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Hard Times on the Colorado River: Drought,
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(Summer Conference, June 8-10)

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SLIDES: Do the Upper Basin States Have Enough Water to Grow?: Is There Enough Water to Go Around?

Don A. Ostler

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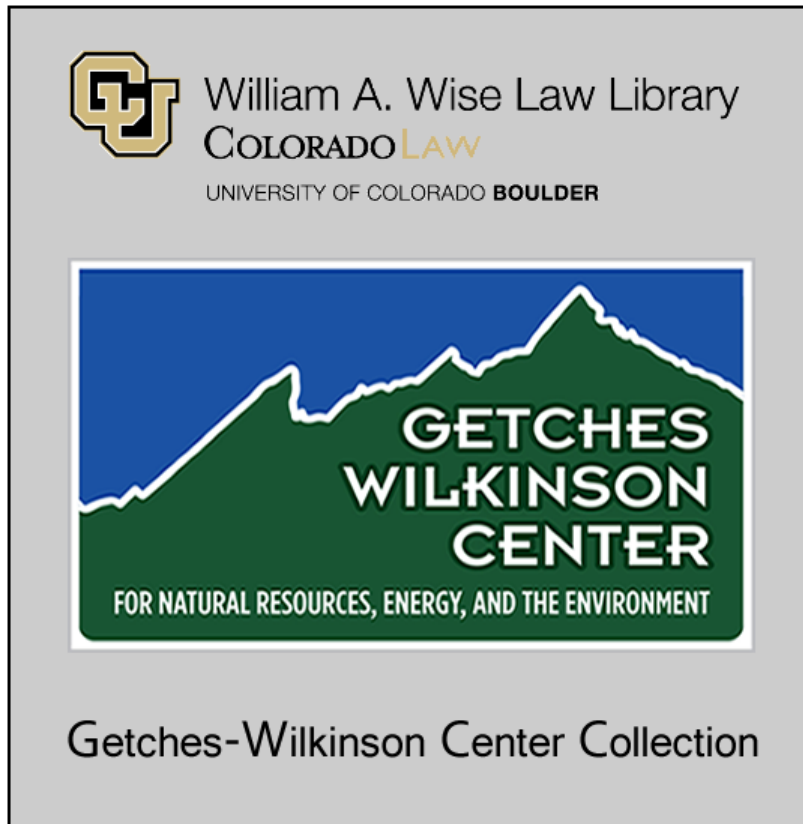
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DO THE UPPER BASIN STATES HAVE ENOUGH WATER TO GROW?

Is There Enough Water To Go Around?

By

Don A. Ostler

Upper Colorado River Commission





NEVADA

UTAH

WYOMING

COLORADO

CALIFORNIA

ARIZONA

NEW MEXICO



Calculated Virgin Flow of the Colorado River at Lee Ferry

- Period of record = 1896 to 2004
- Flow in million acre-feet
 - Minimum 5.6 maf
 - Average 14.8 maf
 - Maximum 24.5 maf





Upper Basin CRSP Storage Capacity (1000 Ac-Ft)

• Fontenelle	345
• Flaming Gorge	3749
• Blue Mesa	829
• Navajo	1,696
• Lake Powell	<u>24,322</u>
– Total	30,941



Recent Drought Impacts

- 5 consecutive years of extreme drought
- Powell inflow 51%, 62%, 59%, 25%, and 51% of average (2000 – 2004)
- Low point – 33% capacity, 145 ft. below full – only 65ft above the power pool
- Recent improvement – 108% of ave. runoff; +- 50 feet of rise
- Dry period may not be over!



Rapid Growth In the Colorado River Basin

- Nevada fastest growing state
- Arizona second fastest growing state
- Utah fourth fastest growing state
- Colorado and California expecting between 25% and 50% pop. Increase by 2030
- The number of people added to Ca is large



1922 Colorado River Compact

- Apportions 7,500,000 ac-ft/yr to both the Upper and Lower Basins
- Lower Basin given the right to increase consumptive use by 1,000,000 ac-ft/yr

1922 Colorado River Compact

- Provides that Mexico be supplied with water, first from surplus over 16maf; and borne equally by the Upper and Lower Basins if no surplus
- Upper Basin shall not cause the flow at Lee Ferry to be depleted below 75,000,000 ac-ft for any ten years

The Mexican Treaty of 1944

- Guarantees an annual delivery to Mexico of 1,500,000 ac-ft per year
- Provides an additional 200,000 ac-ft when there is a surplus
- Allows the USA to reduce deliveries during extraordinary drought in same proportion as USA uses are restricted

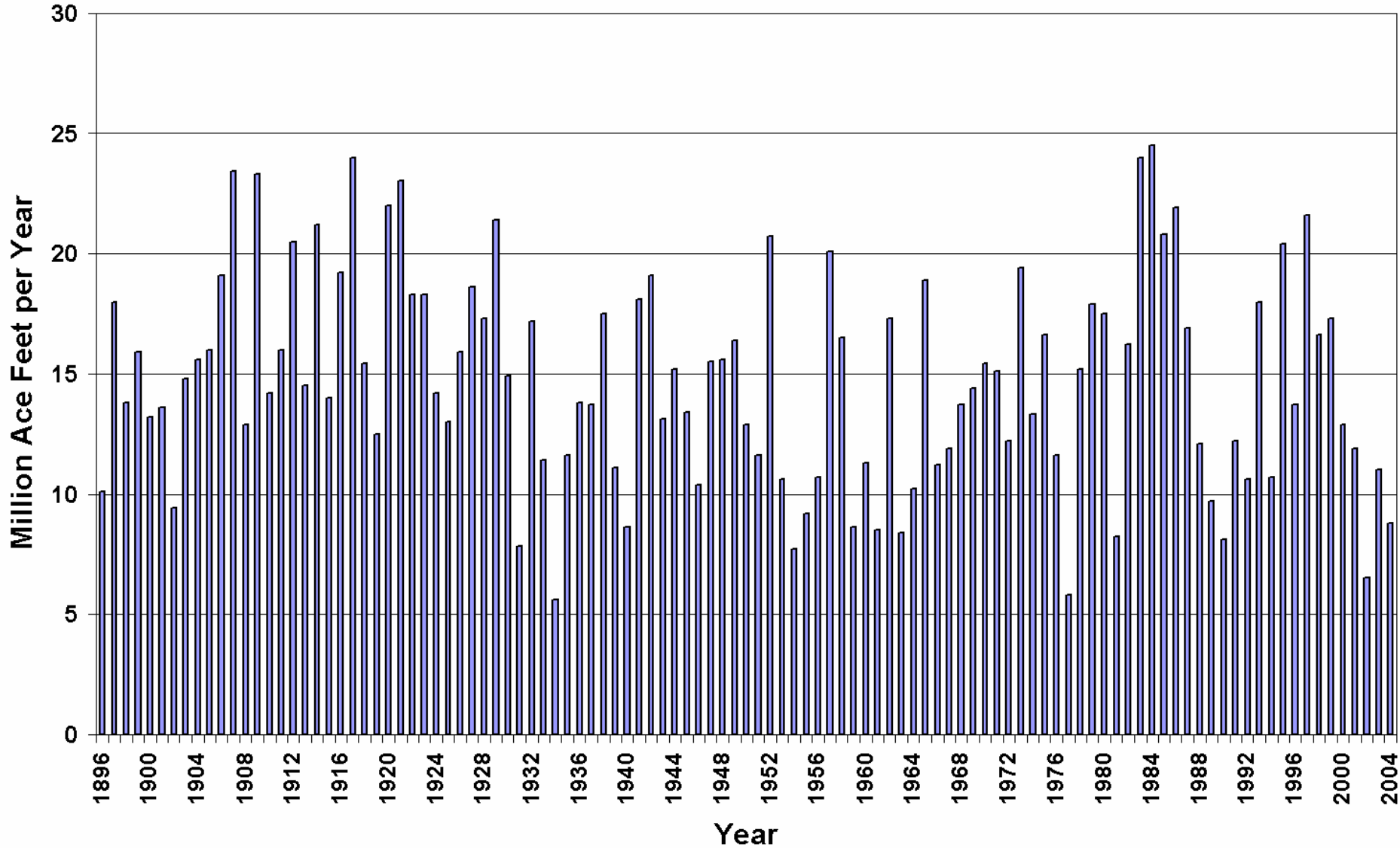
Upper Colorado River Basin Compact of 1948

- Divides Upper Basin water between States
 - 50,000 ac-ft to Arizona
 - 51.75% to Colorado X 7.45 = 3.86
 - 23.00% to Utah X7.45 = 1.71
 - 14.00% to Wyoming X7.45 = 1.04
 - 11.25% to New Mexico X7.45 = 0.84
- 7.45maf ??

Is the water anticipated in the
Colorado River Compact really
there?



Estimated Virgin Flow at Lee Ferry



Drought Heightens Concern

- Prolonged drought impacts yield
- Completed 5 years of extreme drought
- Powell inflow ranged from 25% to 62%
- Powell fell to 33% capacity; 145 feet below full
- 65 feet above power pool
- Dry period may not be over yet!







1988 Hydrologic Determination

- Establishes safe annual yield of 6.0 maf
- Assumptions:
 - 8.23 delivery at Lee Ferry (7.5 + 0.750 maf)
 - Critical draw down period
 - Critical storage (maintain min power pool)
 - Acceptable risk level for stream flow – 98.1%
 - Assumed shortage level – 6%



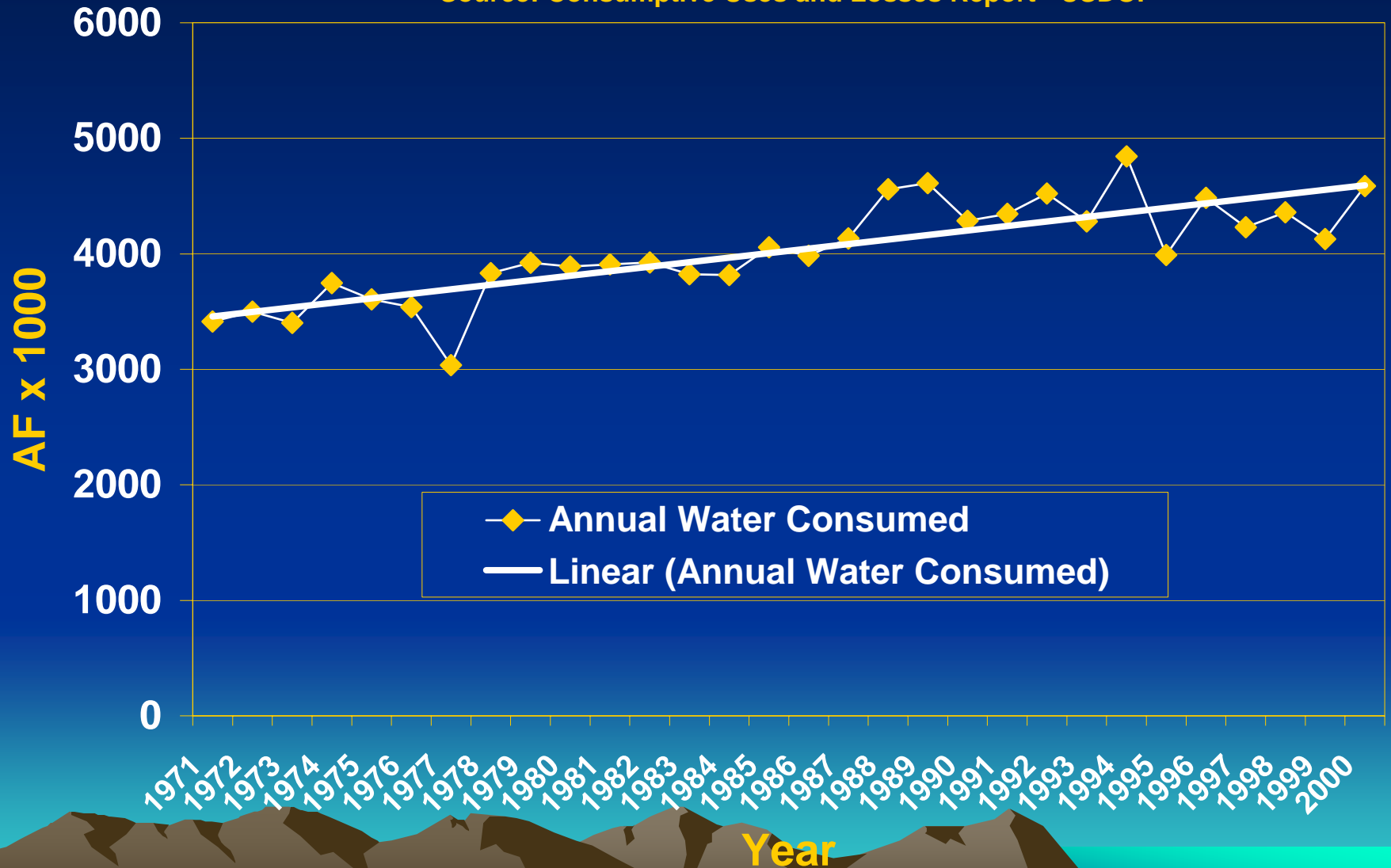
How Much Water Are We Using Now? (year 2000 estimate in kaf)

<u>State</u>	<u>depletions</u>	<u>% remaining</u>
• Colorado	2,686	13%
• New Mexico	508	24
• Utah	953	30
• Wyoming	<u>570</u>	32
• Total	4,717	



Upper Basin Consumptive Use

Source: Consumptive Uses and Losses Report - USDOI



Provided by: Eric Kuhn CRWCD

Estimate of Future Uses (maf) year 2060

• <u>State</u>	<u>2010</u>	<u>2030</u>	<u>2060</u>	<u>%left</u>
• Co.	2.87	2.97	3.079	0
• NM	0.594	0.664	0.677	-1
• Ut	1.095	1.190	1.322	3
• Wy	0.590	0.644	<u>0.833</u>	0
• total			5.91????	



How To Increase The Firm Yield Calculation

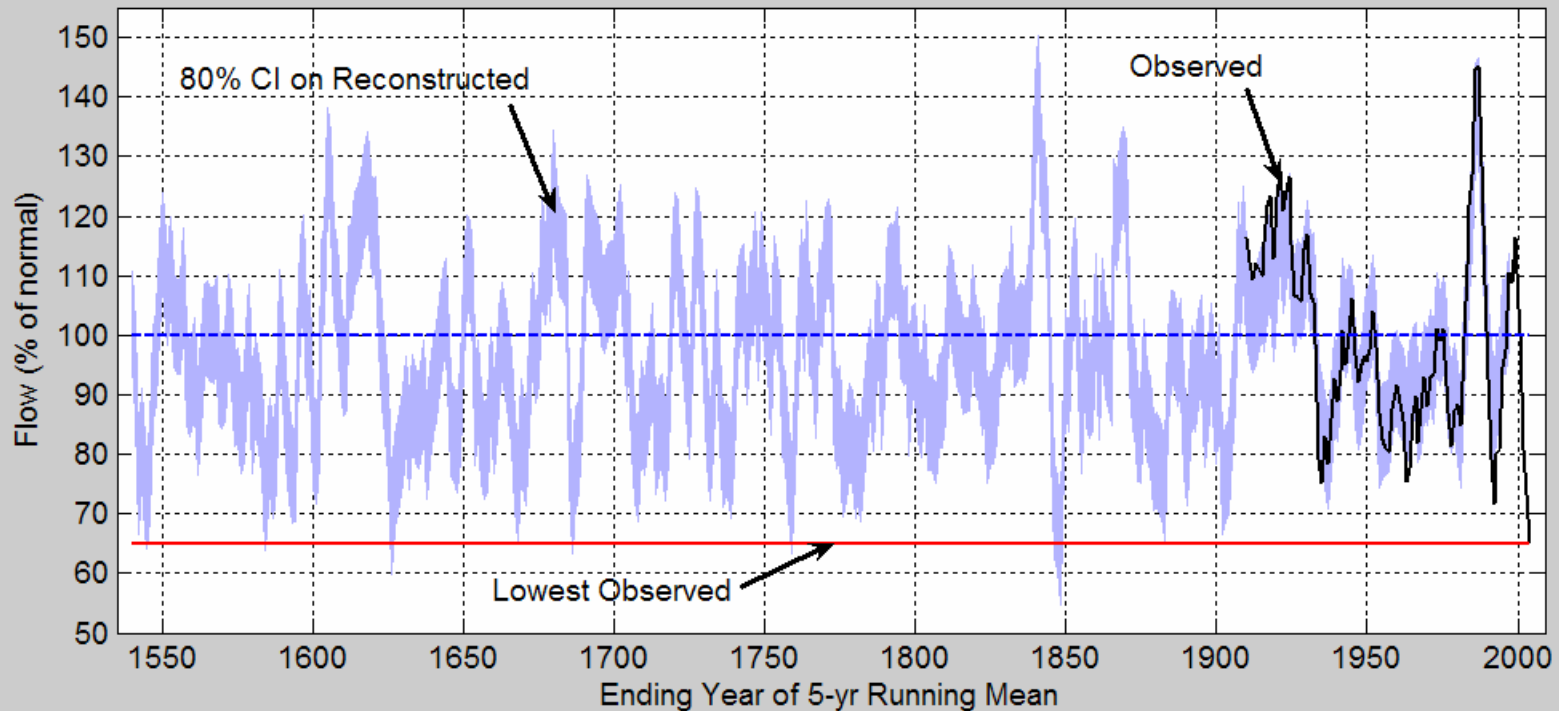
- Change any of the assumptions –
- Does the compact require a delivery of 8.23 maf every year? No!
- Delivery of 7.5maf increases the yield to 6.77 maf
- Interpreting the Compact release volume is important to UB yield!



Lees Ferry Reconstruction, 1536-1997

5-Year Running Mean

Assessing the 1999-2004 drought in a multi-century context



Data analysis courtesy of David M. Meko
From Woodhouse, Gray, and Meko, in
prep, *Updated Streamflow Reconstructions
for the Upper Colorado River Basin*.

Mean flow 1536-1997
14.74 maf

Conclusions

- Upper Basin uses are increasing
- Maximum uses estimated by 2060
- Assumptions used in the hydrologic determination will change the yield
- It is time to address the minimum compact delivery to the lower basin
- Tree ring science could change the yield

