Improvements to Upper Basin Forecasting

Model Improvements

- New diversion data - Uncompaghre
  - Use observed historical diversion data in place of CONS-USE model estimates

- New model segments above Granby Dam
  - 2 headwaters (1 flood forecast point)

Snow Model

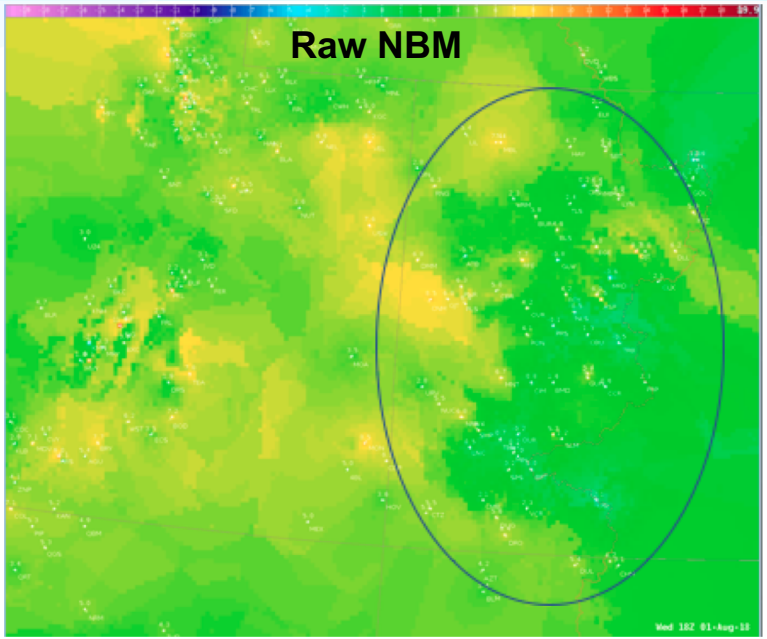
- Utah Energy Balance (UEB) Model
  - Investigating possible improvements from a more sophisticated snow model than the current temperature index model (SNOW-17)
  - Developed by Utah State

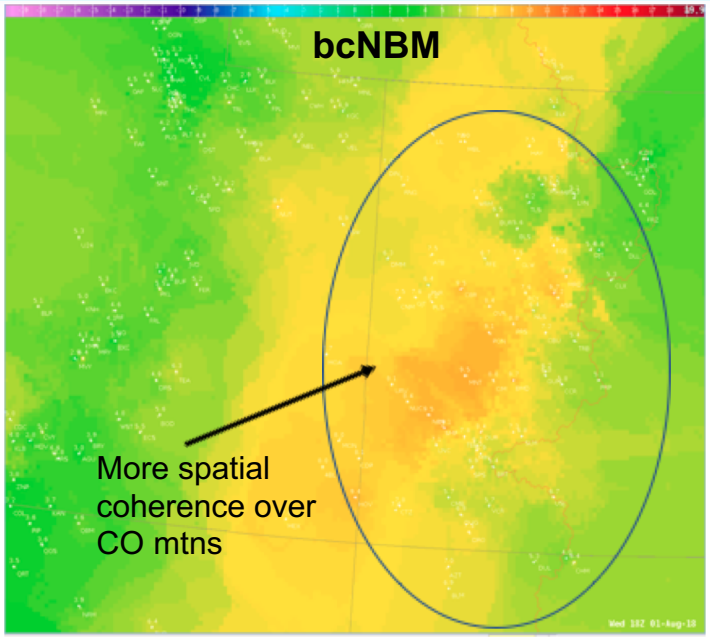
- RTI investigating improvements from a fully distributed version of SNOW-17

NBM Temperature Verification

- National Blend of Models (NBM) : a statistical blend of weather model forecasts
- Temperature forecast verification (MAE/Bias) during the past spring (Apr-Jun)
- Forecast lead times of one to ten days (i.e Fcst hrs of 24 to 240)
- Forecast models included are GFS MOS (MDL), NBM, bias-corrected NBM (bcNBM), and Climatology (Climo)

What is bcNBM?

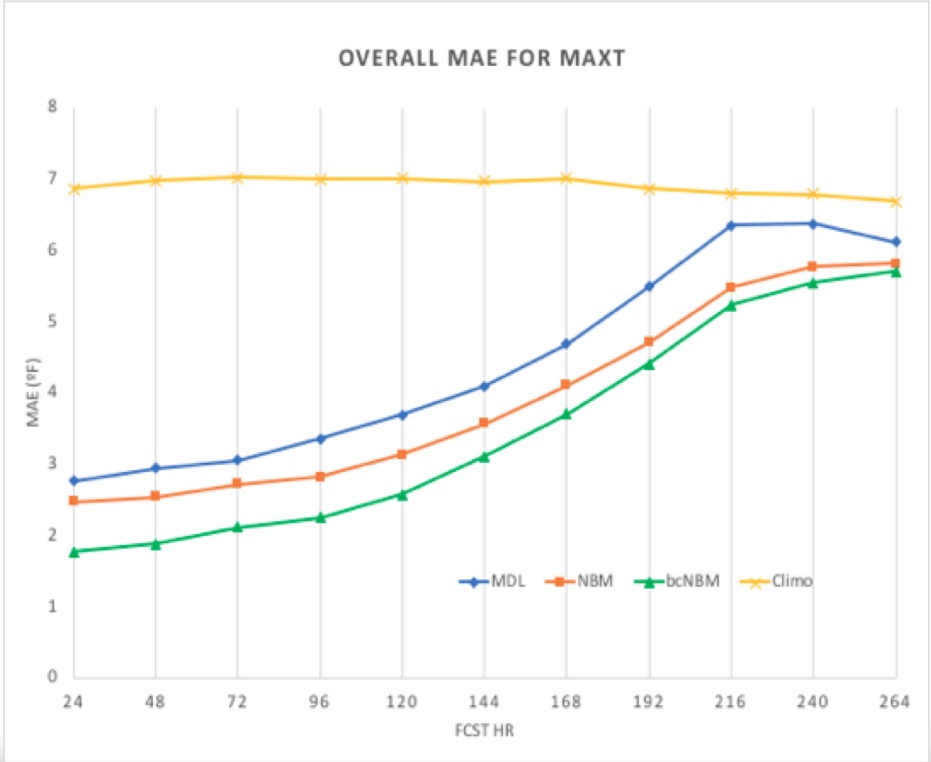




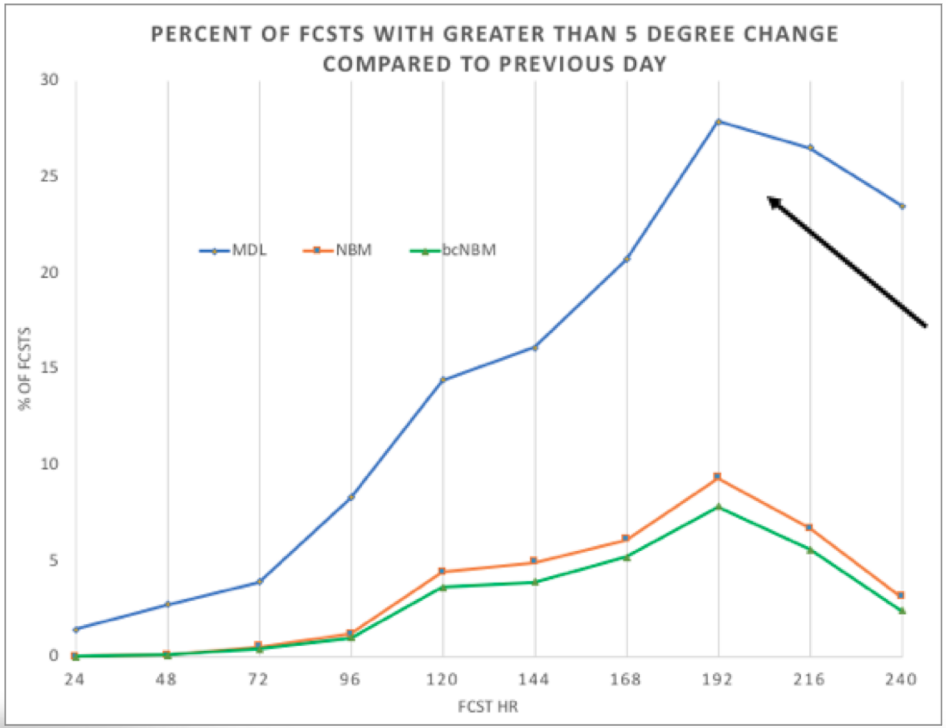
We take the raw NBM temperature forecasts and bias correct using the observations. In other words, it is meant to correct for consistent biases between the grid point forecast value and the observation within that gridpoint.

Model MaxT MAE

Overall, bcNBM produces most skillful forecast at all lead times.



Model Flip Flopping



The MDL fcst, derived from a single GFS model run, are much more inconsistent from one day to the next, especially at longer lead times. This results in inconsistent hydrographs.

In contrast, the NBM, as an average of multiple models, is much more consistent.

Verification Summary

•bcNBM is the best performing model, on average producing the most accurate (lowest MAE) and consistent (lowest % of flip-flopping) forecast.

•This necessitates a change from the current first guess model (MDL) to the bcNBM.

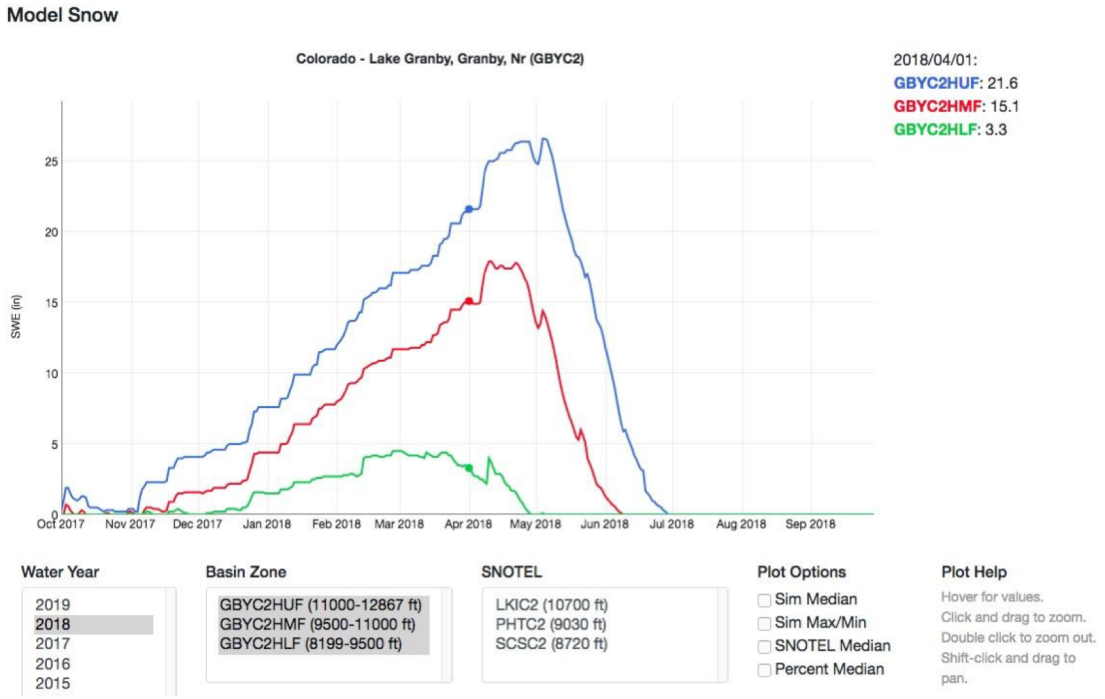
•Performance of bcNBM/NBM will continue to be tracked, especially during the current transitional fall period.

Snow Plot Improvements

CBRFC Model SWE

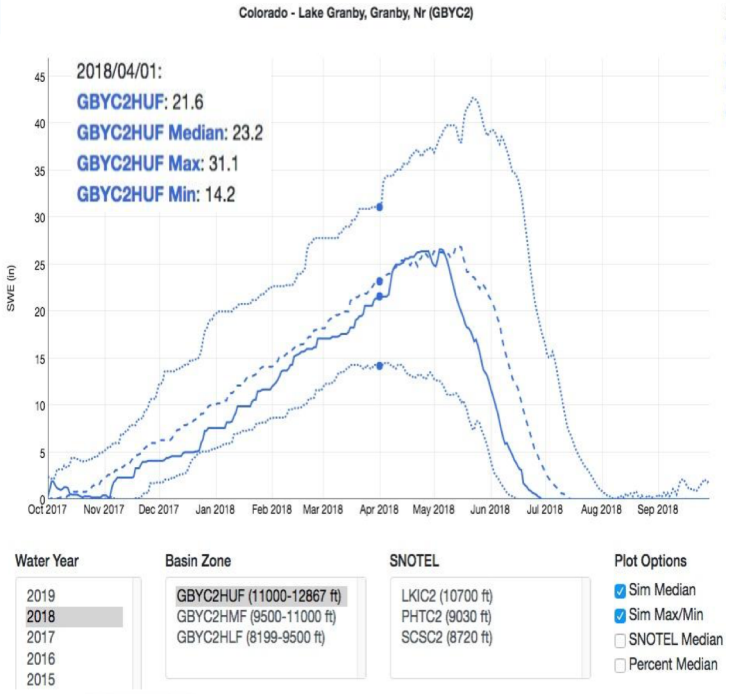
-Primary Goal: supplement/add transparency to streamflow forecasts

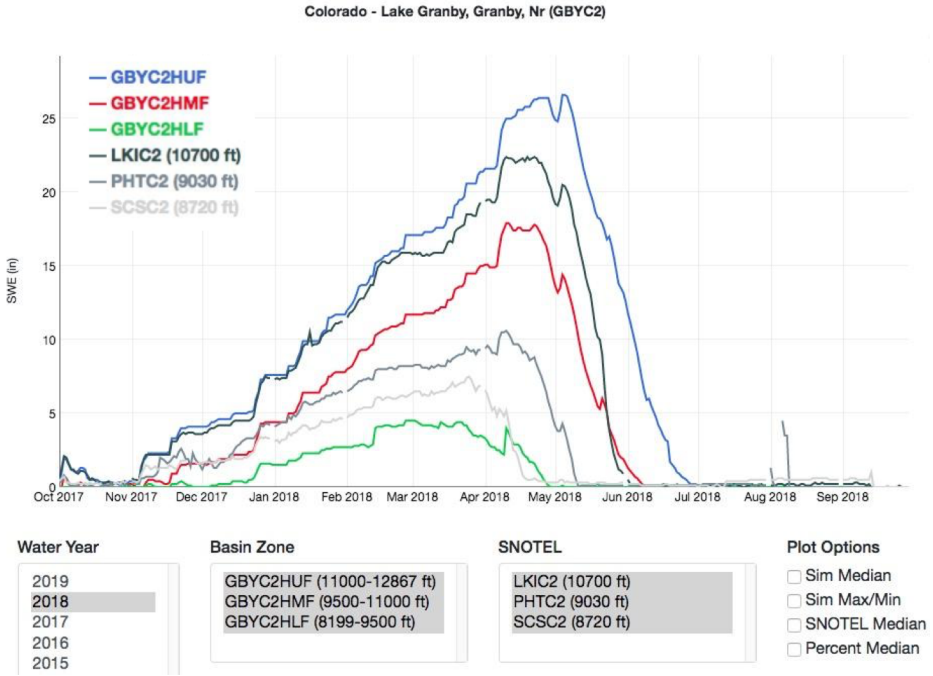
-Project in early development stage; external feedback essential



CBRFC Model SWE

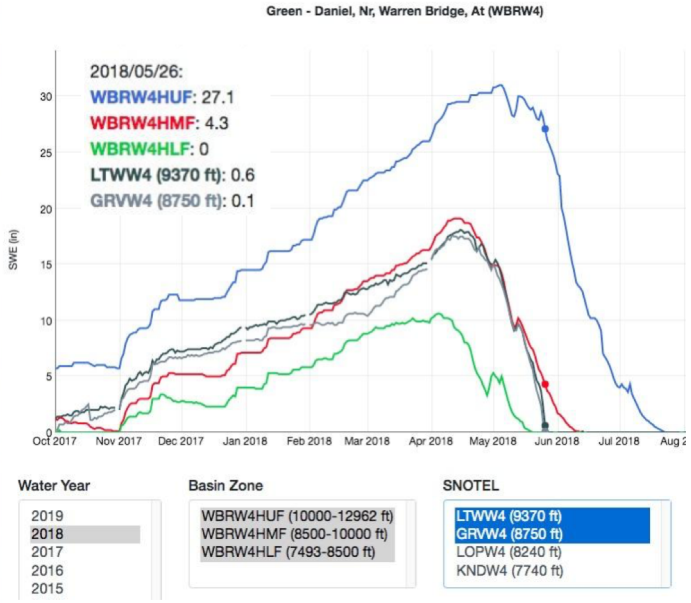
Applications

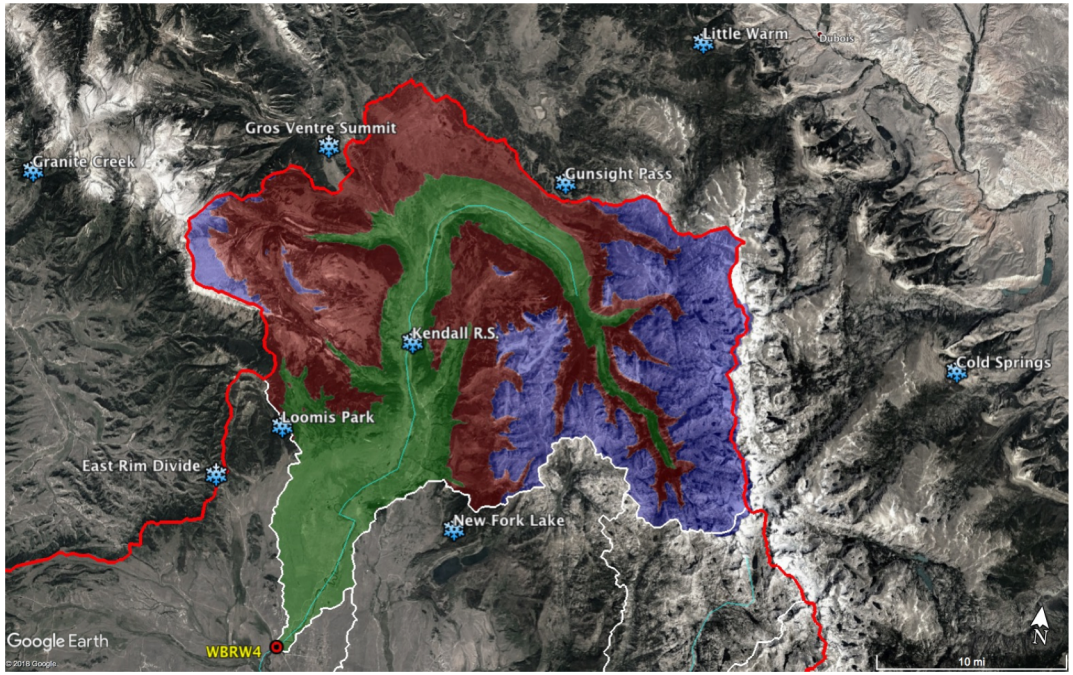




CBRFC Model SWE / SNOTEL Comparison

Upper Green Headwater Basin (468 mi²)

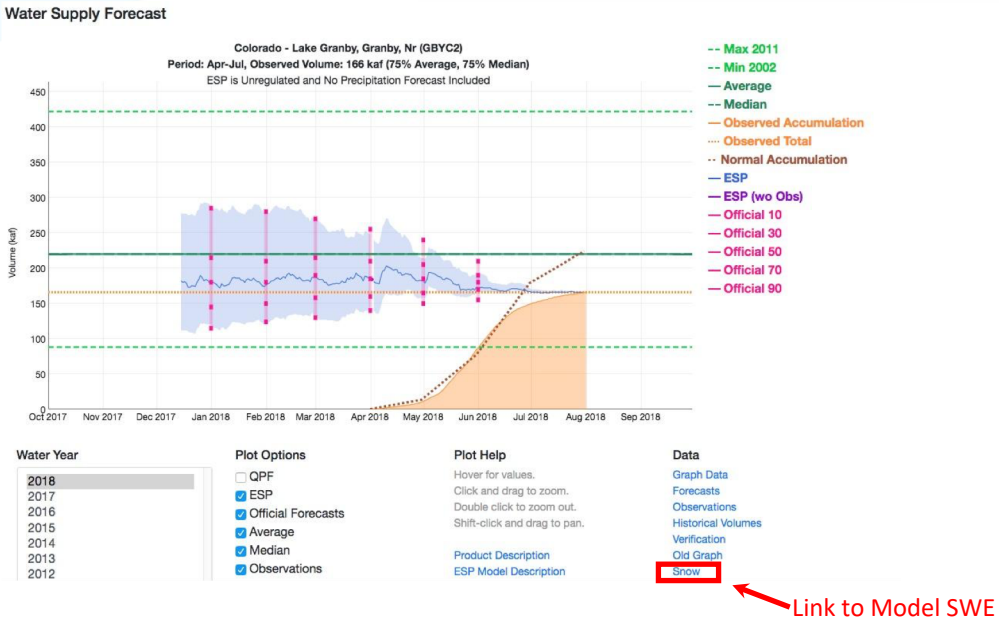




*Gunsight Pass SNOTEL: Elevation = 9,820 ft / POR = 21 years; not currently used in model calibration / MAP

CBRFC Model SWE

Future Development Work



https://www.cbrfc.noaa.gov/dbdata/station/snowmodel/snowmodel_dg.html?id=GBYC2

*Model SWE available for all CBRFC hydrologic model basins

- Show data in table form
  - Data being plotted
  - % Snow cover (areal extent)
  - Years corresponding to max/min values
  - Ranking / percentile
- Overview map corresponding to plot
  - Basin zones
  - SNOTEL stations
- Additional plot flexibility / capabilities:
  - Nearby basin simulated SWE
  - Nearby SNOTEL
    - in addition to calibration based SNOTEL
  - Plot multiple years
- Stakeholder / external user
  - Suggestions / recommendations
  - Training

Use of Seasonal Forecasts

- We do not use long term climate outlooks like those developed at the Climate Prediction Center

  - Lack of forecast skill in our area
    - We verified 25 years of winter and spring forecast in the upper Colorado Basin. We found that the CPC rarely varied from EC (equal chances) which indicates no skill in the CPC seasonal forecasts

  - We are working with the CPC to improve this
    - Use the SNOTEL stations to develop techniques
    - CPC recalibrating climate model
    - Focus on March-May forecasts

  - Local study on seasonal patterns
    - In the planning stages

Questions?

Suggestions for future work?