



Carbon in the Western Australian Outback Understanding the Science

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Questions to be Answered

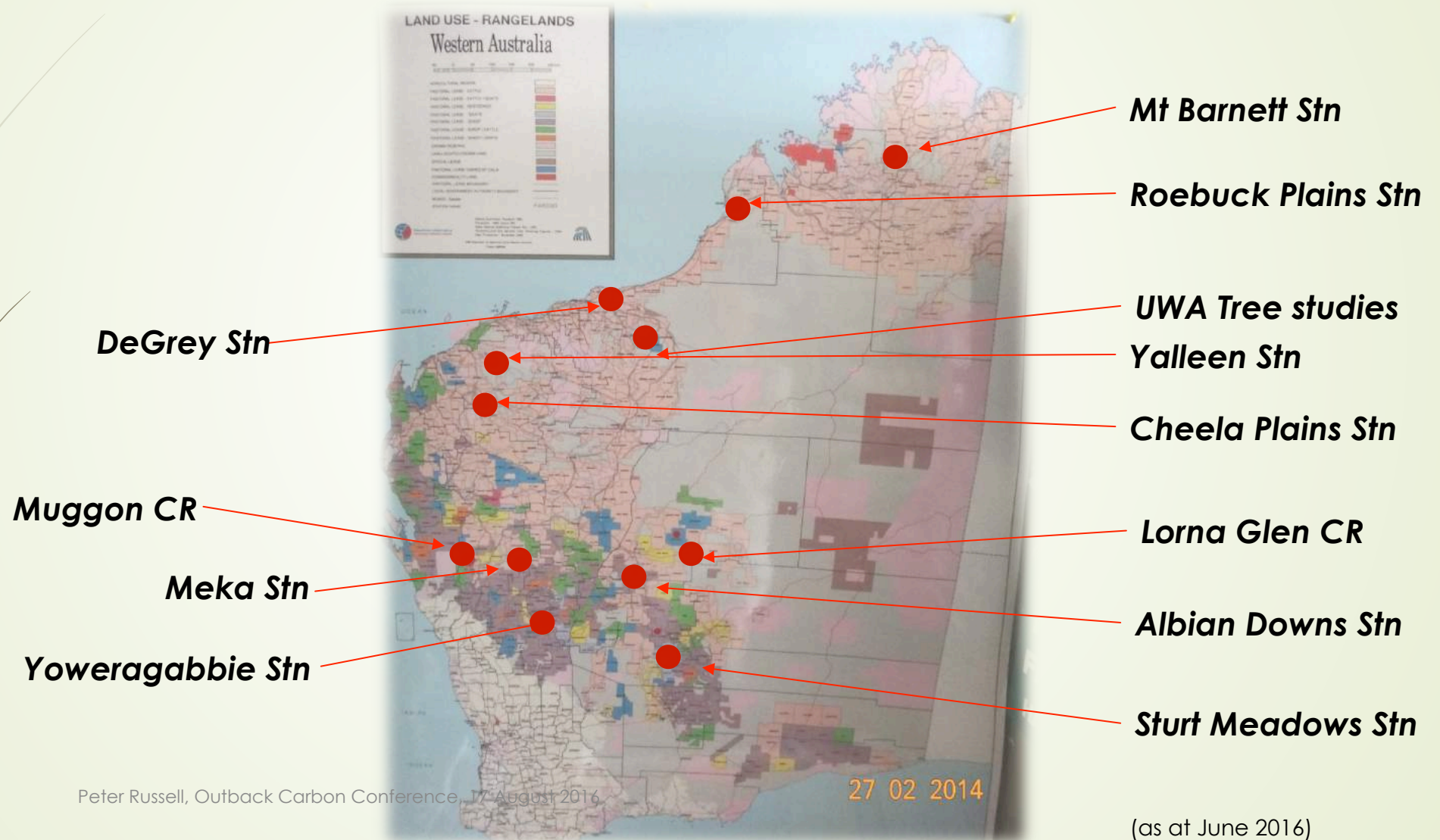
- **How much carbon is sequestered in the WA outback?**
- **Where is it held?**
- **How much more carbon could be stored?**

Presentation Topics

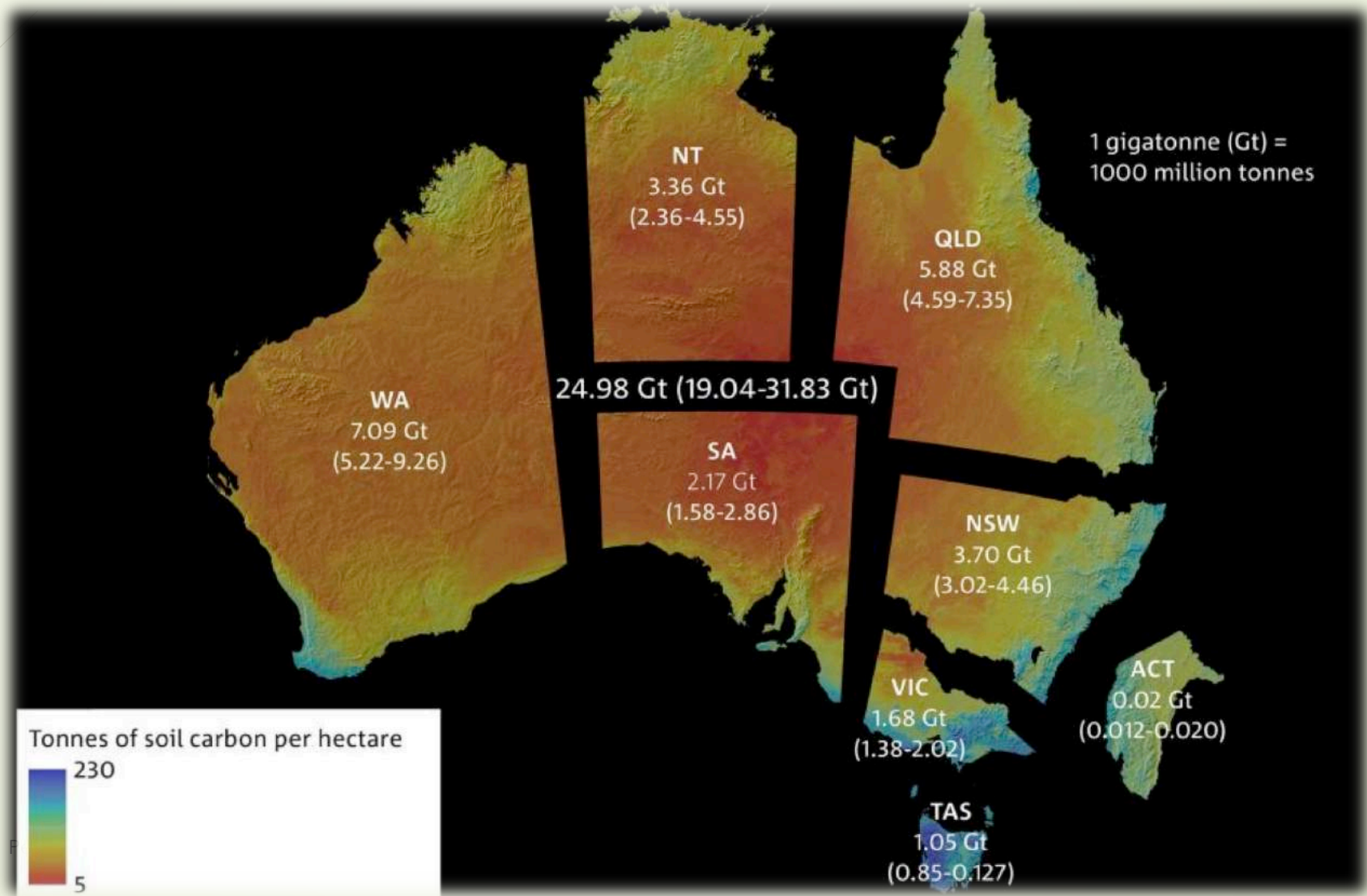
- ***Section 1: Background on Carbon Studies***
- ***Section 2: Land system characterisation***
- ***Section 3: What next in carbon science.***

Section 1: Background on Carbon Science Studies

Carbon studies in WA rangelands



Australia CSIRO Modelled soil carbon



Carbon Awareness Project Rangelands NRM (WA)



Objectives

- ❖ Raising awareness of carbon abatement
- ❖ Provision of sound science



Section 2: Land System Characterisation

Where is the carbon stored?

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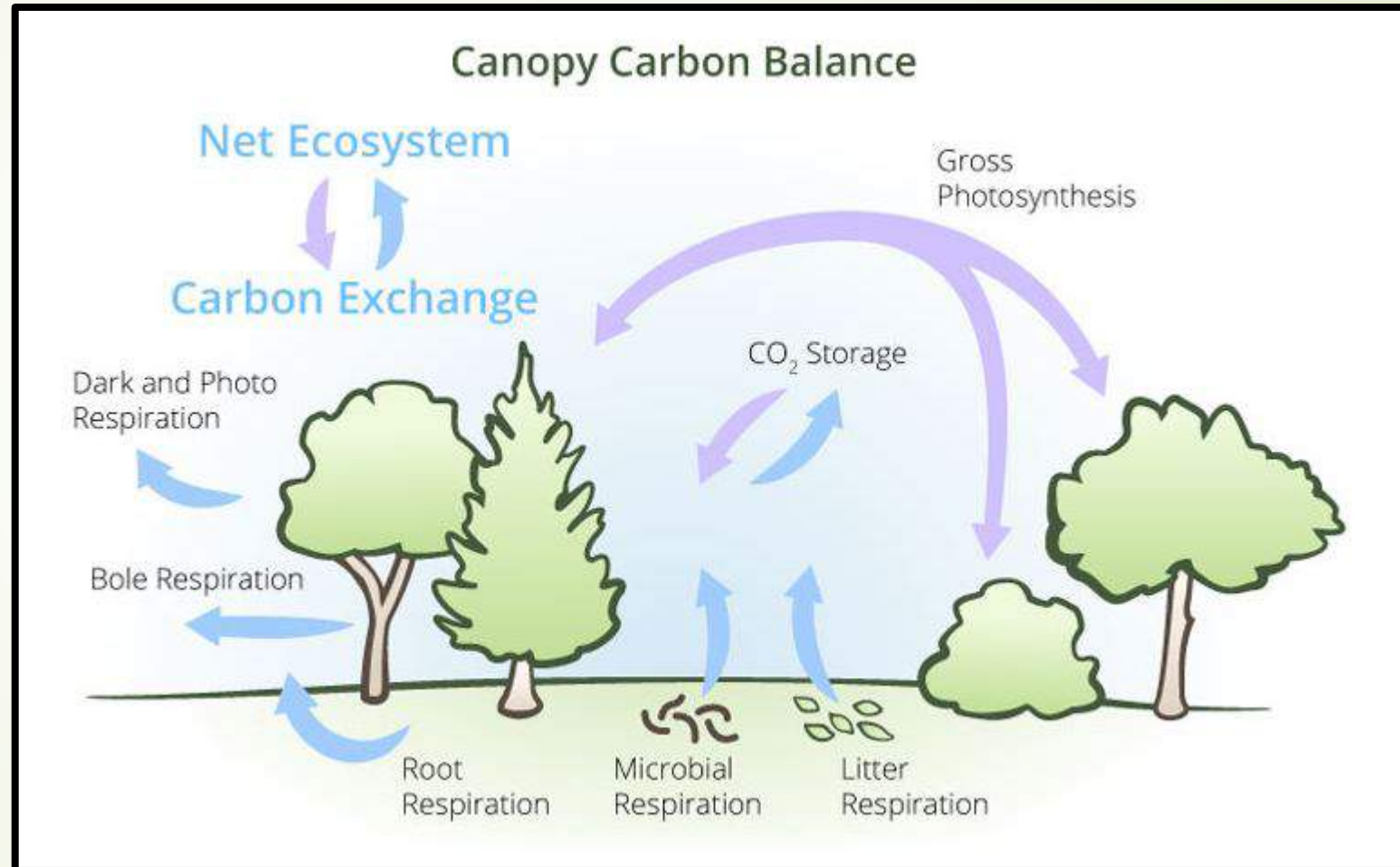
How much carbon is stored?

Where the Carbon is Stored

✓ Plant tissue

✓ Soil

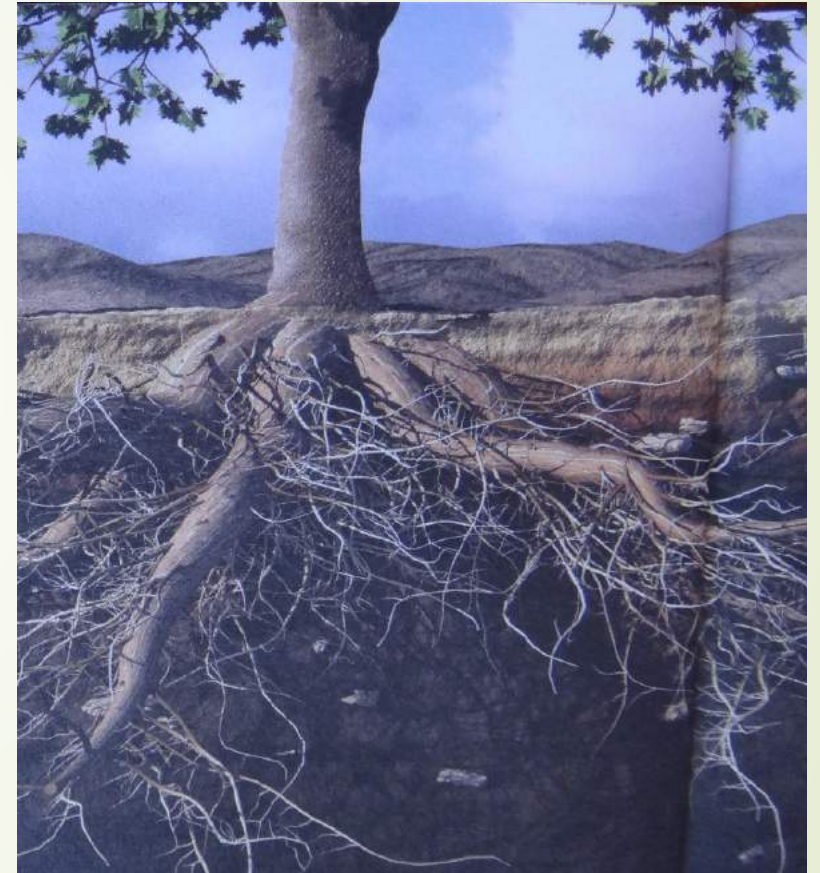
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Land system characterisation

- Carbon density (tC/ha)
- Carbon stocks (tC) for defined area
- Partitioning of stocks above- and below-ground
- Spatial variability (range of values)

Dependent on climate, intrinsic characteristics of the vegetation and soil, and on land use and management.



Description of a land system

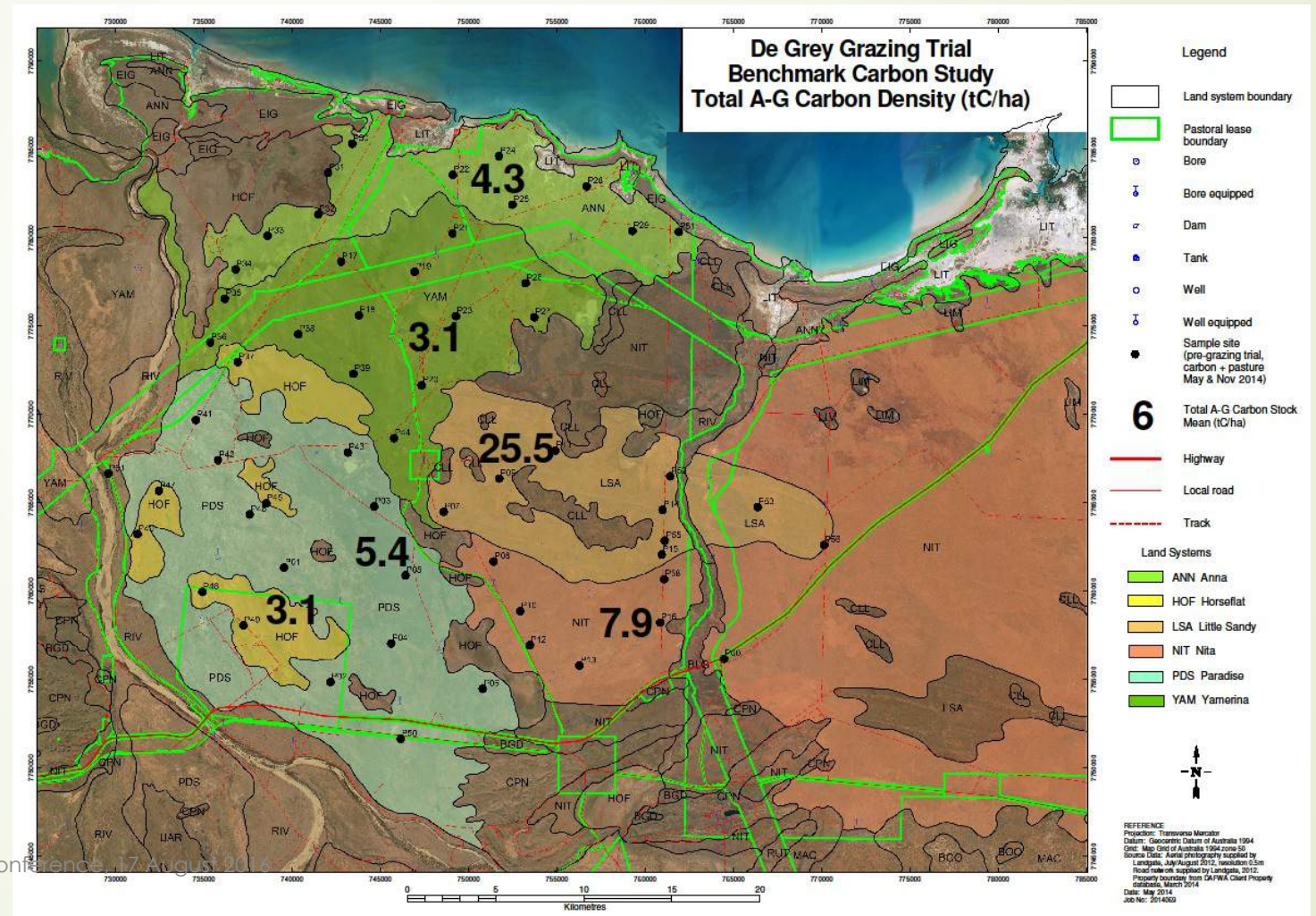
**A land system is an area of land with a
recognisable combination of particular soil
type, vegetation assemblage and topography**

Land system characterisation - an example -

Mean above-ground C
density (tC/ha) for six
land systems

1 tC equiv. to 3.67 tCO₂-e

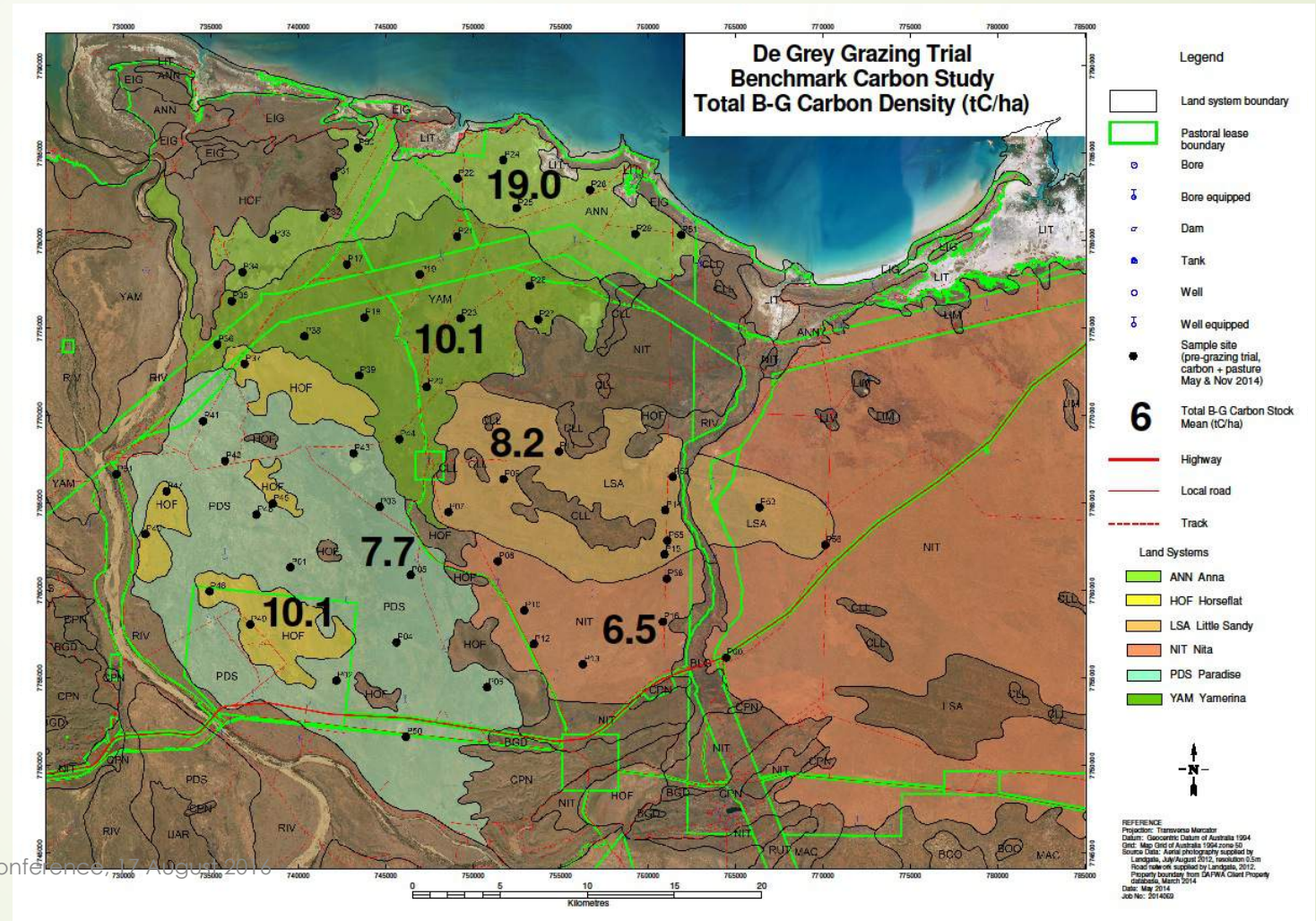
0 20 km



Land system characterisation - an example -

Mean below-ground C density (tC/ha) for six land systems

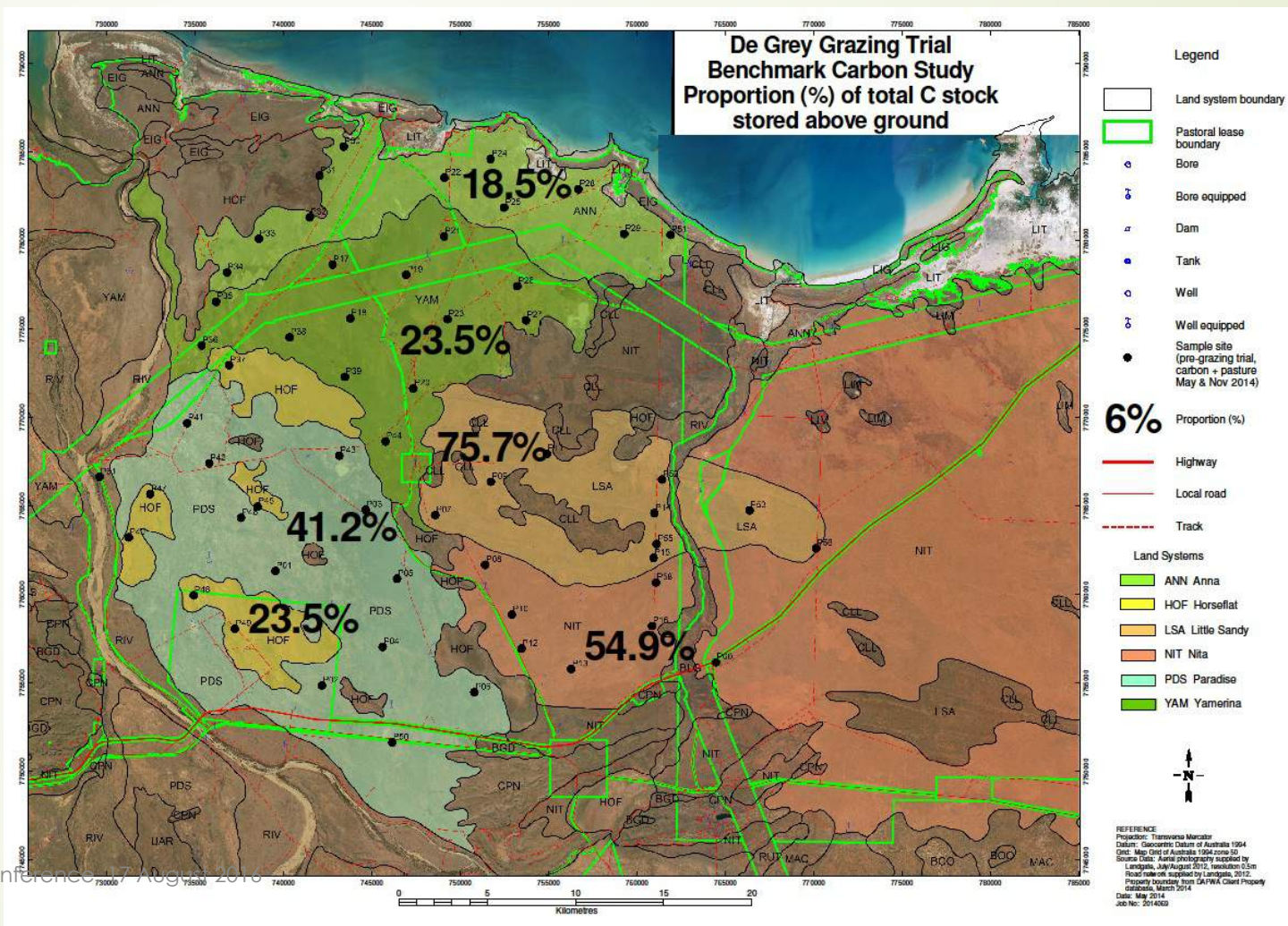
0 20 km



Land system characterisation - an example -

Proportion (%) of total
C stock stored above-
ground

0 20 km



Land system characterisation

More about Soil Carbon - the forgotten +2mm fraction

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Proportion (%) of Soil Carbon in +2mm Fraction

Low (Paradise land system)

High (Little Sandy land system)

1

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Land system characterisation - a contrast of land systems-



<i>Tussock grassland alluvial plain (Pilbara) Horseflat Is</i>	Mean	Range
Above-ground carbon (tC/ha)	3	2 - 18
Below-ground carbon (tC/ha)	10	6 - 18
Above-ground proportion of total stock (%)	23	---



<i>Mulga hard-pan wash plain (Murchison) Woodline Is</i>	Mean	Range
Above-ground carbon (tC/ha)	26	4 - 79
Below-ground carbon (tC/ha)	5	1 - 9
Above-ground proportion of total stock (%)	84	---

Land system characterisation - More about Biomass Carbon -

Measurement of the amount of biomass in plants is not an easy task !!

Plants have:

- ❖ Different growth forms (grasses, shrub, tree)
- ❖ Sizes
- ❖ Shapes
- ❖ Types of tissue (woody/non-woody, alive/dead, attached/detached).



Land system characterisation - More about Biomass Carbon -

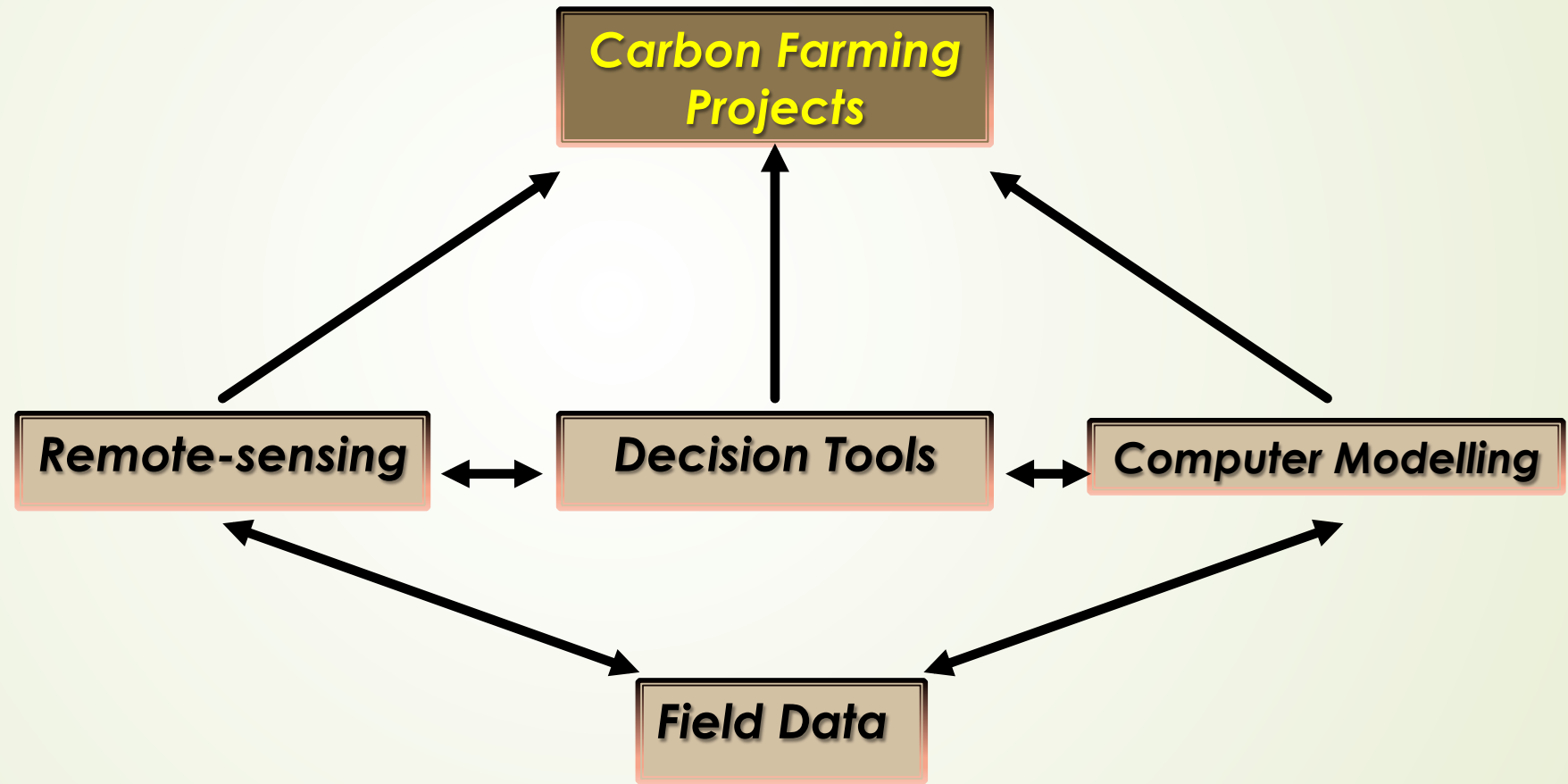
Important findings, applicable to each land system (and condition) studied:

- i. Quantification of relative distribution of C amongst the plant forms**
- ii. Calculation of contained C by growth form *Carbon = mx + c***
- iii. Simple, selected plant shape parameters could be remotely measured**

Section 3 What next in carbon science?

Land system characterisation

- Use of field data -



Wrap-up

Key Messages

- **Huge carbon stocks in the WA Outback**
- **Opportunity to substantially increase the carbon stocks**
- **Carbon farming future is promising**
- **Ecological responsibility**

Thank you



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Sources of Carbon Farming Information

Australian Government

- **Department for Environment:**
<http://www.environment.gov.au/climate-change/emissions-reduction-fund/>
- **Clean Energy Regulator:**
<http://www.cleanenergyregulator.gov.au/ERF/Want-to-participate-in-the-Emissions-Reduction-Fund/Planning-a-project/>

Organisations

- **Rangelands NRM:** <http://www.rangelandswa.com.au/>
- **Carbon Farmers Australia**
- **RepuTex**
- **Carbon Market Institute**

Land system characterisation - More about Biomass Carbon –

In-field:

- ❖ **Measurement of plant shape parameters (height, canopy break & widths, stem diameters (basal & diameter-breast-height))**
- ❖ **Sampled plant parts (living & dead stem, branches, foliage) for weight**

In-laboratory:

- ❖ **Analysis for carbon content (%)**