A process-based phytoplankton model, developed to simulate the movement and growth of five phytoplankton groups in river systems, is presented.

The model was implemented in five reaches of the River Thames (UK) with a daily time-step over a period of three years based on a novel weekly flow cytometry dataset which includes concentrations of 5 phytoplankton groups.

Aims of the study:
- Model development
- Model implementation
- Model testing and multi-objective general sensitivity analysis

River Thames catchment:
- Water supply for 14 million people
- Wastewater discharge from almost 3 million population equivalent
- Agriculture and sewage treatment works supply phosphorus to the river, increasing the risk of eutrophication

The model results were satisfactory in terms of fitting the observed data, with validation NSEs greater than 0.5 for 12 cases out of 25, and greater than 0 for 18 out of 25 cases. The growth and death rate obtained in this study were found to be in agreement with previous river modelling studies.

The death rate parameter is highly influential for all phytoplankton groups and all reaches. The phosphorus half-saturation parameter proved to exert almost no influence, given that phosphorus is not a limiting nutrient in the River Thames.