

Sediment Traps

WORKING FOR OPIHI WATER

www.landcare.org.nz/Regional-Focus/Christchurch-Office/Opihi-Catchment-Project

WHAT ARE THEY?

Sediment in drains and streams is largely made up of soil (clay, silt and sand) and gravel. A sediment trap is an area where the runoff from a paddock will collect and settle for sufficient time to allow any sediment in suspension to drop out before the water drains away through an overflow or spill way. Any measure that spreads water out and slows down the flow, will allow sediments to drop out.

Ponds are formed by excavation into the ground or by the construction of an embankment. They are designed so water leaves at a rate that will allow suspended sediment to settle out.

Drains can and do catch sediment. Sections of a drain can be engineered to increase the amount of sediment that they collect.

Swales are relatively flat grassed areas with gently sloping sides and a gentle longitudinal slope. They are generally used to transport runoff following a heavy rain. Water flows at a low velocity so that the grass acts as a filter to remove sediment.

PREVENTION IS BEST

The reason there is sediment in a catchment is that erosion is occurring.

It's best to prevent clay in particular to being exposed to runoff in the first place.

First of all you need to look at where and why erosion is occurring.

- Use minimum tillage or no tillage cultivation practices to retain topsoil.
- Select cropping paddocks carefully, limiting cropping on steep slopes and in low lying areas such as gullies and swales.
- Avoid over grazing by using the correct stocking intensity and grazing duration to retain vegetative cover, reducing the potential for sediment loss and erosion. Grass cover can provide land with erosion protection from water flows from up to 2 metres per second.
- Identify potential erosion risk areas and stabilise them before they move. Establish deeper rooting trees to ensure longer term stability of unstable areas.



WHY HAVE SEDIMENT TRAPS

Land is lost through erosion which decreases the amount of nutrient rich topsoil available for grass or crop growth, reducing profit and production. Phosphorus binds to the soil particles, so when the farm loses sediment it also loses nutrients.

Erosion can result in sediment, phosphorus and bacteria entering waterways, potentially having a negative effect on water quality.

Sediment build up can obstruct water channels, reduce drainage and possibly cause flooding.

Excessive amounts of sediment in waterways can make it too dirty for fish to live and feed; covering stream beds and suffocating fish eggs and invertebrates. It also affects the availability of water for stock water, domestic supply and irrigation.

Slow down water velocity, whenever possible, to minimise scouring and the loss of suspended sediments. Sand and larger silt particles will settle out reasonably quickly, however clay and fine silt will take much longer (a number of weeks).

When sediment is cleaned out from sediment traps and returned to paddocks it can be phosphate rich, improving pasture growth.

CREATING SEDIMENT TRAPS

– Plan

- How you shape the trap(s) is very site specific. Talk to the experts before you begin.
- The size of a sediment trap will be influenced by the size of the catchment area; soil type and soil aggregate size, the slope of the catchment and the severity of significant rainfall events. The catchment area is the area of land that drains into a given silt trap.
- Plan before you dig. Seek advice from Environment Canterbury (ECAN) regarding consent requirements, location and design of in-channel sediment traps.
- Prepare a construction and maintenance plan ahead of time and be sure to obtain the necessary consents before you do any physical work.
- The trap should be positioned where there is no risk of it causing channel instability or compromising infrastructure such as bridge crossings.

Low lying area with grass buffer surrounding it to reduce sediment loss to water from the kale crop.



– Construct

- Retain natural vegetation cover where possible at the inlet to the sediment trap as this will filter runoff as it enters the trap. This could be exotic or native grasses and sedges.
- Don't create steep banks as they will be more prone to erosion (45° or less is better).
- Walls of a pond must be well compacted, otherwise they can blow out in storm events.
- Ensure the overflow or spillway is not in line with the water entrance and will not cause erosion.
- Ensure the system is engineered so that the water does not become stagnant and de-oxygenated.
- Allow for 2 or more ponds if the situation is suitable, with the smaller first pond designed so that it can be cleared of sediment more regularly while the second larger pond will allow for more filtering of water.
- When constructing a sediment trap avoid the most sensitive times for fish and animals, usually summer and autumn are best when water flows are lowest.
- Avoid creating a sediment plume downstream by diverting the water around the trap during the construction.
- Plant mainly grasses in areas where heavy equipment will be coming in to do pond maintenance.
- Plant suitable vegetation to stabilise the banks (eg. grasses or sedges).
- Willows don't do much to slow down the water flow but they do protect stream corners. Don't plant in stream areas as they will block waterways.

Fine silt and clay stay suspended in the creek for a long time.



– Don't forget maintenance

- Inspect traps regularly and particularly after each storm.
- Fix any damage.
- Sediment traps will need to be cleaned out – make sure you have the space along one side, suitable access and the fencing and planting allows for this. This includes putting gateways into sediment trap fencing. Check with ECAN, a consent may be needed to clean out the sediment pond.
- Retain at least 50 percent storage capacity by cleaning.
- A sediment trap that is not cleaned out can become a sediment source.
- When sediment traps get too shallow the sediment can get stirred up by ducks or storm events and the sediment ends up back in the waterway.

BIODIVERSITY

Before removing mature willows check whether they are a roosting place for long-tailed bats. On the East Coast of the South Island bats are limited to a small area from Peel Forest and southwards through the foothill gorges of the Orari, Waihi, Te Moana Rivers and the Kakahu and Opihi Rivers.

Canterbury has less than 0.5% of its original native vegetation, so planting around a sediment trap can help. When planting natives, only plant an area each year that you can easily manage for weed and pest control. Consider, sedges (*Carex secta*) and rushes at the water edge and tussock, flax, toetoe, cabbage tree, ribbonwood and kowhai on the banks. Their roots can help bank erosion. (Refer to the companion publication Orari-Opihi-Pareora Planting Guide at www.landcare.org.nz/Regional-Focus/Christchurch-Office/Opihi-Catchment-Project)

You can discourage large flocks of ducks, geese and swans by limiting grassy bank areas and densely planting the margins of the pond. Waterfowl introduce significant amounts of nutrients and E.coli into a pond and stir up the sediment



REDUCING SEDIMENT LOSS – A FARMERS EXAMPLE

Kelly Bennett, a member of the Kakahu Catchment Group, farms a property between Geraldine and Fairlie that has steep slopes, plenty of rainfall and a Claremont soil type that drains poorly due to the clay pan. Runoff is worst during the winter, when soil gets saturated. There are usually eight to ten flooding events a year. Kelly is reliant on growing kale to feed his deer over winter. All the water running off the property and surrounding catchment ends up in a single creek. The combination of all the above results in high levels of sediment loss into the creek that feeds into the Kakahu River. Kelly is keen to ensure all of the water that leaves the farm is as good as it can be.

A pond that was originally created as a duck pond effectively catches sediment from one third of the property, thus it is acting as a sediment trap. This pond over the last ten years has filled up with at least 2 metres of sediment. Kelly is now looking at options that include cleaning out the pond, and/or creating a new second sediment pond above the other pond. Other options

The deer fence pole in the centre shows that sediment has built up about 1m over the last 10 years. This willow could be removed, but in South Canterbury you need to ensure it is not a roost for long-tailed bats.

include creating other additional ponds to catch the sediment from the remaining two thirds of the farm. Due to the steepness of the surrounding catchment, the soil type and the flood events it will be very difficult to capture all the sediment and phosphorus. One of the biggest issues for Kelly to do this work is the cost of getting consents from Ecan which could be in the \$3000 - \$5000 range. However it is possible to get a single consent for a range of environmental projects on the property, covering several years.

For further information refer to *New Zealand Guidelines for Constructed Wetland Treatment of Tile Drainage*; NIWA Information Series No.75, 2010. ISSN 1174-264X

For information about consents and waterway management please contact Environment Canterbury 0800 EC INFO (0800 324 636) www.ecan.govt.nz

