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NEW GUIDELINES FOR EDGE-OF-FIELD CONSTRUCTED WETLANDS

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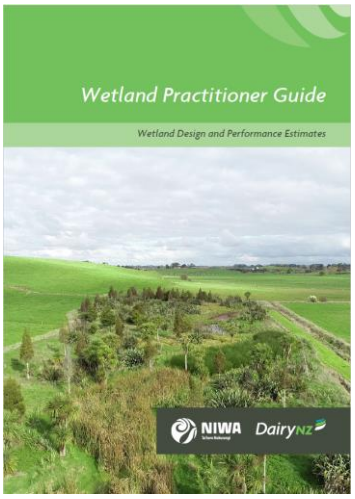
Extended abstract: Constructed wetlands are an innovative solution for farmers looking to improve the quality of water leaving their farms. This new guidance provides design and performance information for people wanting to establish a surface-flow constructed wetland to reduce contaminant loss on pastoral land and can be found here:

- wetland-practitioner-guide-web.pdf (dairynz.co.nz)
- Constructed wetland guidelines | NIWA



The information in the guidance is based on advice from water quality scientists, regional councils, non-government organisations, wetland practitioners and farming experts, and draws on NIWA's "Technical guidelines for constructed wetland treatment of pastoral farm run-off" (Tanner et al. 2021) and review of New Zealand and international performance data (Woodward et al. 2020).

The wetland performance estimates for reduction in sediment, nitrogen and phosphorus have been reviewed and endorsed by a technical advisory group established to help deliver this guide.

Assuming a constructed wetland meets the recommended design guidance, then as its size increases from 1% to 5% of the contributing catchment area, on average, the percentage of contaminants removed from inflowing water increases from:

- 50% to 90% for sediment (Figure 1)
- 25% to 50% for phosphorus (Figure 2)
- 25% to 50% for nitrogen in warm climates (>12°C), and 20% to 40% in cool climates (8-12°C) (Figure 3).

The sediment and phosphorus performance estimates do not apply to tile drainage flows or areas with high (more than 35%) clay content in soils, as there is currently insufficient information to reliably predict performance for these situations.

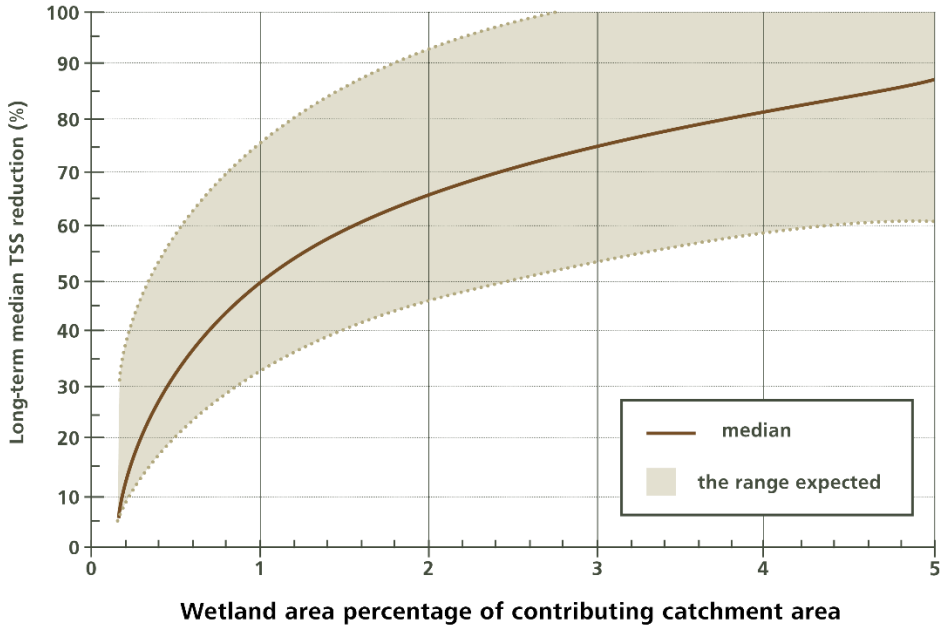


Figure 1: Performance estimates for reduction in total suspended solids (TSS) based on wetland size. Note that the sediment performance estimates do not apply to tile drainage flows or areas with high (more than 35%) clay content in soils.

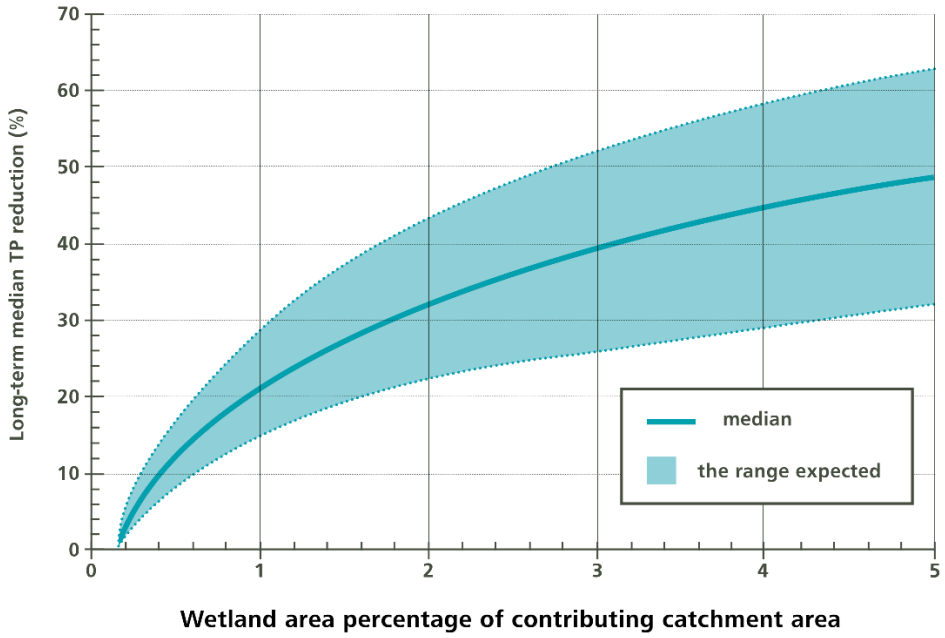


Figure 2: Performance estimates for reduction in total phosphorus (TP) based on wetland size. Note that the phosphorus performance estimates do not apply to tile drainage flows or areas with high (more than 35%) clay content in soils.

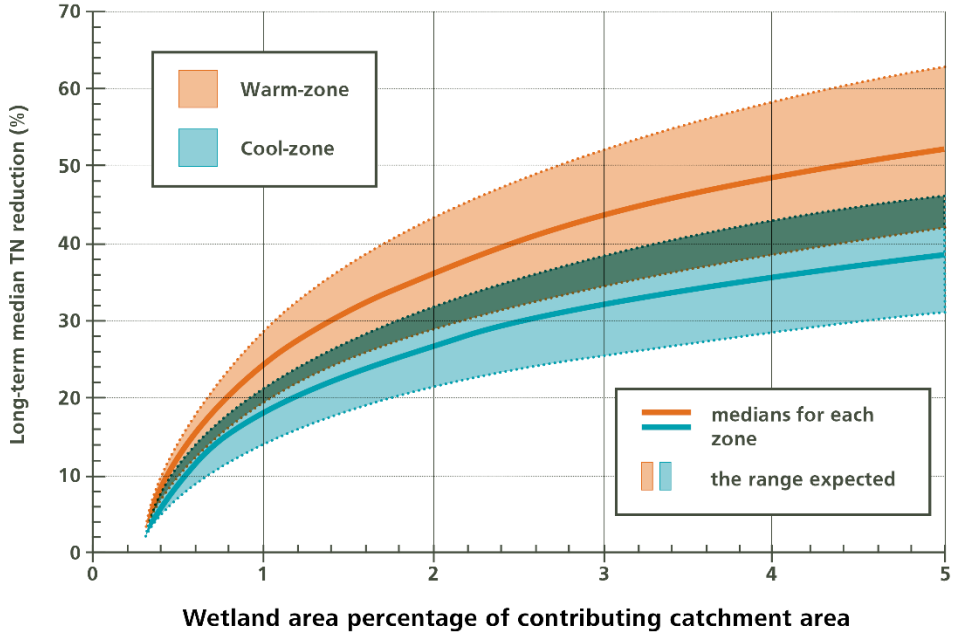


Figure 3: Performance estimates for reduction in total nitrogen (TN) based on wetland size and whether situated in a warm or cool zone in New Zealand. Note that nitrogen removal generally decreases as temperature decreases. Different performance estimates are therefore provided for warmer (median annual air temperatures ≥12°C) and cooler (median annual air temperature 8 - 12°C) regions of New Zealand (see Figure 4 in the guidance document).

The guidelines contain information on how constructed wetlands function, legal and consenting requirements, wetland size and flow path positioning, their shape and the arrangement of cells, sediment pond requirements, inlet and outlet structures and spillways, embankment design and lining and growth media, and wetland vegetation.

The guidance also contains information on costing and maintenance and showcases 11 case studies located throughout New Zealand that provide examples of constructed wetlands that have been developed to improve water quality and habitat outcomes. They encompass a range of wetland designs, contaminant reduction performance, and construction costs.

References:

Tanner, C.C., Sukias, J.P.S. and Woodward, B. (2021). Technical guidelines for constructed wetland treatment of pastoral farm run-off. Technical guidelines for constructed wetland treatment of pastoral farm run-off. NIWA Client Report DairyNZ, May 2021.

Woodward, B.; Tanner, C.C.; McKergow, L.; Sukias, J.P.S. and Matheson, F.E. (2020). Diffuse-source agricultural sediment and nutrient attenuation by constructed wetlands: A systematic literature review to support development of guidelines. NIWA Client Report to DairyNZ, January 2020. https://niwa.co.nz/freshwater-and-estuaries/management-tools/restoration-tools/constructed-wetland-guidelines.

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