



Top End wetland, photo Michael Douglas.



Northern Australia
Environmental
Resources
Hub

National Environmental Science Programme

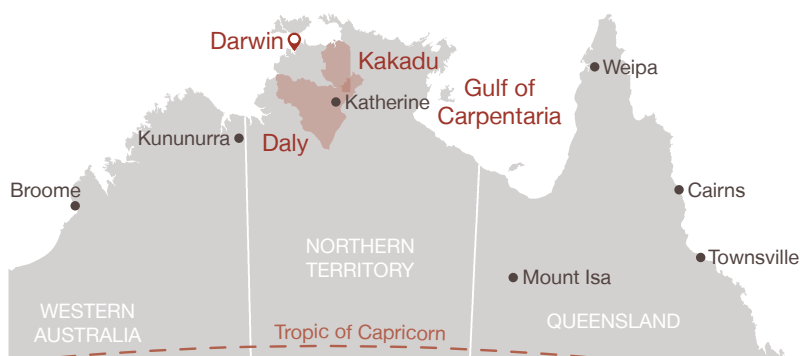
Research overview

Top End

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Our regional focus

In the Northern Territory, our research focuses on the Daly River catchment, greater Darwin region, Kakadu National Park and the Gulf of Carpentaria. Across much of this region, tropical invasive weeds and fire are key research priorities, as well as improving survey and monitoring methods through the use of environmental DNA. In the Kakadu region, our research is informing risk assessments to assist with rehabilitation of the Ranger Uranium Mine, and we are working closely with Traditional Owners to undertake action-research partnerships to address their priorities. In the Gulf, we are investigating the devastating mangrove dieback that occurred in 2015–16. In the Daly catchment, we need to know how much water can be made available for agriculture development without exposing the river's unique aquatic ecosystems to significant risk. Other Hub research across northern Australia, on topics such as Indigenous land management, threatened species and carbon, is also generating information to support the management of environmental resources in the Top End.



What is the Northern Hub?

The Northern Australia Environmental Resources Hub supports sustainable development in northern Australia and is assisting decision-makers to understand, use, manage and safeguard northern Australia's outstanding natural environment through world-class science. Current research focuses on:

- Landscape-scale studies covering savanna and freshwater ecosystems and biodiversity.
- Land and water planning for new developments, e.g. agriculture and infrastructure.
- Indigenous land management including Indigenous Protected Areas.

The \$24 million Hub collaborates with government, Indigenous, environment and industry bodies. Projects build on past work by the Tropical Rivers and Coastal Knowledge research hub and the National Environmental Research Programme, and link with other research in the region.

Environmental water needs for the Daly River

The amount of water in the Daly River, particularly during the dry season, as well as the timing of flow and flood pulses in the wet season, are important for supporting the river's health, including the fish and turtles living there. This project is determining the water requirements of key environmental assets within the river and improving our capacity to predict the impact of current and future water allocations. The outcomes are informing water allocation planning, water management and fisheries management.

Fire and weeds in the Top End

Weed invasion, land clearing and changed fire regimes have the ability to significantly alter ecosystem processes across northern Australia. This project is drawing on existing information about the combined impacts of these threats and collecting additional data to model fire behaviour and scenarios of altered ecosystem function over the next 30 years in the Darwin and Daly regions. It is also developing remote sensing methods to map areas of high biomass grass invasions across the north. This information is critical to land use planning and management to predict, and hopefully prevent, ecosystem failure.

Informing closure and rehabilitation of the Ranger Uranium Mine

Three projects are working with the Australian Government's Supervising Scientist to improve ecological knowledge within and downstream of the mining lease. One project will quantify how riparian vegetation along Magela Creek depends on groundwater and couple this information with new data on the sensitivity of riparian vegetation to magnesium sulfate. Another project is investigating fish movement in Magela Creek and its floodplain and whether magnesium sulfate may affect this. Both these studies will inform risk assessments of the potential impacts of mine-related contaminants. A third project is assessing how animals are recolonising revegetation sites and informing closure criteria for successful ecosystem rehabilitation of the mine.

Indigenous natural resource management in Kakadu National Park

Traditional Owners have a widely recognised role in environmental management in Kakadu National Park. Since the park was declared, it has been jointly managed by Bininj/Mungguy and Parks Australia. While this management structure facilitates shared decision-making and prioritises an exchange in knowledge, skills and information, there is room to bring the interests of Kakadu's Traditional Owners, park managers and the public into closer alignment. This project has identified

and is now implementing action-research projects to support Indigenous natural resource management in Kakadu National Park.

Managing savanna riparian zones

Riverbank vegetation supports important ecosystem, economic and cultural values. It is however vulnerable to pressures such as invasive plants, feral animals and fire, which can be compounded by new development. The project is using case studies in Kakadu National Park and the West Kimberley to deliver improved knowledge on the role of riparian zones in supporting savanna systems, and on where resources could be directed for improved riparian health.

Developing eDNA methods for tropical waters

Analysing environmental DNA (eDNA) is a relatively new technique for detecting the presence of species from DNA left from hair or skin, etc, which has many advantages over traditional monitoring, such as increased efficiency and safety. This project is developing eDNA technology for aquatic environments and trialling field methods for several species of conservation and management significance through case studies across north Australia. It aims to significantly improve the efficacy of field surveys and monitoring, hence providing a cost-effective tool to dramatically improve our knowledge and management of aquatic biodiversity in northern Australia.

Trialling eDNA methods to assess terrestrial biodiversity in data-poor areas

The project is investigating the use of eDNA as a reliable and cost-effective method to sample key animal species in the Top End that are difficult or expensive to detect using conventional survey techniques. The concept is being initially tested for the threatened Gouldian Finch, with field validation using water samples from billabongs where the abundance of the species is intensively monitored. Researchers will compare eDNA test performance against existing survey methods under a major government program assessing biodiversity values in remote, data-poor regions, allowing both validation and an assessment of cost-effectiveness and potential complementarity.

Knowledge brokering for Indigenous land management

This project is supporting Indigenous land managers to strengthen their use of scientific and Indigenous knowledge for improved environmental and land-use decision-making. Collaborative case studies in WA's Fitzroy River Catchment and with Waanyi Garawa Traditional Owners in the NT are designing and testing Indigenous-driven knowledge-

exchange tools and approaches which, together with input from other Indigenous knowledge case studies, will inform “Our Knowledge Our Way” guidelines.

Assessing mangrove dieback in the Gulf

One of the worst mangrove dieback events ever recorded occurred along more than 1000 km of coastline from Limmen River (NT) to Karumba (Qld) during the 2015/16

wet season. This project is surveying, describing and analysing the exact extent and condition of the dieback. It is also examining the patterns, trends and likely causes of dieback, and local Indigenous rangers are being trained in quantitative mangrove assessment and monitoring methods. The project will provide recommendations for recovery, potential intervention, future monitoring and further studies.



Fieldwork in the Daly, photo Krystle Keller.

Other projects relevant to the Top End

Northern Australia environmental flow needs – synthesis project

Previous and current Hub research is quantifying the ecological responses to changes in flow regimes in rivers across northern Australia such as the Fitzroy, Daly and Mitchell. This project is evaluating how transferable these relationships are to other locations and scales, and identifying the key factors that water planners need to consider when applying this knowledge. Project outputs will be targeted to underpin sustainable water resource management in northern Australia.

Guiding non-government investment in Indigenous resource management enterprises

This research will investigate the performance motivations and the monitoring and assessment requirements of key non-government investors in Indigenous cultural and

natural resource management (ICNRM) enterprises. It will identify investor needs, and options to meet these, to help practitioners articulate ICNRM benefits in investor-friendly ways, showcase the multiple benefits, reduce monitoring loads by aligning needs, and support more non-government investment in ICNRM.

Savanna carbon sequestration method

By accounting for carbon stored in dead grass, leaves, twigs and coarser woody debris, as well as the non-CO₂ greenhouse gases, we can better quantify the value of improved fire management to greenhouse gas abatement. This has the potential to increase the incentive for land managers to adopt improved fire practices by allowing them to earn additional carbon credits. This project is improving our ability to calculate the carbon benefit in dead organic matter from changed fire regimes in lower-rainfall savannas across northern Australia.

Prioritising threatened species in northern Australia

This research will guide improved management and investment to bolster threatened species recovery in high-priority areas of northern Australia. The team is modelling and mapping the distribution of threatened species, and the pressures on these species, across the north. This can be used to help prioritise investment and to inform assessments for future development. The project team will provide guidelines and training so models and maps can be updated and applied in everyday management activities.

Multiple benefits and knowledge systems of Indigenous land and sea management programs (ILSMPs)

As well as generating environmental benefits, ILSMPs generate many social, cultural and economic benefits. While we can clearly value some ILSMP benefits, we lack information to value many of the less tangible benefits, for example those relating to culture or to whole communities. This project is providing quantified or comparable data about these co-benefits of ILSMPs, with case studies in the Kimberley and north Queensland.

Multi-objective planning in northern Australia

Planning approaches that explore multiple alternative uses of land and water can help overcome tensions generated by development proposals in northern Australia. This project is using participatory scenario planning to explore different development pathways and their consequences. The project will help to build shared understandings of what is happening, understand what changes could happen and their positive and negative impacts, create an opportunity to develop connections, and facilitate group learning about strategic planning to support decisions about future land-water uses. It's being applied in WA's Fitzroy River catchment and is transferable to other areas in northern Australia and beyond.

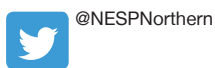
Completed projects relevant to the Top End

Please see the project wrap-up factsheets on our website for information on

- Investigating the role of feral cats in small mammal decline
- Lessons and protocols for Indigenous fire management partnerships
- Waste and marine debris in remote northern Australian communities
- Remote environmental monitoring techniques
- Research priorities for the north's Indigenous Protected Areas
- Supporting development decision-making in northern Australia



Kakadu floodplain, photo Michael Douglas.



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For further information, including our North Queensland and West Kimberley factsheets, visit nespnorthern.edu.au or contact Clare Taylor (clare.taylor@cdu.edu.au, 0405 730 999 or 08 8946 7476).



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