THE UNIVERSITY of ADELAIDE

Annual Report 2021

Environment Institute

make history.

“Solving these problems requires skills from every discipline, from arts to engineering, from mathematics to the social sciences. This is exactly why the Environment Institute is perfectly positioned to become a major global player in sustainability science and solve seemingly intractable global problems.”

Professor Hugh Possingham
Environment Institute Advisory Board Chair

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About the Institute

The Environment Institute is committed to environmental excellence.

Mission

The Environment Institute's mission is delivering relevant, innovative and actionable outcomes to complex global environmental challenges, to ensure sustainable goals benefit the health of our environment, our wellbeing and support the economy.

Vision

To develop strong local and international collaborations and engagement to address complex future environmental problems while exporting innovation around the world.

There are many complex, global environmental challenges that threaten the health and wellbeing of our delicate ecosystems, communities and economies. Environment Institute researchers engage in a diverse range of cross-disciplinary research to gain an understanding of our environmental past and plan for a sustainable future. We play a vital role in translating research into management, policy and technology. With over 100 research members and significant input from the three Faculties within the University, our membership continues to broaden. The diversity of our membership and our access to outstanding research facilities is a great strength to deliver a holistic approach the global issues.

Here at the Environment Institute, we're proud to provide on-going mentoring and leadership development of our early and mid-career researchers. We recognise the importance of providing our less experienced staff every opportunity to succeed in what is an ever more competitive environment. We have witnessed impressive outcomes from this high-quality program including outstanding success in securing competitive funding.

Connecting knowledge to lead change

The Institute has significant experience in delivering outcomes of importance to our environmental wellbeing, industry and government agencies. We provide new knowledge and develop novel tools to better monitor climate change impacts, biodiversity, invasive species and ecosystem health; past, present and future.

Our members are experts in:

- Climate change: variation through time, resilience, adaption, mitigation and legal compliance.
- Conservation biology
- Environmental economics
- Evolutionary biology
- Genetics, ancient DNA and DNA barcoding
- Human health, behaviour and mobility
- Landscape transformation and restoration
- Low energy technologies
- Marine and freshwater ecosystems
- Natural hazard risk reduction
- Palaeontology
- Safeguarding biodiversity
- Water quality and supply

The Environment Institute is affiliated with the following programs, centres and facilities:

- Adelaide Exposure Science and Health
- Australian Bioactive Compounds Centre
- Australian Centre for Ancient DNA
- Australian Centre for Evolutionary Biology and Biodiversity
- Centre for Applied Conservation Science
- Marine Biology Program
- Spatial Science Research Group
- Sprigg Geobiology Centre
- Unmanned Research Aircraft Facility
- Water Research Centre

PhD student Emily Leyden holding a soil clod to measure sulfur isotopes at St Kilda. Photo credit: Emily Leyden.

2021 at a glance

37
Professorial Researcher Leaders

100
Members

$14.2m
Research income

6 Major Research Themes

- Climate & Biodiversity
- Low Energy Technologies
- Sustainable Landscapes
- Green Urban Futures
- Marine & Freshwater Ecosystems
- Water Quality (Water Research Centre)

Australian Research Council Funding Outcomes

5
Discovery Projects

1
Future Fellowship

3
Linkage Projects

2
Linkage Infrastructure, Equipment and Facilities (LIEF)

Publications

Our research members produced the following publications in 2021:

701
Journal articles

3
Books

48
Conference items and papers

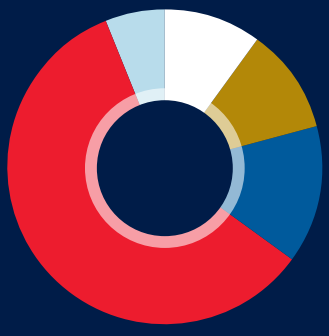
25
Expert reports to external bodies

Articles in High Impact Factor Journals

15
15+ JIF* publications

24
10-14.99 JIF* publications

82
6-9.99 JIF* publications



Membership breakdown by Faculty**

6%	Arts
10%	Engineering, Computer and Mathematical Sciences
11%	Health and Medical Sciences
14%	Professions
59%	Sciences

*Journal impact factor
**As at December 2021

Highlights

- Four Environmental Institute members and two Environment Institute Advisory Board members were named in *SA's 50 most influential people in the Environment sector* by *The Advertiser*, including **Professor Bob Hill, Professor Andrew Lowe, Associate Professor Patrick O'Connor, Dr Katja Hogendoorn, Professor Chris Daniels** and **Ms Elaine Bensted**.
- The Environment Institute recognised six major research themes, grouping member activities and focus: Climate & Biodiversity, Green Urban Futures, Low Energy Technologies, Marine & Freshwater Ecosystems, Sustainable Production Landscapes and Water Quality.
- **Dr Kieren Mitchell, Professor Kris Helgen** and colleagues authored the *Nature* paper 'Dire wolves were the last of an ancient New World canid lineage' which revealed the complex history of the ice age predators.
- In an article in *Science*, titled 'Globally observed trends in mean and extreme river flow attributed to climate change', **Professor Seth Westra**, Director of the Water Research Centre, and colleagues revealed complex river patterns caused by climate change.
- **Professor Sarah Wheeler** launched her book 'Water Markets: A Global Assessment' with keynote speaker former Prime Minister Malcolm Turnbull.
- Echidna CSI received a SA Science Excellence and Innovation Award for SA Citizen Science and Engagement. Congratulations to **Professor Frank Grützner** and **Dr Tahlia Perry**.
- A prestigious Australian Research Council Future Fellowship Award was received by **Professor Melissa Nursey-Bray** for 'Pathways for Indigenous and Western knowledge into Environmental Policy'.

- **Professor Andy Austin** was recognised by the Society of Australian Systematic Biologists with a Distinguished Career Award.
- Fifteen participants underwent the Environment Institute's Early-Career Researcher Leadership Development Program, which included a 'Dragon's Den'.
- New insights into the unique biology of monotremes and their place in evolution was described by **Professor Frank Grützner** and colleagues in their *Nature* paper, 'Platypus and echidna genomes reveal mammalian biology and evolution'.
- **Professor Peng Bi** was the recipient of the Professor Tony McMichael Award of 2021 from the Public Health Association in Australia (PHAA)
- **Professor Holger Maier** was awarded the Modelling and Simulation Society of Australia and New Zealand (MSSANZ) medal.
- **Professor Andy Lowe** joined University of Canberra led Economic Participation of Indigenous Communities CRC bid.
- Greening Adelaide Forum brought together key industry stakeholders to discuss critical issues facing increasing urban vegetation cover required to achieve climate-resilient and ecologically vibrant cities.

Golden Whistler (Pachycephala pectoralis): Numbers are down in the Mount Lofty Ranges. Picture: Peter Day

Overviews

Deputy Vice-Chancellor (Research)

The University's purpose 'to be a catalyst for innovation and knowledge creation; an engine of social advancement; and an active participant in the local, national, and global economies' is supported by the outstanding contribution of the Environment Institute. Its researchers excel on the world stage by tackling essential environmental research around climate change and resilience, safeguarding biodiversity, marine and freshwater ecosystems, low energy technologies, sustainable landscapes, green urban futures and water quality.

Professor Bob Hill concluded his 10-year term as the Director of Environment Institute at the end of 2021. I thank him for his outstanding contribution to the pursuit of environmental research during this time. Under his guidance, the Institute has strived for innovation and developed significant links with internal and external stakeholders.

This report provides a comprehensive overview of the Environment Institute's 2021 activities, and illustrates how its research provides relevant insights into understanding and tackling long-term sustainability around environmental issues.

It was a strong year for the Environment Institute members in the Australian Research Council grant schemes. Members were awarded five Discovery Projects, three Linkage Projects, one Future Fellowship, and two Linkage Infrastructure, Equipment and Facilities grants. Highlighting the world-class research and contribution to their fields of research were three papers published in the prestigious journal *Science* and four in *Nature*.

Illustrating the national relevance of the Environment Institute's research was securing the former Prime Minister Malcolm Turnbull to provide a keynote speech for Professor Sarah Wheeler's book launch '*Water Markets: A Global Assessment*'.

The Environment Institute prides itself on developing the next generation of researchers through its leadership development program and coaching. It was encouraging to see participants recognised with the 2021 SA Young Tall Poppy Awards.

Professor Anton Middelberg
Deputy Vice-Chancellor
and Vice-President (Research)

Advisory Board Chair

We use the word sustainability a lot – without realising it is not an optional extra, it is a must have. At some point, ideally soon, the world's human population needs to start inhabiting the planet without degrading the natural capital, such as soil and biodiversity, that underpins our health and wealth. Sustainability can't be "traded off" against other fundamental human needs like jet skis and plastic balloons.

Several of the world's ecosystem processes have already crossed "safe operating spaces": unsustainable flows of nitrogen and phosphorous, extinctions 1000 times the normal rate, contaminant release such as plastics, and the rate at which land is converted. Australia has a special global role, as one of just two wealthy megadiverse countries on earth, to become truly sustainable.

Solving these problems requires skills from every discipline, from arts to engineering, from mathematics to the social sciences. This is exactly why the Environment Institute is perfectly positioned to become a major global player in sustainability science and solve seemingly intractable global problems. It is especially pleasing to see that the Environment Institute members span three faculties and incorporate almost every discipline in the university.

Under Professor Bob Hill's remarkable leadership over ten years the Environment Institute has developed into the cooperative, collaborative endeavour initially intended. One of the signatures of Bob's leadership has been mentoring – empowering and supporting early and mid-career researchers from across the university. Many of the Institute's investments of time and money have been about supporting new researchers, with a focus on diversity; those investments are now paying dividends.

While culture is important – research outcomes are also essential. Research grant income facilitated by the Institute continues to grow, as do publications in top academic journals. Even more importantly, we are starting to see impact in critical areas such as: sustainable timber harvesting, cleaner water, cooler cities, reducing extinctions, and urban food production – all covered in this annual report.

I look forward to a new era for the Environment Institute, building on its solid foundations. Now is the time for the University of Adelaide to deliver impact, not just at local and regional scales, but on continental and global scales.

Professor Hugh Possingham
Advisory Board Chair

Director

Despite the uncertainty that has overwhelmed the world over the past two years, the Environment Institute and its members continue to excel. 2021 has been an outstanding year for our members, with many awards and external recognition highlighted on pages 23 to 25. The Institute took opportunities to engage with the community at a grass roots levels through public events, with colleagues through conference sponsorship and with influential stakeholders through Professor Wheeler's book launch, demonstrating the Environment Institute's commitment to public engagement with significant environmental issues.

Our researchers come from the three faculties across the University and have developed many new interdisciplinary projects, including securing over $14M of new research funding. This funding includes approximately $5M funding from 11 Australian Research Council grants (5 Discovery, 3 Linkage, 2 Infrastructure) and a Future Fellowship awarded to Associate Professor Melissa Nursey-Bray.

Environment Institute members were successful in establishing large-scale programs of research during 2021. An example of this is the scientific verification to eliminate illegally logged timber products form global supply chains.

Funding of just of $1M was secured through a Global Innovation Linkage and International Tropical Timber Organisation grants to develop DNA species and regional of origin identification tools for application by the timber trade (see page ten for more information).

This year we streamed our research into six theme areas.

- Climate & Biodiversity - Our researchers provide new understandings and tools to better monitor and manage biodiversity, invasive species and ecosystems; while our palaeontologists and evolutionary biologists learn from the past to better manage the future world.
- Marine & Freshwater Ecosystems - Our researchers work across fisheries and seafood quality, water quality, ocean warming and acidification, restoration of marine habitats, nature-based solutions to climate change (including blue carbon), conservation technologies, biological forensics, education and training.

Our researchers come from the three faculties across the university and have developed many new interdisciplinary projects, including securing over $14M of new research funding."

Professor Andy Lowe

- Green Urban Futures - Future-proofing our cities against extreme heat events through re-vegetation. By harnessing the power of world-leading research to foster the resilience of our natural and built environment, our university researchers can assist in delivering an exceptional adaptation and green model for other arid cities to follow.
- Low Energy Technology - New Materials for Enduring Challenges. The future of the environment is dependent on the nature of our ongoing relationship with energy. The Centre of Advanced Nanomaterials can offer research and support for the design, synthesis, and applications of porous materials. Our research has developed novel technologies for encapsulating and protecting biomacromolecules such as protein, enzymes and DNA.
- Sustainable Landscapes - There is an opportunity to regain health and value for agricultural landscapes through the return of ecological function in soils and accompanying vegetation. Such outcomes can be achieved by designing and implementing vegetation plantings that regenerate ecosystem services in degraded landscapes, i.e. carbon sequestration, soil function, pollination, water filtration, livestock shelter, native biodiversity, and habitat.

Other work has developed scientific verification testing to eliminate illegally logged timber products from global supply chains. Funding from a Global Innovation Linkage and International Tropical Timber Organisation grants has allowed the development of DNA species and region of origin identification tools for application by the timber trade.

- Water Quality - As one of the most critical resources to life on Earth, water quality is essential for all. Our teams of researchers and industry partners in the Water Research Centre provide experts, stimulus and support needed to initiate and maintain projects. We help solve water issues in our areas of expertise, including contested and complex basin water management, digital water systems, engineering optimisation, urban design, water economics and law.

Further details of the main initiatives supported by the themes are available in our Research Capability document.

The Environment Institute's 2021 Annual Report highlights the strong multi-disciplinary research delivered by our members, and their positive impacts. The report provides insights into the fight against the illegal timber trade using DNA barcoding; demonstrates the diverse research focussed on cooling our warming cities; unravels the extinction of the woolly mammoth by humans, poses the questions of food security using urban agriculture, illustrates the restoration success using noise to recruit oyster larvae; and demonstrated the effect of climate change on Australian river patterns.

Professor Andy Lowe
Interim Director

Technological advances fighting the illegal timber trade

Illegal logging is a significant global issue. Approximately 30% to 50% of all timber traded globally is illegally sourced.

Illegal logging comes in many forms. These include replacing high-value for low-value timber products or incorrect declaration of species or region of origin of products. This masks the trade in endangered species and the exportation of timber from protected areas, resulting in mixing illegitimately and legitimately sourced timber.

Illegal logging is a driver of significant economic, environmental, and social problems in timber-producing countries. It reduces legal timber industry revenue, destroys virgin forest, increases emission of greenhouse gases and displaces forest-dwelling communities. In monetary value, illegal logging ranks high with other transnational crimes, including people, drugs and arms smuggling.

There are now global efforts to halt illegal logging. Legislation to prosecute traffickers has been introduced in many countries and at COP26 (26th United Nations Climate Change Conference of the Parties) Australia made a declaration to stop illegal logging by 2030.

Combatting illegal logging needs a multifaceted approach, with many of these being technology-based solutions that support behaviour change. This includes identifying the species and region of origin of timber, thus allowing enforcement of legislation and verification of claims of legality and sustainability. Other tools incorporate advanced technologies, such as genomics, elemental profiling, computer vision and machine learning, and are now promoted by the United Nations and other transnational organisations.

The Environment Institute's Professor Andy Lowe, Dr Arif Malik and colleagues at the University of Adelaide have been leading the advancement of these tools.

Our researchers are tackling a complex problem with diverse solutions made simpler through new technologies application. Here's how they are approaching it:

Increased testing

The rapid, and in some cases automated, testing of timber origin is underway worldwide. Timber shipments are being tested in Europe, USA and Australia, amongst others, to monitor and control timber imports. For example, using DNA species ID methods (DNA barcoding) 40% of timber products imported into Australia were recently shown to be not what they claimed to be and therefore considered illegal under current legislation.

Information accessibility

Data needs to be available to allow a broader range of government and industry groups to access and utilise these methods, The Global Timber Tracking Network (GTTN) - a network of research, government and technology labs – has launched an open-source database for this purpose. Several datasets are already available to the GTTN consortium, including the upload of the big leaf maple DNA database. This dataset was used to prosecute four people involved in the illegal harvest and trade of big leaf maple from national parks in Washington State, USA.

Technology application within industry

Georeferencing, blockchain ready data channels, and machine learning driven automation of information capture-all assist in the complex area of timber import and export verification. The timber industry can use these technologies to control their supply chains, but further development is required to develop methods that can make fully transparent supply chains. Voluntary certification agencies (e.g. Forest Stewardship Council) are also now adopting these advanced technologies.

The Australian Government has also recently awarded funding to develop new tracing technologies. InterpreData and the University of Adelaide were awarded a grant to work towards automatically recovering DNA information from internationally databases to build genetic resources to fight illegal logging.

Building data resources

Finally, there is still a need to build databases required for timber testing. Good species-level ID tools exist using wood anatomy, DNA and secondary compounds. But a review of technologies for the top 200 traded timber species found that less than 20% had any geographic provenance data. To make matters worse, at current investigation rates, it will take between 20 and 100 years to generate the required information.

Several high-profile database development projects are underway or have recently been completed, including; Madagascan rosewood, the top 20 African and American timber species, teak from Myanmar and surrounding areas and the valuable dipterocarp timber groups from Borneo. For example, a recently supported project (International Tropical Timber Organization) is looking to develop a DNA verification system for Prunus Africana in Cameroon, a valuable and important medicinal tree.

A multidisciplinary approach

A grant from the Commonwealth Government's Global Innovation Linkages Program was awarded to the University of Adelaide in partnership with InterpreData and DoubleHelix Tracking Technologies, Singapore. This project will develop scientific origin verification tools for global timber supply chains by creating new sample databases, developing new genetic markers and elemental profiles, and combine this data utilising InterpreData's software. This approach will aim to produce an origin verification tool with greater resolution than either method could provide on their own.

It's promising to see the development of these methods to stop the illegal timber trade, not only from a scientific 'push', but also from a policy 'pull', and industry application and adoption. Industry players are set to apply these technologies across their very complex supply chains. The fight to resolve this significant global issue may not be easy, but these technology breakthroughs strive towards a solution.

Further readings

United Nations: United Nations Office on Drugs and Crime 2016, *Best Practice Guide for Forensic Timber Identification: International Consortium on combating wildlife crime*.

Dormontt, EE, Jardine, DI, van Dijk, K-J, Dunker, BF, Hipkins, RRM, Tobe, S, Linacre, A & Lowe, AJ 2020, 'Forensic validation of a SNP and INDEL panel for individualisation of timber from bigleaf maple (Acer macrophyllum Pursch)', *Forensic Science International: Genetics*, vol. 46, art. 102252.

Hickson, K 2021, *How DNA test and trace aims to cut illegal exports of the endangered African cherry*, Double Helix Tracking Technologies.

A cool change is coming to city streets

Our cities are heating up and we need to find innovative ways to lower urban temperatures, or life will become increasingly harder for residents.

In Adelaide, the number of days when outdoor temperatures soared above 40°C increased from only two days per year in 2000 to six days per year in 2020.

Green Urban Futures is a multidisciplinary team of researchers from all three University faculties who have united under the umbrella of the Environment Institute at the University of Adelaide, to investigate a range of ways to reduce urban heat, including increasing urban greenery.

Dr Ehsan Sharifi of the School of Architecture and Built Environment said their modelling showed that increasing Adelaide's inner city tree canopy by 30% will reduce surface temperatures by 3°C in summer.

"This will lead to a reduction of around 140,000 tone of total carbon emission annually compared to a business-as-usual scenario." Dr Sharifi added.

A similar study in the New South Wales suburb of Parramatta, involving Dr Carlos Bartesaghi-Koc also from the School of Architecture and Built Environment working with researchers from the University of New South Wales found a combination of increasing greenery and different design and building approaches will reduce ambient temperatures by up to 3.3°C and surface temperature by 30.9°C.

"Our findings show that a combination of increasing greenery, using reflective materials, employing spray systems, and applying shading structures is an effective strategy," says Dr Bartesaghi-Koc, "it provides a very significant reduction of ambient temperature in CBD areas like Parramatta."

But increasing greenery to mitigate urban heat is not without challenges. So, Dr Ehsan Sharifi, together with Professor Bob Hill, former Director of the Environment Institute and Dr Kate Delaporte, Curator of the Waite Arboretum, have been working with Professor James Hayter, School of Architecture and Built Environment and President of the International Federation of Landscape Architects, to develop a multiple-criteria street tree selection database.

"The tool helps practitioners make informed decisions on what trees to plant where in the Greater Adelaide Metropolitan region," says Dr Delaporte. "It takes into account factors such as maintenance, tolerance to drought, allergenicity, weed potential, as well as the tree and root structures."

Planning and designing buildings that better address urban heat is another necessary step to achieve green urban cities. Buildings contribute around 20% of total greenhouse gas emissions, caused by the energy use for cooling/heating spaces and water.

Smarter site planning, more green space around buildings and well-designed buildings can help reduce cooling energy as well as improve the comfort, health and well-being of the occupants. This is particularly critical for people who are more vulnerable to extreme temperatures, such as older people, people with disability and people with low socio-economic status.

A recent ARC Discovery Project led by Professor Veronica Soebarto of the School of Architecture and Built Environment, found a significant correlation between temperatures and the perceived health and well-being of older people in South Australia.

“Indoor temperatures above 28°C and below 15°C are perceived to reduce older-people’s health and well-being,” says Professor Soebarto. “Our guideline to improve the thermal comfort in housing of older people in South Australia is due to be made publicly available by the end of 2021.”

The research has highlighted that the community needs to be part of discussions and decision making, in particular those at higher risk of the impact of extreme temperatures.

Critically, Professor Melissa Nursey-Bray, of the School of Social Sciences, has been focusing on engaging communities to be part of environmental decision making, particularly in the context of climate change and biodiversity protection.

What’s next?

An important aspect of the team’s research is creating the first national picture of the impact of climate change on human health.

An ARC Discovery Project led by Professor Peng Bi, School of Public Health, is investigating the impact of climate change on human health and will generate the first national picture of the climate attributable burden of diseases in Australia.

“This work is expected to provide scientific evidence to policy-makers,“ says Professor Bi, “it will help in the development, prioritisation and implementation of current and future climate change and health adaptation strategies.”

Every piece of work undertaken by this diverse group of researchers is adding another piece to the history making work of the Green Urban Futures Research Theme.

Reproduced from the University of Adelaide Research Impact site

“Buildings contribute around 20% of total greenhouse gas emissions, caused by the energy use for cooling/heating spaces and water.”

Humans hastened the extinction of the woolly mammoth

An international team of scientists led by researchers from the University of Adelaide's Environment Institute and University of Copenhagen's Globe Institute, uncovered a 20,000-year pathway to extinction for the woolly mammoth.

It has been revealed that humans had a significant role in the extinction of woolly mammoths in Eurasia, and that woolly mammoths likely went extinct thousands of years later than previously thought.

"The research shows that humans were a crucial and chronic driver of population declines of woolly mammoths, having an essential role in the timing and location of their extinction," said lead author Associate Professor Damien Fordham from the Environment Institute.

Researchers used computer models, fossils and ancient DNA to identify and unravel the very mechanisms and threats that were integral in the initial decline and later extinction of the woolly mammoth. They showed that reconstructing signatures of past changes in the distribution and demography of woolly mammoths from fossils and ancient DNA, required people to hasten the extinction of woolly mammoths by up to 4,000 years in some regions. Previously, it had been thought that humans had a limited role in the extinction of the woolly mammoth, despite exploiting woolly mammoths for meat, skins, bones and ivory.

The study also showed that woolly mammoths are likely to have survived in the Arctic for thousands of years longer than previously thought, existing in small areas of habitat with suitable climatic conditions and low densities of humans.

The finding of long-term persistence in Eurasia independently confirmed recently published environmental DNA evidence that showed that woolly mammoths were roaming around Siberia 5,000 years ago.

The modelling and analysis have strengthened the case for human impacts as a driver of population decline and range collapses of megafauna in Eurasia during the late Pleistocene. This evidence challenges the prevailing theory that climate change alone decimated woolly mammoth populations and that the role of humans was limited to hunters delivering the final blow.

The research emphasises that the pathway to extinction for the woolly mammoth was long and lasting, with the role of humans starting many millennia before the final extinction event. It also pinpoints likely locations of yet-to-be-discovered Holocene-age refugia in the high and low Arctic.

From a technical perspective, integrating information from fossils and genes into ecological models allowed the researchers to remove the major barriers that have caused fierce debate for centuries surrounding the relative roles of climatic change and human hunting on the fate of the megafauna during the Late Pleistocene.

Similar integrated-approaches are being used to reconstruct the pathways to extinction for other long-lost animals, which once roamed the landscapes of Australia and New Zealand, as well as Eurasia and North America. These ancient extinction events can provide important lessons for assessing species survival under future climate and environmental change.

This research is some of the progressive work undertaken in the Climate and Biodiversity theme in the Environment Institute.

Further Reading:

Fordham, DA, Brown, SC, Akçakaya, HR, Brook, BW, Haythorne, S, Manica, A, Shoemaker, KT, Austin, JJ, Blonder, B, Pilowsky, J, Rahbek, C & Nogues-Bravo, D 2021, 'Process-explicit models reveal pathway to extinction for woolly mammoth using pattern-oriented validation', in T Coulson (ed.), *Ecology Letters*, vol. 25, no. 1, pp. 125–137.

“The research shows that humans were a crucial and chronic driver of population declines of woolly mammoths, having an essential role in the timing and location of their extinction”

Associate Professor Damien Fordham

Woolly mammoths persisted in Siberia until the mid-Holocene. Copyright: Mauricio Anton

Urban Agriculture: safe and productive farming systems in our cities

The practice of cultivating and producing food in towns and cities – Urban Agriculture – can make a significant contribution to food supply, in a way that minimises environmental impact and maximises nutritional benefit.

Engaging in Urban Agriculture also provides participants with many additional social, economic and health benefits. Accordingly, the Food and Agriculture Organization (FAO) of the United Nations (UN) has stated that "a greater focus on the Urban Food Agenda is long overdue".

While Urban Agriculture plays a significant role in domestic food security in some parts of the world, in developed economies, such as Australia, Urban Agriculture has long been viewed as a 'hobby' rather than a serious farming system. The Environment Institutes' Professor Tim Cavagnaro and colleagues Dr Matthias Salomon and Isobel Hume's research explores the potential for Urban Agriculture systems to produce significant amounts of safe and nutritious food, in an environmentally sustainable way.

Whilst aspirational to suggest that we should produce food in our backyards, is there enough space in the average Adelaide backyard to grow enough vegetables to meet the daily requirements of the average household? To answer this question, high-resolution airborne imagery and remote sensing techniques has been used to create 3D computer models of urban areas.

This data quantified the lawned area in every backyard across metropolitan Adelaide; over 490,000 properties in total. The focus on lawn was because this land that has the potential to be converted to in-ground vegetable production, without the need to remove infrastructure, or other vegetation (trees or shrubs). This information was coupled with data on the average household size, the recommended number of serves of vegetables per person, yield data on vegetable production in Urban Agriculture systems, along with historical climate data for Adelaide. Together, these data sets revealed that with as little as 21m2 of land, enough vegetables could be grown to support the needs of the average Adelaide household.

Pleasingly, when looking at the amount of lawn in backyards across Adelaide, more than 90% of households had enough space available to achieve this goal. Continued research considers the unique opportunities for back-yard farmers to minimise the environmental impact of food production. Not only do Adelaide homes have adequate space for food production, but a typical residential block would be able to capture and store enough rainwater to irrigate their food garden and help address issues increasing water scarcities. Put simply, for most Adelaide households, there is more than enough space in backyards to have their lawn with a side of salad!

In addition to having enough space, soils in Urban Agriculture sites need to be fertile and safe for vegetable production. As with any farming system, healthy soils are the backbone of productive, safe and sustainable urban agriculture. In a survey of community gardens and commercial sites across Adelaide, the levels of heavy metals were below national guideline levels. However, they were higher in sites with a history of industrial land use, such as metal processing. Therefore, it is important to test soils prior to establishing new gardens, and take appropriate measures to mitigate risks, for example using raised beds with liners and imported soil.

Soil fertility is a key factor affecting crop yield and quality and determines how much land needs to be converted to achieve a level of vegetable self-sufficiency. In many cases, there were an excess of nutrients, well above recommended levels. This is most likely the result of an over-application of composts and animal manures. In some cases, this leads to nutrient imbalances and antagonistic effects on some micronutrients, which will reduce yields.

A key conclusion of this work is that there is a need for training on nutrient management if urban agriculture is to reach its full potential. Community gardens are considered a prime location to educate a broad cross-section of the population.

Finally, recent work has focused on soil microbiomes in Urban Agriculture systems revealing high levels of soil biodiversity in urban agriculture soils. This diversity, however, includes both beneficial and potentially deleterious (e.g. plant pathogens) microbes. Next steps will be to focus on how we can tip the balance in favour of building healthy, productive, Urban Agriculture soils, using free and abundant urban waste products.

The case for Urban Agriculture is simple, with half of the world's population now living in cities, a number projected to increase to 68% by 2050, Urban Agriculture has been flagged as a key strategy for global food security. It was also identified as a strategy for advancing food and nutrition security in response to COVID-19. For urban agriculture to realise its potential, it needs to be treated as a serious farming system. If we are going to green our cities, why not dedicate some of that effort to producing healthy and safe food?

This research is some of the progressive work undertaken in the Green Urban Futures theme in the Environment Institute.

“The case for Urban Agriculture is simple, with half of the world's population now living in cities, a number projected to increase to 68% by 2050, Urban Agriculture has been flagged as a key strategy for global food security.”

Actionable solutions: Coastal restoration success strengthened by science and technology collaboration

Environmental biologists are being asked to play a more decisive role in shaping environmental solutions.

They are encouraged to become more engaged in the earlier stages of technological innovation, align their investigations with society's aspirations and provide greater legitimacy to governments bold enough to seize environmental solutions.

The recent restoration of oyster reefs in South Australia provides an example of this deeper engagement. The key uncertainty for restoring any ecosystem is whether the restoration will form self-sustaining populations. That is, a natural supply of new recruits that arrive in sufficient densities to dominate the formally degraded landscape. With the functional extinction of South Australia's oyster reefs, encouraging the natural arrival of new oysters larvae posed a risk. One or two oysters were only seen every few hundred metres of seabed.

Marine biologists from the Environment Institute, in collaboration with the engineers of a tech-start-up *AusOcean*, set out to test if sound could attract remaining larvae to the restoration sites.

The team needed to know whether larval oysters could navigate by sound and if they could engineer the right sounds at an affordable cost. However, researchers faced the problem of not knowing what the lost oyster reeds sounded like. Marine soundscapes vary enormously from ecosystem to ecosystem. Through trial and error, the team investigated whether the native oyster larvae could not only detect sounds of different type, but also actively navigate towards their source.

It was found that oyster larvae could swim along 8 metre 'race tracks' in the laboratory when played the sounds of kelp forests, but not of shipping or industrial noise. This was a world first, because previous information suggested that for a North American oyster species, they can only choose to sink or float in response to noise. The team from *AusOceans* engineered inexpensive underwater speakers which required innovation around water proofing, playback

resolution, battery life and ready to buy parts from Bunnings. When tested at the restoration sites, it was found that the arrival of larvae could be boosted by up to 1000 times. Where larvae were naturally rare, they could be enticed to be recruited in dense aggregations that matches sites with naturally high recruitment.

This restoration project has provided a wonderful test-case to encourage environmental scientists to consider co-design partnerships that develop conservation technology. Researchers face challenging roadblocks to restoration that increase risk of government investment. This solution of the technological repair of a biological process (recruitment process), simplifies policy decisions by giving credibility to success. It is hoped that this technology will be widely available to coastal communities and that they will receive the nation-wide Federal funding to implement their own oyster reef restoration.

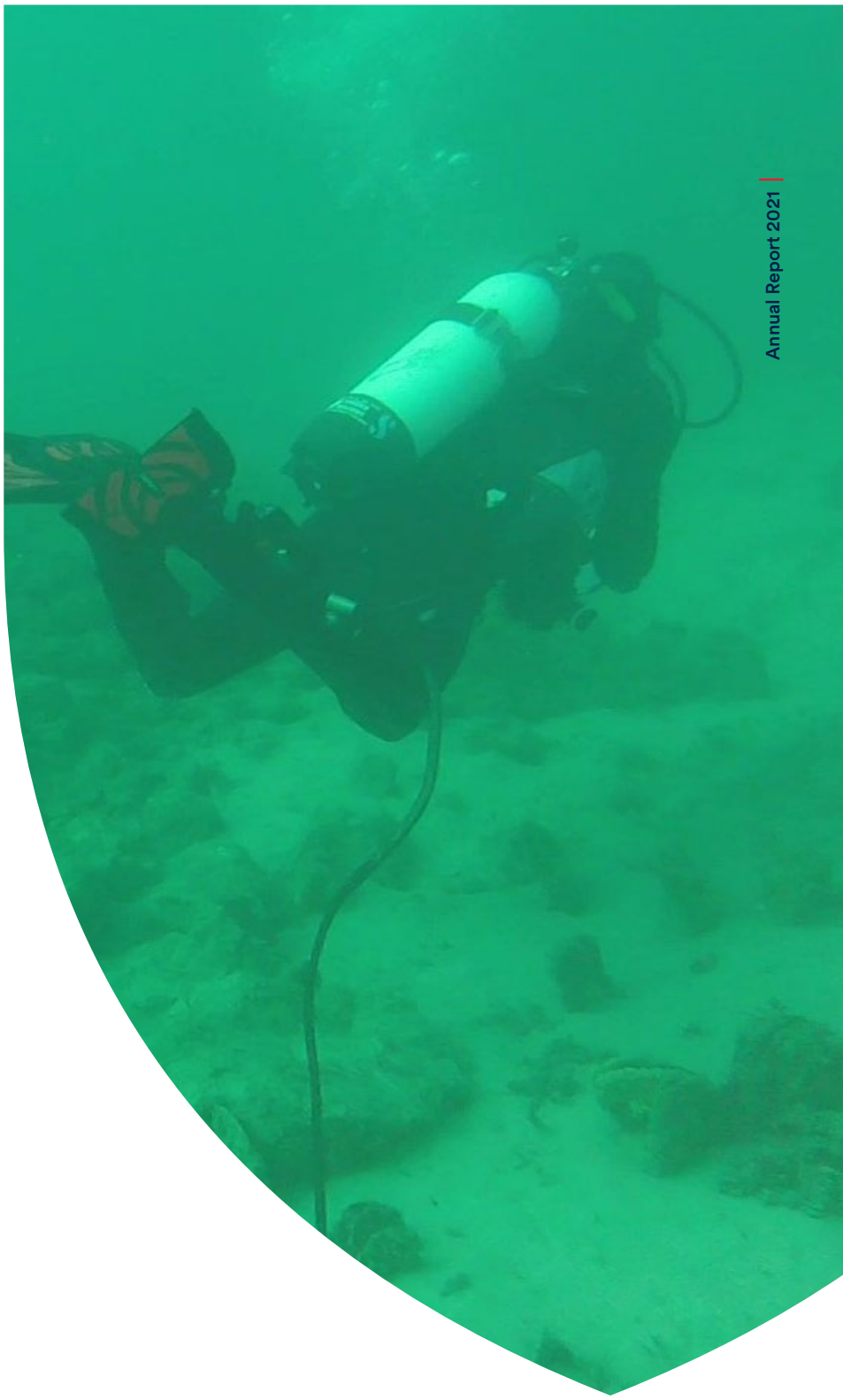
Imagine achieving restoration success on a national scale with this cooperation of science and technology and bringing back a coastal ecosystem from extinction.

The key challenge for creating socially relevant knowledge (solutions) for action by decision-makers (policy), is the need to balance the provision of environmental solutions with the inherent uncertainty of how they playout in nature.

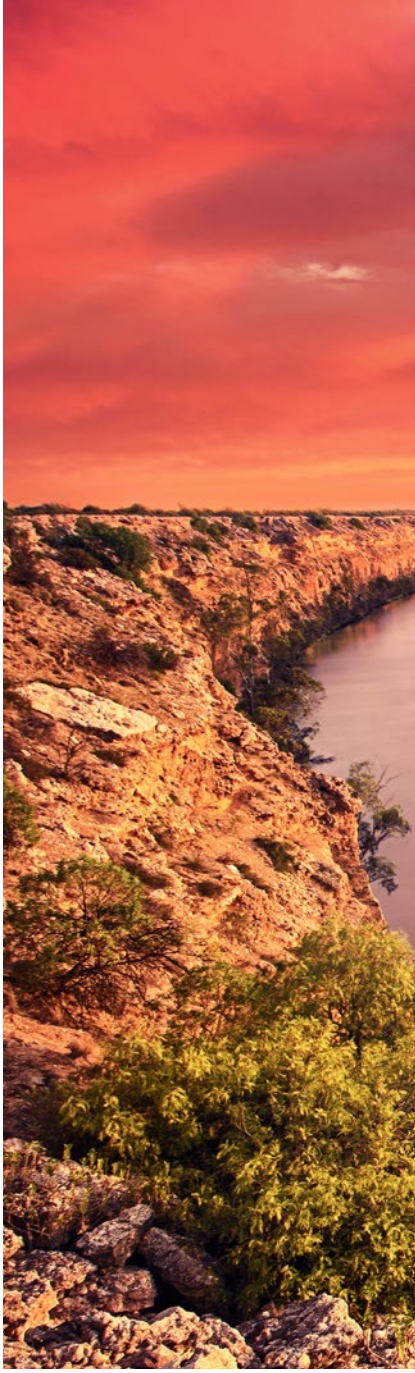
This research is some of the fascinating work undertaken in the Marine and Freshwater theme in the Environment Institute.

Further Reading:

Williams, BR, McAfee, D & Connell, SD 2021, 'Repairing recruitment processes with sound technology to accelerate habitat restoration', *Ecological Applications,* vol. 31, no. 6.



Why our rivers are running drier



An international team of researchers including the University of Adelaide has demonstrated that climate change is responsible for the changes in the flow and water volume of rivers globally, with major implications for Australia.

In the study published in *Science*, the team investigated changes in river flow, and whether the globally visible changes could be attributed to climate change or to water and land management. The researchers modelled the changes using data collected from 7,250 measuring stations worldwide, including in southern parts of Australia.

While climate change's impact on water volumes and flooding and drought is widely recognised, this is the first research to examine the changes in river flow globally using direct measurements of stream flow.

The research demonstrated that river flow has changed systemically between 1971 and 2010. Complex patterns were revealed – with some regions including Australia and the Mediterranean becoming drier, while elsewhere such as in Scandinavia, water volumes have increased. The research found that climate change is a key factor in these changes.

Co-author, Professor Seth Westra from the Water Research Centre and Environment Institute, said: "In Australia, it is increasingly recognised that at least part of the observed decreases in flowing water volumes in our rivers and streams can be attributed to climate change."

"Historically Australia is known as 'a land of droughts and flooding rains' – in that throughout our history there has been times of severe drought but also times where there has been too much water. In the past, those extremes have been largely attributed to natural environmental processes," Professor Westra said.

"However, because of the drying effect of climate change on our river systems, we can no longer assume history will repeat and we must prioritise mitigating the impact."

River flow is an important indicator of water resources available to humans and the environment.

"In Australia around 70 per cent of water is used in agriculture production, with much of that water used in the irrigation of crops. Australia's economy, food security and wellbeing are all dependent on our water resources, so it's critical we plan for a drier future." said Professor Seth Westra.

The research acknowledges there are other factors affecting water fluctuations including water management and land use, but found that these were not sufficient to explain global changes. Rather, the global changes in water resource availability could only be understood if climate change was taken into account.

The research was made possible by a collaboration of researchers across 12 countries, and the data collation represents the largest global data set with river flow observations available today. With the models developed from the data, it will be possible to project how rivers will continue to change in the future. Such projections provide an important basis for planning in the affected regions in order to secure water supply and adjust to climate change.

Professor Seth Westra is the Director of the Water Research Centre. This research is some of the outstanding work undertaken in the Water Research Centre in the Environment Institute theme of Water Quality.

The original article was published in the University of Adelaide Newsroom.

Further Reading:

Gudmundsson, L., Boulange, J., Do, H.X., Gosling, S.N., Grillakis, M.G., Koutroulis, A.G., Leonard, M., Liu, J., Müller Schmied, H., Papadimitriou, L., Pokhrel, Y., Seneviratne, S.I., Satoh, Y., Thiery, W., Westra, S., Zhang, X. and Zhao, F. (2021). Globally observed trends in mean and extreme river flow attributed to climate change. *Science*, 371(6534), pp.1159–1162. doi:10.1126/science.aba3996.

“

In Australia around 70 per cent of water is used in agriculture production, with much of that water used in the irrigation of crops. Australia’s economy, food security and wellbeing are all dependent on our water resources, so it’s critical we plan for a drier future.”

Professor Seth Westra

Public engagement

Environment Institute members were active in participating in public engagement opportunities in 2021

Pint of Science

The Environment Institute partnered with the University's Ecoversity to present *Pints of Ideas* event. This environmental pub-talk series explored the solutions in research, policy and industry, and most importantly what individuals can do to help from a distinguished line-up of university and external guests. The two sessions held in 2021 were:

Topic:
How big is the plastic pollution problem and what can we do about it?

Special Guests
Hon David Speirs MP, Minister for Environment & Water

Professor Melissa Nursey-Bray, Department of Geography, Environment and Population and Environment Institute

Scott Morton, Australian Director of BioBag

Paige LeCornu, Coordinator of the Adelaide Sustainability Centre

Facilitated by Professor Bob Hill, Environment Institute Director.

Topic:
How can plastics become part of the circular economy in Australia?

Special Guests
Ian Overton, Chief Executive, Green Industries SA

Uma Preston, Sustaining Endeavour

Kai Hau & Gary Hau, YCA Recycling

Jodie Bricout, School of Civil, Environmental & Mining Engineering

Facilitated by Professor Veronica Soebarto, The Environment Institute.

(L to R) A successful *Pint of Ideas* event; Hon Malcolm Turnbull MP Keynote speaker at '*Water Markets: A Global Assessment*' book launch

Healthy Development Adelaide

Amid increased urbanisation, and an increasingly digital world, children are engaging less with the natural environment. Despite these trends, there is a growing awareness about the benefits of nature for child health, wellbeing, and learning. Dr Mark Kohler, from the School of Psychology and Environment Institute, hosted the June Health Development of Adelaide event and presented *'The nature of child learning and wellbeing at school'.*

World Fisheries Conference

The Environment Institute was a proud partner of the World Fisheries Conference in 2021 held at the Adelaide Convention Centre, 20-24 September 2021.

Spines, scats and six legs

In an engaging event held during National Science Week (August 2021) Dr Erinn Fagan-Jefferies encouraged the community to learn all about the creepy crawlies living in the backyard and identify insects. Dr Tahlia Perry educated participants on the citizen science project EchidnaCSI and how you can learn about echidnas from their scat.

Book launch

In November the Environment Institute hosted the official book launch of Prof Sarah Wheeler's book *'Water Markets: A Global Assessment'.* Keynote speaker, former Prime Minister Malcolm Turnbull MP, attended and gave an introduction and overview to water policy in Australia, sharing his experience as Water Minister. Guest presenter was Sandy Losefellis and Federal Greens senator, Sarah Hanson-Young attended.

(L to R) Professor Sarah Wheeler and Sarah Hanson-Young at the *'Water Markets: A Global Assessment'* book launch

Awards and achievements

Congratulations to Environment Institute members on their outstanding awards and achievements

50 most influential people in the environment sector

Four Environmental Institute members and two Environment Institute Advisory Board members were named in SA's 50 most influential people in the Environment sector by *The Advertiser*.

- Dr Katja Hogendoorn
- Associate Professor Patrick O'Connor
- Professor Andy Lowe
- Professor Bob Hill
- Professor Chris Daniels, Green Adelaide Chairman & EI Advisory Board
- Ms Elaine Bensted, ZoosSA CE and EI Advisory Board

Dr Katja Hogendoorn

Prof Andy Lowe

Prof Bob Hill

Ms Elaine Bensted

Prof Chris Daniels

Asia-Pacific Spatial Excellence Awards

Dr. W. Boone Law, was recognised as a joint recipient of the Oceanic-region Postgraduate Student Award at the Asia-Pacific Spatial Excellence Awards (APSEA). He was recognised for his fantastic engagement examples and innovative thesis which aimed to promote and utilise advanced aerial and satellite remote sensing technologies to better understand the Aboriginal archaeological record.

(L to R) Prof Megan Lewis and Dr Boone Law at the Asia-Pacific Spatial Excellence Award ceremony

Bonython Chair in Law

Professor Paul Babie has been appointed the ninth holder of the Bonython Chair in Law. Professor Babie is Associate Dean of Law (International) and Director of the Research Unit for the Study of Society, Ethics, and Law.

Prof Paul Babie
Bonython Chair in Law

Climate Subak Advisory Board

Professor Andrew Lowe was appointed to the Climate Subak Australia Advisory Board. Climate Subak is an international non-profit accelerator that scales climate impact through data, policy and behaviour change.

Dragons Den/Leadership Development Program

For a number of years, the Environment Institute has invested in a leadership program for early career researchers. This program has been a great success and many of the participants of the program in the past are now in leadership positions within the University or externally. This year's participants were Dr Perry Beasley-Hall, Dr Aysegul Birand, Dr Sam Culley, Dr Micha Jackson, Dr David Kroll, Dr W. Boone Law, Dr Thomas Lines, Dr Arif Malik, Dr Rowan Mott, Dr Jasmin Packer, Dr Patrick Reis Santos, Dr Cameron Shearer, Dr Yassine Souilmi, Dr Oliver Stringham and Dr Hamish Toop.

Dr Jasmin Packer

Dr Patrick Reis Santos

Dr Cameron Shearer

Dr Yassine Souilmi

Fellow in the Academy of the Social Sciences in Australia (ASSA)

Professor Sarah Wheeler was admitted as a Fellow of the ASSA, in which practitioners are elected by their peers for their distinguished contribution to one or more fields of social science research or practice in Australia.

Fresh Scientists

Brittany Williams and Nina Wootton, PhD students from the School of Biological Science, who were announced as two of the finalists for South Australia in the 2021 Fresh Science program. Brittany's research is titled 'A Snappy Solution to Restoring Oyster Reefs' and Nina's is titled 'Plastic Pollution in Seafood'.

Modelling and Simulation Society of Australia and New Zealand (MSSANZ)

Professor Holger Maier was awarded the MSSANZ medal for 'exceptional research contributions to modelling and simulation, and for promoting the aims of the Society'. Professor Maier's research is focused on developing improved techniques for the sustainable management of infrastructure, with a particular focus on water resources and natural hazards in an uncertain environment.

MSSANZ receipent Prof Holger Maier

National Citizen Science Grants

Dr Erinn Fagan-Jeffries received one of nine National Citizen Science Grants. Together with the SA Museum, much of the work will be undertaken in University of Adelaide laboratories, helping to further strengthen ties between the organisations. Dr Fagan-Jefferies "Insect Investigators" program engages community members in biodiversity discovery.

Dr Erinn Fagan-Jeffries received a National Citizen Science Grants for "Insect Investigators" program

Periodic Table of Food Initiative

Professor Andy Lowe was nominated as the Period Table of Food Initiative Australian lead. The Initiative is funded by the Rockefeller Foundation.

Public Health Association in Australia (PHAA)

Professor Peng Bi was the recipient of the Professor Tony McMichael Award of 2021. The Award is presented to a person who has made a significant, discernible contribution in the combined domains of public health and ecology or environmental health, which is consistent with and has contributed to fulfilling the aims of the PHAA and the Environmental Epidemiology Special Interest Group.

Professor Peng Bi awarded Professor Tony McMichael Award of 2021

Society of Australian Systematic Biologists

Professor Andy Austin was awarded the Society of Australian Systematic Biologists Distinguished Career Award, in recognition of his research into the systematics, biodiversity and evolution of arthropods, and his significant contribution to student education.

South Australian Science Excellence and Innovations Awards

Our members were well represented at the South Australian Science Excellence and Innovation Awards, which showcase the SA science community. The following were Environment Institute winners and outstanding finalists:

SA Citizen Science and Engagement Awards – Outstanding Science and Research

- Echidna CSI (winner)
- iBandi (finalist)

SA Tall Poppy of the Year

- Dr Dominic McAfee (finalist)

PhD Research Excellence

- Dr Tahlia Perry (finalist)

Prof Frank Grützner and Dr Tahlia Perry accepted the SA Citizen Science and Engagement Award for Echnida CSI

South Australian Young Tall Poppy Science Awards

The Young Tall Poppy Science Awards recognise the achievements of Australian scientists and their commitment to sharing their research and passion for science with the broader community.

The Environment Institute was proud to have three researchers receive SA Young Tall Poppy Awards in 2021.

- Dr Alice Jones. Research Field: restoring and protecting coastal habitats for climate change mitigation.
- Dr Dominic McAfee. Research Field: new techniques for oyster reef restoration.
- Dr Linda Armbrecht. Research Field: Ancient DNA techniques to understand past marine species survival.

(L to R) 2021 SA Young Tall Poppy awardees Dr Alice Jones, Dr Linda Armbrecht and Dr Dominic McAfee

University of Adelaide Award

Enhancement and Innovation of Student Learning

Dr Carlos Bartesaghi-Koc was recipient of the 2021 Teaching Commendations, recognised in the category of 'Innovations in blended and/or online learning'. These awards recognise the diverse range of activities, services and programs that contribute to student learning and engagement at the University of Adelaide.

Excellence In Research

Dr Dominic McAfee received the Excellence in Research Award for an early-career researcher. Dr McAfee has published 13 first author papers and is an emerging leader in research at the interface of environmental science and policy.

Dr Carlos Bartesaghi-Koc, Enhancement and Innovation of Student Learning

Australian Research Council funding outcomes

Type	Announced	EI Investigator(s)	Aim of Project	Amount
Linkage Project	3	Professor Alan Collins and Dr Juraj Farkas	Reconstructing the Beetaloo/Greater McArthur Basin System	$536,198
		Professor Veronica Soebarto	Determining the social value of extreme, mixed-use urban developments*	$287,994
		Professor Sean Connell, Dr Georgina Drew, Dr Dominic McAfee	Addressing social and ecological constraints to expand marine restoration	$355,822
Future Fellowship	1	Professor Melissa Nursey-Bray	Pathways for Indigenous and Western knowledge into Environmental Policy	$866,502
Discovery Project	5	Professor Bronwyn Gillanders	Investing in ecological portfolios: retaining migratory strategies of fish	$509,000
		Professor Veronica Soebarto and Professor Dino Pisaniello	Developing Resilient Housing for Low Socio-Economic Older People	$375,000
		Associate Professor Diego García-Bellido	Evolutionary dynamics in deep time: faunal turnover during the Ediacaran	$488,000
		Professor Christian Doonan and Professor Christopher Sumby	Metal-organic Framework (MOF) Superstructure Catalysts	$476,000
		Professor Sarah Wheeler and Associate Professor Alec Zuo	Impacts of changing water ownership and reforms on Australian water markets	$234,878
Linkage Infrastructure, Equipment and Facilities	2	Professor Alan Collins and Professor Bronwyn Gillanders	Mass spectrometry for mass geochronology	$389,526
		Adjunct Professor Andrew Austin, Professor Steven Cooper, Professor Michelle Waycott and Associate Professor Jeremy Austin	Enhancing the SA Regional Facility for Molecular Ecology & Evolution	$361,354

*Lead institution University of South Australia

Environment Institute Advisory Board

Professor Hugh Possingham

Queensland Chief Scientist

Professor Hugh Possingham has had a long and distinguished career developing mathematical and economic tools for solving nature conservation problems such as where to place protected areas and which are the most efficient actions for saving threatened species. Most notably his co-development of the Marxan software for conservation planning, has been described as "the most significant contribution to conservation biology to emerge from Australia's research community."

He has co-authored more than 650 peer-reviewed papers, with more than 30 in the world's top two scientific journals *Science* and *Nature*.

He has held positions at the University of Adelaide and the University of Queensland, where he has led several research centres and held Australian Research Council Professorial, Laureate and Federation Fellowships.

Hugh was the Director of the Australian Research Council Centre of Excellence for Environmental Decisions and Australian government's Threatened Species Recovery Hub, Chief Scientist at The Nature Conservancy (2016) and Queensland's Chief Scientist (2020). Hugh was elected a Fellow of the Australian Academy of Science (2005) and a Foreign Associate of the US National Academy of Sciences (2016).

Professor Richard Hillis

Pro Vice-Chancellor (Research Performance), University of Adelaide

Richard is the Pro Vice-Chancellor (Research Performance), providing leadership in achieving the University's strategic goals in relation to research quality, revenue, productivity and international standing. Richard spent 18 years at the University of Adelaide (1992-2010) where he was Mawson Professor of Geology, State of South Australia Chair of Petroleum Geology and Head of the Australian School of Petroleum. From 2010-2018 Richard was CEO of the Deep Exploration Technologies Cooperative Research Centre (DET CRC) which developed transformational technologies for mineral exploration. Richard is a Fellow of ATSE (Australian Academy of Technology and Engineering) and of the Geological Society of Australia. He was awarded the Geological Society of Australia's Webb Medal for leadership in the earth sciences (2014) and South Australian Scientist of the Year (2018).

Ms Sandy Carruthers

Executive Director of Strategy Science and Corporate Services, Department for Environment and Water

Sandy is the Executive Director of Strategy Science and Corporate Services for the Department for Environment and Water (DEW). Through her role, Sandy is accountable for the coordination and delivery of DEW's core science capability to support NRM in South Australia. She plays a key role in the interface between NRM science, policy and delivery in South Australia, and recently led the development of a Research Partnership Strategy for DEW, to support the critical relationships between DEW and the South Australian research sector.

Dr Susannah Eliott

Chief Executive Officer, Australian Science Media Centre

Susannah has more than 20 years of practical experience in science communication. Susannah is currently CEO of the Australian Science Media Centre, an independent not for profit organisation that works with the news media to highlight the scientific evidence behind the story. Previously appointed to the national Climate Commission and Chair for the Expert Working Group on Science and the Media for the Federal Government. She currently sits on the Federal Government's Science Sector Working Group.

Ms Elaine Bensted

Chief Executive, Zoos South Australia

Elaine is Chief Executive, Zoos South Australia commencing in 2012. Since being in the role Elaine has led an improvement in the financial position of this conservation charity and an increase in Zoos SA membership base from 26,000 to over 45,000. She also led the work that culminated in the release of a 20 year Master Plan for Adelaide Zoo and Monarto Safari Park. This has recently seen the opening of new Visitor Centre at Monarto and exciting plans for new accommodation and safari experiences.

Professor Chris Daniels

Presiding member/Chair, Green Adelaide Landscape Board

Chris is currently Presiding member/ Chair of the Green Adelaide Landscape Board. He is also chair of the Koala Life Foundation. He is the immediate past Director of Cleland Wildlife Park (Department for Environment and Water, SA Government). He is also involved in many other environmental leadership activities focused on conserving wildlife and connecting people with nature. Chris has published 9 books, 1 DVD and over 250 scientific and community publications. He received a Doctor of Science (DSc) from the University of Adelaide in 2018.

Following page: PhD student, Emily Leyden, sampling mangrove-salt marsh environments at Sandy Pt, north of Adelaide

“

I look forward to a new era for the Environment Institute, building on its solid foundations. Now is the time for the University of Adelaide to deliver impact, not just at local and regional scales, but on continental and global scales.”

Professor Hugh Possingham
Environment Institute Advisory Board Chair

Our valued members 2021

Management Committee

Professor Bob Hill
Director, Environment Institute

Professor Bronwyn Gillanders
Deputy Director, Environment Institute

Professor Seth Westra
Research Theme Leader, Water Quality
Director, Water Research Centre
Civil, Environmental & Mining Engineering

Professor Sarah Wheeler
Economics and Public Policy

Research Theme Leaders

Associate Professor Damien Fordham
Research Theme Leader, Climate & Biodiversity

Professor Veronica Soebarto
Research Theme Leader, Green Urban Futures

Professor Sean Connell
Research Theme Leader, Marine & Freshwater Ecosystems

Professor Christian Doonan
Research Theme Leader, Low Energy Technology

Professor Andy Lowe
Research Theme Leader, Sustainable Landscapes

Professor Seth Westra
Research Theme Leader, Water Quality

Institute Staff

Ms Leah Panakera-Thorpe
Institute Manager

Mrs Annemarie Gaskin
Digital Marketing Coordinator

Members

Adelaide Business School

Professor Jodie Conduit

Adelaide Law School

Professor Paul Babie
Professor Kerryn Brent
Associate Professor Peter Burdon
Dr Phillipa McCormack
Dr Beth Nosworthy
Dr Alexandra Wawryk
Mr Paul Leadbeter

Agriculture, Food and Wine

Professor Tim Cavagnaro
Dr Katja Hogendoorn

Animal and Veterinary Sciences

Associate Professor Wayne Boardman
Associate Professor Charles Caraguel
Dr Anne-Lise Chaber
Dr Natasha Speight

Architecture and Built Environment

Dr Carlos Bartesaghi Koc
Dr Tanya Court
Dr Scott Hawken
Dr Ehsan Sharifi

Biological Sciences

Associate Professor Jeremy Austin
Deputy Director, Australian Centre for Ancient DNA
Professor Andrew Austin (Adjunct)
Professor Justin Brookes
Professor Robert Fitzpatrick
Director, Acid Sulfate Soil Centre
Professor Frank Grutzner
Professor Megan Lewis (Adjunct)
Professor Ivan Nagelkerken
Professor Michelle Waycott
Chief Botanist, State Herbarium of SA
Professor Tom Wigley (Adjunct)
Associate Professor Phill Cassey
Associate Professor Luke Mosley
Associate Professor Bertram Ostendorf
Dr Kyle Armstrong
Dr Stuart Brown
Dr Raphael Eisenhofer
Dr Jose Facelli (Adjunct)
Dr Erinn Fagan-Jeffries
Dr Diego Garcia-Bellido
Dr Greg Guerin
Dr Alice Jones
Dr Wallace Boone Law
Dr Bastien Llamas
Dr Nastaran Mazloumi (Adjunct)
Dr Dominic McAfee
Dr Camille Mellin
Dr Jasmin Packer
Dr Tom Prowse
Dr Liz Reed
Dr Kate Sanders
Dr Patrick Reis Santos
Dr Ramesh Raja Segaran
Dr Emma Sherratt
Dr Yassine Souilmi
Dr Myall Tarran (Adjunct)
Dr Andrew Thornhill
Dr Fiona Whelan
Professor Steven Cooper (Adjunct)
Principal Researcher, SA Museum

Chemical Engineering and Advanced Material

Professor Volker Hessel
Dr Abel Santos

Civil, Environmental & Mining Engineering

Professor Holger Maier

Global Food and Resources

Professor Mike Young
Associate Professor Patrick O'Connor
Associate Professor Adam Loch
Dr Alexandra Peralta

Institute for International Trade

Professor Peter Draper

Physical Sciences

Professor Alan Collins
Professor David Chittleborough (Adjunct)
Professor Nigel Spooner
Professor Christopher Sumby
Associate Professor Lee Arnold
Dr Juraj Farkas
Dr Cameron Shearer
Dr Jonathan Tyler

Psychology

Professor Anna Chur-Hansen
Professor Sandra Hodge
Professor Deb Turnbull
Associate Professor Rachel Roberts
Dr Mark Kohler
Dr Carolyn Semmler

Public Health

Professor Dino Pisaniello
Professor Peng Bi
Professor Philip Weinstein
Associate Professor Sharyn Gaskin
Director, Adelaide Exposure Science and Health
Dr Leigh Thredgold
Dr Len Turczynowicz

Social Sciences

Professor Melissa Nursey-Bray
Associate Professor John Tibby
Director, Sprigg Geobiology Centre
Associate Professor Georgina Drew
Associate Professor Doug Bardsley
Associate Professor Yan Tan
Associate Professor Benito Cao

Partner members

Professor Stephen Donnellan
Genetics and Evolution, SA Museum

Ecosystem restoration at Glenelg Reef.

Citation statistics 2021

Listed alphabetically below are citation statistics of Environment Institute researchers. These statistics offer insights into the impact of individual authors in their chosen field.

Researcher	No. of Citations in 2021 Number of times an article has been cited by another article	H-index Number of publications with a citation number greater than or equal to h	i10-index Number of publications with at least 10 citations
Dr Kyle Armstrong	116	15	20
Assoc Prof Lee Arnold	744	35	62
Professor Andrew Austin	657	52	174
Assoc Prof Jeremy Austin	727	44	94
Professor Paul Babie	64	9	9
Dr Doug Bardsley	276	23	45
Dr Carlos Bartesaghi-Koc	181	9	9
Dr Simon Baxter	646	37	51
Professor Peng Bi	1448	53	141
Assoc Prof Wayne Boardman	213	17	38
Emer. Prof. Bill Breed	192	36	122
Professor Kerryn Brent	27	6	2
Professor Justin Brookes	1235	51	101
Dr Stuart Brown	200	12	12
Assoc Prof Peter Burdon	126	12	18
Dr Benito Cao	16	4	2
Assoc Prof Charles Caraguel	144	13	21
Assoc Prof Phill Cassey	1840	55	203
Professor Timothy Cavagnaro	1389	54	118
Dr Anne-Lise Chaber	57	8	6
Professor Anna Chur-Hansen	533	33	85
Professor Alan Collins	2058	58	163
Professor Jodie Conduit	794	25	36
Professor Sean Connell	1588	69	182
Professor Steve Cooper	497	46	121
Professor Steve Donnellan	882	49	145
Professor Christian Doonan	2611	52	106
Professor Peter Draper	71	18	34
Dr Georgina Drew	66	10	11

Researcher	No. of Citations	H-index	i10-index
Dr Raphael Eisenhofer	250	8	7
Dr Jose Facelli	457	39	73
Dr Erinn Fagan-Jeffries	33	6	3
Dr Juraj Farkas	248	18	25
Professor Robert Fitzpatrick	490	43	166
Assoc Prof Damien Fordham	746	37	82
Assoc Prof Diego Garcia-Bellido	290	27	53
Dr Sharyn Gaskin	88	11	12
Professor Bronwyn Gillanders	1578	65	188
Professor Frank Grutzner	838	39	67
Dr Greg Guerin	688	20	34
Dr Scott Hawken	232	11	14
Professor Volker Hessel	2361	78	338
Professor Bob Hill	427	59	184
Dr Kathryn Hill	26	5	4
Professor Sandra Hodge	1150	43	113
Dr Katja Hogendoorn	1489	23	33
Dr Alice Jones	212	12	13
Dr Mark Kohler	295	26	40
Dr Wallace Boone Law	6	6	1
Mr Paul Leadbeter	5	3	0
Professor Megan Lewis	390	28	51
Assoc Prof Bastien Llamas	1335	32	56
Assoc Prof Adam Loch	246	19	30
Professor Andrew Lowe	2072	65	185
Professor Holger Maier	2363	69	224
Dr Nastaran Mazloumi	27	5	3
Dr Dominic McAfee	90	9	7
Dr Phillipa McCormack	624	10	11
Dr Camille Mellin	599	26	51
Assoc Prof Luke Mosley	381	25	49
Professor Ivan Nagelkerken	1535	67	154
Dr Beth Nosworthy	2	3	0
Assoc Prof Melissa Nursey-Bray	330	24	42
Assoc Prof Patrick O'Connor	363	19	29
Assoc Prof Bertram Ostendorf	442	30	70
Dr Jasmin Packer	91	9	9
Dr Alexandra Peralta	17	5	3
Professor Dino Pisaniello	557	35	72

Researcher	No. of Citations	H-index	i10-index
Dr Thomas Prowse	421	21	39
Dr Liz Reed	28	12	14
Assoc Prof Rachel Roberts	831	29	76
Dr Kate Sanders	589	26	45
Dr Abel Santos	668	39	82
Dr Ramesh Raja Segaran	148	6	6
Dr Carolyn Semmler	147	15	16
Dr Ehsan Sharifi	132	12	13
Dr Cameron Shearer	414	26	50
Dr Emma Sherratt	681	23	44
Professor Veronica Soebarto	529	28	66
Dr Yassine Souilmi	114	9	9
Dr Natasha Speight	97	12	16
Professor Nigel Spooner	450	38	82
Professor Christopher Sumby	946	38	91
Assoc Prof Yan Tan	331	26	45
Dr Myall Tarran	57	5	1
Dr Vicki Thomson	84	10	10
Dr Andrew Thornhill	388	22	37
Dr Leigh Thredgold	26	5	3
Dr John Tibby	281	32	65
Dr Jonathan Tyler	532	23	36
Professor Michelle Waycott	1739	49	100
Professor Philip Weinstein	1206	51	205
Professor Seth Westra	1951	41	73
Dr Laura Weyrich	2021	28	47
Professor Sarah Wheeler	792	35	76
Dr Fiona Whelan	34	11	11
Professor Tom Wigley	1947	119	302
Professor Mike Young	162	32	61

Selected 2021 publications

The following list has been complied from Altmetrics and comprises our top 20 publications that have attracted online attention and around the world. Environment Institute researchers are shown in bold type and articles are listed based on their Altmetric attention score.

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