How much nitrogen can vegetated drains remove?

Key messages

- Vegetation (like reeds, sedges and grasses) growing in drains can help reduce nitrogen entering waterways.
- Vegetated drains can be used to complement industry best management practices and further reduce nitrogen leaving farming areas.
- The Department of Agriculture and Fisheries is working with partners to find out exactly how much nitrogen is being removed in vegetated drains, and to compare that to non-vegetated drains.
- The trials will look at the practicality of retaining low-growing vegetation in drains and ensure this does not increase flood risk or maintenance costs.
- Results from the trials will inform drain management guidelines.

Why drains?

Drains are common throughout agricultural areas and play an important role in moving water off crops to avoid waterlogging and production impacts. Monitoring of drains near Tully and Innisfail in the Wet Tropics, showed that drains can also help remove excess nitrogen before it enters creeks and wetlands. These drains had patches of vegetation(like reeds, sedges and grasses), which provide the ideal conditions for nitrate-nitrogen in the water to be converted into atmospheric nitrogen, a harmless gas, through a process called denitrification (Figure 1). This denitrification process is undertaken by naturally occurring microbes, which need a carbon source (plants) and low oxygen environment.

Waterlogged soils with plant roots provide ideal conditions for denitrification. Although in high water flows, where there is lots of oxygen in the water and short retention times, the potential for denitrification and hence nitrogen removal, will possibly be reduced. Understanding the range of flow conditions where denitrification is occurring is important for determing the potential for drains to remove excess nitrogen in farming areas.

Figure 1 Vegetation in drains like this can help remove nitrogen from farm run-off.

What is the aim of the trials?

Trials are being conducted in the lower Burdekin and Herbert catchments to investigate how much nitrogen (specifically the dissolved inorganic nitrogen - DIN) drains can remove. Five trial sites (three in the Burdekin and two in the Herbert) are planned.

Trials will involve monitoring a vegetated and a non-vegetated (sprayed out) section of drain under different flow conditions. Each trial will have a vegetated and non-vegetated section of equal length with monitoring stations set up at the beginning, middle and end of the drain trial site (Figure 2). In the vegetated section, low-growing reeds, sedges and grasses will be allowed to grow and the plants in the non-vegetated section will be sprayed out.

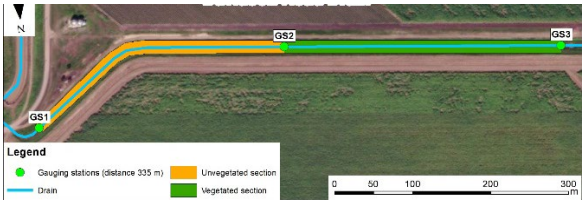

Figure 2 A drain trial site showing the three monitoring points and vegetated (green) and non-vegetated (orange) sections.

What will the vegetated sections look like?

Plants suited to wet conditions will be allowed to grow in the bed of the vegetated section of the drain trial. These are low-growing (less than one metre) reeds, sedges, grasses or other small

water plants that will be overtopped, or lie flat, during flood events (Figure 3). At sites where there are no existing reeds and sedges, suitable vegetation will be planted in the bed of the drain.

Tall, dense reeds like typha and weeds like hymenachne will be controlled.

Figure 3 Patches of sedges like this will be allowed to grow or be planted in the vegetated section of the drain.

What is being monitored?

Equipment will be installed at the three monitoring points per drain. This includes automatic samplers or continuous nitrate monitoring probes depending on the site (Figure 4). There will also be water level monitoring probes and gauges, cameras and rain gauges. The following will be monitored:

- Water flow (velocity, water level)
- water chemistry (dissolved inorganic nitrogen, total suspended solids)
- vegetation cover
- soil carbon
- general water indicators (temperature, pH, dissolved oxygen, conductivity and redox potential).

The monitoring will occur from mid-2024 until early 2026.

The data collected will be analysed to assess:

1. if the DIN concentration and load decreases between the start and end of the vegetated section of drain
2. whether there is a difference between the vegetated and non-vegetated sections of drain
3. under what flow conditions DIN reduction occurs and what other factors (dissolved oxygen levels, soil carbon etc) influence DIN reduction.

The exact source of any DIN in the water and any associated management practices is not being investigated or reported. The site locations of the lower Burdekin sites will be deidentified before public release of results.

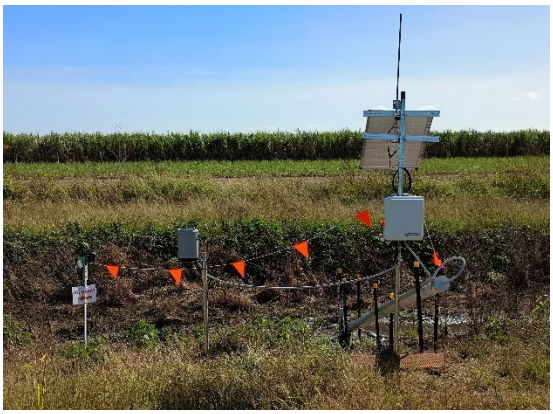

Figure 4 A monitoring station at one of the trial sites.

Who is involved?

The trials are being conducted by Department of Agriculture and Fisheries in partnership with Sunwater and Burdekin Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC) in the lower Burdekin and Hinchinbrook Shire Council and a technical consultant in the Herbert.

For more information

For information on the trials contact Carla Wegscheidl, Department of Agriculture and Fisheries, on 0429 212 752 or Carla.wegscheidl@daf.qld.gov.au.

The Wetland*Info* website contains information on wetlands, treatment systems, vegetated drains and denitrification.

The drain trials form part of the Agriculture Water Treatment Project funded through the Queensland Government's Queensland Reef Water Quality Program.

Information in this fact sheet is current as of July 2024.