Protective watercourse fencing: Insights from the Cudlee Creek bushfire

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Key Points

- Narrower fenced riparian buffers may provide greater ecological outcomes than expected due to being more acceptable to graziers, which results in more watercourse being protected. Landholder acceptance comes from minimizing grazing paddock losses and lower perceived fire risks. There is also less incentive to allow livestock grazing of smaller fenced buffers and these narrower buffers may also be less attractive and accessible for kangaroo grazing.
- Exotic pasture grass dominated fenced buffers, without remnant or planted native vegetation, still provide ecological and bank stabilization benefits.
- Steel fencing provides riparian protection in the event of future bushfire.
- Guarding seedlings from kangaroo grazing is nearly always essential.
- Ongoing public investment is needed to protect riparian areas and permanent water pools.
- Watercourse restoration investment in South Australia is at risk without legal covenant protection.

Abstract

Landscapes Hills and Fleurieu was awarded grant funding to help restore and protect watercourses affected by the 2019 Cudlee Creek bushfire. The fire scar area is mainly privately owned with medium sized grazing properties and the majority of the watercourses were unfenced prior to the bushfire. Watercourses with the highest number of permanent water pools were prioritised for protection because of their habitat value. Willow control, steel fencing and revegetation designed to minimize future fire intensity were undertaken to protect and improve the condition of the watercourses and permanent water pools. Nearly 20 kilometers of fencing was constructed, over 5 kilometers of willows were controlled and over 20,000 native tube-stock seedlings were planted. There were many insights from the project, including learnings about the benefits of narrow fencing buffers, prioritisation of seedling protection from kangaroos, the benefit of steel fencing, timing of in-channel plantings after the heavy flow season and the acceptance of exotic pasture grass dominated buffers. Additionally, direct landholder contributions (financial or in kind) to the project were not significant due to the relatively high cost of riparian restoration. Unlike in other states, riparian zones are entirely the responsibility of the landholder. Generally, landholders did not proactively engage themselves in assisting with the success of their revegetation plantings by voluntarily undertaking weed control, herbivore management, watering or tree guarding. We conclude that if declines in local watercourse condition are going to be slowed or reversed, ongoing Government investment will be required, along with covenant-style protection of that investment, requiring landholders to agree to actively contribute to restoration success.

Keywords

Bushfire, riparian, watercourse, fencing, revegetation, willow control, permanent water pools

Introduction

The Cudlee Creek bushfire burned over 23,000 hectares across the Adelaide Hills region during the 2019-2020 Black Summer event. The South Australian and Commonwealth Government enabled funding through the Local Economic Recovery and Catchment Recovery grants to support communities in their recovery efforts. A portion of these funds were directed to watercourse protection efforts managed by Landscapes Hills and Fleurieu.

The area affected by the Cudlee Creek bushfire includes parts of the Torrens River, Onkaparinga River and Bremer River Catchments, with over 1000 kilometres of individual watercourses burnt mainly on private grazing properties averaging 32 hectares in size. Bushfire events heighten the risk of erosion, sedimentation and habitat loss along watercourses. The watercourses in this part of the Adelaide Hills provide important habitat for native flora and fauna communities, as well as being an important source of water for Adelaide and agriculture uses. Long-term monitoring has highlighted declining trends in annual streamflow and rainfall across parts of the Mount Lofty Ranges, whilst ecological monitoring shows many native fish populations to be in decline. Investment to protect priority watercourses from the acute impacts that followed this bushfire event, and improve resilience for future bushfire events, was environmentally urgent.

In the semi-rural grazing landscape of the Adelaide Hills, the majority of landholders often do not derive their main income from the land. Many are supportive of watercourse protection but very few have the time, money and knowledge to prioritise this expensive work. In addition, many landholders did not have sufficient fencing insurance, so even if the watercourse was fenced prior to the bushfire, re-fencing it was financially prohibitive and a much lower priority than reinstating boundary and internal fencing to contain livestock. Consequently, post-fire livestock access to watercourses compromised the regeneration of vegetation and contributed to soil compaction, erosion, sedimentation of water pools and water fouling with faeces and urine.

Prioritising Permanent Water Pools

Early in the project it was recognised that a method of prioritisation would be needed to maximise the outcomes possible with the available funding. Consequently, watercourses with the highest number of permanent water pools were targeted, due to the important role they play in providing critical summer refuge to threatened and declining native fish species. Pre-existing GIS mapping of permanent water pool locations was used to identify priority sites, supplemented with site visits and local knowledge.

This paper describes the insights learned during the Cudlee Creek bushfire watercourse protection project. It is hoped that these learnings can be used to improve the delivery of similar projects in the future.

The Project

Weed Control

The highly degraded sections of watercourse in the upper reaches of the Onkaparinga River catchment were heavily infested with large established crack willow (*Salix fragilis*). Over 5 kilometres of willows were efficiently killed by chainsaw herbicide frilling. Following this, the dead trees often required felling due to landholder aesthetic perceptions, and the risk, or perceived risk, of channel blockages and damage to watercourse infrastructure, such as crossings and bridges.

Woody weed control was undertaken by experienced contractors. Blackberry was carefully sprayed with long-lines or knapsack sprayers close to standing water. Gorse and broom was often brush-cut then sprayed when the regrow was above knee height.

Halo spot spraying was undertaken before planting seedlings except where exotic pasture grasses were dense and accordingly, planting did not occur.

Fencing

To ensure long term bushfire resilience, steel fencing was installed for 19.5 kilometres, rather than timber posts. Steel fences are expensive, at least $25 per metre installed, therefore it was important to be flexible about the extent of landholder co-contributions to fencing costs, as most people were not willing to contribute to this expense. Fortunately, half way through the project, a local volunteer community group, experienced in fence construction was engaged, and this reduced the cost to $18 per metre, allowing more areas of watercourse to be fenced with the available funding.

Initially, it was decided that a ten metre minimum fencing buffer distance on each side of the stream between the channel edge and new fence-line was ideal. We soon found that it was better to be less prescriptive, as each site varied depending on its surrounding pasture quality, amount of native vegetation, level of channelization, topography and the amount of grazing area landholders were willing to forsake.

Revegetation

Previous watercourse revegetation in the 1990's and 2000's in the Adelaide Hills were densely planted, resulting in tall, narrow trees with closed canopies. This planting style had the benefit of often reducing weedy pasture grass vigor through shading, but was often negatively perceived by landholders as being difficult to access and creating excessive fire risk. These dense plantings also had less biodiversity value compared to more open plantings that encouraged lateral branching.

Therefore the project planting objective was to create an open woodland structure, allowing widely spaced trees to form full canopies. Groups of similar shrubs species were sparsely planted to reduce future bushfire intensity and to assist pollinators to locate food resources. We avoided planting shrub groups beneath existing and future tree canopies to minimise the 'ladder effect' during future fires.

Most of our project sites consisted of reclaimed pasture paddocks and were dominated by exotic perennial grasses. It was recognised that without great effort, time and cost, a native groundstorey could not be established, and pasture grasses would always infiltrate from adjacent pasture paddocks.

Twenty one thousand seedlings were contractor planted, over half of which were in-channel sedges and rushes. Vigorous tree and shrub species, such as swamp wattle (*Acacia provincialis*), were chosen to quickly grow above exotic pasture grasses. At many sites there was little need to plant river red gums (*Eucalyptus camaldulensis*) as they readily recruited when livestock grazing was removed.

Sedges and rushes were planted closely together in clusters both in and near the channel to create easy to maintain groups capable of outcompeting exotic pasture grasses. Planting locations were spot sprayed with knockdown herbicide to create a weed free space prior to plant each seedling. All tube-stock were guarded with cardboard, rather than plastic tree guards to eliminate the possibility of plastic pollution.

Project Evaluation

Whilst the erection of watercourse fencing and the control of willow trees were very successful components of the project, the revegetation outcomes were disappointing and required an adaptation in planting strategy after the first year.

Kangaroo grazing on planted seedlings exceeded all expectation. Peak water flow and flooding during an unseasonably wet year uprooted many freshly planted seedlings nearest the channel. Unrelenting rainfall for an extended period caused seedlings in low lying areas to drown. Consequently, investment in kangaroo tree guards became a must, the timing of planting seedlings nearest the channel was to delayed until spring and planting was avoided in low lying areas in year.**Project**

Insights

See Table 1 for a summary of learnings.

Weed Control

Woody weed control for gorse, broom and blackberry across the fire scar was perceived by landholders to be the highest priority action and was a useful way of 'getting people on board' with broader watercourse restoration.

At many sites that had a long history of grazing, we accepted that exotic pasture grasses would be the dominant groundstorey, or the main vegetation layer in some instances, as native plant establishment was too challenging for a short term project. Nevertheless, exotic deep rooted perennial pasture grasses still provide the important ecosystem services of bank stabilization and providing habitat for insect biodiversity, which is so crucial for native fish and birds.

Whilst woody weed control generally gained significant co-investment from landholders, willow control was less well-supported. Landholders often enjoyed the beauty of willows and required convincing of the detriment they cause to watercourses. Once convinced of the need to control willows, the unsightliness of dead trees left standing was too off-putting for many landholders to consider. This added greatly to the cost of willow control. The average cost of contractor poisoning and felling ($375 per tree) was nearly five times the cost of poisoning alone ($75 per tree).

Fencing

On flatter sites managed for high production grazing in high rainfall areas, landholders were very reluctant to lose pasture area to widely fenced buffers. In these situations, exotic perennial pasture grasses such as phalaris (*Phalaris aquatica)* had been sown right up to the channel banks to maximize the grazing area. We reasoned that a reduced buffer area did have some advantages in this situation to reduce the amount of un-grazed, higher fuel load, hard to manage, exotic perennial grass area within the buffer area. In addition and unfortunately, many previously fenced watercourses in the Adelaide Hills have been used as back-up paddocks, especially those with larger buffer areas. Narrower buffer areas provide less incentive for landholders to use them as backup paddocks.

At lower production, lower rainfall sites, buffer areas were larger as there was less sown perennial grass pasture, therefore landholders were not as concerned about grazing land losses. However, in these larger buffer areas sites we observed higher grazing pressure from western grey kangaroos (*Macropus fuliginosus*) compared to the narrower buffer areas and this resulted in significant losses in planted seedling survival.

In South Australia, no easements or lease tenures exist on watercourses, leaving the sole responsibility of watercourse management to the landholder. Whilst remedial watercourse management actions are having significant positive effects on watercourses in the short term, without a protection covenant over the property, there is no security of investment for this recovery work. A legislated conservation covenant option is sorely needed to properly protect fenced riparian areas, especially those that have been funded by Australian tax payers.

Revegetation

There were a few important key learnings from the plantings. Many sedges/rushes planted in channel were lost due to significant stream flows through winter and early spring. As a result, in the last year of the project, the timing of in-channel planting was deferred to mid-spring. Sedge and rush planting were clustered to help improve their maintenance and were concentrated upstream to allow seed to naturally drift downstream and colonise naturally over time. Planting bowls were created for most of the trees and shrubs, which was found to be unnecessary in wetter locations, as many of these seedlings died due to water logging during an unusually wet year.

In addition, the early plantings had no protection from western grey kangaroo grazing. Adequate guarding of shrubs and trees to protect from kangaroo grazing is necessary, especially at sites with wider buffers or where

older sections of fencing were present that more readily allowed kangaroo access. Later project plantings were adapted to significantly reduce the number of seedlings planted so that investment could be focused on protecting all seedlings with kangaroo guards.

Fast growing species like swamp wattle (*Acacia provincialis*) were good choices for providing habitat structure within a few years of planting, as they grew above exotic pasture grasses quickly. Unfortunately, in many instances these fast growing shrubs stood above the height of surrounding pasture grasses, making them an attractive beacon for kangaroos to easily find and eat.

Prior to using kangaroo guards, many of the smaller cardboard guards were significantly damaged by kangaroos or little corellas (*Cacatua sanguinea*), reducing their effectiveness for rabbit and frost protection greatly.

Table 1. Project learnings summary

Project activity	Learnings
Weed control	Weed control was perceived by landholders to be the highest priority action, and was a useful way of 'getting people on board' with broader watercourse restoration.
	Accept that exotic pasture grasses will be the dominant ground storey species at many sites, but they have the benefit of stabilizing banks and providing habitat.
	Landholders were reluctant to invest in willow control due to the high cost.
	Landholders preferred, and often insisted, that willows be poisoned and felled, rather than just poisoned, due to aesthetics and future watercourse maintenance reasons.
Fencing	Counterintuitively, narrower watercourse fencing may provide greater ecological outcomes than wide fenced areas: • Landholders were willing to erect fencing to protect their watercourses from livestock if as little productive grazing area as possible was lost. • Landholders' decision to fence their watercourse was often influenced by a perceived lower bushfire risk associated with narrowly fenced, lightly vegetated areas. • Landholders were less likely to use the watercourse as another livestock grazing paddock when narrowly fenced, compared to larger fenced grassy watercourse areas. • There was some evidence that kangaroos were less inclined to enter and graze when watercourse fencing was narrow and difficult to negotiate, but this requires further interrogation.
	Watercourse fencing does not prevent kangaroos grazing on planted seedlings and should not be considered as an alternative to using herbivore appropriate tree guards.
	Steel fencing will remain standing after the next fire, providing protection from livestock while the watercourse is most vulnerable, even though the long term integrity of the fence would have been compromised by the fire.
	Can't be too prescriptive about fencing design as terrain and existing vegetation are the main dictators of fence location.
Revegetation	Time the planting of sedges and rushes in, or near, the channel later to avoid the main flood and high stream flow period.
	Plant sedge and rush plantings in dense clusters to make future weed maintenance easier.
	Plant sedge and rush plantings upstream for seed drift and natural regeneration downstream.
	Planting bowls in low lying areas are risky due to waterlogging in wetter seasons.
	Plant fewer plants and invest heavily in kangaroo appropriate tree guards rather than planting lots of unguarded seedlings especially in wider buffers or at sites with older fencing.
	Fast growing shrubs like swamp wattle (*Acacia provincialis*) are great for providing quick habitat structure.
	Cardboard guards are often ripped to pieces by wildlife and this can be overcome by using mesh kangaroo guards.
Landholder engagement	Landholder perceptions of top priorities differed from our own. It was a process of meeting people where they were at and also building awareness.
	Landholders have limited time, money, motivation to undertake watercourse works themselves.
Long term protection of riparian zones	A legislated conservation covenant option for riparian zones is well over due.
	An ongoing financial incentive to help landholders co-invest to protect their watercourse would be hugely beneficial.

Conclusion

In conclusion, most landholders are very appreciative of tax payer funded recovery support to protect and restore their watercourses, but very few have the time or money post-fire to significantly co-invest in this expensive activity. Most also do not provide crucial follow-up maintenance and weed control to protect the taxpayers' revegetation investment. Unfortunately, there is no current ongoing financial incentive to help landholders co-invest and there is no South Australian legal covenant available to adequately protect this investment into the future. We recommend that steel fencing is used for watercourse fencing as it provides assurance that watercourses will remain protected from livestock after the next fire, when they will be in their most vulnerable and fragile condition. Fencing buffer distance needs to be determined with consideration for future management of each site. Counterintuitively, narrower watercourse fencing may provide greater ecological outcomes than wide protected areas. Exotic pasture grass dominated fenced buffers without remnant or planted native vegetation still provide ecological benefits and revegetation is more successful if all plants are property protected from all herbivores.

Whilst significant watercourse benefits have been achieved throughout the Cudlee Creek fire scar, the true cost of watercourse management is well beyond the budget and priority provided by most landholders. Unlike other states, riparian zones are entirely the responsibility of the landholder. If declines in local watercourse condition are going to be slowed or reversed, ongoing Government investment will be required, along with covenant-style protection of that investment, requiring landholders to agree to actively contribute to restoration success.

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