Colorado River Planning Convergence
New Solutions to Old Problems

Southwestern Water Conservation District
33rd Annual Water Seminar
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Colorado Water Conservation Board
Drought Contingency Planning

The Basin States and the Bureau of Reclamation are planning for drought response to reduce risks associated with reaching critical reservoir elevations at Lake Powell and Lake Mead. These are low probability events, but with high consequences.
Drought

Lake Powell Unregulated Inflow
Apr - Jul 2015 Forecast
Issued Feb 3
Comparison with History

Apr-Jul 2015 Forecast
Feb Most Prob: 5.20 maf (73%)
Feb Min Prob: 3.40 maf (47%)
Feb Max Prob: 8.35 maf (117%)
Average: 7.16 maf (1981-2010)

Feb mid-month: 4.9 maf (68%)

Average: 7.16 maf (1981-2010)
Contingency Planning

- Some projections show that if the current drought continues or worsens, there is a possibility that storage at Lakes Powell and Mead could drop below critical elevations.

- If critical elevations are breached, the system faces threats to drinking water supply, irrigation, power production, environmental resource preservation, and overall sustainability.

- Better to negotiate a drought contingency plan in advance of a crisis.
Contingency Planning

- **Colorado River Basin States**
  - Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming

- **Upper Colorado River Commission**

- **Department of the Interior**
  - Bureau of Reclamation, National Park Service, Fish and Wildlife Service, Western Area Power Administration (WAPA)

- **Major Water Providers**
  - MWD, CAWCD, SNWA, DW (FRWC), CRCD, SWCD

- **Others** – water rights holders, NGOs, etc.
Contingency Planning

Goals:

- To identify methods for providing additional security in the Colorado River System in times of ongoing or extended drought.

  AND

- To avoid unilateral and uncoordinated efforts that could provoke or lead to litigation or conflict.
Critical Powell Elevations
Environmental Resources –
UCRIP/SJRIP/GCAMP

Colorado Pikeminnow

- Historical Distribution
- Present Distribution
- Critical Habitat

Map showing the distribution of the Colorado Pikeminnow in various regions of the United States.
Colorado River Salinity Forum

- CWCB represents Colorado in the Colorado River Basin Salinity Control Program (CRBSCP) in conjunction with the CO Department of Public Health and Environment (CDPHE).

- Cooperative effort of the federal government and the seven Colorado River Basin States.

- Controls salinity through irrigation improvements, vegetation management, and point source control.

- Combined efforts of the Program have resulted in the control of an estimated 772,627 tons of salt per year.

- Funded with power revenues from the Colorado River Basin Fund.
Lake Powell Storage

Inflows to Lake Powell

Percentage of 30-year average (1971-2000): 12.04 maf

- 2000 – 7.32 maf (62%)
- 2001 – 6.96 maf (59%)
- 2002 – 3.06 maf (25%)
- 2003 – 6.36 maf (51%)
- 2004 – 6.13maf (49%)
- 2005 – 12.62 maf (105%)

- 2006 – 8.77 maf (71%)
- 2007 – 8.23 maf (68%)
- 2008 – 12.36 maf (102%)
- 2009 – 10.36 maf (92%)
- 2010 – 8.74 maf (73%)
- 2011 – 16.79 maf (142%)

(1981-2010: 10.83 maf)

- 2012 – 4.91 maf (45%)
- 2013 – 5.12 maf (47%)
- 2014 – 10.38 maf (96%)

[Graph showing water levels over time]
Critical Mead Elevations

**Shortages**

- **Tier 1 Shortage** (333 KAF) between 1075 & 1050 ft.
- **Tier 2 Shortage** (417 KAF) between 1050 & 1025 ft.
- **Tier 3 Shortage** (500 KAF) between 1025 & 1000 ft.
- **Below 1000** increased shortages can occur, but consultation required

**Note:** Modeling assumed Mexico would share in shortages so tiers would equal 400, 500 and 600 KAF shortages.
Lake Mead Storage – Assuming Normal Releases

Lake Mead Elevation Since 2000

- January 2000: 91% Active Storage
- 12.52 MAF Release WY 2011
- 8.23 MAF Releases
- First Shortage Tier

Lake Mead Elevation (EOM), Projected 24 Month, 8.23 MAF Releases, First Shortage Tier


975 1,000 1,025 1,050 1,075 1,100 1,125 1,150 1,175 1,200 1,225
Reservoir Status – Lake Powell

Lake Powell End of Month Projected Elevations
Projections from February 2015 24-Month Study Inflow Scenarios

Equalization Tier
Historical
Future

Upper Elevation Balancing Tier
3,575 ft and above

Mid-Elevation Release Tier
3,525 to 3,575 ft

Lower Elevation Balancing Tier
below 3,525 ft

January 2015 CRSS Max to Min Range
January 2015 CRSS 90th to 10th Percentile Range
February 2015 Most Probable Inflow with Lake Powell Release of 9.00 maf in WY 2015 and WY 2016
Historical Elevations
### Lake Powell Operational Tiers
*(subject to April adjustments or mid-year review modifications)*

<table>
<thead>
<tr>
<th>Lake Powell Elevation (feet)</th>
<th>Lake Powell Operational Tier</th>
<th>Lake Powell Active Storage (maf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,700</td>
<td>Equalization Tier</td>
<td>24.32</td>
</tr>
<tr>
<td></td>
<td>equalize, avoid spills or release 8.23 maf</td>
<td></td>
</tr>
<tr>
<td>3,636 – 3,666</td>
<td>Upper Elevation Balancing Tier</td>
<td>15.54 – 19.29</td>
</tr>
<tr>
<td>(see table below)</td>
<td>release 8.23 maf; if Lake Mead &lt; 1,075 feet, balance contents with a max release of 8.23 maf; balance contents with a min/max release of 7.0 and 9.0 maf</td>
<td>(2008 – 2026)</td>
</tr>
<tr>
<td>3,575</td>
<td>Mid-Elevation Release Tier</td>
<td>9.52</td>
</tr>
<tr>
<td></td>
<td>release 7.48 maf; if Lake Mead &lt; 1,025 feet, release 8.23 maf</td>
<td></td>
</tr>
<tr>
<td>3,525</td>
<td>Lower Elevation Balancing Tier</td>
<td>5.93</td>
</tr>
<tr>
<td></td>
<td>balance contents with a min/max release of 7.0 and 9.5 maf</td>
<td></td>
</tr>
<tr>
<td>3,370</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>
## Colorado River Basin Storage (as of March 30, 2015)

<table>
<thead>
<tr>
<th>Current Storage</th>
<th>Percent Full</th>
<th>MAF</th>
<th>Elevation (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powell</td>
<td>45%</td>
<td>10.92</td>
<td>3,591</td>
</tr>
<tr>
<td>Mead</td>
<td>40%</td>
<td>10.44</td>
<td>1,085</td>
</tr>
<tr>
<td>Total System Storage*</td>
<td>48%</td>
<td>28.85</td>
<td>NA</td>
</tr>
</tbody>
</table>

*Total system storage was 28.22 maf or 47% this time last year*
Upper Basin Contingency Planning

Goals

- Reduce or eliminate probability of Lake Powell reaching minimum power pool elevation (est. 3490 ft.) through 2026.

- Ensure the continued operation of the 2007 Interim Guidelines through 2026.

- Respect existing framework for administering use of Colorado River water in both the Upper Colorado River Basin and each Upper Division State.

- Combined with expected actions in Lower Basin, increase the synergistic benefits for Basin as a whole.
Upper Basin Plan - Elements

- Expand existing *weather modification programs*.

- **Extend CRSP operations** (Aspinall, Flaming Gorge, Navajo and Glen Canyon Dam).

- Develop opportunities for *Upper Basin demand management*.

- Term – Consistent with *term for 2007 Interim Shortage Guidelines*.

***Currently being implemented through the UCRC***

- Resolutions dated December 10, 2014
Weather Modification

- Expand cloud seeding in key areas to increase opportunities to enhance system supplies.

- Funding from CWCB, Lower Basin entities, and New Mexico.

- Other Upper Division States doing as well.

- Seeking federal acknowledgment that it works, so additional funds can be provided.
Agree on triggers and operations to implement under emergency conditions to maintain minimum power pool elevation at Lake Powell.

- By conserving water (temporarily) in Lake Powell or moving water available from upper CRSP facilities.
Extended Operations Details

- **Challenge**
  - Identify flexibilities to release water and subsequently recover storage in a manner that:
    - Works within existing Records of Decisions and Biological Opinions for operating each CRSP reservoir.
    - Protects hydropower facilities.
    - Shares the benefits and burdens across the basin.
    - Helps attain contingency planning goals within appropriate timeframe.
Demand Management

- Evaluate alternatives to facilitate temporary, voluntary, and compensated reductions in consumptive use through willing seller/willing buyer arrangements.

- Examples - temporary or rotational fallowing, municipal conservation, interruptible supply agreements, deficit irrigation of crop land, system efficiencies, conservation, etc.
Demand Management

- Challenge - Working within the prior appropriation system, and respecting way of life of water rights holders, to facilitate to voluntarily reductions in consumptive use on willing buyer/willing seller basis.

- Some of the questions - Feasibility, Accounting, Management and Administration, Interest.

- Evaluation Mechanisms - Currently include:
  - System Conservation Pilot Program
  - Water Bank Working Group
July 2014 SC Agreement

- Two year pilot funded by BOR, Denver, MWD, CAP, and SNWA
- $11 million ($2.75 million in Upper Basin)
- Evaluate feasibility of mitigating drought impacts through compensated, temporary, and voluntary reductions in consumptive use.
- Benefits of reductions inure to system and NOT to any one entitlement holder
System Conservation Status

- BOR is administering the program in the lower basin
- Received 14 pre-proposals
- Geographically diverse
- Sector diverse – tribes, municipalities, irrigation districts
- Include efficiency, conveyance loss reduction, fallowing, reuse, and landscape conversions
- Price diverse ($100 - $1000/af)
- Selections made February 2015 for implementation this year
Drought Contingency Plan
Under most Ex Ops, UB maintains ability to deliver water under IG, and meet 75maf/10yr
Combined efforts bend the curve
Combinations of UB and LB DM, together with Extended Operations, gives the best results.

**Graph:**
- **Baseline**
- **Scenario 10 (F50; ROD=M; No DM; 3525)**
- **Scenario 21 (F50; ROD=M, LB DM; 3525)**
- **Scenario 23 (F50; ROD=M; UB + LB DM 0.6MAF; 3525)**

- **Y-axis:** Mead Pool Elevation (ft)
- **X-axis:** Modeled Frequency of Exceedence (1988-2007 ISM)}
Next Steps

- Establish working criteria for contingency operations at CRSP reservoirs.
- Develop MOA with DOI, Western and Upper Basin States on implementing Extended Operations.
- Establish framework for facilitating System Conservation Agreement pilot program in Upper Basin.
- Continue studies and evaluation of other demand management opportunities in the Upper Basin.
- Confirm compliance with Lower Basin MOU, Contingency Planning, AND Sustainability Planning.
- Work to enter into additional Minute with Mexico.
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