
Hub

Northern Australia Environmental Resources

Case study title

Remote environmental monitoring in northern Australia

Project number(s) & project title(s)/or Hub activity

Project 4.1 Remote environmental monitoring in Northern Australia – scoping research needs (12mth review project, complete)

Short version

Accurate, cost-effective and well-designed environmental monitoring is critical to support development in northern Australia but is challenged by severe resource and logistical constraints. This project explored emerging technologies that could mitigate these. Working with monitoring experts and users, the research reviewed the current use and potential future use of emerging technologies and techniques to identify the best ways forward and the research needed to more fully utilise priorities. The information generated has been used by organisations who undertake monitoring in northern Australia to improve their processes and on-ground work, and has informed further research on environmental DNA, an exciting new tool that may revolutionise environmental monitoring across northern Australia and beyond.



Surveying for aquatic species using eDNA technology (photo Damien Burrows).

Narrative

Despite being unsatisfied or unsure about how well current environmental monitoring meets monitoring objectives, most people undertaking environmental monitoring in northern Australia are positive about new techniques improving their monitoring outcomes. Based directly on user and expert input, this project identified priority emerging environmental monitoring technologies and techniques, as well as the research needed to refine them for widespread use. Project participants paid particular attention to overcoming challenges of undertaking environmental monitoring in northern Australia such as wet season inaccessibility, safety hazards (e.g. crocodiles) and of course the remoteness and sheer size of the region.

The project reviewed a range of emerging monitoring techniques and technologies and identified those with a high relevance:research-effort ratio, meaning they are very relevant for use in northern Australia despite, in some cases, needing significant research before widespread use. These priorities include satellite remote sensing, drones and genetic techniques.

The project has provided useful information for government agencies, environmental consultants and researchers alike. For example, Queensland Government scientists have used the monitoring reviews to inform their work in statewide river health monitoring and in the Hub's project on the Mitchell River catchment (e.g. more informed satellite imaging techniques and more informed otolith work). For Northern Territory scientists, the project has stimulated thinking and better defined important gaps in for example storing large data sets, integrating data and in sonar technology needs.

The project's prioritisation work has also informed the identification and scoping of two NESP NAER Hub projects focusing on environmental DNA (eDNA). The use of eDNA for species detection is leading-edge technology that has the capacity to generate practical outcomes for immediate application. eDNA is DNA released by an animal into its aquatic environment via hair, skin, eggs etc. This DNA only lasts a short time before it is broken down so if water, sediment or soil samples taken from waterways contain this DNA, the species recently present in the area can be identified. In other words, surveying an aquatic field site may be as easy as collecting a water sample! The technique has enormous advantages over traditional monitoring including greater time and cost-efficiency, improved safety, increased accuracy and targeted detection e.g. of a rare species or new pest species. The information generated from eDNA surveys can be used to inform planning processes, impact assessments, development decisions and compliance monitoring, meaning its potential to facilitate improved environmental outcomes is enormous.

The 'Developing e-DNA methods for tropical waters' project is working at different field sites across the north to develop and test eDNA probes for key aquatic species, improve sampling and transport methods and answer management questions. The 'Trialling eDNA methods to assess terrestrial biodiversity in data poor areas' project is developing a test for the threatened Gouldian finch as a proof of concept, which is now being trialled in aviary studies. Following this, researchers will test waterhole samples and compare test performance against existing survey methods under the NT Government's \$10M "Mapping the Future" program, allowing both validation and an assessment of cost-effectiveness and potential complementarity.

Research outputs

[Remote environmental monitoring in northern Australia: Scoping key research needs \(final report\)](#)

[Remote environmental monitoring in northern Australia: Scoping key research needs \(wrap-up factsheet\)](#)

[Developing eDNA methods for tropical waters \(start-up factsheet\)](#)

Attributions

This project was led by Dr Alison King, Research Scientist at CDU, supported by Damien Burrows (JCU), Graeme Gillespie (NT DENR), Doug Ward (Griffith Uni) and Jon Marshall (Qld DES). Other experts and research users contributed their expertise and knowledge to the desktop reviews (48 respondents) and workshop on new and emerging environmental monitoring techniques, which was attended by 40 people from government and non-government organisations across northern Australia.
