

‘Reporting in pictures: visualising an easier way to understand outcomes of stream rehabilitation projects’

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Key Points

- Evaluating the effectiveness of stream rehabilitation programs is difficult. Lists of outputs are provided to funding bodies as well as disjointed pieces of information. Even data that is collected systematically is rarely analysed for statistical differences and often does not provide sufficient confidence or insight about project or program success. A feasible and appropriate approach to evaluating outcomes seems illusive.
- The Rapid Appraisal of Riparian Condition (RARC) is a method used for many years in the Rivers of Carbon program to monitor change. It is a method that captures data on a selection of variables and can be undertaken at low cost at all project sites by staff with different skill levels. The method and numbers it generates are useful indicators of change, but do not tell a comprehensive story about the fulfillment of project objectives relating to outcomes. On their own, methods such as RARC are insufficient as an evaluation tool.
- WaterNSW is investing in the Rivers of Carbon -Source Water Linkages program (RoCSW) to improve waterway conditions and water quality in Sydney’s drinking catchments. Outputs are recorded each year such as length of stream fenced, and the area revegetated. However, the program is in its 4th year and interest is increasing in the outcomes of the program: those outcomes related to stream conditions such as vegetation growth, groundcover, and soil stability. We are exploring the use of imagery to systematically capture the change in variables at project sites, a kind of storytelling, that done well is intended to provide on-going confidence in the program, and evaluative feedback.
- Two RoCSW case studies are explored to illustrate how we convey this to investors, stakeholders, and the broader community.

Abstract

The challenges of measuring, evaluating, and communicating outcomes in stream rehabilitation/protection projects remain significant. Stream and riparian projects often have clear but imprecise objectives such as ‘improve water quality’ or ‘increase biodiversity’: worthy objectives without a precise project design. Program outputs can be communicated readily and easily. However, capturing and evaluating the complexity of variables that may contribute to goal outcomes is problematic, even with the extensive science and research about the links between on-ground action and specific outcomes. In the absence of costly and time-consuming evaluation studies, there is a need for systematic performance measurement methods that communicate well, and provide sufficient evidence of program impact. We need methods that are intent of reducing uncertainty and increasing confidence. The Rivers of Carbon – Source Water Linkages program uses the Rapid Appraisal of Riparian Condition (RARC) on every project. The RARC uses visual assessment to capture the condition of riparian habitats using indicators that reflect various aspects of the environment. While the approach is useful for various applications, it is not proving effective for communicating changes across the many variables in a waterway and riparian area. WaterNSW are investing in the Rivers of Carbon – Source Water Linkages program to return to project sites and capture imagery (before and after), film such as drone footage, and landholder interviews, and putting this together in a form of storytelling on a web-based platform. These activities are being undertaken in conjunction with the collection of RARC data. Although the use of before and after imagery is not a new approach, it is rarely invested in as a systematic approach to evaluating project effectiveness. Two case studies are used to illustrate this in practice.

Keywords

Riparian, restoration, monitoring, evaluation, stories, project achievements

We Collect Data but it is not effectively telling the story of change

Monitoring and evaluation is an important component of any on-ground works program to be able to assess outcomes (positive and negative). The requirements of monitoring and evaluation tend to be dictated by investors, as they rightfully want to know what is being achieved with the funding they are investing. This is a reasonable expectation. It is the nature of the variety of organizational requirements that monitoring can vary from simple to extremely complex.

For example, many government agencies require pre-determined monitoring data to be collected and entered into purpose-built databases with associated mapping systems. These generally incorporate lists of outputs such as kilometres of stream, fencing installed, trees planted, weeds controlled, erosion structures and so on, as well as a plethora of data collected along transects in the field by people who may or may not have a good understanding of why they are collecting it. It is an unfortunate fact that many practitioners do not fully understand the methodologies they are feeding data back into. To make things more complicated, monitoring methodologies and data management systems are not consistent between agencies, particularly those in different states, or with those that operate at the national level. In addition, very few agencies talk to each other and many in the scientific field find it hard to share data due to the risk of it being misinterpreted or used for purposes other than what it was intended for.

On the other hand, some investors are happy with photos and an explanation on what a project is achieving, particularly if the contribution to Corporate social responsibility and / or promotional opportunities. There are many examples of these and everything in between. At the end of the day however, the key question that everyone wants to know is whether the investment is resulting in the outcomes that it was intended for?

Monitoring and evaluation of riparian rehabilitation projects is particularly hard due to the broad suite of interventions that can effectively be employed to achieve the outcome of riparian enhancement/restoration. As such there can be difficulty in evaluating the effectiveness of the project implementation, and the fitness of the intervention in achieving the end outcome. This is further complicated by the dynamic and varied nature of waterways. There are also a high number of variables and influences at the catchment scale that influence the outcomes of on-ground interventions. For example, one landholder may remove domestic stock and plant vegetation to reduce nutrient levels and algal blooms along their reach, while an upstream neighbour is busy applying super-phosphate near their riparian zone resulting in eutrophication. Therefore, it is the contextual analysis and interpretation of data that becomes important.

Monitoring and evaluation is also often confused with research, which is the dedicated and often expensive testing of scenarios to answer specific questions. Whilst monitoring programs can contribute to research, the context is different. Monitoring data should primarily be analysed against the backdrop of scientific research to show change – not as a replacement for carefully planned research initiatives. Also, for our monitoring activities to have meaning, we need to understand who it is for, how it is going to be used, what is the time frame (short, medium or long term), and how it is going to be interpreted and conveyed. For people to really connect with any initiative, the logic and science needs to combine with story and emotion. We need to keep coming back to why we are doing it.

So, what do we do about it?

It is important that we capture change over time in a variety of ways. This includes the collection of on-ground data, but it goes further than that. We need to interpret and communicate that data through other means such as time series photography, film, participant interviews and the collection of contextual information to effectively tell a more powerful and nuanced story to a broad range of audiences.

In 2006, the Australian River Restoration Centre, in partnership with Greening Australia implemented a comprehensive monitoring program for the project, Boorowa River Recovery. For the following eight years, data was collected from 20 project sites, paired with 20 control sites in the Upper Lachlan Catchment every two years. This data was collected to measure changes to vegetation (groundcover, level of weed invasion, native vegetation regeneration, success of revegetation, shade and so on), erosion, macroinvertebrates and non-living features (woody debris, leaf litter, trees with hollows and so on). There are multiple sub-indices for each. Researchers from Melbourne and Monash Universities' (Paul Reich and Rob Hale) who were managing the *Riparian Restoration Experiment* at the time, provided invaluable assistance in undertaking analysis of data.

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The results showed that (broadly) the trajectory of most projects were on a positive path for ecosystem function. Further research on long term projects in the Murrumbidgee by Higginson (2015) also supported these findings.

At the same time, we were also able to compare our existing methodology to the much simpler Rapid Appraisal of Riparian Condition (RARC) which is a riparian assessment tool developed by Dr Amy Jansen (2006) based on considerable research involving the measurement of selected indicators relating to ecosystem function and condition. It was also found to be a good tool to monitor change over time at multiple sites when resources are not available to continue to undertake intensive monitoring programs (which is most of the time). RARC is not as sensitive in picking up short-term change than the more detailed project monitoring protocols, but as long as the time-interval between assessments is more than two years at any given site, changes in indicators can be picked up and interpreted to demonstrate change. An additional benefit is that RARC is easy to carry out with minimal training and can be employed at every single site resulting in a high level of analytical rigor.

Although we were excited by all this, someone less interested or well versed in riparian rehabilitation monitoring programs would be forgiven for asking “so what” with a glazed look in their eye. The RARC methodology has given us a tool to monitor some of the most important indicators of riparian health, but we still need to contextualise these data, and be able to tell the story effectively with more than just numbers. Therefore, the aim of the monitoring program for the Rivers of Carbon Project is to recognize all these factors with the aim to develop a monitoring and interpretation methodology that is simple, effective, and easy to understand and disseminate widely.

Monitoring Rivers of Carbon

The Rivers of Carbon Project which is a large-scale program consisting of 8 sub-projects across southeast NSW with multiple stakeholders. Rivers of Carbon Source Water is one of these projects and is a partnership between the ARRC, Water NSW and Greening Australia. As with other Rivers of Carbon projects, we use the Rapid Appraisal of Riparian Condition (RARC) for monitoring, which is effective in demonstrating change over time (scientifically), but it does not always tell the full story that funding bodies want to hear. Water NSW recognized the benefit in effectively interpreting and conveying information about outcomes, and recently invested additional funding to return to Rivers of Carbon Source Water sites to collect information in the form of photography, films, and to undertake landholder interviews using consistent questions. This is in conjunction with the collection of data through RARC, which will be presented alongside the story resulting in a ‘time series’ for each site. Although this seems an obvious approach, returning to project sites is rarely invested in, and only a handful tend to be revisited which results in a snapshot rather than a comprehensive monitoring and evaluation system.

Measuring water quality associated with project activities is also very difficult to undertake at the catchment scale due to the large number of variables influencing this. The use of monitoring vegetation and ecosystem function (based on associated research linking ecosystem processes to improved water quality) can also help to link the project activities to the aim of improving water quality, even if it is not a direct measurement.

Two case studies illustrate this in practice to show the effectiveness of science, combined with visual representation, combined with story. These are ‘Lockyersleigh’ and ‘Tirrannaville’, both located proximate to Goulburn, NSW in the Sydney Water Catchment. The intention is that all sites will be monitored and reported on using this technique to create time-line series associated with on-ground works, landholder stories through film and RARC scores. The outcomes of this will be shared widely and publicly available via the ARRC and Water NSW websites.

Case Studies

‘Lockyersleigh’ - Matt Onions

Matt is a passionate and dedicated farmer whose primary focus is sheep production. He has also been committed to improving his 3500ha grazing property over the past 20 years with a particular emphasis on riparian restoration and larger revegetation projects. The purpose of this is to have good water quality, shelter for stock and wildlife and better production outcomes in combination.

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Although his first official RoC Source Water site was undertaken in 2020, he had already fenced and revegetated major sections of the Wollondilly River and tributaries through previous RoC and other projects resulting in some excellent examples of riparian restoration. This is critical for all of us, as Lockyersleigh is in the headwaters of one of the main feeder rivers to Warragamba Dam and is one of the largest landholdings in the drinking water catchment! The aim for Matt, is to complete the exclusion of livestock from all the main channels and tributaries to the Wollondilly River.

The main outcomes will be an improvement in riparian condition as identified through RARC in association with visual changes through photo monitoring. The RARC scored showed an improvement from 6.5/50 to 22.5/50 due to improved groundcover and revegetation growth activities.

Figure 1. ‘Lockyersleigh’ Rivers of Carbon Project, November 2019 RARC 6.5/50



Figure 2. ‘Lockyersleigh’ Rivers of Carbon Project, April 2021 RARC 22.5/50



As shown in figures 1 and 2, a dramatic change to the landscape has occurred in only 18 months – particularly

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with regards to groundcover, tree growth, soil stability, aquatic plant growth and the removal of rubbish. This translates into better water filtration and the creation of habitat for wildlife (based on a large volume of research). Similarly (as mentioned above) the RARC score dramatically improved as a result of on-ground activities.

Angus Gibson – ‘Tirannaville’

Angus and his family have a 2027ha cattle farming and cropping property along the Mulwaree River not far from Goulburn. The Mulwaree River in this area is a chain of ponds which are exceedingly rare at this scale and valuable as wildlife habitat and water for stock as they don’t dry out. It is a haven for many birds including Coots, Spoonbills, Herons, Egrets Cormorants and Freckled Ducks.

Angus and his son AJ are motivated to continue the work that they have been slowly progressing over the last 25 years to care for the chain-of-ponds which has included protecting the waterways from the negative impacts of stock and the control of over 100ha of Hawthorn. Angus began working with Rivers of Carbon in 2018 which enabled him and his family to extend on the work they had already done and plant riparian vegetation.

The RARC score for this site was 15.27/50 for this site in 2018 prior to works beginning and 25.75/50 in 2021. This score is reflective of the increase in groundcover, vegetation and in particular the natural recruitment of aquatic plants.

Figures 3 and 4 provide a visual representation of these changes. One of the most significant changes is the return of many aquatic plants which reflects its original state which was a chain of ponds through a swampy meadow. This is significant as most of these systems in the district have been destroyed by deliberate draining to increase agricultural land, the sowing of pasture and destruction by cattle grazing.

This site is also the subject of research undertaken by Macquarie University which looked at geomorphic condition, and protection and rehabilitation priorities for the Mulwaree chain-of-ponds (Fryirs 2019) which provides important prioritization and background information to enable sound decision making with regards to on-ground works and where to invest. Research such as this underpins and provides reference to the outcomes of on-ground works.

Figure 3. ‘Tirannaville’ Rivers of Carbon Project, February 2018, RARC 15.27/50



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Figure 4. ‘Tirrannaville’ Rivers of Carbon Project, April 2020, RARC



Conclusions

Monitoring, evaluation and reporting of riparian projects does not need to be difficult or overwhelming, even when there are significant constraints on time, money and understanding (which there usually are). The focus is on providing stakeholders and the public with the confidence that investment or activities are resulting in a positive change in a format that enables them to see this for themselves. This longitudinal photographic and science-based approach is not used routinely in the evaluation and reporting of riparian projects (as there is a tendency to provide one-off case studies), but it has the potential to become a key component for a relatively small investment and is the approach that Rivers of Carbon Source Water will be pursuing into the future. RARC, in conjunction with visual storytelling and complementary specific and robust research is a cost-effective and easily implemented approach to monitoring and evaluation, which provides a way of demonstrating and interpreting project outcomes.

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