

A high-speed photograph of water splashing, creating numerous droplets and a dynamic, wavy surface. The water is clear and bright blue, set against a lighter blue background. The splash is centered horizontally and occupies the lower half of the frame.

RIPARIAN BUFFERS GUIDELINE FOR DAIRY FARMERS

Dairy production and water go hand in hand. On the one hand, water underpins most requirements for a productive dairy farm. The quality and availability of water are limiting factors that can fundamentally affect growth and revenue. On the other hand, dairy farming has the potential to significantly impact water resources that negatively impact ecosystem health and long-term sustainability. The use of riparian buffer zones is internationally recognised as one effective method for reducing many of the impacts associated with dairy farming.

by Dr Jackie Dabrowski (Pr.Sci.Nat. Aquatic Science)

Background and study objectives

The Institute of Natural Resources NPC, in partnership with Confluent Environmental and the World Wide Fund for Nature South Africa (WWF-SA), was awarded a research project through Milk SA's research and development programme. The aim of the project is to describe what good environmental management looks like on a dairy farm, based on results of the two case studies, engagement with sector experts with a range of backgrounds (regulation, operational, soils, pasture, sustainability) through two engagement sessions, and a broad literature review. The emphasis throughout relates to actions that influence aquatic ecosystems and buffer zones. The reader should easily identify practices on the farm that support sustainable management of water resources, versus those that do not.

A key activity for achieving sustainability, according to Milk SA's focus areas is the 'implementation of riparian buffer zones'.

These impacts are often compounded by high levels of water abstraction, which reduce the dilution capacity of surface waters. Chronic exposure to these impacts can test the resilience of aquatic ecosystems state causing eutrophication, species loss, and reduced biodiversity.

Threats to water resources

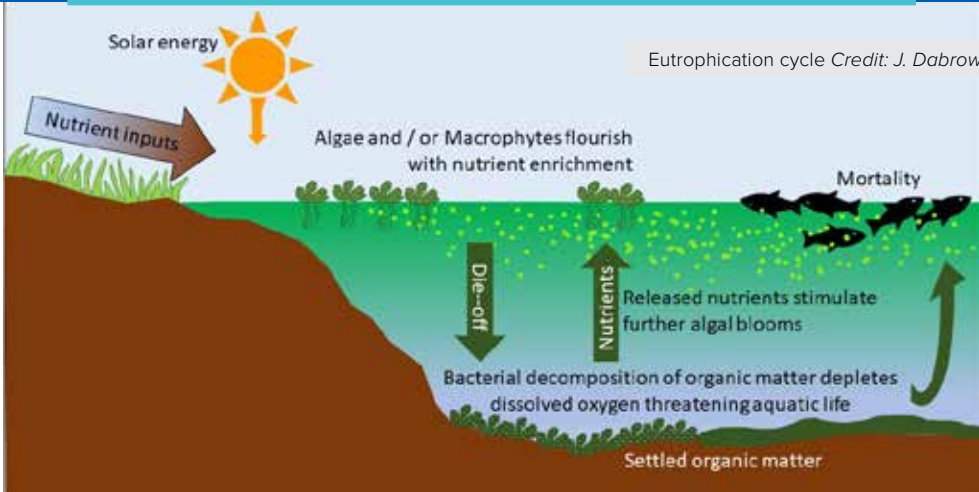
Some examples of potential impacts to water quality and quantity from dairy farming include:

- nutrient enrichment of watercourses from surface runoff of slurry and fertilisers applied to pastures or directly from slurry dams;
- sedimentation caused by soil erosion or soil disturbance or pasture rotation; and,
- bacterial contamination (e.g. *Escherichia coli*) due to cattle defecating in watercourses and/or slurry inputs.

Eutrophication is one of the biggest threats to water quality in South Africa, especially as water supplies are already limited by relatively low rainfall and periodic drought. Once a waterbody such as a dam or lake has been enriched with nutrients, the cycle of uptake and release by aquatic macrophytes or algae is difficult to break. Nutrients are retained in the algae or bottom sediments of the dam and can only be removed through costly and time-consuming interventions. Prevention of eutrophication is definitely better than cure!

Eutrophi-what?

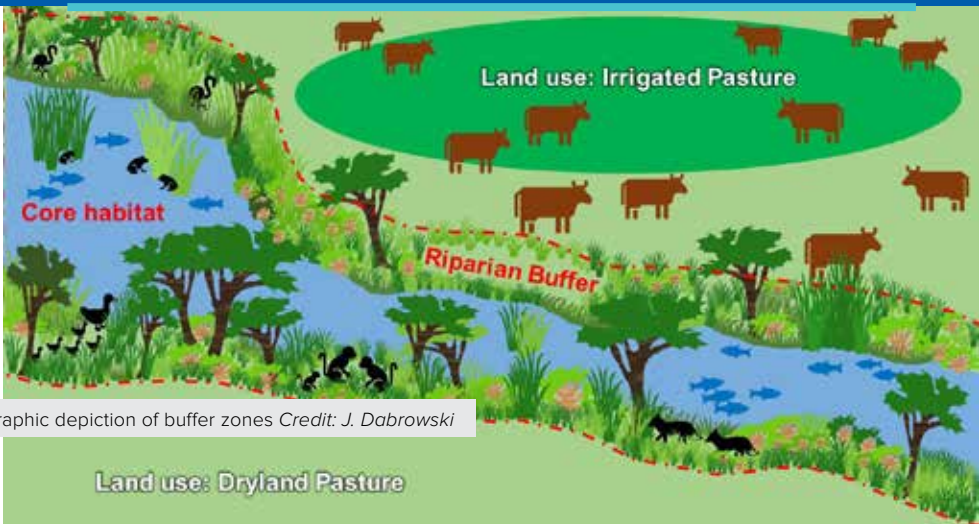
Eutrophication is the process of nutrient enrichment of waterbodies above reference or natural conditions. This effectively stimulates the growth of algae or aquatic plants to excessive degrees. Cyanobacteria blooms (blue-green algae) are often associated with eutrophication and can contain liver toxins harmful to cattle if consumed. When algae and aquatic plants eventually die, they sink and decompose, which depletes oxygen in the water causing fish kills. Nutrients in the plants are released back into the water, and the cycle begins again.



Riparian buffer zones as a tool

What is a buffer zone?

Buffer zones are defined as a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another.



Vegetated buffer zones adjacent to watercourses are one management tool that can reduce the impacts to aquatic ecosystems on a farm as well as downstream.

In the case of dairy farms, buffers can provide numerous direct and indirect benefits such as:

- Reduction in sediment, nutrient, pathogen, and toxics from surface runoff on adjacent lands.
- Maintenance of channel or riverbank stability and increased flood protection.
- Control of water temperature and microclimate.
- Provision of terrestrial and aquatic wildlife habitat and corridors for movement.
- Ancillary benefits such as visual screening and noise control.



An example of a 12 m buffered wetland on the Southern Cape case study farm, compared to a zero buffer degraded wetland on another dairy farm in the same region



Unpacking the guideline

The riparian buffers guideline is a comprehensive document designed for farm owners and managers, study groups, milk buyers, agricultural and environmental researchers, dairy business consultants, sustainability practitioners, and aquatic specialists.

A key question is how wide should the buffer be? This has important implications for the buffer's effectiveness as well as costs due to lost productivity. Recommended buffer widths were determined using the existing spreadsheet-based buffer delineation tool developed by Macfarlane and Bredin (2017). This tool is widely applied by aquatic consultants and supported by the Department of Water Affairs as a complimentary tool for the management of aquatic ecosystems. Originally developed for a wide range of sectors (e.g. mining, housing, energy etc.), this project refined the buffer tool for the dairy sector, taking dairy-specific practices and threats into account. The refined buffer tool was applied to two case study dairy farms from the Southern Cape and KwaZulu-Natal.

The guideline document includes sections detailing the following:

- **Threats posed by dairy farming to aquatic ecosystems** including generic and region-specific examples based on the case study farms.
- **Detailed explanation of buffer zones** including their application, importance, and limitations.
- **Best practice management actions for dairy farms** aimed at protecting water resources that complement the riparian buffers, mitigate risks, and can result in reduced buffer widths.
- **Applicable legislation and regulations** when working in watercourses.
- **Application of the buffer tool to the two case study farms.** Buffer zone widths are determined under high and low threat mitigation scenarios.
- **Implementation cost assessment** estimating the financial costs of implementing buffers within existing dairy pastures under high and low mitigation scenarios.
- **Common scenarios and applicability for artificially enhancing or creating wetlands** to improve water quality when buffers offer limited benefit.

Look out for Part 2 of this article in the January edition of *The Dairy Mail*, which will provide more detail from the guideline. The guideline will be