Influencing management and sharing our findings: communication and engagement efforts within the Victorian Environmental Flows Monitoring and Assessment Program

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Key Points

- A key feature of the Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP) Stage 6 was an enhanced focus on communication and engagement compared to previous stages.
- More frequent communication and improved collaboration between scientists and waterway managers provided waterway managers with the information they needed for evidence-based decision-making and adaptive management. This led to an improved use of environmental water.
- Communication of these research findings has also assisted in demonstrating the outcomes of environmental water with broader audiences including local communities.
- A pilot citizen science project, involving anglers collecting ear bones contributed to, and strengthened the scientific analysis. It also built stronger connections with anglers and provided an avenue to increase water literacy.

Abstract

The Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP) was established by the Victorian Government in 2005 to monitor and assess ecosystem responses to environmental watering in priority rivers across Victoria (Stages 1 to 6). In recent years (Stage 6 and now commencing Stage 7), there has been an enhanced focus on working closely and collaboratively with waterway managers, to provide them with information in a timely manner that informs effective adaptive management of water and to demonstrate the value of environmental water to stakeholders.

Here, we outline the approach taken to communication and engagement within VEFMAP Stage 6 and describe the evaluated outcomes of this approach. Priority was placed on fostering strong partnerships between DELWP (Department of Environment, Land, Water and Planning), catchment management authorities (CMAs), Melbourne Water (MW) and collaborating researchers. These efforts aimed to ensure accountability and transparency, scientifically sound ecological data and evaluation, and prompt delivery of information and advice. The strong collaboration with waterway managers led to a more adaptive approach that improves planning, delivery and evaluation of environmental water. Increased collaboration with other research agencies, student projects and other research programs has improved outcomes, data and knowledge sharing and avoided duplication. The improved understanding of the ecological links to flow, gained through VEFMAP, provides further opportunities for DELWP and waterway managers to now share the value of environmental water to broader audiences.

VEFMAP also included an angler citizen science project in northern Victoria, to gather supplementary ear bone samples (otoliths) to support scientific analysis while also building stronger connections with anglers and providing an avenue to increase water literacy. We describe this pilot as a detailed case study of VEFMAP communication and engagement.

Keywords

Environmental water, rivers, management, collaboration, ear bones, citizen science

Introduction

Water for the environment ('environmental water') is increasingly used to reduce the impacts of river regulation on ecosystem function and help recover native flora and fauna. The Victorian Environmental Flows Monitoring and Assessment Program (VEFMAP) was established by the Victorian Government in 2005 to monitor and assess ecosystem responses to environmental watering in priority rivers across Victoria.

VEFMAP has been undertaken in a series of stages. Stages 1-4 provided the early program development, data collection and evaluation from 2005 to 2014. Since 2015, the Arthur Rylah Institute for Environmental Research (ARI) has taken a key role in this program. Stage 5 involved consolidating eight years of previous data and extensive consultations with waterway managers and scientists to plan a modified approach. This consultation included a 2015 questionnaire to stakeholders in relevant organisations including CMAs, the Victorian Environmental Water Holder (VEWH) and MW. The questionnaire sought to garner their views on the program to date; what they wanted from the program to support their management; and the type of communication outputs and engagement they preferred. Valuable feedback was obtained, broadly relating to the scientific approach, project management, and communication and engagement. This feedback strongly informed Stage 6 of the program which ran from 2016 to 2020 and included a focus on monitoring the response of fish and vegetation to environmental water and meeting the needs of the key stakeholder group of waterway managers.

This paper outlines how communication and engagement efforts were embedded within all aspects of Stage 6 to build a cohesive scientific program, initiate and enhance a range of strong collaborations, share findings and influence water management. We also present a case study of a pilot angler citizen science program undertaken to support scientific analysis, build stronger connections with anglers and provide an avenue to increase water literacy.

Embedding communication and engagement in all aspects of VEFMAP Stage 6

VEFMAP Stage 6 sought to demonstrate ecological outcomes of environmental water management, fill knowledge gaps to improve its management and support reporting under the Murray–Darling Basin Plan. This stage was defined by a modified scientific approach, together with enhanced project management and communication and engagement efforts compared to previous stages. Rather than being seen as a distinct and separate element of the program, communication and engagement were viewed as integral to the process of establishing the program – including developing the scientific approach and implementing appropriate project management.

Scientific approach

Stage 6 was built on a sound and rigorous scientific base, with a deliberate focus on the scientists and program managers engaging closely with waterway managers from the outset. This focus on engagement aimed to: build confidence in the program; enhance contributions to, and awareness of, the approaches taken; as well as foster and enhance relationships. Meeting the needs of waterway managers and informing effective adaptive management of water resources were also a priority. These engagement efforts ranged across the IAP2 (International Association of Public Participation) spectrum from "inform" through to "empower".

A thorough consultative process involved CMAs, the VEWH, University of Melbourne and DELWP identifying knowledge gaps for environmental water management and future monitoring and research needs. This consultation, together with the latest scientific understanding of ecological responses to changes in flow regimes, led to a shortlist of key evaluation questions (KEQs) being developed. A final set of KEQs was compiled after further workshops, individual meetings with CMAs, and independent expert advice. To ensure waterway managers were clear about the VEFMAP scientific approach, two manuals were produced and shared: one outlining program context and rationale; the other outlining program design and monitoring methods. During Stage 6, any modifications and refinements made to the study design were included in

annual monitoring plans and reviewed by independent experts. The program also established a database with an online tool for waterway managers to access information from their areas.

Project management

Project management incorporated comprehensive planning and review processes and documentation. This included monthly project team meetings, reviews of results and monitoring outcomes, annual proposals for monitoring and research, independent scientific advisory input to planning, communication and engagement efforts, and the production of quarterly update reports and annual reports. There was ongoing reflection and evaluation of progress towards achieving program objectives and meeting milestones to enable continuous improvement throughout the four years of Stage 6. A clear governance model also clarified roles and responsibilities of core participants and groups. For example, an Independent Review Panel (IRP) contributed to the program design, providing ongoing input and critical evaluation to inform program objectives, key evaluation questions and monitoring methods. It comprised representatives from Griffith University, University of Melbourne, La Trobe University and South Australian Research and Development Institute (SARDI). A Project Steering Committee, comprising CMA, VEWH and DELWP staff also oversaw the program.

Communication and engagement

A Communication and Engagement Plan was developed at the commencement of Stage 6, to outline the engagement approach, identify key messages and target audiences, and document communication tools and engagement methods. It sought to provide clarity and direction for the development of consistent key communication messages for the findings; provide a framework to guide engagement approaches and enable effective communication; enable the project team to build stakeholder understanding of the benefits of VEFMAP and provision of environmental water; and contribute to enhanced adaptive management with increased transparency and confidence in environmental water decision-making. Waterway managers both within Victoria, across other states and federally were considered a core focus for the program. It was, however, recognized that there were many relevant target audiences, including scientists, Traditional Owners, interest groups such as fishers and conservation groups, regional communities, as well as the general public.

The 2015 questionnaire results informed communication and engagement efforts during Stage 6 for waterway managers. Feedback indicated that waterway managers desired a combination of meetings in Melbourne and regionally, including piggybacking on existing meetings to maximize efficiencies, and regular email updates of program progress. They also preferred a combination of resources that were easy to interpret and user friendly; this included technical reports, summary reports, fact sheets, and case studies. These stakeholders also requested information to be provided in a timely manner so that it could inform and support their management needs. Timeliness of information sharing was a particular priority during Stage 6.

Communication and engagement tools and approaches included preparation of written material, social media posts, online content as well as face to face interactions. The ARI website provided the primary source of project information, including an introductory video, program manuals, and an overview fact sheet and poster. Throughout each year, waterway managers were advised of survey plans and findings via emails, phone discussions, brief survey update reports (that outlined survey methods, locations and observations) and Yammer messaging to an Environmental Water Reserve Officer group. Yearly updates of progress were provided through annual monitoring reports as well as fact sheets, which were produced for northern and southern Victoria (fish results) and specific river systems (vegetation results). Face to face interactions involved regional meetings with staff including field visits, as well as presentations at annual workshops. Participation in some CMA Environmental Water Advisory Groups proved to be a particularly successful way to communicate and engage directly with members of the local regional communities. Social media and other online content including newsletters and videos were developed by both DELWP and waterway managers, primarily to promote noteworthy findings.

Strong and effective communication and engagement across those directly involved in VEFMAP Stage 6 was also embedded in the program. A team of approximately 30 scientists and technical staff within ARI worked on the research and monitoring program, together with two key DEWLP program management staff. There

were monthly program meetings, regular email and phone contact. A communication register was also developed and shared to ensure a comprehensive collation of communication and engagement activities and outputs each month. This register was a useful resource for the ongoing review of communication and engagement efforts.

Since Stage 6 was designed to address key research questions over a four-year timeframe, the full analysis of results was completed in 2020 and included within a final report (Tonkin et al. 2020). In addition to this, an associated suite of 16 supplementary reports were prepared. To date, nine journal articles have been published, with many more are in varying stages of review and preparation. Three online presentations were given at the end of Stage 6 in December 2020, due to Covid-19 restrictions; these provided a program overview, fish outcomes and vegetation outcomes. A brochure was also produced and shared which provided an overview of Stage 6, its approach, findings and achievements.

Figure 1. Scientists and waterway managers worked together closely, including meeting for field visits.

Figure 2. A VEFMAP workshop with stakeholders

Collaborations and connections

Collaborations were initiated or enhanced with a range of universities and research institutes, including University of Melbourne, La Trobe University, Deakin University and SARDI (South Australian Research and Development Institute). This included 13 scientists (involved in student supervision, experimental design and logistics, data analysis and otolith expertise) and five students (including PhD, Masters and Honours). Over 20 environmental water reserve officers and waterway managers staff from six CMAs, Melbourne Water as well as Goulburn-Murray Water provided significant input into the design and implementation of the program, including developing the KEQs, monitoring methods and locations, planning fieldwork, and providing invaluable information regarding flow management on their respective river systems.

VEFMAP also recognized the value of linking in effectively with other environmental water monitoring programs and relevant government agencies in south eastern Australia. These linkages sought to: share knowledge and results; avoid duplication of monitoring and research efforts; combine datasets to create bigger sample sizes for analyses; create multi-disciplinary teams, to make use of diverse and targeted expertise; and contribute to student development. Collaborations occurred with the Commonwealth Environmental Water Office (CEWO's) Flow-MER Program (Monitoring, Evaluation and Research), The Living

Murray Program, Melbourne Water's river and wetland monitoring programs and DELWP's Wetland Monitoring and Assessment Program for environmental water (WetMAP). The range of State and Commonwealth agencies which shared knowledge, data and results included SARDI, NSW Department of Primary Industries, Murray-Darling Basin Authority, Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the Victorian Fisheries Authority. Over 10 staff in a range of consultancies also contributed to VEFMAP Stage 6 in multiple ways including scientific design, collection and analysis of data and report writing. This included Jacobs, Streamology, Austral Ecology, Fishology Consulting, Fish Ageing Services and independent consultants.

Informing water management

The strong collaborations between scientists and waterway managers have enhanced the adaptive approach to improve planning, delivery and evaluation of environmental water management over both the short and long term. Regular communication between the VEFMAP project team, CMAs, MW, VEWH and other relevant stakeholders allowed information and learnings to be fed directly into decision-making processes for environmental flow deliveries. The results from monitoring environmental water deliveries and natural flow events were able to inform and help guide seasonal, annual and longer-term planning.

In the short term, the regular interactions with waterway managers allowed timely advice to be provided to support existing plans for environmental water releases and recommend changes to plans for delivery of environmental water to enhance fish and vegetation benefits. These changes related to the timing and magnitude of flow events and enabled the delivery of desired hydrographs, to trigger fish spawning and movement and to support aquatic, fringing and riparian vegetation. Results were also delivered at annual CMA Environmental Advisory Group meetings. There have also been examples of opportunities for water savings, where advice has been given that particular flow events may not be required for either fish or vegetation benefits.

For longer-term planning, advice was provided on development of environmental objectives for long-term environmental flow studies, as well as the inclusion of more specific vegetation and fish objectives within Seasonal Watering Proposals. These constructive discussions and provision of advice have helped maximize the strategic use of available water to benefit native plants and fish, which was a key aim of the program.

The regular communication between VEFMAP staff and waterway managers also enabled them to provide broader ecological advice regarding: the environmental water requirements of fish and vegetation; the current condition of environmental assets; broad population trends the larger scale perspectives of management of metapopulations; and the influence of other related factors, such as grazing of riparian zones, and Inter Valley Transfers of water.

Evaluation and next steps: a need for continued improvement

VEFMAP underwent regular review and evaluation over the course of the program, including the communication and engagement efforts. In addition to the annual review of the program, and regular discussions and requests for feedback from waterway managers, a questionnaire was again sent to this core target audience in 2018. This sought to garner views on the scientific approach, communication and engagement, and management value. While some acknowledged it was relatively early in the program to provide extensive feedback, encouraging comments were received concerning all three elements. The preferred modes of communication and engagement were consistent to the previous 2015 questionnaire. The most valued approaches were presentations at Environmental Water Reserve Officer meetings, email updates, phone calls and meetings. The most valued outputs were summary technical reports, annual reports, journal articles, case studies, Facebook posts, local TV, and newsletters. There was also, however, a clear desire for the creation of regionally focused content for CMAs to be able to share with their local communities. Over the course of Stage 6, stronger linkages and relationships have developed between DELWP, ARI and CMA staff, including communication staff. This has facilitated enhanced preparation and sharing of regional highlights from the program to build community awareness and support for environmental watering and scientific findings.

The program's final report (Tonkin et al. 2020) flagged highlights relating to communication and engagement as well as project management. These included the strong "team" ethos which operated across the large project team from the outset of Stage 6, and the enhanced relationships and interactions between scientists and Victorian waterway managers which have clearly facilitated sharing of findings and directly influenced water management.

An independent evaluation of the program was also undertaken at the end of Stage 6 by Water's Edge Consulting. This has provided valuable suggestions for improvements to planning and implementation of communication and engagement within Stage 7. This includes a recommendation that the Communication and Engagement Plan could incorporate influence mapping and analysis of stakeholder groups to improve the reach and impact of VEFMAP Stage 7, directing resources and effort to maximum value and benefit. A more formal documented annual review of the Communication and Engagement Plan will also be established.

Examples of feedback from key stakeholders:

> *"VEFMAP is critical for demonstrating outcomes of Victoria's environmental watering program and helps us make more informed and responsive decisions about managing this precious resource for the future." CEO VEWH*
>
> *"The relationship between the West Gippsland CMA and the VEFMAP team shows how managers and scientists can work together to improve environmental outcomes." Stephanie Suter, Environmental Water Officer, West Gippsland CMA*
>
> *"The key researchers from ARI …have been able to provide innovative and complex science information and data in a very clear and easily understood manner. They regularly present this information to the CEWAG. All the partners in this project value the ability to interact with the scientists and to be involved…" Chairperson, Campaspe Environmental Water Advisory Group (CEWAG)*

Next step for VEFMAP Stage 7 include:

- Continue to share the findings and outputs associated with the end of Stage 6. The suite of reports and journal articles produced will be of benefit to waterway managers both in Victoria, other states and federally, as well as scientists. There is, however, a need to continue to work with CMAs to share information with their local communities.
- Increase the focus on sharing findings with particular interest groups, including anglers. For example, there are clear avenues to connect further with groups such as the Victorian Fish and Flows Alliance.
- Build stronger connections with a suite of other target audiences; these include Traditional Owners (including cultural flow officers), irrigation and agricultural industry contacts, and interest groups such as conservation groups.

A Case Study: Engaging with Anglers through Citizen Science

An angler citizen science project was included as one component of communication and engagement within VEFMAP Stage 6.

Background

While citizen science projects can be very diverse, they have a common goal of producing reliable data that can be used for scientific purposes (Kosmala et al. 2016). The growing interest by both the public and government in volunteer participation in scientific research and monitoring programs is partly led by technological advances in methods to collect data, and demonstration of its use for science and policy. Policymakers and scientists increasingly view citizen science as a cost-effective method for monitoring and research (Pocock et al. 2017). Projects can advance scientific understanding, fill knowledge gaps, supplement

existing government monitoring programs, build community understanding, literacy, and advocacy for natural resource management.

Bonney et al. (2021) flag the importance of trust between scientists, government agencies, and the public for effective fisheries management. Citizen science projects may help build this trust, particularly amongst those with differing perspectives. In Victoria, there is growing recognition of the need to improve connections between recreational fishers and government agencies involved in water management, fisheries and habitat protection and rehabilitation. In the last 20 years, stronger connections between DELWP, VFA, VEWH, CMAs and recreational fishers, have been forged, particularly in working together to restore habitats. Many fishers recognize that improved instream and riparian habitats, together with suitable flows, are closely tied to improved fish populations. The Fish Habitat and Flows Alliance, initiated in 2018, demonstrates this collaborative spirit well, and represents a key tool to help facilitate effective collaborations and connections.

A VEWH-commissioned report on Victorians' knowledge of, and attitudes towards, environmental water indicated found a limited community awareness and understanding of how water was managed, including for environmental benefits (ORIMA 2017). This can contribute to limited support for environmental flows as well as negative perceptions being formed. Communication and engagement that helps build the understanding of environmental flows and their benefits can help build trust in their management and potentially contribute to increase support and advocacy for environmental flows. Citizen science projects involving anglers represent a potential avenue to contribute to these efforts, with recent examples of Victorian anglers collecting fish ear bones (Lyon et al. 2014), fish frames and genetic samples and tagging fish (a VFA and Nature Glenelg Trust project on Mulloway).

Approach

VEFMAP Stage 6 used a range of methods to monitor fish in northern Victorian rivers, including the collection and analysis of ear bones. The analysis of ear bones can provide many insights into a fish's life including its age, growth rate, whether it bred naturally in the river or was stocked, and which rivers it has spent time in. Such information can provide insights into the links between flow events in rivers and fish movement, breeding and survival. While ear bones were collected for Golden Perch and Murray Cod during routine VEFMAP monitoring, it was uncertain whether the target number of 50 per species would be achieved. The opportunity to increase the sample size by working collaboratively with anglers who were catching these species to keep and eat was recognized as worthwhile to pursue.

This project aimed to:

- obtain supplementary ear bone samples for analysis
- provide a successful, meaningful and satisfying citizen science program for anglers; and increase angler and broader community awareness of the benefits of water for the environment, VEFMAP, and the information used to guide management of water for the environment.

It was a collaboration between DELWP, numerous angling clubs and other interested anglers, as well as the NCCMA, GBCMA, and VFA. Given this was a small pilot project, with only a relatively low number of ear bones required from anglers, a targeted approach was used. It was promoted online (ARI and VEWH websites), project flyers and a video were produced, and some social media undertaken.

In early 2018, 37 angling clubs across northern Victoria, as well as VRFish, Native Fish Australia and VFA fisheries officers and managers were contacted via letters and emails to gauge their interest in taking part. Follow up emails and letters were sent, and individual contact made with angling clubs. Meetings were held with both participating CMAs and discussions held with VFA managers and northern fisheries officers. The participating CMAs highlighted events where the project could be promoted. Presentations were given at a range of events including: seven angling club meetings and relevant regional DELWP and CMA events and seminars. A training day was also held near Elmore in late 2018, with presentations from ARI and NCCMA

staff. Ear bones were collected by participants until May 2019, to enable sufficient time for their analysis as a component of the broader VEFMAP research.

Ongoing engagement with participants occurred via regular email updates and some individual text messaging. A questionnaire was also sent to participants at the commencement of their involvement to assist in program evaluation. This questionnaire sought insights into their reasons for participating, awareness of environmental water and its management, their ecological knowledge of Murray Cod and Golden Perch and how they wished to be kept informed.

Figure 3. An angler scientist extracts a fish ear bone.

Results

Eighty-four Golden Perch and 25 Murray Cod ear bones were collected from 12 rivers, creeks and lakes in northern Victoria. Once the samples were analyzed, participants were provided with fish profiles for each of their fish which outlined the: fish's age; where it was born; where it was caught and by whom; whether it had moved; additional information about VEFMAP fish monitoring results, how water for the environment is managed in Victoria; and graphs of Golden Perch/or Murray Cod growth vs age (from a large dataset collected over the last 10 years across northern Victoria).

Outcomes

The ear bones collected by angler scientists provided valuable additional information to contribute to the assessment of the benefits of water for the environment. Highlights included a number of Golden Perch which had been born in the lower Darling/Murray junction were caught near Cobram East (> 1000 kms away) and near Piambie (> 400 kms away). These large-scale movements of Golden Perch, which have been observed in other monitoring studies, emphasize the need to manage and coordinate river flows for this species at large spatial scales. The evidence of natural recruitment of Murray Cod and strong growth of stocked Golden Perch are encouraging signs in support of the flow management within the Campaspe River.

While only 13 questionnaire responses were received from participants, the results provided valuable insights: most had a high awareness of the management and benefits of environmental water and expressed a high level of support for environmental water. Participants, in particular, wanted to participate because they loved fish, wished to learn more about their ecology and environmental water, enjoyed being by a river and wanted to participate in citizen science.

This project facilitated strong engagement and knowledge transfer between scientists and anglers. It has provided a foundation on which to build efforts to engage with anglers about environmental water as well as obtain supplementary samples for scientific analysis.

Examples of feedback from angler scientists:

> *"We really enjoyed being involved in this study and couldn't wait to find out how old our fish were and where they came from. The results led to some great discussions around the campfire!" Graeme, Angler Scientist*

> *"… it has been very rewarding for me to help you guys out. I see the potential benefit of your research." Gary, Angler Scientist*

Conclusions

VEFMAP Stage 6 incorporated communication and engagement as a core component of program. There was a primary focus on developing sound relationships with waterway managers to build confidence in the program, meet their needs and directly inform water management. The strong collaborations with waterway managers have led to a more adaptive approach to improve planning, delivery and evaluation of environmental water management. During Stage 6, a suite of activities and tools were used to share findings and demonstrate the benefits of environmental water. The improved understanding of the ecological links to flow gained through VEFMAP now provides further opportunities for DELWP and waterway managers to share the value of environmental water to broader audiences. Stage 7 will include enhanced efforts to engage with a broader range of target audiences. The angler citizen scientist element of VEFMAP Stage 6 proved valuable both in providing additional scientific samples as well as opportunities to engage with the recreational fishing community. It will continue during Stage 7.

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