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LOW IMPACT DRAIN MAINTENANCE IN THE WAIMAKARIRI DISTRICT

G J Bennett, Waimakariri District Council

ABSTRACT

In pre-European times the eastern part of the Waimakariri District from the coast to approximately 15 km inland was predominantly swamp land. Early settlers set about draining these swamps forming the majority of drainage network that exists today. Old style cleaning practices resulted in degradation of waterways and little consideration was given to sediment control or biodiversity values. In recent years respect for in-stream biodiversity and awareness of the benefits of excluding stock from waterways has become common and some waterways have been naturalised. Along with the benefits of increased biodiversity and aesthetics these waterways require less maintenance and in many cases the waterway looks after itself. In 2008 Council staff in collaboration with the drainage maintenance contractor started to experiment with the use of a rake instead of the traditional silt / weed bucket to clean waterways. This has proved effective in removing the majority of weed and allowing in-stream fauna to migrate back into the waterway.

This paper provides examples of low-maintenance waterways and compares the effects of low impact cleaning versus traditional cleaning methods.

KEYWORDS

Drain maintenance, waterway biodiversity

PRESENTER PROFILE

Greg Bennett has been the Land Drainage Engineer at the Waimakariri District Council for five years and manages the District's Drainage Maintenance Contract.

1 INTRODUCTION

When early European settlers of Waimakariri came to the lowland swamp plains they saw opportunity to transform these areas into fertile farming country. They set about draining these swamps and their legacy is the network of waterways that drain the surrounding land today.

Management of these waterways through the decades by the various Boards and Councils was focused entirely on draining the land with high impact methods often without regard to water quality and biodiversity. The practice of planting willows along waterways has been carried out for many years for bank stability however these species have other adverse effects on the waterway, such as root encroachment, which require intervention with heavy machinery.

In recent times the approach to waterway management has altered so that respect for other waterway values has become a normal part of the maintenance regime. Examples of this change in approach in the Waimakariri District are changing the tool used to clean excess weed from waterways from a bucket to a rake so that the impact of cleaning is less and using native plants to stabilise banks and provide shade along with many other ecosystem services.

2 BACKGROUND AND HISTORY

The Waimakariri District occupies some 225,000 hectares and is located north of Christchurch City between the Waimakariri River and just north of the Ashley River and extends from Pegasus Bay in the east to the Puketeraki Range in the west. It is bounded to the north by the Hurunui District (WDC 2012).

In pre-European times the area from the coast to approximately 15km inland was predominantly swamp as Charlotte Godley, wife of Christchurch founder John Robert Godley, recorded:

> 'Equally hard to navigate were the swamp areas to the nor-west of Kaiapoi Island. As with the bush area they were known as the Ohoka and Rangiora swamps and it could take the unwary traveller many hours to walk through them. In fact it took some inexperienced pakeha travellers up to two days to get through. Kai Tahu people on the other hand knew their way through and at times appeared to be walking on water knowing where the solid ground could be found even when the surface was, covered with water.' (Wood (Ed) 1993)

Early European settlers of the area set about draining these swamps and cut deep channels to form outlets for the Eyre and Cust rivers which previously flowed into the western edges of the swamp land. The surrounding land was drained into these channels forming the drainage network that exists today enabling the land to be farmed.

Maintenance of the extensive drainage network in the Waimakariri District was ad-hoc and managed under various river and roads boards and County Councils but mostly maintained by the landowners until the North Canterbury Catchment Board was formed in 1944. It was not until 1950 when torrential rain in the mountains caused the Waimakariri and Rakaia rivers to rise with terrifying suddenness flooding Kaiapoi and the land on both sides of the

lower reaches of the Waimakariri River that the Catchment Board created the Ohoka Drainage District and levied rates for drainage (Wood 2008).

The North Canterbury Catchment Board was dissolved in 1989 during local government reforms and the responsibility for the drainage in the district was ceded to the Canterbury Regional Council and Waimakariri District Council. Environment Canterbury assumed responsibility for the major rivers and approximately 420km of smaller creeks and network of land drains became the responsibility of the Waimakariri District Council.

3 WATERWAY MANAGEMENT

3.1 THE PROBLEM

The main reason why the waterways require regular maintenance is because of the rampant growth of exotic aquatic weeds that infest them, notably *Nasturtium officinale* (Watercress), *Mimulus guttatus* (monkey musk), *Elodea Canadensis* (Oxygen weed). *Potamageton crispus* (curly pondweed) and *Glyceria fluitans* (floating sweet grass) (Johnson & Brooke 1998).

Some waterways require the removal of silt however with modern sediment control measures and the exclusion of stock the removal of silt is no longer the main focus of drain cleaning.

3.2 TRADITIONAL MANAGEMENT

During the County Council period, drain cleaning was usually carried out annually whether the drain needed cleaning or not. Digger operators would take great pride in making the sides and invert as straight as possible; they would scrape the bucket down the far bank, across the bottom and up the near bank. Many of the waterways were over deepened and the spoil was left piled high on the banks. No consideration was given to sediment control or biodiversity values. It was common to allow stock access to the waterways.

3.3 A NEW PARADIGM

In recent years management of the drainage network changed from annual cleaning to an as required basis and respect for in-stream biodiversity has become en vogue and some rural landowners have become aware of the benefits of excluding stock from waterways and planting their riparian strips with native plants. Recent changes in regional policy means that Environment Canterbury now forbids intensively farmed stock from accessing waterways (Ecan 2011).

Excluding stock from waterways has many benefits such as: (Hudson (Ed) 2005)

- Eliminating pugging and damage to stream banks from trampling,
- less sediment entering the waterway from bank erosion, and
- fewer nutrients entering the water.

Riparian planting has many benefits such as: (Hudson (Ed) 2005)

- Providing habitat for native fauna,
- introducing shade over the water which reduces water temperature and hinders aquatic weed growth, and
- filtering runoff of nutrients and sediment from the surrounding land.

3.4 LOW IMPACT DRAIN CLEANING METHODS

In 2008 Council staff in collaboration with the drainage maintenance contractor started to experiment with the use of a rake instead of the traditional silt / weed bucket. The spacing between the tines on the rake is 300mm as opposed to the width of the slots in the weed bucket which are 40 - 50mm (see pictures 1– 8).

Picture 1: Weed bucket

The weed bucket has a cutting edge so the cleaning operation excavates the stream substrate along with silt and weed from the drain. The operator has to pivot the machine to deposit the cleanings alongside the drain. This results in messy piles of cleanings beside the drain which mount up over successive years or require subsequent removal because the lifestyle block owner does not like his lawn damaged by unsightly piles of silt and decomposing weeds. The operator can only deposit the weed onto the near bank. The narrow slots and dish shape of the bucket causes the water to excessively slosh about hindering the cleaning operation and making a mess.

Picture 2: Weed bucket with silt and weed

Picture 3: Cleaning with weed bucket

Picture 4: Cleanings placed alongside drain

Picture 5: Rake

The rake is effective in removing the majority of weed and allowing in stream fauna to pass through. The rake has no cutting edge so the cleaning operation drags the excess weed from the drain without excavating the substrate. The experienced operator can flick the weed onto the edge of the drain with minimum disturbance to the waterway and surrounding land. In stream fauna removed with the weed is able to easily migrate back into the drain. The wide gaps between the tines enable the rake to drag through the water without causing too much displacement. The operator can either flick the cleanings onto the

near bank or far bank without having to pivot and deposit the cleanings on the bank. The operation is quicker, cheaper and less impact than the traditional cleaning method.

Picture 6: Rake with weed

Picture 7: Cleaning with rake, weed is flicked onto edge of drain

Picture 8: Drain cleaned with rake

3.5 USE OF NATIVE PLANTS

Land use in many areas of the Waimakariri District has changed from pastoral farming to lifestyle blocks with the block owners expecting a higher level of service and some, appreciating the waterway through their properties, set about naturalising the banks of their drains with native plants. Along with the additional benefits of increased biodiversity and aesthetics the waterways require less maintenance with a digger, less spraying and in many cases the waterway looks after itself. Pictures 9 - 11 demonstrate the transformation of a farm drain, when annual cleaning with a digger was required, to a naturalised stream that does not require a digger at all. In saying this, it is prudent to consider access for machinery when carrying out riparian planting in case maintenance is required in the future. A track wide enough for an excavator and choosing low plants to allow the machine to reach over and carry out the required maintenance is desirable.

The use of *Carex secta* and *Carex Virgata* (pukio, tussock sedge) and *Phormium tenax* and *Phormium cookianum* (Flax), as shown in Picture 11, along the lower banks of waterways illustrates many benefits including reduced maintenance costs. Well vegetated banks are stable even if planted with pasture grass (Hudson (Ed) 2005). The plants provide shade which is effective in reducing aquatic and land weed growth and provide many other benefits that are classified under the term; ecosystem services (Wikipedia 2012).

Picture 9: Aerial photo of farm drain 2000

Picture 10: Farm drain 2000

Picture 11: Farm drain 2012

3.6 THE WILLOW PROBLEM

In 1951 Eyre County Engineer Ian Treleaven stated in a report proposing the creation of the Ohoka Drainage District:

> 'Removal of willow trees will be required in many cases and it has been difficult to estimate the cost of this. Co-operation from land owners in their disposal after removal would reduce costs' (Treleaven 1951).

As Ian identified in 1951 willows have remained a problem plant in the Waimakariri. They will often drop branches and the older ones are prone to falling in high winds. The tree roots will seek out the nearest watercourse sometimes from several meters away and form a dense root mat that will cause the invert to raise and erosion of the nearby banks. The only recourse in these situations is to cut the root mat away and the problem will repeat unless the trees are removed altogether and the stumps poisoned to prevent regrowth.

The cost of willow control in the district has been considerable in recent years. In 2008 the cost was 25% of the annual drain maintenance budget. In 2009 it was 9% and in 2010 it was 10%. These willow operations have been reactionary i.e. having to act when there is a problem such as fallen tree or branch and blocked waterway. Willow control involves removing whole willows or branches, cutting away willow root mats and spraying regrowth.

Picture 12: Willow root infestation

4 CONCLUSIONS

Since our forefathers drained their swamps and created the drainage network in the Waimakariri these waterways have required regular maintenance to keep the land drained. This has involved management by the various Boards and Councils which have had to levy rates on landowners in order to fund this maintenance.

Drain cleaning techniques have changed from high impact and focused solely on draining water as fast as possible to less impact where the cleaning operation is less intrusive on the structure of waterway and the fauna and flora that inhabit it. The use of a rake instead of a bucket has been effective in reducing this impact.

The use of native riparian vegetation reduces the level of maintenance required to keep the channel clear and flowing by providing bank stability and shade to reduce aquatic weed growth as well as the value added benefits of other ecosystem services.

One cannot write a paper on waterway maintenance without mentioning the willow bane. If not for willows many waterways would not require the intrusion of heavy machinery at all. Perhaps they were planted in order to hold banks in place and stop erosion. In certain circumstances they maybe the best available option for this however it is surety that one day old man willow will fall and a machine will be required to remove him. Better a riparian strip of suitable native species that look after the waterway and themselves without any intervention by man and machine.

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