



GROUND-WATER  
CHARACTERIZATION PROGRAM

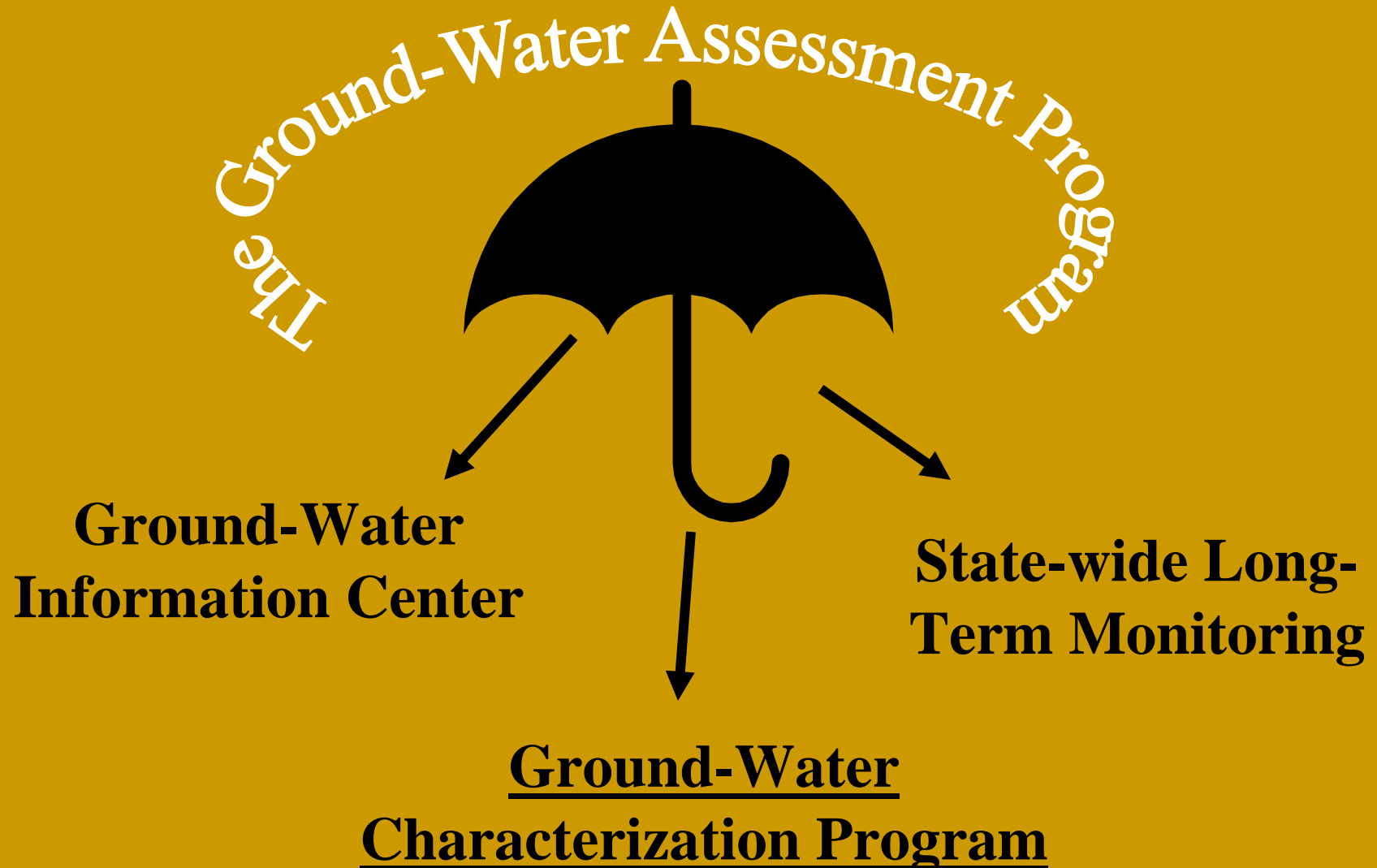
John LaFave  
Larry Smith  
Don Mason  
Mike Richter  
Camela Carstarphen



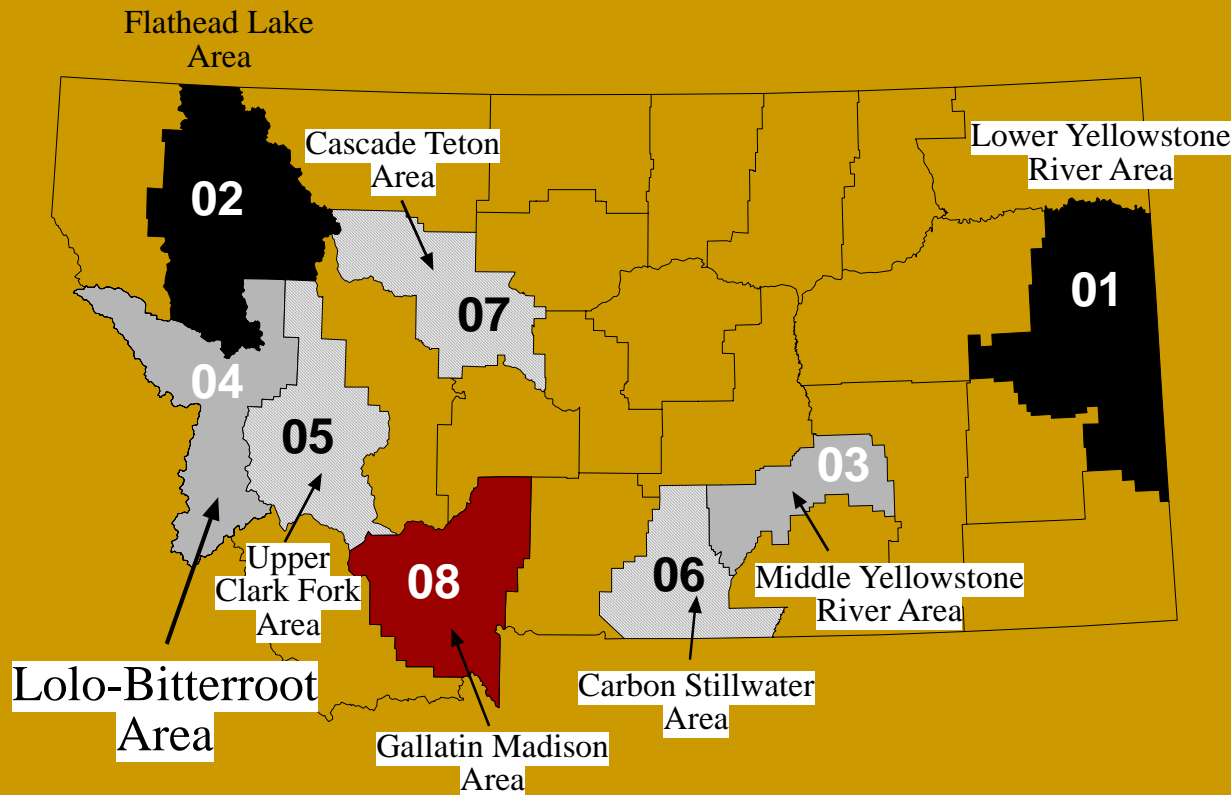
**An update on work in the  
Big Sky area  
by  
The Montana Bureau of  
Mines and Geology's  
Ground-Water  
Characterization Program**

**Mike Richter  
Cam Carstarphen**

# What is the program?



# Characterization Program Study Areas



**Abundant interaction and guidance for other agencies as well as local/ regional groups about ground-water issues.**

**Study Area Products include website-delivered groomed data:**

- **1,000+/- visited wells**
- **250+/- full inorganic analyses (some isotopes and radon)**
- **Three years of monthly measurements from ~ 100 wells**
- **12+/- maps of aquifer and geologic parameters**



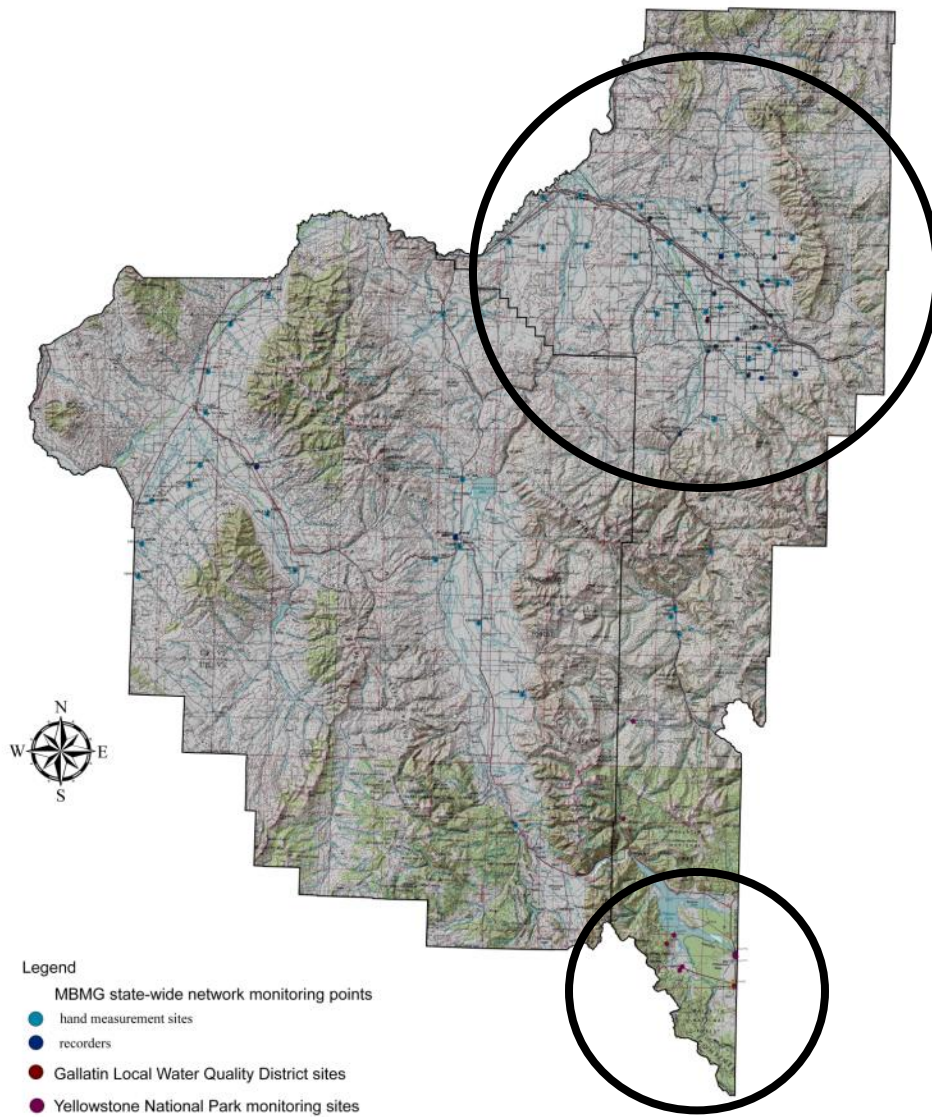
Remember three things:

We are seven months into data collection

There are 2 ½ more years of data collection

We have just started data collection!

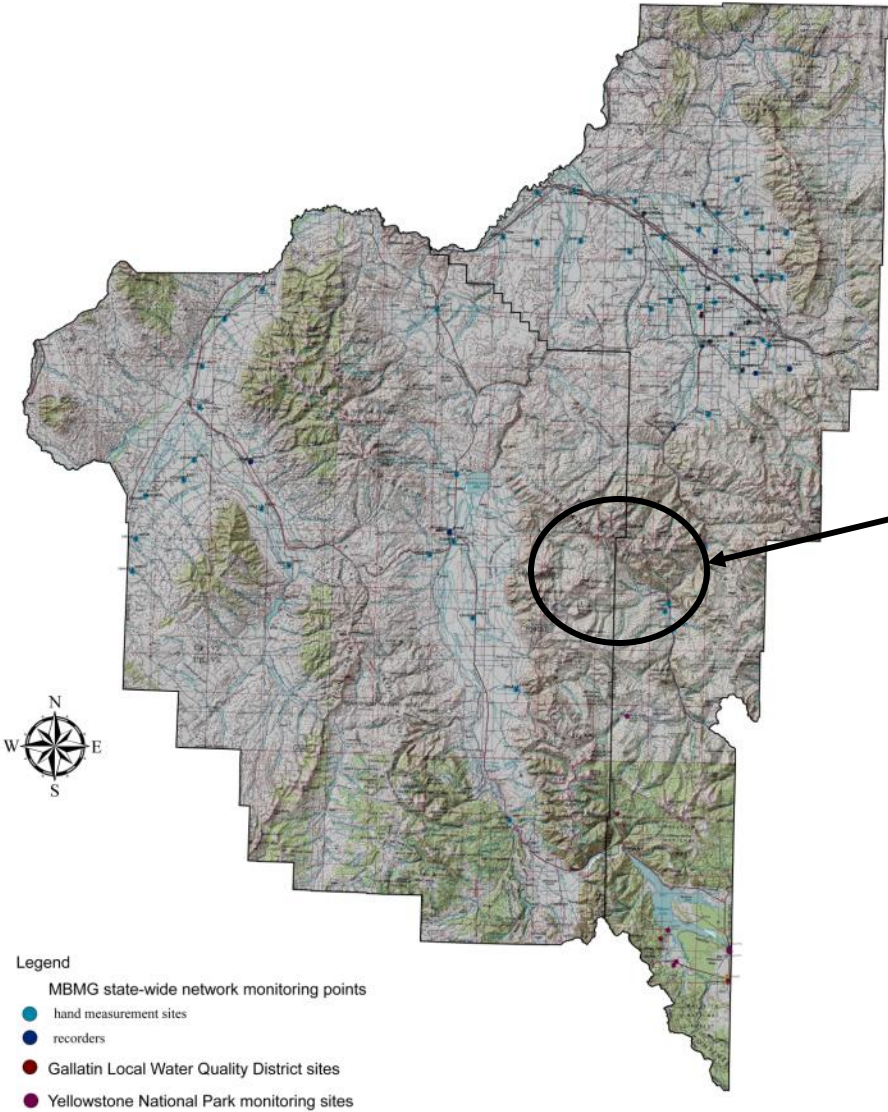
The **GWCP08** focus:  
Working with local groups



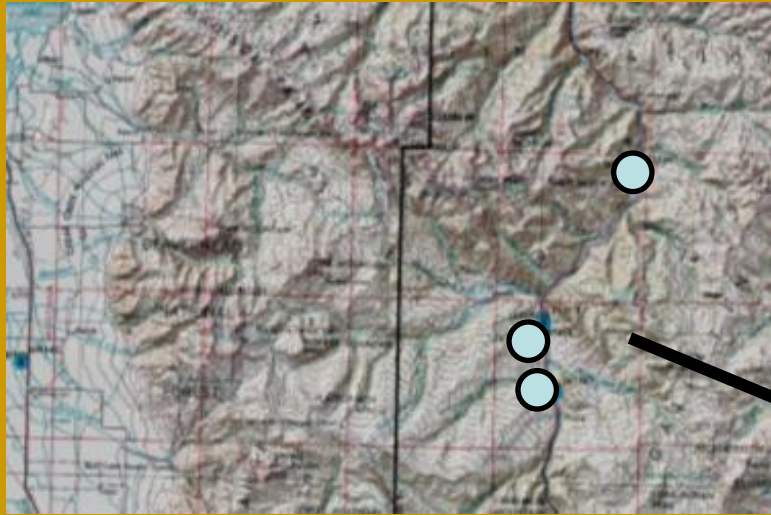
- ❖ The Gallatin-Water Quality District
- ❖ MBMG Pharmaceutical Sampling
- ❖ HB831 modeling
- ❖ MBMG Yellowstone monitoring project
- ❖ Blue Water Task Force and the Big Sky Water and Sewer District
- ❖ Ruby Valley Watershed Council

# Working with Local Groups

Blue Water Task Force (Big Sky)

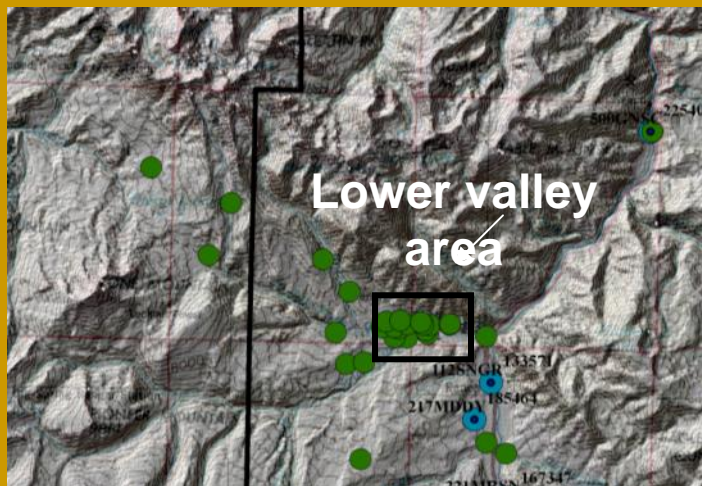


# Big Sky concerns; quantity and quality

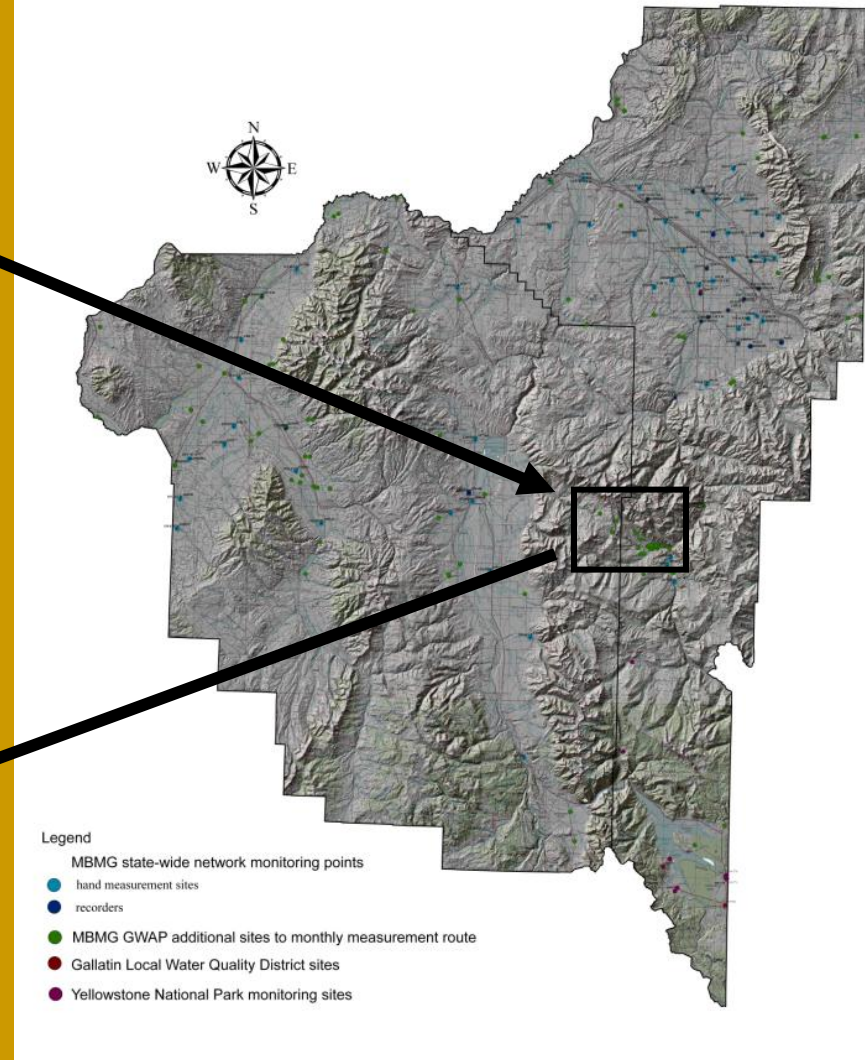


Topographic base with long-term MBMG sites in blue

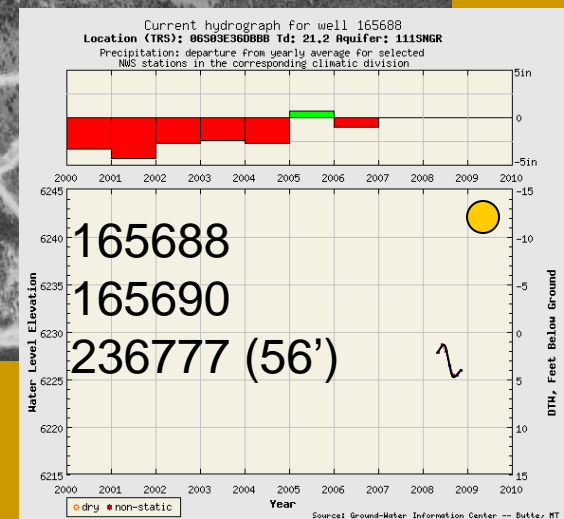
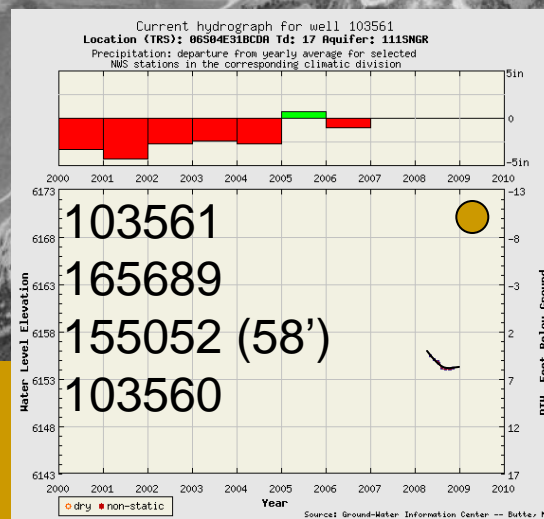
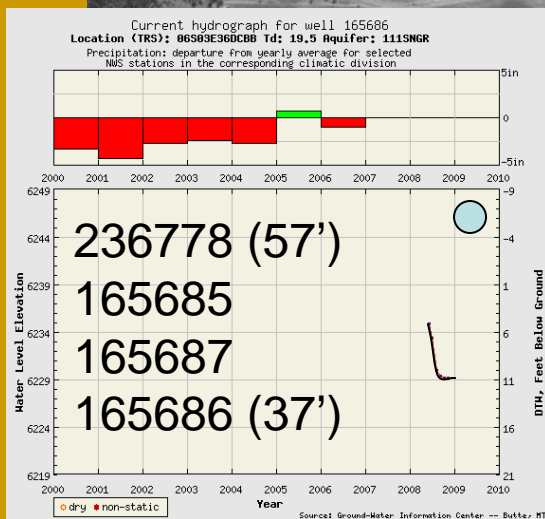
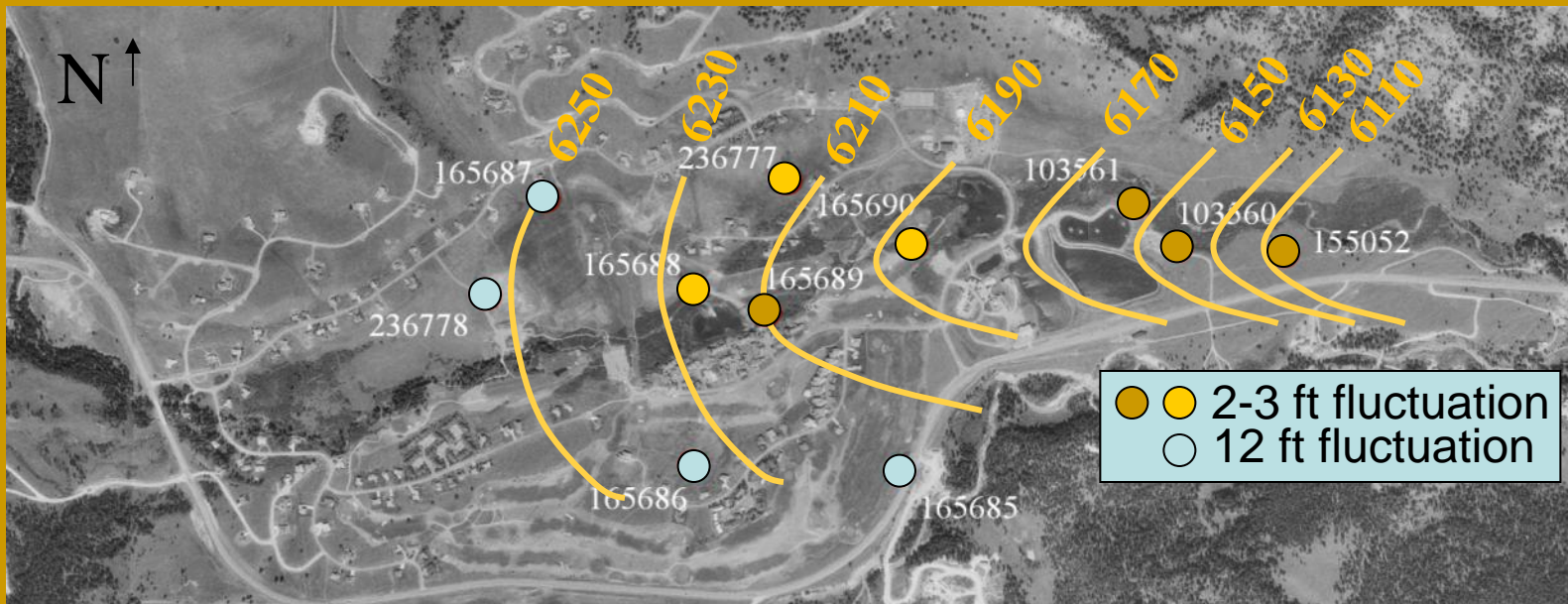
**25 wells monitored in Big Sky area,  
11 in the Lower Valley area**



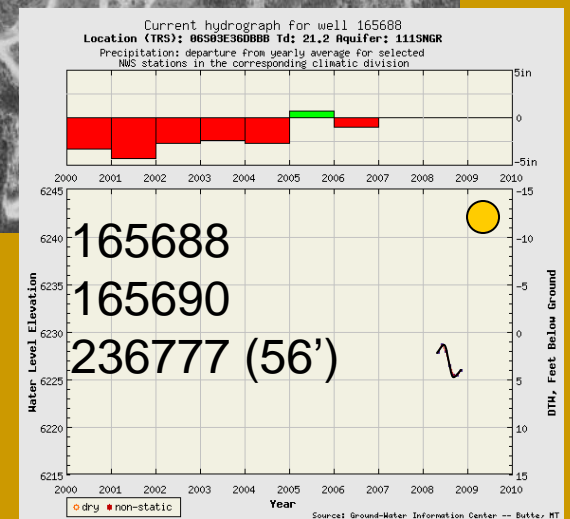
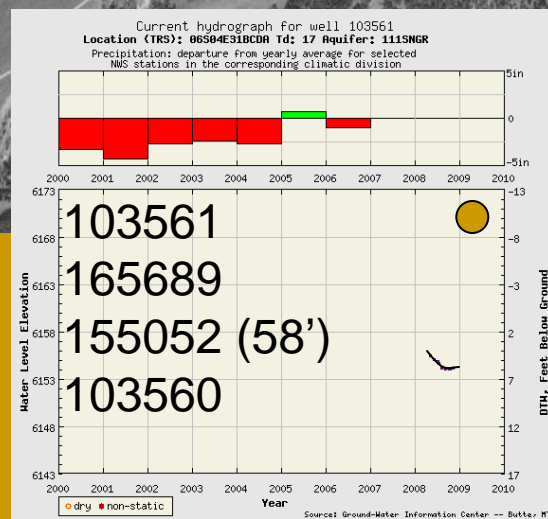
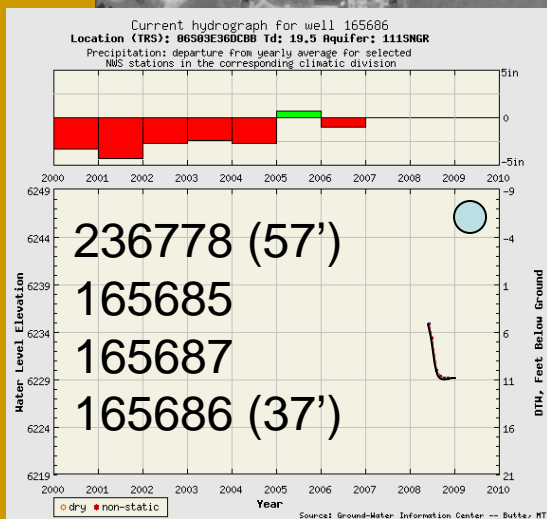
## GWCP08 study area



# First: the lower Big Sky valley: ground-water levels And nitrate concentrations



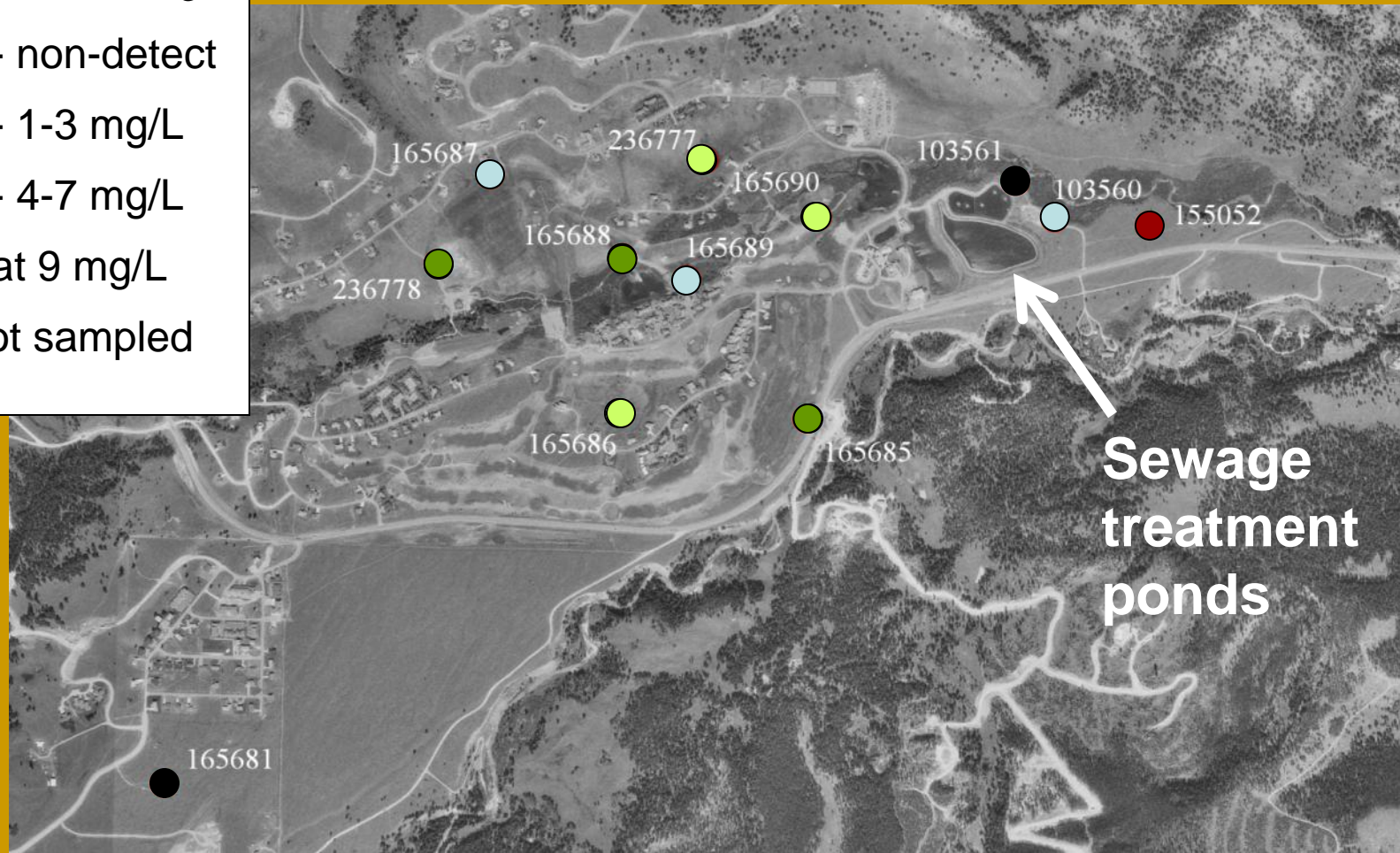
# 10 of 11 wells sampled for nitrate: ●



# July 2008 Nitrate Values

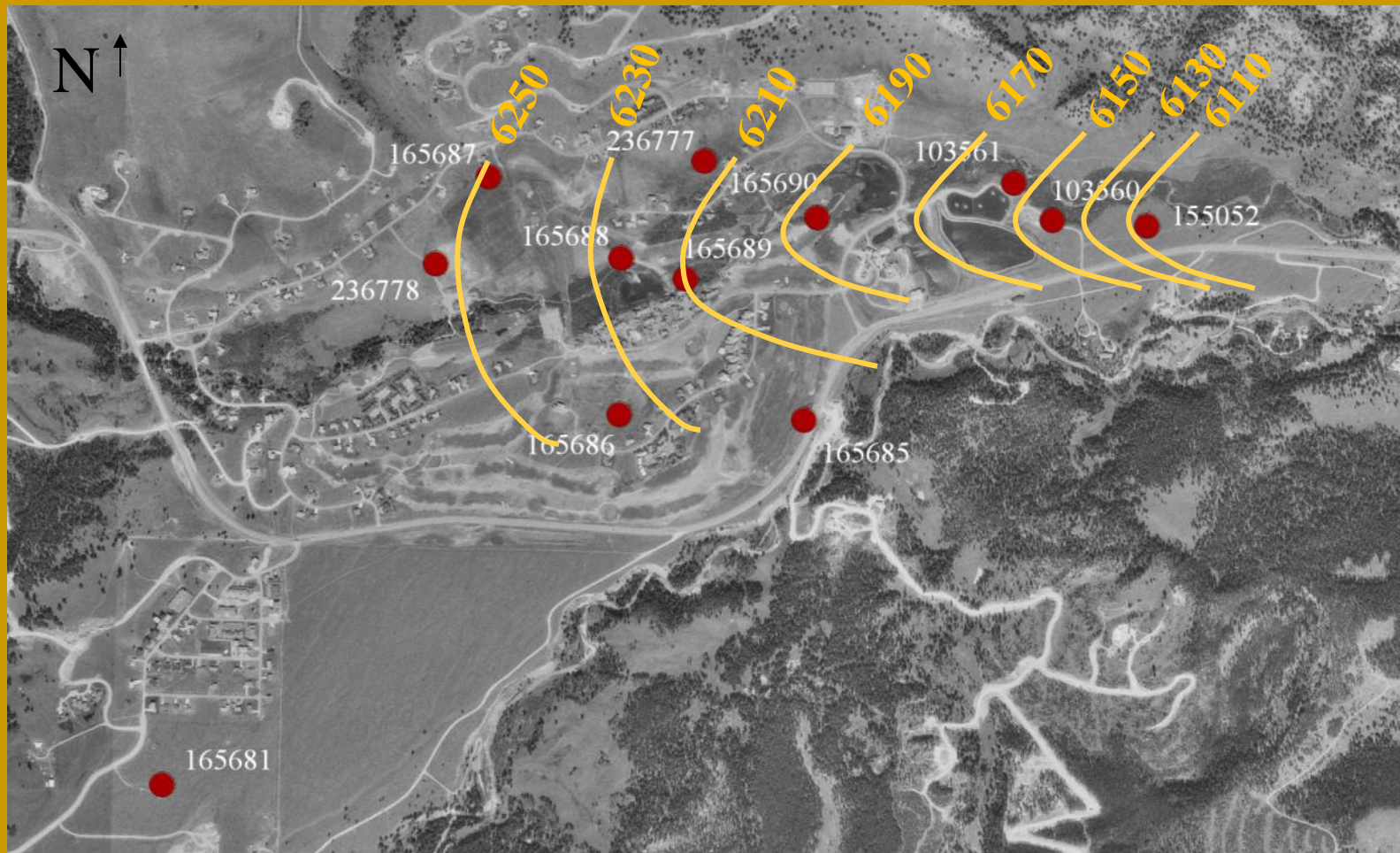
7/2008 Nitrate mg/L

- 3 - non-detect
- 3 - 1-3 mg/L
- 3 - 4-7 mg/L
- 1 at 9 mg/L
- Not sampled

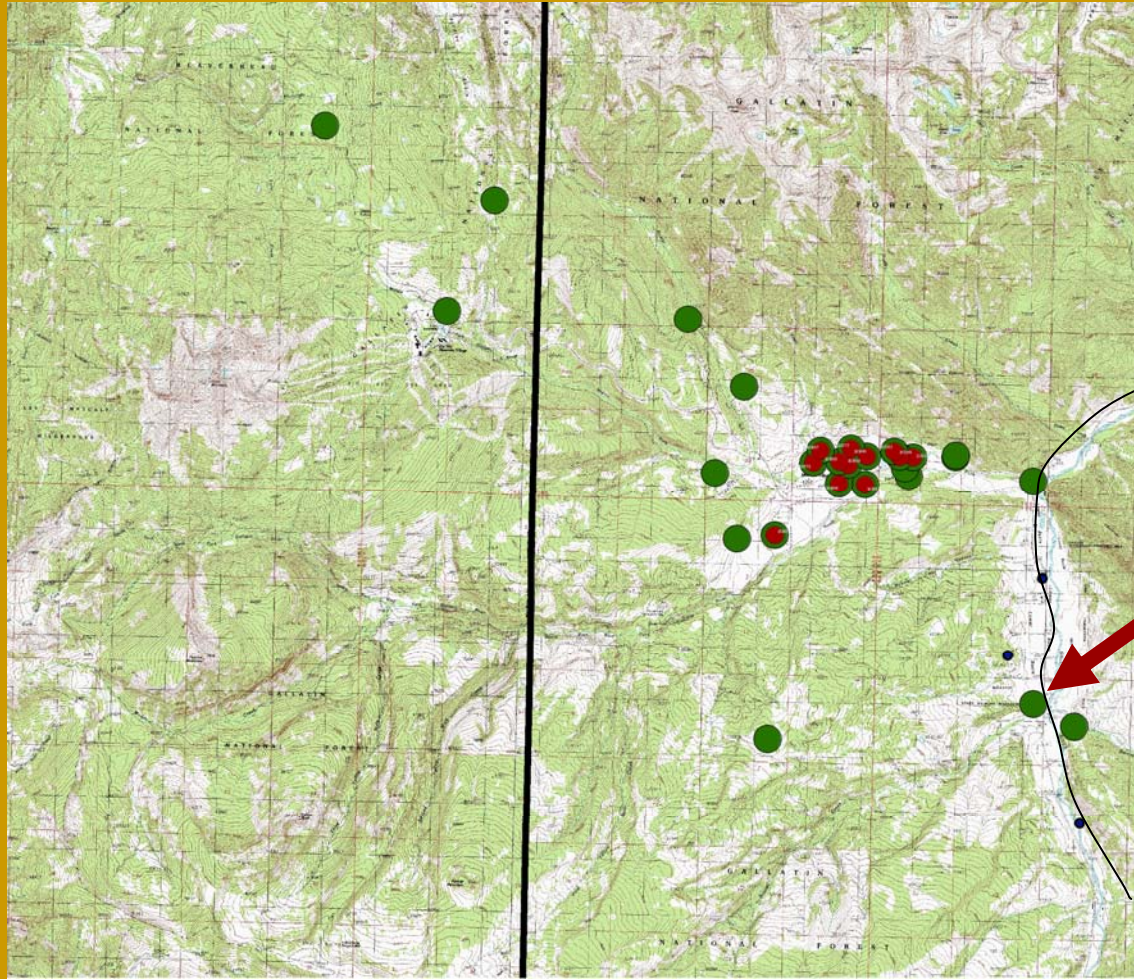


Most Lower Valley wells are completed in outwash deposited over a clay unit, older alluvium, or bedrock. Wells 103560 and 103561 have no outwash. 10/2008 nitrate values except for 165685 are much lower.

**Big Sky's lower valley future: monthly water levels for 2 more field seasons; quarterly nitrate sampling at least for one more year**



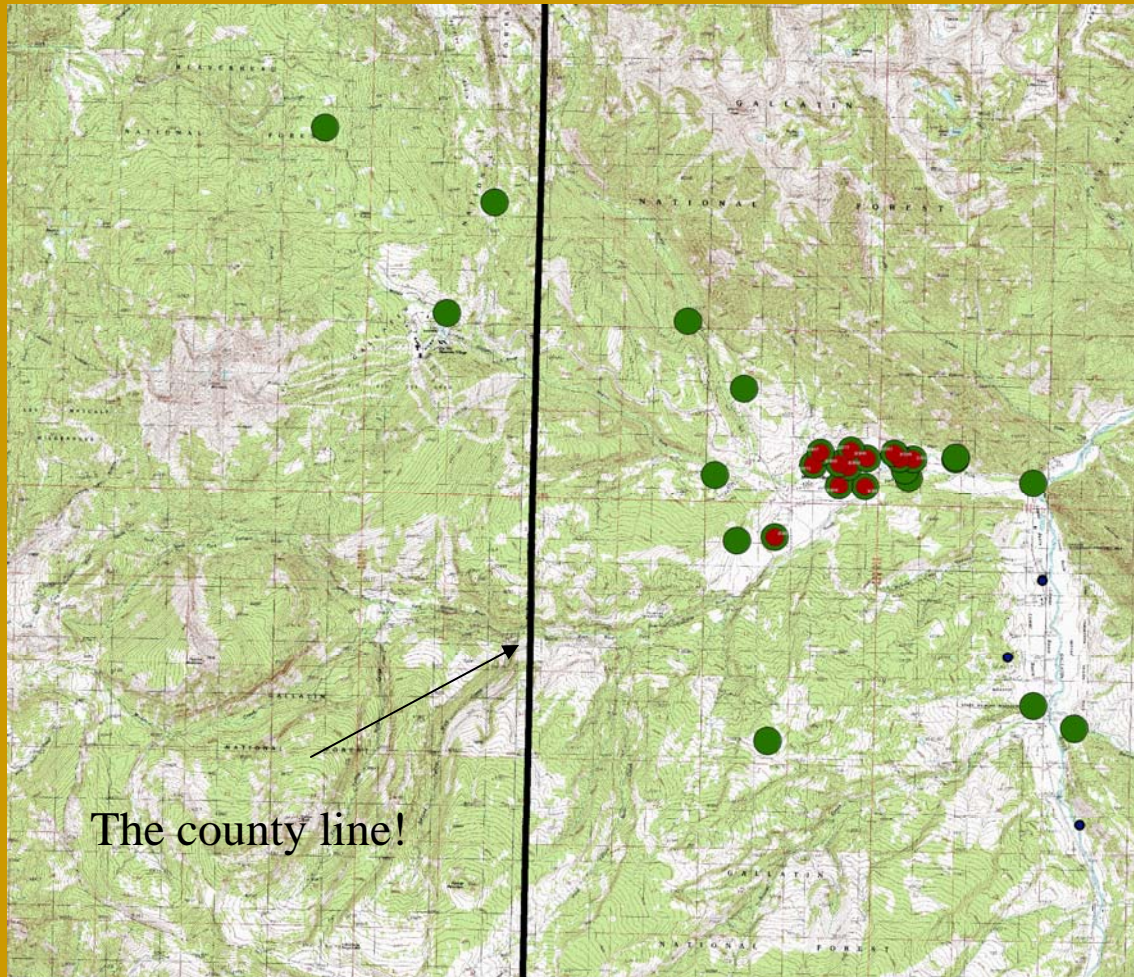
## What about the rest of Big Sky?



You Are Here!

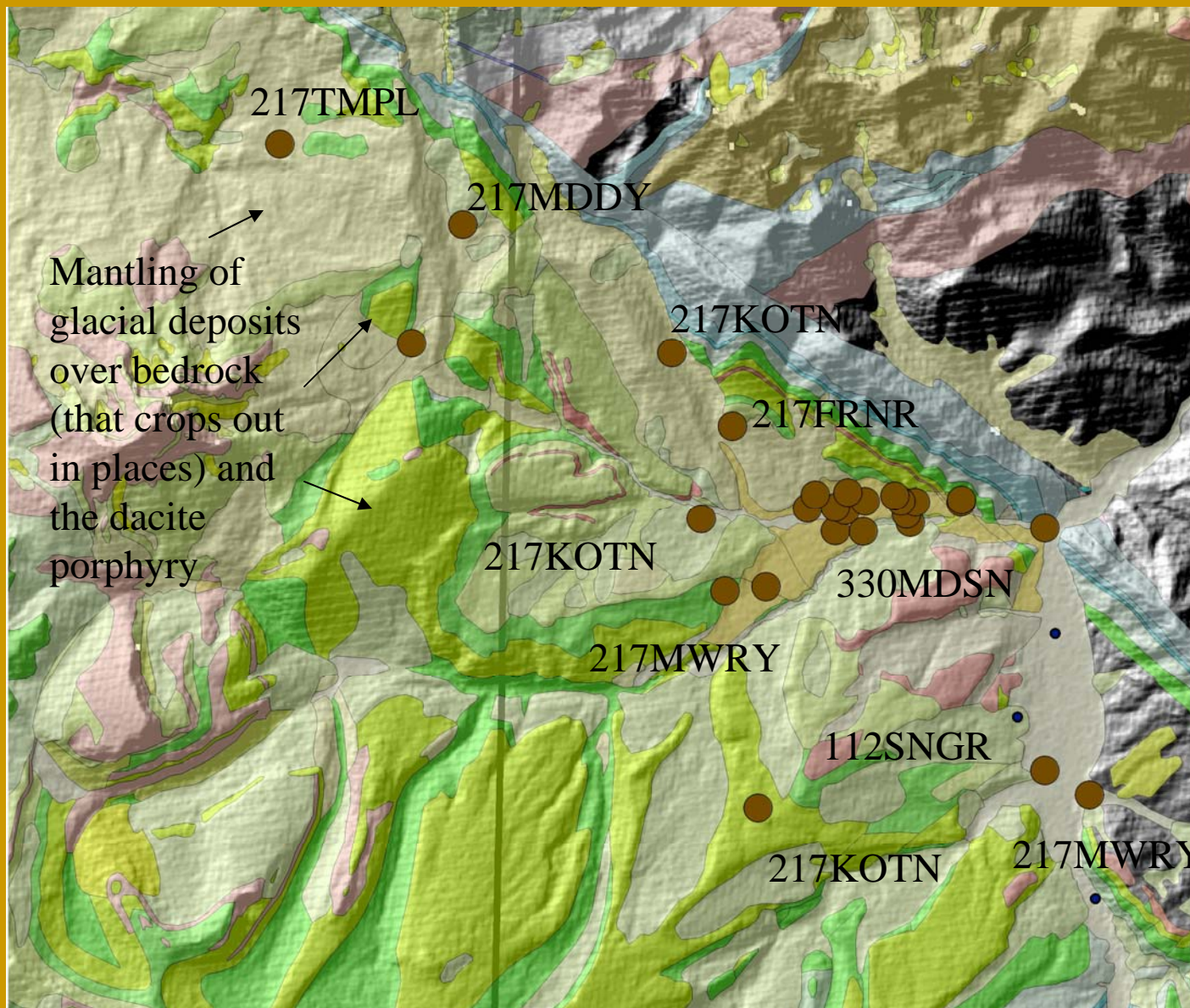
- Big Sky sites not included in the lower valley sampling
- Big Sky sites that are included in the lower valley sampling

## Big Sky sites not included in the lower valley sampling:



- are completed in older geologic units that are faulted, folded or Are part of the volcanic and intrusive complex exposed in the Resort and Moonlight basin Area
- also have monthly water-levels Collected
- and have a full water quality analysis

# Big Sky sites with general geology as backdrop

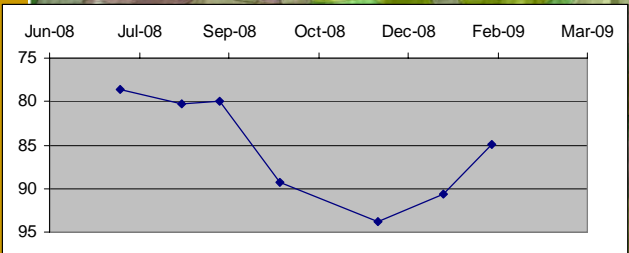
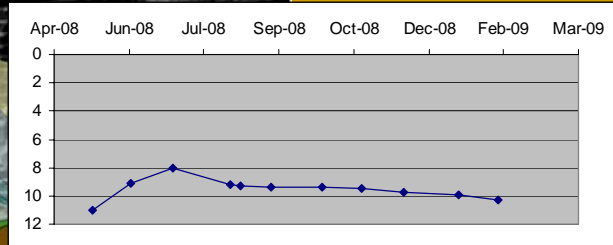
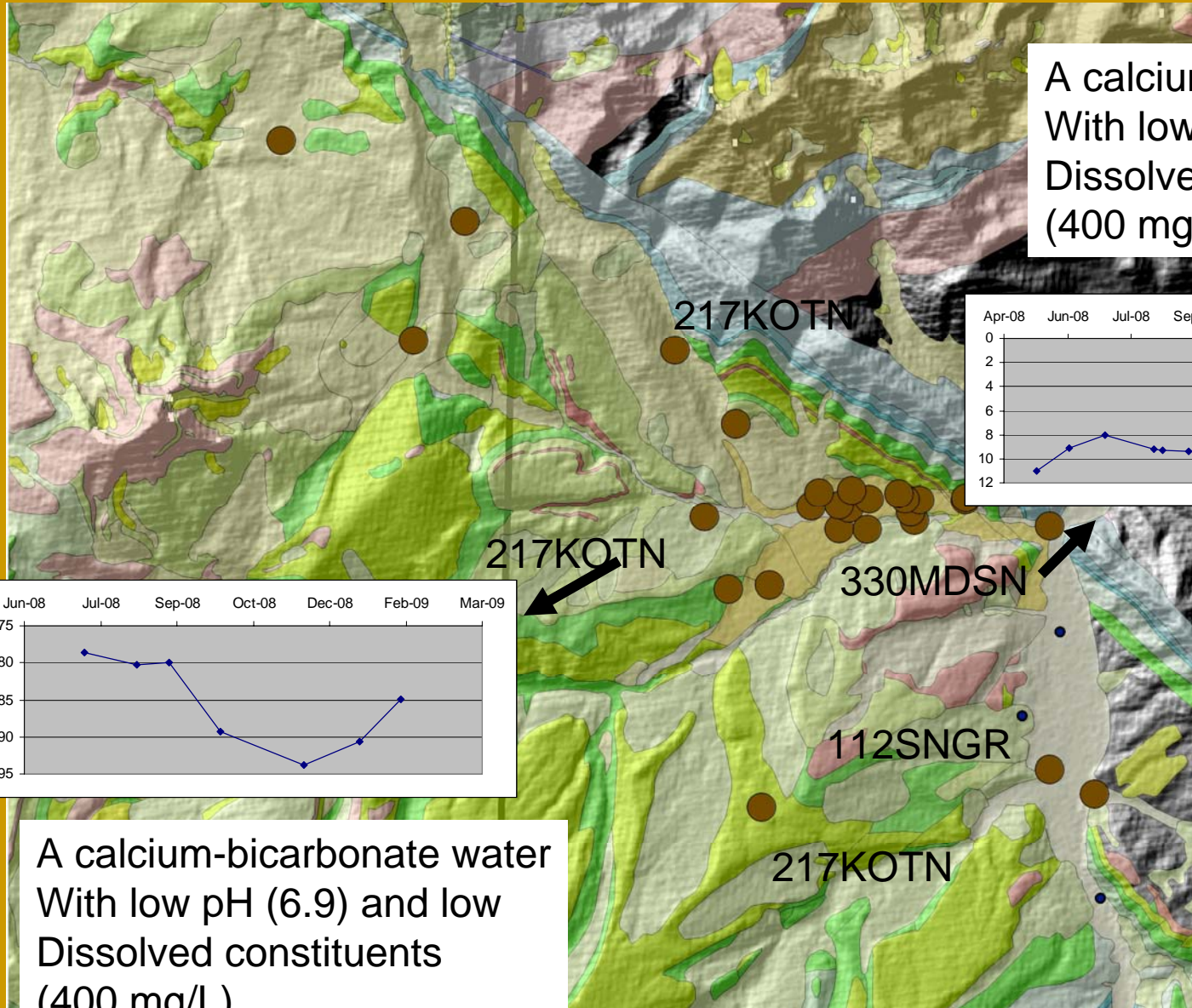


## Major Geologic Units

- 217KOTN  
Kootenai Sandstone
- 330MDSN  
Madison Limestone

# Hydrographs and water-quality

A calcium-bicarbonate water  
 With low pH (7.1) and low  
 Dissolved constituents  
 (400 mg/L)



A calcium-bicarbonate water  
 With low pH (6.9) and low  
 Dissolved constituents  
 (400 mg/L)



## **2009 field assistant crew**

Remember three things:

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There are 2 ½ more years of data collection

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