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Nitrogen dynamics in sediment from three Central Indiana water reservoirs

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Nitrate (NO_3^-) is a widespread water pollutant and has been linked to methemoglobinemia, a condition characterized by a reduction in the capacity of infants' red blood cells to carry oxygen. Most of Indianapolis drinking water supply is obtained from stream- and river-fed reservoirs, and these surface water sources are prone to NO_3^- pollution. In addition to external inputs, the pool of NO_3^- in water reservoirs is also related to N cycling processes in the sediment and to NO_3^- exchange between the sediment and the water column. Processes controlling NO_3^- availability in sediment pore-waters include N mineralization (formation of NH_4^+ from organic N), nitrification (formation of NO_3^- from NH_4^+) and denitrification (conversion of NO_3^- into N gases). To evaluate the potential for reservoir sediment to act as a sink or as source of NO_3^- to the water column, N transformation processes were assessed using sediment from three water reservoirs near Indianapolis. All the sediment samples exhibited high NO_3^- removal capacity, but the average rate of denitrification (mg N_2O-N kg^{-1} d^{-1}) in the Geist samples (3.6) was 1.5 to 3 times lower than in samples from the Eagle Creek (6.7) and Morse (10.4) reservoirs. Results also showed higher H/C ratio (0.25), respiration rate (51 mg mg CO_2-C kg^{-1} d^{-1}), N mineralization (0.43 mg N kg^{-1} d^{-1}) and nitrification rates (4.5 mg N kg^{-1} d^{-1}) in the Geist than in samples from the other reservoirs (0.18, 41, 0.12 and 2.2, respectively). These results suggest an imbalance between NO_3^-- producing and NO_3^--removal processes in the Geist sediment, and this could result in NO_3^- transfer from the sediment to the water column in this reservoir.