TERN Ecosystem Surveillance:

AusPlots rangelands data & ausplotsR

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ecoEd Champions Training, Canberra, December 2018

Talk Outline

- Rangelands
- AusPlots:
  - General Description & Aims
  - Locations
  - Methods
- AusPlots (cont.):
  - Nomenclature
  - Training
  - Applications
- ausplotsR
- Tutorial overview

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Rangelands

- Grasslands, shrublands, woodlands, wetlands, and deserts that are grazed by domestic livestock or wild animals.
- Characterised by: vast spaces, old (often infertile) soils, highly variable (often low) rainfall, diverse and variable plant & animal communities
- Rangelands ecosystems cover 81% of the Australian continent
- Understudied. Studies at local/regional-scale (no standardisation)

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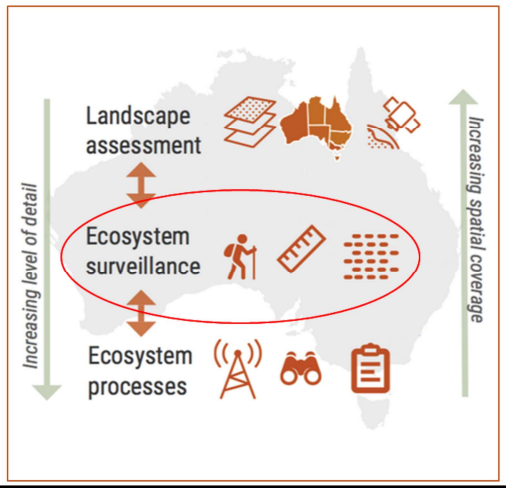
Continental-scale research has been limited in part by lack of precise that that are standardised between jurisdictions.

AusPlots Rangelands: What is it?

- Plot-based surveillance monitoring program, undertaking baseline surveys of ecosystems across the country.
- Aim of AusPlots is to establish and maintain a national network of permanent plots.
- Enable consistent ecological assessment and ongoing monitoring.

TERN 3 Key Monitoring Scales



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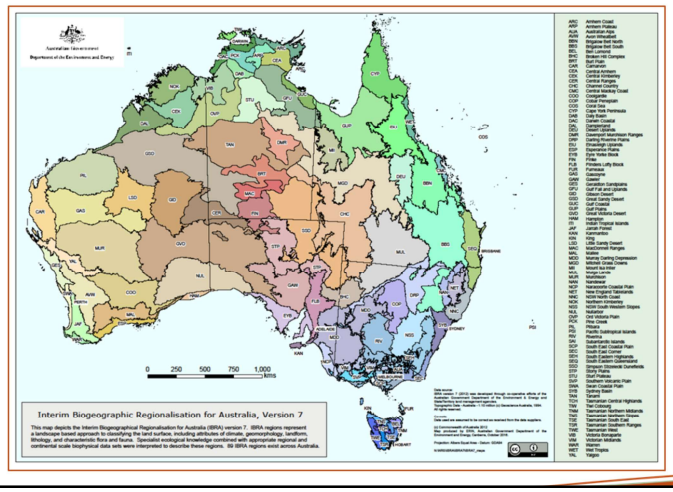
AusPlots Rangelands: Locations[1]

- Across Australia.
- In 52* (49) out of the 89 Australian IBRA7 Bioregions
- Plots surveyed: 582*
- Plots revisited: 77*

*: As per February 2018



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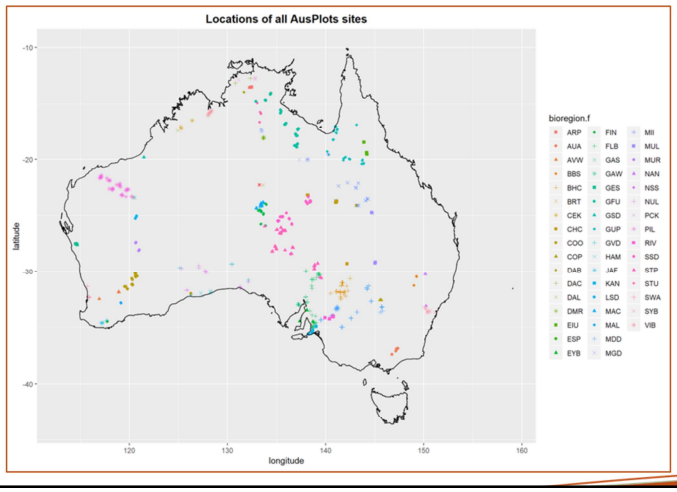
AusPlots Rangelands: Locations[2]

- Across Australia.
- In 52* (49) out of the 89 Australian IBRA7 Bioregions
- Plots surveyed: 582*
- Plots revisited: 77*

*: As per February 2018

We'll make this map in the Tutorial



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AusPlots Rangelands: Methods

- Standardised simple data collection methods for consistent ecological assessment across plots
- Methods developed in collaboration with all rangelands' jurisdictions
- Field data collection aid by an Android app develop by AusPlots team

For additional info see TERN_AusPlots_Desc.pdf

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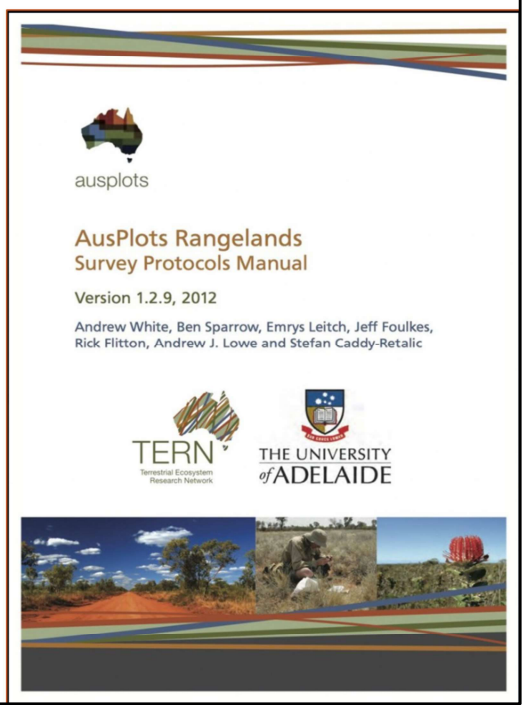

First nationally agreed and consistent method for rangelands monitoring

AusPlots Rangelands: Naming conventions

Naming conventions: 2 Letters for State, 1 letter for Plot Type – 3 letters for Bioregion – 4 numbers for Plot ID

Example: SAS-MDD-0001, corresponds to
South Australia Supersites – Murray Darling Depression – Plot #1

State Code:

Australian Capital Territory	CT	New South Wales	NS
Northern Territory	NT	Queensland	QD
South Australia	SA	Tasmania	TC
Victoria	VC	Western Australia	WA

Plot Type:

A	AusPlots	T	Transects	L	LTERN
S	Supersites	G	General use	TRA	Training

Bioregion code:

Arnhem Coast	ARC	Arnhem Plateau	ARP	Broken Hill Complex	BHC
Burt Plain	BRT	Cape York Peninsula	CYP	Carnarvon	CAR
Central Arnhem	CA	Central Kimberley	CK	Central Ranges	CR

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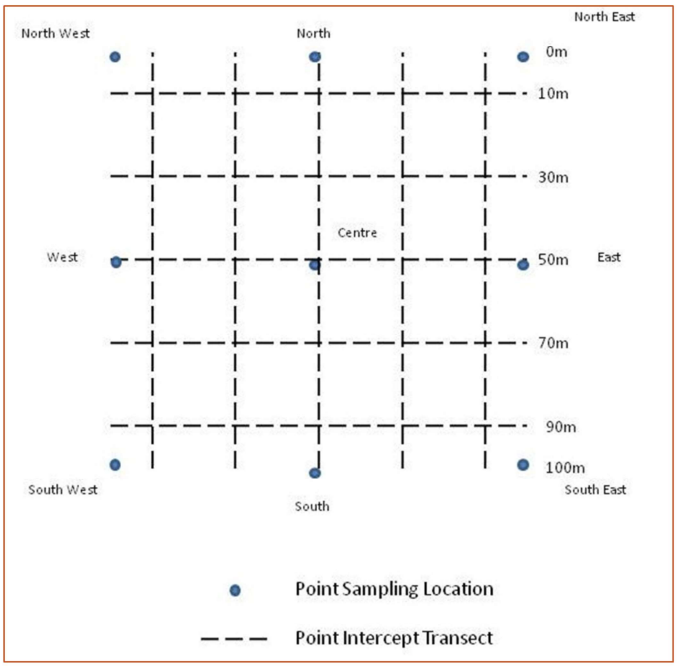
Naming convections

AusPlots Rangelands: Plot layout

- 100m x 100m (= 1ha)
- 9 Sampling Locations
- 10 Transects: 5 N/S + 5 E/W



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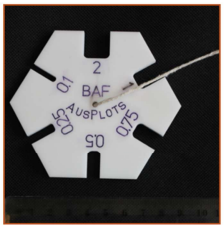
AusPlots Rangelands: Measurements & Sampling[1]

- **Plot**: *Plot Description* ("Yellow Book" for physiography)
- **SW Corner**:
  - *Soil Characterization* (500g samples at 10cm increments to 1m)
  - *Site Photograph*
- **Central Peg**: Photo panorama (360^0) at 3 points
- **9 Point Sampling Locations**:
  - *Basal Area* at 1.3 using basal wedge
  - *Soil Cores* at 3 depths (0-10, 10-20, 20-30cm)
  - *Soil Bulk Density* at 0-10, 10-20, 20-30cm from pit
  - *Soil Metagenomics* (200g)
- **50 Points in Quadrat** (if canopy height > 2m): *Leaf Area Index*



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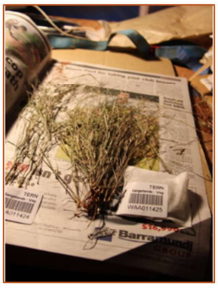
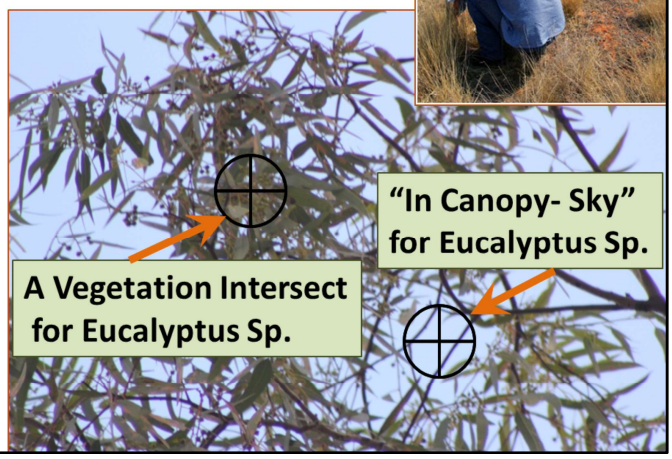
AusPlots Rangelands: Measurements & Sampling[2]

- **10 Transects (at 1m intervals, 1010 points)** record:
  - *Plant species*
  - *Cover/Growth form*
  - *Height*
  - *Stratum at he vertical projection (above & below; laser pointer, densitometer to view canopy)*
- **For each species of vascular plant** (samples barcoded and scanned with app)**:**
  - *Voucher Samples*.
  - *Genetic and Isotope Samples:* Sub-sample form vouchers.





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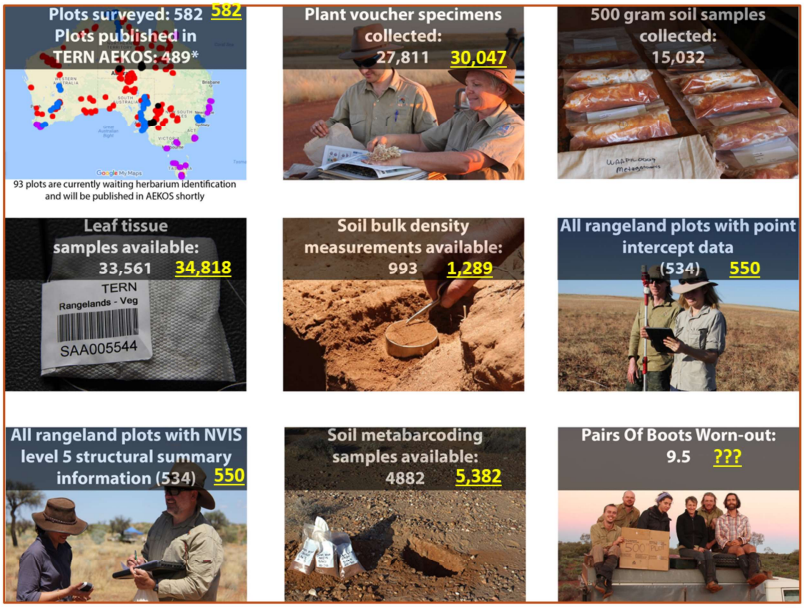
AusPlots Rangelands: Some Stats

Statistics last updated February 2018 (in yellow & box).



No. Plat Vouchers: 30,047

No. Plant specimens in herbaria: 3,519

No. species collected: 4,040

% National Species: 9.4%

No. Plots with LAI data: 292

No. Plots with Photo Panoramas: 550

No. Plots with Basal Area Measurements: 307

Soil Samples for Metagenomic anal. weight: 2,691 kg

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Plot-based surveillance monitoring program, undertaking consistent and ongoing ecological assessment of Australian ecosystems.

The data collected can be integrated with existing knowledge and additional data to help scientists and land managers better monitor, understand, and manage Australian ecosystems.

AusPlots Rangelands: Training

- Training courses:
  - Learning soils, vegetation, and technical aspects of AusPlots work in a rangeland environment
  - 1 day lectures + 3 in the field
  - >= year
- Next one at Calperum in last week of march – Come along!

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AusPlots Rangelands: Applications

Some potential uses of AusPlots Data and Samples:

- Isotopic or genetic analysis of soil and plant samples
- Classification of vegetation types
- Validation of remotely sensed ground cover data (e.g. fractional cover)
- Species presence/absence for training or validation of species distribution models
- Patterns (spatial, across gradients) in: fractional cover (e.g. proportion of green cover), growth form, and community structure composition
- Time series analysis (increasingly possible, currently > 100 sites with revisits) to assess seasonal differences and trends and/or compare to time series remote sensing imagery
- Development of ecological indicators for disturbance

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For more info see references here TERN_AusPlots_ApplsRefs.pdf

AusPlots Rangelands: ausplotsR

- R package that facilitates the extraction and preparation of AusPlots Rangelands data
- Developed by Greg Guerin in the AusPlots team
- Currently 5 functions:
  - 1 to extract live data
  - 4 to prepare the data for visualization and/or analysis:
    - Create Species (P/A, abundance,…) by Site table
    - Create Fractional Cover by Site table
    - Create Growth Form by Site table
    - Create Basal Area (m2/ha) by Site table

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AusPlots Rangelands: Tutorial

1. ACCESSING AND INSTALLING THE ausplotsR PACKAGE
2. OBTAIN & EXPLORE AusPlots DATA: get_ausplots function
3. MANIPULATING AusPlots DATA: Find & Subset Sites in 5 most sampled Bioregions
4. MAP THE SITES: Obtain and prepare Map of Australia & Plot AusPlots Sites
5. SPECIES-LEVEL DATA: 'species_table' function and species occurrence matrices
   - First step: Compute Species by Site table using the function species_table
   - Species Abundance/Percent Cover
   - Species Occurrence (Presence/Absence)
   - Species Diversity
   - Rank-Abundance Curves (= Whittaker Plots) & Relative Abundance Models
6. PROPORTIONAL VEGETATION COVER: `fractional_cover' function
   - Latitudinal pattern in proportional vegetation cover (for a random subset of 200 sites).
   - Temporal Variation in Fractional Cover: Explore, display, and assess (for 5 sites visited twice)
7. GROWTH FORM: 'growth_form_table' function
   - Plant Growth Forms Percent Cover against Sites : Compute using growth_form_table
   - Cluster (Hierarchical Clustering) by Plant Growth Forms Percent Cover, colour leaves by bioregion
8. BASAL AREA: 'basal_area' function
   - Basal Area for each plot (m2/ha): Compute using basal_area
   - Display Basal Areas on map of Australia (dots size proportional to Basal Area)
   - Boxplot of Basal Areas by Bioregion

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More information

- TERN website: www.tern.org.au
- AusPlots: www.ausplots.org
- TERN Data Skills Development Program (DSDP): github.com/ternaustralia/TERN-Data-Skills

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Thank you to Ben Sparrow, Greg Guerin, and Siddeswara Guru

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Citation: Bernardo Blanco-Martín TERN, "TERN Ecosystem Surveillance: AusPlots rangelands data & ausplotsR", ecoEd Champions Training, Canberra, December 2018. https://github.com/ternaustralia/TERN-Data-Skills/ecoEdChamps18/Presentation2_AusPlots

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