Report as of FY2007 for 2006ID57B: "Assessment of Impacts of Population Growth on Ground Water Nitrate Loading in Teton County, Idaho"

Publications

Project 2006ID57B has resulted in no reported publications as of FY2007.

Report Follows

Synopsis of Research

Project Title
Assessment of Impacts of Population Growth on Ground Water Nitrate Loading in Teton County, Idaho

Principal Investigators
Donna M. Cosgrove and Joanna L. Taylor, University of Idaho, Idaho Water Resources Research Institute, Idaho Falls, 83402.

Students Supported on the Project
Ms. Cami Johnson, a summer IWRRI intern, who assisted with sampling and Mr. Gary Billman, a summer IWRRI intern, who prepared GIS maps of Teton County.

Statement of the Problem and Research Objectives
Nitrate levels have become a concern in Teton as well as Ada, Canyon, and Madison Counties in Idaho due to the rapid changes in land use from agricultural to housing developments. This rapid influx of septic systems from the increased housing developments has raised concern both within Idaho Department of Environmental Quality (IDEQ) and among citizen's groups over potential nitrate contamination of the ground water. The Idaho Water Resources Research Institute (IWRRI) was approached by IDEQ and two Teton Valley citizen groups, the Valley Advocates for Responsible Development (VARD) and the Friends of the Teton River, requesting that IWRRI assist in assessing the potential for future water quality degradation due to this rapid population growth in Teton County, Idaho.

The objective of the study was to establish nitrate levels throughout Teton County, Idaho for 2006 and determine whether nitrate concentrations have changed significantly since 2002 USGS water quality sampling.

Well Selection
Forty-nine wells were selected for ground-water sampling. We attempted to sample as many of the 2002 wells as possible. Of the 49 wells sampled in 2006, 17 were sampled in the 2002 study. The rest of the wells were selected to a) provide good spatial coverage of the valley and b) provide a higher sample density in sensitive areas such as wetlands or areas close to the Teton River. In addition to sampling groundwater in the valley, 11 surface water sites were sampled.

Water Chemistry Analysis
The groundwater samples where analyzed for dissolved oxygen (D.O.), pH, specific conductance, temperature, oxidation reduction potential (ORP), and alkalinity in the field. Groundwater samples and 11 surface water samples were collected and brought back to the lab for analysis of major cations and anions (Na, Ca, Mg, K, NH_4, F, Cl, SO_4, NO_3, and PO_4) using an Ion Chromatography (IC).

Results

Water Chemistry

The groundwater chemistries of Teton County were plotted on a Piper diagram. The diagram indicated that the groundwater in Teton County is very uniform and predominantly Ca-Mg-HCO3 water with the exception of one sample, which had high levels of NaCl. The well is located near a highway maintenance facility, so the high levels of NaCl may reflect road salt leeching into the ground in the vicinity of the facility.

Nitrate Concentrations in Teton County

The nitrate concentrations in all 49 ground-water samples and 11 surface-water samples were below the EPA regulatory limit of 10 mg/L NO_3-N. The highest nitrate concentration measured in Teton Valley was at 8.17 mg/L NO_3-N and only 10% of the ground-water samples were greater than 5.0 mg/L NO_3-N. All other ground-water samples were below 5.0 mg/L NO_3-N. One surface-water sample had a slightly elevated nitrate level (7.64 mg/L NO_3-N); however, all other surface water samples were below 5.0 mg/L NO_3-N. The six highest nitrate samples which where greater than 5.0 mg/L NO_3-N, are spatially distributed throughout the study area. One is located west of the river and the other four ground-water samples and the single surface-water sample are located east of the river and evenly distributed north to south.

Nitrate Concentrations in 2002 and 2006

As mentioned earlier, the USGS conducted previous sampling of ground water in the Teton Valley in 2002 for 17 of the 49 wells sampled for this study. We compared previous and current nitrate concentrations for those 17 wells. We observed both increases and decreases in nitrate concentrations from 3 mg/L to less than 1 mg/L NO_3-N from 2002 to 2006. Two wells sampled showed a decrease of 1.65 and 2.63 mg/L NO_3-N, while three other wells sampled showed increase of 1.69, 1.09, and 1.09 mg/L NO_3-N. The other twelve wells exhibited slight increase or degrease of less than 1 mg/L NO_3-N, four wells had an increase, while the other eight wells had a decrease. Wells in the Fox Creek and Victor, Idaho area exhibited a decrease in nitrate concentrations while the wells north of Driggs exhibited both increases and decreases. Overall, there has been little change in nitrate concentrations between 2002 and 2006, with no apparent spatial trends.

Discussion and Conclusions

The water quality investigation in Teton County does not show any alarming results. Even wells with the highest concentrations of nitrate levels are well below the EPA regulatory limit of 10 mg/L NO_3-N, indicating no immediate problem. Wells with higher nitrate concentrations were not located within a specific region in Teton County, but were distributed throughout the county. However, care should be taken to limit the permitted density of onsite wastewater systems and not permit onsite waste water systems in or near ecologically fragile wetlands. Future work should be done to monitor the seasonal fluctuations of nitrate in groundwater. With the rapid growth in the region and the corresponding increase in the number of onsite wastewater and drain fields, nitrate

concentrations should be regularly monitored to ensure safe drinking water for private well owners and to avoid contamination of the aquifer or river.

Publications

Cosgrove, D.M. and J.Taylor. 2007. Preliminary Assessment of Hydrogeology and Water Quality in Ground Water in Teton, County, Idaho. Idaho Water Resource Research Institute Technical Report 07-002.