Soluble Reactive Phosphorus (SRP) Increases in the Hypolimnion of Cayuga Lake: Patterns and Probable Causes

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Cayuga Lake Modeling Project
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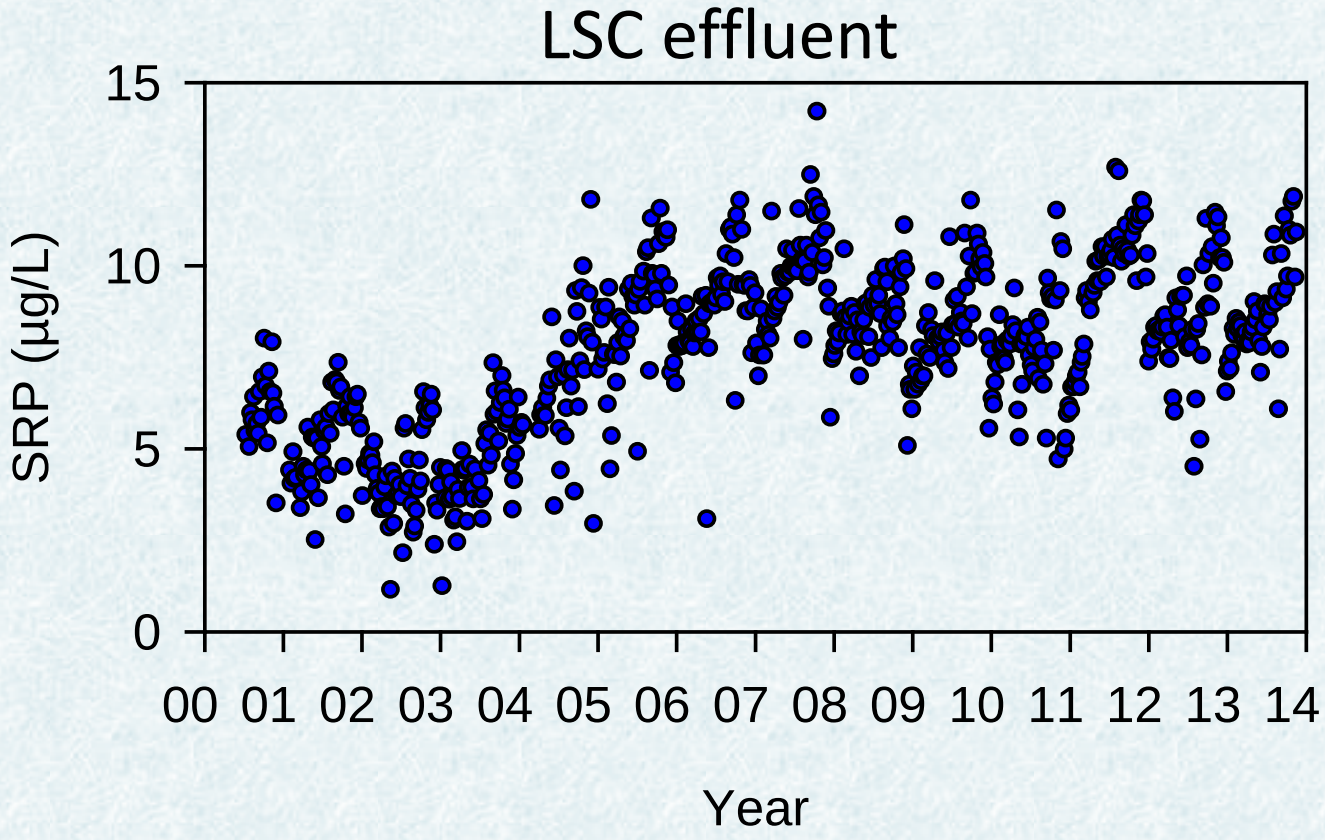
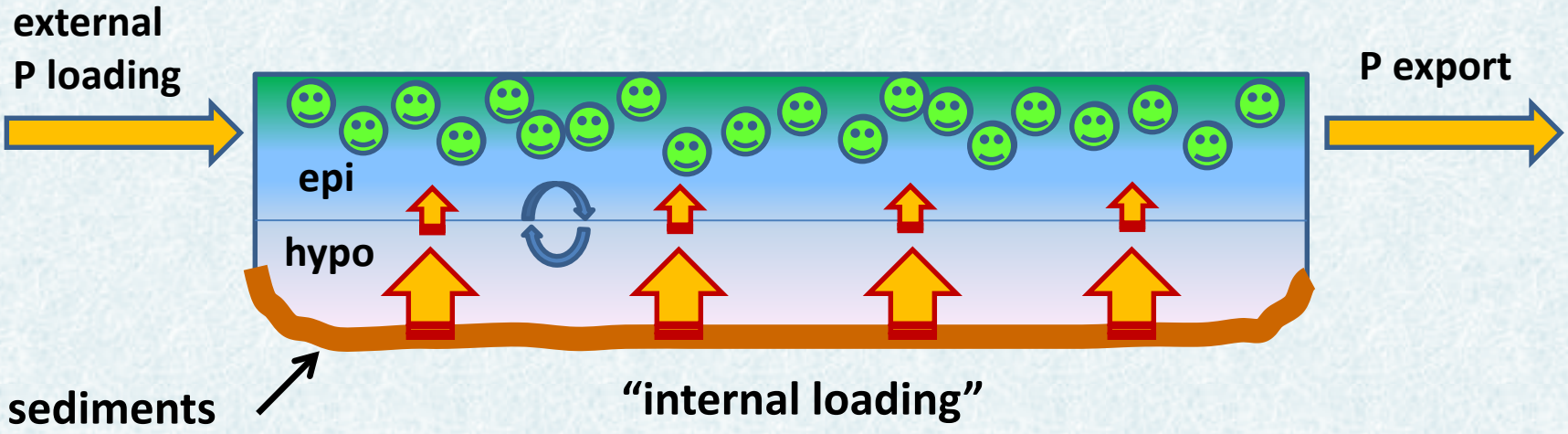
Long-term SRP Pattern in LSC Effluent



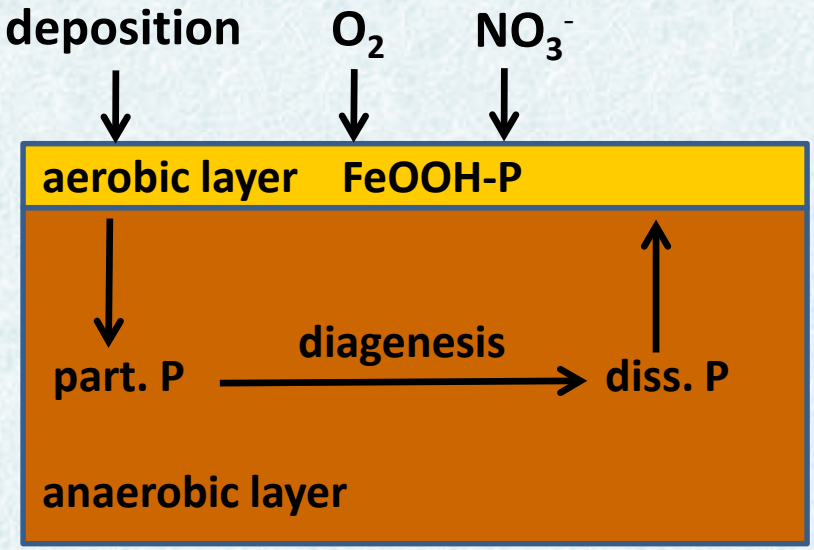
Sediment Phosphorus Release and Delayed Recovery of Culturally Eutrophic Lakes

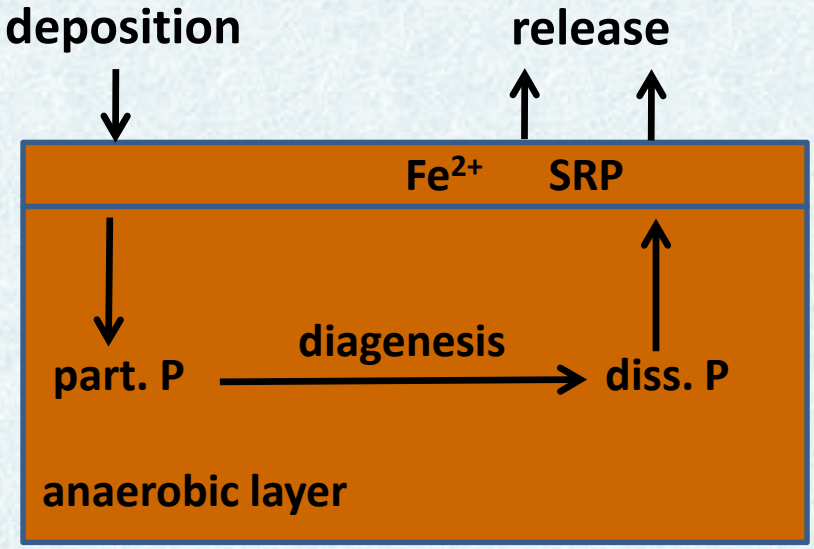
- anaerobic sediments release soluble reactive phosphorus (SRP), which is immediately available to support algal growth after transport to the epilimnion
- continued high rates of P release can limit the benefits of major reductions in external loading
- delayed recovery often observed in shallow eutrophic lakes
  - Shagawa Lake, Minnesota
    - 80 years required to meet TP goal (Chapra and Canale 1991)

Conceptual Model of Sediment P Release

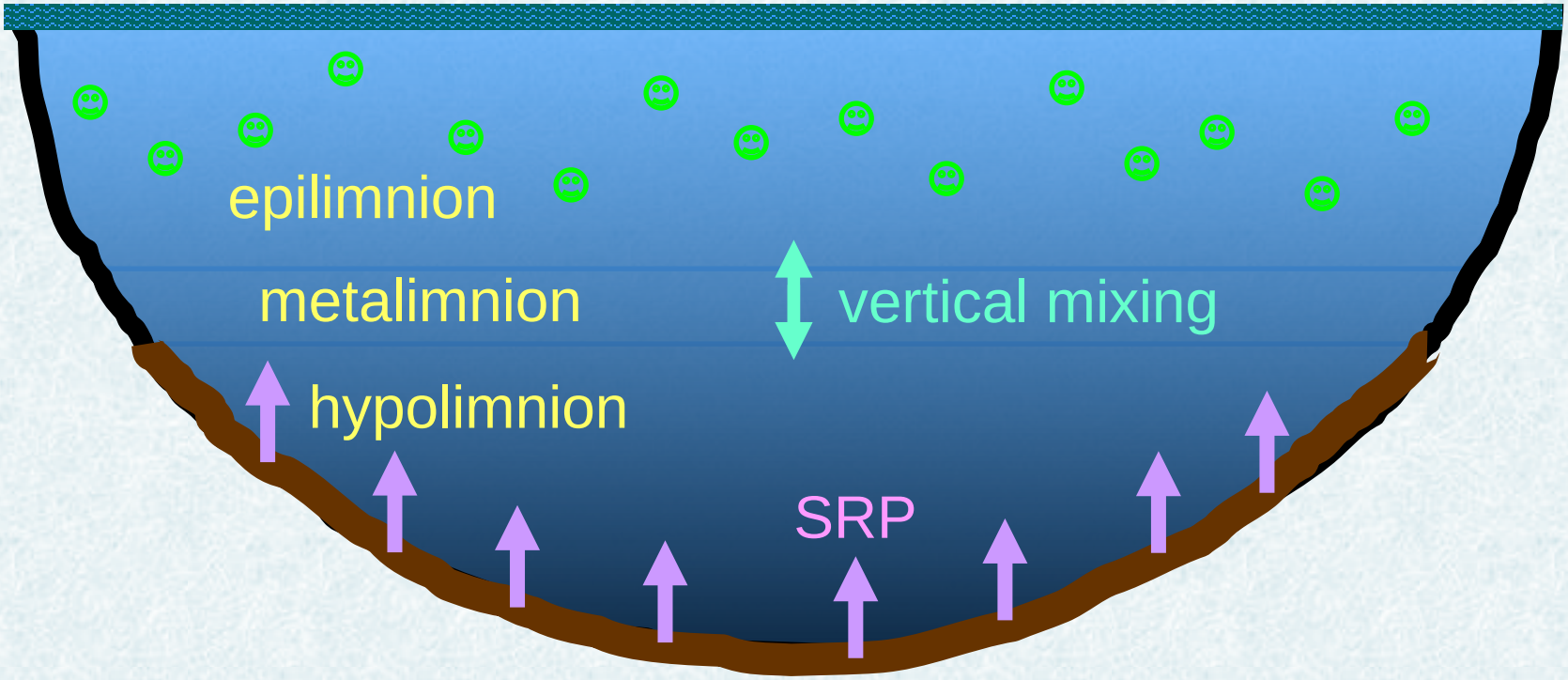


Einsele (1936)/Mortimer (1941-42) Model



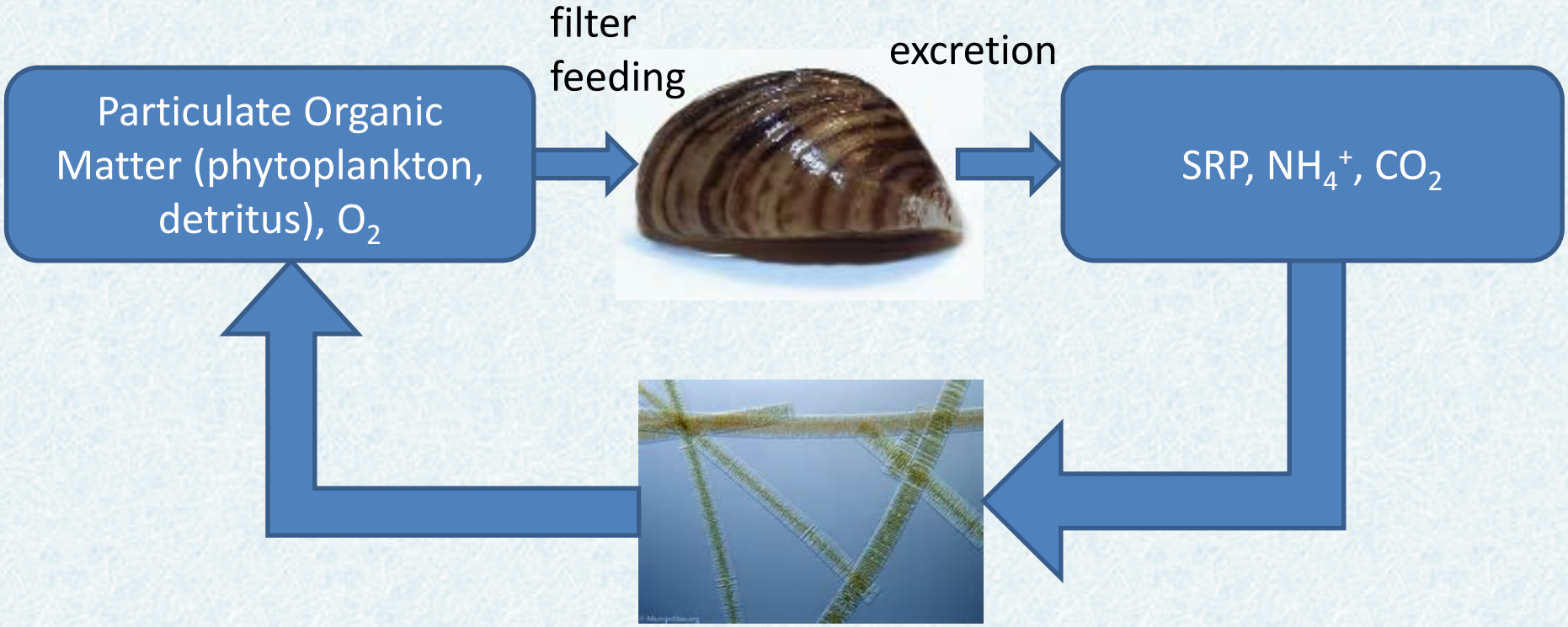


Features of Sediment P Release

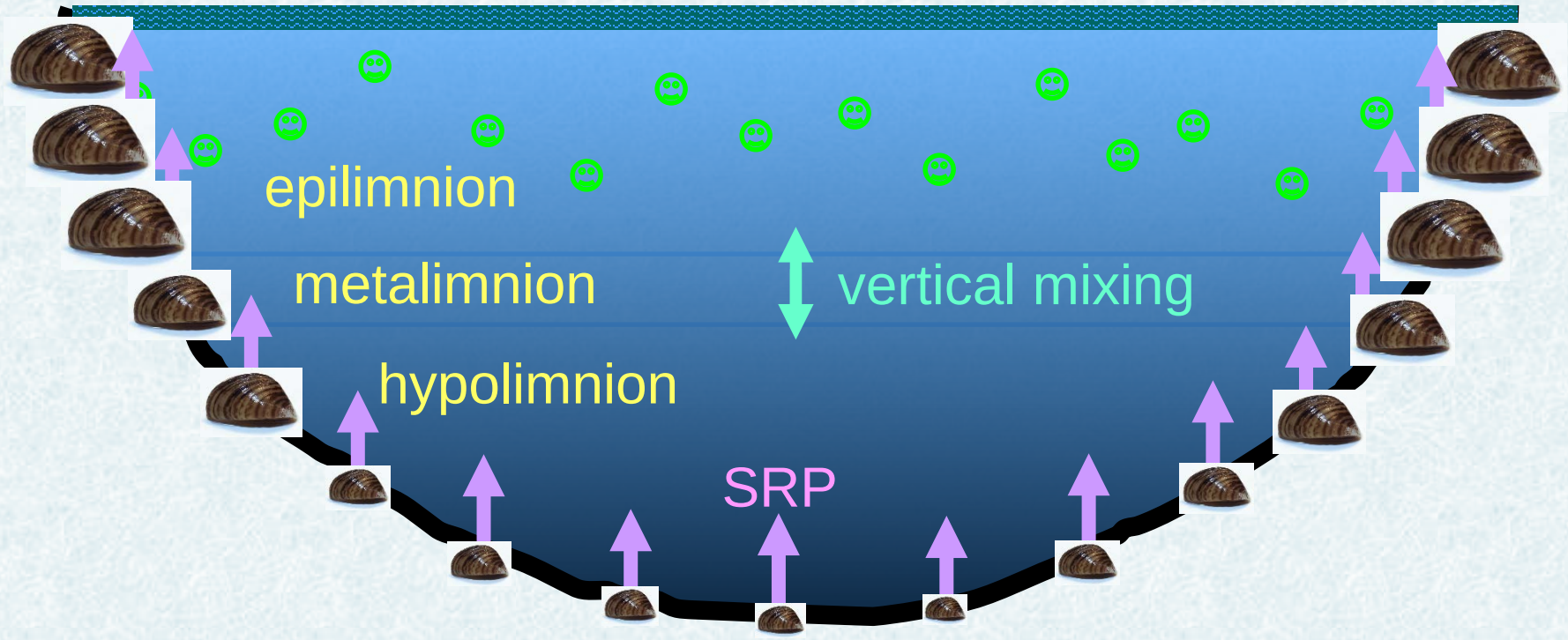


- SRP released from anaerobic sediments
- seasonality (summer stratification)
- mobilization of legacy P deposits
- limited to very productive lakes and shallow lakes with small hypolimnetic volumes

Dreissenid Metabolism

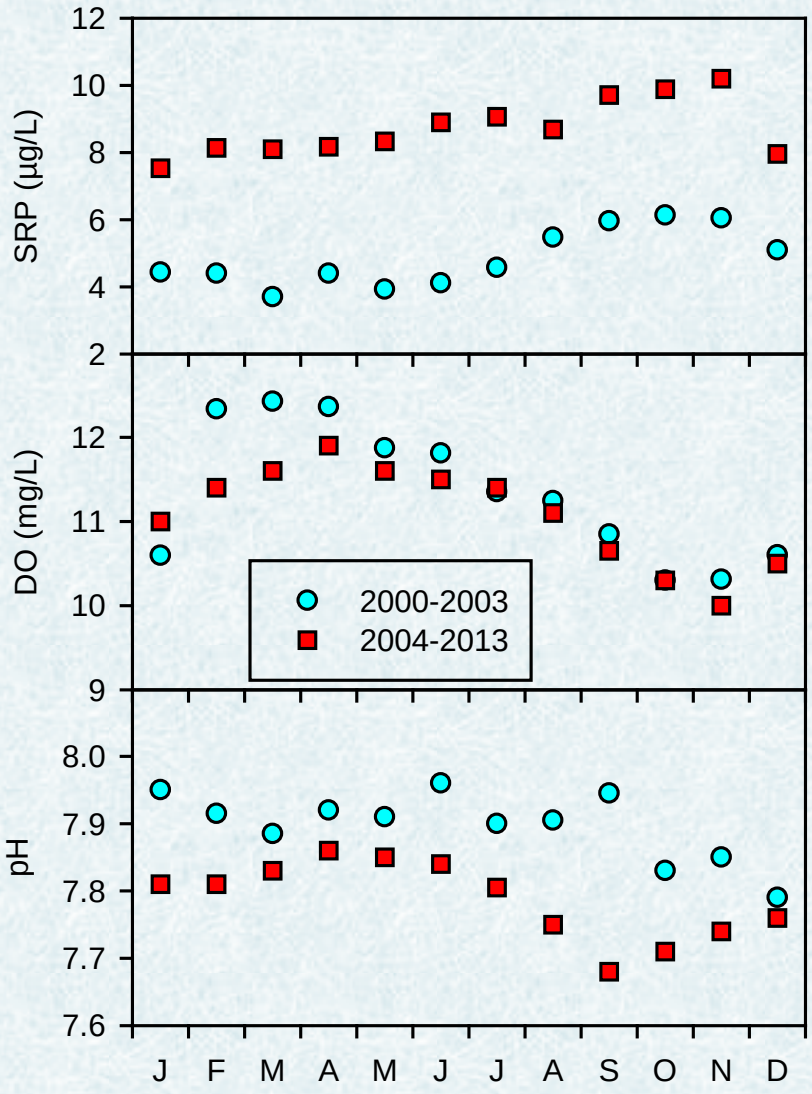


Features of P Excretion from Dreissenid Mussels



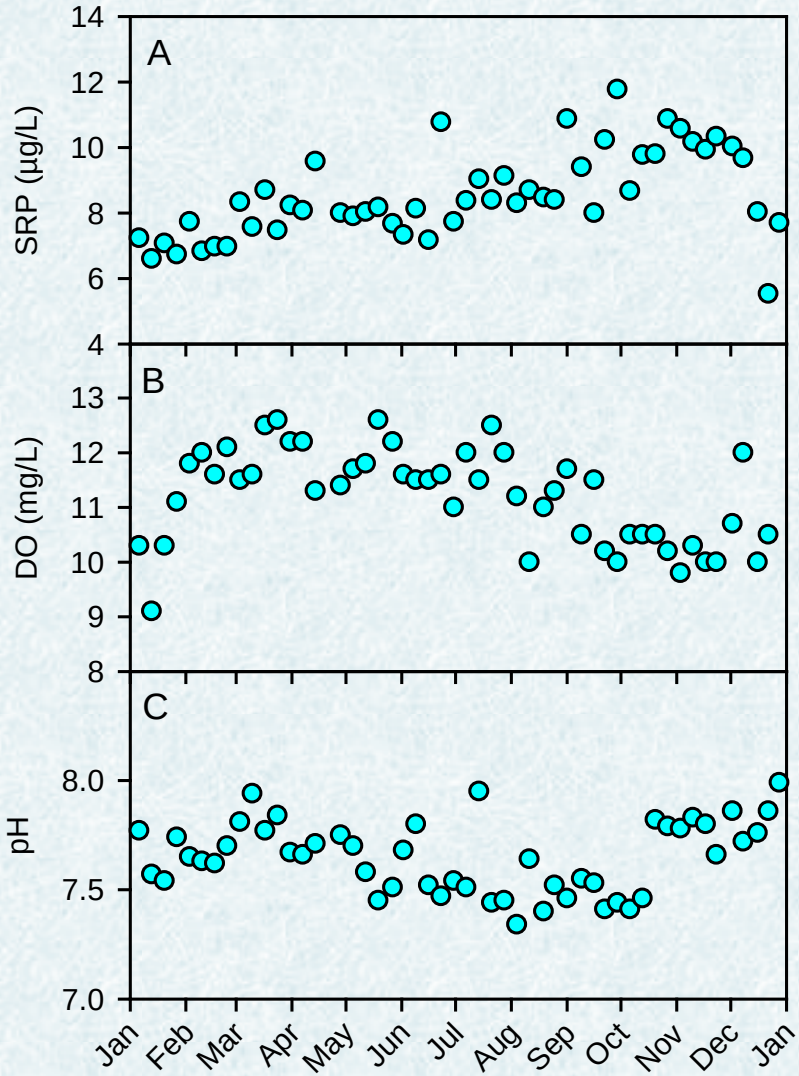
- zebra mussels limited to shallow waters and hard substrate
- distribution and effects of quaggas can be lake-wide
- metabolism (excretion rate) depends on temperature and availability of food
- dreissenid mussels recycle or short-circuit contemporary P deposition that would otherwise be buried
- an extention of “the near-shore shunt” concept (Hecky et al.2004)

Coupled Metabolic Signatures in the Hypolimnion: SRP, DO, pH



Monthly median values for the LSC effluent

Indicators of Hypolimnetic Metabolism, 2009



Observations from the LSC effluent