# Friends of Reservoirs Sedimentation Briefing

Sun Country Outdoors

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Friends of Reservoirs
WATER. HABITAT. LIFE.

# Here we are!

*"Whereas the twentieth century focused on the construction of new dams, the twenty-first century will necessarily focus on combating sedimentation to extend the life of existing infrastructure. This task will be greatly facilitated if we start today"*

*(* Morris & Fan, 1998)

# Reservoir Sediment Management:

# Building a Legacy of Sustainable Water Storage Reservoirs

## National Reservoir Sedimentation and Sustainability Team White Paper

https://woolpert.com/wp-content/uploads/2019/08/National-Res-Sed-White-Paper-2019-06-21.pdf

# Collaborative Effort

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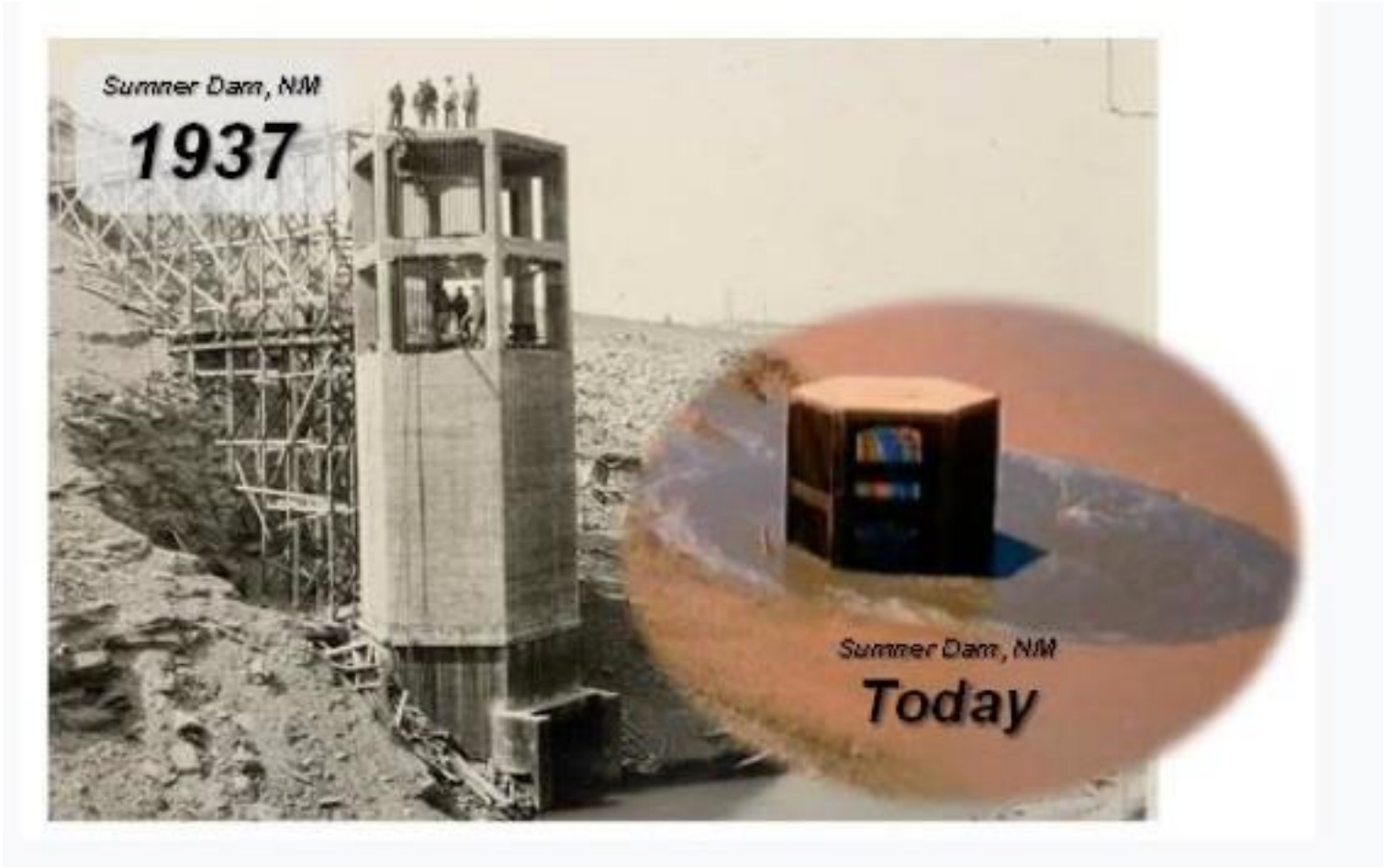
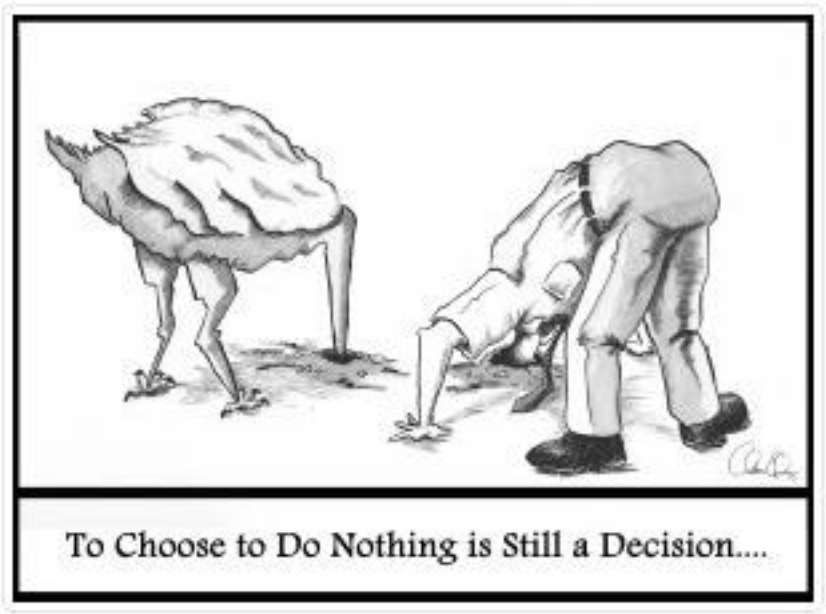
# Too Late for Some NM Reservoirs?



# Whitepaper Goal

- "long-term sediment management strategies to preserve the benefits of the nation's reservoirs for our own children and future generations"



# Impacts of Sedimentation

- Environmental impacts (fish and birds hit hardest)
- Reduction in storage volume
- Reduction of reliable water supply
- Burial of dam outlets and water intakes
- Reduced power production  (turbine erosion and blockage)
- Burial of boat ramps and marinas
- Impaired navigation (rescue costs)
- Increase in evaporation (Surface area : Volume ratio)
- Reduction of useable surface area for recreation
- Increase in upstream flood levels
- Loss of flood control capabilities
- Long term costs of Dam maintenance or removal

# Typical Sedimentation Profile

- Dams: Manmade aggregate sorting and storage structure

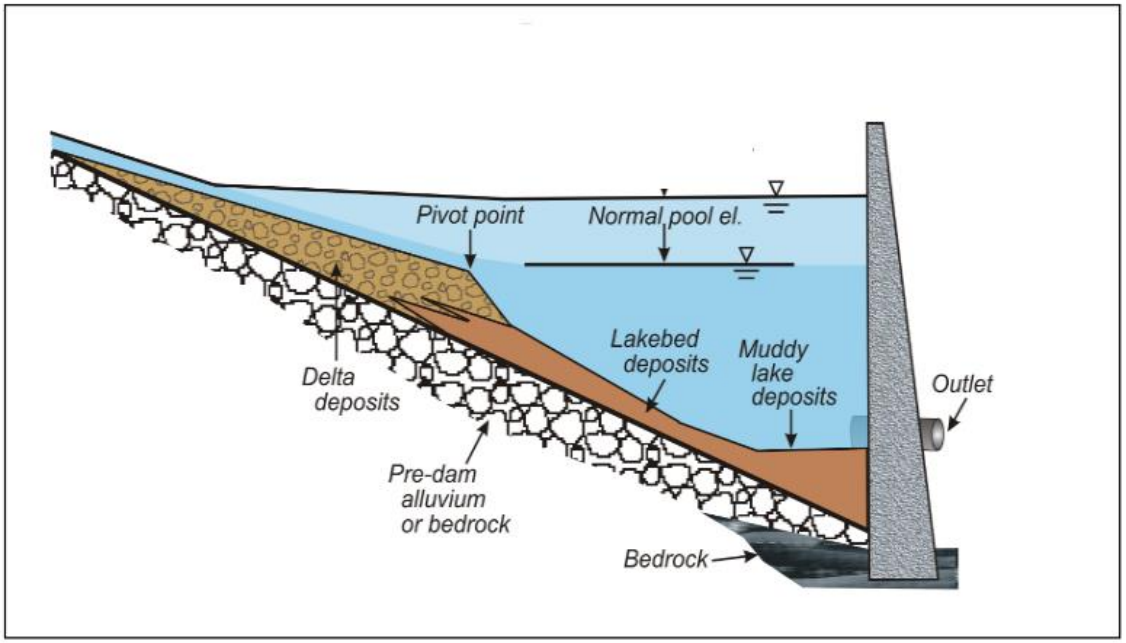



**Figure 3.** Example of reservoir sediment profile adapted from Randle and Bountry, 2017

# Main Take Aways

- The sustainable management of reservoir sedimentation may seem expensive, but the sediment management costs need to be compared with the costs of eventually losing the reservoir benefits and the costs of its removal.
- management plans should include either the implementation of sustainable sediment-management practices or the eventual retirement and replacement of the reservoir
- Plans to periodically monitor reservoir sedimentation need to be formulated and implemented at each reservoir to document the remaining storage capacity and estimate when important dam and reservoir facilities (operations) will be impacted

# Management Strategies

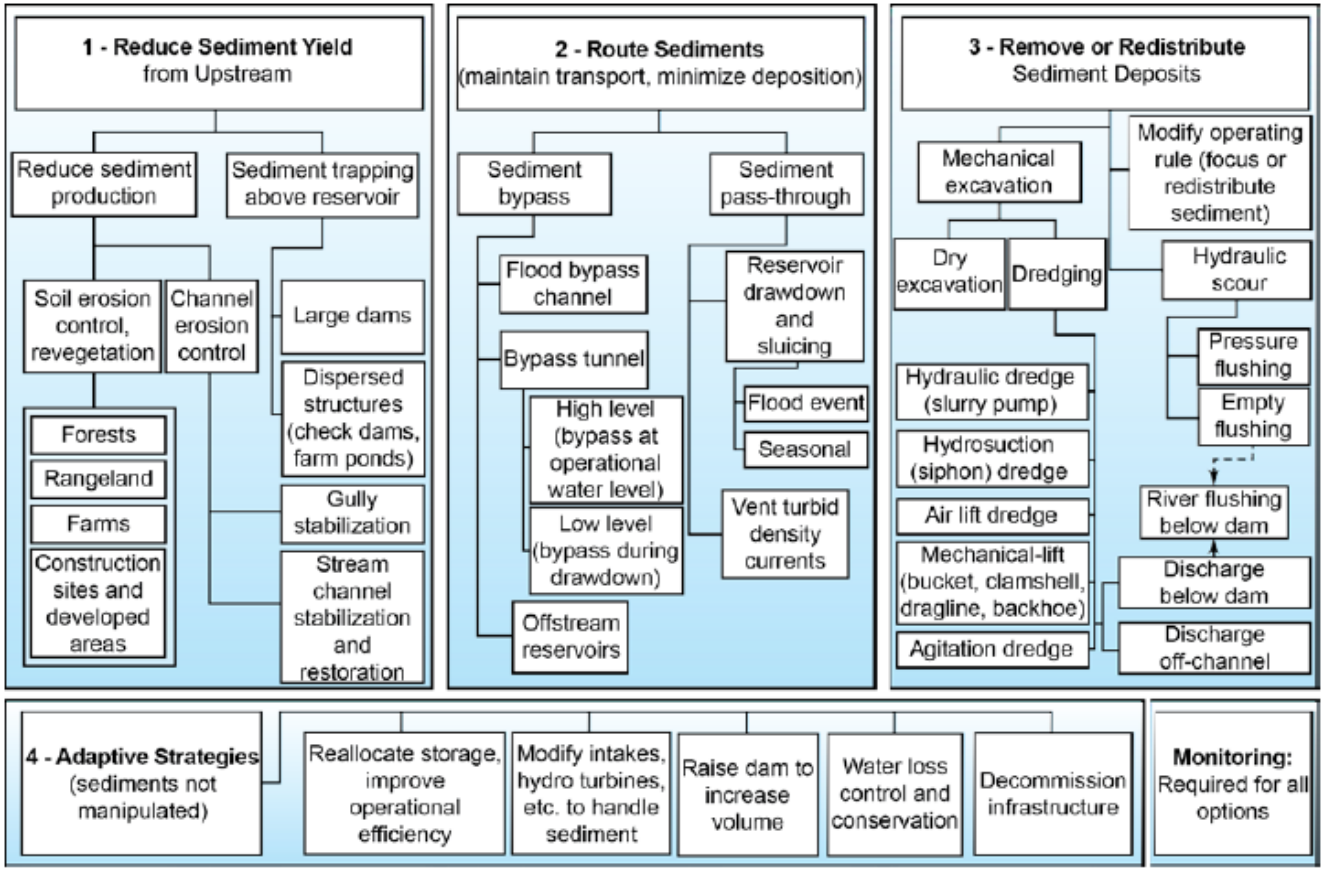
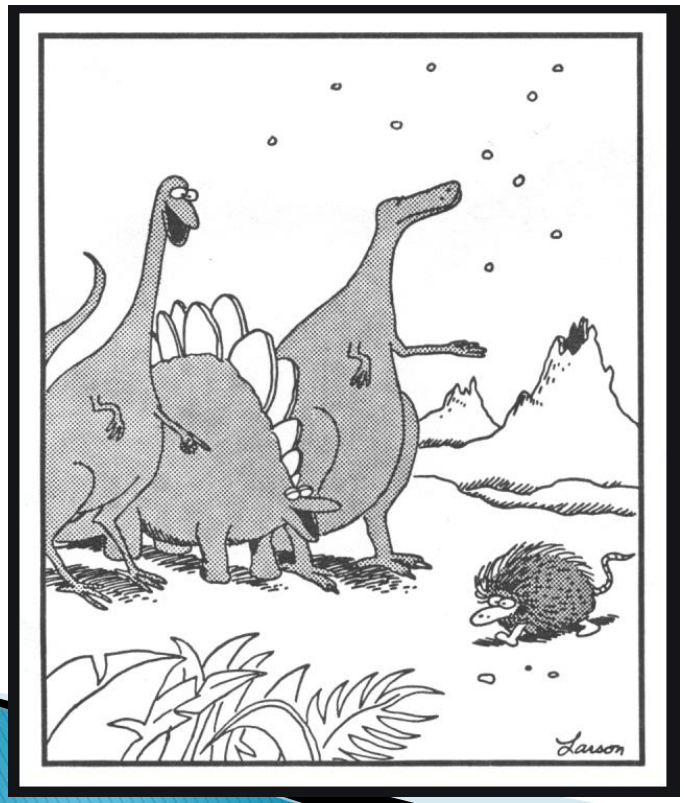
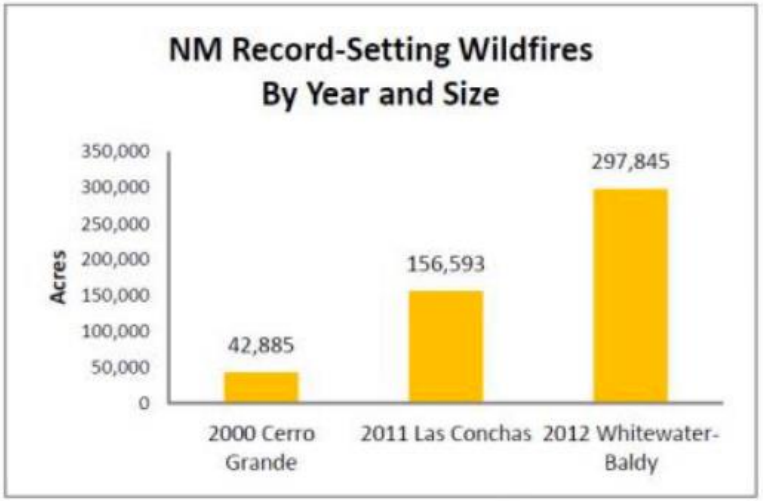



*Figure ES-2. Classification of methods to manage reservoir sedimentation (Morris, 2015)*

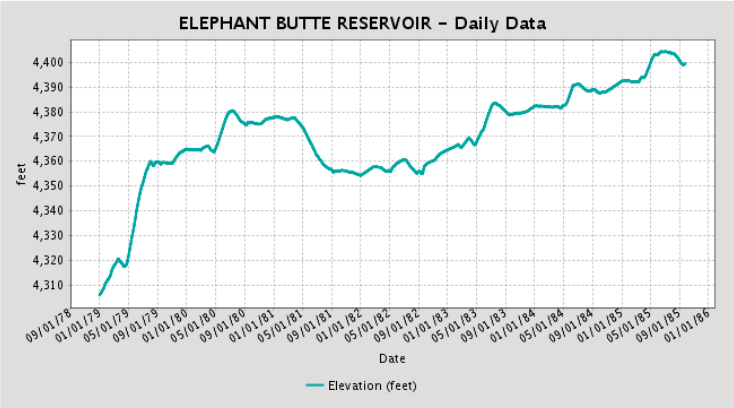
# Times are Changing

- Trends are there even if the science isn't
  - More severe droughts – Bigger wildfires
  - Stronger storms – massive floods/erosion

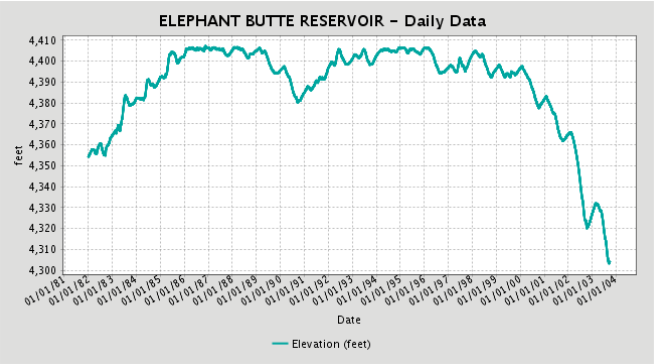


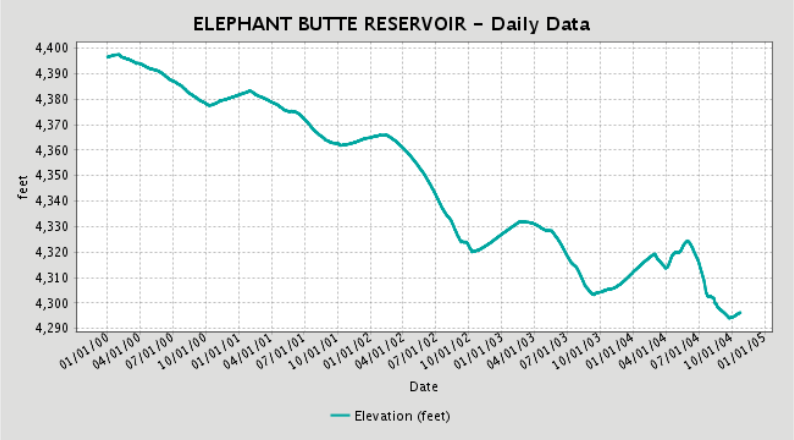
# We are in an era of down-cutting but it could get a lot worse




North filled with sediments first




Deposition south of narrows after 2002




Conveyance Channels dredged

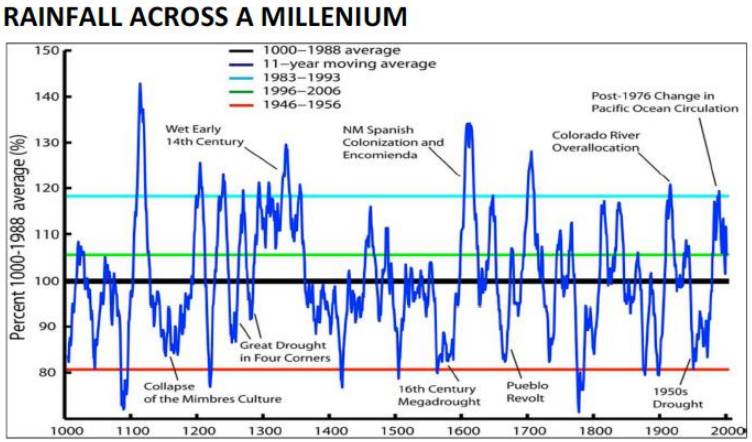



Figure 14: Precipitation Time Series for 1000 Years
(tree ring data; expressed as % departures from the 1,000 year average)[19]

The droughts can be much worse!

# Stop the Bleeding – Erosion

- Erosion management is perhaps the most widely recommended but most poorly implemented sediment management technique because land users may not see any direct benefits from controlling sediment yield. (Grummer, J. )

- Must be a coordinated effort by private Land owners, BOR, BIA, BLM, Tribes/Pueblos, DOT, USFWS, Non-profits, etc….

# The Elephant Butte Story

- 25% of the original capacity is gone!

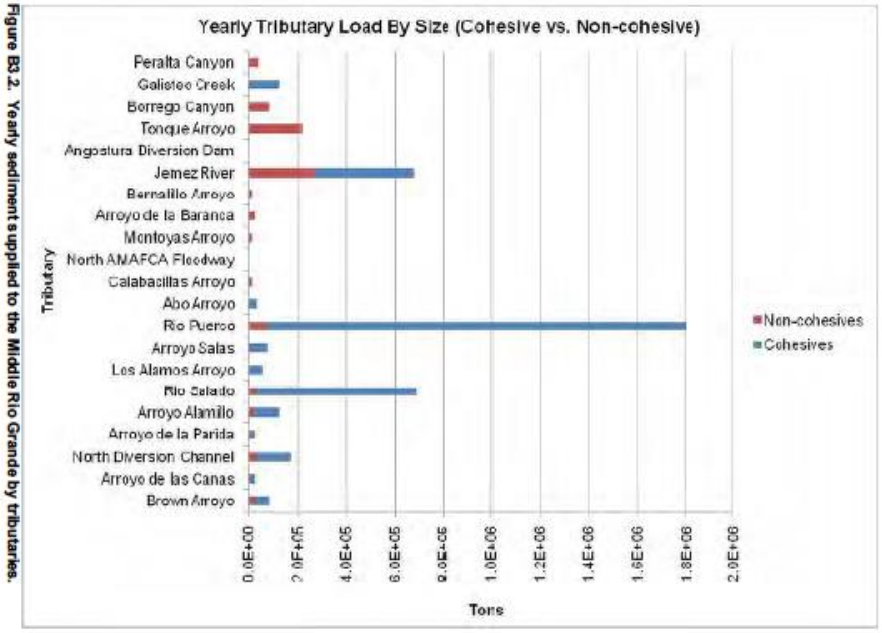


Figure B3.2. Yearly sediment supplied to the Middle Rio Grande by tributaries.

# The Butte would be better if:

- Reservoir storage doesn't fall below 60,000 acre-feet
- The reservoir didn't drop more than 6 inches a day during the spring
- Sediments are no longer filling and killing the reservoir
- Terrestrial vegetation is propagated instead of removed
- Existing sediments are removed to create and restore habitat
- There is a prevention and contingency plan for invasive species
- Recreation was acknowledged by Reclamation as a project objective
- Upriver ponds are accessible and usable for recreation & rearing fish

# Effects of rapid water fluctuations

- Increased fish disease and mortality
- Loss of entire age classes
- Kills aquatic vegetation
- Disconnects shoreline habitat from water
- Interrupts natural vegetation propagation
- Increases erosion and sedimentation
- Increases turbidity during draw downs
- Disrupts benthic process
- Reduces spawning success
- Increases boating hazards
- Increases cost of marina and park operations

# Priority 2. Stop/reverse Sedimentation (or there won't be a reservoir in 100 years)

- 2a. Prepare a 100-year draft sediment management plan for Elephant Butte Reservoir as part of 2020 budget submittal that encompasses the Rio Puerco and Rio Salado watersheds (Congress and Reclamation)
- 2b. Intensify erosion control measures in the Rio Puerco and Rio Salado watersheds. Progress has been good by BLM but much more needs to be done to create an entrenchment channel. (Reclamation, BLM, BIA, USDA/NRCS, State Conservation Districts)
- 2c. Remove at least 6000 acre-feet of sediment from the Elephant Butte full pool annually in a sedimentation pilot project (Reclamation)
- 2d. Build check dams in arroyos on the west side of the reservoir to protect roads and reduce sedimentation in park areas (BLM)
- 2e. Build check dams or bypass channels to protect the Caballo dam operations (Reclamation, BLM)
- 2f. Expedite restoration of native grasslands on adjacent BLM lands (BLM)
- 2g. Encourage using native vegetation to stabilize existing sediment and prevent further arroyo and bank erosion within the full pool (Reclamation)
- 2h. Incentive private ranchers and farmers to control erosion by reducing or eliminating matching requirements for erosion control projects (USDA)
- 2i. Establish water quality standards (turbidity) for in-flow and upper reservoir storage conditions (Reclamation and State)

# Rio Puerco Mud

- Over half of the load can be silt

**Table 3.6 Pollutant source summary for Sedimentation/Siltation**

| Pollutant Sources | Magnitude[a] | Location | Probable Sources[b] |
|---|---|---|---|
| *Point:* | | | |
| None | 0% | -------- | 0% |
| | | | |
| *Nonpoint:* | | | |
| Sedimentation | 68% | Río Puerco (Arroyo Chijuilla to Northern boundary of Cuba) | 100%<br>Highway/Road/Bridge Runoff (non-construction related)<br>Loss of Riparian Habitat<br>Rangeland Grazing<br>Streambank Modification/destabilization<br>Channelization<br>Natural Sources<br>Wildlife other than Waterfowl<br>Drought-related Impacts |

# Rio Puerco Watershed Protection

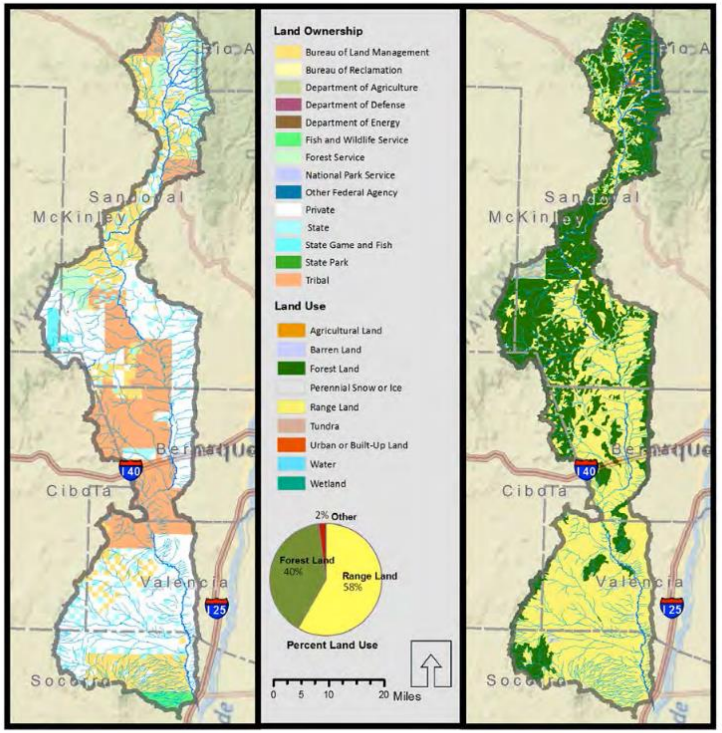



**Figure 3.2** Land ownership (left) and land use in the Rio Puerco watershed

Challenges:
Huge landscape – huge job
Unjustifiable cost/benefit ratio for managers/owners (no big picture)
Multiple owners
Environmental hurdles

# One-Rock dams and Other solutions

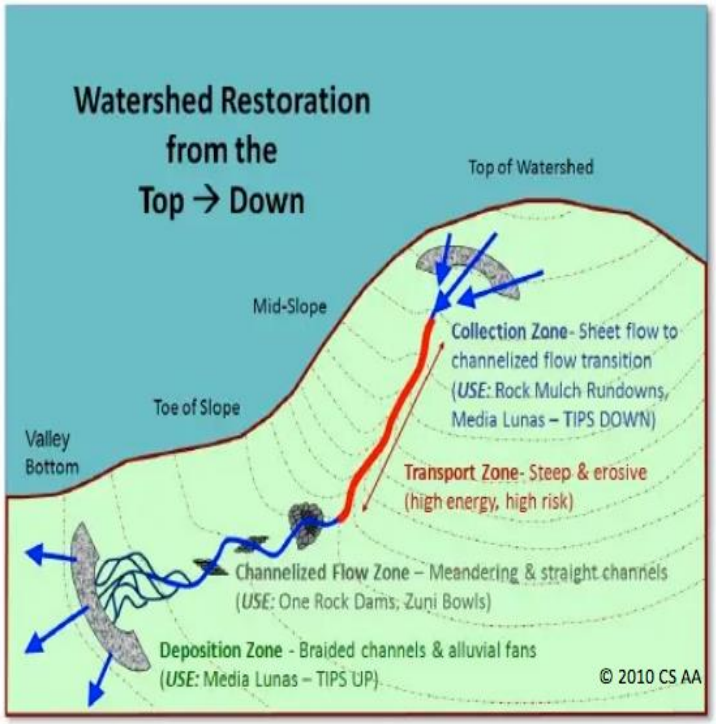



Figure 11. Erosion-control structures in the Penistaja Arroyo drainage. *A*, July 24, 2009, near the start of the study period. *B*, July 2, 2013, after completion of the study.

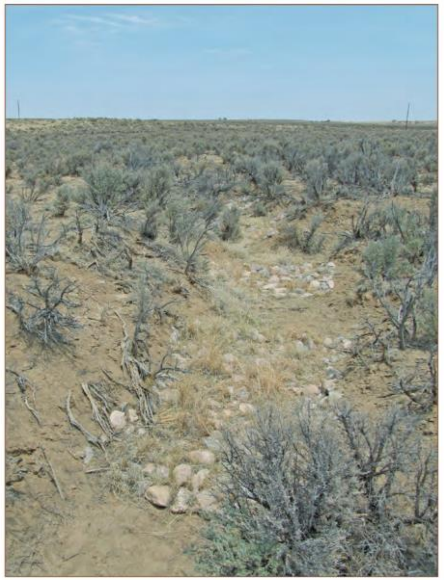


Figure 11. Erosion-control structures in the Penistaja Arroyo drainage. *A*, July 24, 2009, near the start of the study period. *B*, July 2, 2013, after completion of the study.—Continued

# Conclusion

- Spread the word about the whitepaper
- Demand plans for reservoirs in your area
- Think watersheds, not just reservoirs
- Embrace and encourage watershed efforts
  - Sage Grouse Initiatives
  - Wildlife Corridors
  - Other ESA interests
- Know your reservoir's sediment survey (s)