**NIWA - Issues**

**Water clarity**

**Water clarity or turbidity is the cloudiness or haziness in a fluid caused by individual small particles (suspended solids).**

An increase in turbidity results in a corresponding decrease in water clarity. High turbidity may be from an increase in phytoplankton (algae) or an increase in sediments. This may be in response to nutrient inputs and erosion due to land development, stormwater runoff from paved surfaces, wastewater/other discharges, or farming/forestry practices. Urbanisation, forestry, agriculture, industries that discharge into waterways, and mining are all likely to increase turbidity of nearby waterways, especially when these involve large quantities of stormwater and surface runoff.

**Potential impacts of turbidity on water quality and mahinga kai**

* Cloudy water that may be green or brown reduces the ability of fish to see prey and detect predators.
* Reduced light penetration - reduces or inhibits growth of aquatic plants and their ability to produce food and oxygen (DO) for species that depend on them.

<https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/water-clarity>

# Nutrient overloading

**Nutrients in waterways are essential for the growth of algae and aquatic plants but too much can destroy an ecosystem.**

Nutrients in streams are essential for the growth of algae and macrophytes (aquatic plants) that are an important food source for many small invertebrates and fish. The main nutrients in waterways come in the form of inorganic nutrients (simple chemicals) called nitrogen (N) and phosphorus (P). However, only small amounts of each are required in a natural ecosystem and any additional increase of these nutrients in waterways can quickly become a nuisance by causing excessive algae and plant growth. Increases in nutrients are nearly always as a result of land use activities or direct discharges from industry. An increase in the available nutrients in waterways is called eutrophication, which can have severe environmental effects.

[More information on different land use activities and their potential impacts on waterways](https://www.niwa.co.nz/node/83041/)

Both the concentration of nutrients and the means by which they enter a waterway vary greatly. Nutrients may enter from the surrounding catchment from erosion (e.g., when exposed soils are washed from the land into a river/stream after trees are cut down), from stock entering waterways, or from fertiliser applied to pasture or crops. Some nutrients will bind to sediment particles and enter streams from soil erosion. Other nutrients are water soluble and these leach from soils and into streams via groundwater. Nutrients may also enter in the form of leaves, woody debris, grass, and other organic materials. These decompose slowly and release nutrients over time, comprising an important source of food as well as creating habitat for stream invertebrates and fish.

[More information about sediment](https://www.niwa.co.nz/node/90645/)

The nutrient status of a lake, stream, or river reflects the land use of the surrounding upstream catchment. Nutrients may be delivered to larger rivers or lakes by the myriad of smaller interconnecting streams that form a river network within a catchment area. Alternatively, a nutrient-rich lake may feed downstream rivers or streams with nutrients. The ability of a stream or river to process the nutrients present in stream water or nutrients entering from streamsides depends on a range of variables, such as water velocity and depth, catchment geology, benthic substrate (rocky or sandy), and the presence of streamside riparian vegetation.

[More information about loss of riparian vegetation](https://www.niwa.co.nz/node/89889/)

**Potential impacts of high nutrients on water quality and mahinga kai**

* Eutrophication - excess nutrients in lakes, estuaries, or slow-moving streams and rivers can lead to an increase in primary productivity (excessive plant and algal growth) that degrades water quality.
* Loss of species - an increase in plant growth, sometimes called an algal bloom, reduces dissolved oxygen (DO) in the water when the algae die and decompose and can cause organisms (fish and invertebrates) to die. If this cycle happens repeatedly, species may be lost from the lake or waterway.
* Loss of habitat - eutrophication of the water can kill off plants that fish depend on for their habitat and alter the lake bed habitat for invertebrate species.
* Increased turbidity and decreased visibility - when algae increases in response to nutrients this reduces water clarity, visibility, and recreational suitability. It also reduces the ability of some fish to see prey or predators.

**Eutrophication**

**Lakes and estuaries can be described by their nutrient status.**

The trophic status of a lake or estuary refers to the primary productivity (amount of algae) produced in the water and the amount of nutrients (P and N) in the water. Oligotrophic waters usually have low primary productivity (high water quality and few algae) and are nutrient poor, while eutrophic waters have high primary productivity (low water quality and frequent algal blooms) due to excessive nutrients. Mesotrophic waters lie somewhere in between the two states. Eutrophication is an increase in the nutrients available in a waterbody which can subsequently increase primary productivity and degrade water quality, leading to a reduction in mahinga kai habitat and survival.

**Potential impacts of eutrophication on water quality and mahinga kai**

* Excessive plant and algae growth and decay - especially invasive weed species.
* Decreased dissolved oxygen (DO) levels - fish ‘breathe’ oxygen through their gills, therefore a decrease in available oxygen (anoxia) in the water column threatens their ability to respire, which may lead to death.
* Increased turbidity and decreased water clarity - water becomes cloudy and coloured green and brown, which reduces the ability of fish to see, prey, and detect predators.
* Seasonal release of nutrients stored in the lake bed sediment - contributes to the cycle of eutrophication.

<https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/eutrophication>

**Nutrients, meat and dairy**

**What are the potential sources of nutrients from the meat and dairy processing industry?**

Wastewater that is discharged from a processing plant into a waterway will contain nutrients and suspended solids that can cause eutrophication and significantly reduce water clarity. On-site secondary and tertiary wastewater treatment can reduce the impacts of wastewater before it is discharged into a waterway.

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# Nutrients and agriculture

**What are the potential sources of nutrients from agricultural activities?**

Nutrients on farms can come from animal urine and manure, fertiliser, milk residue, and wastewaters. They may enter waterways from animals entering streams without adequate fencing and riparian vegetation , oxidation pond discharges, surface water runoff from the land during periods of heavy rain, or from leaching into groundwater.

[More information on riparian vegetation and agriculture](https://www.niwa.co.nz/node/101920/)

Excess nutrients are more likely to enter waterways when vulnerable areas on the farm are not carefully managed. Nutrients hotspots on farms include areas where animals walk or 'camp' frequently, road and track runoff, eroding soils (nutrients can be bound to sediment), stream crossings, and effluent from dairy sheds, silage pits, oxidation ponds, and other wastewater discharge and storage areas that have been inadequately treated.

[More information on sediment and agriculture](https://www.niwa.co.nz/node/94692/)

**Potential impacts of high nutrients on water quality and mahinga kai**

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* Loss of species - an increase in plant growth, sometimes called an algal bloom, reduces dissolved oxygen (DO) in the water when dead plant material decomposes and can cause organisms (fish and invertebrates) to die. If this cycle happens repeatedly, species may be lost from the lake or waterway.
* Loss of habitat - eutrophication of the water can kill off plants that fish depend on for their habitat and alter the lake bed habitat for invertebrate species.
* Increased turbidity and decreased visibility - when algae increase in response to nutrients this reduces water clarity, visibility, and recreational suitability. It also reduces the ability of some fish to see prey or predators.

# Other Causes of Nutrient Overloading

**What are the potential sources of nutrients from land use activities?** [**https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki\_tools/impacts/nutrients/causes-of-nutrient-overloading**](https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading)

## [Nutrients and agriculture](https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients)

What are the potential sources of nutrients from agricultural activities?

<https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients>

## [Nutrients and aquaculture](https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients-and-aquaculture)

What are the potential sources of nutrients from aquaculture activities?

<https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients-and-aquaculture>

## [Nutrients and horticulture](https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients-and-horticulture)

What are the potential sources of nutrients from horticultural activities?

<https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/land-use/horticulture/impacts/nutrients-and-horticulture>

## [Nutrients and urbanisation](https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients-and-urbanisation)

What are the potential sources of nutrients from urbanisation?

<https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients-and-urbanisation>

## [Nutrients and wastewater](https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutriends-and-waste-water-treatment)

How do nutrients from wastewater treatment enter waterways?

<https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutriends-and-waste-water-treatment>

## [Nutrients and wood processing](https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients-and-forrestry-processing)

What are the potential sources of nutrients from wood processing activities?

<https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/land-use/foresry-processing/impacts-of-forest-processing/nutrients-and-forrestry-processing>

## [Nutrients, meat and dairy](https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients-and-meat-and-dairy-processing)

What are the potential sources of nutrients from the meat and dairy processing industry?

[**https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki\_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients-and-meat-and-dairy-processing**](https://www.niwa.co.nz/our-science/freshwater/tools/kaitiaki_tools/impacts/nutrients/causes-of-nutrient-overloading/nutrients-and-meat-and-dairy-processing)