

Protecting coastal lakes from eutrophication

Multiple lines of evidence converge on critical nutrient loading thresholds to maintain ecosystem health

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The system: Waituna Lagoon, South Island, New Zealand

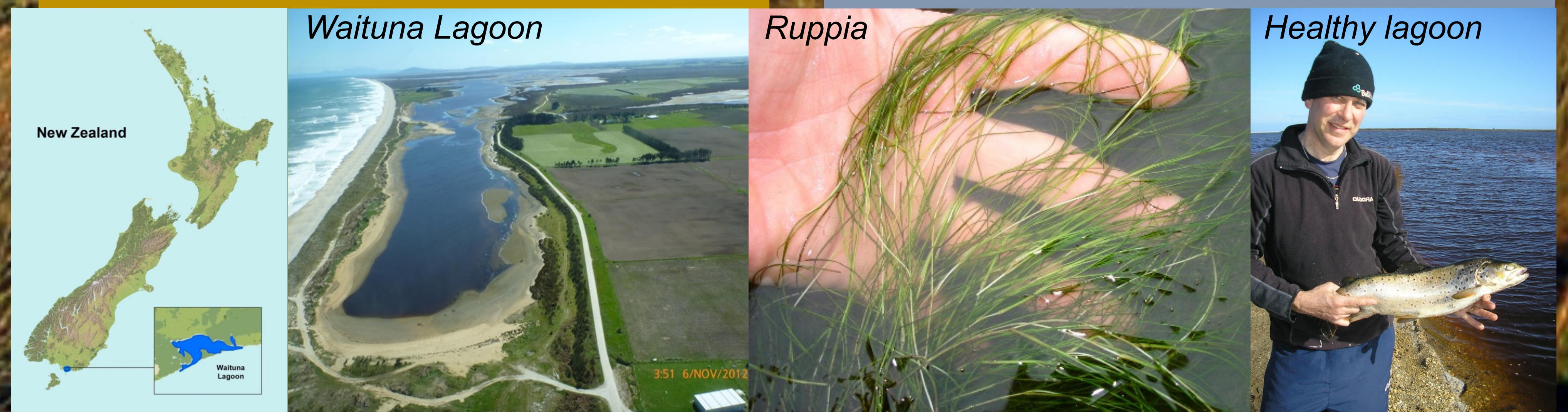
- Latitude = 46°S; Area = 16.3 km²; Depth = 3.3 m; meso-eutrophic
- Waituna is a barrier bar lake/lagoon this is occasionally mechanically opened to drain surrounding farmland
- The lagoon and surrounding wetlands are recognised under the Ramsar convention as a site of important biodiversity, Māori food gathering and recreational values
- Waituna is one of the few coastal lagoons in New Zealand to still have a macrophyte community, dominated by the seagrass, *Ruppia* sp.
- Other similar systems have undergone catastrophic regime shifts, lost their macrophytes, and are now hypertrophic, experiencing cyanobacterial blooms

The problem: Nutrient loading threatens seagrasses

- Since 1993, dairy farming in the catchment has increased from 5% to 50% of the catchment area
- The use of nitrogenous fertilisers has increased in the catchment
- Drainage pipes in the soils allow the rapid movement of nutrients from farms into tributaries
- Peat soils of the lower catchment do not effectively bind phosphorus

The challenge: Setting nutrient load limits to safeguard *Ruppia*

- Environment Southland set up a technical advisory group (TAG)
- The task was to determine nutrient load limit to safeguard the health of the Waituna Lagoon
- The TAG determined that the preservation of the *Ruppia* (seagrass) beds is the key to maintaining the lagoon in a good ecological condition



Three independent lines of evidence identify nutrient loading thresholds to safeguard *Ruppia*

1. Expert Assessment

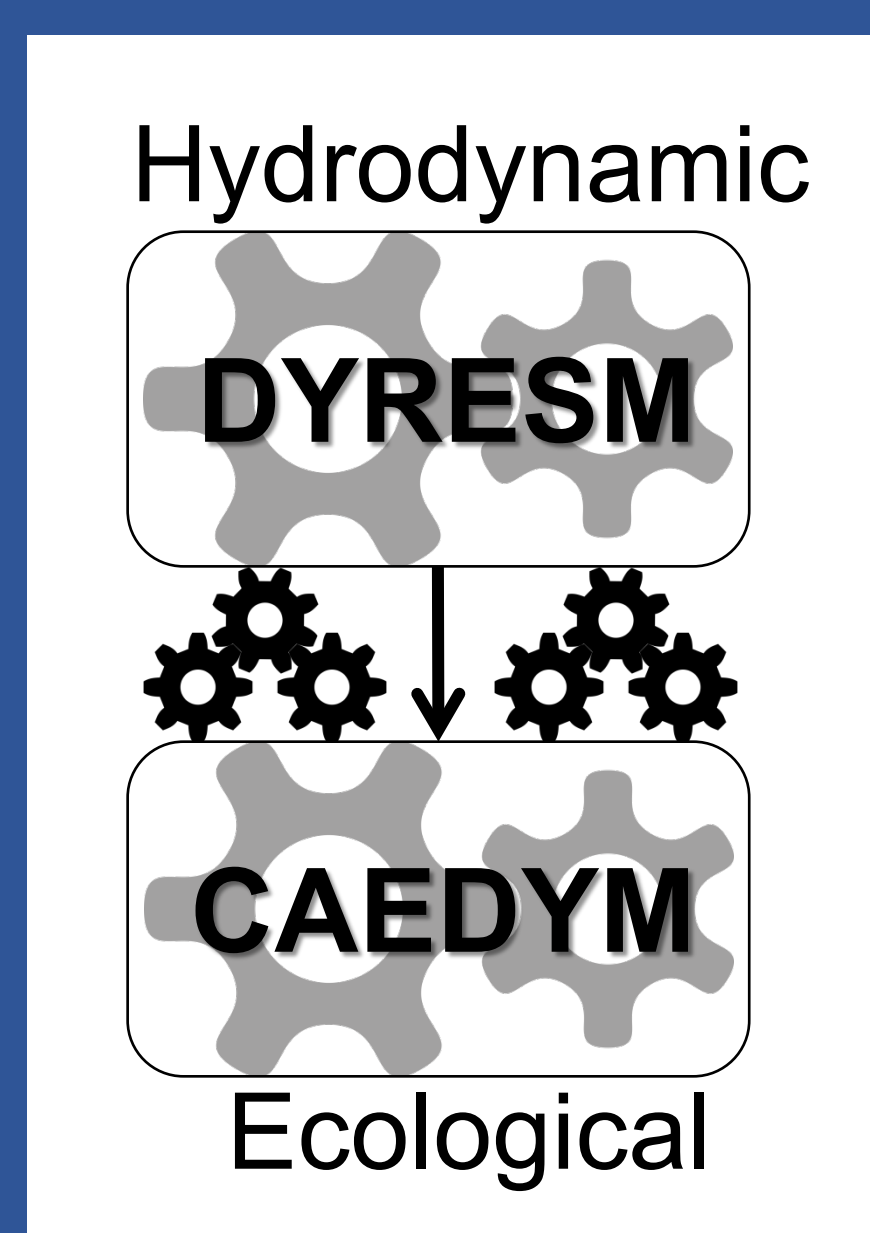
Dr. Peter Scanes

Head of Coastal Waters Unit
New South Wales Office of
Environment and Heritage

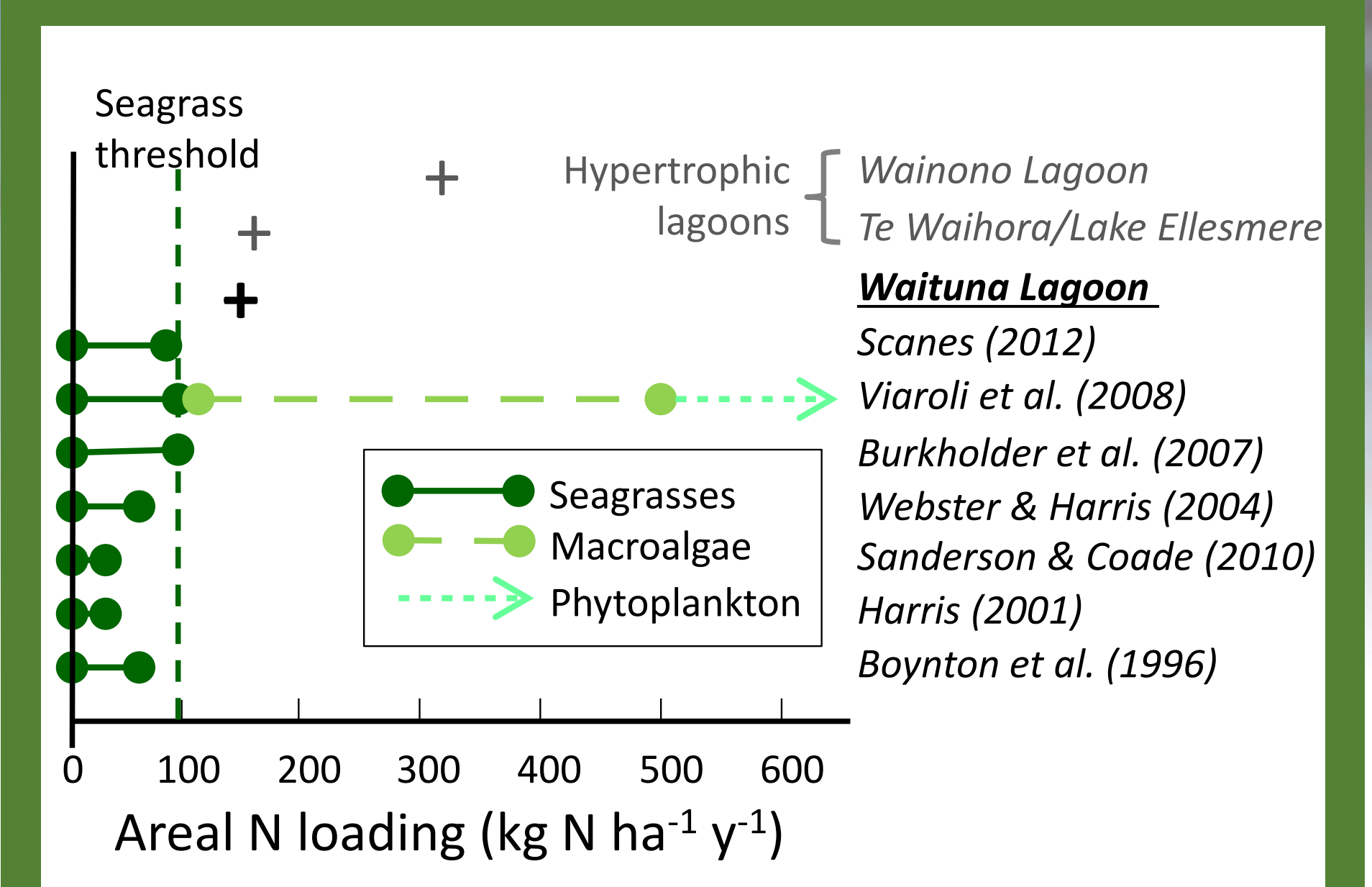
- Received Waituna data
- Compared Waituna's state with that of barrier bar lakes and lagoons from New South Wales, Australia



2. Lake Model

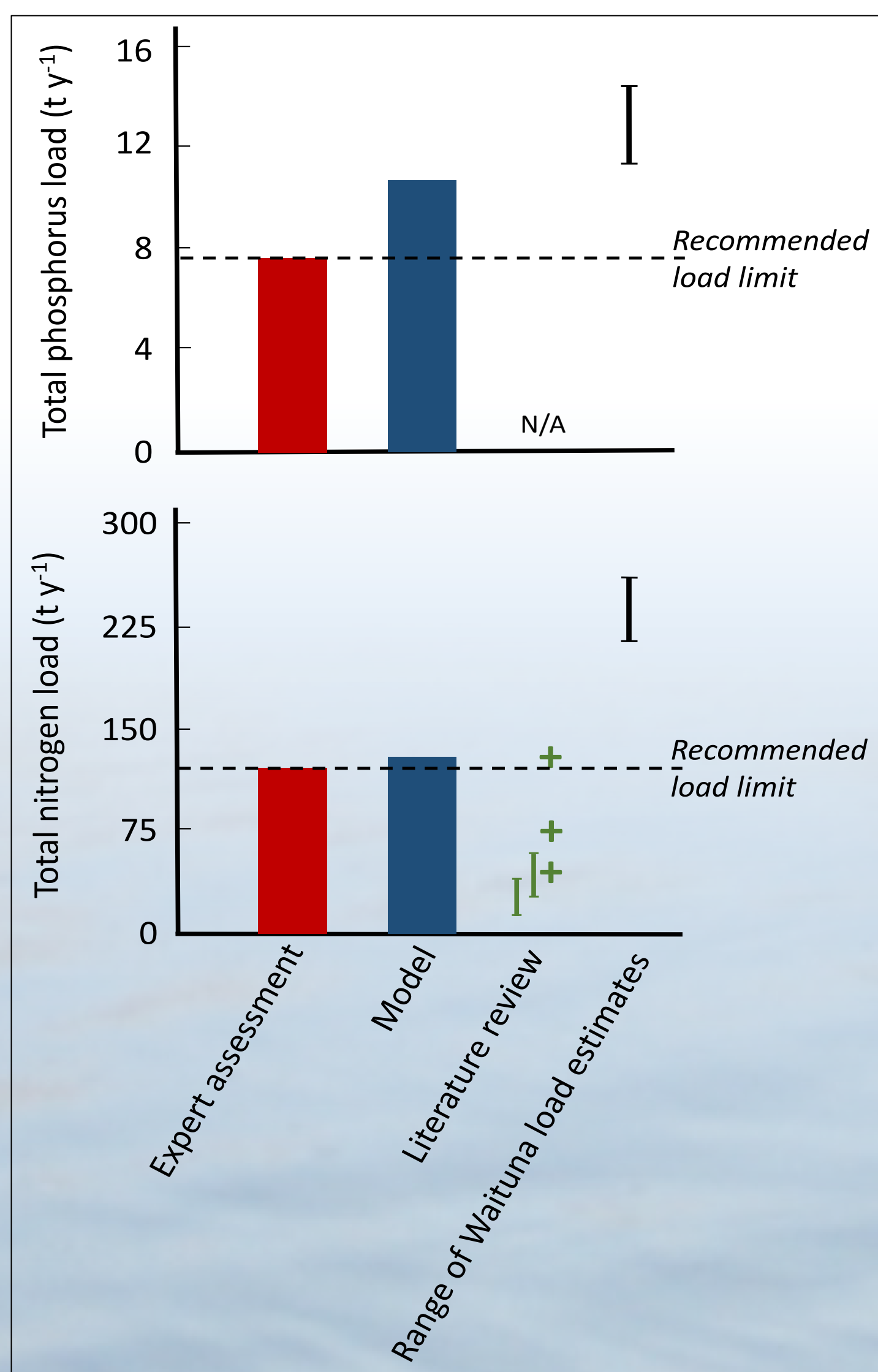


3. Literature Review



Conclusions

- Three independent studies indicated that **current N and P loads must significantly recuded** to safeguard the *Ruppia* community and lagoon health
- The similarity of the 3 load limit estimates gave confidence that the recommended limits are robust
- The load limits formed the basis of new management guidelines for Waituna Lagoon (http://es.datacomsphere.co.nz/media/46677/waituna_lagoon_ecological_guidelines.pdf)
- Dairy conversions in the catchment are now regulated and farmers are working to reduce nutrient losses from farmland to the lagoon



Take home messages

- **Multiple, independent lines of evidence increase robustness and help assess confidence for management decisions**
- Where independent lines of evidence are not congruent and uncertainty exists, management should follow the precautionary principle and an adaptive management approach, with monitoring

Acknowledgements

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