Bushfire recovery in the Nariel Valley – a long way to go.

Abstract
The 19/20 Bushfires impacted much of the Upper Murray, including the Nariel Valley. This paper will explore the challenges of fire recovery focusing on riparian areas and the many complexities of landholder engagement.

Introduction
In January 2020 wildfire tore through areas of the Upper Murray catchment, devastating communities, infrastructure, and the environment. The Nariel Creek and its headwaters were severely impacted, with over 50% of the catchment area experiencing total canopy loss or severe canopy scorch, including much of the riparian area, figure 1 below shows the fire severity in the Upper Murray. 94.1% of the Nariel Valley is public land, with 2.66% being farming zone (Land checker 2021). The Nariel suffered an almost total collapse of its aquatic ecosystem due to fire affected run-off, sedimentation, and critically low dissolved oxygen levels. These impacts were further exacerbated by a series of rainfall events following the fires in January 2021 (38mm on 30/1) February 2021 (77mm on 6/2 and 16.4mm on 13/2) and March 2021 (20.4mm on 14/3 and 21.8mm on 24/3) (Elders Weather, 2021). Though relatively small, these rainfall events triggered large debris flows and sedimentation of waterways.

This paper will focus on the past, present and future management of this system focusing on challenges relating to land managers and riparian recovery.

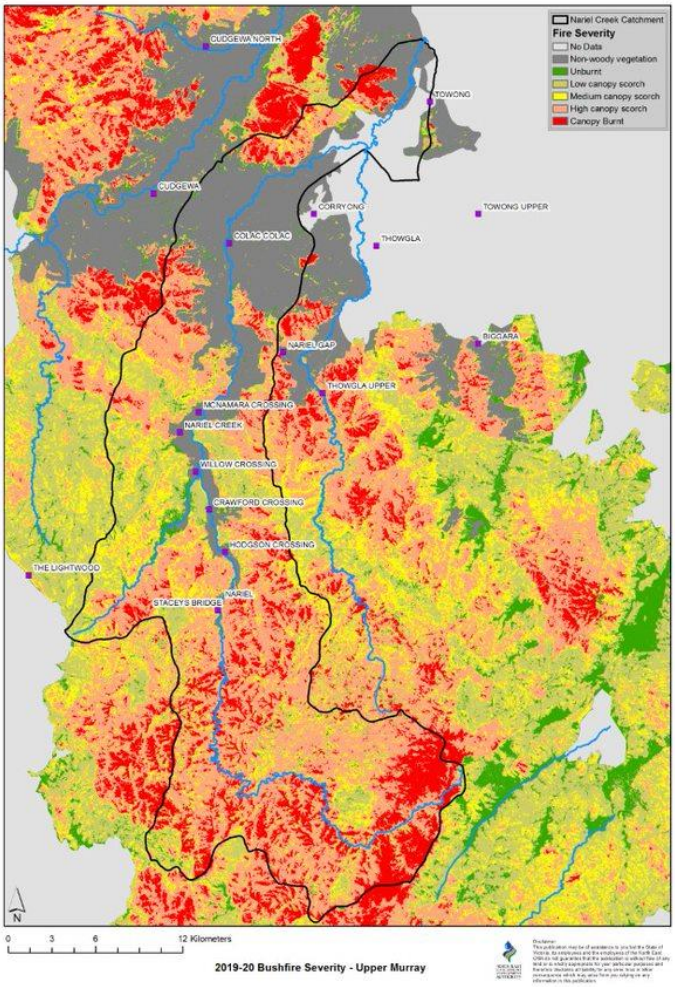

Figure 1: Upper Murray Fire Severity Map

Figure 2 shows the location of the Nariel Valley within the North East CMA boundary**:**

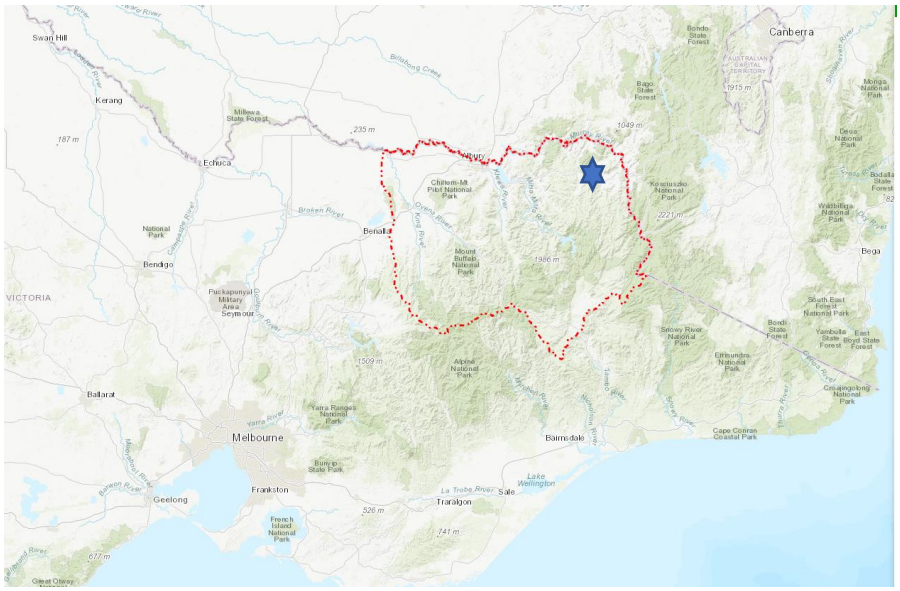

Figure 2: North East CMA Boundary

The Past

The complexities of the Nariel Valley are not new. The paper 'The Evolution of Corryong/Nariel Creek since European Settlement: Implications for On-going Management Prioritisation' (Teo & Marren 2014) was presented at the 7th ASM Conference. Teo and Marren identified the complex history of the Nariel, stating:

> *The entire length of the river has been subject to stream management works of some manner (Water Victoria, 1989). Initial river engineering in the 1960s and 1970s involved major channel straightening and realignment that were meant to increase the rate of drainage. Unfortunately, channel instability increased and a large flood in 1972 led to avulsions through farmland. Farmers responded by fencing the channel and planting willows (Webster, 2006). Gravel was also excavated from banks to build roads during this period, leaving banks exposed and unstable (Webster, 2006). Since the establishment of the Shire's River Improvement Trust (now the North East Catchment Management Authority), attempts to radically modify channels have ceased. Projects now focus on regaining channel stability through rocking and tethered logs.*

Figure 3 below shows the stream management works along the Nariel Valley:

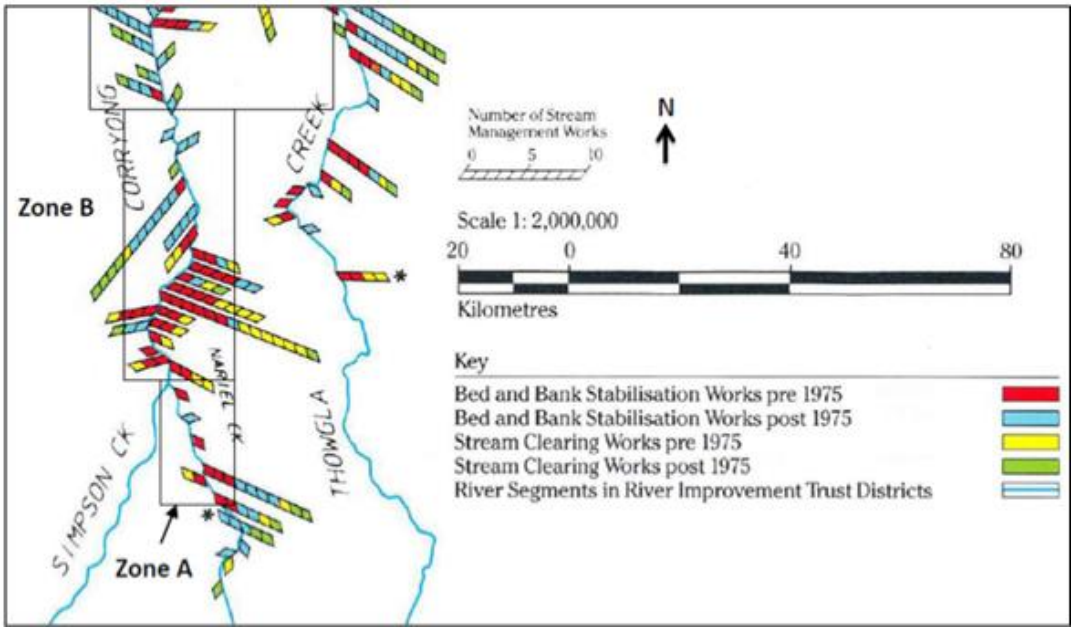

Figure 3: Stream management works along Nariel Valley (Victorian Department of Water Resources 1989)

This long history of intervention has contributed to the complexity of fire response and recovery. Adding to this complexity is the fact that the Upper Murray has been subject to ongoing dry conditions over the past few years. This fire has put immense pressure on an already stressed rural community.

Ovens Murray Climate Projections (2019) advise several climate predictions for the Ovens Murray area (in which the Upper Murray is situated) 'These include maximin and minimum daily temperatures continuing to increase, Extreme rainfall events expected to be more intense on average through the century but remain very variable in space and time'. With these extreme events and dryer climate set to continue it is critical that better planning on the management of riparian areas is undertaken. These areas can provide shade and shelter for stock as well as act as drought refugia for aquatic species.

Impacts of the 19/20 Bushfires

Figures 4 and 5 below show the impacts of a relatively small rain event in February 2020, following the bushfires:

Figure 4: Two sites on the Corryong Creek February 2020

Figure 5: Two sites on the Thowgla Creek, February 2020

North East CMA staff spent a considerable amount of time with landholders in the Upper Murray following the fires. Staff identified an opportunity to undertake a large-scale program of works which would require long term commitment from landholders to change the management of this system.

Landholders who have previously not wanted to engage with the North East CMA to undertake riparian works could see the scale of damage and that any solution was going to be costly. This presented an opportunity for the North East CMA to begin a conversation about a change in land management practices.

To gain a better understanding of where to prioritise investment, based on reach scale benefits for both riparian health and system stability, the North East CMA engaged Streamology Pty Ltd to undertake a geomorphological assessment of Nariel Creek.

The Present

The North East CMA was faced with a question – where to begin to assist in system recovery, and was this even possible? Past management, including ad hoc bank stabilization, has not addressed system-scale stability issues. The long-term solution will need to involve landholders and require them to make a fundamental shift to the way they have historically managed the creek. If this is not

done, the creek will continue to erode and deposit vast amounts of sediment on agricultural land, reduce the quality of water available for stock, and will have serious consequences on aquatic biota.

Armed with the Streamology Geomorphological report, North East CMA staff had to make decisions on prioritisation of investment for recovery of the riparian zone along Nariel Creek, as well as other areas in the Upper Murray.

The Geomorphological Assessment of Nariel Creek (Streamology 2021) notes that:

> *Attempting to simultaneously reduce flooding and stabilise the creek, over a century, human activities have increased energy in the creek through:*
>
> - *Straightening of the creek channel*
> - *Realigning the channel towards the valley walls*
> - *Removing much of the vegetation and instream-wood along the creek.*
>
> *The increase in energy has led to increased bed and bank erosion, and greatly increased gravel loads. Bank erosion releases huge volumes of gravel into the stream (probably twice as much as comes from the catchment). The result is that the creek has changed from a lower energy meandering form, to a 'wandering gravel bed' form inside a well-defined trench).*

Figure 6 below illustrates the relationship between the trench and incised channel, taken from the Geomorphological Assessment of Nariel Creek (Streamology, 2020)

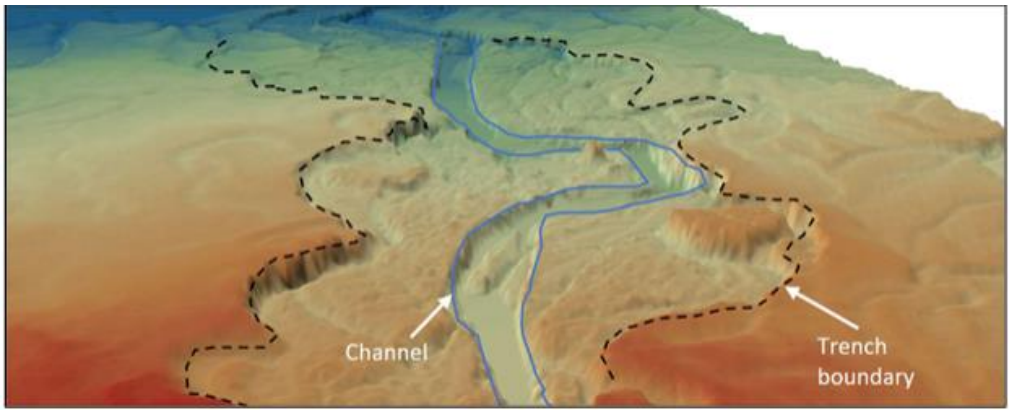

Figure 6: Oblique 3D LIDAR view illustrating the relationship between the trench and incised channel. Gravel deposits in the trench are defined as 'low-bars' which are active point bars, and 'high-bars' which are the higher gravel surfaces deposited in floods (Streamology 2020)

The impacts of these interventions were evident during site visits following the bushfires. CMA staff were faced with sites that were impacted at such a severe intensity that it was clear a change in thinking from traditional intervention methods would be required'. The images below (figures 7 and 8) are examples of sites CMA staff were faced with while undertaking landholder inspections after a relatively small rain event. Figures 7 and 8 below demonstrate the severity of the fires on sites that had been impacted over time by traditional intervention methods.

Figure 7: Property in the Nariel Valley post fires

Figure 8: Channel Abandonment, erosion, smothering of habitats and loss of riparian vegetation on the Nariel Creek Post Fire & Flooding, 2020.

Due to the Streamology report the North East CMA had a greater understanding of the nature of the system. However, due to limited funding we still need to drill down further into information to inform investment prioritisation decision making.

A decision matrix was developed to assist this process which included the following criteria:

- Stream Size
- Factor causing problem
- Threat to/impacts on essential public infrastructure/CMA assets
- Likelihood/extent of impact
- Consequence of inaction
- Risk to asset(s)
- Landholder willingness to enter into works agreement.

Each criteria had a score associated with it. Based on this, an overall score for each site of Low, Medium, or High was determined.

The North East CMA utilised this scoring information in combination with the recommended approach from Streamology, who identified several priority areas for intervention that would positively impact on the reach scale issue of system stability and river health. Streamology provided an example of such an approach, shown in figure 9 below:

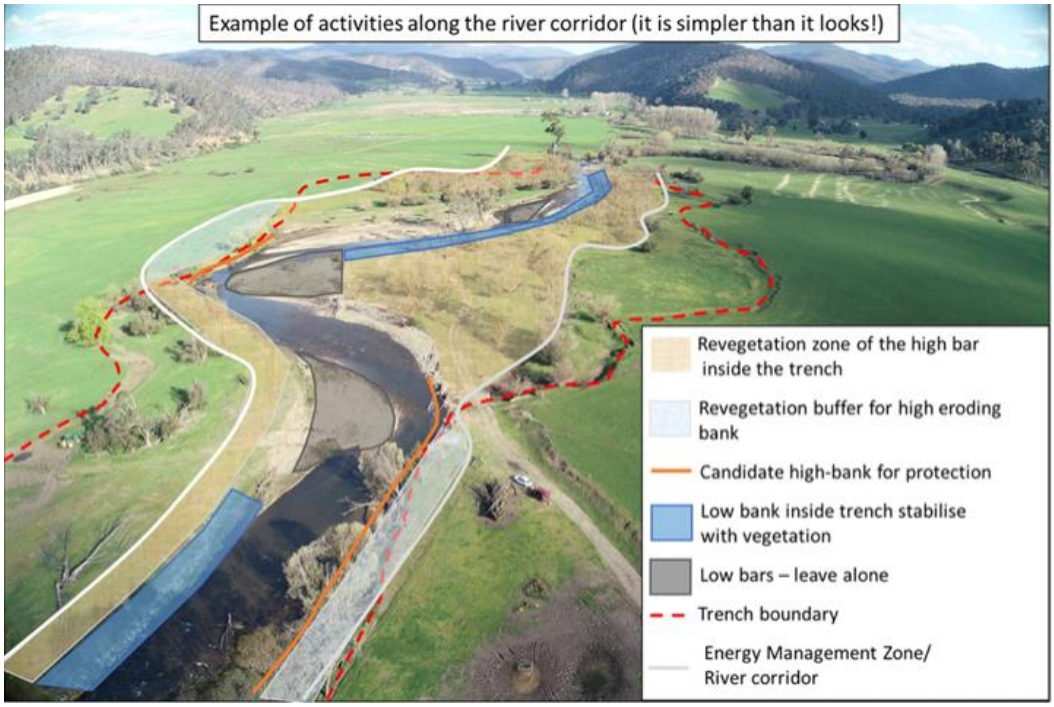

Figure 9: Recommended treatment for interventions on the Nariel (Streamology 2020)

The Future:

Traditional, site specific treatment for erosion and other instabilities along the Nariel have proven to be partially successful, but do not address the issue of system stability. Utilising modern survey and modelling techniques combined with the detailed knowledge from landholders and North East CMA staff (past and present), it has become obvious that a fundamental shift in approach is required if we are to have lasting success in the recovery of this iconic waterway.
We have started these conversations with landholders and are changing the way we approach restoration of riparian sites. These difficult discussions about fencing off riparian areas to allow the river to shift within the defined trench are happening and landholders are gaining an understanding of this concept.

Some landholders do see the reason why we will not just rock the bank. In all our conversations we discuss the benefits of incorporating timber into our erosion control structures to increase aquatic biota.

Conclusion

The North East CMA's current bushfire recovery program is not going to be able to address the issue of large areas of unfenced crown frontage with unrestricted grazing access, and of the over 70 sites inspected in the Upper Murray works are being undertaken on just a few.

We are speaking with Bushfire Recovery Victoria (BRV) and Department of Environment, Land, Water and Planning (DELWP) (Water and Catchments Bushfire Program) to identify possible funding options to continue a reach-based approach to restoring the Nariel. Ideally this program could include:

- Restoration of stream stability.
- Instream habitat and recovery of the fish population. Exclusion of livestock.
- Riparian Planting.
- Stewardship Payments to landholders
- Minor Works

References:

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Teo, E. A. & Marren, P. M. (2014). The evolution of Corryong/Nariel Creek since European Settlement: Implications for On-going Management Prioritisation, in Vietz, G; Rutherfurd, I.D, and Hughes, R. (editors), Proceedings of the 7th Australian Stream Management Conference. Townsville, Queensland, Pages 25-35.

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