Rivers of Carbon, river science in action: connecting farmers and community to practical river restoration solutions

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Key Points

- Rivers of Carbon uses the five Ps to produce riparian restoration outcomes by putting people and relationships first - Profit, People, Place, Proof and Promise.
- Two case studies illustrate the application of the 5 Ps from the project managers' perspective on the ground.

Abstract

Rivers and their tributaries are the lifeblood of communities acting as an important source of income for farmers, water supply for rural towns, and essential habitat for native plants and animals. The Southern Tablelands of New South Wales (NSW) and Australian Capital Territory (ACT) support a range of human enterprises including urban development and agriculture, both have impacts on broader catchment health. The area is home to numerous endangered communities and threatened species, in ecologically diverse landscapes including riparian areas which are critical to their survival. The Rivers of Carbon Program (RoC) provides incentives and personal support to landholders to help them manage their riparian lands in a sustainable way within their farming enterprise. RoC staff work on the basis of the five P's - Profit (multiple benefits), People (listen and get to know the people, meet them where they are at), Place (the site and why it is important), Proof (science that was applied) and the Promise (support for the journey). Two case studies will illustrate the unique approach RoC applies when working with landholders. The key features of the RoC program are the connection with people first and foremost, the application of practical knowledge, access to incentives, collaboration with other organisations, and long-term relationships developed over many years.

Keywords

River restoration, Rivers of Carbon, healing rivers, community, building relationships

Introduction

Australia is the 'Country of drought and flooding rains' and there has never been a time in history where this has been more apparent. The 2017-20 drought and associated fires in the ACT and South-Eastern NSW had a significant effect on the people, landscapes and creatures that call the area home. These drought years were among the hottest and driest on record, with the ACT recording its hottest temperature ever of 44 degrees on 4 January 2020. When the drought broke, flooding in February 2020 heavily impacted rivers, tributaries and wetlands across the region. Many riparian landscapes were failing, as the impacts of erosion, stock, high turbidity and ash increased the flow of water courses. This resulted in natural rock pools filling with sediment, smothering aquatic vegetation and fish habitat, adding nutrients and phosphates to the water, and lowering oxygen levels (Commonwealth of Australia 2024 and NSW Government 2024).

The response from the Australian River Restoration Centre (ARRC) was to implement the Rivers of Carbon (RoC) projects in affected areas which targeted the needs of the communities, both ecological and human, who depend on the rivers. The RoC Team also expanded to welcome two new Project Officers, Alex James and Jed Pearson, who were employed to implement these projects. This paper shares their experience of using the RoC approach to deliver RoC Gudgenby and RoC Boorowa to address a critical need in these areas.

The RoC Approach:

The theory behind RoC is to address the impacts of riverine degradation by implementing the Five P's framework developed by one of the Program's founders, Dr Siwan Lovett. The theory of Five P's looks something like this.

Profit – River restoration brings multiple benefits to people, animals, community and the environment. Improved productivity gains include reduced wind speed and wind chill, impacting livestock and crop productivity through increased wool production and liveweight gains. Farmers also 'profit' from improved aesthetic, access to cleaner water for leisure activities, and increased biodiversity which brings pleasure and wellbeing.

Humans operate on multiple levels, where profit means more than just the bottom line or a commercial transaction. Motivation for such work comes from a desire to profit at a personal, family and community level where benefits such as connection, emotional wellbeing and increased resilience can accrue from land restoration projects.

Proof – RoC acts as a knowledge broker for the landholder by staying up to date on the latest scientific methods of river restoration and sharing our expertise. By offering an evidence-based, multidisciplinary approach to riparian restoration, RoC provides advice based on scientific studies about how fencing, removing livestock, managing weeds and revegetating farms improve biodiversity and water quality outcomes for the farm and broader catchment (Stutter et al 2019). Specialist erosion experts provide consultation and engineering design for instream structures to moderate water flow where needed. The environmental outcomes for each site are monitored using the Rapid Appraisal of Riparian Condition (RARC) model (Jansen et al 2005) to track changes in riparian condition over time. By assessing changes in riparian condition, RoC can effectively measure how the funded on-farm projects restore ecological function. RoC builds on the successful model developed for the Boorowa River Recovery project (Gould 2013) that examined river restoration in the Boorowa River Catchment.

People – RoC values the knowledge that landholders and community partners such as Landcare and government bodies (ACT Natural Resource Management, Water NSW and South East Local Land Services) bring to the table and collaborate with them to develop projects that have catchment level impacts and community engagement opportunities. Community engagement and peer support include field days about river restoration and community planting days as well as online resources on the RoC website.

By building mutual respect RoC helps landholders design a riparian management plan for their property that aligns with their goals and builds on their invaluable knowledge. These conversations enable RoC staff to be the knowledge broker for the landholder, by providing up to date holistic and multi-disciplinary riparian management methods, information and resources. Together, a tailored riparian restoration approach is developed and, where possible, financial incentives are provided that suit the farm. Regular communication with landholders, both during the project and after, ensures that they feel supported if a part of the project does not go to plan, or if the plan fails to achieve the desired outcome. By not dismissing valuable landholder knowledge, but *contributing* to it, goes a long way to building trust and partnerships.

Place – Every landholder, property, river and issue are unique. RoC uses an integrated approach tailored to suit the landholder's specific management challenges and how the project impacts broader regional goals like landscape connectivity, water quality and preservation of biodiversity. Treating each property as an individual piece of a larger, regional puzzle ensures long lasting buy in from the landholder and community.

Promise – Underscoring each of these principles is keeping our promise to build lasting relationships with each of our landholders, project partners and government sponsors such as the ACT government, NSW Environmental Trust and Water NSW.

Within the Five P's there are simple steps used to guide decision making. These include, to protect first and restore second, get the 'best bang for the buck' by prioritizing sites that deliver multiple benefits to the environment, link remnant vegetation, remove stock, stabilize riparian areas, revegetate, manage weeds, allow the river to move and give nature time to heal. Having trust in the process and seeking inspiration from others rounds out the holistic methodology (Lovett 2011).

The following case studies demonstrate how the RoC approach is practically applied in the Upper Murrumbidgee (ACT) and Lachlan Catchments (NSW) in the Canberra Capital region.

A post card from RoC Gudgenby

The Gudgenby River begins near the border of the ACT and NSW in the Namadgi National Park. It travels north and northeast about thirty kilometers through grazing and agricultural land to join the Murrumbidgee River near the Tharwa township. Along its course, the Gudgenby has nine tributaries, including the Naas and Orroral Rivers.

Being close to Canberra, the river attracts recreational fishers, bird watchers and others wanting to enjoy the natural gifts of the region. It is home to the mighty Murray cod, the tiny Scarlet and Flame Robins, and the iconic Platypus.

RoC Gudgenby started in 2022 on the back of the successful RoC Naas project in a neighbouring catchment. Funded as part of the ACT Government's Natural Resource Management's Healthy Waterways program, the project was designed to reduce increasing sedimentation of the Murrumbidgee River downstream, an important contributor to Canberra's water supply. The project was a partnership with ACT NRM (ACT Government), RoC and local landholders of the Gudgenby valley. The aim was to decrease sedimentation by excluding stock, revegetating riparian areas and re-armoring erosion hotspots.

Historically, the Gudgenby region has faced significant pressure from agricultural practices such as land clearing and uncontrolled grazing of livestock, causing erosion and sedimentation downstream. In 2019/2020, a devastating bushfire burned through the region and nearby Namadgi National Park, destroying almost 90,000 hectares of park and rural land. With no groundcover and shrubs to buffer erosion, a subsequent storm washed tons of ash and sediment into the river system, further exacerbating erosion and sediment build-up downstream. Many areas of the river experienced extreme erosion, which had in several cases extended outside of the river's defined banks and undercut fencing installed to exclude livestock by landholders in years past. Other areas were intact, with high biodiversity values and healthy riparian vegetation, but risked future degradation due to grazing.

Past riparian management projects attempted to address environmental issues, including large-scale willow removal. However, no follow up revegetation or stock management led to destabilization of banks and significant mobilisation of unconsolidated sediment from which the river never recovered. This had negative environmental outcomes along the Gudgenby River and downstream in the Murrumbidgee River. As a result, landholders were reluctant to seek support from government or environmental groups as trust was broken and had never been repaired.

The project was implemented using the Five P's framework across a series of consultation processes. RoC staff conducted site visits and consulted landholders to create a tailored plan in partnership with hydrological engineers and the ACT Environmental Protection Authority. Landholders were offered a suite of mitigation techniques, such as off-point watering, stock exclusionary fencing, riparian revegetation and, in more extreme cases of erosion, earthworks and embankment armoring. Landholders were encouraged to contribute to the design of the project, selecting mitigation techniques that fit in with their current land management regimes and capabilities, allowing them to take advantage of new infrastructure to contribute to increased productivity.

Landholders contributed labour and received incentives to pay for materials, such as fencing, pumps, troughs, piping and tubestock. Erosion control works were organised and paid for by the RoC project in consultation with landholders who were also responsible for ongoing maintenance and weed management. Three volunteer planting days were organised with local environmental and educational community groups (eWater and Canberra Institute of Technology) on two properties to supply labour to help landholders plant tubestock. These field days were a great success and provided educational opportunities for people not often able to work on the land.

Just over two kilometers of fencing was installed to exclude stock from the riverbank, protecting four and a half hectares of riparian land. Over 1600 trees and shrubs were planted across two sites to help stabilize banks, and erosion control earthworks undertaken at six erosion hotspots along the Gudgenby River and its tributaries. Their efforts will help ensure higher bank stability along the Gudgenby River, with less erosion, more habitat, better connectivity for wildlife and improved management of stock.

Although there is much more to be done on the Gudgenby River, the partnerships developed between landholders and RoC staff are solid and long-lasting, with many landholders keen to do more. Landholders hold a unique perspective on issues affecting their land and report that they have benefited from the RoC partnership through increased connections and knowledge about riparian restoration.

Trust is an important factor when it comes to working with landholders. The RoC team faced a difficult situation and were advised that the landholders in the valley would not be keen to do any riparian restoration works. As it turned out, landholders were not only willing to talk about the river but were also willing to act notwithstanding concerns about repeating past mistakes. Collectively, the seven landholders that contributed to the project manage over 8km of the Gudgenby River and its tributaries through the incentives and support provided by the RoC Gudgenby project.

By applying the Five P's framework, landholders were increasingly engaged and offered valuable insight throughout the project's life. Landholders proved to be an invaluable resource when making decisions on key project elements such as site selection, remediation methods and priority actions – adding merit to the overall project success This has had a double positive effect, not only ensuring buy-in from the landholders, but also helping to ensure long-lasting dedication to the project after on-ground works have been completed.

One of the landholders had this to say about his involvement in the project:

> *To see the impact of the fires on the river was devastating. To see the land, not just ours but a whole ecological system degrading on that scale is upsetting to say the least. Tree planting, bank stabilisation earthworks and erosion mitigation are all usually beyond the scope of an individual landholder. Programs like Rivers of Carbon help connect farmers to the broader community to achieve outcomes usually unobtainable to small enterprises. - Landholder Steve Angus, Honeysuckle Creek.*

Photo 1 – Planting done on Honeysuckle Creek, a tributary of the Gudgenby River Southern ACT

A deep dive into RoC Boorowa

The Boorowa River is in the Hilltops Region of the Upper Lachlan catchment in the Murray Darling Basin, located an hour north-west of Canberra. RoC Boorowa is a partnership with farmers, the Boorowa Community Landcare Group, South East Local Land Services and the Hilltops Shire Council. The goal is to protect 40 hectares of land and six kilometers of waterways, working with at least seven landholders. The project started in 2023 and will run over three years, addressing declining water quality and biodiversity loss. Over the life of the project, partners will deliver two field days to help farmers plant trees, improve capacity in riparian restoration and promote Landcare activities more broadly in the region.

Woody weed infestation due to the removal of livestock is well documented in research and of concern when developing riparian projects (Jones et al 2022), this has been noticed in monitoring past Boorowa projects. To address this problem, RoC allocates funding for woody weed management and provides technical advice and support for landholders to find specialist contractors for weed removal. Resource manuals for blackberry, willows and box elder are provided on the Rivers of Carbon website.

The results for the first year of the project are promising with seven land holders already working to design riparian management plans. Through careful design and expert consultation erosion remediation plans are site specific and not often needed. The fencing infrastructure usually aids other management goals such as dividing paddocks for rotational or regenerative grazing, further protecting riparian real estate from erosion through better ground cover management. The project for each farm is documented with maps, a site agreement and revegetation plan, with landholders contributing their labour and knowledge for site preparation and weed control for planting.

Photo 2 – An example of erosion on Nunick Nunick Creek, which flows into the Boorowa River.

The effects of the restoration work for each property are monitored using the RARC methodology (Jensen et al 2007) that quantifies the physical, community and landscape benefits of the project from start to finish. The RARC includes taking measurements of habitat, cover, natives, debris and features on four transects to assess the riparian condition of a gully, stream or river. Monitoring photos are taken to track changes in vegetation and riparian condition over the life of the project and beyond.

> *As farming becomes more intensive it is critical to also maintain the quality of the natural environment within which we work. Nature provides the essential ingredients for balancing farming practices with the water, soil and habitat that sustain our fragile ecosystem. Organisations such as Rivers of Carbon contribute important capacity and knowledge to achieve this balance. - Chris Grubb, owner of Billabong farm on the Boorowa River*

RoC Boorowa builds on similar projects implemented in the region including Boorowa River Recovery Project (Gould 2013) and past successes and consultation in the region provided us with confidence to apply for funding. As a result of past RoC and Greening Australia projects, the community have a high-level of trust and awareness and are willing to get involved. It is rewarding to go back and build further on restoration sites that have met their initial outcomes. Following restoration efforts over many years including fencing, alternative stock water, weed control and planting, parts of the Boorowa River have transformed into a healthy, self-sustaining, riparian system, providing a clean source of water for sustainable farming, wildlife and humans to enjoy. Importantly, it also reduces water quality treatment costs as this river is a vital part of Boorowa's town water supply (Gould 2013).

Photos 4 and 5 – Photos of the Boorowa River showing the results of restoration 15 years ago (photo 4 supplied Lori Gould).

Discussion

The science that informs the RoC approach includes exclusion of livestock through fencing, protecting remnant vegetation, restoring ground cover and improving structural diversity to buffer agricultural land uses. These actions result in improved ecosystem function and resilience to climate change. Riparian areas offer unique biodiversity opportunities in cleared landscapes by delivering complexity in vegetation layers, essential microclimates for wildlife and stock, wildlife corridors, better water quality and carbon sequestration in vegetation and soils (Staton and Osullivan 2019 and Stutter et al 2019).

The benefits of stock removal from riparian areas have been quantified in research in Australia and overseas (Jones et al 2022 and Stutter et al 2019) and within the Murrumbidgee catchment (Gould 2013 and Jensen and Robertson 2001). By protecting first through fencing and removing livestock, the land is given time for natural processes to heal erosion and bare ground. Natural ground cover repair after the removal of livestock is augmented with strategic revegetation plans to reinstate missing vegetation layers. The plan includes information on species selection for groundcover, shrubs and trees based on local knowledge and Landcare expertise.

By installing off stream water points, through the provision of tanks, pipes and troughs, multiple water quality benefits are accrued. To the farmer through improved water quality for livestock and for other community users and the environment.

In conjunction with the science underpinning the on-ground works and environmental outcomes (the proof) the 5 P's also provides a framework that articulates and brings together the social, economic and intrinsic values. It is demonstrated through both the project examples that RoC has collaborated with landholders to provide proof of underpinning science, demonstrate value or 'profit' in terms of better management of land and waterways, respect their sense of place, promise to be there over the longer term and to genuinely value the people.

Place is fundamental to the RoC identity, so it is important to recognize and acknowledge connection to Country. Working quietly, one fence, one gully, one creek at a time, RoC transforms landscapes and changes people. It connects strangers to each other and helps farmers heal the scars left by a century of degrading practices. Where fences once used to exclude, community members are now welcomed, to plant a tree or walk a creek they have never heard of, or to connect with a farmer who wants to repair and protect the landscape they love. Sometimes machines are used to move rocks skillfully and coax hard edges into softer, rounder forms that will form a crevasse here, and a microclimate there, enabling a plant to grow. Most often, it is a fence skillfully planned to exclude livestock from a swampy meadow or eroding gully that, when protected, knows just what to do when given a chance to heal. The RoC approach is one where ideas emerge from conversations to develop solutions and a vision for a different future.

That all sounds quite simple, but in a natural resources management environment that is characterised by a lack of time, funding, and capacity, being asked to prioritise a relationship over a result is quite different to other organisational approaches. By using the Five P framework, RoC can collaborate with landholders to complete river restoration projects that acknowledge and achieve multiple benefits – environmental, agricultural, and social. Rivers and people are interdependent and not separate entities, and by taking this approach RoC can benefit from landholder-led conversations, to promote deep understanding and mutual respect by putting people first so that RoC can work to restore the rivers upon which sustain life for all.

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