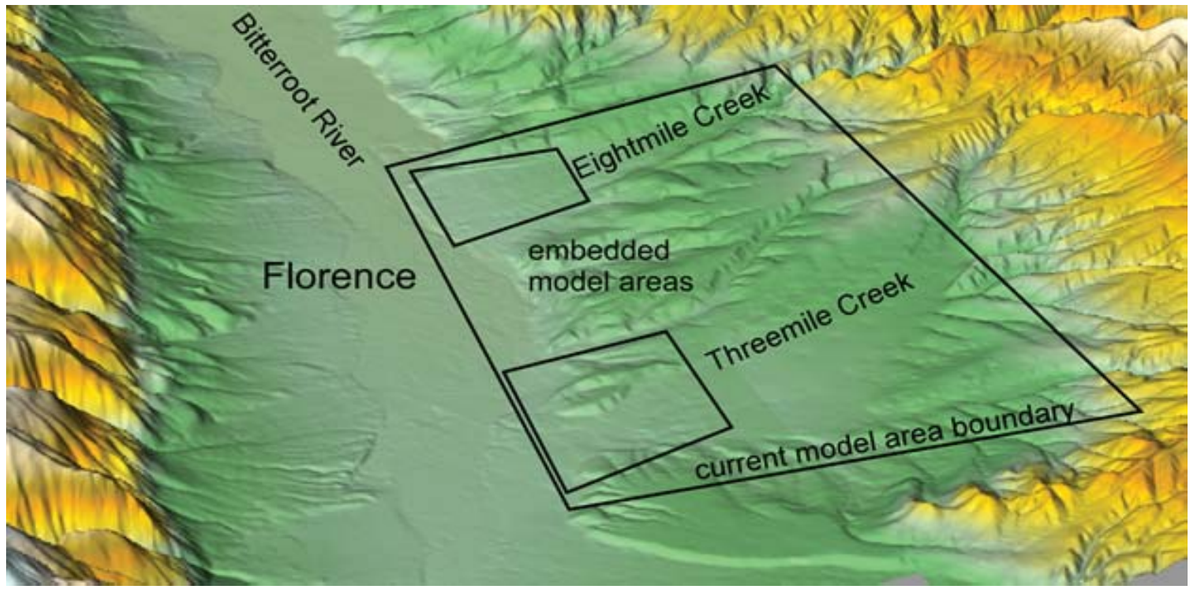
Numerical Modeling

The sub-basin scale model area will include Eightmile Creek and Threemile Creek; the model will produce an overall water balance as well as evaluating groundwater recharge from irrigation canals. An embedded model of the lower portion of Eightmile Creek will evaluate subdivision growth and stream depletion; a second embedded model of the lower portion of Threemile Creek will evaluate the relationship between irrigation and groundwater recharge to the wetlands area.



Once a calibrated model is complete, exploration modeling will be used to evaluate the relative effects of groundwater pumping and recharge/return related to subdivisions.

Project Status

- Groundwater elevations maps have been created.
- Water quality analyses are being evaluated to define the different aquifers.
- The water budget is being analyzed.
- A numerical hydrogeologic model is being constructed 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 the impact of exempt wells on groundwater and surface water availability.

A report summarizing the hydrogeology and addressing the effect of exempt wells on groundwater and surface water availability is being prepared. Project results will be available to landowners, county and state agencies, and other interested parties to guide responsible development that minimizes impacts to groundwater and surface water quantity and quality.

MBMG Ground Water Investigations Program

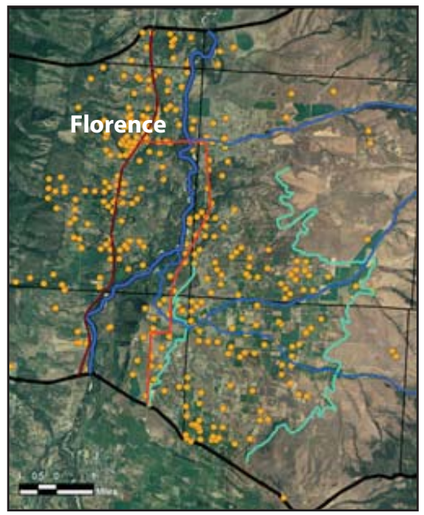
Florence Study Area—
Ravalli County

Introduction

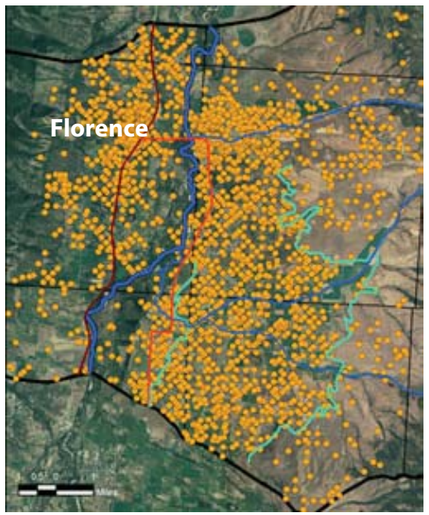
Increased population density and subdivision development in the Bitterroot Valley has raised concerns on both water availability and water quality. Conversion of irrigated to residential land results in a higher density of wells and septic systems. As the demand on aquifers increase, questions about groundwater availability are coupled with the county's concerns about degradation of drinking water by septic waste drainage.

This investigation is focused in the Eightmile Creek and Threemile Creek drainages as examples of increased pumping pressure on ground water and surface water resources in the Bitterroot Valley. The study also examines the sources and extent of nutrients in groundwater and surface water resulting from residential development/septic systems, animal, and agricultural sources.

A numerical model will evaluate the effects of future residential development on ground and surface water quantity and examine mitigation scenarios to offset stream depletion as a result of groundwater development. Project results will be used as management tools by landowners, county and state agencies, and other interested parties to guide responsible development, and minimize impacts to groundwater and surface water quantity and quality.



Well density prior to 1975



Well density through 2010

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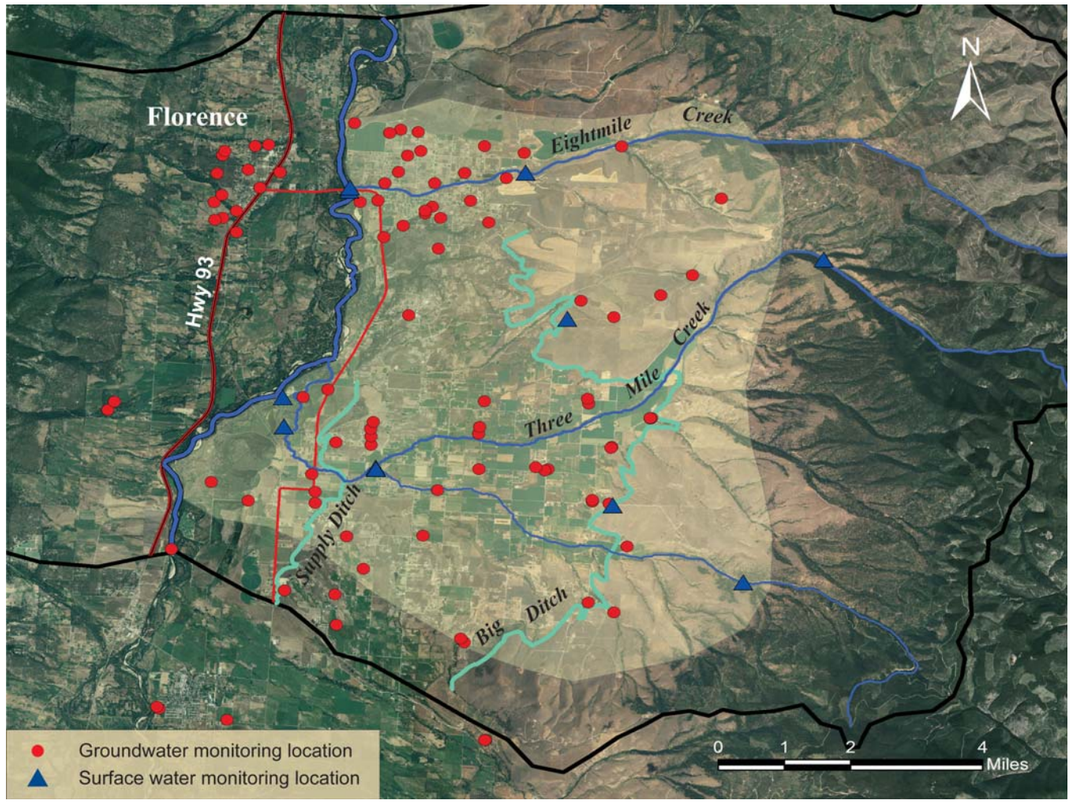
Project Issues

• Groundwater availability: Has conversion of irrigated land to residential lots, which alters groundwater recharge mechanisms and consumptive use, affected groundwater availability and sustainability?

• Groundwater quality: Has development affected water quality? Florence has one of the highest densities of wells and associated septic systems in Montana.

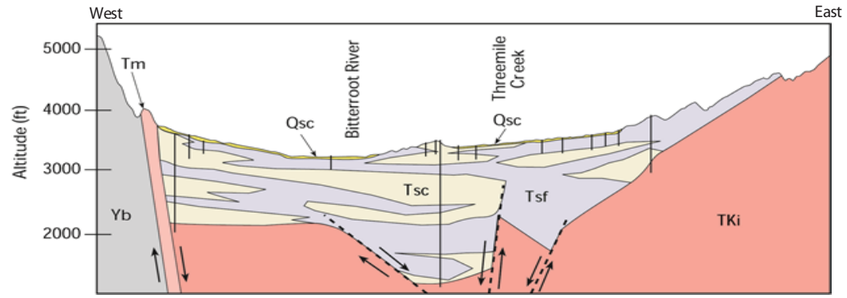
•How much future growth can the Florence area sustain before adversely impacting groundwater and surface water availability?



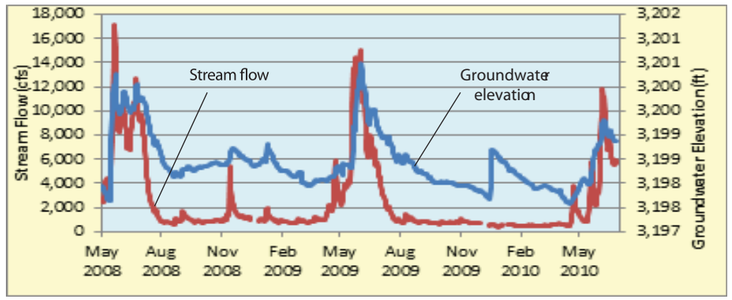
Groundwater and surface water are being monitored to better define the hydrogeologic system and help answer project issues.

Approaches

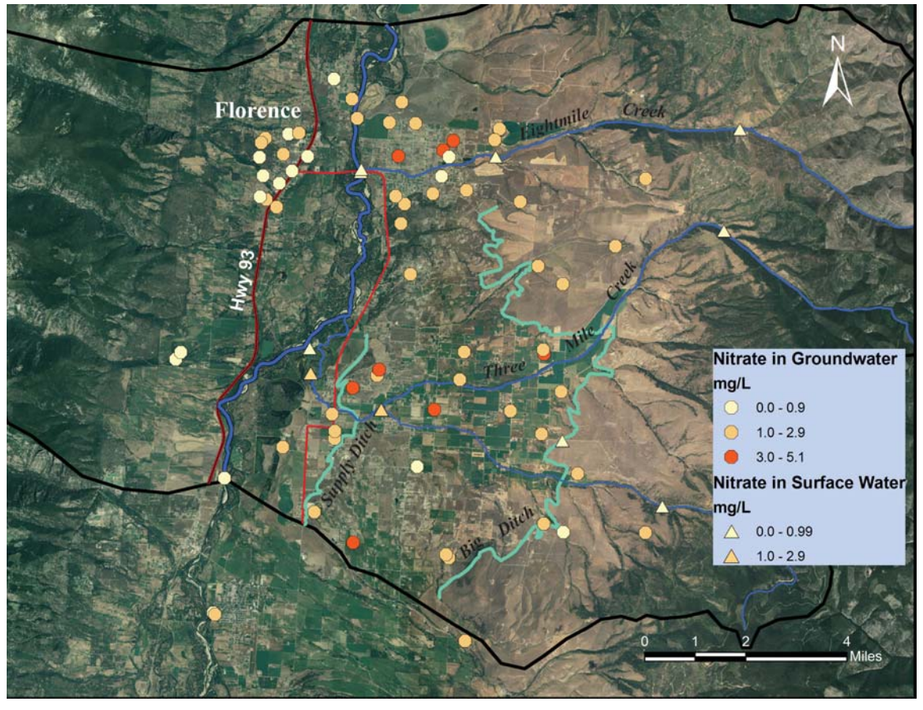
- Monitor groundwater elevations and surface water flow
- Assess nitrate concentrations throughout the study area
- Examine the aquifer systems through water chemistry
- Document the water budget
- Develop a conceptual hydrogeologic model
- Prepare a numerical hydrogeologic model
  - Calibrate using monitoring data
  - Simulate land-use changes such as increased development on groundwater and surface water availability



Quaternary surficial deposits (Qsc) that are less than 60 feet thick underlie the Bitterroot River and its tributaries. These deposits are significant aquifers. Sandy and gravelly beds form local aquifers in the older Tertiary units (Tsf, Tsc).



The Bitterroot River responds to fluctuations in groundwater, illustrating the connection between the alluvial aquifer and surface water.



Data from over 80 groundwater and surface water sites sampled in July 2010 show several locations with nitrate concentrations over 3.0 mg/L. These data are an early warning for drinking water exceedances.