



# Wyoming's Green and Little Snake River Basins

## Demand Management Feasibility Investigation

Public Meetings Nov. 4-7, 2019  
Pinedale, Green River, Baggs,  
Cheyenne

# The objectives:

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With Wyoming stakeholders and water users in the Green and Little Snake River Basins:

- 1) discuss and share detailed information and ideas regarding the feasibility of a potential Demand Management program in Wyoming.
- 2) explore the suite of outstanding issues related to a potential Demand Management program in Wyoming to help inform the State's efforts.



# The process:

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## **September 2019:**

Kick-off meeting with identified “Key Stakeholders” in the Green and Little Snake Basins

## **November 2019 – July 2020:**

Series of (~6 ) Community meetings: Provide background information, answer questions, engage in discussion

Next Steps: (~8) Focus Group meetings: Smaller groups, to facilitate discussion

## **August 2020 – December 2020:**

Final meetings in communities in both Basins to present summary findings from the focus groups and community meetings



# Expected Outcomes:

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- Increased understanding among stakeholder groups in Wyoming regarding the trade-offs (advantages and disadvantages) of a potential Upper Basin DM program (and associated on the ground management).
- Documentation of stakeholders' views on the feasibility of a DM program in Wyoming's Colorado River Basin.
- Documentation of potential approaches and considerations regarding a potential DM program in Wyoming.
- Information will be used by WY and the Upper Basin States in assessing feasibility, development & implementation of an Upper Basin DM program.



# Discussion Planning Team:

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- Steve Wolff, Interstate Streams Division Administrator, Wyoming State Engineer's Office
- Chris Brown, Senior Assistant Attorney General, Attorney for State Engineer's Office
- Charlie Ferrantelli, Interstate Streams Division, Wyoming State Engineer's Office
- Ginger Paige, University of Wyoming Extension, Range Management, Hydrologist
- Kristi Hansen, University of Wyoming Extension, Agricultural Economics
- Anne MacKinnon, University of Wyoming adjunct, water law policy and history



# Background Presentation Outline

- ❖ The Colorado River Basin and Water Allocation (Law of the River)
- ❖ Wyoming's Colorado River Water Uses
- ❖ The Drought and Drought Contingency Planning
- ❖ Demand Management Feasibility Investigation

The background of the slide features a dense pattern of light blue water droplets of various sizes, creating a textured, aquatic effect. This central area is framed by solid dark blue horizontal bars at the top and bottom.

# THE COLORADO RIVER BASIN AND WATER ALLOCATION

## 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.





The 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.



# Water Allocation: The Law of the River

## The Big Three

### ❖ Colorado River Compact, 1922

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

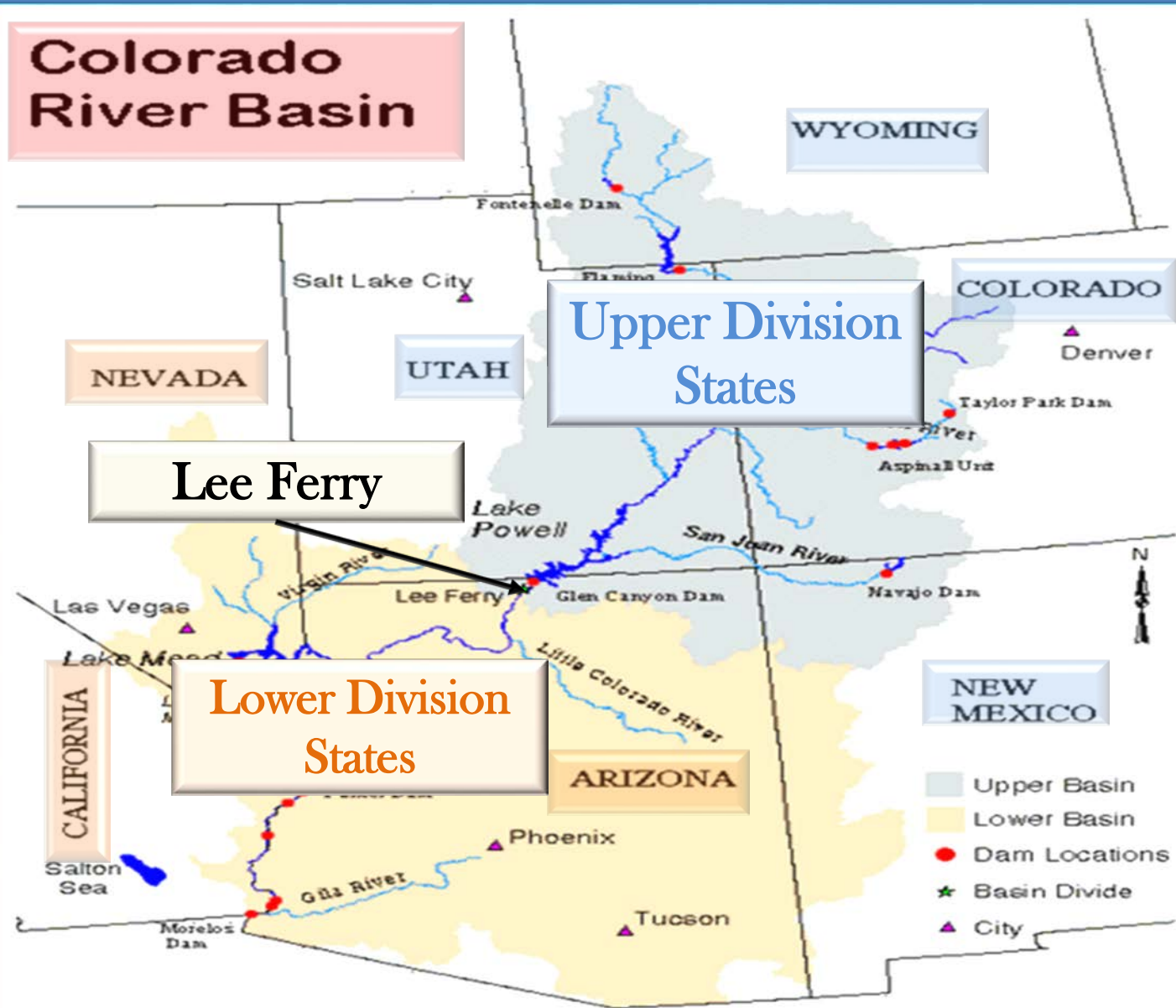
### ❖ Mexican Water Treaty, 1944

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

### ❖ The Upper Colorado River Basin Compact, 1948

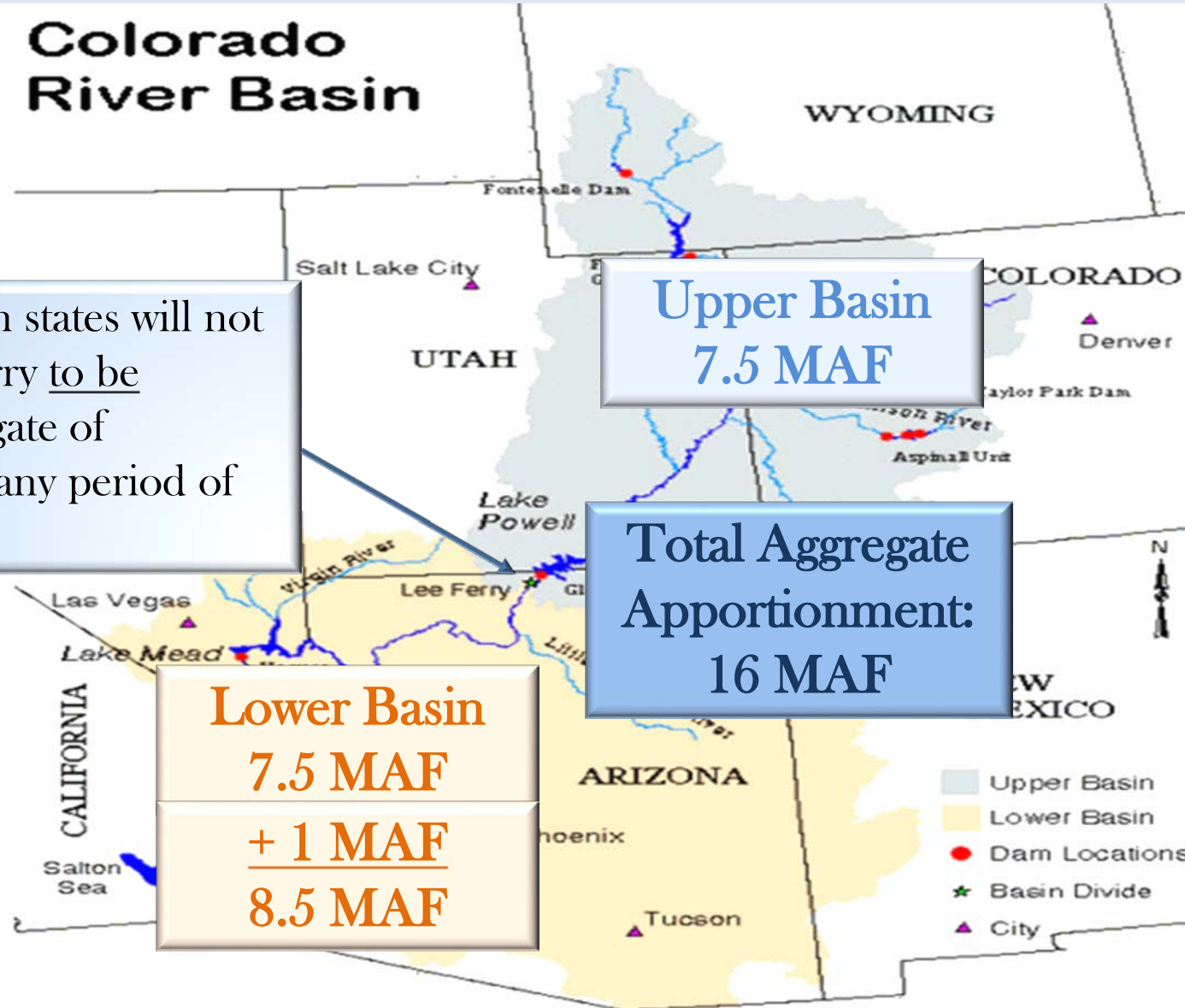
- ✓ Apportions beneficial consumptive use among the Upper Division States.

# 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.

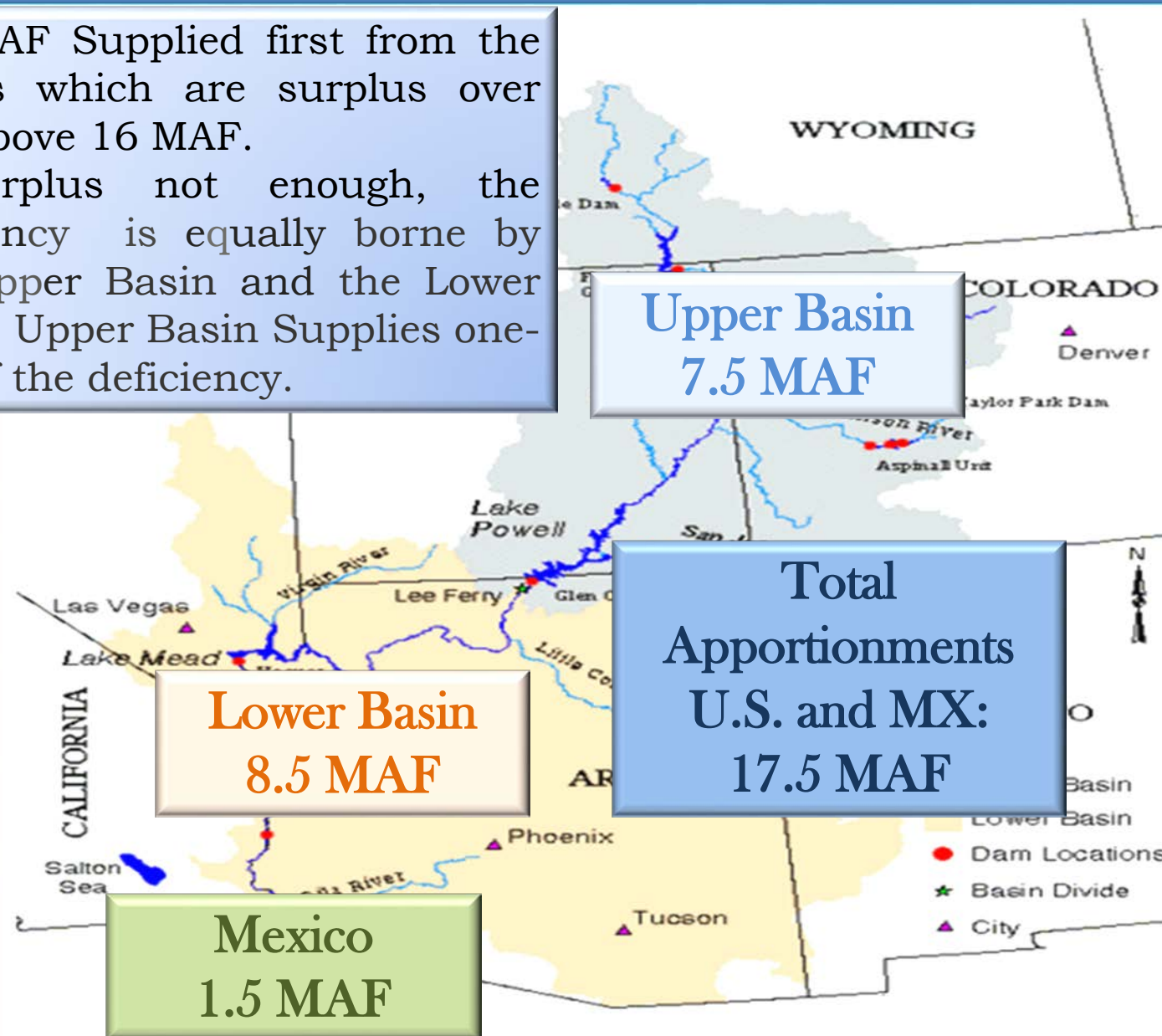
Upper Basin  
7.5 MAF

Total Aggregate Apportionment:  
16 MAF

Lower Basin  
7.5 MAF  
+ 1 MAF  
8.5 MAF

# 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. Upper Basin Supplies one-half of the deficiency.

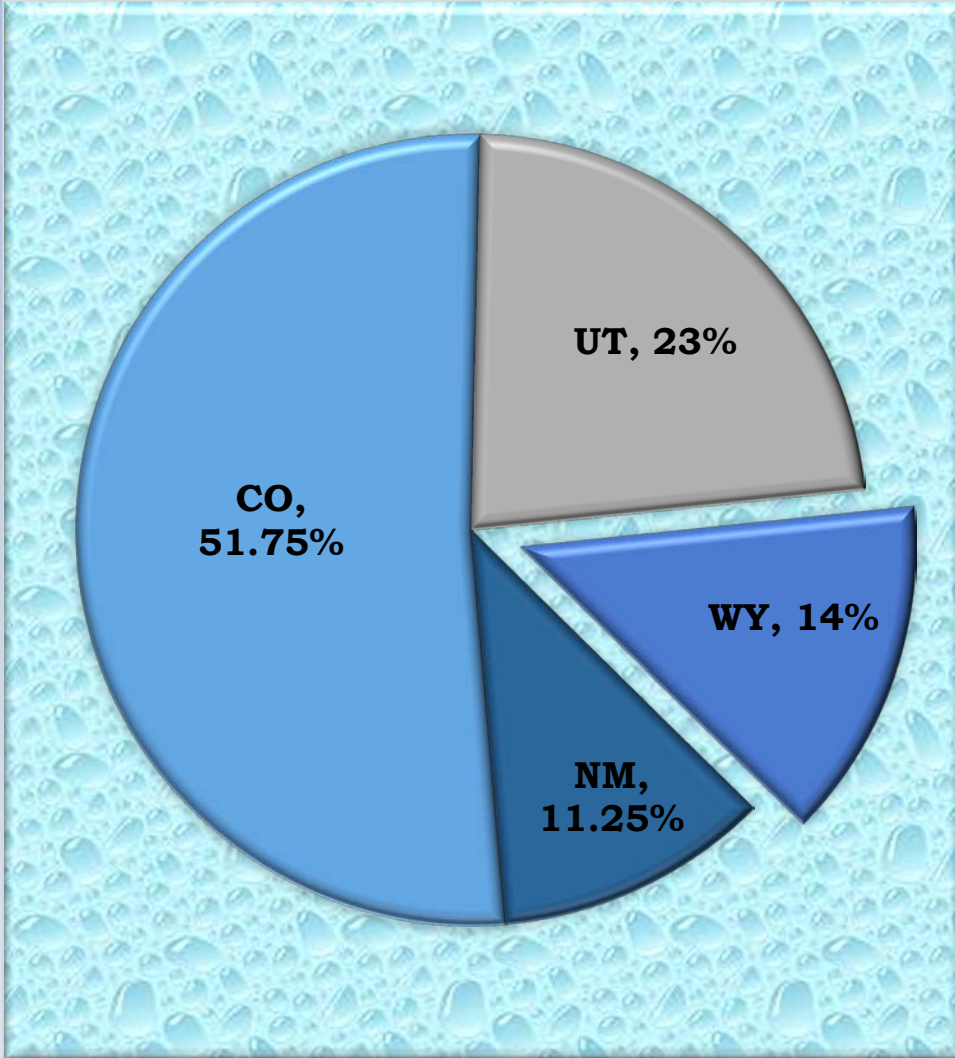


# Upper Colorado River Basin Compact of 1948



- ❖ Divides the Upper Basin's allocation between Arizona, Colorado, Utah, New Mexico, and Wyoming.
  - ✓ Apportions beneficial consumptive use of water.
  
- ❖ Establishes the *Upper Colorado River Commission* ("UCRC"). One commissioner from each of the Upper Division States and one commissioner representing the United States. Arizona is not represented.
  
- ❖ Contains provisions for possible curtailment of Colorado River water use.
  - ✓ "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).
  - ✓ Rights perfected prior to the 1922 Colorado River Compact are excluded.
  
- ❖ UCRC does NOT have authority to determine how curtailment of use will be implemented within an individual state. The State Engineer is responsible for implementing curtailment within Wyoming to maintain compact compliance: Priority regulation.

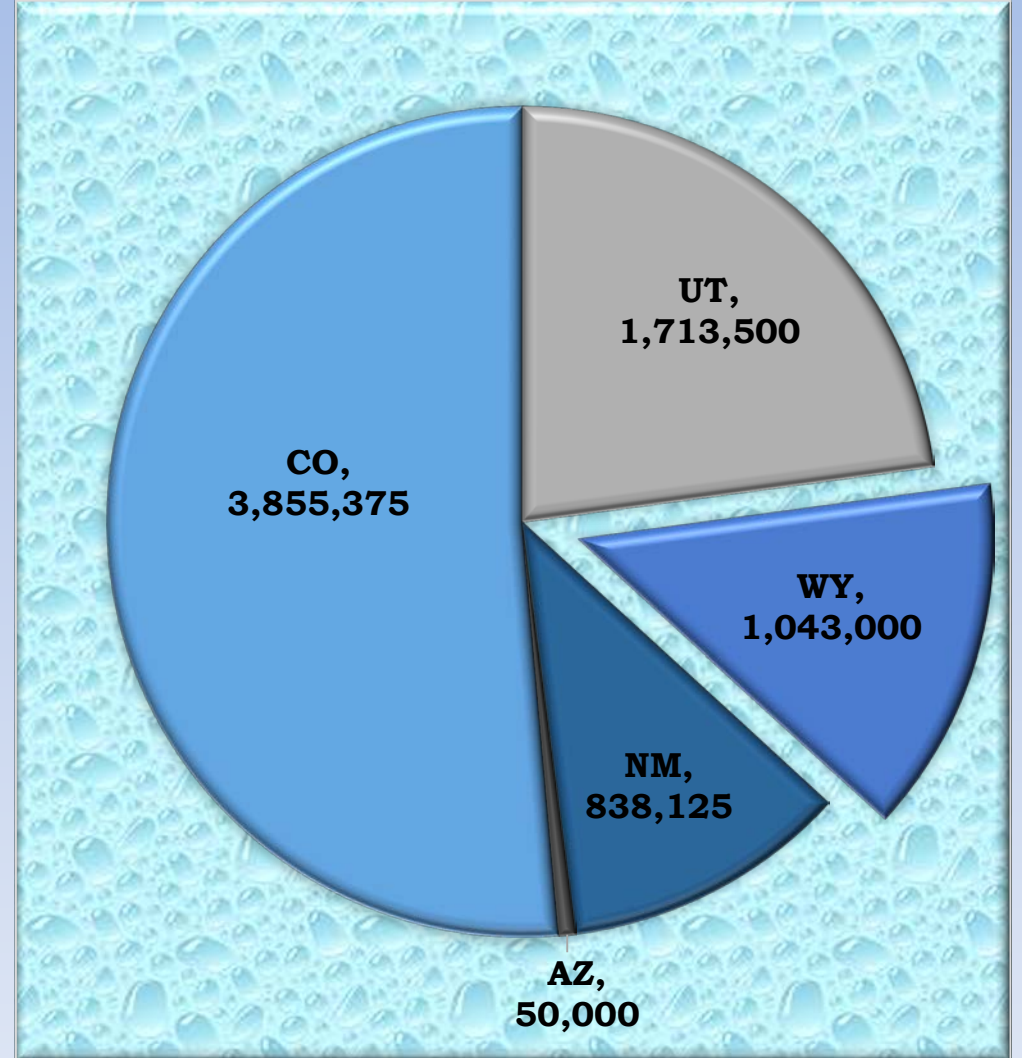
1948 Compact Percentage  
Apportionment of Water Available for  
Consumptive Use. (AZ: 50 kaf)



Current  
Estimated Use:

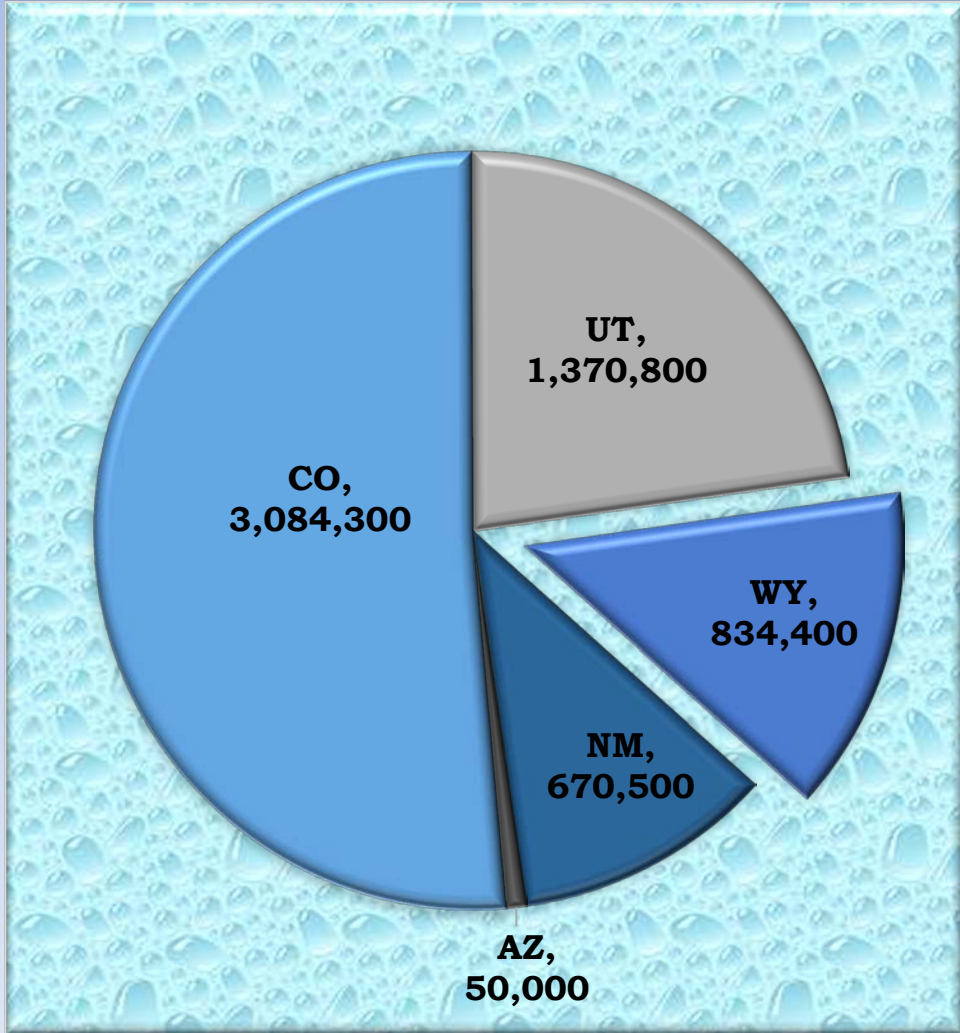
CO: 2,595,000  
 UT: 865,000  
 WY: 565,000  
 NM: 530,000

1948 Compact Apportionment of **Full**  
**Supply** of 7.5 Million Acre-feet



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

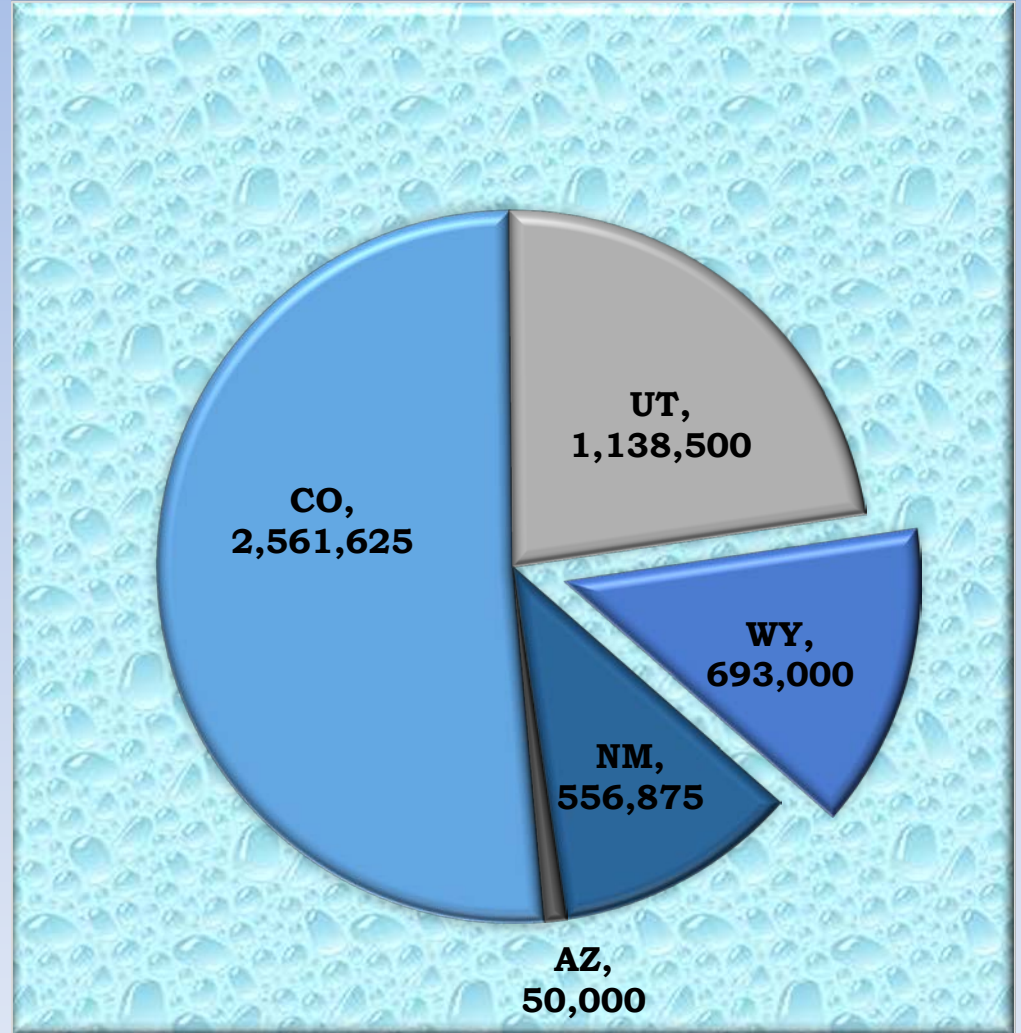
1948 Compact Apportionment of **Less Supply** - 6.01 Million Acre-feet Available Supply



Current Estimated Use:

CO: 2,595,000  
 UT: 865,000  
 WY: 565,000  
 NM: 530,000

1948 Compact Apportionment of **Still Less Supply** - 5 Million Acre-feet Available Supply

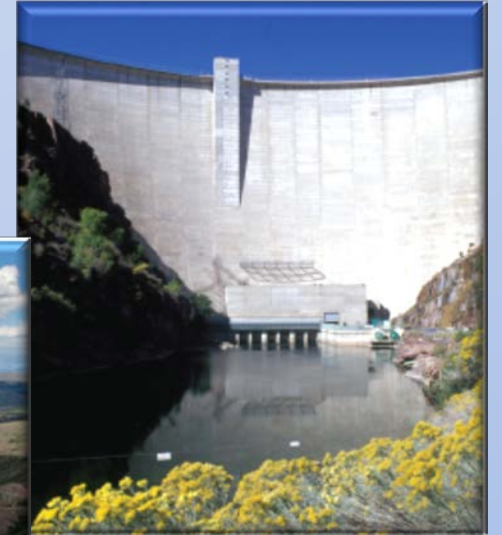


For consistency, current estimated use based upon the December 31, 2016, Current and Future Depletion Demand Schedule.

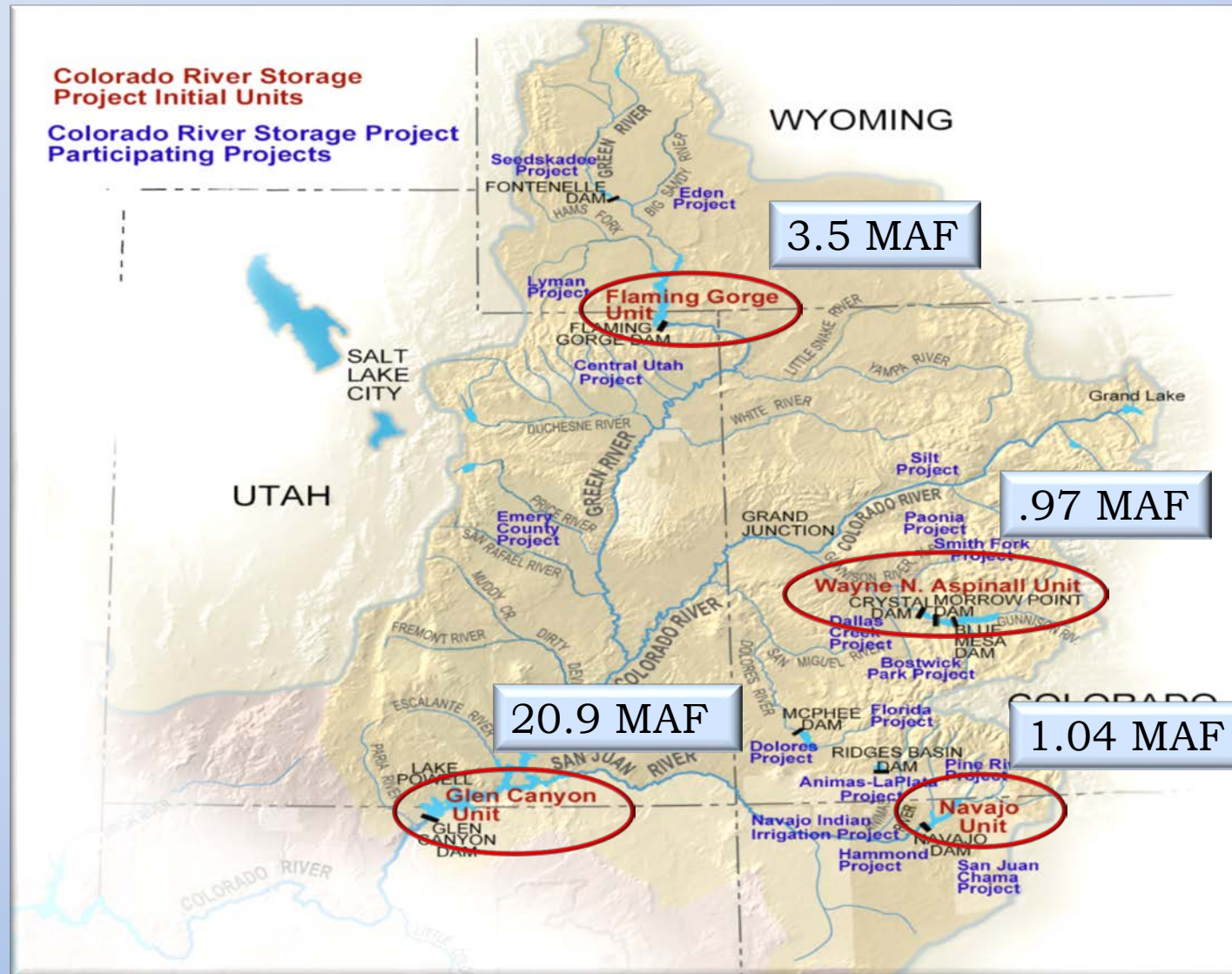


# Colorado River Storage Project Act of 1956 (CRSP)

- ❖ 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



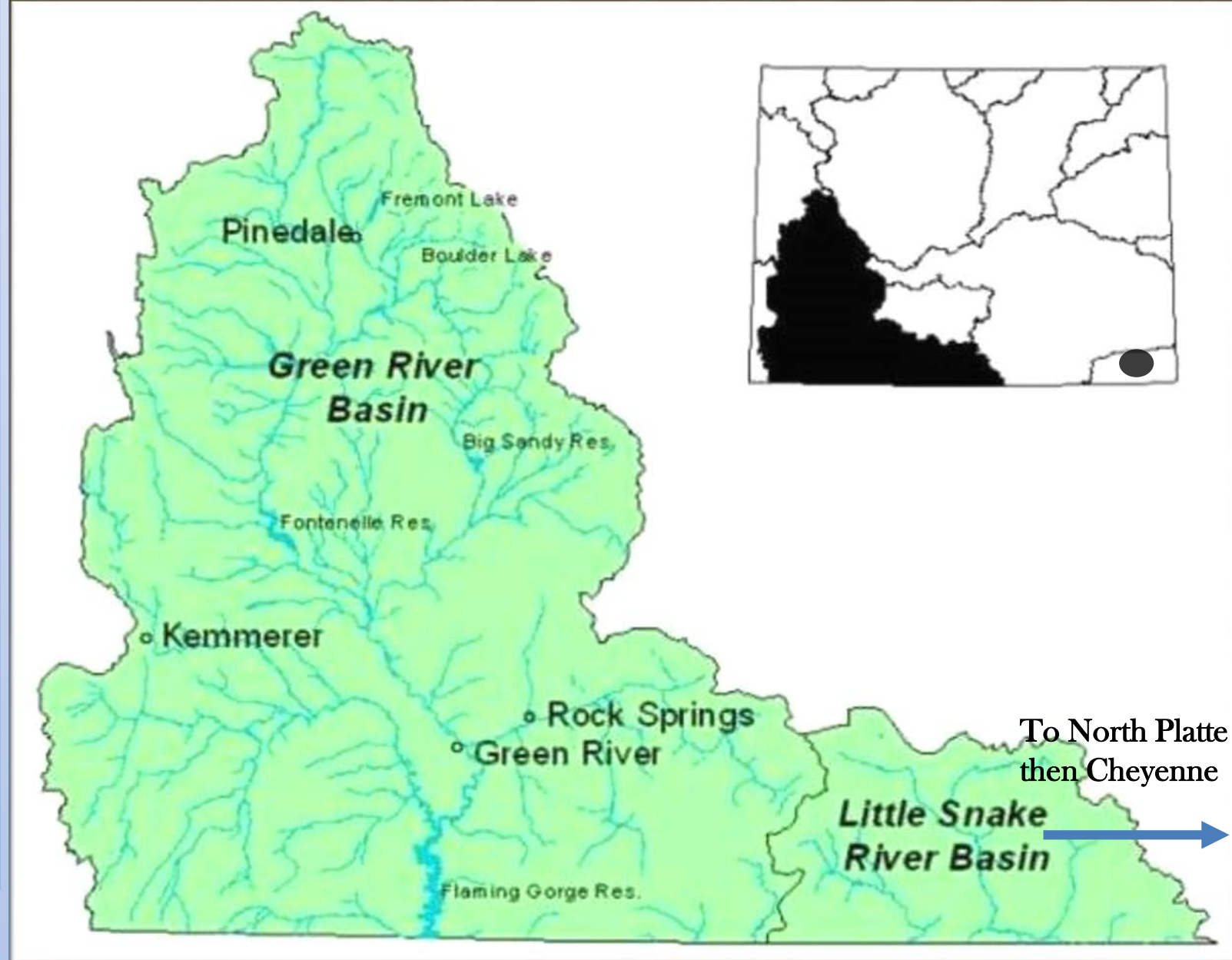
Volumes are Active Capacity

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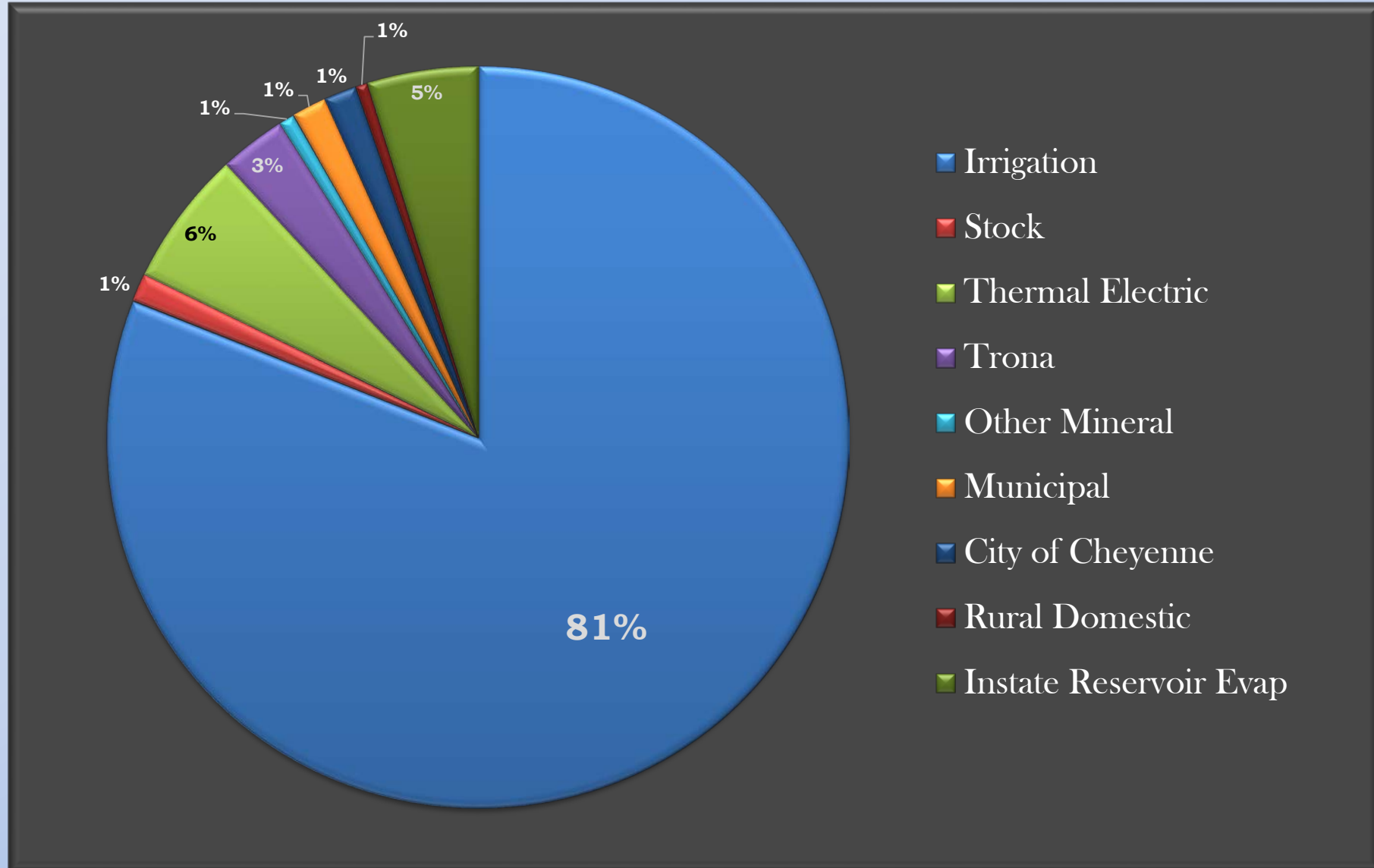
# WYOMING'S COLORADO RIVER WATER USES

# Colorado River Basin in Wyoming

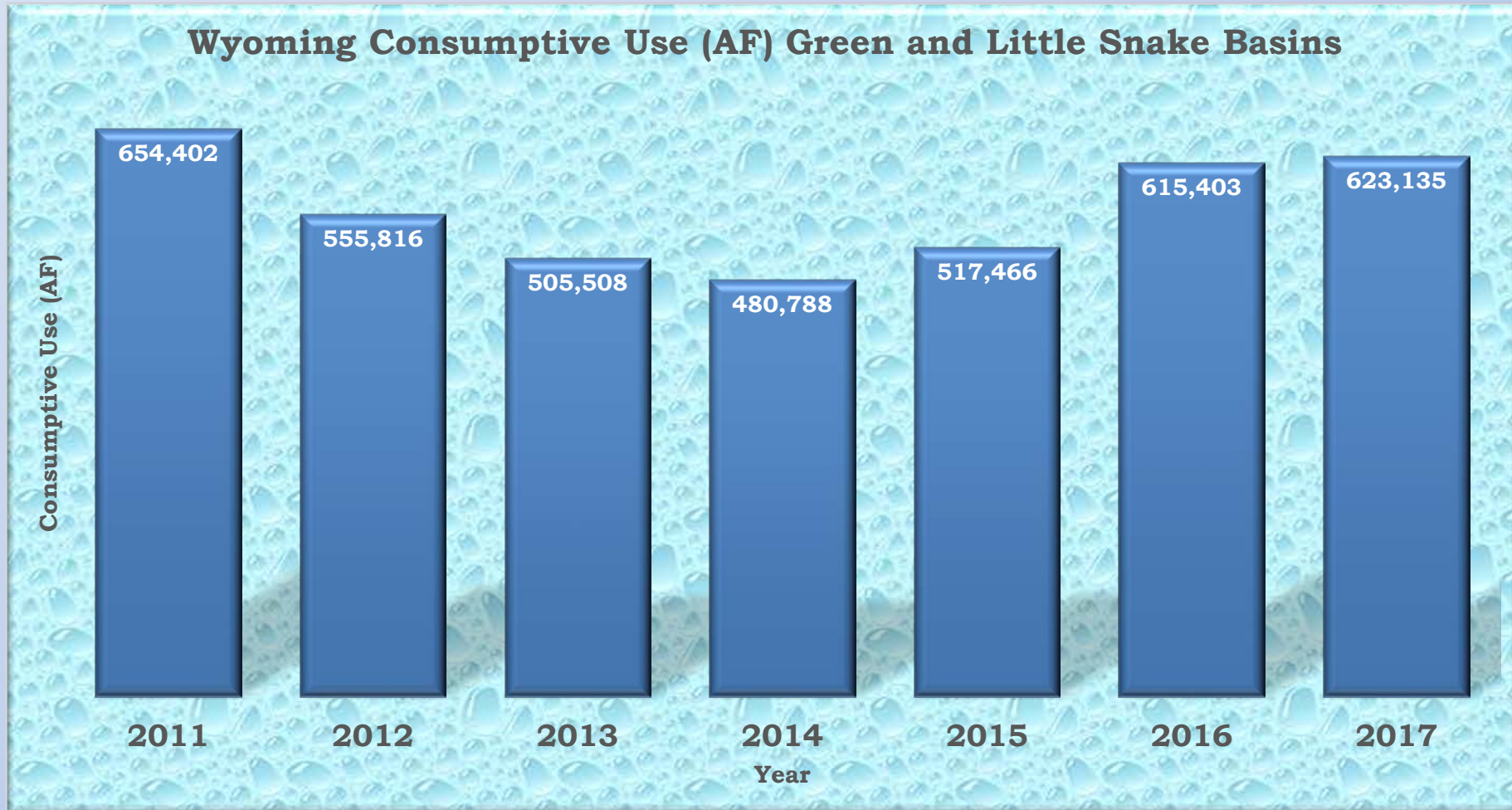
In Wyoming, the Colorado River Basin covers about 17,000 square miles, including the areas drained by the Little Snake and Green Rivers, and supplies water to the City of Cheyenne by a trans-basin diversion from the Little Snake Basin.



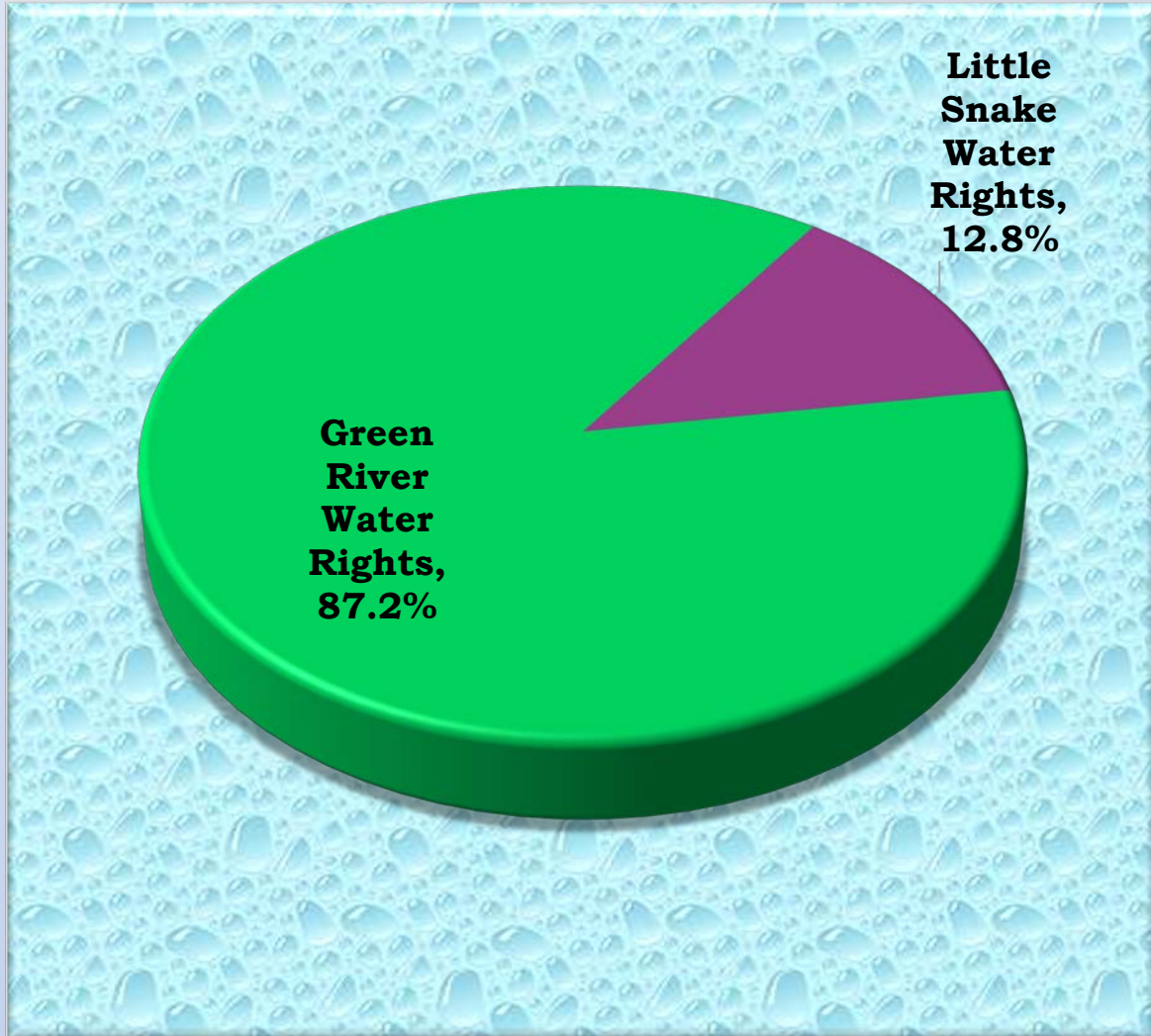
# Wyoming's average annual beneficial consumptive use, Green and Little Snake Basins: 564,645 af (2011-2017)



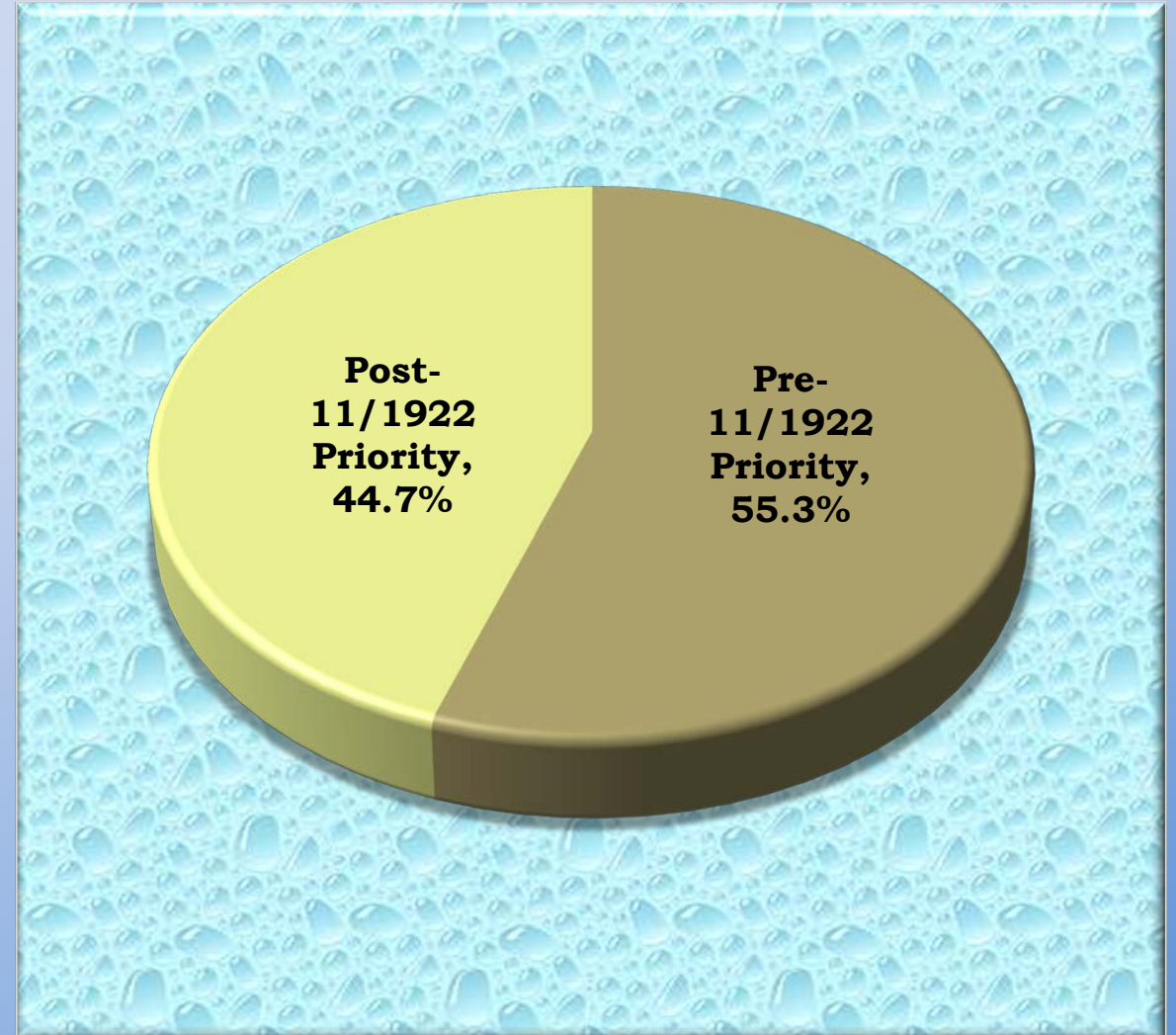
# Wyoming's water use has varied by over 170,000 AF



All Adjudicated Green and Little Snake River  
Water Rights Thru 2018

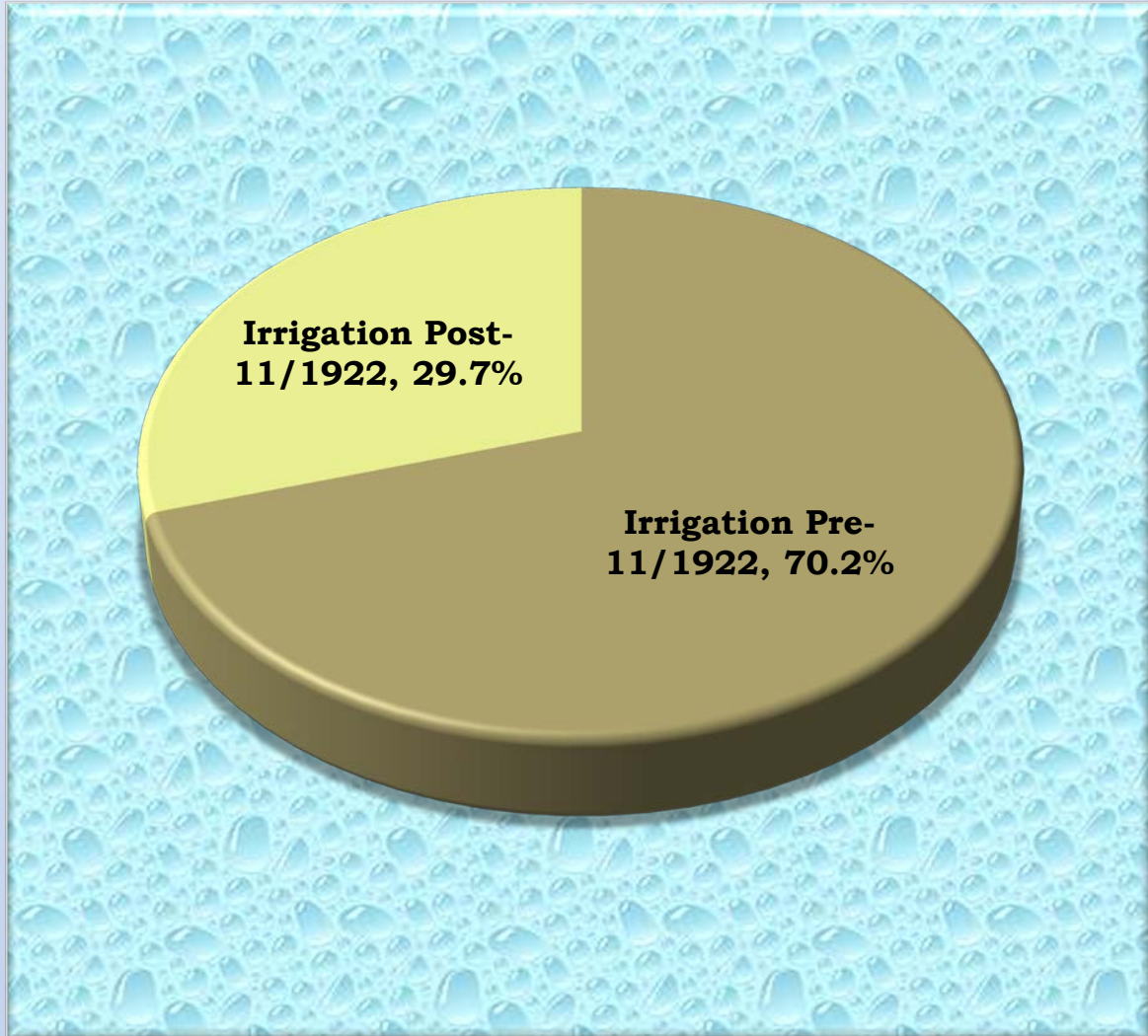


All Adjudicated Green and Little Snake River  
Water Rights Thru 2018

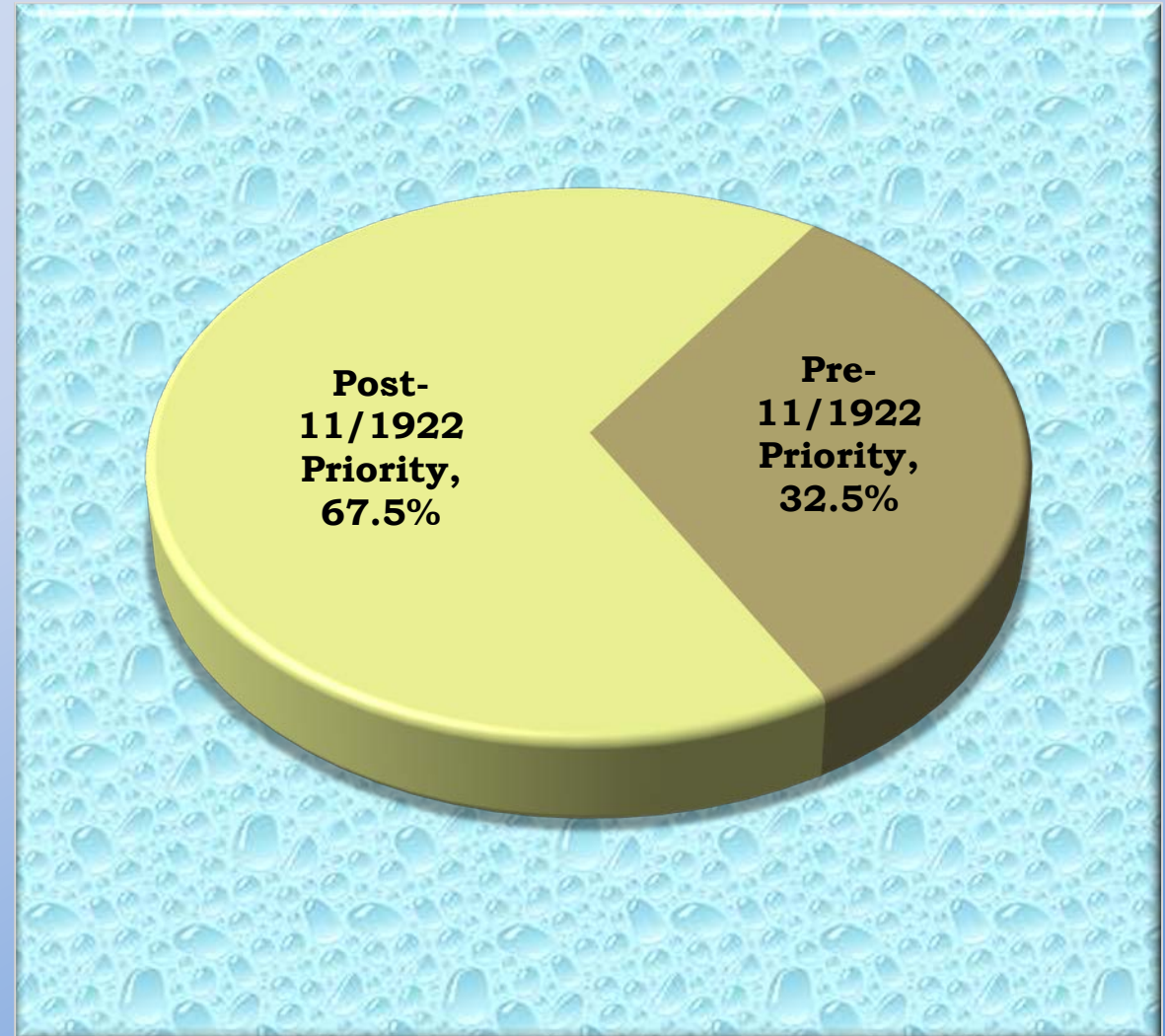


Data is provisional based on SEO E-permit database. Values represent water rights, not consumptive use. Use of 11/1922 priority date is for illustration and discussion purposes only.

Adjudicated Green and Little Snake River  
Irrigation Water Rights Thru 2018



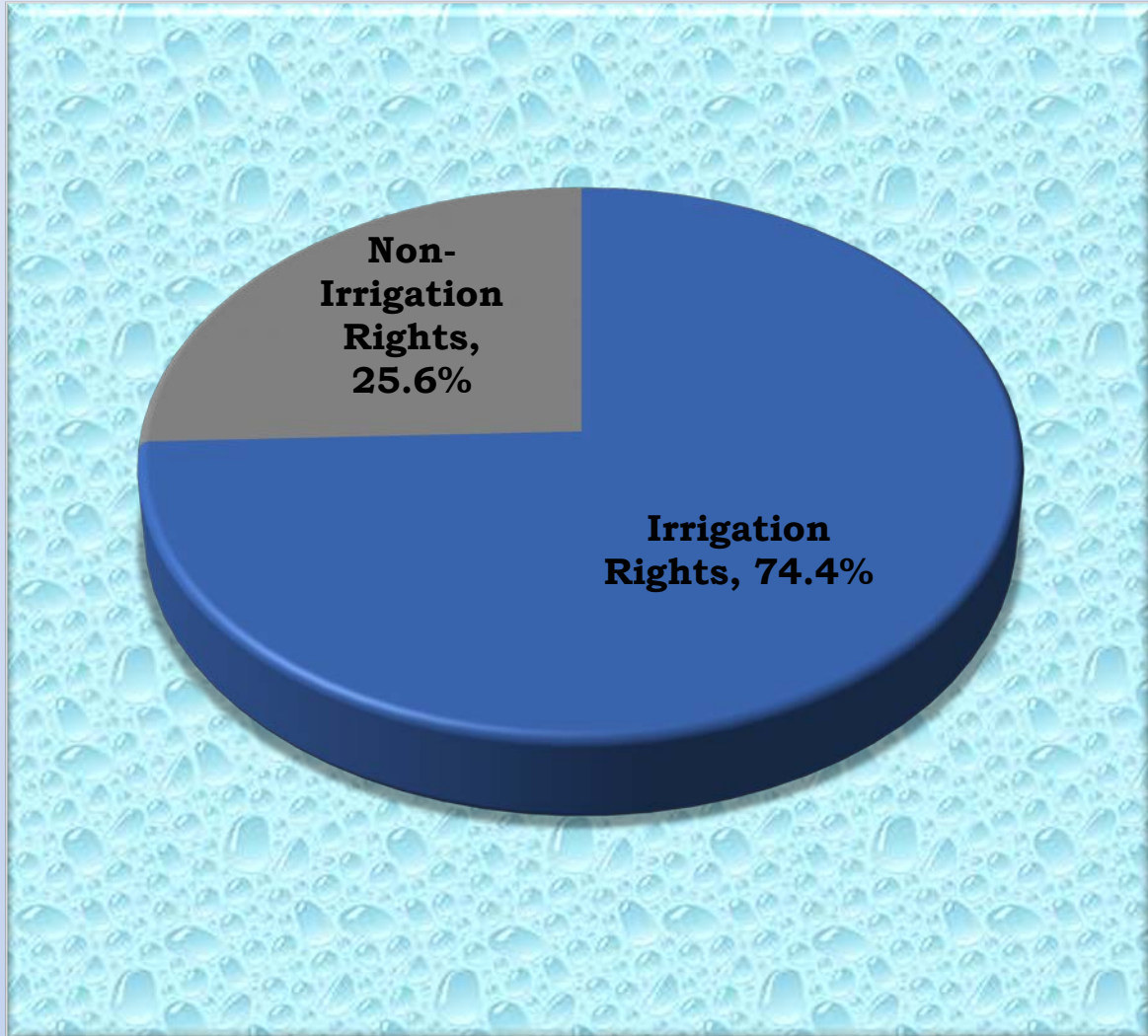
All Adjudicated Green and Little Snake River  
Water Rights Thru 2018 Including Surplus and  
Excess Rights



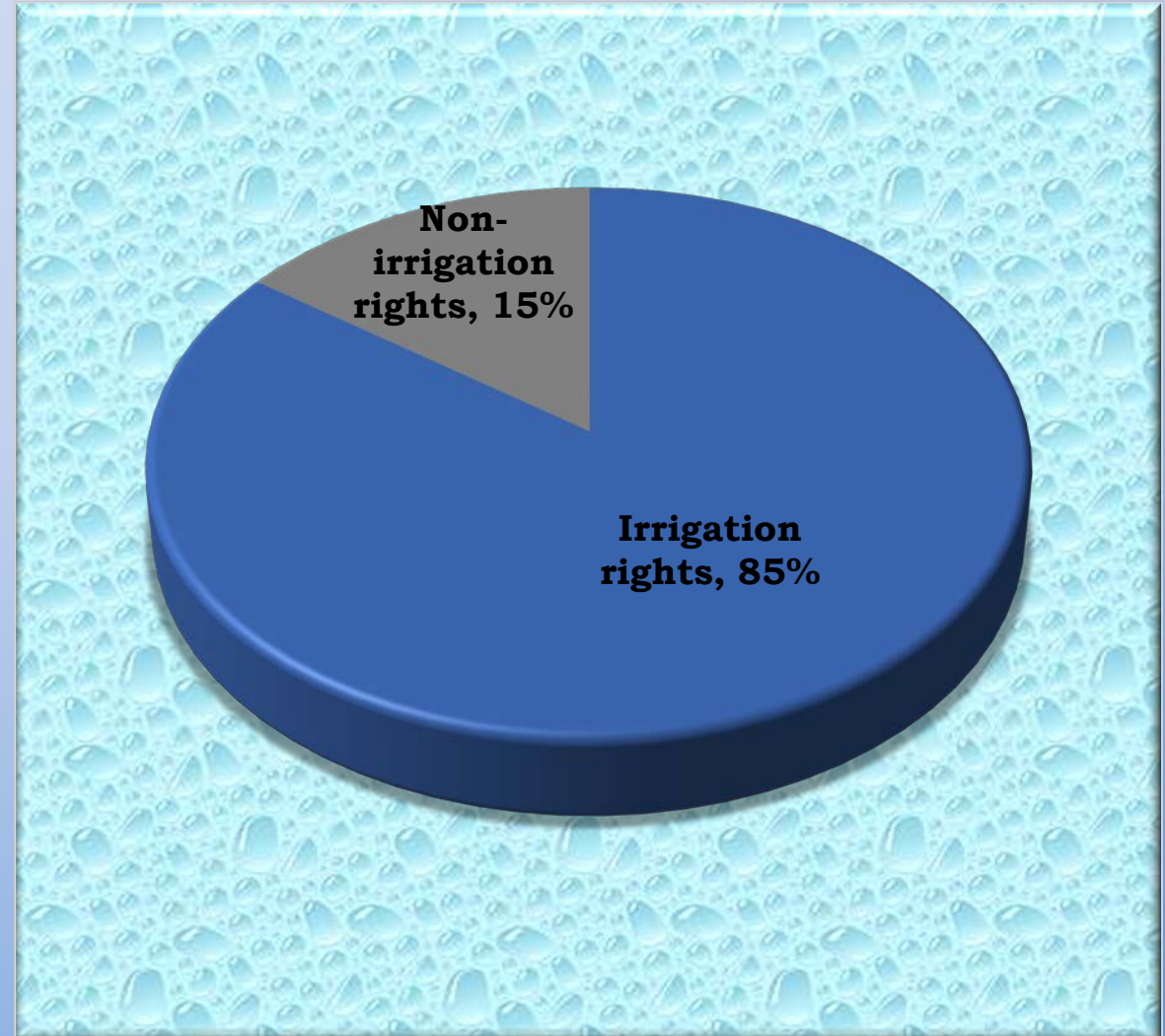
Data is provisional based on SEO E-permit database. Values represent water rights, not consumptive use. Use of 11/1922 priority date is for illustration and discussion purposes only.



All Adjudicated Green and Little Snake River  
Water Rights Thru 2018

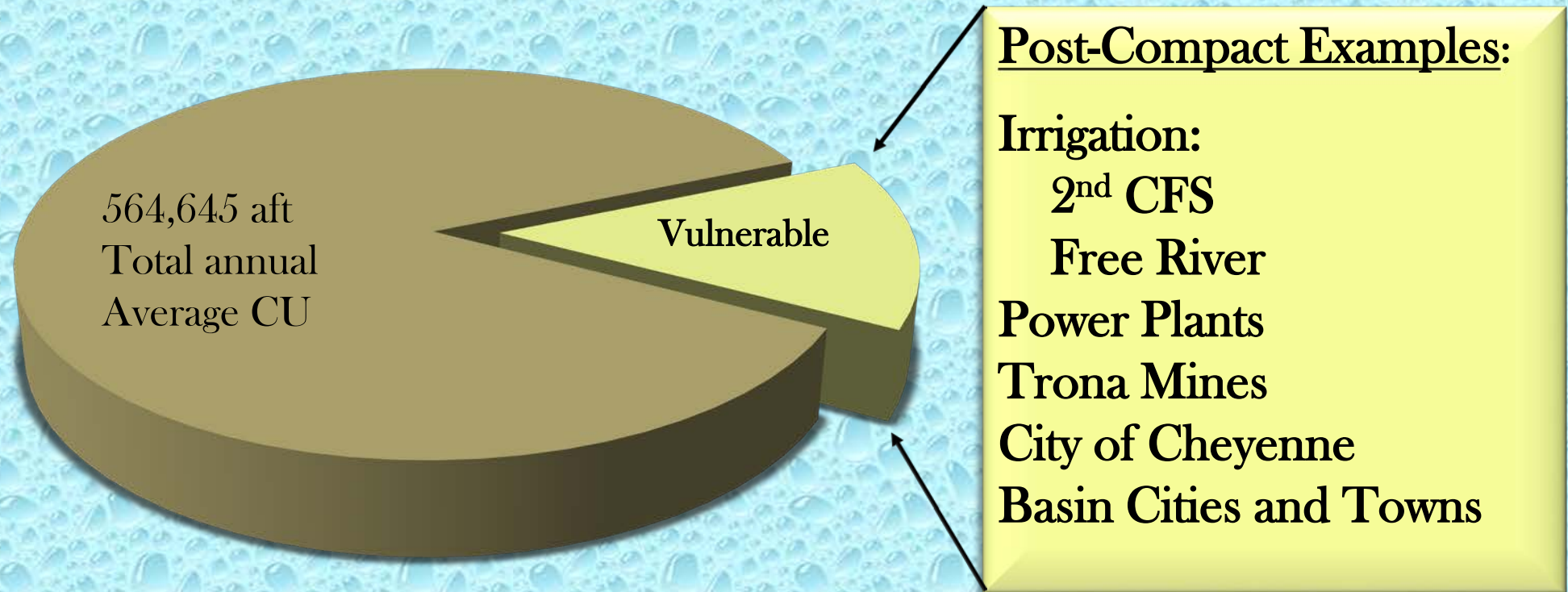


All Adjudicated Green and Little Snake River  
Water Rights Thru 2018 Including Surplus and  
Excess Rights



Data is provisional based on SEO E-permit database.  
Values represent water rights, not consumptive use.

# Vulnerability to Drought/Curtailment

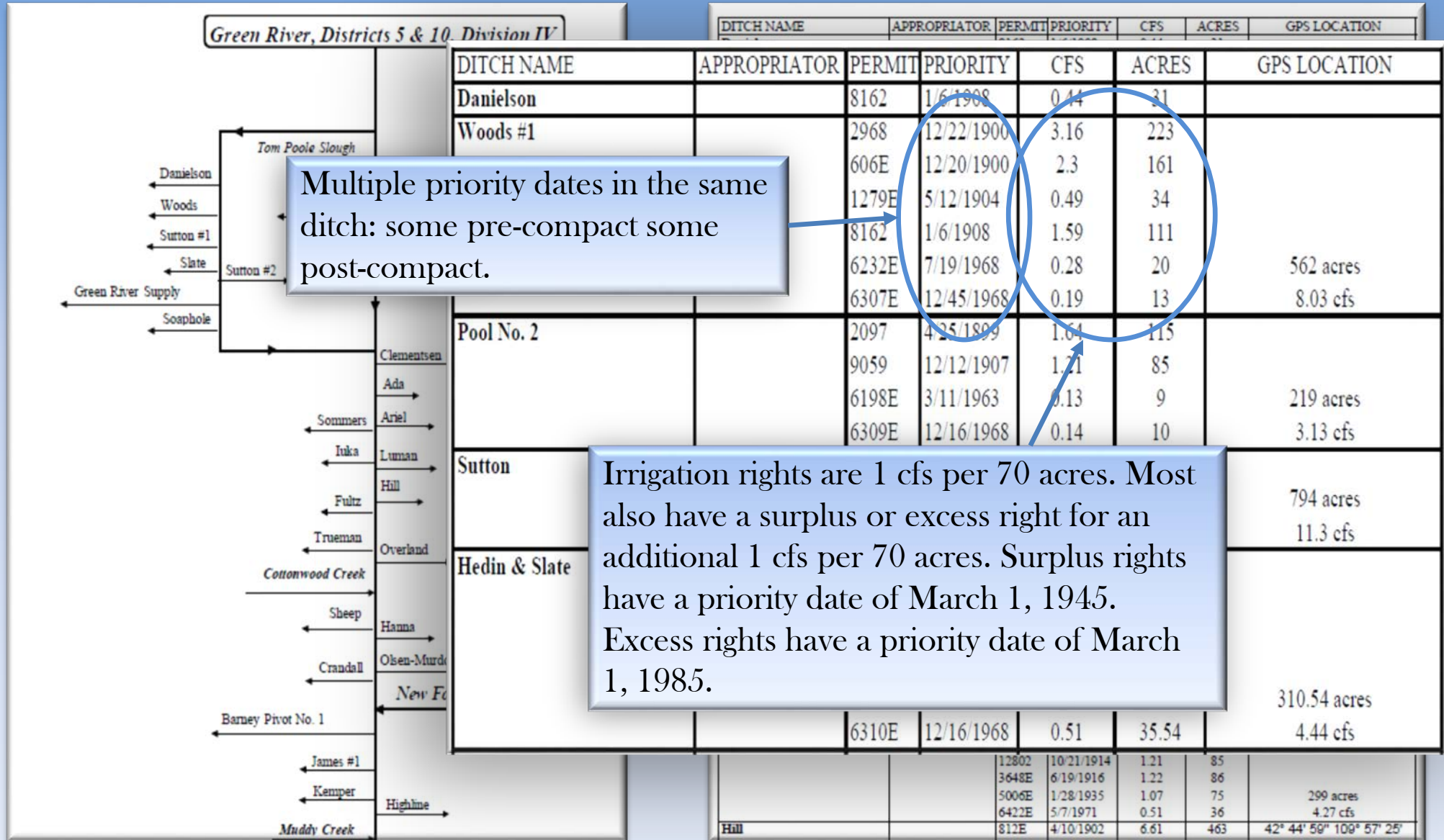


■ Pre-Compact    ■ Post-Compact

# What is Priority Regulation?

- ❖ Wyoming follows the doctrine of appropriation: First in time, first in right.
  - ✓ Appropriations with the earliest priority dates are entitled to receive water up to their full appropriation before junior appropriations may receive water.
  - ✓ Hydrographer/Commissioners divide the water of the streams among the ditches and reservoirs taking water from them according to the prior right of each.
  - ✓ A ditch or reservoir may have several different priority dates, each for a specified amount of water, and all of the various appropriations are administered in priority.
  
- ❖ Some priority regulation considerations:
  - ✓ Measuring devices required
  - ✓ Lockable and controllable headgates required
  - ✓ Reservoirs limited to single fill

# Green River Example



Multiple priority dates in the same ditch: some pre-compact some post-compact.

Irrigation rights are 1 cfs per 70 acres. Most also have a surplus or excess right for an additional 1 cfs per 70 acres. Surplus rights have a priority date of March 1, 1945. Excess rights have a priority date of March 1, 1985.

# Some Wyoming Tools to Consider in Curtailment Mitigation

- ❖ Permanent Transfers: Change in use and change in place of use. Wyo. Stat. § 41-3-104.
  - ✓ Petitions must be approved by the Board of Control.
  
- ❖ Temporary Water Use Agreements: Wyo. Stat. § 41-3-110.
  - ✓ For Temporary Purposes; No injury to other rights; Underlying right protected; Two years
  - ✓ Applications must be approved by 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 must be approved 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.

# Examples of Transfers and Exchanges

## ❖ Permanent transfers:

- ✓ Irrigation to Municipal: Cody, Lander, Casper, and many other Wyoming towns.
- ✓ Irrigation to Industrial: Morton Incorporated transfer to Dave Johnson Power Plant on the North Platte, 1990s.
- ✓ Industrial to Municipal: BP Refinery to Casper, 2000s. Previously a temporary transfer.

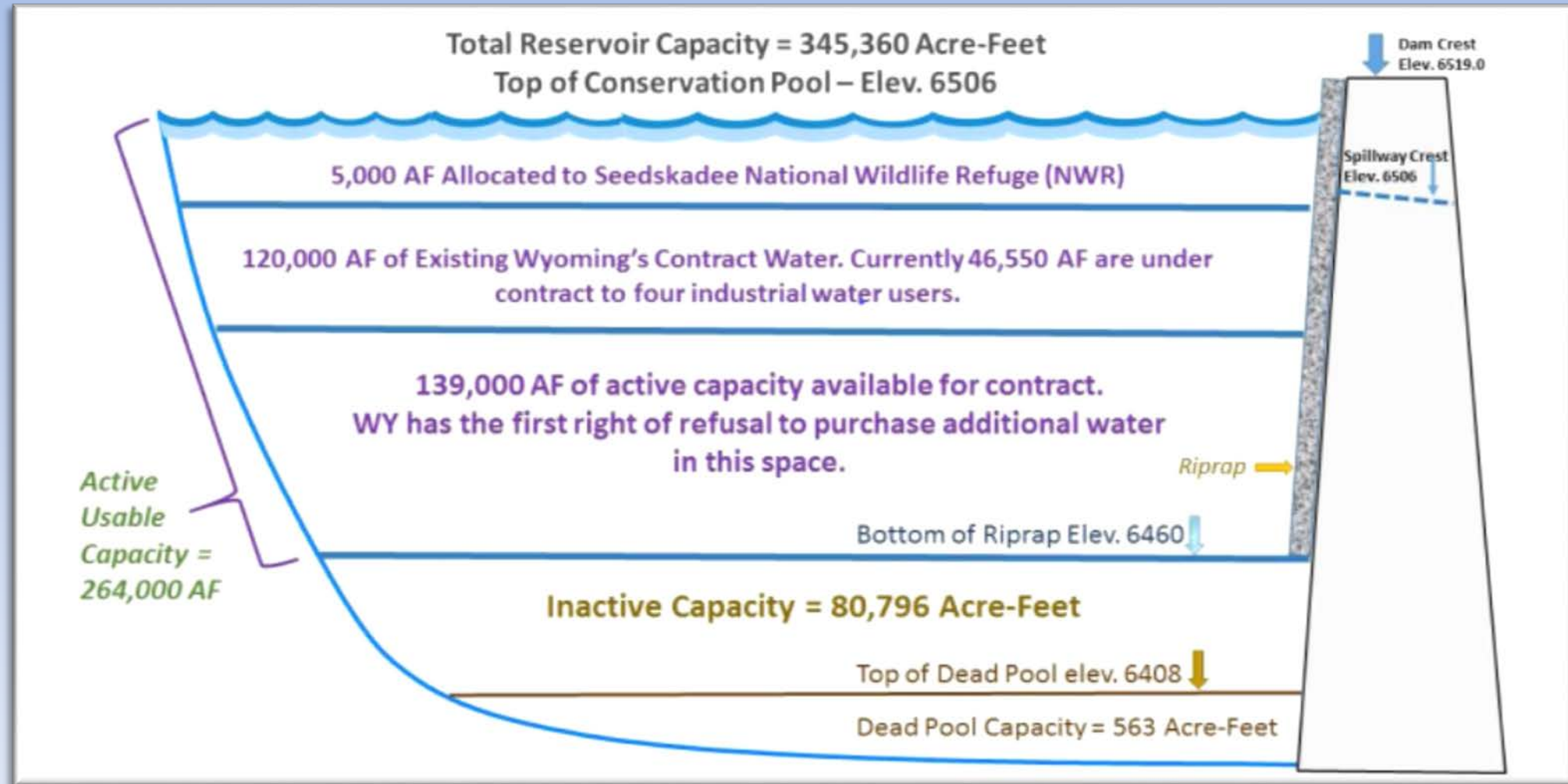
## ❖ Temporary transfers:

- ✓ Irrigation to oil & gas production: 1950s to present, such as Laramie County presently.
- ✓ Irrigation to Municipal: Town of Baggs, 2002.
- ✓ Irrigation to Industrial: Laramie River Power Plant mid 2000s. Irrigation wells.
- ✓ Industrial to Municipal: BP Refinery to Casper prior to permanent transfer, 1990s.

## ❖ Exchanges:

- ✓ Irrigation: Powder River trans-basin diversion to Tongue River in the event of a Compact Call.
- ✓ Municipal: Cheyenne diversion from Little Snake Basin to North Platte Basin in exchange for out of priority diversion in the North Platte.
- ✓ Industrial: Dave Johnson Power Plant exchange with Bureau of Reclamation storage for wintertime use.

# Fontenelle Reservoir



The background of the slide features a dense pattern of small, light blue water droplets on a slightly darker blue surface. The droplets are scattered across the entire width of the slide, creating a textured, organic appearance. The text is centered over this background.

# THE DROUGHT AND DROUGHT CONTINGENCY PLANNING

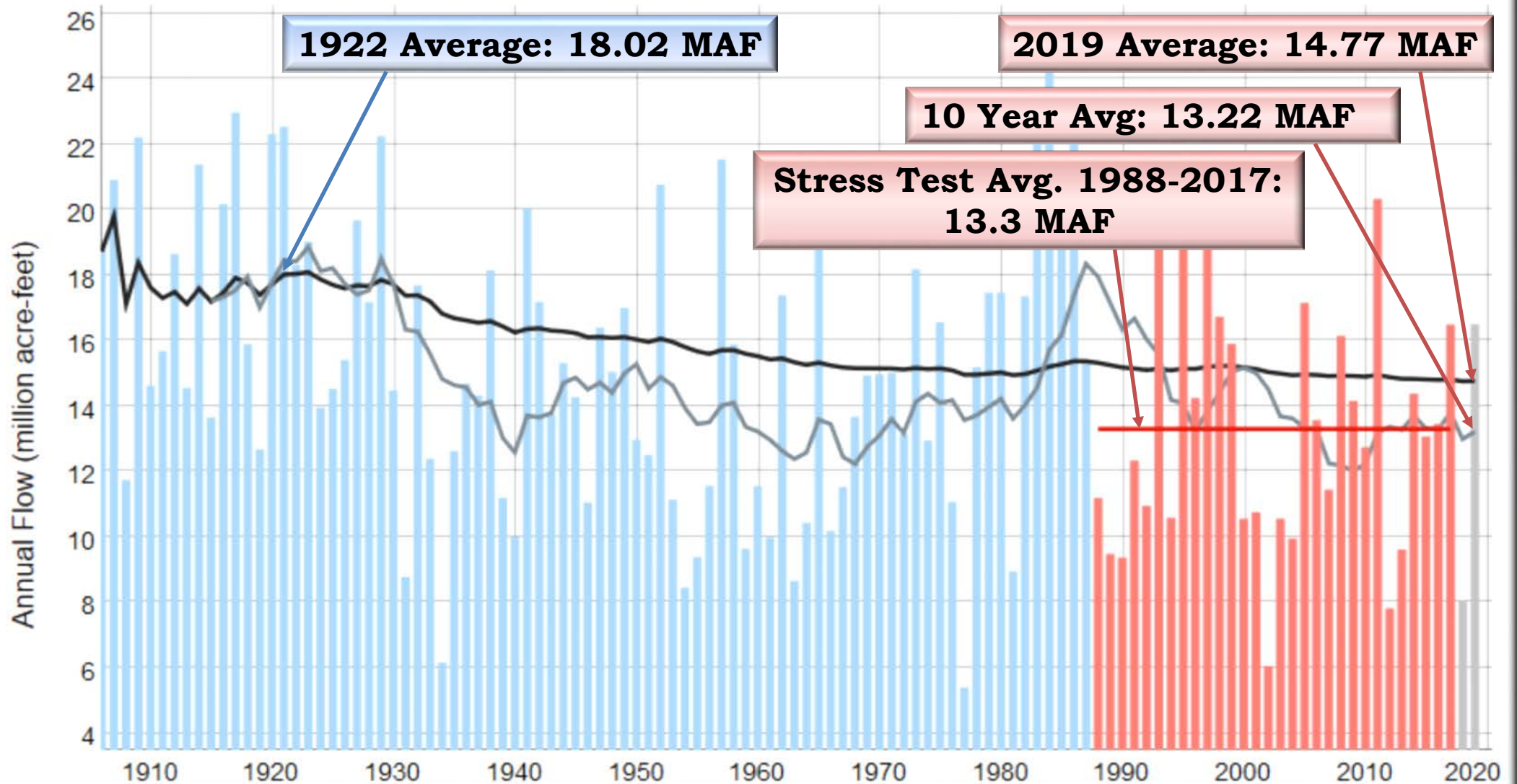


# Drought Contingency Planning - Overview

- ❖ Over the past decade, drought in the Colorado River Basin has increased the risk of reservoirs declining to critically low elevations by nearly four-fold.
- ❖ 2007 operational rules on the Colorado River were insufficient to protect against reservoirs declining to critically low elevations if dry conditions persist or worsen.
- ❖ In response to the historic drought conditions, the seven Colorado River Basin States, the Department of Interior and the Republic of Mexico began working on Drought Contingency Plans (DCPs) in 2013.
  - ✓ DCPs were finalized in May of 2019.
  - ✓ Lower Basin DCP is being implemented, with projections showing the Lower Basin will create 200KAF in DCP contributions; Mexico 42KAF in 2020.

### Colorado River Natural Flow at Lees Ferry Gaging Station, Arizona

— Annual — Provisional — Running Average — 10-year Moving Average — Annual (Stress Test) — Stress Test Average



# Upper Basin Drought Contingency Planning

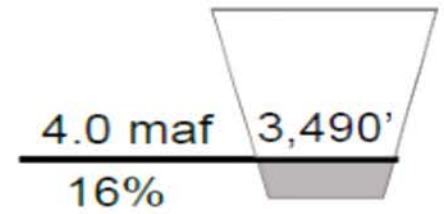
## ❖ Why are we doing it?

- ✓ Maintain 1922 Compact Compliance and reduce risks associated with reaching critical reservoir elevations at Lake Powell.
- ✓ Plans reduce or eliminate probability of Lake Powell reaching minimum power pool elevation (3,490') through 2026.

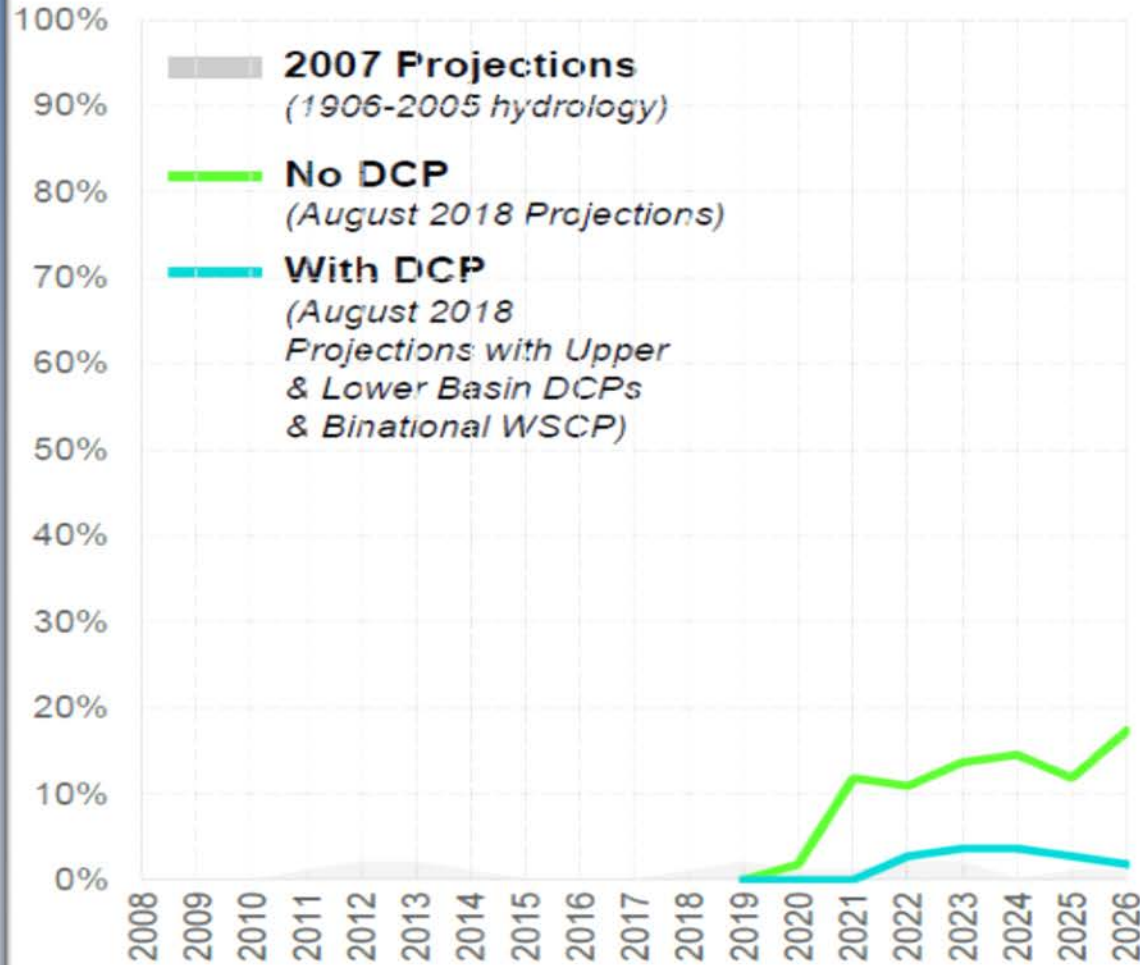
## ❖ Goals:

- ✓ Take proactive approach as opposed to reactive approach, thereby avoiding or mitigating risk of Compact curtailment situation.
- ✓ Create additional flexibility and certainty.
- ✓ Control our own destiny.
- ✓ Avoid unilateral, uncoordinated efforts that could create conflict or litigation.

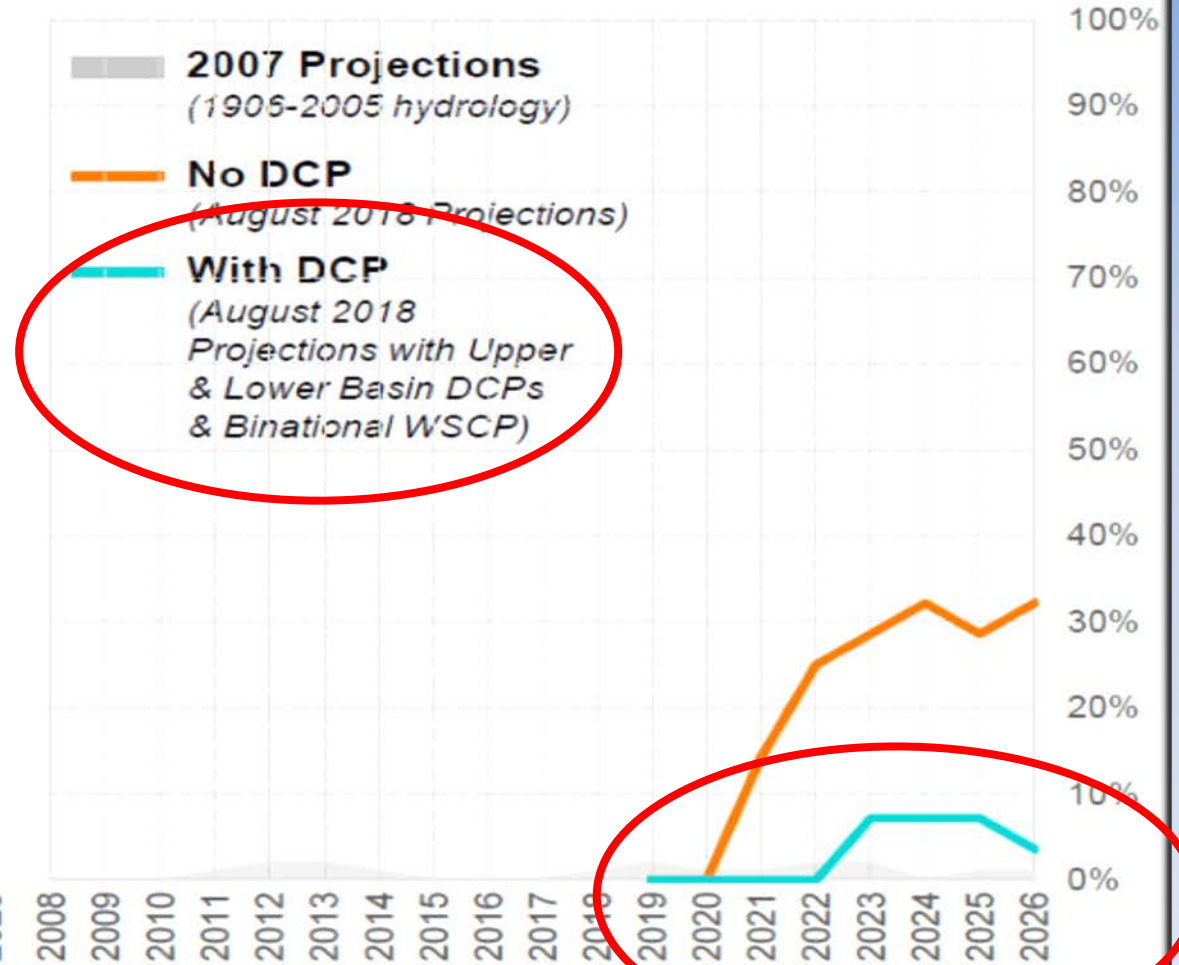
# Risk of Lake Powell < 3,490'



Full Hydrology (1906-2015)



Stress Test Hydrology (1988-2015)

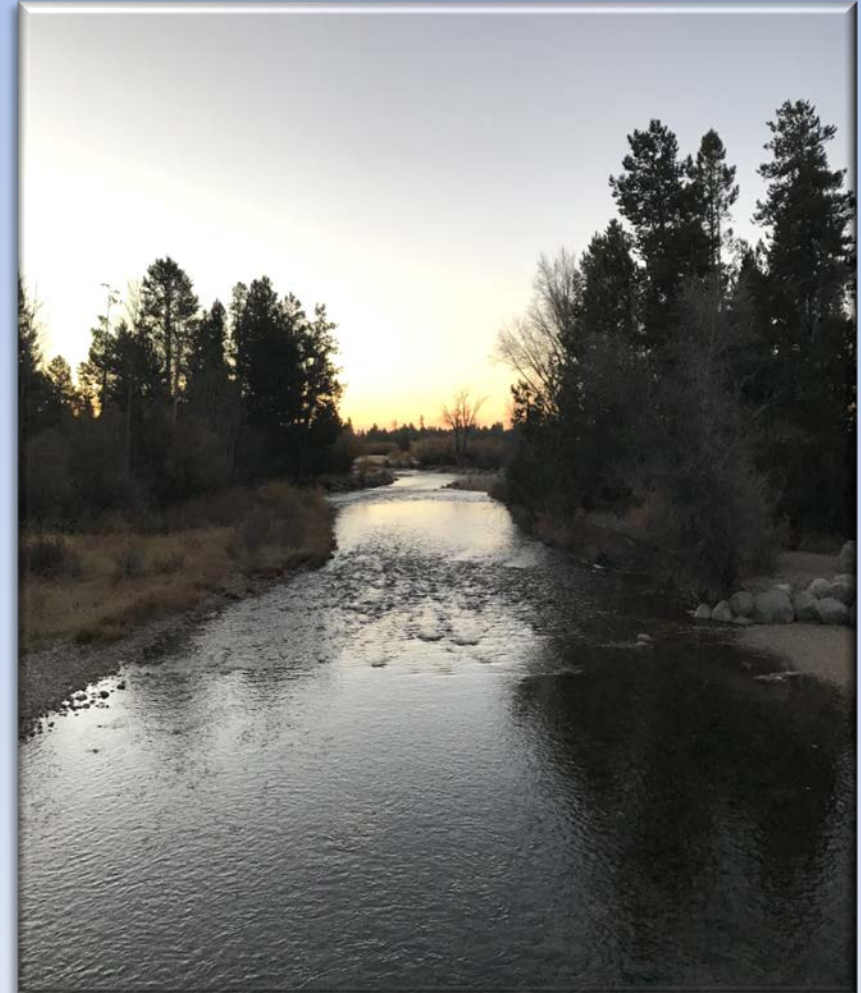




# Demand Management Feasibility Investigation

# 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.



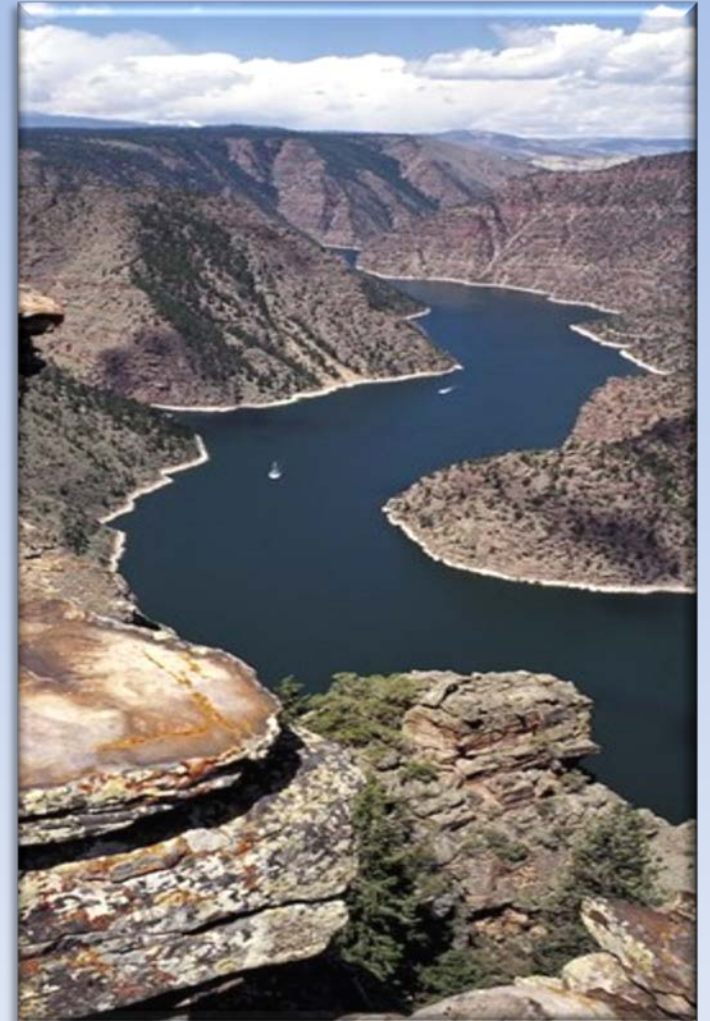
# Considering Demand Management:

- ❖ Any UB Demand Management Program Must be:
  - ✓ Temporary
  - ✓ Voluntary
  - ✓ Compensated
  
- ❖ These conditions agreed upon by the Upper Basin States since first beginning to explore Demand Management in 2014.

# Some Demand Management Issues

- ❖ Lots of issues exist -
  - ✓ consistency with state water law and federal law
  - ✓ protecting existing water rights
  - ✓ water consumption measurement
  - ✓ accounting in delivery and storage
  - ✓ management and administration
  - ✓ interest by water users to participate
  - ✓ shepherding
  - ✓ funding
  - ✓ economic and other local impacts
  - ✓ environmental

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





# 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-requisite - 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;
  - ✓ 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).

# 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
<b>Equalization Tier (Powell ≥ Equalization [EQ] Elevation)</b>	<b>13</b>	<b>26</b>	<b>24</b>	<b>30</b>	<b>27</b>
<i>Equalization – annual release &gt; 8.23 maf</i>	13	26	24	29	26
<i>Equalization – annual release = 8.23 maf</i>	0	0	0	<1	<1
<b>Upper Elevation Balancing Tier (Powell &lt; EQ Elevation and ≥ 3,575 ft)</b>	<b>87</b>	<b>72</b>	<b>59</b>	<b>53</b>	<b>55</b>
<i>Upper Elevation Balancing – annual release &gt; 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 &lt; 8.23 maf</i>	0	0	0	0	0
<b>Mid-Elevation Release Tier (Powell &lt; 3,575 and ≥ 3,525 ft)</b>	<b>0</b>	<b>2</b>	<b>17</b>	<b>16</b>	<b>16</b>
<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
<b>Lower Elevation Balancing Tier (Powell &lt; 3,525 ft)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>&lt;1</b>	<b>2</b>
<b>Below Minimum Power Pool (Powell &lt; 3,490 ft)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>&lt;1</b>

Notes:

- <sup>1</sup> Modeled operation including the Bin...
- <sup>2</sup> Reservoir initial...
- <sup>3</sup> Full Hydrology u...
- <sup>4</sup> Percentages sh...
- <sup>5</sup> Percentages shown may not sum to 100% due to rounding to the nearest percent.

Very small chance UB will need curtailment or Demand Management prior to 2026 unless hydrology worsens.

# Interstate Efforts & Coordination

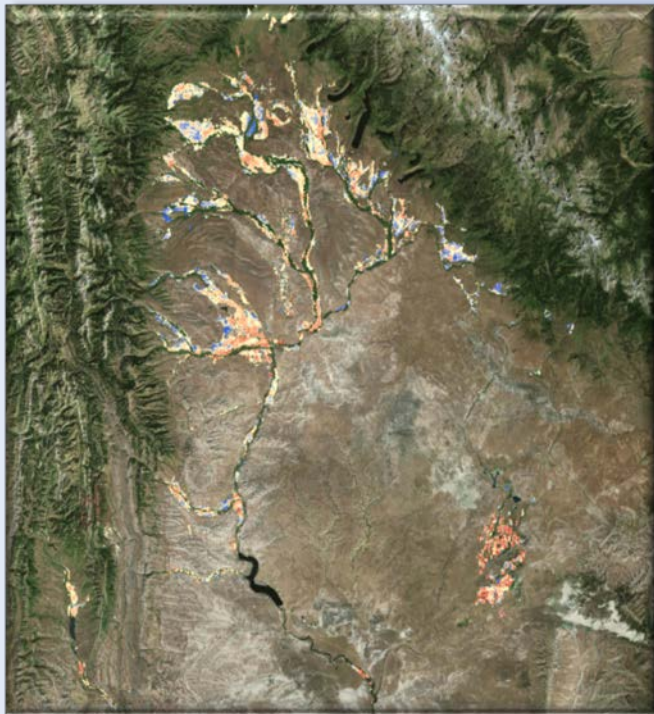
- ❖ UCRC Demand Management Committee: Investigating Demand Management issues at an Upper Basin level.
  - ✓ UCRC released a request for proposals on October 30<sup>th</sup> for bids to investigate legal, technical, economic and stakeholder outreach issues. Work not expected to be completed until 2022.
  - ✓ Proposals must be received by 3:00 p.m., Friday, December 20<sup>th</sup>.
  
- ❖ Upper Basin States each conducting feasibility investigations and considering issues unique to them. This began in Wyoming in September.
  
- ❖ Ongoing coordination between the States and the UCRC.

# Wyoming Consumptive Use Measurement Efforts

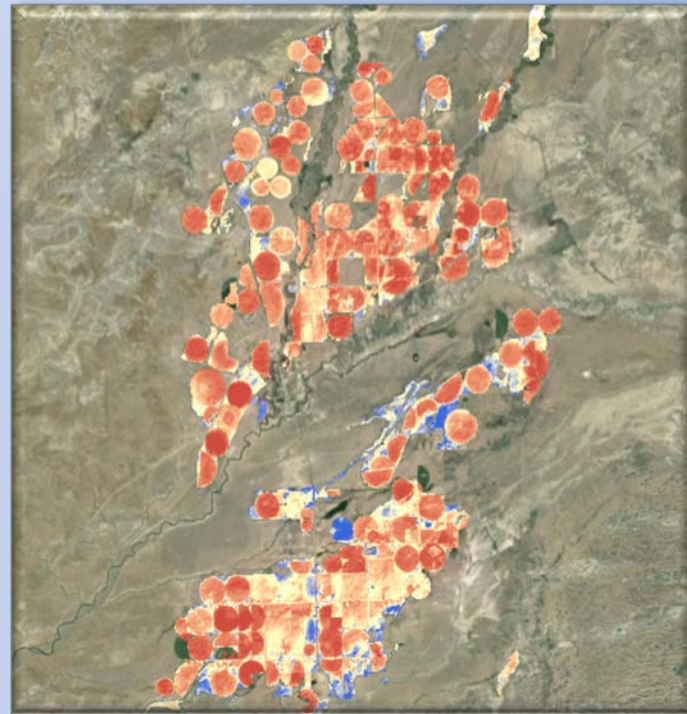
- ❖ In addition to weather station estimates (Penman-Monteith), SEO uses remote sensing method METRIC™ (Currently 2011 and 2015). This method that calculates evapotranspiration (ET) with multiple Landsat satellite images, using an energy balance approach.
  - ✓ Current project will provide two additional years selected from 2012 to 2020.
  - ✓ Combined with UCRC efforts, we will understand our irrigated water consumption better than at any time in the past, basin wide and on a fine scale.
  - ✓ Resulting information can be used in the assessment of risk to water rights by a Compact curtailment, or for calculating the amount of water that could be leased, transferred or credited under potential demand management program.
  
- ❖ SEO plans to engage additional work to further update Wyoming's water right database to better represent actual use under current water rights including better association between water rights and structures and identifying current irrigated acres under specific water rights.
  - ✓ This will be Phase I of additional work, to be followed by two additional phases as funding allows.

# Beneficial Consumptive Use - Remote Sensing Methods

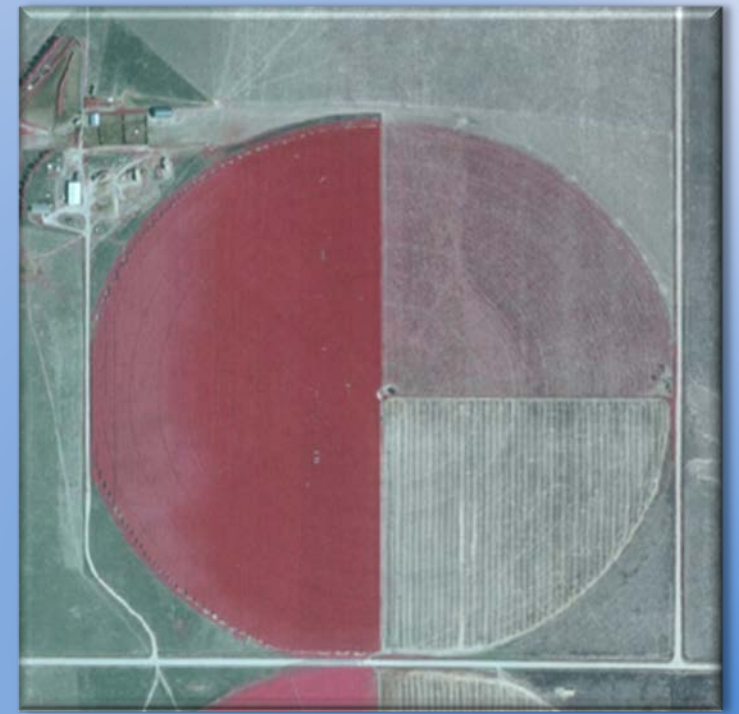
- ❖ ET calculated on a 30m x 30m grid
- ❖ Remote sensing methods are widely regarded as being the most accurate and efficient way of estimating ET, especially on a fine scale.



Basinwide



Farson-Eden



Field scale

# A critical question:

- ❖ Whether Wyoming and the other Upper Basin States create a Demand Management Program to avoid curtailment, or determine involuntary curtailment is the best path, the question of how much water is conserved by reducing uses remains.
  - ✓ After all, the UCRC will determine an acre-foot number for each state, but it will be each state's responsibility to meet it.
  - ✓ Therefore, in either scenario, the amount of water conserved by the reduction in diversions is needed (whether it's by voluntary DM moved into storage, or mandatory regulation at a headgate). Otherwise, we risk either providing too little water, or too much. Both are bad.



# Next Steps:

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- Approximately 8 Focus Group meetings in both basins: TBA
- Website information: <http://www.uwyo.edu/uwe/wy-dm-ucrb/>
- Contacts: Steve Wolff, SEO: [steve.wolff@wyo.gov](mailto:steve.wolff@wyo.gov), (307) 777-1942  
Charlie Ferrantelli, SEO: [charlie.ferrantelli@wyo.gov](mailto:charlie.ferrantelli@wyo.gov), (307)777-6151  
Chris Brown, WY AG's Office: [chris.brown@wyo.gov](mailto:chris.brown@wyo.gov), (307)777-3406  
Ginger Paige, UW Extension: [GPaige@uwyo.edu](mailto:GPaige@uwyo.edu), (307) 766-2200  
Kristi Hansen, UW Extension: [Kristi.Hansen@uwyo.edu](mailto:Kristi.Hansen@uwyo.edu), (307) 766-3598  
Anne MacKinnon, UW adjunct: [amack@vcn.com](mailto:amack@vcn.com), (307) 277-1435
- Opportunity to participate & provide comments: now, on website, by email or phone, and in future meetings





Seedskadee National Wildlife Refuge, Wyoming. *(Photo: U.S. Fish and Wildlife Service)*

Thank You!