

2018 Peter Cullen Lecture, Wednesday 7 November

You are invited to register for this year's Peter Cullen Lecture, delivered by **Ken Matthews AO**, Former Chair and CEO of the National Water Commission. Ken's speech is titled

'Reflections on Peter Cullen and ten years of water reform'.

This is a *free event* that has been organised in cooperation with the University of Canberra and Griffith University. It is being held on **Wednesday 7 November** at the **Shine Dome**, near ANU, Canberra, from **6 pm to 8.30 pm**. For more information, and to register, see:

<https://www.eventbrite.com.au/e/reflections-on-peter-cullen-and-australian-water-reform-with-ken-matthews-ao-tickets-49637431895>

Actually 18 participants in the Science to Policy Leadership Program for 2018

There *really are* **18** outstanding people currently taking part in this year's Science to Policy Leadership Program. *Bridging's* editor apologises for accidentally omitting Michael Rees and his sponsor/donor from the list published in August:

[Michael Rees](#) (supported by Jigsaw Farms).

You can meet the graduating Fellows (*photo'd during the first session of this year's program*), at the **2018 Graduation Cocktail** function on

Thursday 8 November, at **University House** at The Australian National University, at **5.30–8.30 pm**. **Professor Andrew Campbell** is the guest speaker. He is CEO of the Australian Centre for International Agricultural Research (ACIAR) and a Director on the PCT Board. For more information, and to book, see <https://events.humanitix.com.au/the-peter-cullen-trust-9th-annual-graduation-and-cocktail-event>



Note that if you are a **participant on this year's program** you are automatically on the guest list for the cocktail function and every sponsored participant is entitled to a **free ticket** for a **representative from their organisation**. Please send an email to lindy.stein@canberra.edu.au to advise of your attendance.

IMPORTANT! Register for the PD Day (Thursday 8 November)

Chris O'Neill writes: Fellows, it's the *last opportunity* to register for the **Professional Development sessions** on Thursday 8 November, and the all-important '**post-graduation breakfast**' following this year's Science to Policy graduation event. Go to: <https://www.surveymonkey.com/r/39NKHFR>.

Please note that you will still need to register and pay separately for the memorial lecture and graduation dinner if you are planning on attending those functions.

If you have any questions, or **would like to volunteer** for any sessions / content please email chris.oneill@hydronumerics.com.au, soon!

Many applicants for the 2019 Women in Water Leadership Program!

The next Women in Water Leadership Program is based in Canberra, during 18–22 February and 6–9 May next year, with continuing interaction in the intervening weeks. Interviews for the applicants are being held during October.

.....

Articles in this issue of Bridging

- ❖ Northern Australia Water Resource Assessment (with links), by *Cuan Petheram*.
- ❖ Five steps to avoid a global water tragedy, by *R. Quentin Grafton & John Williams* (with links).
- ❖ Fair water management depends on secure property rights, by *Hon. Neil Andrew AO*.

And, as usual,

- ❖ A word from the CEO;
- ❖ Program news;
- ❖ News of Friends & Fellows;
- ❖ Acknowledgement of our generous donors and sponsors during 2018–19;
- ❖ Friends & Fellows in this edition;
- ❖ Trust's contact details.

A word from the Trust's CEO



I had never imagined that I would quote the late President Ronald Reagan for any reason other than humour (although, compared with He-Who-Tweets, Reagan is an intellectual giant). Yet Reagan had great insight on many matters. For example, it was he who said: 'The most terrifying words in the English language are: "I'm from the government and I'm here to help".'

Now, while this statement had its roots in a conservative, small government philosophy, for me it touches on an important issue for leadership. Funny, but deep down serious, because at the heart of this sentiment is the issue of 'trust'. We simply don't trust the government.

My own experience some years ago as a mid-career General Manager revealed a painful lesson about the centrality and power of 'trust' in being an effective leader. I did not appreciate the many dimensions of trust. I thought of trust in terms of *honesty* – one should tell the truth – which is important, but insufficient. And I wasn't too bad at *contractual* trust (one will do as one says) and *competence* (one can deliver what one promises).

But I had much to learn about *intentional* trust. My team needed to know – to see – that I had their interests at heart. Well-rehearsed political lines or carefully crafted corporate messages do not send the message that 'I care for you and I intend to do you no harm'. Of all the dimensions of 'trust', this is the one that requires the most attention (because it requires one to spend time with and have a relationship with people); it is the one that thrives on authenticity; and it is the one that may be the most challenging (in requiring the leader to stand up for her or his team, sometimes contrary to a personal interest).

Our leadership development programs are great because they go to the heart of these issues. I could have used those learnings 20 years ago!

In just a few short weeks, we will have the chance to celebrate the graduation of our 2018 science-to-policy leadership program cohort. I hope that many of you will be able to attend to hear from the class and our guest speaker, **Andrew Campbell**, CEO of ACIAR and a Director on the PCT Board. The other exciting event that week is the **Peter Cullen Lecture**, which will be delivered by **Ken Matthews AO**. Ken's speech is titled 'Reflections on Peter Cullen and ten years of water reform', and will represent a challenging insight into what we have achieved and where we must do more. The Shine Dome, beside the Australian National University (ANU) will be an outstanding venue for this event.

Now, for the next issue of *Bridging*, I was thinking of seeking inspiration from another Reaganism: 'I never drink coffee at lunch. I find it keeps me awake for the afternoon.'

Time for my nap.

Tom Mollenkopf
ceo@petercullentrust.com.au
0422 631 876

Programs news

In a new initiative, the Peter Cullen Trust team has designed and is running an '**Applied Learning Coaching Program**' for the Young Utility Professional Development Program (organised by the Water Services Association of Australia, WSAA) in October. The program is for people the WSAA has identified as having 'significant capabilities for future leadership roles within the sector'. Very exciting.

The Trust recently launched its new **Mentoring Program** to support the ongoing leadership-development of Fellows. There are numerous benefits for both mentor and mentee. If you are a PCT Friend or a PCT Fellow who would like to find out more, including how we match mentors with mentees, please download and complete the *mentoring application form*, available at <http://www.petercullentrust.org.au/mentoring/> and return it to Kate at kate@petercullentrust.com.au.

Kate MacMaster

NEWS of Friends, Fellows and Sponsors

FELLOWS' & FRIENDS' NEWS: initiatives, changes, coming events

LEADERS LUNCHESES in August

Dr Kirsten Shelly writes: During our **LEADERS LUNCH IN MELBOURNE on Friday 3 August**, our guest speaker was **Michael Wandmaker**, Managing Director of Melbourne Water. He shared some highlights from his career and reflected on his learnings from various roles in the private and public sectors. Michael outlined his passion for safety in the workplace and answered a myriad questions from the fellows – until we let him eat his lunch!

Mr Wandmaker has extensive senior leadership experience across several industries, both in Australia and internationally and is a Fellow of the Institute of Engineers. He is currently a Director of Committee of Melbourne.



Left-right: Kirsten Shelly, Joe Lorimer, Tom Mollenkopf, Chris O'Neill, Sandra Brizga, Nikki Gemmill, Elisabetta Carrara, Shaina Shay, Elisa Hunter, Michael Wandmaker, Jon Theobald, Amanda Smith.

.....

The PCT's **second SYDNEY LEADERS LUNCH** was held on **Wednesday 22 August** at No.10 Bistro, located next to The Mint in Sydney's colonial precinct.

Our guest speaker was Deputy Secretary of the Crowns and Land Division of the NSW Department of Industry, **Liz Livingstone**, who reflected on her broad ranging career in the public sector. Liz began her career as a graduate at the Australian Bureau of Statistics, before moving on to roles with the NSW Independent Pricing and Regulatory Tribunal (IPART), the Natural Resources Commission (NRC), the Department of Premier and Cabinet (DPC) and Trade and Industry Investment NSW. After a brief stint in the private sector at PwC, Liz returned to DPC, before her subsequent appointment to the position of Deputy Secretary, Lands and Water in the NSW Department of Industry in December 2017.

Notably, Liz reflected on the value of spending time building knowledge of policy issues, and the importance of science and good information for policy making. Her fellow lunchers were: **Jonathan McKeown, Zara Lowien, Grant Tranter, Brendan Barry, Adam Lovell, Richard Cresswell, Peter Coad, Christobel Ferguson, Tom Mollenkopf**, Wilfred Finn and Lawson Cole. Unfortunately, no-one took a photo.

The PCT Leaders Lunches are small gatherings that seek to connect Fellows and Friends and strengthen the Fellows of the Trust, elicit lively debate and provide food for thought. More Leaders Lunches are planned for both Sydney and Melbourne.

Lawson Cole, Senior Consultant, Aither, Sydney

NEWS OF FRIENDS

Professor Stuart Bunn has been appointed to the Murray-Darling Basin Authority. The six-member Authority takes advice on Basin-wide strategy and policy and planning from the MDBA and collaborates with the Department of Agriculture and Water Resources; Basin jurisdictions and communities; industry; environmental groups; and government organisations (including the

Bureau of Meteorology and the Australian Competition and Consumer Commission) to secure Basin water resources.

The six members are: the **Hon. Neil Andrew AO** (Chair), Phillip Glyde (CEO), and four part-time members: **Susan Madden**, George Warne, Joanna Hewitt AO and **Professor Stuart Bunn**.

Stuart recently gave two international conference presentations:

Bunn S. 2018. 'Protecting and restoring rivers in the UN Water Action Decade'. Plenary presentation, *34th Meeting of the International Society for Limnology*, Nanjing, PDR China, 20 August 2018.

Bunn S. 2018. 'Enabling collaborative investment in sustainable infrastructure to restore catchment resilience'. Keynote presentation on Sustainable infrastructure for inclusive green growth, *Stockholm World Water Week*, 29 August 2018.

.....

Adjunct Professor Gary Jones writes: I am just back from Korea International Water Week in Daegu. I was there with a team from the International Water Resources Association (IWRA) primarily to facilitate organisation of the program and logistics for the **XVII IWRA World Water Congress, which will be held in Daegu, 11–15 May 2020**. As well as being a board member of IWRA, I am chairing the International Scientific Committee for the Congress. The main responsibility for the committee is developing and managing the Program content (congress themes, keynotes, plenaries, high level panels, papers, posters, special sessions, etc.).

IWRA is an international network of multidisciplinary experts on water resources. It is a non-profit, non-governmental, educational organisation established in 1971. IWRA provides a global knowledge-based forum for bridging disciplines and geographies by connecting professionals, students, individuals, corporations and institutions who are concerned with the sustainable use of the world's water resources.

If you are interested to learn more, please drop me an email to: isc.chair@iwra.org. In the meantime, **please note the date in your diaries** – *it would be great to see many Australian water researchers, students and industry professionals in attendance.*

Andrew Dansie at UNSW has just established an Oceania Chapter of the IWRA, and you could contact him if you are interested in joining and getting involved (a.dansie@unsw.edu.au).

While at KIWW, I also gave a talk on the regional work of the Alliance for Water Stewardship Asia-Pacific (formerly known as Water Stewardship Australia). I am also a member of the Board of AWS-AP, along with our good PCT Friend **John Langford** AM, who is the Chair. The AWS assists private sector businesses, large and small, to develop, and accredit, good water stewardship practices, at site scale and catchment scale. We undertake partnership activities across the region, particularly in China, Indonesia, India, Pakistan, Bangladesh, PNG and the Greater Mekong region. Valuable funding for that work is provided by DFAT and the Australian Water Partnership. You can find out more at: www.waterstewardship.org.au.

.....

Major General Steve Day DSC AM is the National Drought Coordinator, appointed in mid-August by former Prime Minister the Hon Malcolm Turnbull.

.....

Professor John Williams and **Professor Quentin Grafton** are co-authors on a paper (reference below) recently published in the Policy Forum section of *Science*. Their research responds to the unfolding global water tragedy by demonstrating that increases in irrigation efficiency, in general, reduce surface run-off and groundwater recharge to the detriment of people, the environment, and Australia's future.

When irrigation efficiency increases, such that a greater share of the water extracted for irrigation is used to grow crops, this often reduces the volume of water that previously was available to flow back to streams and replenish groundwater. Because that water is not consumed by irrigated crops, and therefore does not increase crop yields, it is treated as a 'loss' by irrigators. However, once back in the stream or aquifer, that water can be used elsewhere in the catchment or basin. The key point – the paradox – is that advanced irrigation technologies that increase irrigation efficiency also increase on-farm water consumption and groundwater extractions.

The *Science* paper offers five key steps to resolve this global challenge, as noted also in the Grafton & Williams opinion article in this newsletter (page 10).

Grafton RQ, Williams J. *et al.* (2018). The paradox of irrigation efficiency. Higher efficiency rarely reduces water consumption. *Science* **361**(6404), 748–750.

<http://science.sciencemag.org/content/361/6404/748.summary>

.....
Professor the Hon John Thwaites writes: This is an article I published in *The Conversation* on Australia's progress in implementing the Sustainable Development Goals: <https://theconversation.com/australias-un-report-card-making-progress-could-do-better-on-inequality-and-climate-102630>, 'Australia's UN report card: making progress, could do better on inequality and climate.'

John was also interviewed on ABC radio on 4 September; see <http://www.abc.net.au/radio/programs/am/more-work-to-do-for-australia-to-meet-un-goals/10198326>

.....
Professor Mike Young published an article in *The Conversation*, 'Why splitting the energy and climate portfolios makes sense', on 3 September. <https://theconversation.com/why-splitting-the-energy-and-climate-portfolios-makes-sense-102480>.

LEADERSHIP MASTERCLASS, Melbourne, 23–24 August

Amber Perry writes: On 23–24 August, nine lucky PCT Fellows attended a Leadership Masterclass run by **Siwan Lovett** and **Paul Frazier** in Melbourne.

The two days were filled with plenty of serious leadership-development activities. We reflected on our leadership journeys so far and refreshed our goals. We learnt about how to establish a formal leadership coaching arrangement and conducted coaching sessions for one another. We heard about the latest neuroscience on leadership, innovation and neural plasticity, and received some excellent recommendations for further reading on this emerging topic. And we received the wisdom of two wonderful guest speakers – **Tom Mollenkopf**, CEO of the Peter Cullen Trust, and **Sarina Loo**, Executive Officer at the Victorian Environmental Water Holder.

Ah, but of course we had A LOT of fun and laughs too! Iced Vovos, pig ears and other gourmet delicacies; playdough sculpture competitions (Lisa won with her amazing roses); leadership meme bingo and interpretative dances. Who would have thought that a video on Dung Beetles could be so enthralling and have so much to teach us about leadership!

After two wonderful days, we left feeling refreshed, inspired and more connected to our fellow PCT community. We are so grateful to Paul and Siwan for taking the time to arrange such a worthwhile event.

Apart from Paul, the PCT Fellows involved were: **Lisa Ehrenfried**, **Jill Fagan**, **Phil Jordan**, **Kristen Knight**, **Elissa McNamara**, **Amber Perry**, **Dominic Skinner** and **Neil Sims**. We would be happy to share our experiences with others interested.



Congratulations to Dr Siwan Lovett on ARRC's 10 year anniversary

Dr Siwan Lovett's newsletter from the Australian River Restoration Centre (ARRC) celebrates 10 years of achievements by that initiative, set up by Siwan when the federal Government closed down Land & Water Australia in 2008. The Peter Cullen Trust Science to Policy leadership program, which Siwan helps facilitate, is one of the 10 highlights of the 10 years included in the recent edition. To subscribe to the newsletter, visit <https://arrc.com.au/>

Dr Sandra Brizga writes: In August, I presented a paper at the 9th Australian Stream Management Conference in Hobart: '[Rivers, art and amenity – the geomorphologist's role in health and well-being](#)'. A number of other PCT Fellows and Friends were at the Conference, which included keynote/plenary presentations by **Dr Siwan Lovett** and **Dr Sarina Loo**.

.....

Dr Christobel Ferguson writes: You may be interested in this report: '[A novel data-driven approach to ensuring water security, via data analytics and visualisation](#)'. It describes the outcome of a big data analytics project that we did when I was at the NSW Department of Industry Water (DoI Water), and is published in the *Water* e-journal volume **3(2)**, 2018, at http://www.awa.asn.au/AWA_MBRR/Publications/Water_e-Journal/Volume_3_Issue_2.aspx

The project aimed to develop a smart decision support tool based on data analytics and data mining that collectively incorporates the datasets currently maintained by DoI Water, in addition to other government departments. This enabled the system to rapidly process factors such as hydrological information, future population growth and industry information, social, health and economic related information to identify issues and risks to each water source and Local Government Authority, through a Catchment Needs Assessment Framework (CNAF).

The CNAF Digitised System will enable government to look across the state and identify regions that would collectively benefit from infrastructure upgrades and therefore rationalise the economic costs associated with infrastructure building for regions. It also enables DoI Water to identify what socio-hydrological and environmental issues are affecting water security supply and demand, in order for the State to achieve long term water security. Through this process DoI Water and Infrastructure NSW are then able to ascertain the environmental, economic and social risk to the community if water demands are not satisfied and pre-emptively mitigate this occurring.

.....

Professor Mark Taylor published the article '["Honeygate" deepens as new tests reveal 27% of brands are adulterated](#)' in *The Conversation* on 3 October. His lab's honey test methods and results are published in the scientific reports of the journal *Nature*. See <https://theconversation.com/honeygate-deepens-as-new-tests-reveal-27-of-brands-are-adulterated-104139>

.....

21st International Riversymposium, 14 – 17 October, Sydney

A number of PCT people are speaking and chairing sessions at the 2018 *Riversymposium*. The program is at <http://riversymposium.com/2018-program/>. **Professor Angela Arthington** and **Professor Michael Douglas** and **Dr Phillip Jordan** began the conference talks sessions after morning tea on Monday; **Dr Emma Carmody**, **Dr Tanya Doody** and **Dr Andrew O'Neill** were also speaking that day. On Tuesday, **Dr Heather McGinness** speaks in the River Science session with **Tanya Doody** as chair. Later **Dr Deborah Nias** chairs the Riverprize finalists, and **Dr Phillip Jordan** chairs a session on Technology innovation in restoration and monitoring. The Science to Policy session on Wednesday includes a presentation by **Dr Carmel Pollino**.

.....

Fish Passage conference, December, Albury NSW

Dr John Harris writes: There's an international conference on fish passage planned for December in Albury. The **International Conference on Fish Passage: Showcasing Best Practice and Innovations**, will be in Albury NSW, **Monday 10 – Friday 14 December**, at the Albury Convention Centre, in the heart of the Albury CBD.

This three-day conference will connect engineers, researchers, water managers and users, educators, practitioners, funders, and policy makers from around the world who have a shared interest in the advancement of technical and nature-like fishways, stream restoration, and dam removal projects. The conference will also feature independently offered short courses, workshops and tours immediately before and after the conference.

See <https://fishpassage.umass.edu/> or contact the conference co-chairs: Lee Baumgartner: lbaumgartner@csu.edu.au, Charles Sturt University, and Matthew Gordos: matthew.gordos@dpi.nsw.gov.au, Department of Primary Industries NSW (Fisheries).

.....

Hydrology & Water Resources Symposium (HWRS) 2018, 3–6 December, Melbourne: 'Water and Communities'

It is only a few weeks now till the **HWRS 2018**, in the **first week of December**. Three PCT Fellows are on the organising committee: **Dr Paul Feikema** and **Dr Elisabetta Carrara**, and **Dr Phillip Jordan** who chairs the committee. See <http://hwrs.com.au/> for details of the conference, at **Pullman Melbourne on the Park**, 192 Wellington Parade, Melbourne. The draft program is now available at <https://hwrs.com.au/program>. **Dr Jill Fagan** and Dr Phillip Jordan are among the speakers.

.....

Bradley Moggeridge reports the release of updated guidance for **Cultural and Spiritual Values for the National Water Management Strategy and Water Quality Guidelines**. See: <http://www.waterquality.gov.au/anz-guidelines/guideline-values/derive/cultural-values/>
<http://www.waterquality.gov.au/anz-guidelines/guideline-values/derive/cultural-values/principles>
<http://www.waterquality.gov.au/anz-guidelines/about/how-to-use>

Bradley is one of this year's Science-to-Policy Leadership Program participants. He hopes this guidance is used widely and that we see more positive examples of Aboriginal people's Cultural & Spiritual Values being included in water quality management (with their involvement) by universities, agencies, councils and authorities. He notes with regret that the guidance uses i, not I, for 'Indigenous'.

.....

Obituary published for Dr Philip Wallis

Dr Margaret Ayre, **Dr Katherine Daniell** and **Professor Ray Ison** have co-authored an article about the life and impact of the PCT's Fellow **Dr Philip Wallis** who died in February:

(2018) Philip James Wallis 5th March 1982 – 2nd February 2018, *Australasian Journal of Water Resources*, **22**(1), 93-96, DOI: 10.1080/13241583.2018.1491942.
<https://www.tandfonline.com/doi/full/10.1080/13241583.2018.1491942>

.....

'What's in our Water' symposium, Canberra, 29 – 31 October

A symposium called 'Emerging contaminants in the environment', focusing largely on PFAs is being held in Canberra at the end of October. **Associate Professor Fred Leusch** is on the organising committee and is also a speaker (31 October), according to the draft program at <https://www.wiow.com.au>

.....

SPONSORS NEWS

University of Canberra now ranked in the top 300

The University has climbed to sit among the world's top 300 universities in the latest *Times Higher Education World University Rankings*, further cementing our position in the top 2% of tertiary institutions worldwide. An increase in research influence and impact has contributed to the leap, with the University scoring 95 out of 100 points for citation impact – the highest score among Australian universities.

Further, *The Good Universities Guide 2019* has rated UC number one in the ACT for graduate full-time employment and starting salaries. University of Canberra gained university status in 1990, and these are major achievements.

Articles

Northern Australia Water Resource Assessment

Dr Cuan Petheram, CSIRO

For those who missed it, last month the Northern Australia Water Resource Assessment was released with a bang in a front-page article in the *Australian* newspaper. Their emphasis was on what is physically possible and the potential for thousands of direct and indirect jobs that could arise from irrigated agriculture supplied water by large dams in the north. Not surprisingly, the reaction to these pronouncements was varied, with other media outlets and commentators choosing to focus on the challenges that irrigated agriculture faces in generating a return on investment and the possibilities for ecological change. Even among the 95% of Australia's population who live in southern Australia, northern Australia evokes strong and often contrasting emotions.

The Northern Australia Water Resource Assessment was an initiative of the Australian Government's white papers on Developing Northern Australia and Agricultural Competitiveness, and is fundamentally a resource evaluation. Its overarching objective was to investigate the opportunities for water resource development to help enable regional economic growth in three priority regions in northern Australia – the Fitzroy catchment in Western Australia, four 'small' catchments between Darwin and Kakadu National Park collectively referred to as the Darwin catchments, and the Mitchell catchment in Queensland, which has the highest median annual discharge of any catchment in northern Australia. Collectively these three regions are almost the size of Victoria.

The Assessment sought to provide information that would reduce uncertainty among investors and regulators and provide readily accessible information to inform the debate about irrigated agriculture and aquaculture in these three priority regions. The Assessment did not attempt to draw conclusions. Rather it sought to provide information in such a way that the reader can take and use pieces of information consistent with their own particular requirements and values, allowing them to draw their own conclusions.



A centre pivot irrigator in operation on a fodder crop near Fitzroy Crossing (WA)

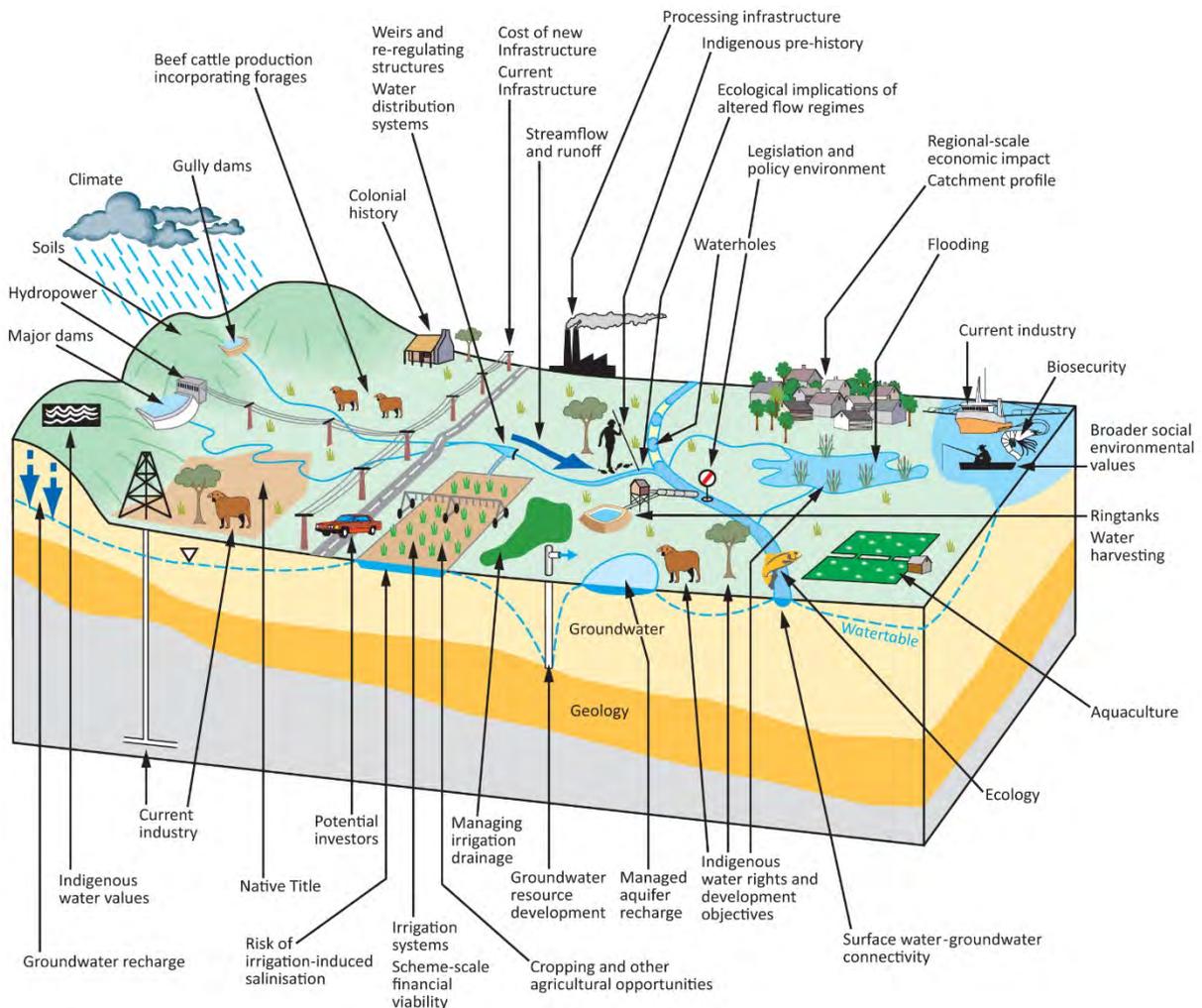
The Assessment does not replace any planning processes, nor does it seek to recommend changes to existing plans or planning processes. A point of contention to some is that the Assessment examined resource use unconstrained by legislation or regulations. The reason for

this is to allow the results to be applied to the widest range of uses possible, for the longest time frame possible.

Assessing greenfield irrigation and aquaculture developments in Australia’s north requires a wide range of considerations, some of which are illustrated in the diagram below. Addressing these considerations required drawing on the skills of over 140 experts from many different disciplines, predominantly from CSIRO but also from the state and territory governments, private sector, universities and non-government organisations. Six fellows of the Peter Cullen Trust directly contributed to aspects of the Assessment: **Carmel Pollino, Phillip Jordan, Neil Sims, Declan Page, Barbara Robson** and myself.

It was not the intention – and nor was it possible – for the Assessment to address all topics related to water, irrigation and aquaculture development in northern Australia. Consequently, many pragmatic decisions had to be made on where to focus effort given the available resources and limited time. For example, with irrigated agriculture typically occupying less than 2% of a catchment area but potentially using large volumes of water, the ecological components of the Assessment focused on identifying instream, riparian and near-shore marine ecological assets and their potential for change as a result of perturbations to flow.

With timelines dictated by policy drivers, the Assessment timelines of 2.5 years was very tight, given the scope of work: late delivery was not an option. Consequently, much of the new science focused on methods for rapidly assessing large areas and quantifying levels of uncertainty.



Schematic diagram of key components and concepts in the establishment of a greenfield irrigation development.

The Assessment also examined six case studies, two in each of the three priority regions. The case studies explore a range of scales of development and a wide variety of water sources, capture and storage options, different cropping opportunities and the potential for ecological change. Although they are realistic representations, they are not designed to recommend or promote particular development opportunities being currently proposed, nor are they CSIRO’s

recommendations on how development should unfold. Just like death and taxes it is also certain that the manner in which future development will unfold in these three priority regions will be different to what we would predict. For this reason, the primary purpose of the case studies is to show how information from different disciplines could be used in an integrated way when considering potential development options, to illustrate to the reader how they can use material from the Assessment to answer their own questions. [Some aspects of the case studies were recently highlighted in the ECOS magazine.](#)

While the Assessment generated more than 10,000 pages of written material, other initiatives of the Assessment of possible interest are the development of several web-based apps, notably the NAWRA-explorer (<https://nawra-exp.appspot.com/>) and NAWRA-river (<https://nawra-river.shinyapps.io/river/>). Although both apps work on phone and laptop, they are best viewed on a monitor. NAWRA-explorer is a data visualisation tool that allows users to interrogate data generated by the Assessment by location or according to subject. The NAWRA-river App allows users to run the river system models, developed as part of the Assessment, and which have been simplified to enable general users to explore the reliability at which water can be pumped/diverted (i.e. water harvesting) or captured and released by large instream dams, in different parts of each catchment. The river models have been linked to a hydrologic–metric analysis developed as part of the Assessment, so the user can infer how different levels of extraction and regulation may impact on components of river flows important to different water based ecological assets.

For those interested in a summary of the results of the Assessment area the 24-page summary reports found on the NAWRA website www.csiro.au/nawra are a good place to start.

.....

Five steps to avoid a global water tragedy: A dangerous paradox lies at the heart of irrigation efficiency

by R. Quentin Grafton & John Williams

Governments are pouring billions of dollars into making irrigation more efficient, with disastrous consequences for water availability. In this article we look at how to reverse the tide of bad policy.

[Drought](#) in Eastern Australia, [heatwaves](#) in Europe, [water riots](#) in India, and [raging fires](#) in California are a symptom of a planet where water, or the lack of it, is generating a crisis.

While the World Economic Forum [recognises this crisis](#), one of the key solutions proposed by many governments is to increase irrigation efficiency with the intent to make water available for reallocation or to the environment.

Contrary to common wisdom, however, this approach actually reduces the water available for reallocation.

As part of an international collaboration with nine other scientists and economists from eight countries and seven universities, we have published a lead paper in *Science* entitled 'The Paradox of Irrigation Efficiency'. Our research responds to the unfolding global water tragedy by demonstrating that increases in irrigation efficiency, in general, reduce surface run-off and groundwater recharge to the detriment of people, the environment, and our future.

What happens to irrigation efficiency really matters. This is because irrigation is responsible for about [70 per cent of the world's freshwater extractions](#).

When irrigation efficiency increases, such that a greater share of the water extracted for irrigation is used to grow crops, this frequently reduces the volume of water that previously flowed back to streams and to replenish groundwater. Because this water is not consumed by irrigated crops, and therefore does not increase crop yields, it is treated as a 'loss' by irrigators.

The tragedy is that these so-called unconsumed water losses to farmers are actually return flows – water that is frequently recovered and reused elsewhere in a watershed or basin. They have value. The key point, and the paradox, is this: advanced irrigation technologies that increase irrigation efficiency increase on-farm water consumption and groundwater extractions.

Irrigation technologies allow farmers to increase water used by existing crops, substitute to more water-intensive crops, or expand the irrigated area. These activities, in turn, reduce return flows – and therefore the water available for reallocation and the environment.

The paradox has been overlooked or ignored for far too long, principally because it provides an inconvenient truth. Indeed, why would anyone be against increased efficiency?

A failure to understand this paradox means that the [United Nations High-Level Panel on Water](#), comprising 11 sitting heads of state (including Australian Prime Minister Malcolm Turnbull), recommended in May 2018 ‘...incentives for water users, including irrigators, to use water efficiently’. Yet, the Panel failed to recognise that these policies may increase, rather than decrease, water consumption in the absence of the five steps outlined in our paper in *Science*.

Subsidies that increase irrigation efficiency, without limits of water extractions, are bringing some countries to disaster.

In India, irrigation is responsible for more than 80 per cent of freshwater extractions. The Indian federal government has allocated some [US\\$7.5 billion to increase irrigation efficiency](#) and Indian states have their own subsidies for irrigation efficiency. Yet, in the [Indian state of Rajasthan](#), subsidies for drip irrigation are responsible for an increase in the irrigated area and the total volume of water applied by farmers. In a country which has already had riots over water access, and where groundwater extractions in some key food-producing regions are [unsustainable](#), subsidies to increase irrigation efficiency are exacerbating, not resolving, its water crisis.

In [Morocco](#), the adoption of drip irrigation, supported by multi-billion dollar subsidies, has reduced recoverable return flows, principally to overexploited aquifers. This has led to increased water consumption and exacerbated groundwater overexploitation.

A similar story is repeated in other countries. Indeed, in a landmark study in 2017, the [Food and Agriculture Organization of the United Nations](#) observed, based on data from 13 countries, that ‘...reductions in water consumption by irrigated agriculture will not come from the technology itself’.

This is not just a poor country problem. Along the Snake River in the US state of Idaho, farmers have increased their irrigation efficiency over decades. This has been responsible for reduced groundwater recharge to the connected Eastern Snake Plain Aquifer by about 30 per cent since the mid-1970s, despite increased rainfall.

In Australia’s Murray-Darling Basin, [billions have been spent increasing on and off-farm irrigation efficiency](#). Yet despite the cost to taxpayers, there has been no comprehensive water accounting of the impact of irrigation on return flows or even a cost-benefit analysis of the dollars spent. This is [bad policy from any viewpoint](#). These subsidies were supposed to be paid to increase stream flows, but may have actually reduced net stream flows in the Basin by as much as [all the water in Sydney Harbour](#) – perhaps more.

So why do governments continue to subsidise increased irrigation efficiency? And why is there so little robust, comprehensive water accounting that measures water inflows and outflows in irrigation at the farm and basin scale?

One reason is that subsidies for irrigation efficiency [promote rent-seeking](#) behaviour by beneficiaries who lobby to [maintain the status quo](#). There is also a phenomenon called ‘[regulatory capture](#)’ identified by the Nobel Laureate in Economics, George Stigler. This involves public servants who are charged with regulating an industry being ‘captured’ by it instead, and ending up serving the industry they regulate rather than the public good.

Our *Science* paper provides five key steps to resolve this global challenge. To deliver a more water-secure future, these actions demand that policymakers who fail to act for the public good in terms of water policy ultimately pay a political cost.

First and foremost, physical water accounts are needed from the farm scale to the basin scale to make transparent ‘who gets what and where’. Second, reductions in irrigated water consumption require decreases in water extractions or limits and caps on the irrigated area.

The other three steps to avoid a global water tragedy include: valuing water (including in-stream flows) to ensure that the public benefits of irrigation efficiency subsidies exceed the costs; risk assessments of the effects of increases in irrigation efficiency, including uncertainties over inflows

and outflows; and a much better understanding of how irrigators' actions change as their irrigation efficiency increases.

We show clear pathways that will allow the world to mitigate global water insecurity while ensuring we have enough food and fibre. Countries that [claim](#) to have the world's best water practice – like Australia – need to stop wasting money by subsidising increases in irrigation efficiency. Governments around the world also need to start doing comprehensive and basin-scale water accounting, as is now happening in California.

In 2018, with all the remote sensing technologies available, it is simply inexcusable for countries not to do water accounting. It's time to the right thing in terms of irrigation efficiency, and it's time to stop this unfolding global water tragedy.

Reference

Grafton RQ, Williams J. *et al.* (2018). The paradox of irrigation efficiency. Higher efficiency rarely reduces water consumption. *Science* **361**(6404), 748–750.

<http://science.sciencemag.org/content/361/6404/748.summary>

.....

Fair water management depends on secure property rights

The Hon. Neil Andrew AO

Chair of the Murray–Darling Basin Authority

With the current drought hurting communities across large swathes of Queensland, New South Wales and increasingly Victoria and South Australia, it's understandable that farmers and policy makers are looking for ways to help.

Some have raised the idea of diverting water initially bought by Australian taxpayers to help the environment, so it can be used to finish fodder crops instead. This proposal is appealing in its simplicity but as is so often the case with water policy, the devil is in the detail.

The Basin Plan came about because, during the millennium drought, the river system was in decline and agricultural industries were critically vulnerable. Through the Basin Plan, there are limits on how much water is available to irrigators and other water users – because we now understand that the ability to enjoy the many benefits of the Basin's water resources in the long term depends on them being managed sustainably.



Communities rely on the water market to respect the property rights of water entitlement holders regardless of whether water is plentiful or scarce. Photo: MDBA.

Firstly, water in the Murray–Darling Basin is held under a system of entitlements that have a value and can be bought and sold at a price set by the market. These water entitlements are assets and, like any other property right, can be traded giving entitlement holders a source of revenue if conditions remain dry. Interfering in the market could jeopardise the returns people are banking on.

Secondly, in a practical sense, making water available to fodder growers would be a difficult proposition. Releasing water onto the market would see it bought by the highest bidder, most likely those growing higher value crops. Any attempt to impose price and purchasing restrictions to benefit one sector over any other would distort the market and erode the value of the asset. And there is water available to buy right now – at market rate – from those who choose to sell.

Some have suggested that the environment could lend water to farmers. This is not possible under current legislation. And even if it were, borrowers could face the real risk of having to enter the market to repay the loan when there is less water available and at even higher prices.

Others have suggested changing the legislation that determines when and how Commonwealth environmental water can be traded so it can be made more readily available to farmers. The current rules say the Commonwealth can only sell water at market prices and must have confidence that trading the water will not diminish environmental outcomes. These are the right rules if we want to ensure the Basin will be healthy in the long term.

There is merit in looking for new ways to help farmers adapt to our highly variable climate. The agricultural sector is of great importance not only to the communities and the economy of the Basin but to the national economy. What we don't want is to unintentionally undermine the value of water entitlements and create more problems than we're fixing.

No one knows how long the current drought will last, so we have to manage the Basin, whether it is productive farmland or iconic wetlands, for the long haul. The Basin Plan gives us the framework to do this – it's what protects the future of the Murray–Darling for all Australians.



The Water Act protects the use of water for the environment to meet the many needs of river ecosystems, even in times of drought. Photo: MDBA.

.....

The Peter Cullen Water & Environment Trust gratefully acknowledges these generous donors and sponsors who are supporting the Trust and its *Science to Policy Leadership Program* in 2018–19



Environment,
Land, Water
and Planning



Australian Government
Commonwealth Environmental Water Office



Department of
Primary Industries
Water



City West Water™

GLENCORE Australia



Environment
Protection
Authority Victoria

TRUST PEOPLE IN THIS EDITION (highlighted in bold black font in the text)

FELLOWS (year; sponsor if applicable, in order of appearance):

Chris O'Neill – 2016 Hydronumerics Fellow
Dr Kirsten Shelly – 2011 Fellow
Dr Sandra Brizga – 2012 Fellow
Nikki Gemmill – 2016 VDELWP Fellow
Dr Elisabetta Carrara – 2016 Australian Bureau of Meteorology Fellow
Elisa Hunter – 2016 City West Water Fellow
Jon Theobald – 2015 South East Water Fellow
Amanda Smith – 2017 City West Water Fellow
Zara Lowien – 2016 Cotton Australia/CRDC Fellow
Grant Tranter – 2014 RBC Blue Water Project Fellow
Brendan Barry – 2013 Cotton Australia/CRDC Fellow
Dr Richard Cresswell – 2012 Sinclair Knight Merz Fellow
Dr Peter Coad – 2015 RBC Blue Water Project Fellow
Dr Christobel Ferguson – 2014 RBC Blue Water Project Fellow
Susan Madden – 2011 Fellow
Amber Perry – 2017 VDELWP Fellow
Dr Paul Frazier – 2012 Eco Logical Australia Fellow
Dr Sarina Loo – 2010 VDSE Fellow
Dr Lisa Ehrenfried – 2014 Office of Living Victoria Fellow
Dr Jill Fagan – 2017 VDELWP Fellow
Dr Phillip Jordan – 2016 Hydrology and Risk Consulting Fellow
Kristen Knight – 2016 Yarra Valley Water Fellow
Elissa McNamara – 2016 Southern Rural Water Fellow
Dr Dominic Skinner – 2011 Fellow
Dr Neil Sims – 2016 CSIRO Fellow
Professor Mark Taylor – 2010 Fellow
Professor Michael Douglas – 2011 Fellow
Dr Emma Carmody – 2013 RBC Blue Water Project Fellow
Dr Tanya Doody – 2015 CSIRO Fellow
Dr Andrew O'Neill – 2017 Jigsaw Farms Fellow
Dr Heather McGinness – 2015 CSIRO Fellow
Dr Deborah Nias – 2010 Fellow
Dr Carmel Pollino – 2012 CSIRO Fellow
Dr Paul Feikema – 2017 Australian Bureau of Meteorology Fellow
Dr Margaret Ayre – 2010 Fellow
Dr Katherine Daniell – 2010 Fellow
Associate Professor Fred Leusch – 2015 Australian Rivers Institute Fellow
Dr Cuan Petheram – 2012 CSIRO Fellow
Dr Declan Page – 2014 CSIRO Fellow
Dr Barbara Robson – 2013 CSIRO Fellow



FRIENDS (in order of appearance):

Ken Matthews AO
Professor Andrew Campbell
Tom Mollenkopf
Jonathan McKeown
Professor Stuart Bunn
Hon. Neil Andrew AO
Adjunct Professor Gary Jones
Professor John Langford AM
Major General Steve Day DSC AM
Honorary Professor John Williams
Professor R. Quentin Grafton
Professor the Hon. John Thwaites
Professor Mike Young
Dr Siwan Lovett
Emeritus Professor Angela Arthington
Dr John Harris
Professor Ray Ison

BRIDGING

Managing Editor: Tom Mollenkopf

Compiler/Editor: Ann Milligan

Photos: Contributors and the Trust.

NOTE: Views and intellectual property embodied in articles published in *BRIDGING* belong to their originators. Even when *BRIDGING* publishes material by Friends or Fellows, the views expressed are not necessarily those of the Peter Cullen Trust.

SOCIAL MEDIA:

<https://www.facebook.com/petercullentrust/>
<https://www.linkedin.com/groups/6845223>
@PeterCullenPCT

OFFICE: Peter Cullen Water & Environment Trust, Building 15, University of Canberra, ACT 2601.

T: 02 6206 8606

E: office@petercullentrust.com.au