Conference on Ecological and Ecosystem Restoration
New Orleans, Louisiana
COLORADO RIVER BASIN INTEGRATED MANAGEMENT

-Minute 319
-Adaptive Management
-California Drought

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Hoover Dam
Hoover Dam - 1999
Hoover Dam - Today
Colorado River Basin Overview

- Over 1,450 miles in length
- Basin makes up about 12% of total U.S. lands
- 60 MAF of total storage
- Average annual inflow of 15 MAF
- Irrigates 3 million acres
- Serves 30 million people
- Generates 10 billion KWh of electricity
- Provides more than 30 million visitor-days of recreation
Background: Key Elements of the Law of the River

- Colorado River Compact, 1922
- Boulder Canyon Project Act, 1928
- Mexican Water Treaty, 1944
- Upper Colorado River Basin Compact, 1948
- Colorado River Storage Project Act, 1956
- Supreme Court Decree, Arizona v. California, 1964
- Colorado River Basin Project Act, 1968
Historic Colorado River Water Supply & Use (Annual)
Colorado River Demands by State

NOTES:
1 Excluding consumptive use in Lower Basin tributaries.
2 Phreatophyte and operational inefficiency losses.
Colorado River Basin Hydrology

- 16.5 million acre-feet (maf) allocated annually
- 13 to 14.5 maf of consumptive use annually
- 60 maf of storage
- 15.0 maf average annual “natural” inflow into Lake Powell over past 100 years
- Inflows are highly variable year-to-year
Colorado River Drought

• 2000-2013 was the driest 13-year period in the 100-year historical record

• Tree-ring reconstructions show more severe droughts have occurred over the past 1200 years (e.g., drought in the mid 1100s)

• Observed 2013 April through July runoff was 163% of average

• Current year at 80% of average

• Not unusual to have a few years of above average inflow during longer-term droughts (e.g., the 1950s)
# Colorado River Basin Storage
(as of April, 2013)

<table>
<thead>
<tr>
<th>Current Storage</th>
<th>Percent Full</th>
<th>MAF</th>
<th>Elevation (Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Powell</td>
<td>73%</td>
<td>17.75</td>
<td>3,654</td>
</tr>
<tr>
<td>Lake Mead</td>
<td>49%</td>
<td>12.80</td>
<td>1,114</td>
</tr>
<tr>
<td>Total System Storage*</td>
<td>65%</td>
<td>38.85</td>
<td>NA</td>
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*Total system storage was 33.50 maf or 56% this time last year*
As part of the ongoing dialogue on Colorado River issues, delegations from the United States and Mexico worked over three years to reach an agreement on a set of cooperative measures for management for the **next five years**.

**Principals to the agreement:**

Seven Colorado River Basin states, representatives from the U.S. Department of State and the U.S. Department of the Interior, U.S. IBWC, Mexico IBWC, and Bureau of Reclamation Commissioner.

Minute 319 demonstrates commitment and the potential opportunities for future cooperation between the United States and Mexico on water conservation, system operations, environmental restoration, and new water sources projects.
The five-year agreement approved by both governments provides for a series of joint cooperative actions between the United States and Mexico. Elements of the agreement include:

• Implementing efforts to enhance water infrastructure and promote sharing, storing, and conserving water as needed during both shortages and surpluses;

• Establishing proactive basin operations by applying water delivery reductions when Lake Mead reservoir conditions are low in order to deter more severe reductions in the future;

• Promoting the ecological health of the Colorado River Delta;
• Extending humanitarian measures from a 2010 agreement, Minute 318, to allow Mexico to defer delivery of a portion of its Colorado River allotment while it continues to make repairs to earthquake-damaged infrastructure;

• Establishing a program of Intentionally Created Mexican Allocation (ICMA) whereby Mexico could temporarily reduce its order of Colorado River water, allowing that water to be delivered to Mexico in the future;

• Establishes a pilot exchange program under which U.S. entities assist in funding water infrastructure and environmental projects in Mexico. These investments provide water benefits to the U.S. agencies in exchange for their funding and generate water for Mexico.
Partnerships and Many Meetings

Seven Basin States

U.S. Department of the Interior

U.S. Department of State

U.S. Bureau of Reclamation

International Boundary and Water Commission, U.S. and Mexico
Glen Canyon Dam Adaptive Management Program
Watershed Conflicts -- Stakeholder Cooperation
Legal/Policy Background

- 1963 Glen Canyon Dam completed
- 1970s Initial concern over dam effects
- 1989 EIS initiated on operation of GCD
- 1992 Grand Canyon Protection Act
- 1995 EIS completed
- 1994 FWS Biological Opinion
- 1996 ROD signed
- 1997 AMWG chartered
Resource Conflicts Below
Glen Canyon Dam

1952
Fine Sediment and Beaches

1995
Biological Opinion on the Operation of Glen Canyon Dam

Fish and Wildlife Service

1994

Humpback chub

Razorback sucker

Endangered Species
Expected outcome of ROD operations

- No change to Compact water deliveries
- Minimum reduction of power benefits to achieve ecosystem goals
- Benefit native and endangered species
- Positive sand storage and improved physical habitat
- Protection of tribal cultural resources
- Improve aquatic and terrestrial resources
- Recreation – increased safety and improved experience
Did everyone agree? No

- 9 alternatives considered in the EIS
- Ranged from maximizing hydropower to seasonally adjusted steady flows
- FWS issued jeopardy Biological Opinion
- Stalemate and deadlock
- Compromise: **Adaptive Management**
Adaptive Management Process

1. Assess Problem
2. Design Management Plan
3. Implement Plan
4. Evaluate
5. Monitor
6. Adjust
7. Stakeholder Input
Structure of the GCDAMP

Secretary of the Interior

Desigee

Adaptive Management Work Group

Technical Work Group

GCMRC

Independent Review Panel(s)
AMP stakeholders

- **5 DOI agencies** (USBR, USGS, FWS, NPS, BIA) and DOE (WAPA)
- **7 Colorado River Basin States** (WY, CO, UT, NM, AZ, NV, CA) and AZ Game and Fish
- **5 Indian tribes** (Hopi, Paiute, Hualapai, Navajo, Zuni)
- **2 Power user groups** (CREDA and UAMPS)
- **2 Recreation groups** (Grand Canyon River Guides and Federation of Flyfishers)
- **2 Environmental groups** (Grand Canyon Trust and Grand Canyon Wildlands Council)
Adaptive Management Results

- Knowledge improvement
- Resource status
- Stakeholder cooperation
Knowledge improvement

• Science institution in USGS
• Competitive awarding of contracts (peer review)
• Development of conceptual models
• Careful consideration of Adaptive Management program protocols
  – How should managers and scientists interact?
  – How should recommendations or decisions be made?
  – External protocol evaluation panels
  – Oversight from Science Advisors
Example -- High Flow Test
Status of selected resources

• Water compact requirements continue to be met
• Greater aquatic productivity in the Lees Ferry reach
• Increased Lees Ferry rainbow trout and more trout throughout the Grand Canyon
• Increasing population of endangered humpback chub
• Temporary beach-building followed by ongoing erosion of sediment resources and cultural resource sites
Stakeholder Cooperation

• Disparate interests and values remain, but willing to engage, discuss and plan
• Major experiments agreed to and recommended to Secretary of the Interior
• Willingness to look beyond dam operations for resource protection
• Development of comprehensive plan for humpback chub recovery actions
Drought in California

**January 2014**, Governor Jerry Brown **proclaimed a Drought State of Emergency**

- March 2014, Governor Brown signed into law:
  - **$687M** drought-relief package to deal with water shortage
  - **$549M** from accelerated spending of bond money voters previously approved in ballot propositions
Additional Budget for Drought Relief

- Governor Brown directed Department of Water Resources to expedite the solicitation and award of $200 million in IRWM (Integrated Regional Water Management)
Proposition 84

- Proposition 84 – “Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006” passed by California voters on November 7, 2006

- The IRWM Grant Program is designed to encourage integrated regional strategies for management of water resources and to provide funding for implementation projects that support integrated water management.
Integrated Regional Water Management

IRWM funding will support projects and programs that:

• Provide immediate regional drought preparedness,

• Increase local water supply reliability and the delivery of safe drinking water,

• Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective, and

• Reduce water quality conflicts or ecosystem conflicts created by the drought.
Allocations to IWRM Areas
Integrated Water Management - Conclusion

- Stakeholder Cooperation
- Long-Term Commitment to Process
- Willingness to Look Beyond Your Own Agenda
- Willingness to Look at Other’s Point of View
Thank you.