GROUND WATER INVESTIGATION PROGRAM

Florence, Montana

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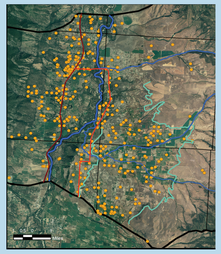
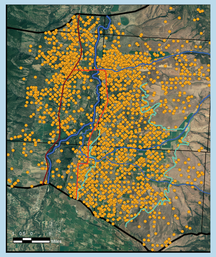
Background

One of the most common land-use changes in the Bitterroot Valley is the conversion of irrigated land to residential lots resulting in a higher density of wells and septic systems.

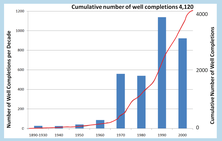


Well density prior to 1975

Florence Area



Well density through 2010



Number of well completions per decade

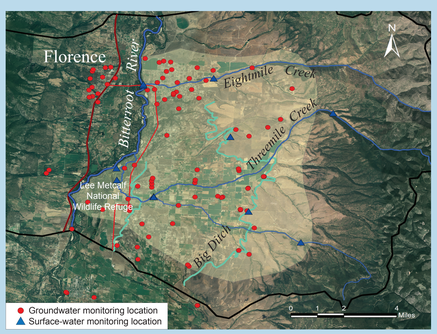
Key Questions

Has increased well density reduced groundwater and surface water availability?

Has increased development and septic systems caused the degradation of groundwater and surface water?

Study Area

The Eightmile Creek and Threemile Creek drainages are being studied to examine the effects of increased well density on groundwater and surface water availability and quality.



Groundwater and surface water monitoring network.

Hydrogeologic System

Three Aquifers

Valley - fill alluvium	-	Very productive yet most vulnerable to contamination
Tertiary sediments	-	Moderately productive and less vulnerable to contamination
Granitic Bedrock	-	Poorly productive

Products

- **Report**

Technical discussion of the hydrogeology of the Florence area, including groundwater - surface water interactions, water quality, and aquifer characteristics.

- **Model**

The groundwater flow model will evaluate the influence of residential development on groundwater availability. Model simulations will provide an indication of how to offset stream depletion that may occur from increased pumping.

- **Data Availability**

Data collected for this project will be made available on-line through the MBMG Groundwater Information Center.

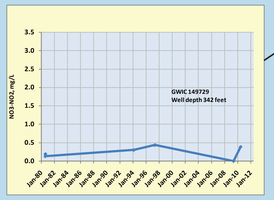
The Bitterroot River from the Florence bridge.

Project results can be used as a management tool for landowners, county and state agencies, and other interested parties as a guide for responsible development, thereby minimizing the impact to groundwater and surface-water quantity and quality.

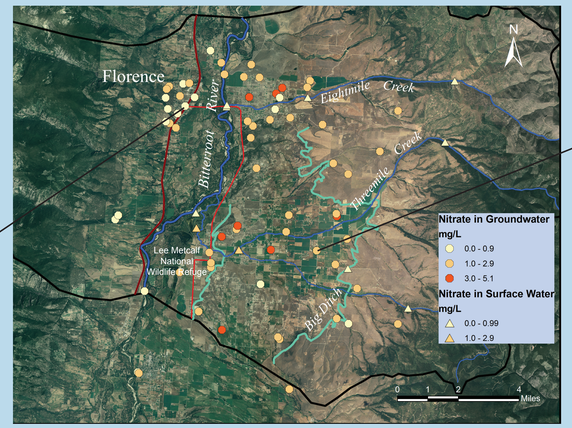
Nitrates

What do nitrates in water tell us?

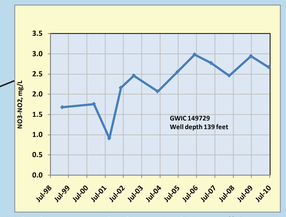
Water naturally contains less than 1 mg/L of nitrate. Common sources of elevated nitrate in drinking water include septic systems, animal wastes and fertilizers. Concentrations and sources of nitrate are being investigated in the Florence area to examine the potential impact of development on water quality.



Nitrate concentrations have remained under 0.5 mg/L from 1980 to present.



Over 80 groundwater and surface water locations were sampled for nitrate in July 2010. Concentrations over 3.0 mg/l were found at several locations in the Threemile and Eightmile Creek drainages. The maximum contaminant level (MCL) for nitrate is 10 mg/L.



Nitrate concentrations in this well have increased through time.

Data Collection

- **Monitoring**

Groundwater monitoring network of over 90 wells has been established.

Surface water is being monitoring in Threemile and Eightmile Creeks.

- **Water Quality**

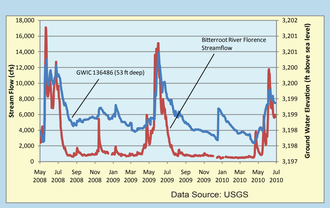
Groundwater and surface water has been sampled for nitrates.

- **Seepage measurements**

Several seepage measurements have been made on Big Ditch.

- **Drilling**

Drilled two wells near the river in cooperation with the MBMG Ground Water Assessment Long Term Groundwater Monitoring Program.



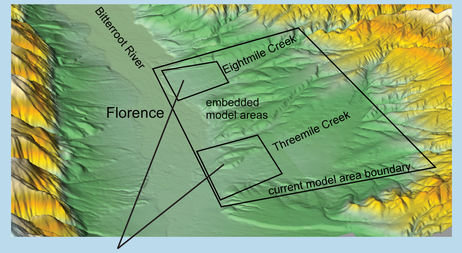
Groundwater elevations in a shallow well located about a quarter mile from the Bitterroot River respond to streamflow illustrating the connection between the alluvial aquifer and surface water.

MBMG

Visit the website
http://www.mbmg.mtech.edu/gwip/gwip.asp
for more details about the GWIP program

Model

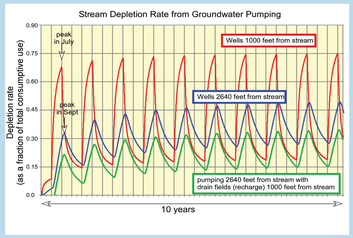
The sub-basin scale model will include Eightmile and Threemile Creeks; the focus of the model will be an overall water balance as well as evalutaing groundwater recharge from irrigation canals.



Embedded models:

Eightmile Creek: To evaluate subdivision growth and stream depletion.

Threemile Creek: To evaluate the relationship between irrigation and groundwater recharge to the wetlands.



Model simulations can be used to evaluate the relative effects of groundwater pumping and recharge/return related to subdivisions.

This example shows how the stream depletion rate can be affected by installing wells farther from a stream while placing recharge/return facilities closer to the same stream.

Status

Data collection will continue through June 2011.

Additional water-quality samples will be collected this fall from a subset of wells sampled this summer.

We will expand the seepage run on Big Ditch and perform additional seepage runs during the start of the 2011 irrigation season.

Elevations of wetlands in the Lee Metcalf National Wildlife Refuge will be compared to River and ditch elevations to examine the source of water in the Refuge.

The computer model will continue to be refined with additional data.

Acknowledgments

Landowners
Ravalli County Health Department
Bitterroot Irrigation District
Bitterroot River Watershed Forum
Lee Metcalf National Wildlife Refuge
Montana Department of Environmental Quality
Montana Department of Natural Resources and Conservation