

State of Wet Tropics 2024–25

Extreme rainfall events: impacts and recovery



WET TROPICS
MANAGEMENT AUTHORITY



Acknowledging Rainforest Aboriginal Peoples of the Wet Tropics

The Wet Tropics Management Authority acknowledges the spirit of Country of the Wet Tropics and recognises Rainforest Aboriginal Peoples as carrying custodial responsibility.

We pay our respects to their ancestors and traditions.

We recognise the deep relationships, connections and responsibilities to lands, waters and skies integral to Rainforest Aboriginal Peoples' identity and culture, and we give regard to their connections as central to culture and being.

We acknowledge Rainforest Aboriginal Peoples' continuous living culture, and the diverse knowledges held, and their traditional lore and customs.

We thank Rainforest Aboriginal Peoples for the enduring relationships connecting Country, ancestors and people, now and emerging. These relationships have safely stewarded and protected the Wet Tropics' lands, waters and skies, reaching back thousands of generations.

We accept that this Country is sacred, that everything in the land has meaning, and that all people are one with it.



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Purpose of the report

This State of Wet Tropics report satisfies the requirements of Queensland's *Wet Tropics World Heritage Protection and Management Act 1993* and the Commonwealth's *Wet Tropics of Queensland World Heritage Area Conservation Act 1994*.

Acknowledgements

The Wet Tropics Management Authority would like to thank Cathy Buck, Sarah Compagnoni, Sally Driml, Chrissy Grant, Kaitlyn Houghton and Tamara Scenna for providing content for the report. Thanks also to the members of the Community Consultative Committee, Indigenous Advisory Committee and Scientific Advisory Committee for their contributions and feedback on the draft report.

Feedback

This report is an important document representing communication and accountability. The Wet Tropics Management Authority values comments and welcomes feedback via email to wettropics@wtma.qld.gov.au.

Public availability

This report can be accessed and downloaded from www.wettropics.gov.au/annual-reports. Alternatively, hard copies of this report can be obtained by writing to wettropics@wtma.qld.gov.au.

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Cover photo: Impacts from Tropical Cyclone Jasper: forest dieback and channel stripping; the orange colour of the water is due to iron-oxidising bacteria. Bloomfield Track, Eastern Kuku Yalanji Country—Wet Tropics Images

ISSN 3083-4988 (Online)

ISSN 3083-497X (Print)

Terms and abbreviations used in this report

Term	Definition
Area; World Heritage Area	Wet Tropics of Queensland World Heritage Area/Wet Tropics World Heritage Area
Biodiversity	The variety of life found in a place, measured by species richness, taxonomic distinctness, and genetic diversity
Biosecurity	Methods used to prevent the entry, establishment, and spread of pests, weeds, and diseases that could harm the environment, economy, and human and animal health
Climate change	A long-term global shift in the Earth's climate caused by human activities such as the combustion of fossil fuels
Cultural heritage	Describes the heritage values, practices, knowledge, places and the identity of the lineage of descendants of the original peoples of the lands and waters of the Wet Tropics of Queensland World Heritage Area—the Rainforest Aboriginal Peoples (Bama)
Disaster	A serious disruption in a community, caused by the impact of an event that requires a significant coordinated response by the state government and other entities to help the community recover from the disruption
DRFA	Australian Government Disaster Recovery Funding Arrangements—DRFA is a jointly funded program between the Australian and state and territory governments to provide financial assistance to support state/territory governments with disaster recovery costs
EIP	Environmental Investigations Program
Endemic	Particular to an area; found nowhere else on Earth
Extinct	A species that no longer exists because of natural or human-induced changes to its environment, such as habitat loss or climate change
Feral	A domesticated animal now living in the wild without human interaction
Habitat fragmentation	The division of areas of habitat into smaller parts, often by human activity such as roads and other built infrastructure
Integrity (for World Heritage)	A measure of the completeness or intactness of the attributes that convey Outstanding Universal Value
Invasive species	A species not indigenous or native to a particular area that can readily establish and spread in such an area and damage the environment and ecosystems
IUCN	International Union for the Conservation of Nature—composed of government and civil organisations, it harnesses the experience of its member organisations and the input of over 17,000 experts to render advice and is the global authority on the status of the natural world
JCU	James Cook University
NRM	Natural Resource Management—refers to the 54 regional NRM organisations across Australia that work with people from the local to national level for the integrated management of the natural resources that make up Australia's landscapes (the land, water, soil, plants and animals)

Term	Definition
Outstanding Universal Value (OUV)	Cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. As such, the permanent protection of this heritage is of the highest importance to the international community as a whole
QPWS&P	Queensland Parks and Wildlife Service and Partnerships—a division of the Queensland Department of the Environment, Tourism, Science and Innovation responsible for the management of protected areas in Queensland
QRA	Queensland Reconstruction Authority—QRA manages and coordinates the state's programs of recovery and reconstruction funding within disaster-impacted communities and delivers the administration of the DRFA
Rainforest Aboriginal Peoples	The term Rainforest Aboriginal Peoples is used by the Wet Tropics Management Authority (the Authority) to refer specifically to the Traditional Custodians of the Wet Tropics of Queensland World Heritage Area and includes more than 20 Rainforest Aboriginal groups. The Authority recognises that Rainforest Aboriginal Peoples may identify themselves at local, state, national and international scale using a diversity of terms. These include but are not limited to: clan groups, tribal groups, language groups, Bama, Traditional Custodians, Traditional Owners, First Nations Peoples, First Peoples, Native Title holders and common law holders
Refugia	A location that supports an isolated or relict population of a previously more widespread species. Isolation can be caused by climatic or geological change, or human activities such as land clearing
RNTBC	Registered Native Title Body Corporate—when a Native Title determination is made by the Federal Court, the <i>Native Title Act 1993</i> requires Traditional Owners to establish a corporation to represent them and their interests
Sclerophyll	A type of vegetation adapted to long periods of heat and low rainfall. In Australia, sclerophyll forest is typically dominated by eucalypts
Taxon	Any taxonomic category between kingdom and subspecies (e.g. species, genus, etc.)
TC	Tropical Cyclone
UNESCO	United Nations Educational, Scientific and Cultural Organization
Wet Tropics bioregion	One of 89 distinct bioregions within Australia—bioregions are geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features and plant and animal communities
WTMA	Wet Tropics Management Authority (the Authority)
WTQWHA	Wet Tropics of Queensland World Heritage Area

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Message from the Chair

The Wet Tropics World Heritage Area (the Area) is at a crucial moment in its history. Climate change, and associated extreme weather events, continues to be the most significant threat to the Area's globally recognised natural and cultural values, exacerbating existing pressures such as invasive species. The impacts of climate change are no longer hypothetical—they are being felt now, with devastating consequences for the environment, local communities and the economy.

In December 2023, Tropical Cyclone Jasper crossed the Far North Queensland coast near Wujal Wujal, bringing persistent heavy rainfall and causing widespread flooding across already saturated catchments. In early 2025, a tropical low-pressure system brought heavy rainfall to Queensland's northeast tropical coast, resulting in some sites recording their highest daily or multi-day rainfall totals on record.¹ During both extreme events, parts of the Wet Tropics endured heavy rainfall that caused flooding, multiple landslides and major damage to vital infrastructure, services and the environment.

The social, environmental, economic and cultural impacts of these events have been profound and will likely be felt for years to come as the effects compound. For example, landslides cause access issues that impede the work of rangers in controlling weeds and feral animals, while environmental disturbance can promote further spread of these invasive species.

These disasters serve as a stark reminder of the urgent need to prepare for the increasing frequency and intensity of such events, which are predicted to worsen under current and future climate scenarios.

The Wet Tropics has unparalleled cultural, scientific, conservation and economic value. It is also a vital economic resource for Far North Queensland, with a tourism industry that supports thousands of jobs and contributes significantly to the regional economy. Protecting this globally significant place is not just an environmental imperative: it is essential for the wellbeing of our communities and the future of our region.

The Wet Tropics Management Authority and many others—including Rainforest Aboriginal Peoples, government agencies, landholders, research organisations, community groups, and the tourism, agriculture and conservation sectors—continue to work tirelessly to protect, manage and restore the Area, but the growing threats are outpacing current efforts. Without urgent action, the values for which the Area is recognised are at risk of irreversible decline. An ambitious and appropriately resourced approach is required to address the scale of the challenges we face.

This year's State of Wet Tropics report focuses on extreme rainfall events—impacts, recovery and research efforts as well as recommendations for future management actions. It underscores the urgent need for action in the key areas of climate change, engaging with Rainforest Aboriginal Peoples and dealing with the threats of invasive species.

This report is a call to action for all of us to escalate the way we work together to ensure the Wet Tropics remains a resilient and thriving landscape for generations to come.

A handwritten signature in black ink that reads "Christine T. Grant". The signature is fluid and cursive, with a large loop at the end of the last name.

Ms Christine Grant

Chair, Wet Tropics Management Authority Board

Executive summary

The Wet Tropics of Queensland World Heritage Area (the Area) is an incredibly special place. It protects an extraordinary degree of biological diversity and is a profound biocultural landscape. The exceptional natural and cultural values of the Area are a drawcard for visitors, making tourism a key economic driver in the region.

Last year's State of Wet Tropics 2023–24 report—'Outstanding Universal Value: now and for future generations'—examined the condition of the attributes that support the World Heritage values of the Area. It noted several threats to these attributes (including invasive species and fragmentation), with climate change and associated extreme weather events clearly identified as the greatest long-term threat to the Area's integrity.

Over the coming decades, climate projections indicate that climate change will continue to bring hotter days, more extreme bushfires, fewer but more intense cyclones, and more extreme rainfall events.² These present unprecedented challenges for the conservation and management of the Area. Despite its global significance and protection, the Area is at risk from increasing threats that are surpassing the capacity of current conservation strategies.

This State of Wet Tropics 2024–25 report focuses on two extreme rainfall events that occurred in the Area: Tropical Cyclone (TC) Jasper (December 2023) and the North and Far North Tropical Low (from 27 January to 5 February 2025—referred to as the Far North Tropical Low in this report). The purpose of this report is to look at the impacts of these events, describe recovery and research responses, and offer priorities for actions to help reduce or mitigate impacts (of these and other extreme rainfall events) and support the resilience of the Area.

Extreme rainfall events have widespread impacts on the environment, communities and infrastructure. Understanding the short and long-term impacts is a complex process that requires coordinated effort over extended periods of time: some impacts are immediately visible, while others only become evident months later. Entire ecosystems can be altered, and recovery can be slow. Identifying and monitoring changes is time-consuming, and resources are often not immediately available; following both TC Jasper and the Far North Tropical Low, government funding to address the environmental impacts was not available for several months.

Impacts on the regional economy can also be significant. Following TC Jasper, over \$256 million in revenue was lost between 5 December 2023 and 29 February 2024 due to cancelled tourism bookings.³

Targeted, adaptive and appropriately resourced actions are needed to protect the Area's natural integrity and its World Heritage values. This report identifies the following management responses to reduce the impacts of extreme rainfall events and support the resilience of the Area:

- **Enhancing ecosystem resilience:** creating and implementing strategies to protect ecosystem functions in the face of disturbances and the increasing threat of extreme weather events. Identifying key areas for the conservation of key ecosystems and their functions.
- **Adaptive management and planning:** updating conservation and management strategies in priority areas after extreme rainfall events to protect vulnerable areas and key ecosystems.
- **Community involvement:** working with Rainforest Aboriginal Peoples, government agencies and all interested partners to improve responses to extreme rainfall events and avoid further impacts to cultural heritage.
- **Infrastructure and operational readiness:** improving infrastructure (where required) and emergency protocols to allow for quick and organised responses to extreme rainfall events.
- **Species and genetic conservation:** identifying key habitats that could act as refugia during or after extreme rainfall events. Planning for ex-situ conservation of threatened and vulnerable species.



Mountain tea tree (*Leptospermum wooroonooran*) is a mountaintop endemic.
Bellenden Ker, Madjandji Country—Wet Tropics Images/Ana Palma

1. Introduction and background



1. Introduction and background

About this report

With climate change and its associated extreme weather events identified as the most significant threats to the Wet Tropics of Queensland World Heritage Area (the Area), this report focuses on two extreme rainfall events that occurred in the Area: Tropical Cyclone (TC) Jasper (December 2023) and the North and Far North Tropical Low (from 27 January to 5 February 2025—referred to as the Far North Tropical Low in this report).

The purpose of this report is to look at the impacts of these events, describe recovery and research responses, and offer priorities for ongoing and future actions to help reduce or mitigate impacts (of these and other extreme rainfall events) and support the resilience of the Area. The economic costs of these events, particularly to tourism, are also considered.

This report is based on the pressure–state–response framework developed by the Organisation for Economic Co-operation and Development. This framework helps us understand and manage environmental issues by identifying relationships between human activities (pressures), environmental conditions (state), and societal responses (including policies and awareness). It helps us identify how human activities impact the environment and how society reacts to these changes.⁴

The Wet Tropics of Queensland World Heritage Area

The Area is internationally recognised for its unique biodiversity, landscapes and evolutionary history—it contains one of the most complete and diverse living records of the major stages in the evolution of land plants, and one of the most significant living records of the evolutionary history of marsupials and songbirds on Earth.⁵ In 2013, the Area was ranked sixth among all protected areas and second among World Heritage sites for its irreplaceability for the conservation of amphibian, bird, and mammal species.⁶

The Area was inscribed on the World Heritage List on 9 December 1988 based on successfully meeting all four of the criteria used to assess natural World Heritage areas:

- **Criterion (vii)—to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance**
- **Criterion (viii)—to be outstanding examples representing major stages of Earth’s history, including the record of life, significant ongoing geological processes in the development of landforms, or significant geomorphic or physiographic features**
- **Criterion (ix)—to be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, freshwater, coastal and marine ecosystems and communities of plants and animals**
- **Criterion (x)—to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation.**

In 2007, the Area was added to Australia’s National Heritage List for its natural values, corresponding with its World Heritage listing. In 2012, the National Heritage listing was expanded to include the Area’s Indigenous cultural heritage values, recognising a remarkable continuous connection—the Wet Tropics is the only place in Australia where Aboriginal people have permanently inhabited a rainforest environment. This was made possible through unique technical achievements related to processing toxic plants and fire management techniques.⁷

The Area’s exceptional natural and cultural values make its conservation a matter of high priority locally, nationally and globally.

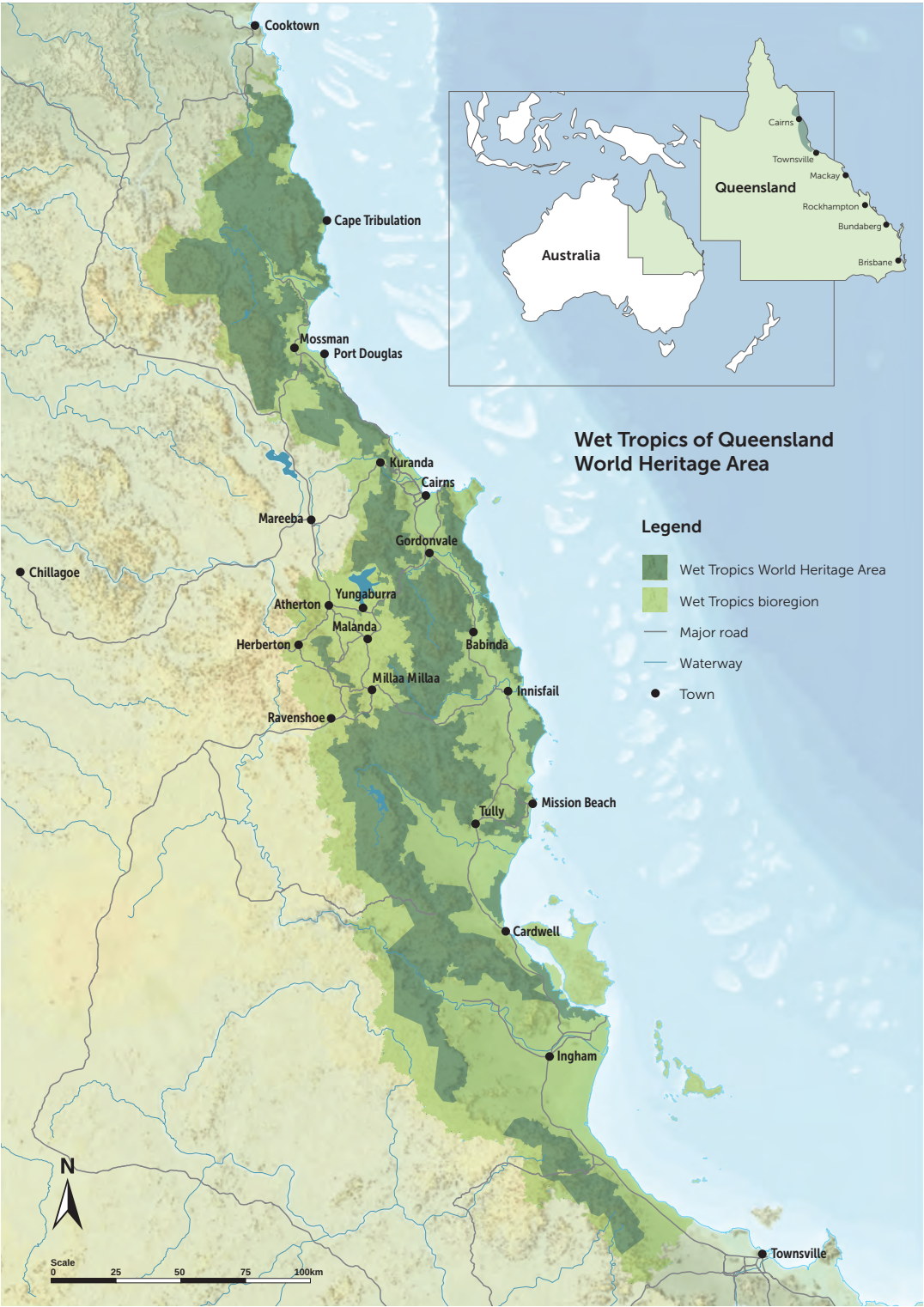


Figure 1 . Wet Tropics of Queensland World Heritage Area.

The Wet Tropics Management Authority

The Wet Tropics Management Authority (the Authority) is the statutory body responsible for overseeing the protection and management of the Area. Established in 1992 under the *Wet Tropics World Heritage Protection and Management Act 1993*, the Authority ensures Australia's compliance with the UNESCO World Heritage Convention, fulfilling that obligation on behalf of the Commonwealth of Australia.

The Authority develops and implements management policies and plans to address challenges such as invasive species, habitat degradation and climate change impacts. Working collaboratively with various stakeholders—including Rainforest Aboriginal Peoples, government agencies, landholders, and groups from the tourism, agriculture and conservation sectors—the Authority aims to preserve the Outstanding Universal Value of the Area for future generations.

Conservation outlook

The International Union for Conservation of Nature (IUCN) is the global authority on the status of the natural world. It aims to provide reliable, transparent and independent information on the present situation and future conservation prospects of natural World Heritage sites through World Heritage Outlook reports.

In 2014, 2017 and most recently 2020, the Wet Tropics of Queensland World Heritage Area was assessed as being of 'significant concern' (see Figure 2). Invasive plants, animals, and diseases—along with the growing impacts of climate change—were highlighted as posing a serious and persistent threat to the Area's biodiversity and its unique endemic species. While considerable efforts have been made to manage these challenges on the ground, the current level of investment falls short of what is needed to support urgent preventative and restorative action.⁸



Figure 2. Conservation outlook for the Wet Tropics of Queensland World Heritage Area for 2014, 2017 and 2020. Source: IUCN (<https://worldheritageoutlook.iucn.org/explore-sites/wet-tropics-queensland>).

Threats to the Wet Tropics

The State of Wet Tropics 2023–24 report examined the condition of the ecological and aesthetic attributes that were key to the Area's World Heritage listing, while considering past, present and potential pressures on their integrity.

Table 1. Attributes that support World Heritage values, status and key pressures identified by the State of Wet Tropics 2023–24 report.⁹

Attribute	Status	Key pressures
Superlative natural beauty Criterion (vii)	Despite the fragmented nature of the Area and increased internal and external pressures on its scenic values, it still presents aesthetics of international renown.	<ul style="list-style-type: none"> • Climate change • Industry, infrastructure and development
High biodiversity and biological evolution Criteria (vii), (viii), (ix), (x)	Significant pressures are and will continue to affect the Area's biodiversity. These attributes are under serious threat from accumulating and synergistic threats.	<ul style="list-style-type: none"> • Climate change • Invasive species • Land clearing, fragmentation and habitat degradation • Altered fire and hydrological regimes
Ancient and endemic plants Criteria (vii), (viii), (ix) and (x)	Current evidence demonstrates degradation of the elements necessary to maintain the integrity of values associated with the Area's ancient and endemic plants.	<ul style="list-style-type: none"> • Climate change • Invasive species • Land clearing, fragmentation and habitat degradation • Changing fire and hydrological regimes
Ancient and endemic animals Criteria (vii), (viii), (ix) and (x)	Many of the Area's ancient and endemic animal species supporting Outstanding Universal Value are declining and in serious and urgent danger.	<ul style="list-style-type: none"> • Climate change • Invasive species • Land clearing, fragmentation and habitat degradation • Changing fire and hydrological regimes
Ecosystems, communities and habitats Criteria (ix) and (x)	The status of ecosystems is of high concern. Due to impacts of climate change, invasive species, and habitat degradation, the integrity continues to decline, especially for upland rainforest, wet sclerophyll and freshwater ecosystems.	<ul style="list-style-type: none"> • Climate change • Invasive species • Changing fire regimes

Climate change was clearly identified as the key pressure affecting all attributes that contribute to the Area's Outstanding Universal Value. As well as significant environmental implications, climate change and its associated extreme weather events have far-reaching economic impacts, particularly on climate-exposed sectors including our agriculture, energy, and tourism industries.

Climate change includes shifts in weather patterns and increases in climate extremes, including more heatwaves, fire-prone conditions, droughts, heavy rainfall and flooding. These changes are accelerating, with the past decade marked by record-breaking extreme events that have fuelled natural disasters.² With the Wet Tropics experiencing the effects of climate change through two extreme rainfall events since December 2023, this report is focused on the resulting significant and ongoing impacts on the natural environment, cultural heritage, infrastructure, local communities and the regional economy.

2. Pressure:

Extreme rainfall events



2. Pressure: Extreme rainfall events

Climate change is causing extreme weather events to happen more frequently and become more intense, in particular extreme rainfall, droughts and tropical cyclones.¹⁰ As global temperatures rise, the intensity and frequency of heavy rainfall events in northern Australia are increasing.²

As air warms, it can hold more water vapour and moisture in the atmosphere can increase by up to 7% with each degree of warming, increasing the probability of intense rainfall. Current data suggests that extreme daily rainfall events, occurring once a year or less, could intensify by about 8% for each degree of warming, with hourly extreme rainfall likely increasing by 15% per degree of warming.²

While current data predicts fewer tropical cyclones, those that do occur are more likely to be of higher intensity. The rainfall associated with these cyclones is projected to become more intense. When combined with rising sea levels, these factors are likely to amplify the impacts of cyclones on ecosystems and communities.^{2,10}

Since the previous State of Wet Tropics report was produced, the Wet Tropics World Heritage Area (the Area) has not only continued to suffer the effects of Tropical Cyclone (TC) Jasper (December 2023), but has also experienced another extreme rainfall event: the Far North Tropical Low (from 27 January to 5 February 2025). Both extreme rainfall events caused widespread flooding, hundreds of landslides and impacts to the environment, infrastructure and the community.

These events met the definition of a 'disaster' as defined in *Queensland's Disaster Management Act 2003*: 'a serious disruption in a community, caused by the impact of an event, that requires a significant coordinated response by the State and other entities to help the community recover from the disruption'. In response to the disasters, financial assistance was provided by the Australian Government through the Disaster Recovery Funding Arrangements (DRFA).



Landslide showing impacts of TC Jasper on rainforest, Cedar Bay. Ngalba–bulal National Park (Cape York Peninsula Aboriginal Land)—Cape York Water Partnership/ Tim Hughes

Snapshot: Tropical Cyclone Jasper—December 2023

Tropical Cyclone (TC) Jasper crossed the Queensland coast near Wujal Wujal, approximately 120km northwest of Cairns on 13 December 2023 as a category 2 system (refer to Table 2 for Tropical Cyclone categories). The area south of the cyclone's centre to Port Douglas experienced the strongest winds, with gusts estimated up to 130 km/h.¹¹



Above: Impacts of TC Jasper: flood waters, mud and debris on the main street at Wujal Wujal, Kuku Yalanji, Kuku Nyungul and Jalunji Country—Wujal Wujal Aboriginal Shire Council.
Below, media coverage of the flooding that followed TC Jasper.

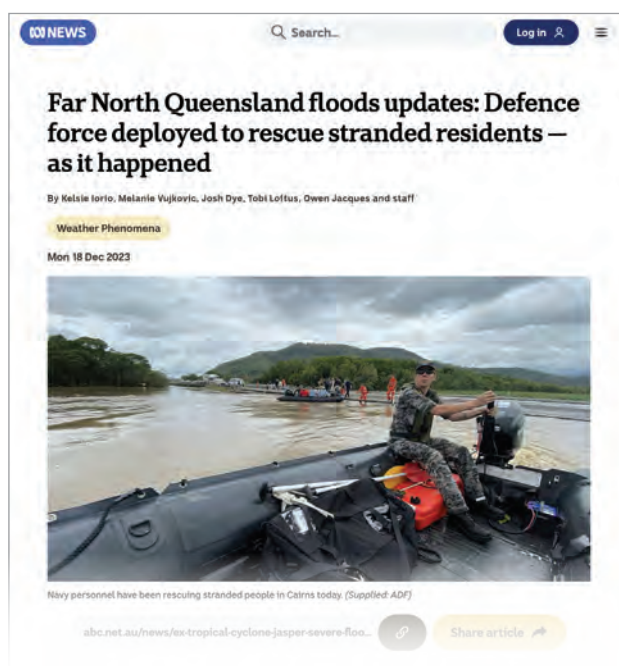


Table 2. Tropical Cyclone categories. Source: <https://beta.bom.gov.au/resources/learn-and-explore/tropical-cyclone-knowledge-centre/tropical-cyclone-categories>.

Category	Wind	Maximum mean wind speed (km/h)	Typical strongest gust (km/h)
1	Damaging winds. Negligible house damage. Damage to some crops, trees and caravans. Craft may drag moorings	63–88 km/h	125 km/h
2	Destructive winds. Minor house damage. Significant damage to signs, trees and caravans. Heavy damage to some crops. Risk of power failure. Small craft may break moorings	89–117 km/h	125–164 km/h
3	Very destructive winds. Some roof and structural damage. Some caravans destroyed. Significant damage to crops and trees. Power failures likely	118–159 km/h	165–224 km/h
4	Significant roofing loss and structural damage. Many caravans destroyed and blown away. Extensive damage to vegetation. Dangerous airborne debris. Widespread power failures	160–199 km/h	225–279 km/h
5	Extremely dangerous with widespread destruction of buildings and vegetation	Greater than 200 km/h	Greater than 279 km/h

While the system weakened quickly to below TC intensity once it crossed the coast, it stalled as a low-pressure system over the Cape York Peninsula for the next five days before dissipating on 17 December 2023. The resulting deep, moist, strong onshore flow from the Coral Sea (combined with already high moisture levels and the region's mountainous terrain) caused extremely heavy rainfall over river catchments that were already saturated, leading to widespread and severe flooding across the north tropical coast.¹¹ Over only five days, more than 2m of rain fell between Cairns and Cooktown (Table 3).¹¹ On 17 December, the Barron River reached 14.09m at Myola—its highest recorded level there in 100 years.¹² On 18 December, the Daintree River at Daintree Village reached 14.85m, well above the old flood record of 12m from 2019.¹²

Table 3. Five-day rainfall totals from 13 to 17 December 2023.¹¹

Weather station location and number	Five-day rainfall (mm)
Black Mountain (531094)	2,166
Bairds (531029)	2,118
Myola Alert (531040)	2,025
Whyanbeel Valley (031062)	1,934

Widespread and severe flooding caused many landslides that blocked and/or damaged roads, isolated coastal communities, and caused major damage to vital infrastructure, public services and the environment.

Landslides and flows of debris caused by the intense and prolonged rainfall were widespread and destructive across slopes in and around the Area. In some places, landslides upstream caused fast-moving debris flows that inundated streams and stripped rainforest, destroyed riparian vegetation, and deposited sediments and debris across floodplains, coastal areas, beaches and inshore coral and seagrass beds. Aerial surveys showed that the greatest levels of impact from landslides and flooding occurred within 10km of the coast.¹³ Impacts of landslides included increased sediment loads in rivers and creeks across the Area, with flood plumes along the coast visible from south of Cairns up to the Normanby River at Princess Charlotte Bay.¹³

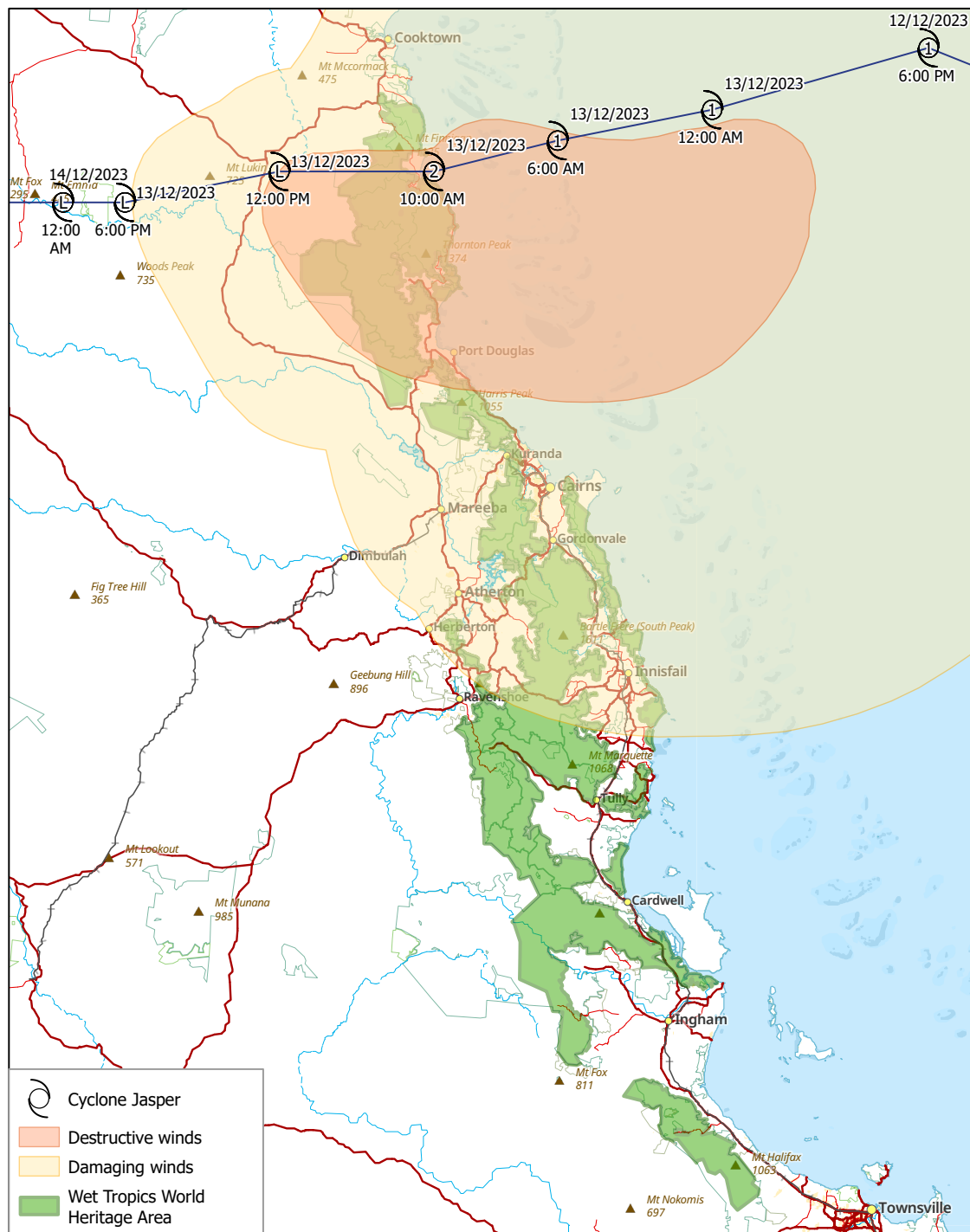


Figure 3. Map showing the path of and areas affected by TC Jasper (December 2023).

Snapshot: Far North Tropical Low—February 2025

Between 27 January and 5 February 2025, a tropical low (named '13U') brought heavy rainfall to Queensland's northeast tropical coast (Table 4) between Cairns and Ayr. Some sites across northern Queensland recorded their highest daily or multi-day rainfall totals on record.^{12, 14}

Several days of heavy rain caused both flash flooding and river flooding across the region. Hundreds of people were displaced, and thousands more impacted when Cardwell, Ingham and surrounding areas were inundated, along with numerous suburbs of Townsville.

As with TC Jasper, heavy rainfall and flooding caused many landslides that blocked and/or damaged roads, isolated communities, and caused major damage to vital infrastructure, services and the environment within the Area.

Mount Spec Road—the main access road to Paluma and Hidden Valley from the coast—experienced substantial structural damage, including more than 60 landslides.¹⁴ The road remains closed to the public, with controlled access while stabilisation and reconstruction works take place.

Table 4. Ten-day rainfall totals from 27 January to 5 February 2025.¹⁵

Weather station location and number	Ten-day rainfall (mm)
Babinda (31004)	1,187
Cardwell (32004)	1,127
Cowley Beach (32194)	957
Innisfail (32163)	964
Rollingstone (32098)	1,805
Townsville (32040)	898



Impacts from the Far North Tropical Low: boulders on Mount Spec Road, Nywaigi Country—
Department of Transport and Main Roads.

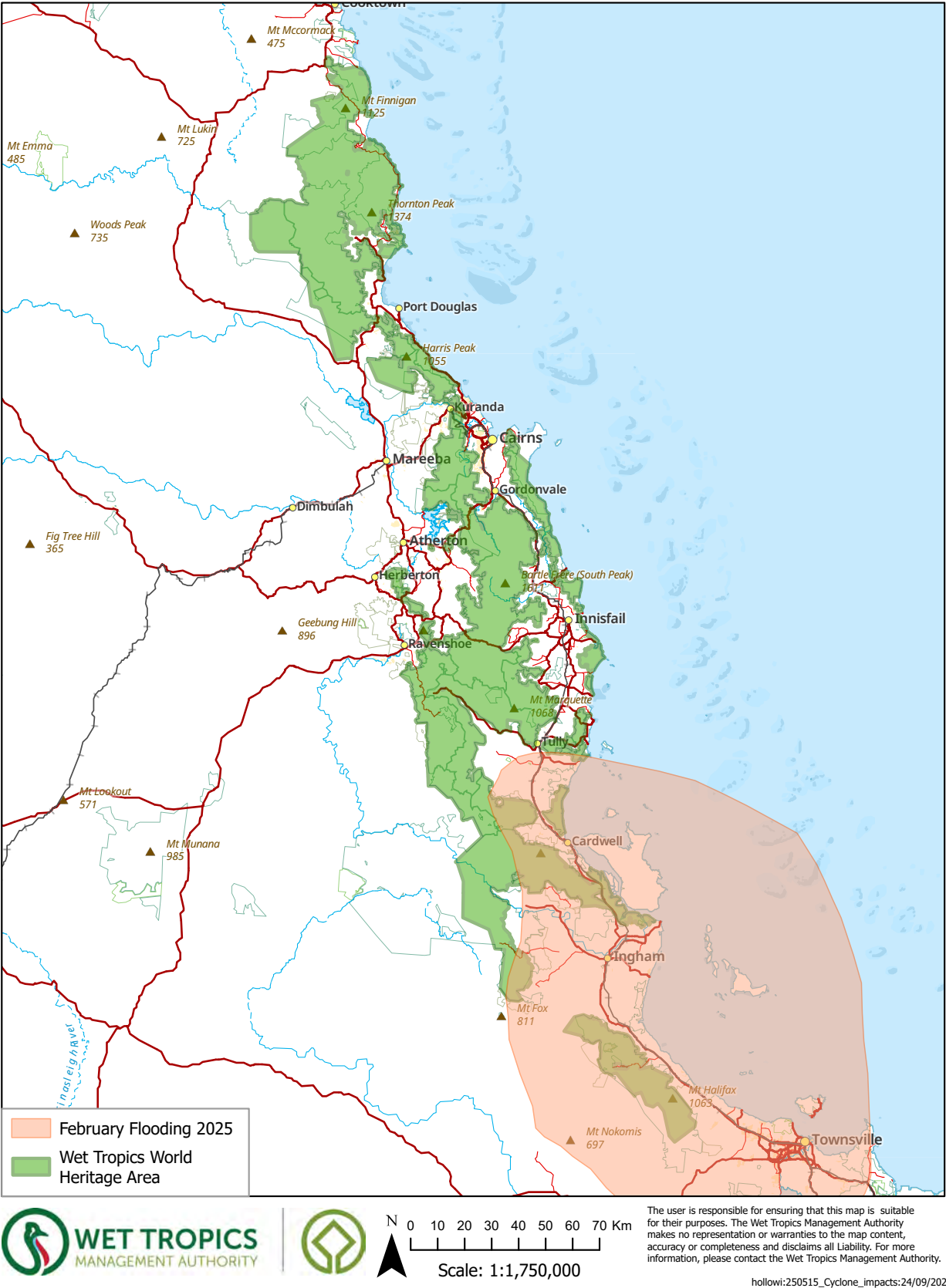


Figure 4. Map showing the areas affected by the Far North Tropical Low (February 2025).

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Queensland

Flooded north Queensland towns face continuing isolation with more rain forecast

Some areas are relying on supply drops from helicopters and planes as they brace for what may be a long wait for inundated roads to clear

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📷 Flooding in Ingham. Forecast heavy rain is expected to prolong the isolation of several towns in northern Queensland. Photograph: Adam Head/AAP

Australian Associated Press

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Flood-hit communities may be isolated for days as Australia after more rain was forecast for another day. Heavy rainfall that has lashed the north Queensland spread west, cutting off towns near the Gulf of Carpentaria.

At least six communities have been isolated in areas between Georgetown and Normanton overnight.

Some areas are relying on supply drops from helicopters and planes as they brace for what may be a long wait for inundated roads to clear.

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"Given the amount of water in those systems it could be eight-to-10 days," the Etheridge Shire Council said of how long communities could be isolated.

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North Queenslanders frustrated over ongoing Bruce Highway closures

By Georgia Loney, Cameron Simmons and Aaron Kelly

ABC North Qld Floods

Thu 20 Mar



Henry Street was among areas flooded in Townsville. (ABC North Qld: Georgia Loney)

In short:

Frustrations are growing over ongoing highway closures amid more flooding in north Queensland.

The Queensland Trucking Association says it's unacceptable that yet another Bruce Highway closure has cut off residents this morning.

What's next?

State and federal governments have pledged \$300 million in early works to upgrade the Bruce Highway between Gympie and Innisfail.

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Thousands flee homes as floods hit Australia

3 February 2025

Simon Atkinson
BBC News, Far North Queensland



Torrential rainfall causes flooding in northern Queensland

A woman has died in Australia and thousands have been forced to flee their homes after torrential rainfall caused flooding in northern Queensland.

Authorities say waters will continue to rise and have warned of a "dangerous and life-threatening" situation, with parts of the region recording almost 1.3m (4.2ft) of rain since Saturday.

"Record" downpours are set to continue into Monday, according to Queensland's Premier David Crisafulli.

Meteorologists say these could be the worst floods in the region in more than 60 years.

Share article

second flood in as many months, the Bruce Highway was again closed today.

on Thursday evening north and south Queenslanders are facing lengthy waits to get supplies.

the north Queensland region has been cut off.



3. State: Impacts



3. State: Impacts

Impacts of these extreme rainfall events are far-reaching and difficult to quantify as they have environmental, economic, social and cultural effects. These impacts are long-lasting, with some impacts only apparent months after the events.

Data on the environmental impacts of Tropical Cyclone (TC) Jasper and the Far North Tropical Low is currently incomplete. Research on ecological impacts is ongoing; with some projects in the planning stages and others collecting and/or analysing data. In addition, initial investigations and assessment of priorities are time consuming and necessary to plan for the best research outcomes.

Assessment of impacts has been delayed where landslides significantly affected roads and created access restrictions and shifting priorities. Recovery efforts are initially targeted to clean-up activities and rehabilitation of roads to enable access to local communities—funding to support environmental recovery activities to accelerate recovery across impacted areas generally becomes available months later.

To date, the main impacts of TC Jasper and the Far North Tropical Low (both actual and likely) are listed below.

Disruption to infrastructure

Infrastructure damage: roads, bridges, power infrastructure and buildings across the region were damaged, affecting local communities. Extended road closures created significant issues and disruptions for communities that are not relocated and face difficulties accessing food, fuel and other supplies. For example, after TC Jasper, Cape Tribulation was isolated for over three weeks, with helicopters and barges used to deliver food and fuel. The collapse of Ollera Creek Bridge between Ingham and Townsville during the Far North Tropical Low closed the Bruce Highway for nine days, impacting supply routes and essential services. The disruption to road networks also delayed efforts to assess the full extent of the environmental and social impacts. The worst of the 100+ landslides across the Douglas Shire following TC Jasper destroyed 56m of Cape Tribulation Road at Noah Range, which is still undergoing repair works.¹⁷



The initial works in January 2024 after TC Jasper to open the road and connect communities.
Noah Range, Eastern Kuku Yalanji Country—Wet Tropics Images

Erosion and decreased water quality

Soil erosion: landslides washed away topsoil in affected areas, causing soil erosion and potentially disrupting successional patterns. Some mangroves and rainforest around Daintree National Park (Cape York Peninsula Aboriginal Land) experienced dieback months after the extreme rainfall that followed TC Jasper.

Water quality issues: siltation and soil inundation as well as increased runoff from landslides and floods decreased water quality, potentially affecting aquatic life (e.g. fish, crustaceans, amphibians, etc.) and further impacting local freshwater and marine ecosystems of the Great Barrier Reef World Heritage Area.

Coastal erosion: inundation of foreshores and dune systems impacted coastal bird nesting sites. The sediment plumes likely resulted in smothering of seagrass meadows, reducing food sources for marine megafauna in the coastal and marine zones.



Forest die back 18 months after TC Jasper impacted the Wet Tropics World Heritage Area.
Bloomfield Track, Eastern Kuku Yalanji Country—Wet Tropics Images

Impacts on research and conservation efforts

Disruption to research: ongoing research and conservation programs have been delayed or affected by the damage to infrastructure and access to key sites such as Mount Lewis National Park. Recovery and monitoring efforts in this and other national parks have been disrupted.

Long-term ecological consequences

Impacts to ecosystems: while ecosystems in the Wet Tropics World Heritage Area (the Area) are naturally resilient and have evolved to withstand cyclones and floods, the increased intensity and/or frequency of these events can accelerate habitat loss and disrupt ecological processes, potentially altering species dynamics over time. The Area may face challenges with long-term recovery, especially given the combined pressures of extreme rainfall events, habitat fragmentation, and the potential spread of invasive species.

Impacts to key species: threatened and priority species in the bioregion have been affected by these extreme rainfall events. The likely affected species include marine species such as dugongs and marine turtles. Coastal birds and estuarine and freshwater crocodiles can be affected by changes in habitat, water quality and sediment deposition. These impacts also affect freshwater fish, crayfish species (e.g. *Euastacus* spp.) and frogs (e.g. critically endangered Mount Elliot nurseryfrog *Cophixalus mcdonaldi* and endangered waterfall frog *Litoria nannotis*). Key mammal species likely affected by these extreme rainfall events include endangered flying-foxes (*Pteropus* spp.) and the mahogany glider (*Petaurus gracilis*). Threatened plants that occur in aquatic and terrestrial flood impacted areas are especially susceptible to these rapid changes in habitat and water quality (e.g. critically endangered tassel ferns).

Severe vegetation damage

Tree falls and loss of canopy integrity: landslides caused extensive damage to rainforest and riparian habitats, with many trees uprooted or severely damaged. This loss of forest canopy disrupts forest continuity and ecosystems, and impacts endemic, vulnerable and threatened plant and animal species.

Forest regeneration challenges: although rainforests can recover from disturbance over time, damage from landslides can significantly slow down and/or alter the regeneration of some areas, particularly where mature trees and topsoil are lost, and where weeds and fast-growing vines establish.



Decalobanthus peltatus, a native vine covering the forest edge 18 months after TC Jasper. Northeast side of Emmagen Creek, Eastern Kuku Yalanji Country—Wet Tropics Images

Social, cultural heritage and economic impacts

Community impacts: flooding and loss of property have had considerable and ongoing consequences for individuals and entire communities that were displaced and deeply affected, both emotionally and financially. During the significant rainfall event that followed TC Jasper, the entire town of Wujal Wujal was evacuated, and residents were unable to return for several months while reconstruction activities were underway. Some significant cultural sites were affected by flooding and clean-up activities. Numerous communities along the coast experienced evacuations and loss of property. The Far North Tropical Low saw prolonged flooding with Cardwell, Ingham and many other communities inundated, with damage to homes and businesses.

Economic impacts: the damage to infrastructure and the environment caused disruptions to economic activities across many industries, including tourism. Communities around Cape Tribulation and Paluma have been especially affected by damage to the road network which has reduced people's ability to travel to these destinations, and ongoing impacts, such as those to the Kuranda Range Road continue to affect the community. Extreme weather can reduce traveller confidence and affect bookings outside impacted areas. For example, the flooding from the Far North Tropical Low resulted in some travel cancellations around Cape Tribulation, even though that area was largely unaffected.¹⁶ Chapter 6 of this report elaborates on the economic impact of the two events to the regional tourism industry. Chapter 5 of this report further addresses the social impacts of these events.



Impacts to road infrastructure and surrounding forest after TC Jasper.
Alexandra Range, Eastern Kuku Yalanji Country—Wet Tropics Images



Impacts to infrastructure and access along Bloomfield Road, Eastern Kuku Yalanji Country—
Cook Shire Council

Wildlife displacement

Destruction of habitat: loss of trees and forest integrity likely forced many animal species to move or seek shelter elsewhere, potentially disrupting local populations including endemic, vulnerable and threatened species. Animals that require continuous forest canopies for shelter and food (like many tree-dwelling mammals) could face significant challenges while seeking food and shelter. Birds that nest on coastlines and islands in the summer months (e.g. little terns, which usually nest on sandspits at mainland river mouths) are particularly susceptible to losing eggs or chicks when events like these cause dune overwash and flooding of these habitats. Chapter 5 presents feedback from Rainforest Aboriginal Peoples, highlighting their observations on specific impacts to wildlife.

Summary

Impacts from extreme rainfall events are difficult to quantify and manage as they can become far greater once broader environmental, economic, social and cultural aspects are considered. The impacts from TC Jasper and the Far North Tropical Low in and around the Area are still being assessed and studied. The ability to do this is impacted by funding availability and ongoing access issues in particularly affected areas.

The vegetation damage, wildlife displacement and challenges caused by these extreme rainfall events further highlights the urgency for conservation and research programs that focus on habitat restoration, species protection, and ongoing monitoring of the long-term ecological effects of extreme rainfall events in the Area.

4. Response:

Management actions



4. Response: Management actions

Effective and timely management actions following extreme rainfall weather events are crucial for safeguarding the unique biodiversity, ecological values and cultural heritage of the Wet Tropics of Queensland World Heritage Area (the Area). Prompt, coordinated responses can help mitigate further impacts, protect critical habitats, and support the recovery of local ecosystems and communities. Swift management actions are essential to prevent long-term impacts on the natural environment and the communities that depend on it. These actions should include funding of green infrastructure to address erosion and flooding, restore damaged habitats, and ensure that future impacts from similar events can be mitigated and managed.

Funding

The Queensland Reconstruction Authority (QRA) manages and coordinates the state government's funding of recovery and reconstruction within disaster-impacted communities. The Australian Government supports this through the Disaster Recovery Funding Arrangements (DRFA). Through DRFA funding, QRA can reimburse state and local governments for eligible costs incurred in a disaster. Funds can also be used for reimbursements, grants or loans to individuals, not-for-profit organisations, primary producers and small businesses affected by the disaster.

Funding for repairs and recovery from the DRFA is essential. However, the funding process can be slow and unwieldy, and is restricted by existing rules that are not flexible enough to adequately encourage rebuilding for resilience. For example, local councils are initially only funded to repair or replace what was there previously, restricting capacity to explore alternative designs that may increase resilience to future extreme rainfall events, such as higher bridges or replacement of asphalt in key areas with materials that allow rainwater to seep through the surface (e.g. tiles). In addition, updated DRFA guidelines prevent some recovery and management works to commence before funds by DRFA have been granted, and currently no reimbursements are allowed for works undertaken prior to the funding arrangements being finalised. This delays recovery and potentially increases the environmental harm of the disasters.

The DRFA currently provides funding under four categories:

- **Category A**—*counter disaster operations, for costs associated with eligible activities to alleviate personal hardship and distress.*
- **Category B**—*counter disaster operations, for costs associated with activities aimed at protecting the public and ensuring public health and safety in public areas.*
- **Category C**—*available where the community is severely affected by an eligible disaster and existing standard DRFA relief measures are insufficient to support community recovery.*
- **Category D**—*available when the community is so severely affected by an eligible disaster that additional funding is required to meet the particular circumstances of the event; and where a gap or need for special assistance arises that is beyond the standard suite (category A and B) of the DRFA assistance.*

Initial DRFA assistance is to reconnect essential services, reconstruct public assets and assist affected communities. Funding to address environmental impacts may become available later, where circumstances are assessed as eligible. Tropical Cyclone (TC) Jasper (December 2023) and the Far North Tropical Low (February 2025) were extreme rainfall events eligible under all four categories.

Tropical Cyclone Jasper

More than \$200M has been allocated to support recovery and resilience since TC Jasper, across multiple packages, including an Environmental Recovery package of just under \$43M. This became available in May 2024 and included:

- Environmental Investigations Program
- Healthy Waters Cleanup and Recovery Program
- Biodiversity and Invasive Species Management Program
- National Park Recovery Program
- Environmental and the Cultural Asset Steward Support Program.

Eligible applicants and partners for this Environmental Recovery package included state and local government, and non-government organisations including natural resource management bodies, conservation groups, nature refuge owners, First Nations corporations and universities.¹⁸

Far North Tropical Low

Significant financial assistance has been provided following the Far North Tropical Low, including a \$75.1M Environmental Recovery package made available in July 2025 which includes four initiatives:

- Environmental Cleanup and Local Conservation Grants
- Catchment and Coastline Rehabilitation
- National Park Recovery
- Environmental and Cultural Asset Support.

There are 40 local government areas in the affected area eligible under this package, which aims to improve the condition of the catchments and associated ecological processes and cultural values in the impacted regions.¹⁹



Landslides and associated forest damage after TC Jasper.
Gap Creek, Eastern Kuku Yalanji Country—Cape York Water Partnership

On-ground collaborations

The Wet Tropics Management Authority (the Authority) advises on recovery actions across the Area to avoid further impacts to the environment. In the aftermath of TC Jasper and the Far North Tropical Low, the Authority has been working with local councils, Queensland's Department of Transport and Main Roads (TMR) and other service providers to re-establish access, rebuild roads and connect the communities while ensuring the integrity of the Area is protected. These events caused significant destruction to essential services infrastructure across the area.

TC Jasper

TC Jasper caused extensive damage to the road network and works to repair and rebuild are ongoing. Road works continue along Tully Gorge Road, Kirrama Range Road, the Palmerston Highway, the Kuranda Range, various sections of the Captain Cook Highway, Barron Gorge Road, Rex Range, Cape Tribulation Road, the Bloomfield Track, Shiptons Flat Road and many other local roads.

Significant damage to the Bloomfield Track (from Rykers Creek, near Cape Tribulation, to Wujal Wujal) has required a concerted effort. The local council (Douglas Shire Council, DSC) and TMR worked together to open the road after TC Jasper. DSC and TMR have actively been engaging with the Authority and Eastern Kuku Yalanji Peoples to seek advice and ensure environmental and cultural values are protected. Damage around the Bloomfield Track comprised more than 45 work sites, and the Authority collaborated with cultural heritage consultants and engineers to find the best solutions to stabilise the road and ensure potential impacts were minimised during construction activities. This process of collaborative efforts to protect natural and cultural values, whilst re-establishing access, has been the focus of the Authority while providing advice to local councils, TMR and consultants engaged in road work repairs.

The Environmental Recovery package (ERP) for TC Jasper is being administered by the Healthy Waters Unit, from the Department of the Environment, Tourism, Science and Innovation (DETSI). Other DETSI divisions and government agencies will lead on programs where this aligns with their functions. The Authority has been involved in activities, particularly advising and gathering experts to inform the Environmental Investigations Program (EIP), a three-year program that will inform other initiatives and provide strategic guidance to prioritise actions.

The purpose of the EIP is to identify the nature and scale of environmental impacts and the potential recovery actions to inform the remaining programs. The Authority has collaborated with research institutions and government representatives to identify the following priorities:

- Water quality and water contamination issues
- Erosion, sedimentation and landslides' impacts
- Pest and weed incursions
- Waste and debris management and impacts
- Cultural heritage management and impacts
- Lack of pre-event baseline data
- Marine habitat concerns e.g. seagrass, corals, mangroves
- Impacts to coastal birds and nesting habitats
- Impacts to freshwater endemics e.g. Bloomfield River cod (*Guyu wujalwujalensis*) and cling gobies (*Stiphodon* spp.)
- Movement of invasive species e.g. Mozambique tilapia (*Oreochromis niloticus*)
- Impacts to threatened frogs of the Wet Tropics bioregion and the Area
- Impacts to threatened flora of the Wet Tropics bioregion and the Area e.g. plants of high conservation value which are endemic to single watercourses
- Impacts to endemic species
- Causes of rainforest vegetation die back observed after the event.

The work and data collected through the EIP is essential to understand impacts of extreme rainfall events and to prioritise future actions.



Accumulated debris across the Bloomfield Bridge at Wujal Wujal after TC Jasper.
Kuku Yalanji, Kuku Nyungul and Jalunji Country—Wujal Wujal Aboriginal Shire Council

Far North Tropical Low

The Far North Tropical Low caused significant damage to infrastructure with ongoing works along Crystal Creek Road and its associated water pipeline, Mount Spec Road, Paluma Dam Road, Wallaman Falls Road, Jourama Falls Road and many other local roads. The Authority is working closely with local councils and TMR to ensure natural and cultural values are protected.

Event-specific research

Research and monitoring activities undertaken in the Area are essential in guiding management and conservation efforts. Given the significant and widespread impacts of TC Jasper and the Far North Tropical Low, recent research and monitoring activities have been focusing on assessing impacts of extreme rainfall events on the Area.

Under TC Jasper's EIP, a suite of projects to understand the environmental and social impacts of the extreme rainfall are ongoing. These projects, involving a range of different agencies and partners, will provide important information on the impacts of extreme rainfall events. Results will assist in the development of conservation and management strategies of threatened and vulnerable species and ecosystems. Brief project descriptions are found below in Table 4.

Table 4. List of ongoing projects assessing impacts of the severe flooding caused by the heavy rainfall following TC Jasper.

Topic	Project partners	Project description
Baseline data for endemic and invasive species	Aquatic ecologists, Department of Local Government, Water and Volunteers	eDNA surveys in heavily impacted areas
Cultural heritage	Cape York Water Partnerships and the Authority	i. Community and Rainforest Aboriginal Peoples engagement ii. Cultural asset steward support grant program
Erosion/sedimentation/landslides	Light detection and ranging (LiDAR) and aerial imagery provider, spatial analyst, consultant (Alluvium)	i. LiDAR and aerial imagery capture and impact analysis ii. Riverine and floodplain management strategy development
Landholder feedback	Gulf Savannah NRM	Collation of NRM's and landholder reports
Marine habitat	James Cook University (TropWater)/National Environmental Science Program (NESP)	Survey of 1,200 sites from the Cassowary Coast to Cooktown including seagrass, corals, and mangroves
Pest and weed incursions	Department of Primary Industries	Delivered through pest and weed management
Pre-event vegetation baseline data	DETSI Sciences/James Cook University (JCU)	Wet Tropics bioregion–vegetation plot data capture
Rainforest vegetation die-back	DETSI Sciences	Collecting and analysing soil samples for pathogens and contaminants. Observing changes in stream morphology to assess impacts from ongoing inundation and waterlogging
Threatened freshwater fish	Griffith University/JCU/NESP	Desktop risk assessment and field surveys for Bloomfield River cod
Threatened flora	Australian Network of Plant Conservation/Threatened Species Operations (TSO DETSI)	Surveys for 17 threatened flora species to prioritise recovery actions
Threatened frogs	JCU/TSO DETSI	Captive husbandry trial of suitable analogue species to gain essential knowledge for keeping and breeding eight threatened frogs of the Wet Tropics
Waste/debris	DETSI/local governments (councils)	Clean up grant program
Water quality	Cape York Water Partnerships	Water quality and potential contamination testing and analysis

Unfortunately, specific funding for an EIP for the Far North Tropical Low was not granted as part of its ERP, therefore less information will be available to understand the environmental impacts of this event and to inform required actions to mitigate impacts and prepare the region for future events. Nevertheless, a collaborative approach to determining investment needs across the entire recovery package through data collection and stakeholder engagement will be implemented.



Tully Gorge National Park, Jirrbal Country—Wet Tropics Images

Other relevant research

In addition to research specifically investigating the impacts of extreme rainfall events on the Area, the following projects and initiatives contribute to our understanding of the Area and the impacts of invasive species, pathogens and ecosystem changes on the environment.

Mountain-top nursery frog (*Cophixalus monticola*): This critically endangered frog (DCCEEW, Threatened Species Strategy Action Plan 2022—2032, 2022) is found only on Mount Lewis at altitudes above 1,100m above sea level.^{20, 21} Terrain NRM, Western Yalanji Traditional Owners, JCU, Gulf Savannah NRM and QPWS&P are undertaking a project to protect the species by reducing the potential impact of feral pigs around breeding sites. The delivery of this project has been affected by the damage to Mount Lewis Road, as several landslides during TC Jasper have blocked the road and access has not been reestablished. The project will rely on access via helicopters to establish pig exclosures and monitor the mountain-top nursery frog.

Assessing the impacts of myrtle rust on forest dynamics and function: Myrtle rust is caused by the fungal pathogen *Austropuccinia psidii* and was first identified in Australia in 2010. Since then, it has spread rapidly, severely affecting native plants in the Myrtaceae family such as eucalypts, bottlebrushes, paperbarks, tea-trees, and lilly-pillies. Currently, several of these species are experiencing significant declines. This project, a collaboration between the Department of Primary Industries and JCU, seeks to understand the challenges presented by the spread of myrtle rust and how to conserve the ecosystem health of Australian World Heritage forests.²²

Managing and monitoring resilience in Australia's national parks: This project will inform management of national parks including those located inside the Area. It is a collaboration between JCU, Queensland University of Technology, the University of Newcastle and the University of Western Australia. The project includes the developing of acoustic monitoring techniques to assist with species recovery and conservation.²²

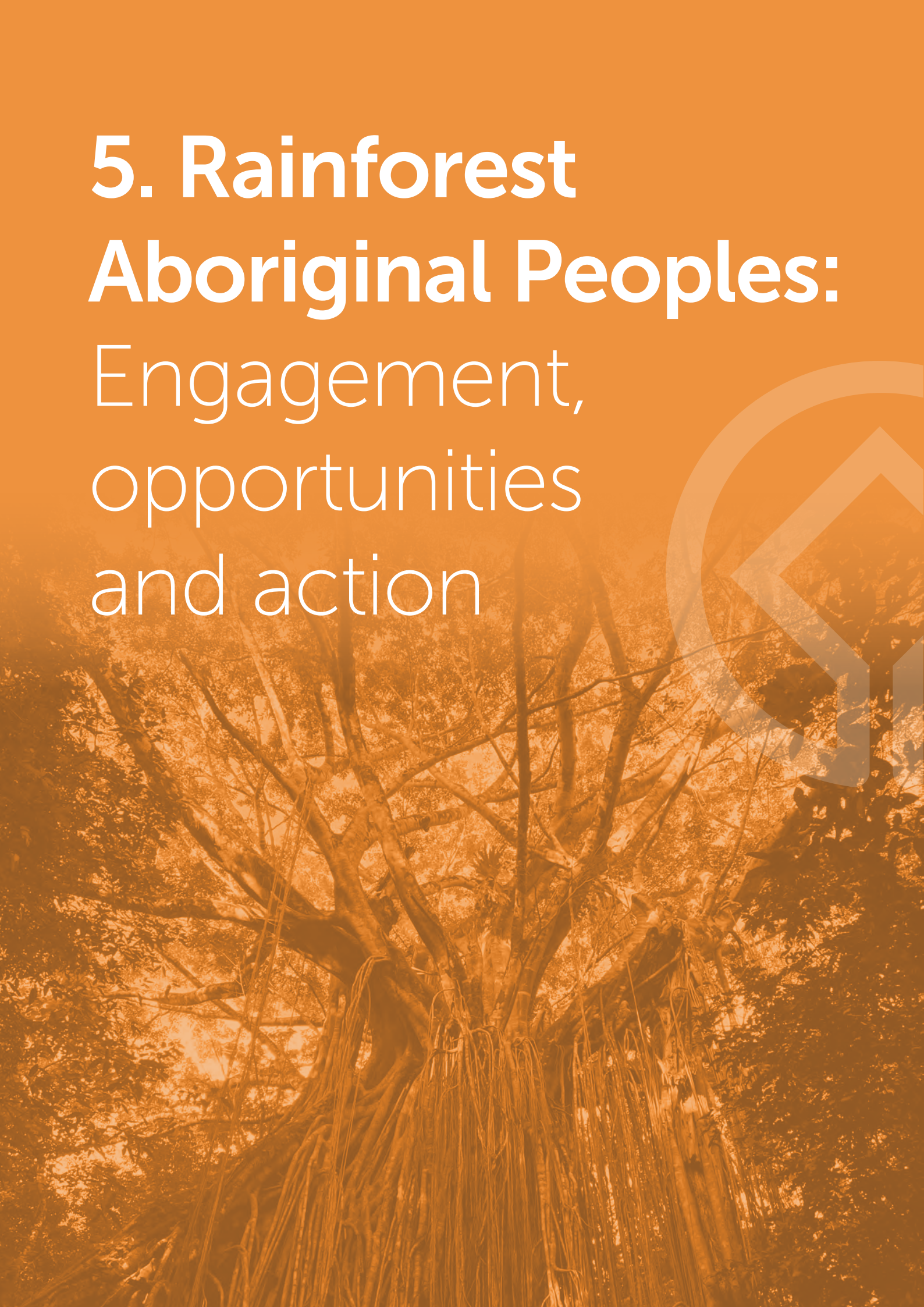
Wet Tropics Management Authority's Yellow Crazy Ant Eradication Program: This program is managed by the Authority to eradicate yellow crazy ant (*Anoplolepis gracilipes*) infestations within and adjacent to the Area. This ant species is one of the 100 world's worst invasive species for its ability to travel in clever ways, establish, thrive and dominate new ecosystems.²³ Yellow crazy ant colonies can be easily spread in floating vegetation, wood, or other debris carried in floodwaters; therefore, extreme rainfall events have the potential to transport these ants to new areas and increase their impacts on the Area. In collaboration with JCU, the Authority works to monitor and eradicate yellow crazy ants, and to understand their impacts to biodiversity and behaviour. This program recently achieved the largest eradication of yellow crazy ants worldwide, with a total of 1,076.2 hectares declared eradicated to August 2025; 63.3 of these hectares are within the Area.

Threatened species recovery teams: Recovery teams are formed by groups of people and organisations working together to help protect and restore threatened species or ecosystems. The recovery teams plan and/or coordinate actions to support the recovery of one species, several species, or entire natural communities.²⁴ The Authority participates and supports recovery teams for southern cassowaries, northern bettongs, mahogany gliders and spectacled flying-foxes.



The magnificent brood frog (*Pseudophryne covacevichae*) is an endemic frog species that is listed as vulnerable, with habitat loss and degradation appearing to be the greatest threats—Edward Evans

5. Rainforest Aboriginal Peoples: Engagement, opportunities and action



5. Rainforest Aboriginal Peoples: Engagement, opportunities and action

Rainforest Aboriginal Peoples have lived in the Area for thousands of years.²⁵ As of one the oldest continuous living populations, different places and ecosystems have been used by Rainforest Aboriginal Peoples as meeting places, bora grounds, story places and campsites; the Wet Tropics World Heritage Area (the Area) is also criss-crossed by trails that have been used for thousands of years and carved trees and stone arrangements can be found across the Area.²⁶ Today, there are more than 20 Rainforest Aboriginal tribal groups with ongoing traditional connections to land in the Area, actively blending traditional knowledge and contemporary land management practices. Ensuring fair and culturally respectful ways of incorporating their traditional ecological knowledge is essential for the effective cooperative management of the Area.⁹

Wujal Wujal, a remote Indigenous community in the northern part of the Wet Tropics, is on the Country of the Kuku Yalanji, Kuku Nyungul and Jalunji clans. Wujal Wujal is the local Kuku Yalanji clan name meaning 'many falls', referencing the many sacred waterfalls that occur in their traditional lands. The Wujal Wujal community was severely affected by Tropical Cyclone (TC) Jasper and the subsequent flooding in December 2023. This highlighted our need to understand the full range of flood events, including rare and extreme events, as climate change continues to influence their unpredictability, frequency and severity.

Like other northern communities, Wujal Wujal was prepared for the cyclone but not for the subsequent extreme rainfall, flooding and devastation of the town. Floodwaters trapped people on roofs without food as homes and buildings were inundated, and the Australian Defence Force was deployed to evacuate residents by air. The entire community was evacuated as the damage was extensive and residents were isolated from assistance. Residents were displaced for up to four months, and were unable to return to help clean up their homes.²⁷

Due to the significant damage and impacts on the town's infrastructure, the Wujal Wujal Aboriginal Shire Council received DRFA category C funding to repair and, where economical, improve the resilience of community and recreational assets.

Engagement

Under the Environmental Investigations Program for TC Jasper, Cape York Water Partnerships (CYWP) and the Wet Tropics Management Authority (the Authority) were engaged under a project aimed at understanding the environmental and cultural impacts through engagement with Rainforest Aboriginal Peoples from across the Wet Tropics.

CYWP met with Rainforest Aboriginal Peoples in Wujal Wujal, Ayton, Rossville, Helenvale, Cooktown, Hope Vale, Normanby Station, Melsonby Ranger Base and Laura. CYWP met with more than 169 people across the region at events specifically related to TC Jasper, and with many more through informal engagements and attendance at other events. Additionally, an online survey and one-on-one meetings gathered information from those who could not attend a meeting or had more information to share.¹³

South of the Bloomfield River, the Authority held six full-day workshops over two weeks in November 2024. These spanned five local government areas, held in Cairns, Mareeba, Mossman, Cardwell, Innisfail and Atherton. Rainforest Aboriginal Peoples from a range of groups attended these workshops, and an online survey was also available for three weeks.

Throughout these engagements, the severe impacts of the extreme rainfall event—both environmentally and culturally—were clear.^{13,28} Rainforest Aboriginal Peoples highlighted challenges in accessing Country following TC Jasper, which delayed assessment of impacts and recovery actions. The environmental damage from flooding and restricted access has disrupted cultural practices.^{13,28}

Most community members have stress, trauma and anxiety from the flood event and the damage to Country, which includes damage to places of cultural significance. While flooding and landslides caused significant damage, further damage was caused by inappropriate responses and recovery actions, as local councils and other service providers did not engage with Rainforest Aboriginal Peoples before and during clean-up activities. This is a lesson to be learned about the importance of ensuring effective engagement with Rainforest Aboriginal Peoples in these activities.

Impacts to waterways, including increased sediment loads and changes in river channels and hydrology, were also noticed by community members across the region. Impacts to fish habitat, including die-back of riparian and floodplain vegetation are also concerning. Other environmental impacts noted were the changes in distribution of estuarine crocodiles and an increase in weeds and feral animals, particularly horses and pigs.^{13,28}

All these impacts affected environmental, social, cultural, and economic values for Rainforest Aboriginal Peoples across the Area.

Opportunities

Following TC Jasper, Rainforest Aboriginal Peoples view the Environmental Recovery package (ERP) as an important opportunity and want to lead culturally appropriate responses and recovery actions following future extreme weather events.²⁸

Discussions with Rainforest Aboriginal Peoples highlighted the desire of groups to be involved in the design and implementation of activities across programs under the ERP. It is important to include people with deep knowledge of Country in programs that monitor the environment and propose recovery actions.

Involvement of Rainforest Aboriginal Peoples in response and recovery activities after extreme weather events will create opportunities for joint management of the Area and will ensure protection of cultural heritage.

Action

To protect the Area and support Rainforest Aboriginal Peoples' interests, the Authority will develop material to guide best practice in effectively engaging Rainforest Aboriginal Peoples in response and recovery actions following extreme weather events. This information will be shared with local councils and service providers.



Atherton workshop with Djabugay Aboriginal Corporation rangers, Jirrbal and Ngadjon-Jii Traditional Owners—Wet Tropics Images



Daintree rainforest, Eastern Kuku Yalanji Country—Wet Tropics Images/Ana Palma

6. Economic impacts



6. Economic impacts

Climate change is exacerbating the intensity and frequency of extreme rainfall events. Rising global temperatures are also contributing to increase in fire weather, droughts, heavy precipitation and flooding. Warmer ocean temperatures are also fuelling stronger tropical storms, increasing their severity and the damage they cause.²⁹ These extreme weather events affect water availability and food production, human health and well-being, tourism sites, infrastructure, biodiversity and ecosystems, and damage key economic sectors.²⁹

Economic impacts from climate change occur on climate-exposed sectors, with regional effects to agriculture, forestry, fishery, energy and tourism. Individuals are affected through changes in agricultural productivity, impacts on human health and food security, destruction of homes and infrastructure, and loss of property and income, with adverse effects on gender and social equity.²⁹ In addition, climate change is forecast to reduce the world economy by 19% within the next 25 years independent of future emission choices; relative to a baseline without climate change.³⁰ Most of Australia could see a decrease in income per capita of about 20 to 25% when considering changes in average annual temperature, daily temperature variability, total annual precipitation, number of wet days and extreme daily precipitation.³⁰

In the Wet Tropics bioregion, these trends manifest as impacts to tourism, agriculture and biodiversity. The bioregion's tropical agriculture, including crops like sugar cane and bananas, faces risks from altered rainfall patterns and increased temperatures, potentially leading to reduced yields and economic losses.³¹

Value of tourism in the region

Tourism is an important industry in the Wet Tropics bioregion. The Wet Tropics of Queensland World Heritage Area (the Area) and the Great Barrier Reef World Heritage Area (GBR) are the major natural attractions underpinning this industry. Research on visitors' motivations for travelling to Far North Queensland showed that "visit the GBR", "visit rainforests", "experience the natural environment" and "rest and relaxation" were consistently the main motivations.³² Economic research on national park visitors to the Area show that these visitors also spend money within the broader region on accommodation, food and beverage, tours, transport and in retail businesses.³³

Tourism economic data is collected regularly by Tourism Research Australia and published by the Australian Trade and Investment Commission for each tourism region. The Tropical North Queensland (TNQ) tourism region includes most of the Area, while the Townsville tourism region includes that part of the Area stretching from Ingham to the west of Townsville. It is not possible to extract from these statistics the tourism that occurs only in the Area or if visitors are attracted to the broader regions because of the Area. However, the overall visitor statistics inform the importance of tourism in these regions as an economic activity and employment generator.



Boyd's forest dragon (*Lophosaurus boydii*), one of the many species that attract visitors to the Area.
Lake Eacham, Ngadjon-Jii Country—Wet Tropics Images

Prior to the COVID-19 pandemic, tourism to Far North Queensland was experiencing steady growth and visitor numbers to both the TNQ and Townsville regions peaked in 2019.³⁴ Domestic visitor numbers started returning to pre-pandemic levels in 2021, but international visitor numbers have not fully recovered.³⁵

In the year ending June 2024, TNQ had 2.7 million overnight visitors, which is a recovery of 89.2% compared to 2019. These domestic and international visitors spent \$4.6 billion, which is 30.9% above 2019 levels. Domestic overnight visitor expenditure decreased by 12.6% over the year to \$3.7 billion. This decrease was due to lower visitation over the year. International visitors spent \$905.7 million in TNQ, a recovery of 88.1 % compared to 2019.³⁶

During 2023–24, the contribution of tourism to the TNQ economy was around 9% of the Gross Regional Product (down 0.2% from 2022–23) and tourism jobs represented around 11.2 % of jobs in the TNQ region (down 0.7% from 2022–23).³⁷ During this same period (2023–24), the contribution of tourism to the Townsville region was around 2.9% of the Gross Regional Product (down 0.1% from 2022–23) and tourism jobs represented around 4.1% of jobs in the Townsville region (down 0.2% from 2022–23).³⁷

The slight decrease from 2022–23 to 2023–24 in tourism's contributions to the economy and employment for both regions could be in part due to the extreme weather events the region has experienced. For instance, direct impacts from Tropical Cyclone (TC) Jasper to biodiversity, road infrastructure and services clearly affected the tourism sector. However, the impact on tourism was felt by this sector as early as 5 December 2023, when the Bureau of Meteorology upgraded tropical low 03P to category 1 TC Jasper, and later when forecasts anticipated a severe (category 3 or 4) tropical cyclone heading towards the Far North Tropical coast. Data from Tourism Tropical North Queensland show that since 5 December 2023, the effect of cancelled tourism bookings resulted in lost and cancelled expenditure of \$256,664,290 (at end February 2024).²⁹ This represents approximately a 5.2% reduction in the total annual tourism expenditure in the region in less than three months. Results from the accommodation and food services sector, which is dominated by tourism businesses in the region, showed that 94.4% of this sector was impacted by the event.³⁸

As highlighted in this report, extreme rainfall events cause large-scale disruption to transport and impacts to agriculture, infrastructure, businesses and tourism. Cairns Regional Council undertook an economic impact assessment of Cairns Statistical Area 4 (SA4), i.e., from Wujal Wujal to north of Lucinda, to understand the economic impacts of TC Jasper. The assessment included a business survey and out of the 511 businesses surveyed, 85.9% reported being impacted by the event—73.2% closed temporarily, almost 3% closed permanently and 38.8% reported impacts to their employment situation.³⁸

The impact on business was significant with 41.8% of businesses indicating that they lost between \$10,000 and \$50,000; 11.1% lost between \$50,000 to \$99,999 and 12.8% lost between \$100,000 and \$500,000. Losses of more than \$1 million in earnings were reported by 4.3% of businesses. The estimated adverse gross economic impact in the Cairns local government area was \$389.4 million, and \$649.1 million in the wider Cairns SA4 region.³⁸

Assessing the specific economic impacts of the Far North Tropical Low on Townsville's tourism industry presents challenges as the event's impacts are still being assessed. However, the Queensland Reconstruction Authority (QRA) announced a \$6.43 million Tourism Industry Recovery Support Program to support the immediate to longer term economic recovery in local government areas that rely heavily on tourism and were significantly impacted by the Far North Tropical Low.³⁹ Tourism activity in Hidden Valley and Paluma is still suffering the impacts from the Far North Tropical Low as Mount Spec Road experienced extensive damage and access will be restricted to residents only until road repairs are completed.

While the impacts from the Far North Tropical Low are still being assessed, it is expected that several areas in national parks around Townsville will remain fully or partially closed for some time due to significant damage to both infrastructure and visitor sites. Natural assets have also been impacted and protected areas that have been affected will require repair and clean-up prior to opening to visitors. In addition to their inherent value, these assets contribute to the local tourism sector and these areas opening to the public as soon as possible will support the economic recovery of the local community.



Progress of repair works after the Far North Tropical Low.
Mount Spec Road, Nywaigi Country—Wet Tropics Images



Mount Yarrabah, Gungandji, Mandingalbay Yidinji Country—Wet Tropics Images

Our current knowledge about the economic impacts of climate change in the Area indicates that more resilience building activities are required. The region needs to develop community capacity to endure extreme weather impacts, and to support services, infrastructure, communities and ecosystems to recover quicker and re-establish local economies.

These extreme rainfall events have impacted local communities and highlighted the need for long-term solutions. For example, TC Jasper severely impacted the Daintree coast, exposing the vulnerability of the region to extreme weather events. The cyclone and subsequent extreme rainfall and flooding caused widespread landslides and extensive damage to roads, infrastructure, and natural habitats. Tourism operators faced major disruptions, including prolonged road closures, power and communication outages, and access issues that led to booking cancellations and economic losses.

The event also worsened environmental challenges, such as the spread of invasive species, and harmed the region's reputation as a tourism destination. As a local tourism operator and Wet Tropics Community Consultative Committee member, Tamara Scenna highlights the resilience of the community but stresses the need for proactive planning, resilient infrastructure, reliable services, and strong partnerships to support recovery and prepare for future challenges.

Tamara recalled "This event showed us how vulnerable we are. We need long-term solutions to ensure our community, environment and economy can recover and thrive."

7. Conclusion and recommendations



7. Conclusion and recommendations

Key findings

Climate change will increase the frequency of extreme weather events such as extreme rainfall and associated flooding, heatwaves, droughts and wildfires.²⁹ Impacts of recent extreme rainfall and flooding highlight the effect these can have on the natural world as well as on our lifestyles and livelihoods.

These extreme rainfall events have also allowed us to understand how we need to better prepare for and manage future events. We have learned about the importance of collaboration in recovery activities, and recognise the opportunities that engaging Rainforest Aboriginal Peoples after natural disasters can bring. Their knowledge and skills can assist local councils and other service providers during clean-up and recovery activities and prevent further damage to cultural and natural values. Rainforest Aboriginal groups should be involved in immediate recovery efforts to prevent and minimise damage to cultural heritage.

Environmental impacts to the Wet Tropics World Heritage Area (the Area) from extreme rainfall events are many and encompass impacts to water, land and a wide range organisms and ecosystems. Official collaborative and resourced recovery works, including Environmental Investigations Programs, are essential to understand the long-term environmental impacts and inform conservation of threatened species and key habitats.

Extreme rainfall events also have social and economic impacts, with communities experiencing displacement, disruption to livelihoods, cultural loss, and health challenges including stress and anxiety.

Recommendations

This report identifies the following management responses to reduce the impacts of extreme rainfall events and support the resilience of the Area:

- **Enhancing ecosystem resilience—creating and implementing strategies to protect ecosystem functions in the face of disturbances and the increasing threat of climate change.** Disaster Recovery Funding Arrangements should include initial provisions to improve the resilience of infrastructure and ecosystems for future events (e.g. through riparian restoration projects). As Environmental Investigations Programs are key to understanding impacts and informing future conservation actions, prompt funding should be a priority.
- **Adaptive management and planning—updating conservation strategies and priority areas after extreme rainfall events.** The impacts from extreme rainfall events have highlighted the more vulnerable areas, species and ecosystems. Management strategies need to adapt to protect vulnerable areas and ensure the protection of key ecosystems. Results of the Environmental Investigations Program from Tropical Cyclone (TC) Jasper will inform management practices and will help us plan for future extreme weather events. Although the Environmental Investigations package for the Far North Tropical Low was not funded, some of the eligible activities will be incorporated into the delivery of the full recovery package. Funding for projects to understand the long-term environmental impacts of these extreme rainfall events should be a priority.
- **Community involvement—working with Rainforest Aboriginal Peoples, government agencies and all interested stakeholders to improve responses to extreme rainfall events.** Affected communities need to have an active role in planning and organising responses to future events. The early engagement of Rainforest Aboriginal Peoples is essential to minimise environmental and cultural damage during assessment, clean-up and recovery activities. Cultural considerations must be built into disaster recovery plans, including adequate resourcing.

- **Infrastructure and operational readiness—improving infrastructure (where required) and emergency protocols to allow for quick and organised responses to extreme rainfall events.** Environmental Management plans must include actions to prevent further environmental and cultural damage following extreme rainfall events. Active planning for future events could help avoid or minimise damage, including through improved infrastructure (e.g. by reducing road closures, which prevent the rapid assessment of impacts, cause social and economic hardship, and delay research). A concerted and meaningful approach to building resilience, including investment in innovative methods, is needed as part of recovery funding.
- **Species and genetic conservation—identifying key habitats that could act as refugia during or after extreme rainfall events.** Crucial information about the status of threatened and vulnerable species and habitats that will inform priority conservation and management actions will come from the EIP for TC Jasper. While there will be learnings from recovery and research activities associated with the Far North Tropical Low, the lack of a specific EIP for this event is a missed opportunity—funding for EIPs for any future events must be a priority if we are to truly understand impacts, improve species management, and build resilience.



Bellenden Ker, Madjandji Country—Wet Tropics Images/Ana Palma

8. References



8. References

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Chapter cover photos:

1. Bellenden Ker, Madjandji Country—Wet Tropics Images/Ana Palma.
2. Road damage by landslide, Bloomfield Road, Eastern Kuku Yalanji Country—Cook Shire Council.
3. Big boulders on Mount Spec Road as a result of landslides after the Far North Tropical Low, Nywaigi Country—Department of Transport and Main Roads.
4. Rykers Creek after Tropical Cyclone Jasper, Eastern Kuku Yalanji Country—Wet Tropics Images/Terry Carmichael.
5. Curtain Fig Tree, Ngadjon-Jii Country—Wet Tropics Images.
6. Road damage around Gap Creek after Tropical Cyclone Jasper, Eastern Kuku Yalanji Country—Cook Shire Council.
7. Tree damaged by rocks after high water flows following Tropical Cyclone Jasper, Bloomfield Road, Eastern Kuku Yalanji Country—Wet Tropics Images.
8. Landslide after Tropical Cyclone Jasper, Bloomfield Road, Eastern Kuku Yalanji Country—Cook Shire Council/Tom Hart.

