Minimising nitrogen leaching from warm-season turfgrass:

Irrigation & fertiliser strategies

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Key points

- *Nitrogen leaching is detrimental to ground and surface water quality, and represents a waste of fertiliser.*
- *Efficient irrigation management, and matching nitrogen fertiliser rates to turfgrass requirements, are the main strategies for minimising nitrogen leaching.*
- *The risk of nitrogen leaching from turfgrass should be low for all fertiliser types when recommended fertiliser and irrigation practices are followed.*
- *Turfgrass areas are most susceptible to nitrogen leaching during preparation for, and immediately following, planting.*

Background

Applying nitrogen fertiliser is an integral part of turfgrass management and is needed for maintaining turfgrass growth and aesthetics. Best management practices for irrigation and fertilisers are needed to prevent the leaching of nitrogen. Nitrogen leaching is problematic as it can degrade surface- and ground-waters.

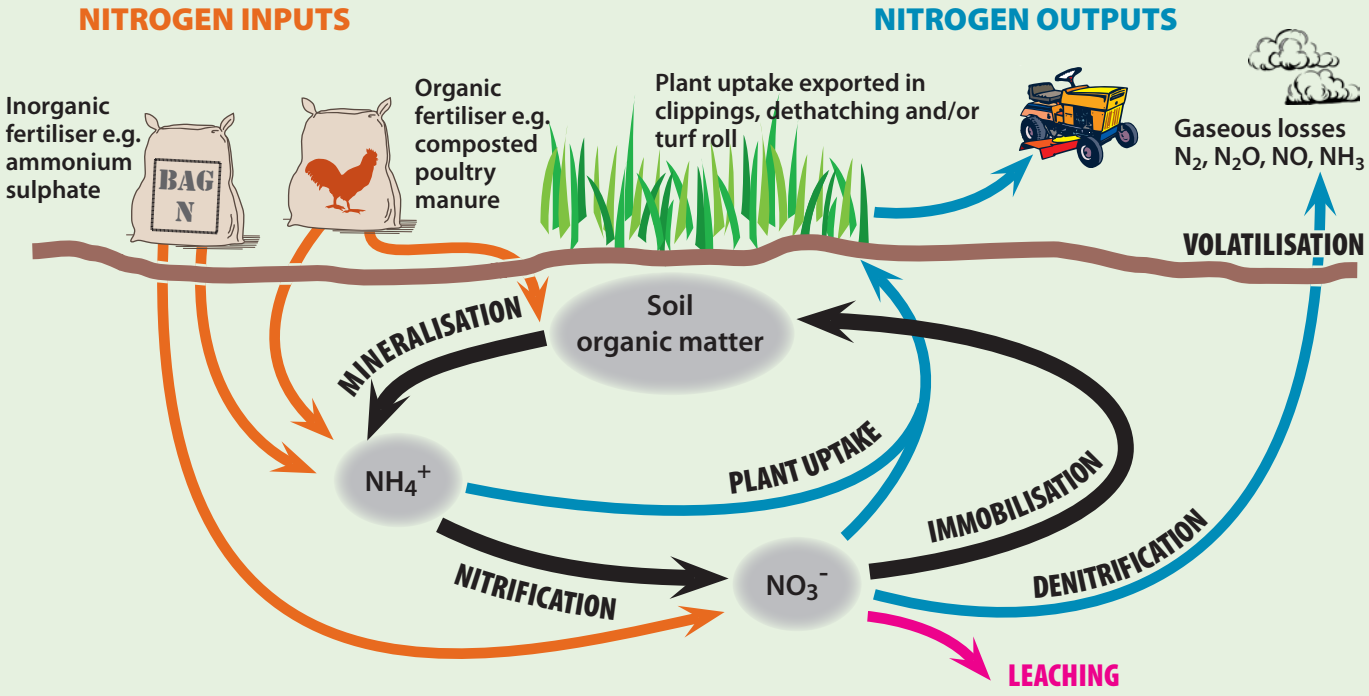
Causes of nitrogen leaching

Nitrogen fertiliser not utilised by turfgrass is subject to soil processes that may render it unavailable to plants (see diagram below). Many of the plant and soil processes that remove nutrients occur at a greater rate in the surface soil (e.g., top 20 cm) containing the majority of turfgrass roots. Nitrogen not taken up by the turfgrass, or made unavailable by soil processes, is at risk of being leached.

Irrigation and rainfall events that cause water to move beyond the rooting zone will promote nitrogen leaching. Therefore, choosing irrigation rates that maintain soil water in the rooting zone not only conserves water, but also minimises the risk of nitrogen leaching.

Turfgrass areas are most susceptible to nitrogen leaching during preparation for, and immediately following, planting.

Simplified nitrogen cycle for a turfgrass system (adapted from McLaren and Cameron, 1996)



During this stage, root development is shallow and not at a high density, and so nutrients can move beyond the rooting zone. Furthermore, the turfgrass is more likely to be receiving high rates of nitrogen fertiliser and irrigation immediately after planting.

Minimising nitrogen leaching

Efficient irrigation management is critical for efficient nitrogen fertiliser use. Irrigation scheduling that does not cause water to move beyond the active rooting zone decreases the amount of nitrogen leached from established turfgrass, without being detrimental to, and in some instances enhancing, turfgrass growth and quality.

Utilise irrigation systems that apply water evenly and at known precipitation rates. Irrigation systems should enable the operator to adjust applications according to turfgrass type and environmental conditions (i.e., daily and seasonal adjustments depending upon turfgrass water demands) or be adjusted by automated systems, such as weather stations or soil water (moisture) sensors.

Adjust nitrogen fertiliser applications over time. Applying nitrogen fertilisers at rates and frequencies that match turfgrass requirements minimises the amount available for leaching. The nitrogen status should be assessed using plant tissue testing, as older turfgrass (with organic matter contents) requires less nitrogen fertiliser than newly planted turfgrass.


Photo: K. Johnston

Benchmark irrigation scheduling and nitrogen fertiliser management regimes for warm-season turfgrass systems grown on sandy-textured soils, in Mediterranean-type climates in Australia.

Turfgrass system	Irrigation scheduling	Nitrogen fertiliser management [1]
Turfgrass farming	70% of cumulative net evaporation, daily	200–300 kg N per hectare, per crop, 'split' across 3-weekly applications
Amenity maintenance	60% of cumulative net evaporation, every second day	up to 150 kg N per hectare, per year, 'split' across four applications per year (2 in spring, 2 in autumn)

[1] Application rates are for inorganic nitrogen fertiliser (based per unit N, as percent N in fertilisers can vary, check product details)

Further reading and references

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