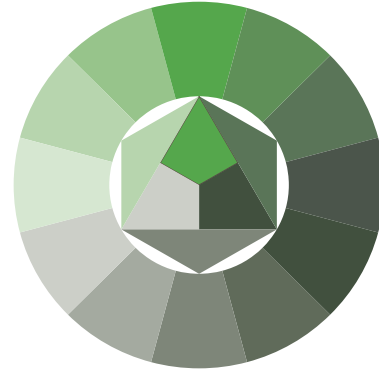




Mine Rehab Conference 2014



Best Practice Ecological Rehabilitation

Conference Program



25th
September
2014

Singleton Diggers
York Street
Singleton

8.00am -
5.10pm

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WELCOME

Welcome to our FOURTH annual "Best practice ecological rehabilitation of mined lands" Conference.

As an Adelaide Uni student in 1964 I was hitchhiking with a mate to Queensland and slept the night in the bush near Ballarat. As dawn broke I realised that I was sleeping dangerously close to several of the hundreds of open holes dug by gold miners decades before and left uncovered to trap the careless. Never did I think that I would someday be running a conference on rehabilitation of mines!!

Never did we dream in 2011 that our meeting would endure for the next four years. It is a testament to the interest in this emerging field of research and practise not to mention the evolution of regulation. Our meeting this year brings researchers from four universities to present their academic studies, regulators from all three areas of government and most important of all those who actually deal on a day to day basis with the business of regrowing the ecosystems that were present pre-mining. These past four years have seen the evolution of the regulations to deal with the problem of scarcity of like-ecosystems for offsetting, alluded to at our inaugural meeting in 2011 when Mark Nolan raised the alternative of creating a fund for improving biodiversity post-mining instead of offsetting. Today we will have updates on the draft NSW Biodiversity Offsets Policy for Major Projects, and the Upper Hunter Strategic Assessment of coal mining.

My thanks once again to OEH for financial support and organisational partnership that has made the process of putting on the conference possible, and to my team, Nigel, Chatchada and Belinda, in the Tom Farrell Institute who have worked so hard to make the program come to fruition. Nigel Stace has been a magnificent team leader and we have all benefited greatly from his attention to detail, his enthusiasm and his doggedness.

Please take time to review the degree and research options available at the University of Newcastle while you are with us today. We offer undergraduate degrees to train your staff, we offer online Masters degrees to assist you to keep up to date and to become more competitive in your field. We can also provide access to students who might work on projects for you, or assist with summer vacation work.

I hope you find the day rewarding and enjoyable and that you grow up new relationships as a result of the networking opportunities that we have structured to operate through the breaks.



Tim Roberts, Director of the Tom Farrell Institute for the Environment, at the University of Newcastle.

Scientific Committee

Professor Tim Roberts University of Newcastle
 Dr Steven Lucas University of Newcastle
 Dr Sharon Molloy, NSW Office of Environment and Heritage
 Dr Charles CC Lee, University of Newcastle (Singapore)
 Dr Yvonne Nussbaumer, University of Newcastle

Conference Organisers

Sharon Molloy, NSW Office of Environment and Heritage
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Tim Roberts, Nigel Stace, Belinda McNab & Chatchada Hooper
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PROGRAM

08.00 Registrations

- 08.30 – 08.40 **Tim Roberts**, Director of Tom Farrell Institute for the Environment, University of Newcastle
Acknowledgement of country and Welcome to the Conference
- 08.40 - 08.50 **Martin Rush**, Mayor of Muswellbrook Shire
Muswellbrook Perspectives
- 08:50 - 09:25 **Peter Erskine**, Centre for Mined Land Rehabilitation, University of Queensland
Ecological Rehabilitation: the past, the present and the future
- 09.25 - 09.50 **Matthew Newton**, NSW Trade and Investment
Expectations and Future Directions of MOP Guidelines
- 09.50 - 10.15 **Sharon Molloy & Dominik Nicholls**, NSW Office of Environment and Heritage
Developing and implementing Government Policy. A case study - Upper Hunter Strategic Assessment BCAM

10.15 – 10.35 Morning Tea

- 10.35 - 11.00 **Martin Fallding, Stephen Bell & Bob Dupont**, Land and Environment Planning Consultants
Effective Biodiversity Offsets: Improving planning, valuation and monitoring practice
- 11.00 - 11.25 **Luke Bewley**, Australian Department of Industry
Australian Department of Industry Multiple Land Use Framework (MLUF)
- 11.25 - 11.50 **Peter Elliott**, B Howard, D Pershke and M Jones, URS Australia
Negotiated net benefit - better mine closure outcomes for less money
- 11.50 - 12.15 **Rob Loch**, Landloch Pty Ltd
Meeting new challenges in waste landform design
- 12.15 - 12.40 **Rod Eckels**, Landforma Pty Ltd
Rehabilitating mines - using natural landforms

12.40 - 13.30 Lunch Break



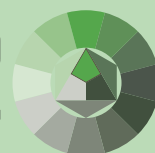


PROGRAM

- 13.30 - 13.55 **Ian Oliver**, Laura Kuginis & Carmen Castor, NSW Office of Environment and Heritage
Ecological rehabilitation of self-sustaining plant communities
- 13.55 - 14.20 **Barbara Drigo** & Ian Anderson, University of Western Sydney
Carbon flows from plants to soil microbes
- 14.20 - 14.45 **Alexandra Callen**, John Clulow and Michael Mahony, University of Newcastle
Build it and they still may not come - using new knowledge to move beyond physical restoration of amphibian habitat
- 14.45 - 15.10 **Carmen Castor** & Yovonne Nussbaumer, University of Newcastle
Promoting herbaceous plant populations on mine rehabilitation in the Hunter Valley

15.10 -15.30 Afternoon Tea

- 15.30 - 15.55 **Tasman Willis**, Mangoola Coal
Developing a natural landform in its mine overburden rehabilitation
- 15.55 - 16.20 **Bill Baxter**, Rio Tinto Coal Australia, Coal & Allied
Coal & Allied's recent efforts to restor Central Hunter Ironbark Communities
- 16.20 - 16.45 **Joe Thompson** & Steve Eccles, Hunter Local Land Services
Wybong Catchment Health Improvement Project (Wybong CHIP)
- 16.45 - 17.10 **John Sanderson** & Adrian Morphett, Earth Systems Victoria
A transportable process for biomass waste management and biochar production at remote mine sites
- 17.10 **Networking and Drinks**



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)**MARTIN RUSH, MAYOR OF MUSWELLBROOK SHIRE COUNCIL****SPEAKER NUMBER 1**

Councillor Martin Rush
Mayor of Muswellbrook Shire Council
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Martin Rush was born in Young in country New South Wales in 1976. He graduated in economics and law from the University of Newcastle in 2000. He commenced practice as a solicitor in Muswellbrook in 2000 – mainly in legally aided criminal law. In 2004, Martin was called to the New South Wales Bar. Martin has been the Mayor of Muswellbrook Shire since 2008.

Abstract**Muswellbrook Perspectives**

Muswellbrook Shire Council has been a determined advocate for change in the way the planning system addresses progressive and end of life mine rehabilitation. This presentation explores the impact of local government policies on environmental planning outcomes from mining developments.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

PETER ERSKINE

SPEAKER NUMBER 2

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Peter Erskine is a Senior Research Fellow at the University of Queensland and leads the landscape ecology group in the Centre for Mined Land Rehabilitation.

Over the last two decades he has worked on ecosystem function, landscape forest restoration and revegetation techniques in Australia, Laos, PNG, Sierra Leone, Uganda and Vietnam. He currently works closely with mining companies and government agencies to develop monitoring methods to assess environmental impacts of mining. Peter's research interests include the development of novel ecosystems, the utility of reference sites for measuring rehabilitation success and the deployment of unmanned aerial vehicles to quantify issues of scale. He has worked on projects with mining companies including BMA, Centennial Coal, Glencore, Legend, Oxiana, Rio tinto, Sibelco and Wesfarmers.

Abstract

Ecological Rehabilitation: the past, the present and the future

The NSW Minerals Council suggests that mining can be regarded as a temporary land use, yet most available evidence suggests that mining is really a transformative land use. This transformation can lead to positive outcomes for areas that were in a degraded state prior to mining, but it is likely that most mines will have a long-term impact on the existing biodiversity of a site. Over the last fifty years the implementation of environmental impact assessments, closure planning and mine rehabilitation standards has meant that many mines have undertaken to ecologically rehabilitate disturbed areas. More recently, companies have signed on to International Finance Corporation Performance Standard 6 on Biodiversity Conservation, which requires a strategy to achieve no net loss of biodiversity. These sorts of aspirations are desirable, for a range of reasons, but will they lead to a range of unfulfilled and unachievable expectations for mining companies and interested stakeholders? In this talk I cover some of the history of this journey and present data from a range of mine sites to assess biodiversity outcomes. It is also timely to review what lessons have emerged from these experiences and explore the application of the novel ecosystems concept to these transformed landscapes.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

MATTHEW NEWTON

SPEAKER NUMBER 3

Matthew Newton, B Env Sc (Hons)
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Matthew commenced in the role of Principal Officer Rehabilitation Standards with the Division of Resources & Energy (DRE) in November 2013. Amongst the key functions of this role includes the development and implementation of standards, guidelines, policies and procedures based on best practice to improve mining / exploration rehabilitation outcomes across the state of New South Wales (NSW).

Matthew has approximately 18 years of experience in environmental assessment and management and has been involved in a range of environmental projects relating to mining operations situated throughout NSW, Queensland, Victoria, Western Australia and Virginia in the USA. Prior to DRE, Matthew has worked as a consultant as well as in site-based roles with a particular focus on rehabilitation and mine closure projects. A notable project has involved the development and implementation of a mine closure plan right through to completion, including government sign-off, of closure activities at Glencore's New Wallsend No.2 Colliery in Newcastle.

Based on his experience in closure and rehabilitation planning, Matthew has prepared mine closure and rehabilitation monitoring standards for key corporate clients to be applied across world-wide operations as well as detailed closure cost liability assessments. Matthew has also undertaken a number of audits focussing on rehabilitation quality; progress with meeting closure criteria; and integrating mine closure planning with day to day operational planning.

Abstract

Expectations and Future Directions of Mining Operations Plan (MOP) Guidelines

A key objective of the Division of Resources and Energy (DRE) is to ensure a sustainable minerals industry. To achieve this, a key focus area of DRE's regulatory approach is to promote the implementation of best practice rehabilitation methodologies required to achieve final land use outcomes as required by a Project Approval for a mining project.

As a requirement of a mining lease, DRE requires a mining company to submit a Mining Operations Plan (MOP) to detail its rehabilitation strategy. Subject to amendments to the Mining Amendment Act 2008, it is proposed to replace the MOP with the requirement to submit a Rehabilitation Management Plan (RMP). Guidelines for the new RMP are currently being drafted and will be designed to provide greater clarity for industry in regards to governments expectations for mine rehabilitation. Further, the guidelines will also be designed to support DRE's shift in approach towards performance-based regulation.

The new RMP will require industry to adopt a systematic approach to rehabilitation that is risk-based, scientifically sound, adaptive to enable the uptake of leading edge solutions or changing site conditions as well as be effectively integrated within the day to day mine planning systems. Evaluating the level of rigour that industry applies to this systematic approach to rehabilitation will be a key focus area for DRE in order to ensure that sustainable rehabilitation outcomes are achieved.

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SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

SHARON MOLLOY & DOMINIK NICHOLLS

SPEAKERS NUMBER 4

Sharon Molloy

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Sharon Molloy grew up and was educated in Ireland, graduating in 1994 with a Degree in Zoology and a research Masters. She emigrated to Australia in 1998 and worked for NSW Fisheries as a Conservation Manager in northwest NSW based in Inverell. During that period she was agency representative during the Water Reform process and also dealt with aquatic habitat compliance and rehabilitation issues. She moved to the Port Stephens area in 2004 and worked in the Fisheries Threatened Species unit before becoming a founding member of the Conservation Action Unit – a business unit within NSW Department of Primary Industries which designs and manages projects to improve aquatic biodiversity. Sharon commenced working at the Office of Environment and Heritage in 2011 at the Newcastle office as the principal estuary specialist. She has been in her current position since June 2013 and one of her key roles is the management of the Upper Hunter Strategic Assessment Project.

Dominik Nicholls

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Dominik Nicholls has a Bachelor of Science (majoring in ecology) and a Bachelor of Laws from The University of Melbourne. She was admitted as a legal practitioner in 2009. After several years in private practice, she now works as a Principal Policy Officer at the NSW Office of Environment and Heritage. Dominik has had a key role in development of the draft NSW Biodiversity Offsets Policy for Major Projects and has recently been working with the Commonwealth Government on a bilateral agreement for environmental approvals under the Environment Protection and Biodiversity Conservation Act 1999.

Abstract

Developing and implementing Government Policy: A case study - Upper Hunter Coal Strategic Assessment

We will provide updates on two major biodiversity initiatives relevant to the Hunter. The first is the draft NSW Biodiversity Offsets Policy for Major Projects, which was announced in July 2013 and publicly exhibited for comment earlier this year. The presentation will outline the proposed role and operation of the policy and its relationship to the Commonwealth Government's one-stop shop for environmental approvals. The second will be the Upper Hunter Strategic Assessment of coal mining. It was in this forum in 2012 that we first spoke about the Upper Hunter Strategic Assessment of Coal Mining. Back then we covered the policy and legislative settings, again in 2013 we spoke about the methodologies being used in the assessment, and now in 2014 we will be reporting on the significant progress of the project including the final outputs – the Biodiversity Plan, the Strategic Assessment Report and guidelines for mine rehabilitation and mitigation.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

MARTIN FALLDING & STEPHEN BELL

SPEAKERS NUMBER 5

Martin Fallding

Land & Environment Planning (LEP), Environmental planning and land management consultants

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Martin is an environmental planner and has worked extensively on biodiversity offset policy and practice in recent years. His experience includes strategic biodiversity planning, establishing a Biobank site, negotiating offset arrangements, preparing offset management plans, and co-ordinating bushland monitoring and rehabilitation programs. His consultancy LEP specialises in strategic biodiversity planning and management plans preparation.

Stephen Bell

Eastcoast Flora Survey

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Stephen has worked as a vegetation ecologist and mapper within the Hunter Region for nearly 25 years. During this time he has undertaken numerous projects defining and mapping the distribution of vegetation communities, and researching threatened plant species and endangered ecological communities. He is currently investigating the return of former grazing lands to natural ecosystems and endangered ecological communities, such as those included in mine offset lands.

Abstract

Effective Biodiversity Offsets: Improving planning, valuation and monitoring practice

New and extended Hunter Valley mining operations now normally include biodiversity offset packages to compensate for the loss of native vegetation. Areas are required to be protected and rehabilitated and many support remnants of endangered ecological communities and threatened species.

This interdisciplinary presentation reviews biodiversity offset practice for Hunter Valley coal mines and key aspects of the framework required to effectively integrate consideration of biodiversity values with development outcomes. The review is timely, with the NSW Government finalising a Biodiversity Offsets Policy for Major Projects and the Upper Hunter Strategic Assessment and 'Biodiversity Plan'.

The presentation provides an overview of biodiversity offsets and their role in coal mining approvals processes, and planning principles and strategic approaches required for effective offsets. It highlights issues faced in implementing offsets at both regional and site scales.

Improvements are required to planning, valuation and monitoring practice, and can significantly reduce costs and improve ecological outcomes. Case studies of valuation and ecological monitoring practice suggest that improved methods of assessing and valuing offset land are required. In particular, good quantitative ecological data collection can improve management practice and reduce costs.

The issues raised will inform discussion about the emerging role of biodiversity offsets in mining approvals and rehabilitation practice.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

LUKE BEWLEY

SPEAKER NUMBER 6

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Luke Bewley is currently Manager, Coal and Access Section, Resources Division, in the Commonwealth Department of Industry. Luke's role is to provide effective and influential leadership in government approaches to improving productivity and competitiveness in the resources sector, in particular coal mining, resources infrastructure, land access and mine safety. Luke has worked in the Resources Division for over seven years in a number of roles, including work on sustainable development issues that involved development of a national multiple land use framework, implementation of an access management framework in the Woomera Prohibited Area, promotion of leading practices and Indigenous participation, engagement with the APEC Mining Task Force and responsibility for management of Commonwealth offshore petroleum taxation and royalties.

ABSTRACT

Australian Department of Industry multiple landuse framework (MLUF)

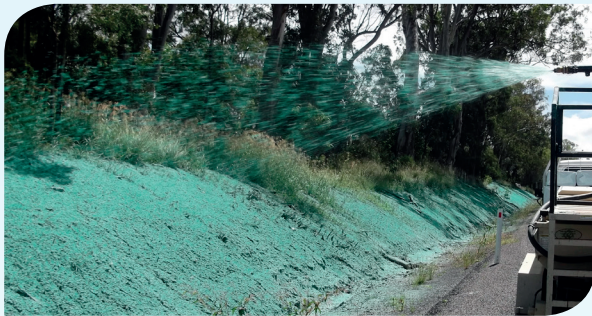
The presentation will focus on the Multiple Land Use Framework (MLUF) in recognition that leading mine rehabilitation practices is a precursor to leaving a positive legacy to the community and securing future options for post-mine land use. The Commonwealth, in collaboration with State and Territory governments, developed the MLUF to enable government, community and industry to effectively address challenges arising from competing land access, land use and land use change. Application of the MLUF has the potential to achieve better land use outcomes through improved land use planning, policy and development practices that provide certainty for industry and improve community confidence in land use decision making. Leaving a positive legacy for the community post-mine closure is both the right thing to do and makes good commercial sense – both at the local level and globally, helping Australia's mining sector remain internationally competitive and attractive to investors.



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SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

PETER ELLIOTT

SPEAKER NUMBER 7

Peter Elliott
Senior Principal - Sustainability
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Peter Elliott is Senior Principal Sustainability with URS Australia Pty Ltd in the Perth office. Peter has had a long history of facilitating and leading integration of sustainable principles into both mine and other infrastructure projects. He worked for the resource sector for over 20 years including Alcoa World Alumina and Western Mining where he was instrumental in developing good practice in Mine closure and Completion. In 2006 he was a prime author of Mine Closure and Completion booklet produced as part of the leading practice sustainable development program for the Australian Mining Industry produced by the Australian government Department of Industry Tourism and Resources.

He has assisted the Australian Centre for Minerals Extension and Research part of the Sustainable Mining Institute with mine closure workshops, with a focus on the integration of socio-economic aspects of mine closure into Mine Closure Plans. He has provided advice to the WA Department of Mines and Petroleum and Office of the Environmental Protection Authority in the development of Guidelines for preparing Mine Closure Plans.

Peter's background includes being a member of the world benchmark bauxite mine rehabilitation team that received the David Judd Award, the Alcoa environmental excellence award. He developed the first agreed set of mine closure completion criteria developed in Australia. He is currently involved in developing the negotiated net benefit approach for mine closure, the theme of his presentation, with a number of clients in WA.

ABSTRACT

Negotiated Net Benefit: Better Mine Closure Outcomes for Less Money

Current closure objectives and criteria are often difficult to achieve and are not delivering best value outcomes at closure. Current mine closure processes tend to focus on returning bio-physical structures to as close to pre-mining condition as possible, rather than focusing on the functions of those structures and values they provided. Achieving pre-mining conditions is often not achievable and objectives and criteria aimed at achieving close to these conditions is often very costly. The authors have developed a broader approach, Negotiated Net Benefit, to developing mine closure plans based on environmental risk and gaining of post closure social, environmental, economic value. We think the focus should shift from trying to return the original landscape to returning the functions of the original landscape and the values provided on and off-site. If it is not possible to return those values on-site in a cost-effective manner then off-site investment should be provided to deliver equivalent values elsewhere. A process of transparent options evaluation and stakeholder engagement to link outcomes to stakeholder values is undertaken to achieve a Negotiated Net Benefit for closure. We present examples of how the framework could be applied to identify alternate closure options that achieve equivalent value outcomes while reducing the costs of closing the mines.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

ROB LOCH

SPEAKER NUMBER 8

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Dr Rob Loch is:

- Principal consultant for Landloch Pty Ltd
- A Certified Professional Soil Scientist at Leading Professional level
- One of Australia's leading erosion research scientists, and author of close to 60 papers in refereed journals, covering research in agriculture, forestry, intensive agriculture, and minesites, with topics including soil structure, crop and tillage management, sediment, nutrient, and contaminant movements in runoff, soil erodibility measurement, and soil erosion modelling.
- Chair of the Soil Science Australia committee developing competency guidelines for Soil Erosion Assessment and Management
- A regular lecturer at industry training courses.
- At various times he has been:
 - President of the Queensland branch of Soil Science Australia
 - A member of the Editorial Advisory Committee of the Australian Journal of Soil Research
 - An Honorary Research Fellow of the University of Queensland and the University of Southern Queensland
- For the last 20 years, Rob has been an industry leader in development of improved minesite landform design methods, delivering objective, defensible, and cost-effective ways of combining runoff and erosion prediction with soil profile and vegetation design for sustainable, practical, outcomes. His work has changed industry leading practice in some states, and achieved rapid bond return and mine closure for clients, some of whom have also won industry awards.

Abstract

Meeting new challenges in waste landform design

Historically, minesite waste landforms have not been designed at all. Rather, the same benched profile has been constructed irrespective of materials, climate, and vegetation targets. However, the use of relatively complex erosion modelling to design less "engineered" landforms has recently delivered dramatic successes in the arid regions of WA and NSW.

Public perceptions and expectations of waste landforms have evolved rapidly. As well as diminished tolerance for instability and failed revegetation, minesites operating in closer proximity to population centres now face expectations that waste landforms will also be aesthetically acceptable; appearing "natural". This is particularly so for mining in the Hunter Valley.

Delivering a landform that appears "natural" is not necessarily straightforward. Natural landforms occur in a wide variety of shapes, challenging landform designers to develop an objective assessment of aesthetic "quality". This paper outlines a method developed and applied by Landloch.

But there is still the challenge of how to design a landform that not only appears "natural", but also can be demonstrated to meet requirements of stability and sustainability. Basing designs on adjacent landforms is an attractive concept, but fails to consider variations in material properties – particularly where dispersive wastes are excavated – and any certification of stability that considers that a "natural" profile guarantees stability is simply relying on blind faith.

Application of erosion models can, on its own, deliver landforms that appear natural. However, it can also be paired with analysis of adjacent natural landforms to not only deliver "natural" landforms, but to also verify their stability for the site-specific climate, wastes and topsoil, and target vegetation. This paper presents examples for the Hunter Valley area.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

ROD ECKELS

SPEAKER NUMBER 9

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Rod Eckels is an Australian surveyor who has been involved in GPS surveying since 1984. When working in machine guidance systems in the USA in 2003, Rod met Nicholas Bugosh who was managing mine rehabilitation activities at the BHP La Plata mine, New Mexico, USA. Nicholas had developed the GeoFluv approach to land rehabilitation and was applying these principles at the La Plata mine. Rod saw the incredible results that were achieved with GeoFluv and started Landforma in 2009 to promote and support this new approach in Australia.

Abstract

Rehabilitating Mines – using Natural Landforms

The traditional approach for storing overburden materials in open pit mines, is to pile the waste rock in large 'flat topped' pyramid shaped piles, with the intention of reducing haul distances and minimizing the disturbance footprint.

Experience has shown, however, that from an environmental perspective, this approach is less than ideal. These landform shapes are subject to erosion, the development of incised gullies and sometimes slope failures. Surrounding water channels are exposed to increased sedimentation affecting water turbidity and salinity. Long term maintenance is required including rock drains, contour banks and sediment ponds to mitigate this problem.

In 2000 a new approach to mined land rehabilitation was developed in the USA by Nicholas Bugosh following fluvial geomorphic principles. The designed landforms are stable, "natural" landforms that honor the rules of water flow in the landscape, and are therefore not subject to accelerated erosion. The resulting landscapes are stable, aesthetically pleasing and promote biodiversity of native flora and fauna

The paper will discuss the basic principles and philosophy behind the "GeoFluv" approach and how it has been successfully applied to mine rehabilitation projects.





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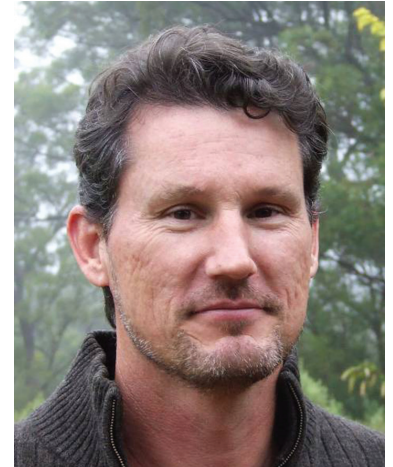
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SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

IAN OLIVER

SPEAKER NUMBER 10

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Ian is a conservation ecologist with 20 years experience in biodiversity assessment and monitoring research. Recent applied research has focused on developing and delivering an adaptive monitoring program designed to evaluate the restoration outcomes for biodiversity, vegetation, and soil, from CMA supported land cover, land use, and land management change on agricultural lands. Ian was recently appointed to the new position of Senior Team Leader / Restoration Science & Implementation within OEH's recently restructured Science Division

Abstract

Ecological rehabilitation of self-sustaining plant communities following open-cut coal mining in the Hunter Valley

The Office of Environment and Heritage (OEH) has developed a method to estimate gains in biodiversity values from the ecological rehabilitation of mined land. The method is based on re-establishing 10 vegetation attributes and achieving "self-sustaining" plant communities. However, rigorous scientific evidence demonstrating the successful re-establishment of vegetation attributes and self-sustaining plant communities following large-scale open-cut mining is limited. In this presentation we will introduce a project that has recently commenced in the Hunter Valley. The project aims to: (1) test whether the expected re-establishment of vegetation attributes following open-cut coal mining can be supported by empirical data; (2) field-test additional biophysical attributes (that measure or indicate key ecosystem processes) to track progress towards, and achievement of, self-sustainable plant communities on rehabilitated mined land; and (3) develop an operational framework that provides guidance on the selection and use of an optimum set of attributes for assessing progress towards, and achievement of, self-sustainable rehabilitated ecosystems.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

BARBARA DRIGO

SPEAKER NUMBER 11

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Dr Barbara Drigo is an Associate Lecturer at Hawkesbury Institute for the Environment. Her research interests centre on Restoration Ecology; Plant-Microbe Interactions; Microbial Ecology; Molecular Ecology; and Climate Change within the Soil Biology & Genomics research theme.

Abstract

The future of dirt: re-establishing self-sustaining vegetative cover on reclaimed mine lands

Economically important mining operations and increasing recognition of the threat that global climate change poses to Australia's fragile ecosystems requires the development and deployment of innovative and cost effective technologies for mine rehabilitation, carbon sequestration and bioenergy production. Synthetic Natural Gas (SNG) has been proposed as a viable alternative fuel source capable of meeting part of this demand. In addition to providing a renewable energy source, the production of SNG creates a carbon rich bio-product known as 'biochar'. It is postulated that biochar could be used to mitigate the threat of climate change by sequestering carbon from the atmosphere and improving the fertility of mine spoils, facilitating the growth of 'carbon sinks'. Here, we investigate the interaction of biochar with mine spoils and its effects on sustaining plant growth to improve revegetation, drainage and long term management practices. Using a series of greenhouse pot trials, Eucalyptus crebra and different mycorrhizal and non-mycorrhizal grass species were grown in mine spoils treated with 8% biochar. Analysis involving a suite of abiotic approaches showed significant beneficial changes in plant productivity and soil physical properties including increases in mine spoils water holding capacity. Next generation sequencing and real-time PCR revealed that revegetated mine spoils treated with 8% biochar stimulated the growth of plant beneficial soil microorganisms important for successful long term management practices and facilitate the growth of soil 'carbon sinks'. Collectively, our data demonstrate that bio-amendment of mine spoils with biochar is an important management option for mitigation of the negative impacts of mining and enhancing carbon sequestration and have the potential to re-establish self-sustaining vegetative cover on reclaimed mine lands.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

ALEXANDRA CALLEN

SPEAKER NUMBER 12

Alexandra Callen

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Alex is an environmental scientist in the Conservation Biology Research Group at the University of Newcastle. She is particularly interested in applied research related to habitat restoration and the success of animal reintroductions into these areas. Her research investigates the potential for environmental salinity to limit the impact of disease on a semi-wild population of the threatened green and golden bell frog. As an ecologist, she is concerned with not only determining the effectiveness of environmental salinity to inhibit amphibian disease, but also understanding the response of the broader ecological community to low levels of environmental salinity. Prior to recommencing research with the University of Newcastle, Alex previously worked as an environmental officer with the Department of Defence and as a senior ecological consultant.

Abstract

Build it and they still may not come – Using new knowledge to move beyond physical restoration of amphibian habitat

The cryptic nature of some threatened species makes it difficult to determine suitable habitat requirements that meet all life-cycle stages to ensure population persistence. As a result, habitat restoration efforts can be perceived as expensive to establish, with little apparent success in terms of population increases of the key species of concern. Additionally, the elements which threaten the viability of such populations may also be difficult to quantify and manage, further reducing the likely success of restoration. For the threatened and somewhat enigmatic green and golden bell frog in the Upper Hunter, conservation efforts have largely focussed on habitat restoration, with no resultant increase in the occurrence or abundance of the species since 2007. New knowledge about the management of key threats to this species and evidence of historic genetic connectivity between all extant NSW bell frog populations would suggest it is timely to consider experimental re-introductions of the species to restored landscapes and/or offset habitats to increase the security of the Upper Hunter population. This objective is consistent with the Management Plan for the Green and Golden Bell Frog Key Population in the Upper Hunter and the Draft Green and Golden Bell Frog Recovery Plan.



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SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

CARMEN CASTOR

SPEAKER NUMBER 13

**Carmen Castor
Snr Scientist, Restoration Science & Implementation,
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Dr Carmen Castor – Conjoint Lecturer at University of Newcastle and employed as Snr Scientist in the Science Division of the Office of Environment and Heritage (OEH). Carmen has worked at the University of Newcastle for the last 12 years on mine restoration and participating in the establishment of the Ravensworth State Forest Vegetation Complex model site at Mount Owen. Recent foci have been on restoring the understorey and the establishment of viable plant populations with students. Current research with the OEH Restoration Science and Implementation team lead by Dr Ian Oliver focuses on how to measure sustainability of restored ecosystems.

Abstract

Promoting Herbaceous Plant Populations on Mine Rehabilitation in the Hunter Valley

Trends in long term monitoring of rehabilitated mine sites in many instances show a gradual reduction in plant species diversity over time. Of particular importance is the lack of sustainability of herbaceous plants which can comprise the majority of species in an ecosystem. Several reasons can be invoked to explain this but one that we are focussing on is the continued existence of germination microsites as the system develops and ages. At Ravensworth Operations, a coal mine in the Hunter Valley, N.S.W., Australia, we have set up a trial consisting of different soil and substrate ameliorations of the dump area which has been direct seeded with a complex matrix of native forest-woodland species of all strata. Into this developing ecosystem we have planted additional herbaceous species of interest and are monitoring survival of these and the appearance of seedlings. The quality and quantity of microsites on the different substrates will be determined and their evolution over time followed. The effective germination microsites will also be qualified as seedlings start to emerge. We will present data on the set up of a fully blocked field trial, initial results of the success of the matrix seeding, initial survival of planted herbs and the presence of reproductive features and seedlings. We hope to determine which substrate condition is optimum for the sustainable development of a population of herbaceous plants, how this differs for different herbaceous species and how this evolves with time.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

TASMAN WILLIS

SPEAKER NUMBER 14

**Tasman Willis, Land Management Officer, Mangoola Coal
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Tasman Willis has a background in terrestrial ecology and studied Environmental Science and Management at the University of Newcastle as well as Bushland Regeneration. Prior to his employment with Mangoola Coal, Tasman was the Senior Ecologist at an Environmental Consultancy firm and has also completed bushland regeneration/revegetation projects, has been a Demonstrator at the University of Newcastle (Science/Ecology) and volunteered in numerous ecological studies through Forest NSW, Hunter Councils, Earthwatch and the University of Newcastle. Tasman joined Mangoola Coal as the Land Management Officer in 2011 and his responsibilities include developing ecological and mine rehabilitation management plans, coordinating mine rehabilitation (including natural landform design, flora species selection based on local vegetation communities, habitat augmentation and rehabilitation inspections), threatened species management, pre-vegetation clearance surveys and reporting, ecological and aquatic monitoring and reporting and other land management activities. Tasman is a passionate ecologist and aside from his achievements at Mangoola Coal, he is also a keen bird and bat enthusiast (being a member of the Hunter Bird Observers Club and Australian Bat Society) and enjoys sharing his knowledge with work colleagues.

Abstract

Natural landform at Mangoola Coal.

Mangoola Coal is developing a natural landform in its mine overburden rehabilitation. Mangoola has developed a conceptual landform design of the entire Pit disturbance area (1,300ha), and a detailed plan for the next five years (approx. 560ha). The modelling program selected for this project was Natural Regrade (Carlson Software). This software models onsite dump parameters and soil types, with comparisons to surrounding natural land surface, and provides a theoretically stable landform based on fluvial geomorphic landform design methods. To date, 80 hectares of natural landform mine rehabilitation has been developed at Mangoola, with an additional 40 hectares to be complete by the end of 2014.

Following the development of the natural landform, areas are strategically targeted for specific vegetation types that occur in the surrounding local area, based on similar topography, slope, aspect and topsoil type. Only species that occur in the local area are used in rehabilitation. Habitat structures are established including, wood piles, rock piles, standing habitat trees, low areas of inundation and dams. Nest boxes will be installed over time as the vegetation provides appropriate habitat.

The presentation aims to discuss the process of implementing a natural landform in mine rehabilitation and identify successful aspects, and the less successful aspects.

SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

BILL BAXTER

SPEAKER NUMBER 15

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Bill Baxter graduated from the University of Queensland in Civil Engineering and worked for over 10 years as a Civil and Mining Engineer in various Rio Tinto open cut coal mines before being drawn to the rehabilitation side of mining work. Following further study in Natural Resource Management through the University of New England, he made the switch to environmental management roles and in 2007 secured a rehabilitation specialist role with Coal & Allied. In this role, his focus has been on improving the consistency of the quality of rehabilitation being undertaken for both native vegetation and agricultural outcomes

Abstract

Coal & Allied's recent efforts to restore Central Hunter Ironbark Communities

The previous approval process for the Warkworth Extension saw Coal & Allied committing to rehabilitating the majority of mined land to an ecological community similar in composition and function to the Central Hunter Grey Box – Ironbark – Spotted Gum Endangered Ecological Communities. Much of the diversity in these communities is in the understorey layer so the establishment of a diverse native understorey is an important part of the rehabilitation process.

Previous native vegetation rehabilitation undertaken by Coal & Allied (and other Upper Hunter mining companies) has been focussed on tree and shrub establishment with the understorey component of the seed mixes being made up of exotic grasses to provide initial stability and cover. Some local mines have been able to achieve a native understorey in rehabilitation when they have had the benefit of spreading fresh woodland topsoil on rehabilitation areas. The reality however for most Upper Hunter Mines is that they will largely be using topsoil that is recovered from ex-grazing land or from stockpiles with soil seed banks dominated by exotic pasture species and weeds.

Since 2011, Coal & Allied has been conducting research (at an operational scale) of methods that can establish a diverse native understorey in the absence of good quality native topsoils. This presentation will detail the methods that have been trialled and summarise the results achieved to date.



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SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

JOE THOMPSON

SPEAKER NUMBER 16

Joe Thompson
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Joe Thompson grew up on the Central Coast of NSW, graduating in 1985 from Tocal Agricultural College. After a number of years working in the agriculture and horticulture industries, including dairying, sheep, both intensive and broadacre vegetable production and amenity horticulture, Joe secured a role as Manager of Trees in Newcastle in 1996. Since that time, Joe has been actively engaged in NRM in the Hunter region working in roadside environment projects, farm forestry extension and regional Landcare facilitation before joining the former Hunter Central Rivers Catchment Management Authority and taking on the role of Catchment Coordinator for the Upper Hunter, a role he held for three years. Following this, Joe was appointed to manage the redevelopment of the Catchment Action Plan. During 2013, Joe took some time away from state agency work and took up a role at Port Stephens Council in coast and estuary project work, rejoining Hunter Local Land Services in December 2013. His current role focuses on the development of partnerships with industry groups, corporate partners and government bodies

Abstract

Wybong Catchment Health Improvement Project (Wybong CHIP)

The Wybong catchment is located in the Hunter coalfields approximately 200km north west of Newcastle. This catchment was identified as a priority area in the Local Land Services Catchment Action Plan as well as through other processes such as the Great Eastern Ranges Initiative (GERI).

The Wybong Catchment Health Project (Wybong CHIP) is a partnership between industry, government and community to achieve natural resource management outcomes on a catchment scale. The NSW state governments Hunter Local Land Services (LLS, formerly Hunter Central Rivers Catchment Management Authority) has partnered with mining company Glencore (formerly Xstrata Coal) since 2011 to support land managers to improve land management practices on private land in the Wybong sub-catchment.

The project aims to achieve its purpose through: implementing on-ground works under agreements with individual landholders; landholder engagement and capacity building via education programs; and monitoring, evaluation, reporting and improvement through actions at each project site and through a sub-catchment scale bird monitoring project.

The project utilises \$1.5m in funding from Glencore in an agreement spanning four years and is focused on on-ground works agreements with individual landholders on private land complemented by capacity building programs.

To date the project has engaged approximately 40% of the landholders in the Wybong CHIP area. The catchment scale bird monitoring project has identified over 130 species including thirteen threatened species and thirty five species not previously recorded in the catchment.

The Wybong CHIP has proven that natural resource management on private land can be dramatically improved and increased through the single catchment approach. This requires large-scale financial investment which can potentially be achieved through partnerships between NRM organisations and large business; the case between Hunter LLS and Glencore.

The Wybong CHIP and the regional scale bird monitoring project could both be used by other organisations as a template for large industry and NRM providers to work together. It is envisaged that the bird monitoring project will also provide valuable information about climate change into the future.



SPEAKER BIOGRAPHIES and ABSTRACTS (in order of appearance)

JOHN SANDERSON

SPEAKER NUMBER 17

John Sanderson

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Dr. John Sanderson is an environmental and engineering consultant with specialist expertise in the field of bioenergy and pyrolysis processes. After completing a PhD in chemical engineering at Monash University, John worked at the CSIRO with the Fluidization Group, principally focussing on improving metallurgical and mineral processing equipment. John has worked at Earth Systems for the last 5 years where he is a principal level consultant in the Carbon and Energy team. His work for Earth Systems has included GHG auditing, mining and industrial energy efficiency, regional renewable energy feasibility studies, waste to energy consulting and the design and development of bioenergy systems including hydrothermal processing, fluidized beds, gasification and pyrolysis technologies. John is co-creator of Earth Systems' CharMaker MPP20 mobile pyrolysis plant and in addition to his work at Earth Systems, he is a director of Gasification Australia, where he is currently involved in the development of a small-scale off-grid biomass to electricity technology to supplement household solar PV systems.

Abstract

A transportable process for biomass waste management and biochar production at remotes mine sites

Woody wastes are generated at mine sites through vegetation management and removal, as well as the accumulation of various packaging materials associated with ongoing mine operations. The conversion of these wastes to biochar presents an opportunity to not only deal with a site waste problem but also produce a valuable char by-product which can be beneficially applied on-site as a soil amendment in rehabilitation works, as a filtration medium in site stormwater management and as a sorbent for use in spill control, for example. Over the last few years, Earth Systems has developed a fully self-contained transportable system for converting unchipped wood wastes to clean biochar and now has units deployed in Victoria, Queensland and the Northern Territory. Chars have been produced from multiple feedstocks and trialled in numerous applications. The presentation will cover the sustainable production and application of biochars in site remediation and rehabilitation works, based on our experience of a variety of feedstocks, processing arrangements and relevant biochar end uses.



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Poster Presentations

A range of poster presentations will be available to observe and discuss during the breaks in our conference today. Below is the listing of those posters and their presenters.

**Matthew Williams¹, Rebecca Cross^{1,2},
Malika Virah-Sawmy^{1,2}, Ros Taplin¹ and Simit Raval¹**

**¹ Australian Centre for Sustainable Mining Practices,
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**² Institute of Environmental Studies, University of New
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Biography

Matthew Williams is a final year Bachelor of Engineering (Mining Engineering) student in the School of Mining Engineering, University of New South Wales. His fourth year thesis research is on 'Assessment of social-environmental mining impacts on biodiversity and agriculture in the Upper Hunter Valley'. This project is being conducted in association with the Australian Centre for Sustainable Mining Practices. Matthew has over 25 weeks first hand experience working at an open cut coal mine in an environmentally sensitive and agriculturally significant area of the Hunter region. Before commencing his Engineering studies in 2010, Matthew lived on a dairy farm in close proximity to an open cut coal mine in the Hunter Valley and feels strongly about mining and agriculture working more closely together. After studying for two years at the University of Newcastle's Callaghan Campus, he moved to the University of New South Wales (UNSW) in Sydney to complete his final two years of Mining Engineering study. He has represented UNSW on a six month student exchange to Austria and recently at the National Mining Games and New Leaders Conference in Perth.

Poster Abstract

Biodiversity Offsets for Mining and the Potential for Farmers' Involvement in the Upper Hunter, New South Wales

Despite the Biodiversity Banking and Offsets Scheme (BioBanking) having been implemented in New South Wales (NSW) in 2008, there has been limited uptake by private landholders. Also from a scientific perspective there is potential for step-change improvements in environmental management and regulatory requirements to enhance the effectiveness of biodiversity offsetting. As a response to such developments, the NSW Government has released a *Draft NSW Biodiversity Offsets Policy for Major Projects*, a *Draft Framework for Biodiversity Assessment*, and a *NSW Biodiversity Offsets Fund for Major Projects Discussion Paper* in March 2014. In line with the objectives of the new draft policy and framework to assist landowners, including farmers, to establish offset sites on bushland portions of their land, we present our research findings on: (i) a recent survey of farmers conducted in the Upper Hunter, NSW on their potential interest for involvement in biodiversity offsetting associated with mining; (ii) ecological restoration needs and potential of Upper Hunter agricultural land sites; (iii) a methodology to quantify biodiversity (and potentially socio-economic) benefits of the approach.

Poster Presentations

Peter Stevens

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Peter Stevens is an associate of the TFI and a former senior manager in the NSW National Parks and Wildlife Service, with qualifications in architecture, environmental science and project management. Currently lecturing in the Disaster Preparedness and Sustainable Redevelopment Master's program at the University of Newcastle. Peter is studying the mismatch between human environment development patterns and the patterns that occur in nature to accumulate resources. The poster presented at this conference alludes to opportunities afforded in mined landscapes to explore these patterns of accumulation as the basis for ecologically sustainable human habitat. He is looking for an industry partner to pilot the approach based upon pilot projects and research undertaken over twenty years.

Abstract

Fertile Mines

This paper examines the roles of energy rich communities in building landscape fertility and of mining houses as the champions of a new environmental era. There is the opportunity for leadership in this area, particularly in the ancient landscapes of Australia where vast reserves of stored carbon are being extracted and exported for the production of goods purposes. Beyond the politics, beyond the current landuse paradigm and beyond inherent landuse conflicts there are practical reasons to establish a new landuse model with a focus on increasing long term biological capacity.

There is scope in the mining sector to introduce landforms that ensure the conditions for soil moisture retention are significantly enhanced with an abundance of accessible minerals, soil carbon, mycorrhizal fungi and photosynthesising biota. This will require experimentation and the direct involvement of communities on a regional and landscape scale. It will involve the cyclic reintroduction of resources otherwise deemed to be waste, and the active generation of seed and useful vegetative materials on an unprecedented scale. This is a direct and practical action that will increase the viability and sustainability of Australian landscapes and reduce the risks associated with soil loss, water pollution, and changes in rainfall distribution, and the impact of drought, fire and flood. It will engage communities and the human capacity for collaborative effort in ways that have rarely been mobilised in the course of human history. The approach will bring the mining houses and communities together with a common purpose and place those involved on a global pedestal. It will create an entirely new pathway to economic prosperity and societal wellbeing. It will generate exportable skills and technologies. Basic landscape reforms are discussed with examples from the author's own work and the work of other landscape reform advocates in Australia. Examples of naturally productive landscapes are drawn from the vast Australian landscape laboratory.



Poster Presentations

Penny Dunstan
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Penny is a landscape artist currently enrolled in a PhD Fine Art. Her work includes photography, both analogue and digital, oil painting, drawing and installation works in earth.

She is also a trained scientist. Previous jobs included working as an agronomist, a viticulturist, a lab technician and TAFE manager. She has a Masters in Agriculture from Sydney University. Penny is looking forward to working with people who have an intense interest in landscape reconstruction and future management.

pennydunstan.com

Abstract

Penny Dunstan poster The Role of Aesthetics in Terraformed Landscapes

The Hunter Valley has many hundreds of hectares of man-made landform as a result of open cut mine rehabilitation. Terraforming land requires decisions to be made about how land looks and feels, and those decisions are bequeathed to the future generations. The aesthetics of landscape are dealt with in the literature as an engineering design problem however aesthetics encompasses broader questions of land form, land features and the mix of these parts. In the long term, the aesthetics of terraformed land affects how the rehabilitated land reintegrates with the community.

The rehabilitation of previously mined land is a process not often understood by the arts community or the general public. The land is made new and unfamiliar. Community memories of land must start again. The inertia of solastalgia, (Albrecht 2013) or nostalgia for lost land must be overcome. This study seeks to identify and record the achievements of ecological restoration where a landscape aesthetic is evident.

In this study I am interviewing those whose hard work and persistence made new land out of rubble and recreated complex ecosystems, the rehabilitation officers, environmental officers and contractors working for coal companies. The resulting interviews and art works will document these achievements and show a picture of the future of the Upper Hunter post mining.



Poster Presentations

Lisa Zillig

Visiting Intern, Tom Farrell Institute for the Environment, University of Newcastle

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Biography

I am in my first year of the Bachelor of Science (Biology) at the University of Duisburg-Essen, in Germany. In the course of my 6 weeks lasting internship in the Tom Farrell institute, with an scholarship of the German Academic Exchange Service, I have concentrated on mined land rehabilitation.

Poster Abstract

This poster will give an overview of the regulation and practice outcomes of rehabilitation of open cut coal mines in Germany. Germany has three major brown coal mining regions which are, like the other mining activities in Germany are regulated by the Federal Mining Act from 1982, in in this way, also the rehabilitation of those areas. Concentrating on some of the likely issues, caused by coal mining, some examples of post mining land-use, soil improvement and the chance to establish new ecosystems are presented.



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The NSW Biodiversity Offsets Policy for Major projects will clarify, standardise and improve biodiversity offsetting for major project approvals under the NSW planning system. Under the policy, proponents will have two options for calculating the contribution of mine site rehabilitation to their offset requirements. For more information see <http://www.environment.nsw.gov.au/biodivoffsets/14100minerehab.htm>

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