

# **Collaborative water management in the Ringarooma River catchment Tasmania, Australia**

Cleary C.<sup>1</sup>, Hardie S.<sup>1</sup>, Morrison B.<sup>2</sup>, Aldridge A.<sup>3</sup> and Pryor S.<sup>1</sup>

1. Department of Primary Industries, Parks, Water and Environment, P.O. Box 44, Hobart, Tasmania, Australia, 7001. Email: Chris.Cleary@dpipwe.tas.gov.au

2. Tasmanian Farmers and Graziers Association, Launceston, P.O. Box 193, Launceston, Tasmania, Australia, 7250. Email: Brigid.Morrison@tfga.com.au

3. Ringarooma Water Users Group, Ringarooma, Tasmania, Australia

## **Key Points**

- Water planning, knowledge sharing and improved understanding through engagement have been the cornerstones of collaborative water management in the Ringarooma River catchment, Tasmania, Australia.
- The Ringarooma River Water Management Plan provides for collaboration based on monitoring, evidence and knowledge sharing and a commitment by the regulator/policy makers, scientists and water users/community to collaborate to manage river flow.
- Water users in the Ringarooma River have demonstrated the benefits of communities taking greater responsibility for implementing water management arrangements to achieve mutually beneficial social, economic and environmental outcomes.

## **Abstract**

Sustainable resource use and agricultural production systems underpin Tasmania's 'clean green' market advantage. To support this, 12 statutory water management plans have been adopted in Tasmania between 2003 and 2016. Rapid changes in the water management environment occurred concurrently with water planning, and were driven by expansion of irrigated agriculture, increased demand for water and new water markets. Strategic evaluations of the effectiveness of water planning (2003-2018) and identification of emerging risks and new opportunities have initiated a rethink of approaches to water management and planning in Tasmania. More effective collaborative approaches to water management and planning involving the Department of Primary Industries, Parks, Water and Environment (the regulator), other water managers, stakeholders and scientists are now being undertaken.

The Ringarooma River catchment, north-east Tasmania (Australia) provides a useful case study that demonstrates how Tasmania's water management environment is changing and how policy makers have responded to stakeholder's concerns that local knowledge was not being adequately recognised or utilised. This paper outlines how the Ringarooma River Catchment Water Management Plan 2014 is enabling collaboration between community-based water managers, the regulator and scientists to support greater community participation in implementing water management strategies.

## **Keywords**

Flow management, Adaptive management, Water planning, Collaboration, Community, Tasmania, Irrigation

## **Introduction**

The Ringarooma River catchment is located in northeast Tasmania, Australia (Figure 1) and has an area of 974 km<sup>2</sup>. Approximately 25% of the catchment has been cleared for grazing and cropping, while approximately 9% consists of forestry plantations, most of which are located in the upper catchment.

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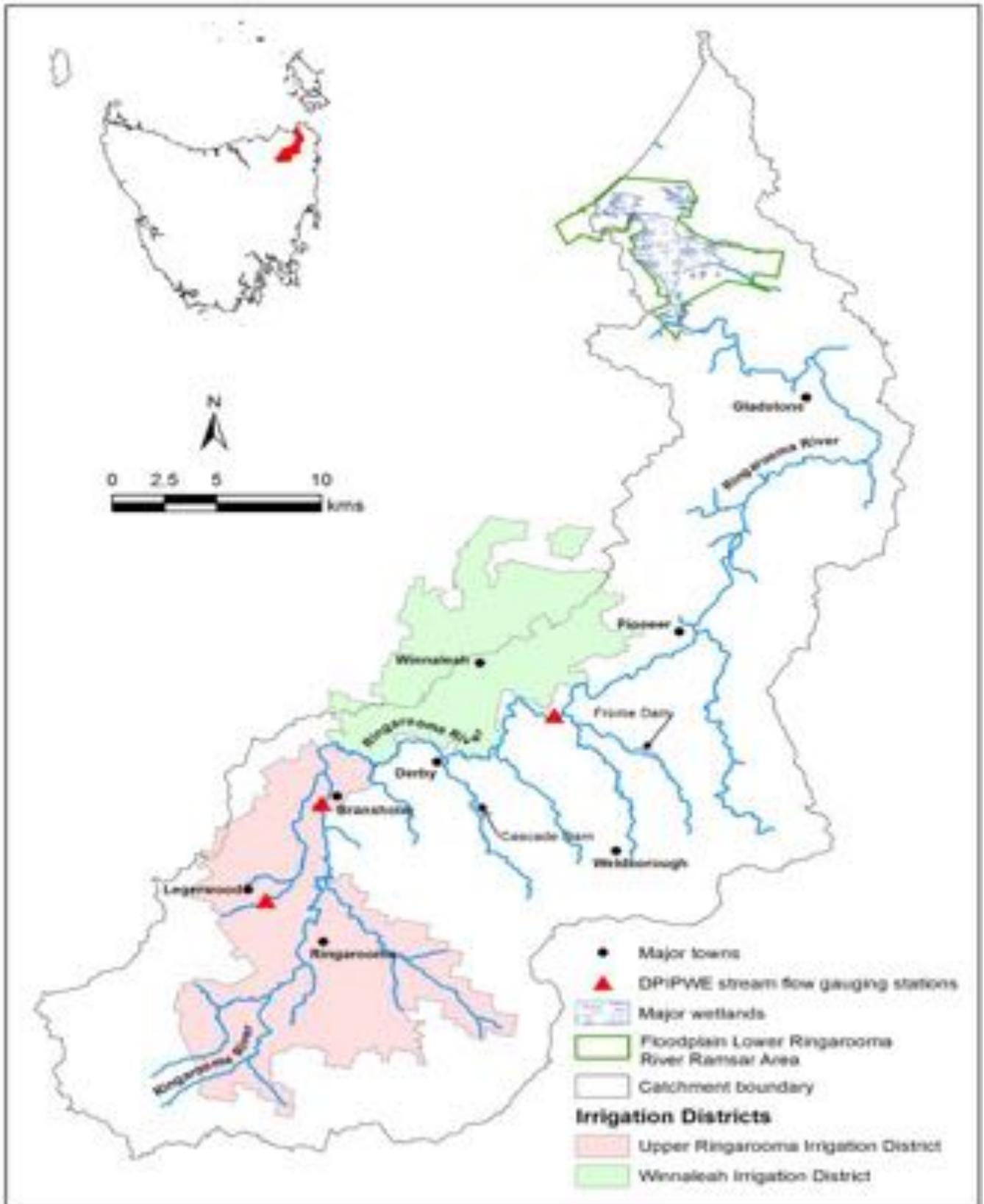
Freshwater-dependent values in the catchment include threatened aquatic fauna (e.g. giant freshwater crayfish and dwarf galaxias, green and gold frog), and riparian vegetation (e.g. native gipsy wart, bristly knotweed) (DPIWE 2006). The Floodplain Lower Ringarooma River Ramsar Wetland site (Figure 1) has very high conservation values, and several other high conservation value wetlands are also found in the lower catchment.

The Ringarooma catchment has a median annual yield of approximately 392,000 ML (based on flow data from 1979 to 2009) and is a largely unregulated river system that exhibits a strong seasonal flow pattern, with highest flows occurring from May to November (DPIW 2008b). There are a number of on-stream and off-stream dams in the upper reaches of the catchment, which are used to supply water for irrigation together with direct water extraction from the river when flows are available under water access rules.

Irrigation schemes and water trading is increasingly underpinning the development and growth of higher value irrigated agriculture in the Ringarooma River catchment. The Winnaleah Irrigation Scheme commenced operation in 1987, supplying 3,254 ML of Irrigation Rights. Between 2010 and 2018, two further major irrigation scheme projects were licensed and allocated water entitlements prior to being built and commissioned. The Winnaleah Irrigation Scheme Augmentation commenced operation in 2012 supplying 3,700 ML and in 2015 the Upper Ringarooma Irrigation Scheme also commenced supply of a further 5,700 ML. In total, these schemes supply 12,654 ML of up to 95% reliable water to the area. Approximately 18,500 ML of the allocated water is licensed to the irrigation schemes under the Tasmanian *Water Management Act 1999* (WMA). Scheme operators own the licences, dams and pipelines and contractually supply 'Irrigation Rights' to customers under the Tasmanian *Irrigation Clauses Act 1973*.

The Ringarooma River Catchment Water Management Plan (the WMP) took effect in 2014 defining access rules to protect environmental flows (which are not allocated) and sustainable allocation (diversion) limits providing up to 102,300 ML of commercial abstraction on an annual basis, representing 26% of the median annual discharge of the catchment. Since 2014, most of the available water has been allocated to licensees and increasingly water is only available via the water market (comprising formal and informal trade and water sharing arrangements). The majority of the available water allocation (83,800 ML) is held by private interests who own significant private storage and pump infrastructure: many are also customers of one or more of the irrigation schemes. The majority of scheme water is piped to properties; however, some scheme water and privately traded water is conveyed via parts of the river system and must be managed in conjunction with licensees who extract natural flows directly from the river. The increasingly complex water management environment is driving a need for increased transparency, accountability and collaboration between scheme managers and water users in order to deliver the environmental, and water use and development objectives of the WMP.

This paper explores how regulators/policy makers, scientists and water users/community have worked together to trial new collaborative approaches to address current and emerging water management issues in a rapidly evolving and increasingly complex water management environment in Tasmania.



**Figure 1** Map of the Ringarooma River catchment, Tasmania showing the flow gauging stations, main watercourses, Irrigation Districts and the major wetlands and Ramsar site.

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**Story of water management in the Ringarooma River**

*Pre-planning (2000-2012)*

In 2000, the WMA came in to effect and required all commercial surface water users to be licensed. Water entitlements that existed under the previous Act (*Tasmanian Water Act 1957*) were recognised under the WMA and converted into allocations on water licences. However, prior to the WMA taking effect it became apparent, through improved understanding of actual water use by all stakeholders, that a significant volume of the water historically taken was in excess of entitlements and many irrigation businesses had become dependent on that use. The State Government's policy was to prevent any further unauthorised use beyond 2003, while recognising historic use prior to 2003 to limit the impact on established water-dependent businesses. The WMA enabled historic water use to be allocated conditional on access to the water being consistent with sustainable environmental and water use objectives of the new WMA.

The volumes of historic use identified in the Ringarooma catchment were relatively high compared to other catchments. Water use surveys for the period 2000 to 2003 estimated up to 13,000 ML of unlicensed historic take in addition to 9,000 ML of licensed allocations for the 'summer take period' (Dec-Apr). While the Ringarooma River has naturally high yields during the lower flow take period, owing to significant groundwater contributions to baseflows, the unmanaged extraction of large volumes of historic water use was considered to present a risk to the environment and existing licensees, particularly during drier climatic periods.

The statutory planning process under the WMA in the Ringarooma River catchment commenced in 2004 and the progress towards developing and implementing the WMP typified the challenges experienced across Australia during the early stages of national water reform. The challenges related to the iterative and resource-intensive nature of resolving complex issues (Doolan & Hart 2017; Guest 2017), poor engagement with often broad stakeholder groups that had competing agendas, and difficulties associated with a lack of resources, information, trust and capability (Tan & Auty 2017).

Like most water planning processes in Tasmania at the time, the catchment community recognised the need for water reform to ensure sustainability and security of water access following a period of growth in water use. However, there was also trepidation as government and communities were placed in adversarial water planning environments and faced grappling with understanding the different views and objectives of a broad range of interest groups. These groups were all attempting to recognise and reconcile competing management interests, whilst trying to understand how these issues related to water policy objectives that operated at local, State and National scales. Initial discussions were constrained as participants learned how to effectively resolve complex policy problems with limited trust, experience or a shared understanding of the information available to support effective decision-making. In these circumstances, increased levels of knowledge sharing, trust and collaboration are necessary prerequisites to tackling complex social, economic and environmental policy problems (Head 2007; Loo & Clarke 2017).

By 2005, stakeholders in the Ringarooma catchment were concerned that accurate information relating to water availability and use were not yet available to inform the decision-making; therefore, the development of the WMP was deferred until 2012. Between 2005 and 2012, significant research into climate change effects on water yields (CSIRO 2009; Bennett et al. 2010), effects of forestry activities on water yields (Hydro Tasmania Consulting 2007), and freshwater ecosystem values (CFEV 2005; DPIW 2008a) in Tasmanian catchments was undertaken. In addition, a holistic environmental flows assessment approach was developed for Tasmanian rivers (DPIW 2007; Bobbi et al. 2014) and an intensive ecological study of several Tasmanian rivers (including the Ringarooma River) was also undertaken (DPIPWE 2010; Warfe et al. 2014) to improve understanding on the influence of flow regime characteristics on river ecology. Collectively, this work supported the development of the Ringarooma WMP.

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Once planning recommenced in 2012, two key issues emerged that needed to be addressed by the WMP. These were:

1. The unauthorised taking of considerable volumes of water during the irrigation season, on which farm businesses were historically dependent and for which there was a reasonable expectation that access would be recognised by water entitlements; and
2. Determining the level of water extraction that is sustainable, taking into consideration the water requirements of the river system and historic level of water extraction.

To deal with a broad range of views in relation to the level of water allocation that should be provided by the draft WMP and how this water should be allocated and accessed, an allocation framework was developed. The framework set out a risk based adaptive management strategy to support developing the WMP. The framework committed to allocating the full volume of historic use identified through Water Use Surveys (2000-2003) but sought to manage risks posed by high levels of water extraction by including robust access rules to protect key features of the flow regime (e.g. seasonal pattern in baseflows, high flow events) with a view to maintaining the condition of the river.

At the final stages of the planning process, representations on the draft WMP to the government (the regulator) from water users indicated concern that the proposed environmental flows (protected by monthly cease-to-take rules) would significantly impact their access to water. Refer to the Tasmanian Planning Commission Report (2013) for details of representations and the government's responses. Water users argued that the access rules proposed by the draft WMP were overly prescriptive and inflexible and would limit the effective, efficient and sustainable use of water above the cease-to-take thresholds, and would limit opportunities to optimise access to water and manage impacts on river condition through adaptive flow management. Additionally, local water users felt that their knowledge and expertise had not been properly recognised and that local water users struggled to represent their points of view in the face of technical experts. The sentiment was that the planning process was disempowering because local stakeholders lacked the resources and capacity to effectively influence planning outcomes. Local irrigators did, however, put a case forward that they would be more effective in developing their own water sharing and restriction management arrangements, and that they had a significant track record demonstrating a capacity to cooperatively and effectively share and manage water resources in the catchment.

The final WMP (adopted in February 2014; DPIPWE 2014b), took this feedback on board and provided an transition (implementation) period (2014-2021) to verify and finalise water allocation volumes related to historic use. During this period, historic water users must verify their historic water use by providing at least two years of metered water use records in order to receive a permanent ongoing allocation. To ensure that key features of the flow regime are protected, the Ringarooma WMP includes robust water access rules (cease-to-take flow thresholds, take periods and allocation limits). The WMP also provides an adaptive management approach to monitor the river health and flow outcomes in the Ringarooma River system in order to evaluate the environmental sustainability of allocating historic water use. According to the WMP (DPIPWE 2014b), this environmental monitoring will enable two key outcomes:

- a) Confirmation that the taking of water is not harming the environment prior to granting ongoing water allocations; or
- b) In the event that significant deterioration in river health or adverse impacts on environmental values, attributable to water extraction, are detected, the WMP will be reviewed.

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Another key outcome of the monitoring strategy has been to inform and provide feedback on local adaptive management strategies and actions.

### **Collaborative management under the WMP**

The Ringarooma WMP (DPIPWE 2014b) provided for the establishment of a water user group to assist the regulator in implementation of the WMP. The WMP provides flexibility for a water user group (representing water users) to establish its own agreements on the sharing of water above the cease-to-take thresholds at times when water becomes limited. The WMP provides a commitment by the regulator to support local water users to implement the WMP.

Following the WMP's adoption, water users established the Ringarooma Water Users Group (RWUG) which has been instrumental in working with the regulator to trial and develop water sharing arrangements to optimise the water use and development and environmental objectives of the WMP. The RWUG has also partnered with researchers through the Sense T Adaptive Water Resource Management project to improve availability of information on flows through remote sensing and development of tools to inform water access and management under the WMP (Nogrady 2017, Sense T Project 2014; University of Tasmania 2014).

The WMP sets out a staged management process of notifications, where by the regulator supports water users to modify their patterns of water extraction when flows approach the cease-to-take thresholds (i.e. STAGE 1 – when flow drops to within 25ML/day above the cease-to-take threshold water users are notified that their flow sharing arrangements should be implemented; STAGE 2 – when flow drops to within 15ML/day the regulator undertakes active management to support the implementation of water user's sharing arrangements; STAGE 3 – when flow drops to or below the cease-to-take threshold the regulator commences formal implementation of restrictions). In addition real time flow data and notifications on restrictions are communicated via SMS and via the internet. The development of water sharing arrangements by the RWUG (e.g. rostered direct extraction from the river, water releases into the river from farm dams) has maintained flows above the thresholds and largely alleviated the need for the government to impose restrictions on water extraction during recent periods of low flow in the river. It has also alleviated daily variation in flow for short periods (i.e. weeks). Compliance is achieved through open communication of information on river flow and management, water users being accountable for keeping records of water use and an active on-ground presence of regulatory officers who support compliance with the Plan, water licences and facilitate water users to implement and comply with their established water sharing arrangements.

### **Scientific monitoring informing collaboration and adaptive management**

Environmental monitoring by the State Government in the upper Ringarooma River catchment began during the final stages of adopting the Ringarooma WMP and is continuing during the transition phase of the WMP. The scientific monitoring is focusing on defining the condition of the upper river system, where agriculture is most intense in the catchment, and examining the effects of agricultural land and water use on the health of the river (in line with the prescriptions of the WMP, see Planning process). The findings of the monitoring are being regularly communicated to the RWUG via technical reports, briefs and meetings to discuss the work. To date, the monitoring has been invaluable to the implementation of the WMP as the results have influenced decisions regarding flow management during the transition phase of the WMP. However, the monitoring and its findings are presenting challenges to scientists (e.g. disentangling effects of water use and other stressors), water users (digesting findings and understanding ramifications) and water planners (reconciling water use effects and water management options).

The ecological monitoring has included three phases:

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- Phase 1 (2012-2014): Intensive spring/autumn sampling at 19 sites in the upper Ringarooma River system to examine river condition (focusing on water quality, benthic algae and macroinvertebrates, and fish) and responses to upstream land and water use, and analysis of historical river condition data for long-term monitoring sites in the catchment. The effects of diel (sub-daily) variation in baseflows in summer on macroinvertebrates were also investigated (DPIPWE 2014a; Hardie & Bobbi 2016; Hardie & Bobbi 2018).
- Phase 2 (2013-2016): Continued monitoring of macroinvertebrates at 12 sites in upper river system to determine if varying climate/flow conditions influence findings of studies in phase 1. Continued monitoring of river condition at long-term monitoring sites.
- Phase 3 (2017-2018): Longitudinal examination of river condition (focusing on benthic algae, sediment and macroinvertebrates) at 10 sites on the main channel of the upper Ringarooma River to define the spatial extent of impacts. Continued monitoring of river condition at long-term monitoring sites.

The findings of the monitoring to date indicate that there have been temporal and spatial declines in the ecological condition of some stretches of river system, and that agricultural land and water use is associated with these declines. However, the mechanisms that are causing the impacts are unclear and require further investigation. Since 2014, the implementation of the WMP and associated flow sharing measures have contributed to an increase in minimum flows in the Ringarooma River during summer-autumn. This outcome shows the value of the collaborative approach to water management in the catchment. Monitoring and flow management is currently addressing the effects of diel variation in baseflow that occurs in the upper Ringarooma River during peak periods of water extraction (summer-autumn). This work will provide a greater understanding of what levels and patterns of water extraction are sustainable in Ringarooma catchment.

## **Achievements and challenges –water user’s perspectives**

Numerous interacting factors are enabling successful collaborative flow management in the Ringarooma River catchment. These factors are typical of innovation processes, commencing with a need to understand differences between the community and the regulator, identify the common goals to support resolving a general state of initial frustration and power imbalance that can develop when Government’s or large institutions are perceived to be imposing rapid or top down change on local communities (Gosman & Botchwey, 2013). Water users were successful in leading and participating in the water planning process because of: a strong sense of local community grounded in trusted relationships; local leadership experience in the operation of irrigation schemes and flow management and an understanding of the risks of inaction; local experience in negotiation with regulators supported by local leaders who are actively involved with industry advocacy groups. These factors also supported engagement with research and development organisations and government who assisted by providing research, information and tools to inform adaptive management of river flows. The persistent efforts of water users to manage river flows, and reciprocal effort by the regulator to support and monitor the progress, has developed into a relationship with significantly improved levels of trust. This relationship has fostered greater understanding and open communication between water managers, working together for the long-term sustainable development of the Ringarooma River, therefore enabling innovative flow management actions to evolve.

The RWUG has shown leadership and success, which has led to increased ‘buy-in’ and adoption of collaborative approaches by the broader irrigation community who have observed and realised the tangible benefit from participating. While the practices have also commenced from a baseline of trust in the skills, knowledge and good will of the leadership group, the evolution of the management arrangements have occurred slowly, somewhat organically and are generally informal. Strategies have developed through a process that is still in its infancy and requires small incremental steps based on trial and error, learning and building on small successes to grow the trust and confidence of all participants.

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At the completion of the 2017/18 irrigation season, there are still new challenges emerging, not only from the results of adaptive management actions, but also around the governance structure and resources required to continue the active management on behalf of the community. Although there is a reasonable level of transparency in the decision-making process and its communication to most water licence holders, it could be considered slightly ad hoc. At present the regulator issues formal notifications to licensees via text messaging (SMS), web pages and public notices when there is a need related to the regulators core functions under the WMP or the WMA; but these messages and communication channels may not always serve the communication needs of the RWUG. The RWUG hold community meetings during the irrigation season that are invariably well attended, when active flow management is required. The RWUG also communicates by email and SMS to the management group and the broader community to undertake flow management and research, and seek feedback to assist with decision-making and keeping records of actions undertaken. During critical periods, the RWUG have met on weekday nights at the local pub to have in depth discussions to review, plan and refine actions and strategies. This process also illustrates the importance of culturally suitable forums for innovation and collaboration to thrive. Notwithstanding the informality of the arrangements, the practices have had major social, economic and environmental impacts. However, the level of responsibility and commitment of resources that falls back to a small and voluntary local leadership group, is probably not sustainable longer term without more effective implementation strategies and further support. Despite this, it is recognised by the local community, that without a suitable alternative it is, at present, vitally important that the RWUG succeed.

It is likely that more formal governance may need to be arranged for the RWUG and support is being sought to assist with this. Improved strategies to implement water sharing to reduce the workload is always being considered, along with ways to collaboratively resource local management activities, and how the value and tangible benefits can be optimised. Continued support from the regulator to monitor and communicate the management actions and their impact to the broader community is seen as an important factor.

For any of these innovation strategies to be sustained, 'good news stories' need to be told, heard and felt by all stakeholders. For ongoing success, all stakeholders will need to be open-minded and informed about the risks and opportunities involved in collaborative water management. Clear management goals and an understanding of roles, interests and limitations of each stakeholder, along with effective monitoring and evaluation of the economic, social and environmental impacts is key. The RWUG have commenced discussions around developing a long-term, self-sustaining governance model that provides the legitimacy, flexibility and transparency to achieve adaptive flow management without creating a level of administrative burden or resourcing that is unsustainable or reliant on a few individuals. It must also be remembered that active management is "fluid" and a "set and forget" approach will not deliver the outcomes required by all stakeholders.

## **Conclusions**

The process of community engagement in the Ringarooma catchment has required extensive time, resources, commitment and leadership of both government and communities to share and develop knowledge and understanding. Knowledge sharing and improved understanding through engagement have been the cornerstones of efforts to address the complexity of water management in this catchment.

The WMP provides a commitment to a collaborative approach based on monitoring, evidence and knowledge sharing, and a resolve by the regulator and community to work together to manage flow in the river. The community has been successful in taking greater responsibility for implementing water sharing arrangements to achieve a range of mutually beneficial social, economic and environmental outcomes. Government and water users in the Ringarooma River catchment have recognised the challenges of achieving growth in the value of agriculture while maintaining the ecological health of the river system, the profitability of water extractive businesses and the support of the broader community. This commitment by government and local

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Cleary, C. et.al. - Collaborative water management in the Ringarooma River catchment Tasmania water users is a work in progress but it demonstrates how local management can be achieved and accommodated by water plans and their associated processes.

## Acknowledgments

The authors would like to thank the members of the Ringarooma community who have participated in the development of the WMP and the ongoing commitment of time and effort by the members of the RWUG who have taken a leadership role in seeking to represent the interests of water users and the views of the Ringarooma community.

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