Remote Sensing of Fire Severity in north Australia

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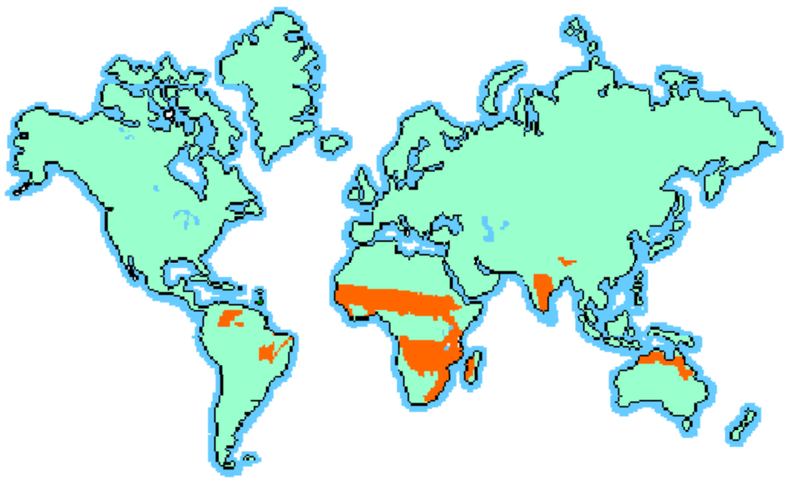
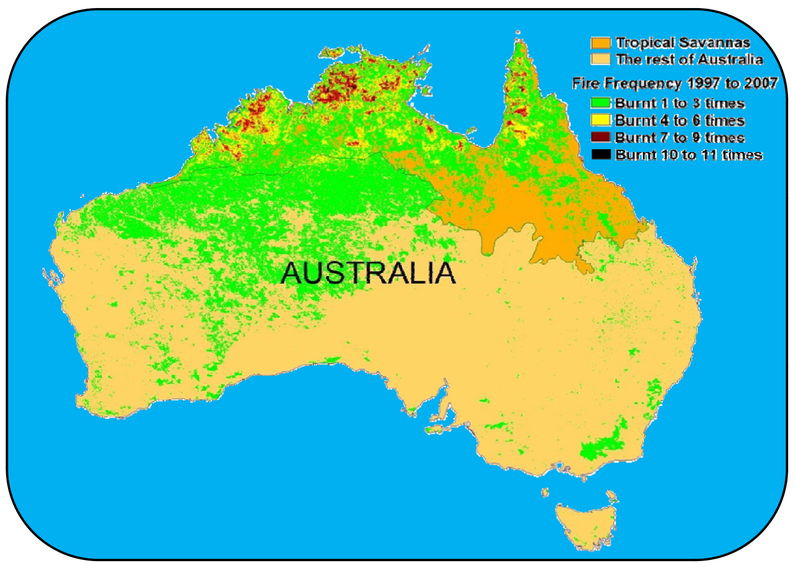
Tropical Savannas

Tropical savanna grasslands and woodlands:



- globally constitute the largest annually recurring source of pyrogenic emissions;
- the world's most heavily grazed biome;
- cover 12% of the earth's landmass.

Australia's tropical savanna grasslands and woodlands cover 25% of the Australian landmass, and with over 90% of mean annual fires occurring in the north, information on fires that can assist the land manager is vital.

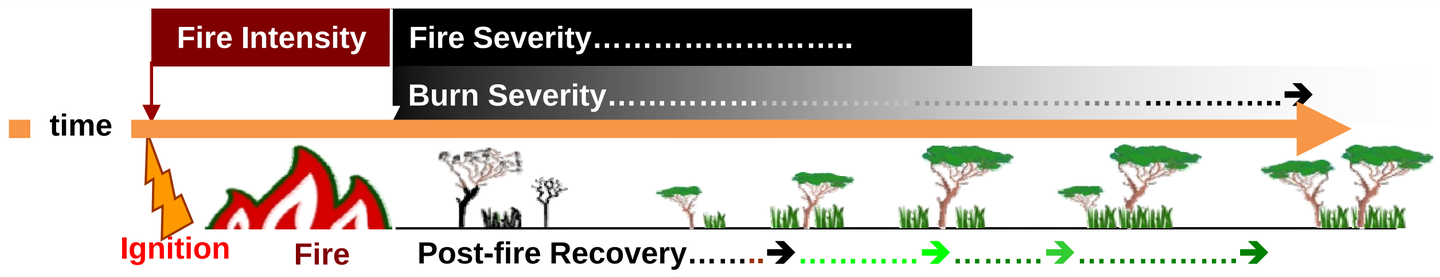


Current Information

Current fire mapping provides land managers with the knowledge of the occurrence, extent, and frequency of fires. It has not yet provided information on the affect of various types of fire, referred to as Fire Severity.

Fire severity is useful for determining the effectiveness of prescribed or hazard reduction burning, the effect of wildfires & for calculating Greenhouse Gas Emissions.

The Fire Continuum



Fire Severity

We define the fire severity to be the measureable post-fire affect of the fire on the vegetation. The definitions of the classes of fire severity are taken from the paper by Russell-Smith & Edwards (2006):

Fire Severity	Leaf Scorch Height (m)	Ground Patchiness (%affected)	Fire Line Intensity (MWm^{-1})
Low	< 2 m	> 20%	<< 1
Moderate	> 2 m	> 80%	< 1 – 2
High	> 5 m		< 1 – 10+
Extreme	Total charring		> 10

Results

The ground sampled data provides a measure of the fire severity from the parameters in the table above. The categories are correlated first with the ground parameters to determine the drivers of fire severity, then with the spectra to create a model for remote sensing.

Ground variables:
DOES NOT indicate Fire Severity
The amount of Charred material (blackened)
The amount of Green material (photosynthetic vegetation)
DOES indicate Fire severity
The amount of White Ash
The amount of non-Green plant material (non-photosynthetic vegetation)

Remote Sensing: Mapping Fire Severity
Severe v not-Severe Fires accuracy = 89%
Low v Moderate Severity Fires accuracy = 75%

Methods

A coupled top-down/bottom-up sampling methodology was developed for the project.

Top Down

Using a helicopter and a hand-held spectrometer, light (spectra) reflected from recently burnt areas is measured for each wavelength in the optical portion of the electromagnetic spectrum (450 – 2400 nm) including the visible, near infrared and short wave infrared.

Bottom Up

Ground sampling in the same area is undertaken. Measures such as the vegetation structure, proportions of various components, scorch height, and ground patchiness characterise the affect of the fire.