Otago Regional Council

MEMORANDUM

To: Danielle Korevaar

From: Pete Ravenscroft

Date: 9/4/2024

Re: Science response to additional questions on drain maintenance

Name	Role	Date Completed
Pete Ravenscroft	Author	4/4/2024
Jason Augspurger	Reviewer 1	May 2024

Purpose

The purpose of this memo is in response to request from Otago Regional Council Policy team member Danielle Korevaar

Policy seeks additional advice via email dated Wednesday 27th March 2024.

"A late request that may not have made it onto your radar Pete is providing a more enabling pathway for drain maintenance works (clearing sediment etc. from drains and modified watercourses). This is currently drafted as being discretionary, but looking to include a permitted pathway that will rely on a to-be-developed code of practice, and a controlled activity pathway to manage clearance in the short term.

The controlled activity will rule will need some limits around extent of drain maintenance, and how it is undertaken, so your thoughts on what should be included there would be much appreciated. Controlled activities must be granted but can have consent conditions imposed."

Background

Altered waterways in drainage networks, particularly the lower Taieri and the Clutha River systems, are often thought to contain limited ecological values. These drains have unattractive aesthetics and are often in intensively developed farmlands. Due to this, they are perceived to be part of the farming operation rather than a watercourse that holds ecological values. However, drains often have fish assemblages comparable to nearby natural streams and sometimes contain more diverse animal communities than unmodified waterways. (Greer 2021).

Otago freshwater fish can be split into two broad groups: diadromous (migrate between fresh and saltwater) and non-diadromous. Each of these groups will use highly modified systems. There has been more stream and wetland modification in Otago lowlands, and modification is probably at its highest closer to the coast. Consequently, lowland drains are more likely to provide temporary habitat for diadromous species, including eels and whitebait species. Also, drains can provide permanent habitat where surrounding habitats have been lost or degraded.

Although drains are less common in the Central Otago area, non-diadromous species such as upland bullies and species that form part of the Otago non-migratory galaxiid complex will permanently occupy drains and water races.

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Advice

There is no specific Code of Practice for the Otago Region for this topic, the following text comes from Dr Mike Greer (2021). Dr Green provided technical advice for mediation of the effects of drain maintenance for Southland Regional Council and Greater Wellington (2022).

Dr Greer outlined the following to minimise the effects of draining maintenance:

Conduct fish recovery

To minimise the adverse effects of fish stranding during and after drain clearance, it is good practice to conduct fish salvage in the following manner:

1. Undertake a fish removal operation prior to undertaking the drain clearance
2. Drain clearance operations should be avoided, during hot days where temperatures are greater than 20°C.

Search the spoil for fish as soon as removing it from the waterway;

1. If recovered fish are not returned immediately to the waterway upstream of the drainage works, place them in a bucket or fish bin containing clear water from the waterway being cleared;
2. Keep the water in the container well aerated and below 18°C by;
   - Using an aquarium bubbler; or
   - Providing manual aeration by frequently stirring up the water or pouring in new water from a height of at least one metre; and
   - Place the container in the shade and replace the water as often as necessary.
3. Hold the fish for no more than one hour before returning them to the drain upstream of the drainage work; and
4. Periodically re-examine the spoil throughout the day, at the end of the day and the next morning for any remaining fish. Store and return recovered aquatic life to the drain using the process above.

Use a weed rake in hard-bottomed drains.

Weed rakes (rake-type excavator buckets) allow fish caught in the spoil to escape. Using these rakes is especially useful in waterways known to contain species that utilise plants for cover, like longfin eels, or in areas where rare or threatened species are present. However, weed rakes are inefficient at removing sediment and inappropriate for use in operations where silt removal is a primary objective. If large amounts of fine sediment are present, weed rake used to clear drains may increase the adverse effects by stirring up silt without removing it. Consequently, operators should limit using weed rakes to gravel bed streams or drains with very little deposited fine sediment on the bed.

Leave the bucket submerged at the end of each scoop.

Fish can often swim out of the excavator bucket while it is still in the water. If operators find large numbers of native fish with spoil, they should ensure that the bucket is submerged long enough at the end of each scoop so that fish can escape.

Distribute spoil so that eels can return to the water.

Eels can often return to the waterway from the spoil, provided operators deposit it correctly. Spoil should be spread evenly along the bank, not placed in discrete built-up mounds. Spoil should be placed at the minimum distance from the waterway to ensure it does not re-enter the channel during heavy rain to increase the chances of stranded eels returning to the waterway (see Section 3.2.2.1 below). Eels can travel long distances on wet grass but tend to move downhill. If the bank is built up and sloped on both sides, the spoil should be placed on the 'ridgeline' to encourage eels to move towards the waterway rather than the adjacent dry area.

Place spoil away from the waterway. It is good practice to place spoil in a way that prevents the sediment removed by the excavator from falling back into the channel during floods or re-entering through surface run-off. The distance will depend on bank gradient, maximum water height etc., and operators must determine this case-by-case. It is important to note, however, that spoil should not be placed further from the waterway than is necessary to prevent re-entry, since this may reduce the number of stranded eels and other fish that can return themselves to the channel.

Minimise downstream sediment transport.

To minimise the risk of sediment impacting fish and invertebrates downstream of the excavator, it is good practice to trap and retain as much disturbed sediment as possible before it moves out of the reach. There are several methods of doing this:

- Install permanent sediment traps – Sediment traps are wide, short and deep excavated pools. As water flows into these pools, velocity reduces, allowing fine sediment disturbed by the excavator to settle out onto the stream bed. After drain clearance, the fine sediment accumulated in the trap is excavated. Permanent sediment traps can also control sediment transport even when drain clearance is not occurring, which may decrease the frequency at which clearance is needed.
- Install temporary sediment retention devices – Sediment retention devices are commonly made by stretching filter cloth across the channel to form a silt fence or placing hay bales on the bed and securing them with waratahs (steel stakes). When placed at the downstream end of the cleared reach these devices may provide some sediment control in small waterways. While these devices are cheap and easy to install, in some instances, they may "blow out" and wash away without frequent monitoring and maintenance. Accordingly, they are ill-suited to large clearance operations in fast-flowing drains.

Maintain an uncleared section downstream of the excavated area – Leaving an uncleared section of aquatic plant material downstream of the excavator will trap and retain some sediment released during drain clearance. The uncleared section of aquatic plants can then be excavated to prevent the sediment retained within it from moving downstream.

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Use a conventional bucket in heavily silted drains.

Removing aquatic plants reduces bed stability, allowing sediment to continually resuspend until being transported out of the cleared reaches or reconsolidated by re-emerging plants. Using a conventional bucket rather than a weed rake in heavily silted drains will remove a significant proportion of the sediment and limit sediment suspension effects in the following weeks and months. The downside is that the rate of fish stranding will be greater than when using a weed rake. However, operators can mitigate this through fish recovery.

Recover distressed fish from the waterway.

Operators can reduce fish mortality from de-oxygenation caused by sediment suspension by recovering and relocating fish exhibiting obvious signs of stress (gasping for breath at the surface, floating belly up etc.) within the waterway. Operators should conduct recovery in all heavily silted waterways containing healthy fish populations.

Do not remove vegetation from the dry banks and stabilise soil exposed on the bank during weed control.

Scraping the banks with the excavator bucket during drain clearing significantly increases erosion risk by removing the vegetation holding the bank together and exposing soils prone to surface wash. Such bank erosion can significantly impact habitat structure, sediment transport, channel shape and hydrology. To minimise the adverse effects of drain clearing on bank erosion, it is good practice to retain vegetation cover on the banks of the channel by avoiding contact between the cutting edge of the excavator bucket and the dry bank, especially when working in deeply incised steeply banked channels. It is also good practice to re-seed or replant areas of bare earth on the bank.

Practices to reduce effects.

Partially clear plants from the waterway

Plants provide important habitat for invertebrates and fish in soft-bottomed streams. It is good practice for operators to maintain at least some vegetation to minimise the impacts of drain clearing on aquatic fauna.

This can be achieved in one of two ways:

- Retain sections of intact aquatic vegetation at regular intervals – Where high-value species are present and full restoration of hydraulic capacity is not required, operators should take a staggered approach to clearing by retaining short, uncleared sections of aquatic plants at regular intervals along the cleared reach.

Clear one side of the drain at a time – Where restoration of hydraulic capacity is of the utmost importance and leaving entire sections of the waterway undisturbed is not an option, limit plant removal to one side of the drain at a time, leaving a strip of vegetation along the opposite bank to provide refuge habitat for fish.

Installing artificial fish refuges.

If partial clearance is not an option, operators can potentially replace fish habitat lost during drain clearance with artificial refuge structures made of PVC piping, concrete masonry units or wood. Cover-loving species like giant kokopu and eels (all taonga species) have been found to use such structures in the Waituna catchment, and their presence after drain clearance is likely to reduce the number of fish leaving in search of habitat. Artificial refuge structures have the benefit of being permanent installations, meaning that, unlike partial clearance, they represent a one-off investment. However, this form of mitigation is expensive, largely untested and may require resource consent depending on the design. Thus, in most cases, partial clearance is likely the best method of maintaining habitat after drain clearance. Indeed, improperly designed refuge structures may not provide appropriate habitat and result in bank erosion. Thus, expert ecological and engineering advice should be sought if considering this option.

Avoid clearing all waterways on a property at once.

Aquatic ecosystems recover from disturbances like drain clearing quicker when an undisturbed habitat is nearby for fauna to move into and recolonise from. Where possible, avoid excavating all the waterways on a property or in a catchment in any one year. If the waterways require clearing every five years, clear one-fifth annually.

Do not alter the width or depth of the channel.

To minimise the adverse effects of drain clearing on aquatic habitat and bank erosion, it is good practice to maintain the channel profile by only removing unconsolidated fine sediment deposited on the bed since it was last cleared. In most instances, an experienced excavator operator should be able to differentiate between deposited fine sediment and the underlying original bed. Even in soft-bottomed streams, the sediments that make up the "original" bed are generally more consolidated than those deposited on top.

Preserve specific habitats.

Before undertaking the works, inspect the targeted section of the waterway. Identify and mark features, such as pools, riffles, woody debris, threatened species habitats, or sections of the channel that should not be disturbed during excavation, and ensure the operator knows to preserve these features. It is especially important when working in tidal areas to identify potential inanga spawning habitat (riparian grasses covered by water during spring tides) and avoid either removing it with the excavator or destroying it when dumping spoil.

Avoid removing gravel

Gravel provides valuable habitat for fish and has the added benefit of being a poor rooting environment for recolonising plants. Where possible, only remove fine sediment from the channel.

Maintain variability in stream bed profile.

Small variations in the stream bed profile have minimal effect on hydraulic efficiency and provide important habitat diversity. To preserve these features, avoid excessive levelling of the stream bed.

References

Greer.M (2021): Southland Water and Land Plan: Technical advice for mediation.

Greer M (2022): Good Guide for landowners & excavators Practices for the Management of Highly Modified Waterways. Greater Wellington.