Australian Government

National Environmental Science Program

National Environmental Science Program

State and territory showcase

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Keep in touch

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About the program

Investment

The National Environmental Science Program (NESP) is a long-term commitment by the Australian Government to environment and climate research.

The program builds on its predecessors—the National Environmental Research Program and the Australian Climate Change Science Programme—to support decision-makers to understand, manage and conserve Australia's environment with the best available information, based on world-class science.

NESP funding of $145 million over 6 years from 2015 to 2021 supports 6 themed research hubs. A further $149 million will be invested over the next 6 years into 4 new hubs.

Find out about all the projects: NESP approved projects.

Research hubs

The 6 hubs deliver collaborative, practical and applied research to inform decision-making and on-ground action.

They also provide cross-hub collaboration and input to emerging priority projects. The research spans the breadth of all Australian states and territories.

Indigenous research partnerships are a highly valued program activity. The NESP recognises there is much we can learn from Indigenous knowledge and peoples as key custodians of the environment.

Read more in the program's Indigenous collaboration for Australia's environmental science brochure.

National focus, on-ground outcomes

Partnerships

The National Environmental Science Program has real impact through partnerships and collaboration. The program connects scientists, policy makers, Indigenous peoples and communities to deliver collaborative, practical and applied research to inform on-ground action.

The program supports the integration of science into decision-making as a key principle of evidence-based environmental policy. Many of the projects provide key information at a national level, as well as across jurisdictions and in regional and local areas.

Watch how a new digital platform is helping people visualise liveability across 21 of the country's largest cities. The Australian Urban Observatory, supported by the Clean Air and Urban Landscapes Hub, transforms complex urban data into easily understood liveability maps across Local Government Areas, suburbs and neighbourhoods. Research by RMIT's Healthy Liveable Cities Group underpins the digital platform, and is being used to measure city performance and to guide local government liveability plans, which aim to strengthen the health and wellbeing of their urban communities.

Science for policy

The hubs have provided valuable input to the development of policy at a national level through a range of projects including:

- National food waste baseline
- National flying-fox monitoring
- Implementing monitoring of Australian marine parks and the status of marine biodiversity assets on the continental shelf
- Three-Category Approach toolkit
- The carbon budget of continental Australia and possible future trajectories.

Here, we showcase just some of the important work that phase one of the program has helped to achieve at a state and territory level.

Australian Capital Territory

Research

The Australian Capital Territory is a key partner of NESP research through its parks and government agencies.

Scientists from the Earth Systems and Climate Change, Threatened Species Recovery, and Clean Air and Urban Landscapes Hubs are delivering research projects in partnership with universities including the Australian National University, government agencies such as Geoscience Australia, and industry groups across the Australian Capital Territory to provide information and tools to support decision-making and on-ground outcomes.

Projects

A wide range of research applies to the Australian Capital Territory and its national parks—from supporting the re-introduction of threatened species to making cities better for people and biodiversity. Some key completed and ongoing studies include:

- Establishing bettongs beyond-the-fence
- Researching the relationship between biodiversity and profitability in grazing enterprises
- A National Review and proposed action plan for Myrtle Rust.

Australian Capital Territory research showcase:

A perfect storm—a hypothetical climate change challenge

Young professional events draw together a range of participants from across different backgrounds, including government, research, industry and the private sector, to consider complex and multi-faceted climate challenges.

The Earth Systems and Climate Change Hub researchers met with 40 early career professionals, Australian Capital Territory and Australian Government policy makers, consultants, health and emergency sector workers to look at a climate planning scenario for Canberra.

In this hypothetical scenario the year is 2032 and Canberra is experiencing extreme weather events, triggering systematic failure in public services and infrastructure.

Contributors discussed the risks, impacts, interdependencies, possible adaptation solutions and associated climate data and information needs to inform decision-making to better plan for the scenario.

Building knowledge

Participants identified critical issues and developed innovative responses across 4 policy challenges:

- Water security
- Built environment including transport and electricity
- Health, wellbeing and social resilience
- Economic systems.

These events aim to assist our next generation of leaders in building strong and lasting relationships and capacity across sectors, to consider challenges from different angles, and to understand how their expertise and knowledge can play an important role in the overall solution to future climate challenges for Australia. Read more about the scenario outcomes.

Australian Capital Territory research showcase:

Looking for new territory for Northern Corroboree Frogs

Australia's endangered Northern Corroboree Frog populations have declined due to the amphibian disease chytrid fungus. This threat has also hampered past efforts to re-establish wild frog populations in the mountains of Namadgi in the Australian Capital Territory. The Australian Capital Territory leads Australia's main captive breeding program for the tiny black and yellow Northern Corroboree Frogs at Tidbinbilla Nature Reserve, accounting for 90% of the captive population.

A research collaboration with the Threatened Species Recovery Hub supports the captive breeding and release program to ensure that these special frogs have the best chance of establishing healthy wild populations.

Watch as Australian Geographic explains how Australia boasts more than 200 species of frog and one of the most endangered is the Corroboree Frog. Only about 100 are believed to survive in the wild. A captive breeding program aims to avoid extinction of this vulnerable species.

Building knowledge

The researchers are identifying new wild reintroduction sites that will give the frogs an advantage compared to existing sites. These new sites will have naturally lower levels of chytrid fungus and fewer other frog species that could act as carriers of the disease. Lower elevation sites are also being surveyed by researchers as warmer temperatures could give the frogs a helping hand to grow faster and breed earlier.

This critical research is moving beyond previously known habitat for Northern Corroboree Frogs to a broader range of sites that will give these frogs a head start in the wild.

New South Wales

Research

Scientists from the Earth Systems and Climate Change, Threatened Species Recovery, Marine Biodiversity and Clean Air and Urban Landscapes Hubs are delivering research projects in partnership with New South Wales government agencies, Indigenous communities and rangers and industry groups across the state.

Key universities and organisations providing on-ground outcomes across the state include the University of Wollongong, University of New South Wales, University of Sydney, CSIRO and the Australian Wildlife Conservancy.

Projects

Research across New South Wales ranges from investigating the impact of air pollution in cities, to understanding and applying climate change information for policy and supporting the re-introduction of threatened species. Some key completed and ongoing studies include:

- Air quality in Australia
- Enhancing habitat for the threatened Pink-tailed Worm-lizard within critically endangered communities
- Management of urban flying-fox colonies
- Grey Nurse Shark close-kin mark-recapture population estimate—East Coast
- Marine and coastal climate services for extremes information.

New South Wales research showcase:

No breathing easy as summers get hotter

Extreme heat events are becoming more common, and there has been much attention on the effect of heat waves on health. Heat waves are associated with increased illness and death, as well as increased ozone pollution, which can trigger a range of breathing problems. The Clean Air and Urban Landscapes Hub has shown how high temperatures negatively impact urban air quality, and demonstrated the crucial role that trees in cities play in this.

Research from Greater Sydney provided an ideal setting because of the availability of a dense air quality monitoring network, proximity to the Blue Mountains and the extreme heat event experienced in Sydney where temperature stayed above 40 degrees for multiple days.

Watch as Professor Clare Murphy describes the Air Quality in Western Sydney and Beyond research project.

Building knowledge

Using an atmospheric chemical transport model, researchers modelled the surface ozone (which is a major component of urban smog) concentrations in Sydney during extreme heats to ultimately test what effect temperature had on air quality. This involved a critical collaboration on air quality measurements and modelling, including routine measurements made by the New South Wales Office of Environment and Heritage and the Environmental Protection Authority, and a detailed measurement campaign involving researchers from CSIRO, the University of Wollongong and other partner universities.

New South Wales research showcase:

Working together to care for the Byron Bay Orchid at Arakwal National Park

Arakwal National Park is home to the threatened Byron Bay Donkey Orchid and its clay heath habitat, which are both listed as regionally endangered in New South Wales.

The park is jointly managed by the Bundjalung people of Byron Bay (Arakwal) and the New South Wales National Parks and Wildlife Service. Arakwal was the first protected area in the world to be Green Listed by the International Union for Conservation of Nature (IUCN). Achieving Green List certification means the protected area has good governance, sound design and planning and effective management supporting successful conservation outcomes.

A Threatened Species Recovery Hub project led by CSIRO is supporting Arakwal joint managers to renew their Green Listing, to incorporate Indigenous knowledge into the Green List evaluation framework, and to identify ways to improve the joint management of this important Indigenous and protected area.

Building knowledge

This research is now translating into on-ground management with the co-design and evaluation of cultural burning activities needed to re-nourish the orchid's habitat back to life. As a result, the Arakwal people have been able to undertake their first cultural burn in over 30 years on the clay heaths of the park. The Bundjalung are now more actively guiding decisions about the care of the rare Byron Bay orchid and its clay heath habitat.

This partnership shows how Indigenous knowledge can be used with science to deliver the best solutions for complex environmental problems. The Indigenous-led research approach equips Traditional Owners and their families with the tools to culturally care for this jointly managed protected area.

Northern Territory

Research

In the Northern Territory, Charles Darwin University hosts the Northern Australia Environmental Resources Hub, in partnership with the Northern Territory Department of Environment and Natural Resources, North Australian Indigenous Land and Sea Management Alliance Ltd, Griffith University, CSIRO, Queensland Department of Environment and Science, James Cook University, University of Western Australia, Queensland Department of Agriculture and Fisheries, and the Western Australian Department of Biodiversity, Conservation and Attractions.

The Earth Systems and Climate Change, Threatened Species Recovery, Marine Biodiversity and Clean Air and Urban Landscapes Hubs are also delivering research projects in partnership with Northern Territory government agencies, Indigenous communities and rangers and industry groups in the Northern Territory.

Watch as together, Traditional Owners and researchers identify indicators that they can use to monitor and evaluate the health of country in Kakadu National Park. This approach is being trialled at 3 pilot sites; 1 each in stone country (Kun-warddewardde), floodplain country (An-kabohkabo dja kurrula) and woodland country (Kukarnhkarndan). This research from the Northern Australia Environmental Resources Hub also contributes to Kakadu's ongoing monitoring, evaluating and reporting efforts.

Projects

Research across the Top End of the Northern Territory is focused on building new knowledge about the northern savanna rangelands, wetland and rivers systems and their dependent flora and fauna. Knowledge based studies and transfer tools include:

- Environment water needs for the Daly River
- User guide for mapping threatened species and threatening processes across northern Australia
- New knowledge to recover the Brush-tailed Rabbit-rats on the Tiwi Islands
- Helping remote communities identify and manage the marine waste stream
- Mapping habitat use, movements and biologically important areas to support sawfish and river shark recovery.

Northern Territory research showcase:

Getting on top of gamba grass

Gamba grass was planted across northern Australia as a pasture species in the mid-1980s and has spread rapidly. It transforms Australia's northern savannas by replacing native species with dense stands of highly flammable grass that burns at up to 8 times the intensity of native grasses.

Northern Australia Environmental Resources Hub research is looking at the linkages between gamba grass and fire. The research is helping the government rangers at Mary River National Park in the Northern Territory turn this invasion of gamba grass around by guiding and providing evidence of the effectiveness of changes in their management activities to reduce fire frequency and carefully target spray treatments.

Building knowledge

The changed approach by park rangers included reducing the frequency of gamba burning. Rangers maintained fire breaks and responded quickly to stop any gamba wildfires that broke out. In the wet season, the gamba was sprayed, focusing on creating a 20-metre-wide buffer along the park's boundary, and then increased the area sprayed each year. Excluding fire to protect the tree canopy helped deprive gamba of full sunlight. This also helped maintain a dense layer of leaf litter that inhibits the germination of gamba seeds.

These management changes are enabling the regeneration of the native savanna woodlands in areas formerly infested with gamba grass. This recovery data has promoted discussion about alternative approaches to managing gamba grass.

Northern Territory research showcase:

Keeping mango magic alive

Mangoes are the Northern Territory's largest horticultural product, and the Territory is Australia's largest grower of mangoes. In 2018-19, the Northern Territory produced almost half of the national mango crop, worth around A$199 million.

Mango flowering in the Northern Territory is promoted by low night-time (minimum) temperatures and can be inhibited by high daytime (maximum) temperatures. Changes in absolute maximum and minimum temperatures and the frequency of these events will affect flowering and fruit production in northern Australian mango production regions.

Building knowledge

Recognising that mango flowering is sensitive to minimum and maximum temperature thresholds at particular times in the growing season, the Earth Systems and Climate Change Hub worked with the Northern Territory's Department of Primary Industry and Resources and the Australian Mango Industry Association to determine changes to these thresholds in the Northern Territory's growing regions, and how these changes impact on commercial mango cultivars and those in development.

This assessment will help both individual producers and the mango industry ensure sustainable mango production into the future by providing climate change information to inform current and future decisions about viable mango varieties and growing regions, and by outlining future risks and questions around regional adaptation and management practices.


Bahia

Queensland

Research

Queensland hosts 2 of the 6 research hubs. The University of Queensland hosts the Threatened Species Recovery Hub in partnership with the Australian National University, University of Sydney, University of New South Wales, Charles Darwin University, University of Tasmania, RMIT University, Monash University, University of Melbourne, University of Western Australia, and Australian Wildlife Conservancy.

The Reef and Rainforest Research Centre hosts the Tropical Water Quality Hub in partnership with the Australian Institute of Marine Science, CQUniversity, CSIRO, Griffith University, James Cook University and University of Queensland.

The Marine Biodiversity, Northern Australia Environmental Resources, and Earth Systems and Climate Change Hubs are also delivering research projects in Queensland.

Watch as the Tropical Water Quality Hub's gully remediation techniques are put into action at the Indigenous-owned Crocodile Station in Cape York by reshaping gullies and installing erosion prevention structures.

Projects

Research conducted across Queensland is focused on building new knowledge and decision-making at the farm, reef and regional scales. Knowledge-based studies and transfer tools include:

- Critical water needs to sustain freshwater ecosystems and aquatic biodiversity in the Mitchell River
- Cat suppression to conserve Night Parrots
- Mitigating and managing barriers to fish passage and improving river connectivity
- Crown-of-Thorns Starfish research informs ecological decision control framework
- The value of constructed wetlands in Great Barrier Reef catchments.

Queensland research showcase:

No one-size-fits-all approach to predators that plunder turtle nests

Protecting the nests of marine turtles from raids by pigs, dingoes and goannas requires species-specific management strategies, according to Northern Australia Environmental Resources Hub research. Nest predation is one of the most significant threats to marine turtles, which are a culturally important species for the Southern Wik Traditional Owners on Cape York.

Over 6 months, the researchers recorded all attempts by predators on the nests of Flatback and Olive Ridley Turtles along a 48-kilometre stretch of beach in Queensland's western Cape York Peninsula.

They found that dingoes were less likely to dig down to the egg chamber of Olive Ridley Turtle nests when they were covered with squares of plastic mesh, but this did not deter goannas or feral pigs. Even though pigs raided fewer nests than dingoes or goannas, they consistently devoured every egg within a chamber.

Building knowledge

The research, in partnership with Indigenous rangers from Aak Puul Ngangtam (APN Cape York), shows that efforts to minimise the depredation of marine turtle nests must be based upon local data and adapted to the predators present, with real-time data visualisation guiding when control takes place.

The integration of science, monitoring and management has allowed Traditional Owners to more effectively control feral pigs with this targeted control leading to a 95% reduction in feral pig depredation on the beaches managed by APN Cape York. This work is also helping to manage biosecurity risks by informing surveillance activities under the Australian Government's Northern Australian Quarantine Strategy.

Queensland research showcase:

Traditional Owners take the lead on restoration in their sea country

Effective techniques for restoration and monitoring of coral reef systems are increasingly important as health impacts continue to compound on the Great Barrier Reef and other reefs worldwide. Tropical Water Quality Hub researchers are evaluating the effectiveness of coral restoration projects on the Great Barrier Reef and communicating this knowledge to decision-makers and managers. As key managers of the reef, Traditional Owner groups are using these learnings to initiate activities on their sea country and identify inshore reefs that could benefit from restoration and monitoring.

Gidarjil Development Corporation is a Traditional Owner organisation operating on the Port Curtis Coral Coast region, Central Queensland. They have launched the 'Belbendimin Wulgan Djau' ('Caring for Sea Country') coral monitoring project in their sea country alongside the neighbouring Butchulla Traditional Owners. ‘Belbendimin Wulgan Djau’ is recording knowledge on coral conditions and fish populations.

Building knowledge

Eight Gidarjil sea country rangers and 2 ranger coordinators are using Australian Institute of Marine Science standard reef sampling methods (detailed 5 fifty-metre photograph transects spaced 20 metres apart with a resolution of 1 photo per metre) at multiple survey sites, in addition to counts of live fish and macroinvertebrates along transect lines.

Along with providing detailed information on natural variability in coral condition and fish numbers, these transects also document the effects of acute impact events such as cyclones, mass coral bleaching and Crown-of-Thorns Starfish outbreaks. This inshore coral monitoring is providing vital information to Great Barrier Reef researchers and managers.

South Australia

Research

South Australia's unique natural environment is vast and complex. There is an opportunity for the researchers to help to build a foundation in science, information, knowledge and strong partnerships, to support the policy and management decisions for South Australia's environmental assets.

NESP research hubs including the Threatened Species Recovery and Marine Biodiversity Hubs work in partnership to deliver scientific outcomes with a range of government and non-government agencies across South Australia including universities, the aquaculture sector and The Nature Conservancy.

Glossy and red-tailed black-cockatoos in southern Australia are endangered. One of the key problems is lack of successful breeding. Watch how Dr Daniella Teixeira is developing a new bioacoustic monitoring method, which will help conservation managers learn more about their breeding. This work is conducted through the Threatened Species Recovery Hub.

Projects

A broad variety of research is conducted by NESP researchers across South Australia—from helping threatened species recover, to developing shellfish restoration techniques. Some key studies include:

- Sustainable polymer technologies for controlling mercury pollution
- Securing the Kowari in South Australia
- Integrated management of feral herbivores and feral predators
- Responses of the threatened Kangaroo Island Dunnart (and other threatened species) to cat eradication program, Kangaroo Island.

South Australia research showcase:

Reviving the gulf—shellfish reef restoration

Around the world, interest is growing in the restoration of coastal habitats, from saltmarshes to mangrove forests and shellfish reefs. Shellfish reefs in Australia's estuaries are identified as a priority for habitat restoration and are the focus of the Australian Shellfish Reef Restoration Network, whose members include fish farmers, recreational fishers, fishery managers and seafood processors, restaurateurs, researchers, coastal communities and governments.

Supported by the Marine Biodiversity Hub, a specialist group has identified key factors affecting restoration projects in Australia. High on the list was the need for a benefit-cost analysis framework for estimating the viability of shellfish reef repair projects. This would cover risks, market and non-market costs and benefits, and the testing of alternative management approaches, spatial scales and habitat types.

Watch as The Nature Conservancy and the Marine Biodiversity Hub work with local, state and Australian governments to build a 20-hectare native oyster reef near Ardrossan which, when finished, will be the largest restored reef in Australia.

Building knowledge

The preliminary framework developed by researchers is being applied to a 20-hectare shellfish reef restoration project in Gulf St Vincent, South Australia, led by The Nature Conservancy. The restored 'Windara' reef (Windara Narungga is the name for the eastern Yorke Peninsula Region) has been built in 2 phases, creating a limestone reef seeded with over 7 million Australian Flat Oysters.

This unique, cross-sectoral collaboration to restore Windara reef, underpinned by Marine Biodiversity Hub science, is yielding significant social, economic and environmental benefits for the communities of Yorke Peninsula. New opportunities are being generated for employment, aquaculture, ecotourism, recreational fishing, volunteering and community education programs.

South Australia research showcase:

Indigenous tracking helping to unlock life in the arid zone

Arid zone researchers are working to blend Indigenous tracking skills with ecological science through standardised approaches. Information collected in a standardised way can be used to monitor the presence of animals across large areas, track changes over time, and identify important environmental conditions for key species.

The core method developed was the ‘2-hectare sandplot' survey. Sandplot surveys have become very popular with many ranger groups, non-government organisations, government agencies, natural resource management groups and consultants across Australia. Researchers estimate that well over 7,000 surveys have now been carried out across almost two-thirds of Australia.

As Threatened Species Recovery Hub researchers work with many project partners to gather the national data, they have gained access to important sandplot survey data from South Australia, covering more than 4,000 surveys.

Some of the animals that are detected in sandplot surveys, shown together with their track or sign. The project will collate data on many different kinds of animals, including threatened species, animals that are important to Indigenous groups and feral animals.

Building knowledge

This project is working with over 30 desert groups and rangers including APY Land Management, and Alinytjara Wilurara NRM in north-western South Australia to collate and analyse this wealth of information, to better understand the ecology of these regions and to answer questions to help ranger groups manage their country.

Collating and analysing this enormous dataset will fill many knowledge gaps about the distribution, trends and ecology of desert species. The project also showcases and celebrates the management and monitoring work being carried out by many groups, especially Indigenous groups, across vast areas of Australia.

Tasmania

Research

The University of Tasmania hosts the Marine Biodiversity Hub, Other partners are Geoscience Australia, NSW Department of Primary Industries, NSW Office of Environment and Heritage, Charles Darwin University, Australian Institute of Marine Science, CSIRO, University of Tasmania, Integrated Marine Observing System, Museums Victoria and University of Western Australia.

Other hubs, including the Threatened Species Recovery Hub and the Earth Systems and Climate Change Hub, also work in partnership with a range of government and non-government agencies across Tasmania including Hydro Tasmania, the Tasmanian State Emergency Service, agriculture, aquaculture and forest management sectors.

Around Tasmania, parts of the ocean floor are being explored for the first time. Scientists are using technology to survey the extent of deep-sea coral communities and monitor their recovery after protection from fishing. Watch this video shot for the Economist's Ocean series: Secrets of the deep sea.

Projects

A wide range of research is happening across Tasmania—from investigating the linkages between climate change and bushfire impacts on the World Heritage Areas to helping the swift parrot avoid predators. Some key completed studies include:

- Designing nest boxes for conservation success
- Assessing the feasibility of restoring Giant Kelp beds in Eastern Tasmania
- Climate change and bushfire research initiative—Tasmania
- Estimating the population abundance and mixing of Southern Right Whales in the Australian and New Zealand regions.

Tasmania research showcase:

Investigating Red Handfish ecology and biology

Tasmania's Red Handfish and Spotted Handfish are critically endangered. The Red Handfish is arguably one of the rarest marine fishes in the world and little is known about its ecology and biology.

Human activities are impacting much of the Red Handfish's remaining rocky coastal habitat, with degradation of their seaweed and seagrass habitats and ongoing threats from pollution, excessive nutrients, warming seas, and ecological interactions associated with native sea urchins and their predators.

But a collaboration between scientists, managers, industry and the community is mobilising to save the Red Handfish from extinction. The Marine Biodiversity Hub is helping to facilitate the conservation activities, which are part of the Handfish Conservation Project. The hub supported the collection and hatching of a Red Handfish egg mass (led by CSIRO) and 17 juveniles are being raised at Seahorse World.

Building knowledge

Efforts have also been made to rehabilitate Red Handfish habitat to reduce the threat of loss of habitat through various processes, including ecological interactions associated with sea urchins and their predators. Coordinated by the National Handfish Recovery Team, divers have removed 6,000 urchins from an area of degraded, shallow reef.

Hub research, through the Institute for Marine and Antarctic Studies, is investigating Red Handfish ecology and biology, with the aim to provide the first formal population estimate for these unique and rare fishes.

To help raise awareness about the plight of these cryptic creatures, the research is complemented by a free poster featuring beautiful illustrations and information about Red Handfish and Spotted Handfish.

Tasmania research showcase:

Understanding Tasmania's climate information needs for multi-year to decadal climate forecasts

Climate conditions influence the operations and subsequent profitability of many Australian industries. Advance knowledge of the climate, on timescales relevant to operational decisions, may assist in planning and management activities for these industries, potentially providing the ability to identify periods of increased profitability or risk.

Daily to approximately 10-day weather forecasts, monthly to seasonal climate forecasts and climate change projections (up to 100 years into the future) are currently available to users. Bridging the gap between seasonal forecasts and climate change projections are forecasts on the yearly, multi-year and decadal timescales.

Forecasting on these timescales is an emerging area of global research. The CSIRO's Decadal Climate Forecasting Project is building Australia's capability in this area.

Building knowledge

The Earth Systems and Climate Change Hub, in collaboration with the Decadal Climate Forecasting Project, engaged industry stakeholders in Tasmania to collect valuable information that will contribute to developing multi-year to decadal forecasts for Australia.

The project also sought to shine a light on which climate variables would be most useful. These varied from sector to sector and included sea ice extent and thickness for the Australian Antarctic Division's shipping operations; extreme rainfall events for the Tasmanian State Emergency Service; changes in maximum temperatures for crop growth and grape sweetening for the wine industry; and extreme wet and dry periods due to their influence on water catchments managed by Hydro Tasmania.

Victoria

Research

Victoria hosts 2 of the 6 research hubs.

The Clean Air and Urban Landscapes Hub is hosted by the University of Melbourne, in partnership with RMIT University, University of Wollongong and University of Western Australia.

The Earth Systems and Climate Change Hub is hosted by CSIRO, in partnership with the Bureau of Meteorology, University of New South Wales, Australian National University, Monash University, University of Melbourne and University of Tasmania.

Other hubs also work in partnership with a range of government and non-government agencies across Victoria, including Zoos Victoria and the Victorian Department of Environment, Water, Land and Planning.

Eastern Barred Bandicoots are extinct on the mainland except behind fences. Watch Andrew Weeks talking at Mount Rothwell in Victoria where there is a self-sustaining population of 300 to 400 individuals with skills and traits to assure their survival on release into the wild.

Projects

A wide range of research is conducted across Victoria—from investigating the liveability of regional towns and cities, to understanding and applying climate change information for policy and supporting the re-introduction of threatened species. Some key completed studies include:

- Urban greening for liveability and biodiversity
- Water futures under climate change
- Coastal hazards in a variable and changing climate
- Adaptive management for threatened mammals in Victorian Central Highlands
- Mapping distributions, threats and opportunities to conserve the Greater Glider.

Victoria research showcase:

Shadeways—keeping our cool in urban areas

Excess heat in Australia costs the economy around $9 billion per year in days off work and health-related problems. As urban areas become less green and the climate warms, cities are becoming increasingly vulnerable to heat extremes. This means opportunities for spending time outside are reduced and health complications from a sedentary lifestyle increase.

Large amounts of data are available to different levels of government to map the extremes of urban heat, but walkers and cyclists do not use this information on a daily basis because it is not available in an intuitive format that is relevant to users.

To meet this need, the Clean Air and Urban Landscapes Hub conducted research to improve urban-heat maps and worked with the City of Greater Bendigo, Spatial Vision, Pozi and La Trobe University to develop a new digital platform, Shadeways.

Building knowledge

The City of Greater Bendigo has worked with the research team often in a highly experimental way—introducing researchers to groups potentially interested in the technology, and linking researchers with its Clever Weather project. Even the natural characteristics of the city were an advantage for the project. Bendigo is known as a 'city within a forest' and that, paired with its mixture of different urban environments, was a useful starting point for conversations about greening and shading.

The impact of the research in the short term has been to highlight the challenges of planning for heat in a regional inland city with a growing and ageing population. Since its launch, Shadeways has been used more than 6,000 times with activity peaking over summer. The concept has also been adopted by the City of Melbourne through its Cool Routes project.

Victoria research showcase:

Leek Orchids versus extinction—understanding mycorrhizal fungi to save a genus of threatened orchids

Leek Orchids (*Prasophyllum*) are small, native wildflowers, found in bushlands, native grasslands and swamps across southern Australia. Nearly a third of the 140 species of Leek Orchid are at risk of extinction due to habitat clearing, weed invasion, feral herbivory and climate change.

On top of these issues, growing Leek Orchids in cultivation has proven extremely difficult and unreliable. This has meant that breeding programs could not be implemented for Leek Orchids, leaving many critically endangered species teetering on the brink of extinction. Recent research conducted by the Threatened Species Recovery Hub with the Australian National University and Royal Botanic Gardens Victoria, has uncovered the secret to germinating their seeds in the laboratory.

Building knowledge

To improve the understanding of how Leek Orchids seeds germinate and survive in the wild, root samples were collected from 33 wild Leek Orchid species. Symbiotic soil fungi living inside the orchid's roots are key to the survival of Leek Orchids. Using DNA sequencing, 38 species of fungi were identified, some of which are new to science.

Field testing using Leek Orchid seeds in 'tea bags' buried in the soil around wild plants showed that some Leek Orchids required just one symbiotic fungus to germinate while others used up to 6 fungi species. Understanding the identity, number of species and distribution of these symbiotic fungi is an important consideration for when Leek Orchids are eventually introduced back to the wild. Find out more about this project.

Western Australia

Research

NESP research in Western Australia is being delivered by 5 of the 6 hubs across a vast geographic area including the Kimberley in the north, central deserts, the south-west woodlands and urban streetscapes of Perth.

This work has been conducted in partnership with the WA Departments of Water and Environmental Regulation, Biodiversity, Conservation and Attractions, and Primary Industries and Regional Development; Parks Australia Marine (Commonwealth); Traditional Owners and their representative bodies; Perth local governments; non-government conservation organisations; and peak industry bodies.

The University of Western Australia is a partner institution for the Northern Australia Environmental Resources Hub, the Clean Air and Urban Landscapes Hub and the Marine Biodiversity Hub with the Western Australian Marine Science Institution.

Threatened Species Recovery Hub plant scientist Leonie Monks is on the front line of saving species in Western Australia. Watch what happens behind the scenes at the Western Australian Seed Centre to support the reintroduction of threatened plant species back into the wild.

Projects

Research is building new knowledge about Western Australia's biodiverse environment covering the savanna rangelands and desert regions, littoral rainforests, marine and coastal ecosystems, inland wetlands and river systems. Knowledge-based studies and threatened fauna and ecosystem management projects across Western Australia include:

- Perth street verges provide opportunities for many urban ecosystem services
- Martu People lending Country Knowledge to Greater Bilby monitoring
- Natural recovery of seagrasses at Shark Bay in collaboration with the Malgana Community
- Climate science for risk assessment and adaptation at the Shark Bay World Heritage property.

Western Australia research showcase:

Surveying the deeper waters of Ningaloo Reef

Marine Biodiversity Hub researchers surveyed marine life and habitats along almost 200 kilometres of Western Australian coast, from Coral Bay to the Muiron Islands just north of Exmouth in late winter 2019. The team from CSIRO and the University of Western Australia deployed Baited Remote Underwater Stereo-Video (stereo-BRUVs) at 200 sites to record the types and sizes of fish near the seafloor at Ningaloo Reef.

Ningaloo Reef is Australia's largest fringing coral reef system and a World Heritage site. It is protected by a state-managed inshore marine park and an offshore Australian Marine Park, managed by Parks Australia.

Watch rare imagery of the rich marine biodiversity at Ningaloo Reef. This footage was collected by Marine Biodiversity Hub researchers at the University of Western Australia after deploying baited underwater cameras to analyse various fish species.

Building knowledge

Researchers also mapped parts of the upper continental shelf and outer shelf areas, which feature extensive sponge gardens on deep reefs.

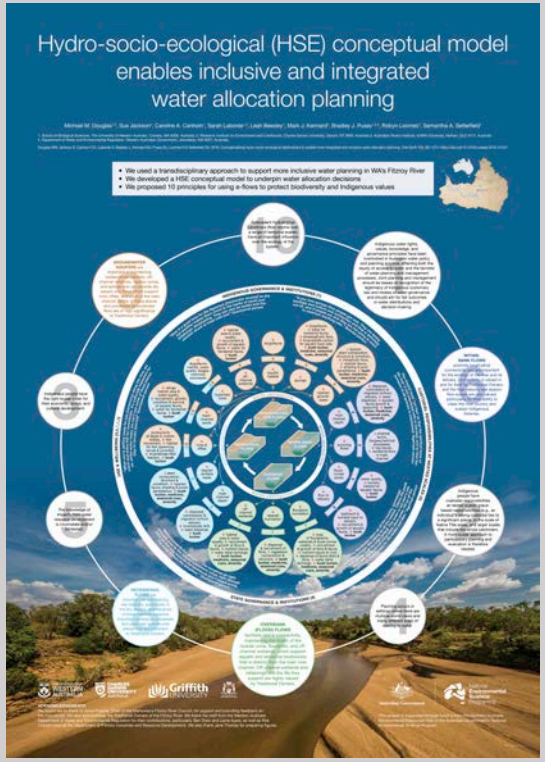
Although commercial fishing is not permitted at Ningaloo Reef, the majority of the offshore Ningaloo Marine Park (Commonwealth Waters) is open to, and within easy reach of, recreational fishers. Information on fish communities, including fish size and composition and how these differ between locations and depths, will provide park managers with a baseline for understanding the existing natural values, and monitoring change.

Western Australia research showcase:

Shared learning to protect the Fitzroy River

The mighty National Heritage-listed Fitzroy River in the west Kimberley has the largest flow of any river in Western Australia. After heavy monsoonal rains, the lower reaches of the Fitzroy become a 300-kilometre-long floodplain that can be up to 15 kilometres wide, recharging groundwater, replenishing riparian vegetation and filling wetlands and billabongs away from the main channel.

With increasing interest in irrigated agriculture in the region, research by the Northern Australia Environmental Resources Hub is increasing knowledge of the important environmental and cultural water requirements of the river, working in partnership with the Fitzroy River Traditional Owners.



This poster was produced to highlight the conceptual model developed around the 10 principles for using e-flows to protect aquatic ecosystems and their dependent human cultures and livelihoods.

Building knowledge

Using a model of hydrological connectivity, the research is helping the WA Department of Water and Environmental Regulation (DWER) water planners ensure that every aspect of the river's flow regime and their importance to Traditional Owners is addressed. The model is supported by a set of principles to guide water planning that capture both the cultural values of the Traditional Owners and the water needs of river ecosystems as the Fitzroy's flows fluctuate from wet to dry.

The hub's 'shared learning' approach to research and strong relationships with Traditional Owners in the Fitzroy River catchment have helped DWER to better understand the river and the valued relationships Indigenous peoples maintain with the river and its billabongs, floodplains and connected groundwaters and Jila pools.

Future program

Investment

The Australian Government is investing a further $149 million over the next 6 years in climate and environmental science targeting sustainable communities and waste, threatened species, climate systems and a range of key environmental issues.

This next phase of the NESP will build on our past achievements through multi-disciplinary and applied research that will be consolidated into 4 hubs and delivered through regional nodes where appropriate.

The next phase of the program will draw on expertise from organisations, big and small, from all around Australia.

Hubs will create genuine partnerships between organisations that collectively bring together multiple disciplines and multiple viewpoints to form a national capability.

Program guidelines and information are available at the Community Grants Hub.