Updates to CBRFC Projects and Collaborations
Overview

• Collaborative Snow Work
  – Snow Comparison Work
  – UofU Physically Based Snow Model Project
  – ASO update

• Collaborative Work with the Climate Prediction Center on S2S forecast improvement

• HEFS update

• USBR DSS Tool for HUP Collaboration
Collaborative Snow Work
Snow Product Comparisons

• Many external snow products exist within the Colorado River Basin
• We will look at the added value to ...
  – Operations
  – Water Supply Volumes
• Some examples include: SNODAS, SWANN, ASO, C.U. Boulder Snow Reconstruction, Sentinel Snow Depth
Current Focus

- **SWANN - Snow Water Artificial Neural Network (University of Arizona)**
- Summer Student has been looking at historic SWE 1981-2019 at 4 km
- Resulting framework can be used to analyze different products.
Snow Product Comparison

Upper Basin April-July Streamflow Differences
1982-2015

Differences in flow volume (Kaf)

Basins
Physically Based Snow Model

- Project with University of Utah and Agricultural Research Service in Boise
- iSnoBal - distributed energy balance model
  - Test runs on East River WY 2018 (baseline)
  - Current work: Albedo Updates from MODIS
  - UofU Center for High Performance Computing
- Remote Sensing Component - Using GOES derived cloud cover to constrain net radiation
  - UofU Masters Student started in September
Airborne Snow Observatory Update

• We continue to evaluate the limited ASO data sets for use in our model.
• Currently not used operationally
• Data is being used as a research dataset to aid in calibration work
Collaborative Work with the Climate Prediction Center (CPC) on Seasonal to SubSeasonal (S2S) Forecasts
S2S Forecast

• Project with CPC to utilize their long range forecasts
• Start with the 2 week median forecast for precipitation and temperature
  – We have received reforecast from 1985-2019
  – CPC is evaluating skill
• Expand to 3-4 week forecast
• Long term goal (FY 22) 6-5-4 month forecast starting with Oct 1st forecast
• Incorporate into HEFS system
HEFS Update
HEFS quick review

- Meteorological Ensemble Forecast Processor (MEFP)
  - Correct forcing bias
  - Merge in time
  - Downscale (basin)

- WPC/RFC forecasts (1-5 days)
- Climatology (271+ days)
- GEFS forecasts (1-15 days)
- CFSv2 forecasts (16-270 days)
- Climatology (271+ days)

Hydrologic models (CHPS)
  - Bias-corrected ensemble flow forecasts
  - Flow bias / uncertainty accounting
  - NWS and external user applications

forcing unc. = forcing uncertainty
hydro. unc. = hydrologic uncertainty
users = applications

Ensemble Post-Processor (EnsPost)
  - Correct flow bias
  - Add spread to account for hydro. model uncertainty

NWS and external user applications
• Migration to GEFSv12
• Plan to use for 10-15 day contingency forecast
• Hopeful S2S project will provide more skill for longer range volume forecasts
USBR Decision Support Tool
Project Collaboration
• 15-mile reach: Colorado River section extending upstream from the Gunnison River confluence to the Grand Valley Diversion dam at Palisade, CO

• Significant decision support area for CBRFC:
  ○ HUP group (low flows/irrigation season)
  ○ CROS group (peak flow/snowmelt season)

• Weekly HUP coordination meetings to share information regarding flow forecasts, weather forecast, quantity and timing of reservoir releases, diversions and return flows that impact flows in the 15-mile reach

• This reach is identified as a critical stream reach for the recovery effort of Colorado River endangered fish. The U.S. Fish and Wildlife Service has defined a suite of recommended flows for this reach that are tiered to the hydrologic condition.
  ○ Irrigation has a significant impact on 15-mile river reach flows
  ○ Water/Flow management: fish vs. irrigation vs. reservoir water availability
Project Objective

Develop a DSS to improve coordination and transparency of water management operations in the river during the Historic User Pool (HUP) phone calls

- Provides a visual representation of river response to actual and anticipated reservoir releases
- Relies on local flow forecasts from CBRFC
- Relies on routing parameters from CBRFC
- Leverage existing tools and models to generate on the fly streamflow forecast

- CBRFC Project Role: provide USBR 4 CO River adjusted local flow time series
  - Adjusted local flow time series - do not include upstream reservoir releases
    - Tool allows USBR/CODWR/etc to run what-if reservoir outflow/Colorado River flow scenarios
  - Kremmling, Dotsero, Cameo, Palisade
USBR has set up capability to ingest CBRFC adjusted flow forecast time series and run what-if reservoir outflow scenarios in near-real time and view impacts on Colorado River flow magnitude and timing.
Upstream Reservoir Outflow Scenarios → Impact on Colorado River flow downstream

**Green Mountain Reservoir**
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**Colorado at Dotsero**
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Project Status

- Wrapping up first year of the two year project

- In year two, USBR has plans to collect the most likely future system operations from stakeholders:
  - Reservoir releases
  - Irrigation diversions

- CBRFC will have the ability to pull in best guess future reservoir releases and diversions from USBR hydrologic database (HDB) for use in operational forecast model
  - More accurate CBRFC flow forecasts during the crucial low flow/irrigation season