

Development of an interactive catchment water quality modelling framework to support stakeholder decision making

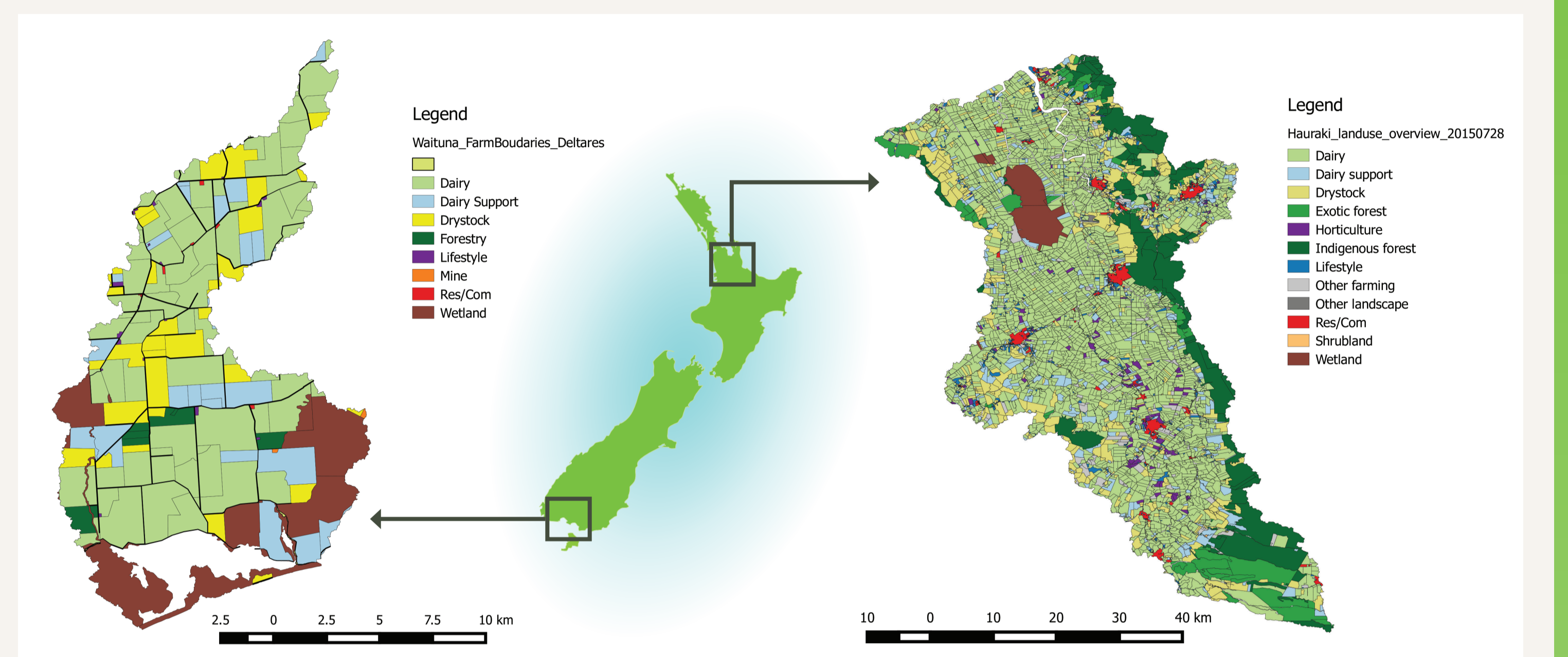
D.F. Burger¹, M. Weeber¹, N. Goorden², E. Meijer², J. van den Roovaart² & D. Tollenaar² | DairyNZ, Cnr Ruakura & Morrinsville Roads, Newstead, Private Bag 3221, Hamilton 3240, New Zealand

¹DairyNZ, Hamilton New Zealand, ²Deltares, The Netherlands

Introduction

This study developed and applied a new spatially-refined water quality modelling approach using Waituna Lagoon catchment (Southland New Zealand) and the Hauraki Plains catchment (Waikato, New Zealand), as case studies (Fig. 1). A better understanding of catchment contaminant loading and management options is required for many New Zealand water bodies through the limit setting process. In agricultural catchments, individual farm nutrient losses may vary significantly due to differences in farm system type and environmental factors. Many existing catchment models do not reflect these differences and are therefore limited in their use as a tool to optimise within-catchment management options.

Figure 1. Location of the Hauraki Plains and Waituna catchment and their land-use distribution



Modelling approach

Individual farm nitrogen and phosphorus losses were quantified using the Overseer[®] farm nutrient budget model. River flows were simulated using a distributed hydrological model (WFLOW) coupled to FEWS operational software for data management and model output visualisation. Total seasonal catchment nitrogen (N) and phosphorus (P) loads were quantified using the lumped, steady-state catchment water quality model (WFD-Explorer) in Delta Shell (Fig. 2). Loads associated with different farming activities (i.e. pasture, cropping) and soil types within each individual farm boundary were implemented separately to allow different on-farm management scenarios to be applied. Model output was calibrated and validated against downstream flow measurements and monthly water quality measurements (Fig. 3).

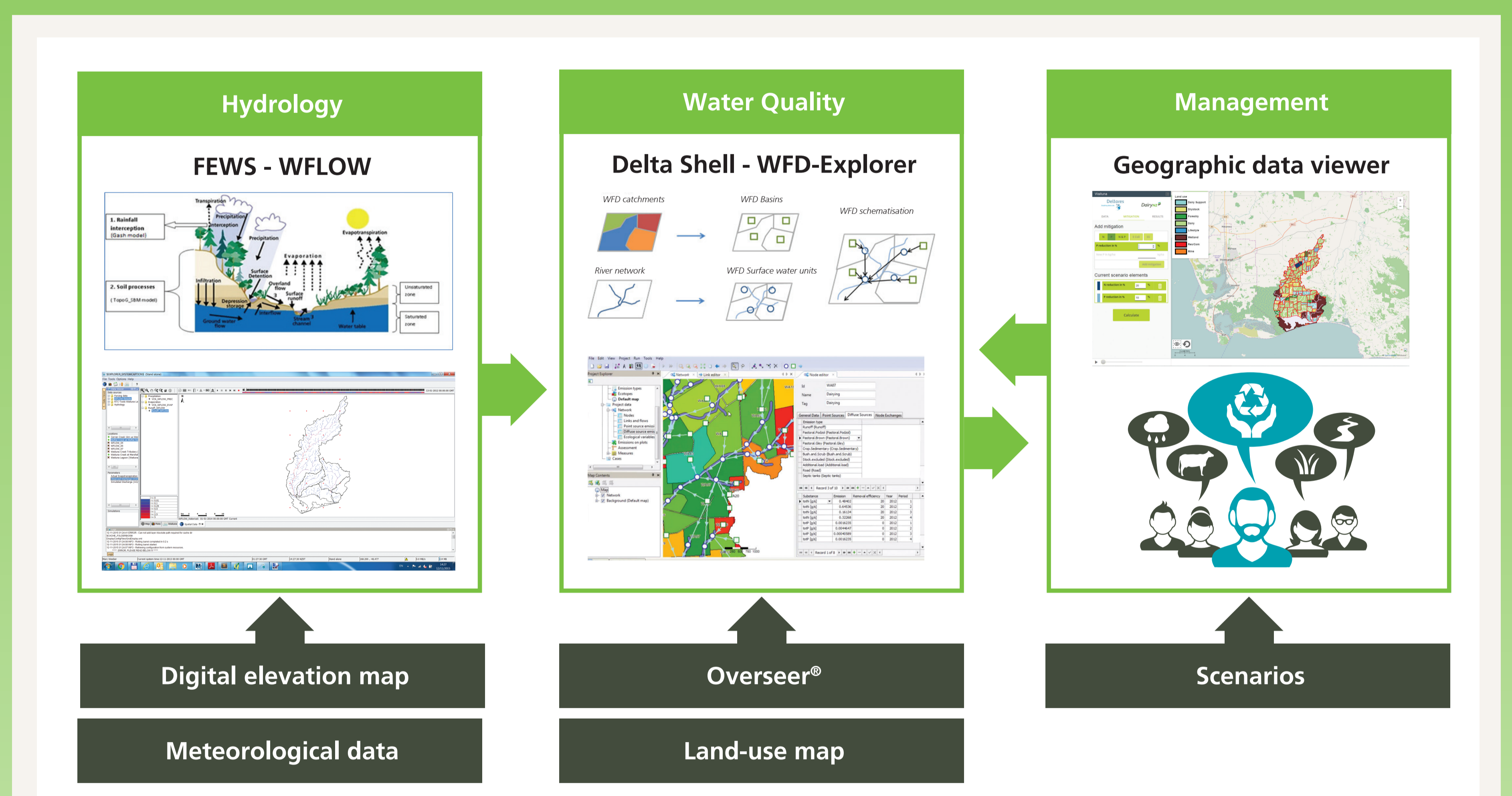


Figure 2. Complete hydrological and water quality model framework. The model results can be altered and presented in the stakeholder component.

Stakeholder tool

The model framework was further integrated into a web-based decision support tool with a geographic data viewer to assist stakeholder decision making. This application, which is touch screen enabled, allows users to select, simulate and understand the impacts of different management scenarios on total catchment nutrient loading in an interactive and visual way.

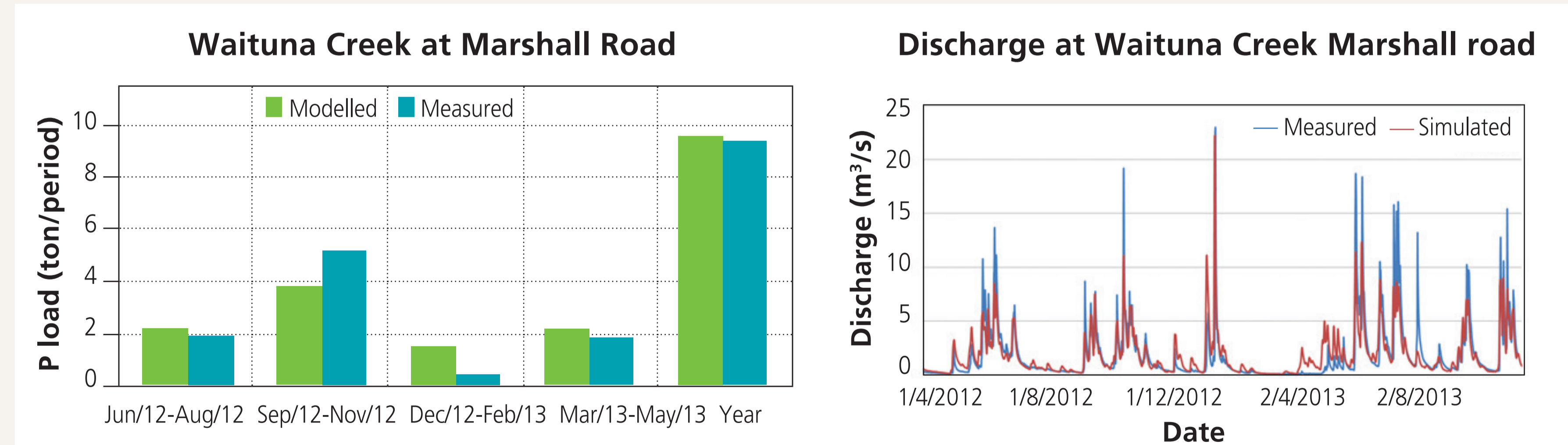


Figure 3. Waituna model validation on phosphorus load and discharge.

Summary

The developed framework has potential as a planning tool to support stakeholders in any future limit setting processes in these catchments. The spatially-refined approach provides greater accuracy around load determination and allows for optimisation of management options within the catchment. Model development is ongoing and is focused on coupling to groundwater models, temporal refinement and the inclusion of economic scenarios.

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