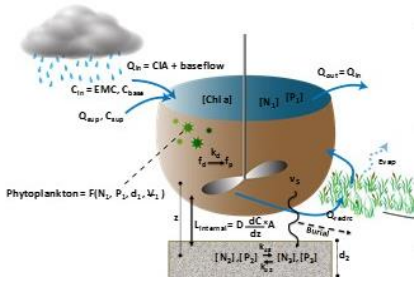
A PRACTICAL AND ROBUST TOOL FOR MODELLING LAKE WATER QUALITY

SLAM
Simplified Lake Analysis Model

SLAM was developed by Dr Tim Cox, for the US consulting firm CDM Smith, to address an identified need for a practical model that can be easily and simply applied in planning studies by a wide range of end-users. SLAM is designed to be intuitive in its use and streamlined in functionality and data requirements, while still providing for a robust simulation of lake nutrient and phytoplankton dynamics.

MODEL BASIS

SLAM calculates lake mass and flow balances on a daily time-step assuming one or more well-mixed lake zones. Each zone is depicted in the model as a "continuously stirred tank reactor" (CSTR), in which complete and immediate mixing is assumed in both the vertical and horizontal directions. This assumption makes the model particularly well suited for lakes that are generally well mixed and that can be divided into a limited number of small and/or shallow zones. For deeper lakes, SLAM does not explicitly calculate lake stratification, but does allow for user-defined seasonal stratification.

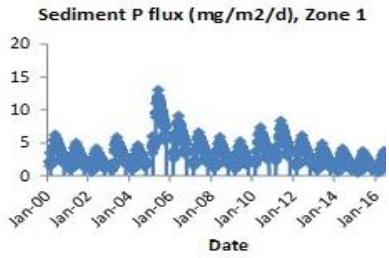


The model targets the key parameters important for eutrophic lakes: phytoplankton (as chl-a), phosphorus (P) and nitrogen (N). An established empirical model (Walker 2004) is used to describe the relationship between summer phytoplankton levels and lake nutrient concentrations and hydraulics. Lake watershed hydrology and pollutant loadings can either be explicitly calculated by the model or can be user prescribed.

USE SLAM TO INVESTIGATE IN-LAKE BMPS

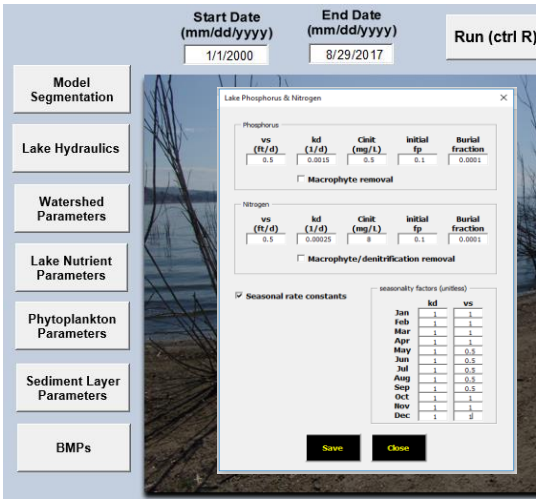
SLAM allows for quick and easy simulations of a variety of in-lake best management practices (BMPs), including: sediment dredging, hypolimnetic oxygenation, supplemental water inputs, pump and treat systems, alum application, and re-circulating off-channel wetlands treatment.

SEDIMENT NUTRIENT FLUXES



SLAM includes a state-of-the-art dynamic sediment nutrient flux module. This module calculates internal nutrient loads from the sediments to the water column as a function of shallow sediment nutrient dynamics and diffusive exchanges between sediment porewater and the overlying water column. Internal nutrient loads are a key component of many eutrophic lakes. The inclusion of dynamic and rigorous sediment nutrient calculations within a practical planning-level water quality model distinguishes SLAM from most other published lake water quality models.

SLAM HAS A PROVEN TRACK RECORD



SLAM has been used in support of planning, permitting and restoration studies across the US, in New Zealand and in the UK.

✓ In New Zealand, the model was used to evaluate the effectiveness of a proposed river-water flushing scheme designed to improve water quality in heavily-polluted Lake Waikare (36 km^2 in area). The model simulated a scheme to divert large volumes of local river water into the lake to flush lake nutrients and phytoplankton. The calibrated model helped to better define and understand existing lake water quality dynamics, and revealed the large impact of catchment agriculture on lake water quality. Modelling results showed a potential for significant improvements in water quality from the proposed diversion, but at the expense of impaired quality in downstream receiving waters. SLAM has also been used to assess the impacts of new development on an urban lake in Hamilton (Rotokauri) and to forecast water quality for a new constructed lake in northern Waikato.

✓ Overseas, SLAM was used to support a $100 million restoration project for Machado Lake (Los Angeles, CA). The model was used to develop and evaluate a suite of restoration strategies that have subsequently been implemented to reduce lake nutrient and phytoplankton levels. SLAM is currently being used by the Ireland Environmental Protection Agency to help guide lake and catchment restoration projects and target-setting. In support of permitting, SLAM was used to quantify the impacts of a proposed new discharger on lake phytoplankton levels in Lake Wichita (Wichita Falls, TX) and to perform total maximum daily load (TMDL) analyses for multiple lakes in Illinois, for the state Environmental Protection Agency.

CONTACT US FOR A DEMONSTRATION OR FOR MORE INFORMATION

Phone (07) 974 4678 **info@streamlined.co.nz** **www.streamlined.co.nz**

Streamlined Environmental Ltd, 510 Grey Street, PO Box 7003, Hamilton East, 3247, New Zealand