

<http://www.inkstain.net/fleck/2019/06/is-there-a-grand-bargain-to-be-had-in-the-colorado-river-basin/>

### **Incrementalism I**

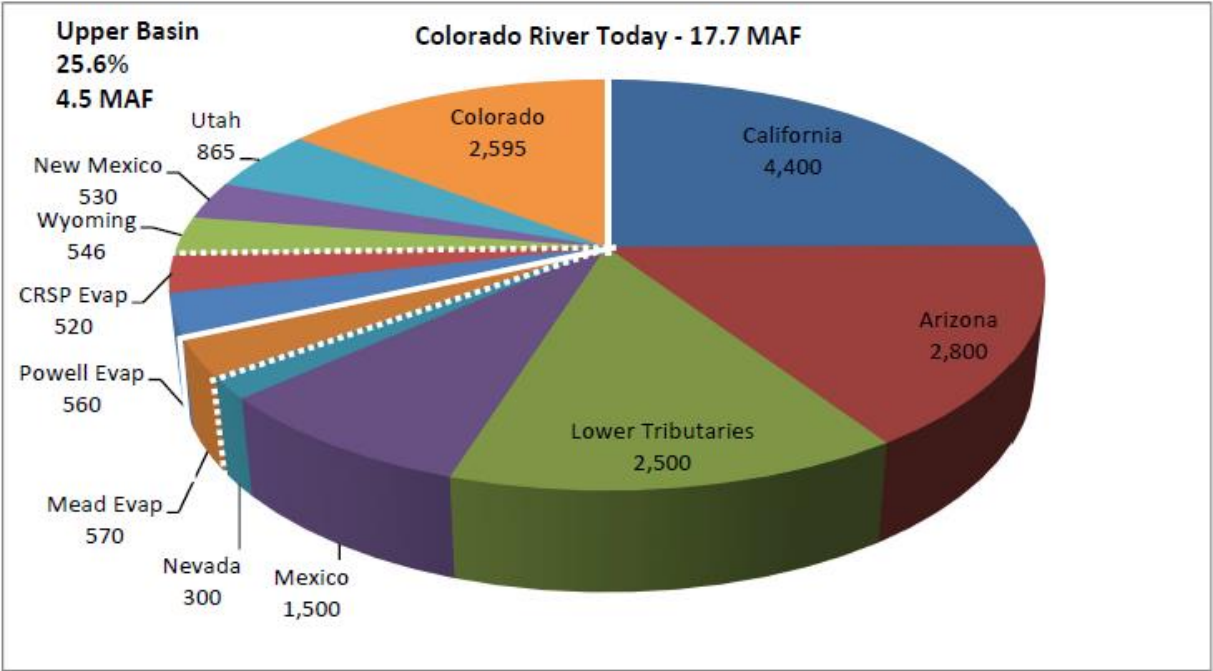
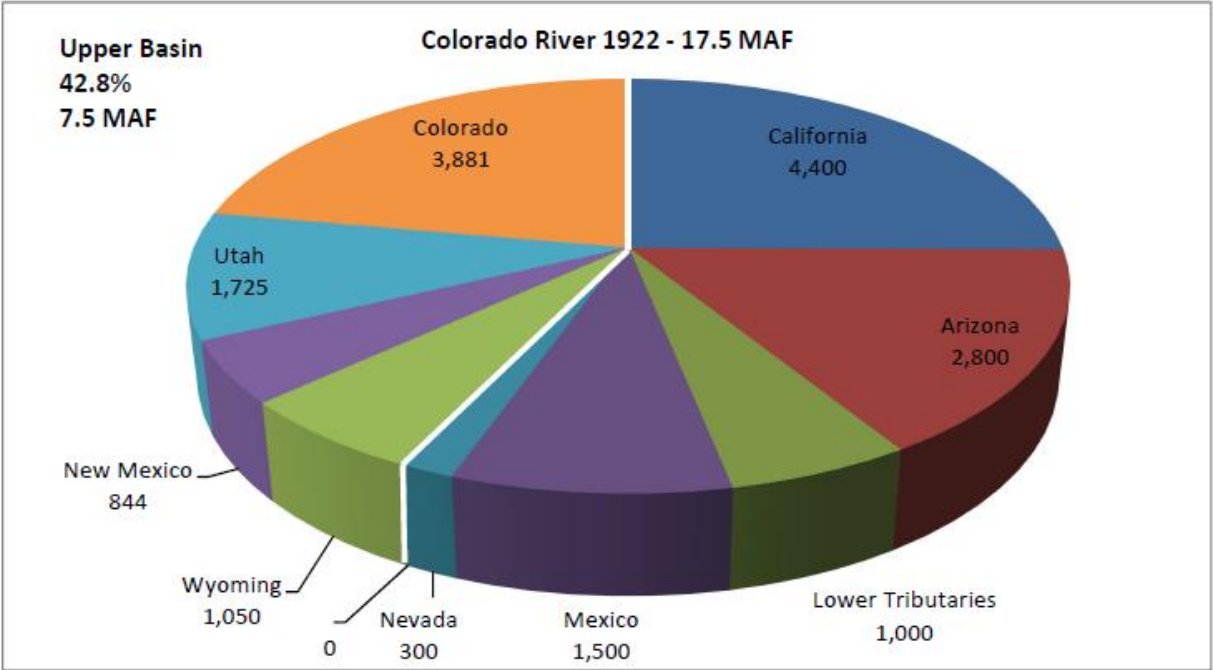
The current package of the 2007 Interim Guidelines (with a few tweaks here and there), the Upper Basin and Lower Basin DCPs, and Minute 323 could be extended for anywhere from 5 to 20 years.

### **Incrementalism II**

River operations could revert to the pre-2007 Long Range Operating Criteria-based operation (an 8.23 MAF minimum objective release plus occasional equalization releases) on a temporary or extended basis. This approach would not be a good outcome for the Lower Basin

### **The Grand Bargain**

Upper Basin would agree to not object to the Lower Basin's overuse and some form of an Upper Basin use cap (4.5 MAF). In return the Lower Basin would agree that the Upper Basin had no flow obligations at Lee Ferry (no threat of a compact "call"). Lakes Mead and Powell (and possibly other Upper Basin reservoirs) would be operated to maximize the yield and certainty of supplies for the Lower Basin and Mexico and address environmental issues. The three Lower Basin states and Mexico would share shortages in a manner similar to the current DCP and Minute 323.



## Interesting Parts of Getches Wilkinson Summer Conference

Kevin Wheeler Slides

<https://www.getches-wilkinsoncenter.cu.law/wp-content/uploads/2019/06/Kevin-Wheeler.-2019-GWC-Summer-Conference.pdf>

Kevin Wheeler Stream

<https://www.youtube.com/watch?v=dg-hDlp8sZ4&t=2100>

Brad Udall Slides

<https://www.getches-wilkinsoncenter.cu.law/wp-content/uploads/2019/06/Brad-Udall.-2019-GWC-Summer-Conference.pdf>

Brad Udall Stream

[https://www.youtube.com/watch?v=3FC3Ea\\_o34E&t=13790](https://www.youtube.com/watch?v=3FC3Ea_o34E&t=13790)

Day 2 Final Panel

<https://www.youtube.com/watch?v=dg-hDlp8sZ4&t=12160>

Day 2 Final Panel – Entsminger on Water Banking

<https://www.youtube.com/watch?v=dg-hDlp8sZ4&t=16730>

# Summary

(given assumptions used)

- An Upper Basin Cap
  - Removes the primary risk of compact litigation
  - Allows more flexible reservoir operations
- Upper Basin:
  - Upper Basin Cap and removal of compact requirement significantly improves reliability for the Upper Basin
- Lower Basin:
  - If 75 maf prevails, the Upper Basin Cap would have no significant relative consequences under most conditions
  - If 82.5 maf prevails, small but significant relative consequences exist under most conditions
- Severe drought:
  - The current compact assumptions impact the Upper Basin disproportionately
  - Will there be sufficient time to litigate in the Supreme Court during a drought?
- FMF or FPF
  - Presents challenges at these two extremes
  - But operations in between are likely feasible and beneficial for all

# Mead + Powell Contents 2000 – 2019 plus Hydrology

46 maf 2000  
20 maf 2019  
Loss of 26 maf or 60%

## 4 Periods

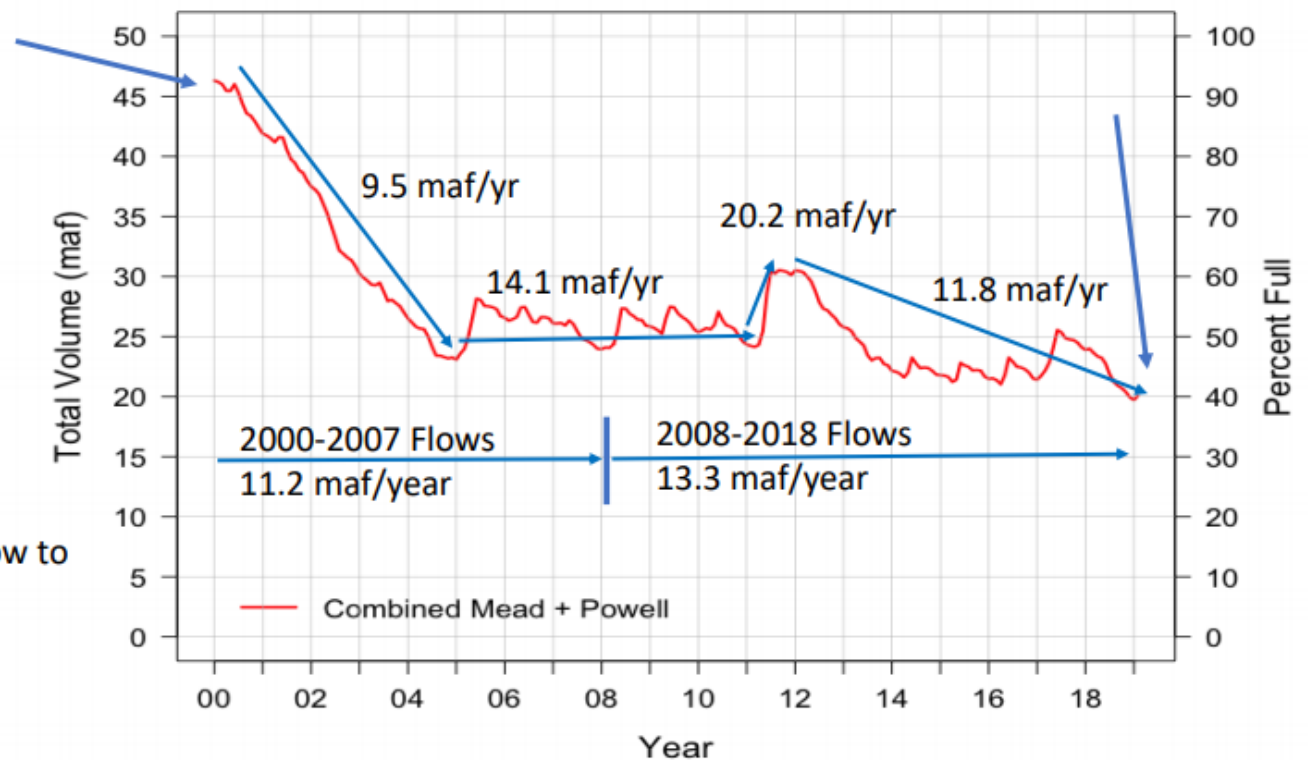
2000 – 2004 Loss of 23 maf  
2005 – 2011 Stasis, gain of ~1 maf  
2011 Gain of 6 maf  
2012 – 2019 Loss of 10 maf

In worst years: lose about 5 maf/year  
In best years: gain about 6 maf/year

It would take 4 2011-type years in a row to refill the system to 2000 levels

## Hydrology 2000-2007

2.1 maf/yr  
worse than 2008-2018



# Lake Powell Contents 2000-2019

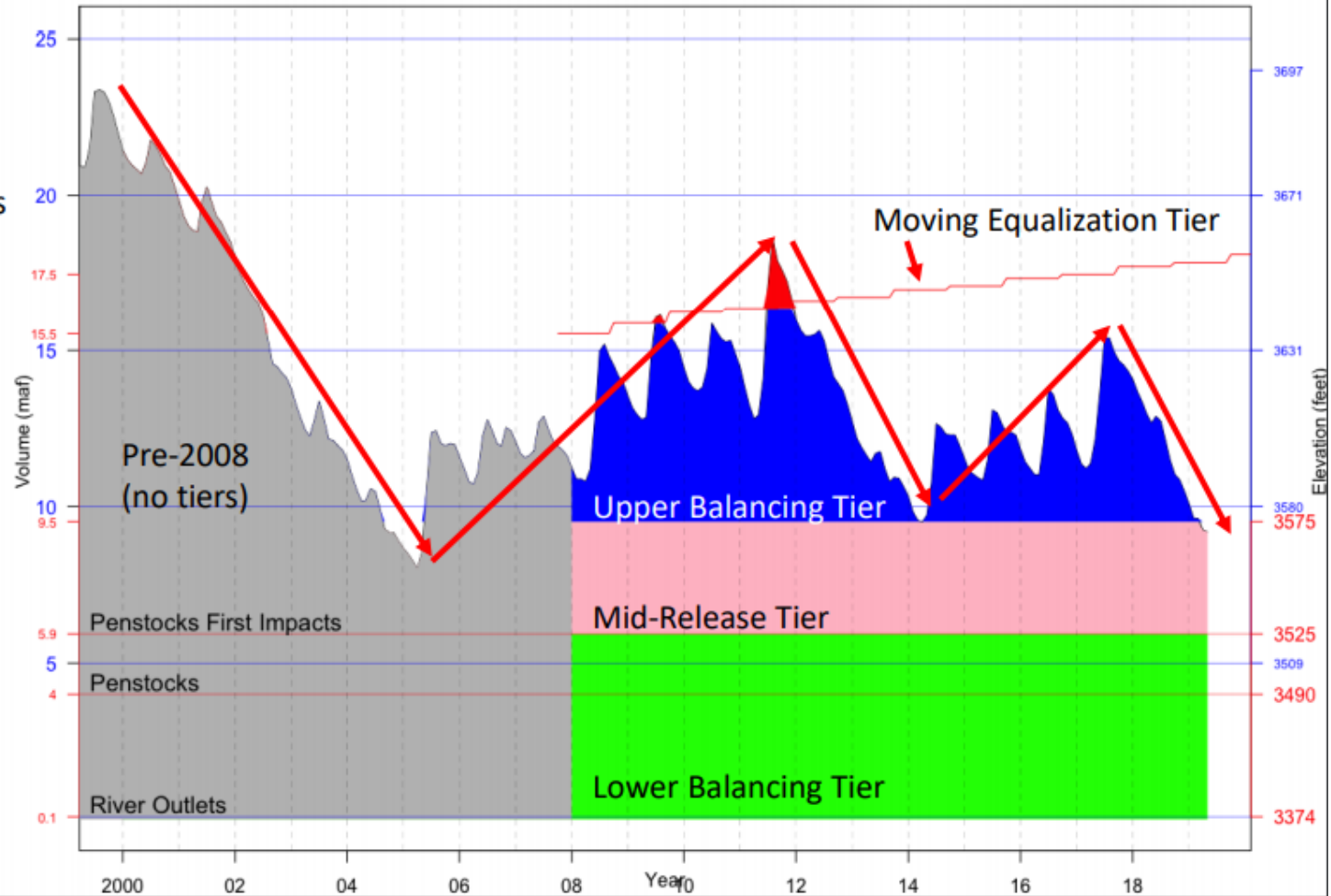
Loss of 14 maf over 19 years  
740 kaf/year

\*\* with 2019 inflows ~ 9 maf loss  
470 kaf/year

5 Periods

- 2000-2004 – Loss of 15 maf
- 2005-2011 – Gain of 10 maf
- 2012-2014 – Loss of 8 maf
- 2014-2019 – Gain of 5 maf
- 2018-2019 – Loss of 5 maf

Since 2007 Operational  
Tiers are: AOPs?



# Lake Mead Contents 2000-2019

Loss of 15 maf over 19 Years  
800 kaf/year, 40% remains

4 Periods

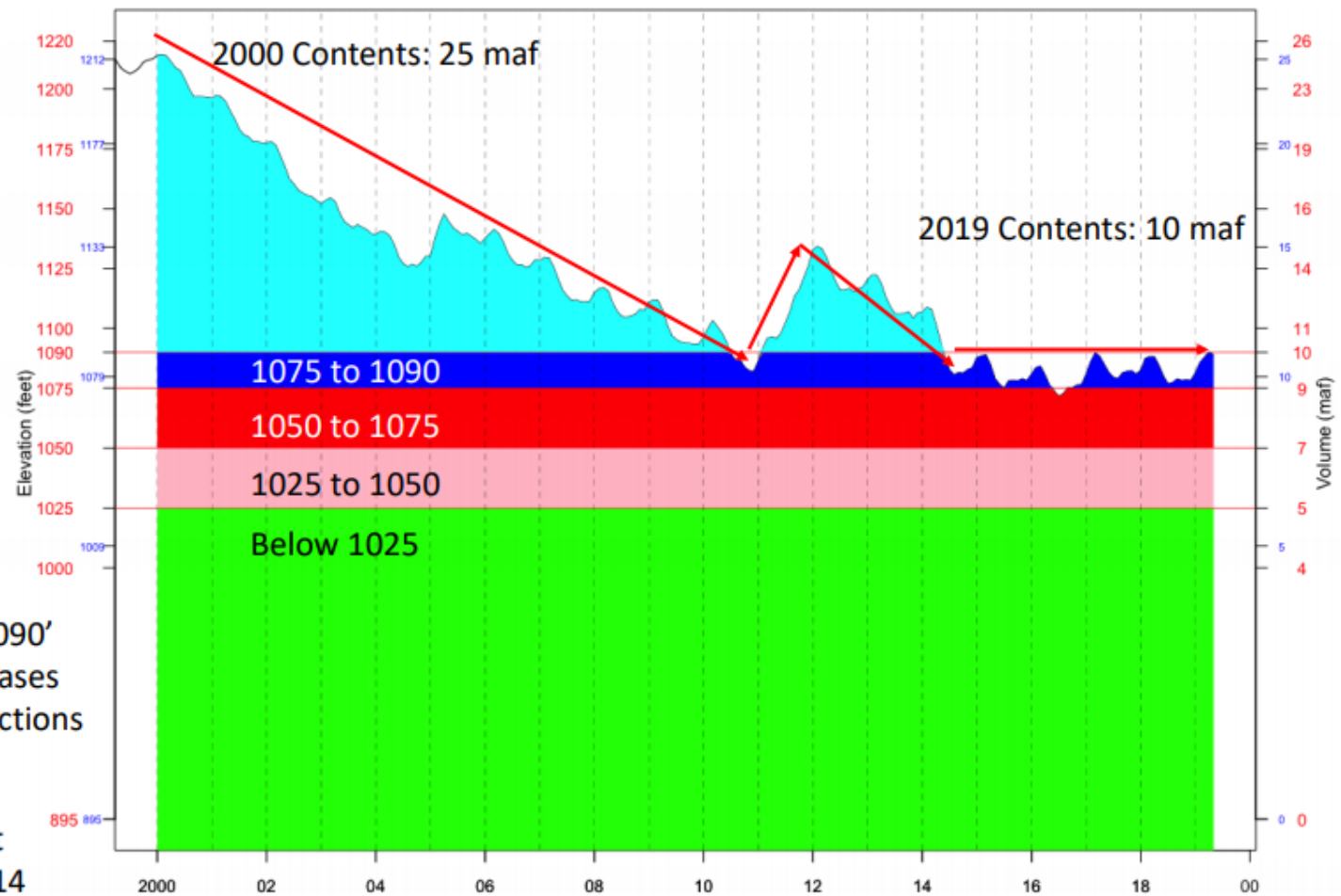
2000-2011 -- Loss of 15 maf  
1.4 maf loss/year

2011 -- Equalization  
5 maf gain

2012-2014 -- Loss of Equalization  
5 maf loss

2014-2019 -- Stabilization below 1090'  
9 maf/yr Powell Releases  
Small Demand Reductions

Interesting to speculate what might  
have occurred if DCP in place in 2014  
~ 340kaf/yr reductions



# Powell Releases 2000 – 2019 Relative to 8.23 maf

Cumulative Releases above  
8.23 maf/year (red line)

13 maf total since 2000  
11 maf total since 2008

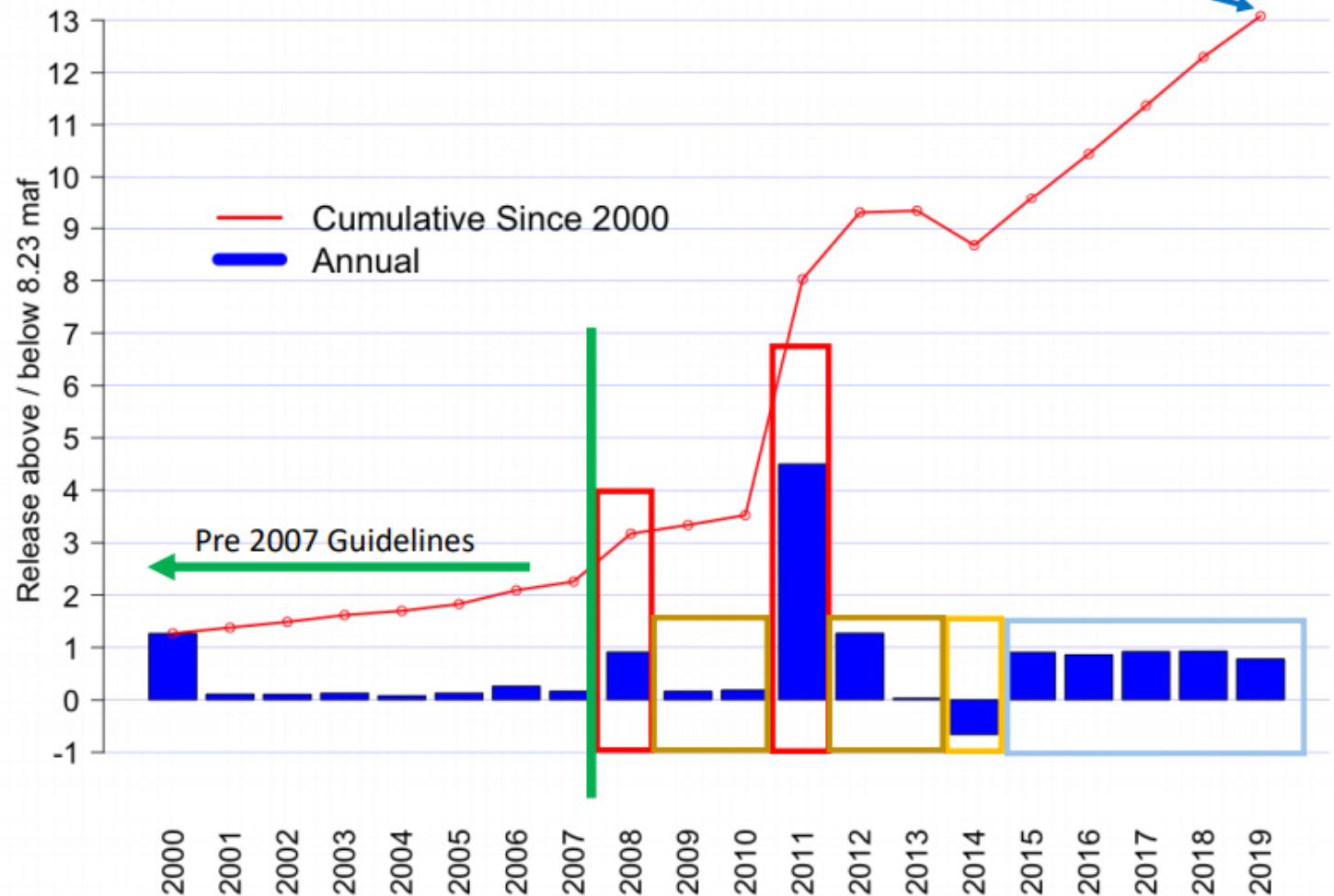
1 Year at 7.48 maf  
2014

4 Years at 8.23  
2009,2010,2012,2013

5 Years at 9 maf  
2015-2019

2 Equalization Years  
2008,2011 (plus 2012\*\*)

7/12 Years  $\geq 9.00$  (60%)  
4/12 Years = 8.23 (33%)  
1/12 Years  $< 8.23$  (7%)





## Comparison of June 2019 and January 2019 Projections Chance of Reaching Critical Reservoir Elevations

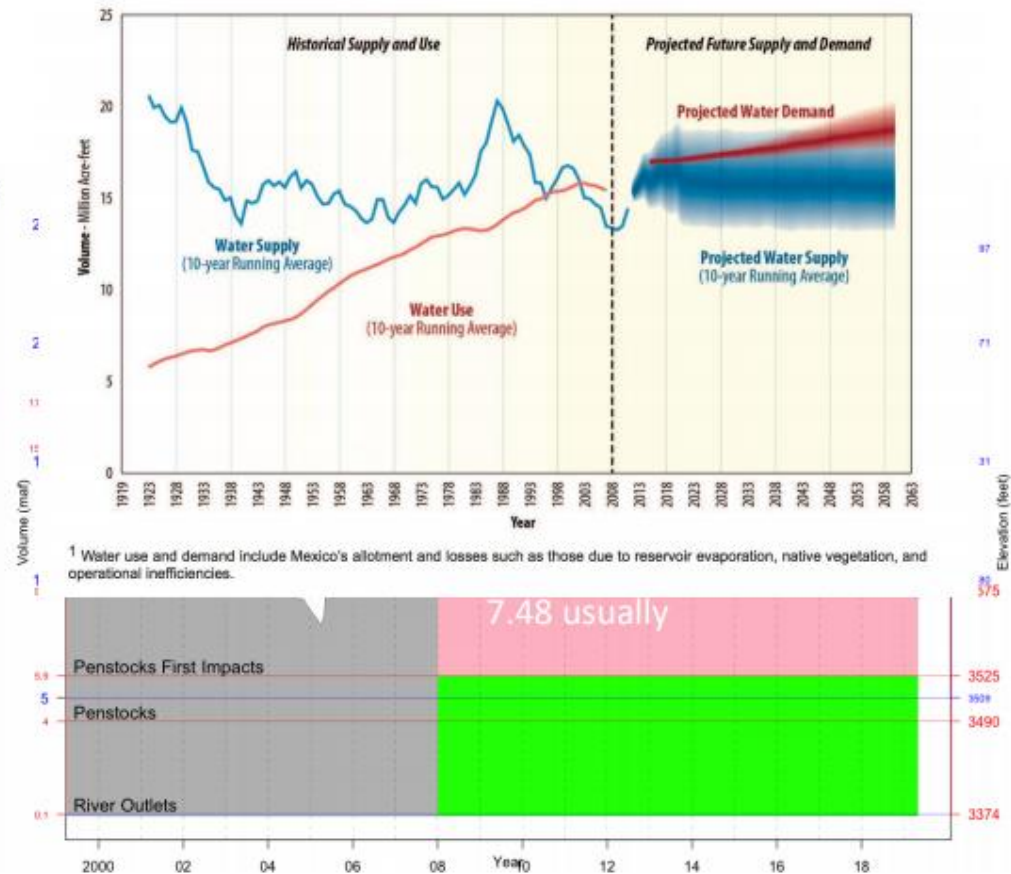
	Run	2020	2021	2022	2023	2024
<b>Lake Mead less than 1,025 feet</b>	January 2019	<1%	9%	21%	26%	30%
	June 2019	0%	0%	0%	2%	3%
	Difference	<-1%	-9%	-21%	-23%	-26%
<b>Lake Mead less than 1,000 feet</b>	January 2019	0%	0%	7%	12%	16%
	June 2019	0%	0%	0%	0%	0%
	Difference	0%	0%	-7%	-12%	-16%
<b>Lake Powell less than 3,525 feet</b>	January 2019	7%	18%	19%	22%	23%
	June 2019	0%	0%	1%	3%	4%
	Difference	-7%	-18%	-18%	-19%	-19%
<b>Lake Powell less than 3,490 feet</b>	January 2019	0%	5%	12%	14%	16%
	June 2019	0%	0%	0%	0%	0%
	Difference	0%	-5%	-12%	-14%	-16%

# Inflated Demands in Models can lead to Bad Outcomes

- 2012 Letter from Pacific Institute / WRA re Basin Study
- Demands not consistent with 6 different storylines
  - Not consistent with historic or recent trends in muni savings
- Not using best, updated information
  - One state had growth of 150% by 2030 despite 1%/yr now
  - Another state had 35% increase over 4 years in large metro area
- Too High Demands have Model World Impacts
  - Skew imbalances in supply/demand
  - Skew options and strategies to correct the imbalances
- Too High Demands have Real World Impacts
  - In 2007, UB wanted to hedge continued low flow hydrology risk with 7.48 maf/year releases without giving up too many 9.0 maf/year releases
  - Modeling results with high demands showed idea worked well
    - But modeled high demands forced Powell lower, leading to more 7.48 releases than were likely given realistic demands
  - Reality has been vastly different than the modeling
    - ~60% of releases  $\geq$  9maf /year
    - Only 7% at 7.48 maf/year
- Note: DCP Demands were recently modified by Reclamation

FIGURE 2

Historical Supply and Use<sup>1</sup> and Projected Future Colorado River Basin Water Supply and Demand



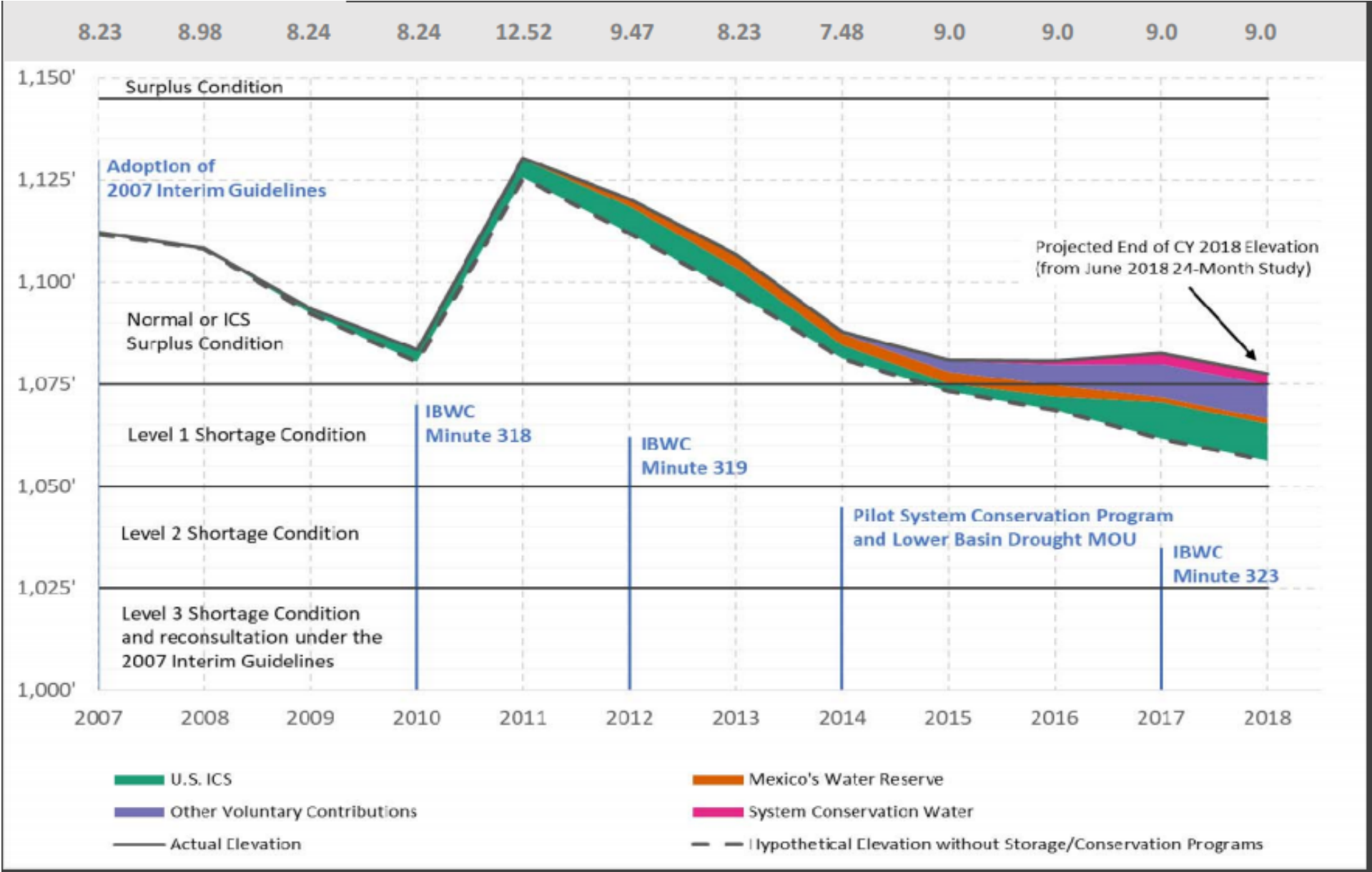
# Intentionally Created Surplus (ICS) Issues

- 4 Types created in 2007 and a new type created in the DCP
- Solved 'Use it or Lose it' Problem with the LB
- Intentionally Created Surplus of any kind can be later recovered
  - 2007 – above 1075' before
  - DCP: Normal ICS can be taken in lieu of shortages
- ICS Withdrawals could make low flow / low reservoir years worse
  - Main worry: withdrawals more likely in precisely those years
  - 'Bank Run' to avoid stranding, eg. MWD January 2019
- 2007 ICS Issues
  - Pretend we have saved water and point to higher reservoirs
  - But not real conservation, merely shifting use in time
  - Yet another technique to maximize use from the system
- New DCP ICS ("Shortage ICS") has another problem
  - DCP ICS – when Mead > 11 maf (1110')
  - Worry that later recovery depletes reservoirs just when recovering
  - Some bad debts may need to be written off to allow system recovery
- Note: most people agree that overall ICS is a benefit. It allowed inter-year storage rather than use it or lose it.



THIS JUST IN ... Metropolitan Water District begins drawing down stored water in Lake Mead

January 7, 2019 Maven Breaking News



# Manipulating the System

- “Actions to Keep us from reaching an undesirable target”
  - Good Versions – System Conservation PP
  - Bad Version – Sweet Spot
- Need to explicitly consider human manipulation / behavior in all targets and operational rules
- Maximize opportunities for good manipulation
  - System Conservation Pilot Projects
  - ICS may be an example in some cases
- Minimize opportunity for bad manipulation
  - Simple, clear, transparent rules help assuming good vetting
  - “Agent-based” modeling perhaps ?

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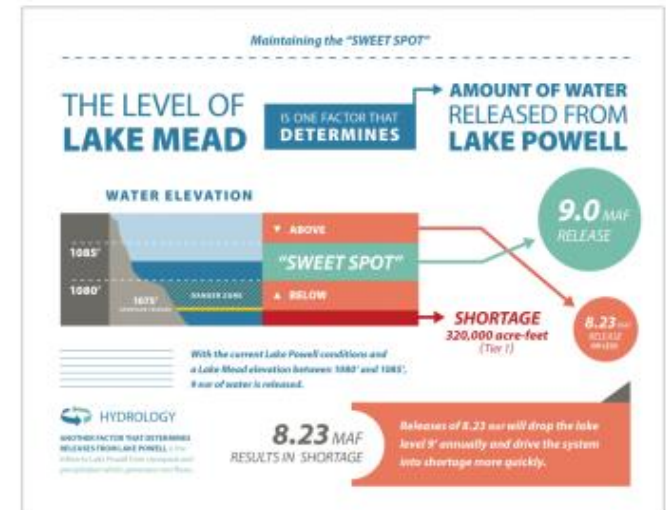
BOARD CONTRACTING DEPARTMENTS EDUCATION EMPLOYMENT PUBLIC INFORMATION STAKEHOLDERS SUSTAINABILITY ABOUT US

CONSTRUCTION  
PURCHASING  
SAFETY

### Pilot System Conservation Program Celebrates Innovation in Water Conservation

Butthead City turns pond water into valuable resource to protect Colorado River System

For more information:  
Crystal Thompson  
623-869-2138  
cthompson@cap-az.com



# Questioning some of the 2007 Rules

- Are the current rules meeting the objectives set out in the ROD?
  - Are we addressing UB Section III (d ) risk appropriately?
- No explicit consideration of UB III (d) Risk
  - Violating III (d) to meet LB Demands in excess of 8.5 maf/year seems ill-considered
  - Fundamental tension in the Compact III (d) vs III (e )
  - One solution: Hold UB Harmless for III (d) violation
- Are the current rules too complicated?
  - Would a simple (not simplistic) system be better?
  - Are the models running the show rather than humans?
- Struggling to understand the value of 9 maf Powell releases when Powell about 40% full
  - We're hitting the accelerator when maybe the brake is the right option\*\*
- Rules seem skewed to maximizing water deliveries rather than optimizing reliability
  - DCP Shortage converted to DCP ICS, latest example
  - ICS just shifts use in time, no real conservation
  - ICS recovery now allowed at very low Mead levels
  - Mid-Year Mead release re-adjustment can only increase release

## 2007 ROD

The Preferred Alternative proposes:

- ♦ discrete levels of shortage volumes associated with Lake Mead elevations to conserve reservoir storage and provide water users and managers in the Lower Basin with greater certainty to know when, and by how much, water deliveries will be reduced in drought and other low reservoir conditions;
- ♦ a coordinated operation of Lake Powell and Lake Mead determined by specified reservoir conditions that would minimize shortages in the Lower Basin and avoid the risk of curtailments in the Upper Basin;
- ♦ a mechanism to encourage and account for augmentation and conservation of water supplies, referred to as Intentionally Created Surplus (ICS), that would minimize the likelihood and severity of potential future shortages; and
- ♦ the modification and extension of the Interim Surplus Guidelines (66 Fed. Reg. 7772, Jan 25, 2001) (ISG) through 2026.

### Article III

(d) The states of the upper division **will not cause the flow of the river at Lee Ferry to be depleted below an aggregate of 75,000,000 acre-feet for any period of ten consecutive years** reckoned in continuing progressive series, beginning with the first day of October next succeeding the ratification of this compact.

(e) The **states of the upper division shall not withhold water, and the states of the lower division shall not require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses.**

### Article IV

(b) Subject to the provisions of this compact, water of the Colorado River **system may be impounded and used for the generation of electrical power, but such impounding and use shall be subservient to the use and consumption of such water for agricultural and domestic purposes and shall not interfere with or prevent use for such dominant purposes.**

### 1968 Colorado River Basin Projects Act

*SEC. 603. (a) Rights of the upper basin to the consumptive use of water available to that basin from the Colorado River system under the Colorado River Compact shall not be reduced or prejudiced by any use of such water in the lower basin.*

# Questioning some of the 2007 Rules

- Why are we forecasting Jan 1 Mead Contents from Aug 15 using 24-Month Model?
  - Adds complexity, 24-Month model subject to change, not generally available
  - Added 4.5 month forecast provides minimal additional information, yet some opportunity to manipulate
- Why are we using forecasted Mead elevation on just 1 date?
  - Feels more like an inadequate single marker than a thoughtful management strategy
  - Why not use easily calculated average reservoir volume over a period of time?
  - Is there a benefit to looking slightly backward in time?
- Are the Powell Tiers the right sizes and locations?
  - Is this even the right approach?
- Would there be benefits to using inflows in some cases as a partial trigger?
  - This year could justify 9 maf release when otherwise would seem unwise
  - Converse, true, too. Low flow year should generate conservation



# Concluding Thoughts

- Kudos to those managing this system and balancing lots of interests
- Much of the Storage loss was pre-2007
  - Worse hydrology by 2 maf, but we've lost another 10 maf post 2011
  - For every 2011 and 2019, we're getting 2012, 2013, 2018
- Recent Warm Temperatures may be "too cold" to occur in 2100
  - It doesn't have to be this way
  - In the UB, 2018 was horrendous
- We need to get the best possible data into our models
  - Work on getting politics out of that part of our work
- Is the whole system skewed to producing deliveries at expense of robust management at low flows?
  - ICS allows us to think we have more water than we do
- Make sure we consider how humans interact with the system
  - Maximize good actions, block/hinder bad actions
- My preference is to operate the system with as transparent, simple, clear rules as possible

Mead + Powell Contents 2000-2019

