

Forest Carbon Balance and Emission Management

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1. Measure the immediate impact of prescribed burning on carbon balance across a range of forests and burn conditions
2. Develop a better knowledge base to enable end-user agencies to model the immediate consequences of prescribed burning on both carbon and greenhouse gas (GHG) emissions
3. Model recovery of carbon stocks over a range of timescales
4. Identify burn techniques likely to minimize emission of GHGs whilst achieving appropriate fuel- and risk-reduction outcomes

MEASURING IMPACT OF FIRE ON FOREST C


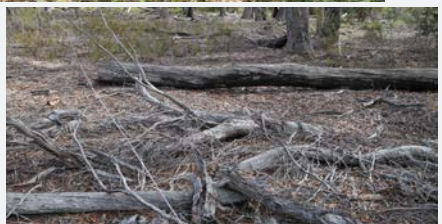


- Field based study sites
 - Forest type: dry sclerophyll;
 - Similar fire history (unburnt > 15 years)
 - Mid /low elevation
 - Sites in SE Australia from Tasmania to Queensland



- Measurements of:
 - Forest C pools pre/post fire
 - C and N concentration of different C pools
 - Fireline intensity
 - Burning efficiency of fuels
 - Recovery of carbon

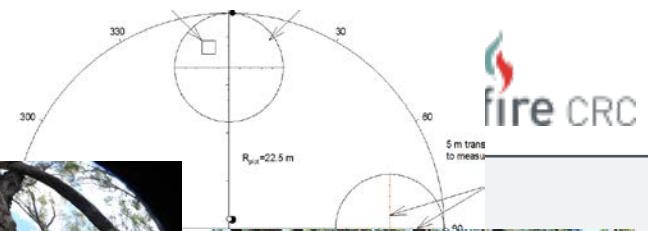


FOREST CARBON BY POOLS

| Pool | Description | |
|---------------------------|--|---|
| Aboveground biomass (AGB) | Living biomass above the soil |  |
| Deadwood | Coarse woody debris (CWD); standing dead trees and stumps |  |
| Litter (or fine fuel) | Dead plant material such as fruits, leaves, flowers, and small branches (<2.5cm) on the forest floor |  |
| Soil organic carbon | Organic carbon in soils to 30 cm depth |  |

Source: IPCC Land Use Land Use Change and Forestry 2004

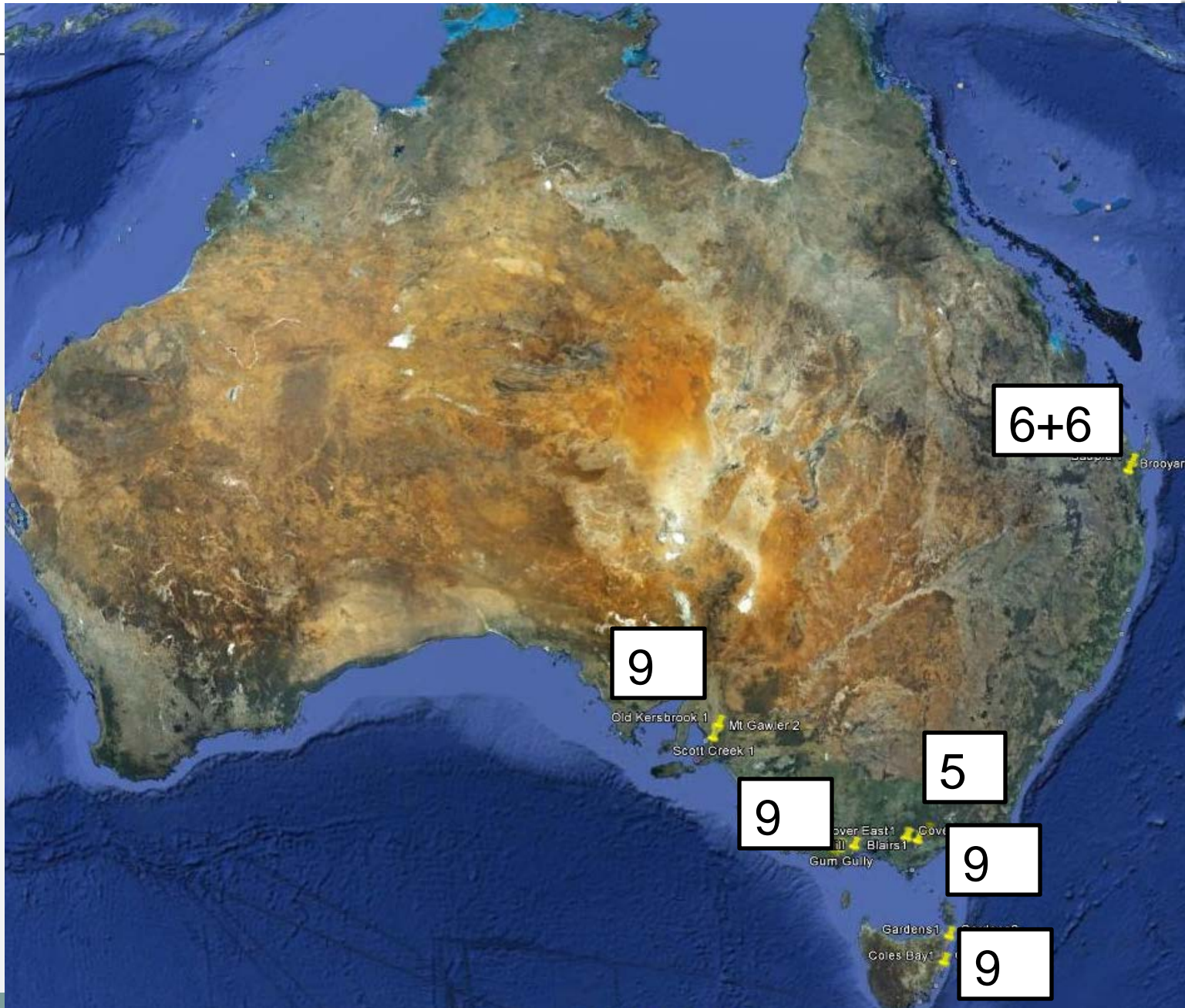
MEASURING FOREST CARBON



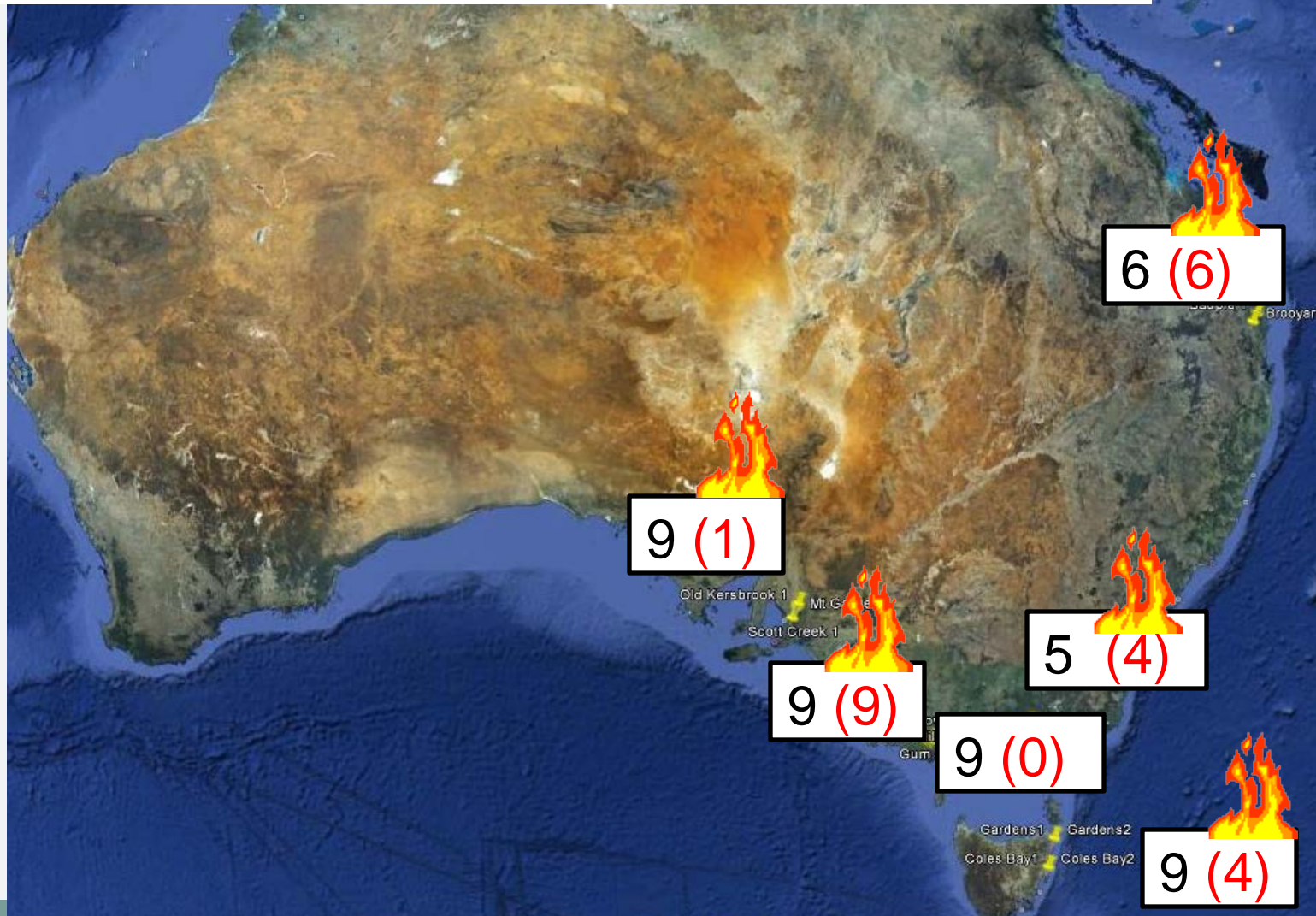
| | |
|---|---|
| Aboveground alive biomass (AGB) | Overstorey, $d \geq 20$ cm |
| | Understorey, $5 > d > 20$ |
| | Ground cover (small shrubs, grasses) |
| Deadwood | Dead standing |
| | CWD, $d \geq 2.5$ cm |
| Litter | |
| Soil organic matter (SOM); soil 0-30 cm | |



SITES LOCATION



47 plots measured pre-fire
24 plots were burnt (+8 plots from SA expected)

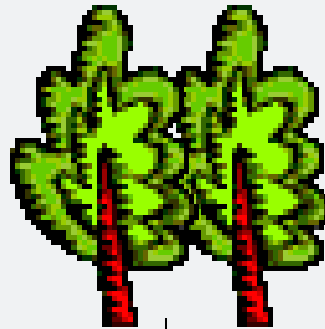


SITES DIVERSITY

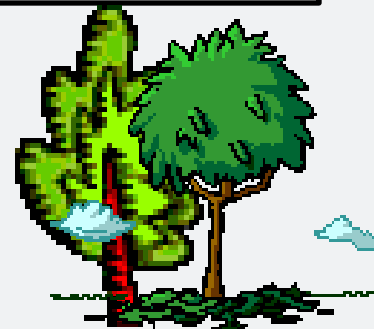
d=44 cm,
height=22 m;
242 trees/ha;
E. obliqua



d=37 cm,
height=21 m;
167 trees/ha;
E. obliqua



d=37 cm,
height=25 m;
145 trees/ha;
E. acmenoides



SA

VIC,
Otways

VIC,
Heyfield

TAS

QLD

d=23 cm,
height=12 m;
225 trees/ha;
E. obliqua

d=34 cm,
height=10 m;
175 trees/ha;
E. amygdalina

ESTIMATING EMISSION AND FIRE INTENSITY

Emission j_{gas} = Fuel loads * Burning efficiency of fuel * Fuel C concentration * Fuel N concentration * Emission factor j_{gas}

(Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks, 2006)



Fireline intensity is measured in the field, based on Byram 1959

→ Collaboration with Mick Meyer, CSIRO, to measure $EF_{j_{gas}}$ in the field

EMISSION FACTORS IMPROVED 😊



Study sites in Gippsland (Heyfield);
Burnt 18 Sept 2012

ACKNOWLEDGEMENT

- DSE, Victoria
- Tas. Parks and Wildlife Services
- Qld. Parks and Wildlife Services
- DEWNR, SA



- We have developed a method to accurately estimate carbon loss in a forest with 90% probability
- We know how to improve the estimates by increasing the sampling rate for variable of interest (e.g. coarse woody debris)
- We are collaborating with CSIRO to derive new field-based measures of Emission Factors for fine and coarse fuels of SE Australia eucalypt forests
- calibrate operational fuel load estimates with findings of this project → to get better estimates of emission → modify forest management