



*State NRM and Coastal  
Conference 2017*

29 – 31 August 2017  
Curtin University  
Bentley, Perth

Adapting in a changing world



natural resource  
management program



Western  
Australian  
Planning  
Commission

**NRMWA**  
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# State NRM and Coastal Conference

29-31 August 2017

**ABSTRACT BOOK**

## **Responding to the Risk of Coastal Inundation - The Busselton Case Study**

Stuart Barr, Oscar Staples  
*Shore Coastal*

This paper outlines adaptation to coastal inundation by local government along a regional, highly dynamic, low-lying coastline.

The City of Busselton in Western Australia has large areas of residential and commercial development sited along a Holocene coastal barrier that is generally less than 3 meters above sea level. Coastal erosion rates of more than 7 meters per year, sustained over decades, have been observed along the adjacent sandy shoreline. Migrating transverse offshore sandbars and historic coastal protection structures influence shoreline behavior. A series of shore parallel estuaries and coastal lagoons are located immediately behind the residential areas of the coastal barrier and interface with the coast through drain outlets and tidal inlets.

This paper describes responses to the risk of coastal inundation by the City of Busselton along a highly dynamic coastline subject to erosion. Case studies are provided of managing coastal erosion and adapting to coastal inundation.

The challenge of managing a regional response to coastal inundation along a coastline that requires ongoing attention to coastal erosion is outlined.

### **Planned or Managed Retreat**

Ben Bassett  
*Department of Planning, Lands and Heritage*

There are existing public and private assets in a number of localities along the WA coastline that are currently vulnerable to coastal hazards.

These hazards, and the associated risks to public and private assets, are likely to intensify over time. It is important to recognise this problem and that the adaptation option of "planned or managed retreat" is often the most efficient, effective (including cost effective) and equitable response to such hazards.

Planned or managed retreat is part of the suite of policy measures set out in SPP 2.6 and is based on principles of social, environmental and economic sustainability. It adheres to the principles for sustainable land use and development on the coast and adaptive risk management as required by the PD Act and SPP2.6 respectively.

Adopting this strategy in appropriate circumstances ensures the ongoing responsible and sustainable management of the coastline for the benefit of the whole community. It ensures ongoing protection and provision of a coastal foreshore reserve and beach amenity and continuing and undiminished public access to beaches while allowing development to remain in situ until the coastal hazard risk becomes unacceptable. Removal of "at risk" development is to occur upon the happening of certain events, which should be identified through the completion of a comprehensive coastal hazard risk management and adaptation planning process.

The WAPC has adopted Guidelines to assist decision-makers in implementing this policy measure in response to coastal hazards where considered appropriate.

## **Coastal Hazard Risk Management and Adaptation Planning Workshop**

Ben Bassett

*Department of Planning, Lands and Heritage*

Coastal zones are vulnerable to adverse impacts from inundation and erosion and ongoing physical process changes and these hazards are expected to increase in the future. The Western Australian Planning Commission's State Planning Policy No. 2.6 - State Coastal Planning Policy is the key planning policy for ensuring these factors are taken into consideration. The accompanying Coastal Hazard Risk Management and Adaptation Planning Guidelines provide guidance for decision-makers in developing and implementing effective coastal hazard risk management and adaptation plans (CHRMAP).

SPP 2.6 requires that a CHRMAP be developed by a management authority and/or proponent responsible for coastal zones where existing or proposed development or landholders are in an area at risk of being affected by coastal hazards over the planning timeframe of 100 years to 2110.

The workshop seeks input from stakeholders to inform a review of the Guidelines to understand issues and difficulties encountered whilst preparing CHRMAP's; to share knowledge and experience; and to encourage collaboration to encourage consistency and uniformity.

### **Target weed species and revegetation at Blue Gum Lake.**

Kim Benjamin, Jason Bird

*South Metropolitan TAFE, Marlak Environmental Consultancy and Landcare*

Blue Gum Lake, which forms the northern most tip of the Beelier Wetlands, is a Bush for Ever site whose conservation value is being impacted by weeds. The Friends of Booragoon and Blue Gum Lake, in collaboration with the environment constancy group Marlak, have chosen two small areas where problem weeds and their seed bank can be targeted through regular busy bees. By adopting a targeted approach, it is hoped these areas can be successfully revegetated within the 3 year time frame.

### **Integration of Community Consultation and Values Assessment into a CHRMAP Project**

Gemma Bertrand, Colleen Thompson, Shahab Hosseini

*GHD Pty Ltd*

Involving communities in Coastal Hazard Risk Management and Adaptation Planning (CHRMAP) projects to understand community values and the implications that coastal hazards may have on the communities in the future is a developing process which has been built directly into the risk assessment and adaptation option assessment process for the Port, Leighton and Mosman Beaches CHRMAP Project. GHD developed a community survey to enable development of a social risk consequence scale by grouping community values, amenities and benefits and asking questions to identify what assets and values were most important to respondents, whether they could access these values or assets elsewhere and how their way of life would be impacted if access to these assets or values were lost. Surveys were undertaken in the field and online and the information was used to guide the risk assessment process. Assets which traditionally would have resulted in an economical or environmental low to moderate risk were often identified to trigger a higher social risk, based on our direct understanding of what was highlighted as being important to the community. This risk rating

was then used to identify the mitigated risk levels for the proposed adaptation solutions. The results of the community consultation were also used to develop the socio-technical framework for criteria used to assess the impacts and benefits of the proposed adaptation options in a multi criteria decision analysis process.

### **Coastal vulnerability made simple**

Charlie Bicknell, Karl Ilich, Sira Tecchiato  
*Evo Coast*

What is a coastal vulnerability assessment and how do you complete one? Although intended to be a simple process, there is often confusion on how to undertake an assessment. Establishing the objectives, planning the methodology and defining the expected outcomes can all be difficult to comprehend.

A coastal vulnerability assessment moves the focus from coastal processes and understanding physical changes in the position of the shoreline, to identifying the impacts on assets within the coastal zone. Having a clear understanding of the relative vulnerability of assets provides the essential guidance on the need for, and prioritisation of, future planning and adaptation. Vulnerability is usually defined as the combination of exposure, sensitivity and adaptive capacity. This uses different terminology to a conventional risk assessment (likelihood and consequence). However, there is significant commonality between the two processes.

In this paper, we explore the synergies between a vulnerability assessment and a risk assessment and identify opportunities where they can be combined. In doing so we present a simple framework and methodology for undertaking a coastal vulnerability assessment. The method has been found to meet the requirements of the Western Australia State Planning Policy No. 2.6 State Coastal Planning Policy and be consistent with the Coastal Hazard Risk Management & Adaptation Planning Guidelines.

### **Sedimentology of microbialite-bearing hypersaline coastal lake systems: example from Rottneest Island, Western Australia**

Karl Bischoff, Annette George, Dr Moyra E.J Wilson  
*Department of Earth Sciences, University of Western Australia*

Elliptical to elongate lakes on a sub-km to 20 km scale are a major feature of the West Australian coastline, forming unique natural ecosystems with the potential to provide archives of Holocene environment change. Despite the importance of these coastal lakes few studies have investigated the modern sedimentology of small-scale, hypersaline coastal lakes in karstic settings. The Rottneest Island lakes of this study are ideal for investigating the controls on sedimentation and microbialite formation in such coastal lake settings, due to their variability in water depth, size and degree of seasonal permanence.

The six permanent and two ephemeral Rottneest lakes are hypersaline, Ca-SO<sub>4</sub> dominant, vary in area from ~1 km<sup>2</sup> to ~0.1 km<sup>2</sup> and are up to 7 m deep. Lake levels fluctuate seasonally by up to 2.5 m, reaching ~1.5 m below the Australian Height Datum in late summer. The permanent lakes host morphologically and texturally diverse benthic microbial mats. In the deeper lakes, mat morphologies vary systematically with depth, from pustular to nodular to stippled. The mats are typically laminated ranging in thickness from ~1 – 12 cm. Microbialites occur at late summer depths to ~1.3 m. Domes up to 20 cm high and 30 cm wide are common. Stromatolitic and thrombolitic fabrics are both present. Laterally extensive millimetric gypsum crusts occur at late summer depths below ~2 m. The lakes

contain a diverse invertebrate fossil fauna. Molluscs are the dominant element, but are mainly relict allochems of marine origin. The molluscs accumulated during minor sea-level highstands between ~2 – 5 ka ago, when sea level was up to ~2.4 m higher than today and the lakes were lagoonal arms of the sea. The mollusc assemblage is no longer extant anywhere on the Australian coast, with many species, including *Katelysia scalarina*, *Irus irus* and *Batillaria estuarina* locally extinct. During the same highstands fibres of the seagrass *Posidonia australis* were deposited and are widespread in the lake sediments. Preliminary examination of the foraminifera assemblage suggests that it is distinct from the local modern marine assemblage. This represents the first detailed sedimentological study of the Rottnest Island lakes. Apart from providing a baseline to evaluate past and future change, this study will contribute new insights into the controls on microbialite formation and sedimentation in coastal lake settings.

### **Status of coastal planning in WA**

Sam Bishopp

*Department of Planning, Lands and Heritage*

The Department has completed an audit of the status of coastal planning in Western Australia. Through a survey sent to all coastal land managers between November 2016 and January 2017, information was collected on coastal planning related documents and plans such as strategies, policies, management plans and coastal hazard/vulnerability studies.

Coastal local governments, indigenous land managers, State government agencies and natural resource management groups were invited to participate.

The objectives of the survey were to:

- (1) review coastal planning documents that were collected during the last audit (2012) to see whether they are still current/relevant or superseded;
- (2) collect information on coastal planning documents have been completed since the last audit (2012) or are currently in preparation; and
- (3) identify future coastal planning tasks and priorities (i.e. outstanding planning tasks).

The results of the survey will be made available through the Department's public GIS system PlanWA. This will allow users to view the spatial extent of coastal plans/documents and summary information, in any area of interest. Outstanding planning tasks may also be eligible for funding through the Western Australian Planning Commission's Coastwest program or Coastal Management Plan Assistance Program.

### **Ten years of Conservation Council' Citizen Science Program**

Carolyn Bloye

*Conservation Council, WA*

This powerpoint presentation will highlight the past 10 years of the Citizen Science Program, Conservation Council, WA has been running since 2006 under the guidance of Dr Nic Dunlop.

This presentation will detail the projects, volunteers, resources, challenges and our highlights.

## **Balloons, Butts and Party Poopers**

Sandra Boulter

*Private*

Find a conservation group

People looking for a conservation group in their area can do so quickly and easily with the Urban Nature 'Find a conservation group' web app.

The app uses Google maps to find groups in a given area and will work on a computer, tablet or smart phone. Users can zoom, scroll and click on the map or use the address search function to locate conservation groups, their contact details and website link. It is simple to use and has a useful 'help' function if you get stuck.

The app focuses on the Department of Parks and Wildlife's Swan Region and currently maps 162 groups. There are 146 friends groups which, in combination, work to conserve and manage 35,000ha across a range of land tenures, working with State and local government land managers. There are also 17 regional groups that work across catchments and local government areas. Regardless of the size of their patch and the way in which they work, all of these groups make a huge contribution to the work of managing and maintaining our local bushlands.

Volunteers who care passionately about the environment are vital in managing our natural areas. Urban nature created this app to help link people to each other and to their bushland. We hope this app will help people looking to become involved make contact with their local groups and also provide a way for groups to let others know what they are doing [www.dpaw.wa.gov.au/find-a-conservation-group](http://www.dpaw.wa.gov.au/find-a-conservation-group).

### **Making networks work**

Keith Bradby, Nic Dunlop

*WA Landcare Network, Conservation Council WA*

Running organizations to achieve landcare objectives is becoming increasingly difficult as the funding available continues to decline. Low cost, largely self organising networks can help us do more with less whilst increasing the level of community involvement. To do that we need to understand the key features of effective networks and what they can achieve. This workshop will draw on the extensive literature, a mix of WA examples and the experience of attendees to explore key aspects of successful network operation. We will discuss how networks built on natural communities of interest can be self-driving in many ways. This includes social networks that can be activated via personal friendships through to larger networks made up of organisations. Effective networks can build social capital with environmental, personal, social and economic benefits. For some environmental and natural resource work larger structured organisations with their corporate strategies are needed but these can miss the advantages of local less formal networks, and unintentionally suppress local engagement. The workshop will be structured through six landcare and coastal case studies, drawing together key themes and stimulating questions from the audience. Through these discussions we aim to determine a set of principles that underpin effective network operation in WA, including how to manage shared information, and highlight proven ways to set priorities and improve the efficiency and effectiveness of conservation actions.

## **Achieving transformational change at the scale we need**

Keith Bradby

*CEO, Gondwana Link Chair, WA Landcare Network Member, World Commission on Protected Areas  
Connectivity Conservation Specialist Group*

Difficult as it is to measure ecological health and resilience, there is little doubt since European occupation these have steadily declined across south-western Australia and are still declining. As we face the increasing impact of global climate change it is clear that we must be more audacious in what we aim to achieve. The Gondwana Link program has been recognised as a national pioneer in the establishment of collaborative large landscape approaches. But it's not easy, and 15 years on we are still learning. We are also actively sharing the lessons learnt with similarly ambitious programs in eastern Australia, New Zealand and elsewhere. This presentation will bring together some common elements shared across these established programs – having the courage to pitch at the ‘audacious but achievable’ level, creating the conditions in which innovation occurs and is adopted, finding funds for the risk taking that is needed and maintaining collaborations in a world where funding generally comes through competitive processes. We will outline the challenges of maintaining a low cost ‘backbone organisation’ amidst a rapidly expanding program and discuss the obstacles large landscape programs must constantly navigate. We will also celebrate the key elements that underpin success at all scales - the warmth and trust of personal relationships, the feet on the ground, the growth through tangible achievement, the commitment to place, and the tenacity that keeps us going when the money dries up for a bit.

### **Changing the future – together**

Keith Bradby

*Gondwana Ltd*

As the world enters the period known as the Anthropocene we are experiencing levels of species extinctions not seen for some 65 million years, unprecedented challenges in feeding over 10 billion people by 2060 and exponential growth in land degradation globally. Could be the climate is changing as well. While humans can be an adaptive species, our short history is littered with examples of how civilisations, organisations and industries collapse by responding to long term widespread change with short-sighted and narrow self-interest. But right now we need to achieve rapid and transformational change of behaviour focused on the long term collective interest. A common assumption is that the more we work together the easier this will be. So in this talk I want to explore what we can learn from how effective West Australians, and a few others I've been fortunate to meet, have been at working together to repair their battered environments. The future will be different, but our behaviour in the recent past is all we have to learn from.

### **NRM extension as an effective tool to improve adoption of NRM practices.**

Lynda Braddick

*Curtin University*

An integrative model of the traditional Stages of Change model developed by Prochaska and DiClemente (1983) and the adoption process (Pannell et al. 2011) was developed for a PhD study to identify patterns in WA Wheatbelt landholders' practice change, and the stages where extension to encourage adoption of NRM practices are most beneficial. In an online survey respondents were asked

to rate their stage of adoption for 13 recommended NRM practices at six stages of change, and the benefit of 17 methods of support at four stages of change. The results showed respondents' stage of adoption varied with different types of NRM practice, and as they progress through the stages of adoption their preferences for the method of support they receive changes. These authors emphasise that many interventions are inappropriately targeted at the action stage and warn that interventions planned to progress change need to be applied at the appropriate stage to be effective. Therefore, identifying landholders' adoption stage during initial phases of planned interventions provides a clearer picture of their readiness for change. Combining this information with evidence of the stage of adoption when methods of support may be most beneficial, gives a strong indication of the strategies required to improve landholder adoption, and ensure the most relevant methods of NRM extension are implemented at the most beneficial stage of adoption. Use of this data will improve the prospects for NRM extension to be used as an effective tool to improve adoption of NRM practices.

### **Assisting the growth of *Casuarina obesa* with nitrogen fixing *Frankia* – a new frontier.**

Alan Briggs, Robert Hingston  
*Avongro Incorporated, Agro-forestry Consultant*

The search for alternative tree crops has been ongoing in the Avon Region. Following earlier research into managing *Casuarina obesa* (Swamp sheoak) by Bob Hingston (Hingston, 2011) Avongro received funding from the State NRM and Wheatbelt NRM to conduct trials over two sites to test the impact of *Frankia* strains on *Casuarina obesa*. *Frankia* is a nitrogen fixing bacteria. The aims of the trials were also to revegetate saline sites with longer term commercial options and to promote and develop agroforestry on Wheatbelt farms.

Trial planting plots were established on land affected by rising salt levels. The selected plots were provided by local landowners and prepared for planting in 2015. Bob Hingston arranged for a selection of five *C. obesa* State-wide provenances to be trialled, establish randomised planting systems and monitored seedling health and soil salinity. Planting was done by hand with only minimal weed control as the sites were largely samphire flats.

This presentation will discuss the section process, show earlier results of management of *C. obesa* stands and the initial results to indicate the range of tolerance by *C. obesa* in saline areas and growth variations for the selected provenances of *C. obesa*.

### **Avongro's Activate the Wheatbelt – engaging with metropolitan and rural communities**

Alan Briggs, Rosanne Scott  
*Avongro Incorporated, Avongro - Activate the Wheatbelt*

Over the past several decades, there has been experienced rural burnout associated with declining small town populations. To regenerate passion for improvement in our environment Avongro's Activate the Wheatbelt program brings urban communities in contact with rural communities to plant trees, build understanding and develop long term relationships between the city and the country. Since 2015 Activate the Wheatbelt has organized tree planting activities in Toodyay, York, Greenbushes and Gabbin.

The program is self-funded through online advertising and community support.

In 2016 Avongro realized a Federal Government grant to plant 50 hectares of farmland for mallee fowl corridor and habitat in the Gabbin area. Working with the local community Activate the Wheatbelt has seen a re-engagement of the Gabbin community with tree planting activities. At the time of planting Activate the Wheatbelt arranged for a large contingent of active, interested urban people to travel, camp, plant and play over a 3-day period at Gabbin. Shuttles are arranged to the planting areas, catering is on a grand scale, entertainment is provided and friendships are formed.

This presentation will provide details of the outstanding achievement being made under Avongro's Activate the Wheatbelt program and the positive impacts being achieved in Gabbin.

### **Improving the life prospects of Malleefowl in the Gabbin Region of Western Australia**

Alan Briggs, Dr. Elizabeth Kington  
*Avongro Incorporated*

Establishing corridors of vegetation between islands of remnant natural bushland is often held out as an objective for many landcare groups. Avongro is not just aiming for it, but is achieving it. With the assistance of a 20 Million Trees grant in 2016 Avongro worked with local and urban communities to establish a 50-hectare conservation corridor between two islands of native vegetation to create better habitat and protection for malleefowl.

Avongro liaised with Gabbin community members to access private land and a nursery to grow seed collected locally. Avongro's Activate the Wheatbelt program engaged with urban communities who assisted with seed collection and planting seedlings.

An excellent survival rate was achieved and the planted area continues to be monitored with ongoing research into the malleefowl population.

This presentation will outline the processes used to establish the conservation corridor, the planting outcomes as well as demonstrate the value of working with rural and urban communities, reinvigorating both with common visions and activities that bring the city to the country.

## **How to hit the ground running – helpful tips for new project officers**

David Broadhurst, Kylie Fletcher  
*South Coast Natural Resource Management Inc.*

Are you a new project officer working in NRM? Have you just started working for a not for profit organisation managed by volunteers? Have you just been placed in an office in the middle of nowhere wondering where to begin or who to talk to? Or are you a committee member of a NRM group who has just employed a new project officer? Then this presentation is for you. Either fresh out of uni or plucked off the farm to take on a project officers role for a NRM community group is exciting, rewarding but also intimidating. Often, you will be in an office by yourself with a computer and filing cabinet bursting with information filed away by different people using different methods. If you are lucky, you will get a thorough handover however this is an exception rather than the norm. Your desk will have current and old project files, catchment management plans from the 1980's and a contact list started in the mid 90's. This presentation will provide some tips and tricks on how to move from first day jitters to hitting the ground running as quickly as possible. The presentation will discuss prioritising your time, prioritising projects and activities, recognising and planning for choke points, the importance of communication, building and maintaining networks, building a positive reputation, professional development and tips for working with volunteers. Don't make the same mistake that most of us have made when you can learn from others that have been there before.

### **Methane, perennials and a farmers perspective.**

David Broadhurst, Charlotte Powis, Kanako Tomita, Craig Carter,  
*South Coast Natural Resource Management Inc., Earthrise Productions,*

South Coast NRM partnered with CSIRO and the Gillamii Centre in Cranbrook to provide farmers with methods of reducing methane emission intensity through demonstrating a variety of perennial grazing systems compared to an annual "business as usual" system found on the South Coast. Information generated will enable farmers to make informed management decisions that will improve productivity, increase efficiency and bottom line profit.

This presentation uses short film media to highlight the motivations and learnings from a farmers perspectives that how they are planning for a more sustainable farming system into the future.

Short Film 1. Farmer Ian Walsh tells his story about restoring marginal farmland on his broad acre family property in Cranbrook Western Australia. The once marginal farmland has been restored using perennial forages and is now a productive and sustainable part of the whole farming system. Ian has worked with the CSIRO to measure methane emissions and production benefits of this restored part of the farm.

Short Film 2. Sam Lehmann, a third generation farmer from Cranbrook Western Australia, talks about his passion for a farming life. Working close with his father, he has transformed unproductive country into land that is now an important and profitable part of his farming business. He shows how perennial species such as salt bush and kikuyu have positively changed the way he farms and the important role his wife and children play in how Sam plans for the future.

## **Reimagining Community NRM**

Kathleen Broderick

*Australian National University*

This presentation will examine cases where changing contexts or environmental change have caused a reimagining of community NRM. There is plenty of evidence to suggest that communities are willing and able to not only be involved but many have already generated creative solutions to the challenges they are facing. This presentation will focus on cases from real community groups around Australia and will draw out key learnings. The presentation will address such questions as: What caused the group to reconsider their usual practices? What did the change process involve? What's working (signs of success)? What does this mean for policy makers? What are the important elements that enable powerful reimagining? What might a new NRM governance framework consider?

### **Final NRM Workshop – What is the Future of NRM in WA?**

Kathleen Broderick

*Australian National University*

No matter what you call it, landcare, soil conservation, integrated catchment management, whole of landscape management, NRM is important work that is differentiated by some key attributes:

- Focused on outcomes- soil, water, biodiversity,
- It is the work of many, an aware and engaged community, active groups and local organisations (landcare, grower groups, coastal groups, and environment groups), industry professionals, government officers and leaders, community leaders.
- Promotes local stewardship;
- Recognises the wellbeing of communities as a fundamental consideration.
- Undertakes integrated planning at a whole of landscape scale;
- With a long term view;
- Builds partnerships and leverages investment.

Throughout the conference we have heard about change in NRM including the application of new technologies, the decline of local landcare groups, the great work enabled by State and Australian Government investment, new thinking about governance and management, new enterprises, novel community led projects, learnings from project failures, and new understandings of our unique Western Australian environments.

This session will explore the idea of a new State NRM Framework, as both a conversation and a document. This is a project that will articulate the principles which underpin the sector, describe mechanisms that will align effort, and it will identify roles and responsibilities.

It should acknowledge and build on the past, and harness the energy and possibility of the new ideas we have heard in these recent days.

What key elements do you think should be considered in developing a State NRM Framework?

What do you think should be included?

What should be left out? Avoided?

Bring your ideas along to this session and come prepared to either share them with the whole group, or in small group setting. All the ideas will be captured and will inform the next steps.

This workshop will be facilitated by Kath Broderick.

### **Building Community Capability in a Changing Climate**

Helen Bryant  
*BirdLife Australia*

BirdLife Australia's primary objective is to improve conservation outcomes for Australian birds and promote appreciation and understanding of Australian birds. We do this principally through science and education to deliver positive conservation outcomes for Australian birds.

We focus on our relationships with the broader birding community and on promoting wider public appreciation and enjoyment of birds. BirdLife Australia has an extensive track record of successful delivery of conservation, community engagement, research and monitoring projects with a broad range of partners, particularly in Western Australia.

We deliver our work through a combination of on-ground activities and community engagement programs, using new technologies and trusted methodologies to inspire people to monitor what is happening in their own neighbourhoods and further afield, using birds as ecological indicators.

We adapt our projects to engage different audiences and stakeholders, including government, organisations and local residents alike to promote capacity within the wider community. Our programs are designed to positively impact our collective mental and physical well-being and provide genuine learning opportunities which enhance our natural environment.

Our work ranges from implementing citizen science projects to protect our biosecurity and inform decision-making, to revegetation and breeding-habitat programs, to working with Aboriginal students in remote communities, to encouraging more urban-based citizen scientists to get involved in our work to protect our native birdlife across the State.

Given the breadth and range of our programs, BirdLife Australia would be pleased to share our experiences in collaborating with land managers, local communities and stakeholders to bring about meaningful change.

### **New insights into the geomorphic evolution of Geographe Bay, South-West Australia**

Giada Bufarale, Michael O'Leary, Julien Bourget  
*Curtin University, University of Western Australia*

A high-resolution seismic survey was carried out across the metropolitan reach of the Swan River (Perth, Western Australia) to investigate the sub-surficial geomorphology of this wave-dominated estuary. Shallow-imaging data, integrated with sediment cores and LiDAR images, revealed a complex system of buried palaeochannels, which developed during glacial sea-level lowstands, and related channel-fill deposits that formed during interglacial highstands.

Four major acoustic reflectors (seafloor-R1-R2-R3) were found bounding as many seismic units (U1-U2-U3), over the bedrock.

The deepest unit (U3, between R2 and R3) has been interpreted as the Perth Formation, which consists of ~20m thick fluvial to estuarine sediments, deposited during the Last Interglacial (~130-80 thousand years Before Present, BP) and infilling a palaeo-valley that cut the bedrock.

U3 is overlaid by a ~27m thick unit (U2, between R1 and R2), composed of heterogenic fluvial (possibly lacustrine) and estuarine deposits. This sedimentary sequence belongs to the Swan River Formation and mainly infills a palaeochannel that incised the older formations during the Last Glacial lowstand (about 18,000 years BP).

The shallowest unit (U1, between river-bed and R1) is up to 14m thick and comprises Holocene fluvial and estuarine sediments (last 10,000 years). These sediments are found filling palaeochannels and blanketing the pre-existing topography.

This research represented the first environmental high-resolution acoustic investigation of the Swan River estuary and improved the understanding of its Late Quaternary development, providing a useful tool for modelling the river onset and evolution, following sea-level transgressions.

### **Sea-level controls on buried geomorphology within the Swan River Estuary during the Late Quaternary**

Giada Bufarale, Michael O'Leary, Alexandra Stevens, Lindsay Collins  
*Curtin University*

Like several other examples around the world, the geomorphic character of Late Quaternary sea-level fluctuations in Geographe Bay (south-west Australia) is recorded by a series of architectural features which developed during different sea-level stands.

High-resolution shallow seismic profiles exposed five main acoustic units, separated by unconformities, corresponding to different geological facies, deposited under various sea level conditions. The top unit (U1) is Holocene in time and overlies Tamala Limestone (U2, U3, U4, Late to Mid Pleistocene); the acoustic basement (U5) is likely belonging to the Early Cretaceous Leederville Formation. Combining this information with high-resolution marine LiDAR (Light Detection and Ranging) bathymetry and sediment grabs, a correlation between surficial and buried morphology is revealed.

Two sets of shore-parallel, low-relief ridges, located nearshore and at a depth of ~ 20 m, are relict landforms, probably regressive beach ridges and sub-littoral deposits (paleo-dunes), belonging to Tamala Limestone. These geomorphological structures were formed during Late Pleistocene relatively high sea-level stages (late Marine Isotope Stage 5e and 5c, respectively) and subsequently cemented and subject to sub-aerial weathering, when the sea-level was lower.

LiDAR bathymetry and seismic data revealed also the presence of several palaeochannels (buried and surficial) and shore-oblique sandbars. These seabed features seem to have a spatial correlation, probably due to a combination of submarine groundwater discharge and local currents, especially longshore.

The data allowed a more accurate assumption on the volume of the mobile sediment layer (Holocene) in Geographe Bay and its supply status.

In addition, understanding of how the shelf and coastal sedimentary system evolved and matured in response to past changes in sea-level and climate is essential to infer how they may change in the future.

The outcomes of this research can be considered of a significant importance for the future coastal monitoring and management strategy of the area.

**Sharing plant disease information for better biodiversity outcomes using online technology -  
“Dieback Information Delivery Management System” – DIDMS.**

Robyn Cail, Tilo Massenbauer  
*South Coast Natural Resource Management*

Phytophthora Dieback 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 has been an ongoing ten year Western Australian state NRM Office and federal government funded project that strategically addresses the threat of *P. cinnamomi*. The occurrence, distribution and threat of Phytophthora species do not discriminate between differing land tenure, managers or owners. Effective management of Phytophthora species 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 Phytophthora information to assist with awareness raising, planning and management. DIDMS enables users to create, store, modify and share data online using standardised templates, and map production tools. DIDMS also incorporates some results from hazard mapping and dispersion tools which have been applied to Project Dieback Priority Protection Areas and the Esperance Ramsar Lakes Catchments. The information stored within DIDMS helps stakeholders implement more targeted Phytophthora mitigation actions resulting in better biodiversity outcomes for restoration, rehabilitation and environmental protection activities.

**Successful biodiverse seeding in deep...deep...deep sands!**

Robyn Cail  
*South Coast Natural Resource Management*

Restoration with direct seeding on ‘gutless’ sandplain soils in the south east agricultural area of WA has been fraught with headaches and failures....until now! Guided by native plant agronomist Geoff Woodall, South Coast NRM has successfully established over 130 hectares of approximately 80 mixed local native species on a property near Hopetoun. The exciting aspect of this project is the significant reduction in the amount of seed required per hectare (and hence cost), and the great establishment success of a diverse mix of local native species on pale, deep, non-wetting, nutrient poor, unstable sands. Local farmers, project officers, and industry personnel were upskilled with several targeted training sessions, with an operating manual produced on how to use the upgraded/ retrofitted direct seeder machine.

This presentation will focus on sharing the practical restoration knowledge we have gained as a result of this project, including the upgrading of old machinery to enable best practice in direct seeding techniques on a limited budget.

This project was a partnership between South Coast NRM and the Water Corporation with technical guidance and training from Geoff Woodall, local seed collected by Steve Challenger and funding provided by the Australian Government.

**Broome Coastal Hazard Risk Management and Adaptation Planning**

Jim Churchill

### *Baird Australia*

The Broome Coastal Hazard Risk Management and Adaptation Planning (CHRMAP) Project examined coastal hazard risk for the township of Broome and its 30km of surrounding coastline, based on a risk management framework in accordance with the State Coastal Planning Policy (SPP2.6) and CHRMAP guidelines (WAPC 2014). Baird Australia led a project team comprising Coastal Engineers, Planners, Economists and Community Engagement specialists who worked closely with the Shire of Broome, key stakeholders and the Broome Community through a structured process that informed the community of the risks associated with coastal hazards, quantified impacts to coastal assets and developed adaptation responses that could mitigate the identified risks over the next 100 years. A comprehensive engagement process was designed to understand the way in which the local population currently use the coast and how future climate change impacts would impact this relationship. The involvement and participation of the community throughout the CHRMAP process was a major contributor to the success of the project. At key locations including Chinatown, Cable Beach and Town Beach the significant risk posed by coastal inundation and erosion in current and future planning periods presented a unique set of challenges in developing an adaptation strategy to effectively manage the identified risks over extended planning horizons. Across the project area the CHRMAP developed a suite of management and adaptation responses to guide the Shire of Broome in future coastal infrastructure and planning requirements based on community and stakeholder values; supported by economic assessment of adaptation alternatives, including cost benefit analysis.

#### **NSW Coastal Management Reforms**

Matthew Clark

*NSW Office of Environment and Heritage*

An introduction to the New South Wales Government's new coastal management framework and some lessons learned from the policy reform process.

#### **Photomon Services: Monitoring Change in your Patch**

Tegan Clarke, Michael Payne,

*Northern Agricultural Catchments Council*

In 2013, Coastwest funded the Northern Agricultural Catchments Council (NACC) to develop the smartphone app "Photomon" to support its community beach photo-monitoring program. The app, and its backend database, streamlines the photo-monitoring process and increases accuracy via the following features:

- Direct upload of photos to a dedicated database for easy storage/access;
- Date, site location, direction and text notes recorded with each photo;
- Ghosted reference image overlays to ensure standardised field-of-views;
- Database structure allowing different levels of administrative access (e.g., community monitor, project manager);
- On-line instruction manual and training videos;
- Reminder function prompting users that the next monitoring photo is due.

At NACC, use of Photomon has expanded to include not only monitoring beaches but most on-ground activities, including revegetation, weed control and bush regeneration following fencing.

NACC has received numerous expressions of interest from other NRM organisations around Australia for access to the Photomon database. In 2016 NACC received funding from WA's State NRM Program to develop a cost-recovery model to enable this access. Photomon Services, referring to the smartphone app and backend photo storage database, is now available through a subscription service that allows project managers from any organisations to establish projects in the Photomon database. These managers can add monitoring sites to their projects and register community Photomon users to monitor these sites. Annual subscription fees cover initial establishment costs and on-going training and tech support, as well as technical maintenance and upgrades of the app and database.

This poster outlines the benefits of Photomon Services.

### **Noongar NRM Pathway**

David Collard  
*Consultant*

Since Native Title became a source of land tenure for the Aboriginal people of Australia offering access to numerous parcels of land. This presentation will discuss the use of existing resources to assist the Aboriginal community to build their capacity to manage these parcels of land and to ensure the compliance with land management practices. It will also provide insight into the development of an engagement process that assists in ensuring the complexity of the pathway does not become a major hurdle in Natural Resource Management. The final aspiration of the Aboriginal community is to transfer the Traditional Ecological Knowledge across from Elder to youth to secure the protection of the cultural knowledge for future generations.

### **Uses and Applications of Airborne LiDAR Bathymetry for Coastal Zone Management**

Alex Cowdery, Benoit Cajelot  
*Fugro*

Full Abstract The Australian coastline requires modern and integrated coastal management systems to ensure economic, social, environmental and population pressures are managed in a coherent and coordinated way.

Through the use of Airborne LiDAR Bathymetry, Fugro helped Western Australian Government stakeholders to understand the coastline and nearshore environment, to update charts and better analyse the risks and exposure of the coastline to climate change events. This enabled safer boating as well as better decision workflows for government planning and management of coastal environments.

As seen in 2016 / 2017 storms affecting the many Australian states' coastlines, coastal communities must understand and adapt to the stronger waves, winds and surges impacting the coastal environment. The first step in this understanding is the identification of risks to coastal populations and infrastructure.

The use of current generation aerial remote sensing technology is an essential tool to compile accurate, comprehensive baseline datasets for these purposes. This paper will review the technology used and some of the current uses of the remotely sensed datasets.

## **“Oh I do like to be beside the seaside”: Exploring Criminal Opportunities in and around Perth Beaches.**

Paul Cozens, Shane Greive  
*Curtin University*

Beaches are recreational resources that are not only enjoyed by the local residents but also attract and service a potentially broad range of visitors. For those arriving by car, there is a common problem of what to do with the car keys when they go for a swim. For observant thieves, this can present potentially very rewarding opportunities, and with relatively low risk. Metropolitan beaches in Perth are locally, and in many cases regionally, important places. Considerable public investment is directed at improving amenities and better servicing the crowds and tourists. Car parking, lighting, CCTV, security patrols, and landscaping are generally the responsibility of local government councils. Thefts from and theft of cars are antagonistic to these efforts to improve the experience of beach goers. Using a case study we identify tensions between aesthetic and security-focused principles in beachside landscape designs that could potentially add to or minimise the risks of car associated thefts.

### **Find a conservation group**

Julia Cullity  
*Department of Biodiversity Conservation and Attractions*

People looking for a conservation group in their area can do so quickly and easily with the Urban Nature ‘Find a conservation group’ web app.

The app uses Google maps to find groups in a given area and will work on a computer, tablet or smart phone. Users can zoom, scroll and click on the map or use the address search function to locate conservation groups, their contact details and website link. It is simple to use and has a useful ‘help’ function if you get stuck.

The app focuses on the Department of Parks and Wildlife’s Swan Region and currently maps 162 groups. There are 146 friends groups which, in combination, work to conserve and manage 35,000ha across a range of land tenures, working with State and local government land managers. There are also 17 regional groups that work across catchments and local government areas. Regardless of the size of their patch and the way in which they work, all of these groups make a huge contribution to the work of managing and maintaining our local bushlands.

Volunteers who care passionately about the environment are vital in managing our natural areas. Urban nature created this app to help link people to each other and to their bushland. We hope this app will help people looking to become involved make contact with their local groups and also provide a way for groups to let others know what they are doing [www.dpaw.wa.gov.au/find-a-conservation-group](http://www.dpaw.wa.gov.au/find-a-conservation-group).

### **Southern Shores Coastal Program - Partnerships for restoring and protecting coastal environments on the South Coast of Western Australia**

Brett Dal Pozzo, Dylan Gleave  
*South Coast Natural Resource Management (NRM) Inc.*

The South Coast Region of Western Australia contains a relatively intact coastal vegetation corridor of over 1000km. While this coastal corridor remains largely intact, through the established local

government and conservation reserves, pressure through recreational activities is impacting and threatening the ongoing sustainability. Capacity of land managers to undertake projects through external funding is currently restrained, and has resulted in South Coast NRM taking a partnership approach with the regional representative body South Coast Management Group (SCMG), by implementing on ground actions directly across land tenure. This program identified approximately 30 priority project sites across the region with a focus on hotspots of recreational activities impacting coastal vegetation, shore bird habitat and fragile landscapes. This program offered land managers a dedicated and fully resourced skills based project team, to undertake; - Closure of access by off road vehicles to sensitive coastal areas. - Measures to manage spread of Phytophthora Dieback - Providing user training events in safe and responsible 4WD use in the coastal zone, and development of a 'Code Offroad' - Develop localised coastal site plans working directly with local governments - Coastal restoration and rehabilitation - Protection of shorebird habitat - Measures to minimise the impacts of camping and other recreational activities All works were aligned with existing management plans. These projects all involved site planning, consultation and co-delivery with land managers. The outcomes not only involved tangible outputs on the ground but benefits for the region of improving the skills, knowledge and cooperation in coastal management.

### **NRM Skills and Knowledge Development with the Green Army**

Mick Davis

*Shire of Kalamunda*

The Shire of Kalamunda spans a large section of the Perth Hills and Swan Coastal Plain and has partnered with the Australian Government, community groups, local experts, service providers, local and regional councils to support three integrated Green Army projects since 2015. The Shire of Kalamunda has integrated Australian Government funded Green Army project works into local community led Action Plans across 15 community managed bushland areas. This has enabled significant progress at each site, controlling Weeds of National Significance, improving habitat values in areas which support listed threatened species as well as reducing erosion and rubbish along significant cultural corridors. In addition to the on-ground works, the Shire monitored skills and knowledge of the participants longitudinally across 19 project specific topics relevant to NRM, including their ability to identify weeds, knowledge of local species, skills with using relevant tools, ability to handle chemicals and competence with GPS technology. Improvements in each of the 19 skills or knowledge areas were achieved by creating a diverse and meaningful program of works for each team, which allowed a wide range of on-ground works to be undertaken. The involvement of local 'Friends Groups' was key to success of each of the projects, which also gave the Green Army participants the chance to develop an awareness of the importance of working with local community groups to achieve quality natural resource management goals.

### **Dung beetles - unfinished business**

Kathy Dawson

*Warren Catchments Council*

CSIRO's Australian Dung Beetle Project (1966–1986) was an internationally significant scientific research and biological control project with the primary goal of controlling the polluting effects of cattle dung.

Of the 53 species introduced, 23 have been classified as established, predominantly in summer rainfall areas.

A DAFWA survey (2012-14) of the south west land division and Warren Catchments Council's intensive monitoring programme (2014-2017) confirmed serious gaps in dung beetle spatial and temporal activity and limited preference for sheep manure.

A national five year programme is targeting a number of gaps:

- 1 inadequate range of introduced beetles to address dung removal, including sheep dung, throughout the year, especially in spring, in southern Australia's winter rainfall area
- 2 declining number of scientists with expertise in dung beetles;
- 3 absence of comprehensive data quantifying economic, social and environmental value of dung beetles' ecosystem services;
- 4 minimal on-ground awareness of individual dung beetle species' ecology, soil fertility and parasite control benefits or management practices to ensure their survival;
- 5 lack of systematic approach to redistributing established species or technical expertise to mass rear locally
- 6 reliance of livestock producers on a limited number of suppliers

WCC will coordinate a NRM network throughout the south west land division where more comprehensive local monitoring will provide evidence-based decision making for the redistribution of established beetles and the allocation of newly imported species. At the local level, through structures such as Agricultural Colleges, developing technical expertise in mass rearing beetles will accelerate the rate of establishment.

**Community engagement in scientific assessment, management and conservation of marine biodiversity with the Reef Life Survey program.**

Paul Day, Rick Stuart-Smith  
*University of Tasmania*

The Reef Life Survey program (RLS) was initiated in 2007 to engage community SCUBA divers in scientific assessment, management and conservation of Australia's marine biodiversity. Since then, RLS has grown to a global team of divers numbering 268 who have completed over 10,200 surveys in 50 different countries – all using the same methods. The scientifically-robust information collected under the supervision of marine scientists, has contributed to over 25 scientific publications and numerous management reports that contribute to state and commonwealth marine management plans and the goals of project partners. The high level community engagement that is part of the culture within RLS, often places volunteers alongside managers and scientists during activities, and greatly boosts scientific capacity around Australia.

RLS has completed two major projects funded by State NRM, "Volunteer scientific monitoring of Western Australian marine biodiversity", together documenting marine biodiversity in 2015 and 2016 at Rottnest Island (with project partner Rottnest Island Authority) and Ningaloo Marine Park (with project partner Department of Parks and Wildlife). These projects allowed continuation of valuable time-series datasets for these areas of high biodiversity value, which straddled the famous "marine heatwave" event in 2011/2012. The RLS data collected reveals a clear signal of this event through

changes in the sub-tidal reef fish communities, and highlighted local extirpations of species at Rottneest, some of which are only just starting to re-appear on Rottneest reefs five years later.

### **Targeted community engagement and investment at a catchment scale – Mortlock connections**

Anika Dent, Rowan Hegglun  
*Wheatbelt Natural Resource Management*

Approximately 90 kilometres inland from Perth lay the Mortlock River East and South catchments. In 2014 Wheatbelt NRM embarked on a targeted landholder engagement project to provide improved landscape connectivity and increased potential for genetic exchange for native species. Work began with a desktop analysis to highlight priority conservation areas. The next stage involved getting out to talk to the community in the paddock, having a conversation around the types of activities their property would lend itself to and the support Wheatbelt NRM could provide.

This methodology of approaching community alleviates the pressure and technical barriers presented by funding application processes that are so widespread in NRM. Of 190 conversations with community, 94 project proposals were drawn up for community consideration. These resulted in 55 landholder agreements for on-ground conservation work. While this may on the face of it seem like a huge effort for 55 contracts; these landholders are achieving over 35,000 hectares of vertebrate pest management, have secured over 2000 hectares of priority remnant bushland from grazing pressure and over 600 hectares of native revegetation. Concurrently Wheatbelt NRM were running region-wide grant rounds using a traditional application process. Analysing the landholder engagement process responses we found targeted engagement more effective for conserving priority landscape areas though involving landholders that would not have participated in these activities otherwise. Furthermore we demonstrated higher uptake in areas that traditionally showed lower engagement with Wheatbelt NRM.

This presentation will consider the investment in community engagement with the return in on ground activity.

### **Rat Island Recovery**

Nic Dunlop  
*Conservation Council WA*

The Rat Island Recovery Project began with a feasibility study published in January 2004 and provided to the Department of Fisheries. Since 2008 it has been part of the Conservation Council (WA) Citizen Science for Ecological Monitoring Program. The project monitors and documents the recovery of the Rat Island seabird colonies and the terrestrial ecosystem following the successful eradication of Black Rats and feral cats in the 1990s and facilitates restoration projects that may enhance the recovery process. In 2013 CCWA produced a Rat Island Management Plan for the Department of Fisheries with support from NACC .

Rat Island, in the Houtman Abrolhos, was once the most important seabird breeding island in the eastern Indian Ocean (in terms of numbers) until the introduction of Black Rats and cats by the guano miners during the colonial period. It was then devoid of breeding seabirds for nearly 70 years. Today up to 35 000 pairs including 8 species have returned to breed on Rat I. Implementation of a Rat Island Management Plan is well underway with continued monitoring of the seabird colonies and the terrestrial ecosystem, weed control, breeding habitat rehabilitation, a planned House Mouse eradication program and possible re-introduction of an extirpated lizard.

## THE SOUTH WEST FAIRY TERN CONSERVATION NETWORK

Nic Dunlop  
Conservation Council (WA)

The breeding and foraging habitats utilised by threatened Fairy Terns bring them into conflict with human activities in populated or regularly visited areas. Preventing further decline in the numbers of Fairy Terns necessitates a greater understanding of the structure of the population and on building public support to provide and manage secure breeding locations. In 2016 the Conservation Council (WA) established the South-west Fairy Tern Conservation Network to engage the community in citizen-science based research and management actions to protect the migratory sub-population.

This presentation will summarize the results from the citizen-science project to date. The project showcases the early success of a coordinated, community-based, approach to the management of a threatened seabird on a multi-regional scale. The poster display consists of 3 inter-related A1 size panels.

### **The 'State of landcare in WA' report**

Loiuse Duxbury, Keith Bradby, Nicole Hodgson  
*WA Landcare Network, Consultant*

The 'State of landcare in WA 2017' report, released in March, highlights that while the landcare movement is needed more than ever, this 30 year old success story is being re-written, perhaps inadvertently. The report puts out the challenge for Commonwealth, State and Local governments to re-consider their support for landcare in WA. It documents a substantial decline in the number of local landcare groups operating in our farming and pastoral areas, a decade long steady decline in the funds available for local initiatives and a weakening of statutory support to maintain the benefits of landcare work. At least that's what we think we see. The lack of good data showing us just what is happening to the sustainability of our landscapes and our community efforts is of major concern in itself. Despite changes in government support for landcare, it has survived in many forms, and grown in some areas. Brand recognition remains high, despite some confusion across related programs. There have been many successes, and there is motivation in the community to do more. What then could be achieved if more consistent and locally focused support was provided across WA? The WA Landcare Network has set out what it sees as the initial steps necessary to sustain community effort, including some structural and policy changes, sustained base-level support for landcare groups and landcare works, and more direct links from the ground to the Ministers. Let's hear what you think would help.

### **Change begins with rethinking**

Naomi Edwards  
*Intrepid Landcare and Griffith University*

If we coin the Prime Minister Turnbull's interpretation of opportunity, "it's an exciting time" for coastal and natural resource management in Australia. Despite glossed over budget cuts, and ongoing institutional restructures and conflicts, the future of coastal and natural resource management that belongs to us - coastal and natural resource management professionals - could be exciting. The catch

here is that the future will only be exciting if we rethink our practice, which begins with changing the way we think.

Through re-thinking her practice, Naomi Edwards, has designed and packaged exciting opportunities for communities to purposefully engage and lead in coastal and natural resource management. Think BeachCare, Gold Coast's Biggest Tree Planting Day, Happy Beaches and Intrepid Landcare. Each initiative has been designed outside institutional mindsets to bring personality, leadership and disruption, and allow community engagement to be owned by the community. Having intentionally designed engagement initiatives through success and failure, this has inspired her to focus her more recent work on engaging the other way, inside institutions to discover how professionals can re-think the practice of coastal and natural resource management to allow change she has seen in communities to happen for professionals.

This keynote presentation will inspire you to think how you can re-think your practice of coastal and natural resource management by bringing personality, leadership and disruption to coastal and natural resource management.

### **Observations from the east: Lessons learned in coastal hazard resilience and adaptation**

Greg Fisk  
*BMT WBM Pty Ltd*

The collective effort of governments in Queensland and New South Wales concerning planning and development in coastal hazard areas has been substantial and ongoing since the 1980s. For the most part, this has been based on sound scientific principles and applied stridently by State Departments and by many of the local authorities within the two States.

However, achieving desired outcomes - particularly at a local government level - continues to be thwarted by key barriers. These include legacy tenure decisions to lease and freehold land to the high water mark, short term priorities for coastal growth, uncertainty caused by the science, changing and divisive politics, a lack of clear guidance from State government, and a lack of financial and technical resources to make and defend decisions.

Recognising that current planning and management processes for the coast need to be improved, both States are embarking on reforms. In the north, Queensland is approaching the problem from the 'bottom up' with a significant investment in supporting local governments to prepare coastal hazard adaptation strategies with a strong focus on climate change. The programme is voluntary and being administered by the Local Government Association of Queensland. Down south, following a sustained period of investment in local government coastal zone management plans, New South Wales is implementing legislative reforms from the 'top down'. These reforms seek to ensure coastal hazard zones and overlays are consistently mapped and incorporated into local planning instruments.

As a new generation of coastal planners implement these reforms, many of the old issues remain unresolved. The presentation will reflect on the current state of practice in both States, provide an overview of the proposed reforms, and make some suggestions for the future based on lessons learned from both failures and incremental successes.

### **Restoration post blackberry decline**

Lee Fontanini, Andy Russell  
*Warren Catchments Council*

In recent years there has been a rapid decline in Blackberry (*Rubus anglocandicans*) populations along waterways within the Warren region of South Western Australia.

Warren Catchments Council was revisiting an historic blackberry control rust release site on the Warren River. To their surprise the blackberries had disappeared completely. Investigation showed that this was not caused by the previously introduced rust nor herbicide application.

The infested site was originally dominated by 3m high impenetrable blackberry but was now a picturesque blackberry free picnic site. Other noticeable observations included dead canes that disintegrated on touch and dead crowns.

'Decline Syndrome' is the phrase that has been coined to describe these blackberry death events and is the result of a combination of new plant pathogens and a variety of auxiliary factors.

As a result a multi-faceted action plan was created and funded by the Australian Governments National Landcare Programme. The WCC coordinated the project that included scientific research and on-ground action.

CSIRO and a University PhD candidate researched the cause of the disease complexity of the decline; they have also studied the resilience and dormancy of the blackberry seeds, effects of shade and grazing on blackberry recruitment. DPaW researched the genomic variation and adaptability of endemic plants to be used in river revegetation with climate change resilience.

WCC mapped the Warren River catchment blackberry infestations and identified the decline zones, developed a specialised restoration project that has seen 600,000 seedlings planted in the decline zones of public estate and private property river foreshore.

### **CHA-CHA-CHA: Adapting to a new coastal rhythm**

Joanna Garcia-Webb  
*Water Tech*

Australians place a high value on the coastline, which is used extensively for recreational and commercial purposes. Processes affecting the coastal zone are multiple and complex: storm surge, tidal movement, shoreline stability, stormwater drainage and the interactions of surface and groundwater all contribute in differing degrees. In addition, the potential impacts of climate change will place increased pressure on the coastal zone, and threaten public infrastructure and assets, private property, foreshore reserves, coastal attractions and public open spaces.

It is nationally recognised that coastal adaptation planning be undertaken for areas at risk of being affected by coastal hazards over planning timeframes. Best practice identifies a coastal foreshore reserve that allows for coastal processes sufficient to mitigate the risks of coastal hazards, and incorporates this into the planning process. Coastal vulnerability assessments are recommended, under various methodologies, to identify this coastal foreshore reserve. Following this, a risk mitigation approach to planning identifies the hazards located within the reserve, and prioritises adaptive measures according to coastal values.

This paper presents a review of the approaches to assessing coastal hazard vulnerability, risk identification and adaptive planning across Australia: In Western Australia, the process is Coastal Hazard Risk Management and Adaptation Planning; Queensland applies the Coastal Hazard Adaptation Strategy; while South Australia follows the Climate Adaptation Planning Guidelines. In Victoria, the Victorian Coastal Hazards Guide provides the framework for coastal risk assessments. The

purpose of this review is to understand the similarities and differences between the approaches and what we can learn from each.

### **Coastscapes – A New Approach to Protecting and Enhancing Biodiversity Resilience at Macro-Corridor Scale in the South Coast of WA**

Dylan Gleave, Robyn Cail  
*South Coast Natural Resource Management (NRM) Inc.*

The South West Botanical Province of Western Australia is a recognised 'biodiversity hotspot'. Within this hotspot the almost continuous strip of intact native vegetation along the south coast is the major east-west link in the region's coastal corridor.

Coastscapes - lead by South Coast NRM - is a new approach to coastal protection and restoration. The project aimed to protect and enhance the 512 km long coastal macro corridor made up of the Two Peoples Bay to Fitzgerald Corridor; and Fitzgerald to Cape Arid Corridor as defined in the South Coast Macro Corridor Network (Wilkins et al., 2006).

The project delivered strategic and targeted works at a landscape scale improving connectivity, quality and resilience of the region's coastal corridor. Coastscapes involved partnerships with four coastal local governments, Department of Parks and Wildlife, private landholders and contractors, traditional owners, community groups and volunteers.

Strategic assessments identified priority areas and implemented targeted works across the landscape including:

- Large scale biodiversity plantings expanding the extent of native habitat within priority areas of the coastal corridor building resilience and connectivity;
- Protecting, restoring and enhancing existing native vegetation;
- Managing landscape scale Phytophthora dieback and invasive species threats to biodiversity; and
- Building community capacity to deliver best practice rehabilitation and protection works through strategic planning, technical support, skills and training by a dedicated project team.

The Coastscapes project and project outcomes have lead the way in coastal protection and restoration in the region and built ongoing partnerships in a landscape approach to coastal management.

Wilkins, P., Gillfillan, S., Watson, J. Sanders, A. (2006) The Western Australian South Coast Macro Corridor Network – A bioregional strategy for nature conservation.

## **Habitat restoration at the Houtman Abrolhos islands – current status and future directions**

Maryke Gray, Sarah Graham, Juan Gutierrez, Suresh Job,  
*Central Regional TAFE*

The Abrolhos islands – a chain of 122 islands that lie approximately 70 km off the coast of Geraldton – are home to millions of birds including the largest colonies of Wedge-tailed Shearwater birds in the eastern Indian Ocean and several rare bird species that exclusively nest on only a few of the islands. Over the decades, invasive weeds and loss of habitat have placed immense pressure on the bird species, as well as many other priority species including the Australian Sea Lion, Abrolhos Painted Button Quail, Brush Bronzewing, Abrolhos Spiny-tailed Skink, Abrolhos Dwarf Bearded Dragon and Carpet Python.

Central Regional TAFE's Batavia Coast Maritime Institute (BCMI) in partnership with the Northern Agricultural Catchments Council (NACC) have recently completed a project to restore native plant biodiversity at key sites on the islands. Activities included strategic restoration activities with local provenance native plant species and undertaking threat abatement measures. Over 28,000 local provenance seedlings were planted, with seed and plant propagation material collected from the islands before being propagated at BCMI's NIASA accredited nursery. In addition, priority weeds were mapped on 42 different islands/islets and more than 1000 hectares have been managed for weeds via mechanical and chemical control. A total of 3,676kgs of marine debris were also removed from 28 islands, from a total length of 58kms of coastline. At the heart of this project are community volunteers and students (a total involvement of 600 people) who were involved in all project activities and were vital to its success.

## **Coastal Rehabilitation Challenges in an Historic Off-road Vehicle Playground**

Damian Grose  
*Tranen Revegetation Systems*

The stretch of coastal land between Burns Beach and Yanchep has been subjected to decades of use and abuse by unauthorised off-road recreational vehicles. Whether it is for beach access by fisherman and surfers, or general four wheel driving and motorbike riding, many areas have become degraded because of the activity, and ongoing vehicle use presents a challenge to rehabilitation efforts. Tracks so created, as well as destroying bush, can lead to large blowouts due to wind action, and also promote the spread of weeds. Very few coastal and bushland sites are immune to this threat, and with a reduction in area available to recreational vehicles, the pressures are only likely to increase.

Tranen Revegetation Systems has been engaged in on-ground rehabilitation activities by all of the major landowners in this coastal corridor over the past decade. Over this time we have witnessed firsthand the damage caused, observed changing driver behaviour in response to the shifting conditions associated with progressive land development in the area, and seen attempts at trying to control unauthorised vehicle activity in these areas at the local and regional level. All whilst trying to undertake large-scale rehabilitation activities in this already challenging environment.

This presentation will explore historic vehicle use in the area and management strategies undertaken attempting to curb the activity, and share our practical experiences undertaking rehabilitation in this dynamic landscape.

## **How the community benefits from profitable environmental businesses.**

David Hancock

*Natural Area Consulting Management Services*

The for profit environmental sector provides essential

industry capacity to the environmental restoration effort. However, there are many aspects of the interactions between the for profit sector and the community NFP / volunteer sectors that need to be recognised and appreciated. Whilst profit is the critical success factor for the commercial env sector, this presentation will provide detail of the successful engagements that have taken place and what exists in prospect.

## **Conservation Action Planning in the Pilbara – process, products and next steps**

Barry Heydenrych, Blair Parsons

*Greening Australia*

The Pilbara Conservation Action Plan (CAP) seeks to provide a guiding framework for planning and implementing biodiversity conservation actions across the bioregion. It seeks to plan and implement in a coordinated manner based on broadly agreed priorities and targets. This is not an easy task as the Pilbara is huge, complex and has a multitude of stakeholders and conflicting pressures on its natural assets. Greening Australia, who has been leading the CAP on behalf of the Pilbara Corridors project, employed the internationally-recognised 'Open Standards for the Practice of Conservation' to guide the process, a method which has been used widely around the globe. The Pilbara CAP was initiated in 2015 with a series of stakeholder workshops to identify key conservation assets, threats to these assets and to develop strategies for their protection. After this initial 'knowledge collection and collation' phase, the numerous assets, threats and strategies were refined to provide greater focus for conservation actions. This was undertaken through consultation with ecological experts, literature survey including an examination of the Pilbara Biodiversity Audit II and road testing with key stakeholders. We present an overview of the process undertaken, some key results and products produced along the journey. We will also discuss some lessons learnt when undertaking a Conservation Action Planning process across a region as sizeable and diverse as the Pilbara and where to next for this important initiative.

## **Real-Time Flood Forecasting Using Readily Available Datasets**

Martin Heyting, Cameron Druery, Stuart Atkinson

*Advisian*

Large scale flooding in recent years has led to the requirement, and indeed expectation, that Government Authorities be better prepared for impending flooding. Part of this, is the need to understand the implications of impending rainfall, in real-time.

Traditionally, flood forecasting has focused on utilising telemetted rainfall data and broad-based forecast rainfall.

In recent times, various weather forecasting agencies, in both the Government and private sectors, have enhanced the detail in their weather forecast information. For example, gridded rainfall forecasts are available on both country and local scales, in real-time, extending out to 7 days.

Such datasets can provide an effective means of “buying time” in preparation for impending flooding and provide temporal and spatial detail on forecast rainfall.

When these detailed forecast grids are combined with information available from flood studies and organisation-specific GIS datasets, an effective flood forecasting system can be readily built using data that most Government Agencies, Local Authorities and indeed many private enterprises have available.

Importantly, such systems are capable of providing real-time flood intelligence on what the implications of flooding may be, such as who and what will be affected by the coming flood, by how much and when, ahead of the commencement of causative rainfall.

Equally, advancements in the quality of storm surge predictions have enabled organisations to assess the likely impact of storm surges, well ahead of actual inundation.

### **GRID Roadmapping Workshop**

Piers Higgs  
*Gaia Resources*

The Geographical Reporting and Information Database (GRID) is an easy to use online mapping system built for – and by – the Natural Resource Management (NRM) community. It is already in place within almost all of the NRM regions in Western Australia.

Leading on from the recent funding from the State NRM body, Gaia Resources is seeking input on the next phase of GRID and what sort of additional components would be valued by the NRM community. This workshop aims to bring together the existing GRID user base to define the priorities for the next phase in GRID’s evolution.

Run similarly to the roadmapping workshop run at the previous State NRM conference, representatives from each of the GRID client organisations will be asked to provide feedback prior to the workshop on the future directions for GRID. Once these are then reviewed and discussed, then each group will be asked to prioritise these for the future roadmap.

Opportunities for future funding will also be explored at the workshop to determine a sustainable pathway forwards for GRID that will ensure that the system will continue to be updated into the future.

### **Coastal Action Plan (CAP), Binningup to Walpole, Western Australia: - Dealing with data gaps and working through it when prioritising strategic coastal on-ground actions and critical activities**

Joanna Hugues-Dit-Ciles  
*South West Catchments Council*

South West Catchments Council commissioned a Coastal Action Plan (CAP) in 2014 to prioritise coastal on-grounds works and other supportive activities across the South West NRM region, in Western Australia. The CAP covers approximately 400 km of coastline stretching from Binningup to Walpole and; operates across multiple tenures, jurisdictions and land management responsibilities. This coastline is one of the State’s greatest assets with diverse values, landscapes, habitats, vegetation, species and is a valuable resource for residential and tourism development. Increasing pressures and competing usage from development, recreation, combined with high biodiversity these fragile coastal features make for complex management decisions when prioritising strategic on-ground works.

The CAP was developed to be a living document, that gets updated, improved and reviewed when new information and data gaps arise to allow managers of the coastal assets to prioritise on grounds management actions through a shared understanding of the values, threats and management recommendations and priority actions at priority sites. The CAP was achieved through extensive public consultation ranging from interviews, workshops and online questionnaires.

The presentation will address how SWCC produced the CAP dealing with knowledge gaps and uncertainties, yet still providing reliable and validated strategic directions that are being used to direct investment projects in a funding environment with limited financial resources to implement targeted work.

### **Unseen invasion: aquatic pests in the Midwest.**

Colin Johnson, Samantha Courtney  
*Central Regional TAFE*

Invasive species have the potential to markedly alter aquatic ecosystems through predation, aggressive interactions, food and space competition and habitat modification. This can lead to displacement of native species and potentially the complete dominance of riverine fauna by introduced species. Complete eradication of any animal pest species has proven unachievable in mainland Australia. This is even more difficult in aquatic environments where crypsis of pest species and the inherent problems of viewing subsurface ecosystems may mask pests' presence. It is imperative to obtain accurate distribution information on aquatic pests to allow concentrated control efforts in areas of new incursions before invasive species become firmly entrenched. Central Regional TAFE's Batavia Coast Maritime Institute (BCMI) in partnership with the Northern Agricultural Catchments Council (NACC) and supported by the Australian Government, have been working to establish the current distributions of riverine invasive species in the Midwest in order to develop control strategies to inhibit further range expansion. To date, 327 trap surveys have been undertaken at 50 sites as well as Tilapia eDNA surveys in 27 sites across the Irwin, Greenough, Chapman, Hutt, Buller, Bowes and Murchison Rivers representing a cross-section of aquatic habitats at different stages of invasion by aquatic pests. In total, 590,443 animals have been sampled and 393,041 pest animals removed. This has allowed more accurate mapping of pest distributions indicating a range expansion of three established pest species and detection of a potentially new invasive species. Future management options and research directions to combat pest expansion will be discussed.

### **Catalysing Community Conservation - Malleefowl Benefit from Local Knowledge**

Lizzie King  
*Northern Agricultural Catchments Council*

The Northern Agricultural Catchments Council (NACC) and Greening Australia's Restoring Native Vegetation to Enhance Malleefowl Neighbourhoods in the Yarra Yarra Catchment Project is supporting private landholders to revegetate cleared farmland through direct seeding and hand planting of native species. The Yarra Yarra catchment covers over 1.8 million hectares and contains impressive diversity of flora and vegetation communities; however, as is the case in many agricultural areas, the area has been heavily cleared with less than 10 per cent of native vegetation ground cover now remaining. Through this partner project, NACC and Greening Australia are working with the local community to undertake strategic restoration of more than 300 hectares of cleared farmland to increase native vegetation cover, buffer remnant vegetation, improve connectivity and enhance habitat for the Malleefowl and potentially other threatened species such as the Western Spiny-tailed Skink and the Fitzgerald's Mulla Mulla. Integral to the success of this project is community engagement. NACC's

mission is to 'Catalyse Community Conservation' and the strength of NACC's work is through regionally based staff. NACC employs a staff member based in the Yarra Yarra Catchment and they provide the link between the local community, land managers and operational staff. This enables local contacts to be made more easily; trust to build up within the community over a number of years and as a result, a larger number of landholders are keen and willing to get involved in NRM.

### **Paradigms in Management of Natural Areas, City of Stirling**

Walter Kolb, Rae Kolb, Sheldon Pritchard  
*Stirling Natural Environment Coastcare (SNEC)*

As non-scientists Stirling Natural Environment Coastcare's (SNEC) volunteer community group's Works Co-Ordinator, Walter Kolb (WK) evolved an on ground integrated management approach across the 6.85 km of the City of Stirling coastline. The implementation of this approach has been successful despite constraints imposed on SNEC by the Land manager, City of Stirling (CofS), such as no authority to apply chemicals or use machinery, requiring permission to access all sites, approval of plant lists and on ground funding applications needing their approval. We were not authorised to collect seed although we were able to take cuttings with only approved propagation nurseries able to be used. Constraints imposed became strengths. Out of necessity SNEC outsourced map production and site preparation was staged with hawkish persistence in advance of becoming 'a funded project site'. Initial projects were small and successful. As projects continued further, the preparation and management of projects considered the Bigger Picture which became the key to overall success. Contractor's works are closely supervised and outcomes are measured. Monitoring and timely maintenance is planned with precision. Initial SNEC weed mapping was followed up by ecologist designed digital mapping of both weeds and locally endemic plant communities resulting in an outcomes based Decision Support Tool for all stakeholders. Detailed records are kept for all sites. Most invasive weed species are contained or eradicated. Opinions on shifts in Paradigms in management will be made.

### **"Healthy Estuaries: effectively engaging community members in citizen science"**

Hamish Longbottom  
*Northern Agricultural Catchments Council*

Engaging community members in a new citizen science project can be challenging. From project conception the race is on to ensure interested individuals stay engaged in the collection of meaningful data.

The NACCs Healthy Estuaries project aims to build community capacity in the Hill and Moore River catchments to gather accurate and consistent water quality data to aid estuary managers in their decisions. In collaboration with the Department of Water, NACC is training local community members in collecting robust water quality monitoring data for submission to the DoW Water Information (WIN) database.

By understanding the motivations of volunteers, their skills, knowledge and level of interest in the project, we can tailor the experience to meet their needs and ensure they remain actively involved in the project. The Friends of the Moore River Estuary are passionate about their local estuary, requiring mostly increased technical capacity to turn this passion into valuable information for estuary managers.

It has been observed that 1) participation was higher in those individuals who had a passion/connection with the project site(s), 2) the level of interest in technical information increased the longer participants were engaged in the program and 3) opportunities to socialise and share knowledge with like-minded people increased participation.

The Healthy Estuaries program provides the perfect opportunity for passionate communities to collect meaningful information to help management of the natural asset they care so much about. NACC are collaborating with the Corangamite Catchment Management Authority to display data using their Estuary Watch data portal.

### **Forums to Case Studies - Compiling and sharing practical coastal management information**

Joanne Ludbrook, Blair Darvill

*Peron Naturaliste Partnership, South West and Peel Coastal Management Group (CoastSWaP)*

Over a three year period from 2014 to 2017 coastal management stakeholders from community groups, local governments, Department of Parks and Wildlife and catchment groups were invited to attend sub-regional stakeholder forums. These were funded by successful Coastwest grants (14/15 & 15/16) and Local Government contributions.

The planned outcomes of the forums were based on the understanding that when these people are given an opportunity to meet their peers, share their knowledge and discover ways to help each other they can work to achieve their goals more efficiently and effectively. These were achieved through:

- Peer-learning and knowledge sharing
- Networking opportunities
- The application of Integrated Coastal Zone Management principles
- Advocating for changes in coastal management that improve effectiveness and efficiency

Over the three year period, 14 forums were held between Mandurah and Walpole in the South West of WA. Over 150 key stakeholders attended the forums.

Significant information that was shared between stakeholders at the forums was developed into a series of 10 detailed coastal management case studies (<http://coastswap.org.au/case-studies/>) funded through a 25th Anniversary National Landcare grant.

The case studies cover topics such as; revegetation, stabilisation, off road vehicles, coastal monitoring, engagement, adaptation, regional management and the status of Coastcare in the South West and Peel Harvey regions.

This process of compiling and sharing information between key stakeholders, although simple, is a very effective method in discovering what the gaps are, what we know and don't know as well as who is involved.

## **Coastal Adaptation in the Peron Naturaliste region of SW WA**

Joanne Ludbrook, Craig Perry  
*Peron Naturaliste Partnership*

The peron Naturaliste Partnership (PNP) established in 2011 in response to an increase risk and pressures on the coast from climate change impacts such as sea level rise, flooding and storminess. The PNP is a collective of 9 local government's between Point Peron (in Rockingham) and Cape Naturaliste (in Bussleton). The PNP will be providing an overview of the establishment phase, current focus and future plans of the partnership.

### **WA Coastal Zone Strategy**

David MacLennan, Sam Bishopp, Vivienne Panizza  
*Department of Planning, Heritage and Lands*

Western Australia's coastline is one of the State's most significant and valuable natural assets. It is used and enjoyed by local communities and is a major drawcard for tourists to the State.

The coast is fragile and exposed to threats and pressures including erosion and rising sea levels, population growth, recreational activities and coastal development. These present significant planning and management challenges both now and into the future.

The WA Coastal Zone Strategy provides a framework for collective action to manage and adapt to threats and pressures being experienced along our coast. It provides for social and economic needs while ensuring the coast and its values are maintained and enhanced through sound planning and management.

The Strategy complements State legislation, existing government strategies and policies including the State Planning Policy No. 2.6 State Coastal Planning Policy. It also outlines the State Government's position on the use of coastal protection to mitigate the impacts of coastal erosion and inundation.

The Strategy establishes a vision of a sustainable coast for the long-term benefit of the community and visitors to the State. It emphasises that State and local government, public and private organisations, community groups and individuals all play an important role in coastal planning and management.

### **NRM meets collective impact in the rangelands - getting to the heart of the issue**

Gaye Mackenzie  
*Rangelands NRM*

How does an NRM group transform from being a relatively simple project/contract delivery organisation—a conduit of government funds, a 'funding bucket'—to an organisation that provides holistic program development and delivery which has problem solving and innovation at its centre? All with a sociologist as a CEO?

Join Gaye to hear about the journey that Rangelands NRM WA has taken over the last three years to transform the way it sees itself, how others see it and how we do things. To make any kind of difference working in the expansive WA rangelands, we need to think landscape and as soon as we do that we need to think across tenure. People need to be empowered to look after their own patch and they also need to work together in a strategic way to ensure efforts are sustainable.

Gaye will briefly explore the theories and concepts that have helped shape the thinking behind the transformation. Also, perhaps more importantly, she will demonstrate how by being guided by a set of values rather than a set of rules has enabled the organisation to have the freedom to learn and adapt—a process which has resulted in deep learning for staff and those who we have worked closely with. It is a journey through acronyms that has taken us from priority areas (PAs) to Landscape scale projects (LSC), to landscape scale collaborations (LSC) to Collective Impact (CI) to arrive at a Innovative Landscape Program (ILP) and back to PAs!

**Preston River to Ocean proposed Regional Park: protecting a unique bushland linkage in an urban landscape**

Pip Marshall, Joanna Hugues dit Ciles  
*South West Catchments Council*

The Preston River to Ocean proposed Regional Park covers 893ha (twice the size of Kings Park) of continuous bushland reserves in Bunbury. The Park stretches 7 kilometres from east to west and supports over 600 species of flora and 180 species of fauna. It is home to threatened fauna and contains threatened ecological communities, namely the Swan Coastal Plain Claypan and the Banksia Woodlands of the Swan Coastal Plain. The bushland linkage is unique, as it includes four of the five uncleared vegetated landforms of the Swan Coastal Plain (Quindalup/Spearwood/Bassendean Dunes and Pinjarra Plain) in an almost unbroken corridor with intact interfaces between vegetation types. The area is currently proposed for Regional Park proclamation, awaiting State Government approval. The South West Catchments Council (SWCC) and the City of Bunbury have been working in partnership since 2013 to protect and enhance the environmental, social and cultural values for the Park. Close stakeholder engagement and partnerships between SWCC, State government agencies, local government, volunteer groups and the local community have been key to the project's success. SWCC and Project Partners have implemented a coordinated approach to manage threats such as, invasive weeds and pests, dieback, illegal 4WD activity and rubbish dumping. Project funding will cease in June 2017, when continued management of the proposed Park area returns to the individual landholders. The presentation will share the project's achievements, experiences and learnings about the challenges of protecting high-value bushland in an urban landscape with complex threats, competing values, multiple stakeholders and land tenure.

**Rangelands NRM Enabling On-ground Connection**

Kieran Massie  
*Rangelands NRM*

This poster outlines the new Rangelands NRM philosophy of Connect > Coordinate > Deliver, and provides examples of the on-ground connections that Rangelands NRM has enabled.

Rangelands NRM is a not-for-profit, non-political and neutral organisation working towards better WA rangelands. We connect people and projects so that real solutions can develop. We coordinate effort and resources so that the maximum results are achieved on the ground. We work with organisations to deliver on ground results. We believe if we work together, we can achieve better results.

We understand that the rangelands is a complex and diverse system and that the region's greatest asset is its people. By recognising, sharing and promoting the local knowledge of land managers and complementing this knowledge with technical expertise and support at appropriate junctures, barriers to the development of sustainable pastoral production can be identified for further enquiry through shared learnings.

We strive to share the lessons of 'on-ground' stakeholders and reach out for innovative solutions being developed in all sectors. This facilitates continuous improvement and allows for adaptive management by land managers. Ultimately, the approach bolsters the confidence of pastoralists in applying, adapting and improving current best practices, and in evolving new practices leading to locally-owned and tailored landscape interventions. To achieve this we collaborate at all levels, aligned support from government agencies, financial institutions and NGOs. These are some of the examples of Connect > Coordinate > Deliver.

### **Coastcare @ Mullaloo**

Sharon McArthur

*Mullaloo Beach Community Group Inc.*

Mullaloo Beach Community Group Inc.(MBCG Inc.) is dedicated to the long term conservation of biodiversity within Bush Forever Site 325 and Marmion Marine Park. We are a small community group that has been working at Mullaloo/Ocean Reef in the northern suburbs of Perth since 2006. We acknowledge the traditional custodians of the land, the Nyoongar People, and pay our respects to Elders, past and present. We hold walks with Bindi Bindi Dreaming to raise community awareness of traditional culture in the coastal zone. We have undertaken projects over the past ten years that have been designed to protect and enhance biodiversity in the coastal zone. MBCG Inc. works in partnership with the City of Joondalup and Perth NRM. Volunteer efforts have been enhanced by projects funded by Coastwest and the State NRM office. Our projects involve fauna and flora monitoring to raise community awareness of coastal biodiversity and litter collection to reduce the risks this pollution poses to the marine and terrestrial environments. These activities are combined with extensive revegetation and chemical free weed management that has resulted in significant improvements in vegetation condition. These projects have had a strong emphasis on community engagement and education and engaged a large number of volunteers, including local families, high school and university students. This poster presentation would tell the story of a long term community commitment to protecting the coast through a photographic record of the results of numerous Coastwest and State NRM Office funded Projects.

### **Case Study: Irwin River Estuary & the fight against African Boxthorn**

Vanessa McGuinness

*Northern Agricultural Catchments Council*

The Irwin River Estuary (IRE) contributes significant ecological, cultural and economic values to the Dongara and Port Denison community. However African Boxthorn (*Lycium ferrocissimum*), recognised in 2012 as a Weed of National Significance (WoNS), has had detrimental impacts on the riparian vegetation of the IRE which in turn has reduced both biodiversity and recreational amenity.

Since 2012 the Northern Agricultural Catchments Council (NACC) has directed substantial funding towards removing the bulk of African Boxthorn biomass around the IRE via contractors.

NACC, in collaboration with the Shire of Irwin, released the "Irwin Estuary Weed Management Plan" in 2013 detailing boxthorn as a "Very High Priority Weed" and highlighting the need for on-going management. The IRE has also been identified as a high priority area for boxthorn control in the 2016 "Draft Regional Management Plan: Control of African Boxthorn (*Lycium ferrocissimum*)" prepared by NACC.

Results of boxthorn control works at the IRE from 2012 to present have been effective and will be detailed in the presentation, along with a cost-benefit analysis of completed works.

With the bulk of boxthorn biomass now removed, the challenge has shifted to preventing reinfestation from surrounding populations. The “Boxthorn Brigade” consists of local community members who are keen to see their estuary remain boxthorn-free. Regular capacity raising workshops and boxthorn flagging/pulling days have been organised and will continue into the future. These activities help raise community awareness on the important ecological process that keep their estuary healthy and ensures that local eyes keep it boxthorn-free.

### **Beyond the Prison gates**

Bianca McNeair, Greg Burrows, Rolan Deutekom  
*Northern Agricultural Catchments Council*

This presentation will focus on the evolution of NACC’s Aboriginal Participation Program, it’s impact and the opportunities it has provided for Aboriginal people and the local environment. A large part of NACC’s work has focussed on delivering the National Landcare Programme’s project NRM Capacity Building for Indigenous Prison Inmates. The origins, development, partnerships and outcomes of this project will be shared with the hope of other regions initiating similar projects. Other NACC Aboriginal engagement projects have since developed such as Return to Country camps to transfer Traditional Ecological Knowledge, Aboriginal Art recording TEK and engaging young people in NRM, with a single goal: engaging more Aboriginal people in NRM.

### **Understanding recreational fishers and their attitudes to conservation in Western Australia**

Asha McNeill, Dr Julian Clifton, Professor Euan Harvey  
*The University of Western Australia, Curtin University*

Marine parks, also known as marine protected areas, are a management tool where resource use is restricted or prohibited within a series of zones for the purpose of conserving ecosystems. Consequently, the establishment of marine parks as a conservation strategy invariably impact upon communities’ ability to access marine resources, including individuals who fish for recreation. Recreational fishers are a key stakeholder group in the state of Western Australia (WA), amounting to approximately 700,000 individuals in a population of 2.6 million. However, various constraints serve to constrain their effective participation in, and contribution to, marine park planning processes, despite the disproportionate impact of zonation on their activities. An internet based survey of 500 recreational fishers across WA was employed to assess fishers’ attitudes towards marine conservation and management tools. The survey was designed to collect information on fisher avidity, catch orientation and motivations in addition to attitudes toward management including marine parks, fisheries management tools and the government agencies responsible for them. Results show that recreational fishers are a diverse stakeholder group who are likely to be impacted in a variety of ways by conservation policy, with correspondingly different roles to play in policy planning. However, engaging with recreational fishers and managing these impacts requires consideration by planners if the goals of meeting stakeholder needs are to be met.

### **Novel approaches and challenges to improving water quality in an urban wetland**

Linda Metz, Chris Beaton  
*City of Cockburn*

The City of Cockburn has collaborated to trial a novel approach to improving water quality within Yangebup Lake. Through incompatible historical land use the wetland at Yangebup Lake has become hypertrophic which has contributed to issues such as nuisance midge and algal blooms. In response

the City has developed a nutrient stripping basin harnessing solar power to reduce nutrient loads within the wetland. Complementary revegetation works and adaptive management have seen a decline in midge prevalence and increase in habitat values. Stage 2 of this project will see a new treatment train installed based on outcomes of a research project being undertaken by Murdoch University. This project demonstrates use of alternative renewable energy sources in natural resource management, improvement of habitat values and collaborative approaches between government, industry and research institutions.

### **Understanding the recreational values of the coast**

Garry Middle, Marian Tye  
*Curtin University*

This workshop will explore for the recreational values of the coast and near-shore marine areas can be identified and quantified or assessed so as to provide an input into decision making. As coastal areas come under increasing pressures from both increasing population and loss of beach because of sea level rise and increased inundation due to climate change, it is important to better understand the recreational values of the coast are understood and evaluated. This will help in decision making where there are competing values, including different recreational uses, and also where a beach could be lost depending on adaptation choices in response to climate change. This workshop will use participants' knowledge and input to explore recreational values.

### **What is the Future of Coastal Planning and Management in WA**

Garry Middle  
*Curtin University*

The policy-making supporting coastal planning and management has evolved significantly since the 1970s where it was primarily seen as a conservation issue, with the State's environmental agency taking the lead. Planning is now the lead agency, marking a shift in policy from one primarily focused on environmental protection to one that also considers broader socio-economic matters.

The government has three coastal grant schemes - Coastal Management Plan Assistance Program (CMPAP), Coastwest and the Department of Transport's Coastal Adaptation and Protection (CAP) grants.

Planning for climate change is now central to the key coastal policy – SPP 2.6 - requiring we plan for a sea level rise of 0.9m by 2100 and that local governments carry out coastal hazard & risk management adaptation planning (CHRMAP).

Most of the conference presentations have covered what is happening currently in the coastal planning and management space – this workshop will be firmly forward looking and addressing the following key questions:

1. What do we want our coast to look like in 2050?
2. What are the key barriers to us achieving that vision?
3. What is the best way to get there?
4. What should change for us to get there?
5. Are these the right future looking questions to ask?

This will be a highly interactive workshop, starting with a one-minute power talking session, where participants are offered the opportunity to speak for one minute to give their answer to one or more of these questions. Once we run out of power talks, we will break into small groups to tackle the above questions. We will then report back to the final plenary session.

The workshop convenor is Garry Middle, the Coastal planning and management representative on the WAPC.

**Managing interests and engagement within a state Indigenous Protected Area: the Woodstock-Abydos reserve**

David Milroy, Luke May, Darren Graham, Nerida Haynes,  
*Budadee Aboriginal Corporation, Terra Rosa Consulting*

Budadee Aboriginal Corporation and its not-for-profit Foundation aims to protect the cultural and environmental integrity of Tharra, a highly significant area within the Woodstock-Abydos Indigenous Protected Area in the Pilbara region of WA. Important songlines pass through Tharra, linking sites to ceremonial songs and dances practised across the Western Desert and inland Pilbara.

In 2012 Budadee was established to exist in a charged political environment and endeavours to be as representative as possible of the native title, land usage, law and cultural obligations within the protected area. Board members, representatives and associates have engaged in ongoing consultation with senior cultural figures, representative bodies, native title working groups, heritage committees and government departments. Taking its name from an acacia tree used during traditional law and culture Budadee is symbolic of healing and looking after the country. Therefore the organisation is working towards managing the area with employees from the surrounding communities of Yandeyarra, Nullagine, Marble Bar and Port Hedland. Consultation with elders regarding the cultural needs of the area has been extensive and inclusive of senior law people from Palyku, Kariyarra, Njamal, Ngarla, Martu and Niyaparli communities. This has heightened the importance of ensuring regional support for the program among elders from many groups to 'get the story straight'.

Budadee has made significant progress over the years and conducted environmental surveys, supporting the removal and monitoring of feral animals. The aim is to continue this work with the support of regional partners and stakeholders including Greening Australia, Rangelands NRM and DPAW.

**Saving Five mile Brook**

Jen Mitchell  
*South West Catchments Council*

Historically, there have been various methods attempted to prevent unwanted vehicle access to dunes and sensitive coastal areas. Most fail as there are often no hard structures (such as rocks or trees) that prevent vehicles from driving around.

South West Catchments Council (SWCC) and the Water Corporation joined forces in 2014 to undertake a large dune restoration project (0.5Ha) alongside the mouth of the Five Mile Brook in Stratham, 15 km to the south of Bunbury. The project was initiated to rehabilitate and stabilise a dune area to minimise the movement of sand that was threatening to engulf Five Mile Brook, and smother the surrounding coastal vegetation.

The project assisted the Water Corporation in their operations by rehabilitating a large dune blowout ensuring the Five Mile Brook drainage channel continues to discharge effectively. The rehabilitation works included the installation of rocks and cable barrier fencing to prevent vehicle access, coir logs to reduce wind erosion and the planting over 4,000 seedlings to re-establish the vegetation.

While cable or wire rope is often used for car safety barriers along roadsides, it hadn't been used as a method of dune protection before, although this method has proven to be successful in preventing vehicle access into sensitive bushland areas. The heavy-duty construction and permanent installation has been effective in deterring illegal activity and has allowed the seedlings planted within the newly protected area to establish without disturbance.

### **Home River Ocean: urban nutrient behaviour change**

Sarah Molloy

*South West Catchments Council*

The Home River Ocean (HRO) urban nutrient behaviour change program is aimed at reducing the amount of nutrients entering South West waterways from urban development. Two 'Save the Crabs, Then eat Them' campaigns have targeted the timing of fertiliser applications on urban lawns and gardens, using humour and the iconic Blue Swimmer Crab to highlight the impact nutrient runoff has on coastal waterways. This broad-reaching behaviour change campaign uses television, newspaper, radio, online and printed material, as well as targeted community initiatives and events.

Urban fertiliser use is an increasing nutrient pollution source to waterways and the ocean. Currently in the Peel, urban development occupies only 6% of land use and yet it contributes nearly 20% of phosphorus entering the Peel-Harvey Estuary 9 (EPA, 2008). Collectively, urban areas contribute as much as dairy farms in some Geographe sub-catchments.

HRO has raised awareness of the impact of urban fertiliser use through an engaging and memorable approach. An evaluation of the program found high levels of campaign awareness (75%), perceptions of relevance (79%) and believability (97%) of the campaign messaging. A preliminary review of the behaviour change outcomes found that although there was no statistically significant decrease in winter fertilising after one year (1.5%), there were shifts in the types of fertilisers used.

The program has been highly effective in reaching the target audience, raising awareness and shifting perceptions of urban fertiliser use. Continued exposure is expected to create further shifts in fertiliser behaviours and improve the environmental condition of South West coastal waterways.

### **Advocating for Change: NRM opportunities in WA through engaging with the farmer members of the nation-wide Australian Farmers for Climate Action alliance.**

Verity Morgan-Schmidt, Richard McLellan

*Farmers for Climate Action, Northern Agricultural Catchments Council*

Farmers for Climate Action are a movement of over 2,000 Australian farmers representing an array agricultural industries working together to find climate solutions. Our work aligns perfectly with the 'Adapting in a Changing World' conference theme.

Farmers for Climate Action recognize that the best way to meet with challenging and uncertain times, including climate change, extreme weather events, droughts and natural disasters is with strong and resilient farmers and regional communities.

Farmers for Climate Action are active in the areas of policy and advocacy and are pursuing an ambitious outreach strategy to engage rural Australia. Our priority areas include:

- Bringing Carbon & Biodiversity Back Into the Landscape
- Energy Transformation
- Research, Development & Extension

Our approach addresses the key conference themes as per below:

2.1 What's at risk – what is the outlook for WA agriculture in a changing climate?

3.1 Local community stories – how are WA farmers adapting to climate change?

4.1 Successful stakeholder engagement across the agricultural and environment sector

5.1-5.5 Structural Response: Driving whole of society and community change through the re-writing of the farming and climate change narrative, delivering institutional and organizational change at all levels, formulating pro-active policy and legislation, building resilience among farmers and rural communities and advocating for change.

6.2-6.3 Identifying the gaps and filling the holes

6.6 Opportunities and innovation

We are putting the voices of Australian farmers front and centre in developing climate solutions. We subsequently welcome the opportunity to present an overview of our activities and vision for rural Australia with delegates at the WANRM Conference.

### **Environmental Volunteer Engagement in a Metropolitan Region**

Sharon Munro, Diana Neuweger  
*Perth NRM*

Since 2013 Perth NRM has been undertaking a “Community Capacity in NRM” survey to engage with environmental community volunteers within the Perth Region in order to better understand the capacity of those groups to undertake environmental restoration. There are an estimated 165 volunteer environmental groups in the Perth region; our initial survey engaged 89% of those groups. The survey looks at the capacity of groups using a four capitals framework of Human (skills & knowledge), Social (networks & relationships), Financial (money & assets) and Organisational (governance & management) capitals, to determine capacity gaps. This unique survey provides our regional organisation insight in to how environmental volunteer groups are organised, how they are funded and supported, who they are working with and at what level, as well as understanding their personal motivations and the time they spend undertaking on ground and administrative tasks. The annual survey results guide us in determining the most sought after topics for our Volunteer Capacity Building in NRM program workshops, to assist with closing the capacity gaps of environmental volunteers. With continued use of this engagement tool we can start to note trends occurring in the field, and understand the dynamics of the changing volunteer community, and to direct funding to where it is most needed for our regions environmental volunteer groups. The Community capacity in NRM survey is funded by the Australian Governments National Landcare Program.

**The South West Group's Natural Areas Management Forum: A multi-stakeholder collaboration achieving improved NRM outcomes in the southern metropolitan area**

Peter Nash  
*South West Group*

The South West Group's Natural Areas Management Forum is a collaborative initiative involving 10 Local Governments and 5 State Government agencies cooperating to achieve better NRM outcomes in Perth's southern metropolitan area. The Forum was initiated and is facilitated by the South West Group, a Voluntary Region of Councils. It operates at both the on-ground (operational) level and management level and is supported by an Agreement of Cooperation. This initiative is delivering collaborative action on key NRM issues.

The Forum recognises the interconnectedness of the remaining bushland and modified natural areas within the metropolitan area, the fact that these areas are vested in and managed by a multitude of organisations and that the interconnectedness means that how an adjoining parcel of bushland directly impacts on those connected to it. This has implications for weed and feral animal control, fire risk mitigation, post-fire recovery, rubbish dumping, biodiversity conservation, illegal access and inappropriate use, and many other issues.

The presentation will cover:

- What need drove the regional initiative?
- What process was used to gain support for the initiative and facilitate the collaboration of partner organisations?
- What resources (financial, in-kind, political will etc) were required to implement the initiative?
- What outcomes (environmental, social, economic, organisational, other) are being achieved?
- What lessons have been learnt?

The presentation will showcase ways collaboration, knowledge sharing and skills development is fostered through the Forum and allow others to learn from our experience. It will also provide an opportunity for new stakeholders to partner in this initiative.

**Collaboration in action: Achieving better NRM outcomes through multi-stakeholder collaboration in the metropolitan area.**

Peter Nash, Nicole Matthews, Lisa Potter, Joanne Woodbridge, Doug Vickery  
*South West Group, WA Local Government Association, Perth NRM, Eastern Metropolitan Regional Council, City of Cockburn*

A series of short 7 or 15min presentations will showcase current examples of successful regional scale, multi-stakeholder collaborative projects and initiatives in the metropolitan area. Each presentation would emphasise:

- What need drove/prompted the regional initiative?
- What process was used to gain support for the initiative and facilitate the collaboration of partner organisations?

- What resources were required to implement the initiative?
- What outcomes (environmental, social, economic, organisational, other) were achieved?
- What lessons were learnt?

Proposed presenters are:

- South West Group (Peter Nash): SWG Natural Area Management Forum involving 10 LGAs and 5 state govt. agencies collaboratively managing interconnected bushland
- SERCUL (Brett Kuhlman): provision of support to community groups and services to LGAs and state agencies
- Perth NRM (Lisa Potter/Bronwyn Ryan): Sediment Task Force project. Multi stakeholder project to reduce sediment inflow to the Swan and Canning rivers
- WALGA (Nicole Matthews): Corella Control Coordinating Group initiative. Collaboration between LGAs and DPaW for feral animal control.
- Cockburn Sound Coastal Alliance (Doug Vickery): Cooperative approach to coastal threats.
- EMRC (Joanne Woodbridge): Bush Skills 4 Youth program

These presentations would be followed by a 40min facilitated workshop to identify new opportunities for regional scale collaboration in the metropolitan area. The workshop would be informed by the presentations that precede it and focus on the need, process, resources, outcomes and lessons learnt from these. The target audience for the workshop is:

- local governments
- state government agencies
- commonwealth government agencies
- regional scale NRM/environmental organisations (eg. Perth NRM, SERCUL)
- research providers (universities, WAMSI, WABSI, CRCs etc)

While the workshop will have a metropolitan focus, the principles will be directly transferrable elsewhere.

The workshop would be designed and facilitated by the above presenters led by Peter Nash.

### **Case Study - Successful Community Coastcare in Sorrento and Marmion**

Michael Norman

*Friends of Sorrento Beach & Marmion Foreshore*

"Friends of Sorrento Beach & Marmion Foreshore" (FoSB&MF) have been restoring the foreshore reserve of the suburbs of Sorrento (since 2002), and Marmion (since 2013), but the work has considerably speeded up over the last five years by settling on the best ways to get the work done. The changes are landscape wide over a high profile 2.5km section of metropolitan coastline ranging from sand dunes to rocky cliffs. The site was originally 70% in degraded condition. The aim is to get the entire area to "excellent condition" (to be independently verified). This involves planting over 27,000 seedlings of 40 species (with consistently high survival rates - 85% overall) and consistent

removal of 25 weed species prior to seed set. The weeding process has also resulted in substantial natural regeneration. We aim to totally eliminate most weed species – that has already been achieved with some species. The project will be 90% complete by the end of 2017. We wish to share our methods and achievements with others to encourage more intensive on-ground work to be undertaken elsewhere.

### **Supporting climate adaptation on the coast: applying CoastAdapt to local challenges**

Jean Palutikof, David Rissik, Sandra Boulter  
*Griffith University, NCCARF, Private*

CoastAdapt is a resource developed by the National Climate Change Research Facility (NCCARF) to support users to manage the risks of climate change on the coast. Developed following substantial end user consultation, and with formal and informal engagement throughout, CoastAdapt has over 200 information pages, guidance, documents, tools, templates, data resources and more, CoastAdapt is a one-stop shop for climate adaptation. CoastAdapt has been applied to a variety of coastal challenges in Australia. This talk presents early feedback from application project, and works through some of the features in CoastAdapt which are critical to long-term adaptation planning. The talk will place adaptation examples in the context of C-CADS, CoastAdapt's adaptation planning framework. CoastAdapt has been endorsed by the Western Australian government, which is an important factor for its use in the state.

### **Benchmarking the Accumulation of Microplastics off South-Western Australia**

Harriet Paterson, Kate Born, Nic Dunlop  
*University of Western AUstralia, Conservation Council of Western Australia*

Issues associated with micro-plastics are an increasing global issue, not only in terms of physical entanglement but also chemically. This study aims to identify micro-plastics hotspots and determine their concentration on beaches of the South-West of Australia. 130 volunteers collected 200 1 kg sand samples from different beaches between Geraldton and Esperance, WA. Samples came from the calmest part of the beach in the strand line and were analysed at UWA using a density separation technique. Plastic fibers constituted all of the micro-plastic items encountered. Approximately 85% of the samples yielded between 0 and 5 fibres per 100 g. 13 fibres per 100g of sand represented the 95th percentile, and were considered a fibers hotspot (Table 1). Six hotspot beaches were identified, only one is on the south coast (Hillier beach). The remaining hotspot beaches are between Scarborough Beach and the Geraldton Foreshore. The data was examined using Bayesian distributions and the following variables: Coast (West or South), local population size, shape of the beach, orientation and grain size). There were no patterns of distribution at the 0.05 level of significance. However, at 0.1 there was a significant difference between the west and south coasts. This weak difference is probably due to the number of hotspots found on the west coast. Further sampling is required to determine which variables are responsible for the distribution of fibers. This should include sampling in different seasons and at different scales ranging from sub-sampling within collected samples to individual beaches.

## **A SHARED RESPONSIBILITIES APPROACH TO IMPROVING THE SUSTAINABILITY OF OUR FOOD SUPPLY CHAINS**

Keith Pekin, Graham McAlpine  
*Perth NRM*

While innovation and new technologies will continue to help our farmers produce more food with fewer inputs, the challenges of a changing climate and diminishing natural resources is limiting their capacity to produce enough food for a growing population.

The once inseparable bonds between our natural resources, the farmers who utilise these resources to produce food and consumers who eat the food have been compromised, with consumers being increasingly disconnected from this equation. To meet the challenges of producing sufficient food into the future, consumers need to be re-engaged and participatory. In short, we need a shared responsibilities approach.

The challenge for enabling a shared responsibilities approach is to rationalise the differing priorities the two key stakeholder groups have; producers seek profitability with access to resources while consumers seek local, safe & ethically produced food at an affordable price.

Though they have competing priorities, the overarching objective of food security can drive a shared responsibilities approach that generates greater reciprocity (beyond financial transactions) between the stakeholders.

NRM organisations are well placed to support this approach through the development of benchmarking and sustainability indicator tools that producers and consumers can utilise to identify and validate the adoption of sustainability practices in the areas of; food safety, food quality, environmental, social and economic performance on a shared use platform.

As consumers become better informed and engaged, the pull-thru impact of their decision making will drive greater market access and/or financial reward for more sustainably produced food and a more secure food future.

### **Peron Naturlaiste Partership - Regional Coastal Monitoring Program**

Craig Perry, Joanne Ludbrook  
*Peron Naturaliste Partnership*

The Peron Naturaliste Partnership is a group of nine local governments who have adopted a regional, collaborative approach to address climate change, including monitoring and management of the coastal zone from Cape Peron to Cape Naturaliste in southwest Western Australia. The Partnership is delivering an innovative regional Coastal Monitoring Program, covering approximately 210km of coast and estuarine areas. This will assist the Partnership and State and Local Governments to better understand the coastal dynamics and processes in the region and will improve response to erosion and inundation hazards. A standardised multi-level monitoring program was developed using the sediment cells as a base framework. The program was designed to be sustainable, encourage economies of scale, reduce duplication of effort and be adaptable to long-term or development change. Outputs from the first stage included development of a database input/export tool, an oblique aerial photograph dataset covering the PNP coast, guidelines for local government-focused monitoring and a ten-year Coastal Monitoring Action Plan with actions specific for each local government. The second stage which is implementation of the Coastal Monitoring Action Plan is being delivered with assistance from the University of Western Australia. Monitoring is being undertaken at

identified erosion hotspots within tertiary sediment cells utilising techniques including monthly beach width measurements, photo monitoring, bi-annual oblique aerial imagery, dune migration monitoring, flood frequency logging, and inundation extent mapping. The collected data will be included in an annual report that will include assessment of the results and assessment of the methodology and recommendations.

### **Involving Communities in Developing Coastal Risk Management Frameworks in Western Australia**

Craig Perry, Laura Stocker, Joanne Ludrook  
*Curtin University, Production Function, Peron Naturaliste Partnership*

Local Governments are required to make informed coastal planning and management decisions that need to consider often competing values in areas at current risk or projected to be at risk in the future. In order to effectively address current and future coastal hazards and risks, coastal planning in Western Australia, namely State Planning Policy 2.6 - State Coastal Planning (SPP2.6) requires that a risk management approach be adopted. A fundamental component of SPP2.6 is to consult with the community throughout the Coastal Hazard Risk Management and Adaptation Planning (CHRMAP) process which includes the identification and assessment of community values (Western Australian Planning Commission 2014). A number of coastal cities and towns in the south-west of WA have been identified as being at significant risk from the impacts of climate change (Damara, 2012). Furthermore, it has been observed in a number of projects (Damara 2016; GHD 2016) that the community as key stakeholders have not been effectively engaged in developing CHRMAP's. A research project is being undertaken by the Peron Naturaliste Partnership, Production Function and a Curtin Research Masters student to deliver a community focused coastal climate change study; Involving Communities in Developing Coastal Risk Management Frameworks in Western Australia. This project will address a current gap in literature and knowledge to identify how and what communities value in coastal areas and how these values may be impacted as a result of climate change. This information will inform the development of coastal hazard and risk management plans to manage coastal risks.

### **Measuring How Well Our Conservation Strategies are Working: Citizen Science Based Ecological Monitoring At Balijup Farm, Tenterden**

Anthony Peterson, Basil Schur  
*Green Skills*

Balijup Farm, a 921 hectare property near Tenterden is an important site in the implementation of the Forests to Stirlings' conservation action plan for the Gondwana Link Project \*.

A key question that a group involved in conservation needs to answer is: "Are the conservation strategies we are using having their intended impact?"

A monitoring framework has been developed at Balijup Farm, and is being refined, so that the most critical and practical methods to collect data and measure success against a range of conservation targets are employed.

The monitoring framework aims to:

- Deliver evidence-based information on how well our conservation strategies are working
- Demonstrate how citizen scientists can collect valuable data that complements and expands upon data collected by environmental science consultants

- Provide a portfolio of techniques, guidelines and procedures useable by citizen scientists at other conservation sites

\* References:

Environmental Monitoring at Balijup Farm & Fauna Sanctuary 2017

<http://www.greenskills.org.au/pub/balijup/env-mon.pdf>

Forests To Stirling Conservation Action Plan <http://www.greenskills.org.au/pub/gl/ncp.html>

Balijup Farm Land for Wildlife Report:

[http://www.greenskills.org.au/pub/balijup/Balijup\\_LFW\\_Property\\_Report.pdf](http://www.greenskills.org.au/pub/balijup/Balijup_LFW_Property_Report.pdf)

### **SALP - A TWENTY YEAR SUCCESS STORY**

Lisa Potter

*Perth NRM*

The Swan Alcoa Landcare Program (SALP) is a Community Grants Program funded by Alcoa of Australia and the Department of Parks and Wildlife and managed by Perth NRM. SALP aims to protect, restore and manage natural assets with consideration to a broad ecological context, by funding the community to enhance and restore critical habitat and ecological linkages within the Swan Region. The key objectives of the program are to retain or restore habitats, protect and enhance the quality of ground and surface water in the rivers and wetlands, and improve ecological linkages across the Swan region. Since the program's inception in 1999, the funding partners have contributed over \$7.98 million to 1,298 on-ground projects, engaging thousands of volunteers in protecting the Swan Canning catchments. Volunteers have contributed over 176,000 hours to projects, installed almost 2.4 million plants, revegetated more than 1,927 hectares and control weeds from 4,762 hectares of land. The 2018 round will mark the twentieth year for the program and is an exceptional and unique example of long term commitment to grass roots Landcare that has provided dozens of community groups with continuity of delivery across hundreds of sites, consistently focused on regional scale catchment management. The reliability of the program has been a critical factor in achieving significant environmental outcomes. It means community groups can plan larger or linked projects spanning multiple years and strengthen partnerships over the long term, allowing them to better leverage additional contributions or resources. A winning recipe for the environment.

### **Climate Planning in Local Government Authorities, South Coast NRM Region**

Melanie Price, Kaylene Parker

*Aurora Environmental, South Coast NRM*

The purpose of this study was to assess the current status of climate planning within Local Government Authorities in the South Coast NRM Region.

As Local Government Authorities are integrally linked to their communities, economic drivers such as agriculture and transportation are important in LGA considerations.

Our study demonstrates most LGA's are accommodating elements of planning for climate change in 'core business' areas such as waste management; energy efficiency; response to emergencies (storms, flooding and bushfire); water security; vegetation management; and policies to guide land use planning.

Key gaps identified include lack of State and Commonwealth policy direction and frameworks for adaptation, lack of funding, lack of technical advice and lack of knowledge in the community in relation to attributing impacts to climate change.

The report identifies opportunities for LGA's such as integrated bush fire management across the region, increased community and stakeholder awareness of climate change, shared adaptation strategies across regions, case studies to document successful initiatives and opportunities to share learning's between Local Government Authorities.

The findings of the survey have been provided to key stakeholders who assist LGA's in climate planning. This will help ensure that we can continue to target the needs of local government with clear processes and support to continue to adapt and plan for climate change.

### **Attracting Sharks to Cottesloe**

Sally Pyvis

*Speaking as private citizen (but I am a Cottesloe Councillor)*

Illegal shark fishing takes place on recreational swimming beaches in Cottesloe on a regular basis. There have been fatal shark attacks in Cottesloe. Is there a connection?

With a Local Beach Law and Fisheries regulations that prohibit shark fishing, Cottesloe is arguably the best protected Perth metropolitan beach in terms of legislation. So why isn't the law working? Cottesloe has been a Fish Habitat Protection Area (FHPA) under the WA Fisheries Act since 2001. So why isn't the community aware of the Cottesloe Reef FHPA? This community includes local residents, beach visitors, local government employees (including Rangers), elected members, local surf clubs, schools, the Cottesloe Police and university researchers. Is the solution increasing enforcement resources and introducing harsher penalties, or improving community education and awareness? Does Recfishwest have a role to play? There was a time when beach fishers in Cottesloe monitored each other. Is it as simple as allocating a budget for the Town of Cottesloe to improve signage, to train its Rangers and Sustainability Officer to be educators and to raise awareness of the issue through social media? Through stories of beachfront hostilities between shark fishers and angry residents and incidents of shark cruelty, this talk will explore best strategies for ending illegal shark fishing in the Cottesloe Reef Fish Habitat Protection Area.

### **Measuring community values of the coast in Western Australia**

Abbie Rogers, Dale Bastin

*Department of Planning WA*

Understanding community values is a critical element of Coastal Hazard Risk Management and Adaptation Planning (CHRMAP), particularly in terms of selecting adaptation options and trade-offs. This research project will develop a method for measuring the community values of the coastal areas of Western Australia during CHRMAP processes, with a particular interest in intangible values. Literature regarding economic and non-market valuation methods will be reviewed to identify methods that would most suit measuring coastal values in WA. Instruments and procedures will be developed and piloted for the method that is most suitable for application in WA. While the project is due for completion later in 2017, observations and findings from literature review and design of instruments will be presented.

## **Quantifying the intangible values of natural hazards**

Abbie Rogers, Fiona Gibson  
*The University of Western Australia*

Natural hazards, such as storm surge and bushfire, can cause significant damage to our State's natural resources. For NRM agencies, managing the risk of natural hazards requires an understanding of the costs and benefits of alternative management options which then allows decision makers to prioritise management effectively. The financial costs of natural hazard management are often large and are well documented. Less well documented are the social and environmental benefits of avoiding the damage from natural hazard events which can be even larger. These types of intangible values are often neglected in decision making because information about them is not readily available. Recognising the potential of these values to have an impact on how decisions are prioritised, as part of a Bushfire and Natural Hazards CRC research project, we have identified what types of intangible values are likely to be affected by natural hazards and their mitigation. We then extracted quantitative information about these values from the economic literature, which provides dollar estimates of the intangible costs and benefits related to natural hazards. The dollar estimates have been compiled in a 'Value Tool' database that makes information about these intangible values accessible to decision makers.

### **NRM's role in supporting the community; a case study of recovery after the Waroona bushfire**

Luke Rogers, Megan LeRoy  
*Peel-Harvey Catchment Council*

The January 2016 the Waroona/Yarloop bushfire swept across 70,000 hectares in the Peel-Harvey Catchment, including 38,000 ha of farmland. Impacts to the community, environment and agricultural productivity was significant. How could PHCC, with limited resources, meaningfully respond to a disaster of this scale? Through talking to key community members we promptly secured a farm property planning expert, Darren Doherty to provide advice through a 2-day workshop. Whilst very aware of their raw emotions, Darren guided the farmers to switch their thinking to look at their burnt out properties as a blank canvas on which to plan their future operations to maximise productivity and minimise inputs, while mitigating risk from future fires. The workshop brought together a like-minded group of farmers who shared their experiences during, and maintained contact after, the workshop. A second workshop with Darren was held a year later with participants from the first to share their journey a year on. In this presentation we describe our learnings from these workshops, the essential partnerships that were cemented with Local Government and other agencies, and how a number of additional activities to support farmers grew from this initiative. This included State NRM grants which provided a part-time NRM fire-recovery support officer, and on-ground funding to support farmers to undertake weed control, fence waterways and bushland and implement sustainable approaches to their farming enterprise. The project has now evolved into a package of works that provides meaningful community support and helps reduce the environmental impacts from a large-scale natural disaster.

## **Green Card Training: Setting a new standard for biosecurity hygiene management**

Katherine Sambrooks  
*Dieback Working Group Inc*

Phytophthora Dieback is a complex disease and one of the greatest threats to Western Australia's native ecosystems. It has a long history in Western Australia that is famous with plant pathologists around the world for the massive impact on our native ecosystems - more than 40% of plant species in south-west are susceptible. The Australian Government recognises the threat of Phytophthora Dieback to Australia's biodiversity in key federal legislation and has developed a Threat Abatement Plan (TAP) to address this disease. The TAP for Disease in natural ecosystems caused by Phytophthora cinnamomi identifies objectives and actions for addressing the threat including the development of a national training standard for on-ground operators. The Dieback Working Group (DWG) has sought to meet this need with the DWG Green Card Training Program™. The program, originally developed within the Department of Parks and Wildlife for internal training, was adopted by the DWG in 2013 and adapted it for delivery across tiers of Government and across a wide range of industries. The focus of the program on understanding Phytophthora diseases, their impact, responsibilities for management and demonstrating relevant biosecurity hygiene practices has made it an effective management tool for Phytophthora Dieback. Green Card has been run widely throughout the South West of WA, training hundreds of people from a wide range of organisations and industry types including Local Government, Mining and Community Landcare. We will be discussing the Green Card Training Program, how it works and how you can incorporate it into your management practices.

### **Telling Our Stories to the World: Using YouTube to promote South Coast eco-restoration projects.**

Basil Schur, Craig Carter  
*Green Skills, Earthrise Productions*

A local south coast group, Green Skills has partnered with a local film maker to produce and upload on Youtube short video documentaries that portray various citizen science and other south coast environmental projects.

Earthrise Productions has produced three such videos. This included "The Living Wetlands of Gondwana Link: caring for Wilson Inlet & its catchment". This documentary outlines the significance of this Inlet and its wetlands for Noongar culture, as a hotspot for migratory shorebirds, and as a good example of community action for the environment. This is available to see at <https://www.youtube.com/watch?v=80lyV7LP6hc>

Other Youtube videos focus on the citizen science program being run at Chingarrup Sanctuary near Boxwood Hill (<https://www.youtube.com/watch?v=EjC2QZKCjeY>) and on Balijup Farm and Fauna Sanctuary near Tenterden (<https://www.youtube.com/watch?v=oLaxA5Lc1Sc>). A fourth video is now in production focussing on the environmental value of the upper pools of the Margaret River, and the wetlands of the forested region of Gondwana Link including the Ramsar listed Lake Muir wetlands complex.

This presentation/paper will discuss the value of using Youtube as a means of promoting particular citizen science and other environmental initiatives across Gondwana Link, in the lower South West of WA.

## **Coastal Adaptation Planning and Implementation Project**

Dr Lucy Sheehy  
*City of Joondalup*

The City of Joondalup (the City), located in the northern suburbs of the Perth Metropolitan Area, includes 17 km of coastline that is highly valued and utilised by residents, visitors and the local community. Increasing erosion and inundation and future sea level rise has the potential to damage natural and built assets and may alter the way these areas can be accessed and enjoyed in the future.

The City of Joondalup's Coastal Adaptation Planning and Implementation Project has been developed and implemented to ensure future risk to the City's coastline is understood, local communities, affected property owners and stakeholders are informed of the potential risks, and a long term approach to guide the City's future coastal adaptation activities is identified.

The Project involves scientific components (coastal hazard assessment, geotechnical investigations, coastal monitoring), planning and development aspects (development of a local planning policy), community and stakeholder engagement and the establishment of a long term approach for coastal adaptation planning within the City.

As part of the Project an extensive information and engagement campaign was undertaken to ensure the community, affected property owners and stakeholders were informed about potential impacts from coastal hazards and the implications of SPP 2.6. Through targeted and well-timed information, and by providing opportunity for residents to further engage, the City was able to minimise the level of concern and alarm in the community.

This presentation will share the experiences, challenges and lessons learnt from the implementation of the City's Coastal Adaptation Planning and Implementation Project.

### **Strong & Proud – Wumbudin koul-ye-rah, after school recreation program for Aboriginal youth**

Graeme Simpson  
*South Coast Natural Resource Management Inc*

The Strong & Proud, Wumbudin koul-ye-rah, program provides disengaged Aboriginal youth between the ages of 12-17 years old, with culturally appropriate activities that connect them to their culture and country. Based in Albany, the after school program involves Aboriginal youth in sport and active recreation, cultural and environmental activities with the assistance of mentors and Aboriginal Elders. The Strong & Proud program has been developed around the 6 Noongar seasons and locations where Aboriginal people would have traditionally moved. The program is built on the foundation that being strong in culture and connection to country assists Aboriginal youth to have pride in themselves and their community. The Strong & Proud program has been developed through a highly successful pilot project in 2014 and 3 subsequent projects refining the program in 2015, 2016 and 2017 with strong community partnerships. Over 140 Aboriginal youth have been engaged in the program. They have benefited with improved school attendance, increased cultural awareness, identity, self-esteem, well-being and connection to community along with improved health outcomes due to increased physical activity and greater awareness of healthy eating. This exciting program is enabling South Coast NRM to gain ground in engagement with the local Aboriginal community.

## **The real lowdown on running a community NRM project**

Deb Slater-Lee  
*State NRM Program*

Working with the Western Australian and Australian Governments since 2003 the State Natural Resource Management (NRM) Office has coordinated the delivery of natural resource management in the state. With over 850 projects funded by the Western Australian Government's State NRM Program since 2009, there are amazing stories of outstanding work, passionate individuals and groups, and best of all – the winner has been the people and environment of Western Australia.

The State NRM Program has enabled WA community and volunteer groups supporting capability improvement and the provision of resources to achieve on-ground work.

Diverse environments - coastal and marine; agricultural, pastoral and urban; river and estuarine; natural bush; sustainable farming and wildlife sanctuaries - have been conserved and restored through their activities.

Community groups working in their local environment have great ideas and inspiration to share and this session will invite recent grant recipients to recount the highlights and insights of their projects. Telling their story through pictures, the case studies will focus on the incredible effort and influence that volunteers, local community groups and youth bring to the NRM space – and their hopes for a better future.

To find out more about these groups and their projects, the short presentations will be followed by a facilitated discussion panel featuring the presenters and providing an opportunity for the audience to ask questions. Panel members will be invited to explore the challenges, barriers and benefits of their projects; and the importance of the support of and partnership with the State NRM Program.

### **The constant companion and partner**

Deb Slater-Lee  
*State NRM Program*

Established in 2003 the State Natural Resource Management (NRM) Office was tasked by the Western Australian and Australian Government to facilitate the coordinated delivery of natural resource management in Western Australia.

The State NRM Program team is currently responsible for coordinating and supporting the delivery of the Western Australian Government State Natural Resource Management Program (the Program). With a strong customer service ethic, the Program supports community and volunteers to deliver outstanding NRM outcomes by on-ground works for local environments.

Community groups, local governments, regional NRM groups and state agencies have all benefited from the Program and its grants and the assembled results are remarkable. Since 2009, more than 850 NRM projects supported through over \$87 million of grants have been delivered.

And now?

Delving into the Program, this facilitated session will share and investigate the evolution of the program's focus from exclusively on-ground activities towards building community capability with on-ground works as an ultimate outcome.

This fun and informal interactive session will use technology to allow the audience of NRM and coastal professionals and volunteers to give real time input in shaping the next stage of the State NRM Program: for empowered, educated community groups who can undertake better on-ground works for great NRM outcomes in WA.

### **Australian Marine Debris Database Upgrade**

Walter Smith, Heidi Taylor  
*Tangaroa Blue Foundation*

The Australian Marine Debris Initiative Database has been collecting and housing data from Australian clean-ups since 2004. Over 8 million items have been cataloged by 80 281 citizen scientists across 2250 sites throughout Australia and its offshore islands. It is the longest running, largest and most comprehensive database of its kind in Australia. Recently, the AMDI Database has undergone a major upgrade and facelift thanks to funding from the Great Barrier Reef Marine Park Authority through Reef Trust and Sustainability Victoria.

NRM staff, citizen scientist and government agencies are important stakeholders and key contributors to the AMDI Database. Working on their own computers, this workshop will help participants register and guide them through using the new interface, interactive map and improved identification categories as well as the data access portal to assist database contributors to access their data and reports.

### **Innovative approaches to engaging the Aboriginal community and supporting Indigenous business in natural resource management on the south coast of WA**

Chris Spurr  
*South Coast Natural Resource Management*

Aboriginal people living in the south coast region of Western Australia face two challenges: their disconnection from country and culture, and a weakened capacity to engage in the economy. South Coast NRM Inc. has developed innovative approaches to address these issues. Being strong in culture with a healthy connection to country develops self-esteem and pride. This assists to develop skills to participate and contribute in mainstream society.

South Coast NRM Inc. has developed an Aboriginal employment guideline tool that articulates strategies to improve engagement and employment of Aboriginal people within the natural resource management sector.

We will examine three business streams that emphasise innovation in Indigenous business opportunities.

1. Environmental services
2. Cultivation of Traditional Ecological Knowledge species
3. Cultural tourism

Our integrated approach to enterprise development in all phases of the business cycle enables targeted and timely support driven by the Aboriginal community. Initial stages involve consultation and analysis of the communities' aspirations, expectations and the skills needed to make these dreams a reality. A growing number of approaches are incorporated in our business support services including:

- mapping existing business support agencies and programs;

- business forums;
- individual business planning;
- targeted training and mentoring;
- cultural tour guide training program; and
- sponsorship of Aboriginal people to attend business conferences and forums.

This approach is enabling the Aboriginal community to improve their engagement, education and employment in the natural resource management sector with successes presented through videos and case studies.

### **Coastline movement datasets for WA**

Timothy Stead

*Department of Transport*

Various coastal local governments in Western Australia are looking to a process called Coastal Hazard Risk Management and Adaptation Planning (CHRMAP) to effectively plan for and manage current or future hazards along their respective coasts. One of the requirements to achieve an effective CHRMAP process is to abide by recommendations under the State Coastal Planning Policy (SPP 2.6), which directs appropriate considerations for future planning in the coastal zone. One of several planning requirements in SPP 2.6 is to consider historic fluctuations of shoreline position (coastline movements), when creating allowances for development. Understanding historic movement of the coastline requires a considerable aerial imagery record and creation of a key dataset called the coastal vegetation line. This line generally represents the interface between coastal vegetation and the back beach; analysis of this line's variable spatial and temporal position provides a useful approximation for coastal erosion or accretion trends. While the importance of such a dataset is clear for management and planning purposes, the availability of complete coastline movement records was ad hoc and inconsistent across WA. Recent efforts by DoT aim to provide a more complete record of the vegetation line over time and space for >90% of WA coastal settlements, including recently identified coastal erosion hotspots. Creating this record is a substantial task entailing data capture and aerotriangulation needs over a wide range of imagery from 1940 to present. This presentation will detail the processes behind the project alongside implications for coastal managers when this dataset becomes available.

### **Direct seeding works! – a look at large-scale restoration on the South Coast of WA**

Glen Steven, Barry Heydenrych

*Greening Australia*

Greening Australia and partners have been undertaking direct seeding to restore landscapes in Gondwana Link on the South Coast of WA for a number of years. In the past, successful direct seeding of native vegetation was mainly confined to better quality soils such as gravels and loams, and tricky soils such as clays and deep sands were revegetated with seedlings, as direct seeding proved difficult in these soils. Following trials with new equipment, techniques and seed mixes, Greening Australia is currently able to get successful establishment of direct seeding in a range of soils including clays and deep sands. We report on some of our recent successes with direct seeding hundreds of hectares on the South Coast of WA.

## **Professor Lindsay B. Collins: Rock Legend. A Review.**

Alexandra Stevens  
*Curtin University*

Professor Lindsay Collins was a distinguished coastal and marine geoscientist, with an international reputation as an expert on the sedimentology and marine geology of Western Australia's coastline and offshore seabed. Much of his research focused on Shark Bay, the Rottneest Shelf and the coral reefs of WA, including the Abrolhos, the Rowley Shoals, Ningaloo and, most recently, the Kimberley.

Lindsay was always very aware of his work being relevant to management and current issues, focusing on research that would assist coastal and marine managers and stakeholders. He took a holistic view, and often liked to remind people that without an understanding of what the coastal and marine environment is sitting on and made up of geologically you're missing the bigger picture. Lindsay also had a gift for making the impossible possible. He collected sediments along the Rottneest shelf for his PhD from a sailboat, ran seismic on Scott Reef in a tinny, cored the crest of the Ningaloo Reef, and led a ground-breaking mapping, coring and seismic program in the pristine, and relatively unstudied, Kimberley.

He was a man ahead of his time, an enthusiastic and highly respected teacher and supervisor with an unquenchable thirst for knowledge, whose love of the coast and the ocean never left him. His research significantly increased knowledge of the geology, geomorphology and ecosystems of Western Australia's coastal and offshore region and this reflection on his work aims to highlight those achievements and the future of his research.

Lindsay passed away in 2015.

### **Coastal Erosion Hotspots in Western Australia**

Tanya Stul, Matt Eliot, Ian Eliot, Bill Andrew, Rhian Wardley  
*Seashore Engineering*

State-wide examination of coastal erosion threat was undertaken to evaluate the spatial extent and scale of management costs required around Western Australia for the next 25 years. Erosion hotspots were identified, where erosion hazard is expected to impact public and private assets, needing management action or adaptation.

For 55 locations, assets and recreational activities threatened by erosion were evaluated. Assets that may be at risk included roads, leasehold assets, services/utilities, private property and recreational assets. Change to erosion hazard over time was considered by using three scenarios, distinguishing between imminent threat, expected threat based on existing trends and potential threat, including the effects of projected sea level rise. In many of the hotspots, existing defence structures influenced coastal trends, including downdrift erosion.

Understanding how the assets at risk varied over time supported high-level assessment of management options for each location within the Western Australian Planning Commission adaptation hierarchy of 'Avoid-Retreat-Accommodate-Protect'. Thresholds for the perceived effectiveness of each management strategy were considered, identifying simple monitoring suitable for triggering shifts in management. For the identified hotspots, 'Protect' has been the main strategy practiced to date, with 'Retreat' now being recommended for many medium-term applications if downcoast transfer effects are to be avoided.

Local foreshore managers were surveyed to assess operational constraints to coastal management. The main constraint identified was insufficient funding to implement coastal planning mechanisms and erosion mitigation techniques.

### **WALIS Marine Group and how we can help respond to Data needs.**

Ralph Talbot-Smith  
*Department of Transport*

WALIS Marine Group (WMG) is made up of a number of State Government agencies who generate or use Coastal & Marine datasets. The WMG has been actively involved in coordinating joint funding for projects such as bathymetric Lidar Surveys over areas of the WA Coastal Waters. During this presentation we will be making conference participants aware of WMG's goals and projects. The aim is to actively encouraging Local Government and NRM participants to become active members of the WMG to enhance data sharing and avoid data duplication across the state. This will also act as a technology advancement share point for all of those involved in the Coastal and Marine environment.

### **Developing the Flexible Adaptation Pathway - Cockburn Sound Coastal Adaptation Plans**

Colleen Thompson, Bill Grace  
*GHD, Australian Urban Design Research Centre*

Traditional approaches to developing coastal adaptation plans compare the options of 'accommodate', 'defend' and 'retreat' based on projected vulnerability within a 100 year planning timeframe. This approach neglects the reality that sea levels may rise beyond that timeframe. Accordingly, retreat will become inevitable in areas currently identified as vulnerable. Option comparisons should therefore articulate that 'accommodate' and 'defend' measures are interim and delay eventual retreat. As the timing of coastal risk scenarios is uncertain, a flexible strategy is necessary. This was a key consideration in Stage 3 (Coastal Adaptation Plans) of the Cockburn Sound Coastal Vulnerability & Flexible Adaptation Pathways Project with the Cockburn Sound Coastal Alliance. The outcome was the definition of the flexible adaptation pathway.

The flexible adaptation pathway is a trigger-based planning process that couches decisions within a long-term approach. Triggers are defined: the point at which risk to a value/asset shifts from tolerable to intolerable. The pathway promotes adaptation decisions being made within a reasonable (15 year) planning horizon of the trigger, enabling decisions to be made based on community values of the time. The pathway articulates that adaptation decisions are not permanent, and triggers will reoccur in future, triggering the need for new – possibly different – decisions. Importantly, the pathway recommends that local and state government undertake an ongoing strategic planning process that maintains and prepares for future avoid and retreat decisions to enable ongoing flexibility in adaptation. Through the strategic planning element of the pathway, resilience is built into planning processes and coastal settlements.

### **Coastal oceanography for life guards and beach lovers: Development and application of a mobile phone app for swimmer safety**

Arnold van Rooijen, Roderik Hoekstra  
*Deltares Australia, Deltares Netherlands*

The beach has always been a major attraction for people to spend their free time, and many beachgoers enjoy spending some time in the water. However, the ocean is a highly dynamic environment, and the local conditions (e.g. rip currents, waves) may vary greatly over relatively short

periods of time. Therefore, swimmer safety is traditionally one of the major concerns for local governments and life guards.

In 2011 a mega-nourishment was constructed at the Delfland Coast (the Netherlands). The size of the nourishment raised public concern with regard to swimmer safety, and this motivated the development of an information platform to support the local lifeguards in their work. In order to predict the ocean currents, a numerical model was developed. To ensure easy access for the lifeguards and general public, it was chosen to couple this model to a mobile phone application. The app is currently being used on a daily basis and includes predictions of ocean currents, beach width and beach population density. Yearly evaluation sessions with the board of lifeguards turned out that this is the optimal way of presenting information for the purpose of swimmer safety: clear, low-profile in use, up-to-date and reliable.

The generic setup and the global availability of numerical models and other data sources provide great opportunities to extend the application in functionality and to other regions in the world.

### **Assigning Likelihood in the CHRMAP Context**

David van Senden, Jo Buckee  
*Cardno, Cardno*

One of the challenges for application of the State coastal planning policy 2.6 and preparation of Coastal Hazard Risk Management and Adaptation Plans (CHRMAPs) is selection of data and modelling methods underpinning the characterisation of hazards. Despite prescriptive definition of storm events based on probability of annual occurrence, there is considerable room for interpretation around how this is executed and translated into the risk assessment framework.

This brief presentation outlines Cardno's standard approach to dealing with the concepts of frequency, probability and likelihood when undertaking CHRMAP assessments in relation to relevant guidance.

### **Beyond CHRMAP, Roles and Responsibilities for Coastal Adaptation Implementation As Identified for Southern Metropolitan Perth**

Doug Vickery  
*Cityof Cockburn*

Commencing well before the State Coastal Planning SPP2.6 guidelines and CHRMAP processes becoming the norm, the Cockburn Sound Coastal Alliance (CSCA) embarked on a project to identify the vulnerability of the Cockburn Sound and Owen Anchorage coastline to inundation and erosion from coastal processes influenced by climate change induced sea level rise and to develop adaptation actions in response. Over nine years the CSCA has moved through (1) assessing coastal vulnerability taking account of metocean processes, sediment movements and geomorphological factors influenced by climate change; (2) 'valuing' those areas at risk from economical, social and ecosystem services perspectives; and (3) undertaking adaptation option assessment both direct stakeholder and subsequently with wider community input. This has produced a set of staged, event triggered, adaptation action recommendations for each of the 'coastal compartments' between Fremantle and Point Peron in the City of Rockingham. The paper and presentation specifically draws attention to the limitation on what the Local Government Authorities alone can do to implement these Adaptation Plan recommendations and what will be needed from State Government and its agencies via coastal planning legislation, zoning, funding for land acquisition, sand and rock resource security and

coordinated agency and industry infrastructure relocation to facilitate the retreat strategies identified as being the best long term strategy. The identified governance and land management responsibilities are relevant elsewhere, highlighting what we all collectively will need across the levels of government and private interests to adequately move past plans into actual adaptation plan implementation.

### **Want Moore wildflowers?**

Rachel Walmsley

*Moore Catchment Council*

This poster will be a colourful feast for the eyes ! The Moore catchment has the most spectacular array of wildflowers which many people don't know exist. MCC is focused on sharing Moore wildflower wonders with the public to achieve a better appreciation of the natural habitat by land managers including farmers, Shires and state planners. Luckily MCC has a keen wildflower photographer who has captured thousands of images and will share around 300 of them in a poster collage.

MCC believes that eco-tourism is a key player in increasing the public's appreciation of the natural environment and also an additional reason to conserve the remnant vegetation. MCC will feature our Moore shire Eco walk trails booklet which shows the general public and local community places to walk in nature and what wildflowers they will see. This has been a brilliant resource already and MCC seeks further funding for eco-trail booklets for other shires.

### **Moore Native clearing by stealth**

Rachel Walmsley

*Moore Catchment Council*

Poster will be about native clearing in the Moore catchment and around the state. This is a hot topic right now and needs more exposure. In the Moore catchment there has been a number of different native clearing issues recently including roadside vegetation removal by Shire and landholders, paddock tree removal and clearing in Shire managed reserves. This clearing by stealth is making a huge impact on the health of the natural ecosystems by further fragmenting habitat and also depleting eco-tourism opportunities which is on the increase in WA. The poster will address the balance between agriculture, eco-tourism and healthy ecosystems.

MCC recently organised a clearing information day which was well attended from people from inside and outside the region. There is frustration and confusion over the current native clearing laws. Speakers included the Environmental Defenders Office and Eddy Wajon helped make sense of the laws and offered practical ways to keep remnant vegetation. Some of this information will be shared on the poster. There is also a need for more Shire decision makers to become more informed of the importance of the native vegetation and the birds and animals it supports.

MCC will also print an A4 handout for the conference attendees of the poster information.

### **Harnessing innovative financing mechanisms to conserve Australia's natural capital**

Adrian Ward

*Wentworth Group of Concerned Scientists*

Every five years the government releases a State of the Environment report, which describes the health of Australia's environment. Each report, since the first was released 20 years ago, has concluded that while air and water quality in our major cities has improved, across vast areas of the Australian continent many of the nation's environmental assets (soils, native vegetation, rivers,

estuaries and habitat for threatened species) are still in a poor condition, and are continuing to deteriorate. While government provides some financial support to address the pressures on the Australian landscape, it has never been enough to halt this degradation, let alone reverse it. Within 20 years, economic growth driven by the Asian Century will produce a new middle class of over 3 billion people, one hundred times greater than the entire population of Australia. This will place even greater pressure on Australia's land, water and biodiversity assets. If we are to maintain a strong economy, built on our nation's natural endowments, we must find new ways to incentivise landholders, across the country, to adopt sustainable land management practices and repair Australia's landscapes. Impact investing, green infrastructure asset development, climate finance, green bonds, nutrient and carbon trading are no longer fringe investment opportunities – rather, they represent innovative and scalable finance solutions which are likely to play a significant role in regional natural resource management.

### **Keeping 4WD tracks open in WA**

Graham Weber

TCWA

Four-wheel drive recreation is one of the fastest growing forms of recreation in WA. Evidence from overseas indicates unmanaged motorised recreation is one of the four largest threats to national parks. Impacts include soil compaction, erosion and disease. Track Care WA Inc has documented similar impacts in the Wandoo NP, located about 80 km east of Perth. The evidence recorded includes unplanned roads, soil erosion, degradation in water quality, destruction of habitat, spread of invasive species and conflict with non-motorised user. One location in Wandoo NP that has received a considerable amount of impact from motorised recreation is Big Darkin Swamp where it is crossed by Piggery Road resulting in numerous unplanned tracks. Another location is Deefor Wetland, which is one of a small number of locations supporting a rare trigger plant *Stylidium asymmetricum*. Deefor Wetland was identified as the priority management area of these two sites. A partnership was formed between Track Care WA Inc and the Motor Traders Association to develop two projects to address the motorised recreational impacts at these sites. These projects were actively supported by DPaW. We believe that partnerships between community groups, industry groups and land managers is one way to protect our natural resources when public monies are becoming increasingly scarce. This presentation highlights the on ground works undertaken to date and introduces possible alternative methods of achieving better natural resource management of areas used for four wheel drive recreation.

### **The Key Ecological Principles Workshop for Wheatbelt Landholders and NRM Managers: Swarming the Issues of Climate Change, Habitat Fragmentation and Species Loss**

Dennis Williamson, David Jones

*Deakin University (Faculty of Science Engineering & Built Environment, School of Architecture & Built Environment)*

Recent doctoral research at Deakin University in Victoria has sifted past ecological research to identify 16 key ecological principles (KEPs) for Australian flora and fauna habitat in the wheatbelt regions of from Queensland to Western Australia. Habitat fragmentation and climate change, threaten the loss of 20-50% of Australia's flora and fauna species within the next 50 years. Fourteen percent of Australia is comprised of intensive wheatbelt regions. Climate change also threatens wheatbelt farmers. They

have lost 27% of per/ha/yr. crop yields since 1990. Do these production landscapes hold the key to better balance between agriculture and ecology? Do we have time to wait for further ecological research? Is there must a quicker and better way? Wheatbelt landholders and NRM managers will discuss specific questions regarding their natural resource values; environmental services; current agricultural/NRM practices; and adaptations to changes in climate and weather patterns. They will also learn how over 200 wheatbelt farmers and NRM managers responded to these same issues to influence the refinement of a set of KEPs that may provide 16 ways in which we can more rapidly respond to landscape scale habitat fragmentation, climate change and species loss, while accommodating wheatbelt agricultural practices. Participants will swarm like bees over the problems and take away new knowledge and ideas for KEPs on how such principles can be put into action on the ground on their farms and in their regions.

### **Landcare by Stealth**

Paulina Wittwer

*Carnamah Landcare Group LCDC*

4. Successful Engagement - community - local.

2012. Carnamah LCDC was at an all time low. Members were well-respected farmers, an elite group, now busy adapting to change on their increasingly larger farms. Only an AGM each year, to keep the books straight, kept it ticking.

2013. An opportunity arose.

"Centennial Celebrations for Carnamah district'.

An idea for a land history poster was borne. "100 Years of Farmland management in the district."

Photos were called from the community - from dusty old albums, sheds and grandfathers. Minutes were scoured, state libraries visited, old-timers interviewed.

The landscape, key events & pivotal years were documented and stood proudly alongside community sporting achievements at the 100 year celebrations The community got to see the heritage of their land. Posters were sold to farming families many with their forefathers names now in print and shaping the district.

Then we got cracking. More projects. More community groups approached. District High School, Historical Society and Museum, North Midland Agricultural Show, Carnamah Shire, Art Show, and latterly, Lions and Crafts.

We imparted our knowledge of local trees and where best to plant them, landscaped public areas, we talked of soil profiles, What Bird Was That? articles, and sent biographies and stories from early trailblazers to local papers so the past would not be forgotten.

We adopted the name Carnamah Landcare Group LCDC which made it accessible to all.

We now have presence in the community. Five women on the committee. Also, still retained, three older, wiser farming dads and in some cases their sons.

We wear our LCDC 'badge' with pride but we've morphed into a viable, approachable, GoTo group which gets asked to join in with others. In five years we've come through, sometimes controversially but in the end, with flying colours.

## **Evolving Engagement**

Natarsha Woods

*Wheatbelt Natural Resource Management*

Over the last few years there has been a growing body of research that has described a pattern of decreasing involvement in community or civic groups both in the environmental areas such as landcare/NRM and more generally. . This has been attributed to:

- The community becoming more 'time poor'
- Administration burdens associated with Government Funding
- Intergenerational change in expectations of community groups
- Lack of diversity in volunteering opportunities
- Declining populations in regional areas
- Funding models in NRM

So what does this mean for community involvement in natural resource management? Wheatbelt NRMs headline strategy is "By 2018 have 25% of the Wheatbelt community actively improving the environment of the Wheatbelt through our multi-disciplinary project strategies and programs". How are we tracking against this in an environment of declining volunteerism?

In this presentation I will look at the patterns we are seeing in the Wheatbelt in terms of the changing nature of engagement, what we think are the reasons for it and how we are adapting our approach to this reality to ensure that community engagement in NRM is alive and well now and into the future.

### **Case study of Elastocoast based open porous coastal revetment against typhoons in Korea**

Henry Yin, SeungHun Lim

*BASF Australia Ltd, BASF South East Asia Pte Ltd*

Performance of Elastocoast based open porous coastal revetment was monitored with comparison to other types revetments built on the same site in Gagye, South Korea. The revetment has weathered 12 typhoons since the first installation in 2011.

Instead of using concrete or boulderstone, Elastocoast bonds rocks and aggregate into a porous yet stable structure that absorbs wave energy. This prevents damage to the revetments and reduces wave run-up.

Gagye project is one of the first Elastocoast projects in Asia after it was developed in Europe. Revetment is extremely important to protect local abalone seed farming business which needs not only protection against harsh coastal condition but also to be environmental friendly. Elastocoast was verified by series of toxicity and biology tests. Three different concrete revetment designs were constructed side by side with Elastocoast based revetment. Real time visual monitoring by CCTV was prepared, sediment size and terrain analysis were performed for the observation of sediment movement on wave energy changes.

Within 2 years after installation, 4 big typhoons attacked this area. Three other concrete base revetments were partly or fully destroyed, while Elastocoast revetment remained no damage. Five geographical surveys were conducted for topographical changes, Elastocoast revetment area showed

relatively more sediment while other concrete revetments areas showed erosion. The particle size of sediment near Elastocoast revetment was found of smaller size than that of other revetments which suggested effective wave energy reduction by Elastocoast revetment.

## INDEX

|                    |        |                         |        |
|--------------------|--------|-------------------------|--------|
| Abbie Rogers       | 45, 46 | Henry Yin               | 58     |
| Adrian Ward        | 56     | Jean Palutikof          | 41     |
| Alan Briggs        | 8      | Jen Mitchell            | 36     |
| Alan Briggs,       | 8, 9   | Jim Churchill           | 15     |
| Alex Cowdery       | 16     | Joanna Garcia-Webb      | 23     |
| Alexandra Stevens  | 52     | Joanna Hugues-Dit-Ciles | 27     |
| Anika Dent         | 20     | Joanne Ludbrook         | 30, 31 |
| Anthony Peterson   | 43     | Julia Cullity           | 17     |
| Arnold van Rooijen | 54     | Karl Bischoff           | 4      |
| Asha McNeill       | 34     | Katherine Sambrooks     | 47     |
|                    |        | Kathleen Broderick      | 11     |
| Barry Heydenrych   | 26     | Kathy Dawson            | 19     |
| Basil Schur        | 47     | Keith Bradby            | 6, 7   |
| Ben Bassett        | 2, 3   | Keith Pekin             | 42     |
| Bianca McNeair     | 34     | Kieran Massie           | 32     |
| Brett Dal Pozzo    | 18     | Kim Benjamin            | 3      |
|                    |        | Lee Fontanini           | 23     |
| Carolyn Bloye      | 5      | Linda Metz              | 34     |
| Charlie Bicknell   | 4      | Lisa Potter             | 44     |
| Chris Spurr        | 50     | Lizzie King             | 28     |
| Colin Johnson      | 28     | Loiuse Duxbury          | 21     |
| Colleen Thompson   | 53     | Luke Rogers             | 46     |
| Craig Perry        | 43     | Lynda Braddick          | 7      |
| Craig Perry,       | 42     |                         |        |
|                    |        | Martin Heyting          | 26     |
| Damian Grose       | 25     | Maryke Gray             | 25     |
| David Broadhurst   | 10     | Matthew Clark           | 15     |
| David Collard      | 16     | Melanie Price           | 44     |
| David Hancock      | 26     | Michael Norman          | 40     |
| David Milroy       | 36     | Mick Davis              | 18     |
| David van Senden,  | 54     |                         |        |
| Deb Slater-Lee     | 49     | Naomi Edwards           | 22     |
| Dennis Williamson  | 57     | Natarsha Woods          | 58     |
| Doug Vickery       | 54     | Nic Dunlop              | 20, 21 |
| Dr Lucy Sheehy     | 48     |                         |        |
| Dylan Gleave       | 24     | Paul Cozens             | 17     |
|                    |        | Paul Day                | 19     |
| Garry Middle       | 35     | Paulina Wittwer         | 57     |
| Gaye Mackenzie     | 31     | Peter Nash              | 39     |
| Gemma Bertrand,    | 3      | Piers Higgs             | 27     |
| Giada Bufarale     | 12, 13 | Pip Marshall            | 32     |
| Glen Steven        | 51     |                         |        |
| Graeme Simpson     | 48     | Rachel Walmsley         | 55     |
| Graham Weber       | 56     | Ralph Talbot-Smith      | 53     |
| Greg Fisk          | 22     | Robyn Cail              | 14     |
|                    |        |                         |        |
| Hamish Longbottom  | 29     | Sally Pyvis             | 45     |
| Harriet Paterson   | 41     | Sam Bishopp             | 5      |
| Helen Bryant       | 12     |                         |        |

|                 |    |                       |    |
|-----------------|----|-----------------------|----|
| Sandra Boulter  | 6  | Timothy Stead         | 51 |
| Sarah Molloy    | 37 |                       |    |
| Sharon McArthur | 33 | Vanessa McGuiness     | 33 |
| Sharon Munro    | 38 | Verity Morgan-Schmidt | 37 |
| Stuart Barr     | 2  |                       |    |
|                 |    | Walter Kolb           | 29 |
| Tanya Stul      | 52 | Walter Smith          | 50 |
| Tegan Clarke    | 15 |                       |    |