Colorado River Overview

- 16.5 million acre-feet (MAF) allocated annually – 7.5 MAF to Upper Basin and 7.5 MAF plus an additional 1 MAF to Lower Basin
- 1944 Treaty grants 1.5 MAF to Mexico
- 13 to 14.5 MAF of consumptive use annually
- 60 MAF of storage
- 15.1 MAF average annual "natural" runoff over past 100 years
- U.S. Bureau of Reclamation serves as "water master" for the Lower Basin.





Natural Flow Colorado River at Lees Ferry Gaging Station, Arizona Calendar Year 1906 to 2005



Provisional data, subject to change



Hydrologic Conditions Since 2000 Have Impacted Storage in the Colorado River System.

- 2000 2007 has been the driest 8-year period in the 100-year historical record
- Increased water use attributable to growth in the Basin States
- Increased tension among the Basin States
- To date, there has never been a shortage in the Lower Basin and prior to the 2007 ROD, there were no shortage guidelines
- Also prior to the 2007 ROD, operations between Lake Powell and Lake Mead were coordinated only at higher reservoir levels ("equalization elevations")



State of the System (1999-2007)

Water Year	Inflow to Powell % of Average	Powell and Mead Storage, MAF	Powell and Mead % Capacity
1999	109	47.59	95
2000	62	43.38	86
2001	59	39.01	78
2002	25	31.56	63
2003	52	27.73	55
2004	51	23.11	46
2005	105	27.24	54
2006	73	25.80	51
2007	68	24.42	48

April 18, 2005 Upper Basin Letter to Secretary Norton

- High precipitation and runoff in the Lower Basin have resulted in Lake Mead rising to... 16.1 million acre feet which is 62 percent of live storage capacity.
- Lake Powell has dropped to... 8.03 million acre-feet which is 33 percent of live storage capacity.
- <u>Requested that the Secretary release</u> less than 8.23 maf from Lake Powell.

LOW LEVELS AT POWELL

April 26, 2005 Lower Basin Letter to Secretary Norton

- The three Lower Division States believe that the minimum objective release for Lake Powell contained in the 2005 <u>AOP must not be reduced below 8.23 million</u> <u>acre feet.</u>
- At the end of 2005 water year, the contents of Lake Powell and Lake Mead are forecasted to be 11.7 maf and 14.9 maf, respectively. Although Lake Mead's contents are forecasted to be about 3.0 maf more than Lake Powell's contents at the end of 2005 water year, the contents of Lake Powell and Lake Mead are projected to be substantially equal at the end of water year 2006, with each lake at approximately 13.4 maf.

LOW LEVELS AT LAKE MEAD

May 2, 2005 letter from Secretary Norton

- "<u>An adjustment</u> to the release amount from Lake Powell during the next five months is not warranted."
- "When developing annual operating plans for the Colorado <u>River...the Department retains authority</u> <u>pursuant to applicable law and the Operating Criteria to</u> <u>adjust releases from Glen Canyon Dam</u> to amounts less than 8.23 million acre-feet per year."
- After this consultation, through the Federal Register the Department will work on at least:
 - 1)Development of Lower Basin Shortage Guidelines; and,
 - 2) Development of Conjunctive Management Guidelines for Lake Powell and Lake Mead.

TIMELINE

- January 16, 2001 Secretary adopts Interim Surplus Guidelines.
- Reduction in storage levels in Lakes Powell and Mead.
- May 2, 2005 Secretarial determination on Mid-Year Review of 2005 Annual Operating Plan.
- June 19, 2005, 70 Fed. Reg. 34794.
- August 25, 2005, Seven States' Letter.
- September 30, 2005, 70 Fed. Reg. 57322.
- February 3, 2006, Seven States' "Preliminary Proposal"
- February 28, 2007, Bureau of Reclamation, Draft Environmental Impact Statement.
- *April 23, 2007*, 7-States signed Agreement.
- *December, 2007,* Final EIS and 2007 ROD issued.

Clark County Population Reaches 2 million

Year	Clark County Population	Nevada Population	Percentage of Nevada residing in Clark County
1970	277,230	496,960	55.79%
1975	351,300	621,975	56.48%
1980	463,087	800,508	57.85%
1985	562,280	955,810	58.83%
1990	770,280	1,236,130	62.31%
1995	1,055,435	1,611,593	65.49%
2000	1,394,440	2,023,378	68.92%
2001	1,485,855	2,132,498	69.68%
2002	1,549,657	2,206,022	70.25%
2003	1,620,748	2,296,566	70.57%
2004	1,715,337	2,410,768	71.15%
2005	1,796,380	2,518,869	71.32%
2006	1,874,837	2,622,753	71.48%
2007	1,954,319	2,716,975	71.93%
2007 i	s estimated	Data Source: Nevada	State Demographer.

Nevada had been pursuing the Virgin and Muddy projects

 \$ 2 billion dollars on projects that created no new water.

• Opposition from all sides.

• Nevada was in a box.

Overarching Purposes

- Provide for additional Colorado River Compact development
- Create more reliability in Colorado River water supply
- Avoid legal controversies
- Reduce Lower Basin shortages
- Minimize potential for curtailment of uses in Upper Basin

States Pursued Collaboration

- Vegetative management (tamarisk removal)
- Augmentation Study (desalinization, importation, other options)
- Weather Modification (cloud-seeding)
- U.S. Mexico bilateral negotiations

Explanation Modeling Assumptions -- Lake Powell Operations

Operations revert to No Action for all alternatives in 2027

Lake Powell Elevation (ft)	No Action	Basin States	Conservation Before Shortage	Water Supply	Reservoir Storage	Lake Powell Storage (maf)
3700	Flood Control/70R	Flood Control/70R	Flood Control/70R	Flood Control/70R	Flood Control/70R	24.3
Equalization	<u>602(a)</u>	Upper Equalization Line	Upper Equalization Line	602(a)	<u>602(a)</u>	Equalization
	8.23	8.23; If Mead < 1075, balance contents with a min/max release of 7.0 and 9.0	8.23; If Mead < 1075, balance contents with a min/max release of 7.0 and 9.0	8.23; If Mead < 1075, balance contents with 7.0 and 9.5	8.23	
3595						11.3
3575					7.8	9.5
3560		7.48; 8.23 if Mead < 1025	7.48; 8.23 if Mead < 1025	Balance contents with a min/max release of 7.0 and 9.5		8.3
					Balance contents with a min/max release of	
3525		Balance contents with	Balance contents with		7.8 and 9.5	5.9
3490		a min/max release of 7.0 and 9.5	a min/max release of 7.0 and 9.5			4.0
3370						0

The Agreement

- The parties agreed to support the Secretary's ROD as long it complied with States' alternative.
- Provided an "off ramp" if the ROD was not in substantial conformance with the parties' recommendation.
- Parties agreed to confer annually and at other specified times.

The Agreement

- Consistent with and reaffirms existing law.
- Parties agree to consult in good faith to try to resolve any claims or controversies under this agreement or under the Colorado River Compact and "law of the river" prior to initiating litigation.
- Parties agree to pursue system augmentation, including desalination and cloud-seeding.
- Parties will support an interim water supply of at least 280,000 af for Nevada, part of which will be obtained from Nevada's funding of Drop 2 Reservoir (annual recovery will not exceed 40,000 af).
- SNWA will:
 - Withdraw right-of-way application and will not refile the Virgin River application prior to 2014 so long as Nevada is able to use its pre-BCPA Virgin and Muddy River rights.

And will not:

 Refile permit after 2014 as long as diligent pursuit of system augmentation water is proceeding that will provide SNWA with 75,000 af long-term by 2020.

Powell Operations

• Defines Equalization levels in Powell based on Upper Basin Depletion Schedule

 Recognizes releases from Powell can be less than 8.23 MAF

 Minimum Power Pool Operations provided some protection

Intentionally Created Surplus (ICS)

- Purposes
 - Create Storage Accounts in Mead for the Lower Basin States
 - Avoid Lower Basin Shortages
 - Benefits Lakes Mead and Powell
- Guidelines
 - No surplus water can be used to create ICS
 - 5% of any ICS goes to CR system
 - Evaporation on ICS account charged (3%)
 - Contractors can reduce ICS credits mid-year, but may not increase them

Intentionally Created Surplus

• Land fallowing, canal lining, desalination where water is used in lieu of CR water, Tributary Conservation ICS and Imported ICS not released in the Year created, and other extraordinary conservation measures, including development and acquisition of a non-Colorado River System water supply used in lieu of CR water within the same state.

Maximum annual creation Maximum total account Maximum annual release

California	400,000	1,500,000	400,000
Nevada	125,000	300,000	300,000
Arizona	100,000	300,000	300,000

Total allowable ICS account in Mead

2.1 MAF (Considering enlarging up to 2.9 MAF for benefit of Mexico & U.S.)

Mead Operations

- Any unused apportionments go first to:
 - Domestic needs of MWD & SNWA, then to
 - Water Banking, then to
 - California pursuant to the 7-party agreement & QSA guidelines.
- ISG goes thru 2016 & extended to 2025
- Normal operations are defined as 9.0 MAF to the Lower Basin (7.5 MAF mainstem & 1.5 MAF Mexico).
- During flood control operations:
 - ICS reduced by amount of Flood Control release
 - Mexico by Treaty receives surplus (up to 200k AF)

Shortage Conditions

Lake Mead Step Shortages			
<u>Mead Elevation</u> (ft)	<u>Stepped</u> Shortage	<u>Mead Live</u> <u>Storage</u>	
1075 to 1050	333,000 af	9.37 to 7.47 maf	
< 1050 to 1025	417,000 af	7.47 to 5.80 maf	
< 1025 to 1000	500,000 af	5.80 to 4.33 maf	
< 1000	Increased reductions to be consistent with consultation(s)	< 4.33 maf	

Shortage Allocations

Lake Mead Levels	Nevada's Share of the Shortage	Arizona's Share of the Shortage
1,050 – 1,075 ft.	13,000 af	320,000 af
1,025 – 1,050 ft.	17,000 af	400,000 af
Below 1,025 ft.	20,000 af	480,000 af

The States will consult with the Secretary for any shortages (cumulative) above 500,000 af.

MEXICO

- States' proposal: Mexico to accept 16.7 % shortage
- Secretary's February 28, 2007 DEIS:

"In order to assess the potential effects of the alternatives, it was assumed that Mexico would share proportionately in Lower Basin shortages. . . . [I]n order to assess the potential effects of the proposed federal action in this Draft EIS, certain modeling assumptions are used that display projected water deliveries to Mexico. <u>Reclamation's modeling assumptions are not intended to</u> <u>constitute an interpretation or application of the 1944 Treaty or to</u> represent current or future United States policy regarding deliveries to Mexico. <u>The United States will conduct all necessary and</u> <u>appropriate discussions regarding the proposed federal action and</u> <u>implementation of the 1944 Treaty with Mexico through the IBWC in</u> <u>consultation with the Department of State.</u>

MEXICAN TREATY

 "In the event of extraordinary drought or serious" accident to the irrigation system in the United States, thereby making it difficult for the United States to deliver the guaranteed quantity of 1,500,000 acre-feet (1,850,234,000 cubic meters) a year, the water allotted to Mexico under subparagraph (a) of this Article [10] will be reduced in the same proportion as consumptive uses in the United States are reduced."

Mexican Water Treaty, Treaty Series 994, 59 Stat. 1249, November 14, 1944., Article 10 (b).

Coordinated Operation of Lakes Powell and Mead

Powell Elevation	Powell Operation
3,700 ft.	Equalize or 8.23 maf
3,636 - 3,664 ft. (see table)	8.23 maf; If Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf
3,575 feet	7.48 maf 8.23 maf if Mead < 1,025
3,525 feet	Balance contents with a min/max release of 7.0 and 9.5 maf
3,370 feet	

Colorado River Basin Water Management WSTB, NRC, National Academies Press

- Warmer future temperatures will reduce future Colorado River streamflow and water supplies.
- Gauged record of Colorado River streamflow covers a small subset of the range of natural hydroclimatic variability.
- Dendrochronology—decadal-long shortages
- Population growth rates are on a "sharply increasing trajectory."
- Agricultural water constitutes a large reservoir of available water for urban use.



Next Steps....

Interstate:

- Mexico negotiations
- Augmentation
- Vegetative Management
- Cloud-seeding
- System efficiencies (Drop 2, AAC, etc.)
- Annual Operation Plans
- Regularly confer

Intra-state:

- Inter-basin roundtable discussions
 - Consumptive use needs studies
 - Non-Consumptive use needs studies
- Water supply availability study
- Curtailment study