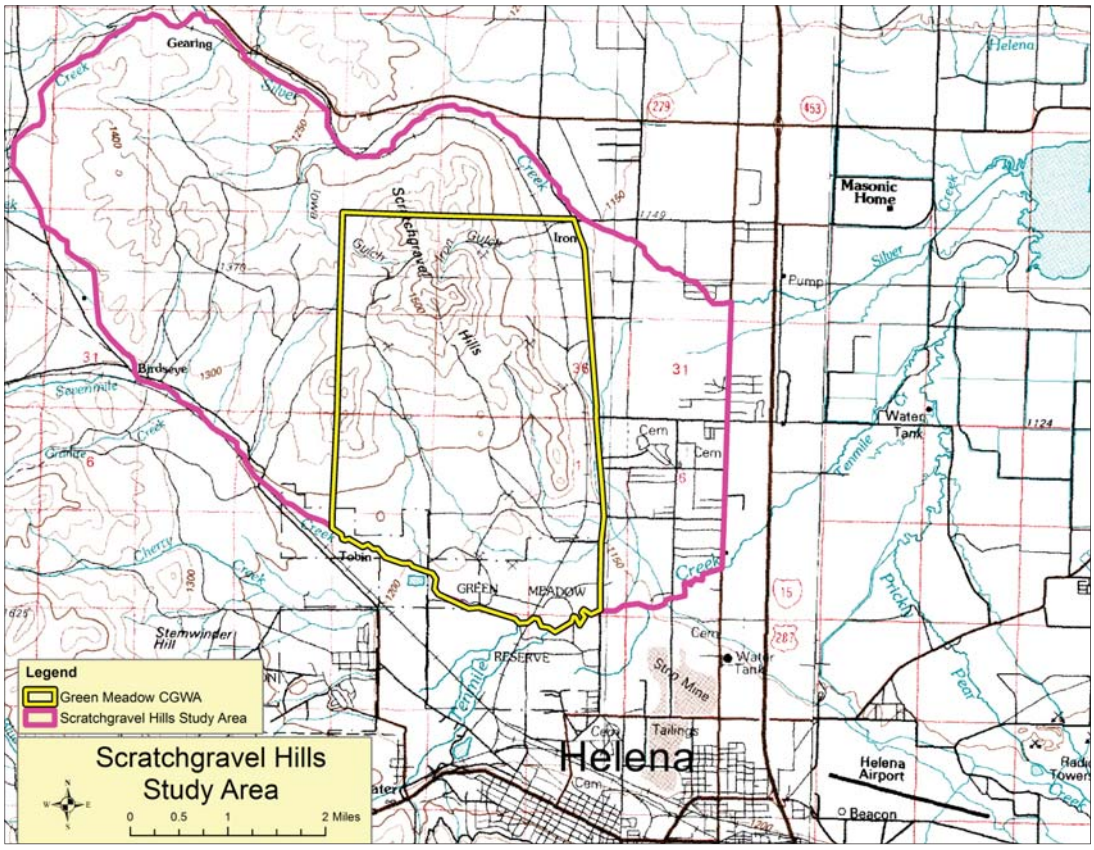
MBMG Ground Water Investigations Program

Scratchgravel Hills Study Area—
Lewis and Clark County

Introduction

Proposed subdivisions in the Scratchgravel Hills have caused concern about how much development can occur, how densely homes can be spaced, and if restrictions on water usage are needed. Elevated nitrate levels have been seen in some wells, creating concerns about the use of individual septic systems in this area of thin soils and shallow fractured bedrock. These concerns resulted in the designation of the Green Meadow Temporary Controlled Groundwater Areas (CGWA) in April 2008.

An improved understanding of the geologic setting, aquifer properties, aquifer recharge, and aquifer discharge is being obtained through the collection of detailed hydrogeologic data. Monitoring of water levels has allowed the potentiometric surface to be better defined. Aquifer tests and water chemistry are being used to define aquifer properties, the degree to which aquifers are connected, and to evaluate water quality patterns. A numerical model of groundwater flow is being developed using these data. This will allow for the impacts from various development scenarios to be evaluated.



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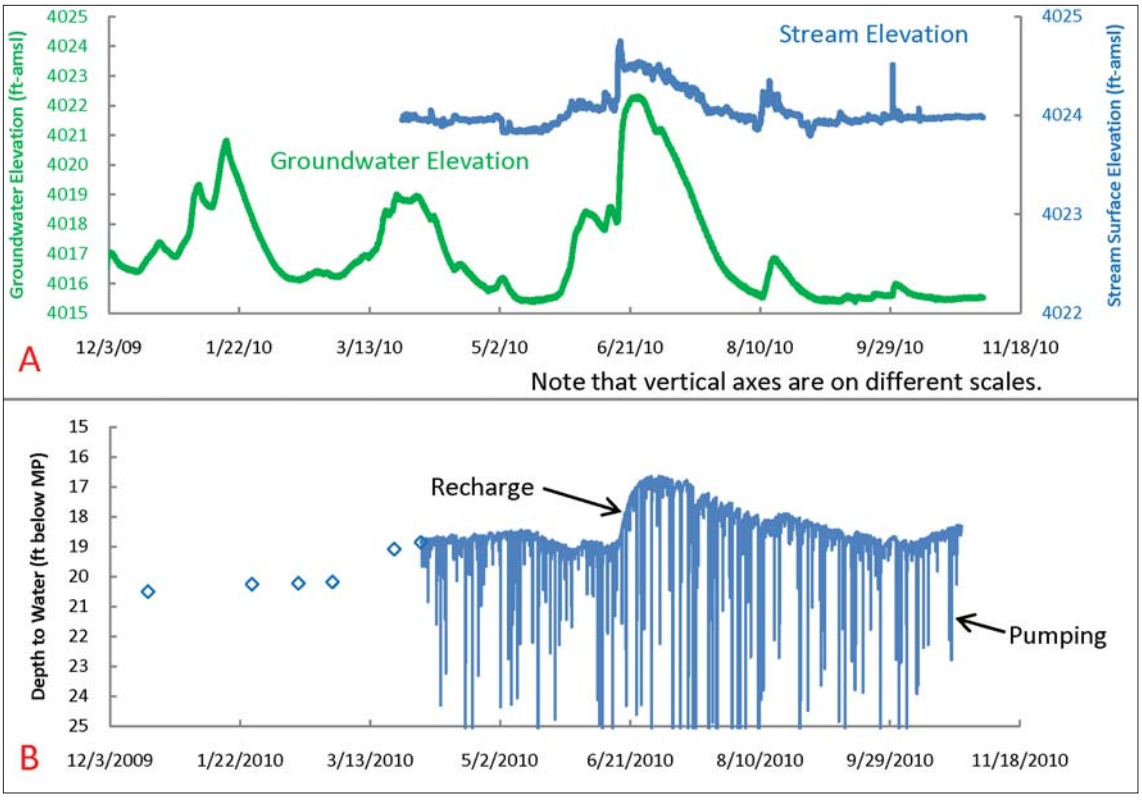
Project Issues:

- How much development can occur in the Scratchgravel Hills?
- Do septic systems need to be managed differently in the Scratchgravel Hills?
  - How densely can homes be spaced?
- Should future groundwater development within the CGWA be limited or ongoing monitoring be established?
  - MCA 85-2-506:
    - Will groundwater withdrawals reduce groundwater levels to the point that water right holders cannot reasonably exercise their water right?
    - Will groundwater withdrawals reduce surface-water availability to the point that water right holders cannot reasonably exercise their water right?
    - Is the groundwater suited for beneficial use?
- How would prospective limitations of development benefit existing water users?
- What ongoing monitoring is needed and how could it be used to trigger prospective limitations of development within the CGWA?

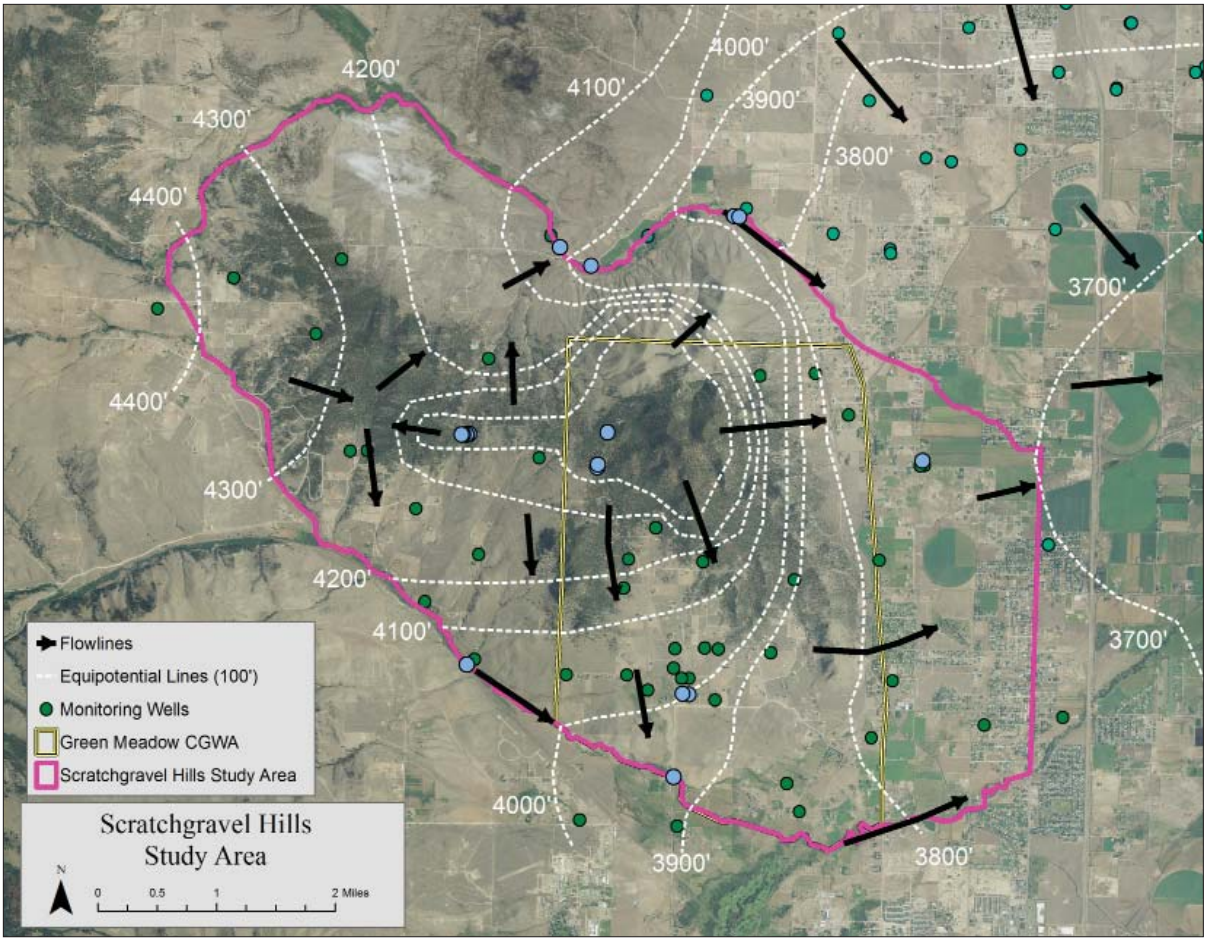
While these are primarily regulatory issues that must be addressed by the DNRC, DEQ, Lewis and Clark County, and others, the purpose of this investigation is to provide scientific information to assist decision making.

Approaches:

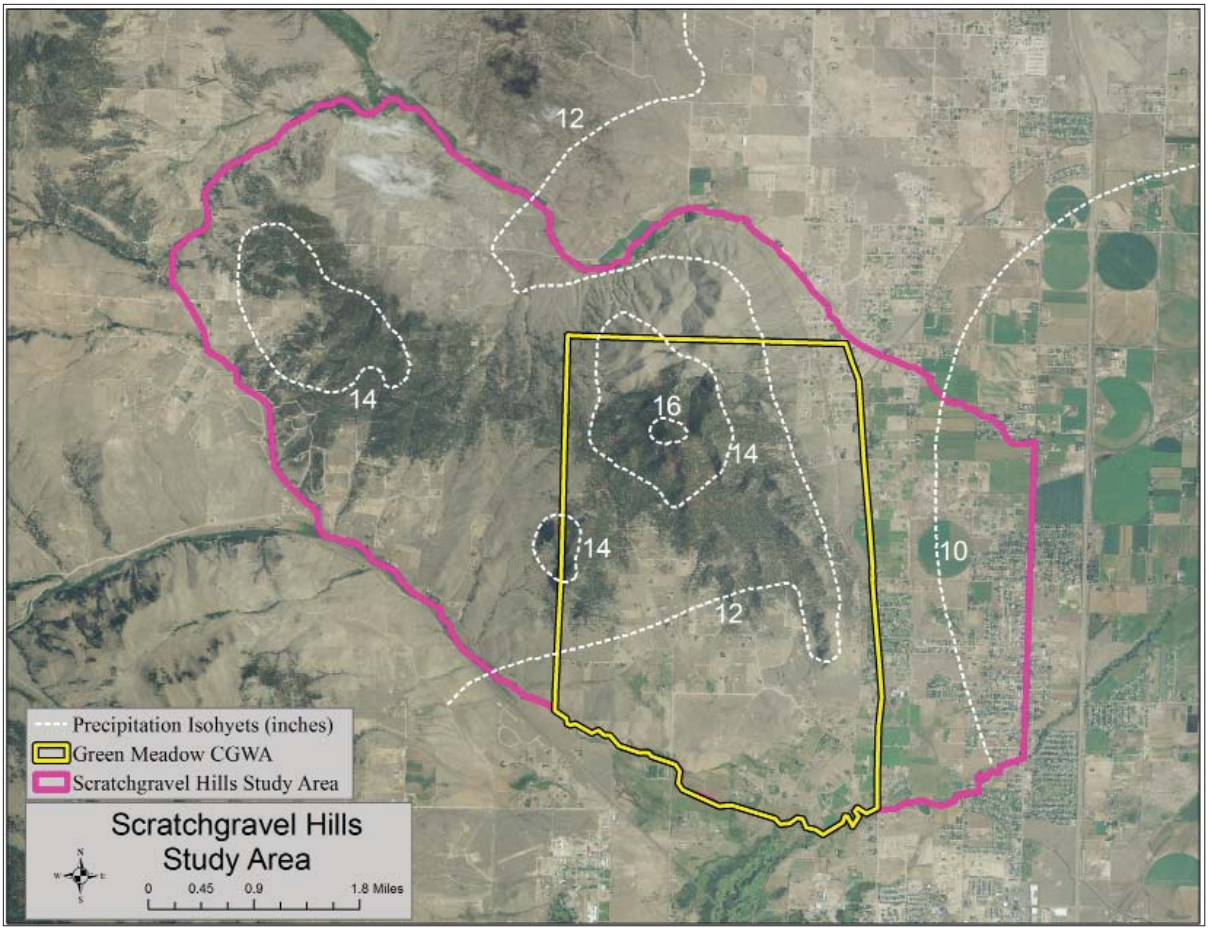
- Monitor groundwater elevations and spring discharges
- Conduct aquifer tests
- Document the water budget
- Develop a conceptual hydrogeologic model
- Prepare a numerical hydrogeologic model
  - Calibrate using monitoring data
  - Test development and mitigation scenarios



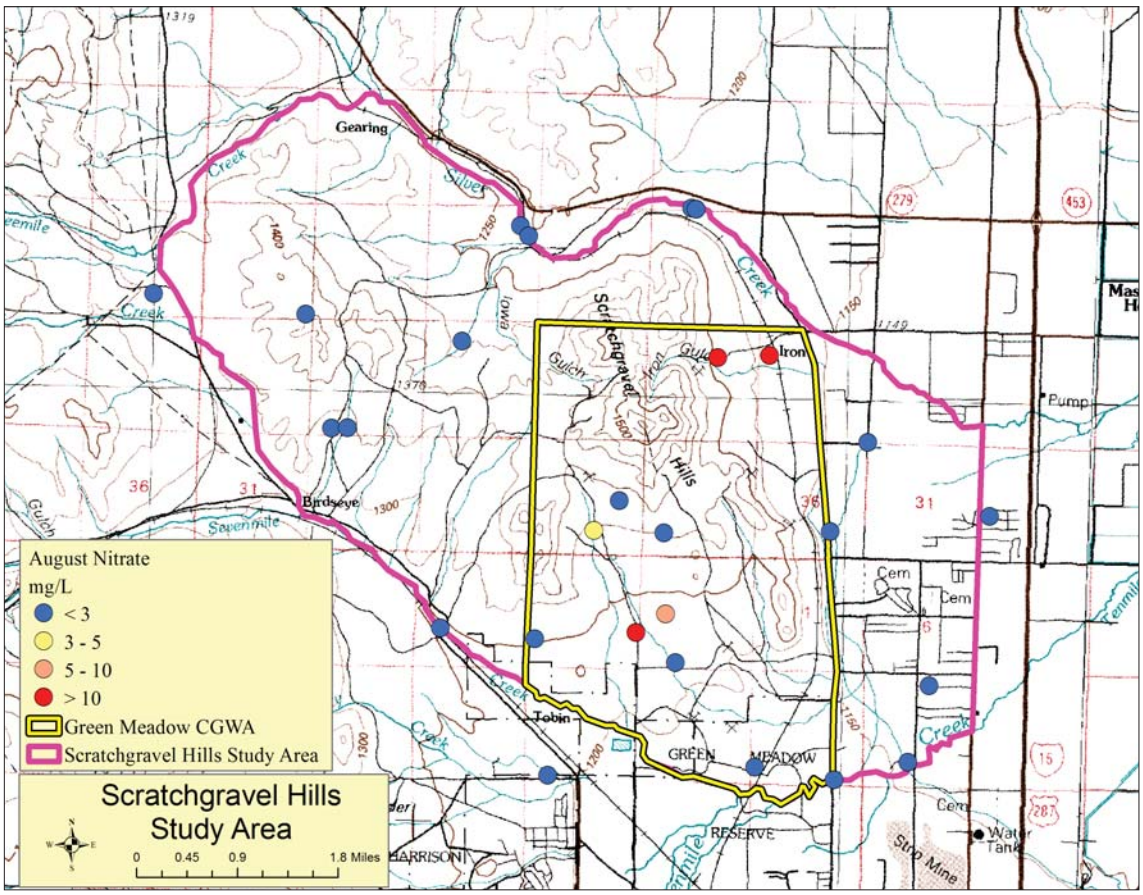
Groundwater levels and stream stage are closely correlated at the Upper Silver Creek site, and stream elevation is consistently higher than groundwater elevation (A). This same pattern is seen at all monitored surface-water sites, which indicates that water flows from the streams to the groundwater, and that water does not flow from groundwater to surface water at these locations. Bedrock wells (B) respond to recharge events and pumping.



Monitoring of groundwater elevations shows that recharge to the CGWA is exclusively local. Newly installed wells (blue) were critical in defining this pattern.



Analysis of precipitation data has significantly improved quantification of the precipitation pattern. This pattern drives the shape of the potentiometric surface.



Analysis of groundwater chemistry has shown that the standards for nitrate (above), arsenic, and manganese have been exceeded in some samples. The occurrence of these higher values appears to be localized.

Preliminary Project Results/Status:

- A refined potentiometric surface
- Aquifer test results
- Water quality data
- Surface water/groundwater interactions have been assessed.
- The water budget is being analyzed.
- A numerical hydrogeologic model is being constructed in consultation with the DNRC, DEQ, and Lewis and Clark County. It will be constructed using aquifer test data and calibrated using observed water levels and the water budget.
- Once the model is calibrated, it will be used to evaluate numerous development scenarios. The model will be able to evaluate local and regional impacts from each scenario.

It is anticipated that this information will assist the DNRC, DEQ, and Lewis and Clark County in making necessary regulatory decisions. This information may also be used by the Legislature's Water Policy Interim Committee (WPIC) to determine if legislative actions are needed.