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## **Spatio-temporal variability of nitrogen dynamics in a freshwater reservoir**

Jacinthe, P.A.

Indiana University-Purdue University, Indianapolis, Department of Earth Sciences

The Eagle creek reservoir (ECR) is a stream-fed freshwater reservoir which, over the years, has evolved into a nutrient-rich system manifested in recent episodes of algal blooms. Although the productivity of aquatic ecosystems has generally been linked to P availability, several studies have also demonstrated that, in eutrophic systems, nitrogen (N) availability is often the factor controlling primary productivity.

ECR comprises two distinct sections: a shallow (average depth, 2.5 m) and well mixed section, and a deep (up to 15 m) and generally stratified section. Nitrogen mass balance, based on mineral N ( $\text{NO}_3^-$  and  $\text{NH}_4^+$ ) concentration in ECR tributaries and outlets in 2004, showed that 42 % of the annual N loading was removed. Assuming that denitrification was the predominant N sink, the corresponding denitrification rate averaged  $72.5 \pm 46 \text{ mg N m}^{-2} \text{ d}^{-1}$ . In addition to the mass balance approach, mineral N was also monitored at different depths and locations throughout the reservoir. In the shallow section of the reservoir,  $\text{NO}_3^-$  concentration within the reservoir mirrored that in the inlets and exhibited similar temporal patterns. In contrast, although  $\text{NO}_3^-$  input into the deep section was 3-4 fold higher (mean:  $5.9 \text{ mg N L}^{-1}$ ), reservoir  $\text{NO}_3^-$  concentration varied independently of, and was always  $< 30 \%$  inlet concentration. The main  $\text{NO}_3^-$  sink in ECR appears to reside, not in the shallow, but in the deep section of the reservoir. These results contrasted with those obtained from denitrification enzyme assays (summer and late fall) which showed limited spatial and temporal variation in the denitrification capacity ( $120 \text{ mg N m}^{-2} \text{ d}^{-1}$ ) of ECR sediment. Concentration profiles in the deep section also indicated a flux of  $\text{NH}_4^+$  from the sediment into the water column. An inverse relationship between dissolved  $\text{O}_2$  and  $\text{NH}_4^+$  flux was observed, suggesting that dissimilatory nitrate reduction to ammonia (DNRA) may be active in ECR sediment. The significance of DNRA is being evaluated through field studies combining perfusion of  $^{15}\text{NO}_3^-$  and diffusive equilibrium probes. These results will be presented and discussed along with events affecting water column mixing regime.