Evaluation of the Ex-tropical Cyclone Oswald on-farm productivity and riparian recovery program (2013–2015)

February 2016
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<th>Description</th>
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<tbody>
<tr>
<td>NDRRA</td>
<td>Natural Disaster Relief and Recovery Arrangements</td>
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<tr>
<td>DPOC</td>
<td>Disaster Recovery Program Oversight Committee</td>
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<tr>
<td>DSITI</td>
<td>Department of Science, Information Technology, and Innovation</td>
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<tr>
<td>DNRM</td>
<td>Department of Natural Resources and Mines</td>
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<tr>
<td>EHP</td>
<td>Department of Environment and Heritage Protection</td>
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<tr>
<td>RCC</td>
<td>Regional consultation committee</td>
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<tr>
<td>NRM</td>
<td>natural resource management</td>
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<td>DTMR</td>
<td>Department of Transport and Main Roads</td>
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<tr>
<td>FBA</td>
<td>Fitzroy Basin Association</td>
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<td>BMRG</td>
<td>Burnett–Mary Regional Group</td>
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<tr>
<td>CA</td>
<td>Condamine Alliance</td>
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<tr>
<td>SEQC</td>
<td>South East Queensland Catchments</td>
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<td>QMDC</td>
<td>Queensland Murray–Darling Committee</td>
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<tr>
<td>PMP</td>
<td>property management plan</td>
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<td>QRA</td>
<td>Queensland Reconstruction Authority</td>
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<tr>
<td>QRAA</td>
<td>Queensland Rural Adjustment Authority</td>
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Evaluation of the ex-tropical cyclone Oswald on farm productivity and riparian recovery program, Department of Natural Resources and Mines, 2016.
Summary

In response to the impact of heavy rainfall and flooding following ex-Tropical Cyclone Oswald in early 2013, the Commonwealth and the Queensland Government jointly funded a range of measures to aid recovery. The aim of the *Ex-tropical Cyclone Oswald On-farm Productivity and Riparian Recovery Program* (the recovery program) was to assist the most heavily impacted primary producing communities in Queensland to resume production. It was jointly funded under natural disaster relief and recovery arrangements, with the Queensland Government contributing $10 million and the Commonwealth contributing $5 million. The Department of Natural Resources and Mines (DNRM) had the lead role in implementation. Other agencies that were closely involved were the Department of Agriculture and Fisheries (DAF), Department of Environment and Heritage Protection (EHP), the Queensland Reconstruction Authority (QRA), and the Department of Science, Information Technology and Innovation (DSITI).

Overall, the recovery program delivered 26 projects, providing assistance to landholders on 2,121 properties. Its delivery was implemented by way of contracts between DNRM and five regional natural resource management (NRM) bodies within the impacted catchments, following a prioritisation process. Two high-priority tasks were undertaken by state government departments. All disaster recovery projects undertaken under the program were completed within budget, and all regional NRM bodies submitted audited financial statements for their projects.

An evaluation was commissioned by the Disaster Recovery Program Oversight Committee (DPOC), the primary objective being to assess the efficiency, effectiveness and appropriateness of the recovery program. This report has been prepared for DPOC and the Minister for Natural Resources and Mines in response to that requirement. It was undertaken by NRM Programs, DNRM, and the Science Delivery Division, DSITI. DNRM undertook a desktop study and review of information on the performance and progress of the recovery program, while DSITI undertook an online survey, focus group discussion and telephone interviews with landholders and stakeholders, and compiled their findings in a stand-alone report entitled *Impacts and contributions of the Ex-tropical Cyclone Oswald on-farm productivity and riparian recovery program (2013–2015)*.

It is considered that this comprehensive intra-agency evaluation will contribute to the Queensland government’s knowledge of the effectiveness of agricultural and natural resource management disaster recovery funding in Queensland, inform decision making, and improve future disaster recovery programs.
Conclusions

This report has focused on the efficiency, effectiveness and appropriateness of the recovery program as evidenced by:

- the responses made in telephone interviews, the online survey, and the focus group discussion
- the desktop evaluation of the projects’ conformity with the six focus areas.

The key program question to be addressed was whether the funding made available under the recovery program did assist landholders to recommence full agricultural production in the targeted areas earlier than would have been possible otherwise. Feedback received from landholders in the interviews, the online survey and focus group discussion indicates that, while the recovery program was appropriate, there were some delays and confusion that compromised its efficiency.

The desktop component of the evaluation assessed the performance and progress of projects against stated objectives and outputs; however, some weaknesses in data collection were identified. The evaluation identified that all projects in the recovery program were completed; however, it has been difficult to ascertain whether all projects achieved their intended outputs. While the effectiveness of certain on-ground activities cannot be fully assessed until tested by a significant flood event, findings of the overall program evaluation suggest that the approach of this program was considered effective.

It is therefore concluded that:

- the recovery program was appropriate overall
- based on the information reported, the majority of projects achieved or exceeded their intended outputs.

Recommendations

Several recommendations were made. Most are direct contributions from the research participants themselves (i.e. the respondents), while others were either devised by the research team, or identified in relevant literature as being appropriate solutions to the issues that arose in this study.

The recommendations can be broadly grouped as outlined below.

- Establish a framework and develop guidelines prior to an event, where possible.
- Improve the administrative aspects of program funding, including by—
  - increasing communication and promotion
  - improving equity by expanding the eligibility criteria and project completion timelines
  - providing the money early and increasing the diversity of funding arrangements
  - enhancing data collection, auditing and reporting requirements
  - enhancing long-term monitoring and evaluation.
- Collaborate with related service providers and initiatives.
- Foster social activities within affected communities.
- Support natural disaster planning and management for long-term resilience.
1 Introduction

From 22–29 January 2013, Category 1 ex-tropical Cyclone Oswald spread over parts of Queensland and New South Wales, causing severe storms, flooding and tornadoes. It had a particularly disastrous effect on Queensland. Landholders in many areas experienced severe damage to crops, land and vegetation.

1.1 Background

In response to the impact of heavy rainfall and flooding following ex-Tropical Cyclone Oswald, the Australian and Queensland governments agreed to jointly fund a range of measures to aid recovery, including the following sub-programs:

- A $5 million program funded under Category D of the Natural Disaster Relief and Recovery Arrangements (NDRRA) to assist primary producers to clear debris and restore fencing in the worst affected areas, to maintain workers while income-generating activities were reduced, and to clear watercourses of any debris that posed a hazard to downstream infrastructure and activities.
- A $10 million program (complementary to, but outside of, the NDRRA framework) to support environmental recovery by funding flood-specific clean-up and soil conservation work, and conducted in collaboration with natural resource management bodies and similar organisations.

NDRRA determined that assistance through the Category D Exceptional Disaster Assistance Scheme would be available to communities affected by flooding as a result of ex-Tropical Cyclone Oswald within the defined areas of north-west and far north Queensland to the south-east coast of Queensland. Priority target areas were the Callide–Dawson, the Burnett, and the agricultural and cropping areas of south-east Queensland and the Darling Downs. The On-farm debris clean up and recovery program was limited to the worst impacted areas of the North Burnett, Bundaberg and Lockyer–Fassifern regions.

1.2 Context

The objective of the recovery program was to provide funding and technical assistance for on-ground activities to help rural farming communities restore enterprise productivity and implement environmental recovery initiatives in the hardest hit farming communities. To assist with timely clean up and restoration, some urgent initiatives proceeded ahead of the formal prioritisation process. These included clean-up assistance to the citrus and macadamia industries in the Burnett ahead of harvest preparation, and aerial and on-ground surveys of the damage along river systems in preparation for the clean-up program.

Soil conservation, repairs to fencing, riverine restoration, riparian rehabilitation, management of weed spread, and debris clearing all provide critical support to the recovery of agricultural enterprises, local communities, healthy river systems and water quality. Evidence from the last few years of floods in Queensland suggests that such work particularly needs to address stream bank and gully erosion, and extreme overland flows.

The program of works was limited to those areas worst affected by ex-Tropical Cyclone Oswald. Many of these were still in the process of recovering from the severe 2011 events. It was therefore vital that available resources were directed to recovery, reconstruction and capacity building to not only improve the condition of, or re-create, what had been destroyed, but to also reduce the risk of damage from future events, improve the condition of devastated natural areas and make them more resilient.
1.2.1 Eligible activities

Activities that were eligible for funding through the on-farm component of the recovery program related to:

- the removal of on-farm debris
- infrastructure restoration, including repair and/or replacement of fences and farm roads
- crop re-establishment, land reconfiguration, soil conservation and water management.

Environmental recovery measures that received funding included:

- improved mapping
- removal of excess debris from watercourses
- gully and stream-bank stabilisation
- soil conservation
- riparian rehabilitation
- weed control.

1.3 Governance

An interagency oversight committee, known as the Disaster Recovery Program Oversight Committee (DPOC), was formed to provide leadership in developing and implementing the program. Chaired by the Department of Natural Resources and Mines (DNRM), this Executive Director–level committee included representatives from the Department of Agriculture and Fisheries (DAF) and Environment and Heritage Protection (EHP), and advisors/observers from the Queensland Reconstruction Authority (QRA). A Director–level implementation committee, also chaired by DNRM, supported its work. DSI was consulted on the program of works.

Regional consultation committees (RCCs) were established for the flood-affected zones in the north (Burnett–Fitzroy) and south (Lockyer–Fassifern/Darling Downs). The committees were chaired by senior regional managers from DAF, and included regional representatives of other state agencies and disaster recovery coordinators, and the Chief Executive Officer of the Regional Groups’ Collective.

The RCCs facilitated high-level liaison with program agencies and, where necessary, local stakeholders such as councils, regional NRM bodies, river improvement trusts, and peak and volunteer organisations. The RCCs reviewed the priority program of works developed by the regional project teams and led by regional NRM bodies before their presentation to DPOC. DPOC forwarded its recommendations to the Minister for Natural Resources and Mines. (This framework is detailed in the governance flowchart at Appendix A.) The RCCs also assisted in monitoring the progress of projects, and provided comments and advice to DPOC on issues that arose during the program. Chief executive officers of the regional NRM bodies participated on the RCCs, but were excluded from meetings when project proposals were discussed or assessed.

1.4 Program delivery

The program began in April 2013 and finished in July 2015. It was largely implemented via contracts with five regional NRM bodies within the affected catchments. The exceptions were two high-priority tasks (‘Other’ projects) that were identified by the lead agencies as needing to proceed ahead of a formal prioritisation process. These were undertaken by DAF and the Department of Transport and Main Roads (DTMR) respectively.
The participating regional NRM bodies were Fitzroy Basin Association (FBA), Burnett–Mary Regional Group (BMRG), Condamine Alliance (CA), and South East Queensland Catchments (SEQC). These community-based, not-for-profit regional NRM bodies collectively undertook five ‘urgent/critical’ and 19 ‘priority’ projects (including sub-projects) and were considered to be optimally placed to engage landholders with one-on-one interaction. The regional NRM bodies undertook the following tasks as part of the recovery program:

- Provided advice and recorded requests for on-farm debris and fence work.
- Appraised proposals based on assessment criteria—considering social, economic and environmental risk; value for money; public benefit; capacity to leverage private or additional funding; and capacity to mitigate short- and longer term risks, including building longer term resilience.
- Prioritised a draft regional program of works for consideration by the DPOC Chair.
- Presented a finalised prioritised program of works to DPOC for recommendation to the Minister.
- Managed projects and provided technical support and advice to landholders and other entities.
- Facilitated regulatory and NDDRA compliance checks to ensure that program delivery occurred in accordance with the approved scope of works, budget, time and audit requirements, seeking advice from the RCC as needed.
- Provided regular progress and final reports to DNRM and DPOC on project achievements, including financial and spatial information.

Funding was also provided to two state government departments to undertake urgent clean-up activities following Cyclone Oswald:

- DTMR coordinated the Burnett River dredging project to improve the navigability of upstream reaches of the Burnett River to provide all tide access for most vessels.
- DAF organised the collection and disposal of chemical drums that had been deposited on farms by the flood waters.

1.5 Evaluation aims and objectives

Project reporting, evaluation and review is essential for assessing achievements against budgets, milestones and targets; and for ensuring accountability and transparency in the expenditure of public funds. This evaluation is specifically focused on the efficiency, effectiveness and appropriateness of the recovery program.

1.5.1 Scope

In this evaluation, no attempt has been made to assess whether the individual projects making up the overall recovery program were warranted, the assumption being that they were appropriately scoped and prioritised by the participating NRM groups. Instead, the focus has been upon assessing the effectiveness of:

- the recovery program as a whole
- 25 individual projects.

Evidence has been drawn from:

- the responses made in telephone interviews, the online survey, and the focus group discussion
- the desktop evaluation of the individual projects’ conformity with the six focus areas.
The key question addressed through the focus group discussion, online survey, and telephone interviews was:

Has the program funding assisted landholders to recommence, or return to, full agricultural production in the targeted areas earlier than would have been possible without the funding?

In order to fully examine this question, the following sub-questions were asked regarding the efficiency and effectiveness of the administration of the recovery program:

- Have the projects obtained the desired outcome—that is, were they appropriate for addressing the issue?
- Were the projects delivered on time?
- Were the projects delivered cost effectively?
- Were the participants happy with the delivery and final outcome of the projects?
- Were there additional flow-on effects to the broader community from the investment (e.g. small business, neighbours)?
- What was the impact of the program on participants’ health and wellbeing?

In addition, the following secondary set of questions concerning the individual effects and the broader economic and social contributions of the recovery program were asked at the request of DNRM:

- In your opinion, did the program contribute to the economic recovery of the local community? If so, how?
- In your opinion, did the program contribute to the health and condition of the local community? If so, how?
- In your opinion, did the program contribute to the ongoing resilience of the local community? If so, how?
- In your opinion, did the program contribute to community safety and amenity as a result of disaster-related debris on land and water being mitigated? If so, how?
- In your opinion, did the program contribute to improving water quality, and the health and stability of aquatic and riparian ecosystems? If so, how?
- In your opinion, did the program contribute to enhancing the resilience of farms and stream banks in the affected areas to the impacts of future flood events?
- In your opinion, to what extent will projects funded by the program prevent further damage or erosion on land?
- In your opinion, did the program contribute to ensuring that excess debris, resulting from flooding, has been used beneficially?

1 Please note that this question was asked only of the funding recipients (i.e. the landholders).
1.5.2 Objective

This report focuses on the desktop component of the evaluation, but also draws on the data gathered in the quantitative analysis conducted by DSITI. Information gathered about the performance and progress of the recovery program as a whole, and its associated projects, has been reviewed and analysed by using, and building upon, the key performance measures identified at the start of the program.
2 Methodology

Four methods were used to evaluate the efficiency and effectiveness of the recovery program:

- Desktop analysis and review of information on the performance and progress of the program and 25 of the 26 projects
- Qualitative focus group discussion
- Quantitative online survey
- Semi-structured open-ended telephone interviews

One project in the recovery program was not included in the evaluation. The Rapid on-ground assessment of flood affected areas project (FB FR 01) was a 'critical' project undertaken by the Fitzroy Basin Association. A flood recovery implementation plan was completed in June 2013; however, this project was not evaluated because it did not fit into any of the focus areas.

The other regional NRM bodies included their assessment and planning work for the recovery program as a component of their individual flood recovery projects.

2.1 Desktop analysis and review

The desktop analysis and review of the performance and progress of the recovery program and 25 individual projects entailed evaluating and documenting the efficiency and effectiveness of the projects in meeting their stated objectives and outputs. Project applications, final project reports, data entered into the enQuire database reporting system, and financial reports were all considered.

A reporting template was developed for regional NRM bodies to report cumulative project progress outputs for on-ground works by local council area, using standard output codes that have been developed for natural resource management activities., regional NRM bodies were required to submit project progress and financial reports into the enQuire online project reporting system every six months, using the templates developed by DNRM. The number of properties assisted during the recovery program was also recorded.

To consolidate on-ground outputs for the purposes of the evaluation, a summary table was developed from the tables of cumulative outputs for each of the regional NRM bodies.

Six focus areas and their corresponding outputs were identified from the key performance indicators and on-ground cumulative project progress outputs:

Focus Area 1: Pest plant mitigation
Focus Area 2: Removal of excess flood debris
Focus Area 3: Rehabilitation of cropping and grazing land
Focus Area 4: Riparian restoration and erosion control
Focus Area 5: Improved flood and vegetation mapping
Focus Area 6: Infrastructure restoration

Project activities undertaken by the regional NRM bodies have been recorded under each focus area to which they relate. A project assessment table was developed and used to ensure that all focus areas and projects were assessed consistently (see Appendix B).
Key criteria included:

- Anticipated project goals, outputs and outcomes
- Project efficiency and effectiveness
- Consultation, engagement and communication
- Key gaps, constraints and risks
- Key learnings and opportunities

Questions in the assessment table were used to capture information and project results, and responses were grouped to inform each of the focus area assessments.

2.2 Focus group discussion

Seven focus group sessions were planned for August 2015, comprising five landholder sessions (one for each regional NRM area) and two regional coordination committee sessions (one for each committee). The objective was:

- to determine whether funding and activities through the recovery program assisted landholders to return to agricultural production earlier than would have been possible without it; **AND**
- to understand whether the recovery program had an influence on the local community’s environmental, economic and social recovery, and ongoing resilience to natural disasters.

The first (and only) landholder focus group was held on Thursday, 6 August at Gatton. Despite 10 landholders indicating that they would be present, it was very poorly attended, with only three properties being represented. In spite of the research team’s best efforts, there did not appear to be a lot of interest from landholders in attending. The cost and travel distance appeared to be a contributing factor.

After further discussion, the research team decided that consultation with landholders should occur through telephone interviews instead of focus groups.

2.3 Online survey

An online survey comprising 10 questions was conducted. While the initial questions were designed to gauge the respondents’ levels of participation in the recovery program, subsequent questions probed for specific information about their individual experiences, if relevant. The final three questions were then open to all respondents to provide feedback on the administrative aspects of the recovery program, as well as its contribution to the broader community. The question design differed, and included:

- a Likert-style scale, using a five-point rating range to effectively measure direction and intensity of responses
- simple, multiple-choice questions.

The survey was conducted during October 2015 using the *Survey Monkey* online survey tool. It was completed by 108 respondents—a response rate of 35.6%. The responses required additional quantitative and qualitative analyses, and a descriptive (percentage) analysis was used to present the results for each question. No inferential statistics were carried out.
2.4 Telephone interviews

A total of 43 confidential telephone interviews were conducted, with 22 landholders (five from each region, except SEQ) and 18 stakeholder representatives participating. Participants were sourced from the contact lists provided by the regional NRM bodies and from the people whom interviewees recommended for involvement based on their ability to provide further insights. Stakeholder representatives included the five regional NRM bodies, RCC members, state government, consultants and contractors, and industry groups across the different regions.

The telephone interviews were conducted between August and September 2015. To encourage a deeper exploration of topics raised, a semi-structured question format was selected to allow for follow-up prompts. The interviews, which averaged 45 minutes, were recorded by Dictaphone and professionally transcribed; and additional notes and memos were handwritten by the researcher. Both deductive and inductive methods were employed in analysing the data.

It should be noted that many landholders did not want to be interviewed for this study. Several had arranged interview times, but were not available when contacted by the researcher, and did not return the messages left. This may be indicative of landholders’ general weariness with government consultation.
3 Results—Focus area 1: Pest plant mitigation

Following Cyclone Oswald, outbreaks of terrestrial and aquatic weeds threatened the productivity and viability of farming enterprises in some flood-affected areas. Weeds are opportunistic and flourish in post-flood environments, causing reduced crop production and outcompeting native plants in riparian areas.

The objective of projects in focus area 1 was to control pest plants in catchments to promote the recovery of pastures and riparian areas affected by terrestrial and aquatic weeds spread by the flood. Eligible projects conducted in conjunction with local government included targeted weed control activities for high-priority risks on public land. (Maintenance weed control that was undertaken in conjunction with riparian revegetation activities has not been included in this evaluation.)

3.1 Pest plant mitigation projects

Two regional NRM bodies undertook flood-spread pest plant mitigation projects as part of the recovery program: the Burnett–Mary Regional Group and the Queensland Murray–Darling Committee.

Table 3.1: Summary of pest plant mitigation projects (focus area 1)

<table>
<thead>
<tr>
<th>Project code</th>
<th>Project title</th>
<th>Project description</th>
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| BM FR 01 (SP1) | Burnett–Mary Regional Group: Post-flood invasive species mitigation program | This project aimed to protect agricultural land and maintain biodiversity of vegetation through:  
- targeted control of opportunistic weed species on riparian and agricultural land  
- raising awareness of weed threats  
- implementing weed control projects at a sub-catchment scale. |
| QM FR 01 (SP4) | Queensland Murray-Darling Committee: Weed control | This project will maintain the biodiversity of vegetation through targeted control of opportunistic Weeds of National Significance (WONS) that have invaded ecosystems in the Maranoa and Border Rivers catchments. |

3.2 Evaluation

In this section, the efficiency and effectiveness of the pest plant mitigation projects are evaluated. In subsection 3.2.1, the project processes and delivery methods are appraised. Subsection 3.2.2 provides an assessment of whether the projects achieved their objectives and outputs, and includes an assessment table for each project in this focus area. Significant achievements, a description of project activities, partnerships, key learnings and recommendations for future direction are also discussed.

Nine participants (6%) in DSITI’s online survey accessed funding to control pest plants.

3.2.1 Project efficiency

One of the notable and unexpected benefits of the weeds program, and the program as a whole, were the partnerships formed—for example, support for the North Burnett Landcare group brought social benefits to the region. Long-term unemployed people were recruited for a Jobstart team, and some were able to secure permanent employment as a result of being involved with the recovery program. Additionally, as a direct result of working with landholders to control weeds, QMDC was able to
develop new engagement opportunities across the spectrum of natural resource management, including landholders registering for the Land for Wildlife program.

Following is a description of some of the challenges that the regional NRM bodies faced during pest plant mitigation activities:

- The prolonged drought that followed the flood resulted in difficult conditions for weed control. As the timeframe for delivery was limited due to environmental and seasonal conditions, delivery of the milestone was expected before conditions were conducive to locating and treating outbreaks. Consequently, contract variations were requested to allow the milestone to be addressed when weeds emerged nearly 12 months later.
- It was a challenge to obtain weed control contractors when needed due to the high demand from other organisations.
- At the time of the flood recovery program, there had been a reduction in Biosecurity Queensland staff numbers, resulting in their very limited participation in the program.

3.2.2 Project effectiveness

Both BMRG and QMDC achieved the objectives and outputs for their pest plant mitigation projects, and all were completed on time.

3.2.3 Significant achievements

- In their respective regions, BMRG and QMDC carried out weed control across a combined total of 43,018 hectares.
- Biological control facilities were established in Monto and Bundaberg.

BMRG used an integrated approach to managing invasive weeds through the use of herbicides, mechanical and biological control, and education on the role of ground cover. Priority weeds were determined based on their ability to disperse via floodwaters. BMRG contracted catchment and Landcare groups and regional councils to manage and undertake the delivery of all pest plant mitigation activities, including the establishment of biocontrol facilities. Fourteen sub-projects were approved to deliver technical advice and on-ground works. Terrestrial species targeted were parthenium, cat's claw creeper, giant rat's tail grass, Madeira vine and rubber vine. Aquatic species treated were hymenachne, salvinia and water hyacinth.

Of the three biological control facilities that were established, the two facilities at Bundaberg (see photo 3.1) are raising the salvinia weevil (Cyrtobagous salviniae) to control the Class 2 weed Salvinia molesta, and the leaf-mining jewel beetle (Hylaeogena jureceki)—an insect used in the control of the Class 3 weed cat's claw creeper (Macfadyena unguis-cati). The facility in the North Burnett is raising biocontrol agents to target parthenium and cat's claw creeper, and an officer has been funded to coordinate the facility and undertake biocontrol releases. Biocontrol is a longer term control option for these weed species into the future.

To build capacity, workshops and field days were held across the region. In the North Burnett, the project coordinator worked with 96 landholders to develop property management plans (PMP) that included weed control activities. Free herbicide was supplied to landholders by a local retailer, and recipients were required to provide proof that the herbicide had been used. Follow-up visits to properties took place, where possible, while ‘before’ and ‘after’ photographic evidence was supplied in
other cases. BMRG considered this approach to be the most efficient and cost-effective way of assisting as many flood affected landholders as possible.

Photo 3.1: Bio-control facility constructed for cat’s claw creeper at Bundaberg [Photo: BMRG]

One of the highlights of the QMDC’s weed control program was the success of an aquatic weed control exercise on Dogwood Creek at Miles. In partnership with Biosecurity Queensland, the Western Downs Regional Council, QMDC Aboriginal Rangers, Murilla Landcare and other community groups, QMDC worked to control an outbreak of salvinia on the Gil Weir. An aquatic harvester was used to collect this Class 2 weed (see photo 3.2).

Signage was installed at Gil Weir and other locations to raise public awareness of the presence of salvinia, alert landholders, and advise on how to prevent it spreading further. Most of the on-ground control work occurred at the head of the catchment, at the source of the infestation, to ensure that benefits would be extended downstream.

Landholders now have the skills to monitor for future outbreaks and provide effective control.

3.2.4 Partnerships

During the course of the recovery program, BMRG worked collaboratively with regional councils; community, Landcare and catchment groups; rural produce stores; and staff from Biosecurity Queensland and Queensland Parks and Wildlife Service (QPWS) to mitigate the impacts of invasive weeds. QPWS staff assisted with distributing biocontrol agents in estates adjacent to landholder properties where control was being undertaken, increasing management effectiveness. Working with regional councils in planning and implementing the program contributed to its success. The local knowledge and on-ground experience provided by council officers ensured that a strategic approach was taken to the targeted control of weed infestations. Moreover, the North Burnett Weeds
Stakeholder Committee and the Weeds Technical Group met regularly to ensure a coordinated approach for planning projects. Funding was provided to North Burnett Landcare Group (NBLG), which established the biocontrol facility at Monto, and a weeds crew who were upskilled in the biological characteristics and control of weeds. (The quality this work was recognised when NBLG became a National Finalist in the 2014 National Landcare Awards.)

QMDC provided funding direct to Millmerran Landcare to control mother-of-millions across six properties in the headwaters of the Western Creek catchment. QMDC collaborated with Waggamba Landcare and members of the Pipeclay Sub-Catchment Group to map locations and control mother-of-millions on two properties in the headwaters of the catchment. A field day was held in conjunction with Biosecurity Queensland, Inglewood and Texas Landcare Group, and Dumaresq Valley Landholders to address flood spread weeds on the Dumaresq River.

In managing salvinia, formal and collaborative arrangements were established between QMDC and many partners, including the local council, the QMDC Aboriginal Ranger Program, the Miles Fishing Club, SES, the Show Society and the general community.

It is considered that the likelihood of weed control and monitoring works continuing in these regions has been increased by the development of good working relationships between regional NRM bodies and affected landholders.

### Table 3.2: Assessment projects against stated objectives and outputs (focus area 1)

<table>
<thead>
<tr>
<th>Project title &amp; ID</th>
<th>Project objectives</th>
<th>Project outputs</th>
<th>Assessment and/or status</th>
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<tr>
<td>Burnett Mary Regional Group: Post-flood invasive species mitigation program BM FR 01 (SP1)</td>
<td>This project aimed to protect agricultural land and maintain biodiversity of vegetation through: • targeted control of opportunistic weed species on riparian and agricultural land • raising awareness of weed threats • implementing weed control projects at a sub-catchment scale.</td>
<td>The project’s stated output was: • control of terrestrial and aquatic weeds across 30,000 hectares of priority agricultural and riparian areas in the Burnett Mary region</td>
<td>This project was completed on budget in June 2015. The project achieved 41,347 hectares of weed control in riparian areas of the North Burnett and Bundaberg regions. Five terrestrial and three aquatic species were targeted. Technical advice was provided to 113 landholders. Ninety eight landholders receive assistance to develop Property Management Plans for weed control. Three facilities were established to raise biological control agents. Two fact sheets and a video were produced on aquatic and terrestrial weed species.</td>
</tr>
<tr>
<td>Queensland Murray-Darling Committee: Weed control QM FR 01 (SP4)</td>
<td>The objective of this project was to protect the Maranoa and Border Rivers catchments from invasion by declared and environmental weeds, and to maintain biodiversity of vegetation through targeted control of Weeds of National Significance (WONS).</td>
<td>The project had 2 distinct outputs: • control of declared and environmental weeds across 600 hectares • technical advice provided to 180 properties.</td>
<td>This project was completed, on budget, in June 2014. Landholders targeted mother of millions (Class 2 weed) and salvinia (WONS) across 1,662 hectares Technical advice was provided to 225 landholders on how to monitor for future weed outbreaks.</td>
</tr>
</tbody>
</table>

### 3.2.5 Key learnings

A key observation of the BMRG is that parthenium is unlikely to be eradicated in the region due to floodwaters dispersing the seed bank across the landscape. Future activities need to focus on integrated management and control options rather than on eradication. Maintaining good groundcover on agricultural properties will be a key component in outcompeting parthenium.
In relation to chemical control, the North Burnett Landcare group identified that a blend of two broadleaf chemicals treated target weeds more effectively, without harming beneficial grasses. Program funding allowed for the prompt assessment of larger areas, which is something that the regional councils did not have the resources or capacity to achieve.

### 3.3 Recommendations for future direction

As the extent of weed infestations resulting from flooding is unknown, a comprehensive surveillance and monitoring program is required. Long-term land management education is essential for successful weed control, and regional councils need to continue monitoring activities to ensure that treatment continues and new landholders moving into the area are informed of weed risks.

While there will always be a focus on the use of herbicides, investment into biocontrol projects will ensure a multi-pronged approach to weed control in the future. One critical issue that has been identified is the ability to produce the required number of biocontrol agents for release into paddocks. BMRG recommends that additional smaller biocontrol facilities be established in its region to address the shortage.

To ensure that the current progress on weed control activities continues, some regional NRM bodies have contracts with landholders that require them to maintain current control works and monitor the outcomes. In turn, the regional NRM bodies will continue to provide support to landholders.
Photo 3.3: Agrotrend field day in Bundaberg display of invasive weeds and biocontrol [Photo: BMRG]
4 Results—Focus area 2: Removal of excess flood debris

Record-breaking floods were experienced in the Burnett River and Baffle Creek catchments following Cyclone Oswald; and nearly 140,000 hectares of agricultural land in the Condamine catchment was flooded.

Activities reported under this focus area include the removal and disposal of excessive or dangerous disaster-related debris from land, watercourses and riparian areas—in particular, debris that threatened the local or downstream environment or infrastructure. Delivery of flood waste to landfills, recycling waste recovery centres, and timber mills was encouraged under the recovery program. If recycling of the debris was not possible, its relocation to suitable sites was negotiated with landholders and other experts. Debris removed included large trees, boats and pontoons, fencing, chemical drums, and silt and sand deposits from cropping land.

I mean, the thing is, when a cyclone hits like that you spend half the time cleaning up. So there was a lot of clean up to do before we could even get fences back up, debris on fences and fences knocked over and we actually replaced a boundary fence... I mean it’s been fantastic. Between the QRA funding this year and that funding last year, we’ve managed to do some really significant repairs that would have taken us several years to catch up otherwise.

Landholder 13 FBA

4.1 Removal of excess flood debris projects

BMRG and CA were each funded under this recovery program to undertake multiple projects to remove flood debris agricultural land, and coastal and riparian areas. SEQC also removed debris deposited in riparian areas.

Some regional NRM bodies removed debris from their properties prior to the funding for damage mitigation becoming available under the recovery program.

Table 4.1: Summary of projects (focus area 2)

<table>
<thead>
<tr>
<th>Project ID</th>
<th>Project title</th>
<th>Project description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAFF FR 01</td>
<td>DAFF: Chemical clean up</td>
<td>The Department of Agriculture and Fisheries collected and disposed of flood affected chemicals from landholders.</td>
</tr>
<tr>
<td>DTMR FR 01</td>
<td>Navigation dredging of Burnett River</td>
<td>This project dredged the Burnett River to improve navigation for fishing, boating, industry and tourism sectors that use the river. Silt deposition from the flood had caused navigation problems in an 8 kilometre reach of the river.</td>
</tr>
<tr>
<td>BM FR 02</td>
<td>Burnett Mary Regional Group: Flood debris removal – removal of stranded and damaged boats</td>
<td>This was a Critical project to remove stranded and damaged boats from the Bundaberg area, including the Burnett River and coastal areas.</td>
</tr>
<tr>
<td>BM FR 01 (SP5)</td>
<td>Burnett Mary Regional Group: Flood debris removal</td>
<td>This project will assist landholders to clean up and remove flood debris - woody in-stream vegetation that impacts on stream hydrology, and debris on agricultural land that prevents the harvest of cane and other agricultural activities.</td>
</tr>
<tr>
<td>BM FR 01 (SP3)</td>
<td>Burnett Mary Regional Group: Increasing productivity in the Burnett Catchment</td>
<td>This project was a small grants program that provided targeted incentive payments in priority areas to restore productivity.</td>
</tr>
<tr>
<td>CA FR 01 (SP2)</td>
<td>Condamine Alliance: Debris removal</td>
<td>This project assisted landholders to recover from the impacts of flooding by cleaning up and removing debris in riparian areas in the following locations:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Glengallan Creek and Swan Creek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Condamine River, Cecil Plains</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Myall Creek, Dalby</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Jandowae Creek, Jandowae</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Charley’s Creek, Chinchilla</td>
</tr>
<tr>
<td>SE FR 03 (SP3)</td>
<td>South East Queensland Catchments: Targeted recovery and resilience projects</td>
<td>Three separate targeted recovery project programs were undertaken in the Lockyer, Fassifern and Upper Brisbane areas to help landholders return to production and improve the natural resilience of waterways.</td>
</tr>
</tbody>
</table>
4.2 Evaluation of removal of debris projects

In this section, the efficiency and effectiveness of the debris removal projects are evaluated. In subsection 4.2.1, the project processes and delivery methods are appraised. Subsection 4.2.2 provides an assessment of whether the projects achieved their objectives and outputs, and includes an assessment table for each project in this focus area. Significant achievements, a description of project activities, partnerships, key learnings and recommendations for future direction are also discussed.

Nine respondents (6%) to DSITI’s online survey accessed funding to remove disaster-related debris from agricultural land or riparian areas.

4.2.1 Project efficiency

BMRG encountered numerous challenges in delivering debris removal projects:

- Removing stranded vessels proved to be a complex exercise. It was difficult to identify who had jurisdiction for removing vessels in different areas, and budgeting was challenging due to the location and variety of stranded vessels. BMRG had to develop minimum workplace health and safety (WHS) standards for the contractors who to be engaged in removing vessels; and, during the process, assisted other contractors to improve their WHS standards. Safety issues also had to be addressed when clean-up teams were working in close proximity to cane harvesters.

- Program design and management was challenging at times due to variations in the knowledge and management capability of landholders.

- The priority for clean-up was houses and infrastructure, with paddocks being left until later. When the issue of debris in sugar cane surfaced, the crops had matured, making clean up more difficult.

- One unforeseen difficulty was that many landholders were unwilling to nominate for cane paddock clean ups. BMRG believed that the reason for this was that broad advertising by local canegrower groups was not an effective method of recruitment. A better outcome resulted when BMRG worked directly with the harvesting contractors.

4.2.2 Project effectiveness

The five projects that were funded to undertake debris removal achieved their stated objectives and outputs, and were completed on time.

4.2.3 Significant achievements

- Debris was removed from 110 hectares of agricultural land and 91 kilometres of waterways.

- More than 600 tyres (weighing 48 tonnes) were cleared from a site at Chinchilla, and recycled.

- Ten stranded marine vessels and nine pontoons were removed.

- 1,400 litres of Group 2 agricultural chemicals were collected and disposed of.

- 26,000 cubic metres of sand and gravel were removed from mouth of the Burnett River to re-establish a navigation channel.

The DTMR critical dredging project (see photo 4.1) created a 40-metre wide channel at the mouth of the Burnett River to remove 65,000 cubic metres of sand and gravel that had been deposited during
the flood and was impeding navigation. The financial contribution made by DNRM under the recovery program equated to the cost of dredging approximately 26,000 cubic metres.

BMRG was funded to undertake three projects in this focus area. The first to be delivered was a critical project that involved the removal and disposal of 17 stranded marine vessels and pontoons from the Burnett coastline and riparian areas. The project was an important community and environmental exercise with excellent outcomes, one of which was connecting with the ‘boatie’ community. The project allowed the community to share stories of loss and grief. BMRG notified the QRA of people who were in severe distress, and appropriate assistance was organised.

BMRG’s second project continued on from the first, with the removal of several abandoned vessels, a pontoon and a fuel tank that were considered a risk to the local marine environment. Environmental, social, economic and cultural aspects were all taken into consideration prior to moving these large items. There are still a number of vessels and other large items of debris along the coastline of the Lower Burnett River requiring removal.

The clearing of debris from cane paddocks and the provision of assistance to horticultural growers was the third project to be funded. Debris in the cane paddocks inhibited the effective harvest of cane, and presented safety and equipment damage issues for harvesters. Items removed included a house, logs, house stumps, cattle feeders, chemical drums and wire. The house was demolished and the timber recycled at the local Men’s Shed. Work for the Dole participants provided assistance to an elderly citrus farmer in ill health whose farm had been severely impacted. Debris was removed from trees, trickle irrigation was realigned, and household debris was collected from paddocks.

Interestingly, only 28% of participants in the online survey agreed that the recovery program contributed to the broader community by ensuring that debris resulting from flooding had been used beneficially. More than half of the respondents (56%) were either neutral (neither agree nor disagree) or unsure, while 10% disagreed with the statement. It is difficult to determine why this statement was largely unsupported, but it is possible that the responses indicate a lack of understanding of what the statement was implying. Further, many respondents did not access the funding for removal of debris, which may explain why there was such a low level of agreement with the statement; however, it is difficult to say this with any certainty.

Further, only 45% of respondents believed that the recovery program contributed to the broader community by increasing the safety and amenity of the area as a result of the mitigation of disaster-related debris on land and water. Of the respondents, 41% were either neutral (neither agree nor disagree) or unsure, while 10% disagreed with the statement. Given the number of respondents who were unsure or neutral, it is possible that they didn’t use the funding provided through the recovery program to remove debris and may not have felt comfortable commenting on this statement. As only 10 respondents disagreed with the statement, it is unlikely that the recovery program was considered to have negatively impacted on safety and amenity.
BMRG also managed a small grants program for landholders under the recovery program. These grants comprised incentive payments (capped at $10,000) that funded the removal of sand and gravel deposited by flood waters from 108 hectares of agricultural land.

CA assisted 37 landholders to remove debris in riparian areas along 84 kilometres of Glengallan Creek, Swan Creek, the Condamine River, Myall Creek, Jandowae Creek and Charley's Creek. The highlight for the Chinchilla community was the end of a long-standing problem of dumped tyres, some of which are shown in photo 4.2. At Charley's Creek, the ‘tyre grave’ was an environmental mess that had frustrated Chinchilla Landcare and landholders for 20 years. Many of the 600 tyres were partially buried in the soil from years of exposure to flood waters. Each time the creek bed flooded, tyres would be washed downstream, causing damage and extra work for local landholders. The collection of tyres weighing 48 tonnes was transported to a recycling plant.

In the Condamine, this flood event was a catalyst for a change in management practices. The extent and nature of the damage to land and infrastructure helped landholders to realise that their on-ground activities were a contributing factor. During the course of the recovery program, the CA project team gained valuable skills in working with communities under pressure.

The Targeted recovery and resilience project conducted by SEQC cleared flood debris from 2.3 kilometres of stream bank. Items that were adversely affecting farm operations were removed from crop fields and grazing paddocks, and included logs, tanks, fence posts, wire and toxic chemical containers.
4.2.4 Partnerships

The component of the recovery program that entailed the removal of marine vessels and pontoons required significant liaison with a variety of organisations outside of the scope of natural resource management, including the Queensland Reconstruction Authority, customs officers, recognised training organisations, Department of Communities, and Maritime Services Queensland. The Burnett Mary Regional Group coordinated regular stakeholder meetings with these groups. Industry Recovery Officers were pivotal in referring the worst affected landholders.

One example of positive partnerships involved a lychee farmer who had sustained considerable damage to their crop and infrastructure, and lost all machinery. Two work crews provided assistance for eight weeks, removing debris, slashing, repairing irrigation lines, spray units and netting, and treating weeds. This assistance enabled the farmer to produce a crop of lychees in 2013. Professional counselling and business planning was also arranged for this grower due to the psychological and financial strain of the event.

In the Condamine and elsewhere, partnerships were instrumental to project delivery and to bringing a diversity of knowledge and experience to inform changes to management practices. CA worked with technical specialists, three regional councils, the local Landcare network, and landholders, demonstrating that accessing local knowledge networks facilitates effective and efficient targeted engagement. To ensure that team members undertaking landholder engagement were equipped to work with community members under stress, a psychologist assisted with all projects.
I think this program along with things like helping hands and taking debris off fences, all those things help get people back to normal quicker. I would certainly probably give that even more value in terms of getting people back to productivity because it got them into the right frame of mind to get their business back up and running.

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Table 4.2: Focus area 2—Assessment of projects against stated objectives and outputs

<table>
<thead>
<tr>
<th>Project title</th>
<th>Project objectives</th>
<th>Project outputs</th>
<th>Assessment and/or status</th>
</tr>
</thead>
</table>
| **DAFF – Chemical clean up**  
**DAFF FR 01** | The objective of this Critical project was to collect and dispose of flood damaged chemicals from landholders. | Flood damaged chemicals will be collected from 9 landholders and disposed. | This project was completed in July 2013, on budget. 1,400 litres of group 2 chemicals, including pesticides, Starane, and Hydrochloric acid were recovered from landholders and disposed. |
| **Navigation dredging of Burnett River**  
**DTMR FR 01** | This Critical project aimed to remove silt deposited in the Burnett River to improve navigation. | The project will remove 26,000 cubic metres of sand and gravel from an 8 kilometre stretch of the Burnett River. | The project was completed in April 2014 and on budget. In total, 65,000 cubic metres of sand and gravel was removed (dredged) from the mouth of the Burnett River. This Program funded the removal of 26,000 cubic metres. |
| **Burnett Mary Regional Group: Flood debris removal – removal of stranded and damaged boats** | The objective of this Critical project was to remove stranded and damaged boats. | Stranded and damaged boats will be removed from the coastline and riparian areas in the Burnett region. | The project was completed on budget in July 2013. Eight stranded marine vessels and nine pontoons were removed. |
| **Burnett Mary Regional Group: Flood debris removal** | The goal of this project was to assist landholders to clean up and remove flood debris - woody in-stream vegetation that was impacting on stream hydrology, and debris on agricultural land that was preventing the harvest of cane. | Riparian areas in the Burnett Mary region will be rehabilitated and restored. Thirty eight landholders in the Bundaberg and Gayndah areas will receive assistance to remove flood debris and restore farm productivity. | This project was completed in December 2014 and under budget. Debris removed included two marine vessels and one fuel tank. Seven farmers were assisted to remove debris from 110.3 ha (74ha?) of agricultural land |
| **Burnett Mary Regional Group: Increasing productivity in the Burnett Catchment** | This project was a small grants program that provided targeted incentive payments in priority areas to restore productivity. | The project sought to remove 108.3 hectares of sand and debris from farms. | This project was completed in December 2014. Sand and gravel was removed from 108.3 hectares of agricultural land. |
| **Condamine Alliance: Debris removal** | This project aimed to rehabilitate riparian areas and protect the health and safety of the community by removing man-made debris in the following locations:  
- Glengallan Creek and Swan Creek  
- Condamine River, Cecil Plains  
- Myall Creek, Dalby  
- Jandowae Creek, Jandowae  
- Charley’s Creek, Chinchilla. | It was anticipated that assistance would be provided to 37 landholders to remove debris along 43 kilometres of riparian areas. Collaborative arrangements will be formally documented to provide technical support to 8 landholders and delivery partners. Cooperative and collaborative arrangements will be developed with 46 landholders and delivery partners. | Projects to remove flood debris in all locations were completed on time, in June 2015. Assistance was provided to 37 landholders and debris was removed from riparian areas along 89 kilometres of waterways. More than 600 tyres weighing 48 tonnes were removed from one site and recycled. Formally documented collaborative arrangements were developed with 8 landholders and delivery partners, providing technical support. Cooperative and collaborative arrangements were developed with 46 landholders and delivery partners. |
<table>
<thead>
<tr>
<th>Project title</th>
<th>Project objectives</th>
<th>Project outputs</th>
<th>Assessment and/or status</th>
</tr>
</thead>
<tbody>
<tr>
<td>South East Queensland Catchments: Targeted recovery and resilience projects</td>
<td>No objectives identified.</td>
<td>No outputs identified.</td>
<td>This project was completed in June 2015. Flood debris was removed from 2.3 kilometres of stream bank.</td>
</tr>
</tbody>
</table>

### 4.2.5 Key learnings

In the Burnett–Mary region, some members of the community expected that woody debris deposited within the river could be removed as part of the recovery program. After BMRG inspected the areas it was decided that no positive environmental outcomes would be achieved, so the debris remained in place. This highlighted a lack of awareness in the community that debris can have an environmental value, which is illustrated by the following comment made by a landholder:

> [The recovery program] should spend some time and money in sensible prevention mitigation programs to watercourses subjected to severe flooding in high-rainfall events by removing excess vegetation from the stream channels that seriously impede the natural water flow causing alternate stream flows and enhanced flooding.

One risk that may have contributed to the effective delivery of the debris removal projects was the sourcing of labour. The collaboration between BMRG and employment agencies to source labour for projects was critical to achieving good outcomes in this focus area. Labour, travel costs and WHS requirements were all provided in-kind. To obtain the labour force to assist with debris removal activities, BMRG leveraged support from a local job service provider and Rural Training Queensland. This enabled local jobseekers to receive training and gain skill sets relevant to the local labour market, while assisting primary producers. Sixteen of the 20 participants who were involved in the debris removal projects gained paid employment through their direct involvement in the recovery program—a significant outcome, as Bundaberg has a very high unemployment rate. This good news story was featured on a local news channel. The employment of an experienced project officer, who was well-connected with the employment agency, delivered excellent outcomes.

During the program, CA found that the cumulative impacts of multiple natural disasters can result in communities going into shock, making engagement difficult because people are unable to function effectively. Seasonal variation can also affect the interest and ability of landholders to participate during some stages of a program. The resilience threshold of community members (i.e. financial and mental ‘health’) needs to be taken into consideration when planning new work.

### 4.3 Recommendations for future direction

Several regional NRM bodies commented that, to ensure that projects align, it would help them greatly in their project planning phase if, prior to their offering new opportunities, they had an understanding of other disaster recovery initiatives being implemented in the community.

There are many information gaps around the significant environmental role of woody debris in waterways. Community education is recommended to avoid the costly unnecessary removal of debris in the future where damage to infrastructure is not a concern.

It was suggested that current environmental investment programs be linked to local needs to create opportunities to enhance and accelerate recovery, and mitigate future risks.

Regular hydrographic surveys need to be undertaken to ensure that the channel retains an adequate depth for the majority of vessels using the Burnett River. The disposal site behind Kirby’s Wall that
was used is now full, so a new site needs to be secured for future dredging events as soon as possible to ensure that the necessary approvals are obtained.
5 Results—Focus area 3: Rehabilitation of cropping and grazing land

Due to their high soil fertility, floodplains are highly productive and intensively farmed; however, farming on floodplains comes with the drawback of being at much higher risk of flooding. Floodplains are used for a variety of agricultural activities, including broad acre cropping, horticulture, and grazing. Flooding can cause lateral creek bank erosion, resulting in the permanent loss of productive land.

Focus area 3 covers activities and advice given relating to the rehabilitation or reconfiguration of cropping or grazing lands to maximise groundcover, including on-farm soil management to minimise soil loss, gully erosion control, and contour bank design. (Works in riparian areas are reported under focus area 4.)

It wasn’t just a case of saying, well the water has gone down now, we’ll just starting ploughing up the ground and plant the next crop – it was acres and acres of soil and farm land gone. They couldn’t do anything without actually starting to replace what was there, before they could even work on the soil and plant again. They didn’t know where to start – there were only so many contractors involved.

Stakeholder 07

5.1 Rehabilitation of cropping and grazing land

Four regional NRM bodies undertook flood recovery program projects that have been included in this focus area: Burnett–Mary Regional Group, Fitzroy Basin Association, Queensland Murray–Darling Committee and South East Queensland Catchments.

Table 5.1: Summary of rehabilitation projects (focus area 3)

<table>
<thead>
<tr>
<th>Project ID</th>
<th>Project title</th>
<th>Project description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM FR 01 (SP3)</td>
<td>Burnett Mary Regional Group: Increasing land productivity in Burnett Catchment</td>
<td>One component of this project focused on repairing damage to highly valued agricultural lands through the provision of advice on best practice management in soil conservation and agronomy to address soil degradation, restore productivity and reduce future risks. Activities were undertaken in Bundaberg, Monto, Cherbourg and Mundubbera.</td>
</tr>
<tr>
<td>BM FR 01 (SP4)</td>
<td>Burnett Mary Regional Group: Floodplain stabilisation and management</td>
<td>This project provided on-ground soil conservation and technical assistance to coordinate flood run-off and drainage works between landholders in Bundaberg, Monto and Cherbourg. Constructed levees that affect downstream land uses and productivity were removed.</td>
</tr>
<tr>
<td>FB FR 02 (SP2)</td>
<td>Fitzroy Basin Association: Gully stabilisation and soil conservation</td>
<td>This project provided funds, technical advice and project management support to landholders to undertake gully stabilisation and soil conservation works in strategic areas in the Dawson-Callide, Lower Fitzroy and Lower Boyne.</td>
</tr>
<tr>
<td>QM FR 01 (SP1)</td>
<td>Queensland Murray–Darling Committee: Gully erosion control</td>
<td>This project assisted landholders in the Moonie, Weir River and Eastern Border River to recover from the impacts of flooding by undertaking gully stabilisation and soil conservation works.</td>
</tr>
<tr>
<td>QM FR 01 (SP3)</td>
<td>Queensland Murray-Darling Committee: Soil conservation works</td>
<td>This project provided assistance to landholders to the north and west of Goondiwindi and the high value cropping areas of the western downs, Tara to Miles area to recover from the impacts of flooding by restoring infrastructure.</td>
</tr>
<tr>
<td>QM FR 01 (SP2)</td>
<td>Queensland Murray–Darling Committee: Cropping and soils advice</td>
<td>Works will be undertaken in the north and west of Goondiwindi and high value cropping areas of the western downs, Tara to Miles area to recover from the impacts of flooding by restoring farm infrastructure including fencing, irrigation, and farm roads.</td>
</tr>
<tr>
<td>SE FR 02</td>
<td>South East Queensland Catchments: Mulgowie Laidley on-farm recovery</td>
<td>This project enabled horticultural and agricultural producers to improve their management practices on floodplains to enhance resilience to future flood events.</td>
</tr>
</tbody>
</table>
Project ID | Project title                                                                 | Project description                                                                 |
------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
SE FR 03 (SP1) | South East Queensland Catchments: Mulgowie Laidley on-farm recovery (Part 2) | Stage 1 of this project improved floodplain planning, farm planning, capacity for farm husbandry and capacity to recover degraded productive land. Stage 2 restored two reaches of Laidley Creek through soft engineering works and revegetation. |
SE FR 03 (SP3) | South East Queensland Catchments: Targeted recovery and resilience projects | Three targeted recovery programs were delivered in the Lockyer, Fassifern and Upper Brisbane. One aspect of the programs assisted landholders with redesigning properties to improve resilience and providing advice on soil erosion and land management. |

5.2 Evaluation of the rehabilitation of cropping and grazing land projects

In this section, the efficiency and effectiveness of the rehabilitation of cropping and grazing lands projects are evaluated. In subsection 5.2.1, the project processes and delivery methods are appraised. Subsection 5.2.2 is an assessment of whether the projects achieved their objectives and outputs, and includes an assessment table for each project in this focus area. Significant achievements, a description of project activities, partnerships, key learnings and recommendations for future direction are also discussed.

Of the landholders who participated in DSITI’s online survey, 93% identified themselves as mainly using their land for agricultural production. The majority of landholders who participated in the interviews also identified themselves as agricultural producers. One-third (twenty) of the respondents to the online survey accessed funding for soil conservation and land management assistance, and twelve respondents accessed funds to reconfigure their property or paddocks to improve disaster resilience.

DSITI’s study components identified the following in relation to the contribution made by the recovery program to the resumption of full agricultural production.

- A majority of survey respondents (81%) believed that the recovery program contributed to the broader community by assisting landholders to return to full agricultural production sooner.
- 68% of landholders who were funded thought the recovery program enabled them to get back on their feet faster.
- 45% of landholders agreed that the funding and/or assistance they received helped them to earn an income.

5.2.1 Project efficiency

There were significant delays in the delivery of on-ground funding, with a nine-month gap occurring between the cyclone event and access to funding being reported. As a result, landholders undertook many critical repair works themselves so that they could continue to operate. In the Fitzroy Basin, this created challenges around equity issues because landholders who had completed repair work were ineligible for funding.

Several regional NRM bodies considered it unrealistic that quarterly reporting was required from the beginning of the recovery program. The Queensland Murray–Darling Committee said that quarterly reporting on the negotiation stage of projects placed undue pressure on staff and landholders, and created difficulties in data management where progress reports included contracted works and completed works.
BMRG encountered several unexpected difficulties in delivering their cropping and grazing lands rehabilitation projects:

- There was a backlash from representatives of the citrus industry because BMRG’s Technical Group determined that citrus growers weren’t the highest priority for funding under this project. (The citrus industry was primarily targeted in the North Burnett for riparian restoration projects, where bank erosion was directly threatening productivity.)
- Due to confusion in interpreting the program guidelines, BMRG thought that devolved grants were not allowed. When the group became aware that this was not the case, a Deed of Variation was sought to reallocate funds to another project.
- The extent of flood damage in the South Burnett region was considered to be less than in the North Burnett. Consequently, less funding was allocated to the South Burnett for on-ground works; however, its residents believed that their community had been equally disadvantaged by the flooding and that they did not receive adequate support.
- One project in the South Burnett required collaboration between numerous stakeholders. As a result of funding limitations, changes to the project design were required and the project was modified. Friction developed between landholders, resulting in the cancellation of the project and the diversion of funds to other projects.
- It became apparent that some underground irrigation pipes uncovered during the flood were made of asbestos. This presented a problem for restoration teams, so advice was sought from a qualified company on how to manage the problem. It was decided that the best course of action was to bury the pipes again. Unfortunately, later work crews accidentally dug up the irrigation pipes with machinery, resulting in pipe fragments being spread in the soil.

*It wouldn’t have made any difference on my creek crossings, but some of the other neighbours had to clean all of the logs and things out of theirs. It’ll help when the next flood comes. No, it certainly stopped more erosion on my place through having all of the contour banks done. Yes there would have been a lot more erosion this year if we hadn’t had them done.*

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**Landholder 15 QMDC**

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*Photo 5.1: Sorghum crop at ‘Condalilly’ inundated by the Condamine River [Photo: Condamine Alliance]*
We talked to a lot of people about how they might better prepare for future flood events. We did farm planning with them and looked at a little bit beyond the normal rainfall runoff model, dealing with water on farms and to try and take into account managing the flood plains as well for flood events, which has not specifically been explored from a farming sense, with the erosion of waterways and how they manage their runoff. We probably helped more with the resilience building side of things and addressing issues that they may have otherwise ignored to their detriment down the track because they might not have built in that resilience, the creek banks falling away for example...I thought that was a really good outcome.

Stakeholder 14

5.2.2 Project effectiveness

The reported outcomes indicate that most projects achieved their stated objectives.

5.2.3 Significant achievements

- 7,697 hectares of soil erosion remediated through fencing and engineering works
- Improved soil and groundcover management across 3,581 hectares of agricultural land
- 2-D hydraulic model developed for Laidley Creek
- Cross floodplain roughness structures installed at Laidley Creek catchment
- Two floodplain management plans were developed for Byee Floodplain (South Burnett) and Three Moon Creek Floodplain (North Burnett).
SEQC undertook several innovative projects to improve soil management practices on floodplains. A 2-dimensional hydraulic model was developed for the channel and floodplain of a target reach in Laidley Creek. Modelled results aligned closely with the Oswald flood event, and the model has been used to test several scenarios for future channel and floodplain management.

Cross floodplain roughness structures were installed at several locations in the Laidley area. Each structure is composed of a line of wooden posts planted with a vetiver hedge, installed perpendicular to the direction of flood flows (as shown in the photo series 5.2 below). The structure aims to reduce the shear stress of flood flows, reduce the likelihood of floodplain scour, and induce deposition of soil and flood debris. The impact and optimal placement of these structures were determined through their inclusion in the 2-D hydraulic model.

Another initiative that SEQC implemented for improving soil management on floodplains was the use of strategic cropping practices. One practice involves identifying higher risk areas of the property, which are more likely to sustain floodplain flows, and managing cropping schedules accordingly. Crops that have a robust root system and rough foliage, such as maize, are planted during the higher risk months of December to February. Other practices include limiting the number of paddocks left fallow during these months, and using ‘strip’ tillage to facilitate stubble retention and reduce soil disturbance. Strip tillage has not been adopted widely in intensive horticulture in south-east Queensland; however, SEQC intends to promote the practice. Project sites were used as demonstration sites to leverage further funding for similar activities in the catchment.

In the Burnett–Mary region, the 2013 flood caused crop losses, loss of topsoil and nutrients, soil scour and waterlogging. In this region, broadacre cropping, horticulture, lucerne, and sugarcane are major primary production activities. One key activity coordinated by BMRG was floodplain management planning. Three experienced floodplain experts were engaged, and management plans were developed for two key areas in the North Burnett: the Byee Floodplain in the South Burnett, and Three Moon Floodplain. A participative workshop methodology was used to maximise community ownership, understanding and participation. The plans informed on-ground investment and the strategic use of funds for priority activities.

Targeted incentive payments were made available for immediate works to assist farmers to return to production. Grants of up to $10,000 assisted 31 landholders, and were focused on restoration through soil laser levelling and soil amendments to address paddock erosion.
Five workshops held across the region addressed soil health issues that arise following floods and agronomic measures to rehabilitate soils to improve productivity. Paddock soil sampling, leaf analysis, and laboratory soil analysis were all covered. Landholders were provided with a soil health report that included recommendations and options for remediation. Three irrigation workshops were held to help landholders enhance their irrigation systems by improving water and energy efficiency, and becoming more resilient and adaptable. Twenty-three landholders in the North Burnett were provided with irrigation water and energy efficiency plans.

In the Fitzroy Basin, the Callide, Fitzroy and Boyne regions were the hardest hit areas as a result of Cyclone Oswald, and many landholders were unable to return their agricultural enterprises to a productive capacity without assistance. To aid recovery, works were undertaken to control stock and vehicle access in active gullies and other eroded sites and cultivation activities were re-aligned to minimise the impact of future floods. Farm productivity was enhanced by returning properties to pre-flood conditions. A selection of strategic projects, and the development of rapid flood-mitigation property plans, enhanced long-term resilience. Targeting key recovery areas within the region allowed program resources to be strategically focused to achieve the most effective outcomes.

QMD assisted 19 property owners to implement gully stabilisation works and restore the productive capacity of 1,018 hectares of land. The use of grasses in best practice gully restoration was promoted to landholders. As a result of the soil conservation works undertaken by landholders upstream, neighbours downstream were able to progress their soil conservation works, including gully restoration.

Another of the positive outcomes of this project was that landholders in the Talwood district demonstrated a willingness to engage with QMDC in addressing other natural resource management issues. The program gave QMDC the opportunity to train new soil conservation staff during the projects, enabling succession planning. This had benefits for the entire Basin because there are a limited number of soil specialists in the region.
Landholders in the Murray–Darling were given the opportunity to assess different types of machinery for gully stabilisation works, and to experience the latest GPS survey equipment used for soil conservation works. To be eligible for funding, landholders were required to design soil conservation works to comply with regional specifications developed by QMDC, whose local soil conservation officers inspect completed earthworks to ensure that they have been constructed to regional specifications.

Another positive outcome of the recovery program was that QMDC’s role in NRM was enhanced through new engagement opportunities, including a project to fence remnant riparian vegetation, and landholders registering for the *Land for Wildlife* program.

Eighty percent of survey respondents agreed that the recovery program contributed to environmental benefits, including helping to prevent further damage or erosion. The following comments were made by a landholder and a stakeholder respectively:

*The recovery program* definitely benefits everyone long term. Protecting the little agriculture land we have left is critical; keeping the farmers on the farms even more critical for food security in future.

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**Landholder**

I think it helped their business return (to production faster) in the sense that — I’d have to use some specific examples I suppose — but if a grazing property had lost its fences on its watercourse then it can’t graze its cattle until a fence goes back up, so putting the fence up and putting the fence in the right place, and repairing the banks does increase its productivity ... The levee bank issues I saw down in the (catchment name withheld), where a producer had his whole paddocks, you know, [a foot] of soil washed away and they had to restore that and re-contour it. Without that help they wouldn’t have been in business, so absolutely, yes.

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**Stakeholder 02**

Table 5.2: Assessment of projects against stated objectives and outputs (focus area 3)

<table>
<thead>
<tr>
<th>Project title &amp; ID</th>
<th>Project objectives</th>
<th>Project outputs</th>
<th>Assessment and/or status</th>
</tr>
</thead>
</table>
| Burnett Mary Regional Group: Increasing land productivity in Burnett Catchment BM FR 01 (SP3) | To provide advice on best practice management in soil conservation and agronomy to remEDIATE severe soil degradation, restore productivity values and reduce future risks. Activities to be undertaken in the following locations:  
- Bundaberg  
- Monto  
- Cherbourg  
- Munduberra. | Anticipated project outputs included:  
- the provision of technical advice to 100 landholders  
- improved soil management of 500 hectares through soil testing and/or amendments training workshops. | Activities were completed, on budget, in December 2014.  
91 primary producers received one-on-one assistance with soil health testing and improved management practices, covering 3,490 ha.  
29 ha eroded agricultural land was restored (funding provided via targeted incentive payment).  
Irrigation and Water Efficiency Plans were completed for 23 landholders, covering 2,133 hectares.  
Five soil health workshops and three irrigation planning workshops were held. |
<table>
<thead>
<tr>
<th>Project title &amp; ID</th>
<th>Project objectives</th>
<th>Project outputs</th>
<th>Assessment and/or status</th>
</tr>
</thead>
</table>
| Burnett Mary Regional Group: Floodplain stabilisation and management BM FR 01 (SP4) | To provide on-ground technical assistance to coordinate flood run-off and drainage works between landholders in Bundaberg, Monto and Cherbourg. To remove or stabilise floodplain structures that affect downstream land uses and productivity. | This project aimed to assist 100 primary producers to adopt improved management practices to enable the repair of degraded floodplains across 1,000 hectares. | The project was completed in June 2015 and on budget. Three main activities were reported.  
- Small grants, capped at $10,000, were delivered to 31 landholders for immediate soil restoration activities, including laser levelling, soil amendments across 895 hectares  
- Technical assistance provided to 74 landholders included floodplain planning, management practices, soil erosion issues, and farm mapping.  
- 2 floodplain management plans developed for Byee Floodplain and Three Moon Creek  
- Stabilisation of levee along 8 kilometres, affecting 429 hectares and 16 hectares of cropping land converted to permanent pasture. |
| Fitzroy Basin Association: Gully stabilisation and soil conservation FB FR 02 (SP2) | To provide funding, technical advice and project management support to landholders to undertake gully stabilisation and soil conservation works in strategic areas in the Dawson-Callide, Lower Fitzroy and Lower Boyn. | This project aimed to assist 26 landholders to complete engineering works to stabilise gullies and conserve soil on 4,845 hectares. | The project was completed in June 2015, on budget. Soil conservation advice and funds to support recovery work and increase resilience was completed on 6,629 hectares of farming land. |
| Queensland Murray-Darling Committee: Gully erosion control QM FR 01 (SP1) | To assist landholders in the Moenie, Weir River and Eastern Border River to undertake gully stabilisation and soil conservation works. | This project aimed to assist 16 landholders in stabilising gully erosion to restore 320 hectares by installing exclusion fencing. | This project was completed in June 2015.  
19 property owners implemented gully stabilisation works, resulting in the productive capacity of 1,108 hectares being protected. |
| Queensland Murray-Darling Committee: Cropping and soils advice QM FR 01 (SP2) | Technical advice will be provided to landholders in the north and west of Goondiwindi and high value cropping areas of the western downs, Tara to Miles area to recover from the impacts of flooding by restoring farm infrastructure, including fencing, irrigation, farm roads. | Technical advice and project management provided to ensure high quality planning, engagement, monitoring and delivery of outcomes – 600 properties assisted. | This project was completed in June 2015, on budget. A series of fact sheets titled “Saving your soils” provided relevant technical advice to 525 properties on maintaining constructed waterways, contour banks etc. |
| Queensland Murray-Darling Committee: Soil conservation works QM FR 01 (SP3) | To assist landholders to the north and west of Goondiwindi and the high value cropping areas of the western downs, Tara to Miles area to recover from the impacts of flooding by restoring farm infrastructure. | Works will be undertaken in the north and west of Goondiwindi and high value cropping areas of the western downs, Tara to Miles area to restore farm productivity. | This project was completed on budget in June 2015.  
43 landholders received on-site advice or assistance on conserving soils through engineering works and funds to implement recommended works.  
Landholders were assisted in improving the productive capacity of 918 hectares and reduce nutrient and sediment runoff into regional waterways. |
| South East Queensland Catchments: Mulgoie Laidley on-farm recovery (Pt 1) SE FR 02 | To allow horticultural production to continue or recommence, prevent further erosion on land and enhance resilience of horticultural and agricultural systems to future flood events. A secondary objective is to improve water quality to Brisbane’s bulk water supply. | Two outputs were identified for this project:  
- Engage 3 landholders to change management practices for 25 hectares of highly productive horticultural land  
- Develop a two-dimensional stream model. | The project was completed on budget in June 2014.  
Awareness raising activities were attended by 50 people.  
Technical advice was provided to 6 landholders on soil nutrition, agronomy and hydrology issues. Floodplain roughness structures were installed on one of these properties.  
A calibrated 2D stream and floodplain hydraulic model was developed. |
| South East Queensland Catchments: | To allow horticultural production to continue or recommence, prevent | This project sought the following outcomes:  
- Enhanced floodplain | The project was completed June 2015. Three cross floodplain roughness structures were installed. Improved soil |
### Project title & ID

- Mulgowie Laidley on-farm recovery (Pt 2)
- South East Queensland Catchments: Targeted recovery and resilience projects

### Project objectives

- Further erosion on land and enhance resilience.
- To plan and implement floodplain works to improve flood resilience.
- To improve water quality to Brisbane’s bulk water supply.

### Project outputs

- Planning and capacity for improved on-farm husbandry
  - Improved soil management practices adopted on 175 hectares of Laidley Creek floodplain
  - 1 demonstration area for extension training and increased community awareness.

- Catchment and property scale redesign for improved resilience and improved water quality through landowner horticultural land management improvement programs
  - Soil erosion and land management advice
  - 75 hectares of improved horticultural husbandry.

### Assessment and/or status

- Management practices have been adopted on 205 hectares of floodplain land.
- A tillage trial demonstration using a ‘strip’ tillage implement was developed to facilitate the retention of stubble and reduce erosion potential.
- A best management practice factsheet was developed for locating irrigation infrastructure.

- One activity of the Targeted recovery and resilience projects aimed to assist targeted landholders in priority areas to return to production.
- Three targeted recovery programs were delivered in the Lockyer, Fassifern and Upper Brisbane.

- Projects were completed in June 2014, on budget.
- Soil erosion risk was reduced on 99 hectares through engineering works, including the addition of topsoil to restore production.
- Seven hectares of vulnerable land was protected by fencing out stock (non-riparian).
- Groundcover and soil health was increased across 180 hectares.

### 5.2.4 Partnerships

FBA partnered with their sub-regional NRM groups, Fitzroy River and Coastal Catchments (FRCC) and the Dawson Catchment Coordinating Association (DCCA), to deliver all their flood recovery projects. To ensure that contracted milestones were met, FBA was responsible for overall project management and coordination of the recovery program, while FRCC and DCCA worked with landholders to complete on-ground works. FBA formed a Regional Stakeholder Advisory Group (RSAG), comprising key industry and community stakeholder representatives such as local government, DAF, AgForce, QRAA, Growcom, and sub-regional NRM groups. The RSAG assessed proposed projects, and was deemed the most appropriate way to give landholders equal access to funds. All on-ground projects received expert technical assistance, advice, and visits from field officers.

SEQC worked with local councils, industry, consultants, and experts in hydrology, agronomy, earthworks and revegetation in delivering their floodplain restoration projects. DAF provided expertise on irrigation placement and soil science. Lockyer Valley Regional Council provided post-flood aerial imagery to SEQC to support on-ground works, and the local government undertook site inspections of works. SEQC benefited from the shared learning that resulted from discussions with technical staff from other regional NRM bodies on methods and techniques to increase the resilience of prime agricultural land and stream restoration for future flood events.

QMDGC partnered with 28 sub-catchment planning landholder groups in the Border Rivers and Maranoa–Balonne region to assist with the distribution of technical information for the floodplain restoration projects.
At the commencement of the recovery program, BMRG assembled a technical group that included representatives from industry and state government departments. In the planning and delivery phase of the land productivity sub-program, many partnerships were formed between agronomists, state government department and industry representatives, financial advisors, and economic development organisations. The project enabled BMRG and delivery staff to engage with landholders who hadn’t been actively involved with NRM activities in the past.

The North and South Burnett regional councils and DTMR were involved in the floodplain management planning workshops, assisting with planning for infrastructure impacts on floodplain flows such as roads and bridges. In the North Burnett, a priority site is being investigated by DTMR, with hydraulic and engineering studies being commissioned.

5.2.5 Key learnings

One activity that BMRG found very useful was to provide landholders with maps and overlays, and ask participants to identify and write their issues on the map. This proved to be very empowering, and drew out issues in a non-confrontational way.

An unsolicited project proposal was submitted to BMRG for a collaborative project between three landholders. Construction of a weir on the Kolan River was proposed as a flood mitigation measure. To ensure that the assessment process was transparent, the proposal was discussed by the Fitzroy and Burnett Oversight Committee, and a decision was made to invest in a design investigation report. The report revealed that the structure would have adverse impacts and therefore the project did not proceed, highlighting the importance of following correct processes to ensure that engineering designs are appropriate.

Some landholders were severely impacted by the floods and required assistance under several programs. BMRG’s project officers assisted landholders to prioritise activities to help them get back on their feet faster. One example of this was prioritising the repair of an irrigation pump, rather than fixing an erosion problem, to allow a return production and the generation of income.

Some effects of the floods may not become apparent for some time, including the loss of topsoil and the subsequent impact on long-term productivity.

SEQC identified that many of the high-cost enhancements have significant off-site benefits downstream for bulk water suppliers, conservation (sea grass beds in Moreton Bay), fisheries and tourism. Investigations into the geomorphological changes occurring in Warrill Creek catchment have highlighted the greater challenges faced when restoring other catchment areas. Strategic cropping practices offer a low-cost, low-risk approach to minimise flood impacts to production in the Laidley floodplain and could easily be applied elsewhere. Many farmers are willing to take a long-term view and invest small amounts of resources over time, when they have the capacity.

SEQC developed a permanent display to capture community memories and recovery program achievements (photo 5.4). It was gifted to the community for installation in the local Community Hall to tell the story of the Mulgowie floods and provide for ongoing reflection.

Knowledge of soil health and functionality thresholds was generally lower than expected across all landholder demographics in the Condamine. This was the area of biggest demand for advice by a significant margin; however, rather than build their own skills, many people just wanted the specialists to ‘tell them how to fix the problem’. Soil testing is not a widely used management practice amongst targeted landholders, particularly in the grazing and marginal cropping areas. A lack of soil information restricts a landholder’s ability to provide restoration advice, and a lack of soil management
skills reduces their ability to implement restoration works. This increases the need and value of intervention programs, but also the respective transaction costs.

Some landholders are less receptive than others to changing their management practices, which resulted in resources being focused on those with the capacity for, and willingness to, change. Repairs and recovery take some time, and circumstances may change through the life of a program. It can be challenging to have flood recovery activities happening at the same time as drought initiatives.

Landholders in the Murray–Darling learned the importance of working together in a coordinated way to solve a common problem. An example of this was the stabilisation of eroding gullies on several properties where catchment run-off requires management and cannot be solved by simply stabilising the gully.

Providing the opportunity to brainstorm and share knowledge was an important part of the restoration process. When key landholders in a region implement rehabilitation work, it brings other people on board and provides locally relevant demonstration sites. In the future, QMDC intends to provide better oversight of revegetation, stabilisation, and monitoring activities in similar programs, in the belief that this may result in better outcomes for both landholders and landscapes.

Some landholders reacted negatively to the receipt of regular information mailings. QMDC managed this by ensuring that only relevant, high-quality fact sheets and documents were distributed.

FBA believed that their practice of delivering projects through third parties such as sub-regional NRM groups, community groups and contractors enabled good outcomes, as investment was spread across the region, aiding recovery and building capacity.
5.3 Recommendations for future direction

FBA has made several recommendations for the implementation of similar programs in the future:

- Either funding needs to be provided sooner, or retrospective funding must be provided and procedures put in place for landholders to provide documentation to verify that work has been undertaken.
- FBA will require that landholders continue to participate in relevant industry best management practice programs to be eligible to receive on-ground funding.
- On-farm technical reports will be obtained by industry experts, with on-ground completion reports to confirm deliverables and uptake. Stronger project management oversight of sub-regional groups will ensure timely completion of on-ground works.
- An increased ‘first response’ procedure would be useful to initially assess the damage and the assistance needed.
- To allow access to paddocks, the recovery program should be expanded to include restoration of farm access roads and creek crossings.
- Depending on the nature of the extreme event, a regular review of project caps and timelines would be useful when considering the demand for funding.

To ensure the legacy of projects, QMDC contracts included requirements for landholders to maintain works undertaken as part of the recovery program, and to monitor the natural resource outcome of the contracted works. Other regional NRM bodies have similar procedures in place.

SEQC recommends that learnings from projects be captured to allow the expansion of works to other catchments and areas of intensive agriculture production in south-east Queensland. Investment into catchment resilience needs to be ongoing to reduce the impact of these events. Where possible, an impacted reach approach (rather than a property specific approach) is considered ideal.

SEQC landholders in the project target area are seeking to expand works and develop long-term plans for changed management practices and property design, with a focus on stream and channel restoration. The broader environmental outcomes of a range of projects were significant in increasing resilience. For example, SEQC was able to negotiate the inclusion of revegetation at several sites, providing long-term stability and conservation outcomes.

BMRG made the following recommendations for the future:

- As their employment of a soil conservation officer made technical expertise readily available and was integral to the implementation of the program, BMRG recommends this process as an excellent way of engaging landholders.
- It is important to maintain the technical expertise within BMRG and the region on soil health and erosion, and to maintain the relationships established with specialist consultants, to ensure that the legacy of the program is maintained.
- High salinity levels in the Burnett River catchment have become an issue as a result of several flood events followed by drought, and will need to be monitored. Irrigators with crops such as citrus and ginger that are sensitive to water quality will continue to receive assistance in monitoring soil health through soil health workshops.
- A primary contact in DNRM for floodplain management issues in identified areas would be very useful to the community.

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2 FBA were not aware that the recovery program did allow these activities.
• Legislation relating to levee banks should be simplified, and policies need to be developed to reduce the placement of structures on floodplains.
• Incentives to improve water use efficiency via alternate irrigation technology should be provided because irrigation infrastructure impedes floodplain flows.

![Photo 5.5: Gully erosion on a property in the Jandowae Creek area. Light soils and low groundcover make this type of land very susceptible to erosion. [Photo: Condamine Alliance]](image1)

![Photo 5.6: The above site following restoration works. The low bank will slow water and spread it out. [Photo: Condamine Alliance]](image2)
6 Results—Focus area 4: Riparian restoration and erosion control

In south-east Queensland, ex-tropical cyclone Oswald caused intense rainfall and rapid flood events that resulted in significant damage to riparian areas. Severe channel and bank erosion contributed to the substantial sediment loads transported downstream to the Brisbane River and Moreton Bay. Activities in the Fitzroy Basin were focused on the Callide, Lower Fitzroy and Lower Boyne catchments. In the Burnett–Mary region, the Burnett and Kolan River catchments, and sub-catchments of the Mary River, required work to stabilise riparian areas.

This focus area covers activities related to the repair, stabilisation or rehabilitation of riparian areas impacted by slumping, scouring, and vegetation removal; and areas where recent flooding has changed the watercourse location and flow regimes. Activities include revegetation, provision of off-stream watering points, stabilisation through engineering works and the protection of native riparian vegetation by fencing. Wherever possible, stabilisation and rehabilitation using existing material and native vegetation has been recommended to maintain water quality and natural ecosystem function.

6.1 Riparian restoration and erosion control

Five regional NRM bodies undertook riparian restoration and erosion control projects: Burnett–Mary Regional Group, Condamine Alliance, Fitzroy Basin Association, Queensland Murray–Darling Committee and South East Queensland Catchments.

Table 6.1: Summary of projects (focus area 4)

<table>
<thead>
<tr>
<th>Project ID</th>
<th>Project title</th>
<th>Project description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM FR 01 (SP2)</td>
<td>Burnett Mary Regional Group: Riparian stabilisation and management</td>
<td>This project assisted landholders to stabilise bank erosion to protect agricultural land and reduce sedimentation of waterways in flood damaged riparian areas of the Burnett and Kolan River systems, and priority sub-catchments of the Mary River.</td>
</tr>
</tbody>
</table>
| CA FR 01 (SP1) | Condamine Alliance: Stream bank stabilisation and riparian restoration        | This project assisted landholders to restore, rehabilitate and stabilise riparian banks by providing technical advice for on ground works, fence restoration and revegetation of riparian areas, and planning for mitigating future flood risk. Landholders were assisted in the following areas:  
  - Glengallan and Swan Creeks, Warwick  
  - Condamine River, Cecil Plains  
  - Myall Creek, Dalby  
  - Jandowae Creek, Jandowae  
  - Charley’s Creek, Chinchilla.                                                      |
| FB FR 02 (SP1) | Fitzroy Basin Association: Stream bank stabilisation and riparian restoration | This project provided funds, technical advice and project management support to landholders to fence riparian areas and install off-stream water points in strategic areas of the Callide, Lower Fitzroy and Lower Boyne.                                                                                                  |
| QM FR 01 (SP5) | Queensland Murray-Darling Committee: Stream bank stabilisation and riparian restoration | This project provided direct financial assistance for fencing and off-stream water sites, and extension and educational services to engage landholders in restoration works in the Moonie and Weir River, and Eastern Border River catchments.                                      |
| SE FR 02      | South East Queensland Catchments: Mulgowie Laidley on-farm recovery (Part 1)   | This Critical project developed a plan to outline recommended stream rehabilitation works for two reaches of Laidley Creek through soft engineering works and revegetation.                                                                                                                       |
| SE FR 03 (SP1) | South East Queensland Catchments: Mulgowie Laidley on-farm recovery (Part 2)   | This project will restore two reaches of Laidley Creek with soft engineering works and revegetation.                                                                                                                                                                                                                                             |
### Project ID | Project title | Project description
--- | --- | ---
SE FR 03 (SP2) | South East Queensland Catchments: Lockyer and Warrill Creeks and the Upper Brisbane River (Harlin) | This project addresses riparian failure at eight major reaches where farmers and regional agricultural production have been significantly affected, watercourses degraded and the quality of Brisbane's bulk water supply has been adversely affected.

SE FR 03 (SP3) | South East Queensland Catchments: Targeted recovery and resilience projects | One activity of the Targeted recovery and resilience projects will directly assist targeted landholders to rehabilitate streams, stabilise banks and protect riparian areas to improve the natural resilience of waterways. Three targeted recovery programs were delivered in the Lockyer, Fassifern and Upper Brisbane.

### 6.2 Evaluation of riparian restoration and control projects

In this section, the efficiency and effectiveness of the riparian restoration and erosion control projects are evaluated. In subsection 6.2.1 the project processes and delivery methods are appraised. Subsection 6.2.2 is an assessment of whether the projects achieved their objectives and outputs, and includes an assessment table for each project in this focus area. Significant achievements, a description of project activities, partnerships, key learnings and recommendations for future direction are also discussed.

Over 50% (32) of the respondents to DSITI’s on-line survey were funded to rehabilitate or stabilise stream banks or riparian areas. The majority of respondents (64%) believed that the recovery program contributed to the broader community by enhancing the water quality and/or the health and stability of aquatic and riparian ecosystems. In fact, in certain regions, it was thought that the majority of the funding was actually used to support riparian restoration rather than to assist landholders to return to full agricultural production.

#### 6.2.1 Project efficiency

In the Lower Boyne catchment, delays were experienced in completing the majority of projects due to intense rainfall in 2014 and Cyclone Marcia in 2015. Extensions to projects were required because sites became too wet to access. Several of FBA’s projects had to be closed following Cyclone Marcia because landholders were unable to commit the necessary time or funds to projects by the end of the recovery program.

Persistent drought conditions proved to be a challenge for revegetation projects in the Burnett Mary, with limited rainfall to water plants. As a result, projects were adjusted to include more maintenance, meaning that progress slowed. This was resolved towards the end of the program when rainfall increased. Another unexpected challenge for the project staff was the intensive project management that was required. Sourcing supplies, storing equipment, procuring tube stock, tracking expenditure, when combined with time challenges, all meant high workloads for staff.

In south-east Queensland, an unexpected challenge was the scale of damage caused which meant that some landholders requiring assistance didn’t receive it. Community expectations had to be managed, although some landholders were grateful to simply receive a visit from someone, discuss their concerns, and have access to information on solutions.

One of SEQC’s flood recovery projects did not proceed because, following a technical analysis, concept design and costing, it was found that the on-ground rehabilitation works proposed for Blackfellow Creek at Mt Sylvia were beyond both the scope of funding available and the project timeframe. An alternative project that was undertaken at Harlin achieved similar outcomes.
6.2.2 Project effectiveness

The majority of projects achieved their stated outcomes.

6.2.3 Significant achievements

- Soil erosion control by fencing and engineering works to restore 7,697 hectares
- 37,910 hectares of stream bank has been stabilised
- 85 off-stream watering sites have been installed to protect 119 kilometres of waterway from stock
- 187 kilometres of riparian vegetation has been protected and 5 kilometres of waterway planted with endemic species
- Comprehensive evaluation of channel conditions and dominant processes over 304 kilometres of the Burnett River
- A publicly accessible demonstration site and display has been developed at Mulgowie.

Photo 6.1: Tank and solar panel installed for off-stream watering, to protect fragile riparian environment in the Yelarbon District [Photo: QMDC]
After the cyclone Oswald floods, BMRG identified a lack of up-to-date post-flood imagery in the Burnett catchment. To identify priority areas, BMRG commissioned the collection of high-resolution aerial photography of 3,500 kilometres of the Burnett and Mary Rivers and their tributaries. Due to the extensive riparian damage in the Burnett catchment, consultants were engaged to undertake site specific assessments and system-wide stability conditions in the Burnett and Kolan rivers. Site specific data was obtained, resulting in an almost continuous evaluation of channel conditions and dominant processes over 304 kilometres of the Burnett River.

This assessment determined that approximately 47 million tonnes of material had been eroded by bank processes from 2011–13. An example is illustrated in photo 6.2. BMRG believe that the achievements of this project are critical for the entire catchment, extending beyond flood recovery, and that it is unlikely the work would have been done without the assistance of the recovery program.

Photo 6.2: Aerial photo of bank erosion adjacent to a citrus property at Mt Debatable, North Burnett [Photo: BMRG]

Well they assisted us with repairing about a 20 metre section of the riverbank where the water has come in and just ripped part of the riverbank away and dug a big hole... It took a massive big area out of that same section...We filled it in and we've put some rocks down the riverbank and planted some trees and that to stabilise and try and prevent next time a flood comes, well there'll be rocks there to protect it and hopefully it won't take the bank away.

Landholder, BMRG

SEQC completed four programs that focused on riparian restoration. One sub-program undertook specific riparian repair work on eight major reaches of Warrill Creek, Laidley Creek and the Upper Brisbane River, where erosion was significant. These major riparian failures impacted both farmers and regional agricultural and horticultural production. The quality of Brisbane’s bulk water supply was also adversely affected. Engineering works included the battering of eroded creek banks and the
installation of pile fields to increase bank resilience, and reduce flow velocity and rock chutes. All engineering works were approved by a registered engineer. Revegetation of restored creek banks was also undertaken. A two-dimensional hydraulic stream and floodplain model was developed using LiDAR from 2011 that was updated with 2013 data. (Further details on the LiDAR project are provided in chapter 8, focus area 5.) A publicly accessible demonstration site was established at Mulgowie township to showcase restoration work and leverage further funding in the catchment for similar activities.

Another program consisted of 30 separate projects involving stream bank stabilisation earthworks, fencing of the riparian zone, and revegetation works in the Lockyer, Upper Brisbane and Fassifern catchments. The riparian restoration program assisted a range of producers to return to production, and was an important and well-received initiative in the region. The broader environmental outcomes of a range of projects were significant in that they increased resilience in the river system. SEQC negotiated the inclusion of revegetation at a number of sites, resulting in longer term stability and conservation outcomes.

Fencing riparian areas and installing off-stream water points is a key activity in good riparian management. In the Fitzroy Basin, 192 kilometres of riparian area was restored and protected by fencing and the installation of a total of 17 off-stream water points in the Callide, Lower Fitzroy and Lower Boyne catchments, protecting 3,510 hectares of native riparian vegetation. Disaster mitigation was incorporated into their planning, and fences were repositioned to higher ground to improve resilience to future flood events.

Eighteen landholders in the Queensland Murray-Darling Basin were assisted to fence 66 kilometres of riparian area and install off-stream watering points to encourage the regeneration of ground cover and other vegetation, and to manage stock access (see photo 6.2). Neighbouring landholders, particularly those downstream, will benefit through improved water quality for stock and the improved value of riparian zones for wildlife habitat and movement corridors.

We put in a watering system, poly pipe through the middle of the farm and we put a couple of tanks in, and we also put in 8 troughs. The fencing, if we fenced the creeks off, well we had to put water into those paddocks, and hence we got funding for full poly pipe, water tanks, troughs and fencing. That was all really good.

Landholder 08 FBA

The focus of CA’s stream bank and riparian restoration work under the recovery program was on stabilising damage caused by severe stream bank slumping at Swan Creek in the headwater of the Condamine River, adjacent to Carey Brothers Meat Works at Yangan. Channel instabilities were threatening the operations of the meat works. A consultant was engaged to develop a comprehensive design to resolve issues at the site and guide ongoing restoration works. Revegetation of stream bank areas is underway as the first part of the repair and restoration process.
<table>
<thead>
<tr>
<th>Project title &amp; ID</th>
<th>Project objectives</th>
<th>Project outputs</th>
<th>Assessment and/or status</th>
</tr>
</thead>
</table>
| Burnett Mary Regional Group: Riparian stabilisation and management BM FR 01 (SP2) | To assist landholders to stabilise flood damaged riparian areas of the Burnett and Kolan River systems in the Burnett catchment, and priority sub-catchments of the Mary River, to protect agricultural land. Secondary aim is to reduce sedimentation of waterways and build landscape resilience to reduce future loss of production. | This project aimed to achieve the following outputs.  
- Stabilisation of 40 kilometres of riverbank  
- Enhancing 250 hectares of riparian vegetation  
- Landscape resilience will be built on 100 properties. | This project was completed in June 2015 and on budget. Project outcomes were as follows.  
- 35 kilometres of stream bank was stabilised  
- 202 hectares of riparian areas were rehabilitated  
- 39 landholders have improved riparian management skills  
- Guidelines developed  
- 2 case studies  
- 15 workshops, field days |
| Condamine Alliance: Stream bank stabilisation and riparian restoration at: CA FR 01 (SP1) | To assist landholders to restore, rehabilitate and stabilise riparian banks through provision of technical advice; repair fences and revegetate riparian areas; plan for mitigating future flood risk. Landholders were located at:  
- Glengallan and Swan Creeks, Warwick  
- Condamine River, Cecil Plains  
- Myall Creek, Dalby  
- Jandowae Creek, Jandowae  
- Charley’s Creek, Chinchilla. | Stated outputs for the five projects are as follows.  
- 16 kilometres of stream bank will be stabilised  
- 123 kilometres (960 hectares) of riparian vegetation is to be rehabilitated on 112 properties  
- 28 off-stream water sites are to be installed  
- Cooperative and collaborative arrangements are to be formally documented with 10 landholders and delivery partners  
- Cooperative and collaborative arrangements are to be developed with 106 landholders and delivery partners. | The five projects were completed in June 2015 and achieved the following outcomes.  
- 17.2 kilometres of stream bank was stabilised  
- 141 kilometres (1,266 hectares) of riparian vegetation was rehabilitated on 116 properties  
- 28 off-stream water sites were installed.  
- Cooperative and collaborative arrangements were formally documented with 17 landholders and delivery partners.  
- Cooperative and collaborative arrangements were developed with 124 landholders and delivery partners. |
| Fitzroy Basin Association: Stream bank stabilisation and riparian restoration FB FR 02 (SP1) | To provide funding, technical advice and project management support to landholders to undertake riparian fencing and install off-stream watering points in strategic areas. Landholders are located in the Caliide, Lower Fitzroy and Lower Boyne. | Stated outputs for projects in the three locations were as follows:  
- 155.6 kilometres of riparian vegetation will be protected  
- 33 off-stream water points installed on 16 properties. | The three projects were completed, on budget, in June 2015. Outcomes were as follows:  
- Total 184 km of riparian area restored and protected with fencing  
- 71 km stream bank protected from stock & 47 off-stream watering points  
- 3,510 ha native riparian vegetation protected with fencing |
| Queensland Murray-Darling Committee: Stream bank stabilisation and riparian restorationQM FR 01 (SP5) | To assist landholders in the Moonie and Weir River, and Eastern Border River catchments to undertake on-farm and riparian works | This project will assist 18 landholders affected by flood damage in the Moonie and Weir River and Eastern Border Rivers catchments, to stabilise 55.4 kilometres of stream bank through stock management. | This project was completed in June 2015 on budget. Twenty landholders received assistance to protect 67 kilometres of stream bank through the installation of fencing and off-stream water points. |
| South East Queensland Catchments: Mulgowie Laidley on-farm recovery (Part 1) SE FR 02 | To plan the restoration of two reaches of Laidley Creek through soft engineering works and revegetation. | The project aims to engage three landholders and develop one restoration plan. | This project was completed in June 2014. A restoration plan for one reach of Laidley Creek was completed, outlining recommended stream rehabilitation works. |
| South East Queensland | To restore two reaches of Laidley Creek with soft engineering works to | The project will undertake soft engineering works to | The project was completed in June 2015. |

Table 6.2: Assessment of projects against stated objectives and outputs (focus area 4)
Catchments: Mulgowie Laidley on-farm recovery (Part 2)
SE FR 03 (SP1)

One activity of the Targeted recovery and resilience projects aimed to directly assist targeted landholders to improve the natural resilience of waterways.

Three targeted recovery programs were delivered in the Lockyer, Fassifern and Upper Brisbane.

One activity of the Targeted recovery and resilience projects aimed to directly assist targeted landholders to improve the natural resilience of waterways.

Three targeted recovery programs were delivered in the Lockyer, Fassifern and Upper Brisbane.

Earthworks (bank battering and rock chute) were completed on 500 metres of Laidley Creek to increase stream stability, and reduce bank erosion and the transfer of sediment downstream. 500 metres of stream was revegetated. A demonstration site was developed at a rock chute at Mulgowie to showcase restoration techniques to landholders.

South East Queensland Catchments: Lockyer and Warrill Creeks and the Upper Brisbane River (Harlin)
SE FR 03 (SP2)

The primary objective of this project was to restore eight at-risk waterway reaches to greatly increase their resistance to future flood damage. A secondary objective was to improve the quality of Brisbane’s bulk water supply.

This project aimed to:
- deliver earthworks to 100 metres of Warrill Creek and vegetate 0.4 hectares (0.2 km) of repaired reach
- deliver earthworks to 300 metres of Laidley Creek and vegetate 1.2 hectares (0.6 km) of repaired reach
- construct three pile fields to restore a reach of the Upper Brisbane River, at Harlin.

This project was completed in June 2015 and on budget. At Warrill Creek, 300 metres of eroded creek bank was battered to reduce scouring and slumping. At Laidley Creek, two rock chutes were constructed, 500 metres of creek bank was battered and 1.2 hectares were revegetated along 0.2 kilometres of waterway.

Thirteen pile fields and associated rock protection were constructed at three sites along a four kilometre reach of the Upper Brisbane River at Harlin. 50 metres of bank was restored with revegetation.

South East Queensland Catchments: Targeted recovery and resilience projects
SE FR 03 (SP3)

One activity of the Targeted recovery and resilience projects aimed to directly assist targeted landholders to improve the natural resilience of waterways.

Three targeted recovery programs were delivered in the Lockyer, Fassifern and Upper Brisbane.

Project activities that relate to this Focus Area sought the following outcomes:
- Protect riparian areas through rehabilitation and stabilisation of banks
- Improve riparian management along 750 metres of waterway
- Develop river management improvement programs for 21 landowners.

The three targeted recovery programs were completed in June 2015.

30 separate on ground projects resulted in 10 kilometres of engineered stream bank stabilisation earth works. Nine kilometres of stream bank was fenced to protect the riparian zone.

22 hectares of native riparian vegetation was enhanced along 5 kilometres of stream bank, mainly through fencing to improve stock management.

Five hectares was revegetated with native riparian species along 4 kilometres of stream bank.

A further 7 hectares was planted with non-native grasses for quick bank stabilisation.

6.2.4 Partnerships

Neighbouring landholders in the Fitzroy Basin collaborated on projects to create linkages across the landscape and riparian zones, resulting in both a more cost-effective delivery of funds and social cohesion. Entire reaches of stream banks are now protected, further increasing long-term resilience. Affected landholders were provided with specialised training and support, focusing on the social function of recovery; and Biosecurity Queensland ran workshops during which the economic functions of recovery were discussed. Ongoing connections formed between key staff in stakeholder groups will be invaluable for future disaster events.

In the Murray–Darling Basin, the existing network of Landcare groups assisted with the identification of landholders and priority sites to target for works. Through the riparian restoration project, partnerships were developed with landholders in sub-catchment planning groups in the Lower Comuron, Talwood, Yarril–Wyaga and Rocky Crossing districts.

BMRG partnered with Bundaberg State High School to assist a group of students to remain at school to complete their high school studies. The students had been struggling for a variety of reasons and were disengaging from their studies and school. BMRG were able to involve them in revegetation work, and provided a mentoring role to encourage them to continue their education. Seqwater has
been a partner in the Mary River restoration project at Kenilworth for some time. Their prior experience and support with this type of work was invaluable.

In the initial stages of the targeted recovery and resilience projects, SEQC worked closely with the Somerset, Scenic Rim and Lockyer Valley regional councils; state government departments; the Queensland Farmers Federation; and other relevant industry liaison officers to gather a list of affected landholders and identify a prioritisation process.

Some people are not prepared to change their practices to become more resilient ... Just because they've had a disaster doesn’t mean they’re a different person. I think there’d be a strong correlation between the people who weren’t open to some of those improvements around improving resilience. They'd be exactly the same people who are not open to any of the innovation in agriculture. You know, they don’t fence their creeks. There’s lots of things they don’t do. When you go in and say that some of the criteria are that if you’re going to get the support on this program, you would need to exclude grazing on the creek so you can protect it from erosion in the future, have a buffer zone between an area and the edge of a waterway, relocate some of the infrastructure because it is in an inappropriate area, they're not interested...They were looking for grants—not the support to do things better.

6.2.5 Key learnings

The collection of post-flood, high-resolution aerial photography in the Burnett Mary allowed BMRG to identify affected landholders and target key priority sites through a technical process, which worked better than advertising devolved grants. Having BMRG manage the project achieved better outcomes than directly funding landholders because it could ensure that projects met required standards and guidelines. Prior to the program commencing, a soil specialist was employed to visit properties, assess damage, provide technical advice and mentor project staff. Experienced supervisors were employed to manage Work for the Dole teams for revegetation work. Team participants were selected by the supervisors to ensure that a consistent labour force was available to complete projects. The teams gained considerable experience, improving their future employment prospects and making this approach a model for community engagement in NRM.

An unexpected challenge for BMRG was the length of time required to obtain approvals for two projects in the Mary Catchment for works in an estuarine area of the Mary River. Prior to the commencement of site works, approvals were required from the then Department of State Development, Infrastructure and Planning, Department of Environment and Heritage Protection, Department of Natural Resources and Mines, North Queensland Bulk Ports Authority, and Fraser Coast Regional Council. It took many months for the approvals to be granted. Experience gained during this process will assist in the future.

FBA found that some rural communities were not well-equipped to handle disaster recovery and therefore struggled to obtain contractors when required. Future programs would benefit from a recovery services needs analysis and the provision of the services identified as being required. The recovery program highlighted the importance of preparedness, but many landholders did not have a flood mitigation or management plan in place. Almost 20% of landholders in the Lower Fitzroy catchment intending to participate in projects withdrew for a variety of reasons, including subsequent flood events. This will be an important consideration when managing future programs because it made project management difficult.
SEQC identified a need for improved communications during the planning stages of similar future projects to ensure that works are not planned in isolation and that competing interests in the region are balanced. Investigations into the geomorphological changes occurring in Warrill Creek catchment have informed the greater challenges faced when restoring other catchment areas. When planning and delivering projects for this type of program, landholder ‘buy-in’ is an important component of project success.

QMDC’s funding for riparian fencing specified that it must be wildlife friendly. Most landholders were willing to comply with this specification, which should be included in all future works contracts to ensure that this standard continues to be met.

Regarding stream bank stability and water quality activities, I think that’s probably where the bulk of the money went, anecdotally, and I think there was some good work done there.

**6.3 Recommendations for future direction**

BMRG considered project management to be a huge responsibility because of the logistics of landholder engagement, and recommends that all staff employed in this type of program have good skills in this area. Due to the large investment in on-ground works in the area, future biophysical and environmental monitoring for project sites is very important to determine whether current works have been successful in achieving project objectives. Fortunately, science experts from DNRM facilitated the collection of baseline data for stream bank condition at 20 project sites in the North Burnett and Bundaberg regions during this project. This will be part of a long-term commitment to monitoring the success of bank stabilisation works.

Continued engagement in SEQC’s project areas will improve the management of the riparian zone and increase the natural resilience of the creek to future flood events. For this to happen, planning and funding for a coordinated, long-term engagement program is required. Additional structural works are required at the Harlin site in the Upper Brisbane River to increase the resilience of the system. Educating all landholders in the value of riparian areas and the importance of preventing bank erosion and slumping is considered vital.
Evaluation of the ex-tropical cyclone Oswald on-farm productivity and riparian recovery program, Department of Natural Resources and Mines, 2016

Photo series 6.4: a) March 2013–Stream avulsion has removed cropping land [Photos: SEQC]

b) June 2014–looking downstream over initial channel re-alignment and battering works

c) July 2014–looking downstream over completed earthworks

d) Showing revegetation
7  Results—Focus area 5: Improved flood and vegetation mapping

Up-to-date post-flood imagery is a valuable tool for quantifying damage sustained to the landscape, and to prioritising and planning restoration work. Accordingly, the aim of this focus area was to fund improved flood and vegetation mapping at the regional, local and property scale in order to improve ongoing property and infrastructure planning and development.

DNRM developed a number of products under the Queensland Flood Mapping Program (QFMP), including: a rapid initial assessment of flood hazard for 98% of Queensland floodplains; catchment modelling and mapping of extreme flood events; and town flood maps to support better emergency management, community education and awareness, and land use planning. Being prepared products, this mapping was not able to be used by the regional NRM bodies for the purposes of the post-event flood recovery program.

7.1 Improved flood and vegetation mapping

SEQC undertook a project to improve flood mapping.

BMRG identified a lack of up-to-date post-flood imagery in the Burnett–Mary catchments to support decisions on priorities and possible solutions for riparian stabilisation and management. BMRG commissioned the collection of high-resolution aerial photography of 3,500 kilometres of the Burnett and Mary rivers and main tributaries prior to the commencement of the recovery program, using non-flood recovery funding.

Table 7.1: Project summary (focus area 5)

<table>
<thead>
<tr>
<th>Project ID</th>
<th>Project title</th>
<th>Project description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE FR 01</td>
<td>South East Queensland Catchments: LiDAR</td>
<td>This was a 'critical' project that captured high definition LiDAR for high-priority areas to be used for modelling stream flows and identifying key investment sites in the Lockyer, Upper Bremer, Upper Warrill Creek catchments.</td>
</tr>
</tbody>
</table>

7.2 Evaluation of improved flood and vegetation mapping

In this section, the efficiency and effectiveness of the improved flood and vegetation mapping projects are evaluated. In subsection 7.2.1, the project processes and delivery methods are appraised. Subsection 7.2.2 is an assessment of whether the projects achieved their objectives and outputs, and includes an assessment table for each project in this focus area. Significant achievements, a description of project activities, partnerships, key learnings and recommendations for future direction are also discussed.

7.2.1 Project efficiency

A positive unintended outcome of the project was the continued data sharing between SEQ Catchments, state agencies and local councils, resulting in access to post-flood imagery captured by the Lockyer Valley Regional Council.

7.2.2 Project effectiveness

The LiDAR project undertaken by SEQC achieved its objectives and outputs.
7.2.3 Significant achievements

- High-definition imagery has been captured for high-priority areas of the Lockyer, Upper Bremer River and Upper Warrill Creek catchments, identifying areas of change and zones for flow mitigation investigation.
- Provision of mapping products to key partners and stakeholders.

SEQC engaged RPS Mapping to undertake airborne laser survey known as LiDAR (Light Detection and Ranging). The project was jointly funded by the Commonwealth and the state government to capture high-definition imagery for high-priority areas of the Lockyer, Upper Bremer River and Upper Warrill Creek catchments following cyclone Oswald. LiDAR was captured over an area of 3,305 square kilometres.

Mapping has identified active erosion and deposition sites, active and non-active gullies for priority sub-catchments of the Lockyer Creek system, and loss of infrastructure. The LiDAR information has informed flood modelling to target resilience and restoration works within Laidley Creek and Tenthill Creek. The information was used to generate a series of contour datasets used for property management planning, and is being applied to catchment action planning and floodplain management. Change maps have been generated showing areas of deposition and erosion. Flow mitigation investigation zones have been identified generally around the confluence of streams, downstream of high-risk upper slopes.

All products were provided to key partners and stakeholders, including the Queensland Government, local governments, Healthy Waterways, and research institutions. An example of a LiDAR topographic analysis map is shown in Image 7.1 (overleaf).

Table 7.2: Assessment of project against stated objectives and outputs—focus area 5

<table>
<thead>
<tr>
<th>Project title &amp; ID</th>
<th>Project objectives</th>
<th>Project outputs</th>
<th>Assessment and/or status</th>
</tr>
</thead>
<tbody>
<tr>
<td>South East Queensland Catchments: LiDAR SE FR 01</td>
<td>To identify soil loss, stream instability and active gully erosion to be used for modelling stream flows and identify key investment sites in the Lockyer, Upper Bremer, Upper Warrill Creek catchments.</td>
<td>The aim of this project was to enhance the detail and currency of LiDAR data for target areas. One interpretive report and dataset will be developed and made available to stakeholders.</td>
<td>This project was completed in December 2013, on budget. LiDAR imagery was captured over 3,305 square kilometres of priority flood affected areas of the Lockyer catchment, upper Bremer River and Upper Warrill Creek sub-catchment. A report was prepared titled ‘The value of LiDAR in Catchment Management’. Products were provided to stakeholders.</td>
</tr>
</tbody>
</table>
7.2.4 Partnerships

The LiDAR was captured by RPS Mapping and the data was captured by RPS. SEQC staff analysed the data to produce models and maps.

7.2.5 Key learnings

Initial findings indicate that gullies on western facing slopes are more active than on eastern facing slopes. Main waterway channels in various stages of degradation are also actively eroding. This work will help to prioritise investment in future works, taking into consideration land use, the size of gully system, and how active the gullies and stream banks are. Information from LiDAR is being applied towards catchment action planning and floodplain management. Flow mitigation investigation zones have been identified generally around the confluence of streams, downstream of high-risk upper slopes.
7.3 Recommendations for future direction

This work will enable a better understanding of the catchments and underlying hydro-geomorphologic processes, as well as providing input into hydrologic modelling, and modelling to calculate nutrient and sediment loads.

LiDAR should be captured at semi-regular intervals to monitor landscape changes and inform or calibrate models used for estimating nutrient and sediment load generation, transport & deposition. By taking advantage of improving technology that will make LiDAR cheaper and easier to acquire, it could be used over individual catchments on a 5–10 year rotation, supplemented by rapid response acquisitions immediately after significant flood events.
8  Results—Focus area 6: Infrastructure restoration

Flooding that resulted from tropical cyclone Oswald caused significant damage to community and farming infrastructure in many areas of Queensland. Primary producers suffered major losses associated with damaged fencing, irrigation equipment, machinery, buildings and roads.

Activities covered in this focus area include the repair and restoration of fencing and other farm-related infrastructure, including irrigation or watering equipment; and the removal of silt around pumps and infrastructure. The reconstruction of destroyed farm roads in a way that reduces soil loss, optimises fish passage, improves accessibility and reduces the risk of future flood damage, is also covered.

8.1  Infrastructure restoration

‘Critical’ project funding was provided to BMRG to provide technical support for the repair of pumping infrastructure and irrigation control systems in the Burnett–Kolan catchments.

BMRG, FBA, CA and SEQC all carried out priority infrastructure repair projects, including fence replacement and the rebuilding of farm access tracks.

Table 8.1: Summary of infrastructure restoration projects—focus area 6

<table>
<thead>
<tr>
<th>Project ID</th>
<th>Project title</th>
<th>Project description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BM FR 03</strong></td>
<td>Burnett Mary Regional Group: Infrastructure repair Burnett Kolan</td>
<td>This was a ‘Critical’ project to assist landholders in the Burnett Kolan with technical support to assist with the reinstatement of critical pumping infrastructure.</td>
</tr>
<tr>
<td><strong>BM FR 01 (SP3)</strong></td>
<td>Burnett Mary Regional Group: Increasing productivity in the Burnett Catchment</td>
<td>One component of this project will provide targeted incentive payments to graziers and croppers to repair infrastructure and improve farm productivity.</td>
</tr>
<tr>
<td><strong>BM FR 01 (SP4)</strong></td>
<td>Burnett Mary Regional Group: Floodplain stabilisation and management</td>
<td>A component of this project will provide grants for strategic floodplain works in Three Moon Creek (North Burnett) and Byee Floodplain (South Burnett).</td>
</tr>
</tbody>
</table>
| **CA FR 01 (SP3)** | Condamine Alliance: Farm infrastructure restoration | This project assisted landholders to recover from the impacts of flooding by restoring farm infrastructure, such as fencing, and providing technical advice and assistance to primary producers to enable recommencement of production. Landholders were assisted in the following areas:  
  - Glengallan Creek and Swan Creek  
  - Condamine River, Cecil Plains  
  - Myall Creek, Dalby  
  - Jandowae Creek, Jandowae  
  - Charley’s Creek, Chinchilla. |
| **FB FR 02 (SP3)** | Fitzroy Basin Association: Farm infrastructure restoration | This project provided funds, technical advice and project management support to landholders in the Dawson-Callide, Lower Fitzroy and Lower Boyne to recover from flooding impacts by restoring farm infrastructure. |
| **SE FR 03 (SP3)** | South East Queensland Catchments: Targeted recovery and resilience projects | Three separate targeted recovery project programs were undertaken in the Lockyer, Fassifern and Upper Brisbane areas to assist landholders return to production. |
8.2 Evaluation of infrastructure restoration projects

This section evaluates the efficiency and effectiveness of the focus area 6 infrastructure restoration projects. Section 8.2.1 evaluates the projects in relation to project processes and delivery. Section 8.2.2 assesses whether the projects achieved their objectives and outputs and includes an assessment table (Table 8.2) for each project in this Focus Area. Significant achievements, a description of project activities, partnerships, key learnings and recommendations for future direction are also discussed.

Nearly half (28) of the online survey respondents received funding for new fencing and/or the repair or restoration of existing fencing. Twenty one respondents used the funding to repair or restore other farm related infrastructure, including roads and irrigation equipment.

8.2.1 Project efficiency

BMRG’s ‘critical’ pumping infrastructure project initially encountered difficulties in attracting landholders to apply for grants. Invitations were extended to growers in other areas, and the grant application deadline was extended.

If the funding had come sooner I think it would have helped them get back into production sooner. It would have actually helped them probably get into production for that growing season. A lot of guys were just — it meant that those dams weren’t filled for the rest of the year because they were washed out. So they lost water basically for a wet season until that work was done. In some cases it was two wet seasons. So if you think about how this infrastructure works on properties that really limits your production or it increases your input costs because you’ve got to import water or you’ve got to run another pipeline from somewhere. So you’ve got extra costs involved in producing your livelihood, so all that compounds on their bottom line … I think people would have felt more supported had it come sooner rather than waiting for a while.

Stakeholder

Since the program delivered money late, most landholders had already replaced crucial infrastructure and fencing to allow them to return to pre-flood production.

Stakeholder

There was considerable discussion around what constituted eligible activities. Additional works that the respondents wanted to have funded through the recovery program included: contour bank formation; dam wall restoration; and repairs to larger infrastructure (e.g. houses, sheds); however, it was conceded that the latter might not be appropriate, due to the potential for legal ramifications.

I would have liked to have done some contour banks, which we are funding ourselves because we don’t meet the criteria. We actually believe that we—we believe the banks we’re building are far superior to theirs, but they’re not covered in their criteria.

Landholder, QMDC

Interviewee: What’s the name of the program, On Farm Productivity?
Facilitator: Yeah.

Interviewee: They just missed the whole point of that. Or maybe they didn’t miss it from their perspective, but to get the benefit of that you’re looking for some immediate works, restoring fencing and restoring infrastructure, troughs and tanks and watering points and things like that and irrigation. None of that was able to be funded and I was pretty peeved to be honest.

Landholder, CA
It was extremely useful for us to repair some of the damage that had occurred. We had some erosion issues. We were able to repair the bank of a dam using some of the funding that was available. On a water security aspect that was critical for us. We have a dam on the southern end of our property and it was broken by the water that came down there. So we were able to repair that. It was fairly straightforward and fairly well organised.

<table>
<thead>
<tr>
<th>Project title &amp; ID</th>
<th>Project objectives</th>
<th>Project outputs</th>
<th>Assessment and/or status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burnett Mary Regional Group: Infrastructure repair Burnett Kolan BM FR 03</td>
<td>This was a Critical project to provide technical support to landholders to assist in the reinstatement of critical pumping infrastructure.</td>
<td>This project will provide short-term support for up to 15 landholders to plan repair activities for flood impacted critical pumping infrastructure and irrigation control systems.</td>
<td>This critical project was completed in September 2013. Technical design plans were developed for 25 landholders. Extension information was delivered at two field days.</td>
</tr>
</tbody>
</table>
| Burnett Mary Regional Group: Increasing productivity in the Burnett Catchment BM FR 01 (SP3) | One component of this project aimed at providing targeted incentive payments to graziers and croppers to repair infrastructure and improve farm productivity. | Incentive payments will be provided through small $10,000 grants to:  
  - repair 10 kilometres of fence  
  - repair five farm dams  
  - repair one creek crossing  
  - repair four kilometres of farm roads. | All activities were completed on budget in December 2014.  
  - 43 irrigation pumps were repaired to restore irrigation to 2,259 hectares of farm land  
  - one stock trough was replaced  
  - 22 kilometres of fencing was replaced, assisting 18 landholders  
  - five dams were repaired  
  - three creek crossings were repaired to restore farm access. |
| Burnett Mary Regional Group: Floodplain stabilisation and management BM FR 01 (SP4) | To provide grants for strategic floodplain works in Three Moon Creek (North Burnett) and Byee Floodplain (South Burnett). | Grants will be provided to 18 landholders to undertake strategic floodplain works. | The project was completed in June 2015 and on budget.  
  - Grants were provided to 18 landholders  
  - Seven kilometres of fences were repaired  
  - Five creek crossings were repaired  
  - Nine kilometres of constructed levees were removed, affecting 430 hectares of land. |
| Condamine Alliance: Farm infrastructure restoration CA FR 01 (SP3) | To assist landholders by restoring farm infrastructure, such as fencing. Provide technical advice and assistance to primary producers to enable recommencement of production. Cooperative and collaborative arrangements will be developed with landholders and delivery partners. | The projects expect to provide assistance to 28 landholders to repair 30 kilometres of farm fencing. Technical advice will be provided to 144 landholders, assisting a return to production across 10,000 hectares. Collaborative arrangements will be formally documented with 43 landholders and delivery partners to provide technical support. Cooperative and collaborative arrangements will be developed with 153 landholders and delivery partners. | All projects were completed in June 2015 and on budget.  
  - Twenty eight landholders were assisted to repair 71 kilometres of farm fences. Technical advice was provided to 157 landholders to restore 15,824 hectares of land to production.  
  - Forty nine collaborative arrangements were formally documented with landholders and delivery partners to provide technical support. Cooperative and collaborative arrangements were made with 153 landholders and delivery partners. |
Fitzroy Basin Association: Farm infrastructure restoration
FB FR 02 (SP3)
To support landholders in the Dawson-Callide, Lower Fitzroy and Lower Boyne by restoring infrastructure including fencing, irrigation and farm roads.
This project sought to restore 90 kilometres of farm fencing to 18 properties.
This project was completed on budget in June 2015.
It was reported that a total of 100 landholders accessed on-ground funding to repair infrastructure and improve resilience to future events. Eighty four kilometres of farm fencing was restored or replaced.

South East Queensland Catchments:
Targeted recovery and resilience projects
SE FR 03 (SP3)
No objectives documented
No outputs documented
The project was completed in June 2015.
Landholders were assisted with rebuilding infrastructure, including damaged farm access tracks and creek crossings.

8.2.2 Project effectiveness
The reported outcomes indicate that most infrastructure restoration projects achieved their stated objectives.

8.2.3 Significant achievements

- 46 landholders have implemented improved irrigation practices across 2,260 hectares
- Technical design plans for irrigation redevelopment strategies were developed for 25 landholders in the Burnett and Kolan catchments
- 185 kilometres of fencing was restored
- 8 creek crossings, 5 dams and 43 irrigation pumps were repaired in the Burnett–Mary

BMRG undertook several infrastructure restoration projects:
- The first was a ‘critical’ infrastructure project that provided short-term support for planning repair activities for flood-affected critical pumping infrastructure and irrigation control systems in the Burnett–Kolan catchments. Assistance was provided mainly to citrus growers in Mundubbera, Bundaberg region, South Burnett and Monto–Eidsvold. BMRG worked in conjunction with DAF to develop technical design plans for 25 landholders’ irrigation pumping sites. Two field days facilitated the delivery of extension information.
- Funding for infrastructure repair was delivered through two grants programs. The first provided targeted incentive payments to landholders through small grants of up to $10,000 for the repair of irrigation pumps and the replacement of fencing, dams and creek crossings. Grants were made available through an expression of interest, and these grants enabled landholders to leverage infrastructure repairs through QRAA grants.
- The second program funded strategic floodplain works, providing grants to assist 18 landholders to replace fences, repair creek crossings, and remove constructed levee banks that were causing severe erosion in paddocks.

FBA funded 100 landholders to repair infrastructure. Eighty-four kilometres of boundary and internal fences were replaced, and some landholders took the opportunity to relocate fences and water infrastructure in more appropriate locations to limit damage in future flood events.

In the Condamine, 28 landholders in five separate geographical areas were funded to repair 71 kilometres of fencing to assist in their return to production.
I know there are examples of that which would obviously help farmers, graziers, producers, community, better prepare for the next one … Yeah I’m aware of (name withheld)’s projects... who have worked with farmers to, rather than put their fences back here or build the structure this way, move infrastructure so the next flood may not damage as much.

SEQC assisted landholders to rebuild infrastructure such as farm access tracks and creek crossing points that had been damaged.

8.2.3 Partnerships
DAF proposed the ‘critical’ infrastructure project. BMRG contracted a local irrigation business to make property visits, and a steering committee was formed to identify priority landholders and seek expressions of interest. Twenty-five landholders were provided with fully costed options for irrigation infrastructure redevelopment. Thirty-four people attended two field days, where general solutions were shared.

Bundaberg Regional Council provided BMRG with shed storage facilities for the disaster recovery works at no cost. This greatly assisted the group, enabling them to purchase items in bulk and make considerable cost savings.

8.2.4 Key learnings
When growers have been heavily impacted by a natural disaster, it is sometimes difficult for them to prioritise activities that they would like funded. BMRG’s practice of field officers visiting landholders on site, to assist with their project applications, proved to be very productive. It allowed for the re-prioritisation of works and assisted landholders to resume production sooner. One example of this was repairing an irrigation pump to allow a farmer to plant a crop and irrigate, before repairing an eroded site.

SEQC observed that irrigation infrastructure has often been located in areas at high risk of damage from floods, including along creek banks and under levees. This practice, particularly in narrow floodplains, can cause substantial damage and loss. SEQC developed a best management practice factsheet that provides guidance for local growers on irrigation head pipe location.

8.2.5 Recommendations for future direction
BMRG identified the need for a comprehensive review of floodplain management. This includes the development of policies to simplify and provide practical and focused direction to reduce structures on floodplains. Incentives are needed to improve water use efficiency via alternate irrigation technology, as irrigation infrastructures often impede floodplain flows.

For future programs, SEQC recommended a review of project output codes. It is also desirable that project proponents are consulted in relation to scheduled output reporting.
The Fitzroy Basin Association provided a case study on Farm Infrastructure Restoration—Flooding disaster leads to property re-design and resilience (see Appendix C).
9 Conclusions and recommendations

This report has focused on the efficiency, effectiveness and appropriateness of the recovery program as evidenced by:

- the responses made in telephone interviews, the online survey, and the focus group discussion
- the desktop evaluation of the projects’ conformity with the six focus areas.

9.1 Telephone interviews, online survey and focus group discussion

The key program question to be addressed was whether the funding made available under the recovery program did assist landholders to recommence or return to full agricultural production in the targeted areas earlier than would have been possible otherwise. Several interview respondents thought that the program was successful and were supportive of the concept of assisting landholders in agricultural and riparian areas as a way of contributing to the resumption of agricultural production, environmental restoration, and the broader economic and social recovery of their communities. The long delay (estimated at between 6–9 months) in finalising the program guidelines and rolling out the funding to regional NRM bodies had a negative impact, however, with some stakeholder representatives indicating that it had prevented the recovery program from being as successful as it might otherwise have been.

It is therefore concluded that, while the recovery program was appropriate overall, there were some delays and confusion that compromised its efficiency and effectiveness from a landholder perspective.

9.2 Desktop study

The desktop component of the evaluation assessed the performance and progress of projects against stated objectives and outputs; however, some weaknesses in data collection have been identified. While all regional NRM bodies reported that their projects had been completed, it has been difficult to ascertain from the desktop study whether all projects achieved their intended outputs because some regional NRM bodies did not document intended outputs in all of their activity agreements and, in some cases, it was difficult to align reported outcomes with stated outputs. Given that funding was not available until nine months after the flood event, however, it is considered that the regional NRM bodies, landholders and other stakeholders involved in the recovery program did well to complete their projects within the given timeframe.

While the effectiveness of many of the on-ground activities (e.g. hydrologic, engineering, riparian restoration) cannot be fully assessed until the areas experience a significant flood event, the findings of the overall program evaluation suggest that the approach of this Program was considered effective. It may be assumed that, had there not been a recovery program, affected landholders would have had to fund priority activities themselves and it would have taken them longer to return to full production. It is also likely that many of the riparian restoration projects would not have been undertaken.

It is therefore concluded that:

- the recovery program was appropriate overall
- based on the information reported, the majority of projects achieved or exceeded their intended outputs.
9.3 Evaluation limitations

As a cost–benefit analysis of the projects was not undertaken, it is not possible to determine whether the projects represented value for money. No comparison has been undertaken between similar projects delivered by different regional NRM bodies in different locations (e.g. the cost of revegetating a kilometre of stream bank). Given that there are so many variables that apply to on-ground works, this type of assessment was considered beyond the scope of this report.

Similarly, the extent to which landholders’ understanding and capacity to manage flood water on farms has improved has not been formally assessed; however, documented responses provide some indication of prevailing attitudes:

Some people are not prepared to change their practices to become more resilient ... [are] not open to any of the innovation in agriculture ... they don’t fence their creeks. When you go in and say that some of the criteria are that if you’re going to get the support on this program that you would need to exclude grazing on the creek so you can protect it from erosion in the future, have a buffer zone between an area and the edge of a waterway, or relocate some of the infrastructure because it is in an inappropriate area, they’re not interested. They were looking for grants, not the support to do things better.

Stakeholder

Furthermore, there were concerns that the regional NRM bodies focused on environmental activities to the detriment of the agricultural productivity objective of the recovery program.

I think that one of the reasons it might be good to have some other bodies involved is that NRM groups will naturally have a ... [will] probably prioritise the environmental side of things higher than the productivity side of things, and I think that did happen.

Stakeholder

Interviewee: What’s the name of the program, On Farm Productivity?
Facilitator: Yeah.

Interviewee: They just missed the whole point of that. Or maybe they didn’t miss it from their perspective, but to get the benefit of that you’re looking for some immediate works, restoring fencing and restoring infrastructure, troughs and tanks and watering points and things like that and irrigation. None of that was able to be funded and I was pretty peeved to be honest.

Landholder 04 CA

There were also queries about the length of time and the amount of effort it would take for regional NRM bodies to engage with non-members in those areas worst affected by Cyclone Oswald.

9.4 Recommendations

It is recommended that the following suggested ways of improving the recovery program for the future should be further investigated.⁵ Many of these recommendations came directly from the study respondents (i.e. the landholders and stakeholder representatives), while the remainder are based on the study results, related literature and desktop study.

⁵ Some of these recommendations were identified and reported by DSITI in their review of the program.
1. **Establish institutional arrangements and develop guidelines prior to a disaster, where possible**

As noted above, many respondents thought the effectiveness of the recovery program was hampered by the 6–9 month delay in finalising the associated guidelines and providing the funding to regional NRM bodies. Correspondingly, many suggestions were made regarding the advisability of having institutional arrangements and guidelines established prior to the disaster event, where possible.

Specifically, there were calls to develop guidelines that can be applied to any disaster, including:

- terms and conditions
- reporting needs and requirements
- roles and responsibilities
- protocols and processes.

Another suggestion involved the completion of a skills audit of all stakeholders, including landholders, small business operators, industry representative bodies, regional NRM bodies, local government and state government agencies; and the subsequent development of a skills database. It was thought that such a database would enable communities to respond more quickly in the aftermath of a natural disaster, as well as helping to avoid the replication of response activities.

2. **Improve aspects of the program administration and increase communication and promotion efforts**

Feedback gathered from both the online survey and the telephone interviews suggests that some people did not know, or were confused, about the recovery program. In particular, it appeared that it may have been confused with the grants made to primary producers under the QRAA Special Disaster Assistance package. It is evident, therefore, that the details of the recovery program such as its availability and objective should be better communicated and promoted, and that clear guidelines and eligibility criteria (especially related to participants, locations and activities) be made available to the general community.

- Several regional NRM bodies commented that it would help them greatly in their project planning phase if, prior to offering new opportunities, they had an understanding of other disaster recovery initiatives being implemented in the community. This would assist in ensuring their projects aligned with, and complemented, other activities being undertaken.
- It was suggested that current environmental investment programs be linked to local needs to create opportunities to enhance and accelerate recovery, and mitigate future risks.
- The project and reporting requirements of the department should be clearly communicated and documented for regional NRM bodies or others responsible for program delivery to improve efficiency and consistency.

3. **Improve equity by expanding the eligibility criteria and extending the completion timeframes**

Findings from this study indicate that there was both confusion and frustration surrounding the eligibility criteria for the recovery program, which was seen by some as being too restrictive and by others as being inequitable. Correspondingly, several suggestions were made about ways to clarify and expand the eligibility criteria, particularly with regard to participants, locations and activities.

These are categorised and summarised below, as are the arguments provided in justification. Other proposed program refinements are also outlined.
a) **Participants**

- **Clearly define and publicise eligibility**

Several landholders thought they were not eligible because they had other income sources and, as a consequence, they did not apply for assistance under the recovery program.

- **Take into account the area of land and the length of creek frontage when determining how much funding to give**

As landholders experienced different degrees of damage, some thought that not everyone should be given the same amount of funding.

b) **Location**

- **Allow entire regions to apply for funding, not just specific catchments**

In some regions, only those catchments that had sustained most damage were eligible to apply for funding. This was seen as inequitable by those landholders who experienced severe damage, but fell outside of the catchment boundaries.

c) **Activities**

- **Expand the eligibility criteria to include other activities such as building contour banks, mending dams, repairing internal/private roads, and reconstructing roads on creek crossings.**

Results from DSITI’s study indicate that project proponents were both confused and frustrated with the Program eligibility criteria, regarding it as too restrictive, and in some cases, inequitable. While it was identified on DNRM’s website that the above infrastructure activities were eligible for funding, some regional NRM bodies were not aware of this.

- **Optionally extend individual project completion timeframes**

This is considered necessary to provide for circumstances in which subsequent adverse weather events (e.g. cyclones, floods, droughts) interfered with the ability to meet the proposed project deadlines.

- **Allow regional NRM bodies to renegotiate their contracts (including activities and timeframes) after one year.**

As most areas had not previously experienced an event of the magnitude of Cyclone Oswald or the extensive damage it caused, projected timeframes were not always achievable on-ground. In some cases it took 12 months to work out whether certain activities would even be feasible, let alone likely to be completed within the project timeframe. Accordingly, the NRM bodies have sought greater program flexibility so that they can adapt to changing circumstances.

- **Provide the money earlier and increase the variety of funding arrangements**

The single most frequent suggestion raised by the respondents was that funding guidelines should be established earlier and the money made available sooner to regional NRM bodies and, consequently, to eligible landholders. There were also calls to increase the range of funding arrangements available to landholders, with suggestions including the establishment of an emergency ‘no regrets’ fund,\(^4\) and the provision of upfront, progressive and/or retrospective payment options for contracts.

\(^4\) Several suggestions were made about creating an emergency fund, with a pre-established list of ‘no regrets’ activities or dollars to be made available to eligible landholders immediately after an event. It was thought that $5000 per landholder or property would be sufficient, as it would be ‘enough to buy 1 pallet of electrical wire and a sling of pickets, so, at the very least, [you] can string the wire up between the trees [and] section off cattle in a safe part of the paddock’. 

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*Evaluation of the ex-tropical cyclone Oswald on-farm productivity and riparian recovery program, Department of Natural Resources and Mines, 2016*
Provide upfront, progressive and/or retrospective payment options for contracts

The funding arrangements differed between each regional NRM body, based on their financial reserves. Nonetheless, it appeared that the majority of regional bodies provided funding to contracted landholders after the works were completed and proof had been supplied (e.g. receipts, photos). This was considered by many respondents to be too restrictive and, correspondingly, there were calls to increase the variety of funding arrangements available to include upfront, progressive and/or retrospective payment options—

- Upfront payments were seen as a way of assisting those landholders who did not have the cash flow to pay for the works prior to receiving funding.
- Retrospective payments\(^5\) were as seen as a way of circumventing the issues associated with the 'inevitable' delays in receiving government funding.
- Progressive payments, in which landholders received incremental funding as contract 'milestones' were met, were seen as a compromise between upfront and retrospective payments.

**d) Funding arrangements**

The following additional suggestions were made—

- Landholders who had not spent all the money within 12 months but did not have 'a good enough reason' (such as adverse weather conditions) should 'have to give back any money not spent'.
- Regional NRM bodies should not be put in the position 'where they were covering the last 25% of funding' for landholders before they received the final payment from government because they do not have adequate financial reserves. Instead, 'government should put 10% straight on the table (i.e. upfront)’ to regional NRM bodies’, without waiting until their contracts have been finalised.

**4. Improve data collection for reporting, auditing and long-term monitoring**

There did not appear to be any consistency in delivery of the recovery program across the different regions. Accordingly, it was suggested that additional data should be sought from the regional NRM bodies to support immediate reporting and auditing requirements and longer-term monitoring and evaluation needs. In particular, more information was requested about:

- the exact breakdown of funding in each region by activities undertaken (e.g. on-ground works, workshops, labour, services, equipment, administration) and recipients funded (e.g. landholders, contractors, consultants)
- the procurement process for consultants
- the proof required to verify that funded activities were undertaken (e.g. receipts, 'before' and after 'photo' points with spatial references)
- the acquittal process used.\(^6\)
- In addition, calls were made to:
  - instigate an auditing mechanism whereby five per cent of works are randomly inspected, with any non-compliant landholders being required to pay back the money in full with interest

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\(^5\) That is, payments to reimburse landholders for eligible activities on the provision by them of sufficient proof such as receipts and/or date stamped 'before' and 'after' photos.

\(^6\) A couple of landholders told the researchers that they had not yet spent all the money that they had received through the recovery program.
• implement a long-term monitoring and evaluation program to test the effectiveness of the on-ground works and activities funded to contribute to long-term resilience
• conduct a cost–benefit analysis to quantifiably assess the economic impacts of the recovery program.

Due to the large investment in on-ground works in the area, future biophysical and environmental monitoring for project sites is very important to determine whether current works have been successful in achieving project objectives. For this Program, science experts from DNRM facilitated the collection of baseline data for stream bank condition at 20 project sites in the North Burnett and Bundaberg as part of a long-term commitment to monitoring the success of bank stabilisation works. It is recommended that this type of long-term commitment to data collection and monitoring is in place for future programs, in all areas.

Catchment Programs team members were unaware that DNRM science experts were collecting baseline data for the recovery program, as detailed above. Better communication between units and teams within DNRM, and with other departments, when developing and implementing programs such as this would be beneficial.

The desktop study identified some aspects of project administration that require improvement, as detailed below:
• Project outputs need to be stated in all project activity agreements and must be achievable and project objectives must be specific. Reported outcomes are to align with stated project outputs, and figures reported need to be as accurate as possible.
• Regional NRM bodies need to be consistent in the way they measure and report outputs (e.g. hectares of feral animal control) to ensure accuracy in reporting project outcomes and effective program evaluation.
• Regional NRM bodies were required to use output codes to report on project outcomes for the recovery program when reporting in the enQuire project management database. Problems were encountered in collating data due to some regional bodies using incorrect codes, the wrong codes, or no codes. This resulted in inaccurate reporting that required manual verification by the evaluator. If there are to be similar programs in the future, output codes must be identified or developed for all eligible activities, and agreed upon by the project delivery partners, prior to the start of the program.

5. Foster social activities and develop skills to support wellbeing

It is clear that the recovery program funded more than just on-ground outcomes for agricultural production and/or riparian restoration. It also had a direct impact on the health and wellbeing of participating landholders, and contributed to the broader economic and social recovery of their wider communities. Nonetheless, there were concerns that there were not enough mental health support services available to the general community in the aftermath of Cyclone Oswald. Accordingly, the following suggestions were made—
• Work more closely with existing mental health services in the wake of a disaster.
• Improve the skills and capacity of delivery organisations (such as regional NRM bodies) and those in direct contact roles7 (such as industry recovery officers) to promote general wellbeing; and recognise and refer at-risk individuals in the aftermath of a natural disaster.

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7 For example, provide training through Lifeline’s Accidental Counsellor course and Mental Health First Aid course.
• Instigate more social events so that landholders can come together to share, debrief and support each other in the aftermath of a natural disaster.

DNRM acknowledges that mental health support services are vital for the health and wellbeing of individuals affected by natural disasters such as Cyclone Oswald; however, it is not considered that such services should be provided by mental health experts rather than programs such as this.

6. Collaborate with related service providers and initiatives

The majority of the respondents in this study were satisfied with regional NRM bodies as the delivery agents of the recovery program. Nonetheless, there were several calls for more collaboration with related service providers and initiatives—in particular, the Queensland Rural Adjustment Authority; state government agencies (especially DAF’s flood recovery liaison officers and farm financial counsellors); the District Disaster Management Group; agricultural industry groups (especially Queensland Farmer’s Federation through initiatives such as the Cyclone Oswald Industry Recovery Initiative); local government; and mental health service providers.

There was also a demand for better integration with other NRM programs (such as Reef, Water Quality Improvement Plans and NRM plans) to undertake preventative activities to mitigate the effects of natural disasters, especially floods.

7. Support natural disaster planning and improved knowledge of natural resource management to increase resilience in the longer term

There were widespread calls for improved planning and knowledge of natural resource management (at both the catchment-wide and the property scale) to support long-term resilience to natural disasters. Similarly, there were pleas not to treat Cyclone Oswald (and the recovery program) as a once-off event, but, rather, to recognise it as being part of a continuum of natural events that may increase in frequency in the future. Related suggestions included —

• Encourage the inclusion of disaster resilience planning in local government planning schemes (e.g. building in a floodplain).
• Invest in improved modelling of potential flooding scenarios in the aftermath of a cyclone.
• Facilitate the earlier and wider dissemination of relevant technical information—in particular, information related to soil conservation and riparian restoration activities.
• Develop best practice guidelines for landscape repair and resilience.
• Exchange information and learnings about on-ground works undertaken through workshops and demonstration sites. Some innovative works were undertaken through the Program; however there were limited opportunities for regions to share this type of information with each other, and with the government.
• Create a pool of experts (regionally, state wide, nationally) that can be called upon to provide specialist advice in in the aftermath of a cyclone and subsequent flooding. A primary contact in DNRM for floodplain management issues in identified areas would be very useful to the community.
• Support training in specialist skills, for example in soil conservation, geomorphology and catchment hydrology processes.
• Develop policies to simplify and provide practical and focused direction to reduce structures on floodplains
• Provide incentives to improve water use efficiency via alternate irrigation technology, as irrigation infrastructure impedes floodplain flows.
• Reduce or streamline permit approvals for on-ground activities to improve future resilience (e.g. stream bank restoration activities).
Appendix A
## Appendix B

<table>
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<th>Project Assessment</th>
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<td>Project goal</td>
<td>What are the key goals/objectives of the project?</td>
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<tr>
<td>Project outputs</td>
<td>What are the proposed outputs of the project?</td>
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<tr>
<td>Project outcomes</td>
<td>What are the anticipated project outcomes?</td>
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<tr>
<td>Focus area outputs</td>
<td>Relevant focus areas for each assessment to be inserted.</td>
</tr>
<tr>
<td>Efficiency assessment</td>
<td>Was the project achieved on, under or over time?</td>
</tr>
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<td></td>
<td>Was the project achieved on, under or over budget?</td>
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<td></td>
<td>Were people with appropriate skills involved in the project?</td>
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<tr>
<td>Effectiveness assessment</td>
<td>Did the project achieve the stated objectives, outcomes and outputs?</td>
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<td></td>
<td>Did the project achieve any unexpected outcomes and outputs?</td>
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<tr>
<td>Knowledge base and capacity assessment</td>
<td>What was the knowledge base (zero, partial, extensive etc.)?</td>
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<tr>
<td></td>
<td>Has the information from the project assisted other projects?</td>
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<tr>
<td></td>
<td>How has the capacity for managers to manage water on farms, control weeds etc. increased/improved?</td>
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<tr>
<td><strong>Key learnings</strong></td>
<td>What are the key learnings as they relate to disaster recovery programs?</td>
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<tr>
<td>(as they relate to communications, stakeholder engagement, integration, project management etc.)</td>
<td>Are there examples of adaptive management or continual improvement?</td>
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<tr>
<td></td>
<td>What innovations (technological, capacity building, cost-sharing, co-investment) have been incorporated into disaster recovery activities?</td>
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<td></td>
<td>Have future opportunities have been identified as a result of the project?</td>
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<tr>
<td><strong>Key constraints</strong></td>
<td>What were the key constraints or obstacles to achieving the project’s outcomes and objectives?</td>
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<tr>
<td></td>
<td>Were there any organisational/institutional constraints to achieving the objectives and outcomes?</td>
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<td>Were they consultation and stakeholder engagement obstacles?</td>
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<td>Were identified constraints successfully navigated, or were they insurmountable?</td>
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<td>Are there any remaining legacy issues?</td>
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<tr>
<td><strong>Overall contribution to the Program</strong></td>
<td>How has the project contributed overall to the Program?</td>
</tr>
</tbody>
</table>
Appendix C

CASE STUDY  FLOOD RECOVERY - EX TROPICAL CYCLONE OSWALD

Farm Infrastructure Restoration
Flooding disaster leads to property re-design and resilience

In the aftermath of ex-tropical cyclone Oswald, it would have been easy for husband and wife team Dave and Leonie Paish to be overwhelmed by the rebuilding work needed to restore their dairy operations at Velvet Waters.

All infrastructure in the paddocks — fences, watering points, tracks and roads — was severely impacted by the initial inundation. Velvet Waters is near Nagoro in the Boyne Valley and lies upstream of Awoonga Dam. The dam’s water level reached a record height 48.3 metres during the rain event. This meant flood waters on Velvet Waters could not drain rapidly, inundating it for a couple of weeks and compounding the challenges Dave and Leonie faced.

A desperate situation
Despite the devastation, milking operations had to continue to ensure the herd retained production and minimize other health problems. The herd had to be milked twice a day, which was extremely difficult as tracks to the dairy facilities had been destroyed. The flood waters had reduced previously smooth tracks to coarse gravel and stones, which in turn caused hoof infection problems in the herd.

Due to the flooding and disruptions to milking and good feed the prevalence of mastitis rose dramatically. Mastitis spreads rapidly through dairy herds and results in losses to the dairy farm through short and long term milk production and veterinary costs.

Road closures also prevented milk trucks from accessing the dairy and collecting the milk produced. This meant thousands of litres of milk had to be discharged, causing a significant loss of income for the dairy.

Furthermore, high protein cattle feed that had been growing for future seasons was lost to the flood waters.

Immediate impacts and long term future
The single weather event impacted every aspect of the dairy’s operations, potentially crippling the business both in the immediate aftermath and for the foreseeable future.

After the flood waters dissipated, 13 kilometres of fencing was immediately restored. Dave and Leonie learned of the flood recovery support provided by Fitzroy Basin Association Inc (FBA) through funding from the Queensland Government via their local group, Boyne Calliope Sub Region and realised it provided an opportunity to build resilience and improve their operations.

Clean slate provides improvement opportunities
Ensuring that a future flood event did not have such an enormous effect on the business was the top priority for Dave and Leonie. As all fences on Velvet Waters had been lost, there was an opportunity to review the property’s...
Farm Infrastructure Restoration
Flooding disaster leads to property re-design and resilience

design and build future resilience into their operations.

The biggest change involved a new property layout. Water tanks and troughs were re-positioned to areas where they are less likely to be washed away by the full force of flood waters travelling across the property.

Also, instead of rebuilding fixed fences, Dave and Leonie decided to install electric fencing instead. This change means that if another flood were to hit the property and remove fencing, the fences could be rebuilt quickly and with less financial outlay than fixed fences.

All these improvements to Velvet Waters meant that in a future flood event, repairs could be conducted faster, costs would be considerably lower, and production could return to pre-flood levels much faster.

Production restored through funding

Without the support from Boyne Calliope Sub Region and access to the flood recovery funding from FBA, though the Queensland Government, it is unlikely that Velvet Waters would have been able to restore milk production to pre-flooding levels. This was because of the vast amount of damage to the property's infrastructure and the enormity of the reparation works required.

By using the disaster as a learning opportunity, they were able to review and significantly improve their resilience to future high rainfall events. While Dave and Leonie met a significant proportion of the project's costs, they are extremely grateful for the additional funds, and would have not been able to improve their property's performance to the same extent without the help.

Improved outcomes

Although the recovery project began in November 2013, it was not completed until August 2014. There was significant works conducted on-property and it wasn't a quick fix. By committing their own, significant, in-kind funds along with the support provided, it was possible to make a much bigger improvement to their operations, which would not have been possible on their own.