National Map of Nitrate Leaching

Pastoral agriculture has an impact on the quality of waters in New Zealand. Fertiliser and animal excreta generally increase nitrogen in waterways, promoting the growth of periphyton and degrading aquatic habitat and recreational values. A national map of nitrate leaching (kg N/ha/yr) was produced from input maps of land use and stocking rates. The model was developed by running Overseer® for all soil and climate combinations in New Zealand (LENZ level II) – see Figure 1. The results are expressed as leaching rates per stock unit and stored in tables associated with the LENZ level II map of New Zealand. The nitrate leaching rates per stock unit can then be combined with a map of stock units (see the pamphlet on **National map of stock units**) to produce a map of nitrate-N leaching at the national scale.

The leaching rates per stock unit shown in Figure 1 are clearly driven by both rainfall and soil type. When annual rainfall is 1000 mm the leaching rate is approximately 0.5 kg N/ha/yr per stock unit. When annual rainfall is 2000 mm the leaching rate is approximately three times that at 1.5 kg N/ha/yr per stock unit. The spatial variation in leaching rate as a function of stocking rates, rainfall, and soil types needs to be taken into account when assessing land use. For example, on shallow soils with high rainfall, leaching rates will be excessively high and will necessitate special mitigation measures. Note that nitrate is lost between the soil and rivers, and that loss is of the order of 50% (Clothier et al., 2007).

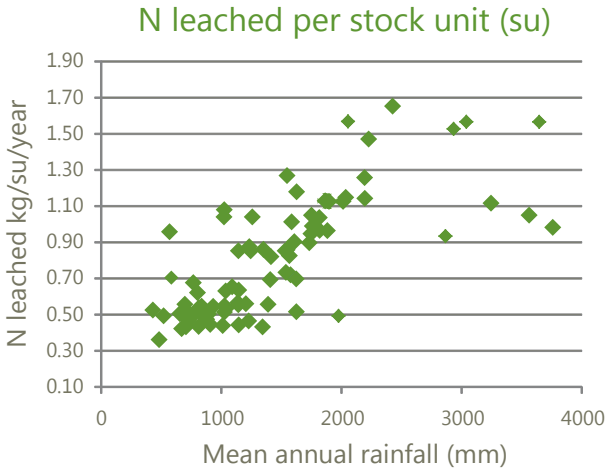

FIGURE 1. Plot of nitrate N-leaching rate per stock unit as a function of mean annual rainfall. Each point represents a unique soil-climate type in New Zealand.

REFERENCES

Leathwick, J. and others. Land Environments of New Zealand. David Bateman, Auckland.

Clothier, B. and 9 others, 2007. Farm strategies for contaminant management. (http://www.horizons.govt.nz/assets/horizons/Images/one_plan/Farm%20Strategies%20for%20Contaminant%20Management%20June%202007.pdf - last accessed 13/1/11)

Contact John Dymond for access to data

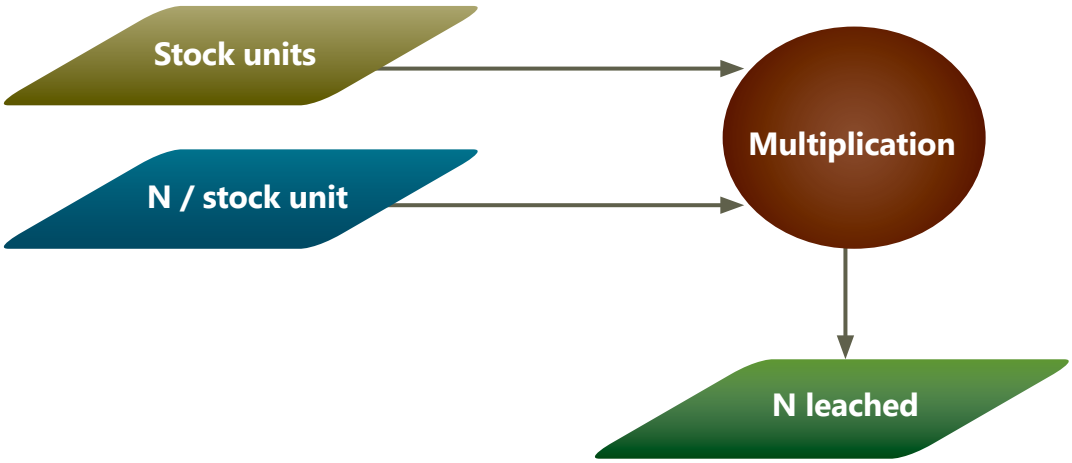

FIGURE 2: A national map of nitrate-N leaching (kg N/ha/yr) was made from national maps of animal stock units and nitrate leached per stock unit.

Stock units: 2003 national map of stock units per hectare at 100 m pixels. Derived from MAF 2003 district statistics and spatially extrapolated using NZLRI stock carrying capacity and LUNZ land use.

N/stock unit: national map of N leached per hectare per year per stock unit at 100m pixels. Derived by running OVERSEER® for the 100 LENZ level II land environments.

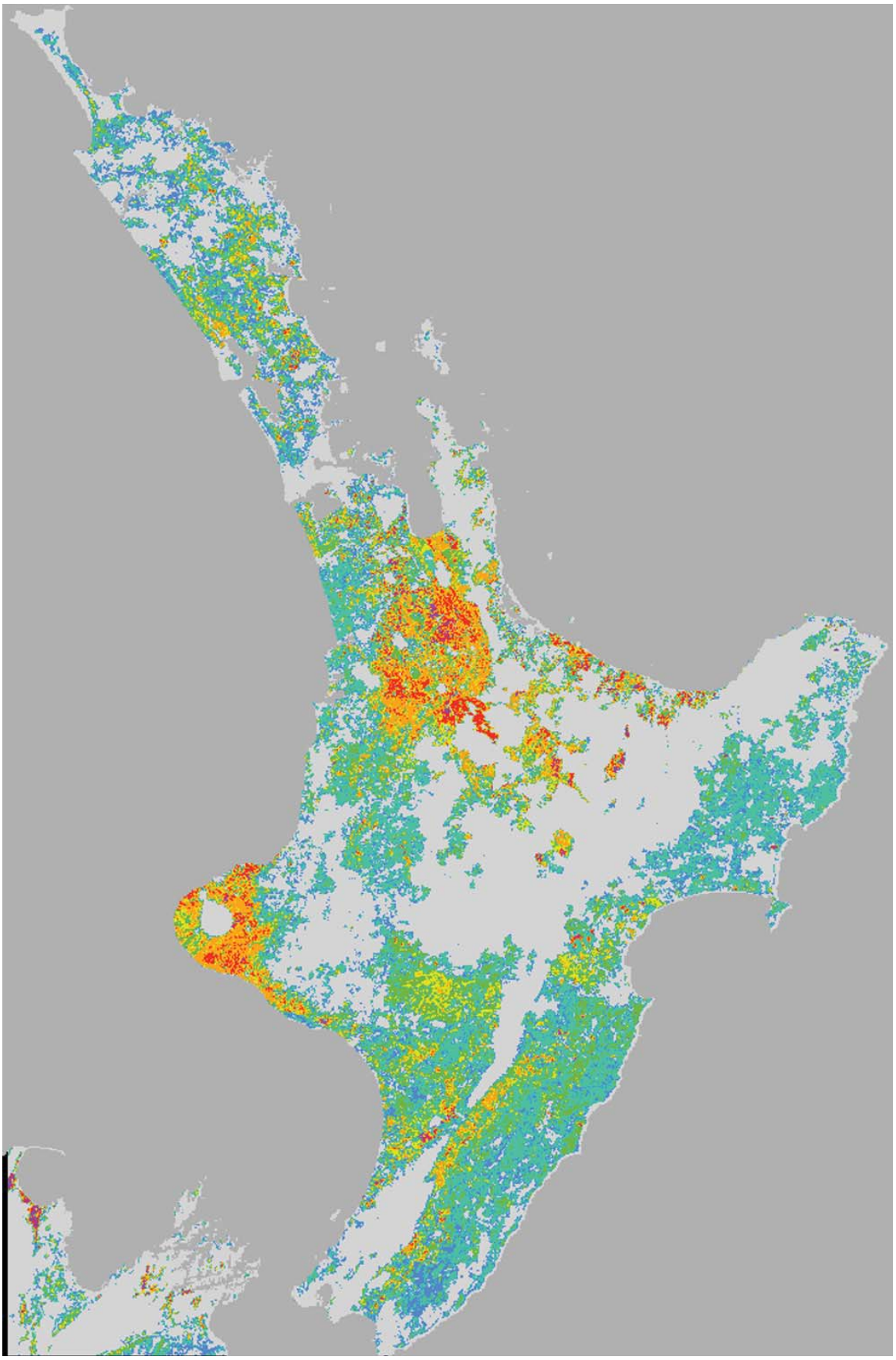

FIGURE 3: Nitrate-N leached in kg N/ha/yr for North Island (100m pixels): grey (0–2); blue (2–5); turquoise (5–10); green (10–15); yellow (15–20); orange (20–30); red (30–40); purple (>40).

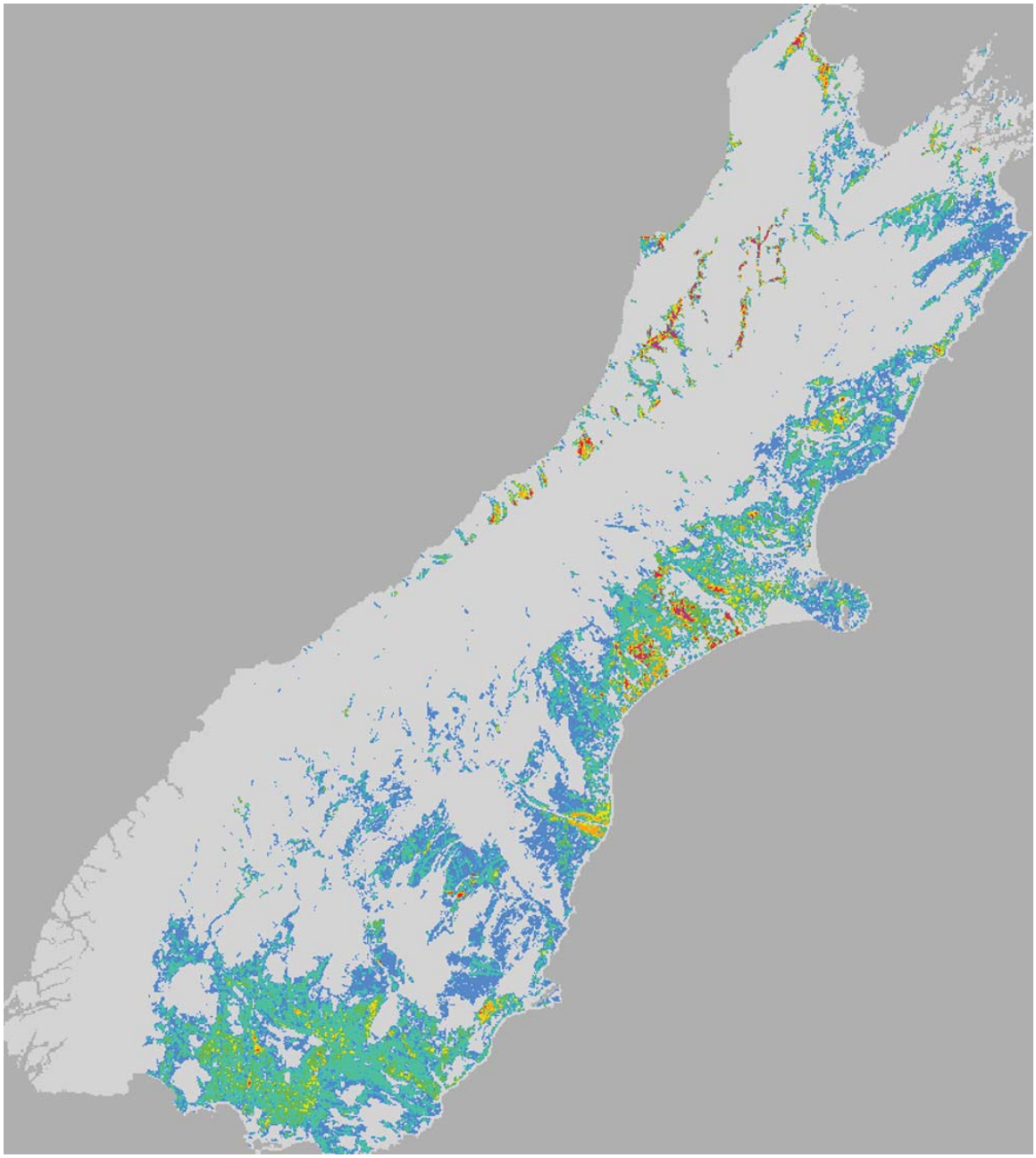

FIGURE 4: Nitrate-N leached in kg N/ha/yr for South Island (100m pixels): grey (0–2); blue (2–5); turquoise (5–10); green (10–15); yellow (15–20); orange (20–30); red (30–40); purple (>40).

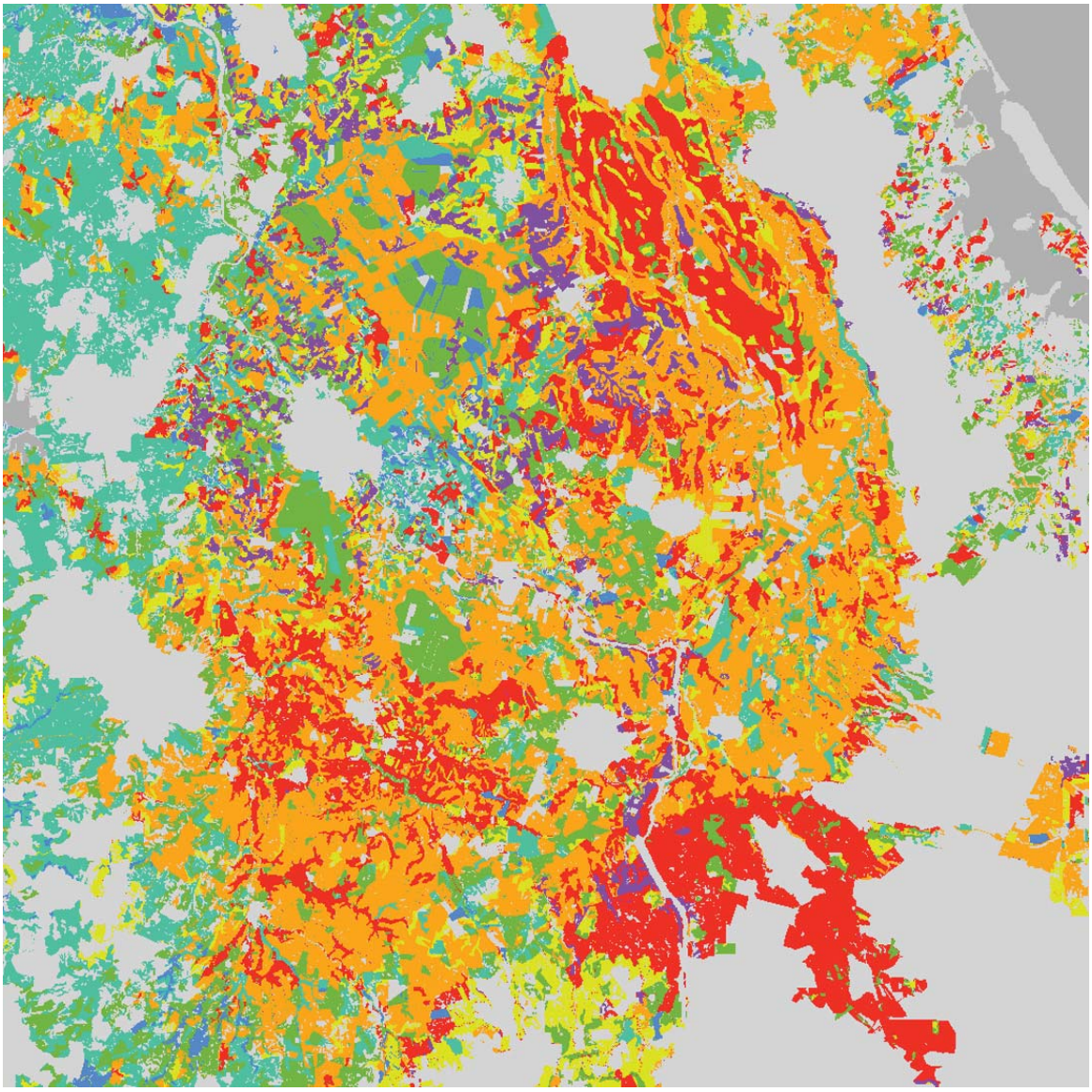

FIGURE 5: Nitrate-N leached in kg N/ha/yr for central Waikato (100m pixels): grey (0–2); blue (2–5); turquoise (5–10); green (10–15); yellow (15–20); orange (20–30); red (30–40); purple (>40).

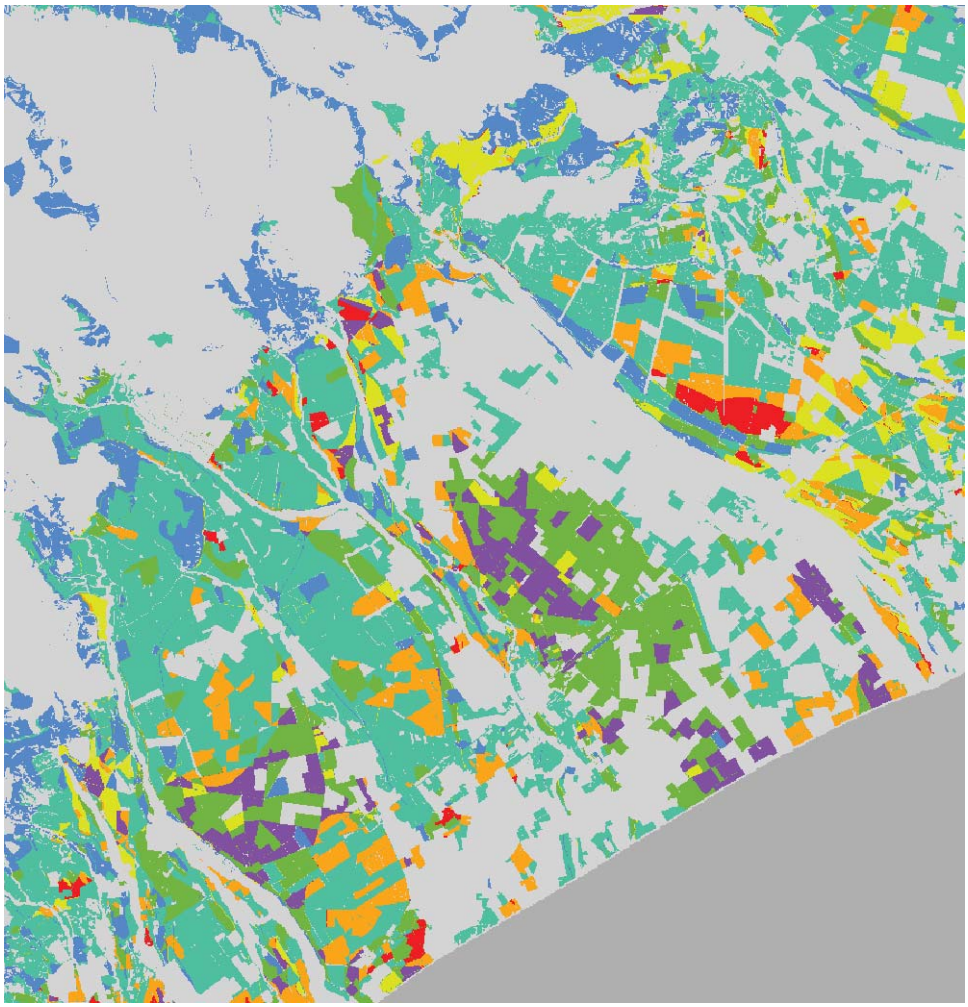

FIGURE 6: Nitrate-N leached in kg N/ha/yr for South Canterbury (100m pixels): grey (0–2); blue (2–5); turquoise (5–10); green (10–15); yellow (15–20); orange (20–30); red (30–40); purple (>40).