'Research for a changing world'

On-line conference presented by the Institute for Land, Water and Society

26th and 27th November 2020

Program & Abstracts
Aim of conference

The ILWS Conference 2020 is an opportunity for our members to share what they have discovered and learnt from their recent research projects and activities and to showcase the work of our strong research teams.

About us

We are a multi- and trans-disciplinary Research Centre at Charles Sturt University, Australia’s largest regional university. In partnership with government and others, we undertake biophysical, social and economic research to address local, regional, national and global issues. Our researchers are involved in individual, collaborative and commissioned work around Australia and the world.

Program Summary

Thursday 26th November
9.00am – 9.20am Welcome and opening
9.20am – 12.00pm Session 1
12.30pm - 5.20pm Session 2

Friday 27th November
9.00am – 12.00pm Session 3
12.40pm – 4.20pm Session 4
4.20pm – 4.45pm Closing remarks
Program Summary

Register for the conference

Tickets are free and the conference is open to everyone


The program reflects the multi and trans-disciplinary research ethos of ILWS.

Each presentation has been colour-coded to reflect the major theme within which the research sits. ILWS strives to conduct inter- and transdisciplinary research. Gold coded presentations are considered interdisciplinary and this includes the transdisciplinary projects that are housed in our Sustainable Development (International) theme.

Biodiversity Conservation

This theme is the platform for research projects undertaken by both the Institute's terrestrial and aquatic ecologists working on one or more aspects of biodiversity conservation including landscape ecology, environmental history, vegetation and wildlife ecology, restoration ecology, plant-animal interactions, ecosystem services and native fish conservation. Learn more

Environmental Water

While this theme is the platform for the Institute's two major environmental water monitoring projects, and related projects, in the Edward/Kolety-Wakool and the Murrumbidgee river systems, it is also home for the Institute’s other fish ecology and irrigation technology projects. Learn more

Rural and Regional Communities

This theme provides a platform for a wide range of research projects where the focus is enhancing the well-being and livelihoods of rural and regional communities. Many past and current projects include a strong social component. Learn more

Interdisciplinary Research including Sustainable Development (International)

This is our cross-cutting research theme for inter- and transdisciplinary research projects undertaken in countries such as Laos, Bhutan, Pakistan and Timor Leste. These are big projects that run over a number of years. Learn more
## Session 1 – Thursday 26 November – 9.00am – 12.00pm

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| 9:20am – 9:40am | Robyn J. Watts, Catherine Allan, Xiaoying Liu, John Trethewie, Nicole McCasker, Julia A. Howitt, Nick Bond, Damian McRae, Katherine Reid, Bruce Campbell, Paul Childs, Sascha Healy, Mike R. Grace, Jason D. Thiem  
**Environmental flow trials in a regulated river in Southern Australia: integrating biophysical and social research** |
| 9:40am – 10:00am | Catherine Allan, Robyn Watts  
**Adaptive management of environmental flows; how reflection on ‘trials’ mediated dialogue and influenced practice** |
| 10:00am – 10:20am | Larissa Bamberry, Donna Bridges, Stacey Jenkins, Branka Krivokapic-Skoko, Elizabeth Wulff  
**It’s a male’s industry. Don’t expect us to change anything for you’; formal and informal regulation of gender equity in the construction industry** |
| 10:20am – 10:40am | Maree Bernoth, Keryl de Haan, Joanna Carlisle  
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| 10:40am – 11:00am | Richard J. Culas  
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| 11:00am - 11:20am | Raf Freire, Leia Rogers, Ellie Sales, Shokoofeh Shamsi, Paul Humphries, Keller Kopf  
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**Visual Analysis and Prediction of PIT data from Murray Darling Basin** |
| 11:40am – 12:00pm | Simone-Maree Hyde  
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<td>Diverse fish communities in lower Mekong floodplain wetlands benefit from improved fish passage: Implementation of operational and structural fish passage options in the Xe Beng Fai, Central Laos.</td>
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<td><strong>Nicolette Duncan</strong>, John Conallin, Sanjiv de Silva</td>
<td>Fish for whom? The role of institutions in translating eco-technical investments into inclusive development outcomes</td>
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<td><strong>Yapa Bandara</strong></td>
<td>International Migration: Is it the answer for Regional Skills Shortage</td>
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<td><strong>Rui Bi</strong></td>
<td>Understanding digital business value creation in Australian SMES</td>
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<td>1:00pm – 1:20pm</td>
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<td><strong>Richard A. Crabb</strong></td>
<td>Investigating the potential of sentinel-1 to detect varying spatial heterogeneity in pasture cover in grasslands</td>
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<td>1:20pm – 1:40pm</td>
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<td><strong>Andrew Hall</strong>, Rachel F. Thomas, Skye Wassens</td>
<td>Mapping the maximum inundation extent of lowland intermittent riverine wetland depressions using LiDAR</td>
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<td><strong>Paul Humphries</strong></td>
<td>The origins and implications of the historic Murray cod commercial fishery</td>
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<td>2:00pm – 2:20pm</td>
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<td><strong>Guy Sion</strong>, Maggie J. Watson, Amos Bouskila</td>
<td>Measuring body condition of lizards: a comparison between non-invasive dual-energy X-ray absorptiometry, chemical fat extraction and calculated indices</td>
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<td>2:20pm – 2:40pm</td>
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<td><strong>Helenna Mihailou</strong>, Dale G. Nimmo, Melanie Massaro</td>
<td>Temporal differences in visitation to ephemeral savanna waterholes limits interference competition between feral ungulates and native macropods</td>
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<td>3:00pm – 3:20pm</td>
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<td><strong>Mobushir R. Khan</strong>, Michael Mitchell, Catherine A. Allan, Jehangir F. Punthakey</td>
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<td>3:20pm – 3:40pm</td>
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<td><strong>Xiaoying Liu</strong>, Robyn J. Watts, Julia A. Howitt, Nicole McCasker</td>
<td>Carbon and nutrient release from experimental inundation of agricultural and forested floodplain soil and vegetation: influence of floodplain land use on the development of hypoxic blackwater during floods</td>
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<td>3:40pm – 4:00pm</td>
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<td><strong>Jodie Kleinschafer</strong>, Felicity Small, Mona Nikideghahani</td>
<td>Exploring the transition to the NDIS in the Western NSW region: Choice under the NDIS: Service provider and Carer Perspectives</td>
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<td><strong>Branka Krivokapic-Skoko</strong></td>
<td>Being Global and Being Regional: African female refugees setting up and running an enterprise in non-metropolitan Australia</td>
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<td><strong>Lucia Wuersch</strong></td>
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<td><strong>Liam Grimmett</strong>, Rachel Whitsed, Ana Horta</td>
<td>Landscape structure influences modelled response to environmental variables: Relevance to forecasting species distributions</td>
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<td><strong>Franz D. Scherping</strong>, <strong>Maggie J. Watson</strong></td>
<td>Adaptation of phenoloxidase assay for use in wild and captive Murray crayfish Euastacus armatus</td>
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<td>Zhenquan Li</td>
<td><strong>Reliable and accurate computations for fluid flows</strong></td>
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<td>9:40am – 10:00am</td>
<td>Jodi N. Price, Judith Sitters</td>
<td><strong>Herbivore exclusion effects on plant diversity depend on rainfall and evolutionary history</strong></td>
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<td>10:00am – 10:20am</td>
<td>Melanie Massaro, Alison Chick, Euan S. Kennedy, Rachel Whitsed</td>
<td><strong>Post-reintroduction distribution and habitat preferences of a spatially-limited island bird species</strong></td>
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<td>10:20am – 10:40am</td>
<td>Clifford Lewis</td>
<td><strong>The impact of LGBTQI+ Pride events on rural communities: The case of Wagga Wagga</strong></td>
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<td>10:40am – 11:00am</td>
<td>Ian Gray</td>
<td><strong>Adventures in the presentation of research by medium of video: ‘the unusual work of Griffith train CM3’</strong></td>
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<td>Michael Mitchell, Jehangir F. Punthakey, Catherine Allan, Richard J. Culas, Mobushir R. Khan, Faizan ul Hasan, Muhammad Ashfaq, Irfan A. Baig, Syed M. Khair, Abdul Rashid, Farooq Ahmed, Saira Akhtar, Asghar Ali, Ghulam Z. Hassan, Tehmina Mangan, A. Latif Qureshi, Aurangzeb Memon, Mustafa Nangraj</td>
<td><strong>Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan</strong></td>
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<td>11:20am – 11:40am</td>
<td>Harry A. Moore, Judy A. Dunlop, Damien R. Michael, Leonie E. Valentine, Euan G. Ritchie, Dale G. Nimmo</td>
<td><strong>In the heart of the spinifex sea: habitat selection of an endangered marsupial mesopredator in naturally fragmented landscapes depends on within patch, patch, and landscape variables</strong></td>
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<td>11:40am – 12:00pm</td>
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| 1:00pm – 1:20pm | Richard H. Loy, Guy Dutson, Peter W. Menkhorst  
Richard D. Segal, Melanie Massaro, Nicholas Carlile, Rachel Whitsed  
Small-scale species distribution model identifies restricted breeding habitat for an endemic island bird |
| 1:20pm – 1:40pm | Reza Mahinroosta, Lalantha Senevirathna  
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Can birds of different feathers fly together? Research collaboration in regional Australia |
| 2:20pm – 2:40pm | Break                  |                                              |
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Social capital in the environment |
| 3:20pm – 3:40pm |                       | Ghulam Zakir-Hassan, Catherine Allan, Jehangir F. Punthakey, Lee Baumgartner  
Groundwater monitoring: a pre-requisite for its management |
| 4:00pm – 4:20pm |                       | David M Watson  
Did mammals bring the first mistletoes into the tree-tops? |
| 4:20pm – 4:45pm |                       | Closing remarks Andrew Hall |

Thank you to all our presenters and participants for contributing to our conference
Abstracts

Session 1 – Thursday 26 November – 9.00am – 12.00pm

9:20am – 9:40am

Environmental flow trials in a regulated river in southern Australia: integrating biophysical and social research

Robyn J. Watts¹, Catherine Allan¹, Xiaoying Liu¹, John Trethewie¹, Nicole McCasker¹, Julia A. Howitt², Nick Bond³, Damian McRae⁴, Katherine Reid⁴, Bruce Campbell⁵, Paul Childs⁵, Sascha Healy⁶, Mike R. Grace⁷, Jason D. Thiem⁸

¹ Institute for Land, Water and Society, Charles Sturt University, Albury, NSW 2640, Australia
² Institute for Land, Water and Society, Charles Sturt University, Wagga Wagga, NSW 2678, Australia
³ Centre for Freshwater Ecosystems, La Trobe University, Wodonga, VIC 3689, Australia
⁴ Department of Agriculture, Water and the Environment, Canberra, ACT 2601, Australia
⁵ Department of Planning, Industry and Environment, Albury, NSW 2640, Australia
⁶ Department of Planning, Industry and Environment, Buronga, NSW 2739, Australia
⁷ School of Chemistry, Monash University, Clayton, VIC 3800, Australia
⁸ NSW Department of Primary Industries (Fisheries), Narrandera, NSW 2700, Australia.

Abstract

Academic literature suggests there are advantages in undertaking multidisciplinary research to address complex problems in natural resource management. We examine this in relation to environmental flows in a complex socio-ecological system, the Edward/Kolety-Wakool system in the Murray-Darling Basin.

The research focused on two flow trials involving changes to operating practices. The trials were planned through a collaboration of Federal and State water managers, representatives of community organisations and landholders. One trial delivered environmental water during winter 2017, whereas under normal operations there is usually a cease-to-flow due to no orders for irrigation water in winter. The second trial in spring 2018 exceeded the maximum daily discharge that was established to avoid inundation of low-lying private bridges. Biophysical responses (inundation, water quality, river productivity, fish movement) to the flows were examined and social research explored how landholders and water managers perceived the flow trials.

The environmental flows increased hydrological connectivity, increased production of carbon, enabled fish to move larger distances and improved water quality. The social research identified that the community accepted the approach of experimenting with environmental water to improve river health, and expressed pleasure in evidence of good environmental outcomes from the trials. While the flows did not interrupt landholder farming practices there were some concerns about how flows might be managed in the future. Integrating biophysical and social research provides a richer understanding of how the local community responds to river management, and has enabled water managers to plan subsequent environmental flows that were supported by the community.
Thursday 9:40am – 10.00am

Adaptive management of environmental flows; how reflection on ‘trials’ mediated dialogue and influenced practice

Allan, Catherine\textsuperscript{1,2}, Watts, Robyn\textsuperscript{1,2},

\textsuperscript{1}Institute for Land, Water and Society, Charles Sturt University, Albury, Australia
\textsuperscript{2}School of Environmental Sciences, Charles Sturt University, Albury, Australia

Abstract

The Murray-Darling Basin (MDB) Plan aims to restore water dependent ecosystems, partially by using water entitlements purchased from irrigators to deliver water to the environment as environmental flows. This delivery is constrained by established river operating rules and practices, and ‘acceptance’ of the practice is influenced by social expectations and norms. Because of this complexity adaptive management is essential to learn how best to implement environmental flow programs; and that means experimenting in public. The study in this presentation is from the Wakool River in the southern MDB, an area of great social and biophysical complexity. Two flow trials were implemented in 2017 and 2018 to test changes to operating rules and practices. In-depth interviews were undertaken with a range of Wakool River stakeholders in 2019, to better understand how they experienced the trials, and the act of experimenting with environmental flows. Five related but distinct framings of the situation emerged from the interviews, which we have labelled as Accounting, Engineering, Scientific Rationality, Ecosystem Health, and Cultural. Each frame provides ways of understanding three key concerns arising in the discussions – control, constraints and systems. The insights from this analysis are of more than theoretical interest; reflection among stakeholders on what these frames uncover about their expectations of communication and behaviours has already influenced the next scheduled flow trial in the area. This paper thus presents an example of how to explore a situation of water managing and use the results to mediate dialogue and influence practice.
Thursday 10.00am -10.20am

It’s a male’s industry. Don’t expect us to change anything for you’; formal and informal regulation of gender equity in the construction industry

Larissa Bamberry¹, Donna Bridges², Stacey Jenkins³, Branka Krivokapic-Skoko⁴, Elizabeth Wulff⁵

¹ School of Management and Marketing and Institute for Land, Water and Society, Charles Sturt University, Albury, NSW, Australia;
² School of Humanities and Social Science, and Institute for Land, Water and Society, Charles Sturt University, Bathurst Campus, NSW, Australia;
³ School of Management and Marketing, and Institute for Land, Water and Society, Charles Sturt University, Wagga Wagga, NSW, Australia;
⁴ School of Management and Marketing and Institute for Land, Water and Society, Charles Sturt University, Bathurst Campus, NSW, Australia
⁵ School of Humanities and Social Science Charles Sturt University, Bathurst Campus, NSW, Australia

Abstract

The skilled trades remain one of the most gender segregated occupations in Australia despite many strategic interventions designed to improve women’s access. Interventions have been focused at individuals, workplaces and the labour market as a whole, however most have been directed at changing formal regulation (laws, policies, rules) rather than informal regulation (practices, narratives and norms). Such interventions have not acknowledged the fragmented, project-based nature of employment within these occupations and the industry’s reliance on subcontracting. Drawing on a recent project in regional NSW and Victoria that explored the experiences of tradeswomen and apprentices working in male dominated trades, this paper investigates how subcontracting of small, medium and micro organisations, in the construction industry, leads to increasingly informal regulation. We argue that informal regulation represents a significant barrier to interventions that target formal regulation. However, some participants have overcome the barriers created by informal regulation. Their success may provide insights into improving women’s access to the skilled trades. This paper provides an important contribution by exploring how interventions targeted at informal regulation of individuals, workplaces and the labour market may achieve more significant change within male-dominated trades than strategies directed at more formal levels of regulation.
Thursday 10.20am -10.40am

Facilitators and barriers to the use of e-health therapy for isolated mothers experiencing post natal depression

Maree Bernoth¹, Keryl de Haan², Joanna Carlisle³

¹ SNMIH and Institute for Land, Water and Society, Charles Sturt University, Wagga Wagga, Australia
² Clinical Leader, Perinatal Infant Mental Health, Substance Use, MLHD
³ Course Director, Faculty of Business Justice and Behavioural Science & Associate Head of School (Acting) | School of Management and Marketing

Abstract

In Australia it is estimated that up to one in five women experience depression or anxiety in the first year after having a baby, yet less than half these women seek help or adequate treatment. In regional, rural and remote areas of New South Wales the options for treatment are more limited and accessibility more difficult.

The presentation will outline the the formation of collaborations to enable the research, outline the project which was supported by a NSW Health Translational Grant and reveal the findings of the two year project.

Supporting isolated women in regional, rural and remote areas of NSW can be a challenge for the midwife and other clinicians involved in a new mother’s care. Providing the right support and evidenced based interventions for a woman with depression during the perinatal period can be complicated by her isolation. MumMoodBooster (MMB) is an online e-Health cognitive-behavioural therapy (CBT) program which has been proven to be successful throughout Australia, providing very similar treatment to traditional face-to-face psychology sessions. The research project used an implementation framework aiming to identifying both the key barriers and facilitators to accessing the online MMB for isolated and hard to reach women in areas of regional, rural and remote NSW.

Information gained through focus groups and interviews with the mums and clinicians have revealed some unexpected findings which have implications for government policy, managers, nursing education, e-health providers and industry. We will also share the positive outcomes derived from the hard fought for collaboration.
Thursday 10:40am-11:00am

Water, Nutrition and Policy Nexus (Developing Optimal Farming Systems)

Richard J. Culas$^{1,2}$

$^1$Institute of Land Water and Society, Charles Sturt University
$^2$School of Agricultural and Wine Sciences, Charles Sturt University, Orange, NSW 2800, Australia

Abstract

Agriculture can be reshaped for producing more nutritious (diversified) food and to use scarce water resources more efficiently. Major food crops such as rice, wheat and maize provide sufficient calories but are inadequate in necessary nutrients required for healthy life. Agriculture uses more than 80 to 90 per cent of available water in irrigation-intense countries but also with an increased use of groundwater which poses serious threat to food security. For example, country like Pakistan is most affected due to increasing groundwater depletion and exporting the major food crops grown with non-sustainable groundwater use. Agricultural sector in Pakistan contributes 20% of GDP but the share of major food crops is only 5% of the GDP. Agricultural sector uses 90% of the available water in the country but the major food crops use up to 80% of the available water. Therefore, growing more of minor crops such as pulses, legumes and vegetables can complement the nutritious values required and reduce the overall water use in the sector. Increasing production of nutritious (diversified) food can also provide opportunity for the smallholder farmers. However, production of diversified and minor food crops are not sufficiently promoted in the country. Pakistan produces and exports wheat and rice but imports pulses and lentils. Hence this type of policy can be improved in relation to food self-sufficiency, scarce water resources and foreign exchange. There is a need to develop optimal farming systems to enhance nutritional values, water use efficiency and farming livelihood (Water, Nutrition and Policy Nexus).
Can animal personality research inform fish conservation?

Raf Freire1, Leia Rogers1, Ellie Sales3, Shokoofeh Shamsi3, Paul Humphries1,2, Keller Kopf1,4

1Institute for Land, Water and Society, Charles Sturt University, Albury, Australia
2School of Environmental Sciences, Charles Sturt University
3School of Animal and Veterinary Sciences, Charles Sturt University
4College of Engineering, IT and Environment, Charles Darwin University

Abstract

“Animal personality” refers to behavioural traits that are reasonably constant across time and context. Variation along different dimensions of personality has been shown in many different taxa. In fish, variation along a bold-shy dimension has proved useful in explaining risk taking behaviour such as foraging decisions in the presence of predators. Here, we describe three areas of research that apply the concept of personality to address fish behaviour and conservation questions. First, we examined whether hatchery-rearing alters fish personality. By comparing hatchery-reared and wild-caught Murray cod using three tests of boldness, we found that hatchery reared fish were significantly bolder than wild fish. Our results confirm that hatchery-reared fish are likely to lack the behavioural traits to be able to succeed in the wild. Second, our preliminary findings show that some parasites alter boldness traits, suggesting that parasites may influence the behavioural profiles of fish in natural ecosystems. Lastly, we found that shy individuals were less likely to learn an operant conditioning task in the laboratory, raising the possibility that laboratory experiments may be reporting on a biased sample of individuals. Our findings support the continued application of the animal personality concept for understanding the impact of hatchery-rearing and parasites on behaviour, and raise the concern that laboratory studies may introduce a subject bias if they fail to pay careful attention to variation in animal personality.
Visual Analysis and Prediction of PIT data from Murray Darling Basin

Xiaodi Huang1,2, Lee Baumgartner1, Zhenquan Li1,2, Wayne Robinson1, Karl Pomorin3

1Institute for Land, Water and Society, Charles Sturt University, Albury, Australia
2School of Computing and Mathematics, Charles Sturt University, NSW 2640, Australia
3KarlTek Pty Ltd. Melbourne, Victoria, Australia

Abstract

In 2001, the Murray–Darling Basin Commission constructed 14 new fishways in the Murray river channel and established a passive integrated transponder (PIT) monitoring system. The PIT system has antennas within each fishway. The movement of fish with PIT taggers can be detected along the river. Our project performed a preliminary visual analysis of the fish movement data collected during 2014–2019 by the PIT system, as well as made prediction on the number of fish required to be tagged in the future. In this talk, we will focus on how to conduct data analysis and visualization by using PIT data as an example.
Thursday 11:40am – 12:00pm

The enablers and barriers of the four day work-week

Simone-Maree Hyde

School of Management of Marketing, Charles Sturt University, Albury NSW 2640

Abstract

There are increasing concerns regarding the effects of excessive working hours on the health and safety of rural and regional Australian workforces; with evidence to suggest that overwork and bottom-line success are not linked. This research questions accepted truths and assumptions of the standard working week, and explores how regional organisations are addressing employee wellbeing in relation to overwork and burnout. The forced impacts of the recent Coronavirus pandemic have seen customer service employees working reduced hours and duties, despite previous concerns employers had regarding productivity and trust. This demonstrates that momentous change to modern work-designs is in fact possible. This project encourages discussions amongst regional employees and employers regarding the sustainability of current working hours, and the feasibility of a four-day work week. Considering the connection between self-preservation and the regulation of working hours, this is an important step towards ensuring the sustainability of the regional workforce. It is hoped that this research can contribute to literature gaps, and promote self-preservation within modern work structures.
Session 2 – Thursday 26 November 12.30pm -5.20pm

5-minute presentations

12.30-1.00pm

Diverse fish communities in lower Mekong floodplain wetlands benefit from improved fish passage: Implementation of operational and structural fish passage options in the Xe Beng Fai, Central Laos.

Wayne Robinson1, Khampheng Homsombath2, Lee Baumgartner1.

1Institute for Land, Water and Society, Charles Sturt University, Albury, Australia
2Living Aquatic Resources Research Centre (LARReC), Vientiane, Laos.

Abstract

This presentation will overview a current project that planned to monitor whether fish were using and or benefitting from 9 ‘fish ladders’ already installed on refurbished irrigation structures along the Xe Beng Fai river in Central Laos. Early in the project it was identified that each structure had its own peculiarities and the manner of operations significantly altered the behaviour of the flow regime, and ultimately the use of the fish ladder by fish. We report on working with the local community, regional staff and the national ministry to fashion changes to the way the structures operate. We present results documenting the diversity and abundance of the fisheries associated with the lower Xe Beng Fai irrigation scheme and the importance of the fishery to local livelihoods.
Fish for whom? The role of institutions in translating eco-technical investments into inclusive development outcomes

Nicolette Duncan1, John Conallin2, Sanjiv de Silva3,

1School of Environmental Sciences, Charles Sturt University, Albury, NSW, 2640, Australia
2Senior Researcher (Freshwater Fish and Ecology), Institute for Land, Water and Society, Albury, NSW, 2640, Australia
3Senior Researcher (Natural Resources Governance), International Water Management Institute, Colombo, Sri Lanka

Abstract

Irrigation represents a long-standing water sector investment, often to service rice agriculture. While rice is important to gross food security, monocentric focus has degraded traditionally diverse agro-ecological food systems. The irony of irrigation has been that in attempts to control water to serve specific livelihoods, infrastructure has undermined significant ecosystem services, including capture fisheries – a nutritionally, socially and economically important common pool resource on which others depend. The irrigation-fish trade-off has been mainly to the detriment of natural fisheries with significant knock-on impacts to the livelihoods, diets and health of rural poor and landless, while benefits are increasingly concentrated into the hands of an elite few. Recent years have witnessed attempts to technically mitigate negative impacts to capture fisheries (i.e. fish passages), or to offset losses by rationalizing fish production. However, the maintenance of fish biomass in the landscape does not ensure equitable distribution of fish benefits. For this, and national and global development goals to be achieved, examination of social factors that mitigate investment impacts is necessary to realign with development aspirations and avoid contributing to further marginalization. This paper is a call to extend the framing of investments beyond technical parameters to include investing in social landscapes that enable inclusive growth. We explore the inland fisheries in Myanmar and Cambodia to illustrate this argument and appreciate the potential benefits of investing in social systems.
Abstract

Skilled labour shortage in the regional economies has been a limiting factor for regional development. One reason for this can be due to local labour preferring to move to capital cities for employment opportunities. Another is the labour in bigger cities not willing to move to regional areas. To address skill shortage in regions, successive governments implemented several policies over the last many years. One of them was to encourage overseas migrants to move to the regional areas. However, these policy prescriptions have not been successful to the level expected. One reason being the overseas migrants choosing to settle down in capital cities, rather than moving to the regions. (e.g.: around 87% of the skilled migrants settled down in capital cities). Another reason is that, out of those migrants who chose to come to the regions, deciding to move to capital cities after fulfilling their visa conditions (for example, compulsory 2 year stay in the region). This trend, on one hand, is not helping to solve the skills shortage issue in the regions, and on the other, contributing to the increasing congestions in capital cities. With the view to address this twin issue, the Morrison government introduced a new Population policy last year, under which new migrants must stay in regional areas at least for 5 years. The impact of this new policy is yet to be realized. Covid-19 adds a new dimension to this policy implementation.

Our study will examine the issues referred to in this abstract.
5-minute presentations

Thursday 12.30-1.00pm

Understanding digital business value creation in Australian SMES

Rui Bi¹²

¹Institute for Land, Water and Society, Charles Sturt University, Albury, Australia
²School of Management and Marketing, Charles Sturt University, Albury, NSW 2640, Australia

Abstract

Examining the digitization for technology use and firm performance has gained thematic line of enquiry in the research field. However, most studies focus on large companies with little attention paid to small-to-medium enterprises (SMEs). Understanding whether and how digital business helps SMEs to achieve business value still remains unclear. In order to fill the research gap, this study develops and tests an integrated theoretical model to evaluate the antecedents and consequences of digital business use in the Australian SMEs context. We propose that IT resources, strategic IT planning, culture, managerial perception of industry environments, and business partnerships are the key antecedents enabling SMEs to use digital business, and thus help these companies to achieve and sustain business value in turbulent environments. We test our model on a cohort of 310 Australian SMEs across different industrial sectors. The results confirm our conceptualization, highlighting the prominent role of IT, strategic planning, culture, managerial skills, and business partnerships in SME success. Our study provides an initial empirical evidence to understand the relationship between IT and entrepreneurial SME performance. These findings have important implications for research and small business practices.
Abstract

Understanding the space use and habitat requirements of a species is important in order to guide conservation practices and measure the scale of negative impacts. Animals often use space within a landscape (i.e. their home range) based on factors including resource availability, shelter availability, and protection from predators. One species lacking this information has been the endangered northern quoll (*Dasyurus hallucatus*), particularly in the western pocket of its range—the Pilbara, Western Australia. We compiled a number of datasets that used GPS telemetry to track northern quolls within the Pilbara between 2014 and 2018. We standardised data and produced short-term home ranges using the *ad hoc* (*ad hoc*) method of kernel density estimation. To investigate habitat selection, we overlaid short-term home ranges onto high quality Sentinel-2 NDVI layers and compared them with randomly placed home ranges within the available habitat. Four key landscape features were identified; rock, spinifex cover, *Acacia* cover, and creek bed. Northern quolls selected home ranges with greater cover of rock and creek bed, with less cover of spinifex, and they used *Acacia* cover in proportion to its availability. Creek beds were not available for half of the individuals monitored, but when available they were used disproportionately. Northern quolls likely use rocky habitat for refuge, and creek beds as a safe method for movement (when available) in an example of facultative landscape complementation. This would allow them to avoid more open spinifex landscapes where invasive predators like feral cats (*Felis catus*) often exist and pose greater threat.
Investigating the potential of sentinel-1 to detect varying spatial heterogeneity in pasture cover in grasslands

Richard A. Crabbe1,2, David W. Lamb3,4, Clare Edwards3

1Institute for Land Water and Society, Charles Sturt University, Albury, NSW, 2640, Australia
2School of Environmental Sciences, Charles Sturt University, Albury, NSW, 2640, Australia Zealand
3Precision Agriculture Research Group, University of New England, Armidale, NSW 2351 Australia
4Food Agility Cooperative Research Centre, University of New England, Armidale, NSW 2351, Australia

Abstract

Selective grazing by livestock may be indicative of a site’s grass species diversity and depending on the grazing intensity; this may or may not promote further diversity. However, the detection of sites with spatial heterogeneity in pasture cover as a manifestation of selective grazing has not yet been investigated using satellite remote sensing. Thus, this study was conducted to address the question; can Sentinel-1 detect surface heterogeneity induced by livestock grazing in grassy fields? Since Synthetic Aperture Radar (SAR) imaging is noted to be sensitive to vegetation architectural arrangement, this study used Sentinel-1 C-band SAR to detect spatial heterogeneity created by selective livestock grazing. The study examined a range of semivariogram, grey-level co-occurrence matrix (GLCM) and eigenvector-eigenvalue polarimetric decomposition features. The coefficient of variation estimates of the GLCM contrast feature consistently produced the strongest correlation ($R^2 = 0.71$) with Lloyd’s Patchiness Index and semivariogram sill while the polarimetric scattering entropy (range estimates) produced a significant linear correlation with semivariogram sill ($R^2 = 0.55$, $p < 0.05$). Inferably, the GLCM contrast and polarimetric scattering entropy can predict spatial heterogeneity in a grazing environment. This is the first time polarimetric scattering entropy estimated from Sentinel-1 has been used for the detection of spatial heterogeneity in a grazing landscape, which makes this study different to past similar studies. Nonetheless, we recommend the testing of this parameter (polarimetric scattering entropy) with a multitemporal SAR data and encourage future studies to investigate the potential of Sentinel-1 for the detection of spatial distances between grass clumps.
Mapping the maximum inundation extent of lowland intermittent riverine wetland depressions using LiDAR

Andrew Hall¹, Rachel F. Thomas², Skye Wassens¹

¹Institute for Land, Water and Society, Charles Sturt University, PO Box 789, Albury, NSW 2640, Australia
²Water and Wetlands Team, Science Division, NSW Office of Environment and Heritage, Lidcombe, NSW 2141, Australia

Abstract

Accurate high-resolution maps of maximum wetland inundation extents are valuable inventorial resources, but mapping such boundaries can be difficult, time consuming and involve a level of subjectivity from the surveyor. We developed a novel, objective and efficient method for delineating the maximum inundation extents of lowland intermittent riverine wetland depressions using a high resolution LiDAR-derived digital terrain model (DTM). The method is based on the premise that immediately after rising water reaches a threshold level, much larger volumes of water are required to inundate not just the discrete wetland depression but also its surrounding local area; that threshold level can be considered the wetland fill level. The fill levels of eight wetland areas, ranging in size from 44 to 384 ha, were produced by this method and subsequently used to map maximum inundation extents. Corresponding maps of the inundation frequency gradient were independently determined from a time series of Landsat derived inundation maps. The level of separation in inundation frequency of map cells inside the maximum inundation extents compared to those outside, validated the technique, while identifying that a minimum level of variation in the elevation of the wetland area may be necessary for it to be successfully applied. The technique as an objective and relatively inexpensive procedure to identify the maximum inundation extent of intermittent floodplain wetlands when a high resolution DTM, acquired during a dry phase, is available.
The origins and implications of the historic Murray Cod commercial fishery

Paul Humphries¹,²

¹Institute for Land, Water and Society, Charles Sturt University, Albury, Australia
²School of Environmental Sciences, Charles Sturt University, Thuringowa, NSW 2640

Abstract

Murray cod formed the basis of a substantial commercial fishery in the Murray and other Murray-Darling Basin rivers, beginning in the mid-1800s. At its heyday, the demand for the tasty and seemingly inexhaustible supply of fish, saw tons of Murray cod transported by rail to Melbourne and other large town markets. The decline of the fishery began within years of its inception, as the lack of regulations meant fish were caught throughout the year, including during the spawning season, ‘bag-nets’ caught every fish, large and small that passed near and the wastage of bycatch was enormous. But the origins of the fishery – as a consequence of gold mining in central Victoria and settlement of Europeans along rivers like the Murray – and the short-term impact on local Aboriginal people, have been relatively obscure until now. Despite my previous ideas that fishing in the early days of settlement began as artisanal and then proto-commercial fisheries, I hypothesize now that the actual process was quite different, and I suggest why this was the case. I will describe how the fishery came about, and how, despite the initial importance and involvement of Aboriginal people, they became collateral damage of the fishery.
Thursday 2:00pm – 2:20pm

Measuring body condition of lizards: a comparison between non-invasive dual-energy x-ray absorptiometry, chemical fat extraction and calculated indices

Guy Sion\textsuperscript{1,2,3}, Maggie J. Watson\textsuperscript{1,2,4}, Amos Bouskila\textsuperscript{2}

\textsuperscript{1} Institute for Land Water and Society, Charles Sturt University, Albury, NSW Australia
\textsuperscript{2} Mitrani Department of Desert Ecology, Blaustein Institutes for Desert Research, Ben Gurion University of the Negev, Midreshet Ben-Gurion, Israel
\textsuperscript{3} School of Zoology, Faculty of Life Sciences, Tel Aviv University, 69978 Tel Aviv, Israel
\textsuperscript{4} School of Environmental Sciences, Charles Sturt University, Thuringa, NSW 2640

Abstract

Condition indices (CIs) are used in ecological studies as a way of measuring an individual animal’s health and fitness. Noninvasive CIs are estimations of a relative score of fat content or rely on a ratio of body mass compared to some measure of size, usually a linear dimension such as tarsus or snout-vent length. CIs are generally measured invasively by lethal fat extraction as in a seasonal sample of individuals in a population. Many alternatives to lethal fat extraction are costly or time consuming. As an alternative, dual-energy X-ray absorptiometry (DXA) allows for non-destructive analysis of body composition and enables multiple measurements during an animal’s life time. DXA has never been used for ecological studies in a small, free-ranging lizard before, therefore we calibrated this method against a chemical extraction of fat from a sample of six geckos (Israeli fan toed gecko \textit{Ptyodactylus guttatus}) ranging in body mass between 4.2–11.5 g. We found that fat mass measured with DXA was significantly correlated with the mass of chemically extracted fat for specimens greater than 4.8g ($N = 5$, $R^2 = 0.995$, $P < 0.001$). Fat percentage regressed with body mass significantly predicted the DXA fat percentage ($N = 30$, $R^2_{adj} = 0.875$, $P < 0.001$). Live wet mass was significantly correlated with calculated fat mass ($N=30$, $R^2=0.984$, $P<0.001$) for specimens more than 4.8g. Among the other calculated non-invasive CIs that we tested, the most accurate was mass/SVL ($N = 30$, $r_{\text{Mass/SVL}} = 0.83$, $P_{\text{two-tailed}} < 0.001$).
Temporal differences in visitation to ephemeral savanna waterholes limits interference competition between feral ungulates and native macropods

Helenna Mihailou\textsuperscript{1,2}, Dale G Nimmo\textsuperscript{1,2}, Melanie Massaro\textsuperscript{1,2}

\textsuperscript{1}Institute for Land, Water and Society, Charles Sturt University, Albury, NSW, Australia
\textsuperscript{2}School of Environmental Sciences, Charles Sturt University, Albury, NSW, Australia

Abstract

Exotic species are often superior interference competitors relative to native species. In northern Australia, several ungulate species have established large feral populations. Due to their high daily water requirements, ungulates typically congregate close to water sources. We investigated whether feral ungulates (cattle, Asian water buffalo and pigs) impact native macropod presence at savanna waterholes in the Northern Territory by using automated cameras at 20 waterholes over two dry seasons. Fencing was used to exclude cattle and buffalo from 10 of those sites. We also tested whether ungulate and macropod presence at waterholes differed within dry seasons and between years with differing wet season rainfall (an average vs a drought year). We found that macropods were active at night, pigs in the pre-dawn hours, cattle during the day and buffalo at dawn and dusk. Macropods and pigs did not preferentially use fenced sites. The presence of all species increased significantly around waterholes during a drought. Cattle and macropod presence also increased significantly with dry season progression. Our results show that feral ungulates and macropods have little overlap in their temporal activity around waterholes, suggesting that cattle and buffalo are not significant interference competitors of macropods and pigs in this system. However, ungulate activity around waterholes increased significantly during dry conditions. Hence, exploitative competition from feral ungulates may limit the availability of water and food for native fauna when they are likely most vulnerable to resource shortages. Further research is needed to investigate exploitative competition between feral ungulates and native macropods.
Thursday 3:00pm – 3:20pm

Location based web and mobile applications for water resource management

Mobushir R. Khan\textsuperscript{1,2}, Michael Mitchell\textsuperscript{2}, Catherine A. Allan\textsuperscript{1,2}, Jehangir F. Punthakey\textsuperscript{2}

\textsuperscript{1}School of Environmental Sciences, Charles Sturt University, Albury, NSW 2610, Australia
\textsuperscript{2}Institute for Land, Water and Society (ILWS), Charles Sturt University, Albury, NSW 2640, Australia

Abstract

Optimal water resource management requires timely and accurate information on crop water requirements and groundwater status. Groundwater modelling, as well as agro-meteorological and spatial analyses, are needed to build such a decision support processes. The complexity of this multiple-informed process exceeds abilities of managers and farmers without the aid of computation. We present a web- and mobile-based Decision Support System (DSS) that integrates hydro-meteorological and socio-economic information for optimal decision-making. The DSS enables users to acquire and visualise their groundwater and soil quality data. It then automatically acquires current online weather data to estimate crop evapotranspiration and crop water requirements using approach from the Food and Agricultural Organisation (FAO). Users can estimate water requirements for multiple crops, compare this with their current groundwater status and use as guidance for irrigation requirements. Lastly, it enables users to visualise profitability of various crops to help inform optimal decision-making. Since this DSS is constructed and applied using integration as a guiding principle, it advances groundwater management from passive towards proactive real-time integrated decision support. The system has been developed as part of an Australian Centre for International Agricultural Research funded project led by CSU’s ILWS, and is currently being used by Pakistani researchers and farmers.
Thursday 3:20pm – 3:40pm

**Carbon and nutrient release from experimental inundation of agricultural and forested floodplain soil and vegetation: influence of floodplain land use on the development of hypoxic blackwater during floods**

**Xiaoying Liu**, Robyn J. Watts, Julia A. Howitt*, Nicole McCasker

1Institute for Land, Water and Society, Charles Sturt University, PO Box 789, Albury, NSW 2640, Australia.
2School of Environmental Sciences, Charles Sturt University, PO Box 789, Albury, NSW 2640, Australia.
3School of Agricultural and Wine Sciences, Charles Sturt University, Locked Bag 588, Wagga Wagga, NSW 2678, Australia. (*In memorium Julia 7 April 2020)

**Abstract**

Overbank floods in modified lowland rivers often inundate a mosaic of different land uses (e.g. forests, crops and pastures) on the floodplain. One possible outcome of extensive floods is that high concentrations of dissolved organic carbon (DOC) derived from the floodplain may enter the river, resulting in hypoxic blackwater events. We used a glasshouse experiment to investigate DOC and nutrient (TP, NH₄, NOₓ) releases, chemical oxygen demand (COD) and dissolved oxygen (DO) depletion in water following inundation of soil and vegetation from a lowland river floodplain in southern Murray-Darling Basin, Australia. Six replicate samples of six intact soil and groundcover treatments were collected during summer; three from a forest (bare soil, wallaby grass and leaf litter) and three from an adjacent paddock (bare soil, wheat and ryegrass). Samples were placed in pots, inundated with river water over 16 days, and their leachates were compared with a river-water control. All vegetated groundcover treatments had significantly higher DOC and COD and significantly less DO at both Day 1 and Day 16 than did the soil only treatments or the control. Leachates from paddock treatments were less coloured than those from forest treatments, despite having similar concentrations of DOC. Our findings imply that the inundation of any vegetation during summer floods can be a major source of DOC and a major contributor to DO depletion. This challenges the current paradigm and community perception that flooding of native forests is responsible for most of the DOC input to rivers during flood.
Exploring the transition to the NDIS in the Western NSW region: Choice under the NDIS: Service provider and Carer Perspectives

Jodie Kleinschafer¹,², Felicity Small², Mona Nikidehaghani³

¹Institute for Land, Water and Society (ILWS), Charles Sturt University, Albury, NSW 2640, Australia
²School of Management and Marketing, Charles Sturt University, Bathurst, NSW, 2795, Australia
³School of Accounting, Economics and Finance, University of Wollongong, NSW, 2522, Australia

Abstract

The implementation of the National Disability Insurance Scheme (NDIS) in Australia included a radical shift from providing block funding to service providers to the personalisation of funding. The result was that the relationship between service providers and people living with a disability had changed with each needing to adapt to the new marked based environment. Anderson et al.’s (2013) TSR entities and outcomes framework provided a basis to explore the interactions of service and consumer entities during this reform. An exploratory qualitative investigation took place between January 2017 and March 2019 in the Western region of NSW. Two semi-structured in-depth interviews were conducted with Industry professionals (n=38) and Carers/family members acting on behalf of people living with a disability (n=19) at 12-month intervals. Both groups were asked their perceptions of how people were choosing services in the region. Responses were compared between respondent types and from interview 1 to interview 2. The findings exposed a disconnect between the perceptions of the two groups. The interviews revealed the importance consumers place on safety and security in the context of choosing a disability support service provider and how decisions changed from the ideal to the pragmatic due to the limited choice in the Western NSW region. It also became apparent that the way a person chose was related to their experience navigating the disability sector. These findings had implications for disability support services and those responsible for ensuring access to supports in rural/region and remote areas of NSW.
Abstract

Refugees are the most disadvantaged cohort of immigrant arrivals and face the greatest settlement difficulties in regional and rural Australia. Refugees face severe difficulties in entering the Australian labour market as regional and rural labour markets are even more constrained. One strategy adopted by refugees over many decades in Australia and other countries to overcome this blocked labour market mobility (Collins, 2003) and engage with the economy is to create their own jobs through refugee entrepreneurship. Refugee entrepreneurship in Australia is shaped by the intersection of a number of factors: ethnic resources and networks, class resources, regimes of regulation, inclusion/exclusion, opportunity, family relations, gender and racialisation.

This paper presents the data gathered from interviews with 15 African female refugee entrepreneurs currently living in regional and rural Australia. It investigates the reasons why female refugees started-up their own business, their strategies for overcoming the massive obstacles they faced setting up the business and the extent to which their businesses are embedded in their family and community. African female entrepreneurs located in non-metropolitan Australia are also involved in diasporic entrepreneurship, with the critical role that international social networks of immigrant communities play in the dynamics and success of those enterprises. The field work identified strong relation between resources obtained from personal network ties of the African female refugees and start-up success of their enterprises, as well through the process of internationalisation. African female refugees benefited from social networks and commitment among the family but even more from the trust and relationship established and maintained through personal contacts with overseas based buyers and suppliers.
Thursday 4:20pm – 4:40pm

Using transactional analysis in internal communication

Lucia Wuersch¹

¹School of Communication and Creative Industries, Charles Sturt University, Bathurst, NSW 2795, Australia

Abstract

Transactional Analysis (TA) is a method used in organisational settings to develop individuals, groups and the organisation itself. This research explores the case of a public administration unit in Switzerland, which applies TA principles for more than two decades, primarily to gain mastery in external communication, that is, for counselling job seekers to help them reintegrate into work. The investigation, however, focuses on the impact of the use of TA principles on the organisation’s internal communication across all levels; intrapersonal, interpersonal and organisational.

Data include interviews with leaders (site and team leaders) and employees (personnel consultants and administrative staff) as well as organisational artefacts and documents. Data analysis is conducted using thematic analysis (King & Brooks, 2017) and NVivo software. The final template, the result of the iterative coding process, shows seven patterns of TA impacting internal communication practice. These patterns include 1) a set of shared TA concepts used in daily work practice; 2) improved skills through TA application; 3) the emphasis on a humanistic attitude; 4) improvements of internal structures; and 5) the achievement of internal benefits such as increased job satisfaction. Furthermore, internal TA applications were found to be 6) mainly implicit, and 7) embedded on each internal communication level, with an emphasis on the intrapersonal level. Such an emphasis on the ‘dimension of self’ is novel in internal communication and opens new avenues of how to approach organisational development.
Landscape structure influences modelled response to environmental variables: Relevance to forecasting species distributions

Liam Grimmett¹,², Rachel Whitsed¹,², Ana Horta¹,²

¹Institute for Land, Water and Society, Charles Sturt University, Albury, Australia
²School of Environmental Sciences, Charles University, Thurgoona, NSW 2640, Australia

Abstract

Correlative species distribution models (SDMs) rely on using statistical techniques to identify relationships between species occurrence and a set of environmental predictors. An important application of SDMs is to forecast the potential impacts of future events on a species distribution, such as potential range of invasion, impacts of climate change, identification of suitable areas for reintroductions. An important assumption of these applications is that the species response to the environment is the same in both the calibration and prediction windows. Virtual species were created using spatially explicit simulations, incorporating population and dispersal processes. Commonly used SDM algorithms were calibrated with the exact environmental variables used to develop the simulations, as well as using presence-absence observations the were sampled in an unbiased manner. Despite testing models under these perfect conditions, the modelled response varies between landscapes. In this talk I will discuss the potential implications of this when using SDMs to forecast changes in species distributions.
Adaptation of phenoloxidase assay for use in wild and captive Murray crayfish *Euastacus Armatus*

Franz D. Scherping,1,2 Maggie J. Watson3,4

1School of Biomedical Sciences, Charles Sturt University, Wagga Wagga, NSW, Australia
2Department of Biological Sciences, North Dakota State University, Fargo ND 58102. f.scherpingbustos@ndus.edu
3Institute for Land, Water and Society, Charles Sturt University, Albury, Australia
4School of Environmental Sciences, Institute for Land Water & Society, Charles Sturt University, Albury, NSW, Australia

Abstract

Phenoloxidase (PO) is a reactive enzyme involved in tissue repair and innate immunity in arthropods, and elevated levels of this enzyme may be indicative of persistent stress or immunosuppression. Methods of detecting phenoloxidase have been described for some arthropods, especially those of commercial value, but none are available for *Euastacus*, a genus within the Parastacoidea. This study is the first step in developing a standardized protocol for the detection and quantification of PO activity in wild or captive Murray crayfish *Euastacus armatus*. Hemolymph extracts from 49 crayfish were assessed for PO activity using an assay measuring the conversion of L-dopa (3,4-dihydroxy-L-phenylalanine) into dopachrome. Handling time of crayfish did not cause any measurable change in PO activity. Phenoloxidase activity was detected in a group (n = 24) of captive crayfish (this species does not survive well in captivity) while no significant (P > 0.05) PO activity was detected in a group (n = 25) from a wild, healthy population up to 15 minutes out of water. The developed protocol is the first of its kind to propose a standardised methodology for the detection and quantification of PO activity in Murray crayfish hemolymph.
Reliable and accurate computations for fluid flows

Zhenquan Li$^{1,2}$

$^1$Institute for Land, Water and Society, Charles Sturt University, PO Box 789, Albury, NSW 2640, Australia
$^2$School of Computing and Mathematics, Charles Sturt University, Thurgoona, NSW 2640, Australia

Abstract

Although fluid flows are commonplace, we still have not found a way to simulate them accurately. One example is cyclone forecasting. If we can determine the accurate location of a cyclone’s centre at every instant, we can forecast the path of the cyclone accurately. The Navier-Stokes (NS) equations model fluid flows accurately, based on various demonstrations performed during the past 150 years. However, the analytical solutions of the NS equations are not yet available (it is one of the seven millennium mathematical problems). We currently calculate the numerical solutions of the NS equations using computers. A limitation of using computers is that we can only perform finite operations. However, there are infinite points in a domain of interest. Therefore, there are two main parts involved in computing accurate numerical solutions of a mathematical model:

1. Selection of the finite points in a domain that provide sufficient information about the characteristics of flows in that domain.
2. Computing accurate velocity fields of the flows at the selected finite points.

The selection of the finite points is normally completed by specialised software. Since we do not know the details of a flow when selecting the points, the selection only reflects the characteristics of the geometry of the domain. The characteristics of velocity fields are hidden in the fields themselves. Therefore, if we want to include the characteristics of a velocity field in selecting the points, we must select the points based on the information from both the geometry of the domain and the velocity field.

In this talk, I will briefly introduce methods I proposed about selecting the finite points and where these methods can be applied to solve practical problems.
Improving sustainable management of groundwater resources in Pakistan

Jay F Punthakey¹, Michael Mitchell¹, Catherine Allan¹, Richard Culas¹, U.K. Awan², L. Anjum³, A.N. Rana³, S. Akhtar⁴, G. Zakir¹,², W. Ahmad⁵, S. Ejaz⁶, A. Memon⁷, A.L. Qureshi⁸

¹Institute of Land Water and Society, ILWS Charles Sturt University, Australia
²International Water Management Institute, Lahore Pakistan
³University of Agriculture Faisalabad, Pakistan
⁴Punjab Irrigation Department, Lahore, Pakistan
⁵Mehran University of Engineering and Technology, Jamshoro, Pakistan
⁶NED University, Karachi, Pakistan
⁷Sindh Irrigation Department, Pakistan

Abstract

Expansion and intensification of irrigated agriculture in Pakistan has been driven by food security and export income needs, and is driving a massive increase in poorly managed groundwater use.

Our 4-year ACIAR project, which commenced in late 2016, uses a collaborative approach to develop tools and options for improved groundwater management and farming family livelihoods at selected case study sites. Central to this approach is engaging and enhancing researcher and irrigation department capacity in Pakistan to improve groundwater monitoring, modelling and management. Together, we have developed groundwater models for the Lower Bari Doab in Punjab and the Left Bank of Sukkur Barrage in Sindh to improve spatial and temporal understanding of the groundwater system, and to explore the impact of pumping, irrigation and climatic conditions on water level trends. The models are providing in-depth analysis of the water balance for estimating sustainable yield. For example, the Lower Bari Doab model suggests an average decline in water levels of 0.45m per year since 2009, a rate corroborated by our groundwater monitoring. Scenarios were also run using historic time-series of climatic data from Oct 2010 to Sep 2047 (Pakistan at 100 years).

This project has taken the first steps towards building capacity to improve management of stressed groundwater resources in Pakistan. In the near future Pakistan will have to rethink how it is going to meet the challenges of lower river flows, overexploited groundwater aquifers, and increasing demand for water from all sectors of society, agriculture, industry and potable use.
Herbivore exclusion effects on plant diversity depend on rainfall and evolutionary history

Jodi N. Price¹, Judith Sitters²

¹Institute of Land, Water and Society, Charles Sturt University, Albury, NSW, Australia
²Department of Biology, Vrije Universiteit Brussel, Brussels, Belgium

Abstract

Ecological models predict that herbivore exclusion reduces plant diversity in high productivity grasslands and increases diversity in low productivity grasslands. Yet, support for this relationship is mixed. The relationship is predicted to depend on plant species exposure to ungulate grazing over evolutionary time scales. Here, we use an experiment replicated in 52 grasslands on six continents to evaluate these relationships using a natural precipitation gradient (globally) and experimentally increased nutrients (locally) as measures of productivity. We test the hypothesis that plant species diversity will decrease with herbivore exclusion in highly productive sites with a long history of ungulate grazing; whereas in short-history sites the effect of grazer removal will be unrelated to site productivity, but will depend on species origin; native species may increase with grazer exclusion and exotic species may decrease. In sites with a long history of grazing, we found herbivore exclusion reduced species diversity at high precipitation, as predicted. In short history sites, changes in species diversity in response to grazer exclusion depended on species origin rather than precipitation; grazer exclusion increased native and reduced non-native species richness. While excluding grazers resulted in loss of diversity in high productivity grasslands that had evolved with ungulates, it led to partial recovery of plant communities with short-history of grazing by benefiting native species at the expense of non-natives, which originated from grasslands with long grazing histories. Our results demonstrate that plant species’ evolutionary history of grazing continues to shape the response of the world’s grassland communities to changing herbivory.
Abstract

Investigating habitat use and preferences of a threatened species can be challenging, especially if wild populations have decreased to such low numbers that they occupy only fractions of their former natural range. Hence, assessing habitat suitability of a potential release site for a threatened species before a reintroduction attempt can be difficult because frequently no comparable baseline data are available. In these instances, post-release monitoring data can inform about habitat use and preferences of a reintroduced species. Here we use monitoring data of an endangered endemic island bird, the Chatham Island black robin (Petroica traversi), to investigate habitat preferences and the temporal change in distribution patterns across 26 years following a reintroduction. We show that densities and distribution of black robin pairs at the reintroduction site have changed significantly over the years. Spatial distribution of pairs is clustered, and this clustering has intensified as the population increased. We used the maximum entropy method MaxEnt to model habitat suitability on the island, showing that black robins clearly prefer forested areas inland that are within 70 m to the forest edge at lower elevations (< 40 masl) and on slopes that have a N-NE aspect. The model also identified one area on the island that comprises suitable habitat, but is currently uninhabited. Applying maximum observed densities to the available area of each suitability class, carrying capacity is estimated as 170 nesting pairs across the island, highlighting the need to find further appropriate habitat urgently. Overall, these topographical and habitat preferences considerably restrict this species’ potential distribution, a constraint that has serious conservation implications for future population growth of current populations and (re)introductions to new locations. This study demonstrates that post-release data can reveal relevant limitations to habitat use of highly threatened species.
The impact of LGBTQI+ Pride events on rural communities: The case of Wagga Wagga

Clifford Lewis

1Institute for Land, Water and Society (ILWS), Charles Sturt University, Albury, NSW 2640, Australia
2School of Management and Marketing, Bathurst, Charles Sturt University

Abstract

Following the Same Sex Marriage vote in 2017, more and more rural communities have begun hosting Pride events. However, while the academic literature has extensively studied such events within a metro context, limited consideration has been paid to when they are hosted within rural communities, and no attention to when they are hosted for the first time in those communities. Rural communities have typically been perceived as being hostile towards LGBTQI+ people; pride events can therefore be a point of contention, and if successful, can have a strong impact on transforming the local community. This project explored the impacts such events can have on rural communities by studying the Wagga Wagga Mardi Gras which was hosted for the first time in 2019. This presentation will draw on multiple studies that have been conducted on the Wagga Wagga Mardi Gras. Using in-depth interviews (n=28), and social media sentiment analysis (n=248 posts), this project reports on the meaning community members associated with the event. The findings indicate how such events can trigger a transformation of communities and ultimately enhance the sense of belonging LGBTQI+ people feel within their rural communities.
Adventures in the presentation of research by medium of video: ‘the unusual work of Griffith train CM3’

Ian Gray¹

¹Institute for Land, Water and Society, Charles Sturt University, Albury, Australia

Abstract

Video is a means of presenting research in meaningful ways differing from usual research publication models. The ‘CM3’ video presents research, but it implies more questions than it answers.

Rail freight is often said to be more economical and environmentally friendly than road transport. However, in Australia other than its application to iron ore and coal, rail freight has been in decline relative to road for around 60 years. The rail industry and governments are hoping that the Melbourne-Brisbane inland railway, currently under construction, will reverse a trend and boost regional economic development. Building infrastructure with hope is a positive thing; attracting freight to a railway remains an issue.

Griffith Train ‘CM3’ is an unusual freight train in New South Wales because it stops to pick up freight. The journey of CM3 is placed in the context of the location of freight: actual and potential customers for a freight train service. The story has an element of tension because rail freight operators are reluctant to stop their trains to attach or detach wagons. Contrarily, many studies and reports say that locating the origins and destinations of freight on or close to railways offers easier and cheaper access to the multiple cost advantages of rail transport. The video suggests how rarely ideal ‘co-location’ is apparent. Towards the end it takes a brief look at features of the very different rail freight system in North America.

Friday 11:00am – 11:20am

**Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan**

*Michael Mitchell¹, Jehangir F. Punthakey¹, Catherine Allan¹, Richard J. Culas¹, Mobushir R. Khan¹, Faizan ul Hasan², Muhammad Ashfaq³, Irfan A. Baig⁴, Syed M. Khair⁵, Abdul Rashid⁶, Farooq Ahmed⁷, Saira Akhtar⁸, Asghar Ali⁹, Ghulam Z. Hassan¹,², Tehmina Mangan⁵, A. Latif Qureshi¹⁰, Aurangzeb Memon¹¹, Mustafa Nangraj¹²*

¹*Institute of Land Water and Society, Charles Sturt University*
²*Pakistan Council of Research in Water Resources*
³*University of Agriculture, Faisalabad*
⁴*Muhammad Nawaz Sharif University of Agriculture, Multan*
⁵*Balochistan University of Information Technology, Engineering & Management Sciences*
⁶*Balochistan Agriculture and Cooperatives Department*
⁷*Balochistan Irrigation Department*
⁸*Punjab Irrigation Department*
⁹*Sindh Agriculture University*
¹⁰*Mehran University of Engineering & Technology*
¹¹*Sindh Irrigation Department*
¹²*Sindh Agriculture, Supply and Prices Department*

**Abstract**

Pakistan’s 210 million people rely heavily on agriculture, which accounts for over 90 percent of the country’s water consumption. Development, climate change and population growth is putting pressure on water supplies. Surface water supply is highly variable, and dependence on groundwater has rapidly increased. Continuous decline in groundwater quantity and quality is undermining livelihoods, especially of poor smallholder farming families. Collaboration among people with an interest in water, agriculture and human dignity is needed to rapidly address the challenge of pursuing productive and sustainable groundwater use. Our ACIAR funded project is part of the Australia Water Program in Pakistan. It aims to encourage and enable collaboration to address the complexity of achieving effective and fair groundwater management, and uses six in-depth case studies across three provinces in Pakistan. Through a focus on partnerships it is building capacity of researchers, farmers, farming communities and relevant government and non-government agencies. Building capacity means building skills, knowledge, networks and confidence. As we reach the end of the project we see that partnerships are consolidating. For example, provincial agencies, universities and other partners are collaborating to investigate social, economic and technical aspects of groundwater management in each case study. Stakeholder forums have been established with all six case study communities to co-design research interventions, with representation from relevant government and non-government organisations, farmers’ organisations and progressive farmers. The stakeholder forums are beginning to comment on outputs and guide research and extension. Small steps maybe, but steps toward working together for a fairer future.
Friday 11:20am – 11:40am

In the heart of the spinifex sea: habitat selection of an endangered marsupial mesopredator in naturally fragmented landscapes depends on within patch, patch, and landscape variables

Harry A. Moore1,2, Judy A. Dunlop3, Damien R. Michael1, Leonie E. Valentine2, Euan G. Ritchie4, Dale G. Nimmo1,2

1Institute for Land, Water and Society, Charles Sturt University, Albury, NSW 2640, Australia.
2School of Biological Sciences, The University of Western Australia, Crawley, WA 6009, Australia.
3Department of Biodiversity, Conservation and Attractions, Bentley Delivery Centre, Locked Bag 104, Perth, WA, Australia
4Centre for Integrative Ecology and School of Life and Environmental Sciences, Deakin University, Burwood, VIC 3121, Australia

Abstract

Species inhabiting patchy landscapes have mostly been studied in habitats fragmented by anthropogenic disturbances, such as agriculture. Here, occurrence is often predicted by within patch (e.g. patch quality), patch (e.g. patch size and shape) or landscape scale (e.g. surrounding habitat extent) habitat variables. However, in naturally fragmented landscapes, patterns of occurrence remain less understood. We test if rocky patches embedded within a ‘matrix’ of fire prone grasslands act as naturally occurring fragmented landscapes for an endangered species of marsupial predator, the northern quoll (Dasyurus hallucatus). We then test how habitat variables measured at the within patch, patch, and landscape scale influence quoll occurrence and abundance. We deployed remote sensing cameras at 184 sites spread across a 6000 km2 area in the Pilbara bioregion of Western Australia. Cameras were deployed for 100 nights in both the dry and wet seasons. Northern quoll responses to habitat was measured using generalised linear mixed effects models.

Northern quolls were three times more likely to be detected in rocky patches when compared to grassland matrix. At rocky patches, quolls were more likely to use patches with higher vegetation cover and den availability (within patch), lower amounts of edge habitat relative to patch area (patch), and larger extents of surrounding habitat (landscape). Additionally, quolls were more likely to use matrix habitat closer to rocky patches, and with higher vegetation cover.

Our results confirm the importance of rocky outcrops as habitat for northern quolls, and support the findings of previous studies within anthropogenically-fragmented landscapes, that suggest species occurrence is often multi-scale dependent and should be managed as such.
Self-cleaning irrigation pump fish-screening solutions can protect fish populations and deliver operational benefits to irrigators. The uptake of fish-screening, however, is mixed and there is limited evidence concerning irrigator attitudes towards fish-screening. This study addressed this knowledge gap through in-depth interviews with NSW irrigators. These interviews considered irrigator: 1. fish-screen awareness levels; 2. experiences with pump screening and debris and fish entrainment/entrapment; 3. attitudes towards the benefits from fish-screening; and 4. knowledge gaps and preferences for additional communications materials. Most interviewees acknowledged the significance of native fish protection and highlighted the importance of working collectively with government/conservation agencies. The majority of interviewees had at least some prior knowledge of fish-screening options and government initiatives. The use of various forms of screens was common to keep debris out of pumps. Many of these existing screens, however, might not be considered “fish-friendly”. The response was mixed in terms of whether the installation of fish-screen would be financially viable and if doing so would protect native fish. Some interviewees challenged the claims of fish-screening advocates of significant fish loss through pumps and asserted that they hadn’t observed any fish loss and, if they had, it was “usually carp”. Whilst some have concerns/questions about cost-effectiveness, the main potential operational fish-screening benefits identified by irrigators related to preventing debris blockages in pumps/drippers/sprinklers. Almost all irrigators were keen to receive additional information about fish-screens (i.e. fish floss stats, screen options, cost-benefits, overseas case studies) through a range of channels (i.e. website, site demonstrations, screening workshops/meetings).
Financing soil stewardship: outcomes from a systemic co-inquiry

Nicholas Pawsey¹, Catherine Allan², Benjamin Wills³, Francisco Ascui⁴, Geoff Cockfield⁵, Simon Cook⁶, Mark Frost⁷, Alfred Wong¹, Julia Lynch¹, Ross Colliver⁸

This project was funded by the Soil CRC.

¹Institute for Land, Water and Society, Charles Sturt University, Albury
²School of Accounting & Finance, CSU, NSW, Australia
³School of Environmental Sciences, CSU, NSW, Australia
⁴Federation University, Ballarat, VIC, Australia
⁵UTAS, Hobart, TAS, Australia
⁶USQ, Toowoomba, QLD, Australia
⁷School of Management & Marketing, CSU, NSW, Australia
⁸The Training & Development Group, VIC, Australia

Abstract

Financial incentives are required to support soil stewardship activities which overcome soil constraints impacting the majority of Australian soils. With the agricultural debt market totaling $80 Billion¹ and the market capitalization of large ASX-Listed agribusinesses exceeding $40 Billion², financial market participants have key role to play in this process. The creation of financial incentives to reward soil stewards can leverage off existing market trends which have seen a rapid growth in the responsible lending and investment market and stakeholder demand for corporate accountability for environmental performance. The substantive aim of this project was to investigate opportunities for activating financial markets to reward soil stewardship. This project involved three systemic co-inquiry workshops held in Melbourne, Perth and Toowoomba. These workshops brought together more than 50 experts from the finance, agriculture, research, conservation, corporate advisory, and government sectors. Inquiry into current systems led to consideration of a range of financial practices. Workshop participants generally accepted the importance of soil stewardship and how it can deliver important productivity, profitability and legitimacy benefits. Despite this, current lending and land valuation practices do not fully account for soil health and actively recognise soil stewardship. Workshop participants accordingly prioritised the importance of bridging the finance and soil science ‘worlds’ to enable financial market to better understand the inherent complexity of soil systems and soil stewardship returns. This included the importance of improving financial market participants’ access to relevant and understandable soil science findings that strengthen the link between soil stewardship and farm financial performance.

Despotic birds and environmental flows profoundly affecting ecosystem structure in black box woodlands

Richard H. Loyn1,3, Guy Dutson1, Peter W. Menkhorst1,2

1Eco Insights, PO Box 283 Beechworth VIC 3747
2La Trobe University, Bundoora VIC 3086 and Centre for Freshwater Ecosystems, Wodonga, VIC 3690
3Institute of Land Water & Society, Charles Sturt University, Albury, NSW 2640

Abstract

Despotic interspecific territorialism is an influential process in Australian woodlands, and more needs to be learned about its effects and how they can be managed. We surveyed bird populations at 200+ sites in Black Box *Eucalyptus largiflorens* woodlands and associated habitats in the Murray River floodplain near Mildura 2014-20 to assess effects of environmental flows, delivered to improve woodland health at icon sites under the Living Murray initiative of the Murray Darling Basin Authority. Despotic native Noisy Miners *Manorina melanocephala* (~60g) increased at many flooded sites, expelling smaller birds (which can reduce defoliating insects). However, small birds increased nearby (to a greater extent), occupying sites vacated by Noisy Miners. Large birds (>60g) became most numerous in sites occupied by Noisy Miners: they included Grey and Pied Butcherbirds *Cracticus torquatus* and *C. nigrogularis* (which often associate with miners); and White-winged Chough *Corcorax melanorhamphos* and Apostlebird *Struthidea cinerea* (which share communal lifestyles with miners). Other co-existing species included three “giant” species (Laughing Kookaburra *Dacelo novaeguineae*, Magpie-lark *Grallina cyanoleuca* and Blue-faced Honeyeater *Entomyzon cyanotis*), each many times larger than their closest local relatives. We suggest that their gigantism may be advantageous in resource-rich habitats favoured by despotic species, contributing to their evolutionary success and development. These observations show the benefits of environmental flows and illustrate the roles of despotism and communal living in periodically productive environments. They demonstrate the rapid changes that can occur in bird communities, and the importance of conserving diverse environments to cater for those changes.
Prediction of migration of PFOS in soil and groundwater in a regional NSW

Reza Mahinroosta\textsuperscript{1,2}, Lalantha Senevirathna\textsuperscript{1,2}

\textsuperscript{1}Institute of Land Water & Society, Charles Sturt University, NSW, 2640, Australia
\textsuperscript{2}CSU Engineering, Faculty of Business, Justice and Behavioural Sciences, Charles Sturt University, NSW, Australia

Abstract

Per- and polyfluoroalkyl substances (PFAS) have polluted both soil and groundwater since 1950. These chemicals are toxic, resist biodegradation, transfer in the environment easily, and accumulate in the body of flora and fauna. The prediction of their transport in the environment is of paramount importance for environmental managers to decide on the remediation strategies. In this study, the results of transport modeling of PFOS (perfluorooctanesulfonate, one of the dominant PFAS) in a contaminated site in regional NSW are presented. For instance, professional software (Geostudio) encompassing major functions of the contaminant transport was used to predict the level of PFOS in soil and groundwater due to climate interaction for 100 years. The initial physico-chemical parameters and adsorption characteristics of the soil were determined from in-situ tests and laboratory mechanical and chemical analysis. The model showed that with the current situation with no remediation action, the level of PFOS in the groundwater postulates the guideline value for drinking water after 25 years, with a constant increase in its level up to 100 years. The results of the modeling are in good agreement with the data from monitoring well in proximity to the contaminated sit. It should be mentioned that the site is categorised as industrial/commercial land use and the use of groundwater for drinking purposes is highly unlikely.
Small-scale species distribution model identifies restricted breeding habitat for an endemic island bird

Richard D. Segal\textsuperscript{1,2,4}, Melanie Massaro\textsuperscript{1,2}, Nicholas Carlile\textsuperscript{3}, Rachel Whitsed\textsuperscript{1,2}

\textsuperscript{1}School of Environmental Sciences, Charles Sturt University, Albury, New South Wales, Australia
\textsuperscript{2}Institute for Land, Water and Society, Charles Sturt University, Albury, New South Wales, Australia
\textsuperscript{3}Department of Planning, Industry and Environment NSW, Parramatta, New South Wales, Australia

Abstract

Mapped geographic distributions of many birds are an overestimation of their true range and this overestimation is particularly high for threatened species. Due to their restricted ranges and inability to relocate to other areas, island birds are particularly vulnerable to anthropogenic effects on their habitats, but few studies have investigated the suitability of remaining habitat for species restricted to small oceanic islands. Here, we developed a fine-scale species distribution model to investigate the breeding habitat of the Lord Howe currawong (\textit{Strepera graculina crissalis}). We found that currawongs nest preferentially near gullies at lower elevations in the forested areas of the island. Distance to drainage was the main factor preventing currawongs from breeding across the island’s forested areas. Using a combination of Thiessen polygons and suitable habitat to define territory boundaries, we estimated the average territory size to range between 2.48 ha and 5.23 ha. Our model identified 196 ha of Lord Howe Island’s land area as highly suitable nesting habitat for the Lord Howe currawong, while a further 246 ha were classified as medium suitable habitat. Hence, we estimated that the island can support a maximum number of 84 breeding territories. This study shows that the Lord Howe currawong has a narrower ecological niche than was expected, lowering the carrying capacity for this species on the island. As birds on remote islands are often unable to relocate to other suitable areas, it is important to determine the remaining habitat to ensure the continued persistence and conservation of threatened island species.
Friday 2:00pm – 2:20pm

Estimating the impacts of mega-fire on animals: how many reptiles were in the path of the 2019-20 Australian megafires?

Dale G Nimmo¹

¹Institute for Land, Water and Society, Charles Sturt University, Albury 25640

Abstract

The 2019-20 Australian bushfires commanded global attention. From August to March 2020, 12.6 million hectares of Australia burned, comprising habitat for thousands of native species. The prediction by Professor Chris Dickman that more than 1 billion animals were killed in bushfires helped focus the world’s attention on the plight of Australia’s wildlife. Yet these predictions were admittedly “back of the envelope”, based on research from the mid-2000s that used animal density estimates to predict the mortality of birds, reptiles and mammals due to land clearing. Predictions for reptiles were particularly problematic owing to a lack of data on reptile density, and so relied on a series of ‘rules of thumb’ regarding how many lizards would be in a given parcel of land. In recent years, global databases of vertebrate density estimates have been assembled, providing a new platform to make more robust estimates of animal densities across the globe. Here, I outline how I have used one such database to model and predict the number of reptiles in the path of the 2019-20 bushfires. Using this new approach, I arrive at an estimate of 2.46 billion individual reptiles in the path of the fires, although there is considerable uncertainty around this estimate. The next step in this project will attempt to determine the mortality of individuals in the path of the fire using a systematic review and meta-analysis.
Can birds of different feathers fly together? Research collaboration in regional Australia

Wesley S. Ward¹, Michael Vanderzee¹, Michael Mitchell¹, C. Max Finlayson¹

¹ Institute for Land, Water and Society, Charles Sturt University, Albury, NSW

Abstract

Collaboration is vital for addressing complex environmental and natural resource issues; however, history is replete with less than successful examples. Community-based organisations, government agencies, research institutes and others can bring complementary expertise, experience and resources to support long-term collaborative efforts. Social and environmental science researchers from ILWS are investigating the barriers to establishing and maintaining collaboration between landholders, researchers, and government agency staff in the Murray River valley at a time when trust and mutual respect has been eroded by past bad experiences, loss of political bipartisanship and top-down water reform. Preliminary qualitative investigations into collaboration between three organisations in the Murray River valley have helped to identify a lack of common purpose, competition, and poor communication between organisations, as well as external socio-economic drivers and personality traits as barriers to collaboration. Improved understanding of these introspective and public processes can help raise awareness of these barriers and provide a basis for building long-term relations and connectivity based on trust and respect. These are all necessary for instituting effective and much needed research collaborations in regional Australia – collaborations that deliver beneficial outcomes for local communities and the wider public.
Empowering Social Workers: Virtuous practitioners

Manohar Pawar$^{1,2}$

$^1$Institute for Land, Water and Society, Charles Sturt University, Albury 2640
$^2$School of Humanities and Social Sciences, Charles Sturt University, NSW, Wagga Wagga, NSW 2650

Abstract

This presentation aims to discuss the process of conceptualization, submission, implementation and producing outputs and outcomes of a successful ARC discovery project entitled ‘Virtuous practitioners: Empowering Social Workers’ (DP140103730, 2014-2019). The submission was made against the advice of a CSU external expert, but it received the grant. The implementation occurred as planned, though some phases were delayed due to practical reasons. Its 17 outputs include two books, a monograph, 13 book chapters and a Q1 article, though it had committed to produce about ten journal articles or book chapters. The project was important and innovative from several perspectives. The analysis of developing and implementing and achieving the outputs and outcomes of this project suggests that although, in addition to knowledge and skills, researchers’ determination and commitment are crucial, research organizations need to provide sustained enabling and conducive environment to facilitate innovative research. Further, experiences gained in this project offer some insights for planning and implementing research in the future.
Social capital in the environment

Sarah Redshaw\textsuperscript{1,2}

\textsuperscript{1}Institute for Land, Water and Society, Charles Sturt University, Albury 2640
\textsuperscript{2}Research Fellow in the Faculty of Arts and Education at Charles Sturt University

Abstract

Social capital has become a strong theoretical frame encompassing a range of semi formal, informal and sometimes formal connections that are crucial in maintaining communities and contributing to economic success. A strong critic of social capital Ben Fine has claimed that the notion has damaged social theory development. Meanwhile Halpern (2005, 2010) has gathered together and discussed the explosion of studies using the notion of social capital. The adoption of social capital by neoliberal governments has placed greater emphasis on individual and community responsibility even as inequality has grown. In Bowling Alone Robert Putnam laments the decline of community. He documents a society that has become more individualistic, more isolated and less communal. For Bourdieu social capital was a product of individuals not collectives enabling them to exert power by mobilising resources but it is based on the development of/investment in goodwill (1986). Social capital has been strongly focused on networks of support but unequal access to resources remains a central problem in the ability of communities to prepare for and manage disasters. The paper will consider some of the main issues relating to considering social capital in social theory giving account of some of the benefits of the concept as well as its potential limitations.
Groundwater monitoring: a pre-requisite for its management

Ghulam Zakir-Hassan\textsuperscript{1,2,3}, Catherine Allan\textsuperscript{1,3}, Jehangir F. Punthakey\textsuperscript{3,4}, Lee Baumgartner\textsuperscript{3}

\textsuperscript{1}School of Environmental Sciences, Charles Sturt University, Albury 2640, NSW, Australia
\textsuperscript{2}Irrigation Research Institute (IRI), Government of the Punjab, Irrigation Department, Lahore, Punjab, Pakistan
\textsuperscript{3}Institute for Land, Water and Society (ILWS), Charles Sturt University, Albury 2640, NSW, Australia
\textsuperscript{4}Ecoseal Pty Ltd, Roseville, NSW, Australia

Abstract

Groundwater, a hidden resource, contributes almost 100\% for drinking and about 40-50\% of irrigation water requirements in Punjab. I am studying managed aquifer recharge (MAR) in the Vehari district, an important agricultural area in which groundwater is at risk. Accurate monitoring of any natural resource is key to its good management. The Punjab Irrigation Department (PID) has an historic network of piezometers to monitor the groundwater levels biannually for regional scale analysis, but this has gaps and inconsistencies. The literature suggests that redressal of gaps in groundwater monitoring can yield better datasets with improved reliability, frequency and accuracy. Therefore, I have conducted field visits to accurately measure groundwater levels and salinity and determined the exact locations and physical conditions of piezometers. I have also installed two auto-data loggers. The performance of newly installed auto-data loggers compared with previous monitoring reveals that frequency, accuracy, consistency, and reliability of data has increased. After confirming the sites, I have analyzed the field observations on groundwater levels for the past 15 years from 41 piezometers in the study area to depict the spatial and temporal trends. Results indicated that the average groundwater levels in the study area have dropped from 123 m to 115 m with an average decline of 0.5 m per year. The water table has declined by 15-25 m below the natural land surface. These data sets took effort to create, but their improved accuracy and precision provide confidence for future modeling of the complex aquifer system using MODFLOW.
Did mammals bring the first mistletoes into the tree-tops?

David M Watson

Institute for Land, Water and Society, Charles Sturt University, Albury, NSW

Abstract

As the only woody parasitic plants that infect host canopies, the growth habit of mistletoes represents a key innovation. How this aerially-parasitic growth habit originated is unknown—mistletoe macrofossils are relatively recent, from long after they adapted to canopy life and evolved showy bird-pollinated flowers, sticky bird-dispersed seeds and woody haustoria diverting water and nutrients from host branches. Since the transition to aerial parasitism predates the origin of their contemporary avian seed dispersers by 20–30 million years, this begs the question—who were the original mistletoe dispersers? By integrating fully resolved phylogenies of mistletoes and aligning the timing of historic events, I identify two ancient mammals as likely candidates for ‘planting’ the Viscaceae and Loranthaceae in the canopy. Just as modern mouse lemurs and galagos disperse Viscaceous mistletoe externally (grooming the sticky seeds from their fur), Cretaceous primates (such as Purgatorius) may have transported seeds of root-parasitic understory shrubs up into the canopy of Laurasian forests. In the Eocene, ancestors of the today’s mistletoe-dispersing marsupials Dromiciops likely fed on the nutritious fruit of root-parasitic Loranthaceous shrubs, depositing them atop western Gondwanan forest crowns. Having colonized the canopy, subsequent mistletoe evolution and diversification coincided with the rise of nectar and fruit-dependent birds.
Estimating the impacts of mega-fire on animals: how many reptiles were in the path of the 2019-20 Australian megafires?

Dale G Nimmo

Abstract

The 2019-20 Australian bushfires commanded global attention. From August to March 2020, 12.6 million hectares of Australia burned, comprising habitat for thousands of native species. The prediction by Professor Chris Dickman that more than 1 billion animals were killed in bushfires helped focus the world’s attention on the plight of Australia’s wildlife. Yet these predictions were admittedly “back of the envelope”, based on research from the mid-2000s that used animal density estimates to predict the mortality of birds, reptiles and mammals due to land clearing. Predictions for reptiles were particularly problematic owing to a lack of data on reptile density, and so relied on a series of ‘rules of thumb’ regarding how many lizards would be in a given parcel of land. In recent years, global databases of vertebrate density estimates have been assembled, providing a new platform to make more robust estimates of animal densities across the globe. Here, I outline how I have used one such database to model and predict the number of reptiles in the path of the 2019-20 bushfires. Using this new approach, I arrive at an estimate of 2.46 billion individual reptiles in the path of the fires, although there is considerable uncertainty around this estimate. The next step in this project will attempt to determine the mortality of individuals in the path of the fire using a systematic review and meta-analysis.