Stream Gages

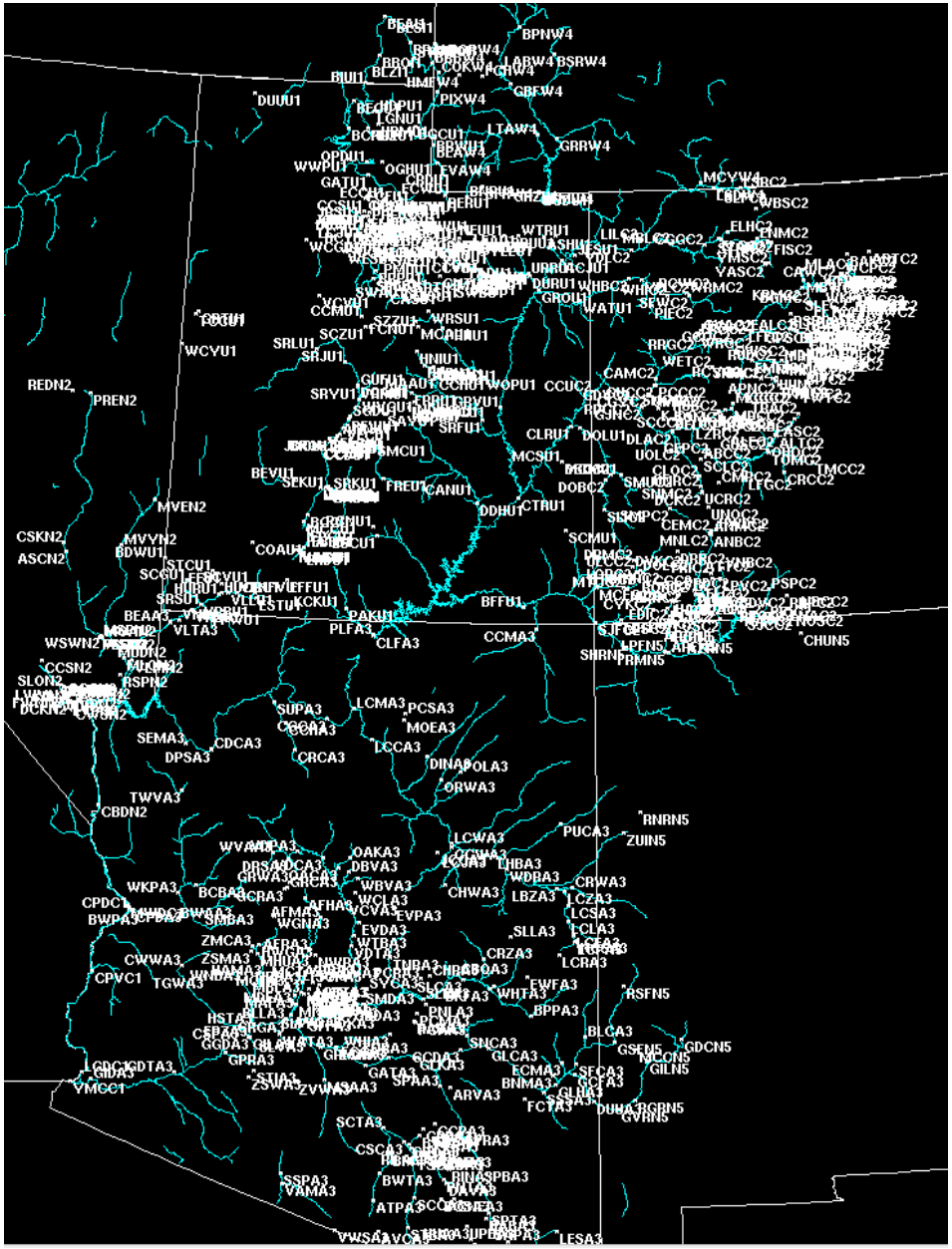
CBRFC Stakeholder Forum

July 31, 2012

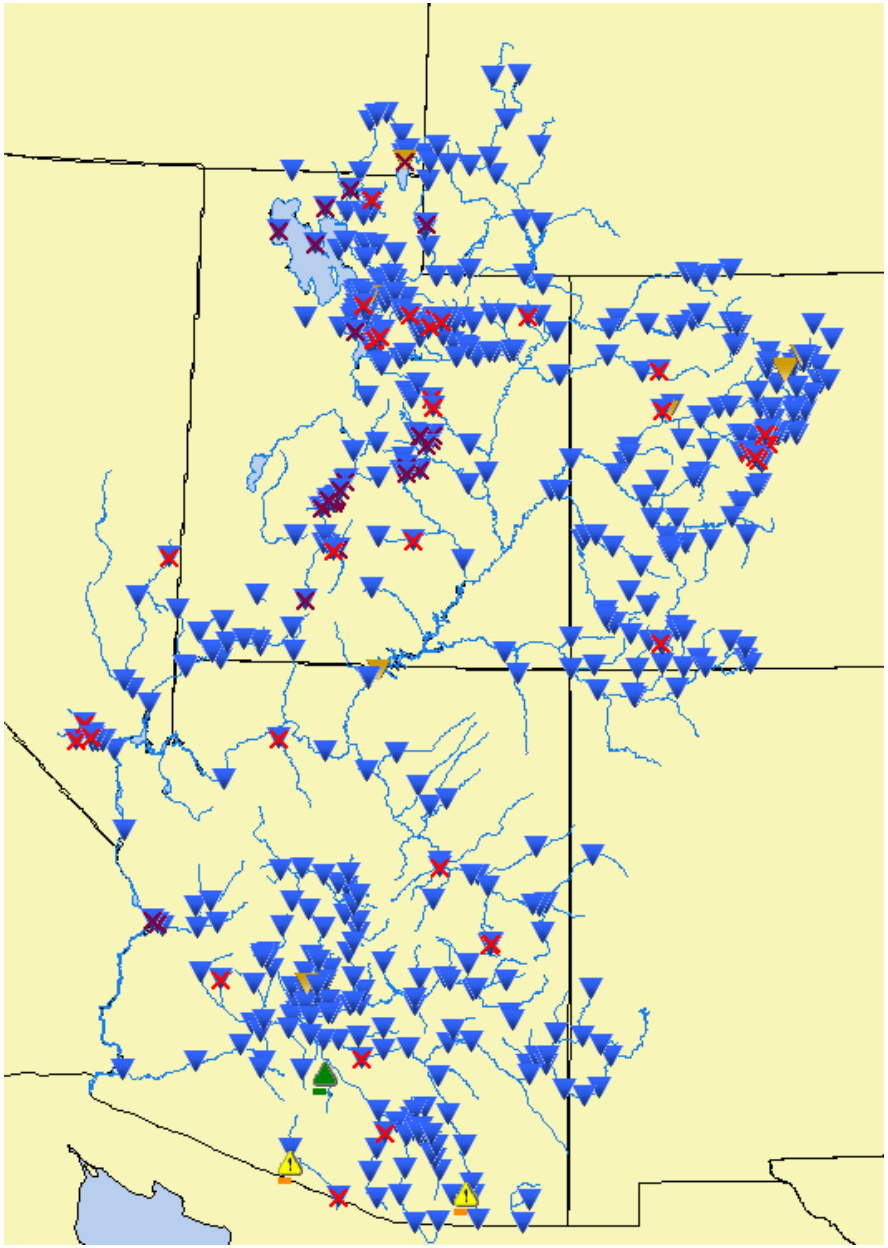
Stream Gage Networks

- USGS
- Colorado Division of Water Rights
- Wyoming State Engineer Office
- Salt Lake County
- Salt Lake City
- ALERT sites (Arizona and Nevada)
- Salt River Project
- Pacifcorp
- Bureau of Reclamation
- Army Corps of Engineers
- Water Conservancy Districts/Water Users

(CUWCD, EWCD, NCWCD, CRWCD, Bear River, Green River, Sevier)



All available stream gages



Stream gages used in model
~875 points

Data Collection

- Hydrometeorological Automated Data System (HADS)
  - NWS real-time data acquisition and data distribution system
  - GOES DCP
  - USGS data corrections
- Websites/Web Service
- Email
- FTP Site

Collect:

- STAGE → RATING CURVE → FLOW → MODEL
- FLOW → MODEL

Rating Curves

Every day

- Check our current stage/flow relationship against the USGS current conditions listing
- If our flow is more than 5% different than USGS flow we download the latest available pre-shifted rating from the USGS Rating Depot

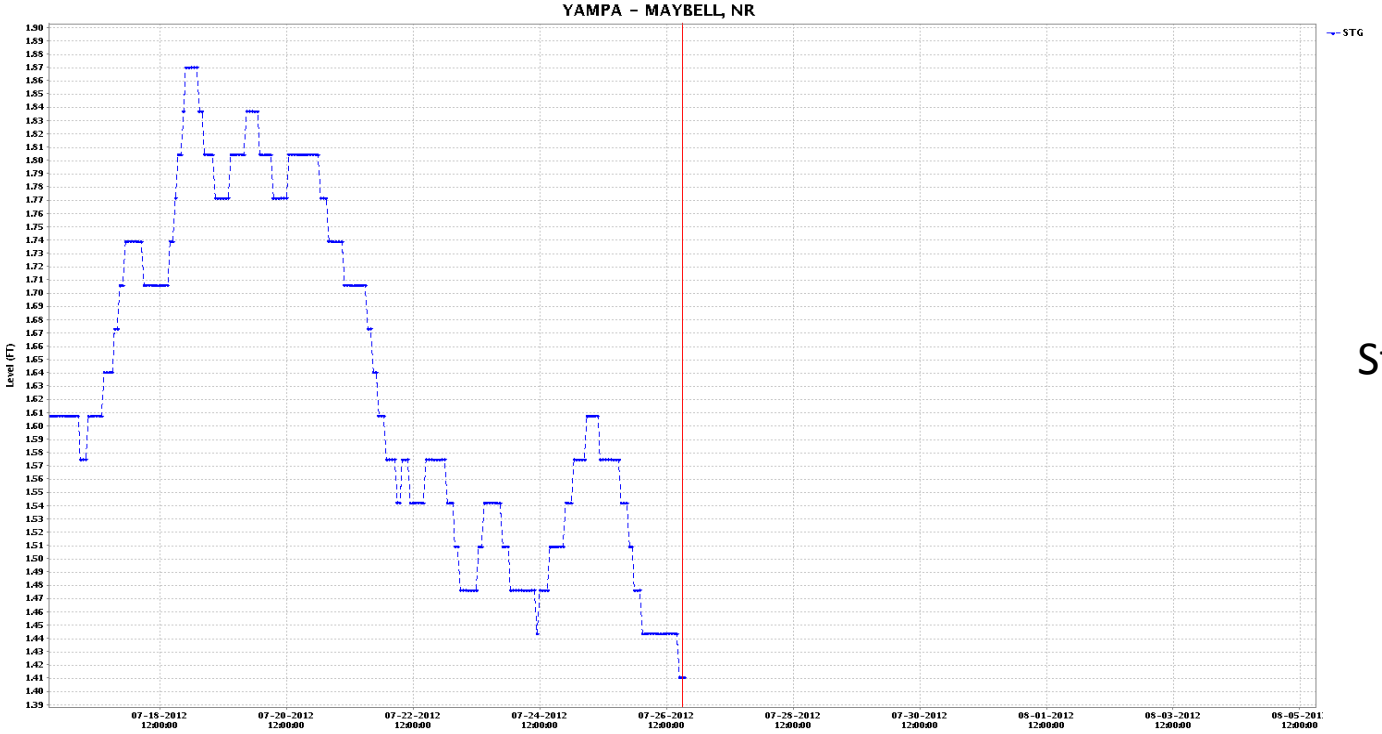
2x week

- Download all ratings from the USGS Rating Depot.
- Download all ratings/shifts from the Colorado Division of Water Resources.

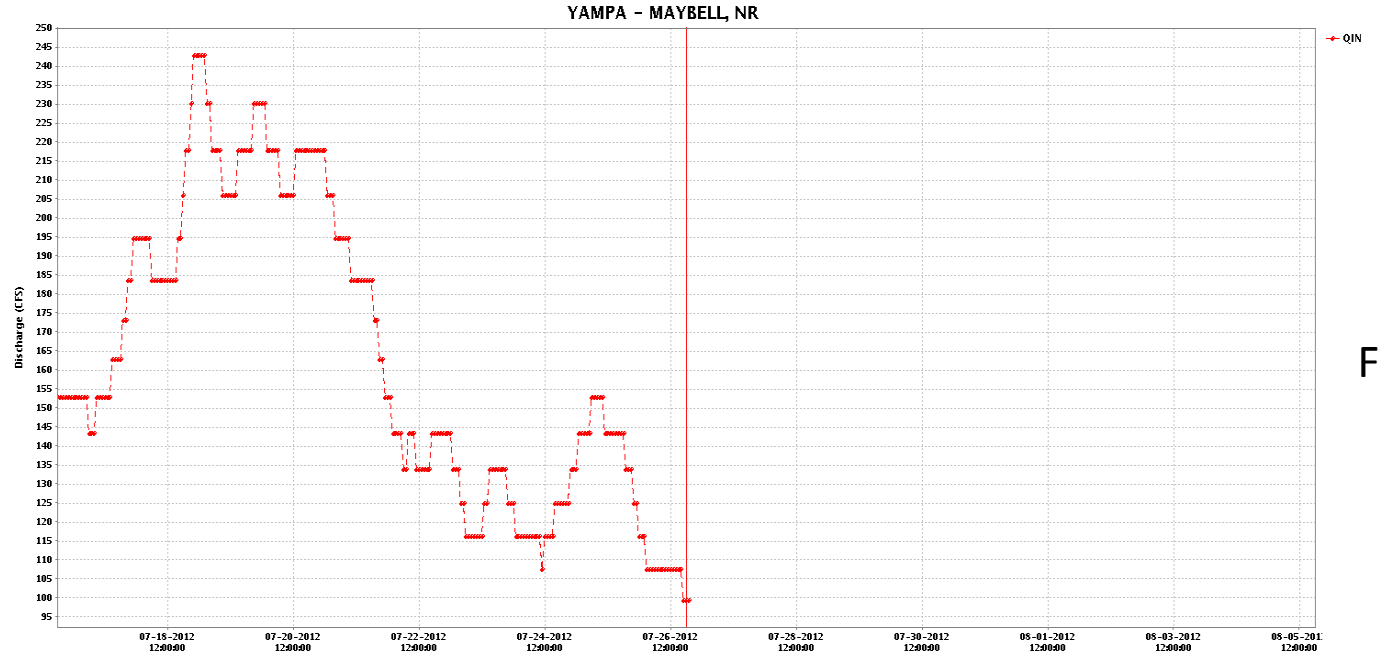
Occasionally (not often)

- Download ratings for Arizona ALERT and WYSEO
- Hard to find, not easy to automate download.
- Updated infrequently

All new ratings are stored to the CBRFC database and copied to CHPS for use in our daily model.



Stage



Flow (cfs)

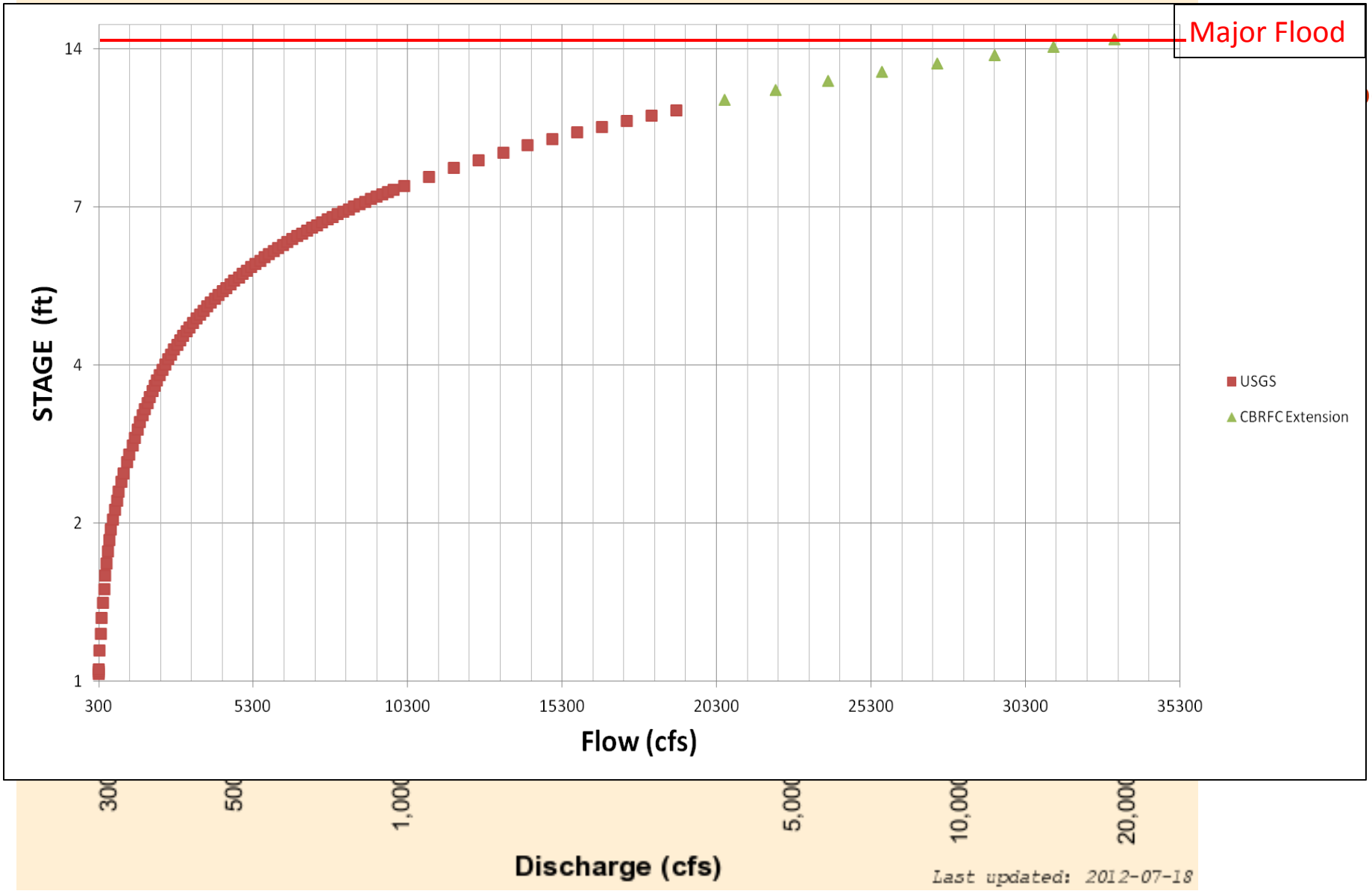
Rating Curve Extension

Stored rating tables are extended to all critical stages (bank, flood, moderate, and major)

- Any of these values that are above the base rating obtained from the owner agency have a flow value calculated for them using a log10 extension of the rating.

On-the-fly extensions for real-time stage values above the stored table also use a log10 extension

May get extension from USGS in flood events


Major Flood
14
7
4
2
1
STAGE (ft)
300
5300
10300
15300
20300
25300
30300
35300
Flow (cfs)
USGS
CBRFC Extension
Discharge (cfs)
Last updated: 2012-07-18

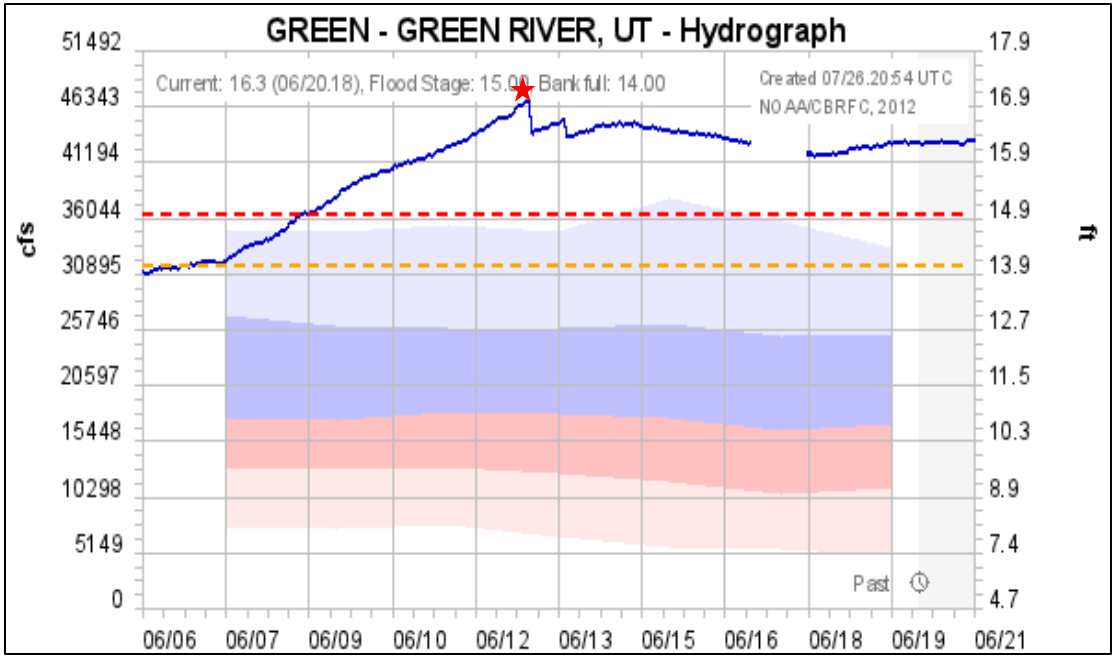
Stream Gage Issues

RATING CURVES

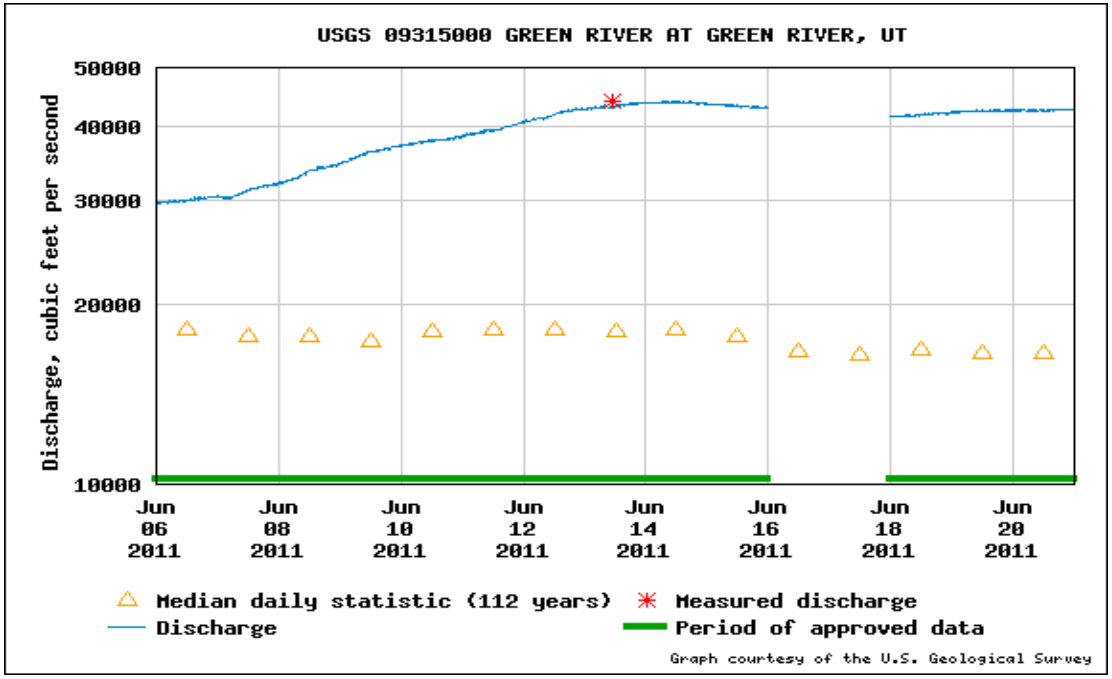
- No Rating
- Outdated rating/shift
  - May be updated only once per water year
  - Rapidly changing conditions
- Observation above or below rating
- Uncertainty in measurements/shifts/ratings
- Timing issues getting rating updates
- No way to “correct” data in the past

OTHER

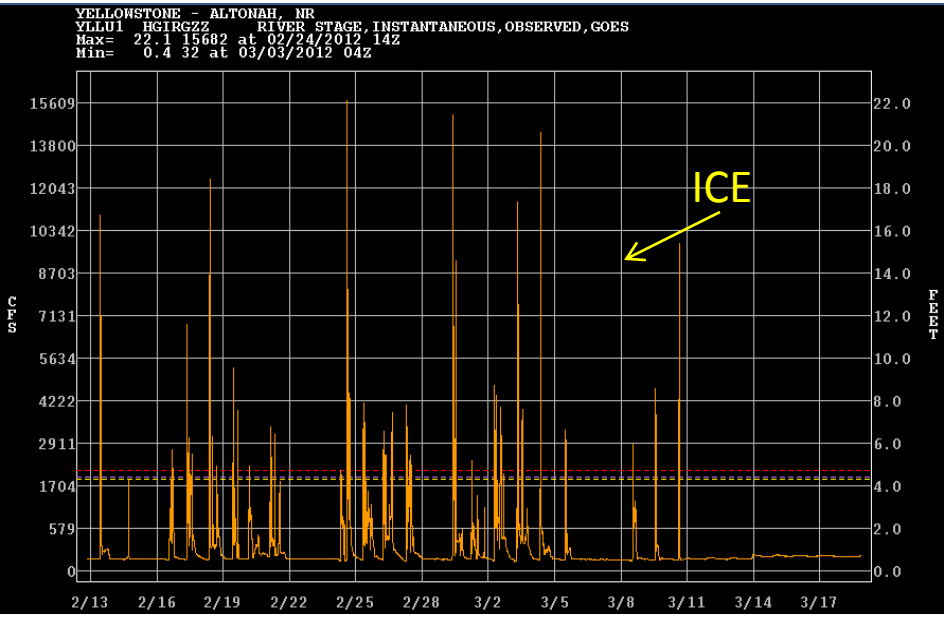
- Bad Data
- Missing Data
- Ice/Frozen
  - Majority of gaging network set bad in winter
- Equipment Issues
- Flood Damage
- Water Balance
  - Upstream -> Downstream

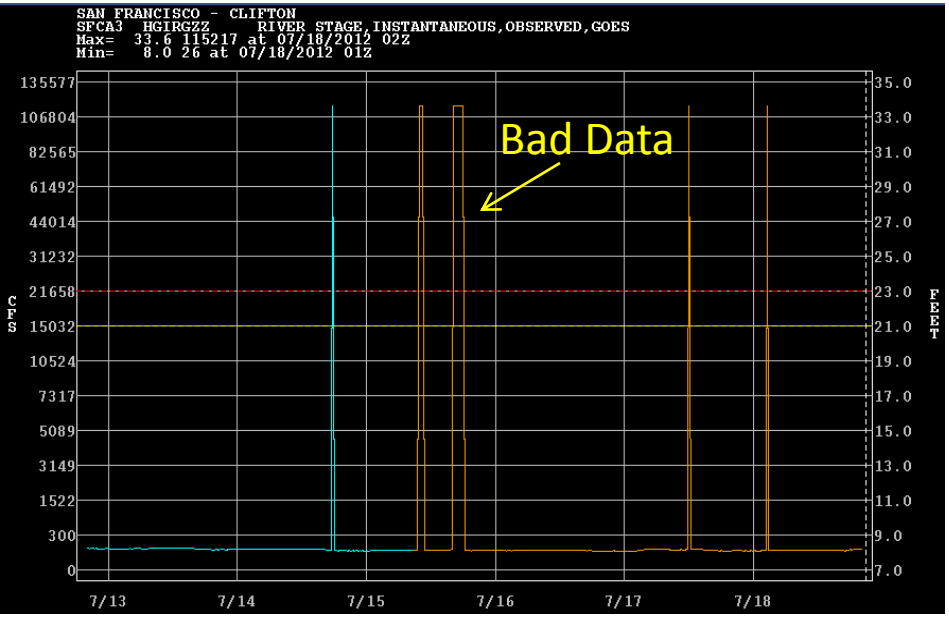


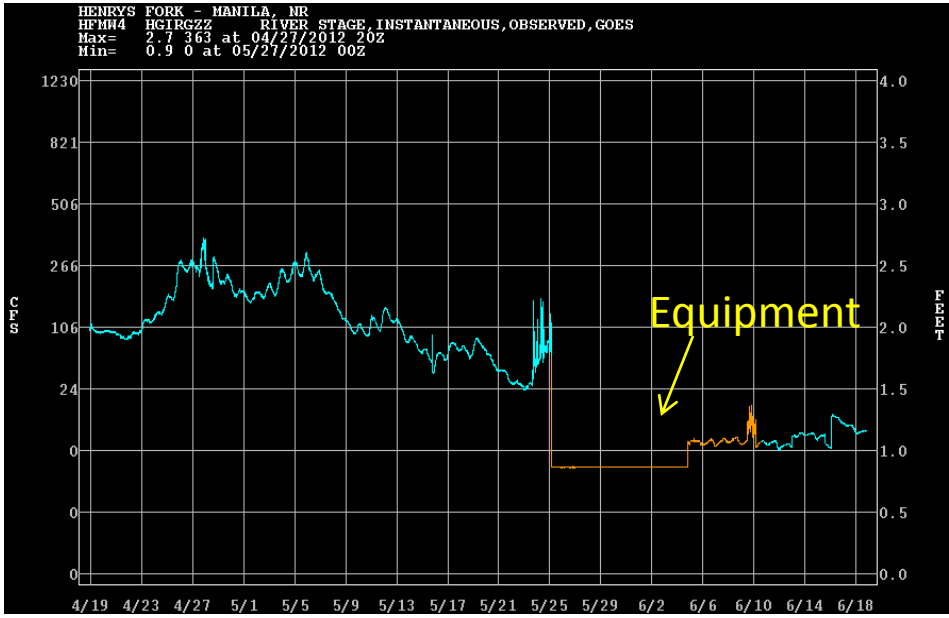
Not corrected in past



Corrected in past

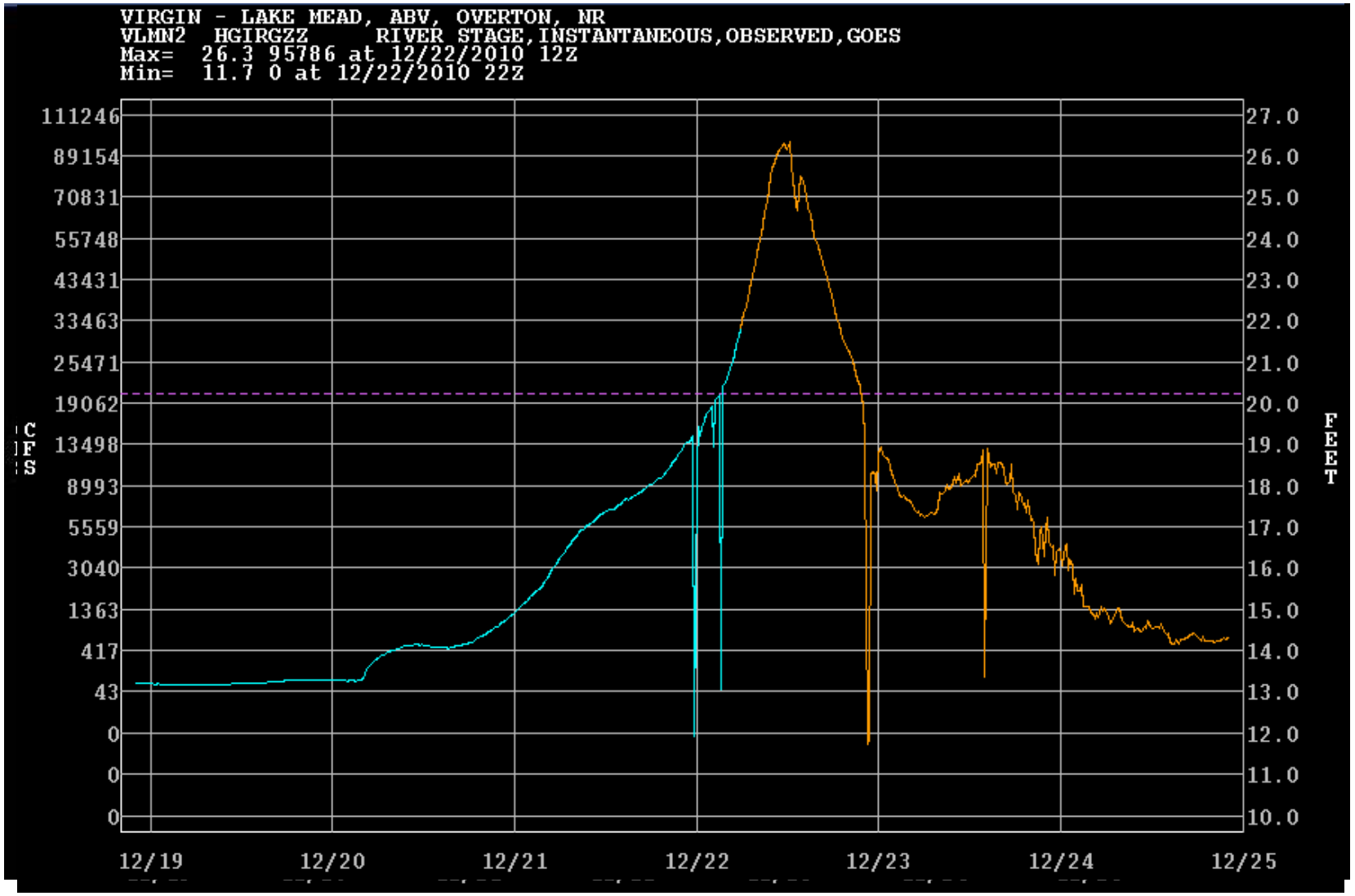






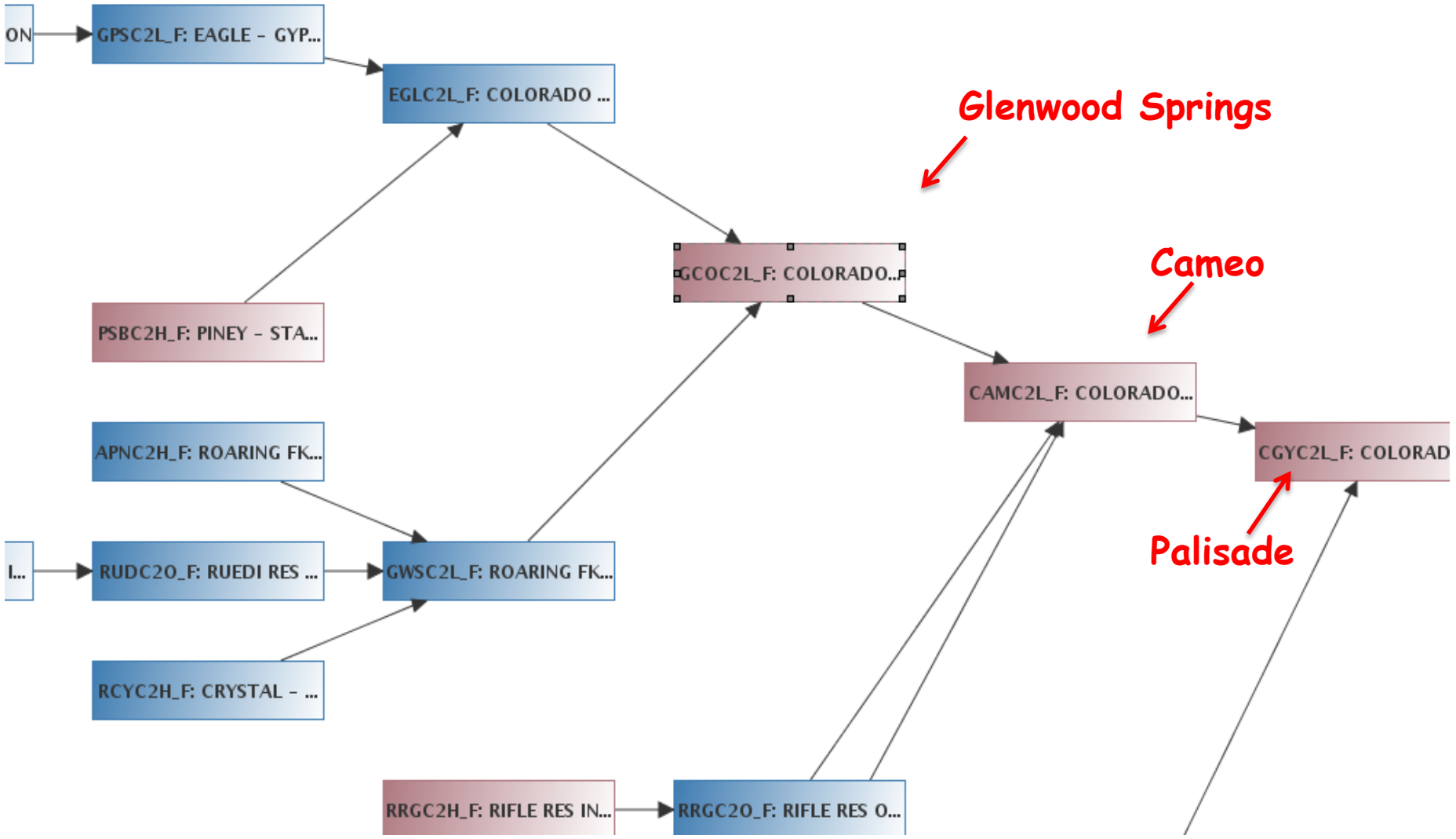
Data must be quality controlled for accurate forecasts….often a tough decision.

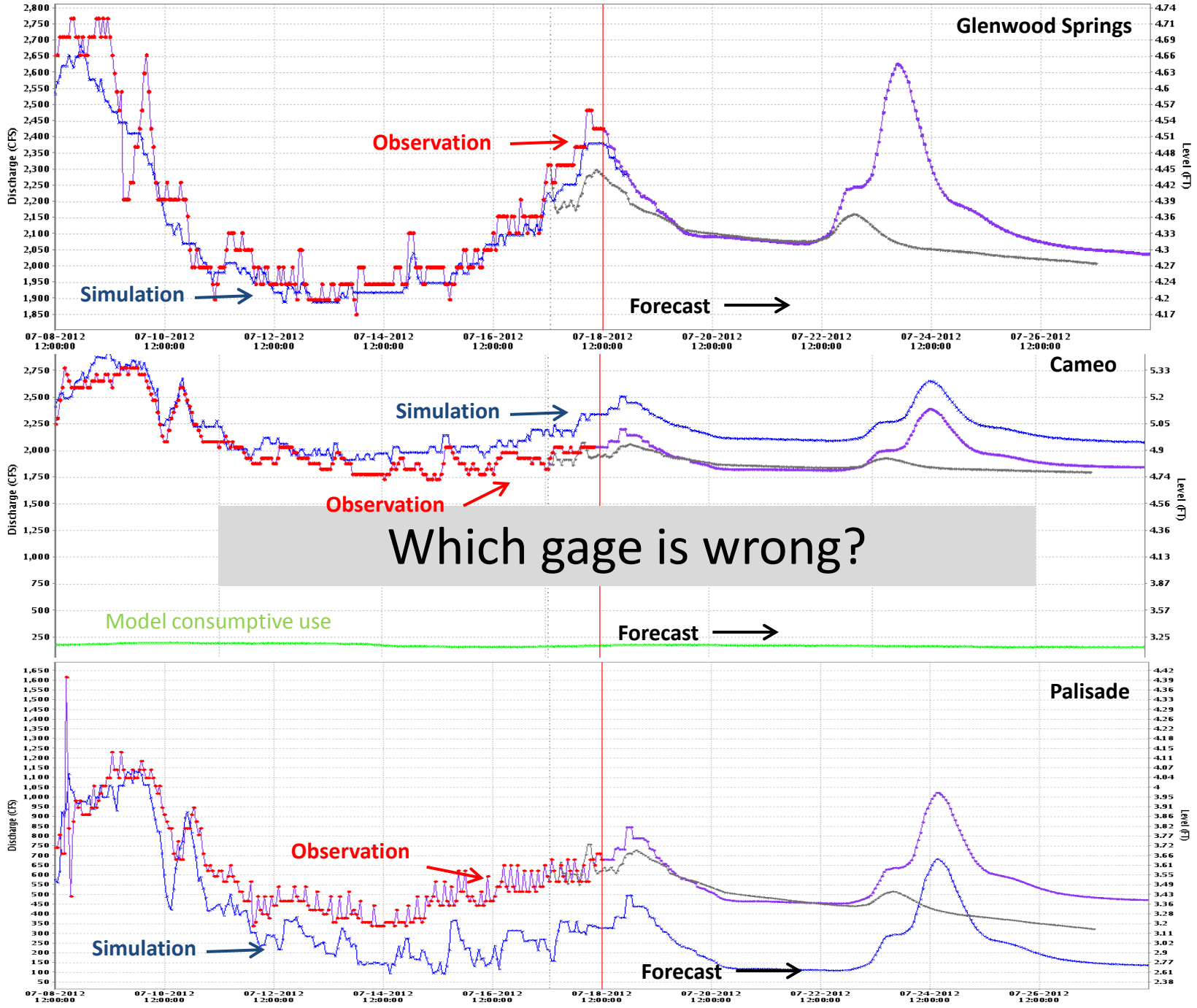
Flood Damage-Virgin River 2010

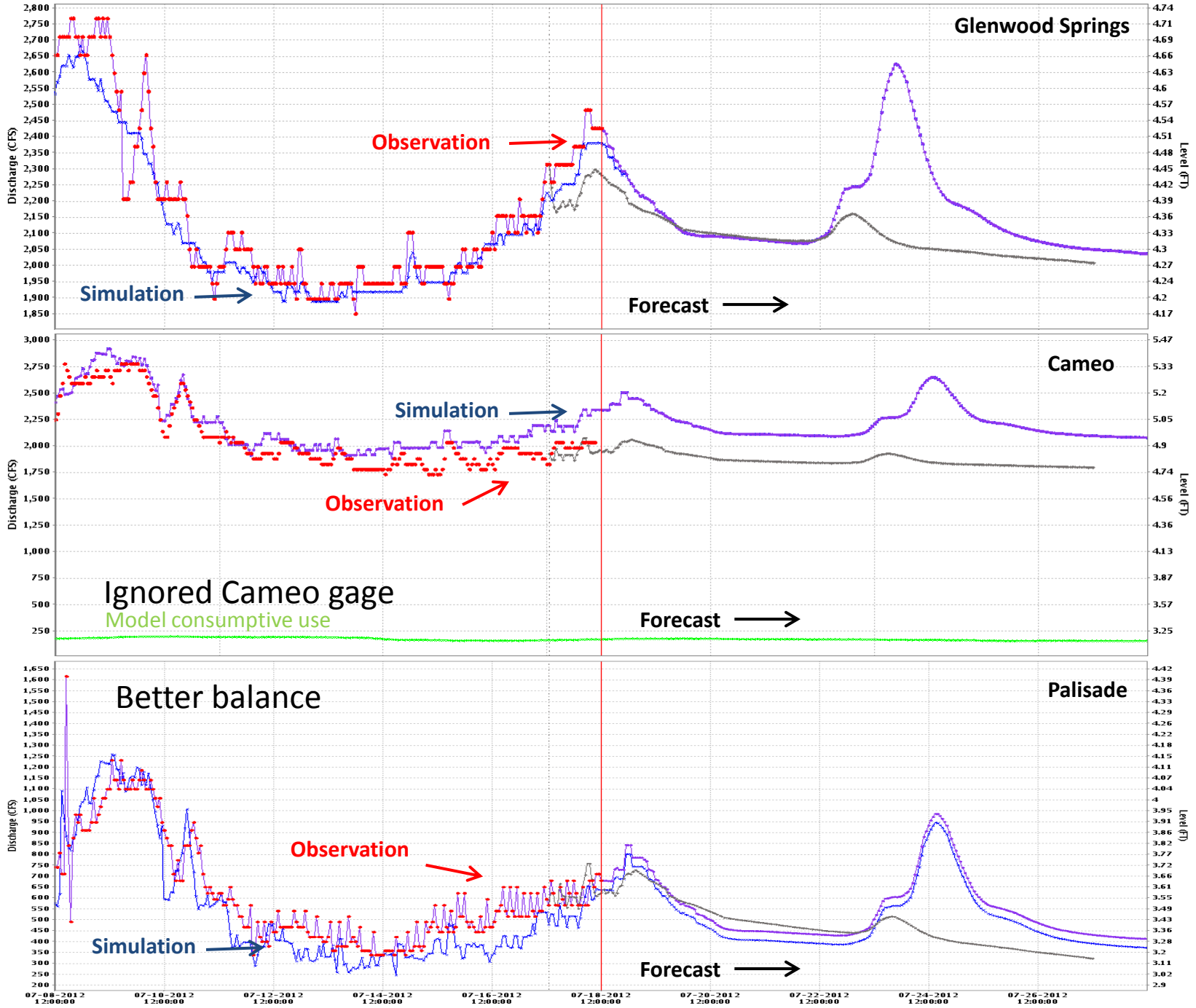


End of the event only ~6/14 gages were still working.
More gages=more information=better forecasts

Water Balance Issue




Glenwood Springs
Observation
Simulation
Forecast
Discharge (CFS)
Level (FT)
Cameo
Simulation
Observation
Which gage is wrong?
Model consumptive use
Forecast
Palisade
Observation
Simulation
Forecast


Glenwood Springs
Observation
Simulation
Forecast
Discharge (CFS)
Level (FT)
Cameo
Simulation
Observation
Ignored Cameo gage
Model consumptive use
Forecast
Better balance
Palisade
Observation
Simulation
Forecast
07-08-2012 12:00:00
07-10-2012 12:00:00
07-12-2012 12:00:00
07-14-2012 12:00:00
07-16-2012 12:00:00
07-18-2012 12:00:00
07-20-2012 12:00:00
07-22-2012 12:00:00
07-24-2012 12:00:00
07-26-2012 12:00:00

Summary

-Stream flow is a direct input into the model

-High quality observed stream flow data is necessary for forecasts and drives the quality of the forecasts:

- -Short term (10 days)
- -Long term (Seasonal Water supply)
- -Calibration

-Quality control of stream flow data is often difficult and we make many assumptions

- -Often use reservoirs as “truth” , especially in the winter

-Observed data helps to keep the model on “track” and verify model states are correct