Nature-based solutions to flooding

Project community update
November 2024



BACKGROUND

The ANU Institute for Climate, Energy & Disaster Solutions (ICEDS) has been working with Ipswich City Council and other regional partners on a national project developing Nature-based Solutions for flood resilience.

ICEDS are a team of researchers, from fields including hydrology, social science, ecology and economics, partnering with communities to develop the first ever Australian guidelines on Nature-based Solutions for flood mitigation and resilience.

The aims for the Australian guidelines for Nature-based Solutions:

- Improve flood resilience using Nature-based Solutions for flood risk management
- Quantify the impacts on flooding and the benefits of Nature-based Solutions
- Build capacity for local government and community decision-making
- Demonstrate how researchers, community groups and government at all levels can work together to build flood resilience.

For Ipswich, there will be two main outcomes to this project:

- Providing input and context as a case study site for the national guidelines
- Examining options for nature-based flood mitigation projects that council may progress in future.



THE PROCESS

Collaboration between ICEDS and council on this project commenced in 2022.

This project connects strongly with the detailed and holistic floodplain management work completed by council with the Ipswich Integrated Catchment Plan.

The project investigations have included a high level of technical work including hydrodynamic modelling, assessments of ecological co-benefits, and analysis of socio-economic and institutional costs and benefits.

ANU is collaborating with WaterTech and Griffith University to quantify the water quality, ecological and economic benefits of the modelled Nature-based Solutions for flood risk management.

There has also been key stakeholder and community engagement as part of the process, including:

- August 2023 and October 2023 – targeted community stakeholder workshops, providing direction for the guidelines and local context
- October 2023 – community awareness of the project and nature-based solutions at the Ipswich Sustainable Living Festival
- December 2023 – expert panel, considering the findings of technical modelling and other factors.

A further targeted engagement session, and another expert panel, expected to be held in November 2024.

NATURE-BASED SOLUTIONS FOR IPSWICH

Based on expert and community feedback, and detailed technical investigations, the ICEDS team have proposed a range of Nature-based Solutions to mitigate flooding in Ipswich's Bremer Catchment.

Collectively, these measures aim to create a 'spongy catchment' approach that could have significant benefits – not only in terms of reducing flood impacts both locally and downstream, but also strong ecological and community benefits.

While these measures can provide benefit individually, the most benefit is obtained collectively.

WHAT IS BEING ASSESSED?

These measures are being investigated and modelled by the project team for their potential effectiveness.

Any future implementation would depend on further planning and design, as well as budget requirements.

Bundamba Creek sub-catchment:

- Revegetation of key riverbanks, providing a significant riparian buffer zone
- Leaky weirs (options for large or small)

Warrill Creek sub-catchment and Bremer River downstream urban area:

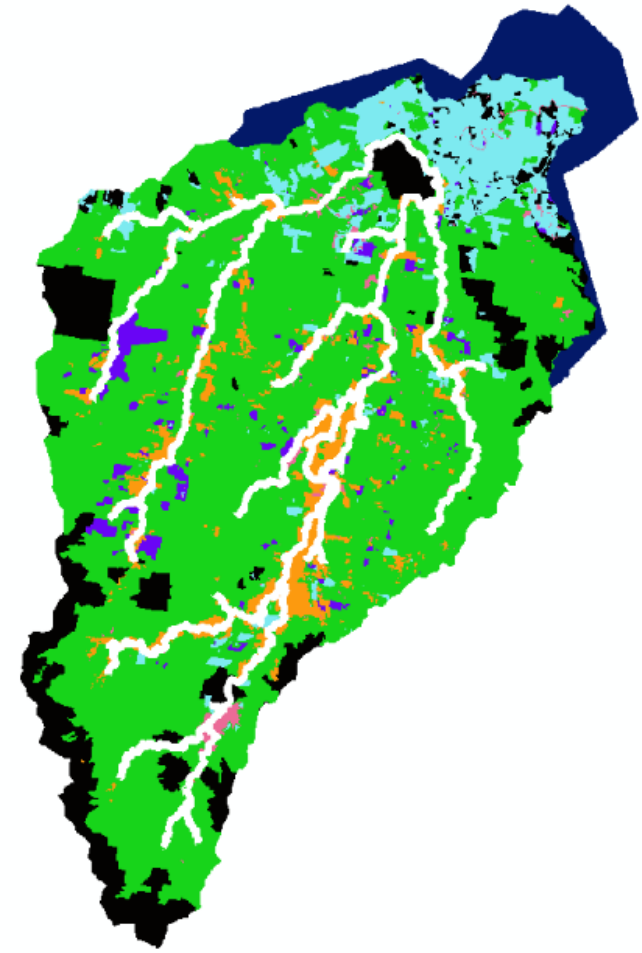
- Reforesting key areas that have been historically cleared
- Revegetation of key riverbanks, providing a significant riparian buffer zone
- Urban green solutions in the Deebing Creek sub-catchment such as rainwater tanks, green roofs, permeable pavements or urban wetlands.
- Leaky weirs or bunds.

FURTHER INVESTIGATION

These initial findings are still being tested and considered, especially in terms of:

- Difference in flood mitigation potential based on design variations
- Socio-economic costs and benefits
- Construction and establishment costs
- Ecological costs and benefits
- Value of flood damage avoided

WHAT MIGHT IT LOOK LIKE



CREATING A 'SPONGY CATCHMENT'

The clearing of vegetation (such as for farming or land development) and the hard, impervious surfaces of urban areas greatly reduce the ability of the landscape to slow and absorb water.

This can worsen the impacts of a flood, as both the amount and speed of water heading downstream is greatly increased across the landscape.

A spongy catchment holds and absorbs water well, usually through the natural processes of a well-vegetated landscape.

This not only reduces runoff and downstream flood impacts, but has multiple other co-benefits such as wildlife habitat, groundwater recharge, erosion and sediment control and nature-based recreation.

Figure A: Revegetating riverbank scenarios in Bremer catchment with a buffer zone of 300m.

ENVIRONMENT AND ECONOMIC BENEFITS

The creeks and rivers of the Bremer catchment greatly affect downstream communities. Infrastructure that supports the daily lives of millions of people is directly impacted by flood as well as nutrients and pollutants in the waterways.

While the results from the ecological analysis are still being finalised, to date the project team have found the economic benefits arising from the prevention of sediment entering the waterways outweigh even the economic benefits for flood mitigation under most conditions.

This is because of the high value of the reduction in nitrogen load to the sewage treatment plant operator and the value of sediment load reduction to the Port of Brisbane via reduced dredging costs.

In addition to these environmental and economic co-benefits, there could also be carbon credit revenue from revegetation.

INITIAL FLOOD MODELLING

The focus of these proposed measures is to provide Nature-based Solutions for reducing flood impacts.

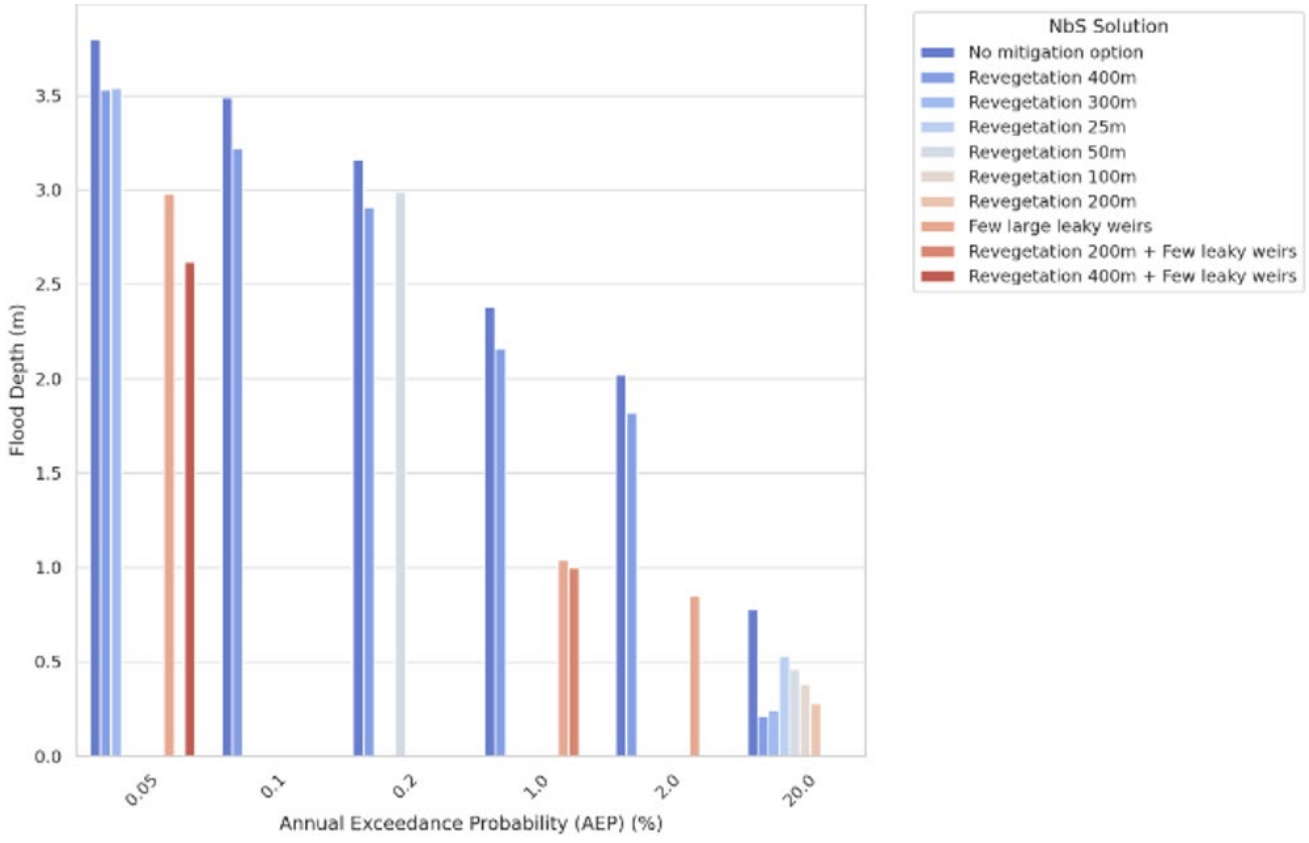
This modelling is an indication only. No two floods are the same.

Importantly, modelling results in Bremer River, Warrill Creek and Purga Creek show that combining the solutions in the context of a 'spongy catchment' notably lowers flood depths over extensive areas. This is particularly the case when the full suite of strategies is used, which reduces flood depths by approximately 0.7 metres across a significant area of the downstream floodplain.

Other examples:

- With a riparian buffer zone of 200m and leaky weirs, the Bundamba Creek 1-in-5 year flood depth on the road (at a reference point near Blackstone Road) could reduce from 0.78 metres to zero. That means the potential for full flood level mitigation.
- With a riparian buffer zone of 100m, the Bundamba Creek 1-in-5 year flood depth on the road (at a reference point near Blackstone Road) could reduce from 0.78 metres to 0.37 metres. That means the potential for more than 40cm flood level mitigation.
- If all of the Warrill Creek catchment / Bremer River measures were implemented, the equivalent of the 2022 flood depth (at a reference point of Pelican Street, North Ipswich) could reduce from 0.7 metres to zero.
- If all measures in urban areas of the Deebing Creek sub-catchment were implemented, the flood depth could reduce 0.2 metres on average, in the streets.
- Revegetation alone has a moderate impact, suggesting there is value in combining Nature-based Solutions for deeper flood mitigation.

Figure B: Combined Nature-based Solutions approaches for flood reduction in Bundamba Creek at Blackstone Road



WHAT ARE LEAKY WEIRS AND BUNDS

Leaky weirs are often built from natural materials such as rocks, logs and vegetation.

They are placed strategically in streams and gullies to slow the flow of water and redistribute it across the landscape, while maintaining natural flows.

Leaky weirs have been used in regenerative agriculture practices, as they can be effective in controlling erosion and sediment loss.

Bunds are non-permeable and are positioned either side of the floodplain to allow water to flow between them. They can similarly store and redistribute floodwater and are generally larger than leaky weirs.

FURTHER INVESTIGATION

The project team are continuing to investigate leaky weir and bund options in both Bundamba Creek and Warrill Creek sub-catchments, including:

- Potential locations
- Flood mitigation impact
- Pros and cons of having either:
  - A large number of small leaky weirs, or
  - A small number of large leaky weirs
- Achieving flood impact for small leaky weirs equivalent to two bunds.

WHAT ABOUT WETLANDS

Incorporating wetlands was a strong consideration throughout investigations and community and stakeholder engagement.

Joint studies by ANU and Ipswich City Council identified potential locations for off-line wetlands (areas that temporarily store flood water) along the Bremer River and its creeks. While many suitable sites were found, detailed modelling later revealed significant limitations that made this approach less viable than initially thought.

Initial modelling revealed that the shallow depth of these natural depressions limited their ability to store significant volumes of water. These areas, though naturally occurring, lacked sufficient storage potential to reduce flood risks during high-flow events.

Locations were considered for large, constructed wetlands, with potential natural capacity for mitigating flooding. In order for these off-line wetlands to function as an effective flood mitigation tool, they would need to be widened and deepened considerably. However the amount of excavation that would be required, potential cost and groundwater level constraints, meant that wetlands of this scale were not practical to include in this project.

On a smaller scale, leaky weirs to provide wetland benefits through the slowing and dispersing of water. These are generally temporary wetlands.

MORE INFORMATION

For general information on the Nature-based Solutions to Flooding project see Shapeyouripswich.com.au/naturebasedfloodresilience

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