Will nutrient reduction targets for protection of Ōtūwharekai Lakes protect the fens?

What are sustainable nutrient loadings for montane fens?

Chris Tanner
James Sukias

NIWA
Taihoro Nukurangi

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Ōtūwharekai – Ashburton Lakes

- High ecological, recreational, scenic and cultural values
  - Mahinga kai for Ngai Tahu
  - DoC Arawai Kakariki
- Complex glacio-fluvial landscape
- Steep eroding rocky uplands
- Porous toe-slopes and valleys
- Cold winters, spring snowmelt, dry summers and harsh winds
- Nutrient poor catchment draining to nutrient sensitive fens and shallow lakes
- Large parts now administered by DoC, 4 large HC stations
- Legacies
  - Native forest→ tussock grassland
  - Livestock grazing/repeated burning/ P fertilisation/exotic grasses and N-fixing legumes/pest animals

Our brief- To identify catchment interventions to reduce nutrient loads to protect the Ōtūwharekai Lakes (& wetlands)

Ōtūwharekai wetlands

- Diverse types - mainly fens
  - >10 % Emily and Emma
  - 1-5% Clearwater/Māori/Heron
  - <1% Camp
- Highly valued by mana whenua as mahinga kai
- Highly valued ecologically
  - DoC Arawai Kakariki
- Primarily N-limited

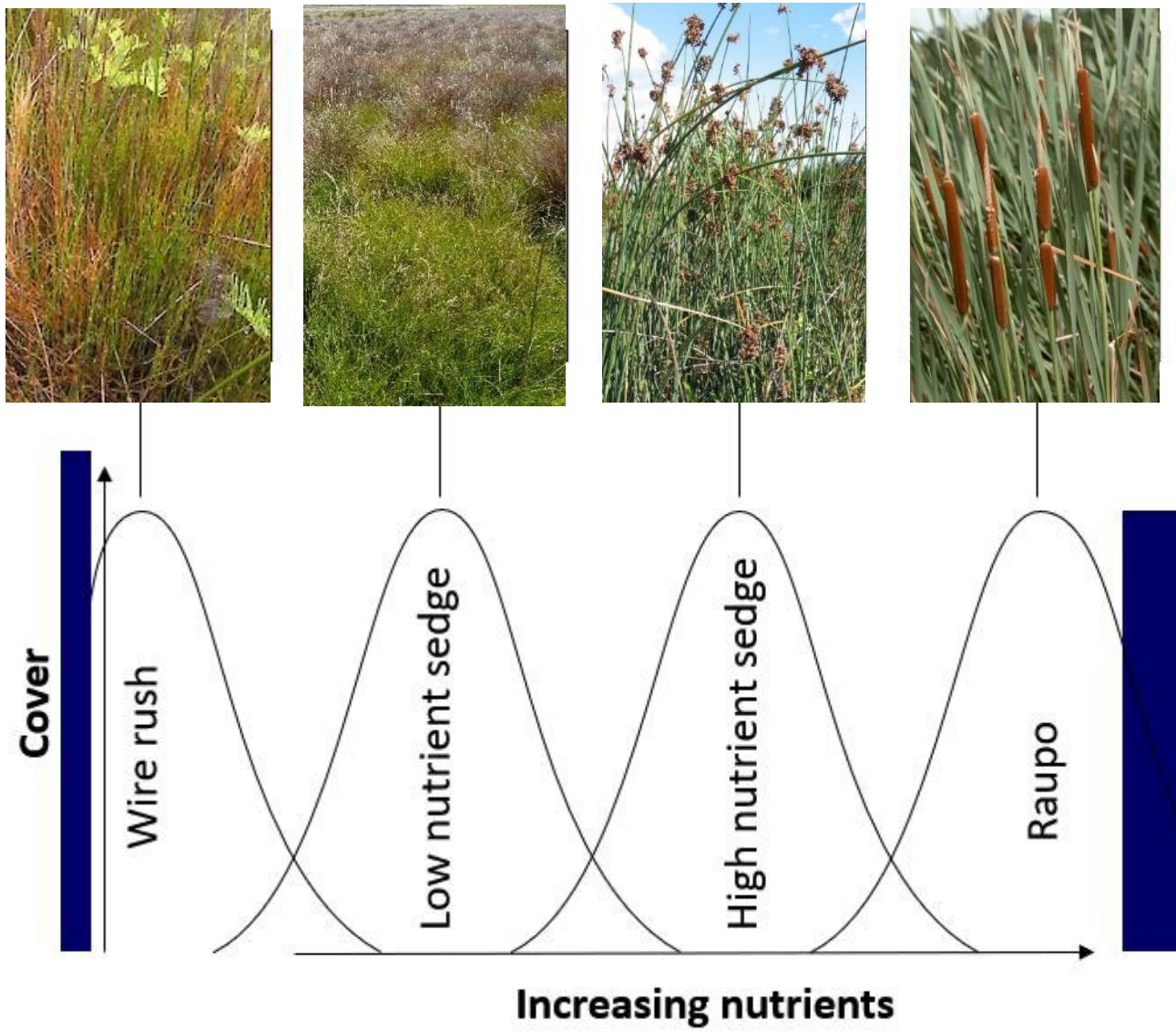

Lake Heron

Lake Clearwater wetlands

Key contaminant flow paths

- N losses- mainly via groundwater from intensive cropping and grazing
- P losses- mainly via surface flows from intensive cropping and grazing
- Sediment mainly via surface flows from steep eroding uplands

Wetland nutrient gradients



Burge, O.R., Clarkson, B.R., Bodmin, K.A., Bartlam, S., Robertson, H.A., Sukias, J.P.S., Tanner, C.C., (2020). Plant responses to nutrient addition and predictive ability of vegetation N:P ratio in an austral fen. *Freshwater Biology* 65, 646-656

Typical herbaceous plant species-nutrient gradient for New Zealand wetlands. Adapted from Beverly Clarkson and Brian Sorrell (pers. comm.)

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Calculating average wetland nutrient loading rates

- Catchment N mass load = Area x annual N loss rate (e.g. Overseer)

100 ha x 30 kg N/ha/yr = 3000 kg N/y

- Wetland average areal loading

= Catchment N mass load / wetland area

3000 kg/yr divided by 2 ha = 1500 kg N/ha/y (1.5 tonnes)

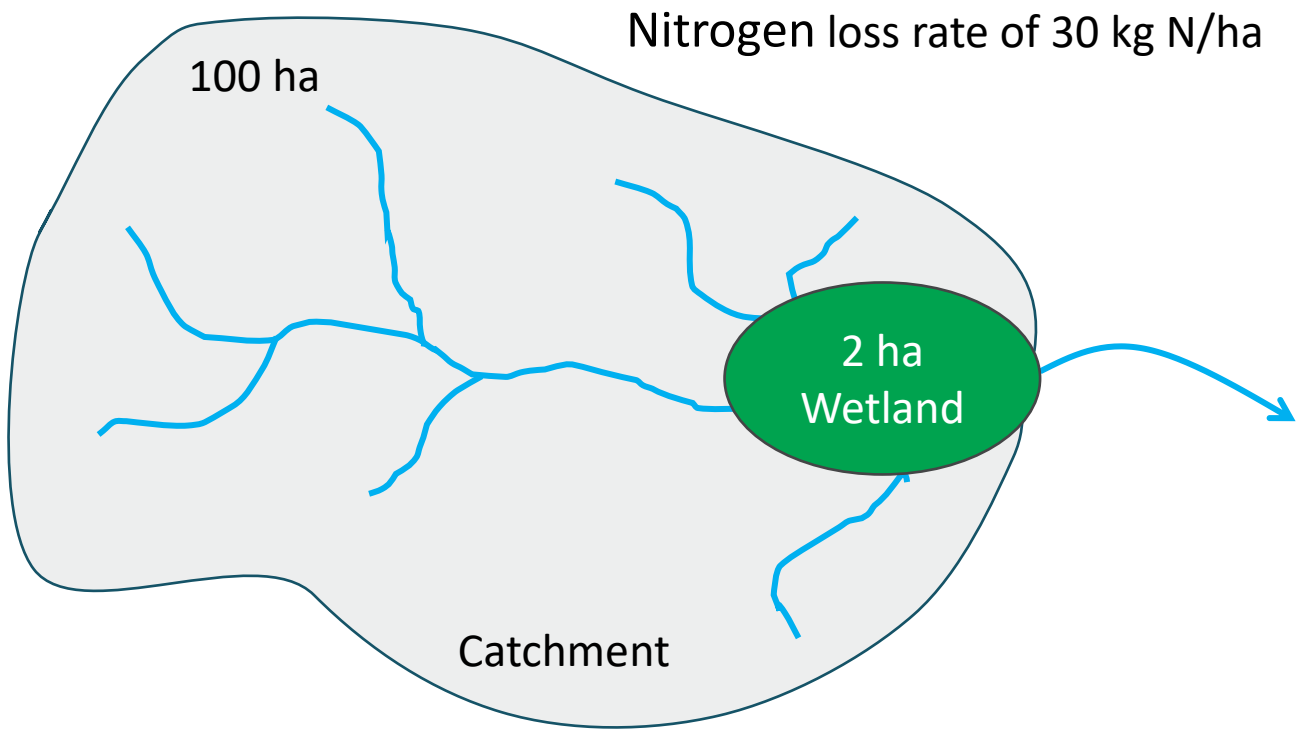
Compare with 100-200 kg/ha/y fertiliser N application on high producing farmland

- Wetlands in farmland are often partially drained

If the wetland was formerly 3 times its present size (i.e. 6 ha) then its loading rate would have been 3 times lower before drainage (i.e. 500 kg N/ha)

- Originally catchment loading rates would have been much lower

If intensive farming has doubled the catchment N loss rate then historically the wetland would have had only half the current loading (i.e. 250 kg N/ha) only 1/6th of current loading



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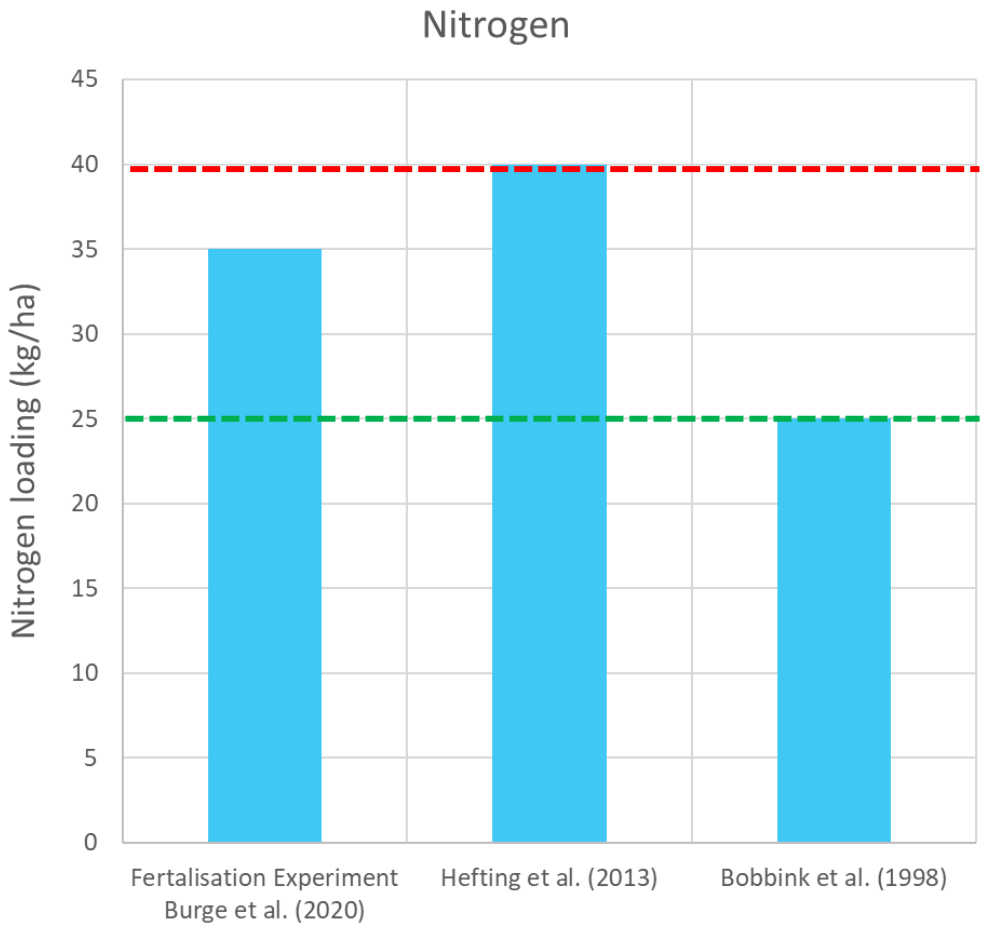
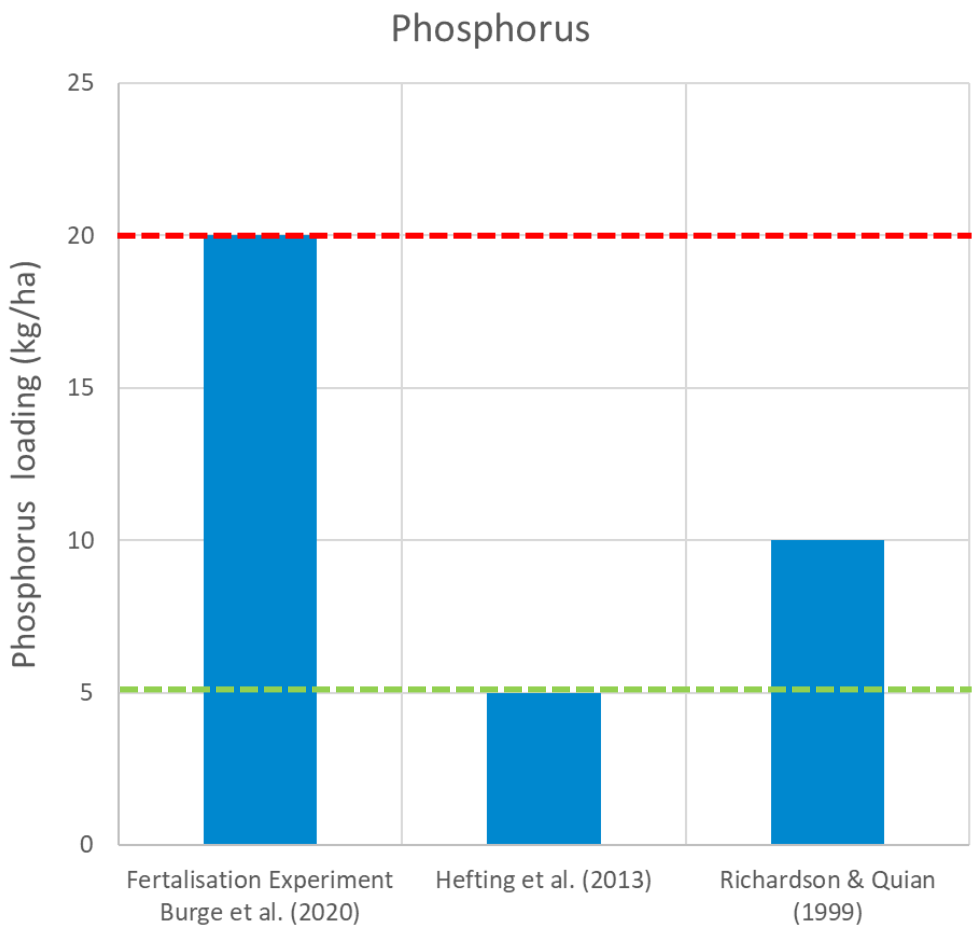
Proposed annual nutrient loading criteria for montane fens





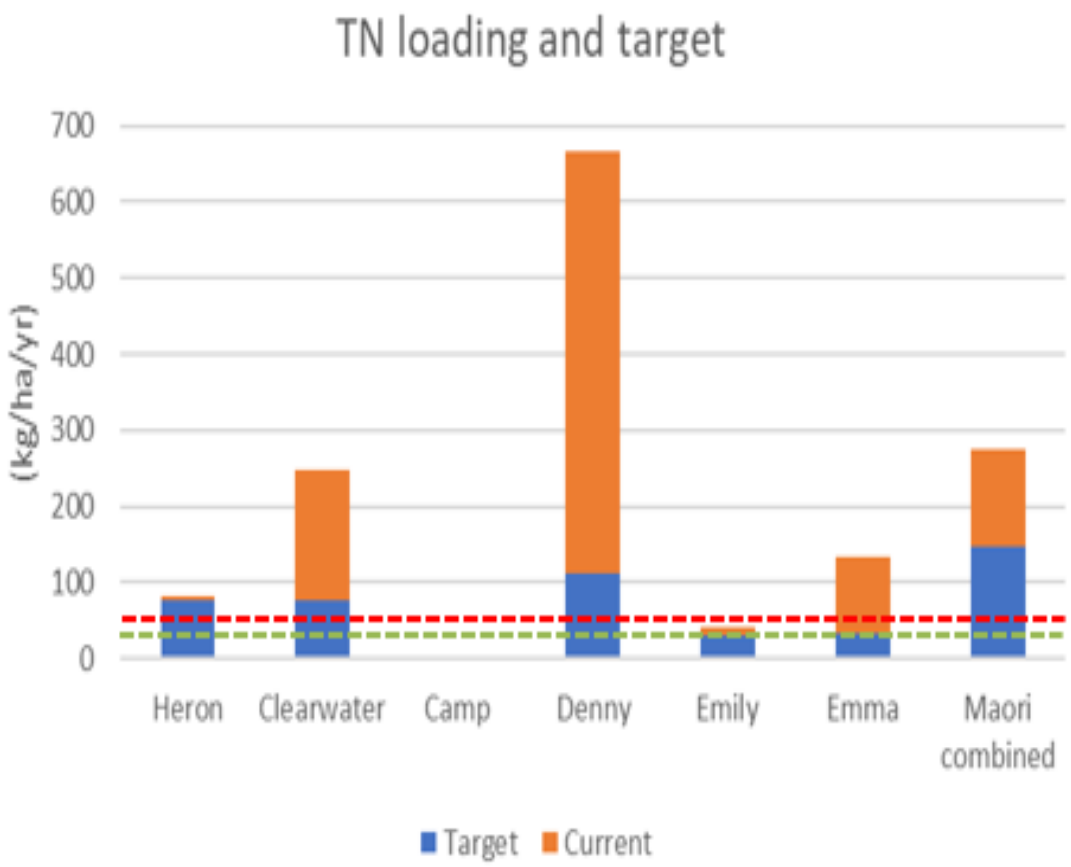
Maximum ecological limit

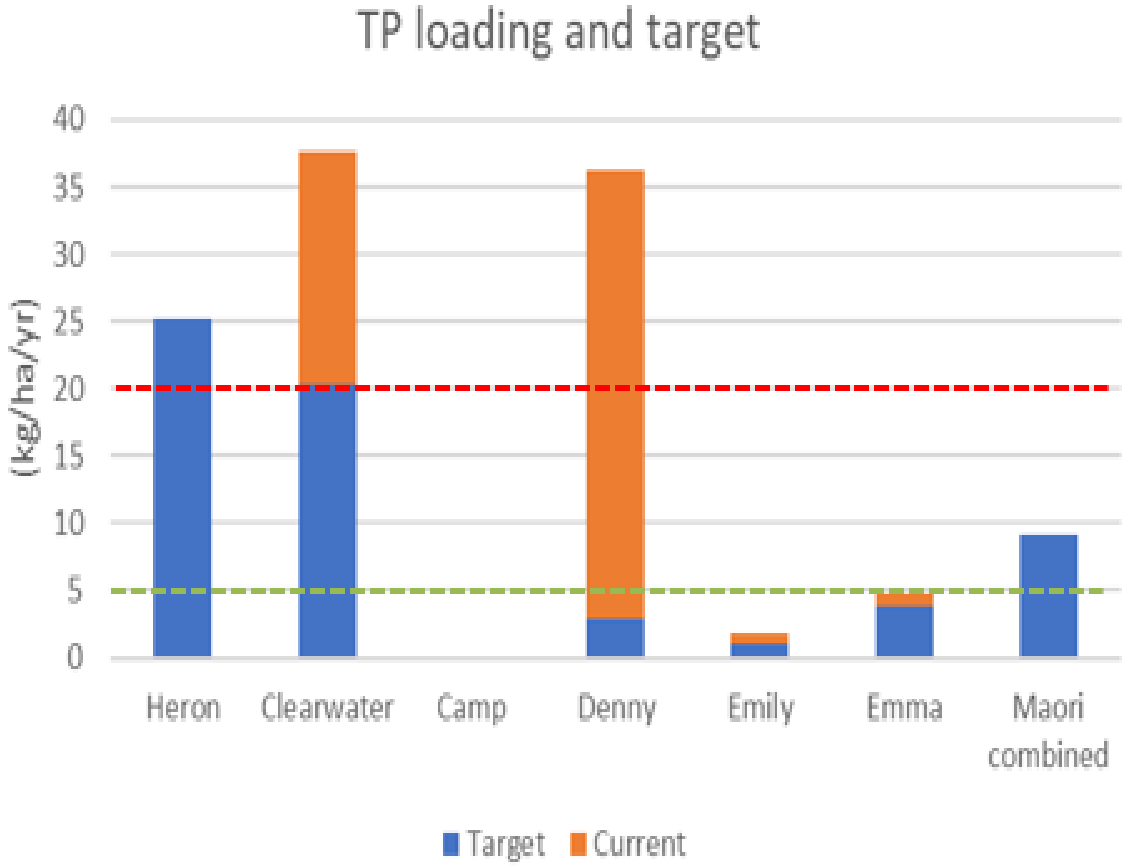
Protective ecological limit

Wetland nutrient loading

Maximum ecological limit

Protective ecological limit





Summary

- The Ōtūwharekai Lakes are P limited; i.e. most sensitive to increased P loadings
- The Ōtūwharekai fens are N-limited; i.e. most sensitive to increased N loadings
- Nutrient reduction targets proposed to protect the Lakes will in many cases not protect the associated fen wetlands, particularly for N
- The wetlands currently help reduce nutrient loadings to the lakes
  - **But at their own risk**
- We need to determine realistic nutrient criteria for different wetland types
- Wetland extent is important, but so is quality
- We need to determine which wetlands are at risk and deserve protection

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