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Colorado Water Institute
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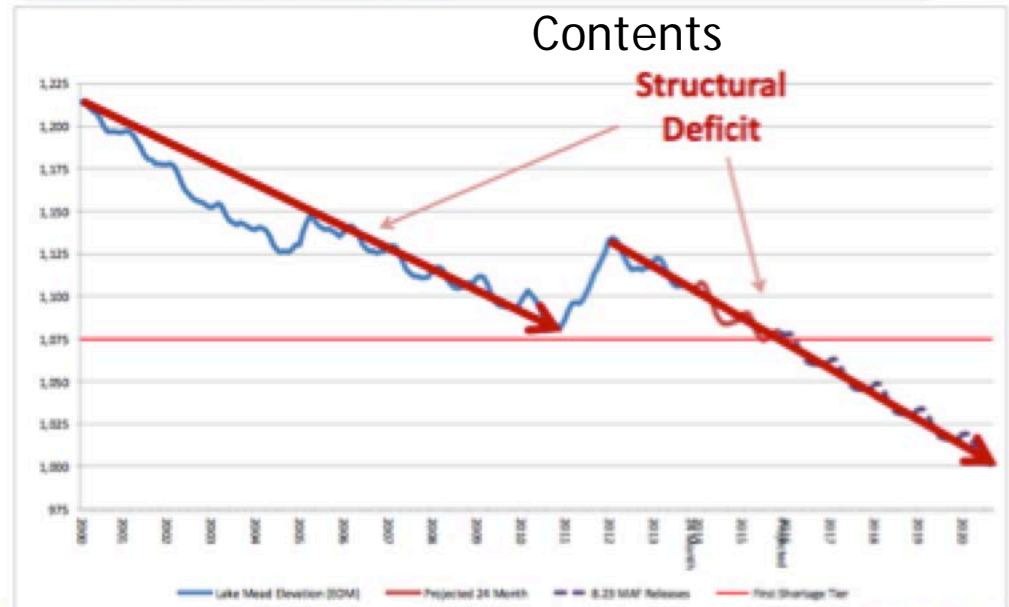
Colorado River Water
Conservation District Annual
Water Seminar

September 19, 2014
Grand Junction, CO

Bradley.udall@colostate.edu

Near-Term Outlook

Lake Mead Contents



* Truth and Consequences of the 1968 CAP* Act

* aka "The Colorado River Basin Project Act"

* President Lyndon Johnson signs the CAP Bill September 30, 1968

"Every drop of water in the Colorado River will be utilized - the Colorado will be the first major river in the world to have complete utilization...The time of complete utilization will come much sooner than anyone now believes possible." Commissioner Straus, 1948



The New York Times

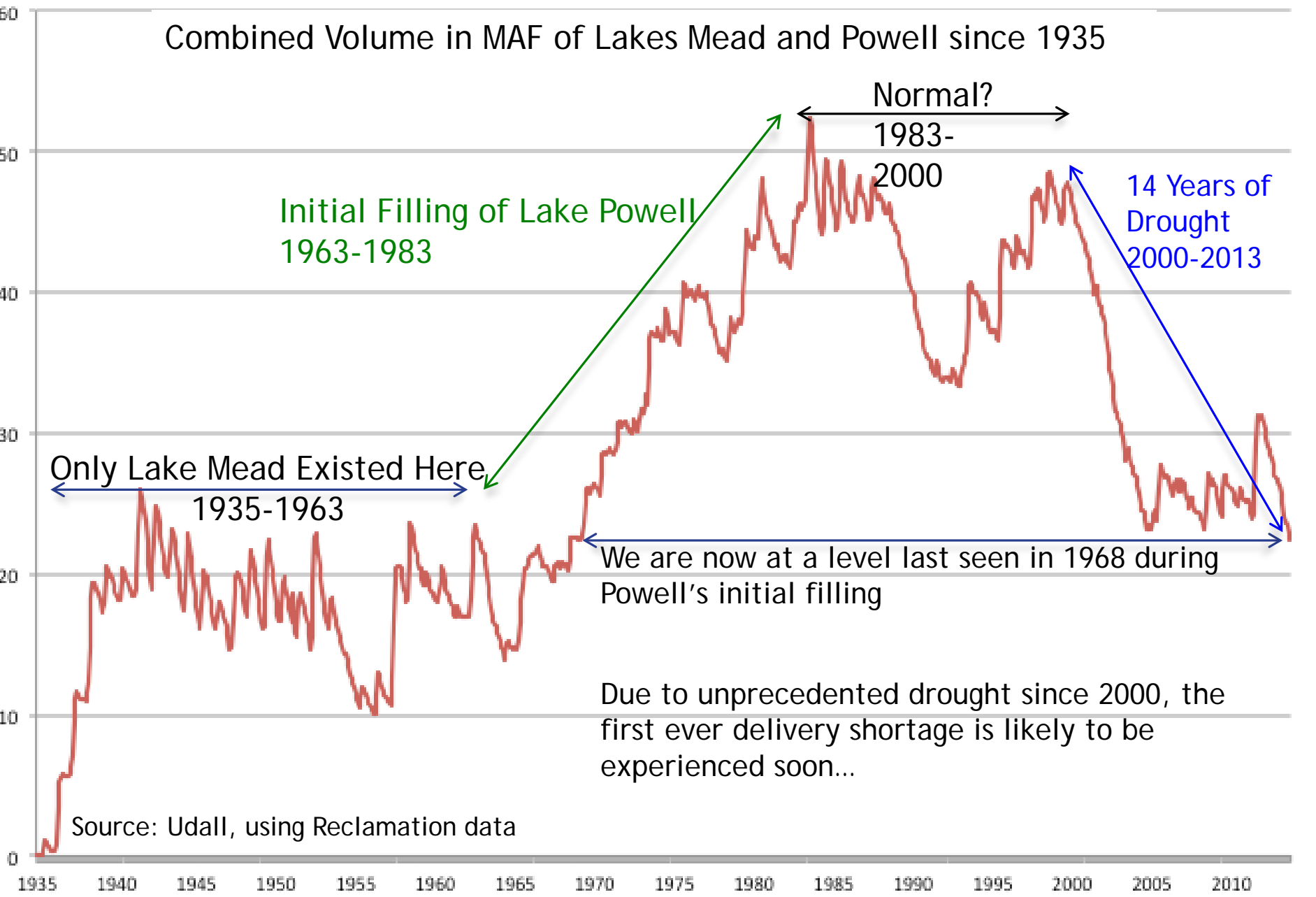
Colorado River Drought Forces a Painful Reckoning for States

By MICHAEL WINES JAN. 5, 2014



- Unprecedented 14-Year Drought
- Low Lake Mead Levels
- First Shortages Ever Likely soon
- Climate Change
- Supply-Demand Gap
- Power Losses
- Central AZ Project Threats
- Desal as Option
- Conservation

Contents of the Two Largest Reservoirs in the United States

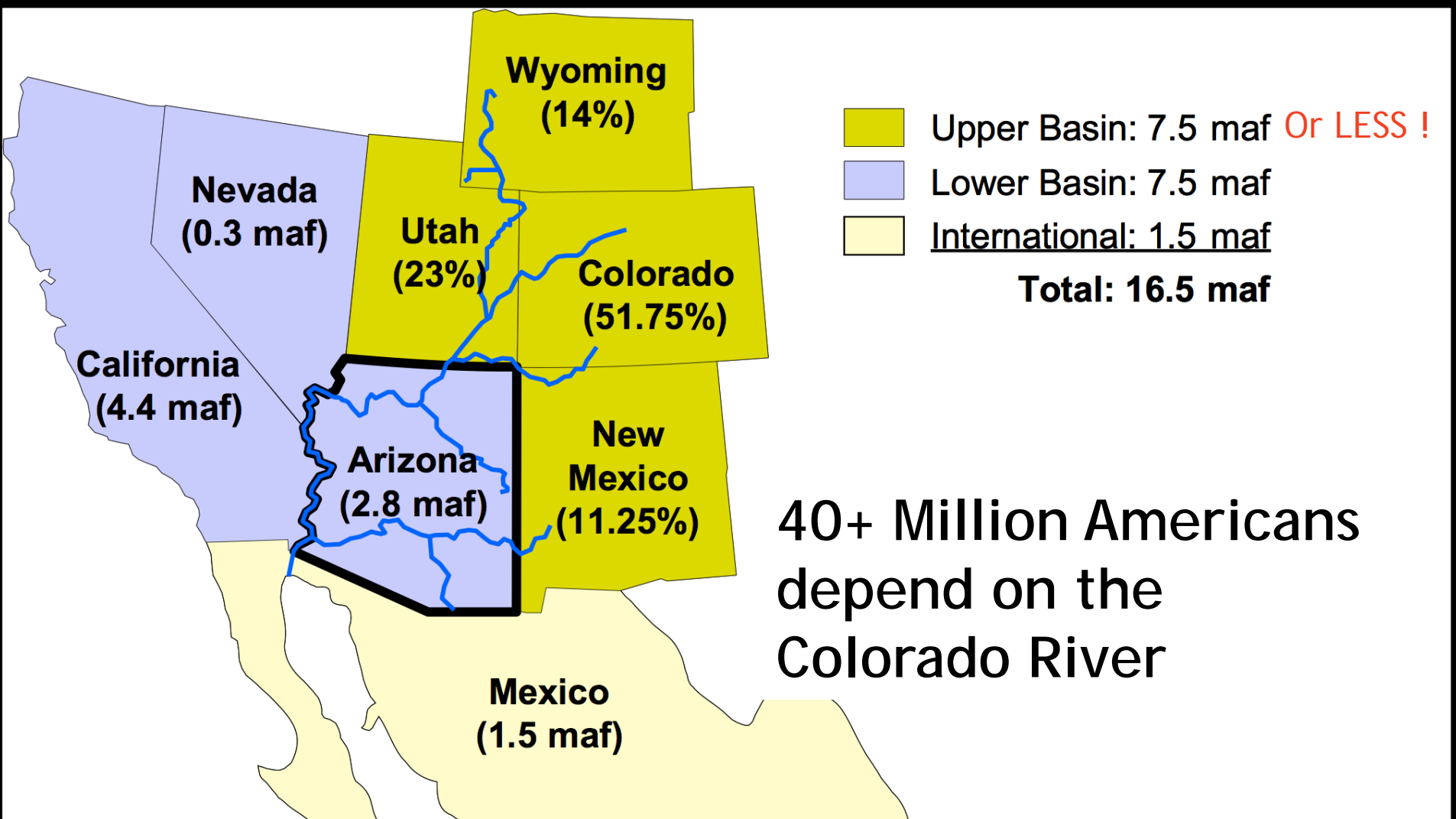


- * A Quick Intro - DONE
- * **Structural Deficit**
- * The Set-Up
 - * The Players, The Issues, and a Timeline
- * The Results
 - * The Projects and The Players again
- * Our 1968 - 2014 Mythical* World
 - * Things we hold true than can not be true
 - * "Oh, the mess we created"
- * Some Conclusions
 - * Moving from Myths to Realities
 - * Personal Observations

* Outline



One day, son, all of these perfectly good A.C. adapters, which have long outlived the products they were originally designed for, will be yours."



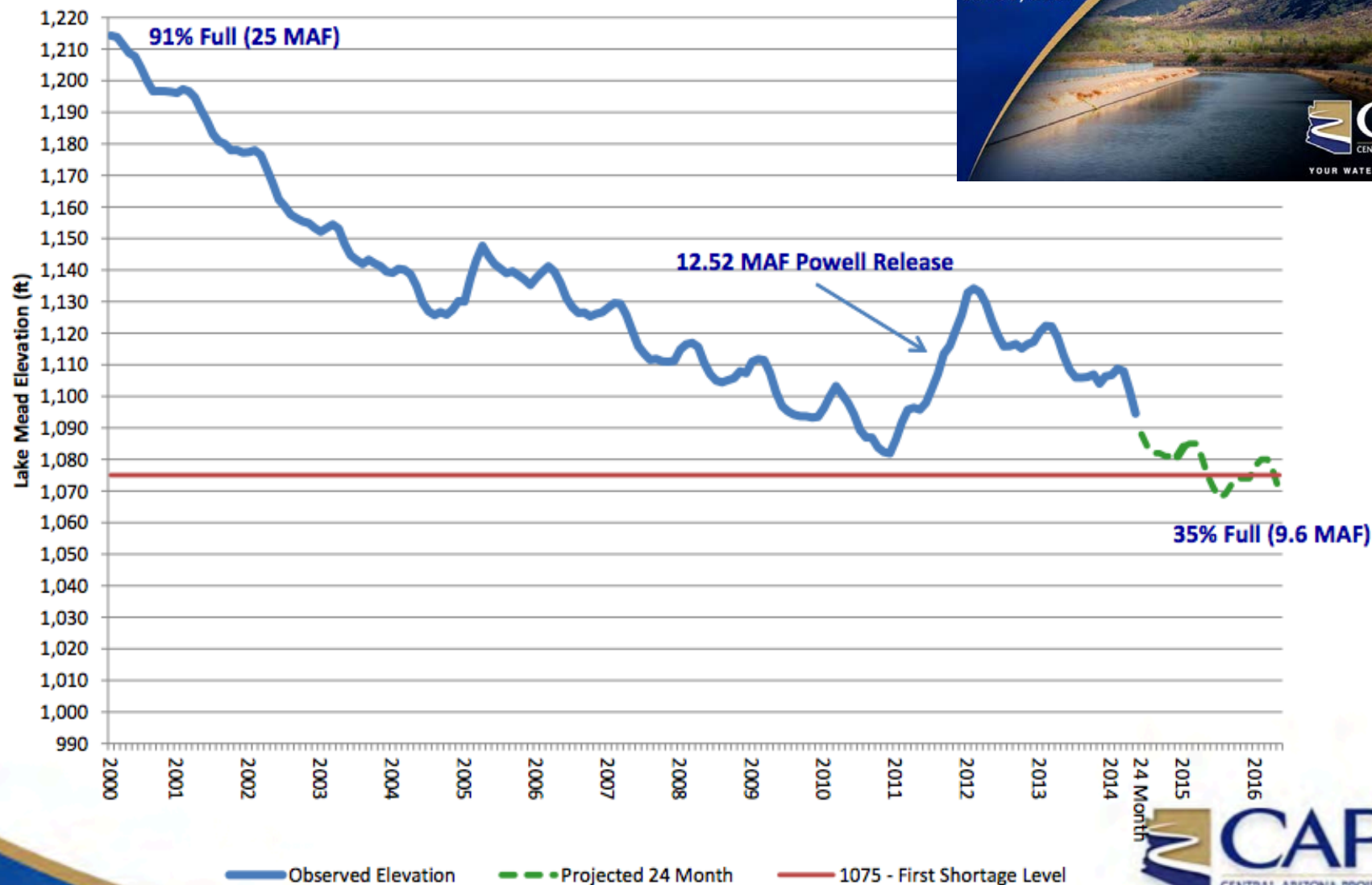
*Colorado River Apportionment

Source: City of Tucson

Lake Mead Since 2000

Colorado River Drought Response and System Sustainability

Tom McCann
Chuck Cullom
June 5, 2014



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

Impact of Structural Deficit

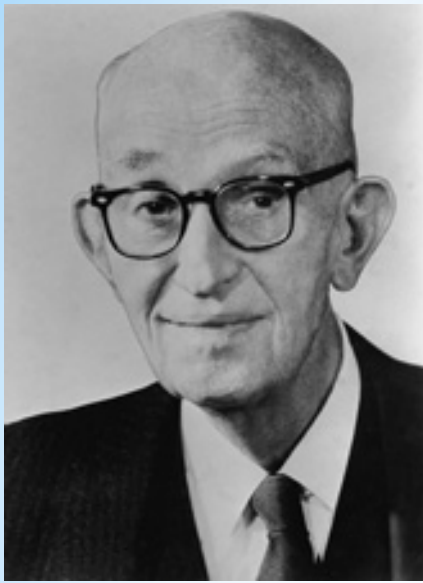
- Results in a decline of 12+ feet in Lake Mead every year when releases from Powell are “normal” (8.23 MAF)
- Undermines effectiveness of the 2007 Guidelines
- Drives Lower Basin to shortage
- CAP forced to bear obligations of others
 - Evaporation and other system losses
 - Lower Basin’s half of Mexican Treaty obligation
 - US failure to operate YDP

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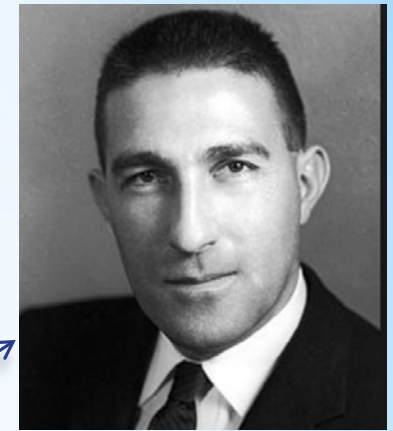
One day, son, all of these perfectly good A.C. adapters, which have long outlived the products they were originally designed for, will be yours."



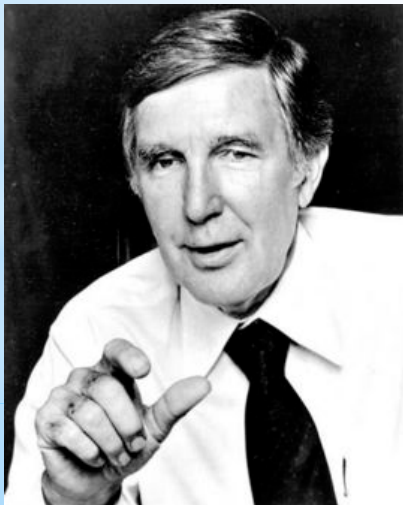
AZ Sen. Carl Hayden
Chair Approps



Rep. Wayne Aspinall
Chair House Interior



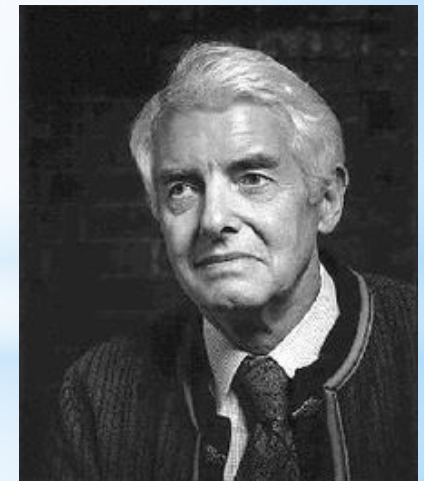
Stewart Lee Udall
Sec. of Interior



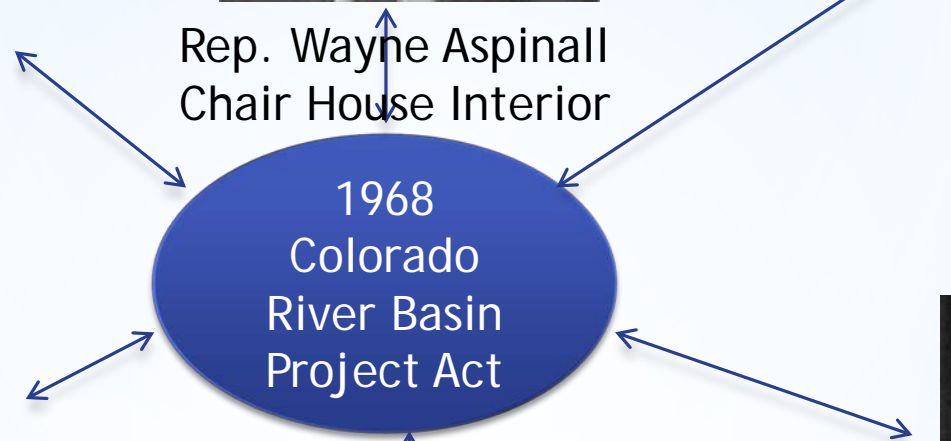
Morris Udall



Scoop Jackson
WA Senator



David Brower
E.D. Sierra Club



JFK Shot

Vietnam War

Nixon Wins

CRSP
PassesSLU
Releases
'Quiet
Crisis'Lake Powell
Flaming Gorge
Blue Mesa
Navajo
ONLINE 63-66Enviros
Oppose BCD +
MCDNPCA pro
'thermal
powerMakings of an AZ-
CA-NV Deal:
Drop Imports
5-yr Import Study
BCD
No MCD
\$300m UB Projects

1950 1956

1963

1964

1965

1966

1967

1968

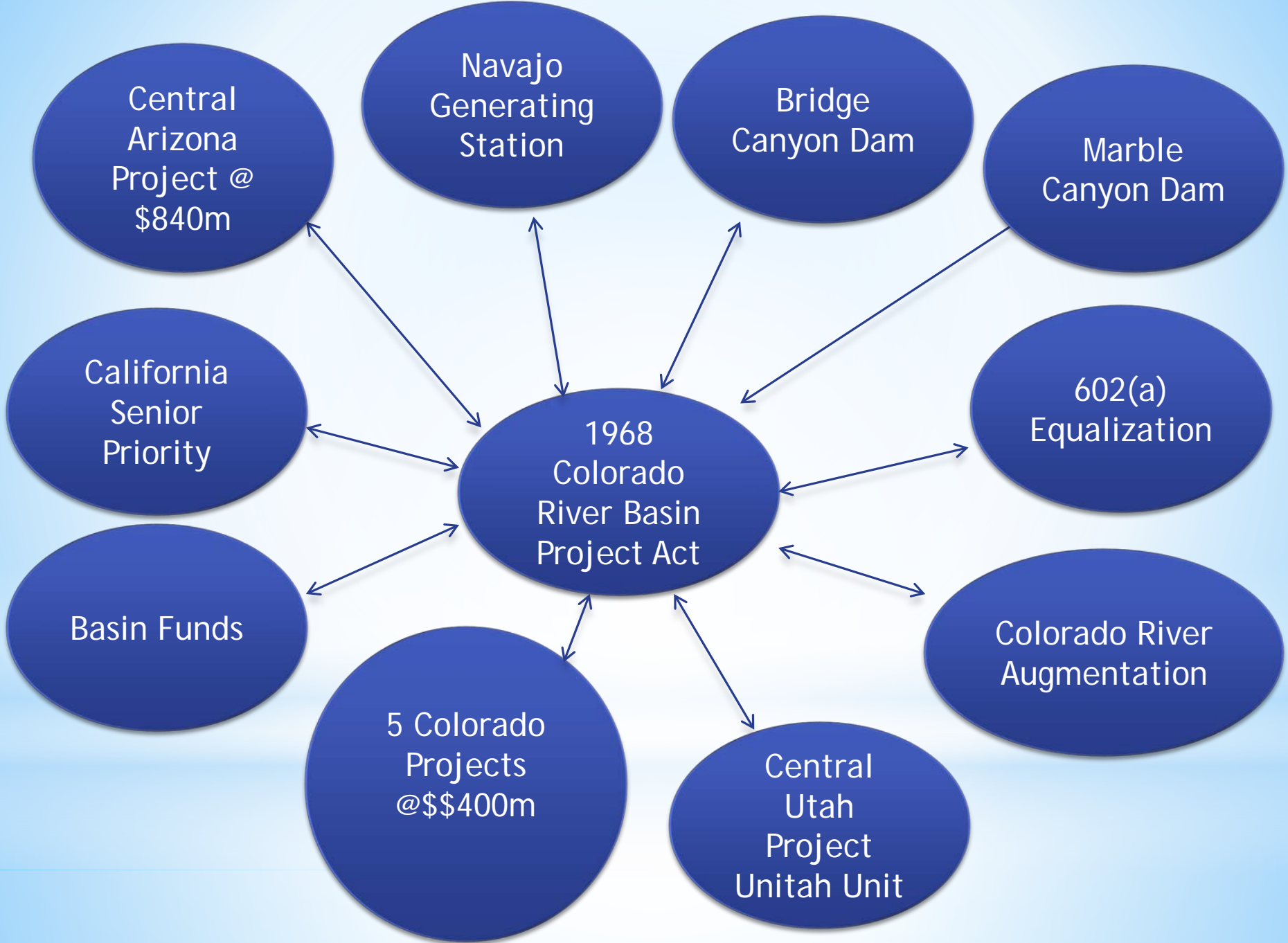
1969

CAP
Passes
Senate,
House
HearingsAZ vs CA
RulingAZ CAP
Bills
AppearFirst talk
of CA
Senior
PrioritySLU PSW
Water Plan
ReleasedJackson
wants
National
Water
Comm.SLU gives
up on PSWNavajos
oppose
MCD and
BCDCAP Passes
Senate,
Hayden
Cuts Fry-
Ark \$,
Attaches to
Public
WorksAspinall
Reconvenes
Committee
and Passes
BillJohnson
uses
antiquity
act to
make
Marble
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AZ Go-it-alone talk

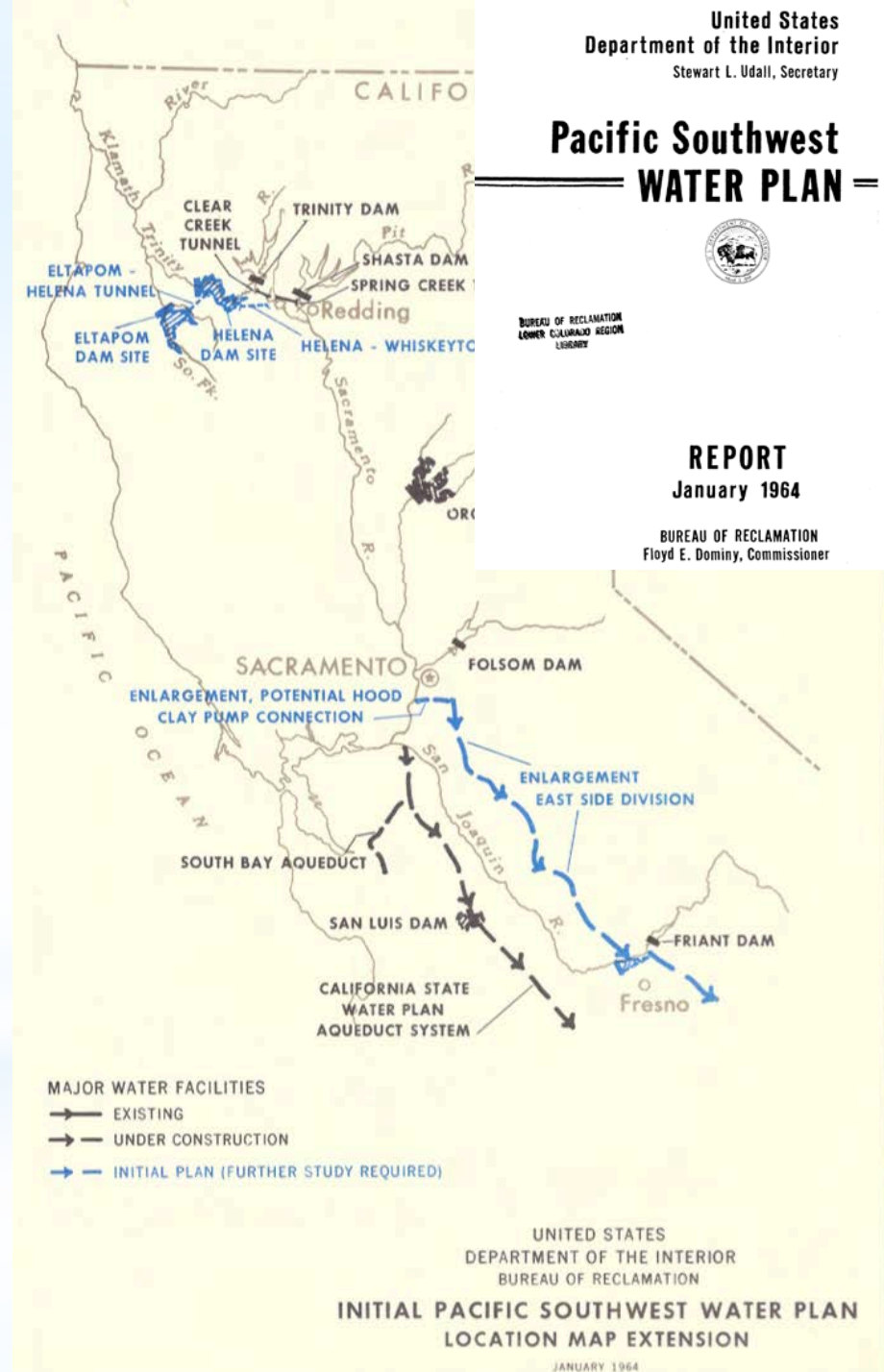


A Simple CAP Timeline



- * SLU's Pacific Southwest Water Plan
- * Aspinall asked for it 1963
- * SLU produced 1964
- * Key Elements
 - * Expects 30m people by 2000
 - * US to guarantee full LB supplies
 - * Construct CAP + BCD + MCD plus slew of other projects
 - * BCD + MCD \$\$ Essential
 - * \$3B to complete plan
 - * No actual plan for the grand import, just study
 - * This must have been purposeful

* Withdrawn 1966



- * Reclamation had been studying this since 1948.
- * "It has been demonstrated that a large quantity of water can be imported to those regions from the Northwest by works well within the scope of current know-how, at a per-acre cost lower than that which many water users in the area concerned are now paying."
- * "In round numbers, it was found that about 240 million acre-feet per year of water from Northwestern streams would be wasted to the sea, even under conditions of full development
- * "The Columbia offers a vast water source for possible development in the distant future, but meanwhile the Klamath, Rogue, Umpqua and other streams are closer to the potential demand, cheaper to develop, and undoubtedly adequate for a great many decades."
- * "The typical plan presented in the report, and represented in plan and profile in Figs. 2 and 3, contemplates an 800ft dam at the mouth of the Klamath. The reservoir so created would conserve 6,000,000 acre-ft"

Water from Pacific Northwest for deserts of Southwest

S. P. McCASLAND, M. ASCE

Executive Engineer, Sanderson and Porter, New York, N.Y. Formerly
Chief of United Western Investigation, USBR, Salt Lake City, Utah

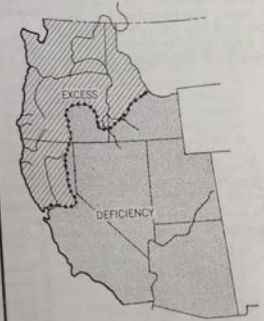


FIG. 1. Basin-wide water supply exceeds ultimate consumptive requirements in area marked "excess" and falls short of requirements in area marked "deficiency."

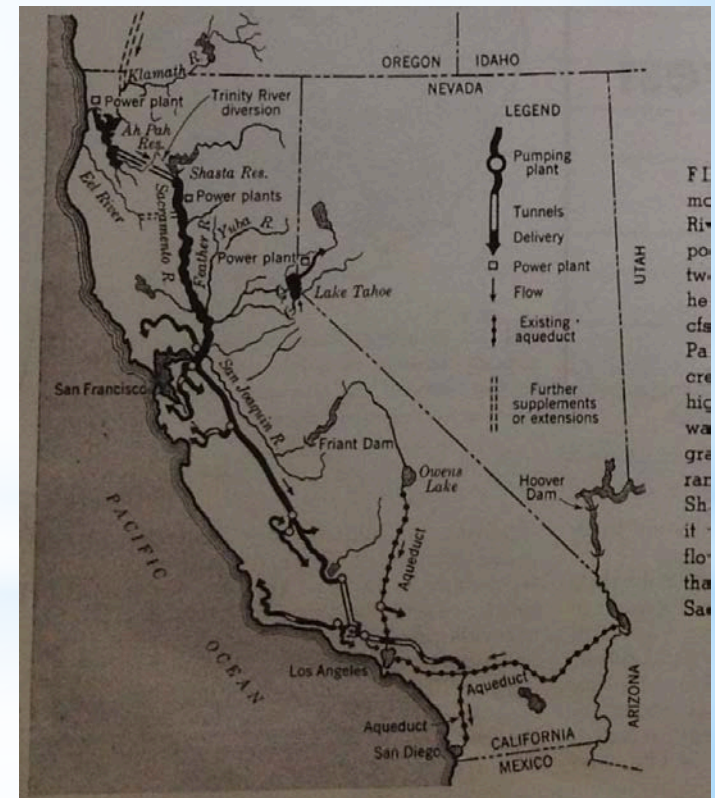


FIGURE 1
Analysis of Lower Basin Supply and Demand and Resulting Deficiency

Lower River Requirements:		
1. Beneficial consumptive use by Arizona, California and Nevada	7.500 maf	
2. Mexican Treaty Deliveries	1.500	
3. Reservoir Evaporation	0.730	
4. Losses below Hoover Dam	0.810	
	<hr/>	
Total Requirements		10.540 maf
Water Supply for the Lower River:		
1. Delivery at Lee Ferry	8.250 maf	
2. Net Inflow Lee Ferry to Lake Mead	0.675	
3. Net Inflow from Bill Williams River	0.055	
4. Release from Lake Mead (drawdown to rated power head)	0.365	
	<hr/>	
Total Water Supply		9.345
		<hr/>
Deficiency		1.195 maf

Source: Tipton, 1965.

- * 3- State Numbers
 - * 95% > 13.3maf/yr
 - * 50% > 14.9maf/yr
 - * Use at 12.9 maf
- * UCRC + CWCB Numbers
 - * Famous Tipton Study
 - * Huge UB Demands
- * Reclamation's Numbers
 - * SLU + Dominy testimony that CAP would have at least 1.0 maf by 2000
 - * Aspinall repeatedly wanted to make sure that CAP didn't impact the Upper Basin
 - * At the End of the Day, CAP would be using the unused Upper Basin Water. The only question was when UB growth would diminish that supply

"We have waited 15 years on a lawsuit. We have waited longer than that on congressional authorization, and as I read your testimony, you are suggesting that we wait until there is a breakthrough in atomic energy, a breakthrough in desalting water, a breakthrough in solar energy" - MKU

*The Numbers Game

- * To Brower: Echo Park All Over Again...
- * Marble Canyon Dam
 - * 360 kaf reservoir
 - * Dam at MP 39
 - * 300 feet, 600 mw
 - * Redwall Cavern, Vasey's Paradise, Roaring 20s, all underwater
 - * Waters backed up to Lee's Ferry
 - * 1969 LBJ Designates Marble Canyon National Monument
 - * 1975 GC Park Enlargement
 - * Left Side: Navajo Land
- * Bridge Canyon Dam
 - * Dam at MP 235, Bridge Canyon
 - * 90-mile reservoir all the way to Kanab Ck
 - * Would touch the GC Park boundary and flow through 40 miles of the GC Monument
 - * Matkatamibi, Havasu, National, Lava Falls, 205 Mile, 217 Mile all underwater
 - * 700 feet, 1500 MW Dam



SHOULD WE ALSO FLOOD THE SISTINE CHAPEL SO TOURISTS CAN GET NEARER THE CEILING?

EARTH began four billion years ago and Man two million. The Age of Technology, on the other hand, is hardly a hundred years old, and on our time chart we have been generous to give it even the little line we have.

It seems to us hoary, therefore, during this blip of time, for Man to think of directing his fascinating new tools toward altering irrevocably the forces which made him. Nonetheless, in these few brief years among four billion, wilderness has all but disappeared. And now these:

- 1) There is a bill in Congress to "improve" Grand Canyon. Two dams will back up artificial lakes into 148 miles of canyon gorge. This will benefit tourists in power boats, it is argued, who will enjoy viewing the canyon wall more closely. (See headline). Submerged underneath the tourists will be part of the most revealing single page of earth's history. The lakes will be as deep as 600 feet (deeper for example, than all but a handful of New York buildings are high) but in a century, sitting will have replaced the water with that much mud, wall to wall.

There is no part of the wild Colorado River, the Grand Canyon's sculptor, that will not be maimed.

Tourist recreation, as a reason for the dams, is in fact an afterthought. The Bureau of Reclamation, which backs them, prefers to call the dams "cash registers." They are expected to make money by sale of commercial power.

They will not provide anyone with water.

2) In Northern California, four lumber companies are about to complete logging the private virgin redwood forests, an operation which to give you an idea of its size, has taken fifty years.

Soon, where nature's tallest living things have stood silently since the age of the dinosaurs, the extent of the cutting will make creation of a redwood national park absurd.

The companies have said tourists want only rough roadside trees for the snapping of photos. They offer to spare trees for this purpose, and not much more. The result will remind you of the places on your face you missed while you were shaving.

3) And up the Hudson, there are plans for a power complex—a plant, transmission lines, and a reservoir on top of Storm King Mountain—destroying one of the last wild and high and beautiful spots near New York City.

4) A proposal to flood a region in Alaska as large as Lake Erie would eliminate at once the breeding grounds of more wildlife than conservationists have preserved in history.

5) In San Francisco, real estate developers are day by day filling a bay that made the city famous, putting tract

houses over the fill; and now there's a new idea—still more fill, enough for an air cargo terminal as big as Manhattan.

There exists today a mentality which can conceive such destruction, giving commerce as ample reason. For 74 years, the 40,000 member Sierra Club has opposed that mentality. But now, when even Grand Canyon can be threatened, we are at a critical moment in time.

The generation will decide if something untrammeled and free remains, as testimony we had love for those who follow.

We have been taking aids, therefore, asking people to write their Congressmen and Senators; Secretary of the Interior Stewart Udall; The President; and to send us funds to continue the battle. Thousands have written, but meanwhile, the Grand Canyon legislation has advanced out of committee and is at a crucial stage in Congress. More letters are needed and more money, to help fight a mentality that may decide Man no longer needs nature.*

David Brower, Executive Director
Sierra Club
Mills Tower, San Francisco

- Please send me more details on how I may help.
- Here is a donation of \$_____ to continue your effort to keep the public informed.
- ☐ Send me "Time and the River Flowing," famous four color book which tells the complete story of Grand Canyon, and why T. Roosevelt said, "leave it as it is." (\$15.00)
- ☐ Send me "The Last Redwoods" which tells the complete story of the opportunity as well as the destruction in the redwoods. (\$17.50)
- ☐ I would like to be a member of the Sierra Club. Enclosed is \$14.00 for entrance and first year's dues.

Name _____
Address _____
City _____ State _____ Zip _____

*The previous ads, urging that readers exercise a constitutional right of petition, to save Grand Canyon, produced an unprecedented reaction by the Internal Revenue Service, our tax deductible agency. IRS says the ads may be a "substantial" effort to "influence legislation." Undefined, these terms leave organizations like ours at the mercy of administrative whims. (The question has not been raised with any organizations that favor Grand Canyon dams.) So we cannot now promise that contributions you send us are deductible—pending results of what may be a long legal battle.

The Sierra Club, founded in 1892 by John Muir, is nonprofit, supported by people who love the outdoors. It is witness to the preservation of the world. The club's program is nationwide; includes wilderness trips, news and films—as well as such efforts as this to prevent the removal of wilderness in the Americas. There are now treasury chapters, branch offices in New York (Biltmore Hotel), Washington (Dupont Circle Building), Los Angeles (Auditorium Building), Albuquerque, Seattle, and most offices in San Francisco.

* The Two 'Cash Registers' Dams

No. 1 THE PRESIDENT THE WHITE HOUSE WASHINGTON 25, D.C. PLEASE ASK CONGRESS TO DEFER BOTH GRAND CANYON DAMS PENDING INVESTIGATION OF THE ALTERNATE SOURCES OF FUNDS TO HELP SAVE OUR NATIONAL PARKS THANK YOU.	No. 2 SECRETARY OF THE INTERIOR WASHINGTON 25, D.C. ALL YOUR SUPPORTED CONSERVATION TECHNIQUES, WHICH MUST BE LIVING GRAND CANYON BY THE HANDS OF YOUR BUREAU OF RECLAMATION, WOULD YOU PLEASE REPORT FULLY TO CONGRESS ON BUREAUS BEFORE THE VOTE ON H.R. 4671. THANK YOU.	No. 3 SENATOR HENRY M. JACKSON WASHINGTON 25, D.C. REPRESENTATIVE HOUSE OF REPRESENTATIVES WASHINGTON 25, D.C. PLEASE JOIN IN THE FIGHT TO SAVE GRAND CANYON BY URGING DELETION OF BOTH DAMS PRO- POSED IN H.R. 4671. THANK YOU.	No. 4 (To your Congressmen) REPRESENTATIVE HOUSE OF REPRESENTATIVES WASHINGTON 25, D.C. PLEASE JOIN IN THE FIGHT TO SAVE GRAND CANYON BY URGING DELETION OF BOTH DAMS PRO- POSED IN H.R. 4671. THANK YOU.	No. 5 (To your U.S. Senator) SENATOR UNITED STATES SENATE WASHINGTON 25, D.C. PLEASE JOIN IN THE FIGHT TO SAVE GRAND CANYON BY URGING DELETION OF BOTH DAMS PRO- POSED IN H.R. 4671. THANK YOU.	No. 6 (To your state's other Senator) SENATOR UNITED STATES SENATE WASHINGTON 25, D.C. PLEASE JOIN IN THE FIGHT TO SAVE GRAND CANYON BY URGING DELETION OF BOTH DAMS PRO- POSED IN H.R. 4671. THANK YOU.
Name _____ Address _____ City _____ State _____ Zip _____	Name _____ Address _____ City _____ State _____ Zip _____	Name _____ Address _____ City _____ State _____ Zip _____	Name _____ Address _____ City _____ State _____ Zip _____	Name _____ Address _____ City _____ State _____ Zip _____	Name _____ Address _____ City _____ State _____ Zip _____

Dinosaur and Big Bend. Glacier and Grand Teton, Kings Canyon, Redwoods, Mammoth, Even Yellowstone and Yosemite. And The Wild Rivers, and Wilderness.

How Can You Guarantee These, Mr. Udall, If Grand Canyon Is Dammed For Profit?

1) A bill will soon be voted in Congress (H.R. 4671) which would put two dams into Grand Canyon, maiming for all time the wild river that has been the canyon's sculptor for 25,000,000 years.

2) If the bill passes, two artificial lakes will back up into 133 miles of canyon gorge. And hardly a century later, silting will have created wall to mud and tangled growth.

3) In some places, the inner gorge will be submerged five hundred feet. A vital part of "The most revealing single page of the earth's history," as Joseph Wood Krutch has described it, will be drowned.

4) It is argued that artificial lakes will be an "improvement" because tourists will be nearer the walls.

Should we flood the Sistine Chapel, so tourists can float nearer the ceiling?

5) Between the lakes, the Colorado's depth will vary fifteen feet from day to day, depending on hydroelectric demand.

Shoreline campsites will become suddenly dangerous. Wildlife will be disrupted, as will the ecology of one of history's treasures.

There is no part of the Colorado River within Grand Canyon that would not be affected.

6) The dams will not be used for water. They are called "cash registers" by the Bureau of Reclamation. They are expected to make money by sale of commercial power.

7) But for even the making of money, Grand Canyon dams will soon be as obsolete as they are unnecessary. Congressional testimony established they are fantastically expensive and wasteful of water. Still the alternatives are ignored.

8) The real push for the dams is political—an attempt by the seven states in the Colorado Basin to finance diversion of water from the Columbia River to the Colorado, at a cost of an undetermined number of billions of dollars to the other states.

9) If the bill does pass, no national park will be safe. With the unthinkable precedent set in Grand Canyon, it will be simple to approve dams or other commercial projects already proposed in a dozen national parks.

10) If the bill passes, America will have violated a treaty obligation signed at the International Convention on Nature Protection and Wildlife Preservation, that it would never subject a national park to exploitation for commercial profit.

Our entire National Park System, so brilliant it has been a model for every nation in the world, would suddenly be meaningless.

11) Secretary of the Interior Stewart Udall could do much to save the day.

Taking advantage of the important new evidence presented in the House hearings, he could urge the dams be deleted from H.R. 4671. He could urge that Congressional committees at least hear the findings of his National Park Service, Bureau of Reclamation, and Mines and Geological Survey, instead of only Reclamation.

By failure to act, Mr. Udall is assisting the demise of the great park system he was pledged to protect.

12) It is an accident of history, but it is this generation which must assure that something untrammeled and free remains in the American earth as testimony that we had love for the people who follow.

13) It is for all the above reasons that we ran the two advertisements on June 9th—protesting the destruction of Grand Canyon—that produced an unprecedented reaction by the Internal Revenue Service.

By 4 P.M. the next day, an IRS messenger delivered a letter to us in San Francisco. It cast a cloud over our tax deductible status, effectively stopping major financial assistance for our public service program.

IRS read the ads as a sudden attempt to "influence legislation" in a "substantial" way. (They do not define those terms, leaving organizations like ours at the mercy of administrative whim.) And they do not even raise the question with organizations that favor the dams.

14) The Sierra Club has been in the business of helping people enjoy and save natural beauty for 74 years. Nothing new has been added to this goal in that time, except that the battle to save Grand Canyon is now in its critical phase.

If the IRS succeeds in slowing us down, it will also have slowed every organization which chooses to work for the saving of our resources. And this is no time to slow down.

15) Therefore, tax deductible or not, we intend to continue. After all, as astonishing as it may seem, it is the Grand Canyon that's in danger this time. *The Grand Canyon.*

16) Possibly within the next two weeks, the House Committee on Interior and Insular Affairs will have reported out the bill and it will be ready for a floor vote in the House.

You can stop it by adding your coupons to those that have been sent already, or better still, your own letters.

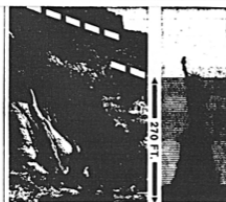
And while we cannot now promise that any contributions you send us are deductible, a determination still in the hands of IRS, we can promise the funds will help fight the remaining battles against a technology that feels it no longer needs nature.

WHAT THE SIERRA CLUB IS FOR

The Sierra Club, founded in 1892 by John Muir, is nonprofit, supported by people who want what Thoreau sensed when he wrote, "In wilderness is the preservation of the world." The club's program is nationwide, including wilderness trips, books, and films—and a major effort to protect the remains of wilderness in the American West.

There are now twenty chapters, branch offices in New York, Washington, Albuquerque, Seattle, and Los Angeles, and a main office in San Francisco.

This advertisement has been made possible by individual contributions, particularly from our Adirondack, Rocky Mountain, Rio Grande, Southern California, and Sierra Club chapter members, and by buyers of Sierra Club books everywhere, especially the twelve in the highly praised Exhibit Format Series, which includes books on Grand Canyon, Glen Canyon, the Redwoods, the Northern Cascades, Mount Everest, and the Sierras.



Vasey's Paradise at Marble Gorge, where a fascinating natural spring gushes out of the sheer rock canyon wall, will be submerged by 270 feet of water. The Statue of Liberty and its base, placed at this spot, would have only its upper arm and torch showing above the water. If the dams are built in Grand Canyon, 133 miles of inner gorge will be submerged by water as deep as 500 feet, and later by that much more.

The proposed Hodgekin Dam (A) would raise the water level at that point by 479 feet, by 154 feet more than the height of the Statue of Liberty and its base. (See map.) Water will back up all the way to Hodgekin Creek (B) 93 miles upstream, effectively flooding the entire gorge in the process, and some of the most elaborate, beautiful and valuable exhibits of natural beauty in the world. Furthermore, within about five years, silting will have reduced the water to its natural level.

The proposed Marble Canyon Dam (C) would back water into an equally spectacular region of Grand Canyon, located about 20 miles from the river's mouth. The water would rise over 100 feet, completely flooding the entire gorge in the process, and some of the most elaborate, beautiful and valuable exhibits of natural beauty in the world. Furthermore, within about five years, silting will have reduced the water to its natural level.

☐ Please send me more of the details of the battle to save Grand Canyon.

☐ I know how much this sort of constructive protest costs. Here is my donation of \$_____ to help you continue your work.

☐ Please send me a copy of "Time and the River Flowing," the famous four-color book by Philip Freid and Francis Leyland which tells the whole story of Grand Canyon and the battle to save it. I am enclosing \$25.00.

☐ I would like to be a member of the Sierra Club. Enclosed is \$14.00 for entrance fee and first year's dues.

Name _____
Address _____
City _____ State _____ Zip _____

(Better Hold Up On The Flowers and Cheery Wires, Just A Bit Longer)

"Grand Canyon National Monument Is Hereby Abolished"

—From a bill submitted to Congress 15 days ago by Rep. Wayne Aspinall

Had You Thought The Battle Against Dams In Grand Canyon Was Over?

I "GOLIATH AND THE PHILISTINES"

ON FEBRUARY 1, Secretary of the Interior Stewart Udall, speaking for the Administration, announced that the President had withdrawn all support for the Marble Canyon Dam, which would have altered irrevocably the wild Colorado River and ruined a large part of Grand Canyon. In fact, the Secretary reported, the Administration was now advocating expansion of Grand Canyon National Park to include this dam site (see map).

A great victory, everyone felt, and the Sierra Club offices were inundated with wires, letters, flowers, and pleasant ecumenisms praising us, as one note said, "for having slain Goliath and turned away the Philistines."

Naturally enough, most people assumed the whole struggle was over. But, as usual, it is not so simple. By now, we have several "Goliaths" and as for the Philistines, they're coming back over the hill.

II "CASH REGISTERS"

FOR while we can now look forward to Administration support this must be understood:

A number of special interest groups are still planning to push dam bills through Congress (and several have already been submitted). Or, failing that, Arizona could build them itself—with or without Administration support.

The key advocates of Grand Canyon dams are these: 1) Commercial interests within the Colorado Basin states, who see these dams (commonly called "cash registers") as a hypothetical means of financing an altogether different project: the turning of part of the Columbia River southward, benefiting themselves, particularly California.

The Grand Canyon itself is of no interest; it is merely an expedient.

2) Southern California real estate developers also gain from presumed dam revenues. (They would like to create still more of Los Angeles.)

3) And the Arizona Power Authority favors the dams. It contends they will provide cheap new sources of power to subsidize Arizona agriculture. (Two-thirds of Arizona's water goes to catelated and cotton, already subsidized products.)

The dams will not provide anyone with water. In fact, through seepage and evaporation they will waste enough water to supply Phoenix.

III TOURISTS IN POWER BOATS

SUPPORTERS of the dams suggest that building them in Grand Canyon is only good sense.

They point out that the new "recreational lakes" will benefit tourists in power boats who will enjoy viewing the upper canyon walls more closely.

Should we flood the ceiling of the Sistine Chapel, so tourists can get nearer the ceiling?

And, to express their "willingness to compromise," some of the dam builders have lately suggested just one dam in Grand Canyon instead of two. Like one bullet in the heart instead of two. (The point, you see, is that if you alter the river's flow at any point you interfere with the life force of the canyon, the element which has made it what writers have called "a museum of the history of the world.")

In some quarters, even Mr. Aspinall's bill (see headline) is considered a "compromise," as it would extend Grand Canyon National Park upstream while eliminating Grand Canyon National Monument (to make room for a 93 mile reservoir). It is felt that if you are flooding is no longer part of the park system, the public will no longer think it important.

But changing official names around doesn't change the fact that it is all part of Grand Canyon, and once flooded, whatever is under the water is gone forever.

IV MENTALITY

SO in summary, while the President's action is heartening, and the Grand Canyon struggle is beginning to turn, we remain in the same essential position, and that is this:

There exists today a mentality which condones destruction done in the name of commerce.

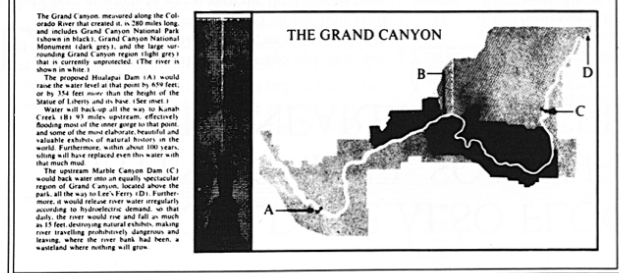
Commercial interests claim who love the land refuse their "reasonable compromises." But it is forgotten that nearly the whole natural landscape has already been compromised... tract houses creep over the hillsides, concrete covers the landscape, forests are gone, waters are fouled, and even the air is heavy with waste.

It is not much to ask that some things at least be left "unimproved" to show we have love for those who follow.

If we can't even save Grand Canyon for them, is there hope for saving whatever else of nature our planet still offers?

We have been taking sad, therefore, suggesting that there is something one can do. Thousands have already responded by writing letters (especially important), sending coupons, and also funds to continue the effort; and prospects have thereby improved. But as Grand Canyon legislation still stands a good chance of passage, please don't stop now.

Thank you.



No. 1 The President The White House Washington 25, D.C. Dear Mr. President: I wish to congratulate you for your Administration's position opposing the Marble Canyon Dam and the suggestion that Grand Canyon National Park be extended to include this dam site. However, I am well convinced that the Marble Canyon Dam may be built. History Building 15 miles of canyon gorge and the entire single page of Earth's history. I ask therefore that you speak out as forcefully as the dignity of the dam site and the special interest groups be able to push a bill containing it through Congress. Yours sincerely, Wayne Aspinall Address _____ City _____ State _____ Zip _____	No. 2 Hon. Wayne Aspinall, Chairman House Committee on Interior and Insular Affairs House Office Building Washington 25, D.C. Dear Mr. Aspinall: As I am increasingly opposed to the sacrifice of our part of Grand Canyon to commercial interests, I therefore urge the use of money and the support for proposals to save Grand Canyon. Testimony has proven that dams are completely unnecessary, even wasteful, and that alternative power sources are available. I am therefore available to assist in the construction of Grand Canyon dams, and I urge that you refrain from backing these dam bills. Yours sincerely, Wayne Aspinall Address _____ City _____ State _____ Zip _____	No. 3 Hon. John Seiler House Committee on Interior and Insular Affairs House Office Building Washington 25, D.C. Dear Mr. Seiler: I am writing you for your forthright opposition to efforts which would push through your committee legislation which could ultimately wreck our entire Grand Canyon. Your voice has been among the loudest and most effective in the Senate and I would like you to know there are many of us who are very grateful to you. Yours sincerely, Wayne Aspinall Address _____ City _____ State _____ Zip _____	No. 4 Hon. Ronald Reagan, Governor Sacramento, California Dear Mr. Governor: I urge that you use your good offices to persuade Southern California commercial interests that even a temporary financial "safety" can be made by revenue from diverting Grand Canyon into "cash registers" the old-fashioned way. If I will help a trend that eventually will also destroy the natural resources of California—the redwoods, the old Big Bear mountains, the Grand Canyon—then I would like to see a dam built in Grand Canyon. If such a great sacrifice can be made for temporary commercial gain, then I would like to see you use your influence in Southern California may help us. Yours sincerely, Wayne Aspinall Address _____ City _____ State _____ Zip _____	No. 5 Hon. John B. Williams, Governor San Francisco, California Dear Mr. Governor: I urge that you use your good offices to persuade Southern California commercial interests that even a temporary financial "safety" can be made by revenue from diverting Grand Canyon into "cash registers" the old-fashioned way. If I will help a trend that eventually will also destroy the natural resources of California—the redwoods, the old Big Bear mountains, the Grand Canyon—then I would like to see a dam built in Grand Canyon. If such a great sacrifice can be made for temporary commercial gain, then I would like to see you use your influence in Southern California may help us. Yours sincerely, Wayne Aspinall Address _____ City _____ State _____ Zip _____
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* Outline



One day, son, all of these perfectly good A.C. adapters, which have long outlived the products they were originally designed for, will be yours."

- * Section 602(a) deals with reservoir equalization
 - * How much water to pass to Mead from Powell?
 - * No formal guidelines
 - * Powell just 7 years old
- * 5-Year Reviews
- * Set forth the famous 8.23 maf/year 'min objective release'
- * Later: Also hourly/daily
- * 2001, 2004, 2007 Modified again

**CRITERIA FOR COORDINATED LONG-RANGE OPERATION OF
COLORADO RIVER RESERVOIRS PURSUANT TO
THE COLORADO RIVER BASIN PROJECT ACT OF
SEPTEMBER 30, 1968 (P. L. 90-537)**

JUNE 8, 1970

These Operating Criteria are promulgated in compliance with Section 602 of Public Law 90-537. They are to control the coordinated long-range operation of the storage reservoirs in the Colorado River Basin constructed under the authority of the Colorado River Storage Project Act (hereinafter "Upper Basin Storage Reservoirs") and the Boulder Canyon Project Act (Lake Mead). The Operating Criteria will be administered consistent with applicable Federal laws, the Mexican Water Treaty, interstate compacts, and decrees relating to the use of the waters of the Colorado River.

The Secretary of the Interior (hereinafter the "Secretary") may modify the Operating Criteria from time to time in accordance with Section 602(b) of P. L. 90-537. The Secretary will sponsor a formal review of the Operating Criteria at least every 5 years, with participation by State representatives as each Governor may designate and such other parties and agencies as the Secretary may deem appropriate.

I. ANNUAL REPORT

(1) On January 1, 1972, and on January 1 of each year thereafter, the Secretary shall transmit to the Congress and to the Governors of the Colorado River Basin States a report describing the actual operation under the adopted criteria for the preceding compact water year and the projected plan of operation for the current year.

(2) The plan of operation shall include such detailed rules and quantities as may be necessary and consistent with the criteria contained herein, and shall reflect appropriate consideration of the uses of the reservoirs for all purposes, including flood control, river regulation, beneficial consumptive uses, power production, water quality control, recreation, enhancement of fish and wildlife, and other environmental factors. The projected plan of operation may be revised to reflect the current hydrologic conditions, and the Congress and the Governors of the Colorado River Basin States shall be advised of any changes by June of each year.

II. OPERATION OF UPPER BASIN RESERVOIRS

(1) The annual plan of operation shall include a determination by the Secretary of the quantity of water considered necessary as of September 30 of that year to be in storage as required by Section 602(a) of P.L. 90-537 (hereinafter "602(a) Storage"). The quantity of 602(a) Storage shall be determined by the Secretary after consideration of all applicable laws and relevant factors, including, but not limited to, the following:

- (a) Historic streamflows;
- (b) The most critical period of record;
- (c) Probabilities of water supply;
- (d) Estimated future depletions in the upper basin, including the effects of recurrence of critical periods of water supply;

- * One of the Largest and Most Expensive Canal Systems in the U.S.
- * \$4B to Construct
- * 336 Miles (541 km)
- * 3000 CFS Canal (85 cms)
- * ~1.6maf/year
- * ~2900' total lift (800m)
- * 400 MW to power
- * Constructed 1973-1993

* Central Arizona Project

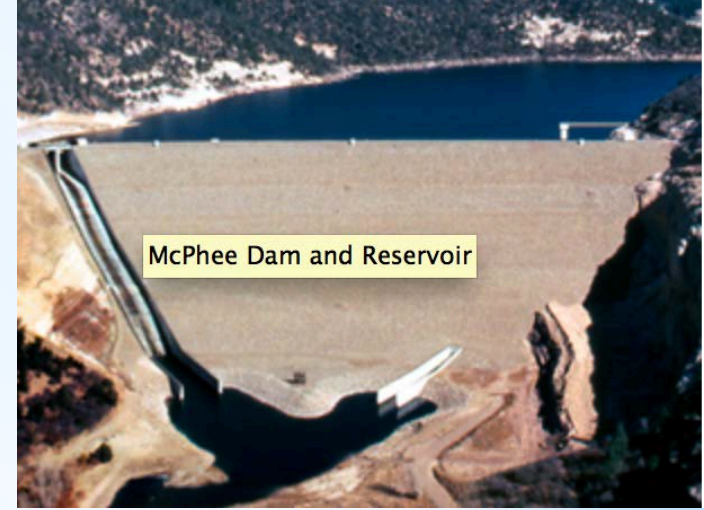




Ridgway Dam and Reservoir



Animas La Plata



McPhee Dam and Reservoir

- Dallas Creek Project
- Constructed 1978-87
- 30 kaf/year/
- Uncompaghre River

- Animas - La Plata Project
- Hugely Controversial
- Originally Indian/Muni/Ag
- 1991 ESA PBO that limited withdrawals to 57 kaf/year
- Restructured as Indian Only
- Pumps from Animas

- Dolores Project
- Constructed
- 400 kaf reservoir
- 60 k acres irrigated
- 90kaf/year supply
- Impacted High Quality Recreational River

* The 5 Aspinall Projects
- the 3 that were built

April 19, 2011

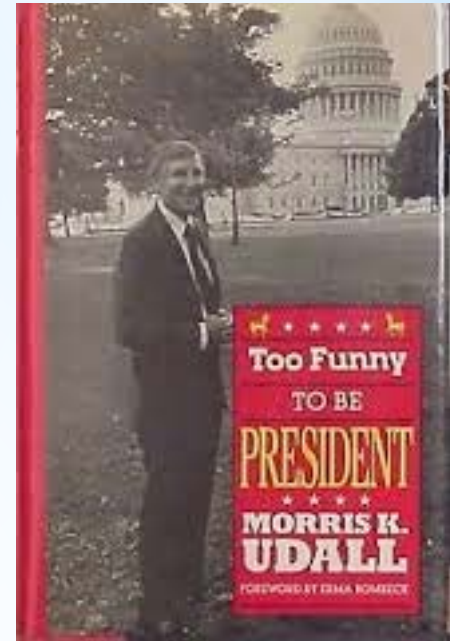
Press Release

CRD Board acts to abandon large transbasin West Divide Project storage rights

- * West Divide Project
 - * Very Controversial
 - * Inter-basin Transfer Crystal to Colorado
 - * 130,000 af reservoir to cover Redstone and Marble
 - * Most rights abandoned by CRD 2011
- * San Miguel
 - * Dam on the San Miguel below Telluride

* The 5 Aspinall Projects
- the 2 that were not built

- * CRBPA does not allow augmentation
- * Odd Language: Secretary shall do a big plan on water needs of SW, but for 10 years can't study importation from ANY basin into CRB
- * 10 years later another rider to prevent augmentation studies
- * Nothing Ever Came of It..
- * Udall to Jackson: "I know I can't study it, but can I dream about it?"



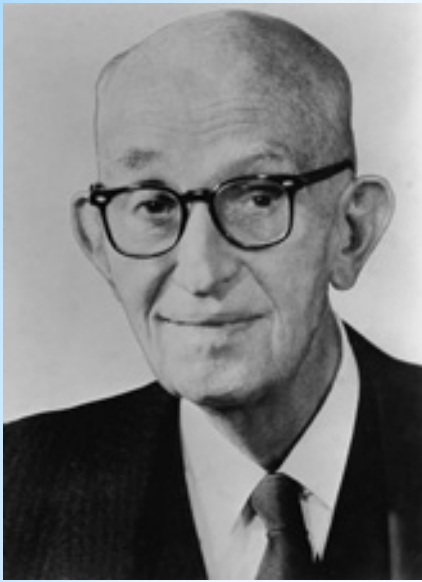
* **Augmentation**

- * Despite talk of a 25-year limit on California's Senior Priority, they got a permanent priority.
- * Odd clause that removes Senior Priority once 2.5 maf imported into basin - meaningless
- * You have to admire how they stuffed poor Nevada with a junior priority, too.



From left to right: Rep. John Rhodes, Sen. Barry Goldwater, Gov. Paul Fannin, Rep. Morris K. Udall, Sen. Carl Hayden, Sec. of the Interior Stewart Udall

* California's Senior Priority



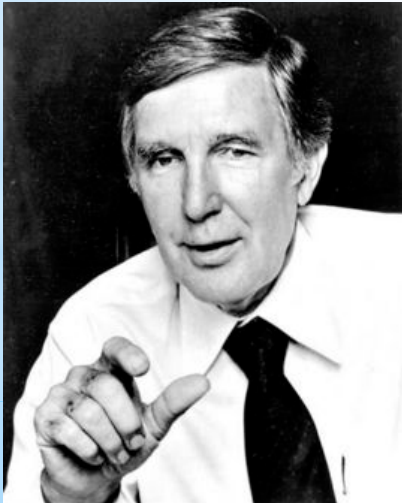
Retires in 1968 after
57 years in Congress



Loses Primary in 1972



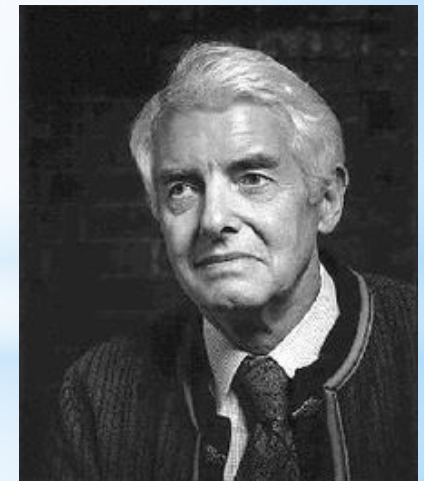
Leaves Office 1968
Long Legal/Writing
Career



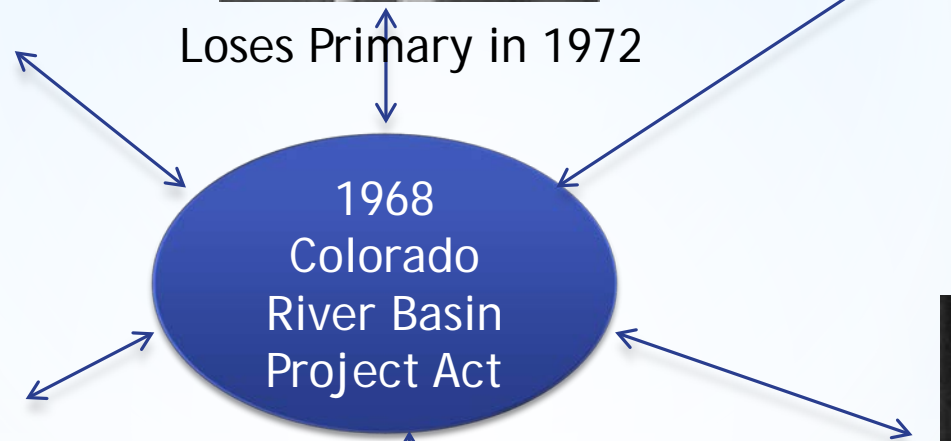
Chair House Interior Comm. 1977



Runs for Pres
in '72, '76

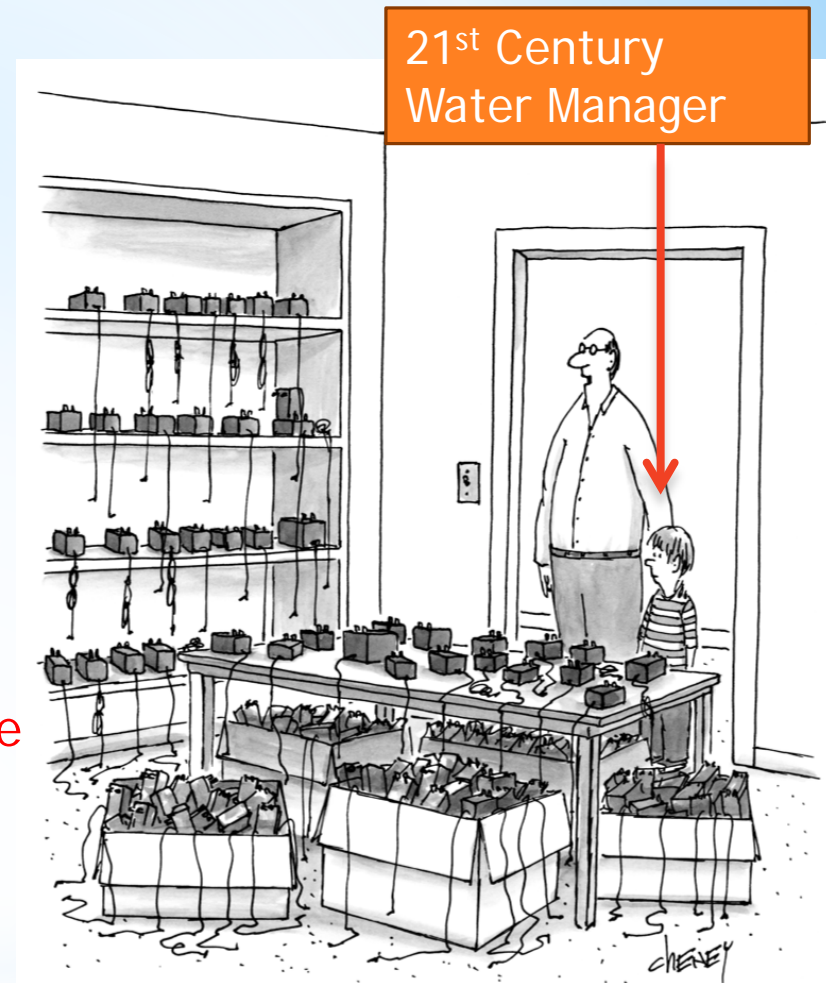


Forced out of S.C
1969, Founds FOE



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* Outline



One day, son, all of these perfectly good A.C. adapters, which have long outlived the products they were originally designed for, will be yours."

* 4 Law of the River Myths that Come from CAP Legislation

- * Myth: Widely Held Belief that is False

* Myth 1: Arizona and Central Arizona Project (CAP) Allocation

- * AZ's entire CAP allocation (~1.6 maf) must be shorted before CA is shorted one drop. (43 U.S.C. § 1521 (b))

* Myth 2: We can and must empty Lake Mead to meet CA's Senior Priority

- * BTW: Never you mind that 2m people in Las Vegas are out of water

* Myth 3: Arizona's Tribal Water Settlements

- * More than 1/3 of CAP Water is Pledged to Tribes and CAP's priority is sufficient to meet these needs

- * AZ should bear the entire national responsibility to meet these federal obligations and it is ok to short these along with AZ.

* Myth 4: Upper Basin and Climate Change (Compact Related)

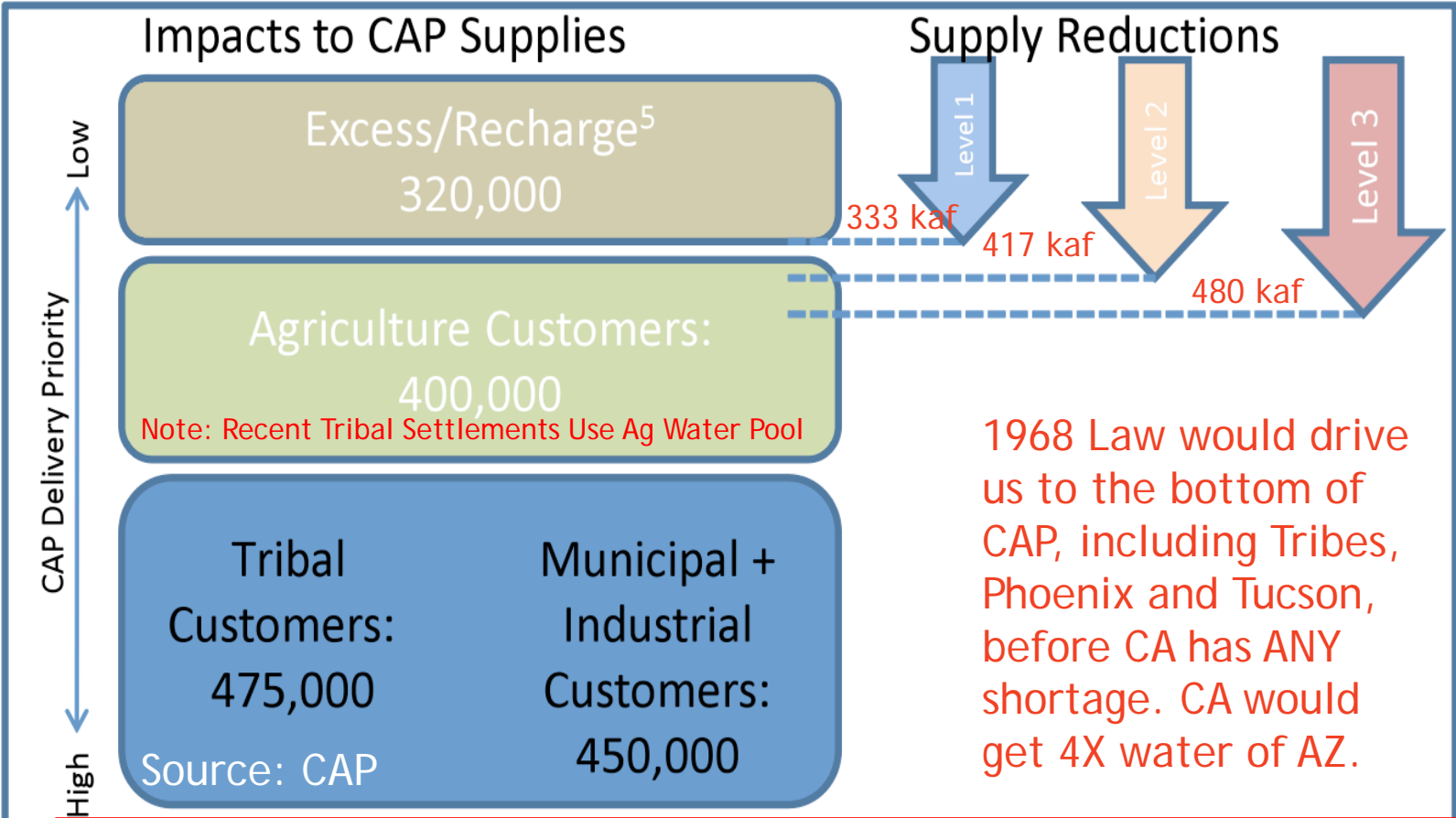
- * Upper Basin is to bear the entire brunt of climate change risk (Colorado River Compact Section III (d))

Myth 1: ALL of CAP gets shorted before California sees any shortage

Basic Allocations: CA 4.4 MAF. Arizona 2.8 MAF

Current AZ Maximum Shortage is ~480 kaf under 2007 Agreement (See Level 3 Below), consistent with 1968 Colorado River Basin Project Act

1968 Law if fully implemented would force AZ to forego all CAP deliveries, 1.6 maf, before CA faces 1 drop of shortage. After implementation AZ=1.2maf, CA 4.4 maf.



- * We already assume that this is a untrue
 - * Reclamation Modeling frequently respects elevation 1000' in modeling to protect LV's current lower intake
 - * "I don't care what you think about the Law of the River, we are not going to dry up a city of 2m people." ~ Mike King, Colorado DNR Director, June 2013
- * With the new intake this myth DOES NOT disappear
 - * At least not yet: they didn't build the \$300m pumping plant
 - * Recreation in Mead is huge draw: +8m visitors/year = Grand Canyon + Yosemite Combined = 5th in NPS
 - * Suggests other myths: Recreation and Power do not matter in the Law of the River

* **Myth 2: We must empty Mead to Meet
CA's 4.4 maf priority**

* Myth 3: AZ's CAP contains enough water for tribal settlements and CAP priority is adequate

- * U.S. Supreme Court Winters 1908
- * 1922 Compact totally excluded tribal considerations
- * AZ vs. California, 1963 'PIA' Standard
 - * Water for AZ tribes to come from AZ share
- * 29 CRB Tribes with 2.9 MAF in decreed rights
- * AZ has allocated > 550kaf of CAP to Tribes in about 8 settlements
- * ~ 10 Remaining AZ Settlements including Navajo and Hopi
- * Recent Settlements have eaten into lower priority agricultural pool not intended for these settlements originally
- * If we short AZ 1.6 MAF per 1968 Act, we also short AZ's tribes, a federal responsibility

Northcutt Ely CA Water Attorney re tribal claims and the Colorado River Compact, 1955: "If inside, and as large as claimed, the Compact is splitting at the seams, and if outside, busted."

Map 1: Arizona's Indian Reservations and Rivers



* Myth 4: Upper Basin Should Bear Entire Climate Risk

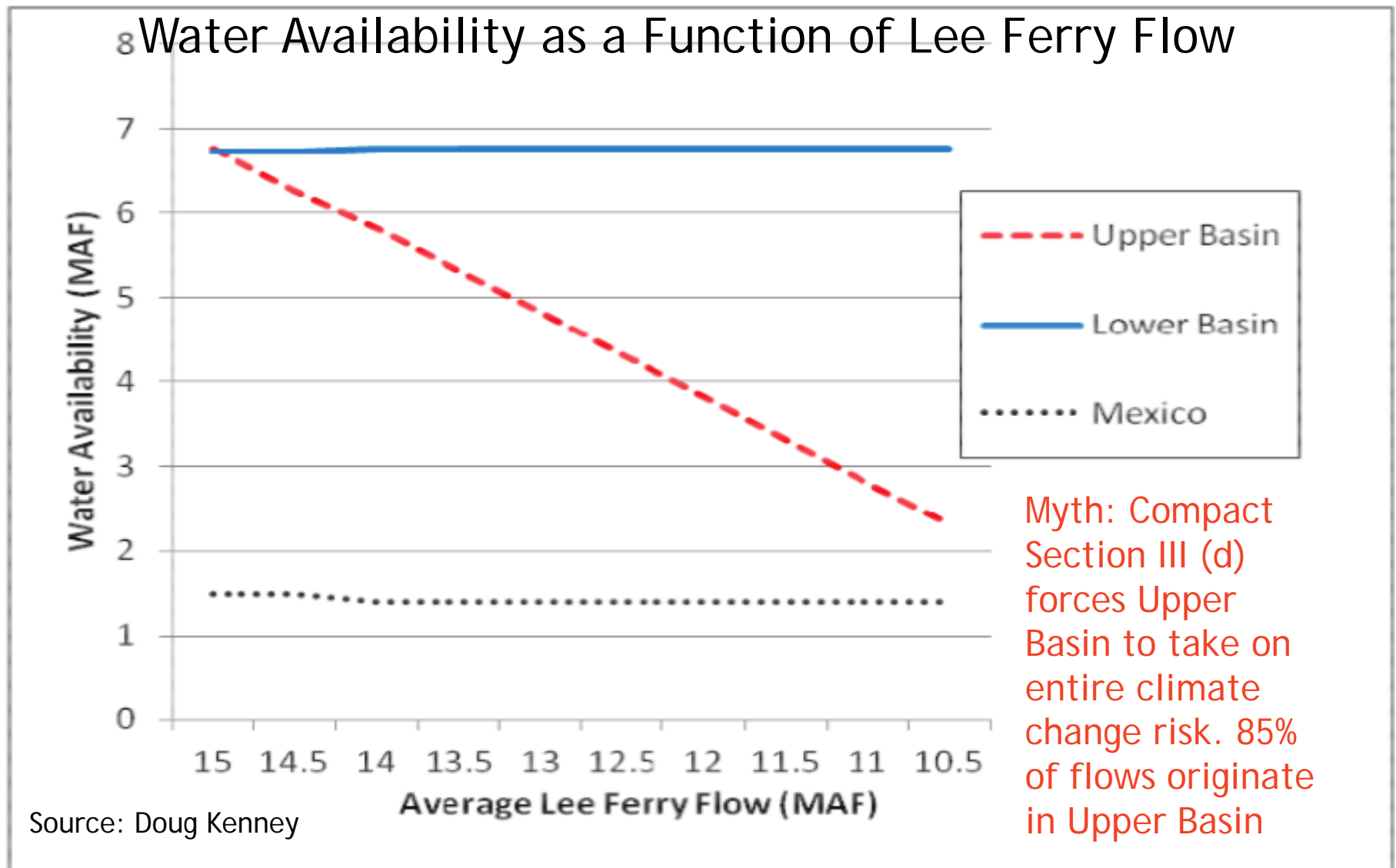


Figure 1. Water Availability (by sub-basin) as a Function of Long-Term Average Flows⁴

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One day, son, all of these perfectly good A.C. adapters, which have long outlived the products they were originally designed for, will be yours."

* So if we can't

- * (1) drop Mead below 1000' (at least for a while)
- * (2) short Arizona 1.6maf before CA
- * (3) make the Upper Basin take all the climate change risk
- * (4) ignore power and recreation entirely...

* What happens?

- * Shortages are going to get shared in new ways
- * California, especially agricultural users, are going to have to share
- * Equity, Economics, and Environment will all have to be considered

* Castle's Points

- * Reclamation and the States Have to do more, do better and do it quickly.
- * "Balancing among the interests" ...
- * Efforts are underway to solve
- * Politics are difficult; will affect everyone, including those who have no idea of the complexity of what we are dealing with.

* **Myths to Realities**

- * Even if the Lower Basin fixes the structural deficit, the Upper Basin is not off the hook
- * 13.5 MAF/Year Runoff (10% Reduction) is a tipping point
 - * Breaks the Compact:
 - * Lower Basin has to deal with reality of NO water in CAP, and Upper Basin has to curtail current uses.
 - * Either one alone is a problem, collectively a deal-breaker
 - * Also empties Lake Mead
 - * Last 14 years are at ~20% reduction
 - * 10% reduction is well within climate projections by 2050
 - * We have seen 60+ years in paleo record at ~ 15% reduction
 - * Good News: still have 80-90%

* **Myths to Realities**

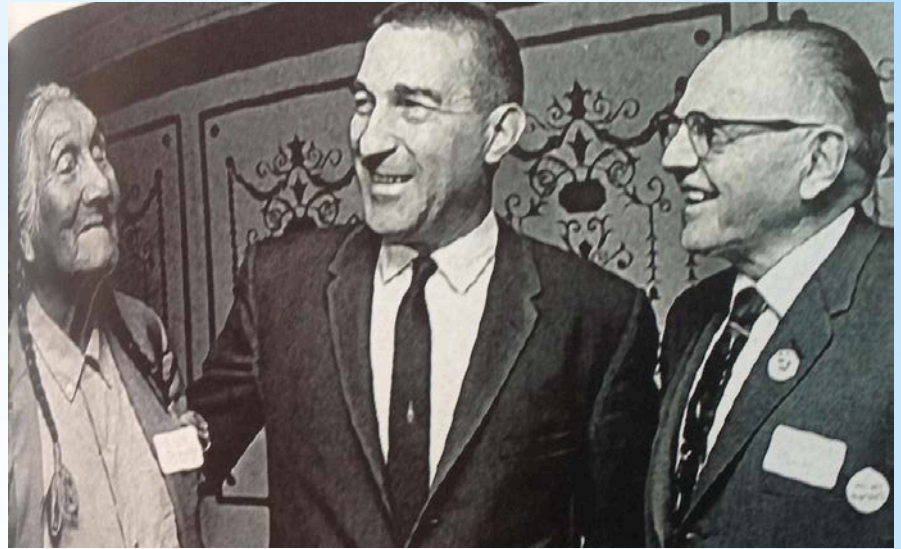
- * I am humbled by just how little we knew in 1968
 - * Well-meaning people proposed truly horrible projects
 - * Is this still possible today?
 - * We knew very little about our environment and its importance
 - * To our cultural and even social well-being
 - * To our economy
 - * Quiet Crisis Example: “Over the long haul of life on this planet, it is the ecologists, and not the bookkeepers of business, who are the ultimate accountants.”
- * 1968 Feels like 2 Centuries ago, not 1
 - * Glen Canyon, Flaming Gorge, Navajo, Blue Mesa all just built
 - * Environmental Flows not a concept
 - * No CWA, ESA, CAA, NEPA
 - * US Population at 180m
 - * We were a lot richer
- * A Different World today if “Go-it-alone” had played out
 - * “Shared-Sacrifice” would be the norm
 - * Strict Priority System does not make sense for the 21st Century
- * We knew in 1968 we had a big long-term problem
 - * Everyone got greedy
 - * CA wanted to avenge AZ vs. CA loss
 - * CO wanted its projects
 - * AZ wanted CAP at all costs
 - * AND NO ONE LOOKED AT THE BIG PICTURE



Stewart and Wayne pushing the plunger for Fry-Ark

* Some Closing Thoughts

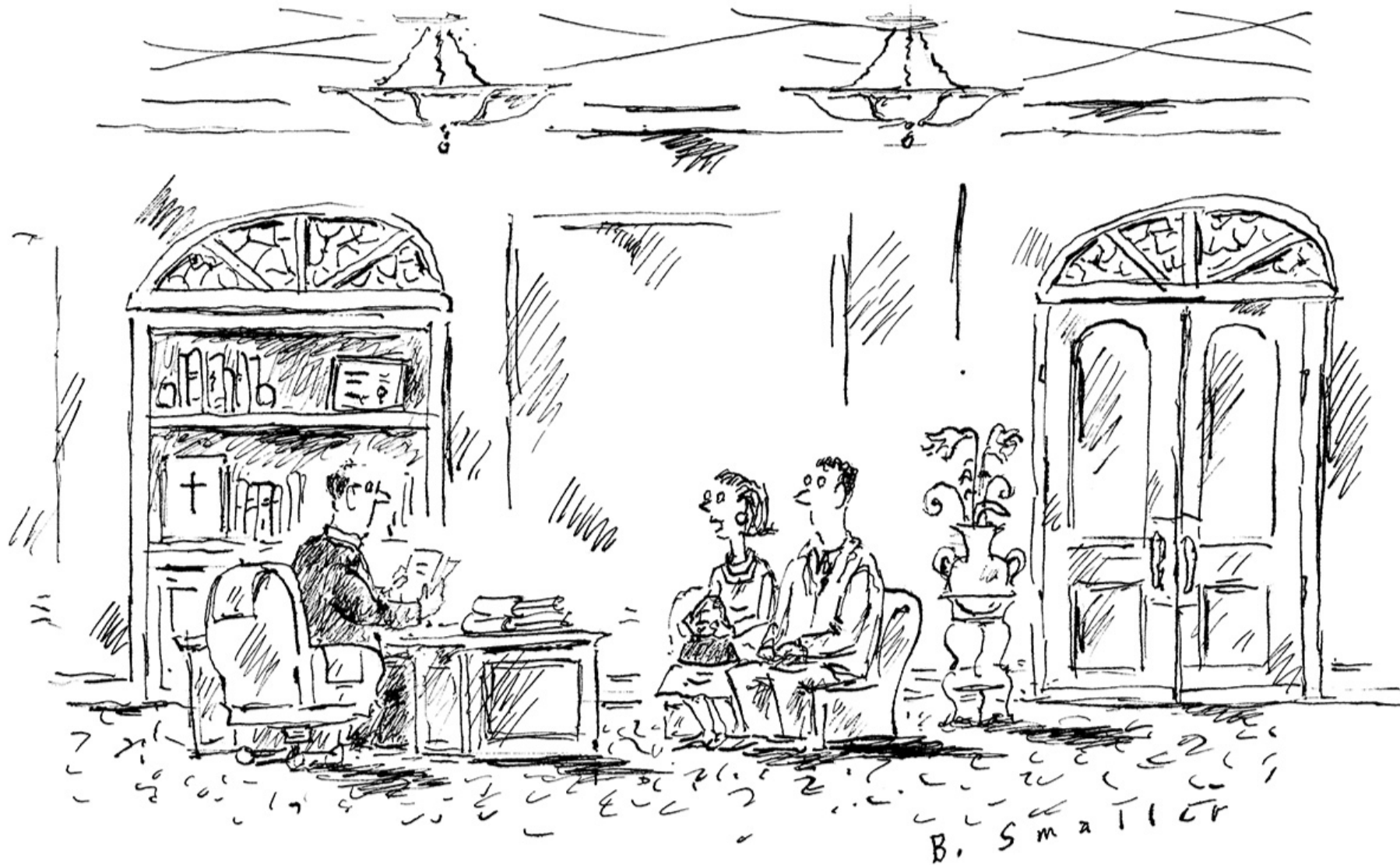
- * We have a history of 'kicking the can down the road'
 - * 1922 Mexico, Indians, Surplus, Gila
 - * 1968 CAP
 - * 2007 Only 600 kaf of shortage
- * Climate Change
 - * This makes the structural deficit occur sooner, and makes it greater
 - * And at some point, it will affect the Upper Basin, too.
 - * Southern Portions will see physical shortages
 - * And possible Compact Delivery obligations due to low flow



Stewart and Wayne with Ute Chief

* **Some Closing Thoughts**

The Basin States



"I don't mind getting married for better or for worse as long as it's not a whole lot worse."

* “Basin of Contention would be an apt name for what generations have called the Colorado River Basin. A limited supply of water in a vast arid and semiarid region is hardly a recipe for tranquility among those who covet that water. The drafters of the compact were clearly aware of that truism, but they nonetheless failed to determine with reasonable accuracy the long-term annual flow of the Colorado River.”

* ...” The decision to apportion water to two basins rather than to each state was made because the drafters lacked the data to make a different apportionment. Indeed, they lacked sufficient data to make almost any significant apportionment.”

* “...The drafters were mesmerized by their desire for haste and their political and personal goals. Without authoritative data, they had an opportunity to pick and choose information that best suited their interests and uncertainties. And that is what they did.”

* ..The consequences of the compact remain with us..

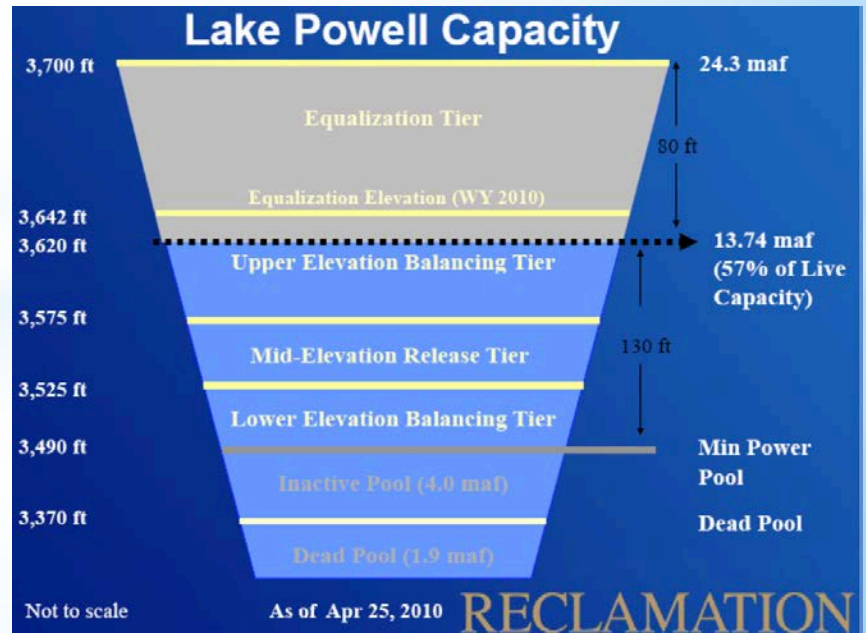
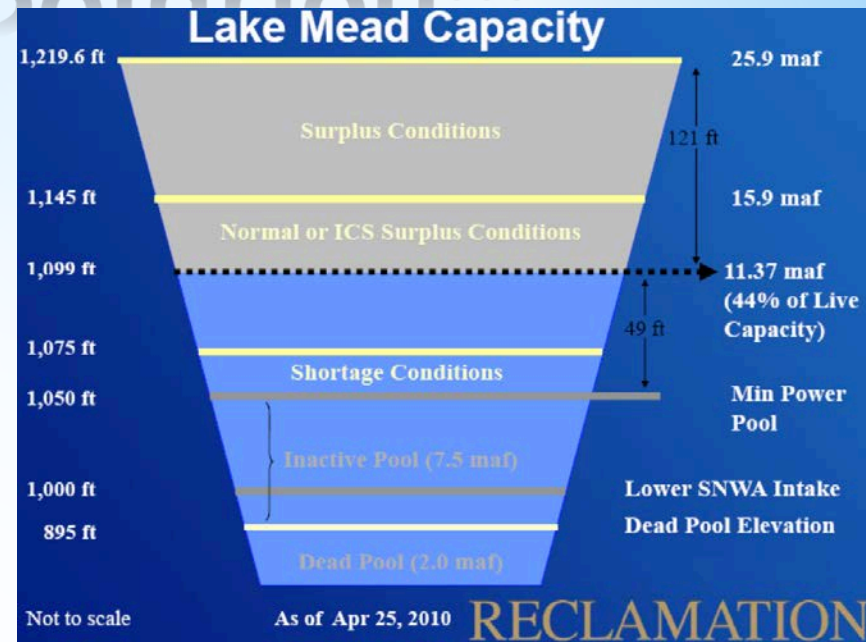


Hundley 2009 Postscript to Water in the West

* One Innovative Solution...

* Remove the Upper Basin Delivery Requirement in exchange for a UB limit on consumption. Allow LB to operate Mead/Powell however they want.

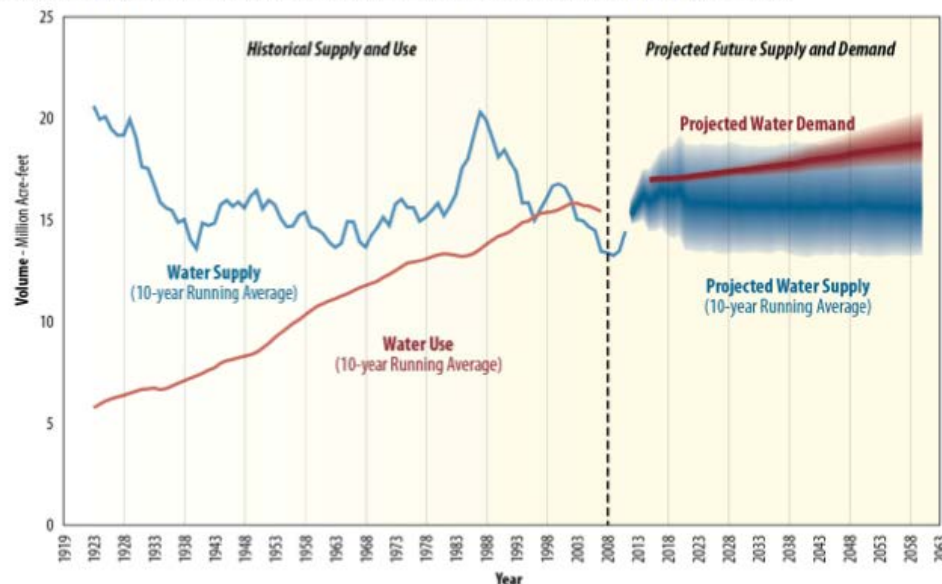
* Would require Congress to act



* Solutions from Basin Study

- * Colorado River is, or will be, water short
- * Basin Study Solutions
 - * Increase Supply: 1.5 maf (imports, reuse, desal, dust)
 - * Decrease Demand: ~ 2 maf (m&I, ag, energy)
 - * Operations: ~ 1.2 maf (evap, new storage)
 - * Xfers: ~ 2 maf (banking, ag xfers)
- * Grand Augmentation Plans - Columbia, Fraser, Mississippi, Ice Bergs - will NEVER happen
- * 'Markets' or Transfers are critical
 - * Fallacy of "water has no substitutes"
- * My Suggestion: Third Party Pressure Needed - Game Theory
 - * Hanemann Thesis, 2009 ESP Article
 - * DOI has such authority

FIGURE 12
Historical Supply and Use¹ and Projected Future Colorado River Basin Water Supply and Demand¹



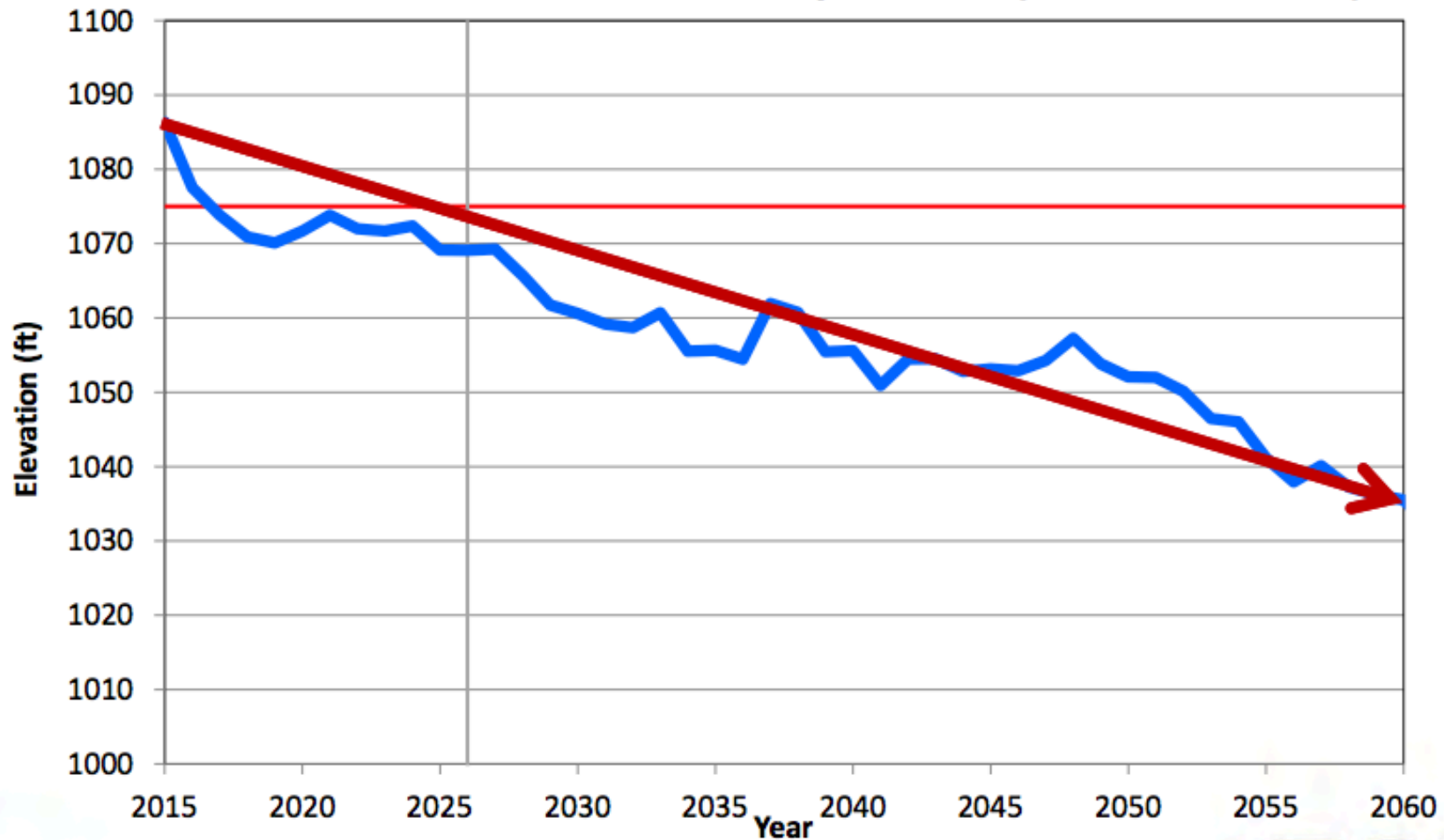
Markets for Federal Water

*Subsidies, Property Rights,
and the Bureau of Reclamation*

Richard W. Wahl

Longer-Term Outlook

Median Lake Mead January Elevation (Baseline CRSS Run)



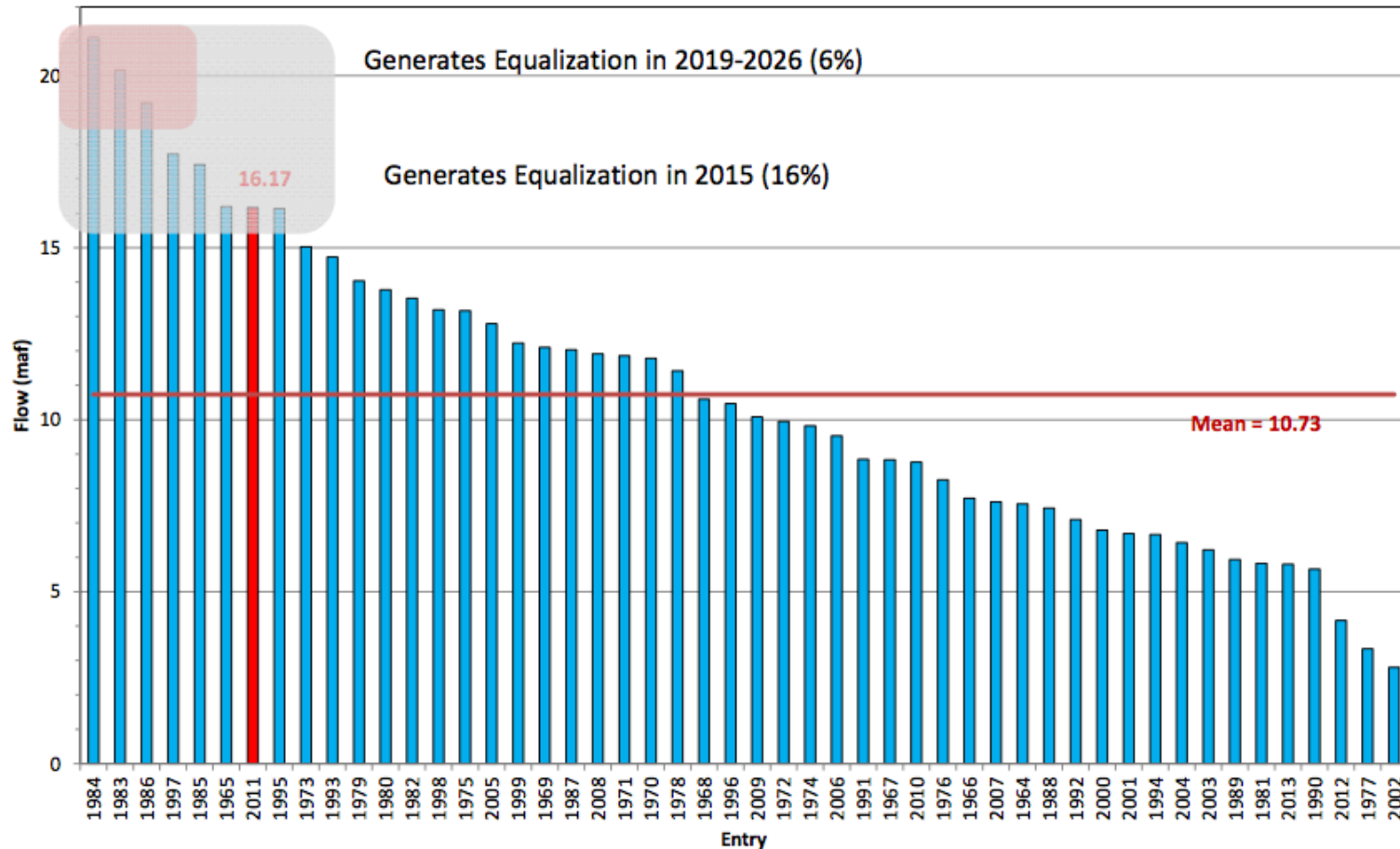
- * 7 States, 2 Nations
- * Annual Flow 16.4 MAF (20,000 GL = 20 km³)
- * 40 M People
- * All of the Major Cities in Southwest
- * 5.5m Irrigated Acres (2.2 m Ha)
- * 250,000 mi² Basin Area (650,000 km²)
- * Huge Topographic and climatic Variability
- * 90 Years of Agreements known as 'Law of the River'
- * Basic Allocation: 50/50 Split Upper Basin - Lower Basin

Colorado River Basics



Powell Inflows (1964 – 2013)

Lake Powell Unregulated Inflow



* A 602(a) World - Equalization

Chances for Equalization

- Equalization trigger under the 2007 Guidelines goes up every year
 - For 2015, requires 17 MAF in storage in Lake Powell
 - By 2019, almost 18 MAF
 - By 2026, more than 19 MAF
- Current storage in Lake Powell is 10.8 MAF
- Powell inflow required for equalization in 2015:
 - 6.2 MAF (storage increase) + 9.0 MAF (release to Lower Basin) = **15.2 MAF**



* A 602(a) World - Equalization