

Wyoming's Colorado River Basin



**Demand Management Feasibility Investigation
Stakeholder Meeting, Rock Springs
Sept 9, 2019**

Discussion planning team

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Introduction

Goal of 16-month process:

- Investigate Demand Management (DM)
- Build joint understanding of trade-offs of DM

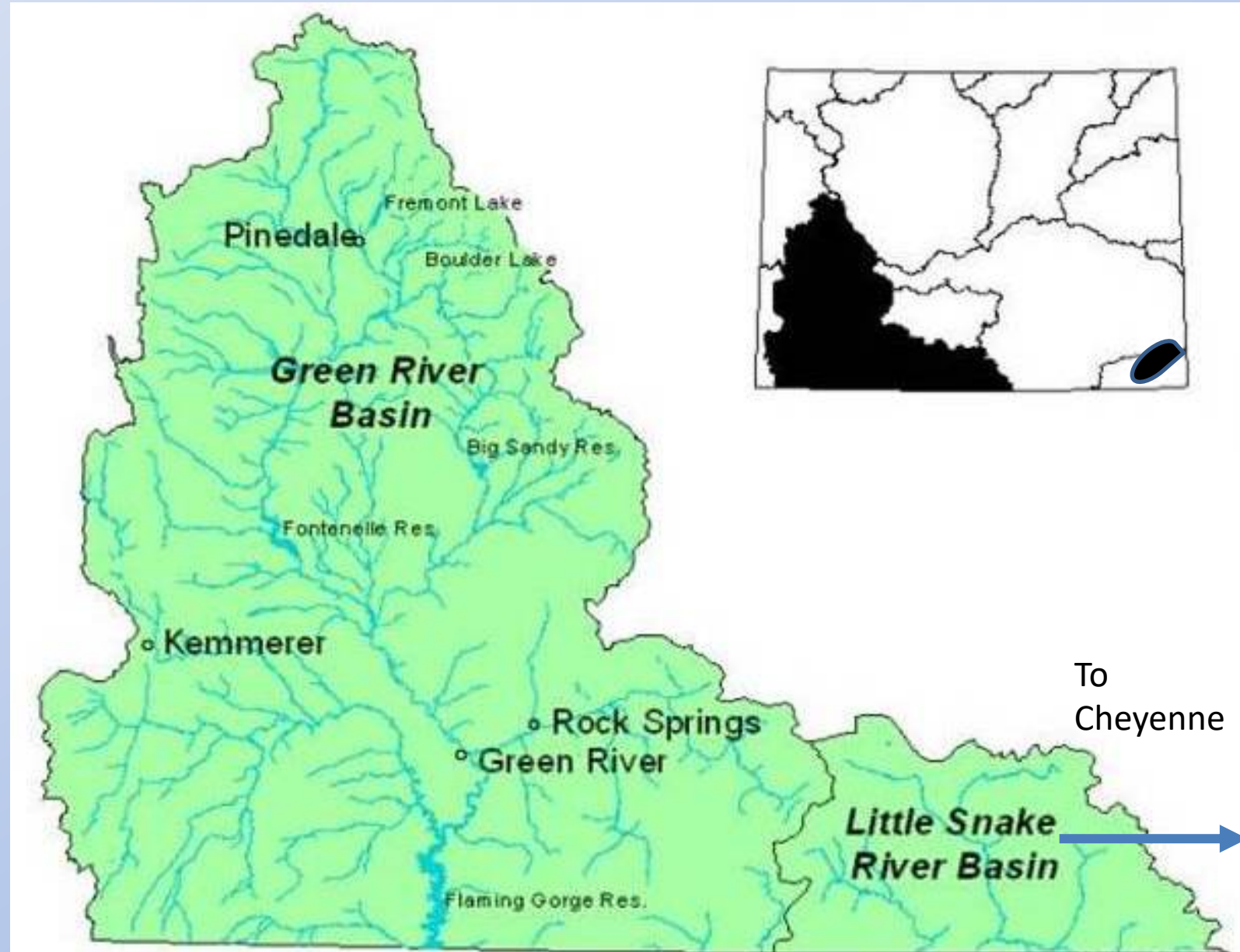
Goal for today:

- Background information
- Present process
- Discuss what, who, how of 16-month process
 - What are key issues to investigate re DM
 - What more info needed and how to get it
 - Who needs to be involved in discussion process

Wyoming's Colorado River Basin: Water and People

Colorado River in Wyoming

In Wyoming, the Colorado River Basin covers about 17,000 square miles, including the areas drained by the Little Snake and Green Rivers, and the City of Cheyenne, using Colorado River water by trans-basin diversion from the Little Snake Basin.



Wyoming as part of the entire Colorado River System:

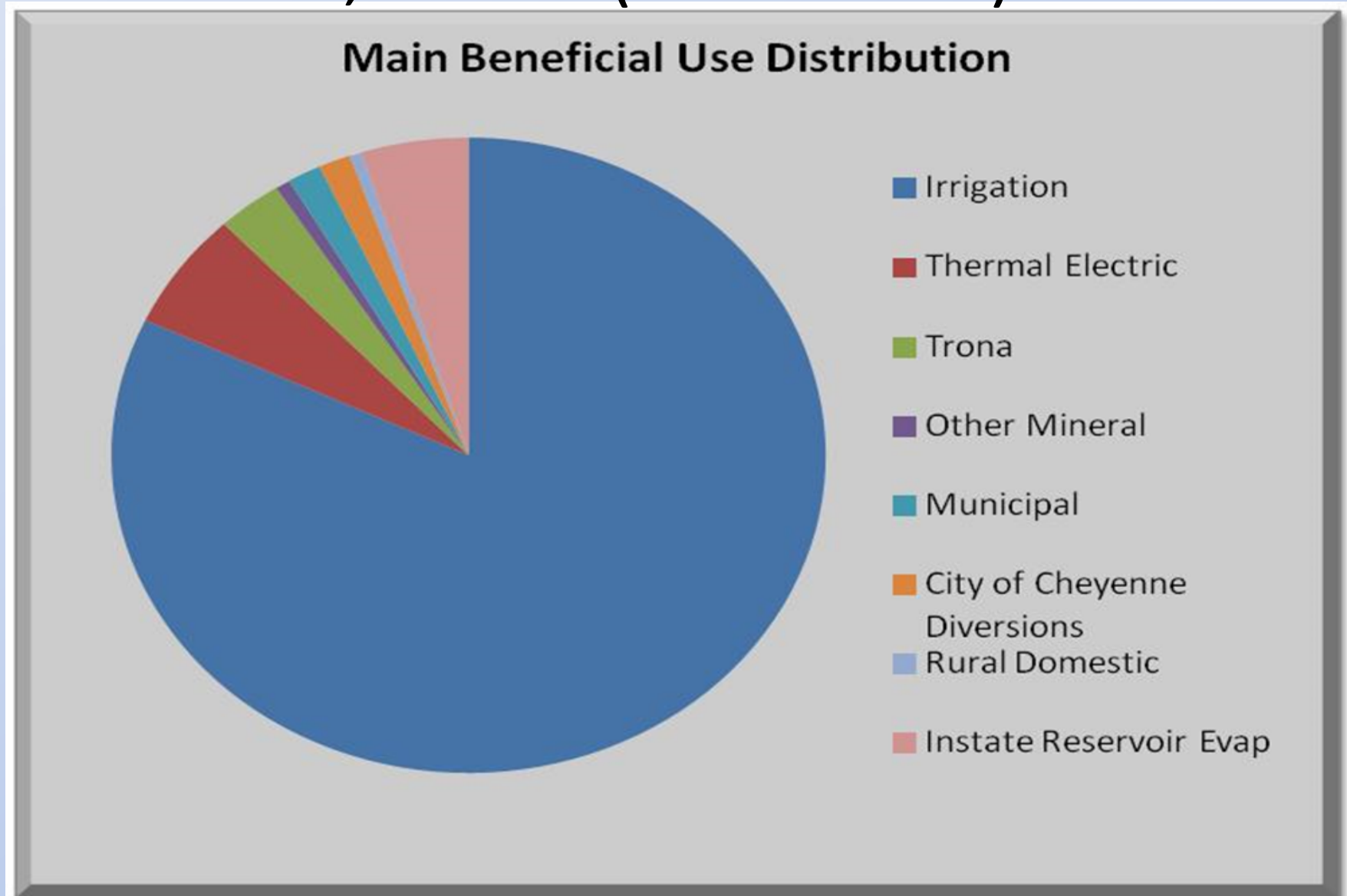
- ❖ Entire CO River Basin covers nearly 250,000 Square Miles.
- ❖ Provides water to seven U.S. States and two Mexican States.
- ❖ Supplies water to 40 million people and 5.5 million acres of irrigated lands.
- ❖ Served area has economic value of approx. \$1.4 trillion annually.
- ❖ Capacity to store four years of average annual flow.



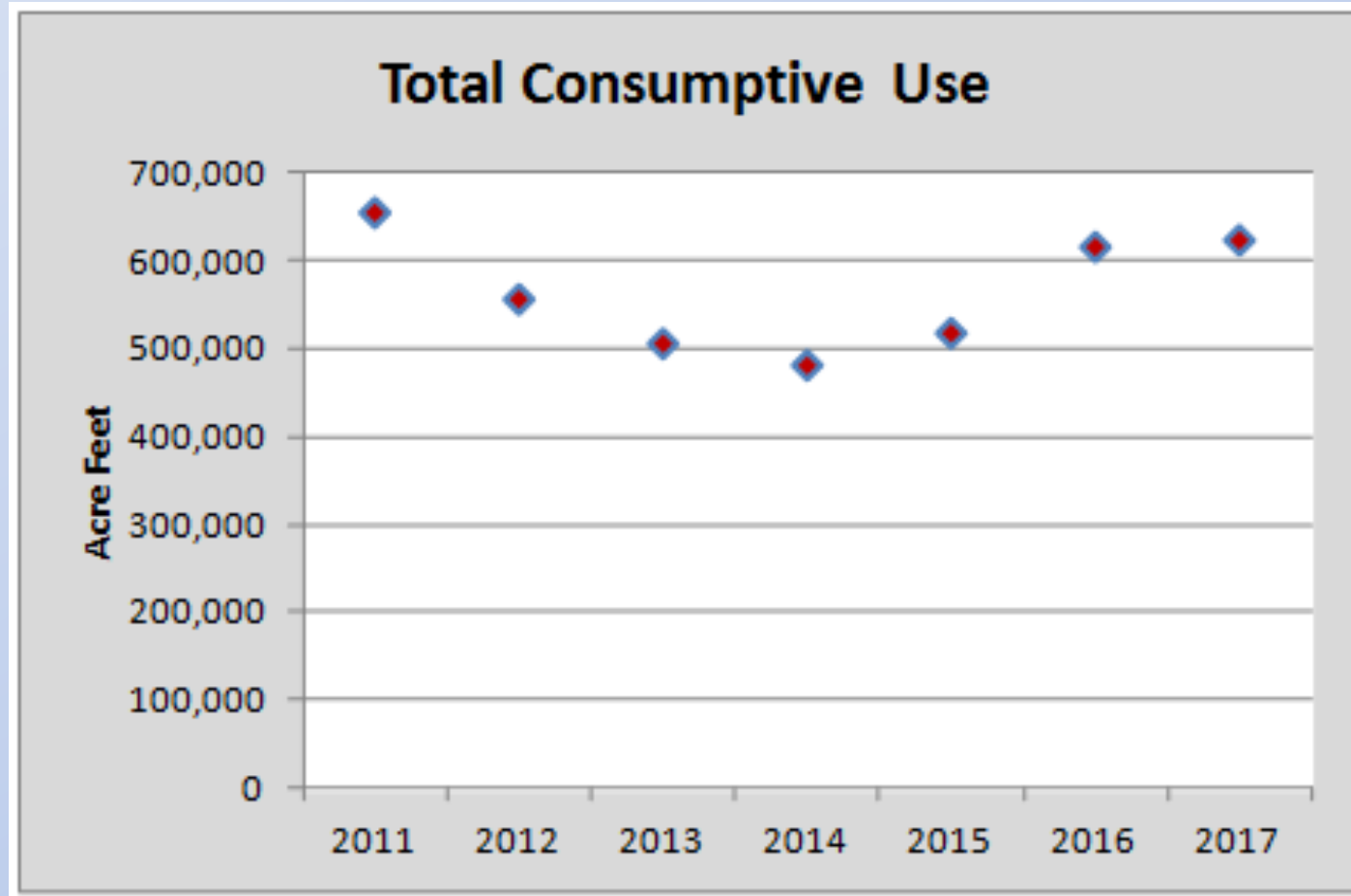
Colorado River Basin
includes areas outside
of the Basin
beneficially served by
System water:
Cheyenne, Salt Lake
City, Denver &
Colorado Springs,
Albuquerque and
NM Rio Grande
valley, Los Angeles &
San Diego, Imperial
& Coachella Valleys
etc.



Wyoming's annual average beneficial consumptive use: 564,645 af (2011-2017)



But there is great variability in Wyoming's water use





“Law of the River” The Basics

“Law of the River”

- ❖ A large body of existing law affecting the interstate and international use, management, and allocation of water in the Colorado River System.
 - ✓ Interstate Compacts: Contracts, State Statutes, and Federal Statutes
 - ✓ International Treaty with Mexico
 - ✓ United States Supreme Court Decisions
 - ✓ Acts of Congress
 - ✓ Federal Regulations and Decisions

For the last 100 years and more, Wyoming and the other states along the river
have assessed and juggled the challenges and worked together

Creating THE BIG THREE:

1922 1944 1948

Colorado River Mexico Upper
Compact Water Treaty Colorado River Basin Compact



And a lot more...

1928
Boulder Canyon
Project Act:
Hoover Dam,
Lake Mead

1956
CRSPA:
Lake Powell,
Flaming Gorge
Fontenelle,
Etc.

adapting to change

1964
Arizona v.
California
Decree:
Lower Basin
Apportionments

1968
CRBPA
Central AZ
Project:
Ties Lakes
Powell and Mead
Together



2007 Interim Guidelines

2019 Drought
Contingency Plans

on the river that ties them all together

Wyoming has always played a major role in creating the Law of the River



Governor & former
State Engineer Frank
Emerson and BuRec
chief and former State
Engineer Elwood Mead
1920s (WY State Archives)

Pat Tyrrell &
Dan Budd
2000s
(WY SEO)



The Big Three

❖ Colorado River Compact, 1922

- ✓ Apportions beneficial consumptive use between the Upper Basin and the Lower Basin.

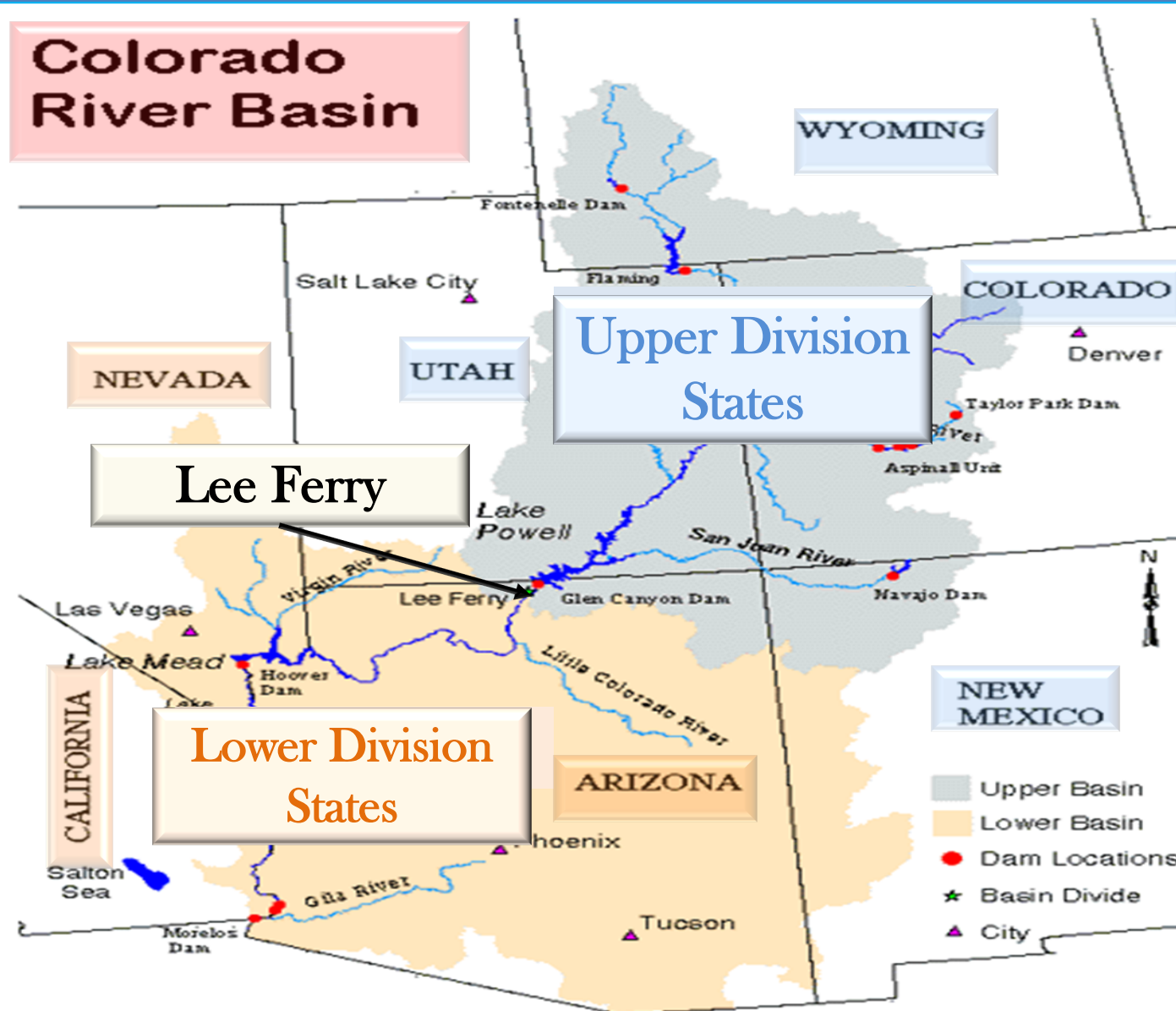
❖ Mexican Water Treaty, 1944

- ✓ Allocates Mexico a *“guaranteed annual quantity”* of 1.5 MAF

❖ The Upper Colorado River Basin Compact, 1948

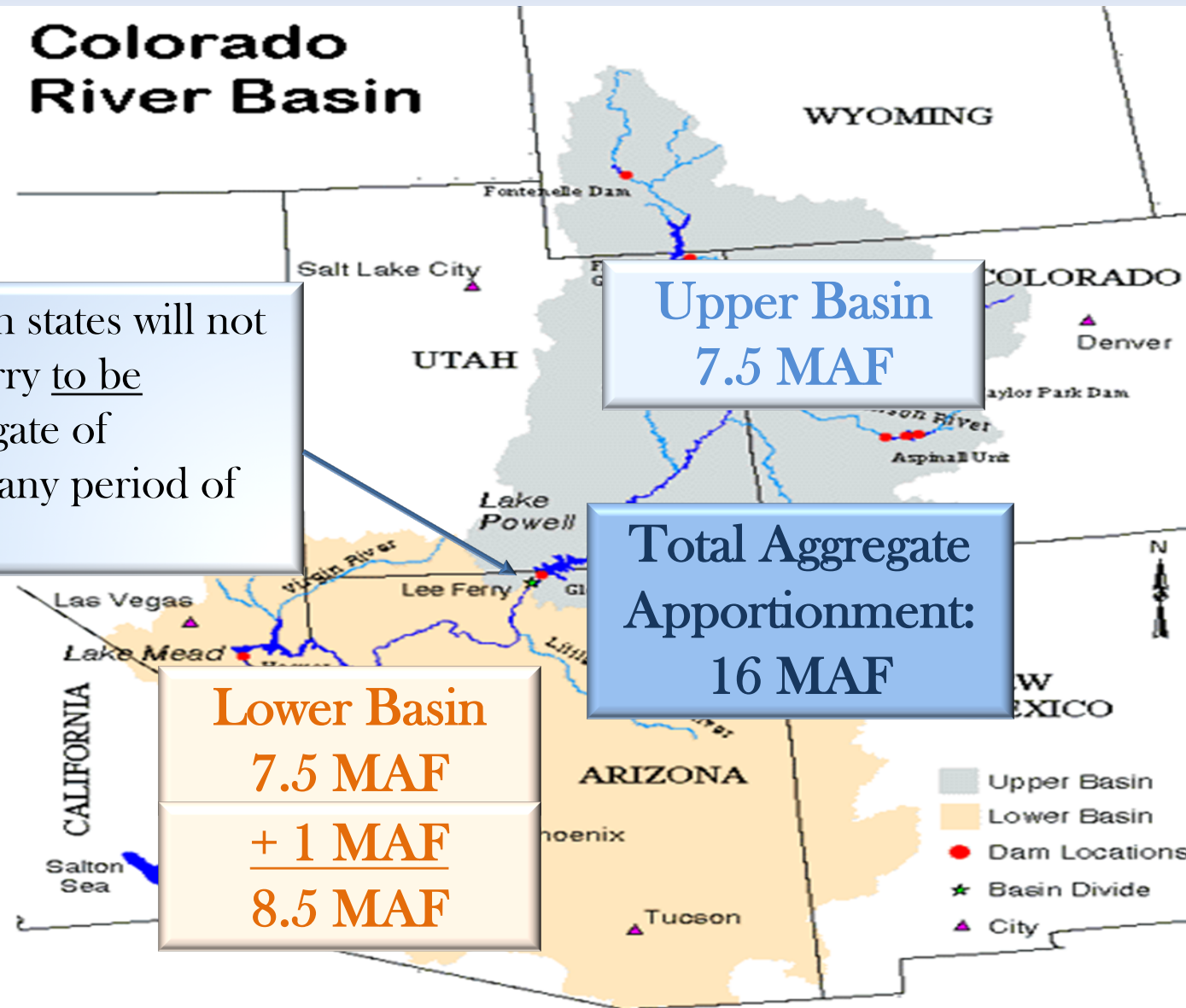
- ✓ Apportions beneficial consumptive use among the Upper Division States.

1922 Compact Divides the River



The 1922 Compact does not apportion water, it apportions the “exclusive beneficial consumptive use” of water.

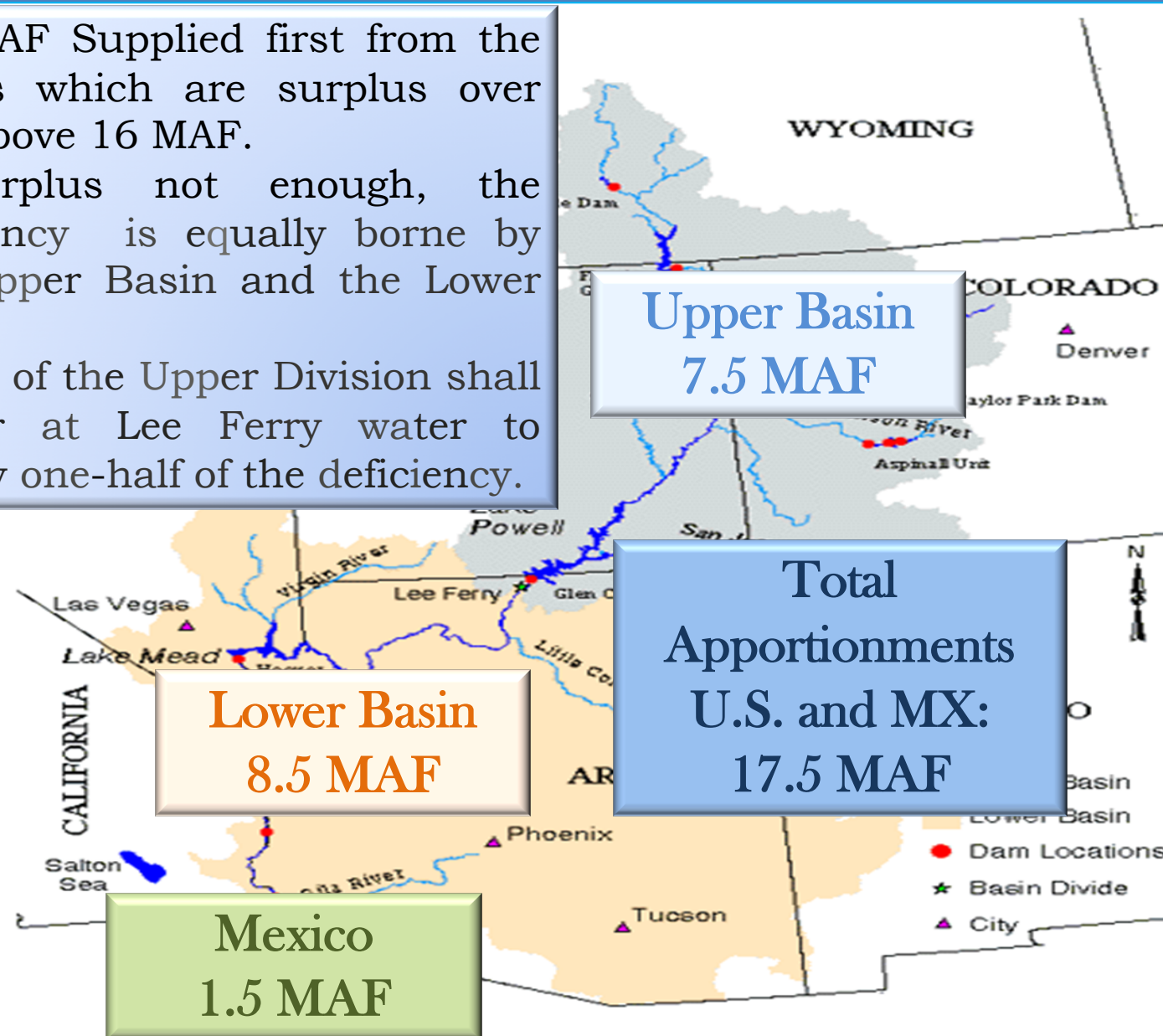
Colorado River Basin



Art. III (d) - Upper Basin states will not cause the flow at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years.

Treaty with Mexico, 1944

- ✓ 1.5 MAF Supplied first from the waters which are surplus over and above 16 MAF.
- ✓ If surplus not enough, the deficiency is equally borne by the Upper Basin and the Lower Basin.
- ✓ States of the Upper Division shall deliver at Lee Ferry water to supply one-half of the deficiency.



Upper Colorado River Basin Compact of 1948



- ❖ Divides the Upper Basin's allocation between Arizona, Colorado, Utah, New Mexico, and Wyoming.
 - ✓ Apportions beneficial consumptive use of water.
- ❖ Establishes requirements for each Upper Division State with respect to the obligation not to deplete flows of water at Lee Ferry under Colorado River Compact.
- ❖ Makes provisions for possible curtailment of use of Colorado River water.
 - ✓ Rights perfected before the Colorado River Compact are excluded
- ❖ Establishes the *Upper Colorado River Commission*.

Upper Colorado River Commission



- ❖ One commissioner from each of the Upper Division states and one commissioner representing the United States. Arizona is not represented.
- ❖ Curtailment: “In the event curtailment of use shall become necessary to not deplete the flow at Lee Ferry below that required by Art. III of the Colorado River Compact, the extent of curtailment by each state shall be determined in such amounts and at such times as determined by the UCRC.” (1948 Compact, Article IV).
- ❖ UCRC does NOT have authority to determine how curtailment will be implemented within an individual state. The State Engineer is responsible for implementing curtailment within Wyoming to maintain compact compliance: Priority regulation.

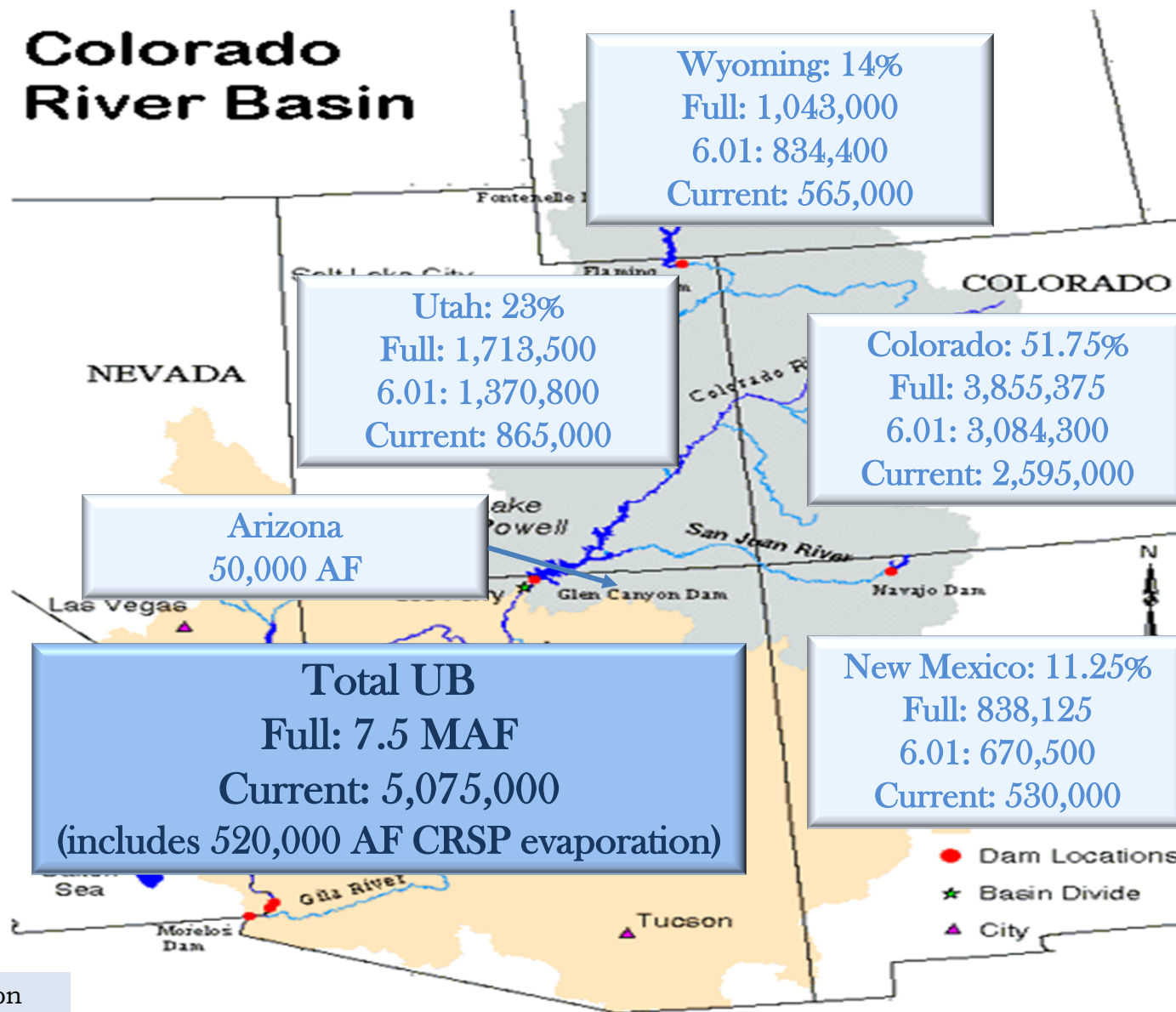
The 1948 Compact Apportions the Upper Basin's Beneficial Consumptive Use

Arizona gets 50,000 AF annually, and the other Upper Basin States get to consumptively use a percentage of water available.

Upper Colorado River Basin Compact Apportionment of Full Supply (7.5 MAF) and of Available Consumptive Use Identified in 2007 Hydrologic Determination (at least 6.01 MAF)			
State	Percentage	Share of 7.5 MAF (full supply)	Share of 6.01 MAF (5.96 MAF after AZ)
Colorado	51.75	3,850,000	3,570,000
New Mexico	11.25	838,000	780,000
Utah	23	1,713,500	1,370,800
Wyoming	14	1,043,000	834,400
Total	100	7,450,000	5,960,000

Wyoming's current
estimated-average use:
565,000 acre feet.

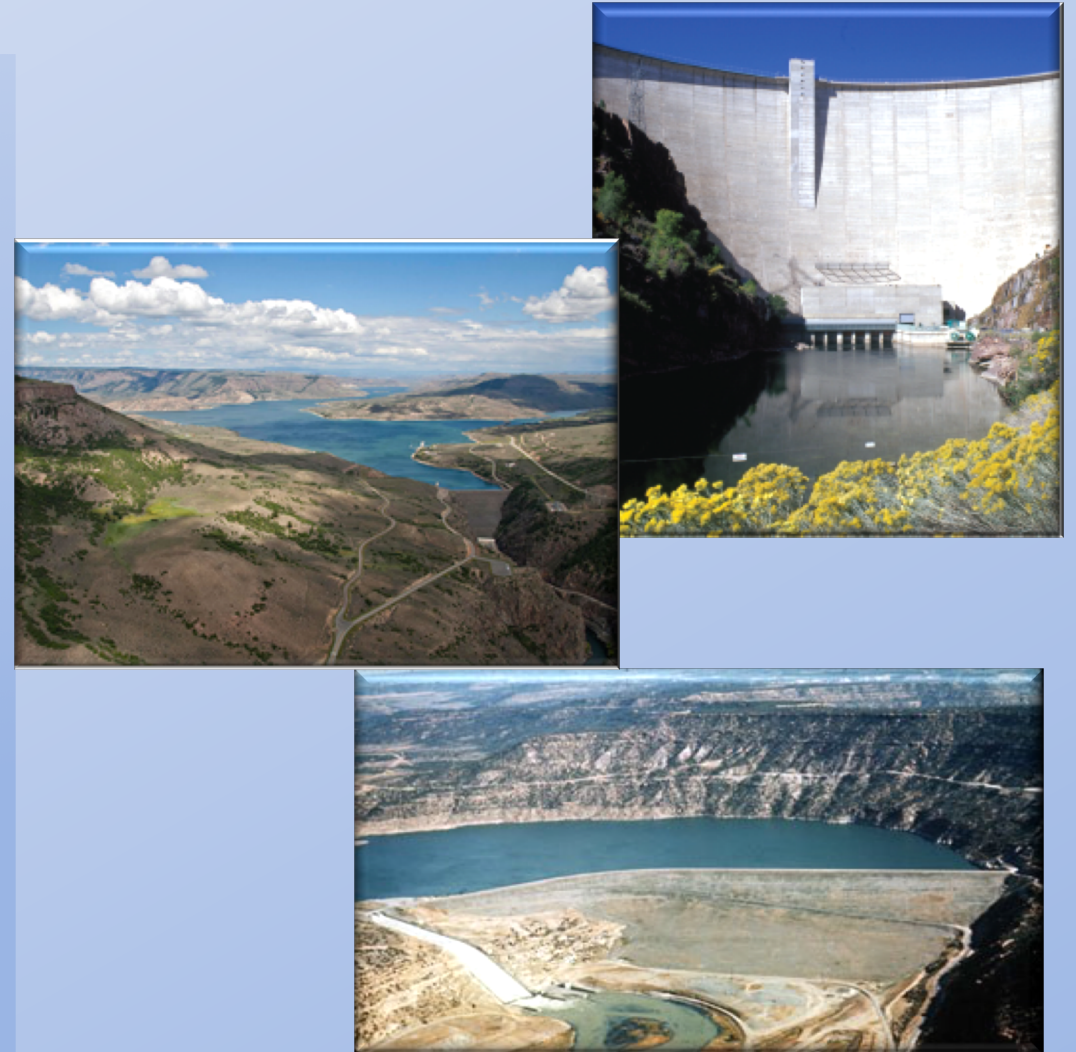
Upper Basin Apportionment



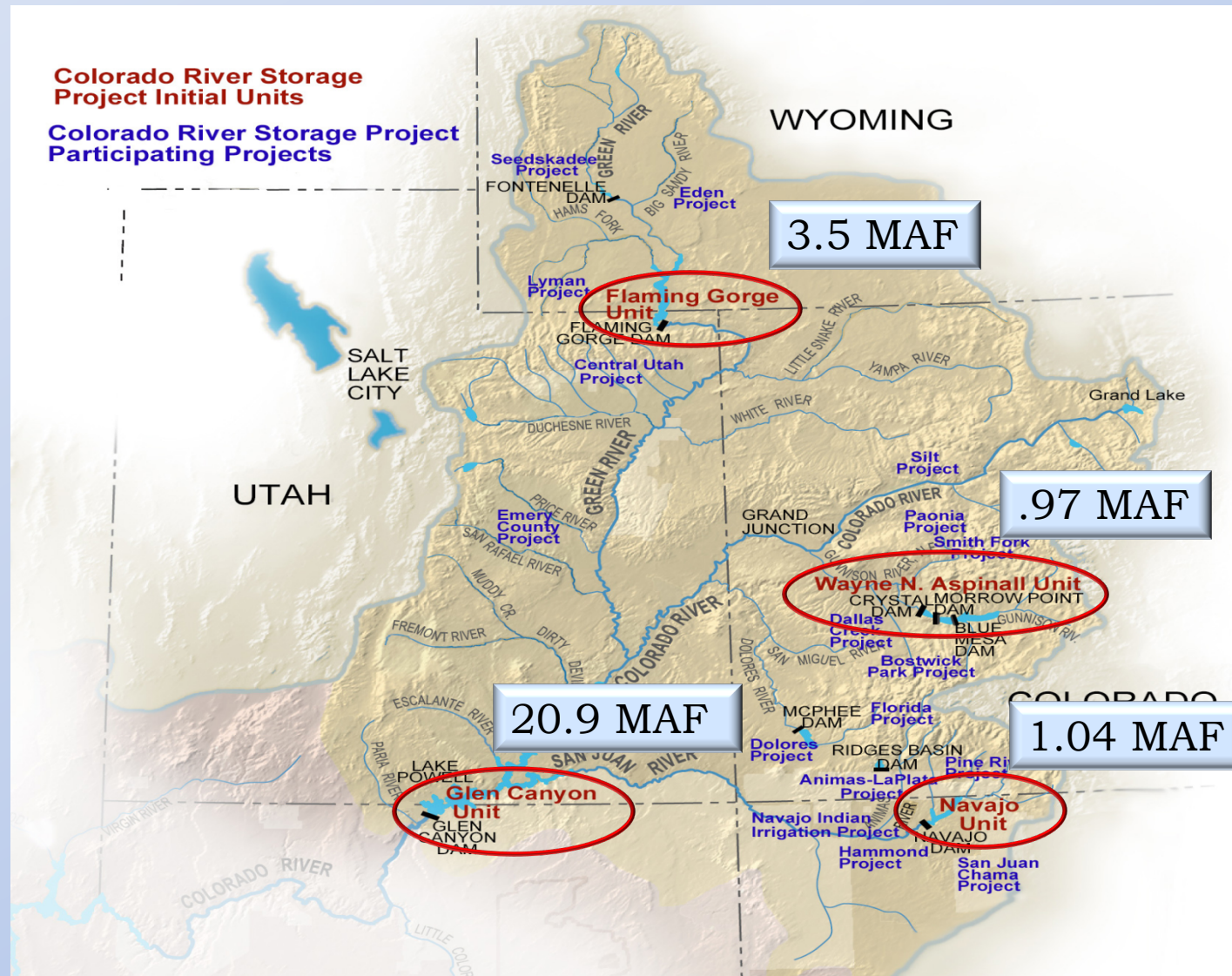
For consistency, current use based upon the December 31, 2016, Current and Future Depletion Demand Schedule.

Colorado River Storage Project Act of 1956 (CRSP)

- ❖ Provides storage to the Upper Basin and promotes Upper Basin development of its Colorado River allocation. Insurance for compact compliance reduces risk of curtailment.
- ❖ Authorized construction of the Initial Units: Glen Canyon Dam, which created Lake Powell, and Aspinall, Flaming Gorge, and Navajo.
- ❖ Authorized a number of other participating projects but not all were built. In Wyoming, Fontenelle (Seedskadee), Eden and Lyman projects built.



CRSP Initial Units



Volumes are Active Capacity

Coordinated Operations



Lake Mead and...

...Lake Powell.



Lake Powell and Lake Mead Tied Together

❖ First tied together by the 1968 Basin Project Act:

- ✓ Resulted in an objective minimum release from Lake Powell of 8.23 MAF per year.
- ✓ Established 602(a) Storage: A balance between meeting the Upper Basin's 1922 Compact obligations without impairing Upper Basin uses. This is the Upper Basin's savings account to get through dry times.
- ✓ If there is more than the required 602(a) storage in Lake Powell, the reservoirs are equalized, which last happened in 2011 with a 12.52 MAF release.

❖ Operations are currently controlled by the 2007 Interim Guidelines:

- ✓ Releases from Lake Powell are generally controlled by the reservoir elevations in both reservoirs. Designed to avoid UB curtailment as well as reduce impact of LB shortages.
- ✓ Generally, releases from Lake Powell are greater if Lake Powell elevation is higher and Lake Mead is lower, and smaller releases if it is not. Release can be as low as 7 MAF per year.

COMPACTS, AGREEMENTS
AND ANY POSSIBLE
FUTURE PROGRAMS ARE

CONNECTED

Rights to Colorado
River Water and
Compact
Compliance
(under variable
water supplies)

Colorado River Compact (1922 - Perpetuity)

- Divides watershed into UB and LB
- 7.5 MAF CU apportioned to UB & LB each
- Requires UB to not cause the flow to be depleted at Lee Ferry below 75 MAF over ten year rolling average

Upper Colorado River Basin Compact (1948 - Perpetuity)

- Wyoming apportioned 14% of UB consumptive use
- Tasks the UCRC with determining volume of water each UB state must provide to comply with 75 MAF over 10 year rolling average

Interim Guidelines (2007 - 2026)

- Requires LB to take shortages
- Coordinates reservoir operations to stabilize system
- Secures UB right to release less from LP
- Avoids protracted litigation
- Will be re-negotiated by 2026

Drought Contingency Plans for the Lower & Upper Basins (2019 - 2026)

- TEMPORARY plans to help prevent system crash if drought worsens
- Allows states to control own destiny
- Helps assure 07 IGs can operate until 2026
- Avoids litigation
- Provides opportunity to identify best tools to continue UB compact compliance

Upper Basin Demand Management Program (?)

- One potential tool made possible under UB DCP **IF DEEMED FEASIBLE**
- Only advances if each UB State agrees to terms and conditions



Demand Management Feasibility Investigation

Upper Basin Demand Management

- ❖ Be proactive in addressing variable hydrologic conditions in the basin.
- ❖ Assess methods to protect Wyoming water users from “hard” regulation in times of severe drought or basin curtailment.
- ❖ Protect against Lake Powell reaching critical elevations.
- ❖ Assure full compliance by the Upper Division states with the Colorado River Compact without impairing existing water rights.
- ❖ The UCRC has facilitated the System Conservation Pilot Program in the Upper Basin to inform the demand management element of its drought contingency plan (2013-2018); NOT a model for DM.



Considering Demand Management:

Any program must be:

- Temporary

- Voluntary

- Compensated

Standards agreed upon by the Upper Basin States

Demand Management

- ❖ Lots of issues exist –
 - ✓ Consistency with water law
 - ✓ protecting existing water rights
 - ✓ feasibility
 - ✓ accounting
 - ✓ management and administration
 - ✓ interest
 - ✓ shepherding
 - ✓ funding
 - ✓ economic
 - ✓ environmental

All need to be investigated before determining if demand management is viable.

Demand Management Storage Agreement

- ❖ Water conserved under a DM program can be stored in the CRSP Initial Units, without charge, for compact compliance purposes
 - ✓ This authorization does not expire.
- ❖ Agreement on how the Upper Basin can access and use that storage before 2026 under a Demand Management Program
- ❖ Agreement does NOT establish an Upper Basin Demand Management Program.
 - ❖ If, after study, the UCRC determines that a Demand Management Program is feasible—as agreed to **independently** by each of the Upper Division States—then it may develop and implement a program.

Demand Management Storage Agreement – Min. Requirements

Feasibility

- Verification and Accounting
- Shepherding
- Storage and Release
- Funding
- Compliance with Law



Develop DM Program

- Minimum requirements for
 - Water Conservation
 - Storage
 - Release



Agreement with SOI

- UCRC/SOI agreements on water conveyed to and stored at Initial Units
- Pre-req - Consultation with Lower Basin



Approvals

- UCRC Finding of Need for DM
- Commission Approval
- State Approval

Demand Management Storage Agreement

- ❖ Demand Management water stored prior to 2026:
 - ✓ Will not be subject to release from Lake Powell through 2057 except upon the request of the UCRC for compact compliance purposes;
 - ✓ Cannot cause a different release than would otherwise occur under operational rules;
 - ✓ The water would have been consumptively used but for conservation as part of a demand management program—not unused apportionment;
 - ✓ Maximum combined storage limitation of 500,000 acre feet;
 - ✓ Subject to proportionate share of evaporation;
 - ✓ Reduced by physical spill from Glen Canyon Dam; and
 - ✓ Subject to annual verification and reporting.

- ❖ After 2026, any demand management storage program would be informed by and considered as part of the renegotiation of the 2007 Interim Guidelines (set to begin in 2020).

Demand Management: Interstate Efforts & Coordination

❖ Next Steps

- ✓ UCRC Demand Management Committee: Investigating these issues at an Upper Basin level.
 - Releasing an RFP in October for bids to investigate legal, technical, economic and stakeholder outreach issues. Work not expected to be completed until 2022.
- ✓ States each conducting feasibility investigations and considering issues unique to them. This is what we are beginning here today in Wyoming.
- ✓ Ongoing coordination between interstate partners, UCRC.

Sideboards:

- No change to Colorado River and Upper Colorado River Compacts
- Wyoming Statutes Title 41 (water law)
- Demand Management Storage Agreement
- All 4 Upper Basin states must accept each other's
Demand Management Program
to create an overall UB Demand Management Program

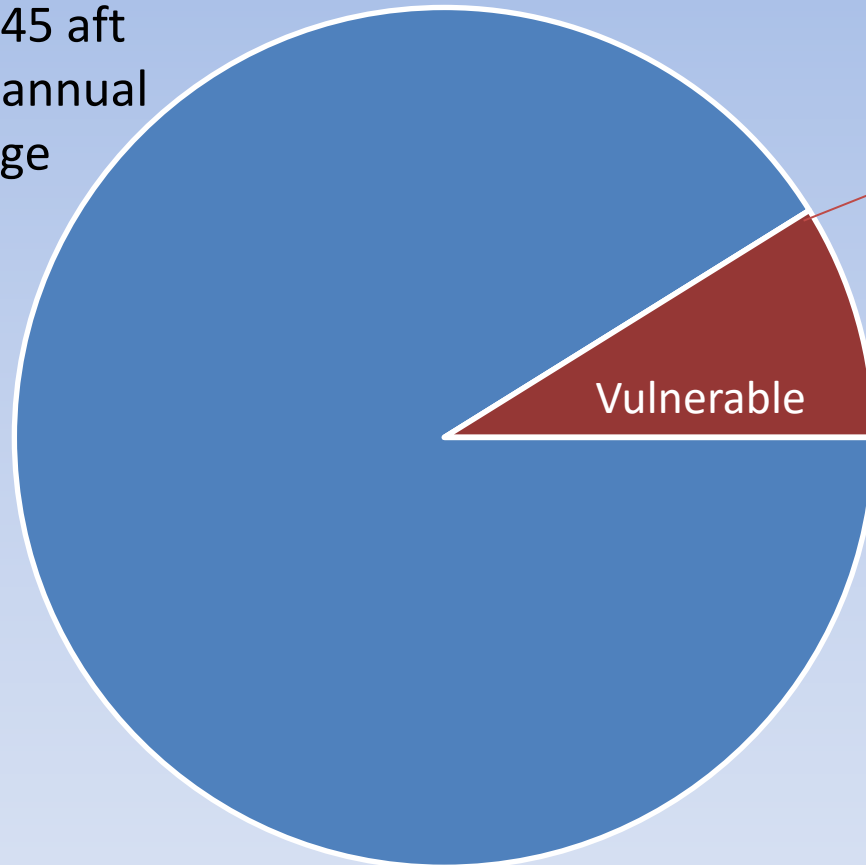
Some Wyoming Tools to Consider in Curtailment Mitigation

- ❖ Permanent Transfers: Change in use and change in place of use. Petitions to the Board of Control. Wyo. Stat. § 41-3-104.
- ❖ Temporary Water Use Agreements: Wyo. Stat. § 41-3-110.
 - ✓ For Temporary Purposes; No injury to other rights; Underlying right protected. Applications to the State Engineer.
- ❖ Water Exchanges: Wyo. Stat. § 41-3-106.
 - ✓ When the source for an existing right is insufficient, or better conservation and use of the state's water. Petitions to the State Engineer.
- ❖ Storage generally: Wyo. Stat. § 41-3-302, -303.
 - ✓ Use of the stored water under such terms as parties may agree, unless secondary permits exist.

Wyoming considerations

Wyoming CRB Average Annual BU and Estimated Vulnerability to Drought/Curtailment

564,645 aft
Total annual
average
BU

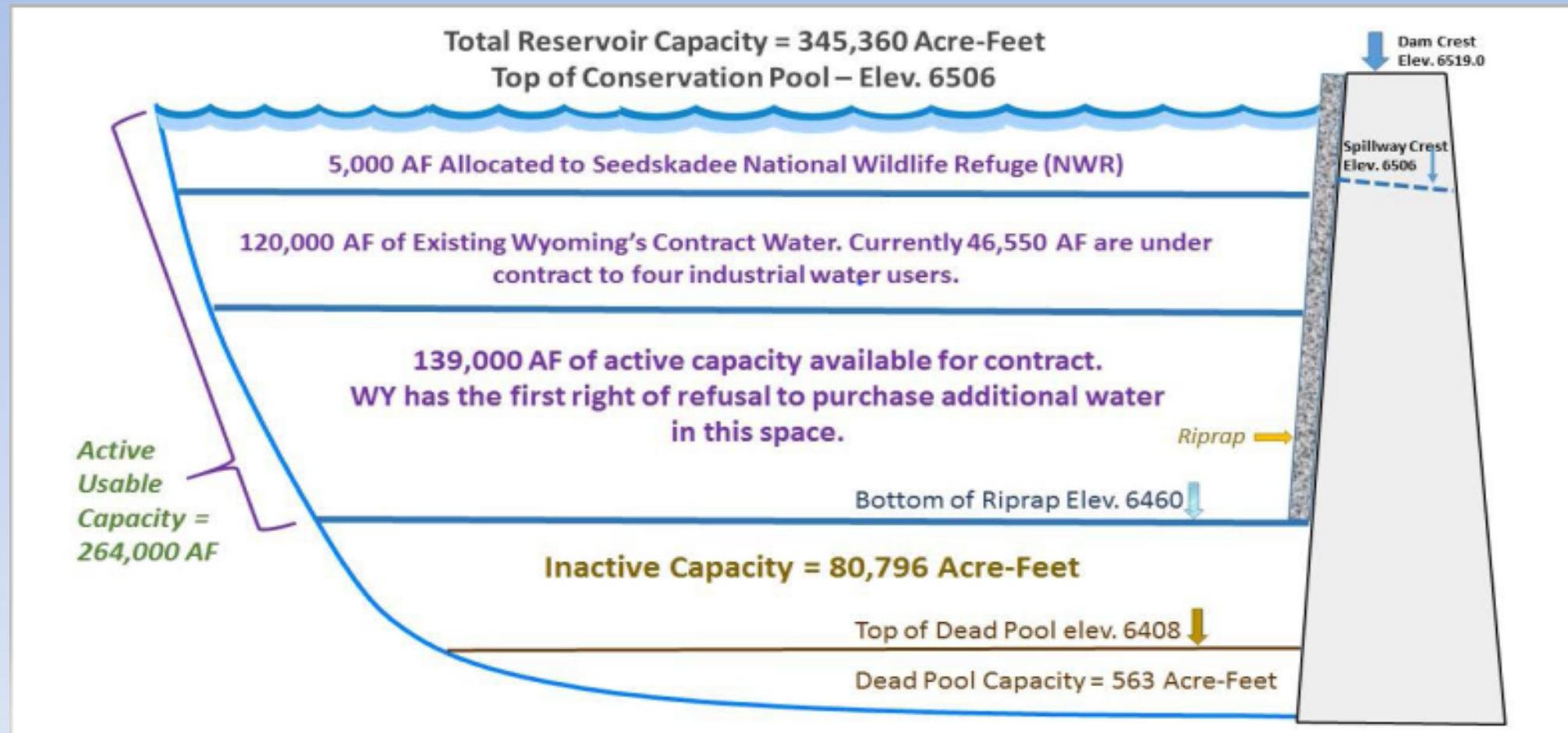


Power plants
Trona plants
City of Cheyenne
Basin cities &
towns

Ag –
2nd ft; no Free
River

■ Pre-compact BCU ■ Post-compact BCU

Fontenelle Reservoir



Related Investigations

Economic Assessment

What are the **regional economic impacts** of a potential demand management program encouraging temporary, voluntary, and compensated water conservation practices on irrigated ranchlands in the Wyoming portion of the Colorado River Basin?

Irrigators who reduce water use would be directly compensated in a potential DM program, but what would be the secondary and indirect impacts in the community on jobs and income resulting from reducing hay production in the region?

For example,

Costs: Reduced input purchases, harvest-related employment

Benefits: Payments may be spent locally (or not)

Survey to be sent to all irrigators in the Green and Little Snake in October.

Ecological and Economic Tradeoffs of a DM Program

(MS Thesis Project, Ellen Yeatman)

A DM program would generate consumptive use savings but could change the pattern and timing of flows and return flows. What would be the impact **on the landscape** of a voluntary, compensated, rotational program?

The study highlights data shortcomings/data needs regarding return flow patterns, habitat response to return flow patterns.

Demand Management Investigation Process

Wyoming Colorado River Basin discussions now through December 2020

What are the tradeoffs for Wyoming
In taking on
a Demand Management Program?

Could Demand Management be useful
to support the economy and people
of the Green and Little Snake River basins
in a time of dwindling water supply?



Sue Sommers

“Law of the River” Lower Basin

Boulder Canyon Project Act (1928)

- ❖ After California agreed to limit itself to 4.4 MAF, the Act congressionally approved the 1922 Compact effective upon ratification by California and the other five states.
- ❖ Authorized Boulder (Hoover) Dam and the All-American Canal.
- ❖ Suggested division of the Lower Basin's 7.5 MAF:
 - ✓ .3 MAF to Nevada
 - ✓ 2.8 MAF to Arizona
 - ✓ 4.4 MAF to California
- ❖ Established statutory scheme for Secretary of Interior to contract for storage and delivery of water from Hoover Dam, establishing Secretary as *Water Master* in Lower Basin.

Boulder Canyon Project Act (1928)

The 1922 Compact paved the way for storage in the Lower Basin.

- ✓ Congress authorized Hoover Dam which created Lake Mead
- ✓ Lake Mead sits above most Lower Basin water users
- ✓ Mainstream users must get water through a contract with Reclamation
- ✓ The Secretary of the Interior is the water master in the Lower Basin



Boulder Canyon Project Act (1928)

All American Canal



Imperial Dam; The All-American Canal serves the Imperial and Coachella Valleys in southern California and the Yuma Project in California and Arizona. The canal has a design capacity of 15,155 cubic feet per second.

Arizona v. California (1963)

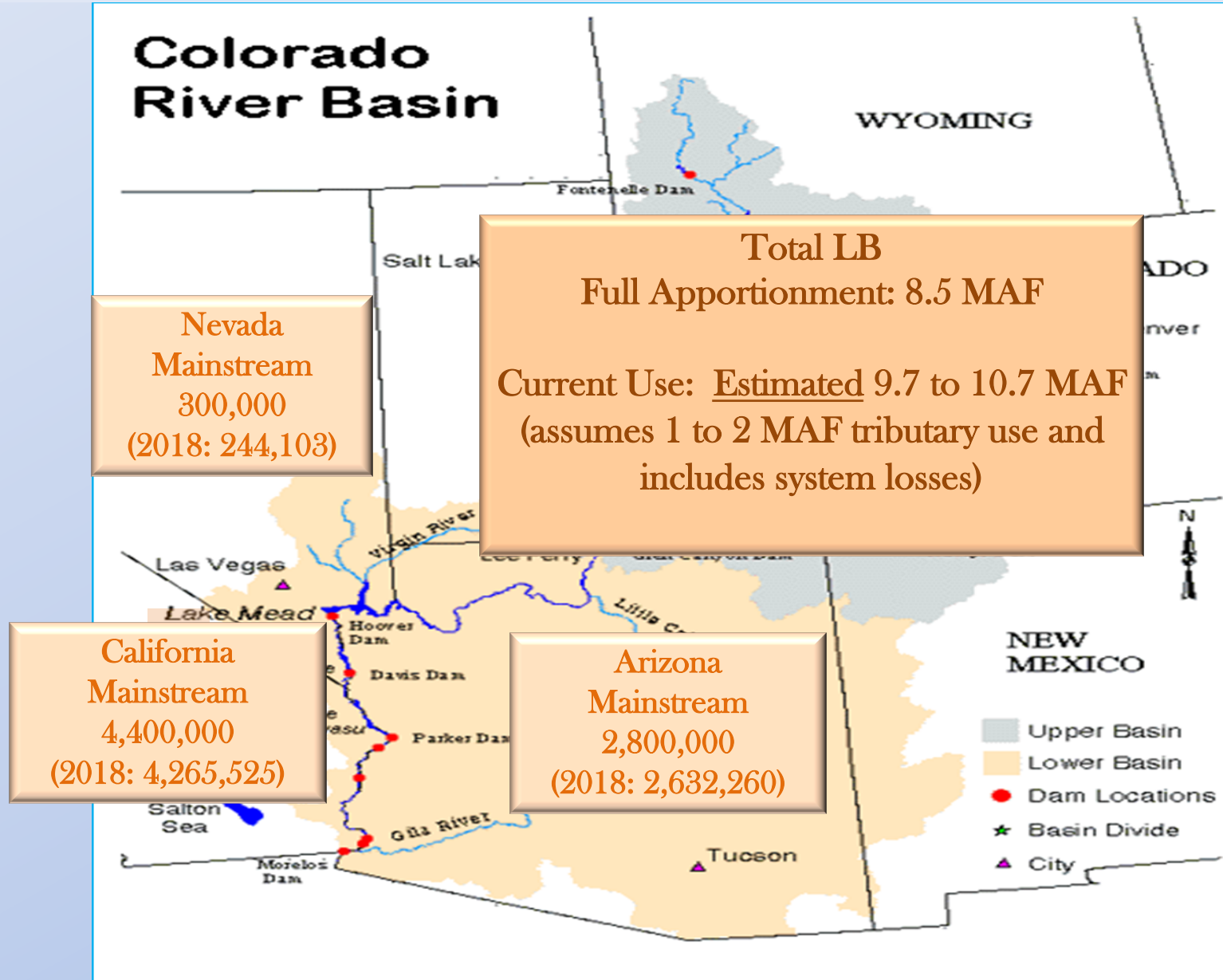
- ❖ Settled the allocation of the Lower Basin's **7.5 MAF** apportionment.
- ❖ The Court's decision was based on an interpretation of the Boulder Canyon Project Act, *and not* an interpretation of:
 - ✓ The Colorado River Compact,
 - ✓ The law of prior appropriation, or
 - ✓ The doctrine of equitable apportionment (used by Courts in the absence of statute to resolve interstate water disputes).

Arizona v. California (cont'd)

- ❖ Recognizes Congress's use of Commerce Power to apportion Lower Basin's 7.5 MAF apportionment under Colorado River Compact via the Boulder Canyon Project Act.
 - ✓ California: 4.4 MAF annually
 - ✓ Arizona: 2.8 MAF annually
 - ✓ Nevada: .3 MAF annually
- ❖ Defines *“present perfected rights”* as water rights existing as of June 25, 1929, “acquired in accordance with state law, which right has been exercised by the actual diversion...”

Lower Basin Apportionments

1922 Compact; Boulder Canyon Project Act (1928); AZ V. CA Decree, 1964.



Structural Deficit

Water Budget at Lake Mead

- Inflow (release from Powell + side inflows) = 9.0 maf
- Outflow (AZ, CA, NV, and Mexico delivery + downstream regulation and gains/losses) = - 9.6 maf
- Mead evaporation losses = - 0.6 maf
- Balance = - 1.2 maf

Given basic apportionments in the Lower Basin, the allotment to Mexico, and an 8.23 maf release from Lake Powell, Lake Mead storage declines about 12 feet each year

RECLAMATION

Colorado River Basin Project Act (1968)

❖ Authorized construction of the Central Arizona Project

But also,

❖ Directs the Secretary to authorize storage and releases from Powell, in order of priority:

1. Releases for half of Article III(c) deficiency (MX).
2. Releases for the non-depletion obligation (75/10).
3. Storage of water necessary for clauses (1) and (2) above, *without impairment* to Upper Basin uses (“602(a) storage”).

❖ Once these priorities are satisfied, releases from Powell can be made:

- ❖ Article III(e) as long as Powell fuller than Mead
- ❖ Balance Powell and Mead storage; and
- ❖ To avoid spills.



2007 Interim Guidelines

Lower Basin Shortages and Intentionally Created Surplus

- ❖ Shortages in the Lower Basin: Insufficient mainstream water to satisfy 7.5 MAF LB use.
 - ✓ Based upon Lake Mead elevations: 1,075', 1,050', and 1,025'. The lower the elevation, the greater the shortage.
 - ✓ Only Arizona (up to 480kaf) and Nevada (up to 20kaf) take shortages. California does not take shortages. Mexico has also agreed to take proportional shortages (Minutes 319 & 323).

- ❖ Intentionally Created Surplus (ICS)
 - ✓ Allows LB users to invest in conservation or augmentation and to bank that water in Lake Mead for later use without other LB users claiming the water.
 - ✓ Provides incentive to conserve water because it can be stored: increases flexibility. Intended to promote higher reservoir elevations and avoid shortages.
 - ✓ Most common form is Extraordinary Conservation ICS (EC ICS). Includes projects such as fallowing of land that was historically irrigated and canal lining.
 - ✓ Subject to creation, total storage, and delivery limitations.

Historic Flow at Lee Ferry

Art. III (d) - Upper Basin states will not cause the flow at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years.

Year	Progressive Ten-Year Total	Notes/rank
2018	91.63 MAF	Middle of the road
2010	84.78 MAF	<u>At 82.5 MAF</u> , differences in interpretation of Law of River implicated
1987	131.75 MAF	Highest – following flooding in mid-80s
1972	75.31 MAF	Lowest – during filling of Lake Powell after construction

Upper Basin – Lake Powell

Percent of Traces with Event or System Condition

Results from August 2019 CRSS (using the Full Hydrology)

(values in percent)

Event or System Condition	2020	2021	2022	2023	2024
Equalization Tier (Powell \geq Equalization [EQ] Elevation)	13	26	24	30	27
<i>Equalization – annual release > 8.23 maf</i>	13	26	24	29	26
<i>Equalization – annual release $= 8.23$ maf</i>	0	0	0	<1	<1
Upper Elevation Balancing Tier (Powell $<$ EQ Elevation and $\geq 3,575$ ft)	87	72	59	53	55
<i>Upper Elevation Balancing – annual release > 8.23 maf</i>	3	39	35	36	32
<i>Upper Elevation Balancing – annual release $= 8.23$ maf</i>	84	33	24	17	23
<i>Upper Elevation Balancing – annual release < 8.23 maf</i>	0	0	0	0	0
Mid-Elevation Release Tier (Powell $< 3,575$ and $\geq 3,525$ ft)	0	2	17	16	16
<i>Mid-Elevation Release – annual release $= 8.23$ maf</i>	0	0	0	0	2
<i>Mid-Elevation Release – annual release $= 7.48$ maf</i>	0	2	17	16	14
Lower Elevation Balancing Tier (Powell $< 3,525$ ft)	0	0	0	<1	2
<i>Below Minimum Power Pool (Powell $< 3,490$ ft)</i>	0	0	0	0	<1

Notes:

¹ Modeled operations include the 2007 Interim Guidelines, Upper Basin Drought Response Operations, Lower Basin Drought Contingency Plan, and Minute 323, including the Binational Water Scarcity Contingency Plan.

² Reservoir initial conditions on December 31, 2019 were simulated using the August 2019 Most Probable 24 Month Study.

³ Full Hydrology uses 112 hydrologic inflow sequences based on resampling of the observed natural flow record from 1906-2017 for a total of 112 traces analyzed.

⁴ Percentages shown in this table may not be representative of the full range of future possibilities that could occur with different modeling assumptions.

⁵ Percentages shown may not sum to 100% due to rounding to the nearest percent.