NOAA's Colorado Basin River Forecast Center

Forecast Uncertainty and Verification Tools

2017 Stakeholder Open House

What Affects Forecast Quality?

- Uncertainty in future weather
  - Precipitation (accuracy, distribution in space & time)
  - Spring temperatures affect melt/runoff pattern
  - Extreme weather events

Biggest unknown in forecast process!

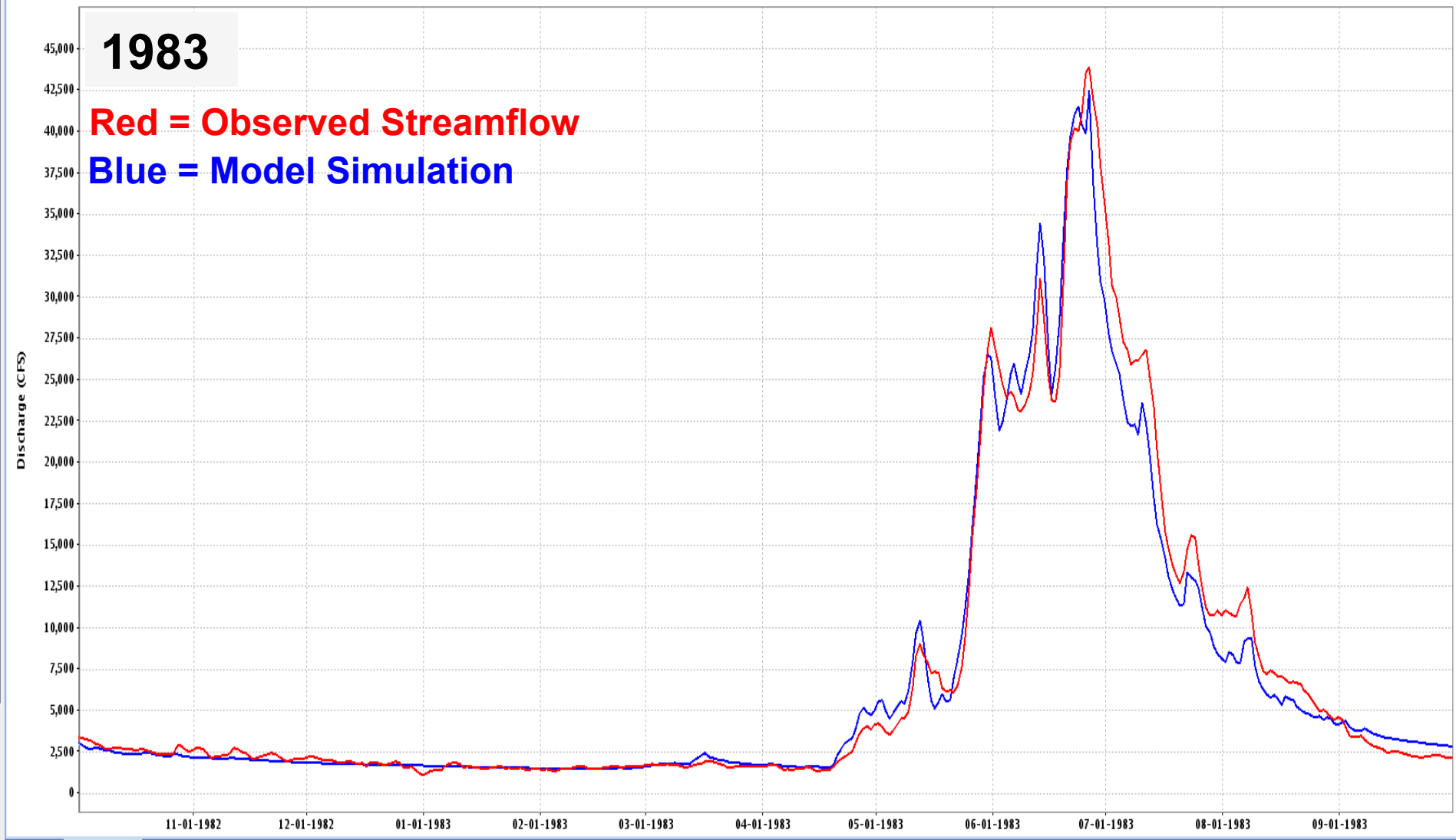
What Affects Forecast Quality?

- Data
  - Data density limitations
  - Errors in observed data; both historical and current
    - Bad or missing data
    - Quality and frequency of streamflow measurements
  - Ungaged/unknown diversions
    - Unmeasured depletion estimate
      - May or may not be what is occurring

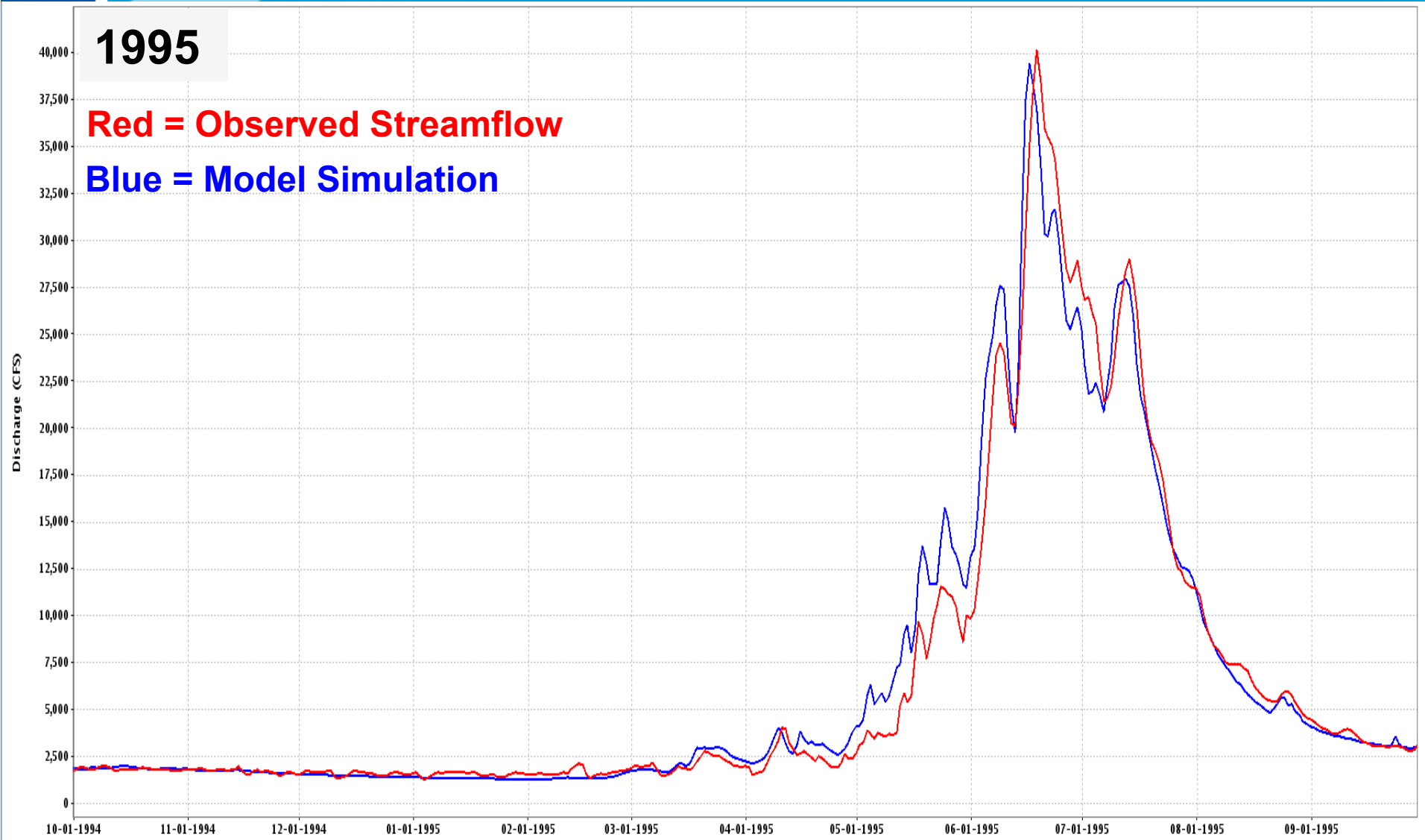
What Affects Forecast Quality?

- Hydrologic Model
  - Bad initial conditions (snow, soil moisture, flows)
    - Tied to data quality
  - Calibration errors/bias
    - Usually tied to quality of historical data

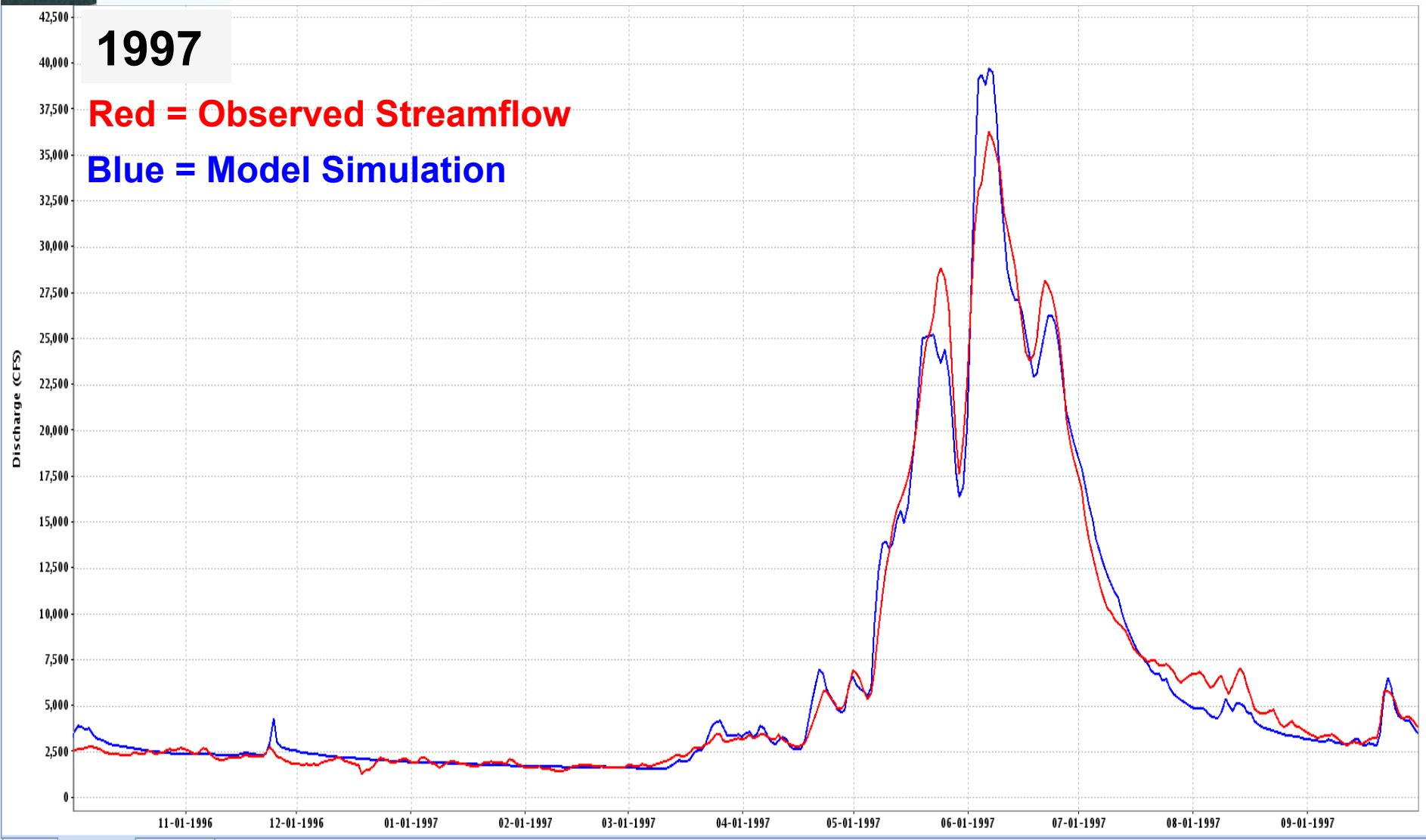
Calibration: Colorado River-Cameo



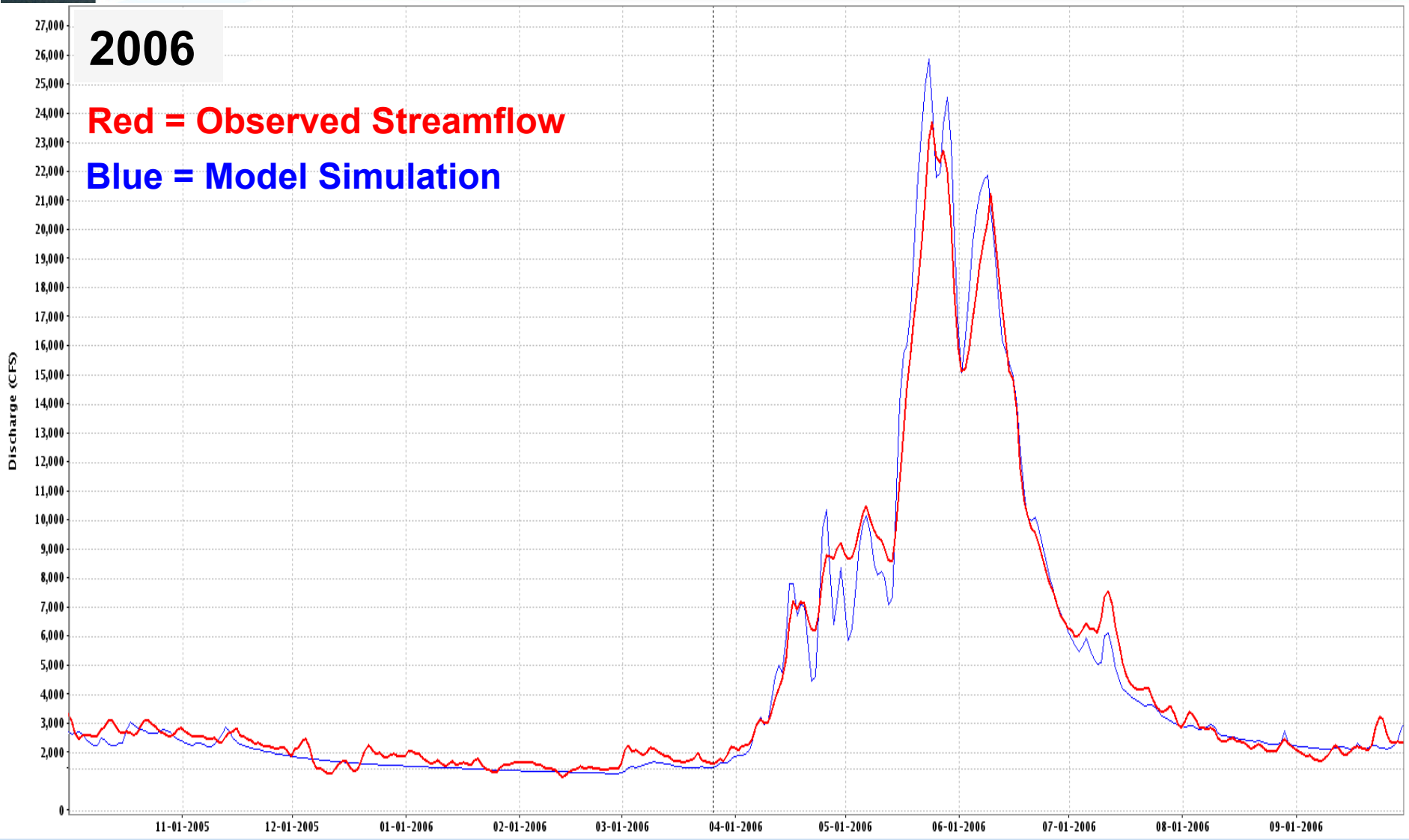
Calibration: Colorado River-Cameo



Calibration: Colorado River-Cameo



Calibration: Colorado River-Cameo



Why the model does well at Cameo

-Downstream location in the Upper Colorado

  -Model errors will be higher at headwater basins

-Snowmelt basin

  -Model errors are higher in basins that are lower in elevation and receive a rain/snow mix

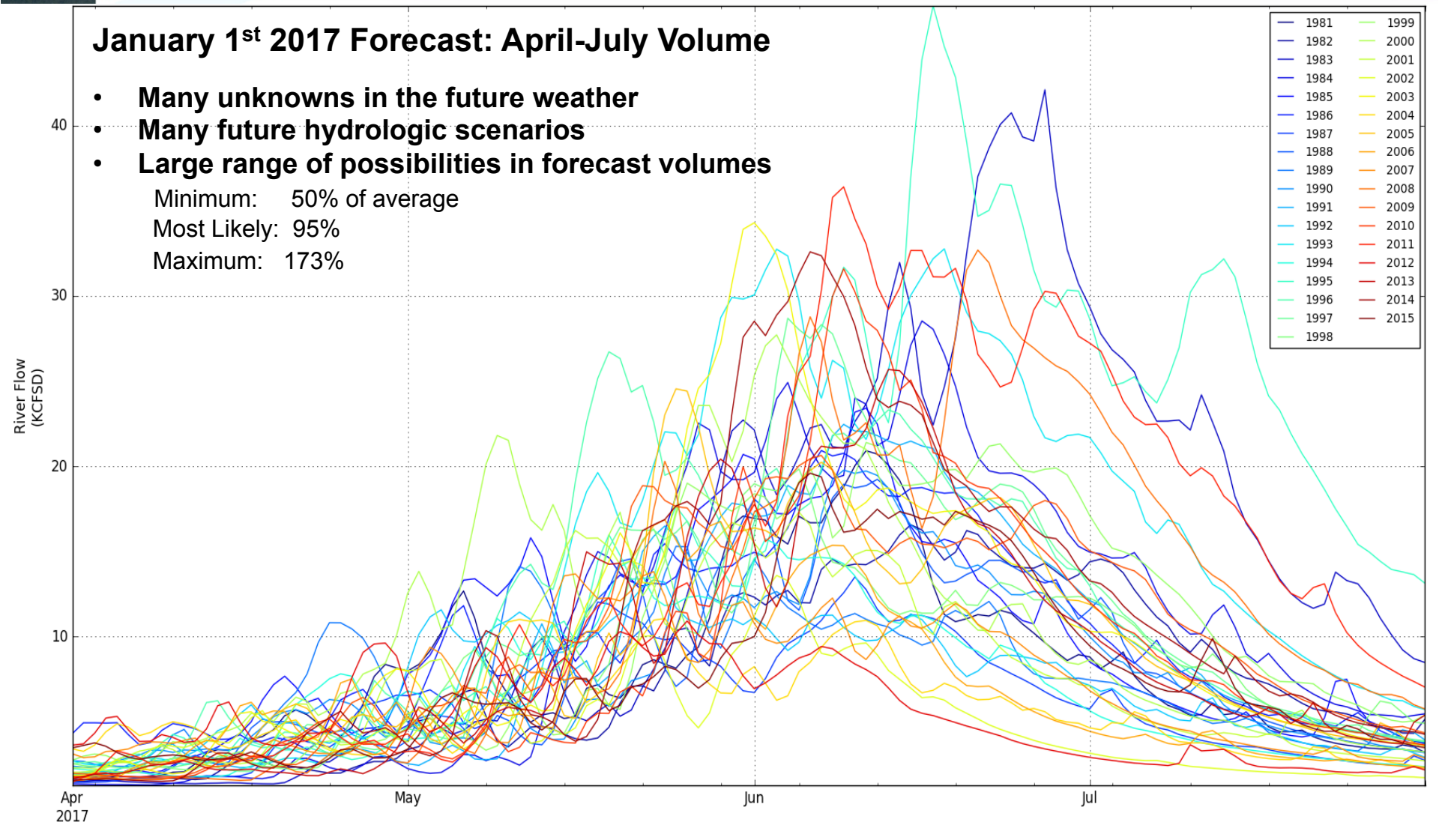
-High quality data set (precipitation, temperature, streamflow, diversions)

  -Representative of all areas/elevations in the basin

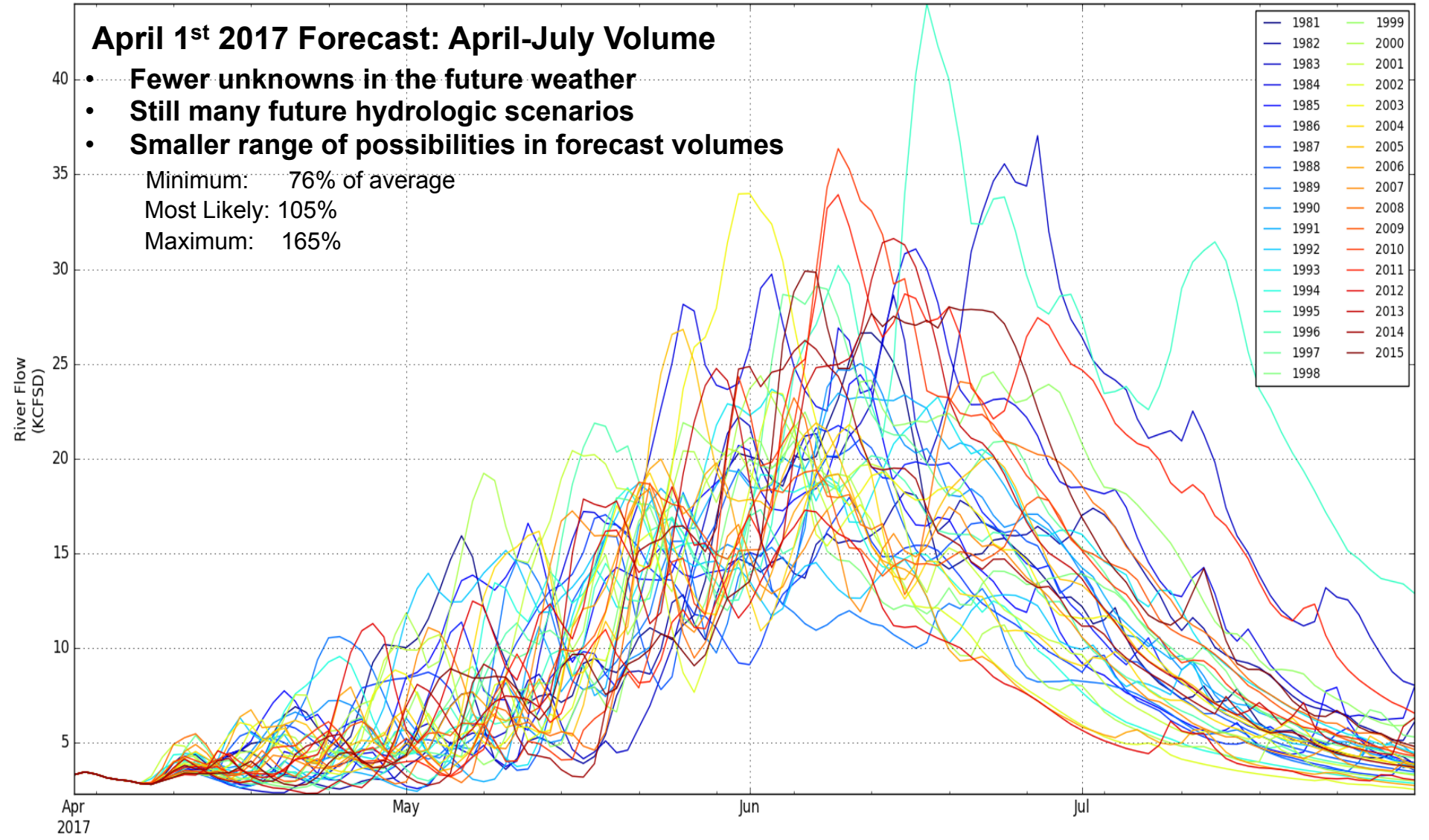
  -Long period of record

  -Sufficient amount of stations

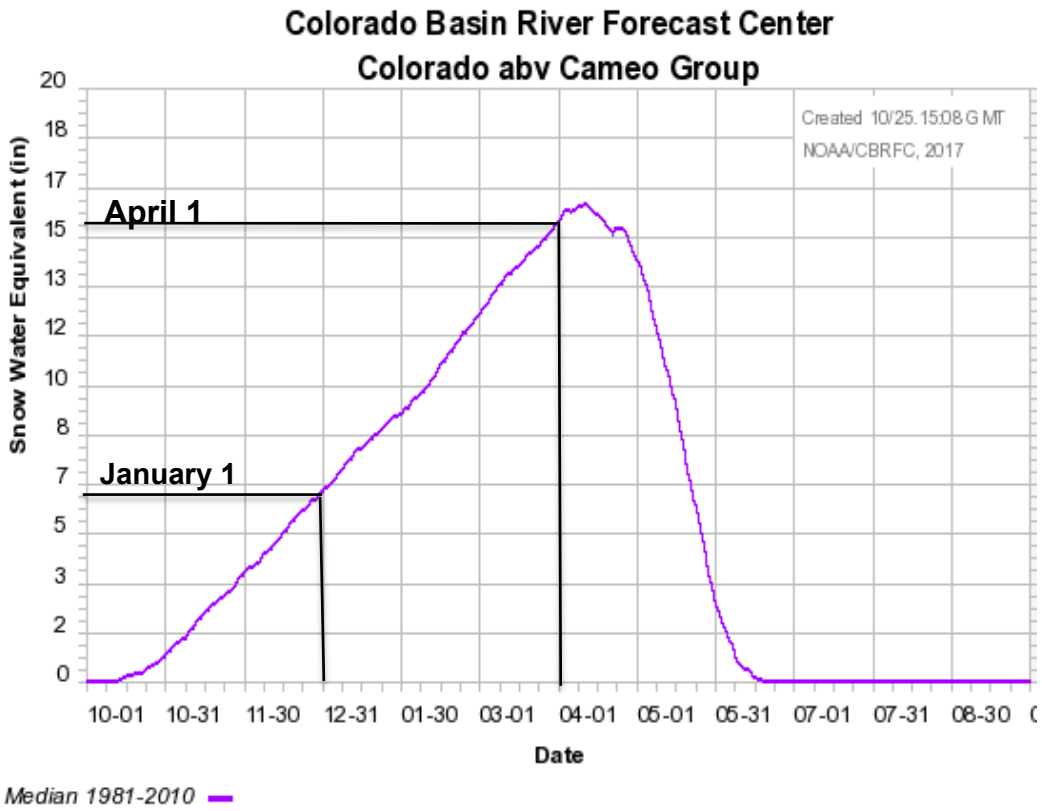
Forecasts: Colorado River -Cameo



Forecasts: Colorado River -Cameo



Future Weather Unknowns



January 1st Forecast:

What we know:

- ~40% of snowpack accumulation

What we DON'T know:

- Jan-May weather (4 months)
- ~60% of snowpack accumulation

April 1st Forecast:

What we KNOW:

- ~96% of snowpack accumulation
- Dec-March weather

What we don't know:

- April-May weather (2 months)
- Snowmelt pattern

Summary

- Uncertainty in the future weather is the largest source of error
  - Forecasts are most accurate when the weather does not deviate from normal
- Model performs well with high quality data inputs
- As data quality decreases; forecast error increases

Verification Tools

- Seasonal Water Supply Forecasts
  - Evolution plots
  - Maps (model and annual forecast performance)
  - Site specific statistics
- Daily Forecasts
  - Working on updating and improving current daily forecast verification tools
- Temperature and Precipitation
  - Current project; stay tuned

Questions?