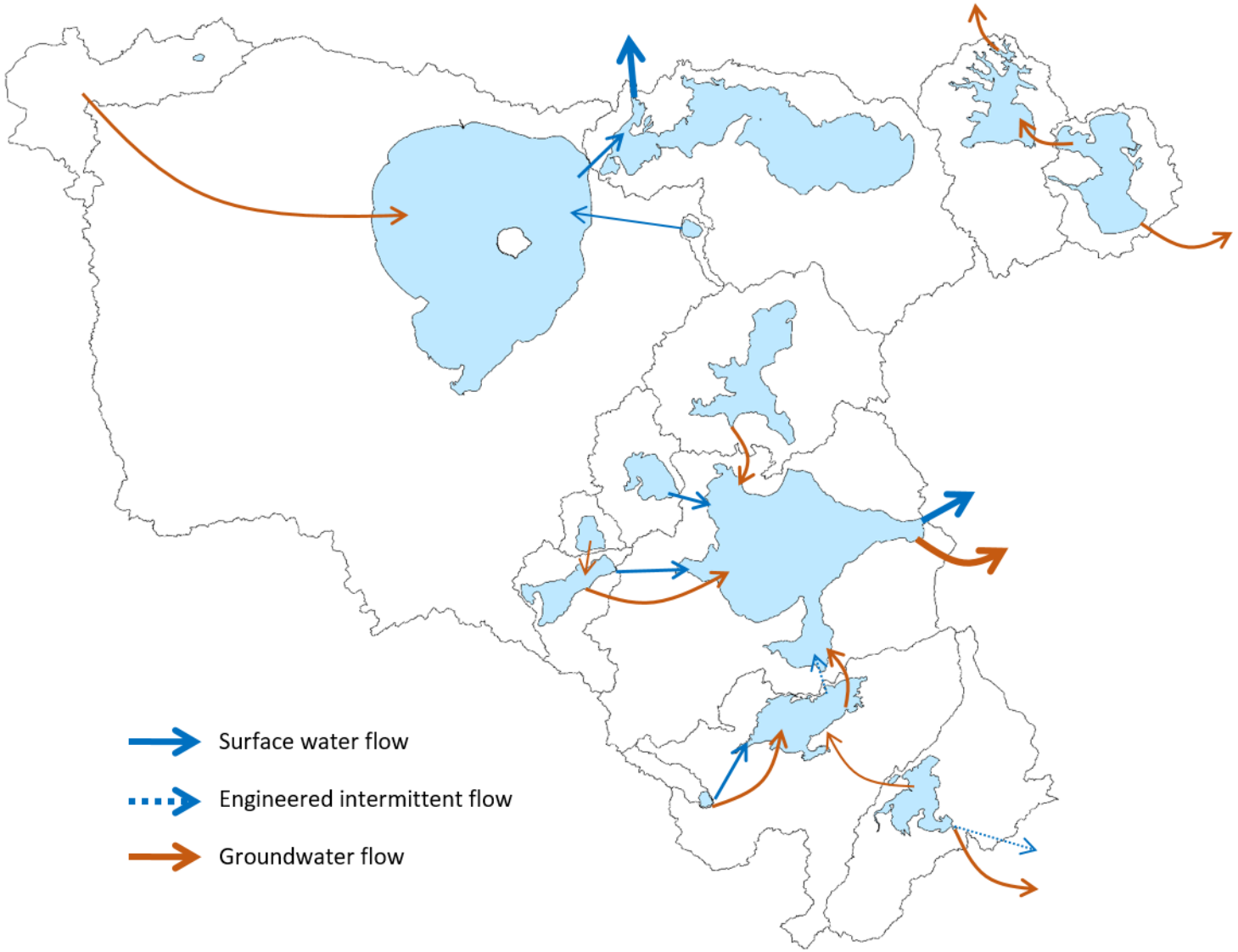
Water quality modelling of Lake Okareka

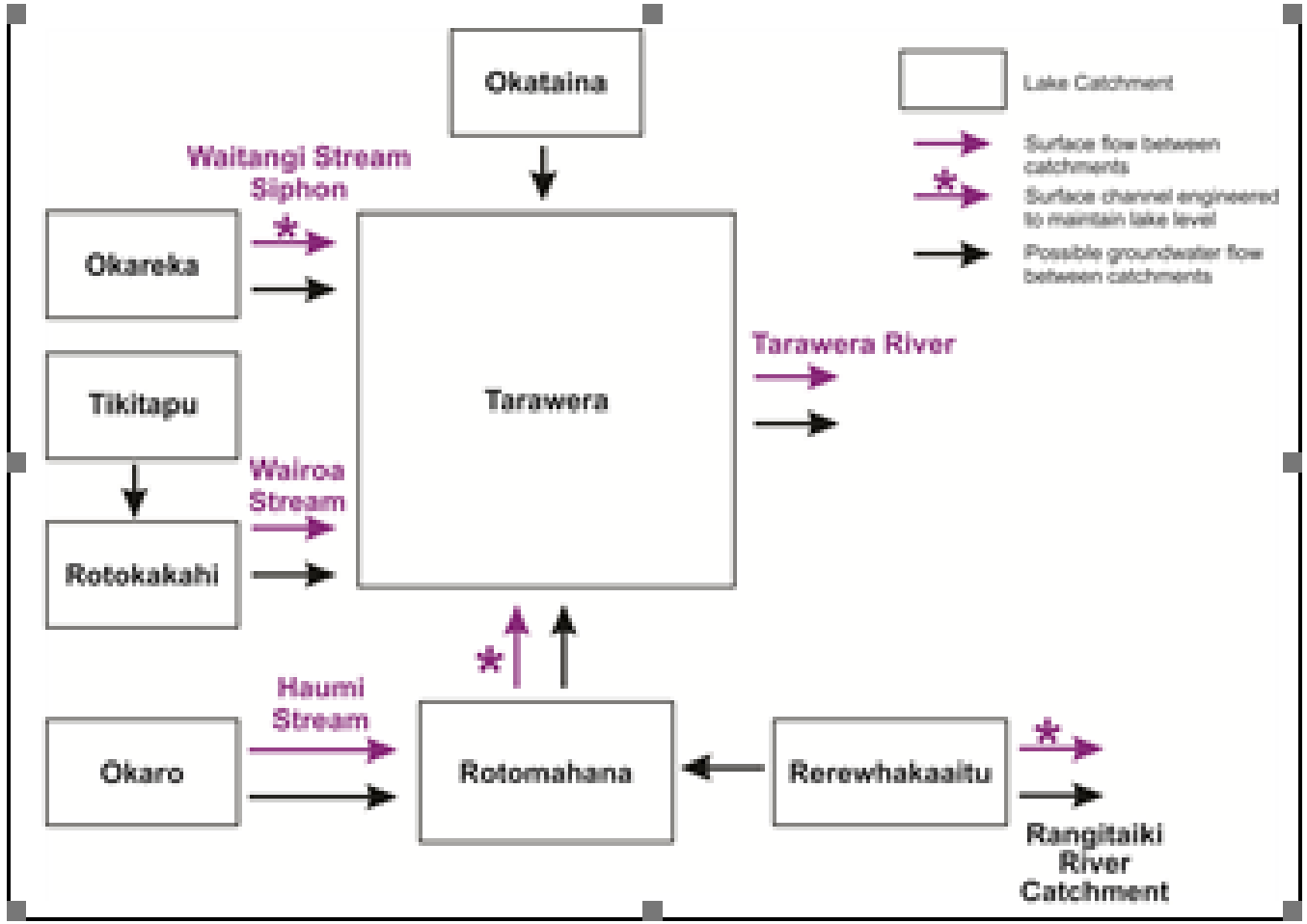
David Hamilton

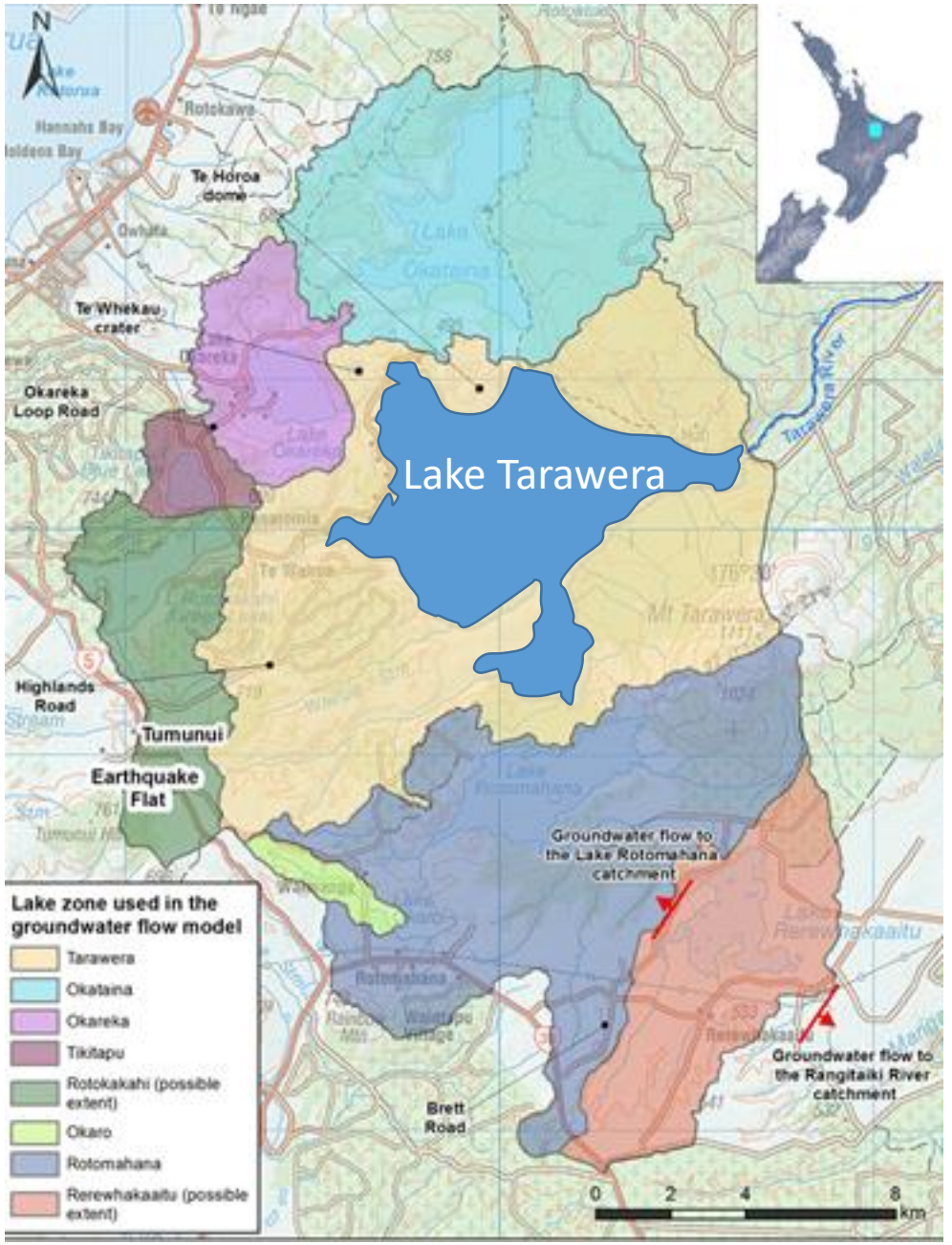
19 April 2018

A perspective on where the water goes in the Rotorua /Te Arawa lakes



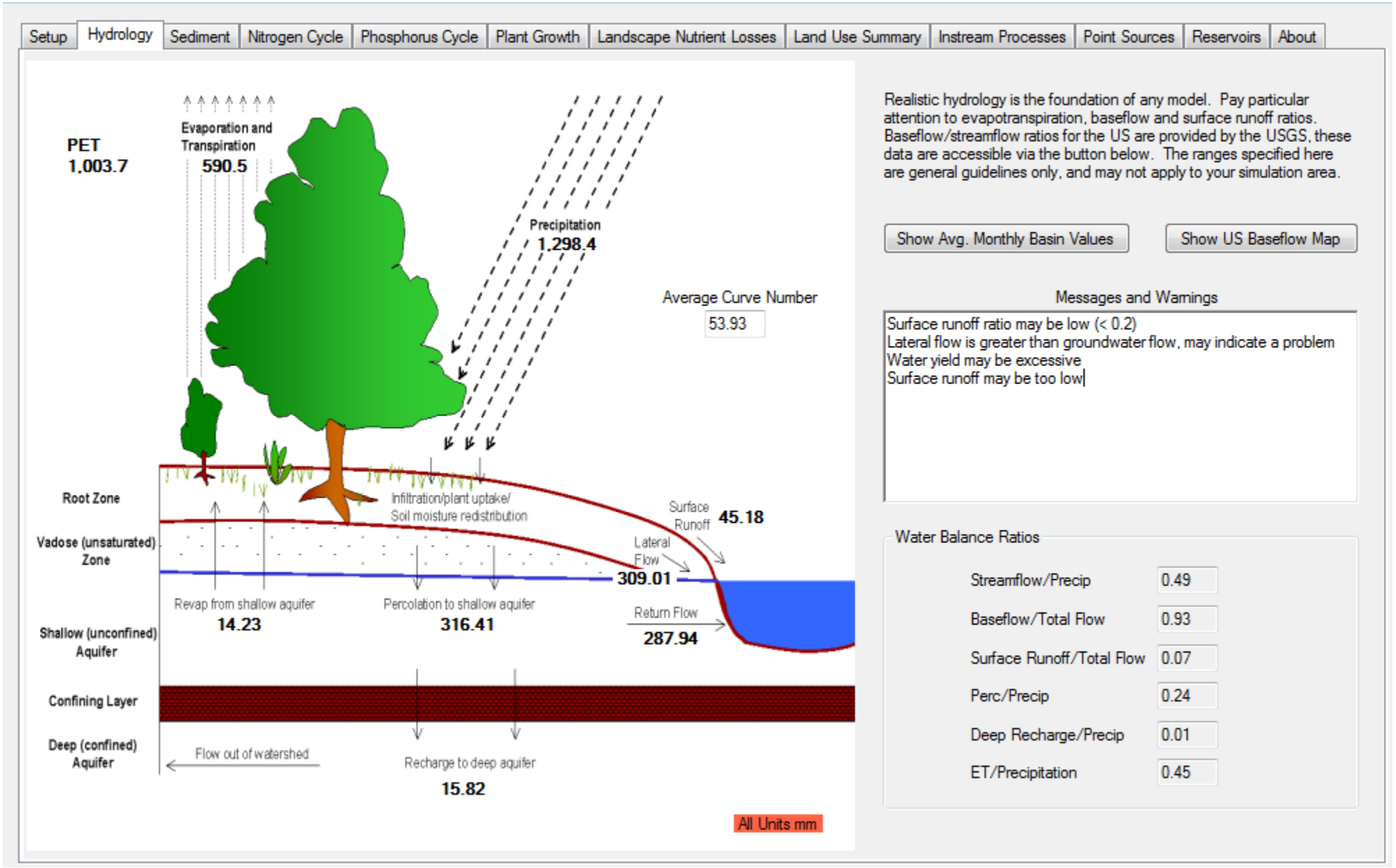
Tarawera subcatchments and water balance



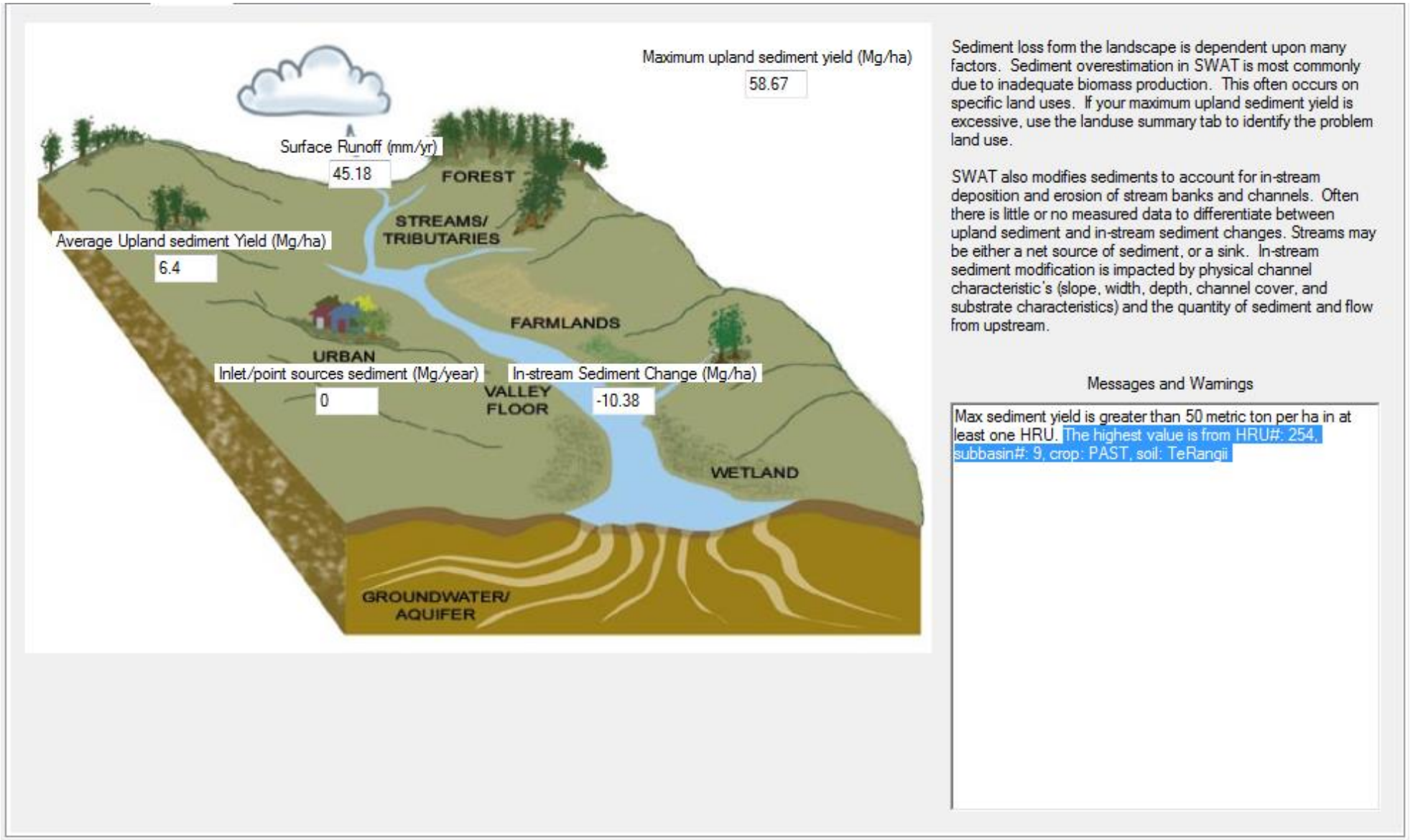


Paul White, GNS

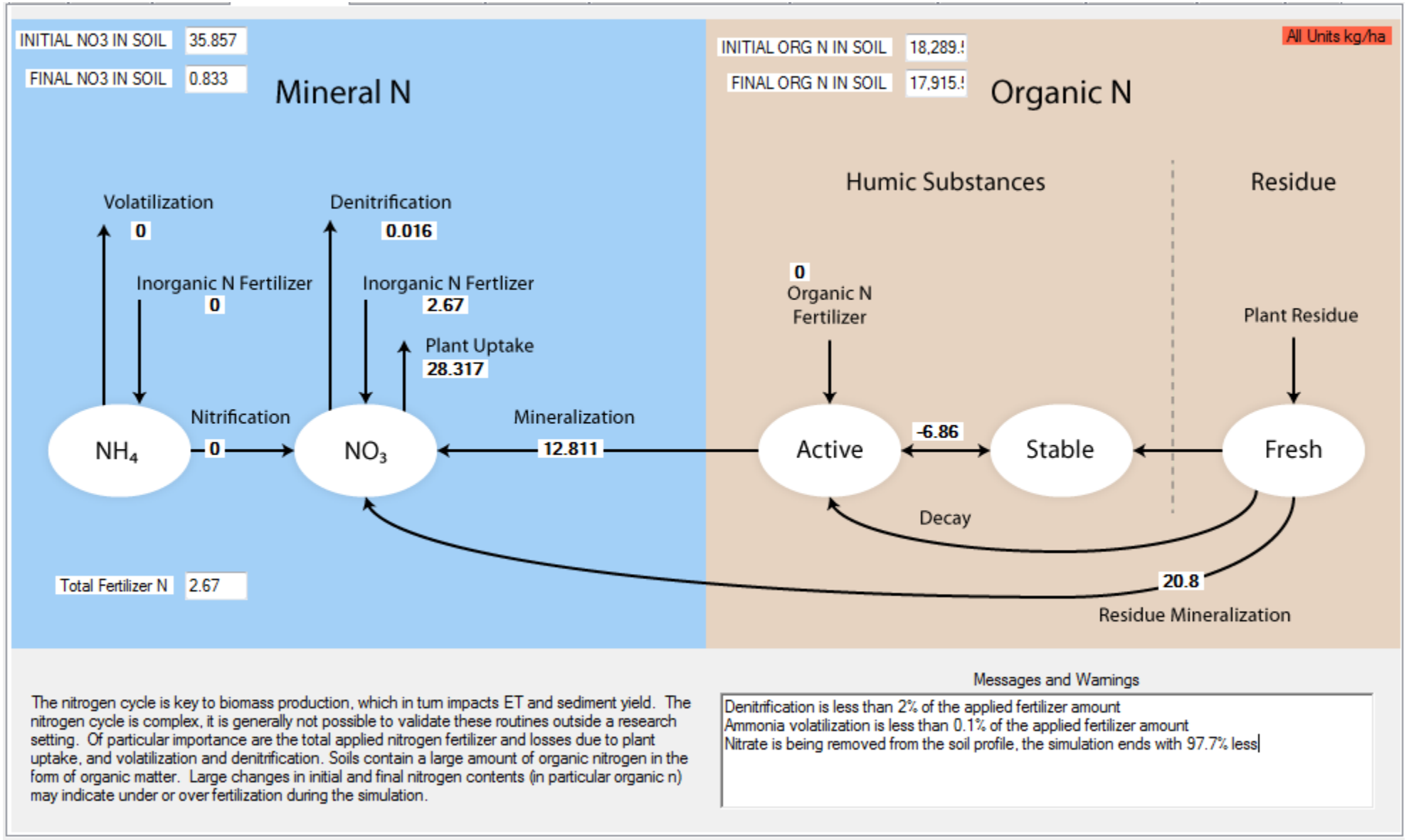
The Surface Water Assessment Tool (SWAT) Model – Water Balance



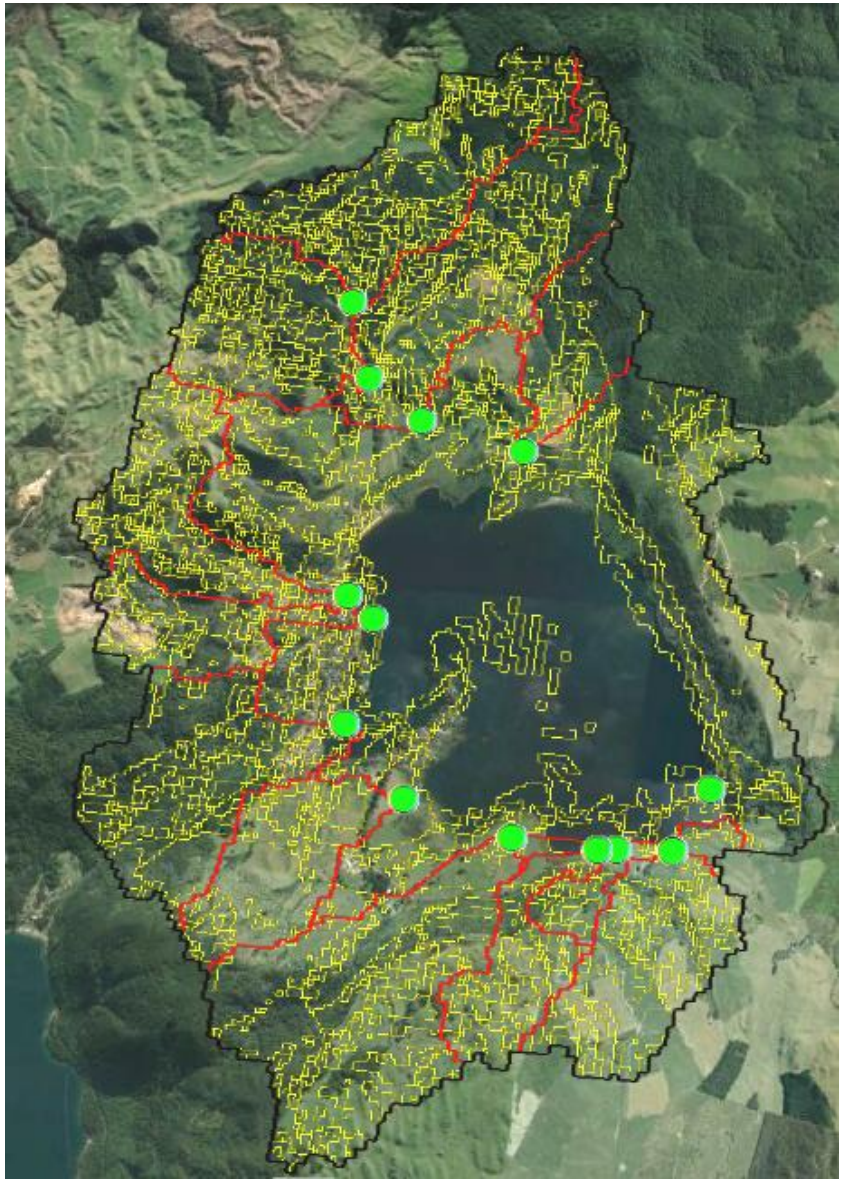
The Surface Water Assessment Tool (SWAT) Model – Sources of water, sediment and nutrients

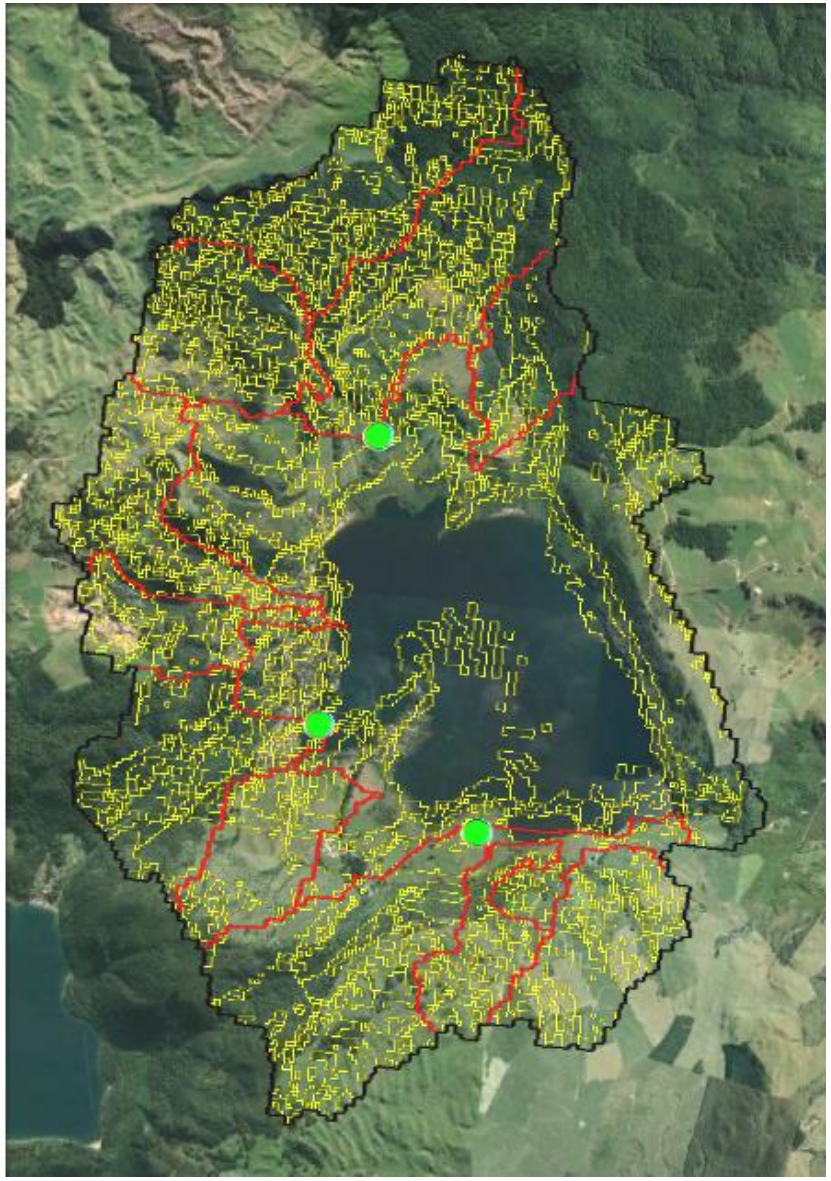


The Surface Water Assessment Tool (SWAT) Model Nitrogen transformations

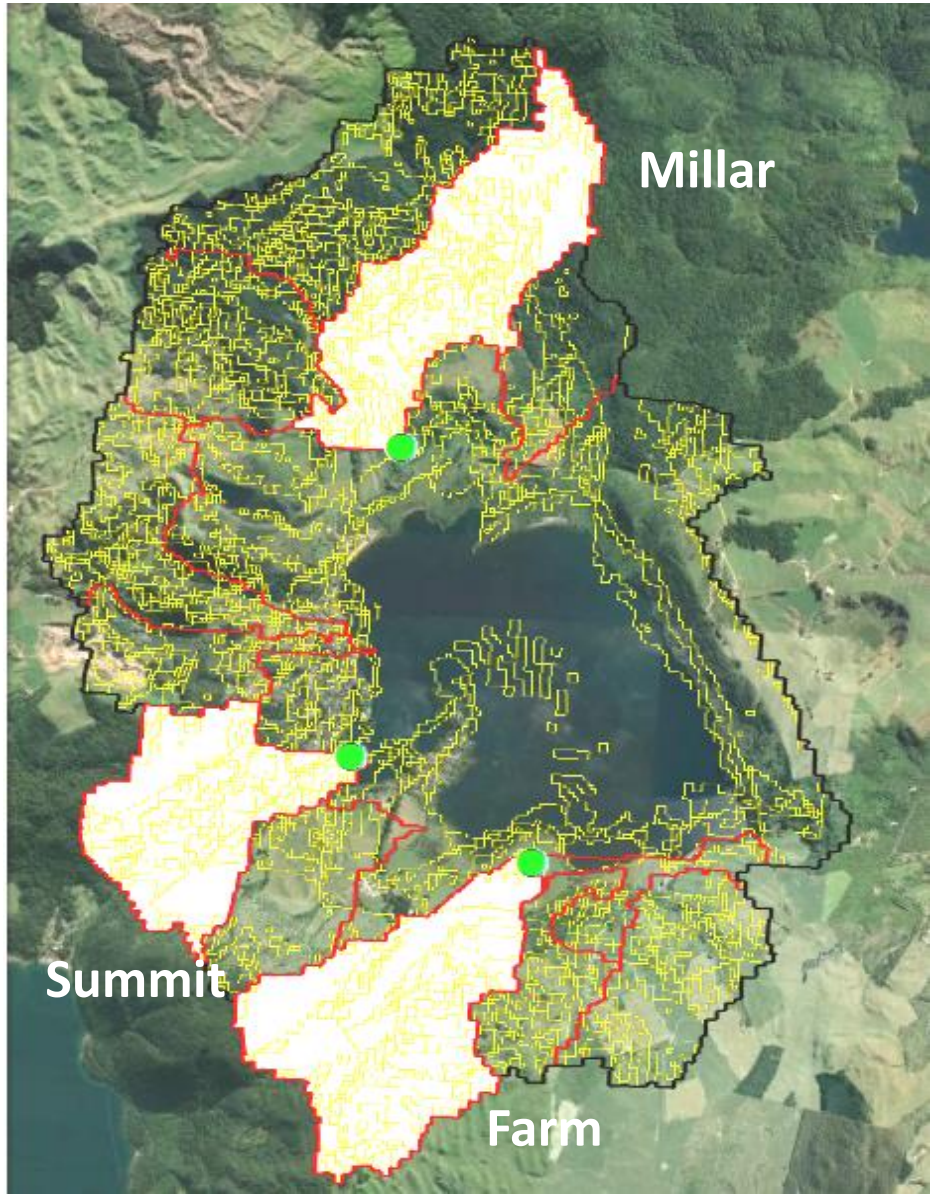


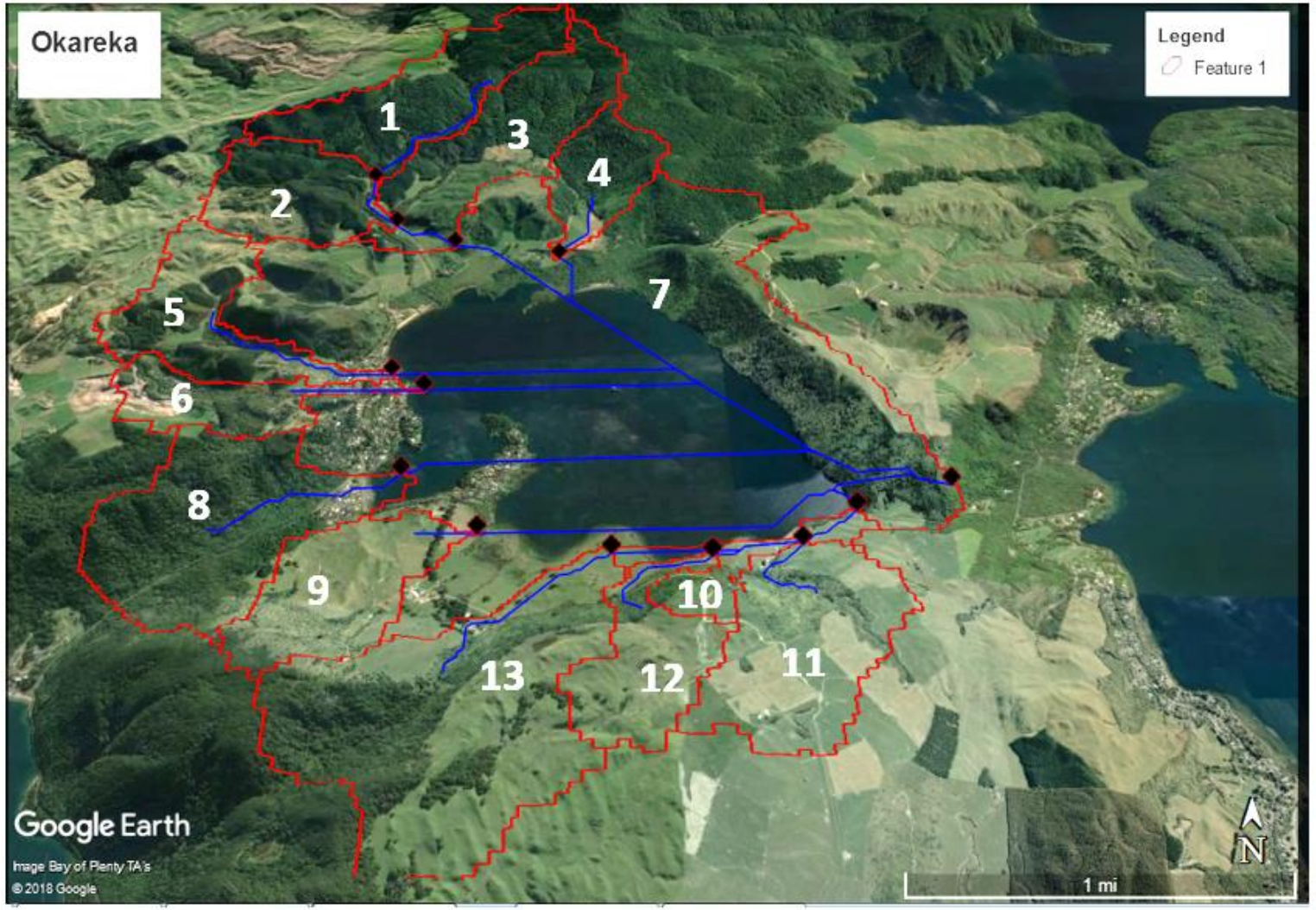
Lake Okareka catchment showing 13 sub-catchments and 3 monitored streams (Millar, Summit and Farm)



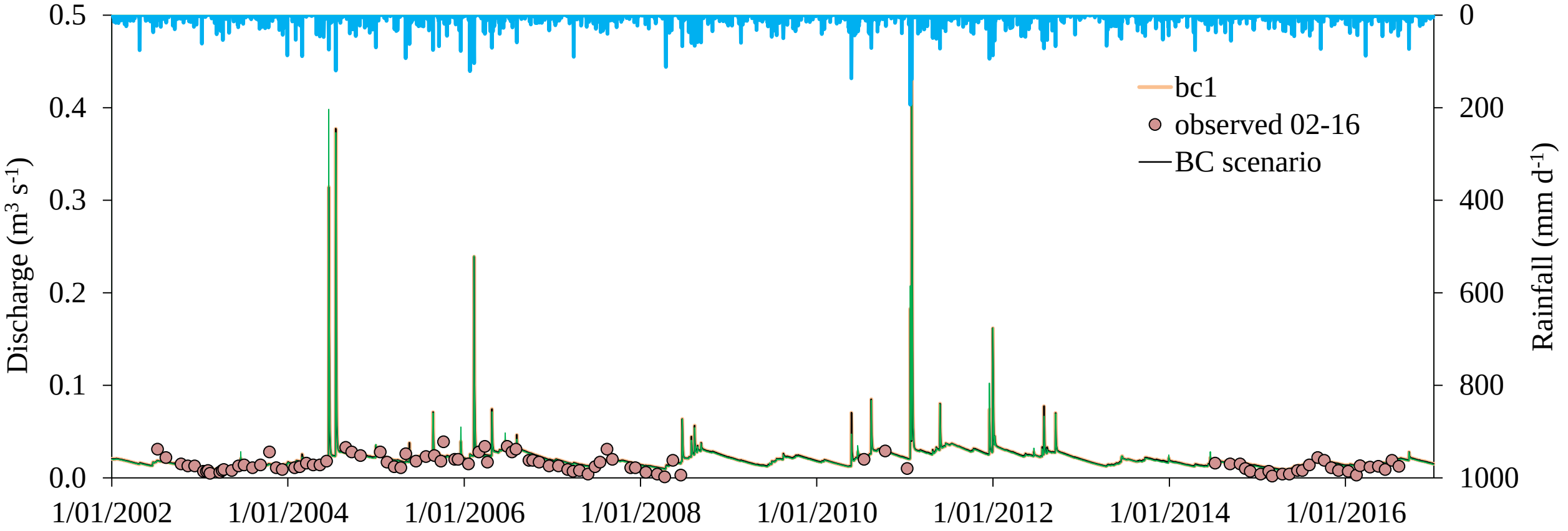


Further delineation of Millar, Summit and Farm subcatchments

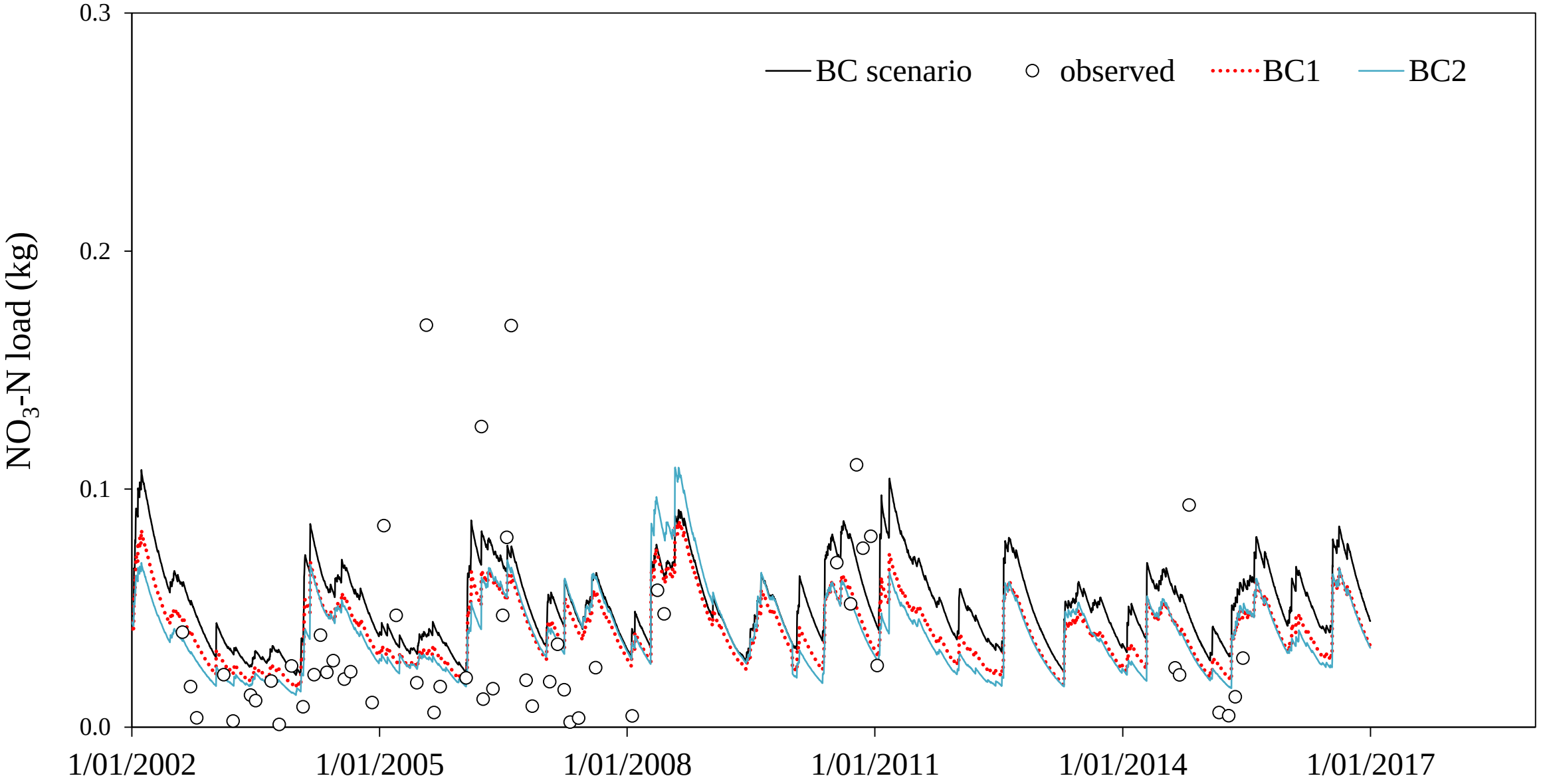




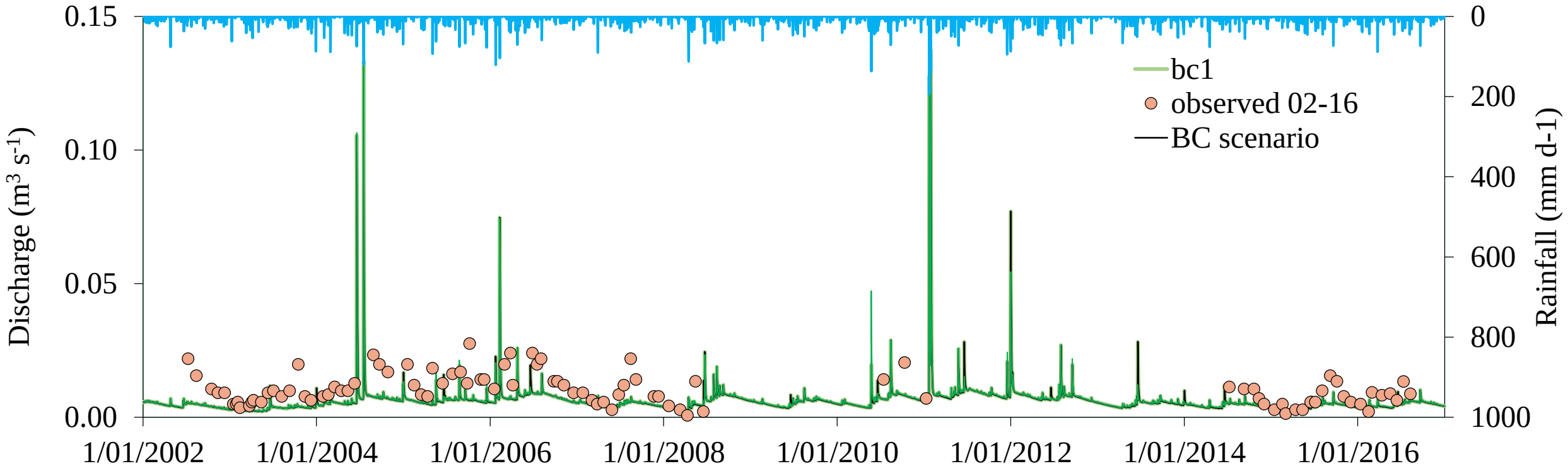
Discharge (flow) at Millar and rainfall (Rotorua Airport)



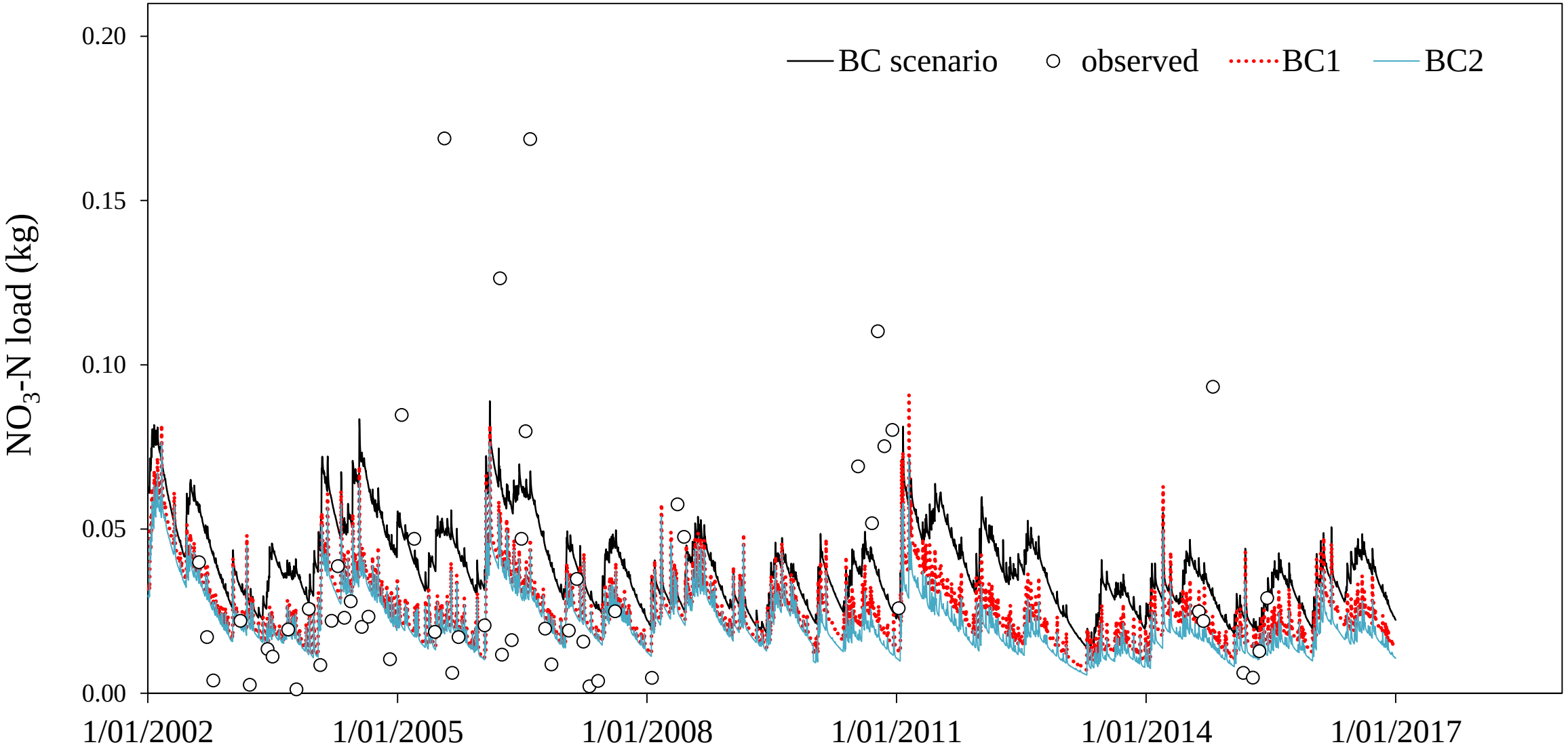
Miller Stream nitrate load



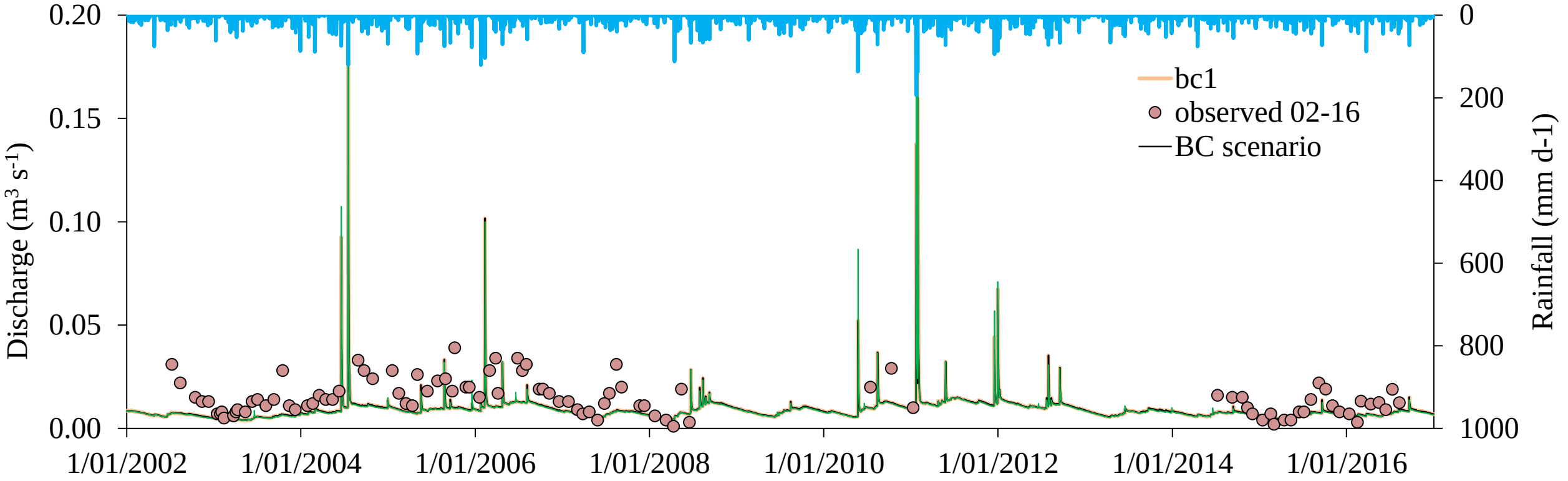
Discharge (flow) at Summit and rainfall (Rotorua Airport)



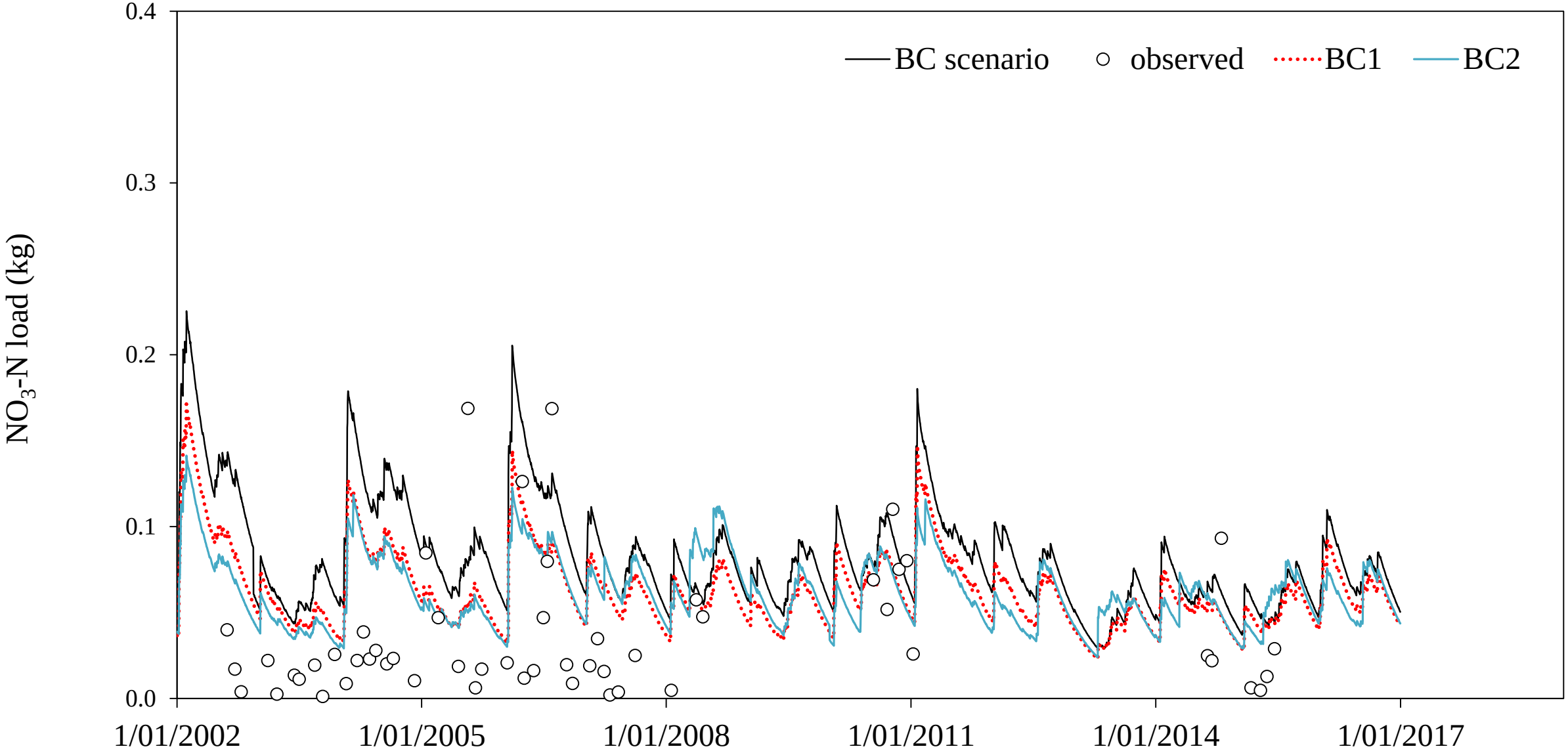
Summit Stream nitrate load



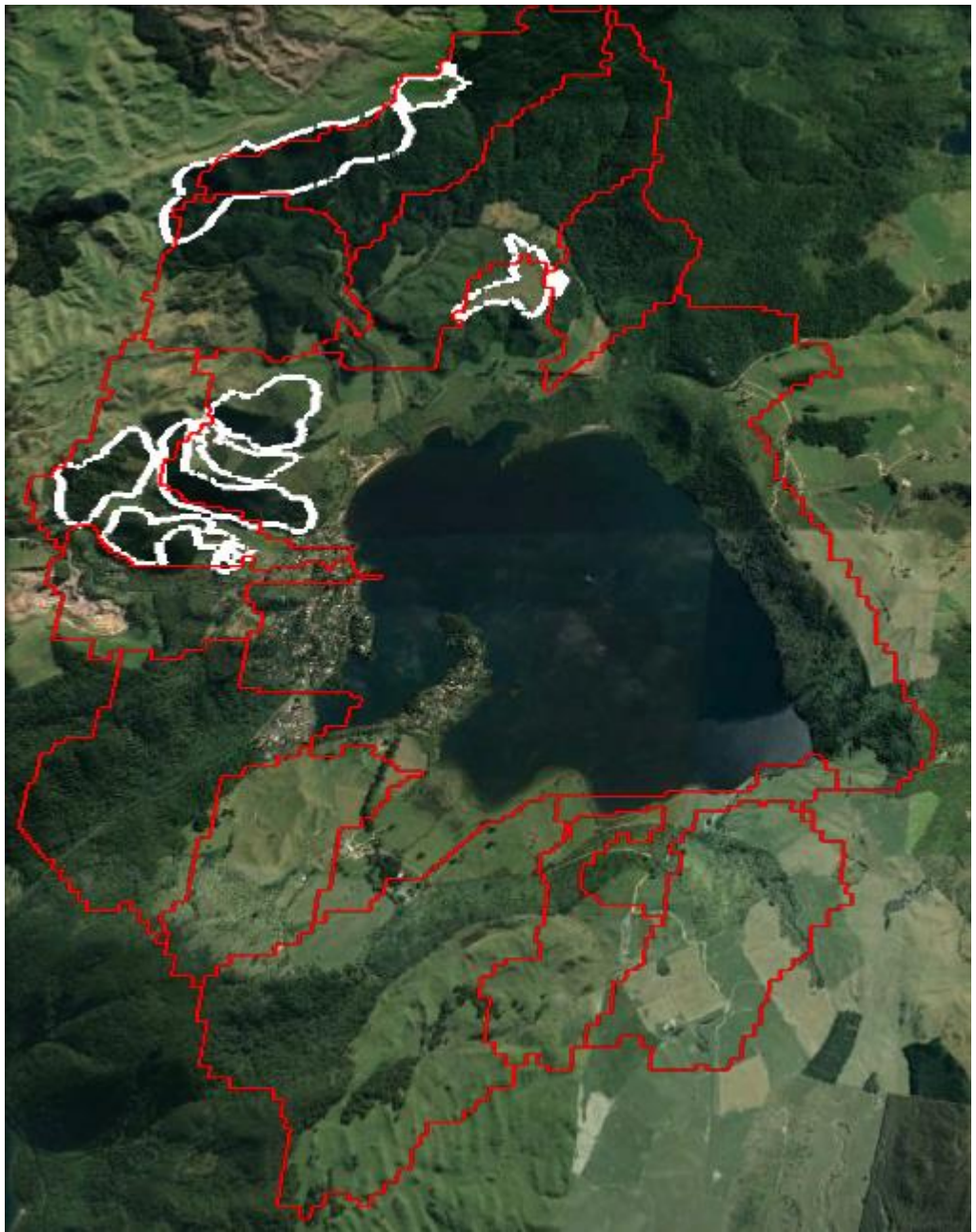
Discharge (flow) at Farm and rainfall (Rotorua Airport)

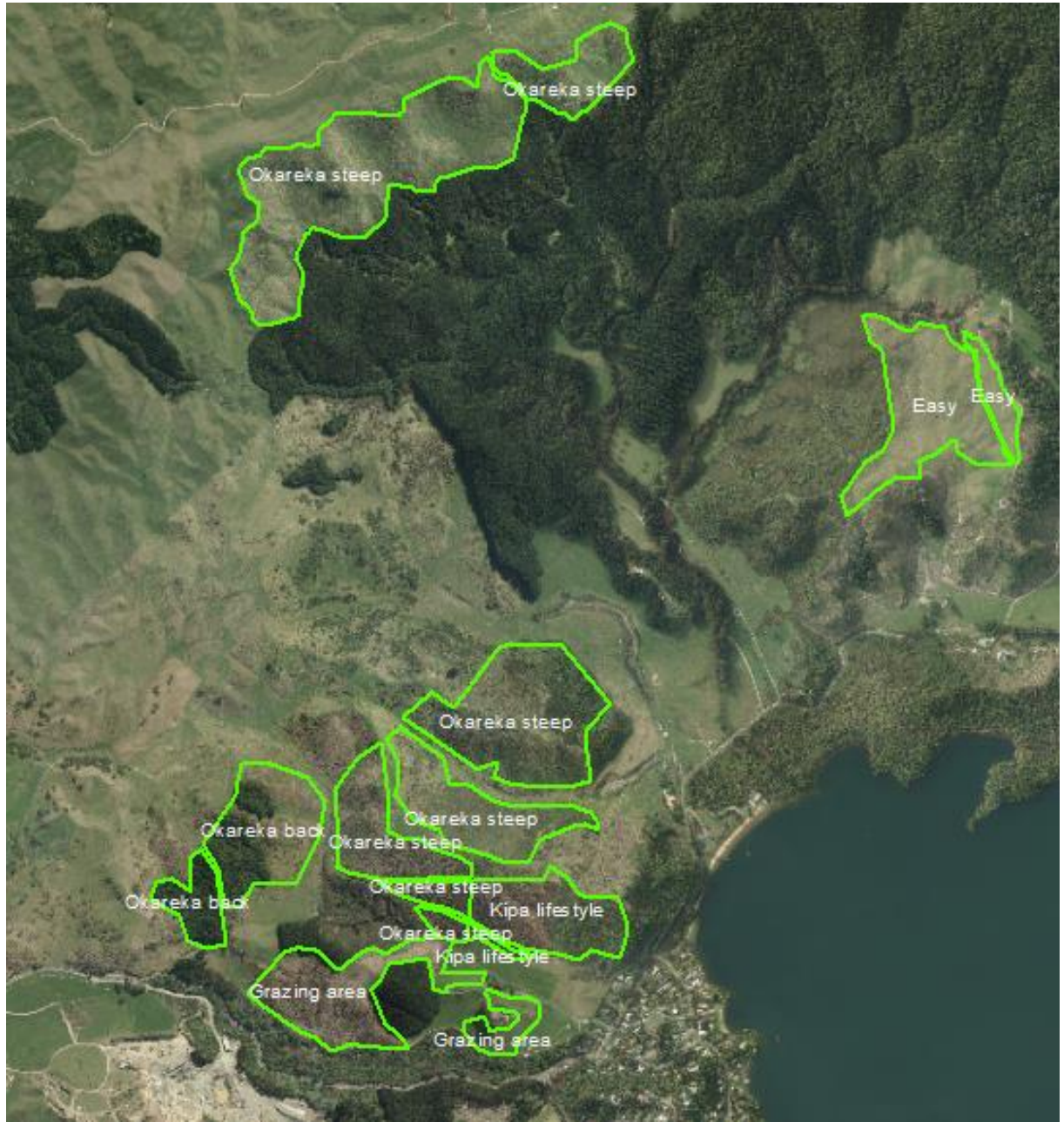


Farm Dam nitrate load

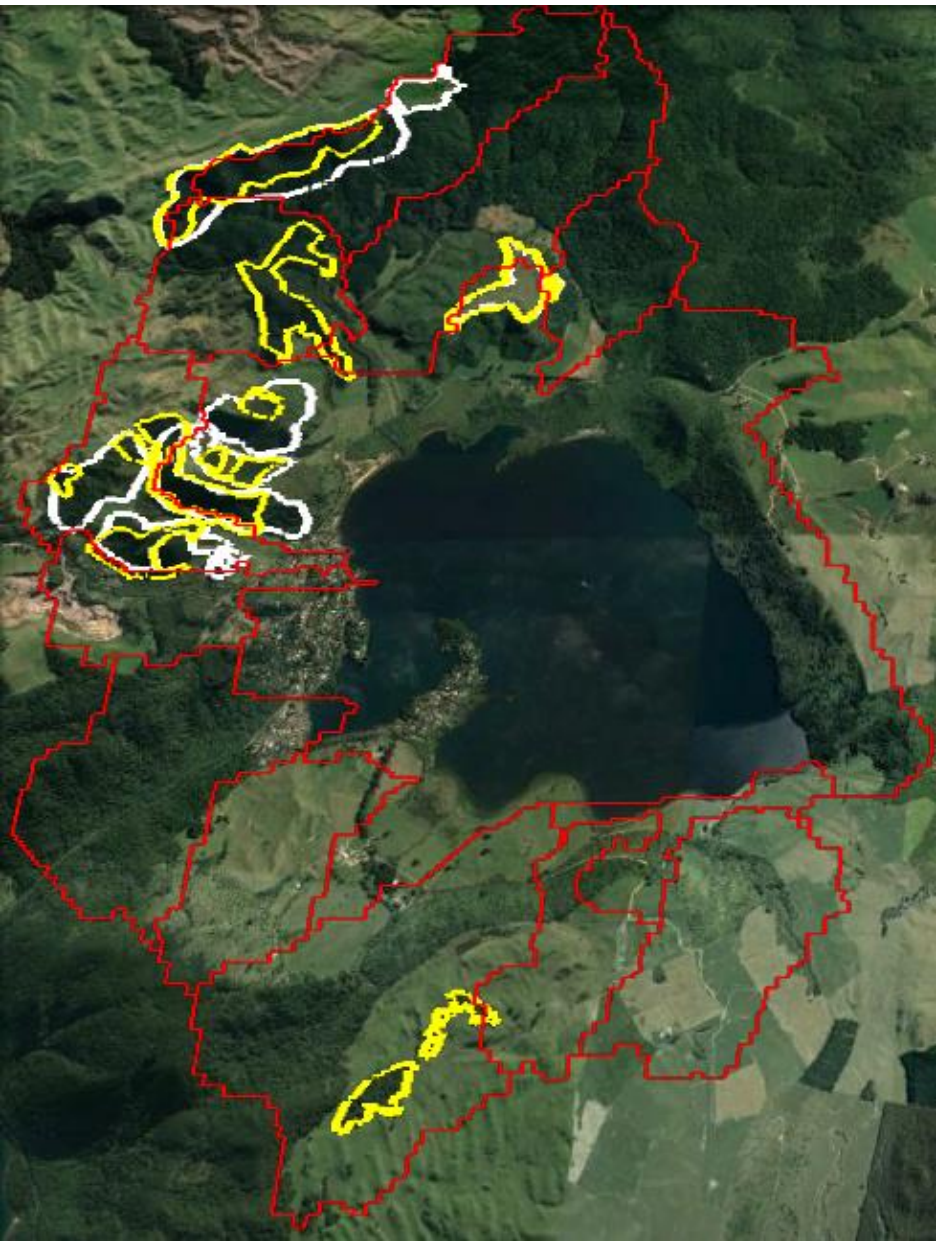


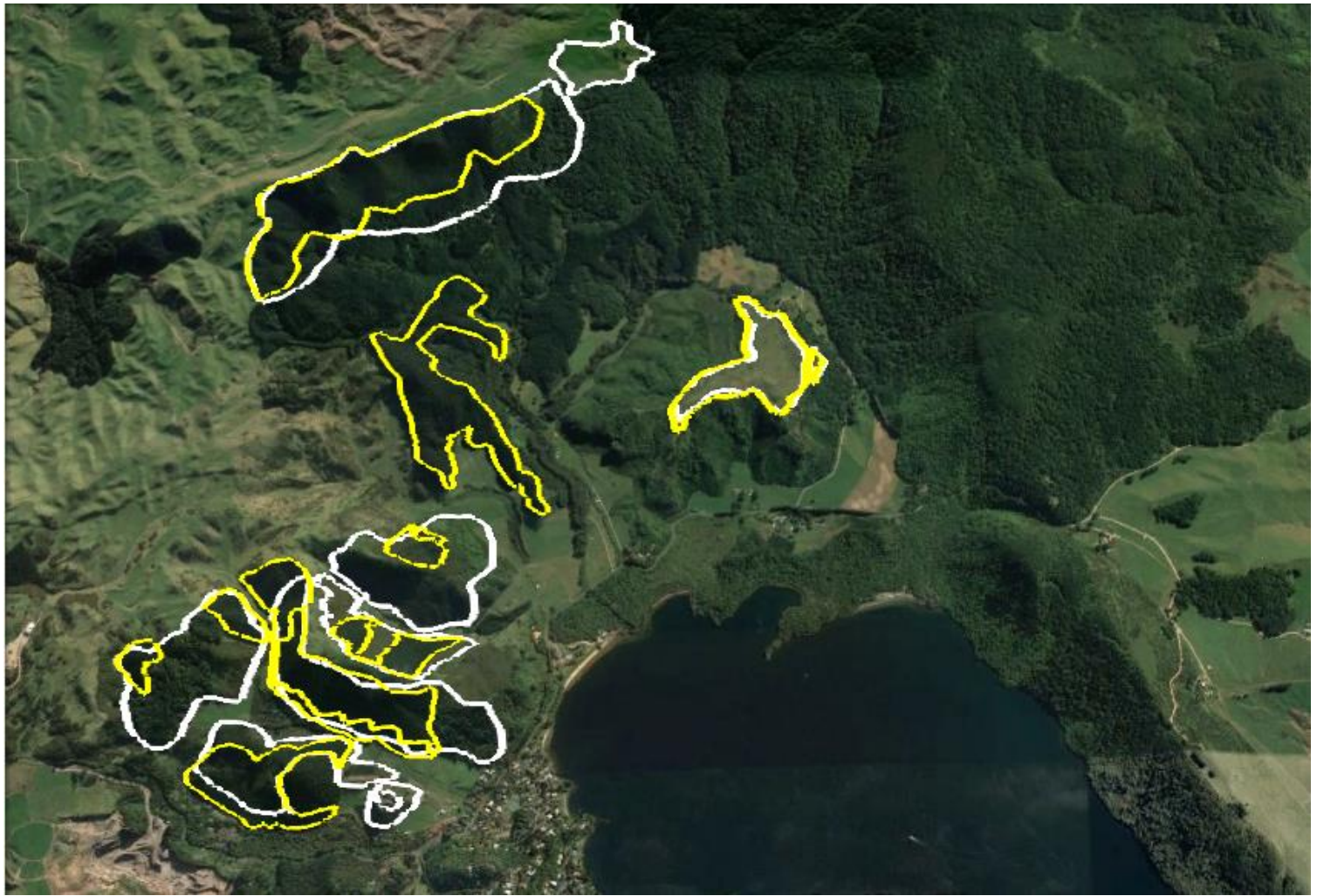
Areas marked for pine plantation (white). Red polygons are subcatchments



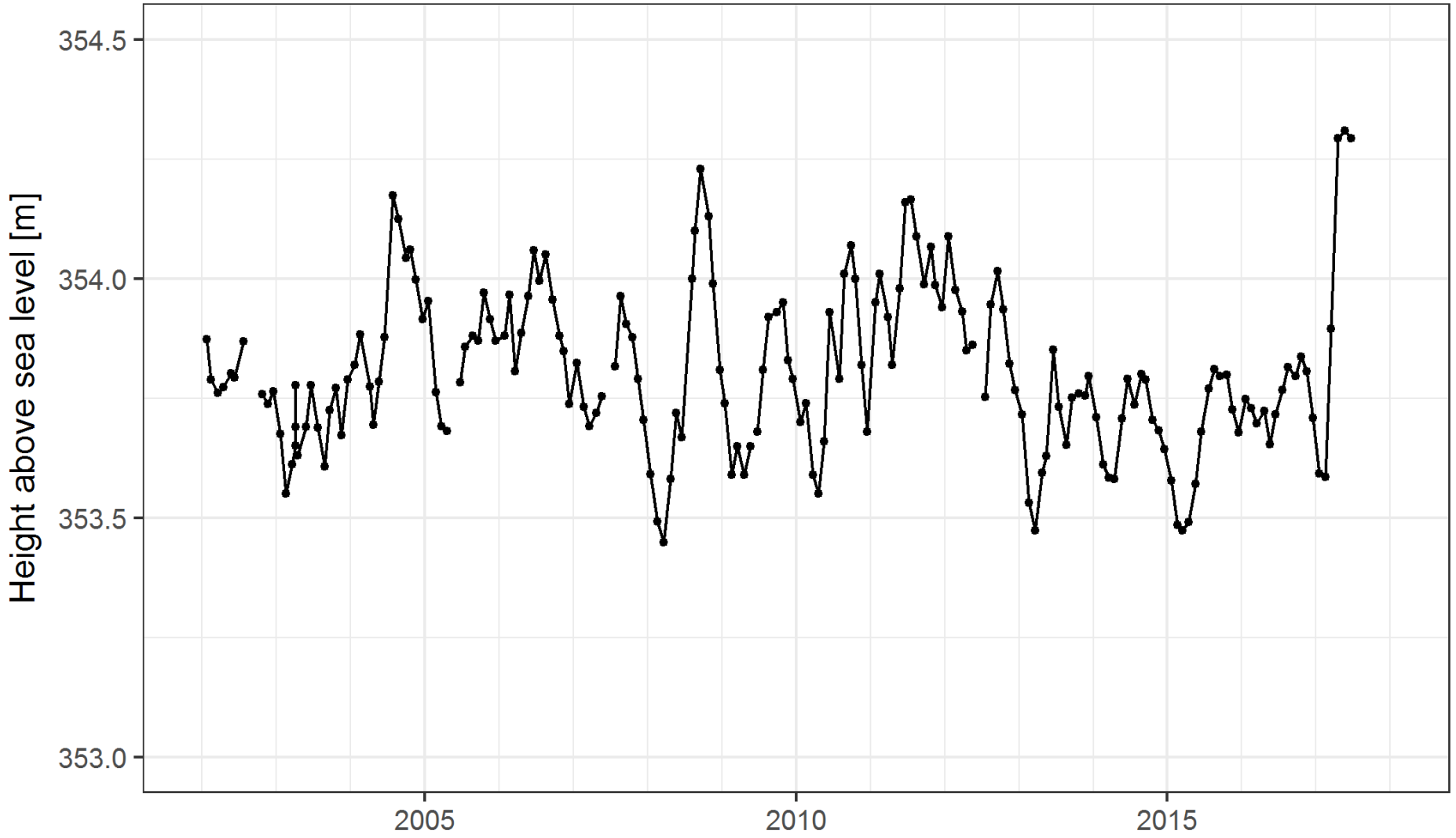


Actual (white) vs proposed (yellow) areas of pine plantation

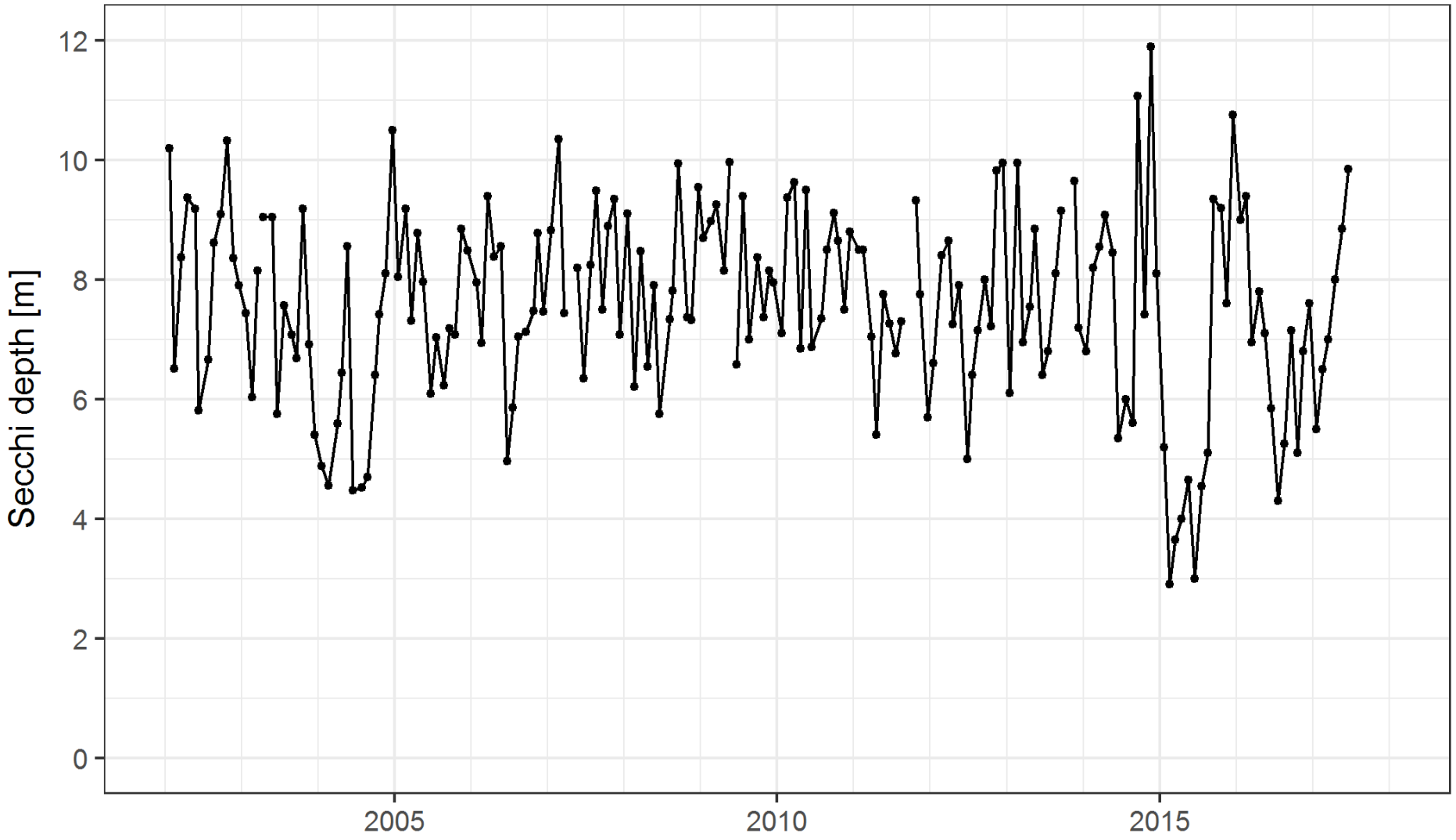




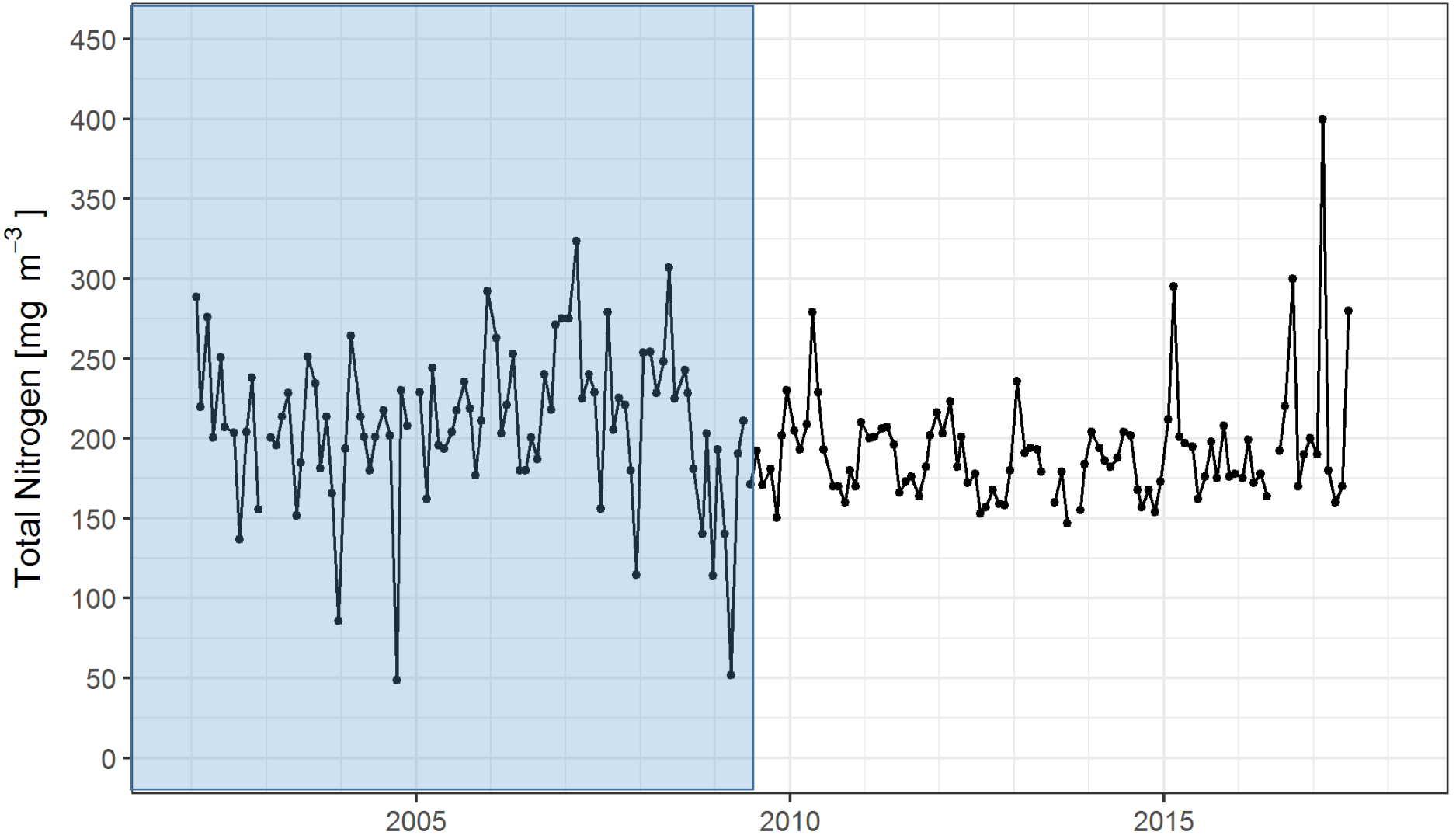
Water elevation for Lake Okareka, 2002 to mid-2017



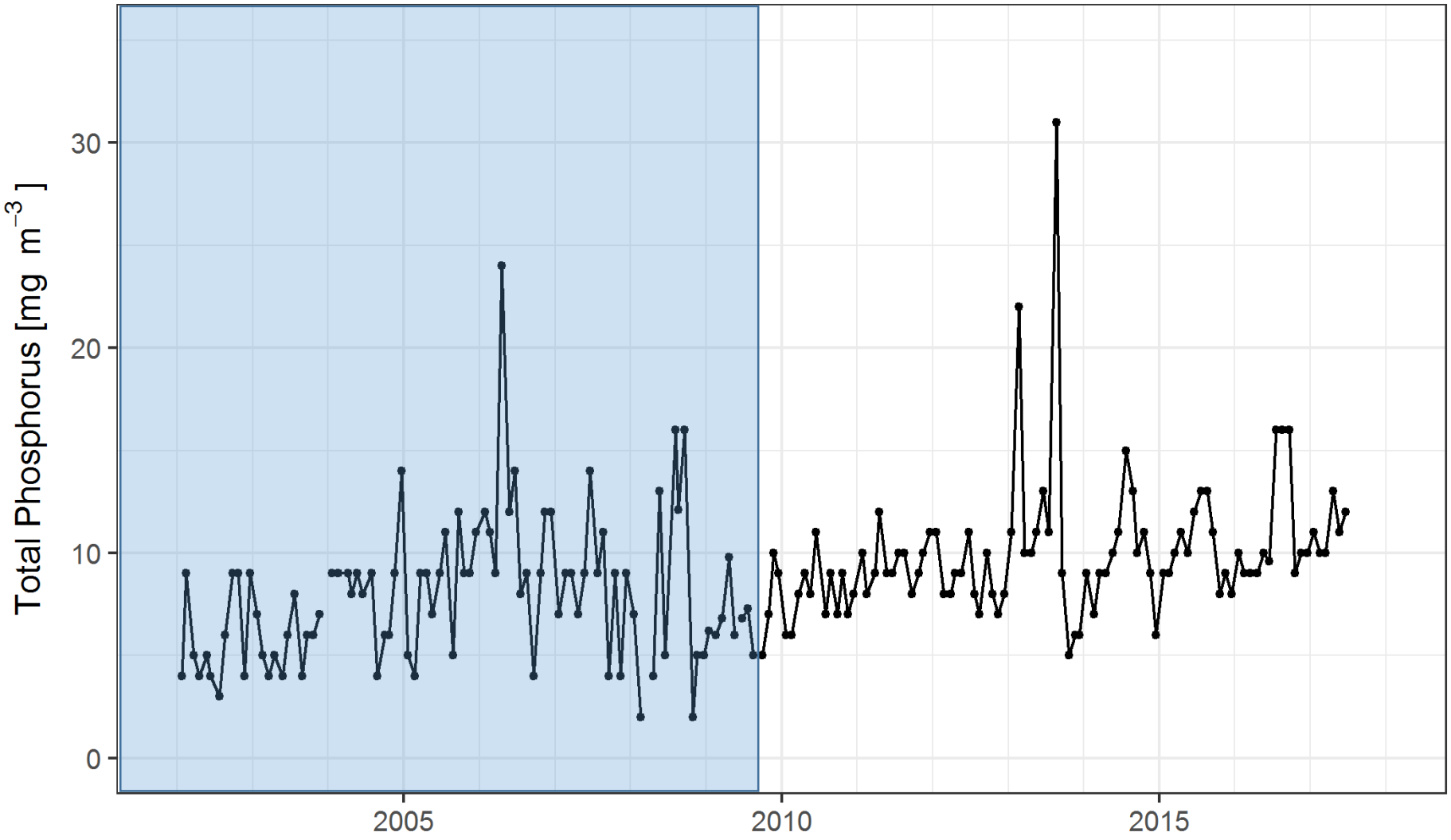
Secchi depth (clarity) for Lake Okareka, 2002 to mid-2017



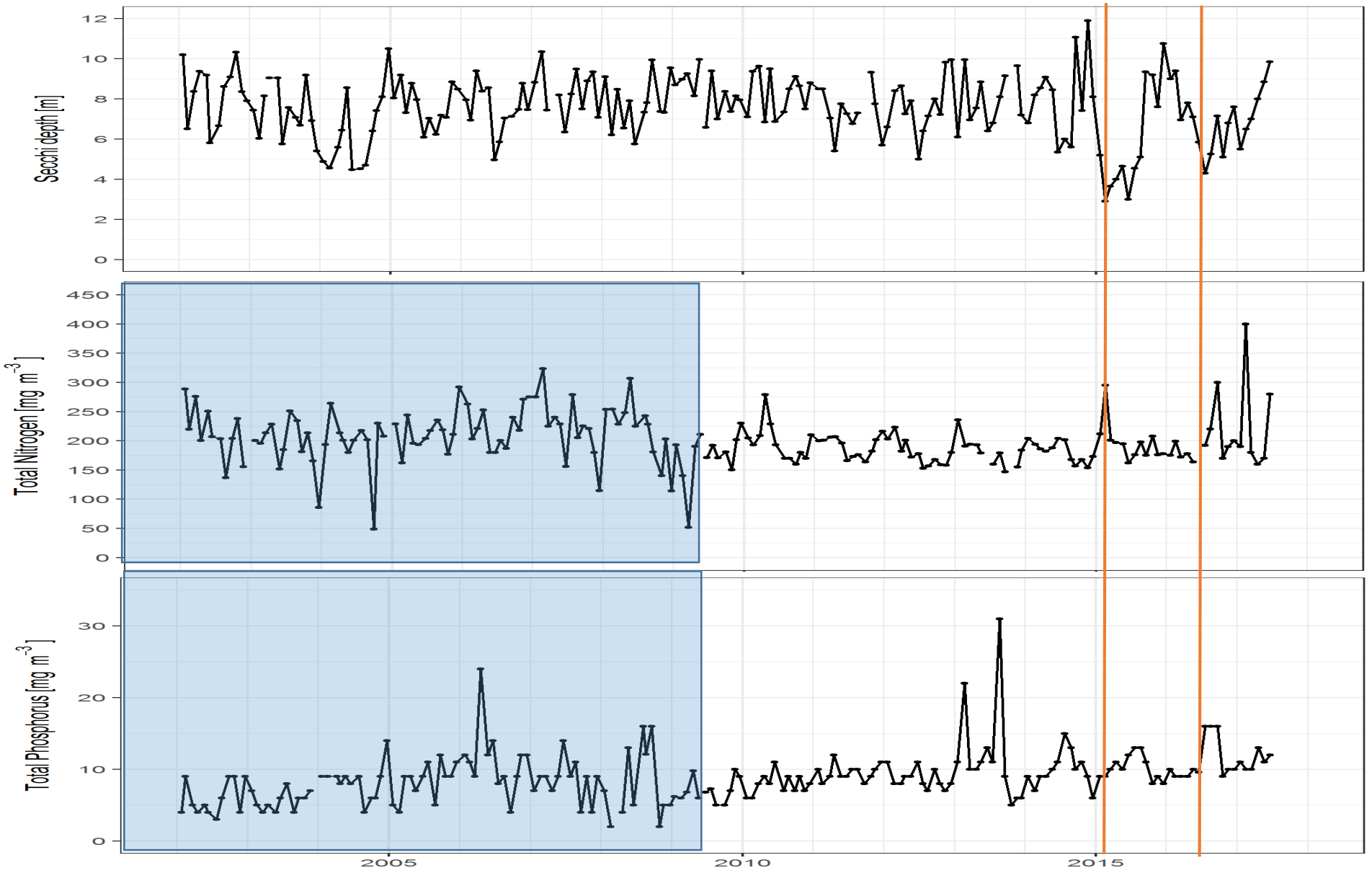
Total nitrogen for Lake Okareka, 2002 to mid-2017



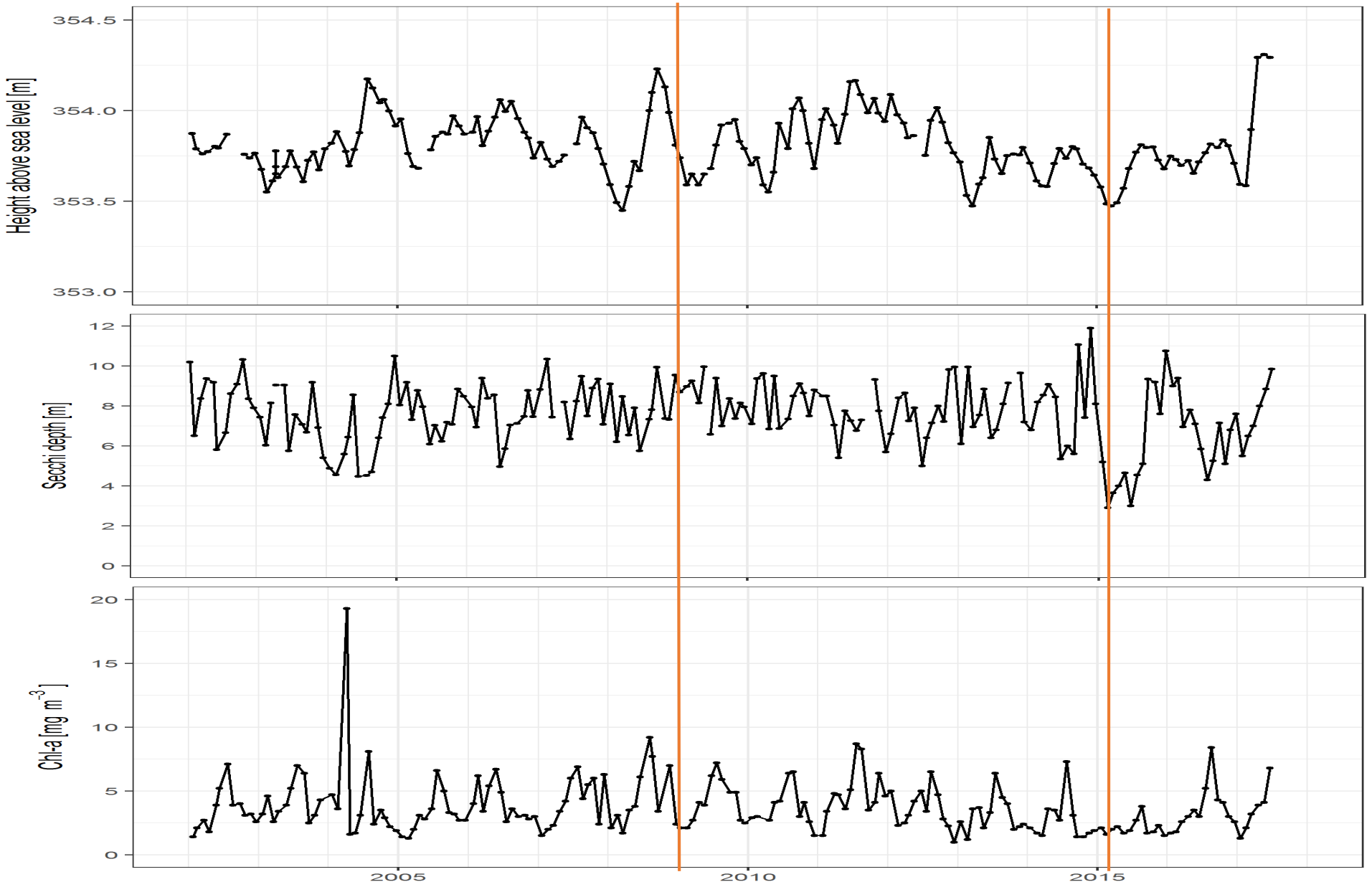
Total phosphorus for Lake Okareka, 2002 to mid-2017



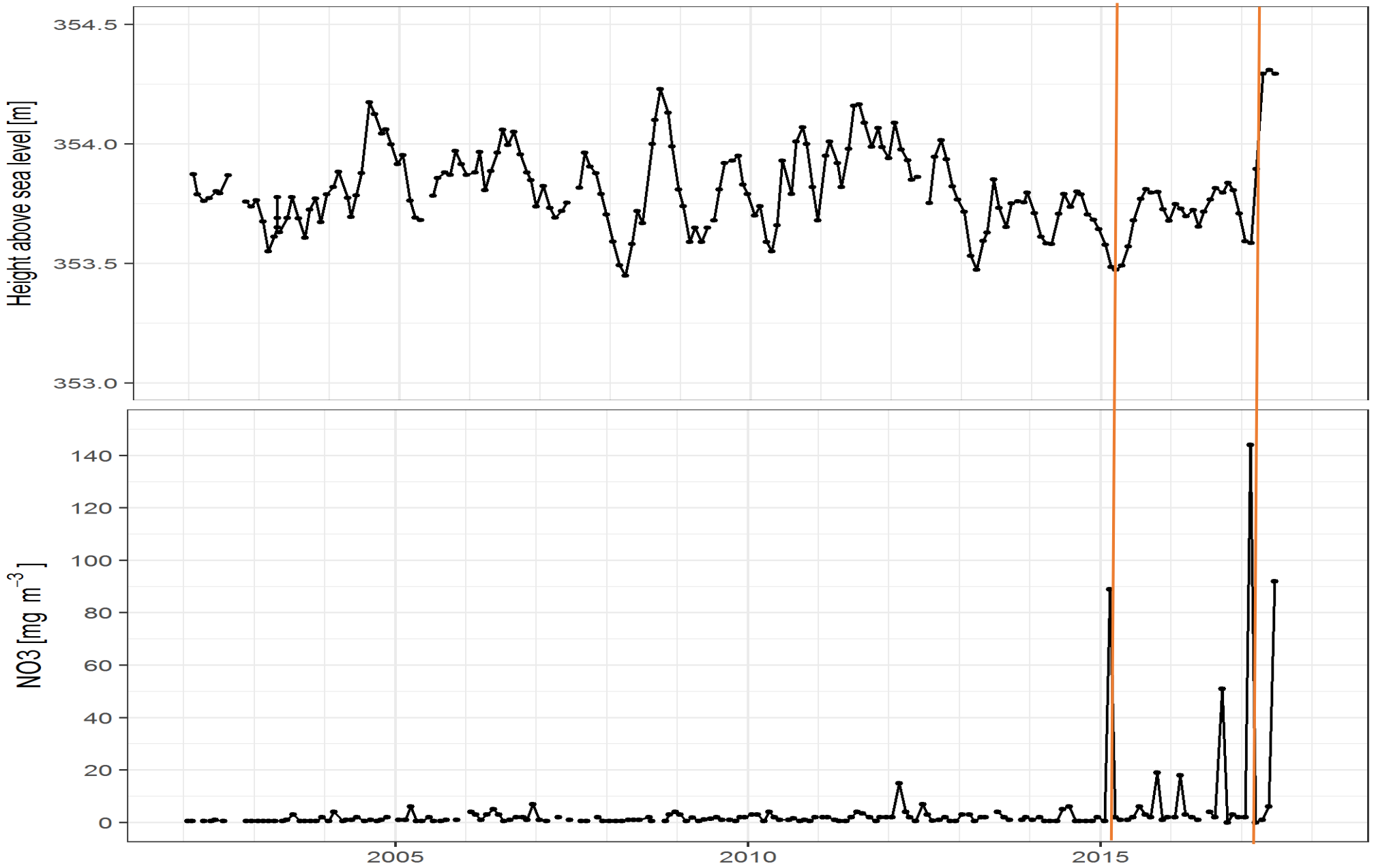
Secchi depth, TN and TP for Lake Okareka, 2002 to mid-2017



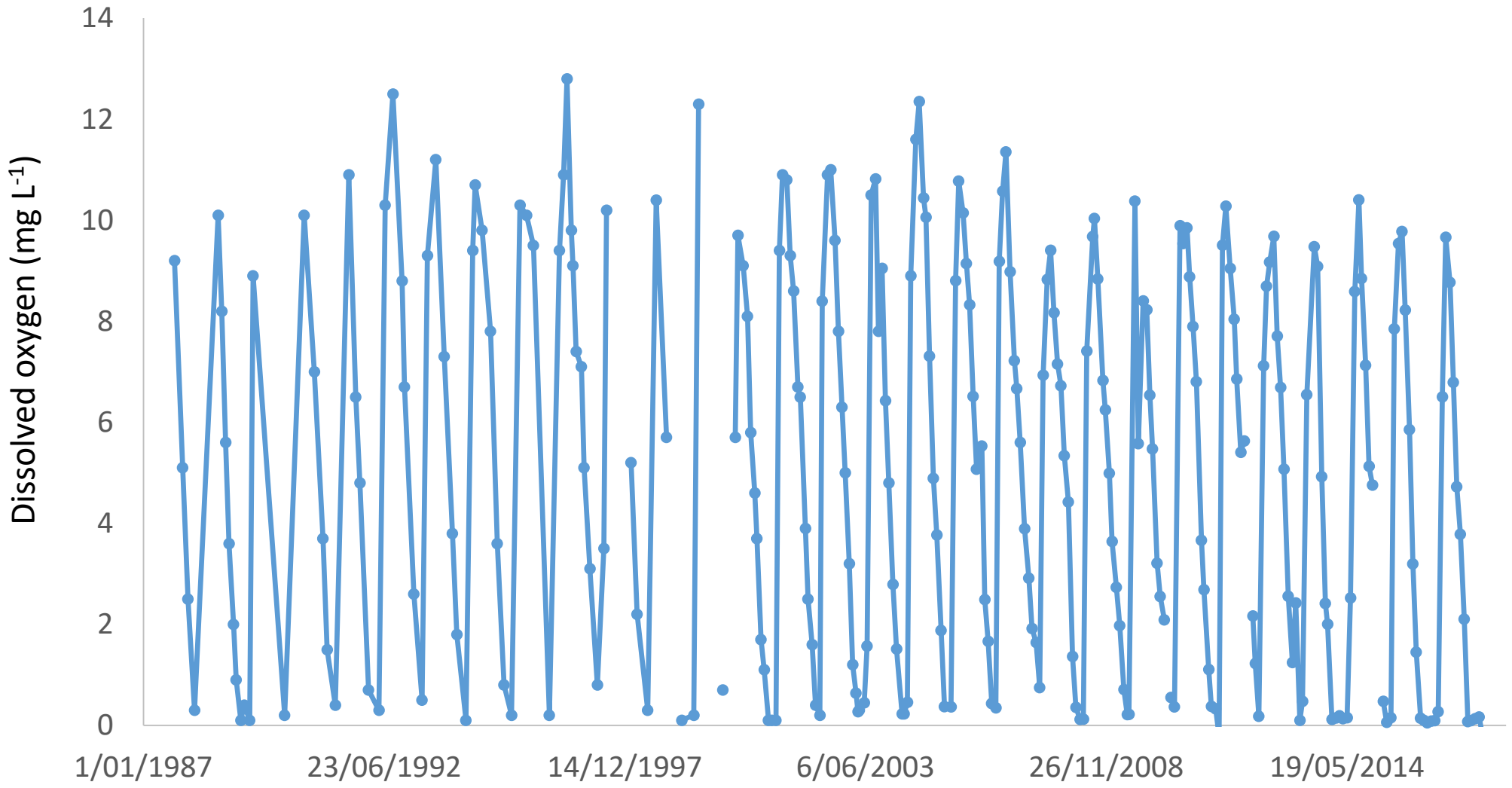
Water level, Secchi depth, chl *a* for Lake Okareka, 2002 to mid-2017



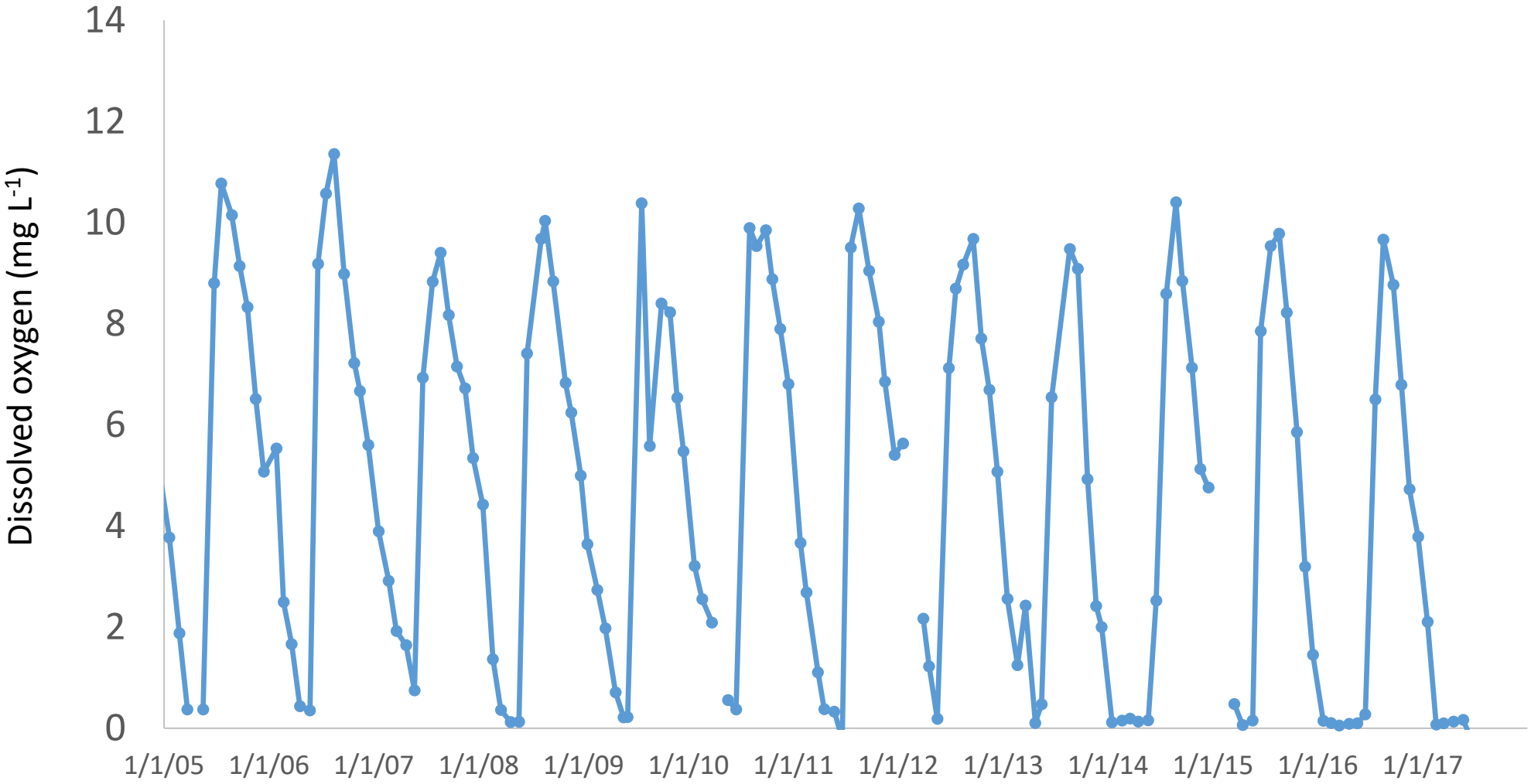
Water level and nitrate for Lake Okareka, 2002 to mid-2017



Dissolved oxygen for Lake Okareka, 1987 to mid-2017



Dissolved oxygen for Lake Okareka, 2005 to mid-2017



Summary Discussion

- Water levels appear to have a strong influence on water quality but a quantitative estimate is difficult to provide at this stage.
- Changes in land use to benefit the lake are likely to offset some of the water quality deterioration that we might expect with changes in climate (e.g., greater variability of rainfall, warmer temperatures).
- Dissolved oxygen (in bottom waters) is a cause for concern and requires a careful watching brief. This sort of change has potential to create a synergistic deterioration of water quality.
- Have not considered food chain (trophic) linkages affecting water quality.