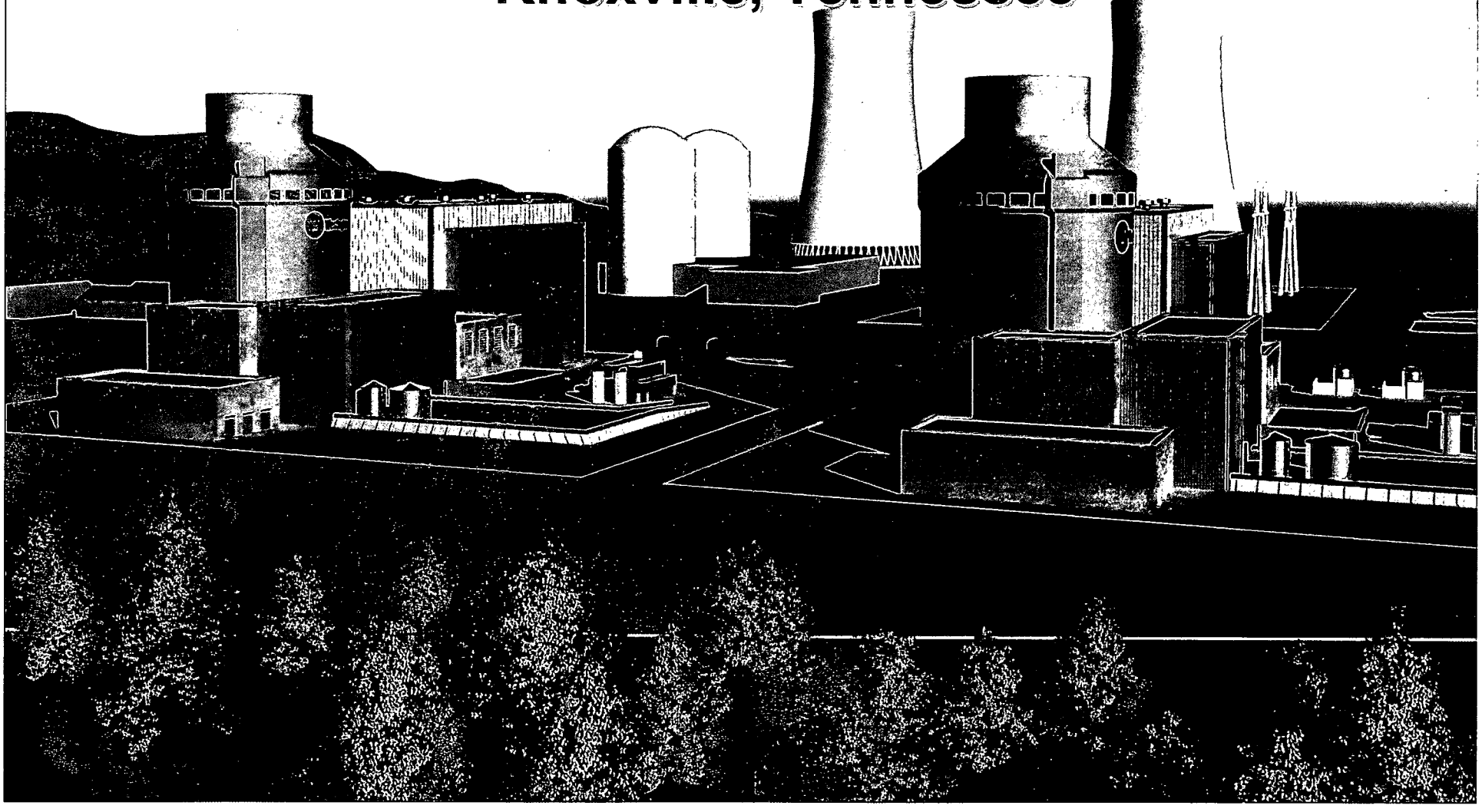
Bellefonte Units 3 and 4
TVA/NRC Hydrologic Analysis Workshop
June 23 – 27, 2008
Knoxville, Tennessee



Bellefonte Nuclear Plant Units 3 and 4
TVA/NRC Hydrology Workshop
Knoxville Tennessee
June 23 – 27, 2008

MONDAY Workshop Schedule

Time	Topic	Location	Instructor
0800	Introductions	WT 2	Maddux
0830	Description of Tennessee River Watershed/System		Lowe
0930	15 Minute Break		
0945	Tour of TVA's River Scheduling Forecast Center		Bowling
1145	Lunch – 1 Hour		
1245	Current Reservoir Operating Policy		Bowling
1400			
1445	15 Minute Break		
1500	History of Reservoir Operating Policy Changes		Goranflo
	Runoff Model-Unit Hydrograph Development		Lee
1600			
1630	Daily Wrap-Up/Summary		All
1700	Adjourn for day		

Bellefonte Nuclear Plant Units 3 and 4
TVA/NRC Hydrology Workshop
Knoxville Tennessee
June 23 – 27, 2008

Tuesday Workshop Schedule
(Modified 6/23/08 – REV 1)

Time	Topic	Location	Instructor
0800	PMF Development	WT 2	Lee
0900	PMF – SOCH Run Sequence		Lowe
0945	15 Minute Break		
1000	PMF – SOCH Run Sequence (Continued)		Lowe
1130	Lunch – 1 Hour		
1230	Sensitivity Analysis – 20% Peaking and 100% Runoff		Limback/Lowe
1400			
1445	15 Minute Break		
1500	Planned Sensitivity Analysis		Maddux
1600			
1630	Daily Wrap-Up/Summary		All
1700	Adjourn for day		

Bellefonte Nuclear Plant Units 3 and 4
TVA/NRC Hydrology Workshop
Knoxville Tennessee
June 23 – 27, 2008

Wednesday Workshop Schedule
(Modified 6/23/08 REV 1)

Time	Topic	Location	Instructor
0800	Project Rating Curves	WT 2	Schohl
0900			
0945	15 Minute Break		
1000	Project Schedule Review		Maddux
1130	Lunch – 1 Hour		
1230	SOCH Breakout Session		Limback/Lowe
1400			
1445	15 Minute Break		
1500	US Army Corp of Engineers		All
	discussion of Bathymetry Data		
1600			
1700	Adjourn for day		

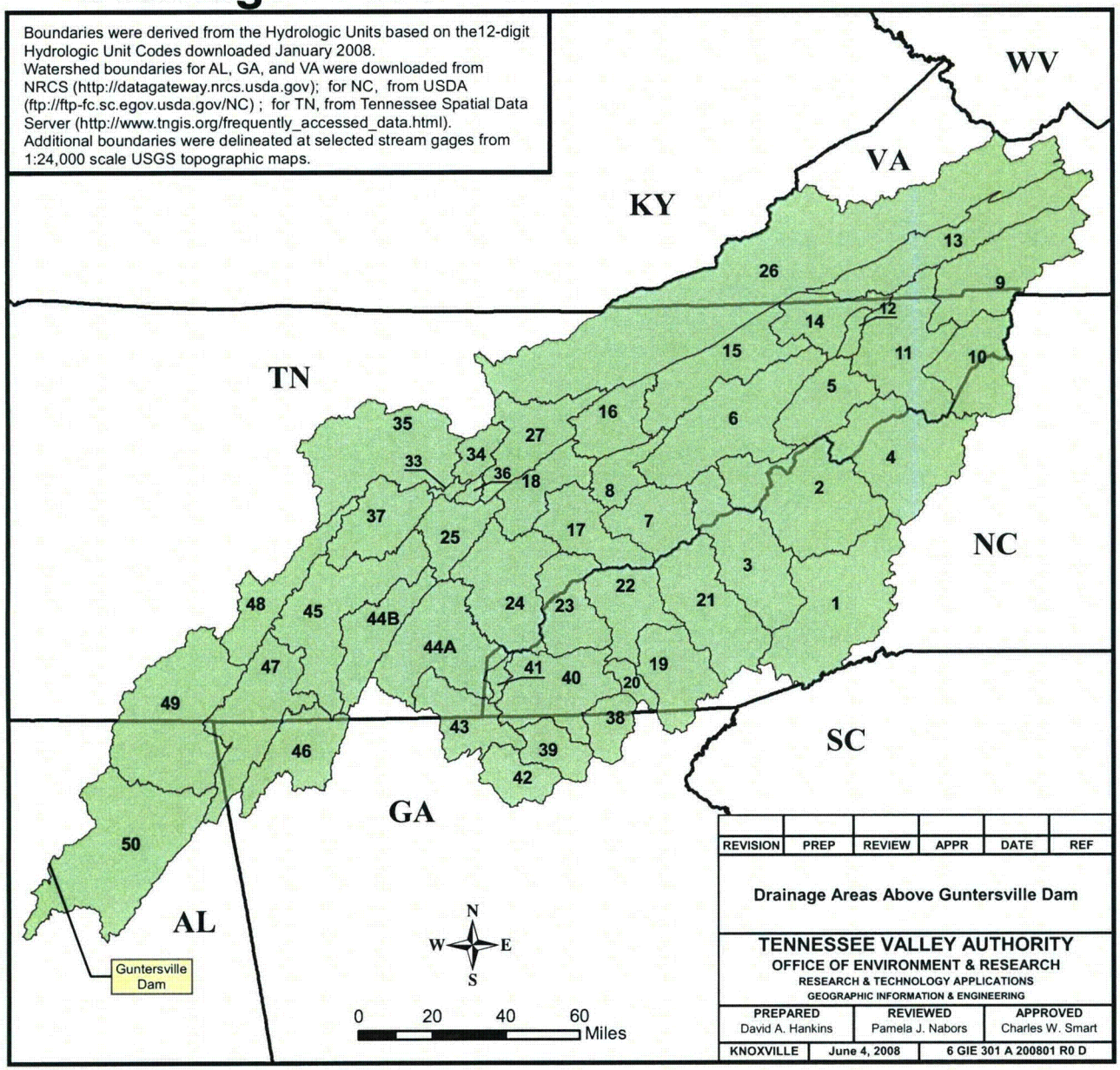
Bellefonte Nuclear Plant Units 3 and 4
TVA/NRC Hydrology Workshop
Knoxville Tennessee
June 23 – 27, 2008

Thursday Workshop Schedule
(Modified 6/23/08 REV 1)

Time	Topic	Location	Instructor
0800	Update from Bechtel - Verification Process	WT 2	Bechtel Staff
0900			
0945	15 Minute Break		
1000	SOCH Breakout Session -		Limback/Lowe
1130	Lunch – 1 Hour		
1230	SOCH Breakout Session		Limback/Lowe
1400			
1445	15 Minute Break		
1500	O&A Wrap-Up for Technical Issues		All
1600			
1700	Adjourn for day		

Drainage Areas Above Guntersville Dam

Boundaries were derived from the Hydrologic Units based on the12-digit Hydrologic Unit Codes downloaded January 2008.
Watershed boundaries for AL, GA, and VA were downloaded from NRCS (http://datagateway.nrcs.usda.gov); for NC, from USDA (ftp://ftp-fc.sc.egov.usda.gov/NC) ; for TN, from Tennessee Spatial Data Server (http://www.tngis.org/frequently_accessed_data.html).
Additional boundaries were delineated at selected stream gages from 1:24,000 scale USGS topographic maps.



REVISION	PREP	REVIEW	APPR	DATE	REF

Drainage Areas Above Guntersville Dam

TENNESSEE VALLEY AUTHORITY
OFFICE OF ENVIRONMENT & RESEARCH
RESEARCH & TECHNOLOGY APPLICATIONS
GEOGRAPHIC INFORMATION & ENGINEERING

PREPARED	REVIEWED	APPROVED
David A. Hankins	Pamela J. Nabors	Charles W. Smart
KNOXVILLE	June 4, 2008	6 GIE 301 A 200801 R0 D

Map Label	Watershed Basin	Sq Miles
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2	French Broad River, Newport to Asheville	913.1
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5	Nolichucky local, Embreeville to Nolichucky Dam	378.7
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8	French Broad River local	206.5
9	South Holston Dam	703.2
10	Watauga Dam	468.2
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17	Little River at mouth	378.6
18	Fort Loudoun local	323.4
19	Little Tennessee River at Needmore	436.5
20	Nantahala Dam	90.9
21	Tuckasegee River at Bryson City	653.8
22	Fontana local	389.8
23	Little Tennessee River local, Fontana Dam to Chilhowee Dam	404.7
24	Little Tennessee River local, Chilhowee Dam to Tellico Dam	650.2
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26	Norris Dam	2,912.8
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33	Clinch River local above mile 16	37.2
34	Poplar Creek at mouth	135.2
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40	Hiwassee River local below Chatuge and Nottely	565.1
41	Apalachia local	49.8
42	Blue Ridge Dam	231.6
43	Ocoee No. 1 local, Ocoee No. 1 to Blue Ridge Dam	362.6
44A	Hiwassee River local, Charleston gage at mile 18.9 to Apalachia and Ocoee No. 1 Dams	686.6
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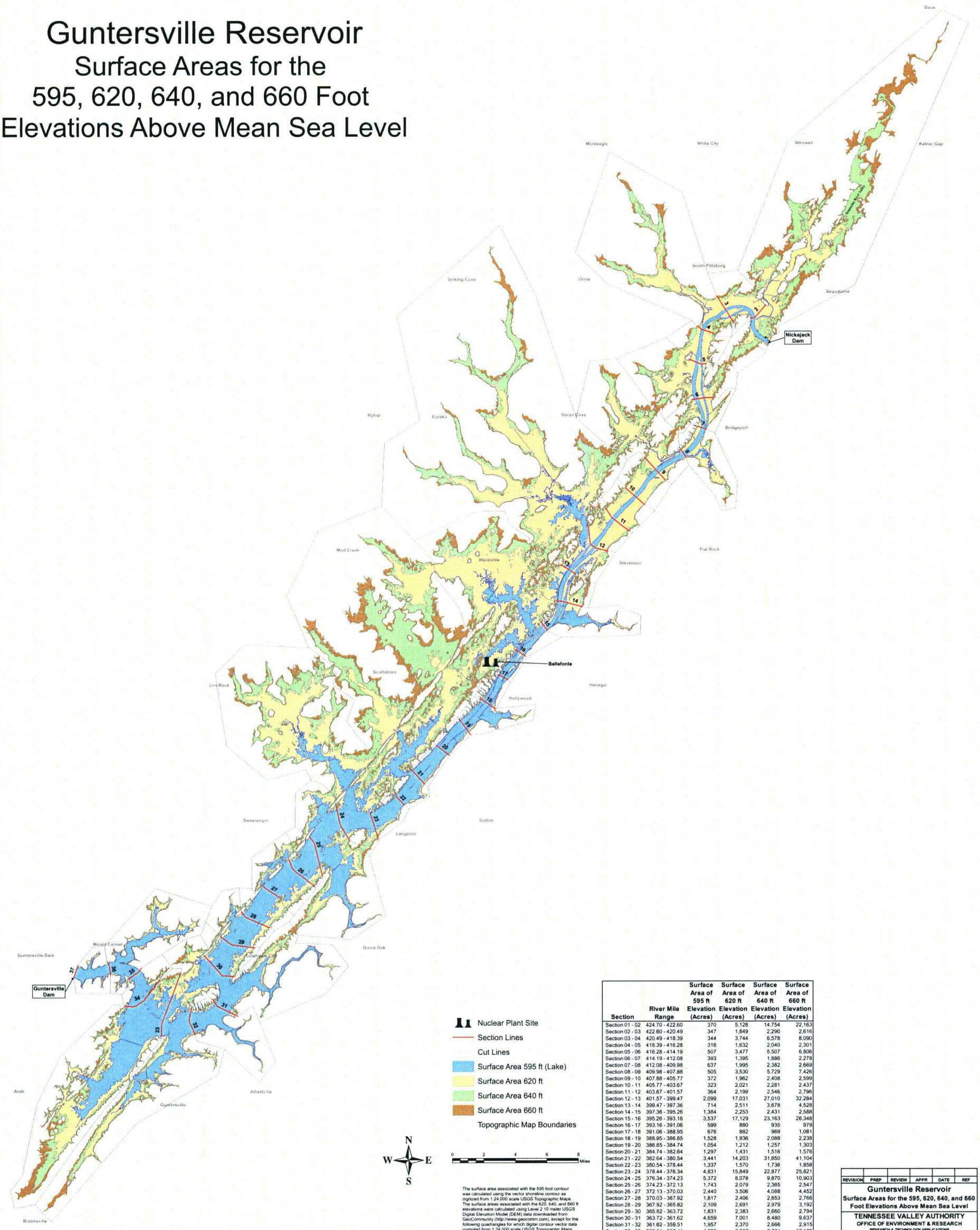
46	South Chickamauga Creek near Chattanooga	428.1
47	Nickajack local	644.0
48	Sequatchie River at Whitwell	400.0
49	Guntersville North local	1,044.1
50	Guntersville South local	1,154.9
	Total	24,451.9

* Includes 30 square miles noncontributing area
** Unit areas 27 - 32 have been combined

Guntersville Reservoir

Surface Areas for the 595, 620, 640, and 660 Foot Elevations Above Mean Sea Level



The surface area associated with the 595 foot contour was calculated using the vector shoreline contour as digitized from 1:24,000 scale USGS Topographic Maps. The surface areas associated with the 620, 640, and 660 ft elevations were calculated using Level 2 10 meter USGS Digital Elevation Model (DEM) data downloaded from GeoCommunity (http://www.geocomm.com), except for the following quadrangles for which digital contour vector data compiled from 1:24,000 scale USGS Topographic Maps by USGS/NGTOC, Rolla, Missouri was available: Guntersville Dam, Mount Carmel, Lim Rock, Mud Creek, Scottsboro, Wannville, Hollywood, Stevenson, Henagar, and Flat Rock.

Section	River Mile Range	Surface Area of 595 ft Elevation (Acres)	Surface Area of 620 ft Elevation (Acres)	Surface Area of 640 ft Elevation (Acres)	Surface Area of 660 ft Elevation (Acres)
Section 01 - 02	424.70 - 422.60	370	5,128	14,754	22,163
Section 02 - 03	422.60 - 420.49	347	1,849	2,290	2,616
Section 03 - 04	420.49 - 418.39	344	3,744	6,578	8,090
Section 04 - 05	418.39 - 416.28	316	1,632	2,040	2,301
Section 05 - 06	416.28 - 414.19	507	3,477	5,507	6,806
Section 06 - 07	414.19 - 412.08	393	1,395	1,886	2,278
Section 07 - 08	412.08 - 409.98	637	1,995	2,382	2,669
Section 08 - 09	409.98 - 407.88	505	3,530	5,729	7,426
Section 09 - 10	407.88 - 405.77	372	1,962	2,408	2,599
Section 10 - 11	405.77 - 403.67	323	2,021	2,281	2,437
Section 11 - 12	403.67 - 401.57	364	2,199	2,546	2,796
Section 12 - 13	401.57 - 399.47	2,099	17,031	27,010	32,284
Section 13 - 14	399.47 - 397.36	714	2,511	3,678	4,528
Section 14 - 15	397.36 - 395.26	1,384	2,253	2,431	2,588
Section 15 - 16	395.26 - 393.16	3,537	17,129	23,163	26,348
Section 16 - 17	393.16 - 391.06	599	880	935	979
Section 17 - 18	391.06 - 388.95	676	882	969	1,081
Section 18 - 19	388.95 - 386.85	1,528	1,936	2,088	2,238
Section 19 - 20	386.85 - 384.74	1,054	1,212	1,257	1,303
Section 20 - 21	384.74 - 382.64	1,297	1,431	1,516	1,576
Section 21 - 22	382.64 - 380.54	3,441	14,203	31,650	41,104
Section 22 - 23	380.54 - 378.44	1,337	1,570	1,736	1,858
Section 23 - 24	378.44 - 376.34	4,831	15,849	22,877	25,821
Section 24 - 25	376.34 - 374.23	5,372	8,078	9,870	10,903
Section 25 - 26	374.23 - 372.13	1,743	2,079	2,365	2,547
Section 26 - 27	372.13 - 370.03	2,440	3,506	4,088	4,452
Section 27 - 28	370.03 - 367.92	1,817	2,406	2,653	2,766
Section 28 - 29	367.92 - 365.82	2,109	2,691	2,979	3,192
Section 29 - 30	365.82 - 363.72	1,831	2,383	2,660	2,794
Section 30 - 31	363.72 - 361.62	4,659	7,001	8,480	9,637
Section 31 - 32	361.62 - 359.51	1,957	2,370	2,666	2,915
Section 32 - 33	359.51 - 357.41	4,095	7,037	8,724	10,129
Section 33 - 34	357.41 - 355.31	8,424	13,757	17,327	20,201
Section 34 - 35	355.31 - 353.21	1,176	1,367	1,492	1,640
Section 35 - 36	353.21 - 351.10	2,345	3,493	4,088	4,557
Section 36 - 37	351.10 - 349.00	980	1,167	1,259	1,344
Totals		65,922	163,153	236,361	280,967

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Guntersville Reservoir
Surface Areas for the 595, 620, 640, and 660 Foot Elevations Above Mean Sea Level

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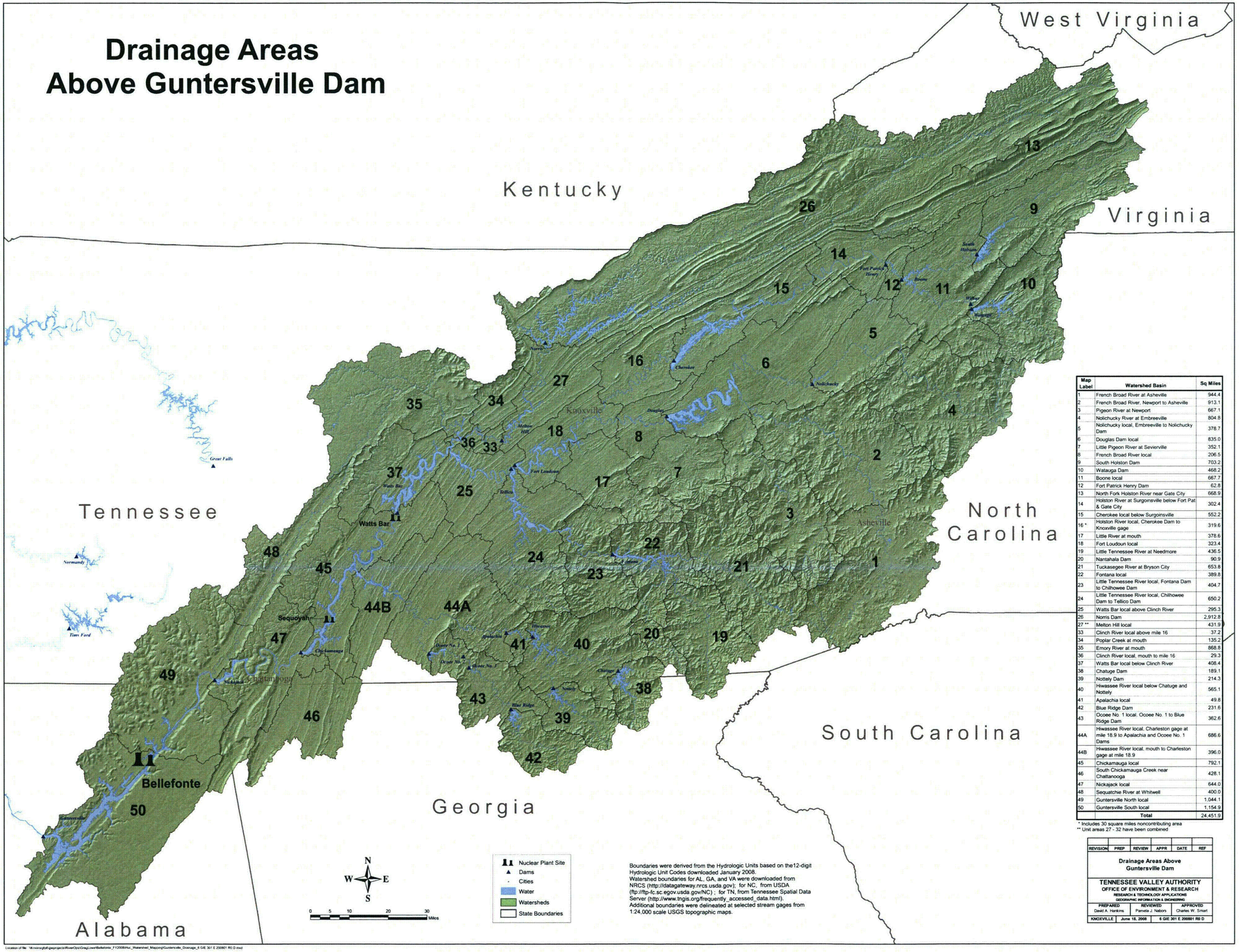
PREPARED	REVIEWED	APPROVED
David A. Hankins	Pamela J. Nabors	Charles W. Smart
KNOXVILLE	June 18, 2008	6 GIE 311 E 200801 R0 D

Location of file: \\Kuuxugfp\gieprojects\RiverOps\GregLowe\Bellefonte_FY2008\SurfaceAreas_forB-widths\Guntersville_Surface_Areas 6 GIE 311 E 200801 R0 D.mxd

Drainage Areas Above Guntersville Dam



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Drainage Areas Above Guntersville Dam

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PREPARED	REVIEWED	APPROVED
David A. Hankins	Pamela J. Nabors	Charles W. Smart
KNOXVILLE	June 18, 2008	6 GIE 301 E 200801 R0 D

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SOCH Simulation Runs required to support BLN COLA Review

	SOCH Simulation Run
	Initial Phase of Analysis
1	Multiple Runs to Recalibrate / Adjust SOCH models for 6 reservoirs
2	Runs in Support of Unit Hydrograph development on 5 main river reservoirs
3	21,400 Sq-Mi design Storm – Base Case - Downstream Centering – Controlling PMF Level
4	Rerun the ½ PMF event – base case for OBE Seismic runs
5	Seismic Failures Combination - #1 – Fontana, Hiwassee, Apalachia, and Blue Ridge OBE Failure with ½ PMF
	Known Sensitivity Runs to address Current NRC Questions
6	Sensitivity Run – 20% Peaking of Unit Hydrograph
7	Sensitivity Run – Percent Runoff to 100% in main storm for controlling event
8	Sensitivity Run – 2003 Flood Data – Cascading of Model computed outflows, Reservoir to Reservoir, Ft Loudoun to Guntersville
9	Sensitivity Run – Current spillway gate condition at Chickamauga for Lock Mod assessment.
10	Sensitivity Run – 6 spillway gates inoperable at Chickamauga for Lock Mod assessment.
	Remaining Simulation Runs for Documentation Completeness
11	21,400 Sq-Mi Design Storm – Upstream Centering
12	7980 Sq-Mi Design Storm - Upstream Centering
13	7980 Sq-Mi Design Storm - Downstream Centering
14	Rerun the 25 Year flood event – base case for SSE Seismic runs
15	Seismic Failures Combination - #2 – Fontana Dam OBE with ½ PMF
16	Seismic Failures Combination - #3 – Norris OBE Failure with ½ PMF
18	Seismic Failures Combination - #4 – Cherokee and Douglas OBE Failure with ½ PMF
19	Seismic Failures Combination - #5 – Norris, Cherokee, and Douglas SSE Failure with 25 Yr Flood
20	Seismic Failures Combination - #6 – Norris, Douglas, Fort Loudoun, and Tellico SSE Failure with 25 Yr Flood

Notes:

1. All runs assume Chickamauga Dam **without** Dam Safety Modifications
2. All runs assume final state of Chickamauga Dam with 5 spillway bays impacted by new Lock.
3. All runs will be routed past the BLN site.

Updated 06/06/08

TVA

TVA/NRC Workshop

June 23–27, 2008

TVA Reservoir System

Workshop Purpose

Review the TVA Reservoir System

Describe the hydrosphere

Discuss programs (computer codes), methods and procedures used to define design basis flood levels at BLN.

Foundations of Operating Policy

TVA Act (1933)

An Act…

To improve the navigability and to provide for the flood control of the Tennessee River.

To provide for reforestation and the proper use of marginal lands in the Tennessee Valley.

To provide for the agricultural and industrial development of said Valley.

To provide for the national defense by the creation of a corporation for the operation of Government properties at and near Muscle Shoals in the State of Alabama, and for other purposes.

Foundation of Operating Policy

In general, operating policy is based on the following sections of the TVA Act:

Foundation of Operating Policy

TVA Act

Section 4j — "Shall have power to construct such dams, and reservoirs, in the Tennessee River and its tributaries … to promote navigation… control destructive flood waters in the Tennessee and Mississippi River drainage basins… and shall have power to acquire or construct power houses… "

Section 9a — "The board is hereby directed in the operation of any dam or reservoir in its possession and control to regulate streamflow primarily for the purpose of promoting navigation and controlling floods… [and] consistent with such purposes, provide and operate facilities for the generation of electric energy…"

Section 22 — "To aid further the proper use, conservation, and development of the natural resources of the Tennessee River drainage basin… and to provide for the general welfare of the citizens…"

Foundation of Operating Policy

TVA Act

Section 23 — "The President shall… recommend to Congress such legislation… to carry out the general purposes stated… and for the especial purpose of bringing about… (1) the maximum amount of flood control; (2) the maximum development… for navigation purposes; (3) the maximum generation of electric power consistent with flood control and navigation; (4) the proper use of marginal lands; (5) the proper method of reforestation of all lands in said drainage basin suitable for reforestation; and (6) the economic and social well-being of the people…"

Section 26a — " …requires that no dam, appurtenant works or other obstruction, affecting navigation, flood control, or public lands …shall be constructed …without approval of the board…"

The Unified Development of the Tennessee River System (1936)

- Report to Congress as dictated by section 4j of the TVA Act.
- TVA to be the coordinating agency for unified development.
- Tennessee River System recognized as part of a larger whole.
- Integrated control ensures consideration of all aspects of operations (navigation, flood control, etc.).

The Unified Development of the Tennessee River System (1936)

- Unified resource control and development advanced two complimentary ways:

  1. Through the construction of great works of engineering;

  2. Through the encouragement of "widespread changes in methods of agriculture and land use."

- Operating objectives are not ends in themselves, but the means for furthering the general well-being of the people.

- TVA more than a public power company.

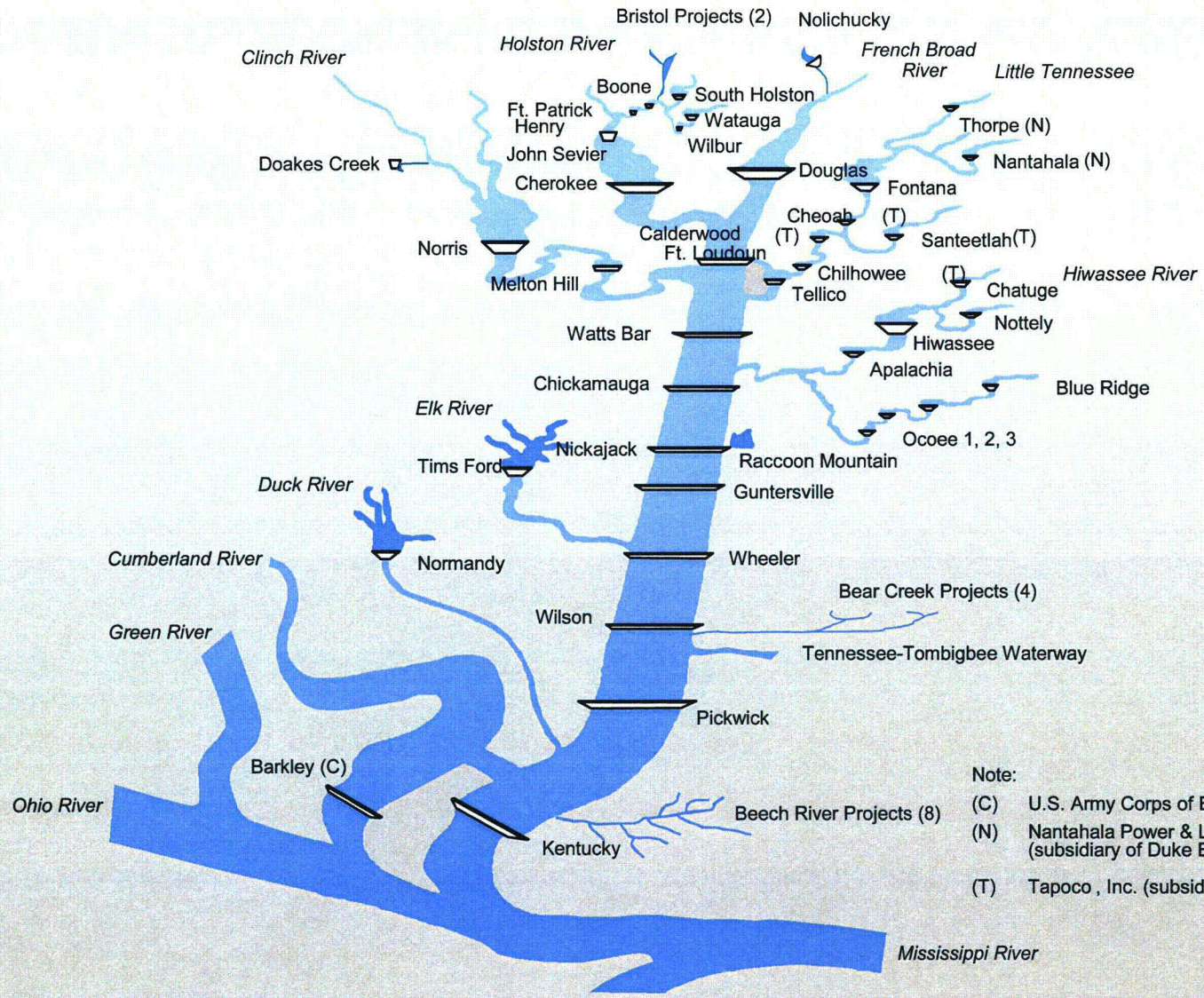
General Information

- The Tennessee River is the fifth largest in the United State in terms of discharge and seventh largest in North America.
- The drainage area covers 40,910 square miles and lies mostly in the state of Tennessee with parts in six other states—Kentucky, Virginia, North Carolina, Georgia, Alabama, and Mississippi.
- The TVA Power service area includes approximately 80,000 square miles and over 8.5 million customers.
- The drainage area consists of 2 major divisions of approximately the same area (above and below Chattanooga).

General Information

- TVA is responsible for the operation and maintenance of 49 dams.
- TVA has 9 dams on the main stem of the Tennessee River, 38 dams on tributaries of the Tennessee, 1 dam on a tributary of the Cumberland River, and 1 pumped-storage project.
- TVA schedules the releases from 36 of these dams (7 x 24 basis).
- TVA also schedules releases from 4 TAPOCO (Alcoa) projects and 8 U.S. Army Corps of Engineers projects (Cumberland River).
- The river system is operated as a multi-purpose system.

River System Schematic



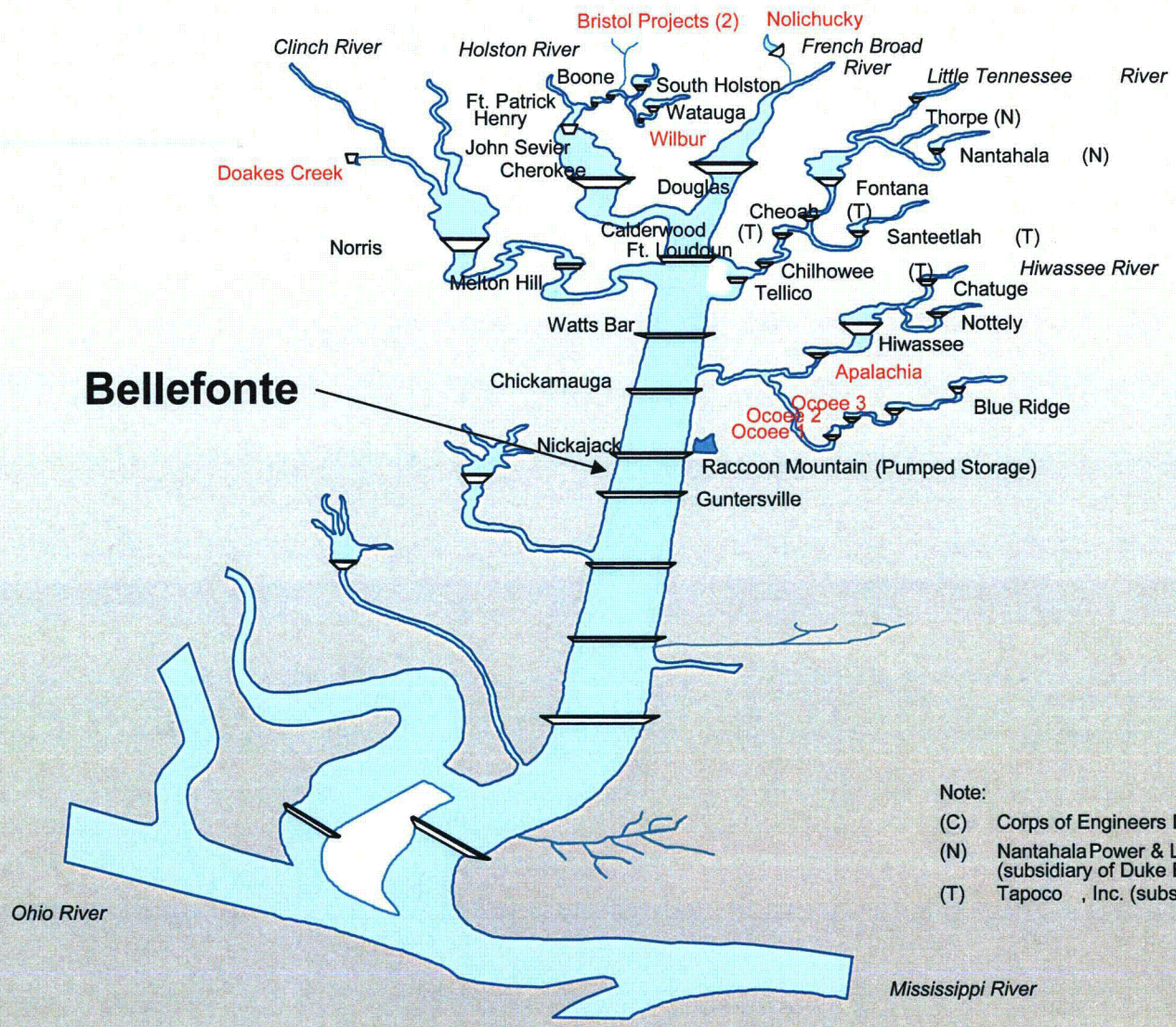
Note:

(C) U.S. Army Corps of Engineers Dams

(N) Nantahala Power & Light Company (subsidiary of Duke Energy)

(T) Tapoco , Inc. (subsidiary of ALCOA)

Bellefonte



Note:

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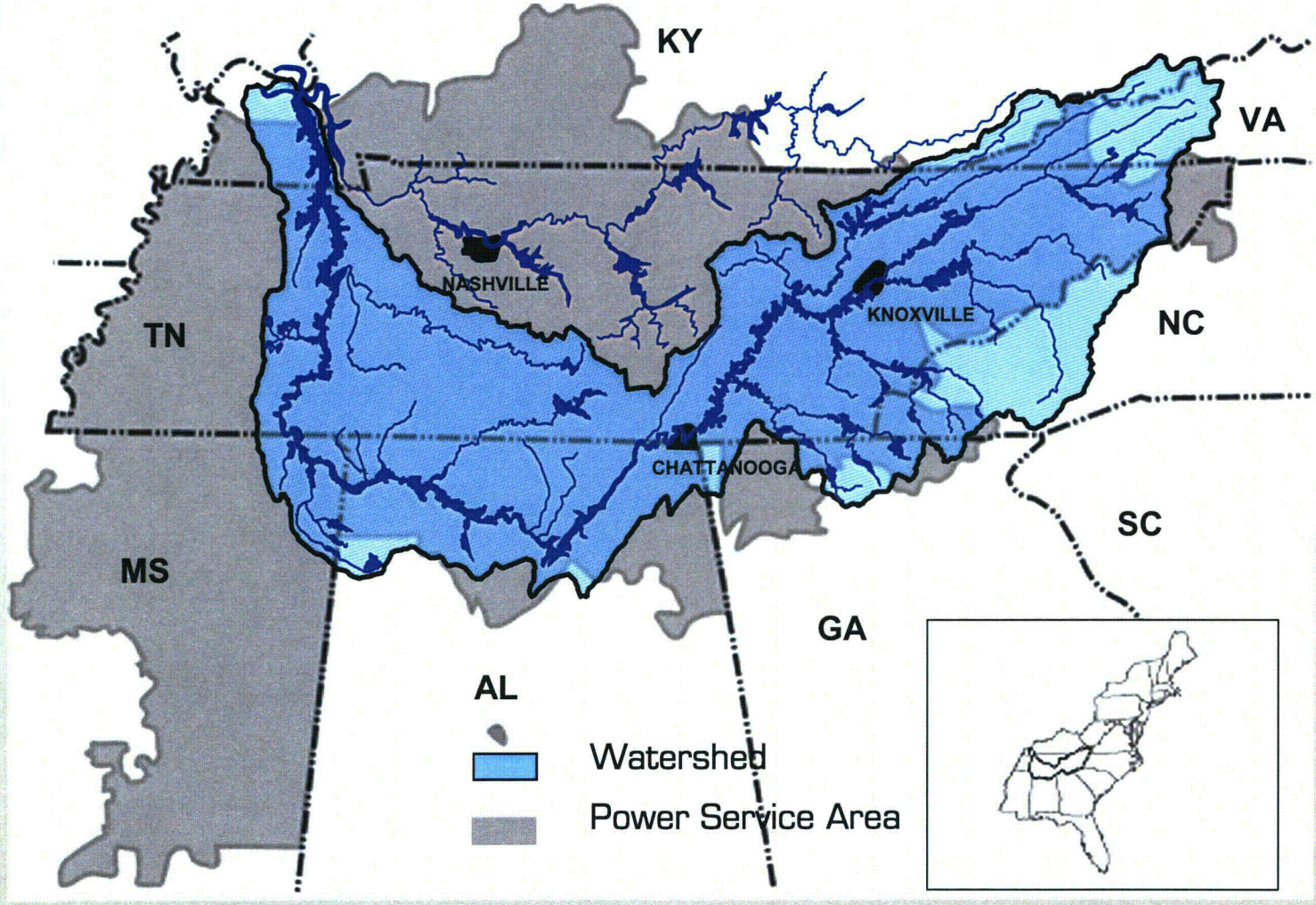
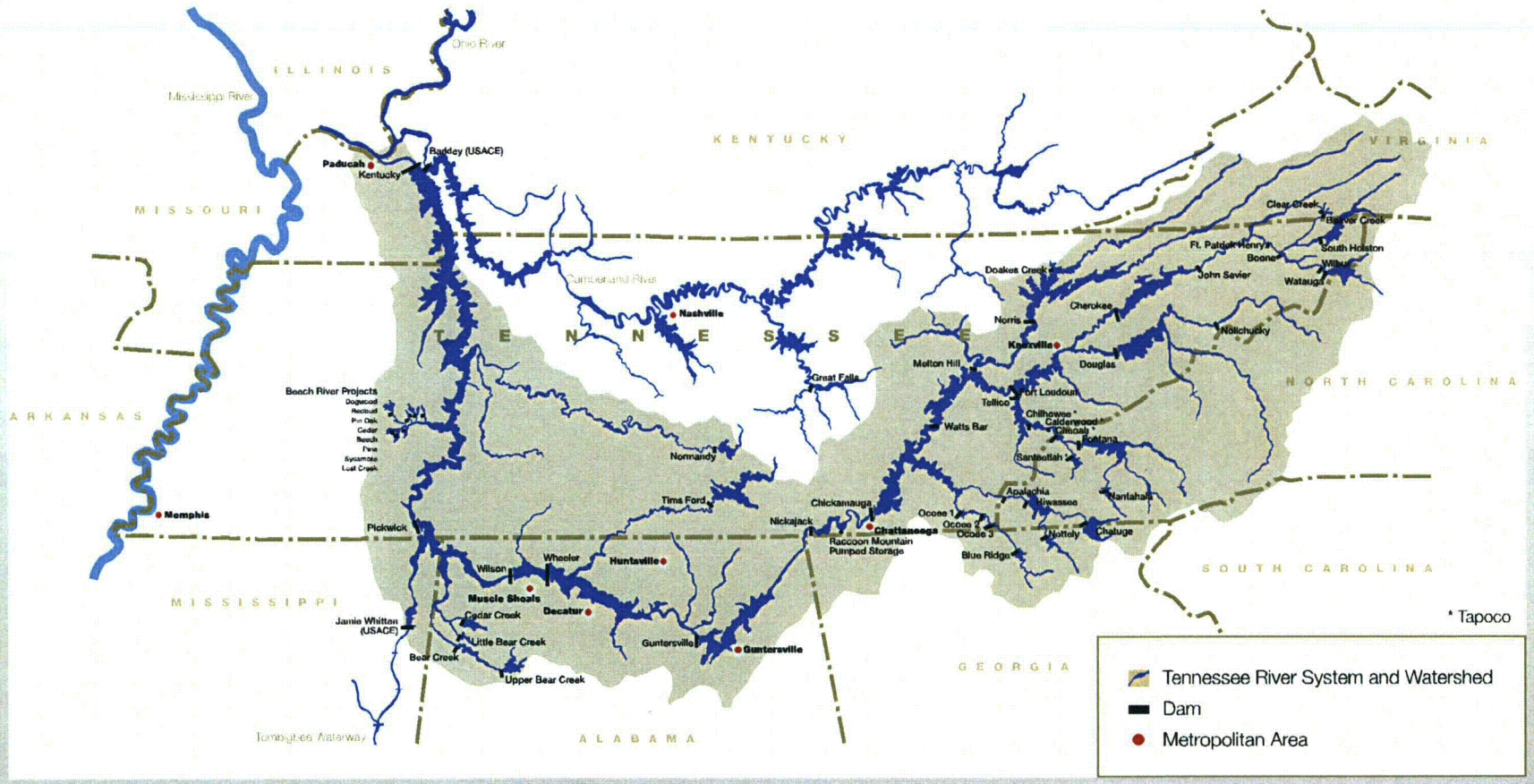
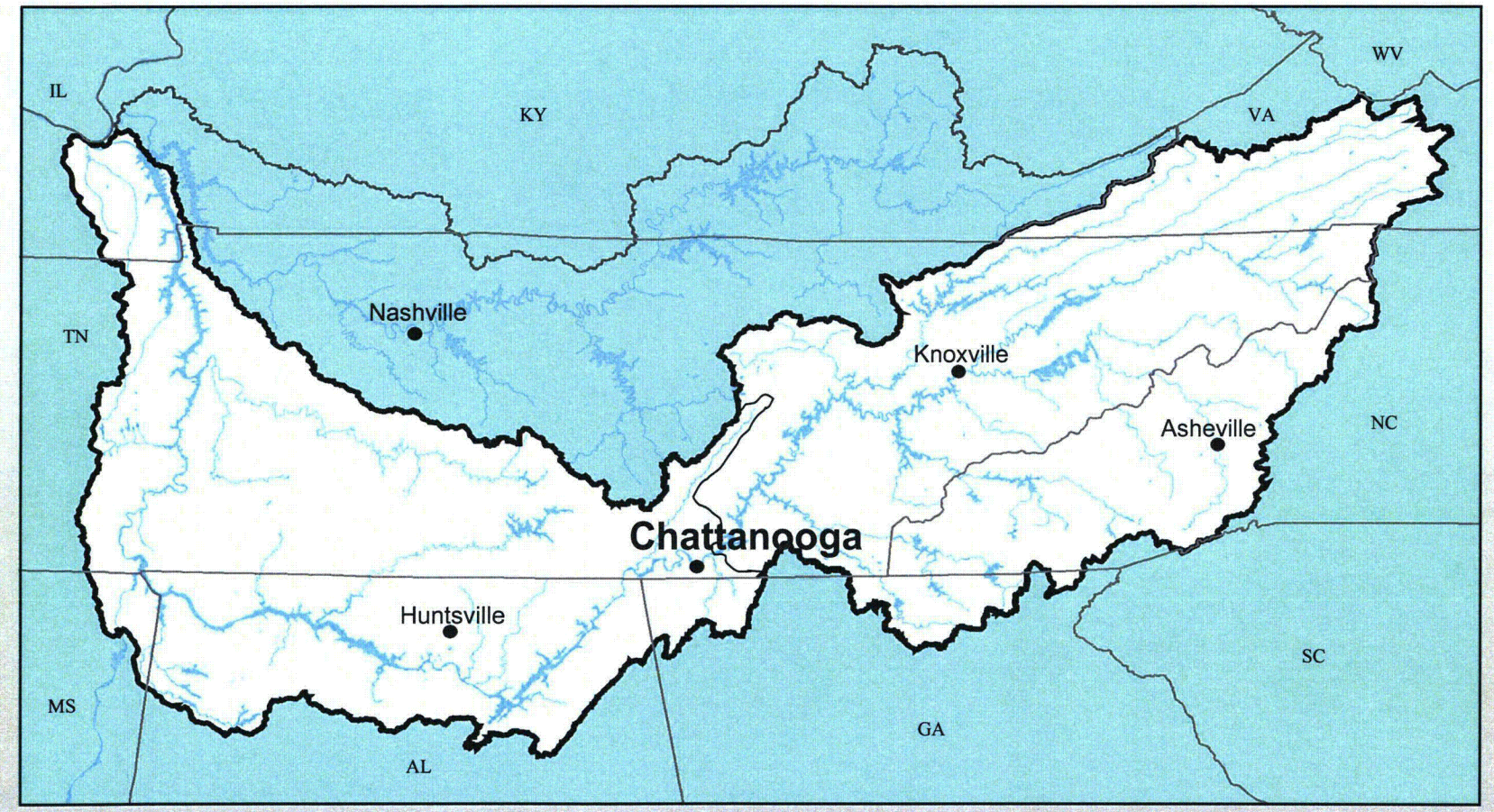
System Description
Watershed Area/Power Service Area



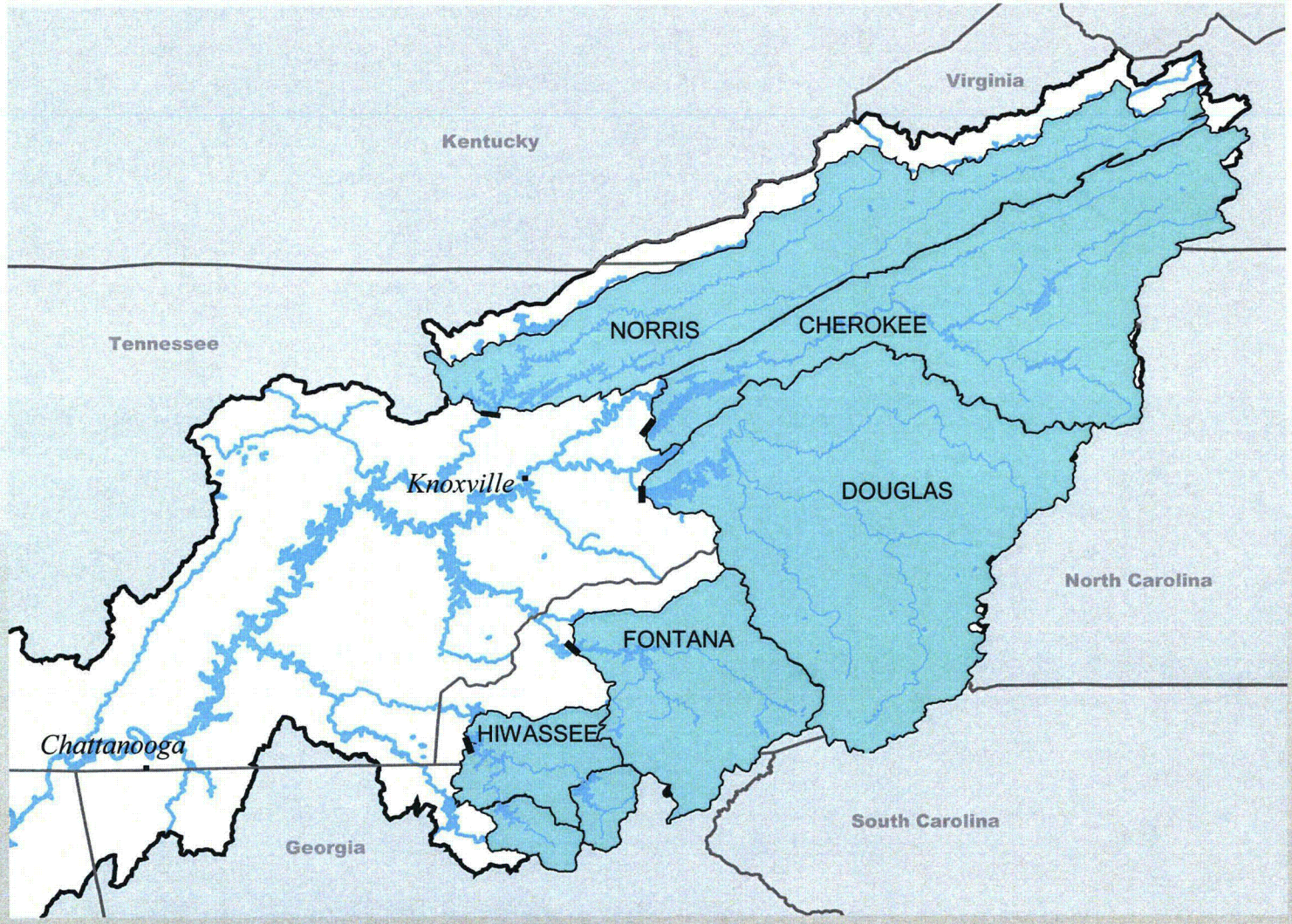
Tennessee River System



Tennessee River Watershed

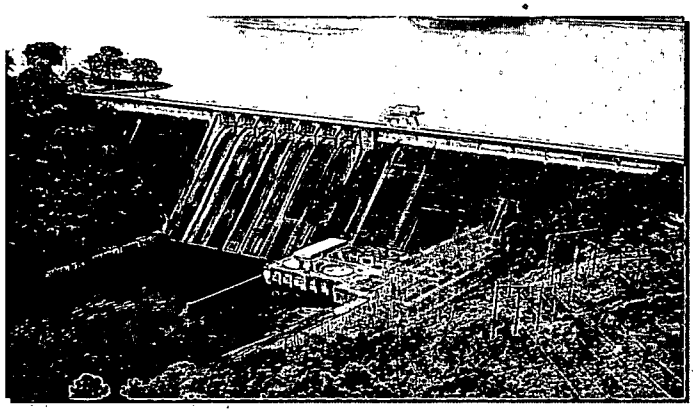


Major Tributary Project Designated for Chattanooga Flood Control

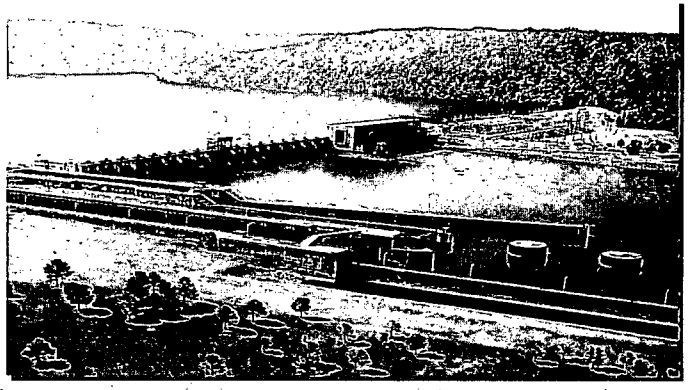


Canal
TXA- Fort Loudoun & Tellico Dams
Tellico Dam
Fort Loudoun Dam

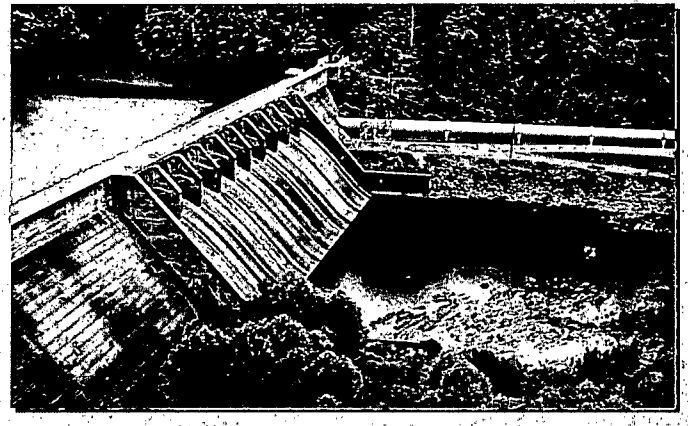
Responsible for Operations and Maintenance of 49 Dams



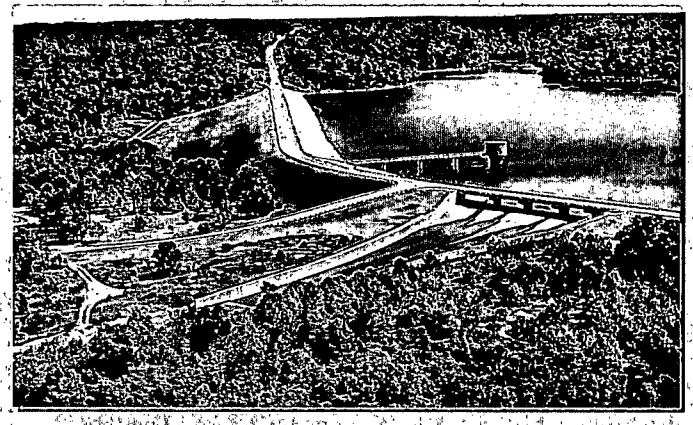
Tributary — Storage
Hiwassee



Main River — Guntersville



Tributary — Run of the River
Apalachia



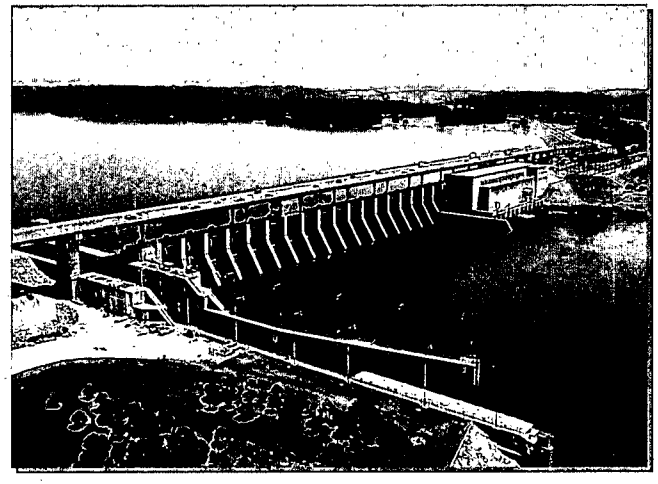
Tributary — Nonpower
Little Bear Creek

Main Stem Storage Projects

- Located on the main stem of the Tennessee River.
- Managed for navigation, flood-damage reduction, power supply, recreation, and other uses.
- Seven main stem storage projects:

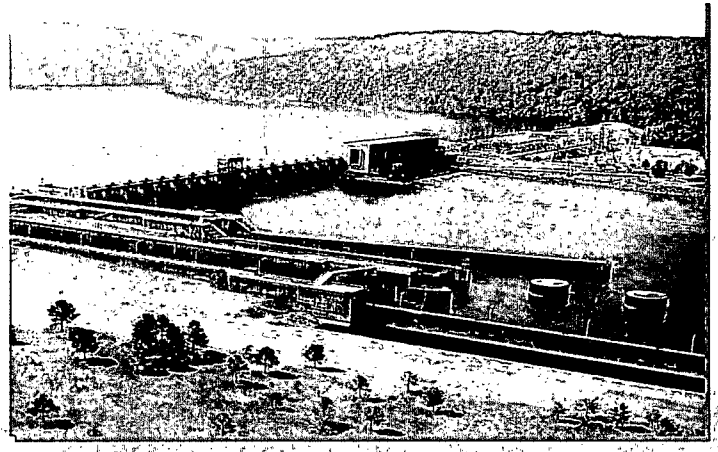
  Fort Loudoun
  Watts Bar
  Chickamauga
  Guntersville
  Wheeler
  Pickwick Landing
  Kentucky

Nickajack and Wilson have no flood storage.



Chickamauga Dam

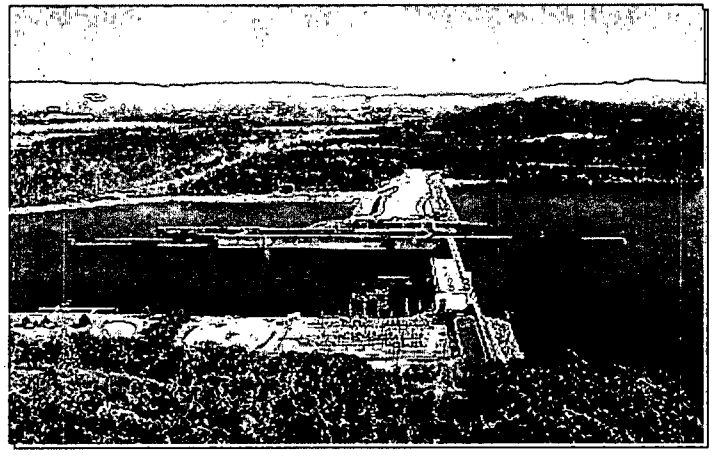
Main Stem Storage Projects



Guntersville

- Associated locks comprise the majority of the 800-mile Tennessee River commercial navigation channel.
- Elevations (or reservoir levels) and flows essential to maintaining commercial waterway.
- Operated on a seasonal basis for flood control.
- Elevations typically fluctuate from 2 to 6 feet.

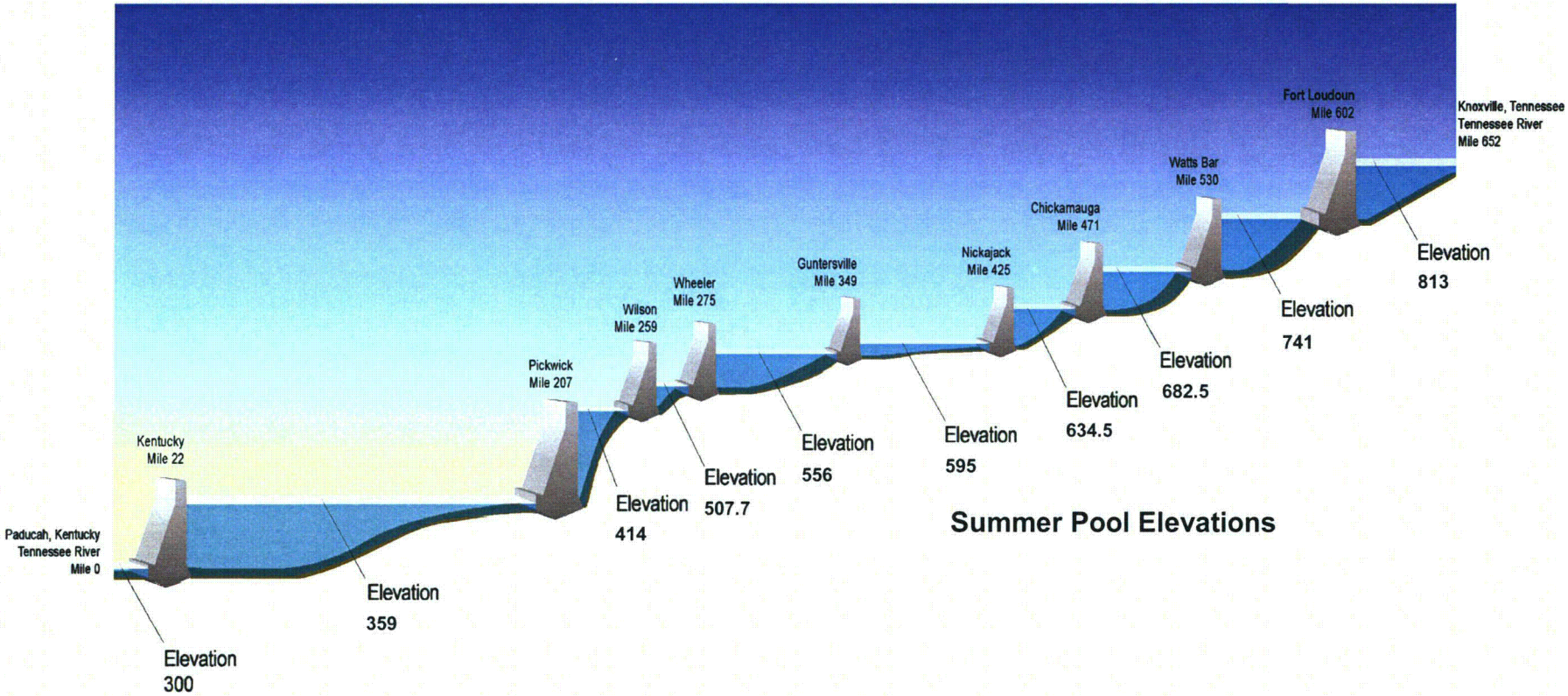
Main Stem Run-of-the-River Projects



Nickajack

- Two main stem run-of-the-river projects: Nickajack and Wilson.
- Serve the same general functions as the main stem storage projects.
- Because of limited storage volume, generally release water on an inflow-equals-outflow basis

Main Stem Profile



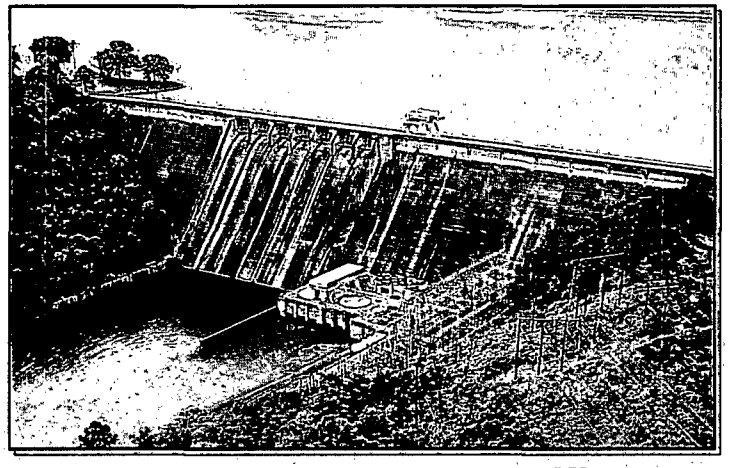
Tributary Storage Projects

- 18 tributary storage projects are located on the tributaries of the Tennessee River:

South Holston	**Tellico**	**Ocoee.1**
Watauga	**Norris**	**Tims Ford**
Boone	**Chatuge**	**Bear Creek**
Cherokee	**Nottely**	**Little Bear Creek**
Douglas	**Hiwassee**	**Cedar Creek**
Fontana	**Blue Ridge**	**Normandy**

- Great Falls Reservoir is located on a tributary of the Cumberland River.

- Store water to provide for navigation, flood-damage reduction, recreation, and water supply benefits.



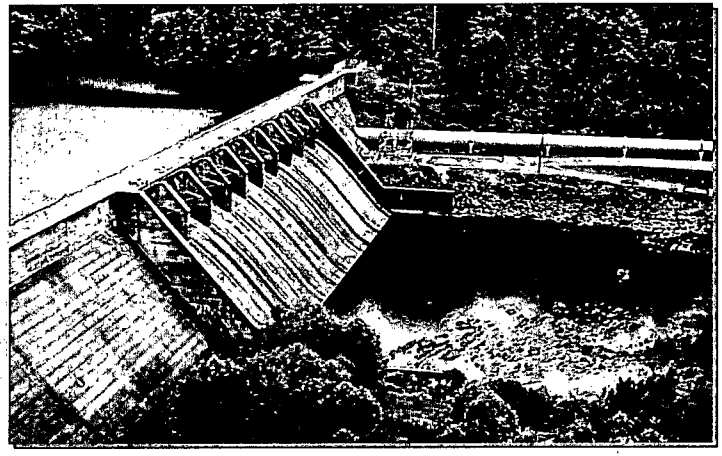
Hiwassee

Tributary Storage Projects

Fontana

- Release water to generate power and support flow requirements at downstream projects.
- Provide minimum flows to help maintain water quality, protect aquatic habitat, and maintain summer pool elevations.
- Pool levels may fluctuate 13 to 50 feet on a seasonal basis.

Tributary Run-of-the-River Projects



Apalachia

- Seven tributary run-of-the-river projects:

Wilbur	**Ocoee 3**
Fort Patrick Henry	**Ocoee 2**
Melton Hill	**Upper Bear Creek**
Apalachia	

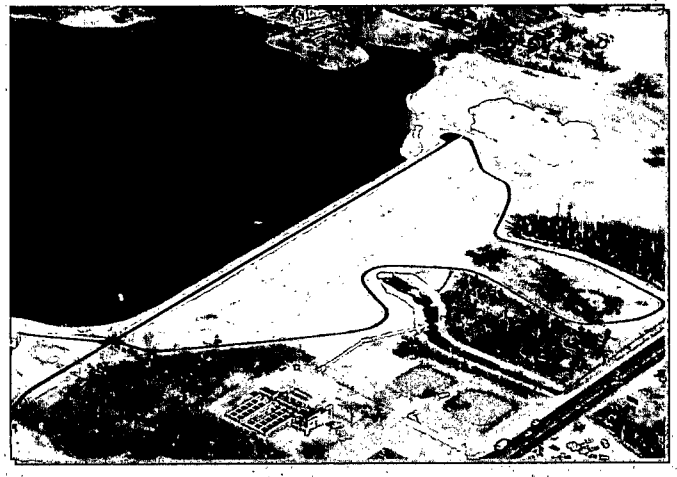
- Located between much larger reservoirs.
- Have limited volume as compared to storage projects.

Tributary Run-of-the-River Projects

Ocoee 2

- Daily fluctuations in pool elevations are common but limited to a few feet.
- Operated for similar objectives as tributary storage projects.
- Provide little storage for flood-damage reduction or minimum flows.

Tributary Detention Projects



Beech

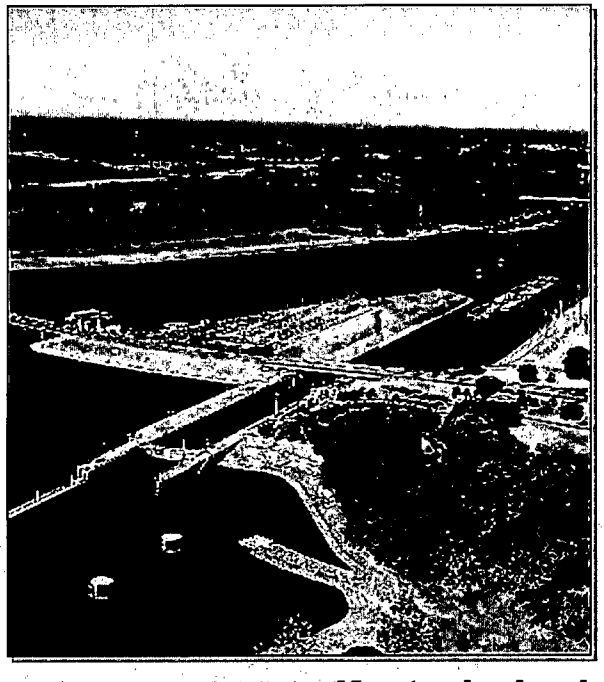
- Store water to provide local flood-damage reduction, recreational benefits, and water supply.
- Eleven small tributary detention projects are located on the Beech River in Middle Tennessee (8 projects), Doakes Creek, located near Lafollette, Tennessee (1 project), and on Beaver Creek near Bristol, Virginia (2 projects).

Tributary Detention Projects

Nolichucky

- Additional project is located at John Sevier Steam Plant on the Holston River for plant cooling water.
- Nolichucky Dam a former hydroelectric project is located on the Nolichucky River. The reservoir is now used as a wildlife refuge.
- Operations at all 13 projects are self-regulating. Their releases are through uncontrolled spillways.

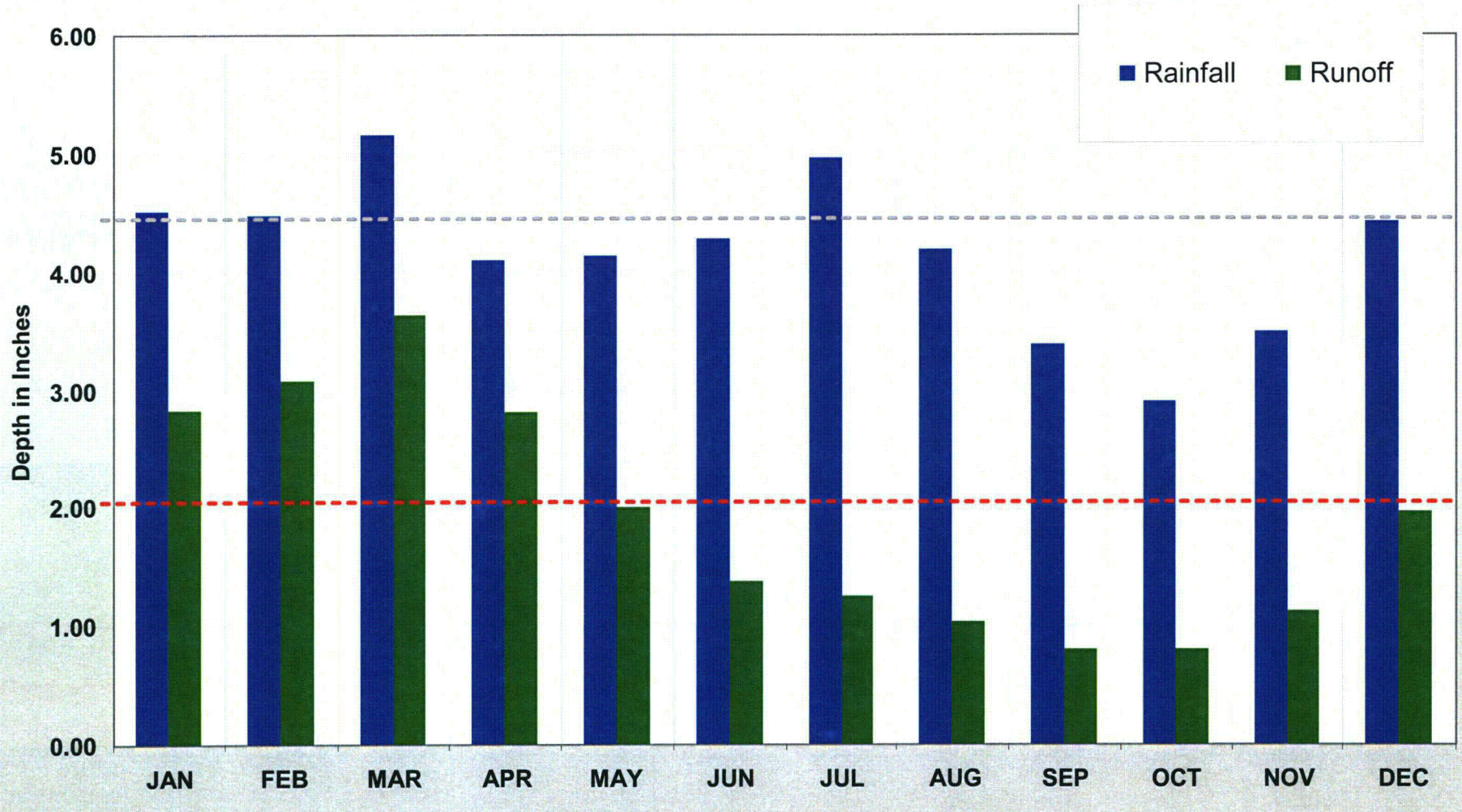
Navigation Locks



Kentucky Lock

- 15 navigation locks located at 10 projects.
- Operated by the USACE.
- Provide an 800-mile commercial navigation channel from the mouth of the Tennessee River at Paducah, Kentucky to past Knoxville, Tennessee, and into parts of the Hiwassee, Clinch, and Little Tennessee Rivers.
- A minimum 11-foot depth is provided in the navigation channel along this navigable waterway.

Basin Man Rainfall and Runoff Above Chattanooga by Month: 1890–2007

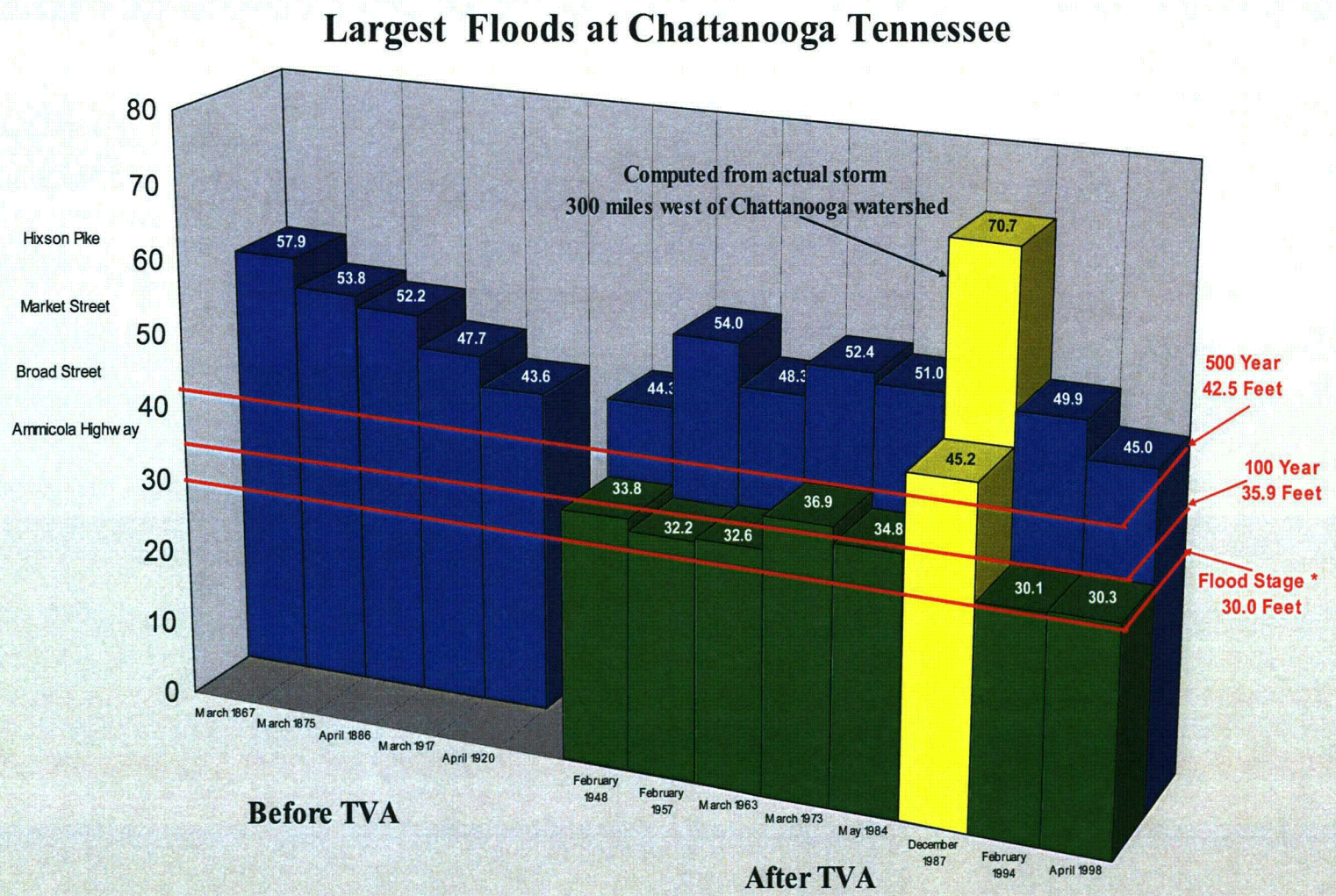


Available Flood Storage

Tributary	Flood Storage January 1 (acre - feet)	Flood Storage March 15 (acre - feet)	Flood Storage Summer (acre - feet)
Boone	75,800	48,200	12,900
Chatuge	62,600	62,600	13,900
Cherokee	749,000	749,000	118,000
Douglas	1,080,000	1,020,000	238,000
Fontana	514,000	514,000	73,400
Hiwassee	206,000	206,000	35,000
Norris	1,113,000	1,113,000	512,000
Nottely	61,600	61,600	12,300
South Holston	253,000	220,000	106,000
Tellico	120,000	120,000	32,000
Watauga	153,000	153,000	109,000
Blue Ridge	***68,600***	***49,500***	***13,100***
Main River *			
Fort Loudoun	111,000	111,000	30,000
Watts Bar	379,000	379,000	165,000
Chickamauga	345,000	345,000	115,000
Total	5,291,600	5,151,900	1,585,600

* Note - Nickajack (not shown) is run-of-the-river project with zero flood storage.

Chattanooga Flooding



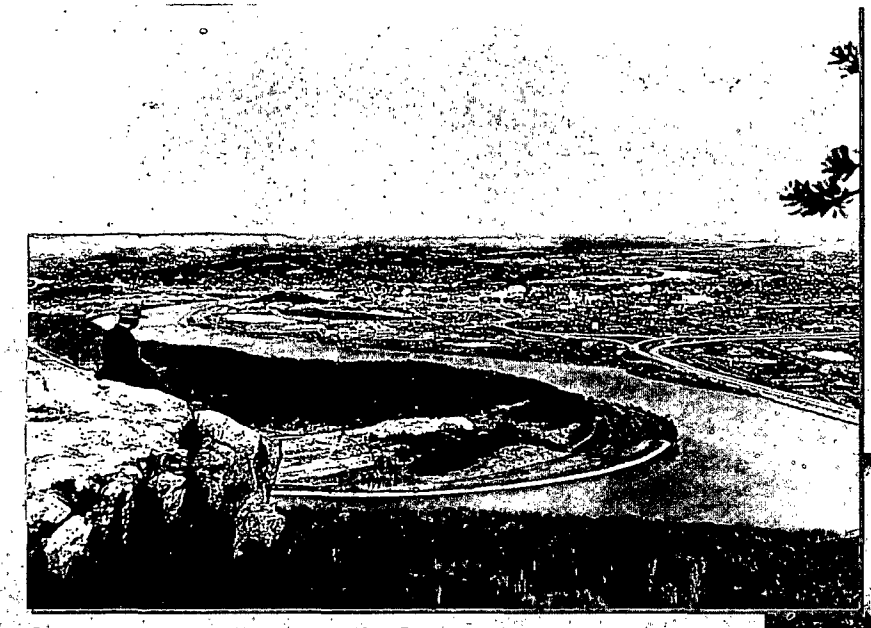
Major Unregulated Historic Floods in Chattanooga — Walnut Street Gage

Date	Max. Stage (ft)	Peak Discharge (cfs)	(day-sec-ft)	Runoff Volume (ac-ft)	(inches)	Approx. Duration (days)
March 11, 1867	57.9	459,000	---	---	---	20.0
March 1, 1875	53.8	410,000	4,734,300	9,390,500	8.23	26.0
April 3, 1886	52.2	391,000	4,525,600	8,976,500	7.86	22.0
March 7, 1917	47.7	341,000	2,780,000	5,514,100	4.84	11.5
April 5, 1920	43.6	298,000	2,653,800	5,263,800	4.60	18.5
March 10, 1884	42.9	297,000	3,092,400	6,133,800	5.37	---
February 2, 1918	42.7	289,000	2,148,400	4,261,400	3.74	---
March 2, 1890	42.6	294,000	2,610,000	5,176,900	4.54	---
January 2, 1902	40.9	279,000	2,457,100	4,873,700	4.27	---
April 5, 1896	40.5	276,000	1,855,100	3,679,600	3.22	---
March 11, 1891	38.9	264,000	2,631,800	5,220,200	4.57	---

Flood Stage is 30 feet.

Ref. 2, Pages 73, 109, 117

Flood Control Operations

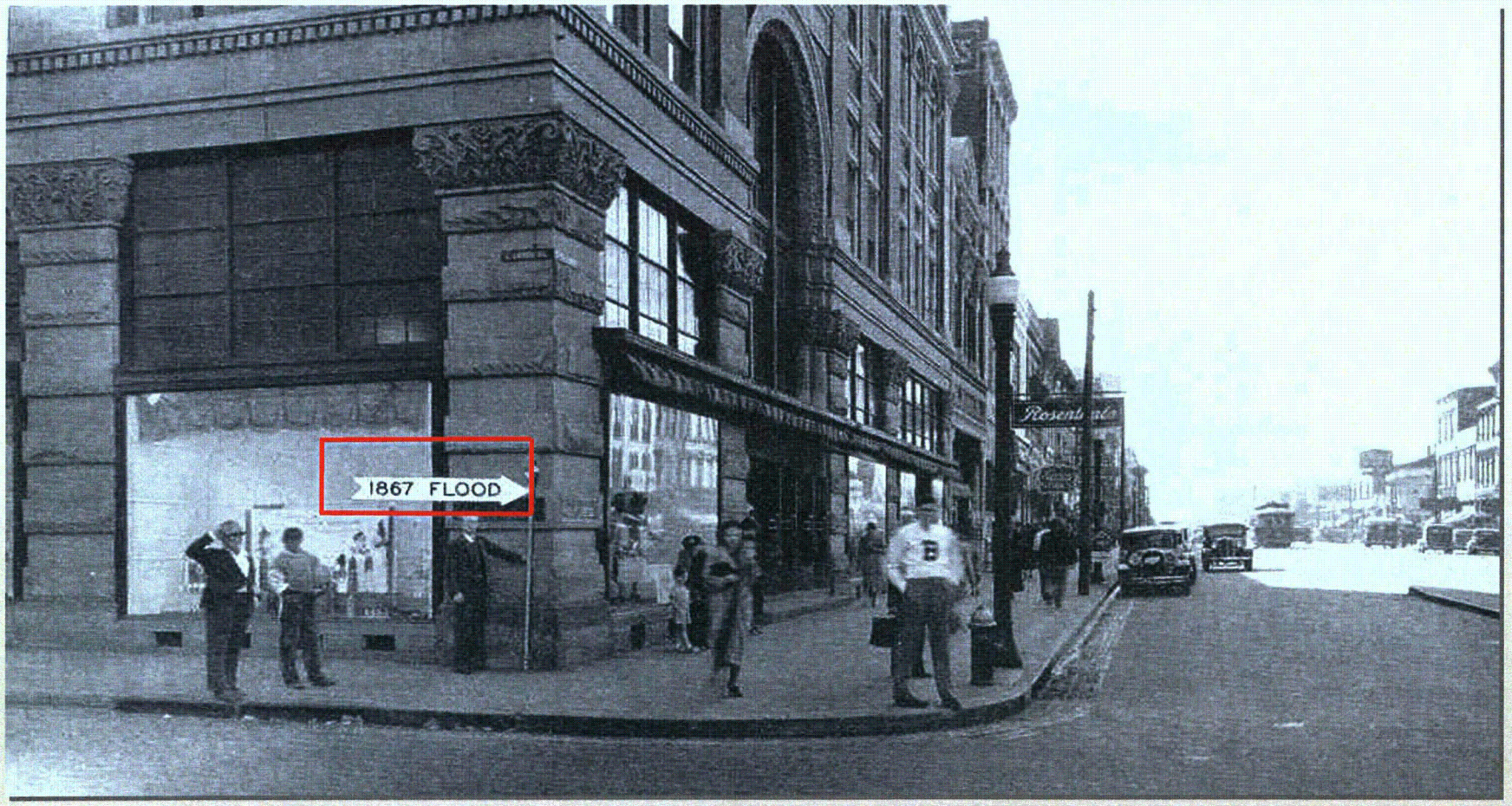


Chattanooga as it is today

Same area during 1867 flood

Chattanooga Flood Control Problem

1867 Flood Marks



Chattanooga, Corner of Eighth and Market Streets

1917 Flood — Chattanooga

1867 and 1917 Flood Marks

Chattanooga, Main Street near Broad Street

1973 Flood — Chattanooga

Brainerd, Tennessee

May 2003 Flood
Chattanooga, Tennessee

May 2003
Looking Upstream Toward Chickamauga Dam

THAT'S All Folks

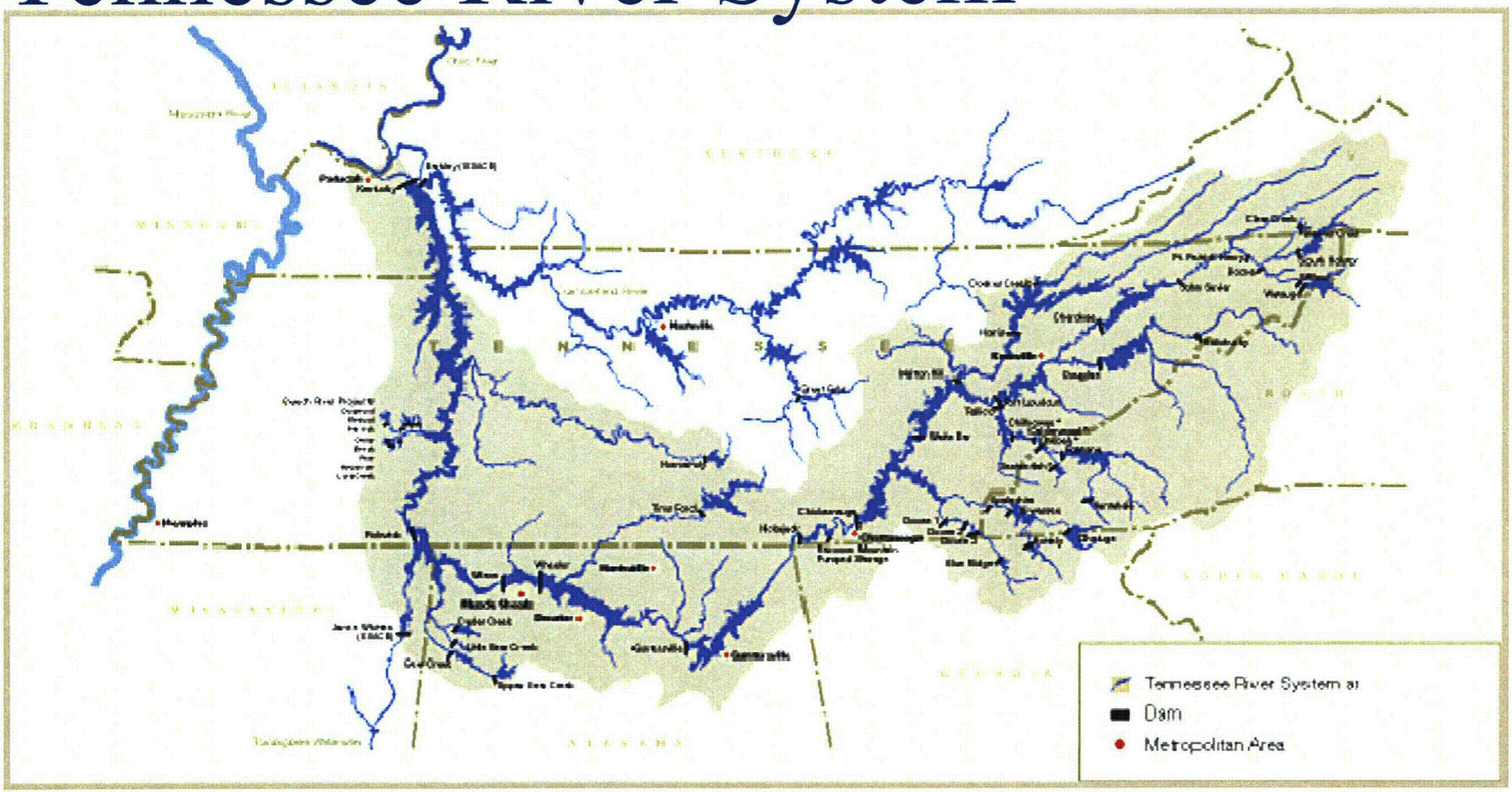
TVA

TVA/NRC Workshop

June 23–27, 2008

Current Operating Policy

Tennessee River System



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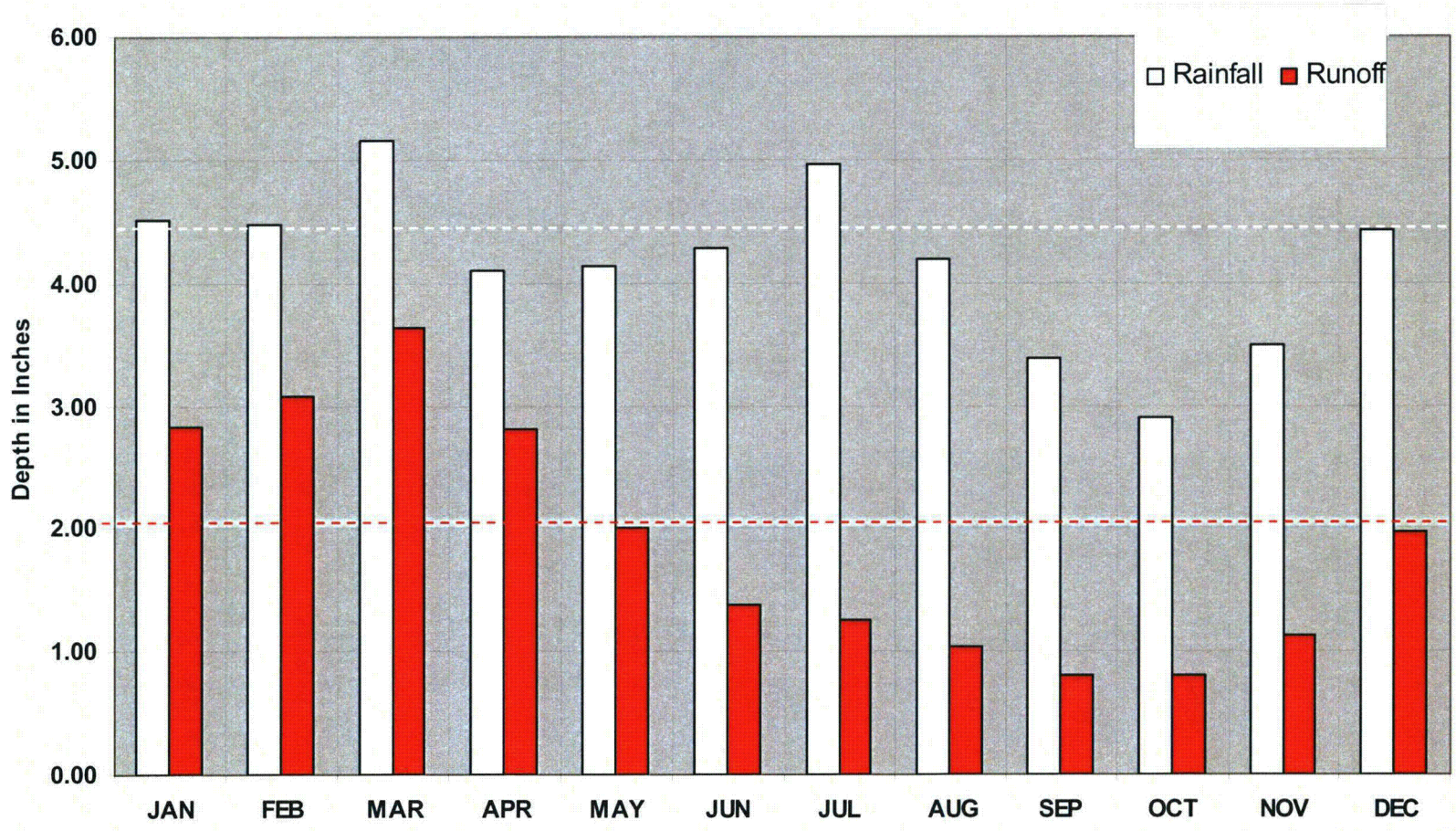
Basin Mean Rainfall and Runoff Above Chattanooga by Month: 1890 - 2007



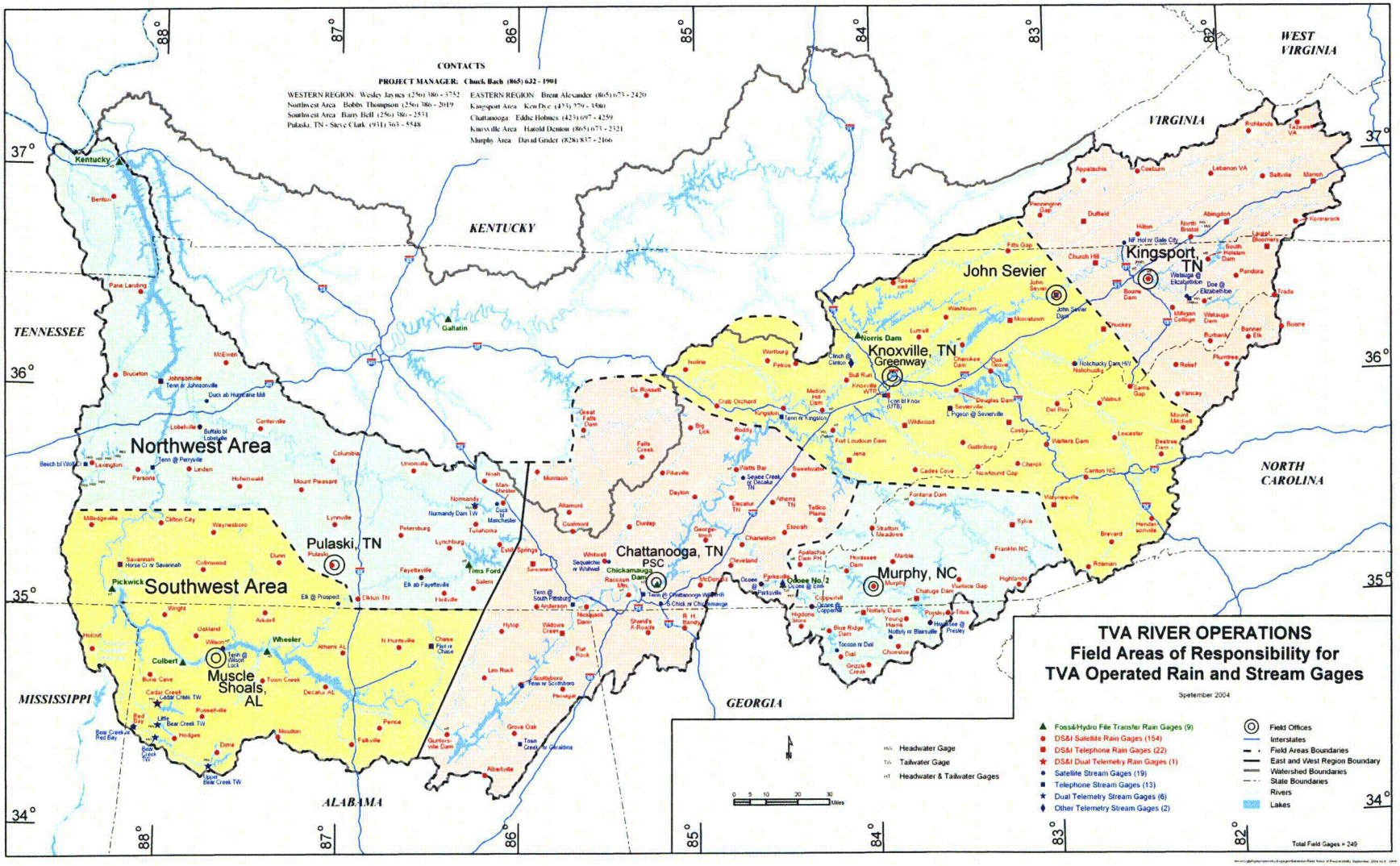
Hydrologic Gauges

- Receive data from over 200 rainfall gauges strategically located in watersheds across the Tennessee Valley. Most of these devices are owned and maintained by TVA, including approx 126 gauges in the eastern part of the Valley and 52 in the western part.

- Receive data from 62 stream gauges of which 37 are operated and maintained by TVA.

- 71 HW / TW Gauges at TVA hydro projects

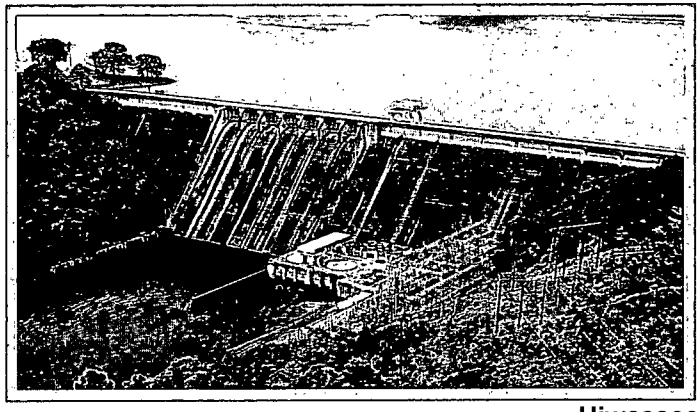
TVA's - Hydrologic Gauge Network



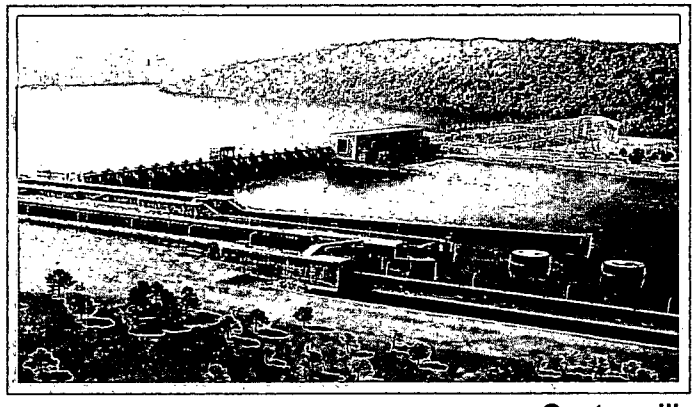
5

Types of

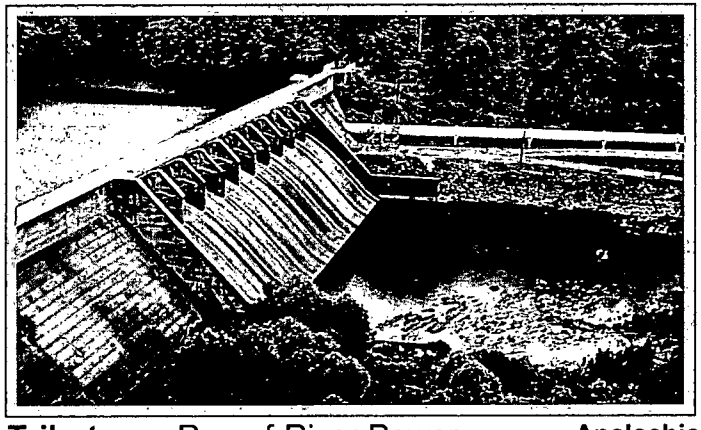
River Projects



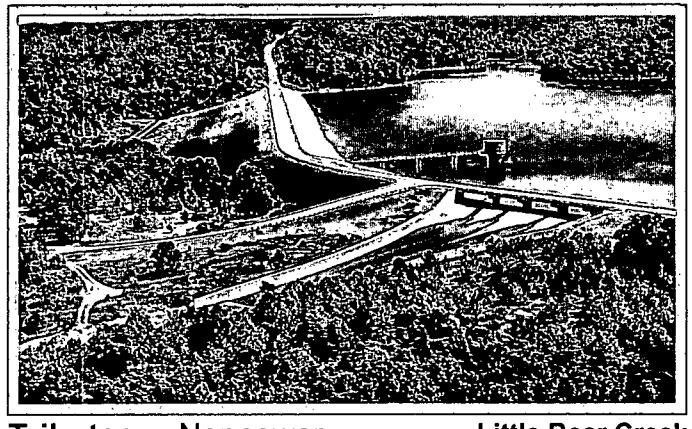
Tributary—Multipurpose **Hiwassee**



Main River—Multipurpose **Guntersville**



Tributary—Run-of-River Power **Apalachia**



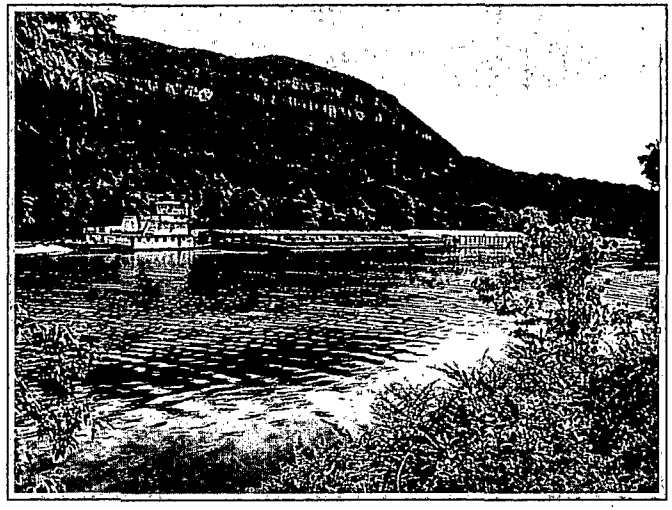
Tributary—Nonpower **Little Bear Creek**

Objectives

Integrated Operation of the River System

- Navigation
- Flood-damage reduction
- Power generation
- Water supply
- Water quality
- Recreation

Maintaining 11-Foot Channel

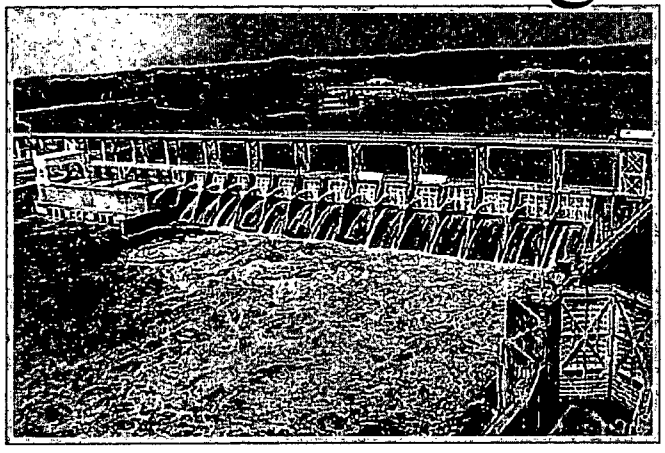


Benefits

- Economic growth in the Valley
- Move nearly 50 million tons annually
- $555 million in shipper savings
- $750 million in reduced rail rates
- Access to Inland Waterway System
- Maintain tributary channel markers

What's being done

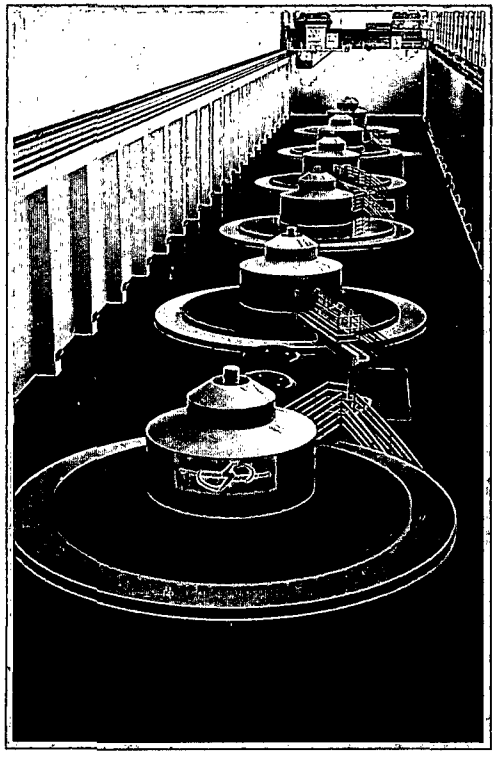
Flood-Damage Reduction



- Maintain flood-storage allocation
- Store water during flood to reduce crest
- Issue flood forecast for regulated streams
- Release water at nonflood rate after crest

Tennessee River System Provides

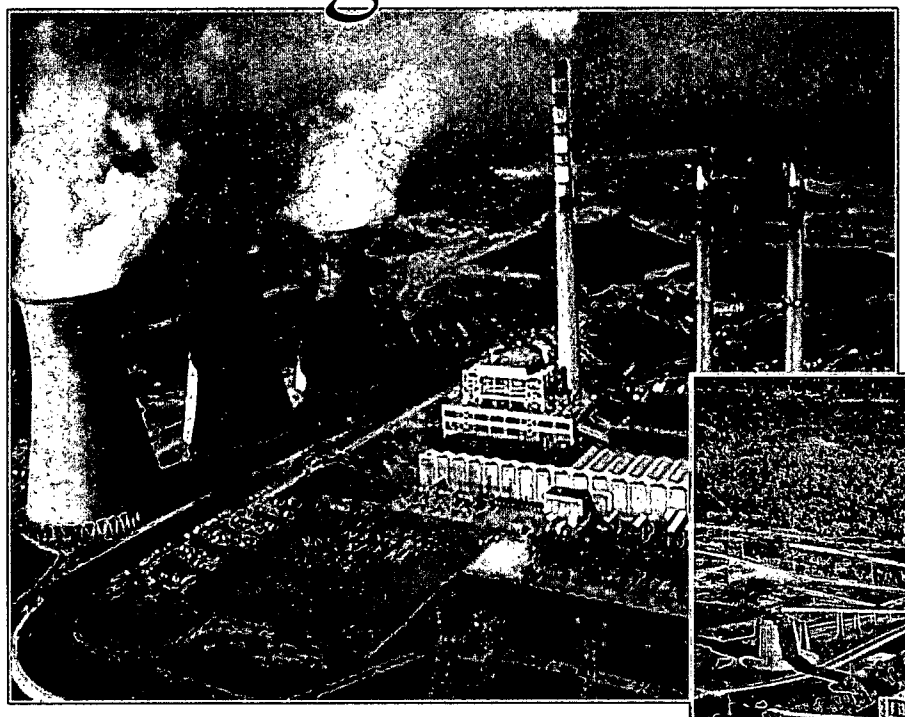
Power Generation

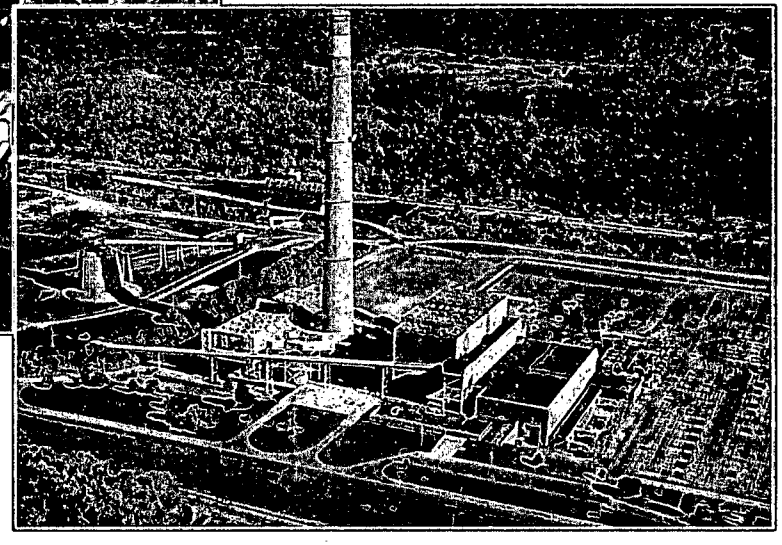


- Hydropower
  - 29 hydro plants and 109 units (excluding Raccoon Mountain)
  - Approximately 3600 megawatts of capacity
  - Approximately 10 percent of total generating capacity
  - Raccoon Mountain Pumped Storage adds about 1600 megawatts
- Cooling water for fossil and nuclear plants

Thermal

Cooling Water





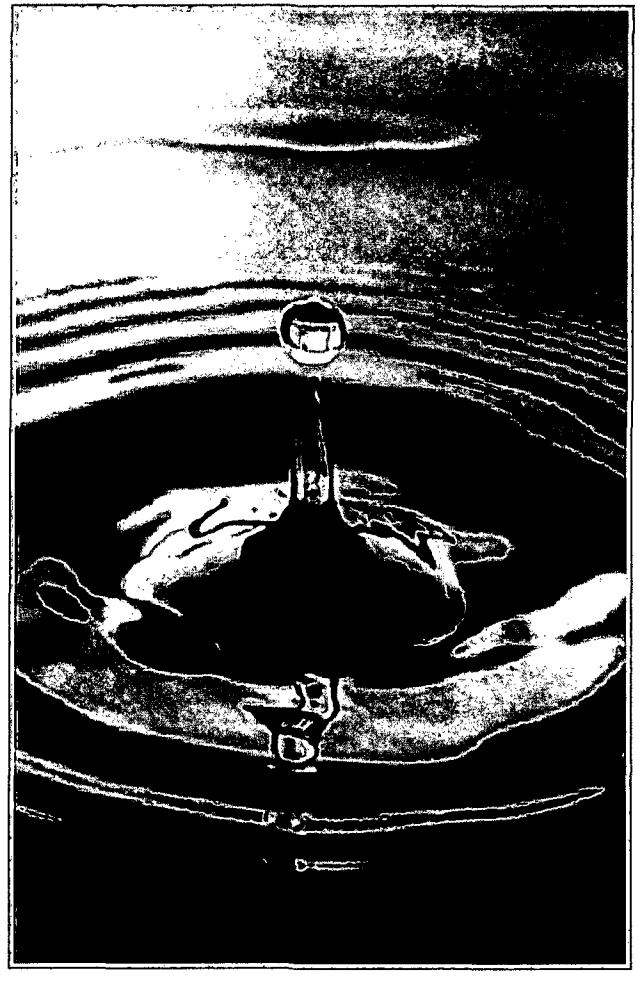
Reservoirs supply cooling water for thermal power plants throughout the Valley

Benefits of

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



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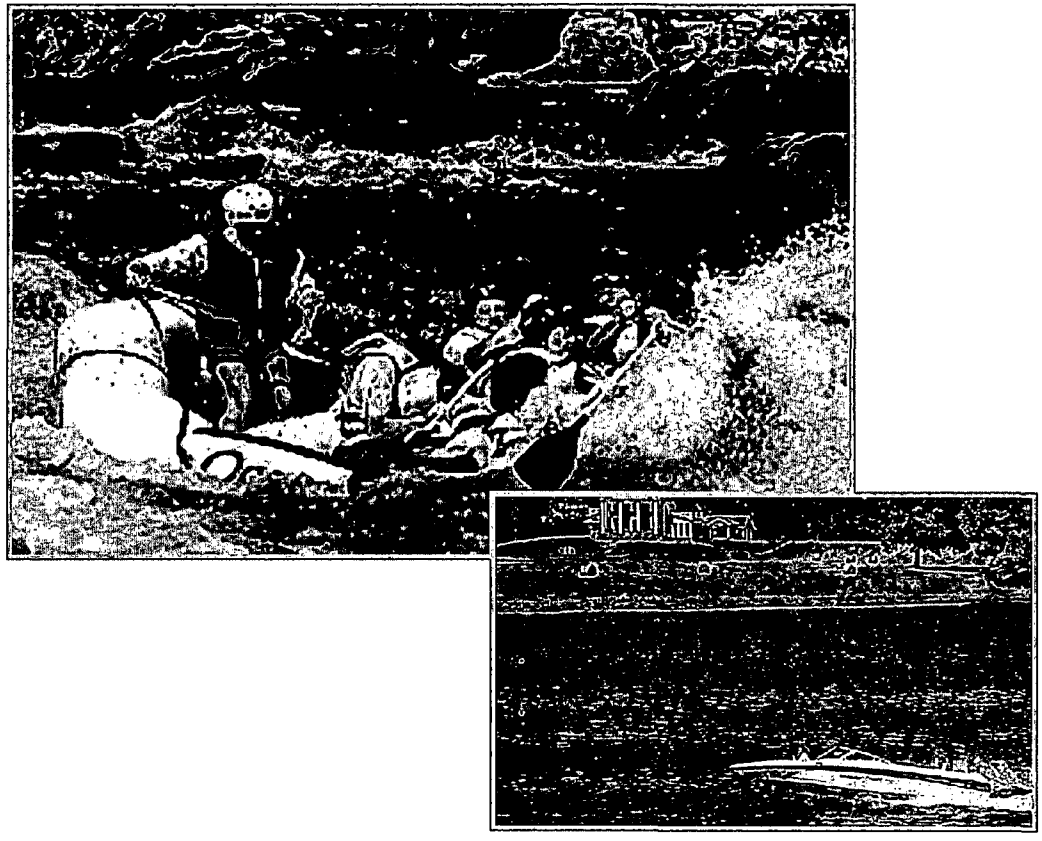
Benefits

Recreation

- Quality of life
- Boost to local economies
- Boating
- Swimming
- Fishing
- Whitewater rafting and paddling



Provides releases for whitewater recreation and summer pool levels

Operations Cycle and Operating Policy

Current Operating Policy

Reservoir Operations Policy

- Establishes a balance of operating objectives.
- Guides system-wide decisions about how much water is stored in specific reservoirs, how the water is released, and the timing of those releases.
- Helps TVA in managing its reservoir system to fulfill its statutorily prescribed operating objectives (navigation, flood control, and power production) and to provide other benefits to the region—such as recreational opportunities and improved water quality.
- Composed of guidelines that describe how the reservoirs should be operated given the rainfall and runoff, and the operating objectives.

Reservoir Operations Policy

- Consists of operating guidelines which must be flexible to be effective over the wide range of rainfall and runoff patterns.
- Establishes pool level parameters for daily operations.
- Deviates temporarily from normal operating guidelines in certain circumstances to meet critical power system situations, to meet other reservoir system needs, or due to floods and droughts.

Elements of Operating Policy

- Water Release Guidelines—guide the release of water needed for reservoir system and project minimum flows, including flows for special operations.

- Other Guidelines and Operational Constraints—include procedures and limitations set for hydropower generation, response to drought conditions, scheduled maintenance for power generation facilities, power system alerts, dam safety, security threats, and environmental emergencies (e.g., spills).

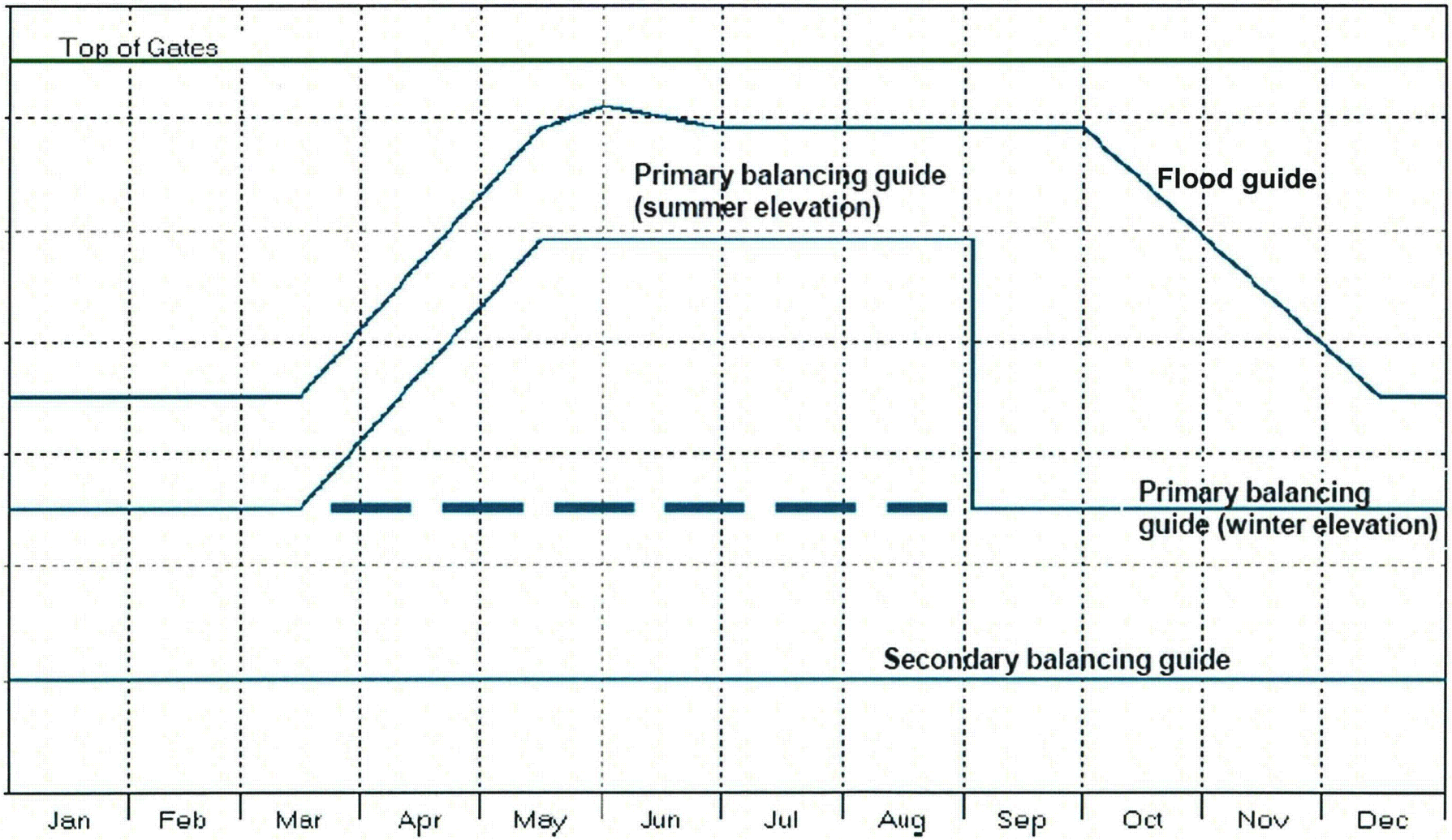
Current Operating Policy

Reservoir Operating Guidelines

Operating Guide Curves

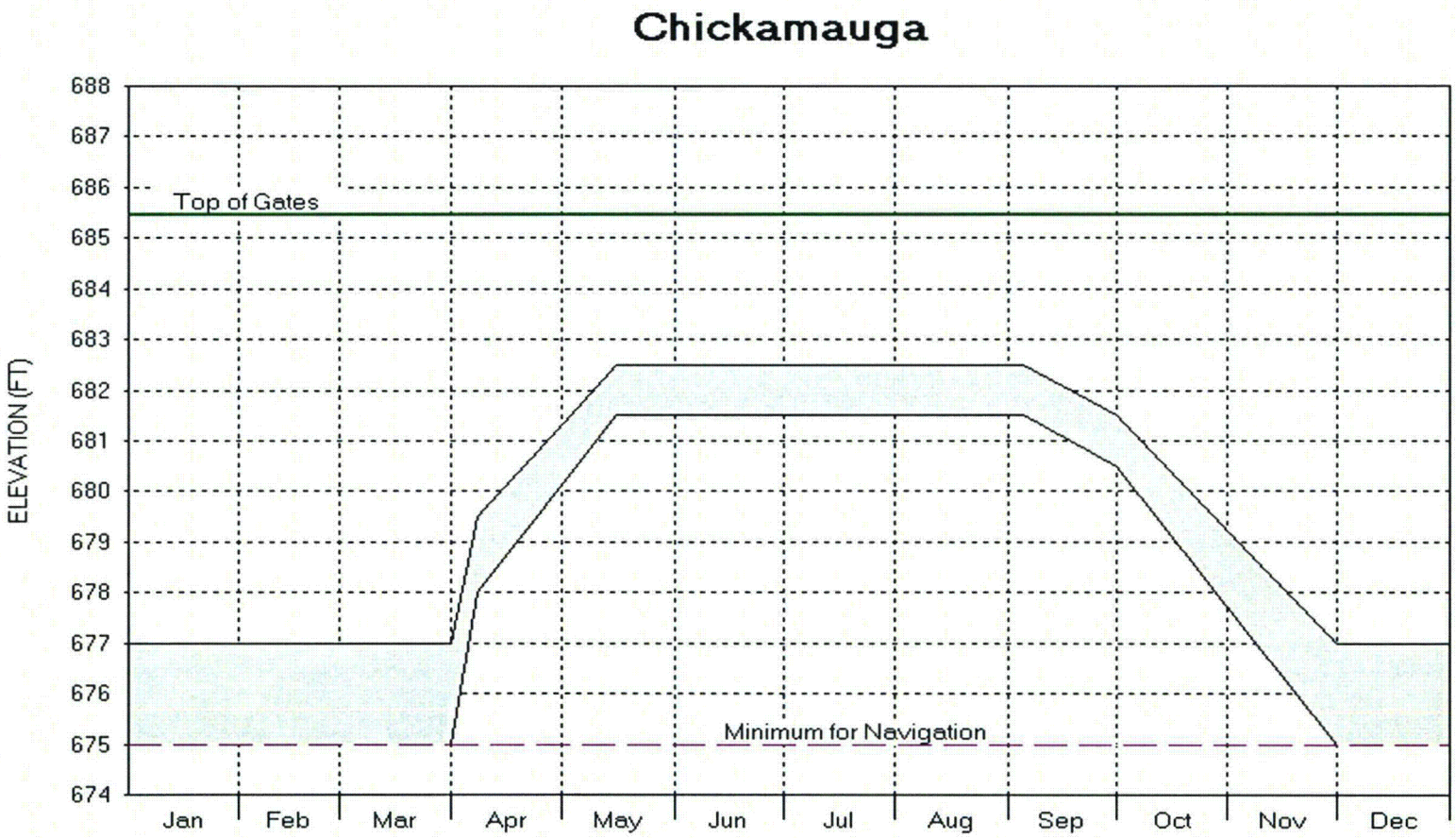
- Used for storage projects only
- Unique for each project
- Depict relationship of pool elevation versus time
- Elevation reflects water in storage and available flood storage.
- Time depicts seasonal aspect of reservoir pool levels.

Reservoir balancing



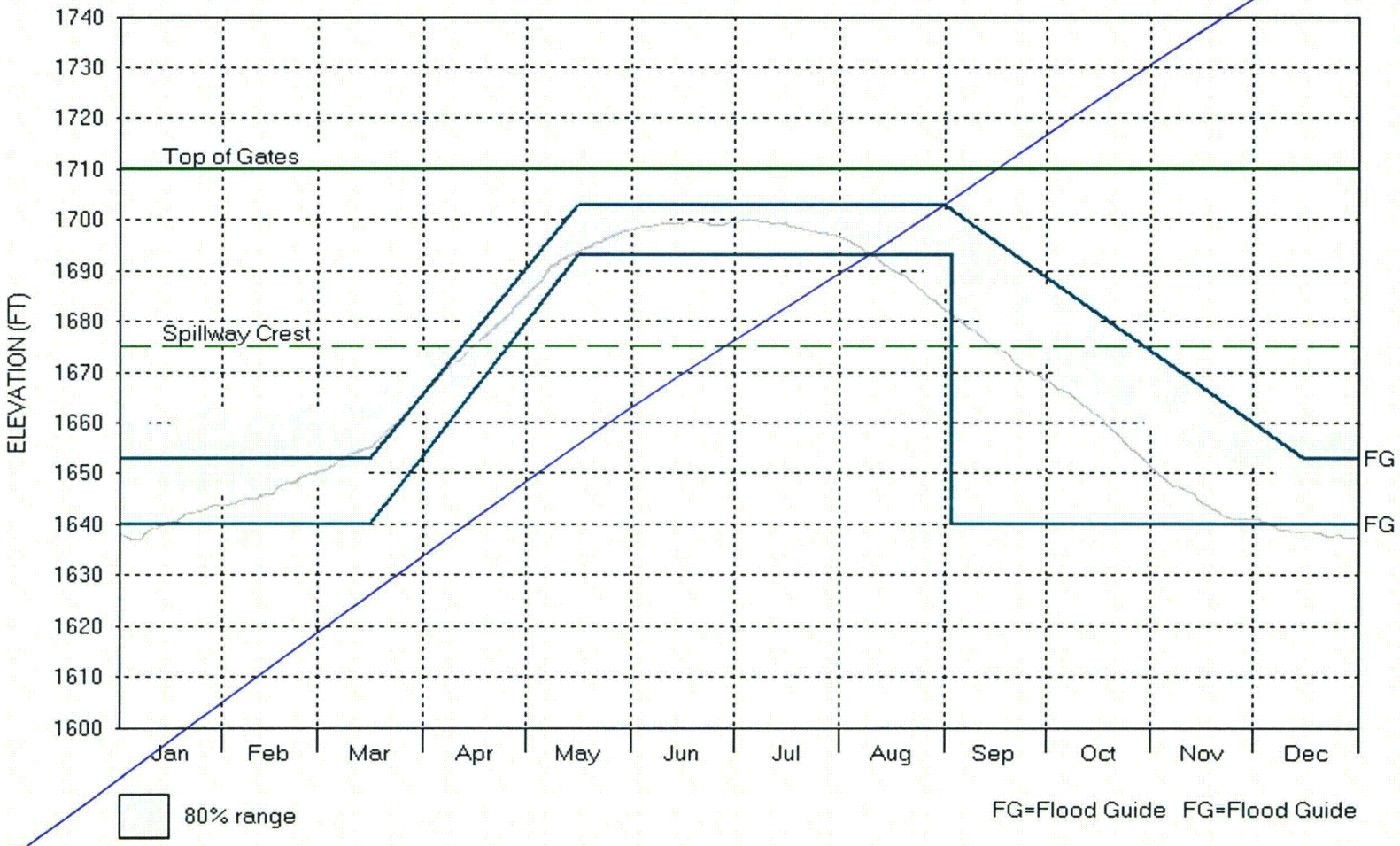
Operating Guide

Main River Reservoir



See updated figure

Fontana



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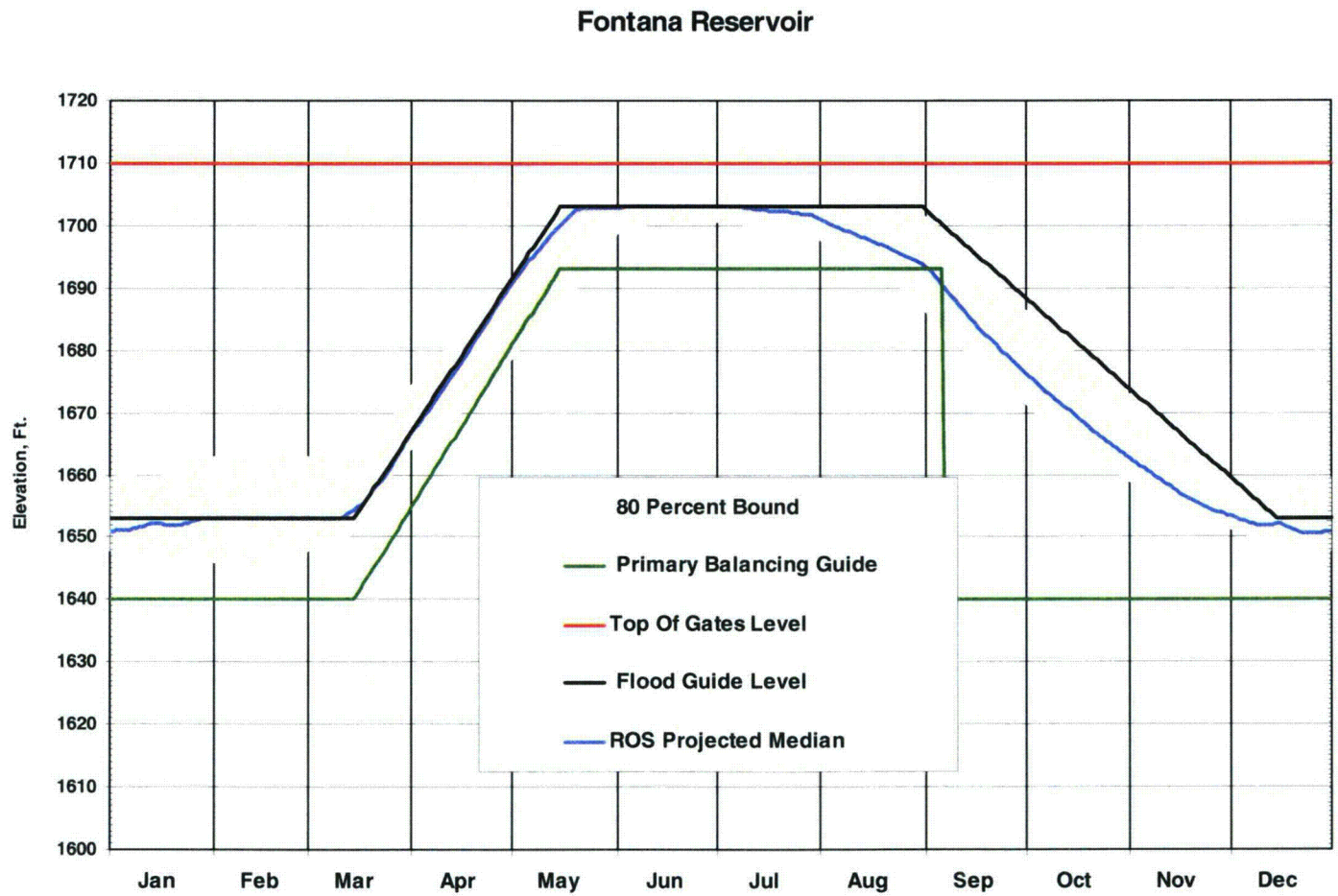
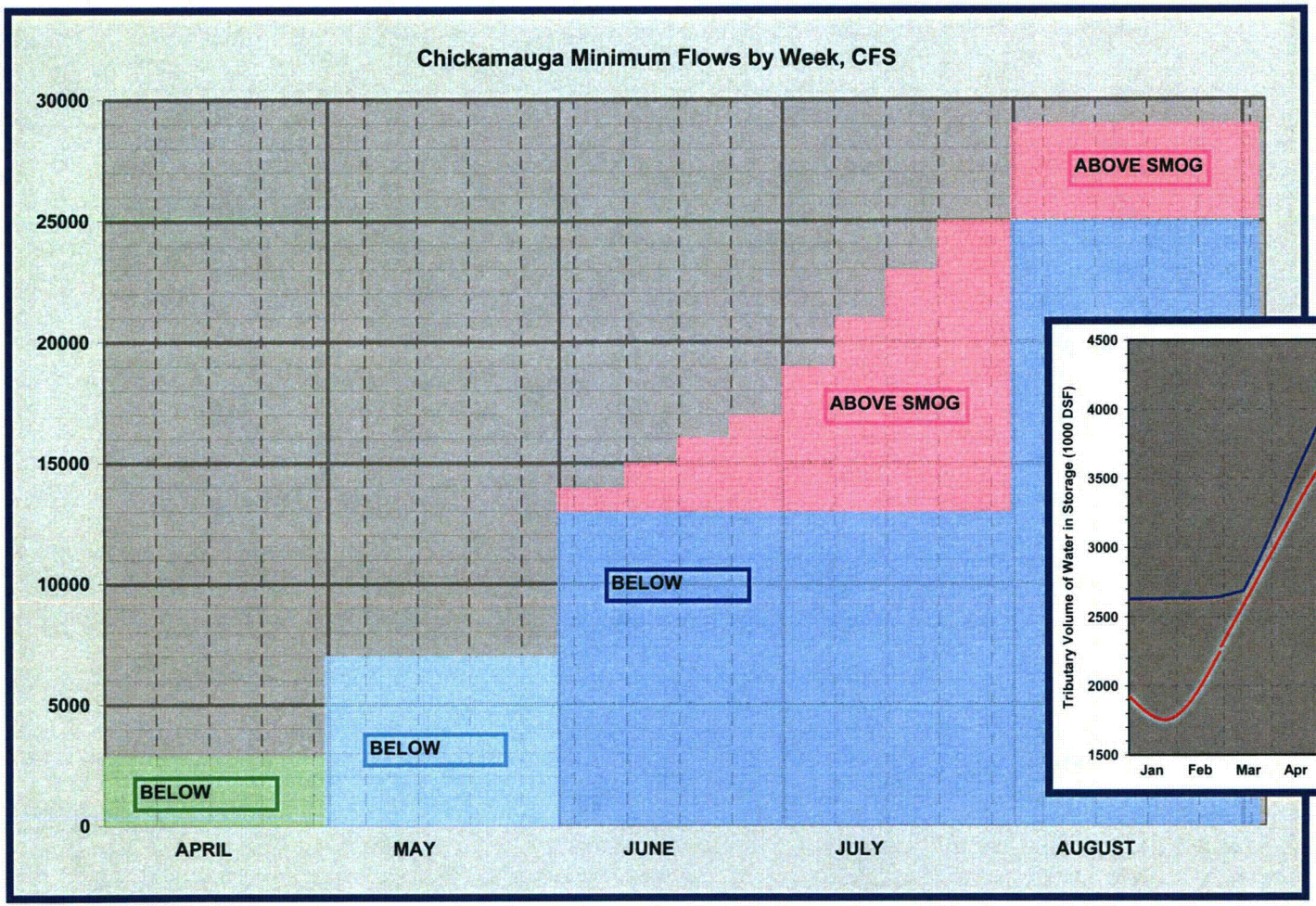
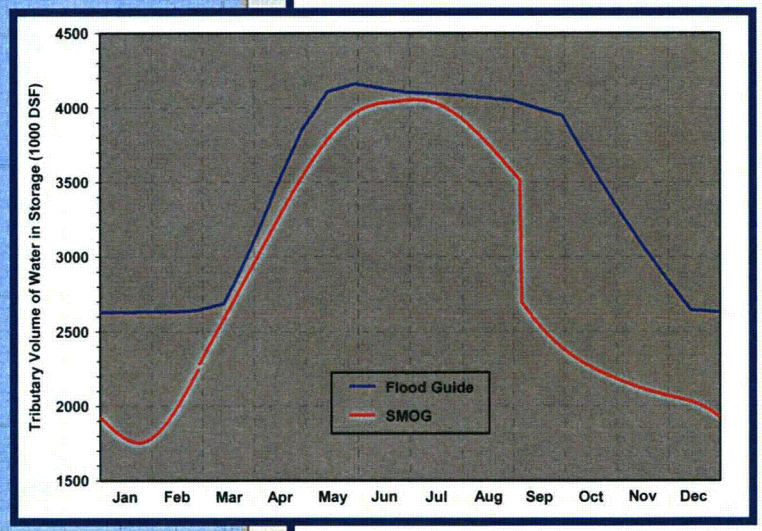
Fontana

Updated Figure



TVA releases depend on the amount of storage relative to the SMOG





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That's All Folks

TVA

TVA/NRC Workshop

June 23–27, 2008

History of Policy Changes

History of Policy Changes

TVA has periodically made changes and adjustments to its reservoir operations policy in order to achieve greater overall value for the public.

History of Policy Changes

Reservoir operations policy also reflects a growing experience and understanding of the challenges and limitations imposed by annual variations in rainfall and runoff, especially during droughts and floods.

History of Policy Changes

Past policy changes reflect factors such as:

- The public's changing needs and concerns.
- Requests from citizens and regional groups.
- Environmental quality issues.
- Changes in the power industry.
- TVA own mission and planning needs.

History of Policy Changes — 1970s

Improved Reservoir System Benefits

- In the early 1970s, TVA began looking for ways to improve system benefits without adversely impacting objectives.
- A multiple-reservoir study completed in 1971 found that some of these objectives could be met by raising minimum winter-water levels at nine tributary storage reservoirs.

History of Policy Changes — 1980s

Reservoir Resource Re-evaluation Program

- Brought together a team of TVA specialists to review its operations and evaluate suggested changes.
- Was the beginning of a more formal evaluation process that involved public input.
- Provided a forum for external groups.

History of Policy Changes — 1980s

Reservoir Release Improvement Evaluations

- Due to low availability of water during the extended drought of the 1980s, TVA experimented with minimum flows to improve aquatic habitat, water quality, and waste assimilation.
- TVA developed methods to provide higher minimum flows, including turbine pulsing, re-regulation weirs, and continuous releases through small turbines.
- TVA also began the process of evaluating and implementing methods to increase dissolved oxygen (DO) concentrations.

History of Policy Changes — 1990s

Lake Improvement Plan (LIP)

- Prepared in response to public input through the National Environmental Policy Act (NEPA) process.
- Reflected a growing recognition that benefits beyond the operating objectives of navigation, flood control, and power production had become increasingly important to residents.
- Was approved by the TVA Board in 1991.

History of Policy Changes — 1990s

Lake Improvement Plan (LIP)

- Extended summer reservoir levels on tributary reservoirs to increase recreational opportunities.
- Increased minimum flow requirements for many of the main stem and tributary projects.
- Began a program to increase DO concentrations in the releases from 16 dams.

History of Policy Changes — 2004

Reservoir Operations Study (ROS)

- Initiated in 2001 with study results implemented in summer 2004.
- Enabled TVA to determine whether changes to its operations policy would produce greater public value.
- Modified the balance among the operating objectives for the system resulting in a different mix of benefits that would be more responsive to public values.

History of Policy Changes — 2004

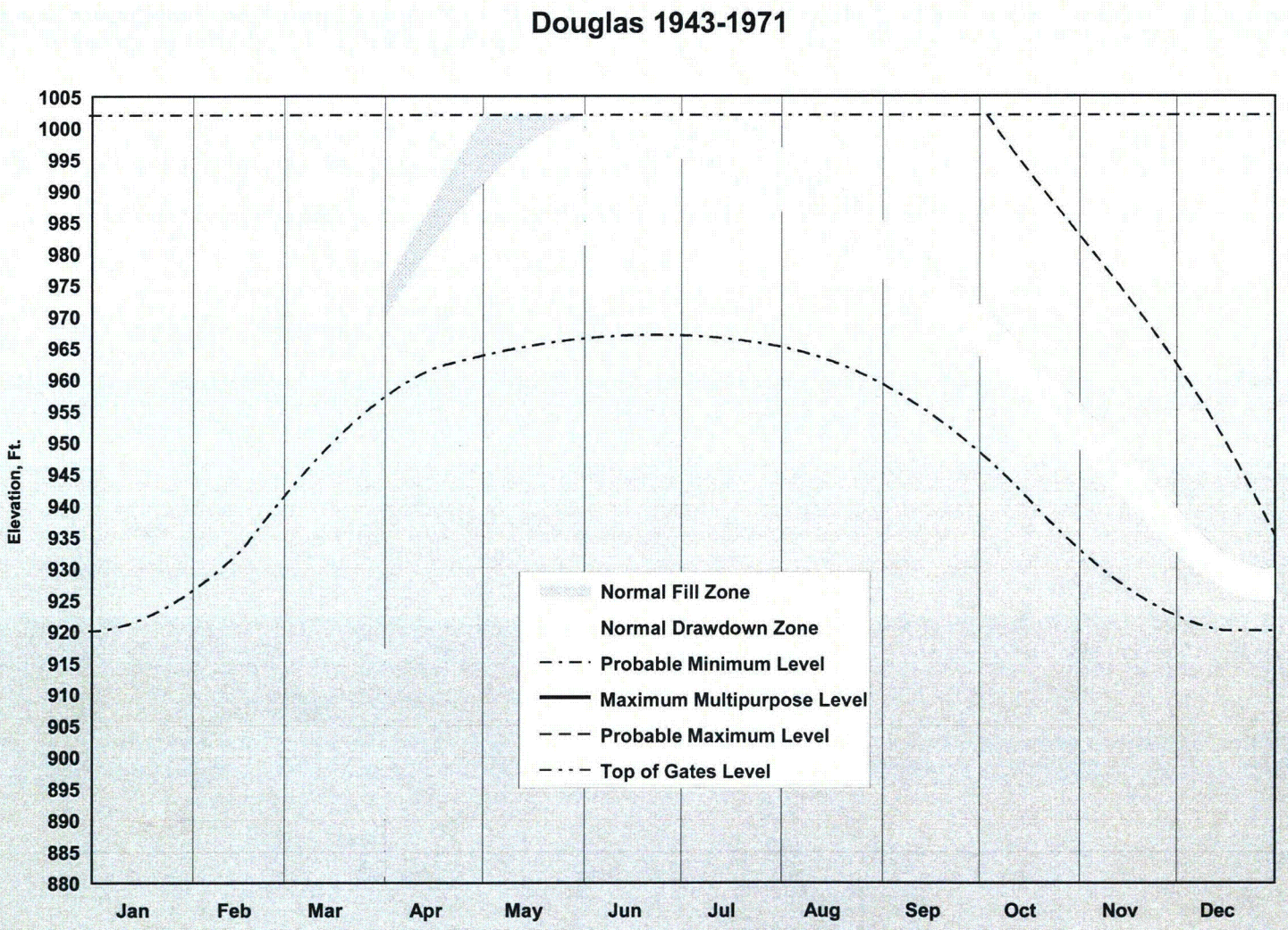
Reservoir Operations Study (ROS)

- Included as study area most of Tennessee and parts of Alabama, Kentucky, Georgia, Mississippi, North Carolina, and Virginia.
- Evaluated nine reservoir operations policy alternatives.
- Resulted in a TVA Preferred Alternative after extensive public review, comment, and additional analysis.

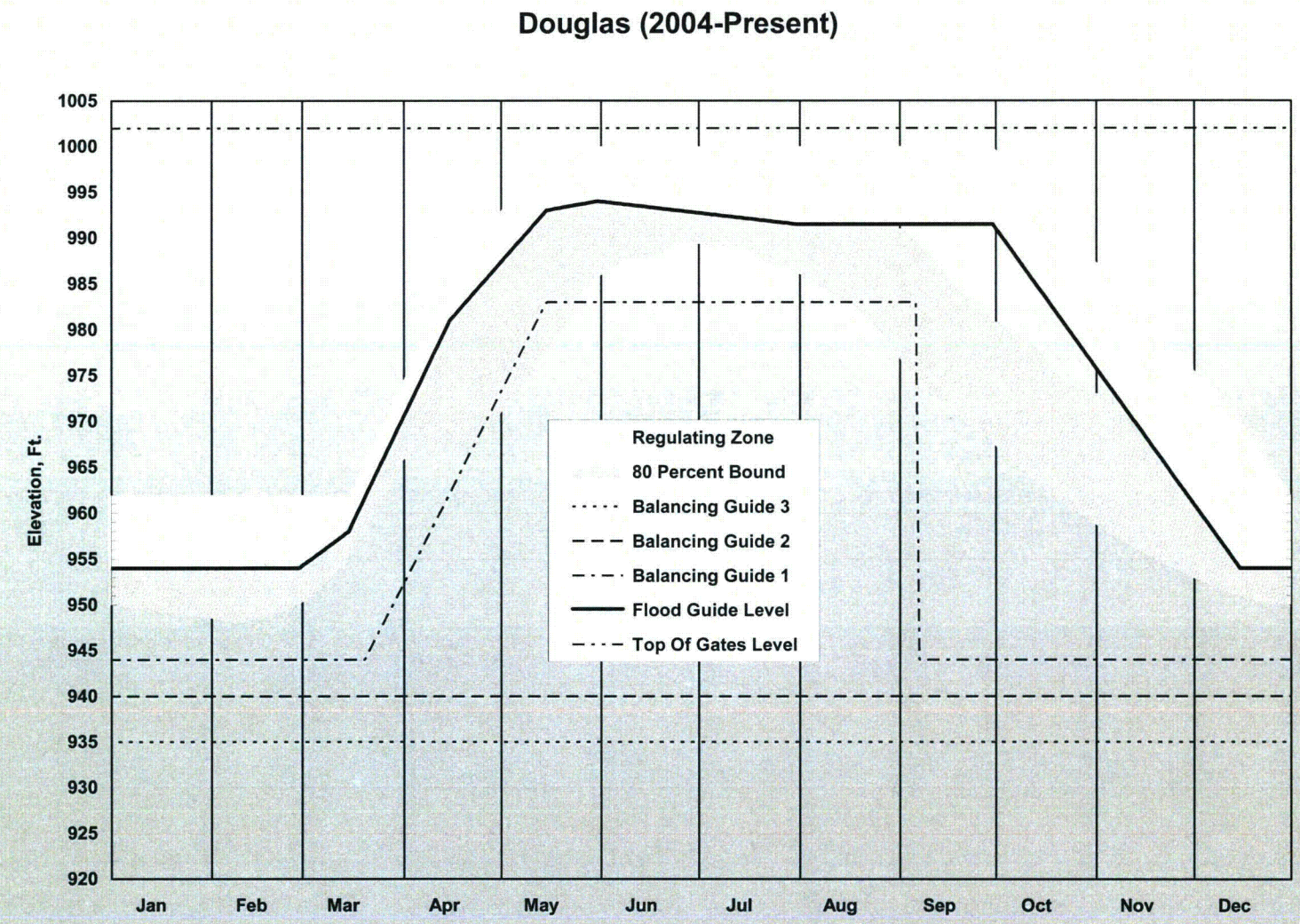
History of Policy Changes

What have been the effects of these policy changes?

Tributary Guide Curve Evolution

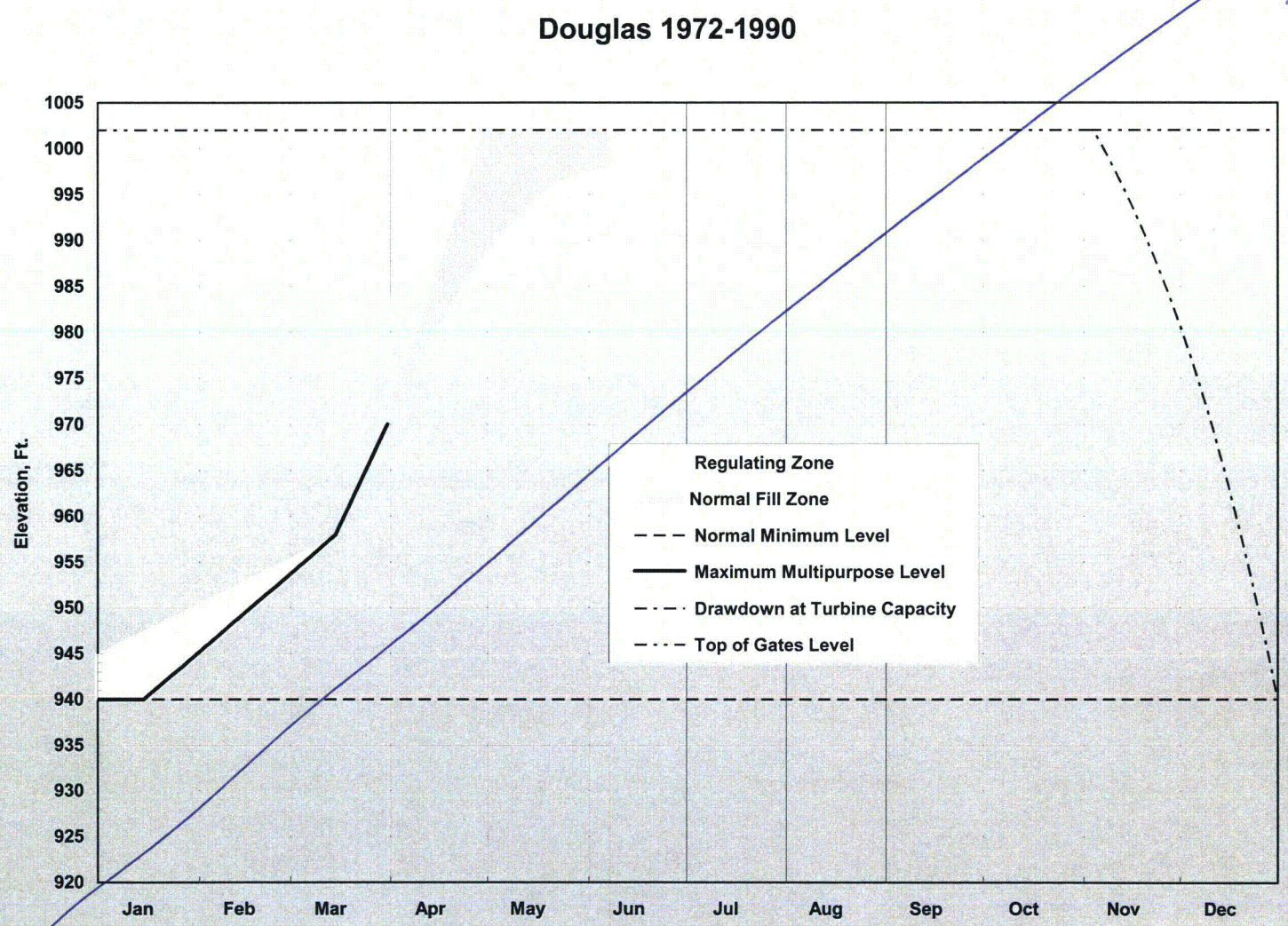


Tributary Guide Curve Evolution



Tributary Guide Curve Evolution

see updated figure



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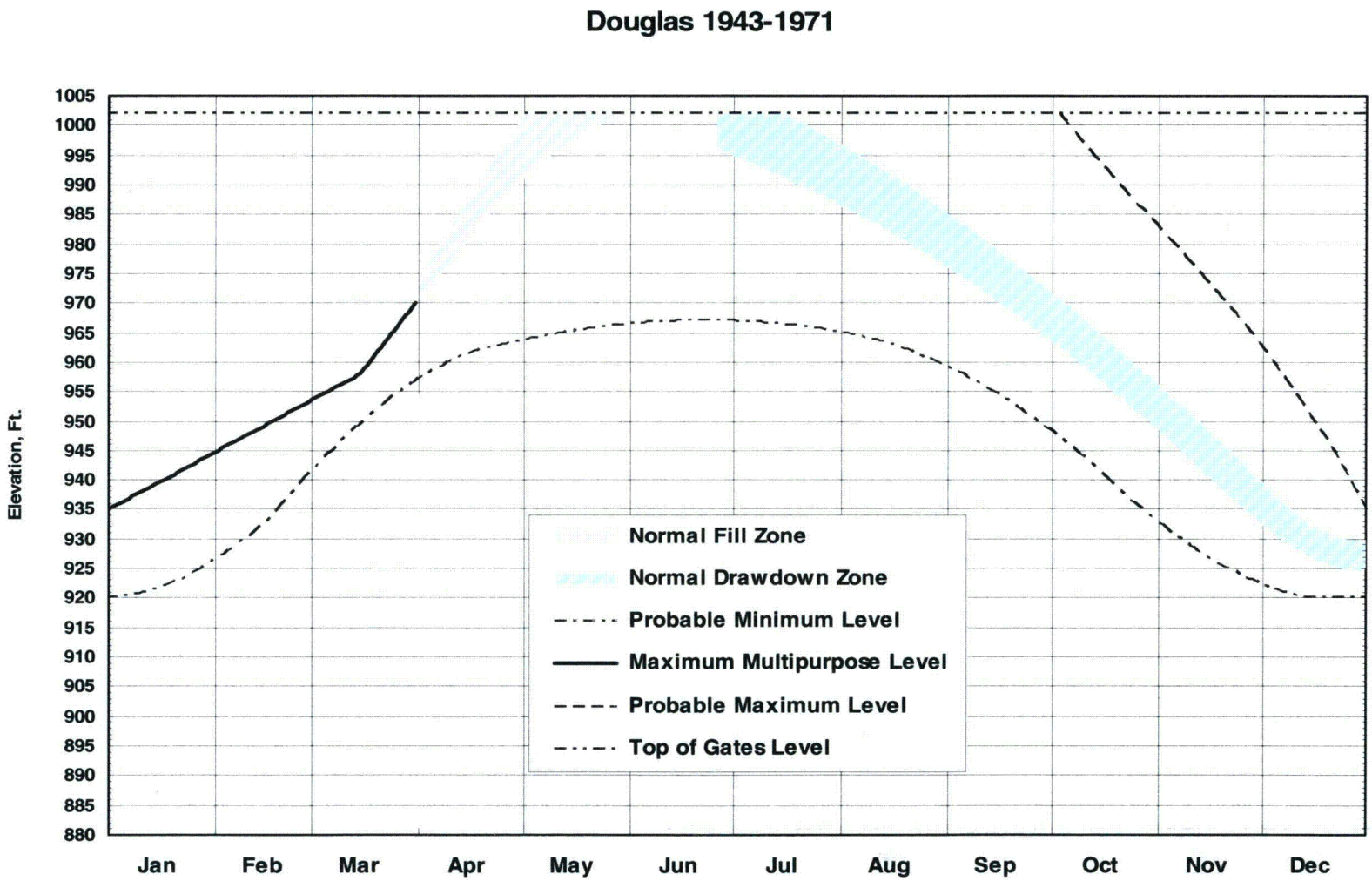
Updated Figure



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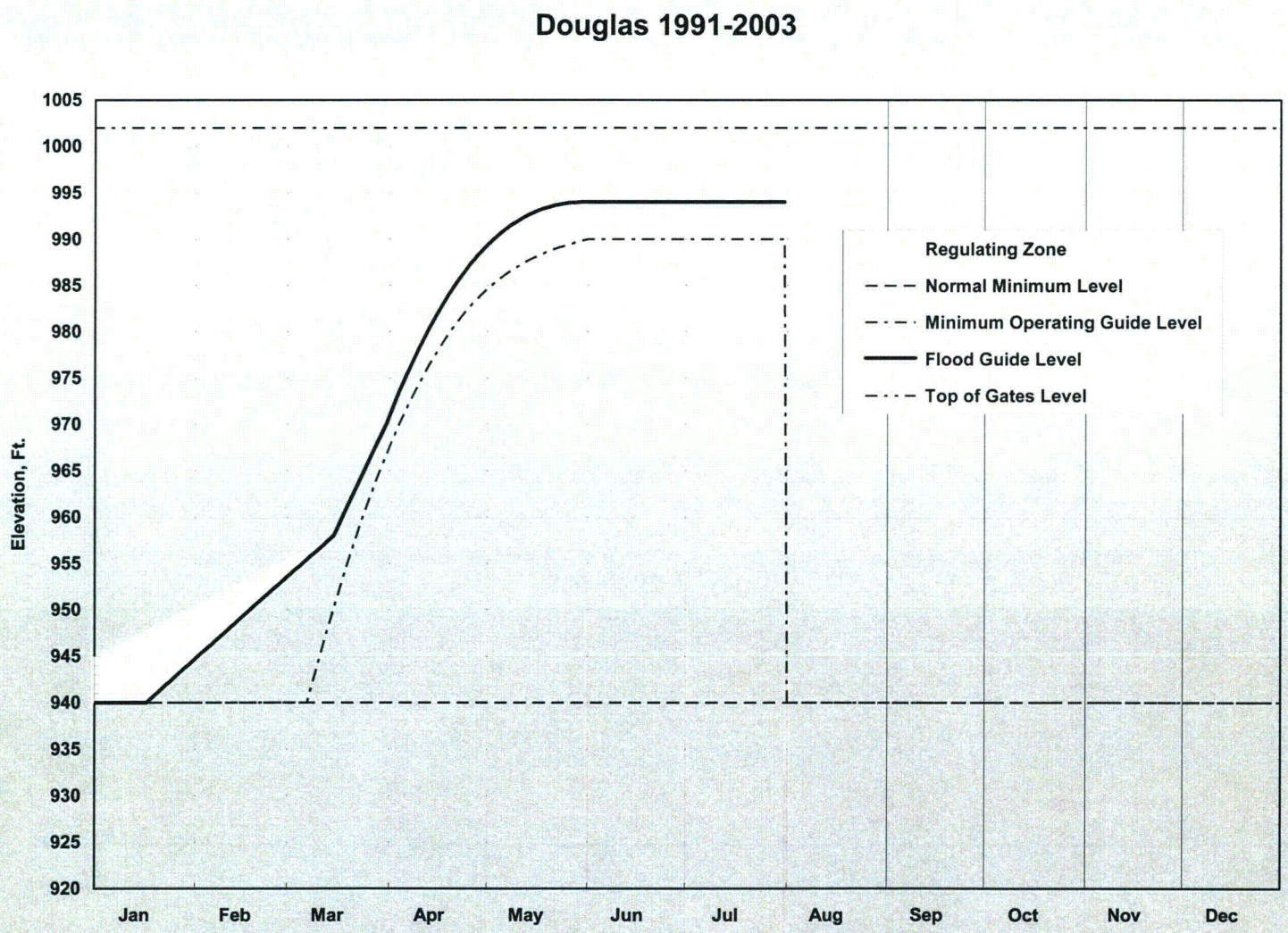
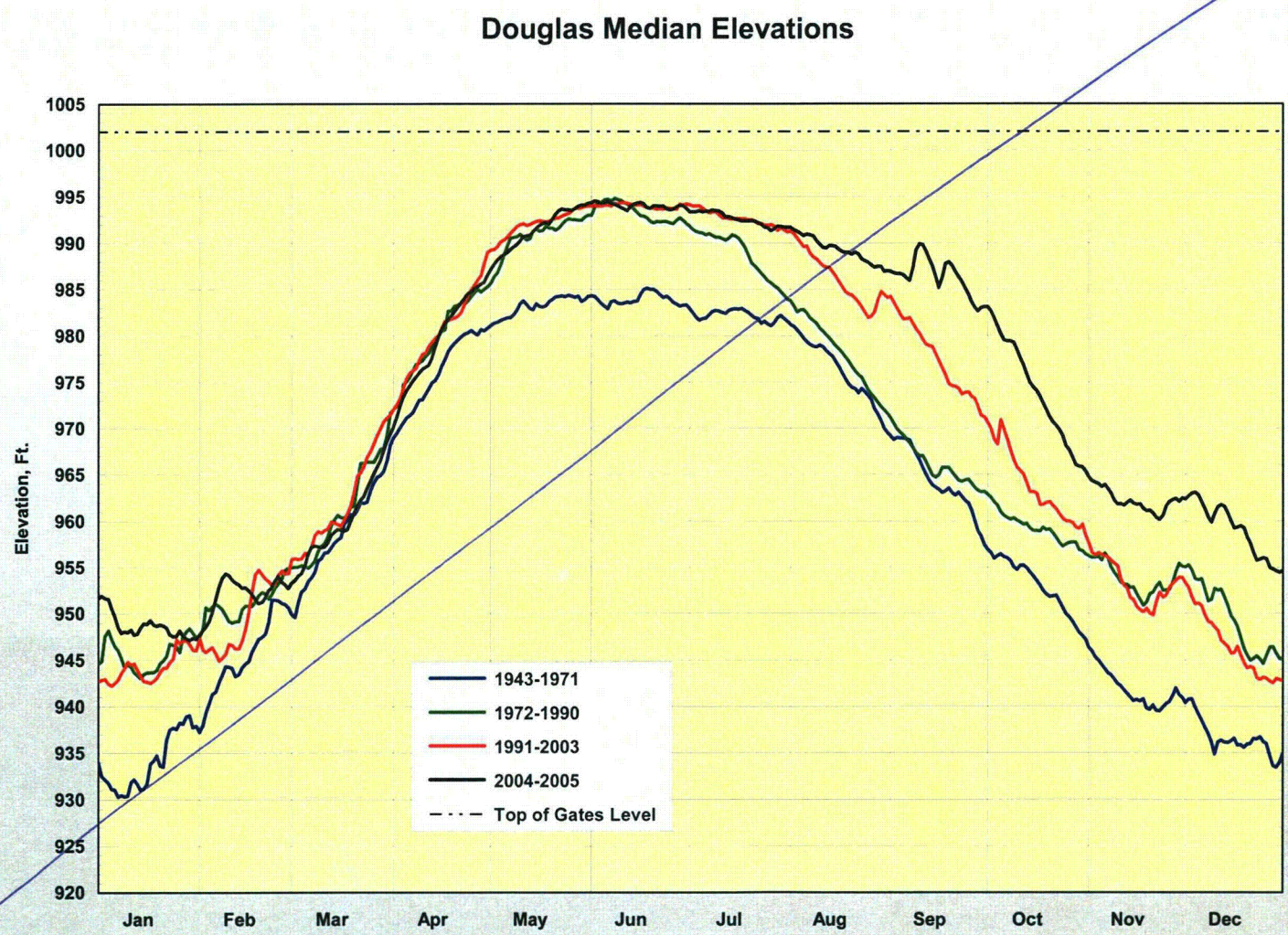


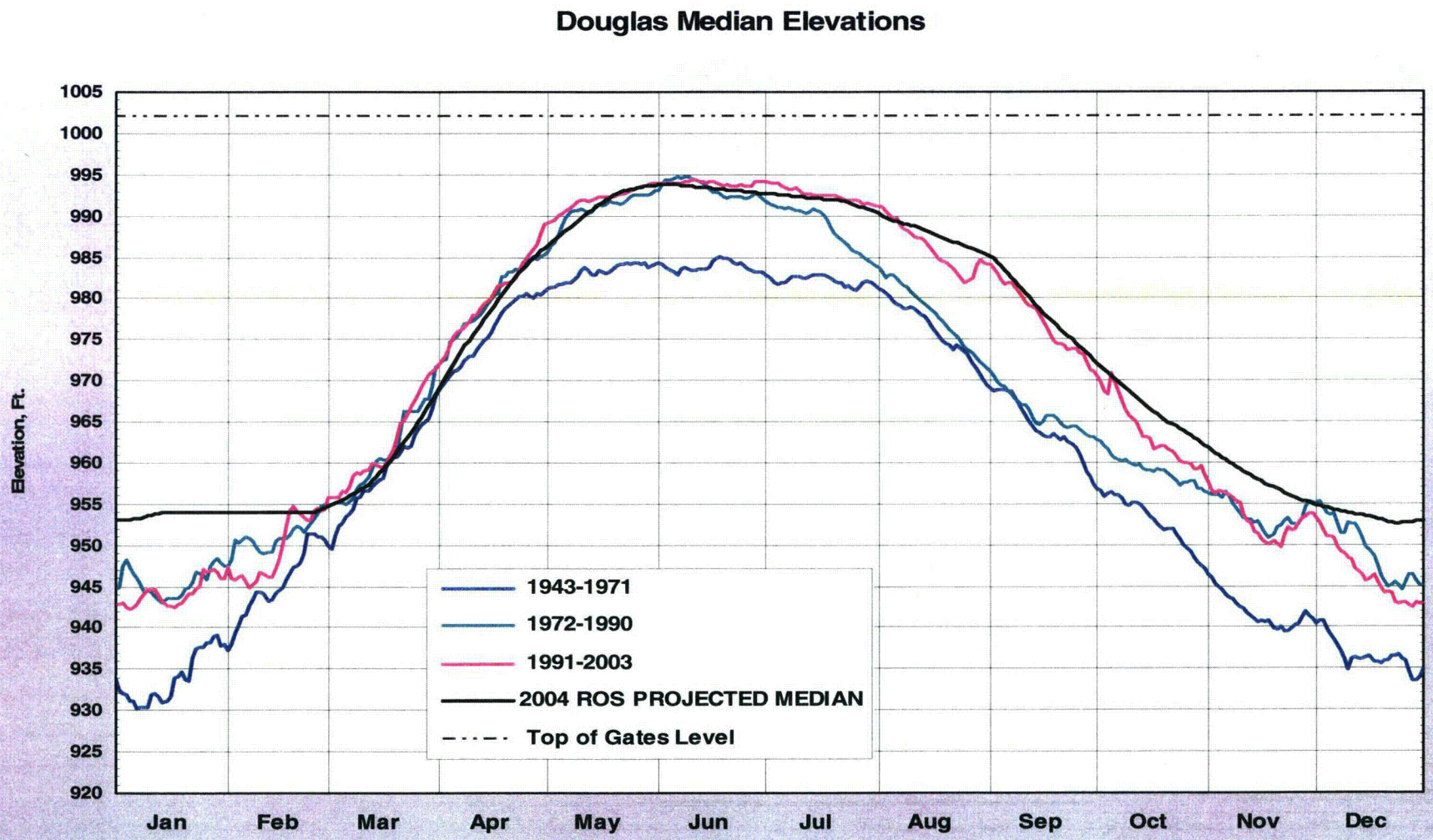
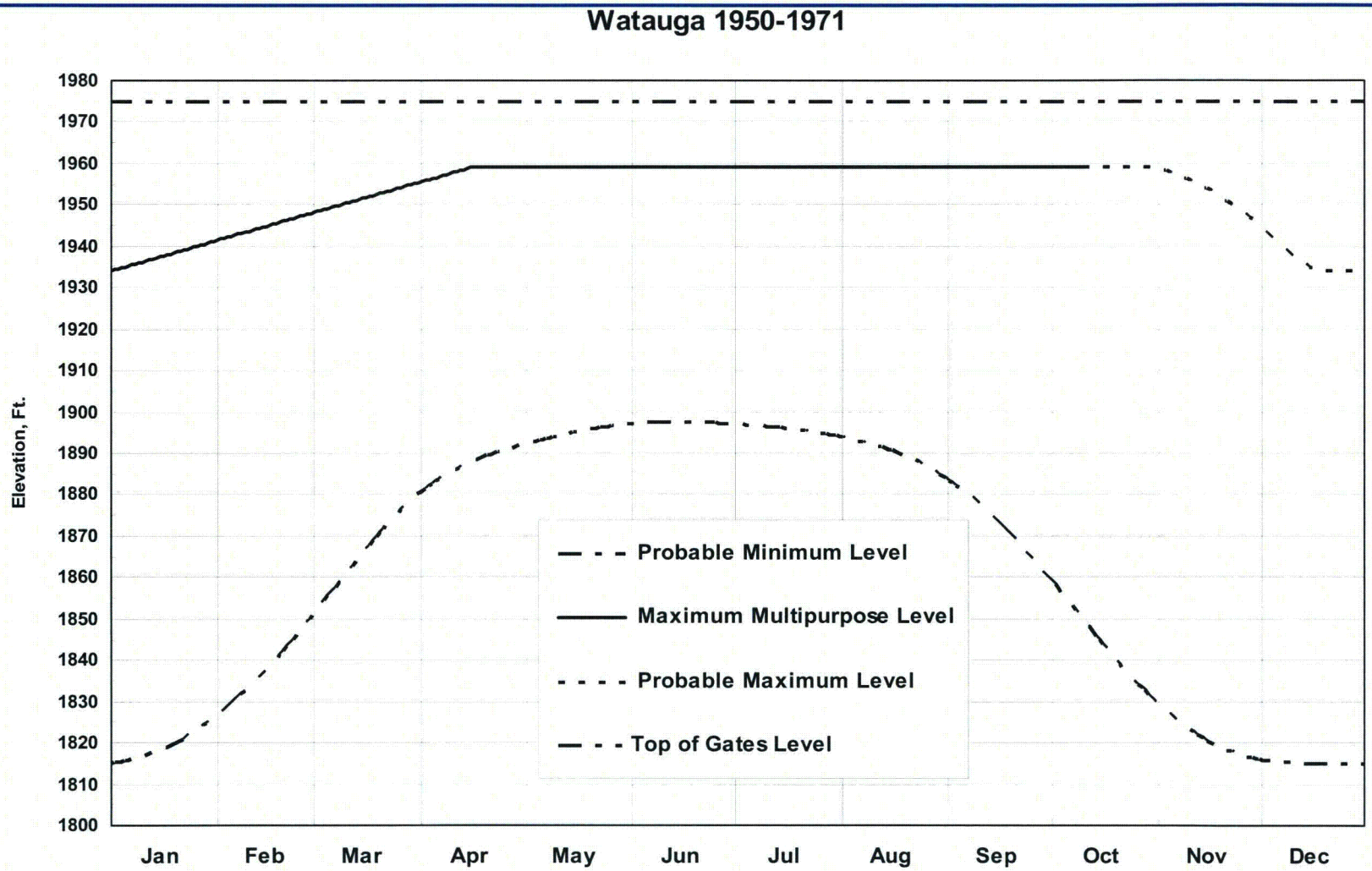
Comparison of Median Elevations

See updated Figure



Comparison of Median Elevations

Updated Figure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