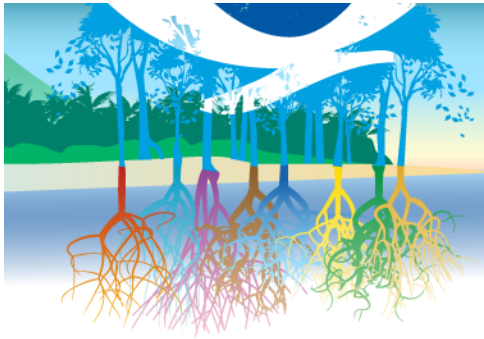


Colorado Basin River Forecast Center

Research and Development in Water Supply Forecasting

Andy Wood
Development & Operations Hydrologist
CBRFC

Western Water Supply Forecast Sources

NOAA RFCs

- Model based (ESP and variations)
- Statistical (regression w/ dimension reduction)

USDA/NRCS Nat. Water & Climate Center

- Statistical (same as RFC, applied differently)

Other Sources

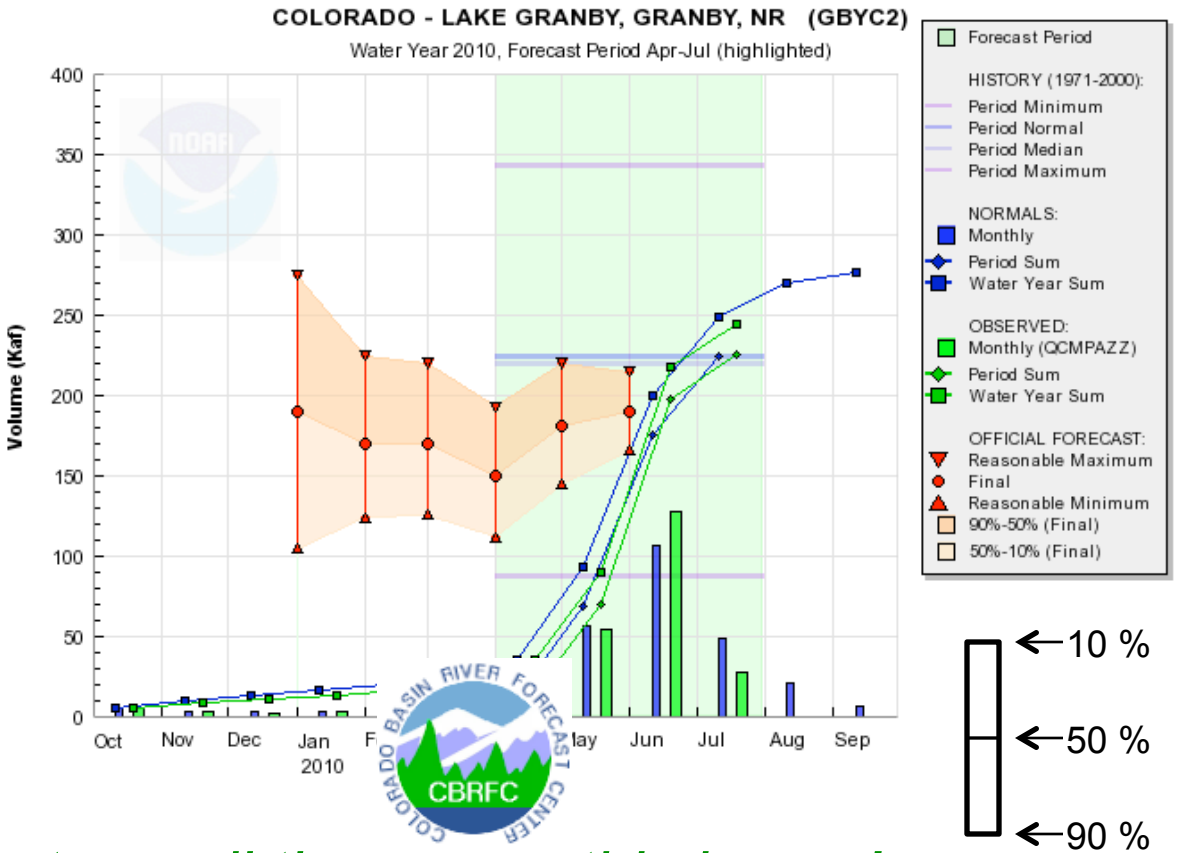
- USBR -- statistical & model based, depending on district
- COE - statistical
- Bonneville Power Agency
- University (eg, U. of Washington, UC Irvine)
- Your forecast?

Western Water Supply Forecasts

The user now sees *one* coordinated forecast for each point/type.

NWCC forecasts
\+ RFC forecasts
\+ forecaster judgment
\+ coordination

Official Forecast



Multi-model forecast are all the rage – this is one!

Western Water Supply Forecasts

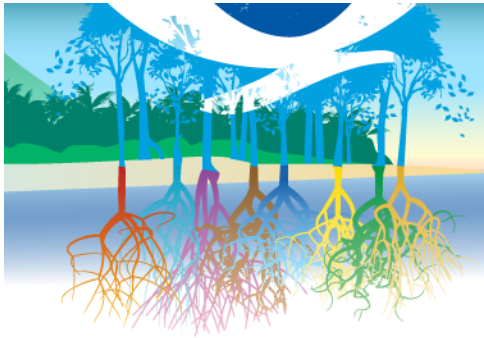
We want to untangle and understand the pieces -- why?

- The coordination process is difficult, slow
  - pros – incorporates forecaster knowledge
  - cons – non-objective, irreproducible

- The component forecasts are very different
  - Do we understand strengths and weaknesses of the approaches?
    - In high years versus low years? In January versus May?
  - Are we combining these forecast in the best way?

- How good are the error bounds? (10-90s?)

- Can additional forecasts be combined to make them even better?
  - We lack a framework (or directive) for doing this

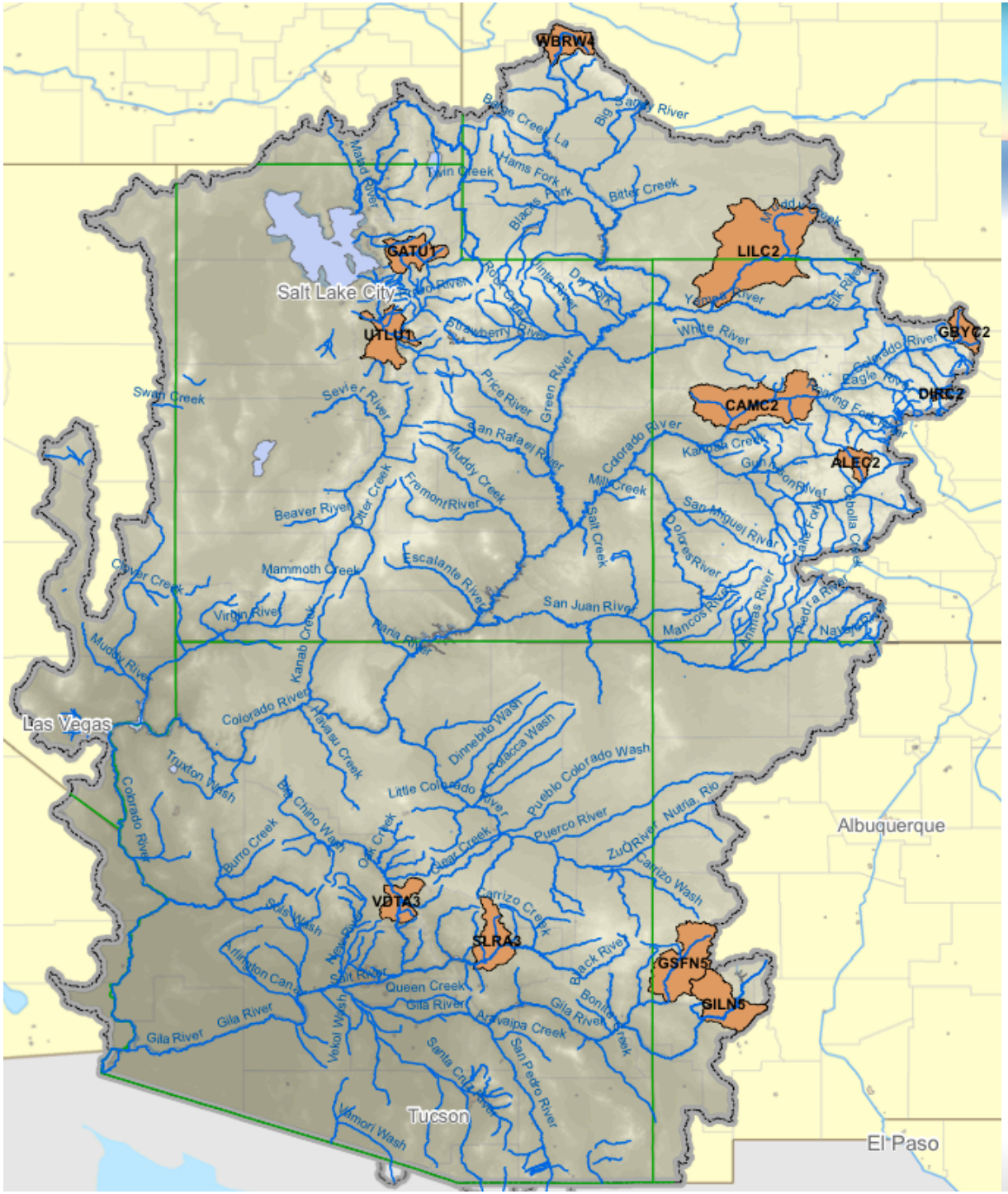


Western Water Supply Forecasts

Project to explore water supply forecast formulation

Goals:

- To provide users greater insight into each forecast component
- To allow users to access individual component forecasts
- To provide a framework for objective combination of the forecasts
- To allow incorporation of additional forecasts if deemed skillful
  - Require real-time preparation
  - Require a historical track record

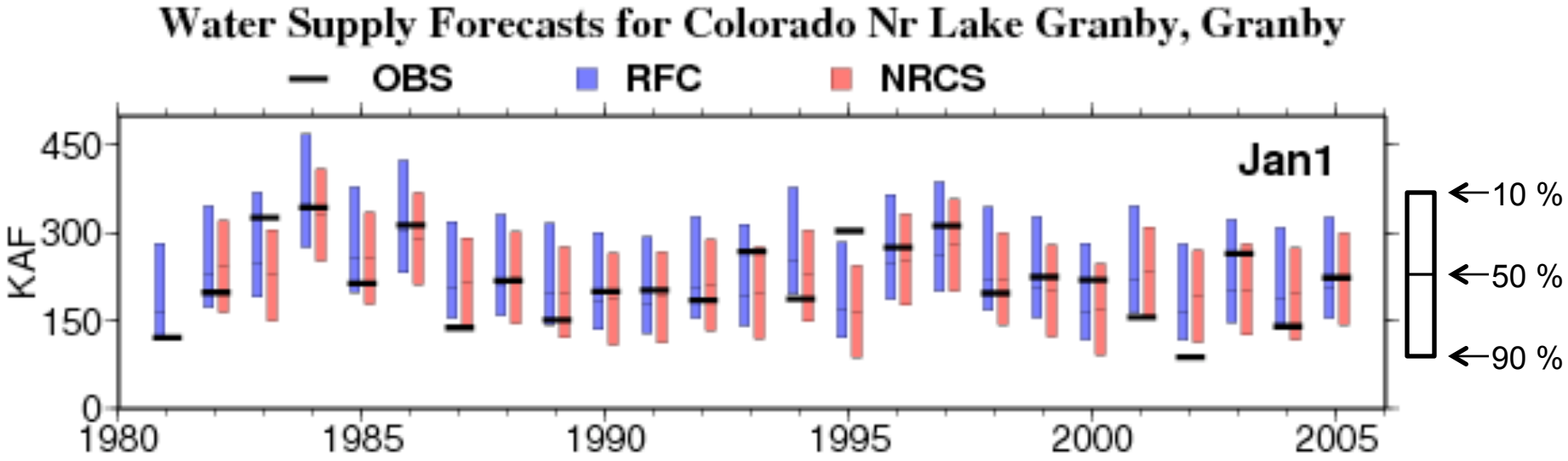


Study Basins

- ❑ Little Snake Nr Lily
- ❑ New Fork Nr Big Piney
- ❑ Jordan Nr Utah Lake, Provo
- ❑ Weber At Gateway
- ❑ Salt Nr Roosevelt
- ❑ Verde Blo Tangle Ck Abv Horsehoe Dam
- ❑ Gila Nr Gila
- ❑ San Francisco Nr Glenwood
- ❑ Colorado Nr Lake Granby, Granby
- ❑ Blue At Dillon Res
- ❑ Colorado Nr Cameo
- ❑ East R At Almont
- ❑ Green R At Warren Bridge
- ❑ Sf Flathead River at Hungry Horse Dam, MT
- ❑ Kootenai River at Libby Dam, MT
- ❑ Clearwater River at Dworshak Dam, ID

Western Water Supply Forecasts

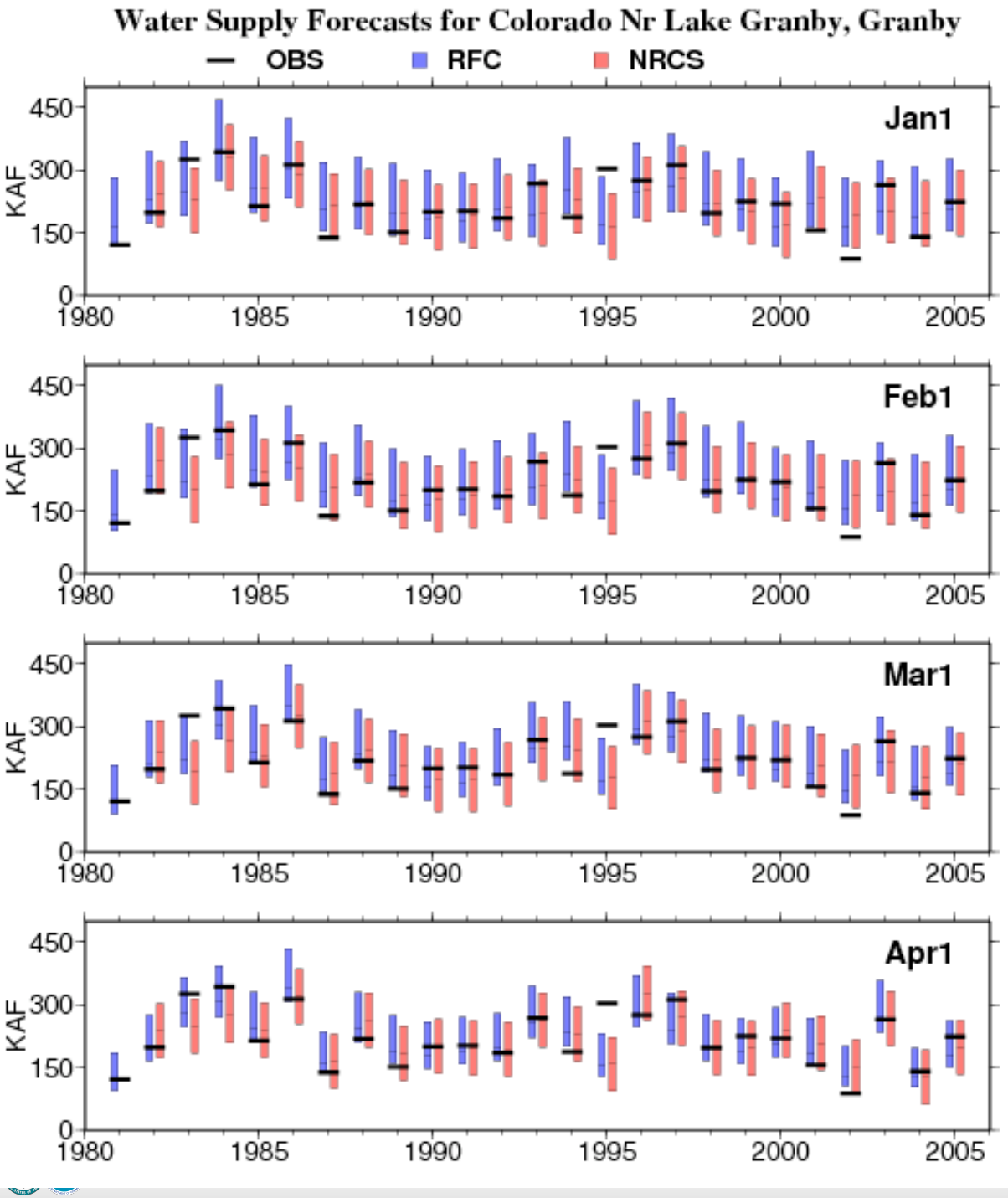
In collaboration with NRCS/NWCC, we're gathering a ~25 year history of re-forecasts from current RFC and NRCS tools.



RFC ESPs are shown

We're evaluating:

- 10-90 spread
- model skill for different situations
- other ways of combining forecasts



Forecast characteristics change as season progresses

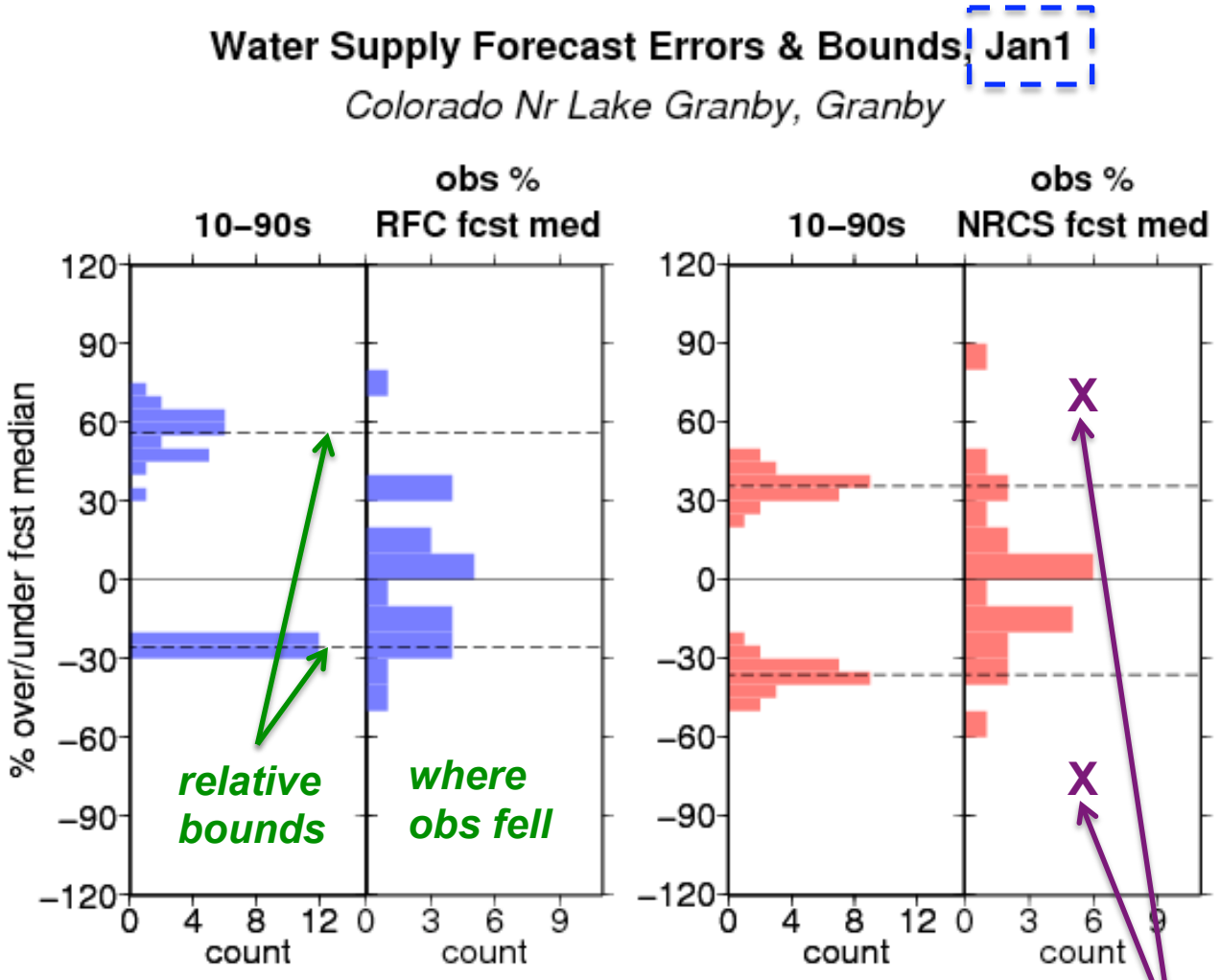
ESP has larger spread

ESP has smaller spread

Western Water Supply Forecasts

Examples of 10-90s performance

- the bounds aren't bad
- the forecast tools bounds differ

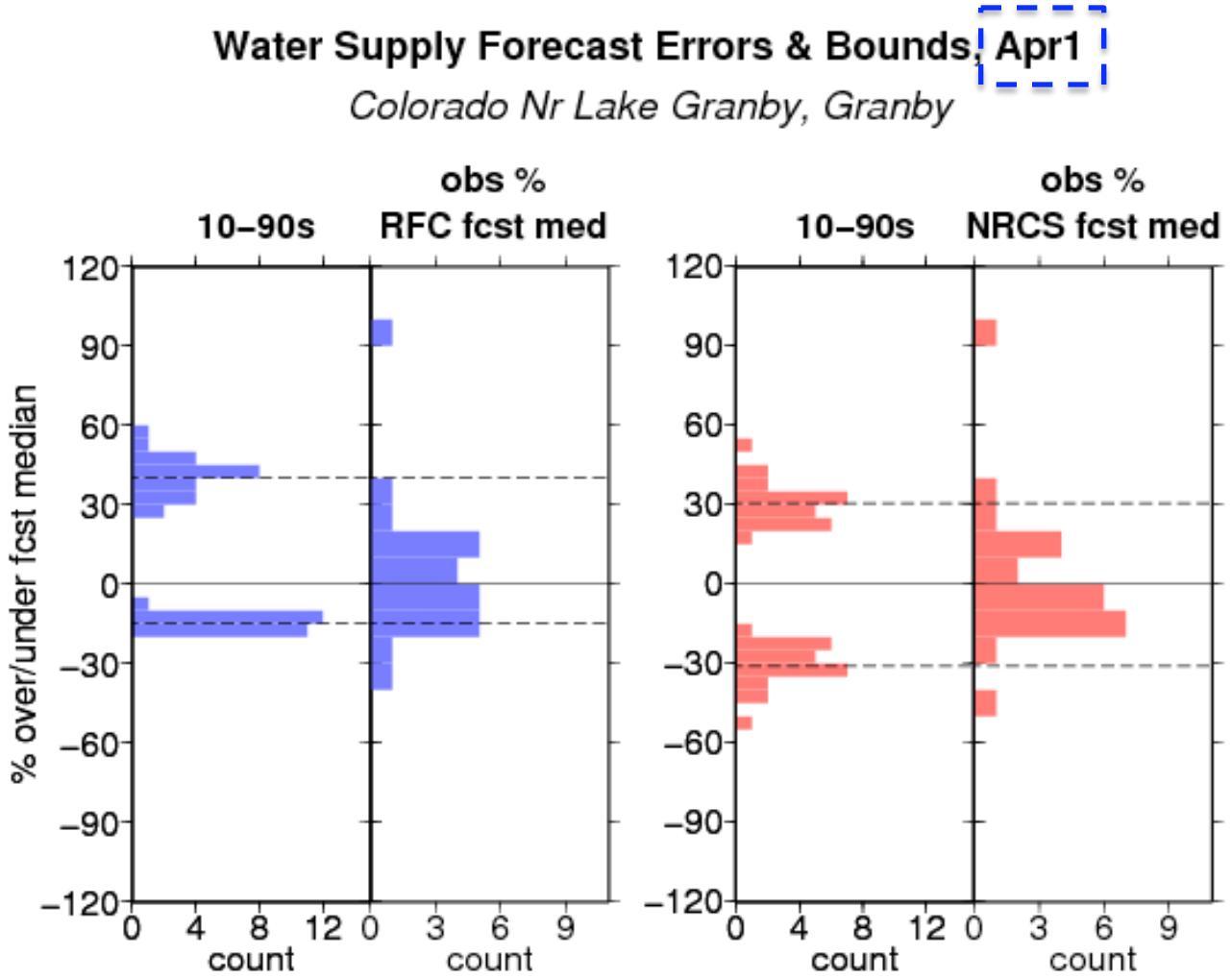


In sample N=25, want 2-3 each outside bounds

Western Water Supply Forecasts

Examples of 10-90s performance

- narrower bounds and smaller errors later in season (to be expected)



Next steps

- Will continue to gather & analyze hindcasts
- Working on combination algorithm
- Will set up experimental website

Feedback/Questions welcome!

Acknowledgements:
David Garen, Gus Goodbody & others at NWCC are collaborating with CRBRC