# Tasmanian NRMs: Scaling nature-based solutions (NbS) for flood resilience and recovery

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**Key points**

- Evaluation of a flood recovery program 10 years post implementation involving over 150 project sites to understand the long-term success of NbS for flood resilience.
- Using a multilayered and comprehensive evaluation process, three trial project locations (8 sites) were selected for NbS on ground works.
- NbS implemented on ground at three locations to be used as demonstration/case study sites for future resilience works across Tasmania.
- Scenario Modelling to demonstrate the social, economic and environmental value of NbS across a catchment devastated by the 2016 flood event in Northern Tasmania.

## Abstract

The 2016 flood event in Tasmania was one of the largest in recent times affecting 20 local government areas, claiming three lives and causing damage to the value of $180m across the state (*Flood – Tasmania 2016)*. In the aftermath of the devastating 2016 floods, Tasmania's three natural resource management organisation's (NRM North, NRM South and Cradle Coast NRM) implemented Nature-based Solutions (NbS) across their regions to rehabilitate agricultural land and support ongoing flood resilience.

Funded by the State Government, $4 million was made available through the Agriculture Landscape Rehabilitation Scheme (ALRS). The scheme was open to flood-affected landowners and communities across 20 local government areas. A total of 159 eligible projects were funded through ALRS.

Through the *Scaling NbS for Flood Resilience and Recovery project* an indicator framework for NbS impacts was developed, a comprehensive landholder survey of ALRS was conducted including online and phone conversations to understand actual and/or potential benefits of NbS in the Tasmanian context. This was followed up with geomorphic evaluation of 60 ALRS sites using a multi-criterial analysis, onsite inspections and using a decision support tool the establishment of three trial locations for NbS on ground works to support previous flood recovery works.

These learnings were then used along with the NbS indicator framework to develop scenario modelling that will look at the social, economic and environmental co-benefits of NbS by creating business case studies at different scales to increase adoption of large scale NbS across Tasmania's three NRM regions.

## Keywords

Nature-based Solutions (NbS) Flood resilience and recovery, waterway restoration, flood recovery program evaluation, social, economic and environmental benefits of NbS

## Introduction

In the aftermath of the devastating 2016 floods, Tasmania's three natural resource management organisation's (NRM North, NRM South and Cradle Coast NRM) implemented Nature-based Solutions (NbS) (see Prinsley et al., 2025) across their regions to rehabilitate agricultural land and support ongoing flood resilience. Funded by the State Government, the Agriculture Landscape Rehabilitation Scheme (ALRS) was open to flood-affected landowners and communities across 20 local government areas. A total of 295 Expressions of interest were recorded for the program with 235 Site visits conducted by Fluvial Geomorphologists during a six-week period, resulting in 159 projects funded

through ALRS (see Figure 1). Eight project sites across three river systems (locations) were chosen - the Inglis, Ouse and Mersey Rivers forming the three trial sites for NbS on ground works (see Figure 1).

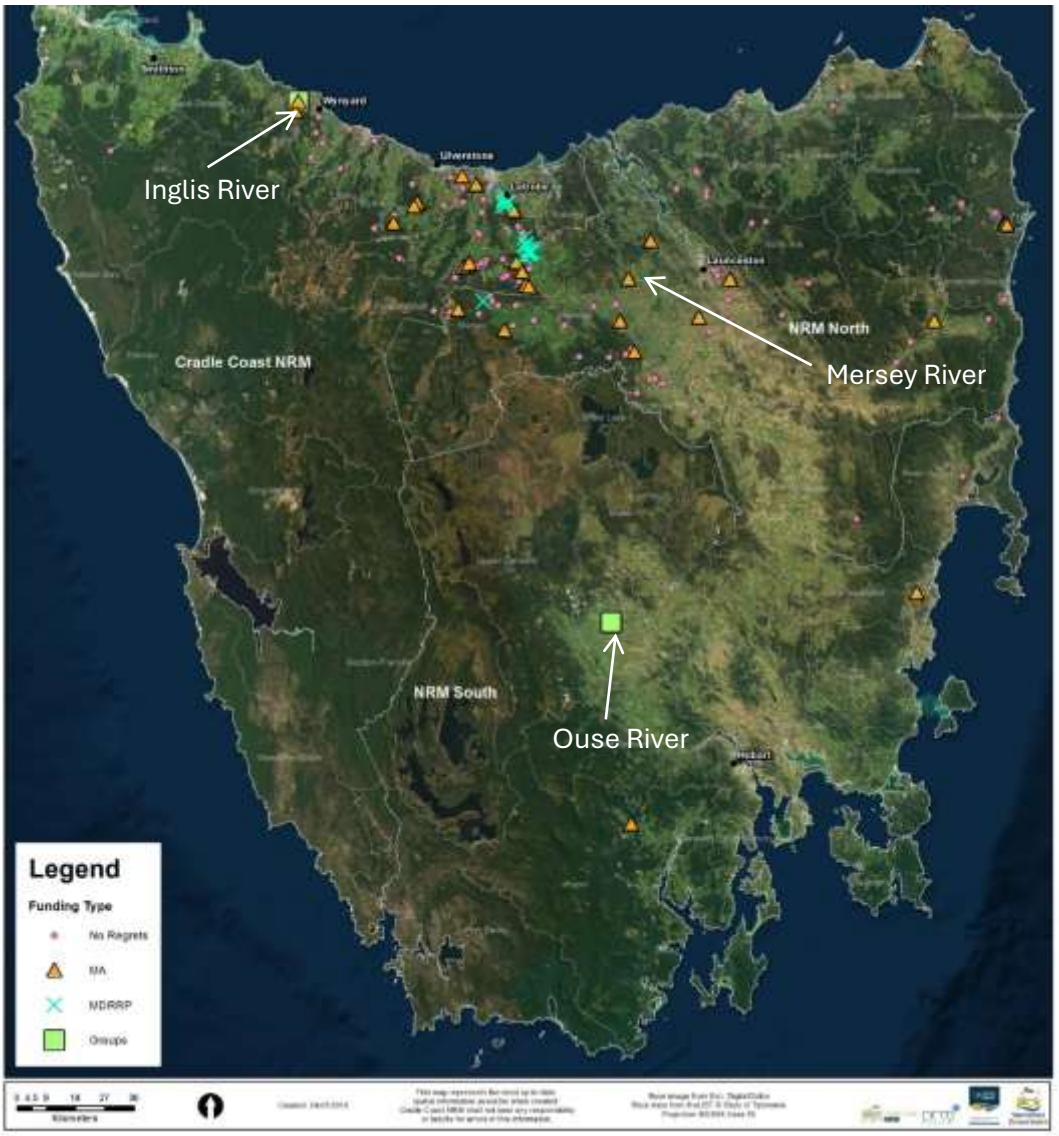


**Figure 1 Map of the flood recovery sites from 2016 across northern Tasmania. Map includes four project categories: No Regrets, MA (Management Agreements), MDRRP (Mersey Dasher River Recovery Projects) and Group projects. The trial project locations: Inglis River, Mersey River & Ouse River**

The *Tasmanian NRMs: Scaling NbS for Flood Resilience and Recovery* is a three-part project that aligns with NRM Regions Australia's national Nature-led Resilience project. The first part was to co-design a NbS Indicator Framework for flood resilience. The second part involved evaluating the ALRS program using the framework to understand the actual and/or potential benefits of NbS in the Tasmanian context. The third part was to use these learnings and locate three trial sites across Tasmania to implement NbS on ground which will be used as demonstration and/or case study sites to improve local adoption within the agricultural community. From these learning scenario modeling will be completed to demonstrate the social, economic and environmental benefits of NbS.

## Project context

Through the *Scaling NbS for Flood Resilience and Recovery project* a comprehensive NbS national indicator framework was created in co-design with NRM Regions Australia to guide the ALRS evaluation

process displayed in Figure 2. The project follows a series of milestones that interrelate to each other over the project lifetime and are displayed in Figure 3.

Using the indicator framework, an extensive survey of the ALRS landholders was conducted. This included 23 online surveys and 56 phone conversations to understand actual and/or potential benefits of NbS as well as identify improvements. Using this data and the indicator framework a subcontractor (Geomorphe) developed a multi-criterial analysis (MCA) to assess 60 ALRS sites. Onsite inspections of 20 sites were conducted by NRM staff to help inform this analysis. Using a decision support tool (DST) three trial locations were chosen for NbS onground works. These works were to support previous works completed through the ALRS. Once the trial sites were selected, onground works were implemented using NbS principals at the three locations under the guidance of a fluvial geomorphologist and River Engineer.

Guided by the indicator framework scenario modelling is currently underway using one of the priority catchments (Inglis-Flowerdale) to create a business case. This should demonstrate the value of NbS across a catchment highlighting the social, economic and environmental benefits of large-scale NbS investments. The project is designed to use the direct onground delivery of NbS that address disaster risk reduction and climate adaptation to provide an increase in evidence, knowledge and frameworks to support greater uptake in Australia.

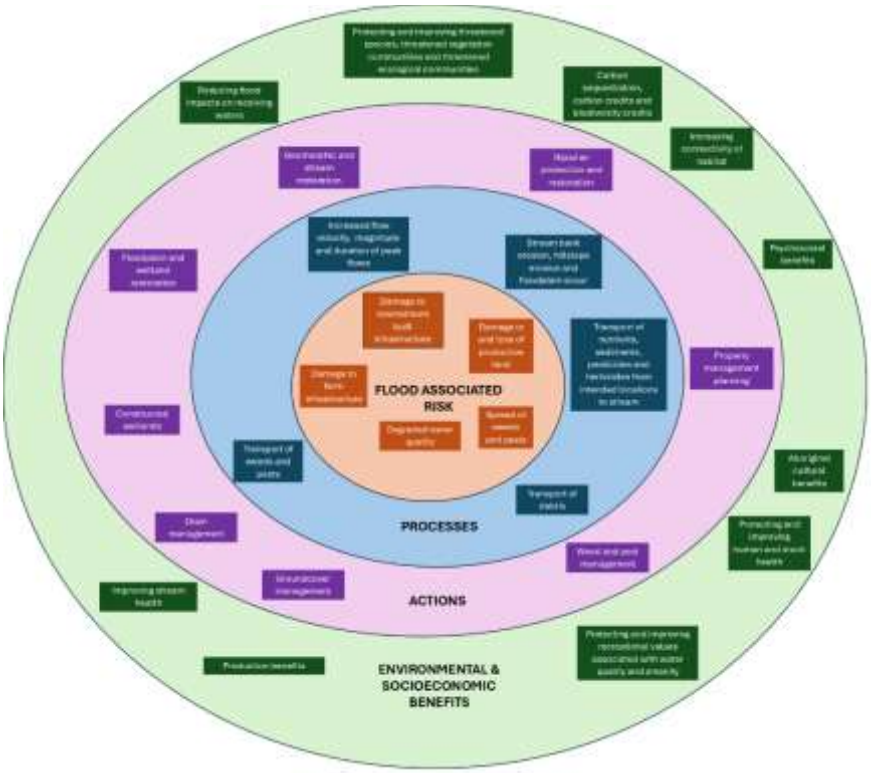


**Figure 2 Nature based Solution Indicator Framework for Flood Resilience. NOTE: the writing is extremely small, and is for visual representation only**

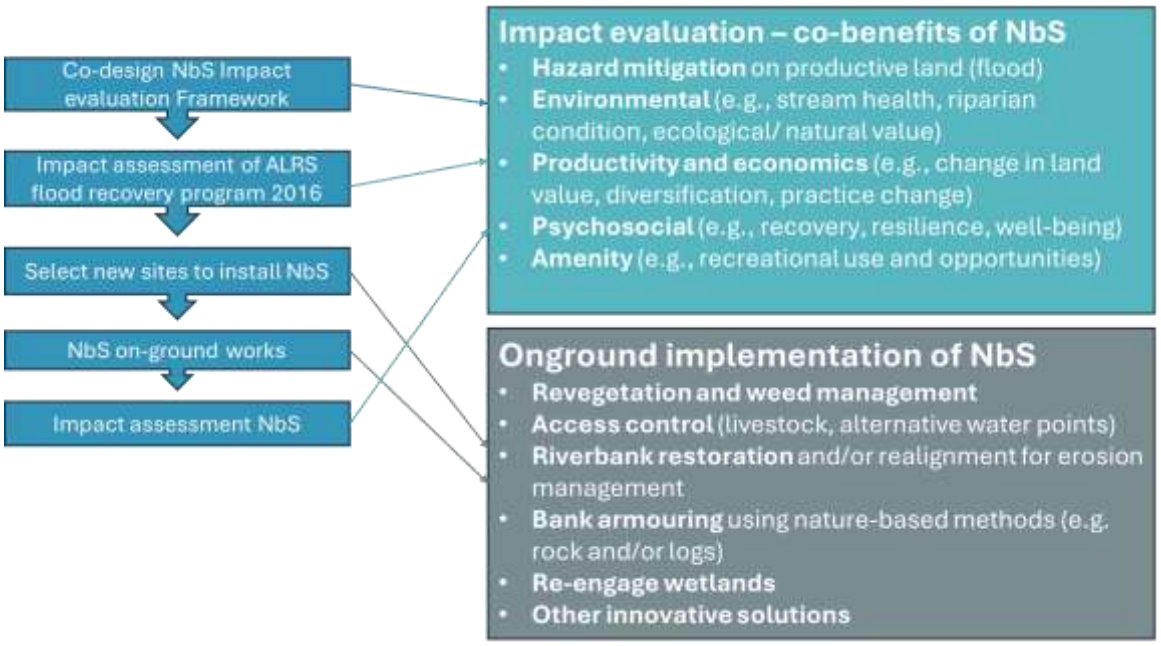


**Figure 3 Project Flow Diagram displaying the interconnected nature of the project**

### Landholder evaluation of ALRS (2016 flood recovery program)

An online survey was completed with 23 respondents completing the survey. The landholders were from across the state with a wide range of projects and works completed through ALRS. Reduced riverbank erosion was the top response for flood impacts that have reduced since the works were implemented, followed by reduced impacts on fencing and floodplain scour as equal second response.

The top three responses for stream condition changes were reduced erosion, increase stability and vegetation regeneration. Landholders had observed a significant amount of wildlife since works were completed with sightings of fish, platypus and birds being the top three responses. From 23 responses 21 indicated that the ALRS funding was 'extremely valuable' for undertaking flood resilience works. When asked if the program was cost effective in terms of investment of their resources and public funds all participants responded yes. 16 landholders indicated they would be interested in attending a workshop/ event on flood resilience with 20 respondents indicating they would consider additional flood resilience works if funding was available.

A total of 33 phone surveys were completed by Amazonian from the 57 landowners contacted, generating a 58% response rate, with more than 41,000 words of feedback. This is a very positive response with ample feedback to give a high level of confidence in the findings. All participants were provided with detailed information on the survey's confidentiality and privacy practices prior to consenting.

In response to the question about whether the flood recovery works reduced impact of subsequent floods on agricultural production, 61% said yes; 27% said no; 12% were undecided. Of those who said yes, most said the re-planted areas successfully stabilised the riverbank. Of those who said no, most said the works were washed away in subsequent floods.

When asked about changes, impacts or benefits of NbS, the key themes in feedback were improved diversity of wildlife, successful re-establishment of native vegetation including Eucalypts and Blackwoods, and improved water quality with less sediment in the river. Some felt that the benefits were undermined by neighbours who didn't use NbS.

When asked if they had changed their perspective on improving waterway management/resilience because of being part of the ALRS, 42% said yes; 49% said no; 9% were undecided. Of those who said yes, people spoke about learning a lot from the hydrologists and appreciating the increased diversity of

wildlife including birdlife. Of those who said no, some of these were using some form of NbS before the 2016 flood. Others felt there was nothing they could do to improve waterway management because 2016 and subsequent floods were just too powerful.

When asked if they felt the ALRS was cost effective, 79% said yes; 18% said no; just one person was undecided. Of those who said no, many respondents spoke of the importance of getting more landowners on board for a whole-river approach.

61% of landowners said they would consider additional flood protection works on their property. 27% said no, and 9% were undecided. Most said any funding was always welcome, and many spoke about the importance of a whole-landscape approach.

The researchers offered the following general (subjective) observations:

- Many of the landowners continued to do works including planting long after the funding ran out at their own expense.
- Some participants used the funding solely for flood recovery, e.g. replacement of fencing and other farm infrastructure and hiring of excavators for removal of debris.
- Some of the participants who clearly grasped the intentions and benefits of nature-based solutions felt that the benefits were undermined by neighbours who did not implement nature-based solutions. Landowners expressed interest in more education and landscape-wide approaches.
- Some landowners were in areas where the river was too powerful for NbS to withstand subsequent floods. Many farmers talked about all the rehabilitation works being lost in subsequent flooding and how disheartening it is to have repeated losses. This factors into their response about whether they would consider doing more flood recovery works.

### Geomorphological evaluation of ALRS

Using the NbS indicator framework the project team worked through about 60 existing ALRS sites. Geomorphe was contracted to provide fluvial geomorphologic and river engineering advice. Geomorphe worked collaboratively with the team to understand the project objectives and created a Multi Criteria Analysis (MCA) tool as well as a Decision Support Tool (DST) for assessing and prioritising the 60 sites. From these sites three locations were identified for new NbS on ground works to support previous works completed under the ALRS.

The assessment criteria used in the MCA (defined in Table 1) were informed by the indicator framework created for assessing the co-benefits of NbS and adapted to incorporate river health principles, together with practical knowledge based on the information available for assessment. The MCA involved scoring each of the potential work areas against the key criteria by rating how well each potential works area meets the specific criteria.

The completed MCA scored 43 potential project sites/ reaches against seven criteria identified in the Environmental and Socioeconomic benefits of the indicator framework. Project sites that included multiple properties along a reach of river came out with higher scoring as the benefits of implementing NbS across multiple properties provides a better return on investment. Based on this information 13 project sites were visited by Geomorphe to determine the final three trial locations for on ground works.

**Table 1 Multi Criteria Analysis (MCA) scoring criteria and description**

| Criteria | Description |
|---|---|
| Improved connectivity and width of riparian habitat | Restoring continuous, well-vegetated riparian corridors along riverbanks and floodplains, potentially linking existing stands of either riparian or terrestrial vegetation. |
| Improving stream health and habitat | Restoration and enhancement of the ecological condition and function of waterways. This includes increasing channel complexity and enhancing riparian and in-stream habitats. |
| Improving channel and floodplain resilience | Strengthening the capacity of rivers and their adjacent floodplains to withstand, adapt to, and recover from disturbances such as floods. This approach emphasises the importance of catchment scale and reach scale rehabilitation responses. |
| Community/Social benefits | Positive outcomes that river rehabilitation and management works deliver for people. These benefits grow in significance as more individuals and groups are able to access or experience them; in general, the broader the community that benefits from a project, the greater its social value. |
| Agricultural production benefits | Improvements in the productivity and sustainability of agricultural land resulting from river and floodplain management. This includes reduced flood and erosion impacts and protection of infrastructure. |
| Landholder willingness | The interest and commitment of property owners to participate in and support on-ground works on their land. This measure is informed by the landholder surveys and is a key factor in the successful implementation of future river management projects. |
| Regional priorities | Consideration of regional projects that can deliver additional value by complementing existing programs or initiatives, creating co-benefits. |

In addition to the MCA, a decision support tool (DST) has been developed to assist in the selection of suitable works once the project areas have been identified through the MCA. This tool, adapted from Water Technology *(Water Tech 2022*), aims to ensure that works are chosen with consideration of the site context, its values, assets, processes, and management objectives. In addition, it provides guidance for assessing the feasibility of different solutions, whether they be nature-based, hard engineering (e.g. rock-based), or hybrid solutions. Eight project sites from the 13 inspected across three river systems (locations) were chosen - the Inglis, Ouse and Mersey Rivers forming the three trial locations for on ground works (see Figure 1).

## On ground works

On ground works have been continuing for the last couple of months, with timber revetment works completed at four project sites, weed management, revegetation works underway on the Inglis River and willow management underway on the Ouse River. Stock exclusion fencing at all sites has been completed along with all of the revegetation works (see Figures 4-8).

Vegetation Condition Assessment (VCA) was conducted across multiple sites during the prioritisation process to capture baseline data to compare change over time for environmental accounting purposes. Each trial site will be used for field days/workshops to demonstrate and educate on the application of NbS for river resilience and highlight what could be achieved more broadly across the landscape given the right level of investment.

**Figure 4 Inglis River capturing revegetation and timber revetment works at Site 1**

**Figure 5 Inglis River capturing timber revetment works at Site 1 (pre revegetation works)**

**Figure 6 Inglis River capturing revegetation and timber revetment works at site 2**

**Figure 7 Inglis River capturing timber revetment works at site 2 (pre revegetation works)**

**Figure 8 The Mersey River capturing timber revetment works, revegetation (fencing yet to be completed)**

## Scenario modelling

The contractor (isNRM) has commenced the modelling component, to be completed by September 2026. This work will provide catchment-scale evidence of the value and return on investment of NbS for communities, the economy and the environment. The Flowerdale–Inglis catchment is the initial case study, with potential for replication across other flood-affected catchments. The modelling will assess:

- **On-farm impacts** of NbS, including streambank erosion, riparian habitat, carbon, productive land, livestock management, stock health and farmer wellbeing, alongside overall flood-related disaster risk.
- **Off-farm (subcatchment) impacts** of scaled-up NbS, including changes to erosion, peak flows, water quality, riparian condition, carbon, productive land, community resilience and livestock management, as well as catchment-scale disaster risk.
- **Wider beneficiaries**, such as downstream infrastructure, government, insurers and the broader community.

## Conclusions

The Scaling NbS for Flood Resilience and Recovery project demonstrates how Tasmania's NRM organisations have built on the lessons of the 2016 floods to strengthen landscape-scale resilience through evidence-based, nature-led approaches. The evaluation of the Agriculture Landscape Rehabilitation Scheme (ALRS) shows that landholders widely recognised the value of NbS, reporting reduced erosion, improved stream stability, and increased wildlife presence following works — with 21 of 23 survey respondents describing ALRS funding as "extremely valuable" and all agreeing the program was cost-effective.

Phone interviews reinforced these findings, highlighting successful riverbank stabilisation, vegetation recovery, and improved water quality, while also acknowledging challenges where subsequent floods overwhelmed works or where neighbouring properties did not adopt NbS approaches. 61% of landholders indicated that the flood recovery works reduced impacts of subsequent floods on agricultural production, with most saying the re-planted areas successfully stabilised the riverbank. Most of the 27% of landholders said who said the works did not reduce impacts, indicated that the works were washed away in subsequent floods.

As the project progressed, rigorous geomorphological assessments, MCA scoring, and DST prioritisation enabled the selection of (8 trial sites) three locations across the Inglis, Mersey and Ouse Rivers, where timber revetments, revegetation, willow removal and stock-exclusion fencing are now demonstrating practical NbS outcomes on ground.

The final phase — catchment-scale scenario modelling will quantify the social, economic and environmental benefits of NbS, providing a business case for broader adoption across the agricultural sector. Together, these components position Tasmania's NRMs to lead national NbS innovation and support long-term flood resilience across their regions.

## Acknowledgements

NRM South, Cradle Coast NRM, NRM Regions Australia, Minderoo Foundation, Geomorphe, Amazonian, isNRM, and all the participating landholders that were affected by the 2016 flood event.

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