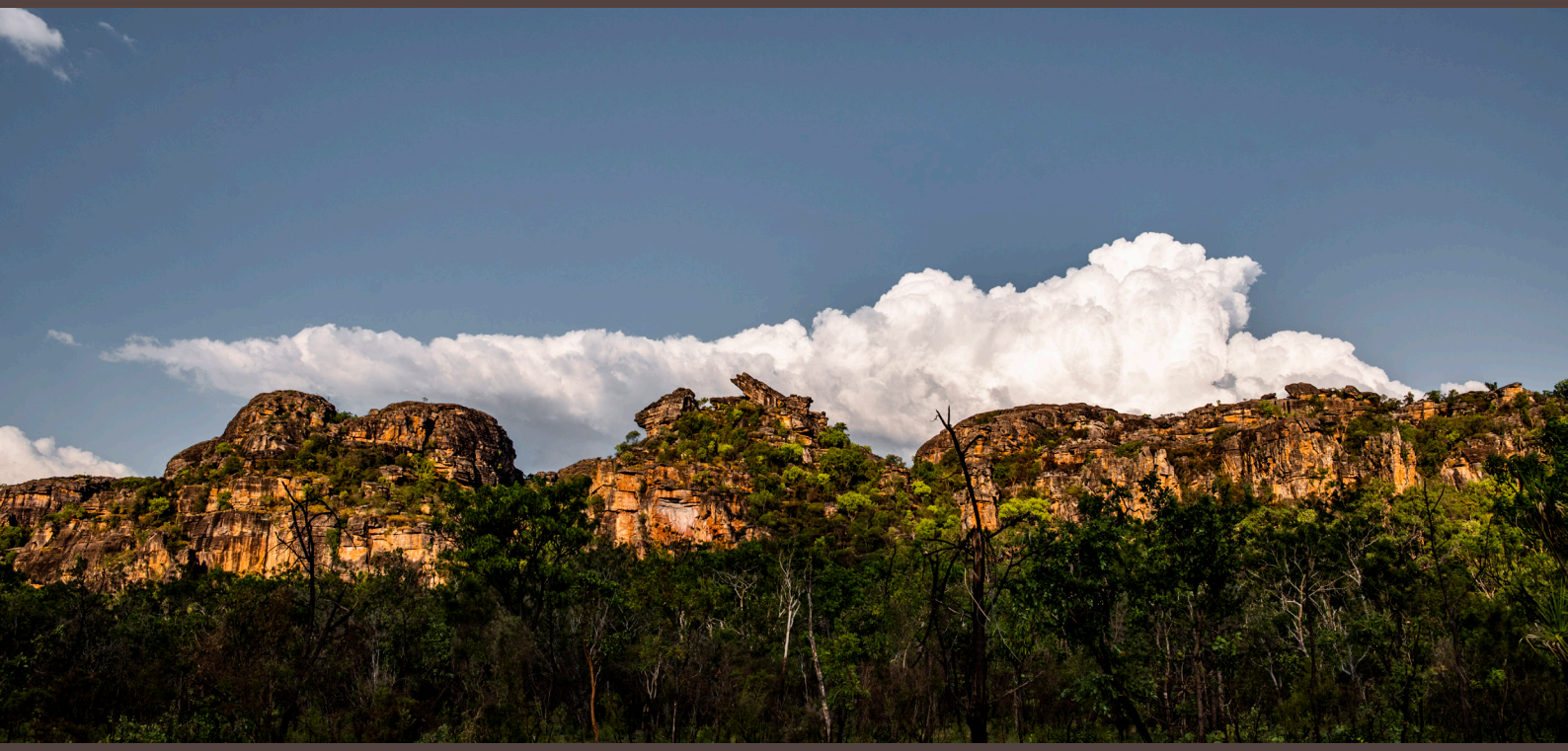
Northern Australia Environmental Resources Hub

National Environmental Science Programme



2019 Annual Report

Australian Government

National Environmental Science Programme

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Cover photographs

Front cover: Kakadu National Park (photo Patch Clapp).

Back cover: Prawn trawler in Karumba, Qld (photo Michele Burford).

This report is available for download from the NESP Northern Australia Environmental Resources Hub website: nespnorthern.edu.au

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Contents

List of tables

Annual Progress Report 5

Northern Australia Environmental Resources Hub
National Environmental Science Program
Annual Progress Report 5
1 January 2019 – 31 December 2019

Hub name: Northern Australia Environmental Resources
Host organisation: Charles Darwin University
Key contact: Professor Michael Douglas (UWA)
Contact email address: michael.douglas@uwa.edu.au
Other consortium partners/subcontractors/research organisations:

- University of Western Australia
- James Cook University
- Griffith University
- CSIRO
- NAILSMA
- NT DENR
- Qld DES
- WA DBCA

Hub Leader certification

As Hub Leader, I certify that I have taken adequate steps to reasonably assure myself that:

- each required report component is attached;
- the contents of each component of the report is complete and accurate in all material respects;
- funds have been used for the purpose for which they were provided and all funding conditions have been met, recipient and other contributions have been received, and appropriate oversight has been maintained of Hub projects, their progress, performance and budgets during the reporting period;
- all relevant risks to project delivery have been notified to the Department in this and previous reports and that appropriate steps are being taken to manage those risks;
- the Hub and its sub-contractors have current workers compensation and public liability insurances, as required under the Funding Agreement; and
- any carryover of project funds have been allocated to projects in the next reporting period or financial year in accordance with the approved Research Plan or funds identified for refund to the Department.

Signed: 

Hub Leader Name: Professor Michael Douglas
Date: 11 May 2020

Hub Steering Committee Chair certification

As steering committee chair, I certify that any issues of concern or matters raised during steering committee meetings where the draft progress report was discussed have been adequately resolved, amended or incorporated into the final report submitted to the department.

Signed: 

Hub Steering Committee Chair Name: John Childs

Date: 11 May 2020

Letter from the Hub Leader

I am pleased to submit the Annual report for the NESP Northern Australia Environmental Resources Hub for 2019.

The Hub has an exciting portfolio of projects that is delivering a diverse set of research outputs for our policy and management partners. Currently the Hub has 32 active projects (including 7 synthesis projects) underway across northern Australia – in the Kimberley, Top End, Gulf of Carpentaria and Cape York Peninsula. The Hub has an additional 15 completed projects. More information available on the project pages on our website. The program has now allocated all of its research funds of $19.2 million and we are in a very sound budgetary and financial management position in the final stages of the program's lifecycle, notwithstanding the impact of Covid-19 (see below).

In a region with little existing baseline data and a highly variable wet season, and in an era when so many other studies are 'desktop', the fact that many Hub projects are collecting multiple years of field data is significant. This work is already starting to contribute to both on-ground management and policy outcomes and will continue to do so for many years to come.

We scoped the majority of our projects with a direct line of communication to relevant policy areas of federal, state and territory governments, and this is having significant benefits for the uptake of research outputs. Engagement with Australian Government's Departments of Agriculture, Water and the Environment (DAWE), and the Prime Minister and Cabinet has been impressive across many of our projects. The rewards of this approach were evident earlier in 2019 when we presented some of our work in Canberra with great feedback. Hub researchers and partners travelled from far and wide to present project findings at the Canberra Research Forum.

We presented at the Department of the Prime Minister and Cabinet and at the Department of Agriculture, Water and the Environment – sessions included videos and perspectives from research users, and these were followed by lunchtime discussions and targeted afternoon meetings. The forum received excellent feedback – there is a short video available of highlights of the trip and a collation of follow-up resources including presentations, films and factsheets. It's clear the Hub is delivering relevant, on-target work and is on the right track to do more.

With projects entering into their final phases, the focus for new activity in 2019 shifted to research synthesis. In 2019, we commenced 7 synthesis projects with the following key features:

- Synthesis of project findings across topics and focus regions
- Transferability of project outputs to other regions
- Development of web-based products and tools for management

The projects are as follows:

- Savana burning and biodiversity
- IPAs and biodiversity
- Kakadu cultural connections
- Gamba grass web resource project
- Mitchell River catchment story
- Kakadu floodplain synthesis
- Integrated assessment for environmental decisions

Our investigation of the *Multiple benefits of Indigenous land and sea management programs* has shown that Indigenous ranger programs and other land and sea management programs contribute to business development, promote economic independence, improve people's wellbeing and support Indigenous communities to reach their own goals. Also, three reports from our *Rehabilitated minesites and Top End animals* project are now available – these look at invertebrate and vertebrate fauna assemblages at revegetation sites at the Ranger uranium mine, and make recommendations for monitoring.

We have had significant media interest in four of our projects – *Developing eDNA for Top End animals*, *Bininj/Mungguy healthy country indicators to monitor Kakadu National Park*, *Rehabilitated mine sites and Top End animals* and *Assessing mangrove dieback in the Gulf of Carpentaria*. These projects highlight how innovative approaches can help overcome some of the challenges that remoteness, climate, small populations and large aquatic predators place on scientists and land managers in northern Australia. Rangers using artificial intelligence (AI) technology in Kakadu National Park generated significant national and international interest that has been a highlight.

The *Developing eDNA for Top End animals* team have been the first to demonstrate that eDNA techniques can be successfully used to trace an endangered terrestrial species (the Gouldian finch). Future development of eDNA approaches for other species that are rare, cryptic or elusive could greatly improve our knowledge of their distribution across the north.

The *Rehabilitated mine sites and Top End animals* research has produced templates for setting specific targets for the animals expected to be found on rehabilitated mine sites in northern Australia. The approach provides guidance for rehabilitation managers on which species to select for monitoring, their attributes to be assessed, the type and number of reference sites to choose, and ensuring that sampling methods are repeatable and robust.

The *Assessing mangrove dieback in the Gulf of Carpentaria* project has continued to expand upon surveys of mangrove recovery following the 2015 dieback event. Researchers found that two-metre tall rafts of dead mangrove wood are piling up on the landward side of the mangroves. As these piles of logs drift back and forth on the tide, they kill or seriously damage new seedlings and stall mangrove recovery.

We have a new Hub project that is trialling a revised fauna monitoring program for Kakadu National Park focused on detecting and reporting trends in wildlife populations.

There has also been uptake of our Fitzroy River ecological and cultural water requirements work in the Western Australian Department of Water and Environmental Regulation water allocation planning process, that has included workshops with water planners and data analysts.

In July, I attended the 2019 Developing Northern Australia Conference in Karratha, WA, where I facilitated a panel discussion on integrated environmental assessments and development in the north. The panel brought together Traditional Owners, agriculturalists and academics, including representatives from the NESP Northern, Threatened Species Recovery, and Tropical Water Quality Hubs.

The Hub also had booths and presented at the 2019 Riversymposium and Ecological Society of Australia (ESA) conferences. Co-presentations with Traditional Owners at the ESA conference emphasised our priority of engaging Aboriginal people in northern Australia as partners in research beyond the life of project funding cycles. Hub researchers working on gamba grass control in both Cape York and the Top End also presented their research at a two-day workshop in Cairns.

Regular and informative communication with the people who most need and want the data from our projects is central to the way the Hub goes about its work. We create a range of outputs tailored to the needs of our research users, underpinned by the high-quality data generated through our research.

Our team working on *Environmental water needs for the Mitchell River* will use the Queensland Government's WetlandInfo Catchment Stories, a visual mapping and story-telling platform, as an engaging way to share their research with a broad audience of Traditional Owners, land managers, policy-makers and other researchers. The *Knowledge brokering for Indigenous land management* team has completed the 'Our Knowledge, Our Way Guidelines' as an Indigenous-led resource that Traditional Owners and ranger groups can use so that research on country is done the right way, for their benefit and in ways that they want it to be used. We expect that the release of these guidelines will be a highlight in the next 6 months.

Collaborative research in Kakadu National Park has fostered productive relationships among Traditional Owners, researchers, park managers, Indigenous rangers and Microsoft. This project has achieved great outcomes in monitoring Indigenous indicators of healthy country as well as successful trials of floodplain weed management and was able to demonstrate these on-ground impacts to Minister Sussan Ley when she visited Kakadu in mid-2019.

In 2019, we employed Dennis Cooper as our Kakadu Indigenous Research Coordinator to help with coordination and communications. This position means we now have Research Coordinators across the north in the Kimberley, Top End and North Queensland.

In 2019 the K&A team produced a wide range of products, and we will be increasing our focus on communicating project outputs, and increasing our media presence:

- 17 project factsheets (start-up, wrap-up and project updates)
- 5 project reports
- 7 case studies on research impact
- 1 annual report
- 3 newsletters
- 7 videos
- 1 photo booklet
- 46 news articles
- 20 Northern Hub research/people profiles
- 4 project webpages
- 85 Facebook posts
- 99 Tweets

Our Hub Steering Committee (HSC) continues to provide strong support and guidance to the program. In 2019, the HSC met on three occasions and in August undertook a field trip to north Queensland where we visited Normanton, Karumba, Cairns, Mareeba and the Mitchell River headwaters. We were joined by local and regional NRM staff who were able to hear directly from researchers involved with our projects. Changes in the branch structure at DAWE, where the NESP is located, may result in changes to HSC membership in 2020.

While we achieved substantial progress in 2019, more recently the immediate future of the program has been overtaken by the impact of the Covid-19 crisis.

On 13 March 2020, we wrote to the Commonwealth requesting an extension to the final deadline for the NESP Northern Australia Environmental Resources Hub to 31 December

2021. We believe that the Hub will face significant difficulties in completing a number of projects this year because of the likely impact of Covid-19.

A lot of our activity planned for 2020 involves bringing groups of people together for meetings, workshops or joint fieldwork. We do not believe that it is appropriate for researchers to visit Aboriginal communities and risk bringing coronavirus to them. The impact of coronavirus could potentially be severe in remote communities. Overcrowding, pre-existing medical conditions, poor local health services and remote access to major health centres are major issues.

Restrictions on interstate travel, organised gatherings and travel to remote Indigenous communities have been put in place by state governments, research institutions and Indigenous organisations, and will affect all of our active projects.

These restrictions affect the collection of data for 61% of our projects, Indigenous engagement requirements or agreements for 71% of our projects and face-to-face reporting or other research user engagement activities for 92% of our projects.

The need to postpone data collection for 71% of our projects has the potential to significantly affect the completion of these projects. The highly seasonal nature of the environments in northern Australia means that a delay of 6 months may mean a missed wet season sampling event that could require a 12-month extension to ensure completion of the original project deliverables.

In a relatively small number of projects, the research is undertaken exclusively by staff on continuing appointments who could resume activity and complete projects when restrictions are eased. For the vast majority of our projects, essential work in the late stages of the projects is being undertaken by staff who have been contracted specifically for this NESP research.

Depending on how long restrictions are in place, it is unlikely that contracts for these staff could be extended within the current resources of the projects to ensure completion of the deliverables. It is not possible at this stage to estimate how many projects are in this situation until we have more certainty around the length of the current restrictions. For these projects, it is highly likely that the outputs and deliverables will need to be revised (scaled back) unless additional time and in some cases funds are available. Following advice from the Department, we will be able to assess the full range of impacts and plan our response.

I am pleased to submit the Annual Report for the NESP Northern Australia Environmental Resources Hub for 2019.

Michael Douglas
Hub Leader

Research

Progress towards outcomes

From the Kimberley to Kakadu and across to Cape York, the Hub is undertaking research to support the sustainable development of Australia's unique northern environments. The Hub's research is delivering new knowledge, tools and partnerships to inform practical solutions as the region responds to the northern Australia development agenda.

Over 2019, the Northern Australia Environmental Resources Hub made substantial progress towards delivering its objectives and outcomes. The Hub is partnering with governments, communities and industry to improve the capacity to manage and monitor Australia's unique northern environments. The Hub's research is supporting sustainable development in northern Australia and informing practical solutions to the region's major environmental challenges. Research is focusing on:

- landscape-scale studies covering savana, rainforest and aquatic ecosystems and biodiversity
- new knowledge to support land and water planning for urban, agricultural, and infrastructure development
- improving and supporting Indigenous land management including Indigenous Protected Areas
- underpinning management effectiveness in Kakadu National Park

Some key outcomes achieved in 2019 include:

- Regular and informative communication with the people who most need and want the data from our projects is central to the way the Hub goes about its work. We produced a range of outputs tailored to the needs of our research users, underpinned by the high-quality data generated through our research. For example, the *Prioritising threatened species across northern Australia* project provided a user guide for prioritising threatened species and threatening processes across northern Australia, and the *Assessing mangrove dieback in the Gulf of Carpentaria* project produced an Indigenous ranger field guide for shoreline assessment of mangrove dieback in the Gulf of Carpentaria.

- Research productivity increased in 2019, particularly peer-reviewed publications (and importantly) citations of NAER published research, as well as published datasets that are now available for research users and state and territory agencies.

- We held a Canberra Research Forum to present project outcomes to relevant policy areas of the Commonwealth, including the Department of the Prime Minister and Cabinet and the Department of Agriculture, Water and the Environment – sessions included videos and perspectives from research users, and these were followed by policy discussions and targeted meetings. The forum demonstrated the benefit of personal interaction with policy-makers and program managers, and members of the senior executive service, who have a direct interest in the uptake of research outputs.

- The Indigenous session on day 1 in Canberra showcased key NAER Indigenous research projects with reflections from Indigenous partners who travelled from the Kimberley, and a number of short films were shown that have been co-produced with West Kimberley Traditional Owner Mervyn Street. On the second day there was good sharing of multi-disciplinary research (mangrove dieback; fire management for carbon farming) and the data-rich interactions of the threatened species and threatening

processes project (3.3) with the Environmental Resources Information Network (ERIN).

- Two important projects were completed. Our investigation of the *Multiple benefits of Indigenous land and sea management programs* has shown that Indigenous ranger programs and other land and sea management programs contribute to business development, promote economic independence, improve people's wellbeing and support Indigenous communities to reach their own goals. Also, three reports from our *Rehabilitated minesites and Top End animals* project are now available – these look at invertebrate and vertebrate fauna assemblages at revegetation sites at the Ranger uranium mine and make recommendations for monitoring. The approaches and standards developed in this project will be transferable to other mine rehabilitation projects.

- We have had significant media interest in four of our projects – *Developing eDNA for Top End animals*, *Bininj/Mungguy healthy country indicators to monitor Kakadu National Park, Rehabilitated mine sites and Top End animals* and *Assessing mangrove dieback in the Gulf of Carpentaria*. These projects highlight how innovative approaches can help overcome some of the challenges that remoteness, climate, small populations and large aquatic predators place on scientists and land managers in northern Australia. The healthy country indicators project attracted national and international attention because of the partnership between Kakadu Traditional Owners, NESP and Microsoft on the use of artificial intelligence to map floodplain health.

- In 2019, we commenced 7 synthesis projects as follows:

    - Savana burning and biodiversity
    - IPAs and biodiversity
    - Kakadu cultural connections
    - Gamba grass web resource project
    - Mitchell River catchment story
    - Kakadu floodplain synthesis
    - Integrated assessment for environmental decisions

Our research priorities are structured under 6 broad research themes including:

Theme 1: Ensuring that the development of northern Australia minimises the risks to the region's environmental resources focuses on research that will help decision-makers assess and plan for development in northern Australia in ways that will ensure that development likely to occur is undertaken in a way that minimises the risks to the region's environmental resources. The overarching focus of the Hub is on research to support sustainable development. Our research is located in areas where future development is more likely to occur, including 3 key regions across northern Australia – the Fitzroy River in the Kimberley, Daly River in the NT, and Mitchell River in Cape York and Gulf of Carpentaria.

Research in the Daly River region of the Northern Territory is now publishing outputs that support water resource planning, by demonstrating the flow-related relationships to key species such as barramundi and pig-nosed turtle. In the Fitzroy valley in the Kimberley, 4 inter-related projects are supporting land and water planning with the support of the WA Government. A number of successful planning meetings for projects 1.3.3, 1.5 and 1.6 were held in 2019 with government, Indigenous and pastoral stakeholders, and bio-cultural data was incorporated into Western Australian Department of Water and Environmental Regulation (DWER) water allocation planning processes. In north Queensland, fieldwork continued to better understand the relative importance of rivers flowing into the Gulf of

Carpentaria, particularly for prawn and barramundi fisheries. A synthesis project to prepare a Mitchell River catchment story, as part of the Qld Government's online Wetlandinfo also commenced in 2019.

This research is helping to predict the likely consequences of development, and to inform planning and management practices that will minimise the risks to environmental resources.

Theme 2: Improving the management of threats to environmental resources in northern Australia recognises that large areas of northern Australia are unlikely to be suitable for intensive development, but these areas still face major threats to environmental resources and research can help to improve how we manage and respond to those threats. In these areas, research is needed to determine the impact of natural stressors (e.g. climate) and current management regimes (e.g. fire, weed and feral animal management) to underpin improvements in on-ground management, to better understand how we can predict ecosystem failure (and to help prevent it from occurring).

Fieldwork on control mechanisms for feral pigs on aquatic ecosystems on Cape York is well advanced and our work on managing the threat of gamba grass in the NT has been expanded to also look at emerging issues in north Queensland. This included a stakeholder workshop in August 2019 on Cape York, and development of a herbicide trial with Biosecurity Queensland. Threats to riparian zones are being examined in the Kimberley, Daly and Kakadu regions, with guidelines for management being developed that address weeds, fire and changed land use.

Theme 3: Developing practical approaches for managing threatened species and threatening processes in northern Australia is focussed on developing practical approaches to manage threatened species and threatening processes in northern Australia. Research is needed to help identify high-priority areas to target threat abatement and species recovery investments and to develop and trial practical methods for on-ground management for the recovery of identified threatened species.

A major project on prioritising threatened species and threatening processes across northern Australia has been producing maps and communication products, including a draft user guide, that have been shared with a range of federal, state and territory research users, with this project to be concluded in early 2020. In Kakadu, research on small mammal declines has moved from cat predation to look at other landscape-wide factors, such as fire and vegetation management.

We also commenced synthesis projects in 2019 on the *Impacts of savana burning on biodiversity*, and a *Gamba grass web resourc*e that integrates knowledge on gamba grass for land managers.

Theme 4: Developing approaches for monitoring environmental resources in the northern Australia recognises that an important part of the management of environmental resources is being able to monitor changes and trends in their condition. Northern Australia presents some novel challenges for monitoring given the remoteness and limited specialist skills base within the region, and research is needed to demonstrate better ways to measure environmental drivers, pressures, stressors and responses in northern Australia, including approaches to environmental accounting and the measurement of changes in soil carbon.

After initially scoping appropriate tools for environmental monitoring in remote areas we have two projects that are looking at the use of eDNA techniques to detect significant species (i.e. Gouldian finch) from water samples. The eDNA projects have developed DNA assays for 3 species of endangered frogs in Australia's wet tropics, and successfully trialled eDNA detection of endangered Gouldian finches at Yinberrie Hills waterholes with Jawoyn

Rangers. Also, a set of three projects are supporting the rehabilitation of the Ranger uranium mine, including developing faunal colonisation criteria, riparian vegetation protection from surface and groundwater contamination, and threats to fish from water runoff into Magela Creek. Final sonar surveys of fish assemblages in Magela Creek billabongs were completed in November 2019.

Theme 5: Supporting Indigenous natural resource management in northern Australia. Aboriginal people own and manage vast parts of northern Australia. Recent increases in the National Reserve System are largely due to the inclusion of new Indigenous Protected Areas and northern Australia has seen a rapid expansion of the Indigenous ranger movement. Research is needed to help support the management of IPAs and Indigenous natural resource management more broadly. Outside of IPAs, there is a need to support the Indigenous land and sea management programs more broadly. Kakadu National Park, which operates under joint management, is another specific priority of the Commonwealth.

This theme has completed a project on the lessons learned from the incorporation of Top End Indigenous fire knowledge into fire management and on Indigenous Protected Areas. A synthesis project looking at the benefits for biodiversity from IPAs commenced in 2019. A major project in the Kimberley is designing and testing culturally tailored Indigenous knowledge brokering methods and tools. Videos and communication products arising out of 'walking on country' activities have focussed on the benefits of educating students and bringing people back to their country. A final draft of the Indigenous-led and authored 'Our Knowledge Our Way Guidelines' has been produced, which is an important resource with national application.

The Cape York mangrove dieback project produced an Indigenous Ranger field guide for shoreline assessment of mangrove dieback in the Gulf of Carpentaria. We also commenced two synthesis projects in 2019 that support Indigenous natural resource management, the *Impact of IPA management on biodiversity* and *Kakadu floodplain knowledge synthesis* projects.

Theme 6: Determining the economic values and benefits of environmental resources in northern Australia is a cross-cutting research theme, as consideration of the economic contribution of environmental resources across northern Australia is important for supporting effective policy and planning decisions

Our project on environmental economic accounting to develop a set of accounts for the Mitchell River has commenced, that will synthesise existing ecological and economic research in the region, and recommend performance metrics for future investments. This project is a priority for DAWE in its efforts to implement the national strategy for environmental-economic accounting. We have also commenced a synthesis project to explore options and make recommendations for including Indigenous cultural connections within the ecosystem accounting framework, using Kakadu as a case study.

Performance against milestones

Performance against funding agreement milestones

All milestones for the period (and to date) have been met as per Funding Agreement Milestones 22 to 25, including the delivery and acceptance of the 2018 Annual Report and the delivery and acceptance by the Commonwealth of Research Plan Version 6, on 12 December 2019.

Performance against the Research Plan milestones

Information on project progress and performance is provided in Attachment A.

Measuring success

The National Environmental Science Program (NESP) is a long-term commitment to support environmental and climate research. The key objective of the NESP is to improve our understanding of Australia's environment through collaborative research that delivers accessible results and informs decision-making. The focus of NESP is on practical and applied research that informs on-ground action and that will yield measurable improvements to the environment.

The program will build on its predecessors – the National Environmental Research Programme and the Australian Climate Change Science Program – in securing for decision-makers the best available information to support understanding, managing and conserving Australia's environment.

The NESP is delivered through multi-disciplinary research Hubs or consortia, hosted by Australian research institutions.

The NESP seeks to achieve its objective by supporting research that:

- is practical, applied and informs on-ground action
- addresses the needs of the Australian Government and other stakeholders by supporting and informing evidence-based policy and improving management of the Australian environment
- is innovative and internationally recognised
- enhances Australia's environmental research capacity
- is collaborative and builds critical mass by drawing on multiple disciplines, research institutions and organisations to address challenging research questions
- produces meaningful results accessible to government, industry and the community
- includes synthesis and analysis of existing knowledge
- builds relationships between scientists and policy-makers to encourage collaborative problem solving on environmental issues

NESP research users will be a broad range of stakeholders whose decisions may impact on the environment, and include the Australian Government, state and territory governments, industry, business, community groups and Indigenous land managers (or Indigenous communities).

The intended outcomes of the NESP are:

- enhanced understanding of, and capacity to manage and conserve Australia's environment.
- improved climate and weather information for Australia through a greater understanding of the drivers of Australia's climate.
- timely research that is used by policy- and decision-makers to answer questions and provide solutions to problems.
- research outcomes that are communicated clearly to end-users and the general public, and stored in a manner that is discoverable and accessible.

Table 1. Quantitative performance measures

Key performance indicator	Hub result for 12-mth period (numerical only)	Explanation (if any)
1. Percent of projects (active or completed in the reporting period) for which there is a research user actively engaged in the project?	**100%**	To better ensure that project outputs meet the needs of research users, and are incorporated into policy and/or management, each project is required to enter into research user agreements that will be signed off by project leaders and the principal research users. The research user agreement specifies the outputs that will be produced by the project and the timeline and format for delivery of those outputs. The principal research user commits to making use of the outputs for specific policy and planning objectives. The agreement also specifies the preferred method of engagement of the research users in the project.
2. Percent of projects approved under RPV6 in which research-users were actively involved in project design?	**100%**	In preparing Research Plan Version 6 we consulted with federal, state and territory agencies relevant to each project. We ensured that in the drafting of each project plan, research users were explicitly identified and consulted.
3. Number of research outputs provided to end users **on time**[1] and as identified in the Research Plan	**37**	This is a collation from Hub project milestone reports where they have reported research outputs completed on time. Includes projects 1.5, 1.6, 2.3, 3.3, 4.3, 4.5, 5.4, 5.5
4. Proportion of research outputs provided to end users **on time** and as identified in the Research Plan	**100%**	The projects that have been completed under the program have all completed their outputs, and these are available on our website, or through other online sources.
5. Number of instances of where the hub has used NESP-generated information from another NESP Hub.	**4**	Projects 3.5, 4.6 and 5.4 reported using NESP-generated information from another Hub – the TSR Hub and ESCC Hub.
6. Number of peer-reviewed NESP-funded publications during the reporting period	**25**	Includes 3 papers that are in review. Includes projects 1.3.1, 1.3.3, 1.5, 2.3, 2.4, 2.7, 3.3, 4.5, 5.4
7. Number of NESP research citations in other researchers' publications during the reporting period	**65**	Project 5.4 reported the most with 30 citations.

[1] On time – delivered on the date the outputs were expected to be delivered

Key performance indicator	Hub result for 12-mth period (numerical only)	Explanation (if any)
8. Number of researchers, including PhD and post-doc positions engaged as a result of NESP (total, full-time equivalent) during the reporting period	**56.93 FTE**	Includes at least 117 individuals across all projects.
9. Number of data sets provided to the Hub, or made publicly available, by third parties for the purposes of informing NESP research	**24**	Attachment A also reports on data sets that are produced as outputs to projects. Includes projects 1.3.3, 1.5, 1.6, 2.4, 2.6, 2.7, 2.8, 3.3, 5.4, 5.6.
10. Percentage of data sets made publicly available under open licence by the Hub	**95%**	Our project leaders and researchers have been advised of their obligations in relation to data management. We have prepared a Hub protocol titled *Ensuring Open Access* that has been included in orientation workshops held in Qld, WA and the NT. Some datasets are restricted because they involve social research responses from individuals, involve culturally sensitive Indigenous knowledge, or the location of threatened species.
11. Percentage of NESP research outputs (including publications, data and metadata) that are discoverable and accessible in accordance with NESP data accessibility requirements and the funding agreement.	**95%**	Our project leaders and researchers have been advised of their obligations in relation to data management. We have prepared a Hub protocol titled *Ensuring Open Access* that has been included in orientation workshops held in Qld, WA and the NT. 61 research outputs from projects were reported in 2018.
12. Number and FTE of Indigenous people employed in a project (separate into full and part time positions).	**9.3 FTE**	85 individuals including permanent, casual and one-off engagements. Includes projects 1.3.1, 1.3.2, 1.3.3, 1.5, 1.6, 2.6, 5.4, 5.6.
13. Number of Indigenous researchers/graduates/post-graduate/PhD/post-doc positions in projects.	**2**	Project 5.5.
14. Number of Indigenous people trained in the use of environmental management tools and techniques.	**242**	A number of projects reported training and education targeted towards Indigenous people, including 1.3.1, 1.5, 2.6, 3.5, 4.3, 4.4, 4.5, 5.4, 5.5.

Key performance indicator	Hub result for 12-mth period (numerical only)	Explanation (if any)
15. The number of management tools for Indigenous waters and land that benefitted from NESP research and outcomes (including but not limited to plans of management for IPAs, co/joint-managed parks, marine park plans of management, conservation agreements).	**5**	Projects 1.6, 2.6, and 5.4 reported the provision of management tools.
16. Number and type of communication products that have been used to communicate research with Indigenous people.	**37**	Eight projects reported the provision of communication products – 1.5, 1.6, 2.6, 3.6, 4.4, 4.5, 5.4, 5.5.
17. Number of research, knowledge-sharing and communication events held with Indigenous communities.	**40 events**	Seven projects had communication events with Indigenous communities – 1.4, 1.5, 2.3, 3.7, 4.5, 5.4, 5.5.
18. Number of public events, conference presentations, jointly authored/published papers with Indigenous participants/contributors.	**10**	Six projects held events with Indigenous participants/ contributors – 1.3.1, 1.5, 1.6, 3.7, 4.5, 5.4, 5.5.

NESP impact stories

NESP impact stories are provided at Attachment B. These stories showcase the contribution of NESP-funded research to the environment, the economy, society, culture, public policy, and quality of life, beyond contributions to academia.

NESP impact stories are particularly useful to demonstrate:

- how the research conducted by the Hub has been used to inform on-ground action or policy
- how the Hub has collaborated with research users to better understand decision-makers needs or the key question research needs to address
- how the Hub used innovative approaches to connect science with policy/decision-making
- how the Hub is successfully including Indigenous Australians in the work of the Hub
- how the Hub has improved the national environmental information base

The following impact stories are outlined in Attachment B:

1. Keeping country healthy in Kakadu
2. A transdisciplinary approach to Fitzroy River water planning
3. New ways to manage gamba grass and fire at Mary River National Park
4. Finding finches – using eDNA to track endangered birds
5. Managing feral pigs on Cape York
6. Filling knowledge gaps for the rehabilitation of Ranger uranium mine

Hub-level risk management

All risks identified in the Hub risk management plan are being actively managed. Management processes are in place for the ongoing management of risk, through the Hub Leadership Group, Research Executive Committee, Hub Steering Committee and at the project leadership level.

The most significant actions in 2019 have occurred around the following risks:

- Loss or change in location of key personnel (has required replacement personnel).
- Difficulties attracting and retaining Indigenous partners in work on their land. Project 1.3.2, *Environmental Water Requirements for the Daly River, NT* has required mediation and a remedial field work program to address a breakdown in relationships with Traditional Owners. Major issues with the project have now been resolved.

More recently, the impact of Covid-19 has required an update to our risk assessment plan as follows.

Table 2. Update to risk assessment plan due to Covid-19 impacts.

Risk	Consequence	Likelihood	Rating	Risk response strategy
Briefly describe the risk that could affect whether the objective is achieved	*Minor *Moderate *High *Major *Critical	*Rare *Unlikely *Possible *Likely *Highly likely	*Low *Medium *High	*Avoid *Reduce *Transfer/share *Accept
Research projects and communications activities, milestones and outputs are delayed due to the impact of the Covid-19 pandemic	Major	Highly likely	High	Reduce
Proposed risk treatment	• Immediate cessation of travel by researchers to remote communities • Advise Commonwealth and HSC of probable impact on research • Hold special REC meeting/s to agree on and implement course of action • Continuously inform project leaders of national, state and territory travel restrictions and other responsibilities • Seek advice from individual project leaders as to Covid-19 impact on project milestones and outputs, and option preference as listed below • Seek program and project extensions within existing resources where required • Revise project outputs only where absolutely necessary Option 1: Complete the project within original timeframe, potentially with some reduced scope. Option 2: Seek a project extension to 30 June 2021, with no additional resourcing, potentially with some reduced scope. Option 3: Seek a project extension to 31 December 2021, with no additional resourcing, potentially with some reduced scope.			

Financial information

Annual financial reporting

Financial information for the Northern Australia Environmental Resources Hub is provided at Attachment C and includes:

- income and expenditure statement
- recipient and other contribution statement
- asset schedule
- audit report

Northern Australia Environmental Resources Hub

National Environmental Science Programme

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