Monitoring blue green algae

Twelve weeks of additional monitoring in the Edward-Wakool River System this year by Institute researchers has produced the most detailed dataset available from the massive blue-green algal bloom along the Murray River earlier this year.

While the data is still being analysed, findings so far include: the concentration of nutrients changed dramatically as the bloom progressed; the bloom grew to different extents in different parts of the system; and the bloom was a controlling influence on how much dissolved oxygen was in the system. See the latest report *Monitoring of the algal bloom in the Edward-Wakool system 2016, Update #4*, and the story on page 10.

Contributions

We have had some great contributions this issue. Check out Professor Adam Steen’s Opinion Piece on the Federal Election 2016: Implications for Regional and Rural Australia on page 20; Institute Adjunct Dr Tony McDonald’s snapshot of climate change as it relates to south-east Asia on page 25; PhD student Liz Znidersic’s report on field work in the U.S (pictured left) on page 23; Dr Nathan Ning’s column ‘Publications Under the Microscope on page 26 and Institute Adjunct Professor John William’s description of a new paper he has co-authored on ‘Sustainable intensification of agriculture for human prosperity and global sustainability’ on page 26.

Project Updates

This issue has all the latest information and updates on a number of the Institute’s new, current and completed research projects. It showcases the diversity of research projects undertaken by Institute members on topics relating to ecology, regional development, community resilience, social research, water and much more. From page 3 on.
From the Director

- Professor Max Finalyson

Over the past months we have been preparing a case for the within-CSU reaccreditation of ILWS as a centre of research excellence.

One of the many outcomes from the consultation that was undertaken to support the case for reaccreditation was an appraisal or reappraisal of our research scope. This I found fascinating. At one level it provided an immense amount of information or “intelligence” that we could use when informing internal CSU discussions about the scope and vision of the university and the role of our research investments.

I was also fascinated by the amount of data that we now have about some of our measures of research activity. There has been an immense investment in recording this data and making it available for purposes such as this, as well as for formal reporting purposes. As fascinating as I found all that, the point I wanted to raise here was the scope of what we do – the variability and the common themes and interactions.

Since it was formed ILWS has been charged with undertaking high quality and internationally recognised and integrated research. The latter is what I see as the point of differentiation that we can bring to the research that is undertaken in our regions and with our communities.

We have been through the discussion about what is meant by integration, and should continue that. We support multi- and trans-disciplinary research through the efforts of individuals and teams, and both change.

Mostly though it was the scope or the scoping that fascinated me – based on the views expressed in various meetings and the information from the research data we were quickly able to regroup the research under 4 themes or pillars. The pillars are shown in the middle of the diagram below along with a detailed portrayal of the range of projects.

There is a lot in this, as I would hope from within an institution such as we have. What I am looking at next is what parts contribute to the integration, and which parts of the integration, and when, and why?

In doing this we know it is not even, and some of it cannot be prescribed or even expected – that’s the beauty I see in what we do. Besides a fetish with data and patterns I am also looking for the benefits we provide for our communities, and how, and hence, where we may need to prioritise in the future and to see if we can do that without falling back to whims and crystal balls alone.

And in doing this also celebrating our successes using our research metrics, awards and general feedback and votes of appreciation. I see it as a great journey and it’s ILWS’s journey.

Recent Grants

External grants

Germination testing of Stackhousia monogyna, Dianella revoluta and Dianella longifolia. (2016)
Price, J. & Vening, G. (Honours)
Director of National Parks, $10,811

What’s in the wetland- Investigating distribution and ecology of secretive wetland birds. (2016)
Watson, D. & Znidersic, E. (PhD student). NRM North, $3250


Foundational activities for the Fish Theme of Environmental Water Knowledge and Research (EWKR). Baumgartner, L. (2016) MDRFC, $16,800

Improving groundwater management to enhance agriculture and farming livelihoods in Pakistan. (2016-2020) Finlayson, M., Punthakey, J., Allan, C., Mitchell, M. ACIAR & CSU ($100,000), Total value of the project $2,100, 500


Internal grants


Members of the Institute’s Sustainable Water Strategic Research Area were successful in obtaining a Research Infrastructure Block Grant (2016) to purchase an Acoustic Doppler Current Profiler (ADCP) for use across a number of the group’s current and planned research projects.

An ADCP is a hydro-acoustic current meter, similar to a sonar, that is used to measure water current velocities over a depth range using the doppler effect of sound waves scattered back from particles within the water column.

It can also be used to undertake a bathymetric survey to produce a detailed map of a riverbed or the bottom of a wetland. It can be mounted on the side of a boat for use in large water bodies or mounted on a hydro-board for use in smaller and shallower water bodies.

The ADCP will be used to support new and existing projects in the following key research areas:
• Ecosystem responses to flows in rivers and streams
• Habitat assessment
• Hydraulic modelling
• Wetland research: Information on depth profiles in wetlands

New Projects

Fire Management

The Can Indigenous fire management restore mammal communities? project, led by the Institute’s Dr Dale Nimmo, will test the hypothesis that the displacement of Australian Aborigines and their fire regimes is a contributing factor to Australia’s mammal decline.

The project’s aim is to reveal the benefits of restoring large-scale Indigenous burning for native mammal communities.

It will do this by undertaking a landscape-scale natural experiment on the effects of Indigenous displacement on mammal communities using biodiversity surveys to compare landscapes under/not under Indigenous fire management.

The project will be based in remote areas of Western Australia’s Western Desert.

Germination testing

Funding for the Germination testing of Stackhousia monogyna, Dianella revoluta and Dianella longifolia project is supporting the work of Honours student, Gabrielle Vening, supervised by Dr Jodi Price (Principal), Dr Lydia Guja (Centre for Australian National Biodiversity Research (CANBR)) and Dr Peter Spooner.

Gabrielle is looking at the seed biology and specific germination triggers for woodland species Stackhousia monogyna, Dianella revoluta and Dianella longifolia, with a view to enhancing production of these species for future restoration work.

Gabrielle, who is doing the laboratory work for her project at the Australian National Botanic Gardens’ (ANBG) National Seed Bank in Canberra, is also looking at the seed storage characteristics to determine optimum regimes for long term storage via seed banking.

“These species, a common component of understoreys, are difficult to establish in restoration trials,” says Gabrielle. “Because of this, it is expected that the seeds have some kind of dormancy mechanism. In laboratory trials, I will subject the seeds to different dormancy alleviation treatments to find the optimum technique.

“The results of my study will help inform restoration work in endangered woodlands by finding the best method for alleviating seed dormancy.”

This project is funded by Transport for New South Wales (TfNSW), which is responsible for the restoration and rehabilitation of Endangered Ecological Communities (EEC’s) located in railway corridors in regional NSW.

Along with funding from TfNSW, this project is supported by John Holland Rail Pty Ltd, the ANBG, CANBR, Mid Lachlan Landcare and Young District Landcare.
New Projects cont.

Connectivity analyses for Slopes to Summit project, Spooner, P. & McDonald, S. (2016-2020) Holbrook Landcare and NSW Environmental Trust (Bush Connects), $30,000

Last year the Holbrook Landcare Network was successful in obtaining nearly $500,000 from the NSW Environment Trust for its Slopes to Summit Bush Connect project.

Tasks associated with that project include (1) strengthening existing roadways, creek-lines and glider-ways with a focus on the threatened squirrel glider, and (2) carrying out other types of restoration work to increase connectivity in fragmented box woodland landscapes in the Slopes to Summit (S2S) area. S2S is an established connectivity conservation group based in the NSW South West Slopes. Partners include CSU, Murray Local Land Services, CSIRO and ANU.

The principal aim of the project is to increase connectivity in two specific study areas — between Woomargama National Park and Table Top Nature Reserve/Benambra National Park; and north of Holbrook, straddling Billabong Creek. Both areas are mostly private land, with much of the vegetation endangered grassy box woodlands.

Holbrook Landcare will use its Bush Connect funding to develop projects for these properties in coming years with an aim to increase connectivity in these fragmented landscapes.

CSU, collaborators in this project, are leading up the research and connectivity analyses support.

“With the assistance of CSU’s SPAN (Simon McDonald) we are conducting innovative Circuitscape connectivity analysis using GIS tools to help Holbrook Landcare plan and design its on-ground restoration works to meet the aims of the major project,” says Dr Peter Spooner who leads the CSU component of the overall project.

The CSU component has three stages:

- Conduct a connectivity analysis for the existing landscape
- A second phase of analysis after Holbrook Landcare has made its decisions on where to place on-ground works based on its threat and opportunity analysis
- At the conclusion of the project, evaluate improvements in connectivity and conduct further analysis to predict the long term outcomes of the project

“This is one of the first research projects of this kind,” says Dr Spooner. “It is attempting to quantify the extent of connectivity improvement in the landscape as carried out by restoration groups such as Holbrook Landcare.”

He said the project was interesting because there was much debate in the literature and scientific community about what connectivity means.

“There are many questions about what species we design projects for, what are their habitat requirements, and how do they move in the landscape,” says Dr Spooner. “For example, do squirrel gliders or other native species use vegetated corridors or not? We are hoping through our research to obtain a better understanding of how species actually use these fragmented, modified rural landscapes.

“We will be using new GIS tools to explore these questions and anticipate future Honours students to assist with ground-truthing of the spatial analyses results.

“Tools like Circuitscape will assist us to visualise and quantify animal movements as ‘flows’ through the landscape, where a landscape model will be developed to simulate different degrees of resistance to animal movement.”

The Hume Highway, a major barrier in the project area, has presented a number of challenges in carrying out the analyses.

“The highway creates a significant barrier, but it is not completely stopping animal movements. The Hume highway corridor contains patches of remnant vegetation and large old growth trees which are critical for habitat. It also possesses significant areas of replantings along the road verge, and various mitigation projects have been put in place, such as glider poles and rope bridges, to address its barrier effects,” says Dr Spooner.

Dr Spooner says the learnings to come from the project will be used to inform similar connectivity conservation programs that are occurring throughout Australia and worldwide.

Completed Projects

Floristic Monitoring


For this project ILWS researchers assisted the NSW Office of Environment and Heritage’s National Parks and Wildlife Scientific Division to conduct vegetation field survey work.
The survey was designed to monitor changes in vegetation composition and structure over time in relation to ecological thinning trials of River Red Gum saplings in the Murray Valley National Park.

“The aim of the work was to provide an understanding of biodiversity conditions prior to the ecological thinning trials,” said Dr Spooner, project leader.

The field work was undertaken by Ms Erika Cross, Dr Alison Matthews, Ms Shona Arber and Mr Gavin Thomas. Full floristic surveys were completed on 198 plots throughout Murray Valley National Park between November 2015 and February 2016. A report on the collaborative project with NSW National Parks & Wildlife Service and University of NSW has been submitted to OEH.

The researchers recorded *Amphibromus fluitans*, a grass species listed as Vulnerable on both the NSW and Commonwealth legislation, in a number of plots.

Principal scientist with NSW OEH Dr Emma Gorrod has stated that the species was not recorded on these plots in 2012-2013, indicating that environmental watering events may have improved habitat conditions.

The floristic monitoring is a part of NSW National Parks’ five year experimental design and monitoring plan for the Murray Valley National Park that seeks to determine whether reducing tree density leads to improved health and biodiversity. Reduced density is likely to mean more access to water, more mature hollow bearing trees which provide habitat and other valuable resources, and more wood debris for native Australian animals and plants. It’s also expected to prevent further decline in the condition of the red gum canopy.

Murray Valley National Park, a national park in the Riverina region of New South Wales, Australia, consists of 41,601 hectares of *Eucalyptus camaldulensis* (red gum) forest along the Murray River and was established in July 2010.

“The Murray Valley National Park was declared only relatively recently,” says Dr Spooner by way of background, “and there are concerns that dense regeneration of Murray red gums are ‘invading’ the park which could result in a decline in the biodiversity conditions of the park. Also, since the area was declared a national park, previous logging has stopped.

“Because of these concerns and the management change, OEH has taken a best scientific practice approach to implementing new disturbance regimes by conducting this thinning trial which will advise and inform future management actions in the park.”

Dr Spooner said he envisaged there was potential for CSU for further collaboration and assistance with ongoing monitoring of the park following the thinning trial.

New Immigrants


The final report on this three year project which has found new immigrants are filling important needs in regional Australia, bringing skills, innovation and vital labour to the agriculture sector, is now out. (Executive Summary)

The report was launched by Institute Adjunct Professor Jock Collins (UTS) and Dr Devaki Monani (ACU) as part of a presentation on ‘The impact of settlement services and programs in regional areas’ at the Triennial and International Conference of the Settlement Council of Australia ‘Settlement and Citizenship in Civil Society’, 5-7 May 2016, in Melbourne.

It outlines the roles of recent immigrant settlers and temporary visitors in re-energising the regional and rural towns across the nation.

“Immigrants are of increasing importance to Australian agriculture, and the new pathways recently opened to permanent and temporary immigrants has generally succeeded in getting them into regional and rural Australia,” says Dr Branka Krivokapic-Skoko.

“We have skilled permanent immigrants filling many vacancies for skilled jobs, bringing lots of expertise from their former home countries.

“Likewise, immigrant farmers are increasing in numbers and significance, adding to agricultural productivity as they bring new insights. For example, Asian market farmers bring a range of new vegetables and fruits as markets grow for them, and African farmers can introduce new and tried ideas on water conservation.”

Temporary workers, such as Working Holiday Makers and Pacific Islands Seasonal Workers, also provide an important workforce, particularly during harvest times around Australia. (More next page)
“However, some well-publicised instances of low pay and unsatisfactory work experiences for both groups threaten to undermine the future of these programs,” says Branka.

In addition, while many refugees and humanitarian immigrants have settled in Australian cities, a number have moved to regional areas becoming farmers and agricultural entrepreneurs adding considerably to the agricultural sector workforce.

The researchers believe that nationwide policies should consider:

• Better targeted migration to regional and rural areas with shortages in skills and employment;
• Providing incentives for new immigrants to move to regional areas;
• Increasing the number of Working Holiday Makers coming to Australia;
• Better promoting the Pacific Islands Seasonal Workers program;
• Increasing resettlement of refugees in regional Australia; and
• Enhancing local incentives to welcome new immigrants to cities and towns.

“Immigrants have so much to offer regional and rural Australia, economically, socially and practically,” says Branka. “We need policies to address the growing needs of regional Australia at a time of major economic and social change.”

B SAFE


The B SAFE project may well be finished with the final report and a new guide to help communities prepare for emergencies out, but that doesn’t mean that the ILWS researchers involved (Dr Sarah Redshaw and Dr Valerie Ingham) have in any way finished with what is such an important topic.

“We are now casting around for the next project idea,” says Valerie. “I think it could be trialing the tools developed in B SAFE in other communities, possibly a community that has been affected by recent floods.”

The B SAFE report, the result of collaborative research with The Blue Mountains and Lithgow Integrated Neighbourhood Network, was launched by the NSW Minister for Emergency Services, the Hon. David Elliot on June 17 along with the associated The Get Ready! Guide, which provides tools to help communities and the community sector prepare for emergencies.

The Meet Your Street program is a ‘ground-breaker’, aiming to raise neighbourhood awareness of the need for preparedness activities. It is held in local parks with community and emergency services attending. The researchers found that this should be followed by More Than a Fire Plan, an informative workshop seminar, focused on changing behaviours such as creating emergency plans, held at a venue other

About 70 people, including local politicians, councilors and emergency personnel, attended the launch at the Blue Mountains Cultural Centre in Katoomba, NSW.

“The Blue Mountains Sustainable Approaches to Fire and Emergencies (B SAFE) project aims to help households become better prepared and more responsible for this preparation in the wake of the 2013 bushfires in the lower Blue Mountains,” says Valerie from CSU’s Australian Graduate School of Policing and Security.

As part of the project, three fire awareness programs delivered in various Blue Mountain communities were monitored in 2015 to identify the type of people attracted to each program and the number of households who subsequently put fire preparedness plans in place. As each program proved effective in its own way, each is featured in the B SAFE report.

The B SAFE team dispersed amongst Blue Mountains Councillors, MP’s Susan Templeman and Trish Doyle, and the Minister for Emergency Services, the Hon David Elliott.

The B SAFE team dispersed amongst Blue Mountains Councillors, MP’s Susan Templeman and Trish Doyle, and the Minister for Emergency Services, the Hon David Elliott.
The long term commitment by Murray Local Land Services (LLS) to social research and its associated investment has enabled strong collaborations to develop with ILWS. ILWS is currently involved in two social research projects, with another project in process. ILWS won the tender to undertake the two projects that are now close to completion, the Community Groups Capacity Check, and a concurrent Stakeholder Satisfaction Survey focused on groups and organisations.

The surveys, designed by Dr Michael Mitchell and Associate Professor Catherine Allan, were administered between February and April this year in paper, email and on-line versions, the latter with assistance from CSU’s Spatial Data Analysis Network (SPAN). The third project, the Billabong Yanco Social Research project, involves former ILWS PhD student and now ILWS adjunct Dr Wendy Minato working in collaboration with Michael and Catherine, as well as former ILWS PhD Student, Elisa Tack.

The commitment of Murray LLS to social research is also evident in that it has employed the only social research officer among NSW LLSs, Dr Gill Earl, another former ILWS PhD student. Dr Gill oversaw both the Community Groups Capacity Check and the Stakeholder Satisfaction Survey projects.

Finally, the Heads Up For Fire (HUFF) program requires a committed local resident from within specific street areas to facilitate genuine connections between residents, the emergency services, local community groups and the local Neighbourhood Centre.

The B SAFE research resulted in the development of a Community Action Framework, available through the NSW Government for other communities prone to bushfires and other natural emergencies.

The report contains various tools to collect data, engage community groups and improve community discussions.

The Get Ready! Guide contains practical steps for organisations such as neighbourhood centres, aged care facilities, child care and out of school hours care workers to take to be better prepared for disasters.

It suggests seven key actions - develop an emergency plan; utilise resources; identify roles and responsibilities; stay in touch; source information; link up with others, and practice emergency plan.

Again, like the B SAFE report it provides a model that can be used by community sectors elsewhere in Australia.

Researchers Drs Sarah Redshaw and Val Ingham

than their immediate street.

“The workshop provided residents with a more detailed idea of the planning required, an understanding of the emotional and psychological impact that an emergency situation evokes, and the effect this can have on decision making,” says Valerie.

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Current Projects-Updates

Community Groups Capacity Check project

This project came about because Murray LLS was looking for a way to inform their investment in group capacity.

“Murray LLS works with groups of different types, size and age so there is no point in trying to provide the same capacity building, the same training, the same money or advice or whatever in a blanket way,” says Associate Professor Catherine Allan.

“The way it evolved is that now it is very much about giving community groups ideas about how they can invest in their capacity,” explains Dr Michael Mitchell. “Murray LLS for some time has had a devolved decision making approach; it wants to devolve responsibility to community groups. One of the ways of doing this is for the groups to make their own decisions. The way we set up the survey for this project supports that process with survey questions organised into categories that allowed the groups to identify their capacity needs and then negotiate how to address those needs by, for example, approaching Landcare coordinators and Murray LLS for projects that might meet those needs.”

To identify survey recipients, Murray LLS identified community groups in the region it covers that it had relationships with, including Landcare groups, producer groups and a few others. The survey was sent to 73 groups, 10 of which were found to no longer be operating. The researchers received 42 replies; a response rate of 71%. While capacity surveys have been done in the past, Michael and Catherine decided to develop their own framework. “Because we are dealing with groups, social capital is obviously a key component,” says Michael.

The framework for the survey comprised of five capital types – human, social (sub-divided into bonding, bridging and organisational) and physical/financial.

“The results confirmed that the groups had high levels of human and social capital, and, in particular, the highest categories were often intrinsic – the things about the group that comes from within the group (for example group motivation, the ability to be a good community catalyst, good community engagement, respect and trust),” says Michael.

Slightly lower scores were achieved for organisational capital and physical and financial capital which Michael describes as the ‘nuts and bolts’ of a group. “For the organisational capital a lot of that had to do with whether or not the group had a strategic plan,” says Michael. (more)
The results of the survey will inform decision-making both within groups and within Murray LLS.

"The groups get a chance to think about their capacity in an organised way and use that in the decisions they make," says Michael.

"Interestingly just doing the survey resulted in one community group deciding to do a strategic plan, and another, which had been in recess, coming back to life."

Stakeholder Satisfaction Survey project

This project came about as Murray LLS was interested in finding out about client satisfaction with its service. While the community groups surveyed in the Community Groups Capacity Check were the predominant target audience, other stakeholder organisations such as local Shires in the Murray LLS region, government agencies such as the NSW Department of Primary Industries and the Office of Environment and Heritage, and private consultants were also surveyed.

"While Murray LLS has done stakeholder satisfaction surveys with individual clients before, this was the first time specific questions relating to groups have been asked in a survey format," says Dr Michael Mitchell.

The survey was sent to 97 group recipients, 51 of which were returned, and, with the ‘null responses’ removed, the response rate was 66%. "Overall the groups reported a high level of satisfaction with the services provided by Murray LLS," says Michael. "The things to highlight in terms of why the interaction was so good were face-to-face interactions with Murray LLS staff. The community groups in particular would like to have more face-to-face interaction with Murray LLS staff. Some of the community groups really liked the fact that Murray LLS has offices in regional centres with staff that lived locally."

The responses to questions about Murray LLS providing benefits to the community, and to the natural environment was "very high agree." Communication from Murray LLS about funding, training, and forthcoming activities was seen as very important particularly by community groups. "Even though the scores were between moderate and doing it well for those three elements, there is an area for improvement there," says Michael. "One of our recommendations was that Murray LLS consider how it could improve communication about funding and training."

Another area for improvement, as determined by the community groups' responses, was in providing activities that helped groups to learn or activities that helped build the level of activity of groups. "While there was still a majority of agreement, that this was happening, there was still a significant minority of groups (15 to 20%) who felt that they weren't receiving that assistance," says Michael.

Another aspect of the survey is, that because Murray LLS is an amalgamation of a number of different past organisations, one of its Key Performance Indicators is around community awareness of the services it provides. The survey covered six of these service areas – agriculture, Landcare, environment, biosecurity, travelling stock routes, and Aboriginal programs. "In general for agriculture, Landcare and environment there were high levels of interaction and satisfaction," says Michael. "For the two new areas, biosecurity and travelling stock routes, there are some groups who aren't currently engaging with Murray LLS on those aspects but who expressed interest in engaging. There was very high satisfaction with the Aboriginal program even though only a few groups were engaging in these programs."

Again, as with the previous survey, this Stakeholder Satisfaction Survey is a base-line survey with researchers providing recommendations to
Murray LLS to help inform future management decisions. Outputs from the survey include group snapshots and an overall report.

**Billabong Yanco Social Research project**

Murray LLS has also provided funding to support its systems analysis of the Billabong Yanco Creek landscape. As Dr Michael Mitchell explains while Murray ILWS has strengths in systems analysis of the landscape from an environmental perspective, it has engaged Institute researchers to assist with the analysis from a social research perspective.

“We are supporting its systems analysis by providing, firstly, a socio-economic profile of the landscape which has been our work to date,” says Michael. The plan is for this to lead into further work to look at social norms. “Analysis undertaken by the local steering committee identified social norms as a strong influence on the system in all its different aspects – social, economic and environmental,” says Michael. “They wanted to know how they could influence social norms to change the system for the better.”

A social norm is described as a custom/habit/cultural behaviour. “It is the hidden part of social capital,” says Associate Professor Catherine. “A good example is, in the health sector, there has been a lot of work to do with influencing social norms around smoking and alcohol. Landcare which has helped bring about a change in agricultural practices, is another example of where social norms have shifted.”

The researchers are working with former ILWS PhD student Elisa Tack, who is managing the Billabong Yanco Creek System Project for Murray LLS.

**Bringing back the nutrients**

Before river regulation the forests of the southern Murray-Darling Basin would have been regularly inundated by rivers flows, according to seasonal conditions. These waters, taking with them the leaf litter from the forest floor and the organic matter off the plains, would flow into nearby wetlands, creeks and rivers, replenishing the nutrients and triggering an increase in river productivity needed for a healthy river system.

Water managers are looking at how to best manage water to restore that connectivity. They are particularly interested in the extent to which floodplain runoff during a flow pulse event contributes to river productivity in downstream ecosystems.

Members of the Institute’s Strategic Water SRA are helping to understand the contribution of flooded forests and floodplains to river productivity with several research projects completed and more on the way.

A return flow project in the Murrumbidgee system was undertaken by Dr Skye Wassens, Dr Ben Wolfenden and Dr Kim Jenkins in 2015. This project was an extension of the Murrumbidgee environmental watering project this team is undertaking in the Murrumbidgee system, funded by the Commonwealth environmental water office (CEWO). They examined the impact of controlled releases of environmental water, delivered through the heavily forested North-Redbank wetland complex, back into the Lower Murrumbidgee River in Oct. 2014 and Feb. 2015. The researchers currently have a paper under review on ‘Return Flows in the Murrumbidgee River system’ examines ecological outcomes and adaptive management of return flows.

Two other projects have been undertaken in the Murray catchment that will provide important base-line data for research on the contribution of flows through the Koondrook-Perricoota floodplain to the productivity of the Wakool River. The Edward-Wakool environmental watering team led by Prof Robyn Watts has been undertaking research in that system for the past 5 years (also funded by CEWO) and has built up an extensive dataset including stream metabolism, carbon, nutrients, chlorophyll and fish in this system. This data set was extended in 2015-16 through funding from NSW DPI (Fisheries) who funded a CSU team led by Dr Wolfenden to monitor some additional sites further downstream in the Wakool River to ensure there were good baseline data to assess the ecosystem responses to return flows from Koondrook-Perricoota Forest when the next forest inundation event occurs.

The Koondrook-Perricoota Forest is one of the largest forested floodplains in Australia, covering over 32,000ha. Before river regulation it would have contributed large amounts of floodplain-derived carbon to the Murray and Wakool Rivers. New regulators and levees have been constructed in the forest under the Commonwealth-funded Koondrook-Perricoota Forest Flood Enhancement Project to allow for managed environmental water deliveries both in and out of the system.

“The purpose of the works is to enable connectivity as well which is really important for both wetlands and rivers,” says Ben. “Of particular interest is fish recruitment on the floodplain and for those fish to be able to move back into rivers, as well as the other processes which support fish. One of the objectives of environmental water is to provide nutrients to support ecosystem function.”

As yet environmental water has not been released out through the new regulators on the edge of the forest (on Barbers and Thule Creeks which flow into the Wakool River.) With the recent rainfall in the catchment it is highly likely that this year may provide the right conditions for the researchers to assess the contribution of Koondrook-Perricoota floodplain runoff to the productivity of the Wakool River. CSU researchers are currently installing additional loggers in the Wakool River, Thule Creek and Barbers Creek to commence a new project (funded by Forestry Corporation of NSW) to assess the outcomes of anticipated flows through the Koondrook-Perricoota floodplain to the productivity of the Wakool River.

“This year is a great opportunity to better understand what happens during floodplain inundation, and then we can use that knowledge to help inform water management and floodplain forest management in the future” says Robyn.
Understanding the blue-green algal bloom

Twelve weeks of additional monitoring in the Edward-Wakool River System this year by Institute researchers has produced the most detailed dataset available from the massive blue-green algal bloom along the Murray River earlier this year.

The bloom which, at its peak, ran the length of the Murray from Lake Hume to past Wentworth, (1630km) caused much economic hardship for primary producers, tourist operators and businesses alike. First reported upstream of the Edward-Wakool River system in late January/early February, it wasn’t until the first week of June that the Edward River at Deniliquin came off red alert. By the end of June all red alerts for the Murray, Edward and Wakool Rivers had been lifted.

Institute researchers who were already monitoring ecosystem responses to Commonwealth watering in the Edward-Wakool as part of a five year project funded by the Commonwealth Environment Water Office (CEWO), were contracted by CEWO to do additional weekly monitoring for the life of the bloom in the Edward-Wakool (from beginning of March to the last week in May).

“It was an extremely long algal bloom, much longer than one you would normally expect in the Murray system,” says Dr Julia Howitt, an environmental chemist and member of the Edward-Wakool monitoring team. “Other organisations were also monitoring the bloom along the Murray River, but not to the same intensity as what we were doing in the Edward-Wakool system.

“We’ve had a great team of people who were able to get out into the field and collect the extra samples. It was very intensive and very hands-on as there was also a lot of lab analysis.”

Samples were analysed for various parameters at CSU laboratories in Wagga and Albury, Monash University in Melbourne, and ALS Environmental Laboratories in Canberra.

The hard work has paid off and team now has a very comprehensive dataset that will go a long way in helping water managers better understand this particular type of algal bloom. The species of naturally occurring cyanobacteria, Chrysosporum ovalisporum, which caused the bloom occurs elsewhere in Australia and in the world. However it is not normally the dominant species in Australian blooms; usually it is a minor component of a blue-green algal bloom.

“The information we have on river metabolism during a bloom of this species will give us a unique dataset,” says Julia. “It is very rare to have a dataset that includes detailed water quality and river metabolism before a bloom has started. However we were already measuring river metabolism, a measure of how much productivity and photosynthesis is occurring in the river, before the bloom occurred.”

The dataset, which shows how the metabolism of the river changed during the algal bloom, includes weekly nutrient data, weekly dissolved organic carbon data and measurements of levels of dissolved oxygen every 10 minutes.

“It is going to take a lot of data analysis but it will enable us to come up with a much more comprehensive understanding of how the bloom behaved than is normally possible,” says Julia.

So far there have been three main findings:

• The concentration of nutrients changed dramatically as the bloom progressed. “What we can see is that blue-green algae can take nitrogen out of the atmosphere,” says Julia. “While this is a well-known property of blue-green algae we can see how much they increased the nitrogen concentration in the river because of all the extra nitrogen they had incorporated into their cells. There was a big change in the nutrient profile of the river system once the blue green algal bloom really got going.” This finding will help in understanding how blooms impact on water quality. “Often we think about degraded water quality encouraging blooms,” says Julia. “We haven’t finished the data analysis yet but there is definitely a sense that, in this case, it was the bloom driving the water quality. There were enough initial nutrients there that, once the algae got started, they had the ability to extract enough extra nutrients to support extremely high concentrations of algal cells.”

• The bloom grew to different extents in different parts of the system. “As a general rule, the bloom grew to much higher concentrations in the Edward River than in the Murray River,” says Julia. “It was not just a case that it was a big bloom that washed through from upstream. It was supported and growing within the system downstream with spots throughout the Murray where it got to higher concentrations.” The bloom, also present in the Mulwala Canal, collapsed in the canal earlier than in the Murray River. “The bloom’s behaviour was different in the canal which gives us an opportunity to learn about what was different at the end of the bloom,” says Julia.

• The bloom was a controlling influence on how much dissolved oxygen was in the system. “We have not had any reports of the fish in the river system being affected and the fish didn’t move away from the bloom when it first started,” says Julia. “The bloom died off very gradually once the water was cold so it didn’t have that catastrophic effect where you run out of oxygen in the system which sometimes can be a problem with big algal blooms. We think the bloom needed the combination of the autumn rainfall and the water temperature getting cold to start to suppress its growth.”

Before the researchers can help come up with answers regarding how to manage for future blue green algal blooms, Julia says the data for the broader system will need to be
looked at first.

“There was a system-wide impact and it may be that management questions at the upper end of the system could have some influence on how likely it is to continue to occur,” says Julia. “But there is a strong feeling that the very high autumn temperatures encouraged the bloom which there isn’t a lot we can do about….”

The addition of the special algal bloom monitoring to the Long Term Intervention Monitoring (LTIM) project has tripled the number of carbon characterization graphs that Julia has to prepare.

“It is an enormous dataset now and it is going to take a bit longer before we are really going to understand all the messages inside it,” says Julia. “We will certainly be able to contribute information about how the bloom behaved, what it did to the water quality…if there was another bloom in the future we will be in a much better position to know what we might be looking for, in terms of things to watch and where there might need to be an intervention.”

However Julia says for the recent bloom the options for intervention in the Edward-Wakool system were extremely limited because the water quality was impacted in both the river and the Mulwala canal.

“There was no source of clean water to flush through the system,” says Julia. “When the canal was emptied at the end of the irrigation season you could see something of a flushing effect with the concentrations in the Wakool River downstream dropping after flushing. But, at some sites, the concentrations started to go back up again the following week because the bloom hadn’t been completely knocked out.”

While the bloom was in progress the researchers were in regular contact with water managers and the Commonwealth Environmental Water Office with the data they were collecting shared with the Murray Regional Algal Coordinating Committee, the Murray Dissolved Oxygen Group, Murray Irrigation Limited, the Murray Darling Basin Authority and other agencies involved in water delivery.

“We were comparing our data with the data from the other monitoring programs,” says Julia. “It was very much an interactive process.”

This sharing of knowledge continues. On June 23 to 24, Julia spoke at a workshop on Prediction of Harmful Algal Blooms, hosted by CSIRO Land and Water in Canberra on ‘Effects of the 2016 algal bloom in the Edward/Wakool river system- a preliminary analysis’. The presentation was co-authored by Professor Robyn Watts (LTIM team leader) and Dr Nicole McCasker.

The workshop brought together those working in the area from across Australia and included overseas speakers. They discussed approaches to modelling harmful algal blooms, remote sensing and in situ monitoring techniques, early warning for drinking water reservoirs, major blooms in the Murray River, health implications and impacts on tourism. Working groups considered aspects of the need for predictive tools for managing harmful algal blooms.

“There was discussion around whether this latest bloom was indicative of climate change potentially influencing the system,” says Julia. “But it was one event and it was different. It was a very hot autumn. When you look at the Bureau of Meteorology data for the regions affected by the bloom there was a three to four degree average temperature anomaly which is considerably hotter than the average temperature for the month of March. It is thought that certainly exacerbated the growth of the bloom once it got started.”

“This is a great example of how ILWS researchers are improving knowledge about blue green algal blooms, networking with other scientists, and engaging with governments and landholders,” says Professor Robyn Watts, team leader.

“It is also an example of how we have been able to value-add to the existing research in the Edward-Wakool system.

“The infrastructure, systems and on-ground contacts we have in place for our ongoing project made it possible for us to undertake a detailed project on the bloom at short notice.”


(Left:) The algal bloom in the Upper Wakool River (Pic R.Watts) on March 11, and (Right) (Pic J. Abell) at the river at same site now, August 3.
Research Activities

The Livvi’s Place Project: Exploring community views on Livvi’s Place Playspace, Port Macquarie

In 2014 the not-for-profit organisation Touched By Olivia (TBO) partnered with Port Macquarie-Hastings Council to establish Livvi’s Place, an inclusive playspace for the local community in Westport Park at Port Macquarie.

Livvi’s Place was specifically designed to be an accessible, all abilities, intergenerational, playspace that would be fun for all children, including those with disabilities. TBO aimed to establish a special place that would change the way society plays and would build an inclusive community.

But is it achieving these goals?

With funding from CSU’s Rural and Regional Community Initiated Research Grant TBO has commissioned Dr Janice Ollerton who, in partnership with Associate Professor Rosemary Black, has been exploring the local community’s views on Livvi’s Place.

Armed with a small band of enthusiastic CSU student volunteers Janice and Rosemary conducted 96 face to face interviews park users at Livvi’s Place and also Town Green Park in Port Macquarie over two days in April 2016. The survey questions were then posted online using Survey Monkey and promoted through the local schools, libraries and neighborhood centres, attracting an additional 97 participants.

Since play is a learning medium for people of all ages the research team drew upon Australia’s early childhood learning framework of Belonging, Being & Becoming to help guide the survey questions and analysis to determine whether or not users of Livvi’s Place had a sense of Belonging to the Port Macquarie Community, of Being part of the Port Macquarie community and of Becoming part of the Port Macquarie community.

The research found that Livvi’s Place was a well used playspace where people expressed a sense of belonging in terms of feeling safe and welcome.

Livvi’s Place encouraged visitors to be themselves, live in the moment and enjoy their experience. The friendships formed, conversations started and playful interactions experienced at Livvi’s Place showed it was a space in which people connected and were becoming included as part of the local community.

For more information on the project please contact Rosemary Black.

Community Engagement

Celebrating iconic Eucalypts

Dr Peter Spooner has contributed to Corowa District Landcare’s book Beauty, Rich and Rare, Celebrating our Region’s Iconic Eucalypts which was launched in June.

The book includes a section on survey blaze trees. Two years ago members of Corowa District Landcare and landholders in the district assisted Peter and his Honours student Jake Shoard with a project on survey blaze trees. (A paper on that work ‘Using historic maps and citizen science to investigate the abundance and condition of survey reference ‘blaze’ trees’ has been accepted by the Australian Journal of Botany.)

“We used a citizen-science approach in our project, where landholders and other members of the Landcare group reported observations of old blaze trees, which we then inspected and recorded their details,” says Peter. “One of these trees is presented in the book, illustrating the methods used by early surveyors to mark trees since the 1870s.”

Some other large Eucalypt trees identified in a previous project led by Peter (through the Slopes to Summit’s Big Tree Competition) were also included in the book.

School visits

Dr Manu Saunders visited Grade 5s at Trinity College, Albury on June 3 as part of the School Environment Day activities to talk about wild pollinators. The visit was one of the conditions of her 2015 Outstanding Outreach Award from the Office of Environment & Heritage/Ecological Society of Australia.

Manu, and the other award winners based in Sydney, Melbourne & Canberra, have been running an ecological experiment with a local school class to collect pollinator insects on the school grounds.

“We are in the process of analysing the data and will write up a paper involving the students,” says
Manu who is also the new curator of Australia’s Best Nature & Ecology Blogs@ Best.Ecology.Blogs previously managed by ILWS Adjunct researcher Associate Professor Ian Lunt.

Meetings, conferences & forums

Mesh refinement

Dr Li (Jan) Zhenquan attended the 16th international conference on computational and mathematical methods in science and engineering (July 4-8, 2016) in Spain where he presented his paper on “Accuracy analysis of a 2D adaptive mesh refinement method using lid-driven cavity flow and two refinements”. Jan also chaired a session on “Mathematical modelling and computational partial differential equations”.

Carp virus and fisheries decline

On July 18 and 19 Dr Lee Baumgartner:
- was invited, as an expert panellist, to soeak at a carp virus information forum held in Yass. The forum, attended by over 80 locals interested in learning more about the release of the virus, was organised by the Yass fishing club and NSW Department of Primary Industries.
- took part in a strategic meeting between Gregory Andrews, threatened species commissioner, Paul Marsh and Andy Warden, Commonwealth Environmental Water Office, and Matt Barwick, NSW DPI seeking to determine possible threatened species outcomes that might be associated with release of the carp virus.
- gave a presentations to the National Irrigators Council in Canberra - Matt Barwick (NSW DPI) on the carp virus release and Dr Lee Baumgartner on factors leading to fisheries declines in the Murray-Darling Basin. The presentations were followed by an energetic Q&A session and exchange of ideas on the roles irrigators could play in native fish recovery.

EWKR workshop

Dr Paul Humphries and Dr Lee Baumgartner took part in a workshop hosted by the Murray Darling Freshwater Research Centre, July 26 - 27 in Albury to finalise a fish theme research plan for the Environmental Water Knowledge and Research (EWKR) project.

The workshop was attended by 12 participants from the Department of Environment, La Trobe university, Arthur Rylah Institute, South Australian Research and Development Institute’s Aquatic Sciences Research Division, University of Canberra and Griffith university.

Visitors

Brazilian Visitors

A big welcome to visiting Academic Professor Luiz Silva who is on sabbatical from the Federal University of Sao Joao del-Rei (UFSJ) in Minas Gerais, Brazil. Luiz, a fish ecologist, will be based at CSU’s Albury-Wodonga campus for 18 months. Luiz’s research interests are in fish passage, fish mortality from hydro-turbines (hydropower), and the impacts on fish from water infrastructure in general.

While here Luiz will be working with colleague Dr Lee Baumgartner. The two are members of a global programme, the International Energy Agency Technology Collaboration Programme on Hydropower – Annex XIII: Hydropower and Fish – of which Australia and Brazil are both members.

“The issues faced by Australia and Brazil in terms of hydropower, dam operations and water infrastructure are very similar,” says Luiz. “The impacts on fish are similar and as scientists we are looking for a ‘win-win’ outcome, for fish, hydropower and irrigation.”

Accompanying Luiz is his wife Lorena Nogueira, who has just started her PhD on fish eggs and larval drift, at La Trobe University, Wodonga. Lorena will be supervised by Drs Susan Lawler and Amina Price (LaTrobe) as well as the Institute’s Drs Lee Baumgartner and Paul Humphries.
The North East Catchment Management Authority’s “Innovation in Landscape Conservation” environment forum held on Tuesday, May 17 at GO TAFE/CSU study centre in Wangaratta certainly “hit the mark.” Around 80 landholders, NRM agency representatives, landcare group members and others with an interest in the environment, attended the all-day event which included the John Paul Memorial Lecture (given by the Institute’s Dr Dale Nimmo), the launch of the North East Conservation Fund, the experiences of the Mount Elephant Community Management Inc., and an interesting talk on conservation funding by Gerard O’Neill, CEO Bush Heritage. The afternoon sessions on deer management and fish ecology (with the Institute’s Dr Lee Baumgartner) were equally interesting. It is planned the event (with partners the Institute, Trust for Nature, and DEWLP) will become an annual one.

Highlights from the John Paul Memorial Lecture ‘Dealing with Multiple Threats: landscape innovation for the 21st Century’ presented by Institute ecologist Dr Dale Nimmo:

Dale presented his talk in two parts. The first part looked at the question ‘What role for regional land management in the face of climate change?’, the second part looked at the potential to ‘re-wild’ Australian landscapes.

“When a big stress, like a climatic extreme, for example a big drought, hits the system there is some pattern in the way species or the biodiversity communities or ecosystem responds to that stress,” Dale told his audience. “That pattern is related to things that, as land managers, we have control over to some extent.”

As an example he asked his audience to think about a heavily degraded ecosystem such as one that has been cleared for farmland, overgrazed and mismanaged.

“How well is an owl, for example, going to cope with a climatic extreme that comes over the top of that degraded ecosystem?” he said. “There is this idea, an un-validated idea, that if we had intact ecosystems in our landscapes then perhaps that owl will be more able to cope with the changes we are likely to experience as the climate changes.”

Another idea in terms of a pattern of the way in which biodiversity responses to climate change, was the idea of refuges.

“People are starting to map climate refuges or drought refuges, areas that should be more resilient to the effects of climate change,” said Dale illustrating his point with a map of Australia showing the indexed refuge potential of different locations for amphibians.

“The only problem with these ideas is that there isn’t a lot of evidence backing them up because we don’t have many empirical studies actually tracking communities through the type of climatic conditions we are expecting to encounter.”

However in the climatic conditions of south-eastern Australia over the last 50 years has provided researchers with a ‘natural experiment’ to be able to test the above ideas.

“The Millennium drought, which ran from 2001 to 2009, was an extreme drought by any measure,” said Dale. “Its abrupt end – the ‘Big Wet’, Australia’s second wettest recorded two year period - was also record-breaking.”

He said the climatic changes were consistent with the changes which are being projected from global climate models, that there will be longer more intense droughts punctuated by extreme weather events such as floods. The sequence between droughts will get shorter and the droughts themselves will be longer.

Dale then drew on his and colleagues findings from research on woodland bird declines related initially to tree cover and then the effects of the Millennium Drought, and further research on how and where woodland bird populations recovered once the drought ended, to answer the question “Are patterns of decline and recovery related to landscape properties?”

“We found that those landscapes that had the least tree cover experienced rapid turnover [composition of bird communities] during the drought,” said Dale. “Whereas those landscapes that were more intact, they were holding on to their species.”

The researchers also found that landscapes with more riparian tree cover retained a higher proportion of their species and had more stable communities.

“The key thing here is that enhancing riparian vegetation and increasing the amount of tree cover at the landscape scale buffered these ecosystems from extreme climatic events,” said Dale.

“The good news is that there is a
very high capacity for land management to have a say in how ecosystems respond to global change. You want to restore tree cover generally, and specifically target riparian/floodplain areas with fertile soils.”

The second part of Dale’s presentation looked at rewilding Australia’s landscape.

“We have, in the world, an invasive species problem, in particular with invasive mammals,” Dale began. “Things like cats, foxes, rodents … are responsible for huge extinctions world-wide.”

In Australia, nationally the two biggest problems are feral cats and foxes.

“We have a native mammal extinction crisis,” said Dale. “Cats and foxes have been implicated in the extinction of 20 species of mammals and the rate of mammal extinction in Australia is increasing linearly since European settlement. There has been no plateau. We lost two species in the last decade.”

While the traditional method of controlling these invasive species was to kill them Dale said it was becoming more apparent that this was not a viable solution in many instances.

“In fact there’s something called ‘compensatory immigration’ which means basically, once you kill a predator, you are just making space for another predator, or even increasing the density of predators,” said Dale. “You could be making the problem worse for the biodiversity that you are trying to save.”

In Europe and North America there has been a resurgence of wolves and other apex predators in the landscape which is controlling mediumsized predators.

“Maybe our native apex predator, the dingo, could do the job,” suggested Dale. “Over the last six years, scientific evidence has started to gather to support this idea. Where you have an abundance of dingoes you often have less activity of smaller predators such as foxes.”

Research Dale has done on the effects of fire on dingoes, in partnership with a colleague studying dingoes, has found that fire does effect dingoes – positively.

“Dingoes like the recently burnt areas because they hunt, primarily, kangaroos,” said Dale. “They are not an ambush predator, they chase after their prey. That has implications…the person who is burning the landscape is making it worse for the person who is trying to manage the dingoes, and the person who is trying to manage the dingoes, is making it worse for the person trying to control the foxes. You need to be able to understand the architecture of ecological networks you are working within. If you do you can make huge savings in the way you manage the landscape.”

He said in European countries farmers are able to co-exist with apex predators by using guardian animals to protect their flocks and herds.

“It’s been said that you need one big dumb dog and one small yappy dog,” he said. “With that combination you can alert your guardian animal to the presence of other predators. The idea of re-wilding landscapes with predators is getting more and more support.”

He said there is also talk of reintroducing Tasmanian Devils to the Australian mainland.

“It wasn’t that long ago that these animals were widespread in a variety of habitats, including the arid interior, on the mainland,” he said.

It isn’t only predator animals that can be used to ‘re-wild’ Australian landscapes. There is also the potential to re-introduce smaller native creatures such as lizards and possums, an idea recently put forward by ILWS’s Professor Dave and Dr Maggie Watson.

“Here the emphasis is on bringing species back to where they have been lost,” said Dale. “We go to a lot of trouble planting trees hoping some species will return but they don’t always come. Sometimes they need some help.”

Events-Coming Up

While most people know of Murray Cod, silver perch, golden perch…. there are lots of smaller fish in the Murray-Darling Basin. While not as well known, they are just as important in terms of the ecology and are among some of the more threatened fish according to Dr Lee Baumgartner.

He said fish-wise the MDB was made up of three main regions – the Northern Basin, the Southern Connected Basin, and the Estuarine (lower) region influenced by sea-water, with certain species of fish found in the Northern Basin not found in the southern and vice versa. While some fish spend their whole life in freshwater, there are others who are dependent on the ocean.

“While some fish spend their whole life in freshwater, there are a whole bunch of fish that used to be here, particularly in the North-East, that are entirely dependent on the ocean,” said Lee.

“The Tupong or fresh-water flathead used to extend from the sea to Mildura, and there are fresh-water eels that historically would have come all the way from the ocean up to our region. The eels spend most of their life in freshwater but they go into the ocean and swim to the Coral Sea to breed…growing and developing in the Murray-Darling is a very important part of their life history stage.”

There are also saltwater species that come into freshwater to breed that are also not well known. “One of these species is the lamprey,” said Lee. “Most people, if they think of lamprey at all, know them as a fish with a sucker disc mouth stuck to the side of a sharks and other large fish in the ocean. But while they do spend most of their life in the ocean, they swim up the Murray River to breed, either in the main channel, or tributary streams. They are absolutely dependent on that migration pathway to breed in freshwater.”

When Europeans first came to the Murray Darling Basin, the system was remarkably productive and full of fish.

“But it’s certainly not like that anymore,” said Lee. “A lot of the small fish species that used to be in the wetlands, which were extremely important parts of indigenous people’s diets, haven’t been seen where they naturally used to occur for almost 40 years. Macquarie perch which used to have good populations downstream, particularly around Euston Weir, haven’t been seen there for 80 years.”

Lee said fish numbers have declined for a number of reasons including commercial fishing; development of the Basin which resulted in barriers [dams and weirs] to fish migration; drought; poor water quality [black water events and algal blooms]; and alien species such as carp and mosquito fish.

“It’s not a great time to be a native fish in the Murray-Darling Basin,” said Lee. “You’ll hear the figure used that native fish are at 10% of pre-European levels. For some species it is already zero per cent. They have already gone from areas where they used to be abundant and now only exist in very small pockets where habitat and water quality is suitable.”

He said while there is a lot that needs to be done to bring the fish back, a lot has been, and is currently being, done. “In the last 20 years there has been a real boom in kicking things along,” said Lee.

One of the projects he has been involved in the “Sea to Hume” project, a multi-million tri-state project funded by the Murray-Darling Basin Authority that was successful in restoring fish migration routes by installing fishways from the Coorong at the Murray’s mouth to the Hume Dam.

“Last year was the first time in a very long time that a fish could theoretically swim all the way from the Coorong to the Hume Dam,” he said. “We have started to see many species migrating hundreds of kilometers, including fish from the ocean into freshwater. So that effort, is starting to work.”

Other efforts to bring back the fish include re-snagging the river; restocking programs; eradicating pests and environmental water.

“There are so many different management tools that are available and so much that needs to be known about fish, but there is limited resources and funding so the challenge for natural resource managers and researchers is to try to use all these different tools and put them together in some sort of coordinated way to help bring fish back in the future,” said Lee.

At the forum (L to R) John Keen, Arthur Rylah Institute, Professor Max Finlayson, Institute Director, Neil McCarthy, North East CMA CEO
Fish Tagging In Laos

Dr Lee Baumgartner and Honours student Bettina Grieve (pictured above) spent a week in Laos at the beginning of June implanting microchips (PIT tags) into Mekong catfish and barbs as part of a collaborative effort between Charles Sturt University, Living Aquatic Resources Research Centre (Laos), National University of Laos and Research Institute for Aquaculture (Vietnam). The work is a critical component of Bettina’s honours project and she spent 40 days in country monitoring which technique was most effective.

The team did targeted research to identify which aspects of gate design created fish welfare issues. The team then worked with Australian company, AWMA Solutions, and local Lao irrigation experts to come up with a design that created much smoother flow conditions.

Breaking new ground in Laos

The Lao fish migration team recently facilitated the installation of the first-ever fish-friendly irrigation gate in the Lower Mekong Basin.

Gate installation on June 24, followed four years of targeted R&D. Researchers initially investigated deficiencies with existing designs in Laos and determined that existing designs resulted in substantial injury and mortality when operated normally.

The team did targeted research to identify which aspects of gate design created fish welfare issues. The team then worked with Australian company, AWMA Solutions, and local Lao irrigation experts to come up with a design that created much smoother flow conditions.

New irrigation gate

The key design improvement was overtopping flow into a deep plunge pool. This created conditions which, under laboratory conditions, facilitated increased fish survival.

The team will now perform a field assessment of these gates to ensure fish are passing downstream successfully.

Environment Canada

Dr Wayne Robinson then spent five weeks in June/July on secondment in Environment Canada’s Bio-assessment office in Vancouver, Canada.

While there, Wayne was involved in reviewing and refining some of the multivariate statistical procedures used in the Canadian Aquatic Biomonitoring Network (CABIN). The network is an aquatic biomonitoring program for assessing the health of fresh water ecosystems in Canada.

It is based on the network of networks approach that promotes inter-agency collaboration and data-sharing to achieve consistent and comparable reporting on fresh water quality and aquatic ecosystem conditions in Canada.

The project, Improving the design of irrigation infrastructure to increase fisheries production in floodplain wetlands of the Lower Mekong and Murray-Darling Basins, is being led by Dr Craig Boys from Fisheries NSW but includes ILWS members Lee Baumgartner, Jarrod McPherson and Wayne Robinson as co-investigators.

Left. Installing new irrigation gate in Lower Mekong Basin, Lao
Profile

Adjunct Professor Peter Waterman

A lifetime’s experience of networking and relationship building is certainly coming to the fore for one of Adjunct Professor Peter Waterman’s latest ventures, a project to secure safe drinking water for regional Australia.

Peter is working together with Institute Director Professor Max Finlayson on the collaborative research project which has received $50,000 in leverage funding from CSU.

At 74 years of age, Peter doesn’t show many signs of slowing down. “I’m just more selective in what I choose to do,” quips Peter, a pioneer in the Australian environmental consultancy business, now a multi-billion dollar industry. “Wear out not rust out is my moto.”

Other than being an Adjunct Professor with the Institute, Peter is also an Adjunct Professor with Queensland University of Technology, Adjunct Associate Professor with the University of the Sunshine Coast and a member of the National Steering Committee for SEGRA (Sustainable Economic Growth for Regional Australia).

He is also (with home offices in Brisbane and Queanbeyan) Managing Director of Environmental Management Services Pty Ltd, a company he set up in 1977, and Director of Water Engineers Sustainable Solutions Pty Ltd.

After a childhood in the West Australian mining town of Kalgoorlie, Peter was an Industrial Arts teacher with the Western Australian Education Department and then a Captain in the Royal Australian Signal Corps, Western Command (Western Australia). At the same time he was an under-graduate student (geography).

In 1969 he commenced post-graduate work in Cockburn Sound, south of Fremantle, assessing the environmental impacts of the development of a civil port and naval base facility.

In 1970 he left the Australian Army to become a co-founding Director of one of Australia’s first environmental consulting companies – Environmental Resources of Australia - to expand his work on the port facilities in Cockburn Sound.

“This work initiated environmental impact assessments for major facility development,” says Peter. “It was the first project designed using environmental data (that we’d gathered) rather than using straight engineering data. It was a totally different approach to the way things had been done.”

In the following years the company expanded and undertook further environmental research and impact assessments for a wide range of public and private sector projects in the mining and heavy industry sectors. In 1972 the WA based company opened offices in Melbourne, Sydney, Adelaide, and later Brisbane.

“The business just exploded,” recalls Peter. One of the many highlights of this period, was, in 1973-74, doing the first environment assessment (EA) and preparation of an Environmental Impact Statement (EIS) under new Federal legislation, for Ranger Uranium Mines in Kakadu, N.T.

“This led to what was known as the Fox Inquiry, whether we would or would not mine, mill and export uranium from Australia,” says Peter. “The creation of Kakadu National Park, in the late 1970s, was a product of the process.”

Peter continued to work in natural resource assessment projects throughout Australia and overseas. Projects included offshore oceanographic investigations for oil and gas projects for Woodside Petroleum, Elf-Aquitane Petroleum and Burmah Oil; the development of oil spill responses and monitoring procedures for BP in Australia, the UK and Italy; the Morton Regional Coastal Management Plan; natural resources inventories and tourist destination area planning for the Gippsland Lake region, Victoria; and the Pulagudung industry precinct development Jakarta, Indonesia.

In 1977 he was appointed Survey leader of the South West Tasmania Resources Survey (1977 to 1981) which systematically inventoried natural, cultural and resources of south west Tasmania (20% of the state).

“A key product of this work was the delineation of the national parks in this region,” says Peter. “Additionally material from the survey was used by the Commonwealth for the Franklin Dam High Court Case, for which I was called as a witness and prepared evidence for.
“The case led to large parts of Tasmania’s south-west wilderness being confirmed as a World Heritage Area in 1983.”

In 1983, Peter joined the Environmental Branch of the Commonwealth Department of Environment and Heritage and in 1984 was appointed Research Director, for the Advisory Council for Inter Government Relations (ACIR), the Commonwealth Statutory Body which was the precursor to the Council of Australian Governments (COAG).

One of the key projects with ACIR was the ‘Regions in Transition’ project (1984-86) which involved the re-initiation of the Commonwealth role in the field of regional development. Peter then returned to his environmental consulting business (from 1986 to 98), employing up to 20 people at a time. Key project work for the Commonwealth government included environmental assessment and management projects for major defence facilities all over Australia; and directing the Australian National Coastal Vulnerability Project (1993-97).

The latter project was “the first cut at looking at the impact of changing climatic conditions on Australia’s coastline.” It was through that project that Peter first met Institute Director Professor Max Finlayson (who later became the Director of the Environmental Research Institute of the Office of the Supervising Scientists) as Kakadu was used as a case study.

In 1998 Peter moved into academia, firstly as Founding Director of the Institute for Regional Development, University of Western Australia; then an Associate Professor in Environment and Public Health with Griffith University; and finally a 10 year position as Associate Professor in Environmental Science at University of the Sunshine Coast, with the role of Co-ordinator climate change, coasts and catchments.

In that role he established a suite of postgraduate programs in the fields of climate change adaptation, integrated coastal zone management and environmental change management. In 2011 Peter returned to environmental consulting, maintaining three university adjunct positions.

While he and Max have been colleagues for years, their latest project has arisen out of CSU’s role with SEGRA, in particular the SEGRA Challenge in 2013 with work in the Murray-Darling Basin with respect to the implementation of the Basin Plan from the ‘bottom up’ and the SEGRA Challenge identified in 2015, the provision of adequate, safe, secure domestic water supplies.

### Safe Drinking Water for Regional Australia

The collaborative research project **Securing Adequate Safe Domestic Water for Regional Australia** has been developed by Challenge Champion, Michael Kitzelmann, CEO Etheridge Shire Council; Kate Charters, Chair SEGRA Foundation; Professor Finlayson, Project leader CSU Team; and Peter, Interim Project Coordinator.

Work on the first stage of the project began in April and will be completed in December. Partners in the Queensland-focussed project include the SEGRA Foundation, Murray Darling Association, the Queensland Department of Health, Etheridge Shire Council, the Queensland Murray Darling Committee (a NRM group), Conservation Volunteers (Australia). Collaborating universities include Queensland University of Technology, University of the Sunshine Coast, University of Southern Queensland, and Southern Cross University. Senior scientists from the CSIRO Land and Water Flagship are also most supportive of the initiative.

The first stage of the project involves pilot rural and remote regions water quality surveys in the Gulf Region of Far North Queensland (Etheridge Shire) and the Darling Basin in southern Queensland.

“We’ve optimised the collaboration to undertake water quality sampling in Etheridge Shire in parallel with the shire’s dog baiting program,” says Peter. “In May water samples and questionnaires were collected from 120 properties throughout the shire which covers 40,000 sq kms with a population of under 1000. Our interest is in people who are on properties who are not protected by any environmental health regulations.”

The sampling has been done by Queensland Health and Peter has begun analysing the data. Sampling in the Darling Basin will begin in August.

“It’s really exciting and fundamentally import stuff,” says Peter. “A lot of people in rural areas live in absolute denial that there are problems with their water, that anything is wrong with their water. It’s about engaging people to understand the risks.”

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*Safe Drinking Water for Regional Australia*
The 2016 Federal Election: Implications for Regional and Rural Australia

by Professor of Finance, Adam Steen

The double dissolution was triggered due to the inability of the Liberal-National Party (LNP) Coalition government to have its proposed reintroduction of the Australian Building and Construction Commission passed by the Senate. There was however little mention was made of this proposal during the election campaign.

What the campaign seemingly devolved to was the Opposition’s accusation that the government was planning to privatize Medicare, and the government’s assertion that Labor was scaremongering.

It is interesting to note that there was little if any mention in the media of the privatization of Medibank by the current LNP government in November 2014. Further it also seems the media forgot that the current Prime Minister was the head of Goldman Sachs when it managed the now infamous second issue of Telstra shares (T2). While the media forgot these facts they were seemingly not beyond the recall of many ordinary Australians.

Why I mention this is that, with the new Senate controlled by an increasing number of crossbenchers on both sides of politics expressed concern about the change and some called for the idea to be dropped, it appears the government still want to press ahead with it.

This change, if introduced, will have major impacts on Australian agricultural industries and communities. Not only will it impact the supply of labor to the agricultural and particularly horticultural industries, it will also negatively impact on rural communities as WHMs spend significant amounts of money in rural and regional areas. The proposal is based on incorrect assumptions and misunderstandings.

Cross bench Senators are expressing concern with the proposal, and so some concessions may well have to be made to change any legislation to do with WHMs.

As a result of the LNP government being reelected I believe there will be few new initiatives specifically for regional and rural Australia. The Prime Minister and his ministers will have to negotiate and compromise to get any substantive legislative changes through both houses. After all, this is what political leadership is and this is what they are paid to do. It is the hope of most, if not all, Australians that what comes are sensible, well thought out policies and programs rather than just squabbling and intransigence based on blind ideology.

Both major parties need to take notice of the 18 per cent of Australians who voted for the minor parties and independents. To scoff at them and their dissatisfaction and think they will come back to the major parties is foolhardy.

The fact is that both the major parties are seen by many – or at least the 18 per cent – to represent an ever-diminishing pool of vested interests.

Like it or not, the same dynamics which are evident in the US with the rise of Donald Trump and in the UK with the Brexit issue are evident here in Australia, and the major parties can ignore it at their own peril.

Awards & Achievements

Congratulations to ILWS researcher Dr Dale Nimmo who, in his previous role at Deakin University, was part of the project team which was awarded the 2016 Nancy Millis Science in Parks Award.

The 10 year collaborative research project, led by La Trobe and Deakin Universities, with significant involvement from Parks Victoria and DELWP staff, has shown that the effects of a single fire could last for well over a century and that too-frequent fire could put the survival of threatened plant and animal species at risk. The innovative research has resulted in significant changes to the way fire and strategic planned burns are managed in mallee ecosystems across Victoria and southern Australia. Based in the Murray Sunset and Hattah-Kulkyne National Parks in north-west Victoria, the project was singled out for its outstanding contribution to understanding how best to manage protected areas and their sustainability. http://parkweb.vic.gov.au/about-us/science-award

The team has also been selected as a finalist for the NSW Office of Environment and Heritage Eureka Prize for Environmental Research, with the winners to be announced August 31.

Congratulations also to Dr Patrick Cobbannah (ILWS Adjunct) and Mr Paul Amoateng (PhD Candidate) on their paper “Rethinking sustainable development within the framework of poverty and urbanisation in developing countries” which has been awarded the Best Paper in the journal Environmental Development for 2015. The paper will be open access until January 8, 2017.

Congratulations too to Dr Joanne Millar, Dr Rick Thwaites, Associate Professor Rosemary Black, Dr Richard Culas, Dr Lee Baumgartner and Dr Wayne Robinson who have been awarded the Office of the Deputy Vice-Chancellor (Research, Development and Industry) Award for Research Excellence.

The six are all members of the Institute’s Improving Rural Livelihoods &...
In the News

As usual plenty of media for our members over the last few months including a segment on the ABC’s science show Catalyst featuring Prof David Watson. More In the News.

Director’s Activities & Engagement

A look into the Director’s diary in any three month period is a bit like a lucky dip. You never know quite what to expect - which country he may have been to, who he has been meeting with (within and outside University), which conference or workshop he may have attended, what publication he has been working on with some of his many collaborating authors, or what research project/event he is helping make happen.

For example, his many recent activities included:

May 3: Participated in an Albury campus “Systems Mapping” exercise for the new CSU Vision conducted on behalf of the Vice-Chancellor. The exercise follows on from previous meetings at Bathurst earlier in the year that Max attended.

May 5: Participated in a brainstorming meeting (video) for CSU’s One Health Research Initiative, looking for interest and common ground across research centres and faculties. The meeting was organised by Robyn Kirk, from Intersect, who comes from the data-management perspective. A second meeting was held on June 29 to further refine the initiative and to identify potential research areas including spatial analysis of environment and human health relationships. This would be an area of special interest to those Institute members who are part of the Spatial Research in Environments in Developing Countries Strategic Research Area.

May 11: One of two Professoriate representatives, attended the CSU’s Academic Senate meeting in Bathurst. The Senate makes recommendations on policies and provides advice to the University’s Vice-Chancellor and Council. “One of the reasons I see it as important is it is a way of ensuring research interests are represented in the development of the various CSU policies,” says Max who then attended the Professorial Forum.

May 16: Met with Emily Malone and Fiona Halloran from CSU Media to discuss media, marketing, development and opportunities within CSU specifically in relation to research. The meeting was followed by an afternoon tea at the Albury-Wodonga campus attended by about a dozen ILWS members.

May 25: Was invited to and did attend the Irrigation Australia Ltd Conference in Melbourne where he had discussions with the CEO of the International River Foundation Ian Atkinson re potential research and interests in rural water management, and attended a meeting on a proposal to develop a Centre of Excellence for Irrigation Management so he could inform CSU as there is potential that research training could be added at a later date.

May 27: Participated in a multi-party discussion (by Skype) on mangrove health in Northern Australia because of (a) his research experience in Northern Australia, and (b) his involvement in Global Mangrove Watch, an international alliance which is addressing mapping and assessing the condition of mangroves globally. The meeting was called in response to the discovery of 100s of hectares of dead mangroves in the Gulf of Carpentaria.

Also participating was Professor Richard Lucas, a remote sensing expert from UNSW, and fellow member of Global Mangrove Watch, and Professor Norman Duke, from James Cook University, the coordinator of Mangrove Watch (the Australian-based organisation). Following this discussion, there were two other Skype conferences on May 31 and July 12, regarding mangrove change in Kakadu National Park with Prof Lucas. “We are looking at revisiting an analyses of long-term change based on work previously published,” says Max who was involved in the original work 15 years ago.

June 1-3: Attended the Society for Wetland Scientists Annual Meeting 2016 in Corpus Christi, Texas where he gave a presentation on ‘Assessing change in wetland ecological character’ as part of a special session organised by Institute Adjunct Professor Nick Davidson. (See page 24) more next page
Cryptic Marsh Birds

A report from PhD student Liz Znidersic, whose principal supervisor is Professor David Watson. Liz spent 11 weeks in the US earlier this year.

I have just returned from 11 weeks (early March- late May) in the USA, South Carolina after completing a component of my PhD fieldwork investigating detection methodologies for cryptic marsh birds, focusing on rail and bittern species.

These species are generally only detected by call as they inhabit dense vegetation. South Carolina is home to some of the world’s most secretive marsh birds, including the Black rail which is the world’s smallest.

Black rail is a candidate species for federal listing under the Endangered Species Act and an intensive survey effort was conducted by South Carolina Department of Natural Resources (SCDNR) in the coastal region of the state during spring to determine distribution and abundance.

My fieldwork included an intensive deployment of Autonomous Recording units (aligned with ARC Discovery project, Bio-Acoustic Observatory: Engaging Birdwatchers to Monitor Biodiversity by Collaboratively Collecting and Analysing Big Audio Data) and remote sensing camera traps (which I have used on other rail species) at the Tom Yawkey Wildlife Centre, South Carolina. The centre is managed and owned by the South Carolina Department Natural Resources (SCDNR) but is 100% funded by the Yawkey Foundation. To protect the high natural and cultural values of this area, the property is managed for research and animal habitat with very limited access by the public.

A component of my data will be used in collaboration with SCDNR’s wildlife biologist Christy Hand (located at Green Pond, South Carolina) to assist with Black rail conservation and management. Christy coordinates the spring marsh bird and wading bird surveys in South Carolina. We plan to investigate a quantitative comparison of acoustic recordings and call playback survey results, and temporal call activity of Black rail in South Carolina.

A big thank you to the Tom Yawkey Wildlife Foundation, Jamie Dozier and a special thanks to Christy Hand for facilitating my visit and collaboration on all things rail.

Post-graduates

Liz Znidersic out in the field
New PhDs

Welcome to PhD student Mark Adler, who started his PhD (part-time) in 2016 with supervisors Dr Helen Masterman-Smith (Principal) and Dr John Rafferty. Mark’s working title is “Understanding relationships between universities and Regional Centres of Expertise in Education for Sustainable Development.”

We also welcome Jeanette Carroll, a part-time PhD student also supervised by Dr Helen Masterman-Smith (Principal) and Dr John Rafferty. Jeanette, who began her PhD last year, is looking at “Animal Activism of the Poor in Australia” and is involved in the Our Place-Corowa project funded by OEH.

Welcome also to Distance Education student Paul Kew (left) who began his PhD in July under the principal supervision of Dr Zhenquan (Jan) Li, an expert in the relatively new field of adaptive mesh refinement.

Paul’s PhD on “Applications of adaptive mesh refinement methods based on the law of mass conservation to environmental flows” follows his Graduate Diploma in Mathematics, which he completed in 2012, and then his Honours in 2013 with Charles Sturt University.

As Paul, who is 46 says, his decision to undertake his PhD full-time was because he wanted a change of direction. “I didn’t want to be doing surveying for ever so I finally got out of that,” says Paul, a surveyor for 20 years. Paul who lives at Umina, on NSW’s Central Coast says he wouldn’t mind teaching mathematics at a university level.

“Adaptive mesh refinement is a calculations process to do with flow calculations whether they be water flow, air flow...it doesn’t matter what type of gas or liquid it is. My PhD will be to do with the application of this type of computational technique. Not much work has been done on this at all. It is a relatively new process.”

ILWS will be welcoming Vu Vi An, as a new PhD student in Session 1, 2017. An is currently a Director with the Vietnamese Research Institute for Aquaculture in Ho Chi Minh City. He is an expert in freshwater fish and in charge of commissioning research to help the Vietnamese government protect a resource which is an important source of nutrition and income to the Vietnamese people.

An was successful in securing an Australia Award, a full fee-paying scholarship, which was awarded by the Australian Department of Foreign Affairs and Trade. “Only limited Australia Awards are granted each year, so it is a phenomenal achievement for An, and a fantastic outcome for ILWS,” says Dr Lee Baumgartner who will be An’s Principal Supervisor.

An will be working on a project titled ‘In search of the Mekong Salmon’. He will spend the next four years trying to understand the complex ecology of migratory fish in the Mekong Delta. It is thought that many species of fish spend many years in the South China Sea, and then migrate upstream, thousands of kilometres to spawn. The young then move downstream to the ocean and the cycle repeats.

“Mainstem dam development in the Mekong threatens the ability for these fish, some which grow to over 1m long, to complete essential life history stages,” says Lee. “An will be unlocking the secrets of these long distance migrants, using a range of scientific techniques to try and locate spawning grounds, and to also determine how long these fish actually spend in the ocean.”

An will be supervised by Dr Lee Baumgartner, Dr Martin Mallen-Cooper (Fishway Consulting Services), Professor Ian Cowx (University of Hull, UK) and Dr Wayne Robinson.

We look forward to welcoming An and his family to Albury-Wodonga in the new year.

PhD News

Loved to hear from former ILWS PhD scholarship recipient Saideepa (Deepa) Kumar who completed her PhD in February 2016. Her supervisors were Prof Allan Curtis, Dr Paul Humphries, Dr Emily Mendham and Dr Wendy Merritt (ANU).

Deepa’s PhD examined the contemporary topic of the management of environmental water in the Murray-Darling Basin in Australia. Drawing upon case studies in the Lachlan and Loddon catchments, she concluded that targets for environmental watering were based on narrow boundaries of river health, resulting in the exclusion of several interests and influences.

The research highlighted how institutional arrangements driven by imperatives of efficiency and accountability, tended to ignore uncertainties associated with the dynamics of river ecosystems. In addition to providing a critical review of current policy and practice, the research also advances methodology for conducting boundary critique in complex institutional settings.

While at CSU, Deepa also developed and taught a subject on groundwater hydrology and management. Upon completion of her PhD, Deepa took up a post-doctoral research position at the Indian Institute for Human Settlements located in Bangalore, India.

Her post-doctoral research focuses on the dynamics of hydrological ecosystem services in a rapidly urbanizing watershed faced with multiple stresses, including a warming climate.

Congratulations to Paul Amoateng on the acceptance of his PhD on ‘The changing spatial extent of water bodies and implications for urban flooding: The case of Kumasi, Ghana’ and also to Buddi Poudel whose PhD on ‘Ecology and Conservation of Himalayan Marmot (Marmota Himalayana) in Nepalese Trans-Himalaya is completed.’

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Adjunct News

Snapshot of a Climate Change

A report by ILWS Adjunct Research Fellow Dr Tony McDonald who has been working in Cambodia, Lao and Myanmar on two projects looking to assist farmers (rice, mango, cassava and maize) in adaptation to impact of Climate Change.

Not sure of the status of Climate Change (CC) arguments in Australia these days, however I understand that while many colleagues have been vigorously working away on their respective research, and the incidence of uncharacteristic weather events gain momentum, there is still a prevalent space filled by those for whom the issue requires a political position.

Cambodia, Laos and Myanmar are three South East Asia (SEA) countries which struggle against the odds of CC impact. People in this region symbolically represent most farmers on this planet, whereby CC simply has no political profile, but impact and effects have become a livelihoods threatening reality.

Recent and ongoing work in SEA reveals that for many small and subsistence level farmers, the realities of CC have been hitting hard on the annual rice growing cycle. I have been part of a number of teams looking into strengthening farmer resilience in this situation. Poor soils, inefficient irrigation, low inputs, depleted productivity, marginal post-harvest storage facilities and limited options for crop diversification all combine to leave many farmers vulnerable.

CC variables can compund this situation in a manner which undermines household livelihoods. The greater landmass of Cambodia has experienced severe drought over the last 20 months and this year saw the very late arrival of the wet season.

The challenge to strengthen arguments concerning the uncharacteristic weather is large where official national data is unreliable or inaccessible to outside agents can be daunting. There is no end to the models that have been generated to predict future impact of CC and they have their uses – but they also have their limitations.

In collaboration with a number of colleagues we have put together what is referred to as a “Vegetation Health Index” or moisture condition, which illustrates over time the germination, vigorous growth and then demise of the annual growth cycle by merging over 37 years of sequenced remote sensing data with radar images to remove cloud coupled with rainfall data.

Satellite imagery has faithfully recorded the changing dynamic since 1981 and courtesy of freely accessible data from the Center for Satellite Applications and Research (STAR) and the National Oceanic and Atmospheric Administration (NOAA) we have been able crunch with the goal of offering a snapshot.

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The data has subsequently been combined using “IBM Watson” which has provided the ability to present a pictorial matrix, faithfully illustrating the “change in climatic pattern” plotted by province and month.

The image below illustrates the VHI for the month of June since 1981 by province. It clearly indicates the late arrival of the “wet season” and the severity of this change in contrast to previous decades. The impact of this late wet season has played havoc with the planting routines of rice farmers. Traditional methods to overcome variations in season have included a strategic mix of varieties, however recent shifts documented present challenges of massive proportions. Additional analysis is forthcoming.

The strong collaboration and contribution of Ian Thomas and Adam Duncan (both ex Mekong River Commission Drought Management team) to this work is acknowledged.

Ramsar Presentations

Adjunct Professor Nick Davidson has been elected as an Honorary Fellow of The Chartered Institution of Water and Environmental Management (CIWEM).

In his capacity as Chair of the Society of Wetland Scientists’ Ramsar Section, Adjunct Professor Nick Davidson co-led a symposium at SWS’s 2016 annual conference, Corpus Christi, Texas, 1-3 June, entitled “A heroic struggle against impos-
sible odds? Helping the Ramsar Convention to assess wetland status and trends”.

Other speakers included ILWS Director Prof Max Finlayson and ILWS Adjunct Dr Ritesh Kumar who gave a presentation on ‘Assessing ecosystem services of Lake Chilika to inform decision making and management.’ A set of papers derived from the symposium talks are now in preparation for submission to *Marine & Freshwater Research* as a “Research Front”.

**Regional Rail**

It must be very rewarding for Adjunct Associate Professor Ian Gray to receive some good news with respect to his, and others, efforts to revive regional rail. The NSW Minister for Minister for Roads, Freight and Ports Duncan Gay put out a media release (June 21) stating there was money in the NSW budget for regional rail including an unspecified amount for reviving disused lines.

“This is the most positive indicator since a tender process for the Blayney-Cowra-Demondrille (Harden) line failed last year despite two tenders having been submitted,” says Ian. “Since then similar tenders have been called with no funding promised for them. These calls occurred before the recent budget. Even a small sum as hinted in the budget could make a big difference. The NSW Government is taking a much broader approach than anything I have seen before.”

Ian says it will be very interesting to see what kind of governance model is adopted if a disused line is revived. “If our arguments are accepted, it will involve some degree of regionalisation to establish a relationship between local interests and the railways which serve them, while at the same time preserving connections to the regional-state-national system,” he says.

**Modern Outback role**

ILWS adjunct Associate Professor Ian Lunt has a new position as a Science Writer for the *Modern Outback* conservation program.

“It's a really exciting position, and a wonderful opportunity and challenge,” says Ian. “Outback Australia is one of the largest natural landscapes in the world. It's comparable in size to the Amazon and the boreal forests of Alaska and Canada. But lots of Australians, including lots of scientists, tend to overlook it. I guess that's just because most of us live along the coast so we need to be reminded of its importance.”

The Modern Outback campaign aims to improve conservation and sustainability in the Outback and to improve the livelihoods of people who live and work there, through programs like the Indigenous Rangers and Protected Areas programs. “It's a great opportunity to use my research and communication skills to achieve long-lasting, on-ground outcomes with a really talented and dedicated team,” said Ian who will retain his links to CSU as an ILWS adjunct and by working from his CSU office, Albury.

**Picture Book**

Adjunct Associate Professor Bruce Pennay has been working on a picture book *Picturing and Re-picturing Bonegilla* drawing on Bonegilla Collection at Albury Library Museum and Bonegilla Migrant Place managed by Wodonga City Council and involving post-war immigrants and their children. The project has received funding from the Department of Environment ($8000).

**Deer Management & Community Activities**

Adjunct Research Fellow Dr Joanne Millar was invited by the North East Catchment Management Authority to a Deer Management Forum on May 27 in Wangaratta to meet stakeholders and identify research needs. Following this Lachlan Campbell, the Kiewa catchment co-ordinator/land management with North East CMA presented a seminar on “Impacts of deer on private and public land in north east Victoria: opportunities for research” to CSU/ILWS staff and students at the Albury-Wodonga campus, July 20. Lachlan gave an overview of increasing deer impacts on environments and landholders; control measures; community consultation and role of a deer stakeholder forum before a discussion on research needs and opportunities for CSU collaboration.

Jo is a member of the Friends of Yackandandah Creek Committee which works on a Wetland Rehabilitation Project. She has facilitated Dr Alex Knight to do a frog survey of the area before and after revegetation (funded by a Federal Government Threatened Species Grant for the wetland project). Alex will also do community education about frog habitat, species etc. in August.

Jo is also a member of the Totally Renewable Yackandandah (TRY) Committee. The committee is working on community education and facilitating high energy commercial or community users to use solar energy. Last year Jo facilitated a CSU grant to survey local households on energy use and attitudes to renewable energy in 2015 (report). She is currently working on a grant application to evaluate and promote a mini-grid trial in the town in 2017.

**New Ramsar Initiative**

Prof Max Finlayson and Adjunct Dr Swapan Paul are working on a new Ramsar initiative - *Rapid Cultural Inventories for Wetlands*. Ramsar believes the Inventories will help better manage global wetlands, whether Ramsar listed or not, with appropriate emphasis and focus given on specific wetlands. The inventories are a simple, quick and practical way to identify, document and make available information about notable cultural values and practices associated with the wetland. The Institute has volunteered to coordinate this inventory in Australia, believing an inventory of this nature can be effectively undertaken only through partnership and cooperation of the wider wetland stakeholders.

The researchers are developing a very short and simple set of questions to gather the information on cultural values and uses of wetlands. They aim to provide the list of questions to respondents shortly. For further details, contact Dr Swapan Paul at Swapan.Paul@sopa.nsw.gov.au or Professor Finlayson.
Publications

Publications under the microscope

For this issue of Connections, Dr Nathan Ning, who is currently sorting through plankton samples for ILWS’s Murrumbidgee LTIM project, has traded the plankton to write ‘Publications under the microscope.’

As usual, the latest publications from our members covered a breadth of topics including aquatic ecology, entomology, parasitology and socioeconomic policy.

Fish were the focus of several interesting ILWS journal publications this quarter. One of these publications, authored by Dr Lee Baumgartner and his colleagues, investigated whether populations of bass in the Snowy River were comprised of wild recruits or stocked fish, by looking at the chemical make-up of their otoliths.

“There was a substantial program to reintroduce bass into the Snowy River via stocking,” says Lee.

Bass are a catadromous species, meaning that they live in freshwater but head to the estuary to breed. This study found that bass collected from the upper reaches of the Snowy River were in fact hatchery fish that had been stocked.

“We didn’t collect any wild-spawned fish from upper sections, suggesting that a pattern of long term recruitment failure in the system was continuing, or that fish from the estuary were unable to colonise upstream habitat,” says Lee. “The results mean that, without stocking, bass would be absent from the upper Snowy River.

A much broader study which includes the collection of small fish from the estuary is essential to now determine the explanation for this.”

In keeping with the theme of exploring new scientific approaches, Professor Max Finlayson and a group of colleagues published a special issue article in Marine and Freshwater Research, discussing the potential to apply palaeoecological methods along with more typical monitoring approaches to describe the ecological health of wetlands.

The study was undertaken within the context of the Ramsar Convention on Wetlands, which advocates the conservation of internationally important wetlands and the wise use of all wetlands. Because of the increasing stress wetlands are being placed under in many parts of the world, the Convention has requested further advice regarding methods to assess changes in the ecological condition of wetlands.

Palaeoecology involves the study of fossil and subfossil remains in sediments and it can assist with interpreting and reconstructing former environmental conditions.

“By examining the occurrence of fossil plant and animal remains in wetland sediments, there is potential to infer changes in both communities and environmental conditions over time,” says Max. “Palaeoecological approaches have been applied to wetlands and lakes, and offer a valuable long-term perspective about past changes that can complement more recent monitoring data and help us tease out appropriate base-lines when setting targets for wetland restoration.”

Entomologists and science communicators were offered a cautionary message from Dr Manu Saunders and her colleague, Dr Tobias Smith, in a recent article in Insect Conservation and Diversity. Their article took a close look at how Australian mainstream media has depicted the importance of introduced honey bees as pollinators.

“Popular media can have a strong influence on how non-scientists perceive and understand conservation issues,” says Manu. “We found that Australian news media consistently portray introduced European honey bees as the ‘best’ or only pollinator in Australian environments.

“However, recent scientific evidence shows that honey bees are often inefficient pollinators, and a diverse insect community is more important for successful pollination. This means that public perceptions of pollinator conservation issues may not match scientific facts, which could influence public and political acceptance of management initiatives.”

The world of social sciences received an interesting journal contribution looking at how the age-old practice of transhumant pastoralism — the seasonal movement of people with their livestock between fixed summer and winter pastures — has been sustained in the context of socioeconomic and climate change in the mountain regions of Nepal.

The authors of the article, Dr Rik Thwaites and Dr Popular Gentle, undertook a case study in the country’s western mountains on the status, opportunities, and constraints of transhumant pastoralism in the changing context.

“Our results suggest that transhumant pastoralism may be at risk of disappearing from Nepal unless there are positive policy and institutional arrangements to support transhumant pastoralism,” Rik says.

Another thought-provoking article focused on the youth foyer model — a model aimed at offering dedicated housing where young people, who cannot live at home, can live in safety and learn life skills while they attend school, training or are commencing work.

The article, by Professor Adam Steen and Associate Professor David MacKenzie, was particularly interested in comparing the success of this approach in the UK where it commenced in the early 1990s, with that in Australia, where the approach has a much shorter history.

“Our findings revealed that unlike in the UK, there is no funding mechanism currently in Australia to cover
the cost of providing such accom-
modation and service models,” says
Adam. “Moreover, the cost of operat-
ing such facilities is a fraction of that
which the public incurs when young
people become homeless, meaning
that youth foyer actually save the
community money.

“With homelessness increasing
rapidly in our major cities, we need
urgent action by government to
develop an extensible source of
funding specifically for supportive
housing for homeless and at-risk
youth.”

To read the full version of any of
these articles or to see a list of the
publications for the quarter, please
go to the ILWS website and/or con-
tact the authors.

**Sustainable intensification
of agriculture** by Institute Adjunct
Professor John Williams

In a recent paper published in
*Ambio* my co-authors and I, who are
members of the CGIAR Steering
Committee for their Land Water and
Ecosystem, attempt to make the
case for an expansion of the vision
and framework for Sustainable Inten-
sification of Agriculture to one which
could transform both human prosper-
ity and global sustainability.

In this paper, we propose that a
paradigm for sustainable intensifica-
tion can be defined and translated
into an operational framework for
agricultural development. We argue
that this paradigm must now be
defined—at all scales—in the context
of rapidly rising global environmental
changes in the Anthropocene, while
focusing on eradicating poverty and
hunger and contributing to human
wellbeing.

Recognizing the central role agri-
culture plays in determining and
regulating Earth’s resilience through
climate and land use change, global
freshwater use, biosphere integrity,
interference with N and P cycles and
introduction of novel chemical
entities and given the sustainabil-
ity criteria for agriculture there is a
strong case for adopting sustainable
intensification of agriculture as the
strategy to meet twin objectives for
people and the planet.

This paradigm shift aims at repo-
sitioning world agriculture from its
current role as the world’s single
largest driver of damaging global
environmental change, to becoming
a key contributor of a global transition
to a sustainable world within a
safe operating space on Earth.

The criteria and approach we pro-
pose, for a paradigm shift towards
sustainable intensification of agricu-
ture, integrates the dual and inter-
dependent goals of using sustain-
able practices to meet rising human
needs while contributing to resilience
and sustainability of landscapes, the
biosphere, and the Earth system.

Both of these, in turn, are required to
sustain the future viability of agricu-
ture.

**Journal Papers**

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Book Chapters


Books


Conference Presentations


Reports


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Other


Saunders, M.E. (2016) Out There: Beyond the birds and the bees, Wildlife Australia. (Winter) 4-6

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