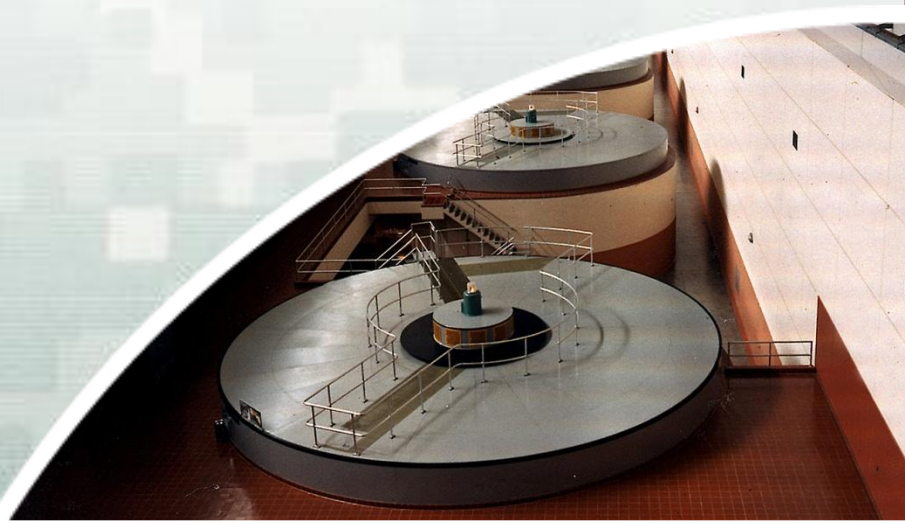
Missouri River Mainstem System

Reservoir Unbalancing



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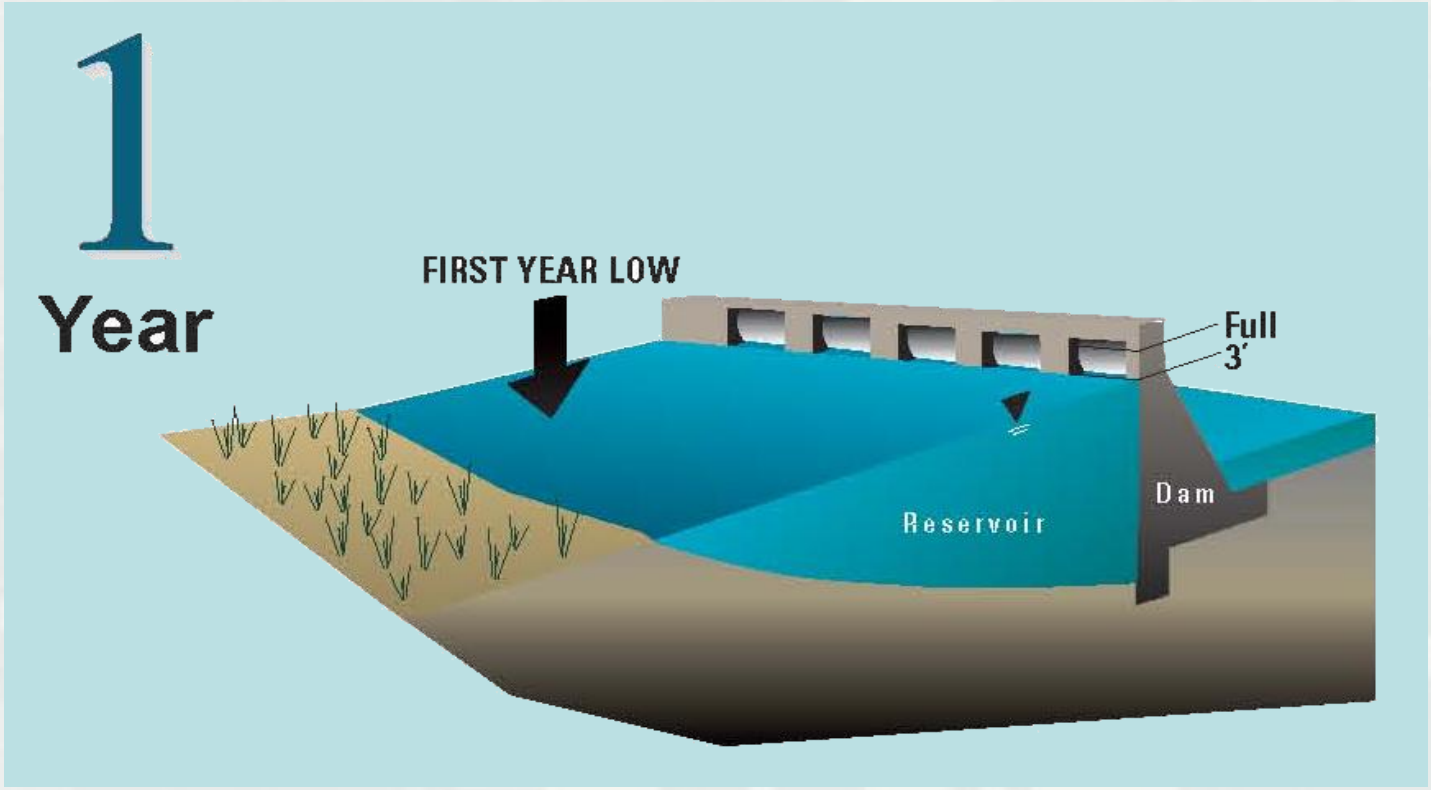
MRNRC Conference

US Army Corps of Engineers
BUILDING STRONG®

What is Reservoir Unbalancing?

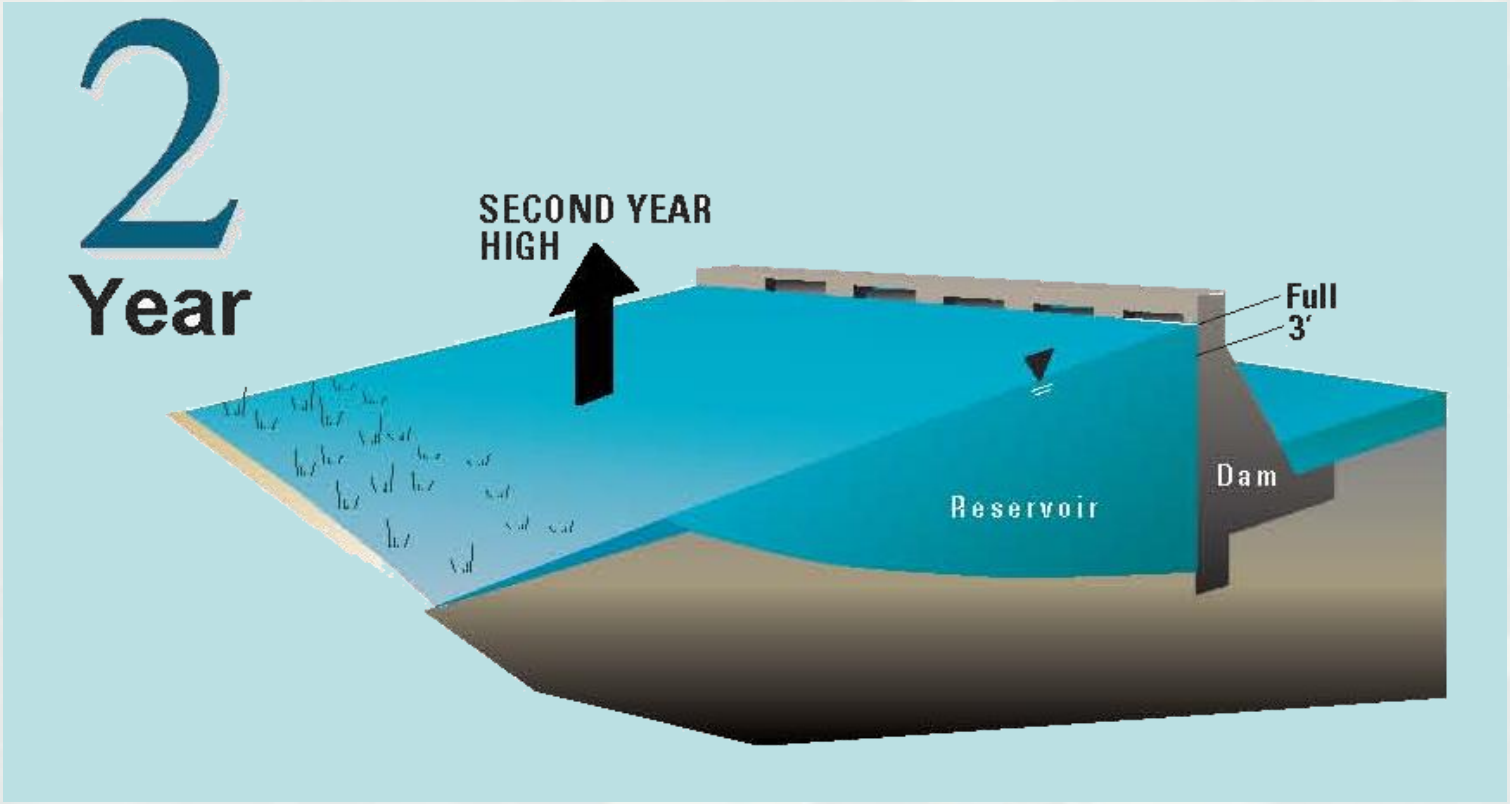
- Purposefully lowering one of the upper three reservoirs several feet to allow vegetation to grow around the rim, and then refilling the reservoir to inundate the vegetation.

Year 1



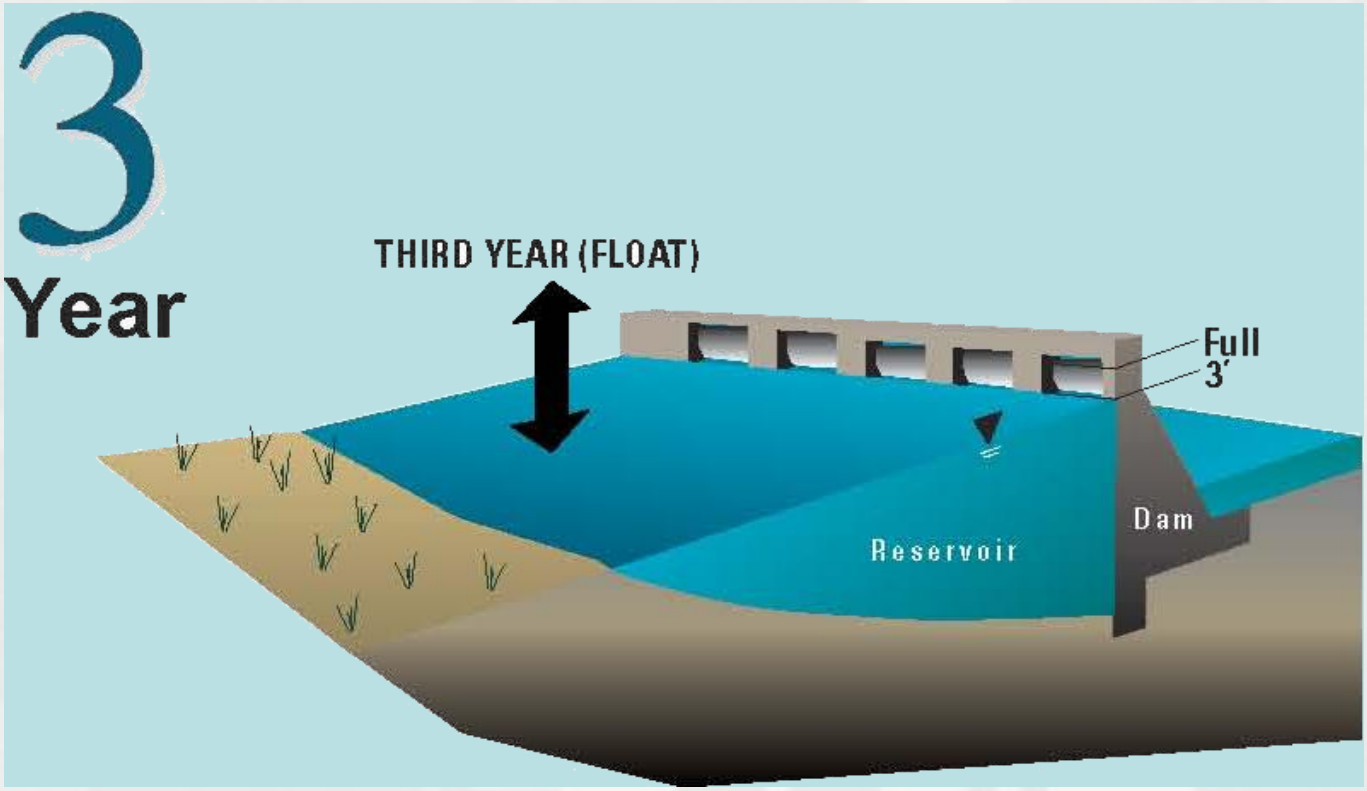
Reservoir is Low, allowing vegetation to grow around the rim

Year 2



2nd Year - Reservoir is refilled inundating the vegetation.

Year 3



3rd Year - Rise at start of year then drop to be in position for low elevation the following year.

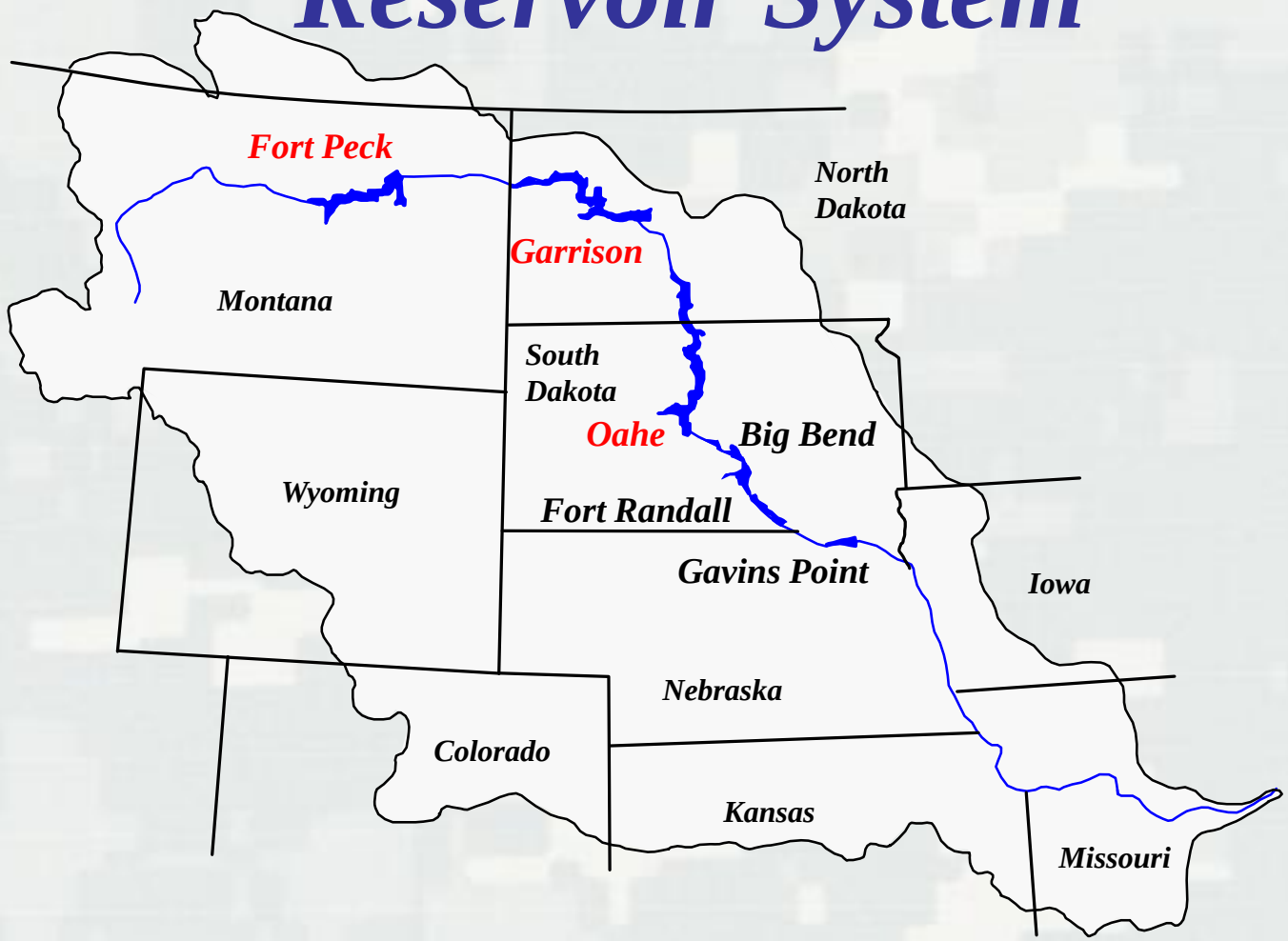
Reason for Unbalancing

- Part of the Adaptive Management on the Missouri River System.
- Benefits Federal endangered Species - Birds (ESA)
- Benefits adult and young fish
- Final Environmental Impact Statement (FEIS) for the Master Water Control Manual Review and Update.
- First included in the 2000 Annual Operating Plan (AOP) Studies. Never implemented
- Prior to 2000 AOP – tried to balance the reservoirs whenever possible.

Unbalancing Benefits

- When the reservoir is rising
  - Benefits game and forage fish spawning
- When the reservoir is down
  - Bare sandbar habitat around the perimeter of the reservoirs for the ESA-protected birds
  - Expose bare sandbar habitat in the reach between the two lakes for use by the listed birds.
- When reservoir is back up again.
  - Inundated vegetation around the perimeter would be used by adult fish for spawning
  - Young reservoir fish to hide from predators

Missouri River Mainstem Reservoir System



When to Unbalance

Reservoir Elevation Guidelines for Unbalancing			
	Fort Peck	**Garrison**	**Oahe**
Mar 1 reservoir elevation above	2234 ft msl	1837.5 ft msl	1607.5 ft msl
Mar 1 elevation in this range and > 3 foot pool rise expected	2227-2234 ft msl	1827-1837.5 ft msl	1600-1607.5 ft msl
Scheduling Criteria	Avoid Reservoir Decline during spawn period Apr 15 to May 30	Schedule after spawn period Apr 20 to May 20.	Schedule after spawn period of Apr 8 to May 15

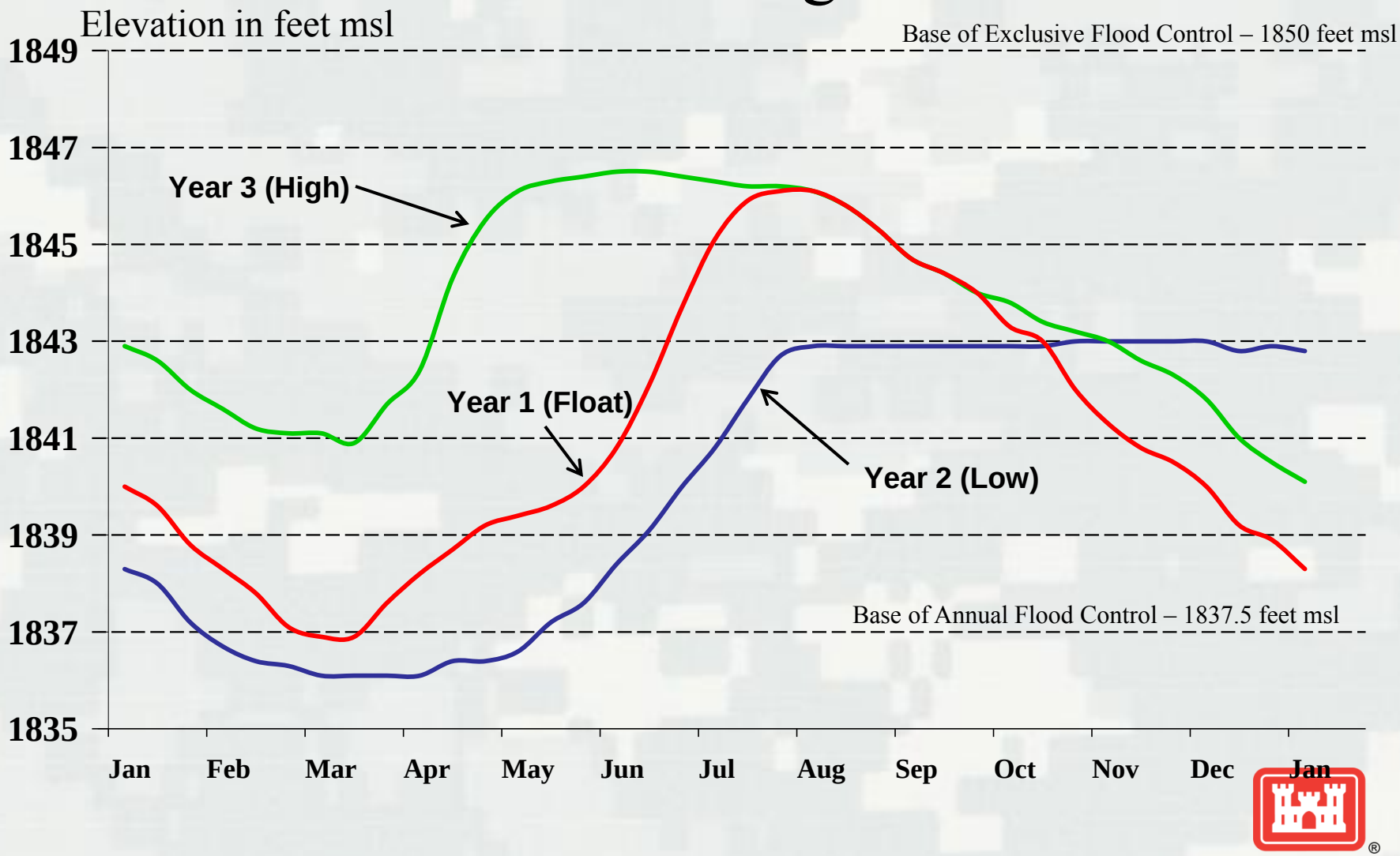
- Will not unbalance:
  - When an extended drought (more that 1 year long) is occurring.
  - When extremely high runoff into the System is occurring.

How to Unbalance

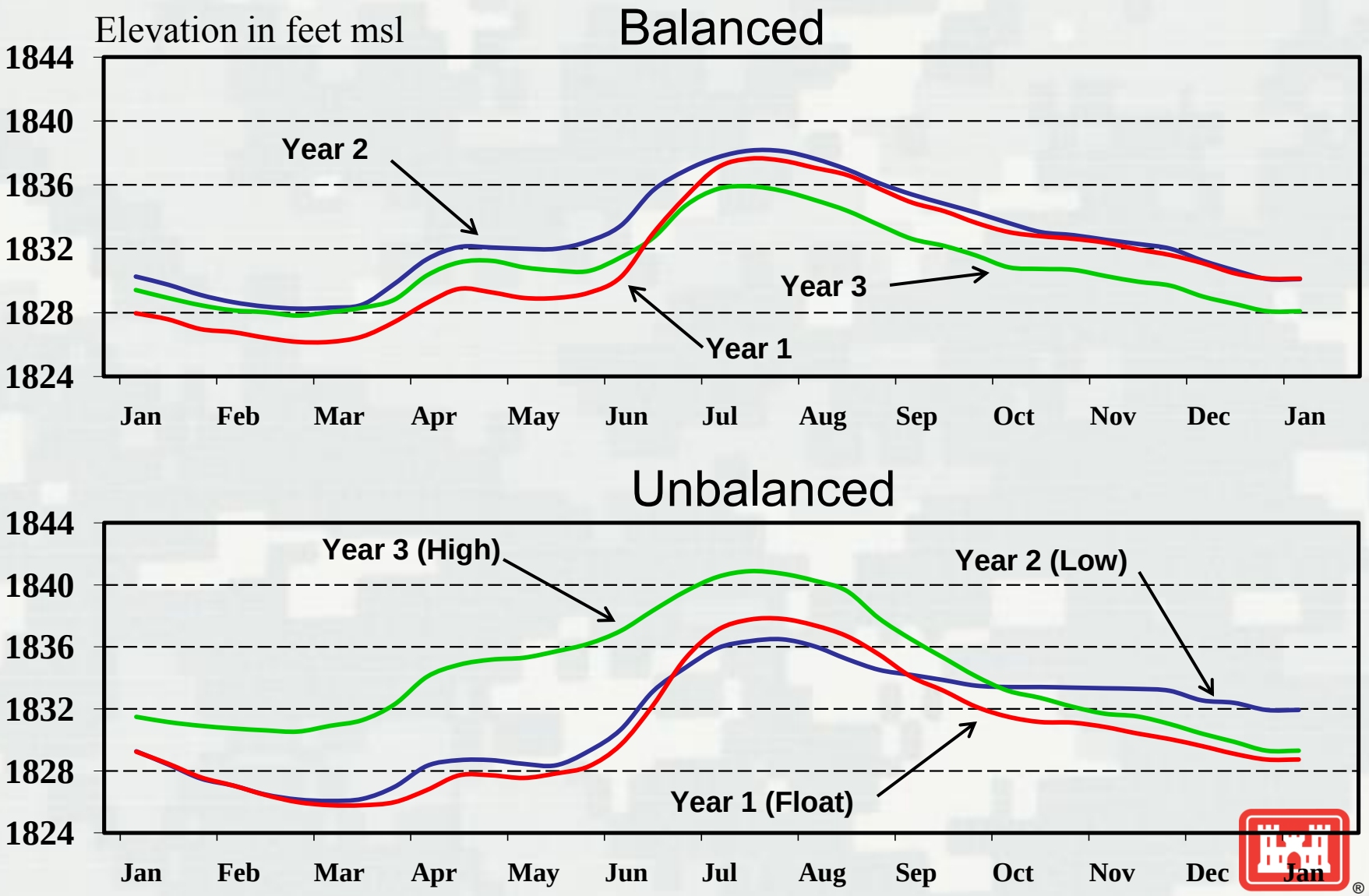
Reservoir Unbalancing Schedule						
	Fort Peck		Garrison		Oahe	
Year	March 1	Rest of Year	March 1	Rest of Year	March 1	Rest of Year
1	High	Float	Low	Hold Peak	Raise & hold during spawn	Float
2	Raise & hold during spawn	Float	High	Float	Low	Hold Peak
3	Low	Hold Peak	Raise & hold during spawn	Float	High	Float

- Example:
  - 1st Year – Fort Peck is up 4.2 feet, Garrison is down 3 feet and Oahe „floats'.
  - 2nd Year –Garrison up 3 feet, Oahe down 3 feet, Ft Peck „floats'.
  - 3rd Year – Oahe is up 3 feet, Fort Peck is down 4.2 feet, Garrison „floats'

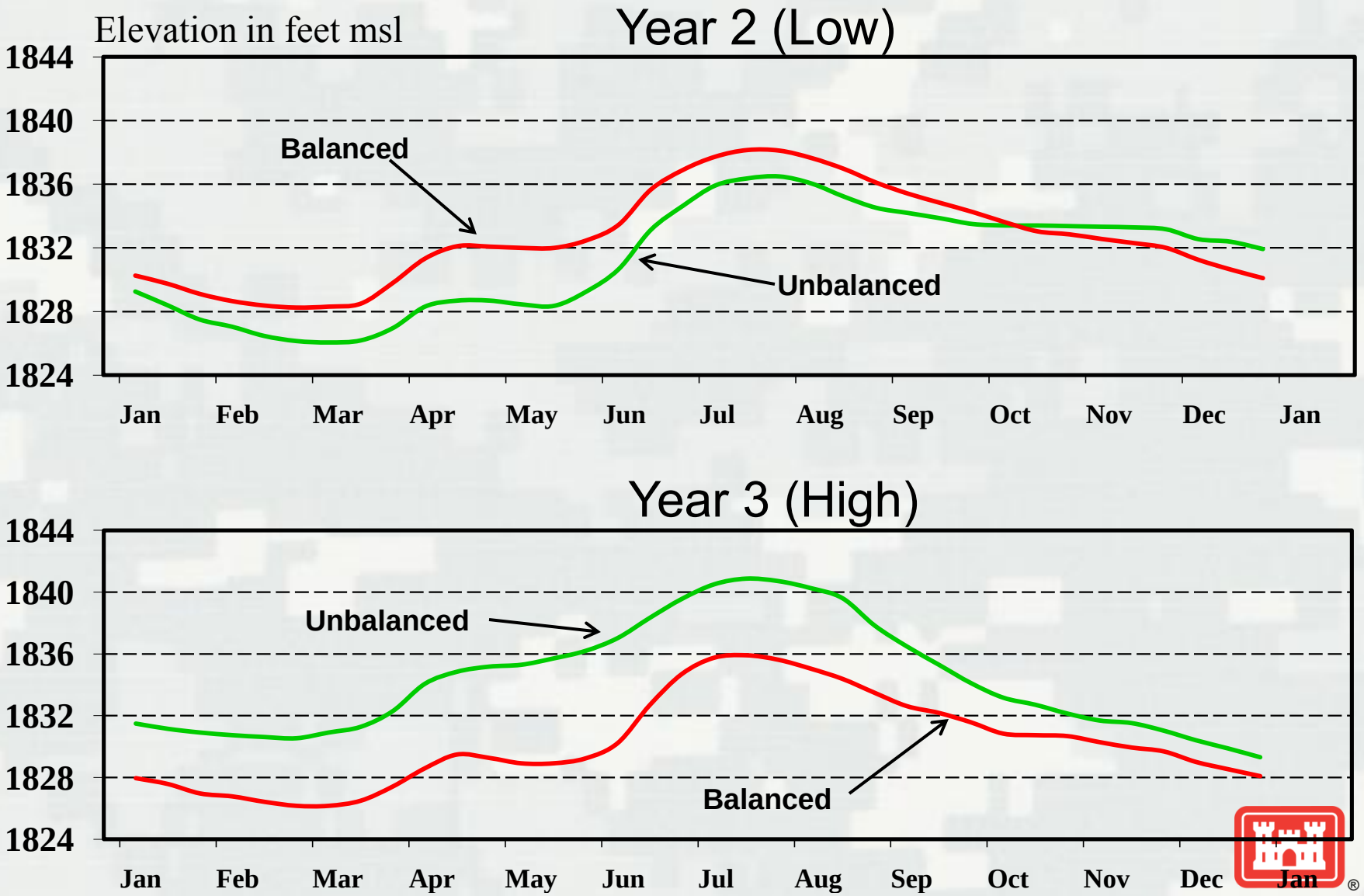
Garrison
3 Year Unbalancing Schedule



Garrison Reservoir



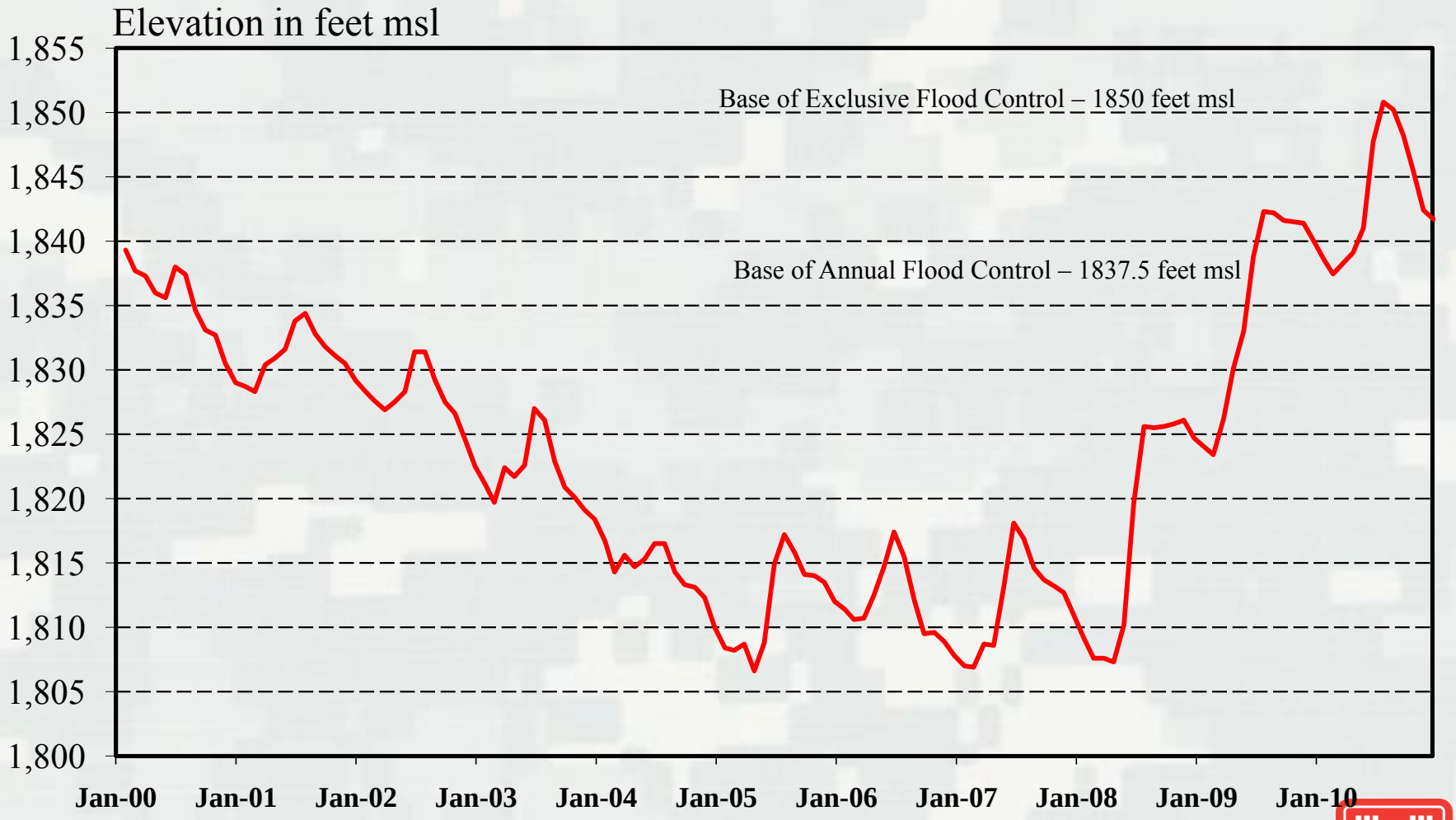
Garrison Reservoir



Implementation of Unbalancing

- Has not been implemented since the Master Manual Update (2004).
- Drought from 2002 thru 2007 (total System recovery in 2010).
- 2011- High potential for high runoff this year.
- Need to start planning today for unbalancing next year in 2012.
- Unbalancing “naturally” occurs during droughts and high runoff years.
  - All 3 upper reservoirs have fallen and risen 35+ feet over the last 10 years.

Garrison End of Month Pool
Jan 2000 - Dec 2010



Future of Unbalancing

- Unbalancing concerns.
  - If Oahe had started 2010 in its high year condition how would that have affected the main stem regulation?
  - How it's written in the master manual does not quite match the DRM model assumptions and results.
- How to meet objective without undue flood risk.
- Meet with the States and other interested parties.

Questions?

Adaptive Management

- Incorporates new information, social considerations, and results of research, monitoring, and evaluation into management decisions