Tennessee Valley Authority

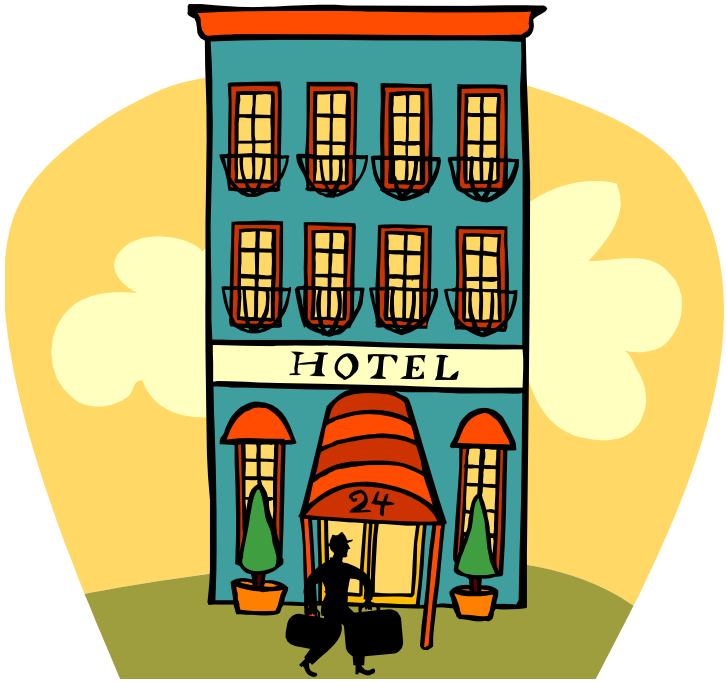
Regional Resource Stewardship Council

Young Harris, Georgia

September 24 and 25, 2014

Welcoming Comments

Safety First



Agenda

8:00	Welcome	Russ Townsend, Council Chair
	Agenda Review	Lee Matthews, Facilitator
8:20	DFO Briefing	Joe Hoagland, Designated Federal Officer (DFO)
8:30	OGC Update	Kendra Mansur, Attorney, Office of General Counsel (OGC)
8:40	Floating Houses Update	Holly Oswalt, Specialist, Process Performance
9:20	Dam Safety Management Update	David Bowling, General Manager, River Management
9:35	Advisory Session Topic and Discussion Questions	Matthews
9:45	Break	
10:00	River Operation	Tom Barnett, Sr. Manager, River Forecast Center; Kelie Hammond, Manager, Hydrology & Hydraulics, Flood Risk & Water Supply; James Everett, Manager, River Forecast Center Operations Support
11:30	Recap and Safety Briefing	Matthews
11:45	Lunch and Adjourn for Field Trip	
6:00	Dinner	

Designated Federal Officer Briefing

- Welcome
- Trout Hatcheries Update
- Purpose of Today's Meeting

RRSC Meeting Protocols

Agenda

- Agenda prepared and approved by the Designated Federal Officer (DFO) in consultation with Council Chair
- Agenda distributed to Council and an outline is published in the Federal Register prior to each meeting
- Topics may be submitted to the DFO by any member of the Council, or non-members, including members of the public

Meeting Minutes

- DFO will ensure that minutes are prepared for each meeting, approved by the Chair, and made available to Council members and the public

Voting

- Any member of the Council may make a motion for a vote
- Recommendations to TVA Board shall require an affirmative vote of at least eleven Council members present on that date
- Council members may include minority or dissenting views

Membership

- Balanced Membership
- Professional or personal qualifications to achieve the mission of regional resource stewardship
- Broad range of diverse views and interests, including recreational, environmental, industrial, business, consumer, educational and community leadership

Floating Houses

Floating Houses

Status

- TVA is reviewing its management and oversight of floating houses and nonnavigable houseboats
- Our goal is to determine how we 1) address existing issues and 2) manage and regulate these structures going forward
- A Notice of Intent was published in the Federal Register April 30, 2014 to conduct an environmental review
- A 90 day public scoping period ended July 29. The full National Environmental Policy Act review will take about 18 to 24 months
- Five public scoping meetings were conducted around the Valley and a wide range of comments and opinions were submitted by the public, state and federal agencies

Floating Houses

Scoping Issues

- **Prevalent scoping comments and issues:**
  - Safety of electrical, mooring and anchoring systems
  - Water quality: proper management of black and grey water
  - Need stronger regulation, policing, enforcement
  - Need minimum safety and environmental standards and regular inspection. Consider an annual registration and inspection fee
  - Economic, financial and personal loss if prohibit/remove floating houses
  - Grandfather floating houses and continue to allow nonnavigable houseboats

Floating Houses

TVA Concerns

- Residential-type proposals on water
- Structures presented as houseboats but designed and used primarily for habitation at a fixed location

- Need to clarify or update regulations with changing times
- Owner/public/investor expectations

Floating Houses

Examples: Nonnavigables - Manufactured Houseboats - Floating Houses

Floating Houses

Residential-Type Use / Harbor Limits

Floating Houses

Disposal and Removal from Reservoir

January 2011 – Moored in Marina

April 2013 – Report from Stakeholder

July 2013 – TVA Cleans up – Approximate Cost $7,000

Floating Houses

Electrical Supply

Floating Houses

Anchoring

Floating Houses

Sewage Disposal (Black and Grey Water)

Floating Houses

Next Steps

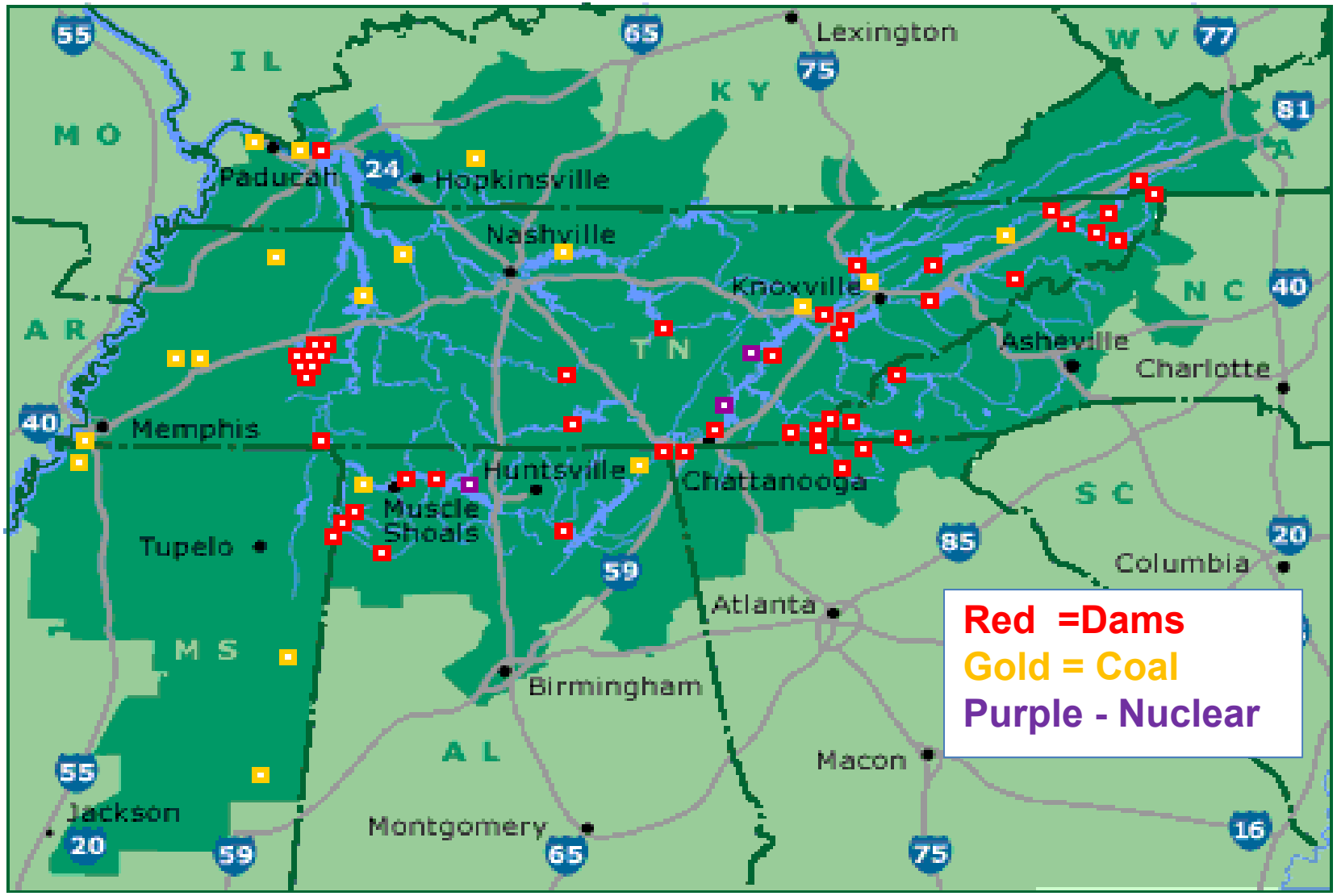
- Interagency Team (Tennessee Wildlife Resources Agency, Tennessee Department of Environment & Conservation, Tennessee Department of Commerce & Insurance, North Carolina Department of Environment & Natural Resources, U. S. Army Corps of Engineers) is working on alternative solutions, minimum standards, rules and management policies
- Develop a full range of management alternatives
- Complete the environmental analysis and release a draft document for public review by early 2015
- Conduct public meetings
- Present update to RRSC and discuss management alternatives
- Issue final environmental analysis summer 2015
- Issue decision and if required, clarify or update TVA regulations through a formal rulemaking process

Floating Houses

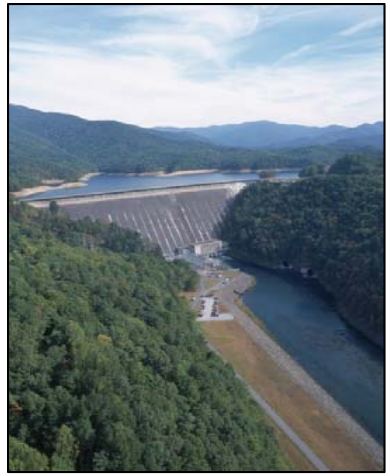
For Information - How To Be Involved

- Visit TVA website: www.tva.gov/floatinghouses/index.htm
- Attend public meetings
- Provide written comments via website, public meetings, or by mail
- Invite TVA to meet with your group or association
- Invite TVA to visit your site or facility for discussion
- Your ideas and comments are important

The TVA System



Structures in TVA Dam Safety Inventory

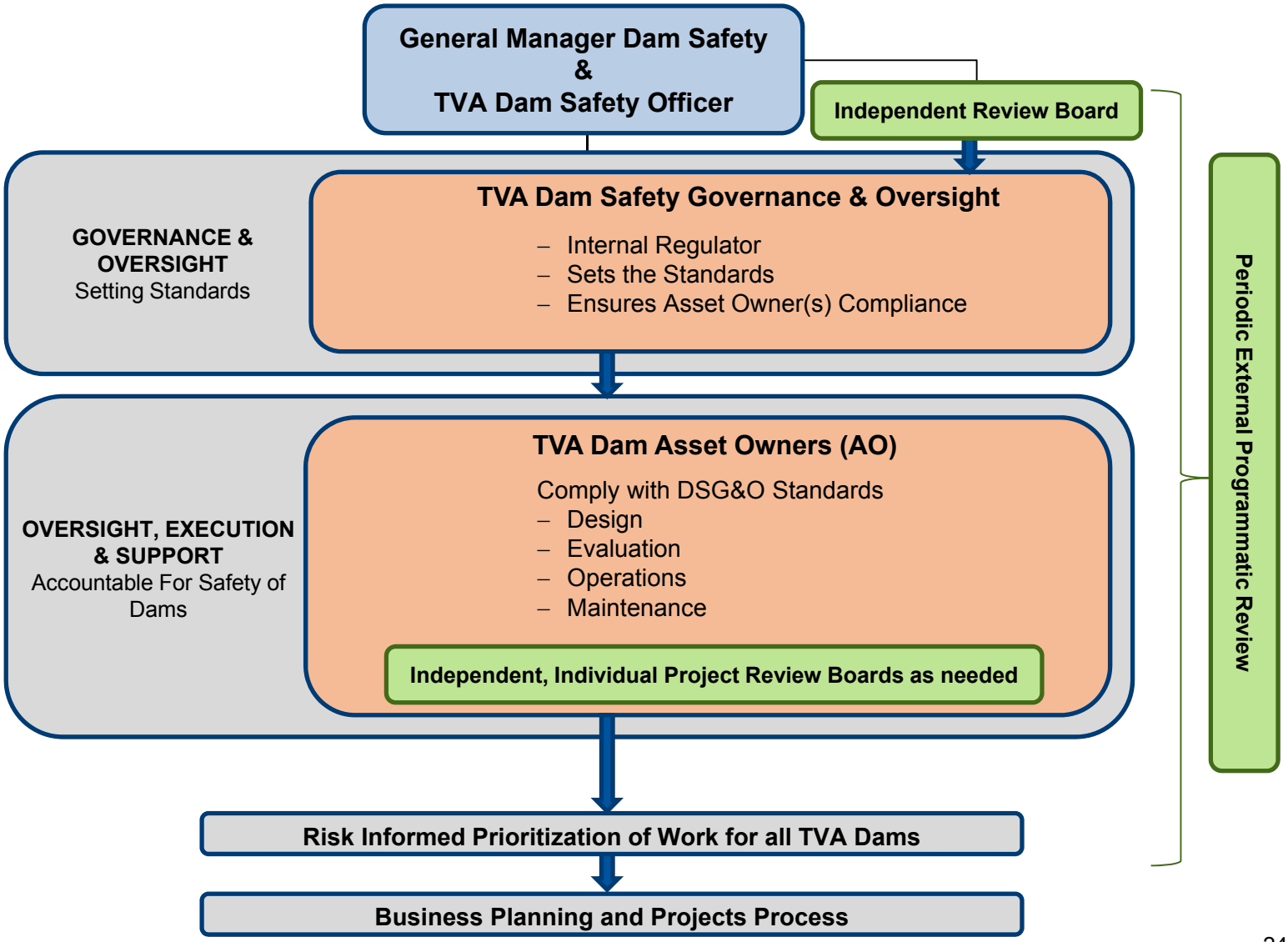


- Traditional river dams, dry ash stacks, levees, etc.
- TVA Inventory (142 structures):
  - Power Operations: 9 Non-River Structures
  - Projects: 31 Non-River Structures
  - Nuclear Power Group: 7 Non-River Structures
  - Natural Resources & Real Property Services: 7 Low Hazard Levees
  - River Operations: 87 Traditional River Structures
  - Other: 1 Under Review
- Of the 142 structures – 121 are on the National Inventory of Dams (NID); 75 are high hazard
  - On the NID – 34 structures meet the definition of a dam and are not part of the traditional river system of dams (e.g. ash ponds and similar structures)
  - Potential for 17 structures to be added to the NID on the next update to the U.S. Army Corps of Engineers
- There are 87 structures at 49 projects related to river operations
  - River Operations owns all 75 high hazard structures

Current Dam Safety Initiatives

- Re-analysis of river dams
  - Current Industry Standards
  - Includes verifying material properties
  - 5 year program
- Risk Informed Decision Making
  - Screening Level Risk Assessments complete on river dams
  - Dam Safety Steering Committee pilot underway

Dam Safety: Governance, Oversight, Execution and Support



Introduce Advisory Session Topic and Discussion Questions

1. Does TVA's ROS approach still balance the objectives in an optimal manner across the Tennessee Valley?

2. Within this operating framework do you have recommendations?

3. Are there other objectives that should be considered and prioritized?

Break

River Operations

8th Term Regional Resource Stewardship Council
September 24-25, 2014

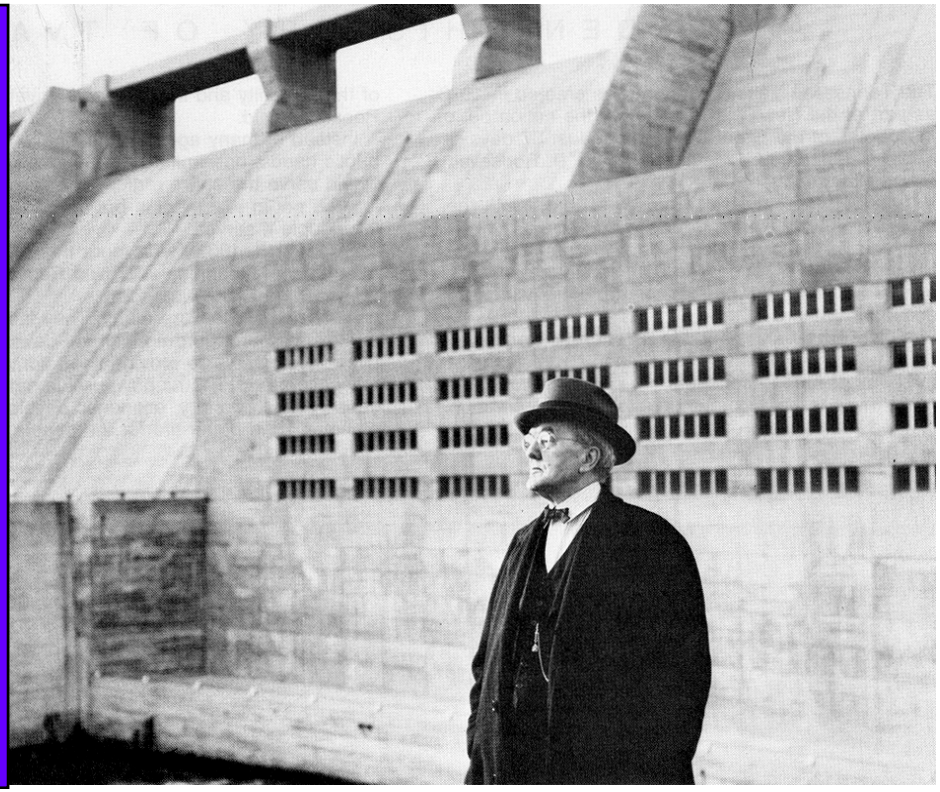
Topics

- Introduction to TVA's Integrated Reservoir System
- Reservoir Operating Policy History and Overview
- Introduction to 2004 Reservoir Operations Study (ROS)
- ROS Successes 2004 - Current
- ROS & Climatic Extremes

TVA Act

River system assigned multipurpose role through TVA Act in 1933

(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 energy...



Senator George Norris

Integrated Tennessee River System Provides Multiple Benefits

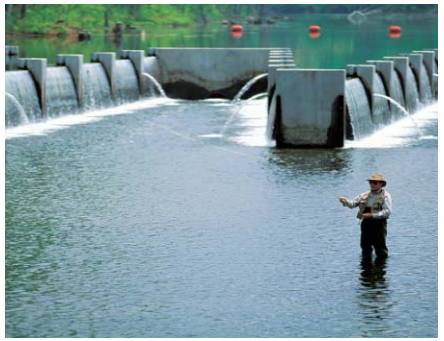
Navigation

Water Supply

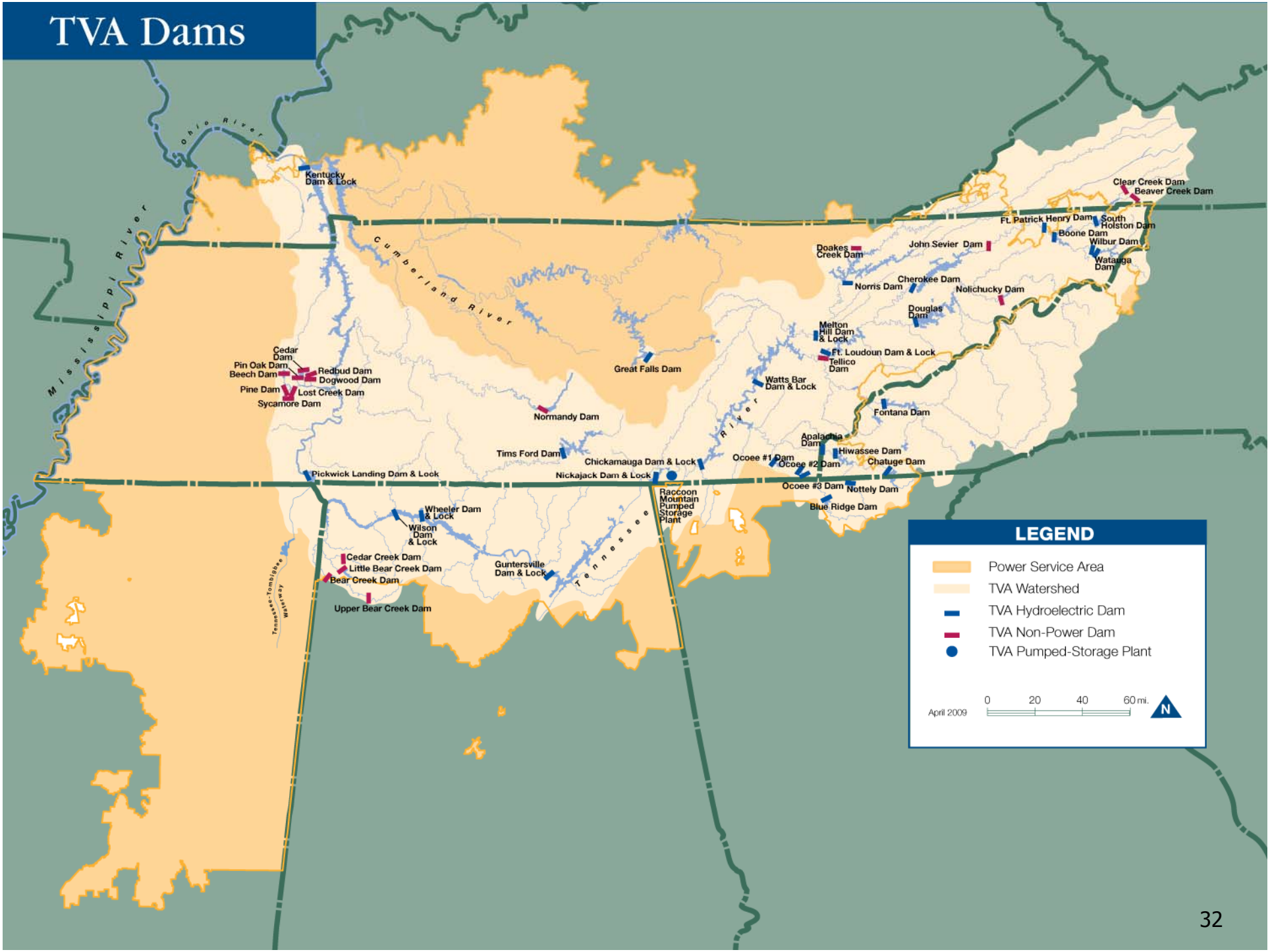
Flood-Damage Reduction

Recreation

Power Generation



Water Quality


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
Great Falls Dam
Tims Ford Dam
Chickamauga Dam & Lock
Nickajack Dam & Lock
Raccoon Mountain Pumped Storage Plant
Watts Bar Dam & Lock
Fontana Dam
Apalachia Dam
Hiwassee Dam
Ocoee #1 Dam
Ocoee #2 Dam
Ocoee #3 Dam
Chatuge Dam
Nottely Dam
Blue Ridge Dam
Melton Hill Dam & Lock
Ft. Loudoun Dam & Lock
Tellico Dam
Douglas Dam
Norris Dam
Cherokee Dam
Nolichucky 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

River Operations- Responsible for Operating and Maintaining 49 Projects

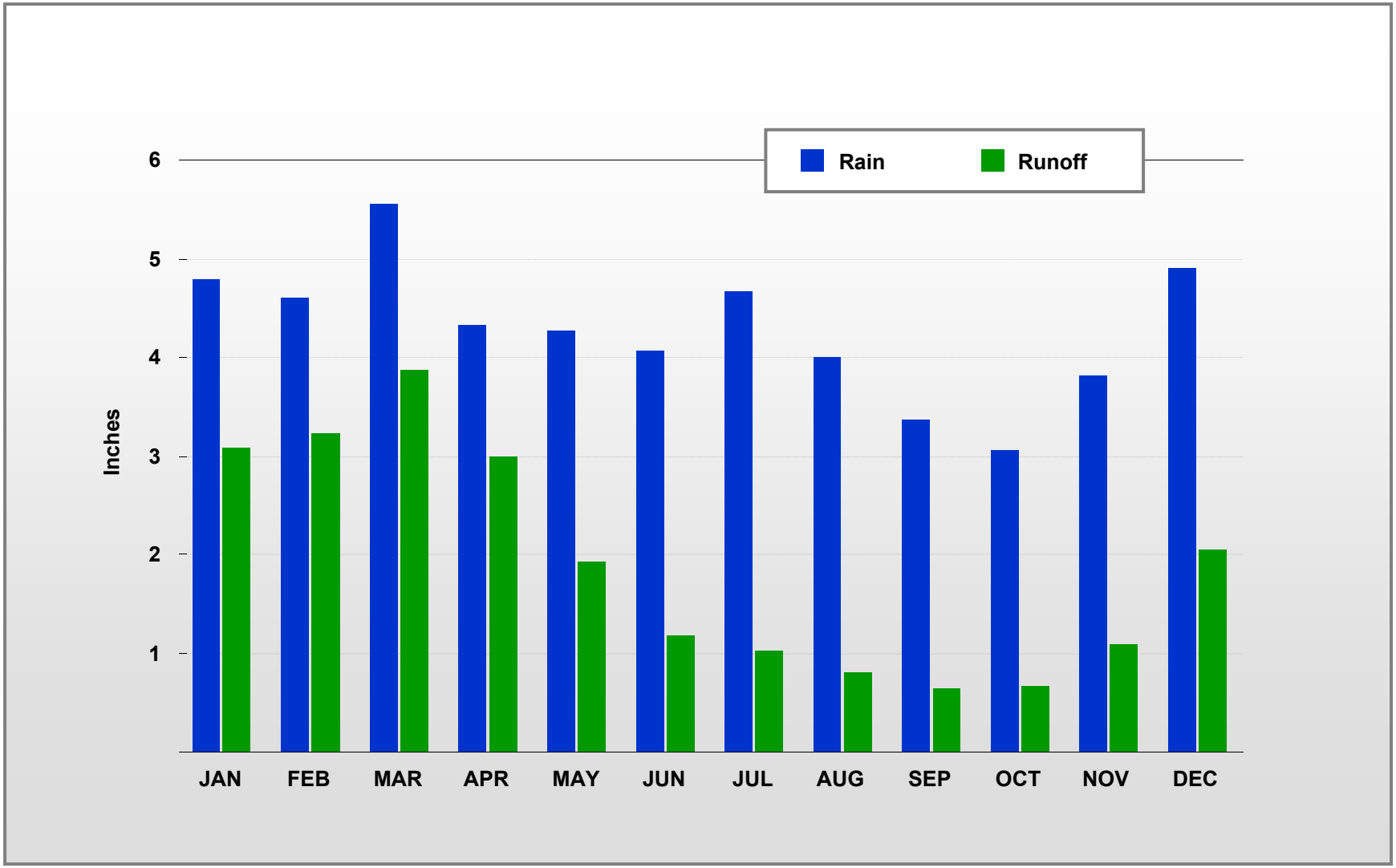
Tributary Storage (Norris)

Main River (Fort Loudoun)

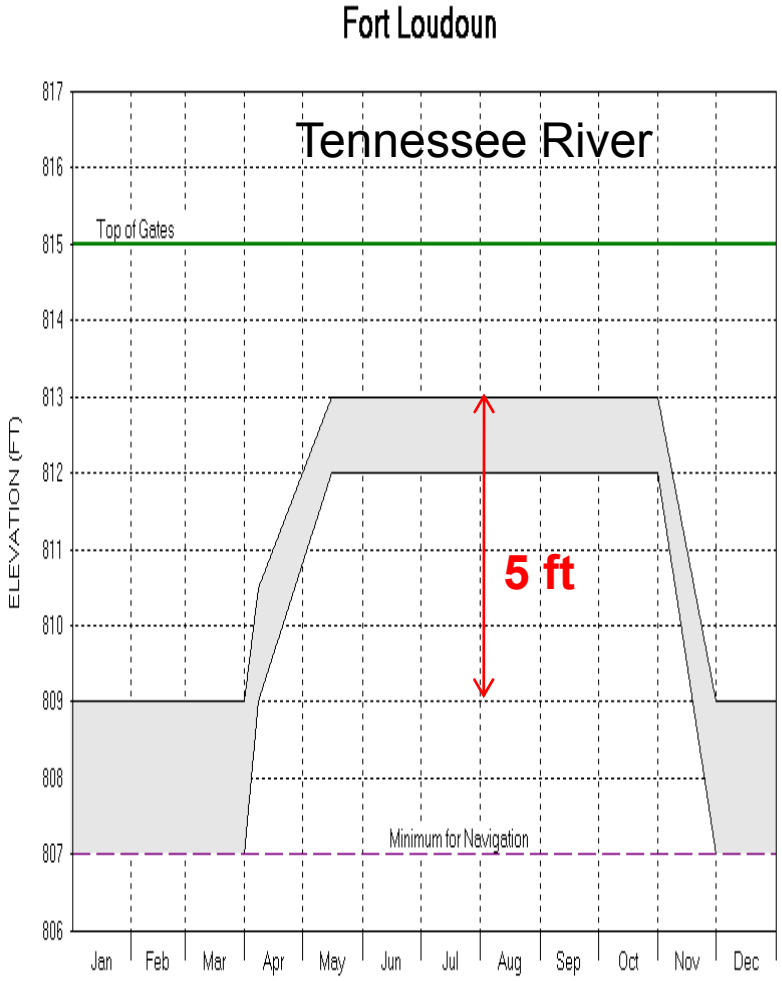
Tributary Run-of-River (Melton Hill)

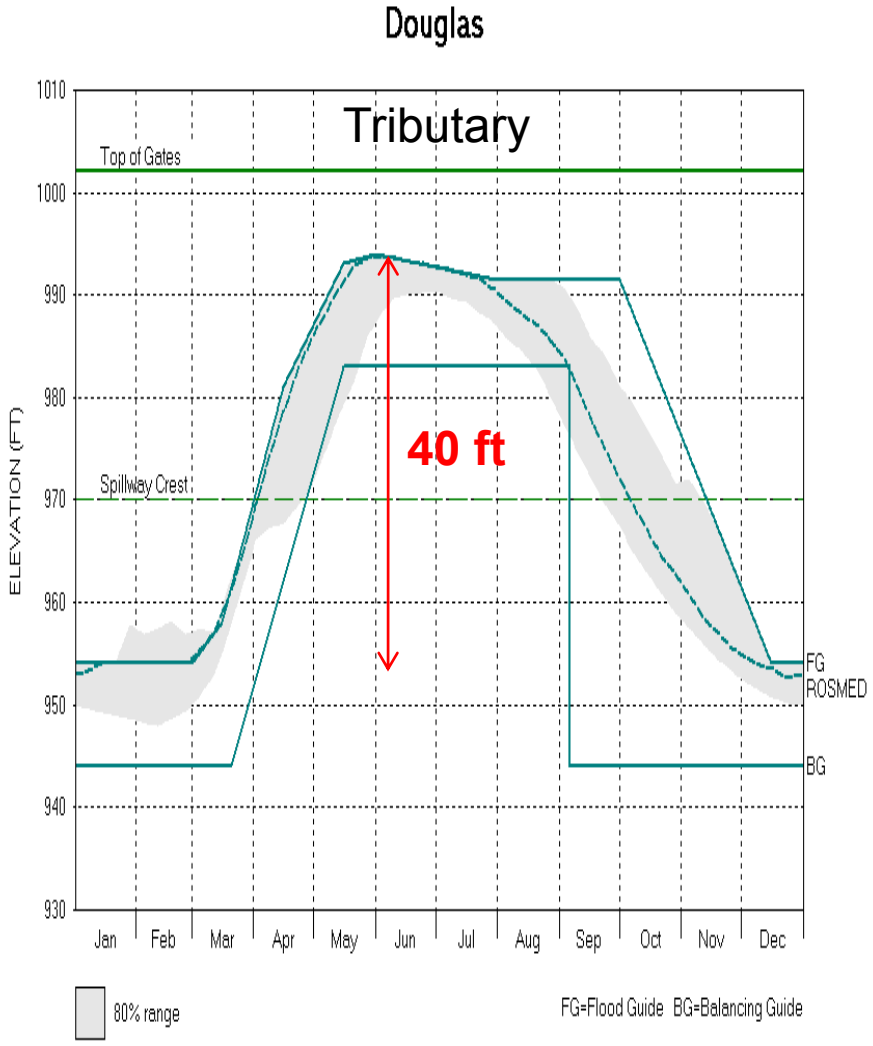
Tributary Non-Power (Upper Bear)

Average Monthly Rain and Runoff

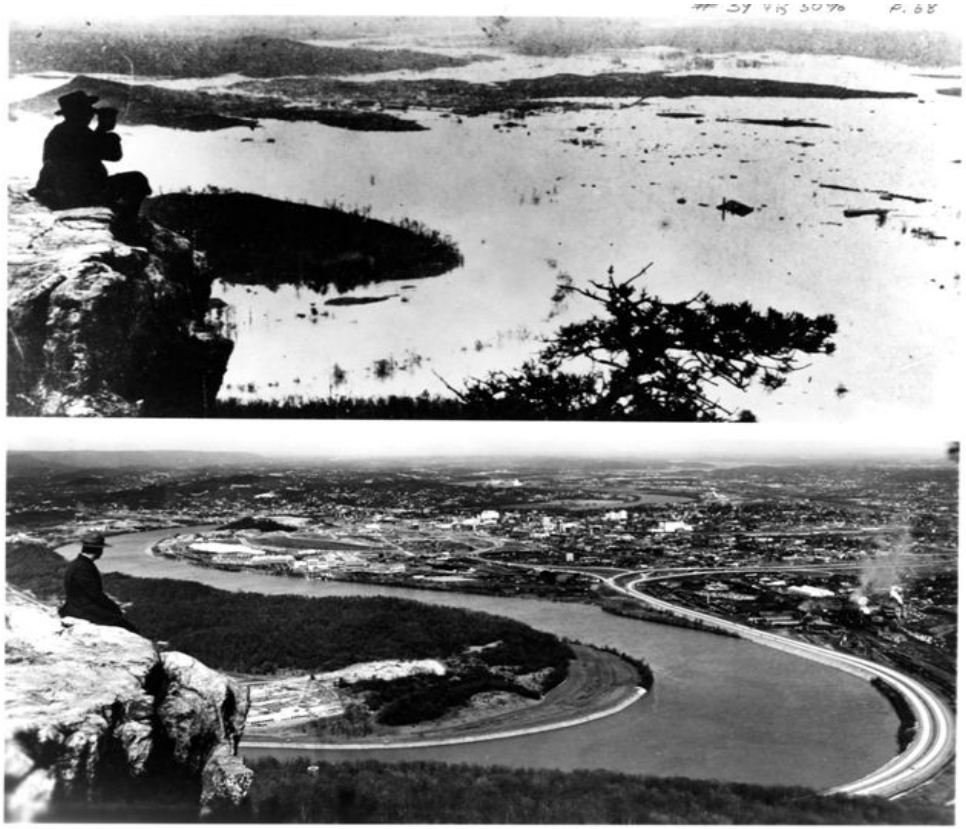


Reservoir Operating Guides



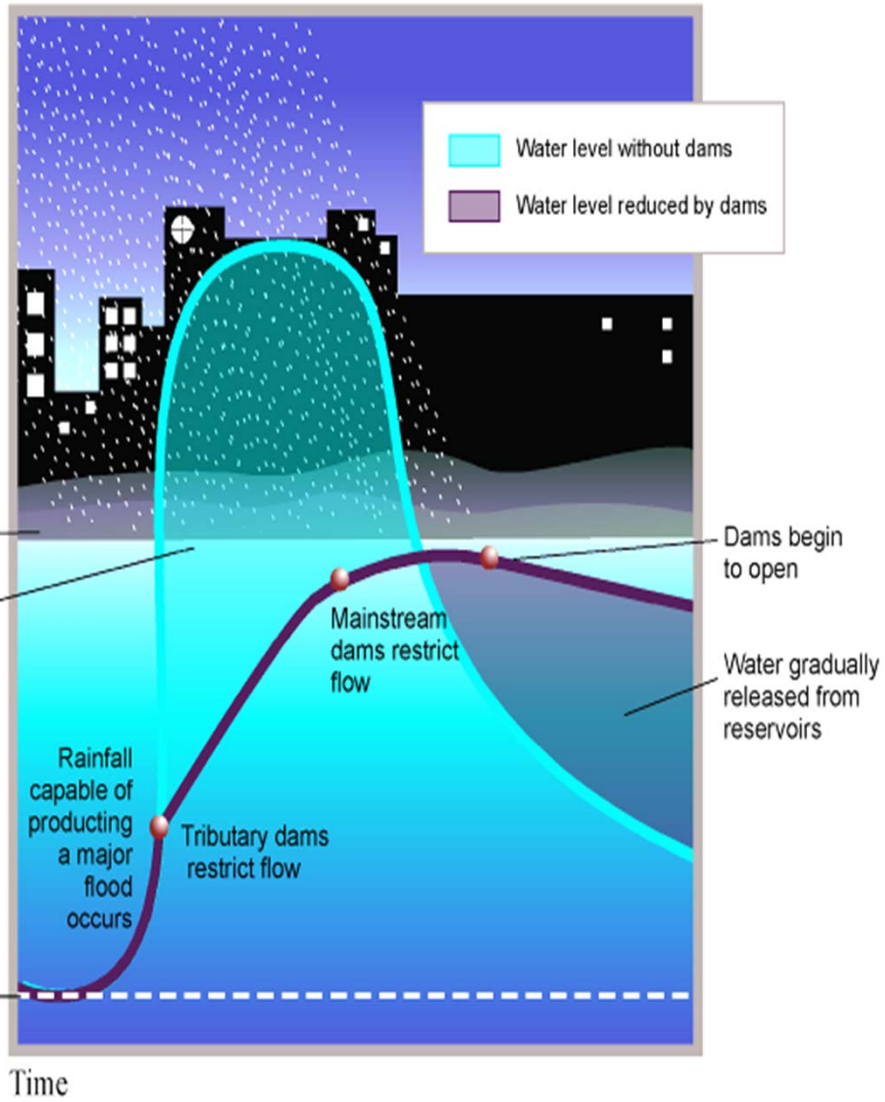


Flood Damage Reduction

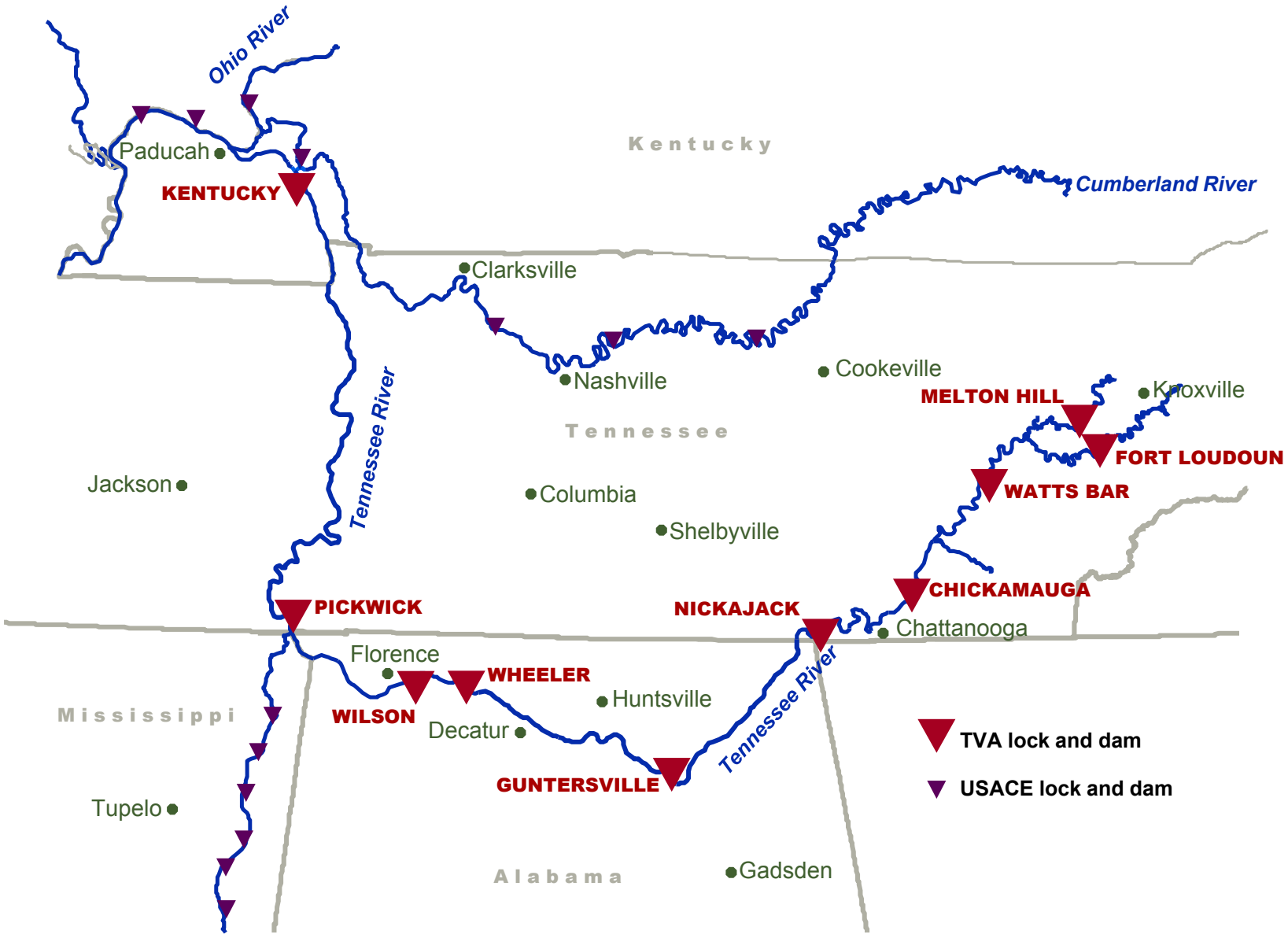


- Maintain flood-storage allocation
- Store water during flood to reduce crest
- Issue flood forecast for regulated streams
- Release water at non-flood rate after crest
- All downstream riparian areas receive some flood-reduction benefits
- Annual average flood damages averted are nearly $260 million ($6.8 billion to date)
- Floodplain management

Flood Damage Reduction



Navigation


Ohio River
Paducah
KENTUCKY
Kentucky
Cumberland River
Clarksville
Nashville
Cookeville
MELTON HILL
Knoxville
Tennessee River
Tennessee
FORT LOUDOUN
WATTS BAR
Jackson
Columbia
Shelbyville
CHICKAMAUGA
PICKWICK
NICKAJACK
Chattanooga
Florence
WHEELER
Huntsville
Mississippi
WILSON
Decatur
Tennessee River
GUNTERSVILLE
TVA lock and dam
USACE lock and dam
Tupelo
Alabama
Gadsden

Navigation

- Functions:
  - Manage flows to maintain a 11-ft waterway for 9-ft draft vessel
  - Supply power for lock operations
  - Maintain locks for year-round navigation
  - Work with the U.S. Army Corps of Engineers to make capital improvements
  - Install and maintain navigational aids on secondary and recreational channels
- Benefits:
  - Annual savings to shippers: $500 million
  - Annual savings to rail users: $500 million (water-compelled rates)
  - Passage for 18,000 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

Affordable and Reliable Electricity

Hydropower generation

- Functions:
  - Manage hydro assets
  - Develop daily/hourly operating plans for the hydro system to meet operating objectives while optimizing hydro value
- Benefits:
  - Conventional generating capacity (109 units): 3,538 megawatts
  - Pumped-storage generating capacity (4 units): 1,653 megawatts
  - Peaking power
  - Ancillary services
  - High efficiencies at partial load
  - Low forced outage rate
  - Low fuel handing costs
  - Clean, renewable energy source

Affordable and Reliable Electricity, cont.

Thermal compliance

- Function:
  - Schedule flows to minimize thermal plant derates due to river temperatures
- Benefits:
  - Avoid National Pollutant Discharge Elimination System (NPDES) discharge permit violations
  - Reduce number and duration of derate occurrences
  - Improve generating efficiency of thermal plants
  - Optimize the use of cooling towers

Water Supply

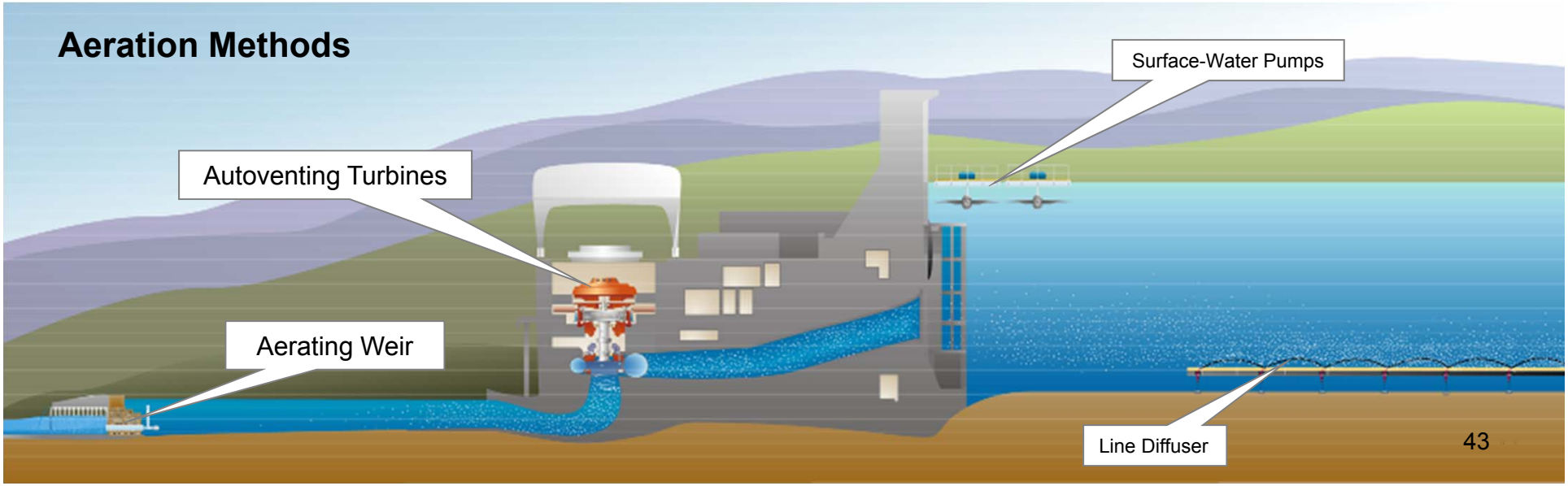
- Ensure that 700 water intakes across the Valley are adequately supplied with water
- Industry supplied with process water and cooling water
- Municipalities supplied with water for household use
- Approximately 4.5 million people depend upon the Tennessee River and it tributaries for drinking water
- Manage flows and releases to provide cooling water for coal and nuclear power plants

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

Water Quality

Functions:

- Work with plants to keep discharge temperatures from coal-fired and nuclear plants within state permit limits (compliance)
- Monitor water-quality conditions
- Meet reservoir-specific and system-wide flow for municipal and industrial waste assimilation as well as aquatic habitat
- Meet dissolved oxygen (DO) targets
- Meet minimum flow targets



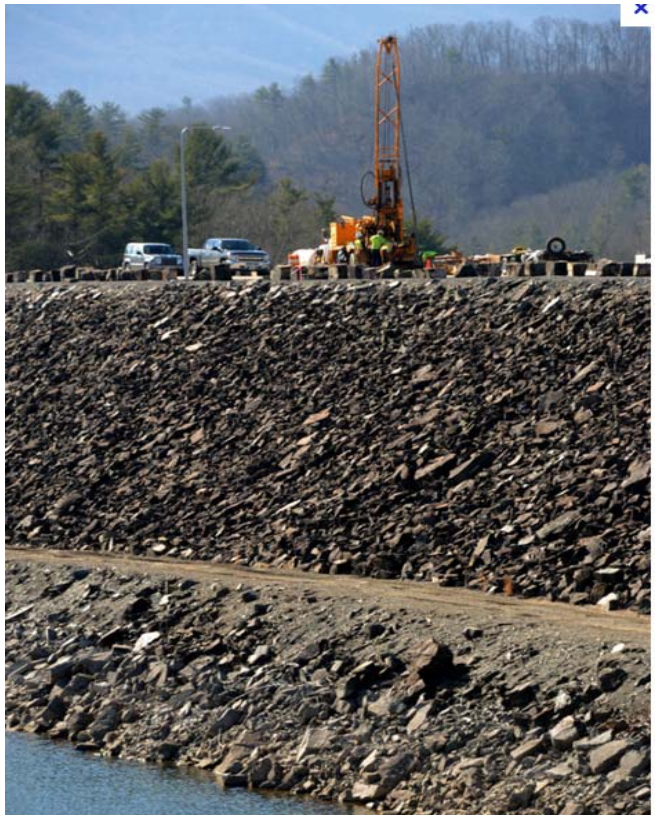
Recreation

- Functions:
  - Provide summer elevations for reservoir recreation and releases for tailwater recreation
  - Restrict the drawdown of tributary reservoirs from June 1 through Labor Day
  - 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:
  - Quality of life
  - Stakeholder relations
  - Economic development
  - Boating, swimming, fishing, whitewater rafting

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

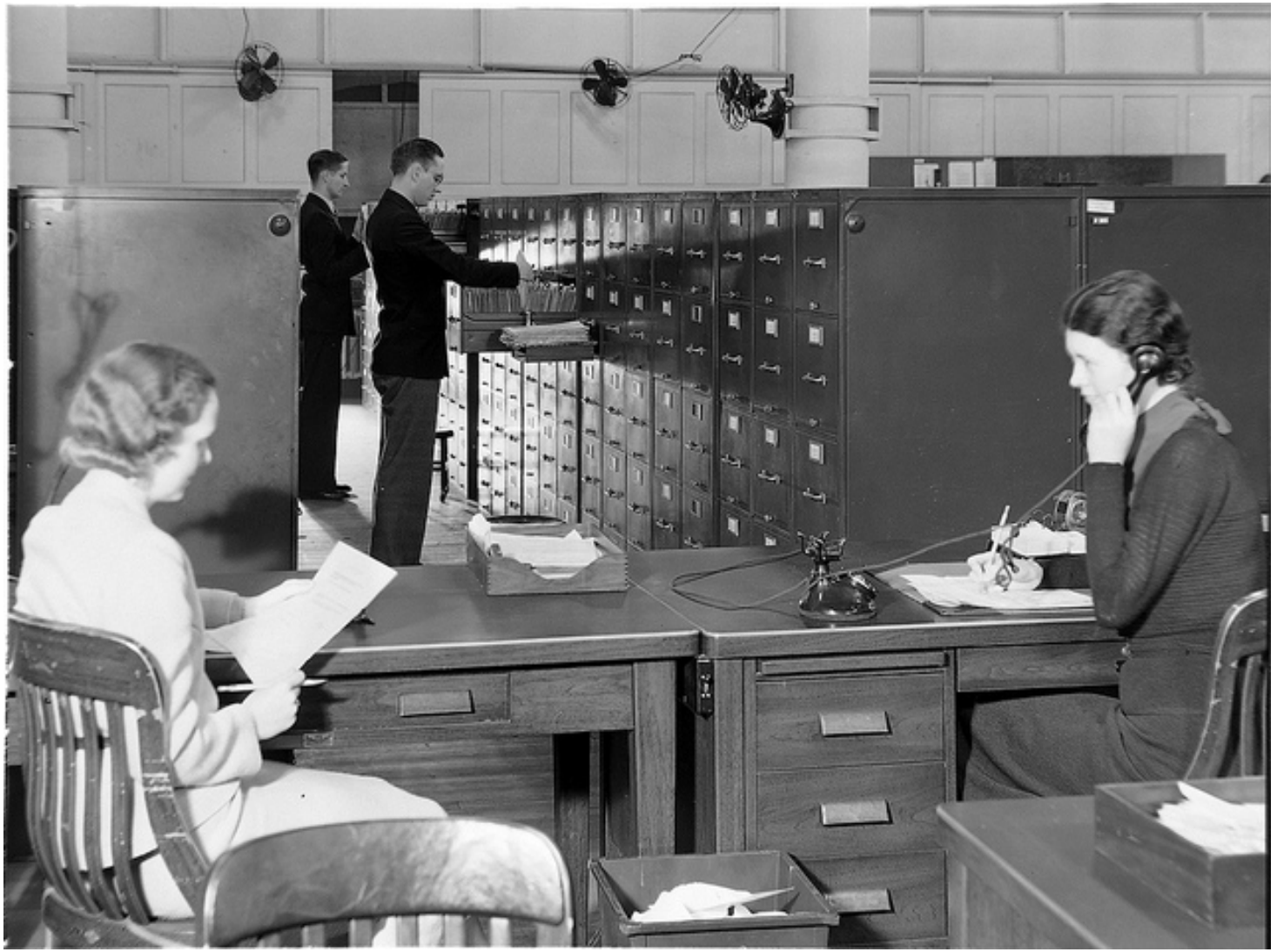


Tennessee River Management

- TVA has a long history that began with its river management mission
- Operations are driven by rainfall and runoff as guided by Reservoir Operations Policy
- Integrated operation allows TVA to balance river system benefits:
  - Navigation
  - Flood-damage reduction
  - Affordable and reliable electricity
  - Improved water quality
  - Dependable water supply
  - Recreation

River Forecast Center

Reservoir Operating Policy History and Overview



History of Reservoir Operations Policy

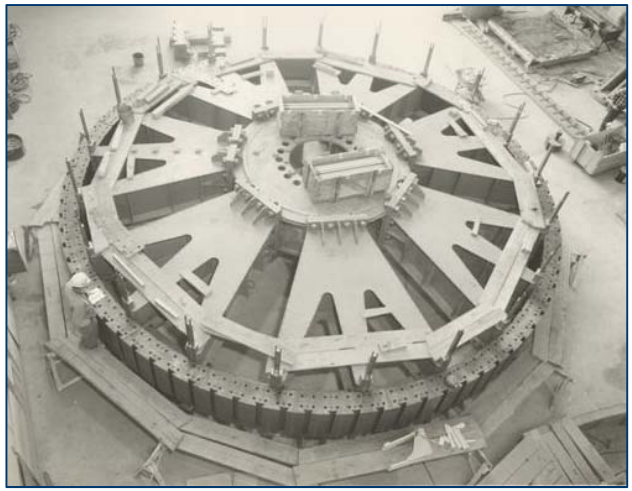
- Based on sections of:
  - TVA Act of 1933
  - Unified Development of the Tennessee River System (1936)
  - Flood Control Act of 1944
- TVA has periodically made changes and adjustments to its reservoir operations policy in order to achieve greater overall value for the public.

History of Reservoir Operations Policy

1933 → **1930's - 1960's** → 2014

Momentous Economical Growth

- 1940's – Peak Construction
- 1950's – TVA became self-financing
- 1960's – TVA begins constructing nuclear plants



History of Reservoir Operations Policy

Improved Reservoir System Benefits

- Began looking for ways to improve system benefits without adversely impacting objectives and considering:
  - Operational experience
  - Environmental requirements
  - Changes in the power industry
  - TVA's own mission and planning needs
- Increasing importance of benefits beyond navigation, flood control, and power production
- TVA specialists reviewed operations and evaluated suggested changes
- It was the beginning of a more formal evaluation process that involved public input and provided a forum for external groups

History of Reservoir Operations Policy

Reservoir Operations Study

- Initiated in 2001; approved in 2003
  - Recommendations by the 1st term RRSC's *Integrated River Management Subcommittee* became the foundation for a comprehensive reservoir operations study
- Goal: Prepare an operating policy to provide the greatest public value through the year 2030
- Involved extensive public review and input, and alternative evaluation
  - 5,400 members of the public commented
  - 3,600 residents responded to telephone survey
  - Almost 7,000 individuals commented on Draft Environmental Impact Statement (EIS) and 2,100 on Final EIS

ROS – Primary Outcomes

- Created balancing guides for tributary storage reservoirs
- Increased minimum depth of the Tennessee River navigation channel at two locations
- Restricted drawdown of 10 tributary reservoirs from June 1 – Labor Day
- Raised flood guides and operating ranges on several tributary reservoirs
- Recreation releases
- Maintained tailwater minimum flows and dissolved oxygen targets
- System-wide flow requirements

Reservoir Operations Policy

Reservoir Operations Policy

- Established a balance of operating objectives
- Responsive to values expressed by the public
- Consistent with the operating priorities established by the TVA Act
- Guides system-wide decisions about how much water is stored in specific reservoirs, how the water is released, and the timing of those releases
- Composed of guidelines that describe how the reservoirs should be operated given the rainfall and runoff, and the operating objectives.
- Provides flexibility to be effective over the wide range of rainfall and runoff patterns
- Allows for temporary deviations from normal operating guidelines to meet critical power system situations, to meet other reservoir system needs, or due to floods or droughts, etc.
- Established pool level parameters for daily operations

Reservoir Operations Policy Flexibility

Reservoir Operations Policy allows for operational flexibility to balance reservoir objectives during abnormal periods

Examples:

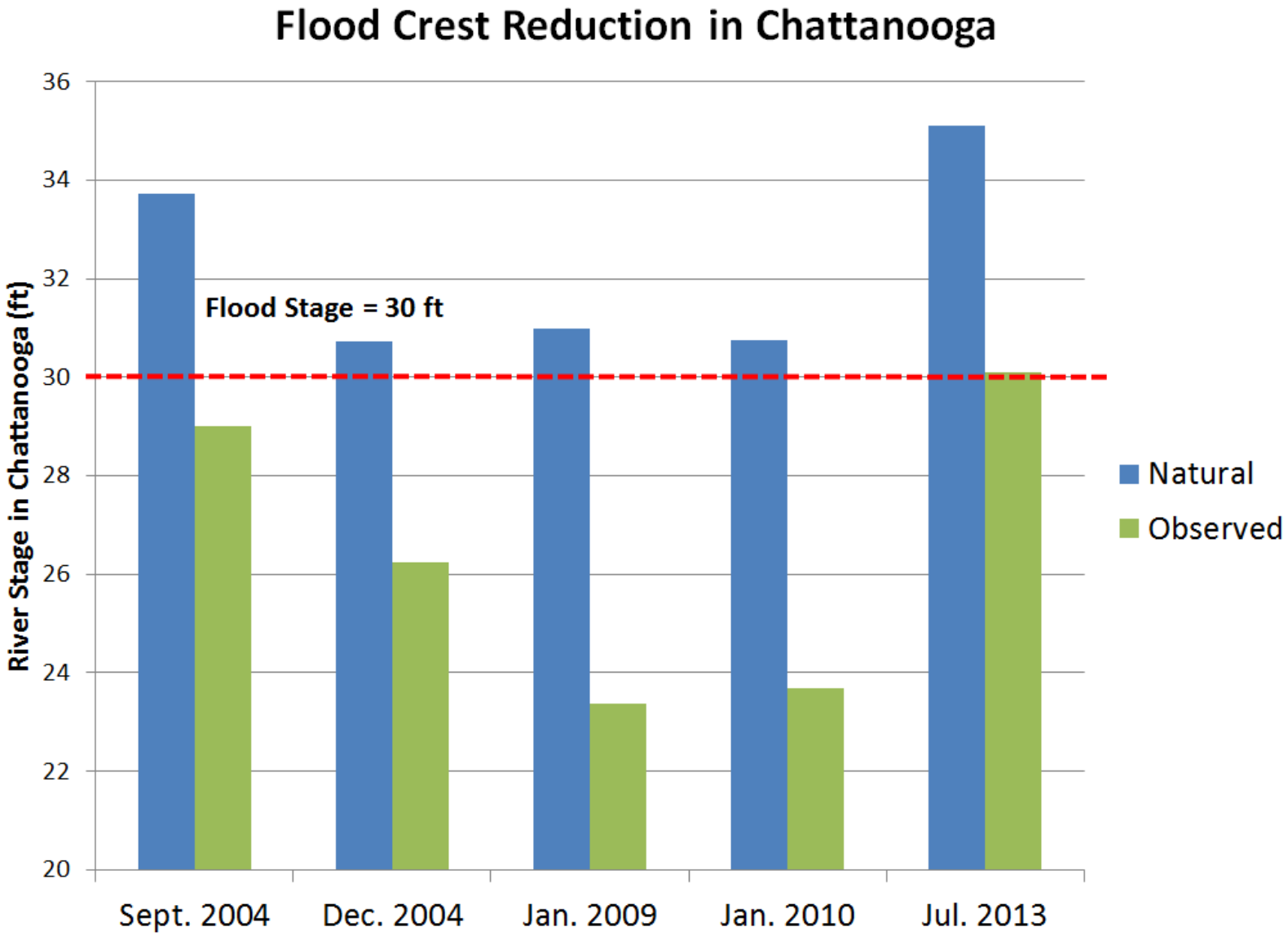
- 2013 foregoing min/rec flows to meet flood control objectives
- Grouping basin-specific reservoir balancing due to abnormal regional hydrology
- Shifting recreation releases to meet stakeholder special requests
- Addressing U.S. Fish and Wildlife Service (USFWS) consultation requirements through adaptive management policies (Tims Ford, Bear Creeks, Pickwick, Wilson)
- Providing extra hydropower & flow to meet extreme summer power demand to protect downstream thermal limits
- Abnormal conditions at Blue Ridge – prolonged deep drawdown

ROS Successes: 2004 - Current

ROS Successes – Flood Control

- Reducing flood damage is one of the most valuable benefits of the system
  - $240 Million in averted damages on average annually in the Valley
  - $20 Million in averted damages on average annually on Ohio & Mississippi Rivers
  - $840 Million in damages averted in the Valley in 2013 alone
- Record reservoir storage on Kentucky during flood of record on the Ohio and Mississippi Rivers (May 2011)
- Only 1 instance at flood stage in Chattanooga in past 10 years
- Trade-off: Slightly less flood control storage for higher reservoir levels, but still successfully reducing flood damages

ROS Successes – Flood Control



ROS Successes – Navigation

- Allowed for slightly deeper draft barges on the lower Tennessee River; fewer navigation disruptions
  - Increased Wheeler Reservoir minimum pool elevation by 0.5 feet
  - Releases of up to 25,000 cubic feet per second at Kentucky to maintain tailwater elevation of 301’
  - Special operation request procedure for Pickwick during periods of zero discharge and low tailwater elevations
- Flexibility of ROS allows for windows of opportunity for lockage during prolonged lock or river closures
- Supported continued navigation during the 2012 significant drought on the Mississippi River
  - The Tennessee and Cumberland Rivers provided more than one-third of the flow down the Mississippi River with only 5% of the drainage area

ROS Successes – Hydropower

- 139,569 Giga-watt hours (GWh's) of reliable energy production over the last 10 years
- Hydro generation is about 10-15% of the total generation mix
- Represents replacement value of approximately $500M annually
- Peaking resources to meet TVA's daily fluctuations in demand
- Ancillary services such as voltage regulation and reserve capacity
- 2013:
  - TVA record for Gross Conventional Hydro Generation (18,470 GWh)
- 2014 Polar Vortex:
  - $36M on January 7 alone ($35M/month average)
  - Total Hydro Value in January 2013 was over $127M
  - 108/109 units generating
  - Flexibility allowed us to go below guide curve and recover in February

ROS Successes – Water Quality and Supply

- NPDES thermal limits managed – only 1 Notice of Violation (2010, Browns Ferry Nuclear plant)
- Improved and enhanced dissolved oxygen (DO) levels
  - Hatchery supported trout fisheries: $20M/year retail activity in TN[1]
- Flows and DO support world class trout and bass fisheries
- Threatened & Endangered species recovery from adaptive management policies
  - Ex. Modified operations at Tims Ford Dam for Boulder Darter
- Water supply targets achieved
- Focus shifted to flow-driven policy vs. elevation-driven
- Higher reservoir elevations in winter provide more water in storage
- Commitments – being good stewards; it is the right thing to do

[1]*Economic Effects of Rainbow Trout Production by the National Fish Hatchery System (USFWS, 2006)*

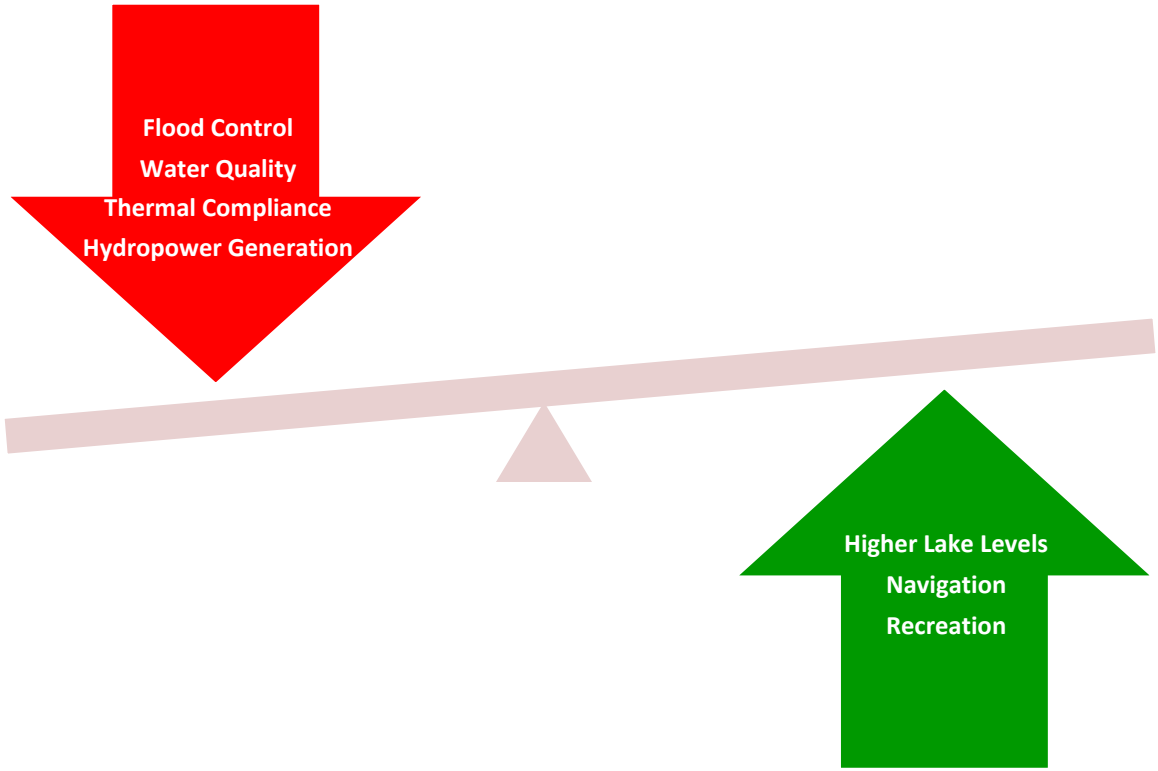
ROS Successes – Recreation

- Tributary winter pools raised at Boone, Chatuge, Cherokee, Douglas, Fontana, Hiwassee, Norris, Nottely, South Holston & Watauga
- Drawdown Restrictions in place June 1 through Labor Day
- Extended recreation season
- Flows and water quality below South Holston support *"one of the finest trout fisheries in Tennessee and the Southeast"* [1]
- Provide increased recreation flows at Apalachia, Norris, Ocoee #1, Watauga and Wilbur
  - TVA Lake Info app
  - Recreation releases are scheduled months in advance

[1] *South Holston Tailwater Trout Fishery*, Tennessee Wildlife Resources Agency (TWRA), 2009

Challenges

- Balancing the competing demands on the system and the overall value to the public
- Lack of understanding of the trade-offs associated with individual wants
- Example: Can you keep my reservoir higher, longer?



ROS & Climatic Extremes

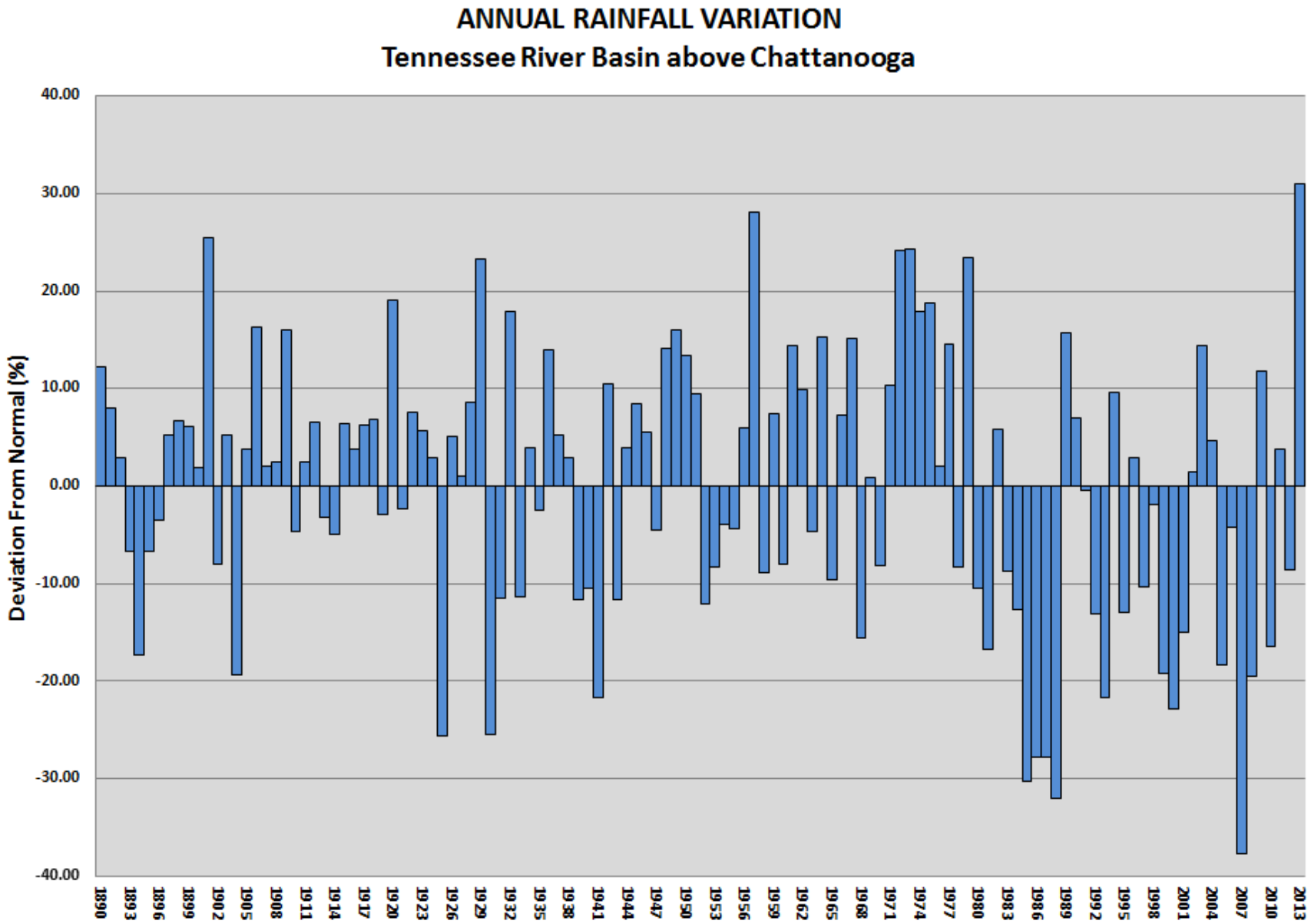
- Hydrology Overview (wet vs. dry vs. normal years)
- Reservoir Impacts 2004 Hurricanes
- Reservoir Impacts 2007 - 2008 Record Drought
- Reservoir Impacts 2010 – Record Hot
- Reservoir Impacts 2013 – Record Wet
- 2014 & Beyond

NOAA Image – Hurricane Francis

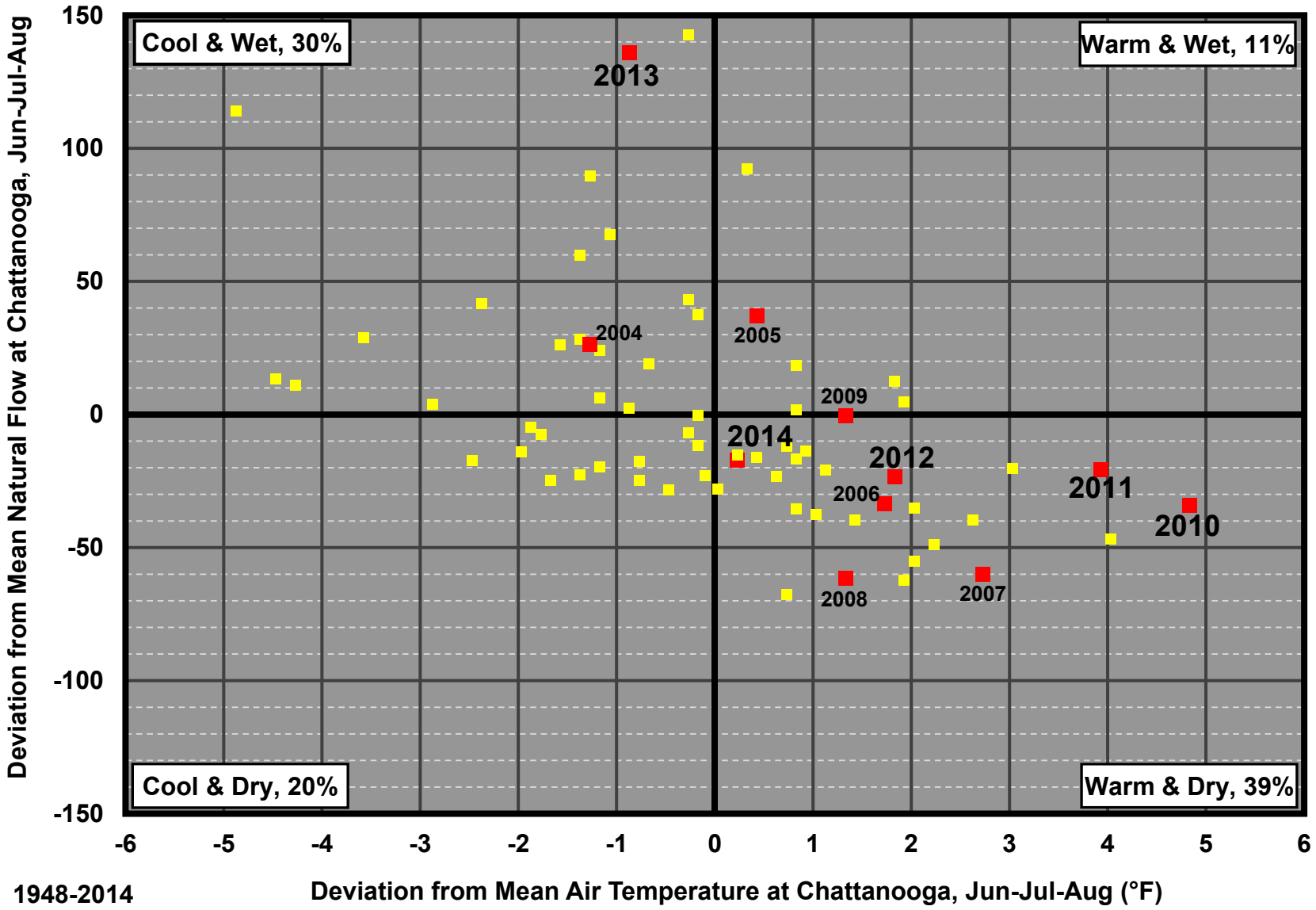
South Holston Marina

Guntersville, AL

Variable Hydrology



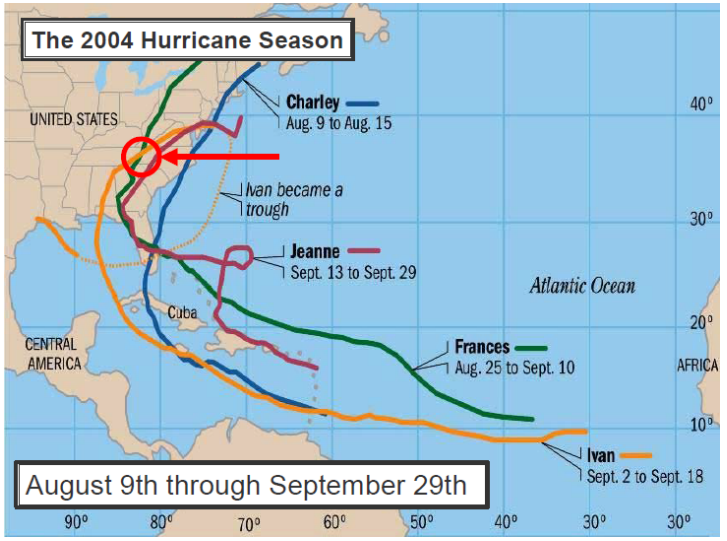
Variable Meteorology



Climate Extremes – 2004

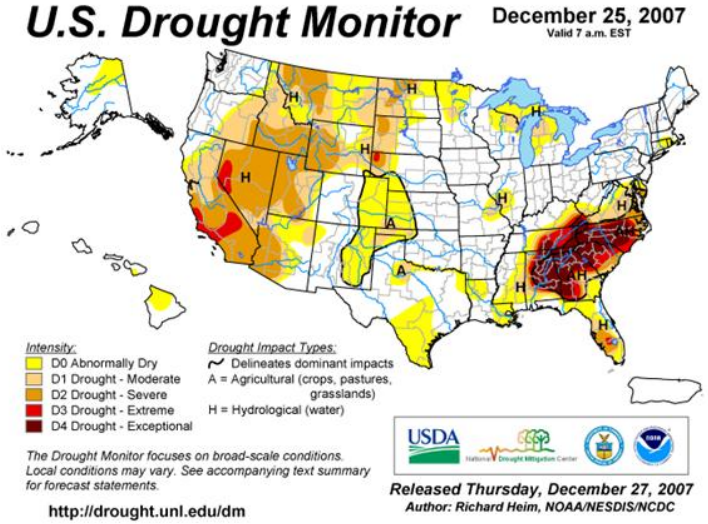
- Hurricanes Ivan, Frances & Jeanne impact the Tennessee Valley - all during the month of September
- Tropical moisture produced heavy rainfall in western NC & the central Valley (rainfall gage in Highlands, NC totals 29 inches for September)
- Tributary reservoirs had begun drawdowns – providing significant flood protection benefit at Chattanooga and other damage centers
- Chattanooga stages remained below flood level and navigation impacts were minimized to 5 days
- Heavy localized damage in NC including washouts and land slides

Interstate 40E - Haywood Co., NC



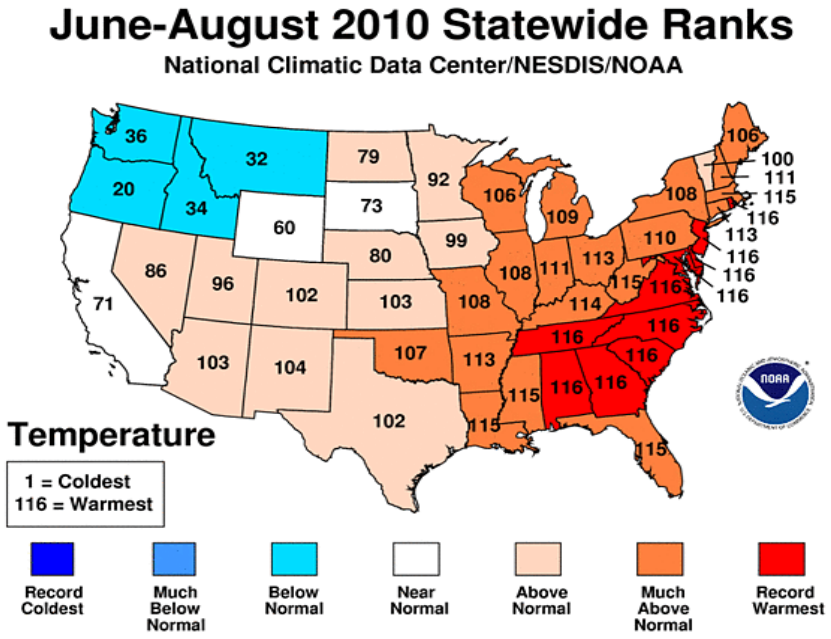
Climate Extremes – 2007 & 2008

- Record setting drought impacts the Valley – 2007 became the driest year on modern record
- Many streams in the Valley hit new record lows
- ROS minimum flow and pulse requirements ensured wetted streams below all tributary dams, despite record low natural inflow
- Storage utilization from tributaries ensured minimum operating levels for navigation are sustained
- 8/10 of TVA's all-time peak energy days occurred in August 2007
- Development of Drought Management Plan



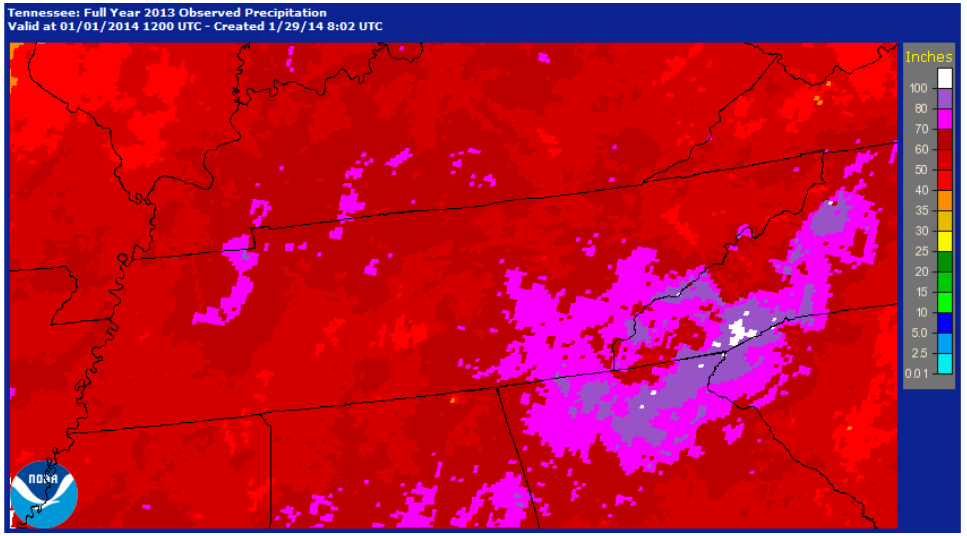
Climate Extremes – 2010

- Record setting heat-wave impacts the Valley – 2010 became the hottest summer on record
- Water temperatures at Nuclear and Coal plants affected, with only 1 recorded Notice of Violation
- Browns Ferry Nuclear required station derates of 50%
- Cold water reserved in storage at tributaries proved beneficial during critical periods of heat wave



Climate Extremes – 2013

- Record setting rain impacts the Valley – 2013 became the wettest year on record for the eastern portion of the Valley
- 70+ inches widespread, some areas 100+ inches of rainfall for Calendar Year 2013
- Chattanooga reached flood stage for the first time in 10 years, first time in TVA's history for Chattanooga flood stage in July
- Record rainfall equated to record conventional hydro generation (18,470 GWh)
- Flood control system averted nearly $1 Billion in potential damages
- Both positive/negative impacts for Recreation, Navigation, Water Supply & Quality



Questions?

Recap and Safety Message

Lunch

Field Trip

Tennessee Valley Authority

Regional Resource Stewardship Council

Young Harris, Georgia

September 24 and 25, 2014

Agenda

7:00	Breakfast	
8:00	Recap	Lee Matthews / Joe Hoagland
8:30	Discussion and Initial Council Advice	Matthews & Council
9:15	Break	
9:30	Public Comment Period	
10:30	Discussion and Initial Advice from the Council	Matthews
11:30	Wrap up and Adjourn	Hoagland / Matthews
11:45	Lunch (Brasstown Dining Room)	All
12:15	Tour of Blue Ridge Mountain Electric Membership Corporation	All

Council Discussion

Advisory Session Topic and Discussion Questions

1. Does TVA's ROS approach still balance the objectives in an optimal manner across the Tennessee Valley?

2. Within this operating framework do you have recommendations?

3. Are there other objectives that should be considered and prioritized?

Break

Public Comment Period

Public Comment Period

- Public participation is appreciated
- This is a listening session; responses are typically not provided
- Members of the public have a set number of minutes for their comments

Council Discussion

Advisory Session Topic and Discussion Questions

1. Does TVA's ROS approach still balance the objectives in an optimal manner across the Tennessee Valley?

2. Within this operating framework do you have recommendations?

3. Are there other objectives that should be considered and prioritized?

Wrap Up & Adjourn

Next Steps: Upcoming Meetings

Spring Meeting: April 8-9, 2015 (tentative)

Location: TBD

Topic: Natural Resources Issues

Please stay for lunch and then join us for a tour the new Blue Ridge Mountain Electric Membership Corporation building

Thank you!