Colorado River Status

Inter-Basin Compact Committee

Karen Kwon

Colorado Department of Law

The views expressed in this presentation are solely those of the author, not the official position of the Colorado Department of Law or the State of Colorado.

Contingency Planning – General

- What is it?
  - Planning for drought response to reduce risks associated with reaching critical reservoir elevations at Lake Powell or Lake Mead.

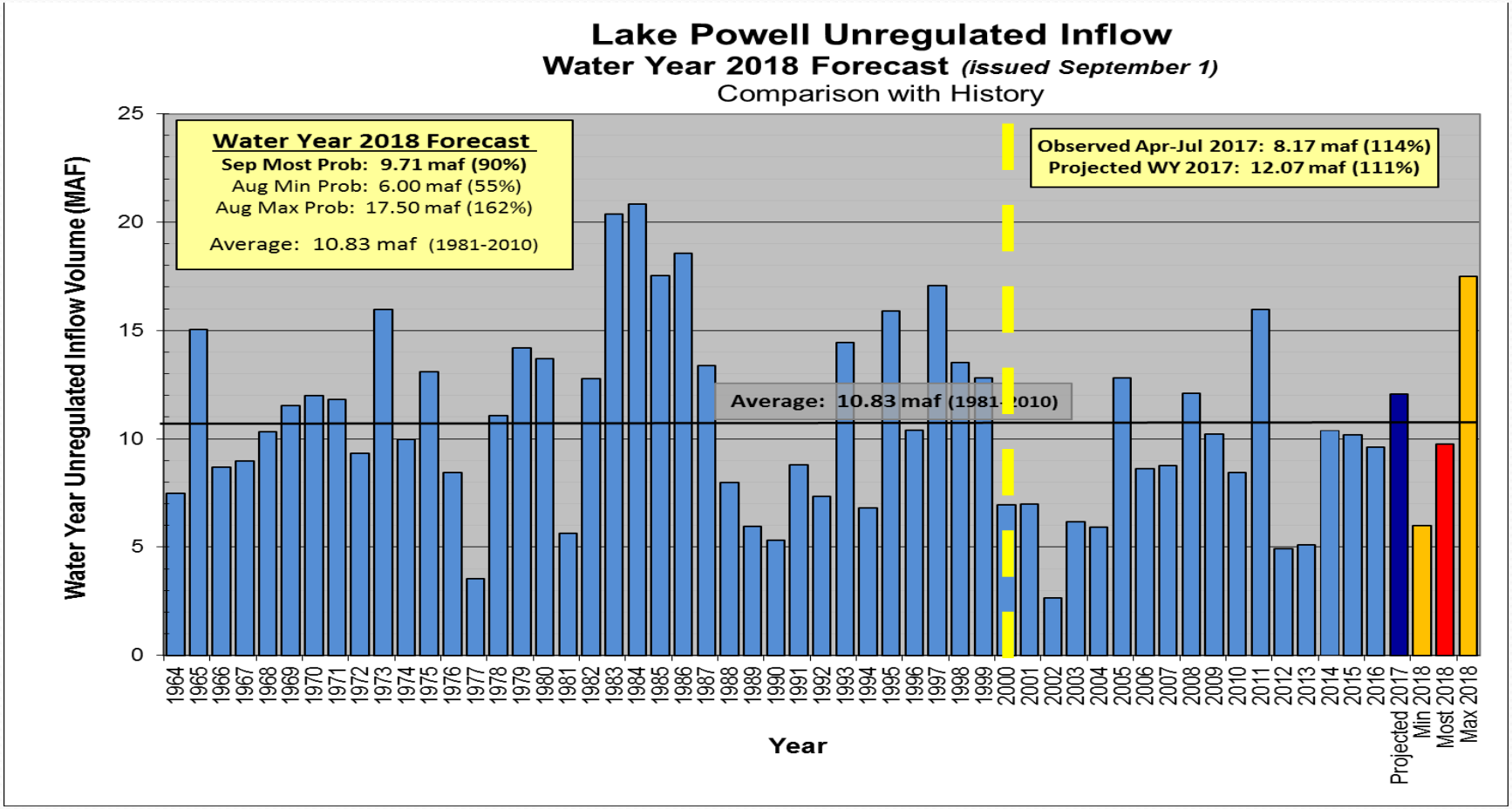
Current Issue: Drought

- Basin Hydrology--How Bad Is It?

- Water Year 2017—good hydrology

- However,
  - ✓ 6 of last 17 years of inflows into Lake Powell were less than 5 million acre-feet.
  - ✓ Above-average inflows into Lake Powell have occurred only 5 years since 2000.
  - ✓ 3 of the 4 lowest years on record have occurred during the 17-year drought, with 2012 and 2013 being the driest consecutive two-year period in recorded history.
  - ✓ Current predictions are for increasing demand and decreasing supply.

Drought in the Colorado River Basin



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%)
- 2015 – 10.17 maf (94%)
- 2016 – 9.62 maf (89%)
- 2017 – 12.23 maf (113%)

Contingency Planning – General

- Why are we doing it?
  - If critical elevations are breached, the system faces threats to ability to control own destiny – drinking water supply, irrigation, power production, environmental resource preservation, and overall sustainability.

- Low probability but High Risk.
  - Sensible to plan for the worst case scenarios to avoid potential controversy, conflict, and uncertainty.
  - Preparation for but not predicting need for implementation.

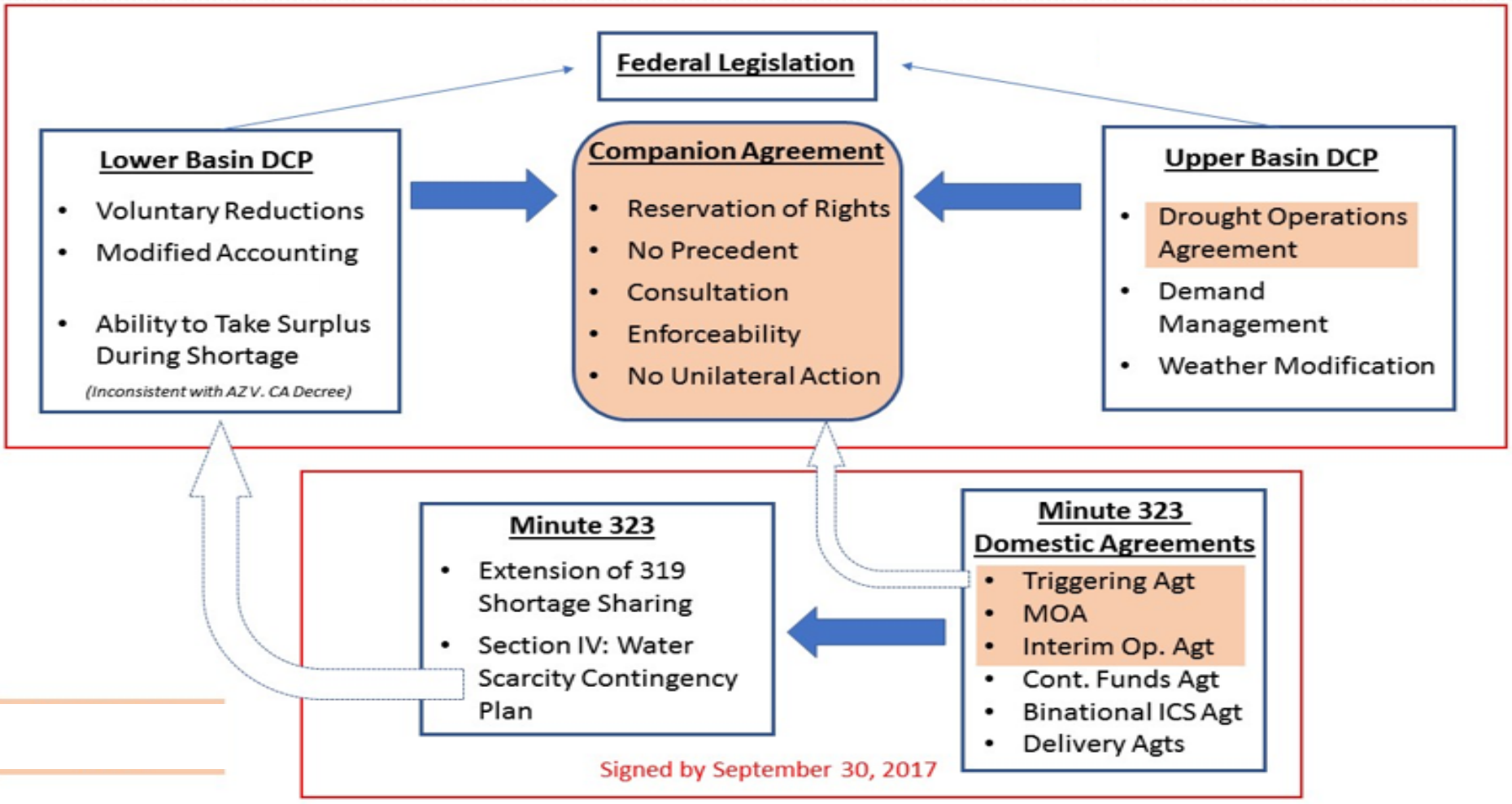
Contingency Planning – General

- **Goals**
  - Identify methods for providing *additional security* in the Colorado River System in times of ongoing or extended drought.

AND

  - Avoid *unilateral* and *uncoordinated* efforts that could provoke or lead to litigation or conflict.

Drought Contingency Relationships



Minute 323

- Goals
  - Maintain binational cooperation in addressing uncertainties on Colorado River
  - Address extended drought
  - Dissuade conflict in Treaty interpretation
  - Promote consistency with 7-States' Agreements

Minute 323, cont'd

- ***Key Elements***
  - Extends key elements of Minute 319 through 2026.
  - Surplus and Shortage sharing.
  - Creation and delivery of Mexico Reserve Water Account, using U.S. Infrastructure.
  - Water exchanges.
  - Water for the environment.
  - Salinity management.
  - International projects.
  - Includes Mexico participation in drought contingency commensurate with actions in Lower Basin.
  - Continues to be consistent with the 1944 Treaty.

Minute 323

- Signed in Santa Fe, October 2017, along with domestic agreements necessary to implement the Minute.
- Key Results
  - ✓ Helps cement drought planning in the Lower Basin (Mexico participating).
  - ✓ Continues problem solving consistent with Treaty.
  - ✓ Does not compromise state authorities or rely on use of state water to accomplish.
- For Minute Water Scarcity provisions to be effective, Lower Basin must effectuate a Drought Contingency Plan.

Lower Basin DC Planning

- Contingency Planning
  - Implement voluntary reductions in water use beyond those required by the 2017 Interim Guidelines
    - Includes a commitment by the U.S. to work to create or conserve Colorado River system water.
  - Incentivize ICS creation/storage
- Sustainability planning
  - Recognizing need for longer-term mechanisms for addressing "Structural Deficit" in the Lower Basin.

Contemplated Proposed Lower Basin Reductions

Lake Mead Elevation (ft)	2007 Interim Guidelines Shortages (kaf)		Voluntary Reductions (kaf)			Combined Reductions (kaf) (2007 Interim Guidelines Shortages + Voluntary Reductions)			
	AZ	NV	AZ	NV	CA	AZ		CA	TOTAL
1,090	0	0	192	8	0			0	200
1,085	0	0	192	8				0	200
1,080	0	0	192	8			8	0	200
1,075	320	13	192				21	0	533
1,070	320	13				512	21	0	533
1,065	320	13			0	512	21	0	533
1,060	320				0	512	21	0	533
1,055				8	0	512	21	0	533
1,050			192	8	0	592	25	0	617
1,045			240	10	200	640	27	200	867
1,040	40	17	240	10	250	640	27	250	917
1,035	400	17	240	10	300	640	27	300	967
1,030	400	17	240	10	350	640	27	350	1,017
< 1,025	480	20	240	10	350	720	30	350	1,100

Upper Basin Contingency Planning

- Goals
  - Reduce or eliminate probability of Lake Powell reaching *minimum power pool* elevation through 2026.
  - Ensure the *continued operation of the 2017 Interim Guidelines* through 2026.
  - Combined with expected actions in Lower Basin, increase the *synergistic benefits* for Basin as a whole.

Minimum Power Pool

- Elevation ~3,490 feet at Lake Powell.
- Below minimum power:
  - Lose large power supply.
  - Lose funds for:
    - Repaying for construction of projects.
    - Operating and maintaining Glen Canyon, Aspinall, Flaming Gorge, Navajo, etc. reservoirs.
    - Implementing compliance with Endangered Species Act, NEPA, and Grand Canyon protection legislation.
  - Increase risk to meeting Compact obligations.

Operational Impacts

- More frequent releases of 8.23 MAF or lower each year.
- Minimum elevation for power generation is *approximately* 3,490 feet.
- Below 3,490 feet, releases would be made through bypass tubes only.
- As elevation decreases, cannot release full capacity of bypass tubes (15,000 cfs.)
  - 3500' – 10.86 MAF annually
  - 3490' – 10.60 MAF annually
  - 3450' – 9.09 MAF annually
  - 3440' – 8.28 MAF annually
  - 3430' – 7.41 MAF annually
  - 3420' – 6.37 MAF annually
  - 3400' - 3.47 MAF annually
  - **3370' = 0 MAF, dead pool**

Upper Basin DCP-Plan Elements

- *Develop Drought Response Ops for CRSP Facilities*
- Explore feasibility and opportunities for *Upper Basin demand management*
- *Weather Modification* and *Phreatophyte Management*
- *Term* – Consistent with *term for 2007 Interim Shortage Guidelines*

Reservoir Operations

Navajo Reservoir

Flaming Gorge Reservoir

Blue Mesa Reservoir

Lake Powell

- Agree on 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

Demand Management

- Goal – evaluate alternatives to facilitate temporary, voluntary reductions in consumptive use through willing participant arrangements.
- Challenges – Working within the prior appropriation system and respecting way of life of water rights holders, to facilitate voluntary reductions in consumptive use on willing participant basis.
- Lots of questions exist – Feasibility, accounting, management and administration, interest. Need to be investigated before determining if viable.
- Evaluation mechanisms – Currently include:
  - System Conservation Pilot Program (UCRC)
  - Others (intra-state or academic).

System Conservation Pilot Program

- Facilitating temporary, voluntary, compensated reductions in consumptive use through willing seller/willing buyer arrangements.

System Conservation Pilot Program

- Purposes of Program:
  - ✓ Educate on role of demand management and how it could work.
  - ✓ Explore interest in participating in voluntary conservation projects.
  - ✓ Evaluate whether and to what extent there could be a potential benefit to the Colorado River System.
  - ✓ Identify obstacles, considerations, and potential solutions to implementing on a broad scale.

- UCRC, states, and Funders understand that the goal of the pilot program is NOT to ensure that wet water gets to Lake Powell. Rather, *investigate options and feasibilities* as possible.

System Conservation Pilot Program

Year	Colorado	New Mexico	Utah	Wyoming	Total
2015	5	0	0	5	10
2016	8[A)]	2	1[B)]	9[C)]	20
2017	2	3	6	4	15
Total	**15**	**5**	**7**	**18**	**45**

A) 11 projects were selected but only 8 were implemented.
B) 2 projects were selected but only 1 was implemented.
C) 10 projects were selected but only 9 were implemented.

- 2018 Projects
  - ✓Just determined SCPP will continue for another year.
  - ✓Request for Proposals recently released to states.
  - ✓Changes in contracting procedure so that process is more streamlined.

Weather Modification

- Snowpack modification through cloud seeding to augment system.
- Established programs in many western states.
- WY studies suggest that may increase precipitation by between 5 and 15%.

Compact Administration/Avoidance Studies

- Contingency Planning
- System Conservation Pilot Program
- Compact Compliance Study
- Upper Basin Compliance Study
- Colorado Water Bank Work Group
- Risk Studies
- Shepherding White Paper and Workshops
- Colorado Water Plan

** IMPORTANT FOR THE STATE TO CONSIDER INPUT AND INTERACTIONS BETWEEN ALL OF THESE**

Compact Compliance Study Summary

- HB 08-1346 –
  - 2008 Projects Bill authorized CWCB to study issues associated with administration of state water rights in the Colorado River Basin under the Compacts.
- Purpose
  - To allow the state to look at options for avoiding curtailments if possible and for the state engineer to have when developing curtailment rules for use in water right administration should curtailments become necessary under the terms of the Colorado river compact.
- Specific Elements
  - Evaluate options for curtailing uses in Colorado in an equitable manner
  - Evaluate options to delay, minimize, avoid curtailment of uses to extent possible

CCS - Where Are We?

- Conducted in Phases of Scopes of Work
  - Phase I – Water rights review
  - Phase II – Compact Compliance Evaluations
    - Evaluation of baseline strategies and impacts
  - Phase III – Next Steps to discuss at future meeting

Processes to Track & Integrate

- Upper Basin Compliance Study
- Colorado Water Bank Work Group
- Contingency Planning
- Mexico Minutes
- Colorado River Water Supply and Demand Study
- Risk Studies
- Shepherding White Paper/Workshop
- Colorado Water Plan
- Among others

****Important to stay up to date, gaining input from all relevant forums/stakeholders and fit within the legal structure established for interacting among sovereign states.****

Themes and Ongoing Issues

- A history of cooperative approach to water management.
- Changing environmental and hydrologic conditions, so management must evolve.
- Maintain compliance with Law of the River.
- Many stakeholder groups requiring inclusion.
- Innovative and responsive demand management strategies.

Thank you

Karen Kwon
Federal & Interstate Water Unit
Colorado River Subunit
Colorado Department of Law
1300Broadway, 7th Floor
Denver, CO 80203

Potential Compact Compliance Strategies

- Possible Curtailment Options considerations:
  - Strict priority administration
  - Pro Rata Administration
  - Administration by water division or sub-basin
  - Anticipatory curtailments
  - Curtailment of all future uses after a prescribed date prior to curtailment of any other uses
  - Curtailments by use type

Strict Priority Administration - Results

- Efficiency in uses increases
  - More efficient use of senior right maintains most of consumptive use

- Increased flow across state line due to reductions in:
  - crop consumptive use
  - diversions to storage
  - transbasin diversions

- Decreased streamflow after curtailment due to:
  - reduced lagged return flows
  - storage recovery

Phase II - CCS Take-Aways

- Current Irrigated Acreage generally matches Pre-1922 acreage as defined in Upper Colorado River Basin Compact

- Junior water rights and Reclamation projects generally supplement supply for lands with Pre-1922 water rights; there has been minimal new irrigation since 1922

- Under Strict Administration curtailment, the vast majority of irrigation would still receive a supply, and would be more efficient in their use of that supply. Crop consumptive use does not decrease significantly.

- Curtailed transmountain storage and tunnel diversions result in the largest addition to stateline flows during curtailment

- Additional stateline flow due to curtailment is highly variable depending on hydrologic conditions during curtailment.