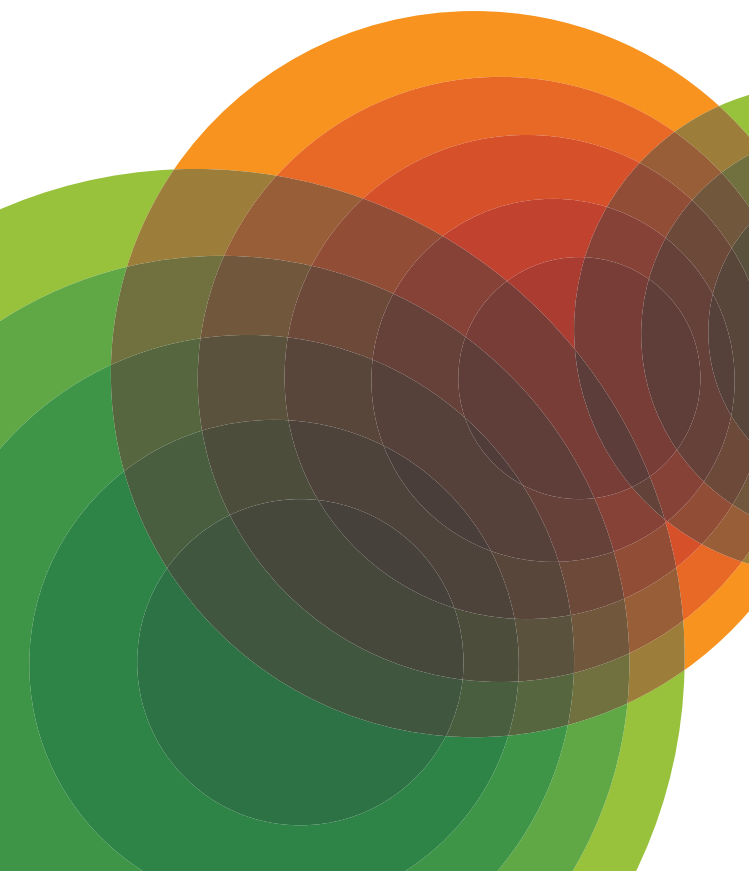


Revegetating the Regions

The 2018 Revegetation
Industry Association
of WA Seminar



DAY 1 PROGRAM

Thursday 6 September

08:30 – 09:00	Registrations
Peel / Guidelines	
09:00 – 09:15	Welcome to Country – Harry Nannup
09:15 – 09:30	Welcome and RIAWA Progress Update – Dr Markus Mikli, RIAWA Chairperson
09:35 – 10:05	Tuart Woodland Restoration – a community-led, partnership approach – Kim Wilson, Peel-Harvey Catchment Council
10:10 – 10:30	New Guidelines to Preparing Revegetation Plans for Clearing Permits – Mathew Gannaway, DWER
10:30 – 11:00	MORNING TEA
Award for Excellence in Revegetation	
11:00 – 11:10	Finalists introduced by Christine Lison
11:10 – 11:30	From Blue Gum Monoculture to Biodiverse Wetland (with some mining in between) – Greg Overton, Cristal Mining Australia Ltd
11:35 – 11:55	Melaleuca Park Offset – Damian Grose, Tranen Revegetation Systems
12:00 – 12:20	Wentworth West Wetlands – Matt Vinkovich, Natural Area Consulting Management Services
12:20 – 12:30	Presentation of Award by Dr Markus Mikli
12:30 – 13:30	LUNCH
South West / Metro	
13:30 – 13:40	Introduction by Brook Devine
13:40 – 14:00	Main Roads WA Coalfields Highway Projects – Alan Grist & Tim Batt, Main Roads WA
14:05 – 14:25	Variable Establishment of Jarrah and Marri following Bauxite Mining – Tai White-Toney, University of Notre Dame
14:30 – 14:50	Key Findings of the Banksia Woodland Restoration Project – Dr Mark Brundrett, DBCA
14:50 – 15:20	AFTERNOON TEA
Wheatbelt / Great Southern	
15:20 – 15:30	Introduction by Dallas Lynch
15:30 – 15:50	Opportunities for Biodiverse Sandalwood Reforestation through Carbon Farming – Ray Wilson, Carbon Neutral Charitable Fund
15:55 – 16:15	From Revegetation to Restoration in Gondwana Link – Keith Bradby, Gondwana Link
16:20 – 16:40	Scaling up restoration, scaling down costs: an examination of direct seeding and its role in landscape-scale restoration in the Great Southern, WA – Barry Heydenrych, Greening Australia WA
16:45 – 16:50	DAY ONE CLOSE – Dr Markus Mikli
18:00 – 21:00	Dinner (optional extra)

DAY 2 PROGRAM

Friday 7 September

08:30 – 09:00	Registrations
Regulations	
09:00 – 09:10	Welcome and Introduction by Damian Grose
09:10 – 09:50	Development of the Biodiversity Conservation Regulations – Dr Ken Atkins, DBCA
09:50 – 10:05	Questions on Regulations
10:10 – 10:30	Regulating Rehabilitation on Mine Sites in WA – Dr Danielle Risbey, DMIRS
10:30 – 11:00	MORNING TEA
Seed / Goldfields	
11:00 – 11:10	Introduction by Dr Peter Golos
11:10 – 11:30	Seed is our Gold – Lisa McCreery, Chatfields Tree Nursery
11:35 – 11:55	Rehabilitation review of waste landforms at Southern Cross Operations – Vanja Sekizovic, Minjar Gold
12:00 – 12:20	Rehabilitation Monitoring Using Drones and Remote Sensing – Case Studies, Field Validation and Lessons Learned – Sam Atkinson, Astron
12:20 – 13:20	LUNCH
Mid West	
13:20 – 13:30	Introduction by Ben Croxford
13:30 – 13:50	Revegetation Practice Improvements in Kwongan of the Mid West – Mark Dobrowolski, Iluka
13:55 – 14:15	The Large Scale Translocation of Two Declared Rare Flora Species at the Mt Gibson Ranges – Matthew Hamilton, Mt Gibson Mining
14:20 – 14:40	Pelleted Seeds as an improved method for application of native Australian seeds in an arid environment – Tony Pekin & Alan Savage, Nurture Revegetation
14:40 – 15:10	AFTERNOON TEA
Pilbara / Kimberley	
15:10 – 15:20	Introduction by Alex Growden
15:20 – 15:40	Identification of vegetation community with the potential to revegetate mine wastes at the Nifty mine site, Great Sandy Desert, WA – Dr Peter Golos, BGPA
15:45 – 16:05	Revegetating Mayi Budan – working with Aboriginal Ranger groups to restore endangered Monsoon Vine Thickets of the Dampier peninsula – Kylie Weatherall, Environs Kimberley & Devena Cox, Nyul Nyul Ranger
16:10 – 16:30	Revegetation of the Pardoo mine: planning to execution to monitoring – Stacey Gregory, Mine Earth
16:35 – 16:40	SEMINAR CLOSE – Dr Markus Mikli

Speaker Profiles

Thursday 09:15 - 09:30



Dr Markus Mikli

Markus has been involved in the revegetation industry for over 16 years. He first worked as a contractor, supervising revegetation projects and directing work teams in planting, broadcast seeding weed control and collecting and supplying native seeds. Markus now works as a consultant, developing plans and assessing revegetation and weed control programs. He has been the project manager for a wide range of environmental impact assessments and management plans, particularly in revegetation, soft landscaping and weed control.

Markus has completed extensive studies in the fields of environmental science and business management, focusing on restoration practices, terrestrial ecology and small business management. His Postgraduate Diploma thesis was on the ecology of perennial grasses of the Fortescue floodplain and his PhD focused on determining appropriate species and methods for revegetating acidic coal overburdens in the Collie region.

Markus is currently the chairperson for RIAWA and has served the committee for nine years.

ABSTRACT

Welcome and RIAWA Progress Update.

Attendees will be presented with a brief progress of RIAWA's efforts since the 2016 seminar series, including the following projects and consultations:

- the inaugural award for excellence in revegetation
- progress on the native seed accreditation system
- development of a seed viability database
- development of a seed purity database
- seed testing standards
- liaison with DBCA on the Biodiversity Conservation Regulations.



Speaker Profiles

Thursday 09:35 - 10:05



Kim Wilson

Kim has worked in the Peel-Harvey catchment for almost 20 years. Since 2004 she has overseen the Peel-Harvey Catchment Council's Ramsar 482 Initiative, managing the projects that developed the Ecological Character Description for the Peel-Yalgorup System (2007), the Peel-Yalgorup System Ramsar Site Management Plan (2009) and the Wetlands and People Plan - Peel-Yalgorup System – A CEPA Action Plan for Ramsar Site 482 (2017). This is Australia's

first site-specific stand-alone CEPA Plan (Communication/Capacity Building, Education and Public Awareness).

Kim has spent the past 12 years as a Program Manager with the Peel-Harvey Catchment Council working with fellow officers and partners to plan, develop, supervise and deliver a range of on-ground and technical projects with cumulative values over \$1 million/year. This includes the Lake Clifton Recovery Program, an ongoing partnership program that supports management of Ramsar-listed Lake Clifton which is home to the critically endangered thrombolites.

Kim believes strongly in the importance of connecting people with one-another and their natural environment and as PHCC's slogan says that by *"Working Together"* we can achieve change and make a difference.

ABSTRACT

"Tuart Woodland Restoration - a community-led, partnership approach" a case study in the importance and effectiveness of partnerships to revegetating the Peel-Harvey Region.

The Peel-Harvey Catchment Council (PHCC) is an incorporated, not-for-profit, community based Natural Resource Management organisation, led by a skills-based Board, which promotes an integrated approach to catchment management and the way we protect and restore the environment within the Peel-Harvey catchment. We see ourselves as key agents for change towards a healthier Peel-Harvey catchment. As environmental stewards we encourage and enable effective catchment management to create a healthier natural environment in the Peel-Harvey by:

- Building community education and capacity
- Influencing and leading critical thought and environmental pride
- Exemplifying and implementing best practice.

PHCC partners with stakeholders to attract Commonwealth and State funds to support restoration of conservation reserves. In 2012/13 PHCC brought partners with a common goal & commitment together for the Lake Clifton Recovery project which included undertaking over 20 hectares of tuart woodland restoration. Partners included DBCA (DEC), Lake Clifton Herron Landcare Group, citizen scientist volunteers, the Noongar community and Murdoch University.

A key message for revegetating the regions, is that these partnerships are as equally important as the technical knowledge for the actual restoration of our publicly managed natural areas; crucial for attracting funds and the collaborative effort that is required to achieve superb on-ground outcomes.

Speaker Profiles

Thursday 10:10 - 10:30



Mathew Gannaway

Mr Mathew Gannaway, Manager Native Vegetation Regulation, from Department of Water and Environmental Regulation, has extensive experience in botanical and ecological studies throughout Western Australia, including the monitoring of rehabilitation for regulatory requirements. Mr Gannaway has worked with the Department for almost two years and provided guidance in the development of the 'Guide to preparing revegetation plans for clearing permits'.

ABSTRACT

New Guidelines to preparing revegetation plans for clearing permits.

An outline of the new guide to preparing revegetation plans, where land revegetation is proposed as an offset or required, as a condition of a clearing permit granted under the environmental Protection Act 1986, including a brief summary of revegetation outcomes to date and where improvements can be made.

Thursday 11:10 - 11:30



Greg Overton

Senior Environmental Supervisor, Cristal Mining Australia Ltd.

Greg has a background in agriculture and has 20 years' experience in environmental restoration firstly with AMC Mineral Sands and then Cable Sands (Now Cristal Mining).

In that time Greg has been involved in eight different mine sites from Waroona to Jangardup on the South Coast that have been rehabilitated and five of the sites have been

relinquished. Currently Cristal is operating at Wonnerup 5km north of Busselton.

ABSTRACT

From Blue Gum Monoculture to Biodiverse Wetland (with some mining in between).

The Gwindinup North Mineral Sands project is located on 240 hectares of freehold agricultural land just south of Boyanup that was artificially drained and planted extensively with blue gums. The land was cleared and mined for mineral sands between 2007 and 2012. Land rehabilitation was progressively undertaken each year from 2010 and was completed in 2017.

Rehabilitation included approximately 65 hectares of native vegetation in a recreated wetland zone traversing the center of the site and an additional 9 hectares of upland vegetation adjacent. The rehabilitation established an ecological link between the wetland and upland areas of the site, where remnant vegetation was retained.

The key to the success of the program was the planning and effort put into the creation of a post-mining soil profile that would create the hydrology required to support the wetland ecology. The deliberate location and construction of the subsoil clay lens was pivotal in the creation of the wetland.

Rehabilitation monitoring has been undertaken since 2013 and will continue until completion criteria have been met in approximately 2019. Commitment to ongoing management and monitoring is critical. You can't just plant/seed and walk away.

Speaker Profiles

Thursday 11:35 - 11:55



Damian Grose

Damian is a founder of Tranen Revegetation Systems, and as the General Manager is responsible for overseeing all of the company's operations. Since graduating from UWA as an Environmental Engineer he has spent the majority of the last 20 years in the local revegetation industry, with several international assignments in Indonesia and New Caledonia. Since Tranen was established in its current form 2002, he has been involved with over 800 separate revegetation projects

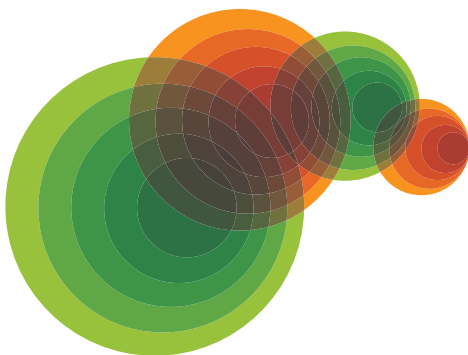
focussing mostly on the greater Perth metro area, and south-west. Although he never formally studied botany, he has developed a passion and solid understanding of our native flora, and enjoys applying that knowledge with his practical project management and problem solving skills.

ABSTRACT

Melaleuca Park Offset.

In 2012 Tranen commenced rehabilitation activities on a 57 ha offset project in Melaleuca Park north of Perth. The project area was former pine plantation surrounding a Resource Enhancement Wetland. The scope of the project was to establish a 50 m wide buffer around the wetland, improve the condition of the wetland, and provide an transitional ecological linkage to adjoining undisturbed Banksia woodland to the north.

The management strategies, experiences, and outcomes will be explored, to share our experience on the project. We hope this will help guide others in future projects of a similar nature.



Speaker Profiles

Thursday 12:00 - 12:20



Matt Vinkovich

Matt has over 5 years' experience managing a diverse range of environmental restoration projects. Matt began his journey with Natural Area in 2013 where he was employed as part of the environmental field crew; he quickly progressed in his role to become a Team Leader. With his exemplary management skills, professional conduct and eagerness to learn; Matt now heads up operations from the company's Beeliar depot.

This role requires management of over 22 staff members, as well as a range of clients from Local and State Government Authorities, utilities, developers and private entities.

Matt oversees all of Natural Areas rehabilitation projects in Perth's southern metropolitan region; in his time at Natural Area he has project managed various large-scale contracts, including bushland, wetland and coastal weed control works, landscaping projects which interface with conservation areas, riverbank restoration projects and offset revegetation works.

Matt has extensive experience in the development and implementation of rehabilitation projects where he has facilitated the restoration of native bushlands across the Swan Coastal Plain. One of Matt's recent achievements involved delivery of the Wentworth West wetland restoration project for Richard Noble, where he played a major role in ensuring complete eradication of *Typha orientalis* from the wetland water body, removal of a range of declared environmental weeds and the successful establishment of fringing native vegetation, to the satisfaction of both Richard Noble and the City of Cockburn.

ABSTRACT

Wentworth West Wetlands

As part of a housing development in Success, Richard Noble committed to rehabilitate the adjacent wetland prior to investment with the City of Cockburn. The Wentworth West rehabilitation project was implemented by Natural Area between 2014 and 2018; the project required weed control, revegetation and maintenance of degraded areas of the wetland. Through comprehensive and targeted weed control, and installation of 45,000 tubestock over the revegetation period, Natural Area were able to increase native species density and cover to an average 2.06 plants per meter squared and 60.8% foliar cover by spring 2017, with further growth expected as plants continue to establish. Weed cover was successfully reduced from 7.21 to 1.36 weeds per meter square and cover reduced from 89.2% to 5% foliar cover. This included the eradication of WONS and declared pests from the management areas and removal of approximately 0.8 ha of *Typha* in the open water body.



Speaker Profiles

Thursday 13:40 - 14:00



Alan Grist

Project Manager, Environment

Alan Grist has worked for Main Roads in the field of Environmental Management since 1986. During this time he has developed particular skills in the establishment of native vegetation by direct seeding, planting and topsoil management. 2005 to 2012 Alan was involved in the New Perth Bunbury Highway and Mandurah Entrance Road

Projects and was responsible for the delivery of the project landscape works.

Tim Batt

Tim Batt who is employed by Fulton Hogan Services has worked with Alan assisting to deliver many of the recent projects such as Coalfields Highway revegetation, Vasse By Pass, Rehabilitation of Borrow Pits and now the Margaret River Perimeter Road

Tim manages seed collection, weed control and topsoil management within many minor projects working with Fulton Hogan Construction and with external agencies.

ABSTRACT

Main Roads WA Coalfields Highway Projects Roadside Revegetation Management.

Alan Grist has been working with Main Roads for over 43 years and has been at the forefront of many rehabilitation projects. In 2010 work commenced on the realignment of the Coalfields Highway linking the South Western Highway with the town site of Collie. The Coalfields Highway Project presented a multitude of challenges which required the application of new and innovative treatments. The presentation covers the critical issues of top soil management, landscape design, manufacturing top soil, batter stabilisation and rehabilitation methods.

Thursday 14:05 - 14:25



Tai White-Toney

Tai White-Toney graduated from the University of Portland (Oregon, USA) with a Bachelor's degree in biology. Her honours research was on patterns of autonomy and regeneration in purple shore crabs, and involved working closely with local fishing communities. Tai's PhD research is with the University of Notre Dame Australia and Alcoa regarding the variable establishment of the two dominant canopy species after bauxite mining.

ABSTRACT

Variable establishment of jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) following bauxite mining.

Variability in seedling establishment during restoration of natural environment leads to undesirable mature states, which impacts the function of the future forest system and often requires additional management intervention (i.e. thinning or re-planting).

Speaker Profiles

The establishment densities of the two dominant canopy species in the northern jarrah forest, jarrah and marri, on a restored mine site can range from 300 to 5,000 stems/ha despite changes to restoration practices to reduce this variability. My study investigates the main ecological factors effecting establishment including an analysis of the impact of changing climate and rehabilitation practices over a 23-year period, field studies assessing patterns of mortality from seed to establishment by species and microhabitat locations, and measuring the impact of natural seed sources: in topsoil and from seed stored in the canopy of nearby forest. Results of the database analysis and two field studies, with some preliminary results on natural seed recruitment and will propose some of the primary factors causing this variability.

Thursday 14:30 - 14:50



Dr Mark Brundrett

Dr Mark Brundrett is an Adjunct Associate Professor at the University of Western Australia and a Research Associate of the West Australian Herbarium. For the past seven years, research has focussed on restoration of banksia woodland and the impacts of fire and weeds on Perth's urban bushland. He has many years of experience investigated interactions between plants and mycorrhizal fungi in natural and disturbed ecosystems. Other current research concerns the evolution

of plant nutrition traits and biodiversity patterns in Australia. He also studies the conservation and diversity of orchids and has published a field guide for them.

ABSTRACT

Key findings of the Banksia Woodland Restoration Project.

Mark Brundrett, Margaret Collins, Anna Wisoloth and Karen Clarke

Six years of comprehensive monitoring of three restoration sites with 60 ha in total suggest it is possible to restore banksia woodland, but also identified major challenges and limitations. We analysed plant cover and abundance trends relative to reference sites over six years. The majority of native species (100 out of a total of 160) primarily germinated from respread topsoil. However, important species including all the trees were missing from that source, so required planting or direct seeding. We believe that topsoil areas are on a trend to recovery, but will take decades to reach targets, while areas with only planting and seeding may always remain a separate vegetation type. It is very challenging to evaluate differences in flora and vegetation between restored and reference sites, since the reference sites were very different from each other due to very high beta diversity in banksia woodland. Another key finding was that the relative dominance of different plant functional groups changes over time, with disturbance opportunists initially dominant then declining back into the soil seed bank. Consequently, long-term monitoring is required to assess outcomes of banksia woodland restoration.

Speaker Profiles

Thursday 15:30 - 15:50



Ray Wilson

Ray Wilson joined Carbon Neutral as CEO in 2010. He has since been involved in the biodiverse reforestation of over 15,000 hectares of degraded and unproductive rural landscapes - funded by the voluntary carbon market.

He previously held State Manager positions in agribusiness banking and as well as a number of agricultural economist roles. He has a Bachelor of Agricultural Economics and Master of Business degrees.

ABSTRACT

Opportunities for Biodiverse Sandalwood Reforestation through Carbon Farming.

The Carbon Neutral Charitable Fund Limited (CNCF) has since 2001 restored close to 4,000 hectares of native forests and woodlands on unproductive soils on dryland farms in Western Australia and South Australia. This has been funded by the generation and sale of forest carbon offsets to businesses and individuals.

CNCF's 2018 planting project is the first in Australia to be registered under the Government's Emission Reduction Fund 'Farm Forestry Plantation' method, providing for biodiversity benefits and revenue from both commercial harvest of forest products and carbon credits. Such farm forestry projects involve establishing and maintaining trees on land that has previously been used for grazing or cropping. Trees can be grown as either permanent plantings (no harvest) or in harvest plantations and proponents must demonstrate the project will not have an adverse impact on agricultural production in the region.

The 2018 site is a pilot planting of 25 hectares on the Nil Desperandum farm near Bencubbin in the central wheatbelt region of Western Australia. Sites targeted in the program are Wodjil (acid yellow sands) and other soils that are difficult and uneconomic to farm but support the native sandalwood (*Santalum spicatum*) tree. Biodiverse native vegetation of Acacia and other tree and shrub species that serve as hosts for the hemiparasitic native sandalwood are restored to these sites.

Participating farmers provide the land, and if required fencing, to protect the new trees from grazing in the early years. They retain the harvesting rights for all forest products, including sandalwood timber and nuts. There is a long established export market for native sandalwood in Western Australia.

Planting to establish the new forest/woodland is done through a combination of direct seeding and planting seedlings with over 20 native species. CNCF will undertake the monitoring and reporting to claim and sell carbon credits (Australian Carbon Credit Units) from the restored native vegetation.

Environmental and landcare benefits include enhanced biodiversity, protection of fragile erodible soils and salinity mitigation. Farmers have the opportunity to diversify farm enterprises and derive income from previously unproductive lands through the harvesting and sale of sandalwood products as well as selective sheep grazing. There is no cost to the farmer for tree establishment as this is met by CNCF.

Such projects present an opportunity for organisations to invest in natural capital and support both ecological restoration and carbon sequestration outcomes through the purchase of carbon credits, either in the voluntary or regulatory carbon markets.

Speaker Profiles

Thursday 15:55 - 16:15



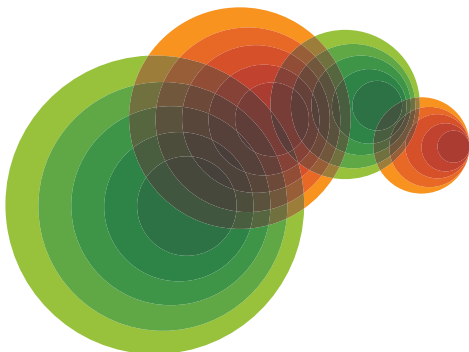
Keith Bradby

Keith is a long-time advocate for the ecological values of south-western Australia. He has been involved with the landcare movement since its inception, and has had roles with his local landcare groups, in managing government programs and developing key government policies affecting landcare. As a businessman he has operated beekeeping and native seed businesses, consulted to the mining sector and worked in local enterprise development. He has authored many essays and scientific papers, plus one book on the environmental history of the Peel-Harvey catchment and estuary. He conspired with friends to establish the Gondwana Link program in 2002 and serves as its CEO. Keith is also currently Chair of the WA Landcare Network and has consulted to large landscape conservation programs in New Zealand, southern Africa and Mexico. Keith was awarded an Order of Australia Medal in 2015 for service to conservation and the environment in Western Australia.

ABSTRACT

From revegetation to restoration in Gondwana Link.

Since 2002 a number of groups and individuals affiliated with the Gondwana Link program have been undertaking large plantings, building on earlier experience and adding a number of important innovations. Over that time we have developed a much sharper focus on the ecological benefits that are being sought through plantings, leading to greater appreciation of both the importance of planting design and the importance of where a planting sits within the larger landscape. There has been a steady improvement in what is being achieved. Over 100 species are now being effectively direct seeded in many plantings. A number of studies are now showing the results were worth it, with strong correlations between the ecological quality of the restoration, their broader ecological value and their use by a wide range of wildlife. So have we all been happy to shift our thinking from revegetation to restoration, and can we afford to do it?



Speaker Profiles

Thursday 16:20 - 16:40



Barry Heydenrych

Conservation planning: Greening Australia.

Barry has been working with Greening Australia for approximately fifteen years, primarily focusing on biodiversity conservation and restoration on the south coast of Western Australia. In this time Barry has coordinated, the implementation of a large-scale revegetation/restoration project across 1000 hectares funded by Shell Australia, and developed Conservation Action Plans (CAP) for groups in the Gondwana Link/South Coast NRM region and the Pilbara Bioregion. Barry has also undertaken monitoring and evaluation of a range of revegetation/restoration projects, and is currently involved with project management, monitoring and implementation of government-funded revegetation projects (i.e. 20 Million Trees). Barry holds an MSc from the University of Cape Town, and continues to strive to get into the field more often to experience the positive results that are brought about by large-scale restoration of our Australian landscapes.

ABSTRACT

Scaling up restoration, scaling down costs: an examination of direct seeding and its role in landscape-scale restoration in the Great Southern, Western Australia.

Heydenrych, B., Steven, G., and Parsons, B., Greening Australia

Greening Australia and other key partners in Gondwana Link have been undertaking broad-scale ecological restoration in the Great Southern Region of WA for over 15 years. Direct seeding has been used extensively and effectively at a large-scale for the majority of this restoration. Direct seeding has been a key enabler for ecological restoration because of its cost-effectiveness, and although other techniques such as tubestock planting still have a minor role to play, direct seeding is the main tool that Greening Australia now employs.

Direct seeding has many other advantages over traditional revegetation techniques (e.g. tubestock planting) including the ability of seed to germinate when conditions are right, and the fact that seeds, once sown, can germinate over multiple years. Owing to a model of continuous improvement, direct seeding practitioners can now establish plants successfully from seed in most soil types including typically difficult soils such as clays and deep sands, where tubestock was once a necessity.

In this presentation we share and discuss some of our recent experiences using direct seeding to implement thousands of hectares of native revegetation/restoration, working on dozens of private landholdings and three Greening Australia-owned properties, primarily funded via a number of major government revegetation grants. We will reflect on how the National Standards for the Practice of Ecological Restoration in Australia (SERA 2017) can be applied to this work. This includes some of the challenges of working at a landscape scale (100s to 1000s of hectares per year) and constraints associated with achieving genuine ecological restoration at this scale, and how the standards can be used for communicating messages about landscape-scale restoration.

Speaker Profiles

Friday 9:10 - 9:50



Dr Ken Atkins

A West Australian, Ken started collecting native plants in his early teens and continued this interest into university where he studied botany at the University of Western Australia. He continued his studies towards a PhD in the Pilbara, investigating the local ecology and developing revegetation prescriptions for a minesite.

After leaving the Pilbara, Ken undertook consultancy work, doing vegetation surveys in the south west of the State. He then joined the Department of Fisheries and Wildlife in 1983 as a Reserve Management Officer based at Pingelly, which began a six year stay in the wheatbelt, during which time he took on the role of District Manager when the Department of Conservation and Land Management was formed, and then Regional Ecologist.

Ken is currently manager of Species and Communities Branch with the Department of Biodiversity, Conservation and Attractions, where he has a role in developing and implementing legislation, policy and practices for biodiversity conservation.

ABSTRACT

Development of the Biodiversity Conservation Regulations.

A Biodiversity Conservation Act has been proposed by successive Western Australian Governments to replace the out-dated Wildlife Conservation Act 1950 and the Sandalwood Act 1929 and their associated regulations. The intention of such an Act was to provide for a modern conservation legislation in Western Australia.

On 21 September 2016 the Biodiversity Conservation Act 2016 received assent and was partially proclaimed on 3 December 2016. Only those parts of the Act that were essentially new, and not dependent on Regulations for their operation were proclaimed at this time. These included those Parts relating to biodiversity management programmes, biodiversity conservation agreements, and biodiversity conservation covenants.

Biodiversity Conservation Regulations are now required to enable the proclamation of the remaining parts of the Act, and allow the Act to come into operation. This will allow for the complete repeal of the Wildlife Conservation Act and the Sandalwood Act.

The main component of the Biodiversity Conservation Regulations is for establishing a licensing system for the taking, supply, possession, processing and dealing in native flora and fauna. These licences will replace all existing wildlife licences. The State Government has taken this opportunity to review the existing licensing system and seeks to establish a new licensing system that provides for the protection and conservation of flora and fauna, while supporting small business and improving the efficiency of the licensing processes.

Information will be provided on the proposed licensing system to be included in the Regulations.

The Biodiversity Conservation Act also provides for the listing of threatened species, other specially protected species, threatened ecological communities, critical habitat and key threatening processes. The procedures and criteria for listing these matters are outlined in the Act, but Ministerial Guidelines are to be prepared to provide greater details for these listings.

Information will also be provided on the Ministerial Guidelines and the provisions in the Act for relating to threatened species and ecological communities and associated matters.

Speaker Profiles

Friday 10:10 - 10:30



Dr Danielle Risbey

Team Leader, Environmental Compliance Branch Resource & Environmental Compliance Division, W.A. Department of Mines, Industry Regulation & Safety

Completed a BSc. (Hons) in Biological Sciences at Murdoch University in 1991 and a PhD on the impact and control of feral cats in Shark Bay in 2000.

Commenced working in the mining industry as an Environmental Consultant in Kalgoorlie in 2000 and later joined the Department of Mineral and Petroleum Resources (now Department of Mines, Industry Regulation & Safety) in 2002.

Transferred to the Perth head office in 2005 and was promoted to a manager role regulating the northern half of Western Australia in July 2007. Has gained over 16 years of experience in environmental impact assessment, guideline development and the environmental regulation of exploration and mining operations in WA.

Key interests include environmental management on mine sites, rehabilitation and successful mine closure and improving environmental regulation.

ABSTRACT

Regulating Rehabilitation on Mines Sites in WA.

- Overview of DMIRS role and influence in revegetating the regions
- Mine closure plans
- Work with WABSI
- Compliance inspections – preparedness for closure scoresheet
- MRF and the rehabilitation of abandoned mines

Friday 11:10 - 11:30



Lisa McCreery

Lisa McCreery has spent a lifetime in the native tree nursery industry. Growing up under the guidance of her parents and landcare pioneers Dennis and Jos Chatfield, Lisa has now taken the reins with husband Dustin of the Wheatbelt's leading commercial tree nursery businesses. Her childhood was spent working in the nursery, assisting in the office and contract tree planting, leaving her with the experience necessary to operate the family's 3.5 million seedling capacity nursery in Tammin.

Over the past 18 years the business has germinated more than 27 million seedlings that have been planted in the Western Australian landscape. Chatfield's continue the tradition of supplying quality, hardened seedlings throughout the region.

ABSTRACT

Seed is our gold.

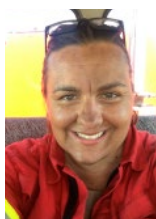
Lisa and Dustin McCreery began working in the Environmental industry since 2001. They plant native tree and shrub seed in September to December each year, grow them in cell trays and then deliver across the state in June/July. They only get one

Speaker Profiles

chance a year to get it right. Each seed to Chatfields is like a little spec of gold. Although they are dealing with relatively small amounts in relation to quantities used in direct seeding rehabilitation and revegetation, the same principals apply to both areas - seed is their most important resource.

If the seed does not germinate...the result of the revegetation is zero. How can we all get the best out of our seed? Issues affecting the quality of the seed include how and when it has been picked (ripeness), the viability and germinability rates and whether it is true to description! Success rates are also affected by pre-treatments that break dormancy, storage, germination and growth temperatures and other factors.

Friday 11:35 - 11:55



Vanja Sekizovic

Vanja has in excess of 12 years experience in the construction, mining, energy and government sectors in Western Australia. Her experience is across all aspects of environment and safety, including regulatory approvals, integrated management systems, management of site issues and rehabilitation. Vanja is the Environmental Superintendent at Minjar Gold's Southern Cross Operations, with the

responsibility for provision of accurate advice and assistance to line and department managers pertaining to achieving satisfactory environmental performance and management of the site. This includes obtaining required approvals, updating the site's management system and assisting critical stakeholders in ensuring the site meets it's legal and other obligations. Vanja is currently reviewing the SXO Mine Closure Plan, assessing the historic successes and improvement opportunities, while planning for future rehabilitation activities. Vanja has also assisted Calibre Group with their health, safety, environment and quality systems and mine closure planning.

ABSTRACT

Rehabilitation review of waste landforms at Southern Cross Operations.

Southern Cross Operations encompasses 82,059 hectares, 222 tenements, ~56 pits and ~103 waste landforms. As one of the oldest mining regions in Western Australia, rehabilitation has been ongoing for many decades, and with varied success. The presentation will examine the rehabilitation and revegetation success (or otherwise) at Southern Cross Operations, with a particular focus on the visual, vegetation and erosion aspects.

The review will incorporate a desktop review of the rehabilitation methods, slope type, depth of topsoil and records of seed mixes used. This will be further verified through inspections of selected waste dumps and comparison of the quality of rehabilitation and revegetation. The conclusion will incorporate the findings of the most successful rehabilitation and revegetation methodologies for the Southern Cross Operations.

In addition, a review of the historical criteria for rehabilitation acceptance by the regulators will be reviewed, and challenges of bringing up historic waste rock dump rehabilitation to the currently required standards.

Speaker Profiles

Friday 12:00 - 12:20



Sam Atkinson

Sam has more than 13 years of experience as a consulting environmental scientist with a background in plant physiology, rehabilitation, weed management, vegetation health monitoring, GIS, remote sensing and UAV technology. He manages Astron Environmental Services' Geospatial team who capture and use satellite, airborne and UAV derived multispectral data for environmental management applications in the resources, Government and agricultural industries. Being passionate about innovating and pursuing new approaches to old problems, Sam enjoys working with Astron's partners to use new technology to advance environmental management.

ABSTRACT

Rehabilitation Monitoring Using Drones and Remote Sensing – Case Studies, Field Validation and Lessons Learned.

The use of drones and remote sensing analysis for rehabilitation monitoring is becoming increasingly common in Western Australia. However as with most new technologies early adopters have climbed a steep learning curve. Using case studies we discuss what aspects of revegetation that can, and can't, be accurately measured using remote sensing approaches. Results of validation studies and the lessons learnt from over four years of testing and applying this new approach to rehabilitation monitoring will be presented.

Friday 13:30 - 13:50



Mark Dobrowolski

Iluka Resources Limited, School of Biological Sciences, The University of Western Australia

Mark is a research scientist with a background in soil science and plant biology, applying this knowledge to the rehabilitation of mined land. His research experience spans soil science, agricultural plant breeding, plant pathology, and molecular genetics of natural ecosystems. For more than a decade he has worked in the mineral sands and bauxite mining/processing industries on research to ameliorate soil water and physical factors that inhibit successful re-vegetation following mine closure. He holds an adjunct position at the School of Biological Sciences at UWA where he co-supervises postgraduate students studying the vegetation ecology of mined land, particularly kwongan vegetation of the Eneabba region, to define achievable targets for mining re-vegetation.

ABSTRACT

Revegetation practice improvements in kwongan of the Mid West.

Seedling emergence rates from broadcast seed are notoriously low in revegetation. At Iluka Resources Limited's Eneabba mine in the Mid West of Western Australia, eight-fold more seedlings emerged under ideal nursery conditions in 2015 than when that seed was broadcast in the field. Unlocking this potential in broadcast

Speaker Profiles

seed is critical to establishing the desired plant density and species diversity of the kwongan shrubland revegetation, and is one focus of R&D at Iluka's Eneabba mine.

Erosion, both wind and water, is a major factor affecting seedling emergence in newly prepared sites. To control wind erosion at Eneabba, Iluka applies a crust of dilute, non-toxic bitumen emulsion to the sandy soil surface. This crust degrades over a few years but does not inhibit germination. It allows seedlings to emerge and establish under windy conditions, common at Eneabba, holding the seed in the soil matrix for germination to occur and eliminating the sand-blasting that kills newly emerged seedlings. Combining this crust application with ripping-mounding to prevent water erosion in 2016 increased seedling establishment almost two-fold.

Soil imprinting, a practice developed in the 1970s, reduces rainfall run-off and increases infiltration and nutrient/organic matter accumulation thereby improving seedling emergence and establishment. However, the imprints erode too quickly in sandy soils such as found at Eneabba. A trial combining soil imprinting and bitumen emulsion crust improved seedling emergence more than two-fold for broadcast seed and three-fold for topsoil derived seed.

Data from large-scale field trials of these practices and the innovative combinations of them will be presented to illustrate their effectiveness and applicability to other revegetation projects.

Friday 13:55 - 14:15



Matthew Hamilton

Matt has worked within the mining industry for 10+ years as an Environmental Professional across various roles. During this time Matt has worked across a range of commodities in different states and environments gaining a broad range of experience. Areas of expertise include but are not limited to compliance, approvals, mine closure, rehabilitation, contaminated sites and monitoring. Over the past 3 to 4 years

Matt's efforts have been focused in the mid-west where he has been seeking to establish populations of Declared Rare Flora across the Mt Gibson Ranges to meet conditions of approval.

ABSTRACT

The Large Scale Translocation of Two Declared Rare Flora Species at the Mount Gibson Ranges.

Mount Gibson Mining Ltd (MGM) mined hematite iron ore from Extension Hill (part of the Mount Gibson Ranges) between 2012 to 2016. Ministerial conditions required MGM to offset potential impacts to two Declared Rare Flora (DRF) species, *Darwinia masonii* and *Lepidosperma gibsonii*, by way of a research program undertaken by Botanic Gardens and Parks Authority (BGPA). The research demonstrated proven concepts to translocate both species through the collection of cuttings, nursery propagation and planting with the assistance of irrigation.

MGM extended the life of operations by gaining approval to mine the adjacent Iron Hill deposits, located to the south of Extension Hill at the Mount Gibson Ranges. Development of the mine commenced in late 2016 and mining is continuing during 2017. Ministerial conditions require MGM to offset 1,327 *Darwinia masonii* and 863 *Lepidosperma gibsonii* contained within the Development Envelope by way of

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translocation based on the research developed by BGPA. MGM commenced the translocation program in 2015 with the initial collection of *Darwinia masonii* cuttings. Since then MGM has planted 3096 *Darwinia masonii* across 5 different plots, of which more than 80% are still alive and 1200 *Lepidosperma gibsonii* in a single plot, of which 50% are still alive.

The translocation program is quite possibly the largest of its kind in WA for DRF species and to date there has been some promising success observed. The success so far has demonstrated that the process applied is capable of increasing the numbers of a plant species and fostering viable populations. This presentation will cover;

- the history and background of the translocation program in relation to previous trials and research,
- the regulatory context inspiring the requirement to undertake the program,
- the process applied to establish and maintain translocation plots,
- trials and learnings gained during the program across the different plots, and
- the future direction of the program to progress towards self-sustaining populations.

Friday 14:20 - 14:40



Tony Pekin

Tony Pekin is the Managing Director of Watheroo Minerals Group. He has a background in Agricultural Finance having worked with Rabobank. He was also the Head of Export Sales for a leading food and industrial minerals producer prior to joining the Watheroo Minerals Group. Nurture Revegetation was established in 2015 to utilise the unique clay resource in specialist applications including pelleted native seeds.



Alan Savage

Alan Savage is head of R&D with Watheroo Minerals Group, a clay mining company with mines at Watheroo in Northern Wheatbelt of WA. He has a background in agriculture and microbiology, and more recently with seed biology and seed delivery systems for native seeds in the arid zones of Western Australia. We are working with Kings Park Botanic Gardens and UWA on a collaborative project looking at improved outcomes for revegetation in Western Australia.

ABSTRACT

Pelleted seeds as an improved method for application of native Australian seeds in an arid environment, with an example from Jundee gold mine in Murchison of Western Australia.

Nurture Revegetation has developed leading technology to embed native seeds in a protective clay pellet enhanced with stimulants. This process has significant advantages over traditional raw seed revegetation options in regard to seed persistence, plant establishment and the logistics of the delivery of seeds to site for revegetation.

A modest revegetation program was conducted at the Nim Blue Waste Dump at Northern Star Resources Jundee mine. Plant species for the Nim Blue trial were

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selected on the basis of being native to the area, and from an analysis of previous environmental surveys, which helped to identify species most likely to establish on modified landforms with limited topsoil and with earthworks to manage erosion. Twenty two species were selected on this basis, encompassing upper canopy large acacias and eucalypts, mid-storey species and ground covers. These were applied by hand to the freshly worked sloping land form at Nim Blue. Seeds were applied in November and a survey to assess recruitment was undertaken in April 2017. Whilst we did encounter a good rain season, there is strong evidence of germination of plants from soil seed banks, and good establishment of local naturally dispersing plant species like *Salsola*, salt bushes and grasses. The presence and abundance of specific species of *Acacia*, *Senna* and *Kennedia* can only be from the pelleted seeds applied. Recruitment of identified species was far higher in the pellet treatments compared to nil seed and naked seed treatments. With a conservative estimate of ~7,500 plants per hectare from 20 species, and with ongoing recruitment from late germination and increase in plant size we expect that this site will be looking good and progressing well into the desired long-term stable ecosystem.

Friday 15:20 - 15:40



Dr Peter Golos

Kings Park Science, Department of Biodiversity, Conservation and Attractions; and School of Biological Sciences, University of Western Australia.

Peter has been employed as a research scientist with Kings Park Science since 2009 and Research Fellow at the University of Western Australia since 2014. He has extensive research experience as a restoration ecologist at mine sites across Western Australia including the Pilbara region, Nifty (Metals X - copper), Telfer (Newcrest - gold) and Yarrie (BHP - iron ore); the Midwest region, Koolanooka, Blue Hills (Sinosteel Midwest - iron ore), and Karara (Karara Mining - magnetite iron); and in the south west region, Perth (Hanson - sand quarry) and Kwinana (Alcoa - bauxite mud residue). As part of a research team (Kings Park Science and UWA) working with Sinosteel Midwest Corporation (SMC), won the 2017 AMEC Environment Award for a project researching leading practice in vegetation restoration of a banded iron formation.

Peter has a strong commitment to see practical outcomes develop from scientific research and its adoption by the broader revegetation community. To help achieve this aim he joined the Revegetation Industry Association of Western Australia (RIAWA) as a committee member in 2015.

ABSTRACT

Identification of vegetation community with the potential to revegetate mine wastes at the Nifty mine site, Great Sandy Desert, Western Australia.

Nifty copper mine is located in the western part of the Great Sandy Desert. A legacy of past mine activities there is a shortage of topsoil suitable for spreading on mine waste rock dumps. As a result there is an imperative need to find species suitable for vegetation restoration on mine wastes without a topsoil cover. Attempts to date of using seed from species collected around the mine site, associated with sandplains and sand dunes, have failed to successfully establish directly on siltstone waste rock.

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This is mostly attributed to differences in physical and chemical properties between siltstone and topsoils resulting in lower seedling emergence and higher seedling mortality in siltstone than topsoil. Field and glasshouse experiments have shown that siltstone on the waste rock dump is highly variable in physical and chemical properties with seedling emergence and growth responding accordingly. Research is currently focusing on identify the most favourable siltstone for plant growth and finding a suitable self-sustaining vegetation community for restoration on siltstone cover on waste dumps at Nifty mine site.

Friday 15:45 - 16:05



Kylie Weatherall

Kylie Weatherall has 10 years' experience working in the environment field. Whilst living in Broome she has worked with Traditional Owners and others to protect country. She is particularly interested in working to protect and enhance The Monsoon Vine Thickets (MVTs) of the Dampier Peninsula. In her current role at Environs Kimberley she is a project coordinator, working together with the Kimberley Community Seedbank to support the work of Aboriginal women rangers

looking after MVTs through revegetation and education activities.



Devena Cox

Devena Cox is a Ngumabarl, Nyikina, and Ninmunburr woman who works as a Nyul Nyul ranger, based in Beagle Bay on the Dampier Peninsula, 100km north of Broome. She works alongside 2 other women in a mixed men's/women's ranger team on projects including endangered Monsoon Vine Thicket rehabilitation, developing a native seedbank and native plant nursery, and on threatened species such as the Greater Bilby and Gouldian Finches.

ABSTRACT

Revegetating Mayi Budan - working with aboriginal ranger groups to restore endangered Monsoon Vine Thickets (mayi budan) of the Dampier peninsula, Kimberley.

Kylie Weatherall (Environs Kimberley), Bardi Jawi Oorany Rangers, Nyul Nyul Rangers and Yawuru Country Managers.

Bardi Jawi, Nyul Nyul and Yawuru Aboriginal Women Rangers have worked with Environs Kimberley and Partners to restore degraded areas of the Monsoon Vine Thickets of the Dampier Peninsula, a culturally significant and nationally Endangered Ecosystem. The Dampier Peninsula is located in the south west corner of the Kimberley, where this rainforest-allied ecosystem occurs as a network of 86 patches nestled in the coastal dune system. Monsoon Vine Thickets (MVT's) are culturally important, containing valuable bush-tucker, medicines, important water places and other cultural sites; and ecologically important making up less than 0.01% of the Peninsular yet containing 25% of the plant species. Known threats include fire, weed invasion, clearing, tourism and recreation. Environs Kimberley worked with the

Speaker Profiles

relevant aboriginal ranger group and community to conduct ecological restoration at 5 MVT patches, including community consultation, site preparation and planning, direct seeding, community tree planting, establishment of reticulation system and ongoing site maintenance. Where possible, seedling stock was bought from the rangers to support business development, with seedlings grown through previous project support in seed collection, storage and propagation.

Revegetation projects in the Kimberley climate confront many challenges, with seedlings requiring the establishment of reticulated watering systems to avoid dying during the dry season, and one site becoming totally inundated during a record wet season. Despite these challenges the project has been incredibly successful in initiating the ecological restoration process, building community collaboration, providing opportunities for traditional knowledge transfer between rangers and school kids and educating the community on MVT importance and threats. This project is one of many collaborative conservation projects run by Environs Kimberley with aboriginal ranger partners, linking the best science and traditional knowledge to help protect the nature of the Kimberley.

Friday 16:10 - 16:30



Stacey Gregory

Principal Consultant, BSc(EnvSc), MSc(EnvBio)

Stacey has worked in the mining industry since 1999 in both operational roles and as a consultant. She has widespread experience in rehabilitation planning and monitoring, development of closure objective and criteria, environmental impact assessments and baseline studies.

Stacey has led numerous large scale and multi-disciplinary projects investigating mining environmental impacts and developing key performance indicators. She has designed targeted closure performance monitoring programs and has monitored rehabilitation at over 20 mine sites within Western Australia. Her focus is the compilation and analysis of data to ascertain the risks and requirements for closure. This has led to the development of acceptable closure objectives and criteria to support effective relinquishment targets for a number of mining projects.

Stacey has presented papers at both national and international conferences, and has published a paper in *Hydrobiologia* the international journal of aquatic sciences. In 2005, Stacey received a research grant from the Minerals and Energy Research Institute of Western Australia and subsequently published a report titled "*The classification of inland salt lakes in Western Australia*".

Stacey joined Mine Earth as a Principal Consultant in 2010 and contributes a unique blend of project management and analytical skills that complement successful mine closure planning.

ABSTRACT

Revegetation of the Pardoo mine: planning to execution to monitoring.

The Pardoo Direct Shipping Iron Ore Project (the Project), located in the Pilbara region of Western Australia, is owned by Atlas Iron Limited (Atlas). Mining commenced in October 2008 and ore reserves were depleted by October 2013. The Project consisted of 11 open pits, six waste rock dumps and mining infrastructure.

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Closure planning commenced in 2010, with closure works across most Project areas undertaken between 2013 and 2014.

Our presentation will describe the risks to revegetation and the investigations that Atlas undertook to mitigate these risks. The revegetation monitoring data will also be presented along with a comparison of revegetation performance against agreed closure criteria.

During the closure planning process, a comprehensive risk assessment was undertaken to identify all closure risks, with a poor revegetation outcome acknowledged as one of the key risks for the Project. The identified causes of this risk included insufficient or hostile growth medium, inappropriate or poor quality seed, grazing pressures, poor climatic conditions and weed occurrence. To mitigate these risks, and others, Atlas undertook a series of targeted closure investigations to ensure that potential knowledge gaps were filled, and appropriate control mechanisms were implemented.

Atlas has adopted the approach of using the best achievable rehabilitation as the benchmark against which to compare rehabilitation performance for perennial plant cover, species richness and weed cover. Considerable effort was invested in developing robust closure criteria to measure and demonstrate revegetation performance over time. These closure criteria were workshoped with, and reviewed by several internal and external stakeholders including regulators, industry peers, the local community and the pastoralist.

The closure investigations, closure criteria and stakeholder engagement informed the development of a revegetation plan and specific work instructions for contractors. Completed closure and revegetation works were then verified against specific work instructions.

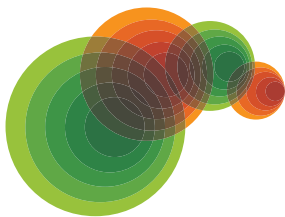
Revegetation performance has now been assessed for five years. Vegetation parameters such as species richness and plant cover are tracking as expected and closure criteria have been met at a number of monitoring sites. Weeds are present in revegetation areas, but are generally not impacting native vegetation growth.

Revegetation success at the Project was attributed to the identification of key risks, investigations which closed knowledge gaps and stakeholder engagement early in the closure planning process.

**Thank you for attending the
2018 RIAWA Seminar.**

The RIAWA Committee welcomes your feedback.

To comment please complete the Seminar Feedback Form.



Revegetating the Regions

The 2018 Revegetation Industry Association of WA Seminar

Thursday 6 September and Friday 7 September

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- Award for Excellence in Revegetation
- South West / Metro
- Wheatbelt / Great Southern
- Regulations
- Seed / Goldfields
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PO Box 1333, Midland DC, WA 6936

Ph: 0418 935 040

enquiries@riawa.com.au

www.riawa.com.au