Geophysical Research Abstracts,
Vol. 10, EGU2008-A-05905, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-05905
EGU General Assembly 2008
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Sources and removal of nitrate in a mountain watershed: Possible riparian zone denitrification, Turkey Creek Basin, Colorado, USA

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One of the goals of this study is to elucidate the mechanisms behind nitrate removal in the Turkey Creek Basin of Colorado. Although nitrate removal is a common phenomenon in a wide variety of environments, the underlying processes are often not well understood. According to the hypothesis of this study, denitrification in the riparian zone plays a notable role in nitrate removal in Turkey Creek Basin, Colorado, USA.

In order to test the hypothesis, two different approaches were used. The first approach involved collecting surface-water samples on a regular basis in order to investigate seasonal trends in the basin. The second approach involved the analysis of many of those samples for stable isotope values of nitrogen in nitrate (denoted as δ^{15}N-NO_3^- values). During the spring of 2007, large amounts of snowmelt resulted in high stream discharge as well as substantial changes in water chemistry. While parameters such as conductivity, alkalinity and chloride concentrations all decreased during spring runoff, nitrate levels rose dramatically during the months of March, April and May. Although several mechanisms may be responsible for nitrate breakthrough during spring months, a diminished extent of hyporheic exchange (which has been associated with lower denitrification rates) may be involved.

In order to determine sources of nitrate in the basin, the stable isotope values of nitrogen in nitrate were measured. δ^{15}N-NO_3^- values ranging between +10‰-+20‰ in the majority of ground-water samples suggest that much of the nitrate in the basin is

derived from septic waste. Because no highly enriched δ^{15}N-NO_3^- values in excess of those expected for septic waste were measured, there is no direct evidence for denitrification in any of the samples. Average differences in δ^{15}N-NO_3^- values throughout basin indicated that surface waters were generally more isotopically enriched than ground waters. On the other hand, low enrichment factors estimated from stream samples cannot be used in order to establish denitrification. Future work in the Turkey Creek Basin will be necessary to determine the extent of hyporheic exchange that is taking place and to measure rates of denitrification.