The Savanna and Rangelands Monitoring and Evaluation Reporting Framework (SMERF)

Research advisory forum / **2018**

Prof Jeremy Russell-Smith / DCBR - CDU
Dr Andrew Edwards / DCBR - CDU
Patrice Weber / DCBR - CDU

Darwin Centre for Bushfire Research
Research Institute for Environment and Livelihoods
Charles Darwin University

CHARLES DARWIN UNIVERSITY

@bnhcrc @bnhcrc

bushfire&natural HAZARDSCRC

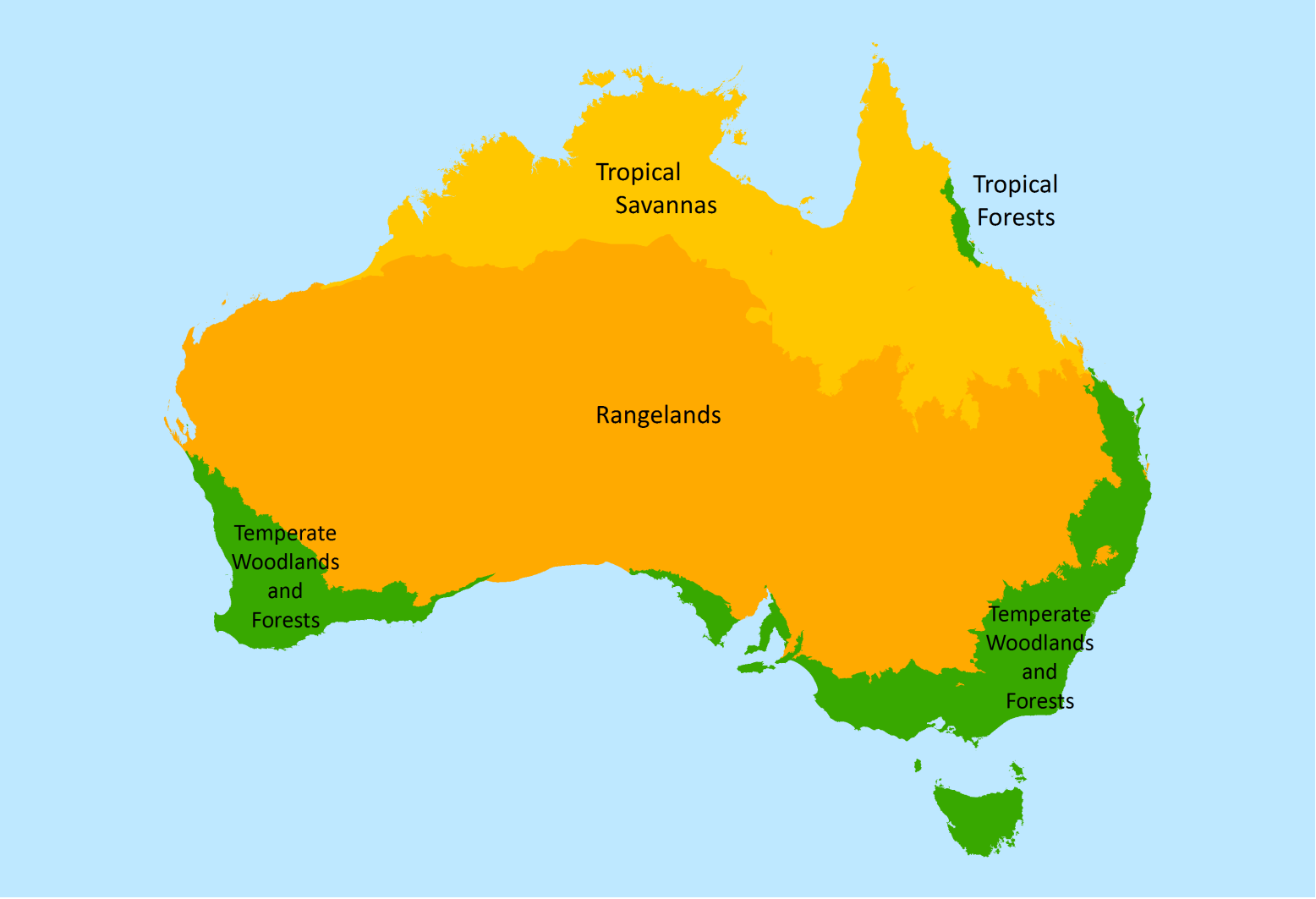
Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

Outline

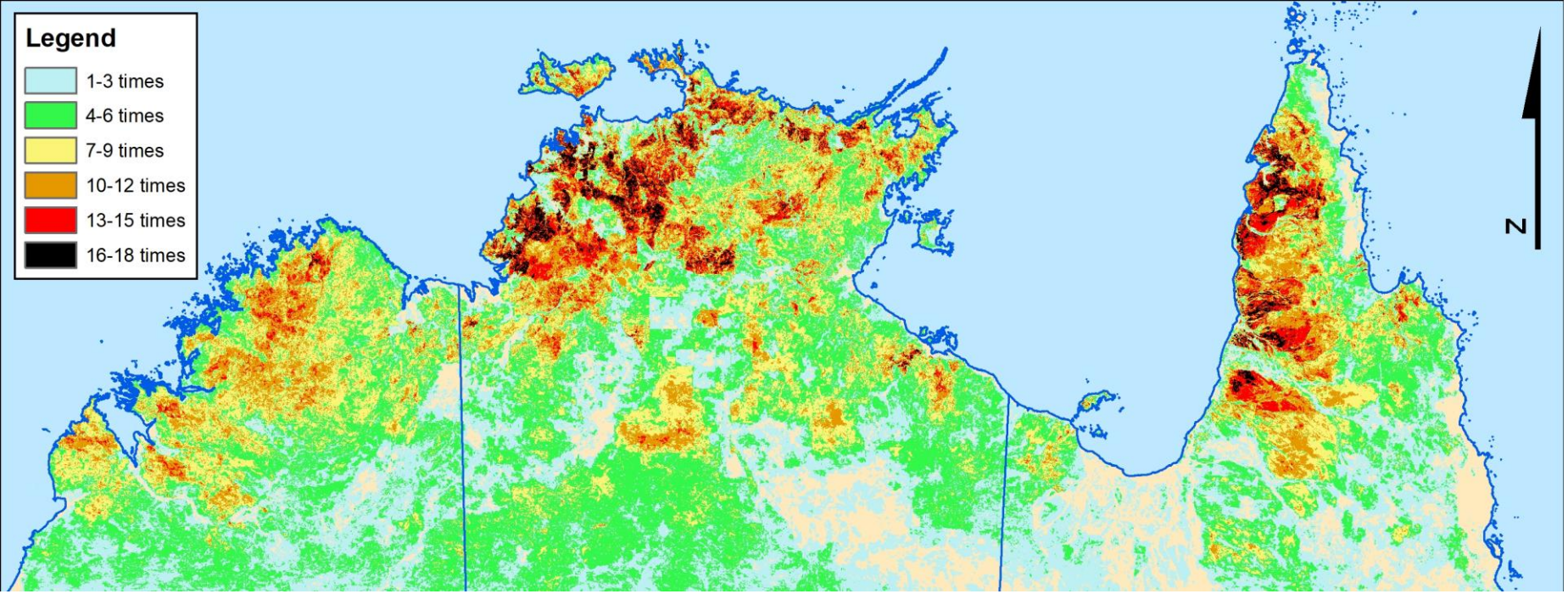
- The Savannas and Rangelands
- Savanna Burning
- Monitoring and Evaluation Reporting
- Current Reporting
- North Australia Fire Information
- The calculation of Metrics
- Ecological indicators

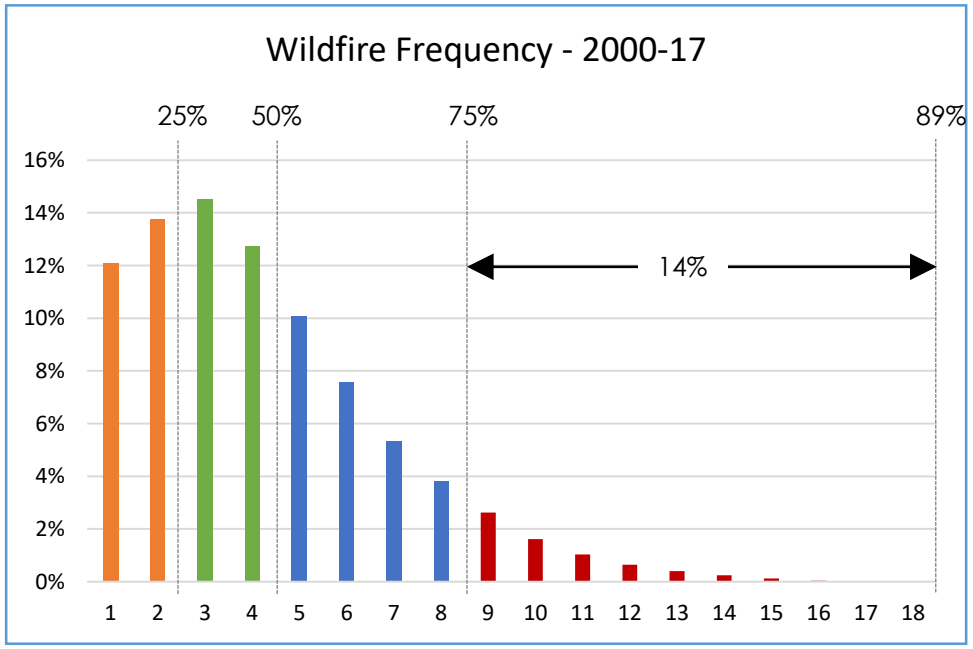
- Case Study: Queensland Parks & Wildlife



Savannas & Rangelands

- 75% of the continent
- 2 % of the population

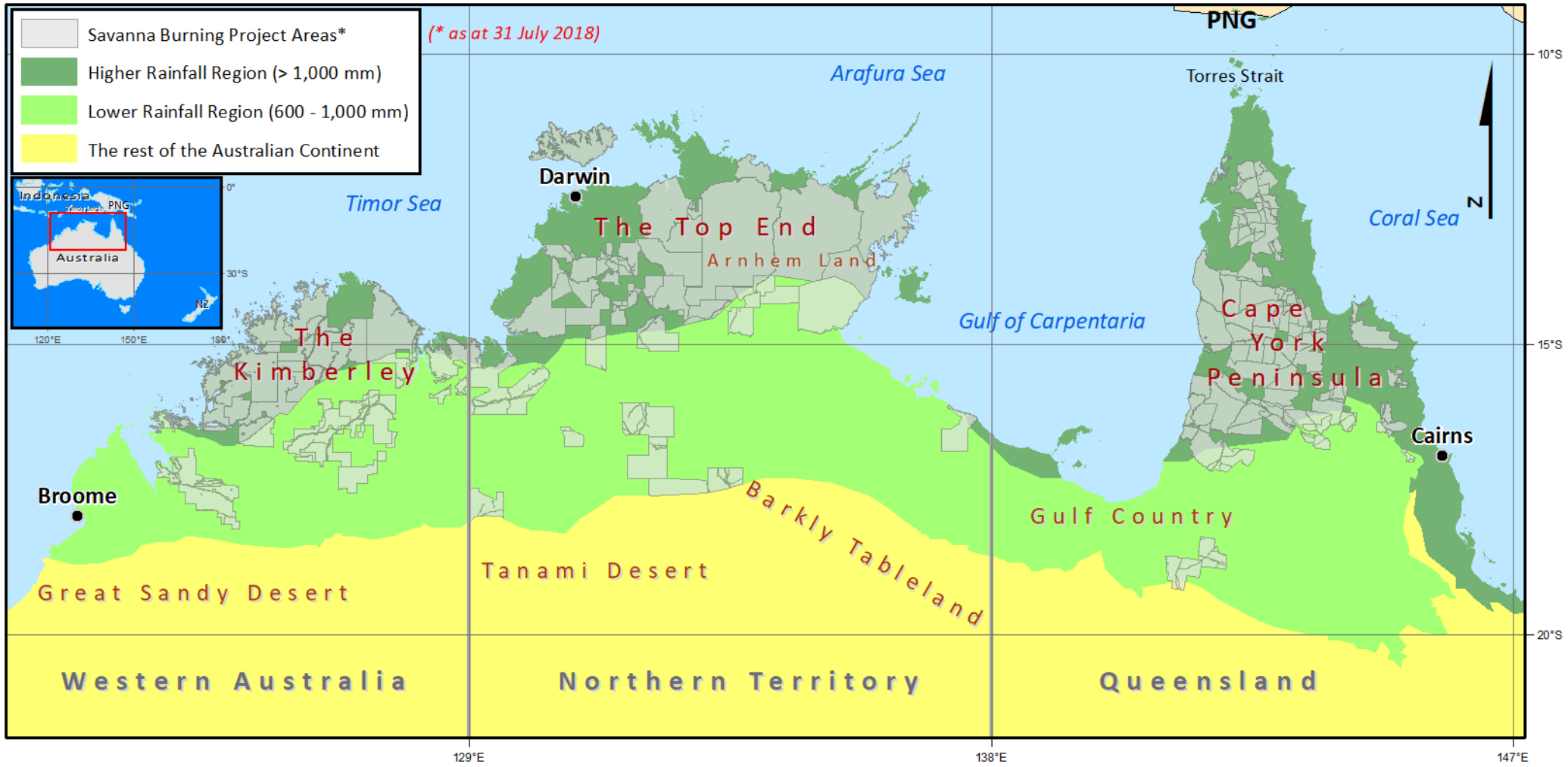




Savannas Burn

It's been a BIG Problem!!

- 3% of Australia's Greenhouse Gas Emissions
- 97% of the annual area burnt



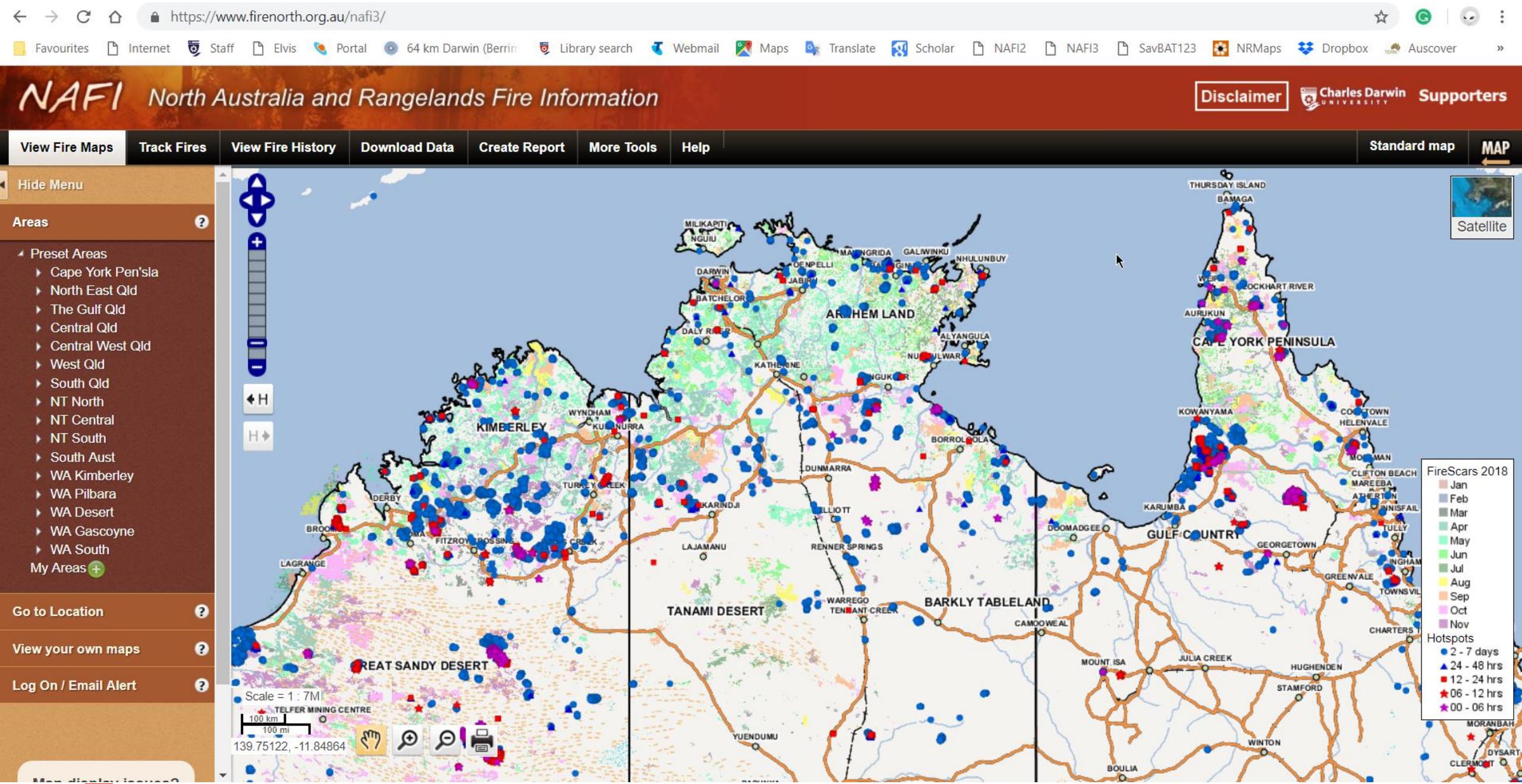
Co-benefits

- Social
- Cultural
- Economic
- Environmental

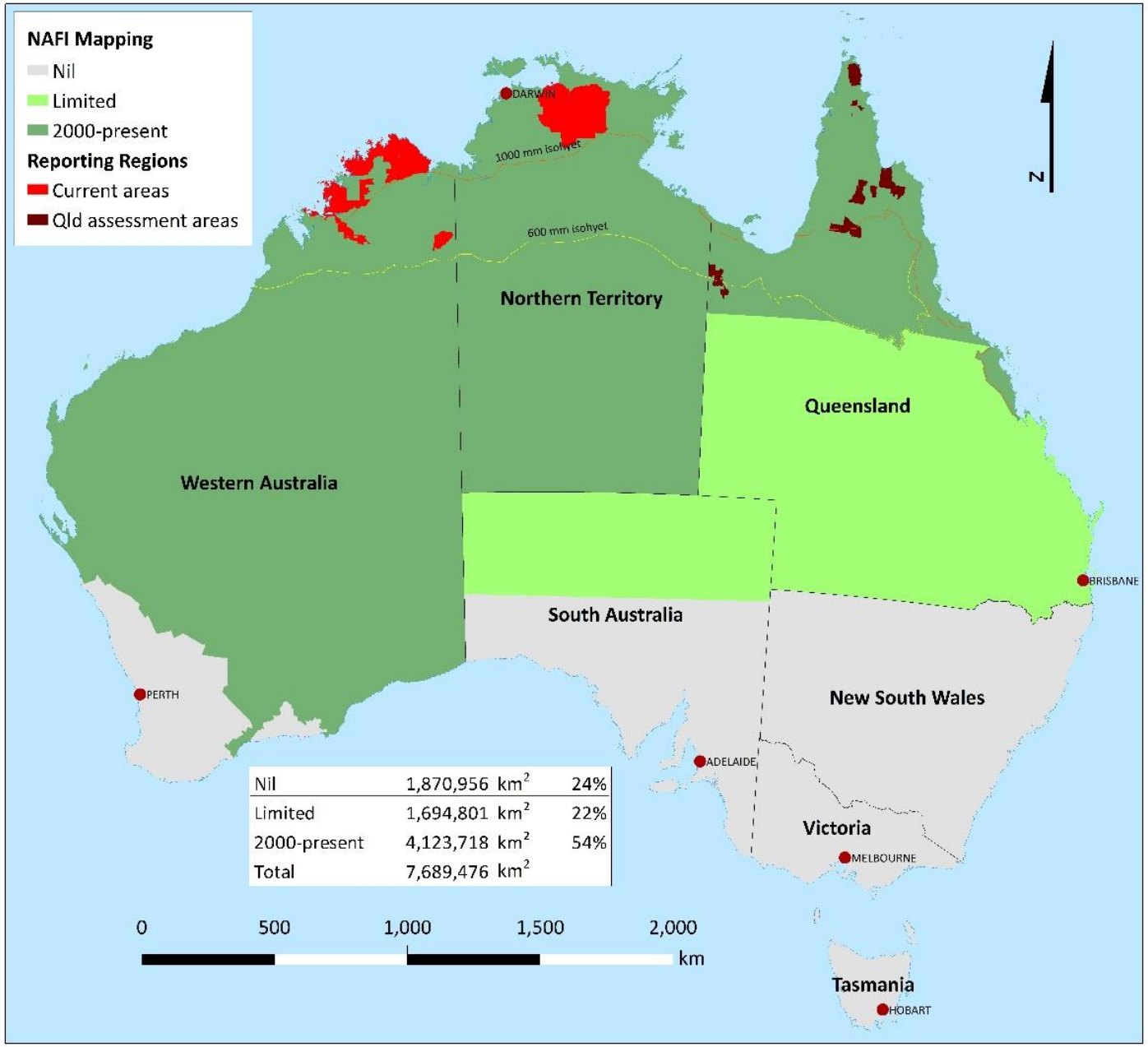
Savanna Burning

Setting a Gold Standard

$40 million p.a. from the Carbon economy
(compared to $6M = tourism and $21M = pastoral)



North Australia Fire Information



Current M&E Reporting and NAFI mapping

Fire Metrics

- Annual fire mapping layers
- Geographical Information Systems

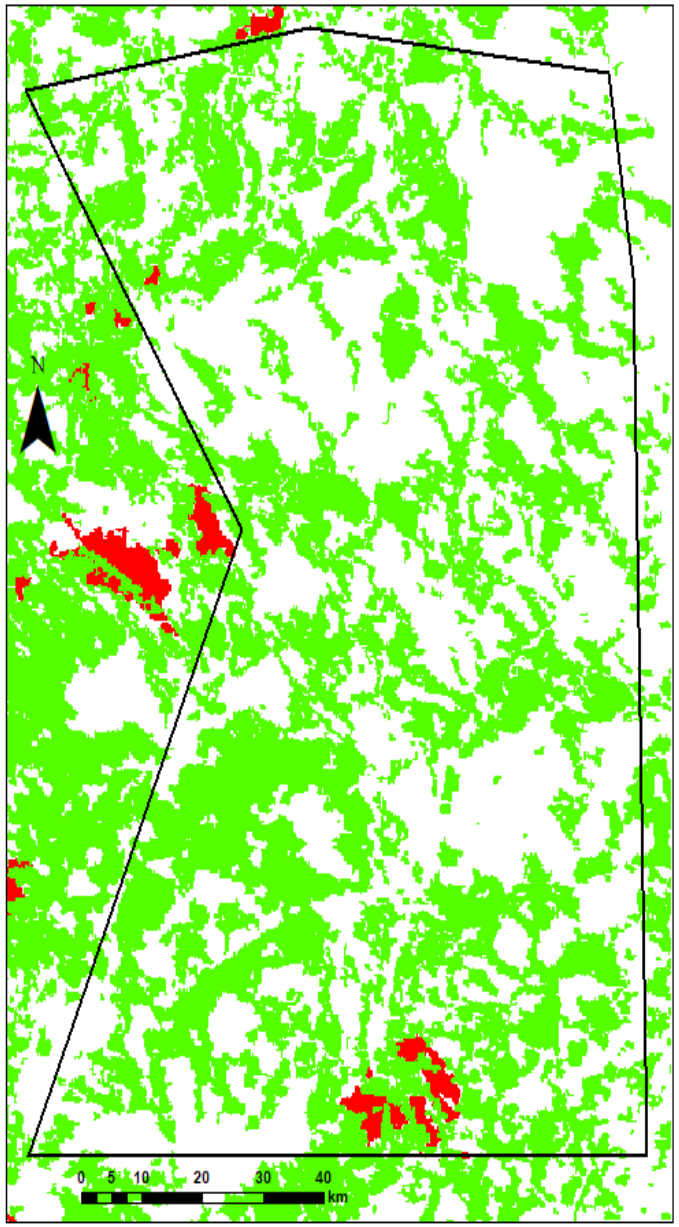
Metric
Total Area Burnt
Area Burnt by Late Dry Season (Wild) Fires
Fire Frequency
Frequency of Late Dry Season (Wild) Fires
Area of Longer Unburnt Vegetation
Minimum Inter-Fire Interval
Patchiness
Area/Perimeter Ratio

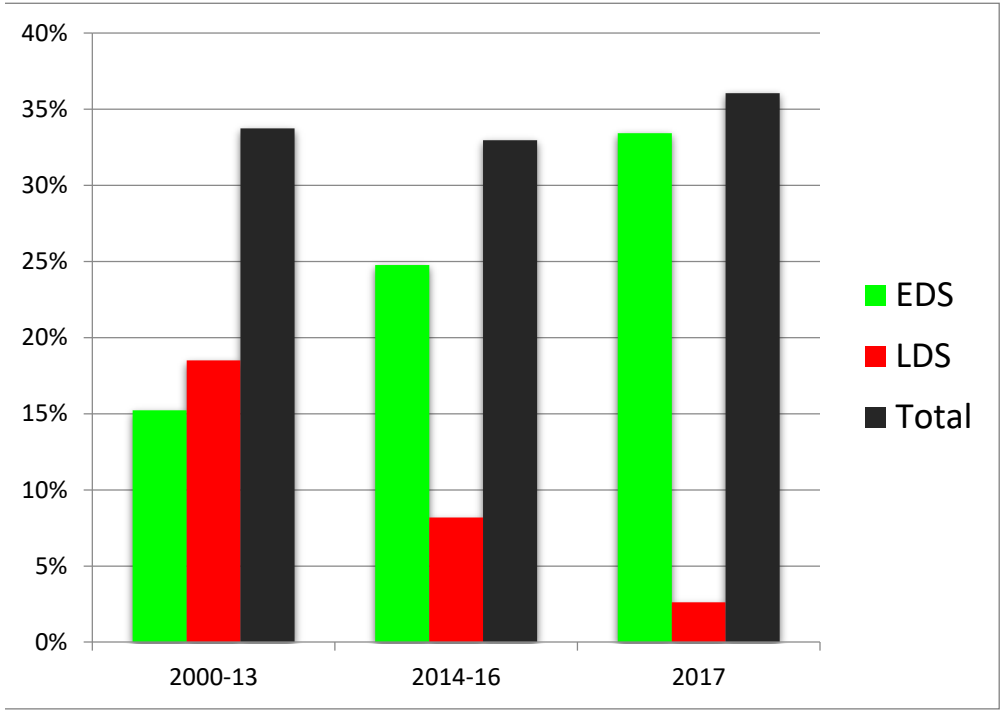
Metric	Description	Objective
Total Area Burnt	A calculation of the proportion of the project area affected by fire.	The fire affected proportion of the project area should decrease.
Area Burnt by late Dry Season (Wild) Fires	The proportion of the project area affected by late dry season fire.	The dry season (~April to October) is characterised by little or no rain. Wildfires dominate in the latter half of the dry season (typically post-July)[37], causing massive destruction to biodiversity in most but not all habitats. The area affected by wild fires should decrease.
Fire Frequency	The calculation of the proportion of the number of times an area has been burnt in a period.	The higher the proportion of high fire frequency the worse the effect on biodiversity. Mean fire frequency should decrease.
Frequency of Late Dry Season (Wild) Fires	The calculation of the proportion of the number of late dry season fires in an area over a period.	The higher the proportion of higher frequencies of late dry season (wild) fires the worse the effect on biodiversity. Mean LDS fire frequency should decrease.
Area of longer unburnt vegetation	An overlay of the previous years of burnt area mapping, back through time, to calculate the area and age of previously burnt areas.	Fire frequency in the tropical savannas has been high in past decades. Improved fire management should mean an increase in the area of longer unburnt vegetation (> 3 years, > 5 years, etc) in most habitats.
Minimum inter-fire interval	An intersection of the fire layers to determine the minimum time (years) between fires.	If the interval between fires in an area $\leq$ the minimum interval required for obligate seeder plant species to grow from seed, mature and set seed then one can expect local extinctions.
Patchiness	Various metrics have been calculated that describe the landscape pyro-diversity: 1. Heterogeneity indices[38]; 2. Mean distance from burnt to unburnt patches [39].	These mean index value should increase under improved fire management. The heterogeneity indices are averaged over five year periods to indicate the longer-term trend. The mean burnt to unburnt patch distance index should improve indicating fire patch sizes are decreasing.
Area/Perimeter Ratio	The ratio of the average perimeter / average area burnt per patch	The ratio is relative, indicating an improvement in patch size and shape, that is, longer narrower patches relate to more strategic fires as compared to large patches of wildfire.

Landscape unit	Model of functional group/species	Fire metrics
Savanna woodlands	Sapling density (All species) Sapling density (Non-Eucalypts) Sapling density (Callitris intratropica) Adult stem density (Callitris intratropica)	Fire frequency Frequency of low severity fires Time since burnt severely Frequency of severe and very severe fires
Savanna and Heathland	Number of shrub taxa (obligate seeders) Number of long maturing (> 3 yrs) shrub taxa (obligate seeders) Shrub density (resprouters)	Minimum inter-fire interval Frequency of early dry season fires Frequency of severe and very severe fires

Fire metrics as Indicators of ecological change

Derived from empirical data
- generally, regionally specific





Comparison to 2000-13 baseline:

Total area burnt 2014-16 = FAIR (< 10% improvement)

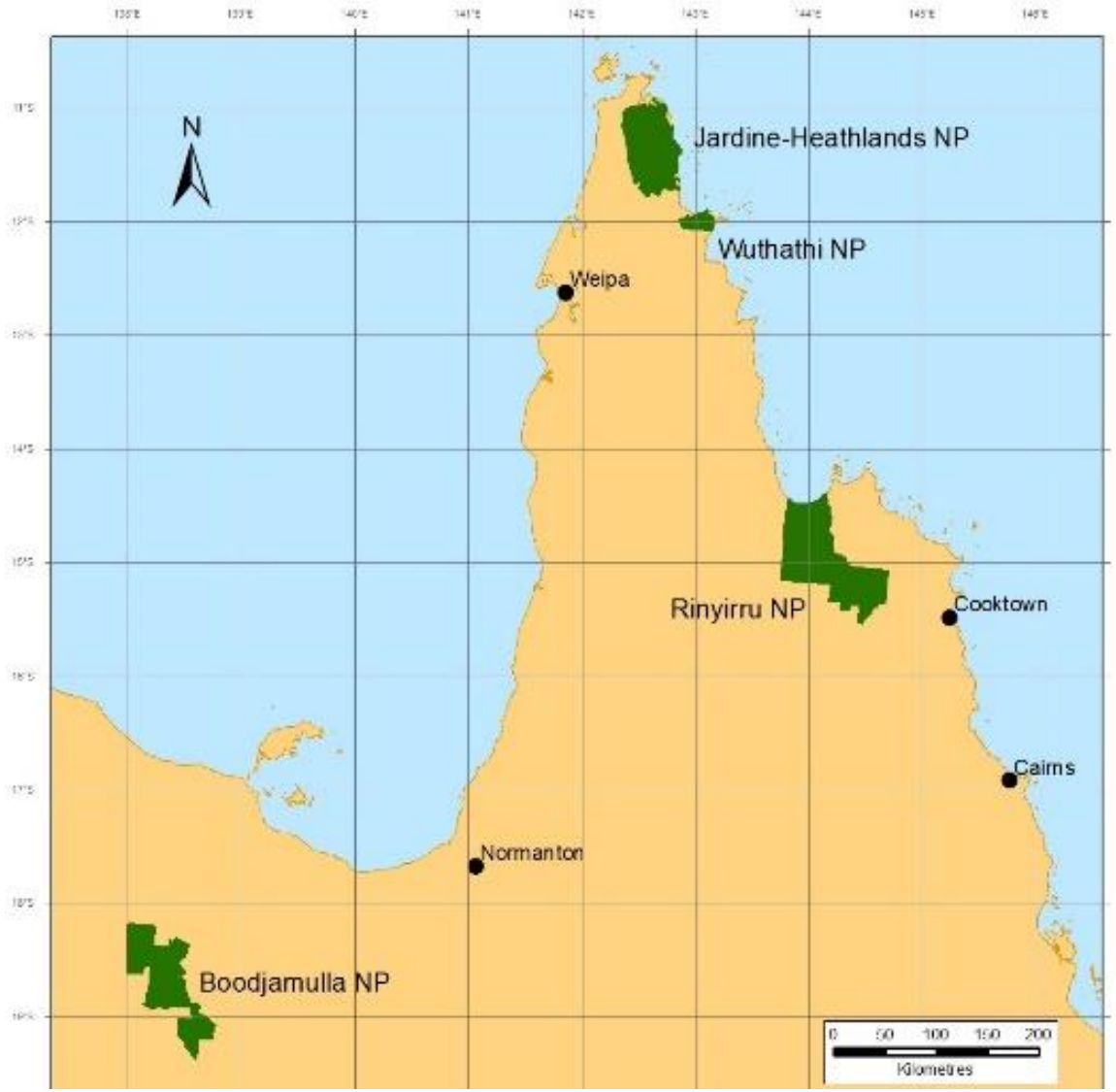
Total area burnt 2017 = POOR (< 10% increase)

Area burnt late 2014-2016 = GOOD (> 10% improvement)

Area burnt late 2017 = VERY GOOD (> 25% improvement)

Example

Area Burnt



National Park	Area (km²)
Rinyirru NP	5,439
Boodjamulla NP	3,753
Wuthathi NP	373
Jardine-heathlands NP	3,422

Queensland Parks & Wildlife

Case Study

End users' needs for NAFI (Bushfires NT)

- Hotspots, fire scars and fire history
  - critical for daily operational use
- Been in use for 17 years
  - with low tech users in mind
- NAFI's future uncertain
  - NT Gov. leading Business Case for stable funding
- Fire management has improved
  - there's now greater scrutiny from within the industry and the public
- Reporting functions in NAFI are currently limited
  - e.g. We would like to measure the effectiveness of prescribed burning at reducing risk
- We need to be able to future proof
  - such as to be able to measure emerging risks: gamba grass and climate change, etc