# Occurrence of Nitrous Oxide in the Central High Plains Aquifer, 1999

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Nitrogen-enriched ground water has been proposed as an important anthropogenic source of atmospheric nitrous oxide ($N_2O$), yet few measurements of $N_2O$ in large aquifer systems have been made. Concentrations of $N_2O$ in water samples collected from the 124,000 $km^2$ central High Plains aquifer in 1999 ranged from < 1 to 940 nM, with a median concentration of 29 nM (n=123). Eighty percent of the $N_2O$ concentrations exceeded the aqueous concentration expected from equilibration with atmospheric $N_2O$. Measurements of $N_2O$, $NO_3^-$, and $^3H$ in unsaturated-zone sediments, recently recharged ground water, and older ground water indicate that concentrations of $N_2O$ in ground water increased over time and will likely continue to increase in the future as N-enriched water recharges the aquifer. Large concentrations of $O_2$ and $NO_3^-$ and small concentrations of $NH_4^+$ and dissolved organic carbon in the aquifer indicate that $N_2O$ in the central High Plains aquifer was produced primarily by nitrification. Calculations indicate that the flux of $N_2O$ from the central High Plains aquifer to the atmosphere from well pumping and ground-water discharge to streams was not a significant source of atmospheric $N_2O$.