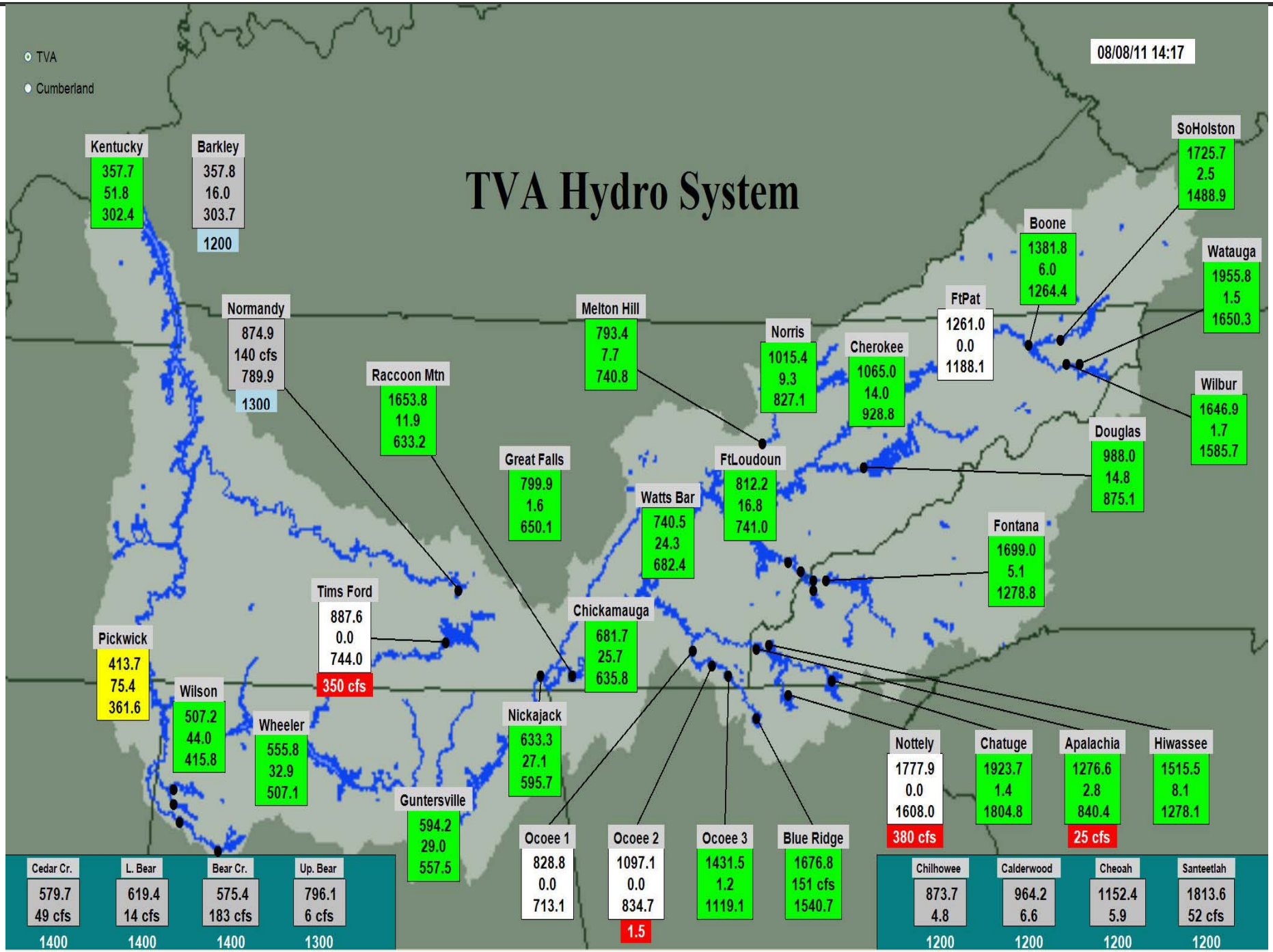
Tennessee River Management Overview

Chuck Bach

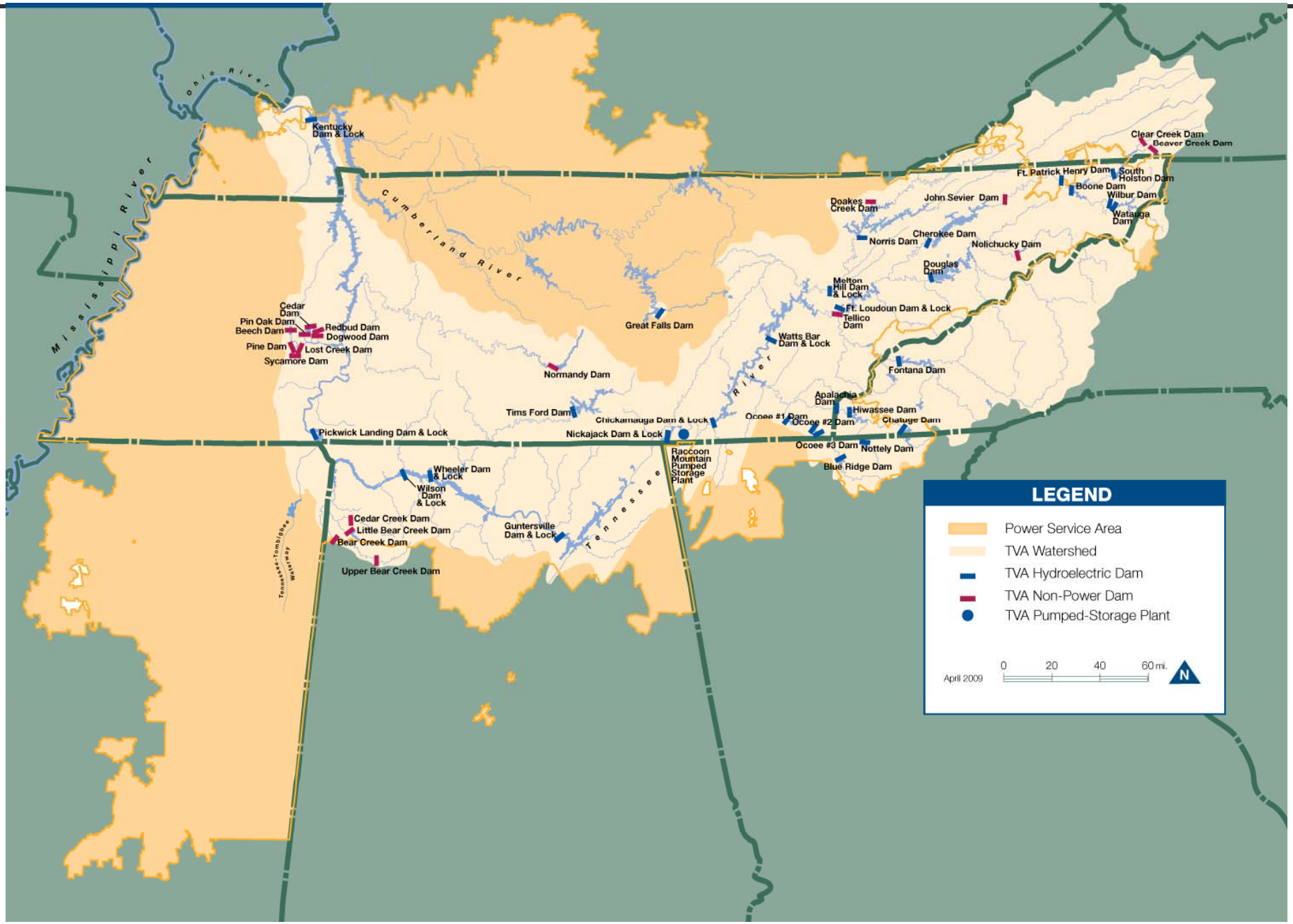
River Operations and Renewables

Reservoir Operations

TVA Hydro System



TVA Dams


Ohio River
Mississippi River
Cumberland River
Tennessee River
Tennessee-Tombigbee Waterway
Kentucky Dam & Lock
Cedar Dam
Pin Oak Dam
Beech Dam
Redbud Dam
Dogwood Dam
Pine Dam
Lost Creek Dam
Sycamore Dam
Pickwick Landing Dam & Lock
Wheeler Dam & Lock
Wilson Dam & Lock
Cedar Creek Dam
Little Bear Creek Dam
Bear Creek Dam
Upper Bear Creek Dam
Guntersville Dam & Lock
Normandy Dam
Tims Ford Dam
Great Falls Dam
Chickamauga Dam & Lock
Nickajack Dam & Lock
Raccoon Mountain Pumped Storage Plant
Watts Bar Dam & Lock
Ocoee #1 Dam
Ocoee #2 Dam
Ocoee #3 Dam
Apalachia Dam
Hiwassee Dam
Chatuge Dam
Nottely Dam
Blue Ridge Dam
Fontana Dam
Melton Hill Dam & Lock
Ft. Loudoun Dam & Lock
Tellico Dam
Douglas Dam
Nolichucky Dam
Cherokee Dam
Norris Dam
Doakes Creek Dam
John Sevier Dam
Ft. Patrick Henry Dam
South Holston Dam
Boone Dam
Wilbur Dam
Watauga Dam
Clear Creek Dam
Beaver Creek Dam
LEGEND
Power Service Area
TVA Watershed
TVA Hydroelectric Dam
TVA Non-Power Dam
TVA Pumped-Storage Plant
April 2009
0
20
40
60 mi.
N

- TVA is responsible for operating and maintaining 49 dams

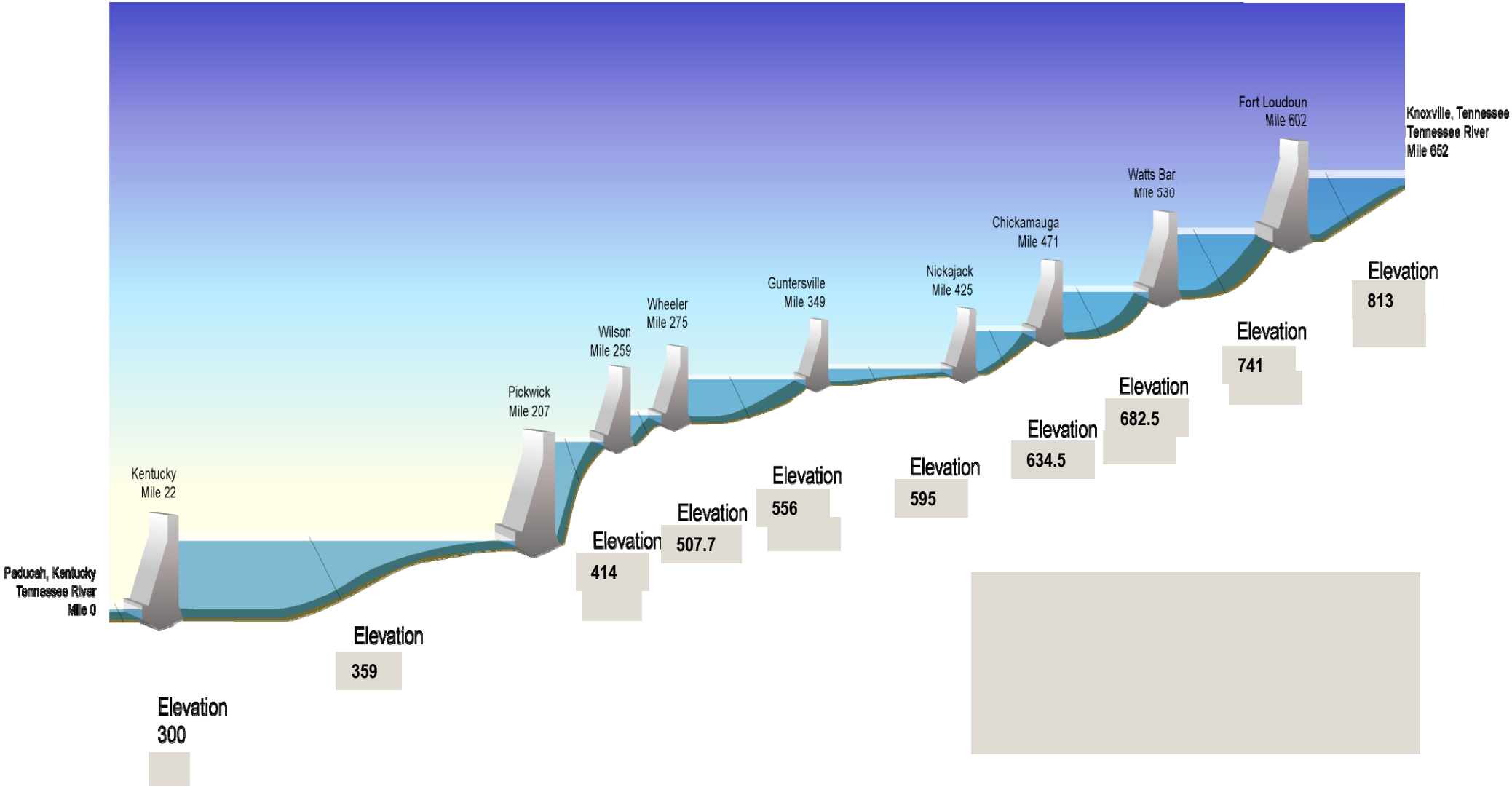
Tributary Storage (Norris)

Main River (Fort Loudoun)

Tributary Run-of-River (Melton Hill)

Tributary Non-Power (Upper Bear)

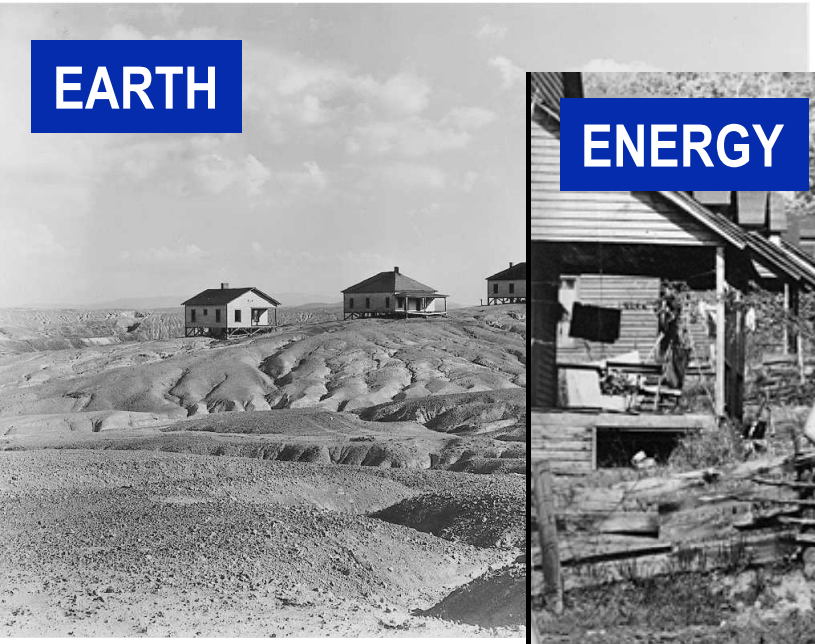
Tennessee River Profile



- History of TVA
- What Drives Our System
  - Rainfall/Runoff
  - Operating Guides
- Multiple Benefits
- Dam Safety
- Questions

The Early Years

Earth, Energy, Water



- Deforestation
- Soil erosion
- Siltation
- Depleted soil
- Low agricultural productivity

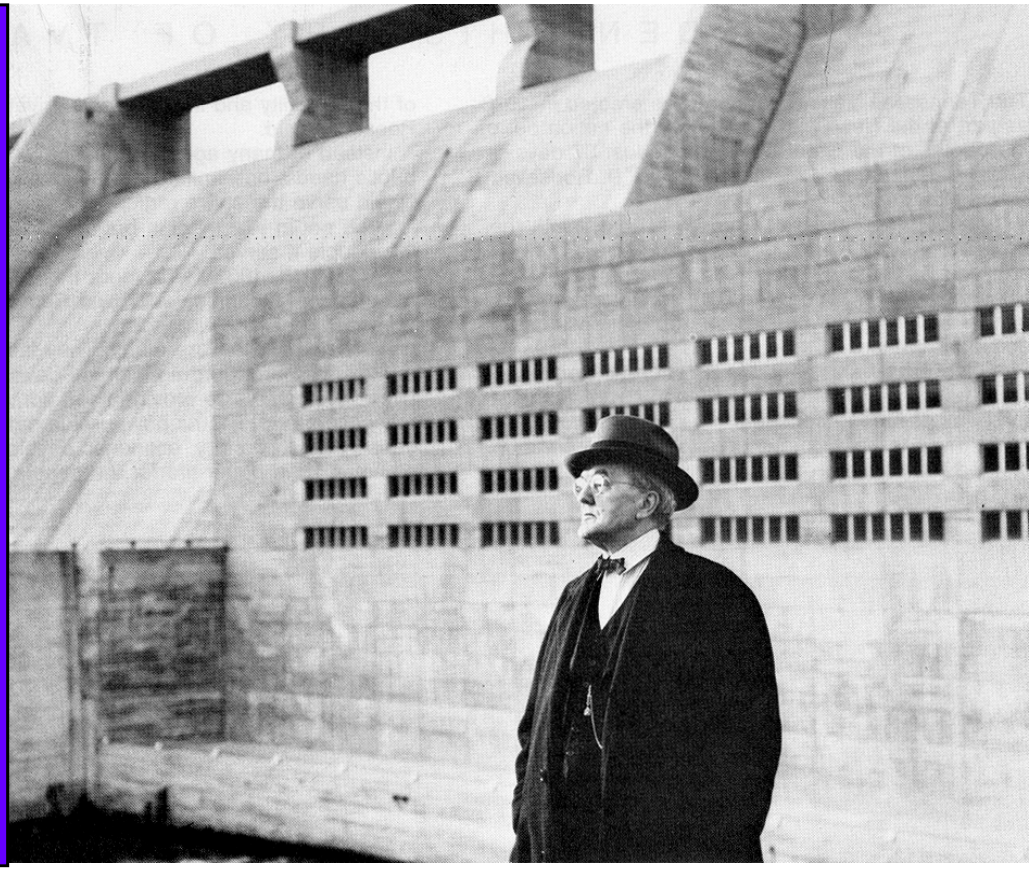
- Widespread poverty
- Low agricultural productivity
- High transportation costs
- Low industrial and municipal development
- Declining population

- Frequent flooding
- Periodic droughts
- Uncertain navigation
- Malaria and other diseases

Integrated Resource Management

River system assigned multipurpose role through TVA Act

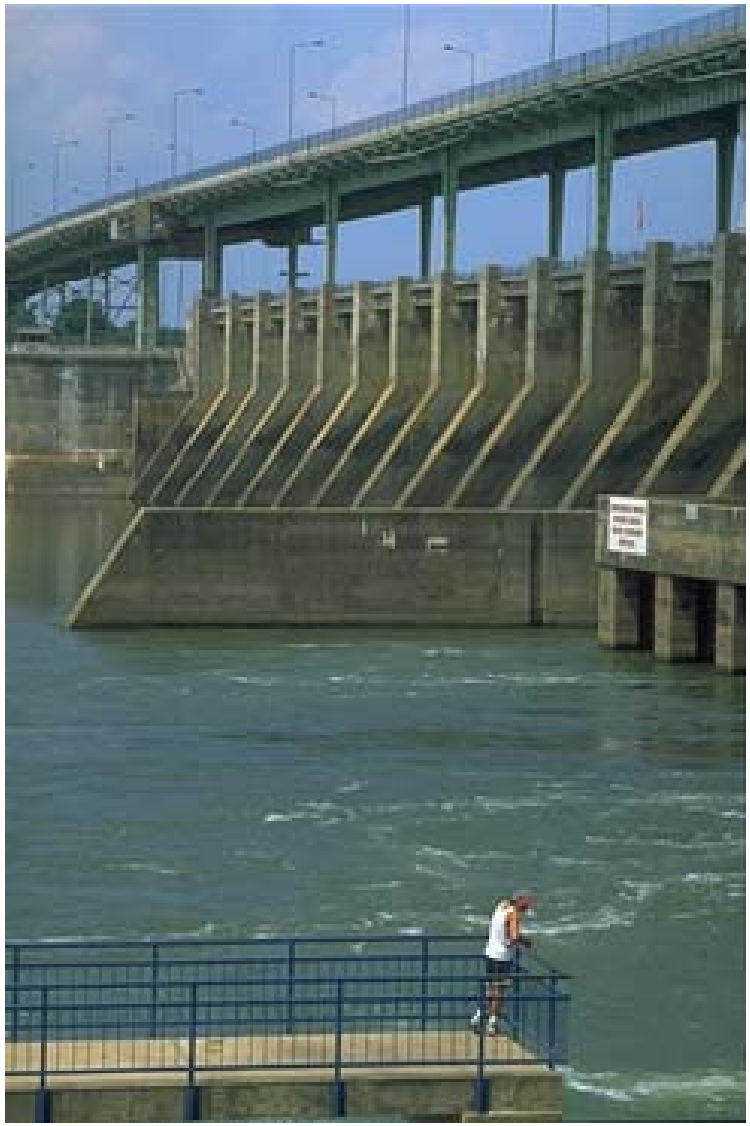
(section 9a) …to regulate the stream flow primarily for the purposes of promoting navigation and controlling floods. So far as may be consistent with such purposes, ...for the generation of electric



"Father of TVA," Senator George Norris

Land-use Management

1930s & ‘40s: Dams



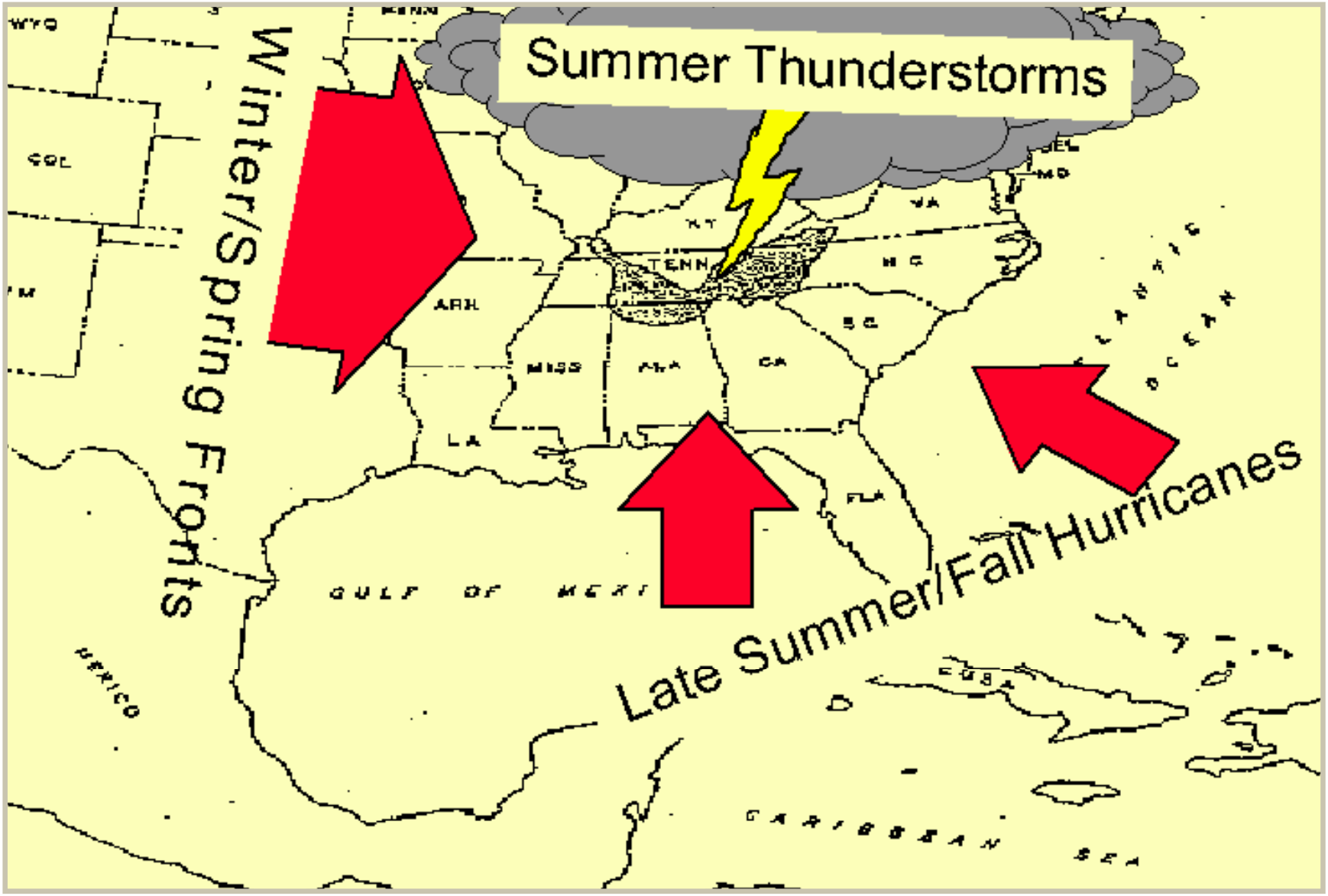
1950s & ‘60s: Fossil Plants

1970s & ‘80s: Nuclear Plants

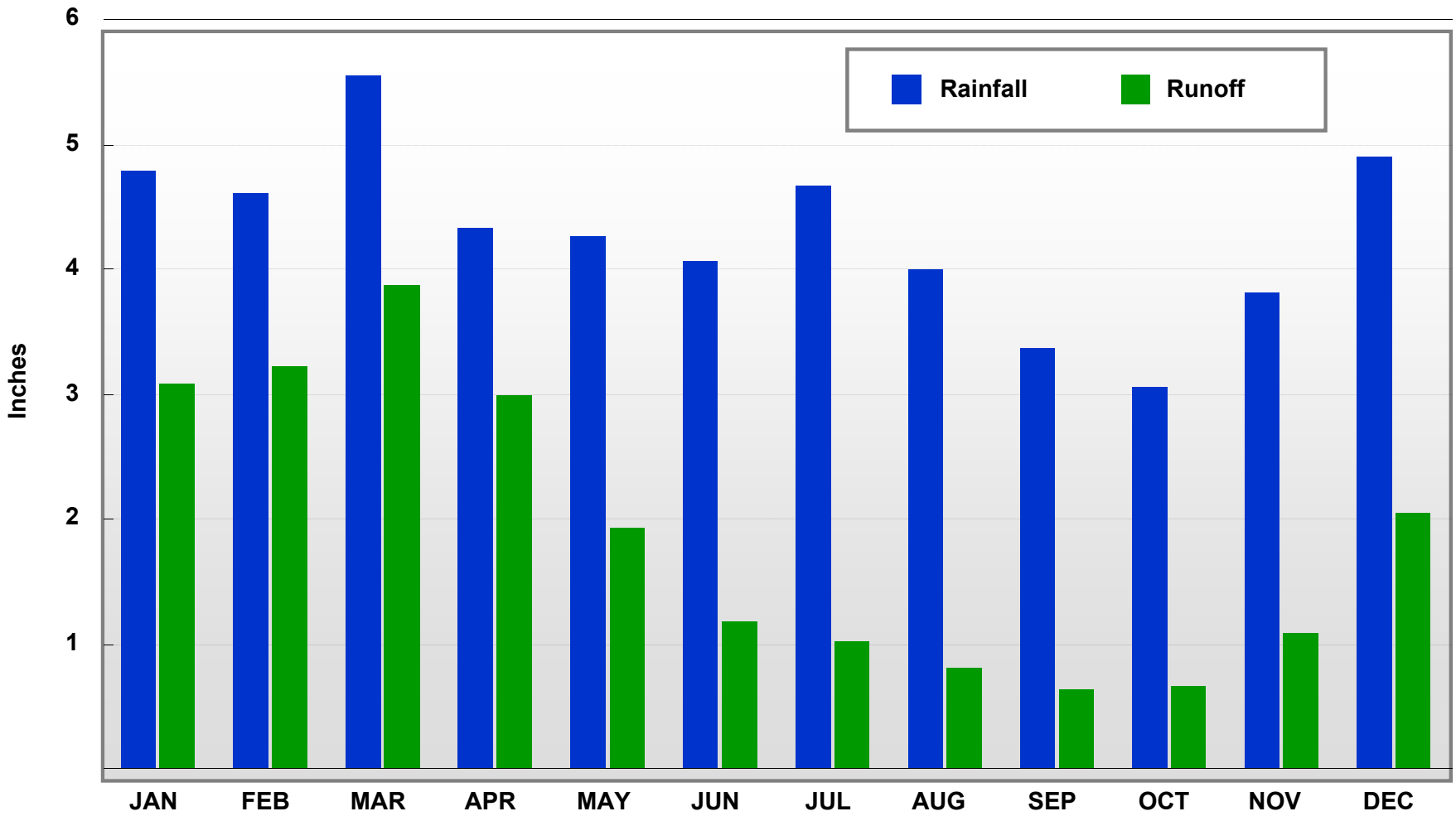
1990s & 2000s: Renewable Energy

What Drives Our System

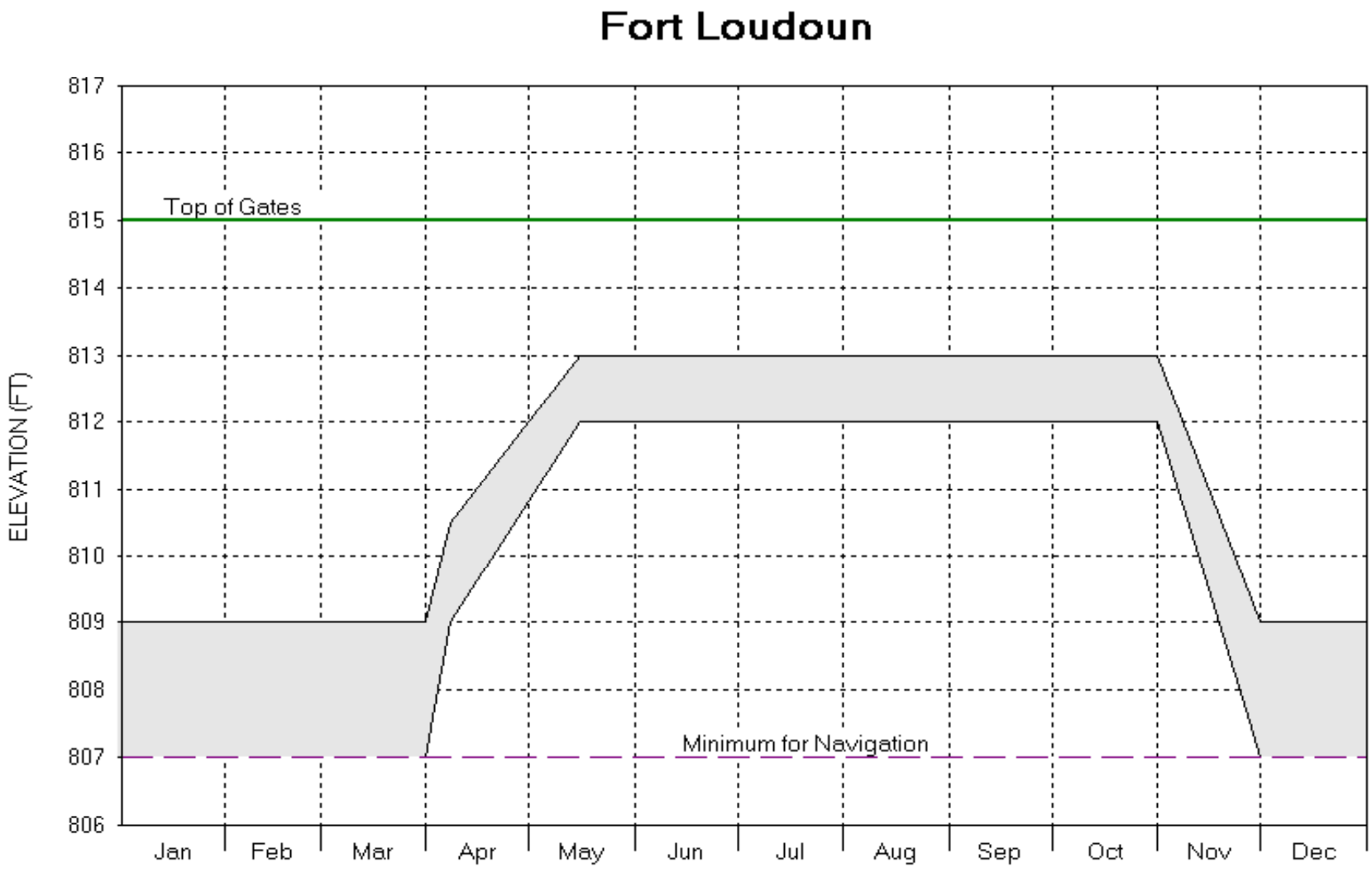
Seasonal Storm Patterns



Average Monthly Rainfall and Runoff



Comparison of Reservoir Operating Guides



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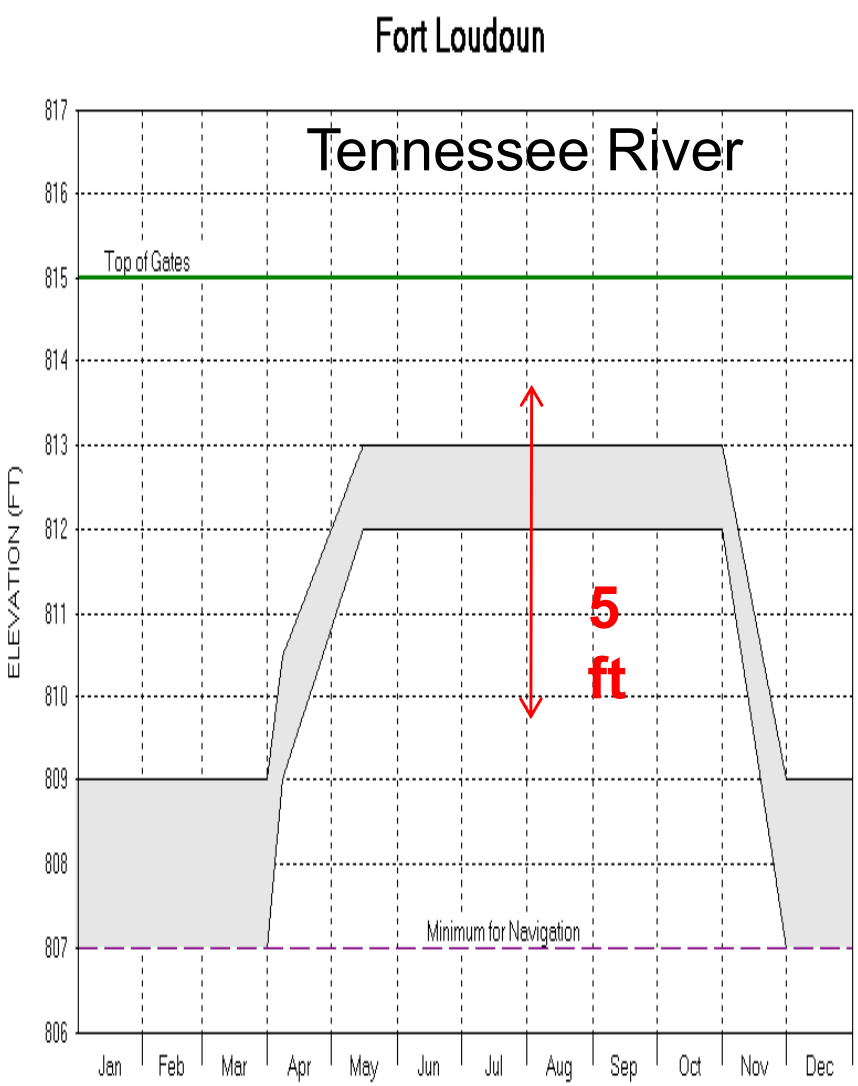
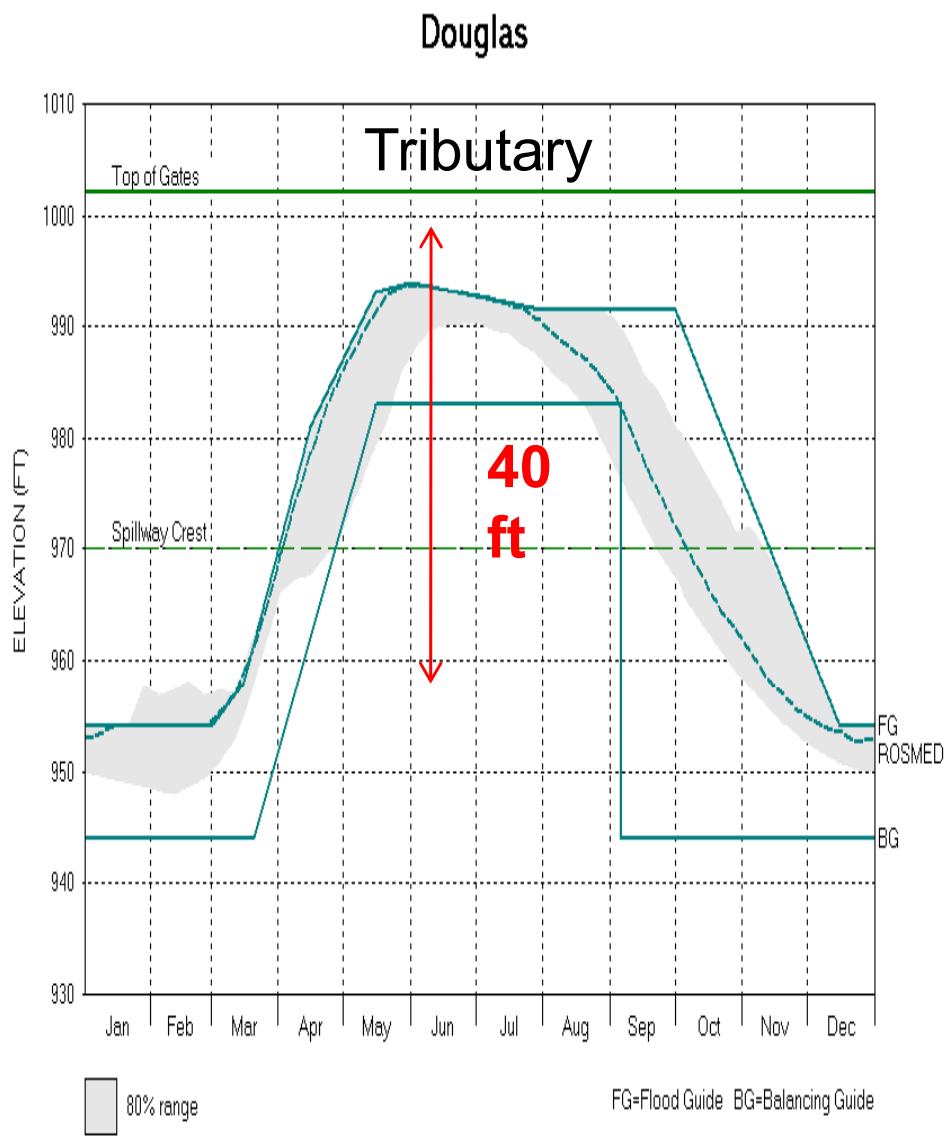




Integrated Tennessee River System

Provides Multiple Benefits

Navigation

Water Supply

Flood -Damage Reduction

Recreation

Power Generation

Water Quality

Navigation

TVA provides 800 miles of navigable waterway by maintaining an 11-foot channel

Navigation, cont.

Benefits:

- Annual savings to shippers: $500 million
- Passage for 17,000 recreational boats
- Removes the equivalent of two million truck loads from the nation's highways and railways, reducing environmental impacts, road damage, and public safety hazards

Flood-Damage Reduction

Reduction Measures

- To keep water away from people—**Structural Approach**
- To keep people away from water—**Floodplain Management**

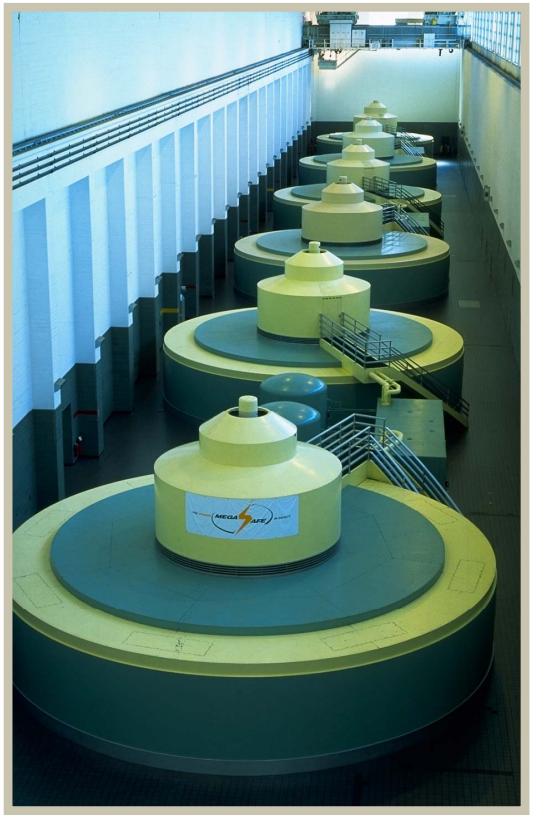
Flood Damage Reduction

- Maintain flood storage allocation
- Store water during flood to reduce crest
- Issue flood forecasts for regulated streams
- Release water at non-flood rate after crest
- Average annual flood damage reduction of $240 million

Power Generation

Tennessee River System Provides

- Hydropower
  - 29 hydro plants and 109 units
  - 3600 megawatts of capacity
  - Approximately 6-10 percent of total generating capacity
  - Raccoon Mountain Pumped Storage adds about 1600 megawatts



Recreation

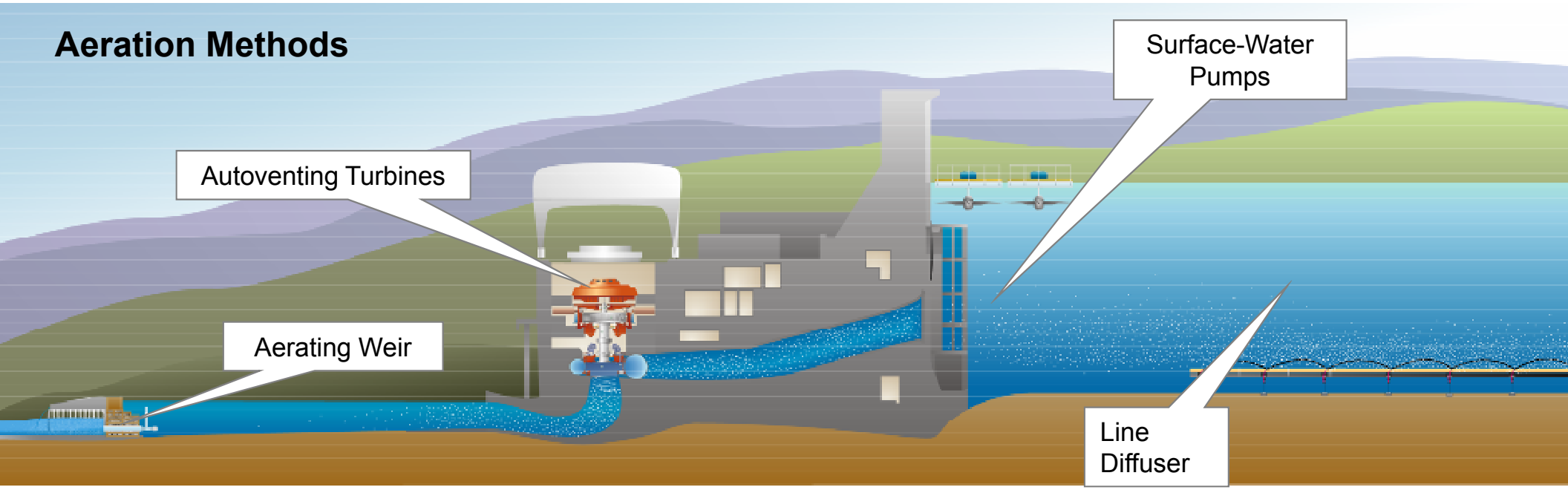
- TVA provides summer elevations for reservoir recreation and releases for tailwater recreation
- Benefits include:
  - Quality of life
  - Boost to local economies
  - Boating
  - Swimming
  - Fishing
  - Whitewater rafting

Recreation

- **Functions:**
  - Restrict the drawdown of tributary reservoirs from June 1 through Labor Day to support reservoir recreation
  - Manage the winter drawdown to facilitate boat access
  - Provide releases to support tailwater recreation
  - Stabilize reservoir levels during the spring spawn to promote spawning success
  - Schedule flows to support special events and activities
- **Benefits:**
  - Stakeholder relations
  - Economic development
- **Issues:**
  - Competing demands

Water Quality

- **Functions:**
  - Work with plants to keep discharge temperatures from coal-fired and nuclear plants within state permit limits
  - Monitor water-quality conditions
  - Meet reservoir-specific and system-wide flow requirements
  - Meet dissolved oxygen targets



Water Quality

Benefits

- Minimum flows improve aquatic life habitat and helps assimilate waste
- Aeration improves dissolved oxygen in tailwaters
- Long-term environmental health monitoring to improve operations
- Stabilized reservoir levels improve spawning success

Water Supply

- Industry supplied with process water and cooling water
- Municipalities supplied with water for household use and waste assimilation

Reservoirs supply clean and reliable water and a minimum depth for intakes

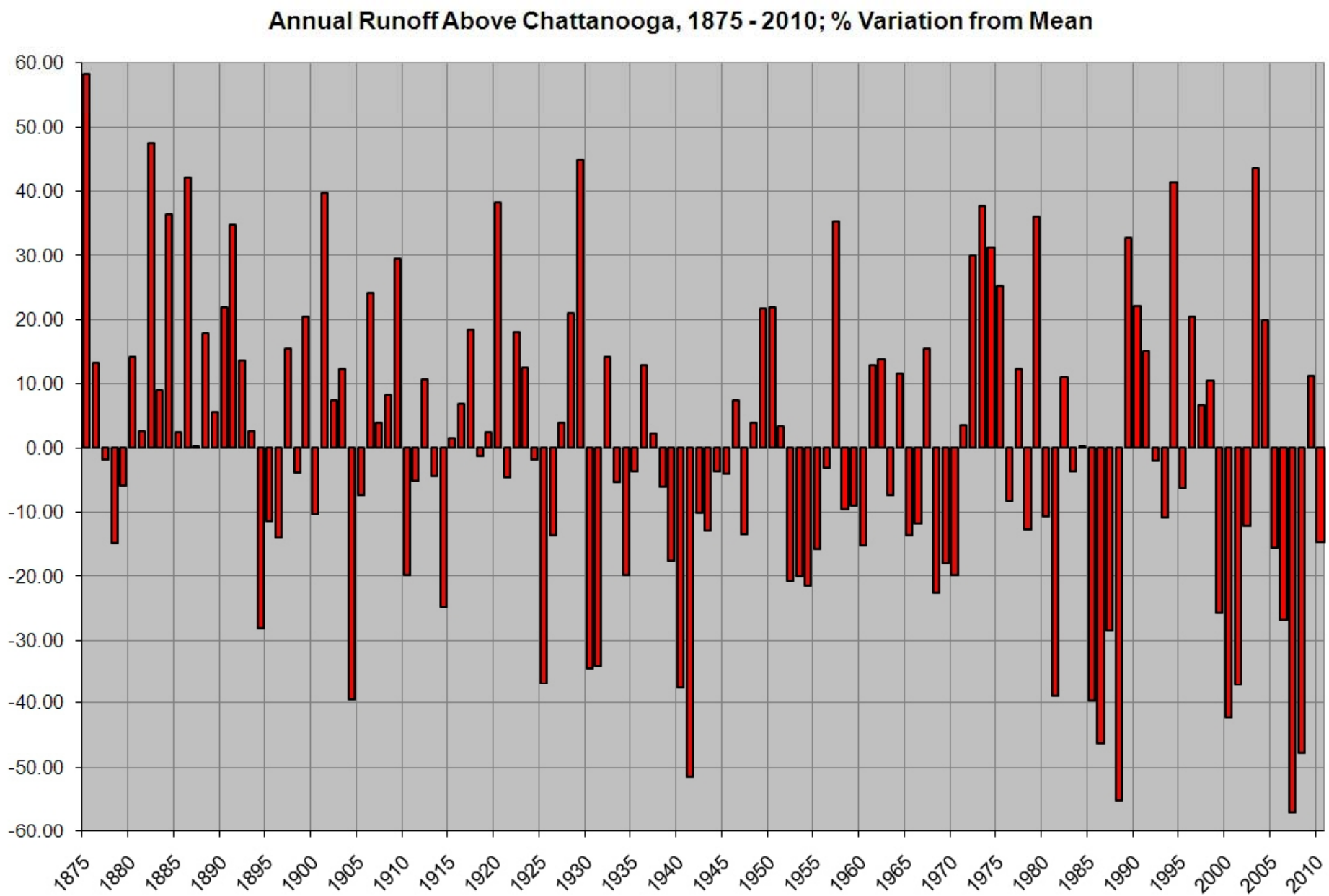
Water Supply

- Manage flows and releases to provide cooling water for fossil and nuclear power plants
- Ensure that 700 water intakes across the Valley are adequately supplied with water
- Provide minimum flows for municipal and industrial waste assimilation

Dam Safety

- **Purposes:**
  - Ensure operational and structural integrity of water barriers
  - Ensure compliance with Federal Guidelines for Dam Safety
- **Functions:**
  - Inspection
  - Instrumentation
  - Maintenance and repair of aging structures
  - Emergency action planning

Runoff


Annual Runoff Above Chattanooga, 1875 - 2010; % Variation from Mean
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
-20.00
-30.00
-40.00
-50.00
-60.00
1875
1880
1885
1890
1895
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010

Summary

- TVA has a Long History
- Operations are driven by rainfall and runoff
- Integrated operation allows TVA to balance river system benefits:
  - Navigation
  - Flood-damage reduction
  - Affordable and reliable electricity
  - Improved water quality
  - Dependable water supply
  - Recreational opportunities

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- Release schedules
- Current reservoir elevations
- Operating guides
- Tailwater improvements
- Monitoring results
- Smart Phone APP

Questions?