

Water Conservation in the Colorado River Basin: An Upper Basin Perspective

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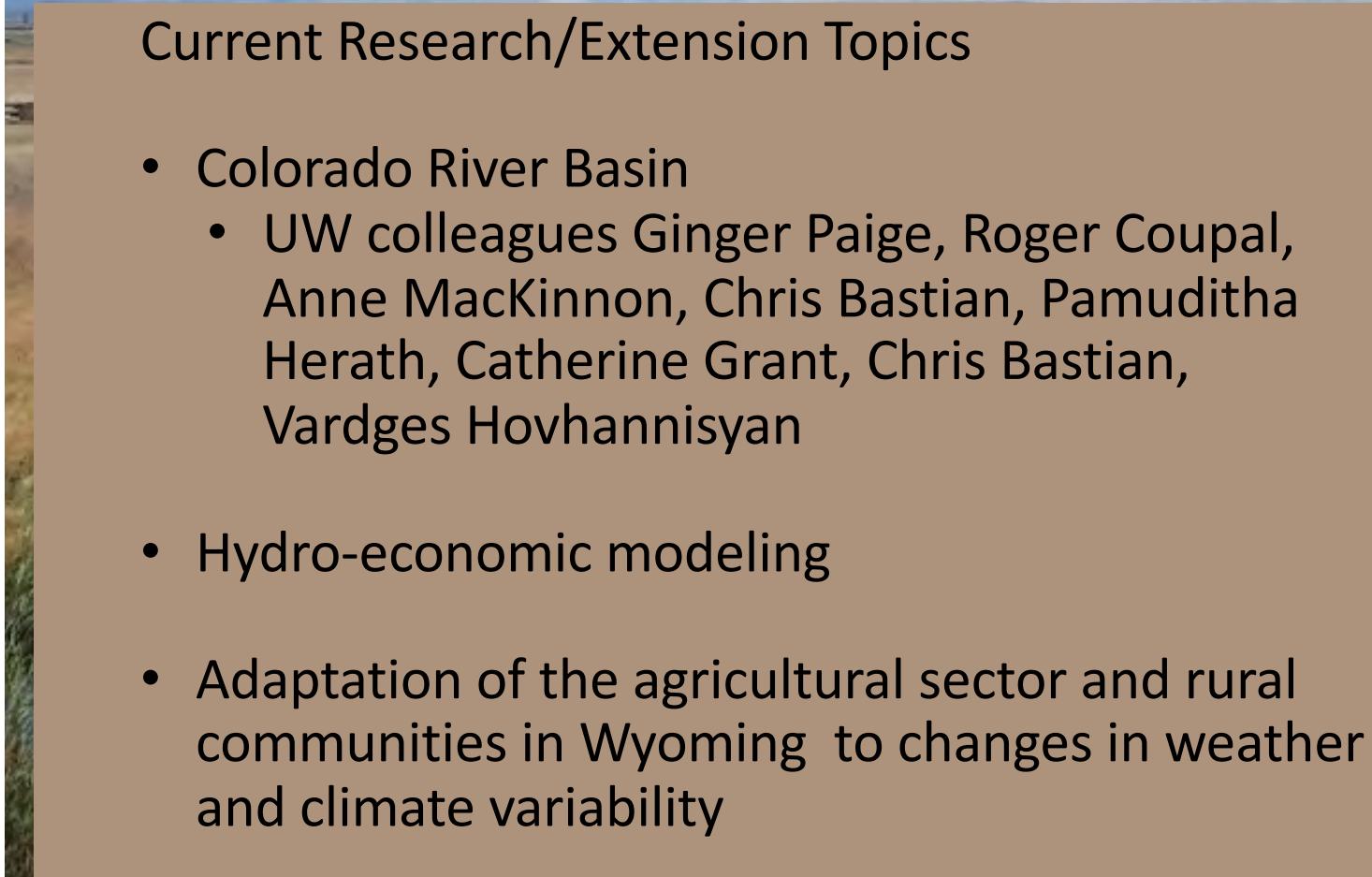


UC Riverside Water Seminar Series ~ February 23, 2023

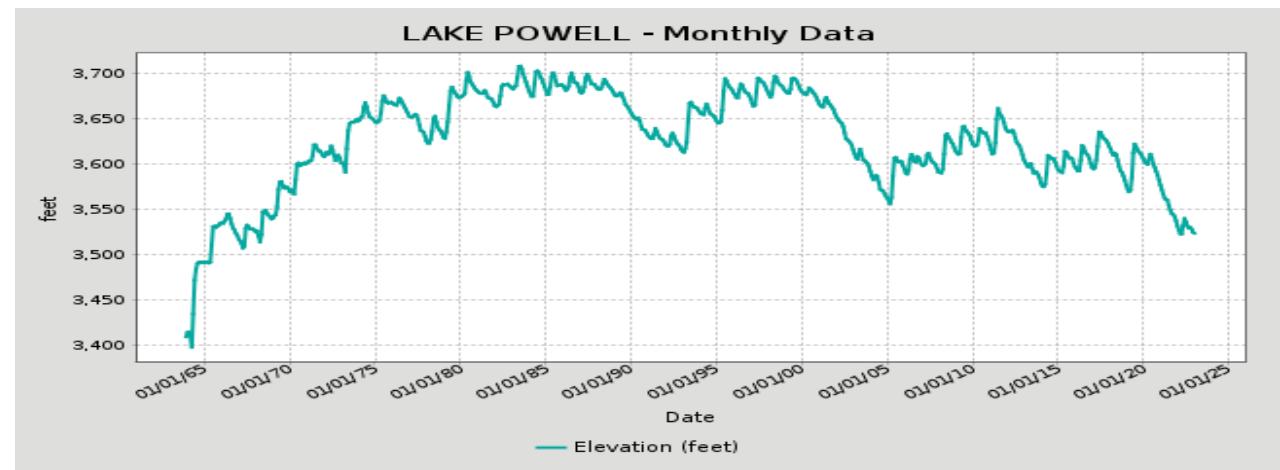
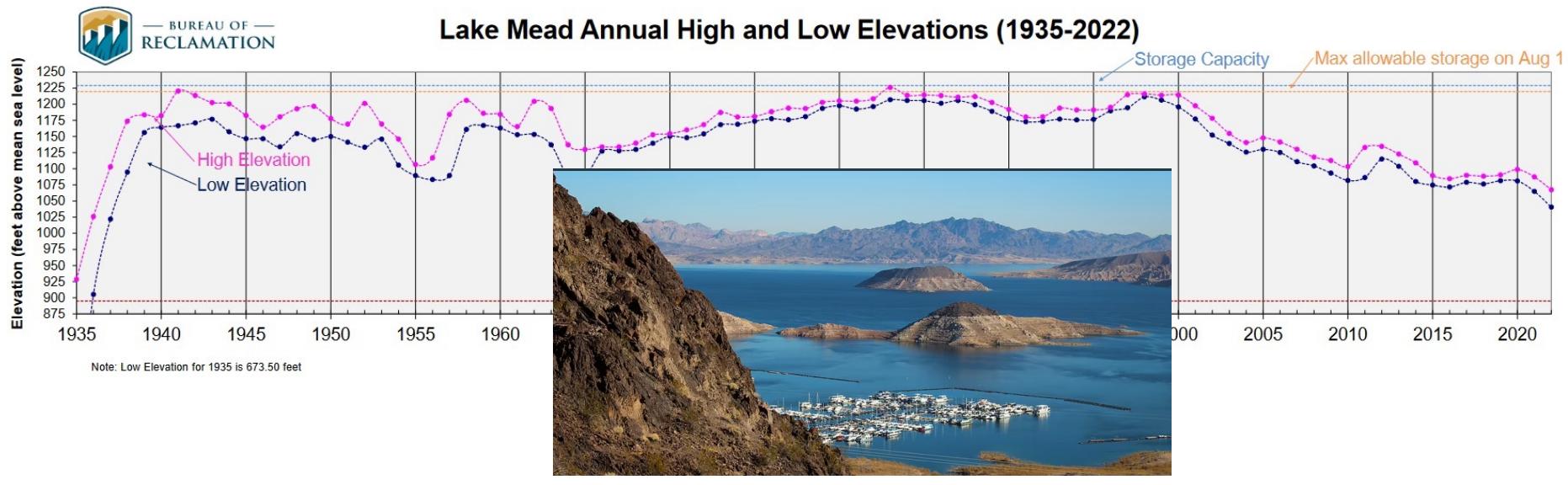
Water Conservation in the Colorado River Basin: An Upper Basin Perspective

Current Research/Extension Topics

- Colorado River Basin
 - UW colleagues Ginger Paige, Roger Coupal, Anne MacKinnon, Chris Bastian, Pamuditha Herath, Catherine Grant, Chris Bastian, Vardges Hovhannisyan
- Hydro-economic modeling
- Adaptation of the agricultural sector and rural communities in Wyoming to changes in weather and climate variability



Colorado River Basin Reservoir Elevation Levels Are at Historic Lows



Sources. Lakes Mead and Powell elevation figures: USBR; Lake Mead photo: John Edelson; Lake Powell photo: Justin Sullivan.

How Did We Get Here?

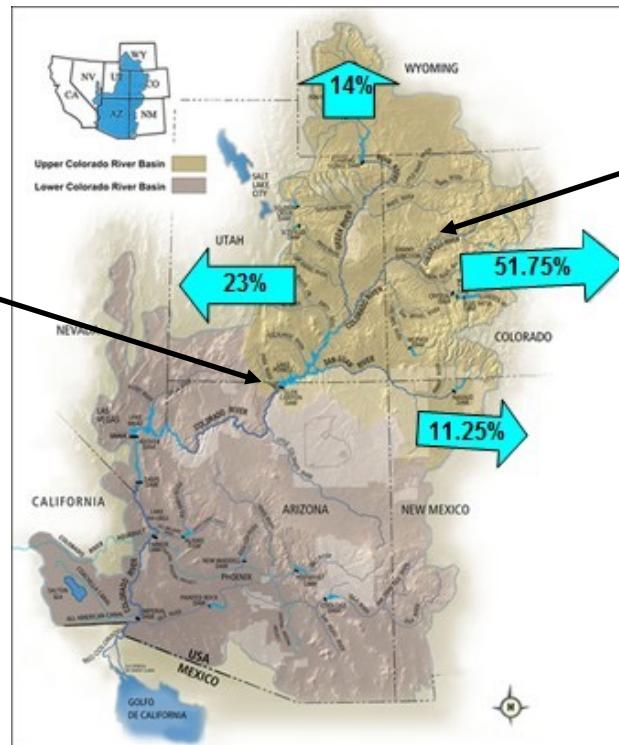
Key Points of the Colorado River Compact of 1922 and the Upper Basin Compact of 1948

Lees Ferry, AZ, is the legal dividing point between Upper and Lower Basins

Lower Division (CA, AZ, NV)
guaranteed 7.5 MAF/y

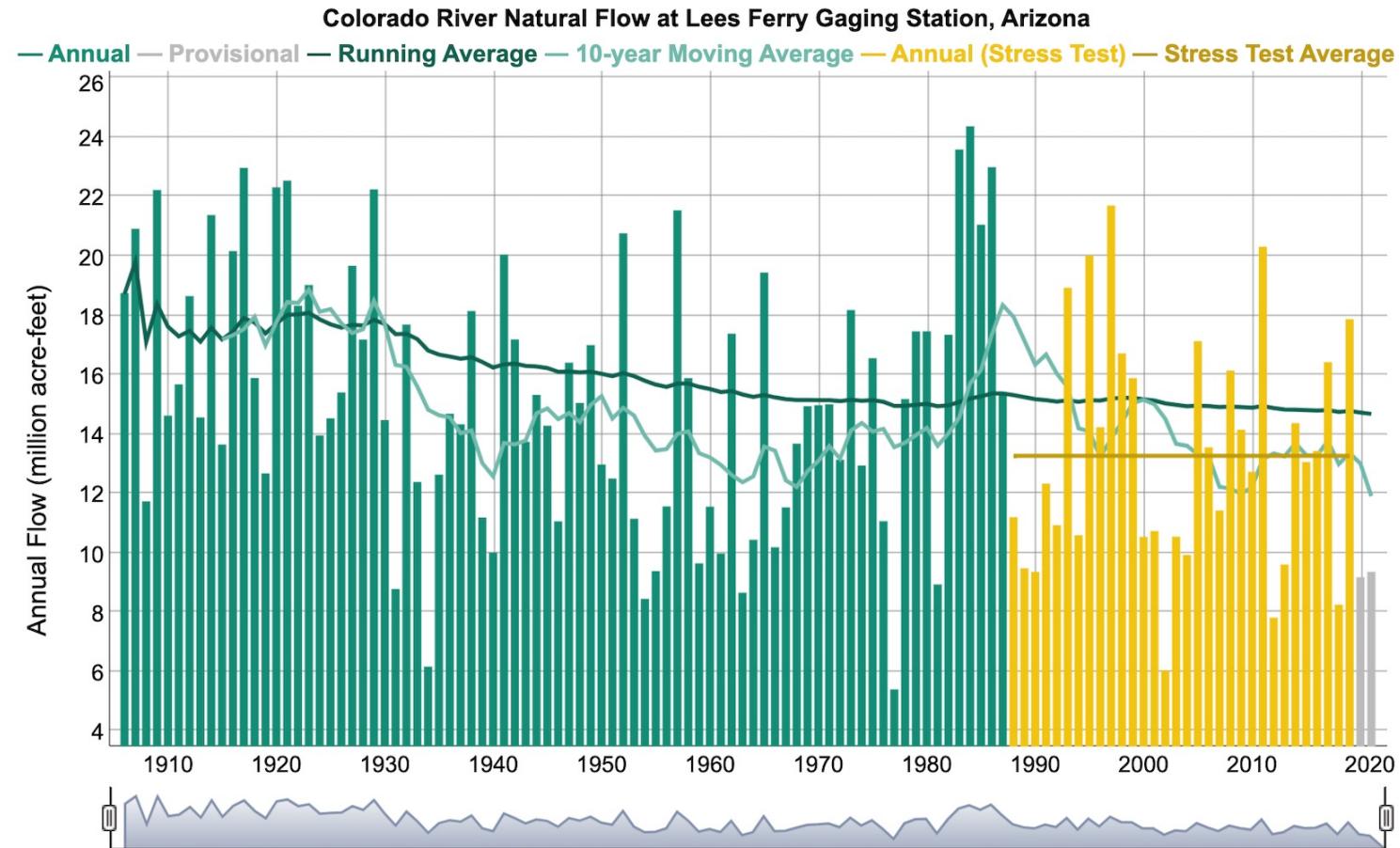
1944 Compact:
Mexico- 1.5 MAF/y

Upper
Division
(CO, UT,
WY, NM)



Curtailment (defined under the 1948 Upper Colorado River Basin Compact): river regulation in which involuntary and uncompensated reductions in water use may be required by the Upper Division states to ensure Compact obligations are met.

How Did We Get Here?

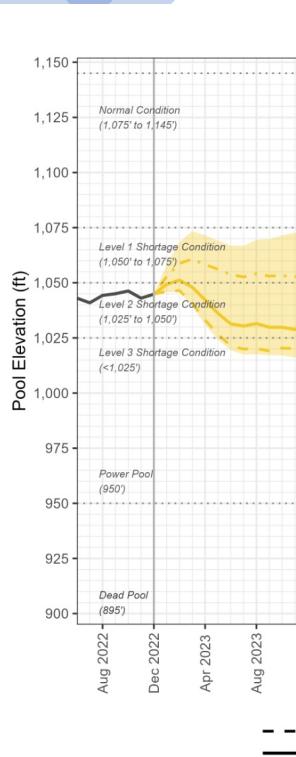


<https://www.usbr.gov/lc/region/g4000/riverops/crss-alt-hydrology.html>

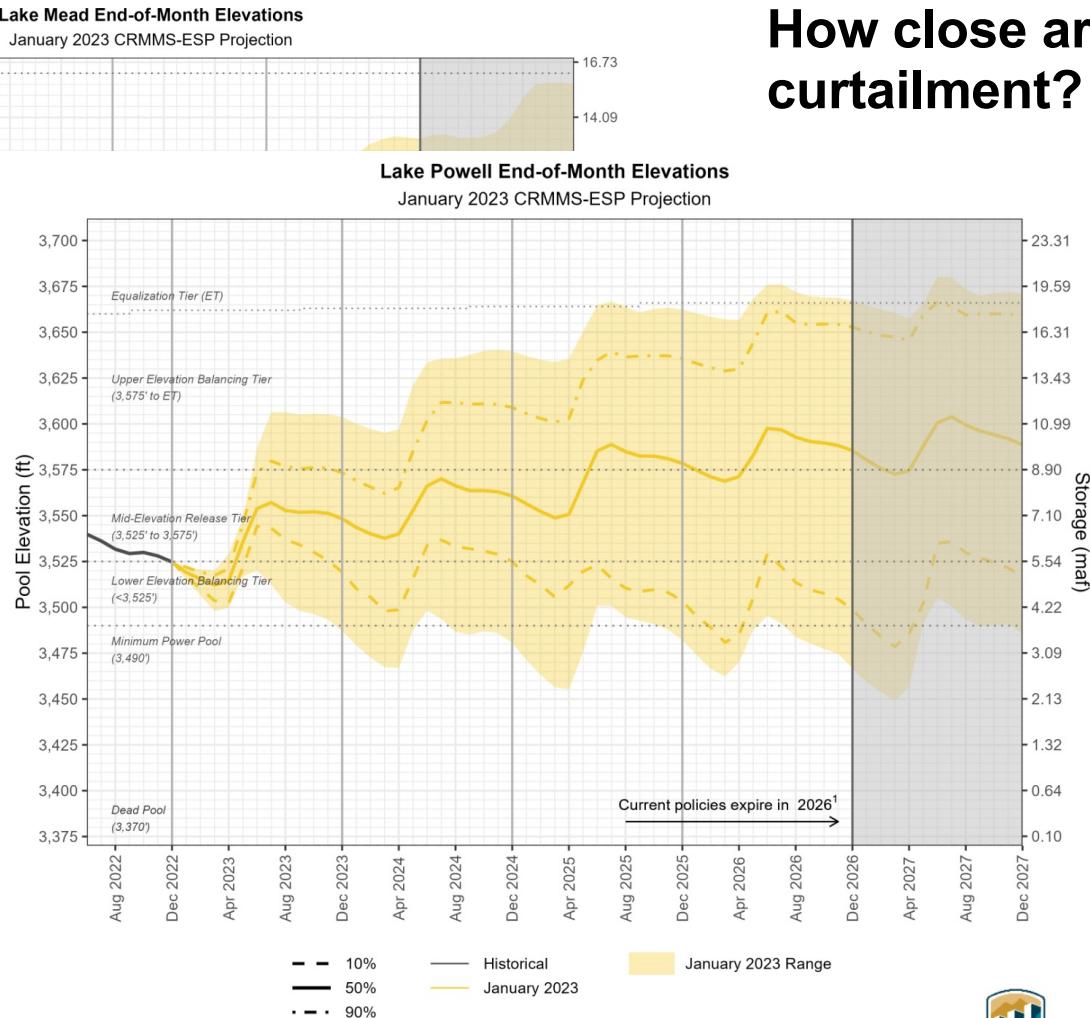
How Did We Get Here?

- 2007 Interim Guidelines (expire in 2026)
- Additional subsequent measures
 - 2019 Drought Contingency Plans
 - Supply Augmentation, Demand Management, Drought Reservoir Operations Agreement
 - 2022 Supplemental EIS for near-term Colorado River operations underway (to become effective in 2023)
 - 2023 Six-state and CA proposals
 - Key provisions of 6-State CBMA. At 3525':
 - The Upper Basin could release up to 500 KAF of reservoir storage (DROA)
 - The Upper Basin will consider additional voluntary reductions
- Renegotiation of the 2007 Guidelines (for post-2026)

How Did We Get Here?



1 - For modeling purposes, simulated years beyond Contingency Plans, and Minute 323, including the demand management, operations under these agreements for post-2026, and the modeling assumptions desig



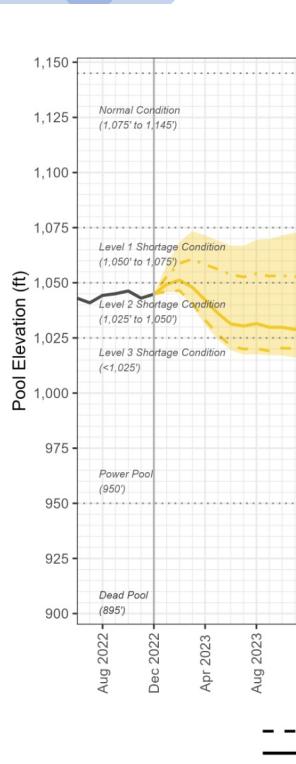
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How close are we to curtailment? Not known.

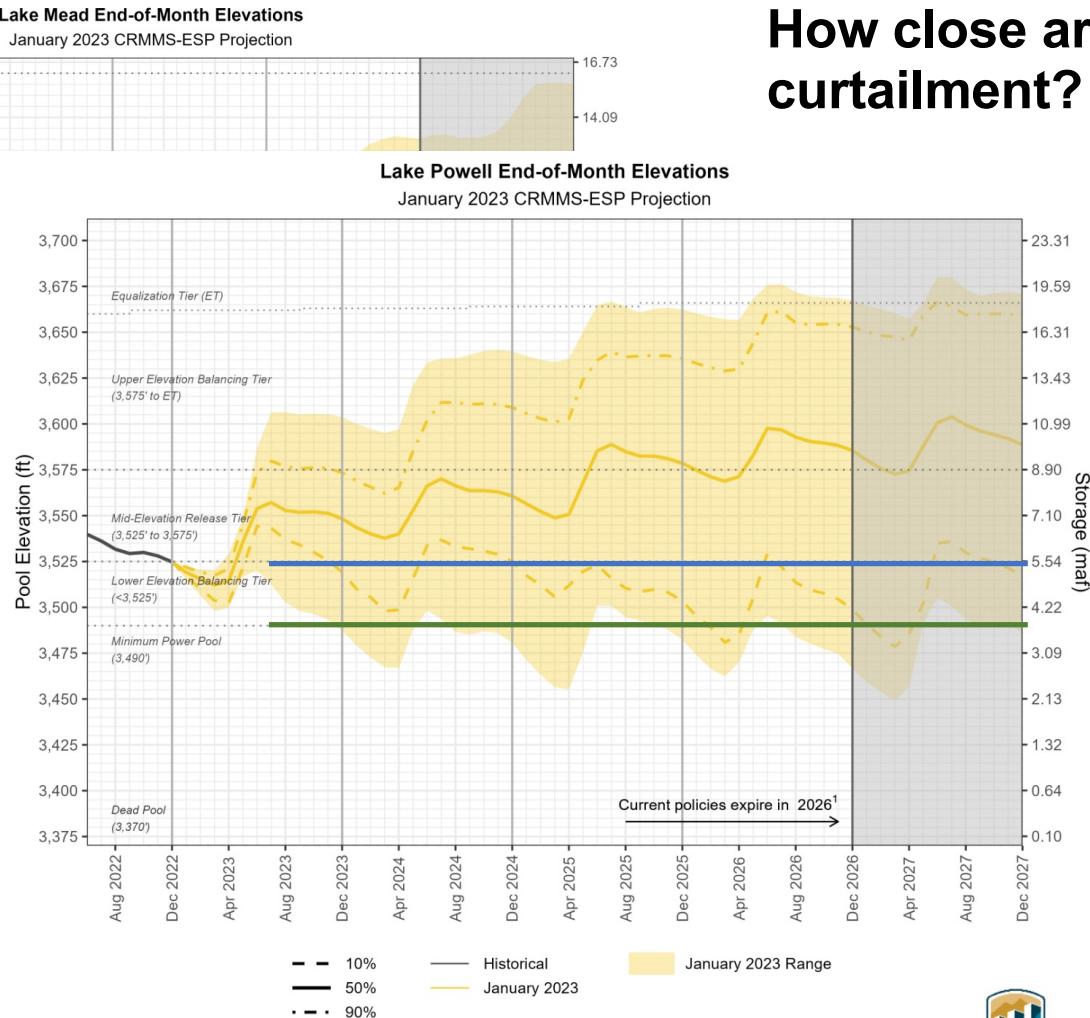


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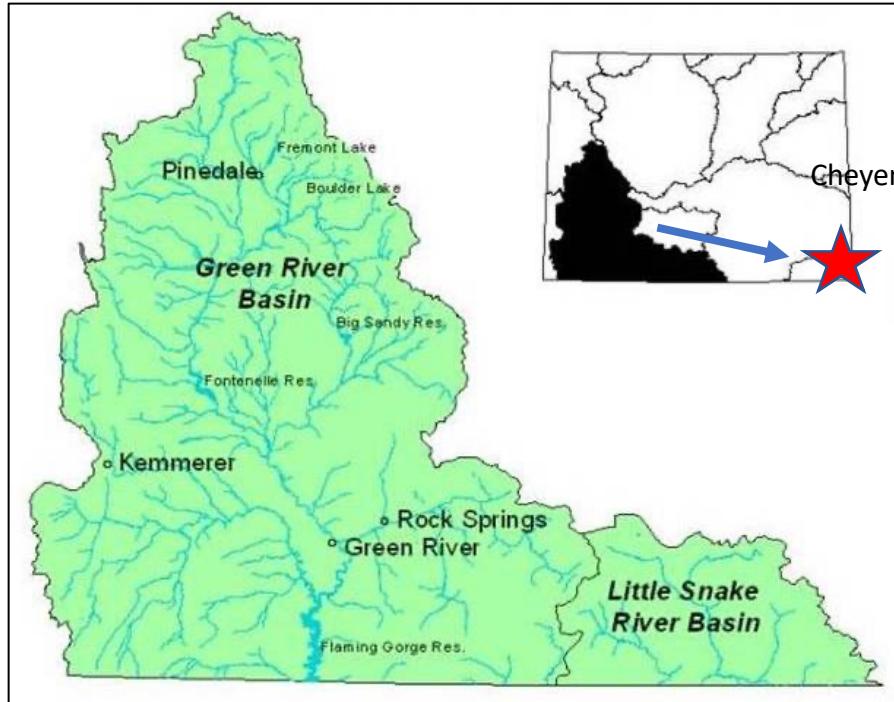
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Curtailment: River regulation in which involuntary and uncompensated reductions in water use may be required by Upper Division states to ensure Compact obligations are met.

What Are We Going to Do About It?



Average Annual Consumptive Use (2011-2020)

Use Sector	Wyoming CRB	
	AF	% of WY-CRB
Agriculture Total	501,571	84%
Grass Flood		
Grass Pivot		
Alfalfa Pivot		
Municipal and Industrial	62,440	10%
Reservoir Evaporation	27,000	4%
Trans-Basin Diversions	9,314	2%
Total	600,325	100%

Source: WY SEO, 2022



Photos: Melanie Purcell, Sublette County Conservation District

What Are We Going to Do About It?

- Upper Basin States have been exploring ways to ensure they meet their obligations to downstream states under 1922 Colorado River Compact.
 - In 2019, Congress passed the Demand Management Storage Act, which facilitates:

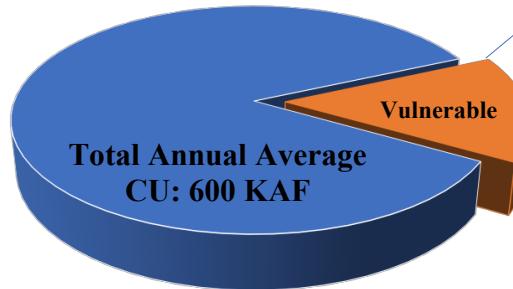
Demand Management

- Reduce consumptive water use
 - Store it in downstream reservoirs, to help the Upper Basin meet its Compact obligations
 - Participation would be **voluntary, temporary, and compensated**
 - DM reduces risk of **Curtailment**



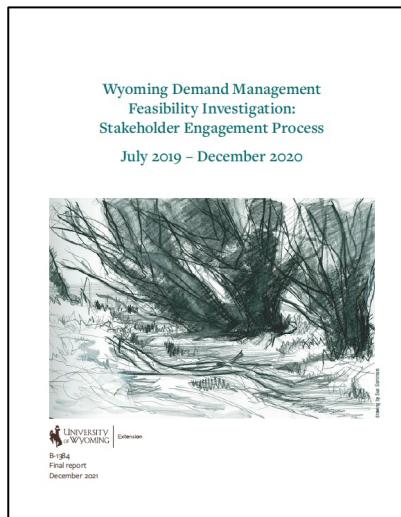
What Are We Going to Do About It?

■ Pre-Compact ■ Post-Compact



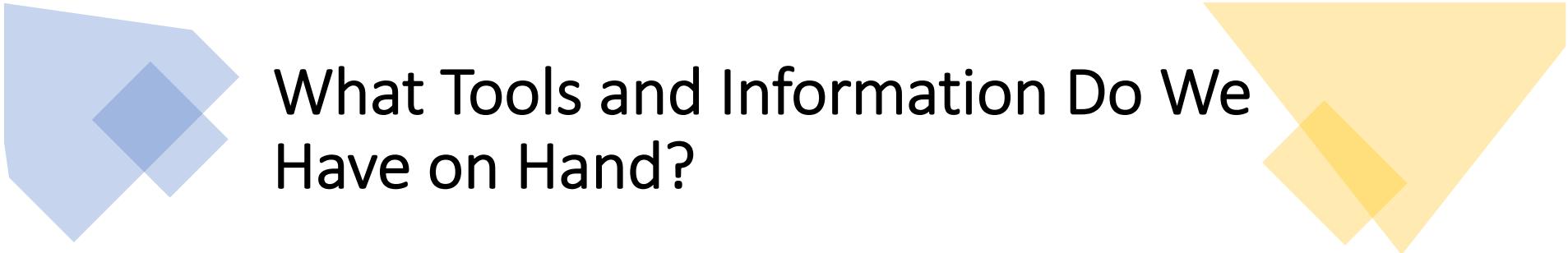
Post-Compact Examples

Irrigation:
2nd CFS
Free River
Power Plants
Trona Mines
City of Cheyenne
Basin Cities and Towns



Search for "WY-CRB DM"
<https://www.uwyo.edu/uwe/wy-dm-ucrb/>

	Agricultural	Municipal/Industrial
Within a Demand Management Program:	<p>May participate, because:</p> <ul style="list-style-type: none"> - The price is right - Operation was planning to downsize anyway 	<p>May participate, to:</p> <ul style="list-style-type: none"> - Explore options/relationships - Demonstrate "skin in the game"
Under Curtailment:	<ul style="list-style-type: none"> - May choose to lease water to curtailed M&I neighbors - May be unable to push own water to field and so reduce water use 	<ul style="list-style-type: none"> - Will need to reduce water consumption and/or - Will need to acquire additional water resources and/or reduce consumption



What Tools and Information Do We Have on Hand?

1. Prior System Conservation Pilot Program (SCPP) Experience (2015-2018)
2. Rancher Survey
 - What did ag water users think about participating in a potential DM program, in 2020?
3. Economic Impacts Study
 - What would be the regional economic impacts of a potential DM program?
4. Existing Tools under Wyoming State Law
 - What tools are currently available under state law to facilitate water transfers?



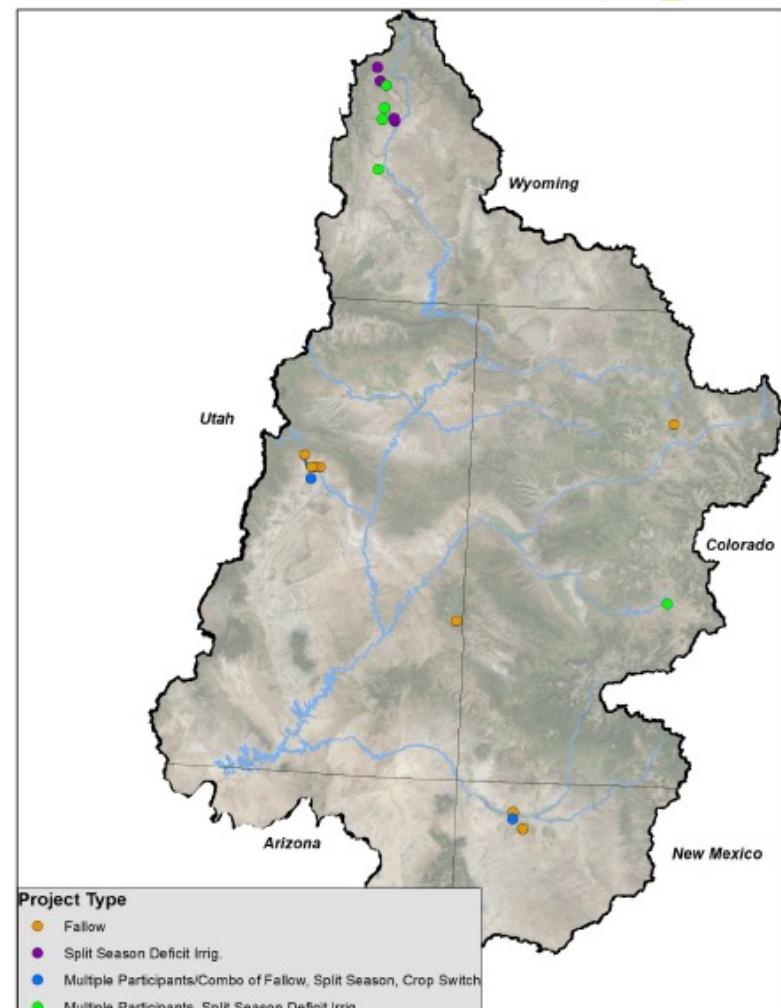
What Tools and Information Do We Have on Hand? Pilot Experience (1/1)

System Conservation Pilot Program

- Program Purpose: To assess the feasibility of voluntary, temporary, and compensated reductions in consumptive water use.
- Program Duration: 2015 through 2018.

In Wyoming for 2018:

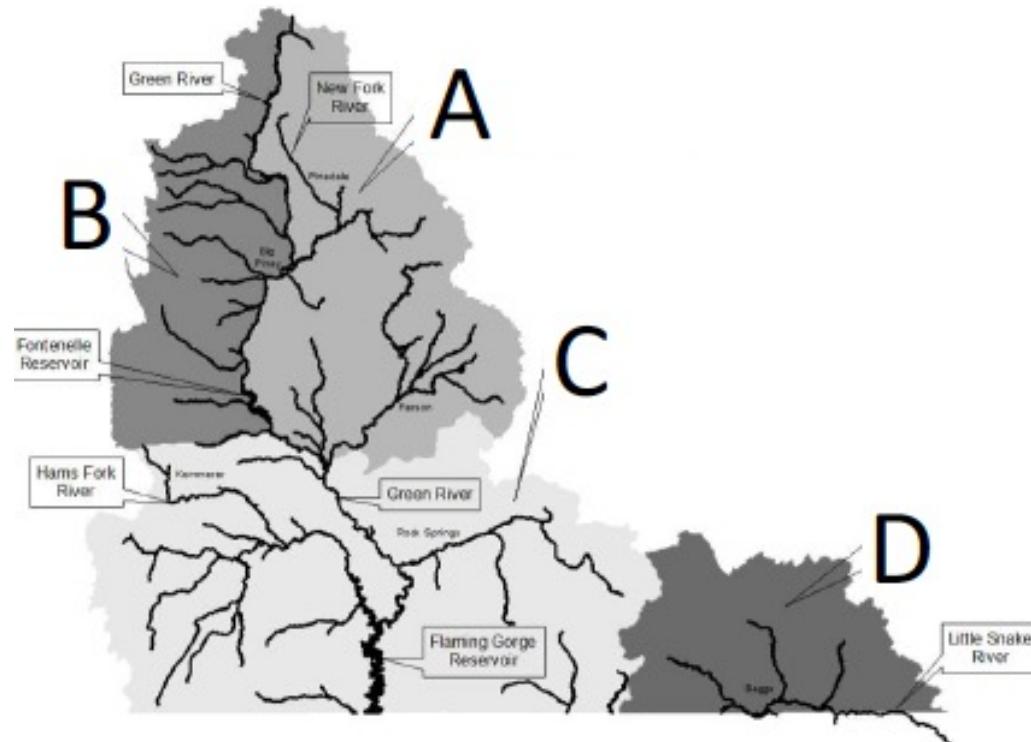
- 23 projects generated estimated consumptive use savings of approx. 14,000 af, estimated.
- Average price: \$150/acre-foot.
- Split-season fallow on grass/alfalfa hay.



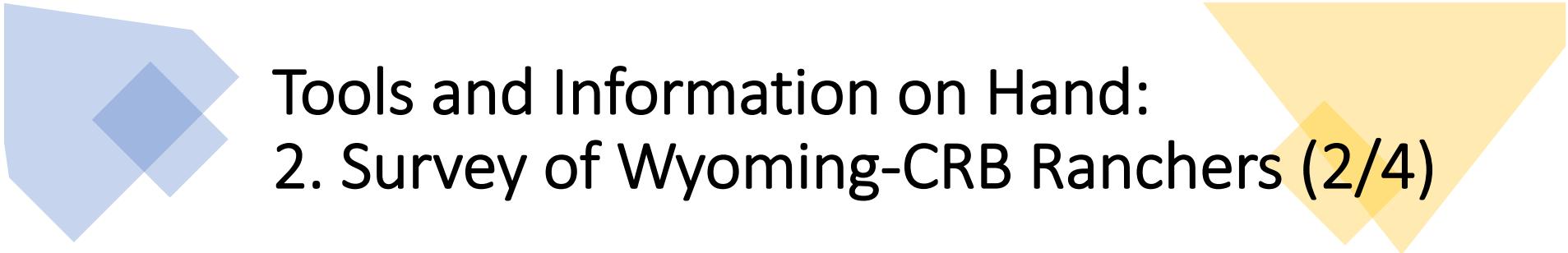
Location of projects implemented in 2018.
Source: UCRC (2019).

Tools and Information on Hand: 2. Survey of Wyoming-CRB Ranchers (1/4)

System Conservation Pilot Program Participant Experiences



- 22 SCPP participants received the survey; 14 responded (64% response rate)
- Overall, survey respondents reported being satisfied with the program.



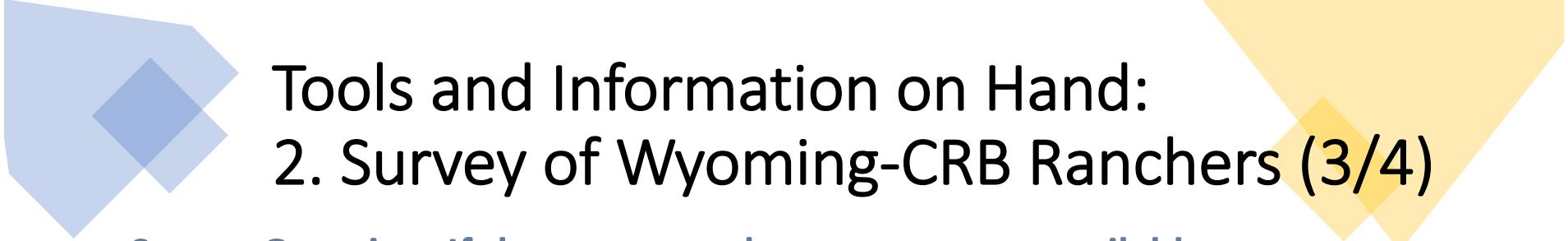
Tools and Information on Hand: 2. Survey of Wyoming-CRB Ranchers (2/4)

System Conservation Pilot Program Participant Experiences

- SCPP Participant respondents generally reported that
 - *Their household and county was about the same or better off as a result of the program; and*
 - *The county would be about the same or better off with an expanded version of the program in the future.*

Positive and Negative Impacts Reported	
Positive	Negative
-Financial benefits of participation -Brought the community together -Helped people to realize the value of the region's natural resource base	-Early drying up of hay fields -Negative yield impacts in the following year -Concern about the impacts of participating on long-term water right

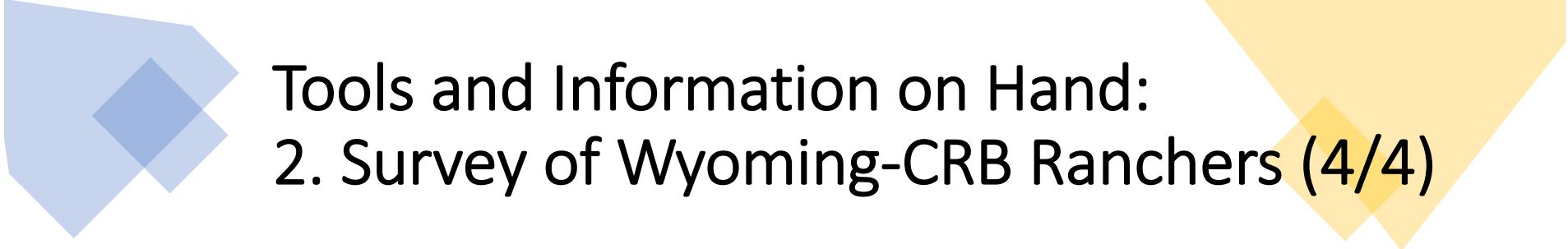




Tools and Information on Hand: 2. Survey of Wyoming-CRB Ranchers (3/4)

Survey Question: If there was a voluntary program available to compensate producers for a reduction in irrigation, would you be interested in any of the following demand management practices?

Practice	% Yes
Investments that reduce water use by enhancing delivery systems	58%
Everyone on a tributary (or irrigation district) agrees to implement specified management practices (e.g., above programs)	32%
Everyone on a tributary (or irrigation district) agrees to save a certain amount of water (no specification of management practices)	25%
Split season (do not turn water back on after last cutting)	39%
Forego the use of any stored water	12%
Earlier harvest than normal (and then turn off water)	10%
No irrigation on some fields for the whole year	10%
No irrigation on the same fields for multiple years	5%



Tools and Information on Hand: 2. Survey of Wyoming-CRB Ranchers (4/4)

- **Survey Question: Do you think there would be agronomic impacts, ecological impacts, or hydrologic impacts from implementing Demand Management practices on your ranch?**

Percentage of surveyed producers who think there would be DECREASES in:

Grass composition or species diversity	(51%)
Wetland presence	(49%)
Return flows	(40%)

- **Key take-home** The decision of whether to participate is complex and depends on many factors unrelated to field-level decision-making.

Tools and Information on Hand:

3. Economic Impacts (1/3)

What would be the **regional economic impacts** of a larger Demand Management program on agriculturally-dependent local communities and economies, if the consumptive use reductions came from the ag sector?

For example:

- Participating producer receives a check for reducing water use
 - Buys a new truck or other equipment (positive impact)
 - Equipment dealer hires more employees (positive impact)
 - Participating producer grows less hay
 - Reduce custom harvest services (negative impact)
 - Reduces equipment repair purchases (negative impact)



Search for “WY-CRB DM Economic Impact Report” <https://www.uwyo.edu/uwe/wy-dm-ucrb/econ-report.html>

Economic Assessment of a Water Demand Management Program in Wyoming's Portion of the Colorado River Basin

(Photo: Bobbi Fink, Wyoming Dept. of Natural Resources)

ECONOMIC ASSESSMENT OF A WATER DEMAND MANAGEMENT PROGRAM IN THE WYOMING COLORADO RIVER BASIN

SUMMARY This paper discusses the feasibility of instituting a water "Demand Management" (DM) program. Under a DM program, water users in the Wyoming portion of the Colorado River basin would be compensated for voluntarily reducing their consumption of surface water. Colorado, New Mexico, and Utah are also considering a DM program. The saved water would be used to help meet the water needs of the Colorado River Basin Compact of 1932. This bulletin reports results from a study assessing the potential impacts of a DM program on households, and communities if a potential DM program in Wyoming, if consumptive use reductions only came from the agricultural sector.

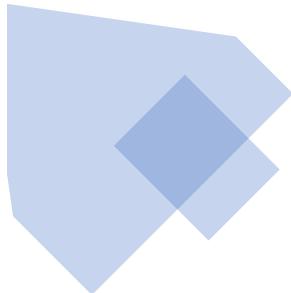
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B-2372
September 2011
Wyoming State Engineer, Roger Clegg, Dean Thrasher, Department of Agricultural and Applied Economics, College of Agriculture and Natural Resources, University of Wyoming, and Drew Bennett, Haub School of Environment and Natural Resources,
University of Wyoming



Photos: Melanie Purcell, Sublette County Conservation District



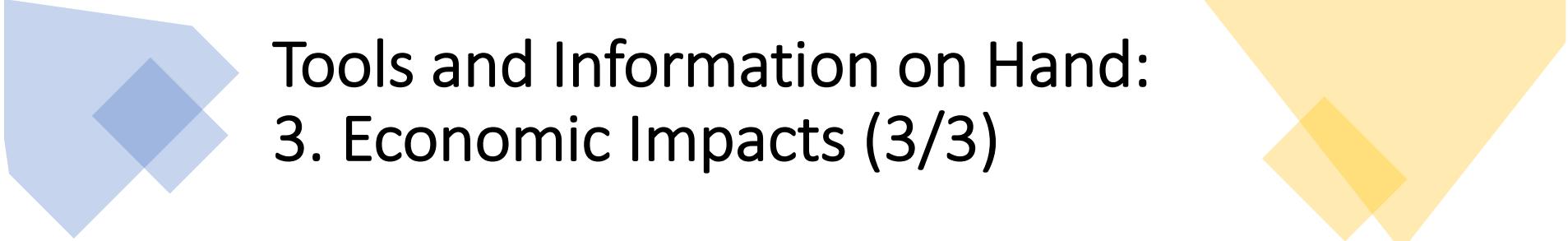
Tools and Information on Hand: 3. Economic Impacts (2/3)



How would these consumptive use reductions be achieved?

- **Flooded grass hay** acres are enrolled
- Management practice: No irrigation for the **entire season**.
- Assume **70% yield reduction in enrollment year** and a **50% yield reduction in the following year**.
- Participation payment is assumed to be \$230/AF.
- **Temporary and rotational**





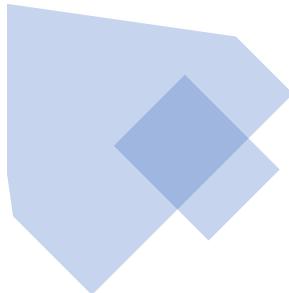
Tools and Information on Hand: 3. Economic Impacts (3/3)

- What is the response of the region's economy to a "shock" (removing acres from hay production)?
- Results are measured in jobs and value-added income

Impacts depend on how producer responds to reduced hay production.

If DM participants reduce hay exports,	we see a 3% reduction in the ag economy	(0.04% in overall regional economy)
If they purchase replacement hay, ...	5% reduction...	(0.07% reduction)
If they reduce herd size,	...7% reduction...	(0.1% reduction)

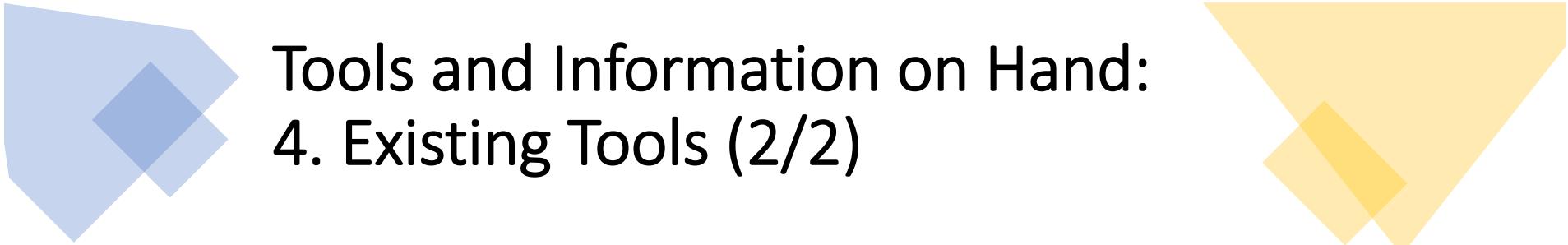
- Temporary Demand Management better for the economy in the exporting region than "buy-and-dry"
- Actual impacts may differ due to model inflexibilities and dynamic processes



Tools and Information on Hand: 4. Existing Tools (1/2)

- Permanent Transfers: Change in use and change in place of use.
- Temporary Water Use Agreements
- Water Exchanges
- Storage generally





Tools and Information on Hand: 4. Existing Tools (2/2)

2023 SCPP Update

WY SEO is accepting applications through March 1, 2023

Water User Interest (as of early February 2023):

- 7 applications in hand (~ 5,000 acres and 7000 af in reductions)
- Approximately 10 (additional) applications in process (~ 2900 acres and 3000 af)
- This is a combined 8000 acres proposed in total, 1000 AF in total

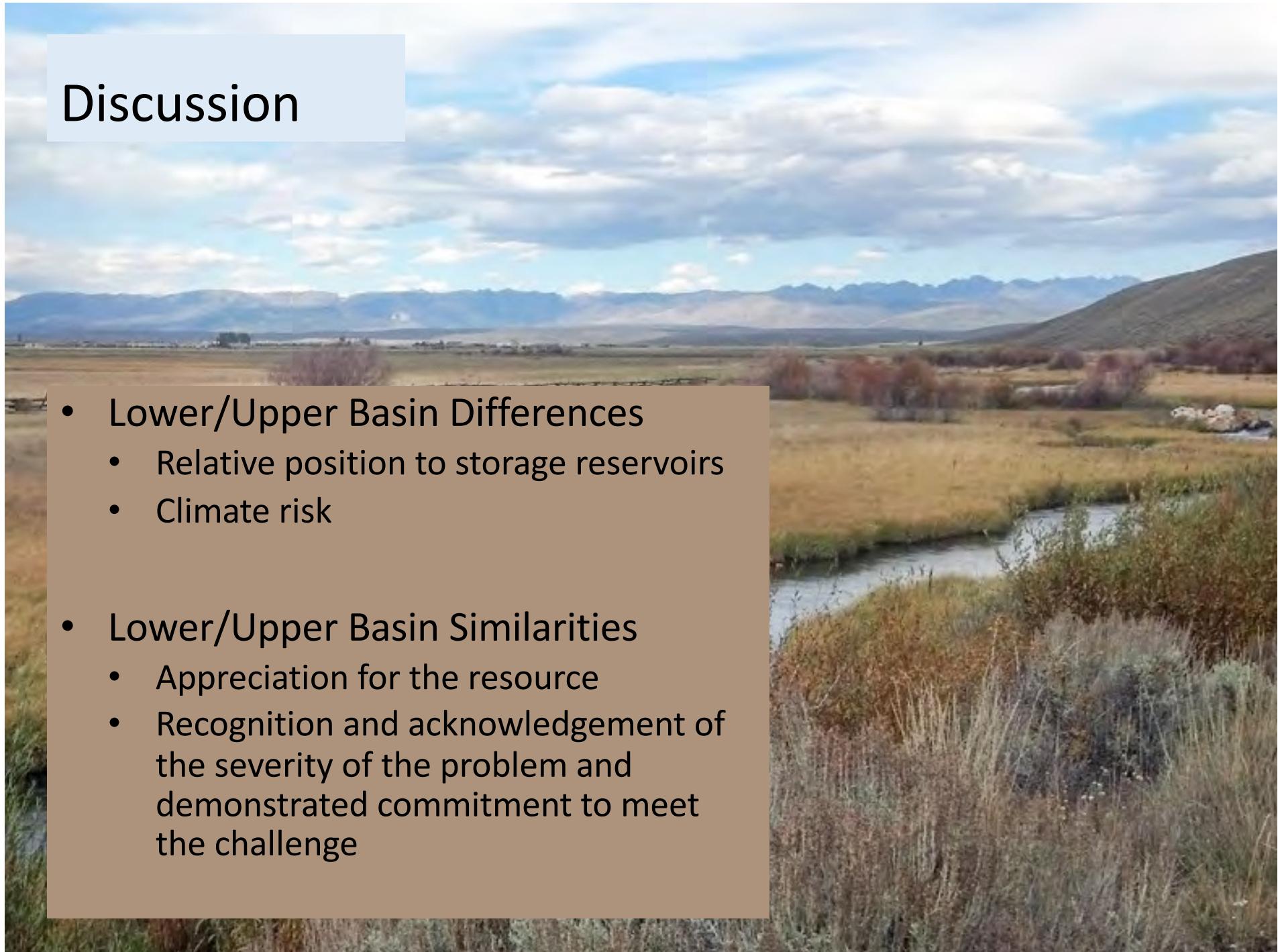
Price and Terms:

- Fixed firm price is \$150/af (bottom price). Higher bids can be accepted: “If your water is worth more than that, ask for it.”
- Compensation based on estimated consumptive use savings (rather than actual)



Discussion

- Lower/Upper Basin Differences
 - Relative position to storage reservoirs
 - Climate risk
- Lower/Upper Basin Similarities
 - Appreciation for the resource
 - Recognition and acknowledgement of the severity of the problem and demonstrated commitment to meet the challenge



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Thank you