



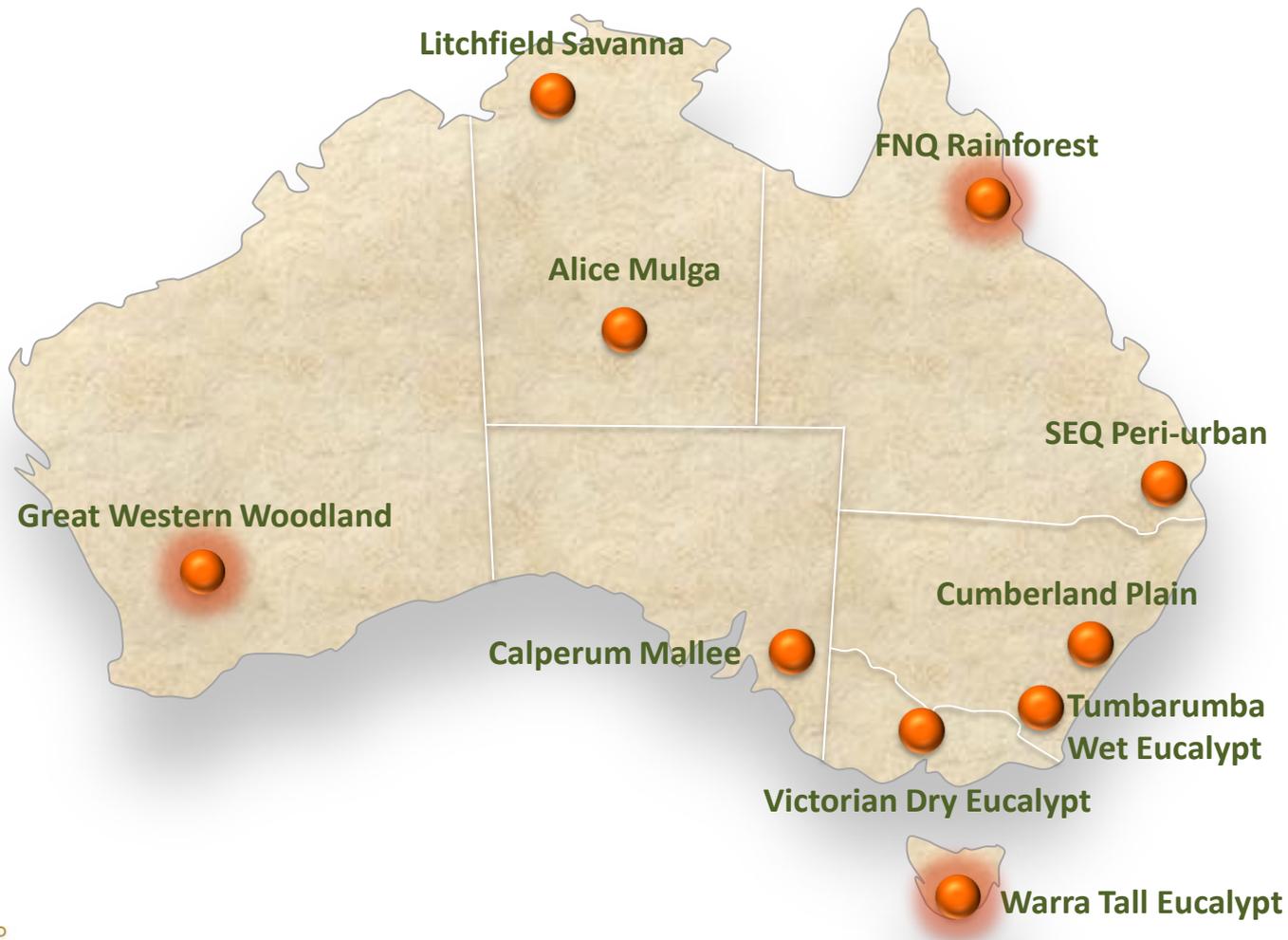
# Coupling Ozflux and Ecology : The Supersite Strategy

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# The Australian Supersite Network Ecosystem Observatories





# What is a TERN Supersite?

- 1) An intensive field station in a typical and important biome
- 2) Physical instrumentation
- 3) Scientists and technical support staff
- 4) Transect(s) or Contrasts (10- 400km)
- 5) One or more nodes.

## Core activities

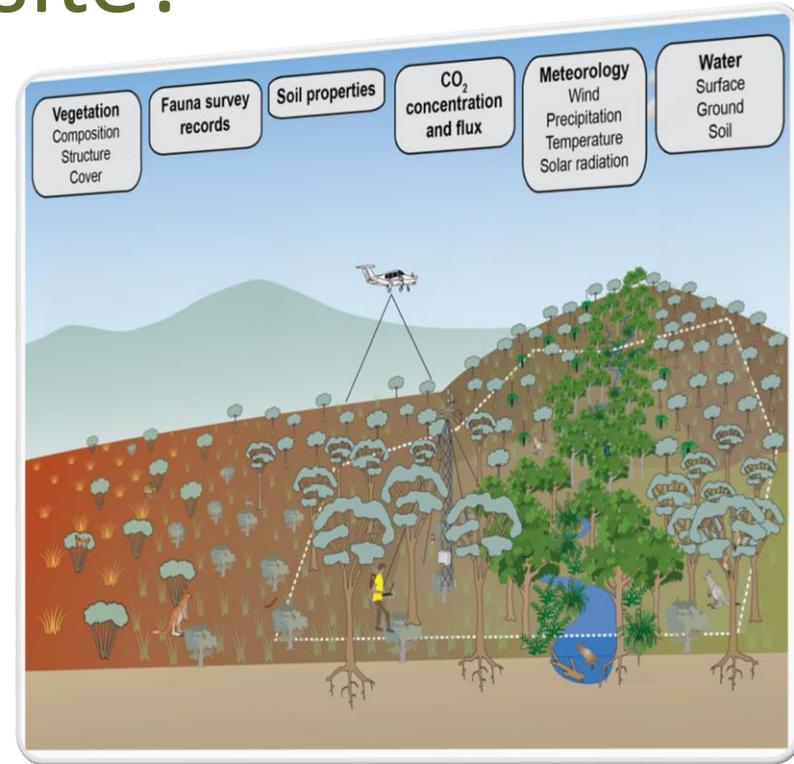
Vegetation plot 1 Ha – field monitoring

Plant physiological and soil/water measurements

Faunal monitoring – field and sensor monitoring

Data / Web portal - linked to TERN portal and ANDS

OzFlux system – biogeochemical fluxes, microclimate



# The Supersite Strategy

Developing a Process based understanding of an Ecosystem

## OzFlux system

- biogeochemical fluxes
- microclimate

## Vegetation plot 1 Ha

- field - diversity, structure, C
- phenocams, LAI

## Plant physiological

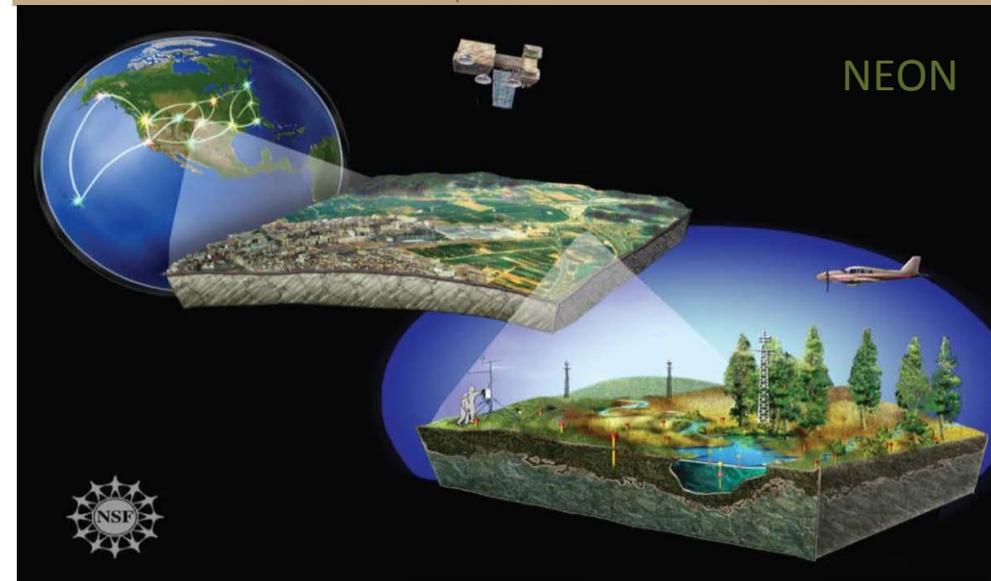
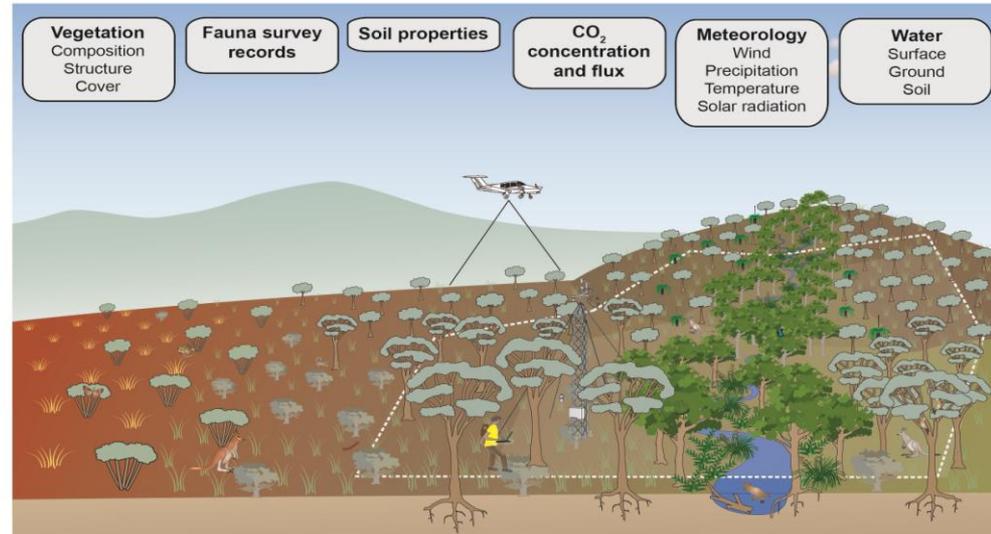
Soil – spatial, metagenomics

## Water

- bores, surface water

## Faunal monitoring

- field – avifauna, invertebrates
- sensor monitoring – acoustics, camera trapping



# The Supersite Strategy

Providing a Resource that facilitates collaborative research Ecologists (and other scientists) are attracted to come and study at a Supersite because of infrastructure, data resource. Ozflux provides part of that key infrastructure. More scientists then more of the picture can be assembled.



# The Supersites and Ozflux

Underpinning measurements of change with the drivers of change

**OzFlux system** - providing spatially integrated measures of carbon and water dynamics – primarily involving the plant community.

– providing microclimate data to underpin most ecological measurements

**Soil** – spatial sampling nutrient and water status, (metagenomics)

**Water** – bores, surface water flows/chemistry/ecology

**Vegetation plot 1 Ha**

– field measures (dbh, height, litter), diversity, structure

– phenocams, LAI - assessing flora – the substrate

**Plant physiological** – field measures to provide the fine detail to assist the modellers in calculating the right fluxes.

**Faunal monitoring** – changes in biodiversity influenced by changes in substrate and climate (and competition).

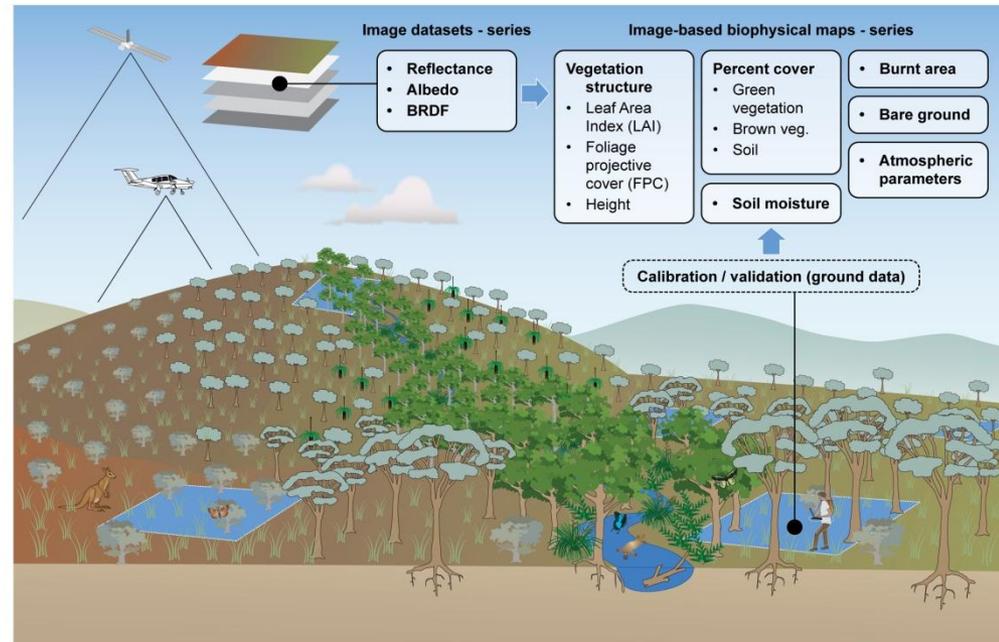


# TERN Auscover

Each Supersite (Alice remains to be done) has had airborne campaigns collecting high resolution Lidar (10cm), hyperspectral and ground based Cal/Val measurements such as terrestrial laser scanning.

The aim is to provide detailed 5km x 5km data sets to assist in biomass and biodiversity assessments. Which in turn can be used to calibrate satellite based products that are produced by Auscover as a national time series.

The Supersites are providing the locations and the vegetation plots are assisting in cross comparison of biomass/biodiversity estimates

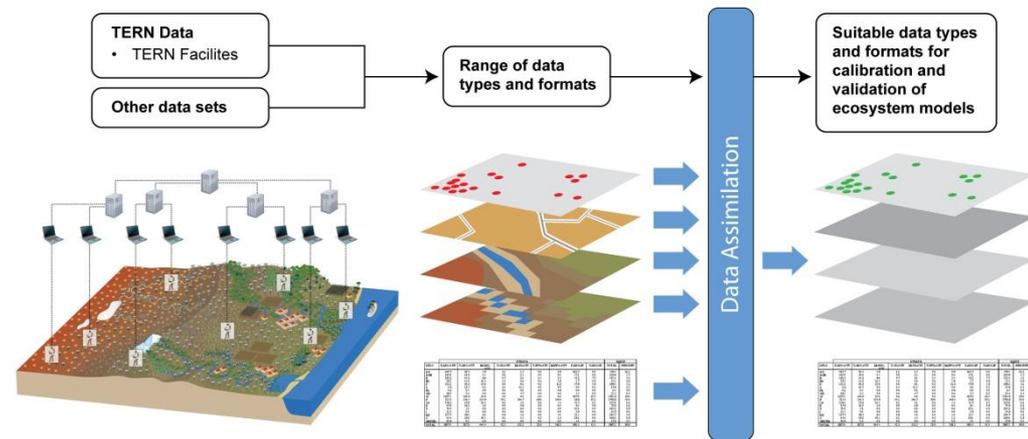


# TERN eMAST

A team of plant ecophysiologicalists from ANU (Atkin, Keith et al) have been working at the Supersites to measure a comprehensive and directly comparable set of plant variables. This data will be used subsequently to inform SVAT type modeling that is being undertaken by eMAST.



Development models are being used to evaluate how to most effectively couple Australian plant response to climate and soil into higher level models such as CABLE and LPJ. Enhancing current



estimates of both Australia's and the global carbon balance.

# BIOMASS TO CARBON

In the next section biomass to carbon estimates will be provided.

Above Ground Biomass (AGB) is typically expressed as a function of diameter at breast height (D), in addition height and density are used where these are available.

$$\text{eg. } \text{AGB} = \exp\{-5.014 + 3.068 \ln(D)\}$$

AGB is then converted to %C.



1) Great Western Woodlands (GWW) – **fire** – Suzanne Prober (CSIRO)  
Arid Mediterranean, Mid-stature-Dry Mixed forest – Salmon Gum.

2) FNQ Rainforest – **biodiversity** – Matt Bradford (CSIRO)  
Warm Tropical, Mid-stature – wet rainforest. – Mixed species

3) Warra Tall Eucalypt – **forestry** – Tim Wardlaw (Forestry Tas)  
Cool Temperate, Tall-Wet Eucalypt forest – Mountain Ash.

# Great Western Woodlands Supersite

16 million hectare mosaic of semi-arid woodland, heathland and mallee vegetation in south-west WA.

Globally unique - nowhere else does woodlands persist on 250 mm MAP.

*“Are old-growth semi-arid woodlands carbon sources or carbon sinks?”*

*“Where do woodland trees source their water from?”*



# Great Western Woodlands Supersite

## Credo Station node

First vegetation type: Salmon gum woodland

Core 1Ha vegetation plot established in 2012

Salmon Gum woodland. Proximity to flux tower.

Above ground biomass (ton/ha) 35

Estimated **total living biomass C** (ton/ha) **24**

Second vegetation type: Gimlet woodland

1Ha vegetation plot established in 2012.

Above ground biomass (ton/ha) 33

Estimated **total living biomass C** (ton/ha) **23**

Credo Station ~ **250mm MAP**.

Groundwater bores drilled in 2013.

No water to bedrock (~ 50m)!



# FNQ Tropical Rainforest Supersite



## 1) Robson Creek node

Upland tropical rainforest

## 2) Daintree node

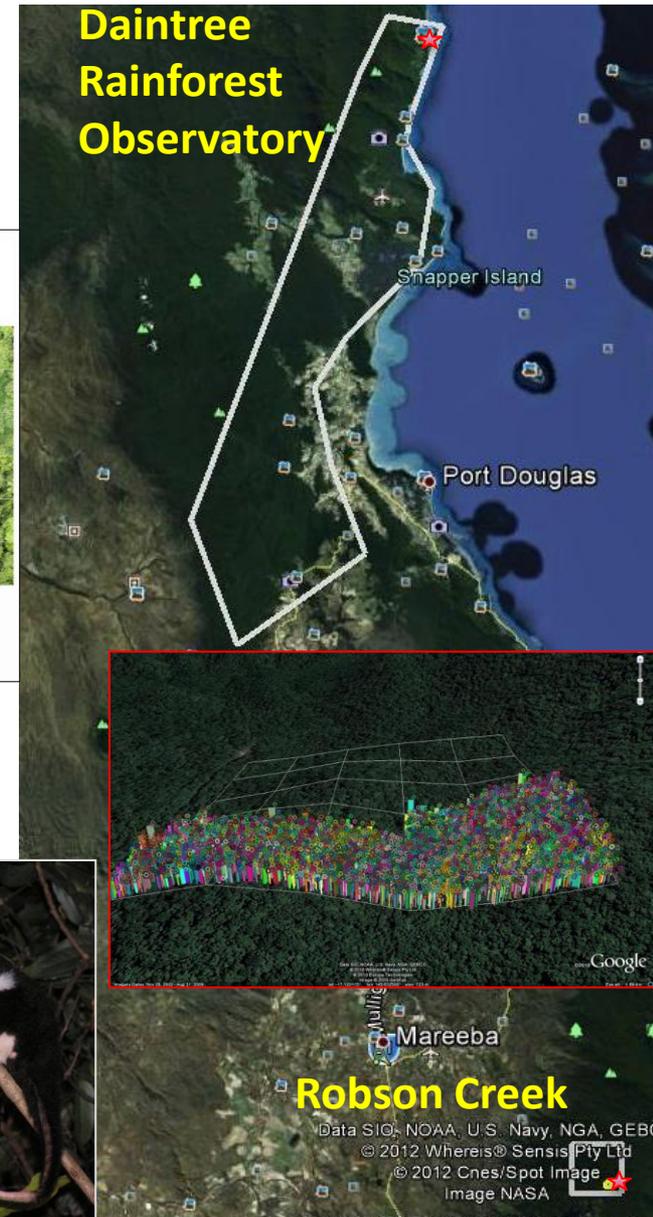
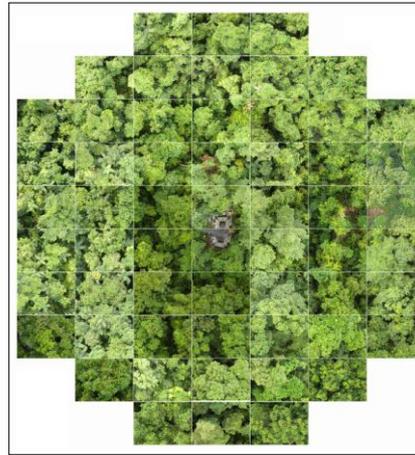
Lowland tropical rainforest

## Major clines in

- Altitude
- Rainfall
- Temperature

*“What are the fundamental carbon & water stocks and flows in FNQ tropical forests and are these likely to change significantly in the future?”*

*“How does seasonal water availability relate to species distribution, growth and phenology?”*



# FNQ Rainforest Supersite

## Robson Creek node

Core 1Ha vegetation plot established in 2012

Mixed species upland rainforest 266 species.

Above ground biomass (ton/ha) 409

Estimated **total living biomass C** (ton/ha) **247**

Robson **2000mm** MAP.

## Daintree node

Core 1Ha vegetation plot established in 2000

Above ground biomass (ton/ha) 270

Estimated **total living biomass C** (ton/ha) **148**

DRO **5700mm** MAP.

Groundwater bores (3) drilled in 2008.

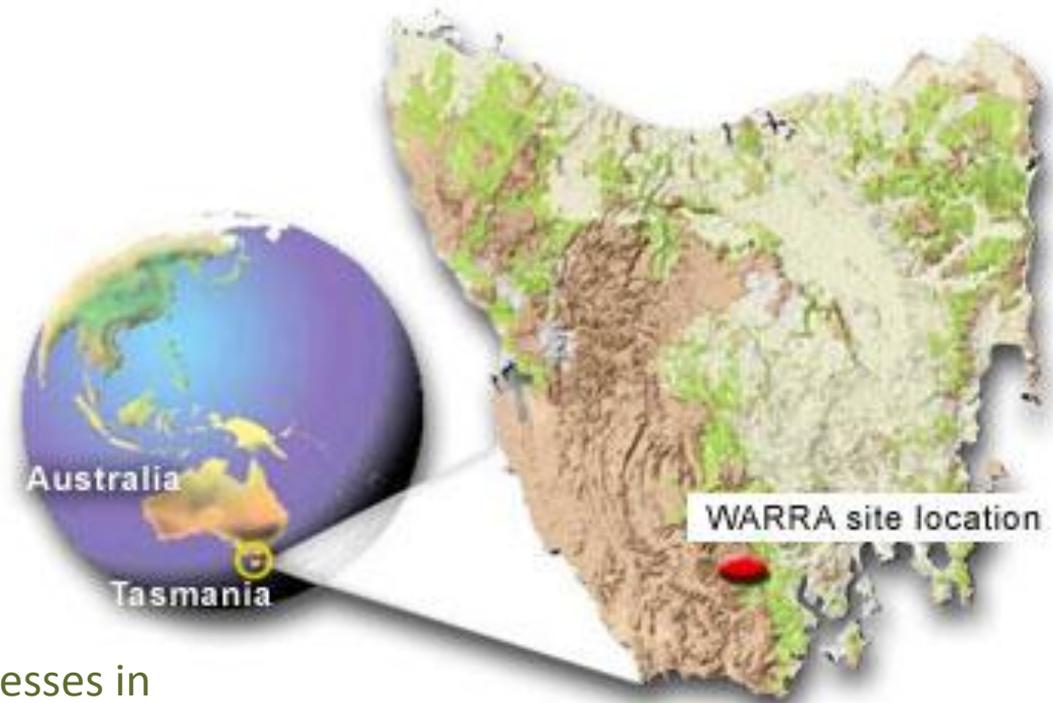
near constant 10m water table.

Carbon stocks are not reliant on ground water.



# Warra Tall Eucalypt Supersite

Managed / Unmanaged Wet  
*Eucalyptus obliqua* forest



“Understand fundamental ecological processes in  
*E. obliqua* wet forests”

“Determine long-term effects of different forest  
management regimes on natural diversity and  
ecological processes”



# Warra Supersite

## Warra 1Ha

Core 1Ha vegetation plot established 2012-13

Mixed species wet temperate 19 species.

Above ground biomass (ton/ha) 1205

Estimated **total biomass C** (ton/ha) **687**

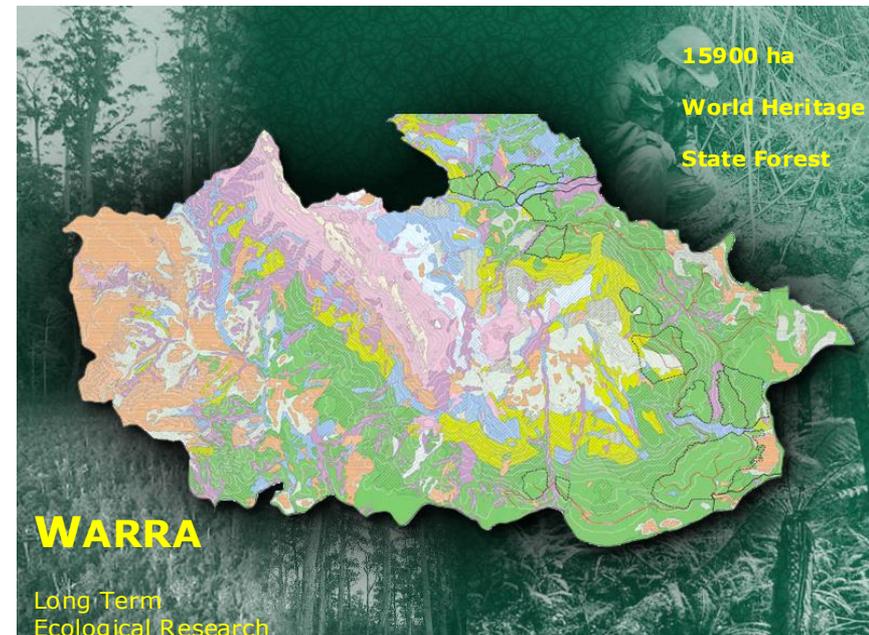
Warra **1650mm** MAP.

CWD volume in this forest 1236 m<sup>3</sup>.

= **349 ton/ha C!**

Longest running Intensive LTER in Australia – 15 years.

Ecosystem measurements used to inform management practice.



# ACKNOWLEDGEMENTS

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