

Reservoir Sedimentation

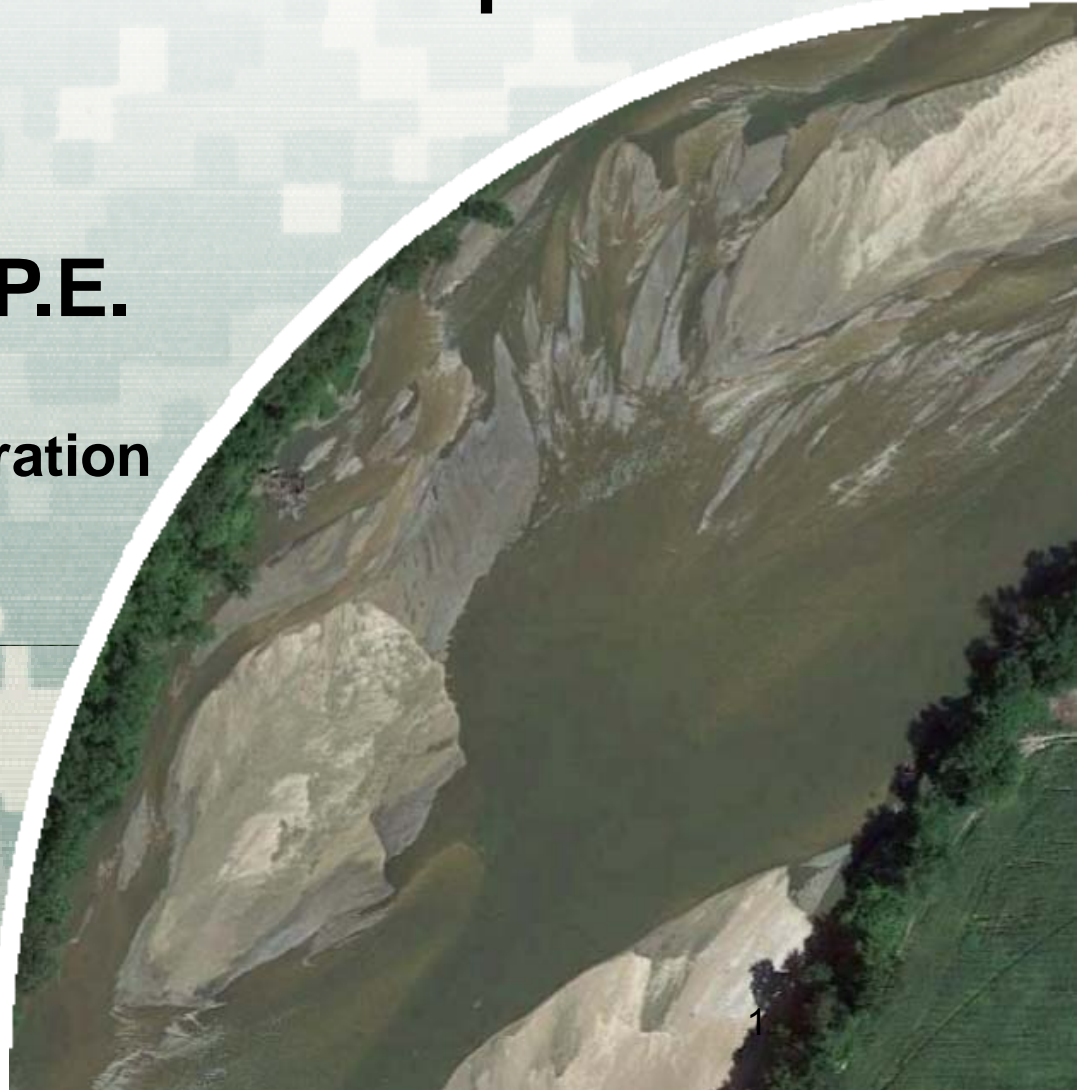
Problems: In-reservoir problems

John Shelley, Ph.D., P.E.
Kansas City District
River Engineering and Restoration
Section

August 2017



US Army Corps of Engineers
BUILDING STRONG®

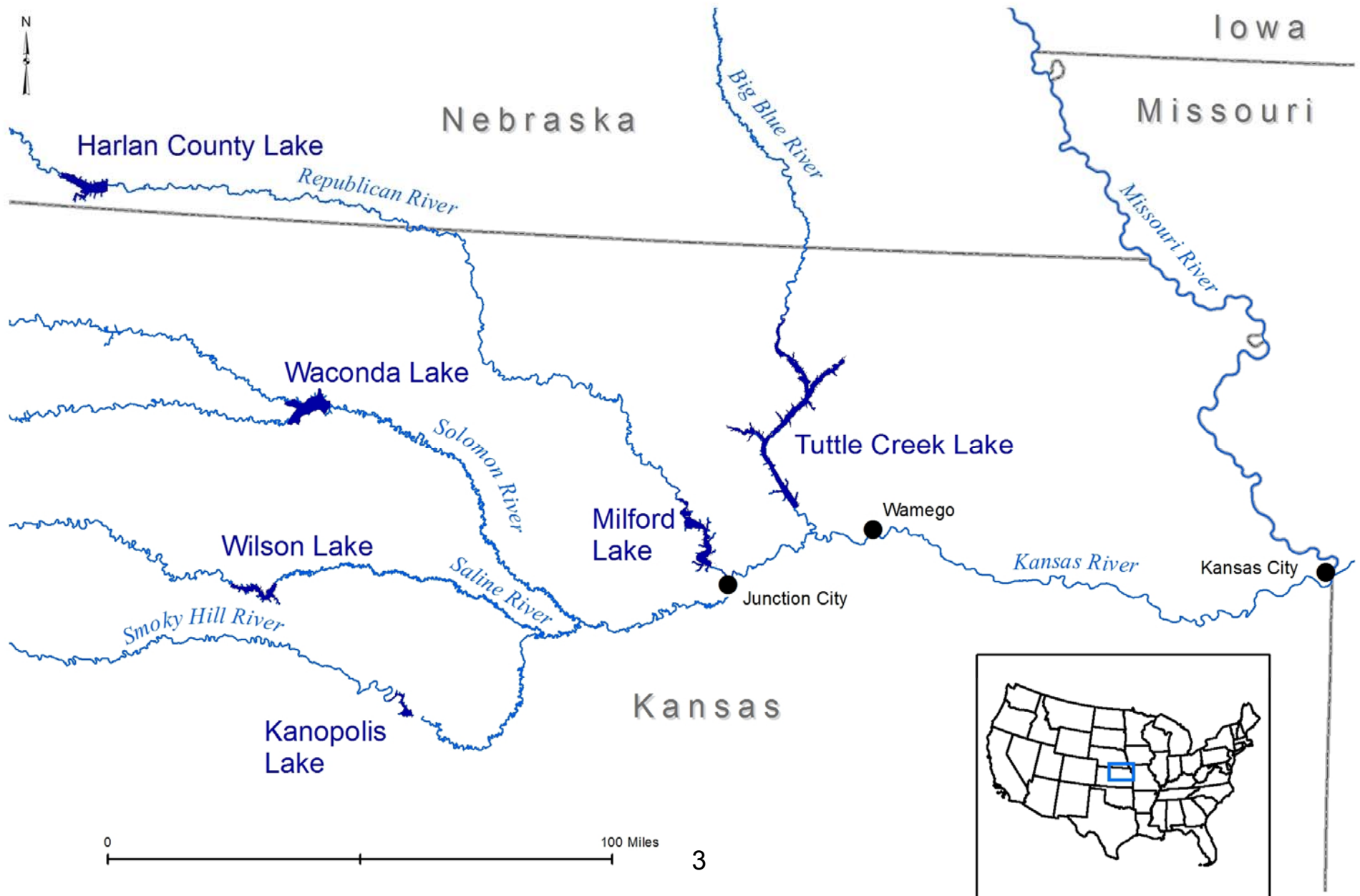


Outline

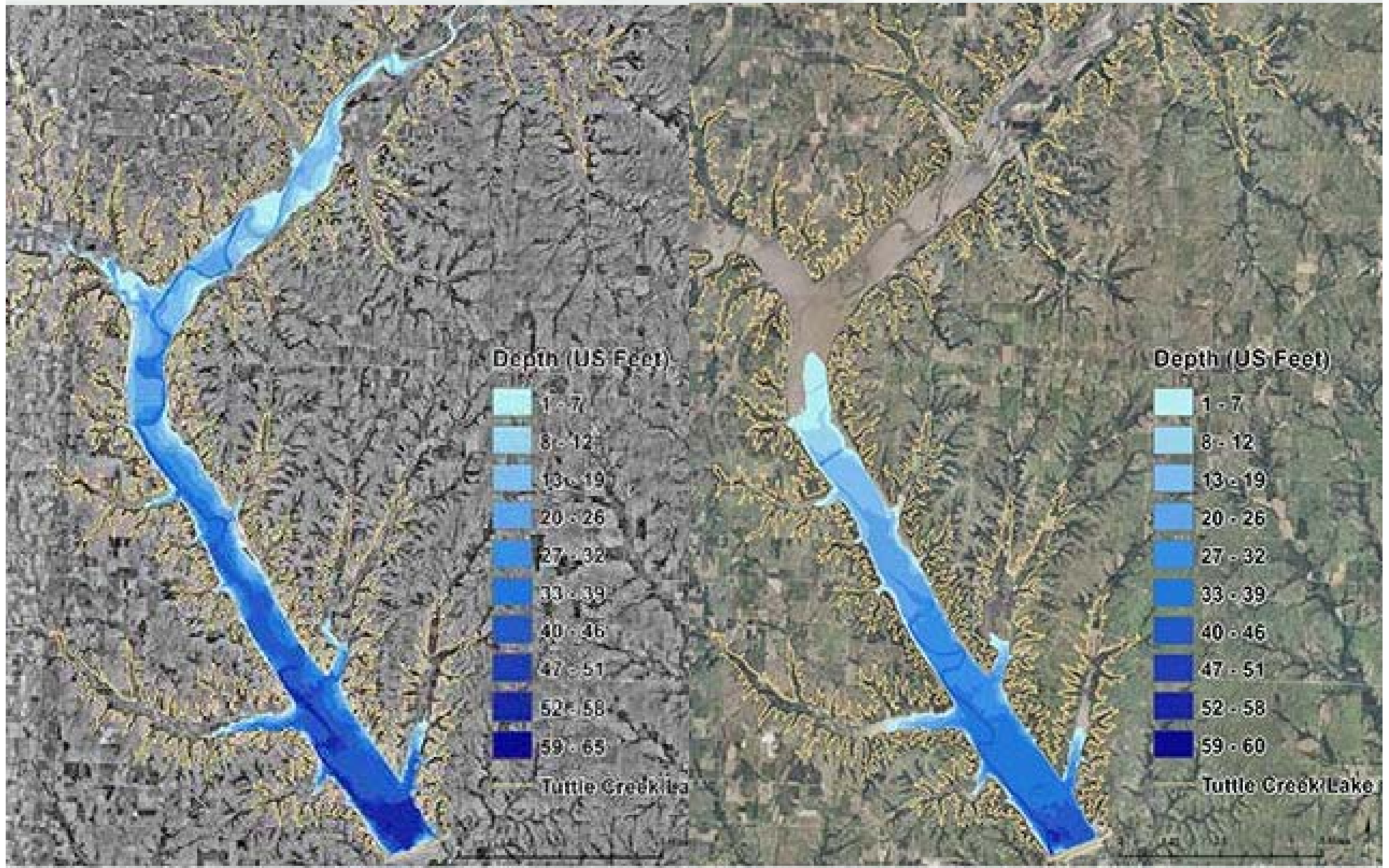
- Reservoir Problems
 - ▶ Lost Water Supply
 - ▶ Impaired Water Quality
 - ▶ Operational Problems
 - ▶ Recreation
 - ▶ Flood Control
 - ▶ Hydropower



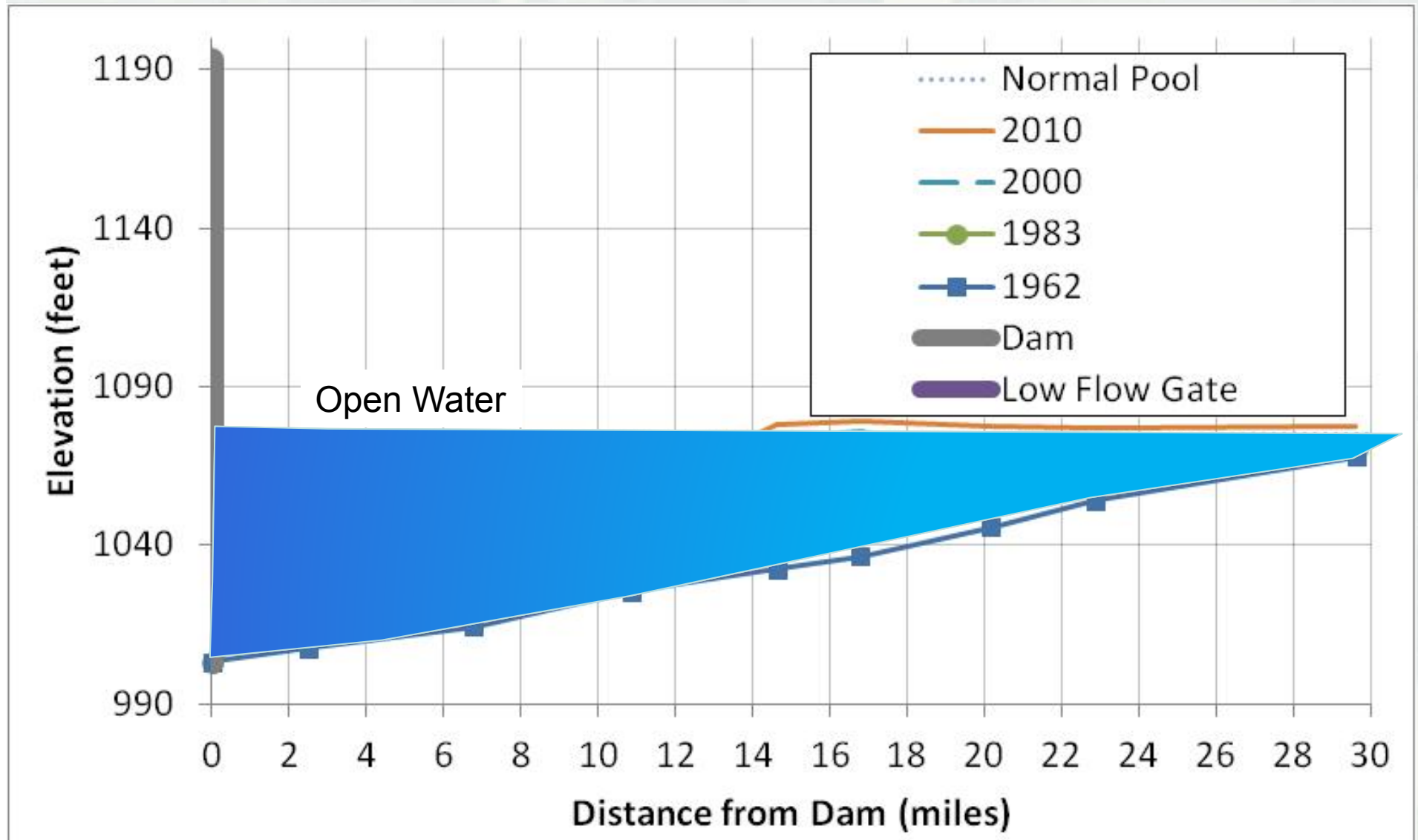
Water Supply: Tuttle Creek Lake



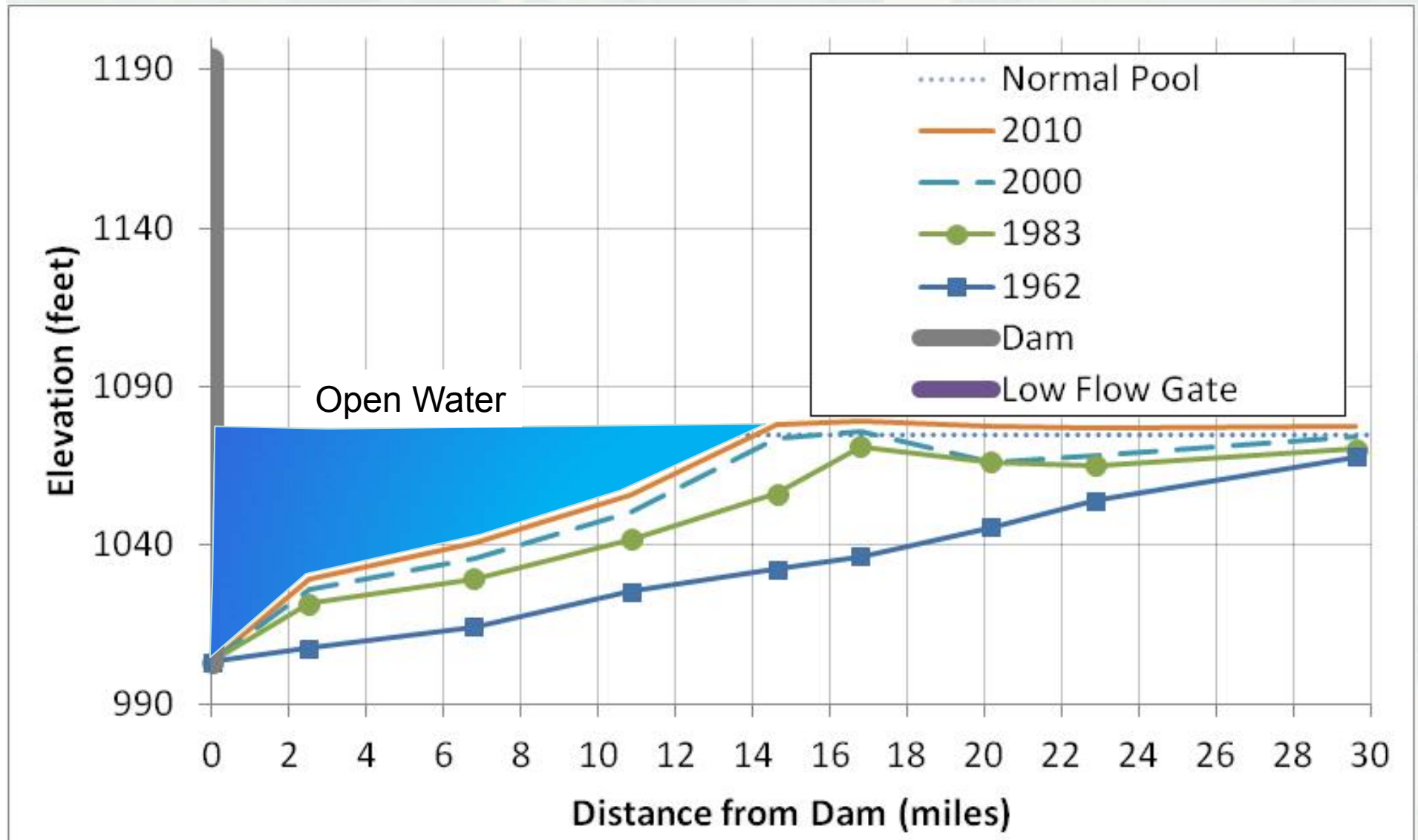
Tuttle Creek Lake: 1957 to 2010



Tuttle Creek Lake



Tuttle Creek Lake



Annual Storage Volume Lost

**Sedimentation rate in multi-purpose pool
(1962 to 2009):**

3,500 ac-ft/yr

5.6 million yd³

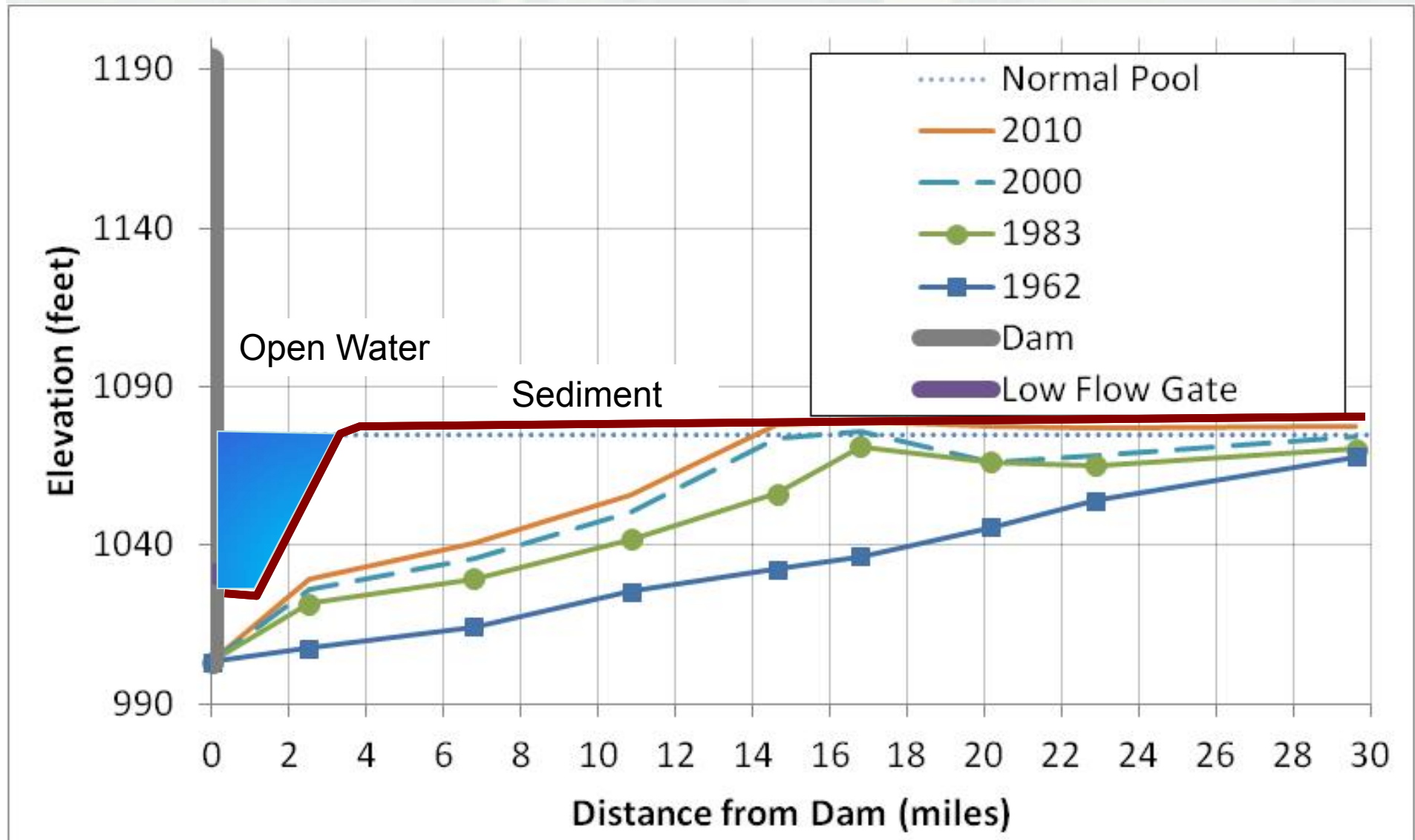


Tuttle Creek Lake: At the same annual rate of sedimentation

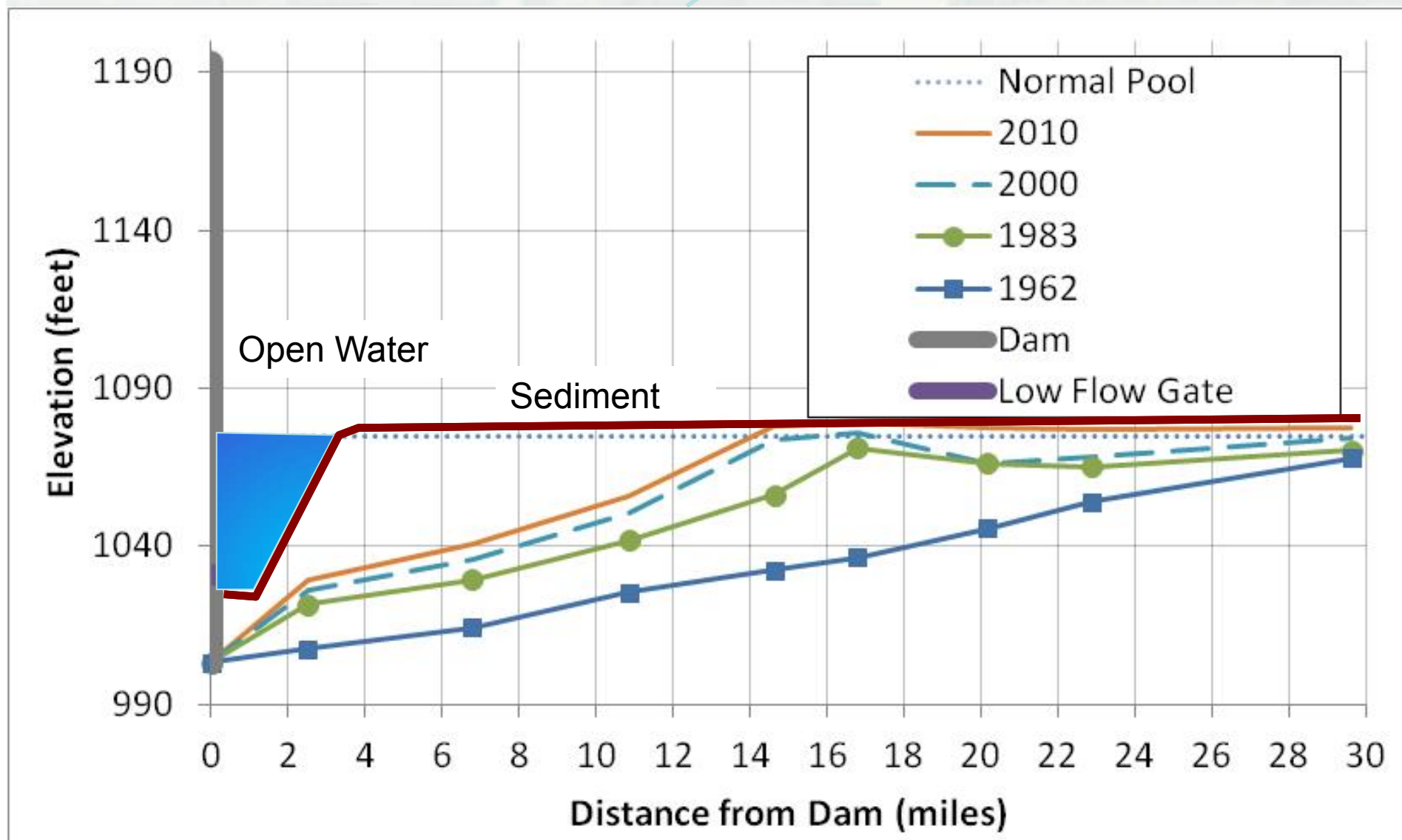
- Multi-purpose pool will be 88% full in 50 years
- Total storage (multi-purpose + flood control) will be 21% full



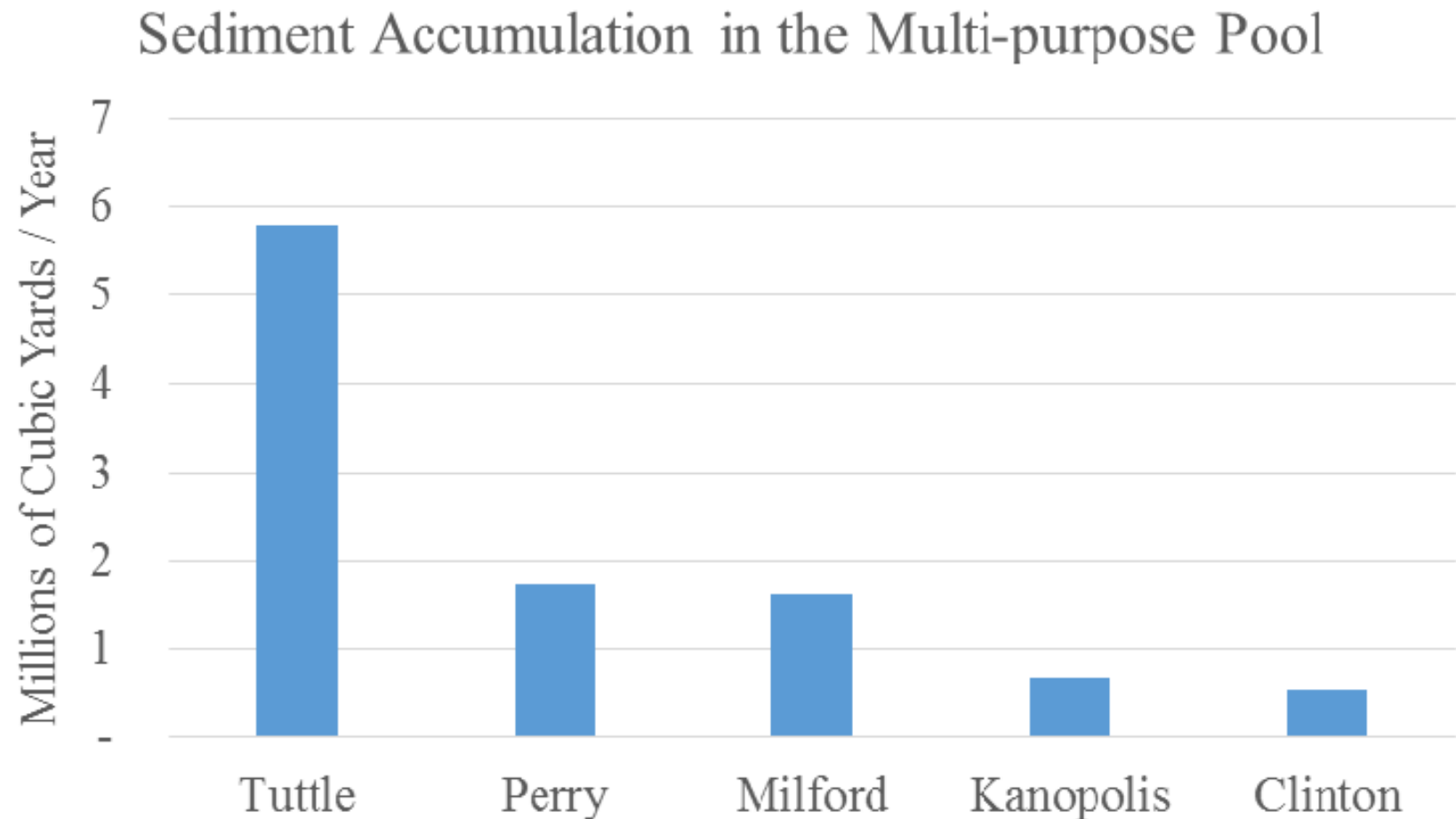
Tuttle Creek Lake: 50 years



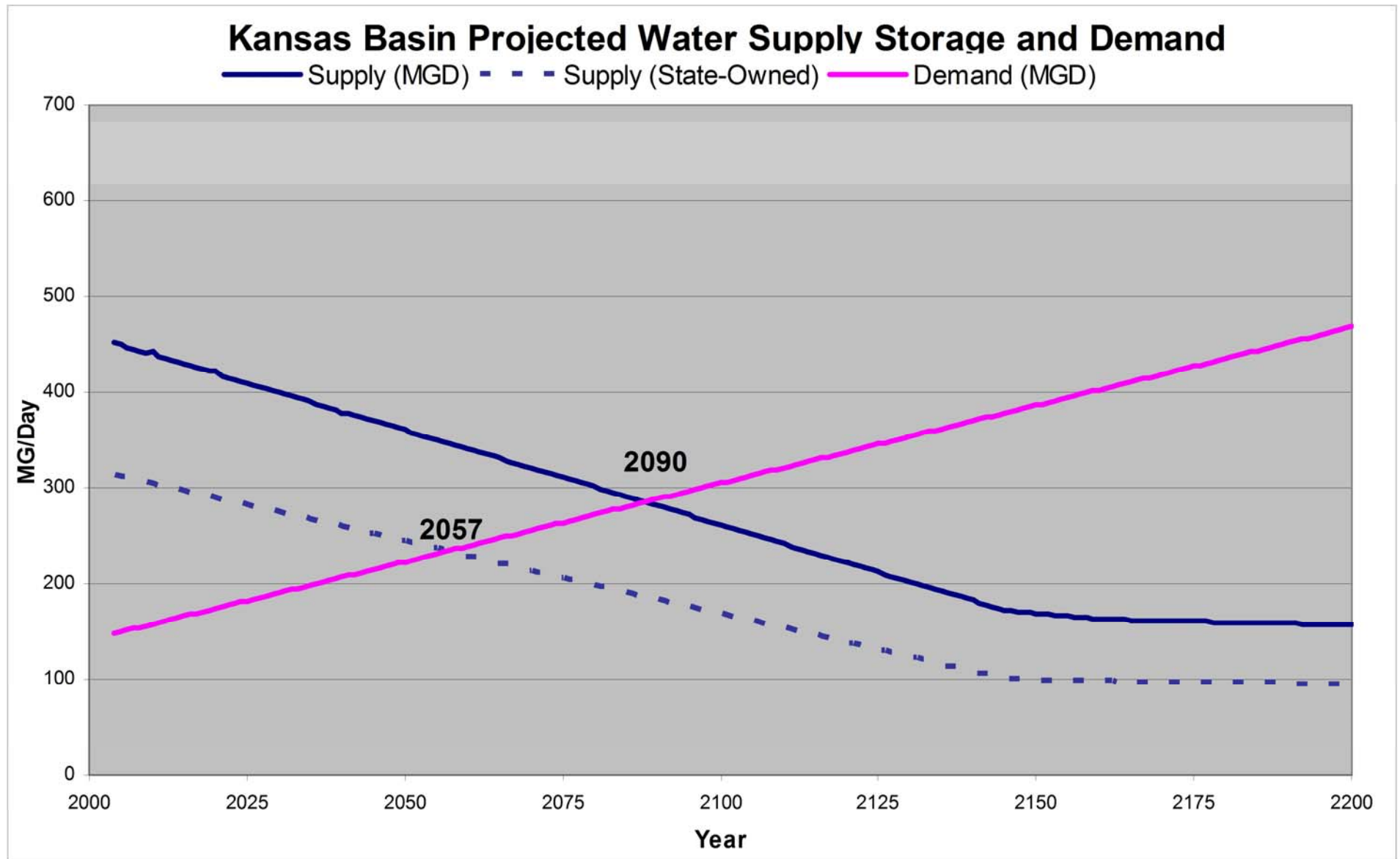
Tuttle Creek ^{Pond} Lake: 50 years

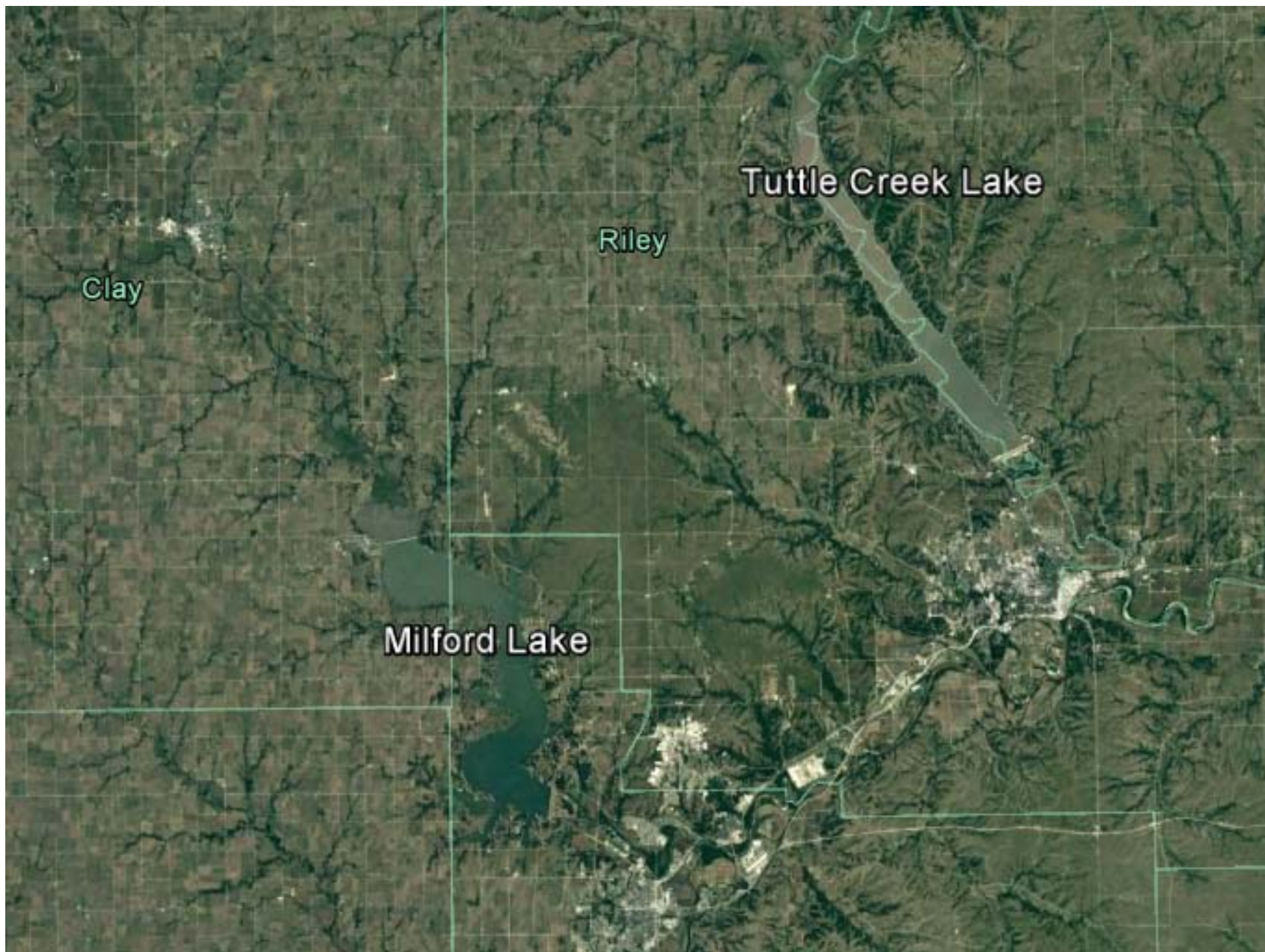


Other Reservoirs in the Basin



Water Supply vs. Demand





Clay

Riley

Tuttle Creek Lake

Milford Lake

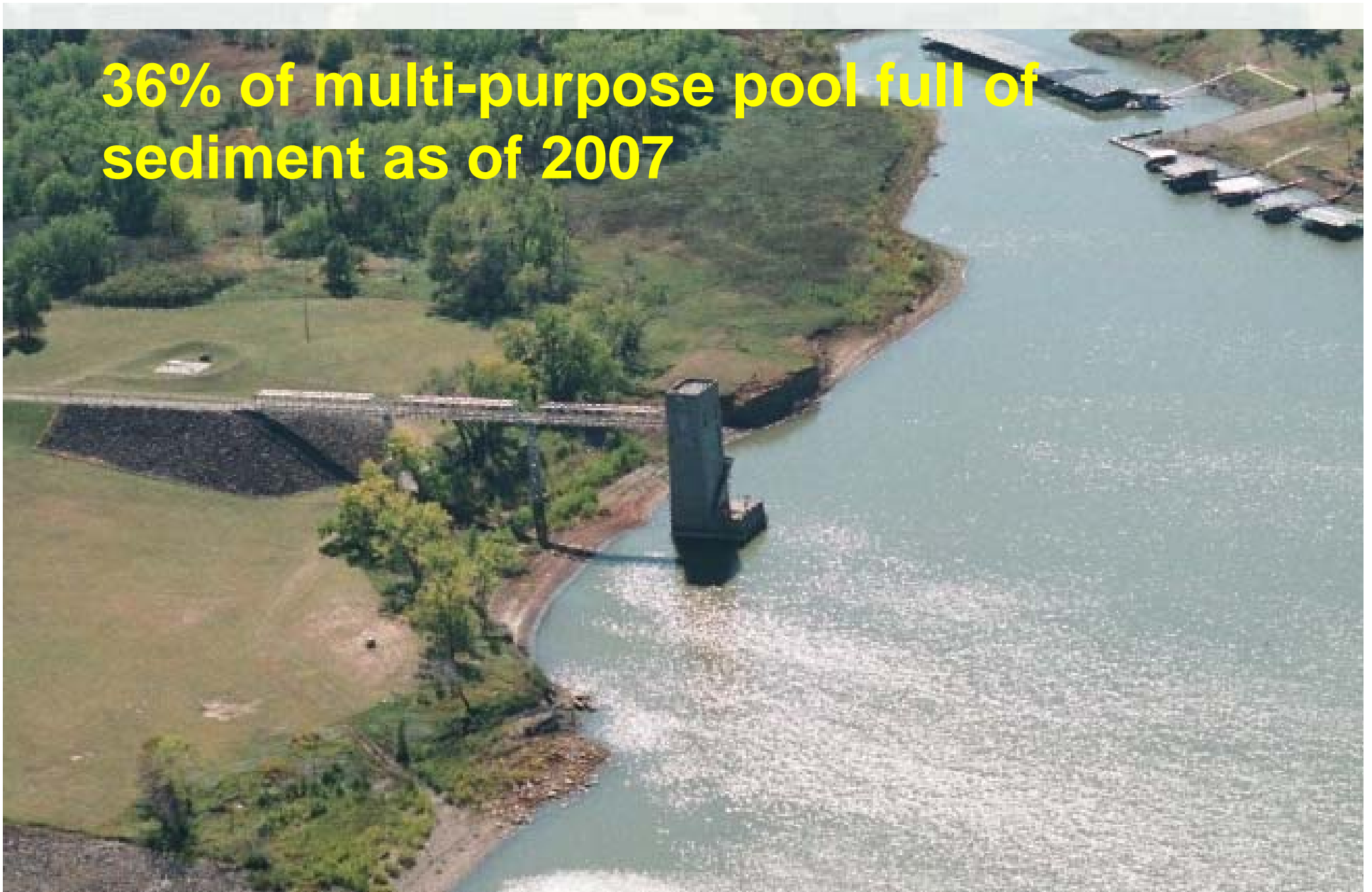
Water Quality: Milford Lake



Operations: Kanopolis Lake



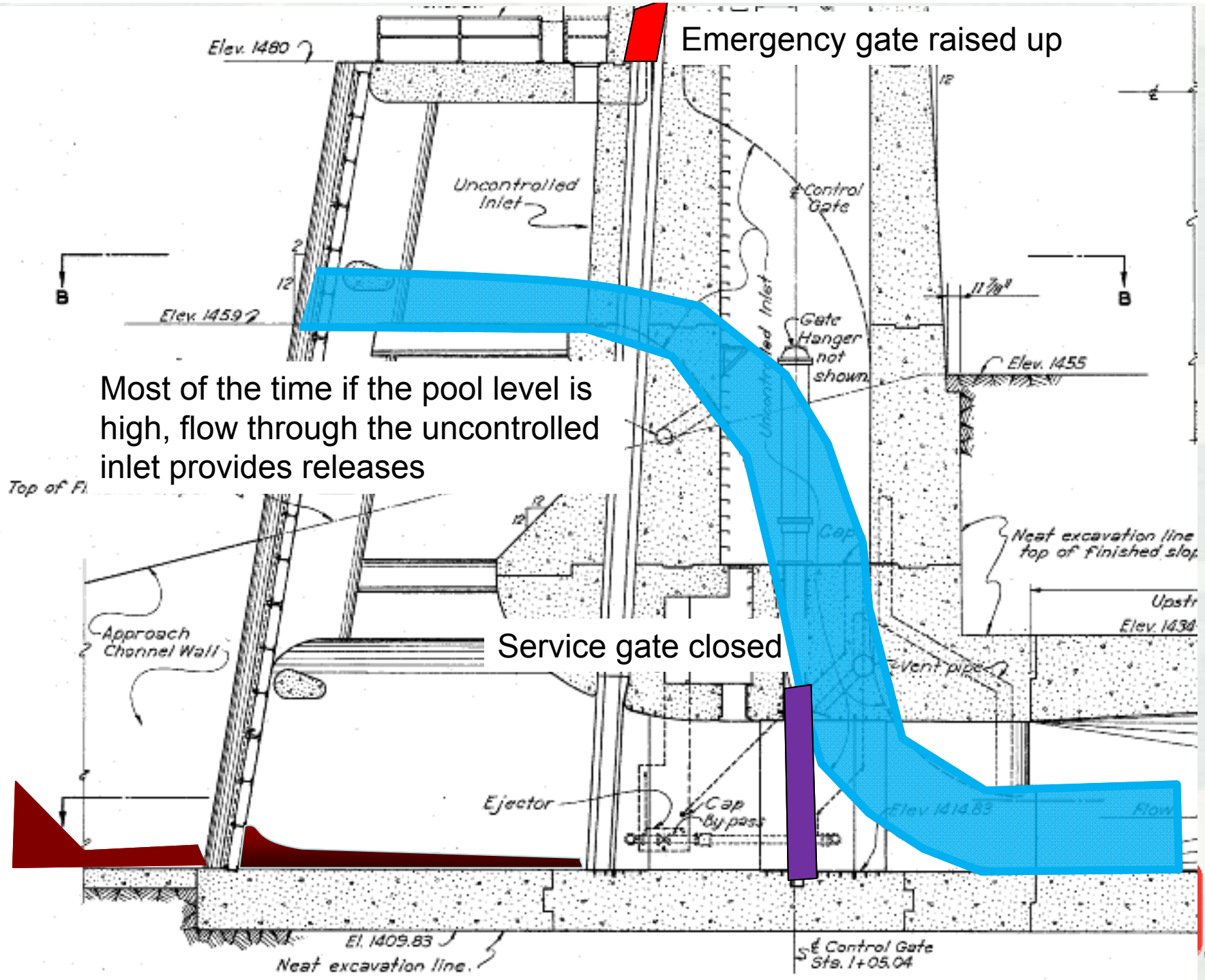
36% of multi-purpose pool full of sediment as of 2007

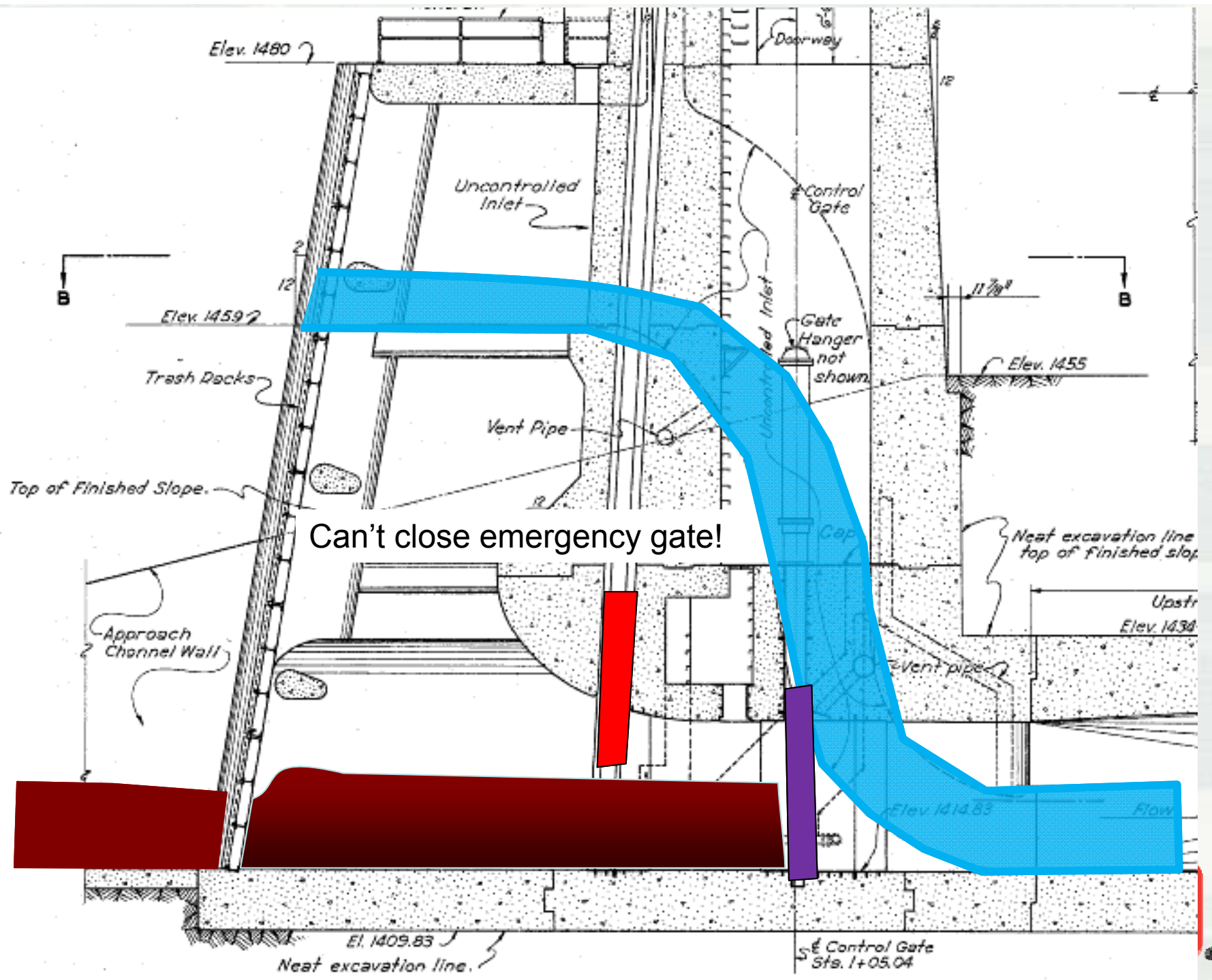


Emergency gate raised up

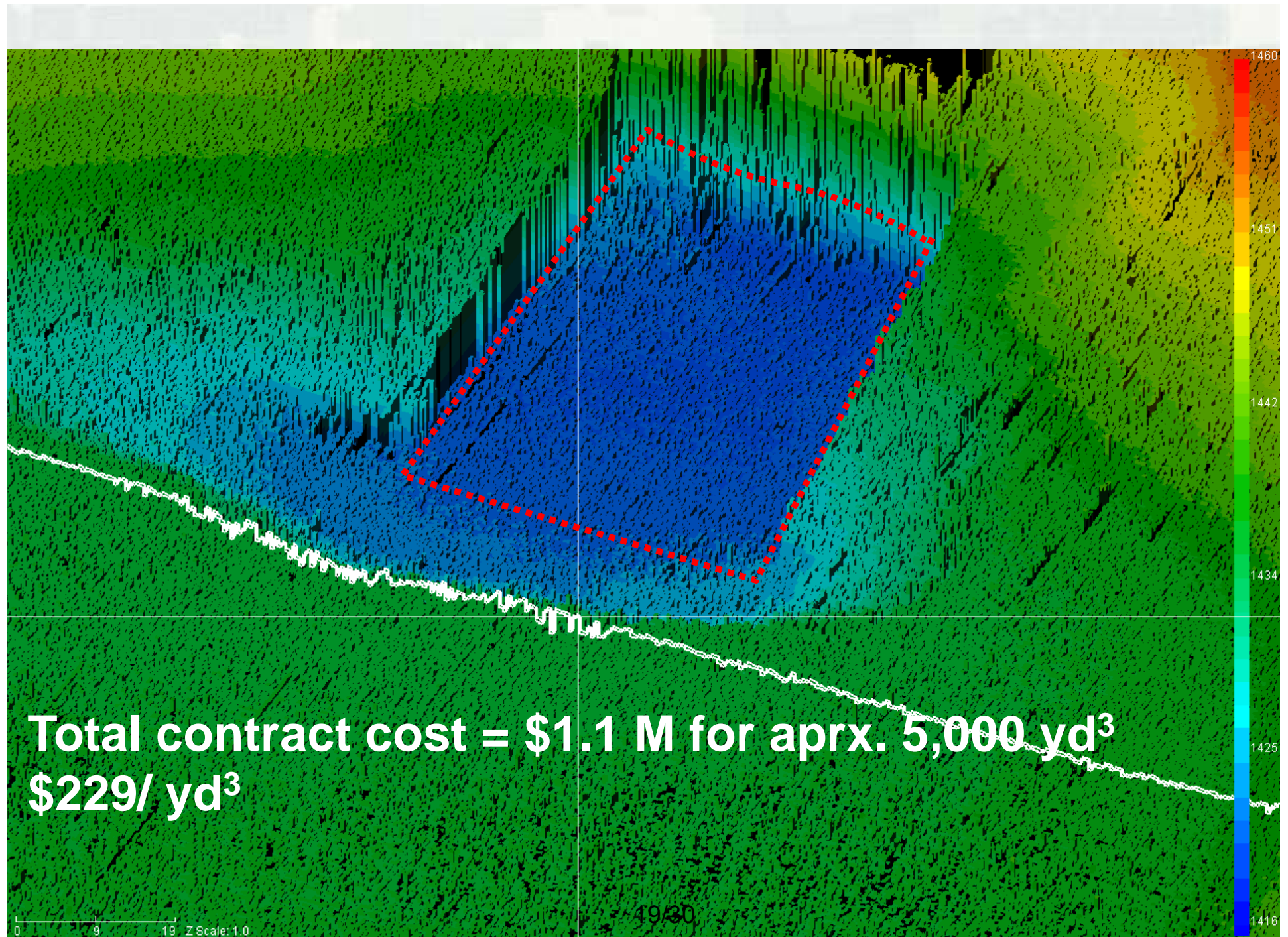
Most of the time if the pool level is high, flow through the uncontrolled inlet provides releases

Service gate closed





Can't close emergency gate!





Recreation Impairment- Lower Granite Reservoir

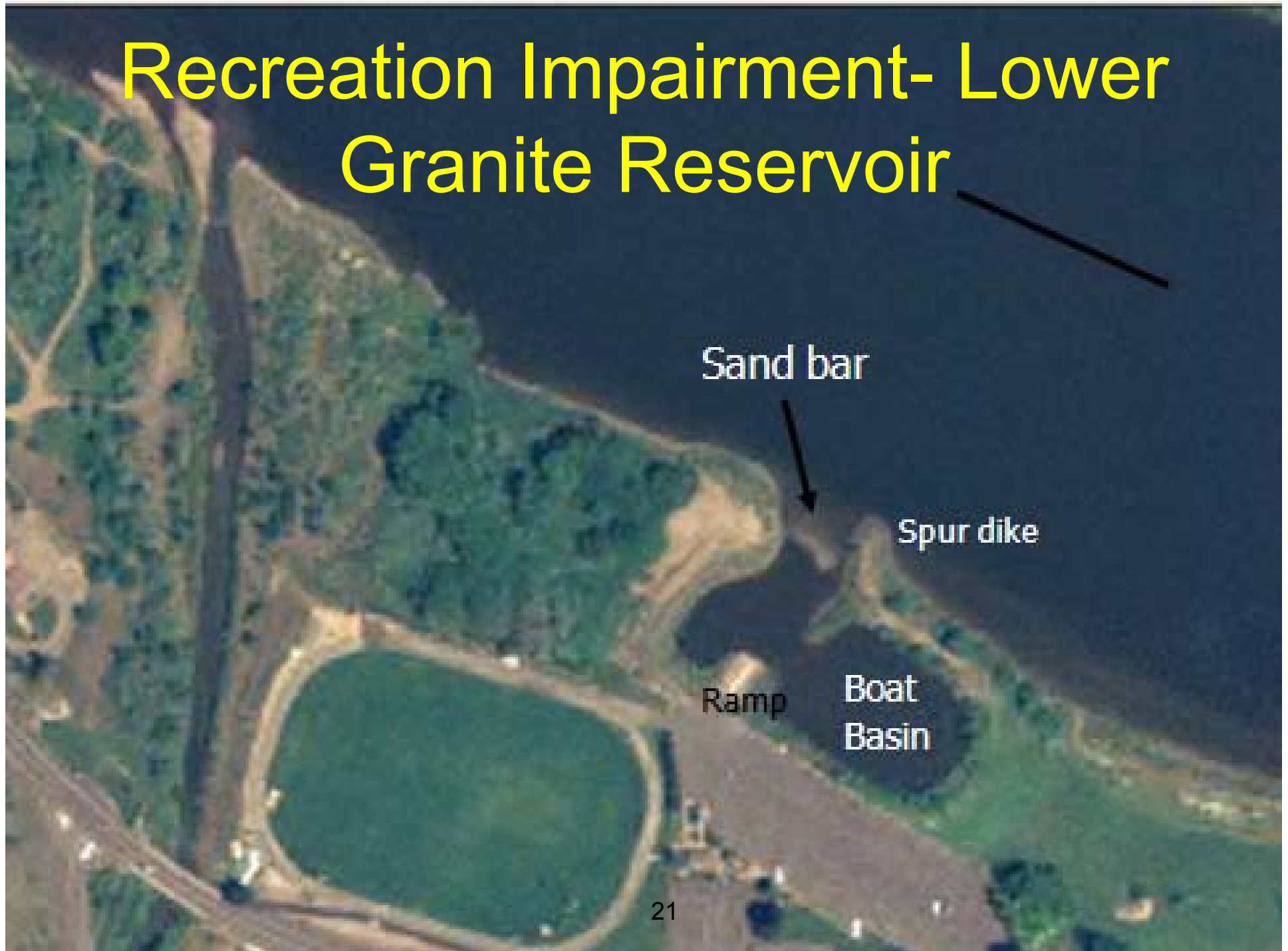
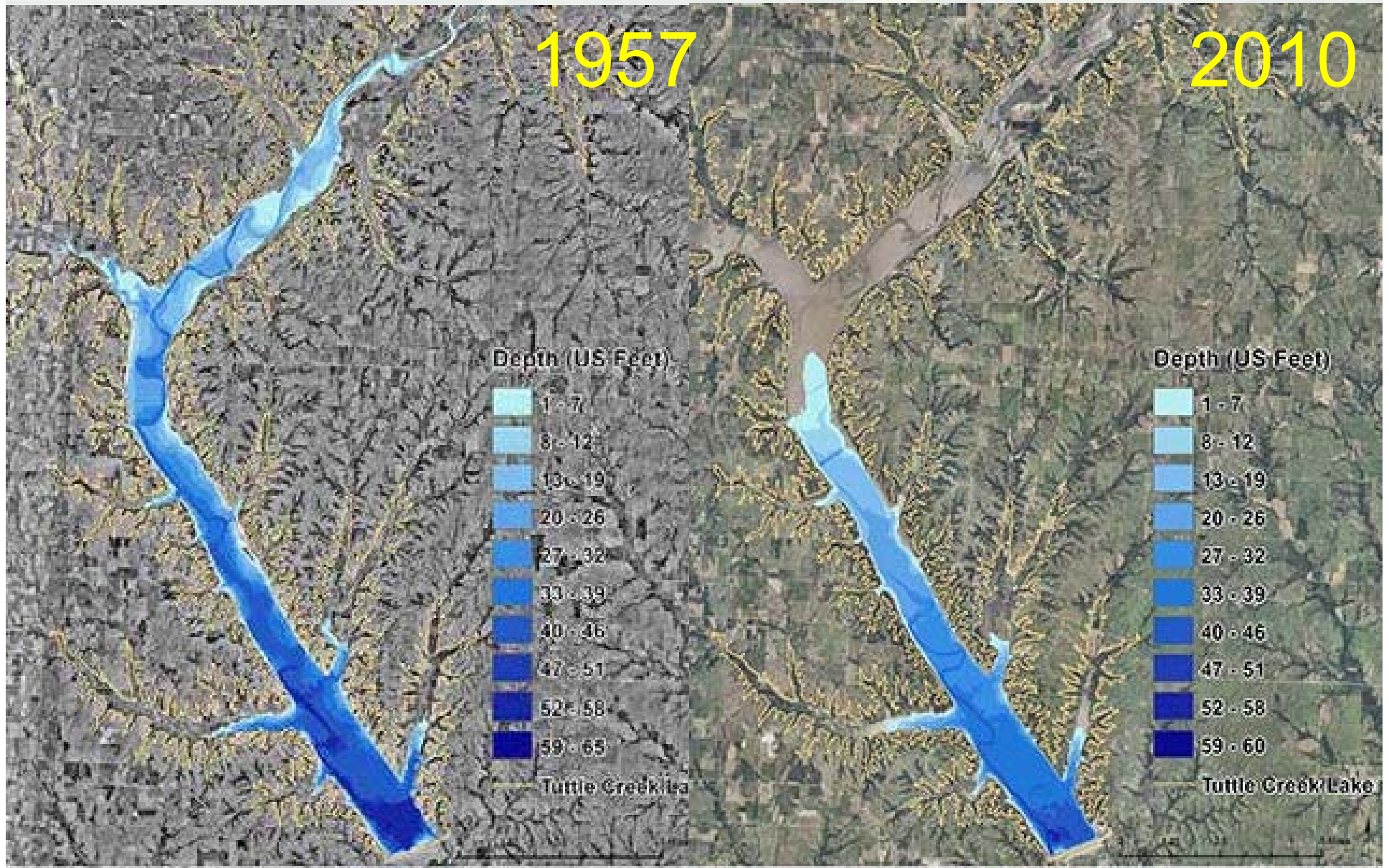


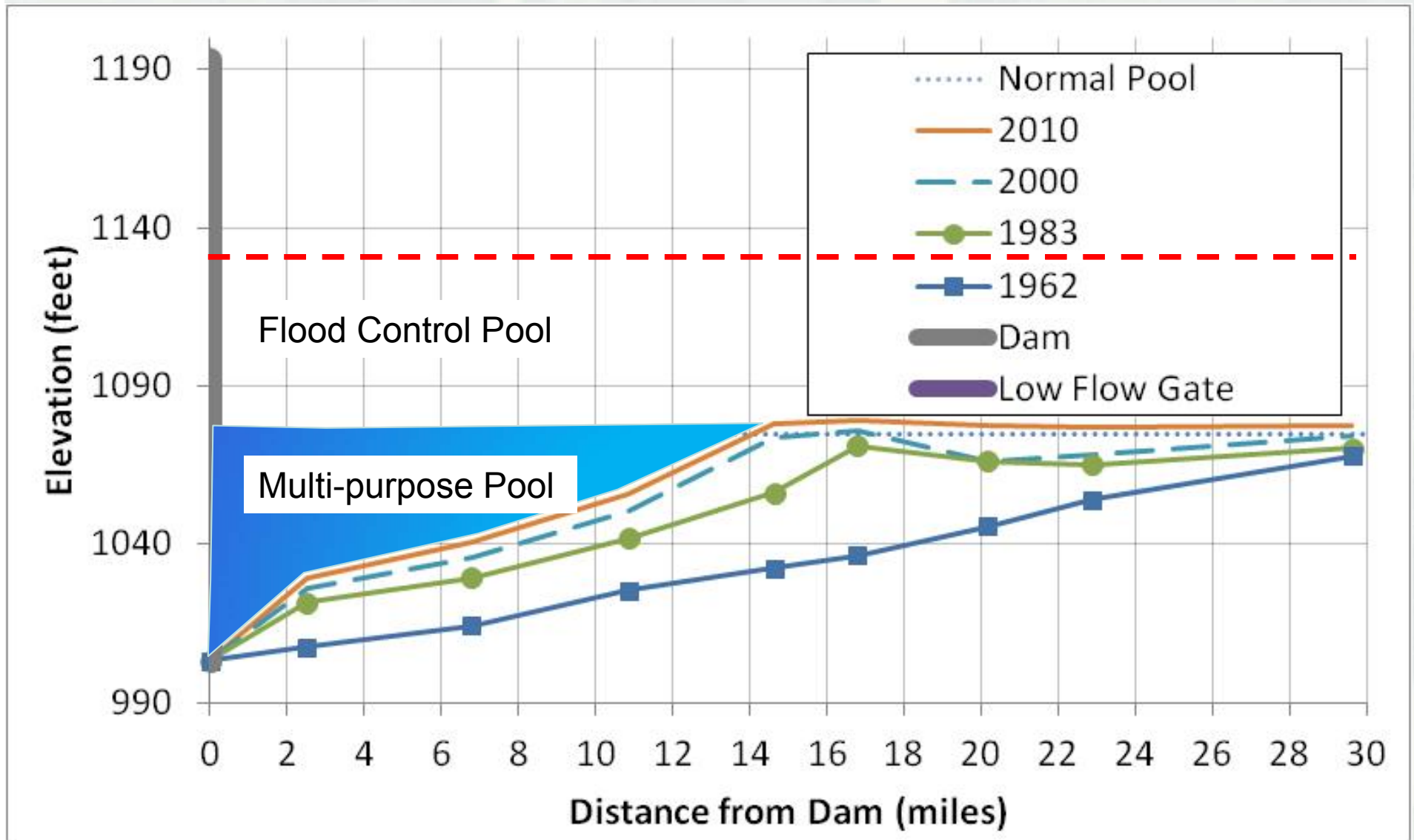


Figure 122. Sand bar at the inlet to the Asotin Boat Basin.

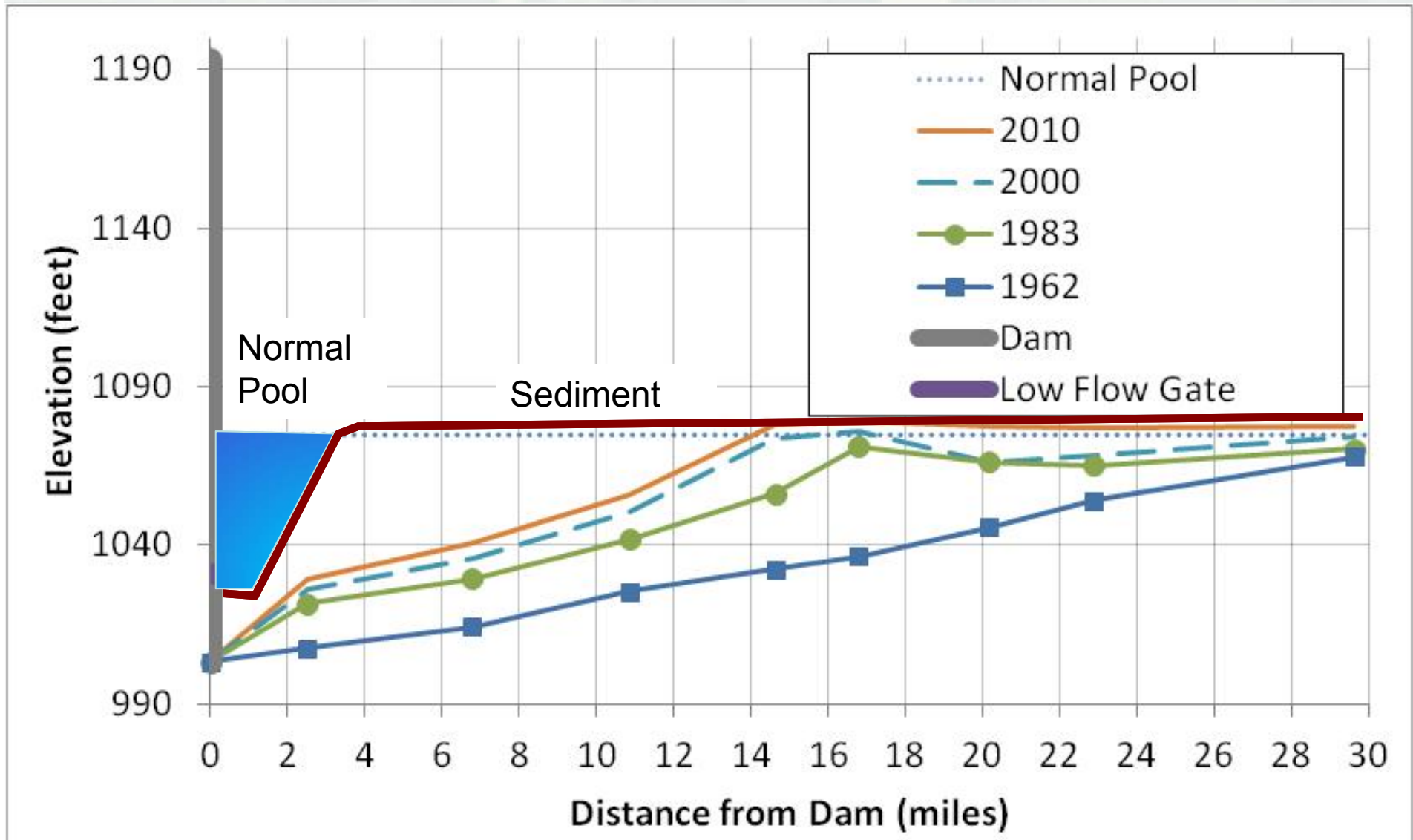
Recreation: Tuttle Creek Lake:



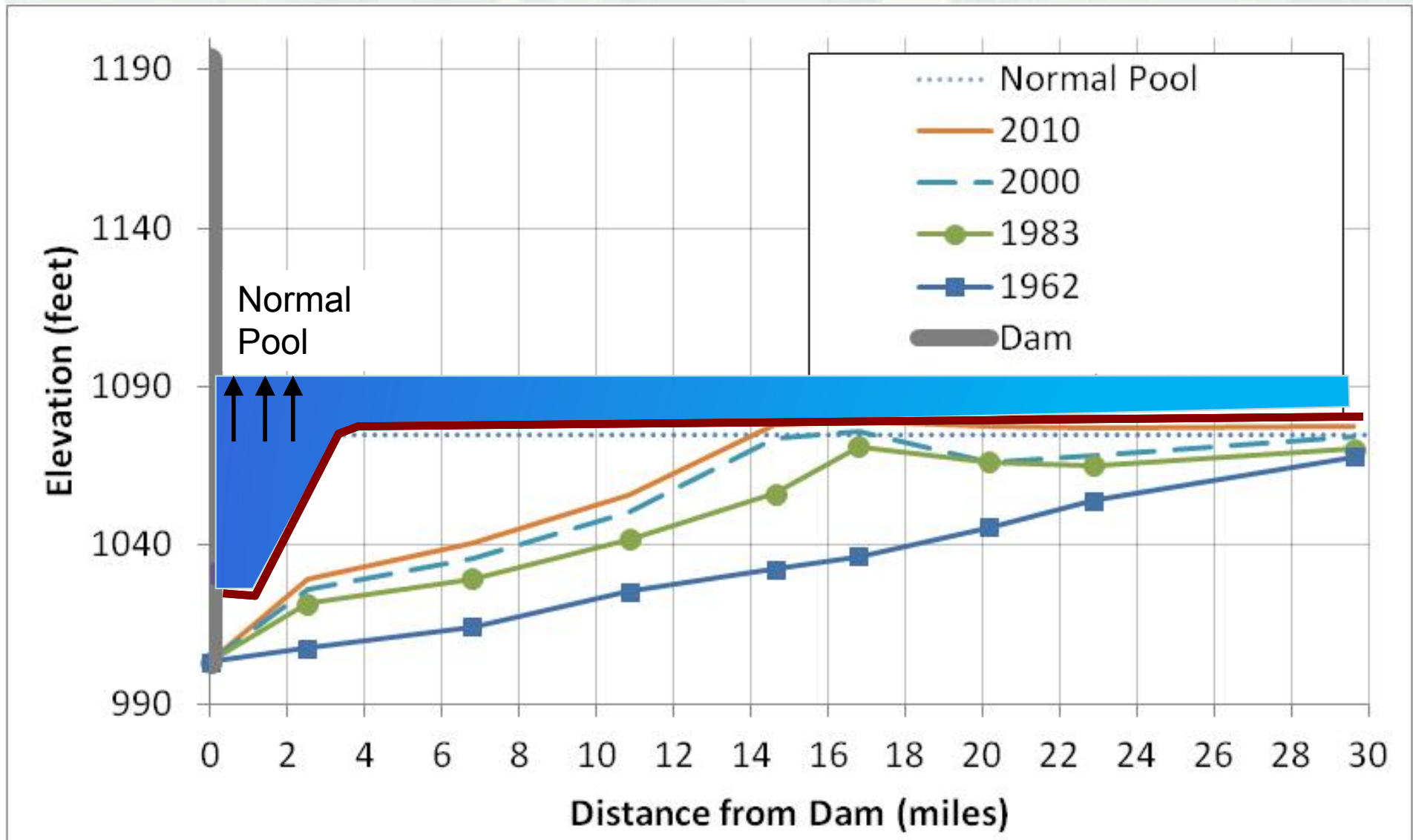
Flood Control: Tuttle Creek Lake



Would this really happen?



Or would this?



John Redmond Reservoir Pool Raise

- 2 ft pool raise in 2013
- Reallocation **from flood control** to water supply
- Deemed in the public's best interest



FINAL REPORT FOR THE
WATER SUPPLY STORAGE REALLOCATION
JOHN REDMOND DAM and RESERVOIR, KANSAS

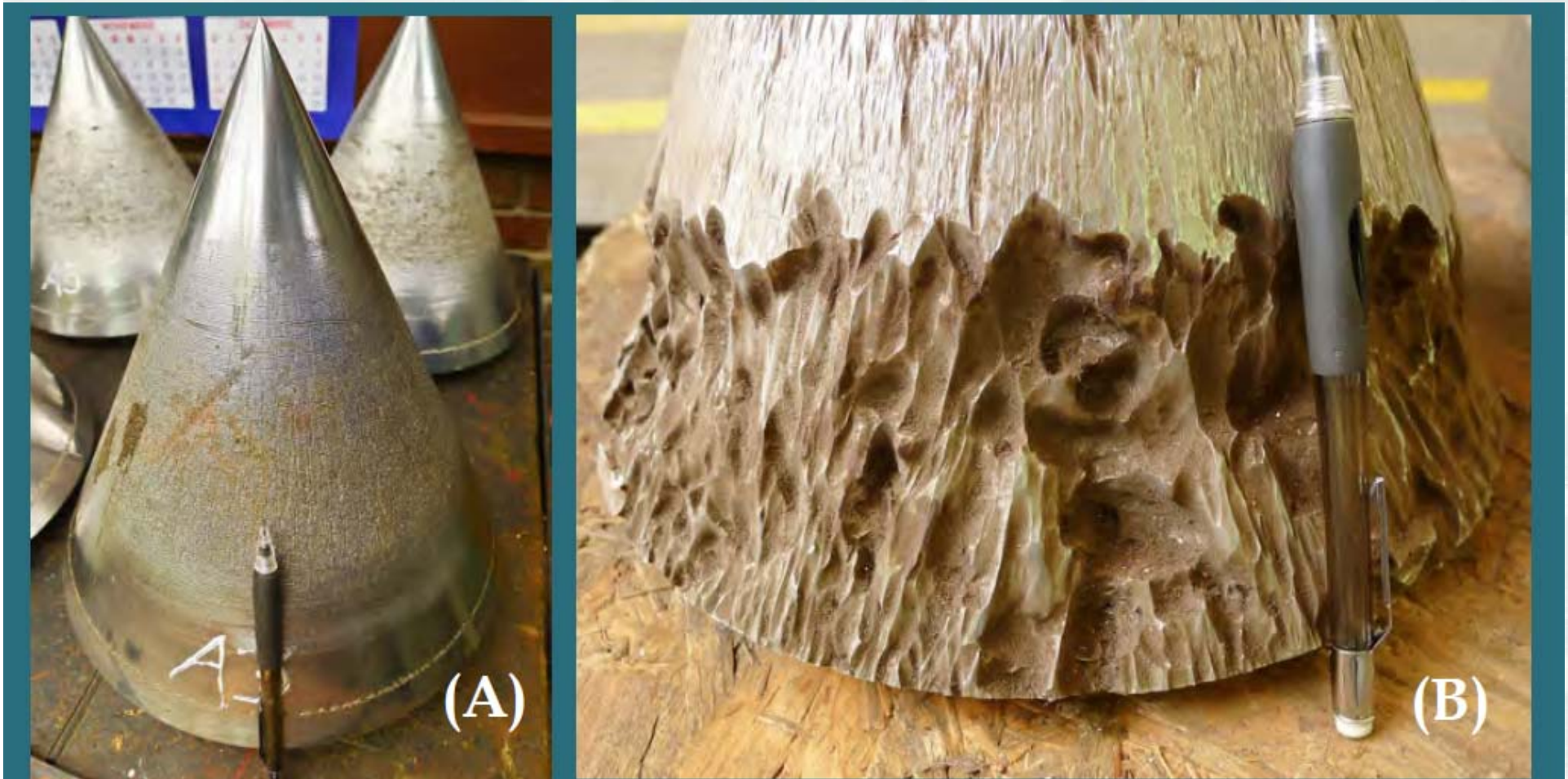


VOLUME III

United States Army Corps of Engineers; Tulsa District
1645 South 101 East Avenue
Tulsa, OK 74128-4609

February 2013

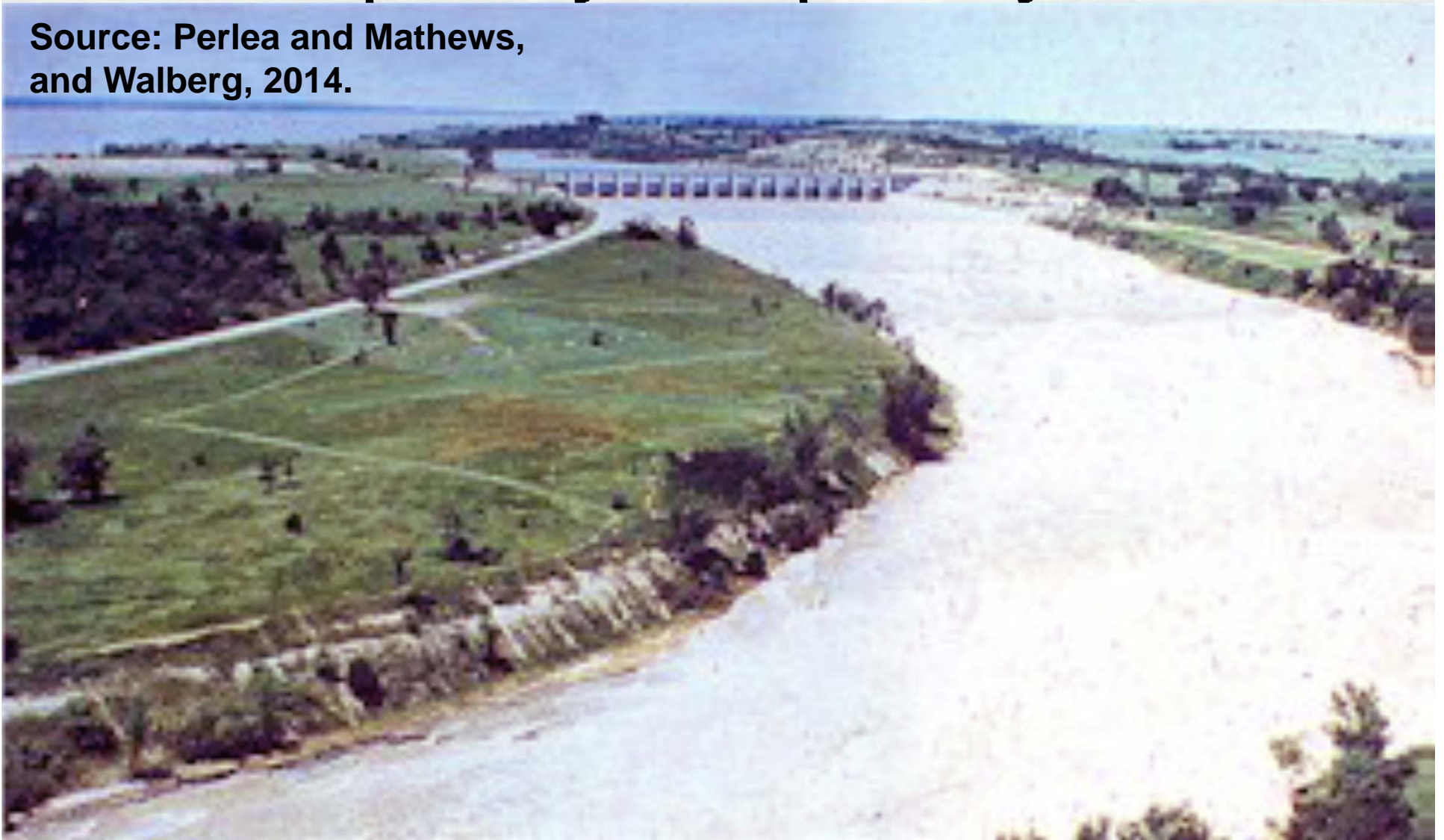
Hydropower



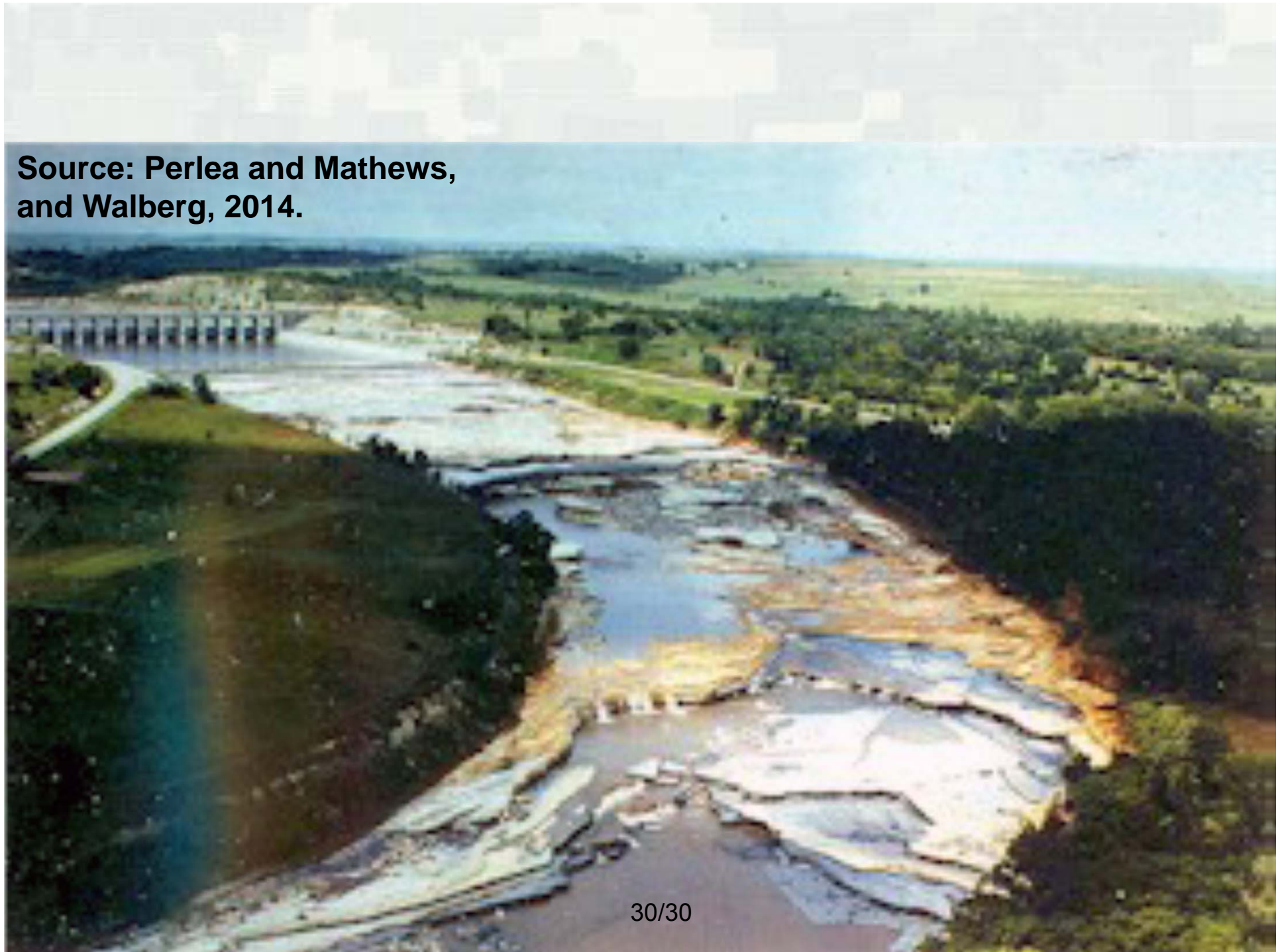
At a 1000 MW power station, Pelton needle valves under 800 meters of head. (A) 10,000 hours normal operations. (B) less than 24 hours passing sand. (Source: Morris, 2016)

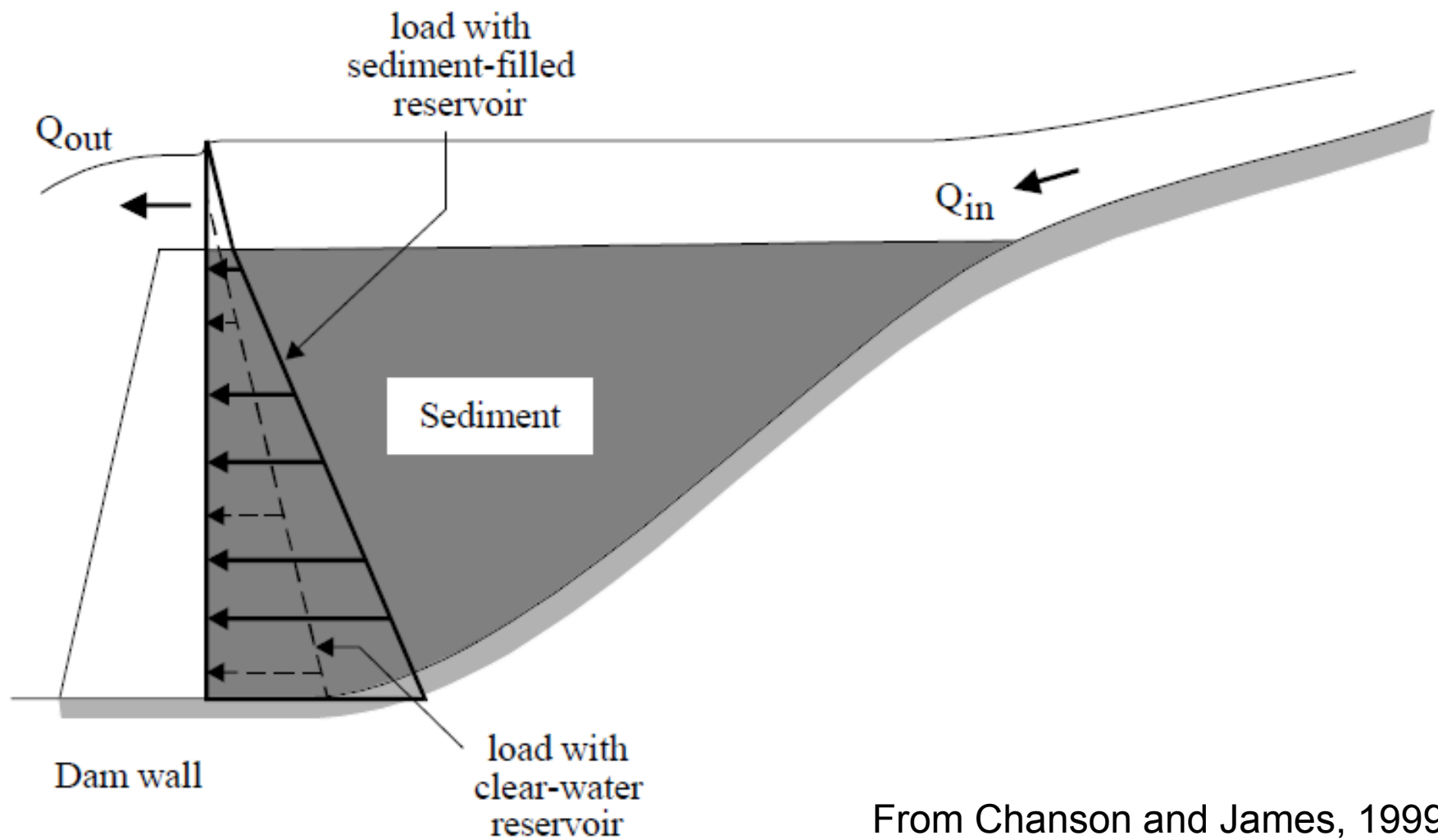
Smaller Flood Pool = Greater Frequency of Spillway Use

**Source: Perlea and Mathews,
and Walberg, 2014.**



**Source: Perlea and Mathews,
and Walberg, 2014.**





From Chanson and James, 1999



Upstream Channel

Downstream Channel

