NRM REGIONS AUSTRALIA

7th National NRM Knowledge Conference

17 November 2019 - 20 November 2019

The Cube, Hovell Street, Wodonga

Building resilience through NRM – how do we do it?

Australian Government | National Landcare Program

NORTH EAST CATCHMENT MANAGEMENT AUTHORITY

Australian Government MURRAY–DARLING BASIN AUTHORITY

North East Water

NRMjobs

Jasper Coffee CAFFEINE DEALERS

Contents

Welcome

NRM Regions Australia, along with our local partner Victoria's North East Catchment Management Authority, are pleased to welcome you to Australia's 7th National NRM Knowledge Conference. Our conference theme and question is: *Creating Resilience through Natural Resource Management – how do we do it?*

We have developed a highly interactive conference with very different types of sessions. Our aim for the conference is to identify a shared future for Australian natural resource management – and actions we will collectively pursue to address the Conference theme – we are calling this our *Call to Action* (more about that a bit later in this conference book). So over to you as delegates to now make this a great conference.

Emma Jackson, Chair, NRM Regions Australia and Chair of Cape York NRM (Qld).

The North East Catchment Management Authority and its NRM Partnership team welcomes delegates to Wodonga for the 7th National NRM Knowledge Conference. We are looking forward to showcasing our work and our beautiful region.

The North East Catchment Management Authority is one of ten authorities established by the Victorian Government in July 1997. We work with the community, government and funding organisations to protect and enhance land, water and biodiversity resources.

Katie Warner, CEO, North East CMA

An interactive Conference

In designing this Conference our primary aim was to facilitate interaction between delegates. We are doing this in several ways:

- Constraining presentations to allow for greater delegate discussion and to maximise the opportunity for all those who submitted abstracts to share their stories in a variety of sessions;
- Developing a collaborative *Call to Action* conference report;

Adopting the Crowd Compass app to allow you to seek out other delegates and to contribute your thoughts to the different conference sessions.

What is our *Call to Action?*

We will be writing a Call to Action at the conference in response to the question we've posed, the challenge, how do we build resilience through NRM?

Through the conference we would like to develop a shared understanding of where we need to head and how we can do this together – the pathways and perhaps even actions that take us there. The Call to Action will begin as a short document that harnesses some of the deep experience, knowledge and commitment that comes together in these few days and will be structured around the conference program. We will be harvesting your ideas from each of the sessions and drafting throughout the conference, touching base with you as we go.

The Call to Action can help build momentum beyond the conference; to bring others along who couldn't be at the conference, and to engage more widely across existing and new partners.

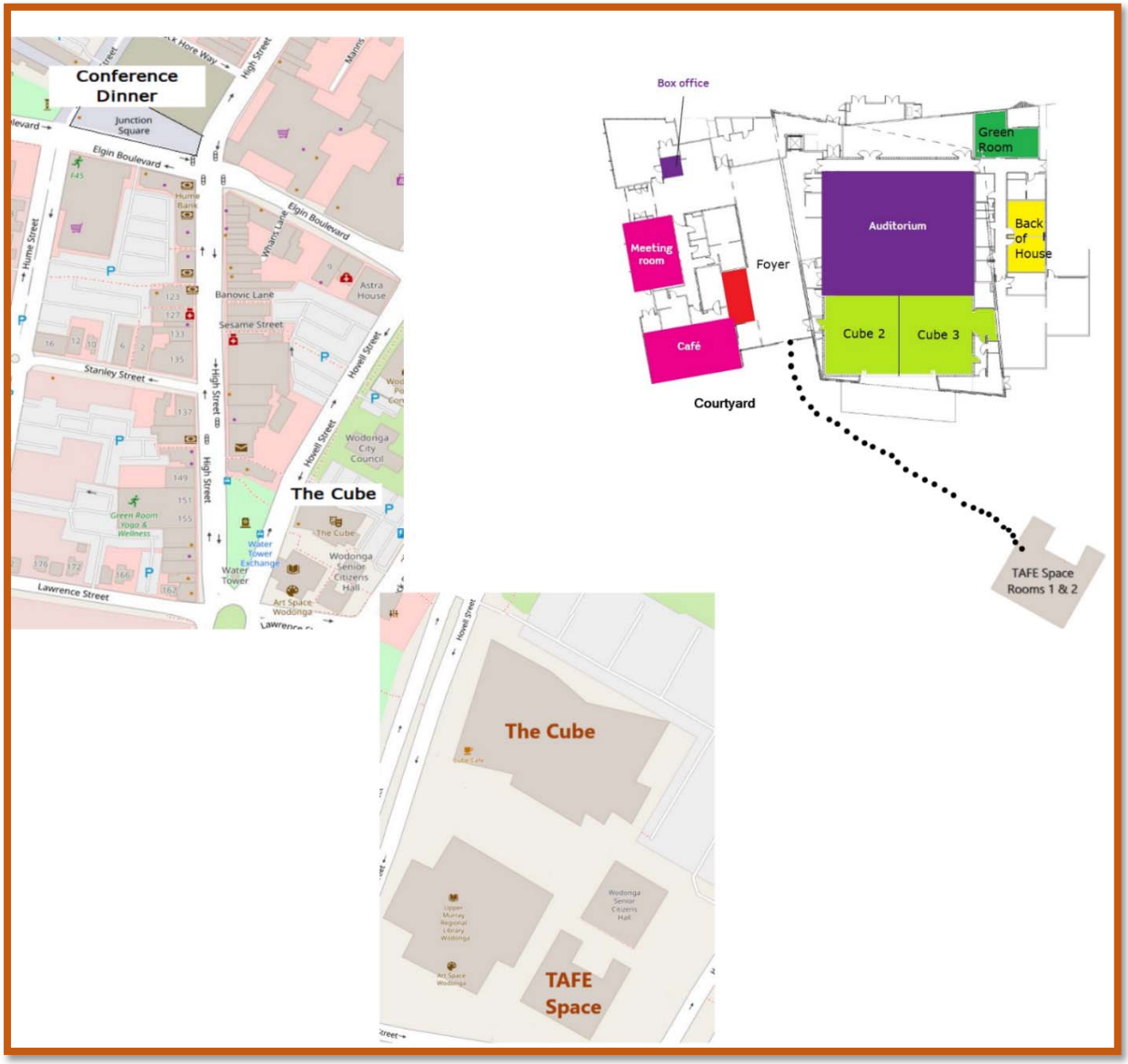
It will be a tangible result for us all.

Crowd Compass

Have you downloaded the Crowd Compass App to your mobile phone (or another mobile device)? You will have received an email to download the app. Check in at the registration desk if you need assistance.

On the App you can view the Conference Program, details about our partners, make appointments with other delegates to use our meeting space (TAFE 2) or other locations of your choice, contribute your thoughts about the conference and most importantly, contribute to the Call to Action through the session feedback.

Conference Locations



Conference Program

Sunday 17 November 2019	
6.00 pm	Welcome Reception and Registration in The Cube foyer
6.30 pm	Welcome to Country – Allan Murray
6.30 pm	Welcome from NRM Regions Australia and NECMA
Monday 18 November 2019	
8.30 am	Registration in The Cube foyer
9.00 am	Conference Opening - **Suzanne Thompson (Conference MC)**
9.00 am	Welcome to Country – Wagarra Dance Group
9.10 am	**Provocateurs: Indiah Fletcher, Charlotte Caling and Sue Middleton**
9.40 am	**Interactive workshop session** Introduction to our collective conference report *Creating Resilience through Natural Resource Management – how do we do it? Call to Action*- **Suzanne Thompson, Katie Warner and Gary Rodda** Familiarisation with the conference Crowd Compass app
10.00 am	**Our policy environment:** Dr Kate Andrews, Executive Officer, NRM Regions Australia and Dr Sally Box, Australia's Threatened Species Commissioner
10.30 am	Morning Tea
11.00 am	**The Hon. Sussan Ley MP, Minister for the Environment**
11.15 am	**Concurrent 1: Resilient communities and industries (4 Tracks)**
12.45 pm	Lunch – with Videos in main auditorium from 1.15 pm to 1.30 pm *Art and Ecology – Alpine Peatlands (4.16 minutes)*, The first film illustrates the importance of Alpine Bogs, and the work that two scientists are undertaking locally. *Living Links: Connecting people and nature in Melbourne's south-east* (5 minutes), Corinne Mays Port Phillip & Westernport Catchment Management Authority
1.45 pm	**Launch of Climate Works Natural Capital Road Map, Eli Court, Program Manager, Climate Works**
2.00 pm	**Partnership Session –** Workshops (see attachment)
3.30 pm	Afternoon Tea
4.00 pm	**R&D and University Panel** (see attachment)
5.30 pm	Meeting Space Session - where individuals can meet with others in TAFE Space 2 upstairs
6.00 pm	**Annual Local Aboriginal Acquisitional Art Prize and Exhibition 2019** in TAFE Space foyer
Tuesday 19 November 2019	
8.30 am	**Plenary:** • ***Call to Action* team:** to report on progress • **Gretchen C. Daily, Director, Center for Conservation Biology Bing Professor of Environmental Science, Department of Biology Senior Fellow, Woods Institute for the Environment** - presentation via Video Link
9.15 am	**Change Agent Panel** hosted by Warwick Long – ABC Rural Reporter **Panel members:** Lucinda Corrigan, Farmers for Climate Action Matt Pfahlert, CEO, Australian Centre for Rural Entrepreneurship Brad Moggridge, National Environment Science Program Carole Sweatman, Terrain NRM

10.15 am	Poster Session in TAFE Space 1
10.45 am	Morning Tea in TAFE Space
11.15 am	**Problem Solving Session (see attachment)**
12.15 pm	**Dr Debra Parkinson, Manager, Gender & Disaster POD - An initiative of WHGNE, WHIN and MUDRI,** *Disaster survivors' accounts of resilience - and the central role of gendered expectations*
12.45 pm	Lunch - with Videos in main Auditorium from 1.15 pm to 1.30 pm *Falls Creek Public Art - the making of "Big Fella"* (2.5 minutes) The film covers the making of the Big Fella mural, a local artwork that has cultural, social and environmental significance surrounding the Bogong Moth and the Water Tank as the life source for the Village, just as Bogong Moth's had been the food source for Indigenous ancestors. *Farmers Connect with Mallee Parks: Re-establishing links between the Murray Sunset and Wyperfield National Parks*. (3 minutes). Stephanie Creer, Mallee Catchment Management Authority *Engaging 'hard to reach' landholders in endangered species conservation* (5 minutes). Gaye Gadsden, Friends of the Helmeted Honeyeater Inc
1.00 pm	**Field Trips**. 5 Field Trips will be offered. These will be repeated on Wednesday morning
1.40 pm	**Provocateur: Gabriel Bani, Wagadagam people, Mabuiag Island, Torres Strait***: Land – Language – Family - Nation*
2.00 pm	**Concurrent Session 2: Ecosystem resilience (3 Tracks)**
3.30 pm	Afternoon Tea
4.00 pm	**Side Meetings Session** (see attachment)
5.30 pm	Meeting Space Session
7.00 pm	**Conference Dinner. Junction Square (see map) – An informal gathering with Street Food and be entertained by Pete Denahy.**
Wednesday 20 November 2019	
8.30 am	**Field Trips**
8.30 am	**Plenary** • **Provocateur: Dr Joelle Gergis (Fenner School, ANU) –** *Sunburnt Country: The future and history of climate in Australia* • **Our *Call to Action* team:** to report on progress
9.00 am	**Concurrent 3: Resilience on a Landscape Scale - why is this important? (3 Tracks)**
10.30 am	Morning Tea
11.00 am	**Sean O'Reilly, CEO, Viridis Ag.** Sustainable Development Goals, business and agriculture
11.30 am	Concurrent Session feedback – what did we learn
12.30 pm	Lunch – with Videos in main auditorium from 1.15 pm to 1.30 pm *Addressing the Recovery of the Small Purple-pea in Central West NSW (3 minutes)* Tanya Muccillo Central West Local Land Services *Tyrrell Project: Ancient Landscapes, New Connections (1.49 minutes)* Nicole Wishart, Mallee Catchment Management Authority *Dieback management - a prioritise, collaborative and cross tenure approach*, Brett Dal Pozzo, South Coast NRM Inc
1.30 pm	Bringing it all together what did we learn/hear over the past three days? **Emma Jackson, Chair of NRM Regions Australia and Chris Norman, CEO, Goulburn Broken CMA**
2.00 pm	Crafting the *Call to Action* -what is the document looking like and where to from here - **Suzanne Thompson, Katie Warner and Gary Rodda**
3.30 pm	Afternoon Tea and Conference Close

Concurrent 1: Resilient communities and industries				
	Indigenous	**Climate Adaptation**	**Sustainable Agriculture**	**Innovation Showcase**
Style	10-minute presentations followed by discussion	10-minute presentations followed by discussion	10-minute presentations followed by discussion	Four x 5-minute presentations followed by 20-minute table discussion led by each presenter. Repeat with four more 5-minute presentations and 20-minute table discussion
Facilitator	Suzanne Thompson	Natarsha Woods, Wheatbelt NRM	Sally Standen First Assistant Secretary, Rural Policy and Farm Performance, Department of Agriculture	Sue Middleton
Location	TAFE Space 1	Auditorium	TAFE Space 2	Cube 2
	Using data to help understand the benefits delivered from Indigenous environmental partnerships and activities **Cathy Robinson, CSIRO**	*Landscape Opportunity and Options for Carbon abatement Calculator* **Cara Stitzlein, CSIRO**	*Australian Rice Industry - leading the way in international sustainability and market access* **Gary Rodda, Local Land Services – Murray & Mark Groat, Sunrice**	*Feedbase Four - pasture best management practices* **Michael Taylor, MLA** *Good stormwater design facilitates resilience building for urban communities* **Andrew O'Neill, Healthy Land and Water** *An Innovative, Cloud Based, Property Flood Risk Report Generation Portal for the Greater Shepparton City and Goulburn Broken CMA* **Brian Jackson, Water Technology** *Virtual fencing and herding* **Mark Turner, Goulburn Broken CMA** *Balancing power and pressure - Development of an Irrigation Energy Calculator* **Chris Nicholson, Goulburn Broken CMA**
	East West Alliance **Neville Atkinson, Goulburn Broken CMA**	*Unlocking the carbon abatement potential of the land sector through aggregation – what are the barriers, and what is the role for NRM organisation?* **Zoe Ryan, Climate Friendly**	*Creating resilience through Regenerative Agriculture* **Margie Milgate, Regen in Action**	
	Noongar Budjar Rangers - a long long path to success **Rebecca Palumbo Wheatbelt NRM**	*Creating resilience through Natural Resource Management, How do we do it?* **Lachlan Campbell, North East Catchment Management Authority**	*The NSW Oyster Industry & the value of relationships* **Andy Myers, Ocean Watch**	
	Supporting Indigenous training and threatened Species through collaboration **Kacie Melfi, Port Phillip and Westernport CMA**	*Carbon Neutral by 2030 (CN30)* **Doug McNicholl, Meat & Livestock Australia**	*Back Barn Farms – their story* ***Jade Miles***	

Concurrent 1: Resilient communities and industries				
	Indigenous	**Climate Adaptation**	**Sustainable Agriculture**	**Innovation Showcase**
				Sharing plant disease information for better biodiversity outcomes using online technology - "Dieback Information Delivery Management System" – DIDMS **Brett Dal Pozzo, South Coast NRM Inc.** *Smart Technology Demonstration Trials for Sustainable Outcomes* **Jonathan Jenkin, GHCMA** *Introducing the Waterbody Area Mapping and Monitoring (WAMM) tool.* **Trent Kershaw, Digital Earth Australia Program Director, Geoscience Australia**

Concurrent 2: Ecosystem resilience			
	Indigenous	**Climate Adaptation**	**Innovation**
Style	10-minute presentations followed by discussion	10-minute presentations followed by discussion	10-minute presentations followed by discussion
Facilitator	Brad Moggridge, National Environmental Science Program	Brendan Wintle Director, Threatened Species Recovery Hub	Emma Campbell First Assistant Secretary, Biodiversity Conservation, Department of Energy and Environment
Location	Cube 2	Auditorium	TAFE Space 1
	Barapa Barapa Wamba Wemba Water for Country project **Nick Stewart, North Central CMA**	*The Australian Ecosystem Models Framework* **Anna Richards et al, CSIRO**	**Vicki Jo Russell, Chair - Nature of SA and Amongst It**
	Finding the track to Mindarabin Reserve – an example of successful Aboriginal engagement on the south coast of WA **Karen Herlihy, South Coast Natural Resource Management**	*Opportunities for Traditional Owners to partner with CMAs in the implementation of carbon abatement projects – findings from the Victorian CAPOTO project.* **Zoe Ryan, Climate Friendly**	*Food Security and strategic NRM investment* **Keith Pekin, Perth NRM**
	Exploring the key considerations when involving Aboriginal people in Natural Resource Management; Learnings from Central Murray Forests Ramsar Project. **Jamie Hearn, Murray Local Land Services & Roland Atkinson - CEO Cummergunga Local Aboriginal Land Council**	*Climate Action* **Gary McDonald and Matt Appleby, Bush Heritage Australia**	*Community based deer program* **Lachlan Campbell, North East Catchment Management Authority**
		Great Southern Ark – The rewilding of southern Yorke Peninsula, South Australia **Andy Sharp, Natural Resources Northern & Yorke**	*Trying a new youth pitch, and the Landcare passion* **Barry Kennedy, Port Phillip & Westernport Catchment Management Authority**

Concurrent 3: Resilience on a Landscape Scale - why is this important?			
	Water	**Climate Adaptation and Drought**	**Innovation**
Location & Style	10-minute presentations followed by discussion	10-minute presentations followed by discussion	10-minute presentations followed by discussion
Facilitator	Carla Littlejohn, International Riverfoundation	Helen Haines MP	Lucinda Corrigan
Location	TAFE Space 2	Auditorium	Cube 2
	Water for the environment- the flow on effect **Erin Lenon, Commonwealth Environmental Water Office**	*Building basin wide resilience through ecosystem-based adaptation in the Lockyer Valley, South East Queensland, Australia.* **Julie McLellan, Healthy Land and Water**	*Towards Landscape SA – A reform program to enhance the way natural resources are managed across South Australia* **Saravan Peacock**, **Department for Environment and Water (SA)**
	Guiding Principles in Waterway Management – Key Considerations for Intervention **Michael Cheetham, Water Technology**	*Remnants on Agricultural Land – An Important Consideration in Achieving Landscape Scale Resilience?* **Stephanie Creer, Mallee CMA**	*How do national pest and weed management datasets help understand change at the landscape scale* **Nyree Stenekes, ABARES**
	Tri-State Murray NRM Alliance- Alliance Native Fish Blueprint **Fiona Johnson, Tri-State Murray NRM Alliance**	*Joining the dots – Cutting carbon and building resilience at the same time?* **Deborah Riley, Melbourne Water**	*Communities of Practice – furthering seascape resilience* **Simon Rowe, Oceanwatch Australia (Marine NRM)**
	Why Investing in People is Powerful – The Waterway Management Twinning Program **Speaker to be advised Adam Bester, GHCMA**	*Tracking change - Wheatbelt NRMs Dashboard* **Natarsha Woods, Wheatbelt NRM**	*Managing for resilience at the landscape scale* **Jen Wilson, GBCMA**
	Intervention, monitoring and innovation on the River Murray **Hugo Bowman, Murray Darling Basin Authority**		*Reef Credits, New partnerships for innovative solutions – building funding resilience for the Reef* **Carole Sweatman, Terrain NRM**

Partnership Session				
	Environmental Biosecurity Office	**Long Term Monitoring and related projects (Dept of Environment and Energy)**	**Have your say on the new National Soils Strategy (Dept of Agriculture)**	**MDBA**
Location	Auditorium	Cube 2	TAFE Space 2	TAFE Space 1
Facilitator	Ian Thompson **Chief Environmental Biosecurity Officer**	Presenters: Dr Ashley Leedman (Department of Environment and Energy), and Dr Samantha Capon (Senior Lecturer, Australian Rivers Institute, Griffith University).	Troy Clarkson, A/g Director, Soils Section, Department of Agriculture Sue Bestow, Senior Policy Adviser to the National Soil Advocate, Department of the Prime Minister and Cabinet	Vicki Woodburn (General Manager Engagement Partnerships and Policy)
Presentations	Justin Bellinger – WA State-wide dieback management – Prioritisation and finding stakeholder agreement Andrew Peters – Integrating science, society and technology in a surveillance system that keeps wildlife healthy To be followed by a workshop session covering Regional Planning and Biosecurity	The Region Land Partnerships program is the Australian Government's flagship NRM program, investing up to $450 million in environment and sustainable agriculture projects over the five years to June 2023. Regional Land Partnerships continues the Australian Government's longstanding commitment to deliver natural resource management at a regional scale. The Australian Government is committed to demonstrating and accounting for the outcomes its NRM investments through on-ground ecological monitoring. To this end, the Department of Environment and Energy are working with Griffith University to develop a long-term monitoring program to better assess the impacts of the four environment focussed RLP outcomes and to help	We invite you to participate in an interactive workshop to help shape the new National Soils Strategy. Long term land use pressures and the current drought, are resulting in widespread soil degradation. The Australian Government is taking action. Recognising the importance of good soil health to our environment, and the role it plays in food production, the Prime Minister has committed to addressing soil degradation through the development of a National Soils Strategy and by reinstating, and making permanent, the Office of the National Soils Advocate. The National Soils Strategy will build on the significant body of work already completed in soils across Australia. Presenting an opportunity to further that work, the strategy will also identify knowledge gaps, including soil monitoring and data, and guide future investment in order to support agricultural production and environmental health.	The value of partnerships to create resilience from a whole-of-Basin perspective • Why is water in the Murray-Darling Basin so contested? • What are some of the challenges we face? • What lessons can we learn from the journey so far?

Partnership Session				
		guide investment in future NRM programs. This workshop will be an introduction to the long-term monitoring framework and provide an opportunity to be involved and provide feedback and ideas.	This session will include a short presentation from Department of Agriculture staff and a representative from the Office of the National Soils Advocate, followed by a workshop seeking genuine input from all participants on what a National Soils Strategy could look like. In small groups you will have the opportunity to have your say on what you think should be covered in the strategy, including priorities, which will be considered in developing a proposal to the Australian Government.	

R&D and University Panel	
Location & Style: Revised: 6 2-minute presentations followed by 6 table discussions, return to main Auditorium for a further 6 presentations followed by 20 minute table discussions. Return to the main Auditorium fir discussion – what did we learn, how do we improve collaboration?	
Facilitator: Professor Nick Bond, Centre for Freshwater Ecosystems, Latrobe University	
Researcher 1	*Resilience in Australian NRM*, Warren Keedle, Charles Sturt University
Researcher 2	*Empowering community groups to engage and build capacity. Catherine Allan,* Institute for Land, Water and Society, Charles Sturt University
Researcher 3	*Soil acidification in the Murray-Darling Basin and its potential impacts on freshwater ecosystems.* Ewen Silvester or Julia Mynott La Trobe University
Researcher 4	*Developing DNA-based monitoring programs for Victorian rivers.* Michael Shackleton, La Trobe University
Researcher 5	*Conserving turtles to increase resilience of freshwater systems.* James Van Dyke, La Trobe University
Researcher 6	*Improving research and on-ground collaboration to support NRM in Australian regional catchments* Wesley Ward, ILWS, Charles Sturt University
Researcher 7	*Food for thought*. Paul McInerney, Centre for Freshwater Ecosystems, La Trobe University
Researcher 8	*Farming for biodiversity, profit and resilience*. Michelle Young, Sustainable Farms ANU
Researcher 9	*What does Citizen Science look like?* Katrina Dent, Reef Catchments and Kevin Kane, North Queensland Bulk Ports.
Researcher 10	*Hydrological Drought Recovery: A statistical analysis of hydrological resilience throughout Victoria.* Tim Peterson, Monash University
Researcher 11	*If we are going to fix it, where do we get the parts?? Martin Driver Australian Network for Plant Conservation*

Problem Solving Session - 5 regional NRM Organisations to present their most challenging problem					
	Effective and Efficient MER Frameworks	*How do we protect our paddock trees within the agricultural landscape?*	*Collapse or Comply? Building Capacity of Traditional Owners for Compliance Mentoring*	*Future support systems for the regional NRM network.*	*Buffel is in remote areas, how do we deal with it!*
Location	Cube 2	Auditorium	TAFE Space 2	TAFE Space 1	Meeting Room
Facilitator	**Stephanie Creer, Mallee CMA**	**Laura Williams, ACT NRM**	**Moni Carlisle, Don Whap and Gabriel Bani, Torres Strait Regional Authority**	**Kate Forrest, Rangeland NRM Alliance**	**Adam Wood and Tatia Currie, Alinytjara Wilurara NRM Board**
Contributors		*YearofthePaddockTree campaign* **Bek Caldwell, Goulburn Broken CMA**		Panel members: **Emma Jackson, Chair, NRM Regions Australia. Paul McDonald, Southern Queensland Landscapes. John Riddiford, Corangamite CMA.**	

Side Meetings					
	National NRM Regions Carbon Working Group	*Delivering Government Priorities – Women in Leadership*	*Insights from the national weeds data collection survey: opportunities for national collaboration?*	*Understanding values and frames for the next generation NRM Communication*	*Spatial Smarts Grow Regional Understanding and Community Action*
Facilitator	**John Gavin, Cape York NRM**	**Amie Twentyman, West Gippsland CMA and Bec Hemming, East Gippsland CMA**	**Katherina Ng, ABARES**	**Dr Trudi Ryan**	**Alun Hoggett Spatial Information & Mapping Southern Queensland Landscapes**
Location	Meeting Room	Auditorium	TAFE Space 1	TAFE Space 2	Cube 2

Field Trips	
1	**Hume Dam:** This will be a relatively short field trip (approximately 2 hours) so delegates can return to the Conference to participate in Tuesday afternoon/Wednesday morning sessions. Participants will gather near the dam wall and hear from the presenter what role the structure plays in running the River Murray to support sustainable water practices for communities, industry and the environment. They will also hear a snapshot of the history of the dam and its place in the overall management of the Murray-Darling Basin. This site visit is very timely considering that in November 2019 the centenary of the beginning of Hume Dam will be celebrated.
2	**Lower Ovens Wetlands:** The Ovens River catchment comprises 0.7% of the Murray–Darling Basin and contributes 6% of Basin water. It is one of the largest unregulated waterways in Victoria. The Lower Ovens floodplain (Ovens River below Wangaratta), is recognised for its environmental and hydrological values in the Basin. The floodplain and its extensive network of wetlands are in much better condition than many other rivers in the Murray-Darling Basin, largely due to the absence of major water storages and major extractions from the upper catchment. The floodplain supports a range of threatened species including birds, amphibians and reptiles, and provides habitat and refuge for the threatened Murray Cod and Golden Perch. Its River Red Gum canopy is among the healthiest in the Basin. It is also significant to local Aboriginal people. The Lower Ovens River was declared a Heritage River due to the quality of River Red Gum forests and fish diversity. Tour stops and discussion will include fish passage sites, including Sydney Weir at Wangaratta and Frosts Crossing in the National Park, the confluence of the King and Ovens Rivers and the challenges of major towns on floodplains, legacy issues from Victoria's gold mining history, challenges related to willow use and management, pest plant and animal control and community engagement in wetland restoration.
3	**Chiltern – Mt Pilot Biodiversity and Cultural Hot Spot:** This tour will focus on the partnerships and works being undertaken in the Barnawartha - Chiltern – Mt Pilot area to improve the resilience of threatened ecological communities and species, including a visit to the culturally significant Yeddonba Aboriginal Cultural Site at Mt Pilot. Key sites to visit: • Barnawartha - Decommissioned water treatment site - Discussion on the large scale 'Bush for Birds' five-year project funded by the Australian Government's National Landcare Program that aims to help landowners create and improve habitat for the threatened Regent Honeyeater. • Chiltern Mt Pilot National Park and associated sites - critical habitat for threatened flora and fauna species – long standing community interest in caring for the park with Friends of Chiltern Mt Pilot National Park. Mt Pilot site of Aboriginal rock art - Yeddonba Aboriginal Cultural Site. The Yeddonba site boasts many significant areas including a rock shelter and bush tucker area. The site is of particular archaeological importance as it features an Aboriginal red-ochre painting, which is believed to be of a Tasmanian tiger (thylacine), supporting the belief that the animal once inhabited the mainland. A well laid out circular walking track will take you by these significant sites, with information boards along the way to help narrate your journey. This walk can easily be completed in an hour.
4	**Wonga Wetlands (to incorporate Yindyamarra Sculpture Walk):** The Wonga wetlands is an ecosystem of man-made lagoons and billabongs covering around 80 hectares (when full). It is a haven for wildlife and a mecca for birdwatchers, photographers, bushwalkers and families. The wetlands are a by-product of AlburyCity's Waterview wastewater (sewerage) treatment plant, constructed in the late-1990s. A requirement of the Waterview plant was that all treated reclaimed water was to be recycled, that is, none goes back into the Murray River.

Field Trips	
	To achieve this, the treated reclaimed water is irrigated on timber plantations and improved pastures in the warmer months and discharged to Wonga Wetlands in the winter months. (Albury generates around 15 megalitres per day of treated reclaimed water, the equivalent of six Olympic size swimming pools). Along the way we will stop at The Yindyamarra Sculpture Walk. This features a series of stunning contemporary Aboriginal sculptures lining the Wagirra Trail from Kremur Street in West Albury to Wonga Wetlands.
5	**Bright:** With rise of Artisan businesses such as micro brewery's and cheese making in the North East other support businesses have also grown, hops production and dairy are just a few. Well managed this can provide growth and prosperity to a region but a lack of strategy could result in disputes over water licencing, impacts on catchments or poor waste management outcomes. This tour will start from the catchment with North East Waters investment in an off river storage at Freeburg to protect environmental flows, to the hops growing in Eurobin leading on to the Bright Brewery and then finishing at Myrtleford waste water treatment plant recently upgraded to include a wet land treatment process.

Poster Session			
Title			**Organisation**
1. Community leadership in planning environmental water delivery at Kanyapella Basin, in the Goulburn Broken Catchment of Victoria, Australia.	Bek	Caldwell	Goulburn Broken CMA
2. Plan2Farm – put your farming future in your hands	Jacqui	Knee	North Central CMA
3. The Great Escape – finding new homes for the critically endangered Helmeted Honeyeater and lowland Leadbeater's Possum	Kacie	Melfi	Port Phillip and Westernport CMA
4. Little Footprint Big Future	Katherine	Allen	NACC NRM
5. A change of plan, building capacity and resource resilience through community engagement.	Lachlan	Campbell	North East Catchment Management Authority
6. The importance of protecting flows for aquatic species at risk from increasing temperatures	Catherine	McInerney	North East Catchment Management Authority
7. Preserving Grey Box Grassy Woodlands in Central West NSW	Kyra	Roach	Central West Local Land Services
8. Restoring farm dams to wetland refuges	Laura	Williams	ACT NRM
9. Making Green Spaces Good Again; remnant eucalypts in the urban environment	Luke	Bulkeley	ACT NRM
10. Improving the dynamics of the Mitta through integration and collaboration	Natalie	Dando	Murray Darling Basin Authority
11. RED CARD – 15 YEARS OF GRASS ROOTS ACTION	Rebecca	Palumbo	Wheatbelt NRM
12. A Healthy Coliban Catchment project	Rod	White	North Central CMA
13. Building resilience in the Shepparton Irrigation Region: taking hybrid drainage from concept to reality	Simon	Cowan	Goulburn-Murray Water
14. Creating resilient relationships with community and partners to achieve NRM goals.	Tony	Gardner	West Gippsland CMA
15. Wet Tropics Major Integrated Project (WTMIP)	Carole	Sweatman	Terrain NRM
16. Can our soils be managed sustainably? – A South Australian experience over 20 years	Craig	Liddicoat	Department for Environment and Water (SA)
17. Cockies helping Cockies – Red Tailed Black Cockatoo recovery across the South Australian & Victorian border	Vicki-Jo	Russell AM,	South-eastern Red-tailed Black-Cockatoo Recovery Team (SA)
18. BITEBACK - A model of community driven pest management in South Australia	Jodie	Gregg-Smith	Natural Resources SA Arid Land
19. Eyes on Eyre – community supporting coastal protection across Eyre Peninsula in South Australia	Andrew	Freeman	Natural Resources Eyre Peninsula
20. A Platform for Ecological Restoration Research Infrastructure (PERRI): accelerating learning and transdisciplinary collaboration in NRM	Suzanne	Prober	CSIRO

Poster Session			
Title			**Organisation**
21. Options for renovating nature under climate change: a global synthesis	Suzanne	Prober	CSIRO
22. Cohuna Fish Screens	Peter	Rose	North Central CMA
23. Using Hydrogeological Mapping as a Land Management Tool in Central West NSW			Central West Local Land Services
24. Addressing the Recovery of the Small Purple-pea in Central West NSW	Tanya	Muccillo	Central West Local Land Services
25. Local Leaders, building resilience capacity in regional communities	Tracey	Potts	Central Tablelands LLS
26. Community Deer Program	Lachlan	Campbell	North East Catchment Management Authority
27. Achieving Landscape Resilience through Targeted Land Management actions	Gareth	Lynch	Mallee CMA

Exhibitor Tables

Name
1. Beechworth Boomerang Bags
2. Threatened Species Recovery Hub
3. Murray Darling Basin Authority
4. Department of Environment and Energy
5. Bookstall for Sunburnt Country
6. Geoscience Australia

Abstracts of Presentations

This section has two purposes:

- to provide you with a guide to the different sessions and the material that will be covered;
- but, as important, to give you a snapshot of what is happening in mid-2019 across Australia in relation to natural resource management

A summary of the Concurrent Session, Poster and Video presenters are included along with some of the abstracts that we received where the presenters were unable to attend.

Concurrent Session Presenters

Concurrent Session 1 Resilient communities and industries - Indigenous

Cathy Robinson CSIRO. Using data to help understand the benefits delivered from Indigenous environmental partnerships and activities

This project is being funded by the Physical Environment Analysis Network (PEAN) - a collaboration between Commonwealth Government agencies who are custodians of valuable data related to people, businesses, natural resources and the environment. In this PEAN project we are interested in working with interested Indigenous land and water management groups to assess and improve the useability of available government data to assess social, cultural and economic benefits and success factors for Indigenous environmental programs. I am particularly interested to engage with regional and Indigenous NRM groups around Australia who have developed innovative ways to report on the multiple benefits of Indigenous environmental management activities with community, government and non-government partners.

Neville Atkinson, Goulburn Broken CMA. East West Alliance

Across Southern Australia there is a positive movement for change happening through the linking of newly formed Aboriginal grower groups to create a powerful and proactive Aboriginal-led "East-West Alliance". Strong links are once again being forged across Australia similar to the historic context and protocols of First World cultural Songlines and Dreaming stories.

At its core, the East-West Alliance (EWA) builds on cultural strength and knowledge for working together and caring for Country to achieve improved socioeconomic and natural resource outcomes for Aboriginal peoples through ethical, cooperative, sustainable, innovative and culturally appropriate land-based business enterprises.

The East-West Alliance creates resilience by using a cooperative Fairtrade model that links Aboriginal groups, NRM agencies and private sector partners under shared values. The model connects and manages previously under-utilised lands and waters using robust ethical business principles that not only build the businesses but also improve the Country's sustainability and the social and Cultural strength and resilience of the communities.

The EWA is an Aboriginal-led movement, working together since 20 3, driven by Outback Academy Australia, the Noongar Land Enterprise Group and the emerging Murray Corridor Enterprise Group. The NRM agencies of the Tri-State Murray Alliance and Western Australia are providing on-going support for the businesses and management of the natural resources. The growing private sector involvement (Jasper Coffee, Allens Lawyers, Aesop, Kabo Lawyers, Veolia, CP Foods) provides in-kind expertise, resources and mentoring support.

EWA is a step towards a national Aboriginal-led cooperative business group that provides a resilient model for the future.

Rebecca Palumbo Wheatbelt NRM, Noongar Budjar Rangers - a long long path to success

Wheatbelt NRM's Noongar Budgar Ranger program took a decade to develop. A decade of trial and error, of learning how to blend Wadjala and Noongar way, a decade of striving to address the NRM priorities of the Ballardong Noongar community. This case study lays bare the lessons learnt and presents a model for a Ranger program that: operates without having 'owned' land to manage, that will thrive without Government grants and that has moved past the stop/start clumsiness of projects.

Under the guidance of an Elders Advisory groups Wheatbelt NRM's Ranger program is addressing the Ballardong Noongar Boodjar plans target of "Economic Opportunities in NRM". Economic is a BIG word here, to achieve the "….long term" the Ranger program has strived to be financially self-sufficient.

The Wheatbelt NRM Noongar Budgar Ranger team isn't big, it isn't going to create its outcomes in a tight three-year period, it isn't going to create economic freedom for the community and it isn't going to solve salinity. The Ranger

program is small and viable, it will create impact over 20 years and in that way the significant outcome for many individuals will become an outcome for the community.

This is the model of Wheatbelt NRM: economically viable, in it for the long term, creating community legacy …… slowly adding up to landscape scale change.

Kacie Melfi, Port Phillip and Westernport CMA, Supporting Indigenous training and threatened Species through collaboration

Two projects combined to support indigenous students to gain a Certificate III in Conservation and Land Management while gaining practical in the field experience undertaking conservation activities on Trust for Nature covenanted properties on Victoria's Mornington Peninsula. The Cert III course was adapted to include a high proportion of field work which both suited the culturally specific needs of the students, allowed for two-way learning and delivered weed management and other environmental works.

Environmental works were undertaken by students under the direction and supervision of both their TAFE teacher and local contractors working as mentors to the students. If was found that field-based learning provided better opportunities for success for the students while also achieving significant environmental gains. These unique approaches required a collaborative partnership between Trust for Nature, PPWCMA, Holmesglen TAFE and other agencies and contractors involved in the field work.

Concurrent Session 1 Resilient communities and industries - Climate Adaptation

Cara Stitzlein, CSIRO, Landscape Opportunity and Options for Carbon abatement Calculator

Our Digiscape Future Science Platform is changing the way agricultural decisions are made in Australia. Digiscape's Greenhouse Gas (GHG) carbon project aims to alleviate some of the challenges facing Australian agricultural producers in participating in the national carbon market.

We're giving producers a helping hand when it comes to realising the potential to implement carbon farming projects on their land. Pronounced 'Look-see', LOOC-C is a software tool that allows you to quickly assess the GHG abatement options for a specific land area, including estimates of abatement quantity such as Australian Carbon Credit Units. By supporting an assessment of specific paddocks or farm areas, LOOC-C helps producers discover and evaluate their options for participating in a project through the Emissions Reduction Fund and other markets.

Zoe Ryan, Climate Friendly, Unlocking the carbon abatement potential of the land sector through aggregation – what are the barriers, and what is the role for NRM organisation?

In addition to generating carbon abatement from the land-sector, the Emissions Reduction Fund (ERF) has strong potential to meet numerous other objectives such as biodiversity enhancement and drought-resilience. There are very high transaction costs involved in compliance with the ERF. There have been few examples of where aggregated projects have successfully achieved economies of scale by collating two or more landowners into a commercially viable project size. This problem has disincentivised carbon project development in Australia's prime agricultural production regions, where the land parcels are typically small in size, and therefore fail to reach commercially viable thresholds. A core strength of many NRM regional organisations is extension and outreach with landowners. To this end, there may be potential for NRM bodies to aggregate landholders into a commercially viable carbon project size, and then package the aggregated project for tender to external carbon service providers. We hope to discuss this concept with the meeting participants, and workshop the barriers and opportunities for NRM bodies to help unlock the carbon abatement potential of the land sector.

Lachlan Campbell, North East Catchment Management Authority. Creating resilience through Natural Resource Management, how do we do it? Embedding climate adaptation in Agriculture.

The North East Catchment Management Authority (NECMA) and the Australian Government National Landcare Program (NLP) have combined to undertake an innovative climate modelling project titled "Embedding climate adaptation in Agriculture" (ECAiA). Designed to increase the knowledge skills and awareness of land managers and local government in North East Victoria around climate and adaptation, the project has developed a spatial tool and technical notes. These will inform agricultural industry and local governments adaptation pathways assisting develop options for adapting practices for a changing climate.

The project has engaged with land managers and local government to understand the key climatic factors that affect agricultural production and regional communities. The key industries are the agricultural economic drivers including, grazing, dairy, forestry, horticulture, viticulture and cropping. This engagement has identified 20 climatic conditions

that effect production systems that can be mapped using 1986 – 2005 base line data and then CSIRO climate projections for 2030 and 2050 under the influence of the IPCC 8.5 climate model.

Climate data and technical reports will be available on the NECMA web site for industry and local government to a scale of 5Km x 5km with specific industry thresholds and best available modelling across the whole of the catchment.

Doug McNicholl, Meat & Livestock Australia, Carbon Neutral by 2030 (CN30)

In 2017 the Australian red meat industry set an ambitious target to be carbon neutral by 2030. The target to be carbon neutral by 2030 (CN30) is a clear message to our global consumers that the Australian red meat industry is serious about addressing GHG emissions.

There is a huge opportunity for the Australian industry to make a real difference in mitigating climate change through increasing carbon storage in the natural landscapes where we operate and reducing emissions, while at the same time improving productivity and deriving new revenue streams through carbon farming.

CN30 will make a demonstrable contribution to reducing emissions from the Australian agriculture sector. It will showcase the red meat industry as a global leader in carbon farming innovation, economic development and environmental stewardship. CN30 will give Australian red meat a marketing edge on the global stage.

Concurrent Session 1 Resilient communities and industries - Sustainable Agriculture

Gary Rodda, Murray Local Land Services and& Mark Groat, Sunrice. Australian Rice Industry - leading the way in international sustainability and market access

This abstract introduces an exciting program to promote resource efficiency and sustainability in the global rice sector. This program looks at establishing the sustainability credentials of the Australian rice industry to ensure it is well positioned to meet the growing world-wide demand for sustainably produced products.

The program will promote the natural resource management skills that our farmers deploy to produce our food. It also identifies where innovation, quality and standards can be shared to influence global practices and lead to better outcomes for communities in Australia and around the world.

The program includes a multi-year engagement with the Sustainable Rice Platform (SRP). The SRP is a multi-stakeholder platform co-convened by UN Environment and the International Rice Research Institute (IRRI) to support growers to adopt practices that drives innovation and creates shared value. SunRice and RGA have represented the Australian Rice Industry on the SRP platform to ensure that the Australian practices are appropriately recognised and reflected in the SRP.

The presentation will look at the approach to sustainability being developed by SunRice and supported by the RGA and Local Land Services. It will set out the long-term vision to create a whole of farm sustainability accreditation approach, recognising that most farms have other production systems and regional sustainability must account for this. Local Land Services assists this by nesting the on farm work into the broader landscape management of natural resources.

This project involves Sunrice, the Rice Growers Association, the Australian Government's National Landcare Program and Murray and Riverina Local Land Services.

Margie Milgate, Regen in Action. Creating resilience through Regenerative Agriculture

Resilience is created by having healthy, thriving soils which form the heart and base of our biological and upstream farming systems. Regenerative Agriculture is a new term that embraces a wide number of farming enterprises and practices and all are united under a key set of principles.

These regenerative principles include:

- Keep soil covered
- Minimum soil disturbance
- Use of diverse cover crops to maintain living roots in your systems
- No pesticides or synthetic fertilisers
- Strive for diversity of both plants and animals
- Managed grazing.

The reason for these principles is to work with the amazing interactions of plant roots and organisms, mostly unseen beneath our feet, to bring about landscape resilience. These interactions in practice bring about improvements in the health of the soil and in the nutritional profile of the plants, and the animals that feed on them. Also, by restoring its

carbon content the soil holds more water which then impacts on the short water cycle by cooling the air, which then allows for light, frequent rainfall, mist or dew events to occur.

Some of the above principles can be a challenge to some current farming practices, however the achievement of greater resilience within these farming systems by a growing and acknowledged number of champions, has given cause for hope for all farming enterprises. It is time for natural resource management bodies to acknowledge the clear benefits they bring.

To regenerate is to restore, to bring about a better, higher or more worthy state. We ask, do our farming and grazing practices do that? With the current state of degraded soils, and loss of biodiversity it is time to look at ways that work with nature to bring us back into balance.

Some of the above principles can be a challenge to some current farming practices, however the achievement of greater resilience within these farming systems by a growing and acknowledged number of champions in these fields has given cause for all farming enterprises and natural resource management bodies to acknowledge the clear benefits they bring.

To regenerate is to restore to bring about a better, higher or more worthy state. We ask, do our current farming and grazing practices do that? With the current state of degraded soils, and loss of biodiversity it is time to look at ways that work with nature to bring us back into balance.

Andy Myers, Ocean Watch, The NSW Oyster Industry & the value of relationships.

The NSW Oyster Industry is making waves. Production volumes & prices are up, innovation is rife and communication within the industry has never been better. This talk reminds us of the value of establishing trust with those we work with, and highlights some of the tools used to build knowledge & capacity within the NSW oyster industry.

Working closely with regulators and peak bodies, over the last 5 years a suite of communication tools have been developed and embraced by the oyster industry. An example of which has been the production of an innovation video series, which has now been viewed over 25,500 times. This extension of information is critical to promote the development of a sustainable aquaculture industry.

Jade Miles, Back Barn Farms – their story

Recently a finalist in the Agrifutures Victorian Rural woman of the year, Jade Miles has been recognised for her work in local food system development in North East Victoria and beyond.

Following a four month research journey to the United States North East in 2014, she returned to Australia and began her food advocacy commitment. She founded the Beechworth Food Co op which now services 800 members, 35 local growers and delivers 12 annual educational events to over 1000 participants. In 2016 she worked with the Open Food Network in a business development capacity for Community Food Enterprises across the state. To conclude this work she shared her learnings with 14 Government agencies in the North East region and proposed the drafting of a 20 year 'Local Food Action Plan' which she then facilitated and has now been endorsed. Jade advocates and educates via her regular public speaking invitations to diverse audiences across the country and mentors 10-15 local food enterprises around the country at any given time.

In 2015 Jade and her family purchased a 20 acre property in Stanley and established “Black Barn Farm and Consult” a bio diverse, multi species, commercial orchard which will open for pick your own in 2020. In the meantime, they have also leased an existing orchard which was in line for being bulldozed, from an orchardist who wanted to retire but did not want to sell his land. Black Barn Farm", offers regular educational events to re-engage community with their food as the first step in building future markets and building food literacy.

Jade applies her 15 years of marketing and business development experience in the tourism sector to her food system development work which ensures she can straddle the strategic requirements with the local growers needs. She still works as an industry development specialist for Tourism North East - the regional tourism board, and in this role drives development of paths to market, delivers operator education workshops, facilitates events, creates marketing and strategic business plans and influences all tiers of operation from individual operators to chambers of commerce, Local Government and statewide industry advocacy bodies.

Jade Miles has an abundantly high energy approach to capturing peoples imagination and taking them on the journey with her. She is collaborative by nature and has a preference for beginning with whole system thinking before drilling down to intimate solutions.

Concurrent Session 1 Resilient communities and industries - Innovation

Michael Taylor, Meat & Livestock Australia. Feedbase Four - pasture best management practices.

MLA investment in the Feedbase Investment Plan (FIP) over the last five years identified opportunities to address feed gaps in southern Australia. Critical analysis of the 2015 FIP research data reveals a potential productivity increase of up to a five-fold in above-ground dry matter (DM) produced by crop and pasture by addressing disease, nitrogen fixation/modulation and pH issues.

FIP also found many grazing enterprises in Australia could be greatly improved by increasing producer skills /capacity of managing pasture quantity, quality and utilisation. Additionally, the FIP identified an industrywide lack of awareness regarding indicators of declining plant health and land condition. These weaknesses are compounded by gaps in core skills/extension opportunities arising from the current user pays extension system in southern Australia.

Feedbase Four (F4) - core elements to drive awareness, actions and adoption of pasture best management practices.

MLA research identified a range of common questions from producers, of which four primary questions were identified as the starting point to awareness for producers, and their trusted information providers, to underpin the F4 strategy.

These four key business requirements will underpin the value proposition that moves the FIP research outcomes toward on ground adoption of FAP objectives. The initial awareness raising strategy will utilise a series of brief publications that outline specific producer's issues. These are:

* How do I get healthy and productive soil?
* How do I get less weeds - more feed
* How do I get more persistent pasture?
* How do I get more clover/legumes?

Andrew O'Neill, Healthy Land and Water. Good stormwater design facilitates resilience building for urban communities

From 15 years of engagement and capacity building, we know that communities, local government and the development industry are struggling to deliver stormwater infrastructure and waterways that are an integral feature within the urban landscape and community. In response to the need, Healthy Land and Water proactively developed Living Waterways - an integrated policy and decision support tool to incentivise designers to integrate multiple benefits in the design of urban water systems.

Living Waterways compares qualitative or semi-quantitative values (e.g. social values and resilience benefits) where previously only cost and quantitative values (e.g. nutrient loads, flow rates) could be compared. This is of particular benefit to the complex decision-making processes involved in retrofit design, urban development and green infrastructure projects implemented by utilities or grant schemes, where contributions to resilience are assessed.

We recently trialled the framework with a local community that adjoins a well utilised, and highly floodprone park in inner city Brisbane. Together with the community, we co-developed a design that realised the significant value to the local community. It demonstrates why communities are essential to the design process and how co-design forges profound values of community stewardship, social cohesion and develops a community's understanding of the value and role of water sensitive urban design.

The Living Waterways framework has been adopted in Queensland Policy along with local councils in Queensland and New South Wales. The combined Living Waterways – CoDesign process has been proven and is driving an invigorated approach to community-led design in the urban landscape.

Living Waterways Version 2 is available at hlw.org.au/livingwaterways

Brian Jackson, Water Technology. An Innovative, Cloud Based, Property Flood Risk Report Generation Portal for the Greater Shepparton City and Goulburn Broken CMA

It is recognised that at-risk individuals and communities are aware of their flood risk and actively taking measures to manage them. In support of this, it is not only essential to have flood data that is current and accurate, but also to effectively use and share that fit-for-purpose flood risk information with the community and relevant stakeholders.

This abstract presents the innovative, cloud based, property flood risk report generation portal ("Flood Portal') developed for Greater Shepparton City Council and the Goulburn Broken CMA.

The modern advances in ICT now allow us to offer a cloud based, software as a service (SaaS) solution for the Flood Portal that securely connects to official flood information data directly at source to provide the public access to view

flood maps and download official property specific flood information reports on-the-fly (known as the "Digital Delta" approach). This makes community access to this information much easier and concurrently saves significant time and cost for the authorities to provide it, as it was previously a manual, time-consuming and repetitive process. It is also intuitive, easy to use and accessible from anywhere.

As a cloud-based SaaS solution, the Flood Portal is scalable and can easily be expanded to other areas without the requirement to pay the full development cost of a custom portal each time (as this cost is now shared amongst the whole Flood Portal community). The SaaS Digital Delta approach also ensures that the Flood Portal will remain up to date into the future.

Mark Turner, Goulburn Broken CMA, Virtual fencing and herding.

In the mid 2000's CSIRO did some early innovative work which proved the concept that the location of cattle could be managed without physical fencing, but with collars and electronic and audible stimulus.

With cattle grazing of riparian areas being a significant threat to waterway health, anticipation was high for the realisation of this tool for the waterway management industry, but nothing happened.

In 2014 the North East CMA and Goulburn Broken CMA partnered up to give it a push. $75K in state government business innovation funding was obtained and a call to the market was made seeking private business to undertake a commercialisation feasibility study. Ian Reilly and CSIRO partnered, were successful in their tender and undertook the feasibility study. The 2014 study showed it was feasibly.

Fast forward to 2018, via much State, Federal and private investment including Gallagher, the company "Agersens" is established and growing and its world first product "eShepherd" was launched at Beef Australia 2018 in Rockhampton.

Agersens now has 36 employees in Melbourne and 4 at their research farm in Queensland. eShepherd is in manufacture in China and Australia and the product is being rolled out to early adopter beef producers in Australia and NZ while the company prepares for distribution by Gallagher. There is significant interest globally – particularly from natural resource management organisations keen to use the product to protect waterways, manage stock on sensitive environments, and improve sustainability of agricultural production.

Chris Nicholson, Goulburn Broken CMA, Balancing power and pressure - Development of an Irrigation Energy Calculator

As water becomes scarcer and more expensive landowners within the Shepparton Irrigation Region in Northern Victoria are seeking ways to become more water use efficient. Increasingly landowners are switching from gravity fed surface irrigation to pressurised irrigation systems such as Centre Pivot and Linear Move irrigators. This pursuit of Water Use Efficiency has led to the consumption of more energy (fuel or electricity), energy being the major component of operating costs for pressurised irrigation systems.

Field assessments of these irrigation systems highlighted that a large percentage of landowners do not have a good understanding of:

- Whether their system is using an appropriate amount of energy (electricity or diesel) for the water being applied;
- Improvements they can make to reduce their energy usage.

Existing literature highlighted existing tools available for landowners to assess the efficiency of their pressurised irrigation system, however, they all required a detailed understanding of the system's engineering or design specifications. Field assessments showed that most landowners do not readily have access to this information, making these existing tools difficult to use.

To assist landowners to become economically resilient in the face of increasing energy costs and assist them to determine how energy efficient their irrigation systems are an irrigation energy decision support tool (Energy Calculator) was developed. The energy calculator allows an Irrigation Extension Officer to assist a landowner to answer the following questions:

- Is my irrigation system functioning energy efficiently?
- What is the likely cost benefit of improving the energy efficiency of my system?
- What components of my system can be improved to operate more efficiently?

Brett Dal Pozzo, South Coast NRM Inc. Sharing plant disease information for better biodiversity outcomes using online technology - "Dieback Information Delivery Management System" – DIDMS

Phytophthora cinnamomi is a plant pathogen spread via roots, soil and water and threatens more than 600 species of native flora within the internationally recognised biodiversity hotspot of South Western Australia. Project Dieback is an ongoing ten year project funded through the Western Australian state NRM Office and federal government that addresses the threat of P. cinnamomi. The occurrence, distribution and threat of P. cinnamomi do not discriminate between differing land tenure, managers or owners. Effective management of P. cinnamomi requires open and transparent exchange of information between stakeholders. The online 'Dieback Information Delivery and Management System' (DIDMS) is a web-based GIS database that facilitates stakeholders in sharing P. cinnamomi information to assist with awareness raising, planning and management. DIDMS is developed using Gaia Resource's "Geographic Reporting Information Database" (GRID) platform. DIDMS enables registered users to create, store, modify and share data online using standardised templates, and map production tools

Data templates and information can be downloaded for further desktop GIS bulk data management and strategic planning. DIDMS caters for expert and non-expert data with disclaimers outlining how to use P. cinnamomi disease information. Some data within DIDMS is linked to a 'Dieback public map' page as a quick and easy viewing platform for the general public. Registered DIDMS Users can view data as (Figure 2):

1. Activities – Where users add their own data to share with one another including GIS, photos and reports;
2. Baselayers – Data provided by the DIDMS administrator such as baselayer Plant Disease information, hydrology, climate, vegetation, Priority Protection Areas, Government data and mapbox imagery; and
3. User Layers – Where uses add their own private data that no one else can see or access such as GPS data, specific imagery, restricted threatened species data.

DIDMS contains important plant disease data as both Activities and baselayers. This information is stored in three formats, all of which used together assists users to plan, manage and communicate the threat of Phytophthora. The format types of plant disease data include:

1. Laboratory confirmed field samples for five different species of soil borne Phytophthora and a specie of Armillaria, which are stored as disease points.
2. Department of Parks and Wildlife Registered Phytophthora Dieback interpretation area mapping of six P. cinnamomi disease status categories, which are stored as polygons; and
3. South Coast NRM generated soil borne Phytophthora Hazard Dispersion GIS Modelling as a raster image.

Once a DIDMS user has viewed data they can rapidly create a map within minutes to be downloaded as a PDF file and imported into a report (Figure 4). To assist in making the process of adding data, viewing data and creating maps within DIDMS easier there is a simple User Manual available to view online. South Coast NRM have also provided several 3-hour DIDMS Training workshops to key stakeholders to support adoption and ongoing efficacy of use.

There are more than 240 registered users from government, private and not-for-profit organisations using DIDMS and all have access to free online training resources. DIDMS provides stakeholders a safe repository to share P. cinnamomi information for education and planning purposes. The information stored within DIDMS helps stakeholders implement targeted P. cinnamomi mitigation actions resulting in better biodiversity outcomes. For further information regarding DIDMS visit: http://www.dieback.net.au/

Jonathan Jenkin, GHCMA. Smart Technology Demonstration Trials for Sustainable Outcomes

Glenelg Hopkins CMA (GHCMA) is leading the way in its innovative approach to collaborating with farmers, local government, state government and technology providers to improve farm sustainability through use of new sensor technology.

In 2018 the Southern Grampians Shire (SGS) activated a LORA (long range) digital wireless data network. With this roll out of new technology and advancement in low cost sensor capabilities there was strong interest from farmers, service providers and SGS to see smart technology utilised for collection of real time on farm data for day to day management and long-term decision making. Changing to an automated electronic system via sensors could present significant savings along with providing important insights on trends and patterns – particularly during times of significant seasonal variation.

Initiated by GHGCMA a collaborative technology demonstration trial program across four local farms was developed to educate farmers (and stakeholders) about the benefits and challenges of the smart sensor technology while also highlighting the region (and industry) for its innovation and sustainable management practices. Key technology

examined in the trial includes wireless soil moisture and temperature probes, weather stations, tank monitors, electric fence monitors and livestock trackers. The trials were the key "Farm Tours" focus in the Digital Innovation and Smart Agriculture Conference held in Hamilton during May and also featured prominently at Sheepvention in August. A truly collaborative two-year project, partners include GHCMA, Grasslands Society of Southern Australia, SGS, Ag Vic and commercial equipment providers Agri Ace, Meshed, Wild Eye, Simply Farm and Telstra.

Concurrent Session 2: Ecosystem resilience - Indigenous

Nick Stewart, North Central CMA, Barapa Barapa Wamba Wemba Water for Country project

Barapa Barapa and Wamba Wemba people aspire to be actively managing land and water, sharing and protecting culture, across generations. Since 2013 the Barapa Water for Country project has made great advances in understanding Traditional Owner values relating to water and documenting cultural watering objectives. The project, recognised as a lead pilot in Aboriginal water, has now uniquely brought Barapa Barapa and Wamba Wamba Traditional Owners together to care for Country in partnership.

A Traditional Owner steering committee meets regularly to govern the project, providing cultural guidance and determining the work plan delivered by a Wamba Wamba Aboriginal water officer, hosted by North Central CMA. A small team have undertaken field work to record, assess and monitor water dependent cultural values, traditional knowledge and perspectives. A map to visually represent both tangible and intangible values has been produced, and cultural knowledge of plant species collated to produce a booklet. Cultural workshops have supported the reinvigoration and sharing of culture and traditional knowledge. Project partners, including North Central CMA environmental water reserve officers, have shared time on Country together to facilitate two-way knowledge sharing. A fifth project film is currently being produced to capture and share project outcomes and cultural values.

Project activities have enabled Barapa and Wamba's water related cultural values to be respectfully incorporated into the management of water for the environment. An increased presence on Country and self-determined opportunities for cultural practice have contributed to the cultural and economic wellbeing of the Barapa Barapa and Wamba Wamba people.

Karen Herlihy, South Coast Natural Resource Management, Finding the track to Mindarabin Reserve – an example of successful Aboriginal engagement on the south coast of WA

NRM organisations face challenges engaging Aboriginal communities in nationally defined environmental priorities. At a high level the EPBC framework of prioritising species and pursuing recovery plans may not align with Aboriginal priorities and at a local level Aboriginal community organisations may have very limited capacity or resources.

Identifying Mindarabin Reserve as Aboriginal owned land with Malleefowl habitat opened the possibility of engaging with the Aboriginal community to partner in recovery works. From the beginning the process of engagement needed to be community driven and authorised. This meant that engagement was in their space, on their time, with their agenda and directed at outcomes identified by the Aboriginal community.

Initially engagement activities were focussed on building governance, providing Board support and gently determining broader community aspirations and priorities. As relations developed it became apparent that the EPBC framework could provide a strategically useful structure for the community to pursue long held community revitalisation actions. Ultimately because Elders and the Aboriginal community were engaged through this process, a high quality, scientifically rigorous and culturally authorised Mindarabin Reserve Property Management Plan has been developed along with increased capacity and newly established relationships to bring new investment and jobs into their community.

The group is now set to play an important role in landscape regeneration projects of the region including recovery actions for Malleefowl in the Mindarabin Reserve. South Coast NRM continue to play a supporting role enhancing caring for country works undertaken by this and other Aboriginal groups across the south coast region.

Jamie Hearn, Murray Local Land Services & Roland Atkinson - CEO Cummergunga Local Aboriginal Land Council. Exploring the key considerations when involving Aboriginal people in Natural Resource Management; Learnings from Central Murray Forests Ramsar Project.

This presentation aims to explore the benefits, challenges and key considerations in involving Aboriginal People in natural resource management activities. It draws on the experience in the Central Murray Forests Ramsar projects in the Southern NSW Murray Region over the last 10 years. What are the benefits?

- Opportunities to learn from traditional ecological knowledge and holistic approach to land management

- Achievement of social outcomes in addition to environmental outcomes

What are some of the challenges?

- NRM staff turnover
- Inconsistent funding streams and change in investor interest in involving Aboriginal People
- Change in contacts with indigenous works crews
- Inconsistent work / employment opportunities
- Impact on other financial support systems and issues with Centrelink etc
- Additional resources may be required, may be more expensive
- May need to train staff, due to a lack of work experience
- May be an unwillingness to get involved due to past discriminatory work environments

What are the key ingredients to success?

- Build positive relationships, trust and respect
- Identifying projects that are relevant and of interest to Aboriginal People
- Ensure that you are well organised, that no one is standing around with nothing to do
- Ensure the work is valuable and has meaning
- Ensure the value of the work is understood by those involved
- Offer formal training opportunities and qualifications

Concurrent Session 2: Ecosystem resilience - Climate Adaptation

Anna Richards et al, CSIRO, The Australian Ecosystem Models Framework

Ecosystems are highly variable and dynamic across space and time as a result of landscape-scale disturbance and recovery processes overlaying climatic and edaphic gradients. The disturbance regimes that drive these dynamics may maintain or degrade ecological condition, depending on whether or not they mirror those regimes to which ecosystems are adapted at evolutionary timescales. The Australian Ecosystem Models framework (https://research.csiro.au/biodiversity-knowledge/projects/models-framework/) provides the conceptual underpinning for objectively interpreting ecological condition that takes account of the dynamic nature of ecosystems. To this end the framework aims to synthesise and summarise scientific knowledge of ecosystem dynamics, in relation to disturbance regimes, and systematically capture this in a set of conceptual models.

The 48 models in the framework have been organised into a disturbance-based typology of ecosystem archetypes from which detailed state and transition model templates can be used to describe recent and transformative anthropogenic-driven impacts on ecological condition. We argue that without a framework to consistently describe differences between reference and observed condition states of ecosystems, it is challenging to develop effective national environmental policy, convincingly argue for intervention and investment, or make predictions of changes to ecological condition under rapid climate change. Using a case study from an expert-derived conceptual model of the Howard Sand Plains, Northern Territory site of conservation significance, we illustrate the utility of the framework for informing ecosystem management at both local and continental scales.

Zoe Ryan, Climate Friendly, Opportunities for Traditional Owners to partner with CMAs in the implementation of carbon abatement projects – findings from the Victorian CAPOTO project.

What are your ideas for Traditional Owner-led carbon abatement projects in Victoria?" and "how would you like to partner with Victoria's CMAs on these carbon abatement projects?"

These were the questions that were put to Victorian Traditional Owners under the Carbon Abatement Partnership Opportunities with Traditional Owners (CAPOTO project) with the aim to understanding the opportunities to support the resilience of Traditional Owners through the carbon market. The response to first question resulted in the identification a number of landscape-scale abatement opportunities, led by Traditional Owners; that could help deliver Victoria's commitment to zero net emissions for Victoria by 2050, as well as multiple other co-benefits. Examples of pilot projects proposed include: avoided ecosystem-shift through reintroduction of cultural burning; restoration of degraded cropland soil through establishment of native food plants; and restoration of floodplain forests through environmental water.

Due to the innovative and complex nature of the pilot projects proposed, the response to the second question was more difficult. It was concluded that in most cases, it is not possible to describe the nature of partnerships between CMAs and Traditional Owners from the outset of the carbon project. Rather, Victoria's Traditional Owners felt it was more appropriate to define the process for assessing potential carbon partnerships from the outset of the carbon project. The nature of carbon partnerships could be determined as the projects evolved, through an open and honest

dialogue, and where partners agree to a series of criteria. The criteria should ensure that Traditional Ecological Knowledge (or Intellectual Property) is protected, that Traditional Owners are represented at the highest level of decision-making in the partnership; and that capacity building opportunities for Traditional Owners are maximised.

Gary McDonald and Matt Appleby, Bush Heritage Australia We've acted: climate-ready revegetation at Nardoo Hills reserve using non-local provenance plants.

Nardoo Hills, the BHA reserve in central Victoria, has Grey box (Eucalyptus microcarpa) and Yellow box (E. melliodora) that are stressed or have died through the influence of intense drought or heat stress, most likely linked to climate change. Old and young trees are affected. We are applying an adaptive management strategy to enhance the evolutionary potential of these key tree species that will also help sustain dependent species.

Through a large 18 ha field trial, we aim to:

- Compare the performance, from seedling to maturity, of 5 provenances of each species including the local
- Increase genetic diversity and adaptation to a drying and warmer climate
- Inform management & community
- Encourage future collaborative research

We identified genetically diverse and climatically suitable populations of Grey box and Yellow box using the 'Climate-adjusted provenancing strategy' (Hancock et al., 2016). The BOM's Climate Analogues tool allowed us to pinpoint regions currently experiencing a climate similar to that which is expected at Nardoo Hills in 30-70 years' time. Seeds have been sourced from geo-positioned mother trees, and seedlings propagated and labelled to allow trace back to these. Seedlings have now been planted into 450 randomised plots arranged along the mid (Grey box) and lower slopes (Yellow box) at Nardoo Hills. The plants will be monitored over many decades but more intensively initially.

We recommend that Government, NRM organisations, NGOs and industry work together to address a supply chain market failure and ensure that appropriate provenances and species are available for future climate-ready restoration investment. We acknowledge Greenfleet, BHA and VicRoads for funding this trial and support from the Arborline Nursery.

Grace Holder, Natural Resources Northern & Yorke, Great Southern Ark – The rewilding of southern Yorke Peninsula, South Australia

Climate change will bring about changes in vegetation composition, structure and productivity in temperate forests. In addition, the frequency and intensity of fire is likely to increase. Such changes have concerning implications for biodiversity, with the rate of climate change predicted to be faster than the rate at which most species can adapt. Highly modified systems will be severely affected, due to a reduced resilience to short and long-term perturbations. In the face of increasing pressures on our native wildlife, there is an urgent need to ensure continuity/bolstering of ecological processes to minimise species loss and increase ecosystem resilience.

Although a well-established management practice world-wide, "rewilding" remains a novel concept in Australia. Rewilding projects seek to restore the natural balance within systems through the reinstatement of vital ecological processes such as predation, pollination, and nutrient cycling. In doing so, rewilding allows nature to take care of itself over the longer-term, by building ecosystem resilience.

On the southern Yorke Peninsula (SA), extensive tracts of remnant vegetation are slowly deteriorating in condition due to the absence of ecological processes that were once provided by 27 mammal species that are now locally extinct. Envisaged as a 20 year project, the Great Southern Ark will reintroduce keystone species that provide the ecological processes that are fundamental for vegetation productivity and quality. Ultimately, southern Yorke Peninsula will be transformed into a landscape-scale safe haven for some of Australia's iconic and endangered wildlife, building resilience in their national populations while minimising species loss on the peninsula.

Concurrent Session 2: Ecosystem resilience – Innovation

Vicki-Jo Russell, The Nature of SA project

The Nature of SA project is about creating a space to reflect on how the state has managed our natural environment in the past and how we can best manage it for the future.

The project is a partnership that includes people from Conservation Council SA, Nature Conservation Society SA, Trees for Life, Department of Primary Industries and Regions (PIRSA), and regional and central offices of the Department for Environment and Water (DEW). We are assisted by the Australian Resilience institute and The Australian Centre for Social Innovation.

Keith Pekin, Perth NRM, Food Security and strategic NRM investment

In Western Australia, we don't have a food security plan or an informed understanding of how we will feed a population that will double in size over the next three to four decades. With Regional Land Partnership funding, we are facilitating a collaborative process for developing a Food Security Plan for Western Australia.

The approach we have taken, is to establish the in-common key stakeholder objective of remaining food secure, by developing a strategic plan that informs the policy and investment decisions that build resilience into our farming systems and communities. The pathway to remaining food secure: Degraded farmland -> Sustainable farming systems -> Sustainable food systems -> Food security

The three stages:

1. Develop a good understanding of how productivity constraints like: climate change, salinity, soil acidity and water availability will impact on our farmers capacity to keep producing enough food.
2. Facilitate collaboration and informed discussion with community, governments and industry to develop a strategic food security plan.
3. Facilitate collaboration that guides and prioritises investment decisions that ensure we remain food secure. This takes into consideration broader issues like land use, production systems, economic/social access to healthy food, food loss and food waste.

Barry Kennedy, Port Phillip & Westernport Catchment Management Authority, Trying a new youth pitch, and the Landcare passion

In January this year the Yarra Ranges Landcare Network was approached to see whether they'd consider an Intrepid Landcare Leadership Retreat to be run with their support. While not seeking funds as such, the network was asked by the PPWCMA to help design the content of the retreat.

The well-established network already has a strong presence across the Yarra Ranges and works diligently. But like other groups, the demographics are older than they'd like and the plan to include young people was a new one. Introducing Intrepid Landcare wasn't resisted, but there was wariness. But the record number of applications for the retreat, youthful enthusiasm and the chance to share stories, do some plantings and exchange experiences was invigorating for the group. The weekend was a chance for all to re-experience the positive benefits of community within the Landcare model.

For the youth involved, a secondary college student through to working mothers, the weekend, particularly an up-close experience with a smoking ceremony and indigenous culture, conservation programs at Healesville Sanctuary and a chance to draw up their own "think global, act local" gameplan was life-changing. A new model for youthful landcare is set to take off in the Yarra Ranges, while for old guard, what's old is new again. The Intrepid Landcare model clearly is capable of reinvigorating groups.

The session with be assisted by the input of Yarra Ranges Landcare Facilitator Anne Fitzpatrick and young Intrepid Landcarer Natalie Mikecz who is finding her way in the NRM sector.

Concurrent 3: Resilience on a Landscape Scale, why is it important? - Water

Erin Lenon, Commonwealth Environmental Water Office, Water for the environment- the flow on effect

Healthy rivers play a part in supporting the communities which rely on them through the provision of water for human needs, agriculture and industry. However, valuing the inextricable benefits ecological services provide to a community is much more challenging as water resources are increasingly under pressure.

Water management is a complex and contentious subject with much reporting done on the negative economic impacts of water recovery. Here we present some examples showcasing positive effects following environmental watering. These case studies have been undertaken at both small and large scales and demonstrate the benefits to families and communities that flow on from ecological restoration of rivers and wetlands being filled with environmental water. At the heart of these examples is effective local engagement breaking down complex water information, working with local partners (including NRM bodies) and building relationships through on-ground environmental water projects. Case Studies:

1. Watering wetlands on private farming land. Working with a farming family to water wetlands and highly degraded floodplain at the junction of the Murrumbidgee and the Murray.

2. Community support and on-ground involvement in recovering threatened small bodied native fish species (Normans lagoon). Exotic species removal and wetland watering on public ground bringing together scientists, agencies, indigenous groups and community in recovering threatened species.
3. Largescale flows during severe drought. During a period of extreme drought providing refuge not only for the river species but also reprieve for communities along the Darling River.

Michael Cheetham, Water Technology, Guiding Principles in Waterway Management – Key Considerations for Intervention

In general, tried and true waterway rehabilitation techniques such as revegetation, weed management, timber brushing, log revetment or rock beaching have not changed over the last 20 years and are adequately described in detail various documents. What has changed over that time is the way in which we look at waterways and how we decide whether or not to intervene. A systems-based, minimal intervention approach is now generally accepted as best practice. Current and emerging best practice stream and catchment rehabilitation techniques (i.e. systems-based) include a variety of nature-based methodologies that consider not only the positive impacts of intervention but also the negative impacts and cost/benefit ratio.

These systems-based approaches allow for an appreciation of the naturally dynamic nature of waterways, despite human influences, and give more weight to the concept of allowing waterways to move and repair themselves in many scenarios. Over the medium to long-term these approaches are likely to be significantly more sustainable as well as being cheaper and easier to undertake. There is now irrevocable evidence that climate is changing. Changes include greater temperature extremes and greater magnitude droughts, floods and intensity of rainfall events. These climatic changes are exacerbating the existing land use and development pressures experienced by stream systems. As such, when undertaking waterway management of any kind, a key principle must be to build resilience into the system.

Any actions undertaken at a site should at least indirectly result in the site, reach or catchment being better able to cope with and/or mitigate future extreme events. Whereas a focus for resilience is often put on flood resilience, drought resilience should also be considered as equally important. Finally, vegetation in the channel, on the banks and on the floodplain is the only long-term solution to positively influence bank stability, resilience, aquatic habitat and water quality. Vegetation is considered best practice in almost all stream rehabilitation projects including to accompany hard engineering works such as rock armouring.

Fiona Johnson, Tri-State Murray NRM Alliance, Tri-State Murray NRM Alliance- Alliance Native Fish Blueprint

The Tri-State Murray NRM Regional Alliance (the Alliance) brings together the seven natural resource bodies from New South Wales, Victoria and South Australia along the full length of the River Murray Corridor. The Alliance was formed in 2015 from a shared recognition that a resilient river system could only be achieved by working together across the entire landscape of the Murray River Corridor. By working together, on-ground works can be coordinated and prioritised to secure sustainable outcomes. The 'Alliance Native Fish Blueprint' is an example that is guiding implementation across the Alliance by identifying the critical habitats, the most significant barriers, targeted refuges and the most at-risk species for the Murray River Corridor.

By working together, people and resources can be connected and drawn on to respond to opportunities, support the community and quickly resolve issues. Opportunities such as integrating the most effective agricultural programs to support emerging indigenous businesses; customising river re-snagging guidelines so implementation can proceed; sharing expertise for successful wetland fish relocations and coordination of media efforts. By working together, the different climates, industries, jurisdictions and community priorities create opportunities, innovation and flexibility. New technologies and approaches such as virtual fencing can be tried and tested wherever the current need and resources are, ready for implementation across the Murray Corridor when the time is right.

This presentation will share learnings to date and highlight where opportunities exist to build a more resilient Murray River Corridor.

Adam Bester, GHCMA, Why Investing in People is Powerful – The Waterway Management Twinning Program

We believe valuing and supporting those working in waterway management is vital if we are to have happy, enthusiastic, creative and committed people doing great things for our rivers, wetlands, creeks and streams. Now in its' fourth year, this presentation will use a story telling approach to share the findings and impact of the Waterway Management Twinning Program, which uses mentoring as a way of inspiring, connecting and implementing change in the Victorian waterway sector. Siwan and Adam will explain how mentoring is a powerful way of effecting change in organisations, and why they feel that investing in our 'social capital' is as important as any fish hotel or willow removal program. This is because mentoring focuses on supporting an individual to achieve their goals in a way that is

collaborative, personal and uniquely human. People are social beings, yet in our fast-paced world we often neglect to invest in the relationships with peers and colleagues that sustain us. Mentoring creates an opportunity for two people to develop a relationship of trust and respect, and to work on a project that combines their skills, expertise and enthusiasm. Through personal stories, great images and an entertaining style, Siwan and Adam will take you into the world of mentoring and the enormous benefits it provides to all involved.

Hugo Bowman, Murray Darling Basin Authority, Intervention, monitoring and innovation on the River Murray

While the water of Australia's rivers are utilised to meet demand for irrigation, critical human water needs and recreation, it is inevitable that they will continue to experience adverse impacts arising from regulation.

The Hume Dam to Lake Mulwala River Works program is the largest of its kind undertaken in the Murray Darling Basin and one of the largest in Australia. To date, over $25M has been invested in physical works along a 200 km reach downstream of Lake Hume. The program was implemented to mitigate the detrimental geomorphic impacts of regulation arising from Hume Dam; the powerhouse of the regulated River Murray system. The program extends as far back as 1959, making it one of the longest running major river works program of its kind.

The vision of the program is to manage the river in 'a manner that is consistent with its laterally migrating, anabranching morphology'. The program has refined a range of established river works techniques and preference is now given to a range of innovative erosion control techniques utilising timber and revegetation. Appropriate river works programs sympathetic to their morphologies and geomorphic behaviour are critical to maintain and enhance resilience into our uncertain future.

Concurrent 3: Resilience on a Landscape Scale, why is it important? - Climate Adaptation and Drought

Julie McLellan, Healthy Land and Water, Building basin wide resilience through ecosystem-based adaptation in the Lockyer Valley, South East Queensland, Australia.

Showcase the results of the ecosystem-base adaptation project implemented in the Lockyer valley, including:

- Triggers for action;
- Business case - benefits of co-investment (multiple sectors and stakeholders);
- Requirements of successful implementation and barriers to success;
- Legislative and governance frameworks needed to support implementation;
- Opportunities for up-scaling to achieve major and cumulative benefits;
- Applicability to other river basins (including transboundary system).

South East Queensland (SEQ) is one of Australia's most desirable and fastest growing regions and is home to the state's capital, Brisbane as well as the cities of the Gold and Sunshine Coasts. The region is a major tourist hub and its extensive network of waterways and access to beautiful beaches, Moreton Bay and islands contribute to the relaxed sub-tropical lifestyle and liveability of the region. However, SEQ is subject to extreme weather events such as heatwaves, droughts, floods, bushfires and severe storms.

Major flooding events in 2011 and 2013 caused extensive damage to infrastructure and highlighted SEQ's vulnerability to these extreme events as the major drinking water supply became too turbid for purification. The level of sediment transported in the recent floods was unprecedented, with around 80% of sediment pollution originating from eroded streams and gullies in the upper catchment. With climate predictions of higher temperatures, longer dry periods and more frequent intense cyclones and rain events, this is set to get worse unless better land management techniques are adopted to improve the resilience of the catchments to these events.

Healthy Land and Water (HLW) is fostering partnerships for strategic investment in large-scale natural restoration projects to improve long-term waterway health and flood resilience on a national scale. In partnership with rural landholders, government, water utilities and the Port of Brisbane, HLW co-invested $2.4m to rehabilitate a 3km stretch of a creek in the Lockyer Valley. This landmark project resulted in:

- Significant reductions in sediment, nitrogen and phosphorus entering the Creek and the Brisbane River,
- Reduced costs to the Port of Brisbane associated with sediment removal from the shipping channel;
- Improved resilience to flooding in the local Creek and stabilisation of valuable farmland; and
- Increased water security through reduced sediment loads in potable water supply.

Recognising ecosystem services in our waterways and applying ecosystem-based adaptation are crucial to achieving river resilience for future generations.

Stephanie Creer, Mallee CMA, Remnants on Agricultural Land – An Important Consideration in Achieving Landscape Scale Resilience?

Resilience based natural resource management (NRM) efforts can present a myriad of challenges when applied across a landscape that supports a combination of both relatively intact and highly modified systems. A key consideration is often the relative and ongoing benefits that can be achieved if resources are directed to 'lower' value assets, such as small remnants of native vegetation remaining on agricultural land.

In the Victorian Mallee, just over half of the region's native vegetation has been cleared since European settlement, particularly vegetation communities occurring on the more fertile alluvial soils (i.e. suitable for agriculture). While large contiguous blocks of terrestrial habitat do remain, predominantly in large reserves such as Murray-Sunset, Wyperfeld and Hattah-Kulkyne National Parks, they are often characterised by their infertile sandy soils and as such do not represent the entire diversity of the region's original habitat.

With only 12% of the region's remaining vegetation occurring on private land (mostly agricultural), efforts to conserve and restore this habitat is essential to the diversity and ecological function of Mallee biodiversity. The capacity of selected management actions to provide long term outcomes within these fragmented remnants, and their potential interactions with and importance to the broader target landscape can often be difficult to quantify when planning delivery.

A key example of long term monitoring programs being undertaken to address this knowledge gap and support systems resilience at a landscape scale is the work being undertaken by Mallee CMA in partnership with the Arthur Rylah Institute for Environmental Research to quantify the impact of management practices on small fragmented remnants, which will be used to determine where investment targeting modified (agricultural) systems should be directed for greatest return.

Reference: Kenny, S., Duncan, M., Leevers, D. and Moxham, C. (2019) Quantifying the impact of land management practices on priority remnant vegetation across the dryland Mallee landscape monitoring program: five-year monitoring at a subset of 14 sites. Arthur Rylah Institute for Environmental Research, Department of Environment, Land, Water and Planning, Heidelberg, Victoria.

Deborah Riley, Melbourne Water, Joining the dots – Cutting carbon and building resilience at the same time?

Melbourne Water has new obligations to cut our greenhouse gas emissions – 50% by 2025. Melbourne Water treats most of the sewage from the metropolitan region, making us a very big emitter (on behalf of Melburnians) compared to other Victorian water utilities. To meet our mandated targets Melbourne Water will cut carbon within our operations, and will also need to rely on carbon offsets.

We expect Melbourne communities to be interested in environmental and social benefits of offsets, and the more local, the better. Policy and regulatory frameworks require Melbourne Water to reduce emissions at a reasonable cost, and with regard to what local communities prefer and are willing to pay for.

Melbourne Water is a newcomer to carbon markets, but has a long history of working with communities to manage and protect natural resources and make challenging investment decisions.

This creates a unique opportunity but also a number of challenges for water authorities, NRM groups, and landholders, who may like to work together to achieve both climate mitigation and resilience and adaptation in our shared backyards. There may be opportunities to tackle some of these challenges together, for the benefit of Australian environments and communities.

Natarsha Woods, Wheatbelt NRM, Tracking change - Wheatbelt NRMs Dashboard

Wheatbelt NRMs strategy identified 12 thresholds that if we cross them, the socio-ecological system will fundamentally change. It was truly sobering to know that we had already crossed or were teetering on crossing 9 of those measures when the strategy was developing in 2013. Six years on, we have only improved on one of them – and it is the financial threshold.

Like the proverbial 'boiling frog' it is very easy to become accustomed the state of the environment where we live. Taking a system wide approach to strategy and tracking change helps to be able to give a realistic picture of the issues and support the call for landscape scale action.

Project by project we see the positive outcomes of NRM work – in 2018 2.4 million seedlings were sold in the Wheatbelt (celebrate) however in also 2018, 1481 ha of land were approved for clearing. The data is out there, Wheatbelt NRM has put it together into a dashboard to bring attention to the predicament of the socio-ecological system we depend on.

With 44 data providers contributing to the updating of indicators for each of the thresholds. This is the system wide picture of the state of the Environment for the WA Wheatbelt.

Concurrent 3: Resilience on a Landscape Scale, why is it important? - Innovation

Saravan Peacock Department for Environment and Water, SA. Towards Landscape SA – A reform program to enhance the way natural resources are managed across South Australia

The South Australian Government is driving a significant reform program to enhance the way natural resources are managed across the State. A landscape-scale and integrated approach underpins the reform program, recognising that people and their livelihoods rely on the health and productivity of our landscapes, and as stewards of the land, their actions play a critical role in maintaining its health and productivity.

The centrepiece of the reform is the creation of a new Landscape South Australia Act which will provide the legislative framework for delivering the reform program. The legislation is based on the following guiding principles:

- decentralised decision making
- a simple and accessible system
- community and landowners at the centre
- back to basics – soil quality, water management and pest plant and animal control
- whole of landscape approach.

A central focus of the reform program is empowering local communities and land managers to be directly responsible for sustainably managing their region's natural resources – with an emphasis on soil quality, water management and pest plant and animal control. Eight arm's length regional landscape boards will deliver services in partnership with their communities. A new board, Green Adelaide, will also be established to manage the urban landscape of metropolitan Adelaide. It will focus on enhancing the city's urban ecology and investing in the natural environment to improve climate resilience and overall community wellbeing.

The new legislation is based on extensive consultation with communities and stakeholders across South Australia. Together, these reforms will strengthen the resilience of our communities and the landscapes and natural resources they depend on.

Nyree Stenekes, ABARES. How do national pest and weed management datasets help understand change at the landscape scale

Pest animals and weeds pose serious management concerns in farming systems across Australia. To better understand this national problem, the Department of Agriculture commissioned ABARES in 2016 to collect a national dataset of landholders' views on managing pest species, including wild dogs, rabbits, deer, pigs, cats amongst others, and weeds. With responses from over 6000 landholders across 53 natural resource management regions in Australia, this was the largest single data collection ever run by ABARES. The survey provided a national picture of the extent of pest species and weed problems across Australia: the impacts on production systems, the effort and cost landholders incurred in managing pest animals and weeds on their land and the types of control actions conducted by landholders and local management groups. This paper highlights key results from the 2016 survey of landholders and looks at long term trends in pest and weed management by comparing results from a follow up data collection just conducted in 2019. The potential for this dataset to be integrated with other national invasive species datasets and how this can add value to research and policy will be discussed.

Simon Rowe, Oceanwatch Australia (Marine NRM), Communities of Practice – furthering seascape resilience.

Communities of Practice are a new description of an old network but how are they evolving over time and are they meeting the needs of change? The formation of a number of Communities of Practice have been instrumental in a collective direction towards better ways of undertaking projects with wider considerations of social attitude, legislative approval and environmental outcomes sought.

We know marine habitats are dynamic, face unprecedented challenges and blue green innovations are often hampered by lack of uptake due to lacking science, engineering or simply policy acceptance. Are today's on-ground interventions following best practice science? Is that knowledge being shared adequately through current channels? The Australian government through the National Landcare Program has supported OceanWatch to support some marine Community of Practice's.

This presentation will discuss and invite feedback on knowledge sharing and promote the efforts underway by a number of Communities of practice across Australia.

Jen Wilson, GBCMA, Managing for resilience at the landscape scale

The Goulburn Broken Catchment Management Authority develops and implements projects with an aim of increasing the resilience of farming systems and natural systems at the landscape scale. We work within priority landscapes, within which we determine critical attributes and tipping points so that we can determine the best approach for each different landscape, in the context of their ecological and social distinctions, and develop priority actions (or no action). For example, native vegetation is a 'critical attribute' and science suggest that 10-30% native vegetation cover in landscapes results in most bird species being conserved, improved water quality and more sustainable farming systems. The current amount of native vegetation in a landscape can be used to inform the likely ability to create resilient landscapes, as well as provide targets for each landscape.

For example, a landscape with 2% native vegetation cover is a lower priority for revegetation than one with 8% cover, where we are more likely to reach the 10% threshold. This 'resilience thinking' can be used to determine a range of integrated catchment practices for priority landscapes. For example, in a priority landscape we could improve habitat connectivity and extent through revegetation, improve farming practices such as retaining ground cover in pastures and no-till cropping, deliver environmental water to wetlands and fence and protect riparian zones. By targeting priority landscapes this results in increasing natural values as well as creating improved benefits to farmers from enhanced ecosystem services and therefore increased productivity on farms.

This landscape scale approach optimises benefits to systems and ensures effective use of funding. Positive landscape scale change can occur once critical attributes and tipping points have been established, as works can be more strategic. A less strategic approach could result in a downward trajectory breaching tipping points and into undesirable landscape change. We continue to work with scientists to increase understanding of resilient landscapes and implement actions through better knowledge of tipping points. This includes monitoring change over time due to works and improving practices through adaptive management. Having clear goals for a landscape can also improve community engagement outcomes, which is critical to successful delivery of projects. Case studies will be provided to demonstrate our approach to improving resilience in landscapes, as well as barriers and lessons learnt.

Carole Sweatman, Terrain NRM, Reef Credits, New partnerships for innovative solutions – building funding resilience for the Reef

Australia's World Heritage listed, Great Barrier Reef (the Reef) is the world's largest coral reef system. It contributes over $6 billion a year to the Australian economy and generates over 69,000 jobs. Great Barrier Reef ecosystems continue to be in poor condition and improving water quality from land-based runoff is one of the most manageable actions to reduce the threats facing the Reef.

The newly created Reef Credit Scheme is an innovative, market-based solution offering a new way to improve the quality of water entering the Great Barrier Reef. The Scheme was conceived in response to the consensus that a market-mechanism to incentivise water quality improvements across Reef catchments was urgently needed.

Reef Credits will enable land managers to improve water quality through management changes that generate a tradeable unit of pollutant reduction or 'Reef Credit'. A Reef Credit represents a quantifiable volume of nutrient, pesticide or sediment prevented from entering the Great Barrier Reef.

Natural resource management organisations, Terrain NRM and NQ Dry Tropics, have teamed up with environmental markets investor, GreenCollar, to develop Reef Credits. Most importantly, the Scheme has been developed in collaboration with agricultural industry groups, research organisations, government and regional communities. The first Reef Credits will be formally exchanged by the end of 2019.

This initiative represents a great solution to ongoing funding challenges and to ensure value is placed on the ecosystem service provided by farmers for reef health. NRM organisations partnering with the for-profit sector is an example of the new types of partnerships we need in NRM to create and deliver innovative and long-term solutions.

R&D and University Panel

Warren Keedle, Charles Sturt University, Resilience in Australian NRM

We present results from research into the practice of resilience thinking in Australian NRM. The research, undertaken for the Resilience Planning Community of Practice, uses qualitative interviews to explore a number of cases where organisations have practiced resilience over the past 10 years of Australian NRM's resilience journey.

The study explores three key factors in resilience thinking and practice (an organisation's internal resilience, external support for incorporating resilience into institutional practice, and understanding of resilience by individuals at multiple levels within the organisation) and how the alignment of these three factors influences all levels of resilience

practice. These factors are examined from both an organisational and individual-within-the-organisation perspective, with the latter informed by institutional entrepreneurism as a driving factor.

We present insights from this research to enhance understanding of the journey involved when adopting resilience thinking in NRM practice: from learning, to embedding and the legacy of the resilience paradigm and practice.

Catherine Allan, Institute for Land, Water and Society, Charles Sturt University, Empowering community groups to engage and build capacity.

We present an approach for assessing community-based NRM group capacity. The approach uses a survey developed for, and used by, Murray Local Land Services and Landcare NSW. The survey approach creates data that are analysed to allow community groups understand their capacity in terms of human capital, financial and physical capital, and three types of social capital: bonding social capital (how cohesive the group is), bridging social capital (how well the group connects with others) and organisational capital (how well the group organises internally).

The analysed data are provided to groups graphically in a snapshot (four-page) report, with commentary provided to enable groups discuss how to build on their strengths, and respond to any capacity needs. A significant overall finding is the high levels of bonding and bridging social capital within both groups and networks. Strong bonds are a testament to the strength of Landcare, and effective networking fulfils Landcare's aspirations. Here we exemplify the approach and how it has been used, and create a discussion to explore its merits and prospects for improvement.

Julia Mynott La Trobe University, Soil acidification in the Murray-Darling Basin and its potential impacts on freshwater ecosystems.

Soil acidification is a growing concern for agricultural land, with approximately 50% of all Australian agricultural land affected. The need to understand the broader off-site impacts, including the relationship between soil acidification and freshwater ecosystems, is recognised by Commonwealth federal and state governments. Soil acidification in the Murray-Darling Basin Plan is seen as a potential key cause of water quality degradation (pH decline) and the investigation of this relationship between soil acidification and the declining pH of waterways is needed.

Despite broad support for further research on the impact of soil acidification on freshwater ecosystems, to date there has been little work done. The precise mechanism for changes in pH is unknown, but there is evidence to suggest an association with the acidification of soils in agricultural areas leading to acid leaching and surface run-off into streams decreasing the pH. If pH changes in the Basin's rivers are linked to soil acidification then the impact on freshwater ecosystems in the Murray-Darling Basin, and other basins more broadly, may be extensive.

A trial project in the Upper Murray has aimed to acquire a more detailed understanding of the spatiotemporal variation in pH with a particular focus on pH changes occurring before, during, and after rainfall events. The trial intends to elucidate the mechanisms underlying pH changes, and the consequences for freshwater ecosystems that will ultimately establish a method to conduct monitoring throughout the MDB.

Michael Shackleton, La Trobe University, Developing DNA-based monitoring programs for Victorian rivers.

DNA-based monitoring tools look to revolutionise the way we monitor organisms and ecosystems. Already being applied to aquatic animals such as platypus, fish and newts, DNA monitoring may soon be used to characterise whole ecosystems. The aquatic ecosystem is particularly well suited for DNA monitoring and development of DNA-based tools offers cost-effective ways to measure river health.

Here I present the current and potential uses of DNA monitoring in Victoria's aquatic environments. Advantages and limitations to various methods are discussed as well as what is required in order to implement a state-wide monitoring program.

James Van Dyke, La Trobe University, Conserving turtles to increase resilience of freshwater systems.

Freshwater turtles used to be one of the most abundant groups of vertebrate animals in Australian river systems. Turtle population densities in the Murray catchment were historically estimated as up to 159 individuals per hectare in some locations. Now, there are some places on the Murray where we catch zero turtles.

In most locations, turtles are present at low-moderate densities, but their populations are dominated by old adults. It appears that nest destruction by red foxes has eliminated recruitment, in some places for decades, which has led to population crashes as adult turtles die.

Their loss has a number of consequences for river ecosystems. Turtles are important scavengers and our data shows that they can help regulate the impacts of fish kills on water quality. They also historically stored a large amount of

biomass, which may have helped to buffer the effects of nutrient runoff into river systems. As turtles have declined, their ecosystem services have not been maintained.

We are proposing a catchment-wide effort to protect and restore turtle populations, using headstarting. We are working with a range of partner organizations, including councils, farms, community groups, and water treatment agencies to supplement turtle populations through a targeted nest-protection strategy and hatchling releases. Although the immediate aim is to prevent turtles from going extinct in the Murray, we will also be monitoring the effects of turtle releases on the environment. We predict that sites with higher turtle densities will have greater resilience to events like fish kills.

Wesley Ward, ILWS, Charles Sturt University. Improving research and on-ground collaboration to support NRM in Australian regional catchments

Collaboration is vital in the NRM space as no one person or organisation can successfully address the complex and challenging socio-ecological issues facing Australia. Research institutes and on-ground organisations such as CMAs can each bring complementary expertise, experience and resources to develop solutions for these issues. However, there is dearth of successful cases of long-term collaboration between research and implementing organisations in Australia.

This study investigated the perceived barriers for establishing and maintaining such collaborations, using a qualitative analysis of interviews with 12 researchers from Charles Sturt University's Institute for Land, Water and Society, and 12 managers and project officers from the North East CMA in Victoria.

Analysis highlighted the vital roles of face-to-face communication and relationship building in establishing and building trust and respect between individuals and the organisations, and the need for online or paper-based resources that enabled the latest expertise and knowledge to be available to members of both organisations.

Interviewees also requested greater prior understanding of the working environment for the other party regarding funding, timelines, available resources and staff availability to enable improved relationships between the organisations and more collaborative funding bids and projects to emerge from these stronger relationships.

The increased need for research that provides effective monitoring and evaluation in projects funded by Federal and some State investors provides added impetus for more collaborative projects that address complex NRM issues in Australia.

Paul McInerney, Centre for Freshwater Ecosystems, La Trobe University, Food for thought.

Basal food resources underpin both aquatic and terrestrial food webs. In aquatic food webs basal resources can consist of algae, bacteria, fungi, detritus and living plant matter. Each of these resources differ in their composition of food molecules that are essential for the development of consumers, such as fish. Improving our understanding of how basal food quality varies in freshwater ecosystems under differing environmental watering strategies has the potential to allow us to develop more resilient ecosystems.

Michelle Young, Sustainable Farms ANU, Farming for biodiversity, profit and resilience.

Over the last twenty years, our team has been studying biodiversity and productivity on hundreds of farms in inland Victoria, New South Wales and south-east Queensland - Australia's eastern wheat-sheep belt. This work is one of the largest, long-term initiatives of its kind.

Combined with farmers' experiences, our research has given us invaluable insights into some of the most effective and lasting ways to improve a farm's natural assets, productivity and resilience. Focusing on these insights, and together with farmers, we are rolling out a program of extension activities, including Field Days and training workshops on how to improve farm dams.

Our project, called Sustainable Farms, is an initiative of the Australian National University to support farmers with the knowledge they need to improve their triple bottom line – farm profitability, biodiversity and farmer wellbeing. Continuing alongside our extension program, our multi-disciplinary research projects are investigating the effects of increased biodiversity on farm productivity and farmers' well-being.

We believe these three elements are connected, and we aim to explain, demonstrate, and quantify these connections. Our purpose is to help to create a sustainable future for Australian farmers, based on the best available evidence and farmers' experience. This presentation introduces the project and highlights work we are undertaking to improve the management of farm dams.

Katrina Dent, Reef Catchments, What does Citizen Science look like?

What is the future of Citizen Science, is it organising volunteers and gathering paper sheets, or it is working with Industry to gain understanding, ownership and control over your future management actions?

Reef Catchments, a natural resource management group, focused on improved land condition is working with partners to moving from the land to the sea to improve the condition of the Great Barrier Reef. Partners include Tourism Industry and Operators, North Queensland Bulk Ports, James Cook University (JCU), Mackay-Whitsunday Healthy Rivers to Reef Partnership and Reef Catchments.

The project would not be possible without funding from the Great Barrier Reef Foundation. The project utilises tourism operators heading out to the reef with tourists to collect marine monitoring data at key locations. The project utilises proven research, science experience and methodology used by Ports and JCU to train Whitsunday tourism operators in the sampling.

The data will be shared amongst Partners, the community and used and communicated through the annual regional report card produced by the Mackay-Whitsunday Healthy Rivers to Reef Partnership. The tourism operators collecting the samples have a vested interest in the long term health and functionality of the Great Barrier Reef (GBR), and they want and are well positioned to lead solution based monitoring, evaluation, and effective communication.

This project will ensure information flows through to the tourism industry who will be informed and empowered to maintain or enhance monitoring in the future and take action and/or advocate for further reef protection. The project is the Whitsunday Blueprint for Water Quality Monitoring for Tourism Operators.

Tim Peterson, Monash University, Hydrological Drought Recovery: A statistical analysis of hydrological resilience throughout Victoria.

Surface and groundwater hydrological models behave so that after a disturbance of any magnitude, such as a drought, the system eventually recovers (Peterson et al. 2009). Hence, catchments have been assumed to be infinitely resilient. Recently, this assumption has been challenged and theoretical deterministic modelling has shown that meteorological variability can displace hydrological systems into a self-reinforcing new stable regime; and hence have a finite resilience (Peterson et al. 2012, 2014a,b).

However, whether real catchments are infinitely resilient and always recover from disturbances remains an open question. To begin to answer this question, we statistically identify if and when unregulated catchments in Victoria (n=162) recovered from the Millennium Drought. Hidden Markov Models (HMM) were developed to statistically quantify when the annual (or seasonal) runoff shifted during the meteorological drought, using an approach similar to Saft et al. (2015), and if and when runoff recovers. For each catchment, 64 different annual timestep HMM maximum likelihood estimated models were derived (seasonal: 32 models).

We found that ~30% of the 162 catchments have not recovered from the Millennium Drought (Fig. 1). This fraction appears stable and suggests that recovery cannot be assumed to occur soon. This is consistent with, but not proof of, catchments having a finite resilience to droughts. However, analysing those that have recovered from either the Millennium Drought or the 1982 drought suggests that recovery is possible. The driver(s) and thresholds for recovery remains an open question, but their identification will inform how management actions alter catchment hydrological resilience and recovery from drought.

Martin Driver Australian Network for Plant Conservation, If we are going to fix it, where do we get the parts??

If we are collectively going to address the range of environmental, climate, production and regional industry and employment opportunities, native vegetation management and restoration is going to have to play a key role. If that is true where is all the native seed going to come from and how is the industry going to develop to support it? ANPC conducted a national survey of the Australian Native Seed Industry in 2016/17. This survey has provided the first current knowledge of how the native seed supply chain and those who are employed in it functions. The results provide an insight into the environmental and economic barriers that exist and the realities of the fragmented industry that is essential to supporting regional NRM outcomes. It also draws on the feedback of the passionate and skilled local players that keep the industry functioning across many NRM regions of Australia.

An outcome of this study has been the NSW Environment Trust funded Healthy Seeds project which is attempting to establish the actual capacity of seed supply in NSW and the barriers and opportunities to make the industry more efficient and resilient to climatic and financial fluctuations.

Posters Presenters

Posters will be on display throughout the Conference, but we will have a poster presentation session on Tuesday 19 November from 10.15am to 10.45 am (followed by morning tea in the same venue). Would you like discuss these presenters work in greater detail? Then get on the Crowd Compass app and arrange a meeting with them.

Bek Caldwell (and others), Goulburn Broken CMA Community leadership in planning environmental water delivery at Kanyapella Basin in the Goulburn Broken Catchment of Victoria, Australia.

The Goulburn Broken Catchment Management Authority builds resilience by engaging with the community and agencies, to solve problems and deliver multiple benefits.

Kanyapella Basin wetland, created during the uprising of the Cadell Fault approximately 18,000 years ago, is a ~3,000 ha high value floodplain asset, connected to the Goulburn River via the Yambuna Creek. The basin is a high priority for water delivery for environmental, cultural and social values, with significant threatened flora and fauna species recorded.

Connection of Kanyapella Basin to the river has been highly modified, which together with changed river flow regimes, has resulted in inadequate wetting of the basin. Flows in the associated tributaries, such as Yambuna and Warrigal Creeks, have also reduced markedly since the millennium drought and irrigation efficiency improvements in the region, leading to significant local community concern.

These community concerns and valuing of the Basin and creek system's cultural heritage and environmental management values were a catalyst for investigating opportunities for delivering environmental water to Kanyapella Basin. The local community, alongside agencies, are actively involved with engagement with key stakeholders regarding the issues in the basin and associated creeks, which provides significant benefit to the project.

In response, the Goulburn Broken Catchment Management Authority and partners assessed water delivery to the Kanyapella Basin via the irrigation supply, drainage system and the Yambuna Creek. Results found delivery of water is feasible, and a pilot environmental water delivery is planned for 2019/20 to provide environmental, cultural and social benefits for the community and region.

Jacqui Knee, North Central CMA, Plan2Farm – put your farming future in your hands.

The farming landscape in the Goulburn Murray Irrigation District (GMID) has seen significant and rapid change over the past decade with the implementation of water reforms such as the Murray-Darling Basin Plan and $2 billion GMW Connections project, as well as changing weather conditions and falling milk prices.

The Plan2Farm project assists farming families to make well-informed decisions relating to changes in; water availability and entitlements, irrigation modernisation works, market dynamics, and climate. Farmers are making more informed and confident decisions about their farming business to improve their resilience through tough times. The project has been delivered since a trial in 2013 with 196 farming families considering all areas of their farming business to develop a clear pathway for their future. The current Plan2Farm project process includes:

- Allocation of suitable independent consultants and/or Plan2Farm agency advisors to guide farmers through the process
- Workbooks tailored to individual farms which will help farmers understand the best way forward and make the right decisions for their business
- Farming families meeting with farm business planning specialists to help strategic planning
- Facilitated group sessions so farmers can meet to discuss issues and plans

In coordinating and implementing the project, the North Central CMA is leading an alliance of key GMID stakeholders to provide an honest broker role to ensure independent third-party advice and support to farmers in their decision making.

Kacie Melfi, Port Phillip and Westernport CMA. The Great Escape – finding new homes for the critically endangered Helmeted Honeyeater and lowland Leadbeater's Possum. Kacie Melfi, Port Phillip and Westernport CMA

Two of Victoria's faunal emblems, the Helmeted Honeyeater and Leadbeater's Possum, are critically endangered with only small wild populations remaining in a single area of suitable habitat. The Helmeted Honeyeater has a single population of around 200 individual birds confined to the Yellingbo Nature Conservation Reserve. The lowland subspecies of the Leadbeater's Possum is also confined to this reserve with just 34 individuals left in this population and a declining trend meaning the threat of extinction looms large.

The Yellingbo Nature Conservation Reserve is relatively small at approximately 600ha and mostly linear, which means the special habitat and populations it contains are highly susceptible to devastating event such as a bushfire, drought or outbreak of disease.

Thanks to amazing efforts of many people and organisations, the wild population of Helmeted Honeyeater has increased from only 50 in the 1990's to around 200 today. It is time to capitalise on the previous and ongoing efforts and allow the Helmeted Honeyeaters to 'spread their wings'. There is now an opportunity to establish new population centres outside of Yellingbo to expand the wild populations and greatly reduce the threat of extinction.

The story for the lowland Leadbeater's Possum is more alarming. In 2001 the population of lowland Leadbeater's Possum was around 110 individuals but since then the population has plummeted to just 34 individuals in the wild. This sub species is on the brink of extinction and urgent action is required to enable the wild population to grow.

Katherine Allen NACC NRM. Little Footprint Big Future.

"What's one small action you can take to help your local environment? " NACC's Little Footprint Big Future interactive exhibit provided some answers. Through a partnership with the WA Museum Geraldton, NACC developed an interactive exhibit giving young families an opportunity to be inspired - to make a change.

The exhibit sought to bring NRM into the broader community, beyond our regular audience. It provided a hands on experience which helped a range of visitors to understand complex NRM issues and also incorporated local traditional Indigenous language and knowledge as well. It reconnected young people and the community more generally, with their local environment and offered an opportunity to help them understand it's value.

The exhibit also demonstrated practical everyday actions which visitors could undertake once they left the exhibition – whether it be recycling, protecting native flora and fauna, removing feral plants or reducing the impact of feral animals as well as opportunities for volunteering.

Children, community members, land managers and planners alike had the chance to explore elements of this exhibition and discover choices and actions that they can take in their everyday life to make a positive impact on the local environment that we all love. We face a range of environmental challenges in our world today. But no matter how big those challenges seem, together, better choices can make a real difference.

Plans are being made for the exhibit to travel to other parts of WA in partnership with other WA Museum sites and local government authorities."

Lachlan Campbell North East Catchment Management Authority. A change of plan, building capacity and resource resilience through community engagement.

"Comprising 2% of the Murray Darling Basin, the North East's three primary river basins, the Upper Murray, Kiewa and Ovens contribute 38% of the total water. It is therefore vital to protect and enhance these valuable land, water and biodiversity resources.

The development of water ways action plans had traditionally been a closed loop between North East CMA, community and local government. The plans were intended for internal investment decisions and strategic planning, taking into consideration a 'landscape' or whole of catchment approach to natural resource management. In 2015 an external review of water way action plan development was undertaken. The review identified the importance of ensuring the central role of communities in plan development, and that outcomes should be aligned to the community values and the water ways they connect with.

In a new approach, in 2016 the City of Wodonga, Wodonga Urban Landcare network (WULN) and NECMA determined that WULN manage the development of a new Wodonga regional water way strategy. The engagement, communications, administration and coordination was undertaken by WULN, engagement included some ~100 community interactions and some 10 events across the catchment.

It is a working example of how a changed approach to a historic process can engage communities and embed a shared ownership of the issues and opportunities whilst building resilience of natural systems through a shared understanding and ownership by the whole of community."

Catherine McInerney North East Catchment Management Authority. The importance of protecting flows for aquatic species at risk from increasing temperatures.

"A recent project looked into how 4 iconic species of the Upper Ovens River are impacted during periods of high temperatures, combined with low flows. The project overlayed the thermal conditions required for the River blackfish, 2-spined blackfish, Murray crayfish and the Highland spiny crayfish with air temperature, water temperature

and flow rates within the Upper Ovens catchment over two summers. It found that although air temperature is the biggest indicator of water temperature, there are also tipping points at which a reduction in flow can contribute to accelerated water temperatures. This work give us an insight into how changes in water temperature can influence species distribution, abundance and even risk of extinction given future climatic predictions.

This project has also highlighted the importance of protecting flows, ie restricting water usage to towns and irrigators to the future survival of aquatic species during warmer periods, and more generally as climates warm. Other management interventions to reduce the thermal stress in waterways also need further consideration and planning to improve the chances of retaining aquatic biodiversity. These could include restoring fine-scale stream geomorphology to increase the range of habitat and therefore thermal diversity (refuge), a greater focus on the reinstatement of the natural movement of water within waterways and revegetating the riparian zone to increase shading."

Kyra Roach Central West Local Land Services. Preserving Grey Box Grassy Woodlands in Central West. NSW

The Grey Box Grassy Woodland is an endangered ecological community which is the focus of our NLP2 funded project- Preserving the Grey Box Grassy Woodlands in Central West NSW. This listed community has been on the decline due to land clearing for agricultural development, fragmentation of habitat, degradation of species diversity due to grazing, and weed invasion. Our project is addressing the threats and trying to conserve the woodlands through the following:

- Installation of augmented hollows to enhance habitat
- On ground weed control works to reduce competition from weed species
- Rubbish removal to assist in restoring groundcover
- Funding for additional fencing to control stock access and implement improved grazing management strategies
- A series of community workshops were carried out to increase awareness of the woodlands and management actions available to assist in the restoration and retention of the community into the future
- Carrying out ecological burning to enhance the vegetation, and passing on knowledge to the community in cool burning techniques
- Monitoring for change on project areas to determine the improvements
- Working across various tenures to maintain and improve connectivity

Through the project, we have been working to support private and public land managers to address the threats through a combination of on ground works and awareness raising and capacity building activities. These actions have secured several sites during the first phase of the project and we hope to deliver further enhancement and restoration works in the next four years of the project.

Laura Williams ACT NRM. Restoring farm dams to wetland refuges.

Box Gum Grassy Woodlands are a threatened ecological community due to having been extensively cleared throughout their range with less than 5 % remaining. Although the ACT is small, it is a stronghold for Box Gum Grassy Woodland with some of the largest and highest quality patches left in the country. These woodlands are present on both private and public land.

ACT NRM has funding through the National Landcare Program to protect and connect Box Gum Grassy Woodlands in the ACT. This is a multifaceted program, bringing together government agencies, catchment groups, community organisations and landholders to actively improve management of Box Gum Woodland.

We are working within a strong scientific framework to plan our on-ground works (revegetation, grazing management, weed control). Properties across the ACT have been prioritised based on the distribution of Box Gum Woodland, connectivity modelling and biodiversity values, although enthusiastic land managers are the key and we will employ a number of techniques to engage landholders.

Baseline measures for a functioning Box Gum Woodland have been developed for the ACT and we are undertaking baseline monitoring to determine what attributes of a site (woodland structure, species richness etc) are below benchmark values and what on-ground actions are required to address this. Rather than measuring success as number of trees planted, or hectares revegetated, our measure of success is whether the attributes of the site have been lifted further towards those benchmarks of a functional Box Gum Woodland.

Luke Bulkeley ACT NRM. Making Green Spaces Good Again; remnant eucalypts in the urban environment.

"Despite the growing awareness around climate change, biodiversity loss, CO2 sequestration and the urban heat island event, the tree canopy of Canberra is declining.

Canberra is home to many large, remnant eucalypt tress which in their natural environment are keystone structures in the natural system. Remnant trees in the urban green space are generally dominated by exotic grasses with the predominant management regime being mowing and tidying up debris to maintain a 'park-like' structure. This management style prevents ecological processes such as natural regeneration from occurring and limits opportunity for habitat retention or development.

ACT NRM is involved in the development of a multidisciplinary project which aims to retain remnant eucalypt trees in the urban landscape with different management regimes to investigate how urban green space can make a greater contribution to biodiversity conservation. We will be conducting a trial to investigate alternative management of existing urban green spaces – mulching beneath remnant trees, increasing structural and floristic diversity by planting a mix of native trees and shrubs in the surrounding green space and retaining woody debris beneath the tree.

As well as the increased biodiversity outcomes of this management type, this project is also likely to achieve socio-economic advantages. The costs of mowing, weed control, planting and tree maintenance should be reduced and these natural environments will provide greater opportunity for community engagement through volunteering and citizen science, thereby creating and strengthening a sense of wellbeing. The biodiversity, economic and social benefits of this changed management regime will be extensively documented to build the case to provide several options of management, other than 'business as usual'. "

Natalie Dando Murray Darling Basin Authority. Improving the dynamics of the Mitta through integration and collaboration. Natalie Dando Murray Darling Basin Authority

The headwaters of the Mitta Mitta River originate in the Victorian alpine region. The river initially flows in a south easterly direction before sweeping around and flowing in a northerly direction towards Dartmouth dam. Dartmouth Dam is the largest capacity dam in Victoria and the highest structure of its kind in Australia. Downstream of Dartmouth Dam, the Mitta Mitta River generally flows in a north-westerly direction into Lake Hume. Hume Dam is the major operating storage of the River Murray system.

The Mitta Mitta River is vitally important for transferring water between the two storages. Since the commissioning of Dartmouth Dam in 1979, the transfer of water between Dartmouth and Hume has altered the natural flow regime of this stretch of the River. Changes to natural flow regime is well understood to contribute to loss of biological diversity and ecological function in aquatic ecosystems. Associated with this loss is that bank erosion is an ongoing issue, as the river adapts to an altered flow pattern. Over the last 20 years there has been a steady yet progressive adaptive management approach to addressing the challenges of regulation on the Mitta Mitta River, leading to practice change and increased collaboration across the industry.

Today the Mitta Mitta River program involves variable flow releases, annual condition assessments, prioritisation of issues for investment, integration of instream habitat, fish monitoring and a holistic approach to sites, to build a more resilient River system for the future. The key partners who are collaborating and investing to help improve the system resilience are the Murray Darling Basin Authority (MDBA), Goulburn Murray Water (GMW), North East Catchment Management Authority (CMA) through Victorian Government's investment in Water for Victoria initiatives, the Arthur Rylah Institute, Victorian Fishing Authority (VFA), the Cods of Anarchy Angler Group, Friends of the Mitta Mitta River and local landholders along the river.

Rebecca Palumbo, Wheatbelt. NRM RED Card– 15 years of grass roots action

Since 2004 the "Red Card for Rabbits and Foxes" program has flourished across the agricultural areas of WA. This community based feral animal control program works on the premise that impact is maximised by coordinating groups to conduct baiting and shooting activities at the same time across the landscape.

Local coordinators rally their local community to participate with support from a central coordinator.
In 15 years Red Card has expanded from its starting point in Wagin/Woodanilling and Katanning to now include 36 groups with over 1000 participants culling over 6000 ferals (2018 results).

While at its core Red Card is a feral control program, it is the social and community cohesion that is recognised and valued by the participants and has driven its popularity and success over the years.
In tough years in the agricultural sector Red Card local shoots are used as a way to bring the community together and support those that are struggling with the challenges. The connection to mental health is also recognised with a sponsorship arrangement where the Sporting Shooters Association donates up to $20,000 annually to the Regional Men's Health Initiative based on the overall shoot tally.

The Red Card program is anchored in grass roots community action. Local action – working together for maximum impact. Red Card is not claiming to save threatened species but the model will create long term change due to its simple logic – be economical, perpetual and create a legacy of community action.

Rod White North Central CMA. A Healthy Coliban Catchment project.

The Upper Coliban catchment provides raw water for drinking water purposes for over 130,000 people, including for the towns of Trentham. Tylden, Bendigo, Kyneton and Castlemaine. Existing and future development pressure including run-off from on-site wastewater treatment systems and uncontrolled livestock access, threaten water quality and riparian ecosystems.

In response, Coliban Water and the North Central CMA, with active participation of other stakeholders, developed a 20-year Integrated Catchment Management Plan (ICMP) for the catchment. It is the first and most important step towards protecting the future supplies of drinking water and the environmental and cultural values that make the area so sought-after.

The ICMP is now being implemented through A Healthy Coliban Catchment project, which is jointly funded and led by the North Central CMA and Coliban Water, working closely with local councils, landholders and communities. Actions include:

- On-ground works include fencing to exclude stock from waterways, weed control and riparian revegetation
- Local Government Planning Scheme amendments that will better protect the catchment from inappropriate development.
- Community engagement, education and awareness raising.

This is one of the most robust and integrated approaches to catchment management undertaken to date in Victoria. It provides a model for CMAs and water authorities, working together to protect and enhance catchments for mutual benefit.

Carolyn Nigro. Building resilience in the Shepparton Irrigation Region: taking hybrid drainage from concept to reality.

Implementation of the Goulburn Broken Catchment Management Authority's Shepparton Irrigation Region (SIR) drainage strategy commenced in 1995 and originally envisaged a continuation of larger public drains connected to smaller community-owned drains. However, since the late 1990s a reduced irrigation footprint, a drier climate, irrigation supply system modernisation and better on-farm water use efficiency have collectively reduced irrigation tailwater runoff, channel outfalls and drainage discharge. Reduced runoff has changed the economic benefits of surface drainage, and therefore completing the SIR surface drainage program in line with the 1995 strategy can no longer be justified because the costs outweigh the benefits. A 2015 SIR drainage strategy review identified a "clear need to address the changed economics by developing a new type of lower cost surface drainage system"; based on "a 'hybrid drain' comprising of drainage course declarations (DCD) and constructed drains…"

A new drainage program, funded by the Victorian State Government, is focusing on bringing low-cost and more flexible hybrid drainage systems from concept to reality. Since 2016 Goulburn-Murray Water (GMW), in partnership with GB CMA, has led the development of pilot hybrid drainage schemes in the SIR. These schemes aim to improve flow through natural drainage courses by removing artificial obstructions (e.g. banks and undersized culverts) and establishing protection under Victoria's Water Act as declared drainage courses (DCDs). This paper discusses how; by applying a unique planning, design, and community engagement approach, these hybrid drainage schemes are helping to build regional resilience by delivering improved economic, social and environmental returns.

Tony Gardner West Gippsland CMA. Creating resilient relationships with community and partners to achieve NRM goals

NRM is our core business - but every outcome is reliant on understanding and addressing the needs and barriers of community, partners and other stakeholders. We must build long term resilient relationships to have success.

The Sideways Arrow: Program logic and MERI is embedded in WGCMA business, It helps achieve outcomes, improve and tell our story better. For every NRM Outcome, there are social outcomes for both community and partners. It may be awareness of values or threats, knowledge or skills required to implement a practice or confidence that the proposed solutions will work and have mutual benefit. We devote effort to relationships, so we can define the critical social outcomes and address them. This is the sideways arrow: Social outcomes that support NRM outcomes.

The Social Change Tool: Once we clarify social outcomes, we design targeted fit for purpose activities, and have simple, real questions that help measure social impact and its connection to NRM success. Asking about barriers and challenges helps us address the concerns of our community and partners and design the next step in our projects, plans and strategies.

This presentation will provide an overview of the WGCMA approach and include practical examples to demonstrate. Practitioners will be challenged to think beyond the NRM outcomes that we tend to focus on and explore how real relationships underpin everything we do.

Carole Sweatman Terrain NRM. Wet Tropics Major Integrated Project (WTMIP).

The release of the Great Barrier Reef Water Science Taskforce report in May 2016 created a rare opportunity to design and deliver a program founded on local knowledge, ownership and stewardship. The objective of the Wet Tropics Major Integrated Project (WTMIP) is to work closely with growers in targeted priority areas within the Tully and Johnstone basins to demonstrate a range of tailored, coordinated actions that reduce pollutants entering the GBR lagoon.

The WTMIP builds on a long established theory that enduring long term change and sustainable communities comes from the people within those communities. The WTMIP proposes that by concentrating effort, using a combination of approaches and closely involving local communities in the design and implementation a steeper trajectory in water quality improvement will be achieved and ensure local industries are sustained.

The WTMIP is being coordinated by Terrain NRM on behalf of its many partners and has oversight from a Project Panel with local industry and community representation. Community input from the design phase focused on addressing the issue of 'show me it's my nitrogen and I'll fix the problem'. Throughout delivery management practices, economic benefits for growers and pollutant loads are being monitored with results informing adaptive management.

'In time' water quality data is being communicated back to growers and engages them in discussions about what the data means to them and practices. The presentation will provide an overview of how, through the WTMIP, local communities are working together to build resilient industries and local community capacity.

Craig Liddicoat Department for Environment and Water (SA). Can our soils be managed sustainably? – A South Australian experience over 20 years.

The sustainable management of our soil is essential to maintain the productive capacity of our land and our social, environmental and economic well-being. About 10.5 million hectares of land are used for agriculture in South Australia with soil erosion and acidification being major threats to this land.

Innovative assessment and evaluation techniques are used to determine the extent of soil protection across the cropping areas most susceptible to erosion and land most susceptible to acidification. Trends in erosion risk are determined by assessing the relative amount of ground cover and soil disturbance at critical stages of the annual plant growth cycle and seasonal cropping activities. Trends in soil acidification are determined by assessing changes in soil pH.

In addition, the quantity of lime sales is used to track the management of soil acidity. Trends in soil and land condition provide quantitative evidence that land managers continue to adopt more sustainable farming practices that protect the soil, and improve soil health and productivity.

Vicki-Jo Russell AM, South-eastern Red-tailed Black-Cockatoo Recovery Team (SA). Cockies helping Cockies – Red Tailed Black Cockatoo recovery across the South Australian & Victorian border.

South Australia's southeast is home to 70 nationally listed threatened species including the noisy and flamboyant South-eastern Red-tailed Black-Cockatoo.

Red-tails are highly specialist feeders, relying almost entirely on the seeds of Brown and Desert Stringybark and Buloke trees. Most Red-tail habitat is in the care of private landholders who are significant partners in the bird's recovery. To understand how best to support private landholder participation the Red-tail Recovery Team undertook a phone survey of landholders and series of one-to-one interviews.

In partnership with the local community six principles were developed which have guided the project's activities over the past decade. Among these lay a commitment to support peers and local community members to become Red-tail experts.

The project has been met with widespread support; working with over 100 landholders in priority habitat areas to develop and implement habitat plans and foster an extensive landholder network.

Jodie Gregg-Smith Natural Resources SA Arid Land. BITEBACK - A model of community driven pest management in South Australia.

In South Australia wild dogs, including dingoes, are managed strategically across two distinct management zones, inside (south of) the dog fence, where the dingo is a declared pest animal and outside (north of) the dog fence, where the dingo is categorised as unprotected native wildlife.

The "Biteback" Program commenced in 2009 and is managed by the SA Arid Lands Natural Resources Management Board, in partnership with landholders, industry and the State government. South of the Dog Fence, the Biteback program is about removing wild dogs to ensure viability of sheep production. Management activities north of the fence are concerned with minimising wild dog impacts on the cattle industry while maintaining the ecological and cultural roles of wild dogs.

Key to the effectiveness of Biteback is the coordinated and systematic control carried out by land managers across 200 pastoral and freehold properties, over an area of 200,000km2. 21 community based Biteback groups have been formed to undertake coordinated district scale control activities. These include development of local plans to define the groups commitment to wild dog control, bi-annual coordinated baiting programs, trapper training workshops for land managers, communication and reporting of wild dog activity.

In 2017, the release of the Board's Wild Dog Best Practice Guidelines, an Australian first, provided a benchmark for landholders and the Board to monitor efforts to control wild dogs. The guidelines are used as a proactive tool on properties where wild dog populations aren't currently known to exist or on properties where wild dogs are seldom sighted to prevent growth of populations. They also outline a reactive management program to manage and reduce dog activity where evidence such as sightings, stock loss, tracks or scats are present.

Andrew Freeman Natural Resources Eyre Peninsula. Eyes on Eyre – community supporting coastal protection across Eyre Peninsula in South Australia.

The Eyre Peninsula, situated in western South Australia, is well known for its spectacular inland and coastal areas with the coastline being recognised as one of the most scenic in the world. Coastal areas are becoming increasingly popular tourist destinations which is placing increased pressure on this unique environment.

The Eyre Peninsula Natural Resources Management Board, Regional Development Australia Whyalla & Eyre Peninsula and the Eyre Peninsula Local Government Association recognised this challenge of sustainably managing this unique environment, particularly coastal areas, in 2016 and started working together under the banner of 'Eyes on Eyre'. The aim is to enable more people to enjoy and appreciate the spectacular coastline and avoid impacts on the natural environment. This is being done by implementing a cohesive, region wide strategy for the sustainable management of visitor access.

Suzanne Prober CSIRO. A Platform for Ecological Restoration Research Infrastructure (PERRI): accelerating learning and transdisciplinary collaboration in NRM

Australian governments and communities are investing in a broad range of ecological restoration programs. A key challenge for these programs is telling the story of our achievements and improving our ability to implement cost-effective and climate resilient restoration outcomes. We propose a national Platform for Ecological Restoration Research Infrastructure (PERRI) to advance ecological restoration in Australia, that would embed well-designed experimental networks across local ecological restoration programs, through collaborations among policy-makers, practitioners and researchers.

Suzanne Prober CSIRO. Options for renovating nature under climate change: a global synthesis.

Climate change is prompting increasing calls to ensure that ecological management and restoration actions are robust to changing environments. To progress the development of options to help nature persist or adapt in a changing climate, we established a typology of intervention options that have been proposed across the globe. These included 'low-regrets' options that are beneficial regardless of climate change, as well as 'climate-targeted' options that may be needed where valued ecological assets are otherwise unlikely to persist.

We propose the term '**ecological renovation**' to describe ecological management and restoration actions that actively allow for environmental change. We view this framing as supporting aspirations to conserve many historical values of ecosystems, while allowing for the inevitability of change - in the same way that a home renovation might restore valued historic character whilst accommodating modern electrical wiring and heating.

Peter Rose North Central CMA. Cohuna Fish Screens

"Native fish populations in the southern Murray-Darling Basin have declined by 90% since European settlement. The Native Fish Recovery Plan - Gunbower and Lower Loddon (the Plan), developed in partnership with leading fish ecologists, is a blueprint for native fish recovery. Focusing on key waterways within the Torrumbarry Irrigation District, as well as wetlands and floodplains within the Gunbower Forest and recommends; reinstatement of habitat, embedding fish restoration flows into irrigation flows and improving connectivity using fishways and fish screens.

The Native Fish Recovery project (the Project) is delivering positive native fish outcomes through:

- Altering irrigation water delivery to ensure appropriate water levels at critical breeding periods, at the same time importantly ensuring irrigators aren't negatively impacted
- Improving instream habitat, by installing snag complexes and fish havens, providing native fish with resting, feeding and breeding sites.
- Improving riparian habitat through stock exclusion, weed control and revegetation, which will, over time, improve the quality of instream habitat by providing shade, increasing organic carbon, decreasing sediment and nutrient loads.
- Facilitating community stewardship by actively involving and partnering with recreational fishers, irrigators and local communities in delivering and monitoring outcomes.

Macroinvertebrate sampling undertaken over the past two years shows that the instream habitat installed through the project is having desired results. The Project has partnered with Waterwatch to develop citizen science program (Riverscan) to monitor outcomes. Being connected to the Project with data analysed and reported, demonstrates the value of monitoring, which is rewarding for volunteers. Recent RiverScan data shows significant improvements to all three macroinvertebrate indices in Pyramid Creek, likely a result of increased habitat and ongoing environmental flows.

Central West Local Land Services. Using Hydrogeological Mapping as a Land Management Tool in Central West NSW.

The Central West Local Land Services, in partnership with DPI and OEH, completed Hydrogeological (HGL) mapping for the majority of the Central West NSW region. This mapping is at 1:250,000 scale and ties together the relationships between soil type, groundwater flow systems, salinity hazard landscapes and land capability. As a result of this, areas in the Central West region were identified where the soil, groundwater and land systems relationship was both complex and had limited information available to provide conclusive land management recommendations to land managers.

Bruie Plains near Trundle was identified as one of these complex areas that was at a high risk of both salinity and sodicity related issues. In this region there is limited soil and landscape information available and a gap was identified in the technical understanding of the biophysical processes impacting on the land systems of this area. The HGL Project resulted from this, the main objectives of the project were:

- To improve the capacity of the local land managers to make better land management decisions.
- To collate, collect and provide farm specific data to land managers which allows for the most informed agricultural and natural resource management decisions to be made now and into the future.
- To influence and support land management changes and specific actions which will implement land capability actions appropriate to the landscape.

Tanya Muccillo Central West Local Land Services. Addressing the Recovery of the Small Purple-pea in Central West NSW.

Central West Local Land Services is in the process of implementing a five-year project funded by the National Landcare Program aimed at preserving and enhancing populations of the endangered flora species the Small Purple-pea. The project is focusing on the small populations within the Central West region around Wellington, Stuart Town and the Lake Burrendong localities.

The project aims to address many of the proposed recovery actions from the Small Purple-pea Recovery Plan and have involved the community and local land managers in many of the actions to ensure there is an increase in awareness of the species within the known and potential habitat reach, and to build capacity in implementing management actions to preserve existing species. In total, 36 workshops and training exercises were undertaken which included:

- Community members attended the botanical surveys to gain skills in plant identification and plot monitoring
- A Basic Fire Fighter Training course to gain skills in conducting ecological burns
- Cert II in Conservation and Land Management course with TAFE NSW was carried out with students carrying out all of the practical work at Small Purple-pea project sites or in the surrounding habitat.
- 15 workshops were run by 5 local Landcare groups to boost awareness about the plant
  Pest Animal control workshops with land managers and community

In addition to the poster we will provide a 3 minute video at one of the lunch time sessions which gives an overview of the community workshops and training activities that were carried out throughout the initial 12 months of the project.

Gareth Lynch Mallee CMA Achieving Landscape Resilience through Targeted Land Management Actions

Co-Authors: S. McLean2, I. Sluiter3, M. Durant4 and G. Allen3 (2Department of Environment Land Water & Planning; 3Ogyris Ecological Research; 4Greening Australia)

The ongoing development and application of regional decision support tools to support a 'whole of landscape' approach to the prioritisation of remnant vegetation works is enhancing outcomes achieved by actions aiming to protect of one of our most iconic threatened species, Malleefowl; and supporting the long term resilience of the broader ecosystems on which they and other species rely.

Malleefowl, once extensive in Victoria, are now largely confined to restricted areas of suitable habitat within National Parks, adjoining State Forest, and a selection of Flora and Fauna Reserves. Some isolated populations continue to persist however in smaller remnants disconnected by the historic clearance and fragmentation of habitat. Remnants which also tend to experience a greater range and concentration of threatening processes (e.g. introduced predators, overgrazing, weed invasion); further reducing the ecological function and landscape processes these areas are able to provide.

Over several years, Mallee stakeholders have been combining their knowledge and on-ground delivery efforts to ensure investment in Malleefowl protection is targeted toward activities and locations that provide the greatest returns and directly address shared priorities; such as reducing the isolation of fragmented Malleefowl populations (e.g. Objective 5 of National Recovery Plan for Malleefowl). This partnership approach has facilitated the development of regional decision support tools to inform on-ground delivery; representing a key information source which continues to improve as new data (site and landscape scale) and associated research becomes available.

The overall effectiveness of these innovative support tools continue to be assessed by monitoring connectivity and vegetation condition outcomes achieved by the region's targeted Malleefowl works programs. Since 2011, these programs have included the construction of 234ha of critical habitat corridors and the enhancement of 14,000ha of remnant habitat. With a further 15,000ha of habitat enhancement and 300ha of corridor establishment works to be delivered and monitored over the next four years, we can expect both Malleefowl resilience and regional delivery processes to continue to improve.

Videos

Video presentations will be held in the main auditorium during the lunch time breaks. The following videos have been scheduled:

Elise Armitage Falls Creek Resort Management, All thanks to a Moth - and a creative community

Elise was not able to attend the Conference but has provided two videos and the following abstract:
Through the expression of people and place, arts and cultural activities have the unique ability to convey experiences and emotions from another's perspective. Many artists are currently attracted to Falls Creek through the rich and unique environment, and the landscapes capacity to deliver unique forms of inspiration. Falls Creek Resort Management, as an organisation provided a formalised structure for artists, academics and community to connect... and then the magic started to happen in ways that we had never imagined. Using a creative approach, new ways of communicating and thinking began to emerge, and Falls Creek is beginning to transition into a community that is utilising the arts as a tool to discuss and find solutions for major environmental and industry issues.
Art and Ecology – Alpine Peatlands. The first film illustrates the importance of Alpine Bogs, and the work that two scientists are undertaking locally.

Corinne Mays Port Phillip & Westernport Catchment Management Authority. Living Links: Connecting people and nature in Melbourne's south-east

Natural spaces within cities can offer important places for biodiversity conservation and deliver vital ecosystem services. They also provide people with easy access to nature - fostering a broad appreciation that flows into many parts of their lives, as well as providing a plethora of health and wellbeing benefits. In this talk I will give an overview of Living Links, an urban nature project that has been working for 12+ years to create a web of green spaces across Melbourne's south-east. Focused on the Dandenong Creek catchment, Living Links is a collaboration between ten Councils, various government authorities as well as environmental and recreational community groups. Drawing

examples from our current $1M project to transform the Dandenong Creek corridor into a world-class urban Living Link, I will illustrate what can be achieved by working together.

Stephanie Creer, Mallee Catchment Management Authority. Farmers Connect with Mallee Parks: Re-establishing links between the Murray Sunset and Wyperfield National Parks.

The 'Connecting Mallee Parks' project worked with private landholders, community groups and public land managers over a four-year period to rebuild connections between two of southern Australia's most ecologically important refuges for native species: Murray Sunset and Wyperfeld National Parks.

With a focus on linking and enhancing existing fragmented habitat within the largely agricultural landscape separating these parks, the project delivered targeted revegetation, stock exclusion fencing, pest plant and animal control, and salinity control actions across some 76,984ha.

Local landholder engagement was key to the project's success, with the revegetation program planting more than 48,000 trees over 500 ha through ongoing delivery partnerships; ultimately establishing over 25km of wildlife corridors.

To promote the importance of these delivery partnerships, a short film was created with participating farmer James Beckmann. In the video James explains why he became involved in the project and the outcomes achieved on his property; highlighting how important technical and resourcing support is for private land managers to realise their conservation goals. Link to video https://www.youtube.com/watch?v=diwug4JvLNw

Through partnerships such as this, project delivery has protected the future resilience of this priority landscape by enhancing important refuges for native plants and animals that have experienced widespread habitat loss; and created natural pathways for wildlife movements, aiding species dispersal and supporting climate change adaptation."

Gaye Gadsden, Friends of the Helmeted Honeyeater Inc. Engaging 'hard to reach' landholders in endangered species conservation

Friends of the Helmeted Honeyeater along with three partner Landcare Groups, established a project in 2017 to engage landholders in conservation action. Half of the 70 private properties that adjoin the Woori Yallock Creek wildlife corridor, (50km east of Melbourne), are taking action.

The primary objective of the project is to provide the increasing population of critically endangered Helmeted Honeyeaters with quality habitat outside Yellingbo Reserve, to which they are currently restricted. The wildlife corridor connects Yellingbo to Butterfield Reserve, earmarked to establish a future population.

A local landholder was selected as Project Officer. Landholders learned about the project through mail outs, events on properties and personal introduction by project partners. Communication focussed on benefits to the landholder and benefits to common wildlife they know rather than endangered species. Property plans were tailored to individual landholder values. Door knocking was undertaken where other methods had failed. Comprehensive support was provided to implement works.

Extensive habitat protection and improvement works have been implemented on 28 private properties. Agencies have welcomed the recruitment of properties by community for their programs and funded $315K of works. Community led engagement has accelerated the establishment of trust and 37% of all landholders were introduced through partner group community champions.

Community-led private land conservation projects can engage 'harder to reach' landholders through community connection, reputation and socio-cultural understanding. Strong stakeholder relationships have delivered a richly collaborative and resource efficient project with multiple agencies fully funding all community negotiated works and philanthropic organisations funding the Project Officer role.

Tanya Muccillo Central West Local Land Services. Addressing the Recovery of the Small Purple-pea in Central West NSW

See poster abstract.

Nicole Wishart, Mallee Catchment Management Authority. Tyrrell Project: Ancient Landscapes, New Connections

The Tyrrell Project: Ancient Landscapes, New Connections is putting local farming communities in the driver's seat when it comes to securing landscape-scale resilience in the Victorian Mallee.

The Tyrrell Project is delivering integrated catchment management through completely community-driven processes, enabling better scope, more partnerships with private land holders and increased volunteerism. Delivered by the Mallee Catchment Management Authority (CMA), through funding from the Victorian Government's Our Catchments,

Our Communities investment, the Tyrell Project is using extensive engagement practices to support communities to nominate activities/works in identified areas of great importance. Each activity delivers triple bottom line outcomes.

One significant output of this project has been increased resilience at the rural township of Sea Lake. The area has faced a surge in international tourism to the nearby Lake Tyrrell, which posed significant social and natural resource management challenges. Through community and local business partnerships, opportunities are being actioned to improve visitor facilities while managing appropriate access, reduce pest plants and animals, maintain soil and biodiversity pathways and increase critical habitat, while supporting social, economic and environmental resilience.

The Tyrrell Project shows how much more can be achieved when community is at the centre of planning and caring for our landscapes. Through natural resource management works and integrated catchment management we can foster resilience and improve sustainability values.

Please follow this link link; https://www.youtube.com/watch?v=cltkn_AbPXQ for a video outlining the importance of this project in the community.

Brett Dal Pozzo, South Coast NRM Inc. Dieback management - a prioritise, collaborative and cross tenure approach.
Please see Brett's abstract in Concurrent Session 1.

Delegates

As of 11 November 2019

Name		Organisation
Judith	Ahmat	North East CMA
Erika	Alacs	NRM South
Pam	Allan	NRM North
Catherine	Allan	Charles Sturt University
Katherine	Allen	Northern Agricultural Catchments Council
Kate	Andrews	NRM Regions Australia
Shayne	Annett	RMCG
Julie	Anorov	Department of Environment & Energy
Alex	Anthony	Murray Darling Basin Authority
Keith	Armstrong	Department of Environment & Energy
Roland	Atkinson	Cummeragunja Local Aboriginal Land Council
Elsie	Baker	Northern Tablelands Local Lands Services
Jan	Barton	Glenelg Hopkins Catchment Management Authority
Elizabeth	Beever	Deakin University
Justin	Bellanger	South Coast NRM
Euan	Belson	Northern Tablelands Local Lands Services
Adam	Bester	Glenelg Hopkins CMA
Leigh	Blackmore	Murray Local Land Services
Klaus	Boelke	Mitta Valley Landcare Group
Conrad	Bolton	North West Local Land Services
Nick	Bond	Centre for Freshwater Ecosystems
Mary	Bonet	ACT NRM
Derrick	Boord	Mallee Catchment Management Authority
Sally	Box	Threatened Species Commissioner
Susan	Brunskill	Wooragee Landcare
Kate	Brunt	Goulburn Broken CMA
Luke	Bulkeley	ACT NRM
Richard	Bull	Local Land Services
Ayesha	Burdett	Upper Hopkins Land Management Group
Ceilia	Burke	Murray Darling Basin Authority
Rebecca	Caldwell	Goulburn Broken Catchment Management Authority
Emma	Campbell	Department of Environment & Energy
Lachlan	Campbell	North East Catchment Management Authority
Sam	Capon	Griffith University
Michelle	Casanova	Glenelg Hopkins Catchment Management Authority
Sara	Chapman	North West Local Land Services
Sheila	Charlesworth	Burnett Mary Regional Group
Aaron	Chatfield	Dreamtime Connections
Michael	Cheetham	Water Technology
Stewart	Christie	Terrain NRM
Jane	Chrystal	Central West Local Land Services

Name		Organisation
Jonathan	Clark	Eyre Peninsula Natural Resources Management Board
Liz	Clay	West Gippsland CMA
Leonie	Coleman	North West Local Land Services
Tim	Collins	South East Natural Resources Management Board
Sean	Conaghan	Fitzroy Basin Association
Catherine	Conroy	Local Land Services
Rosanna	Coombes	NRM North
James	Cornwell	South East Local Land Services
Lucinda	Corrigan	Farmers for Climate Action
Steve	Costello	Department of Environment & Energy
Claire	Coulson	Wodonga City Council
Lyn	Coulston	Upper Murray Landcare Network
Nepelle	Crane	NRM South
Stephanie	Creer	Mallee CMA
Jeanette	Crew	Pandyil Farms, Deniliquin
David	Crew	Pandyil Farms, Deniliquin
Tom	Croft	North East CMA
Chris	Cumming	Central Tablelands Local Land Services
Tatia	Currie	Alinytjara Wilurara NRM Board
Brett	Dal Pozzo	South Coast NRM
Michelle	Dawson	South East Local Land Services
James	de Hennin	Mitta to Murray Blackberry Action Group
Kerry	DeGaris	South East Natural Resources Managment Board
Rebecca	Denniss	First Person Consulting
Katrina	Dent	Reef Catchments
Martin	Driver	Australian Network for Plant Conservation
Andrew	Drysdale	Desert Channels Queensland
Darryl	Ebenezer	Queensland Water and Land Carers
Jorg	Edsen	Terrain NRM
Sophie	Enders	Swamps, Rivers & Ranges
Anthea	Fawcett	Remote Indigenous Gardens Network & Foodswell Network
Claire	Feniuk	RMCG
Josh	Ferguson	Winda-Mara Aboriginal Corporation
Anne	Fitzpatrick	Port Phillip and Westernport CMA
Antony	Ford	Glenelg Hopkins Catchment Management Authority
Kate	Forrest	Rangeland NRM Alliance
Denise	Fowles	Natural Resources SA Murray-Darling Basin
Tony	Fox	Northern and Yorke NRM
Martin	Fuller	West Gippsland CMA
Gaye	Gadsden	Friends of the Helmeted Honeyeater Inc
Libby	Gardiner	Inspiring New Horizons
Tony	Gardner	West Gippsland CMA
Dan	Garlick	West Gippsland CMA

Name		Organisation
Frank	Garofalow	ACT NRM
Patricia	Geraghty	Victorian Catchment Management Council
Christine	Giles	Glenelg Hopkins CMA
Mary	Goodacre	Local Land Services
Bob	Gough	Huon Creek Landcare Group
Jodie	Gregg-Smith	SA Arid Lands Natural Resources Management
Catie	Guise	Central West Local Land Services
Phil	Haines	NRM Conference Support
Helen	Haines MP	Member for Indi
Colleen	Hamilton	Winda-Mara Aboriginal Corporation
Leith	Hawkins	Northern Tablelands Local Lands Services
Jamie	Hearn	Murray Local Land Services
Bruce	Hegge	Perth NRM
Ian	Heiner	NRM Regions Queensland
Craig	Heiner	North East Water
Andrew	Heinrich	Kangaroo Island Natural Resources Management Board
Bec	Hemming	East Gippsland Catchment Management Authority
Karen	Herlihy	South Coast Natural Resource Management
Eleanor	Hetharia	NRM North
Rohan	Hogan	North Central CMA
Brad	Holt	NQ Dry Tropics
Sarah	Hoyal	NQ NRM Alliance
Cindy	Hull	NRM South
Angus	Hume	Victorian Catchment Management Council
Michelle	Humphries	Local Land Services - Murray
Michelle	Hutchins	Department of the Environment & Energy
James	Hutchinson-Smith	North West Local Land Services
Barney	Hyams	Local Land Services - Riverina
Katherine	Ivansson	Department of the Environment & Energy
Brian	Jackson	Water Technology
Emma	Jackson	Cape York NRM
Catherine	Jenkins	Corangamite CMA
Carolyn	Jenkinson	Hunter LLS
Peter	Jennings	West Gippsland CMA
Fiona	Johnson	Tri-State Murray NRM Alliance
Kevin	Kane	Reef Catchments
Warren	Keedle	Charles Sturt University
Barry	Kennedy	Port Phillip and Westernport CMA
Maxine	Kerr	Murray-Darling Basin Authority
Trent	Kershaw	Geoscience Australia
Thomas	Kindred	Wannon Water
Jacqui	Knee	North Central CMA
Alice	Knight	Corangamite CMA

Name		Organisation
Heleen	Kruger	Department of Agriculture
Ashley	Leedman	Department of the Environment & Energy
Craig	Liddicoat	Department for Environment and Water (SA)
Joan	Liley	Victorian Catchment Management Council
Carla	Littlejohn	International RiverFoundation
Siwan	Lovett	Glenelg Hopkins CMA
Gareth	Lynch	Mallee Catchment Management Authority
Suzannah	Macbeth	Sustainable Farms, ANU
Andrew	Maclean	Southern Gulf NRM
Danny	Male	Natural Resources Kangaroo Island
Tony	Marsh	Kiewa Catchment Landcare
Robert	Martin	Wildlife Drones
Corinne	Mays	Port Phillip and Westernport CMA
Lynne	McCarthy	Department of the Environment & Energy
Latarnie	McDonald	Landcare
Paul	McDonald	Southern Queensland Landscapes
Garry	McDonald	Bush Heritage Australia
Catherine	McInerney	North East Catchment Management Authority
Les	McLean	Port Phillip & Westernport CMA
Julie	McLellan	Healthy Land and Water
Kacie	Melfi	Port Phillip and Westerport CMA
Sue	Middleton	AgCorp
Natalie	Mikecz	Western Port Catchment Landcare Network
Jade	Miles	Back Barn Farms
Damian	Miley	Natural Resources Kangaroo Island
Margie	Milgate	Regen in Action
Ian	Minns	Wangaratta Sustainability Network
Natalie	Misic	South East Natural Resources Management Board
Rachel	Morgain	NESP Threatened Species Recovery Hub
Tanya	Muccillo	Central West Local Land Services
Leanne	Mulcahy	North East CMA
Andy	Myers	OceanWatch Australia - Marine NRM
Belinda	Nave	West Gippsland CMA
Katherina	Ng	ABARES
Chris	Nicholson	Goulburn Broken Catchment Management Authority
Carolyn	Nigro	Goulburn-Murray Water
Philippa	Noble	Rutherglen Landcare
Chris	Norman	Goulburn Broken CMA
Hayley	Northcote	Port Phillip and Westernport CMA
Daniel	O'Neill	NRM Regions Australia
Louise	Orr	NSW Dept of Planning, Industry & Environment
Rebecca	Palumbo	Wheatbelt NRM
Deb	Parkinson	Gender and Disaster POD

Name		Organisation
Amanda	Paul	Port Phillip and Westernport CMA
Saravan	Peacock	Department for Environment and Water
Sharyon	Peart	Mallee Catchment Management Authority Board
Keith	Pekin	Perth NRM
Stephen	Pereira	Central West Local Land Services
Matt	Pfahlert	Australian Centre for Rural Entrepreneurship
Lowri	Pryce	OceanWatch Australia
Gemma	Purnell	Meier Farms
Tony	Ricciardi	Burnett MAry Regional Group
Anna	Richards	CSIRO Land and Water
Kristy	Richards	Alinytjara Wilurara Board
John	Riddiford	Corangamite CMA
Maria	Riedl	Mallee Catchment Management Authority
Elyse	Riethmuller	Fitzroy Basin Association
Deborah	Riley	Melbourne Water
Chris	Robinson	Wooragee Landcare
Cathy	Robinson	CSIRO
Gary	Rodda	Local Land Services - Murray
Peter	Rose	North Central CMA
Linden	Ross	North West Local Land Services
Simon	Rowe	OceanWatch Australia- Marine NRM
Debra	Rule	Wheatbelt NRM
Vicki-Jo	Russell	Nature of SA, and Amongst It
Trudi	Ryan	Words for Change
Zoe	Ryan	Climate Friendly
Anya	Salmon	Northern Tablelands Local Lands Services
Caroline	Schaefer	Northern and Yorke NRM Board
Megan	Scott	Department of Environment & Energy
Blaz	Sculac	Department of the Environment & Energy
Andy	Sharp	Department for Environment and Water
Karrinjeet	Singh-Mahil	Glenelg Hopkins CMA
Bob	Smith	North Coast Local Land Services
Andrew	Snowdon	Rural City of Wangaratta
Sally	Standen	Department of Agriculture
Megan	Star	Star Economics Pty Ltd
Anne	Stelling	Wodonga Urban Landcare Network Inc
Fleur	Stelling	Wooragee Landcare
Nyree	Stenekes	ABARES, Department of Agriculture
Nick	Stewart	North Central CMA
Cara	Stitzlein	CSIRO
Dale	Stringer	Holbrook Landcare Network
Carole	Sweatman	Terrain NRM
Iestyn	Taylor	Northern Tablelands Local Land Service

Name		Organisation
Chris	Taylor	Department of Agriculture
Vanessa	Thompson	Greta Valley Landcare Group
Ian	Thompson	Department of Agriculture
Alicia	Thomson	Geoscience Australia
Jan	Trenorden	Rotary
Mark	Turner	Goulburn Broken CMA
Amie	Twentyman	West Gippsland Catchment Management Authority
Peter	Twigg	South Coast Natural Resource Management
James	Van Dyke	La Trobe University
Shane	Vanderwerf	Parklands Albury Wodonga
JJ	Walker	NQ Dry Tropics
Rowan	Wallace	Kiewa Catchment Landcare
Trent	Wallis	RMCG
Sandra	Walpole	Department of Environment & Energy
Karen	Walsh	Department of Agriculture
Andrew	Walsh	Northern Tablelands Local Lands Services
Neil	Ward	Chiltern Landcare
Katie	Warner	North East Catchment Management Authority
Helen	Watts	Corangamite CMA
Wayne	Weaire	Corangamite CMA
Vanessa	Whelan	Department of Agriculture
Mark	Whitfield	Eyre Peninsula NRM Board
Mark	Williams	City of Whittlesea
Laura	Williams	ACT NRM
Helen	Wilson	North East CMA
Jen	Wilson	Goulburn Broken CMA
Brendan	Wintle	Threatened Species Recovery Hub
David	Wolfenden	Local Land Services - Murray
Adam	Wood	Alinytjara Wilurara NRM Board
Vicki	Woodburn	Murray Darling Basin Authority
Natarsha	Woods	Wheatbelt NRM
Chris	Wyhoon	Wheatbelt NRM