Modeling approaches for fate and transport in groundwater coupled with human interactions: A case study in Saskatchewan

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Given that domestic private wells are not regulated by law in Saskatchewan, the safety of these drinking water supplies relies on the adequacy of the guidelines elaborated by the environmental authorities as well as the awareness of private well users regarding best stewardship practices. User's awareness is highly dependent on their perceptions and knowledge impacting, for example, their testing behaviour and the identification of contamination hazards. Furthermore, this study aims to assess groundwater quantity and quality risks faced by users of privately owned wells in Saskatchewan, providing valuable insight into the local-specific factors influencing private well stewardship, aiding decision-making related to water management and public health measures for private well users. Historical well water data from several Saskatchewan aquifers are analyzed to infer the relationships between various meteorological and hydrogeological parameters to assess future groundwater quantity. Moreover, multiple well water samples in addition to surveys collecting users' responses are analyzed to investigate the impact of peoples' behaviors on groundwater vulnerability. The preliminary results show that, out of 173 survey responses, no statistically significant relationships were found between the level of education and income with the management practices adopted in the privately owned wells in Saskatchewan. Regarding water usage, when people start doubting the safety of their untreated drinking well water, the more likely they will look for alternative sources of potable water. In addition, among the sampled individuals, those who use alternative drinking water sources due to concerns regarding the aesthetic of the well water and those who lose the feeling of safety while drinking their well water even after treatment are, respectively, 32% and 70% less likely to use the well water for drinking. The historical data show that most wells were constructed in southwestern Saskatchewan during 1980s for withdrawal purposes despite the downward trend in farmland values during that time. Furthermore, comprehensive analyses will be conducted regarding the correlation between the interview responses and groundwater quality data from privately owned wells across the province, aiming to assess the impacts of people's knowledge, perceptions and behaviors on the chemical and microbial composition of water.