

Restoring stream aquatic fauna: facilitating natural processes

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Bushcare groups and restoration teams can maintain and facilitate restoration of aquatic fauna populations and ecological functioning within stream and riparian ecosystems by implementing relatively simple measures. These measures also boost species resilience to impacts resulting from hotter and more frequent bushfires and changing weather patterns

Aquatic indigenous fauna species such as water insects (generally known as macroinvertebrates or bugs), crayfish, frogs and tadpoles are an essential component of the indigenous species composition of riparian zones and their ecological functioning. When dealing with the restoration of aquatic fauna species, complying with restoration guidelines may present special challenges.

The Australian National Standards for Ecological Restoration indicate that securing substantial to high diversity of characteristic reference ecosystem species within a restoration site is desirable; measuring species composition is vital to assessing restoration progress and obtaining maximal ecological outcomes. Restoration intervention should be undertaken at appropriate levels. The capacity of the species for natural resilience and regeneration are essential considerations when contemplating intervention.¹

With severe degradation of riparian areas such as a stream and its associated aquatic life and their habitat, how can the restoration of indigenous aquatic fauna species be carried out in accordance with these guidelines?

This article confirms, within the context of an observed stream restoration process, that the presence of stream bank indigenous flora species, as well as connectivity to ecologically healthy riparian zones, are important factors that influence indigenous aquatic fauna re-colonisation, and that these factors can be appropriately enhanced and managed by bushcarers and restorationists.

In 2010 the upper reaches of Lawson Creek at Lawson in the Blue Mountains of NSW, west of Sydney, were overwhelmed by massive amounts of sand and sediment deposition resulting from a combination of heavy rains, a collapsed walking track and poor sediment

controls on a building site. A long section of healthy bushland creek was reduced to a shallow trickle of water (Image 1). More than a decade of previous systematic volunteer StreamWatch² and professional aquatic surveys had recorded a wide range of aquatic fauna species in the stream, but they and their natural habitat, such as logs, leaf litter, pools, riffles and aquatic vegetation, were gone.

Fortunately, as it turned out, cost and site restrictions precluded or limited extensive restoration interventions; some coir logging was installed to help spread the sand. In reality, natural recovery of the stream, and its associated aquatic fauna habitat, commenced immediately after the occurrence of the sediment event.

As part of the 1990s NSW government funded Blue Mountains Urban Runoff Control Program, much professional bush regeneration, and subsequent volunteer bushcare work, had been carried out within the stream's riparian zone. Thus in 2010 the natural bushland of the zone was in very healthy condition, with extensive tree canopy cover, shrub layers and groundcovers (Image 1). This proved to be highly relevant to the recovery of the stream and its indigenous aquatic fauna.

Following the sediment event, natural debris from the trees and shrubs, such as large branches, bark, sticks and leaf litter, continued to be deposited in the silted stream. This material further dispersed the sand and created small riffles (splash zones) and also the deeper pools essential to aquatic habitat, as well as steadily replacing the food resources that had been smothered in the sand. The fact that natural vegetation and the debris deposition process were in place and occurring from the time of the sediment event may have facilitated and speeded up the aquatic fauna recovery process: recent research indicates that it is well decayed material, rather than fresh woody material, that

² now administered by Greater Sydney Landcare Network



Image 1: Silted Lawson Creek 2010

Photo: P Ardill

¹ Standards Reference Group (SERA) 'National Standards for the Practice of Ecological Restoration in Australia' Second Edition 2017 Society for Ecological Restoration Australasia, 6,15 www.seraustralasia.com



Image 2: Natural debris in previously silted section Lawson Creek 2018
Photo: P Ardill

provides the best habitat for aquatic bugs.³ There was weed growth of creeping buttercup on the sediments but this was not treated with the group dealing with blackberry and woody weeds in the bushland.

Nevertheless, the stream remained heavily silted for a number of years, and it was only in 2015 that the volunteer StreamWatch Group recommenced water quality testing (not bug testing, as there was still no bug habitat) along the damaged section of stream, with good results: the water had appropriately low levels of salt and phosphates, was well oxygenated, chemically balanced and clear. Due to the increasing layers of decomposing natural debris, the deposited sand and sediments were continuously being spread over an increasing area of the riparian zone and gradually became vegetated. By 2018 the creek was starting to resemble its former healthy condition, displaying a few deep pools and small rapids, some good natural habitat of decayed logs, other fallen timber, and a layer of leaf litter along the banks and channel (Image 2).

In May, 2019, the StreamWatch volunteers tested for bug life in the water, and the results were pleasing. Mayfly nymphs, which are very sensitive to pollution, damselfly nymphs, dragonfly nymphs, boatmen and water treaders, plus crayfish and tadpoles, were all recorded. It appeared that the deposition of a variety of natural debris had created the range of suitable habitats, such as pools, riffles and food resources, that encouraged the recolonisation of diverse aquatic fauna species, but where did all of this life come from?

Amy St Lawrence, Blue Mountains Council's Aquatic Systems Officer, offered explanations: 'Bug re-colonisation relies on having intact bug populations/communities nearby...different types of water-bugs will recolonise in different ways, providing their water quality and habitat requirements recover...insects probably hatched at the site from eggs laid by adults that decided your pools were suitable; adults that possibly came from further downstream on Lawson Creek. Your large crayfish

³ Czarnecka, M. & Miler, O. 2018. 'Decay processes in woody debris influence the taxonomic and functional composition of littoral macroinvertebrates'. Canadian Journal of Fisheries & Aquatic Sciences 75, 1596–1605. <https://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2017-0364#.XfclpW5uLIU> in Freshwater Research News 2019, Kev Warburton, Charles Sturt University KWarburton@csu.edu.au

may have been there all along despite the sedimentation, or may have moved overland from a pool downstream or a nearby creek.'

Often it is erosion concerns that motivate riparian zone and stream bank restoration, but the Lawson Creek experience suggests that the indigenous flora within the riparian zone of a restoration site should be well managed for other good reasons as well: enhanced habitat boosts aquatic fauna natural regeneration rates, degraded riparian zones and water assets under restoration will re-establish mutual ecological connections more rapidly. This will result in increased potential for the further establishment of ecological connectivity with healthy riparian resources. Enhanced riparian zone vegetation condition will promote the stronger natural regeneration that may assist with natural buffering of the results of impacts such as sediments, ash and chemically enriched runoff resulting from intense bushfires⁴. Healthy habitat provides aquatic fauna

species with better conditions in which to cope with changing weather patterns. Healthy riparian vegetation means re-colonising terrestrial fauna will be less prone to exposure and predation when accessing water resources.

Summary

- Successful restoration of the indigenous aquatic fauna at Lawson Creek had been brought about by the same factors that influence re-colonisation by terrestrial fauna: the availability of appropriate habitat plus connectivity with intact natural areas. Good water quality proved to be only one part of the restoration equation.
- Managed riparian zone vegetation quality should be continually checked for degradation and loss of species diversity, particularly in urban areas.
- Riparian zones and stream banks under restoration should be intensively planted with a variety of indigenous flora species if natural regeneration is limited.
- Naturally deposited, decayed debris is best for actual in-stream restoration.
- Decayed ground debris as well as freshly cut material should be utilised for in-stream restoration if overhead debris is not present.
- Don't clean up your stream; messy is best!

⁴ Paul McNerney, Gavin Rees, Klaus Joehnk, 'The sweet relief of rain after bushfires threatens disaster for our rivers' The Conversation January 2020 <https://theconversation.com/the-sweet-relief-of-rain-after-bushfires-threatens-disaster-for-our-rivers-129449>

AABR Movie Socials to lift the spirits

The Gondwanalink project has produced an inspiring, uplifting 48 minute documentary 'Breathing life into Boodja-social and ecological restoration in an ancient land'. AABR has been given permission to screen the movie prior to its public release mid-year.

Would you like to connect with other AABR members in your area, and gather some like-minded folk in the one spot for a movie and be social? We are seeking Expressions Of Interest to host community screenings of 'Breathing life into Boodja'. AABR can assist with the promotion. Contact Suzanne at education@aabr.org.au