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**Modeling Groundwater Nitrate Transport Beneath a Ground Water Quality Management Area in the Central Platte Region of Nebraska**

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Abstract:

A Ground Water Quality Management Area (GWQMA) is being evaluated to determine the effectiveness of producer practices in reducing high nitrate levels that result from excessive N-fertilizer and irrigation water applications. The assessment of nitrate movement in the primary and secondary aquifer relies on simulating groundwater flow and contaminant transport beneath the 588 km<sup>2</sup> Phase III GWQMA. The Platte River is in hydraulic connection with the aquifer and forms the southern boundary of the model. The northern boundary parallels the northern edge of the GWQMA. Hydraulic conductivities from test hole data, irrigation well pedigree information and nitrate concentrations from 1988 to 2003 were input to a 3-D groundwater finite difference model. A Neumann or second-type boundary condition was established for the northern and southern model boundaries. Prescribed heads (Dirichlet-type boundary condition) were imposed on the upgradient and downgradient sides of the GWQMA. The thicknesses of the primary (upper) and secondary aquifers are somewhat variable in the investigated area as are hydraulic conductivities in the secondary aquifer. The groundwater model was calibrated in the steady-state mode with hydraulic head data from 1988 to 2003. The flow path and travel times within the study area result in an approximate evaluation of the susceptibility to nitrate contamination with transport. Results are described in 2-D and 3-D graphical visualizations. Hydraulic head and water quality data from adjacent monitoring wells screened in either the primary or secondary aquifers were used to quantify nitrate transport between the aquifers.

Impact Statement:

Evaluation of the effectiveness of the Central Platte Natural Resources District's efforts to reduce groundwater nitrate concentrations.

Category: CEAP

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