



NUTRIENTS AND CRITICAL SOURCE AREAS

There are two types of discharges to water from land which need to be managed:

- **Point source discharges** refer to contaminants that enter waterways from a direct source such as a septic tank, yards, ofal holes, chicken runs.
- **Non-point source discharges** refer to contaminants that enter waterways from a variety of sources cumulatively, most commonly pasture runoff. Critical source areas are a subset of non-point source discharges.



CSA in paddock flowing into waterway

CRITICAL SOURCE AREAS (CSA)

A critical source area, or CSA, refers to the small and low-lying areas on your land, such as a gully, where runoff gathers. When carried to waterways, this runoff takes with it sediment and nutrients that enter waterways.

Intercepting contaminants before they enter waterways is key to improved water quality.

- Walk the farm and identify critical source areas and point sources where faeces, nutrients and sediment can enter the waterways. Look for point sources such as septic tanks, rubbish pits, stock yards, water troughs, chicken coops, pig pens, ofal holes, or stock camps as well as low lying areas where water pools and travels during wet weather.
- Prevent leaching of water from these areas by directing run-off into wetlands or paddocks using cut-offs.

Plant riparian buffers (see Planting resource) to filter runoff – grass will act as a filter, although a planted margin will offer enhanced and additional benefits such as reducing water temperature through shade and creating habitat for birds and for fish.



CSA in gully of cropped paddock

WHAT ARE THE BENEFITS OF MANAGING CSA'S?

By managing critical source areas landowners can:

- Reduces the loss of valuable topsoil
- Reduce the level of nutrients and sediment entering waterways
- Keep animals out of CSAs which can improve hoof health and reduce the incidence of mastitis.

BEST MANAGEMENT PRACTICES FOR REDUCING CONTAMINATION OF WATERWAYS

- Avoid break-feeding stock close to waterways, especially in wet weather.
- Fence off streams, rivers, swamps, wetlands and seeps to prevent stock access. Use them to filter runoff.
- Plant the banks of waterways with a selection of native plants to help stabilise the bank and trap nutrients.
- Fence and retire wetland areas and ponds. They act as filters and help denitrify excess nitrogen leaving the farm.
- Maintain fences around waterways with a margin between the waterways/drains and the paddock. Control weeds, including willow regrowth, along the stream margins.
- Design and maintain tracks and races to direct run off onto grassed areas.
- Use bridges or culverts for stream crossings.
- Leave a buffer zone between streams and cultivated areas.
- In winter, break feed towards a waterway rather than away from it

And if you irrigate using effluent:

- Move effluent irrigators frequently to prevent ponding of effluent and run off into waterways.
- Provide effluent storage so that dairy shed effluent can be applied at optimal times.
- Maintain a safe distance between waterways and effluent system.
- Avoid irrigating effluent over subsurface drained land.

For more information on managing Critical Source Areas see:

<https://www.dairynz.co.nz/environment/land-management/critical-source-areas/>



Cattle grazing in a critical source area



Channelling contaminated water using a cut-off into a paddock



Stock and vehicle crossing that needs a culvert



Leaking troughs can contaminate waterway

PHOSPHOROUS AND NITROGEN

Nutrients such as nitrogen and phosphorous are important for the growth of plants, including pasture and crops.

If nutrients are applied in too high a concentration, they may enter the waterways, and this can cause the rapid growth of unwanted plants and algae as the natural balance of the ecosystem has been affected. Exotic weeds can then take over and once these die and decompose, the available oxygen in water is used up causing the death of fish and invertebrates which rely on water-borne oxygen.

Being aware of what your soil and land use needs are and using only the amount of nitrogen and phosphorous that is required at the right time, is important. It is also a waste of money to put fertiliser on land when it is not required or if used ineffectively. It is important to soil test.

BEST MANAGEMENT PRACTICES FOR MANAGING NUTRIENTS

- Don't apply nitrogen at rates greater than 40 kgN/ha to minimise leaching losses and maximise profitability and don't exceed 100 kgN/ha annually. Light rain after nitrogen application is ideal to reduce volatilisation losses.
- Don't apply nitrogen routinely, only when short of feed.
- Nitrogen should not be applied when soils are below 6°C, wet or are severely compacted.
- Keep Olsen P at agronomic optimum, usually 20-30, using soil testing. Consider occasional all paddock testing.
- Superphosphate is not applied when soils are wet or ideally if rain is forecast within next 7 days.
- Use equipment for fertiliser application that is suitably calibrated and well maintained and that can track fertiliser placement.
- Fertiliser should not be applied within 5 m of any waterway or in gullies.
- Use 5 m riparian planting as a buffer between paddocks, races and the water. The plants act as a filter, slowing down runoff and catching sediment and phosphate.
- Store and load fertiliser to minimise risk of spillage, leaching and loss into waterways.



CSA in grass paddock



CSA in bank eroded by sheep grazing



Grassy swale protecting CSA

SEDIMENT

Sediment in waterways can very quickly alter ecosystem health and have an impact along the entire catchment including into our marine environments. There are natural causes of sediment, however high rates of sediment are usually the result of human activity and land use.

Sediment is increased when vegetation cover is removed, when stock have access to riparian margins and trample stream banks, or when there are earthworks happening.

Sediment becomes suspended in water and reduces clarity, is harmful to fish, and can destroy spawning habitats. Pathogens such as *E. coli* can be carried through sediment.

See more in the sediment mitigation resource.

PATHOGENS

Faecal matter from animals and from humans contains bacteria that has grown in the gut, some of which can cause serious health problems in humans if they are carried in water used for drinking or for swimming. This includes giardia, campylobacter, cryptosporidium, and *E. coli*. These pathogens can be present not only in flowing water, but also in groundwater.

The source of pathogens in rural waterways usually comes from runoff from paddocks which carries faeces from various animals and wildfowl, from stock having direct access into streams where they defecate, or from septic tanks that are not adequately maintained.

These can be reduced using filtering sediment dams and wetlands, riparian planting and mitigating critical source areas.

For more information on managing and mitigation of *E. coli*: <https://www.landcare.org.nz/resource-item/mitigating-e-coli>



Grass swale capturing sediment protecting CSA