

# Investigating Groundwater and Surface-water Interaction Using Stable Water Isotopes in the Bitterroot Valley, Montana

## Ground-Water Investigation Program



**Todd Myse, P.G.**  
Montana Bureau of Mines and Geology  
**Patrick F. Haley**  
Columbine Logging

**2014 GSA Joint Rocky Mtn/Cordilleran  
Section Meeting**  
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# Ground-Water Investigation Program (GWIP)

## Montana Bureau of Mines and Geology

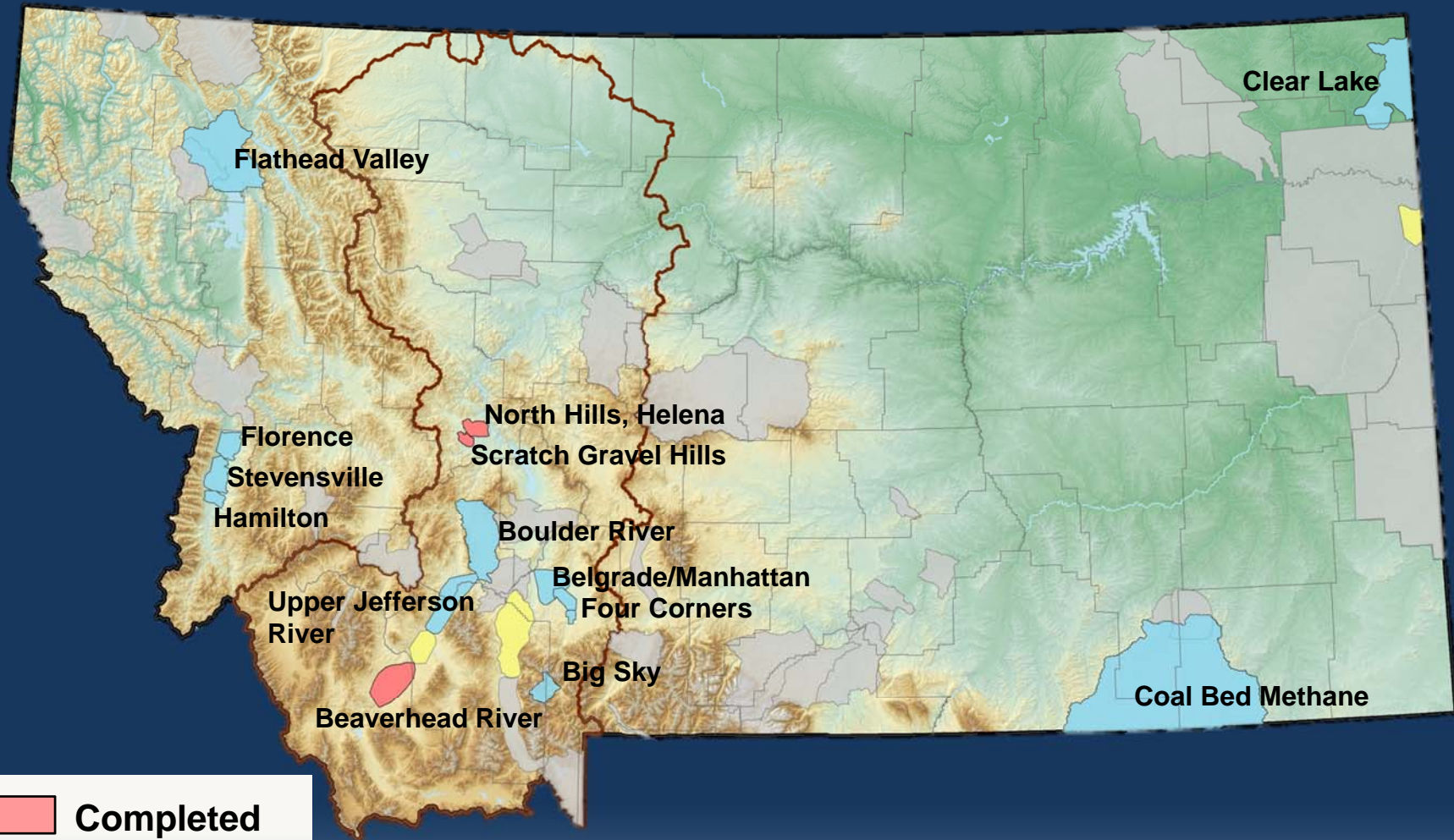
- Specific groundwater research questions
- Local
- Sub-basin
- Study Intervals - one to three year duration





### Questions Researched

- Groundwater/Surface-Water Interaction
- Stream Depletion
- “Incidental” Recharge
- “Managed” Recharge
- Land-Use Changes (e.g., changes in irrigation practices, cumulative effects of existing and proposed water development)

# GWIP Project Areas

GWIP adds to Montana's capability to deal with complex water resource issues



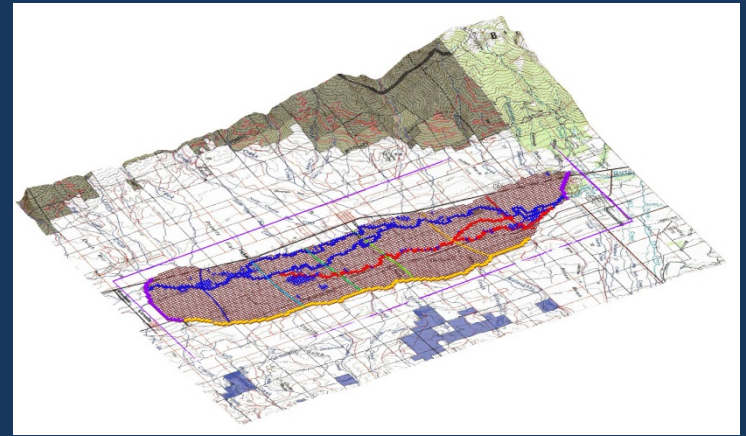
-  Completed
-  Active
-  Scheduled
-  Nominated



# GWIP Products

## Montana Bureau of Mines and Geology

- **Interpretive Report**
- **Modeling Report** (if appropriate)  
Model files available on-line
- **Technical Data Report** (if appropriate)
- **A Comprehensive Set of Hydrogeologic Data**  
Available through MBMG Ground-Water Information Center (GWIC), which is archived forever.



# Shallow Aquifer Investigation

## Stevensville Area



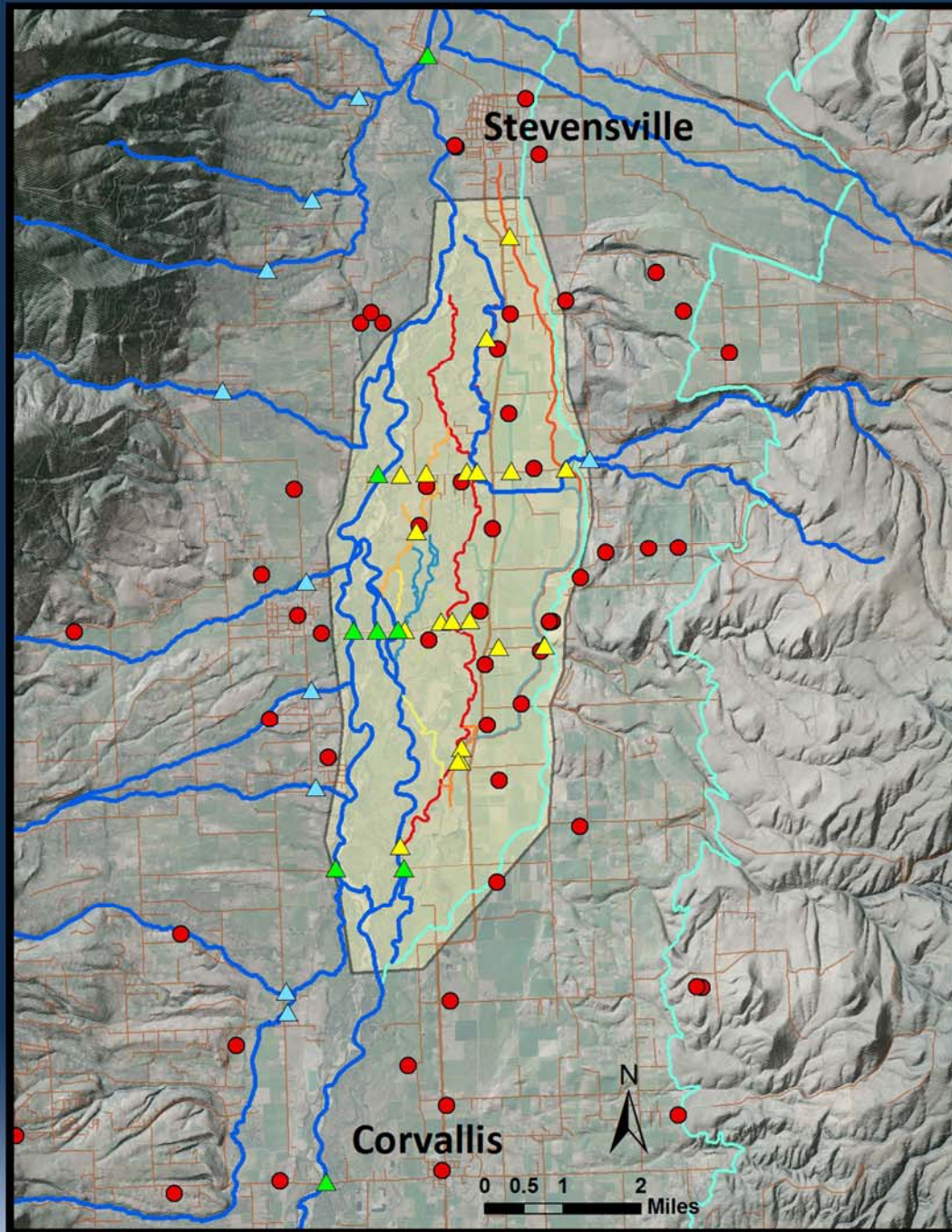
### Purpose

Examine the feasibility of supplementing surface water irrigation supplies with groundwater.

- Find and use Existing information
- Collect groundwater and surface-water elevations to characterize the groundwater flow regime
- Groundwater Flow Model



# Monitoring Network



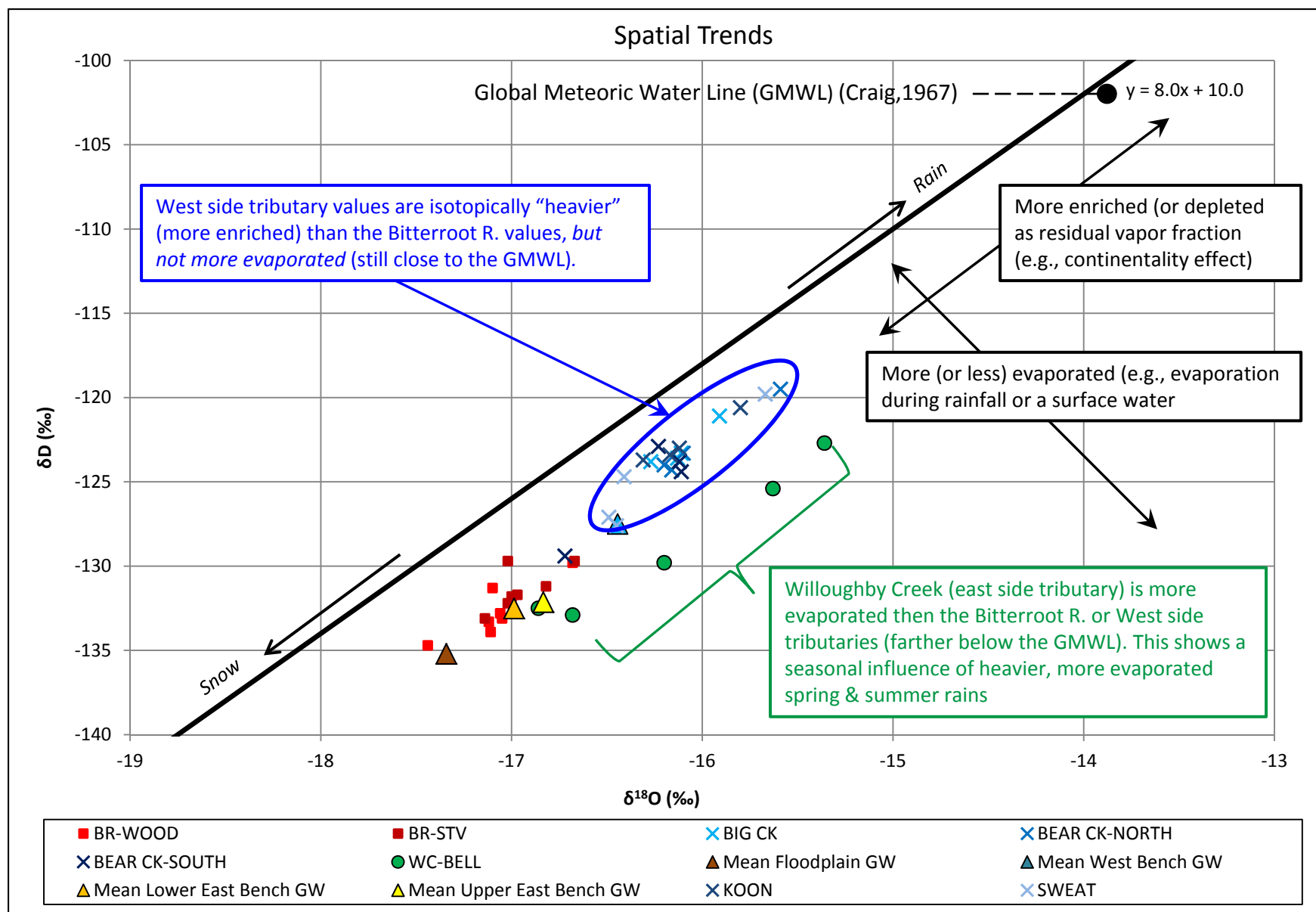


# Data Collection Efforts



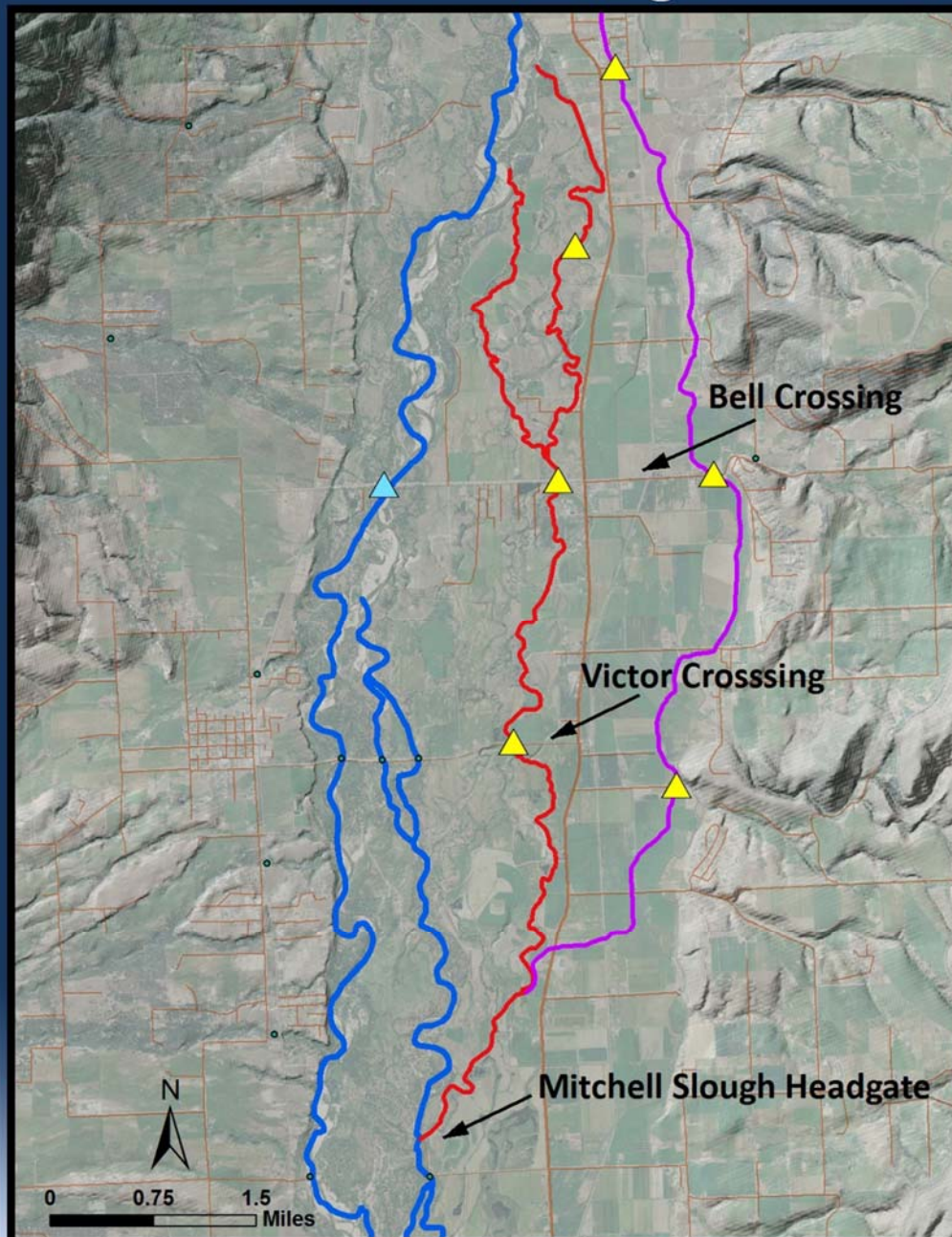
- Groundwater Data
- Surface-Water Data
- Installation of Wells
- Groundwater Sampling
- Isotope Sampling
- Canal Losses/Gains

# Bitterroot Valley East-West Spatial Isotope Trends

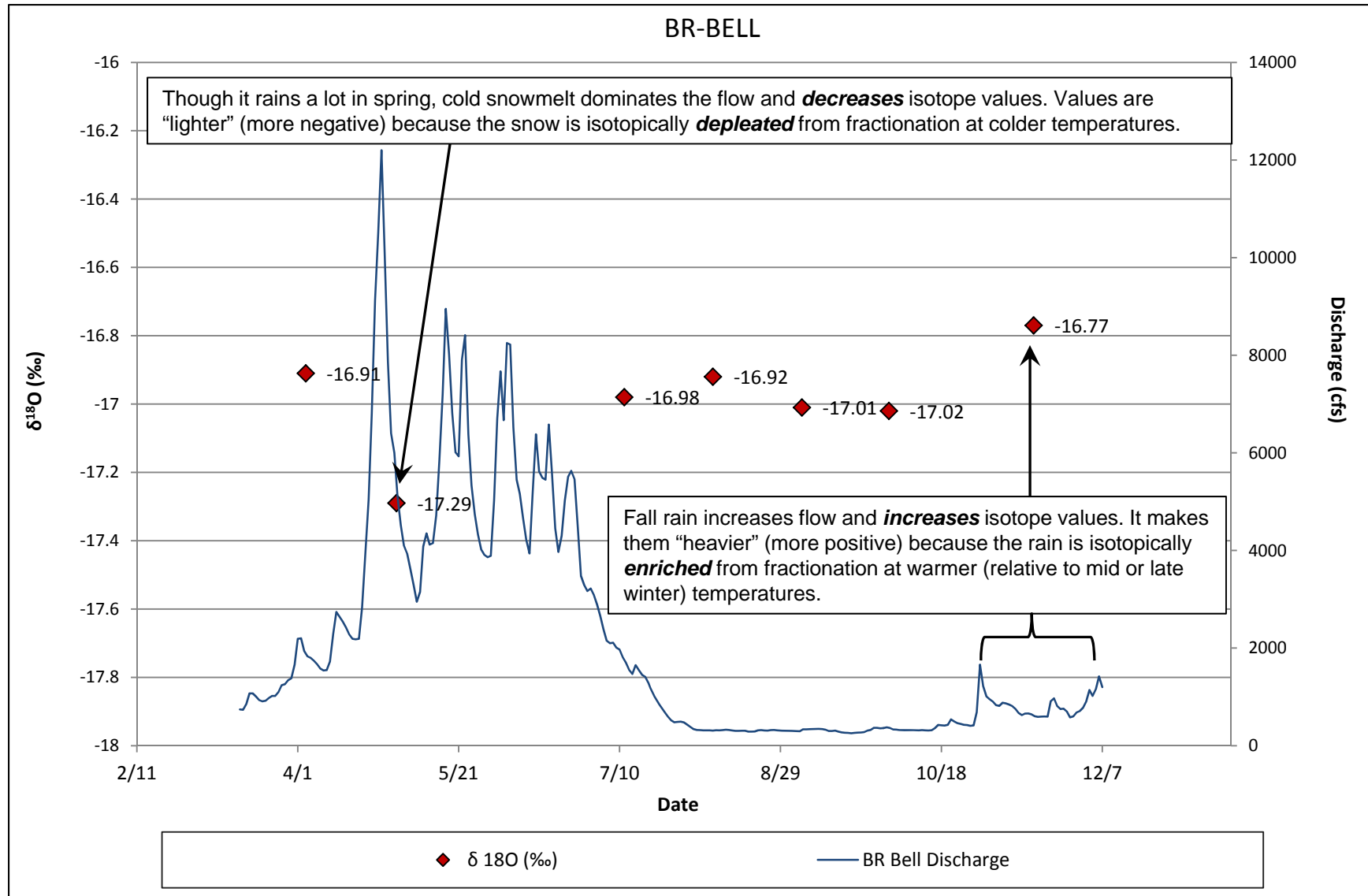




# Bitterroot River, Mitchell Slough, and Union Ditch

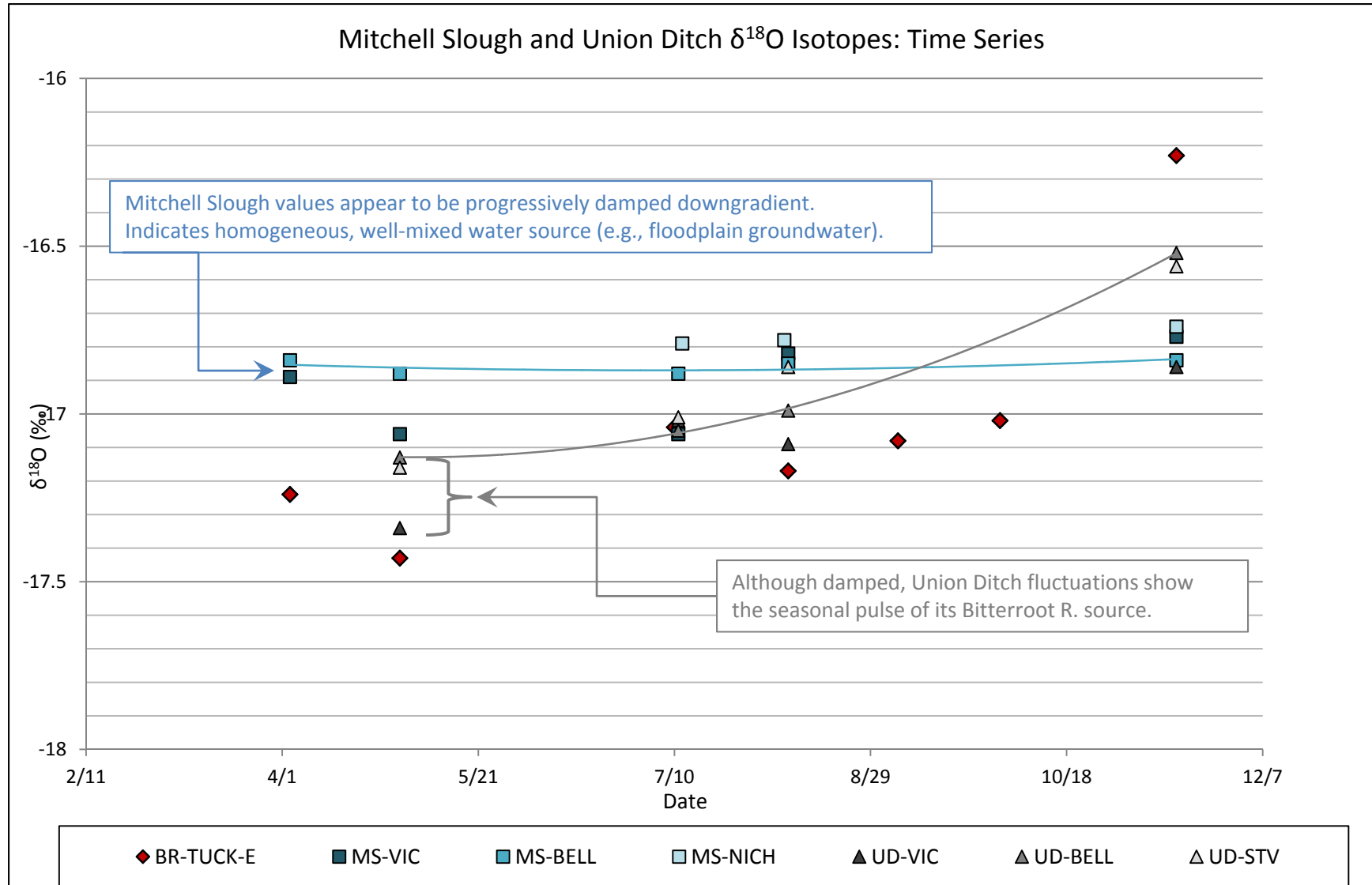


# Seasonality: $\delta^{18}\text{O}$ vs. Flow





# Bitterroot Valley North-South Spatial and Temporal Trends



# Acknowledgments

- Local land and well owners
- Area Ditch Companies
- Bitterroot Water Forum
- Al Pernichele – Water Commissioner
- Local Natural Resources Conservation Service Office
- Kirk Waren – MBMG
- Dean Snyder – MBMG
- Ginette Abdo – MBMG
- Patrick Haley – MTECH Graduate Student
- Allison Brown – MTECH Student





# Questions?

