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

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)

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.
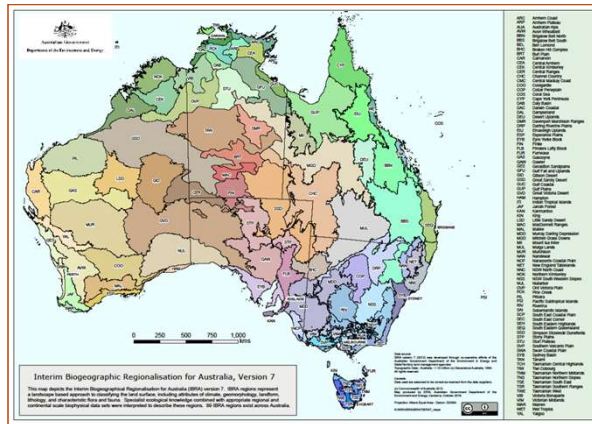- Enable consistent ecological assessment and ongoing monitoring.

TERN 3 Key Monitoring Scales
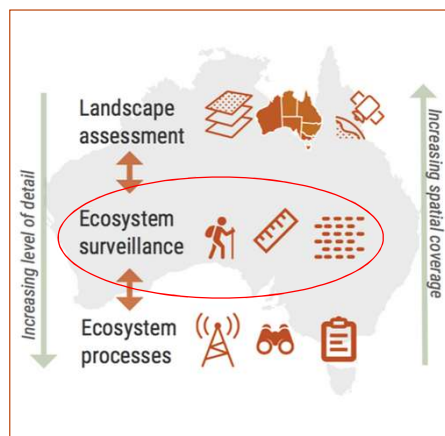
AusPlots Rangelands: Locations[1]

- Across Australia.
- In 52[*] (49) out of the 89 Australian IBRA7 Bioregions
- Plots surveyed: 582[*]
- Plots revisited: 77[*]
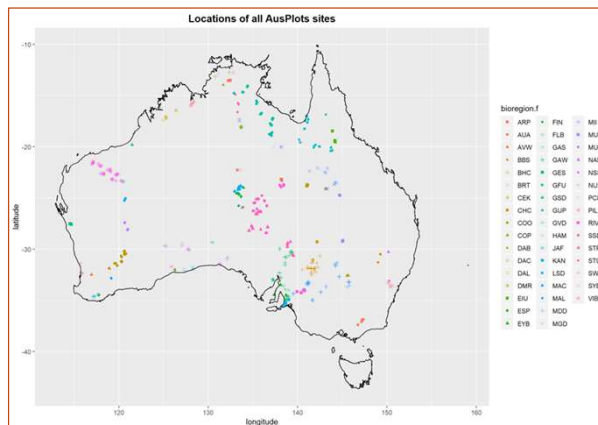
[*]: As per February 2018

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AusPlots Rangelands: Locations[2]

- Across Australia.
- In 52[*] (49) out of the 89 Australian IBRA7 Bioregions
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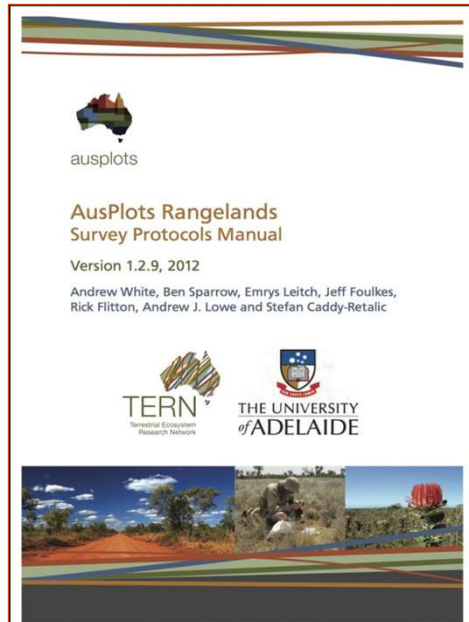
We'll make this map in the Tutorial

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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

RN* Transect Point: 0/100
Species
Abacopteris presliana Abacopteris triphylla

For additional info see TERN_AusPlots_Desc.pdf

ausplots

AusPlots Rangelands
Survey Protocols Manual

Version 1.2.9, 2012

Andrew White, Ben Sparrow, Emrys Leitch, Jeff Foulkes,
Rick Flitton, Andrew J. Lowe and Stefan Caddy-Retalic

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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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AusPlots Rangelands: Plot layout

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

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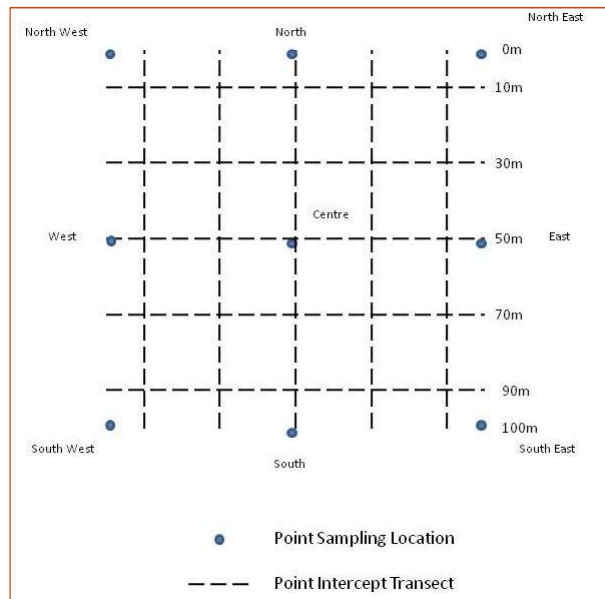
AusPlots Rangelands: Measurements & Sampling[1]

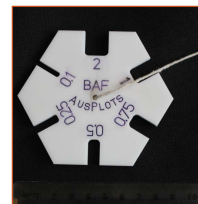- **Plot**: *Plot Description* ("Yellow Book" for physiography)

- **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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"In Canopy- Sky" for Eucalyptus Sp.

A Vegetation Intersect for Eucalyptus Sp.

AusPlots Rangelands: Some Stats

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

Plots surveyed: 582 582
Plots published in TERN AEKOS: 489*

93 plots are currently waiting herbarium identification and will be published in AEKOS shortly

Plant voucher specimens collected:
27,811 **30,047**

500 gram soil samples collected:
15,032

Leaf tissue samples available:
33,561 **34,818**
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Rangelands - Veg
SAA005544

Soil bulk density measurements available:
993 **1,289**

All rangeland plots with point intercept data
(534) **550**

All rangeland plots with NVIS level 5 structural summary information (534) 550

Soil metabarcoding samples available:
4882 **5,382**

Pairs Of Boots Worn-out:
9.5 **???**

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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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!

  www.ausplots.org.au

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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

R x64 3.5.1

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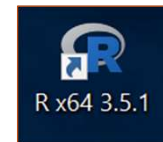
AusPlots Rangelands: Tutorial

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

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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