

# What Affects Forecast Quality

Uncertainty in weather forecasts

Data

- Network density

- Quality of measurements

- Missing measurements

- Loss of data sites used in calibration

Diversions & consumptive use

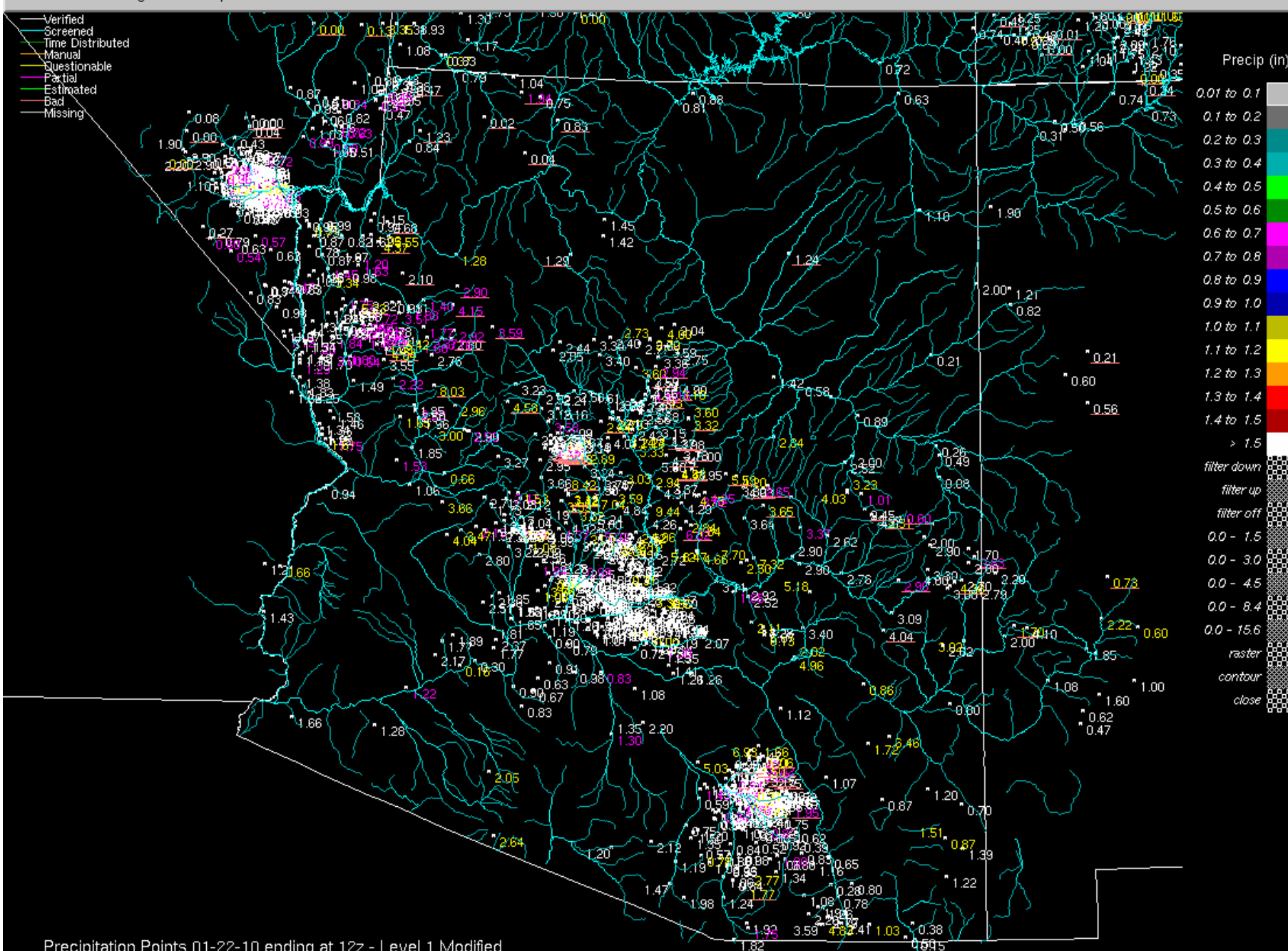
Model calibration errors (usually tied to historical data)

# Precipitation Network (~3000 stations)

- NRCS (SNOTEL and SCAN)
- COOP
- RAWS
- ALERT (several counties in AZ, NM and NV)
- USRCRN
- USCRN
- ASOS
- AWOS
- UCN
- COCORAHS

# Precipitation Network

- Periodically update the metadata
  - Mainly latitude, longitude and elevation
  - Additional check using 30 meter DEM data
  - Goal is to remove obvious errors
  - Done about once each year
  - Important for precipitation analysis
  - Important for radar bias calculation



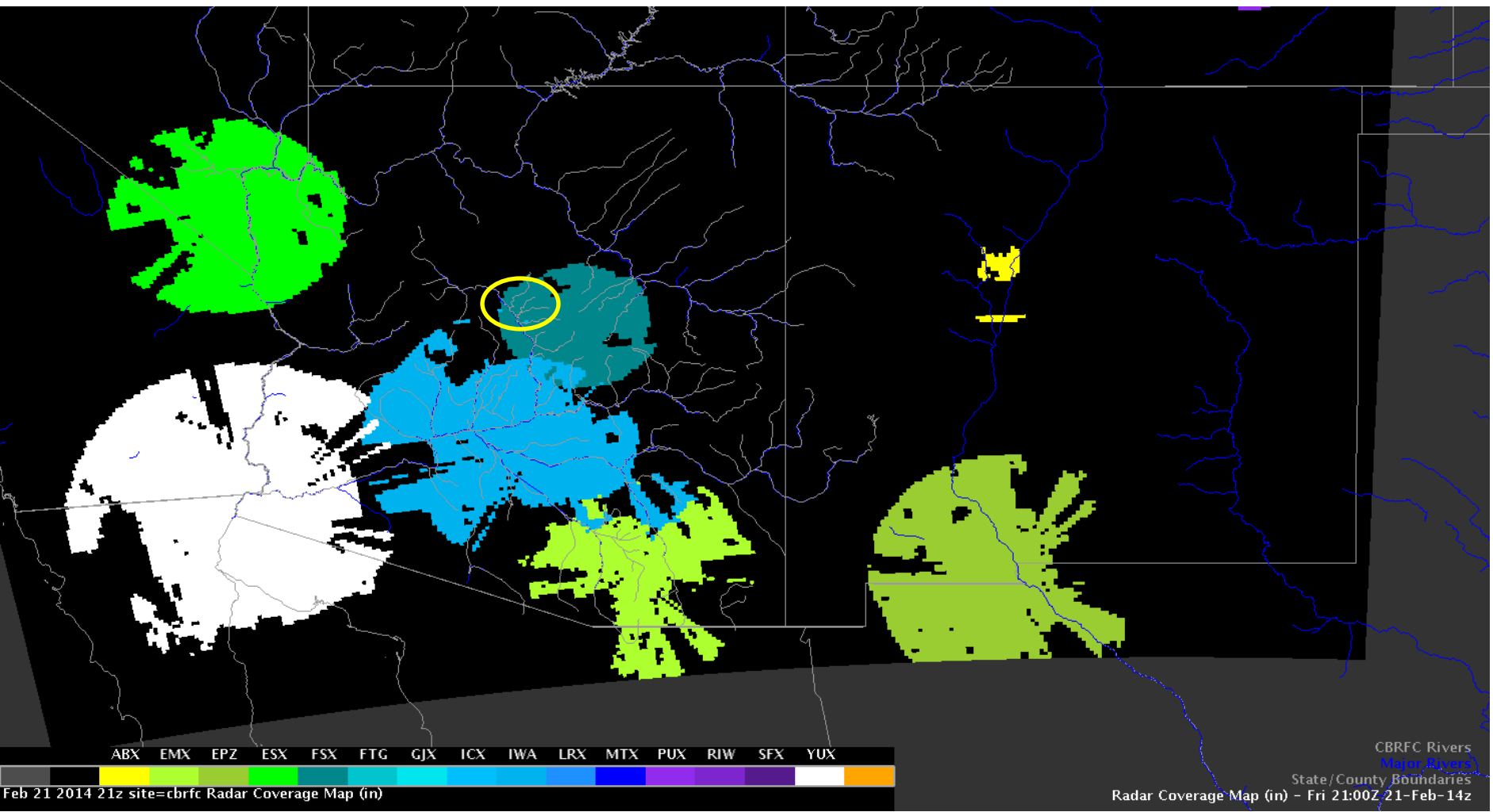
- Verified
- Screened
- Time Distributed
- Manual
- Questionable
- Partial
- Estimated
- Bad
- Missing

- Precip (in)
- 0.01 to 0.1
  - 0.1 to 0.2
  - 0.2 to 0.3
  - 0.3 to 0.4
  - 0.4 to 0.5
  - 0.5 to 0.6
  - 0.6 to 0.7
  - 0.7 to 0.8
  - 0.8 to 0.9
  - 0.9 to 1.0
  - 1.0 to 1.1
  - 1.1 to 1.2
  - 1.2 to 1.3
  - 1.3 to 1.4
  - 1.4 to 1.5
  - > 1.5
- filter down
- filter up
- filter off
- 0.0 - 1.5
- 0.0 - 3.0
- 0.0 - 4.5
- 0.0 - 8.4
- 0.0 - 15.6
- raster
- contour
- close

Precipitation Points 01-22-10 ending at 12z - Level 1 Modified

Radar coverage depends on Freezing Level

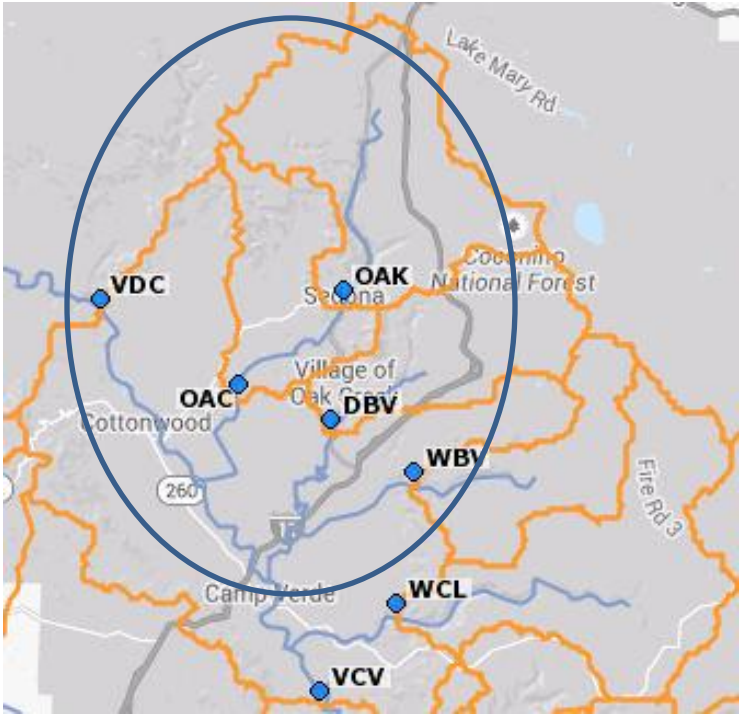
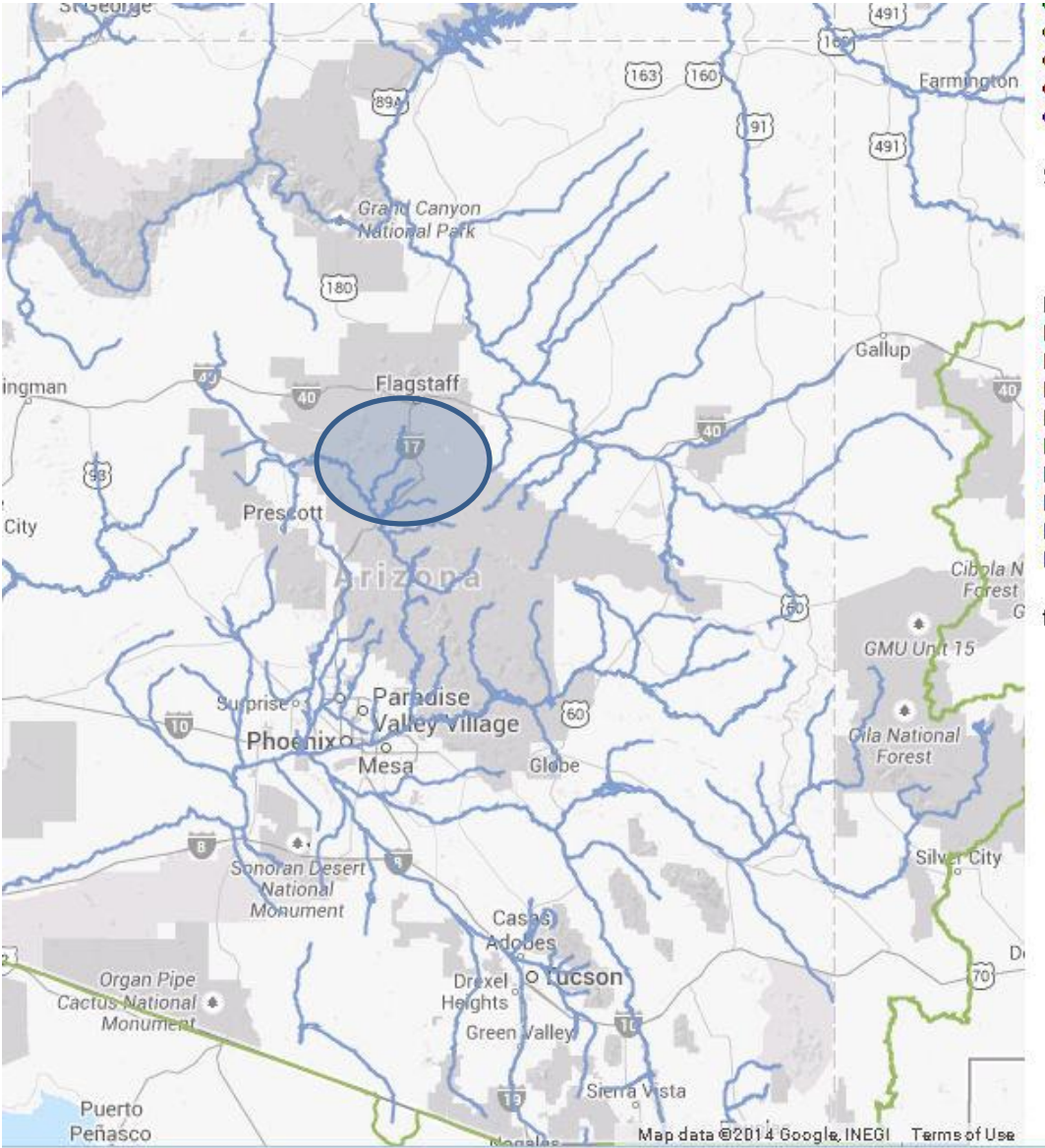
Adjusting for bias depends on gage network density



# Precipitation Network

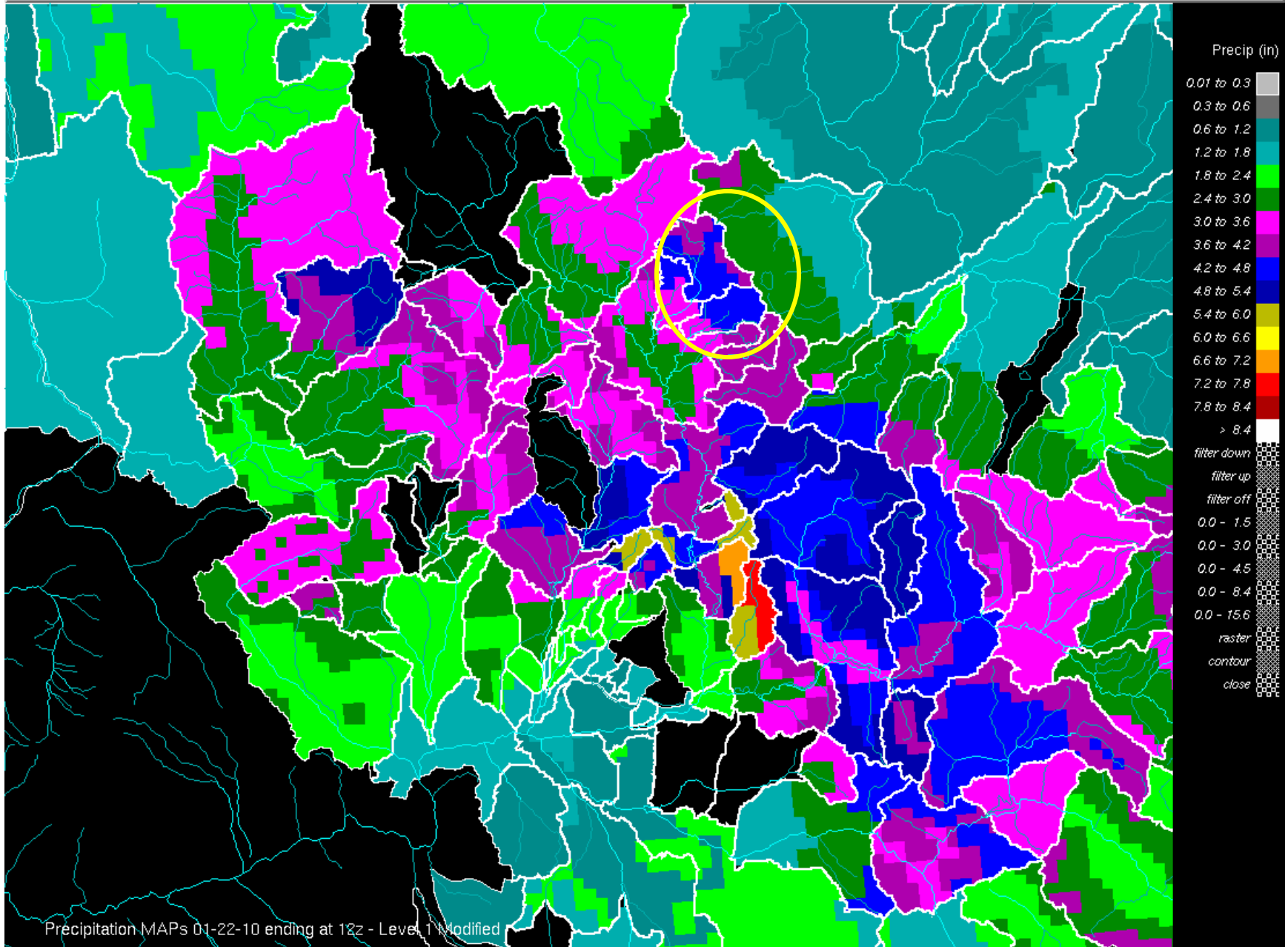
- Upper Colorado
  - Winter: use predetermined station weights
  - summer : use all stations including radar, but limit the radar where the mid beam is  $< 8000$  AGL
- Lower Colorado
  - winter : Use all stations including radar but only use radar in areas where it is raining. This results in only using gauges in most areas
  - summer : use all stations including radar, but limit the radar where the mid beam is  $< 8000$  AGL

# January 2010 Heavy Rain Event Oak Creek



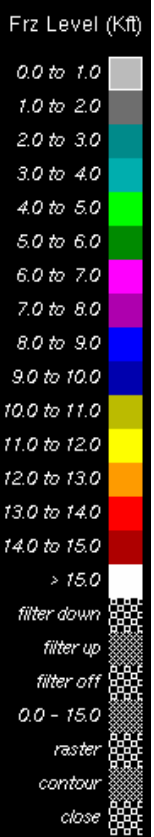
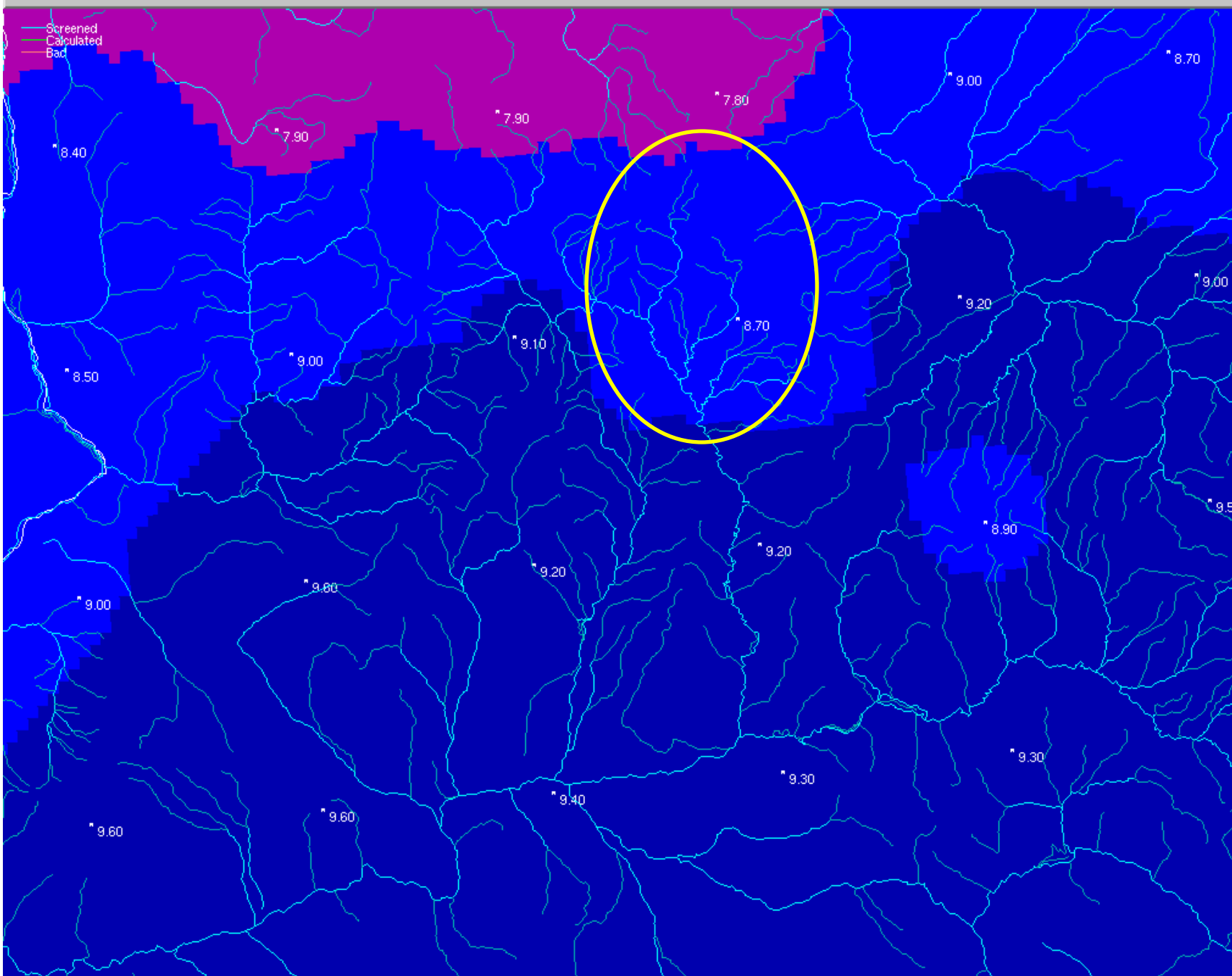
# January 21-22 2010 Observed Precipitation

File Edit Backgrounds Options

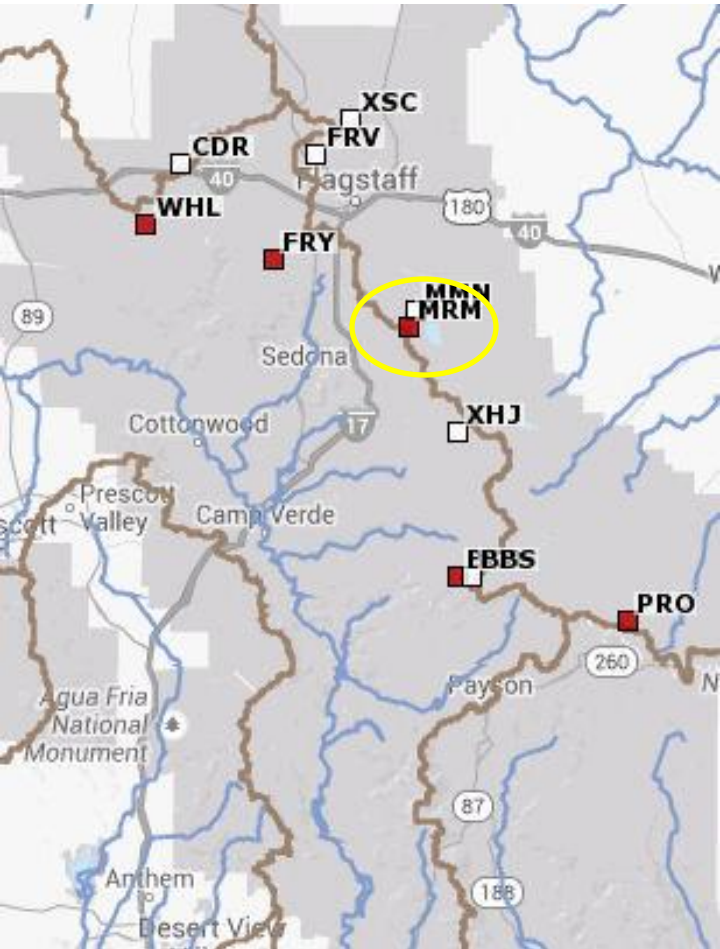




Screened  
Calculated  
Bad



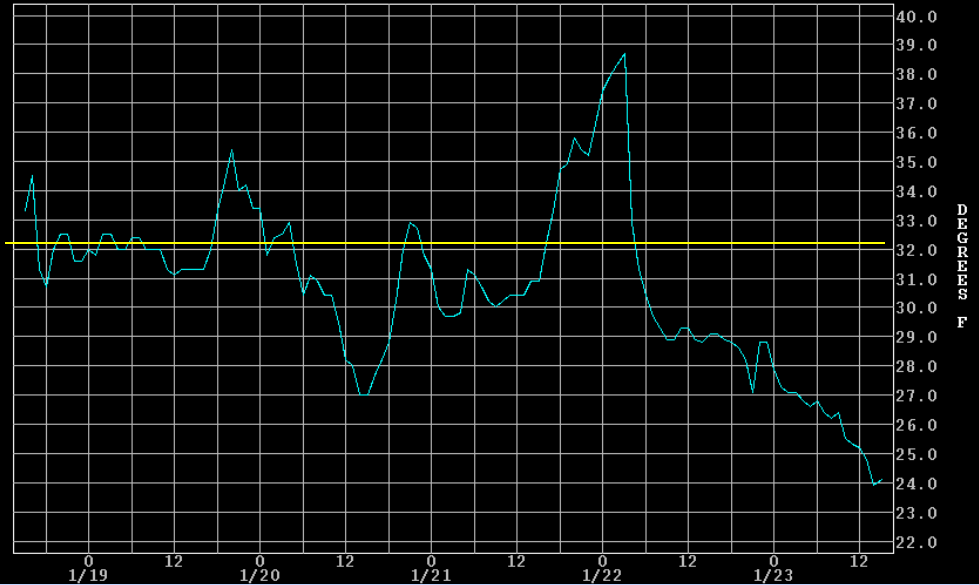
# SNOTEL Site: Mormon Mountain



Precip Type – Remained as snow

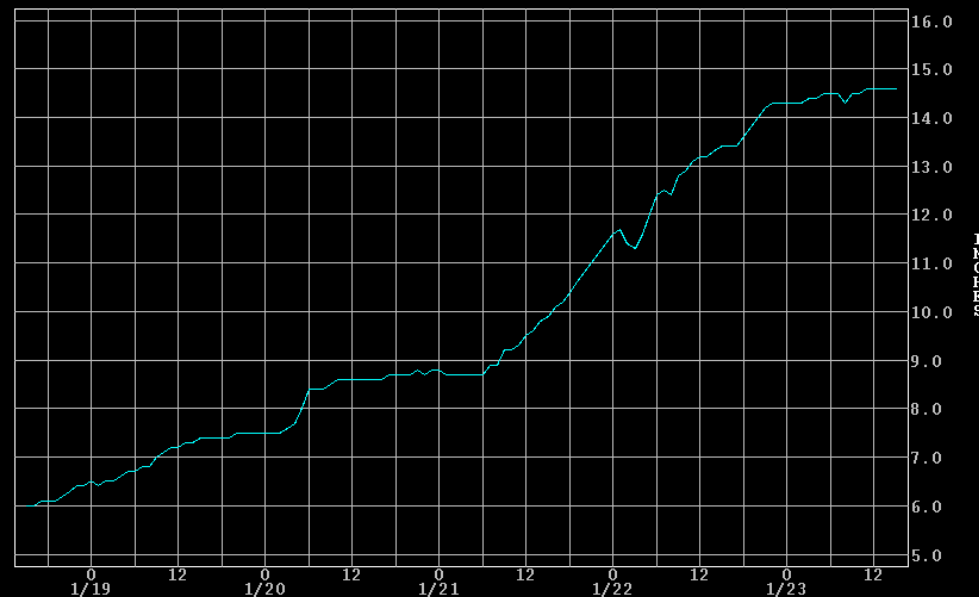
## File Options

MORMON MOUNTAIN  
MRMA3 TAIIRZZ AIR TEMPERATURE, INSTANTANEOUS, OBSERVED, METEOR  
Max= 38.7 at 01/22/2010 03Z  
Min= 23.9 at 01/23/2010 14Z

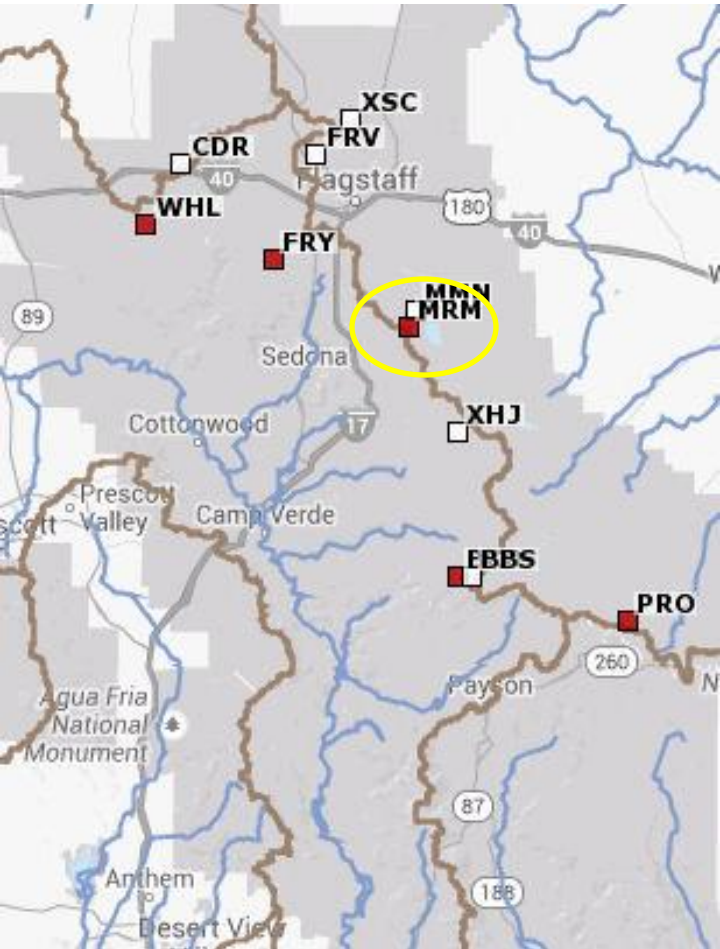


## File Options

MORMON MOUNTAIN  
MRMA3 SWIRMZZ SNOW WATER EQUIVALENT, INSTANTANEOUS, OBSERVED, METEOR  
Max= 14.6 at 01/23/2010 15Z  
Min= 6.0 at 01/18/2010 16Z

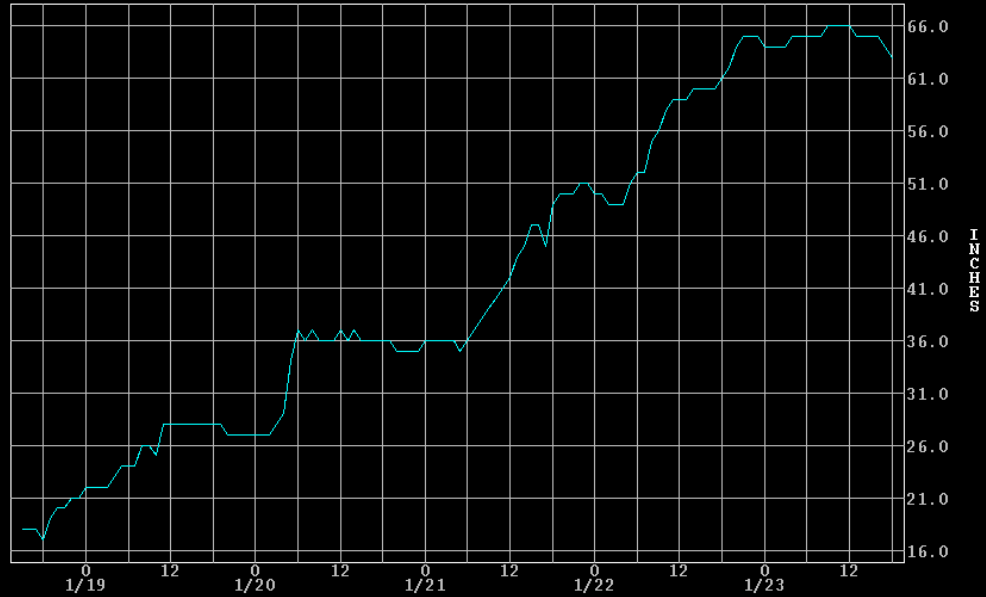


# SNOTEL Site: Mormon Mountain



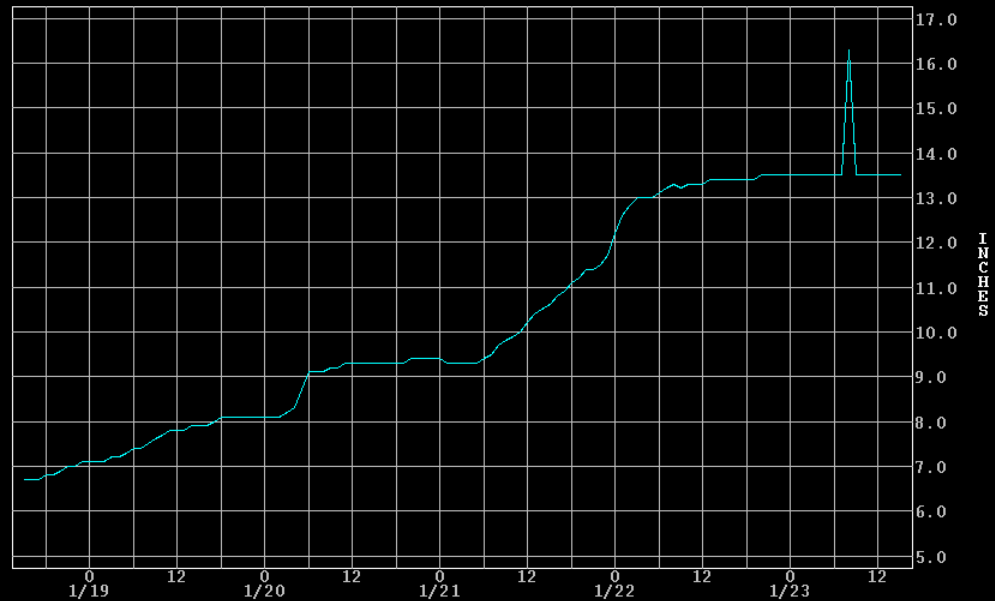
## File Options

MORMON MOUNTAIN  
MRMA3 SDIRMZZ SNOW DEPTH, INSTANTANEOUS, OBSERVED, METEOR  
Max= 66.0 at 01/23/2010 12Z  
Min= 17.0 at 01/18/2010 18Z



## File Options

MORMON MOUNTAIN  
MRMA3 PCIRMZZ PRECIPITATION ACCUMULATION, INSTANTANEOUS, OBSERVED, METEOR  
Max= 16.3 at 01/23/2010 08Z  
Min= 6.7 at 01/18/2010 17Z



## January 2010 Heavy Rain Even - Oak Creek

Large runoff forecast indicated but response was minimal

Never had a good handle on the freezing level, rain/snow line (critical in AZ)

Good data network exists but lower elevation SNOTEL might have helped

Data network limits & uncertainty in future weather (misplaced QPF & challenging Freezing Level) resulted in missed forecast