SEDIMENT MANAGEMENT IN KANSAS

NWSA ANNUAL MEETING

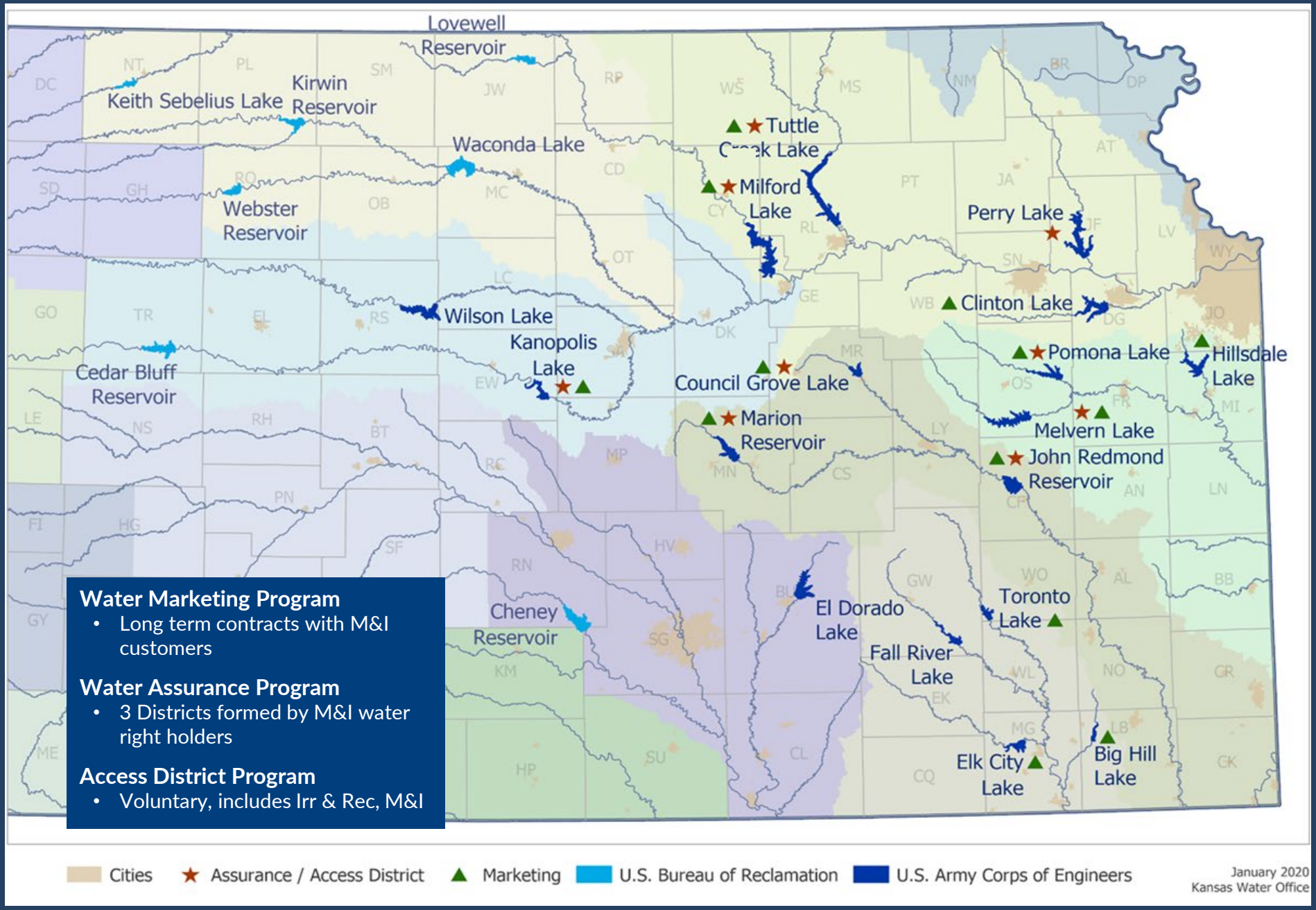
October 28, 2021

Kansas City, Missouri

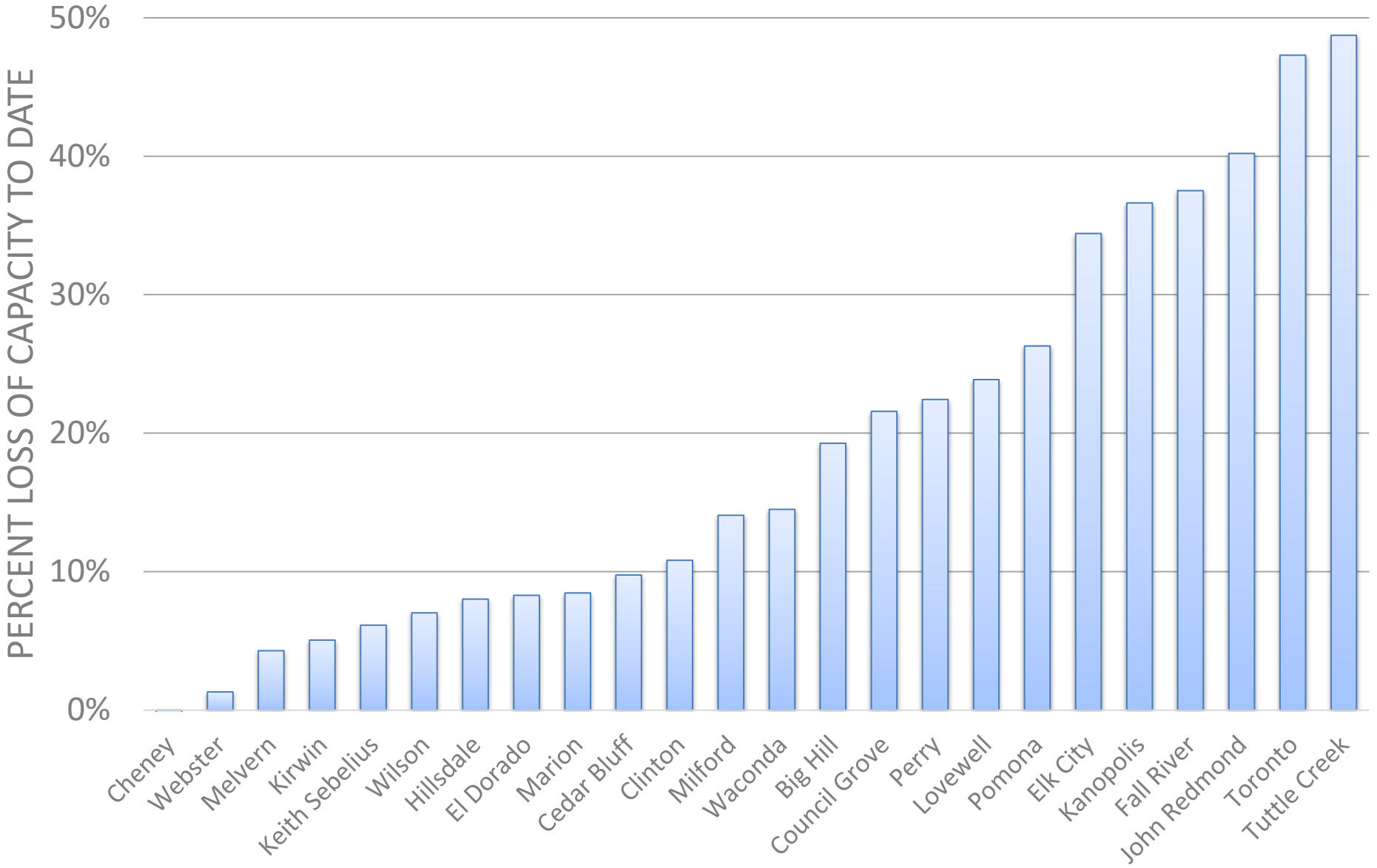
SEDIMENT MANAGEMENT IN KANSAS

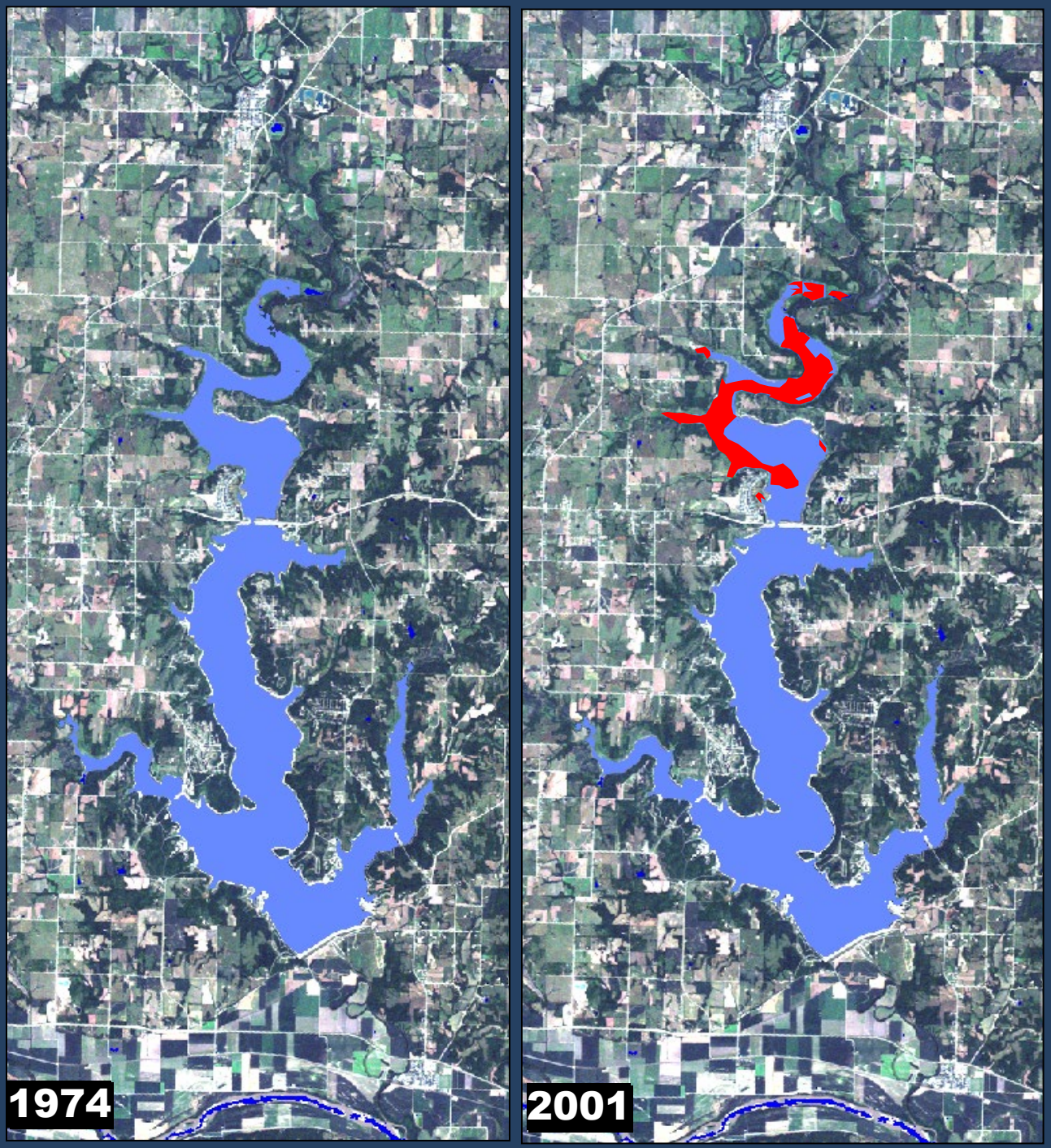
- WHERE WE HAVE BEEN
  - Tracy Streeter & Earl Lewis
- WHAT WE HAVE DONE
  - Matt Unruh
- WHERE WE ARE GOING
  - Josh Olson

WHERE WE HAVE BEEN


Lovewell Reservoir
Keith Sebelius Lake
Kirwin Reservoir
Waconda Lake
Webster Reservoir
Tuttle Creek Lake
Milford Lake
Perry Lake
Clinton Lake
Wilson Lake
Kanopolis Lake
Cedar Bluff Reservoir
Council Grove Lake
Marion Reservoir
Pomona Lake
Hillsdale Lake
Melvern Lake
John Redmond Reservoir
Cheney Reservoir
El Dorado Lake
Toronto Lake
Fall River Lake
Elk City Lake
Big Hill Lake
Water Marketing Program
• Long term contracts with M&I customers
Water Assurance Program
• 3 Districts formed by M&I water right holders
Access District Program
• Voluntary, includes Irr & Rec, M&I
Cities
Assurance / Access District
Marketing
U.S. Bureau of Reclamation
U.S. Army Corps of Engineers
January 2020
Kansas Water Office

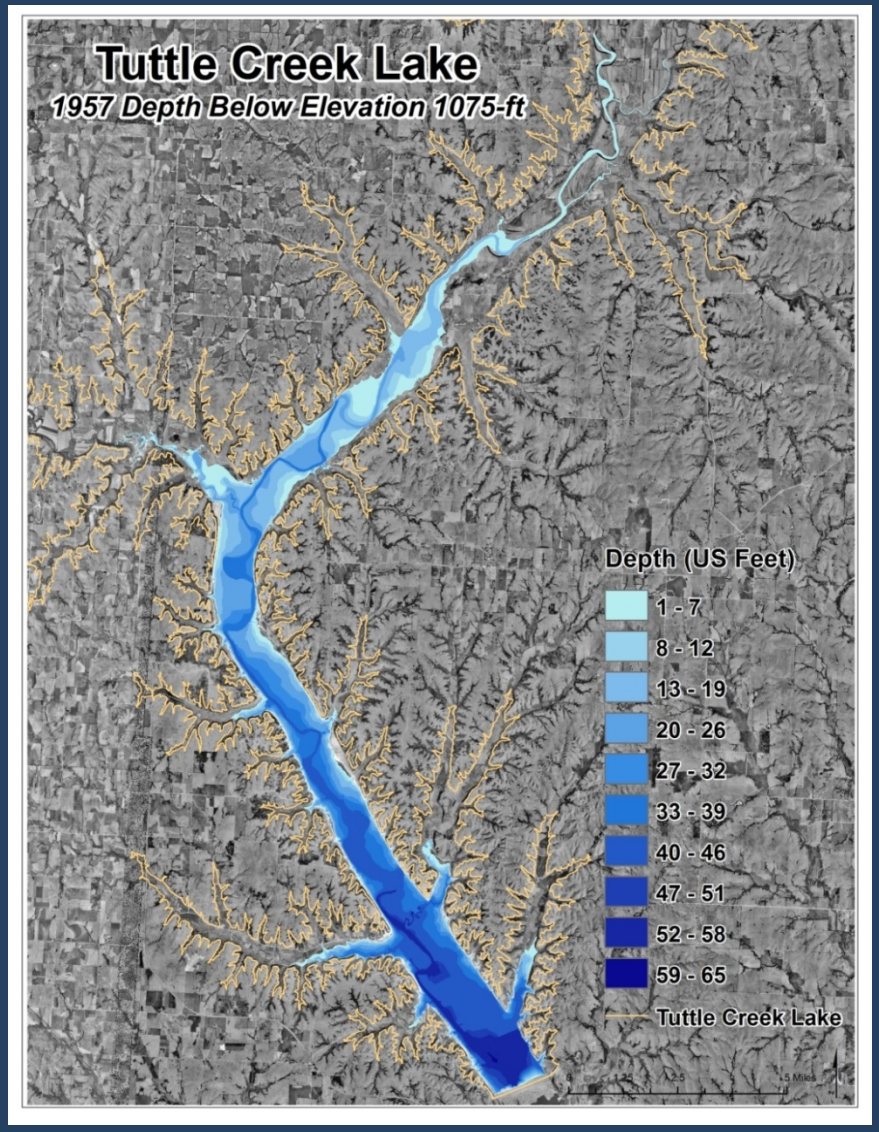
Reservoir Sedimentation Capacity Loss

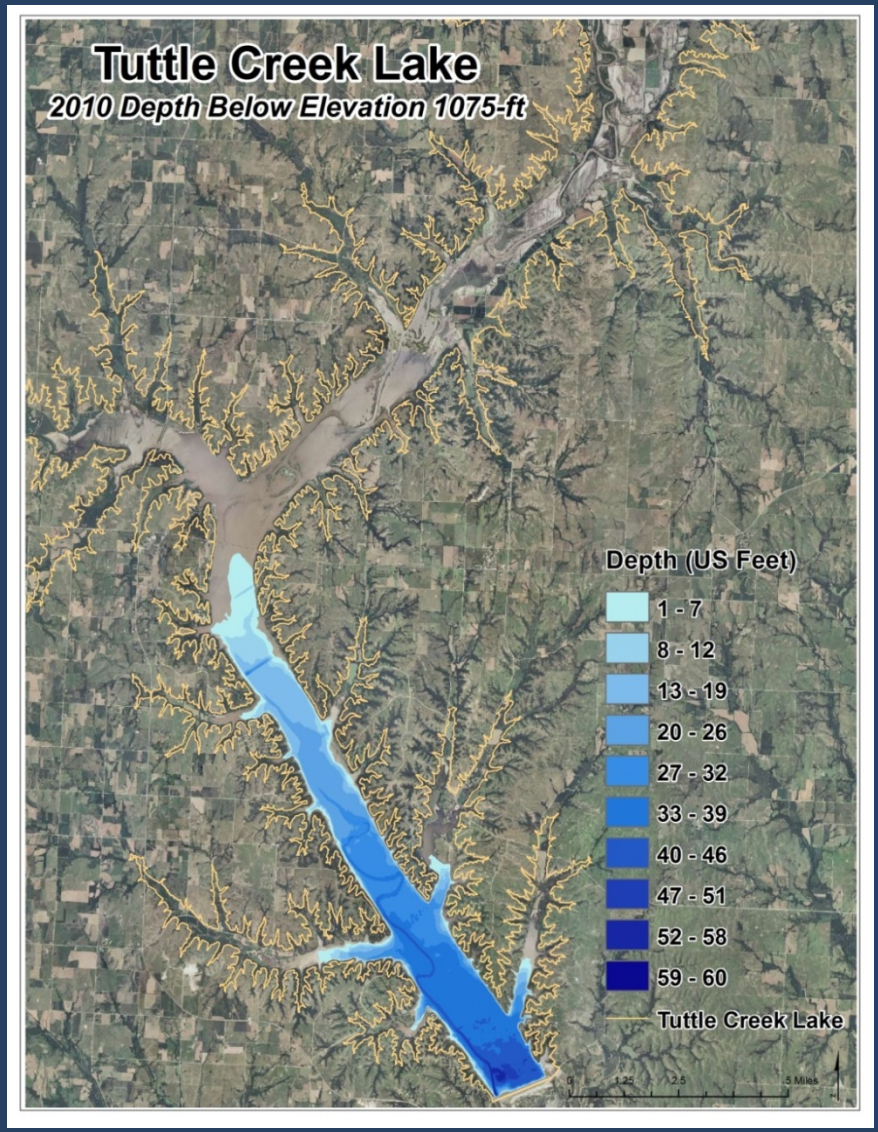


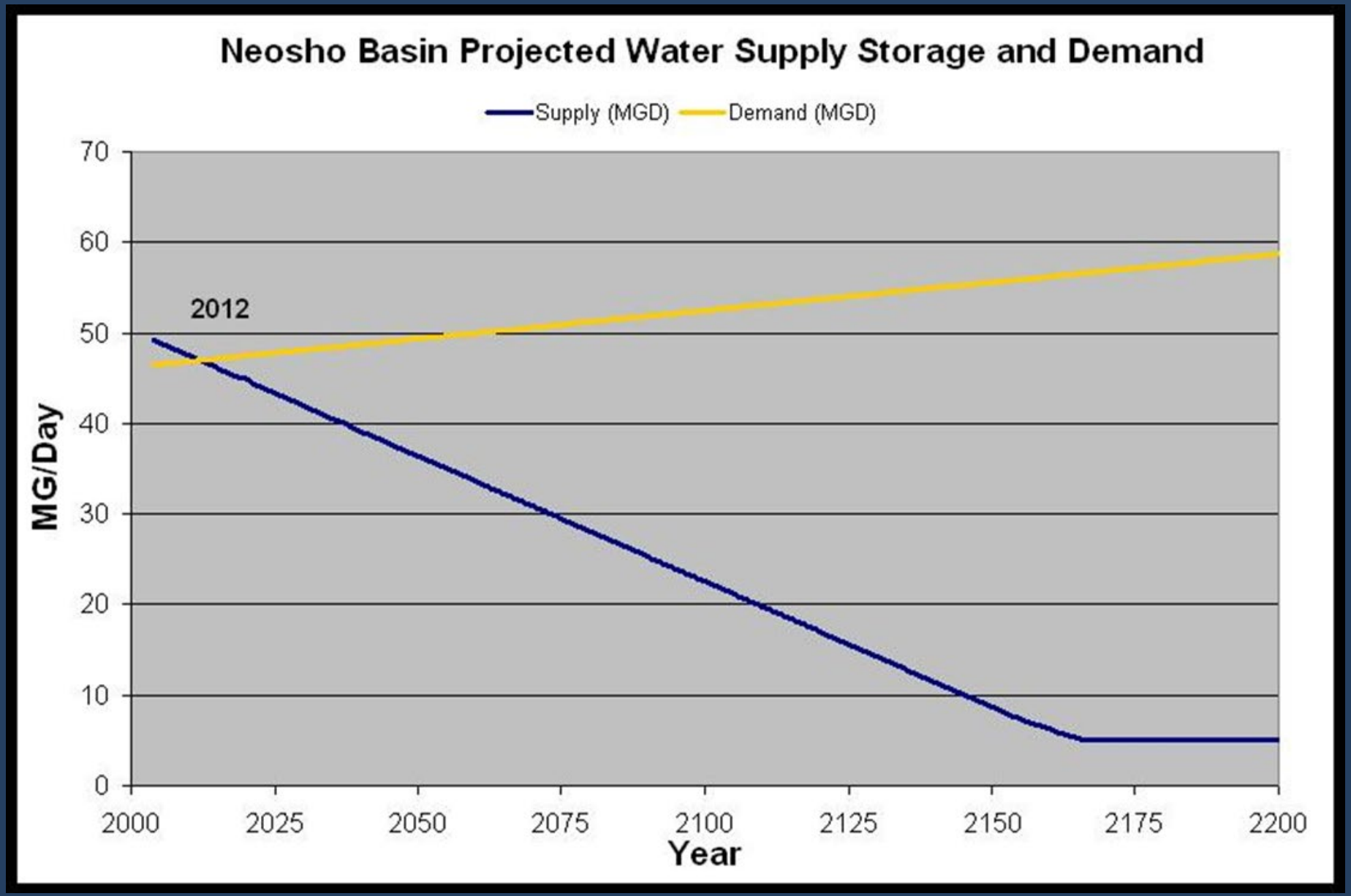

1974
2001

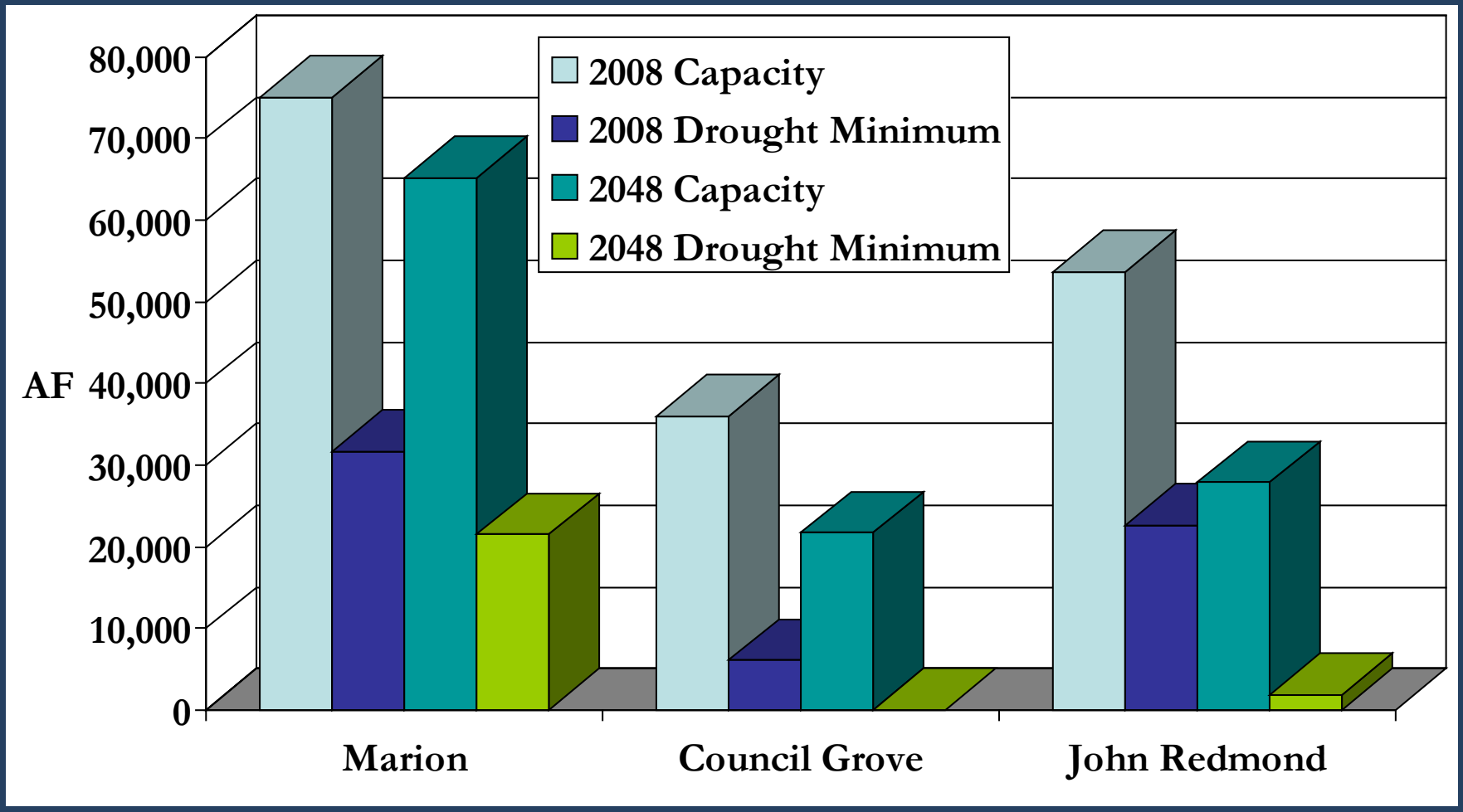

1974


2001

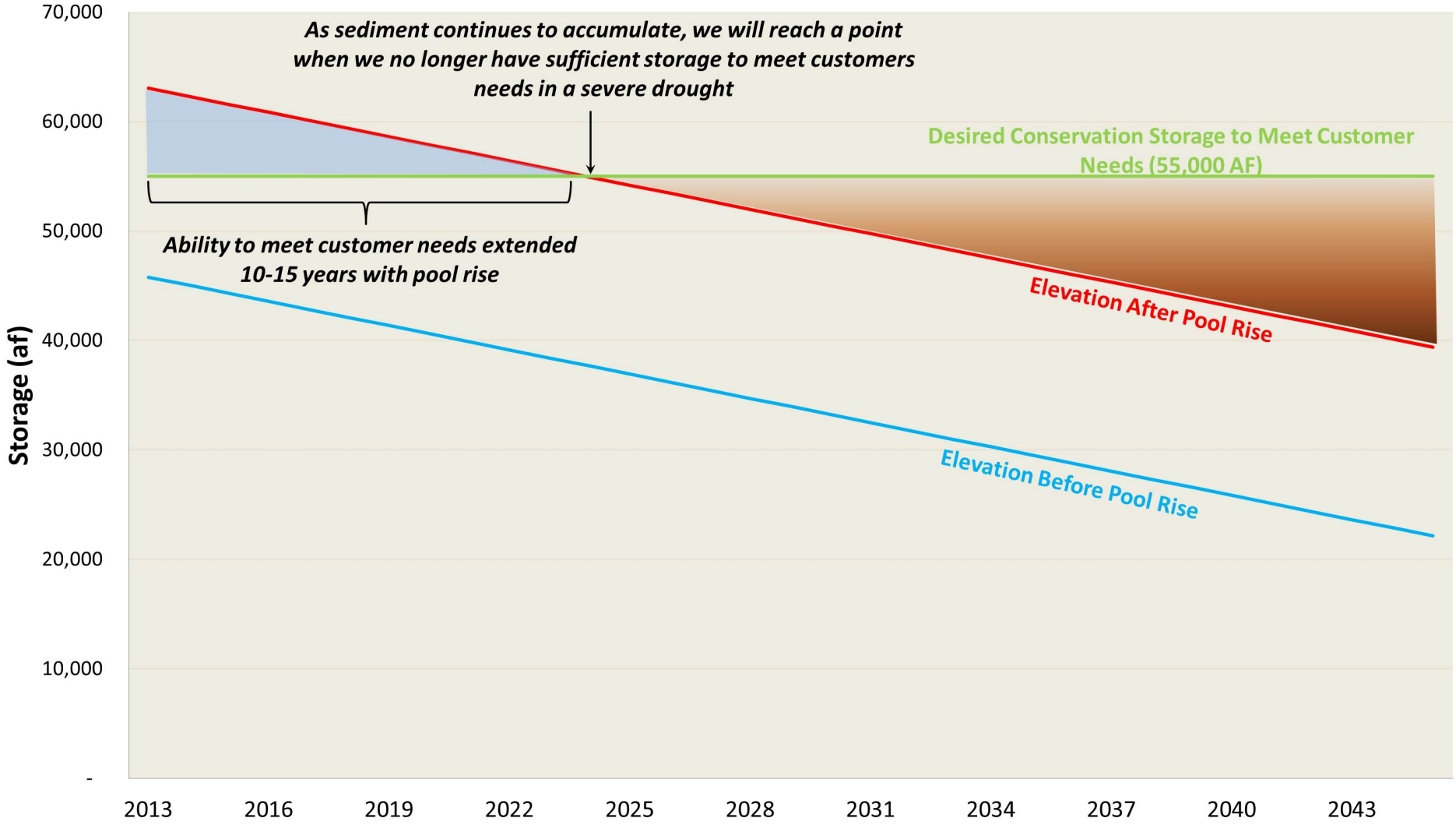

Tuttle Creek Lake
1957 Depth Below Elevation 1075-ft
Depth (US Feet)
1 - 7
8 - 12
13 - 19
20 - 26
27 - 32
33 - 39
40 - 46
47 - 51
52 - 58
59 - 65
Tuttle Creek Lake
0
1.25
2.5
5 Miles


Tuttle Creek Lake
2010 Depth Below Elevation 1075-ft
Depth (US Feet)
1 - 7
8 - 12
13 - 19
20 - 26
27 - 32
33 - 39
40 - 46
47 - 51
52 - 58
59 - 60
Tuttle Creek Lake
0
1.25
2.5
5 Miles


Neosho Basin Projected Water Supply Storage and Demand
Supply (MGD)
Demand (MGD)
2012
MG/Day
70
60
50
40
30
20
10
0
2000
2025
2050
2075
2100
2125
2150
2175
2200
Year


80,000
70,000
60,000
50,000
AF 40,000
30,000
20,000
10,000
0
2008 Capacity
2008 Drought Minimum
2048 Capacity
2048 Drought Minimum
Marion
Council Grove
John Redmond

John Redmond Conservation Storage



WHAT WE HAVE DONE

Dredging and Disposal Site Reclamation at John Redmond Reservoir, Kansas


Slurry Pipeline
Confined Disposal Facility (CDF)
Dredge Area
Staging Area
John Redmond Reservoir
CDF B
CDF F
CDF E
CDF I - North
CDF I - South
Neosho River
N
0 0.25 0.5 1
Miles

PROJECT PERMITTING

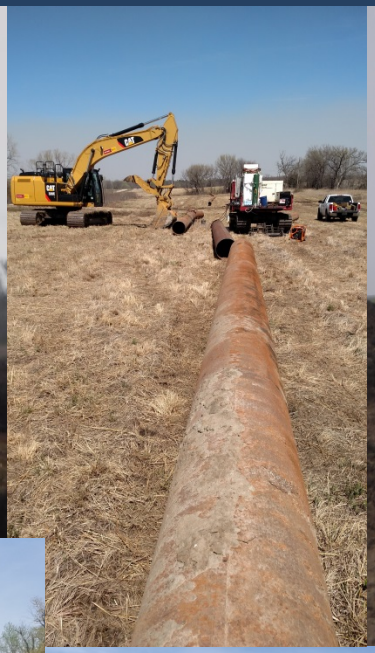
- 33 U.S.C. Section 408
  - RoD Authorized KWO to conduct project on federal property
  - Programmatic Environmental Impact Statement (PEIS)
- Section 106 Programmatic Agreement
  - USACE Tulsa District, KSHS & Osage Nation of Oklahoma
  - Ensure any historic sites were identified/protected
- Section 404 Permit (USACE) & Stream Obstruction Permit (DWR)
  - Slurry pipeline crossing of Neosho River
- Dam Safety Permits KDA-DWR
  - Required for all CDFs (based on DWR dam criteria)
- Floodplain Fill Permits (DWR)
  - CDFs B and F (SFHA Zone A)
- Water Term Permit (DWR)
  - Authorized use of water from Redmond for dredging purposes (> 6 months)
- NOI for Stormwater Runoff from Construction Activities (KDHE)
- NPDES Permit (KDHE)
  - Effluent Limits at point of discharge

PHASE I IMPLEMENTATION TIMELINE

- 2012 - Planning process begins with USACE
- May 2015 – Section 408 Request Final RoD and FONSI on Programmatic EIS Issued.
- November 2015 – June 2016: Confined Disposal Facility (CDF) construction takes place
- May 2016: Dredging operations begin
- October 2016: Dredging operations complete
- October 2016: CDF dewatering efforts begin
- 2017 to current: CDF reclamation

CDF CONSTRUCTION

PIPELINE WORK



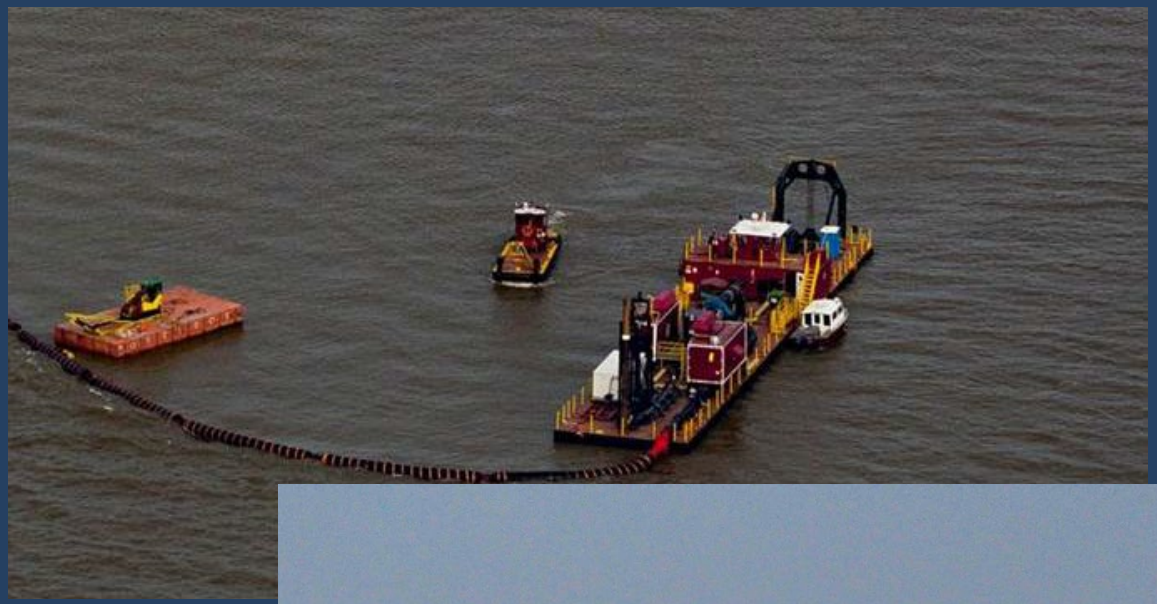
NEOSHO RIVER
SLURRY PIPELINE CROSSING

DREDGING MOBILIZATION

DREDGE “LP”

22” ELECTRIC DREDGE “LP”

- CSD “LP”
  - 22” Discharge
  - 3,500 Total HP
- Booster Pump
  - 1,000 HP
- Crane Barge
- Tug Boats
- Survey Vessels
- Crew Vessels
- Skidder Barge



ONSHORE BOOSTER STATION

21,000 Gallon Frack Tank with 4” Electric Pump (175 GPM)

10,000 Gallon Fuel Tank with Secondary Containment

O/A Length: 40’

Width: 12’

Height: 16’

HP: 1,000HP Cat. 399

Discharge Diameter: 18”

DREDGED MATERIAL ENTERING CDF E

GRAVITY TREATED WATER ENTERING FINAL CLARIFICATION CELL (CDF B)

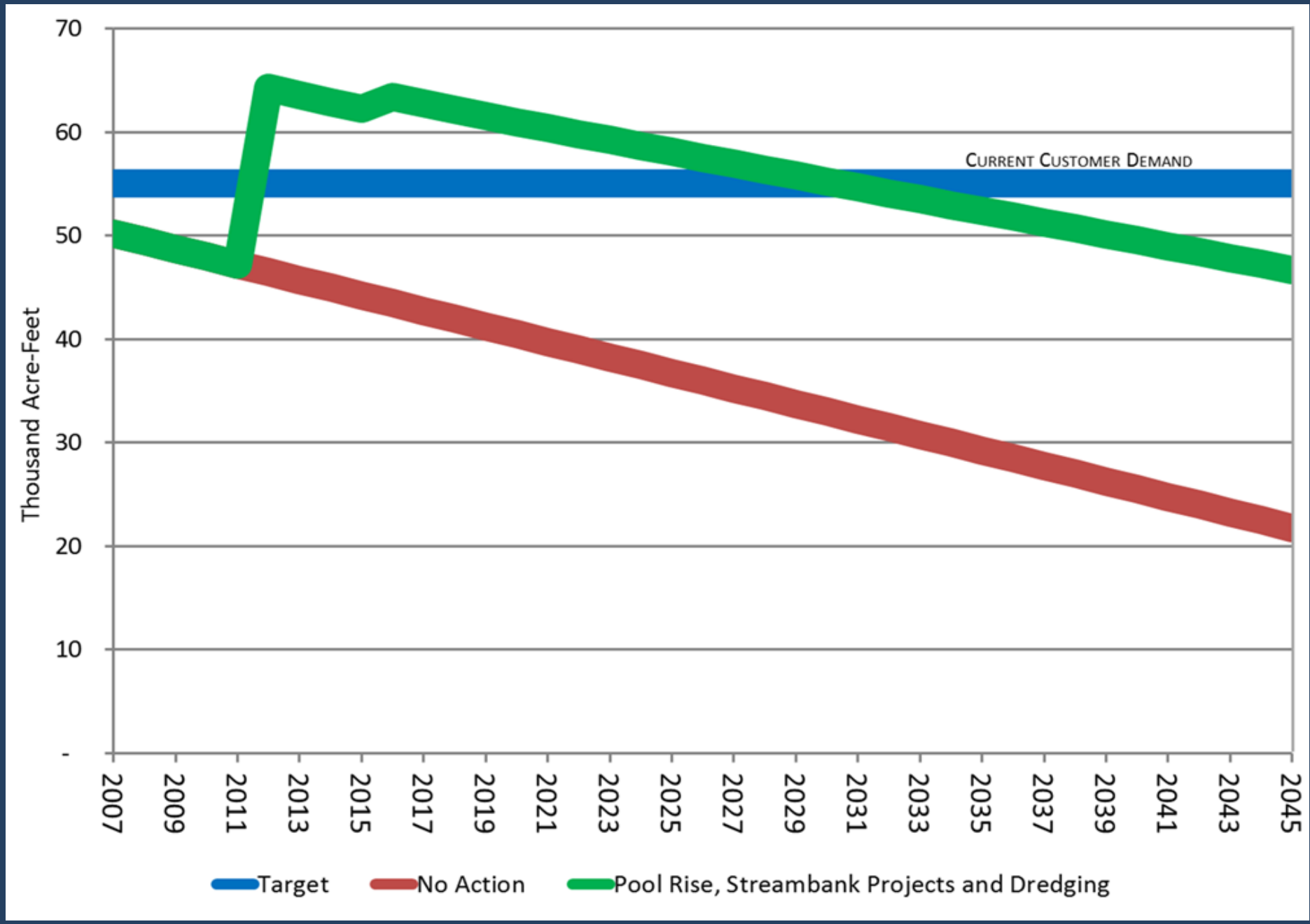
EFFLUENT DISCHARGE TO NEOSHO RIVER

CONFINED DISPOSAL FACILITIES

PROJECT SUMMARY

- 3,000,000 CY of sediment removed (~1,900 AF)
  - Average: ~19,000 CY/day
  - Max: ~32,000 CY/day
- $20 million ~ $6.67/CY
  - Total cost includes permitting, engineering & design, construction, dredging, lease payments and land reclamation
  - Includes some funds for watershed practices above reservoir
- Project financed by 15-year Bond
  - State Water Plan Funds
  - Water Sales Revenue through Water Marketing Program

SUPPLY vs DEMAND

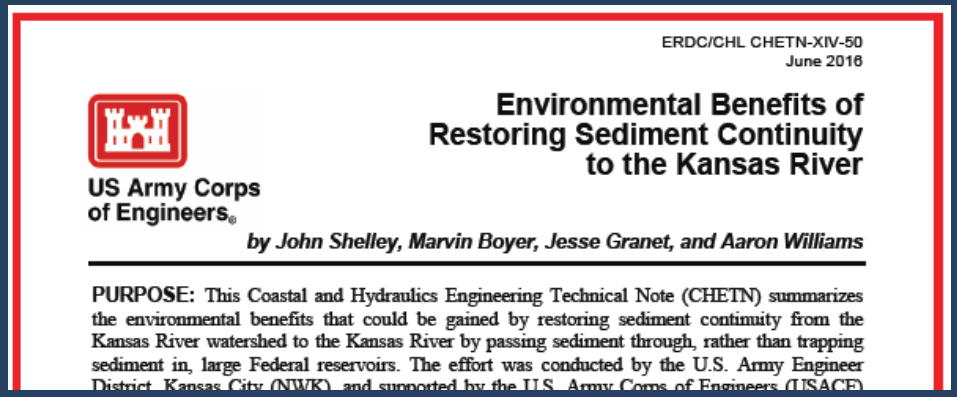


WHERE WE ARE GOING

Tuttle Creek Reservoir

Reduced Sediment Load in 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



ERDC/CHL CHETN-XIV-50
June 2016

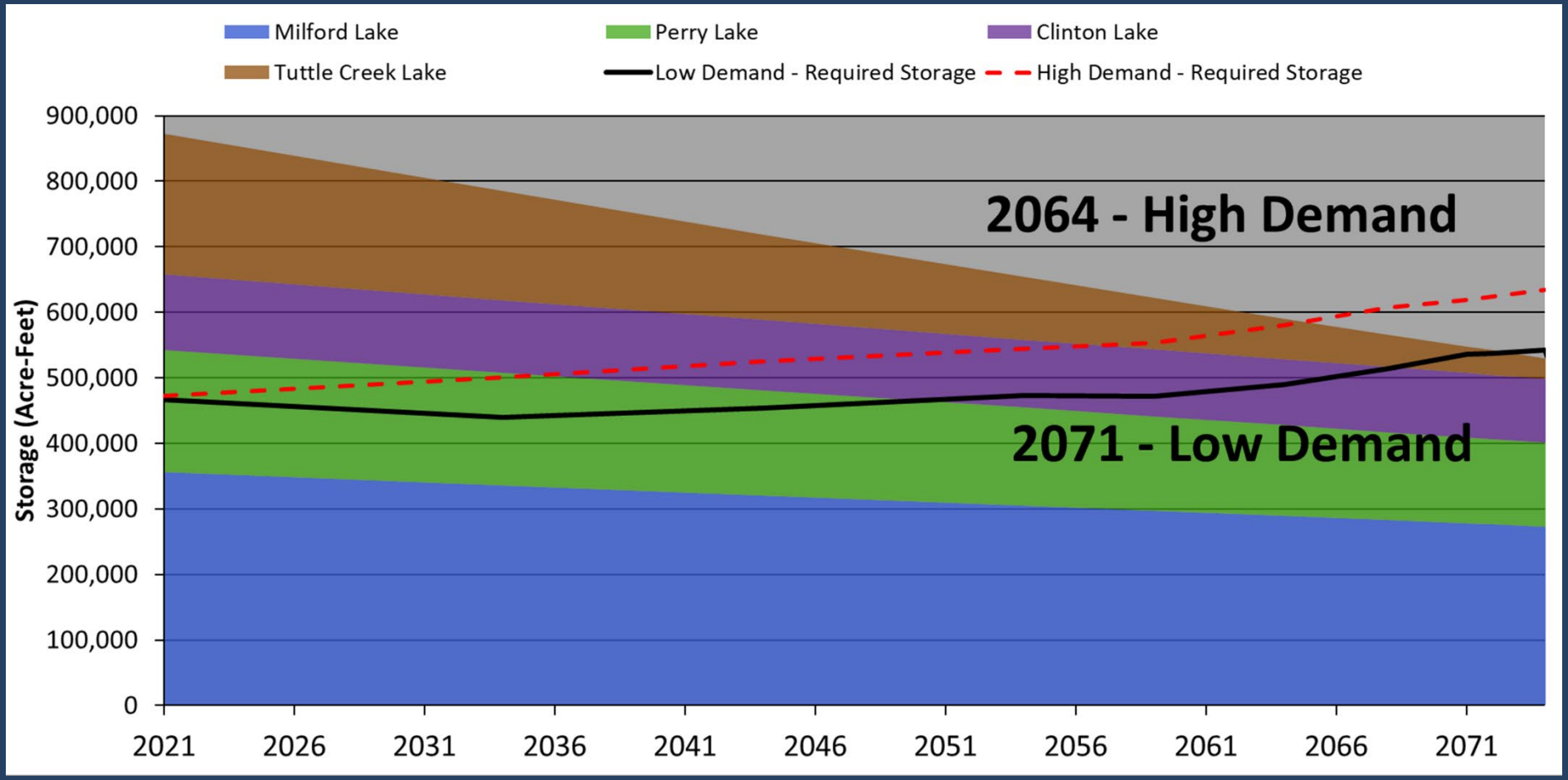
US Army Corps of Engineers

Environmental Benefits of Restoring Sediment Continuity to the Kansas River

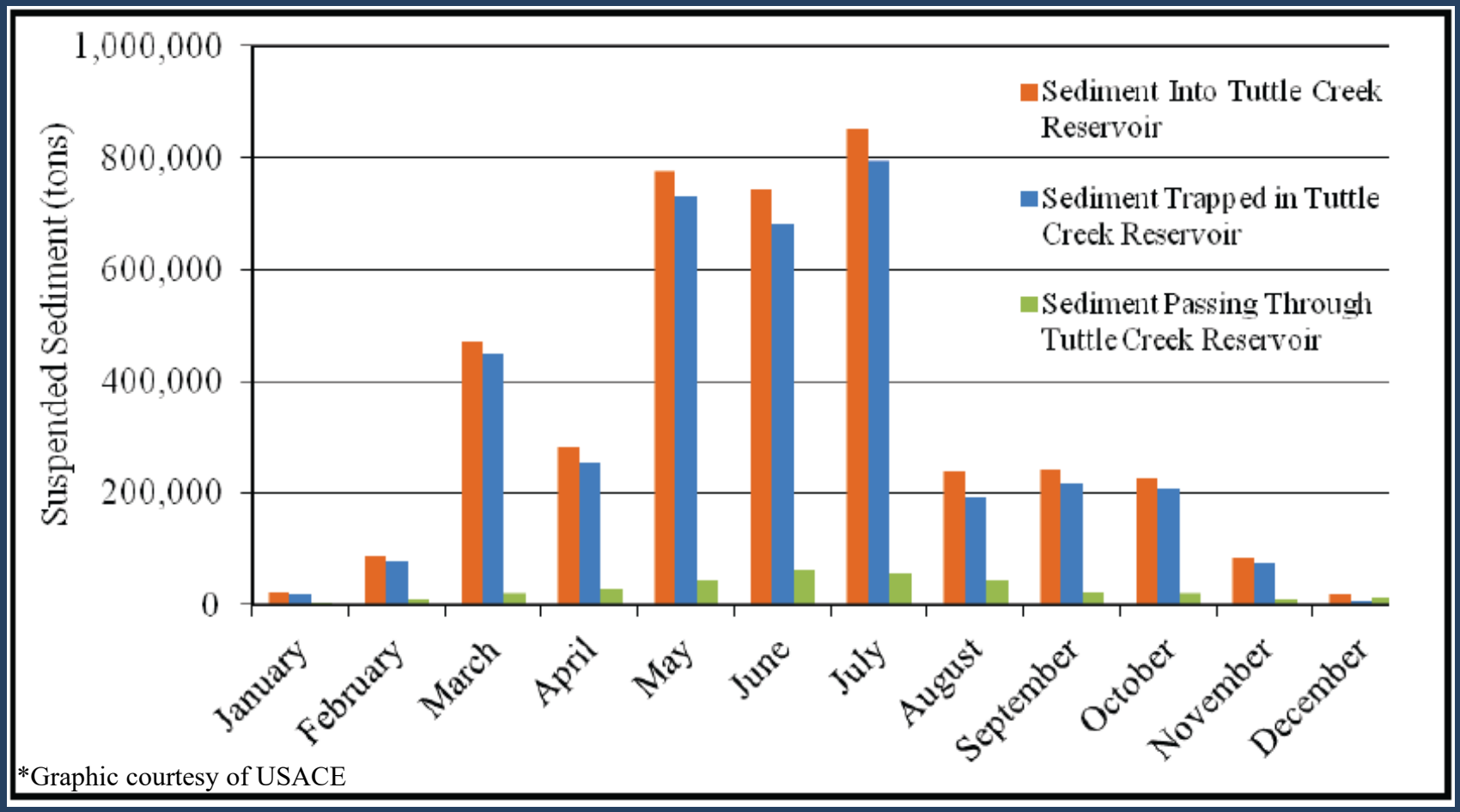
by John Shelley, Marvin Boyer, Jesse Granet, and Aaron Williams

PURPOSE: This Coastal and Hydraulics Engineering Technical Note (CHETN) summarizes the environmental benefits that could be gained by restoring sediment continuity from the Kansas River watershed to the Kansas River by passing sediment through, rather than trapping sediment in, large Federal reservoirs. The effort was conducted by the U.S. Army Engineer District, Kansas City (NWK), and supported by the U.S. Army Corps of Engineers (USACE)

Kansas River Basin Projected Water Supply

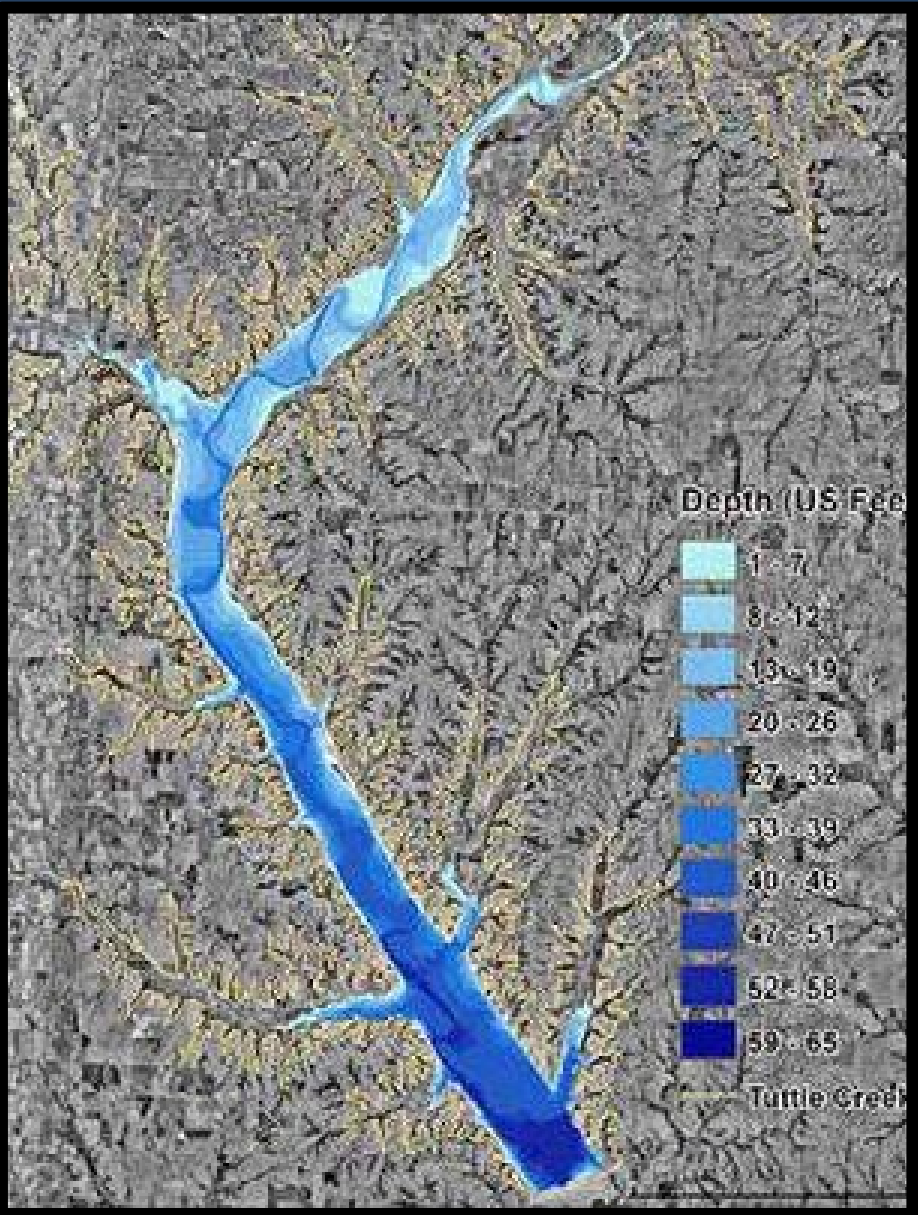


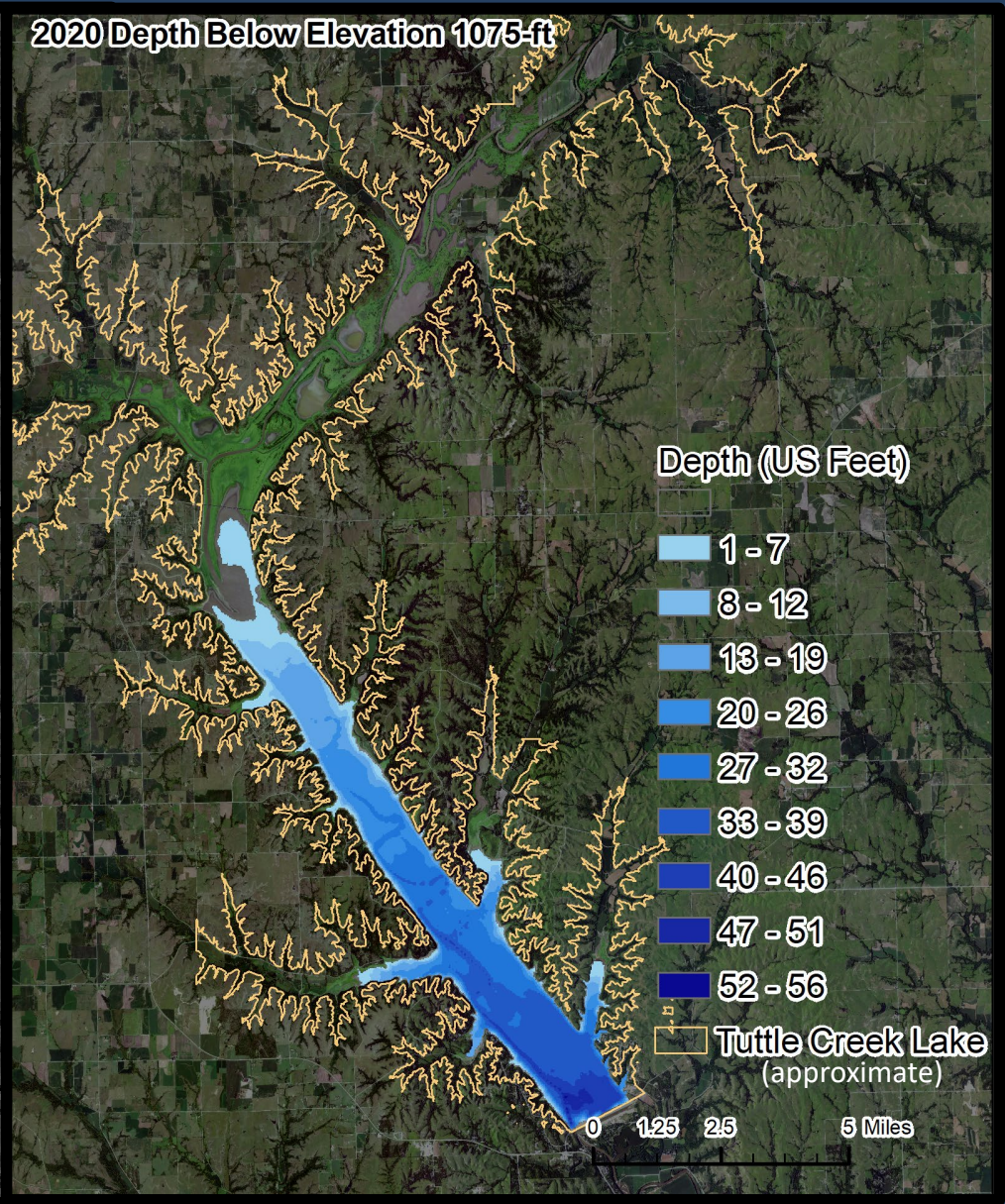
Reservoir Sediment Sustainability



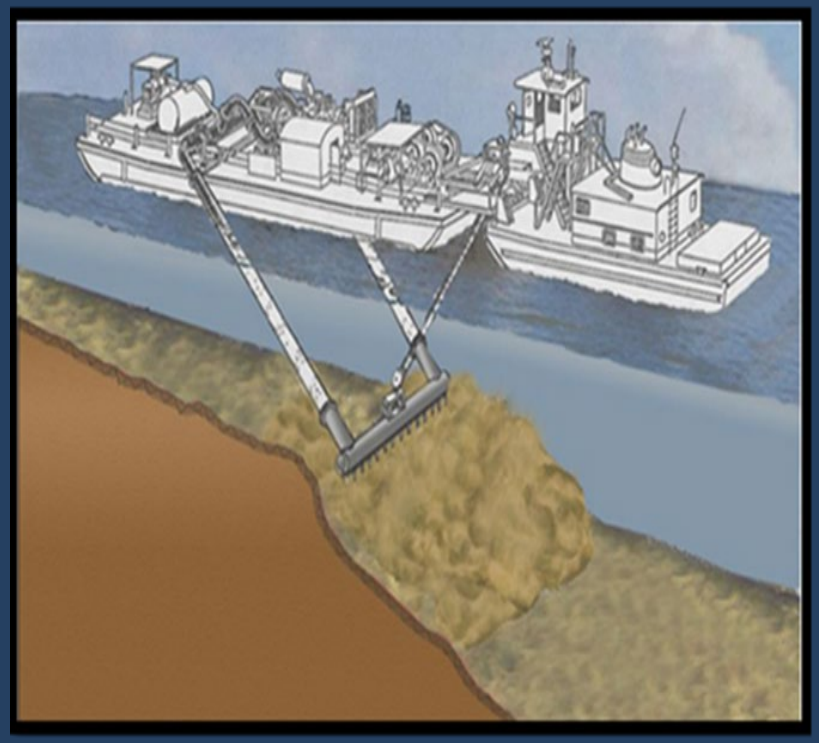
*Graphic courtesy of USACE

Tuttle Creek Lake: 1957 to 2020



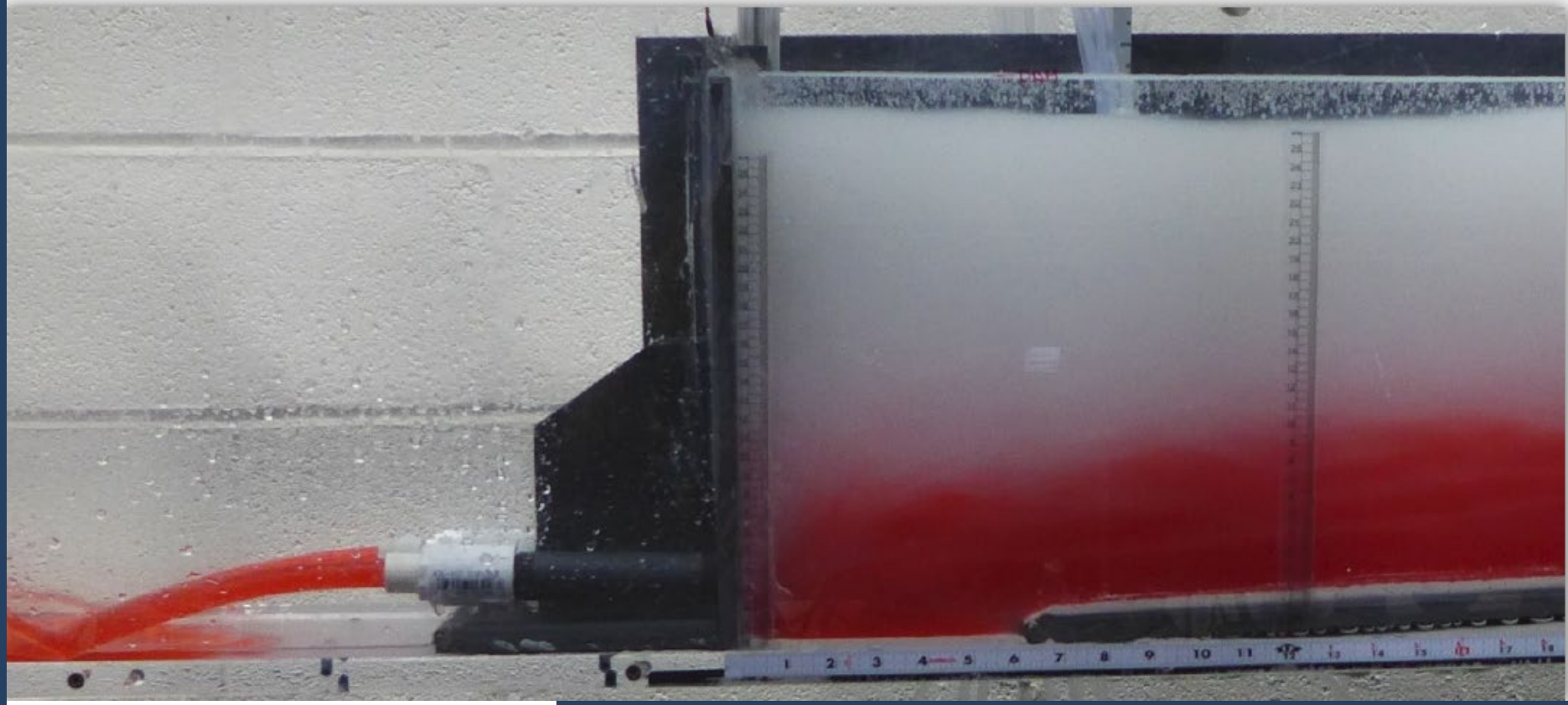


Water Injection Dredging



- Inject water into the sediment deposits to induce a density current
- Open the gates and release the sediment through the existing conduit

Density Current Venting



*Courtesy of U.S. Corps of Engineers

KBS Coring and Sampling

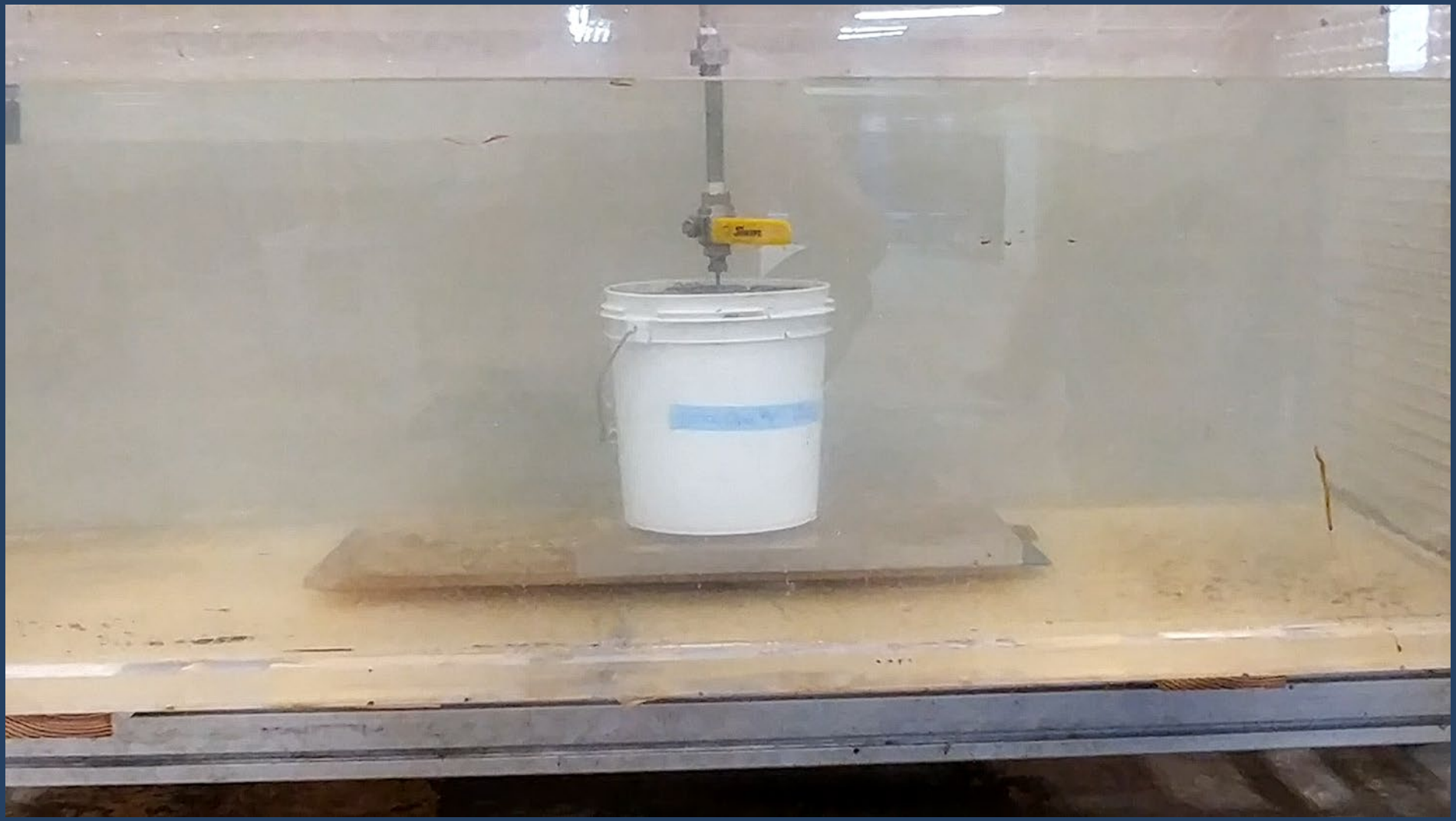
ERDC Sediment Property Analysis

	Tuttle Creek Surface Sample ID		
Property	**1 to 5**	**6**	**7**
In situ or natural water content	322.3	329.2	246.9
Liquid Limit, LL	161.9	144.1	110.9
Plastic Limit, PL	61.9	50.8	47.1
Plasticity Index, PI	100.0	93.3	63.9
Liquidity Index, LI	2.60	2.98	3.13
%Clay	62.0	60.0	39.0
%Silt	38.0	40.0	58.0
%Sand	0.0	0.0	3.0
Classification	CH	CH	CH

Water Quality Analysis

- Developed in coordination with KDHE and other stakeholders
- Results compared to 1999 USGS and 2017 USACE sediment analyses

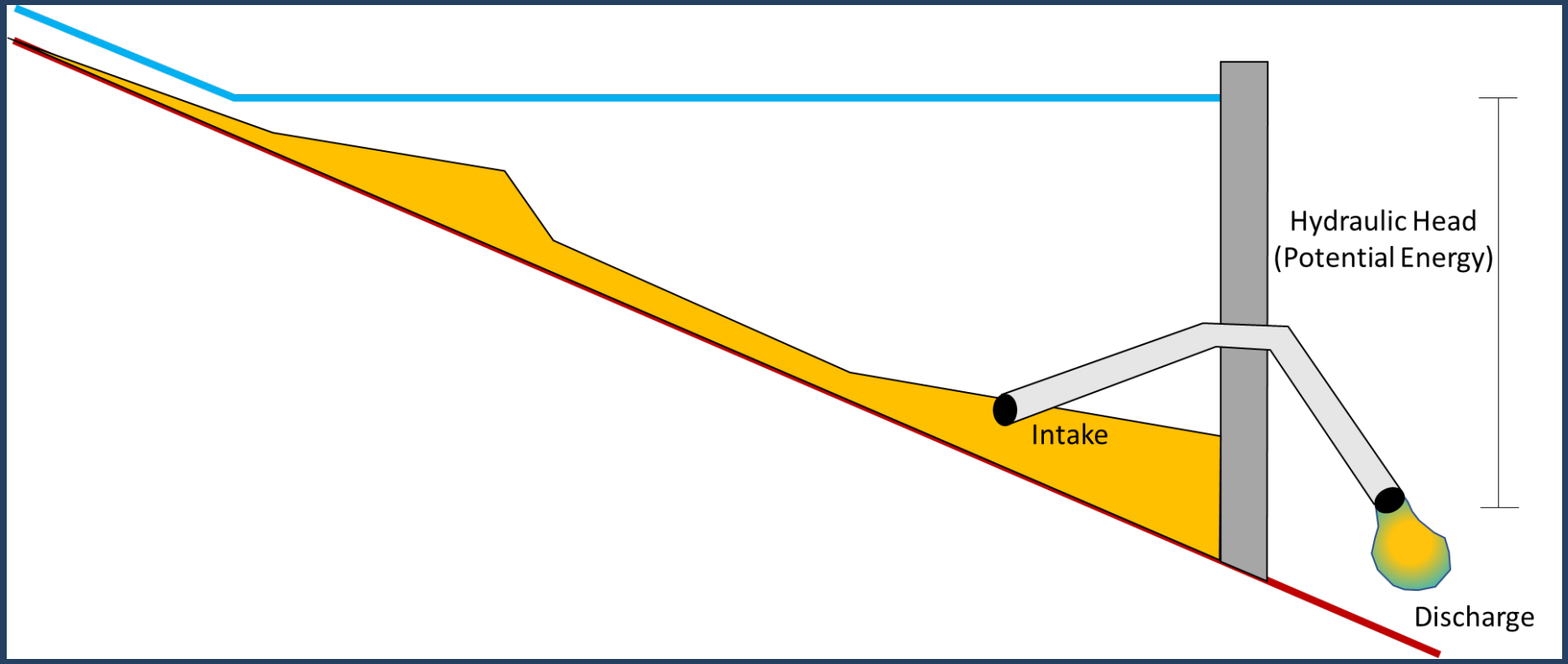
- SVOCs
- PCBs
- Organophosphorus compounds
- Nutrients
  (phosphorus, nitrate, nitrite, TKN, ammonia)
- pH
- Metals (22-TAL)
- Mercury
- Total organic carbon
- Organo-pesticides (including chlordane)
- Chlorinated herbicides



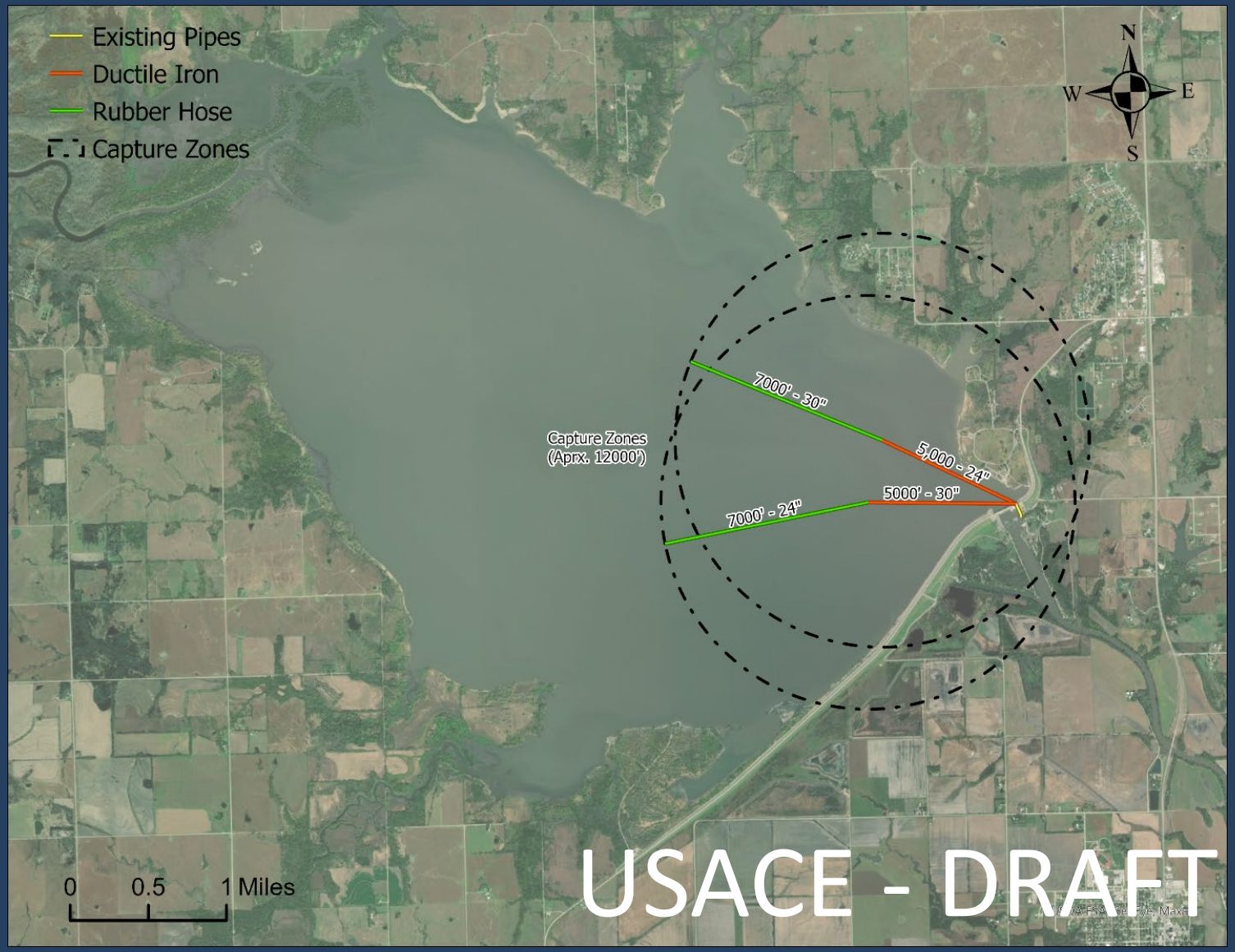
Lab Trial Video

*Courtesy of USACE Engineer Research and Development Center

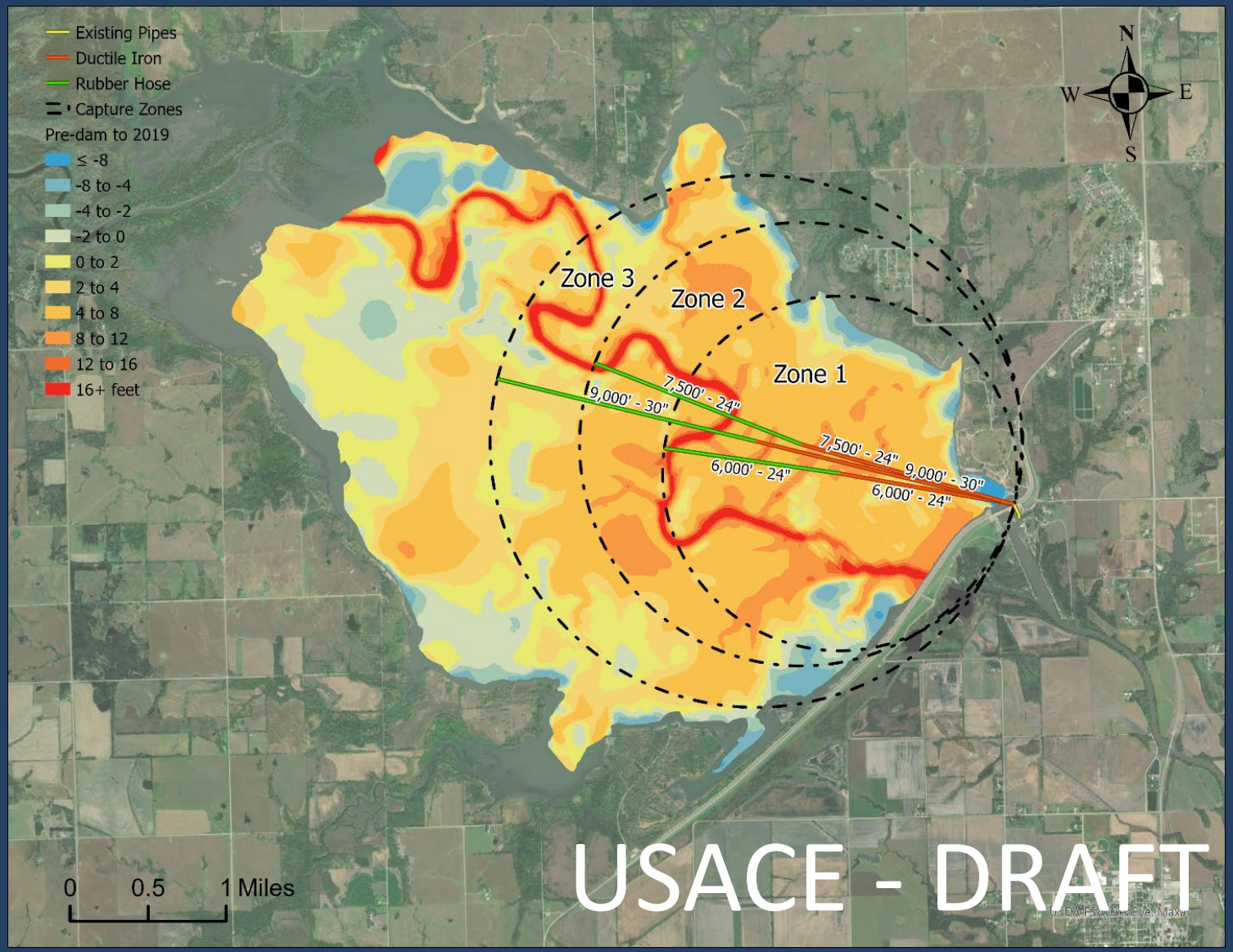
Hydrosuction



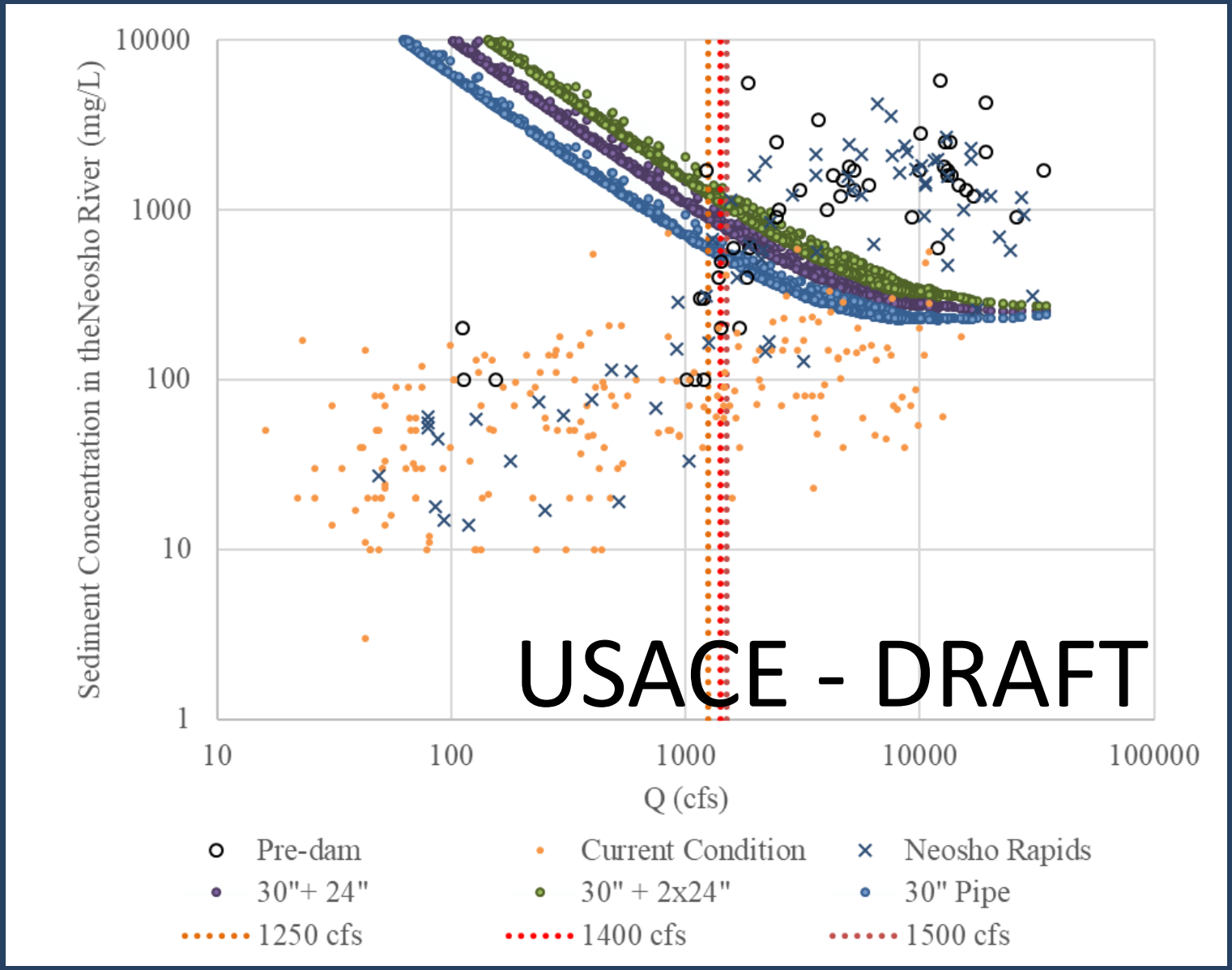
Two-Pipe Configuration



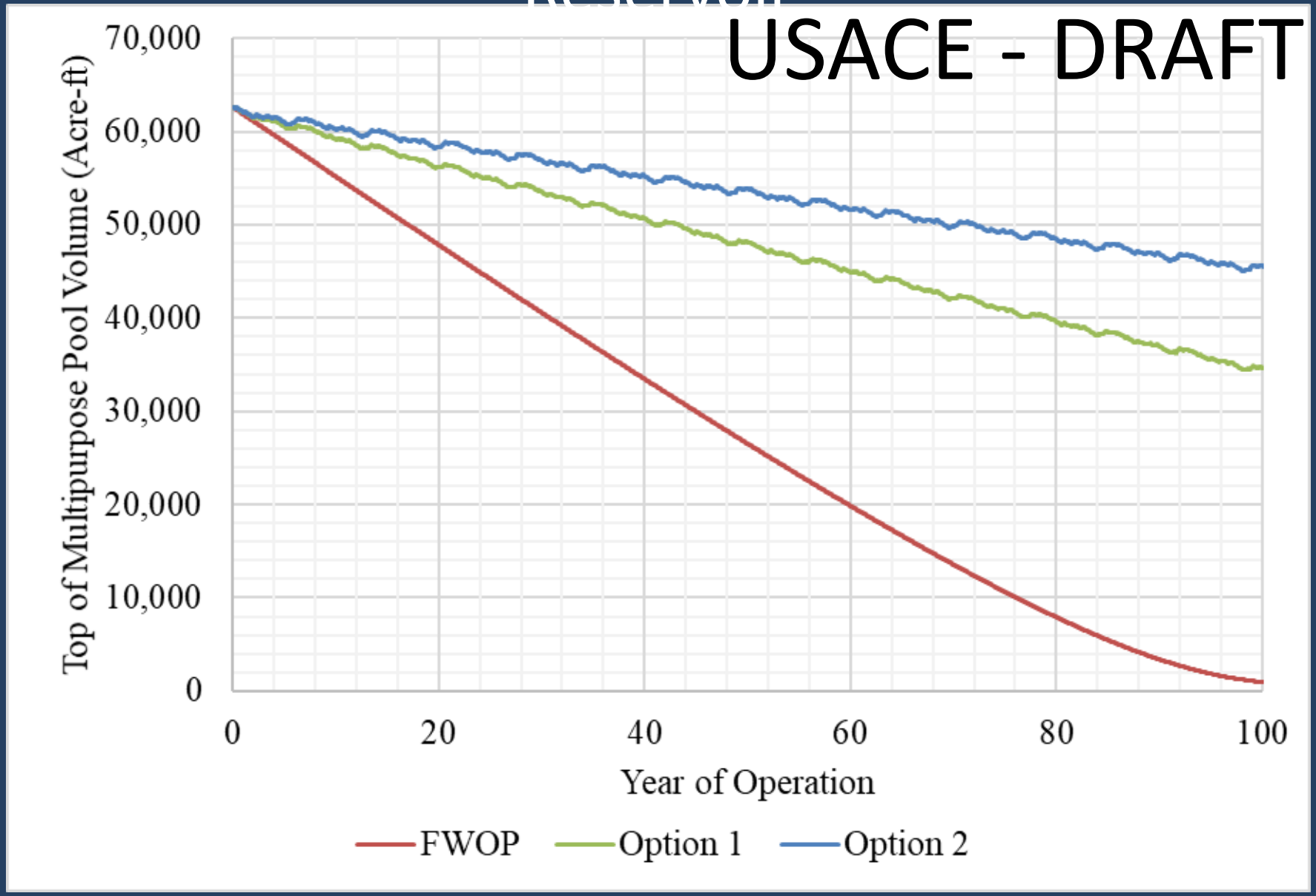
Three-Pipe Configuration



Limited Operation Based on Neosho River Flows



Potential Impact at John Redmond Reservoir



QUESTIONS & DISCUSSION

Thank You!