A northern forecast

FINE AND SUNNY, 32°C WITH A CHANCE OF SHOWERS IN THE AFTERNOON. THE LONGER-TERM OUTLOOK IS MOVING IN A NORTHERLY DIRECTION.

"We are all visitors to this time, this place. We are just passing through. Our purpose here is to observe, to learn, to grow, to love, and then we return home."

Indigenous proverb

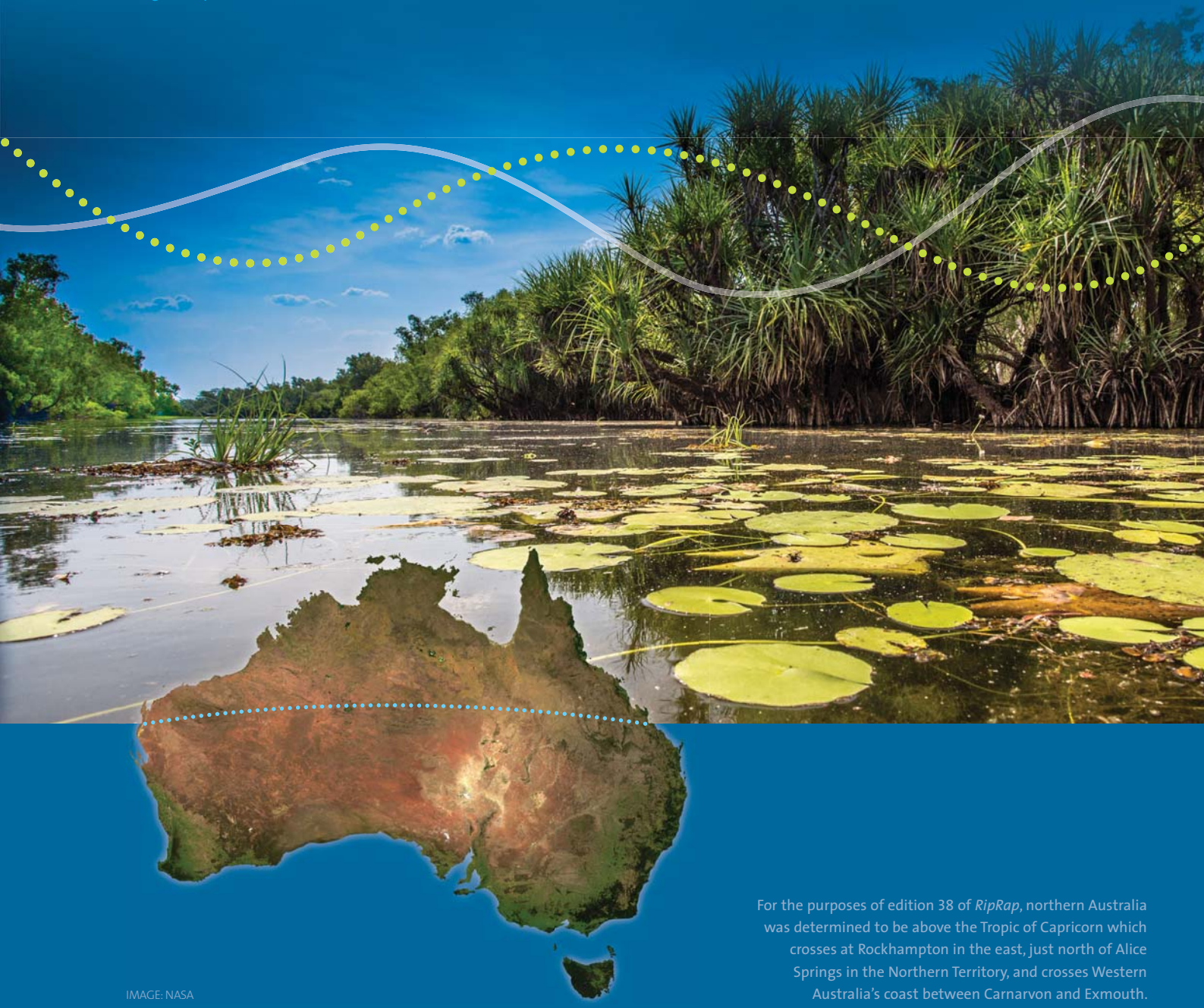

IMAGE: NASA

For the purposes of edition 38 of *RipRap*, northern Australia was determined to be above the Tropic of Capricorn which crosses at Rockhampton in the east, just north of Alice Springs in the Northern Territory, and crosses Western Australia's coast between Carnarvon and Exmouth.

PROFESSOR MICHAEL DOUGLAS IS LEADER OF SEVERAL NORTHERN RESEARCH INITIATIVES (SEE PAGE 5)...

Developing the north has long been a goal of Australian governments. In the mid-2000s, at the peak of the millennium drought, the lack of water in southern Australia led to renewed interest in the seemingly limitless waters flooding from the tropical river systems in the wet season. This interest has continued to grow, and northern development is now a national imperative. Whether it is the need for water to irrigate crops, the need for river flows to support coastal fisheries, or the need to maintain water quality in the face of more intensive development, water is often at the centre of many debates and plans around developing the north.

Northern Australia does hold vast water resources. More than half of all water flowing through Australia's river systems flows through the rivers and tributaries that flood into the Arafura and Timor Seas, or into the Gulf of Carpentaria. Importantly, the rivers of the north are valued for much more than just this potential resource. They have outstanding conservation and cultural values, and are central to the lifestyles and livelihoods of most people living in the north. This is particularly so for the Indigenous people who have been managing these landscapes for millennia, and who continue to rely directly on the wild foods that these rivers systems provide.

...AND A PROLIFIC PHOTOGRAPHER WHO HAS SUPPLIED THE IMAGES IN THIS ARTICLE AND OTHERS IN EDITION 38 OF *RIPRAP*.

Globally, our track record of developing water resources is very poor. Initially seen as limitless, development has often led to over allocation, and this has resulted in degraded river systems requiring billions of dollars to repair. The Murray-Darling Basin is a striking example of this well-worn path, and one that has been repeated in many river basins around the world. In northern Australia there is the potential to do things better. There is still time to get critical information in place to inform good policy, planning and management, before major water allocation decisions are made for most of our northern rivers.

To help avoid a repeat of the problems that have arisen elsewhere, in 2004 researchers became active in trying to build the level of information available to ensure a more sustainable approach to developing the north. Recognition that no single agency has the capacity to tackle the breadth of research needed to do this, led to the formation of new research alliances such as the Tropical Rivers and Coastal Knowledge (TRaCK) consortium, which continues to this day. Involving more than 100 researchers, TRaCK brought an unprecedented level of collaboration and coordination to water research focusing on northern Australia.

The need for research to support and improve decision making has been recognised by the Australian Government which has increased funding for research in the north over the last decade. This support has been bolstered by significant co-investment from the Queensland, Northern Territory and Western Australian governments.

Edition 38 of *RipRap* brings together some of the research carried out by the National Environmental Research Program's (NERP) Northern Australia Hub, as well as from other organisations interested in the north. The articles focus largely on the research related to aquatic ecosystems in this part of Australia, but also feature stories that describe important collaborations between researchers and Indigenous land managers. A number of themes emerge that demonstrate the important contributions of this research.

Picture perfect.

RESEARCH THEMES

New knowledge on the biodiversity of these river systems.

Targeted surveys of fish in the estuaries of Kakadu National Park have uncovered a much greater diversity of species than was known, and long-term fish surveys in the Daly River catchment have revealed new information on seasonal changes in their distribution and abundance.

New understanding of the fundamental ecosystem processes that support this biodiversity.

Research in Kakadu has helped us understand the critical importance of natural flows for maintaining the seasonal movement of sediment transport between the river and the sea—a process that helps to maintain aquatic habitats and connects the river channel with hot-spots of production on the floodplains.

New tools to understand and monitor these systems.

We have learnt to use acoustic and radio tracking combined with stable isotope analysis to understand the movement and feeding patterns of aquatic animals. Rapid surveys of aquatic species (including invasive) using eDNA are being trialled, as well as the development of protocols for camera trapping to standardise terrestrial biodiversity surveys.

New tools and approaches to evaluate social, economic and environmental outcomes of future scenarios and management.

We have also developed new tools to understand the trade-offs of different land and water use scenarios and management actions, including agricultural development in the Daly River catchment and the Gulf, weed management in Kakadu National Park, and grazing management and sediment delivery to the Great Barrier Reef.

The benefits of Indigenous ranger programs and partnerships with Western science.

The articles documenting work in Arnhem Land, the Daly, Cape York and the Kimberley all provide evidence of the wide range of benefits of Indigenous natural and cultural resource management for north Australia's rivers, coasts and catchments.

New partnerships to improve planning for development and management of rivers and catchments across northern Australia.

New alliances are forming to create a broader dialogue around the future of northern Australia, including the Kimberley to Cape initiative and other organisations such as The Wilderness Society lending their perspectives about how we need think carefully about any decisions we make in the region. The articles in edition 38 of *RipRap* also highlight the great benefits for all parties that arise when Indigenous land managers and Western scientific researchers work in partnership to implement and evaluate bio-cultural management.

Although not elaborated in any of the articles, research infrastructure and capacity has benefited enormously from the continuity of funding across the past decade. This has not only allowed for a structured assessment of long-term trends, but also led to the follow up of research questions arising from initial projects. Perhaps most importantly, it has led to the increase in capacity for doing research in northern Australia, including the training of students and early-career researchers, the development of long-term partnerships among researchers and land managers, and the capacity and soft infrastructure to manage successful research programs.

This decade of sustained research funding has led to a dramatic increase in the knowledge base and evidence available to underpin improved planning, management and policy in northern Australia. We have learnt a great deal about the environment, the people and the values of the regions's catchments and rivers. This research is now being used to improve the management of the north. We have also learnt much about doing research in this region, including the benefits of a coordinated, interdisciplinary, issues-driven approach that makes use of Western science and Indigenous knowledge in collaborative partnerships.

There is still more work to be done. The vastness and remoteness of the region, the low baseline level of scientific knowledge, and the relatively recent focus on research in this region, means that we have only scratched the surface and we need to continue our investment in new knowledge about this amazing part of Australia.

FOR FURTHER INFORMATION

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We are fortunate that the lessons from this past decade are being applied in the design and delivery of the newly-established Northern Australia Environmental Resources (NAER) Hub. This is one of six hubs funded by the Australian Government's six-year National Environmental Science Programme (NESP). The NESP NAER hub will focus on research to support the sustainable development of northern Australia's environmental resources. It will include a strong focus on the sustainable use of water resources, and will engage the TRaCK consortium partners in delivering the research program.

We are delighted that a new phase of research into northern Australia is building on the findings highlighted in edition 38 of *RipRap*. This ongoing investment is timely as it follows the release of the Government's White Paper on developing northern Australia. It is also a well-timed reminder that while research has the potential to improve development and management of this region by providing the information to support policy, planning and management, there has to be the political will to make use of this information. Sound decision making underpinning a strong evidence base will be critical for achieving a sustainable future for northern Australia.

We appreciate the opportunity to have the Australian River Restoration Centre (ARRC) feature the work we are doing and hope that the articles and stories inspire those interested in the research being done in Australia's rivers, whether they are down south or in the Top End.

FUNDING MECHANISMS

The Australian Government is committed to realising the potential of northern Australia, funding a range of multi-disciplinary research in the region over the last decade. Significant research outcomes include the former Land & Water Australia's Tropical Rivers Program, and the former National Water Commission's North Australia Water Futures Assessment and Northern Australia Sustainable Yields study. Science to support decision making in the north has also been delivered through the Australian Government national environmental research programs.

The TRaCK hub was one of six operating under the Commonwealth Environmental Research Facilities between 2005 and 2011. It focused on improving research needed to sustainably manage Australia's tropical rivers and coasts. As part of NERP, and operating from 2011 to June 2015, the Northern Australia hub—one of five multi-disciplinary cohorts—provided science to improve biodiversity conservation and management in northern Australia. Australian Government research investment builds on these initiatives through the NESP, with six hubs funded to 2021. The Northern Australia Environmental Resources Hub will deliver research that connects scientists, policy makers and communities, working collaboratively towards sustainable development in northern Australia.

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The NERP articles in edition 38 of *RipRap* have been brought together by Briena Barrett and Jaana Dielenberg.