# Supporting savanna fire management via carbon farming

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CSIRO

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Northern Australia Environmental Resources Hub

National Environmental Science Programme

# Overview

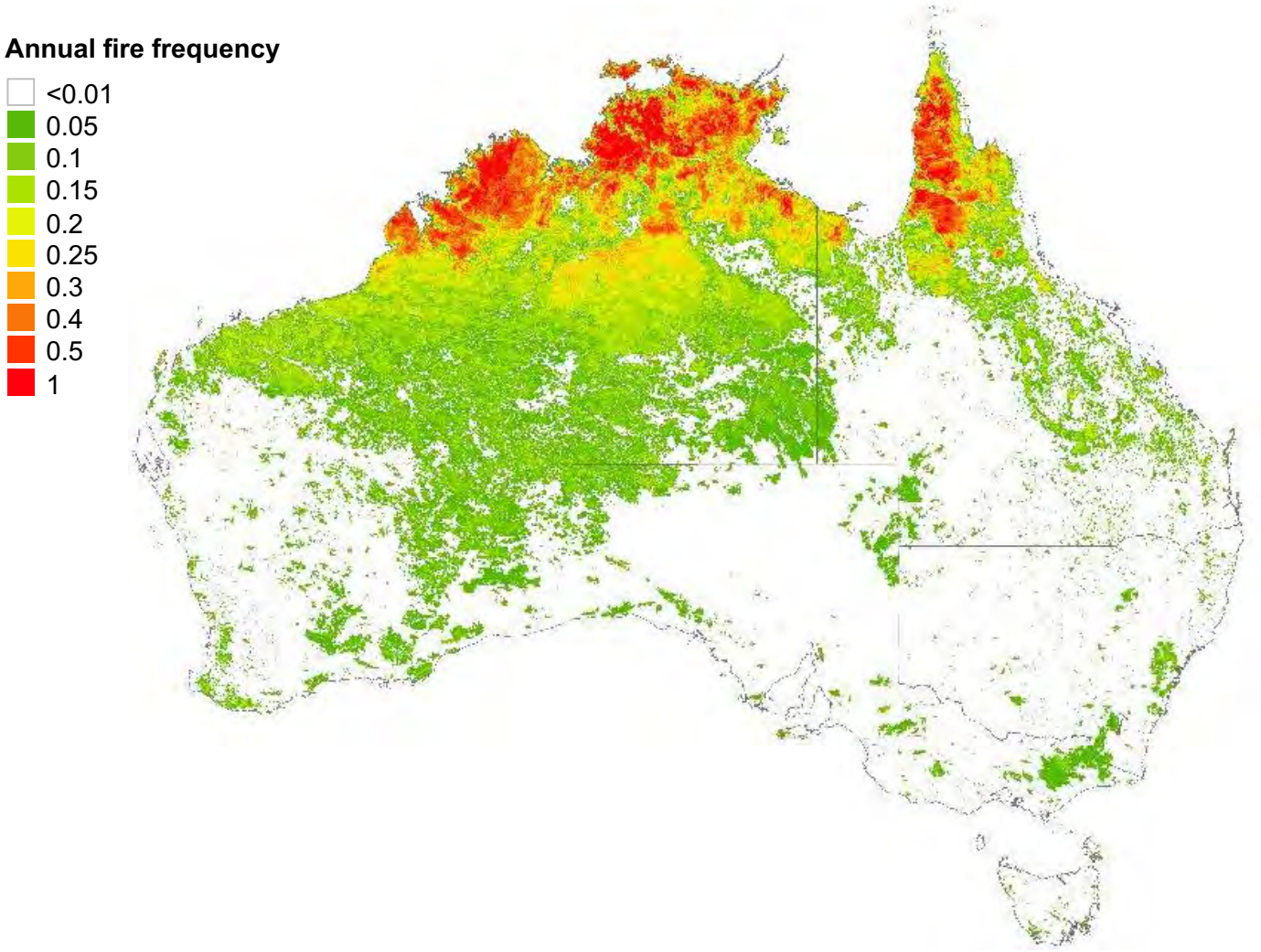
Context of project

Research to support CFI savanna methodology and National Greenhouse Gas Inventory

R&D to position carbon farming and inventory for the future

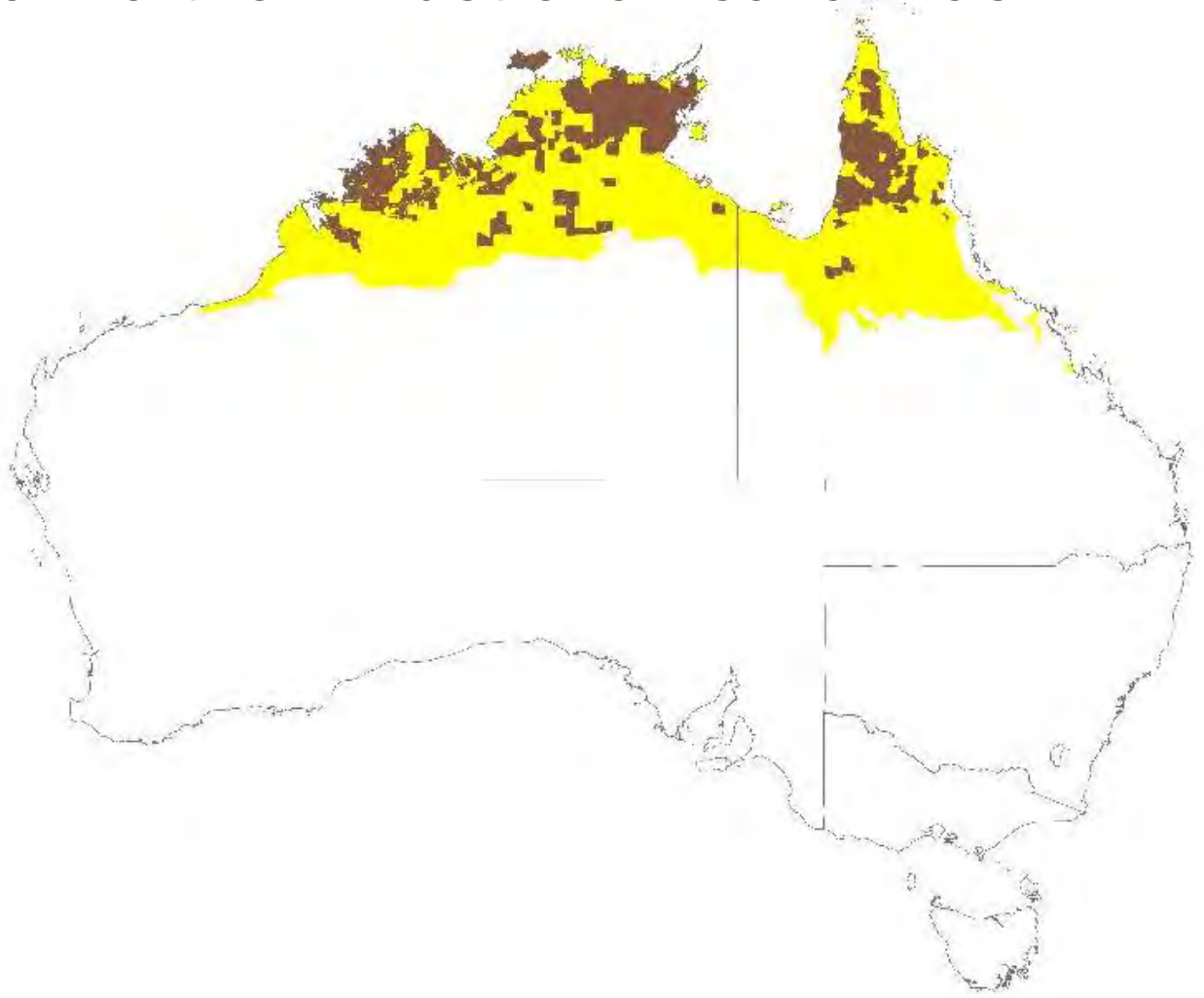
# Savanna carbon farming

## Managing fires & carbon while supporting livelihoods



# Savanna carbon farming

2015 Carbon Farming methodology adopted in >30% of northern Australian savannas

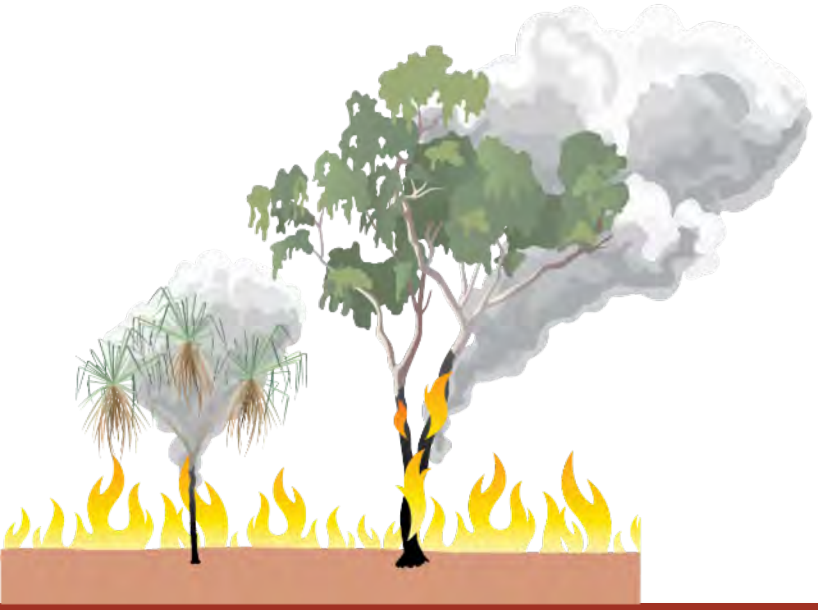


# Savanna carbon farming

- 25 Indigenous owned and operated projects
- Improved Indigenous fire management on 17.3 M ha
- C. 1.2 M tonnes of $CO_2$ abatement per year
- C. $16 M worth of Carbon Credits in 2017/18

# Emissions avoidance (2015)

- Reduced smoke



# Emissions avoidance 2015 methodology
# Two decades out of date (IPCC 1996)



4 AGRICULTURE

## 4.4 Prescribed Burning of Savannas

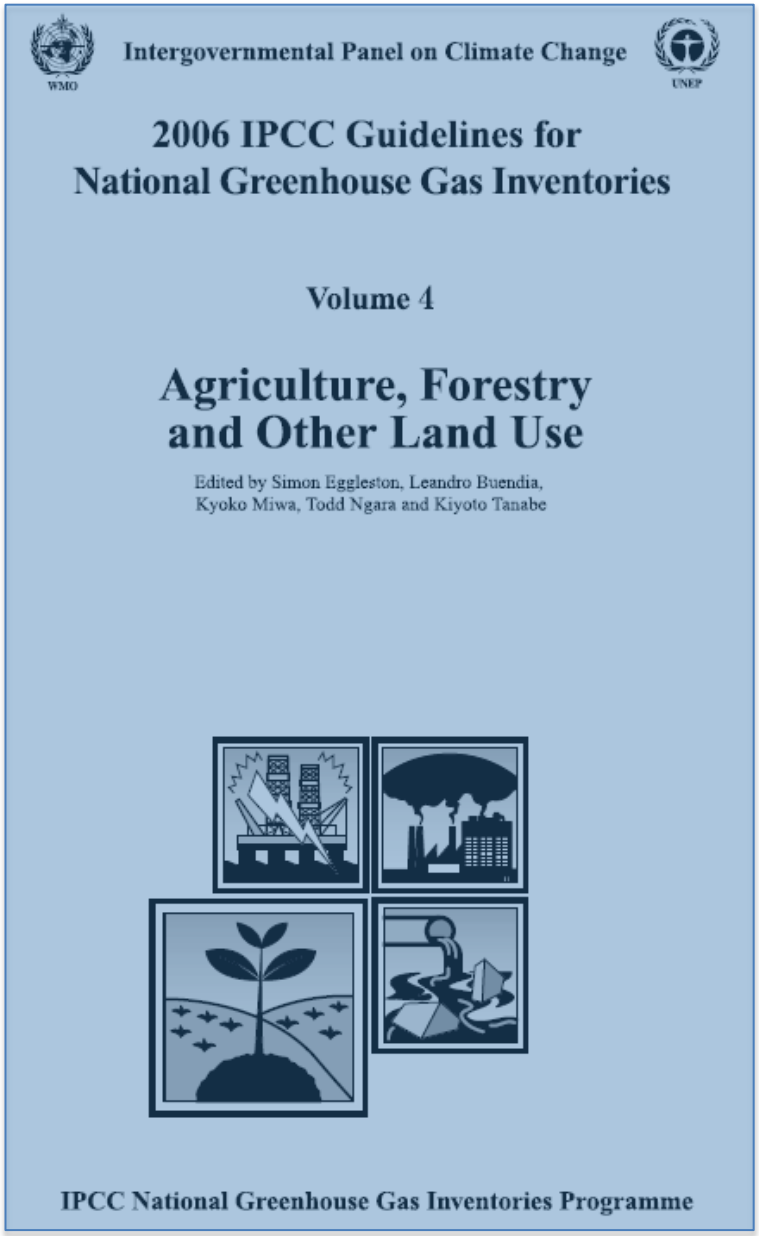
### 4.4.1 Introduction

Savannas are tropical and subtropical formations with continuous grass coverage. The growth of savannas is controlled by alternating wet and dry seasons: most of the growth occurs during the wet season. Man-made and/or natural fires frequently occur during the dry season, resulting in nutrient recycling and regrowth. Large scale burning takes place primarily in the humid savannas because the arid savannas lack sufficient grass cover to sustain fire. Savannas are

**DEGRADED SAVANNAS**

Although the default assumption is that biomass burned on savannas regrows in a short period, this may not always be the case. Sometimes savannas are burned too often, or

# Compliance with IPCC 2006 guidelines



# An integrated handling of emissions avoidance and carbon sequestration

**CSIRO** PUBLISHING

*International Journal of Wildland Fire* **2016**, *25*, 1252–1263
http://dx.doi.org/10.1071/WF15218

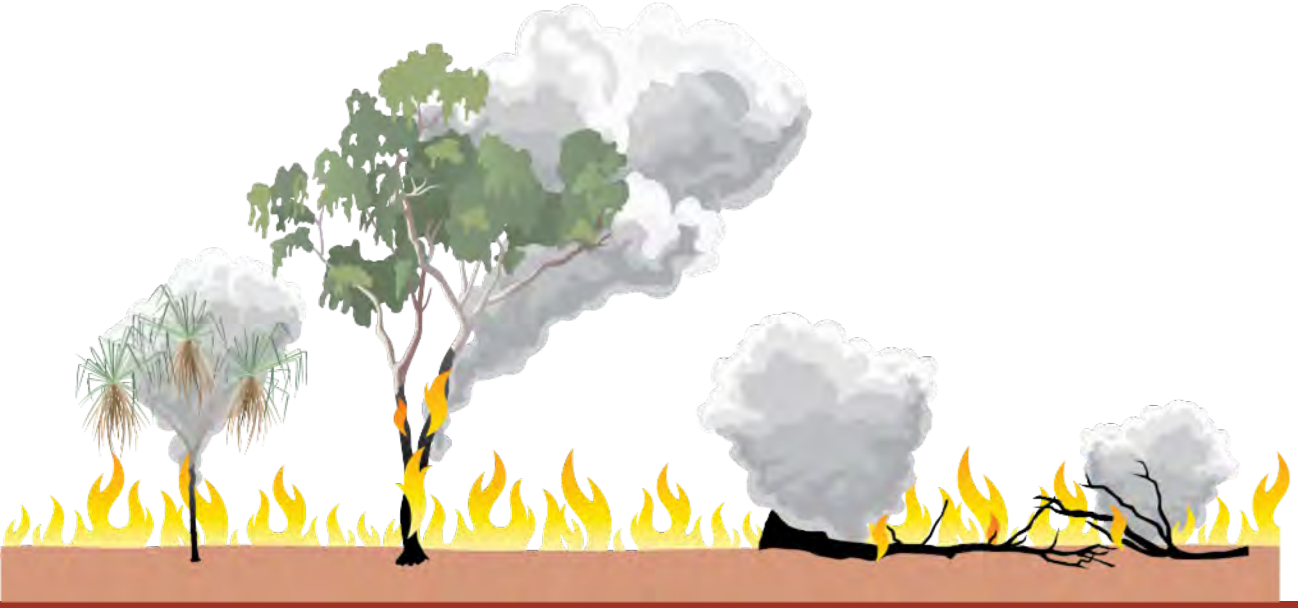
## Dead organic matter and the dynamics of carbon and greenhouse gas emissions in frequently burnt savannas

*Garry D. Cook*[A,D], *C. P. (Mick) Meyer*[B], *Maëlys Muepu*[C] *and Adam C. Liedloff*[A]

$$\bar{\Phi} = \left(\frac{1}{r}\right) \int_0^r \Phi(t)\,dt$$

# Emissions avoidance & carbon sequestration (2018)

- Reduced smoke
- Carbon in dead wood
  - on ground



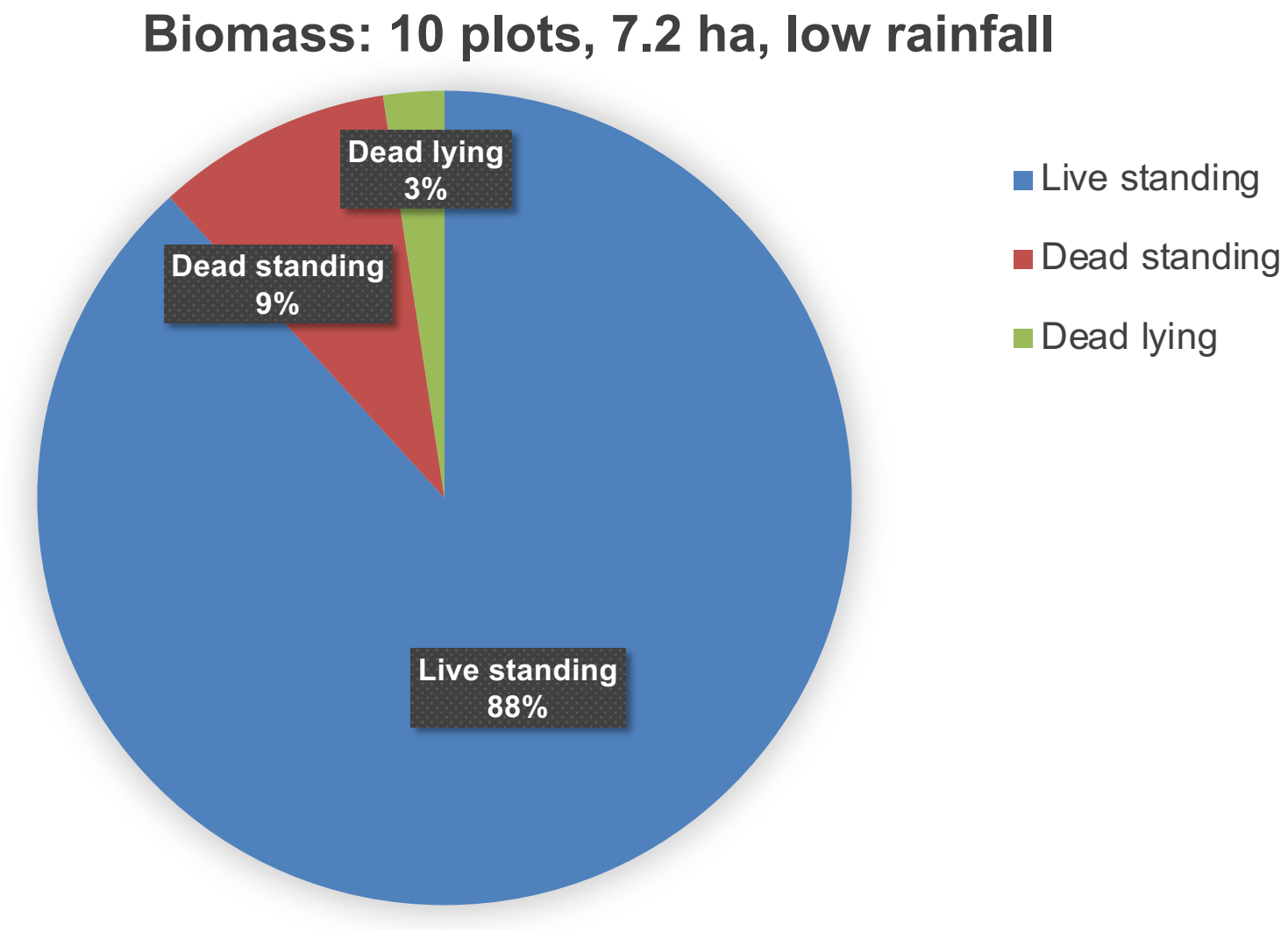
# Emissions avoidance & carbon sequestration (2018 + NESP)

- Reduced smoke
- Carbon in dead wood
  - on ground

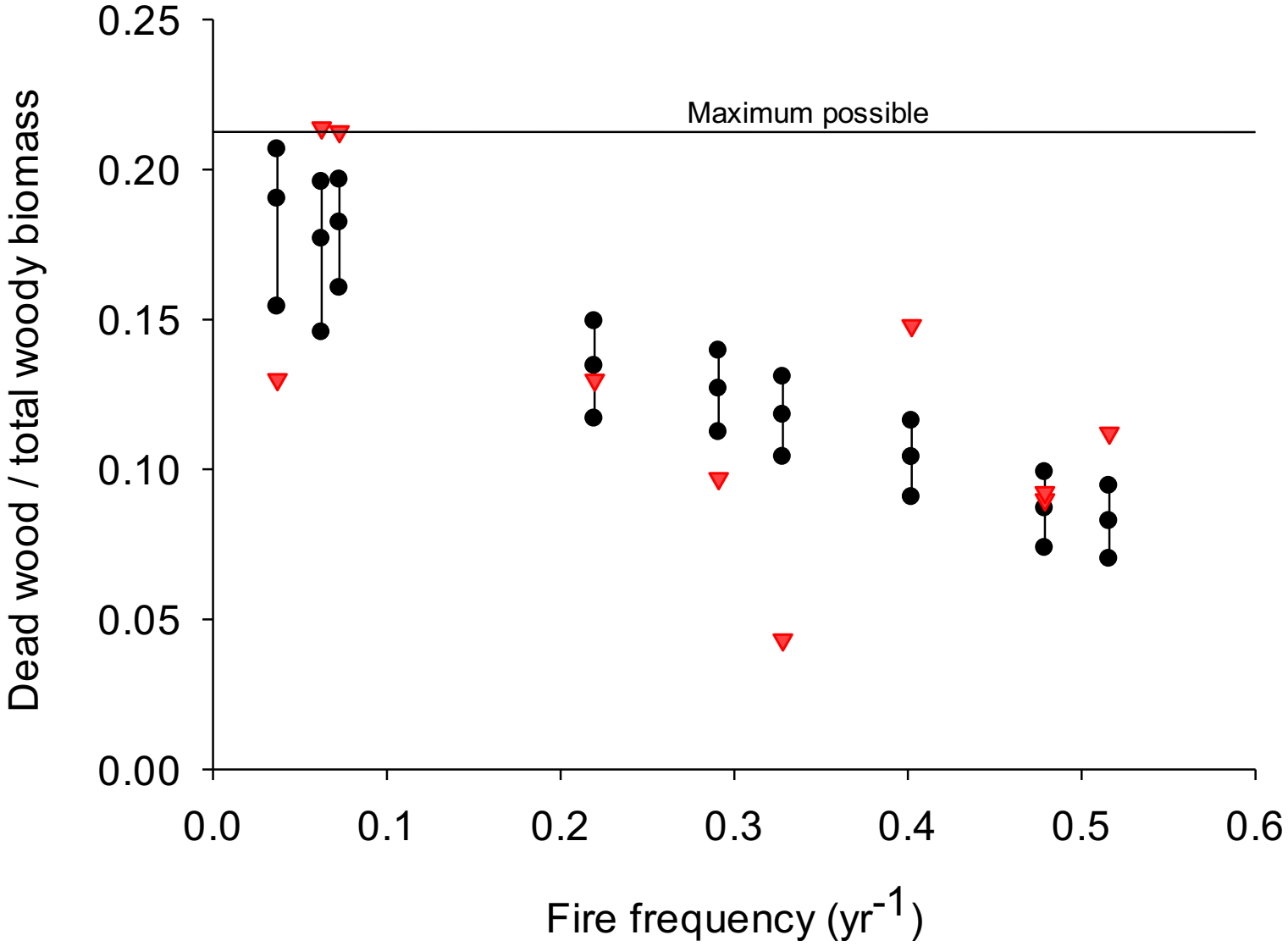
# Emissions avoidance & carbon sequestration (2018 + NESP)

- Reduced smoke
- Carbon in dead wood
  - on ground
  - standing

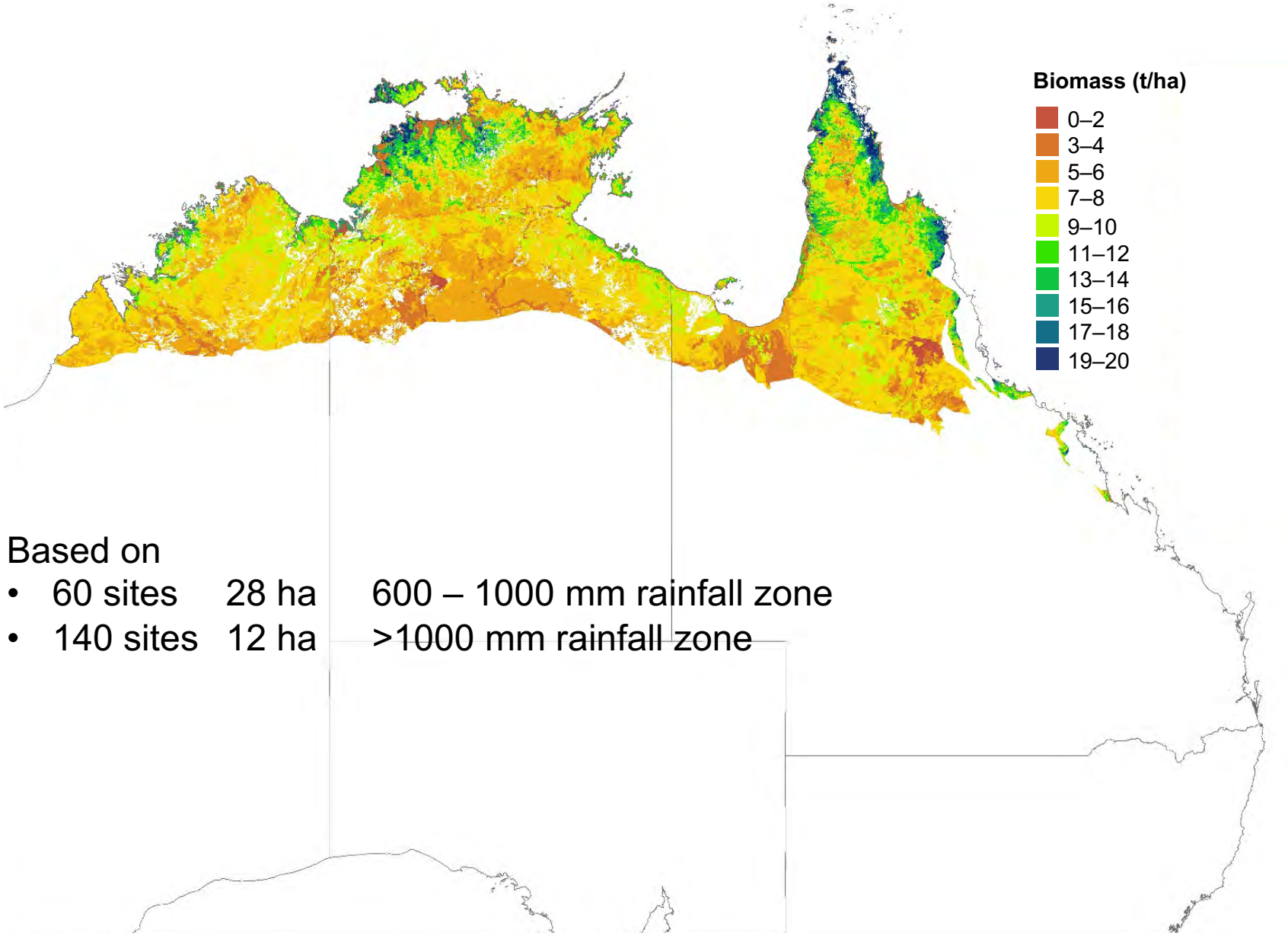
# Standing dead wood



# Less fire = more dead wood = more carbon



# Total dead wood




Based on

- 60 sites 28 ha 600 – 1000 mm rainfall zone
- 140 sites 12 ha >1000 mm rainfall zone

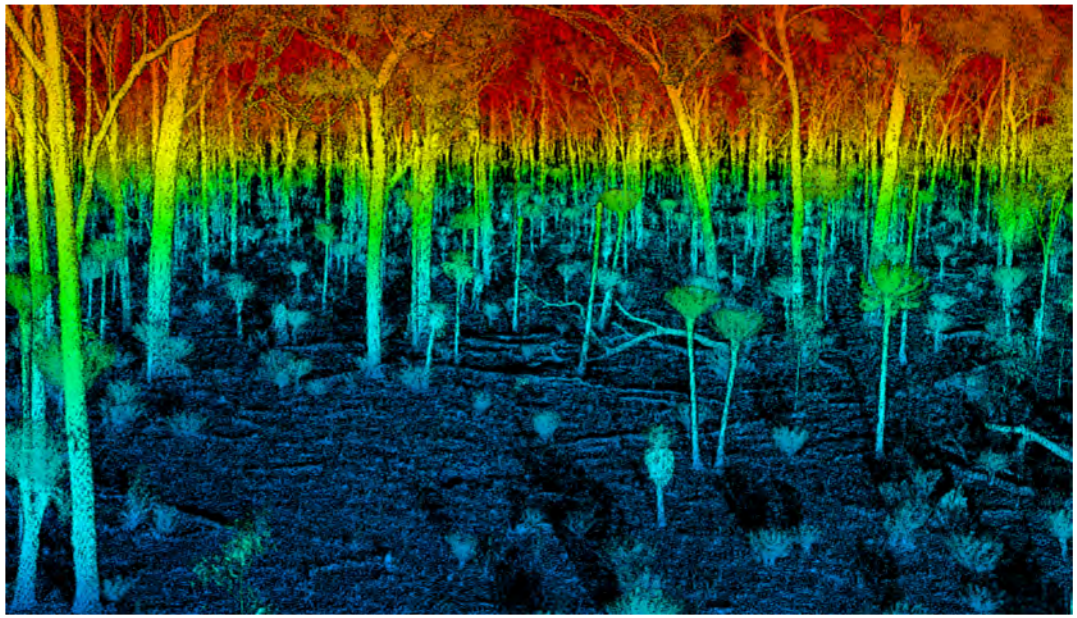
# Quantifying dead wood in savannas

- 23 billion live trees
- Weighing 3.6 billion tonnes
- >2% die per year

# Key outputs

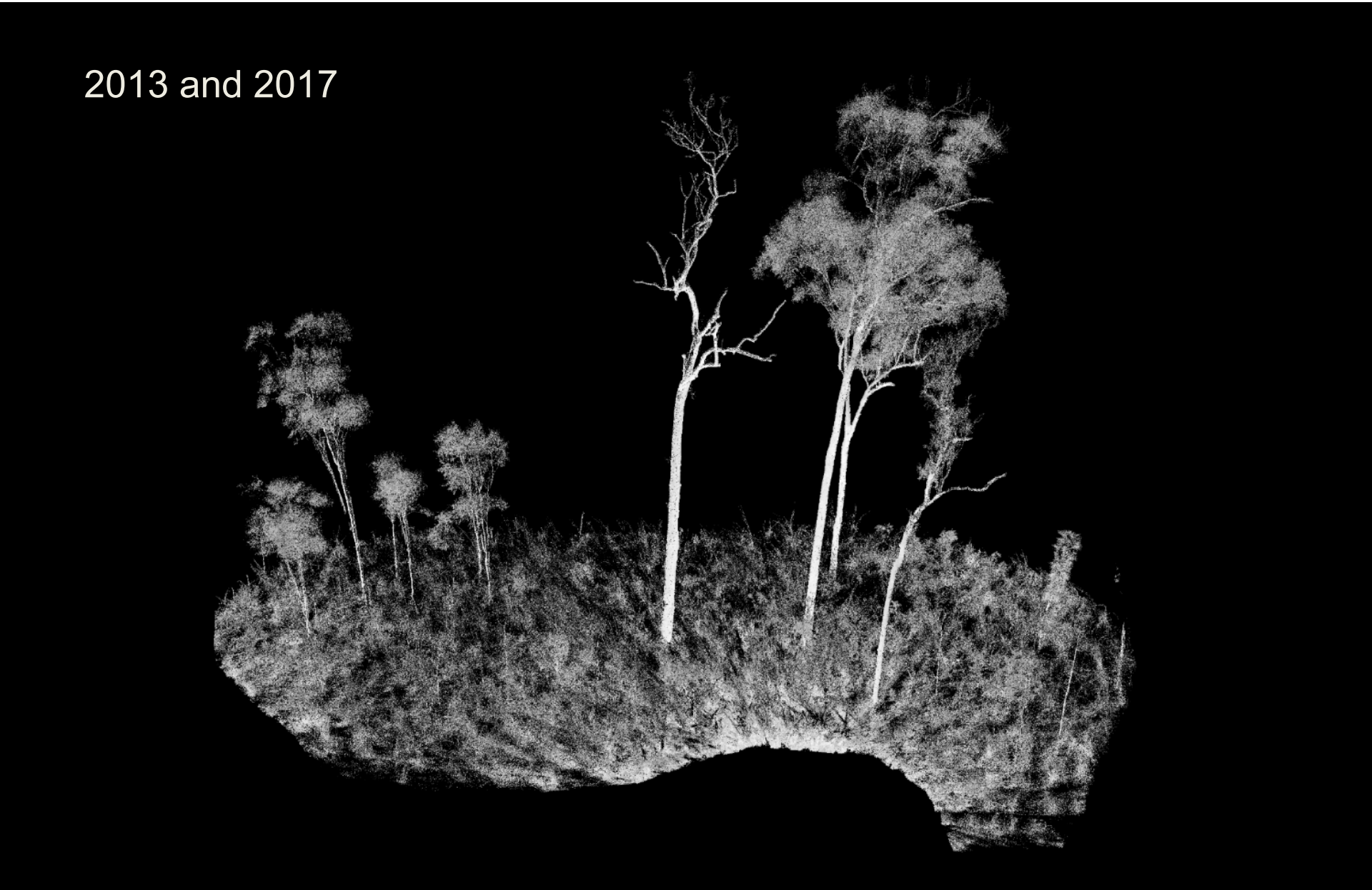
- New parameter table for 2018 methodology
  - Include standing dead wood
- This will be recommended to DoE&E
- Several published papers and data sets
  - to support recommendation
- LiDAR R&D to advance science of carbon assessment

# Long-range terrestrial LiDAR

# Times-series terrestrial LiDAR

2013 and 2017



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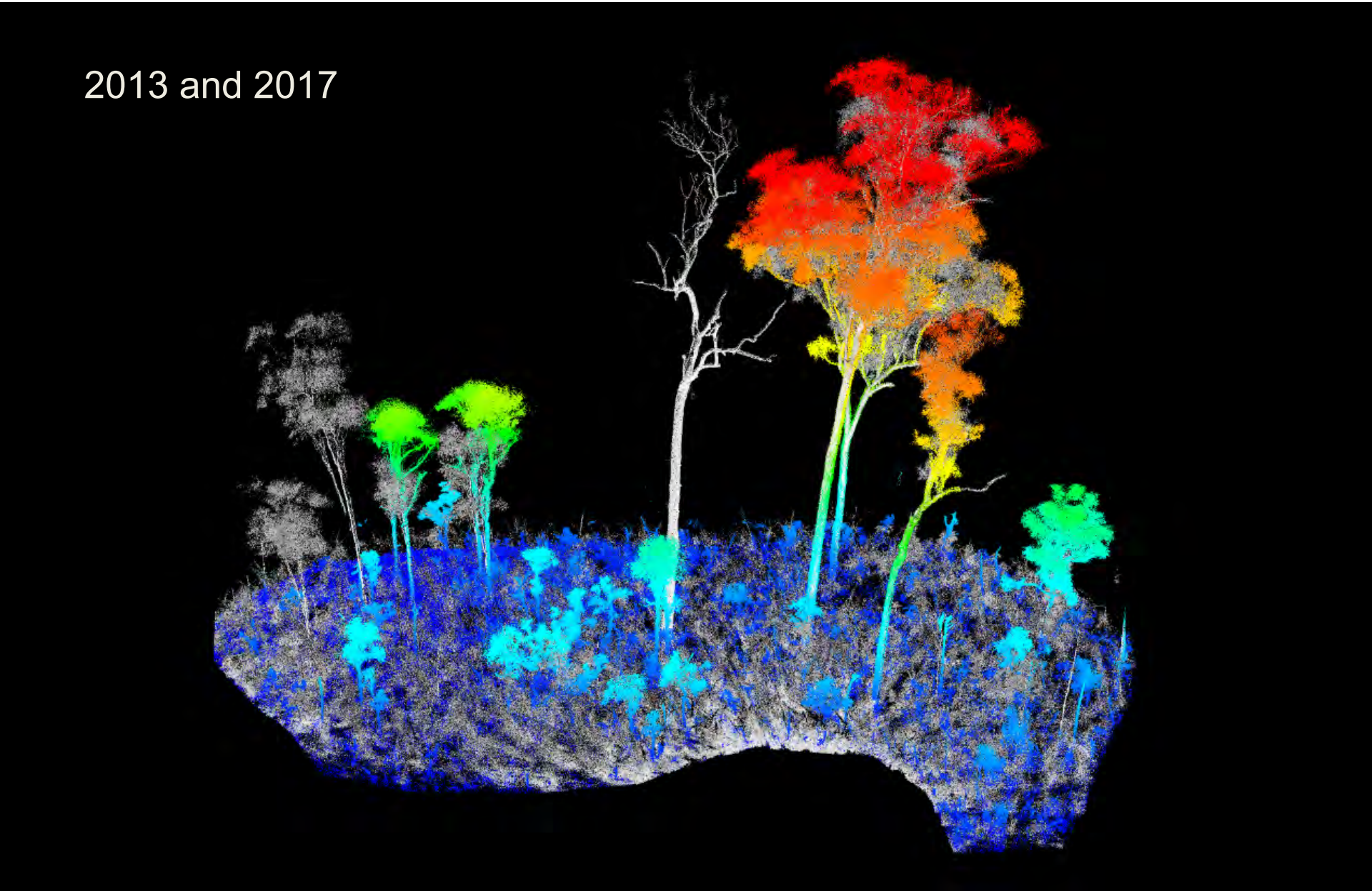

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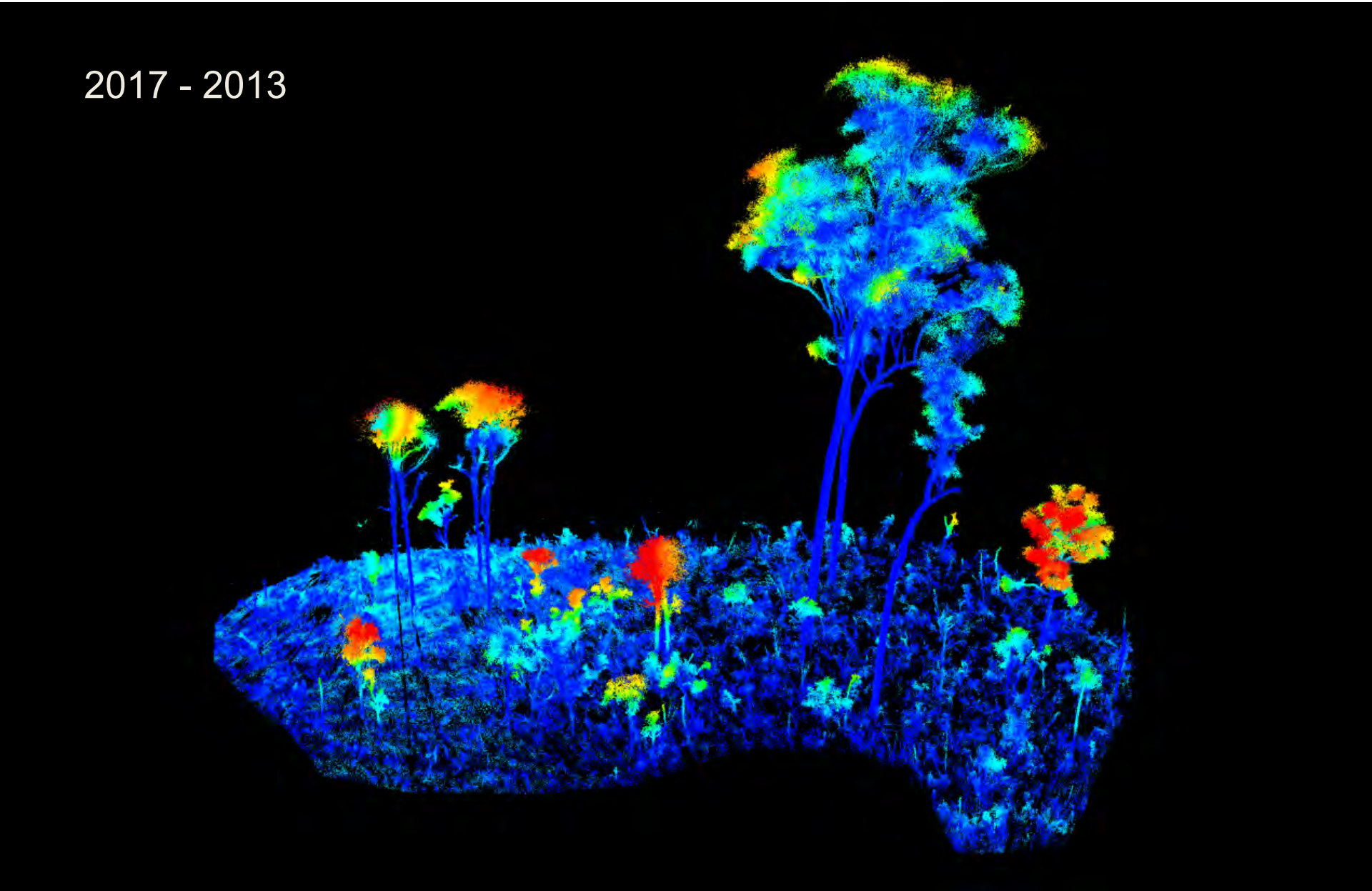
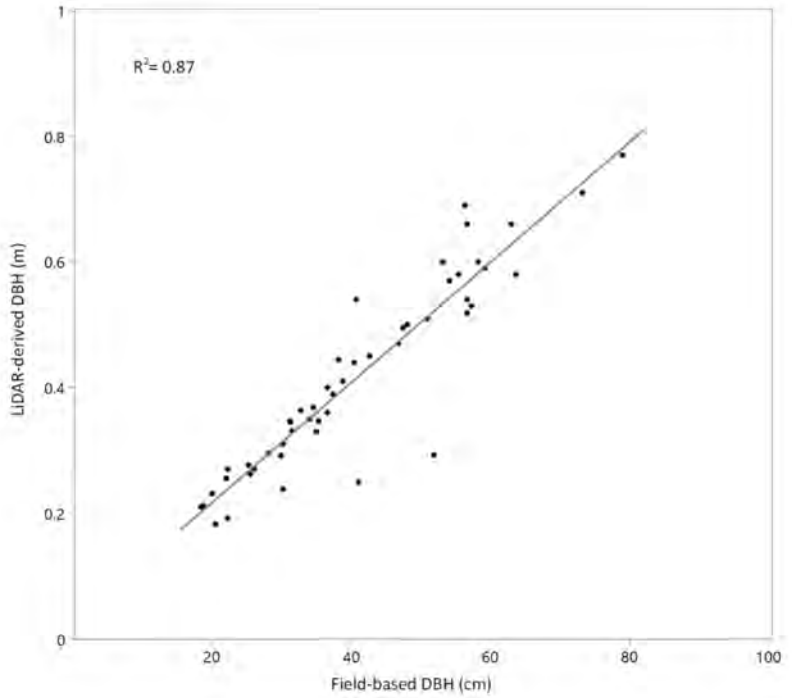


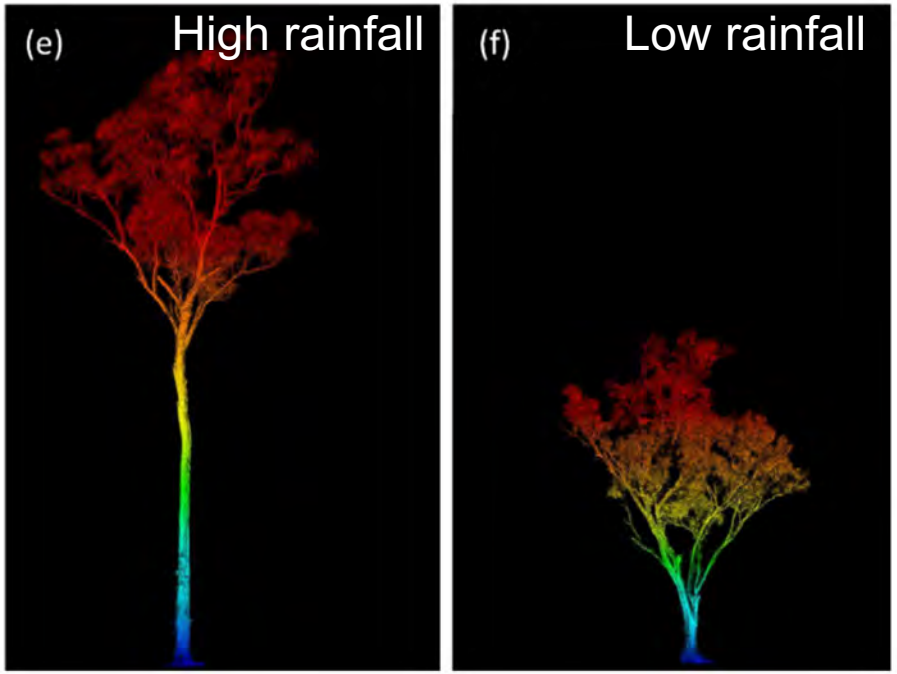
# Data from LiDAR

Variations in tree morphology with rainfall

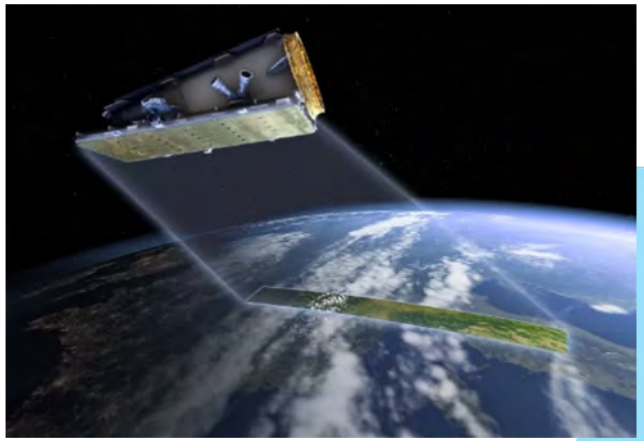
Calibration against field measurements

Courtesy Shaun Levick and Alyson Stobo-Wilson (CDU)



# Multi-scaled remote sensing integrated with targeted field-based calibration and validation




Google Earth Engine

# Impacts

- Support for compliance of Carbon Farming methodology and National Inventory with IPCC 2006
- Support for first CFI methodology that included emissions avoidance & sequestration
- New carbon pool to gain Australian Carbon Credit Units for savanna fire managers
- R&D for future vegetation and carbon dynamics

Northern Australia Environmental Resources Hub

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