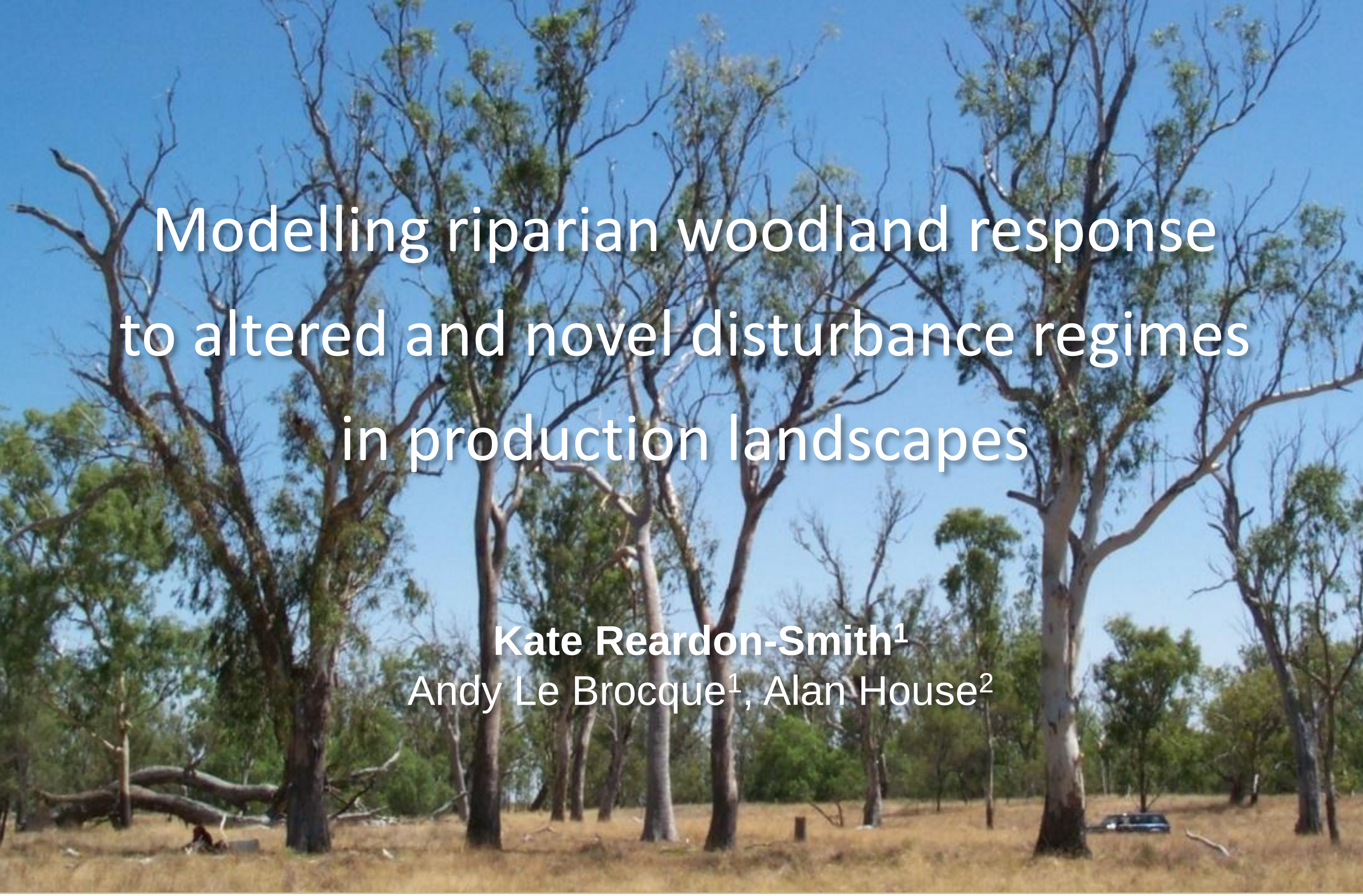
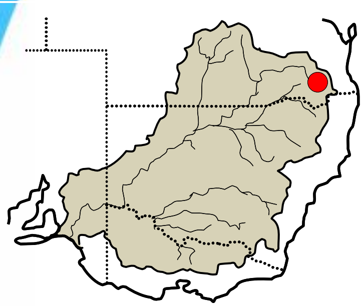


Modelling riparian woodland response to altered and novel disturbance regimes in production landscapes

Kate Reardon-Smith[1]
Andy Le Brocque[1], Alan House[2]

USQ AUSTRALIA
Australian Centre for Sustainable Catchments

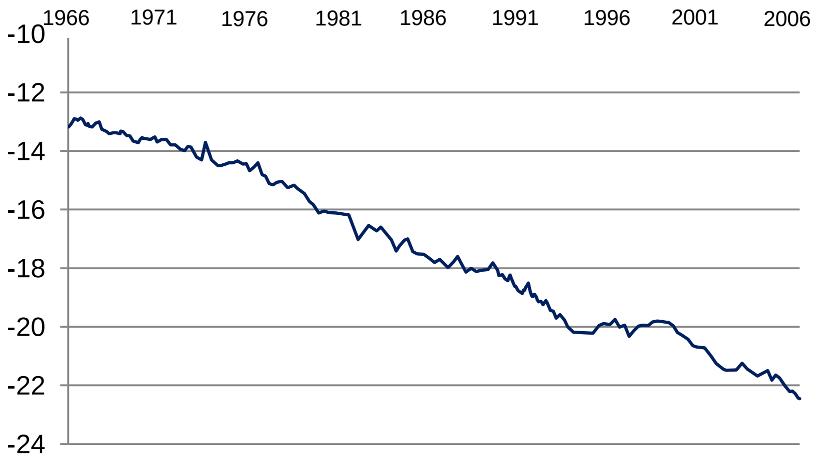
[1] Australian Centre for Sustainable Catchments & Faculty of Sciences
University of Southern, Toowoomba Qld, Australia [2] AECOM, Brisbane Qld, Australia



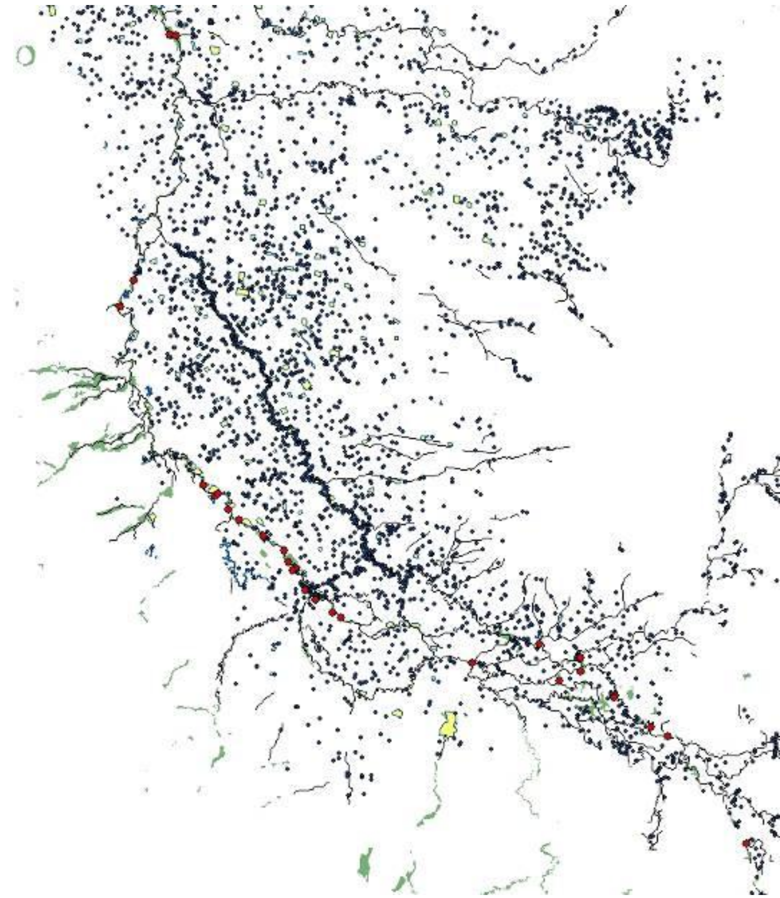
Floodplain development

Upper Condamine

- Land use change & intensification
- Reduced extent of native vegetation
- Loss of hydrological connectivity



Groundwater decline, 1966 - 2008
(UC-GMU3 bore #42230071)



State and transition conceptual model

Upper Condamine floodplain riparian woodlands

State 1
Native RRG woodlands
lippia-free

Transition 1
Lippia invasion & establishment (post 1927)

State 2
Native RRG woodlands
lippia-dominated

Phyla canescens (lippia)

Eucalyptus camaldulensis/E. tereticornis

Floristic composition model

Multivariate pattern analysis (PRIMER-BIOENV)

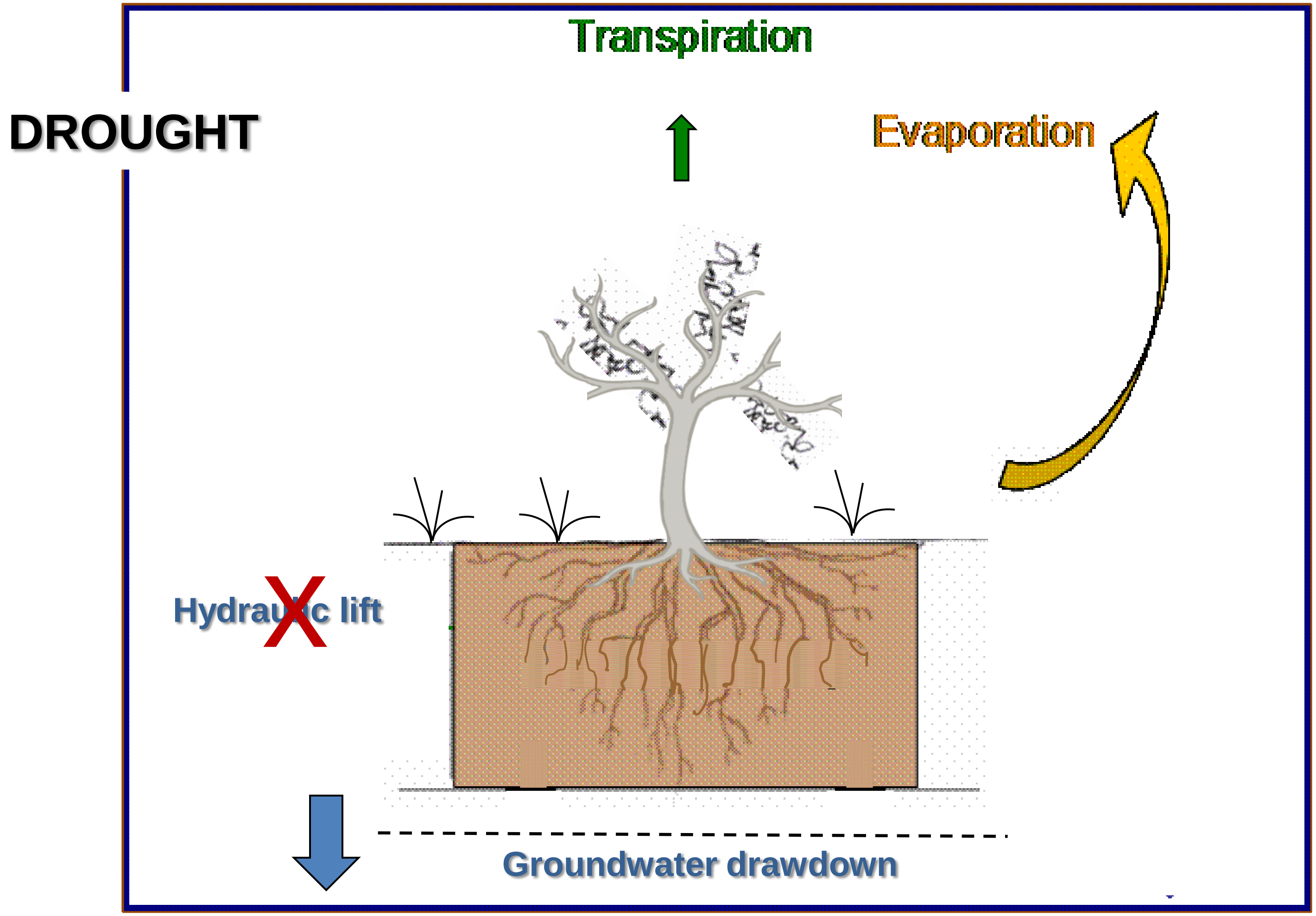
Response variable	**Key Explanatory variables** (**best single** & best set of 6)	**Spearman's r** (best single)	**Spearman's r** (best set of 6)
Floristic composition	**GW depth$_{5000}$,** lippia cover, GW trend$_{5000}$, remnant$_{2000}$, GW bores$_{5000}$	**0.307**	0.449

E. camaldulensis/tereticornis dieback severity model

Bayesian Model Averaging (R)

Response variable	**Key explanatory variables** (posterior effect probability > 0.75)	**Min BIC**	n_{models}	**Max r^2** (best 5 models)
Dieback severity (WWI)	**GW depth$_{5000}$ (1.00*),** grazing$_{500}$ (0.99), GW bores$_{5000}$ (0.80)	-8.177	63	**0.627**

* values in parentheses are posterior effect probabilities


DROUGHT
Transpiration
Evaporation
Hydraulic lift
Groundwater drawdown

State and transition conceptual model

Upper Condamine floodplain riparian woodlands

State 1
Native RRG woodlands
lippia-free
groundwater-buffered

Transition 1
Lippia invasion & establishment

State 2
Native RRG woodlands
lippia-dominated
groundwater-buffered

Transition 2
Floodplain development & groundwater decline
(H_1: below ~ 13 -16 m)

State 3
Native RRG woodlands
lippia-dominated
drought-susceptible

Transition 3
Keystone species (RRG) population failure

State 4
Floodplain grasslands or *Acacia*-dominant shrublands
lippia-dominated
precipitation-driven

Key findings:

- lippia-invaded landscape (dominant functional invasive species)

  → novel ecosystems, with altered response to flooding, grazing & drought

- increasingly fragmented (disconnected) hydrological landscape

  → chronic groundwater decline & loss of drought resilience where groundwater depth exceeds rooting depth of keystone eucalypts

  → increased potential for metapopulation failure of keystone eucalypts & transition to new ecosystem types

Can current policy paradigms - based around environmental flow provision - address critical threats to groundwater-dependent riparian ecosystems in the northern MDB?

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Email: reardons@usq.edu.au