GROUND WATER INVESTIGATION PROGRAM
Montana Bureau of Mines and Geology

Lolo Creek Project

Landowners near Lolo Creek have noted that the stream has become intermittent in the lower reaches during some years. Documentation indicates reaches of the Lolo Creek channel were dry in the 1980's and again in 2007, 2011, 2013 and 2015. There is anecdotal evidence that this has happened since the 1960's, and the frequency appears to have increased. However, there is no historical record that provides the years when flow was continuous to the river and years when dry channel reaches were documented.

PURPOSE: The purpose of this GWIP project is to determine the cause(s) of changes in streamflow character that have occurred in the lowest reaches of Lolo Creek.

Streamflow is impacted by many stresses.

Flow is enhanced by precipitation and groundwater discharge and is decreased by surface diversions, evapotranspiration, and groundwater pumping. A dry stream channel is the culmination of multiple stresses.
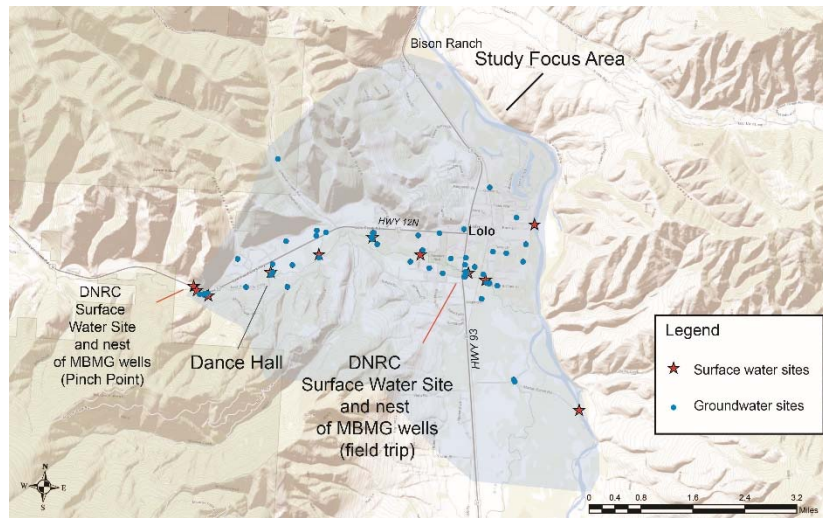
The study area includes the town of Lolo, the lower 5 miles of the stream, and about 13 mi² of the watershed. An extensive network of wells and stream sites are being monitored.

*Understanding impacts and **lack** of impacts, both are equally important.*
Our purpose is to provide information so water resources can be managed, Not just <u>used.</u>

OBJECTIVES:
✓ Evaluate surface-water budget components and channel morphology, and correlate to stream flow.
✓ Investigate how groundwater stresses influence Lolo Creek streamflow.

OUTCOME: The expected outcome of this project is a set of tools and data that will serve the local community in accurately understanding results of specific future water- management decisions.

The groundwater/surface-water connection…
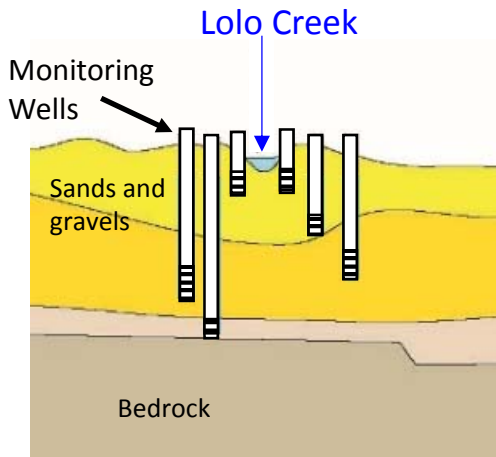
How are monitoring sites constructed?

Five sites were instrumented with near stream wells

- ✓ Each well is completed to study a specific depth
- ✓ Water levels are all different though interconnected
- ✓ What impacts one level impacts all levels

What factors influence streamflow?

Anything that alters the amount of water entering or leaving the groundwater and surface-water systems effects stream flow.

Factors influencing stream flow include:
- ✓ *Precipitation*
- ✓ *Evapotranspiration*
- ✓ *Pumping*
- ✓ *Groundwater inflows and outflows*
- ✓ *Surface water inflows and outflows*

Water levels temporarily rise starting July 11 in response to a July 10 rain event (bottom right graph). The recharged groundwater will eventually flow toward and discharge to surface water.

Note the decreasing water levels through the rest of July in response to stresses including evapotranspiration. Evapotranspiration steadily increases throughout the month (bottom right).

Precipitation and evapotranspiration are only two of multiple factors that can effect flow in the creek.

Water levels in Lolo Creek and in the adjacent alluvial aquifer correspond to one another (top right). Streamflow data are from DNRC (station below US 93).
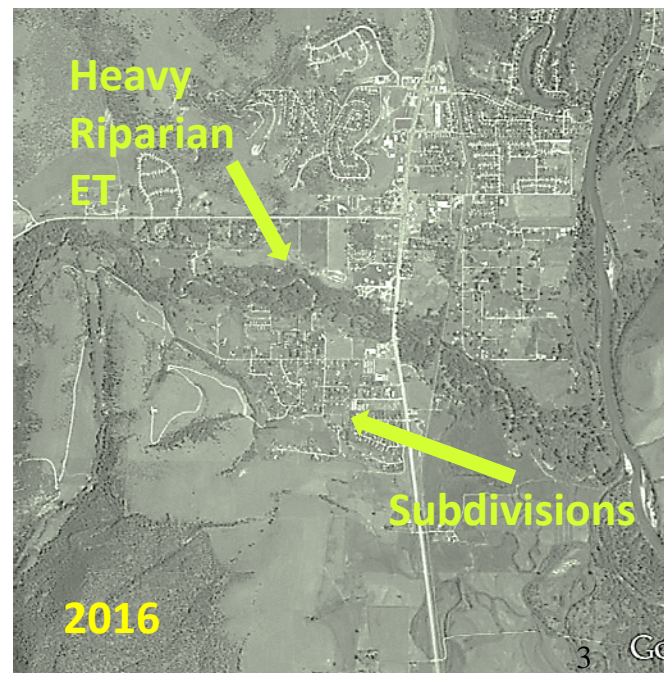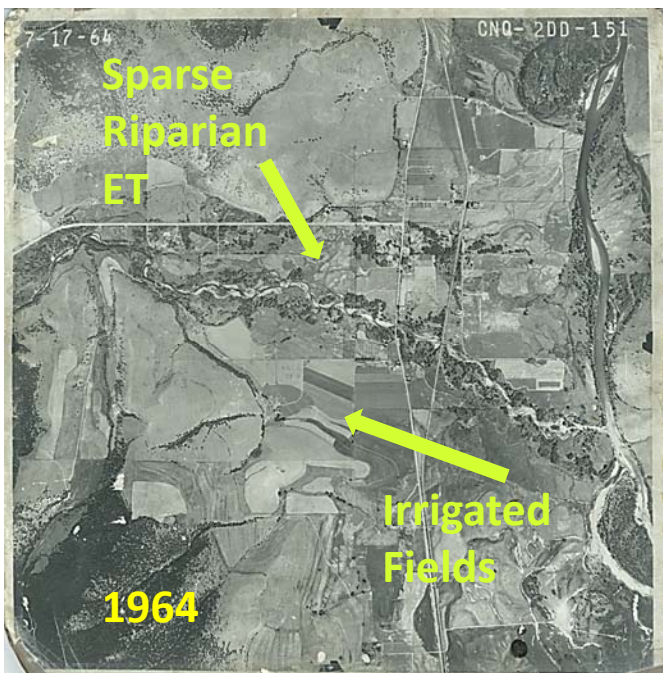
Streamflow along Lolo Creek
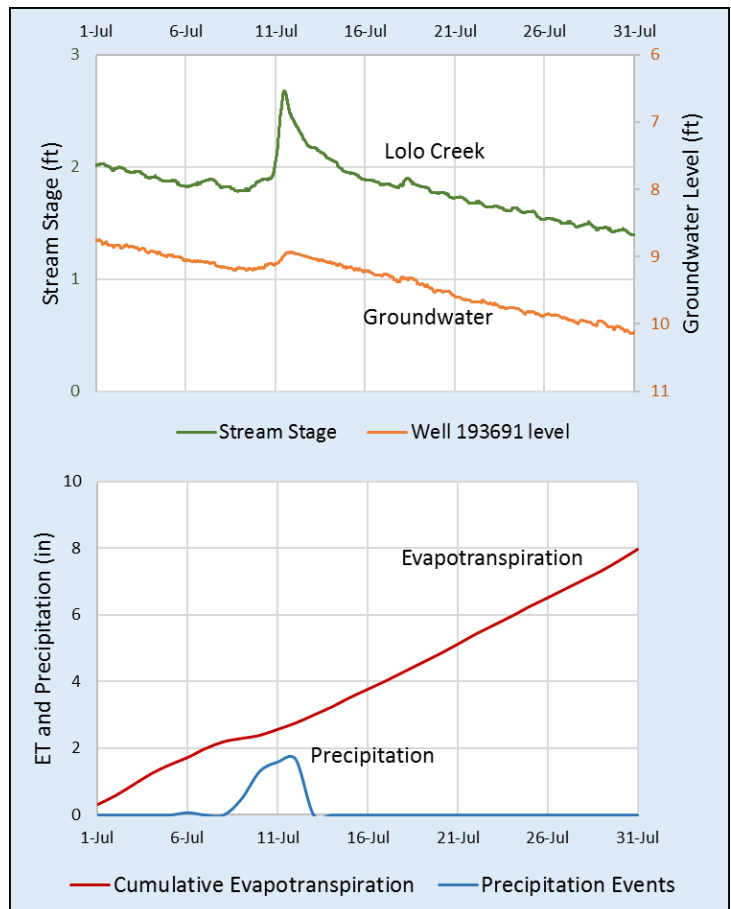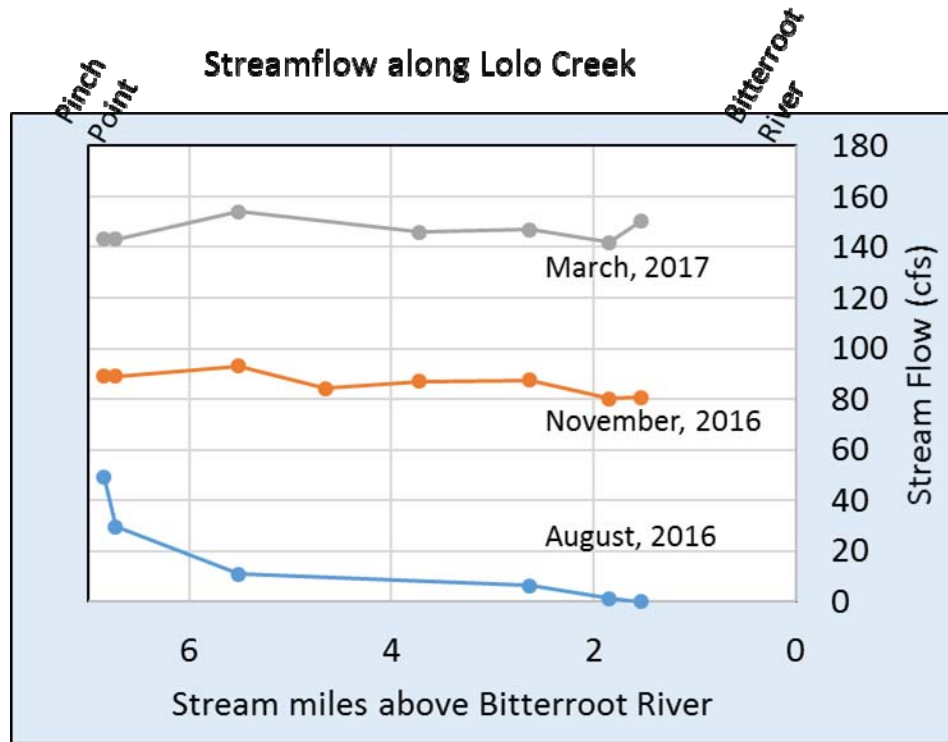
Above, Lolo Creek appears to always lose water through the study area. The loss increases significantly during the high-demand summer months.

Causes and lines of investigation:

Surface-water diversions
Groundwater pumping
Changes in land use that alter recharge and ET
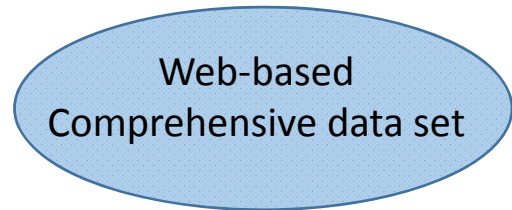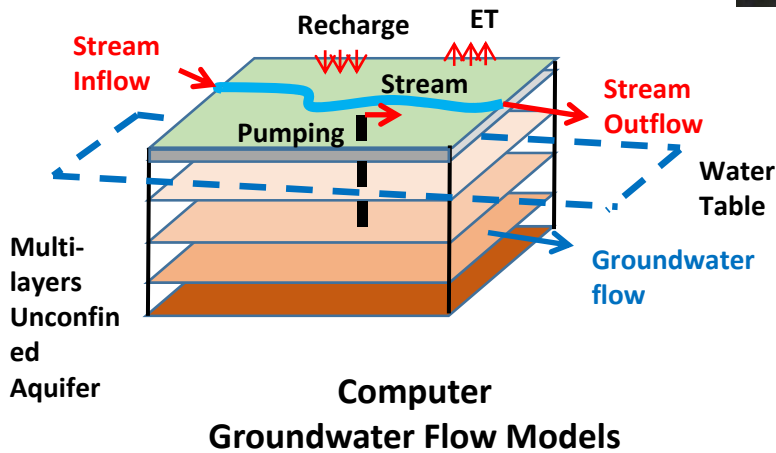Climate influences

PRODUCTS and RESULTS: Tools for science-based water management so you can better design a result and achieve it. Some tools are intended for everyone's use, some are more technical and may be more useful by professional hydrologists.
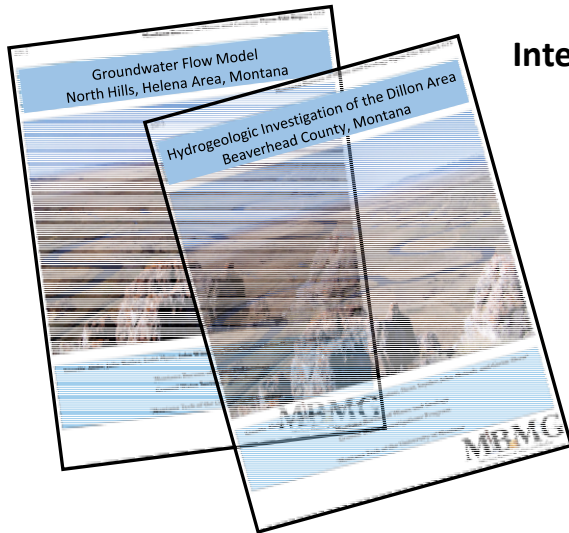
Interpretative Report

Presentations

Computer Groundwater Flow Models

Web-based Comprehensive data set

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Montana Bureau of Mines and Geology – http://www.mbmg.mtech.edu/
Ground Water Investigation Program (GWIP) – http://www.mbmg.mtech.edu/gwip/gwip.asp