

NASHVILLE DISTRICT WATER MANAGEMENT

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OUTLINE

- Background
- Cumberland River Basin Reservoir System
- Water Management Program
 - Operating Objectives
- February High Water Event
- Summary/Questions



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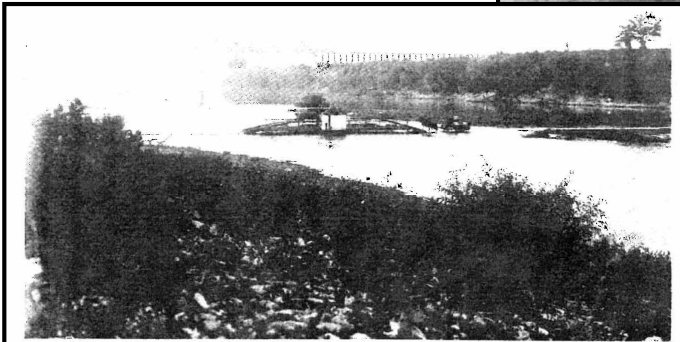
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A REGION THAT RELIES ON THE RIVERS

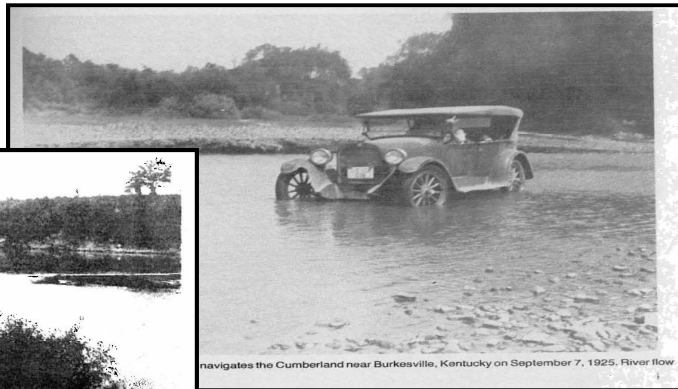


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Low Water on the Cumberland River



Low water on the Cumberland River at Clarksville on October 10, 1913. Teams and wagons were fording the river, driving across the ferry, and continuing to the opposite bank. The Clarksville gage read 0.5 feet on this day.



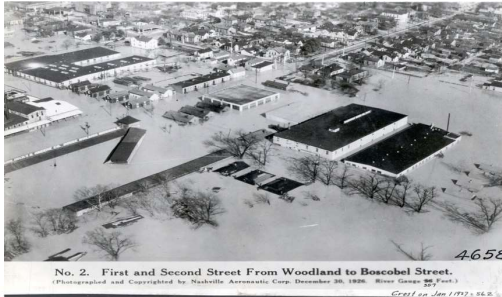
...navigates the Cumberland near Burkesville, Kentucky on September 7, 1925. River flow



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A HISTORY OF FLOODING

Major Flooding in the 1920's and 1930's Prompted Passage of the Flood Control Act of 1938



1926-1927 Flood at Nashville



1937 Flood near current site of Barkley Dam

- Investigation of 6 Reservoir Sites along Cumberland and Tributaries
- Authorized Construction of Wolf Creek, Center Hill, and Dale Hollow Dams



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NAVIGATION DEVELOPMENT

Commercial River Traffic Hindered by Size of Locks Constructed for Steamboat Traffic Prior to 1924

1945 – Nine-foot Minimum Channel Depth Proposed Requiring Construction of Modern Locks for Lower Cumberland

- Construction of Barkley, Cheatham, Old Hickory, and Cordell Hull Lock and Dams Commence
- Modern System of Today Established



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Authorizing Legislation

Flood Control Act of 1938: PL 75-761

- Wolf Creek (1952)
- Dale Hollow (1953)
- Center Hill (1951)
- J. Percy Priest (1970)

River and Harbor Act of 1946: PL 79-525

- Cordell Hull (1974)
- Old Hickory (1957)
- Cheatham (1959)
- Barkley (1966)

Flood Control Act of 1960: PL 86-645

- Laurel (1977)

Flood Control Act of 1965: PL 89-298

- Martins Fork (1978)



Wolf Creek Dam 1940's



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CUMBERLAND RIVER BASIN

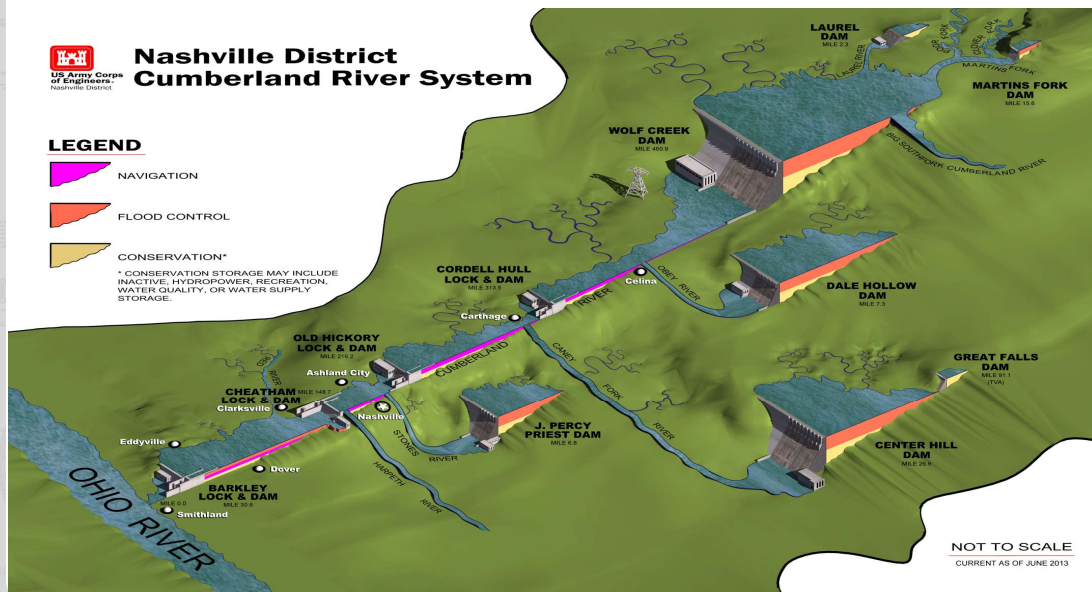


Nashville District Cumberland River System

LEGEND

- NAVIGATION
- FLOOD CONTROL
- CONSERVATION*

* CONSERVATION STORAGE MAY INCLUDE
INACTIVE, HYDROPOWER, RECREATION,
WATER QUALITY, OR WATER SUPPLY
STORAGE.



NOT TO SCALE
CURRENT AS OF JUNE 2013



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CUMBERLAND RIVER BASIN RESERVOIR SYSTEM

System of 10 multi-purpose projects:

- Flood Damage Reduction
 - 5.3 M acre-feet of flood storage
 - > \$4.2B in flood damages prevented through FY18
 - 77% of drainage area above Nashville is controlled
- Hydropower
 - 9/10 projects have hydropower
 - 925 MW capacity from 28 hydropower turbines
- Navigation
 - 380 miles of navigable waterway (4 locks)
 - TN River (10 locks)

Drainage Area – ~18,000 square miles

River Length – 694 miles

- Recreation
 - 5 Nashville District projects in top 25 nationally
 - 31.3 M visitors per year (> \$700 M economic impact)
- Fish and Wildlife
 - Environmental restoration projects
 - Low Flow Releases
- Water Quality
 - Special Operations to meet EOPs
- Water Supply
 - 17 Water Supply Agreements
 - ~75 Known M&I Users

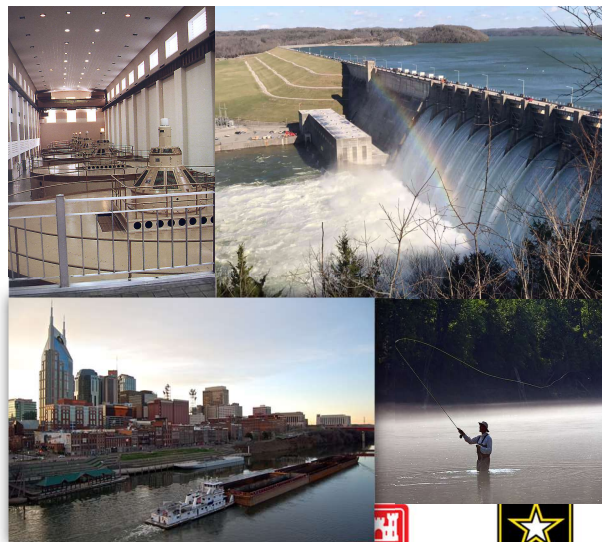


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WHAT IS WATER MANAGEMENT?

A constant and ever-changing balancing act.

- Project Authorized Purposes
- Environmental Statutes
- Changing Societal Values/Expectations



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Water Management Team

- Nashville District Water Management
 - Multidisciplinary staff – engineers & scientists
 - Perform complete system analysis every day
- Nashville District Operators
 - 24/7 operational support
- Great Lakes & Ohio River Water Management
 - Ohio/Mississippi flood control operations
 - Program oversight
- Federal Partners
 - Tennessee Valley Authority (TVA)
 - National Weather Service
 - U. S. Geological Survey
 - FEMA
- State/Local Partners
 - TWRA, TEMA, and TDEC
 - KDFWR, KYEM, and KDOW
 - METRO Nashville, other localities

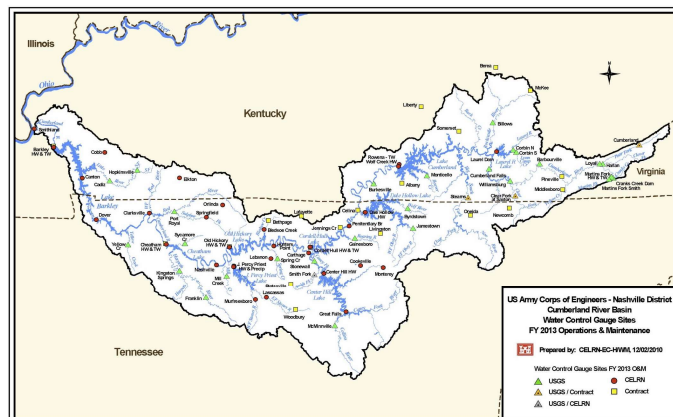


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Water Management Program

Water Control Program

- **Data Collection Program**
 - Project data from 10 multi-purpose projects
 - 75 rainfall sites
 - 45 river stage sites
- **Hydrology, Hydraulic, and Reservoir Simulation Modeling**
- **Reservoir System Operations**
 - Daily analysis of reservoir conditions
 - Balance operating objectives
 - Prepare 10 day forecast



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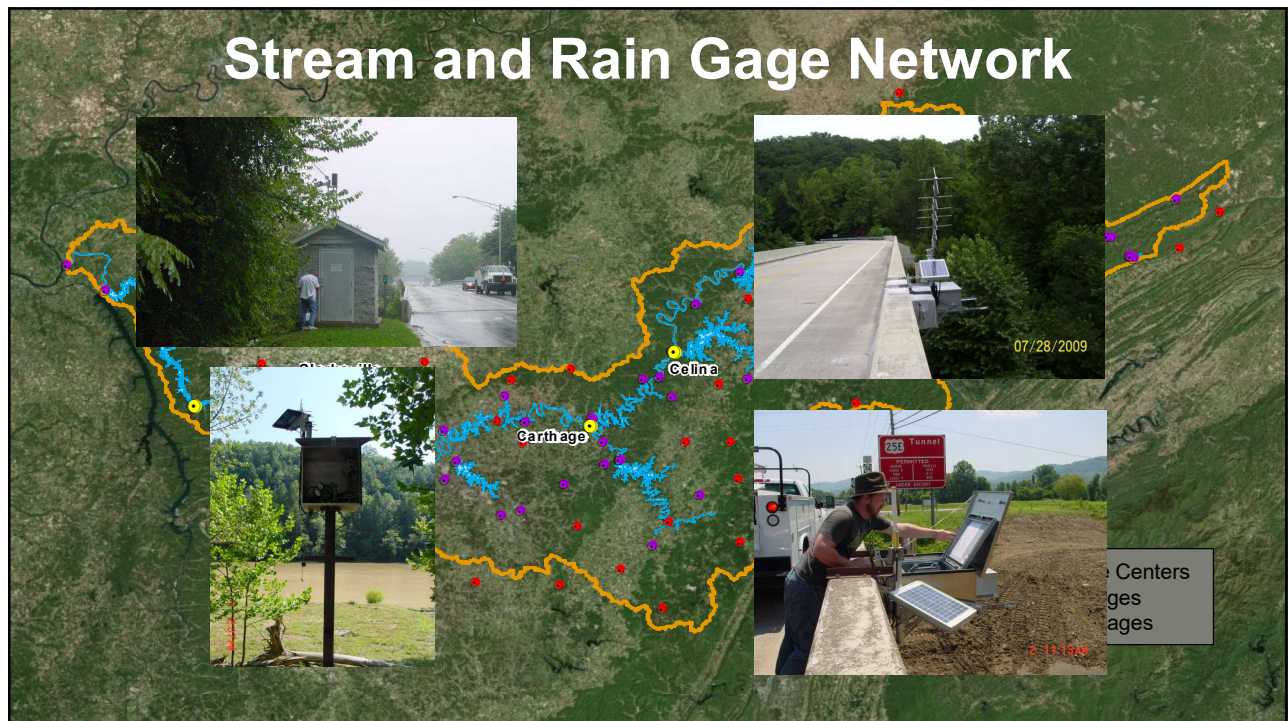
Water Management Operating Objectives

Flood Damage Reduction
Navigation
Hydropower
Recreation
Environmental Stewardship
Water Supply



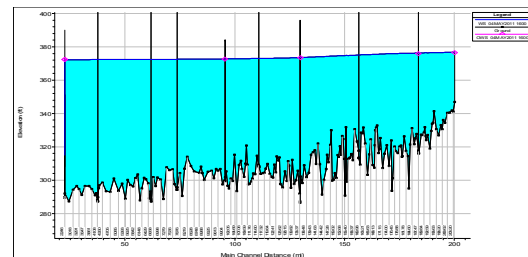
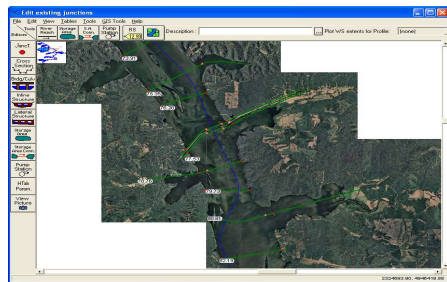
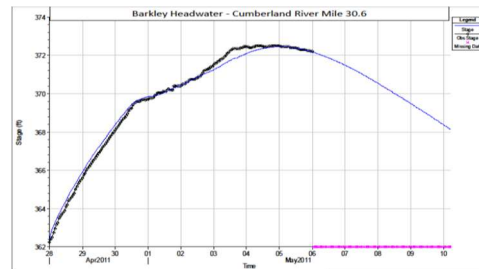
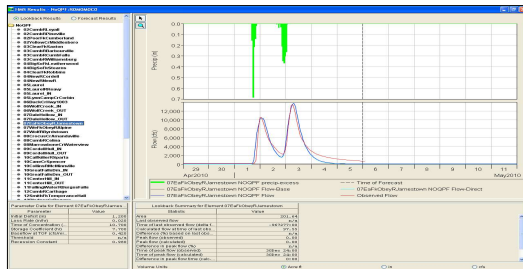
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Stream and Rain Gage Network



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CORPS WATER MANAGEMENT SYSTEM



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Water Management Center

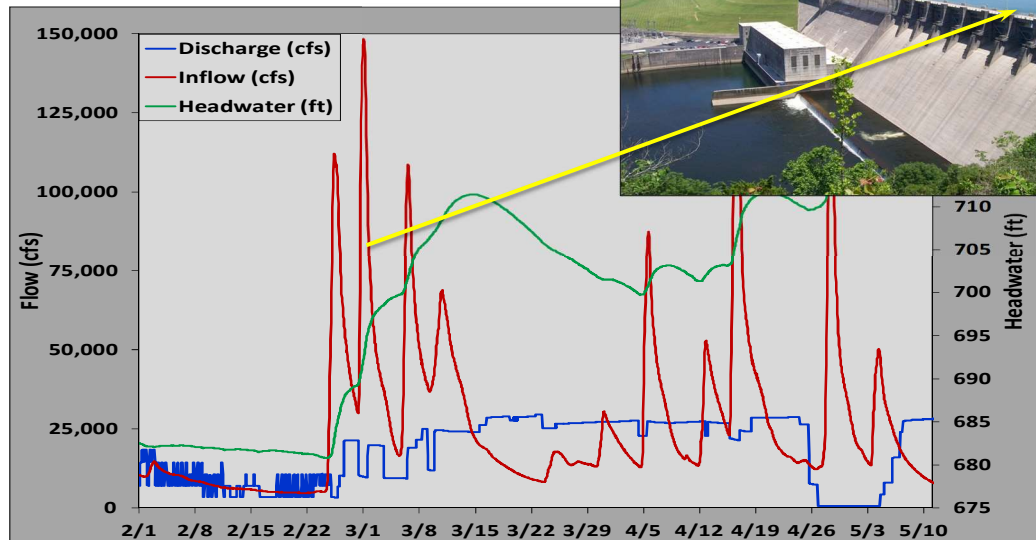


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Wolf Creek Inflow & Dis

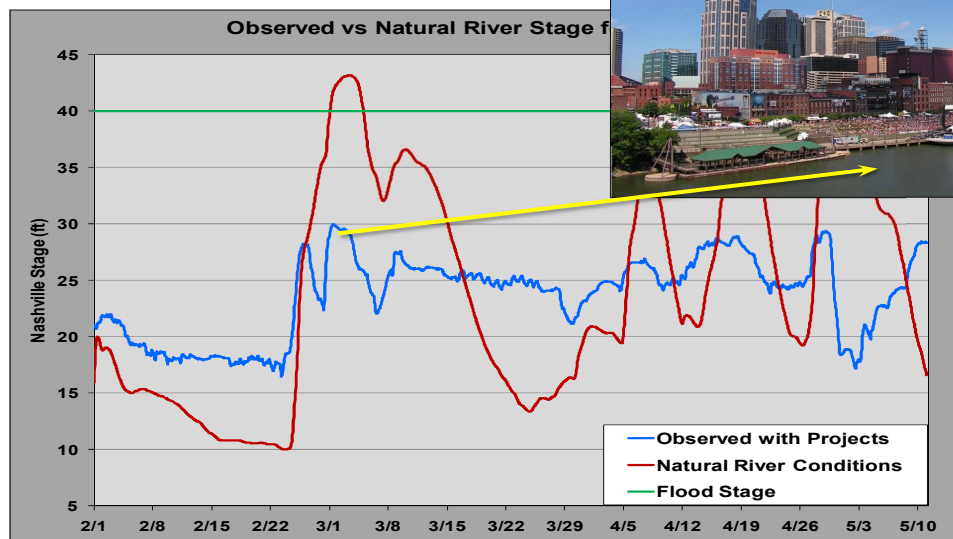


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Cumberland River Stage a



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Water Quality Program

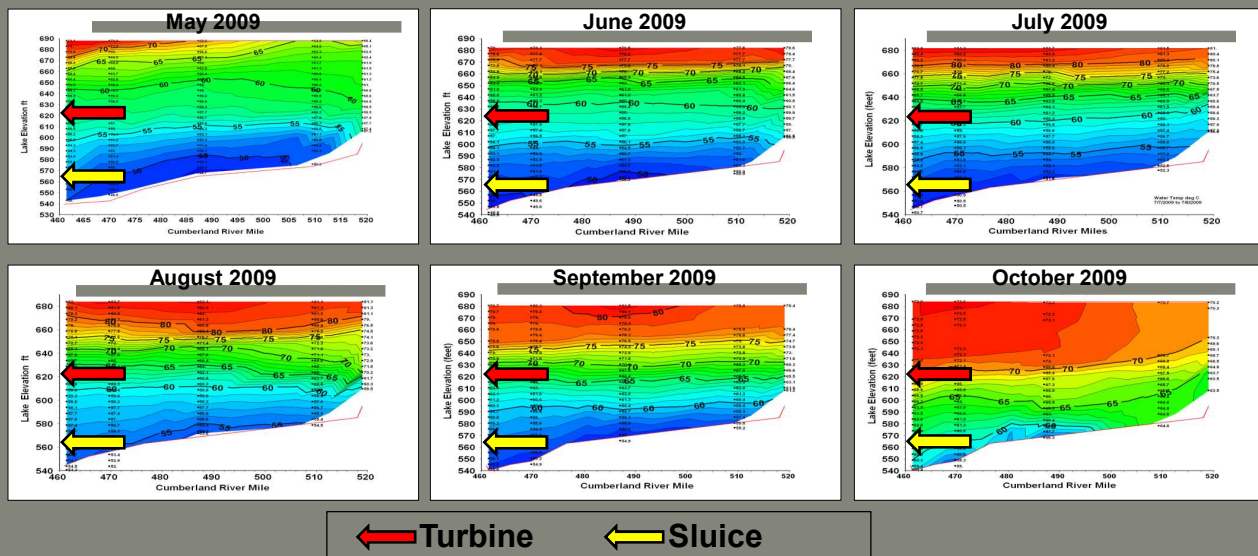
Water Quality

- Data Collection
 - 7 real-time water quality monitors
 - 4 real-time temperature
 - 62 stream sampling sites
 - 95 reservoir sampling sites
- Water Quality Modeling
 - Project specific CE-QUAL-W2 models
 - System water quality modeling
- Water Quality Restoration
 - Dissolved oxygen
 - Minimum flow

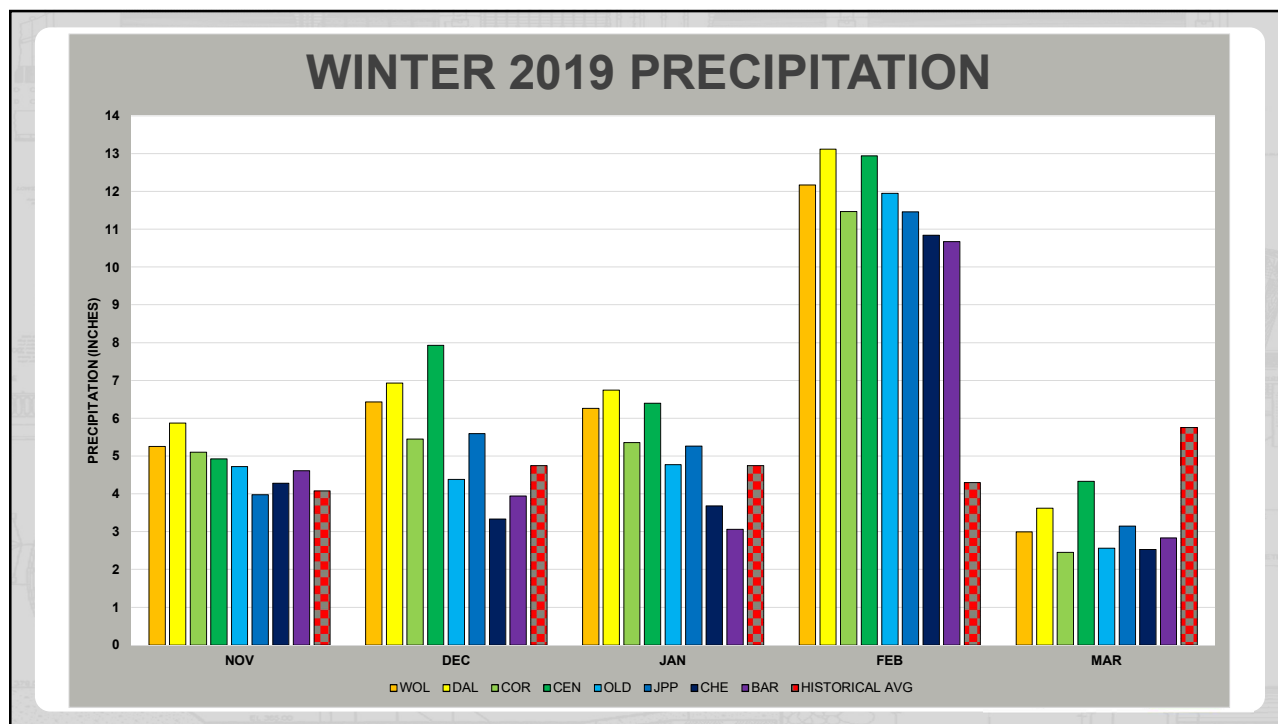


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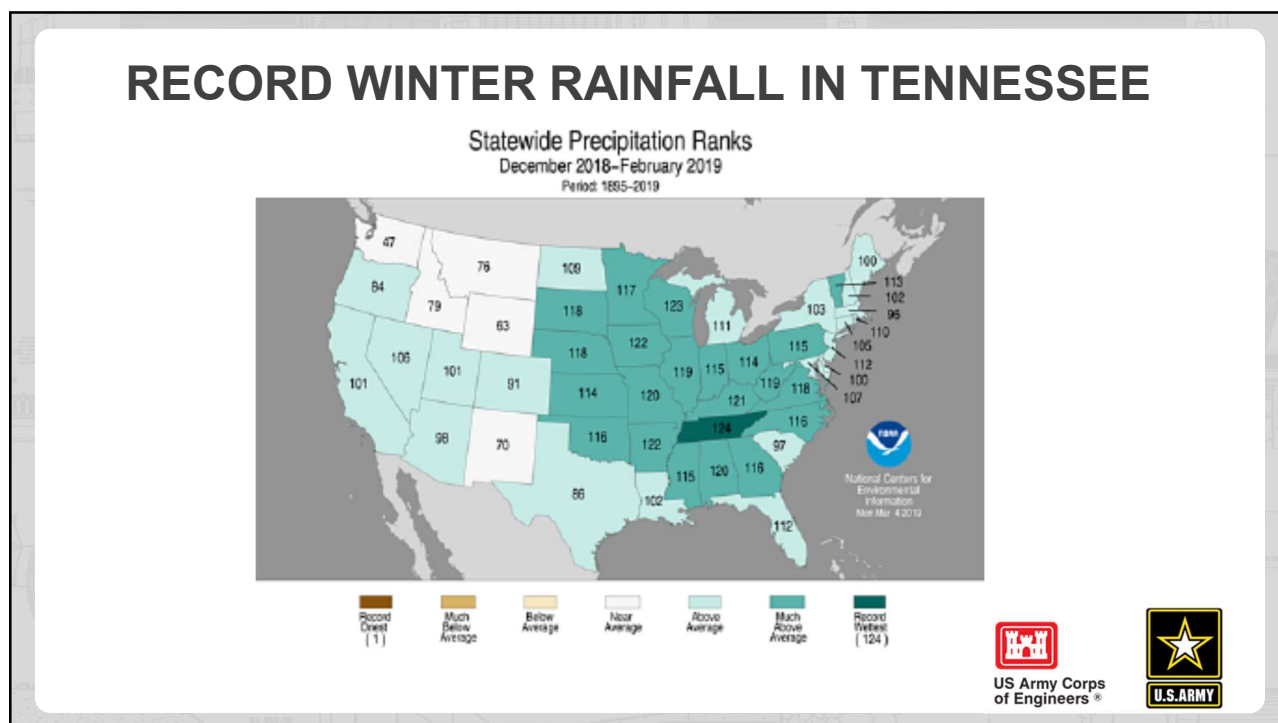
Lake Cumberland Water Temperature (°F) Longitudinal Profiles – 2009



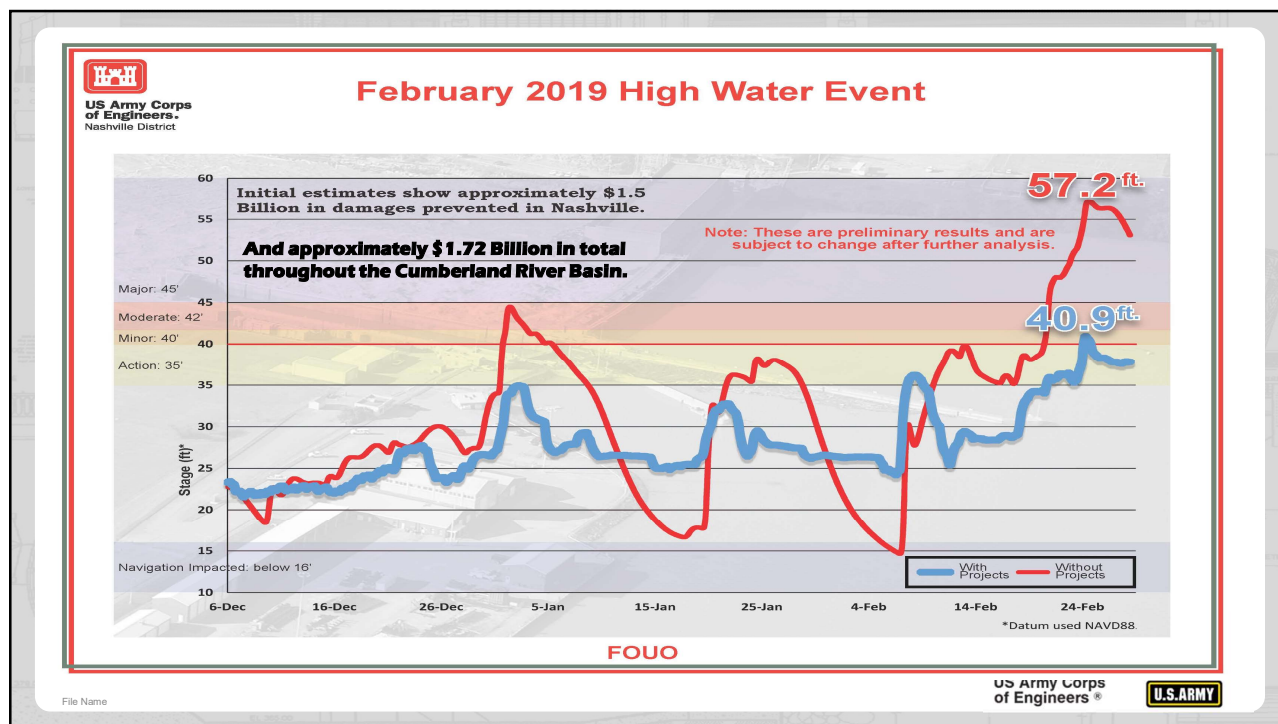
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Summary

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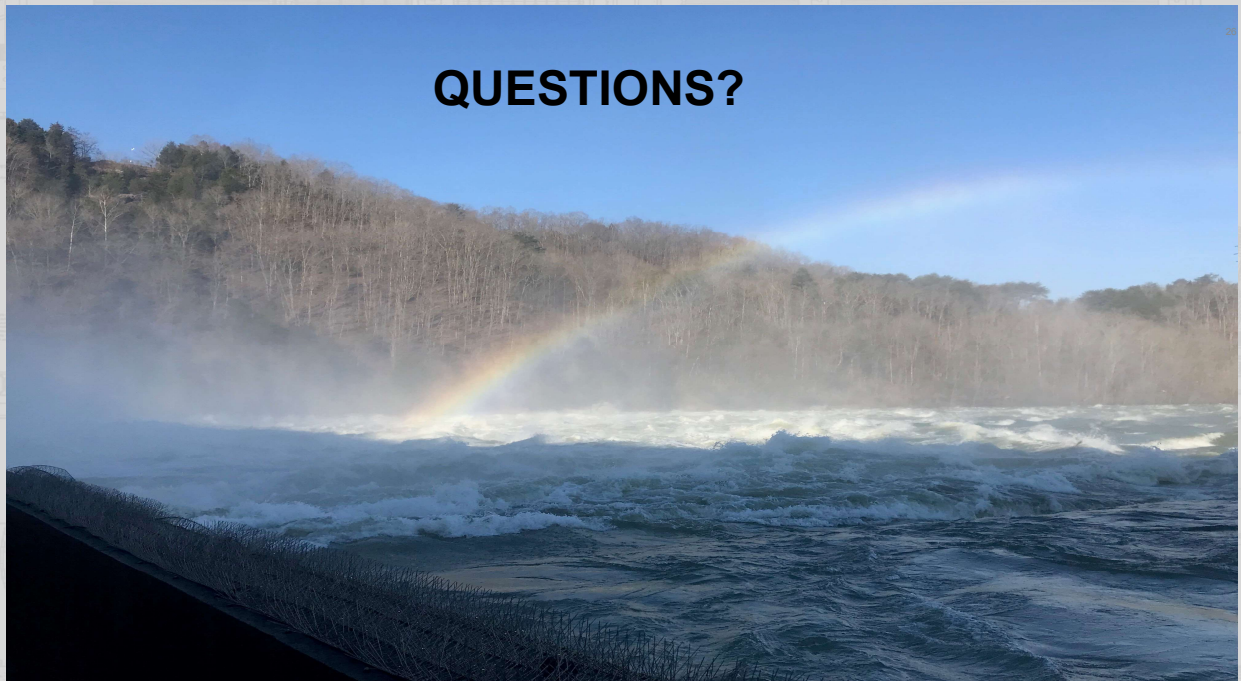
Cumberland River System

- Coordinated operation of a complex system to fulfill wide range of often competing purposes and benefits
 - Flood Damage Reduction for the Cumberland as well as the Ohio/Mississippi averaging \$149 M per year
 - Hydropower production at nine plants worth ~\$35 M per year
 - Recreation valued at \$568 M per year, the highest for a Corps district in the nation
 - Navigation for ~73 M tons of commodities per year over 1,175 river miles with 14 lock & dams on the Tennessee & Cumberland Rivers
- Critical role in a regional system including Ohio and Mississippi Rivers
- Inter-agency coordination with Federal Partners including Tennessee Valley Authority (TVA), National Weather Service, U.S. Geologic Survey
- Adaptive management to improve water quality for fish & wildlife



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QUESTIONS?



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