Treatment Wetlands for Runoff Nitrogen Control. (S10-kadlec171302-Oral)

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Abstract:

Treatment wetlands can intercept and remove ammonia and nitrate from field runoff. Nitrogenous species are inter-related by wetland transformations from inorganic to organic compounds and back from organic to inorganic. Processes that transform nitrogen from one form to another include: (1) ammonification (mineralization); (2) nitrification; (3) denitrification; (4) nitrogen fixation; and (5) plant and microbial uptake, (6) ammonia volatilization, (7) sorption of soluble nitrogen on substrates, and (8) sedimentation of nitrogenous particulates. In aggregate, these provide a mechanism for conversion of nitrate and ammonia to gaseous nitrogen. This paper presents a network model that captures the principal features of wetland processes. Rate equations are temperature sensitive, or seasonally variable. Wetland hydrology and hydraulics determine the degree of nitrogen removal, and are controllable by the design of the wetland and the selected operational strategy. Good designs provide for adequate detention time and avoid short-circuiting. Examples from existing treatment wetlands are presented to illustrate the key features of wetland nitrogen processing and hydraulics.

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