

Report of sediment removal experiences, outcomes & future implementation for Neimann Creek

December 2018



Introduction.

In March 2017 Tasman Environmental trust sought and was granted funding from the Ministry for the Environment (MfE) to undertake a restoration and action research project at Neimann Creek in Richmond, Tasman. This work was informed by the 2015 Neimann Creek Restoration and Management Plan. The funding is the first part of a wider project that aims to restore the water quality and habitat of Neimann Creek to facilitate the return of wildlife including giant kokopu, other aquatic, bird and native plant species. This project supports the health of Waimea Estuary. Neimann Creek has significant water quality issues including excessive nutrient rich benthic sediment (average depth over 500mm), high dissolved nitrate levels, and daily low dissolved oxygen saturation levels. Causes include excessive aquatic plant and algal growth in summer, historic runoff (mostly from a piggery which no longer exists) and stock access to the creek. Unmanaged mature crack willows and other weeds choke the stream in places slowing down the water flow.

The funding from the MfE encompassed both restoration and action research. The restoration component included the poisoning and removal of a section of willow, management of weeds, suitable riparian planting and fencing of a large section of creek. The action research component was targeted at a trial of sediment removal from within the creek.

Restoration

Willow removal

The first stage of restoration was the poisoning and removal of willow and other weeds that were growing along much of the creek. Before restoration work commenced the length of the stage one area of the creek was unable to be navigated by kayak. Fine roots from the willow choked the creek in several places, trapping sediment and impeding water flow. Shortly after the willow were poisoned these fine roots died enabling better water flow and the natural flushing of some fine sediment. It has been reported that poisoning of the willow very quickly led to full navigation of the creek by kayak and more gravels being seen.



Planting

There have been two planting weeks undertaken to achieve the planting targets of stage one of the project. The first was in September 2017 (400 meters planted with 1385 plants) and the second in June 2018 (460 meters planted with 2100 plants). Through these planting days we were able to plant 860 meters of riparian boundary with 3485 plants (up to 8 meters deep where the land owners allowed). This area of the creek is now fenced to protect riparian plantings and to restrict stock access to the creek.



Action Research

The Process



Over 3 days in January 2018 sediment was removed from the source of the main tributary of the creek and down a further 440 meters of the main creek. The process was to have a 20 tonne digger¹ reach out over the existing bank and scoop sediment out of the creek and deposit it on the land behind the digger. The bank of the creek was left undisturbed so that the existing vegetation could form a buffer/filter for water laden sediment draining out of the removed sediment and back into the creek.

This sediment was then sorted through and any eels or other fish in the sediment were captured, counted, measured and released back into the creek up stream or relocated to other suitable local streams. This process was managed and overseen by an Ecologist.



After a period of draining and fish recovery the sediment was spread more evenly over the adjacent paddocks. On the final day straw bales, which had been used as sediment control, were spread over the removed sediment in the paddock to disperse forecast heavy rain and stabilise the now dried sediment.

We estimate that at least 70-80m³ of sediment (dried) was removed from 440 meters of the Creek.



The original plan was to remove sediment from only 200 meters of the creek. The decision to continue beyond the initial 200m metre area was made to maximise the utilisation of the resources and

¹ A digger of this size was used to ensure sufficient reach out over the creek while keeping the diggers tracks well away from the fragile creek edge. The goal was to leave the edges of the creek as undisturbed as possible.

knowledge we had on site at the time and the resource consent for the work and to test the methodology across a variety of depths of sediment and different geography of the creek².



To undertake the work a number of key personnel were required both to inform the work and as a requirement of our resource consent. These personnel included,

- Ecologist to oversee all of the work including sediment control and fish recovery - Fish and Wildlife Services
- Personnel for fish recovery - Fish and Wildlife Services
- NMIT Student - Fish Survey
- Trevor James Resource Scientist - Tasman District Council
- Southwater - dredging specialists
- Chris Wells - digger operator
- Project and Health and Safety management
- Other support personnel

Coordinating the availability of these key people in a cost effective way was one of the biggest challenges the sediment removal work faced. All the people onsite offered their time and expertise at significantly reduced cost to enable the project to be successful and it was critical to utilise them fully while on site as a second sediment removal date was not an option without incurring significant additional costs and logistical difficulties.

The machinery and preparation needed to undertake the sediment removal was significant and included the following

- Fence removal and reinstatement
- Resource consent
- 6 inch Pump
- 20 tonne digger
- Sediment control fences
- Fish recovery tools

² The additional 240 meters was achieved within the 200 meter budget, due to the discounts offered by those involved.

Costs

| | |
|---|---------------------|
| Sediment Removal Neimann Creek Jan 2018 | |
| | |
| Planning | |
| consultant planning | \$ 346.45 |
| consultant planning | \$ 315.00 |
| consultant planning | \$ 78.00 |
| Project Manager | \$ 880.00 |
| Planning total | \$ 1,619.45 |
| | |
| Compliance | |
| resource consent | \$ 1,239.14 |
| water permit (annual cost) | \$ 293.91 |
| Compliance total | \$ 1,533.05 |
| | |
| On Site | |
| Project Manager | \$ 1,120.00 |
| On site fish recovery, sediment control and ecologist | \$ 4,000.00 |
| Digger location and pump hire | \$ 1,345.00 |
| Digger | \$ 2,520.00 |
| On Site total | \$ 8,985.00 |
| | |
| Total | \$ 12,137.50 |
| | |
| | |
| metres covered | 440 |
| | |
| Cost per metre | \$ 27.59 |

Note:

Costs in yellow were significantly discounted up to 40%

Sediment control fences and Hay bales not included as TDC provided

Removal of farm fences and new fencing not included.

Site Logistics

It is worth noting that the digger method we used relied on several key things to be successful. The digger operator we used was very experienced in both this method of sediment removal and in working with the ecologist we had on site. The site we were using had excellent accessibility for the digger to access the creek and for the removed sediment to be spread over the adjacent paddocks. Sediment was spread the entire length of the area of sediment removal and was up to 5 metres wide. Sediment control with the 6 inch pump was also successful when the water was deep enough for it to be suspended over a pontoon. But it did result in the flooding of several paddocks.



The land owners were very accommodating throughout this process, essentially giving us access to three paddocks for the duration of the work and a place to relocate the sediment. Easy access to the creek was critical to the successful removal of sediment. Fences were removed and reinstated as required and there were very few trees or structures to impede work.

Sediment Control

Several sediment control methods were used including pumping sediment laden water to land, straw bale fences and sediment cloth fences, as well as maintaining an undisturbed creek edge. Each of these had varying levels of ease of installation, cost and effectiveness. But at all times we remained within the parameters of our resource consent.



Feedback

Feedback was received from key personnel who participated in the work. Key points that may be useful for future work include

- The placement of sediment controls should be planned and ideally installed in the days prior to sediment removal work commencing
- Use of several sediment control mechanisms is beneficial i.e. hay bales up stream followed by a silt fence will allow the hay to capture silt and weed and debris that could undermine a silt fence alone.

- Before incurring the cost of hiring a pump for sediment control it is recommended that the flow in the water way is measured (in the week prior) this will help to determine if the pump is going to have the desired impact. Suspending the pump below a floating pontoon helped minimise the amount of gravel sucked up by the pump but placing the pump intake in a digger bucket in shallow areas of the creek worked very well. Any pump used should have a fish screen fitted to prevent possible fish mortality.
- Attaching a chain to the bottom of a silt fence might help to hold down the material and stop sediment escaping under the material.
- Fish recovery requires a lot of people due to its time sensitive nature, and a lot of buckets and nets.
- Thorough planning, on site, with all key personnel, in the weeks prior is critical so that the best utilisation of resources is made when the sediment removal takes place. Having one manager during the actual operation directing the work and being responsible for meeting the resource consent requirements will ensure compliance, health and safety, simplify logistics and ensure the best use of resources.

Techniques not used

It would have been interesting to trial using a slotted bucket as it has been suggested that this style of digger bucket may reduce the amount of water being removed and the amount of instream turbulence. This style of digger bucket was not available to us so was not able to be trialled.

The Tasman District Council is hoping to undertake a trial dredging for sediment removal. This will be done either using the Southwater 'sand wand' which works like a vacuum cleaner along the bottom of the creek or a water blasting technique where sediment is 'blasted' into an area and then sucked out. This technology is smaller and potentially less invasive but may be more time and labour intensive. It will be interesting to see how effective these methods are in this setting with a view to use in other creeks. The Tasman District Council is still trying to coordinate timing and availability of equipment.

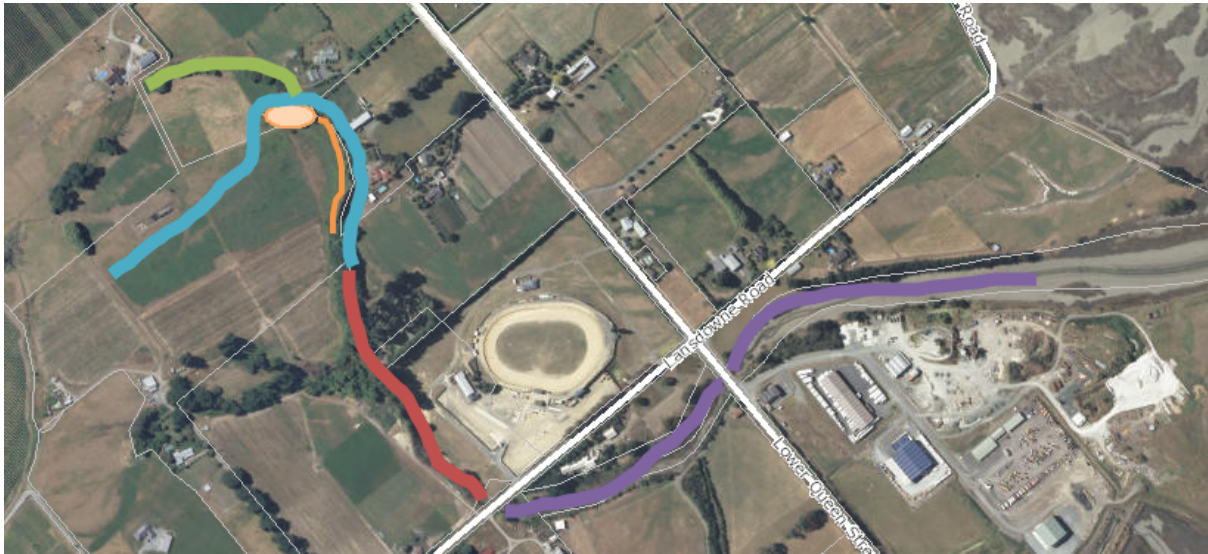
Recommendations

Findings sited in 'Neimann Creek habitat restoration potential: baseline of fine sediment removal' By Morgan Puklowski (Nov 2018)

"This document has reported on the baseline changes of the Neimann Creek habitat characteristics over the short period before and after fine sediment removal in the upper most reaches of the creek. This overall has shown that average fine sediment depth minimum of 13cm, can be significantly reduced in the short term. Though there were other numerous factors which could have potentially contributed to depth changes. More extensive monitoring of methods of remediation such as surrounding riparian restoration, fencing out livestock, reducing runoff and pollution, and management of pest macrophytes to individually determine the effectiveness at fine sediment reduction, as these less destructive methods may provide useful in pre mechanical sediment removal action plans, to assist with freshwater habitat recovery."

From the work and research undertaken in stage one of the Niemann Creek restoration it is recommend that where funds and site access and logistics allow, mechanical removal of sediment can be beneficial. However removal of pest tree and weed species, creation of in stream habitat and shelter, fencing from stock, and planting are just as vital to the ongoing improvement in creek health.

Implementation plan



Stage two restoration of Neimann Creek (indicated in green) is underway with funding from the Department of Conservation Community Fund. This stage will remove willow and weeds, plant and fence the northern tributary of the creek and maintain the plantings undertaken in stage one (blue). There is no sediment removal planned for stage two due to the narrow and low flow of water in the northern tributary and the lack of access to staging areas alongside of the creek. It is anticipated that the willow removal will significantly improve the flow of the tributary allowing some natural reduction of sediment.

Funding for further planting is being sought for stage three (orange). The area indicated in red is not able to be accessed for the project. Both landowners adjacent to the creek in this area do not wish to participate in this project. We remain hopeful that overtime this may change. The area indicated in purple is stage 4. This area is not suitable for sediment removal due to its tidal nature, but would benefit from planting and weed removal and management.

