

# Woodlands

Presented by Caroline Lehmann, Charles Darwin University

Based on the work many people including:

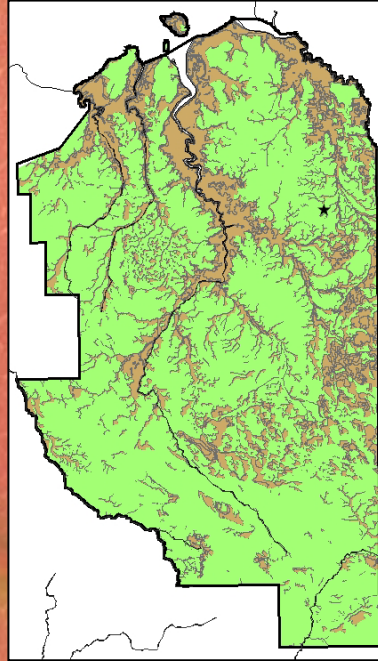
- Dick Williams Alan Andersen & Garry Cook, CSIRO
- Patricia Werner, ANU and CDU
- David Bowman & Lynda Prior, CDU
- Jeremy Russell-Smith & Andrew Edwards, Bushfires Council NT
- John Woinarski & NRETA Biodiversity
- Kakadu National Park staff



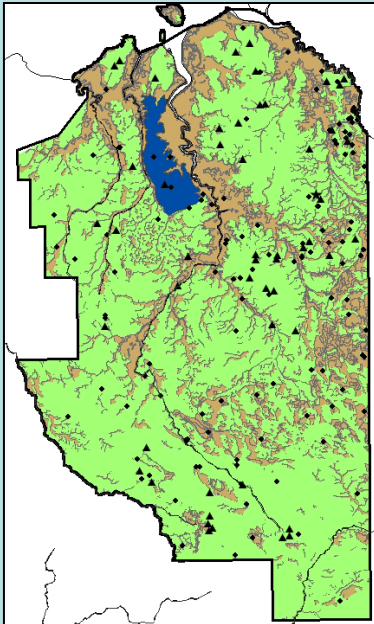
## In this talk...

- What work has been done?
- What are the threats to woodlands?
- How do woodlands change?
- What are the effects of fire on woodlands?
- What about grassy weeds?
- What does this mean for woodlands?

## Woodlands



## There has been lots of science in the woodlands....



Fire plots collecting information on flora & fauna

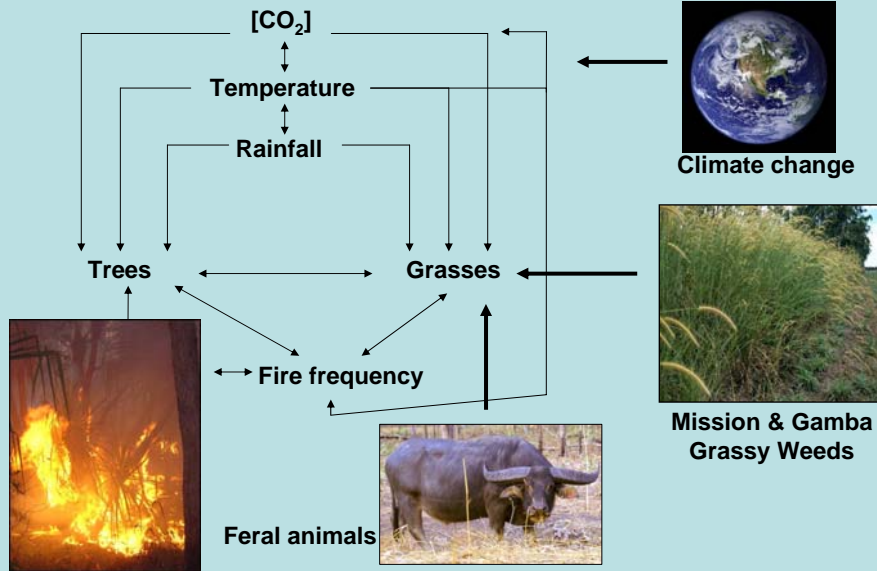
Kapalga fire experiment

Munmalary fire experiment

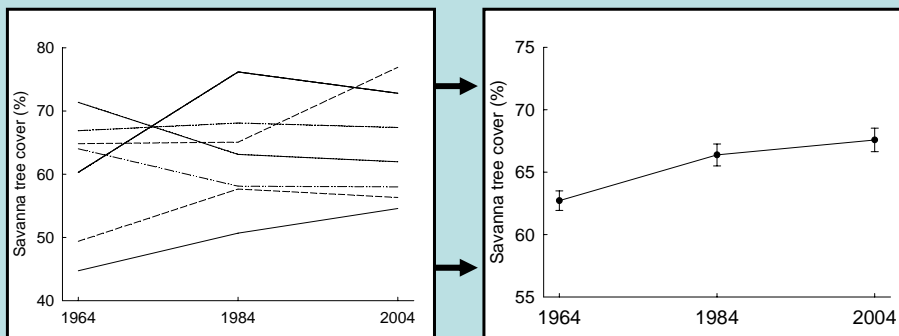
Aerial photography analyses

Many many other flora & fauna surveys

## What are the threats to woodlands?



## Canopy cover in woodlands: 1964 - 2004



*Lehmann, Prior & Bowman (submitted)*

- Cover changed greatly at the local scale but was quite stable across Kakadu
- Canopy cover changes a great deal in time and space

## Aerial photographs have shown that...

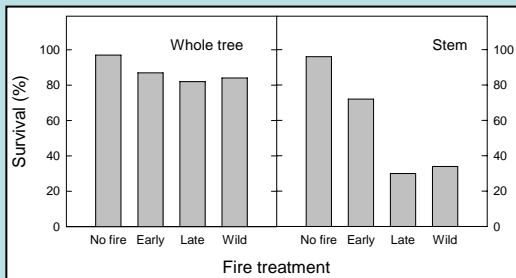
- Fire prevents trees achieving their maximum cover
- Buffalo affect the patterning of fire by consuming grasses which leads to increases in canopy cover
- In north Kakadu there is more fire, and bigger changes in canopy cover associated with this
- Seasonal drought is less important in determining changes in canopy cover in Kakadu's savannas than fire and above average rainfall

*Lehmann, Prior & Bowman, submitted*

## Key findings about woodlands

- ~ 50% of the woodlands burn annually *Edwards et al 2003*
- Fire plots have shown where there was a low frequency of fire there were increases in canopy cover but a reduction in cover and number of herbs *Edwards et al 2003*
- Fire plots have shown that 2 hot fires in anything less than 5 years led to declines in plant species diversity & numbers and the introduction of more annual grasses
- Decline in the woodland mammal fauna *Woinarski et al 2001*

## Eucalypt survival & recruitment

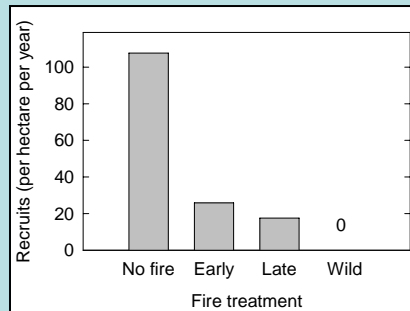


While tree stems may die after a fire, death of the plant itself is less likely regardless of the fire intensity

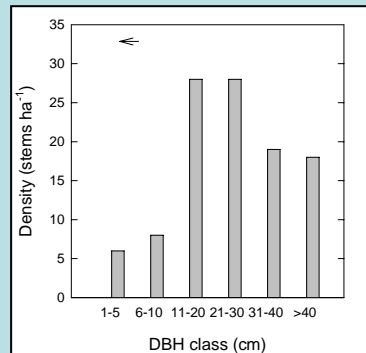
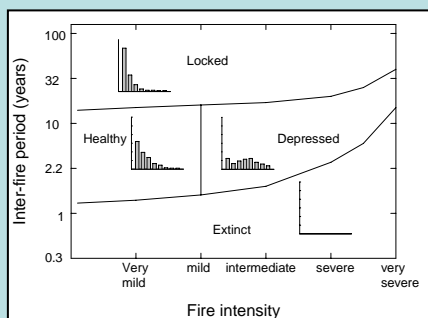
*Williams, Cook, Gill & Moore 1999*

Young trees need fire-free times to grow tall and escape the fire-trap in woodlands

*Dick Williams, unpublished data*



## Cypress pine survival & recruitment



Stand structure of cypress pine next to Round Jungle showed there were not enough small trees to sustain the population – likely because hot fires are too frequent

*Prior, Bowman & Brook 2006*

## What about grassy weeds?

- 4x fuel loads of native grasses and 8x fire intensity of native grass fires
- Leads to high levels of tree death and high reductions in biodiversity
- Changes the nutrient and water cycles of the woodlands and changes the fundamental ecology of the ecosystem

*Rossiter et al 2003*



## Threats and dealing with them

**Fire:** Short fire return times reduces the resilience of woodlands by stopping the growth of young trees and reducing biodiversity

*Found in fire plots, Kapalga, aerial photography*

**Grassy Weeds:** Change fire regimes, harm biodiversity and plant survival and change the fundamental ecology of the ecosystem

*Found in work around Darwin and Wildman River*

**Feral Animals:** Trample woodlands and alter fire regimes and are detrimental to woodland health

*Found in work at Kapalga and aerial photography*

**Climate change:** Changing rainfall patterns will alter fire regimes and increases in severe storm activity

*Predicted from work on aerial photography and CSIRO study*

## Kakadu Landscape Change Projects

Funded jointly by

- Kakadu National Park
- Australian Research Council



Hosted by

- Key Centre for Tropical Wildlife Management (now School for Environmental Research), Charles Darwin University

