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Ozflux 2014

Northern Tropical Transect – 2013/14

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Outline

Northern Tropical Transect – CDU, UWA, Monash, UTS

- Funding: TERN OzFlux, ARC Discovery, ARC Future Fellowship (Beringer)
- ARC Discovery program - *Australian savanna landscapes: past, present and future* (Beringer, Hutley, Yu, Haverd *et al.*)
  - Dr Rhys Whitley – Project Research Fellow (MQ Uni)
  - Project Workshop at CDU, Aug 2014
- TERN SuperSite - Tropical Savanna Super Site – CDU, UWA, NT Gov

Land Use Change – using OzFlux data

- Red Dirt Melon Farm flux tower site - clearing for cropping and greenhouse gases emissions (ARC LP)
- Plantation forest water use – impacts on surface water balance (ARC LP)
- SOC and LUC (CFI) – Qld Gov, USC, CDU
- Termite emissions and fire regime – impacts on savanna burning greenhouse gas abatement accounting

Related publications – 9 peer review journals across UTS, UWA, CDU, CSIRO, international collaborators

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North Australian Flux Network

TERN OzFlux Facility

Adelaide River

Howard Springs

Fogg Dam

Litchfield SuperSite – flux tower

Daly River: Uncleared

Daly River: tropical pasture

Dry River

Sturt Plains

Spatial patterns of mass and energy exchange

UTS arid zone tower

LUC phases

Dry season, site preparation, disc ploughing, June

Final prep and planting August 2013

ARC project workshop

- Use of NTT flux data to test ecosystem and land-surface models (CABLE/BIOS-2, VOM, BESS, SPA)
  - Can they cope with highly seasonal 2-layer C3/C4 vegetation ?
- Savanna + met and flux data + modellers + models = *progress understanding of savanna sensitivity to climate, disturbance regimes*
- Use PALS (Protocol for Analysis of Land Surface models) for model comparison
- Early results
  - inability of the models to consistently capture the observed dry season LE and NEE (deep root issue)

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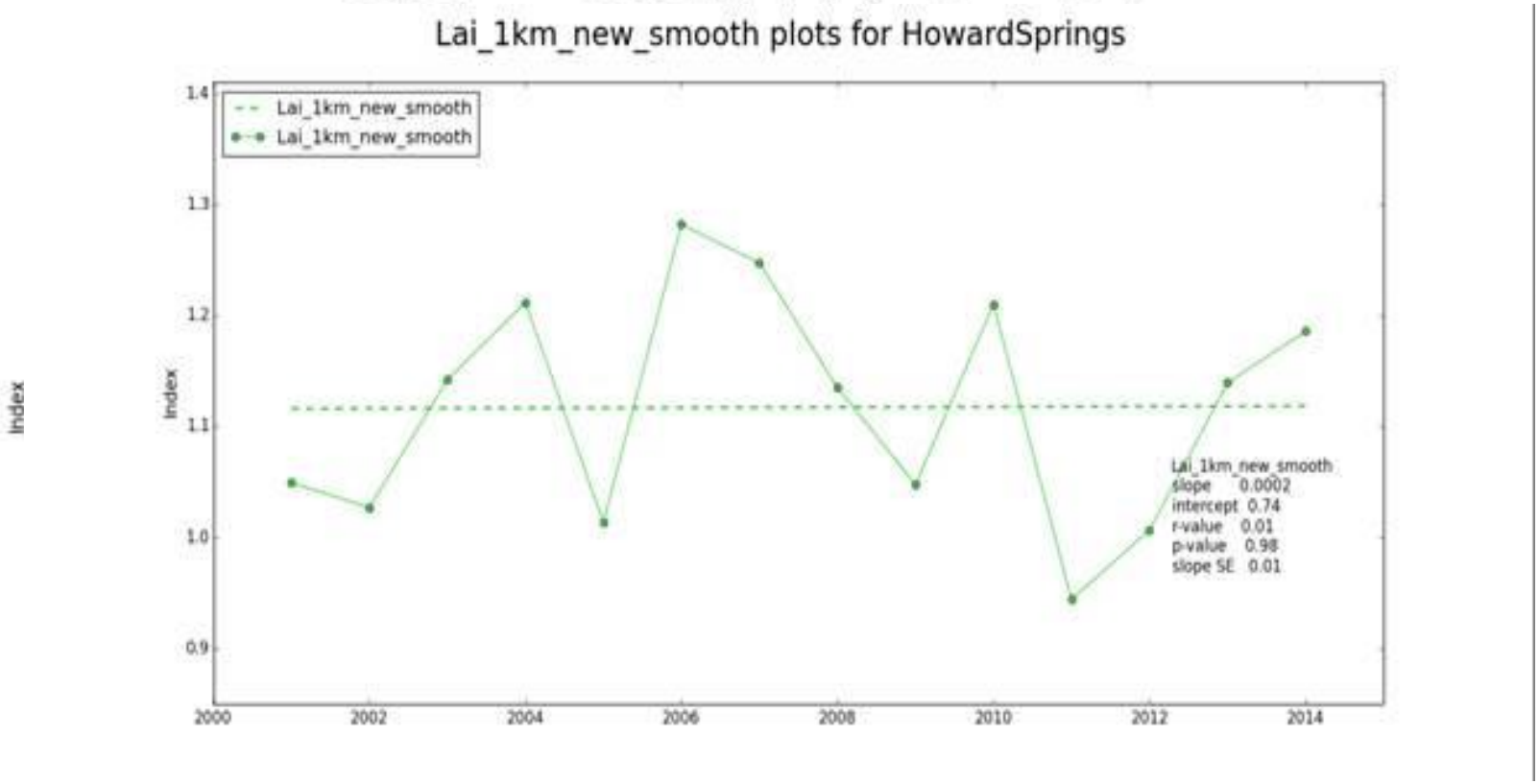
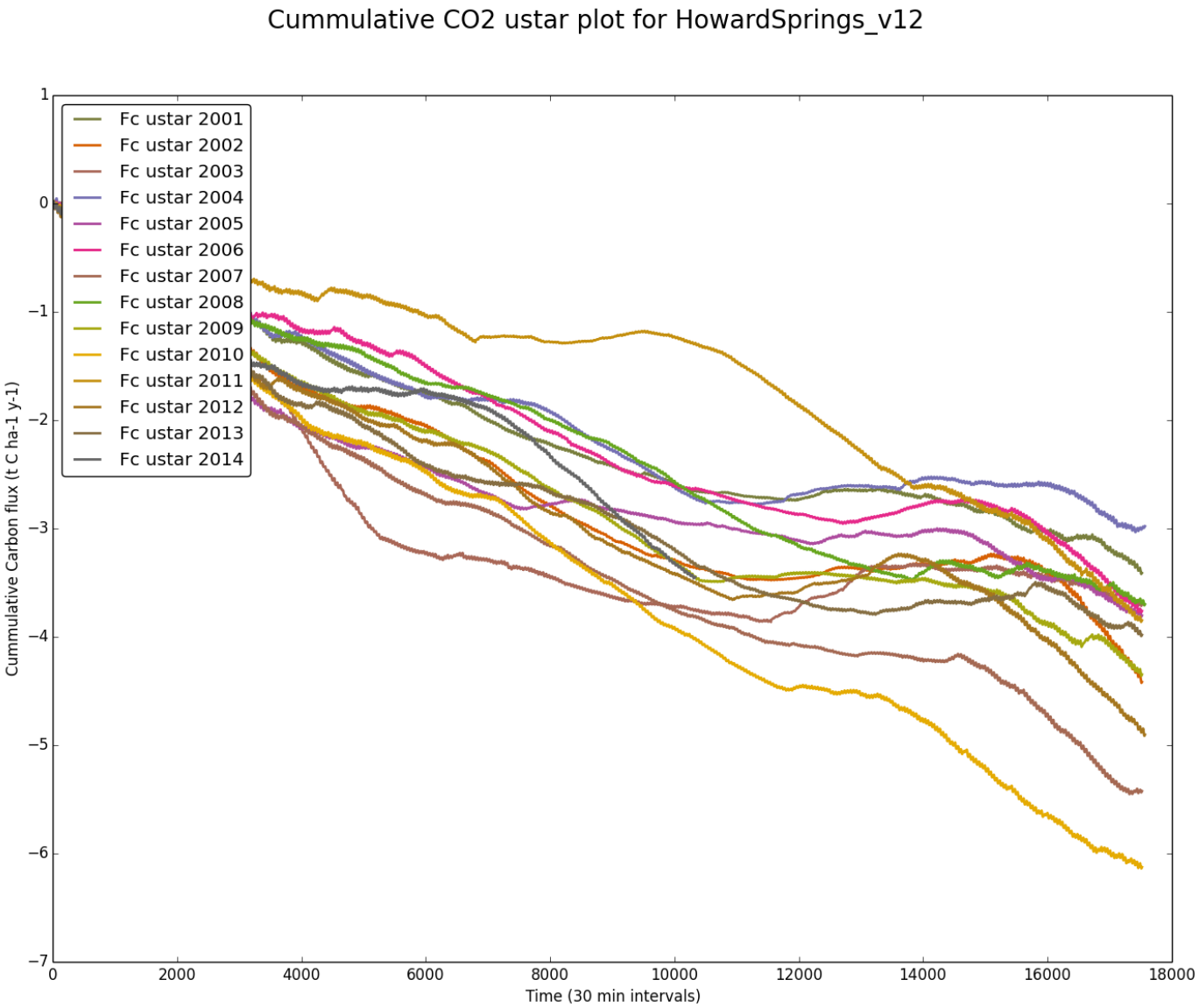
NTT – data availability

- Superb data management, QC, gap filling effort (Beringer, Isaac, OzFlux central staff et al.)
- ~35 site years
- Howard Springs 14 years + ongoing



Interannual variability – climate and fire



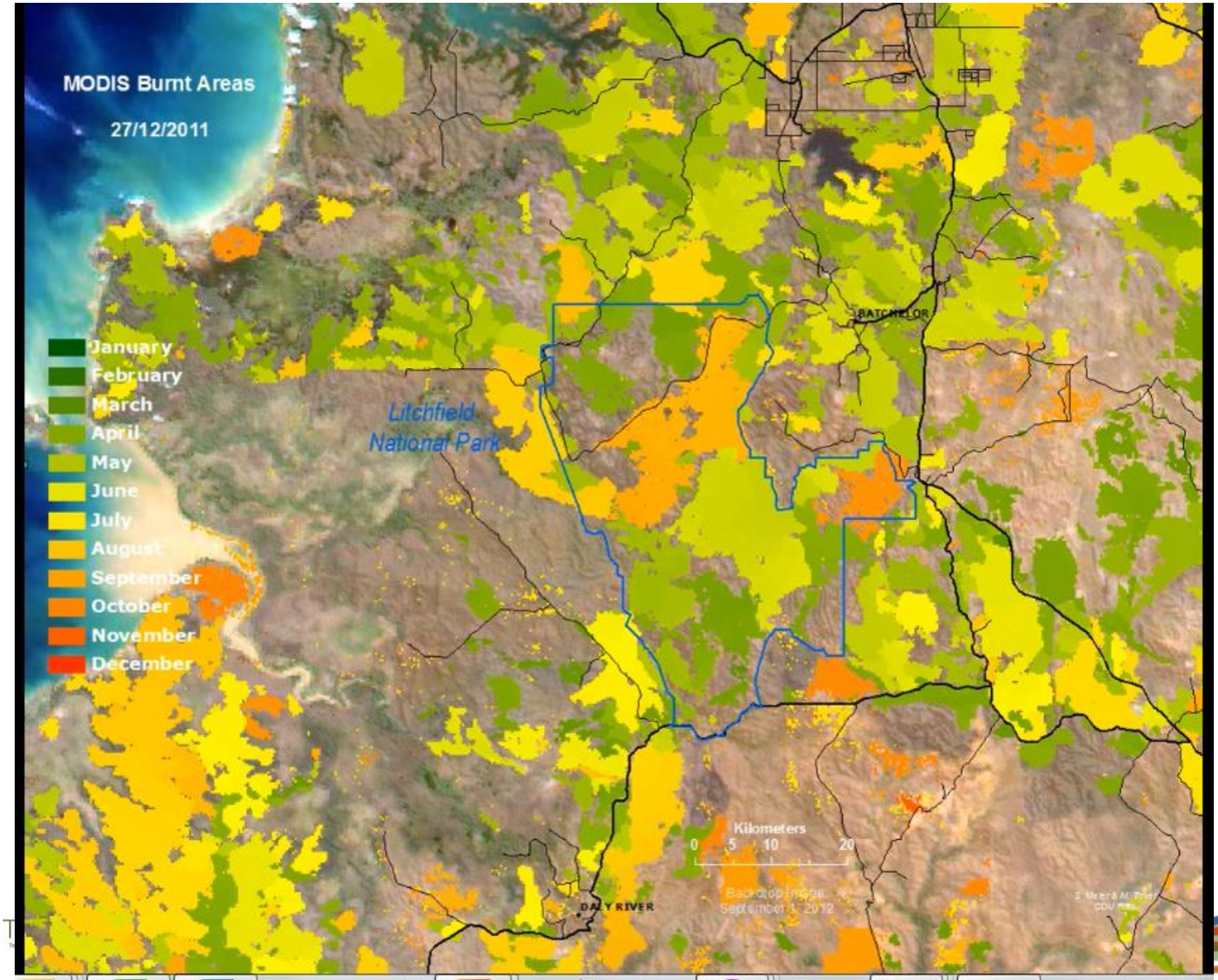
New tower site - Savanna SuperSite Litchfield NP

Savanna Supersite - Science questions

- What are the impacts of prevailing fire regimes (primarily frequency, but also intensity, extent, heterogeneity) on vegetation structure and composition, habitat quality, fragmentation and vertebrate faunal biodiversity?

- How does remotely sensed vegetation structural indices , climate drivers and fire regime influence savanna carbon sequestration rate?

- What are the impact of climate change on fire regimes and subsequent feedbacks to savanna carbon and water cycles?


MODIS Burnt Areas
27/12/2011
January
February
March
April
May
June
July
August
September
October
November
December
Litchfield
National Park
BATCHELOR
DALY RIVER
Kilometers
0 5 10 20
Backdrop Image
September 3, 2012

Planned monitoring systems

Remote sensing

- 3 channel VIS-NIR spectrometer (up-welling below canopy, up-welling above canopy, down-welling above canopy)
- Automatic cameras (upwards, downwards)
- Wi-Fi access point for spectrometers and cameras
- Phenocam, drones (UTS)
- Miniature PC in instrument shed for controlling spectrometer, data storage, online data transfer and systems health monitoring

Flux measurements

- 40 m guyed mast
- Standard OzFlux installation – mass and energy exchange
- Canopy CO_2 profile system
- Soil moisture monitoring to 2.5 m depth

Acoustic sampling

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Existing monitoring

Vegetation dynamics – Maier et al. (CDU, TERN AusCover)

- Litter traps - sampled monthly, 3 years of data,
- Automated canopy photos - 30 min interval, 2 years of data, on-going
- Four cardinal directions + vertically up
  - 1 canopy (upwards looking, *magic angle*)
  - 1 understorey camera (horizontally looking) – 2m above ground,
- Temp/humidity logger – 5 min interval, 2 years of data, 1.3m above ground

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Site campaigns to date

AusCover campaign June 2013

- AusCover star-transects established
- LAI measurement
- Airborne hyperspectral and Lidar data capture
- Ground-based Lidar at star-transects, litter trap and camera locations
- Long term fire plots (LTERN, 3 Parks plots) re-sampled by Russell-Smith et al. 2013

- **Vegetation**
  - 1 ha gridded plot established at tower site
  - Flora survey – floristics, woody tree biomass
  - Soil chemistry, DNA profiling
  - Vegetation C13 sampling (Eamus, UTS)
  - Soil pit install – CS650 / CS616 to 1.5 m

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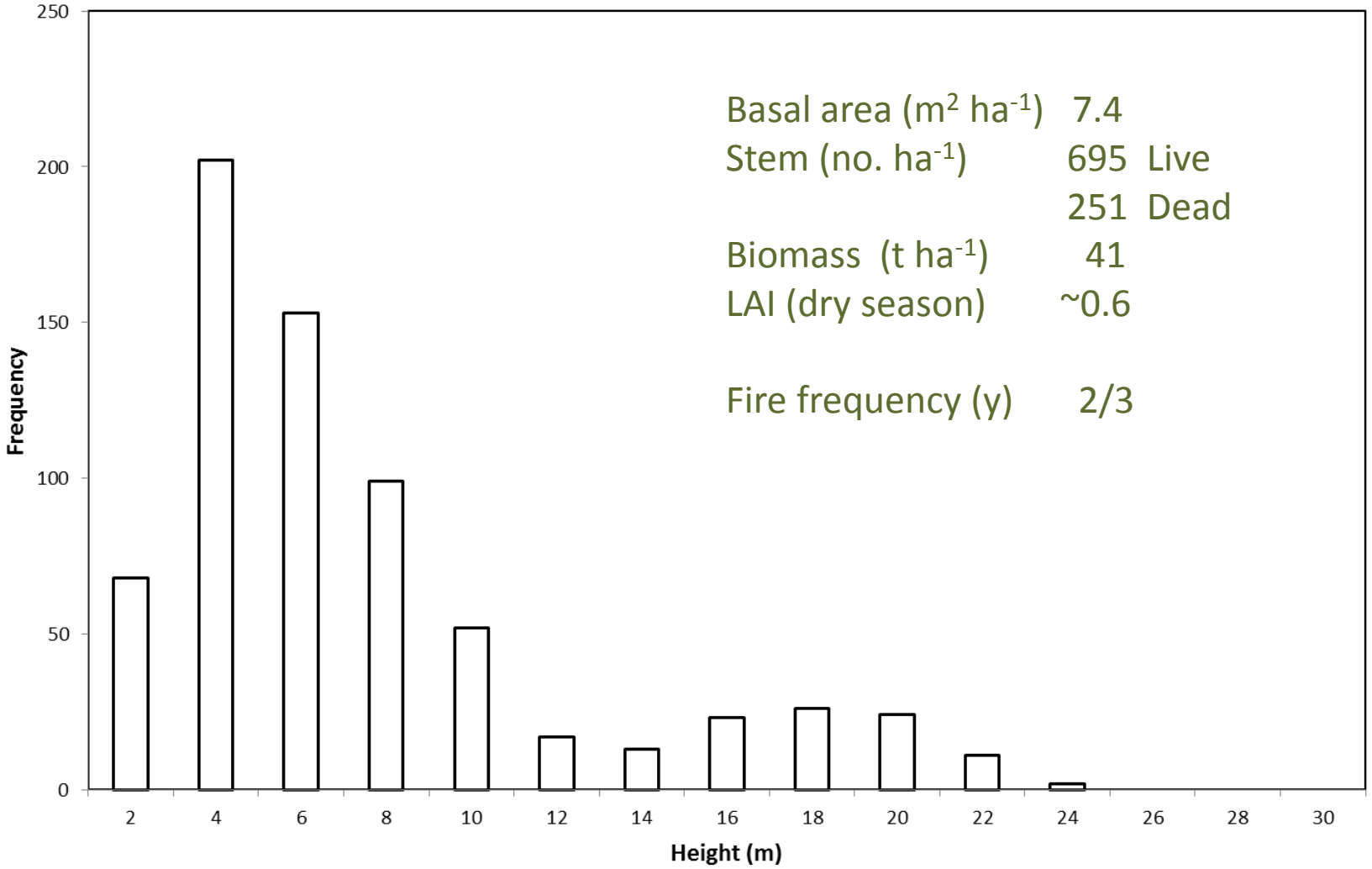
Vegetation survey – ‘recruitment bottleneck’?



Basal area (m^2 ha^{-1})	7.4	
Stem (no. ha^{-1})	695	Live
	251	Dead
Biomass (t ha^{-1})	41	
LAI (dry season)	~0.6	
Fire frequency (y)	2/3	

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Site history and status - Litchfield National Park site

- First Supersite funding allocated for 2014/2015
- Site selection – May 2012
- Approvals – Aboriginal Area Protection Authority (submitted Oct 2012, approved May 2013)
  - NT Parks and Wildlife
- Tower construction commenced Jun-Sep 2013

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The tower journey to date

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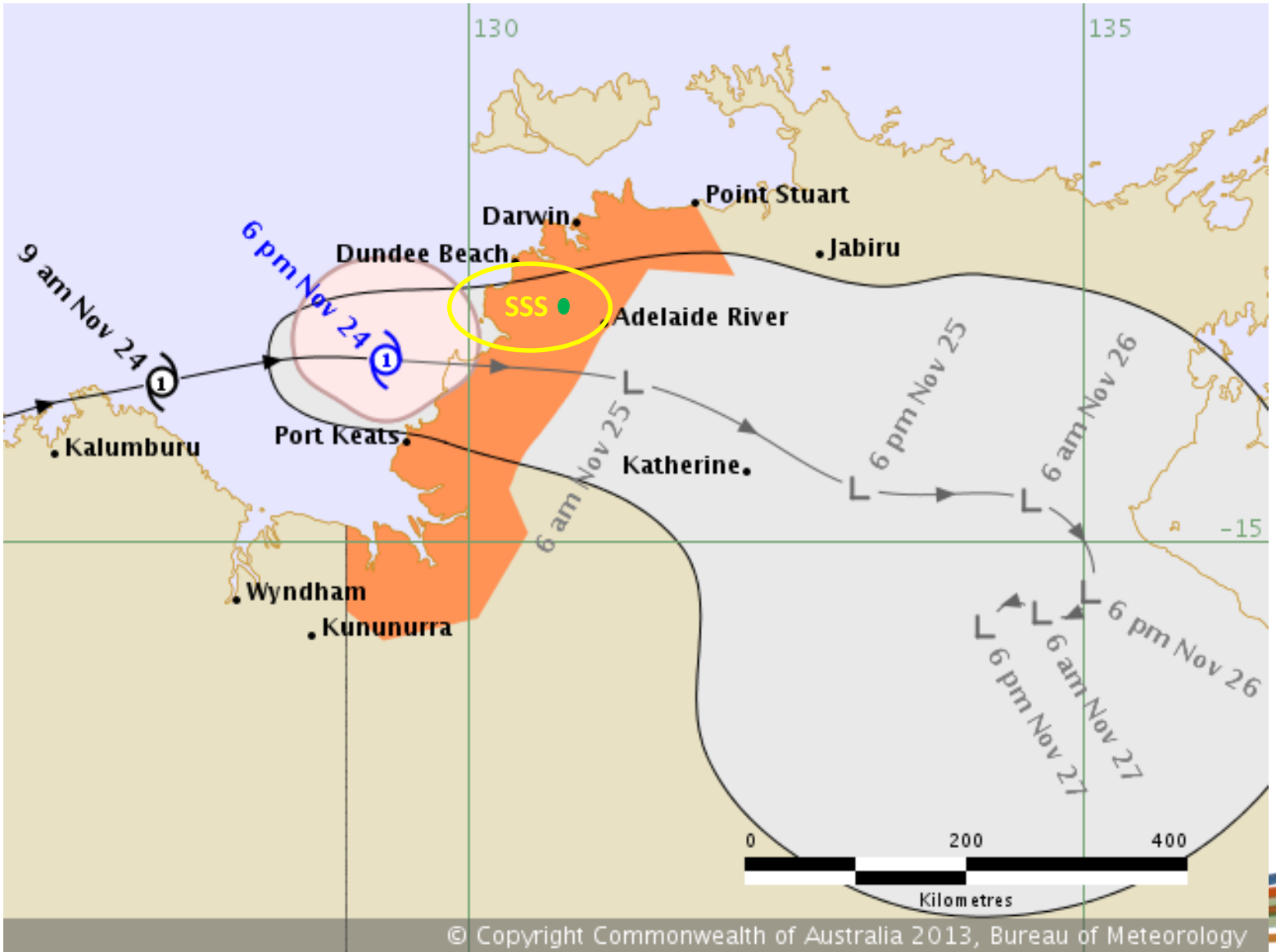
KENNARDS

The journey to date - building towers in cyclone zones…



Tower footings – wet and dry

Wish I was a modeller

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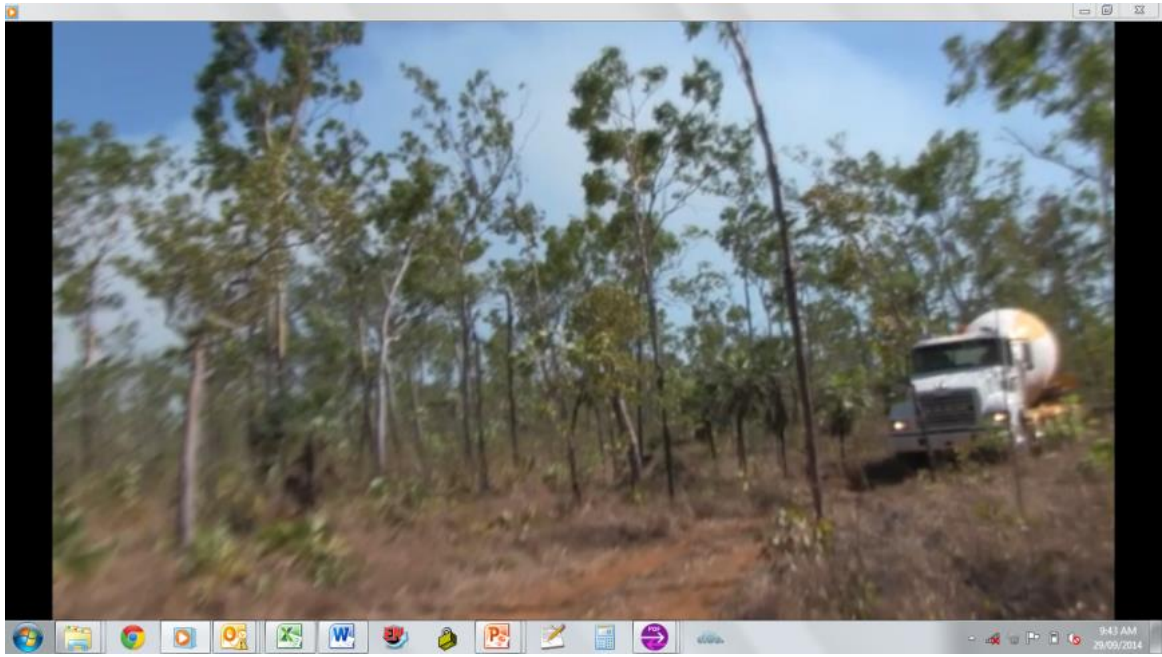
It’s now dry - lets Firecrete®



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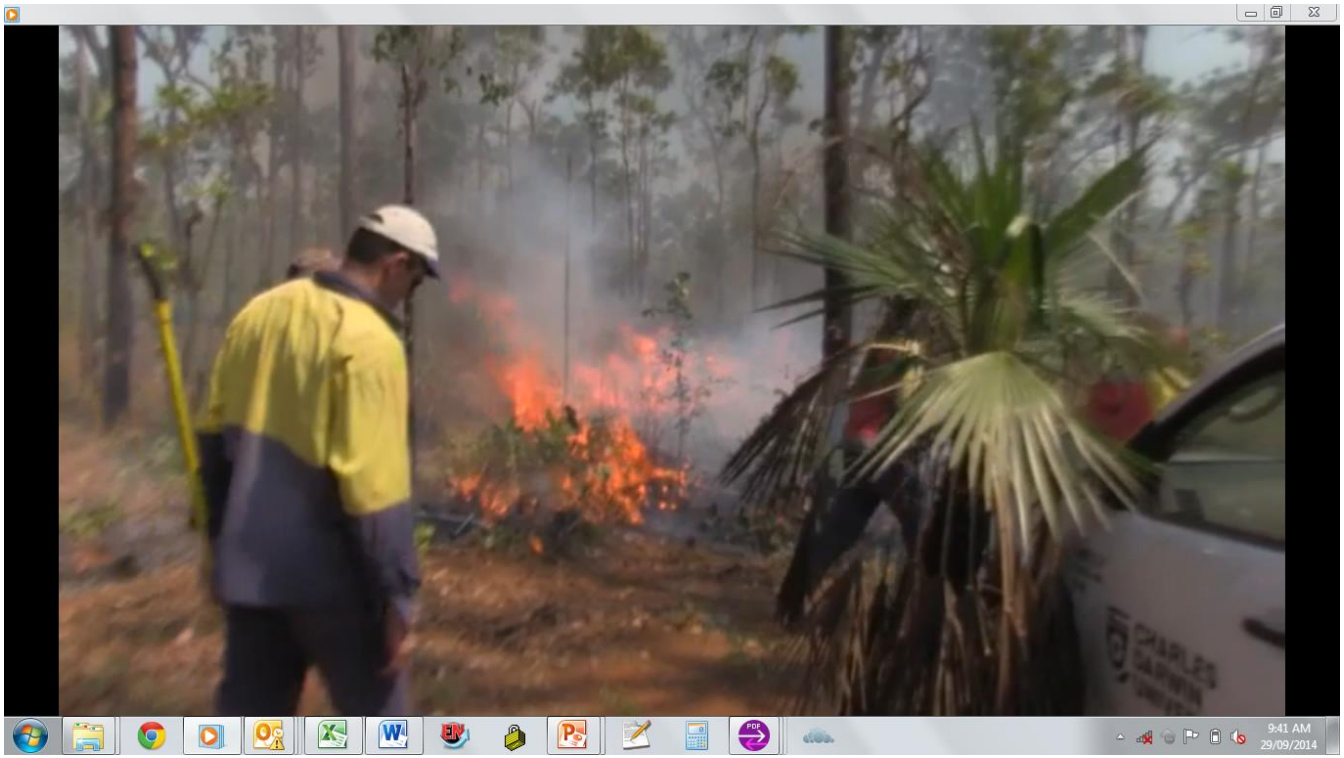
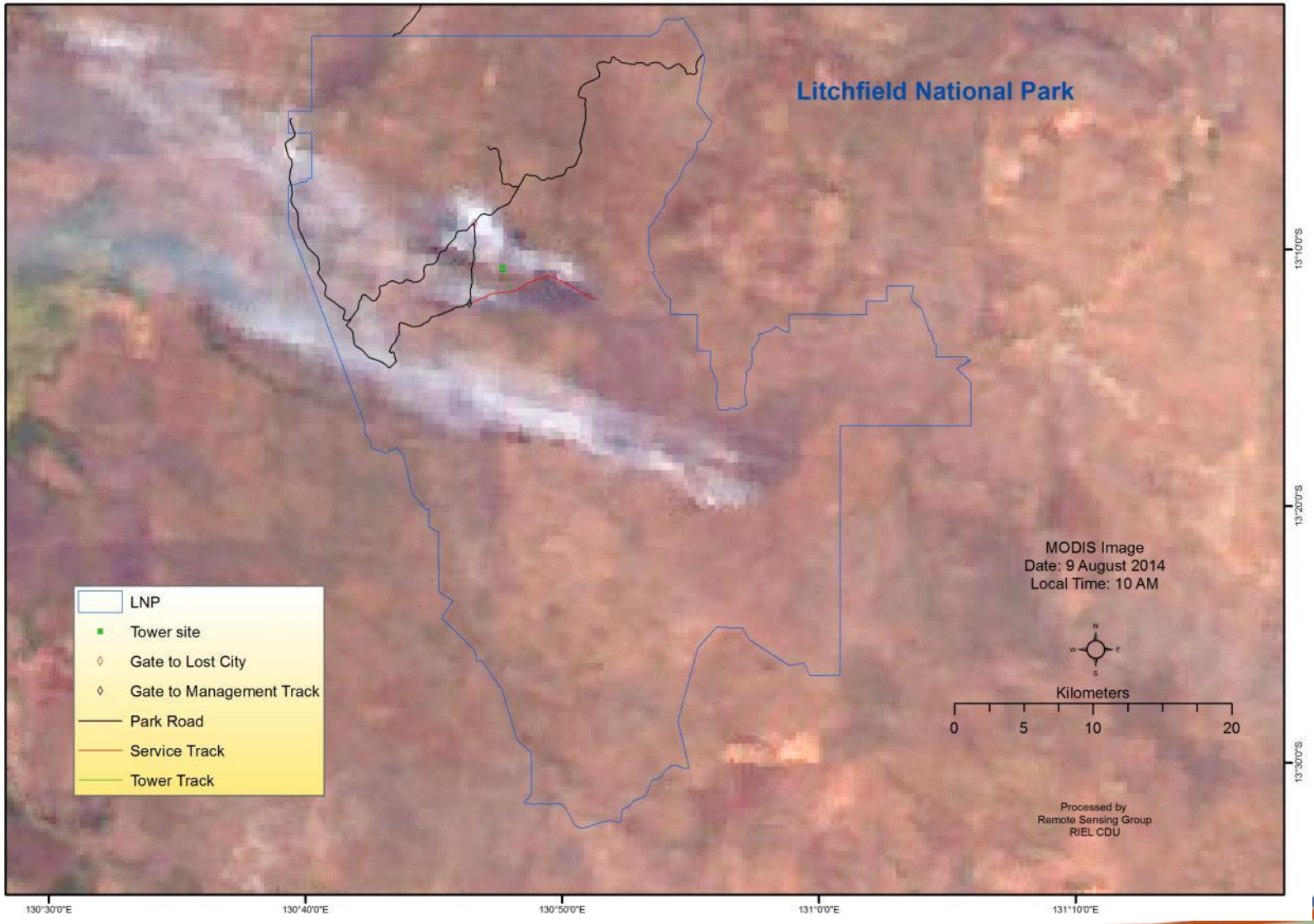
Firecrete – the movie



We made it onto the satellite!



The big lift

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