Gunnison River Basin
Current Conditions and Forecasts

Aspinall Unit Operation Meeting
April 24, 2008

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Hydrologist / Senior Hydrologist
Colorado Basin River Forecast Center
Outline

• Overview of Forecast Process
• Current conditions
• Current Forecast
• Peak Flow
• Improvements / New Tools
Overview of Water Supply Forecast Process

SWS:
• Regression equations that relate observed data to future seasonal streamflow volume.

ESP:
• Uses Operational Forecast System (OFS), a continuous model, for initial states and historical precipitation and temperature data to develop probabilistic forecast.
Sample Equation for April 1:
Apr-Jul volume for Dillon Reservoir

> Apr 1 swe Fremont Pass Snotel
> Apr 1 swe Hoosier Pass Snotel
> Apr 1 swe Grizzly Peak Snotel

Nov-Mar precip Dillon

Nov-Mar precip Breckenridge
NWS River Forecast System

- Continuous, conceptual hydrologic model composed of three major interrelated functional systems.

  - **Calibration System**
    - determine model parameters
    - store historical data

  - **Operational Forecast System**
    - generate short term deterministic river forecasts
    - maintain model states

  - **Ensemble Streamflow Prediction**
    - generate ensemble of hydrographs
    - generate probabilistic forecasts
Current hydrologic states (from OFS):
- River / Res. Levels
- Soil Moisture
- Snowpack

Past <--> Future Time

Historical time series of precipitation and temperature (from Calibration).

Start with current conditions - Apply each year of historical climate - Create several possible future streamflow patterns.
1. Select a forecast window
2. Select a forecast variable
3. Model derives a distribution function
4. 50% exceedance value = most probable forecast
5. Correct for model bias

Ensemble Streamflow Prediction (ESP)
Overview of Water Supply Forecast Process

- Data analysis and quality control; check OFS initial states and current performance
- Run SWS and ESP models
- Analyze model outputs
- CBRFC preliminary forecast
- NRCS preliminary forecast
- Final coordinated forecast
- Forecaster insight
Current Conditions
Water Year 2008
Precipitation Water Year 2008

Legend
- SNOTEL
- COOP
- Lakes
- Rivers

Season
% Avg Precipitation
- < 50%
- 50 - 69%
- 70 - 89%
- 90 - 99%
- 100 - 109%
- 110 - 130%
- 130 - 150%
- > 150%
March Max Temperature Departure

Legend
- SNOTEL
- GOES
- COOP
- Lakes
- Rivers

March
Depart From Max F
- Above 9
- 7 - 9 Above
- 5 - 7 Above
- 3 - 5 Above
- 1 - 3 Above
- Normal
- 1 - 3 Below
- 3 - 5 Below
- 5 - 7 Below
-7 - 9 Below
- 9 Below
Snow Water Equivalent On April 22

Legend
SNOTELs
As of April 22nd
- < 50%
- 50 - 69%
- 70 - 89%
- 90 - 99%
- 100 - 109%
- 110 - 130%
- 130 - 150%
- > 150%
- Not Calculated
- Lakes
- Rivers
- USGS HUCs
Current Stream Flow

Colorado Basin River Forecast Center
GUNNISON - GUNNISON, NR - Hydrograph

Current: 2.0 (04/22.22), Flood Stage: 5.00, Bankfull: 5.00

Created 04/22.22 UTC NOAA/CBRFC, 2008

TOMICHI CK - GUNNISON - Hydrograph

Current: 3.3 (04/22.20), No Flood Stage

Unofficial Estimated Bankfull: 13.16

Created 04/22.22 UTC NOAA/CBRFC, 2008

LAKE FORK - GATEVIEW - Hydrograph

Current: 1.9 (04/22.22), No Flood Stage

Unofficial Estimated Bankfull: 4.73

Created 04/22.22 UTC NOAA/CBRFC, 2008

Observed
Forecast (04/22.22)  Outlook (increasing uncertainty)

Historical Exceedance Probability (USGS): 90-75%  75-50%  50-25%  25-10%
Overview of Monthly Conditions

Gunnison Basin Conditions
Percent of 1971-2000 Average

- As of January 1, 2008
- As of February 1, 2008
- As of March 1, 2008
- As of April 1, 2008

Monthly Precipitation | Water Year Precipitation | Snow Water Equivalent | Monthly Streamflow | Reservoir Contents* | Forecast
Blue Mesa Forecast

GUNNISON - BLUE MESA RES  (BMDC2)
Water Year 2008, Forecast Period Apr-Jul (highlighted)

Volume (kaf)

Gunnison - Blue Mesa Res

- 2008 Forecast
- 2007 Observed
- Average

NOAA/NWS/CBRFC 20:30:58 UTC
## Forecast Compared to Previous Years

**Colorado Basin River Forecast Center**

**SNOWTELS Above Blue Mesa Reservoir**

- **To Date:** 145% (20.2/13.9)
- **Seasonal:** 140% (20.2/14.4)
- **Melt rate:** 0.2 in/day averaged over last 3 days

<table>
<thead>
<tr>
<th>Year</th>
<th>Rank</th>
<th>Apr-Jul kaf</th>
<th>%Avg 720kaf</th>
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<tbody>
<tr>
<td>1984</td>
<td>1st</td>
<td>1433</td>
<td>199%</td>
</tr>
<tr>
<td>1993</td>
<td>6th</td>
<td>985</td>
<td>137%</td>
</tr>
<tr>
<td>1995</td>
<td>2nd</td>
<td>1242</td>
<td>173%</td>
</tr>
<tr>
<td>1997</td>
<td>3rd</td>
<td>1061</td>
<td>147%</td>
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<tr>
<td>2008</td>
<td>4th</td>
<td>1060</td>
<td>147%</td>
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*Figures represent snow water equivalent (SWE) measurements.*
Peak Flows into Blue Mesa
Peak Flow
Peak Regression Curves

NORTH FORK GUNNISON - SOMERSET
APRIL

y = 0.0109x - 0.0558
R² = 0.6498
1. Select a forecast window
2. Select a forecast variable
3. Model derives a distribution function
4. 50% exceedance value = most probable forecast
5. Correct for model bias
### North Fork Gunninsson Peaks

www.cbrfc.noaa.gov/product/peak/peak.cgi

<table>
<thead>
<tr>
<th>Exceedance Prob.</th>
<th>90%</th>
<th>75%</th>
<th>50%</th>
<th>25%</th>
<th>10%</th>
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</thead>
<tbody>
<tr>
<td>Somerset: average peak 3,310 cfs between 5/11 &amp; 6/2</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFSD</td>
<td>4000</td>
<td>4400</td>
<td>4900</td>
<td>5400</td>
<td>5900</td>
</tr>
<tr>
<td>Date of Peak</td>
<td>5/14</td>
<td>5/17</td>
<td>5/23</td>
<td>5/28</td>
<td>6/4</td>
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<tr>
<td>Cedaredge: average peak 210 cfs between 5/3 &amp; 6/8</td>
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<tr>
<td>CFSD</td>
<td>230</td>
<td>265</td>
<td>310</td>
<td>360</td>
<td>410</td>
</tr>
<tr>
<td>Date of Peak</td>
<td>5/14</td>
<td>5/18</td>
<td>5/23</td>
<td>5/29</td>
<td>6/5</td>
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<td>Delta (minus flow from Crystal):</td>
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<td>CFSD</td>
<td>6000</td>
<td>6500</td>
<td>7200</td>
<td>8000</td>
<td>8750</td>
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<tr>
<td>Date of Peak</td>
<td>5/14</td>
<td>5/17</td>
<td>5/23</td>
<td>5/28</td>
<td>6/4</td>
</tr>
</tbody>
</table>
Climate Forecast
Climate Forecast

1 Month Temperature Forecast

1 Month Precipitation Forecast

ONE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.5 MONTH LEAD
VALID MAY 2008
MADE 17 APR 2008
EC MEANS EQUAL
A MEANS ABOVE
B MEANS BELOW

ONE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
VALID MAY 2008
MADE 17 APR 2008
EC MEANS EQUAL
A MEANS ABOVE
B MEANS BELOW
Improvements / New Tools

Current:

- New technique for looking at soil moisture

Future:

- CHPS (Community Hydrologic Prediction System)
- Verification Tools
Contact Information

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