Environmental Benefits of Restoring Sediment Continuity to the Kansas River

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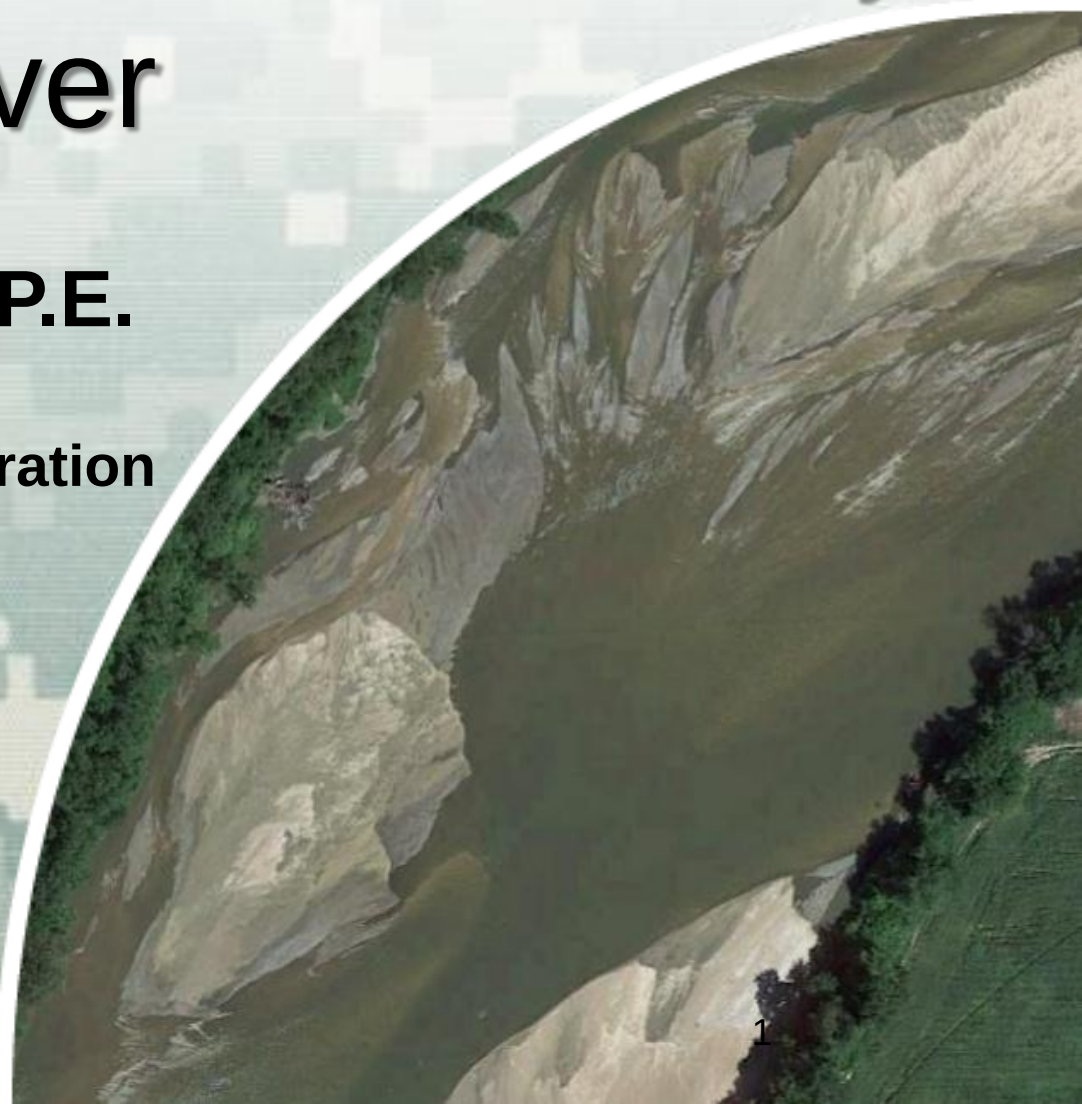

US Army Corps of Engineers

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Outline

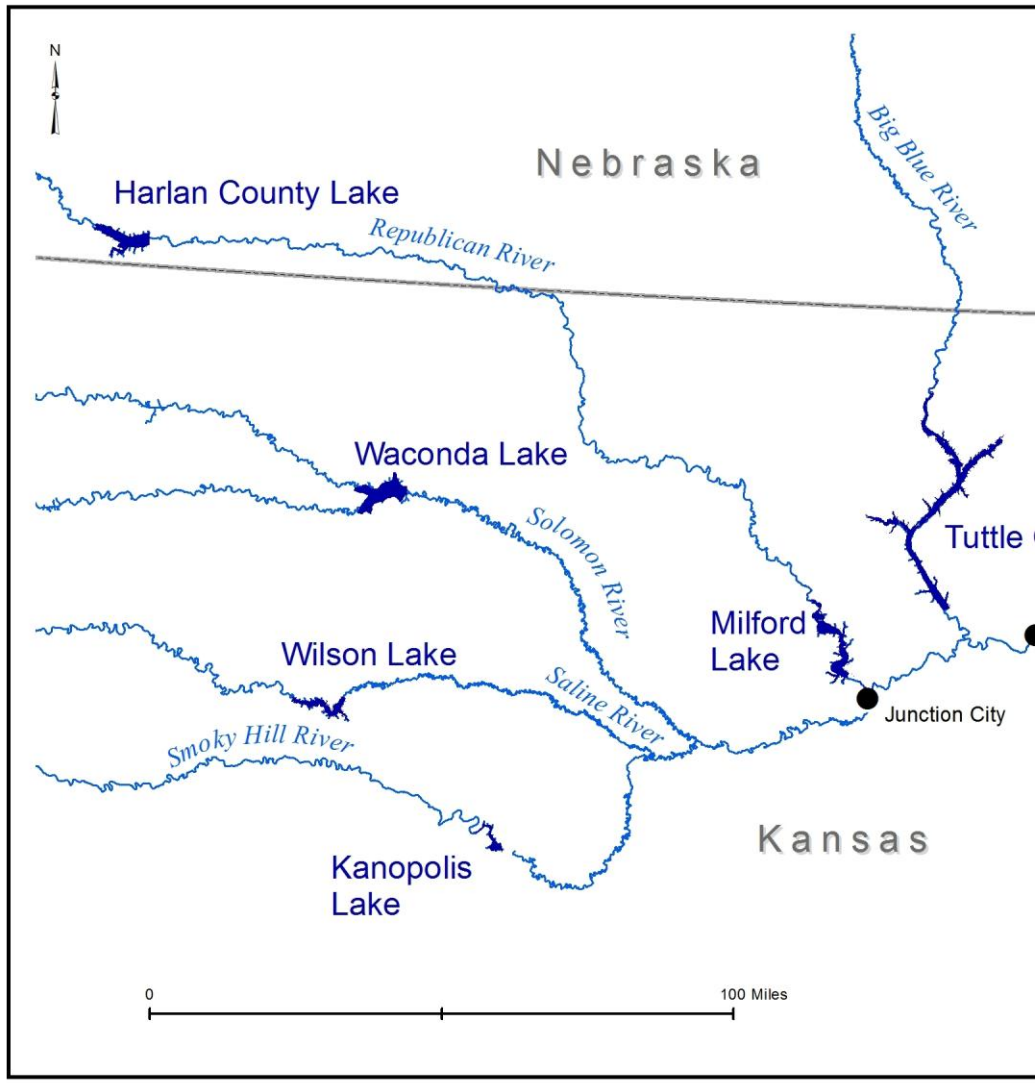
- Dramatic changes to the Kansas River
- The need for turbidity
- The environmental problem with sediment accumulation in the lakes
- Removing the “dam footprint”
- One practical idea

Dramatic Changes to the Kansas River

Pre-dam Sediment Load: 44 million tons per year

Post-dam Sediment Load:13 million tons per year

A 70% reduction in sediment transport



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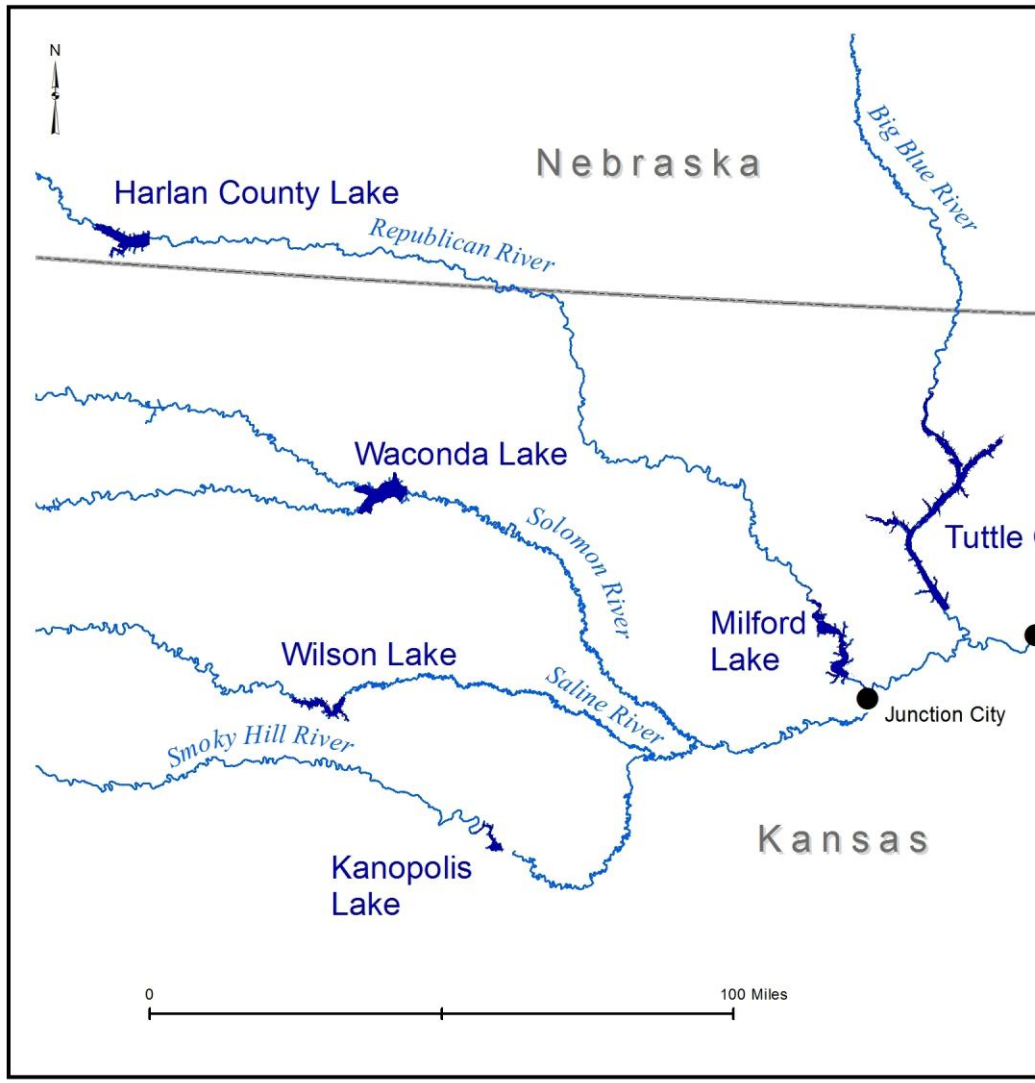
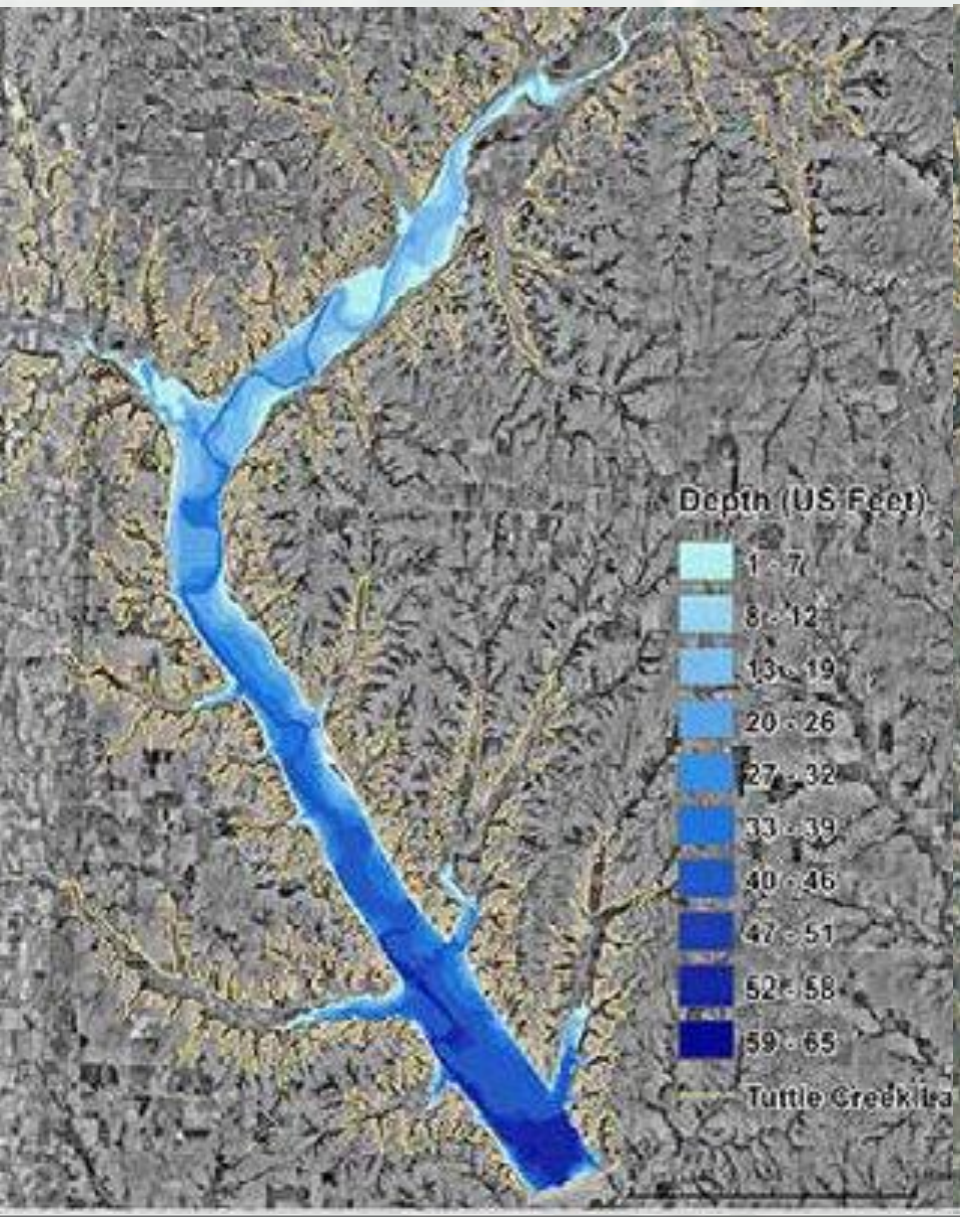
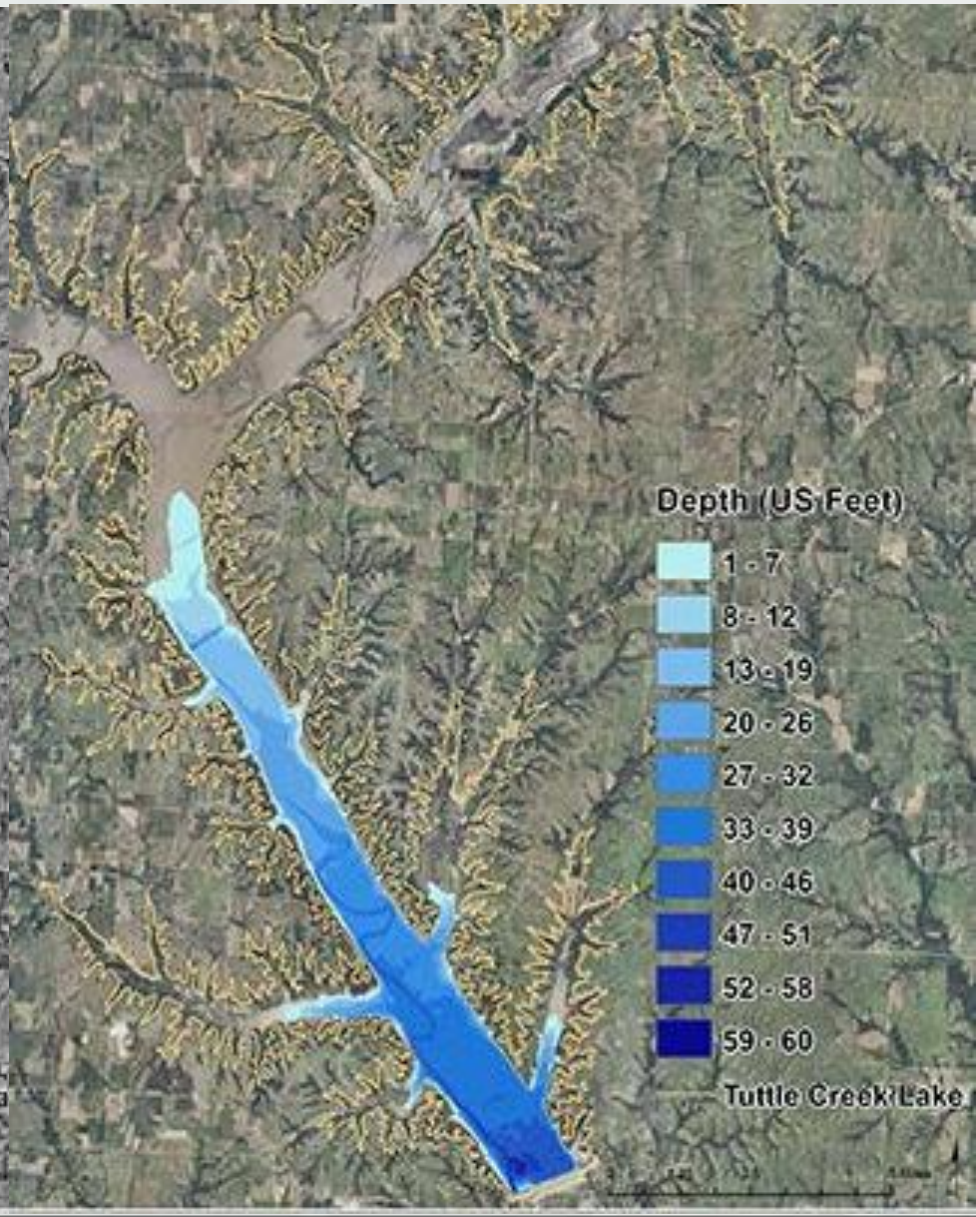
So what?

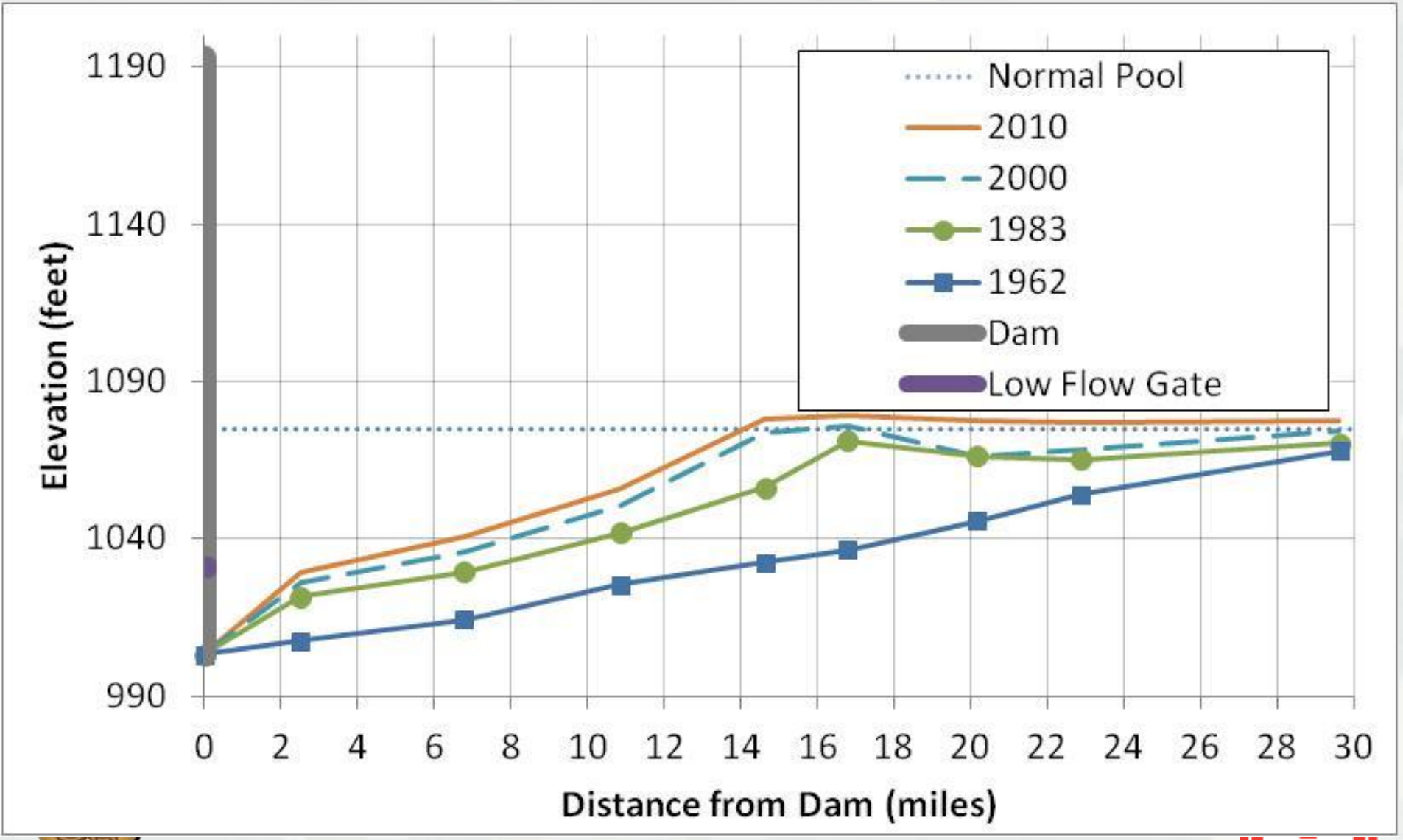


Tuttle Creek Lake: 1957 to 2010



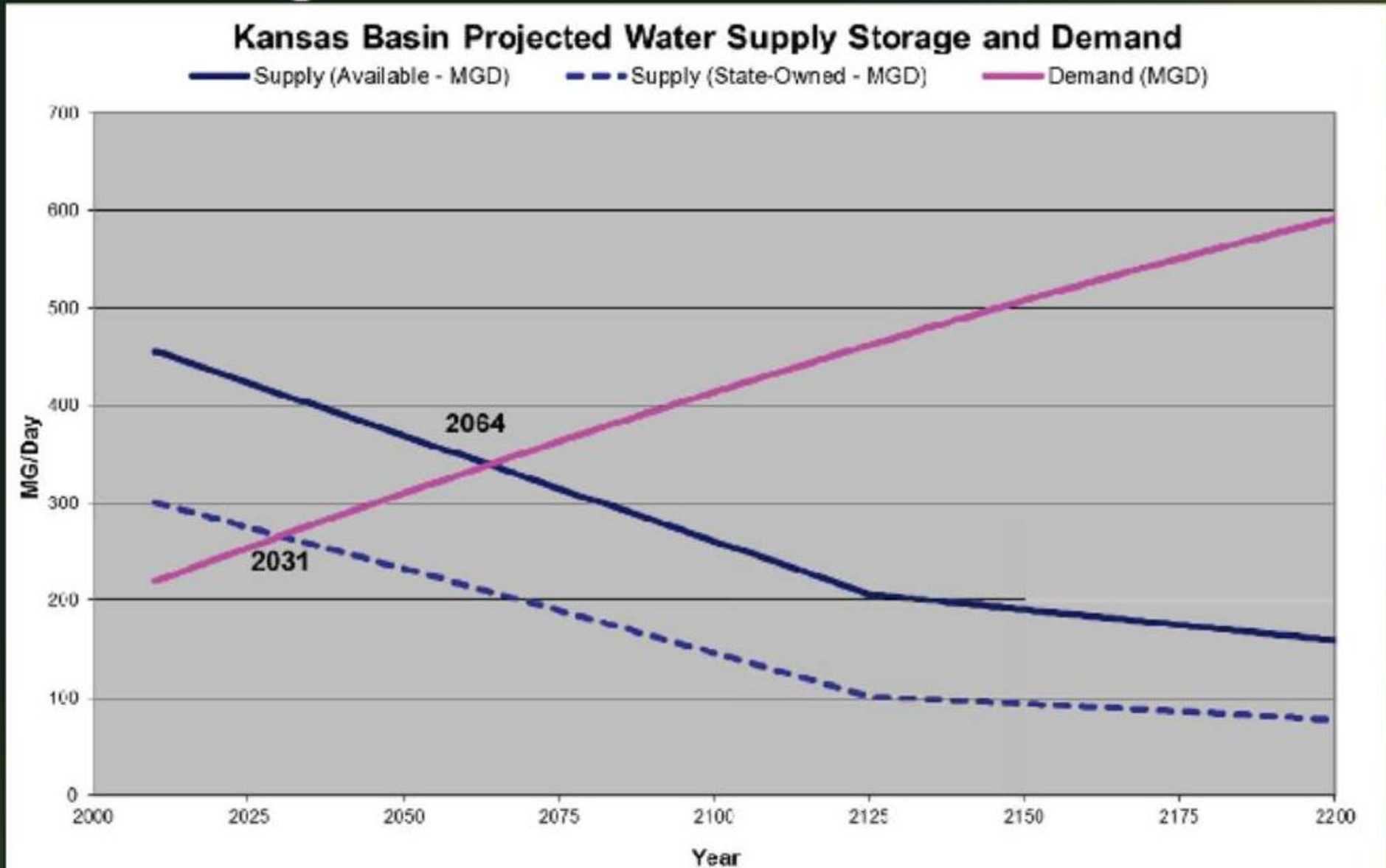


Tuttle Creek Lake

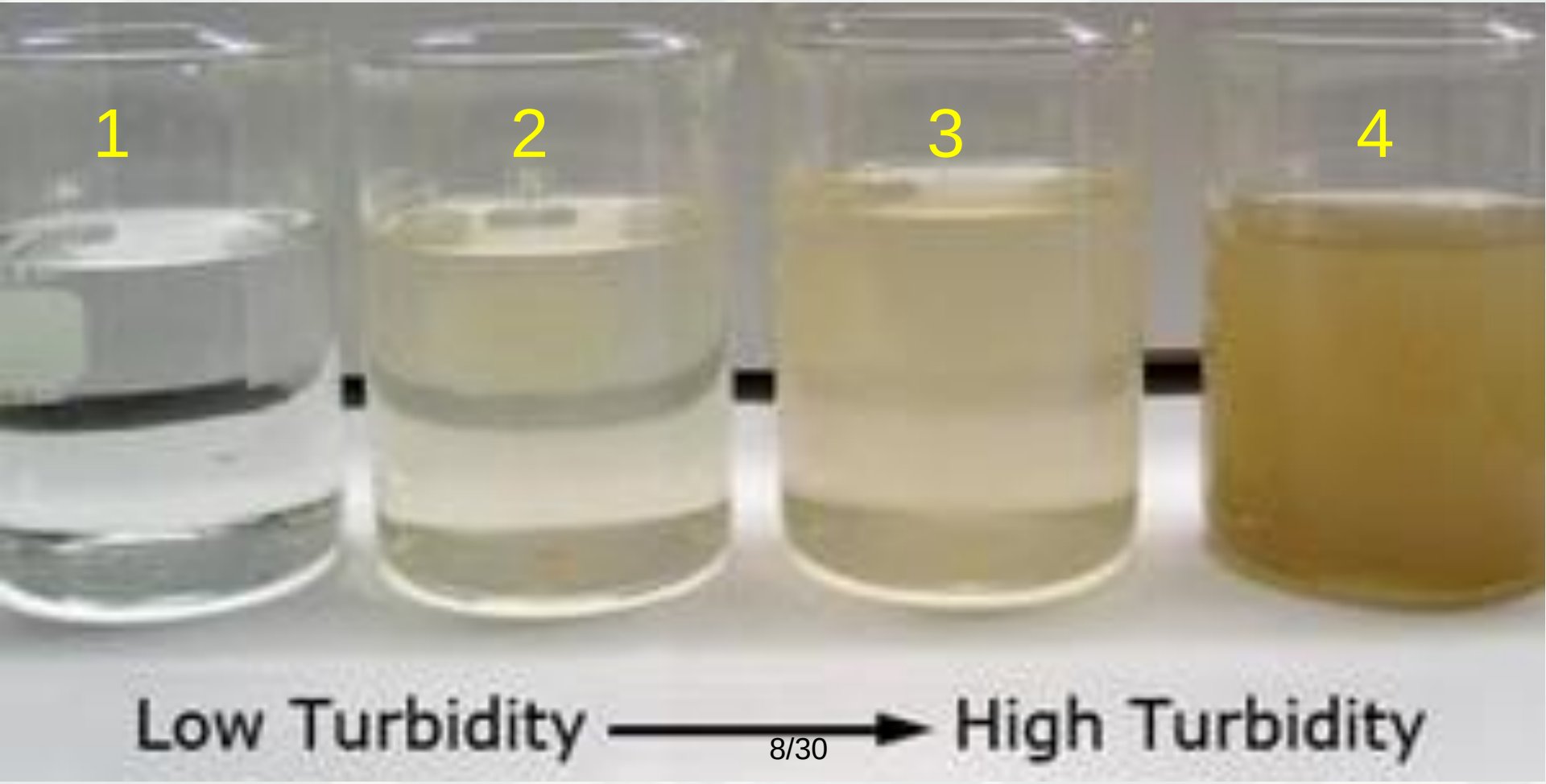


Supply – Demand Graphs

- 2% drought condition



Trick Question: Which is Better Water Quality for Riverine Environments?



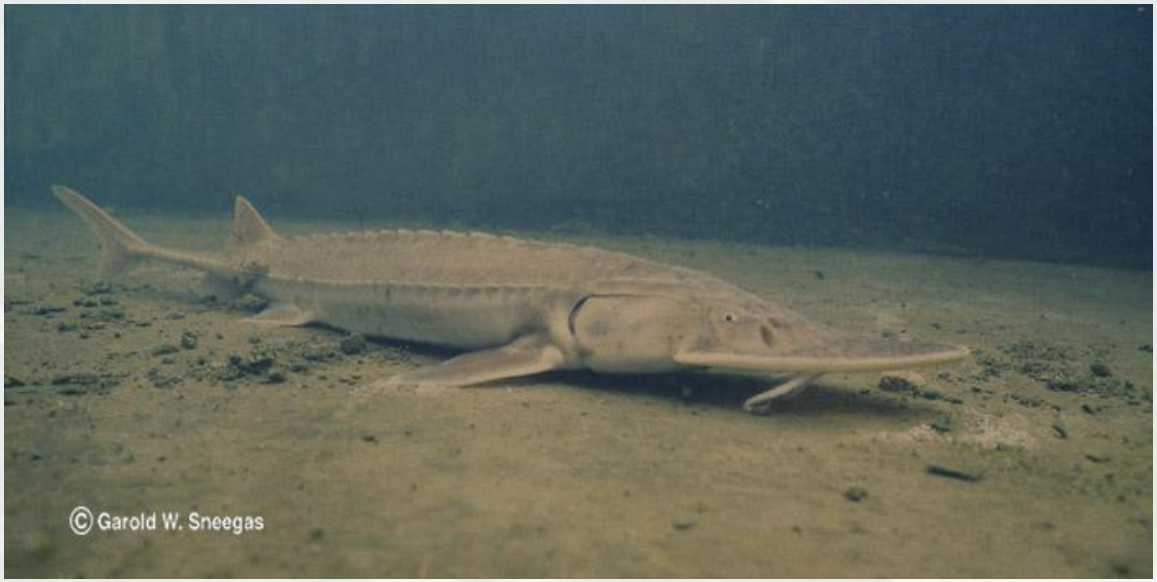
- Sediment should not be universally considered as a pollutant, especially in historically-turbid river systems. To the contrary, the transport of sediment is a natural function in river ecosystems, and a lack of sediment can be deleterious to aquatic habitats and organisms.

- Turbid-water Fish
  - Smaller eyes
  - Smaller optic lobes of brain
  - Electro-sensory and chemo-sensory organs
  - Non-sight feeding
  - Thrive in naturally high-turbidity environments

- Clear-water Fish
  - Larger eyes
  - Larger optic lobes of brain
  - Site-feed
  - Out-compete native Kansas River fish in the current, unnaturally clear Kansas River environment

Shovelnose Sturgeon

- Once abundant in the Kansas River, no longer present in much of Kansas



Identified in *Current status of native fish species in Kansas*, Transactions of the Kansas Academy of Science, Vol 108, 2005.

Imperiled Due to Increased Water Clarity and Predation and Competition from Sight-Feeding Fish

- Formerly found in the lower Kansas River. Not found for 20 years. Considered “extirpated, or nearly so, in Kansas.”

- Significantly reduced in abundance

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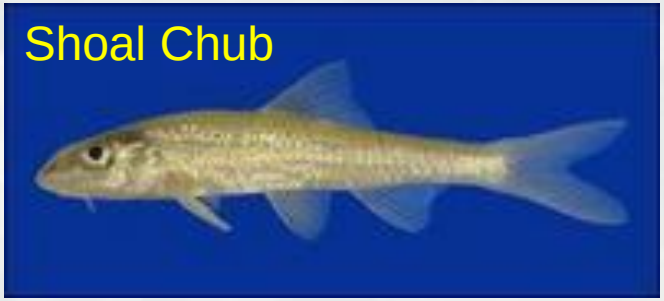

Significantly reduced
in range or abundance

Other impacted species showing significant decline or complete extirpation: Silver Chub, Flathead Chub, River Shiner, Carmine Shiner, Sturgeon Chub

- The State of Kansas has designated critical habitat in the Kansas River for several state-listed threatened and endangered species including the plains minnow, shoal chub, sturgeon chub, and silver chub.

- High clarity = poor quality for Kansas River habitat

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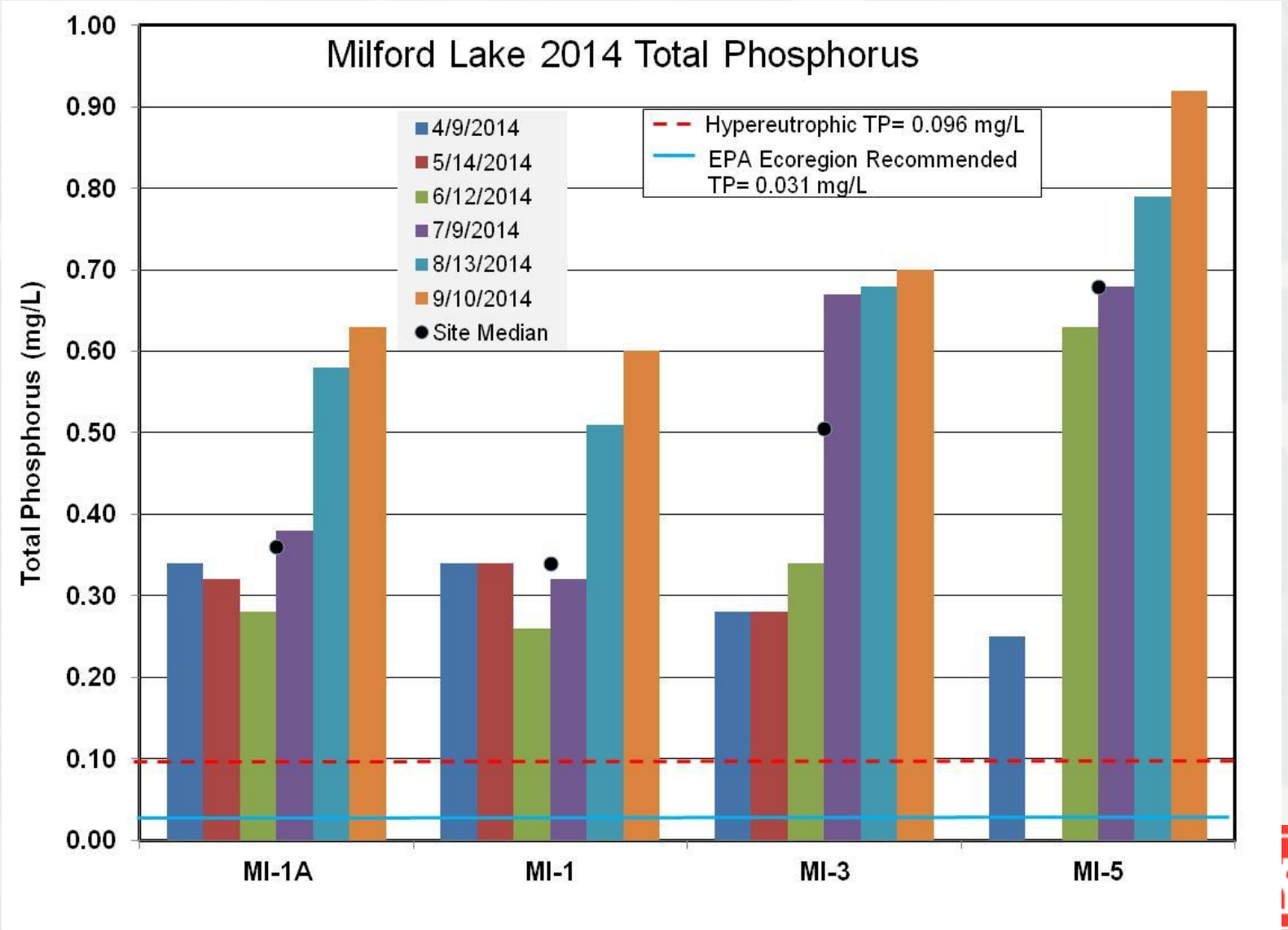
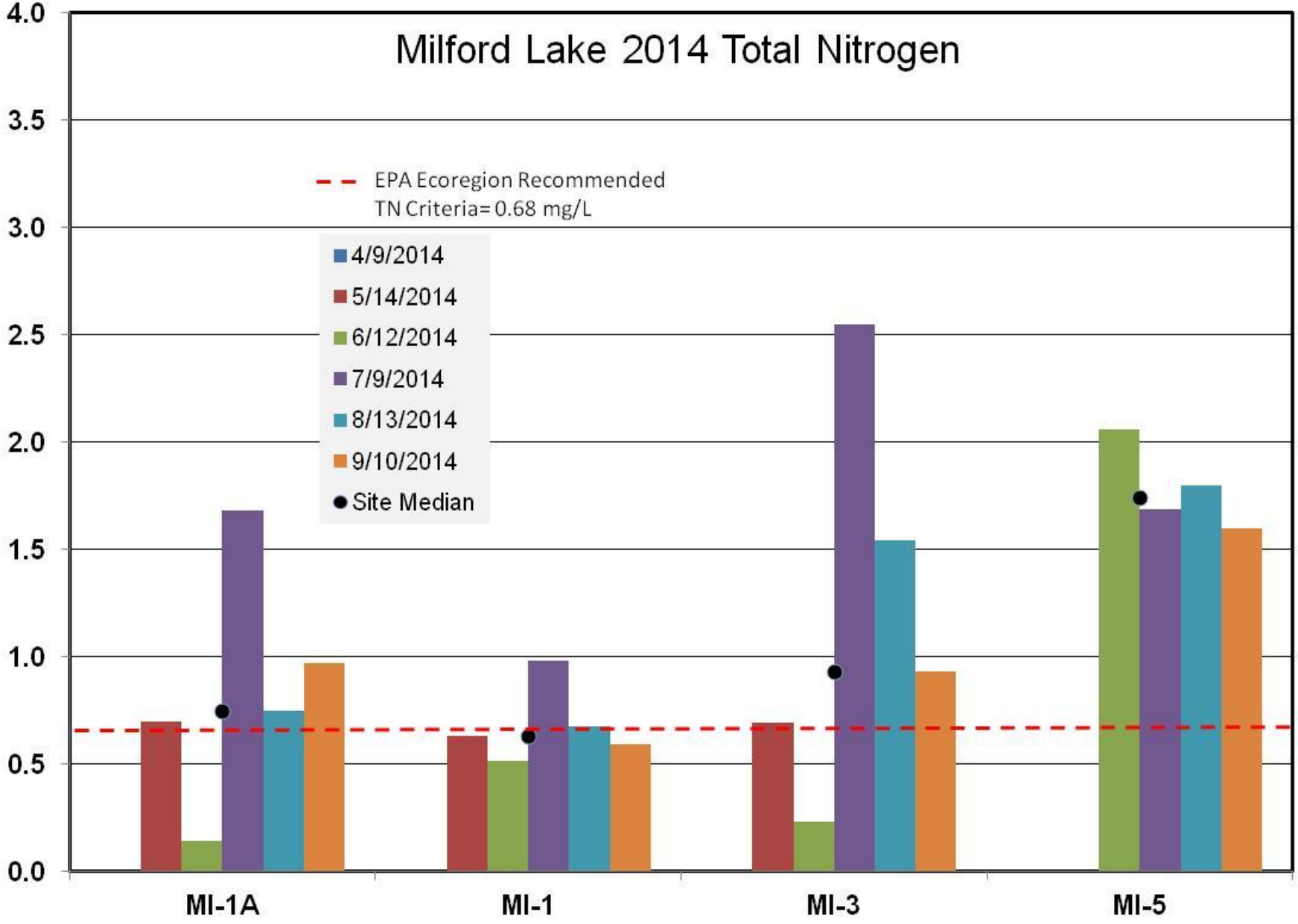
In-reservoir Effects of Sediment Accumulation




Milford Lake 2014 Total Nitrogen
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
EPA Ecoregion Recommended
TN Criteria= 0.68 mg/L
4/9/2014
5/14/2014
6/12/2014
7/9/2014
8/13/2014
9/10/2014
Site Median
MI-1A
MI-1
MI-3
MI-5

Effect over time…

- Phosphorus binds to sediment, concentration increases as the sediment accumulates in the reservoir

- Nitrogen dissolves in the water, residence time decreases as the sediment accumulates in the reservoir

- TN:TP ratio = VERY LOW

In-reservoir Effects of Sediment Accumulation

- Shift in fish species composition from desirable sport fish (primarily piscivores) to less desirable benthivores (Egertson and Downing 2004)

- Increased biomass of common carp

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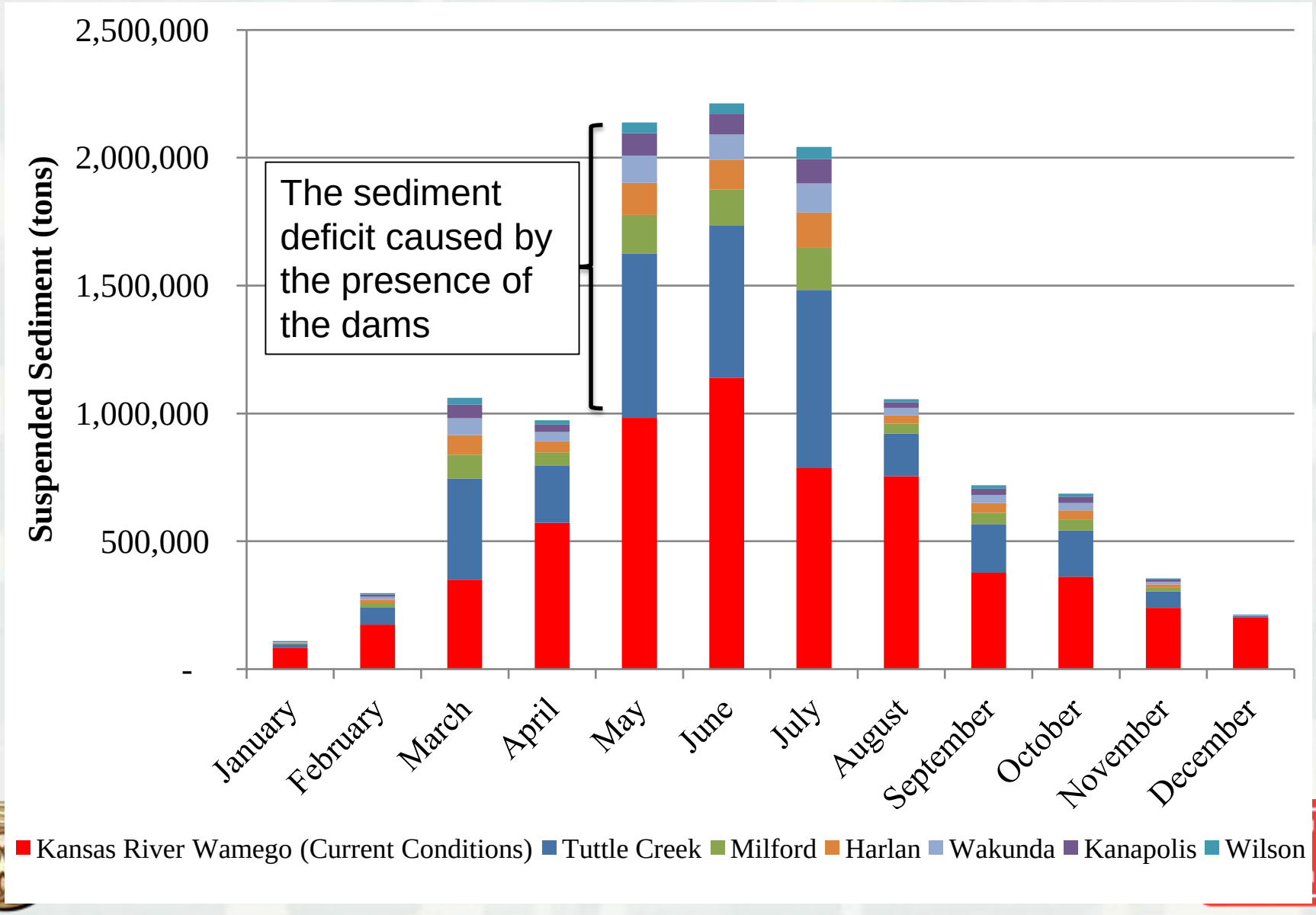
What is the dam footprint?



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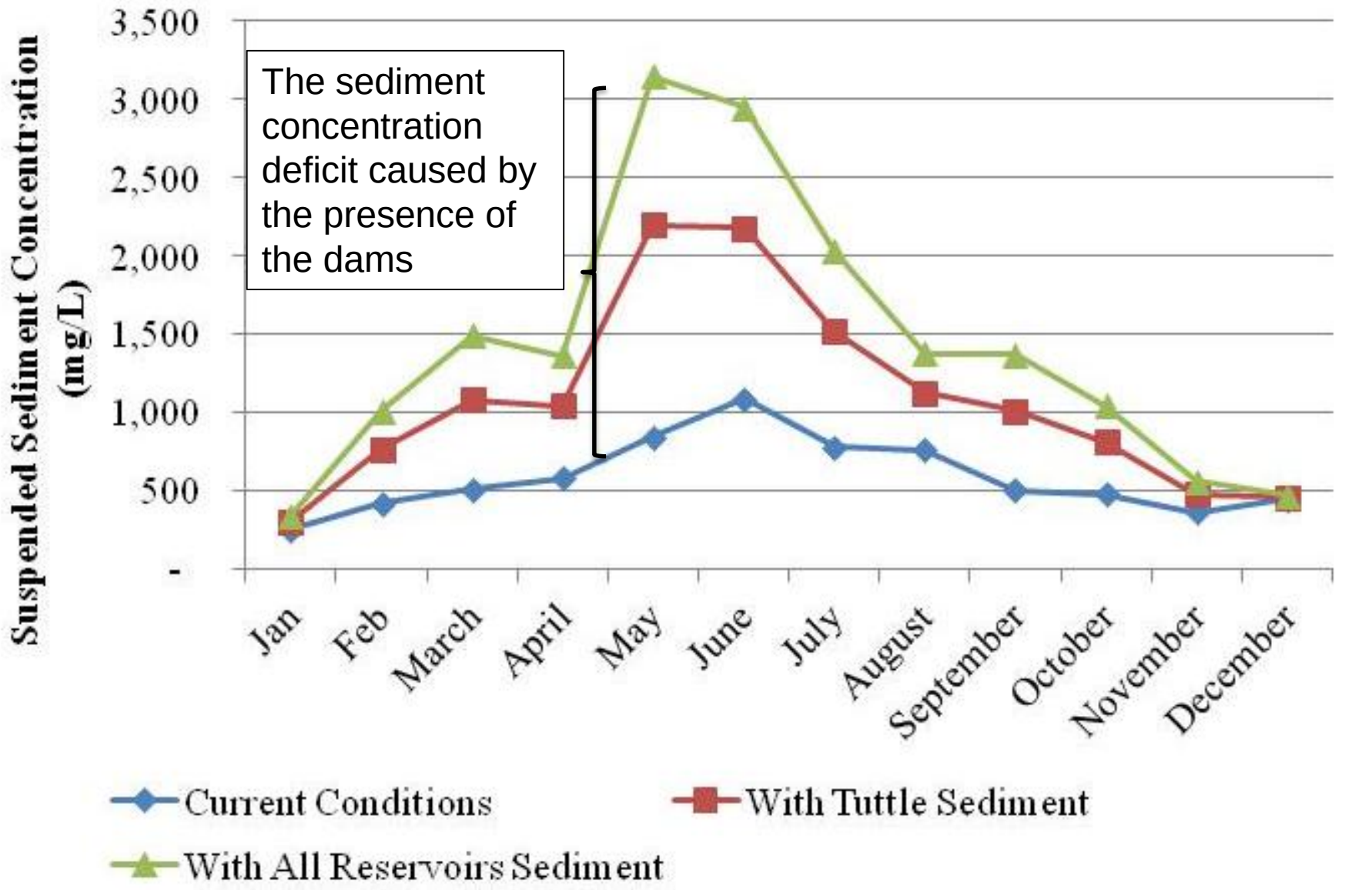


Removing the “dam footprint”

- An environmental lift for the Kansas River
- An environmental lift for the reservoirs
- Benefits human uses of the reservoirs (water supply, recreation, etc.)
- But is it practical?

Dredging

- Dredging Tuttle Creek Lake at the natural rate of incoming sediment and recharging sediments to the downstream channel
  - Costs estimated at $40 million/year
  - Tremendous fuel consumption

Option employed on Fall Creek Reservoir in Oregon

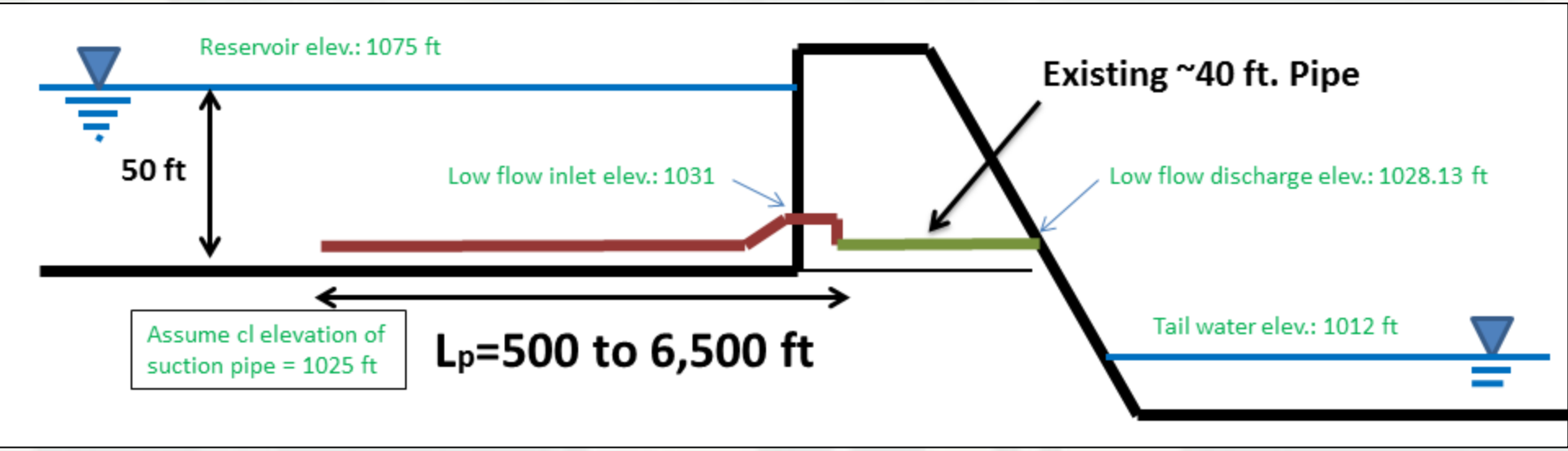
Option employed on Fall Creek Reservoir in Oregon

"The entire food web downstream of the reservoir will see a great benefit over time from the liberation of the trapped material."

http://www.nwp.usace.army.mil/Missions/Current/FallCreekdrawdown.aspx

Removing the “dam footprint”

- A novel, less-expensive idea…



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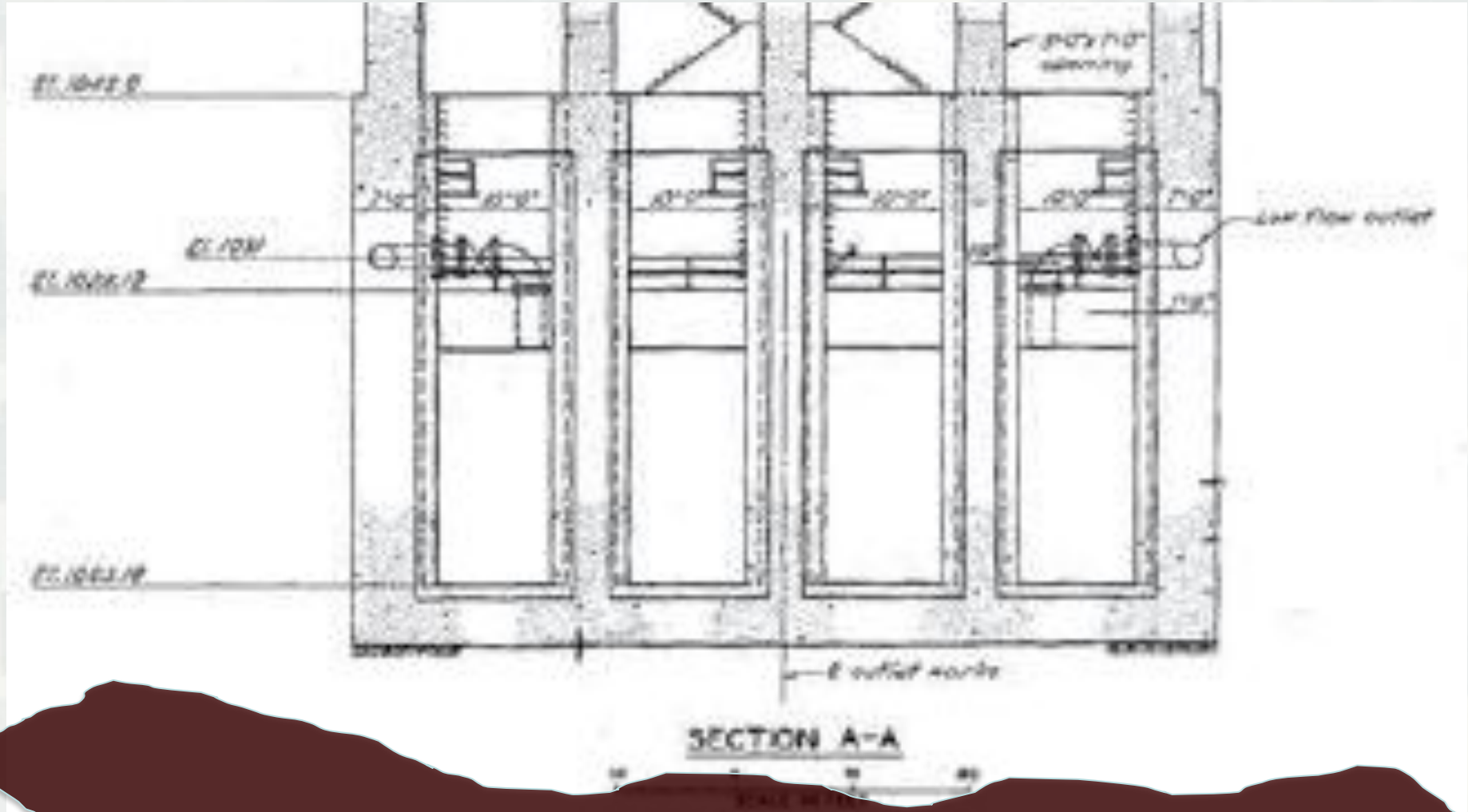

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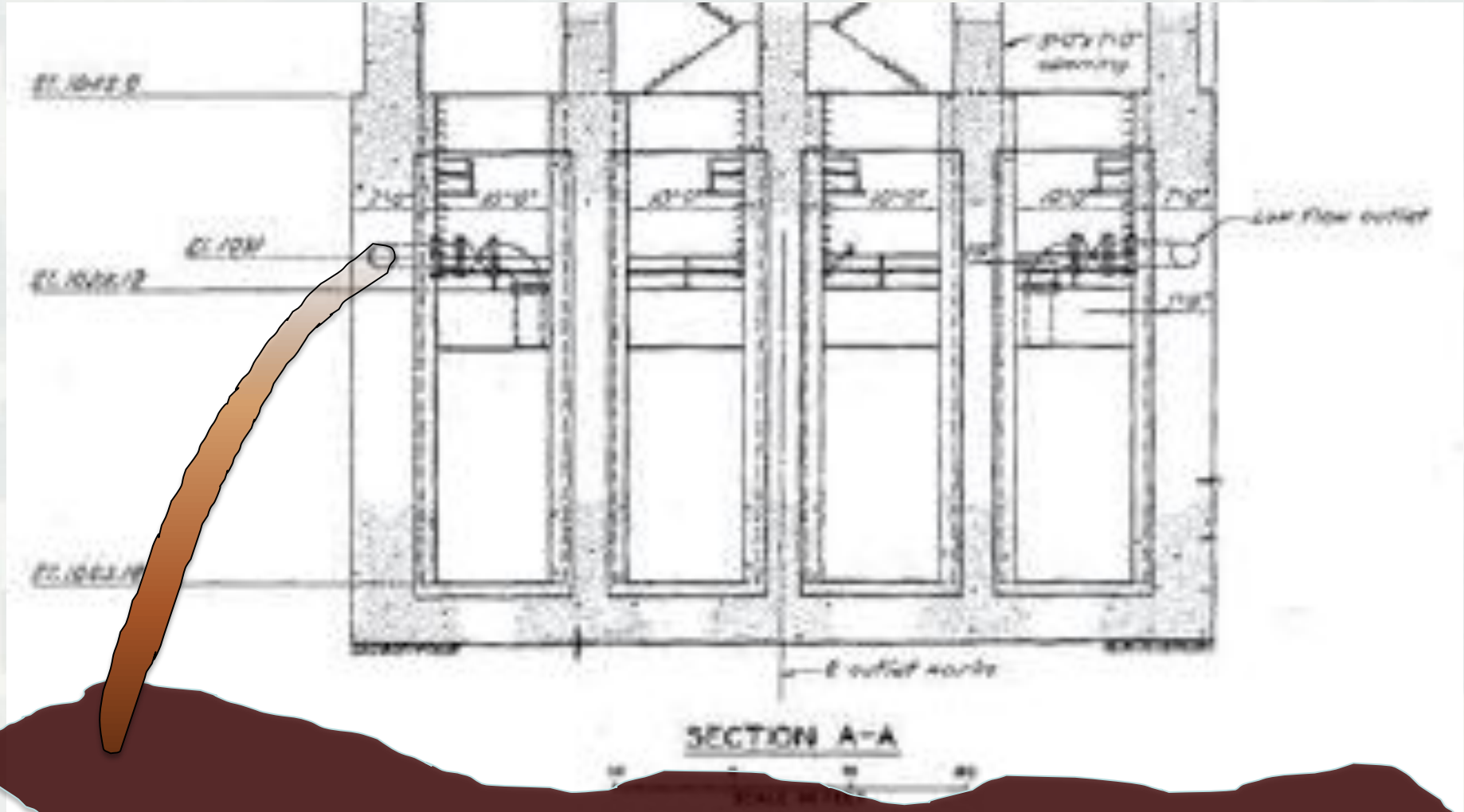

Demonstration

Summary

- Connecting the Kansas River with it's watershed is a good thing
- Practical, cost-effective methods are available for accomplishing this objective

Questions?