Calibration Extension and 2017 Outlook

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CALIBRATION EXTENSION AND FUTURE PLANS
2016 Calibration Update

• Add 5 years to calibration record (2011-2015)
  – ESP will use 35 traces instead of 30
  – NOT updating official averages (still 1981-2010)
  – Upper Colorado River Basin will be ready for WY2017 water supply season (hopefully December 1, 2016)
    • Lower Colorado and Great Basin to follow

• Identify precipitation/temperature gage issues
  – Double mass analysis
  – Corrections applied if necessary

• Make note of poor model performance in the 2011-2015 period
  – Not updating model parameters now unless absolutely necessary
    → to be addressed in 2017
2017 Re-Calibration Plans

- Consider adding additional forecast points
  - North Fork Gunnison above Mouth, near Lazear
- Add diversions where real-time data has become available
  - replace ‘unmeasured diversions’
  - Upper Green, Duchesne
- **SNOW-17 and SAC-SMA improvements:**
  - use GIS to help determine parameters more consistently
  - investigate/resolve evaporation issues
- Plan for a transition from lumped to gridded hydrology:
  - Calculate 30 years of 3 hourly temperature and precipitation on 800m grid
    - calculate MAT/MAP directly from these grids (for Upper Basin)
    - Investigate using similar method for Lower Basin
  - This would ensure consistent forcings for lumped and gridded techniques
• Analysis of 30 year vs. 35 year record so far:

  – Observed Precipitation
    • San Juan, Gunnison, Dolores, Duchesne
      – Drier October – April (especially January – April)
      – Little change May – September overall
        » variable month to month
    • Upper Green, Yampa, Upper Colorado mainstem
      – Little difference between 30 and 35 year averages

  – Observed April-July Unregulated Flow
    • Similar to winter precipitation results
• Simple ratio of 35 year average to 30 year average
  – $> 0 = 35$ year wetter than 30 year
  – $< 0 = 35$ year drier than 30 year
• Used groups of SNOTEL sites within each basin
  – no station weighting
  – had to have 35 years of record
  – Gunnison and Dolores treated as one area
  – Colorado mainstem treated as one area
1981-2015 Precipitation

October – April
35 yr vs. 30 yr precipitation

March
35 yr vs. 30 yr precipitation

Legend:
- NA
- Below -10%
- -10% - -5%
- -5% - -4%
- -4% - -3%
- -3% - -2%
- -2% - -1%
- -1% - 0.5%
- 0% - 0.5%
- 0.5% - 1%
- 1% - 2%
- 2% - 3%
- 3% - 4%
- 4% - 5%
- 5% - 10%
- Above 10%
May-September 35 yr vs. 30 yr precipitation

May 35 yr vs. 30 yr precipitation

Legend:
- NA
- Below -10%
- -10% - -5%
- -5% - -4%
- -4% - -3%
- -3% - -2%
- -2% - -1%
- -1% - -0.5%
- -0.5% - 0%
- 0% - 0.5%
- 0.5% - 1%
- 1% - 2%
- 2% - 3%
- 3% - 4%
- 4% - 5%
- 5% - 10%
- Above 10%
1981-2015 Unregulated Flow

FLAMING GORGE
APR-JUL UNREG INFLOW

KAF


APR-JUL VOLUME
5 YEAR AVG
10 YEAR AVG
71-'00 AVG
81-'10 AVG (980)
81-'15 AVG (985)
BLUE MESA
APR-JUL UNREG INFLOW

1981-2015 Unregulated Flow

KAF

APR-JUL VOLUME
5 YEAR AVG
10 YEAR AVG
71-'00 AVG
81-'10 AVG (675)
81-'15 AVG (665)
WATER YEAR 2017 OUTLOOK
Observed Fall Precipitation

Monthly Precipitation - September 2016
(Averaged by Basin)

Month to Date Precipitation - October 26 2016
(Averaged by Basin)
Model Soil Moisture

- 2016 fall soil moisture model parameter update not yet completed.
- should be done by mid-November
5 Day QPF

QPF Daily Totals (inches), issued: 10-27-2016 12z

<table>
<thead>
<tr>
<th>Day 1, end: 10-28 12z</th>
<th>Day 2, end: 10-29 12z</th>
<th>Day 3, end: 10-30 12z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 4, end: 10-31 12z</td>
<td>Day 5, end: 11-01 12z</td>
<td>5 day total</td>
</tr>
</tbody>
</table>

CBRFC/NWS/NOAA
April - July Unregulated Forecast Volume
Percent of 1981-2010 Average

- Fontenelle: 99%
- Flaming Gorge: 96%
- Yampa-Deerlodge: 94%
- Colorado-Cameo: 79%
- Blue Mesa: 71%
- McPhee: 80%
- Navajo: 82%
- Powell: 71%

% 1981-2010 Average
Flaming Gorge

• Median vs. Average
  – Observed 30 year / 35 year
    • average: 980 kaf / 985 kaf
    • median: 830 kaf / 935 kaf
  – Forecast 30 year / 35 year
    • average: 1045 kaf / 1044 kaf
    • median: 943 kaf / 915 kaf