




Invasive grasses & fire: The changing landscape in Australia's wet/dry tropics


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(*CDU*)
K. Ferdinands, P. Barrow, S. Lamb (*NT Government*)

Outline



- The region – wet-dry tropics
- How invasive grasses affect fire behaviour
- Environmental consequences - stand structure
- Economic consequences - fire management
- Summary – major management issues

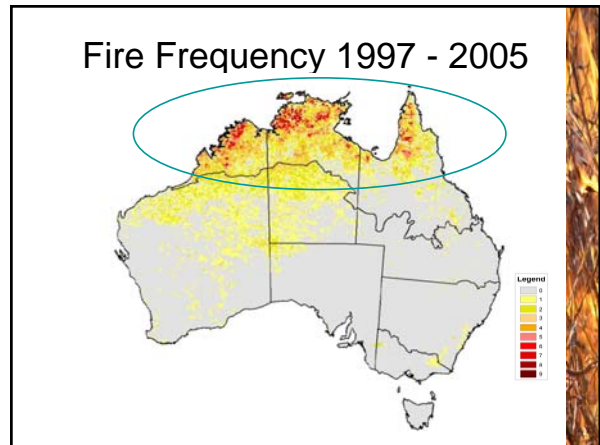
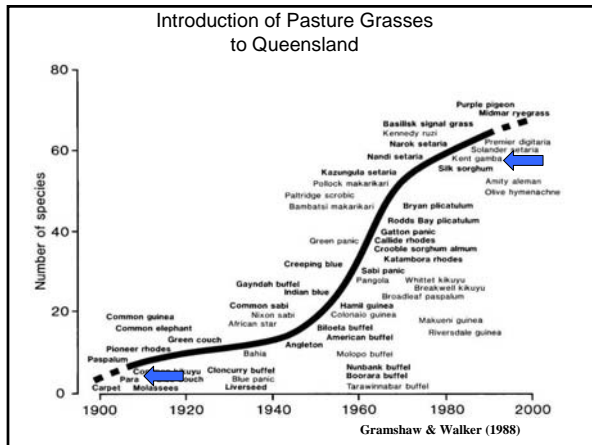
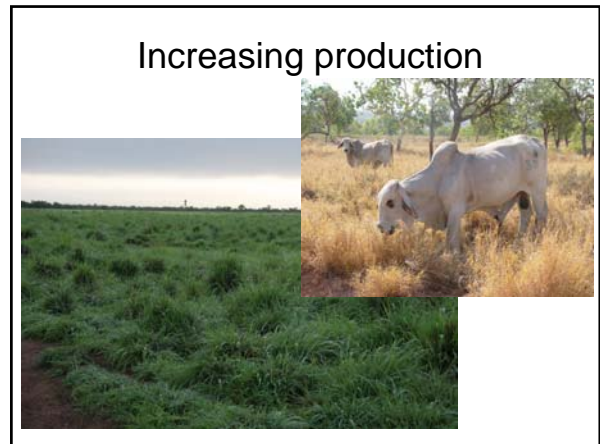
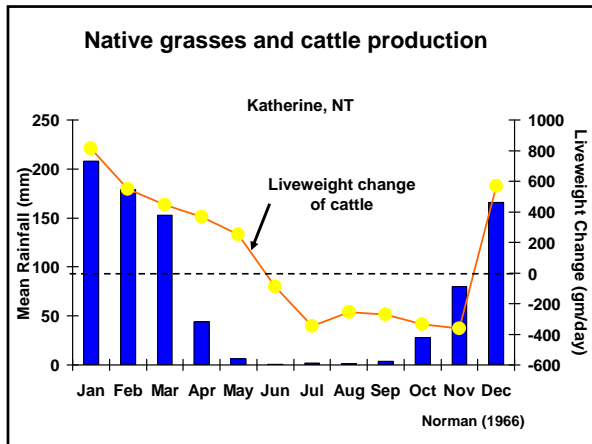




Australia's Wet/Dry Tropics

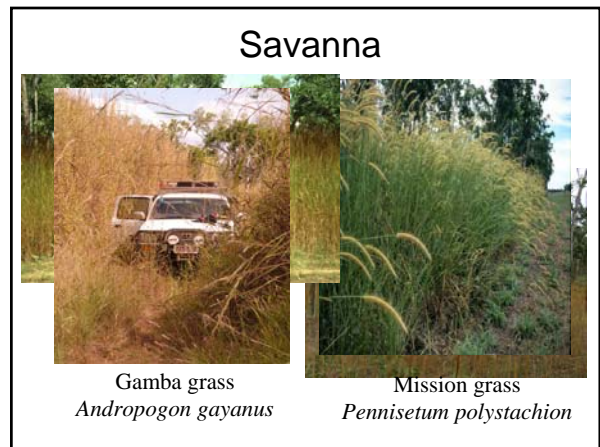


- Savanna biome
- Largest and most intact savannas in world (Woinarski *et al.* 2007)
- Ecology driven by wet-dry cycle

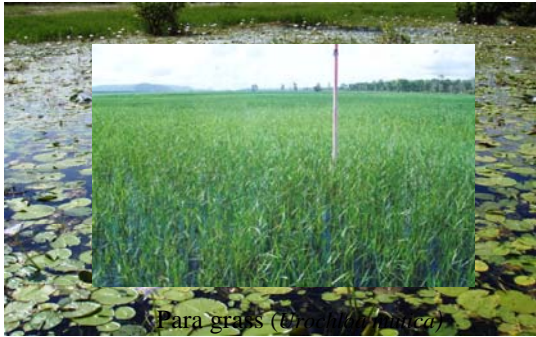



- ### Outline
- The region - monsoonal tropics ✓
 - How invasive grasses affect fire regimes
 - Environmental consequences - stand structure
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 - Current situation
 - Scale of problem



S10

Floodplain



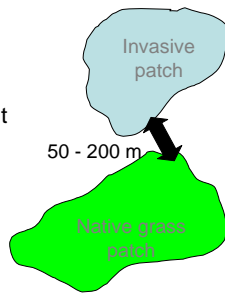
Para grass (*Amphipogon squarrosus*)

Impact studies by CDU

	Para grass	Gamba grass
Plant communities	<i>Douglas et al. in prep.</i> <i>Ferdinands et al. 2005</i>	<i>Ferdinands et al. 2006;</i> <i>Setterfield et al. in prep.</i> <i>Brooks et. al 2006, 2009</i>
Invertebrate communities	<i>Aquatic: Douglas & O'Connor 2003</i> <i>Terrestrial: Douglas & O'Connor 2004a</i>	<i>Ants: Ryan et al. 2005</i>
Vertebrates communities	<i>Fish: Pidgeon et al. 2002</i> <i>Birds: Ferdinands et al. 2005</i>	-
Habitat area	<i>Douglas & O'Connor 2003</i>	<i>Rossiter 2001</i>
Fire regimes	<i>Douglas & O'Connor 2004b</i>	<i>Rossiter et al. 2003</i> <i>Rossiter et al. 2008 (a,b);</i> <i>2009; in prep.</i>
Nutrient cycling	<i>Douglas et al. 2002</i>	<i>Hutley et al. 2005</i>
Water cycling	-	
Carbon cycling	<i>Douglas et al. 2002, 2005, 2006</i>	

Fire characteristics: Methods

- Measured:
 - Fuel load
 - Rate of spread
 - Fire intensity
 - Scorch and Char height



Fuel load (t ha⁻¹)

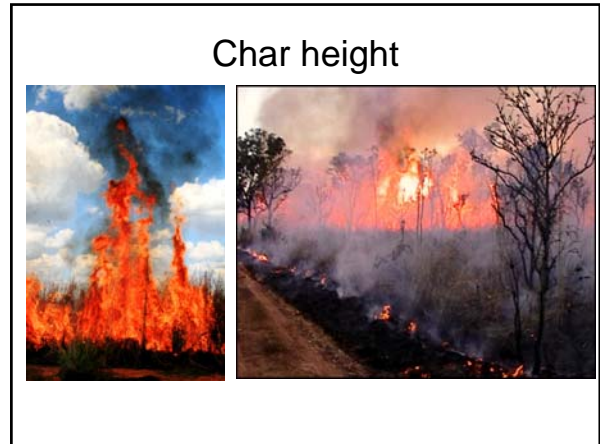
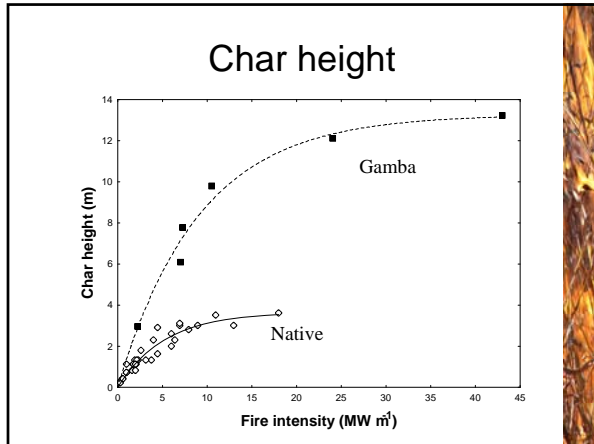
	Native	Invaded	x increase
Gamba	1 – 7	4 – 25	5 - 10
Mission	2 – 3	9 – 14	5
Para	8	14 - 16	2



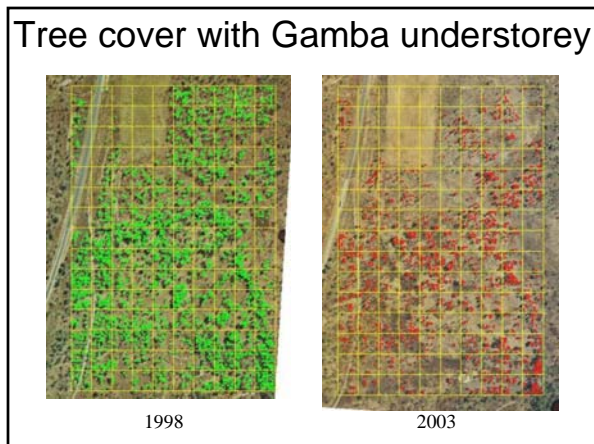
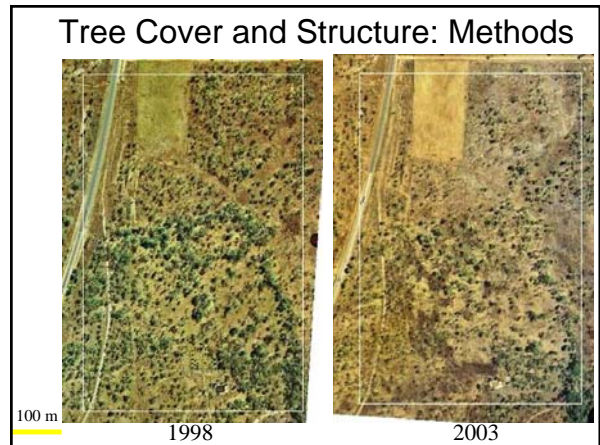
S7
S11

Fire characteristics: Results

	Native	Mission	Gamba
Fuel load (t ha ⁻¹)	1 – 7	9 – 14	4 – 26
Intensity (MWm ⁻¹)	0.5 – 4	5	2 – 42
Scorch ht (m)	4 – 10	13	Above canopy
Char ht (m)	1.5	2 – 3	3 – 13

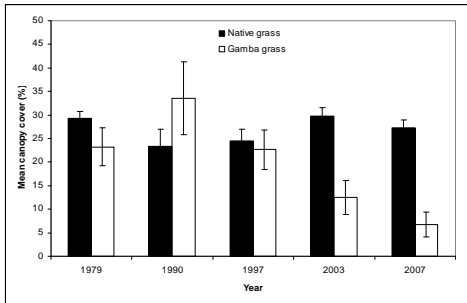


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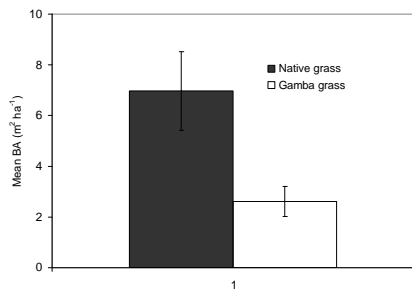


- ### Tree Cover and Structure: Methods
- Ground survey of invaded and native areas
 - Amount of woody biomass
-

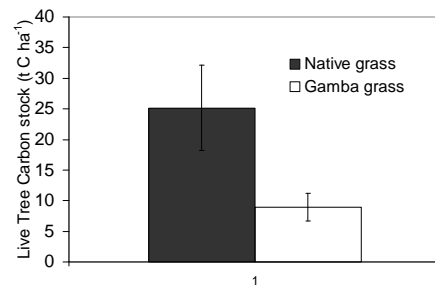
Tree Cover: Results



Basal area



Live tree Carbon





Outline

- The region - NT's monsoonal tropics ✓
- Invasive grasses and fire regimes
 - How do they interact? ✓
 - Environmental consequences ✓
 - Economic consequences for fire management?



Documenting Fire Management - Method

- Case study
 - Coomalie Shire
 - 100km S Darwin
 - Multiple use rural land
- Interview
- Fire histories

Fire Management – Interview Results

- More
 - fire fighters
 - experience/training
 - time
 - fire units
 - heavy machinery
 - helicopters
 - Injuries
- Different tactics
- More money

Fire Management Response

- | | |
|--|------------|
| • Cost of single fire (Rum Jungle) | Total Cost |
| • Native grass
– 4 brigade members | \$1,296 |
| • Gamba grass
– 3 BF staff & vehicles
– 4 brigade units & 6 volunteers
– tanker
– Aircraft (water bomber)
– Helicopters x 2
– Loader
– Ground support staff x 2 | \$16,702 |



Fire Management: Standby costs

- Increased cost of standby equipment to fight gamba fires
 - Standby equipment required on every fire ban day
 - Plane \$3500 per day
 - Helicopter \$1000 per day
 - Water truck \$ 200 per day
 - Loader \$ 200 per day
 - Grader \$ 250 per day
- Total cost \$5150 per day**

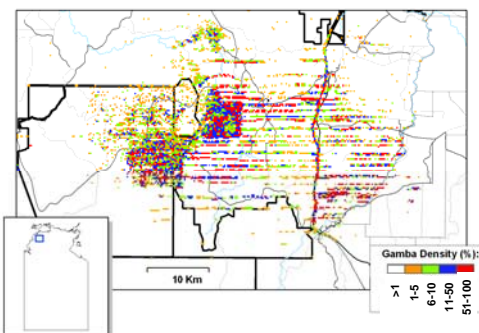
Fire Danger Index: Methods

- McArthur Mark 4 Grassland Fire Danger Index
- Determined by
 - Q is fuel quantity ($t\ ha^{-1}$)
 - C is curing factor (0-100%)
 - T is temperature ($^{\circ}C$)
 - V is wind speed ($km\ hr^{-1}$)
 - RH is relative humidity (%)

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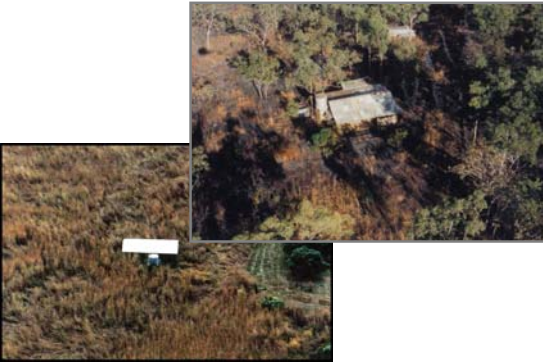
Landscape Threat



Fire Danger Index (>40) Fire zone

	Grass Fuel Loads (t/ha)		
	6	10	15
No. of days	12	47	115
Cost (\$, 000)	\$65	\$253	\$621

Costs of property losses?



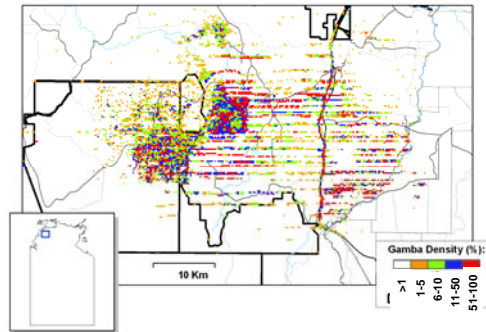
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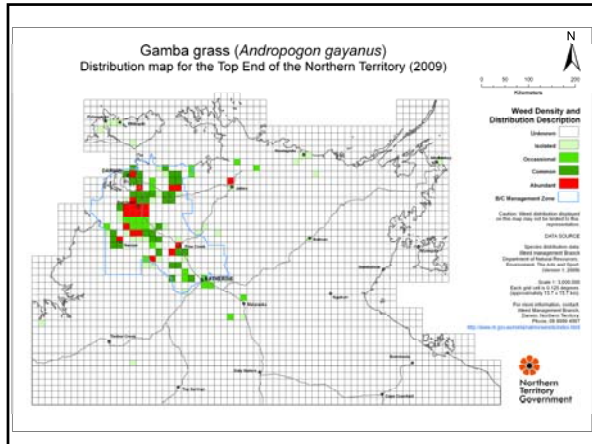
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Counting the costs

- Case Studies –
 - Major environmental, social and economic costs
 - Provide data to estimate damage avoided by undertaking management and preventing spread
 - Incorporate into decision support tools for optimising management resources
 - Assess cost of invasion in different land use types

Litchfield NP and Coomalie Shire





Optimising WRM (CERF Significant Project)

- Economic assessment of weed management actions and costs avoided by preventing spread
 - Adam Drucker (CDU)
 - Lisa Wainger (Uni Maryland)
- Developing spread models
 - Yvonne Buckley (UQ), Dongwook Ko (CDU/UQ)

Summary

- Critical decisions about what to save and what to lose
- DWM project was major contribution to developing decision support tools
- Continuing to develop these tool
 - CERF funded project



