

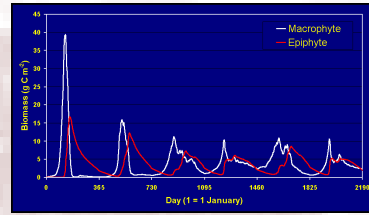


INtegrated CAtchment Model – Phosphorus INCA-P



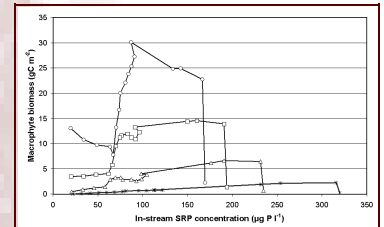
Introduction

The INCA-P model is a process-based, mass balance model that simulates the phosphorus (P) dynamics in both the plant/soil system and the stream. The model simulates variations in P export from different land use types within a catchment using a semi-distributed representation. The land-phase includes a simplified representation of direct runoff, soilwater and groundwater flows and soil P processes. The model also has a multireach in-stream component that routes water down the main river channel. It simulates organic and inorganic P concentrations in the land phase, and Total P concentrations in the in-stream phase. Soluble Reactive Phosphorus (SRP) concentrations are determined from the Total P concentrations and the macrophyte, epiphyte and algal biomasses are also simulated.



Simulated macrophyte and epiphyte interactions over a sequence of low flow years: River Kennet

Simulated macrophyte biomass vs. instream SRP for 4 low flow conditions, from high (·) to low (·) flows showing reducing macrophyte biomass as flow decreases



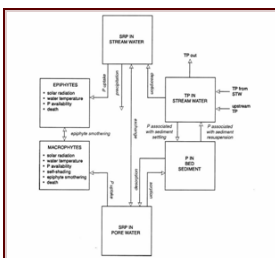
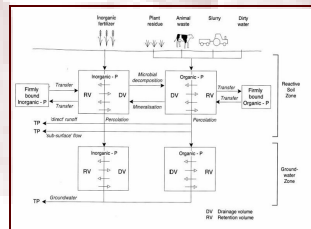
River Kennet



Components of the INCA-P model:

- ◆ GIS interface (defines sub-catchments and calculates land-use)
- ◆ Land-phase hydrological model
- ◆ Land-phase P model
- ◆ In-stream P model

INCA model: Phosphorus inputs, processes and outputs in the direct runoff, soil and groundwater stores of the land-phase component.



Phosphorus inputs, processes and outputs in the in-stream components

Output

- ◆ daily and annual organic and inorganic P fluxes for all processes and stores within the land phase
- ◆ daily time series of flows, organic and inorganic P concentrations in the soil, groundwater and direct runoff
- ◆ daily time series of flows, TP, SRP, chlorophyll-a and macrophyte biomass
- ◆ statistical summaries,
- ◆ distribution graphs of flow and P concentration
- ◆ profiles of P and flow down the river system
- ◆ detailed mass balance checks

Example output: Daily simulation of organic and inorganic P in the soil, subsurface flow, runoff, and groundwater



Simulated and observed Total Phosphorus concentrations at Mildenhall, River Kennet, 1997-1998

