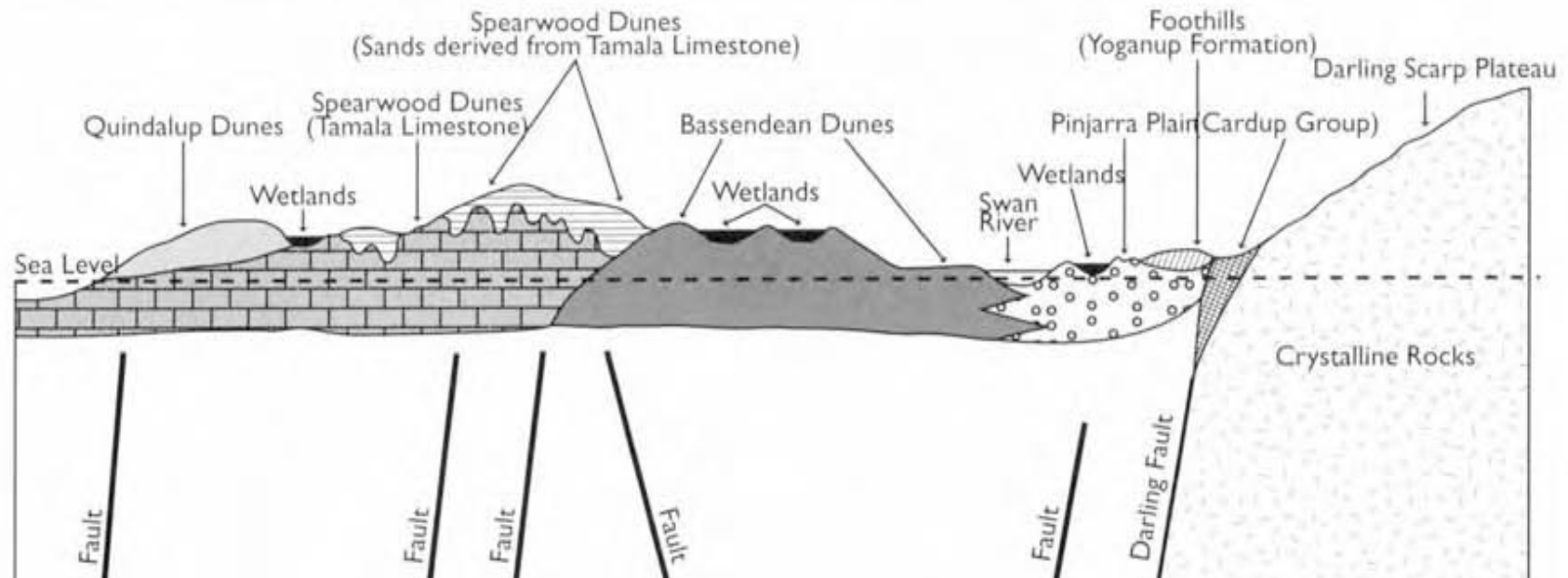
What determines the  
patterning of the plants on  
the Plain?

Photo: Bronwen Keighery

# Landforms and Soils

- Dandaragan Plateau/Gingin Scarp
- Foothills
- Pinjarra Plain
- Bassendean Dunes
- Spearwood Dunes
- Quindalup Dunes

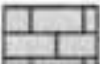





### Foothills (Ridge Hill Shelf)

-  Yoganup Formation
-  Cardup Group

### Spearwood Dunes

-  Tamala Limestones
-  Sands derived from Tamala Limestones

### Pinjarra Plain

-  Guildford Formation

### Bassendean Dunes

-  Bassendean Sand

### Quindalup Dunes

-  Safety Bay Sands

# Pinjarra plain/Foothills/Darling Scarp

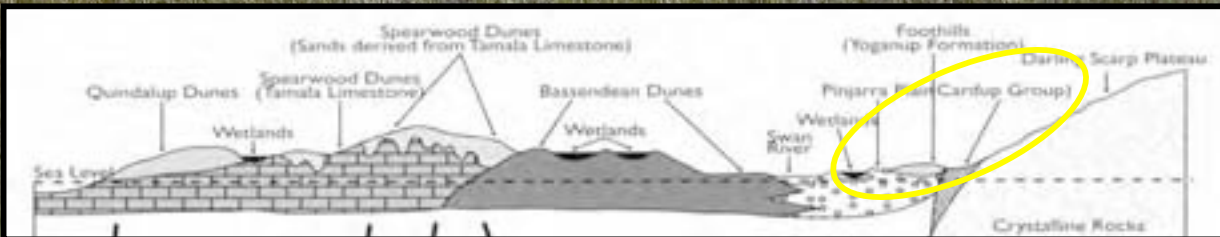


Photo: Bronwen Keighery



# Soils



Sands



Clay



Rocks



Layering of  
soils/rocks

Photos: Bronwen Keighery





# Landforms and Water

Upland

Wetland

Photo: Bronwen Keighery







Winter



Summer

Photos: Bronwen Keighery





Photos: Bronwen Keighery

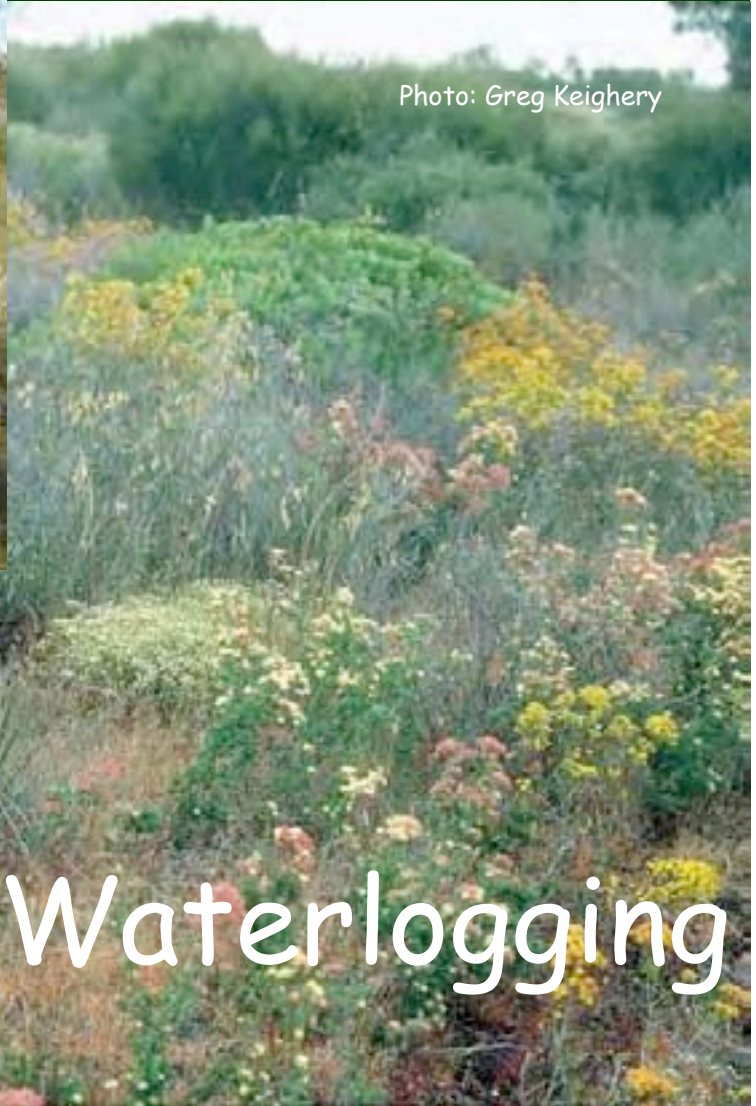


Photo: Greg Keighery

# Inundation/Waterlogging

# Landforms and Patterns

- Dandaragan Plateau/Gingin Scarp
- Foothills
- Pinjarra Plain
- Bassendean Dunes
- Spearwood Dunes
- Quindalup Dunes
- Wetlands (within the Quindalup, Spearwood, Bassendean Dunes or Pinjarra Plain)



# Plant Community Patterns

- Vegetation Types (mapped)
- Vegetation complexes (mapped):  
Plain 38, PMR 26
- Floristic community types:  
Plain - 66, PMR 58
- Threatened ecological communities (TECs)  
PMR 17

# Vegetation Types

Vegetation units based on vegetation structure, cover and dominant species.

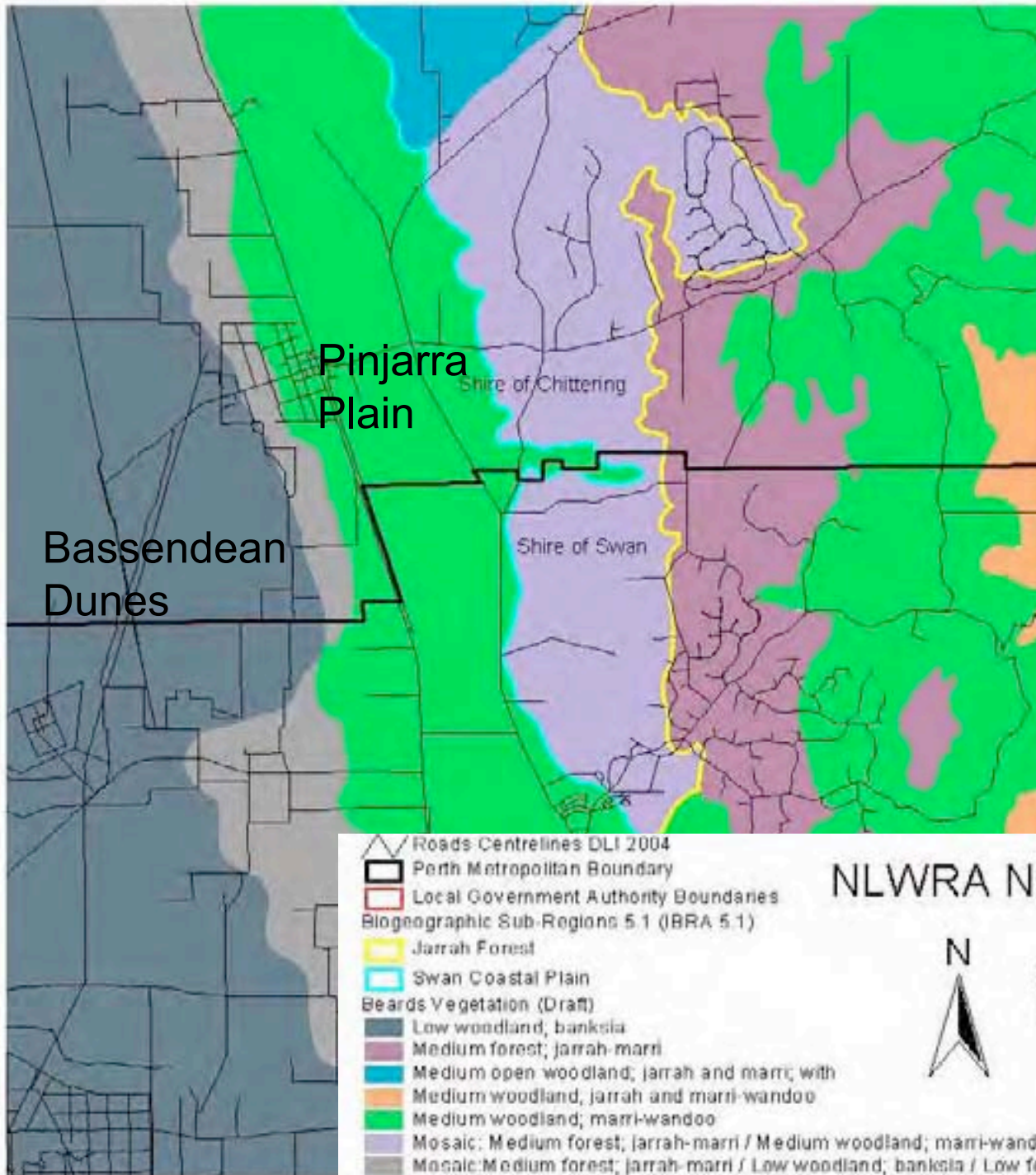
1960's and 70's Beard mapped the vegetation types of the Swan Coastal Plain, north of Pinjarra, at a 1 : 250 000 scale, based on the earlier mapping by Speck. The original extent of the vegetation types is mapped.

1981 Beard produced a map at a 1 : 1 000 000 scale for the entire area.

1996 Beard's 1 : 250 000 maps were digitised (Hopkins *et al.* 1996)



# Vegetation Types



## NLWRA Native Vegetation Types



0 2.5 5 Kilometers



Scale: 1:100,000



# Low Woodland; *Casuarina obesa*



Photo: Greg Keighery



# VEGETATION COMPLEXES

Vegetation complexes are a series of plant communities forming regularly repeating groups associated with a particular soil/landform units.

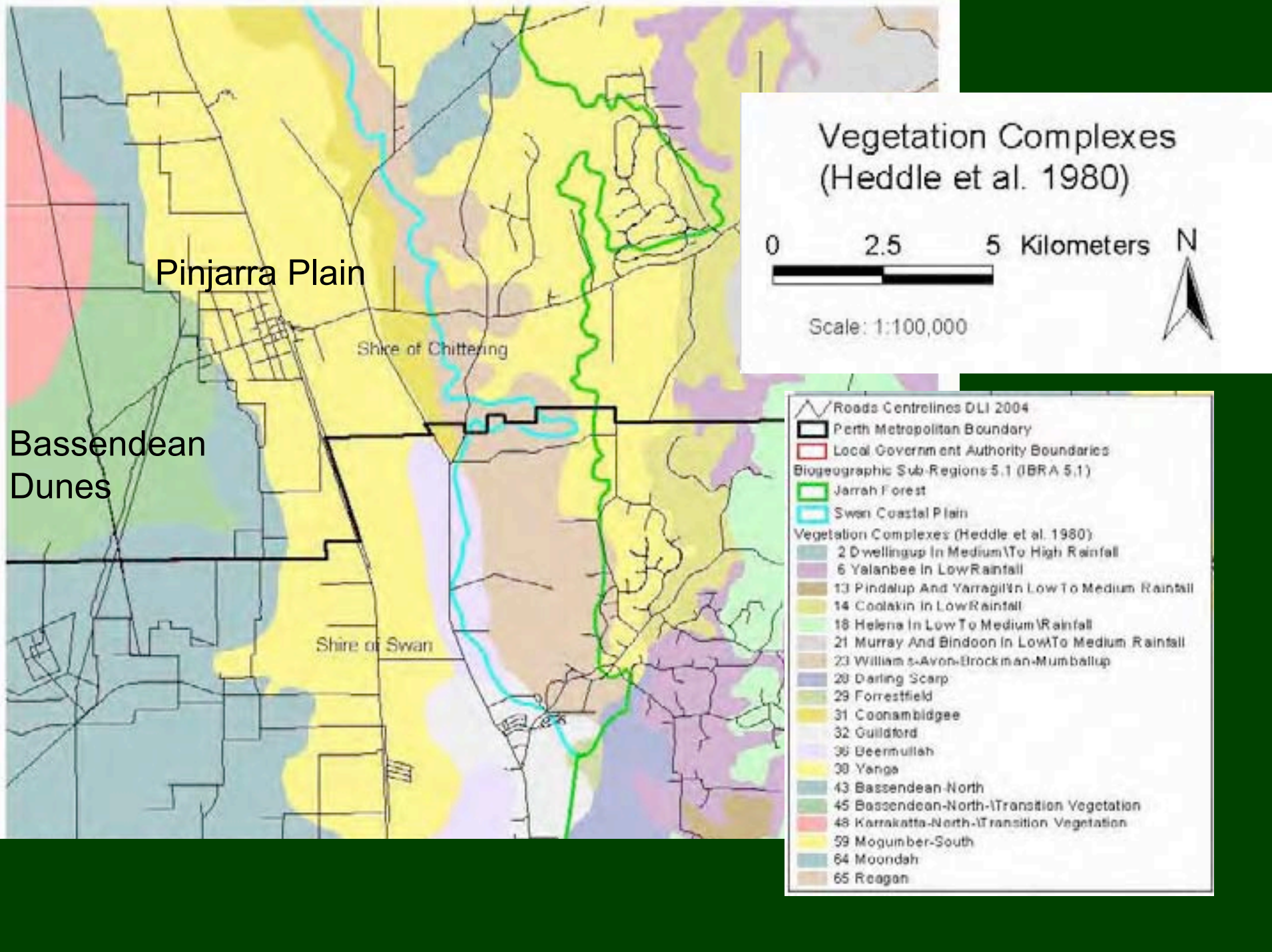
Heddle *et al.* 1980 and Mattiske and Havel 1998

Based on vegetation and floristic information from ground surveys (both plots and transects on small scale areas), road traverses, aerial photographs and from previous interpretations of the vegetation.

1 : 250 000 scale for the Swan Coastal Plain

1 : 50 000 the Jarrah Forest

Regional Forest Assessment, mapping of the Busselton Sheet





# Foothills

**FORRESTFIELD COMPLEX** : Vegetation ranges from open forest of *E. calophylla* - *E. wandoo* - *E. marginata* to open forest of *E. marginata* - *E. calophylla* - *C. fraseriana* - *Banksia* species. Fringing woodland of *E. rudis* in the gullies that dissect this landform.

Photo: Greg Keighery

# FLORISTIC COMMUNITY TYPES

Distinctive floristic assemblages identified on the southern Swan Coastal Plain in Gibson *et al.* (1994) and DEP (1996).

The presence or absence of individual taxa in standard areas (plots) is used to define floristic groupings based on shared species.

Gibson *et al.* 44 FCT's, DEP 66 FCT's (additional wetlands, Quindalup Dunes)

Threatened ecological communities defined from Gibson *et al.* (1994)





Photo: Jeri Alford

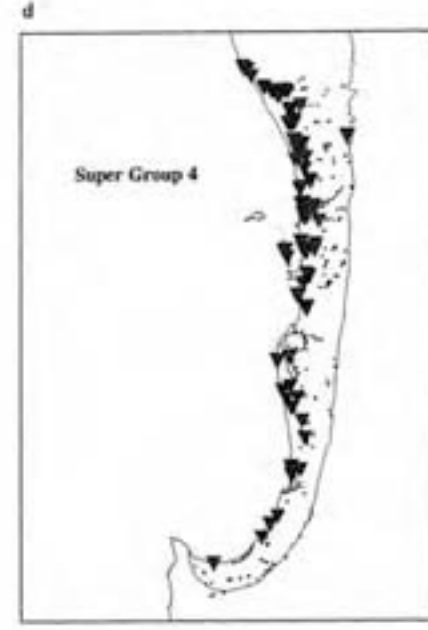
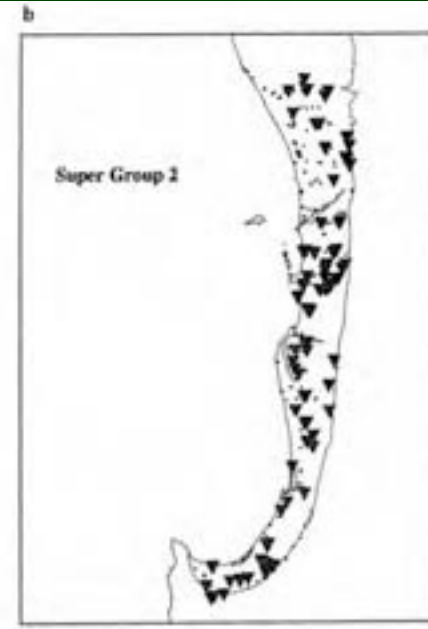
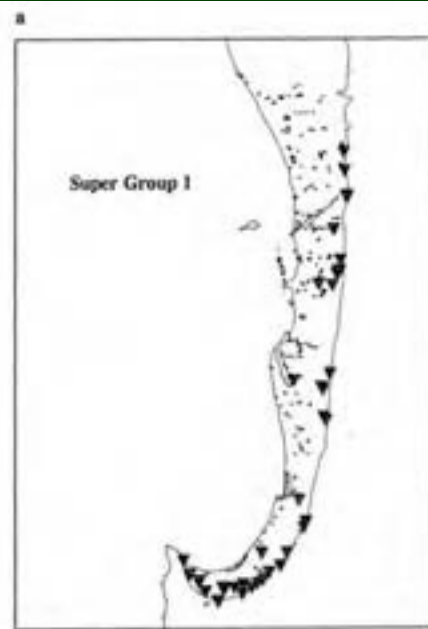
10mX10m plots

A large ongoing set of projects involving several hundred people.



Photo: Greg Keighery

Foothills/  
Pinjarra  
Plain



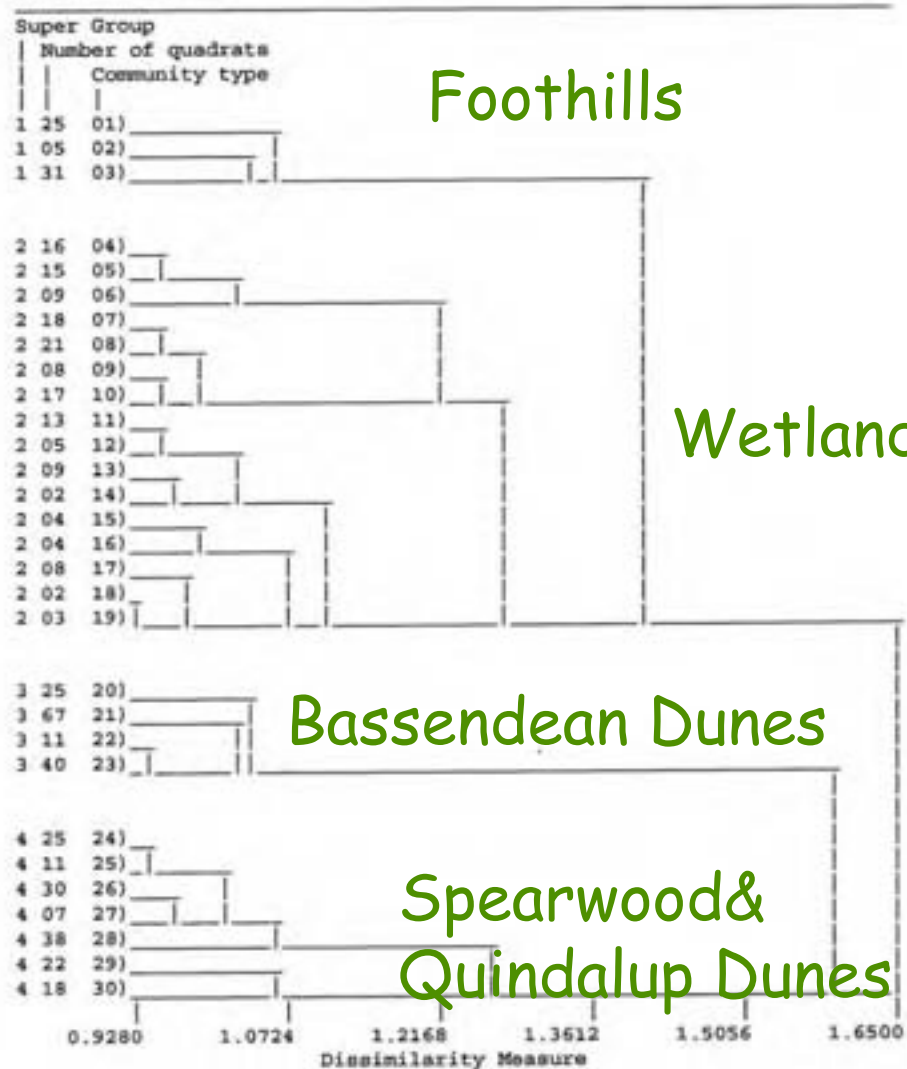
Bassendean  
Dunes

Wetlands

Spearwood &  
Quindalup  
Dunes



Figure 6. Dendrogram showing the four super groups and the 30 community types defined from the floristic presence / absence data set.



# Supergroups

# How does species richness pattern?

## Native species in the typical FCT's (no plots)

- Foothills/Pinjarra Plain 44 to 66 (90)
- Bassendean Dunes 30 - 67 (80)
- Spearwood Dunes 37- 55 (80)
- Quindalup Dunes 9 - 35 (50)
- Wetlands 11 - 53 (70)



# Pinjarra Plain/Bassendean Dunes



23a Central *Banksia attenuata* - *Banksia menziesii* woodlands

10a Shrublands on dry clay flats  
- Threatened ecological community

Photo: Greg Keighery





26a *Melaleuca huegelii* - *Melaleuca acerosa*  
shrublands on Limestone ridges  
- Threatened ecological community



## Spearwood Dunes

Photos: Bronwen Keighery



# How do the species pattern ?

- Total native species : Plain > 2,000, PMR >1,200
- Native species in the typical FCT's (no plots)
  - Foothills/Pinjarra Plain 44 - 66 (90)
  - Wetlands 11 - 53 (70)
  - Bassendean Dunes 30 - 67 (80)
  - Spearwood Dunes 37 - 55 (80)
  - Quindalup Dunes 9 - 35 (50)
- Significant species : PMR >170



*Banksia attenuata*



*Banksia grandis*

Common, widespread species are the basis of patterns/habitats

Photos: Bronwen Keighery



Common, widespread species are the  
basis of patterns/habitats:  
*Banksia menziesii*



Photos: Bronwen Keighery



Common, widespread species  
are the basis of patterns/habitats:  
Jarrah (*Eucalyptus marginata*),  
dominant south of Yanchep



Photo: Bronwen Keighery

Photo: Greg Keighery



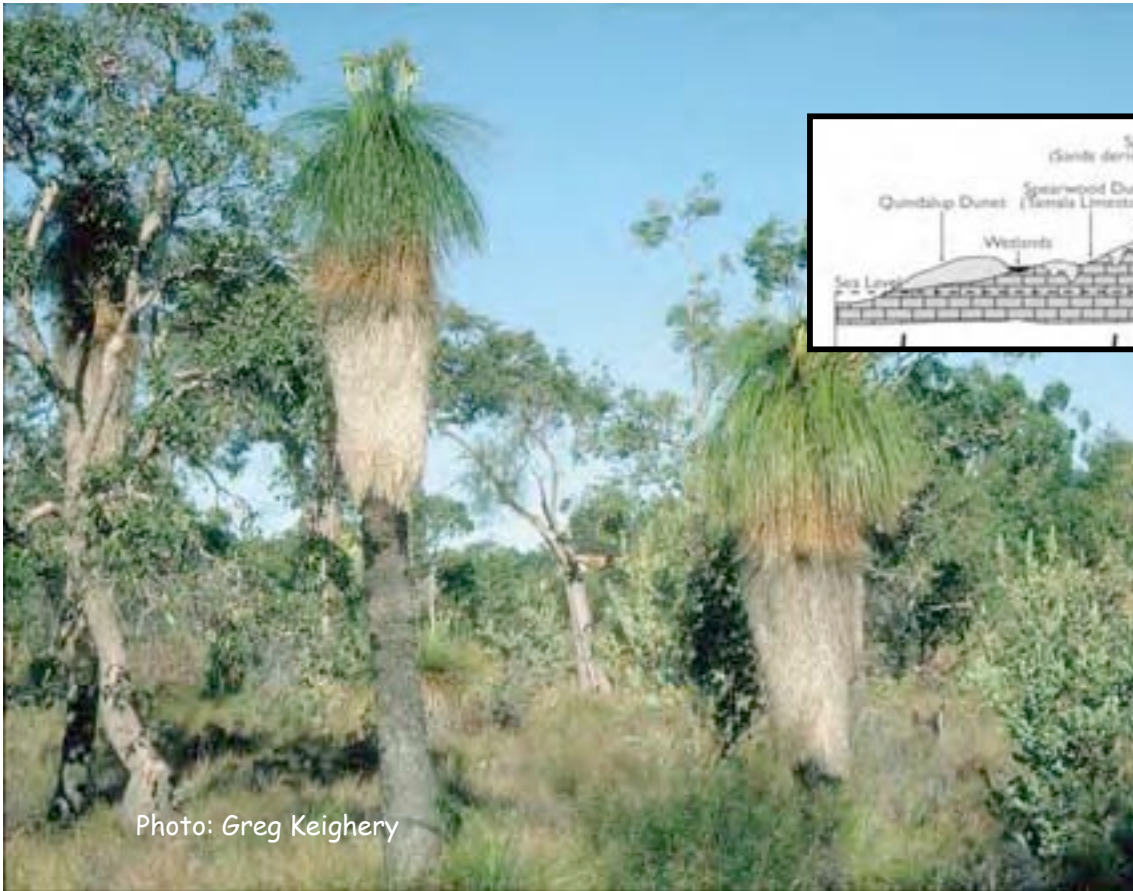
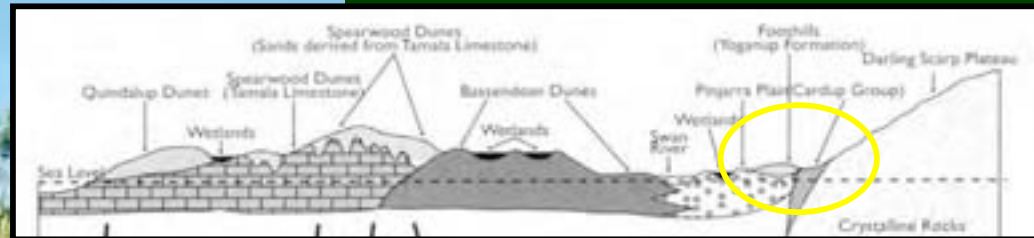


Photo: Greg Keighery



# Foothills



Photo: Bronwen Keighery



# Significant Flora

*Conospermum  
undulatum*

Photo: Greg Keighery







R

*Conospermum undulatum*

- ∩ IBRA 5.1 bioregions
- Specimen record
- Locality checked
- Locality under review
- × Locality unverifiable

grey,



Map by Paul Gioia, WA Herbarium. Current at August 31, 2006

R

*Conospermum undulatum* Lindl.  
Sketch Veg. Swan Riv. Col. 31 (1839)





Photos: Bronwen Keighery



*Conospermum*  
*? undulatum X triplinervium*



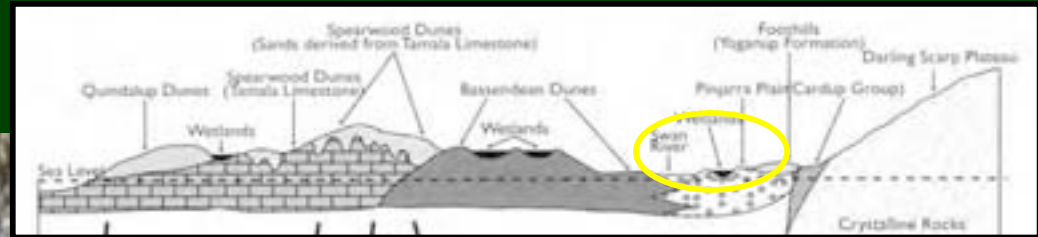
*Cyathochaeta  
equitans*



Photos: Bronwen Keighery







Pinjarra Plain  
*Casuarina obesa*

Photo: Greg Keighery



# *Grevillea curviloba*



Photo: Greg Keighery



*Grevillea curviloba*  
ssp. *incurva*



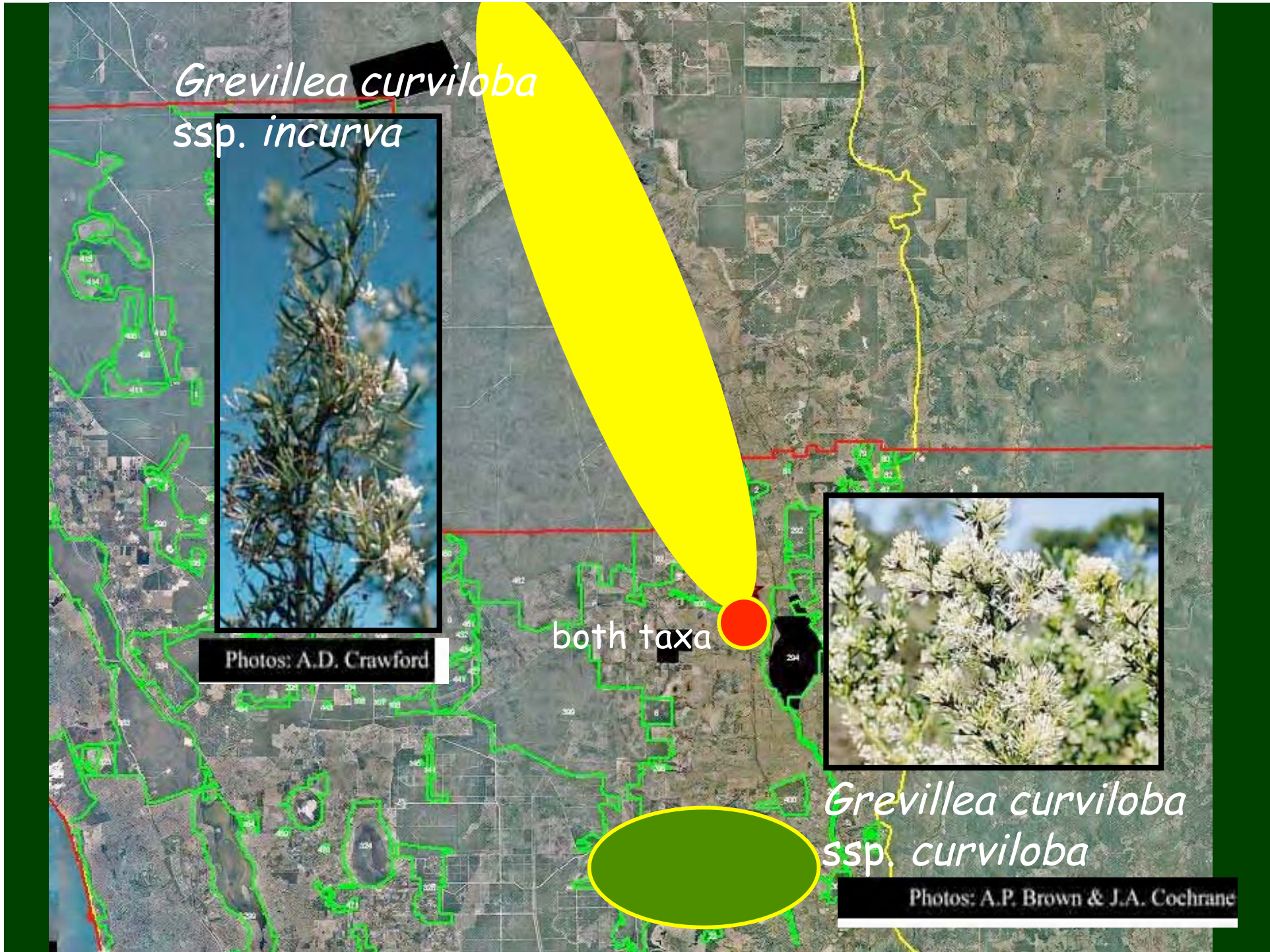
Photos: A.D. Crawford

both taxa



*Grevillea curviloba*  
ssp. *curviloba*

Photos: A.P. Brown & J.A. Cochrane







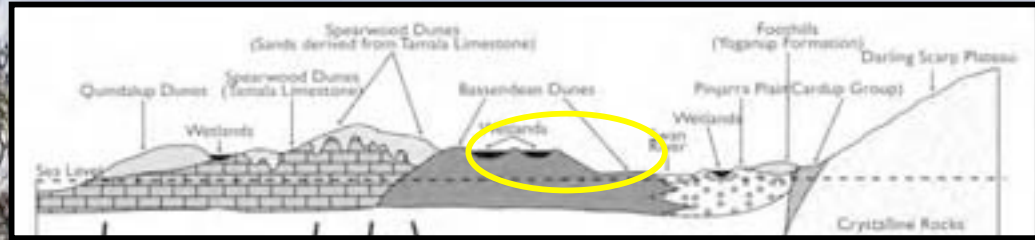
# Aquatics



# Significant Flora

Photos: Greg Keighery





# Bassendean Dunes

Photo: Mark Brundrett



# Significant Flora

*Stylidium crossocephalum*



Photos: Bronwen Keighery

Ends of the plant's  
geographic range -  
south





# Significant Flora

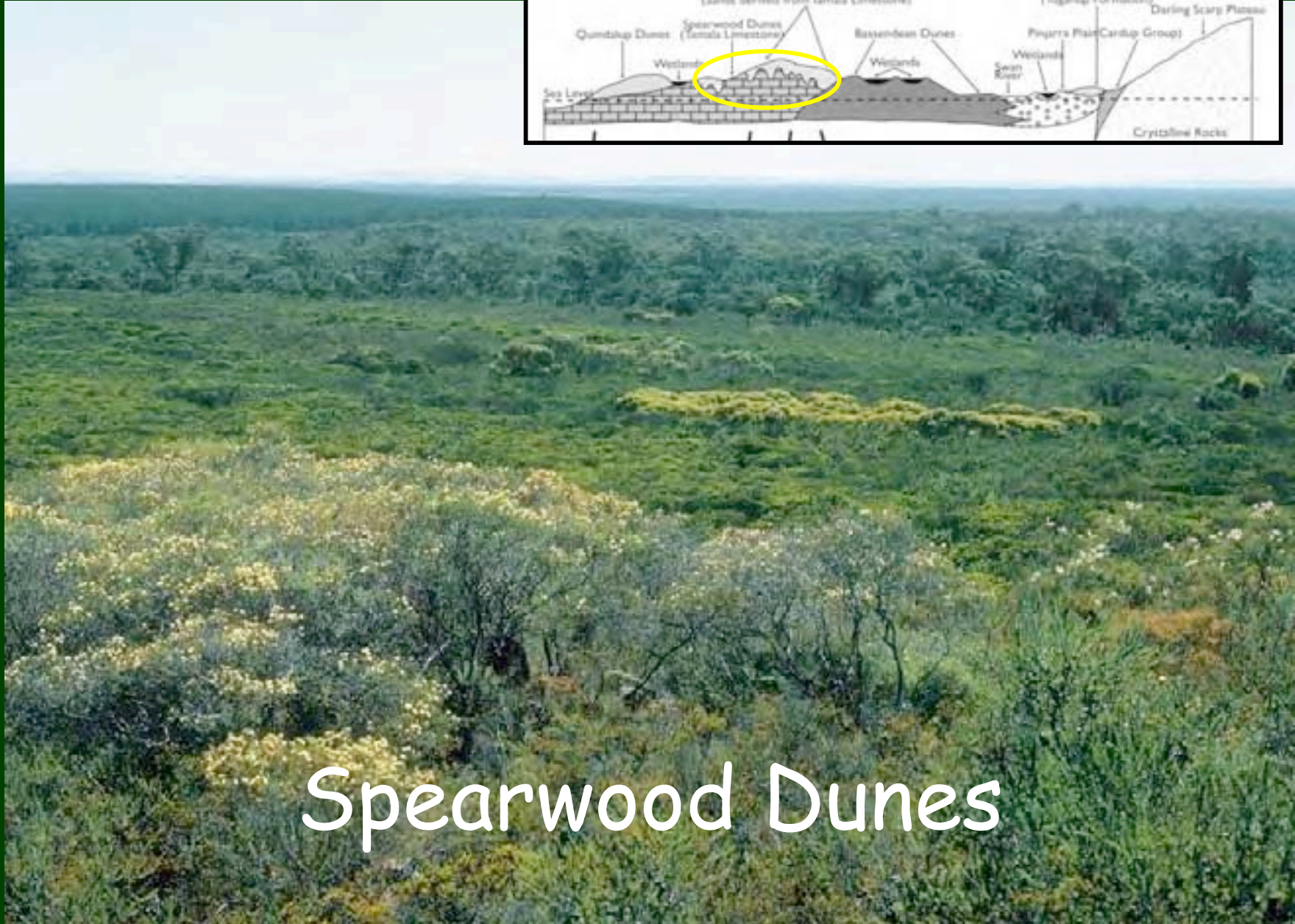
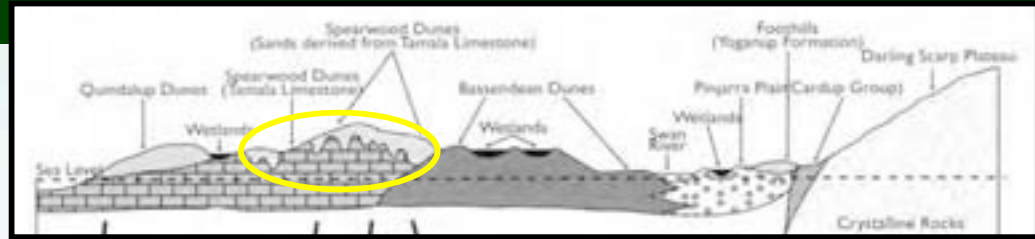


*Jacksonia 'gracillima'*



Photos: Bronwen Keighery





# Spearwood Dunes

Photo: Greg Keighery



# Tuart

*Eucalyptus gomphocephala*

- Endemic to Plain mostly on Quindalups and Spearwood Dunes.
- Isolated occurrences are found along rivers.



mallee

Forest tree

Photos: Bronwen Keighery





*Jacksonia sericea*

Photos: Bronwen Keighery



*Jacksonia 'gracillima'*

Significant Flora



# Significant Flora



Photo: Greg Keighery

Plain Limestone

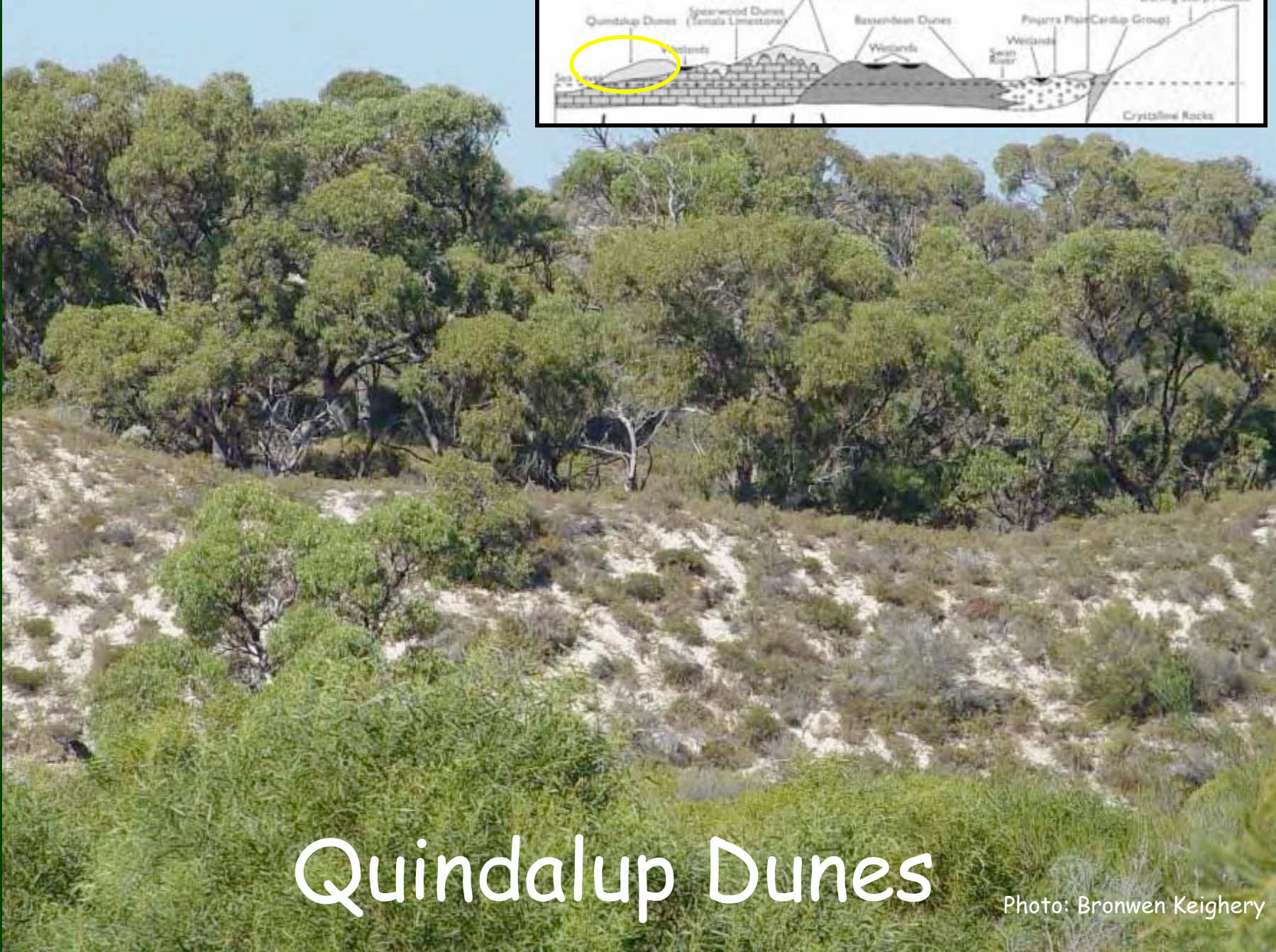
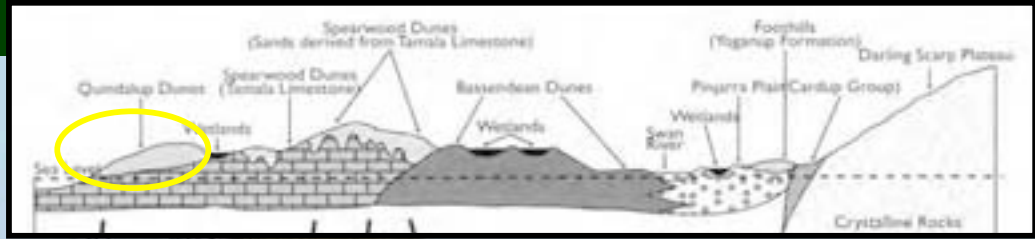
Hills/Foothills



Photo: Bronwen Keighery

Hills laterite





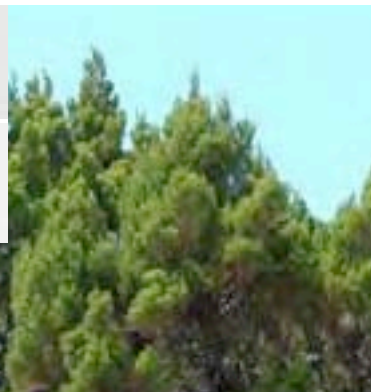
# Quindalup Dunes

Photo: Bronwen Keighery



# Cupressaceae

## Callitris

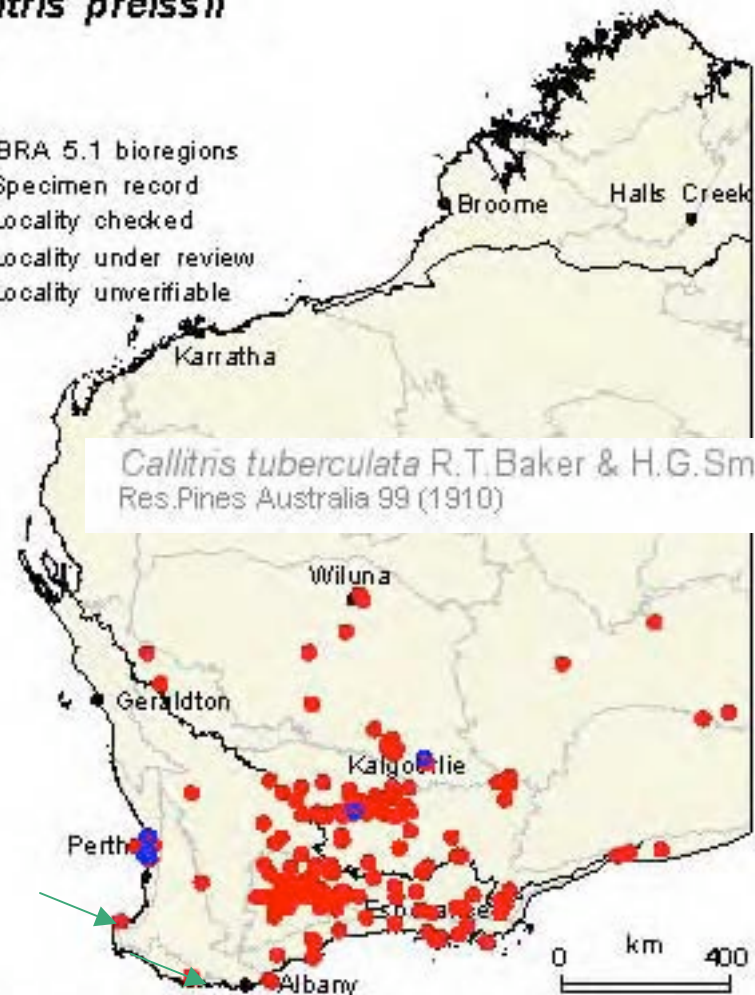


*Callitris preissii* Miq.  
Rottneist Island Cypress Pine  
Lehm., Pl. Preiss. 1:643 (1845)

Photo: Karen Clarke

## *Callitris preissii*

- IBRA 5.1 bioregions
- Specimen record
- Locality checked
- Locality under review
- × Locality unverifiable



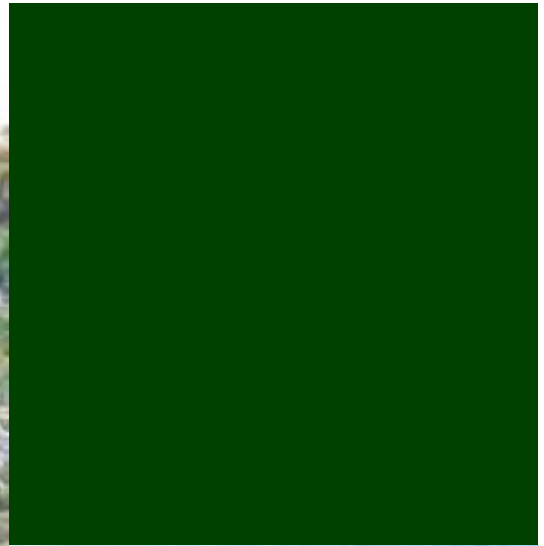
Map by Paul Gioia, WA Herbarium. Current at August 31, 2006

## Weed population

*Callitris preissii* Miq. subsp. *preissii*  
Rottneist Island Cypress Pine

*Callitris preissii* subsp. *verrucosa* (Endl.) J. Garden  
Mallee Cypress Pine  
Contr. New South Wales Natl. Herb. 2:375 (1957)





*Callitris preissii*

- significant species
- associated with a threatened ecological community
- all current known populations in Bush Forever Sites

Photos: Greg Keighery

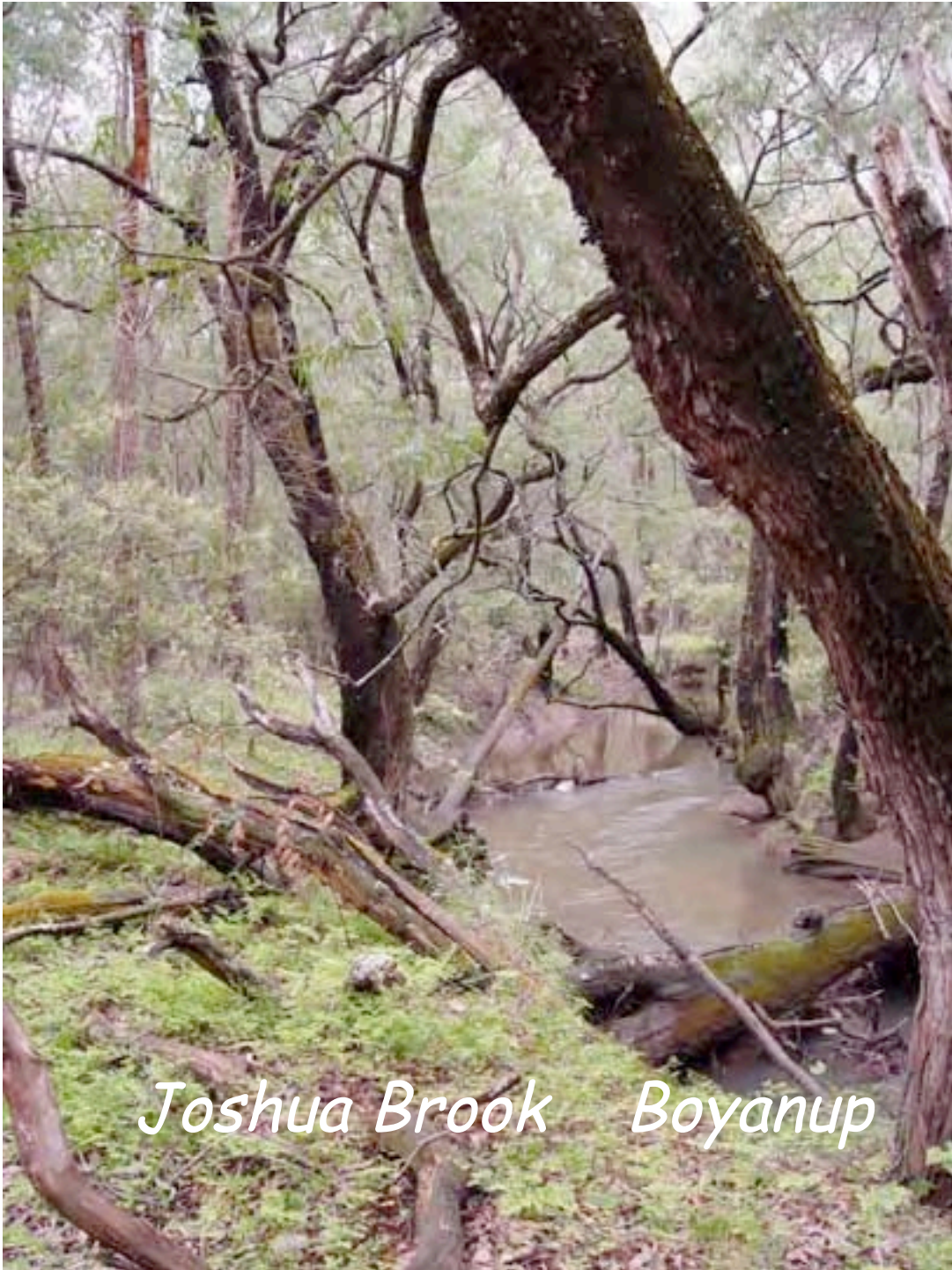




# Serpentine River

Photo: Greg Keighery





*Joshua Brook Boyanup*



Photos: Bronwen Keighery



# Thanks to the following

- people for the use of images they have composed - Greg Keighery, Karen Clarke, Jeni Alford and Mark Brundrett.
- FloraBase and AVH Web sites for use of maps
- AND to the hundreds of people who have contributed to the understanding of the natural areas on the Swan Coastal Plain.

## Further Information

Further information and most references used in this presentation can be found in Volume 2 Bush Forever (BF). Descriptions of BF Sites are also found in Volume 2.

Useful websites related to the BF Project are the Western Australian:

- Department of Planning and Infrastructure (Publications)
- WA Local Government Association (Perth Biodiversity Project, Perth Region Plant Biodiversity Project)