Conservation and Novel Futures

Managing Biodiversity in Multifunctional Landscapes in the Age of the Anthropocene

Dr Sarah Clement (University of Liverpool), Dr Rachel Standish (Murdoch University)

Ecosystem transformation & novel and hybrid ecosystems

Image: Resilience Alliance.

- Why & how systems are transforming
- *Hybrid* ecosystems - most of the measurable traits of the ecosystem (i.e. nutrient load, hydrology, species diversity, etc.) are the same but most of the species have changed.
- *Novel* state - measurable traits altered from historical ranges - new species, interactions, and functions

Novel ecosystems: (mal)adaptive?

- Controversial concept in ecological literature – adaptive response to change or giving up and giving in?
- Restoration & conservation – adherence to historical baselines
- Degraded or just different?
- How, where, and when to manage?
- Reversibility of changes
- Non-technical questions

Governance and novel ecosystems

- Governance and public values discussed as important aspects – but mainly barriers.
- Little investigation of how governance and policy can provided a broadening framework for decision making about how to restore and manage novel ecosystems.

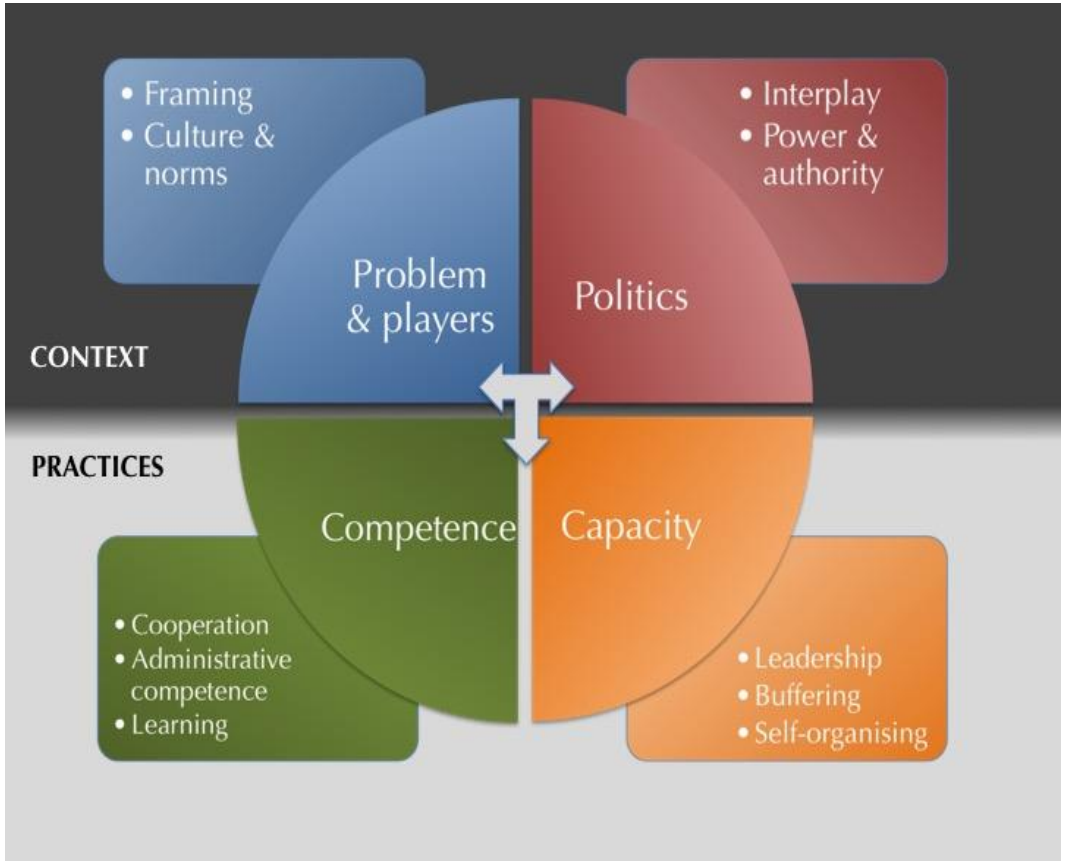
Key questions

- What has been said so far about the governance aspects of novel ecosystems?
- How are we currently dealing with transforming ecosystems?
- What might it mean to re-define conservation ‘success’ in transforming landscapes?

Photo: dried up Lake Hume reservoir during drought by suburbanbloke, via Flickr

2. Review Findings

Ecological perspectives on governance



- Used this conceptual framework to structure review
- General & adaptive capacity
- Only four of the components form a major discussion in the ecological literature

Clement et al. (2015). A diagnostic framework for biodiversity institutions. *Pacific Conservation Biology*

Framing

Photo: frames by George via Fickr, daniandgeorge, CC

Summary of challenges in the literature

- Policy and legal barriers to managing and restoring ecosystems in novel ways (Collier 2015; Hobbs et al. 2009), and do not consider value of NE or functional equivalence in current approaches (Starzomski 2013). But also potential dangers in removing barriers (Graham et al. 2014; Standish et al. 2013).
- Lack of clear definition and diverse ways of viewing the problem and potential management actions (Morse et al. 2014; Murcia et al. 2014; Truitt et al. 2015).

Summary of challenges in the literature

- Cultural values toward nativeness and exoticism; cultural values about historic fidelity and ecological integrity (Manning et al. 2009); sentimentality about historic ecosystems; static view of ecosystems as particular assemblages in particular places (Hobbs et al. 2009; Hobbs 2016; Light et al. 2013). Fostering “new norms”is potentially dangerous (Graham et al. 2014; Murcia et al. 2014; Standish et al. 2013).
- Raises value-laden questions that require broad public dialogue (Hobbs et al. 2014; Hobbs 2016). Social values in relation to NE are largely unknown (Collier 2015).
- Enduring preferences for traditional management actions as a barrier to dealing with transformation(Hagerman and Satterfield 2014).

Culture & Norms

Power & Authority

Photo: Westminster at night.

Summary of challenges in the literature

- Deliberate management of ecosystems as novel could provide authority to approaches that degrade ecosystems (Graham et al. 2014; Murcia et al. 2014; Standish et al. 2013).

- Practical legal challenges, such as property systems and land tenure (Hulvey et al. 2013), allocating rights and responsibilities and setting new procedures for practice (Richardson and Lefroy 2016)

Administrative competence

Summary of challenges in the literature

The feasibility of managing for historical, hybrid, or NE are determined in part to budget constraints and scale of interventions. Need for new practices and technical knowledge about how to manage NE and the efficacy of differing management actions (Collier 2015; Hobbs et al. 2014; Seastedt et al. 2008).

Criteria including reference points, baselines, and bio- and environmental indicators as metrics of change are needed to standardize the use of the novel ecosystems concept for management and policy decision-making (Morse et al. 2014; Truitt et al. 2015).

Buffering

Summary of challenges in the literature

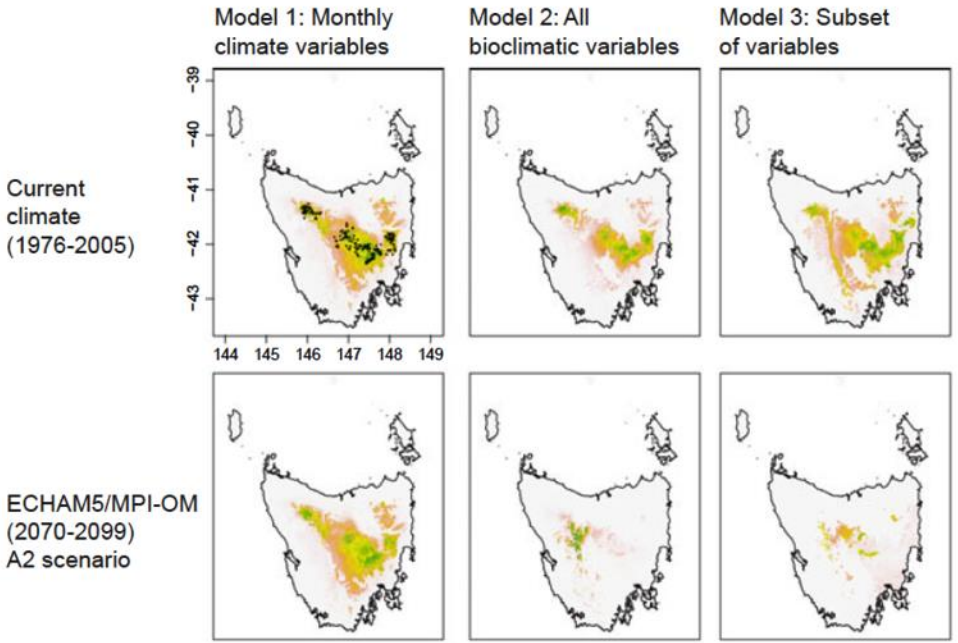
- Mismatch between policy framing and ecological reality is problematic for conservation (Hobbs et al. 2009; Seabrook et al. 2011).
- Governance needs to enable different responses according to local contexts and mechanisms to adjudicate between different perspectives (Richardson and Lefroy 2016) and address fundamental influences on conservation and restoration such as social values (Collier 2015).

Example: Tasmanian Midlands

See:
Clement et al 2016 *Policy Sciences*
Harris et al 2015 *PlosOne*
Raymond et al 2015 *JEM*

- Ecology: Patchwork, <30% native vegetation (1/4 of which is lowland native grassland), tree decline
- Restoration to pre-European state not feasible for much of the landscape + agricultural intensification.
- Most (listed) grasslands on 12 properties
- Suitable climate for listed grasslands will disappear across 50% of geographic extent
- Adaptive capacity high among those with current listed grasslands - Lower capacity among 64% of landholders with areas projected to be suitable by 2050

Climate Models & Species Distribution Models Informed the Scenarios



To Be Or Not to Be? Variable selection can change the projected fate of a threatened species under future climate

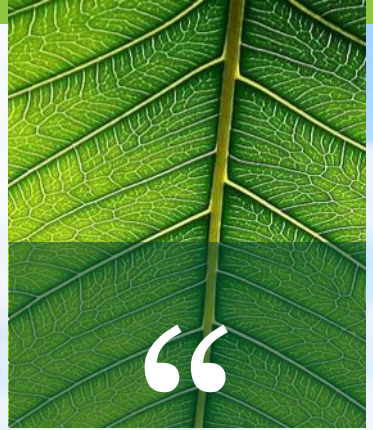
Rebecca M. B. Harris[1], Luciana L. Porfirio[2], Sonia Hugh[2], Greg Lee[1], Nathan L. Bindoff[1], Brendan Mackey[3] and Nicholas J. Beeton[4] ([1]Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC), Private Bag 80, Hobart, TAS, 7000, Australia; Email: R.M.B.Harris@acecrc.org.au; [2]Fenner School of Environment & Society College of Medicine, Biology & Environment Australian National University, Building 48, Linnaeus way, Canberra, ACT 2000, Australia; [3]Griffith Climate Change Response Program Science, Engineering and Architecture Building (G39), Gold Coast campus, Griffith University, Parklands Drive, Southport, Qld 4222, Australia; [4]School of Zoology, University of Tasmania, Private Bag 5, Hobart, TAS, 7001, Australia).

RESEARCH ARTICLE

Noah's Ark Conservation Will Not Preserve Threatened Ecological Communities under Climate Change

Rebecca Mary Bernadette Harris[1]*, Oberon Carter[2], Louise Gilfedder[2], Luciana Laura Porfirio[3], Greg Lee[1], Nathaniel Lee Bindoff[1,4,5]

1 Antarctic Climate and Ecosystems Cooperative Research Centre (ACE CRC), University of Tasmania, Hobart, Australia, **2** Resource Management and Conservation Division, Department of Primary Industries, Parks, Water & Environment, Hobart, Australia, **3** Fenner School of Environment and Society, Australian National University, Canberra, Australia, **4** Institute for Marine and Antarctic Studies (IMAS), University of Tasmania, Hobart, Australia, **5** ARC Centre of Excellence for Climate Systems Science, University of New South Wales, Sydney, Australia



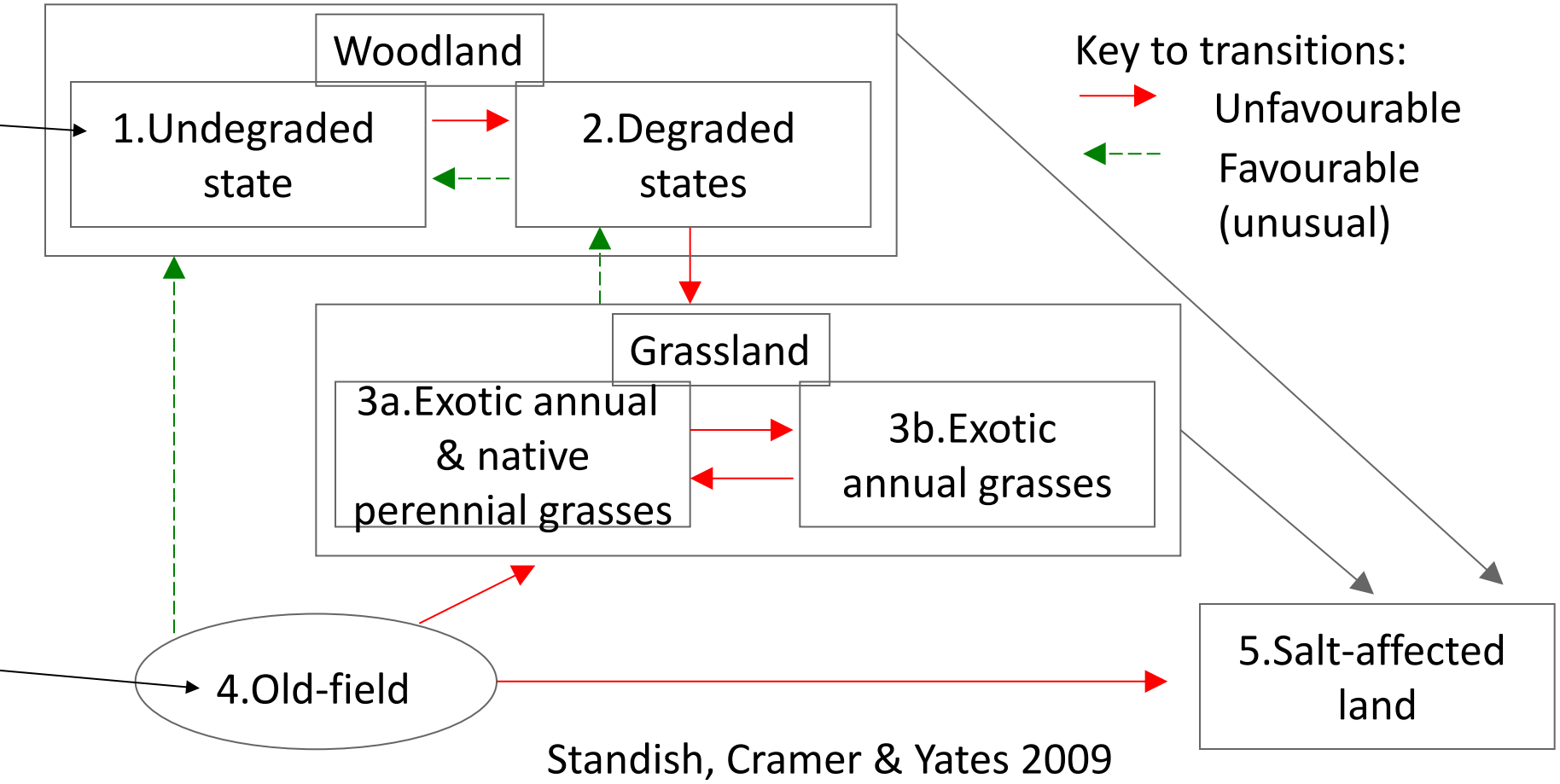
The question for me has changed away from the traditional conserve, protect, language to ***functional thresholds****…just what makes a healthy functional landscape that* ***other things can operate in****, like agriculture?*

- Conservation NGO representative

Example: Australian Wheatbelt

- How “success” is defined in Australian policy.
- Interconnected social and ecological issues.
- Clearing, fragmentation, weed invasion, secondary salinity, nutrient enrichment
- But also: declining production, changing terms of trade, social decline
- Landscapes across southern Australia facing similar issues.

State-and-transition model for wheatbelt woodlands



Standish, Cramer & Yates 2009

Role for carbon market in re-defining success?

- Carbon market: large-scale restoration of degraded agricultural landscapes.
- Achieving restoration goals, such as habitat for wildlife, is more likely if mixes of local native species are planted.
- Theory suggests a positive saturating relationship between biodiversity and ecosystem function. Experiments are underway to test this relationship.

Mallee plantings & biofuel: an opportunity?

Table: From the Future Farm Industries CRC's Mallee jet fuel sustainability and life-cycle assessment report

2013	2014	2015	2016	2017	2018	2019	2020	2021
Airbus Mallee Jet Fuel Sustainability Study 2013	**IFPEn** R&D and process LCA on Australian feedstock		**IFPEn** Scaled up demonstration of upgrading system		**ASTM and RSB** Certified fast pyrolysis biojet fuel			**Certified bio-jet flights Perth**
	ROC Biofuels rebate confirmed		**ROC** Fuel off-take agreements		**ROC** Feedstock secured			**Biofuels plant Collie**
Economic analyses for business case	**ROC** Business case		**ROC** Capital raising				**ROC** Plant construction	
First step RSB assessment of farm impacts	**MOU Partners** RSB accreditation and revised code of practice							**Sustainable biomass South West WA**
Delivered cost of biomass	**MOU Partners** R&D optimising supply chain							
Greenhouse gas emissions	**MOU Partners** Additional detailed LCA							**Society benefits WA and Australia**
Equity and social impacts	**MOU Partners** Regional benefits study							

Restoring function: new measure of success
Old-field example

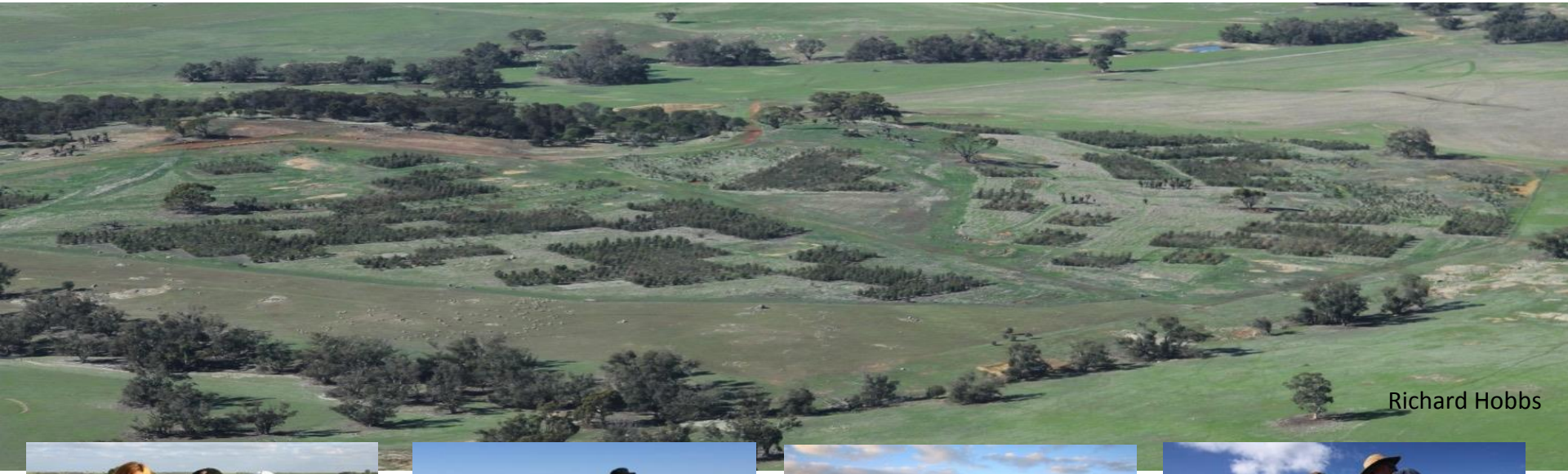
Eucalypt woodland

Wheat field

Grow trees for carbon credits & biodiversity

Old-field

Restoration at Ridgefield



Richard Hobbs

If you plant more species, do you get more function?

Multi-functionality

Planted species richness

Perring et al. 2012

The Moors (UK)

- Cultural landscape – long-term human intervention
- Low intensity agriculture – profitability, resilience
- Exposes tensions between different objectives, classes (and the relationship between the two)
- Re-wilding projects but also intensive management for grouse

The Moors, Grouse, Fire & Flooding

Re-defining success in the moors?

- Cross-cultural differences - What makes a European cultural landscape “novel”?
- Changing social and economic context - and who benefits?
- Role of moors in carbon capture - restoration of bogs (Moors for the Future)
- Different visions of what would “improve” the uplands

Photo: Wheatbelt Sky by Allan Rostron via Flickr (top); Peak District Heather by author

Research currently underway

- Support for ‘taboo’ options
- Noah’s Ark policies vs ecosystem function
- Re-defining ‘success’ in the Anthropocene - social, economic, ecological aspects
- Cognitive challenges and novel futures
- Cross-cultural comparison (Australia & UK)

Questions?