MACKAY WHITSUNDAY

ENHANCED EXTENSION COORDINATION

Regional Extension Plan

FUNDED THROUGH THE QUEENSLAND GOVERNMENT
REEF WATER QUALITY PROGRAM

Queensland Government

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1. Executive Summary

Extension is defined as 'the process of encouraging and supporting voluntary change on farm to improve production, profitability, environmental and/or social outcomes.' This includes increasing awareness, understanding, skills, motivation and pathways to change (Coutts J & R, 2017)

In 2016, the Queensland Government engaged Jeff Coutts, an independent consultant, to undertake a review of extension and education systems in reef catchments to inform funding aligned to the Great Barrier Reef 2050 Water Quality Improvement Plan (WQIP 2050). The review made 65 recommendations on the systems needed to build on current extension capacity. One of these recommendations was the Enhanced Extension Coordination in the GBR program (this program), which aims to facilitate improved coordination of extension activities in reef catchments.

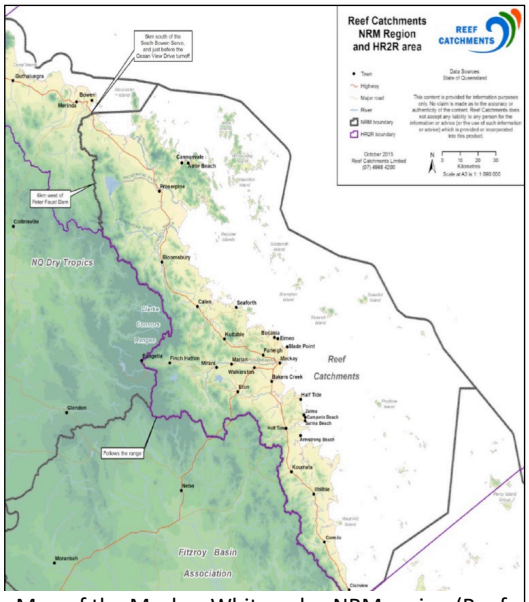
The program

Administered by the Department of Agriculture and Fisheries (DAF), the program established a network of Regional Extension Coordinators (RECs) to engage with local extension groups and providers. The RECs developed a Regional Extension Plan (REP) for each of the six reef Natural Resource Management regions from Cape York to the Burnett Mary.

Regional Extension Plan Structure

In the Mackay-Whitsundays NRM region, a single plan has been developed to incorporate the region's two major agricultural industries - sugarcane and grazing. This Executive Summary describes how extension services will be prioritised within these industries in the Mackay-Whitsunday region to improve water quality outcomes for the Great Barrier Reef (GBR).

The Mackay Whitsunday region



Map of the Mackay Whitsunday NRM region (Reef Catchments, 2018)

With an area of over 900,000Ha, the Mackay-Whitsunday-Isaac region is located along the northern part of the Central Queensland Coast. It extends from the Eden Lassie Creek sub-catchment in the north, to the Flaggy Rock Creek sub-catchment in the south. There are a number of Indigenous groups who culturally identify with this coastal country which include the Gia, Ngaro, Yuwi-bara, and Koinjmal peoples.

The region is bounded by the Great Barrier Reef (GBR) World Heritage Area and Whitsunday Islands to the east and the Clarke-Connors Ranges to the west, and is one of the most biodiverse regions of the GBR. Although occupying only 2% of the total area of the GBR, the coastline length, including the Whitsunday

islands, accounts for approximately 20% of the total GBR catchment length.

The region's high biodiversity has driven the development of tourism with the region supporting the second largest tourism industry in the GBR. In the Mackay Whitsundays, grazing and forestry account for 54% of land use (over 500,000Ha) although 64% of properties have less than 100 head of cattle (and only 9% more than 1000 head). Grazing predominantly supports breeding and sale of weaners, stores and cull cows. Intensive agriculture accounts for 19% of land use, with 95% of this sugarcane.

Water quality priorities in the Mackay Whitsundays

Farming practices and associated environmental impacts of sugarcane production on water quality are outlined in the Great Barrier Reef 2050 Water Quality Improvement Plan (WQIP 2050) which aims to improve the quality of water flowing into the Great Barrier Reef and its long-term health. Priority water quality issues identified for the Mackay Whitsundays include dissolved and particulate forms of nitrogen and phosphorus, suspended sediment, residual photosystem II (PSII) herbicides – ametryn, atrazine, diuron, hexazinone, and tebuthiuron and pesticides such as imidacloprid; which mainly originate from agricultural diffuse sources.

Clearly, a framework that prioritised local extension effort linked to priority practices for improving water quality was needed.

Supporting regional extension

Across the GBR, extension services are delivered by a wide range of providers. In the Mackay-Whitsunday region, there are a large number of existing working groups and networks that connect extension providers. Along with the host organisation, DAF, these include members such as Canegrowers - Sarina/Mackay and Proserpine, Cane Productivity Services - Plane Creek, Mackay and Proserpine, Farmacist, Mills – Mackay Sugar and Wilmar, Reef Catchments, and Sugar Research Australia (SRA). The REC supports both the Cane and Grazing Regional Extension Working Groups at the local level, the Pesticide Working Group GBR-wide and facilitates new connections identified as gaps such as with local resellers and agribusinesses.

With the recent inception of Sugar Research Australia's Adoption Strategy and Investment Guide, the REC and SRA's Regional Coordinator have made a concerted effort to collaborate to support new and existing networks and practices and reduce any duplication of activities between the two programs.

Current water quality investment

A situational analysis was undertaken to highlight the complexity (and gaps) in investment in the Mackay Whitsunday region, which is updated annually by the REC. For sugarcane, this included the Reef Water Quality Coastal Farming Systems extension program, Smartcane BMP, Reef Trust 3 'Growing a Great Barrier Reef' project, Project Catalyst, Sandy Creek Grower Water Quality Monitoring Program, Improved Sub-surface Input application and Reef Regulation Audits. More recently RP161 Complete Nutrient Management Planning for Cane Farming, Myrtle Creek Grower Project, Reef Trust Phase 4 'Enhanced Efficiency Fertilisers,' and the Agriculture Capacity Building program. For both sugarcane and grazing, the Reef Extension and Education Regional Coordinator, Wetlands in Agriculture, Regional Agriculture Landcare Facilitator, Reef Trust Phase 4 'Gully and Streambank Erosion Control' program, Healthy River to Reef Partnership/Report Card, Sustainable Agriculture program and the James Creek Whole of System Repair. There is also the Grass Roots program for graziers and an Urban Water Quality Offset Program.

Allocation of additional funding

The Mackay Whitsunday REP identified barriers to achieving extension priorities including competition for funding and short project funding cycles. Projects approved to date:

Project Approved	Proponent	Delivery Period
Peer-to-Peer Learning Activities 2018-20		
Grazing Regional Working Group meetings with mini field day (pasture species and weeds)	Reef Catchments with support from Regional Agricultural Landcare Facilitator	February 2019, October 2019 and February 2020
Cross-regional event to the Burdekin (Grazing) for Grazing Innovation Network members	Reef Catchments with support from Regional Agricultural Landcare Facilitator	September 2019
Grazing Regional Working Group meeting with Grazing Innovation Network event (presentations on healthy soils, regional grazing projects and riparian rehabilitation)	Reef Catchments with support from Regional Agricultural Landcare Facilitator	May 2019 and May 2020
Improving the knowledge, attitudes, skills and aspirations around the benefits from improving soil health with the Central Queensland Soil Health Systems (CQSHS) Farmer Group - 2018 National Biological Conference (Gold Coast)	Central Queensland Soil Health Systems (CQSHS)	October 2018 – June 2019
Improving the knowledge, attitudes, skills and aspirations around pesticide management with the Plane Creek Sustainable Farmers grower group	Plane Creek Sustainable Farmers	October 2018 – June 2019
Improving the knowledge, attitudes, skills and aspirations of the Mackay Future Farmer grower group around the benefits of peer to peer learning and collaboration to support water quality improvements	Farmacist / Mackay Future Farmer Group	October 2018 – November 2019
Establishment of the Plane Creek Farmers Action Group	Plane Creek Productivity Services Ltd.	October 2018 – April 2020
Mackay Whitsunday Peer to Peer Grower Group Forum	Reef Catchments facilitated by DAF	May 2019 and May 2020
Flexible Funding Activities 2018-20		
Healthy Soils Symposium	Reef Catchments with support from Regional Agricultural Landcare Facilitator	November 2018 and November 2019
Grazing Forum and associated follow up field day	Reef Catchments with support from Regional Agricultural Landcare Facilitator	March 2019 and March 2020
High Steaks III Field Day	Reef Catchments with support from Regional Agricultural Landcare Facilitator	August 2019
Improved Fallow Management to support better soil health and run-off water quality	Central Queensland Soil Health Systems (CQSHS	October 2019 – June 2020

Rocky Dam Creek Sub-Catchment Grower Led Water Quality monitoring and Communication Project	Plane Creek Sustainable Farmers	October 2018 – June 2019
Enhanced stewardship and site-specific application of imidacloprid	DAF-Coastal Farming Systems	October 2018 – June 2020
Munburra Integrated Feral Pig Management Program	Mackay Area Productivity Services	October 2018 – April 2020
Improved stakeholder coordination and collaboration around pest management in Plane Creek	Plane Creek Productivity Services Limited	October 2018 – April 2020
Behavioural Science training for regional extension officers and advisors	SRA / DAF	February 2019

Training and capacity building

The Regional Extension Coordinators and the Training Development Manager are working together to identify regional training needs and either develop required training, or provide subsidies for extension providers to access existing training. Local surveys conducted earlier in 2019 identified a demand for training in skills including Behaviour Innovation Extension (understanding change behaviour with growers, graziers and producers), soil health and improving engagement skills.

To find out more about training opportunities, please register here: https://qld.us19.list-manage.com/subscribe?u=bad02c27eca919dfa58591d4d&id=cceffacef8

Communications and engagement

A dedicated Communications and Engagement Plan has been developed to support the Mackay Whitsunday REP. This will complement the overarching Enhanced Engagement Coordination Program Communication and Engagement Strategy and builds on activities that support the REP.

Monitoring and evaluation

Finally, a monitoring and evaluation framework has been developed to measure the Mackay Whitsunday REP's effectiveness and to inform future iterations of the plan, to enhance coordination of extension projects in the Mackay Whitsunday region.

For more information

To find out more about Regional Extension Networks and plans and funding for innovative ideas in the Mackay Whitsunday region, please check out https://www.qff.org.au/projects/reef-alliance/enhanced-extension/ or contact Phillip Trendell, the Regional Extension Coordinator, based at DAF Mackay.

Coutts J & R, 2017, Practice Change, Education and Extension in Reef Catchments, Review Report for the Queensland Government.

2. Acknowledgement

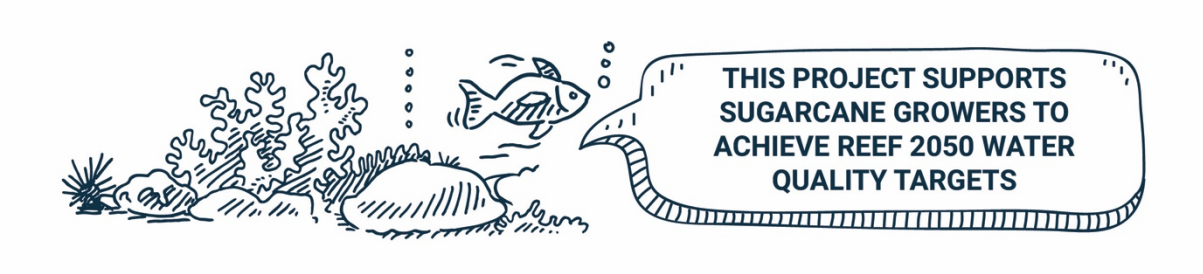
This project has been funded by the Queensland Government Reef Water Quality Program.

The Mackay Whitsunday Regional Extension Coordinator would like to acknowledge all of the support, effort and involvement that a number of organisations and people have made and contributed to the development of this updated Mackay Whitsunday Regional Extension Plan.

- All of the members of the Cane and Grazing Regional Extension Working Groups who have participated in meetings and were involved in the prioritisation process and identifying regional issues, challenges, barriers, risks and more importantly, gaps and opportunities to help overcome them. Thanks for helping to review the plan and provide comments and feedback incorporated into the first version in September 2018 and providing input into the October 2019 update.

  Cane Regional Extension Working Group (previous and current)
  Peter Albertson, Clare Gersch (Plane Creek Productivity Services Limited)
  John Agnew, Andrew Humphrey, Anthony Schembri, Robyn Bell (Mackay Area Productivity Services)
  Peter Sutherland, Frank Millar (Sugar Services Proserpine)
  Phil Ross, Beena Anil Biswas (Sugar Research Australia)
  John Eden (Canegrowers Mackay and Sarina)
  Zoe Eagger, Natalie Fiocco, Kylie Bezzina, John Turner (Farmacist)
  Daniel Gonzalez (Department of Agriculture and Fisheries)
  Kevin Moore (Mackay Sugar)
  Michael Boland, Ian Brooks (Reef Catchments)

  Grazing Regional Extension Working Group
  Jim Fletcher, Roxanne Morgan (DAF Grazing)
  Michael Boland, Mandy Jeppesen, Tegan McBride, Julianne Kasiske (Reef Catchments)



3. Introduction

3.1 Mackay Whitsunday Regional Extension Plan Update

One of the key actions in implementing the Mackay Whitsunday Regional Extension Plan is having an annual review and update process. While the major issues and priorities might not change much from year to year, there are a number of other changes or lessons learnt that need to be documented, which can impact on the regional network, current programs and future actions. For this 2019 update, this includes:

- Existing Projects / Programs that were completed in June 2019
- New Projects / Programs are established and any new networks / steering groups
- Regional staff changes across organisations
- Lessons learned from project / event reviews

3.2 Enhanced Extension Coordination project

The Great Barrier Reef Water Science Taskforce (the Taskforce) recommended that the Queensland Government invest in more targeted and coordinated extension to support large-scale land management practice change that will result in improved water quality outcomes for the Great Barrier Reef (GBR) and accelerate achieving the objectives of the Great Barrier Reef 2050 Water Quality Improvement Plan (Reef Plan). In response, the Queensland Government engaged an independent consultant to review the current status of extension and education systems in Reef catchments. A key objective was to inform an implementation strategy for the Queensland Government and guide the delivery of funding aligned to the Great Barrier Reef (GBR) Water Quality Taskforce Recommendation 3: Extension and Education under the Queensland Reef Water Quality Program. Over 200 stakeholders were consulted, including extension service providers and trainers (government, natural resource management bodies, as well as industry and private organisations) and those who accessed the extension services. A draft review was released in April 2017, and workshops, forums and follow-up interviews resulted in the final report: Practice Change, Education and Extension in Reef Catchments (Coutts J&R, 2017 – here after referred to as the E&E Review) being published in June 2017. The full report can be found at https://reefextension.couttsjr.com.au/. The Queensland Government has agreed, or agreed in principle, with all of the review recommendations and are investing over $10 million to implement its key recommendations (https://www.ehp.qld.gov.au/assets/documents/reef/response-independent-review-extension-reef-catchments.pdf).

The E&E Review identified a range of issues and made 65 recommendations on the education and extension systems to build on extension capacity in GBR catchments under the following themes: improved coordination and collaboration of extension projects, skills gaps and the need for training

and capacity building, and more effective monitoring and evaluation of the extension effort and outcomes. From this, the Enhanced Extension Coordination project was initiated in 17/18 to facilitate improved coordination of extension activities in GBR catchments administered by the Department of Agriculture and Fisheries (DAF). Regional Extension Coordinators (REC) have been appointed to engage local coordination groups/networks and develop Regional Extension Plans in the six GBR Natural Resource Management (NRM) regions (Cape York, Wet Tropics, Burdekin, Mackay-Whitsunday, Fitzroy and Burnett Mary). The Mackay Whitsunday Regional Extension Plan is one of these plans. In addition, DAF will manage projects to service high priority skills gaps and training and development needs across regions and provide funding to each region for extension activities that facilitate improved coordination and collaboration to deliver better on-ground services for producers and to encourage producer peer-to-peer learning activities that are prioritised in the Regional Extension Plans. Figure 1 outlines the project logic of how the Queensland Government in partnership with NRM organisations and industry will implementation the recommendations of the E&E Review.

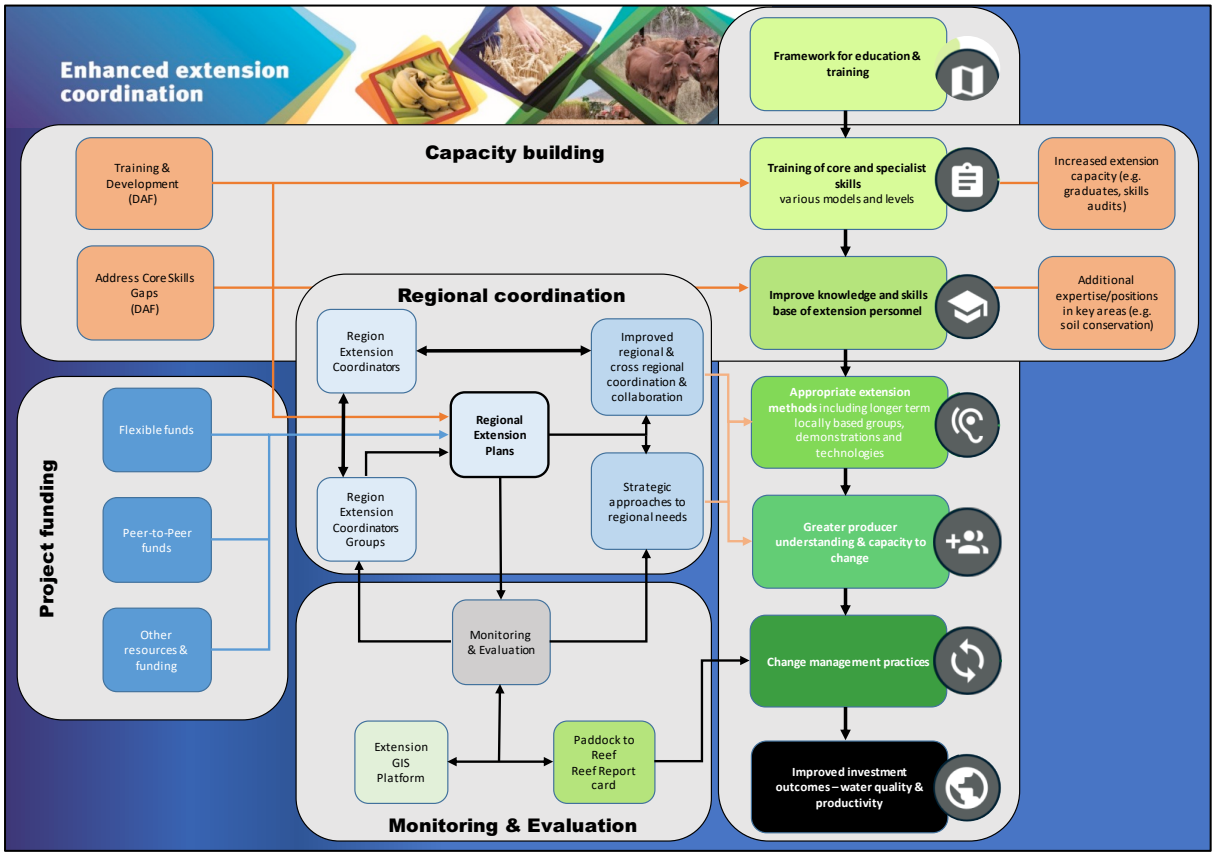


Figure 1. Project logic of the Queensland Governments implementation of the Education and Extension Review: Practice change, Education and Extension in Reef Catchments (Coutts J&R, 2017) being implemented through the Enhanced Extension Coordination project.

A wide range of organisations including industry, private consultants, agri-businesses, NRM bodies and government agencies undertake extension support to the agricultural industries in GBR catchments. Extension services (including data management) in the Mackay Whitsunday region that support agricultural industries to improve management practices are provided by a variety of practitioners including:

- Cane Productivity Services – Plane Creek, Mackay and Proserpine

- Sugar Research Australia (SRA)
- Canegrowers - Sarina / Mackay and Proserpine
- Mills – Mackay Sugar and Wilmar
- Farmacist (agri-business)
- Reef Catchments (local NRM body)
- Department of Agriculture and Fisheries (cane and grazing)

The E & E Review found that an effective Regional Extension Coordination Group is needed, driven and facilitated by extension coordinator/s, with flexible funds to allow strategic collaboration across programs and organisations to more effectively address identified regional and sub-regional priorities. A coordinated regional network will also enable more effective linkages to other programs within the broader Reef program and through these linkages promote better ways of doing things at the local level to accelerate adoption of improve farm management practices.

In the Mackay Whitsunday region, the REC role is hosted by DAF and based in Mackay. The role of the RECs are to facilitate and support the continuation or establishment of Regional Extension Coordination Groups and their networks. This will enable improved sharing of information and joint decision-making and coordinate the implementation of these decisions through a Regional Extension Plan (REP) so that effort and resources being put into extension activities are maximised, coordinated and reported, with learnings being shared and duplication of effort avoided. For the Mackay Whitsunday region, these groups include the newly formed Cane and Grazing Regional Extension Working Groups (facilitated by the REC) and the existing Cane and Grazing Regional Working Groups (REC is an active member). The Mackay Whitsunday Regional Extension Coordinator developed the original 2018 Regional Extension Plan in consultation with the Cane and Grazing Regional Extension Working Groups and associated networks of extension staff / industry service providers. The REP will continue to inform and facilitate future decision-making, providing the platform to support a review and update process, such as this 2019 update.

The Regional Extension Coordinator will also collate and provide feedback on extension delivery to the Manager (Extension Coordinator) and Manager (Training Development), both located with the Department of Agriculture and Fisheries. The aim is to work collaboratively across regions, facilitate cross-regional information sharing through the broader Reef extension network and programs, and provide strategic and practical advice to help inform investment programs (Queensland Reef Water Quality Program, Australian Government Reef Trust, amongst others) in relation to extension requirements and possible solutions to support large-scale land management practice change.

3.3 Purpose of the Mackay Whitsunday Regional Extension Plan

Figure 2. Mackay Whitsunday Regional Extension Plan Structure.

The Mackay Whitsunday Regional Extension Plan is a key part in helping to achieve the objectives of the Enhanced Extension Coordination project around delivering actions that:

- Maintain, enhance and expand regional partnerships around extension coordination and collaboration across major agricultural industries and NRM groups within the GBR catchments to deliver better on-ground services for producers.
- Respond to the relevant areas of need identified in the E&E Review report, including new and innovative approaches to extension and education.
- Enhance and support the increased extension effort provided through reef related funding (e.g. GBR Foundation, Reef Taskforce) and the increased urgency for this to lead to on-ground practice change outcomes for GBR water quality.
- Improve evaluation and review of extension effort and impact to identify gaps/opportunities and provide feedback to inform and support future allocation and targeting of on-ground resources.
- Strengthen links and collaboration between extension and other programs (i.e. MIPs, BMP, incentives etc.) to maximise impact and share information across geographic areas and programs.
- Strengthen links, collaboration and leverage product development between researchers/scientists (reef, industry etc.) and extension staff to maximise knowledge transfer.

- Improve the professional capacity of the extension network through undertaking the training needs analysis, identifying professional capacity challenges, and working collaboratively to address them.
- Provide strategic advice on regional gaps, needs and appropriate responses that meet the needs of Reef Plan and the Queensland Government Great Barrier Reef Water Quality program.
- Minimise the duplication of effort across Australian Government, State Government and industry programs that have extension activities associated with them.

The Mackay Whitsunday Regional Extension Plan (REP) provides a strategic view of on-ground delivery of extension services consistent with regional water quality priorities. The Mackay Whitsunday REP focuses on the cane and grazing industries and provides information on extension delivery, gaps and barriers in the region and opportunities to address these gaps through a more collaborative approach and through strategic investment that expands and add value to current activities. The Mackay Whitsunday REP highlights the relevant water quality targets and priorities outlined in both the Mackay Whitsunday Water Quality Improvement Plan 2014-2021 and the Reef 2050 Water Quality Improvement Plan 2017-2022. It provides an overview of on-ground delivery of extension services based on management priorities, previous and current programs; and identifies needs and gaps that are consistent with regional water quality priorities. Implementing the Mackay Whitsunday REP will facilitate improved regional coordination, collaboration, networking and outcomes of activities and projects located in the region, with delivery of better on-ground services for producers. The Plan will extend the current approach to extension coordination and aim to build on the current extension efforts and substantially enhance the collaborative arrangements between extension providers. The Plan will support private and public suppliers to enhance extension services better meeting producer needs, improving the quality of extension services, avoid duplication, support whole of farm outcomes and make greater use of smarter and more innovative extension approaches to help achieve GBR water quality targets.

Through the Department of Agriculture and Fisheries (DAF), the Enhanced Extension Coordination project provided funds to work with local extension networks to enhance current activities and address gaps in priority collaborative extension services and peer-to-peer learning activities. The Mackay Whitsunday REP helps inform and facilitate decision-making via the Cane and Grazing Regional Extension Working Groups and sets out the consultative and transparent decision framework and processes to prioritise project activity and the strategic allocation of funds to extension providers for projects in the Mackay Whitsunday region. In addition, resources and opportunities are available for training and development of extension personnel and to augment existing services and expertise for high priority skills gaps (e.g. soil conservation, soil health, hydrology, farming systems, and water quality) as identified in the REP and supported through ancillary projects managed through DAF's Extension Coordination Manager and Training Development Manager.

The REP needs updating annually to remain consistent with current programs and water quality priorities. The annual review of the REP will be in consultation with the Cane and Grazing Regional Extension Working Groups and extension/industry service provider networks across the region. Through this process, the REP will set out annual work plans to implement priority actions. The REP also sets out a monitoring, evaluation and reporting framework to track and collate the progress and activities of the extension efforts and outcomes and identify what is working well, barriers and opportunities in achieving management practice change uptake by producers across the Mackay Whitsunday region. This will include the collation of spatial data on extension projects and information sharing with the Paddock to Reef project.

3.4 Mackay Whitsunday 18/19 Achievements and Outcomes

Delivering enhanced communication, coordination and planning

In 18/19, there were a number of key achievements and outcomes for the project, including the development of the first Mackay Whitsunday Regional Extension Plan in September 2018. There was a focus on improving the coordination and collaboration of regional stakeholders and so a number of workshops and discussions were held to help increase the knowledge and understanding around what is collaboration, the benefits of it and how to monitor and evaluate progress. There was strong commitment by regional stakeholders in this process and so there are opportunities to maintain the areas that are already working well as well as improvement across others. This culminated in the development of the Mackay Whitsunday *Collaboration and Coordination Strategy* and *Communication and Engagement Strategy* as supporting documents for this plan.

There were also six Flexible Funding (5 cane and 1 grazing) projects and five Peer-to-Peer Learning (4 cane and 1 grazing) projects supported to help with gaps / opportunities identified within the plan and these have been summarised in Tables 1 and 2. All projects have meet there 18/19 deliverables (outputs / outcomes) including providing Progress and Final reports. A number of these projects where extended to now finish in 2020 (April to June) or will be repeated through 19/20 funding.

The Regional Extension Coordinator provided a monthly Calendar of Events for Cane and Grazing activities to the Mackay Whitsunday extension and advisor network. This included confirmed activities / events for the next 2 months and a "To Be Confirmed" table for events that are being planned or coming up into the future. This is being well utilised for promotion (to other networks etc.) to help improve attendance and planning (dates / timing / topics) to help reduce duplication or clashes.

Pesticide Working Group

P2R Integrated Science Forum

Peer-to-Peer Forum

Developed a Community of Practice to coordinate extension delivery

There continued to be high participation levels in regional extension working groups and this has helped to expand networks, share learnings between projects, coordinate activities /events, industry involvement in prioritisation and approval processes and being up to date with the latest changes concerning policies, regulations and funding. Many of the members from these groups also participate in other regional groups or steering committees such as the Cane and Grazing Regional Working Groups and the Sandy Creek Project Steering Group. This has helped to improve the communication and coordination of extension delivery across the region and the understanding of the different projects and activities that are occurring. This has led to more collaborative projects being implemented in the region where there are more than two regional stakeholders involved in the planning and delivery of them.

A framework to co-design and implement effective collaboration

A priority outcome for the Enhanced Extension Coordination program was to improve collaboration amongst extension staff, advisors and other industry service providers. To help support this, Max Hardy Consulting was contracted to workshop with Mackay Whitsunday stakeholders (coordination group members, peer-to-peer group members etc.) on what is the difference between cooperation, coordination and collaboration, what are the barriers to doing it and where have there been good examples / successes. These workshops were held on March 26th and March 27th, 2019 at Walkerston near Mackay. From the information provided from participant involvement and feedback, Max Hardy Consulting developed the Mackay Whitsunday *Collaboration and Coordination Strategy* and this included a number of recommendations on how we could improve collaboration at the GBR wide and regional level. The following is a brief overview of the information provided in this strategy including how it can be monitored, evaluated (performance indicators) and even benchmarked.

Mackay Whitsunday *Collaboration and Coordination Strategy* summary

Building coordination and collaboration between multiple partners (especially where there are issues such as perceived competition or lack of trust) is not a simple process. There are tools that you can use, but it is important that while increased collaboration may be the ultimate goal, it is not necessary or appropriate at all times and relationships often need to be developed over time before it can be fully achieved.

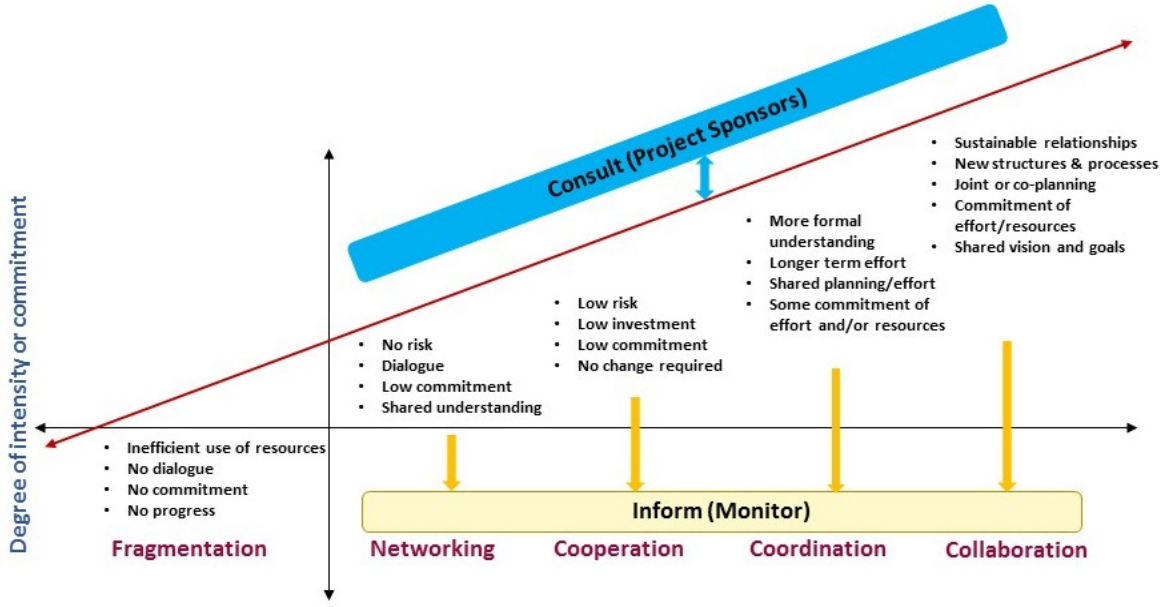


Figure 3: The Collaboration Continuum [Adapted from: Success Works, Putting Partnerships into Practice, final report (Department of Human Resources, 2004)].

There are lots of different ways of working together including participating in meetings (networking), which might lead to cooperating in a shared task or goal for mutual benefit. Working in a coordinated manner requires greater commitment and participants to be organised and/or delegated responsibilities/functions. While coordination is largely about working together to coordinate the implementation of known solutions, collaboration is more experimental and where the partners are contributing to solutions (such as projects, activities or relationships) that didn't exist before and share the responsibility, risks and benefits of these activities.

It may help to identify where you are, and where you may want to be, on the Collaboration Continuum (see Figure 1) and then plan your events and communications accordingly. For example, if your group is 'fragmented,' plan a networking activity; if your group are already 'cooperating' ask for some assistance with 'coordination' – plan an event with the members and ask partners to take responsibility for different tasks. Each step (successful activity) results in greater rapport between the members and more commitment to work together to solve more complex problems. But caution should be taken not to advance faster than the comfort level of the group or to skip levels, for example, if your group is 'fragmented,' a coordination or collaborative activity is unlikely to be successful. Communications likewise need to be cognisant of where the group is on this continuum and whether you want to just bring people together through a networking event or whether you want them to commit and work together on something more challenging.

In taking the first steps towards achieving greater coordination and collaboration, it may help to follow this simple process:

1. Establish a shared understanding of the problem – in this case, why is there a compelling need for greater coordination and collaboration? What are the benefits?
2. Communicate expectations – explain the brief and what organisations will be expected to contribute. You may want to develop up a Terms of Reference for your group.
3. Co-design a shared goal (or goals) for your group. If everyone has a shared goal that they can contribute to, then this will help harness momentum.

4. Build on strengths. These may be the personal strengths of the individuals in your group or their organisational strengths. Not everyone will have resources they can contribute, but encourage everyone to participate in the decision making and planning processes.
5. Foster communication between your group's members. This is a major part of your role and will help build greater rapport and cohesion between your partners.
6. Encourage innovation from partners that are willing to 'think outside the box' to achieve a better outcome.
7. Take actions and deadlines seriously – collaborative partnerships are largely built on trust and respect and this is your way to demonstrate your commitment to the partnership.
8. Recognize, reward and celebrate examples of collaborative behaviour by capturing these in narratives, passing on examples in your communications to your partners and within the project team.

The different stages of the Collaboration Continuum will be recognised through project narratives for the duration of the project and Table 1 shows the indicators used to help determine how the region is progressing across the different levels of working together. Table 2 shows the first attempt to benchmark how the region was working in 2018 based on those indicators, how it has progressed in 2019 and the level wanting to be reached in 2020.

Table 1. *Examples and indicators for the different levels of working together in a collaboration continuum (adapted from Hardy, 2019).*

	Fragmentation	**Networking**	**Cooperation**	**Coordination**	**Collaboration**
Level 1	Participants do not liaise or meet Participants may view other organisations as competitors Participants do not share resources or events	Participants come together socially or informally Participants exchange or are happy to exchange information or contact details	Participants attend a Regional Extension Coordination Network Meeting Participants attend a flexible funding or peer-to-peer learning event	Participants assist with the delivery of a network activity or event (organise catering, venue, take minutes etc) Participation in a shared planning activity Responsibility for meeting action list is shared by 2 or more partners	Participants are taking a lead or contributing to new activities (outside the meetings or funded activities) 2 or more partners that previously didn't work together are now working together on new projects or activities

	Fragmentation	Networking	Cooperation	Coordination	Collaboration
Lead Indicators **Level 2**		Participants happy to attend network meetings Participants interact with each other	Participants come along to meeting with a shared agenda Participation in the meeting	Participants share in a joint planning process (development of agenda or approval of projects for example) Participants contribute resources to planning meetings	Participants are working towards a shared goal Participants are volunteering suggestions Participants are offering to lead new activities
Intermediate indicators **Level 3**		Participants happy to come along to a second meeting Participants tell others about the benefits Participants invite others to the network	Follow up phone calls or emails from participants after meeting	Participants agree on a decision (or with the decision made) Participant(s) other than the REC take a lead on an action	Participants commit resources (time and/or funding) for joint activities Participants are starting to work with other network members on other initiatives
Possible longer-term indicators (outcomes/ impacts) **Level 4**		A higher level of trust is reported among networkers. Evidence of networkers being willing to actively explore working at higher levels (ie, cooperation, coordination and collaboration). Evidence of organisations being more	Evidence of producers being referred to other extension services where more appropriate. Evidence of sharing resources between organisations providing extension services. Messaging about practice	Feedback from producers of significantly less duplication of surveys and events. Feedback from producers of improved scheduling. Greater clarity about which services organisations are providing	Applications for funding jointly prepared by multiple organisations. Extension events jointly organised by multiple organisations. Producers express greater confidence in the relevance and effectiveness of the

	Fragmentation	Networking	Cooperation	Coordination	Collaboration
		willing to share information about achieving practice improvements, or lessons learned.	improvement is more consistent between different providers.		extension system. Evidence of more attempts at innovating through joint planning and delivery.

Table 2. *Benchmarking how the stakeholders in the Mackay Whitsunday Regional Extension Network and wider network are working together relative to the Collaboration Continuum (Orange 2018. Green 2019. Blue 2020).*

2018	Fragmentation	Networking	Cooperation	Coordination	Collaboration
Level 1					
Level 2					
Level 3					
Level 4					

2019	Fragmentation	Networking	Cooperation	Coordination	Collaboration
Level 1					
Level 2					
Level 3					
Level 4					

2020	Fragmentation	Networking	Cooperation	Coordination	Collaboration
Level 1					
Level 2					
Level 3					
Level 4					

Colour Code:

2018	2019	2020	Extent of interaction
			Does not occur
			Occurs but infrequently
			Occurs more often
			Occurs frequently and regularly

Empowering local decision making

Table 3. Mackay Whitsunday Grazing projects developed, approved and delivered in 18/19

Project Overview	Outputs / Outcomes
Supporting priority group extension activities with graziers in the Mackay Whitsunday region MWFF06: Reef Catchments Total Project Costs = $148,300 Funding Provided = **Flexible Funding $22,500** **Completed** June 2019 (1 workshop had to be moved to September 2019)	**Regional Extension Plan Priorities** • Industry Service Provider and graziers training and capacity building • Improved communication and knowledge transfer Successful delivery of priority grazing group extension activities: Healthy Soils Symposium, Mackay Whitsunday Regional Grazing Forum and Grazing Forum Follow Up Field Day. High Steaks III Workshop delivered in September 2019. All events included support from Reef Catchments in communication around promoting the events (flyers, emails) and associated stories on website and e-newsletter. Participant evaluation and feedback on all of the workshops has been collected and collated. Includes the improved identification of which sub-catchments they have come from to attend.
Supporting the Mackay Whitsunday Grazing Innovation Network and Regional Working Group MWPTP05: Reef Catchments Total Project Costs = $39,600 Funding Provided = **Peer to Peer $16,250** **Completed** June 2019 (1 event delayed until September 2019)	**Regional Extension Plan Priorities** • Industry Service Provider and graziers training and capacity building • The establishment or increased support for Peer to Peer learning groups • Improved communication and knowledge transfer Supported Peer-to-Peer learning opportunities with regional graziers and extension staff. 2 x Grazing Regional Working Group meetings that included getting feedback from participants and group members around activities for 19/20. Pasture and Weed ID Mini Field Day at working group member property. Regional Grazing Innovation Network event that included presentations from Reef Catchments and a soil health session with David Hardwick. Cross Regional Bus Trip held in September 2019. Reef Catchments presented on this project at the Regional Peer to Peer Group Event. Participant evaluation and feedback on all of the workshops has been collected and collated.

Table 4. Mackay Whitsunday Cane projects developed, approved and delivered in 18/19

Project Overview	Outputs / Outcomes
Improving the knowledge, attitudes, skills and aspirations around the benefits from improving soil health with CQSHS MWPTP01: Central Queensland Soil Health Systems (CQSHS) – grower group with members from cane, grazing and horticulture. Total Project Costs = $25,083 Funding Provided = **Peer to Peer $11,583**) **Completed** June 2019	**Regional Extension Plan Priorities** • Farmers located in Murray Creek and Pioneer River Main Channel (Very High Priority) • The establishment or increased support for Peer to Peer learning groups • Grower training and capacity building • Value add to group extension activities that are already occurring 9 members attended the 2018 National Biological Conference on the Gold Coast as a capacity building activity for the group. Included identifying guest speakers for future regional events hosted by the group. Group funded one speaker to travel to the region and deliver biological farming training workshop for them. 2 members presented at the Regional Peer to Peer Group Event on the conference and their highlights from it.
Improved Fallow Management to support better soil health and run-off water quality MWFF01: Central Queensland Soil Health Systems (CQSHS) Total Project Costs = $69,500 Funding Provided = **Flexible Funding $44,500** Ends: June 2020	**Regional Extension Plan Priorities** • Trials located in Pioneer River Main Channel and Sandy Creek (Very High Priority). • Increase or maintain the desired number of trials and associated workshops/field days/meetings targeting improved or innovative management around the key pollutants (Sediment and Nutrient losses) / issues (improving fallow management) / barriers (limited regionally relevant information). • Grower led water quality monitoring project Improved fallow management trials on 2 CQSHS member farms. Trials to be established in late 2019 to compare four different treatments - bare fallow, legume fallow, multispecies cover cropping and intercropping on improving soil biology and nutrient run off (Nitrogen and Phosphorus). Will include trial related field days in early 2020.
Improving the knowledge, attitudes, skills and aspirations around pesticide management with the Plane Creek Sustainable Farmers (PCSF) grower group.	**Regional Extension Plan Priorities** • Activities focused on Rocky Dam Creek (Very High Priority)

Project Overview	Outputs / Outcomes
MWPTP02: Plane Creek Sustainable Farmers (PCSF) – cane grower group. Total Project Costs = $32,200 Funding Provided = **Peer to Peer $11,000** **Completed** July 2019	• The establishment or increased support for Peer to Peer learning groups • Grower training and capacity building • Increase or maintain the desired number of trials and associated workshops/field days/meetings targeting improved or innovative management around the key pollutants (PSII herbicides and imidacloprid) / issues (run off losses impacting water quality, accessing experts) / barriers (lack of knowledge and understanding). PCSF implemented a number of group facilitation activities, workshops and trials around improving pesticide performance within Plane Catchment. Included collaborating with a number of stakeholders such as DES, PCPSL and Farmacist in the delivery of a number of activities such as shed meetings. Grower (member and non-member) surveys undertaken to determine baseline knowledge and skills around pesticide management and issues. Capacity building activities delivered to increase grower understanding of the risks and relative toxicity of various pesticides in waterways and the impact on the aquatic environment. This included looking at farming practices plus alternative products and application systems that reduce the risk of off-site movement while maintaining good weed control and pesticide efficacy. The aim of this increase in grower knowledge and skills is to provide them with the confidence that they will have effective, economic weed control even if they reduce the use of PSII herbicides, use alternative lower risk products and better target application rates to weed & cane grub pressure. PCSF presented at both the Regional Pesticide Working Group Forum and Peer-to-Peer Group Events in Mackay on the initial findings and subsequent discussions that have followed with growers.
Rocky Dam Creek Sub-Catchment Grower Led Water Quality Monitoring and Communication Project MWFF02: Plane Creek Sustainable Farmers (PCSF) Total Project Costs = $53,500 Funding Provided =	**Regional Extension Plan Priorities** • Activities focused on Rocky Dam Creek (Very High Priority) • Grower led water quality monitoring project • Improved communication and knowledge transfer Rocky Dam Creek sub-catchment grower based water quality monitoring and extension pilot program. This project linked very closely to the PCSF Peer to Peer learning project MWPTP02 and the interpretation of results from 2017/18 wet season sampling. Communicated and shared learnings from the water quality

Project Overview	Outputs / Outcomes
Flexible Funding $34,500 **Completed** July 2019	analysis results amongst PCSF members and other growers from the Rocky Dam and Plane Creek mill area. Communicated with other grower led water quality monitoring projects such as in Sandy Creek. Collaborated with other stakeholders such as PCPSL (communication to other growers) and Farmacist (Sandy Creek project). PCSF presented at both the Regional Pesticide Working Group Forum and Peer-to-Peer Group Events in Mackay on the initial findings and subsequent discussions that have followed with growers.
Enhanced stewardship and site specific application of imidacloprid MWFF03: Department of Agriculture and Fisheries (DAF) – Coastal Farming Systems Total Project Costs = $92,896 Funding Provided = **Flexible Funding $12,000** Ends: June 2020	**Regional Extension Plan Priorities** • Trial located in Pioneer River Main Channel (Very High Priority). • Increase or maintain the desired number of trials and associated workshops/field days/meetings targeting improved or innovative management around the key pollutants (imidacloprid) / issues (run off losses, poor application) / barriers (limited regionally relevant information). • Value add to group extension activities that are already occurring Interrogation of key spatial mapping layers / imagery to predict likely sites of sugarcane grub infestations. Includes trial work to look at benefits of improved sub-surface application at predicted cane grub impact sites. Project information: • Site is an area with inherently high sugarcane grub pressure • Spatial yield maps (Derived from processed satellite imagery, In-season processed drone imagery) • Fine scale soil mapping surveys to define patterns of contrasting soil properties at an intra-paddock scale (EC or EM soil mapping technologies) • Digital elevation maps (RTK accuracy) (Digital elevation maps (DEM) are captured during EC/EM soil mapping surveys, Surface drainage mapping layers from drone paddock surveys) • Treatment 1: Untreated Control (UTC) • Treatment 2: Confidor Guard with Stool Zippa (22 ml/100m of row) • Treatment 3: Confidor Guard without Stool Zippa (22 ml/100m of row) • Monitoring will include looking at yield and grub pressure of the different treatments • Neighbouring block will not be treated to assess accuracy of cane grub prediction Project presented by DAF at the MAPS Trial Info Day, Landmark Field Day and to the Cane Regional Extension Working Group.
Munburra Integrated Feral Pig Management Program MWFF04: Mackay Area Productivity Services	**Regional Extension Plan Priorities** • Project located across 2000ha at Munburra in Alligator Creek (High Priority).

Project Overview	Outputs / Outcomes
Total Project Costs = $44,500 Funding Provided = **Flexible Funding $12,250** Ends: April 2020	• Provide support for other issues impacting on growers to look for win: win scenarios or increase their receptiveness and ability to participate in practice change around nutrients or pesticides • Grower and grazier training and capacity building • Improved communication and knowledge transfer around coordinated approach Project aims to implement a more coordinated IPM (trapping, baiting, Judas pigs, shooting) approach to controlling feral pigs with contracted experts working directly with growers and extension staff. Water Quality issues from pigs include increased sediment and particulate nutrient losses and increased herbicide use from yield losses (sometimes over 20t/ha from previous studies) causing bare patches / gaps. Project will include grower and stakeholder evaluation of the control measures as well as the value of having a coordinated (following plans, timing of activities, clear communication between partners) group approach in solving an issue and could this work for other ones like weeds or water quality. This will be communicated (newsletters, shed meetings) to other growers across the region and help them solve a big problem while being able to save time and money that can be invested back into their farm. The project will also look at the impact that focusing on the growers high priority issue has on their attitude and receptiveness to other reef related programs or targeted management practice change. Collaboration with growers, MAPS, Mackay Regional Council and Southern Cross Trapping.
Improving the knowledge, attitudes, skills and aspirations of the Mackay Future Farmer grower group around the benefits of Peer-to-Peer learning and collaboration to support water quality improvements. MWPTP03: Mackay Future Farmer Group – cane grower group supported by Farmacist. Total Project Costs = $82,975 Funding Provided =	**Regional Extension Plan Priorities** • Growers farm in the Sandy Creek, Bakers Creek and Pioneer River Main Channel areas (High and Very High Priority) • The establishment or increased support for Peer to Peer learning groups • Grower training and capacity building Capacity building activity for 9 - 10 grower members to visit grower groups and farming operations in the South Island (high rainfall, extensive irrigation use, farm lands proximity to important waterways and water quality issues) of New Zealand. Included visiting McFarlane Rural Business and a day at the South Island Agriculture Field Day. Farmacist hosted the trip and covered all of their own costs.

Project Overview	Outputs / Outcomes
Peer to Peer $15,000 Ends: November 2019	Grower group was keen to get out of their comfort zone as they already participate in number of sugar related events each year such as the Project Catalyst Forum and Next Gen Conference. With feedback provided to them from Farmacist after the QFF Extension Forum held in Townsville, the group wanted to see how other agricultural industries / governments deal with water quality issues and how the adoption of precision agriculture and Peer-to-Peer learning has supported this. Farmacist has supported each participating grower on the trip in the implementation of any practice changes they would like to make as well as providing contacts to further their knowledge and understanding if so required. Activities included pre-trip and post-trip evaluations with a tour debrief once back in Mackay. Farmacist updated their Facebook page during the trip, took many photos, and developed a video. Farmacist and some participating growers presented at the Mackay Peer to Peer regional event.
Establishment of the Plane Creek Farmers Action Group MWPTP04: Plane Creek Productivity Services Limited (PCPSL) Total Project Costs = $19,900 Funding Provided = **Peer to Peer $7,900** Ends: April 2020	**Regional Extension Plan Priorities** • Project located across Plane Creek Mill section of Plane Catchment which includes Alligator Creek and Rocky Dam Creek (High and Very High Priority). • The establishment or increased support for Peer to Peer learning groups • Provide support for other issues impacting on growers to look for win: win scenarios or increase their receptiveness and ability to participate in practice change around nutrients or pesticides • Value add to group extension activities that are already occurring Establishment of a Plane Creek Farmers Action Group (will include mainly cane and grazing landholders along with relevant organisations like the local councils, Landcare and Queensland Parks and Wildlife) within the Plane Catchment. Initial focus will be on improving feral pig management with a demonstration project to look at new technology and monitoring in Rocky Dam Creek. Will look to expand the group focus in 19/20 based on their priorities and discussions in 18/19 and include water quality issues.
Improved stakeholder coordination and collaboration around pest management in Plane Creek MWFF05: Plane Creek Productivity Services Limited (PCPSL)	**Regional Extension Plan Priorities** • Project located across Plane Creek Mill section of Plane Catchment which includes Alligator Creek and Rocky Dam Creek (High and Very High Priority)

Project Overview	Outputs / Outcomes
Total Project Costs = $39,200 Funding Provided = **Flexible Funding $19,300** Ends: April 2020	• Provide support for other issues impacting on growers to look for win: win scenarios or increase their receptiveness and ability to participate in practice change around nutrients or pesticides • Grower and grazier training and capacity building • Improved communication and knowledge transfer around coordinated approach Project supporting improved pest management across Plane Catchment. Project aims to implement a more coordinated approach to pest management through improved stakeholder collaboration (includes Mackay and Isaac Regional Councils, Sarina Landcare and Reef Catchments NRM) and the use of regional experts. Water Quality issues from pests such as feral pigs include increased sediment and particulate nutrient losses and increased herbicide use from yield losses. Aim is to show the value of having a coordinated approach in solving a community wide issue and how this could be useful for other issues around water quality. The project will also look at the impact focusing on the growers high priority issue has on their attitude and receptiveness to other reef related programs or targeted management practice change.
Behavioural Science training for regional extension offices and advisors MWFF07: Sugar Research Australia Total Project Costs = $25,000 Funding Provided = **Training Development $12,500** **Completed** March 2019	**Regional Extension Plan Priorities** • Industry Service Provider training and capacity building Capacity building training for working group members and other interested extension / advisory roles (includes grazing and horticulture extension staff) on the behavioural science aspect of working with landholders (growers, graziers, producers) to achieve management practice change. Coordinated with SRA to maximise the amount of participants that can attend and delivered by Behaviour Innovations. 3 workshops held in February 2019 at Mackay (2) and Cannonvale – 19 participants. ½ day make up workshop held in Proserpine for people impacted by weather in February – 5 participant

Improving extension officers' skills and capacity

Behavioural Skills Training for Extension

Based on the successful learnings from Project Cane Changer, four workshops were delivered by Behaviour Innovations in the region across February and March 2019. There were 2 in Mackay, 1 in Airlie Beach and 1 in Proserpine, with 24 extension staff across cane, grazing and horticulture participating. Feedback by participants was very positive with the majority reporting that it will help them in their future interactions with peers and farmers.

Reef Extension Think Tank – Townsville, May 2019

This event was designed to attract a cross-section of the estimated 200 to 500 extension service providers and pique their interest in further extension capacity building activities. The two-day event was comprised of a half-day Peer-to-peer training workshop followed by a one-and-a-half day Unconference. In all, 105 people from 40 organisations attended the Think tank, with 85 participants at the Peer-to-peer training workshop and 97 at the Unconference. This included 5 people from the Mackay Whitsunday region.

New ways of working together

Mackay Whitsunday Soil Health Community of Practice Project

Identified by all regional industry stakeholders as an area that has had a major reduction in the level of support / resources for growers but is the important basis for farming system improvements. A collaborative region wide project proposal led by SRA was developed in partnership between the regional coordinators (SRA / DAF). Submitted to DAF in August 2019 and was successful in receiving funding from September 2019 to June 2020 to implement and support the establishment of a regional Soil Health Community of Practice for extension providers, advisors and growers.

4. Regional Overview

4.1 Mackay Whitsunday Isaac Region

The Mackay Whitsunday Isaac Region is located along the northern part of the Central Queensland coast and covers an area greater than 900,000ha. It extends from the Eden lassie Creek sub-catchment in the north (south of Bowen) to the Flaggy Rock Creek sub-catchments in the south. The region is bounded by the Great Barrier Reef (GBR) World Heritage Area and Whitsunday Islands to the east and the Clarke-Connors ranges to the west. It is described as one of the most bio-diverse regions located within the GBR catchment (Folkers et al, 2014).

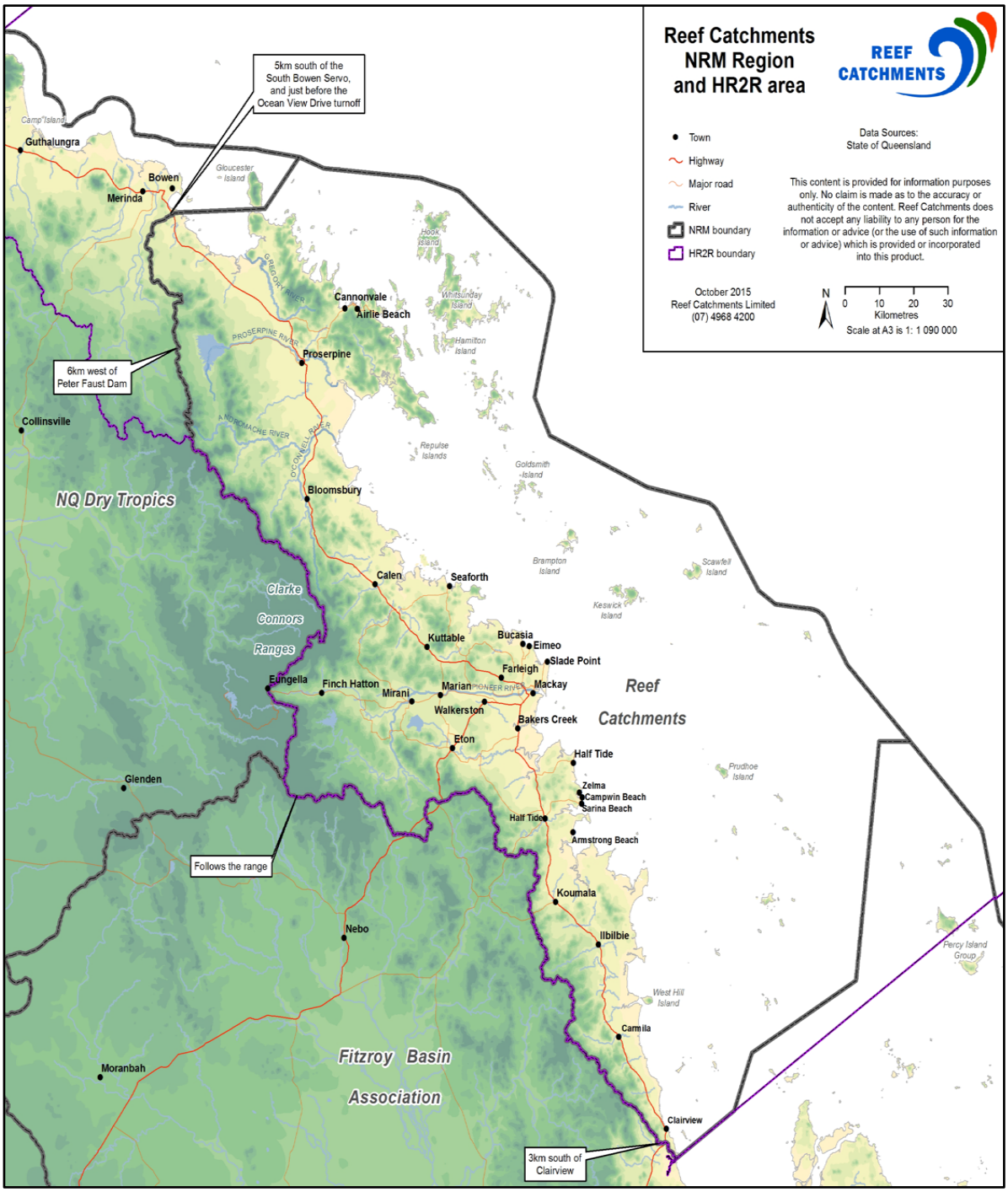


Figure 4. *Mackay Whitsunday NRM region map* *Source: Reef Catchments Website, 2018*

The regions high biodiversity has driven the development of a significant tourism industry and is the second largest tourism region in the GBR. This includes the most extensive systems of islands in close distance to the coast with extensive fringing reefs and even soft coral communities located in some of the inlets (GBRMPA, 2014.). The region has a number of iconic conservation sites including Eungella National Park, Whitsunday Islands National Park, Cape Palmerston National Park and Goorganga Plains. The region has areas of good riparian vegetation, extensive mangrove forest, seagrass and fish habitat, forested mountain ranges and places for recreational fishing and camping. While the Mackay Whitsunday Region only occupies 2% of the total area within the GBR catchments, the coastline length of the region (including the Whitsunday Islands) accounts for approximately 20% of the total GBR catchment length (Drewry et al., 2008).

The region typically has hot wet summers (around 70% of the annual rainfall occurs between December and March) and cool dry winters. Annual rainfall varies significantly across the region with more than 2000 mm/year in some of the ranges down to 1000 mm/year in other inland areas (Bishop, 2007). The reliable rainfall and tropical climate has supported agricultural development with significant production in sugarcane, grazing and horticulture. The Mackay Whitsunday region is the largest continuous area of sugarcane production in Australia, producing approximately a quarter of Australia's sugar. The region also supports industries linked to the coalfields located within the neighbouring Burdekin and Fitzroy catchments and includes mining services, transport and port facilities. In 2014, the region's population was estimated at 175,700 and this is concentrated along the coastal zone and the major urban centres of Mackay, Airlie Beach and Cannonvale. There are a number of smaller regional centres, which include Proserpine, Calen, Mirani, Sarina, and Carmilla and these play a valuable role in servicing the rural industries. There are a number of indigenous groups who culturally identify with this coastal country and include the Gia, Ngaro, Yuwi-bara and Koinjmal groups (Folkers et al, 2014).

4.2 Cane

For the Mackay Whitsunday region, 19% of the landuse is intensive agriculture and 95% of this is sugarcane. There are three distinct milling areas in the Mackay Whitsunday region and Table 6 provides an overview of each. In addition to the mill infrastructure there is other infrastructure directly related to sugar cane in the region:

- Bulk Sugar Terminal at Mackay Harbour
- Co-generation Energy Plant at Racecourse Mill near Mackay
- Ethanol Distillery at Plane Creek Mill in Sarina
- All three milling areas have an extensive rail network for the delivery of cane to the mills and this includes sidings for delivery from paddocks by haul outs and trucks.

The sugarcane industry also has a number of other regional businesses directly related to supporting cane production, which have a direct or indirect impact or influence on extension services.

Table 5. *Other supporting services for cane growers that can impact extension and practice change*

	Impact on Extension
Variety of farm contracting services for harvesting, planting, fertilising and spraying	• Can influence the ability for a grower to adopt a new management practice • Can influence actual inputs / practices compared to planned inputs / practices • Many growers only interact with their preferred reseller or agribusiness and numerous surveys have shown the high level of trust growers have for them • Price changes and issues such as generic brands can make previous studies on the economic benefits of change incorrect or obsolete • Alternative funding sources to achieve similar outcomes • Relying on other sources to provide good quality and accurate data and records on grower inputs
Wilmar Ag Services and the liquid fertiliser (Dunder, Liquid One Shot) contractor fleet	
Variety of Resellers including Mackay Rural, Farm HQ (Sarina), Rogers Rural (Proserpine), Mt Ossa Rural, Landmark, Elders, NQ Farmshed and Liquaforce (also support the other agricultural industries such as grazing)	
Sunwater, Pioneer Valley Water – irrigation water from schemes	
Mackay Regional Council – Bakers Creek Effluent Water Reuse Scheme, Water Quality Offset Program	
Mill mud delivery trucks in each milling area	

Table 6. *Mackay Whitsunday Sugar Cane Milling Area Overview based on information extracted from Canegrowers (2018) and Folkers et al. (2014).*

Mill Area (owner)	**Mackay Whitsunday WQIP related sub-catchments with cane from mill**	**Urban and Regional Centres**	**Approximate Number of Growers**	**2016 Harvested Area (ha) and Tonnes of Cane Crushed**	**2017 Harvested Area (ha) and Tonnes of Cane Crushed**	**Mackay Whitsunday WQIP Landuse (ha – includes fallow, headlands, dams, sheds houses etc.)**
Proserpine Mill (Wilmar)	Eden Lassie Creek, Gregory River, Whitsunday Coast, Myrtle Creek, Proserpine River Main Channel, Lethebrook, Thompson Creek, Andromache River, O'Connell River	Cannonvale, Proserpine, Bloomsbury	160	20,853 ha 2,000,603 tonnes	21,721 ha 1,434,068 tonnes	31,355 ha
Farleigh, Marian and Racecourse Mills (Mackay Sugar)	Waterhole Creek, Blackrock Creek, St Helens Creek, Murray Creek, Constant Creek, Reliance Creek, Mackay City, Pioneer River Main Channel, Upper Cattle Creek, Bakers Creek, Sandy Creek, Alligator Creek	Calen, Seaforth, Kuttabul, Habana, Farleigh, Mackay, Finch Hatton, Gargett, Mirani, Marian, Walkerston, Bakers Creek, Eton	800	63,083 ha 5,559,794 tonnes	66,969 ha 4,973,781 tonnes	107,230 ha
Plane Creek Mill (Wilmar)	Alligator Creek, Sarina Beaches, Plane Creek, Rocky Dam Creek, Marion Creek, Gillibin Creek, West Hill Creek, Carmilla Creek, Flaggy Rock Creek	Sarina, Koumala, Illbilbie, Carmilla, Clairview	150	16,471 ha 1,346,461 tonnes	17,510 ha 1,171,547 tonnes	29,268 ha

4.3 Grazing

While grazing / forestry accounts for 54% of the land use (over 500,000 ha) in the Mackay Whitsunday region, it can be very difficult to find good quality and accurate data specifically on grazing in the Mackay Whitsunday region. There are a number of reasons for this:

- Cattle will move to and from properties outside of the region and so it is hard to track number of head at any one point
- Cattle may go to saleyards or abattoirs outside of the region or alternatively cattle from outside the region will come into the local abattoir (Borthwicks at Bakers Creek) or the Sarina saleyard so figures can be misleading.
- The merger of local council's means some data is now relevant to areas within the Burdekin and Fitzroy regions such as for the Isaac and Whitsunday Regional Councils. An example is that Whitsunday Regional Council area now has 2,600,000 ha of grazing land with 324,000 head (Whitsunday Regional Council, 2012) which is bigger than the whole Mackay Whitsunday NRM region.
- Australian Bureau of Statistics includes areas of the Burdekin and Fitzroy regions (west of the Connors Clarke Range) when referring to the Mackay region. The Australian Bureau of Statistics website shows the Mackay region had 1,286,772 head of cattle in 2011 and 1, 183,764 in 2015, which are much bigger than the numbers identified below for the Mackay Whitsunday NRM region.

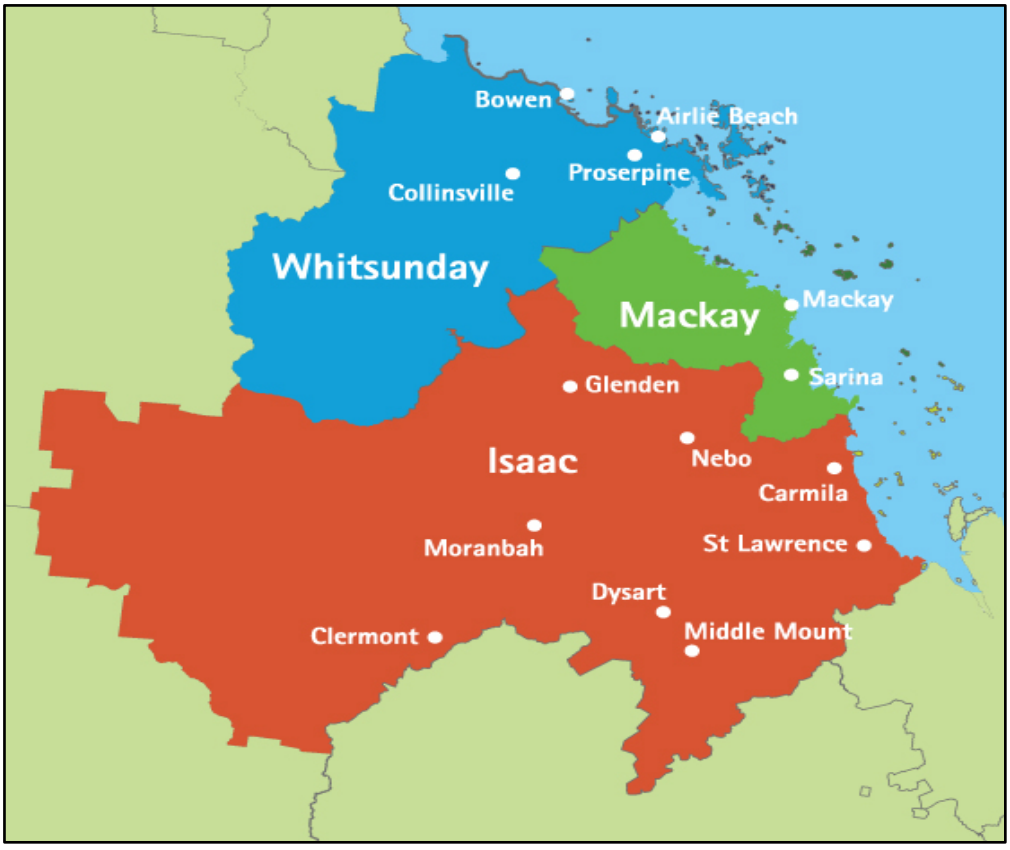


Figure 5. Mackay, Whitsunday and Isaac Regional Council Boundaries 2018. This combined area is often referred to as the Mackay Region when looking at Australian Bureau of Statistics data. Source: Internet

There are some common characteristics of grazing in the region that were highlighted as far back as 2001 that are still very relevant in 2018. There is a high percentage of small properties with less than 100 head. In 2001, this was around 65% of the grazing enterprises in the region with only around 5%

having between 500 – 1000 head (Australian Bureau of Statistics, Agriculture Census 2001). In 2013, across the Mackay, Whitsunday and Isaac local government areas, there was still 64% of the 3426 properties with less than 100 head of cattle, but there are 9% with over 1000 head (NLIS Data 2013).

The total Meat Cattle Numbers in 2001 by local council area was Mackay – 43483, Mirani – 25080, Sarina – 36065 and Whitsunday – 29111 for a total of 133,739 (Agricultural Commodities by LGA estimates for year ending 30 June 2001). In 2011 this was estimated to be 144,692 head and at June 2015 in the Mackay Whitsunday region there were 145,299 head of cattle (Australian Bureau of Statistics).

In 2007, Harry Bishop (grazing expert with DAF in Mackay) stated that the predominant beef business in the region was the breeding and sale of weaners, stores or cull cows. This differs to the wet coastal areas in the far north that will more commonly be used to buy-in stores and fatten for the domestic market (Bishop, 2007). In 2016, Ross Dodt (Industry Development Officer with DAF in Mackay) described the Mackay Whitsunday industry similarly by saying “heavy cattle such as cull cows and bullocks are sold primarily through export abattoirs at Bakers Creek (Borthwicks) and Rockhampton. Cattle to be grown out are sold through saleyards at Sarina and Nebo or by private treaty with livestock agents and return property buyers from areas as widespread as the Burnett and Clermont districts (Dodt R, pers. comms. 2016).

4.4 Water Quality Pollutants and Sources

The key water quality pollutants of concern in the Mackay Whitsunday region impacting on the GBR are:

- Dissolved and particulate forms of nitrogen and phosphorous
- Suspended sediment
- Residual PSII herbicides – ametryn, atrazine, diuron, hexazinone and tebuthiuron
- Pesticides – imidacloprid

The majority of the nutrient and chemical (herbicide and pesticide) pollutant loads reaching fresh and marine waters in the region originate from agricultural diffuse sources. Sugarcane farming is the dominant intensive agricultural landuse and makes up around 19% of the land area in the region. The Mackay Whitsunday Water Quality Improvement Plan 2014-2021 states that the sugarcane area produces 32% of the regional particulate nitrogen load, 65% of the regional dissolved inorganic nitrogen load, 40% of the filterable reactive phosphorous loads and 26% of the regional suspended sediment load. It also produces the majority of the filterable reactive chemicals of concern.

Grazing and forestry are the dominant extensive land uses and make up around 54% of the land area in the region. The Mackay Whitsunday Water Quality Improvement Plan 2014-2021 states that this area produces 27% of the regional particulate nitrogen load and regional dissolved inorganic nitrogen load, 41% of the particulate phosphorous and filterable reactive phosphorous loads and 53% of the regional suspended sediment load.

Urban and other intensive uses (includes horticulture which is less than 1% of the land area) account for just over 10% of the regional particulate nitrogen load and 4% of the regional dissolved inorganic nitrogen load. Point sources such as sewage treatment plants may be significant to local management areas (Folkers et al, 2014).

In 2018, the Reef 2050 Water Quality Improvement Plan (WQIP) developed new catchment based water quality targets across all of the GBR catchments. For the Mackay Whitsunday region, this

involves four catchment areas (Figure 7), which have previously been referred to as basins by regional stakeholders. The new targets and priorities for each have been summarised in Table 7.

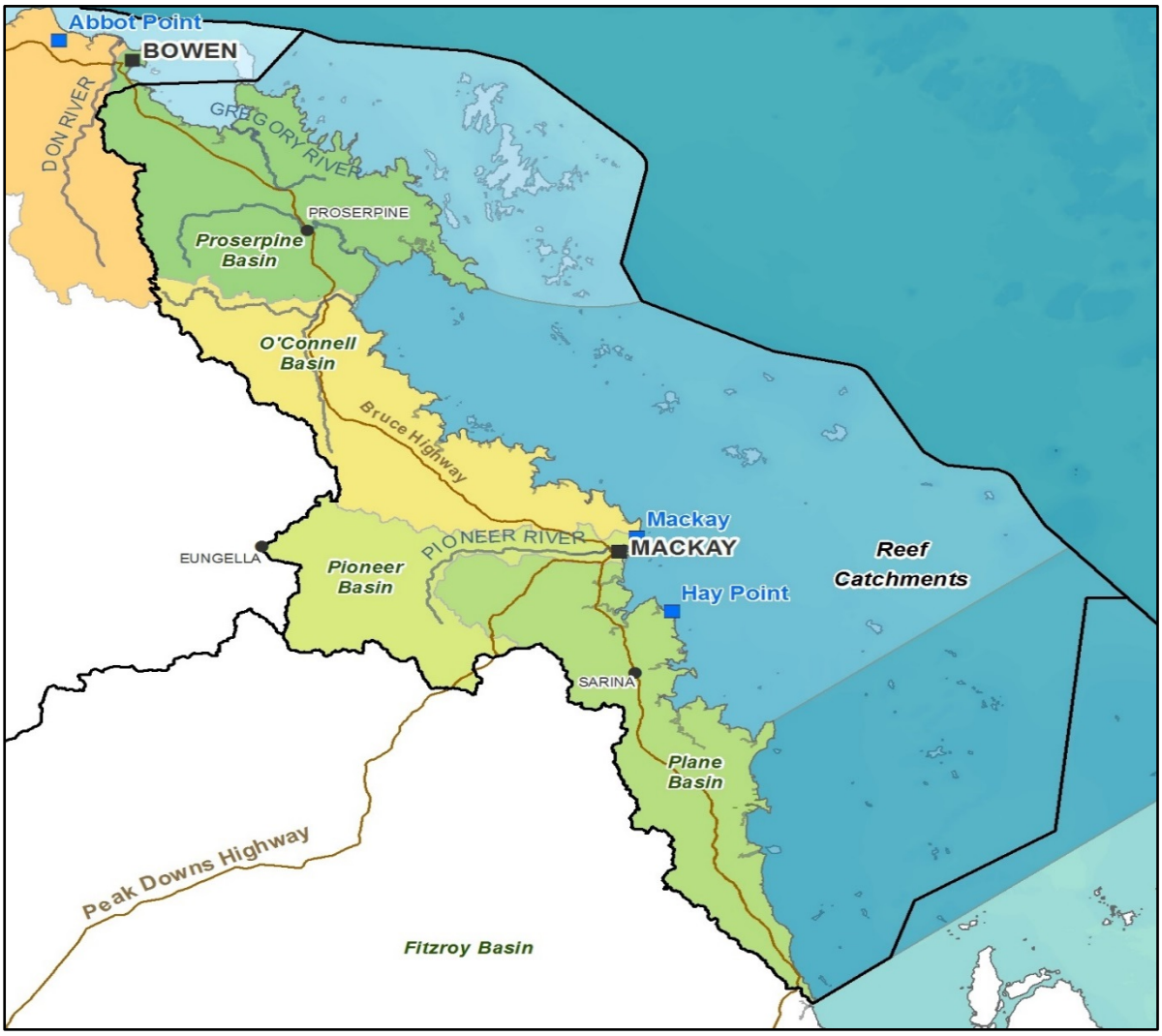


Figure 6. Mackay Whitsunday Basins / Catchments

Source: Healthy Rivers to Reef Partnership Mackay-Whitsunday website, 2018

There are individual Reef Plan factsheets that describe land use areas as a proportion of the catchment area and end-of-catchment 2025 water quality targets and priorities for the four Mackay-Whitsunday region catchment areas – Proserpine, O'Connell, Pioneer and Plane. These are attached in Appendix 1.

These factsheets show that dissolved inorganic nitrogen (DIN) loads are at least a moderate priority issue in each of the catchment areas and high priority in the Plane catchment. The majority of the anthropogenic DIN comes from sugarcane farming areas, with some from sewage treatment plants and urban centres. The Plane catchment is also an area where improved pesticide management is a very high priority, with the Pioneer being a high priority. Again, sugarcane growing areas are the primary source for the pesticides being targeted. Fine sediment and particulate nutrients are a low priority issue across most of the catchments except in the O'Connell where it is a moderate priority. Anthropogenic fine sediment exports have been identified to originate from grazing and sugar growing areas and through streambank erosion. The factsheets show that for the Mackay Whitsunday region it has been determined that the fine sediment exports are related more to soil loss from hillslopes (paddocks) than streambanks and gullies.

Table 7 shows how the Reef 2050 WQIP catchments relate to the Mackay Whitsunday WQIP 33 sub-catchments (Figure 8) which are used by regional agricultural and NRM stakeholders for project planning and have been used when developing priority locations as part of the Mackay Whitsunday Regional Extension Plan.

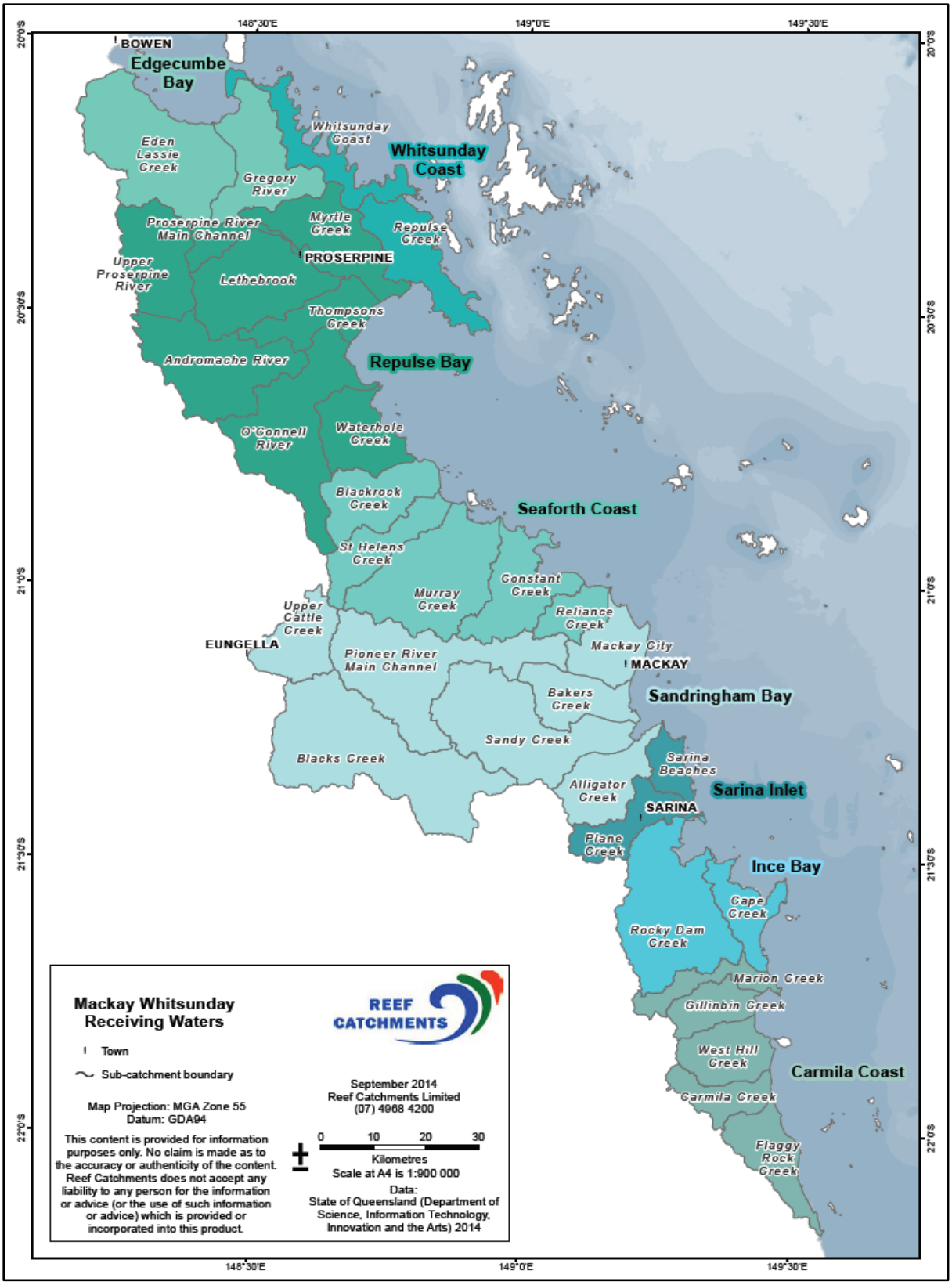


Figure 7. Mackay Whitsunday WQIP sub-catchments and receiving waters Source: Mackay Whitsunday WQIP 2014-2021

Table 7. *Reef 2050 WQIP Mackay Whitsunday Region 2025 Water Quality Targets (End of catchment anthropogenic % and tonne load reductions required from 2013 baseline load of each pollutant)*

Reef 2050 WQIP Catchment (Basin)	Mackay Whitsunday WQIP 2014-2021 Sub-catchments	Dissolved Inorganic Nitrogen (DIN)	Fine Sediment	Particulate Phosphorous (PP)	Particulate Nitrogen (PN)	Pesticides – To protect at least 99% of aquatic species at the end of catchment
Proserpine	Eden Lassie Creek, Gregory River, Whitsunday Coast, Repulse Creek, Myrtle Creek, Proserpine River Main Channel, Upper Proserpine River, Lethebrook, Thompson Creek	70% 110 tonnes	Maintain current load	Maintain current load	Maintain current load	
O'Connell	Andromache River, O'Connell River, Waterhole Creek, Blackrock Creek, St Helens Creek, Murray Creek, Constant Creek, Reliance Creek	70% 130 tonnes	40% 96 k-tonnes	40% 120 tonnes	40% 250 tonnes	
Pioneer	Mackay City, Pioneer River Main Channel, Upper Cattle Creek, Blacks Creek	70% 140 tonnes	20% 35 k-tonnes	20% 23 tonnes	20% 61 tonnes	
Plane	Bakers Creek, Sandy Creek, Alligator Creek, Sarina Beaches, Plane Creek, Cape Creek, Rocky Dam Creek, Marion Creek, Gillibin Creek, West Hill Creek, Carmila Creek, Flaggy Rock Creek	70% 260 tonnes	Maintain current load	Maintain current load	Maintain current load	

Reef 2050 WQIP Water Quality Relative Priority

- Very High
- High
- Moderate
- Low
- Minimal
- Not assessed

5. Extension Providers, Networks and Projects

5.1 Extension Providers

In the Mackay Whitsunday region there are number of different organisations (with varying numbers of staff) that provide extension and advisory services to the cane and grazing industries. Table 8 provides an overview of the services provided by these organisations. The relevant staff are listed in Appendix 2: Reef Personnel – Mackay Whitsundays, which includes name, position title, organisation, industry and Reef Plan basins they work in. This list does not include all staff that work for resellers such as Northern Agriservices, Farm HQ (Sarina), Rogers Rural (Proserpine), Mt Ossa Rural, Landmark, Elders or NQ Farmshed, even though it is recognised that they have an important role in communicating and working with growers and graziers. The Regional Extension Coordinator will continue to keep this list updated to inform regional networks of who the current staff/roles are and will aim to try and include more reseller's information in future versions if possible.

Table 8. *Mackay Whitsunday Cane and Grazing Extension Providers*

Organisation	Applied Research /Trials	Management Practice Adoption	Farm Planning and Inputs	Project Administration / Funding	Data Management	Water Quality Monitoring	Pest and Weed Management	Resources and Reports
Sugar Services Proserpine (SSP)	X	X	X		X		X	X
Mackay Area Productivity Services (MAPS)	X	X	X		X		X	X
Plane Creek Productivity Services Limited (PCPSL)	X	X	X		X		X	X
Sugar Research Australia (SRA)	X	X		X				X
Farmacist	X	X	X	X	X	X	X	X
Department of Agriculture and Fisheries (DAF) - Cane	X							X
Reef Catchments – Cane		X		X	X			X
Canegrowers Mackay		X		X				X
Proserpine Canegrowers		X		X				X

Organisation	**Applied Research /Trials**	**Management Practice Adoption**	**Farm Planning and Inputs**	**Project Administration / Funding**	**Data Management**	**Water Quality Monitoring**	**Pest and Weed Management**	**Resources and Reports**
Mackay Sugar					X			X
Wilmar (Proserpine and Plane Creek Mills)					X			X
Catchment Solutions				X		X		X
Healthy Rivers to Reef Partnership				X		X		X
Whitsunday Landcare							X	
Pioneer Landcare							X	
Sarina Landcare							X	
Regional Agriculture Landcare Facilitator – grazing, cane		X		X				X
Department of Agriculture and Fisheries – Grazing	X							X
Reef Catchments - Grazing	X	X	X	X	X		X	X

While it appears there is a large number of people who work with and support both industries, including local growers and graziers, not all of these roles will focus on issues that are directly related to improving water quality leaving farms and entering the GBR lagoon. To help identify what level of support there is for reef related activities, the Regional Extension Coordinator worked with regional stakeholders to identify the number of Full Time Equivalents (FTEs) working in the different sub-catchments in Mackay Whitsunday against specific roles in the region. This was part of the process in developing Extension and Education (E&E) Spatial Layers to support communication and prioritisation activities and will be updated annually by the Regional Extension Coordinator. Table 9 shows this information at the GBR catchment level for a number of specific roles as at June 2018.

Table 9. *Mackay Whitsunday Cane and Grazing FTE's by GBR Catchment as at June 2018*

Catchment / Basin	Prod Service Staff	Cane Extension Staff	Cane RWQG Staff	Cane BMP Staff	Total Cane FTE	Grazing Extension Staff	Grazing RWQG Staff	Grazing BMP Staff	Total Grazing FTE
Proserpine	0.78	1.22	1.05	0.47	3.52	0.15	0.26	0.00	0.41
O'Connell	2.10	1.75	1.35	0.82	6.01	0.15	0.26	0.02	0.43
Pioneer	2.32	2.00	0.86	0.38	5.55	0.09	0.14	0.02	0.24
Plane	4.51	4.48	2.29	0.68	11.95	0.21	0.35	0.06	0.62
Total	9.70	9.45	5.54	2.34	27.04	0.60	1.00	0.10	1.70

Prod Service Staff – industry (levies, mills) funded roles that interact regularly with a large number of growers across a range of farm issues and activities. This is often not directly reef related.

Cane Extension Staff – mix of industry, private and government funded roles that interact with a smaller group of growers on applied research / trials across a range of issues and extend this information to the wider industry. This may be directly reef related in some instances.

Cane RWQG (Reef Water Quality Grants) Staff – federal government funded roles through Reef Trust Phase 3 that interact specifically with growers to improve nutrient and pesticide management on farm including incentive support.

Cane BMP Staff – state government funded roles that interact with growers to support them going through the Smartcane BMP program including the accreditation process.

Grazing Extension Staff – state and federal government funded roles that interact with a smaller group of graziers on applied research / demonstration trials and extend this information to the wider industry. This has been directly reef related in most instances.

Grazing RWQG Staff - state and federal government funded roles that interact specifically with graziers to improve riparian and land management practices including incentive support.

Grazing BMP Staff – state government funded role that interacts with graziers going through the Grazing BMP program. The Mackay Whitsunday region does not formally have the Grazing BMP program operating but the DAF Grazing BMP Officer based in Mackay provides some limited support to the region around workshops, meetings etc.

5.2 Mackay Whitsunday Extension Networks

In the Mackay Whitsunday region there are a number of existing working groups and networks that have been active over the last 10 years that connect the extension providers and support project work to encourage landowners to adopt farm practices to reduce contaminant runoff and achieve water quality targets. This includes both the Cane and Grazing Regional Working Groups that were established at the start of Reef Rescue 1 in 2008 and are still functioning in 2018 to support the delivery of programs such as Reef Trust Phase 3. At any one time there are also a number of temporary groups (steering committee's etc.) and networks that are established around specific short-term (often 2-3 years) projects that are being implemented in the region. The diagram in Appendix 3: Mackay Whitsunday Stakeholder Groups / Networks is a snapshot as at July 2018 of the different funding sources / projects and working groups / steering committees that will be operating in the region in the 18/19 financial year and the partners / organisations that are directly involved. This includes the different groups that the Regional Extension Coordinator currently participates in. The different coloured arrows between them aims to highlight how well they are interacting and communicating with each other.

While the stakeholder network diagram in Appendix 3 shows how complicated the extension network in the region is, it also shows that components are well connected regionally, with some connected to programs that are GBR wide. It is important that these regional and cross-regional connections continue to be supported and maintained and that projects are rolled out in a coordinated manner. There are other collaborations that have been initiated or improved through the Regional Extension Coordinator role, including supporting the Cane and Grazing Regional Extension Working Groups at a local level and the Pesticide Working Group at the GBR wide level. This support will continue to be a key priority for the Regional Extension Coordinator, while also facilitating some of the connections that have been identified as needing to be established or improved, particularly with some of the new initiatives such as the Sugar Regional Adoption Strategy being led by SRA. The Regional Extension Coordinator is working collaboratively with the SRA Regional Coordinator and Cane Regional Working Groups to develop regional priorities and associated project proposals to service sugar cane growers and assist them to adopt improved land practices in the region. This includes coordinating which projects are submitted to the SRA Industry Adoption Advisory Committee for consideration for funding and which are proposed for funding through other funding avenues.

5.3 Landholder Engagement Projects

The networking diagram (Appendix 3) shows the variety of projects (reef water quality, extension, industry) that are currently operating in the Mackay Whitsunday region. To help provide some more detail to regional stakeholders on these, the Regional Extension Coordinator updates annually a Landholder Engagement Project List focusing on government funded programs that relate directly to reef water quality. The current version covers the 18/19 and 19/20 financial years and has been attached as Appendix 4: Landholder Engagement Project List – Mackay Whitsundays as at July 2019. Some projects are part of GBR wide programs (Reef Trust Phase 3 and 4 projects, Smartcane BMP, Reef Regulations), some cover the whole Mackay Whitsunday region (Healthy Rivers to Reef Partnership, RP161 Nutrient Management Planning), while others are only delivered in targeted sub-catchments (Sandy Creek Grower Water Quality Monitoring, Janes Creek Whole of System repair, Myrtle Creek Grower Project). This list is used to help drive discussion around what are the current

pathways for landholders to get support around management practice adoption, which ones are more successful, locations that are being missed out and priority ones to be continued or expanded.

The list does not include a range of activities, events and programs that are delivered locally by industry and extension service providers that may or may not be directly related to farming issues and practices that influence water quality entering the reef. For example:

Cane

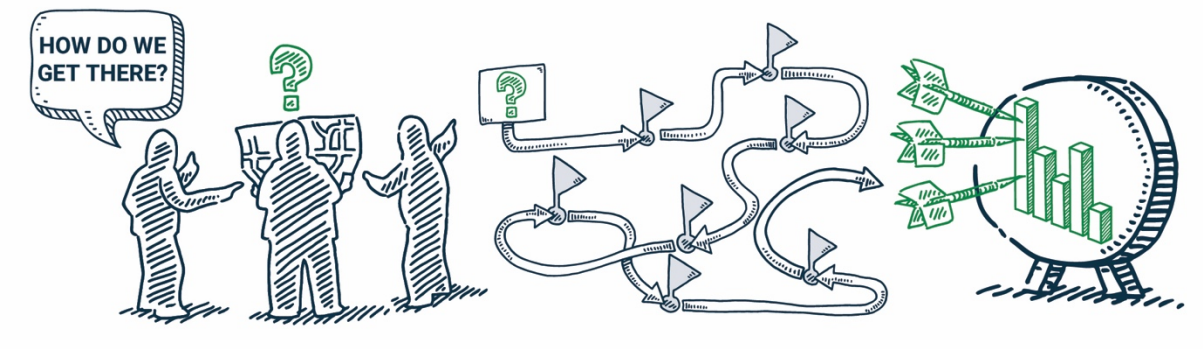
- Industry and agribusiness shed meetings,
- MAPS Field Day,
- MAPS Trial Info Day,
- Central Queensland Soil Health Systems field days,
- Variety Observation Plots,
- Industry trials and demonstrations (e.g. Harvesting BMP)

Grazing

- Mackay Whitsunday Grazing Forum and associated field days,
- Healthy Soils Symposium,
- Innovative Grazing Network,
- High Steaks Workshops

However, most of the projects listed above were included in the situation analysis and prioritisation component of the Regional Extension Plan and have been included in the regional summary tables found in Appendix 5 and 6.

Figure 8. Sandy Creek Sub-Catchment has been the focus of a number of projects Source: Phil Deguara, Cane farmer



6. Situation Analysis

The purpose of this Situation Analysis is to assimilate the information on water quality priorities and targets and identify how current networks, programs, activities and effort are already working toward achieving these targets in the Mackay Whitsunday region and are there areas (new locations, new activities etc.) for improvement. It will inform the prioritisation of project work supported through this REP and used in the decision-making processes to allocate funding and other resources to address regional water quality priorities. This includes strategically investing Flexible, Peer-to-Peer and Personnel and Expertise funds to more efficiently targeted delivery of agronomic extension advice and enhance and value-add to current effort.

When discussing the existing networks and resources with regional stakeholders, it did highlight that there are a high number of existing industry and project based working groups, advisory staff and regional projects operating in the region that landholders can participate in. It was identified though that there was a gap around a formal process for regional extension staff to come together and improve communication, cooperation, coordination and collaboration around extension activities and programs focusing on management practice adoption. To address this need, the Regional Extension Coordinator began a process in late 2017 of establishing Cane and Grazing Regional Extension Working Groups and inviting relevant providers to participate. One of the first activities was to develop draft Terms of Reference for both groups and these will be reviewed during the 19/20 financial year by the working groups so they can be updated and all participants provide a commitment to the objectives in them.

The objective of the two groups is to enhance cane and grazing related extension resources and capacity to support improved productivity, profitability and environmental performance for the regional industries. Based on this objective, the groups comprise of organisations and agencies involved directly in sugar and grazing industry related extension in the central, or Mackay Whitsunday region.

<u>Mackay Whitsunday Cane Regional Extension Working Group members:</u>

- Mackay Area Productivity Services (MAPS)
- Plane Creek Productivity Services (PCPSL)
- Sugar Services Proserpine (SSP)
- Sugar Research Australia
- Department of Agriculture and Fisheries (DAF)
- Reef Catchments - sugar related programs (RC)

- Smartcane BMP - Canegrowers
- Farmacist
- Mackay Sugar

Mackay Whitsunday Grazing Regional Extension Working Group members:

- Department of Agriculture and Fisheries (DAF)
- Reef Catchments - grazing related programs (RC)

Both groups have very similar actions in supporting their objective and so provide opportunities and benefits for all participating members.

- Promoting existing and upcoming cane and grazing extension related activities amongst networks / contacts
- Sharing of information, ideas and learnings from past / current projects and activities relating to extension / practice adoption
- Access to training (extension and technical) opportunities / support and regional funding (Flexible and Peer to Peer funding) pools.
- Avoiding duplication of extension effort and landholder engagement (includes surveys) to ensure any new projects value add to the region
- Collaboration between members in developing extension or practice change projects around the gaps and opportunities identified within the Regional Extension Plan
- Identification and awareness of possible funding sources to implement projects such as through Reef Taskforce or GBR Foundation.

Both Regional Extension Working Groups were directly involved in the identification of local issues, challenges, barriers, risks, gaps and opportunities around extension activities and the P2R water quality risk frameworks (Appendix 5 and 6) that could help improve management practice adoption. To support this process, the Mackay Whitsunday Regional Extension Coordinator utilised the Extension and Education (E&E) Mackay Whitsunday Sub-catchment Spatial Layers that had been developed by DAF. These layers help to visually represent collated stakeholder data around water quality reduction targets, extension effort (in terms of FTE's), BMP and grant uptake, trials (number and focus) and workshop attendance (number and focus) for both cane and grazing since July 2013. A similar approach was followed by both working groups, but there were very different outcomes when it came to prioritising locations and identifying gaps and opportunities.

6.1 Regional Prioritisation Process

The base data layer used for the regional prioritisation process was the 33 sub-catchments identified in the Mackay Whitsunday WQIP 2014-2021. The first stage involved reviewing the water quality reduction targets for the different pollutants from the regional WQIP. For cane the priority was on Pesticide, Nitrogen (DIN and PN) and Particulate Phosphorous (PP) reduction. For grazing it was Suspended Sediment (TSS) and Particulate Nitrogen reduction. Based on the current load and level of reduction required, these sub-catchments were prioritised by the Regional Extension Working Groups as Very High, High, Moderate, Low and Very Low. This was then compared to the Reef 2050 WQIP Water Quality Targets for the four catchment areas and the original prioritisation modified to reflect these GBR wide priorities. Some of the sub-catchments in the Plane catchment area shifted

up a level of priority through this process and following further discussion with the cane working group. This was also the case for some of the sub-catchments in the O'Connell catchment area following discussions with the grazing working group. Water Quality targets were considered to be the main driver prioritising locations, but the working groups also considered other information such as uptake (grants, BMP) and effort (FTEs, trials, workshops, field days etc.) to identify trends or issues that could influence any change in the priority rankings.

Working group members used a similar ranking process (Very High to Very Low) to that used for the water quality targets to allocate a score for maintaining or increasing uptake and effort in the individual sub-catchments. These scores were collated to give an overall relative ranking for all the sub-catchments and compared to the original scores for water quality. The working group subsequently modified the prioritisation ranking in a few sub-catchments where it was identified as being High to Very High priority for maintaining or increasing uptake and effort. The working groups also identified the targeted effort recommended for individual sub-catchments with regards to numbers and focus of trials and workshops (this is expanded on further in Section 5 on Gaps and Opportunities). Working group members were given the opportunity to review the final proposed prioritisation rankings and further investigate any of the results that they did not agree with. This final step helped identify a couple of sub-catchments where working group members felt it was important to maintain momentum in current activities. The outcome of the Regional Extension Working Group sub-catchment prioritisation process are shown in Table 10.

Table 10. *Regional Extension Working Group Sub-catchment Prioritisation results*

Priority	Cane Sub-catchments	Grazing Sub-catchments
Very High	Myrtle Creek, Murray Creek, Pioneer River Main Channel, Sandy Creek and Rocky Dam Creek.	Eden Lassie Creek, Andromache River, O'Connell River, Pioneer River Main Channel, Blacks Creek and West Hill Creek
High	Lethebrook, O'Connell River, Blackrock Creek, Mackay City, Bakers Creek and Alligator Creek.	Myrtle Creek, Bakers Creek, Sandy Creek, Rocky Dam Creek and Marion Creek
Moderate	Proserpine River Main Channel, Constant Creek, Reliance Creek, Plane Creek, Marion Creek and West Hill Creek.	Waterhole Creek, Blackrock Creek, Murray Creek, Alligator Creek, Sarina Beaches and Flaggy Rock Creek
Low	Gregory River, Thompsons Creek, Andromache River, St Helens Creek, Upper Cattle Creek, Sarina Beaches, Carmilla Creek and Flaggy Rock Creek.	Gregory River, Upper Proserpine River, Lethebrook, Thompsons Creek, Reliance Creek, Gillinbin Creek and Carmilla Creek.
Very Low	Eden Lassie Creek, Whitsunday Coast, Waterhole Creek and Gillinbin Creek.	Whitsunday Coast, Proserpine River Main Channel, Repulse Creek, St Helens Creek, Constant Creek, Mackay City, Upper Cattle Creek, Plane Creek and Cape Creek

The details of the decisions for the final sub-catchment prioritisation results are provided in Appendix 7 for cane and in Appendix 8 for grazing. These tables include other information specific to the sub-catchment such as their area (hectares), the % area of each landuse within the sub-catchments and the relevant existing and future projects. This also includes information on key

issues, challenges, barriers and risks which are expanded on in Table 11. These will be further investigated with the Regional Extension Working Groups so the Regional Extension Plan can target activities at the sub-catchment scale. In addition input will be sought through the Sugar Industry Adoption Strategy being managed by SRA and also from the Human Dimension working group (part of networking diagram in Appendix 3) and projects they are working with in the region such as Sandy Creek Grower Water Quality Monitoring.

Table 11. *Regional Extension Plan Issues, Challenges, Barriers and Risks*

Issues	• Sub-catchment specific targeted pollutants – DIN, PN, PP, FRP, TSS, Pesticides • Required reduction priority – Very High, High, Moderate, Low, Very Low • Legacy of some historical practices
Challenges	• Location of catchment load monitoring sites • Targeting existing and new programs to bigger farms • Making the most out of trials / demonstrations that are in place and have resources already committed • Making workshops / field days more effective • Making workshops / field days relevant to coastal systems and smaller farms • Reduction in regional funding, particularly for grazing • **Industry Challenges** - Reef/water quality issues - Other Issues (environmental, animal welfare etc.) - Social Expectations / Licence to Farm - Soil Health Issues - Commodity prices - Cost of Inputs - Farm profitability - Succession planning with an ageing demographic • **Identifying regional trends in motivation for change** - Financial reasons - Social/family reasons or time/work - Weather/climate - Reef related funding / programs such as Smartcane BMP - To improve water quality - Local extension providers – trust, reliability - Resellers/consultant advice - Other growers / graziers - Read on the internet - Read in industry publication - Reef Regulations
Barriers	• Industry Capacity – to expand trials / demonstrations would need to pay for salaries, expenses etc. due to existing commitments • Funding timelines – to implement trials / demonstrations extension providers need 3-4 years of guaranteed funding / support. • Funding scope / amount – the need to have multiple trials / demonstrations to be able to cover off on different soil types and management practices so it can be relevant to more growers. • Uptake of previous programs – ineligible to participate in new ones

	• **Identifying the relevant barriers to growers / graziers within priority sub-catchments participating in existing programs and /or adopting new management practices** - Other priority issues impacting on their farm - Lack of funds (maintaining or adopting new management practices) - Lack of time (too busy to consider options or make a change, crop cycle stage doesn't allow implementation etc.) - Family or social restrictions/reasons - Seasonal issues/ weather - Need more information or skills - Need for more information on economic costs and/benefits of change - Lack of assistance, support or contractors available - No further scope for management improvement
Risks	• Communicating why certain locations or farms are not a priority • Missed opportunities to work with key grower and grazier champions of change

The key issues, challenges, barriers and risks are described in terms of gaps and opportunities in Section 5, developed following workshopping these with the Regional Extension Working Groups and identifying actions or activities that are needed to address them in the priority locations.

7. Regional Gaps and Opportunities around Extension

The situation analysis and regional prioritisation process provided the Regional Extension Working Group with a platform to identify gaps and opportunities to support extension services in the Mackay Whitsunday region to improve grower uptake of better management practices. All working group members were provided with a template to record what they considered were the priority actions and activities to enhance service delivery to growers and encourage collaborations with other industry service providers on reef related issues. These were collated and presented at a follow-up meeting and developed into a draft list of actions and activities. This draft list was distributed to all Regional Extension Working Group members, and some other regional stakeholders, to provide additional feedback. The Regional Extension Coordinator incorporated feedback to finalise these actions and activities to use to inform the Mackay Whitsunday Regional Extension Plan over the next few years. These actions and activities are described in Section 5.3 below.

The templates that were used for this process have been converted into summary tables which include information on Location; Priority; Key Issues / Challenges / Barriers / Risks; Existing / Future Programs; Trials / Workshops / Field Days; and Gaps / Opportunities and included in Appendix 7 for cane and Appendix 8 for grazing.

7.1 Priority Locations

The Regional Extension Plan sets out which are the Very High and High priority sub-catchments for the cane and grazing industries to focus on with regards to helping to improve water quality leaving farms and reaching the GBR (Table 10). While there will be activities happening in the other sub-catchment areas, there is justification in targeting the Very High and High priority areas to supporting improved communication, cooperation, coordination and collaboration around extension and associated activities such as trials, water quality monitoring or field days for the following reasons:

- These areas have a high % of land use under cane or grazing and so have a higher % of the regional growers / graziers numbers within them. This will maximise the impact of activities and follow-on uptake.
- These areas require a larger water quality reduction to help meet the objectives of both the Reef 2050 WQIP and the local Mackay Whitsunday WQIP.
- There is a greater potential for broad-scale practice change and subsequently measureable water quality improvements at a sub-catchment scale.
- The majority of catchment load monitoring sites are located within these priority areas so there is an active water quality monitoring program to link back to extension activities and landholder uptake.
- These areas have numerous examples of where growers / graziers have successfully been involved in past and current programs so can help in developing case studies or hosting field days.
- There are already existing projects and extension effort going into these priority areas and it is critical to value add to this effort and to maintain this momentum.

When considering all of the pollutant types, there are a number of sub-catchments that are identified as a Very High or High priority for both cane and grazing: Myrtle Creek (Proserpine

Catchment), O'Connell River (O'Connell Catchment), Pioneer River Main Channel (Pioneer Catchment), Bakers Creek, Sandy Creek and Rocky Dam Creek (3 in Plane Catchment). These could be an opportunity to focus on a range of activities across different industries to take a whole of catchment approach.

7.2 Level of Effort

As part of the process for identifying gaps and opportunities, the Regional Extension Working Groups proposed three levels of effort, in terms of the number of trials, workshops or field days linked to water quality to occur within the sub-catchments per year. This again forms part of the summary tables in Appendix 7 and 8 and includes the current level as at June 2019 and the targeted level to be achieved into the future. For grazing, this really only identified what the priority was for a specific sub-catchment rather than the level of effort expected as well. For cane, the Regional Extension Working Group identified what the minimum level of effort required was for the different rankings and these are listed in Table 12. The aim of this was to not only help to identify where and what extra effort is required, but also where effort is possibly becoming saturated, duplicated or not achieving the desired outcomes, and so putting in more trials or having more workshops is unlikely to have an added benefit.

Table 12. *Targeted level of effort required to support extension / management practice adoption for water quality improvements in priority cane sub-catchments*

	Cane	
Level of Effort	**Minimum target of Trials** (Productivity / Economics / Water Quality)	**Minimum target of Events** (Workshops / Shed Meetings / Field Days)
High	• 4 trials on nutrients • 4 trials on chemicals	• 4 events around trials • 2 collaborative events focusing on existing programs / trials
Moderate	• 2 trials on nutrients • 2 trials on chemicals	• 2 events around trials. • 1 collaborative event focusing on existing programs / trials
Low	• 1 trial on nutrients • 1 trial on chemicals	• 1 event around trials.

The P2R Sugarcane and Grazing Water Quality Risk Frameworks 2017 - 2022 (Appendix 5 and 6) have been used to help define what are the key practices (or groups of practices) needing to be adopted to help achieve the Reef 2050 WQIP water quality targets. Input from regional stakeholders helped identify key components or gaps relating to these practices at a regional level and inform what any new trials, workshops or field days should focus on. GBR Report Cards inform stakeholders of the current level of adoption relating to these practices and is one way for the region to track how it is progressing towards targets.

7.3 Level of Adoption

In the first version of the Regional Extension Plan, there was limited data with high confidence on the current levels of management practice adoption and progress towards water quality targets at the Mackay Whitsunday regional or basin level. With the release of the 2018 GBR wide Reef Report Card, this is now available and summarised in this section. While it did not change the sub-catchment priorities, it did provide extra information to be included in the summary tables (Appendix 7 and 8) that needs to be utilised in identifying priority gaps and future opportunities from 2020 onwards.

The tables have been set out to show how the scale and detail of the management practice adoption has improved over time and the level that is available now. Table 13 is more representative of how information was presented previously and shows the level of adoption of what were termed BMP practices as a % and in hectare's or km's. These are the moderate to low and low risk practices outlined in the Water Quality Risk Frameworks in Appendix 5 and 6. This is now at the basin level as well where previously was only at the GBR wide and Mackay regional level. Table 14 shows how these figures can be broken up further to show the difference between the practice levels again at the basin scale. Table 15 goes a step further, breaks it up into the specific practices that make up the different risk levels at the basin scale, and is much more useful and relevant to use in any situation analysis.

Table 13. *2016 – 2018 progress towards Reef 2050 WQIP Land Management / Catchment Management Targets*

	Sugarcane 2016 BMP Adoption of 90% Low to Very Low Risk Practices	**Sugarcane 2018 BMP Adoption of 90% Low to Very Low Risk Practices**	**Grazing 2016 BMP Adoption of 90% Low to Very Low Risk Practices**	**Grazing 2018 BMP Adoption of 90% Low to Very Low Risk Practices**	**Ground Cover 2018 90% with >70%**	**Riparian Extent 2018 No net loss**	**Wetland Extent 2018 No net loss**
GBR Wide	9.3% Soil = 1.6% Nutrients = 15.6% Pesticides = 10.8%	9.8% (↑ **0.5%**) Soil = 1.9% or 9,732 ha Nutrients = 16.4 % or 92,859 ha Pesticides = 11.2% or 58,338 ha	35.3% Pastures = 29.8% Streambanks = 51.6% Gullies = 24.6%	35.8% (↑ **0.5%**) Pastures = 31.1% or 11,227,695 ha Streambanks = 51.7% or 650,798 km Gullies = 24.7% or 8,908,132 ha	63%	0.74% Loss	<0.1% loss
Mackay Region	4.8% Soil = 2.3% Nutrients = 7.0% Pesticides = 5.1%	5.1% (↑0.3**%**) Soil = 2.3% or 3,551 ha	31.7% Pastures = 39.2% Streambanks = 18.2%	32.5% (↑0.8 **%**) Pastures = 41.5% or 143,806 ha	93% (90% Target Met)	0.61% loss (1,027 ha)	<0.1% loss (3 ha)

	Sugarcane 2016 BMP Adoption of 90% Low to Very Low Risk Practices	Sugarcane 2018 BMP Adoption of 90% Low to Very Low Risk Practices	Grazing 2016 BMP Adoption of 90% Low to Very Low Risk Practices	Grazing 2018 BMP Adoption of 90% Low to Very Low Risk Practices	Ground Cover 2018 90% with >70%	Riparian Extent 2018 No net loss	Wetland Extent 2018 No net loss
		Nutrients = 7.1% or 10,874 ha Pesticides = 6% or 9,091 ha	Gullies = 37.6%	Streambanks = 18.3% or 7,004 km Gullies = 37.6% or 130,210 ha			
Proserpine	Soil = 0.9% Nutrients = 7.9% Pesticides = 0.8%	Soil = 0.9% or 232ha Nutrients = 7.9% or 1,939 ha Pesticides = 0.8% or 201 ha	Pastures = 38.6% Streambanks = 18.2% Gullies = 37.4%	Pastures = 38.6% or 48,876 ha Streambanks = 18.2% or 1,752 km Gullies = 37.4% or 47,423 ha	90% Target Met		
O'Connell	Soil = 1.4% Nutrients = 9.8% Pesticides = 5.0%	Soil = 1.4% or 426ha Nutrients = 9.8% or 2,986 ha Pesticides = 7.1% or 2,183 ha	Pastures = 39% Streambanks = 18.2% Gullies = 37.6%	Pastures = 39.8% or 44,537 ha Streambanks = 18.3% or 2,137 km Gullies = 37.6% or 42,121 ha	90% Target Met		
Pioneer	Soil = 1.3% Nutrients = 5.5% Pesticides = 4.2%	Soil = 1.3% or 403 ha Nutrients = 6.0% or 2,074 ha Pesticides = 4.2% or 1,364 ha	Pastures = 38.4% Streambanks = 18.1% Gullies = 37.6%	Pastures = 55.4% or 23,533 ha Streambanks = 18.1% or 1,314 km Gullies = 37.6% or 15,976 ha	90% Target Met		
Plane	Soil = 3.8% Nutrients = 6.2% Pesticides = 7.3%	Soil = 3.8% or 2,490 ha Nutrients = 6.2% or 4,015 ha Pesticides = 8.2% or 5,343 ha	Pastures = 40.7% Streambanks = 18.4% Gullies = 37.4%	Pastures = 40.7% or 26,499 ha Streambanks = 18.5% or 1,802 km Gullies = 37.4% or 24,328 ha	90% Target Met		

Table 14. *2018 level of adoption of sugarcane moderate to low and low risk practices and the change from 2016 by Mackay Whitsunday basins.*

Sugarcane 2016 – 2018	Proserpine Basin Report Card 2017 / 2018	O'Connell Basin Report Card 2017 / 2018	Pioneer Basin Report Card 2017 / 2018	Plane Basin Report Card 2017 / 2018
Soil				
Low Risk	0.0%	0.0%	0.0%	0.0%
Moderate – Low Risk	0.9%	1.4%	1.3%	3.8%
Nutrient				
Low Risk	4.9%	7.5%	4.2%	3.8%
Moderate – Low Risk	3.0%	2.3%	1.8% (↑0.6 **%**)	2.4%
Pesticide				
Low Risk	0.0%	0.0%	0.0%	0.0%
Moderate – Low Risk	0.8%	7.1% (↑2.1 **%**)	4.2%	8.2% (↑0.9 **%**)

Table 15. *2018 adoption of specific sugarcane moderate to low + low risk practices and the change from 2016 by Mackay Whitsunday basins.*

Adoption levels of sugarcane key practices from 2016 - 2018	Proserpine Basin	O'Connell Basin	Pioneer Basin	Plane Basin
S: GCTB	100%	100%	100%	98%
S: Machinery Traffic	4%	4%	5%	19.6% (↑0.6 **%**)
S: Fallow Management	10%	25%	17%	16.4% (↑0.4 **%**)
S: Planting preparation	10%	5%	10%	5.3% (↑0.3 **%**)
N: Nitrogen surplus	11.8%	15.2%	9.1% (↑0.5 **%**)	10.2%
N: Phosphorous surplus	6.9%	26%	25%	22%
N: Mud rate	30%	42%	35%	43%
P: Pesticide in plant cane	1%	2.1% (↑2.1 **%**)	9%	9% (↑1 **%**)
P: Pesticide in ratoons	1%	8%	9%	12%
P: Use of residuals	11%	20%	1.9% (↓0.1 **%**)	6.6% (↑0.6 **%**)
P: Pesticide selection	53%	53%	22%	53%
P: Cane grub pesticides	1%	1%	1%	13%

Table 16. *2018 level of adoption of grazing moderate to low and low risk practices and the change from 2016 by Mackay Whitsunday basins*

Grazing 2016 - 2018	Proserpine Report Card 2017 / 2018	O'Connell Report Card 2017 / 2018	Pioneer Report Card 2017 / 2018	Plane Report Card 2017 / 2018
Pasture				
Low Risk	8%	8%	8%	8%
Moderate – Low Risk	30.6%	31.8% (↑0.5 **%**)	47.4% (↑17 **%**)	32.7%
Streambank				
Low Risk	1.0%	1.1%	1.0%	1.2%
Moderate – Low Risk	17.2%	17.2% (↑0.1 **%**)	17.1%	17.3%
Gully				
Low Risk	0.0%	0.0%	0.0%	0.3%
Moderate – Low Risk	37.4%	37.6%	37.6%	37.1%

Source for Tables 13, 14, 15 and 16:
Agricultural Reporting Land Management Practice Adoption results, *Ground Cover Monitoring results*, *Riparian Vegetation Extent results* & *Wetland Extent results*, Reef Water Quality Report Card 2017 and 2018. Reef 2050 Water Quality Improvement Plan, Australian and Queensland Government.

The information provided in these tables can be used as support evidence in the evaluation of current effort (programs, extension etc.) in achieving management practice change on farm. It is used to determine the impact on water quality entering the GBR lagoon and the following table provides a summary of the progress towards achieving the targeted % reduction (in brackets and bolded in the column title) for each of the key pollutants. It shows the % increase from 2016 – 2018 and the current 2018 level at the GBR wide and Mackay regional levels. For the basins, it is only showing the % reduction change between 2016 and 2018. Pesticides are represented slightly different in that they are showing an actual annual calculated % of species protected based on monitoring and practice change data. This information is included in the summary tables in Appendix 7 and 8 and can help provide feedback to regional stakeholders on progress and in planning future activities or priorities.

Table 17. *2018 current progress towards Reef 2050 WQIP Water Quality Targets and changes from 2016.*

	2018 DIN % reduction (70% target)	2018 Sediment % reduction (20% target)	2018 Pesticide % species protected (99% target)	2018 PN % reduction (20% target)	2018 PP % reduction (20% target)
GBR Wide	↑ 0.3% (21.2%)	↑ 0.5% (14.4%)	97%	↑ 0.5% (13%)	↑ 0.6% (16.2%)
Mackay Region	0.0% (26.8%)	↑ 0.7% (12.5%)	81%	↑ 0.5% (12.9%)	↑ 0.5% (14.9%)
Proserpine	0.0%	↑0.5%	91%	↑0.2%	↑0.1%
O'Connell	↑0.1%	↑0.7%	84%	↑0.6%	↑0.6%
Pioneer	↑0.1%	↑0.7%	76%	↑0.7%	↑0.8%
Plane	0.0%	↑0.6%	74%	↑0.3%	↑0.2%

Source: *Catchment Loads Modelling results* & *Pesticide Risk Baseline results*, Reef Water Quality Report Card 2017 and 2018. Reef 2050 Water Quality Improvement Plan, Australian and Queensland Government.

7.4 Actions and Activities

The following tables (Table 18 and 19) describe the actions and activities identified in the process outlined in the introduction to this section. This includes how it relates to reef water quality, the P2R Water Quality Risk Frameworks and an indication of the support (financial, organisational) required to implement these actions and activities and improve cooperation, coordination and collaboration around extension services to growers and graziers. Some of these can be achieved with the commitment of regional stakeholders through existing roles / positions / projects and support from the Regional Extension Coordinator. Many of them require funding resources and the development of partnerships to be successfully established and delivered. Some of these funding sources have been identified in the table and will be expanded on in Section 6 Funding Resources. There is also an opportunity for the Regional Extension Working Groups to expand these actions and activities in the future to include projects such as:

- Addressing a specific gap or barrier to adoption identified in the plan – e.g. target a specific pesticide not previously worked on; or use of an organic fertiliser or soil conditioner; or could be a geographic area with no previous shed meetings etc.
- Targeting a specific demographic e.g. young farmers, women, older farmers transitioning to retirement, recalcitrant farmers etc.
- Targeting specific on-ground management practices such as in the Reef Plan Paddock to Reef Water Quality Risk Frameworks (Appendix 5 and 6) that help identify / explain what practices are needed to reduce specific water quality risks.

Table 18. *Cane Actions / Activities from Gaps and Opportunities Analysis*

Actions / Activities	Impact on Reef Water Quality	Support Required / Available
Coordinated promotion of current / existing programs and activities to growers. Remove the risk of mixed messages going out through the industry. Could include targeting the key regional programs to the bigger growers within these sub-catchments.	Increased involvement by growers in existing programs supporting uptake of priority management practices reported through P2R. Increased skills, knowledge and confidence in growers around priority management practices. Includes consistent messaging and maximising impact with the grower's available time. Reduce the risk of dis adoption by growers in the process of implementing priority management practices. Includes issues with machinery.	Regional Extension Coordinator • Regional Working Groups • Calendar of Events – REC Regional Stakeholders • Existing positions and projects • Improved communication and knowledge transfer Flexible Funding • Cover operating expenses such as event costs or bus hire
Encourage and support growers to attend relevant meetings, workshops, field days etc. within the sub-catchment and also in neighbouring or other areas.		
Value add to group extension activities that are already occurring – expanding the information being presented and discussed through improved coordination and collaboration in delivery.		
Follow up support for growers who have been involved in previous programs like Reef Rescue, Reef Water Quality Grants and RTP3.		
Identify key grower champions that could be utilised to promote practice change from the work they have done on their farm.		
Identify the relevant barriers to sub-catchment growers participating in existing programs and /or adopting new management practices		
Identify sub-catchment trends in motivation for change		
Increase or maintain the desired number of trials and associated workshops/field days/meetings targeting improved or innovative management around the P2R Water Quality Risk Framework and *local key pollutants/issues/barriers*. • Soil Management – GCTB, Controlled Machinery, Fallow land management and Preparing land for planting • Nutrient Management – Matching N and P supply to crop requirements *(Implementing steps 5 and 6 of 6ES to refine nutrient management practice)*, Application of Mill Mud (*rates, application, timing*) • Pesticide Management – Residuals in Ratoons (*Can wet season application of the legal low rate of 450 g ai/ha diuron plus paraquat lead to exceedances*), Targeting herbicide application and timing, Pesticide selection, Managing cane grubs (*Block-scale runoff trials involving imidacloprid – rates, application*) • Irrigation Management – Timing, Volume, Minimising losses, Tailwater capture and reuse, Production indicator	Increase in locally relevant data and information around priority management practices and water quality issues. This can then be used in training and extension activities to get increased skills, knowledge and confidence in extension providers and growers. Expansion or continuation of regional projects with a proven track record in increasing skills, knowledge, confidence and	Regional Extension Coordinator • Regional Working Groups • Possible funding sources • Cross –Regional information • Reseller involvement Regional Stakeholders • Existing trials - SRA, Farmacist, Prod Boards, DAF • Existing projects - SRA, Farmacist, Prod Boards, Canegrowers, Reef Catchments

Actions / Activities	Impact on Reef Water Quality	Support Required / Available
Can include: • New trials of innovative land management practice that have high potential to impact water quality – will probably also require a water quality monitoring element to test efficacy • Follow up trials / project to verify result and add to learnings of long-term benefit • Geographic expansion of extension services (trials, workshops, field days projects etc.) to new group of landowners in priority catchments.	uptake of the priority management practices Improved cooperation, coordination and collaboration amongst extension providers to support increased skills, knowledge, confidence and uptake in growers around priority management practices. Reduction in water quality impacts from other grower farm issues / priorities. Aim is to make them more receptive to regional programs and activities that can support improved nutrient and pesticide management. Improved reporting of management practice change by growers to P2R to capture all water quality improvements.	• Future trials and projects – other funding sources • Collaboration capacity building Flexible Funding • Cover operating expenses such as trial costs, water sample analysis, expert advice, fine scale mapping / imagery etc. • Collaboration of different providers combining skills and services for a more holistic approach • Improved communication and knowledge transfer • Trial of new innovative extension methods • Continuation of a successful project to maintain momentum • Building on the findings/results of a previous project
Grower led water quality monitoring projects – establish new groups similar to Sandy Creek project.		
Provide support for other issues affecting growers to look for win: win scenarios or increase their receptiveness and ability to participate in practice change around nutrients or pesticides. • Feral pig damage and the need for a coordinated approach in key areas. Water quality issues include increased risk of sediment and particulate nutrient losses, increased risk of herbicide losses due to higher weed pressure needing to be controlled and reduction in yield meaning poorer nitrogen use efficiency in blocks that have a high yield potential. • Reduction in irrigation water usage – rising costs due to inefficient systems and increased electricity tariffs. Water quality issues include the reduction in yield meaning poorer nitrogen use efficiency and an increased risk of nutrient or pesticide losses from non-incorporation of inputs.		
Access to finer scale data – soil mapping, EM mapping, Yield Mapping, Imagery, Drones etc.		
Improved cooperation, coordination and collaboration amongst industry service providers with a focus on including resellers / agribusiness. This could include		
Use of innovative learning approaches and/or new tools and technologies to support on-farm learning.		
Improved monitoring and evaluation around extension activities and practice change. Includes supporting effective and efficient record keeping and data sharing.		

Actions / Activities	Impact on Reef Water Quality	Support Required / Available
Industry Service Provider training and capacity building – increase in skills and knowledge of regional Extension / Advisory staff. Can include extension, facilitation and industry specific technical skills. • Human dimensions – behaviour change	Improved communication and delivery of regional projects / activities by extension providers supporting increased skills, knowledge, confidence and uptake in growers around priority management practices.	Training and Development Program – DAF • Extension / Advisor Survey • Training Needs Analysis and Priorities • Regional Reports • Training Options • Delivery of Workshops / Courses / Forums Flexible Funding • Support Mackay Whitsunday specific activities
Access to Specialist Skills: 1. Soil Health 2. Irrigation Management 3. Stormwater / Drainage Management 4. Soil Conservation	Access to more accurate or up to date regional data that can support the accelerated adoption of the priority management practices. Access to experts / specialists to support increased skills, knowledge, confidence and uptake in extension providers and growers around priority management practices.	Regional Extension Coordinator • Regional Extension Plan Regional Stakeholders • Existing positions • Capacity building Flexible Funding • Support Mackay Whitsunday specific activities Specialist Skills • Access to experts / consultants • Regional roles
The establishment or increased support for Peer to Peer learning groups – could possibly link in with existing projects. Includes training and capacity building for group participants.	Increased skills, knowledge and confidence in growers around the benefits of peer to peer learning and increased support	Peer to Peer Learning Funding • Group establishment and facilitation • Capacity building

Actions / Activities	Impact on Reef Water Quality	Support Required / Available
	for adopting priority management practices.	• Trials and workshops • Cross-regional visits

Table 19. *Grazing Actions / Activities from Gaps and Opportunities Analysis*

Actions / Activities	Impact on Reef Water Quality	Support Required / Available
Coordinated promotion of current / existing programs and activities to graziers. Remove the risk of mixed messages going out through the industry. Could include targeting the key regional programs to the bigger graziers within these sub-catchments.	Increased involvement by graziers in existing programs supporting uptake of priority management practices reported through P2R. Increased skills, knowledge and confidence in graziers around priority management practices. Includes consistent messaging and maximising impact with the graziers available time Reduce the risk of dis adoption by graziers in the process of implementing priority management practices. Includes fencing impacted on from floods etc.	Regional Extension Coordinator • Regional Working Groups • Calendar of Events – REC Regional Stakeholders • Regional Landcare Facilitator • Existing positions and projects – Reef Catchments, DAF • Improved communication and knowledge transfer Flexible Funding • Cover operating expenses such as extra field days, bus hire or printing costs
Encourage and support graziers to attend relevant meetings, workshops, field days etc. within the sub-catchment and also in neighbouring or other areas.		
Value add to group extension activities that are already occurring – expanding the information being presented and discussed through improved coordination and collaboration in delivery.		
Identify key grazing champions that could be utilised to promote practice change from the work they have done on their farm – field day / workshop, present at forums / working groups, factsheet / video.		
Follow up support for graziers who have been involved in previous programs like Reef Rescue, Reef Water Quality Grants and QNRM Grazing Grants.		
Identify the relevant barriers to sub-catchment growers participating in existing programs and /or adopting new management practices		
Identify sub-catchment trends in motivation for change		
Establishment of the Grazing BMP program within these sub-catchments so interested graziers can participate.	Increase in locally relevant data and information around priority management practices and water quality issues. This can then be used in training and extension activities to get increased skills,	Regional Extension Coordinator • Regional Working Groups • Possible funding sources • Cross –Regional information • Reseller involvement
Increase the number of trials / demonstrations and associated workshops/field days/meetings targeting improved or innovative management around the P2R Water Quality Risk Framework and *local key pollutants/issues/barriers* – target of four trial / demonstration sites and 4 field day / workshops across the sub-catchments		

Actions / Activities	Impact on Reef Water Quality	Support Required / Available
Pasture / Hillslope Management – long term carrying capacity, stocking rates, groundcover thresholds, Land condition assessments, Vegetation management, Recovery of vulnerable areas, Property mapping. Streambank Management – managing grazing pressure and improving condition Gully Management – gully remediation, linear feature erosion, hillslope management *Local Trial / Demonstration / Workshop Topics:* • *Gully Remediation / Erosion (Bob Shepard DAF – large earth works, diversion. Stomping out Sediment)* • *Riparian Management* • *Pasture Monitoring* • *Weed Management* • *Stock handling / selection / genetics / breeding (NQDT Brendon Smith – linked to MIPS)* • *Climate / Marketing* Can Include: • New trials of innovative land management practice that have high potential to impact water quality – will probably also require a water quality monitoring element to test efficacy • Follow up trials / project to verify result and add to learnings of long-term benefit • Geographic expansion of extension services (trials, workshops, field days projects etc.) to new group of landowners in priority catchments.	knowledge and confidence in extension providers and graziers. Expansion or continuation of regional projects with a proven track record in increasing skills, knowledge, confidence and uptake of the priority management practices Improved cooperation, coordination and collaboration amongst extension providers to support increased skills, knowledge, confidence and uptake in graziers around priority management practices. Improved reporting of management practice change by graziers to P2R to capture all water quality improvements.	Regional Stakeholders • Regional Landcare Facilitator • Existing demonstrations / trials – Reef Catchments, DAF • Existing projects - Reef Catchments • Future demonstrations/ trials and projects – other funding sources Flexible Funding • Cover operating expenses such as event costs, guest speakers, expert advice, printing costs, communication products etc. • Collaboration of different providers combining skills and services for a more holistic approach • Improved communication and knowledge transfer • Trial of new innovative extension methods • Continuation of a successful project to maintain momentum • Building on the findings/results of a previous project
Improved monitoring and evaluation around extension activities and practice change.		
Use of innovative learning approaches and/or new tools and technologies to support on-farm learning.		
Update the existing Mackay Whitsundays Pasture Booklet to include any new information and research. Could include a section on gully management.		
Resellers / Rural Stores - Grazing Workshops – expand locations and/or presenters e.g. Mt Ossa Rural		

Actions / Activities	Impact on Reef Water Quality	Support Required / Available
Industry Service Provider training and capacity building – increase in skills and knowledge of regional Extension / Advisory staff. Can include extension, facilitation and industry specific technical skills. Ideas include: • Cross Regional Tour to Fitzroy / Burdekin • Beef Expo • Human dimensions – behaviour change	Improved communication and delivery of regional projects / activities by extension providers supporting increased skills, knowledge, confidence and uptake in graziers around priority management practices.	Training and Development Program – DAF • Extension / Advisor Survey • Training Needs Analysis and Priorities • Regional Reports • Training Options • Delivery of Workshops / Courses / Forums Flexible Funding • Support Mackay Whitsunday specific activities
Access to Specialist Skills: 1. Soil Conservation 2. Soil Health 3. Gully Rehabilitation 4. Herd Management 5. Pasture Management	Access to more accurate or up to date regional data that can support the accelerated adoption of the priority management practices. Access to experts / specialists to support increased skills, knowledge, confidence and uptake in extension providers and graziers around priority management practices.	Regional Extension Coordinator • Regional Extension Plan Regional Stakeholders • Existing positions – DAF • Capacity building Flexible Funding • Support Mackay Whitsunday specific activities Specialist Skills • Access to experts / consultants
The establishment or increased support for Peer to Peer learning groups – could possibly link in with existing projects or groups such as the Grazing Innovation Network or the Grazing Regional Working Group. Includes training and capacity building for group participants.	Increased skills, knowledge and confidence in graziers around the benefits of peer to peer learning and increased support for	Peer to Peer Learning Funding • Group establishment and facilitation • Capacity Building • Field days and workshops

Actions / Activities	Impact on Reef Water Quality	Support Required / Available
	adopting priority management practices.	

7.5 Capacity Building and Training Need Analysis

Executive Summary Extract from Reef Extension Training Needs Analysis 2018 (James, 2019).

A Reef Extension Training Needs Analysis (TNA) was undertaken in October 2018 to guide both the range and the form of the training and development activities to build the capacity of extension service providers in the Great Barrier Reef catchments, as part of the Enhanced Extension Coordination program. The link to an online survey was distributed via email, inviting respondents to complete the 21 qualitative and quantitative questions. The 161 respondents included representatives from the six Reef regions in the following proportions: Burdekin (31%), Burnett Mary (24%), Fitzroy (23%), **Mackay Whitsundays (21%)**, Wet Tropics (16%), Cape York (4%) and other (4%). The respondents included representatives from the six primary industries in the following proportions: grazing (56%), sugarcane (43%), cropping (21%), horticulture (10%), bananas (5%), dairy (4%) and other (8%).

The respondents most frequently worked for natural resource management organisations (40%), followed by state government and industry-based organisations (both at 20%). Just over half (56%) of the respondents identified as being on-ground extension service providers, while others were team leaders (15%), managers (11%) and other roles (18%). Almost a third of the respondents (32%) had between two and five years of experience with delivering extension services and only one-third (34%) had more than 10 years of experience. Only 10% of the respondents spent more than 80% of their time on extension activities, while the remainder of the respondents indicated a fairly even split between the other percentage blocks (0 to 20%, 21 to 40%, 41 to 60%, and 61 to 80%). Just over half (54%) of the respondents identified as female, which aligns with the membership of Australasia–Pacific Extension Network (APEN), where 54% of the current members are female. Almost one-half (48%) of the respondents identified as belonging to the Gen X group, one-third (33%) as Gen Y and just 6% as Gen Z. Over two-thirds (70%) of the respondents indicated they had completed a bachelor's degree, while 11% had completed a Masters and 3% had completed a PhD.

The ten most commonly mentioned challenges experienced by respondents in the delivery of extension services were:

1. Lack of producer engagement
2. Resistant attitude towards change
3. Lack of resources
4. Project relevance and uptake of desired change
5. Lack of funding impacts
6. Over-abundance of information sources
7. Poor access to grower contact details
8. Lack of project continuity
9. Policy and regulatory negative impacts
10. Limited access to growers.

The top ten extension skills needed to achieve greater impact were:

1. Extension and facilitation skills
2. Technical knowledge
3. Meaningful producer engagement
4. Reporting requirements
5. Understanding producer knowledge levels
6. Measuring change
7. Time management

8. Meaningful producer relationships
9. Understanding delivery tools
10. Understanding social media.

The ten most commonly mentioned technical challenges currently experienced in the delivery of extension services to producers, observed across region and industry, were identified as:
1. Access to and use of existing and new technologies
2. Topics and issues related to soil management
3. Training and mentoring
4. Industry specific knowledge
5. Land management
6. Data management
7. Limited access to research
8. Business related skills
9. Economics
10. Extension and facilitation.

The five most commonly mentioned extension approaches, which were noted to be working well and achieving practice change as a result, observed across region and industry, were identified as:
1. One-on-one extension
2. Peer learning
3. Local and continuous communication
4. Relevant and timely information
5. Workshops.

The five most commonly mentioned responses to how extension will look in ten years' time were:
1. Traditional extension approaches to continue
2. Increased use of non-specified technology
3. Increased use of web-based technologies
4. Advanced data management technology
5. Better qualified and accredited extension officers.

Respondents rated extension-related topics by their importance to their work and their current level of proficiency, creating the following priority ranking:
1. Planning extension activities based on industry needs
2. Using trials and demonstrations effectively
3. Enabling peer-to-peer learning of farmers
4. Engaging with farmers not currently engaged
5. Using different monitoring and evaluation approaches
6. Group facilitation and group dynamics
7. Using social marketing to persuade behaviour
8. Using webinars to engage geographically distributed clients.

Respondents rated technical topics by their importance to their work and by their current level of proficiency, creating the following priority ranking:
1. Soil health
2. Business knowledge and skills
3. GIS and data collection
4. Property design and layout
5. Water quality
6. Weed management

7. Precision agriculture
8. Chemical use and application.

When asked to nominate other high priority topics, the five most frequently mentioned items were:
1. Understanding social behaviours and learning
2. Grazing and pasture management
3. Communication and networking skills
4. Business and farm management
5. Customised extension approaches.

7.6 Collaboration and Communication Strategies

As part of the Regional Extension Plan update, a regional Mackay Whitsunday Collaboration Strategy and Communication / Engagement Strategy were developed as supporting documents to help identify key actions / outputs / guidelines for the Regional Extension Coordinator and stakeholders (working group members, Flexible and Peer-to-Peer funding project proponents) to work on in 19/20. The information and regional stakeholder feedback used to develop them was sourced from a range of activities including:

- 2018 Mackay Whitsunday Regional Extension Plan review
- Enhanced Extension Coordination team Collaboration and Communication Workshop held in Townsville in January 2019. Facilitated by Max Hardy and Sue Sargent who the Regional Extension Coordinators will work with developing the strategies and included some staff from the SRA Industry Adoption Strategy team.
- Collaboration workshop with Cane and Grazing Working Group members in Mackay on 26th March 2019 facilitated by Max Hardy.
- Collaboration workshop with Central Queensland Soil Health Systems grower group in Mackay on 27th March 2019 facilitated by Max Hardy.
- Discussions between Regional Extension Coordinator and some key regional stakeholders directly with Max hardy and Sue Sargent.

The Collaboration strategy focuses on the actions that the Regional Extension Coordinator needs to implement to support improved **networking, coordination** and **collaboration** amongst regional stakeholders and extension providers. It also provides the framework for showing the process to monitor and evaluate the regions improvement across these three areas. This was highlighted in 3.4 Mackay Whitsunday 18/19 Achievements and Outcomes in Tables 1 and 2.

The Communication and Engagement strategy focuses on the actions and guidelines that the Regional Extension Coordinator and project proponents (Flexible and Peer-to-Peer funding) can implement or utilise in the successful delivery and evaluation of projects and events / field days etc. It also provides guidelines for acknowledging the project funding, conducting event debriefs and contacts for a range of communication mediums/sources including social media, industry newsletters, radio, news and newspapers.

8. Allocation of Funding Resources

Figure 3 outlines the central role of regional coordination in implementing the recommendations of the E & E review and targeting investment to achieve more effective and efficient extension delivery. The Review highlighted that Regional Extension Coordination Groups are needed to more effectively address regional and sub-regional priorities and to provide for better integration and planning of funded programs prior to them being rolled out in the regions. The Mackay Whitsunday REP provides information on extension delivery, gaps and barriers in the region and opportunities to address these gaps through a more collaborative approach and through strategic investment that expands and add value to current activities. It will be used to facilitate decision-making via the Cane and Grazing Regional Extension Working Groups and sets out a consultative and transparent decision framework to prioritise project activity and the strategic allocation of funds to extension providers in a way that encourages collaboration between extension projects and minimises the duplication of effort.

To address all of the actions and activities listed in Tables 18 and 19 will require a high level of long-term investment and regional stakeholder support and collaboration. The Regional Extension Coordinator will play a key role in progressing actions and activities that can be supported through existing positions and projects. For the activities that do require new resources and extra support, the Regional Extension Plan sets out processes for the Regional Extension Working Groups to direct and prioritise the allocation of available (or future) funding towards them and will assist regional stakeholders to attract other funding sources to help implement the identified actions/activities. The REP provides strategic and practical advice to help inform investment programs and ensure that investment will be: well targeted and aligned to priorities for the Mackay Whitsunday region (location, level of effort, action/activity); is coordinated and efficiently rolled out in the region; and importantly, has the support of the regional stakeholders.

Through the Department of Agriculture and Fisheries (DAF), the Enhanced Extension Coordination project has provided funds to support regional coordinator positions and project funds to work with local extension networks to enhance current activities and address gaps in priority collaborative extension services and peer-to-peer learning activities that are prioritised in the Regional Extension Plans. The allocation of these funds are described below in Section 8.1. DAF will also manage projects to service high priority skills gaps and training and development needs across regions. The projects identified to be supported by these resources are describe in Section 8.2 and 8.3 respectively. These initial funds have been provided to all six Reef NRM regions and are intended to instigate the development of local stakeholder groups and REPs to build an effective platform for regional collaboration in extension delivery for future investment. The continued development of Regional Extension Plans and systems and processes will facilitate further investment from multiple sources and enable regional stakeholders to play a more prominent role in the roll out of investment targeted towards extension services. When funds become available to support additional projects, these will be incorporated into the REP and associated work plans to ensure continued coordination.

8.1 Enhanced Extension Coordination Project Funding

Through the Enhanced Extension Coordination project, funding has been made available to support priority actions / activities (Flexible Funding) and Peer to Peer Learning.

Table 20. *Mackay Whitsunday Enhanced Extension Coordination Project funding 2017-2020*

Year	Flexible Funding – Cane	Flexible Funding – Grazing	Peer to Peer Learning - Cane	Peer to Peer Learning - Grazing
18/19	$122,550	$22,500	$45,483	$16,250
19/20	$85,950	$19,000	$51,000	$12,267

Project proposal templates for both Flexible Funding and Peer to Peer learning have been developed and updated in 2019. The templates provide information on both the Enhanced Extension Coordination project eligibility guidelines (Table 16) and the priorities and criteria from the Mackay Whitsunday Regional Extension Plan. The summary tables are also provided as supporting information.

Table 21. *Eligible and Non-eligible Activities for Enhanced Extension Coordination Project funding*

What types of activities are eligible for funding?	**What types of activities are out of scope — not appropriate for funds expenditure?**
• Targeted activities to increase uptake of key practices to address water quality priorities	• Activities that fall outside Great Barrier Reef regions
• Targeted extension activities that address challenges and fill gaps in current delivery effort	• Vehicle purchase/lease/running expenses
• Building synergies within catchments and regions to add value to current programs	• Purchasing equipment for host organisation, which is not for use in a demonstration/trial
• Supporting cross regional and cross organisational activities, learnings and information sharing (e.g. events such as field days/ workshops)	• Delivery of existing activities or projects (e.g. BMP programs which have ongoing support via other funding arrangements), or activities which duplicate others, or are otherwise funded from previous or current funding sources
• Innovative capacity building for producers and/or extension staff	• Water quality monitoring or research if producer engagement and education is not the purpose of the activity
• Piloting/demonstrating new technologies or platforms that assist in the engagement or education of producers and/or extension staff	• Purchasing equipment or providing funding to a particular producer (e.g. as per grants program)
• Facilitating producer groups (peer-to-peer learning), and may include targeted training for facilitators where not duplicating other projects/activities	• Activities that are not related to agricultural management (e.g. urban or industrial)
• Multi-year projects, in particular to support longer term peer-to-peer learning groups (annual funding allocations pending demonstration of outcomes and endorsement of reporting requirements)	• Activities that do not contribute to improved water quality outcomes
• Demonstrations/applied research trials aimed at engaging and educating producers e.g. regional validation of existing improved management practices in new areas* * This may include on-ground works in limited situations where it is an essential component of an extension activity that facilitates learning in an area of identified need or as part of peer-to-peer learning via facilitated producer groups.	• Salary for existing staff and staff relocation costs
	• Activities which are retrospective—have commenced/are funded but not yet completed
	• Activities required to comply with any legislation or are part of an approval or funding contract under Commonwealth or State legislation or agreement
	• Administrative costs above 10% of the total annual allocation

An overview of the process used by the Regional Extension Working Groups for allocating funding to projects in 18/19 is as follows:

1. Confirmation and approval of funding eligibility guidelines, priorities and criteria by the Regional Extension Working Groups and the development of project proposal templates for both Flexible Funding and Peer to Peer Learning.
2. Templates and supporting information emailed to both Cane and Grazing Regional Extension Working Group members – 20th August 2018. Project Proposals were due back from cane stakeholders on the 14th September 2018 and grazing stakeholders on the 12th October 2018.
3. Project Proposals went through an approval process at the regional level (meets guidelines, priorities and criteria) through the Regional Extension Working Groups – emails, phone calls and meetings. There was also discussion with the GBR wide Enhanced Extension Coordination Manager about the proposed projects and how they link in with the overall program. Any unsuccessful proposals would be contacted at this stage and feedback provided on why.
4. Successful proposals developed into collaborative agreements (outputs/outcomes, milestones, M&E activities, communication activities, payments) between the proponent and funding administrator. For the funding in the Mackay Whitsunday region, DAF provided this administration.
5. Regional Extension Coordinator supported successful proponents to implement projects and activities to ensure all milestones were achieved. This includes communication back to the Regional Extension Working Groups.

An overview of the process used by the Regional Extension Working Groups for allocating funding to projects in 19/20 is as follows:

1. 2019 Funding eligibility guidelines, priorities, criteria and timelines confirmed by the Regional Extension Working Groups for both Flexible Funding and Peer to Peer Learning and project proposal templates updated.
2. Grazing Regional Extension Working Group agreed in June 2019 to extend the current 18/19 Grazing Flexible Funding and Peer to Peer projects with Reef Catchments NRM to June 2020 and continue delivering the key priority group extension events and develop some new activities for the grazing innovation network.
3. Updated templates and supporting information emailed to Cane Regional Extension Working Group members and Cane Peer to Peer group contacts in Late May / Early June 2019. Project Proposals were due back from cane stakeholders by June 14th but ended up being delayed until the end of July.
4. Project Proposals went through an approval process at the regional level (meets guidelines, priorities and criteria listed on following pages) through the Regional Extension Working Groups – emails, phone calls and meetings. Any unsuccessful proposals would be contacted at this stage and feedback provided on why.
5. Successful proposals developed into collaborative agreements (outputs/outcomes, milestones, M&E activities, communication activities, payments) between the proponent and funding administrator (DAF).

Mackay Whitsunday Enhanced Extension Project Prioritisation Matrix	Outcomes
Initial Eligibility Assessment	
Project activities are within Mackay Whitsunday Region/ GBR Catchment?	***Do not progress if answered 'No' to ANY of these questions***
Project proposal does NOT include Vehicle Purchase/lease/running expenses and/or purchasing equipment for host organisation, which is not for use in a demonstration/trial?	
Project EXCLUDES the delivery of EXISTING activities or projects (e.g. BMP)?	
Project activities are for extension, engagement and education purposes?	
Project activities does NOT include grants or direct funding to a producer?	
Project activities are related to agricultural management?	
Project activities contribute (directly or indirectly) to improved water quality outcomes?	
Project EXCLUDES salary for existing staff?	
Project Management costs (PMD) are below 10% of the total annual allocation?	
Sub Catchment Location	
Cane Very High Priority: Myrtle Creek, Murray Creek, Pioneer River Main Channel, Sandy Creek, Rocky Dam Creek	***Do not progress if projects do not work in ANY of these areas***
Cane High Priority: Lethebrook, O'Connell River, Blackrock Creek, Mackay City, Bakers Creek, Alligator Creek	
Grazing Very High Priority: Eden Lassie Creek, Andromache River, O'Connell River, Pioneer River Main Channel, Blacks Creek, West Hill Creek	
Grazing High Priority: Myrtle Creek, Bakers Creek, Sandy Creek, Rocky Dam Creek, Marion Creek	
Grazing Moderate Priority: Waterhole Creek, Blackrock Creek, Murray Creek, Alligator Creek, Sarina Beaches, Flaggy Rock Creek	
Water Quality Pollutant Target	
Nitrogen – Dissolved Inorganic Nitrogen	***Do not progress if projects do not focus on ANY of these pollutants***
Nitrogen – Particulate Nitrogen	
Phosphorous – Filterable Reactive Phosphorous	
Phosphorous – Particulate Phosphorous	
Pesticides – PSII's, Imidacloprid (Target is for 99% species protection within waterways)	
Suspended Sediment – linked to erosion from hillslopes, paddocks, gullies and streambanks with a focus on the finer particle (clays) component	
Regional Extension Plan Gaps and Opportunities (Eligible Funding Activities)	
Increasing the number of demonstrations / applied research trials and associated workshops / field days aimed at engaging and educating growers / graziers / producers on improved or innovative management around the key pollutants	***Do not progress if projects do not***
Supporting cross regional (may be Mill or Basin based) and cross organisational activities, learnings and information sharing activities - meetings, advisory groups, field visits etc.	
Targeted activities to increase uptake of key practices to address water quality priorities such as Grower / Grazier led water quality monitoring and extension projects.	
Improved cooperation, coordination and collaboration amongst growers /graziers and industry service providers with a focus on including resellers / agribusiness	
Improved monitoring and evaluation around extension activities and practice change. Includes supporting effective and efficient record keeping and data sharing.	

Industry Service Provider training / capacity building – increase in skills and knowledge of regional Extension / Advisory staff. Can include extension, facilitation and industry specific technical skills.	***meet ANY of these criteria***
Use of innovative learning approaches and/or new platforms, tools and technologies for engagement or education of growers / graziers (and / or extension staff) to support on-farm learning.	
Encourage and support growers / graziers to attend relevant meetings, workshops, field days etc. within the sub-catchment and in neighbouring or other areas.	
Provide support for other issues affecting growers to look for win: win scenarios or increase their receptiveness and ability to participate in practice change around nutrients or pesticides.	
Value add to group extension activities that are already occurring – building synergies and expanding the information being presented and discussed through improved coordination and collaboration in delivery.	
The establishment or increased facilitation support for Peer-to-Peer learning groups. Includes linking in with existing projects or working groups.	
Grower / Grazier training / capacity building – increasing the skills and knowledge of regional growers / graziers to support improved management practice adoption.	
Project Logistics	
Does the project represent good value for money?	Yes / No
Describe / Comment:	
Does the project have cash contributions from other funding sources?	Yes / No
Describe / Comment:	
Does the project have In kind contributions from the involved stakeholders / participants e.g. time, resources, other.	Yes / No
Describe / Comment:	
Do the project proponents have the capacity to deliver? e.g. staff, timeframe, resources	Yes / No
Describe / Comment:	
Projects to be prioritised higher if they rate well in these criteria	
Links to REVIEW Report on Practice Change, Education and Extension	
Improves the targeting, collaboration, coordination and evaluation of reef funded extension and education programs across state and commonwealth funded programs using extension best practice in their design and implementation.	***Projects to be prioritised higher if they meet any of these criteria***
Rewards collaboration and provides the mix of longer-term extension approaches that deal with building trust, peer support and build producer understanding and commitment to long-term improvements.	
Ensures that there are consistent messages (across programs and organisations) in relation to information and recommendations about farming and grazing practices.	
Strengthens and supports Industry Best Management (or equivalent) approaches as a framework for benchmarking, continuous improvement, identifying changes needed, measuring and reporting change over time and meeting regulatory requirements.	
Provides training / capacity building by experienced people with practical and theoretical skills to ensure interest and direct relevance to participants.	
Develops a mentoring framework that enables newer / less skilled extension staff to line with and learn from more experienced and successful staff.	
Uses distance engagement technologies for grazing and sugar stakeholders to maximise access to peers, information and expertise that complement face-to-face and group extension methods. These include webinars; You Tube videos; on-line moderated forums.	

Table 22. *Mackay Whitsunday Grazing projects approved in 19/20*

Project Title	Proposal Overview	Evaluation Component
Supporting priority group extension activities with graziers in the Mackay Whitsunday region MWFF06 DOV Total Project Costs = $133,200 Funding Provided = **$19,000** (venue, catering, guest speaker costs etc.) Ends: June 2020	**Proposal Proponent** Reef Catchments **Flexible Funding** – supporting 3 priority grazing group extension activities that include the Healthy Soils Symposium, Mackay Whitsunday Regional Grazing Forum and Grazing Forum Follow Up Field Day. All events include support from Reef Catchments in communication around promoting the events (flyers, emails) and associated stories on website and e-newsletter. Includes participant evaluation and feedback on the workshops and improved identification of which sub-catchments they have come from to attend. **Regional Extension Plan Priorities** • Industry Service Provider and graziers training and capacity building • Improved communication and knowledge transfer	**Strengthen links, collaboration and leverage of product development between researchers/ scientists (reef, industry etc.) and extension staff / graziers to maximise knowledge transfer** **Improve the professional capacity of the extension network (service providers, extension staff, advisors and graziers)**
Supporting the Mackay Whitsunday Grazing Innovation Network and Regional Working Group MWPTP05 DOV Total Project Costs = $35,617 Funding Provided = **$12,267** (venue, catering, guest speaker costs etc.) Ends: June 2020	**Proposal Proponent** Reef Catchments **Peer to Peer –** to support Peer to Peer learning opportunities with regional graziers and extension staff. Activities include 3 x Grazing Regional Working Group meetings (1 of these to have a field day/guest speaker component), Regional Grazing Innovation Network event (guest speakers / social event. Will include getting feedback from the group around activities for 19/20) and Regional Peer to Peer Group Event (cane and grazing groups present on their projects). **Regional Extension Plan Priorities** • Industry Service Provider and graziers training and capacity building • The establishment or increased support for Peer to Peer learning groups • Improved communication and knowledge transfer	**Strengthen links, collaboration and leverage of product development between researchers/ scientists (reef, industry etc.) and extension staff / growers to maximise knowledge transfer** **Improve the professional capacity of the extension network (service providers, extension staff, advisors and graziers)**

Table 23. *Mackay Whitsunday Cane projects approved in 19/20*

Project Title	Proposal Overview	Evaluation Component
Progressing Central Queensland Soil Health System (CQSHS) members to the Albrecht System MWPTP06 Total Project Costs = $27,600 Funding Provided = **$15,100** (workshops, farm plans, monitoring activities, field days etc.) Ends: June 2020	**Proposal Proponent** Central Queensland Soil Health Systems (CQSHS) – grower group with members from cane, grazing and horticulture. **Peer-to-Peer Learning –** As a follow up to attending the National Biological Conference (MWPTP01), CQSHS would like to implement some of the priority learnings into workshops and paddock scale demonstrations focusing on the adoption of the Albrecht System (balance of science, chemistry and agronomy). This will require access to expert support/advice to help improve the skills, knowledge and understanding by group members and the practical implementation and demonstration on a number of member's properties. These demonstration sites will have M&E activities on them including collecting some water quality samples to help with the evaluation. **Deliverables** <u>Training Activities</u> • Member workshops with experts <u>Farm Planning and Demonstration</u> • Working specifically with 4 members to develop input management plans • Establish demonstration sites • Monitoring and evaluation activities <u>Communication Activities</u> • Member meetings/events • DAF EEC project <u>Presentations</u> • Peer to Peer Regional event • Group Field Days **Regional Extension Plan Priorities** • Farmers located in Murray Creek, Pioneer River Main Channel and Sandy Creek (Very High Priority) • The establishment or increased support for Peer to Peer learning groups • Grower training and capacity building	**Strengthen links, collaboration and leverage of product development between researchers/ scientists (reef, industry etc.) and extension staff / growers to maximise knowledge transfer** **Improve the professional capacity of the extension network (service providers, extension staff, advisors and growers)** **Active engagement of communities and land managers in programs to improve water quality outcomes is increased** **Load Reductions** • Improvement in yield and reduction in N inputs helping to improve NUE and reduce DIN losses (60% reduction target)

Project Title	Proposal Overview	Evaluation Component
	• Increase or maintain the desired number of trials and associated workshops/field days/meetings targeting improved or innovative management around the key pollutants (PSII herbicides and imidacloprid) / issues (run off losses impacting water quality, accessing experts) / barriers (lack of knowledge and understanding).	
Establishment of the Proserpine Young Farmers Group MWPTP07 Total Project Costs = $40,000 Funding Provided = **$15,000** (capacity building activities, meeting expenses, cross regional tour) Ends: June 2020	**Proposal Proponent** Proserpine Young Farmers Inc. **Peer-to-Peer Learning** – The establishment of the Proserpine Young Farmers (PYF) group that aims to facilitate the sharing of information and creation of knowledge of the younger generation of sugar industry professionals. The group will undertake a range of activities to build relationships within and outside of the group, increase knowledge of water quality issues and identify practical ways to improve the quality of water leaving our farms. **Deliverables** <u>Group Establishment</u> • Invites and promotion for "Join" night BBQ <u>Group Activities</u> • Group Survey - current issues / priorities • Monthly meetings / BMP farm tours (spray rigs, record keeping, WQ monitoring etc.) • Burdekin Irrigation Tour • Mackay Fallow Management Tour <u>Communication Activities</u> • Facebook Group / Page • Canegrowers Proserpine – regional newsletter updates • DAF EEC project <u>Presentations</u> • Peer to Peer regional event May 2020 **Regional Extension Plan Priorities** • Some of the participating growers / advisors will be located in the Myrtle Creek sub-catchment (Very High Priority) and the Lethebrook and O'Connell River Sub catchments (High Priority). • The establishment or increased support for Peer to Peer learning groups • Grower training and capacity building	**Improve the professional capacity of the extension network (service providers, extension staff, advisors and growers)** **Active engagement of communities and land managers in programs to improve water quality outcomes is increased** **90% of agricultural land managed using best management practice for water quality outcomes** • Increase grower uptake of improved pesticide management practices that reduce risk of pesticide losses and help reach the target to protect at least 99% of aquatic species at the end-of-catchments

Project Title	Proposal Overview	Evaluation Component
Implementing learnings and expanding opportunities for growers to reduce pesticide losses in the Sandy Creek catchment MWFF08 Total Project Costs = $28,000 Funding Provided = **$16,000** (water quality sample analysis, spray equipment modifications) Ends: June 2020	**Proposal Proponent** Reef Catchments (linked in with Farmacist and MAPS) **Flexible Funding** - For several years, growers throughout Sandy Creek have been supported to increase understanding and awareness of the pesticide issues in an attempt to bring about and measure a water quality improvement. This is continuing as RP201c within a confined sub catchment (Brightley) to engage with and provide intensive and tailored support to all of the growers. This project would like to be able to support 2 extra components linked to this project: • Accelerate the identified spray equipment modifications / upgrades with growers above WQ Auto Sampler at Brightley before the 2019 spray season to help identify and communicate possible water quality improvements over 18/19 baseline levels when equipment was poorly set up. • Continue to engage with growers throughout the wider Sandy Creek catchment, and increase their understanding (water quality sampling and analysis) and adoption of improved management practices. This includes some growers who were previously involved in water quality sampling but are now outside of the Brightley area. New interested growers would receive training on collecting and storing samples. **Deliverables** Project Outputs • Spray Equipment upgrades / overview • Grower led water quality sampling and analysis • Project reports Communication Activities • Information / Data provided for RP201c Fact sheets / Case studies / Articles in newsletters and on –line • Information / Data provided for RP201c grower shed meetings • Information / Data provided for MAPS and Farmacist Shed Meetings Presentations • Cane Regional Extension Working Group • Mackay Peer to Peer Event May 2020 **Regional Extension Plan Priorities** • Project and participants located in Sandy Creek (Very High Priority)	**Strengthen links, collaboration and leverage of product development between researchers/ scientists (reef, industry etc.) and extension staff / growers to maximise knowledge transfer** **Enhance and support the increased extension effort being provided through existing projects and the increased urgency for this to lead to on ground practice change outcomes for reef water quality** **Improve the professional capacity of the extension network (service providers, extension staff, advisors and growers)** **Active engagement of communities and land managers in programs to improve water quality outcomes is increased**

Project Title	Proposal Overview	Evaluation Component
	• Grower training and capacity building • Increase or maintain the desired number of trials and associated workshops/field days/meetings targeting improved or innovative management around the key pollutants (PSII herbicides and imidacloprid) / issues (run off losses impacting water quality, accessing experts) / barriers (lack of knowledge and understanding).	
Supporting Mackay Sugarcane Growers in improving their use and management of on farm irrigation for better water quality outcomes MWFF09 Total Project Costs = $32,000 Funding Provided = **$12,000** (accessing experts, materials/resources etc.) Ends: June 2020	**Proposal Proponent** Mackay Area Productivity Services (MAPS) **Flexible Funding** – the aim of this project is to maintain and build on the existing irrigation scheduling infrastructure (16 EnviroProbes, Over 100 GDots), 4 x weather stations (Calen, Balberra, Gargett and Victoria Plains) and project work that MAPS has been doing since 2015. The priority outcome is to ensure that growers who do have irrigation water available are maximising their production and reducing the risk of losses through improved input (nutrient, pesticides etc.) management and incorporation. This will be through using the information provided through the upgraded, functioning scheduling tools / weather stations and accessing irrigation experts to run workshops and a new collaboration between Mackay Canegrowers and Agritech Solutions in the use of the software program, Irrigweb. **Deliverables** Infrastructure / Technology • The replacement and maintenance of the existing hardware / infrastructure to maintain current capacity. Training outcomes • Upskilling of extension staff with new software and technology. • Grower irrigation workshop Communication Activities • One on one extension through MAPS officers • MAPS – shed meetings • Regional newsletters – MAPS, Canegrowers :The Billet" • MAPS website Presentations • Cane Regional Extension Working Group • MAPS Trial Info Day	**Strengthen links, collaboration and leverage of product development between researchers/ scientists (reef, industry etc.) and extension staff / growers to maximise knowledge transfer** **Enhance and support the increased extension effort being provided through existing projects and the increased urgency for this to lead to on ground practice change outcomes for reef water quality** **Improve the professional capacity of the extension network (service providers, extension staff, advisors and growers)** **Load Reductions** • Improvement in yield helping to improve NUE and reduce DIN losses (60% reduction target)

Project Title	Proposal Overview	Evaluation Component
	Regional Extension Plan Priorities • Project is directly involved with irrigators in the Very High Priority sub-catchments of Pioneer River Main Channel, Sandy Creek and the High Priority sub-catchments of Bakers Creek and Alligator Creek. • Project will have influence on growers in the Very High Priority sub-catchments of Murray Creek, Pioneer River Main Channel, Sandy Creek and the High Priority sub-catchments of Blackrock Creek, Mackay City, Bakers Creek and Alligator Creek. • Provide support for other issues impacting on growers to look for win: win scenarios or increase their receptiveness and ability to participate in practice change around nutrients or pesticides • Grower training and capacity building • Improved communication and knowledge transfer around coordinated approach	
Supporting Mackay Sugarcane Growers with practical knowledge and advice to increase the adoption of rotational break crops in the fallow MWFF11 Total Project Costs = $45,000 Funding Provided = **$15,000** (facilitation, materials, accessing experts, trial monitoring etc.) Ends: June 2020	**Proposal Proponent** MAPS **Flexible Funding** – This project's aim is to support MAPS in providing practical on-farm demonstration and knowledge to encourage and assist growers to regularly plant a break crop in their sugarcane fallow period. MAPS will commission the construction of a relatively inexpensive seed drill, as one of the outcomes is to help reduce the overall costs for growers to implement it. This will be demonstrated to growers, with the aim to give them confidence to either obtain their own machine or for neighbours to share the cost of one. The small planting window that is sometimes available makes it necessary for growers to have their own equipment or one nearby. MAPS will be using the seed drill at the Victoria Plains farm, planting legumes / break crops as demonstrations in some of the fallow. It will also be demonstrating the planter in action at its annual Field Day (May 2020) and possibly at other observation and trial sites around the region depending on grower interest / support. **Deliverables** MAPS will commission the construction of a relatively inexpensive seed drill, as one of the outcomes is to help reduce the overall costs for growers to implement it. This will be demonstrated to growers, with the aim to give them confidence to either obtain their own machine or for neighbours to share the cost of one.	**Improve the professional capacity of the extension network (service providers, extension staff, advisors and growers)** **Enhance and support the increased extension effort being provided through existing projects and the increased urgency for this to lead to on ground practice change outcomes for reef water quality** **90% of agricultural land managed using best management practice for water quality outcomes** • Increase grower uptake of improved farm management practices that reduce risk of nutrient and sediment losses

Project Title	Proposal Overview	Evaluation Component
	MAPS will be using the seed drill at the Victoria Plains farm, planting legumes / break crops as demonstrations in some of the fallow. It will also be demonstrating the planter in action at its annual Field Day (May 2020) and possibly at other observation and trial sites around the region depending on grower interest / support. MAPS will communicate the project / information / outcomes to all growers, collaborators and other industry personnel in the following ways: • One on one extension to growers, through their MAPS Productivity Officers. • Demonstration blocks on the MAPS Victoria Plains Farm which can be visited by growers and will be utilised at events such as the MAPS Field Day • MAPS newsletters, which are emailed/mailed to all growers; also articles which are written for other publications such as "The Billet" and the Australian Canegrowers Magazine. • MAPS hold annual grower shed meetings throughout the region every year in March; this is an opportunity to discuss the project with growers. • MAPS Trial Information Day for advisors in February 2020 • MAPS Annual Field Day for growers in May 2020. **Regional Extension Plan Priorities** • Project is directly involved with irrigators in the Very High Priority sub-catchments of Pioneer River Main Channel, Sandy Creek and the High Priority sub-catchments of Bakers Creek and Alligator Creek. • Project will have influence on growers in the Very High Priority sub-catchments of Murray Creek and the High Priority sub-catchments of Blackrock Creek and Mackay City. • Provide support for other issues impacting on growers to look for win: win scenarios or increase their receptiveness and ability to participate in practice change around nutrients or pesticides • Grower training and capacity building • Improved communication and knowledge transfer around coordinated approach	
Sharing Learnings and Fostering Engagement at Oaky Creek MWPTP08 Total Project Costs =	**Proposal Proponent** Reef Catchments (RC) **Peer to Peer Learning** – This project aims to build on the riparian rehabilitation work supported in Oaky Creek (small sub-catchment within Sandy Creek catchment) through a range of previous	**Active engagement of communities and land managers in programs to improve water quality outcomes is increased**

Project Title	Proposal Overview	Evaluation Component
$51,670 Funding Provided = **$24,080** (facilitation, materials, accessing experts, trial monitoring etc.) Ends: June 2020	investments and the engagement with the growers / other stakeholders along the system. This includes: • helping growers who are maintaining the 11 rehabilitation sites • coordination of field days / group activities (target of 4) • monitoring of the 11 sites including actions/ costs/outcomes • the development of a Revegetation – Achieving Long Term Outcomes Fact Sheet • participating growers networked with other Peer-to-Peer groups working in the region (Participate in Peer-to-Peer Group Forum May 2020). **Deliverables** • Working with and supporting the landholders who are maintaining the eleven sites on Oaky Creek (Nov – Jun): The type of support will vary between each site depending on the capacity of the landholder to have done maintenance activities. The support could be advice / information / linking with Peer or could be the priority activity (weed control, revegetation back filling, watering) they need to do to help with establishing the site to be self-sufficient into the future. • Events: GBR Synthesis Forum, Oaky Creek Day, Mackay Whitsunday Isaac Wetland Working Group Field Trip, Oaky Creek Day 2, Mackay Whitsunday Peer to Peer Group Forum • Factsheet: Revegetation – Achieving Long Term Outcomes. This fact sheet will provide details on a standard revegetation plan for riparian areas in the Mackay Whitsunday Region and provide the reader information to take them from initial planning through to canopy closure. It we be a useful resource for officers planning riparian projects and will provide landholders with information on works planned for their property. **Regional Extension Plan Priorities** • Project and participants located in Sandy Creek (Very High Priority) • The establishment or increased support for peer-to-peer learning to enable on-farm practice change leading to improved water quality. This includes grower training and capacity building. • Increase or maintain the desired number of demonstrations and associated workshops/field days/meetings targeting improved or innovative management around the key pollutants (particulate nutrients and herbicides) / issues (riparian management including erosion and weed control) / barriers (limited resources, lack of knowledge and understanding).	**Improve the professional capacity of the extension network (service providers, extension staff, advisors and growers)** **90% of agricultural land managed using best management practice for water quality outcomes** • Increase grower uptake of improved farm management practices that reduce risk of nutrient, pesticide and sediment losses

Project Title	Proposal Overview	Evaluation Component
	• Follow up support for growers who have been involved in previous programs like Reef Rescue, Reef Water Quality Grants and Sandy Creek projects.	
Rocky Dam Creek Sub-Catchment / Plane Basin Grower Led Water Quality Monitoring Project Stage 2 MWFF10 Total Project Costs = $75,630 Funding Provided = $39,770 (facilitation, materials, water quality monitoring and analysis) Ends: June 2020	**Proposal Proponent** Reef Catchments (RC) **Flexible Funding** – The project has been developed to engage with growers throughout the wider Rocky Dam Creek sub-catchment, and increase their understanding (water quality sampling and analysis) around local water quality levels / issues. This may include some growers who were previously trained and involved in water quality sampling over the last 2 years. This project aims to engage with new interested growers to receive training on collecting and storing samples and being part of the process. The collection of samples will facilitate the development of analysis reports and the subsequent delivery of shed meetings throughout the catchment specifically focusing on water quality. Growers undertaking the sample collection will provide the local data to make these shed meetings more relevant to encourage other local growers to attend. These shed meeting will allow engagement and extension opportunities to reach a wider audience. This will also value add to existing group extension already happening and provide support to growers to ensure a win: win to increase receptiveness and willingness to participate. **Deliverables** • Grower and Community led WQ sampling / analysis in Rocky Dam Creek and the wider Plane Basin: Target of 108 samples • Project report (June 2020) • Information / Data provided for water quality monitoring grower shed meetings x 2 • Information / Data provided for other shed meetings (PCPSL, PCSF, and Reef Catchments) in Plane Creek Mill area x 3 • Project updates in PCPSL and Reef Catchments newsletters (on-line or emailed) • Cane Regional Extension Working Group updates • Mackay Peer to Peer Event May 2020 presentation **Regional Extension Plan Priorities** • Activities focused on Rocky Dam Creek (Very High Priority). • Grower led water quality monitoring project. • Grower training and capacity building. • Increase or maintain the desired number of workshops/field days/meetings targeting improved or innovative management around the key pollutants / issues / barriers.	**Strengthen links, collaboration and leverage of product development between researchers/ scientists (reef, industry etc.) and extension staff / growers to maximise knowledge transfer** **Enhance and support the increased extension effort being provided through existing projects and the increased urgency for this to lead to on ground practice change outcomes for reef water quality** **Improve the professional capacity of the extension network (service providers, extension staff, advisors and growers)** **Active engagement of communities and land managers in programs to improve water quality outcomes is increased**

Project Title	Proposal Overview	Evaluation Component
	• Coordinated promotion of current / existing programs and activities to growers.	

8.2 Training Development Program

The Regional Extension Coordinator will play a key role in supporting capacity building for the regional extension providers. Through the Extension Training and Development project hosted by DAF, regional extension staff had the opportunity to participate in a GBR wide training needs analysis in late 2018 around generic extension and industry specific technical skills. The analysis identified the high priority topics that extension providers have indicated they need to improve their skills and knowledge on. These results can be presented at the GBR wide level but also at the Mackay Whitsunday level and can be industry specific i.e. cane extension providers in the Mackay Whitsunday region. The results were presented to the Cane and Grazing Regional Extension Working Groups with further discussion around what are our regional priorities, including any missing topics. These are included in the gaps/opportunities section of future updates to the Mackay Whitsunday Regional Extension Plan. The funding to organise and deliver the high priority training workshops may come from a variety of sources including local industry extension providers through staff development activities; Flexible funding linked to the Mackay Whitsunday Regional Extension Plan or the Extension Training Development project.

2018/19 Overview

To date across the entire GBR catchments, 18 training and development events have been organised resulting in 175 enrolments. For the Mackay Whitsunday region, the relevant workshops and events are detailed in Table 24.

Table 24. *Training programs relevant to Mackay Whitsunday stakeholders*

Course	Provider	Location	Start date	Enrolled
Behavioural Skills Training for Extension	Behaviour Innovation	Mackay	04/02/2019	7
Behavioural Skills Training for Extension	Behaviour Innovation	Mackay	05/02/2019	8
Behavioural Skills Training for Extension	Behaviour Innovation	Airlie beach	07/02/2019	4
Behavioural Skills Training for Extension	Behaviour Innovation	Proserpine	14/03/2019	5
Reef Extension Think Tank	DAF	Townsville	15/05/2019	5 (over 100 across GBR)

The development of an online Reef extension training and development database has enabled course participants to apply to attend a training program, and upon completion of the course requirements, apply to have the approved registration fees reimbursed. It also allows students to upload proposed work plans that demonstrate how they will apply their learnings and the associated contribution to improving the Reef water quality, which will feed into the project's impact evaluation. This has streamlined the administrative function of managing such a large training program single-handedly.

Reef Extension Think Tank

This event was designed to attract a cross-section of the estimated 200 to 500 extension service providers and pique their interest in further extension capacity building activities. The two-day event was comprised of a half-day Peer-to-peer training workshop followed by a one-and-a-half day Unconference. The need for peer-to-peer training was highlighted in the Reef E&E review (Coutts, 2017). The Unconference process was chosen as a highly participatory process that would allow the participants to nominate and discuss topics of interest to them.

A rigorous procurement process selected the Mercure Townsville as the most appropriate and best-value for money venue. The event was originally scheduled for 20-22 March 2019 and was postponed to 15-17 May 2019 due to flooding from Tropical Cyclone Oma affecting the venue. The costs of the event were covered by the TF 3.1.1 R4 project budget and a subsidy of $200 inc GST was offered to help cover the travel and accommodation costs for those extension service providers working in the Reef catchments, limited to five people from the one organisation. A total of 28 people applied for the subsidy.

In all, 105 people from 40 organisations attended the Think tank, with 85 participants at the Peer-to-peer training workshop and 97 at the Unconference. It was disappointing that 42 people either cancelled their ticket prior to the event (35) or didn't show (7), though this is not unusual for free events.

8.3 Specialist Skills Gaps

The E&E Review noted a lack of capacity in some specialty areas, exacerbated by the real, or impending, loss of experienced extension personnel in the regions and an inability to readily replace this expertise in a timely manner to deal with issues around land management practices facing producers in the region. Consequently, there will be cases where specialised skills are not available in the region to address priorities identified in Regional Extension Plans and the specific nature of a task or timeframe does not enable the development of these skills locally through training. For example, the review found strong agreement across regions, industries and organisations for the need for more skilled people in the area of soil management (soil conservation, health and hydrology), skills that take many years to develop. The Review also noted a lack of extension expertise in some regions to adequately advise on mixed farming/rotational crops and in the effective use of on-farm trials and demonstrations to develop trust and experience with recommended practices. Farm economics and business management was another area where capacity was limited. Even in the area of water quality, the background in water chemistry and hydrology needed was not always adequate, restricted to the research institutions, or some consultants, and not readily available for many extension activities.

Through the Enhanced Extension Coordination project DAF will provide resources to augment existing services or expertise for high priority skills gaps (e.g. soil conservation, soil health, and hydrology or water quality) or other local skills gaps (e.g. farming systems, rotational crops or farm economics). These priorities will be determined through gaps identified in the Regional Extension Plans developed across the six NRM regions and will be resourced across regions. That is, where multiple regions identify similar priorities, where practical, suitable expertise will be engaged to work across regions and Regional Extension Coordinators will collaborate with one another to

extend this expertise into their respective regions. Where there are region specific needs, Regional Extension Coordinators will collaboratively plan and prioritise which are supported with the available resources. The decision on what skills gaps can be filled will also depend on being able to access suitable expertise and their availability to service projects in the regions at times when aligned projects are being rolled out. If there are opportunities to align to the Training and Development program and value add to this program this will also be considered.

Mackay Whitsunday Cane Priorities.

1. Soil Health – Identified by all stakeholders as an area that has had a major reduction in the level of support / resources for growers but is the important basis for farming system improvements. A collaborative project proposal (September 2019 to June 2020) led by SRA was successful in receiving funding from DAF to support the establishment of a regional Soil Health Community of Practice. This is linked to a newly established Soil Health program focusing on the M&E of paired sites and the training of industry service providers in using the SRA developed Soil Health Tool Kit.
2. Irrigation Management – due to the supplementary nature of irrigation in the region, there is limited support / resources available even though it is seen as a key component in achieving yield and water quality improvements. Some support provided through the Flexible Funding in 19/20.
3. Stormwater / Drainage Management – very limited support (advice, design etc.) / resources (funding etc.) available to growers across the region. Monitoring of various on-farm stormwater structures has shown the benefits they can have on providing not only an extra irrigation source (re-use) but also on water quality improvements (treatment).

Mackay Whitsunday Grazing Priorities.

1. Soil Conservation / Soil Health – high priority issue that does require access to experts / advisors that are often located outside of the region, state or even country. Supported through Flexible Funding in 19/20 at a limited level through forums and field days.
2. Gully Rehabilitation – majority of this work funded through either Reef Trust Phase 4 or Disaster Relief, which has required that suitable experts develop site plans. Tool Kit has been developed by CSIRO to support advisors / extension staff.
3. Herd Management – important issue that is often lost in the focus on sediment reduction but an area where graziers could make improvements to help their business performance. Supported through Flexible Funding in 19/20 with delivery of one workshop in 19/20.
4. Pasture Management – regional stakeholders have recognised that the priority is to update the existing Mackay Whitsunday Pasture Booklet (Bishop, 2007) with the latest information, case studies and possibly a section on gully management.

9. Monitoring and Evaluation Framework

A Monitoring and Evaluation (M&E) Framework has been designed to monitor and evaluate the performance of the Regional Extension Plan (REP) in coordinating the extension effort in the Mackay Whitsunday region and in facilitating collaboration amongst extension providers to implement the REP. It is based around Key Result Areas (KRAs) established in the Enhanced Extension Coordination

project that were developed by the Department of Agriculture and Fisheries (DAF) with input from the Department of Environment and Science and Coutts J&R. In addition, the M&E Framework can include objectives identified by the Cane and Grazing Regional Extension working groups and associated with any future projects and funding sources that are managed through the REP.

The M&E Framework sets out the processes and methods for measuring the effectiveness of implementing the Mackay Whitsunday REP and the associated efforts to enhance the coordination of extension projects in the Mackay Whitsunday region. The purpose of the evaluation information can be summarised into the following categories:

- Reporting: justifying the investment
- Communication: increasing awareness of the outcomes, successes and lessons learnt
- Adaptive management: making improvements to project delivery
- Informing future work: evaluate outcomes to provide recommendations for future projects.

It is designed to streamline and clarify the M&E process around key elements set out in three tables:

- Table 20 that describes who needs the evaluation information and what they need it for;
- Table 21 that sets out how progress towards each project objective will be measured in terms of effectiveness, efficiency, impact, legacy and project management; and
- Table 22 that outlines how the evaluation information will be collected including, the proposed timeframes and responsibilities.

By following this M&E framework, the Mackay Whitsunday REP can be revised and updated and processes improved over time so that the extension projects it supports will be more effective in increasing the adoption of improved farm practices that result in better water quality outcomes. This monitoring and evaluation framework will be implemented by the Regional Extension Coordinator with support from the Cane and Grazing Regional Extension working groups and form part of the broader cycle of review, reporting and improvement of the Regional Extension Plan and the Enhanced Extension Coordination project. However, this M&E Framework is not a substitute for project level monitoring and evaluation and does not provide for the monitoring and evaluation of all the individual extension projects being coordinated by the Mackay Whitsunday REP within the region. It does aim to build on this project level evaluation and capture outcomes from such projects, as a measure of the effectiveness of enhanced coordination. To this end an M&E Template to guide the monitoring and evaluation of projects supported through the Mackay Whitsunday REP is provided in Appendix 9.

Table 25 identifies the users of the evaluation information and how it will be used, to inform the monitoring and evaluation framework. By identifying the users and needs upfront, the framework will be selective and efficient and only conduct the evaluation that is needed and negate unnecessary over-evaluation.

Table 26 describes the objectives of the REC and REP and the activities to deliver these outcomes with evaluation questions and performance indicators to measure and assess progress and outcomes. The evaluation questions are designed to assess five key evaluation criteria:

- Effectiveness: how well has the project delivered on planned methods and outputs and what were the benefits?
- Efficiency: how efficient has the project been in targeting investment and using resources?

- Impact: what impact has the project had on creating change and contributing to Reef2050 and regional targets?
- Legacy: what are the lasting long-term benefits and obligations of completing the project?
- Project Management: what project processes and systems have been developed and is there evidence of learnings and adaptive management?

Performance measures are based on the project objectives and will be measured through a combination of quantitative and qualitative data and analysis. Table 27 outlines how the information in the Evaluation Methods described in Table 26 will be collected including, the proposed timeframes and responsibilities.

The YourDATA data base platform has been chosen for each Regional Extension Coordinator throughout GBR catchments to report to the Manager (Extension Coordination) (DAF) on activities coordinated through the Regional Coordination Groups and the implementation of the Regional Extension Plans. YourDATA is an online monitoring and evaluation database developed by Coutts J&R to assist programs and projects collect and report key evaluation data, including project activities, narratives, milestones, and feedback sheet responses. It provides a secure central data collection point with individual user accounts, allowing team members to input, edit, and view their own M&E data (or all data for their assigned region/project) and managers to view, filter, analyse and export all project/program data for reporting.

In addition regional data on extension effort, resources and uptake of improvement management practices will be collated by the Regional Extension Coordinator and entered into the Reef Extension and Education (E & E) WebMap, an ESRI ArcGIS Online interactive mapping platform designed to display the extension, incentive and best management practice projects activities being delivered by a range of industry, government and regional Natural Resource Management (NRM) organisations. The purpose of this tool is to make information more accessible and to view information with other available data to assist extension providers to review, prioritise, plan and monitor extension activities in their region.

The components of the framework, evaluation questions, performance indicators and evaluation methods are aligned to the MERI Plan for the Enhanced Extension Coordination project and have been influenced by the Stockwell et al. (2015) RP150 report, Coutts et al. (2017) E&E Review report and Moore and Rinehart (2017). The information collated in the YourDATA and E & E WebMap platforms will form part of the Evaluation Methods and be used to inform the Performance Indicators. Analyses will be limited by the information that is available at the time and not all datasets will be at the same spatial or temporal scale, as they are aggregated from various sources. The aim of the evaluation will be to coordinate and prioritise extension effort in the Mackay Whitsunday region, but will also identify data needs and target the information required to improve the efficacy of Performance Indicators to implement in future iterations of the Mackay Whitsunday Regional Extension Plan.

Table 25. *Users and uses for the evaluation information.*

Who needs the information?	What do they want to know?	How will they use the information?
Regional Extension Coordinators &	• Are the RCGs functioning effectively? • Is the REP & work plan implementation on track?	• Report on progress to DAF towards milestones and objectives • Make improvements to the structure and functioning of the RCGs

Who needs the information?	What do they want to know?	How will they use the information?
Regional Coordination Group (RCG) partners	• Is the work meeting needs?	• Make improvements to the REP & work plan • Make decisions about resourcing
Stakeholders (e.g. extension officers, industry, NRM, growers)	• What is the project doing? • How does the project impact their work? • Is the project improving the on-ground delivery?	• To inform their work program/determine whether to participate • To develop linkages with the project or others • To communicate to other stakeholders or peers
Department of Agriculture and Fisheries (DAF)	• Are RECs and RCGs functioning effectively? • Have REPs been developed and are they being implemented? • Are partnerships operating effectively? • Is there improved extension coordination & collaboration in each GBR region? • What results, expected and unexpected, and direct and indirect, are produced?	• Report on progress to OGBR (DES) towards milestones and objectives • Make improvements to the Enhanced Extension Coordination project • To facilitate learning and continuous improvement • Make recommendations about investment • Make decisions about staffing, resourcing • To justify program and continued support for Regional Extension Coordinator positions
Office of the Great barrier Reef (OGBR)	• Are partnerships operating effectively? • Is the project meeting milestones and objectives? • Is the project worth the investment? • What results, expected and unexpected and unexpected; and direct and indirect are produced?	• To justify investment • Make decisions about investment • Report on Taskforce recommendations
External funders (including Australian Government and GBR Foundation	• Is the Extension network functioning effectively and worth investing in?	• Make decisions about investment

Table 26. *Evaluation framework for project*

Project objectives	Activities/deliverables	Evaluation questions	Performance indicators	Evaluation methods
Overall Reef Water Quality Outcomes	Reef 2050 : Queensland Reef Water Quality Program Goals Of which the Regional Extension Plan and associated actions are contributing activities.	**Impact** • What measurable progress has been made towards meeting Reef 2050 WQIP 2025 land management and water • How has the Regional Extension Plan and coordination added to the rate and quality of progress • What have been the positive and negative impacts that have resulted?	**1. Extent of progress** **2. Evidence of added value from the Regional Extension Plan and coordination** **3. Examples of positive and negative impacts**	• Paddock to Reef Report Card • Scientific Consensus statements • Collated data from the evaluation of the coordination project below.
Key Result Area 1: Improved effectiveness and efficiency through improved collaboration and coordination • Maintain, enhance and expand regional extension partnerships and collaboration across major agricultural industries and NRM groups, programs (e.g. MIPs) and projects (e.g. Reef Trust Phase 3 and	**Coordination Positions** • Regional Extension Coordinator • Regional Extension Group **Resources** • Flexible regional funding to support collaborative activities and fill regional gaps. • Peer-to-Peer funding. • Skills/expertise gap program (DAF). • Training and Development program (DAF).	**Benefits derived** • What cost efficiency, practice change, economic and environmental benefits have occurred from the extra coordination and funding in terms of improved efficiencies and effectiveness of extension. • Has the effectiveness of extension in the Mackay Whitsunday region improved through the	4. **Documented cases** of newly initiated collaborative extension activities, projects or programs and linkages between related programs – at regional, cross-regional, state and national levels. 5. **Increased formal linkages** between extensions and capacity building programs and projects	**Secondary data** • Documentation/progress reports of structures, positions, resources, activities and outputs put in place in the coordination program. • Membership and activity details of proposed Mackay Whitsunday Extension Network. • Regular extension practitioner workshops sessions about

Project objectives	Activities/deliverables	Evaluation questions	Performance indicators	Evaluation methods
future funding e.g. Reef Taskforce) • Strengthen links, collaboration and leverage of product development between researchers/ scientists (reef, industry etc.) and extension staff to maximise knowledge transfer • Minimise the duplication of effort across Australian Government, State Government and industry programs which have extension activities associated with them • Enhance and support the increased extension effort being provided through existing projects and the increased urgency for this to lead to on ground practice change outcomes for reef water quality	• Collaboration with other funding sources • Contribution of extension / industry service provider resources **Platforms** • Establish and maintain a Regional Extension Group and regional extension network – formally bringing deliverers together, facilitating collaboration and new initiatives to fill gaps and developing the Regional Extension Plan. • Inclusion of other regional industry/NRM/Community groups in coordinated extension program e.g. SRA regional adoption coordinator. • Community of practice – on-line platform and face to face events. • Working with other regional groups and industry extension coordinators. **Activities** • Development of Regional Extension Plan. • Identified regional extension gaps and barriers.	implementation of the Regional Extension plan? **Impact on organisations and people** • To what extent has extension coordination improved across the Mackay Whitsunday region? • To what extent are extension and other programs being (better) strategically planned and targeted (with reduced overlap) at areas of greatest need and to achieve largest potential impact towards water quality targets? • What new initiatives have resulted from the coordination activities? • To what extent do extension personnel feel more connected, supported and valued and better able to undertake their extension activities? **Effectiveness of process** • Has the implementation of the Regional Extension Plan been effective?	funded to improve water quality. 6. **Evidence of impact of improved coordination on practice changes** on enterprises which have a known impact on economic and/or water quality benefits. 7. **Improvements in the levels of stakeholder satisfaction** re coordination, access and effectiveness of extension delivery. 8. **Increases in the extent/type of interaction** between extension staff within region and between regions and their awareness of other programs 9. **Production and use of required Regional Extension Plans**. 10. **Extent of participation in extension capacity building activities** and resulting improvement in the levels of understanding, skills,	coordination, learning, issues and impacts. **Primary data collection** • Outputs of monitoring and evaluation from projects and programs being funded and/or supported through the Regional Extension Plan. • Use of YourDATA to record extension coordination activities. • Narratives and detailed case studies of where extra coordination has resulted in collaboration and impacted on efficiency and impacts • Regional Landholder Engagement Project List updated annually • Updated E&E Spatial Database / Layers annually

Project objectives	Activities/deliverables	Evaluation questions	Performance indicators	Evaluation methods
Key Result Area 2: Improve the professional capacity of the extension network • undertaking training needs analysis, identifying professional capacity challenges, and working collaboratively to address them **Key Result Area 3: Improve evaluation and review of extension effort and impact** • Identify gaps/opportunities and provide feedback to inform and support future allocation and targeting of on-ground resources • Provide strategic advice on regional gaps, needs and appropriate responses that meet the needs of Reef Plan and the Queensland Government Great	• Identify extension practitioners influencing improved management practices in the Mackay Whitsunday region. • Identify opportunities to improve collaboration. • Undertaking agreed collaborative activities in line with the Regional Extension Plans, supported through Flexible funds. • Facilitated Peer-to-Peer learning projects. • Undertaking regional Communication Activities – led or facilitated by Regional Extension Coordinators **Training** • Undertaking the training needs analysis, identifying professional capacity challenges, and working collaboratively to address them. • Raise awareness amongst network and facilitate training organised through Manager (Training & Development). **Skill/expertise gaps**	• To what extent is communication and sharing of information/ experience (more effectively) occurring in the Mackay Whitsunday region and between projects within and across regions and industries? • What extra capacity building activities have occurred and what was the participation, reaction and impact on participants? • To what extent is the communication and collaboration between researchers/scientists and extension officers increased? • To what extent does reporting of M&E meet the P2R needs and requirements? • To what extent is strategic advice being provided to investors on where extension effort should be targeted? • What barriers/ issues have impacted on the	motivation, job satisfaction and commitment to extension in the reef regions. 11. **Documented use of new science** being used in extension activities and their uptake by producers.	

Project objectives	Activities/deliverables	Evaluation questions	Performance indicators	Evaluation methods
Barrier Reef Water Quality program	• Identify regional needs for skills and expertise to value add to extension activities and for support from DAF skills gap/expertise project. **Evaluation** • Record information in YouDATA and provide data for the E&E WebMap platform. • Regional Extension Coordinators to work with P2R and delivery organisations to increase spatial monitoring and evaluation of extension impact. • Document findings to provide policy makers with information and implications for extension policy, funding and operational activities. • Facilitate annual regional meetings to provide feedback to key stakeholders including Manager (Extension Coordination)	process and what changes are needed? • What were the expected/ unexpected results of coordination?		

Table 27. *Evaluation Methods and Timing*

Evaluation Method	Focus	Timing	Responsibility
Secondary data capture and analysis	Using available reporting and data sets to capture trends, activities, changes in linkages and impacts. Includes analysis of capacity building/extension projects and linkages; progress reports of extension providers; P2R reports and Report card; Reef Extension Network data.	Annually	Regional Extension Coordinators Member extension providers
Narratives	To qualitatively capture impacts and outcomes from projects and also barriers/issues.	Collected throughout projects and reported via six-monthly progress reports.	Regional Extension Coordinators
Case studies	To quantify where possible specific instances of change and resulting efficiencies and impact	Annually with an emphasis on final 6 months	Regional Coordinators Member extension providers
Interviews with informed stakeholders	To quantify and qualify benchmarks and changes in coordination, collaboration and extension delivery performance. Informed Producer input should also be sought in the final benchmark.	Annually	Regional Extension Coordinators Member extension providers M&E Consultants
Workshop debrief of coordinators	Capture observations, experiences and outcomes from coordinators as well as opportunities for improvement.	Annual Regional Extension Coordinator workshop	Manager (Extension Coordination) to organise workshop M&E Consultants
Workshop evaluation – AG and QG	Capture feedback provided to AG and QG, actions planned and success of workshop, areas for improvement	Annual Regional Extension Coordinator workshop	Manager (Extension Coordination) to organise workshop

Evaluation Method	Focus	Timing	Responsibility
			M&E Consultants/ Independent facilitator to collect data
Extension personnel survey	To capture feedback, satisfaction, observations and experiences from stakeholders involved in the project and document examples of actions taken and how activity assisted.	Annual	Manager (Extension Coordination) M&E Consultants
Analysis of Communication activities	Show evidence of key messages being developed and used by extension officers. To share project outputs and outcomes.	Reported in six-monthly progress reports	Regional Extension Coordinators Communications officer Manager (Extension Coordination)
Capacity building evaluation	Show evidence of capacity building in extension network.	Reported in six-monthly progress reports	Regional Extension Coordinators Manager (Training & Development)

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11. Appendices

Appendix 1: Mackay Whitsunday Region Catchment Water Quality Targets (source: reefplan.qld.gov.au)

MACKAY WHITSUNDAY REGION

Proserpine catchment water quality targets

Catchment profile

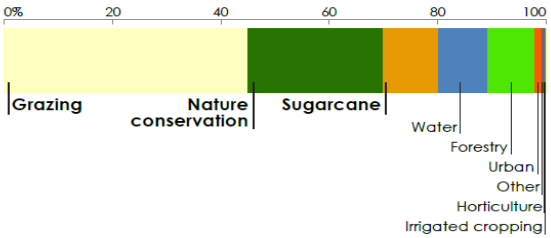
Under the Reef 2050 Water Quality Improvement Plan, water quality targets have been set for each catchment that drains to the Great Barrier Reef. These targets (given over the page) consider land use and pollutant loads from each catchment.

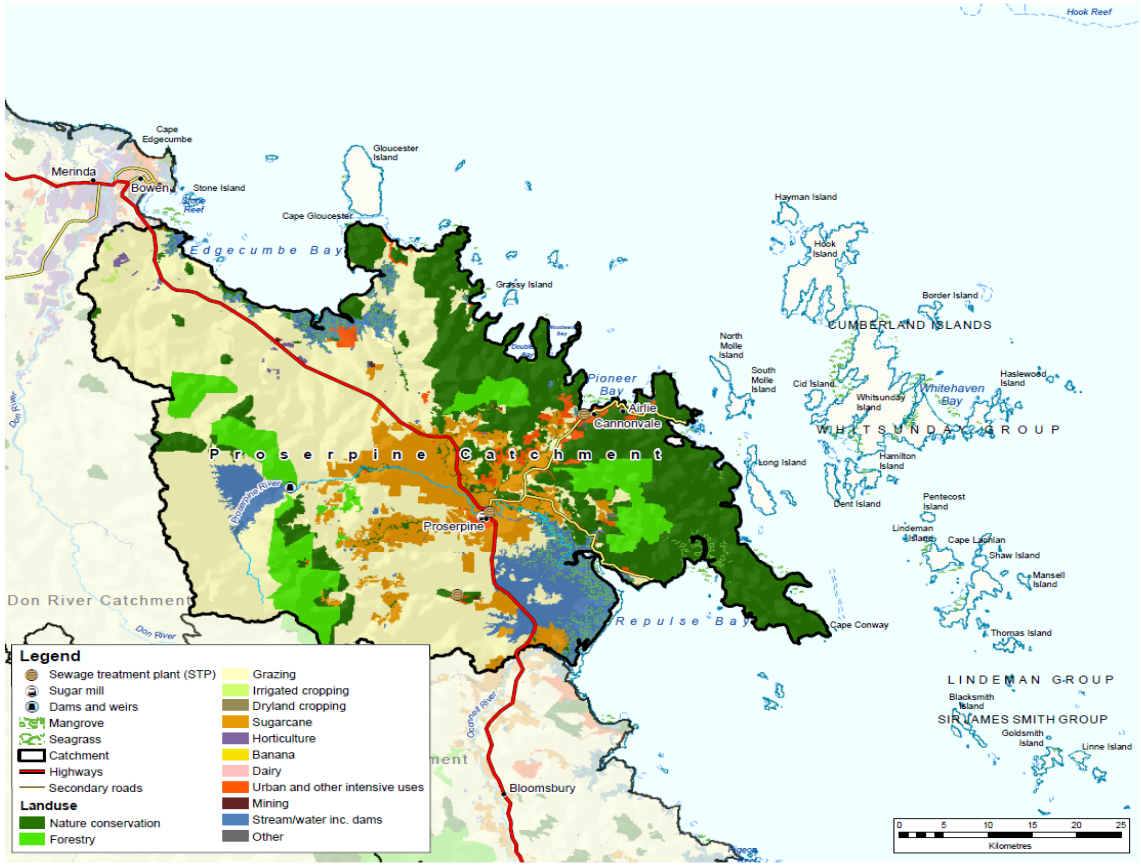
The Proserpine catchment covers 2494 km² (28% of the Mackay Whitsunday region). Rainfall averages 1474 mm a year, which results in river discharges to the coast of about 2150 GL each year.

The Proserpine catchment is the northernmost catchment in the Mackay Whitsunday region and comprises nine sub-catchments. The main waterway is the Proserpine River located in the centre of the catchment area. The upper tributaries of the Proserpine River are dominated by grazing and come together at Lake Proserpine (Peter Faust Dam). The lower reaches flow through the township of Proserpine and through sugarcane and conservation areas before reaching the coast at Repulse Bay. The northern sub-catchments discharge to Edgecumbe Bay and include Eden Lassie Creek and Gregory River. The Whitsunday Coast and Repulse Creek sub-catchments lie on the coastal fringe, and Myrtle, Lethebrook and Thompson creeks capture the southernmost section of the catchment area. Grazing, conservation and sugarcane are the main land uses, with some horticultural and urban areas.

Land uses in the Proserpine catchment

The main land uses are grazing (45%), nature conservation (25%), and sugarcane (10%).





2025 water quality targets and priorities

End-of-catchment anthropogenic load reductions required from 2013 baseline				Pesticides
Dissolved inorganic nitrogen (DIN)	Fine sediment	Particulate phosphorus (PP)	Particulate nitrogen (PN)	
70% 110 tonnes	**maintain current load**	**maintain current load**	**maintain current load**	To protect at least **99%** of aquatic species at the end of catchment

The 2025 targets aim to reduce the amounts of fine sediments, nutrients (nitrogen and phosphorus) and pesticides flowing to the reef. Where there are minimal anthropogenic pollutant loads, the aim is to maintain current water quality so there are no increases in loads. Each target for sediment and nutrients is expressed as: (a) the percentage load reduction required compared with the 2013 estimated load of each pollutant from the catchment; and (b) the load reductions required in tonnes. Progress made since 2013 will count towards these targets. Previously reported progress between 2009 and 2013 has already been accounted for when setting the targets. The pesticide target aims to ensure that concentrations of pesticides at the end of each catchment are low enough that 99% of aquatic species are protected. The targets are ecologically relevant for the Great Barrier Reef, and are necessary to ensure that broadscale land uses have no detrimental effect on the reef's health and resilience.

A high percentage reduction target may not necessarily mean it is the highest priority. The priorities (ranked by colour) reflect the relative risk assessment priorities for water quality improvement, based on an independent report, the 2017 Scientific Consensus Statement. The priorities reflect scientific assessment of the likely risks of pollutants damaging coastal and marine ecosystems.

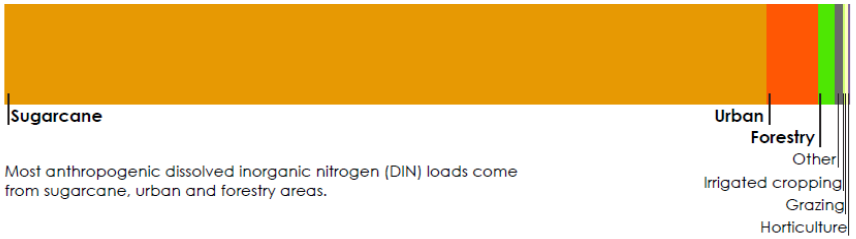
Water quality relative priority

- Very high
- High
- Moderate
- Low
- Minimal
- Not assessed

Modelled water quality pollutant loads

The Proserpine catchment has minimal anthropogenic fine sediment loads. The aim is to reduce loads of dissolved inorganic nitrogen, most of which come from sugarcane.

Dissolved inorganic nitrogen



Most anthropogenic dissolved inorganic nitrogen (DIN) loads come from sugarcane, urban and forestry areas.

MACKAY WHITSUNDAY REGION

O'Connell catchment water quality targets

Catchment profile

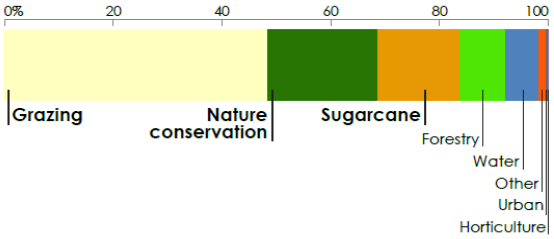
Under the Reef 2050 Water Quality Improvement Plan, water quality targets have been set for each catchment that drains to the Great Barrier Reef. These targets (given over the page) consider land use and pollutant loads from each catchment.

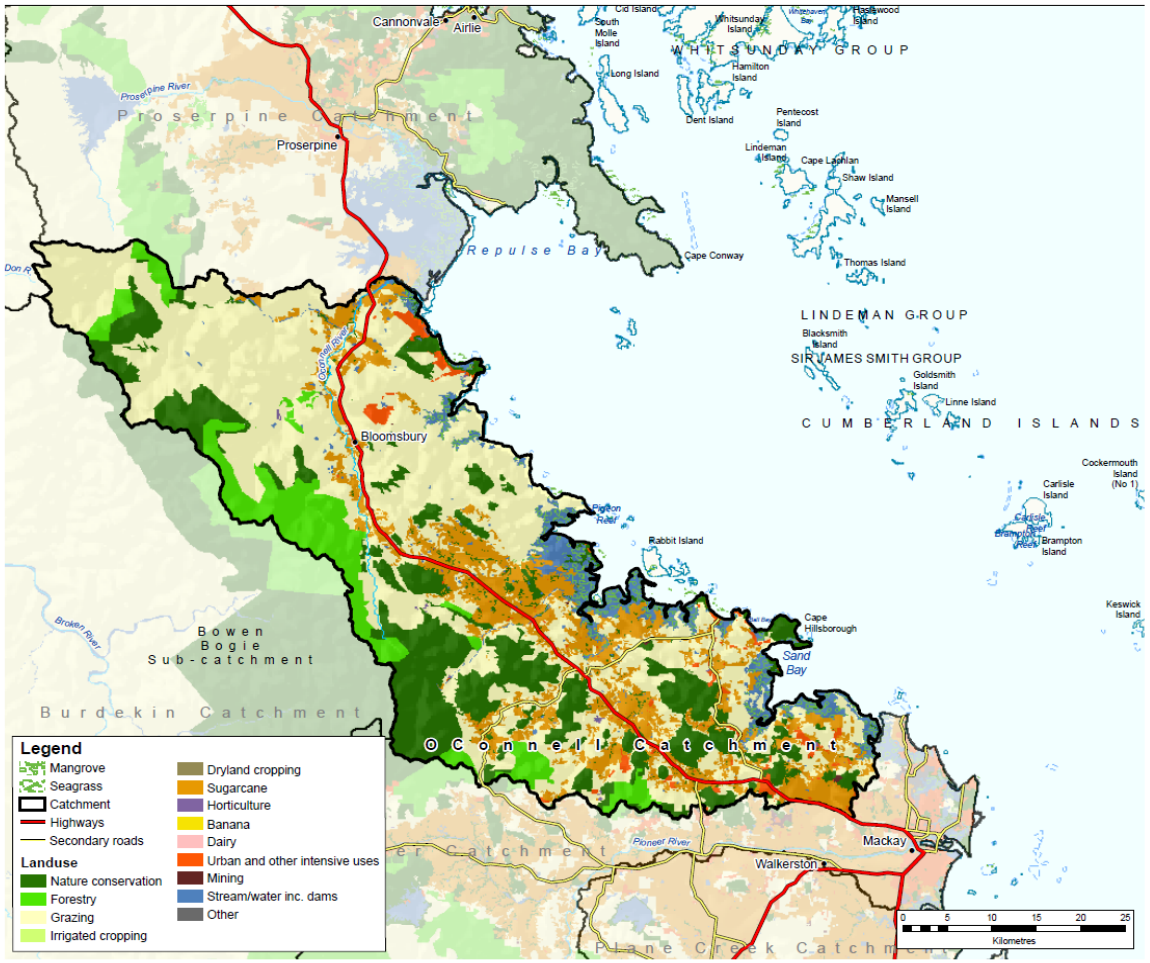
The O'Connell catchment covers 2387 km² (27% of the Mackay Whitsunday region). Rainfall averages 1705 mm a year, which results in river discharges to the coast of about 1774 GL each year.

The O'Connell catchment encompasses the O'Connell and Andromache rivers in the north, St Helens and Murray creeks in the centre and Constant and Reliance creeks in the south. These sub-catchments discharge into Repulse Bay and the Seaforth Coast receiving waters. The southern boundary of the basin encompasses the city of Mackay's Northern Beaches area. The major land use in the catchment is grazing, which is primarily in the north, followed by conservation and forestry in the upper reaches of the catchment and sugarcane farming in the south.

Land uses in the O'Connell catchment

The main land uses are grazing (48%), nature conservation (20%), and sugarcane (15%).





2025 water quality targets and priorities

End-of-catchment anthropogenic load reductions required from 2013 baseline				Pesticides
Dissolved inorganic nitrogen (DIN)	Fine sediment	Particulate phosphorus (PP)	Particulate nitrogen (PN)	
70% 130 tonnes	**40%** 96 kilotonnes	**40%** 120 tonnes	**40%** 250 tonnes	To protect at least **99%** of aquatic species at the end of catchment

The 2025 targets aim to reduce the amounts of fine sediments, nutrients (nitrogen and phosphorus) and pesticides flowing to the reef. Each target for sediment and nutrients is expressed as: (a) the percentage load reduction required compared with the 2013 estimated load of each pollutant from the catchment; and (b) the load reductions required in tonnes. Progress made since 2013 will count towards these targets. Previously reported progress between 2009 and 2013 has already been accounted for when setting the targets. The pesticide target aims to ensure that concentrations of pesticides at the end of each catchment are low enough that 99% of aquatic species are protected. The targets are ecologically relevant for the Great Barrier Reef, and are necessary to ensure that broadscale land uses have no detrimental effect on the reef's health and resilience.

A high percentage reduction target may not necessarily mean it is the highest priority. The priorities (ranked by colour) reflect the relative risk assessment priorities for water quality improvement, based on an independent report, the 2017 Scientific Consensus Statement. The priorities reflect scientific assessment of the likely risks of pollutants damaging coastal and marine ecosystems.

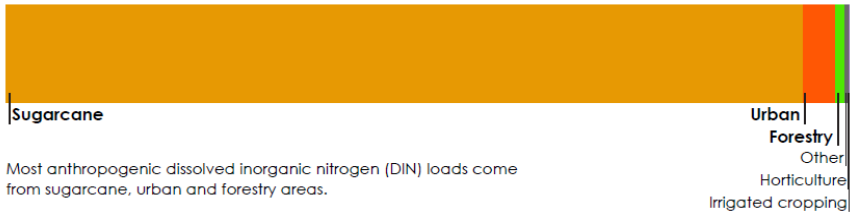
Water quality relative priority

- Very high
- High
- Moderate
- Low
- Minimal
- Not assessed

Modelled water quality pollutant loads

Of the Mackay Whitsunday catchments, the O'Connell contributes the third largest loads of anthropogenic dissolved inorganic nitrogen and the largest loads of fine sediment, mostly from sugarcane and streambank erosion.

Dissolved inorganic nitrogen



Most anthropogenic dissolved inorganic nitrogen (DIN) loads come from sugarcane, urban and forestry areas.

Fine sediment

Most anthropogenic fine sediment loads come from sugarcane, streambank erosion and grazing areas.

Types of sediment erosion

Most sediment erosion comes from hillslopes and streambanks in the O'Connell catchment.

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Pioneer catchment water quality targets

Catchment profile

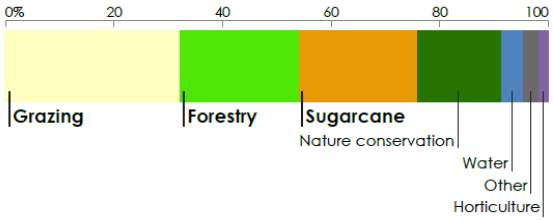
Under the Reef 2050 Water Quality Improvement Plan, water quality targets have been set for each catchment that drains to the Great Barrier Reef. These targets (given over the page) consider land use and pollutant loads from each catchment.

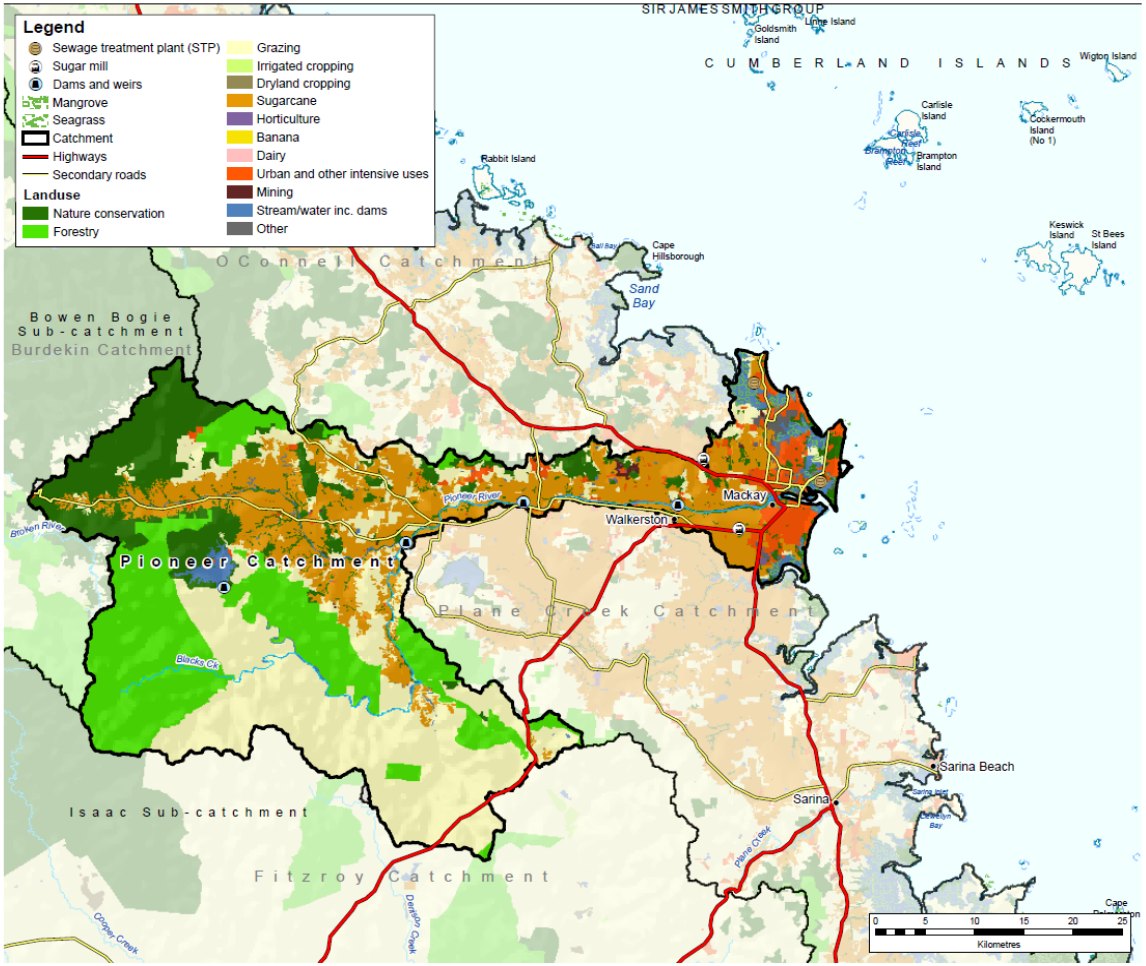
The Pioneer catchment covers 1572 km² (17% of the Mackay Whitsunday region). Rainfall averages 1578 mm a year, which results in river discharges to the coast of about 1012 GL each year.

The Pioneer catchment is the smallest in the Mackay Whitsunday region. The bulk of the catchment lies inland with just one main channel, the Pioneer River, draining to the coast to Sandringham Bay. The westerly upper reaches of the Pioneer River are divided into two sub-catchments, Upper Cattle Creek and Blacks Creek. The eastern section of the catchment area is the city of Mackay with the main channel of the Pioneer River running through the city. Grazing land occupies the majority of the catchment area, primarily found in the upper, inland section. Forestry and conservation are also major land uses in the upper reaches of the catchment. In the lower reaches, sugarcane dominates the land use, along with urban and other intensive uses at the mouth of the river.

Land uses in the Pioneer catchment

The main land uses are grazing (32%), forestry (22%), and sugarcane (22%).





2025 water quality targets and priorities

End-of-catchment anthropogenic load reductions required from 2013 baseline				Pesticides
Dissolved inorganic nitrogen (DIN)	Fine sediment	Particulate phosphorus (PP)	Particulate nitrogen (PN)	
70% 140 tonnes	**20%** 35 kilotonnes	**20%** 23 tonnes	**20%** 61 tonnes	To protect at least **99%** of aquatic species at the end of catchment

The 2025 targets aim to reduce the amounts of fine sediments, nutrients (nitrogen and phosphorus) and pesticides flowing to the reef. Each target for sediment and nutrients is expressed as: (a) the percentage load reduction required compared with the 2013 estimated load of each pollutant from the catchment; and (b) the load reductions required in tonnes. Progress made since 2013 will count towards these targets. Previously reported progress between 2009 and 2013 has already been accounted for when setting the targets. The pesticide target aims to ensure that concentrations of pesticides at the end of each catchment are low enough that 99% of aquatic species are protected. The targets are ecologically relevant for the Great Barrier Reef, and are necessary to ensure that broadscale land uses have no detrimental effect on the reef's health and resilience.

A high percentage reduction target may not necessarily mean it is the highest priority. The priorities (ranked by colour) reflect the relative risk assessment priorities for water quality improvement, based on an independent report, the 2017 Scientific Consensus Statement. The priorities reflect scientific assessment of the likely risks of pollutants damaging coastal and marine ecosystems.

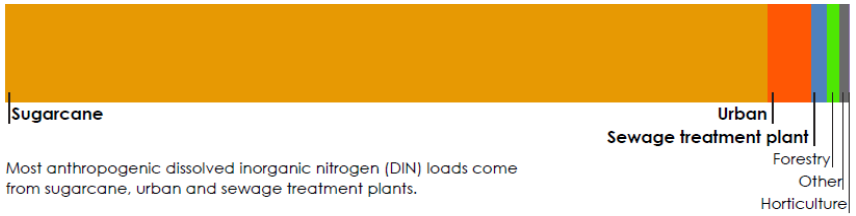
Water quality relative priority

- Very high
- High
- Moderate
- Low
- Minimal
- Not assessed

Modelled water quality pollutant loads

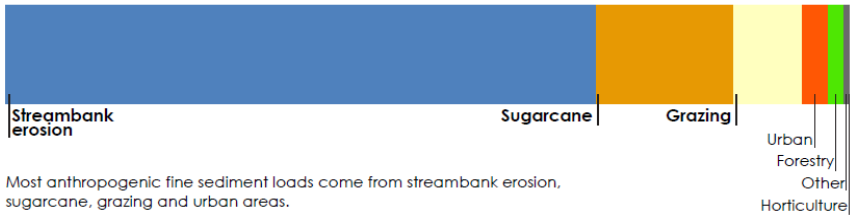
Of the Mackay Whitsunday catchments, the Pioneer contributes the second largest loads of anthropogenic dissolved inorganic nitrogen, which comes mostly from sugarcane. The Pioneer contributes the second largest loads of fine sediment in the region. Most sediments come from streambank erosion.

Dissolved inorganic nitrogen



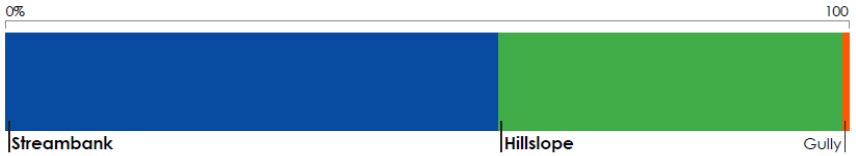
Most anthropogenic dissolved inorganic nitrogen (DIN) loads come from sugarcane, urban and sewage treatment plants.

Fine sediment



Most anthropogenic fine sediment loads come from streambank erosion, sugarcane, grazing and urban areas.

Types of sediment erosion



Most sediment erosion comes from streambanks and hillslopes in the Pioneer catchment.

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Plane catchment water quality targets

Catchment profile

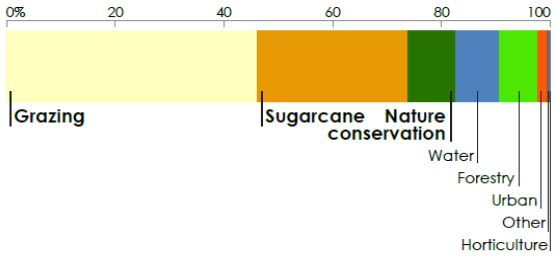
Under the Reef 2050 Water Quality Improvement Plan, water quality targets have been set for each catchment that drains to the Great Barrier Reef. These targets (given over the page) consider land use and pollutant loads from each catchment.

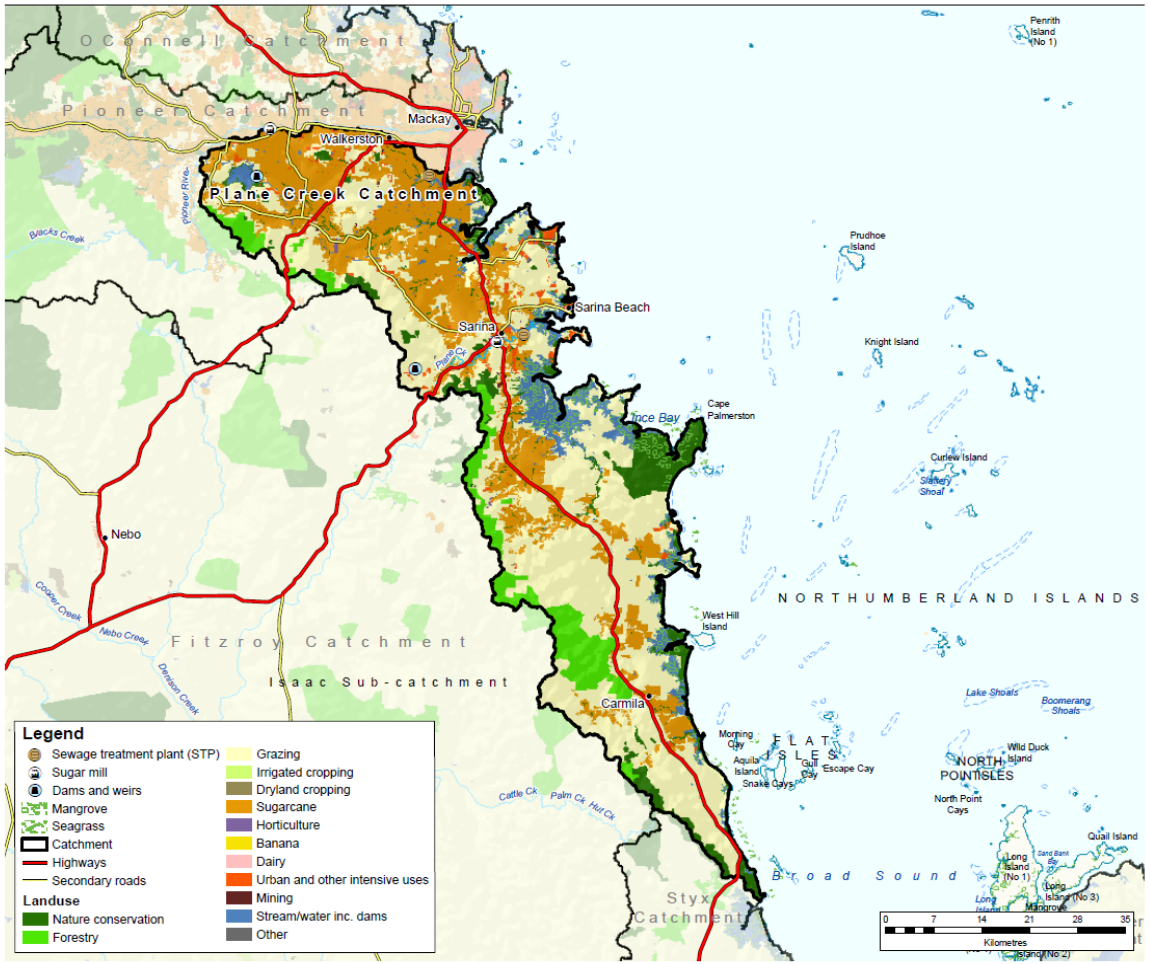
The Plane catchment covers 2539 km² (28% of the Mackay Whitsunday region). Rainfall averages 1526 mm a year, which results in river discharges to the coast of about 1261 GL each year.

The Plane catchment occupies the southern section of the Mackay Whitsunday region. It is bordered by the Connors Range in the west and encompasses a number of small sub-catchments that flow straight to the coast. The Plane catchment has the highest area of sugarcane farming across the Mackay Whitsunday region, and this is found primarily in the northern sub-catchments of Sandy, Bakers and Alligator creeks. Further south, the land use becomes dominated by grazing, although sugarcane is still widespread throughout. There are also small areas of forestry and conservation in the catchment. The major township of Sarina is situated on the lower part of Plane Creek. The other sub-catchments are distributed south along the coast from Rocky Dam Creek to Cape, Marion, Flaggy Rock and Carmila creeks, which drain into the Sarina Inlet, Ince Bay and Carmila Coast receiving waters.

Land uses in the Plane catchment

The main land uses are grazing (46%), sugarcane (28%), and nature conservation (9%).





2025 water quality targets and priorities

End-of-catchment anthropogenic load reductions required from 2013 baseline				Pesticides
Dissolved inorganic nitrogen (DIN)	Fine sediment	Particulate phosphorus (PP)	Particulate nitrogen (PN)	
70% 260 tonnes	**maintain current load**	**maintain current load**	**maintain current load**	To protect at least **99%** of aquatic species at the end of catchment

The 2025 targets aim to reduce the amounts of fine sediments, nutrients (nitrogen and phosphorus) and pesticides flowing to the reef. Where there are minimal anthropogenic pollutant loads, the aim is to maintain current water quality so there are no increases in loads. Each target for sediment and nutrients is expressed as: (a) the percentage load reduction required compared with the 2013 estimated load of each pollutant from the catchment; and (b) the load reductions required in tonnes. Progress made since 2013 will count towards these targets. Previously reported progress between 2009 and 2013 has already been accounted for when setting the targets. The pesticide target aims to ensure that concentrations of pesticides at the end of each catchment are low enough that 99% of aquatic species are protected. The targets are ecologically relevant for the Great Barrier Reef, and are necessary to ensure that broadscale land uses have no detrimental effect on the reef's health and resilience.

A high percentage reduction target may not necessarily mean it is the highest priority. The priorities (ranked by colour) reflect the relative risk assessment priorities for water quality improvement, based on an independent report, the 2017 Scientific Consensus Statement. The priorities reflect scientific assessment of the likely risks of pollutants damaging coastal and marine ecosystems.

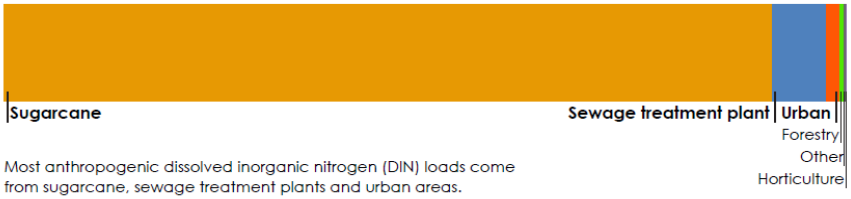
Water quality relative priority

- Very high
- High
- Moderate
- Low
- Minimal
- Not assessed

Modelled water quality pollutant loads

Of the Mackay Whitsunday catchments, the Plane contributes the largest loads of anthropogenic dissolved inorganic nitrogen, mostly from sugarcane.

Dissolved inorganic nitrogen



Most anthropogenic dissolved inorganic nitrogen (DIN) loads come from sugarcane, sewage treatment plants and urban areas.

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Appendix 2: Reef Personnel – Mackay Whitsundays as at July 2019

Name	Position title	Organisation	Industry	Reef Plan Basins
Mark Hetherington	Productivity Officer	Plane Creek Prod Services	Cane	Plane
Peter Albertson	Extension Officer	Plane Creek Prod Services	Cane	Plane
Jefferson	QFF Graduate Role	Plane Creek Prod Services	Cane	Plane
Mal Langdon	Chair	Plane Creek Prod Services	Cane	Plane
Kevin Borg	Chair	Canegrowers (Plane Creek)	Cane	Plane
Damian Baxter	Agronomist	Wilmar Ag Services	Cane	Proserpine, O'Connell, Pioneer, Plane
George Russell	Agronomist	Wilmar Ag Services	Cane	Proserpine, O'Connell, Pioneer, Plane
Liana Lillford	Agronomist	Wilmar Ag Services	Cane	Proserpine, O'Connell, Pioneer, Plane
John Tait	Mill Data Management	Wilmar Plane Creek Mill	Cane	Plane Creek
Ian Davies	Mill Representative	Wilmar	Cane	Proserpine, O'Connell, Plane
Anthony Schembri	Manager	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Audra Allan	Extension and BMP Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
David McCallum	Development Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Andy Humphries	Extension Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Mary Anne Volker	Productivity Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Andrew Dugan	Productivity Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Britney Gibbs	Productivity Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Shane Hare	Productivity Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Steven Garrad	Productivity Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Ian Marais	Productivity Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Brendan Rae	Productivity Officer	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Frank Perna	Chair	Mackay Area Prod Services	Cane	O'Connell, Pioneer, Plane
Kevin Moore	Cane Harvest & Development	Mackay Sugar	Cane	O'Connell, Pioneer, Plane
Paul Stuart	Cogeneration Superintendent	Mackay Sugar	Cane	O'Connell, Pioneer, Plane
Rob Sluggett	Researcher / Agronomist	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
Tony Crowley	Researcher / Agronomist	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
John Markley	Researcher, GIS Specialist	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
Natalie Fiocco	RTP3 Cane Extension Officer	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
Che' Trendell	Extension officer RP161	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
Kylie Bezzina	Extension officer	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
John Turner	Extension officer Bonsucro	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
Zoe Eagger	Extension officer	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
David Clancy	QFF Graduate Role	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane

Name	Position title	Organisation	Industry	Reef Plan Basins
Stephen Newbury	Extension officer - Pesticides	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
Kaitlyn Reddacliffe	Extension officer	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
Ian Faulkner	Extension officer - Pesticides	Farmacist	Cane	Proserpine, O'Connell, Pioneer, Plane
Daniel Gonzalez	Extension officer	DAF - Mackay	Cane	Proserpine, O'Connell, Pioneer, Plane
Brendon Nothard	Ag Economist	DAF - Mackay	Multiple	Proserpine, O'Connell, Pioneer, Plane
Dylan McCane	Ag Economist	DAF - Mackay	Multiple	Proserpine, O'Connell, Pioneer, Plane
Phil Trendell	EEC Regional Coordinator	DAF - Mackay	Multiple	Proserpine, O'Connell, Pioneer, Plane
Barry Salter	Farming Systems Leader	SRA	Cane	Proserpine, O'Connell, Pioneer, Plane
Phil Ross	Regional Coordinator	SRA	Cane	Proserpine, O'Connell, Pioneer, Plane
Matt Schembri	Adoption Officer	SRA	Cane	Proserpine, O'Connell, Pioneer, Plane
Clare Gersch	Adoption Officer	SRA	Cane	Proserpine, O'Connell, Pioneer, Plane
Nicholas Hill	EEF Project Officer	SRA	Cane	Proserpine, O'Connell, Pioneer, Plane
Molly O'Dea	Myrtle Creek Project Officer	SRA	Cane	Proserpine
Carol Norris	Harvesting BMP Extension	SRA	Cane	Proserpine, O'Connell, Pioneer, Plane
John Eden	BMP Facilitator	Mackay Canegrowers	Cane	O'Connell, Pioneer, Plane
Kerry Latter	Manager	Mackay Canegrowers	Cane	O'Connell, Pioneer, Plane
Shelley Dent	BMP Trainer	Mackay Canegrowers	Cane	O'Connell, Pioneer, Plane
Christine Walker	Communications Officer	Mackay Canegrowers	Cane	O'Connell, Pioneer, Plane
Frank Millar	Extension Officer	Sugar Services Proserpine	Cane	Proserpine, O'Connell
Laurent Verpeaux	Productivity Officer	Sugar Services Proserpine	Cane	Proserpine, O'Connell
Christine Petersen	BMP Facilitator	Sugar Services Proserpine	Cane	Proserpine, O'Connell
Michael Porter	Manager	Canegrowers Proserpine	Cane	Proserpine, O'Connell
Tony Large	Chair	Canegrowers Proserpine	Cane	Proserpine, O'Connell
Lindsay Altman	Chair	Sugar Services Proserpine	Cane	Proserpine, O'Connell
Phil Jeston	WQ Monitoring Officer	Catchment Solutions	Multiple	Proserpine, O'Connell, Pioneer, Plane
Andrew Campbell	Manager / Project Catalyst	Catchment Solutions	Multiple	Mackay Whitsundays
Katrina Dent	General Manager	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Traci Ellwood	Business Manager	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Wendy Slater	Finance Manager	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Emma Carlos	Executive Officer MWHRTR	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Alysha Lee	Technical Officer MWHRTR	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Jessica Gillespie	Technical Officer MWHRTR	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Chris Dench	Water, Waterways and Coasts	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Michael Boland	Inland and Sustainable Agriculture	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane

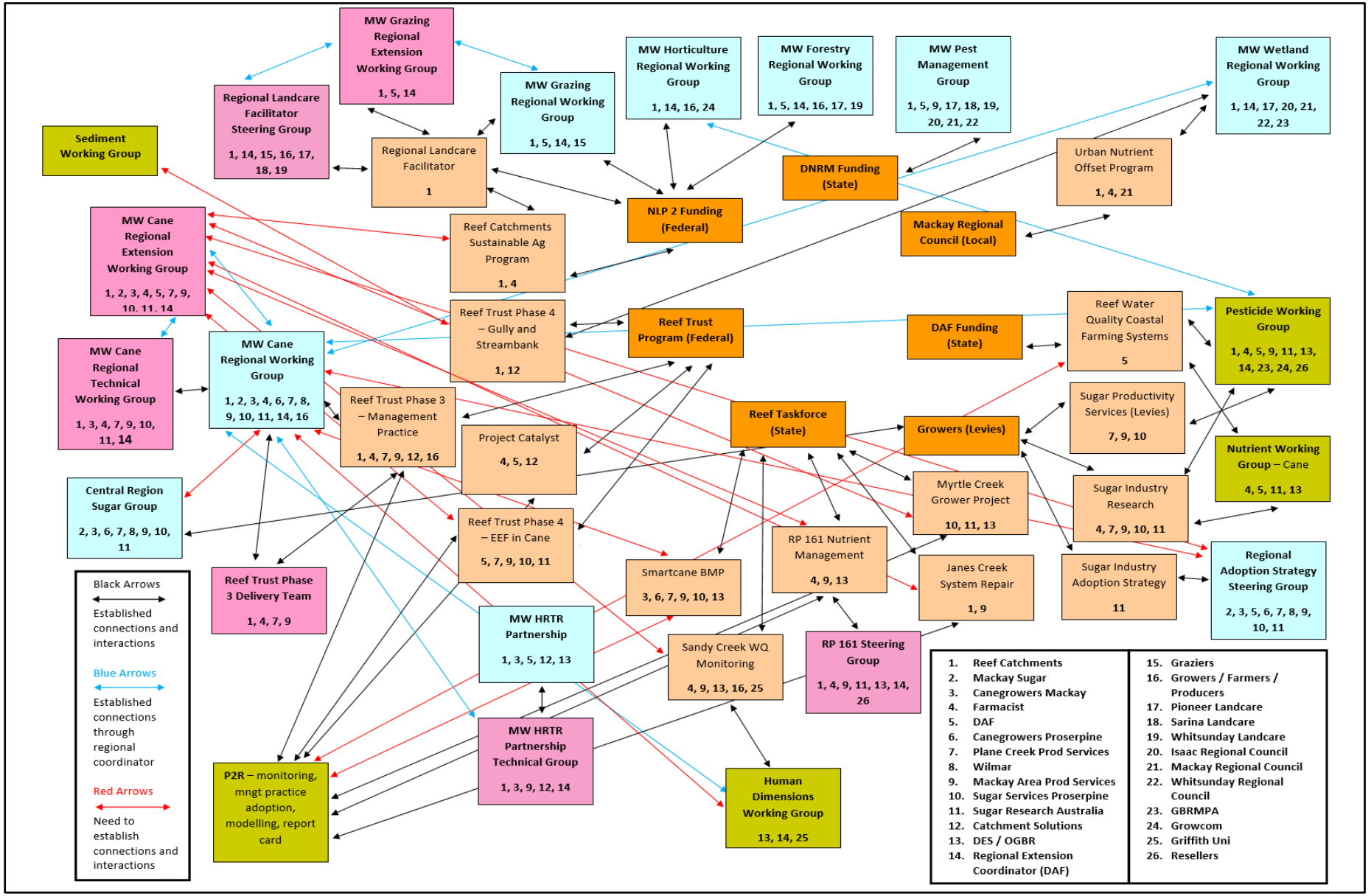
Name	Position title	Organisation	Industry	Reef Plan Basins
Tegan McBride	Sustainable Agriculture	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Ian Brooks	Agriculture Extension	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Mandy Jeppesen	Grazing Management	Reef Catchments NRM	Grazing	Proserpine, O'Connell, Pioneer, Plane
Juliane Kasiske	Regional Landcare Facilitator	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Aaron Reagan	Streambank Restoration	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Cass Hayward	Coasts & Biodiversity and GIS Officer	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Jonathan Reichard	Communications and Media Officer	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Chris Barbeler	Pests and Weeds	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Carlos Bueno	Water and Waterways	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Jordanna Kitching	GIS Officer	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Olivia Brodhurst	Riparian and Streambank Repair	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Amanda Bland	Reef Trust 4	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Margaret Meng	Coasts and Biodiversity	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Matt Newland	NRM planning and MERI	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Jessica Sabatino	Wetlands	Reef Catchments NRM	Multiple	Proserpine, O'Connell, Pioneer, Plane
Carla Lambropoulos	Landcare Coordinator	Pioneer Landcare	Multiple	O'Connell, Pioneer, Plane
Kade Slater	Project Officer	Pioneer Landcare	Multiple	O'Connell, Pioneer, Plane
Saskia Von Fahland	Landcare Coordinator	Sarina Landcare	Multiple	Plane
Cath Campbell	Landcare Coordinator	Whitsunday Landcare	Multiple	Proserpine, O'Connell
Peter Alden	Project Officer	Whitsunday Landcare	Multiple	Proserpine, O'Connell
Darren McGrath	Branch Manager	Landmark	Multiple	Proserpine, O'Connell, Pioneer, Plane
Brad Hussey	Agribusiness Advisor	Landmark	Multiple	Proserpine, O'Connell, Pioneer, Plane
Don McNichol	Agribusiness Advisor	Landmark	Multiple	Proserpine, O'Connell, Pioneer, Plane
Aaron Oesch	Agribusiness Advisor	Landmark	Multiple	Proserpine, O'Connell, Pioneer, Plane
Kerry Qualischefski	Agribusiness Advisor	NQ Farm Shed	Multiple	Proserpine, O'Connell, Pioneer, Plane
Wayne Berginey	Agribusiness Advisor	NQ Farm Shed	Multiple	Proserpine, O'Connell, Pioneer, Plane
Paul Rogers	Agribusiness Advisor	Rogers Rural / Farm HQ	Multiple	Proserpine, O'Connell, Pioneer, Plane

Group Acronyms

CRWG **Mackay Whitsunday Cane Regional Working Group**
MWCTWG **Mackay Whitsunday Cane Technical Working Group**
RPCDT **Mackay Whitsunday Reef Programme Cane Delivery Team**
GRWG **Mackay Whitsunday Grazing Regional Working Group**
WWG **Mackay Whitsunday Wetland Working Group**

FWG	**Mackay Whitsunday Forestry Working Group**
HWG	**Mackay Whitsunday Horticulture Working Group**
CREWG	**Mackay Whitsunday Cane Regional Extension Working Group**
GREWG	**Mackay Whitsunday Grazing Regional Extension Working Group**
MWPMG	**Mackay Whitsunday Pest Management Group**

Appendix 3: Mackay Whitsunday Stakeholder Groups / Networks as at June 2018



Appendix 4: Landholder Engagement Project List – Mackay Whitsundays as at July 2019

Initiative / Industry	Mechanism	Focus	Location	Involves producer survey / benchmarking?	18/19 Status	19/20 Status
Reef Water Quality Coastal Farming Systems extension program (DAF) - Cane	Trials, advice, workshops, field days, economics/case studies, demonstrations	Deliver management practice improvements that both improve production and profitability of Queensland's sugarcane industry and reduce nutrient, herbicide and sediment loads to the Great Barrier Reef in line with Reef Plan water quality targets.	Mackay-Whitsunday, Burdekin and Wet Tropics	Yes	On-going	On-going
Smartcane BMP (Canegrowers) - Cane	Self-assessment and accreditation	Industry-developed modules covering a wide range of usual farm activities. Practices in the modules are categorised depending on their ability to improve productivity, profitability and stewardship. The three key modules include soil health and plant nutrition management; pest, disease and weed management; and drainage and irrigation management.	Wet Tropics, Burdekin, Mackay-Whitsundays, Burnett-Mary	Yes	On-going	On-going
Reef Trust Phase 3 (Aust. Gov via Reef Alliance Project 'Growing a Great Barrier Reef') Improved Management Practice Adoption - Cane	Incentives for on-ground practice change, extension, training, workshops	Continuation of the increase in voluntary uptake of improved land management practices by landholders that will reduce the discharge of nutrients, sediments and pesticides into the GBR. Delivered through extension, training, water quality grants and partnerships. Includes an innovation component.	All regions	Yes	On-going – complete June 2019	On-going until December 2019 in some regions
GBRF Reef Alliance Program	*Maintaining capacity and engagement between farmers and extension staff / advisors.*	*More details provided once the project starts in the region.*	*All regions*	*Yes*		*Starting*

Initiative / Industry	Mechanism	Focus	Location	Involves producer survey / benchmarking?	18/19 Status	19/20 Status
Reef Extension and Education Regional Coordinators – Cane and Grazing	Coordination, communication, M&E, capacity building	To coordinate, monitor and evaluate the effectiveness of industry extension across the GBR for improved WQ outcomes	Fitzroy, Mackay Whitsundays, Burdekin, Wet tropics	Yes – Extension Providers	On-going	On-going
Project Catalyst (NRMs and other partners) - Cane	Trials, workshops, economics/case studies	Reduce the environmental footprint that sugarcane production has on water quality and the Great Barrier Reef by speeding the evolution of innovative / cutting edge farming practices in the sugar industry.	Wet Tropics, Burdekin, Mackay-Whitsundays	Yes	On-going	On-going through GBRF
Wetlands in Agriculture – Training, Extension and Resources (WATER) (DAF) – Cane and Grazing	Training, advice, field days, workshops, providing information, capacity building, economic case studies	Provide information and support to agricultural industries within the GBR catchments to promote long-term sustainable use and management of wetlands.	Wet Tropics, Burdekin, Mackay-Whitsundays, Fitzroy, Cape York		On-going	On-going
Regional Landcare Facilitators (NRMs) – Cane and Grazing	Workshops, field days, providing information, coordinate capacity building,	Support Landcare and production groups to adopt sustainable land management and protect the landscape.	Wet Tropics, Burdekin, Mackay-Whitsundays, Fitzroy, Burnett-Mary, Cape York?		On-going	On-going
Reef Trust Phase 4 – Enhanced Efficiency Fertilisers - Cane	Trials, Demonstrations, Extension, Water quality monitoring	The implementation of 60 trials across GBR catchments looking at the effect of enhanced efficiency fertilisers on production and water quality. Includes an extension component to communicate results to a wider audience.	Wet Tropics, Burdekin, Mackay Whitsunday, Burnett Mary		On-going	On-going
Reef Trust Phase 4 – Gully and		This program will target sediment run-off from gully and streambank erosion by	Burnett Mary, Fitzroy,		On-going	On-going

Initiative / Industry	Mechanism	Focus	Location	Involves producer survey / benchmarking?	18/19 Status	19/20 Status
Streambank Erosion Control Program – Cane and Grazing		providing landholders/riparian managers with opportunities and resources to address losses from a range of priority sources/locations.	Mackay Whitsunday, Burdekin, Wet Tropics, Cape York			
Agricultural Capacity Building Program (QLD Gov, QFF) – Cane and Grazing	Employ and mentor trainee extension personnel	Train early career extension officers by enhancing their skills in delivering agricultural and NRM projects with landholders in the GBR Catchments.	Wet Tropics, Burdekin, Mackay-Whitsundays, Fitzroy, Burnett-Mary,		On-going – Stage 1 roles finish Aug 2018. Stage 2 roles start May 2019.	On-going to May 2020
Project Bluewater (Farmacist)	*Capacity Building, Equipment auditing, Reseller training / participation.*	*Targeting improvement in pesticide management practices including both increased knowledge and skills around pesticide selection / application and improvements in application equipment / calibration. More details provided once the project starts in the region.*	*Burdekin, Mackay-Whitsundays*	*Yes*		*Starting*
Chemical Management (DAF / DES)	Communication, Awareness, Auditing, Capacity Building	Targeting improvements in chemical management linked to the requirements under the Chemical Usage Act that landholders need to understand and follow when using them on their properties.	Wet tropics, Burdekin, Mackay-Whitsundays		Starting	On-going
Mackay Whitsunday Healthy River to Reef Partnership / Report Card – Cane and Grazing	Reporting on regional progress towards water quality targets and other catchment based activities.	Regional partnership formed from community, industry science, tourism and government to develop annual report card. This uses indicators to report on the environmental condition of freshwater basins, estuaries, inshore and offshore marine environments, as well as social, economic, and cultural heritage.	Mackay-Whitsundays		On-going	On-going

Initiative / Industry	Mechanism	Focus	Location	Involves producer survey / benchmarking?	18/19 Status	19/20 Status
Sustainable agriculture program (Reef Catchments NRM) - All	Working groups, trials, demonstrations, workshops, field days, advice	Working with Cane, Grazing, Horticulture and Forestry industries and farmers to promote sustainable practices through the development of ABCD frameworks that can help improve profitability and environmental stewardship.	Mackay-Whitsundays		On-going	On-going
Sandy Creek Grower Water Quality Monitoring Program (MAPS, Farmacist, DES, Griffith Uni) – Cane Stage 1 and 2.	Water quality monitoring, Working groups, trials, workshops, field days, advice	MAPS/Farmacist are supporting 12 growers in a collaborative approach to monitoring water quality within the Sandy Creek catchment. There is also the linking of new trials and extension activities to the WQ analysis and results. Griffith Uni also looking at human dimension aspects of the grower community.	Mackay-Whitsundays	Yes	Stage 1 – complete Stage 2 - starting	On-going
RP161 Complete Nutrient Management Planning for Cane Farming (Farmacist, MAPS) – Cane	Training, extension, advice to target of 150 growers	Support growers not currently implementing the SIX EASY STEPS™ program to undertake the journey with local support from Farmacist in conjunction with existing service providers. Aim is to develop a practical whole-farm plan with a focus on nutrient management taking into account specific farming circumstances in-line with the SIX EASY STEPS™ process	Mackay-Whitsundays	Yes (benchmarking)	On-going	On-going
Myrtle Creek Grower Project (SRA) – Cane	Trials / demonstrations, water quality monitoring, workshops / field days, advice/grower meetings	Working with growers within the Myrtle creek sub-catchment area to identify the benefits (water quality and profitability/productivity) and barriers (costs, advice etc.) of adopting improved management practices around nutrient and herbicide management. Includes	Mackay Whitsundays: Myrtle Creek Sub-Catchment (Proserpine Mil)	Yes (benchmarking)	Establishment phase then On-going	On-going

Initiative / Industry	Mechanism	Focus	Location	Involves producer survey / benchmarking?	18/19 Status	19/20 Status
		monitoring individual trials / farms and extension activities around the results.				
Janes Creek Whole of System Repair (Reef Catchments, MAPS) – Cane and Grazing	Practice change support, advice, treatment train systems, ecosystem repair	Working with 10 Cane farmers, 5 Graziers and Harvesting Contractors within the Janes Creek Sub-catchment to improve water quality and ecosystem resilience before it flows into the Gooseponds in urban Mackay. Includes supporting practice change on farm and also the use of treatment train systems to reduce pollutants flowing through the system.	Janes Creek Sub-catchment (Mackay Sugar)	Yes (benchmarking)	Establishment phase then On-going	On-going
Grass Roots (RCS, Reef Catchments, FBA) – Grazing	Property Planning / Advice, Workshops, Business Performance Analysis, Grants	Funding and support for graziers (EOI process) to develop farm management capacity, grow property production and improve land condition. Includes group and individually activities and advice.	Mackay Whitsundays, Fitzroy	Yes	On-going	On-going
Reef Regulation Audits (Environmental Services and Regulations) – Cane	Compliance Program	Individual grower audits to confirm compliance with reef regulation requirements for nutrient management – soil testing plant cane blocks, determining N&P requirements, calibrating equipment, record keeping.	Mackay Whitsundays	No	On-going	On-going
Enhance Extension Coordination Flexible Funding Projects – Stage 1 and 2	Resources and support to deliver priority extension activities and on-ground activities (includes meetings etc.)	Small scale and short term funding provided to regional extension providers to deliver high priority activities identified within the Regional Extension Plan. Includes supporting grower led water quality monitoring, supporting win: win scenarios and trial work around priority issues such as imidacloprid.	Mackay Whitsundays	Yes – for some projects	All Stage 1 projects starting. Some Stage 1 projects completed by June 2019.	Some Stage 1 projects On-going and all Stage 2 projects starting. Stage 2 projects completed by June 2020.
Enhance Extension Coordination Peer	Resources and support for Peer-to-Peer	Funding provided to local Peer-to-Peer groups (existing or new) to improve	Mackay Whitsundays	Yes – for some projects	All Stage 1 projects	Some Stage 1 projects On-

Initiative / Industry	Mechanism	Focus	Location	Involves producer survey / benchmarking?	18/19 Status	19/20 Status
to Peer Projects – Stage 1 and 2	learning and capacity building activities.	networking opportunities and participate in capacity building activities. Includes attending conferences, visiting overseas industries, improving pesticide management and improving coordination around pest management.			starting. Some Stage 1 projects completed by June 2019.	going and all Stage 2 projects starting. Stage 2 projects completed by June 2020.
Disaster Relief Funding	Funding for on-ground works planning, implementation and maintenance.	On-ground works (planning, implementation and maintenance) targeting the remediation of existing river rehabilitation work that had been established prior to Cyclone Debbie and new work in high priority sub-catchments.	Mackay Whitsundays		On-going	On-going with maintenance.

Appendix 5: Sugarcane Water Quality Risk Framework 2017 - 2022

Soil management (weighting)	**Relative water quality risk**			
	Lowest risk (A)	**Moderate – Low risk (B)**	**Moderate risk (C)**	**High risk (D)**
	Innovative	Best practice	Minimum standard	**Superseded**
Crop residue cover (40%)	Cane trash blanket is retained, including as fallow cover after final ratoon.		Cane trash blanket is retained on ratoons.	Cane trash blanket is not retained.
Controlled machinery traffic (20%)	Less than 36% of the field is trafficked by machinery every year.		Between 37% and 60% of the field is trafficked by machinery every year.	At least 60% of field is trafficked by machinery every year.
	All machinery wheel spacings matched to row spacing for all operations including harvesters and haul-outs. GPS guidance is used for **all** field operations, **including** harvesters and haul-outs.	All machinery wheel spacings matched to row spacing for all operations including harvesters and haul-outs. GPS guidance is used for all operations **except** harvesters and haul-outs.	Most machinery operates on the same wheel spacing and is matched to row spacing. Harvesters and haul-outs are on different wheel spacings.	Machinery operates on different wheel spacings.
Land management during sugarcane fallow (20%)	Legume or cover crops are planted on **all** fallow land, without tillage. Crop residues are maintained.	Legume or cover crops grown on **all** fallow land, and crop residues are maintained.	Soil cover maintained during the fallow phase. Trash blanket and sprayed cane or growth of a legume/cover crop **when opportunity arises.** Weeds are controlled with knockdown herbicides.	Bare fallow or no fallow.
Preparing land for planting (20%)	Minimum tillage.	Zonal tillage only, less than 60% of area is cultivated.	Up to 5 passes of tillage equipment.	Six or more passes of tillage equipment.
	Plant cane is established after fallow using 1 tillage operation or less.	Zonal tillage after a fallow or break crop. Only the row area is cultivated, inter-rows are left uncultivated.	Plant cane is established after a fallow using zonal tillage or the minimum number of passes required for soil and conditions.	All plant cane blocks are prepared with a fine tilth.

Nutrient management (weighting)	Relative water quality risk			
	Lowest risk (A)	**Moderate – Low risk (B)**	**Moderate risk (C)**	**High risk (D)**
	Innovative	Best practice	Minimum standard	**Superseded**
Matching nitrogen (N) supply to crop nitrogen requirements (70%)	Six Easy Steps Nutrient Management program is employed, which includes developing a whole farm nutrient management plan. Nutrient management plans include consideration of yield history and trends in order to estimate optimal amounts of nitrogen required for each major soil type and/or management zone.		Nitrogen fertiliser rate for each plant crop and its subsequent ratoons are derived from soil tests and the Six Easy Steps method. Rates are based on district yield potential with adjustments made according to the soil N mineralisation index (based on organic carbon percentage). Deductions are made for other significant sources of N including from irrigation water, mill mud and legumes.	N fertiliser rate typically exceeds the Six Easy Steps baseline application rate. Non-compliant with regulated method for calculating optimum N rate.
Matching phosphorus (P) supply to crop P requirements (15%)	P fertiliser requirements are determined through soil testing and consideration of extractable phosphorus and the P buffer index. P is not applied unless testing indicates it is necessary.		Phosphorus is regularly or routinely applied as part of plant or ratoon cane blends.	
Application of mill mud or mud/ash (15%)	Do not apply mill mud or ash. OR Mill Mud/ash is deep banded at <50 wet tonnes per hectare.	Mill mud is not applied where soil testing indicates P levels are adequate. Mill mud/ash is applied in a band over the crop row at <70 wet tonnes per hectare.	Broadcast application at rates up to 100 wet tonnes per hectare. For fallow applications, mill mud/ash is incorporated soon after application.	Broadcast application at rates over 100 wet tonnes per hectare.

Pesticide management (weighting)	Relative water quality risk			
	Lowest risk (A)	**Moderate – Low risk (B)**	**Moderate risk (C)**	**High risk (D)**
	Innovative	Best practice	Minimum standard	**Superseded**
Use of residual herbicides in ratoons (30%)	Do not use residual herbicides in ratoons.	Overall strategy based on use of knockdown products only in ratoons. Residual herbicide use in ratoons only occurs as strategic response to problem situations.	Residual herbicides are routinely used in ratoon crops, both in response to known weed problems and as a preventative measure.	
Targeting herbicide application (30%)	Residual herbicides are applied in a directed band over the row only. Inter-row spaces are managed with knockdown herbicides. AND Precise weed mapping informs zonal residual herbicide applications. Application occurs only where weed pressure is expected.	Residual herbicides are applied in a directed band over the row only. Inter-row spaces are managed with knockdown herbicides.	Residual herbicides are applied through 100% coverage with conventional boomspray.	
Timing of application (20%)	Residual herbicides are applied more than 3 weeks prior to significant runoff event.		Residual herbicides applied as soon as practical after harvest, with due consideration to current weather conditions and 4 day rainfall forecast.	
Pesticide selection (10%)	Pesticide choice is informed by assessment of control efficacy AND environmental risk, with lower toxicity products selected wherever feasible. Product choice considers the amount of active ingredient applied, its relative toxicity, half-life, solubility, and soil adsorption properties and their interaction with the soils on the farm.		Pesticide product choice is based on efficacy and cost effectiveness of control.	

Pesticide management (weighting)	**Relative water quality risk**			
	Lowest risk (A)	**Moderate – Low risk (B)**	**Moderate risk (C)**	**High risk (D)**
	Innovative	Best practice	Minimum standard	**Superseded**
Managing canegrub (10%)	Control of canegrub is based on monitoring plant damage and risk assessments of likely pressure. An integrated pest management approach and participation in a district monitoring program informs grub management plans. No more than one application per crop cycle unless monitoring indicates economic thresholds are likely to be exceeded. For liquid formulations, coulter slots are completely closed or covered in.		Control of canegrub is based on monitoring plant damage and risk assessments of likely pressure. No more than one application per crop cycle unless monitoring indicates economic thresholds are likely to be exceeded. For liquid formulations, coulter slots are completely closed or covered in.	Insecticides are routinely applied to plant or ratoon crops. Often more than one application to a block over a crop cycle.

Irrigation management (weighting)	**Relative water quality risk**			
	Lowest risk (A)	**Moderate – Low risk (B)**	**Moderate risk (C)**	**High risk (D)**
	Innovative	Best practice	Minimum standard	**Superseded**
Calculating the timing of irrigation (20%)	Irrigation schedule is informed by the use of in-field indicator tools in the *majority* of blocks, and the use of crop growth models to optimise timing.	Irrigation schedule is informed by in-field indicator tools such as gypsum blocks, mini pans or capacitance probes in the *majority* of blocks.	Irrigation schedule is informed by in-field indicator tools such as gypsum blocks, mini pans or capacitance probes in *some* blocks.	Irrigation scheduled on a set cycle.
Calculating the volume of irrigation to apply (35%)	Irrigation applications aim to replace a measured or modelled soil water deficit.		Efforts made to adjust irrigation volume to match estimated crop water requirement at the time.	Fixed cycle and/or fixed duration irrigation events.
Minimising irrigation losses (20%)	Irrigation monitored closely (manual or with in-field advance sensors) and furrows are turned off as they reach completion. Inflow rates are increased in remaining furrows to ensure all/majority of furrows get through.		Irrigation sets are allowed to run until all/majority of furrows are completed.	
Irrigation tailwater capture and re-use (25%)	No irrigation tailwater leaves the farm (tailwater from 100% of farm area is captured). Storages are equipped with adequate pumping capacity and captured tailwater is rapidly re-used in the short term (days/weeks).		The majority of irrigation tailwater is retained on-farm (tailwater from 50-90% of farm is captured).	The majority of irrigation tailwater is not retained on-farm (less than 50% of farm area is captured).
Production indicator: Estimated Crop Water Use Efficiency CWUE = TCH /(gross irrigation + effective* rainfall) – not included in calculations *Assumes 450mm average effective rainfall*	More than 9 tonnes of cane per megalitre per hectare.	7-9 tonnes of cane per megalitre per hectare.	5-7 tonnes of cane per megalitre per hectare.	Less than 5 tonnes of cane per megalitre per hectare.

Appendix 6: Grazing Water Quality Risk Framework 2017 - 2022

Hillslope (pasture) management	Relative water quality risk			
	Lowest risk (A)	Moderate – Low risk (B)	Moderate risk (C)	High risk (D)
Expectations of long term carrying capacities (LTCC[i]) (>10 years) for the whole property are strategic and realistic. (10%)	LTCC estimates are equivalent to or less than district benchmarks. LTCC is developed using: • land condition monitoring data • district benchmarks • historical data • paddock records. GLM[ii] and Stocktake equivalent processes are considered and where available and appropriate, remote sensing data is also incorporated. LTCC is reviewed each year and if changes in land condition occur.	LTCC estimates are equivalent to district benchmarks. LTCC is developed using a combination of the following: • land condition monitoring data • district benchmarks • historical data • paddock records. GLM and Stocktake equivalent processes are considered. LTCC is not reviewed on an annual basis.	LTCC estimates are greater than district benchmarks. LTCC is developed using at least one of the following: • land condition monitoring data • district benchmarks • historical data • paddock records. LTCC is not reviewed on an annual basis.	LTCC not estimated or estimates are greater than district benchmarks. LTCC is developed based on personal experience and limited additional data sources. Never reviewed.
Expectations of seasonal and/or annual stocking rates (SR), that each paddock will carry, are realistic and tactical. (35%)	Stocking rates are estimated for all paddocks based on seasonal forage budgeting using Adult Equivalents (AE) or Livestock Units (LSU) standards. **Stocking rates do not exceed 10-30% pasture utilisation and/or >2000kg/ha pasture biomass[iii]**. Stocking rates are proactively adjusted to meet pasture utilisation and biomass targets and the required level of ground cover.	Stocking rates are estimated for the entire property and sometimes use Adult Equivalents (AE) or Livestock Units (LSU) standards. Annual forage budgeting is sometimes taken into consideration. **Stocking rates do not exceed at least 30% pasture utilisation at least 2000kg/ha pasture biomass**. Stocking rates are occasionally adjusted to meet pasture utilisation and biomass targets and the required level of ground cover.	Stocking rates are rarely estimated for the entire property and do not use Adult Equivalents (AE) or Livestock Units (LSU) standards. **Stocking rates achieve pasture utilisation levels of 30-50% and at 1000-1500kg/ha pasture biomass.** Stocking rates are rarely and reactively adjusted to meet pasture utilisation and biomass targets and the required level of ground cover.	Stocking rates are not estimated for the entire property. **Stocking rates achieve pasture utilisation levels of <50% and at 1000kg/ha pasture biomass.**

Hillslope (pasture) management	Relative water quality risk			
	Lowest risk (A)	Moderate – Low risk (B)	Moderate risk (C)	High risk (D)
Groundcover[iv] thresholds are monitored and objectively managed to inform paddock management and used to inform SR and pasture management decisions. (30%)	**Annual ground cover thresholds are maintained at >75% across the whole property[v].** Forage budgets as per the GLM, Stocktake, grazing charts or equivalent process are undertaken on a seasonal basis in each paddock to monitor ground cover changes and the density of 3P pasture species. Ground cover trends and changes are monitored using FORAGE or VegMachine. Any changes are used to inform stocking rate.	**Annual ground cover thresholds are maintained at 70-60% across the whole property.** Forage budgets as per the GLM, Stocktake, grazing charts or equivalent process are undertaken on a seasonal basis across the property to monitor ground cover changes and the density of 3P pasture species. Any changes are used to inform stocking rate.	**Annual ground cover thresholds are maintained at <60% across the whole property.** Forage budgets as per the GLM, Stocktake, grazing charts or equivalent process are undertaken on an annual basis in most paddocks to monitor ground cover changes and the density of 3P pasture species. Changes are rarely used to inform stocking rate.	**Annual ground cover thresholds are maintained at <50% across the whole property.** No form of forage budgeting is undertaken.
Land condition assessments for all land types are based on: **1) Soil condition (amount of ground cover, infiltration rate, level of erosion)** **2) Pasture condition (density and vigour of 3P grasses, amount of weed species)** **3) Woodland condition (balance of woody weeds vs. pasture in different land types, amount of thickening). (10%)**	Land condition assessments of soil, pasture and woodland condition are undertaken using photo monitoring sites and historical data (or equivalent techniques). This assessment is documented for all land types, undertaken on a seasonal basis and is considered in grazing and livestock management. Where available and appropriate, remote sensing technology is used to monitor long term trends in ground cover (FORAGE, VegMachine).	Land condition assessments of soil, pasture and woodland condition are undertaken and use photo monitoring sites or historical data (or equivalent techniques). This assessment is documented for all land types, is undertaken on an annual basis and is considered in grazing and livestock management.	Land condition assessments of soil, pasture and woodland condition are rarely undertaken. This assessment is not documented for all land types, is rarely undertaken on an annual basis and is sometimes considered in grazing and livestock management.	No assessments of land condition are undertaken.

Hillslope (pasture) management	Relative water quality risk			
	Lowest risk (A)	Moderate – Low risk (B)	Moderate risk (C)	High risk (D)
Vegetation management for woody regrowth is managed to avoid land degradation and its secondary impacts which include[vi]: • **Soil erosion and instability** • **Salinity** • **Acid sulfate soils** [Not included in calculations]	When undertaking vegetation management for woody regrowth the following are considered to limit soil erosion and instability: • slope of cleared land, location of access tracks and linear features (fence lines) and use of contouring • maintenance of ground cover • stock access, grazing pressure and stocking rates • off-stream watering points All efforts are made to minimise the exposure of highly erodible and dispersive subsoils. For acid sulfate soils some codes prohibit mechanical disturbance to a depth greater than 30 centimetres in land zone 3 at elevations less than 5 metres. Acid sulfate soils may also occur in other land zones, but these zones are not covered by the codes. When clearing vegetation, the activity does not further contribute to any dryland salinity in the area. The codes prevent or limit the extent of clearing within 100 metres of a salinity expression area		When undertaking vegetation management for woody regrowth the following are not considered: • slope of cleared land, location of access tracks and linear features (fence lines) and use of contouring • maintenance of ground cover • stock access, grazing pressure and stocking rates • off-stream watering points No effort is made to minimise the exposure of highly erodible and dispersive subsoils. When clearing vegetation, the activity may negatively impact on any dryland salinity in the area.	
Management is tailored to encourage recovery of vulnerable areas, particularly those in declining (C) or poor condition (D). (10%)	Selectively grazed or vulnerable areas in C and/or D condition are identified and appropriate actions are taken to remediate these areas. The grazing management of affected area/s has been reviewed and stock have been permanently excluded for D condition areas and where appropriate for C condition areas. Additional actions include establishing diversion banks, break surface of scalded areas and sow grass seed, review placement of existing infrastructure such as watering points and incorporation of a spelling regime.	Selectively grazed or vulnerable areas in C and/or D condition are identified and appropriate actions are taken to remediate these areas. The grazing management of affected area/s has been reviewed and where possible stock have been excluded. Additional actions include establishing diversion banks, break surface of scalded areas and sow grass seed, review placement of existing infrastructure such as watering points and incorporation of a spelling regime.	Selectively grazed or vulnerable areas in C and/or D condition have mostly been identified and some actions have been taken to remediate these areas.	Selectively grazed or vulnerable areas in C and/or D condition have not been identified. No actions to remediate these areas.

Hillslope (pasture) management	Relative water quality risk			
	Lowest risk (A)	Moderate – Low risk (B)	Moderate risk (C)	High risk (D)
Property mapping and inventory of natural resources enables objective assessment of long-term carrying capacity and stocking rate. (5%)	Property map (GIS/GPS, sat image, aerial photo, farm map software etc.) including: • actual fence line location • actual water point location • land types based on grazing land types for region (or equivalent) • measured paddock areas • measured land type areas • grazing circles around water points • vulnerable/sensitive land types (including frontages and wetlands).	Property map (hard copy, aerial photo, topographic map and/or farm map software etc.) including: • estimated fence line location • estimated water point location • land types based on grazing land types for region • measured paddock areas • estimated land type areas.	Limited fence line and infrastructure mapping, rough estimates of paddock areas, little or no information on paddock land types or their areas.	

Streambank management	Relative water quality risk			
	Lowest risk (A)	Moderate – Low risk (B)	Moderate risk (C)	High risk (D)
Grazing pressure on frontage country and wetlands is effectively managed. (50%)	Fencing as much as is practical and cost-effective, off-stream water points throughout, seeking assistance with areas which cannot be justified by benefit:cost alone.	Fencing as much as is practical and cost-effective, off-stream water points or other measures (supplementary feed/shade for camps) installed to attract cattle away from riparian and wetland areas.	Limited fencing, limited off-stream water points.	Generally no fencing or off-stream water points.
Grazing pressure on frontage country and wetlands is managed carefully to maintain or improve the condition of these vulnerable land types. (50%)	Full stock exclusion or low stocking pressure, regular wet season spelling, weed control through fire or other means, feral pig control program.	Moderate stocking pressure, occasional wet season spelling and weed/pest control.	Some spelling but unplanned and largely incidental.	No specific management applied.

Gully management	Relative water quality risk			
	Lowest risk (A)	Moderate – Low risk (B)	Moderate risk (C)	High risk (D)
Remedial actions are undertaken to facilitate recovery of entire gullied area/s. (40%)	Remediation of the entire gullied area is undertaken using professional advice to inform the required remediation actions. Actions include revegetation of gullied area and stock exclusion, temporary structures such as stick traps, porous check dams, contour banks, engineered check dams and mechanical gully reshaping and earth works.	Remediation of sections of the gullied area is undertaken using a mix of actions. These include managing existing infrastructure (watering points, fences) to reduce erosion, redistributing the grazing pressure away from gullied areas, fencing to exclude stock and/or adjusting stocking rates to encourage pasture growth.	Management of gullied areas is addressed through grazing management practices such as: those aimed at increasing pasture biomass and decreasing pasture utilisation rates to 25-30%, increasing ground cover levels, redistribution of grazing pressure, using fire and weed management, and reducing the clearing of woody vegetation.	Little or no change in management for gullied areas.
Managing risk of erosion associated with linear features. (30%)	Linear features (roads, tracks and fences) planned and built with due attention to erosion risk. Where there are significant risks, an appropriate mix of actions has already been undertaken. Actions will include: • locating tracks on contour where possible; **avoiding disturbance of sodic subsoils,** • whoa boys or similar means to allow run-off to cross the road; • table drains where required; • outfalls for low usage, • cross-slope roads on steep country; • using invert, floodway, causeway, culvert or bridge when track crosses drainage line or creeks, • fences follow contour lines where possible, or ridge lines in steep country. Where fence line is not on the contour, and slope is steep, whoa-boys are used as required.	Linear features planned and built with due attention to erosion risk. Areas with known sodic subsoils are avoided where possible. Creek crossings built at bed level to avoid changes to hydrology. Where there are significant risks, an appropriate mix of actions is in process of being completed.	Linear features not routinely planned or built with due attention to erosion risk. Whoa boys or equivalent sometimes used, some stream crossings have appropriate works in place.	Little or nothing in terms of planning or precautions for erosion risk.
Hillslope erosion assessment (30%)				

Appendix 7: Cane Regional Extension Plan Summary Table as at June 2019.

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
Myrtle Creek Area: 9300ha % Landuse: 32% WQ Issues: Pesticide Reduction (VH) – PSII's and Phosphorous Reduction (VH) – Particulate Nitrogen Reduction (H) – DIN	Very High	Proserpine Basin 2018: Pesticides: 91% of species protected (99% target) 2016 – 2018 PP: 0.1% reduction (20% target) 2016 – 2018 DIN: no reduction (70% target) Soil 2018 % adoption of Low Risk Practices: 0.9% (20% target) Machinery Traffic – 4%, Fallow Management – 10%, Planting Prep – 10% Nutrient 2018 % adoption of Low Risk Practices: 7.9% N surplus – 11.8%, P Surplus – 6.9%, Mud Rate – 30% Pesticide 2018 % adoption of Low Risk Practices: 0.8% Residuals Plant – 1%, Residuals Ratoon – 1%, Residual Use – 11%, Selection - 53%, Cane Grub – 1% Industry Challenges: Catchment Load Monitoring Site on Proserpine River at Glen Isla – exceedances There has been some historical inappropriate Mill mud use. Majority of growers within sub-catchment have not been involved in previous Reef related programs. Trials and Workshops / Field Days:	**Existing** • Smartcane BMP (SSP) • Productivity Services (SSP) • Reef Regulations (QG) • Myrtle Creek Grower Project (SRA) • Nutrient Management Planning (Farmacist) • Project Cane Changer (BI) **Future** • Proserpine Agronomic Advisors Group (SSP) • EEC Peer to Peer project – Proserpine Young Farmers Group **Trials** Maintain current level of effort - Moderate (minimum 2 trials each on nutrients and herbicides) **Workshops / Field Days** Increase current level of effort - to Moderate	Need to identify sub-catchment trends in motivation for change Need to identify the relevant barriers to sub-catchment growers participating in existing programs and /or adopting new management practices Coordinated promotion of current / existing programs and activities to growers. Remove the risk of mixed messages going

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		2016 – 2018: Irrigation – 1 Current level of trials is now moderate with establishment of Myrtle Creek project in 2018. Current level of workshops / field days is low.		out through the industry. Could include targeting the key regional programs to the bigger growers within these sub-catchments. Encourage and support growers to attend relevant meetings, workshops, field days etc. within the sub-catchment and in neighbouring or other areas. Value add to group extension activities that are already
Murray Creek Area: 10800ha % Landuse: 23% <u>WQ Issues:</u> Pesticide Reduction (VH) – PSII's Nitrogen Reduction (VH) – DIN Phosphorous Reduction (L) – Particulate	Very High	<u>O'Connell Basin 2018:</u> Pesticides: 84% of species protected (99% target) 2016 – 2018 DIN: 0.1% reduction (70% target) 2016 – 2018 PP: 0.6% reduction (20% target) Soil 2018 % adoption of Low Risk Practices: 1.4% (20% target) Machinery Traffic – 4%, Fallow Management – 25%, Planting Prep – 5% Nutrient 2018 % adoption of Low Risk Practices: 9.8% N surplus – 15.2%, P Surplus – 26%, Mud Rate – 42% Pesticide 2018 % adoption of Low Risk Practices: 7.1% Residuals Plant – 2.1%, Residuals Ratoon – 8%, Residual Use – 20%, Selection - 53%, Cane Grub – 1% <u>Industry Challenges:</u> Historically low level of trial work – distance from Mackay. Majority of growers within sub-catchment have not been involved in previous Reef related programs.	**<u>Existing</u>** • Smartcane BMP (MAPS, Canegrowers) • Productivity Services (MAPS) • Reef Regulations (QG) • Variety Observation Plot (MAPS) • Nutrient Management Planning (Farmacist) • Project Cane Changer (BI) **<u>Future</u>** • Coastal Farming Systems (DAF) • EEC Peer to Peer Biological Farming project (CQSHS) **<u>Trials</u>** Increase current level of effort - to Moderate (minimum 2	

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		Trials and Workshops / Field Days: 2016 – 2018: Industry BMP – 2 Current level of trials is below low. Current level of workshops / field days is below low.	trials each on nutrients and chemicals) **Workshops / Field Days** Increase current level of effort - to Moderate	occurring – expanding the information being presented and discussed through improved coordination and collaboration in delivery. Increase or maintain the desired number of trials and associated workshops/field days/meetings targeting improved or innovative management around the P2R Water Quality Risk Framework and *local key*
Pioneer River Main Channel Area: 27600ha % Landuse: 49% WQ Issues: Pesticide Reduction (VH) – PSII's Nitrogen Reduction (VH) – Particulate Phosphorous Reduction (VH) – Particulate	Very High	Pioneer Basin 2018: Pesticides: 76% of species protected (99% target) 2016 – 2018 DIN: 0.1% reduction (70% target) 2016 – 2018 PP: 0.8% reduction (20% target) Soil 2018 % adoption of Low Risk Practices: 1.3% (20% target) Machinery Traffic – 5%, Fallow Management – 17%, Planting Prep – 10% Nutrient 2018 % adoption of Low Risk Practices: 6.0% N surplus – 9.1%, P Surplus – 25%, Mud Rate – 35% Pesticide 2018 % adoption of Low Risk Practices: 4.2% Residuals Plant – 9%, Residuals Ratoon – 9%, Residual Use – 1.9%, Selection - 22%, Cane Grub – 1% Industry Challenges: Catchment Load Monitoring Site on Pioneer River at Dumbleton Weir – exceedances	**Existing** • Smartcane BMP (MAPS, Canegrowers) • GBRF RAP project (MAPS, Farmacist) • Productivity Services (MAPS) • Reef Regulations (QG) • Sustainable Ag Trials (RC / Farmacist) • Variety Observation Plot (MAPS) • Project Catalyst (CS, Farmacist) • Nutrient Management Planning (Farmacist) • Project Bluewater (Farmacist) • Project Cane Changer (BI) • Coastal Farming Systems (DAF)	

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		Number of growers within sub-catchment have not been involved in previous Reef related programs. <u>Trials and Workshops / Field Days:</u> 2016 – 2018: Soil – 2, Nutrient – 3, Chemical – 1, Irrigation – 5, Industry BMP - 1 Current level of trials is moderate to high. Current level of workshops / field days is Moderate to High.	• EEC Flexible Funding Imidacloprid management project (DAF CFS) **<u>Future</u>** • EEC Flexible Funding Improved Fallow project (CQSHS) • EEC Peer to Peer Biological Farming project (CQSHS) • EEC Flexible Funding Irrigation Scheduling and Performance (MAPS) **<u>Trials</u>** Maintain current level of effort on Nutrients and Increase current level of effort on Chemicals – Moderate to High (minimum 3 trials each on nutrients and chemicals) **<u>Workshops / Field Days</u>** Maintain current level of effort – Moderate to High	*pollutants/issues/barriers.* • <u>Soil Management</u> – GCTB, Controlled Machinery, Fallow land management and Preparing land for planting • <u>Nutrient Management</u> – Matching N and P supply to crop requirements *(Implementing steps 5 and 6 of 6ES to refine nutrient management practice)*, Application of Mill Mud (*rates, application, timing*) • <u>Pesticide Management</u> – Residuals in Ratoons (*Can wet season application of the legal*

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
Sandy Creek Area: 25300ha % Landuse: 51% <u>WQ Issues:</u> Pesticide Reduction (H) – PSII's and Imidacloprid Nitrogen Reduction (H) – DIN Phosphorous Reduction (H) – Particulate	Very High	<u>Plane Basin 2018:</u> Pesticides: 74% of species protected (99% target) 2016 – 2018 DIN: no reduction (70% target) 2016 – 2018 PP: 0.2% reduction (20% target) Soil 2018 % adoption of Low Risk Practices: 3.8% (20% target) Machinery Traffic – 19.6%, Fallow Management – 16.4%, Planting Prep – 5.3% Nutrient 2018 % adoption of Low Risk Practices: 6.2% N surplus – 10.2%, P Surplus – 22%, Mud Rate – 43% Pesticide 2018 % adoption of Low Risk Practices: 8.2% Residuals Plant – 9%, Residuals Ratoon – 12%, Residual Use – 6.6%, Selection - 53%, Cane Grub – 13% <u>Industry Challenges:</u> Catchment Load Monitoring Sites on Sandy Creek at Homebush and Bruce Highway – exceedances Number of growers within sub-catchment have not been involved in previous Reef related programs. <u>Trials and Workshops / Field Days:</u> 2016 – 2018: Soil – 7, Nutrient – 19, Chemical – 7, Irrigation – 4, Industry BMP - 9 Current level of trials is High.	**<u>Existing</u>** • Smartcane BMP (MAPS, Canegrowers) • GBRF RAP project (MAPS, Farmacist) • Productivity Services (MAPS) • Sandy Creek WQ and Pesticides (MAPS, Farmacist) • Reef Regulations (QG) • Variety Observation Plot (MAPS) • Project Catalyst (CS, Farmacist) • Sustainable Ag Trials (RC / Farmacist) • Coastal Farming Systems (DAF) • Nutrient Management Planning (Farmacist) • EEF Trials (SRA) • Project Bluewater (Farmacist) • Project Cane Changer (BI) • EEC Peer to Peer Mackay Future Farmer Group (Farmacist)	*low rate of 450 g ai/ha diuron plus paraquat lead to exceedances*), Targeting herbicide application and timing, Pesticide selection, Managing cane grubs (*Block-scale runoff trials involving imidacloprid – rates, application*) • <u>Irrigation Management</u> – Timing, Volume, Minimising losses, Tailwater capture and reuse, Production indicator Identify key grower champions that could be utilised to promote practice change from the work they have done on their farm.

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		Current level of workshops / field days is High.	**Future** • EEC Flexible Funding Improved Fallow project (CQSHS) • EEC Peer to Peer Biological Farming project (CQSHS) • EEC Flexible Funding Irrigation Scheduling and Performance (MAPS) • EEC Flexible Funding Sandy Creek WQ monitoring (RC) **Trials** Maintain current level of effort – High (minimum 4 trials each on nutrients and chemicals) **Workshops / Field Days** Maintain current level of effort - High	Grower led water quality monitoring projects – establish new groups similar to Sandy Creek project. Improved cooperation, coordination and collaboration amongst industry service providers with a focus on including resellers / agribusiness Improved monitoring and evaluation around extension activities and practice change. Includes supporting
Rocky Dam Creek Area: 11900ha	Very High	Plane Basin 2018: Pesticides: 74% of species protected (99% target) 2016 – 2018 DIN: no reduction (70% target) 2016 – 2018 PP: 0.2% reduction (20% target)	**Existing** • Smartcane BMP (PCPSL, Canegrowers) • GBRF RAP project (PCPSL)	

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
% Landuse: 23% WQ Issues: Pesticide Reduction (VH) – PSII's Nitrogen Reduction (H) – DIN Phosphorous Reduction (L) – Particulate		Soil 2018 % adoption of Low Risk Practices: 3.8% (20% target) Machinery Traffic – 19.6%, Fallow Management – 16.4%, Planting Prep – 5.3% Nutrient 2018 % adoption of Low Risk Practices: 6.2% N surplus – 10.2%, P Surplus – 22%, Mud Rate – 43% Pesticide 2018 % adoption of Low Risk Practices: 8.2% Residuals Plant – 9%, Residuals Ratoon – 12%, Residual Use – 6.6%, Selection - 53%, Cane Grub – 13% Industry Challenges: Number of growers within sub-catchment have not been involved in previous Reef related programs. Trials and Workshops / Field Days: 2016 – 2018: Soil – 3, Nutrient – 8, Chemical – 2 Current level of trials is moderate to high. Current level of workshops / field days is High.	• Productivity Services (PCPSL) • Reef Regulations (QG) • Project Catalyst (CS, Farmacist) • Sustainable Ag Trial (RC / Farmacist) • Nutrient Management Planning (Farmacist) • Project Bluewater (Farmacist) • Project Cane Changer (BI) • EEC Flexible and Peer to Peer Pesticide and WQ projects (PCSF) • EEC Plane Creek Farmer Action Group (PCPSL) • EEC Flexible Funding Pest Management project (PCPSL) **Future** • Coastal Farming Systems (DAF) **Trials** Maintain current level of effort on Nutrients and Increase current level of effort	effective and efficient record keeping and data sharing. Industry Service Provider training – increase in skills and knowledge of regional Extension / Advisory staff. Can include extension, facilitation and industry specific technical skills. Access to Specialist Skills – Soil Health, Irrigation Management, Stormwater / Drainage

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
			on Chemicals – to High (minimum 4 trials each on nutrients and chemicals) **Workshops / Field Days** Maintain current level of effort - High	Management, Soil Conservation Use of innovative learning approaches and/or new tools and technologies to support on-farm learning. Access to finer scale data – soil mapping, EM mapping, Yield Mapping, Imagery, Drones etc. The establishment or increased support for Peer-to-Peer learning groups – could
Lethebrook Area: 7500ha % Landuse: 10% WQ Issues: Pesticide Reduction (H) – PSII's Nitrogen Reduction (H) – DIN Phosphorous Reduction (L) – Particulate	High	Proserpine Basin 2018: Pesticides: 91% of species protected (99% target) 2016 – 2018 PP: 0.1% reduction (20% target) 2016 – 2018 DIN: no reduction (70% target) Soil 2018 % adoption of Low Risk Practices: 0.9% (20% target) Machinery Traffic – 4%, Fallow Management – 10%, Planting Prep – 10% Nutrient 2018 % adoption of Low Risk Practices: 7.9% N surplus – 11.8%, P Surplus – 6.9%, Mud Rate – 30% Pesticide 2018 % adoption of Low Risk Practices: 0.8% Residuals Plant – 1%, Residuals Ratoon – 1%, Residual Use – 11%, Selection - 53%, Cane Grub – 1% Industry Challenges: Majority of growers within sub-catchment have not been involved in previous Reef related programs. Trials and Workshops / Field Days:	**Existing** • Smartcane BMP (SSP) • Productivity Services (SSP) • Reef Regulations (QG) • Project Catalyst (CS, Farmacist) • EEF Trial (SRA) • Nutrient Management Planning (Farmacist) • Project Cane Changer (BI) **Trials** Maintain current level of effort on Nutrients and Increase current level of effort on Chemicals – Low (minimum 1 trial each on nutrients and chemicals) **Workshops / Field Days** Maintain current level of effort – Low	

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		2016 – 2018: Nutrient – 2 Current level of trials is below low to moderate. Current level of workshops / field days is Low.		possibly link in with existing projects.
O'Connell River Area: 5300ha % Landuse: 11% <u>WQ Issues:</u> Nitrogen Reduction (H) – DIN Pesticide Reduction (M) – PSII's Phosphorous Reduction (M) – Particulate	High	<u>O'Connell Basin 2018:</u> Pesticides: 84% of species protected (99% target) 2016 – 2018 DIN: 0.1% reduction (70% target) 2016 – 2018 PP: 0.6% reduction (20% target) Soil 2018 % adoption of Low Risk Practices: 1.4% (20% target) Machinery Traffic – 4%, Fallow Management – 25%, Planting Prep – 5% Nutrient 2018 % adoption of Low Risk Practices: 9.8% N surplus – 15.2%, P Surplus – 26%, Mud Rate – 42% Pesticide 2018 % adoption of Low Risk Practices: 7.1% Residuals Plant – 2.1%, Residuals Ratoon – 8%, Residual Use – 20%, Selection - 53%, Cane Grub – 1% <u>Industry Challenges:</u> Catchment Load Monitoring Sites on O'Connell River at Staffords Road and Bruce Highway – exceedances. Some growers within sub-catchment have not been involved in previous Reef related programs. <u>Trials and Workshops / Field Days:</u>	**<u>Existing</u>** • Smartcane BMP (SSP) • Productivity Services (SSP) • Reef Regulations (QG) • Project Catalyst (CS, Farmacist) • Sustainable Ag Trial (RC / Farmacist) • Nutrient Management Planning (Farmacist) • Project Cane Changer (BI) **<u>Trials</u>** Increase current level of effort – Low (minimum 1 trial each on nutrients and chemicals) **<u>Workshops / Field Days</u>** Maintain current level of effort – Low	Follow up support for growers who have been involved in previous programs like Reef Rescue, Reef Water Quality Grants and RTP3. Provide support for other issues impacting on growers to look for win: win scenarios or increase their receptiveness and ability to participate in practice change

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		2016 – 2018: Soil – 1, Nutrient – 1 Current level of trials is below Low to Low. Current level of workshops / field days is Low.		around nutrients or pesticides. **Examples** • Feral pig damage and the need for a coordinated approach in key areas • Reduction in irrigation water usage – rising costs due to inefficient systems and increased electricity tariffs.
Blackrock Creek Area: 7300ha % Landuse: 29% WQ Issues: Pesticide Reduction (VH) – PSII's Nitrogen Reduction (M) – DIN Phosphorous Reduction (M) – Particulate	High	O'Connell Basin 2018: Pesticides: 84% of species protected (99% target) 2016 – 2018 DIN: 0.1% reduction (70% target) 2016 – 2018 PP: 0.6% reduction (20% target) Soil 2018 % adoption of Low Risk Practices: 1.4% (20% target) Machinery Traffic – 4%, Fallow Management – 25%, Planting Prep – 5% Nutrient 2018 % adoption of Low Risk Practices: 9.8% N surplus – 15.2%, P Surplus – 26%, Mud Rate – 42% Pesticide 2018 % adoption of Low Risk Practices: 7.1% Residuals Plant – 2.1%, Residuals Ratoon – 8%, Residual Use – 20%, Selection - 53%, Cane Grub – 1% Industry Challenges: Number of growers within sub-catchment have not been involved in previous Reef related programs. Trials and Workshops / Field Days: 2016 – 2018: Nutrient – 1	**Existing** • Smartcane BMP (MAPS, Canegrowers) • Productivity Services (MAPS) • Reef Regulations (QG) • Project Catalyst (CS, Farmacist) • Nutrient Management Planning (Farmacist) • Project Cane Changer (BI) **Trials** Increase current level of effort - to Low (minimum 1 trial each on nutrients and chemicals) **Workshops / Field Days** Increase current level of effort - to Low	

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		Current level of trials is below Low to Low. Current level of workshops / field days is below Low		
Mackay City Area: 5600ha % Landuse: 33% <u>WQ Issues:</u> Pesticide Reduction (H) – PSII's Phosphorous Reduction (H) – Particulate Nitrogen Reduction (M) – DIN	High	<u>Pioneer Basin 2018:</u> Pesticides: 76% of species protected (99% target) 2016 – 2018 DIN: 0.1% reduction (70% target) 2016 – 2018 PP: 0.8% reduction (20% target) Soil 2018 % adoption of Low Risk Practices: 1.3% (20% target) Machinery Traffic – 5%, Fallow Management – 17%, Planting Prep – 10% Nutrient 2018 % adoption of Low Risk Practices: 6.0% N surplus – 9.1%, P Surplus – 25%, Mud Rate – 35% Pesticide 2018 % adoption of Low Risk Practices: 4.2% Residuals Plant – 9%, Residuals Ratoon – 9%, Residual Use – 1.9%, Selection - 22%, Cane Grub – 1% <u>Industry Challenges:</u> Number of growers within sub-catchment have not been involved in previous Reef related programs. <u>Trials and Workshops / Field Days:</u> 2016 – 2018: Nutrient – 2, Industry BMP – 3.	**<u>Existing</u>** • Smartcane BMP (MAPS, Canegrowers) • GBRF RAP project (MAPS, Farmacist) • Productivity Services (MAPS) • Reef Regulations (QG) • Project Catalyst (CS, Farmacist) • Janes Creek Whole of System Repair (RC) • Nutrient Management Planning (Farmacist) • EEF Trial (SRA) • Project Bluewater (Farmacist) • Project Cane Changer (BI) **<u>Trials</u>** Maintain a current level of effort for Nutrients and Increase the current level of effort for Chemicals – Low	

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		Current level of trials is below Low to Moderate. Current level of workshops / field days is Moderate.	(minimum 1 trial each on nutrients and chemicals) **<u>Workshops / Field Days</u>** Maintain current level of effort –Moderate	
Bakers Creek Area: 10700ha % Landuse: 57% <u>WQ Issues:</u> Pesticide Reduction (M) – PSII's Nitrogen Reduction (L) – DIN Phosphorous Reduction (L) – Particulate	High	<u>Plane Basin 2018:</u> Pesticides: 74% of species protected (99% target) 2016 – 2018 DIN: no reduction (70% target) 2016 – 2018 PP: 0.2% reduction (20% target) Soil 2018 % adoption of Low Risk Practices: 3.8% (20% target) Machinery Traffic – 19.6%, Fallow Management – 16.4%, Planting Prep – 5.3% Nutrient 2018 % adoption of Low Risk Practices: 6.2% N surplus – 10.2%, P Surplus – 22%, Mud Rate – 43% Pesticide 2018 % adoption of Low Risk Practices: 8.2% Residuals Plant – 9%, Residuals Ratoon – 12%, Residual Use – 6.6%, Selection - 53%, Cane Grub – 13% <u>Industry Challenges:</u> Number of growers within sub-catchment have not been involved in previous Reef related programs. <u>Trials and Workshops / Field Days:</u>	**<u>Existing</u>** • Smartcane BMP (MAPS, Canegrowers) • GBRF RAP project (MAPS, Farmacist) • Productivity Services (MAPS) • Reef Regulations (QG) • Project Catalyst (CS, Farmacist) • Sustainable Ag Trial (RC / Farmacist) • Coastal Farming Systems (DAF) • Nutrient Management Planning (Farmacist) • EEF Trial (SRA) • Project Bluewater (Farmacist) • Project Cane Changer (BI) **<u>Trials</u>**	

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		2016 – 2018: Soil – 2, Nutrient – 16, Industry BMP – 3. Current level of trials is below Low to High. Current level of workshops / field days is Low to Moderate.	Maintain a current level of effort for Nutrients and Increase the current level of effort for Chemicals – Moderate to High (minimum 3 trials each on nutrients and chemicals) **Workshops / Field Days** Increase current level of effort – to Moderate	
Alligator Creek Area: 11100ha % Landuse: 53% WQ Issues: Pesticide Reduction (H) – PSII's Nitrogen Reduction (H) – DIN Phosphorous Reduction (M) – Particulate	High	Plane Basin 2018: Pesticides: 74% of species protected (99% target) 2016 – 2018 DIN: no reduction (70% target) 2016 – 2018 PP: 0.2% reduction (20% target) Soil 2018 % adoption of Low Risk Practices: 3.8% (20% target) Machinery Traffic – 19.6%, Fallow Management – 16.4%, Planting Prep – 5.3% Nutrient 2018 % adoption of Low Risk Practices: 6.2% N surplus – 10.2%, P Surplus – 22%, Mud Rate – 43% Pesticide 2018 % adoption of Low Risk Practices: 8.2% Residuals Plant – 9%, Residuals Ratoon – 12%, Residual Use – 6.6%, Selection - 53%, Cane Grub – 13% Industry Challenges:	**Existing** • Smartcane BMP (MAPS, PCPSL, Canegrowers) • GBRF RAP project (PCPSL, MAPS, Farmacist) • Productivity Services (PCPSL, MAPS) • Reef Regulations (QG) • Project Catalyst (CS, Farmacist) • Nutrient Management Planning (Farmacist) • EEC Flexible Funding Feral Pig project (CQSHS) • Project Bluewater (Farmacist) • Project Cane Changer (BI)	

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
		Sub-catchment split across 2 milling companies / prod services – includes having different District Yield Potentials. Number of growers within sub-catchment have not been involved in previous Reef related programs. Trials and Workshops / Field Days: 2016 – 2018: Soil – 1, Nutrient – 7. Current level of trials is below Low to High. Current level of workshops / field days is Low.	**Future** • Coastal Farming Systems (DAF) **Trials** Maintain a current level of effort for Nutrients and Increase the current level of effort for Chemicals - Moderate (minimum 2 trials each on nutrients and chemicals) **Workshops / Field Days** Increase current level of effort - to Moderate	
Proserpine River Main Channel Constant Creek Reliance Creek Plane Creek Marion Creek	Moderate	Cane increasing in area or % of total land use within sub-catchment. Moderate to small reductions required across the WQ pollutants **so may need some extra effort above current level.** There are quite a few bigger growers/farms within the sub-catchments so change can have larger positive impacts. There are some key grower champions within these sub-catchments so don't ignore these areas. May also	**Existing** • Smartcane BMP (SSP, MAPS, PCPSL, Canegrowers) • GBRF RAP project (RC, Farmacist, MAPS, PCPSL) • Productivity Services (SSP, MAPS, PCPSL) • Reef Regulations (QG) • Project Catalyst (CS, Farmacist)	Business as usual to maintain current effort. Follow up support for growers who have been involved in previous programs like Reef Rescue, Reef Water Quality Grants and RTP3. Ensure that there is some trial work (may not need to be water quality focused)

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
West Hill Creek Area: 1500 – 5000ha % Landuse: 15 – 30%		have more influence on their neighbours just by having more farms around them. Number of growers within sub-catchments that have not been involved in previous Reef related programs. <u>Trials and Workshops / Field Days:</u> 2016 – 2018: Soil – 1, Nutrient – 3, Industry BMP – 5.	• Sustainable Ag Trial (RC / Farmacist • EEF Trial (Plane Creek x 2 SRA) • Coastal Farming Systems (DAF) • Nutrient Management Planning (Farmacist) • Project Bluewater (Farmacist) • Project Cane Changer (BI) • EEC Plane Creek Farmer Action Group (PCPSL) • EEC Flexible Funding Pest Management project (PCPSL) **<u>Trials</u>** Some current trials and there will be future ones established due to location (priority area within milling zone) and willing growers. Low priority location to expand the number of trials or have ones with a water quality focus.	occurring in each of these sub-catchments so there is some opportunity to have group extension activities. General promotion of existing programs and activities. Could target the key regional programs to the bigger growers within these sub-catchments. Identify key grower champions that could be utilised to promote practice change from the work they have done on their farm. Value add to group extension activities that are already occurring – expanding the information being presented and discussed Encourage growers to attend existing / planned meetings, workshops, field days etc. Encourage growers to attend relevant meetings, workshops,

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
			<u>Workshops / Field Days</u> Some group extension activities delivered in these sub-catchment areas and important they continue. Not a priority location to expand the delivery of group extension activities unless linked to some trial/demonstration work.	field days etc. in neighbouring or other sub-catchments.
Gregory River Thompsons Creek Andromache River St Helens Creek Upper Cattle Creek Sarina Beaches	Low	Cane is generally still a small area or % of total land use within sub-catchment. Small to zero reductions required across the WQ pollutants **so about maintaining current effort.** There are some bigger growers/farms within the sub-catchments so change can still have positive impacts. There are some key grower champions within these sub-catchments so don't ignore these areas. Number of growers within sub-catchments that have not been involved in previous Reef related programs. <u>Trials and Workshops / Field Days:</u>	**<u>Existing</u>** • Smartcane BMP (SSP, MAPS, PCPSL, Canegrowers) • GBRF RAP project (RC, Farmacist, MAPS, PCPSL) • Productivity Services (SSP, MAPS, PCPSL) • Project Catalyst (CS, Farmacist) • Reef Regulations (QG) • EEF Trial (Upper Cattle Creek SRA) • Nutrient Management Planning (Farmacist)	Business as usual to maintain current effort. General promotion of existing programs and activities. Could target the key regional programs to the bigger growers within these sub-catchments. Identify key grower champions that could be utilised to promote practice change from the work they have done on their farm.

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
Carmilla Creek Flaggy Rock Creek Area: 500 – 3000ha % Landuse: 5 – 20%		2016 – 2018: Soil – 2, Nutrient – 2, Chemical – 1, Industry BMP – 2.	• Project Bluewater (Farmacist) • Project Cane Changer (BI) • EEC Plane Creek Farmer Action Group (PCPSL) • EEC Flexible Funding Pest Management project (PCPSL) Some current trials and there will be future ones established due to location (priority area within milling zone) and willing growers. Not a priority location to expand the number of trials or have ones with a water quality focus. **<u>Workshops / Field Days</u>** Some group extension activities are delivered in these sub-catchment areas and important they are maintained. Not a priority location to expand the delivery of	Value add to group extension activities that are already occurring – expanding the information being presented and discussed Encourage growers to attend existing / planned meetings, workshops, field days etc. Encourage growers to attend relevant meetings, workshops, field days etc. in neighbouring or other sub-catchments

Location / WQ Issues	Priority	2018 Report Card Results / Industry Challenges / Current Effort	Existing and Future Programs / Projects / Effort Target	Gaps / Opportunities
Eden Lassie Creek Whitsunday Coast Waterhole Creek Gillinbin Creek Area: < 500ha % Landuse: <5%	Very Low	Very small area or % of total land use of cane land within sub-catchment. Very small to zero load reductions required across the WQ pollutants **so about maintaining current effort.** Growers in these areas may have farms within other sub-catchments so can interact with them through other activities. Cost or ease of moving machinery or adopting new management practices on these isolated or smaller farms. Growers from other sub-catchments may not be as willing to travel to these areas for activities.	**Existing** • Smartcane BMP (SSP, PCPSL, Canegrowers) • Productivity Services (SSP, PCPSL) • EEC Plane Creek Farmer Action Group (PCPSL) **Trials** No current trials and not a priority location to establish any. **Workshops / Field Days** No current group extension activities and not a priority location to deliver any.	Business as usual to maintain current effort. General promotion of existing programs and activities. Encourage growers to attend relevant meetings, workshops, field days etc. in neighbouring or other sub-catchments

Appendix 8: Grazing Regional Extension Plan Summary Table as at August 2018

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
Eden Lassie Creek (Area: 49,000 ha % Landuse: 89%) Andromache River (Area: 32,500 ha % Landuse: 80%) O'Connell River (Area: 37,000 ha % Landuse: 76%) Pioneer River Main Channel (Area: 17700 ha % Landuse: 29%) Blacks Creek (Area: 66,300 ha % Landuse: 90%) West Hill Creek (Area: 13,000 ha % Landuse: 75%)	Very High	Sediment Reduction (VH) Particulate Nitrogen Reduction (H to VH) Catchment Load Monitoring Sites on O'Connell River at Staffords Road and Bruce Highway. Catchment Load Monitoring Site on Pioneer River at Dumbleton Weir. <u>Industry Challenges:</u> Number of graziers within sub-catchment have not been involved in previous grazing programs. Large Scale v Small Scale – need to keep extension activities relevant to their	**<u>Existing</u>** • Reef Trust Phase 4 Bank Stabilisation • Grass Roots (continuing but at capacity) • Innovative Grazing Network • Regional Landcare Facilitator • Grazing Regional Working Group • QNRM Water Quality Grazing Project – 4yr project, targeting 16 priority sub-catchments, riparian fencing / off-stream watering points, gully remediation, pasture improvement, land type fencing / off-stream watering, planning component – 60 graziers over project period. **<u>Future</u>** • High Steaks Workshop III (August 2019)	Need to identify sub-catchment trends in motivation for change. Need to identify the relevant barriers to sub-catchment graziers participating in existing programs and /or adopting new management practices. Coordinated promotion of current / existing programs and activities to graziers. Remove the risk of mixed messages going out through the industry. Could include targeting the key regional programs to the bigger graziers within these sub-catchments. Encourage and support graziers to attend relevant meetings, workshops, field days etc. within the sub-catchment and in neighbouring or other areas. Value add to group extension activities that are already occurring – expanding the information being presented and discussed through improved coordination and collaboration in delivery.

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
		enterprise / economy of scale etc. Extension activities need to be based on information specific to coastal farming system - fertiliser, pasture quality, legumes, weed control etc. Need a Holistic approach when looking at improving grazing management practices (business and environmental sustainability) Reduction in funding (and locations) for grazing on-ground management practice change.	• EEC Peer to Peer Cross-Regional Tour to Collinsville region (September 2019) • Soil Symposium (November 2019) • Grazing Forum (March 2020) • Grazing Forum Follow Up Field Day (March 2020) **Trials** Increase current level of effort. High priority locations to expand or establish relevant trials / demonstrations with interested graziers. **Workshops / Field Days** Increase current level of effort High priority locations to expand or establish group extension activities.	Increase the number of trials / demonstrations and associated workshops/field days/meetings targeting improved or innovative management around the P2R Water Quality Risk Framework and *local key pollutants/issues/barriers* – target of four trial / demonstration sites and 4 field day / workshops across the sub-catchments Pasture / Hillslope Management – long term carrying capacity, stocking rates, groundcover thresholds, Land condition assessments, Vegetation management, Recovery of vulnerable areas, Property mapping. Streambank Management – managing grazing pressure and improving condition Gully Management – gully remediation, linear feature erosion, hillslope management *Local Trial / Demonstration / Workshop Topics:* • *Gully Remediation / Erosion (Bob Shepard DAF – large earth works, diversion. Stomping out Sediment)* • *Riparian Management* • *Pasture Monitoring* • *Weed Management*
Myrtle Creek (Area: 5,900 ha % Landuse: 23%)	High	Sediment Reduction (H to VH)	**Existing** • Reef Trust Phase 4 Bank Stabilisation	

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
Bakers Creek (Area: 4,200 ha % Landuse: 26%) Sandy Creek (Area: 18,000 ha % Landuse: 39%) Rocky Dam Creek (Area: 29,600ha % Landuse: 60%) Marion Creek (Area: 8,200ha % Landuse: 79%)		Particulate Nitrogen Reduction (H to VH) Catchment Load Monitoring Site on Proserpine River at Glen Isla. Catchment Load Monitoring Sites on Sandy Creek at Homebush and Bruce Highway. <u>Industry Challenges:</u> Number of graziers within sub-catchments have not been involved in previous grazing programs. Large Scale v Small Scale – need to keep extension activities relevant to their enterprise / economy of scale etc. Extension activities need to be based on information specific to	• Grass Roots (continuing but at capacity) • Innovative Grazing Network • Regional Landcare Facilitator • Grazing Regional Working Group • QNRM Water Quality Grazing Project – 4yr project, targeting 16 priority sub-catchments, riparian fencing / off-stream watering points, gully remediation, pasture improvement, land type fencing / off-stream watering, planning component – 60 graziers over project period. **<u>Future</u>** • High Steaks Workshop III (August 2019) • EEC Peer to Peer Cross-Regional Tour to Collinsville region (September 2019) • Soil Symposium (November 2019) • Grazing Forum (March 2020)	• *Stock handling / selection / genetics / breeding (NQDT Brendon Smith – linked to MIPS)* • *Climate / Marketing* Use of innovative learning approaches and/or new tools and technologies to support on-farm learning. Establishment of the Grazing BMP program within these sub-catchments so interested graziers can participate. Access to Specialist Skills – Soil Conservation, Soil Health, Gully Rehabilitation, Herd Management, Pasture Management Improved monitoring and evaluation around extension activities and practice change Follow up support for graziers who have been involved in previous programs like Reef Rescue, Reef Water Quality Grants and QNRM Grazing Grants. Identify key grazing champions that could be utilised to promote practice change from the

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
		coastal farming system - fertiliser, pasture quality Need a Holistic approach when looking at improving grazing management practices (business and environmental sustainability) Reduction in funding for grazing on-ground management practice change.	• Grazing Forum Follow Up Field Day (March 2020) **Trials** Increase current level of effort. Moderate priority locations to expand or establish relevant trials / demonstrations with interested graziers **Workshops / Field Days** Increase current level of effort Moderate priority locations to expand or establish group extension activities.	work they have done on their farm – field day / workshop, present at forums / working groups, factsheet / video. Industry Service Provider training – increase in skills and knowledge of regional Extension / Advisory staff. Can include extension, facilitation and industry specific technical skills. Ideas include: Cross Regional Tour to Fitzroy / Burdekin Beef Expo Behavioural Science The establishment or increased support for Peer-to-Peer learning groups – could possibly link in with existing projects or groups such as the Grazing Innovation Network or the Grazing Regional Working Group. Update the existing Mackay Whitsundays Pasture Booklet to include any new information and research. Could include a section on gully management.

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
Waterhole Creek Blackrock Creek Murray Creek Alligator Creek Sarina Beaches Flaggy Rock Creek	Mod	Moderate to small reductions required across the WQ pollutants so may need some extra effort above current level. Still graziers within the sub-catchments that have not been involved in previous grazing programs so change can still have positive impacts on water quality. Need to make workshops / forums relevant to their enterprises if expected to travel to participate. Particularly for those sub-catchments which are a longer distance away from Mackay.	**Existing** • Reef Trust Phase 4 Bank Stabilisation • Grass Roots (continuing but at capacity) • Innovative Grazing Network • Regional Landcare Facilitator • Grazing Regional Working Group • QNRM Water Quality Grazing Project – 4yr project, targeting 16 priority sub-catchments, riparian fencing / off-stream watering points, gully remediation, pasture improvement, land type fencing / off-stream watering, planning component – 60 graziers over project period. **Future** • High Steaks Workshop III (August 2019) • EEC Peer to Peer Cross-Regional Tour to Collinsville region (September 2019)	General promotion of current / existing programs and activities to graziers. Remove the risk of mixed messages going out through the industry. Could include targeting the key regional programs to the bigger graziers within these sub-catchments. Encourage and support graziers to attend relevant meetings, workshops, field days etc. within the sub-catchment and in neighbouring or other areas. Value add to group extension activities that are already occurring – expanding the information being presented and discussed through improved coordination and collaboration in delivery. Establishment of the Grazing BMP program within these sub-catchments so interested graziers can participate. Follow up support for graziers who have been involved in previous programs like Reef Rescue, Reef Water Quality Grants and QNRM Grazing Grants. Identify key grazing champions that could be utilised to promote practice change from the work they have done on their farm – field day / workshop, present at forums / working groups, factsheet / video.

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
			• Soil Symposium (November 2019) • Grazing Forum (March 2020) • Grazing Forum Follow Up Field Day (March 2020) **<u>Trials</u>** Trials / demonstrations have been and still may be established due to willing and interested graziers. Low priority locations to expand or establish relevant trials / demonstrations. **<u>Workshops / Field Days</u>** Group extension activities are delivered in these sub-catchment areas (due to venues or linked to trials) and important they are maintained. Low priority locations to expand or establish the delivery of group extension activities.	Industry Service Provider training – increase in skills and knowledge of regional Extension / Advisory staff. Can include extension, facilitation and industry specific technical skills. Ideas include: • Cross Regional Tour to Fitzroy / Burdekin • Beef Expo • Behavioural Science The establishment or increased support for Peer to Peer learning groups – could possibly link in with existing projects or groups such as the Grazing Innovation Network or the Grazing Regional Working Group. Resellers / Rural Stores - Grazing Workshops – expand locations and/or presenters e.g. Mt Ossa Rural Local provenance food production – including producer, abattoir, butcher

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
Reliance Creek Gregory River Upper Proserpine River Lethebrook Thompsons Creek Gillinbin Creek Carmilla Creek	Low	Small to zero reductions required across the WQ pollutants so about maintaining current effort. Funding directed to other sub-catchments so need to communicate why to graziers in these areas. Need to make workshops / forums relevant to their enterprises if expected to travel to participate. Particularly for those sub-catchments which are a longer distance away from Mackay.	**Existing** • Reef Trust Phase 4 Bank Stabilisation • Grass Roots (continuing but at capacity) • Innovative Grazing Network • Regional Landcare Facilitator • Grazing Regional Working Group **Future** • High Steaks Workshop III (August 2019) • EEC Peer to Peer Cross-Regional Tour to Collinsville region (September 2019) • Soil Symposium (November 2019) • Grazing Forum (March 2020) • Grazing Forum Follow Up Field Day (March 2020) **Trials** Trials / demonstrations have been and still may be established due to willing and interested graziers.	General promotion of current / existing programs and activities to graziers. Remove the risk of mixed messages going out through the industry. Could include targeting the key regional programs to the bigger graziers within these sub-catchments. Encourage and support graziers to attend relevant meetings, workshops, field days etc. within the sub-catchment and in neighbouring or other areas. Value add to group extension activities that are already occurring – expanding the information being presented and discussed through improved coordination and collaboration in delivery. Follow up support for graziers who have been involved in previous programs like Reef Rescue, Reef Water Quality Grants and QNRM Grazing Grants. Identify key grazing champions that could be utilised to promote practice change from the work they have done on their farm – field day / workshop, present at forums / working groups, factsheet / video.

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
			Not priority locations to expand or establish relevant trials / demonstrations. **Workshops / Field Days** Group extension activities are delivered in these sub-catchment areas (due to venues or linked to trials) and important they are maintained. Not priority locations to expand or establish the delivery of group extension activities.	
Whitsunday Coast Proserpine River Main Channel Repulse Creek St Helens Creek Constant Creek Mackay City	Very Low	Very small to zero load reductions required across the WQ pollutants so about maintaining current effort. Catchment Load Monitoring Site on Proserpine River at Glen Isla and Plane Creek at Sarina. Funding directed to other sub-catchments so need	**Existing** • Janes Creek Whole of System Repair (Mackay City) • Reef Trust Phase 4 Bank Stabilisation • Innovative Grazing Network • Regional Landcare Facilitator • Grazing Regional Working Group **Future** • High Steaks Workshop III (August 2019)	General promotion of current / existing programs and activities to graziers. Remove the risk of mixed messages going out through the industry. Could include targeting the key regional programs to the bigger graziers within these sub-catchments. Encourage and support graziers to attend relevant meetings, workshops, field days etc. within the sub-catchment and also in neighbouring or other areas. Value add to group extension activities that are already occurring – expanding the information being presented and discussed through improved coordination and collaboration in delivery.

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
Upper Cattle Creek Plane Creek Cape Creek		to communicate why to graziers in these areas. These catchments include some of the larger urban areas within the region so may need to communicate to the grazing industry what other land uses are doing to help improve water quality. Need to make workshops / forums relevant to their enterprises if expected to travel to participate. Particularly for those sub-catchments which are a longer distance away from Mackay.	• EEC Peer to Peer Cross-Regional Tour to Collinsville region (September 2019) • Soil Symposium (November 2019) • Grazing Forum (March 2020) • Grazing Forum Follow Up Field Day (March 2020) **Trials** Trials / demonstrations have been and still may be established due to willing and interested graziers. Not priority locations to expand or establish relevant trials / demonstrations. **Workshops / Field Days** Group extension activities are delivered in these sub-catchment areas (due to venues or linked to trials) and important they are maintained. Not priority locations to expand or establish the delivery of group extension activities	Follow up support for graziers who have been involved in previous programs like Reef Rescue, Reef Water Quality Grants and QNRM Grazing Grants. Identify key grazing champions that could be utilised to promote practice change from the work they have done on their farm – field day / workshop, present at forums / working groups, factsheet / video.

Location	Priority	Key Issues / Challenges / Barriers / Risks	Existing and Future Programs / Projects and Effort	Actions / Gaps / Opportunities
			unless linked to the requirement of a larger venue in Mackay or Proserpine.	

Appendix 9: Monitoring and Evaluation Template to guide the monitoring and evaluation of projects supported through the Mackay Whitsunday Regional Extension Plan

A Project Plan should be developed setting out the Project Logic and SMART Objectives to guide this Monitoring and Evaluation Plan

Each Project will be assessed against the criteria of: Effectiveness, Efficiency, Impact, Legacy and Project Management. Key Evaluation Questions (KEQs) need to be devised for each criteria. Example KEQs (based on those that will be used for the Program scale evaluation) are given below. New, Project specific questions can be added under the relevant criteria.

Note that monitoring data can be quantitative (such as P2R reporting and output measures) or qualitative (e.g. collected through interviews, focus groups, other)

Standard Key Evaluation Questions (based on those that will be used for the Program scale evaluation) are given below. New, Project specific questions can be added under the relevant criteria.

When answering the Key Evaluation Questions refer to the methods, outputs, objectives, outcomes outlined in the Regional Extension Plan, the Reef 2050 WQIP intermediate outcomes, land management and water quality targets in the Project Plan.

Evaluation criteria	**Key Evaluation Question**	**What will be monitored and how will it be monitored** Metric and how measured (method)	**What information sources and monitoring data (including existing M&E tools or specific monitoring or data collection) will be used to answer the question** Where will you get the data from and what is that data	**Monitoring frequency** How often will the data be gathered	**Evaluation and reporting process** How often will the evaluation be reported (through a MERI report)
Effectiveness	How well has the project delivered on planned methods and outputs				
	What measurable progress has been made towards the stated Project Objectives (as a result of the methods and outputs)				
	What extent has this progress contributed to the WQIP intermediate outcomes?				
Efficiency	What measures have been taken to improve project efficiency (e.g. targeting investment, cost sharing)?				
Impact	What evidence is there that the project has made a contribution towards Reef 2050 WQIP land management and water quality targets?				

	What progress would have been made anyway, in the absence of the funding for this project?				
	What, if any, unanticipated positive or negative impacts have resulted from the project?				
Legacy	What are the long-term requirements and arrangements for managing and resourcing maintenance of the project outcomes?				
Project Management	How well are the project management arrangements, systems and processes contributing to efficient and effective project performance?				
	What processes and evidence is there of adaptive management and learning and active implementation of MERI?				