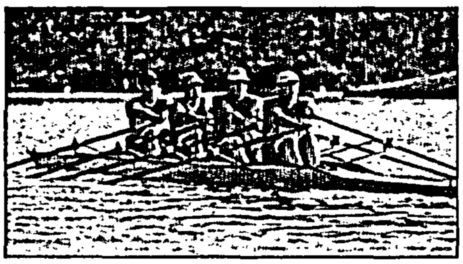
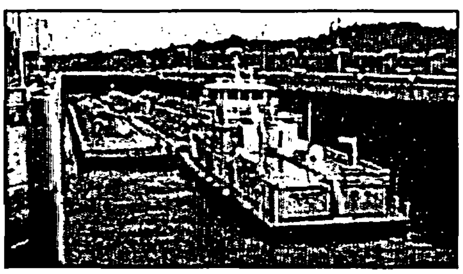
FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT



Tennessee Valley Authority Reservoir Operations Study



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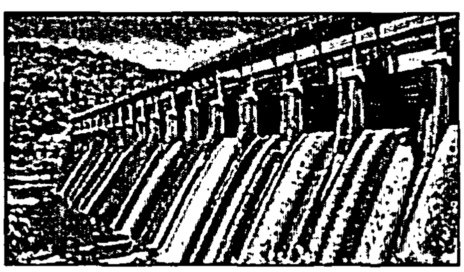

Lead Agency: Tennessee Valley Authority

In cooperation with U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service.

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Appendix A

Base Case Water Control System Description Tables

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Appendix A Water Control System Description Tables

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Table A-01 General Project Characteristics

Project	Year Completed	Length of Reservoir (miles)[2]	Miles of Shoreline	Navigation Facilities	Turbine Units (rated capacity in MW)[6]	Turbine Discharge Capacity[6] (total cfs for all units)	
						Most Efficient Load (MEL)	Maximum Sustainable Load (MSL)
Mainstem Projects							
Kentucky	1944	184.3	2,064.3	2 Locks, canal[3]	5 (223)	–[8]	70,000
Pickwick	1938	52.7	490.6	2 Locks, canal[4]	6 (240)	–[8]	89,000
Wilson	1924[1]	15.5	166.2	2 Locks	21 (675)	–[8]	115,000
Wheeler	1936	74.1	1,027.2	2 Locks	11 (412)	–[8]	120,000
Guntersville	1939	75.7	889.1	2 Locks	4 (135)	–[8]	50,000
Nickajack	1967	46.3	178.7	Lock	4 (104)	–[8]	45,000
Chickamauga	1940	58.9	783.7	Lock	4 (160)	–[8]	45,000
Watts Bar	1942	95.5*	721.7	Lock	5 (192)	–[8]	47,000
Fort Loudoun	1943	60.8*	378.2	Lock	4 (155)	–[8]	32,000
Total Mainstem		**663.8**	**6,699.7**	**14 Locks**	**64 (2,296)**		
Tributary Projects							
Norris	1936	129.0	809.2		2 (131)	6,900	9,100
Melton Hill	1963	44.0	193.4	Lock	2 (72)	17,000	22,000
Douglas	1943	43.1	512.5		4 (156)	19,000	24,600[9]
South Holston	1950	23.7	181.9		1 (39)	2,700	3,300[10]
Boone	1952	32.7*	126.6		3 (92)	10,900	13,200
Fort Patrick Henry	1953	10.4	31.0		2 (59)	6,100	9,000
Cherokee	1941	54.0	394.5		4 (160)	15,700	17,800
Watauga	1948	16.3	104.9		2 (58)	2,700	3,300
Wilbur	1912[1]	1.8	4.8		4 (11)	2,500	2,900
Fontana	1944	29.0	237.8		3 (294)	9,000	11,300
Tellico	1979	33.2	357.0	Canal[5]	0[7]	–	–
Chatuge	1942	13.0	128.0		1 (11)	1,500	1,650
Nottely	1942	20.2	102.1		1 (15)	1,420	1,900
Hiwassee	1940	22.2	164.8		2 (176)	8,100	9,800
Apalachia	1943	9.8	31.5		2 (100)	2,700	2,900
Blue Ridge	1930[1]	11.0	68.1		1 (22)	1,600	1,800
Ocoee #1	1911[1]	7.5	47.0		5 (19)	3,200	3,800

Table A-01 General Project Characteristics (continued)

Project	Year Completed	Length of Reservoir (miles)[2]	Miles of Shoreline	Navigation Facilities	Turbine Units (rated capacity in MW)[6]	Turbine Discharge Capacity[6] (total cfs for all units) Most Efficient Load (MEL)	Turbine Discharge Capacity[6] (total cfs for all units) Maximum Sustainable Load (MSL)
Tributary Projects (continued)							
Ocoee #2	1913[1]	–	–		2 (23)	900	1,050
Ocoee #3	1942	7.0	24.0		1 (29)	1,100	1,500
Tims Ford	1970	34.2	308.7		1 (45)	3,700	4,000
Normandy	1976	17.0	75.1		0[7]	–	–
Great Falls	1916[1]	22.0	120.0		2 (34)	2,700	3,700
Upper Bear Creek	1978	14.0	105.0		0[7]	–	–
Bear	1969	12.0	52.0		0[7]	–	–
Little Bear Creek	1975	6.0	45.0		0[7]	–	–
Cedar Creek	1979	9.0	83.0		0[7]	–	–
Total Tributary		**622.1**	**4,307.9**	**1 Lock**	**45 (1,546)**		
Total Projects		**1,285.9**	**11,007.6**	**15 Locks**	**109 (3,842)**		

Notes:

cfs = Cubic feet per second; MW = Megawatts.

1 Projects acquired from others.
2 Normal summer pool. *Fort Loudoun–49.9 miles on the Tennessee River, 6.5 miles on the French Broad River, and 4.4 miles on the Holston River; Watts Bar–72.4 miles on the Tennessee River and 23.1 miles on the Clinch River; Norris–73 miles on the Clinch River and 56 miles on the Powell River; Boone–17.4 miles on the South Fork Holston River and 15.3 miles on the Watauga River.
3 Includes new main lock chamber (110 feet wide and 1,200 feet long) and the Barkley Canal.
4 Tennessee–Tombigbee Waterway; Bay Springs Reservoir is connected to Pickwick Reservoir by a navigation canal.
5 River diversion through a canal increases energy generation at Fort Loudoun.
6 Actual capacity and turbine flows at any time depend on several factors, including operating head, turbine capability, generator cooling, water temperature, and power factor. Capacities and turbine flows include modernization of turbine units (HMODs) already performed, as well as those in the design, construction, or authorization phase. Turbine discharge assumes availability of all units at maximum discharge.
7 Project design does not include power generation capacity.
8 Mainstem projects can be operated well below MSL values but are predominately operated at MSL values because of higher capacities that can be achieved with acceptable loss of efficiency.
9 Primarily operated at this flow rate during flood control operations or emergency power demands.
10 Limited to a flow rate of 3,000 cfs during non-flooding situations to minimize downstream streambank erosion.

Source: TVA file data.

Table A-02 Reservoir Operating Characteristics

Project	Reserved Flood Storage January 1 to Top of Gates[2] (1,000 acre-feet)	Top of Gates Elevations (feet above mean sea level)	Flood Guide Elevations (feet above mean sea level)			Minimum Targeted Summer Level (feet above mean sea level)	Operating Range of Elevations for Run-of-River Projects[4] (feet above mean sea level)
			Jan 1	Mar 15	Jun 1	Aug 1	
Mainstem Projects							
Kentucky	4,008	375	354	354	359	–	
Pickwick	493[3]	418	408	408	414	–	
Wilson	0	507.88	–	–	–	–	504.5–507.8
Wheeler	349	556.28	550	550	556	–	
Guntersville	162	595.44	593	593	595	–	
Nickajack	0	635	–	–	–	–	632–634
Chickamauga	345	685.44	675	675	682.5	–	
Watts Bar	379	745	735	735	741	–	
Fort Loudoun[1]	111	815	807	807	813	–	
Total Mainstem	**5,847**						
Tributary Projects							
Norris	1,473	1,034	985	1,000	1,020	1,010	
Melton Hill	0	796	–	–	–	–	790–796
Douglas	1,251	1,002	940	958.8	994	990	
South Holston	290	1,742	1,702	1,713	1,729	1,721	
Boone	92	1,385	1,358	1,375	1,382	1,382	
Fort Patrick Henry	0	1,263	–	–	–	–	1,258–1,263
Cherokee	1,012	1,075	1,030	1,042	1,071	1,060	
Watauga	223	1,975	1,940	1,952	1,959	1,949	
Wilbur	0	1,650	–	–	–	–	1,635–1,650
Fontana	580	1,710	1,644	1,644	1,703	1,693	
Tellico[1]	120	815	807	807	813	–	
Chatuge	93	1,928	1,912	1,916	1,926	1,923	
Nottely	100	1,780	1,745	1,755	1,777	1,770	

Table A-02 Reservoir Operating Characteristics (continued)

Project	Reserved Flood Storage January 1 to Top of Gates[2] (1,000 acre-feet)	Top of Gates Elevations (feet above mean sea level)	Flood Guide Elevations (feet above mean sea level)			Minimum Targeted Summer Level (feet above mean sea level)	Operating Range of Elevations for Run-of-River Projects[4] (feet above mean sea level)
			Jan 1	Mar 15	Jun 1	Aug 1	
Tributary Projects (continued)							
Hiwassee	270	1,526.5	1,465	1,482	1,521	1,515	
Apalachia	0	1,280	–	–	–	–	1,272–1,280
Blue Ridge	69	1,691	1,668	1,678	1,687	1,682	
Ocoee #1	0	830.76	820	820	829		
Ocoee #2	0	1115.2	–	–	–	–	Not applicable[6]
Ocoee #3	0	1,435	–	–	–	–	1,428 –1,435
Tims Ford	220	895	873	879	888	–[5]	
Normandy	48	880	864	866.7	875		
Great Falls	0	805.3	–	–	–	–	785–800
Upper Bear Creek	0	797	–	–	–	–	790–797
Bear Creek	37	602	565	572.8	576	–	
Little Bear Creek	25	623	603	615	620	–	
Cedar Creek	76	584	560	574.2	580	–	
Total Tributary	**5,979**						
Total Projects	**11,826**						

Notes:

1 Projects are operated in tandem because of diversion canal to increase power generation at Fort Loudoun.
2 The observed flood storage varies, depending on rainfall and runoff.
3 Includes additional storage volume from Bay Springs Reservoir.
4 The observed range varies, depending on demands on the river system.
5 Tims Ford has no August 1 target level; it does have a minimum elevation requirement of 883 feet above sea level from May 15 through October 15.
6 Does not have a permanent pool.

Source: TVA file data.

Table A-03 Minimum Flows, Techniques, Requirements, and Commitments

Project	Techniques	Minimum Flows (cfs)	Frequency and Duration of Flows	Operating Objective
Mainstem Projects				
Kentucky	Appropriate daily scheduling	18,000	Bi-weekly average: June–August	Water supply, water quality
		15,000	Bi-weekly average: May and September	
		12,000	Daily average: October–April	
		5,000	Year-round instantaneous flows if Paducah, Kentucky, stage on Ohio River is greater than 16 feet (occurs about half the time)	Navigation
		15,000	Continuous when Paducah stage is between 14 and 16 feet (occurs about half the time)	Navigation
		20,000	Continuous when Paducah stage is less than 14 feet (occurs about 2% of time)	Navigation
Pickwick[1]	Appropriate daily scheduling	15,000	Bi-weekly average: June–August	Water supply, water quality
		9,000	Bi-weekly average: May and September	
		8,000	Daily average: October–April	
		16,000	Instantaneous when Kentucky headwater is at 354-foot elevation	Navigation
		8,000	Instantaneous when Kentucky headwater is at 355-foot elevation	Navigation
Wilson	Appropriate daily scheduling	8,000	Instantaneous when Pickwick headwater is at or below 409.5-foot elevation	Navigation
Wheeler and Guntersville	Appropriate daily scheduling (45% Wheeler plus 55% Guntersville flows)	10,000	Daily average: July–September	Operation of downstream nuclear plant
		11,000	Daily average: December–March	
		7,000	Otherwise	
Chickamauga	Appropriate daily scheduling	13,000	Bi-weekly average: June–August	Water supply, water quality
		7,000	Bi-weekly average: May and September	
		3,000	Daily average: October–April	

Table A-03 Minimum Flows, Techniques, Requirements, and Commitments (continued)

Project	Techniques	Minimum Flows (cfs)	Frequency and Duration of Flows	Operating Objective
Mainstem Projects (continued)				
Watts Bar	No more than 15 hours of zero flow for holding pond drainage	1,200	Daily average	Operation of downstream nuclear plant
Douglas and Cherokee flows for Knoxville	Appropriate daily scheduling of Cherokee and Douglas along with local inflow	2,000	Daily average	Water supply, water quality
Norris	Turbine pulsing and reregulation weir	200	Daily average: pulse every 12 hours for 30 minutes	Water supply, water quality
For Bull Run fossil plant	Appropriate daily scheduling	800	Daily average: February–March	Thermal compliance–operation of downstream fossil plant
		1,000	Daily average: April–May	
		1,200	Daily average: June	
		1,500	Daily average: July–September	
		2,000	Daily average: October	
		600	Daily average: November–January	
Melton Hill	Appropriate daily scheduling	400	Daily average	Water supply, water quality
Douglas	Turbine pulsing	585	Daily average: every 4 hours for 30 minutes	Water supply, water quality
Douglas for Knoxville	Appropriate daily scheduling of Cherokee and Douglas along with local inflow	2,000	Daily average	
South Holston	Turbine pulsing and reregulation weir	90	Daily average: pulse every 12 hours for 30 minutes	Water supply, water quality
Boone	Turbine pulsing	400	Daily average	Water supply, water quality

Table A-03 Minimum Flows, Techniques, Requirements, and Commitments (continued)

Project	Techniques	Minimum Flows (cfs)	Frequency and Duration of Flows	Operating Objective
Tributary Projects				
Fort Patrick Henry[2]	Turbine pulsing	800	Average 3-hour discharge–year round	Water supply, water quality
		1,250	Instantaneous: January	Operation of downstream fossil plant
		1,300	Instantaneous: February–March	
		1,500	Instantaneous: April–May	
		1,833	Instantaneous: June–September	
		1,450	Instantaneous: October–November	
		1,350	Instantaneous: December	
Cherokee	Turbine pulsing	325	Daily average: every 6 hours for 30 minutes	Water supply, water quality
Cherokee for Knoxville	Appropriate daily scheduling of Cherokee and Douglas along with local inflow	2,000	Daily average	
Watauga measured from Wilbur[3]	Turbine pulsing	107	Daily average: small unit every 4 hours for 1 hour or large unit every 4 hours for 15 minutes	Water supply, water quality
Fontana measured from Chilhowee[4]	Appropriate daily scheduling	1,000	Daily average: May–October Fontana and Santeetlah plus local inflow	Water supply, water quality
Chatuge	Turbine pulsing and reregulation weir	60	Daily average: every 12 hours for 30 minutes	Water supply, water quality
Nottely	Small hydro unit when large unit is not generating	55	Continuous	Water supply, water quality
Apalachia[5]	Turbine pulsing	200	Daily average: every 4 hours for 30 minutes	Water supply, water quality
	Appropriate daily scheduling of discharges from Apalachia and Ocoee #1	600	Daily average	
Blue Ridge[2]	Small hydro unit when large unit is not generating	115	Continuous	Water supply, water quality

Table A-03 Minimum Flows, Techniques, Requirements, and Commitments (continued)

Project	Techniques	Minimum Flows (cfs)	Frequency and Duration of Flows	Operating Objective
Tributary Projects (continued)				
Ocoee #1	Turbine pulsing	140	Daily average: every 4 hours for 1 hour	Water supply, water quality
	Appropriate daily scheduling of discharges from Apalachia and Ocoee #1	600	Daily average	
Tims Ford	Small hydro unit when large unit is not generating	80	Continuous	Water supply, water quality
For Fayetteville	Appropriate daily scheduling	120	Continuous	
Normandy for Shelbyville	Appropriate daily scheduling	40 155	Continuous	Water supply, water quality
Upper Bear Creek		5	Continuous	Water quality, water supply
Bear Creek for Red Bay		21	Continuous	Water quality, water supply
Little Bear Creek		5	Continuous	Water quality, water supply
Cedar Creek		10	Continuous	

Notes:

cfs = Cubic feet per second.

[1] Minimum tailwater below Pickwick is maintained at or above a 355-foot elevation for navigation. Continuous minimum discharge from Pickwick is used to maintain this minimum elevation whenever Kentucky headwater is at or below a 355-foot elevation. These discharges vary as the Kentucky headwater varies between elevations of 354 and 355 feet.

[2] Fort Patrick Henry is required to supply a minimum flow for the John Sevier Steam Plant that equals the plant cooling water intake plus a minimum bypass flow for the current time of year. The minimum bypass flow is defined as follows in the National Pollutant Discharge Elimination System permit for John Sevier:

> To the maximum extent practicable (considering only the short and long term availability of water for release from upstream impoundments and alternative sources of generation to meet the public demand for power), not less than 350 cfs nor one-third of the plant cooling water flow, whichever is greater, shall be passed over the dam during the period from June 1 to September 30 at any time the plant is in operation. During the winter months, or during the period of October 1 to May 31, the minimum bypass flow shall be 100 cfs. These are the minimum volumes of cold-water to be provided which will ensure the protection of spawning, development and survival of fish eggs, larvae, and fry and to provide living space for fish consistent with classified uses downstream from the diversion dam.

[3] Watauga minimum flow is met at downstream Wilbur.

[4] Fontana minimum flow is met at downstream Chilhowee Dam.

[5] Apalachia plus Ocoee #1 must meet a combined minimum flow of 600 cfs as the combined daily average.

Source: TVA file data.

Table A-04 Ramping Constraints by Project

Project	Number of Turbine Units	Ramping Rate
Watauga	2	Ramp units up and down a maximum of one unit per hour for downstream safety
Cherokee	4	Ramp units up and down a maximum of two units per hour to minimize downstream bank erosion
Douglas	4	Ramp units up and down a maximum of two units per hour to minimize downstream bank erosion
Apalachia	2	Ramp units up a maximum of one unit per hour for downstream safety
South Holston	1	Maximum turbine flow of 3,000 cubic feet per second (cfs) (below Maximum Sustainable Level [MSL] flows) for hydropower needs required to minimize downstream bank erosion; MSL flows allowed for flood control
Pickwick	6	Turbines limited to a ramp rate of 60 megawatts (MW) per hour when ramping up and a maximum of 40 MW per hour when ramping down for downstream navigation and bank stabilization
Kentucky	5	When Paducah stage is greater than 16 feet–maximum hourly discharge variation of one unit per hour When Paducah stage is less than 16 feet but greater than 14 feet–maximum hourly discharge variation of one unit per hour If Kentucky is not spilling–maximum daily discharge variation of 35,000 cfs per day
Chickamauga	4	From November through April, ramp units up and down a maximum of one unit per hour for Sequoyah Nuclear Plant thermal compliance

Source: TVA file data.

Table A-05 Fishery Types, Dissolved Oxygen Targets, and Type of Aeration Facilities at Reservoir Tailwaters

Project	Fishery Type	DO Target (mg/L)	Type of Aeration Facilities
Mainstem Projects			
Watts Bar		4	Oxygen injection
Fort Loudoun		4	Oxygen injection
Tributary Projects			
Norris	Cold-water	6	Turbine venting
Douglas	Warm-water	4	Turbine venting, surface water pumps, oxygen injection
South Holston	Cold-water	6	Turbine venting, aerating weir
Boone	Cold-water	4	Turbine venting
Fort Patrick Henry[1]	Cold-water	4	Upstream improvements
Cherokee	Warm-water	4	Turbine venting, surface water pumps, oxygen injection
Watauga	Cold-water	6	Turbine venting
Fontana	Cold-water	6	Turbine venting
Chatuge[2]	Warm-water	4	Aerating weir
Nottely	Warm-water	4	Turbine air injection
Hiwassee	Cold-water	6	Turbine venting, oxygen injection
Apalachia[3]	Cold-water	6	Turbine venting
Blue Ridge	Cold-water	6	Oxygen injection
Tims Ford	Cold-water	6	Turbine air injection, oxygen injection

Notes:

mg/L = Milligrams per liter.

[1] The first 4 miles below Fort Patrick Henry are classified as a cold-water fishery; below this point, the tailwater is classified as a warm-water fishery.
[2] Chatuge is classified by state standards as a warm-water fishery but has a trout fishery in its tailwater.
[3] Below the powerhouse.

Source: TVA file data.

Table A-06 Year 2030 Additional Net Water Supply Demand by Project

Project	Additional Net Water Demand (cfs)
Mainstem Projects	
Kentucky	49.91
Pickwick	42.39
Tennessee–Tombigbee Waterway flows	968.80
Wilson	23.99
Wheeler	132.45
Guntersville	17.15
Nickajack	21.70
Chickamauga	31.12
Watts Bar	14.44
Fort Loudoun	16.92
Tellico	1.44
Tributary Projects	
Norris	5.44
Melton Hill	21.99
Douglas	43.22
South Holston	3.79
Boone	-8.62
Fort Patrick Henry	167.60
Cherokee	-133.87
Watauga	23.84
Wilbur	–
Fontana	1.42
Chatuge	3.32
Nottely	0.66
Hiwassee	0.30
Apalachia	0.69
Blue Ridge	16.91
Ocoee #1	-9.02
Ocoee #2	–
Ocoee #3	–
Tims Ford	24.01
Normandy	0.00
Great Falls	–
Upper Bear Creek	0.00
Bear Creek	–
Little Bear Creek	–
Cedar Creek	0.00

Note:

cfs = Cubic feet per second.

Source: TVA file data.

Table A-07 Drawdown Limits for Tributary Reservoirs

Project[1]	Description	Drawdown Limits[2]
Apalachia	Concrete	3 feet per day not to exceed 12 feet per week
Blue Ridge	Hydraulic fill	2 feet per day not to exceed 7 feet per week for 28 feet; then 3 feet per week
Chatuge	Impervious rolled fill	2 feet per day not to exceed 7 feet per week for 28 feet; then 3 feet per week
Cherokee	Concrete and impervious rolled fill	2 feet per day not to exceed 7 feet per week for 28 feet; then 3 feet per week
Douglas	Concrete and impervious rolled fill	2 feet per day not to exceed 7 feet per week for 28 feet; then 3 feet per week
Fontana	Concrete	2 feet per day not to exceed 7 feet per week for 28 feet; then 3 feet per day not to exceed 12 feet per week
Great Falls	Concrete	2 feet per day not to exceed 12 feet per week
Hiwassee	Concrete	2 feet per day not to exceed 7 feet per week
Norris	Concrete and earth fill	2 feet per day not to exceed 7 feet per week for 28 feet; then 3 feet per week
Nottely	Impervious rolled fill	2 feet per day not to exceed 7 feet per week for 28 feet; then 3 feet per week
South Holston	Impervious rolled fill	2 feet per day not to exceed 7 feet per week for 28 feet; then 3 feet per week
Watauga	Impervious rolled fill	2 feet per day not to exceed 7 feet per week for 28 feet; then 3 feet per week

Notes:

[1] For those reservoirs not shown, the drawdown rate would follow the rate shown for Blue Ridge.
[2] Restrictions are based on dam safety and erosion considerations.

Source: TVA file data.

Table A-08 Fill and Drawdown Dates

Mainstem Project	Operating Mode	Reservoir Fill Target Date	Target Date for Start of Reservoir Drawdown
Kentucky	Storage	May 1	July 5; sloped to December 1
Pickwick	Storage	April 5	July 1; 1-foot fluctuation for mosquito control from mid May to mid-September
Wilson	Run-of-river	Mid-April	December 1
Wheeler	Storage	Mid-April	August 1; 1-foot fluctuation for mosquito control from mid-May to mid-September
Guntersville	Limited drawdown	Mid-April	July 1; with 1-foot drawdown to November 1; 1-foot fluctuation for mosquito control from mid-May to mid-September
Nickajack	Run-of-river	–	–
Chickamauga	Storage	Mid-April	July 1; with 1.5-foot drawdown to mid-August, remainder of winter drawdown begins on October 1; 1-foot fluctuation for mosquito control from mid-May to mid-September
Watts Bar	Storage	Mid-April	August 1; 1-foot drawdown to September 1, then begin remainder of winter drawdown
Fort Loudoun[1]	Storage	Mid-April	November 1
Tributary Project	**Operating Mode**	**Reservoir Fill Target Date**	**Date for Start of Unrestricted Reservoir Drawdown**
Norris	Storage	June 1	August 1
Melton Hill	Run-of-river	–	–
Douglas	Storage	June 1	August 1
South Holston	Storage	June 1	August 1
Boone	Storage	Mid-May	Labor Day (follows guide curve)
Fort Patrick Henry	Run-of-river	–	–
Cherokee	Storage	June 1	August 1
Watauga	Storage	June 1	August 1
Wilbur	Run-of-river	–	–
Fontana	Storage	June 1	August 1
Tellico[1]	Storage	Mid-April	November 1

Table A-08 Fill and Drawdown Dates (continued)

Tributary Project	Operating Mode	Reservoir Fill Target Date	Date for Start of Unrestricted Reservoir Drawdown
Chatuge	Storage	June 1	August 1
Nottely	Storage	June 1	August 1
Hiwassee	Storage	June 1	August 1
Apalachia	Run-of-river	–	–
Blue Ridge	Storage	June 1	August 1
Ocoee #1	Storage	May 1	November 1
Ocoee #2	Run-of-river	–	–
Ocoee #3	Run-of-river	–	–
Tims Ford[2]	Storage	Mid-May	October 15
Normandy	Storage	May 1	November 1; usually falls throughout summer to meet downstream minimum flows
Great Falls	Storage	August 1	October 1
Upper Bear Creek	Run-of-river	–	–
Bear Creek	Storage	Mid-April	November 15
Little Bear Creek	Storage	Mid-April	November 1
Cedar Creek	Storage	Mid-April	November 1

Notes:

[1] Tellico, connected by canal to Fort Loudoun, has a pool elevation the same as Fort Loudoun. Because Fort Loudoun is targeted to reach its summer pool level by April 15 and its drawdown does not begin until November 1, Tellico has a flat summer pool.

[2] Tims Ford, by design and original project allocation, has always been operated with a minimum summer pool level of 883 feet, which applies until October 15.

Source: TVA file data.

Table A-09 Hydro Modernization Projects To Be Completed by 2014

Power Plant	Status in October 2001[1,2]	Runner Performance Planned	Increased Flow[3]
Phase 2 and Phase 3 Projects			
Douglas (Units 1–4)	Phase 3	High efficiency and capacity	Yes
Guntersville (Units 1–4)	Phase 3	Increased efficiency and capacity	No
Raccoon Mountain (Units 1–4)	Phase 3	High capacity	Yes
Fort Loudoun (Units 3–4)	Phase 3	Increased efficiency and capacity	Mix
Boone (Units 1–3)	Phase 2	High efficiency, low flow	Insignificant
Chatuge (Unit 1)	Phase 2	High capacity	Yes
Apalachia (Units 1–2)	Phase 2	Increased efficiency and capacity	Insignificant
Watts Bar (Units 1–5)	Phase 2	Increased efficiency and capacity	Yes
Phase 1 and Not Started Projects			
Cherokee (Units 1–4)	Phase 1	High efficiency, low flow	Yes
Wheeler (Units 1–8)	Phase 1	High efficiency, low flow	Not expected
Wilson (Units 19–21)	Phase 1	Increased efficiency and capacity	Expected
Fort Loudoun (Units 1–2)	Not started	Increased efficiency and capacity	Mix
Wilson (Units 1–4)	Not started	High efficiency	Yes
Wilson (Units 5–8)	Not started	High efficiency	Yes
Ocoee #3 (Unit 1)	Not started	Increased efficiency and capacity	Yes
Nickajack (Units 3–4)	Not started	Increased efficiency and capacity	Yes
South Holston (Unit 1)	Not started	Increased efficiency and capacity	No
Melton Hill (Units 1–2)	Not started	Increased efficiency and capacity	No
Watauga (Units 1–2)	Not started	Increased efficiency and capacity	Yes
Blue Ridge (Unit 1)	Not started	Increased efficiency and capacity	Yes
Wilbur (Units 1–4)	Not started	Increased efficiency and capacity	Insignificant

Notes:

HMOD = Hydro Modernization.
Phase 1 = No plans developed to date; Phase 2 = Design; Phase 3 = Construction.

[1] HMOD projects that have been completed or are scheduled to start soon include:

Tims Ford (Unit 1)	Wheeler (Units 9–11)
Chickamauga (Units 1–4)	Kentucky (Units 1–5)
Wilson (Units 9–18)	Nottely (Unit 1)
Norris (Units 1–2)	Fontana (Units 1–3)
Fort Patrick Henry (Units 1–2)	Hiwassee (Units 2)
Guntersville (Units 1 and 4)	Douglas (Units 2, 3, and 4)
Douglas (Unit 1)	Guntersville (Unit 3)
Raccoon Mountain (Unit 3)	Fort Loudoun (Unit 4)
Guntersville (Unit 2)	Hiwassee (Unit 1)

[2] HMOD projects that were in Phase 2 (design) and Phase 3 (construction) in October 2001 are included in the Base Case. Projects that were in Phase 1 or not started in October 2001 are addressed in the cumulative effects analysis.

[3] HMOD flows for completed projects and those in Phase 2 (design) and Phase 3 (construction) are included in Table A-01.

Source: TVA file data 2001.

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Appendix B

Reservoir Operations Study

Preliminary Alternatives

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RESERVOIR OPERATIONS POLICY ALTERNATIVES EVALUATED IN DETAIL

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

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Preliminary Alternative 1A

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• Maintain reservoir elevations at or above current August 1 levels through Labor Day for South Holston, Watauga, Cherokee, Douglas, Fontana, Chatuge, Nottely, Hiwassee, Blue Ridge, and Norris. • For Great Falls—Revise the operating guide curve to fill the reservoir by June 1 and maintain summer elevations through Labor Day. • No changes to the following reservoirs for the reasons described: ► Wilbur—run-of-river project. ► Boone—maintains summer elevation through Labor Day. ► Fort Patrick Henry—run-of-river project. ► Apalachia—run-of-river project. ► Ocoee #1—maintains summer elevation through November 1. ► Melton Hill—run-of-river project. ► Tims Ford—maintains summer elevation through mid-October. ► Upper Bear Creek—maintains the same fluctuation range year round. ► Bear Creek—maintains summer elevation to mid-November. ► Little Bear Creek—maintains summer elevation through November 1. ► Cedar Creek—maintains summer elevation through November 1. • Normandy—guide curve stays at summer elevation through mid-October, however; this elevation is subject to meeting downstream minimum flows and usually falls throughout the summer.	• Extend the current summer elevation through August 1 for Watts Bar, Chickamauga, Guntersville, Wheeler, Pickwick, and Kentucky/Barkley. • Then slope the guide curve from August 1 through Labor Day by 1 foot for each reservoir. • After Labor Day, slope the new curve to meet the current curve. • No changes to the following reservoirs for the reasons described: ► Fort Loudoun—maintains summer elevation through November 1. ► Nickajack—run-of-river project. ► Wilson—maintains summer elevation through December 1.

Preliminary Alternative 1A (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify winter reservoir elevations and/or fill dates	• No change	• No change
Modify drawdown restrictions	• No change	• No change
Modify rate of flood storage recovery	• Slower flood recovery; extend the current 7- to 10-day flood recovery policy to 14 to 20 days when warranted (except for Hiwassee). • Raise Cherokee and Nottely minimum operations guide based on revised observed inflows.	• No change
Modify water releases	• No change in water releases associated with producing power and increasing flood storage capacity. • Same as Base Case minimum flow commitments. • No change in recreation releases below Watauga, Apalachia, Tims Ford, Ocoee #2, and Ocoee #3.	• No change in water releases associated with producing power and increasing flood storage capacity. • Same as Base Case minimum flow commitments, except for increasing weekly average release from Chickamauga to 25,000 cfs between August 1 and Labor Day.

cfs = Cubic feet per second.

Preliminary Alternative 2A

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• Maintain reservoir elevations at or above current August 1 levels until Labor Day for South Holston, Watauga, Cherokee, Douglas, Fontana, Chatuge, Nottely, Hiwassee, Blue Ridge, and Norris. • For Great Falls—Revise the operating guide curve to fill the reservoir by June 1 and maintain summer elevations through Labor Day. • No changes to the following reservoirs for the reasons described: ▸ Wilbur—run-of-river project. ▸ Boone—maintains summer elevation through Labor Day. ▸ Fort Patrick Henry—run-of-river project. ▸ Apalachia—run-of-river project. ▸ Ocoee #1—maintains summer elevation through November 1. ▸ Melton Hill—run-of-river project. ▸ Tims Ford—maintains summer elevation through mid-October. ▸ Upper Bear Creek—maintains the same fluctuation range year round. ▸ Bear Creek—maintains summer elevation to mid-November. ▸ Little Bear Creek—maintains summer elevation through November 1. ▸ Cedar Creek—maintains summer elevation through November 1. ▸ Normandy—guide curve stays at summer elevation through mid-October; however, this elevation is subject to meeting downstream minimum flows and usually falls throughout the summer.	• Extend the current summer elevation through August 1 for Watts Bar, Chickamauga, Guntersville, Wheeler, Pickwick, and Kentucky/Barkley. • Then slope the guide curve from August 1 through Labor Day by 1 foot for each reservoir. • After Labor Day, slope the new curve to meet the current curve. • No changes to the following reservoirs for the reasons described: ▸ Fort Loudoun—maintains summer elevation through November 1. ▸ Nickajack—run-of-river project. ▸ Wilson—maintains summer elevation through December 1.

Preliminary Alternative 2A (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify winter reservoir elevations and/or fill dates	• Raise the winter flood guides equal to the current March 15 flood guide elevations for South Holston, Watauga, Cherokee (this would be equivalent to the new flood guide elevations established in Preliminary Alternative 1), Douglas, Chatuge, Nottely (this would be equivalent to the new flood guide elevations established in Preliminary Alternative 1), Hiwassee, Blue Ridge, Norris, and Tims Ford. • No change to spring fill dates.	• Raise the minimum winter elevation by 2 feet to create a 13-foot navigation channel (11 feet with 2 feet overdraft) on Fort Loudoun, Watts Bar, Chickamauga, Wheeler, and Pickwick. • Modify the winter operating range of these reservoirs to allow only 1 foot of fluctuation versus the current 2 feet of fluctuation allowed. • No change to spring fill dates.
Modify drawdown restrictions	• No change	• No change
Modify rate of flood storage recovery	• Slower flood recovery; extend the current 7- to 10-day flood recovery policy to 14 to 20 days when warranted (except for Hiwassee). • Raise Cherokee and Nottely minimum operating guide based on revised observed inflows.	• No change
Modify water releases	• Release only Base Case minimum flows during June and July, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert. • Same as Base Case minimum flow commitments. • No change in recreation releases below Watauga, Apalachia, Tims Ford, Ocoee #2, and Ocoee #3.	• Release only Base Case minimum flows during June and July, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert. • Same as Base Case minimum flow commitments except for increasing weekly average release from Chickamauga to 25,000 cfs between August 1 and Labor Day. • No change in release below Watts Bar for Sauger spawn.

cfs = Cubic feet per second.

Preliminary Alternatives 3A, 3B, and 3C

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• Fill reservoirs to full summer pool levels by June 1. After that, release only Base Case minimum flows, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert, to arrive at or above current August 1 levels on: ▸ November 1, if possible, for Alternative 3A; ▸ October 1, if possible, for Alternative 3B; and, ▸ Labor Day, if possible, for Alternative 3C. • If August 1 levels on November 1 (3A), October 1 (3B), and Labor Day (3C) are not possible, state the elevation for these dates that has 90 percent reliability with releasing Base Case minimum flows only.	• Hold full summer pool levels until: ▸ November 1 for Alternative 3A; ▸ October 1 for Alternative 3B; and, ▸ Labor Day for Alternative 3C. • Current drawdown dates that are later than those specified for each alternative would not be moved to the earlier date.
Modify winter reservoir elevations and/or fill dates	• Increase winter levels based on being able to store in each reservoir an inflow volume equal to the 7-day, 500-year storm.	• Raise the minimum winter elevation by 2 feet to create a 13-foot navigation channel (11 feet with 2 feet overdraft) on Fort Loudoun, Watts Bar, Chickamauga, Wheeler, and Pickwick. • Modify the winter operating range of these reservoirs to allow only 1 foot of fluctuation versus the current 2 feet of fluctuation allowed.
Modify drawdown restrictions	• No change. If delaying unrestricted drawdown to November 1 (3A), October 1 (3B), or Labor Day (3C) prohibits meeting dam safety limits on the maximum allowable drawdown rate, the date would be adjusted accordingly.	• No change
Modify rate of flood storage recovery	• No change	• No change

Preliminary Alternatives 3A, 3B, and 3C (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify water releases	• Release only Base Case minimum flows between June 1 and November 1 for Alternative 3A, October 1 for Alternative 3B, or Labor Day for Alternative 3C, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert. • Same as Base Case minimum flow commitments. • No change in recreation releases below Watauga, Apalachia, Tims Ford, Ocoee #2, and Ocoee #3.	• Release only Base Case minimum flows between June 1 and November 1 for Alternative 3A, October 1 for Alternative 3B, or Labor Day for Alternative 3C, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert. • Same as Base Case minimum flow commitments.

cfs = Cubic feet per second.

Preliminary Alternatives 4A, 4B, 4C, 4D, 4E, and 4F

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• Fill reservoirs to current full summer pool levels by June 1. • After that, unrestricted drawdown begins immediately to maximize power production and flood storage capacity.	• Fill reservoirs to current full summer pool levels by June 1. • Begin drawdown on June 1 to maximize power production.
Modify winter reservoir elevations and/or fill dates	• Increase winter levels based on being able to store in each reservoir an inflow volume equal to the 7-day, 500-year storm.	• No change
Modify drawdown restrictions	• Unrestricted drawdown begins on June 1.	• Unrestricted drawdown begins on June 1.
Modify rate of flood storage recovery	• No change	• No change
Modify water releases	• Maximize summer water releases to increase power production. • No tailwater recreation releases except for Ocoee #2. • Same as Base Case minimum flow commitments.	• Maximize summer water releases to increase power production. • Alternatives 4A through 4F—same as Base Case minimum flow commitments except for increasing weekly average release from Chickamauga between June 1 and September 15 as follows: ▸ Alternative 4A – 20,000 cfs ▸ Alternative 4B – 25,000 cfs ▸ Alternative 4C – 30,000 cfs ▸ Alternative 4D – 35,000 cfs ▸ Alternative 4E – 40,000 cfs ▸ Alternative 4F – 45,000 cfs (turbine capacity at Chickamauga)

cfs = Cubic feet per second.

Preliminary Alternative 5A

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• Establish year-round flood guides at a level that is based on each reservoir being able to store, at a minimum, its inflow volume for the critical-period, 500-year storm.	• Set elevations on the upper mainstem reservoirs (Fort Loudoun, Watts Bar, and Chickamauga) to hold a volume equal to the critical-period, 500-year storm inflow with a 30-foot flood stage release at Chattanooga. Reshape lower mainstem reservoir guide curves, except Kentucky, based on those for upper mainstem reservoirs. Hold Kentucky summer elevation only to Labor Day.
Modify winter reservoir elevations and/or fill dates	• Establish year-round flood guides at a level that is based on each reservoir being able to store, at a minimum, its inflow volume for the critical-period, 500-year storm.	• Set elevations on the upper mainstem reservoirs (Fort Loudoun, Watts Bar, and Chickamauga) to hold a volume equal to the critical-period, 500-year storm inflow with a 30-foot flood stage release at Chattanooga. Reshape lower mainstem reservoir guide curves, except Kentucky, based on those for upper mainstem reservoirs. In March, however, take only as low as their current minimum elevation.
Modify drawdown restrictions	• No change	• No change
Modify rate of flood storage recovery	• No change	• No change
Modify water releases	• Perform water releases to “equalize” seasonal flood risk. • Release only Base Case minimum flows during June and July, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert. • Same as Base Case minimum flow commitments. • No change in recreation releases below Watauga, Apalachia, Tims Ford, Ocoee #2, and Ocoee #3.	• Perform water releases to “equalize” seasonal flood risk. • Release only Base Case minimum flows during June and July unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert. • Same as Base Case minimum flow commitments except for increasing weekly average release from Chickamauga to 25,000 cfs between August 1 and Labor Day.

cfs = Cubic feet per second.

Preliminary Alternatives 6A and 6B

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• No change	• Alternative 6A—same as Base Case. • Alternative 6B—same as Base Case.
Modify winter reservoir elevations and/or fill dates	• No change	• Alternative 6A—raise winter elevations by 2 feet to create 13-foot navigation channel, where possible (11 feet with 2-foot overdraft). • Alternative 6A— Modify the winter operating range of these reservoirs to allow 1 foot of typical operating range versus the current 2 foot operating range. • Alternative 6B—lower winter elevations to 9 feet (no overdraft) except on Wheeler and Guntersville.
Modify drawdown restrictions	• No change	• No change
Modify rate of flood storage recovery	• No change	• No change
Modify water releases	• Same as Base Case minimum flow commitments. • No change in recreation releases below Watauga, Apalachia, Tims Ford, Ocoee #2, and Ocoee #3.	• Alternative 6A—same as Base Case flow commitments except for: ▸ Release continuous minimum instantaneous flows of 25,000 cfs from Kentucky. ▸ Release maximum flow of 28,000 cfs below Barkley. ▸ Release continuous minimum instantaneous flows of 18,000 cfs from Pickwick during the winter when Kentucky elevation is less than or equal to 357 (weeks 1-15 and 34-52). ▸ Release continuous minimum instantaneous flows of 18,000 cfs from Wilson during the winter when Pickwick elevation is less than or equal to 411 (weeks 1-12 and 39-52). • Alternative 6B—same as Base Case flow commitments.

Preliminary Alternatives 7A, 7B, and 7C

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• Fill reservoirs to full summer pool levels by June 1. After that, release only Base Case minimum flows AND tailwater recreation flows, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert, to arrive at or above current August 1 levels on: ▸ November 1, if possible, for Alternative 7A; ▸ October 1, if possible, for Alternative 7B; and, ▸ Labor Day, if possible, for Alternative 7C. • If August 1 levels on November 1 (7A), October 1 (7B), and Labor Day (7C) are not possible, state the elevation for these dates that has 90 percent reliability with releasing Base Case minimum flows only AND tailwater recreation flows.	• Hold full summer pool levels until: ▸ November 1 for Alternative 7A; ▸ October 1 for Alternative 7B; and, ▸ Labor Day for Alternative 7C. • Current drawdown dates that are later than those specified for each alternative would not be moved to the earlier date.
Modify winter reservoir elevations and/or fill dates	• Increase winter levels based on being able to store in each reservoir an inflow volume equal to its 7-day, 500-year storm.	• Raise the minimum winter elevation by 2 feet to create a 13-foot navigation channel (11 feet with 2 feet overdraft) on Fort Loudoun, Watts Bar, Chickamauga, Wheeler, and Pickwick. • Modify the winter operating range of these reservoirs to allow only 1 foot of fluctuation versus the current 2 feet of fluctuation allowed.
Modify drawdown restrictions	• No change. If delaying unrestricted drawdown to November 1 prohibits meeting dam safety limits on the maximum allowable drawdown rate, date will be adjusted accordingly.	No change
Modify rate of flood storage recovery	• No change	• No change

Preliminary Alternatives 7A, 7B, and 7C (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify water releases	• Release only Base Case minimum flows and tailwater recreation flows between June 1 and November 1 for Alternative 7A, October 1 for Alternative 7B, or Labor Day for Alternative 7C, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert. • Same as Base Case minimum flow commitments.	• Release only Base Case minimum flow commitments and tailwater recreation flows between June 1 and November 1 for Alternative 7A, October 1 for Alternative 7B, or Labor Day for Alternative 7C, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert. • Same as Base Case minimum flow commitments.
Modify tailwater recreation releases	• Norris—provide flows year round on Saturday and Sunday ► No release prior to 10:00 a.m. ► Two-unit use for 8 hours. • Watauga—provide flows from April 1 to November 1, 7 days per week ► Two-unit use for 4 hours. ► One-unit use for 2 hours. • Apalachia—provide flows from April 1 to November 1, 7 days per week ► Minimum flow of 200 cfs until 9:00 a.m. ► One-unit use from 9:00 to 10:00 a.m. ► Two-unit use for 8 hours. • Ocoee #1—provide flows from Memorial Day to September 30, 7 days per week ► Minimum flow until 10:00 a.m. ► Two-unit use for 6 hours (1,000 cfs). • Ocoee #2—no change. • Ocoee #3—no change. • Melton Hill—zero flow one weekend per month, from April 1 to November 1. • Great Falls—no change.	• No change

Preliminary Alternatives 7A, 7B, and 7C (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
	• Tims Ford—no change. • Blue Ridge—no change. • Upper Bear—no change. • South Holston—provide continuous minimum flows of 180 cfs below the weir from March 15 to October 15, 7 days per week.	

cfs = Cubic feet per second.

Preliminary Alternatives 8A, 8B, and 8C

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• No minimum operating guide, target minimum elevations, or annual drawdown schedule. Flood guides would be set the same as for Alternative 2A. • Reservoir elevations would be determined by retaining a percentage of inflows listed below, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides, to meet Base Case minimum flow commitments, or to support special operations during a power system alert: ▸ Alternative 8A—retain 75 percent of inflows. ▸ Alternative 8B—retain 50 percent of inflows. ▸ Alternative 8C—retain 25 percent of inflows.	• No minimum operating guide, target minimum elevations, or annual drawdown schedule. The same guide curves as described for Alternative 2A would be used. • Reservoir elevations would be determined by retaining a percentage of inflows listed below, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides, to meet Base Case minimum flow commitments, or to support special operations during a power system alert: ▸ Alternative 8A—retain 75 percent of inflows. ▸ Alternative 8B—retain 50 percent of inflows. ▸ Alternative 8C—retain 25 percent of inflows.
Modify winter reservoir elevations and/or fill dates	• No minimum operating guide, target minimum elevations, or annual fill schedule. Flood guides would be set the same as for Alternative 2A. • Pass the releases listed below, unless additional releases are necessary to stay below the flood guide, meet Base Case minimum flow commitments, or to support special operations during a power system alert. ▸ Alternative 8A—pass 25 percent of inflows. ▸ Alternative 8B—pass 50 percent of inflows. ▸ Alternative 8C—pass 75 percent of inflows.	• No minimum operating guide, target minimum elevations, or annual fill schedule. The same guide curves as described for Alternative 2A would be used. • Pass the releases listed below, unless additional releases are necessary to stay below the flood guide, to meet Base Case minimum flow commitments, or to support special operations during a power system alert. ▸ Alternative 8A—pass 25 percent of inflows. ▸ Alternative 8B—pass 50 percent of inflows. ▸ Alternative 8C—pass 75 percent of inflows.
Modify drawdown restrictions	• No change	• No change
Modify rate of flood storage recovery	• No change	• No change

Preliminary Alternatives 8A, 8B, and 8C (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify water releases	• High inflows—release water from reservoirs as necessary to keep elevations below the flood guide. • Low inflows—release water from reservoirs as necessary to meet Base Case minimum flow commitments. • When elevations are below the flood guide and minimum flows are being met, pass inflows as specified above. • No peaking will be performed unless low flow dips below the minimum amount required to operate one unit. Then peaking will be performed only to the extent necessary to peak one unit at the most efficient load.	• High inflows—release water from reservoirs as necessary to keep elevations below the flood guide. • Low inflows—release water from reservoirs as necessary to meet Base Case minimum flow commitments. • When elevations are below the flood guide and minimum flows are being met, pass inflows as specified above. • No peaking will be performed unless low flow dips below the minimum amount required to operate one unit. Then peaking will be performed only to the extent necessary to peak one unit at the most efficient load.

cfs = Cubic feet per second.

Preliminary Alternatives 9A, 9B, 9C

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• Fill reservoirs to full summer pool levels by June 1. After that, discretionary water is still available after the following flows have been met and water remains in the reservoirs: ▸ Base Case minimum flows. ▸ 25,000 cfs from Chickamauga (from August through Labor Day). ▸ Alternative 9A—pass 25 percent of inflow (like Alternative 8A, but peaking flows would be allowed) with 20 hours of peaking guaranteed per week from June 1 to September 15 and from December through February. ▸ Alternative 9B—pass 25 percent of inflow (like Alternative 8A, but peaking flows would be allowed) with 40 hours of peaking guaranteed per week from June 1 to September 15 and from December through February. ▸ Alternative 9C—pass 50 percent of inflow (like Alternative 8B, but peaking flows would be allowed) with 40 hours of peaking guaranteed per week from June 1 to September 15 and from December through February.	• Extend the current summer elevation through August 1 for Watts Bar, Chickamauga, Guntersville, Wheeler, Pickwick, and Kentucky/Barkley. • Then slope the guide curve from August 1 through Labor Day by 1 foot for each reservoir. • After Labor Day, slope the new curve to meet the current curve. • No changes to the following reservoirs for the reasons described: ▸ Fort Loudoun—maintains summer elevation through November 1. ▸ Nickajack—run-of-river project. ▸ Wilson—maintains summer elevation through December 1.
Modify winter reservoir elevations and/or fill dates	• Raise the winter flood guides equal to the current March 15 flood guide elevations for South Holston, Watauga, Cherokee (this would be equivalent to the new flood guide elevations established in Preliminary Alternative 1), Douglas, Chatuge, Nottely (this would be equivalent to the new flood guide elevations established in Preliminary Alternative 1), Hiwassee, Blue Ridge, Norris, and Tims Ford. • No change to spring fill dates.	• Raise the minimum winter elevation to permit a 13-foot navigation channel (11 feet with 2 feet overdraft) on Fort Loudoun, Watts Bar, Chickamauga, Wheeler, and Pickwick. • Modify the winter operating range of these reservoirs to allow only 1 foot of fluctuation versus the current 2 feet of fluctuation allowed. • No change to spring fill dates.

Preliminary Alternatives 9A, 9B, 9C (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify drawdown restrictions	• No change	• No change
Modify rate of flood storage recovery	• No change	• No change
Modify water releases	• Same as Base Case minimum flow commitments. • No change in recreation releases below Watauga, Apalachia, Tims Ford, Ocoee #2, and Ocoee #3.	• Same as Base Case minimum flow commitments.

cfs = Cubic feet per second.

Preliminary Alternative 10A

Alternative Characteristics	Tributary Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• Tributary reservoirs are divided into three groups. • Each group is operated differently to focus on different reservoir system objectives. • Each reservoir group cycles through the three different types of reservoir operations over a 3-year period. **Operation 1** • Fill reservoirs to full summer pool levels by June 1 and hold until Labor Day. • Between June 1 and Labor Day, release only the amount of water necessary to: ▸ Meet Base Case minimum flow commitment for each reservoir; and, ▸ Supply 10 percent of the water needed to meet system minimum flow commitments at Chickamauga, Pickwick, and Kentucky and to prevent additional thermal power plant derates. **Operation 2** • Fill reservoirs to full summer pool levels by June 1. • Between June 1 and Labor Day, release only the amount of water necessary to: ▸ Meet Base Case minimum flow commitment for each reservoir; ▸ Meet tailwater recreation flows; and, ▸ Supply 30 percent of the water needed to meet system minimum flow commitments at Chickamauga, Pickwick, and Kentucky and to prevent additional thermal power plant derates. **Operation 3** • Fill reservoirs to full summer pool levels by June 1. • Between June 1 and Labor Day, release only the amount of water necessary to: ▸ Meet Base Case minimum flow commitment for each reservoir; and, ▸ Supply 60 percent of the water needed to meet system minimum flow commitments at Chickamauga, Pickwick, and Kentucky and to prevent additional thermal power plant derates.

Preliminary Alternative 10A (continued)

Alternative Characteristics	Tributary Reservoirs
	Notes: • Remove Boone Reservoir from the cyclic operation due to substantial impacts on reservoir levels. • Increase weekly release from Chickamauga to 25,000 cfs between August 1 and Labor Day. • Operate mainstem reservoirs the same as described for Alternative 2A. • Provide tailwater recreation flows as described for Alternative 7. • For mainstem reservoirs, summer guide curves would be the same as described for Alternative 2A.

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Reservoir groups	<u>Group A</u>: Norris, South Holston, Nottely, Tims Ford <u>Group B</u>: Douglas, Watauga, Chatuge, Fontana <u>Group C</u>: Cherokee, Hiwassee, Blue Ridge	Not applicable
Modify winter reservoir elevations and/or fill dates	• Raise the winter flood guides equal to the current March 15 flood guide elevations for South Holston, Watauga, Cherokee (this would be equivalent to the new flood guide elevations established in Preliminary Alternative 1), Douglas, Chatuge, Nottely (this would be equivalent to the new flood guide elevations established in Preliminary Alternative 1), Hiwassee, Blue Ridge, Norris, and Tims Ford. • No change to spring fill dates.	• Raise the minimum winter elevation to permit a 13-foot navigation channel (11 feet with 2 feet overdraft) on Fort Loudoun, Watts Bar, Chickamauga, Wheeler, and Pickwick. • Modify the winter operating range of these reservoirs to allow only 1 foot of fluctuation versus the current 2 feet of fluctuation allowed. • No change to spring fill dates.

Preliminary Alternative 10A (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify drawdown restrictions	• No change	• No change
Modify rate of flood storage recovery	• Slower flood recovery; extend the current 7- to 10-day flood recovery policy to 14 to 20 days when warranted (except for Hiwassee). • Raise Cherokee and Nottely minimum operating guide based on revised observed inflows.	• No change
Modify water releases	• Provide tailwater recreation flows as described for Alternative 7C. • Release only Base Case minimum flows and tailwater recreation flows between June 1 and Labor Day.	• Release only Base Case minimum flows during June and July, unless additional releases are necessary to manage reservoir levels that have exceeded flood guides or to support special operations during a power system alert. • Same as Base Case minimum flow commitments except for increasing weekly release from Chickamauga to 25,000 cfs between August 1 and Labor Day.

cfs = Cubic feet per second.

Preferred Alternative

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify summer reservoir elevations and/or drawdown dates	• Subject to each project meeting its minimum flow requirements and a proportionate share of the system minimum flow requirements, maintain elevations as close as possible to the flood guides during summer (June 1 through Labor Day) for Blue Ridge, Chatuge, Cherokee, Douglas, Fontana, Nottely, Hiwassee, Norris, South Holston, and Watauga. • No changes to the following reservoirs for the reasons described: ▸ Apalachia—run-of-river project. ▸ Bear Creek—maintains summer elevations to mid-November. ▸ Boone—maintains summer elevations through Labor Day. ▸ Cedar Creek—maintains summer elevations through October 31. ▸ Fort Patrick Henry—run-of-river project. ▸ Great Falls—maintains summer elevations through September 30. ▸ Little Bear Creek—maintains summer elevations through October 31. ▸ Melton Hill—run-of-river project. ▸ Normandy—subject to meeting downstream minimum flows summer elevations are maintained through mid-October. ▸ Ocoee #1—maintains summer elevations through October 31. ▸ Tims Ford—maintains summer elevations through mid-October. ▸ Upper Bear Creek—maintains the same fluctuation range year round. ▸ Wilbur—run-of-river project.	• Maintain Base Case summer operating zone through Labor Day for Chickamauga, Guntersville, Pickwick, and Wheeler. • Eliminate 1-foot drawdown from August 1 to November 1 for Watts Bar. • No changes to the following reservoirs for the reasons described: ▸ Fort Loudoun—maintains summer operating zone through October 31. ▸ Nickajack—run-of-river project. ▸ Wilson—maintains summer operating zone through November 30. ▸ Kentucky—potential resource and flood risk impacts.

Preferred Alternative (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify winter reservoir elevations and/or fill dates	• Raise winter flood guide to elevations based on flood risk analysis for Boone, Chatuge, Cherokee, Douglas, Fontana, Hiwassee, Norris, Nottely, South Holston, and Watauga. • Great Falls—Fill reservoir to summer pool by Memorial Day.	• Raise minimum winter pool elevation by 0.5 foot at Wheeler. • Follow the Base Case fill schedule during the first week in April for Fort Loudoun, Watts Bar, and Chickamauga. Then delay the fill to reach summer operating zone by mid-May.
Modify drawdown restrictions	• Restrict drawdown June 1 through Labor Day, and proportion withdrawals to meet system minimum flows to keep tributary reservoir pool elevations as close as possible to the flood guides.	• Maintain Base Case summer operating zone at Chickamauga, Guntersville, Wheeler, and Pickwick through Labor Day.
Modify water releases	• Same as Base Case minimum flow commitments except for additional scheduled tailwater recreation releases as shown below. • Apalachia—provide 25 cfs continuous minimum flow in bypass reach from June 1 through November 30.	• Establish weekly average Chickamauga Reservoir releases from the first week in June through Labor Day as described below. ▸ If above system minimum operations guide curve, increase weekly average minimum flow from Chickamauga each week during June and July (beginning with 14,000 cfs the first week in June, increasing 1,000 cfs each week for the next 3 weeks, then increasing 2,000 cfs each week for the next 4 weeks, and ending with 25,000 cfs the last week in July). ▸ If below system minimum operations guide curve, release 13,000 cfs weekly average minimum flow from Chickamauga during June and July. • Release 29,000 cfs weekly average minimum flow from Chickamauga from August 1 through Labor Day if above system minimum operations guide curve or 25,000 cfs if below system minimum operations guide curve. • Provide continuous minimum flows up to 25,000 cfs at Kentucky, as needed, to maintain minimum tailwater elevation of 301 feet.

Preferred Alternative (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify tailwater recreation releases	• No change in tailwater recreation releases below Great Falls, Ocoee #2, Ocoee #3, Tims Ford, and Upper Bear Creek Reservoirs. • Provide tailwater recreation flows for the projects as described below: ▸ Apalachia May 1 through October 31 (Saturdays and Sundays only) Minimum flow only prior to 10 a.m. Memorial Day through Labor Day (7 days per week) One-unit use from 10 a.m. to 11 a.m. Two-unit use from 11 a.m. to 7 p.m. (8 hours) Labor Day through October 31 (Saturdays only) One-unit use from 10 a.m. to 11 a.m. Two-unit use from 11 a.m. to 3 p.m. (4 hours) ▸ Norris May 1 through October 31 (Saturdays and Sundays only) Minimum flow only prior to 10 a.m. Memorial Day through Labor Day (Saturdays and Sundays only) One-unit use from 10 a.m. to 2 p.m. (4 hours) Two-unit use from 2 p.m. to 6 p.m. (4 hours) Labor Day through October 31 (Saturday only) One-unit use from 10 a.m. to 1 p.m. (3 hours) Two-unit use from 1 p.m. to 4 p.m. (3 hours)	• No change

Preferred Alternative (continued)

Alternative Characteristics	Tributary Reservoirs	Mainstem Reservoirs
Modify tailwater recreation releases (continued)	▸ Ocoee #1 June 1 through August 31 (Tuesdays and Wednesdays only) Minimum flow only until 11 a.m. Minimum two-unit use from 11 a.m. to 5 p.m. (6 hours) ▸ South Holston April 1 through October 31 Increase minimum flow below the weir to 150 cfs ▸ Watauga operation for recreation flows below Wilbur Memorial Day through Labor Day Mondays – Fridays—one-unit use from 1 p.m. to 6 p.m. (5 hours) Saturdays—one-unit use from 12 p.m. to 1 p.m. Two-unit use from 1 p.m. to 5 p.m. (4 hours) One-unit use from 5 p.m. to 6 p.m. Labor Day through October 31 Saturdays only—one-unit use from 1 p.m. to 6 p.m. (5 hours)	

cfs = Cubic feet per second.

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Appendix C

Model Descriptions and Results

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Analytic Models

C.1 Introduction

Computer simulations using recognized computer models were used in the Reservoir Operations Study (ROS) to analyze potential impacts on environmental resources that could result from implementation of any of the reservoir operations policy alternatives. Computer models were used to provide information for analysis in six principal areas:

- Reservoir levels, water availability, and hydropower production;
- Energy production costs;
- Water quality;
- Flood risk modeling;
- Land values; and,
- Economic modeling.

The models used to develop the information listed above are described in the succeeding sections. Graphs summarizing the results of the Weekly Scheduling Model (WSM) are included after the model descriptions.

C.2 Reservoir Levels, Water Availability, and Hydropower Production Modeling

Interactions of unregulated streamflow, regulated discharges, and reservoir pool elevations must be determined to analyze the effects of policy alternatives. To evaluate these interactions, TVA used computer simulations to model the existing reservoir system operations under the existing operations policy and establish a Base Case against which all proposed alternatives were compared. This approach allowed TVA to consider 99 years of hydrologic record under the existing reservoir system and operations policy. The modeling, modeling approach, calibration, and input and output of this effort are described in the following sections.

Weekly Scheduling Model Description

TVA used the WSM as its basic simulation tool. This proprietary software was developed by TVA for modeling major water control projects in the Tennessee and Cumberland River basins.

This deterministic model simulates operation of the Tennessee and Cumberland River projects on a weekly time interval for a specified period of historical record. For the ROS, the period of record was the 99-year period beginning in 1903 and continuing through 2001. The model operates 1 week at a time, solving the mass balance equations for all reservoirs and satisfying operating constraints/guidelines in a prioritized order (i.e., higher priority guidelines are satisfied first and then secondary guidelines are satisfied next to the extent possible, without violating higher priority operating objectives). The model uses a linear programming approach to develop a solution for each time interval.

TVA has used the model for many years, for many different applications—including contractual power agreements with the Southeastern Power Administration and U.S. Army Corps of Engineers for generation and marketing of Cumberland River hydropower generation, contractual power agreements for purchase of Tapoco power from four facilities on the Little Tennessee River, reservoir studies for the TVA 1990 Lake Improvement Plan, monthly forecasting of power generation for the TVA and Cumberland River systems, and studies for special operations for the TVA reservoir system and unit outage planning.

Model input requirements include:

(1) Average historical weekly unregulated inflows to each reservoir in the model. These were derived from TVA operational data after completion of the projects and from gaged streamflow data prior to completion of the projects.

(2) Plant operating characteristics for all hydropower generating facilities, relating power capacity and energy per unit volume of water as a function of operating head.

(3) Physical characteristics of reservoirs, including maximum and minimum levels, and storage versus elevation curves.

(4) Initial conditions, including pool elevations at the beginning of the simulation.

(5) Operations policy expressed as a prioritized linear programming constraint set, including minimum and maximum flows, minimum and maximum operating levels, and guide curves—all of which can be expressed on a seasonal (or weekly) basis and as conditional constraints based on flow or level conditions at the beginning of each week.

Of the above model inputs, only (4) and (5) were changed when simulating various alternatives to compare to the Base Case.

Available model outputs for each reservoir include:

(1) End of week reservoir elevations (feet above mean sea level);
(2) Weekly average total discharge (in cubic feet per second [cfs]);
(3) Weekly generation (in megawatts per hour [MWH]);
(4) Weekly average turbine discharge capacity (cfs); and,
(5) Maximum generation capacity (MW).

Two examples of post-processed model output are shown in Figures C-01 and C-02.

The WSM was re-calibrated prior to the start of the ROS to ensure that the existing operations policy and project operating characteristics were simulated by the model as accurately as possible. The 10-year period from 1991 to 2000 was used as the calibration period, and yearly results as well as 10-year statistics were used.

In addition to providing detailed information about reservoir levels and water availability, the WSM provided the basis for more detailed information required for the Water Quality modeling and power system evaluations. Post-processing of the WSM results are described below for these two resource areas.

Water Quality modeling required using data for hourly discharges at each of the TVA projects. Because the WSM produces only average weekly discharges, a reasonable disaggregation of the weekly averages into chronological (by hour) release patterns was required. TVA used existing proprietary software to estimate hourly schedules based on the following:

(1) Assumed hydropower peaking hours for each season of the year;

(2) Regression analysis of historical data for each project to determine the ratio of flows on weekdays vs. weekends;

(3) Use of water for hydro peaking at one unit use to cover peak hours, then two-unit use, etc. until available water is scheduled;

(4) If more water is available than will pass through the hydro units, then spill at a steady rate for the week was assumed;

(5) Minimum flows (instantaneous or pulsing) are met first; and,

(6) Ramping rates for the project are satisfied.

Each policy alternative was also evaluated for its impacts on TVA power supply costs. This evaluation required that weekly hydroelectric generation statistics be provided to the overall power resource evaluation modeling effort, as described in Section 5.23 in Volume I of this FEIS.

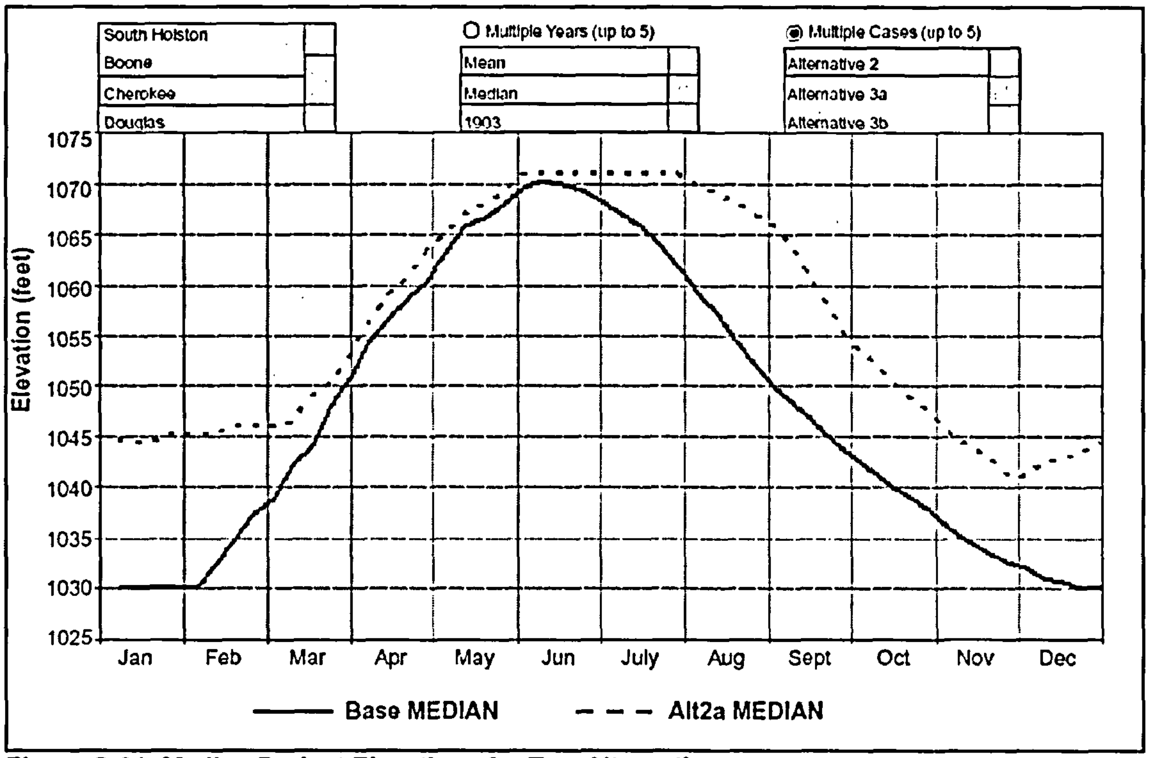


Figure C-01 Median Project Elevations for Two Alternatives

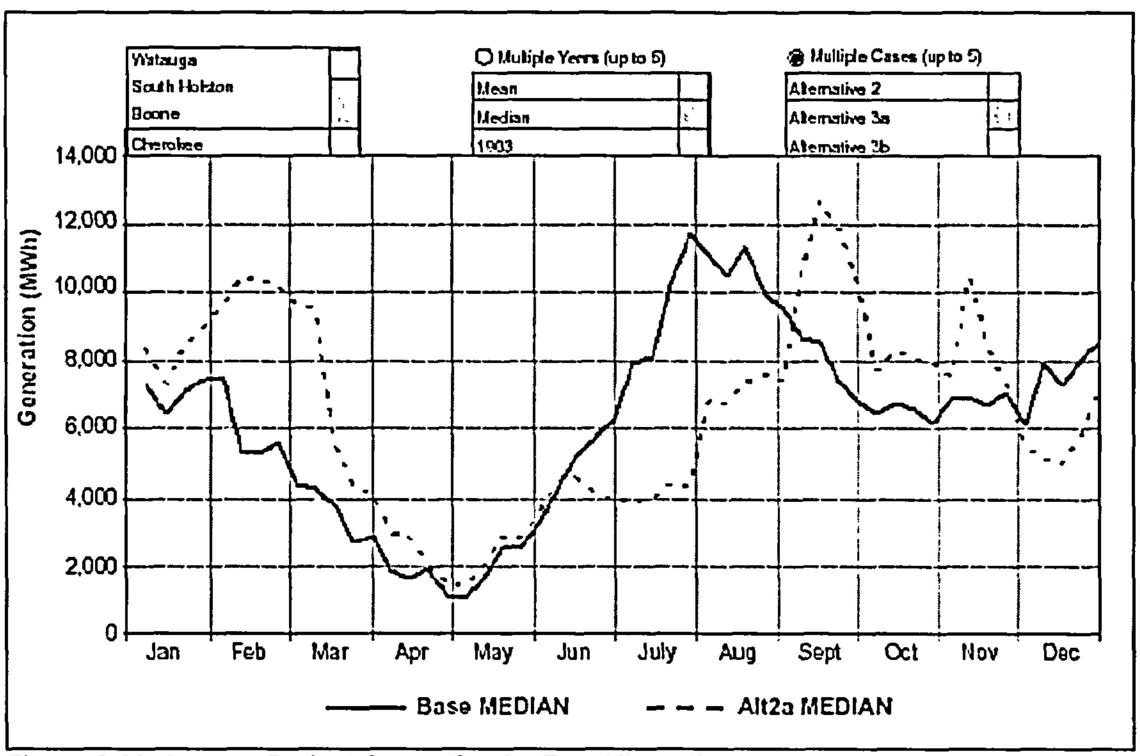


Figure C-02 Average Project Generation for Two Alternatives

The power evaluation model required the following statistics for each alternative:

(1) For a median year, the weekly system hydropower (energy, MWH) available to TVA, and the minimum and maximum power levels (MW) throughout the week at which the generation can be dispatched; and,

(2) The 10th and 90th percentile of ranked generation for each week over the period of record of the simulation, and the 10th and 90th percentile of minimum and maximum power levels.

The WSM provides weekly generation for each project for each week of the historical record, from which the system hydropower generation energy statistics can be computed. Hydropower capacity values were computed based on the assumption that the available generation at each plant will be dispatched during the highest cost hours, at the highest available capacity, subject to reserving energy (water) for meeting minimum flow requirements throughout the week.

Weekly Scheduling Model Results

The WSM was a central tool in the impact assessment for the policy alternatives. This model was used to convert reservoir operations policy changes into predicted future changes in reservoir levels and discharges from the ROS projects in the TVA water control system, given the annual variability in rainfall and runoff within the TVA system.

The WSM provided outputs for each alternative, for different reservoirs and for different time periods. Depending on the comparison desired, a single week, groups of weeks, or an entire year (or years) was selected. The various outputs that can be generated from the WSM include:

- Elevation and flow plots—weekly average reservoir elevation (msl) or flow releases (cfs) for a given period of time;
- Generation and turbine capacity plots—average weekly generation (MW) and weekly average turbine capacity (cfs) for a given period of time; and,
- Probability elevation and flow plots—the predicted frequency at which different average weekly reservoir elevations, flows, or generation would occur over the next 99-year record of a reservoir over any defined set of weeks (e.g., Labor Day, the month of June, or August through October). These are expressed as percentiles—the percentage of time that different levels and flows would occur.

The WSM is important to the EIS because reservoir elevations and reservoir releases and tailwater flows are the drivers for most impacts. This tool quantitatively compares the effects of alternatives on the water control system.

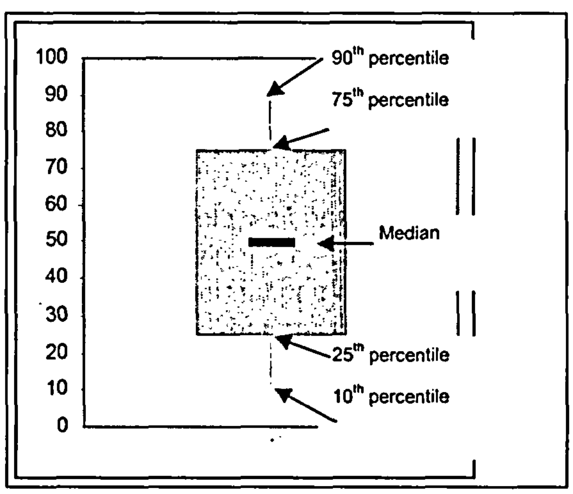
Overview of Weekly Scheduling Model Results

The results of the WSM predictions are presented in Section C.8. Graphical comparisons in the form of box plots showing the differences in reservoir elevations and flows that would occur under the various alternatives are provided for each of the reservoirs for selected periods, as shown below. The tributary storage reservoirs were plotted for elevation, and all reservoirs in the WSM within the scope of the ROS were plotted for flow. Additionally, elevation probability plots along with flood guide curves for the tributary reservoirs and operating guides for the mainstem reservoirs are presented for the Base Case and the Preferred Alternative.

Elevation	Flow
January 1 (week 52)	Spring fill (weeks 12 – 22)
March 15 (week 12)	Summer pool (weeks 22 – 35)
Labor Day (week 35)	Fall drawdown (weeks 36 – 48)
Memorial Day (week 21)	
Last week of October (week 43)	

Box Plots

Box plots are used to demonstrate the variability in the results among the alternatives, and the variability that results from interaction between the reservoir operations policy and the wide range of rainfall and runoff conditions that occur from year to year in the Tennessee River basin.

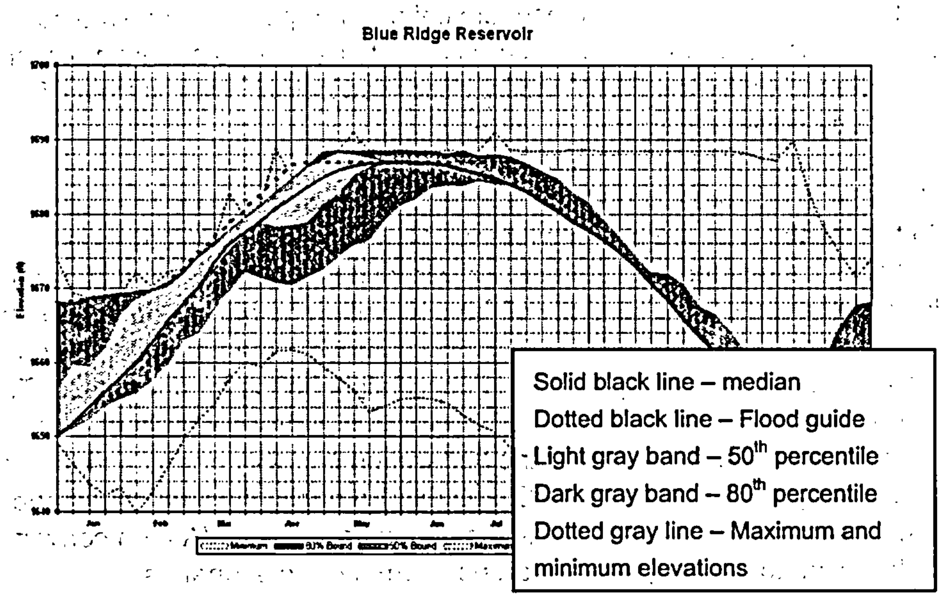


Box plots present, in a single graphic depiction, the full range and distribution of the flows and reservoir levels that would occur over the predicted 99-year record. The statistics presented in box plots and their interpretations are described in the inset box and the table on the next page.

Percentiles Used in Box Plots	
90th percentile	Reservoir elevations/flow release would be lower/less than this elevation 90% of the time (higher 10% of the time)
75th percentile	Reservoir elevations/flow release would be lower/less than this elevation 75% of the time (higher 25% of the time)
Median	Reservoir elevations/flow release would be higher than this elevation 50% of the time and lower than this elevation 50% of the time
25th to 50th percentile range (grey box)	Reservoir elevations/flow release would fall within this range (grey box) 50% of the time
25th percentile	Reservoir elevations/flow release would be lower/less than this elevation 25% of the time (higher 75% of the time)
10th percentile	Reservoir elevations/flow release would be lower/less than this elevation 10% of the time (higher 90% of the time)

Probability Plots

Probability plots were developed using the WSM and 99 years of available hydrologic data. Each alternative analyzed was loaded into the WSM and run with the 99 years of hydrologic data. This resulted in 99 plots of modeled weekly elevations for each reservoir. The elevation probability plots represent the results of these 99 years of



weekly elevations. The median line indicates the weekly median elevation for the 99 years (i.e., for any given week, 50% of the 99 modeled elevation points for that week were at or above the point in the median line and 50% of the 99 modeled elevation points for that week were at or below the median point). The 50% bound for any given week indicates the range where 50% of the 99 modeled elevation points for that week fell. Similarly, the 80% bound indicates where 80% of the points fell. The maximum and minimum lines (the highest modeled elevation for each week and the lowest modeled elevation for each week, respectively) are also included, along with the flood guide elevation (see glossary in Chapter 10 for definition).

C.3 Energy Cost Modeling

The models used in the power generation analyses for this EIS include the WSM, the PROSYM model, and the RELY model.

The PROSYM model is a commercially available and well established electric power production costing simulation computer software package. This proprietary model is licensed by The Henwood Energy Services, Inc. of Sacramento, California. It is designed for performing planning and operational studies; because of its chronological nature, the model accommodates detailed hour-by-hour investigation of TVA's power operations. PROSYM simulates TVA's power system operation on a chronological hourly basis in 1-week increments and is used to define power system operating costs to meet power loads. Input into the model includes fuel costs, variable operation and maintenance costs, and startup costs specific to TVA's plants. PROSYM determines how to meet hourly loads in the most economical manner possible, given a specified set of generating resources as well as the future capacity needed to maintain power system reliability as determined by the RELY model described below. Output from PROSYM is production cost by power resource.

The RELY model is a generation reliability model used to determine the capacity needed to maintain the reliability of the power system. It calculates the TVA system loss of load probability (LOLP) hourly for the summer and winter peak load seasons through 2022. The results were based on the capacity of the generating resources and purchases, expected equivalent forced outage rates, planned outages, the hourly load forecast, contract load available for interruptions, and uncertainty on the load forecast. The impact of the hourly dispatch each week of the various hydropower alternatives was analyzed to determine the different electric generation capacity needs and to compare them to the capacity needs of the Base Case. On the basis of assumptions about the construction costs of peaking and base types of power plants, TVA then converted the resulting differences to capacity cost differences among the scenarios.

TVA currently uses PROSYM and RELY in its operations and planning activities.

C.4 Water Quality Modeling

TVA has developed numerical water quality models for various reservoirs in the Tennessee River, Cumberland River, and other river systems to investigate water quality issues typically involving water temperature and dissolved oxygen (DO). The water quality models presently in use in the Tennessee River system include TVARMS, BETTER, CEQUAL-W2, and SysTemp. Each of these models is described below.

TVA uses TVARMS (the Tennessee Valley Authority River Modeling System) to simulate tailwaters and regulated stream reaches. TVARMS consists of two individual models: a flow model (ADYN) and a water quality model (RQUAL) (Hauser et al. 1995). These models can be used independently or in sequence. ADYN is a one-dimensional, longitudinal, unsteady flow model that is valid for streams and the tailwater portions of reservoirs. ADYN solves the one-dimensional equations for conservation of mass and momentum using a four-point implicit finite difference scheme, or McCormack explicit scheme. RQUAL is a one-dimensional water quality model used in conjunction with ADYN. RQUAL solves the mass transport equation with the same numerical scheme as the flow model. RQUAL is useful for studying temperature and nitrogenous and carbonaceous biochemical oxygen demand. TVA rigorously calibrated and verified this model, and has applied it on numerous rivers and reservoirs (Beard and Hauser 1986, Hauser 1985, Brown and Shiao 1985, Hauser and Ruane 1985, Hill and Hauser 1985, Hauser 1983, Hauser et al. 1983, Hauser and Beard 1983). TVA distributed this software and trained others in its use. Several consulting firms use the model.

For the ROS, TVA used TVARMS to simulate tailwaters, including:

Norris	Beard et al. 1986, Hauser et al. 1983
Cherokee	Hauser et al. 1983
Douglas	Hauser et al. 1989
South Holston	Hauser et al. 1985, Hadjerioua and Lindquist 2002
Chatuge	Julian 2003
Nottely	Shiao 2002
Watauga	Julian 2002
Fort Patrick Henry	Hadjerioua 2003 (not yet published)
Apalachia	Proctor 2003 (not yet published)
Normandy	Bevelheimer 2003 (not yet published)

An additional model was used in the Water Quality analysis. The Box Exchange, Transport and Temperature of a Reservoir (BETTER) model simulates temperature, DO, nutrients, pH, and algal biomass in the longitudinal and vertical dimensions. The strengths of BETTER are:

- Relatively easy simulation of seasonal water quality patterns;
- Representations of numerous physical and biochemical processes; and,
- No major execution problems such as numerical instabilities.

BETTER solves conservation of mass but does not include the momentum equation (Bender et al. 1990). Model results have been accepted by the Tennessee Department of Environment and Conservation (TDEC). For the ROS, TVA used the pre-existing calibrated BETTER models for eight reservoirs:

Normandy	Beard and Brown 1984
Boone	Bender et al. 1990
Cherokee	Hauser et al. 1983 and 1987
Douglas	Brown et al. 1987
Fort Loudoun	Brown et al. 1985a
Guntersville	Bender et al. 1990
Kentucky	Shiao 2000
Nickajack	Shiao 2000
Nottely	Shiao 1995
Pickwick	Brown et al. 1985b
Tellico	Hauser et al. 1982
Watts Bar	Shiao (not published)
Wheeler	Shiao (not published)

CE-QUAL-W2 was developed by the U.S. Army Corps of Engineers (Cole and Buchak 1995). It is a two-dimensional, laterally averaged, hydrodynamic and water quality model that is widely distributed, accepted, and used. The model is best suited for long, narrow waterbodies with longitudinal and vertical water quality gradients. A branching algorithm allows application to geometrically complex waterbodies. The model is useful for predicting water surface elevations, velocities, and temperatures, as well as 21 other water quality constituents. TVA had previously calibrated CE-QUAL-W2 models for Melton Hill and Douglas Reservoirs (Hadjerioua and Lindquist 2000a, 2000b). As part of the ROS, CE-QUAL-W2 models were calibrated for 16 additional reservoirs, as described in the following reports:

Apalachia	Proctor 2003
Bear Creek	FTN 2003
Blue Ridge	Proctor 2002
Cedar Creek	FTN 2003
Chatuge	Shiao 2003
Fontana	Hadjerioua and Lindquist 2003a
Fort Patrick Henry	Hadjerioua and Lindquist 2003b
Great Falls	FTN 2003
Hiwassee	Proctor 2003
Little Bear Creek	FTN 2003
Norris	Hadjerioua and Lindquist 2000c
South Holston	Hadjerioua and Lindquist 2003
Tims Ford	Julian 2002
Upper Bear Creek	Ruane 2003
Watauga	Higgins 2003
Wilson	Proctor (not published)

TVA developed a system-wide water temperature model (SysTemp) to simulate how the TVA system of connected reservoirs thermally responds to meteorology and changes in reservoir operations (Miller et al. 1992). SysTemp extends from Melton Hill and Watts Bar Reservoirs through seven additional reservoirs to Kentucky Dam. Each reservoir in the system includes a BETTER model within each reservoir. SysTemp uses release temperatures and flow from Norris and Watts Bar Hydro Plants as upstream boundary conditions. Headwater elevation at Kentucky Dam forms the downstream boundary condition. As input, SysTemp uses releases from each hydro plant and meteorological conditions. TVA routinely uses SysTemp to provide 90-day water temperature forecasts, which are automatically updated daily.

For the ROS, TVA upgraded the SysTemp model to link the TVARMS, CE-QUAL-W2, and BETTER models to simulate a larger portion of TVA's water control system. The upgraded version has been designated SysTempO and uses water quality model output from upstream waterbodies as input for the next tailwater or reservoir downstream. The individual elements in SysTempO were pre-calibrated for at least 1 year of data before being linked. After linking models together in SysTemp, 8 years of modeled temperature and DO were compared to measured data, and the model was adjusted. The model was then used to simulate the Base Case and policy alternatives to examine the effect of alternative reservoir operations policies on water quality.

All of the reservoirs and tailwaters listed above were linked together except Upper Bear Creek, Bear Creek, and Little Bear Creek Reservoirs. These were not included because changes in operations were not proposed for these reservoirs. Models were not calibrated for Ocoee #1, #2 and #3 Reservoirs. Hiwassee Reservoir results were used as an analog to estimate impacts on the Ocoees. The Tapoco projects between Fontana and Tellico Reservoirs were also not modeled. Empirical relationships were developed by Montgomery (2003) to estimate the changes in water quality between Fontana and Tellico Reservoirs.

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C.5 Floodflow Modeling

Modeling for the flood control analysis was conducted using RiverWare, a general purpose river basin modeling software system developed by the University of Colorado under primary sponsorship by TVA and the U. S. Bureau of Reclamation. Optimization and simulation functions of this model have been used for several years by TVA to schedule the operation of the reservoir system. For the flood risk analysis in the ROS, the rule-based simulation capabilities of RiverWare were used to model the entire water control system for the 99-year period of record, using a 6-hour timestep.

The model allows sophisticated operating rules to be written for all projects that mimic TVA's operations of these projects during flood control operations and during flood recovery operations. The model results show the headwater elevation for each project and the maximum outflow rates at each project for each storm (minor and major) that has occurred at any location in the Tennessee Valley during the past 99 years, as well as for a number of synthesized design floods. Model calibration for both the physical modeling attributes and the representation of the operations policy for the Base Case was conducted based on recent floods back to 1973.

Additional information on RiverWare can be retrieved from the University of Colorado's web site at: http://cadswes.colorado.edu.

Use of Modeling Results in Developing the Preferred Alternative

Except for the Base Case, none of the alternatives in the Draft Environmental Impact Statement were completely acceptable from a flood risk standpoint. Detailed analyses indicated that all alternatives investigated were characterized by an unacceptable increase in the risk of flooding at one or more critical locations in the Tennessee Valley. However, the analysis also indicated that each of the alternatives satisfied flood risk evaluation criteria at least for certain seasons at certain locations. This suggested the possibility of combining specific elements of the alternatives investigated in a new, "blended" alternative. It was therefore necessary to conduct additional floodflow modeling to determine whether a Preferred Alternative could be developed that would allow meaningful changes in reservoir pool levels without violating the flood risk criteria.

The RiverWare model was used in developing a series of eight blended alternatives based on successive attempts to limit increases in flood risk to an acceptable level at all locations. Reservoir Recreation Alternative A was used as a baseline for developing Blend 1. Winter flood guides were raised for 11 tributary storage projects, summer flood guides were lowered for five tributary storage projects, winter flood guides were raised for five mainstem projects, and summer flood guides were extended for six mainstem projects. Modeling results showed unacceptable increases in flood risk throughout the system, but particularly in the Hiwassee River watershed and the Tennessee River.

To address these issues, additional modifications were made to the flood guide curves and regulating zones for individual projects where problems were identified, resulting in Blend 2. Modeling of Blend 2 identified additional flood issues, leading to more incremental changes in flood guide curves and regulating zones at individual projects and the development of Blend 3. This process continued until flood risk issues at the critical locations considered were eliminated based on modeling of Blend 8.

Flood risk issues identified for a particular simulation could be associated either with the period of record (flood events observed over a continuous 99-year period), design storms (hypothetical flood events based on scaled replicas of large historical events), or both.

C.6 Hedonic Valuation Model – Estimated Changes in Property Values

The hedonic valuation model was used to estimate changes in property values as they relate to reservoir levels, a key parameter that varied among the policy alternatives. This model is derived mostly from Lancaster's (1966) consumer theory and Rosen's (1974) model. Numerous studies have used this technique to examine the relationship between attribute preference and the price of properties (Gillard 1981, Li & Brown 1980, Sirpal 1994, Walden 1990). More specifically, applications have included the influence on property sales price of residential and neighborhood attributes, such as land use (Crecine et al. 1967), residential quality and accessibility (Kain and Quigley 1970, Richardson et al. 1974, Randolph 1988, Can 1990, Dubin 1992), externalities in the local surrounding environment (Ridker and Henning 1968; Anderson and Crocker 1971; Wilkinson 1973; Smith and Deyak 1975; Nelson 1978; Berry and Bednarz 1979; Mark 1980; Clark et al. 1997; Simons et al. 1997, 1998, 1999), and water-related amenities (Milon et al.1984, Brown and Pollakowski 1977).

The hedonic valuation model is well suited for linear regression analysis. In the hedonic valuation model, the implicit price of each characteristic of the property embedded in the market price of the property is identified.

The following identifies the basic equation used in this analysis.

(1) $Y_i = a + BX_i + CZ_i + E_i$, where

Y is a vector of assessed property values,

X is a matrix of property attributes exclusive of water fluctuations,

Z is a vector of values of average annual distance to pool, and

E is a vector of normally distributed residual values.

For the purpose of the ROS, it was postulated that the value of residential property located adjacent to the TVA reservoirs reflects the recreational and aesthetic (RA) benefits received from the reservoir by residents (i.e., residential property on or near reservoirs will have a higher value if the winter reservoir level drawdown exposes less area between the summer high pool and winter low pool elevations).

Average annual distance to pool (ADTP) was the variable that linked elevations to property values in the hedonic valuation model and is defined as

(2) ADTP = (Horizontal distance to summer pool) + (Reservoir maximum elevation – average elevation)/(parcel slope fraction).

ADTP variables were derived from distance to pool and slope data for sample parcels from several reservoirs, using a Geographic Information System and historical pool elevation levels. Thus, with simulated weekly elevations for alternative operating scenarios in the context of highly regulated, annual fluctuations in pool levels, potential policy changes can be mapped directly into property values through the ADTP variable. If an operations alternative requires summer reservoir levels to remain at the normal maximum elevation for an additional 30 days per year, for example, the ADTP will be less than it is in the existing condition.

The coefficient for ADTP, then, yields a dollar value per foot of change in average annual distance to pool, and the effect of changes in reservoir operations on property values can be estimated.

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C.7 Economic Modeling

This project uses TVA's 10-area economic simulation and forecasting model purchased from *Regional Economic Models, Inc.* (REMI) to estimate the total effects, which are reported as economic impacts of alternatives. The REMI model is an integral part of a system of models and processes that TVA uses for economic forecasting and analyses. REMI constructs models that reveal the economic and demographic effects that policy initiatives or external events may impose on a local economy. A REMI model has been built especially for the TVA region that is based on 31 years of historical data. REMI's model-building system uses hundreds of programs developed over the past two decades to build customized models using data from the Bureau of Economic Analysis, the Bureau of Labor Statistics, the Department of Energy, the Census Bureau and other public sources.

REMI Policy Insight, the newest version of REMI's software, utilizes years of economic experience. A major feature of REMI is that it is a dynamic model, which forecasts how changes in the economy and adjustments to those changes will occur on a year-by-year basis. The model is sensitive to a very wide range of policy and project alternatives, and to interactions between the regional and national economies.

The REMI model is a structural model, meaning that the REMI TVA ROS Model includes cause-and-effect relationships. Estimated changes to the five direct drivers are model inputs. The model builds on two key underlying assumptions that guide economic theory: households maximize utility and producers maximize profits. In the model, businesses produce goods to sell to other firms, consumers, investors, governments and purchasers outside the region. The output is produced using labor, capital, fuel and intermediate inputs. The demand for labor, capital and fuel per unit of output depends on their relative costs; an increase in the price of any of these inputs leads to substitution away from that input to other inputs. The supply of labor in the model depends on the number of people in the population and the proportion of those people who participate in the labor force. Economic migration affects the population size. People will move into an area if the real after-tax wage rates, the likelihood of being employed, and the access to consumer goods increases in a region.

Supply and demand for labor in the model determines the wage rates. These wage rates, along with other prices and productivity, determine the cost of doing business for every industry in the model. An increase in the cost of doing business causes an increase in production costs and the price of the goods or service, which would decrease the share of the domestic and foreign markets supplied by local firms. This market share, combined with the demand described above, determines the amount of local output. The model has many other feedbacks. For example, changes in wages and employment affect income and consumption, while economic expansion changes investment and population growth affects government spending.

Figure C-03 is a pictorial representation of the model. The Output block shows a factory that sells to all the sectors of final demand as well as to other industries. The Labor & Capital Demand block shows how labor and capital requirements depend both on output and their relative costs. Population & Labor Supply are shown as contributing to demand and to wage determination in the product and labor market. The feedback from this market shows that economic migrants respond to labor market conditions. Demand and supply interact in the Wage, Costs, & Prices block. Once costs and prices are established, they determine market shares, which along with components of demand determine output.

Linkages indicated by the dashed arrows account for the effects of agglomeration in both the labor and product markets. These effects are crucial to accurately capture the key to why certain areas with a concentration of similar businesses can prosper despite high wages and real estate costs. By having a choice of suppliers and workers, each firm can obtain specialized labor and inputs that best fulfill their needs. This increases productivity and efficiency. Nashville's agglomeration of musical artists, producers, recording studios, show case venues, songwriters, agents, and entertainment lawyers is the perfect example of an agglomeration economy.

The dashed arrow from the Output block to the Cost block shows that more suppliers will increase the efficiency of inputs, which will then reduce production costs and competitiveness. The dashed arrow from the Labor block shows that more labor will increase the productivity of labor, thus reducing labor costs and thereby making the area more competitive. The arrow from Output to the Population block shows that the greater output provides more variety of choices and enhances consumer satisfaction, and thus inward migration. The arrow from the Output to the Shares block shows that the areas with concentration can offer more to purchasers, thus having an effect on market share in addition to the price advantages through the Cost & Price block.

The REMI model has strong dynamic properties, which means that it forecasts what will happen and when it will happen. The model brings together all of the above elements to determine the value of each of the variables in the model for each year in the baseline forecast. Inter-industry relationships contained in typical input-output models are captured in the REMI Output block; but REMI goes well beyond typical input-output models by including the relationships among all of the other blocks shown in Figure C-03.

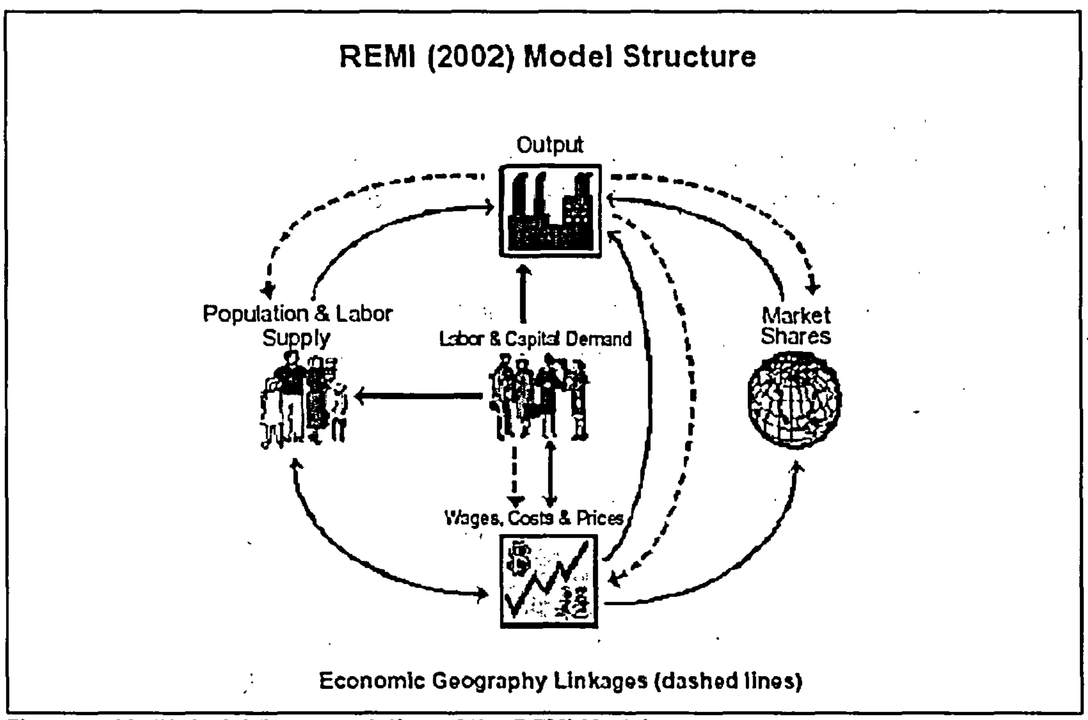


Figure C-03 Pictorial Representation of the REMI Model

The REMI TVA ROS model is designed to examine the effects of policy changes or direct economic changes to the TVA regional economy arising from the five economic drivers. The baseline forecast uses the baseline assumptions about the national and regional economic variables. Alternative forecasts have been generated using selected input variable values for the five drivers that reflect changes caused by alternative reservoir operations. Figure C-04 shows how this process would work for a reservoir operations change called Alternative X.

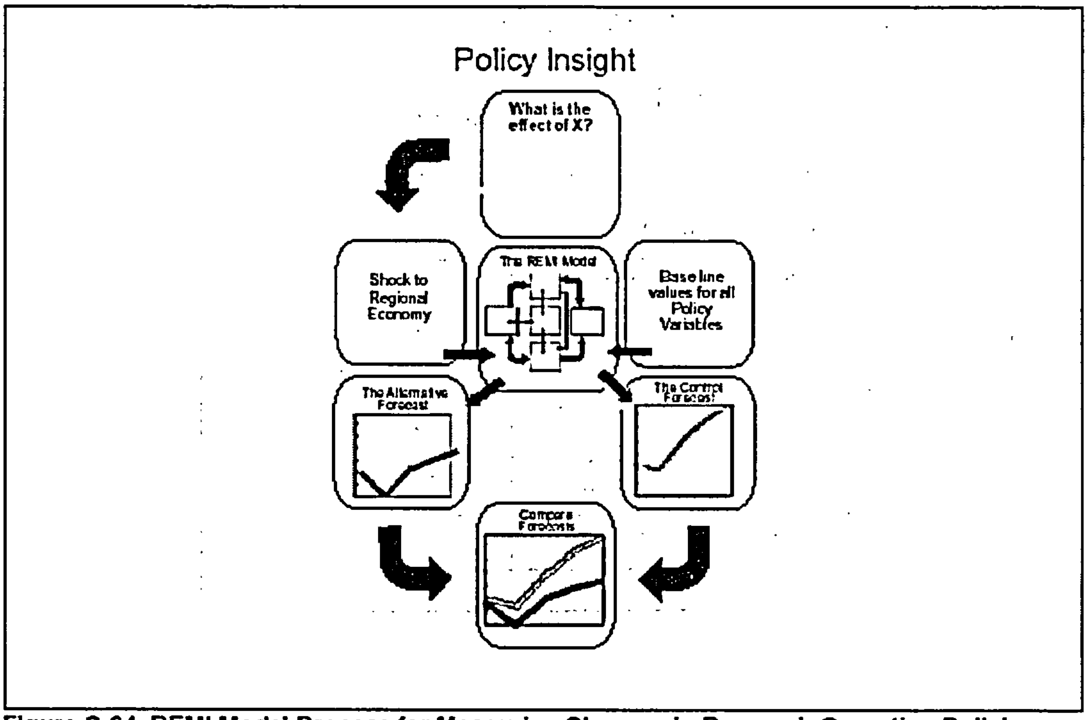


Figure C-04 REMI Model Process for Measuring Changes In Reservoir Operating Policies

The REMI model comes with default baseline economic forecasts for the United States and the TVA region, referred to as "Control Forecasts." Specified alternatives that will have some effects on the regional economy have been studied to understand and estimate their direct effects. The direct changes to industries affected by reservoir operations are introduced into the model, which is then run to produce a new forecast incorporating the impacts of the specified alternatives. Results are shown in terms of how the new forecast differs from the Control Forecast. For example, reservoir operation changes that sustain tributary reservoir water levels longer into fall would affect local recreation activity and associated spending. The REMI model tracks these changes as consumer spending in relation to specific recreation activities. This study reports incremental changes between the baseline and alternative as the results.

C.8 Weekly Scheduling Model Results Outputs

The following pages include the tabular and box plot results for selected reservoirs. The conversion chart below relates the letter and number code to the alternative names used in the text of the main document.

RESERVOIR OPERATIONS POLICY ALTERNATIVES EVALUATED IN DETAIL

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

Reservoir Elevation (feet above MSL) on January 1st

Tims Ford Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	870.0	875.0	871.0	871.0	865.0	870.0	871.0	875.0	870.0
25	870.0	875.0	871.0	871.0	865.0	870.0	871.0	875.0	870.0
50	870.5	875.0	871.0	871.0	865.0	870.0	871.0	875.0	870.0
75	873.0	878.1	873.0	873.0	865.0	873.0	873.0	878.7	873.0
90	873.2	879.0	873.5	873.0	865.0	873.2	873.5	879.0	873.2

Blue Ridge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1650.0	1660.0	1660.0	1624.5	1666.0	1648.2	1660.0	1677.9	1664.8
25	1650.0	1660.0	1660.0	1649.8	1666.0	1650.0	1660.0	1678.0	1664.8
50	1650.0	1669.2	1660.0	1660.0	1667.0	1650.0	1660.0	1678.0	1667.2
75	1656.5	1677.5	1668.0	1663.5	1672.4	1656.5	1668.0	1680.0	1670.1
90	1668.0	1680.0	1668.0	1668.0	1677.0	1668.0	1668.0	1680.0	1672.0

Hiwassee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1460.0	1472.0	1482.9	1465.9	1479.9	1460.0	1482.9	1482.0	1479.0
25	1464.9	1475.3	1482.9	1474.8	1479.9	1461.8	1482.9	1482.0	1479.0
50	1466.5	1480.8	1488.2	1483.1	1482.0	1465.9	1488.2	1483.0	1483.5
75	1476.1	1486.9	1491.9	1490.0	1486.7	1476.1	1491.9	1489.2	1490.0
90	1476.2	1490.0	1493.1	1493.0	1488.0	1476.2	1493.1	1490.1	1491.8

Nottely Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1743.0	1753.0	1760.0	1742.0	1763.3	1743.0	1760.0	1760.0	1758.0
25	1745.0	1754.3	1760.0	1750.5	1764.0	1743.5	1760.0	1760.0	1758.0
50	1745.8	1757.0	1762.4	1760.0	1764.5	1745.6	1762.4	1760.6	1760.7
75	1752.1	1763.0	1766.3	1764.9	1766.6	1752.1	1766.2	1764.4	1762.0
90	1752.1	1765.0	1767.1	1766.9	1768.0	1752.1	1767.1	1765.1	1762.0

Chatuge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1911.0	1913.5	1916.0	1907.9	1915.9	1911.0	1916.0	1916.0	1916.0
25	1912.0	1913.7	1916.0	1913.3	1915.9	1911.2	1916.0	1916.0	1916.0
50	1912.5	1915.2	1917.5	1916.0	1916.4	1912.3	1917.5	1916.4	1917.5
75	1916.1	1917.8	1918.6	1918.0	1919.3	1916.1	1918.6	1918.6	1918.0
90	1916.1	1919.0	1919.1	1919.0	1920.0	1916.1	1919.1	1919.1	1918.0

Reservoir Elevation (feet above MSL) on January 1st (cont.)

Norris Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	981.5	992.0	1006.0	962.8	998.7	981.5	1004.1	1000.0	994.0
25	982.2	992.2	1006.0	987.1	1001.0	981.5	1006.0	1000.0	994.0
50	985.0	998.2	1009.0	1005.3	1002.4	985.0	1008.2	1000.0	997.0
75	990.1	1000.0	1010.0	1009.3	1004.2	989.5	1010.0	1000.0	1000.0
90	995.0	1003.3	1014.4	1010.6	1006.5	995.0	1014.2	1004.7	1003.0

Fontana Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1597.7	1597.7	1597.7	1597.3	1597.7	1597.7	1597.7	1596.6	1626.1
25	1625.0	1625.0	1658.0	1627.3	1658.5	1625.0	1658.0	1644.0	1647.8
50	1639.3	1625.5	1659.7	1658.0	1659.1	1636.9	1659.5	1644.0	1650.9
75	1644.0	1642.0	1663.0	1663.0	1660.0	1644.0	1663.0	1644.0	1653.0
90	1648.1	1647.3	1669.0	1663.7	1660.9	1648.0	1669.0	1651.7	1653.0

Douglas Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	940.0	950.0	960.0	945.7	956.0	940.0	960.0	958.0	950.0
25	940.0	950.0	960.0	956.9	956.0	940.0	960.0	958.0	950.0
50	940.0	955.2	963.0	960.0	957.4	940.0	963.0	958.0	953.0
75	940.2	958.0	963.0	963.0	959.0	940.2	963.0	958.0	954.0
90	943.6	958.0	963.0	963.0	959.0	943.5	963.0	958.0	954.0

Cherokee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1028.0	1040.0	1049.0	1028.8	1048.0	1028.0	1049.0	1046.0	1041.0
25	1028.2	1040.3	1049.0	1040.4	1048.0	1028.0	1049.0	1046.0	1041.0
50	1030.0	1044.5	1051.4	1049.0	1049.0	1030.0	1051.4	1046.0	1043.4
75	1030.0	1046.0	1053.0	1052.8	1050.0	1030.0	1053.0	1046.0	1045.0
90	1030.0	1046.0	1053.0	1053.0	1050.0	1030.0	1053.0	1046.0	1045.0

South Holston Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1695.0	1706.2	1711.7	1679.1	1704.5	1693.9	1713.6	1710.9	1702.4
25	1695.6	1707.0	1721.0	1695.0	1714.9	1695.0	1721.0	1713.0	1704.8
50	1701.1	1710.0	1722.1	1713.5	1720.0	1700.3	1722.2	1713.0	1706.4
75	1702.0	1713.0	1723.0	1722.1	1721.0	1702.0	1723.0	1713.0	1708.0
90	1702.8	1713.0	1723.0	1723.0	1721.0	1702.7	1723.0	1713.0	1708.0

Reservoir Elevation (feet above MSL) on January 1st (cont.)

Watauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1935.0	1943.3	1947.2	1924.7	1942.0	1933.8	1940.3	1946.8	1947.1
25	1935.4	1945.4	1954.0	1940.6	1951.3	1935.0	1947.4	1952.0	1949.2
50	1939.8	1949.1	1955.1	1949.1	1955.0	1939.1	1954.0	1952.0	1950.4
75	1940.0	1952.0	1957.0	1954.9	1957.0	1940.0	1956.9	1952.0	1952.0
90	1940.1	1952.0	1957.0	1957.0	1957.0	1940.0	1957.0	1952.0	1952.0

Reservoir Elevation (feet above MSL) on March 15

Tims Ford

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	878.2	878.2	878.1	878.1	865.8	878.2	878.1	878.2	878.2
25	878.3	878.3	878.3	878.3	865.8	878.3	878.3	878.3	878.3
50	878.7	878.9	878.7	878.7	866.2	878.6	878.7	878.9	878.7
75	879.1	879.2	879.1	879.1	866.2	879.1	879.1	879.2	879.1
90	879.4	880.2	879.4	879.4	868.0	879.3	879.4	880.2	879.4

Blue Ridge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1668.5	1673.9	1672.5	1665.0	1660.7	1665.1	1672.4	1678.8	1674.0
25	1673.8	1676.1	1674.8	1674.2	1664.7	1673.5	1674.8	1678.9	1674.7
50	1674.8	1679.5	1675.2	1675.0	1667.0	1674.8	1675.2	1679.9	1676.6
75	1676.2	1680.7	1676.5	1676.4	1667.0	1676.2	1676.5	1680.9	1678.9
90	1677.0	1681.0	1677.0	1677.0	1669.1	1677.0	1677.0	1681.0	1679.3

Hiwassee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1482.0	1482.0	1481.8	1481.8	1460.4	1481.0	1481.8	1482.8	1482.6
25	1482.0	1483.3	1482.0	1482.0	1467.3	1482.0	1482.0	1484.2	1484.4
50	1482.7	1488.6	1485.0	1484.5	1468.4	1482.7	1485.0	1489.5	1488.5
75	1488.4	1492.5	1491.7	1490.7	1474.8	1488.4	1491.7	1492.7	1491.7
90	1492.4	1493.3	1493.3	1493.2	1477.0	1492.4	1493.3	1493.6	1497.2

Nottely Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1754.7	1759.2	1760.0	1759.4	1760.6	1754.4	1760.0	1760.7	1760.6
25	1755.3	1760.8	1761.3	1761.1	1762.3	1755.3	1761.3	1761.5	1761.5
50	1755.7	1763.0	1762.9	1762.8	1762.6	1755.7	1762.9	1763.7	1762.3
75	1758.2	1764.8	1764.1	1763.9	1764.8	1758.0	1764.1	1764.8	1762.3
90	1760.0	1765.1	1764.4	1764.4	1765.3	1760.0	1764.4	1765.1	1762.5

Chatuge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1916.0	1916.1	1916.4	1916.1	1914.4	1915.8	1916.4	1916.4	1917.3
25	1916.2	1916.5	1917.4	1917.0	1915.3	1916.2	1917.4	1916.8	1917.7
50	1916.3	1917.8	1918.3	1918.2	1915.4	1916.3	1918.3	1918.1	1918.2
75	1917.4	1918.8	1918.9	1918.8	1916.1	1917.2	1918.9	1918.9	1918.2
90	1918.1	1919.0	1919.1	1919.0	1916.6	1918.1	1919.1	1919.2	1918.6

Reservoir Elevation (feet above MSL) on March 15 (cont.)

Norris Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	995.7	999.2	1001.4	999.0	992.6	993.8	1001.4	1000.6	997.2
25	998.5	1000.0	1001.7	1001.5	992.9	998.4	1001.7	1000.7	998.4
50	999.6	1001.5	1004.4	1004.2	995.6	999.5	1004.4	1001.7	1001.0
75	1000.8	1004.8	1006.5	1006.0	996.5	1000.6	1006.5	1006.6	1004.5
90	1005.6	1009.5	1008.7	1008.4	999.0	1005.5	1008.7	1009.5	1007.1

Fontana Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1643.5	1643.5	1651.2	1648.3	1649.0	1643.5	1651.2	1645.5	1651.1
25	1643.8	1644.0	1653.9	1653.9	1650.5	1643.5	1653.9	1645.5	1652.5
50	1645.5	1645.5	1655.1	1655.1	1650.5	1645.4	1655.1	1645.5	1654.2
75	1645.5	1645.5	1656.2	1656.2	1651.7	1645.5	1656.2	1645.6	1654.2
90	1651.2	1652.0	1667.5	1667.5	1658.8	1651.2	1667.5	1652.1	1660.3

Douglas Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	958.0	958.6	957.9	957.9	943.8	958.0	957.9	959.1	956.0
25	958.1	958.9	958.2	958.2	943.8	958.1	958.2	959.1	956.9
50	958.5	959.1	958.5	958.5	943.8	958.5	958.5	959.1	958.6
75	958.5	959.1	958.5	958.5	944.5	958.5	958.5	959.1	958.6
90	958.5	959.8	958.5	958.5	949.0	958.5	958.5	959.8	958.6

Cherokee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1041.6	1045.8	1049.0	1049.0	1049.0	1041.2	1049.0	1047.5	1043.6
25	1042.5	1046.4	1050.7	1050.6	1049.9	1042.5	1050.7	1047.7	1044.2
50	1043.3	1047.7	1053.0	1053.0	1050.0	1043.3	1053.0	1047.7	1045.6
75	1043.8	1047.7	1053.0	1053.0	1050.0	1043.8	1053.0	1047.7	1045.6
90	1043.8	1047.7	1053.4	1053.0	1050.3	1043.8	1053.4	1047.7	1045.6

South Holston Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1707.1	1711.9	1721.0	1702.4	1717.4	1705.6	1721.0	1713.5	1711.1
25	1710.8	1713.0	1721.7	1721.0	1717.9	1710.4	1721.7	1713.8	1712.5
50	1713.2	1713.8	1722.4	1722.4	1718.2	1713.2	1722.4	1713.8	1713.2
75	1713.5	1713.8	1722.4	1722.4	1718.2	1713.5	1722.4	1713.8	1713.2
90	1713.5	1716.7	1725.0	1724.4	1722.3	1713.5	1724.7	1716.7	1714.3

Reservoir Elevation (feet above MSL) on March 15 (cont.)

Watauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1944.0	1949.5	1954.0	1943.5	1956.4	1940.8	1954.0	1950.3	1949.5
25	1947.7	1950.8	1955.0	1954.0	1957.1	1946.5	1954.9	1950.9	1951.0
50	1950.2	1952.2	1957.0	1957.0	1958.1	1950.0	1957.0	1952.2	1952.2
75	1951.4	1952.2	1957.0	1957.0	1958.1	1951.4	1957.0	1952.2	1952.2
90	1951.5	1953.0	1957.8	1957.5	1959.2	1951.5	1957.7	1953.0	1952.7

Reservoir Elevation (feet above MSL) on Memorial Day

Tims Ford Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	885.6	885.6	885.6	885.6	875.1	885.6	885.6	885.6	885.6
25	887.0	887.0	887.0	887.0	877.9	887.0	887.0	887.0	887.0
50	887.9	887.9	887.9	887.9	879.3	887.9	887.9	887.9	887.9
75	887.9	887.9	887.9	887.9	880.3	887.9	887.9	887.9	887.9
90	887.9	887.9	887.9	887.9	880.5	887.9	887.9	887.9	887.9

Blue Ridge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1680.0	1683.0	1683.7	1678.6	1673.6	1676.8	1685.6	1685.4	1683.2
25	1686.9	1686.9	1686.9	1686.8	1676.2	1683.0	1686.9	1687.0	1686.3
50	1686.9	1686.9	1686.9	1686.9	1678.6	1686.9	1686.9	1687.0	1686.8
75	1687.4	1687.5	1687.4	1687.4	1678.7	1687.4	1687.5	1687.6	1687.0
90	1688.5	1688.5	1688.5	1688.5	1679.9	1688.5	1688.5	1688.5	1688.0

Hiwassee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1511.5	1514.0	1514.5	1509.5	1493.6	1509.0	1503.1	1509.6	1511.8
25	1516.7	1518.0	1518.3	1517.0	1501.4	1514.6	1511.5	1515.2	1516.5
50	1520.3	1520.3	1520.3	1520.3	1507.7	1520.2	1516.0	1520.8	1520.7
75	1520.5	1520.5	1520.5	1520.5	1508.0	1520.5	1520.5	1520.9	1520.7
90	1521.0	1521.0	1521.1	1521.1	1508.9	1521.0	1521.0	1521.4	1521.3

Nottely Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1767.6	1768.5	1768.9	1769.5	1768.1	1766.1	1764.3	1769.3	1770.2
25	1771.7	1772.6	1773.2	1773.7	1770.3	1769.8	1768.4	1772.2	1773.3
50	1776.6	1776.6	1776.6	1776.6	1771.6	1776.3	1774.0	1776.3	1776.6
75	1776.8	1776.8	1776.8	1776.8	1772.1	1776.8	1776.8	1777.0	1776.8
90	1777.0	1777.0	1777.0	1777.0	1772.6	1777.0	1777.0	1777.3	1776.8

Chatuge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1922.2	1922.6	1922.8	1922.1	1920.2	1921.1	1920.5	1922.9	1922.4
25	1924.1	1924.4	1924.9	1924.7	1921.5	1923.2	1922.3	1924.5	1924.2
50	1925.9	1925.9	1925.9	1925.9	1922.7	1925.8	1924.8	1925.9	1925.7
75	1925.9	1925.9	1925.9	1925.9	1922.7	1925.9	1925.9	1926.0	1925.8
90	1926.0	1926.0	1926.0	1926.0	1923.0	1926.0	1926.0	1926.1	1925.8

Reservoir Elevation (feet above MSL) on Memorial Day (cont.)

Norris Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1009.0	1010.6	1011.8	1007.2	1002.0	1006.1	1010.0	1011.0	1009.2
25	1012.8	1014.4	1014.7	1012.9	1004.6	1012.2	1013.0	1015.1	1013.6
50	1017.1	1017.7	1017.8	1017.5	1007.3	1017.0	1016.6	1019.5	1019.2
75	1019.2	1019.2	1019.8	1019.8	1011.1	1019.2	1019.7	1020.0	1019.9
90	1019.9	1019.9	1020.0	1020.0	1013.8	1019.9	1020.0	1020.1	1020.2

Fontana Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1693.1	1695.1	1696.3	1694.7	1670.2	1687.4	1694.3	1690.5	1695.7
25	1700.6	1701.7	1702.1	1702.3	1675.1	1697.0	1701.6	1697.4	1702.5
50	1702.6	1702.6	1702.6	1702.6	1678.3	1702.6	1702.6	1702.9	1702.9
75	1702.6	1702.6	1702.6	1702.6	1678.3	1702.6	1702.6	1702.9	1702.9
90	1702.9	1702.9	1702.9	1702.9	1678.7	1702.9	1702.9	1702.9	1703.0

Douglas Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	989.1	990.4	991.2	987.0	970.3	984.7	991.1	986.4	985.7
25	993.2	993.6	993.7	992.8	976.3	991.0	993.7	992.3	991.2
50	993.8	993.8	993.8	993.8	981.6	993.8	993.8	994.0	993.7
75	993.8	993.8	993.8	993.8	982.9	993.8	993.8	994.0	993.7
90	994.0	994.0	994.0	994.0	983.0	994.0	994.0	994.0	993.8

Cherokee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1056.8	1058.5	1059.3	1060.9	1057.2	1053.6	1059.0	1060.1	1058.7
25	1061.1	1064.5	1065.7	1065.6	1058.6	1059.9	1065.2	1063.9	1063.1
50	1068.4	1070.1	1070.5	1070.4	1059.8	1068.4	1070.7	1068.8	1067.4
75	1070.9	1070.9	1070.9	1070.9	1060.3	1070.9	1070.9	1071.0	1070.3
90	1071.0	1071.0	1071.0	1071.0	1060.5	1071.0	1071.0	1071.0	1070.5

SouthHolston Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1721.6	1722.4	1724.2	1719.7	1722.5	1720.5	1723.7	1720.7	1719.5
25	1726.4	1726.5	1726.8	1725.1	1723.5	1725.5	1727.1	1724.0	1724.3
50	1727.4	1728.3	1728.6	1728.5	1724.4	1727.3	1728.7	1727.2	1727.2
75	1728.9	1728.9	1728.9	1728.9	1724.8	1728.9	1728.9	1729.0	1728.8
90	1729.0	1729.0	1729.0	1729.0	1725.0	1729.0	1729.0	1729.0	1729.0

Reservoir Elevation (feet above MSL) on Memorial Day (cont.)

Watauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1949.4	1953.1	1956.1	1945.6	1959.2	1948.9	1952.3	1953.1	1950.9
25	1957.0	1957.4	1957.5	1955.5	1960.4	1956.2	1954.9	1955.4	1954.2
50	1957.9	1958.5	1958.7	1958.6	1961.5	1957.8	1957.2	1957.6	1957.0
75	1958.9	1958.9	1958.9	1958.9	1962.0	1958.9	1958.6	1959.0	1958.8
90	1959.0	1959.0	1959.0	1959.0	1962.2	1959.0	1958.9	1959.0	1959.0

Reservoir Elevation (feet above MSL) on Labor Day

Tims Ford Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	885.2	885.2	887.6	873.3	878.2	885.2	887.6	885.2	885.2
25	885.2	885.2	887.9	873.3	880.8	885.2	887.9	885.2	885.2
50	885.2	885.2	888.0	873.3	883.7	885.2	888.0	885.2	885.2
75	885.2	885.2	888.0	873.3	885.4	885.2	888.0	885.2	885.2
90	885.2	885.2	888.0	873.3	885.4	885.2	888.0	885.2	885.2

Blue Ridge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1676.4	1675.7	1682.3	1651.4	1664.3	1676.0	1681.8	1682.9	1676.7
25	1676.4	1679.8	1685.4	1659.1	1669.6	1676.4	1685.6	1686.1	1679.5
50	1676.4	1682.3	1686.8	1665.6	1672.9	1676.4	1686.9	1687.0	1680.5
75	1676.4	1685.0	1687.0	1676.0	1676.3	1676.4	1687.0	1687.0	1681.1
90	1679.2	1686.9	1687.0	1683.1	1676.9	1679.2	1687.0	1687.0	1682.1

Hiwassee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1503.4	1503.9	1511.3	1470.9	1468.9	1501.5	1500.0	1506.9	1503.1
25	1503.6	1509.9	1515.6	1480.1	1487.1	1503.4	1510.9	1515.5	1508.9
50	1505.2	1513.6	1519.3	1490.0	1496.2	1505.0	1518.2	1519.1	1510.6
75	1509.0	1518.0	1521.0	1505.3	1505.9	1509.0	1520.9	1521.0	1511.6
90	1516.5	1520.6	1521.0	1515.8	1508.0	1516.5	1521.0	1521.0	1513.1

Nottely Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1763.1	1767.2	1771.5	1748.4	1761.4	1762.7	1765.0	1769.0	1766.9
25	1763.3	1770.6	1773.9	1753.6	1763.8	1763.1	1771.3	1773.9	1769.5
50	1764.5	1772.8	1776.1	1759.3	1765.0	1764.3	1775.4	1775.9	1770.4
75	1767.5	1775.3	1777.0	1768.0	1766.2	1767.5	1777.0	1777.0	1771.1
90	1773.4	1776.8	1777.0	1774.0	1766.5	1773.4	1777.0	1777.0	1771.9

Chatuge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1920.0	1921.7	1923.6	1913.5	1915.2	1919.5	1920.8	1922.5	1920.5
25	1920.0	1923.2	1924.7	1915.8	1917.4	1920.0	1923.5	1924.6	1921.8
50	1920.6	1924.2	1925.6	1918.2	1918.5	1920.4	1925.3	1925.5	1922.3
75	1922.1	1925.2	1926.0	1922.1	1919.6	1922.1	1926.0	1926.0	1922.8
90	1924.7	1925.9	1926.0	1924.7	1919.9	1924.7	1926.0	1926.0	1923.3

Reservoir Elevation (feet above MSL) on Labor Day (cont.)

Norris Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1004.2	1009.3	1012.2	986.5	998.2	1002.3	1008.4	1013.3	1004.9
25	1004.5	1012.8	1015.2	994.5	1003.4	1004.4	1011.9	1015.4	1008.4
50	1006.4	1015.0	1018.3	999.8	1010.1	1006.0	1016.8	1018.7	1011.4
75	1010.2	1017.9	1019.6	1009.6	1017.0	1009.8	1019.3	1019.7	1014.3
90	1016.0	1019.4	1020.0	1014.5	1020.5	1016.0	1020.0	1020.0	1018.0

Fontana Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1659.0	1667.6	1667.6	1646.3	1654.4	1659.0	1667.7	1667.6	1659.0
25	1681.0	1684.3	1693.9	1651.6	1658.0	1680.2	1693.2	1695.5	1683.5
50	1682.2	1692.9	1702.1	1664.7	1664.2	1682.0	1702.3	1702.5	1693.2
75	1685.4	1698.8	1703.0	1681.6	1671.0	1685.2	1703.0	1703.0	1696.9
90	1694.2	1701.8	1703.0	1692.9	1673.5	1694.2	1703.0	1703.0	1699.4

Douglas Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	978.2	977.6	987.4	942.2	949.1	978.2	988.1	988.7	976.3
25	978.2	983.6	992.1	953.2	958.5	978.2	992.2	992.9	982.0
50	979.3	987.2	993.8	962.8	964.5	979.1	993.9	994.0	984.9
75	982.0	991.2	994.0	977.7	970.5	982.0	994.0	994.0	987.3
90	990.8	993.7	994.0	987.3	972.6	990.7	994.0	994.0	990.9

Cherokee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1048.7	1058.5	1065.7	1031.7	1053.4	1048.7	1066.2	1067.0	1054.9
25	1048.9	1063.1	1069.2	1040.1	1058.7	1048.9	1069.5	1070.1	1058.4
50	1050.0	1065.8	1070.9	1047.0	1062.1	1049.7	1070.9	1071.0	1061.2
75	1053.1	1068.9	1071.0	1058.7	1065.5	1052.9	1071.0	1071.0	1064.1
90	1062.1	1070.8	1071.0	1065.1	1066.5	1061.0	1071.0	1071.0	1068.0

South Holston Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1713.0	1716.5	1716.7	1703.1	1711.5	1711.5	1718.7	1716.3	1710.7
25	1713.0	1721.9	1721.6	1708.7	1718.8	1713.0	1724.2	1721.5	1719.8
50	1714.7	1725.2	1726.9	1713.2	1723.0	1714.7	1727.6	1726.9	1721.8
75	1718.0	1727.5	1728.8	1720.9	1725.4	1717.9	1729.0	1728.9	1725.0
90	1725.9	1728.8	1729.0	1725.1	1726.5	1725.7	1729.0	1729.0	1728.1

Reservoir Elevation (feet above MSL) on Labor Day (cont.)

Watauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1941.4	1950.1	1950.3	1940.0	1948.5	1941.4	1944.2	1950.1	1948.6
25	1941.8	1954.0	1953.7	1944.5	1954.2	1941.6	1947.8	1953.9	1950.7
50	1944.2	1956.3	1957.4	1947.7	1955.5	1943.9	1952.6	1957.4	1951.8
75	1946.7	1957.9	1958.9	1953.1	1956.1	1946.7	1956.2	1959.0	1955.0
90	1954.3	1958.9	1959.0	1956.3	1957.1	1954.1	1958.1	1959.0	1958.1

Reservoir Elevation (feet above MSL) at end of October

Tims Ford Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	881.3	881.3	880.8	870.4	869.7	881.3	880.8	881.3	881.3
25	881.3	881.3	880.8	870.9	869.7	881.3	880.8	881.3	881.3
50	881.3	881.3	880.8	871.0	869.7	881.3	880.8	881.3	881.3
75	881.3	881.3	880.8	871.0	869.7	881.3	880.8	881.3	881.3
90	881.8	881.3	880.8	871.0	869.7	881.8	880.8	881.3	881.8

Blue Ridge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1659.5	1667.3	1671.8	1620.0	1665.6	1659.4	1671.6	1679.5	1669.4
25	1659.5	1669.1	1673.7	1643.6	1670.7	1659.5	1673.8	1685.4	1669.9
50	1659.5	1671.8	1674.3	1659.4	1672.9	1659.5	1674.3	1687.0	1671.1
75	1659.5	1675.1	1675.7	1667.7	1673.0	1659.5	1675.7	1687.0	1672.6
90	1664.0	1679.9	1679.2	1675.5	1674.6	1664.0	1679.2	1687.0	1675.3

Hiwassee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1483.0	1484.4	1498.1	1450.0	1474.0	1482.4	1490.7	1504.0	1488.2
25	1484.1	1486.2	1501.0	1459.6	1492.4	1483.7	1498.3	1504.0	1489.4
50	1486.5	1490.5	1502.9	1480.8	1499.2	1486.4	1502.3	1504.0	1491.5
75	1493.8	1498.7	1504.8	1492.5	1499.2	1492.7	1504.3	1504.5	1493.2
90	1504.0	1504.0	1508.6	1505.2	1499.2	1504.0	1507.9	1506.1	1499.3

Nottely Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1751.7	1757.2	1766.2	1735.0	1760.8	1751.6	1761.9	1770.4	1761.7
25	1752.4	1758.4	1767.9	1739.9	1761.7	1752.2	1766.2	1776.3	1762.2
50	1753.8	1760.3	1768.8	1755.4	1762.0	1753.8	1768.6	1777.0	1763.3
75	1758.6	1763.9	1769.8	1762.4	1762.1	1757.8	1769.6	1777.2	1764.3
90	1764.9	1769.6	1771.3	1769.9	1764.0	1764.9	1771.2	1777.7	1766.3

Chatuge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1915.4	1916.5	1920.1	1905.0	1915.4	1914.9	1918.2	1923.2	1917.9
25	1915.5	1916.9	1920.8	1911.9	1916.9	1915.4	1920.1	1925.6	1918.1
50	1916.4	1917.9	1921.3	1915.8	1917.5	1916.4	1921.2	1926.0	1918.7
75	1918.5	1920.3	1921.8	1918.9	1917.5	1918.3	1921.7	1926.1	1919.2
90	1921.9	1923.1	1922.8	1922.1	1918.0	1921.9	1922.7	1926.4	1920.4

Reservoir Elevation (feet above MSL) at end of October (cont.)

Norris Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	988.4	996.2	1007.9	965.2	994.3	988.3	1003.3	1009.2	998.4
25	989.3	997.7	1010.9	983.1	1000.4	988.8	1007.5	1009.3	999.4
50	991.4	1000.2	1012.9	991.9	1007.5	991.2	1011.7	1009.3	1001.5
75	999.0	1005.2	1013.7	1003.5	1014.6	999.1	1013.4	1009.3	1003.8
90	1004.2	1009.3	1015.5	1011.6	1015.2	1004.0	1015.0	1009.6	1008.7

Fontana Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1603.0	1612.0	1612.0	1603.0	1603.0	1603.0	1612.0	1612.0	1603.0
25	1650.4	1651.9	1677.0	1608.8	1656.8	1649.3	1676.6	1684.8	1661.9
50	1653.3	1658.0	1681.7	1652.5	1666.4	1652.7	1681.6	1684.8	1664.3
75	1660.3	1669.5	1682.3	1669.6	1666.4	1660.1	1682.4	1684.8	1667.7
90	1673.4	1676.7	1686.8	1679.6	1667.4	1673.3	1686.9	1684.8	1672.5

Douglas Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	956.0	958.3	975.2	940.0	953.9	953.5	975.2	991.2	959.6
25	956.2	960.0	977.3	942.1	963.7	956.0	977.5	991.6	961.3
50	957.8	964.5	978.0	955.6	964.6	957.8	978.0	991.6	963.0
75	964.3	971.4	979.3	967.1	964.7	964.3	979.4	991.6	965.9
90	972.7	978.0	983.6	979.0	965.6	972.4	983.7	991.6	973.5

Cherokee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1035.6	1044.7	1057.9	1020.9	1058.0	1035.5	1058.1	1058.4	1046.4
25	1036.3	1045.4	1060.0	1031.0	1063.8	1036.0	1060.2	1058.4	1047.4
50	1037.9	1047.6	1060.7	1042.7	1066.1	1037.9	1060.7	1058.4	1049.0
75	1042.5	1051.7	1061.5	1051.8	1066.1	1042.4	1061.5	1058.4	1051.0
90	1050.2	1056.9	1063.5	1060.6	1067.1	1048.7	1063.5	1058.4	1056.4

South Holston Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1701.0	1710.2	1713.1	1676.0	1708.4	1700.7	1717.7	1711.7	1705.6
25	1701.7	1712.7	1718.7	1695.1	1714.1	1701.6	1722.2	1718.3	1709.8
50	1704.0	1715.1	1723.7	1707.3	1720.2	1703.8	1724.7	1725.2	1711.5
75	1708.1	1720.8	1725.4	1715.2	1723.0	1707.5	1725.6	1729.0	1714.2
90	1715.3	1725.3	1726.7	1722.9	1724.0	1714.0	1727.3	1729.0	1719.6

Reservoir Elevation (feet above MSL) at end of October (cont.)

Watauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1936.6	1945.4	1947.9	1929.0	1945.3	1936.5	1936.9	1946.9	1948.4
25	1937.2	1945.8	1952.7	1940.0	1950.5	1937.1	1942.0	1951.7	1949.8
50	1940.0	1948.6	1955.8	1943.3	1953.7	1940.0	1946.5	1956.5	1951.1
75	1942.4	1951.1	1956.9	1949.4	1953.8	1942.4	1952.6	1959.0	1953.6
90	1948.6	1955.1	1958.2	1955.0	1954.5	1948.0	1954.9	1959.0	1956.4

Average Reservoir Releases (cfs) during Weeks 12 through 22

Wilson Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	21644	22573	22706	21951	25680	24264	23923	23918	22676
25	30068	31266	32116	31082	35127	32337	33350	32849	30678
50	39894	42482	43766	40293	45606	41567	44068	41983	40544
75	64160	66829	68706	66686	69729	65503	68855	66650	65455
90	81509	84266	86088	84425	88088	82843	86380	83965	79668

Guntersville Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	15899	16887	17523	16771	19524	18718	18812	19023	17402
25	22077	23278	24384	23178	25985	23989	25415	24331	22881
50	29090	30812	31808	30753	34899	30215	32236	30863	29435
75	45003	47238	49093	48179	51303	45882	49313	47258	46292
90	57246	59496	60922	59943	63298	58125	61117	59172	57675

Kentucky Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	24737	25677	27435	24828	27048	32491	27924	26137	25249
25	37350	39286	41276	38916	41809	45869	42019	39364	38196
50	50534	52178	54460	51514	55263	57927	54971	53007	50834
75	80257	83242	86343	83029	88243	88228	86603	83506	82006
90	103831	107372	110102	106650	112713	110266	110124	107248	105552

Pickwick Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	21192	23122	23744	21356	25739	24714	24951	24842	22970
25	30808	32621	33486	32484	34857	33981	34586	34045	32421
50	41040	44012	45251	41856	46147	43023	45624	44457	41530
75	66688	69719	71406	68743	73044	68501	71509	69649	67824
90	87390	90627	91962	90012	93103	89194	92316	90514	87636

Wheeler Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	19971	20858	21849	20829	23863	23143	23394	22114	21639
25	27987	29658	30409	29081	33088	30480	31440	31130	28751
50	36341	39106	40344	38891	41683	37711	40952	39551	37066
75	59548	62368	63969	62262	65444	60918	64165	62130	60766
90	77506	80009	81255	79832	82353	78855	81276	79974	78012

Average Reservoir Releases (cfs) during Weeks 12 through 22 (cont.)

Chickamauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	12075	13387	13426	13242	15813	14711	14825	14323	13220
25	16881	18016	18859	18026	20466	18760	19602	19144	17664
50	21712	23931	25225	23340	28065	23066	25725	24053	22437
75	33884	36120	38212	37298	40151	34764	38438	36360	35186
90	44338	46647	48024	47110	50056	45217	48052	46578	44693

Watts Bar Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	9092	9305	9850	9563	12484	10847	10558	10576	10298
25	11673	12472	13186	12730	15755	13294	14041	13559	12617
50	16484	17655	19327	18099	22027	17147	19424	18045	16815
75	24910	26656	28695	27763	31135	25494	28892	26429	26021
90	36778	38197	39938	39311	41528	37383	40081	38097	35865

Fort Loudoun Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	5564	5703	6079	6407	8677	6812	6346	6628	5799
25	6610	7160	8194	7916	10877	7861	8295	7741	7405
50	9945	10002	11493	11174	14522	10447	11493	10372	10610
75	15699	16663	18293	18015	20827	15967	18340	16665	16614
90	22382	23444	25156	24878	27691	22650	25160	23444	22446

Nickajack Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	13030	14081	14692	14541	16896	16135	16040	15344	14053
25	18557	19834	20536	19579	22364	20870	21423	20953	19647
50	23522	25463	26752	25450	29926	24492	27383	25656	24151
75	36814	39049	41044	40130	43058	37693	41270	39124	38116
90	46873	48733	50699	49785	52706	47752	50749	48986	47477

Tims Ford Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	83	82	80	80	80	83	80	82	85
25	349	349	349	349	193	349	349	349	349
50	596	596	596	596	415	596	596	596	596
75	1068	1069	1068	1068	875	1066	1068	1069	1068
90	1537	1605	1537	1537	1480	1537	1537	1605	1474

Average Reservoir Releases (cfs) during Weeks 12 through 22 (cont.)

Blue Ridge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	282	365	299	180	285	313	310	399	340
25	422	472	408	403	397	450	412	502	433
50	566	611	566	562	570	572	566	647	597
75	771	849	771	771	778	772	771	849	818
90	1057	1136	1057	1057	1074	1057	1057	1138	1112

Hiwassee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	301	297	324	365	564	365	859	521	407
25	514	636	594	600	783	597	984	768	643
50	956	1044	976	1044	1194	1015	1267	1108	1130
75	1575	1763	1747	1747	1927	1604	1803	1757	1713
90	2271	2555	2417	2408	2632	2271	2460	2523	2536

Nottely Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	67	122	123	77	165	68	226	156	97
25	101	170	164	147	225	107	256	197	154
50	180	257	245	243	343	193	308	266	237
75	267	358	345	347	475	281	384	359	355
90	438	522	508	508	652	438	508	518	480

Chatuge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	120	119	124	91	157	121	228	126	160
25	165	169	175	171	211	181	264	176	209
50	236	247	250	244	318	257	324	265	282
75	408	443	444	444	479	417	450	443	439
90	545	567	582	582	635	545	584	577	596

Norris Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1000	1099	1193	1023	1488	1000	1569	1166	1197
25	1453	1592	1718	1767	1998	1777	2073	1634	1633
50	2358	2638	2940	2940	2968	2593	3049	2478	2405
75	3883	4249	4501	4395	4521	3963	4585	4032	3945
90	5646	6236	5896	5896	6346	5644	5978	6241	5627

Average Reservoir Releases (cfs) during Weeks 12 through 22 (cont.)

Fontana Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	634	594	848	858	2230	747	876	824	880
25	979	897	1143	1166	2505	1130	1206	1001	1242
50	1644	1644	2045	2045	3443	1870	2045	1668	2097
75	3010	3032	3434	3434	4725	3010	3434	3032	3236
90	4230	4230	4653	4653	5900	4238	4653	4241	4549

Douglas Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1819	1638	1315	1811	2023	2043	1515	1891	1954
25	2466	2339	2032	2466	3196	2876	2232	2487	2515
50	3865	3865	3805	3856	4345	4170	3805	3865	3866
75	5892	5892	5892	5892	6715	5892	5892	5892	5868
90	8687	8687	8687	8687	9184	8687	8687	8687	8436

Cherokee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	325	357	1066	705	1613	325	1113	891	438
25	452	784	1544	1324	2727	554	1719	1221	811
50	981	1378	2445	2366	3928	1484	2413	1731	1520
75	2149	2838	4017	3835	5445	2153	4017	2866	2607
90	3627	4327	5202	5152	7189	3888	5275	4560	4282

South Holston Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	318	364	663	448	535	318	598	501	471
25	467	518	857	772	826	459	832	610	587
50	712	737	1091	1091	1132	729	1091	813	757
75	962	1000	1344	1342	1387	962	1342	1017	993
90	1218	1297	1662	1647	1748	1213	1649	1300	1303

Watauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	374	462	584	337	461	376	646	444	524
25	434	550	666	653	596	442	735	535	590
50	618	658	821	818	807	628	860	670	713
75	856	917	1057	1048	1011	856	1109	907	934
90	1016	1082	1236	1235	1173	998	1263	1068	1116

Average Reservoir Releases (cfs) during Weeks 12 through 22 (cont.)

Great Falls Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	2369	2233	2233	2233	2322	2369	2233	2233	2280
25	3121	2985	2985	2985	3038	3121	2985	2985	2985
50	4181	4065	4065	4065	4087	4181	4065	4065	4065
75	5385	5249	5249	5249	5262	5385	5249	5249	5249
90	6287	6152	6152	6152	6157	6287	6152	6152	6058

Ocoee #1 Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	932	1015	932	828	957	933	929	1086	956
25	1246	1276	1256	1209	1194	1262	1256	1339	1265
50	1642	1667	1641	1612	1635	1619	1641	1710	1655
75	2090	2163	2092	2092	2063	2092	2092	2170	2121
90	2594	2652	2594	2594	2682	2600	2594	2668	2627

Boone Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1132	1232	1667	1251	1451	1143	1718	1353	1463
25	1492	1760	2207	2002	2213	1517	2237	1841	1820
50	2199	2305	2762	2762	2808	2309	2778	2453	2379
75	2885	2960	3549	3465	3630	2885	3591	2956	2998
90	3570	3787	4350	4264	4422	3570	4373	3787	3708

Ocoee #2 Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	864	958	897	766	928	830	870	987	911
25	1124	1167	1117	1088	1094	1149	1107	1199	1135
50	1499	1536	1499	1459	1491	1459	1499	1541	1504
75	1818	1880	1820	1820	1820	1820	1820	1898	1841
90	2340	2430	2345	2345	2375	2340	2345	2437	2326

Melton Hill Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1613	1611	1634	1710	1934	1685	2082	1668	1711
25	1969	2174	2263	2353	2542	2390	2623	2232	2173
50	3243	3523	3740	3801	3783	3486	3888	3346	3196
75	4851	5463	5475	5473	5532	4950	5583	5207	4899
90	7330	7929	7702	7702	7826	7330	7810	7626	6960

Average Reservoir Releases (cfs) during Weeks 12 through 22 (cont.)

Ocoee #3 Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	738	843	765	657	785	760	764	880	810
25	1003	1045	1017	983	994	1019	1015	1091	1026
50	1322	1353	1322	1271	1370	1352	1322	1379	1343
75	1601	1671	1602	1602	1615	1641	1602	1679	1612
90	2144	2224	2144	2144	2197	2146	2144	2224	2185

Apalachia Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	393	395	419	469	666	472	932	618	498
25	640	726	707	709	890	705	1094	880	749
50	1091	1183	1098	1181	1327	1152	1379	1222	1262
75	1742	1930	1914	1914	2084	1768	1969	1929	1886
90	2509	2769	2618	2614	2869	2509	2652	2737	2752

Fort Patrick Henry Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1034	1163	1572	1176	1360	1059	1626	1248	1395
25	1460	1689	2143	1947	2169	1460	2155	1779	1778
50	2175	2258	2719	2719	2748	2266	2731	2406	2331
75	2893	2992	3586	3471	3690	2893	3628	2958	3059
90	3630	3755	4347	4232	4419	3616	4359	3755	3686

Average Reservoir Releases (cfs) during Weeks 23 through 35

Wilson Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	25274	21823	17452	39069	20412	24470	17461	17405	21889
25	28683	23659	19677	40698	22086	28098	19976	20069	24369
50	34203	28285	24871	43386	26971	33787	25004	25404	28943
75	41130	35509	32037	47247	33293	41130	31864	32893	37020
90	51058	45128	43517	53814	43565	51058	43228	43872	46018

Guntersville Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	23133	19940	16320	35948	19304	22275	16383	15823	20610
25	26155	21146	18108	36577	20537	25781	18289	17753	22164
50	30755	24478	21214	37721	23972	29831	21342	21330	25816
75	36585	30377	27153	40034	29584	35757	27174	27929	31778
90	42914	38808	37203	44490	37561	42493	37074	37899	39488

Kentucky Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	27119	23918	21124	36760	22317	28567	21023	21862	25077
25	31168	27010	23939	39119	25638	33192	23984	24683	28219
50	35993	31008	28912	41952	29721	40127	28828	30208	32744
75	42628	38289	35356	46604	36842	46585	35504	36612	40079
90	53160	50692	49135	56650	49183	62438	49063	49865	49952

Pickwick Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	24876	21548	16751	39258	19602	24254	16835	17259	21011
25	28932	23041	18923	41060	21526	28661	19171	19944	24002
50	34853	28744	25066	44228	27482	34793	25285	25773	29139
75	42537	35495	31693	49107	32967	42537	31256	32802	36758
90	51555	46786	44827	55475	45357	51555	44843	45146	46371

Wheeler Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	24822	21740	17099	38800	20405	24170	17199	17192	22102
25	28952	23451	19711	40311	22454	28431	19925	20225	24176
50	34066	27699	24528	42613	26517	33671	24661	25091	28455
75	40350	34424	31644	46191	32542	39905	31419	32278	35859
90	49700	43704	42089	52093	41938	49700	41945	42569	44830

Average Reservoir Releases (cfs) during Weeks 23 through 35 (cont.)

Chickamauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	21061	18610	14946	35000	18319	20396	14989	14352	19057
25	24714	19418	16663	35000	19125	23900	16803	16011	21078
50	28129	22236	19602	35000	21833	27634	19674	19232	23918
75	33068	27166	25025	36071	26272	33068	25020	25072	29438
90	38065	33562	32435	40655	32648	38065	32160	32689	35130

Watts Bar Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	16983	14530	11654	27241	14308	16519	11932	11044	15440
25	20213	15708	13059	28140	15294	19478	13097	12512	16989
50	23183	17882	15821	28966	17345	23089	16065	15458	19991
75	26951	21322	20229	29997	20846	26936	19851	19602	23281
90	30932	27643	26965	32307	25891	30578	26850	26603	28229

Fort Loudoun Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	13440	11509	9215	20181	11556	12849	9194	8402	11848
25	15762	12472	10394	21176	12313	15338	10498	9915	12942
50	17868	14070	12543	21952	14067	17630	12517	11582	15044
75	20700	16766	15569	22741	16955	20486	15670	15453	17706
90	22713	19423	19067	23670	19654	22713	19018	18473	20325

Nickajack Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	21033	18720	15367	34797	18510	20519	15471	14499	19424
25	24928	19653	16493	35255	19151	24195	16610	16095	21093
50	28695	22969	19929	35606	22372	28435	19808	19504	24569
75	34194	28048	25724	36688	27155	33715	25753	25881	30420
90	39646	33945	33385	40936	33716	39494	33130	33593	35536

Tims Ford Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	219	220	80	830	80	232	80	220	229
25	328	328	174	938	80	336	174	328	328
50	454	454	292	1061	80	454	292	454	454
75	633	634	472	1243	173	633	472	634	634
90	897	898	736	1482	439	897	736	898	882

Average Reservoir Releases (cfs) during Weeks 23 through 35 (cont.)

Blue Ridge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	369	362	301	589	388	340	319	315	402
25	510	429	354	683	442	492	359	352	446
50	594	513	446	756	530	595	446	443	535
75	715	603	559	832	610	712	559	556	647
90	916	871	801	936	871	903	804	798	903

Hiwassee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1271	1058	967	2206	1284	1213	1016	1049	1299
25	1733	1350	1093	2389	1551	1656	1039	1079	1523
50	2082	1634	1380	2624	1842	2055	1166	1302	1829
75	2414	1963	1717	2792	2207	2374	1567	1676	2217
90	2628	2546	2458	2839	2672	2602	2393	2413	2858

Nottely Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	235	170	155	453	289	240	174	199	249
25	390	289	238	485	352	374	207	235	332
50	479	349	281	569	396	464	254	281	393
75	535	428	357	614	485	531	330	353	465
90	634	541	530	647	592	623	523	525	623

Chatuge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	267	212	194	431	308	259	191	225	269
25	375	281	249	490	355	369	229	253	346
50	449	342	298	536	421	447	270	298	403
75	525	412	366	579	491	510	341	361	485
90	600	560	529	637	644	599	523	523	621

Norris Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	2216	1407	1407	3221	1407	2167	1767	1407	1840
25	2697	1762	1407	3973	1407	2571	1767	1443	2249
50	3310	2295	1908	4547	1580	3297	1891	1792	3078
75	4010	2911	2460	5238	2009	4006	2407	2520	3615
90	4585	3690	3441	5654	2775	4585	3386	3356	4233

Average Reservoir Releases (cfs) during Weeks 23 through 35 (cont.)

Fontana Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	2873	2597	2260	4132	2660	2836	2212	2054	2756
25	3439	2935	2574	4371	3004	3410	2566	2463	3007
50	4005	3423	3177	4560	3398	3956	3172	3073	3407
90	5385	5251	5256	5452	4809	5205	5249	5105	4317
75	4632	4092	4013	4920	3980	4632	4017	3929	5362

Douglas Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	4657	4478	3477	6995	4989	4462	3340	3111	4344
25	5556	4921	3839	7631	5662	5287	3810	3646	5012
50	6372	5492	4684	8059	6472	6335	4644	4512	5629
75	7386	6409	5792	8627	7553	7340	5738	5663	6883
90	8231	7561	7370	9284	8799	8073	7370	7260	7827

Cherokee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	3407	2199	1451	4931	1825	3330	1352	1216	2468
25	4321	2797	2087	5629	2178	4194	2093	1808	3116
50	5602	3300	2721	6574	2506	5518	2754	2354	3847
75	6305	3858	3382	7156	3009	6214	3412	3109	4559
90	7105	4812	4452	7933	3884	7071	4341	4280	5261

South Holston Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	730	548	528	770	529	716	490	480	564
25	838	621	592	911	584	830	550	567	670
50	976	717	720	1078	719	970	682	678	782
75	1144	826	824	1205	809	1144	798	785	904
90	1301	1025	1000	1341	1009	1301	977	926	1011

Watauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	620	392	385	532	532	579	583	366	414
25	720	453	428	654	609	706	583	403	494
50	846	509	503	740	675	832	583	479	573
75	960	613	595	845	784	958	608	577	675
90	1137	809	785	971	994	1113	818	764	887

Average Reservoir Releases (cfs) during Weeks 23 through 35 (cont.)

Great Falls Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	267	381	381	483	343	267	381	381	418
25	545	659	659	760	604	545	659	659	659
50	868	900	900	1002	891	868	900	900	900
75	1460	1570	1570	1671	1570	1460	1570	1570	1570
90	2265	2312	2312	2414	2312	2265	2312	2312	2300

Ocoee #1 Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	766	741	644	1025	766	749	675	682	755
25	964	907	822	1194	923	959	819	815	932
50	1147	1066	996	1328	1065	1134	996	993	1102
75	1411	1319	1250	1462	1314	1399	1255	1256	1345
90	1932	1861	1838	1918	1865	1932	1843	1829	1854

Boone Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1799	1471	1429	2305	1387	1816	1535	1414	1524
25	2100	1551	1522	2533	1475	2089	1607	1503	1629
50	2445	1697	1662	2810	1629	2433	1728	1630	1823
75	2790	2164	2080	3041	2151	2768	2191	2043	2311
90	3207	2814	2765	3451	2706	3207	2749	2739	2795

Ocoee #2 Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	731	695	608	980	711	673	633	640	717
25	880	832	746	1132	841	867	750	747	848
50	1056	966	900	1238	963	1050	898	909	1001
75	1347	1213	1192	1364	1220	1347	1190	1187	1275
90	1756	1646	1657	1723	1666	1756	1664	1631	1727

Melton Hill Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	2564	1667	1541	3605	1585	2503	1887	1552	2178
25	2892	1986	1669	4229	1700	2751	1980	1713	2568
50	3813	2645	2196	4999	1963	3717	2265	2180	3397
75	4587	3331	2880	5631	2560	4494	2970	3006	4028
90	5417	4652	4210	6116	3423	5417	4301	4261	4939

Average Reservoir Releases (cfs) during Weeks 23 through 35 (cont.)

Ocoee #3 Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	680	650	580	929	669	648	602	601	684
25	823	779	685	1059	791	798	683	676	785
50	981	884	812	1155	883	962	817	808	922
75	1205	1125	1050	1269	1138	1205	1048	1058	1147
90	1654	1556	1525	1638	1557	1654	1525	1525	1584

Apalachia Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1324	1100	1013	2248	1347	1261	1066	1100	1358
25	1783	1401	1154	2456	1607	1705	1087	1135	1579
50	2150	1693	1446	2681	1898	2110	1223	1364	1891
75	2514	2047	1799	2870	2281	2456	1656	1768	2308
90	2769	2665	2573	2882	2787	2723	2511	2525	2973

Fort Patrick Henry Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1698	1363	1310	2230	1265	1740	1415	1304	1395
25	1996	1444	1418	2431	1387	1974	1500	1401	1525
50	2356	1651	1586	2710	1554	2348	1660	1534	1774
75	2723	2125	2070	3026	2137	2702	2141	1961	2224
90	3165	2741	2695	3418	2633	3155	2676	2676	2723

Average Reservoir Releases (cfs) during Weeks 36 through 48

Wilson Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	25548	25938	23631	18203	17039	24778	23596	25066	24399
25	29914	31150	28218	19620	21714	28724	27871	30292	28967
50	37528	39018	33243	24436	29042	36246	33478	35753	37252
75	42253	44826	40986	31104	38174	41161	40907	44041	44673
90	53612	56405	52948	43087	51538	52766	52812	57761	54591

Guntersville Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	23606	23589	20954	16982	14190	23090	20880	23017	21079
25	26576	28299	24291	17872	17611	25638	24303	26470	25490
50	32763	35223	29512	21161	23437	31717	29150	31967	32160
75	37183	39121	34547	26728	29558	36613	34480	39356	37683
90	46132	48015	44059	36790	42019	45466	44008	49317	46932

Kentucky Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	23821	24871	23820	18915	20491	25450	23757	24992	23963
25	27791	29876	27123	20116	24649	27696	27004	28427	27522
50	33106	34413	31689	24238	29740	32289	31718	32890	32386
75	40610	41981	39796	32764	39138	41573	39638	42253	40663
90	52817	55586	53558	44475	51393	54759	53269	57572	52716

Pickwick Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	25155	25524	23513	17411	17273	24301	23406	24293	24584
25	30031	31890	28580	19265	22361	28714	28296	30116	29829
50	37216	38757	33922	24513	29736	35699	33592	35439	37520
75	43045	44576	41780	32690	39053	41706	41663	45227	45497
90	54386	57014	53963	43267	52842	53167	53758	58369	57126

Wheeler Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	25355	25956	23328	18212	17611	24675	23376	25153	24257
25	29589	31399	28150	19550	21496	28645	27803	29249	29029
50	36596	38254	33414	23858	28535	34814	32946	35289	36432
75	41628	44521	40185	30743	36896	40815	40210	43151	44322
90	52786	55445	52009	42527	50598	51907	51919	56800	53160

Average Reservoir Releases (cfs) during Weeks 36 through 48 (cont.)

Chickamauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	22562	21846	19588	15914	12785	22209	19388	21578	19176
25	24711	26740	22631	16872	16027	23890	22521	25483	23780
50	30242	32908	27202	19154	20818	29498	27194	29950	29607
75	35610	36756	31451	24688	26128	35090	31296	35789	34902
90	38949	40891	37532	31334	34990	38155	36826	42459	39746

Watts Bar

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	18179	17580	15308	12744	9397	17759	15407	18100	15171
25	20645	22905	18296	13603	12360	20091	18428	21728	19721
50	24956	27789	21919	15381	16511	24711	21935	25301	24291
75	28676	30443	24820	19758	21081	28424	24588	29270	28814
90	32272	34281	29840	24370	27179	32011	29537	35899	33025

Fort Loudoun

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	13530	14237	12663	9014	6703	13410	12740	14431	11536
25	15100	17089	14439	9844	8745	14965	14569	16327	14785
50	17869	20324	17091	11986	12027	17735	17228	18757	18116
75	21278	22970	19608	14892	15577	21095	19428	21903	21342
90	23224	24684	22067	17787	19350	23161	22135	25871	23911

Nickajack Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	22001	22149	19549	16009	12858	21851	19398	21744	19287
25	25130	27154	22659	16985	16142	24406	22721	25564	23787
50	30592	33630	27528	19453	21375	29976	27419	30298	29687
75	36225	37283	32242	25043	26571	35718	32087	37334	35535
90	39875	41456	38850	32047	36127	39257	38232	43529	40897

Tims Ford Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	557	527	751	194	798	557	751	527	559
25	643	592	782	229	949	643	782	592	641
50	737	687	870	319	1105	737	870	681	734
75	913	854	1016	531	1338	929	1016	842	899
90	1212	1196	1346	877	1634	1220	1346	1196	1217

Average Reservoir Releases (cfs) during Weeks 36 through 48 (cont.)

Blue Ridge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	475	306	460	325	173	482	460	218	334
25	536	443	528	397	256	538	529	294	416
50	609	561	605	456	360	609	605	379	503
75	699	666	675	570	461	699	675	460	585
90	839	737	780	694	630	839	779	665	725

Hiwassee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1610	1666	1522	1006	526	1673	1057	1331	1298
25	1797	2075	1838	1209	802	1851	1649	1756	1671
50	2051	2381	2125	1464	1212	2063	2105	2048	1900
75	2379	2624	2415	1885	1701	2384	2357	2383	2202
90	2701	2891	2903	2397	2259	2701	2917	2961	2611

Nottely Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	326	325	292	210	162	339	203	244	253
25	376	412	363	248	203	379	330	367	326
50	430	498	429	306	265	433	418	428	389
75	511	562	483	391	326	512	469	496	439
90	578	617	599	512	457	578	599	632	550

Chatuge Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	311	355	322	258	143	311	252	223	235
25	348	418	378	293	190	352	357	309	309
50	413	502	447	357	284	417	435	370	386
75	475	545	506	424	343	477	485	430	436
90	540	598	654	558	504	540	654	617	573

Norris Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	3229	2627	1614	1910	1307	3259	1695	2918	1670
25	3511	3817	2173	2041	1307	3521	1949	3670	2781
50	4117	4545	2603	2365	1703	4091	2455	4182	3647
75	4744	5334	3028	3196	3290	4717	2955	4839	4184
90	5622	5992	4002	3966	4456	5644	3989	5973	5278

Average Reservoir Releases (cfs) during Weeks 36 through 48 (cont.)

Fontana Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	3375	3834	2941	2316	1360	3300	2940	3252	2657
25	3827	4311	3317	2650	1851	3831	3334	3705	3414
50	4433	4837	3930	3174	2616	4442	3933	4375	4250
75	4883	5175	4795	4210	4251	4906	4797	5194	4885
90	5650	5898	5600	5072	4969	5650	5613	5967	5684

Douglas Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	4731	4569	4597	2094	1640	4893	4560	4630	4341
25	5369	5976	5470	3284	2503	5490	5475	5793	5509
50	6473	7163	6327	4259	3910	6450	6320	6665	6644
75	7699	8219	7445	5690	5357	7664	7444	8025	7973
90	8829	9426	9118	7024	6977	8829	9128	10240	9201

Cherokee Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	3687	3927	3481	2089	1588	3691	3516	4552	3040
25	4056	5066	3996	2512	2144	4056	4071	5171	3974
50	4667	5980	4363	2943	2685	4728	4458	5878	4669
75	5587	6994	4814	3500	3564	5633	4846	6475	5834
90	6954	7772	5886	4205	4800	6935	5726	7992	6498

South Holston Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	713	588	382	506	417	717	353	481	604
25	829	800	451	586	484	825	459	621	746
50	981	999	524	691	571	981	538	804	935
75	1216	1168	635	884	652	1224	644	996	1120
90	1461	1357	882	1064	861	1461	945	1227	1265

Watauga Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	318	347	286	321	301	338	399	304	202
25	377	499	328	420	366	403	399	338	294
50	544	612	392	482	441	564	406	451	429
75	734	770	518	588	526	746	499	605	589
90	927	912	677	865	648	927	659	754	725

Average Reservoir Releases (cfs) during Weeks 36 through 48 (cont.)

Great Falls Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	317	317	317	216	317	317	317	317	319
25	504	504	504	402	504	504	504	504	504
50	935	935	935	834	935	935	935	935	935
75	1577	1577	1577	1485	1577	1577	1577	1577	1577
90	2529	2529	2529	2427	2529	2529	2529	2529	2502

Ocoee #1 Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	721	606	694	646	477	732	694	506	592
25	864	791	861	742	575	855	860	631	744
50	1039	1001	1050	886	799	1039	1050	806	952
75	1232	1204	1216	1079	984	1232	1217	983	1108
90	1531	1368	1478	1354	1288	1531	1478	1341	1393

Boone Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1606	1510	1349	1378	1245	1645	1425	1409	1469
25	1758	1865	1412	1465	1325	1796	1505	1554	1622
50	2252	2251	1640	1586	1429	2261	1693	1901	2030
75	2778	2684	1965	1843	1742	2806	1983	2404	2499
90	3215	3197	2658	2331	2327	3236	2649	3023	2950

Ocoee #2 Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	707	571	696	580	437	722	696	471	580
25	806	761	789	701	529	819	797	572	692
50	973	935	975	802	718	973	975	738	876
75	1181	1099	1130	1021	921	1181	1130	934	1064
90	1489	1339	1363	1270	1169	1489	1363	1230	1279

Melton Hill Reservoir

Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	3321	2676	1762	2058	1382	3350	1777	2937	1878
25	3622	4021	2383	2204	1505	3629	2149	3842	2920
50	4445	4889	2791	2720	1876	4409	2632	4361	3967
75	4965	5612	3376	3629	3568	4994	3250	5248	4563
90	6096	6659	4716	4172	5220	6199	4558	6682	5711

Average Reservoir Releases (cfs) during Weeks 36 through 48 (cont.)

Ocoee #3 Reservoir

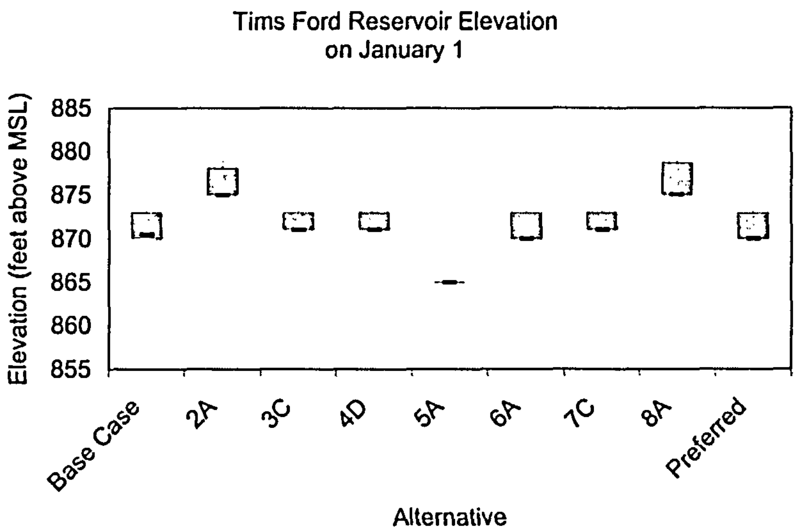
Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	675	511	639	552	391	703	638	429	534
25	768	680	756	636	466	759	756	517	644
50	891	831	889	755	635	892	889	650	761
75	1089	1017	1044	907	824	1089	1044	832	963
90	1339	1207	1286	1203	1111	1339	1289	1154	1233

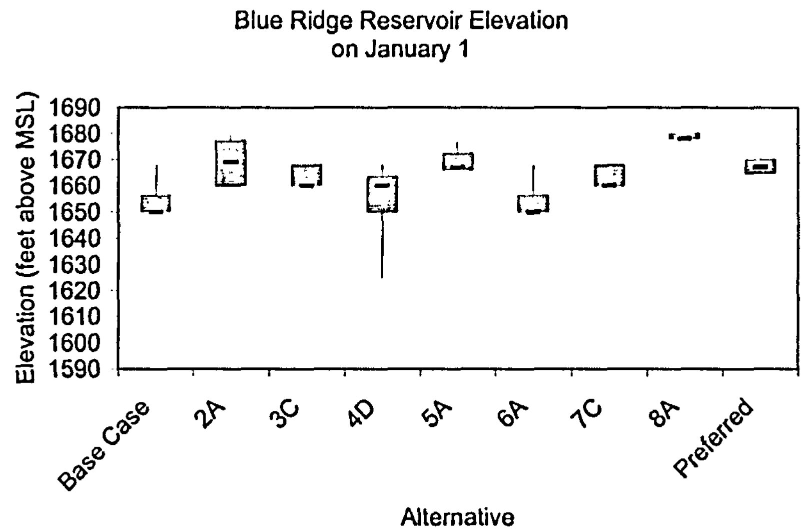
Apalachia Reservoir

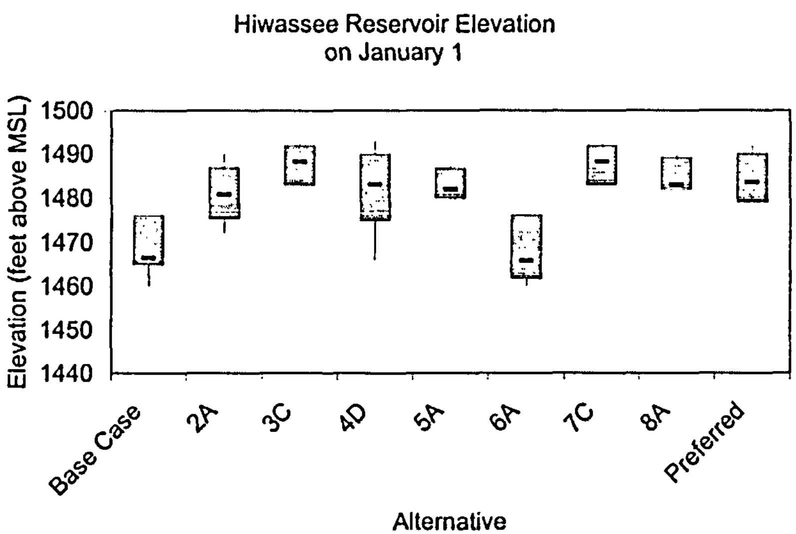
Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1638	1692	1559	1039	548	1700	1090	1366	1324
25	1831	2115	1874	1242	835	1886	1688	1783	1703
50	2093	2418	2167	1491	1238	2110	2160	2088	1937
75	2445	2681	2475	1942	1756	2445	2419	2440	2258
90	2760	2968	2985	2455	2344	2760	3000	3044	2697

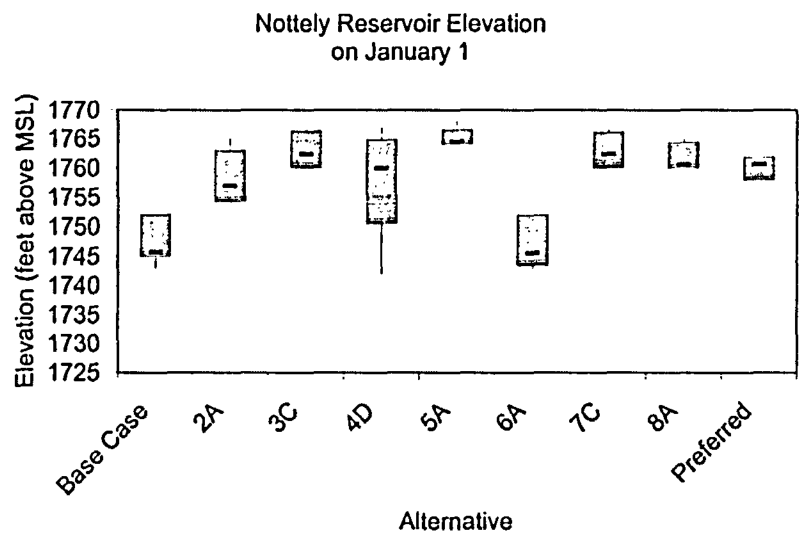
Fort Patrick Henry Reservoir

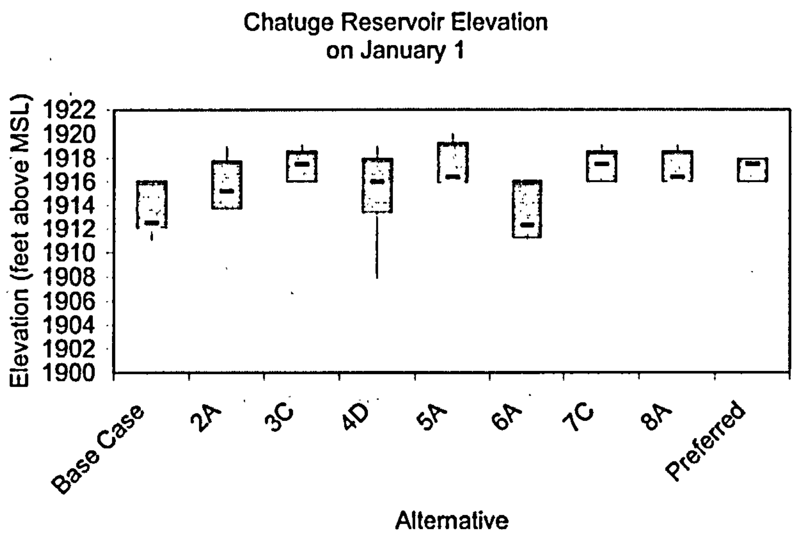
Percentile	Base	2A	3C	4D	5A	6A	7C	8A	Preferred
10	1476	1377	1210	1254	1132	1500	1286	1264	1325
25	1641	1753	1298	1360	1199	1667	1363	1424	1512
50	2153	2139	1521	1479	1314	2147	1593	1786	1905
75	2667	2580	1903	1729	1644	2687	1881	2286	2416
90	3147	3189	2679	2276	2447	3177	2590	3017	2974

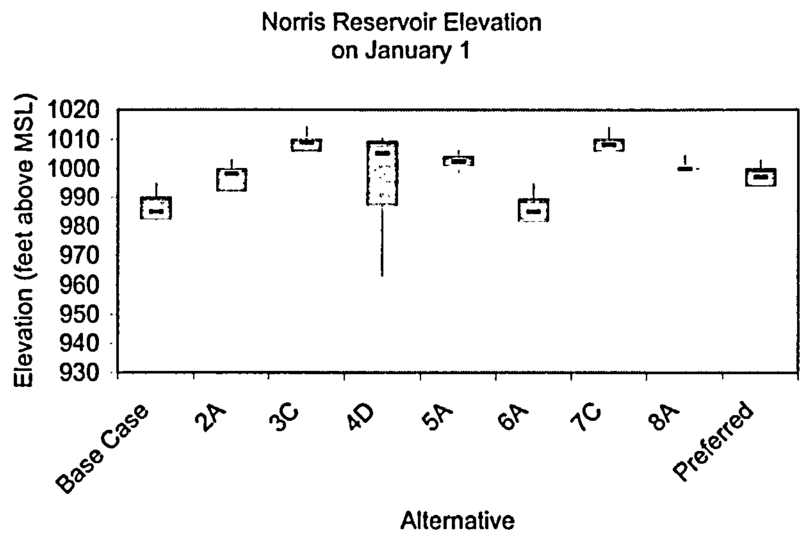

Tims Ford Reservoir Elevation
on January 1
Elevation (feet above MSL)
885
880
875
870
865
860
855
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

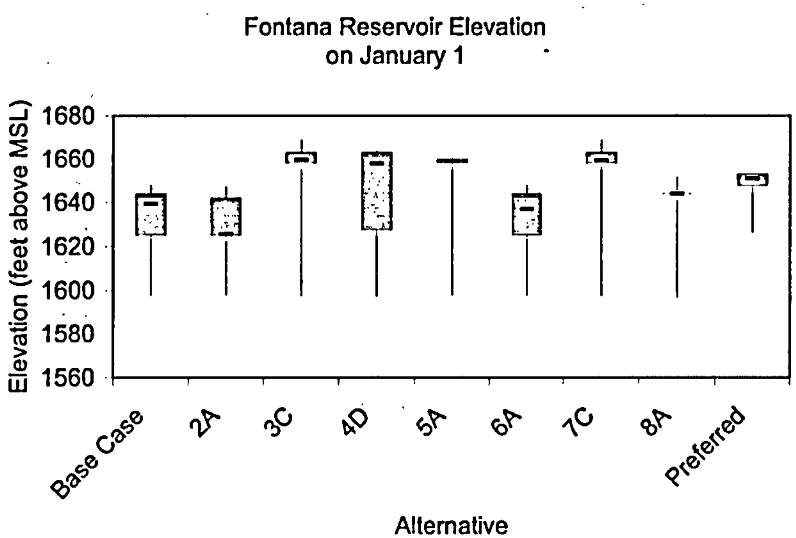

Blue Ridge Reservoir Elevation
on January 1
Elevation (feet above MSL)
1690
1680
1670
1660
1650
1640
1630
1620
1610
1600
1590
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

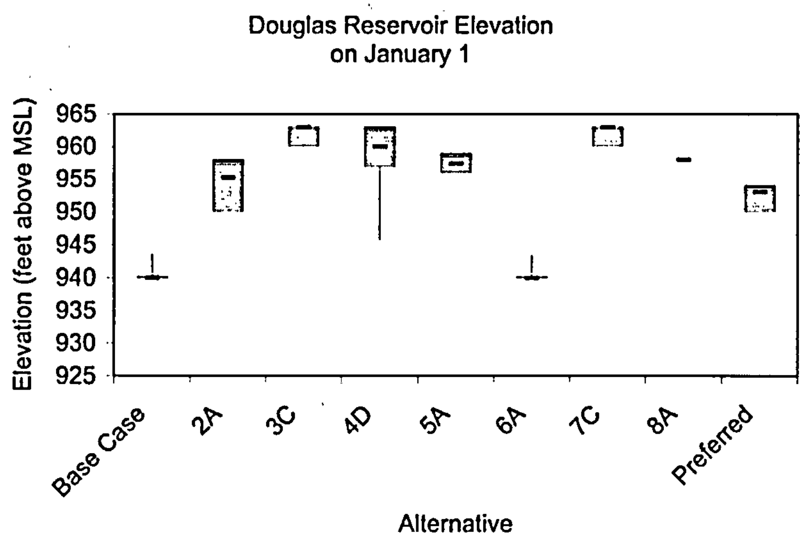

Hiwassee Reservoir Elevation
on January 1
Elevation (feet above MSL)
1500
1490
1480
1470
1460
1450
1440
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Nottely Reservoir Elevation
on January 1
Elevation (feet above MSL)
1770
1765
1760
1755
1750
1745
1740
1735
1730
1725
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

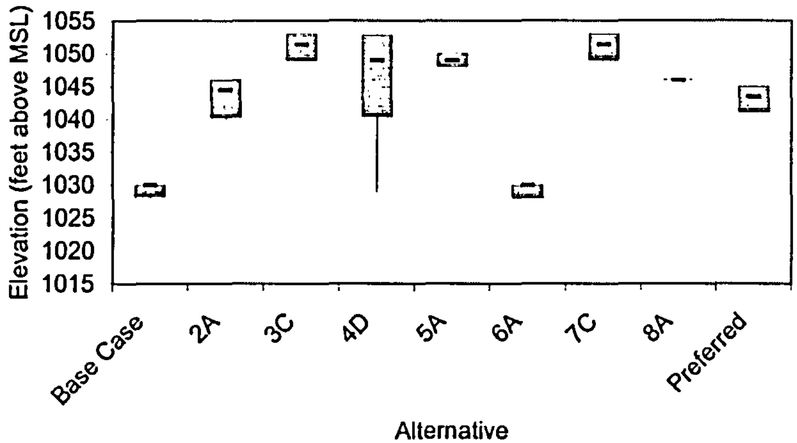

Chatuge Reservoir Elevation
on January 1
Elevation (feet above MSL)
1922
1920
1918
1916
1914
1912
1910
1908
1906
1904
1902
1900
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Norris Reservoir Elevation
on January 1
Elevation (feet above MSL)
1020
1010
1000
990
980
970
960
950
940
930
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

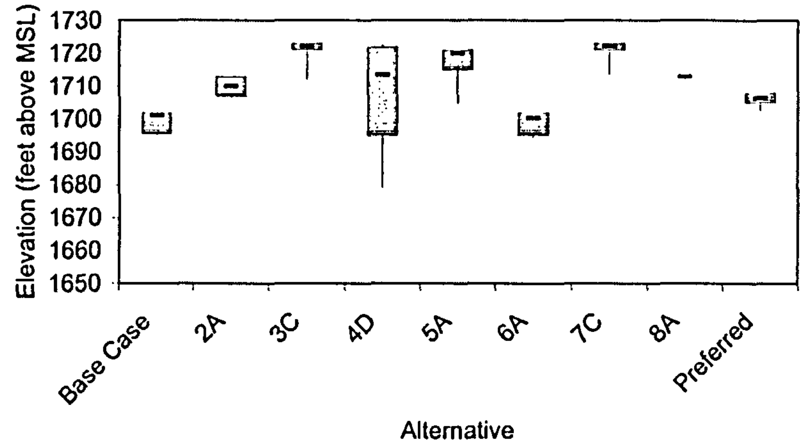

Fontana Reservoir Elevation
on January 1
Elevation (feet above MSL)
1680
1660
1640
1620
1600
1580
1560
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Douglas Reservoir Elevation
on January 1
Elevation (feet above MSL)
965
960
955
950
945
940
935
930
925
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

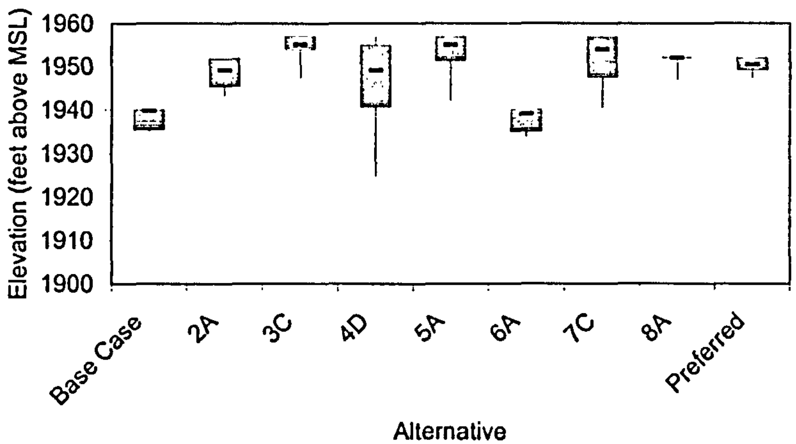
Cherokee Reservoir Elevation
on January 1

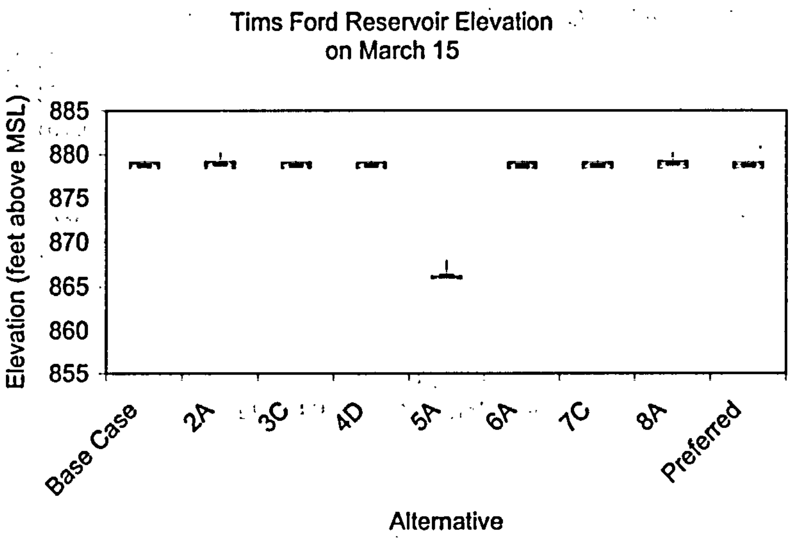


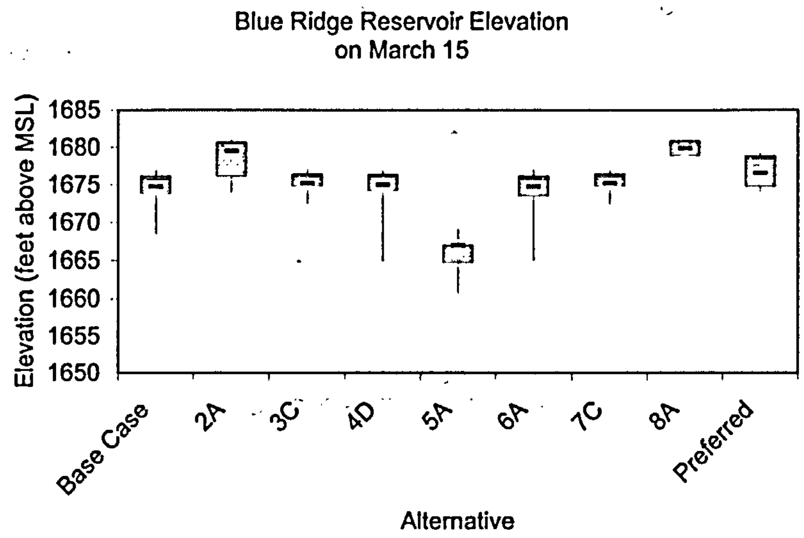
South Holston Reservoir Elevation
on January 1

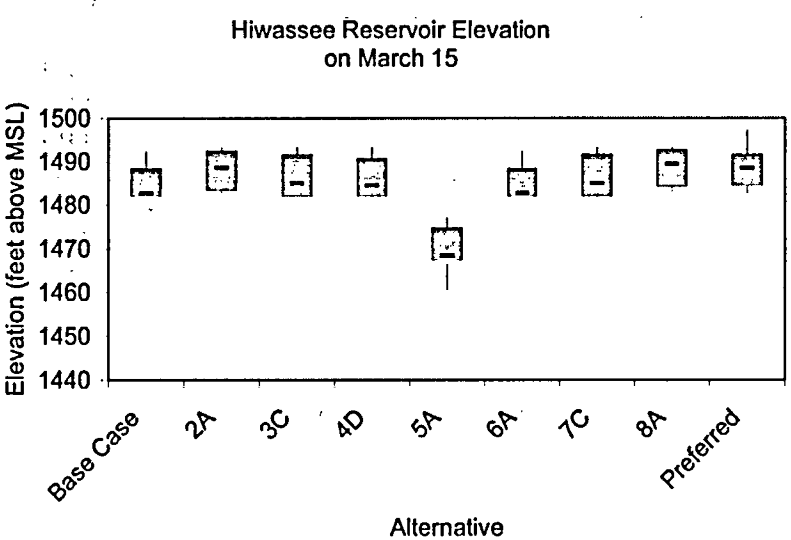


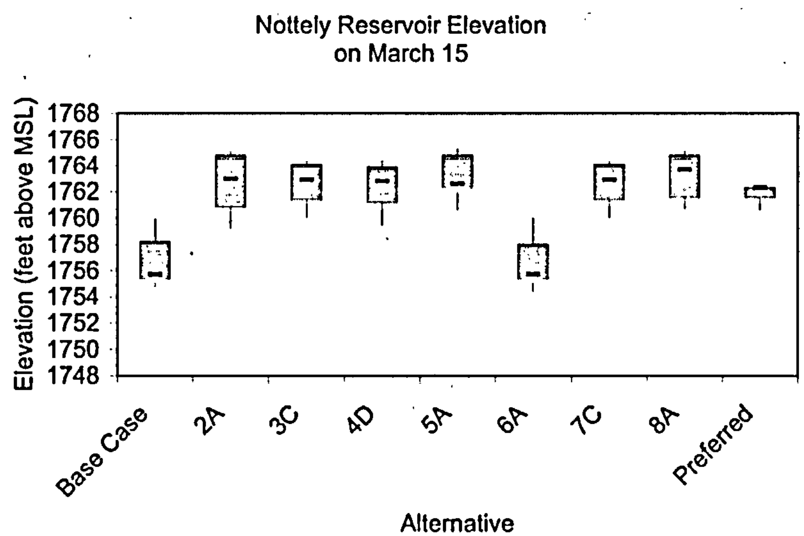
Watauga Reservoir Elevation
on January 1

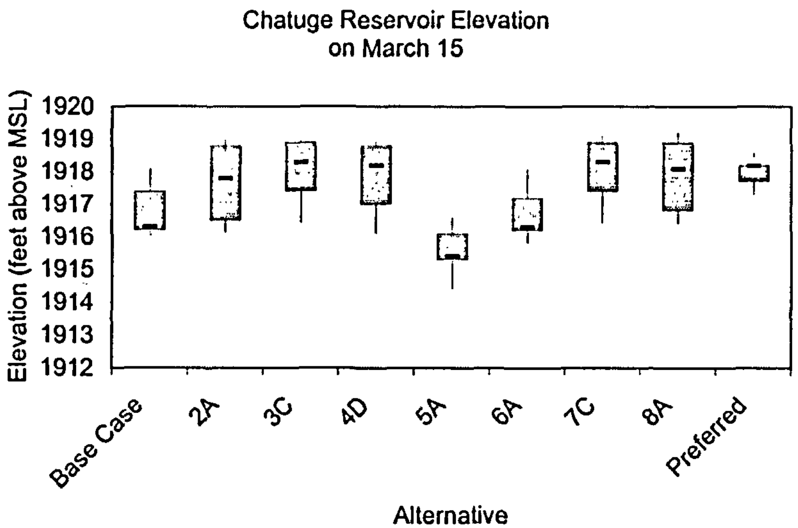


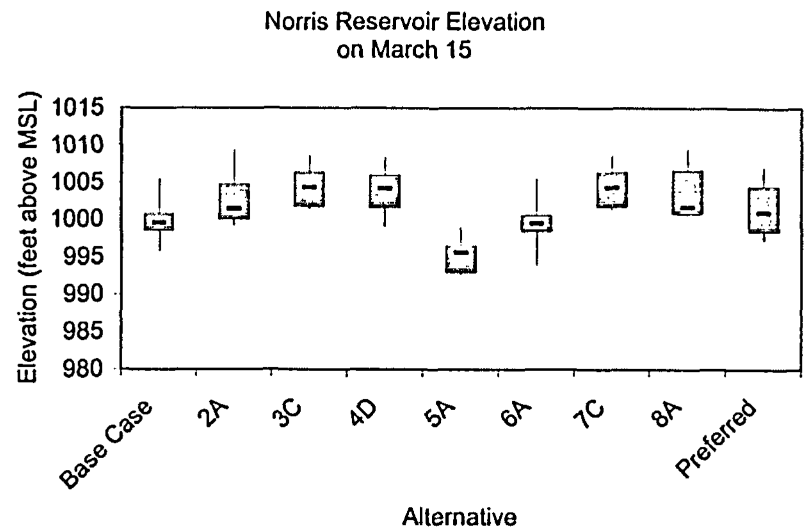

Tims Ford Reservoir Elevation
on March 15
Elevation (feet above MSL)
885
880
875
870
865
860
855
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

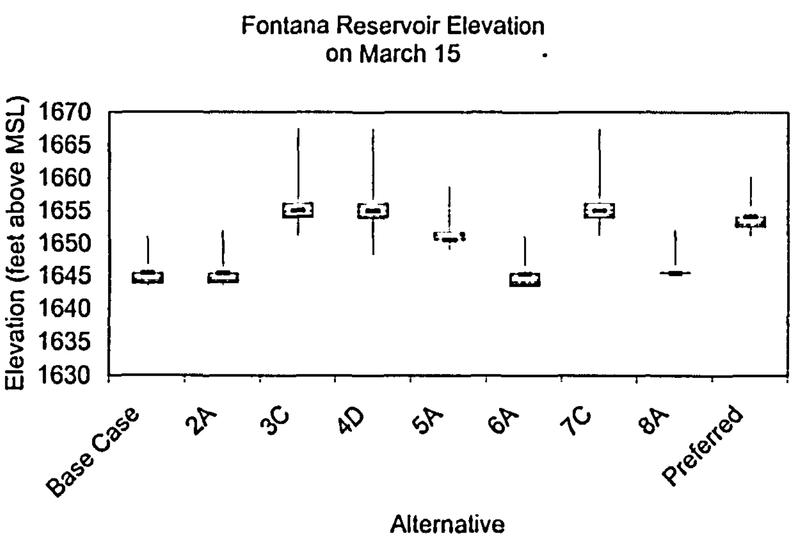

Blue Ridge Reservoir Elevation
on March 15
Elevation (feet above MSL)
1685
1680
1675
1670
1665
1660
1655
1650
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

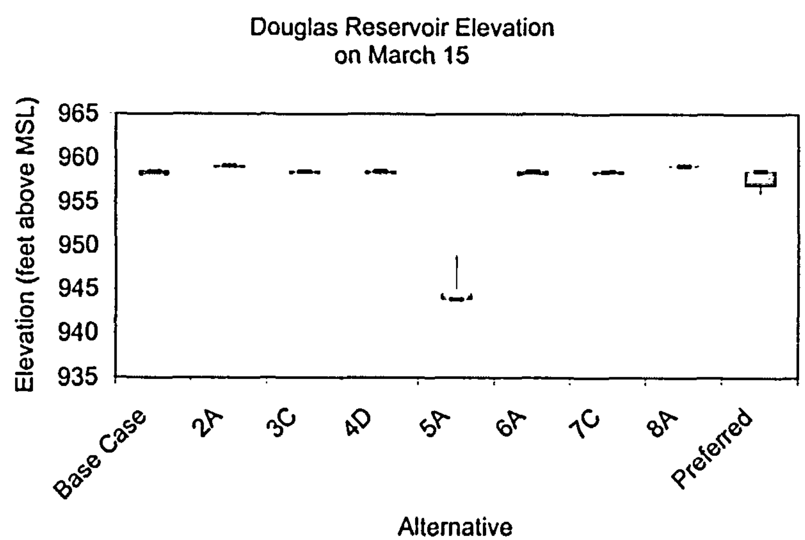

Hiwassee Reservoir Elevation
on March 15
Elevation (feet above MSL)
1500
1490
1480
1470
1460
1450
1440
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

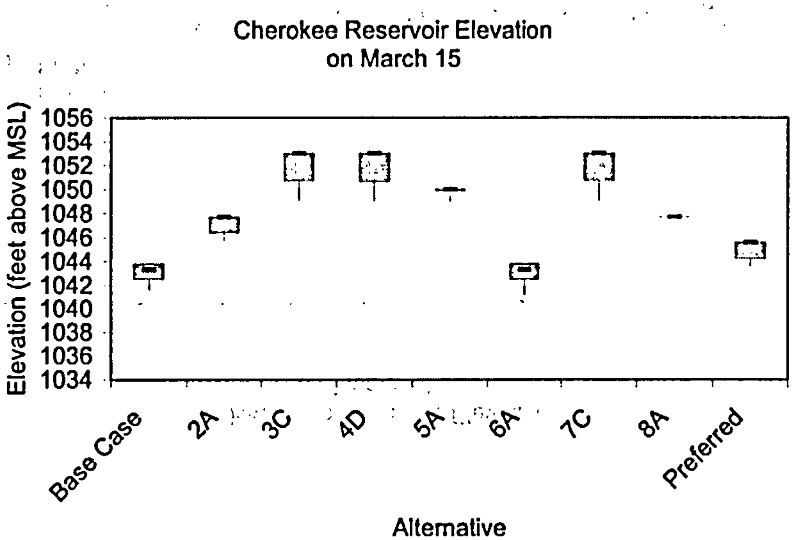

Nottely Reservoir Elevation
on March 15
Elevation (feet above MSL)
1768
1766
1764
1762
1760
1758
1756
1754
1752
1750
1748
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

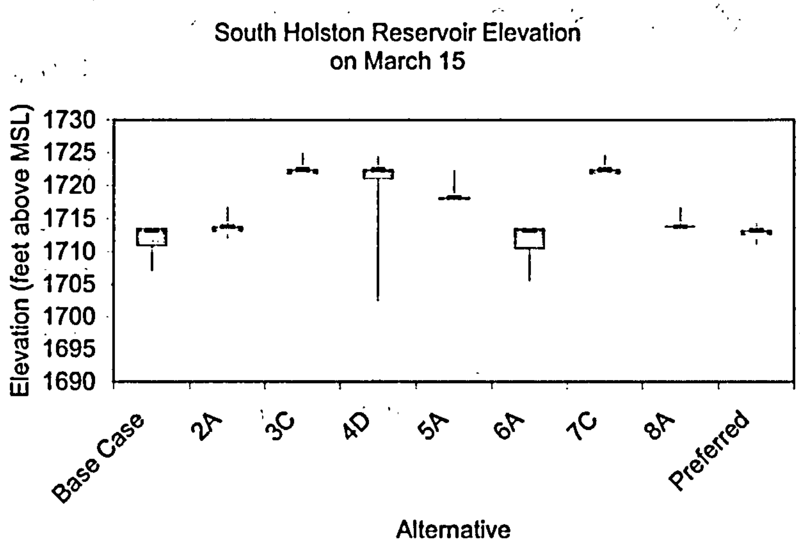

Chatuge Reservoir Elevation
on March 15
Elevation (feet above MSL)
1920
1919
1918
1917
1916
1915
1914
1913
1912
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

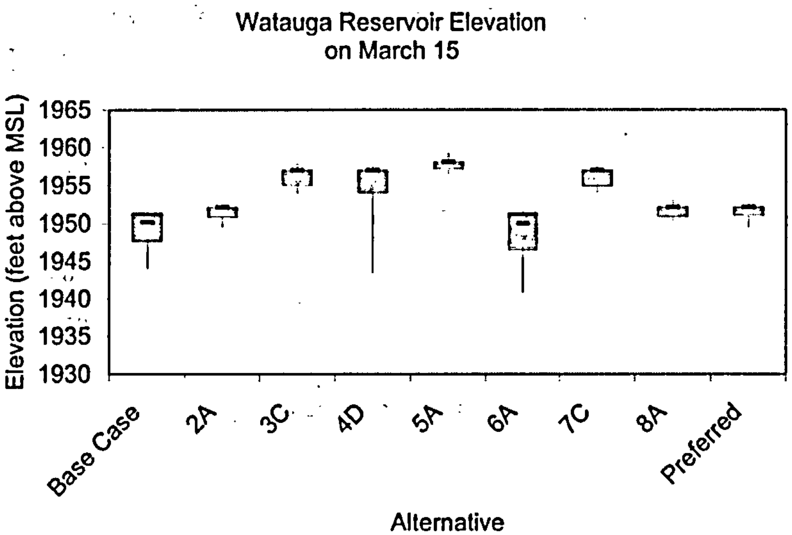

Norris Reservoir Elevation
on March 15
Elevation (feet above MSL)
1015
1010
1005
1000
995
990
985
980
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

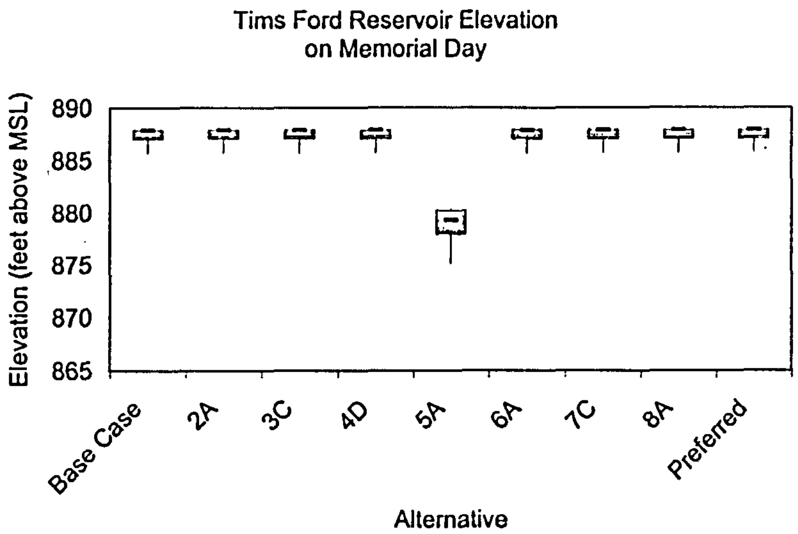

Fontana Reservoir Elevation
on March 15
Elevation (feet above MSL)
1670
1665
1660
1655
1650
1645
1640
1635
1630
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

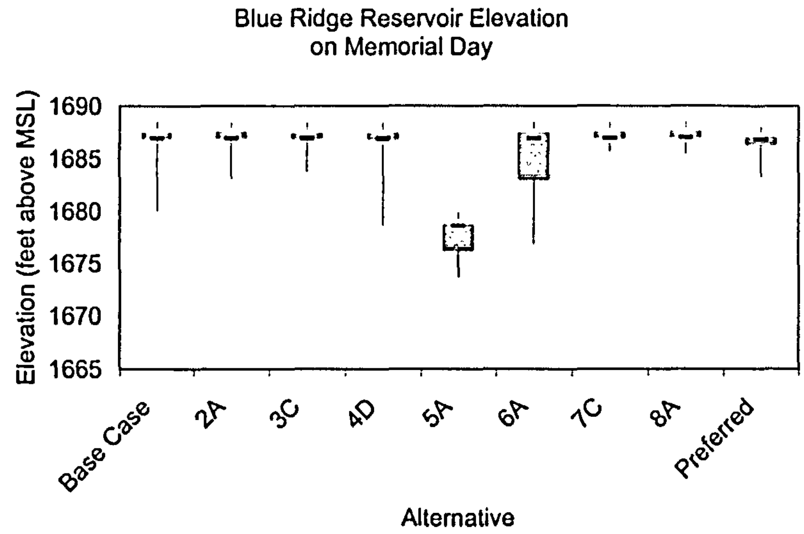

Douglas Reservoir Elevation
on March 15
Elevation (feet above MSL)
965
960
955
950
945
940
935
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

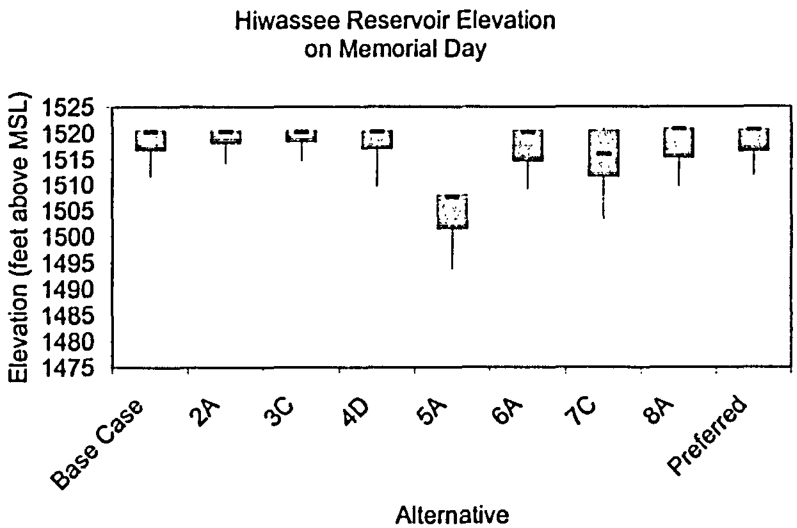

Cherokee Reservoir Elevation
on March 15
Elevation (feet above MSL)
1056
1054
1052
1050
1048
1046
1044
1042
1040
1038
1036
1034
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

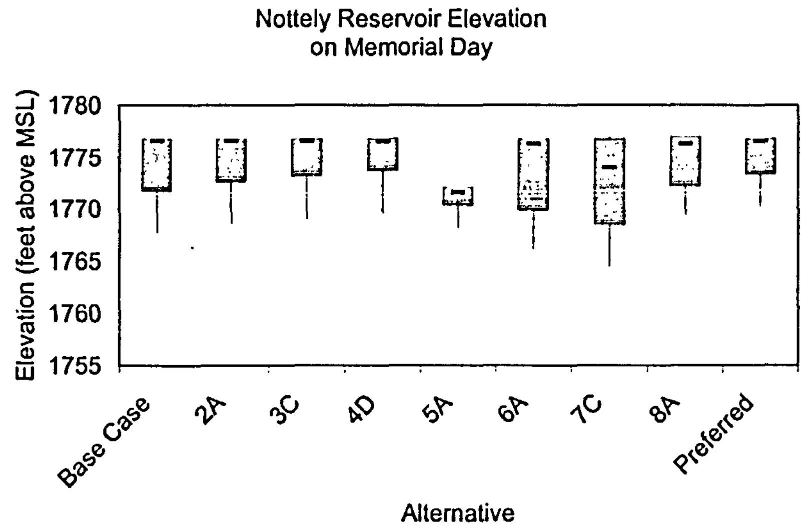

South Holston Reservoir Elevation
on March 15
Elevation (feet above MSL)
1730
1725
1720
1715
1710
1705
1700
1695
1690
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

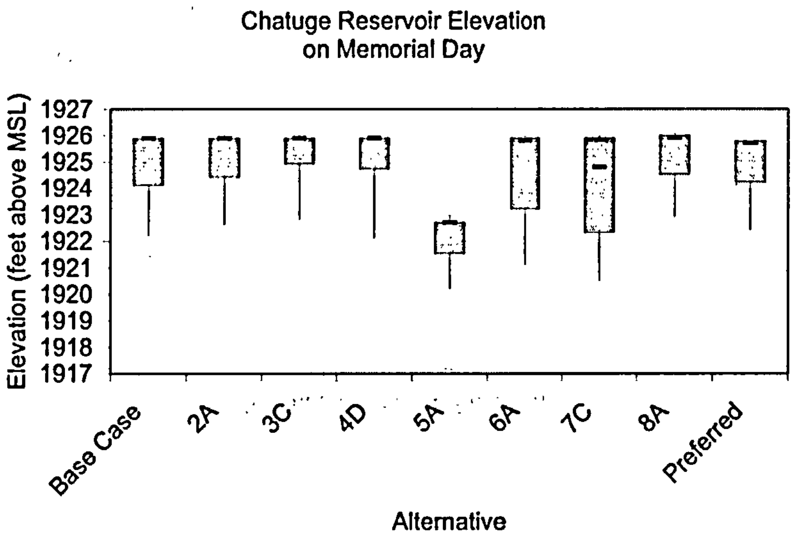

Watauga Reservoir Elevation
on March 15
Elevation (feet above MSL)
1965
1960
1955
1950
1945
1940
1935
1930
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

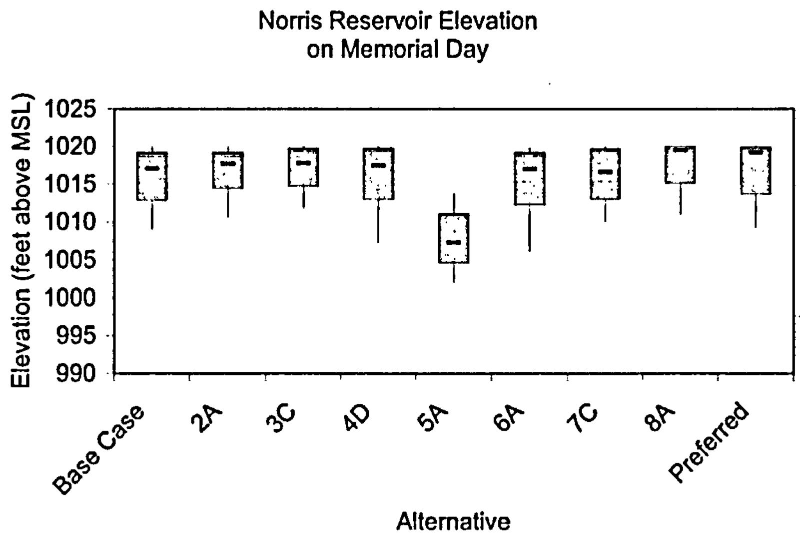

Tims Ford Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
890
885
880
875
870
865
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

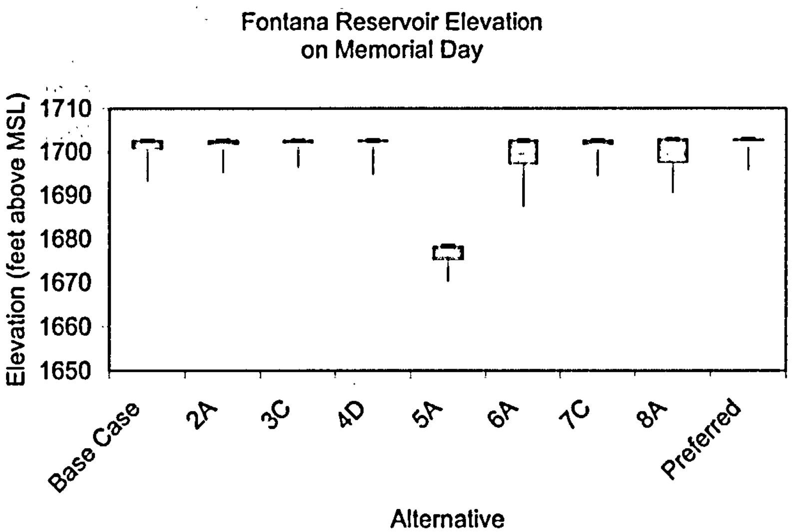

Blue Ridge Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1690
1685
1680
1675
1670
1665
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

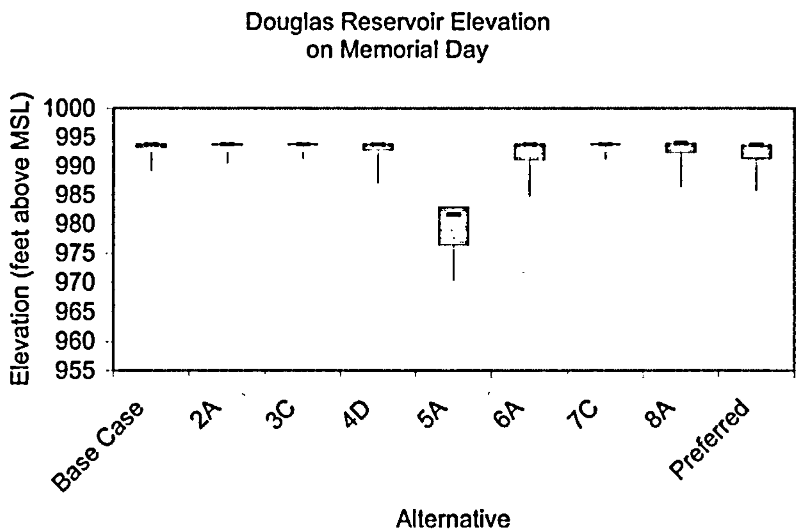

Hiwassee Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1525
1520
1515
1510
1505
1500
1495
1490
1485
1480
1475
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

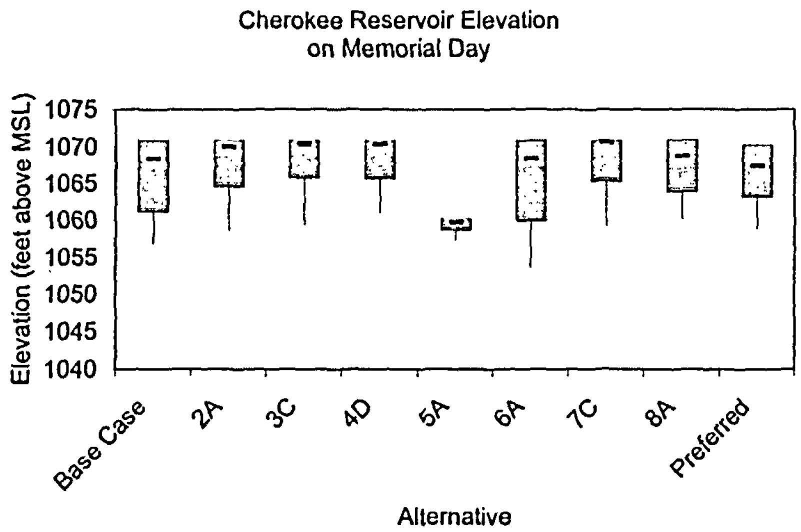

Nottely Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1780
1775
1770
1765
1760
1755
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

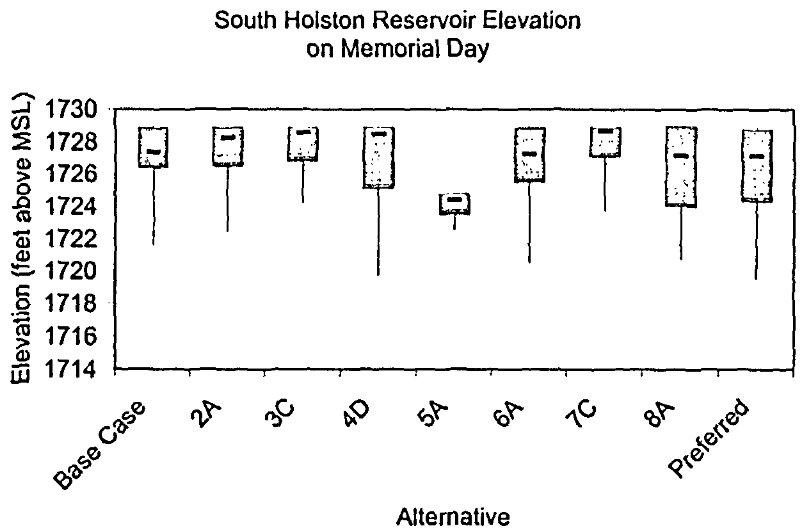

Chatuge Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1927
1926
1925
1924
1923
1922
1921
1920
1919
1918
1917
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

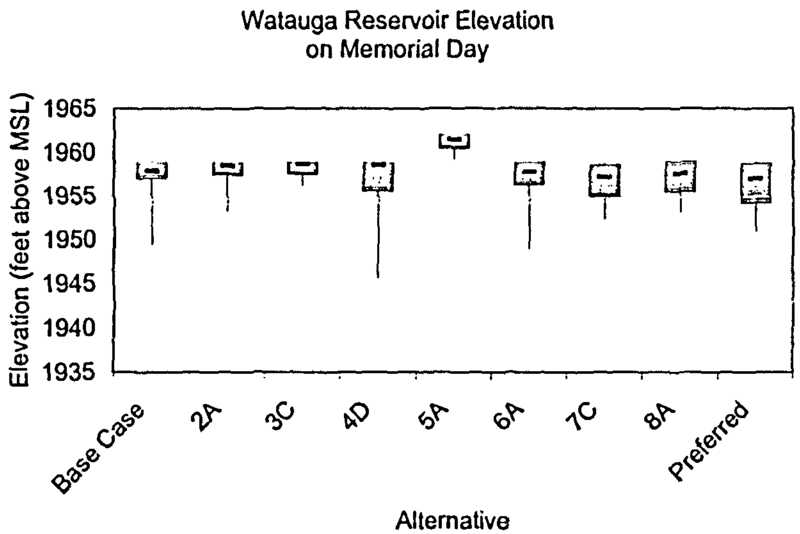

Norris Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1025
1020
1015
1010
1005
1000
995
990
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Fontana Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1710
1700
1690
1680
1670
1660
1650
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

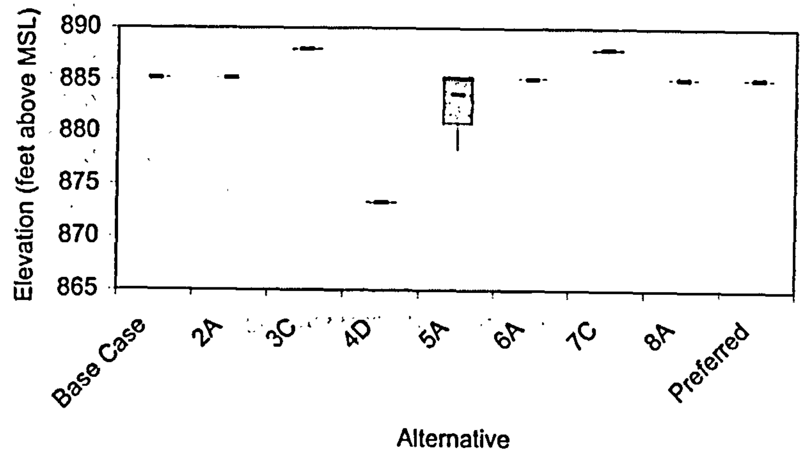

Douglas Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1000
995
990
985
980
975
970
965
960
955
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Cherokee Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1075
1070
1065
1060
1055
1050
1045
1040
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

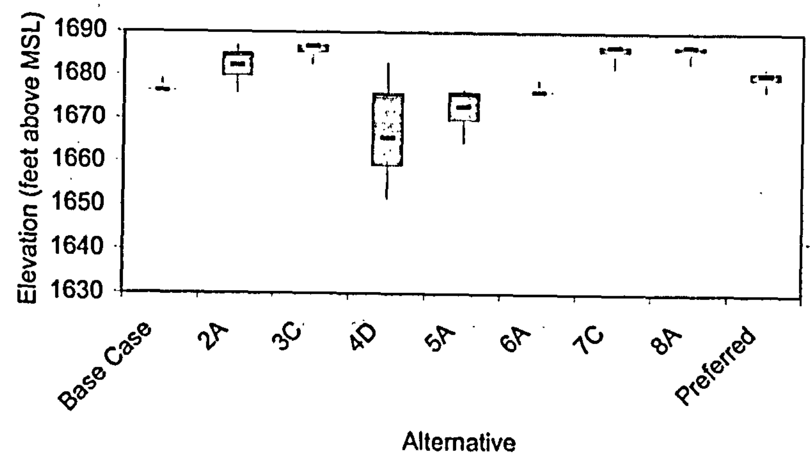

South Holston Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1730
1728
1726
1724
1722
1720
1718
1716
1714
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Watauga Reservoir Elevation
on Memorial Day
Elevation (feet above MSL)
1965
1960
1955
1950
1945
1940
1935
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

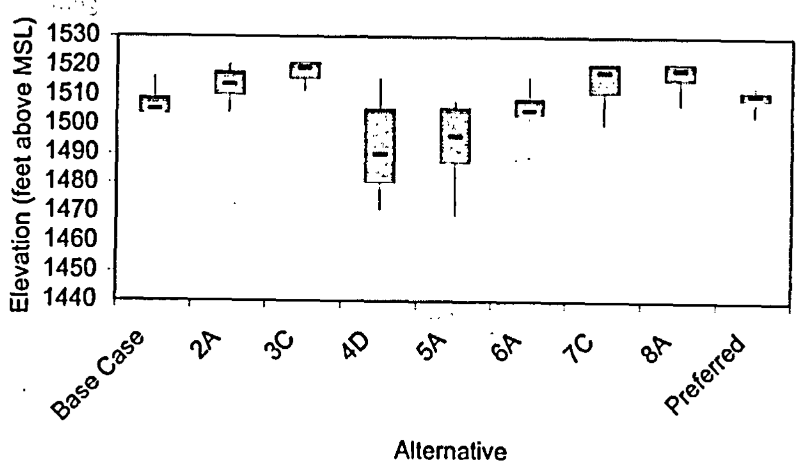
Tims Ford Reservoir Elevation on Labor Day



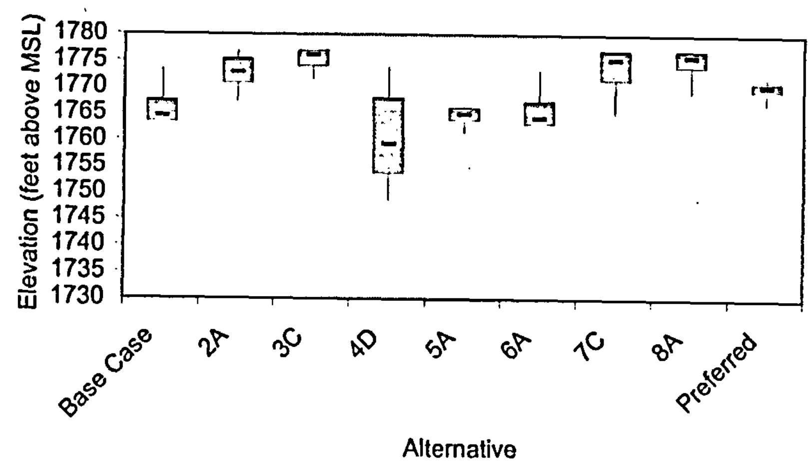
Blue Ridge Reservoir Elevation on Labor Day

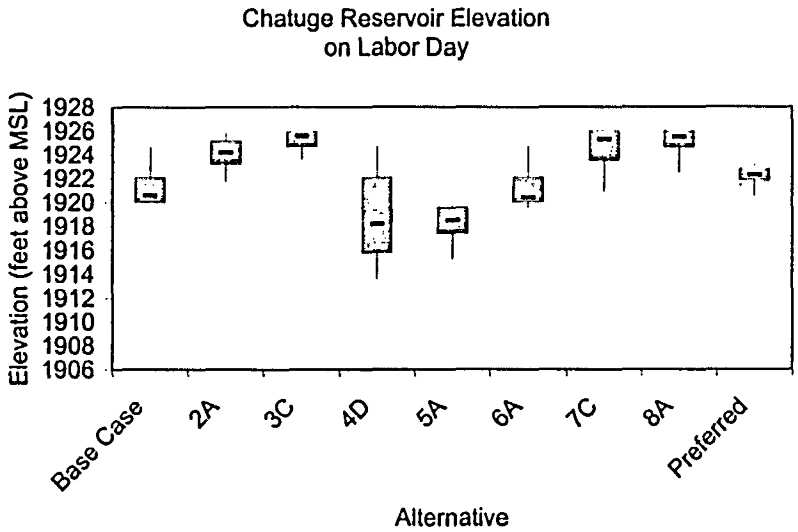


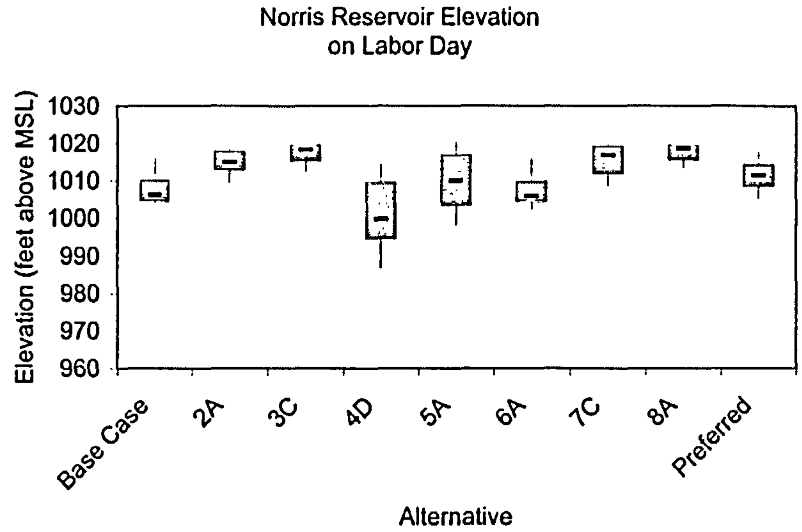
Hiwassee Reservoir Elevation on Labor Day

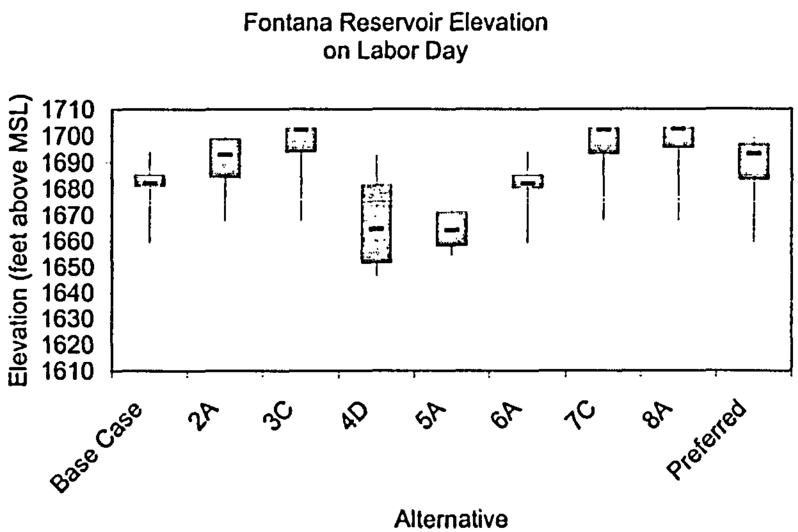


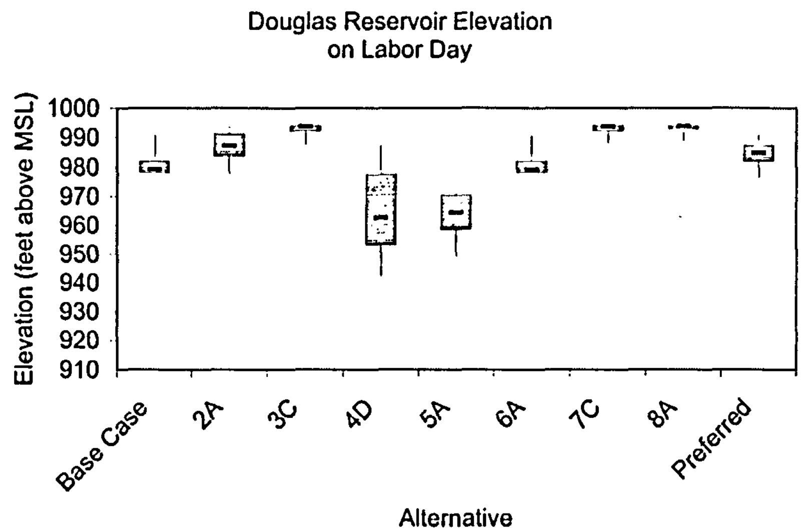
Nottely Reservoir Elevation on Labor Day

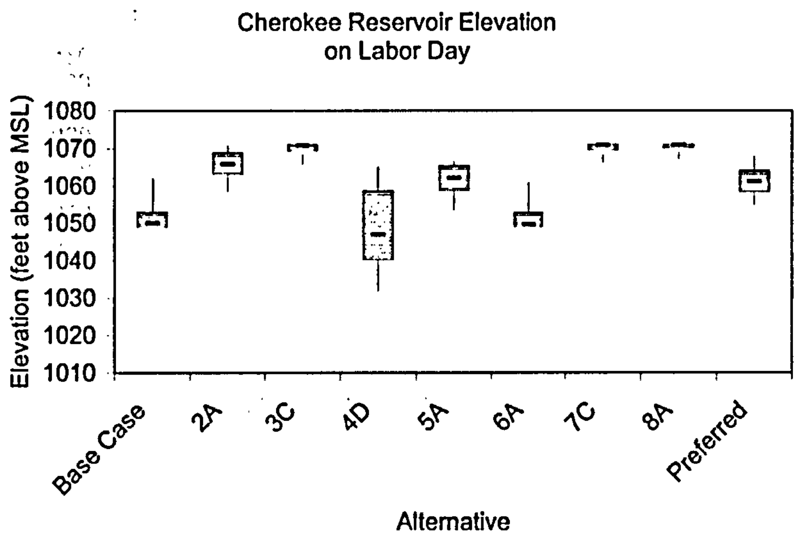


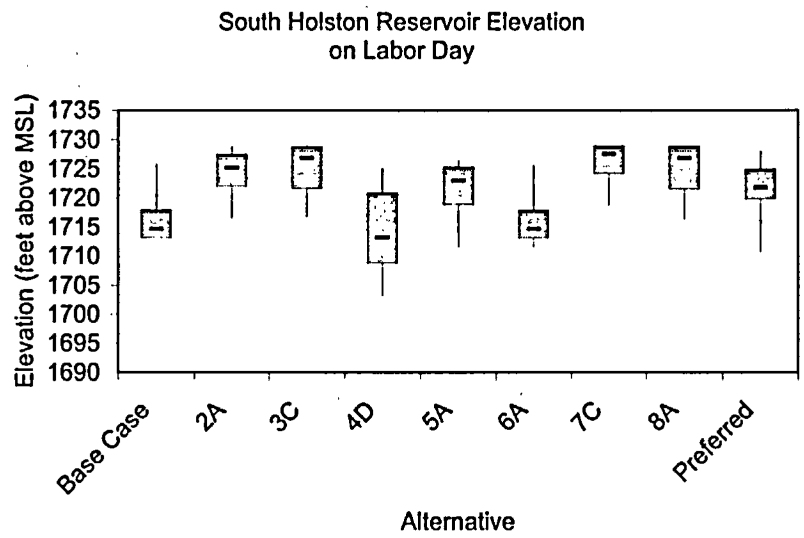

Chatuge Reservoir Elevation
on Labor Day
Elevation (feet above MSL)
1928
1926
1924
1922
1920
1918
1916
1914
1912
1910
1908
1906
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

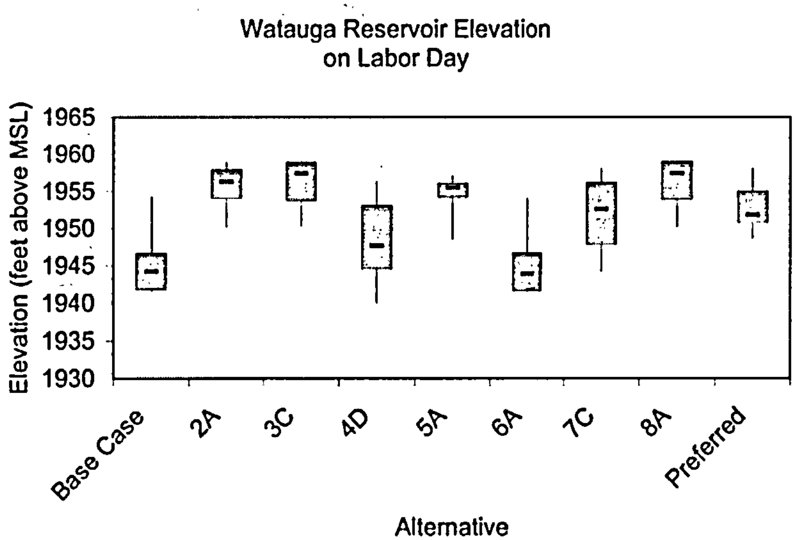

Norris Reservoir Elevation
on Labor Day
Elevation (feet above MSL)
1030
1020
1010
1000
990
980
970
960
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

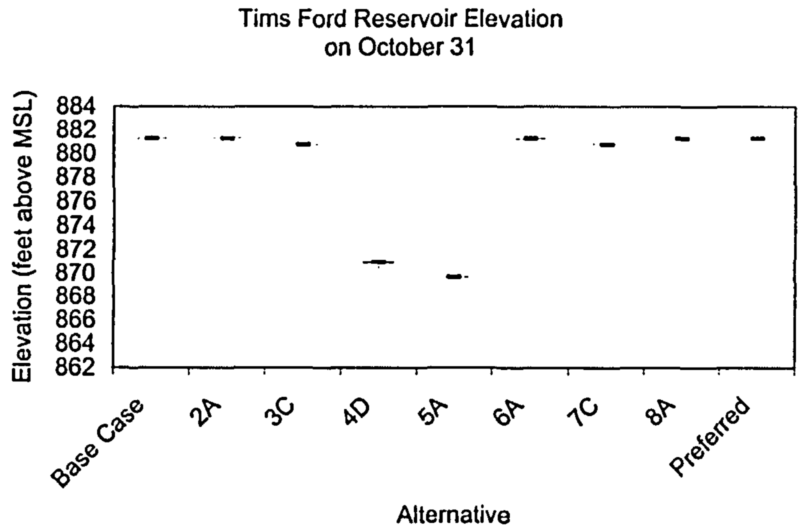

Fontana Reservoir Elevation
on Labor Day
Elevation (feet above MSL)
1710
1700
1690
1680
1670
1660
1650
1640
1630
1620
1610
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Douglas Reservoir Elevation
on Labor Day
Elevation (feet above MSL)
1000
990
980
970
960
950
940
930
920
910
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

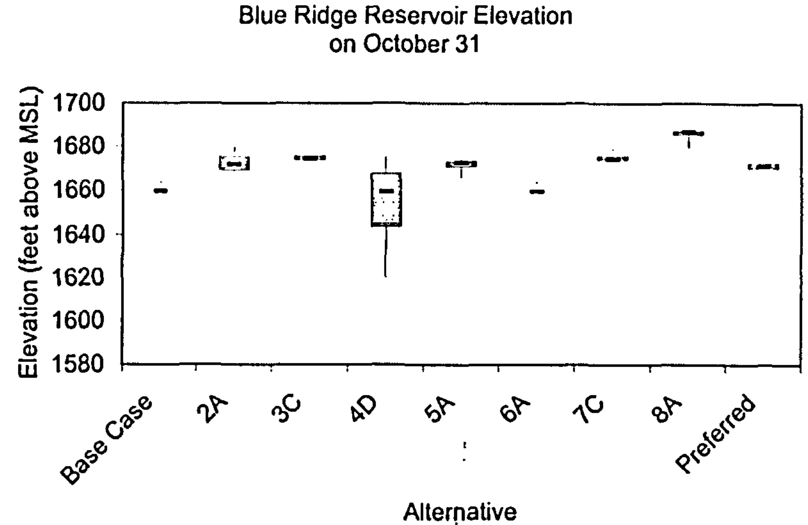

Cherokee Reservoir Elevation
on Labor Day
Elevation (feet above MSL)
1080
1070
1060
1050
1040
1030
1020
1010
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


South Holston Reservoir Elevation
on Labor Day
Elevation (feet above MSL)
1735
1730
1725
1720
1715
1710
1705
1700
1695
1690
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

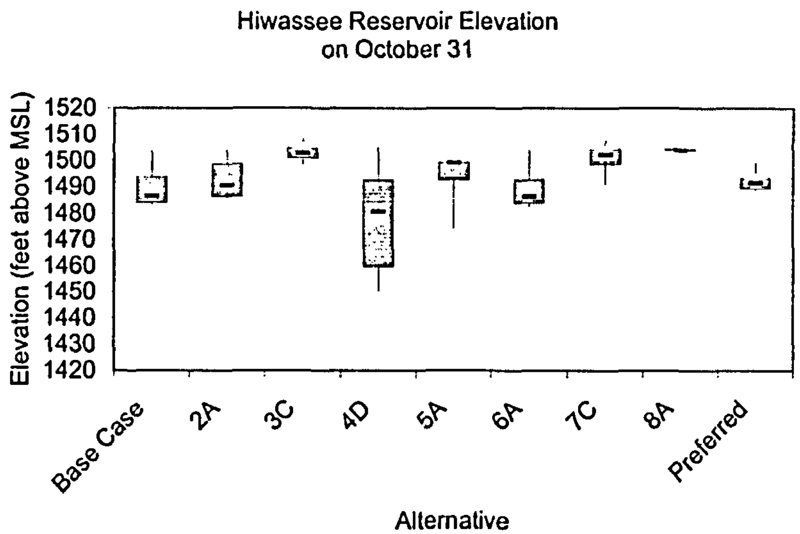

Watauga Reservoir Elevation
on Labor Day
Elevation (feet above MSL)
1965
1960
1955
1950
1945
1940
1935
1930
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative



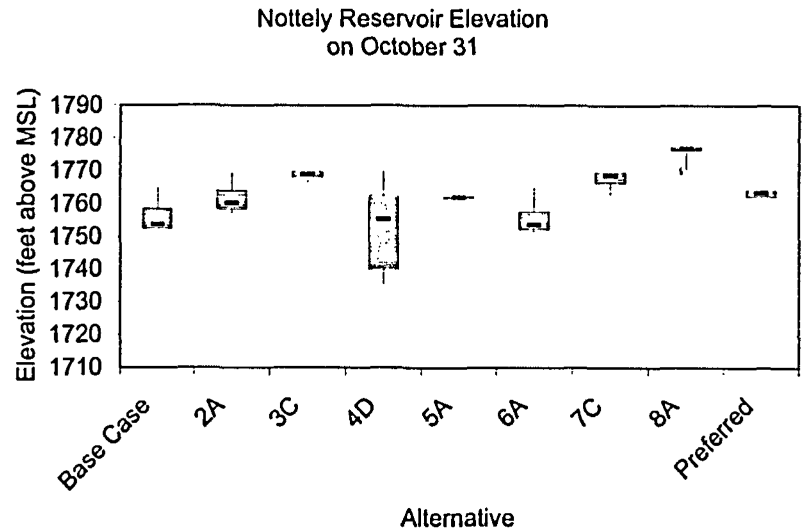
Tims Ford Reservoir Elevation
on October 31
Elevation (feet above MSL)
884
882
880
878
876
874
872
870
868
866
864
862
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative



Blue Ridge Reservoir Elevation
on October 31
Elevation (feet above MSL)
1700
1680
1660
1640
1620
1600
1580
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

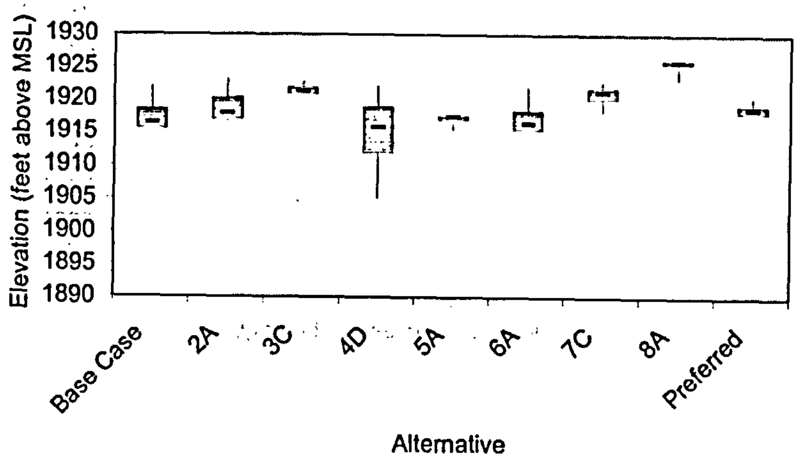


Hiwassee Reservoir Elevation
on October 31
Elevation (feet above MSL)
1520
1510
1500
1490
1480
1470
1460
1450
1440
1430
1420
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

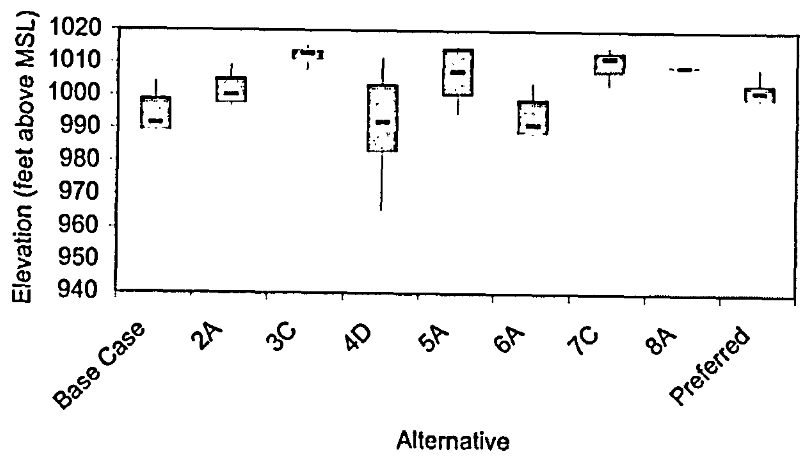


Nottely Reservoir Elevation
on October 31
Elevation (feet above MSL)
1790
1780
1770
1760
1750
1740
1730
1720
1710
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

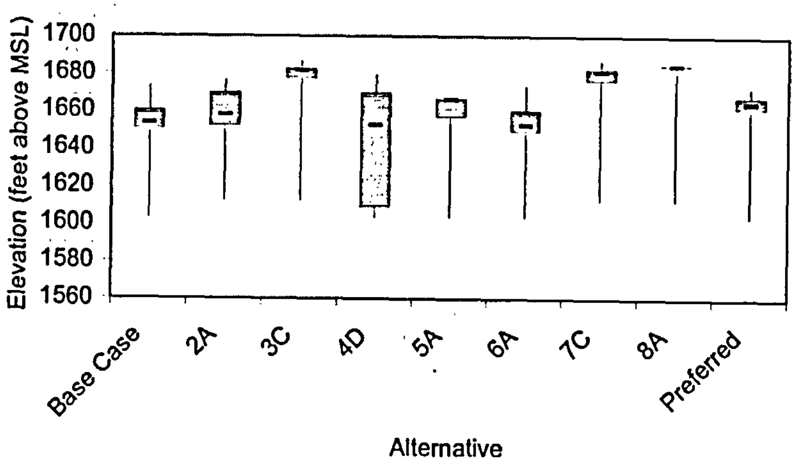
Chatuge Reservoir Elevation on October 31



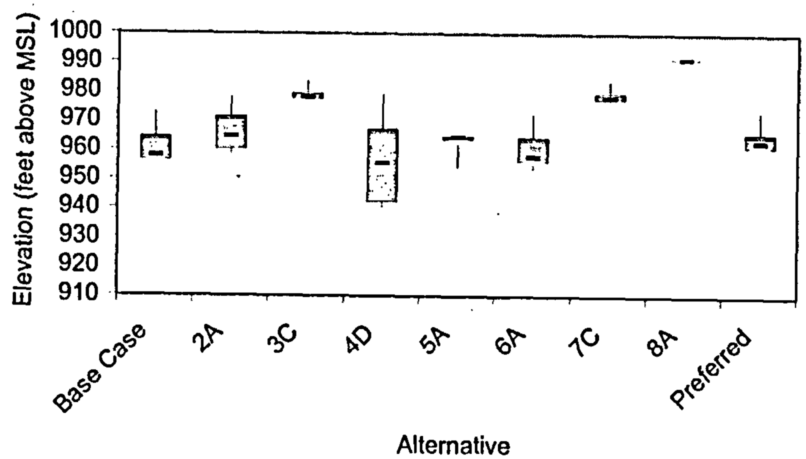
Norris Reservoir Elevation on October 31

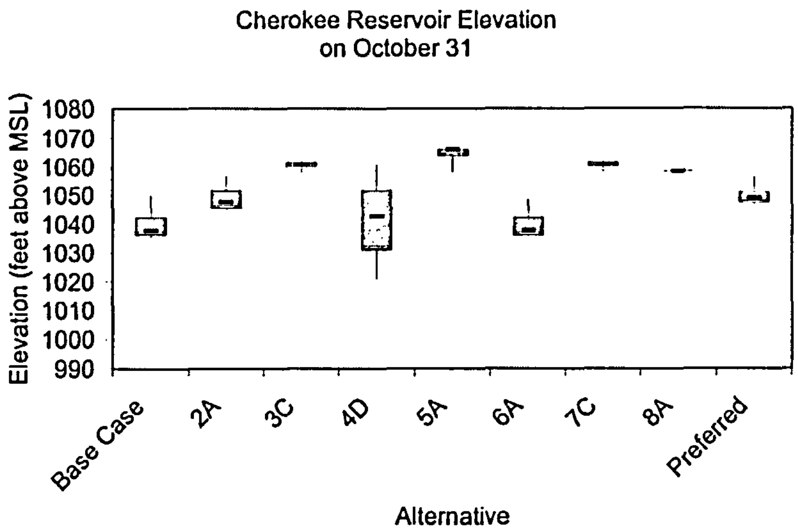


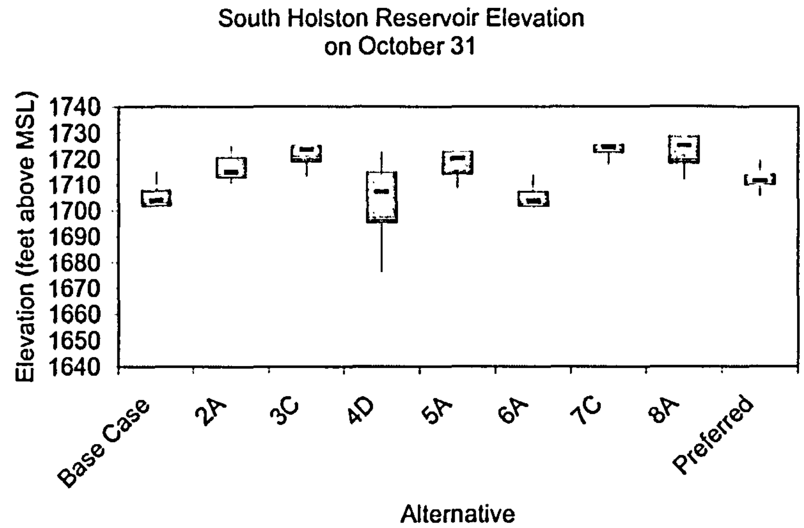
Fontana Reservoir Elevation on October 31

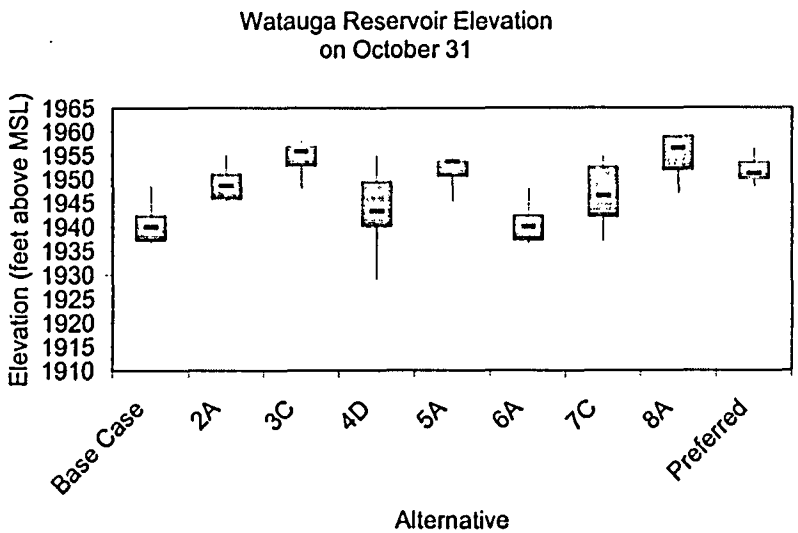


Douglas Reservoir Elevation on October 31

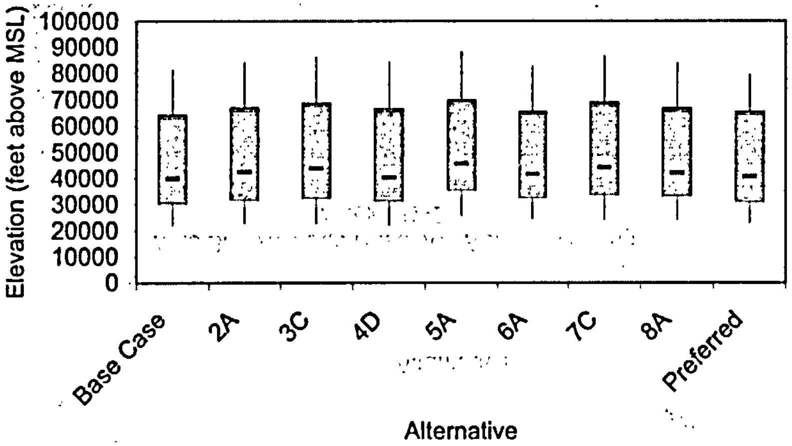



Cherokee Reservoir Elevation
on October 31
Elevation (feet above MSL)
1080
1070
1060
1050
1040
1030
1020
1010
1000
990
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

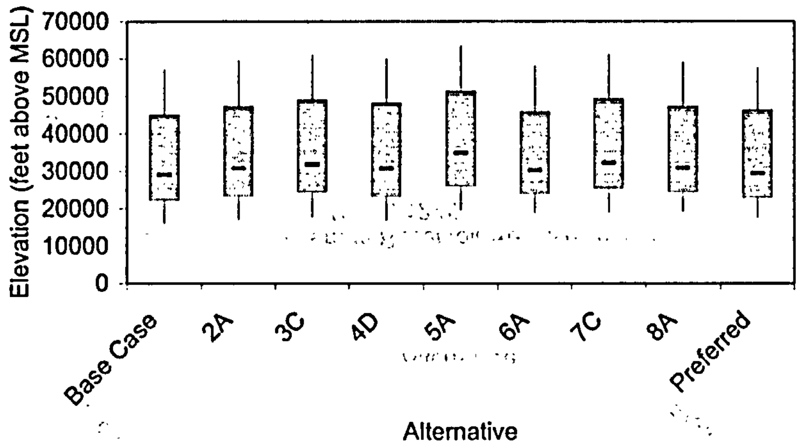

South Holston Reservoir Elevation
on October 31
Elevation (feet above MSL)
1740
1730
1720
1710
1700
1690
1680
1670
1660
1650
1640
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Watauga Reservoir Elevation
on October 31
Elevation (feet above MSL)
1965
1960
1955
1950
1945
1940
1935
1930
1925
1920
1915
1910
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

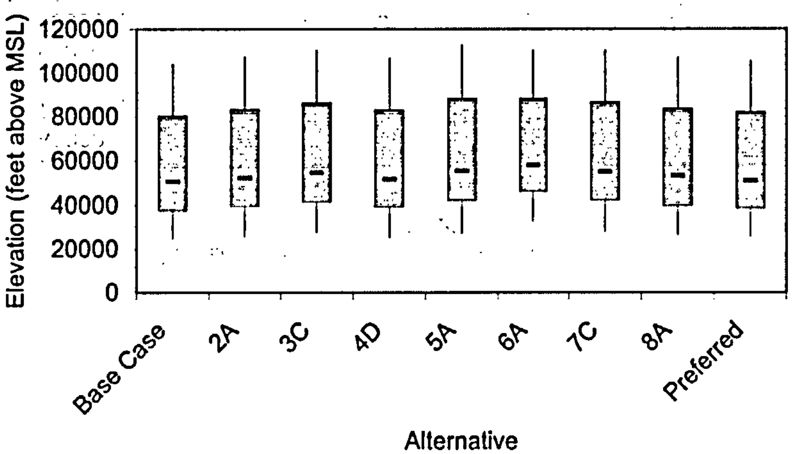
Wilson Average Reservoir Releases during Weeks 12-22



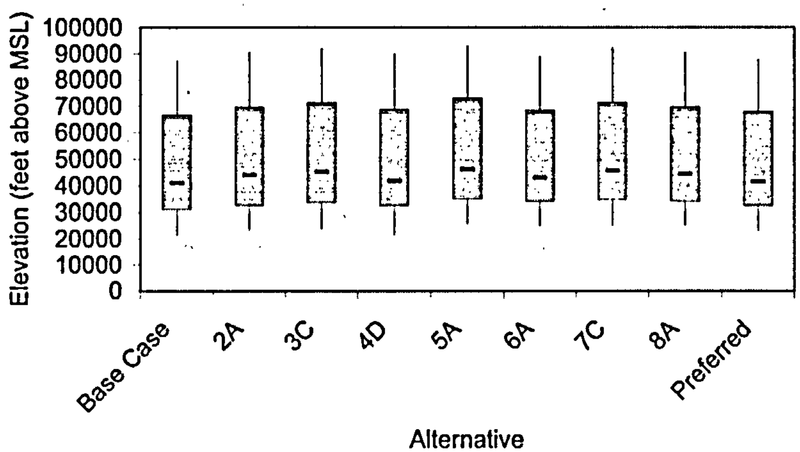
Guntersville Average Reservoir Releases during Weeks 12-22



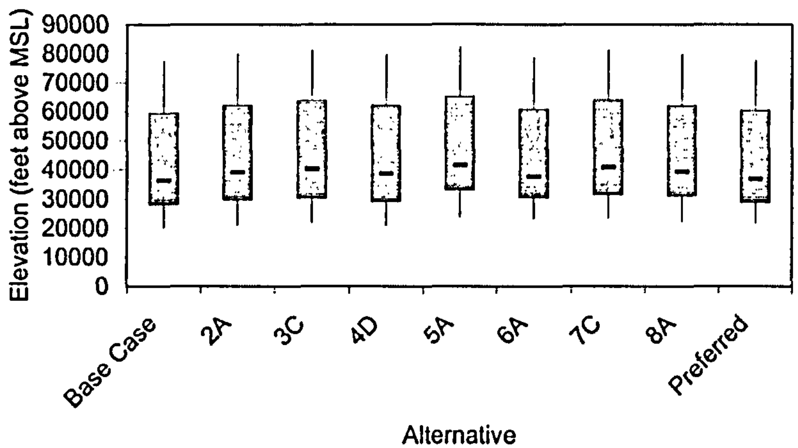
Kentucky Average Reservoir Releases during Weeks 12-22



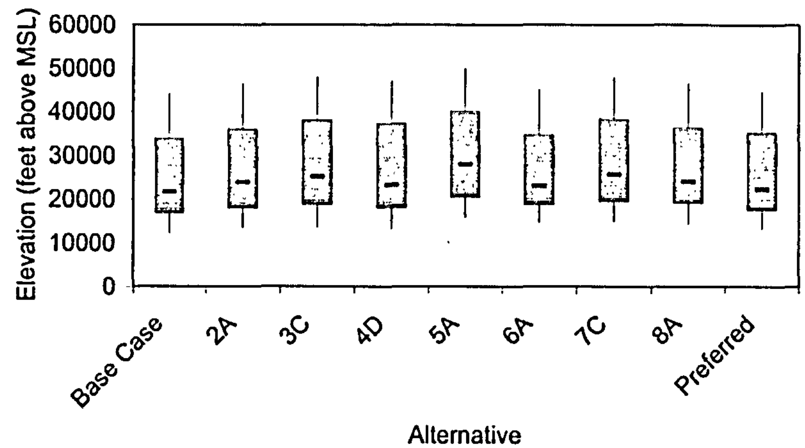
Pickwick Average Reservoir Releases during Weeks 12-22



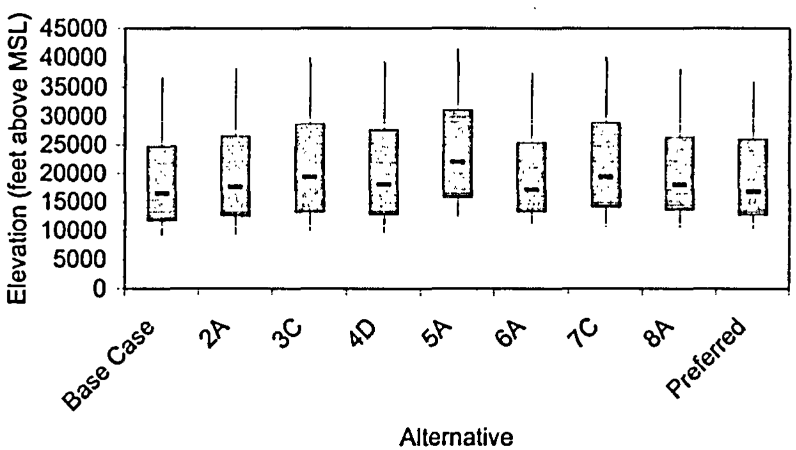
Wheeler Average Reservoir Releases during Weeks 12-22



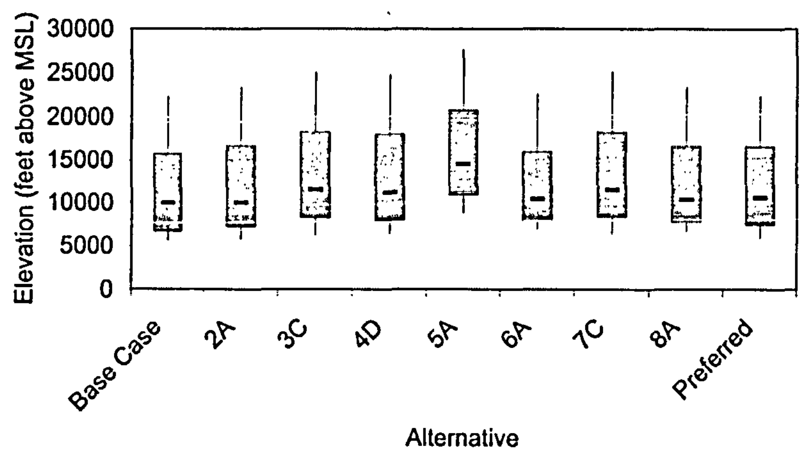
Chickamauga Average Reservoir Releases during Weeks 12-22



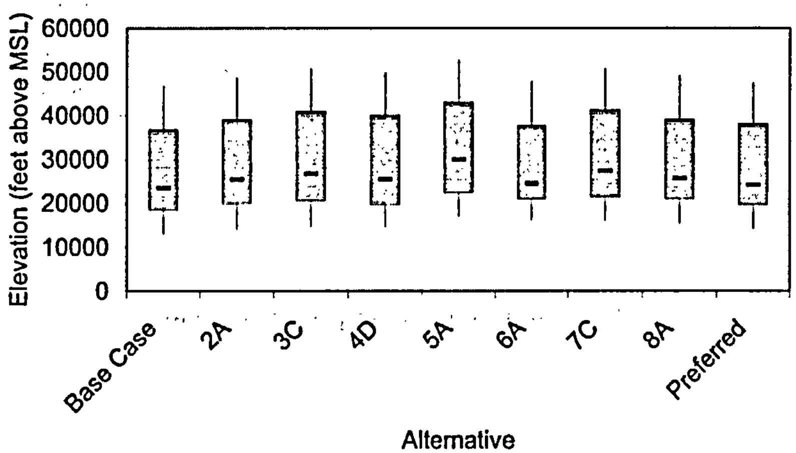
Watts Bar Average Reservoir Releases during Weeks 12-22



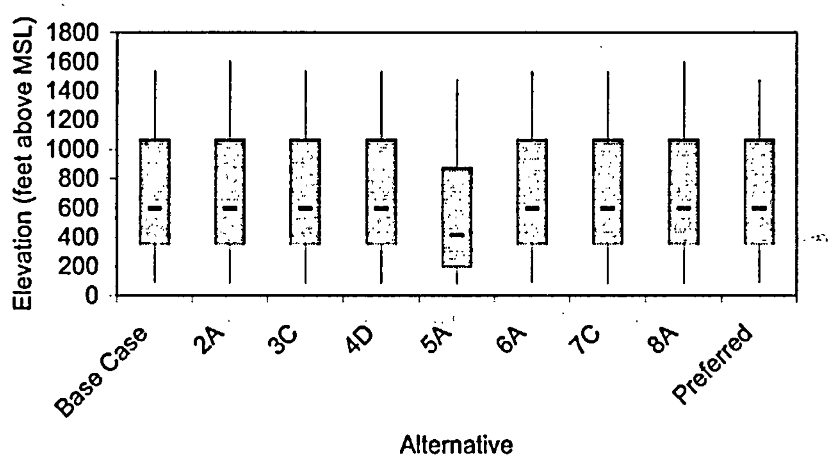
Fort Loudoun Average Reservoir Releases during Weeks 12-22



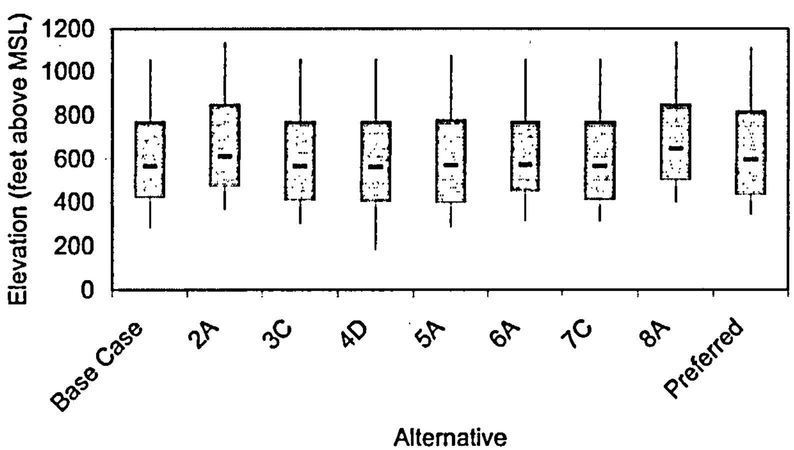
Nickajack Average Reservoir Releases during Weeks 12-22



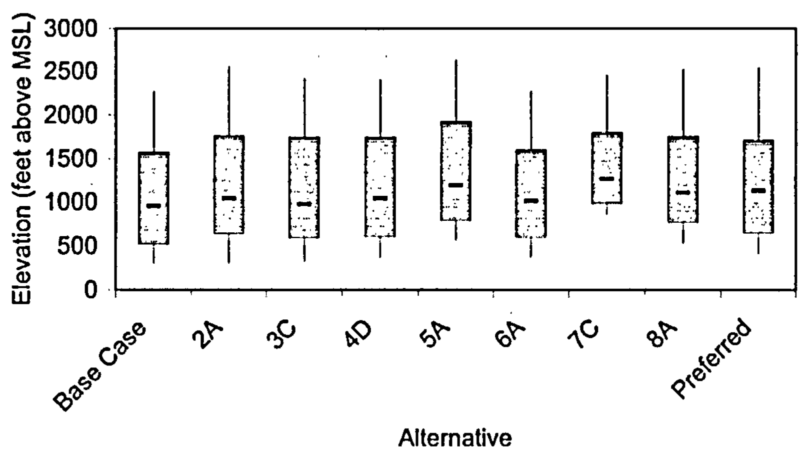
Tims Ford Average Reservoir Releases during Weeks 12-22

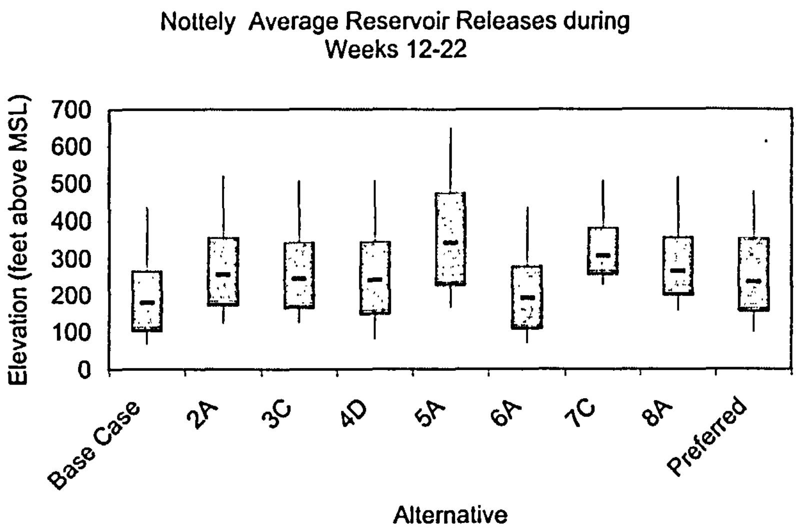


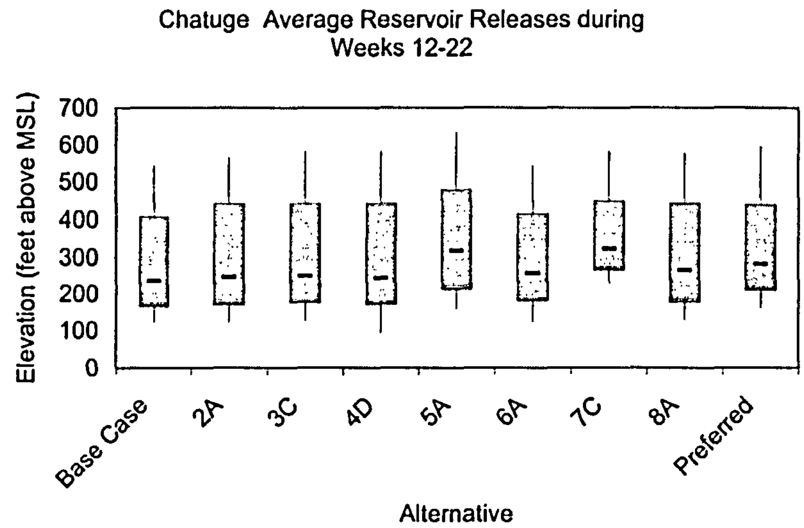
Blue Ridge Average Reservoir Releases during Weeks 12-22

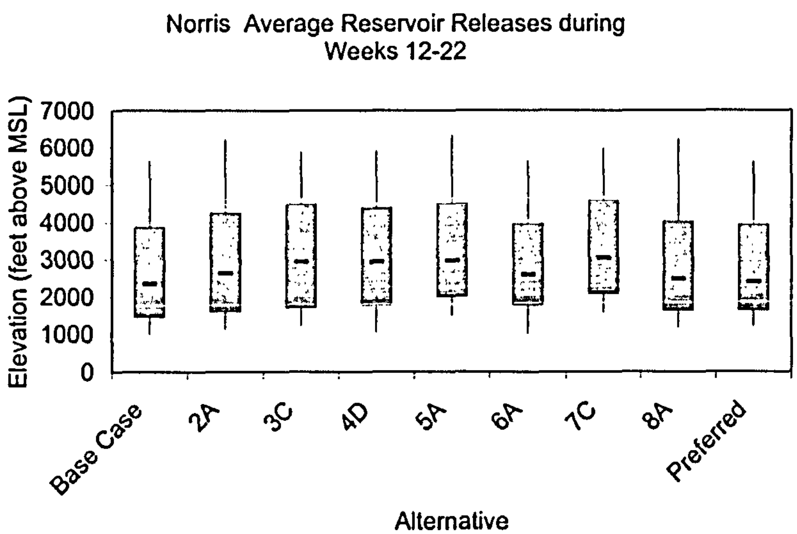


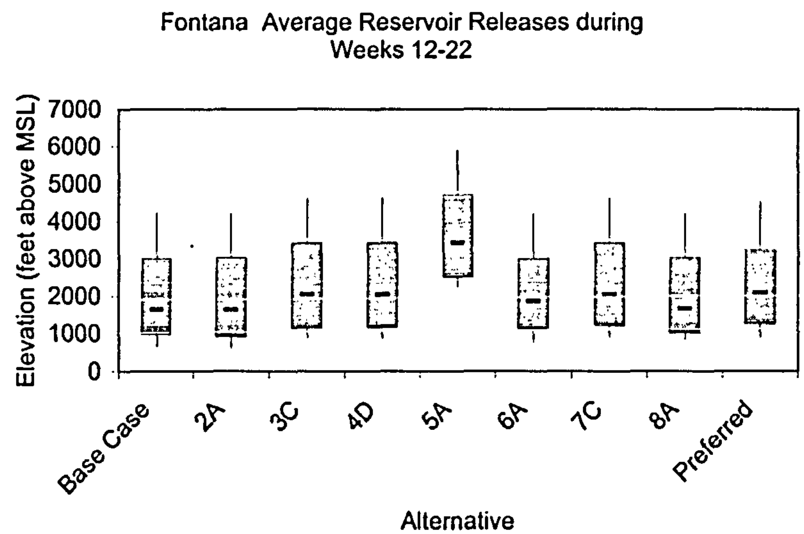
Hiwassee Average Reservoir Releases during Weeks 12-22



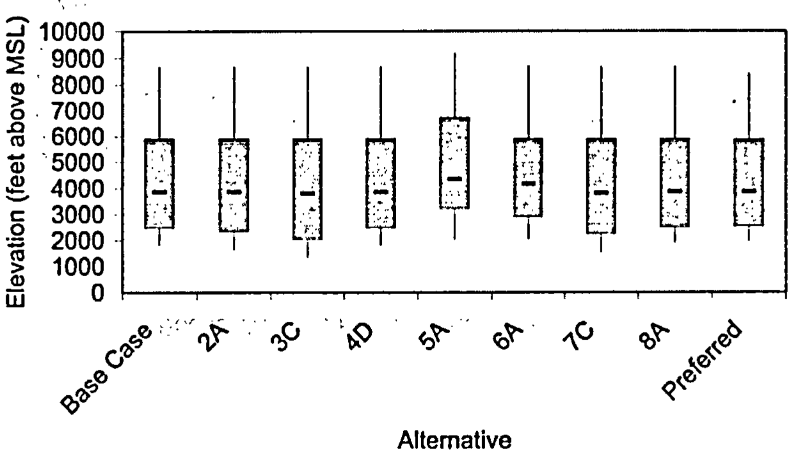

Nottely Average Reservoir Releases during Weeks 12-22
Elevation (feet above MSL)
700
600
500
400
300
200
100
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Chatuge Average Reservoir Releases during Weeks 12-22
Elevation (feet above MSL)
700
600
500
400
300
200
100
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

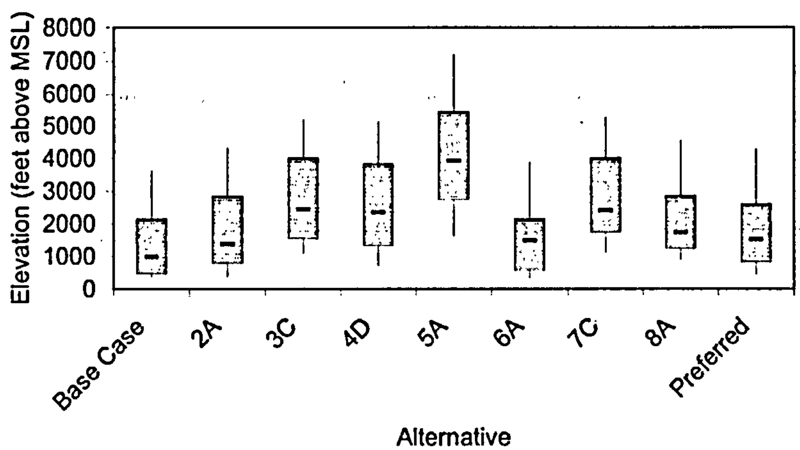

Norris Average Reservoir Releases during Weeks 12-22
Elevation (feet above MSL)
7000
6000
5000
4000
3000
2000
1000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Fontana Average Reservoir Releases during Weeks 12-22
Elevation (feet above MSL)
7000
6000
5000
4000
3000
2000
1000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

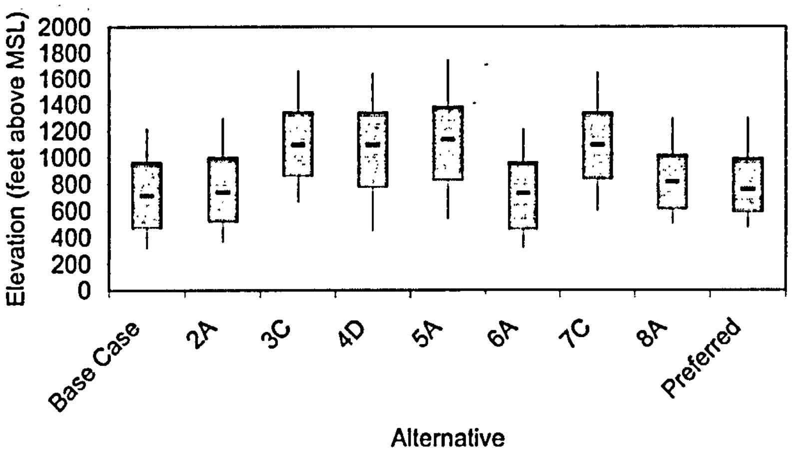
Douglas Average Reservoir Releases during Weeks 12-22



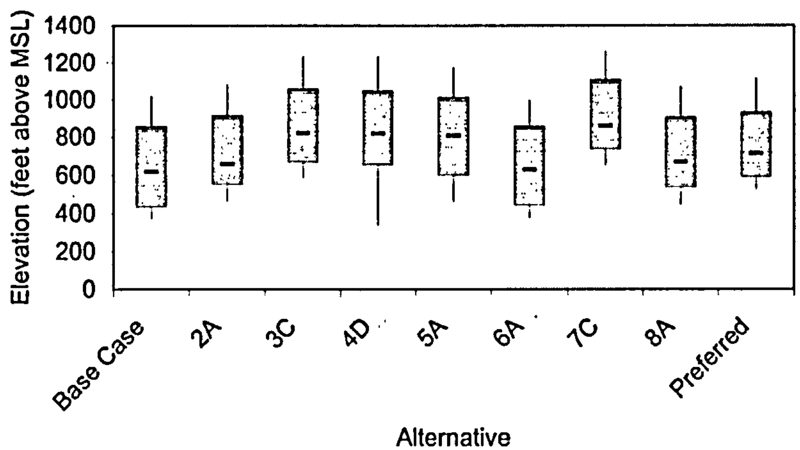
Cherokee Average Reservoir Releases during Weeks 12-22



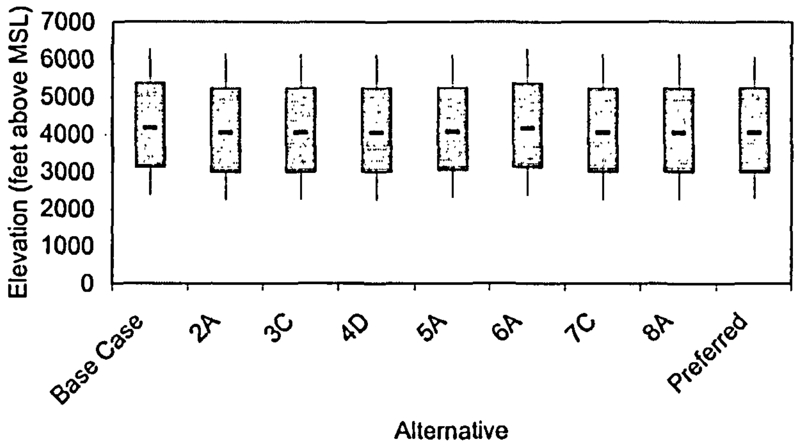
South Holston Average Reservoir Releases during Weeks 12-22



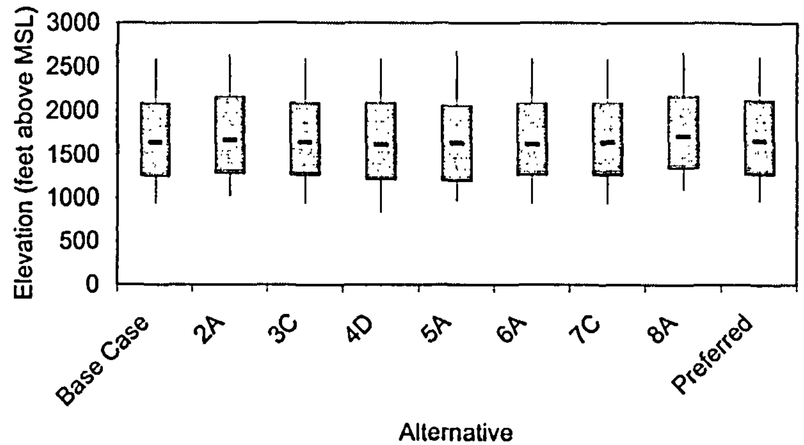
Watauga Average Reservoir Releases during Weeks 12-22



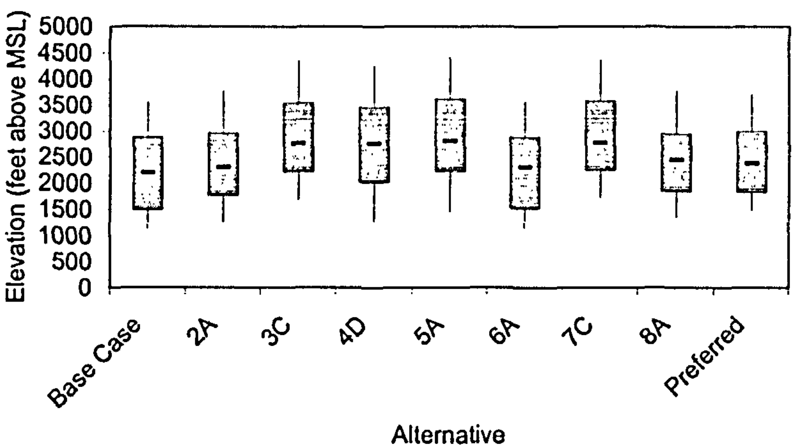
Great Falls Average Reservoir Releases during Weeks 12-22



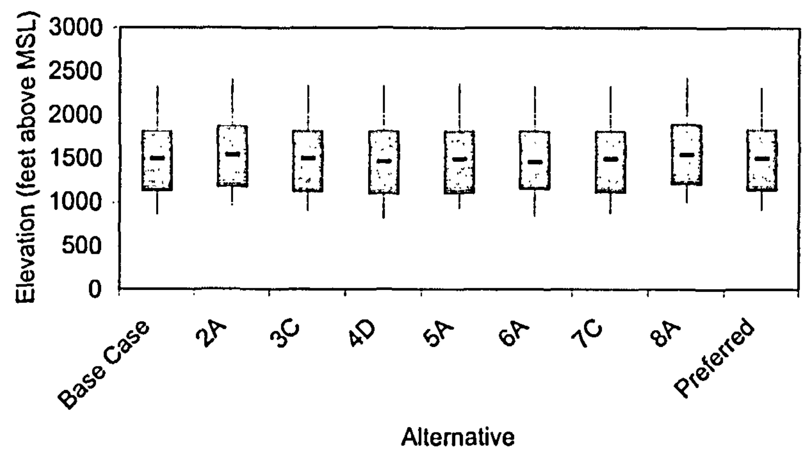
Ocoee #1 Average Reservoir Releases during Weeks 12-22



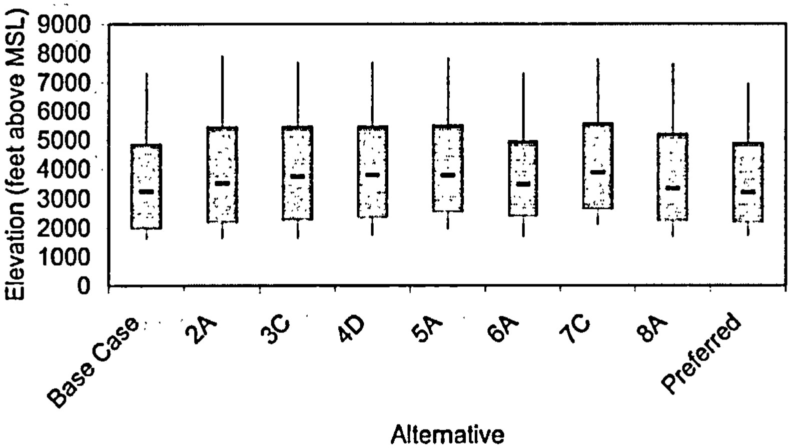
Boone Average Reservoir Releases during Weeks 12-22



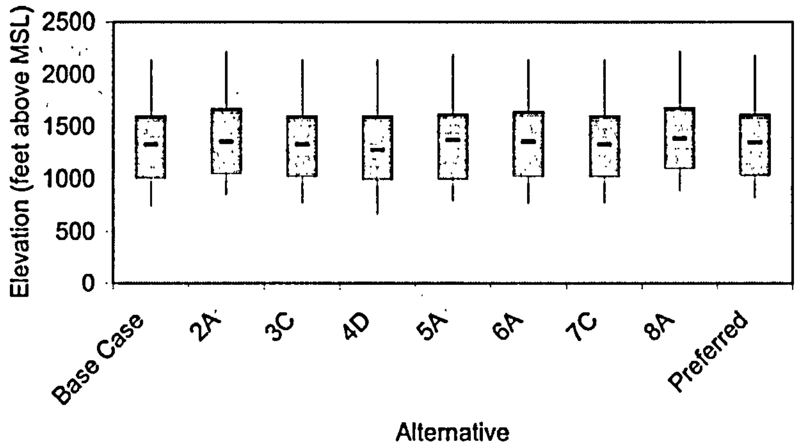
Ocoee #2 Average Reservoir Releases during Weeks 12-22



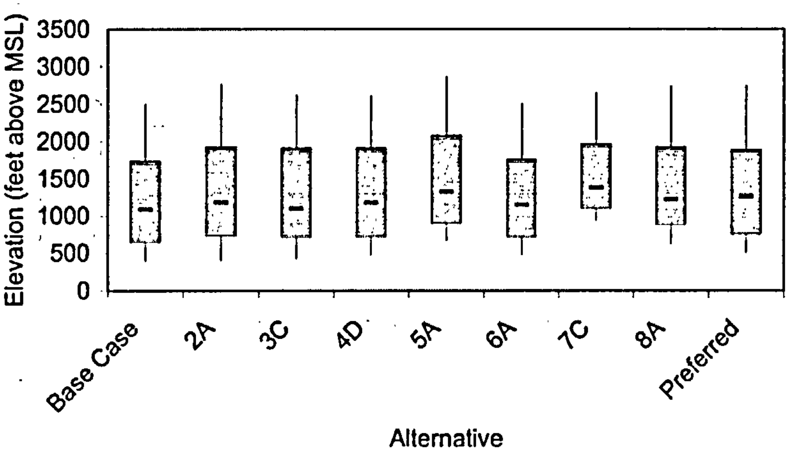
Melton Hill Average Reservoir Releases during Weeks 12-22



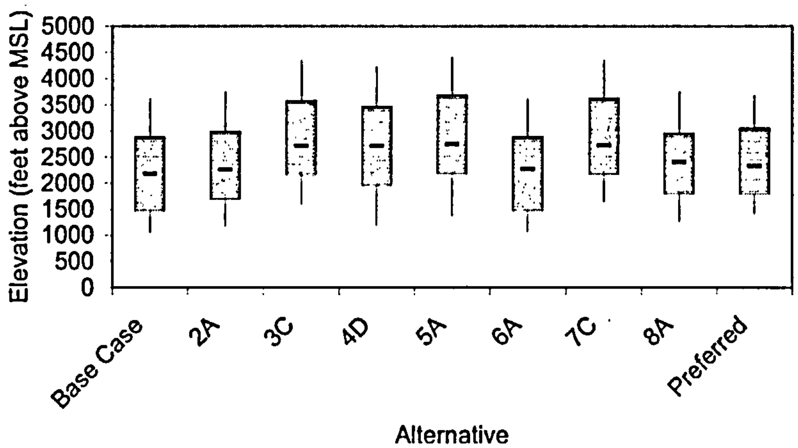
Ocoee #3 Average Reservoir Releases during Weeks 12-22

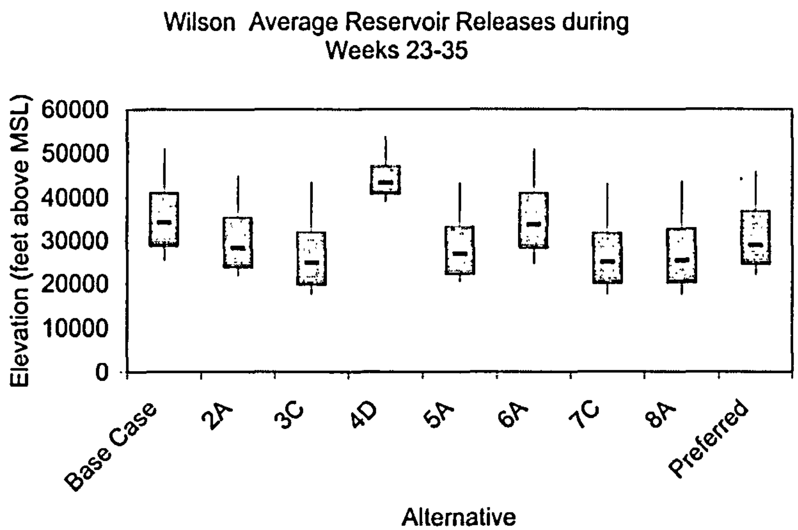


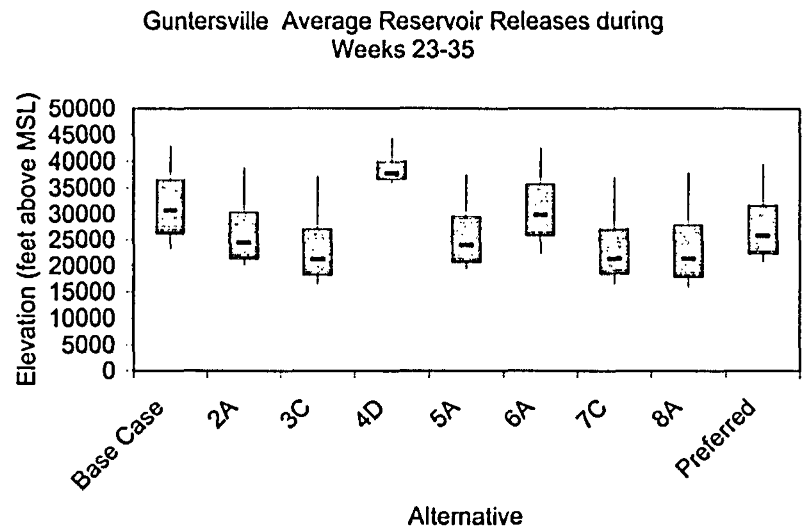
Apalachia Average Reservoir Releases during Weeks 12-22

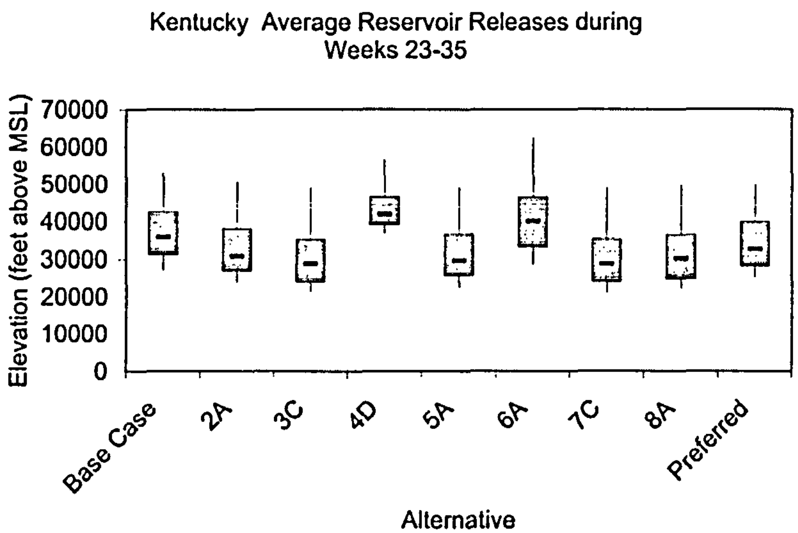


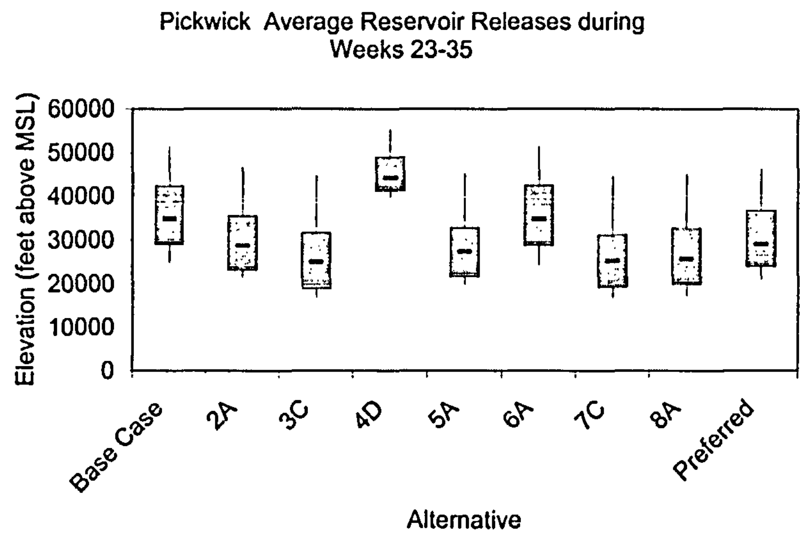
Fort Patrick Henry Average Reservoir Releases during Weeks 12-22

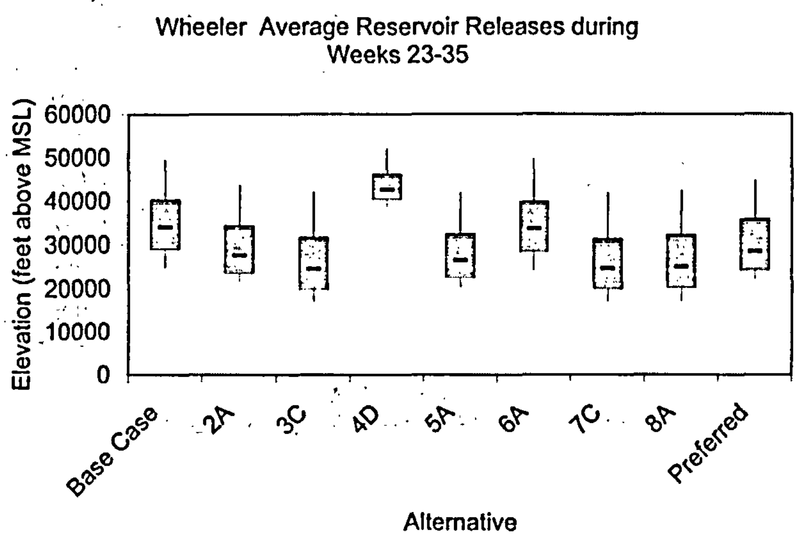


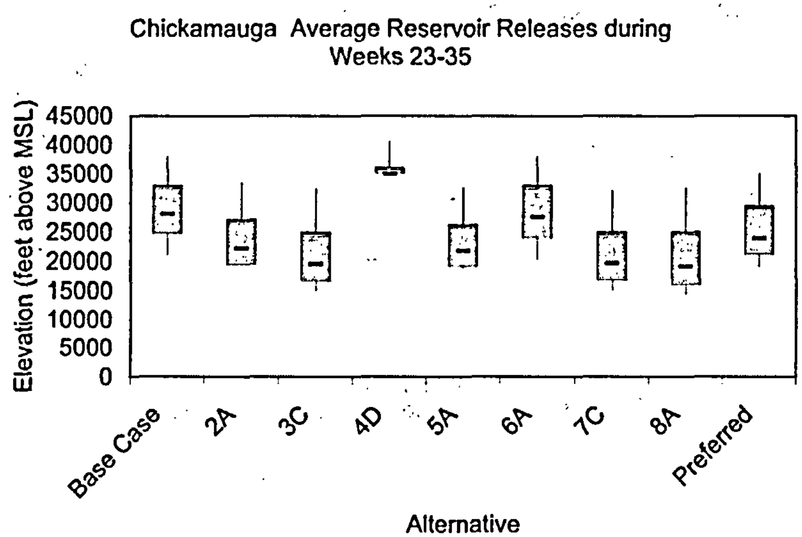

Wilson Average Reservoir Releases during Weeks 23-35
Elevation (feet above MSL)
60000
50000
40000
30000
20000
10000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

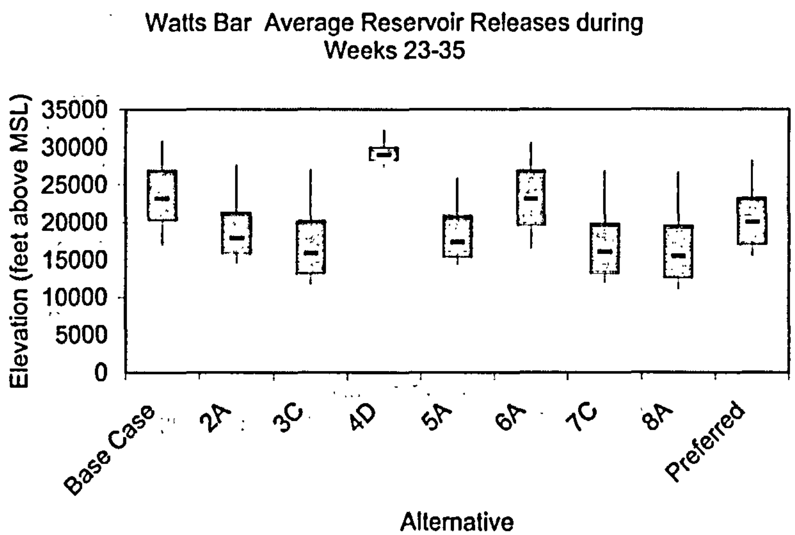

Guntersville Average Reservoir Releases during Weeks 23-35
Elevation (feet above MSL)
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

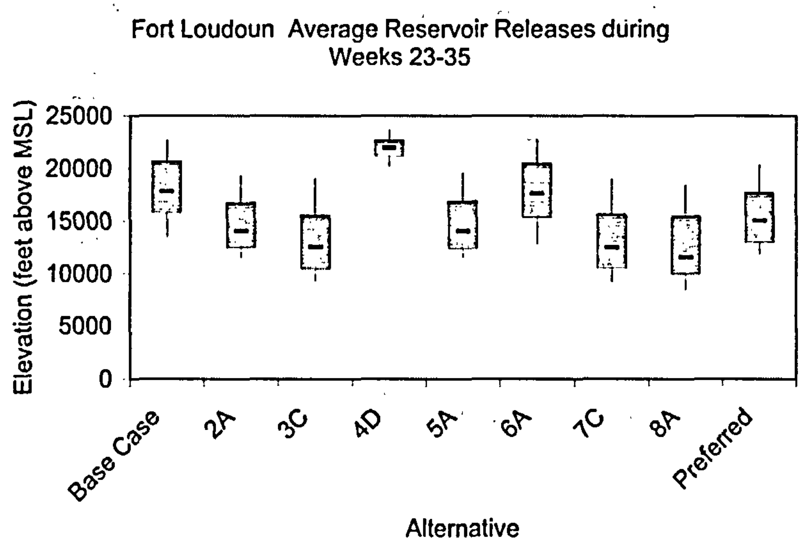

Kentucky Average Reservoir Releases during Weeks 23-35
Elevation (feet above MSL)
70000
60000
50000
40000
30000
20000
10000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Pickwick Average Reservoir Releases during Weeks 23-35
Elevation (feet above MSL)
60000
50000
40000
30000
20000
10000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

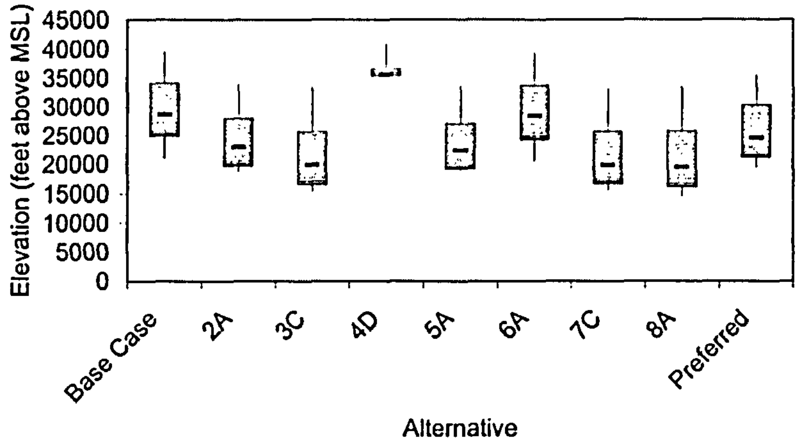

Wheeler Average Reservoir Releases during Weeks 23-35
Elevation (feet above MSL)
60000
50000
40000
30000
20000
10000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Chickamauga Average Reservoir Releases during Weeks 23-35
Elevation (feet above MSL)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

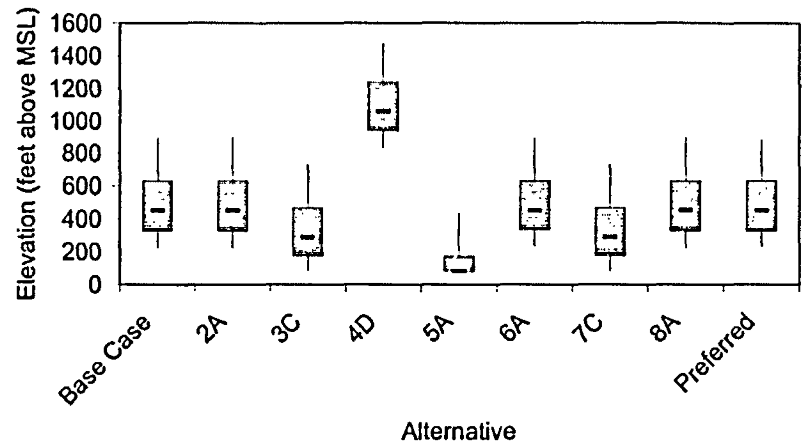

Watts Bar Average Reservoir Releases during Weeks 23-35
Elevation (feet above MSL)
35000
30000
25000
20000
15000
10000
5000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Fort Loudoun Average Reservoir Releases during Weeks 23-35
Elevation (feet above MSL)
25000
20000
15000
10000
5000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

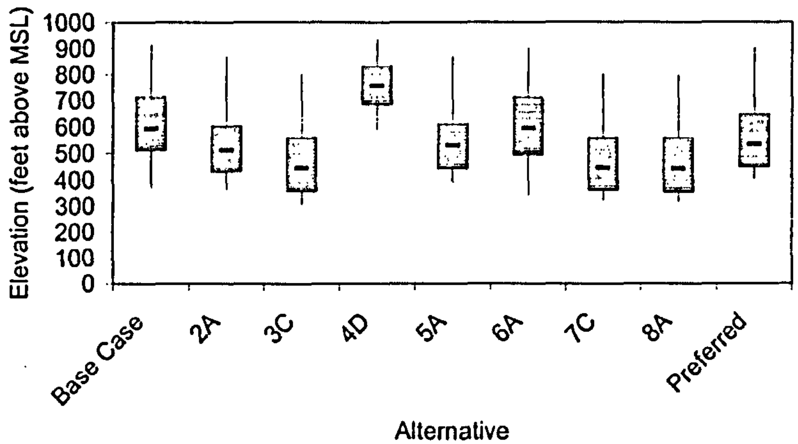
Nickajack Average Reservoir Releases during Weeks 23-35



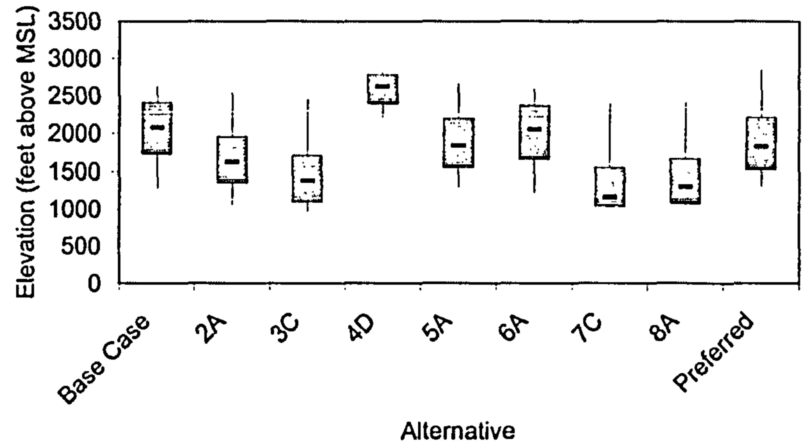
Tims Ford Average Reservoir Releases during Weeks 23-35

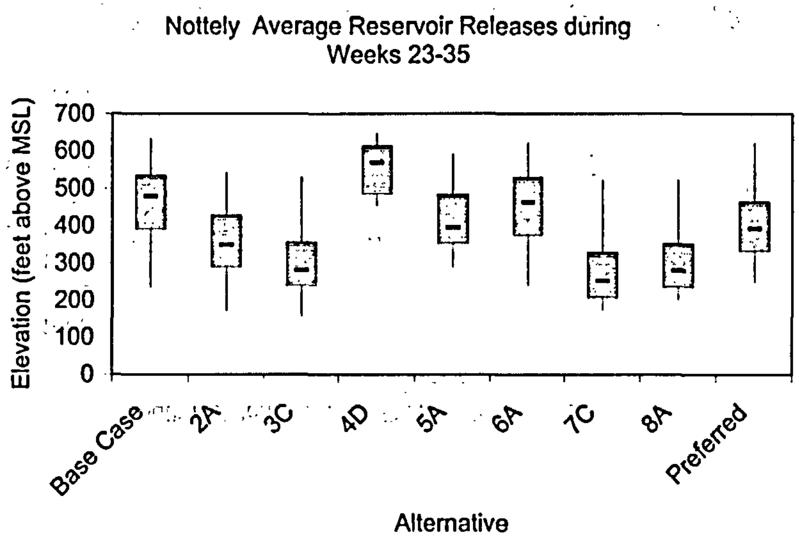


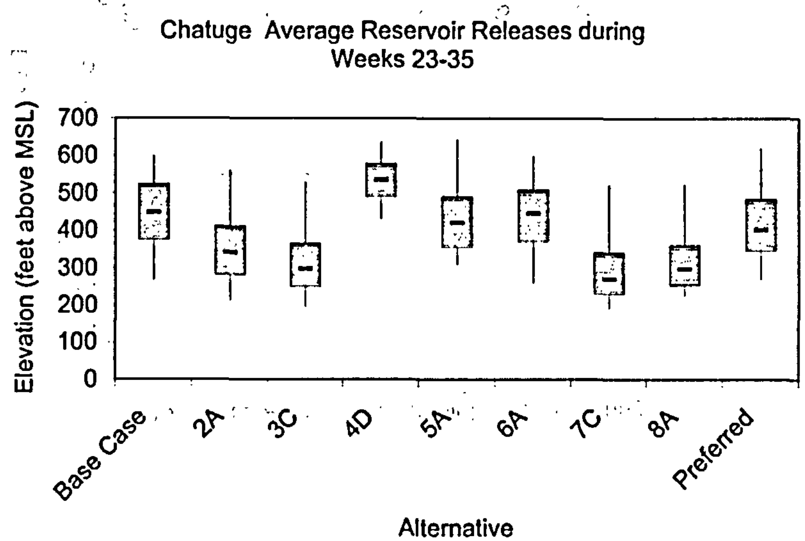
Blue Ridge Average Reservoir Releases during Weeks 23-35

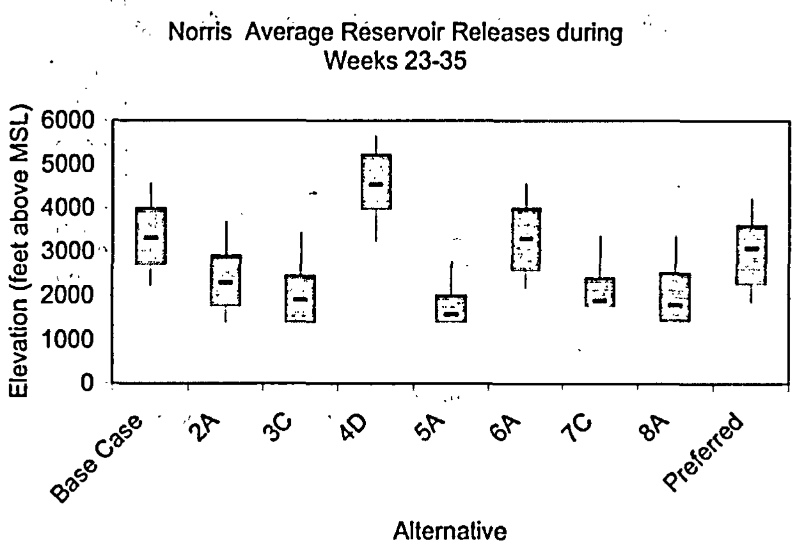


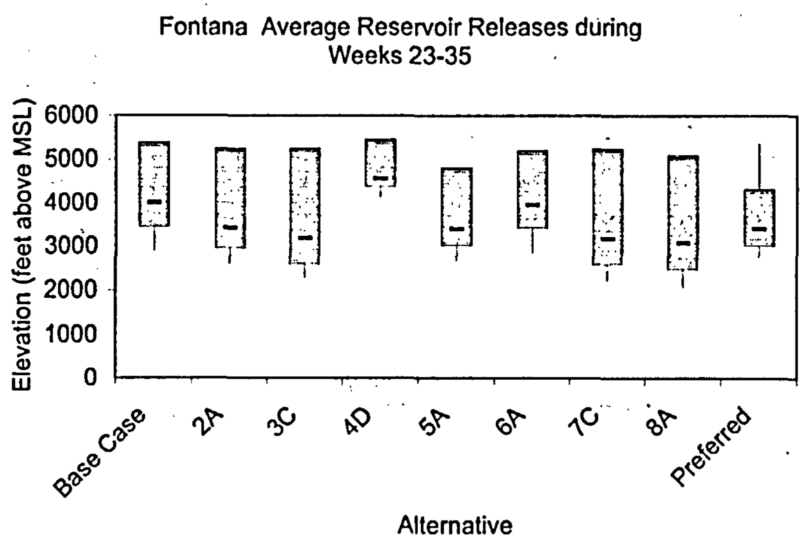
Hiwassee Average Reservoir Releases during Weeks 23-35



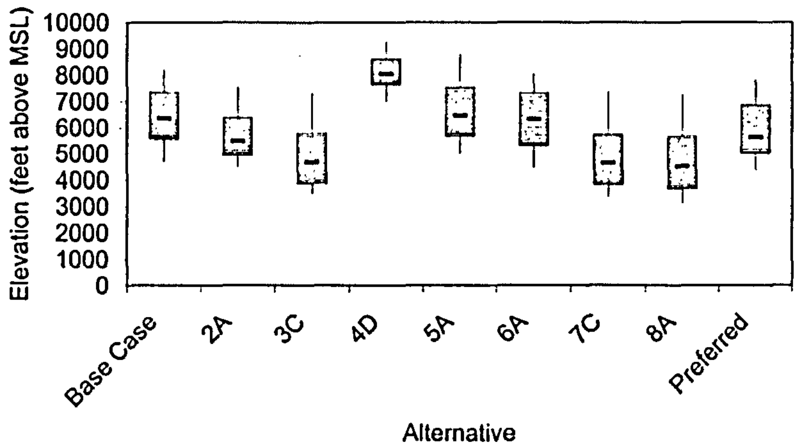

Nottely Average Reservoir Releases during
Weeks 23-35
Elevation (feet above MSL)
700
600
500
400
300
200
100
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Chatuge Average Reservoir Releases during
Weeks 23-35
Elevation (feet above MSL)
700
600
500
400
300
200
100
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

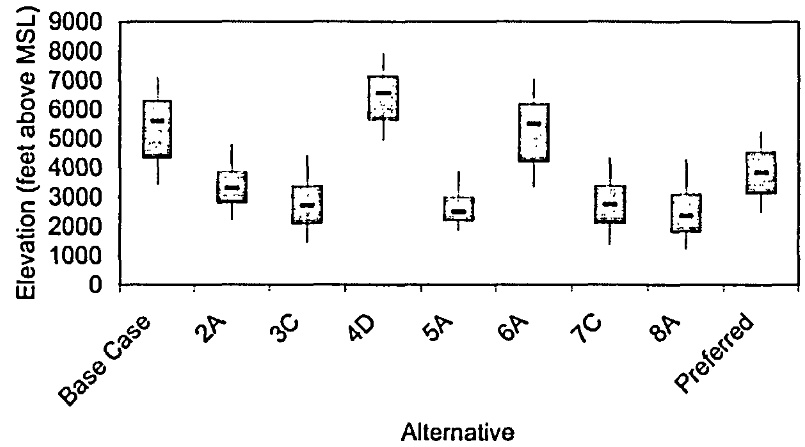

Norris Average Reservoir Releases during
Weeks 23-35
Elevation (feet above MSL)
6000
5000
4000
3000
2000
1000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Fontana Average Reservoir Releases during
Weeks 23-35
Elevation (feet above MSL)
6000
5000
4000
3000
2000
1000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

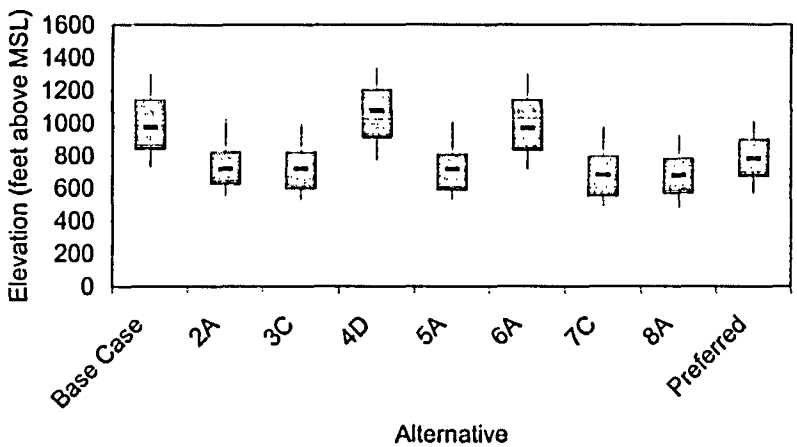
Douglas Average Reservoir Releases during Weeks 23-35



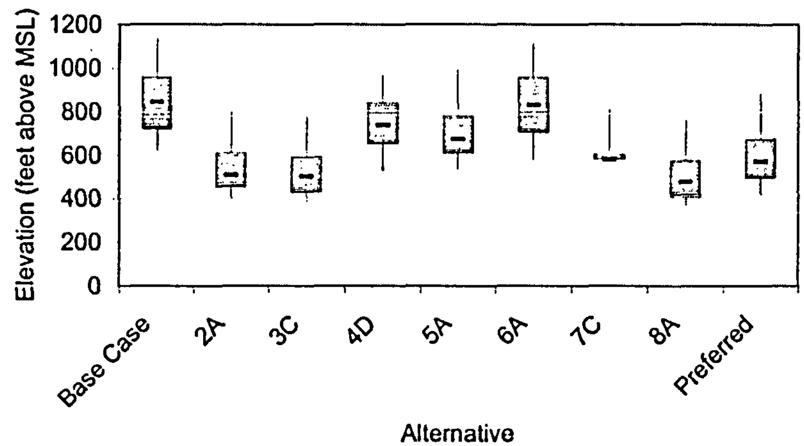
Cherokee Average Reservoir Releases during Weeks 23-35



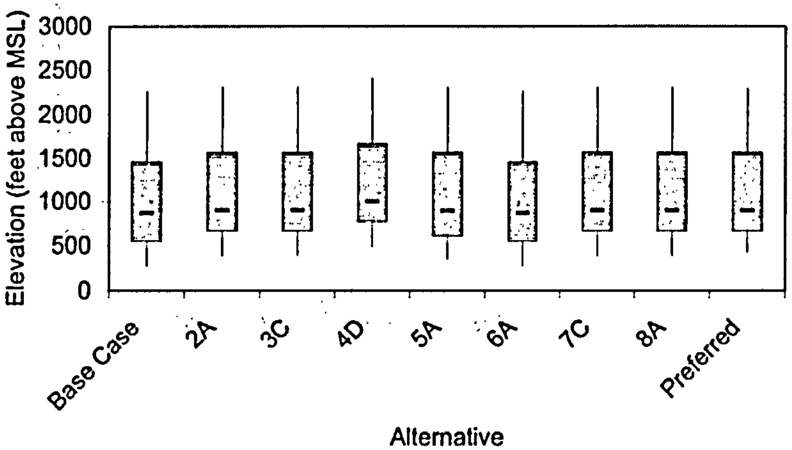
South Holston Average Reservoir Releases during Weeks 23-35



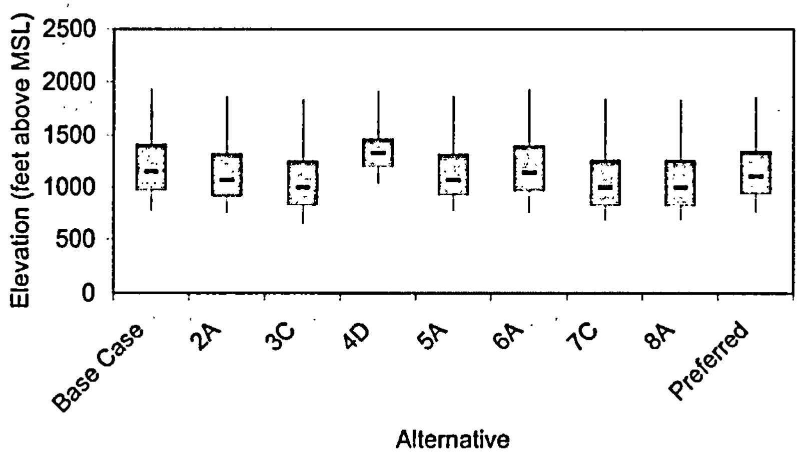
Watauga Average Reservoir Releases during Weeks 23-35



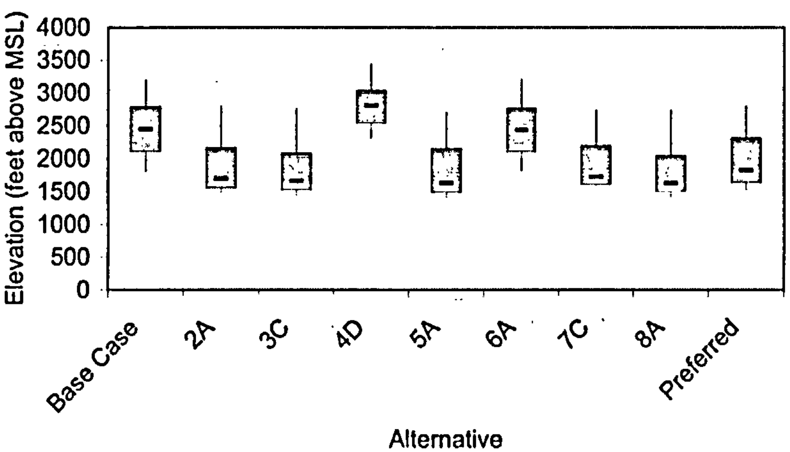
Great Falls Average Reservoir Releases during Weeks 23-35



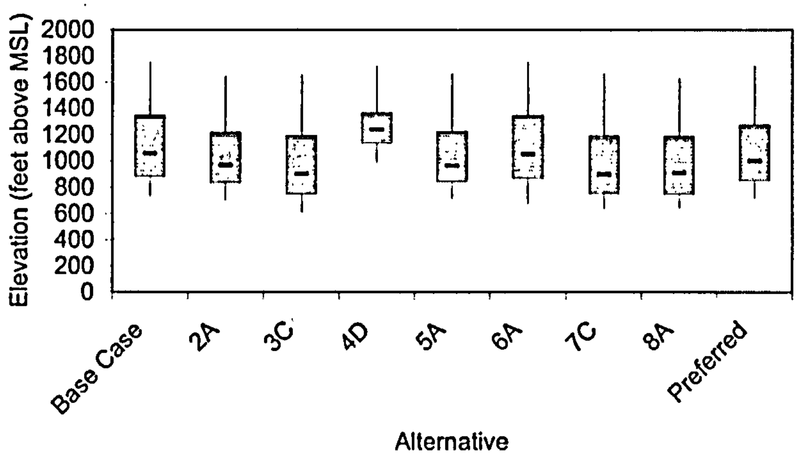
Ocoee #1 Average Reservoir Releases during Weeks 23-35



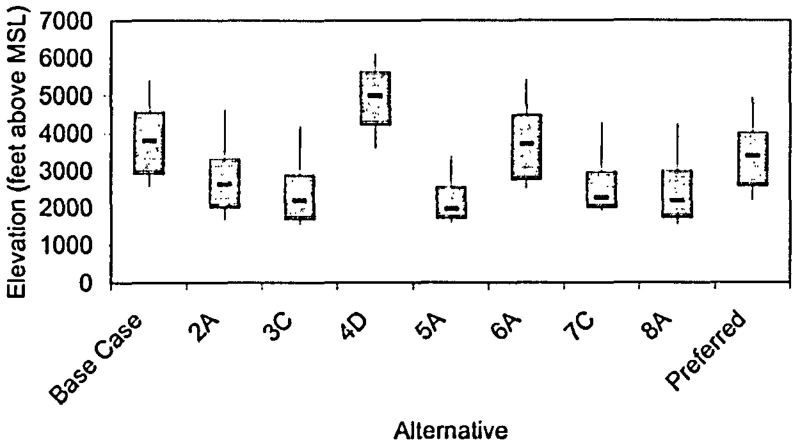
Boone Average Reservoir Releases during Weeks 23-35



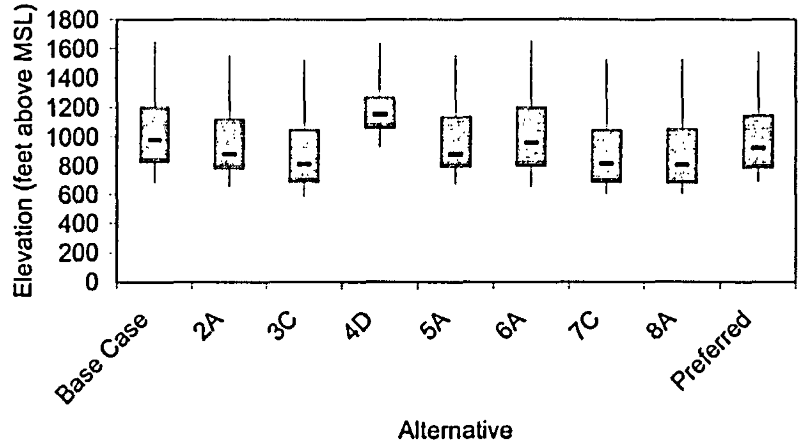
Ocoee #2 Average Reservoir Releases during Weeks 23-35



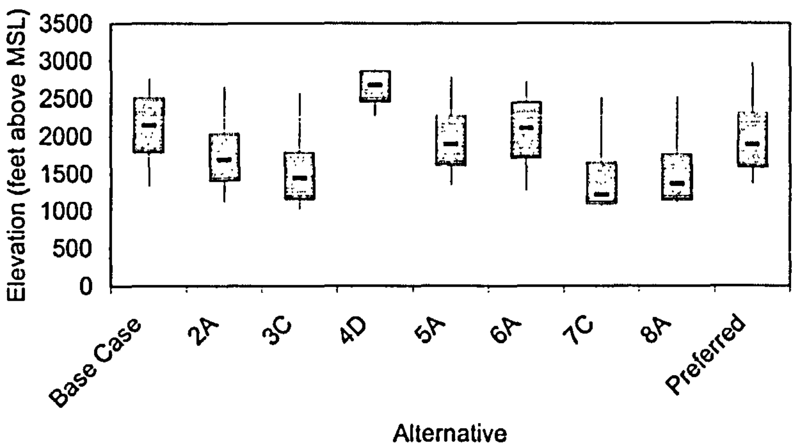
Melton Hill Average Reservoir Releases during Weeks 23-35



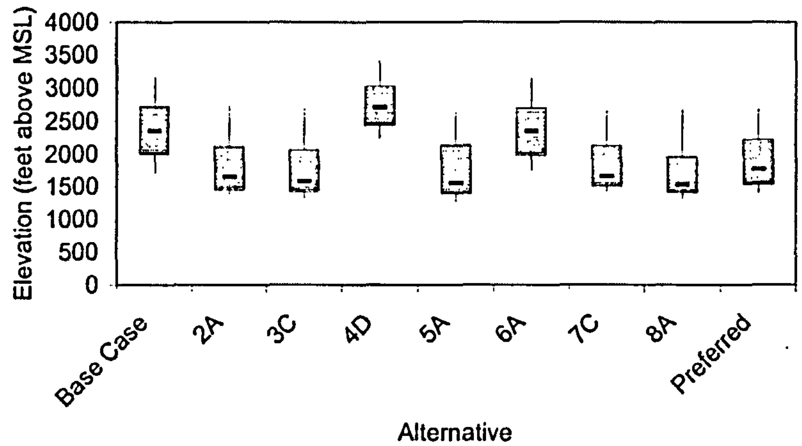
Ocoee #3 Average Reservoir Releases during Weeks 23-35



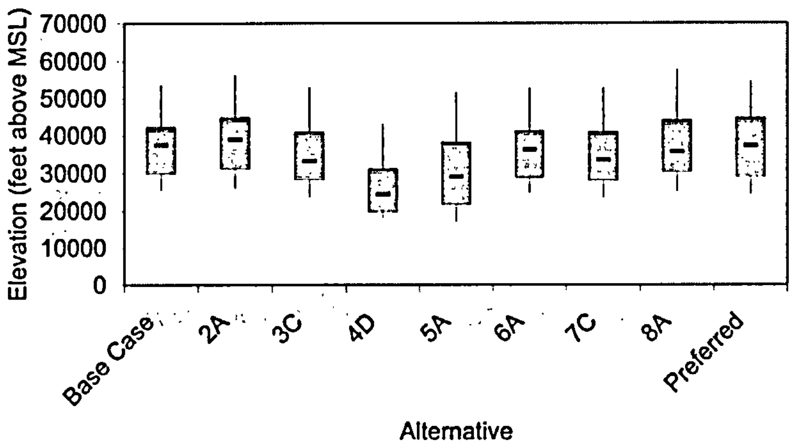
Apalachia Average Reservoir Releases during Weeks 23-35



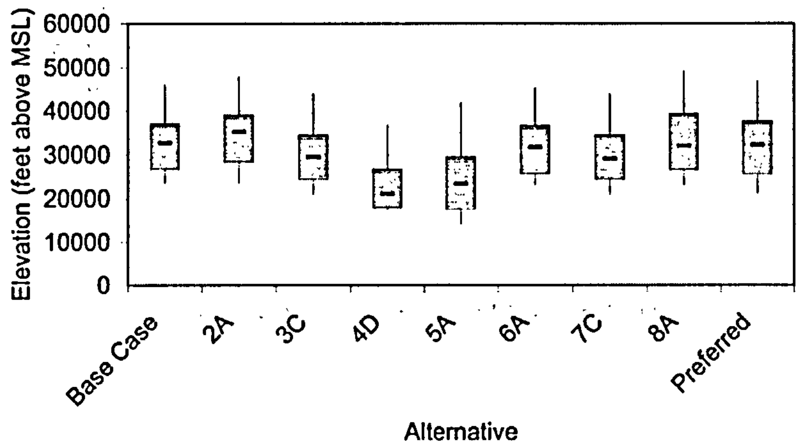
Fort Patrick Henry Average Reservoir Releases during Weeks 23-35



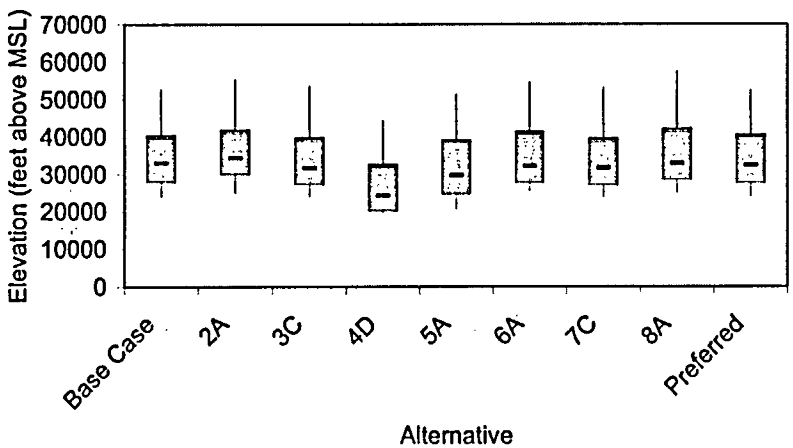
Wilson Average Reservoir Releases during
Weeks 36-48



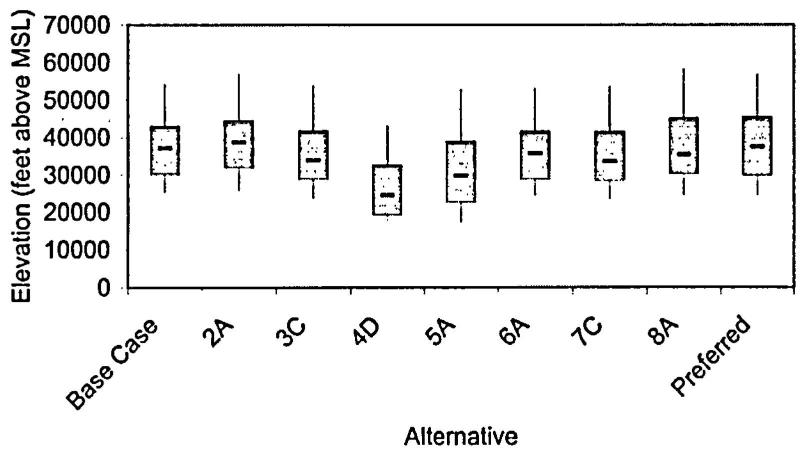
Guntersville Average Reservoir Releases during
Weeks 36-48

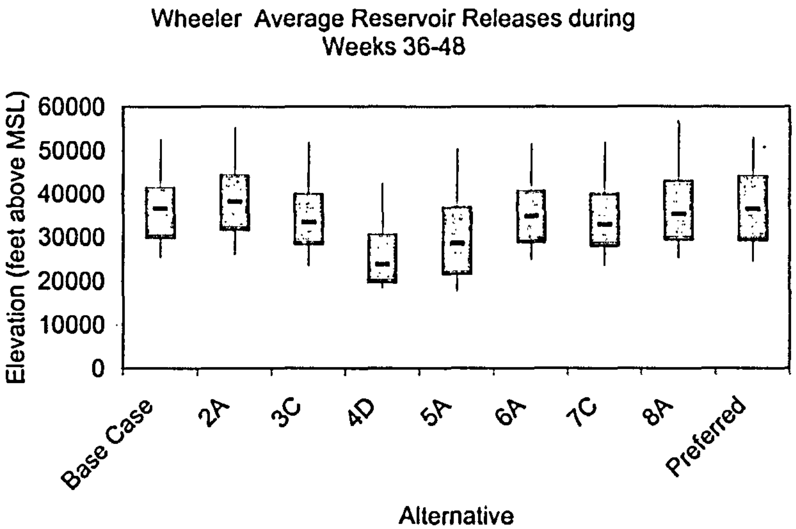


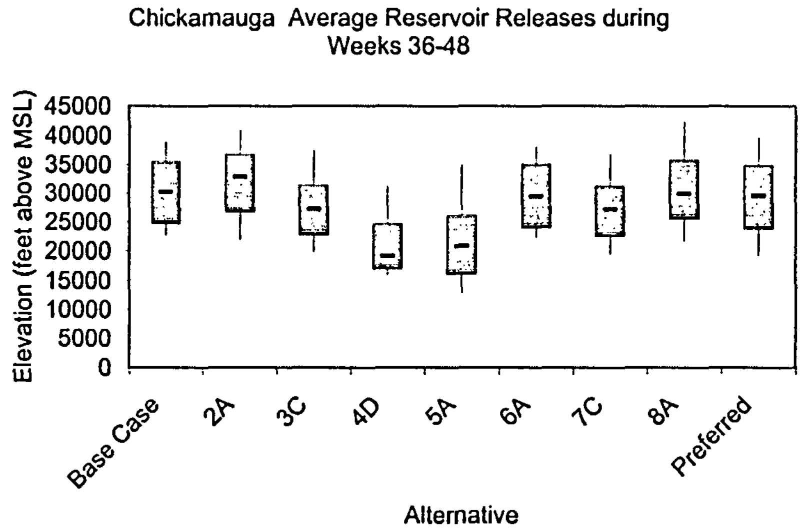
Kentucky Average Reservoir Releases during
Weeks 36-48

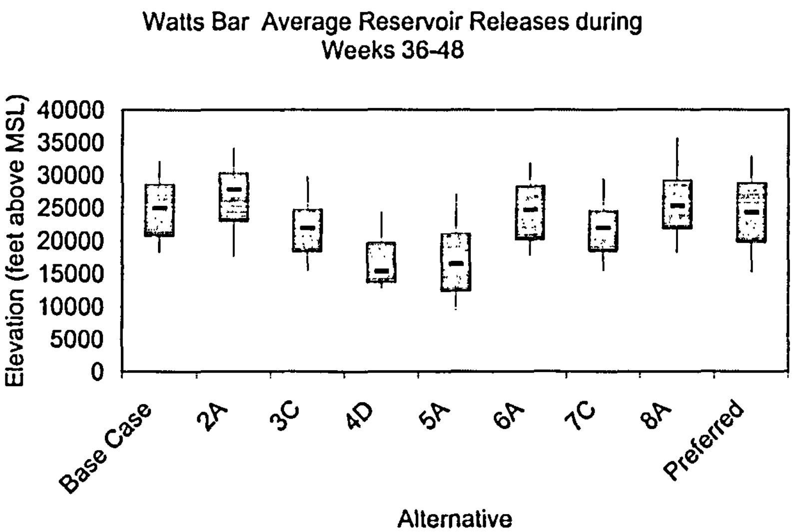


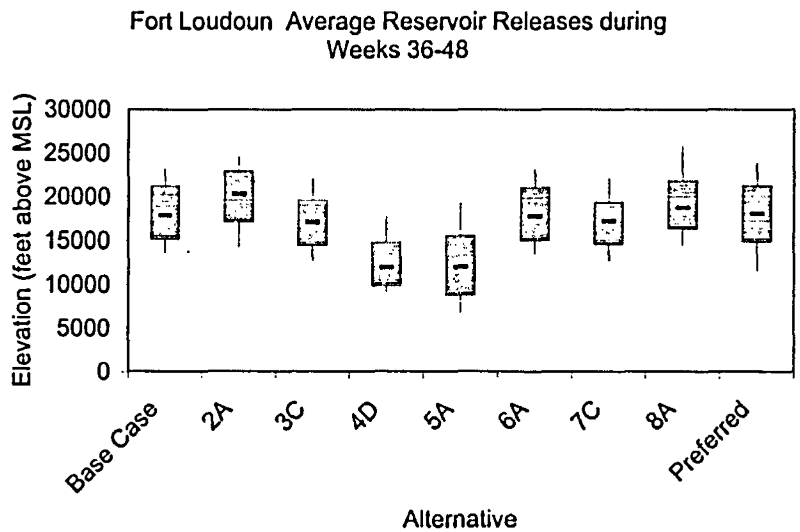
Pickwick Average Reservoir Releases during
Weeks 36-48



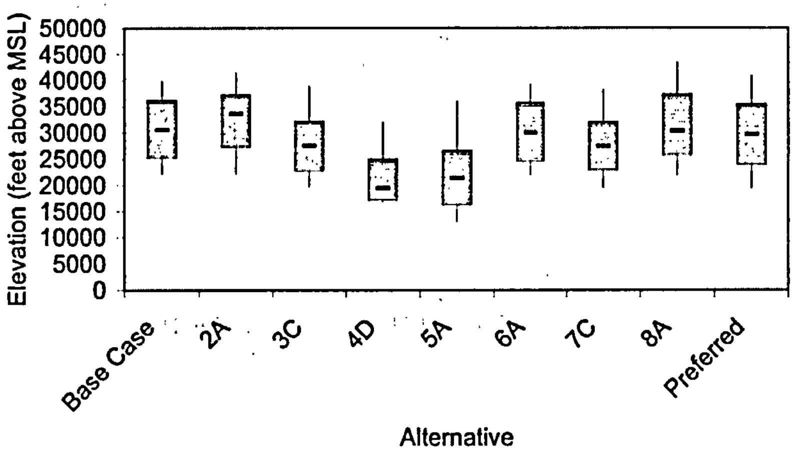

Wheeler Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
60000
50000
40000
30000
20000
10000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Chickamauga Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

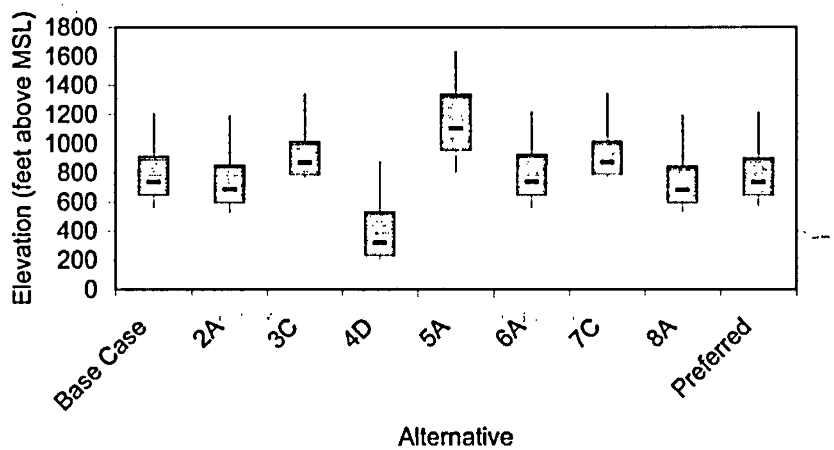

Watts Bar Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
40000
35000
30000
25000
20000
15000
10000
5000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Fort Loudoun Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
30000
25000
20000
15000
10000
5000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

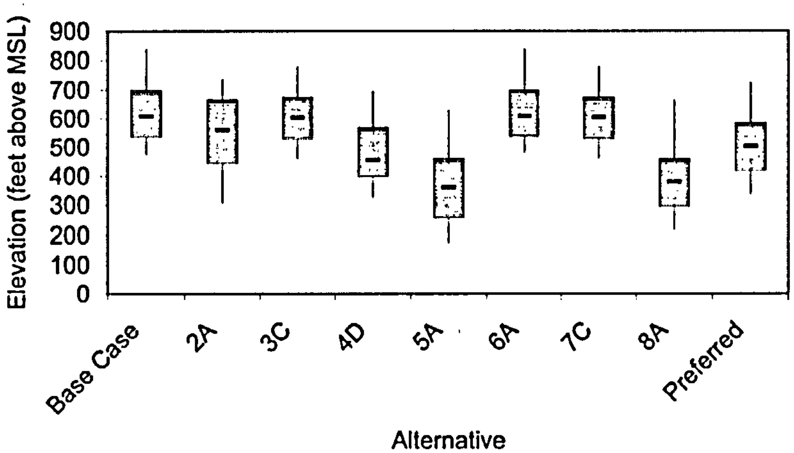
Nickajack Average Reservoir Releases during Weeks 36-48



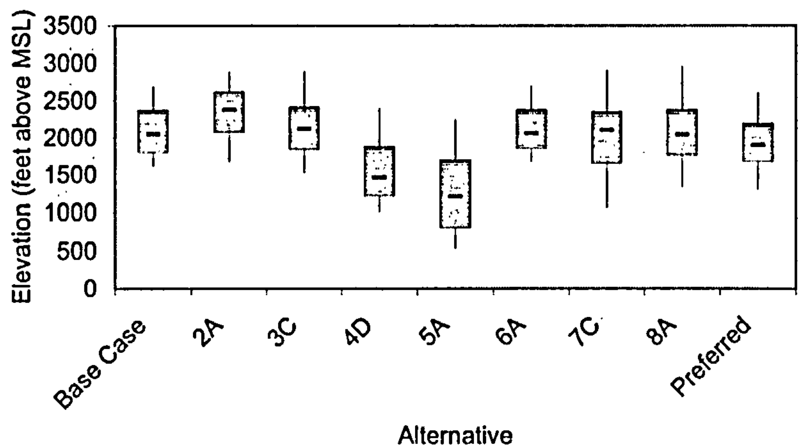
Tims Ford Average Reservoir Releases during Weeks 36-48



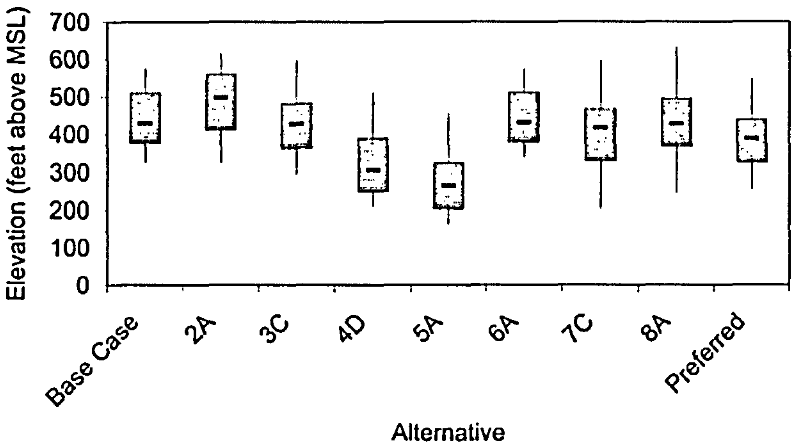
Blue Ridge Average Reservoir Releases during Weeks 36-48



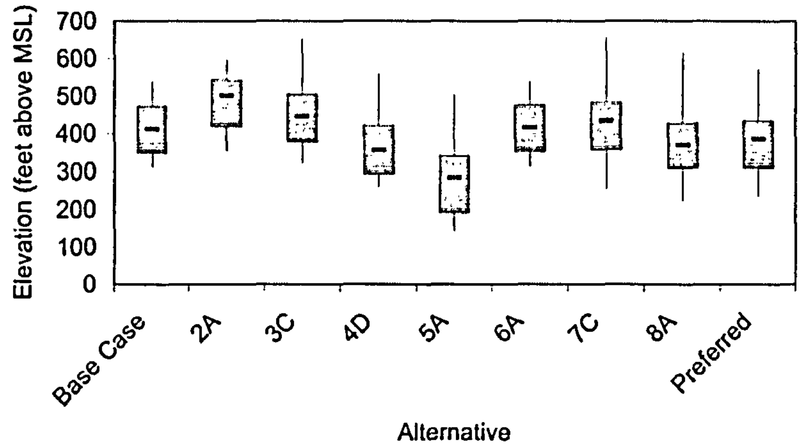
Hiwassee Average Reservoir Releases during Weeks 36-48



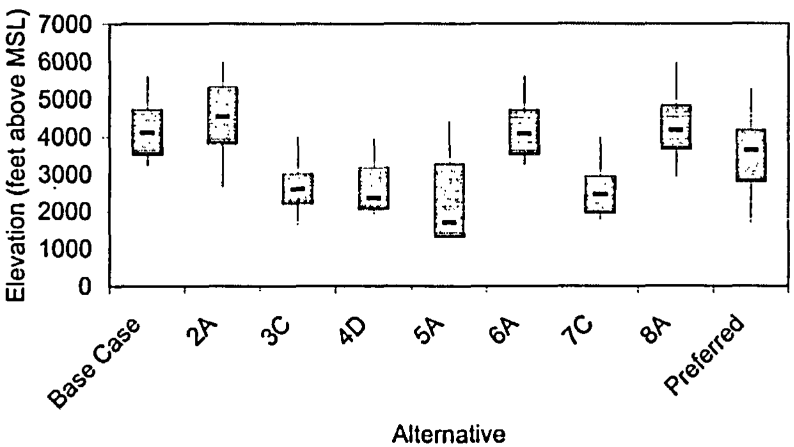
Nottely Average Reservoir Releases during Weeks 36-48



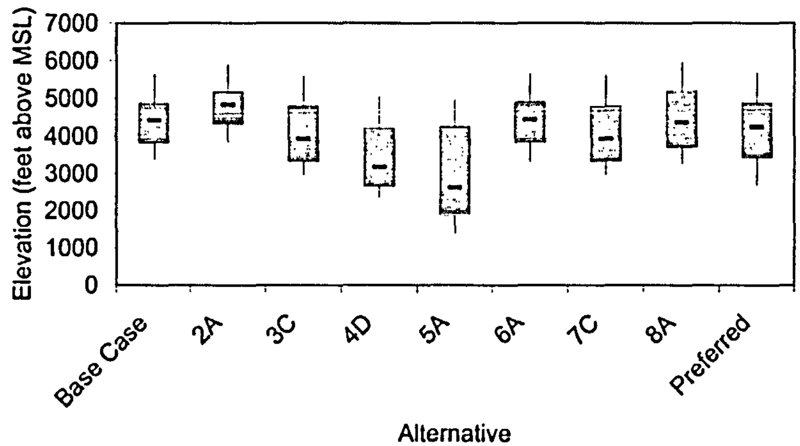
Chatuge Average Reservoir Releases during Weeks 36-48

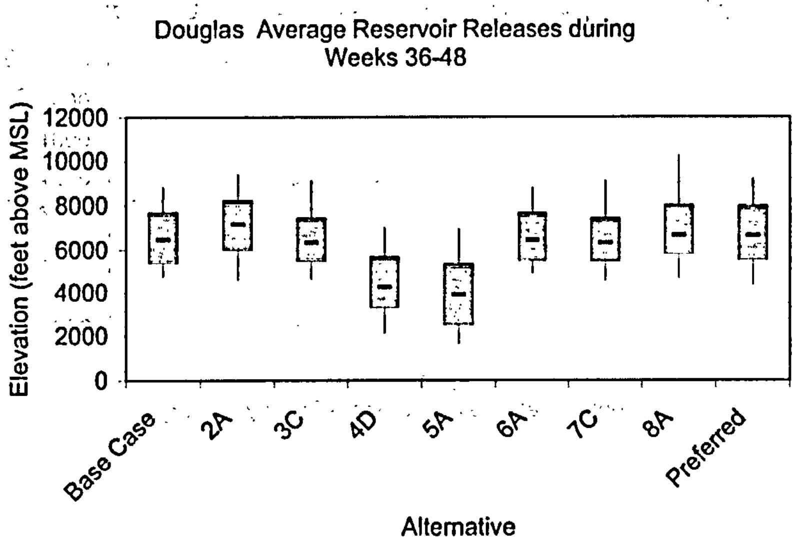


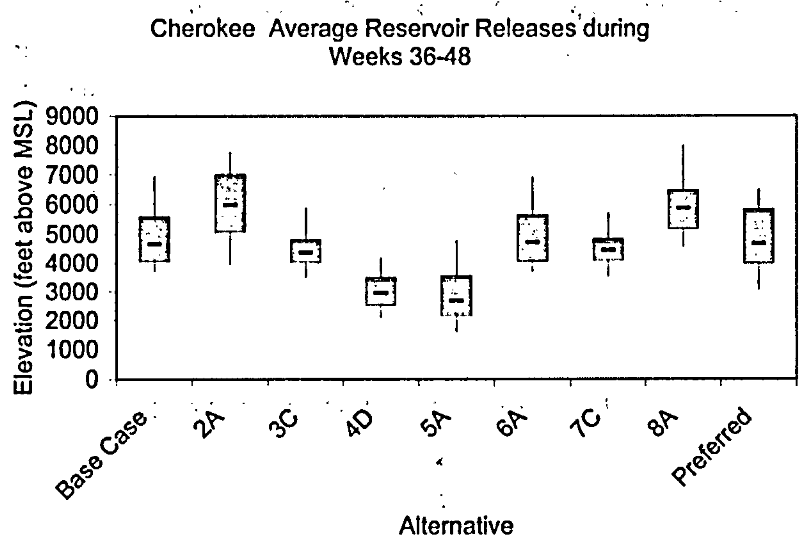
Norris Average Reservoir Releases during Weeks 36-48

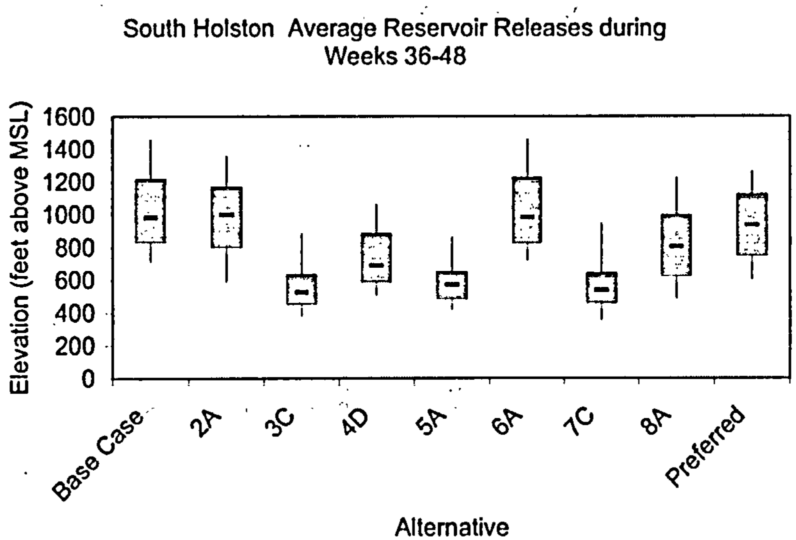


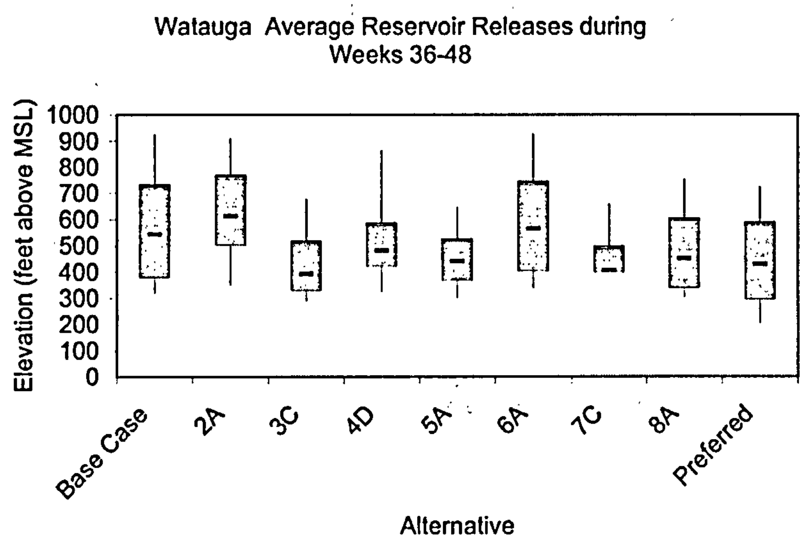
Fontana Average Reservoir Releases during Weeks 36-48



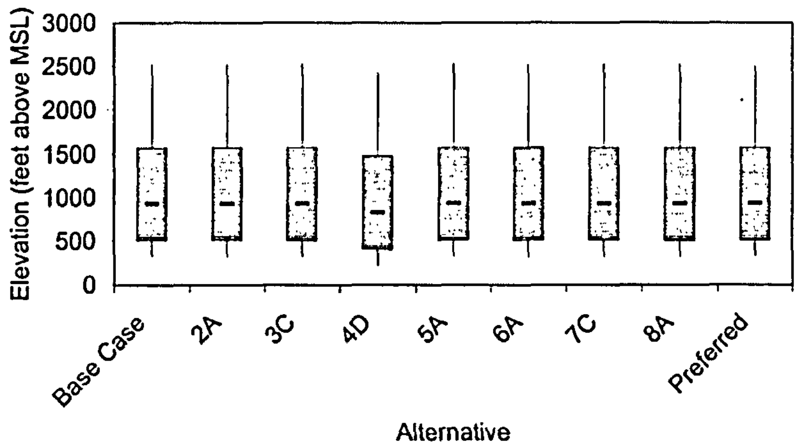

Douglas Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
12000
10000
8000
6000
4000
2000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Cherokee Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

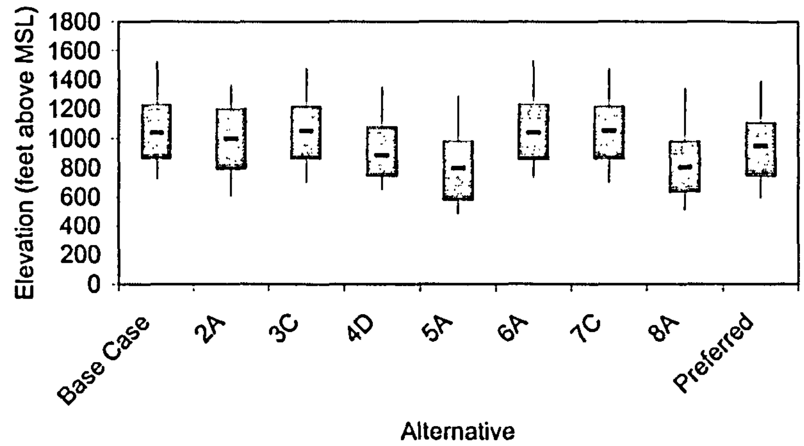

South Holston Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
1600
1400
1200
1000
800
600
400
200
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Watauga Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
1000
900
800
700
600
500
400
300
200
100
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

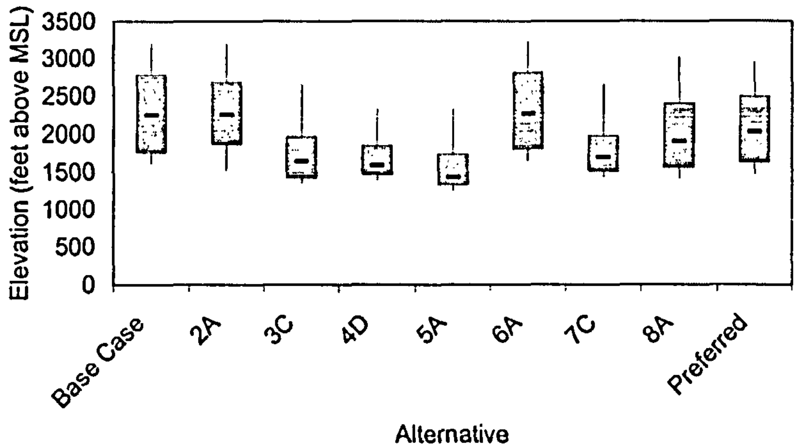
Great Falls Average Reservoir Releases during Weeks 36-48



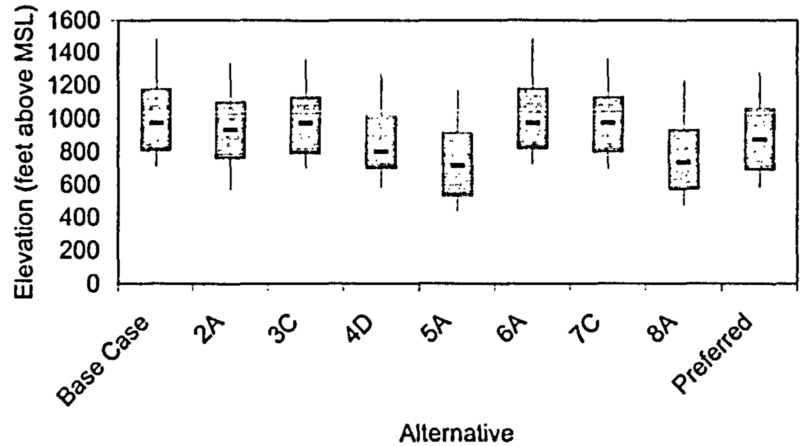
Ocoee #1 Average Reservoir Releases during Weeks 36-48

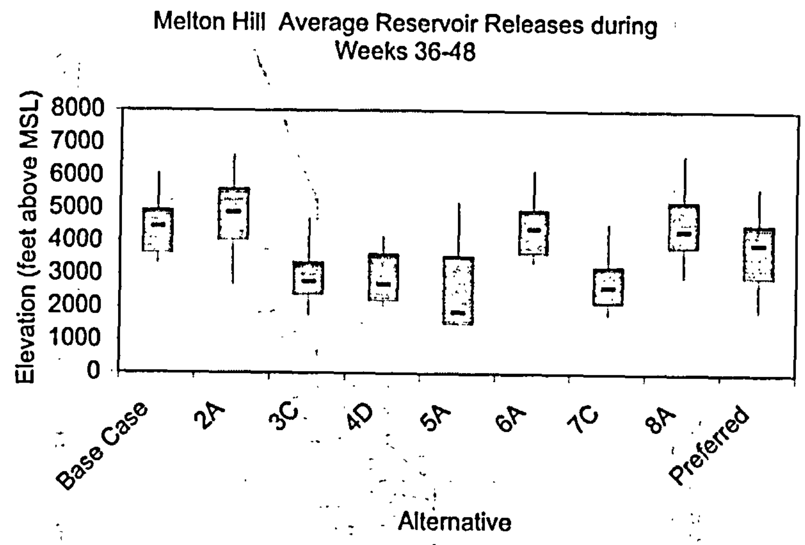


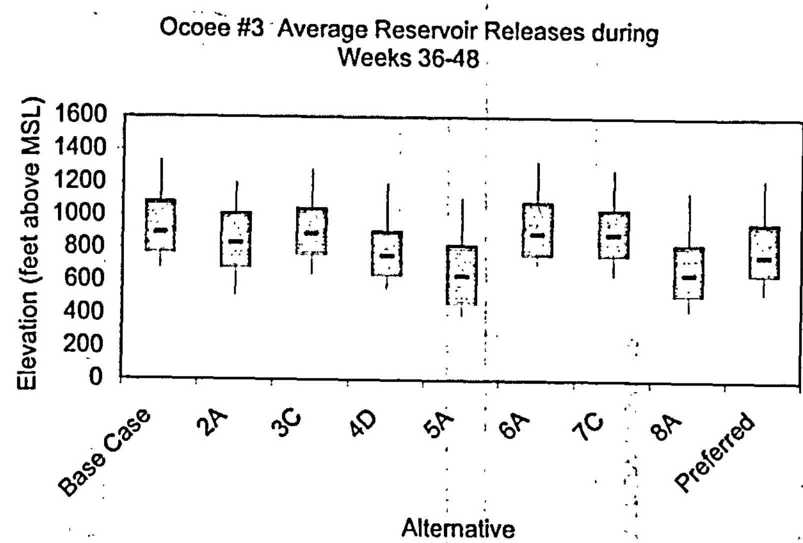
Boone Average Reservoir Releases during Weeks 36-48

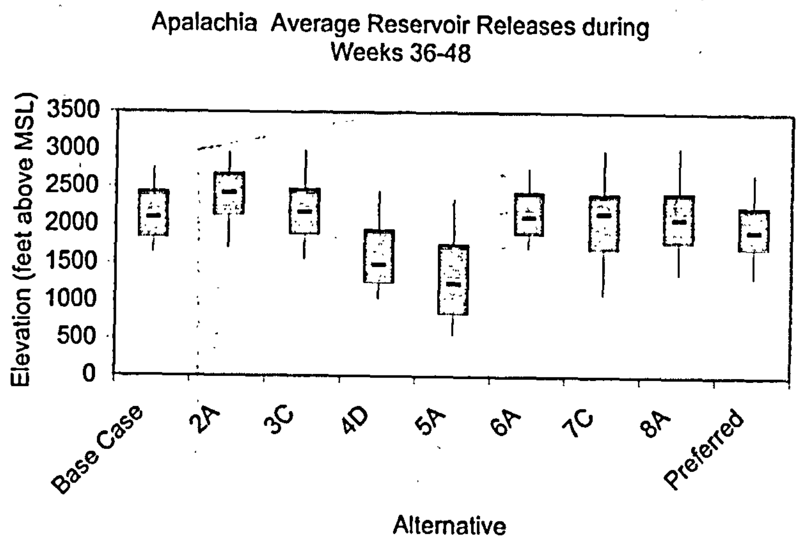


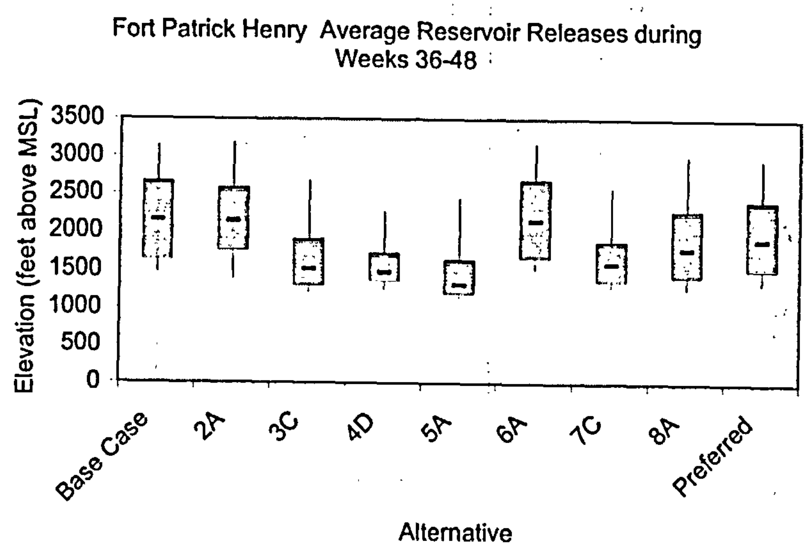
Ocoee #2 Average Reservoir Releases during Weeks 36-48



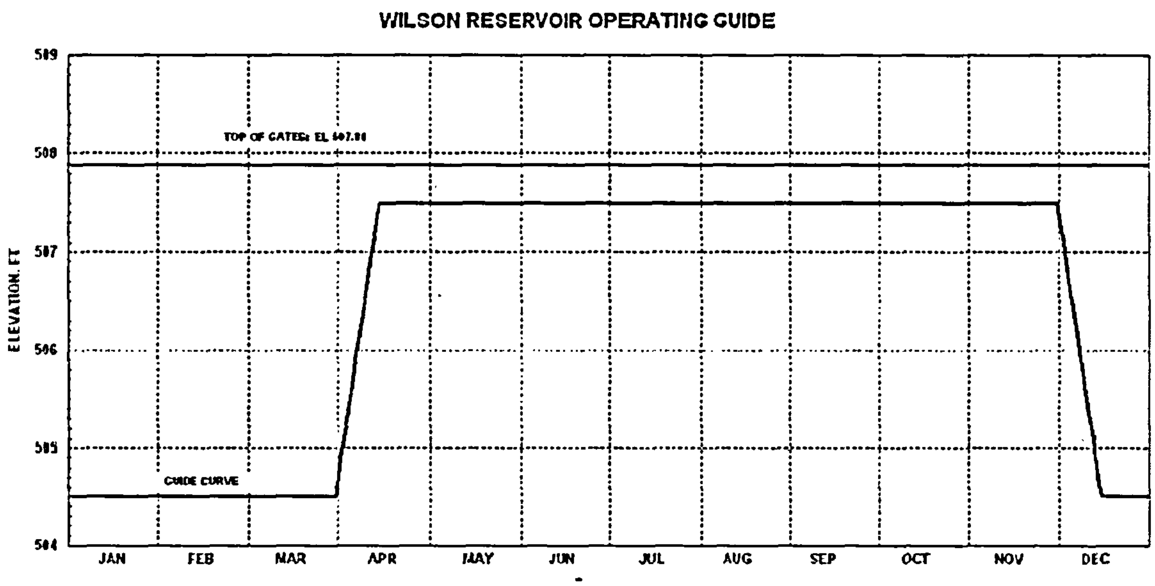

Melton Hill Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
8000
7000
6000
5000
4000
3000
2000
1000
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

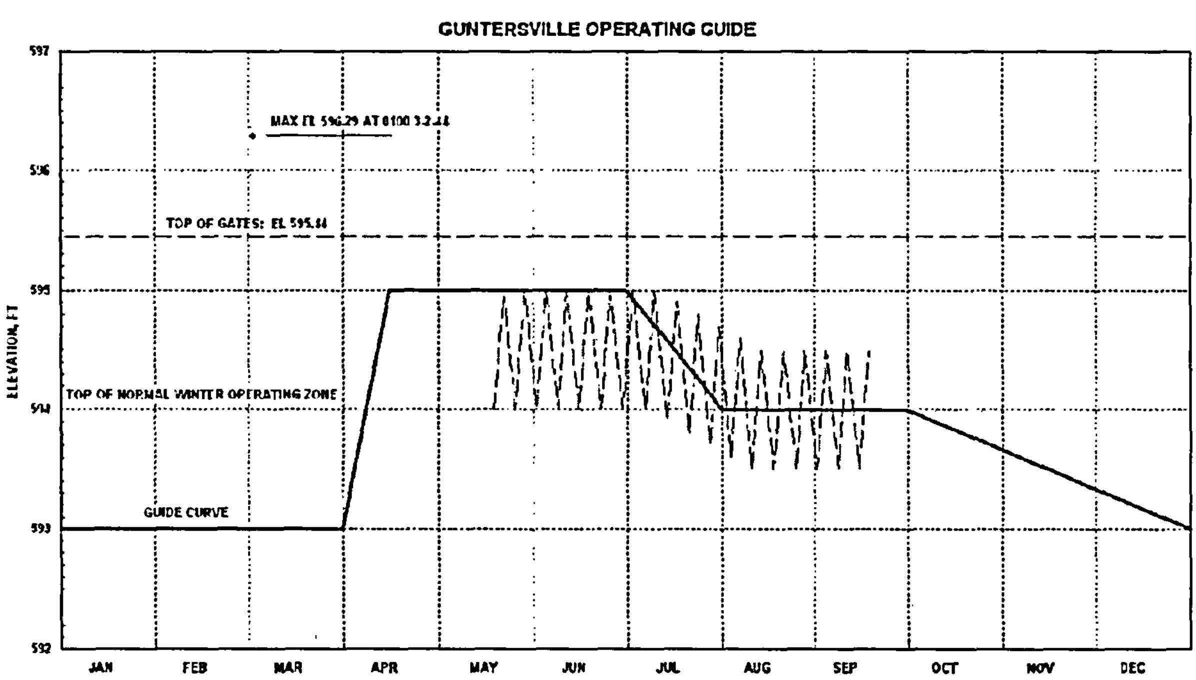

Ocoee #3 Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
1600
1400
1200
1000
800
600
400
200
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Apalachia Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
3500
3000
2500
2000
1500
1000
500
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative


Fort Patrick Henry Average Reservoir Releases during Weeks 36-48
Elevation (feet above MSL)
3500
3000
2500
2000
1500
1000
500
0
Base Case
2A
3C
4D
5A
6A
7C
8A
Preferred
Alternative

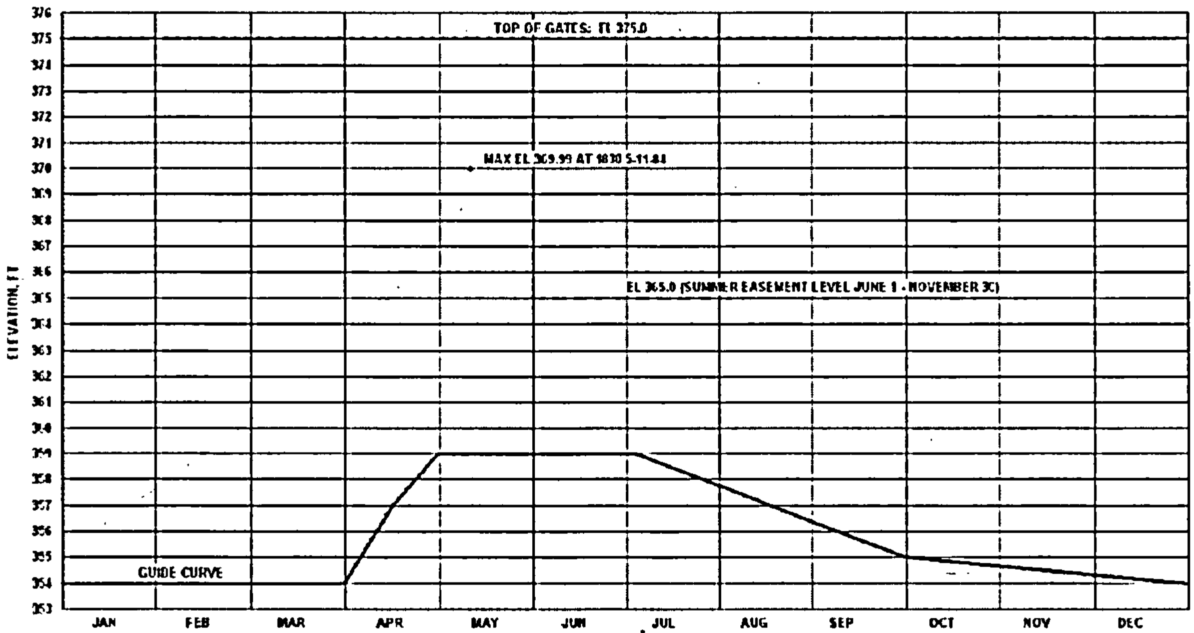
Operating guides for the 9 mainstem projects, Great Falls, and Boone under the Base Case



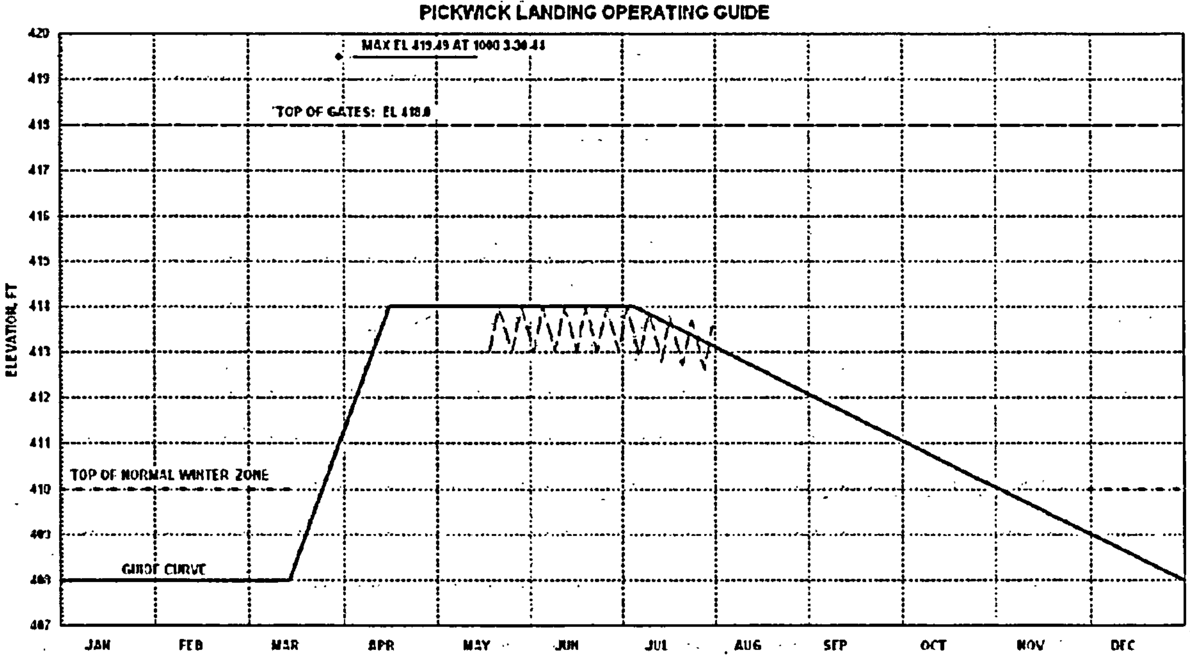


Operating guides for the 9 mainstem projects, Great Falls, and Boone under the Base Case (cont.)

KENTUCKY OPERATING GUIDE

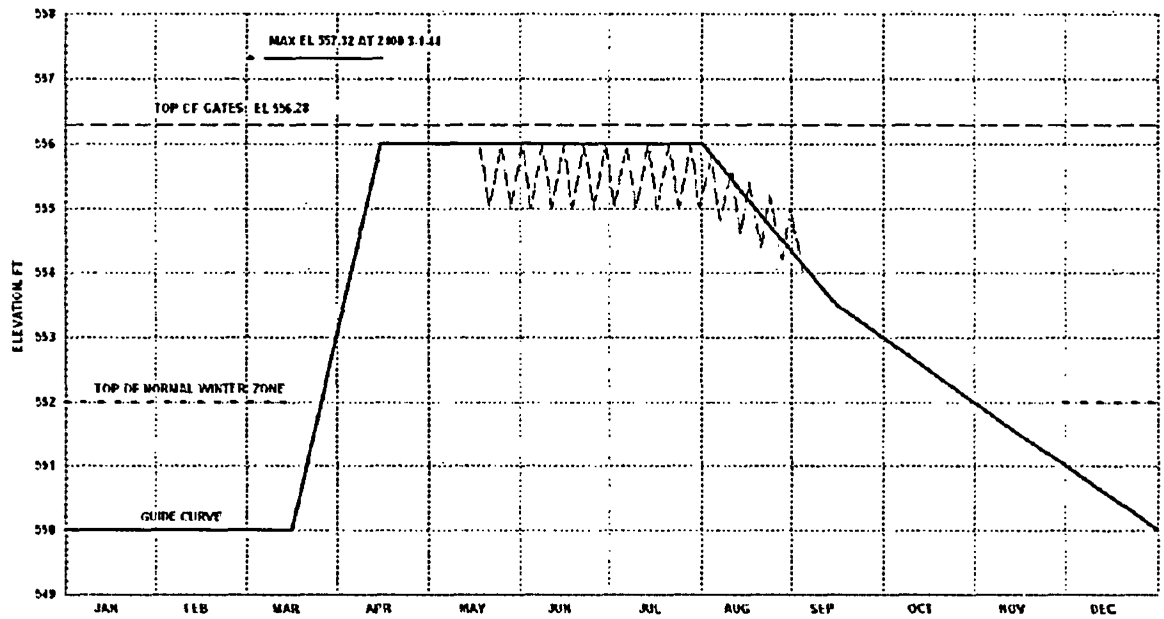


PICKWICK LANDING OPERATING GUIDE

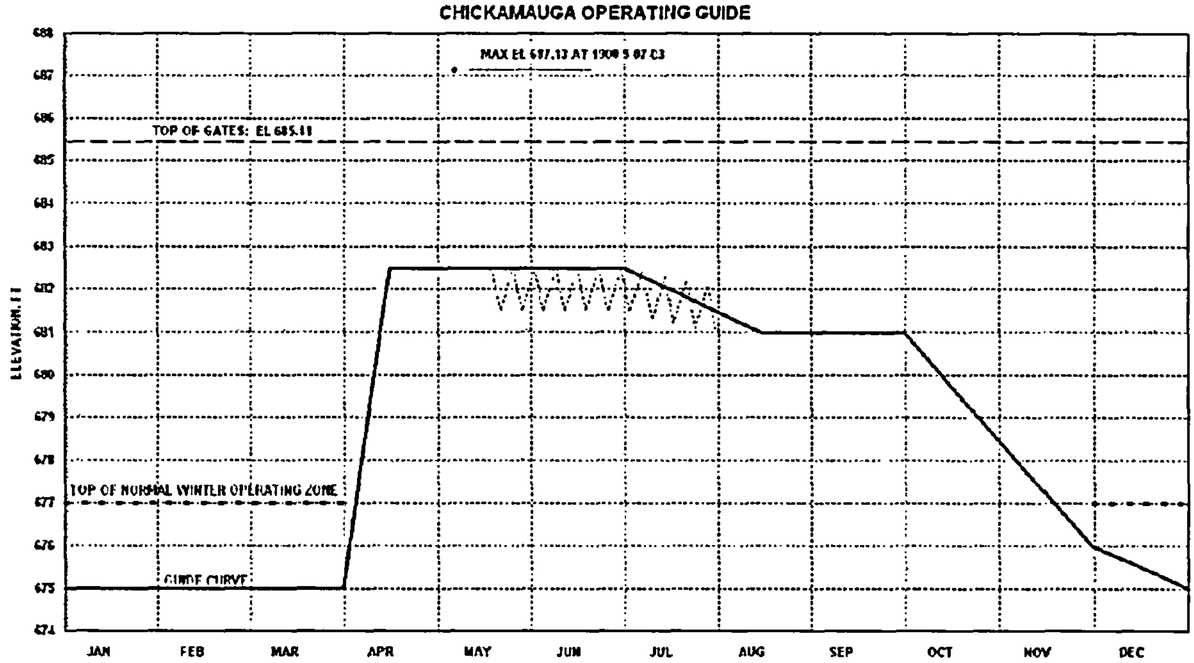


Operating guides for the 9 mainstem projects, Great Falls, and Boone under the Base Case (cont.)

WHEELER OPERATING GUIDE

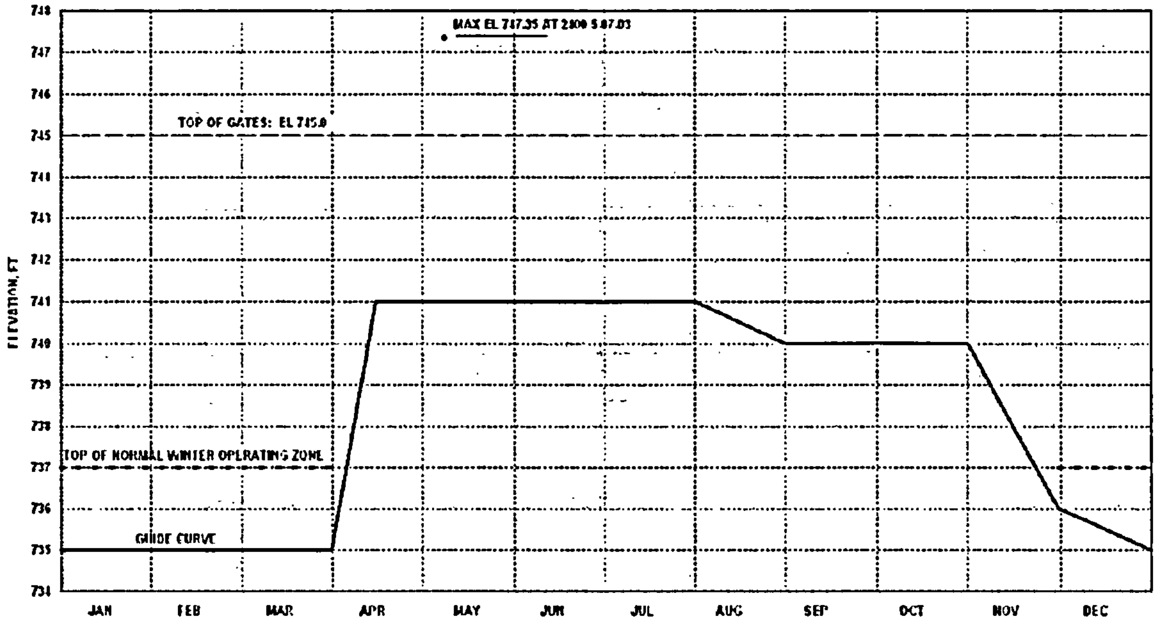


CHICKAMAUGA OPERATING GUIDE

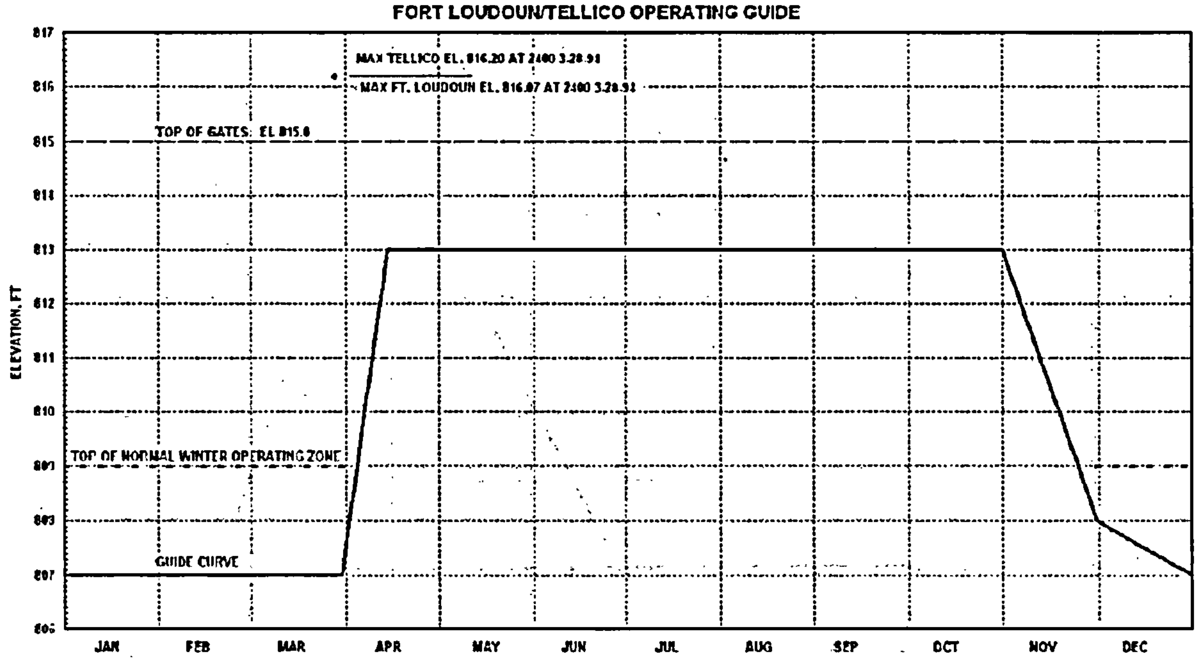


Operating guides for the 9 mainstem projects, Great Falls, and Boone under the Base Case (cont.)

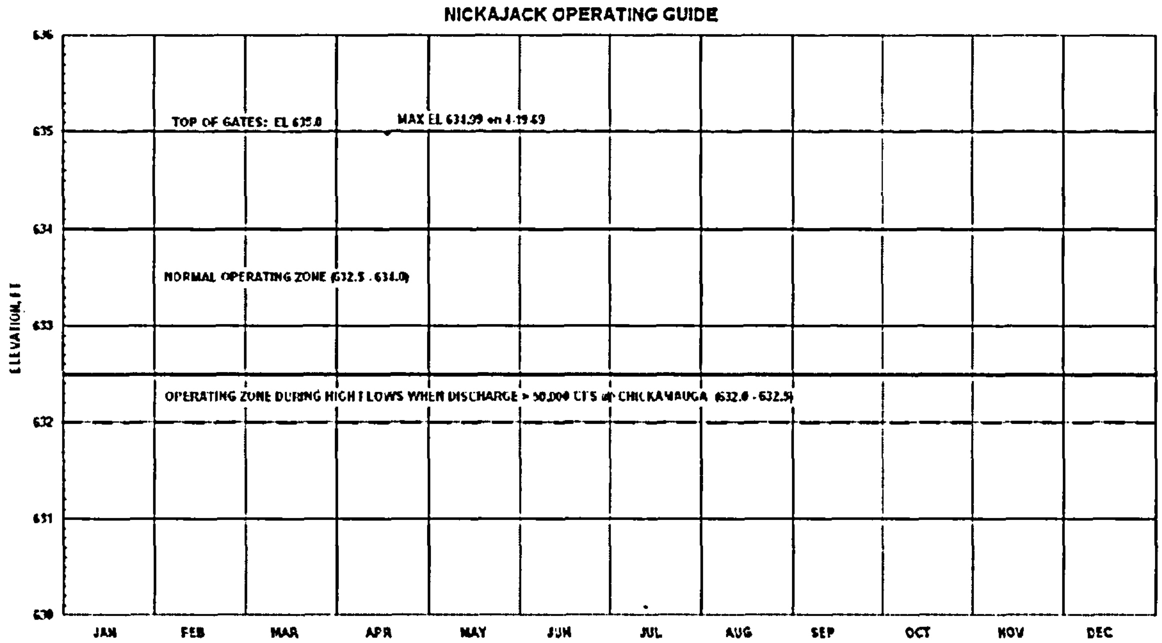
WATTS BAR OPERATING GUIDE

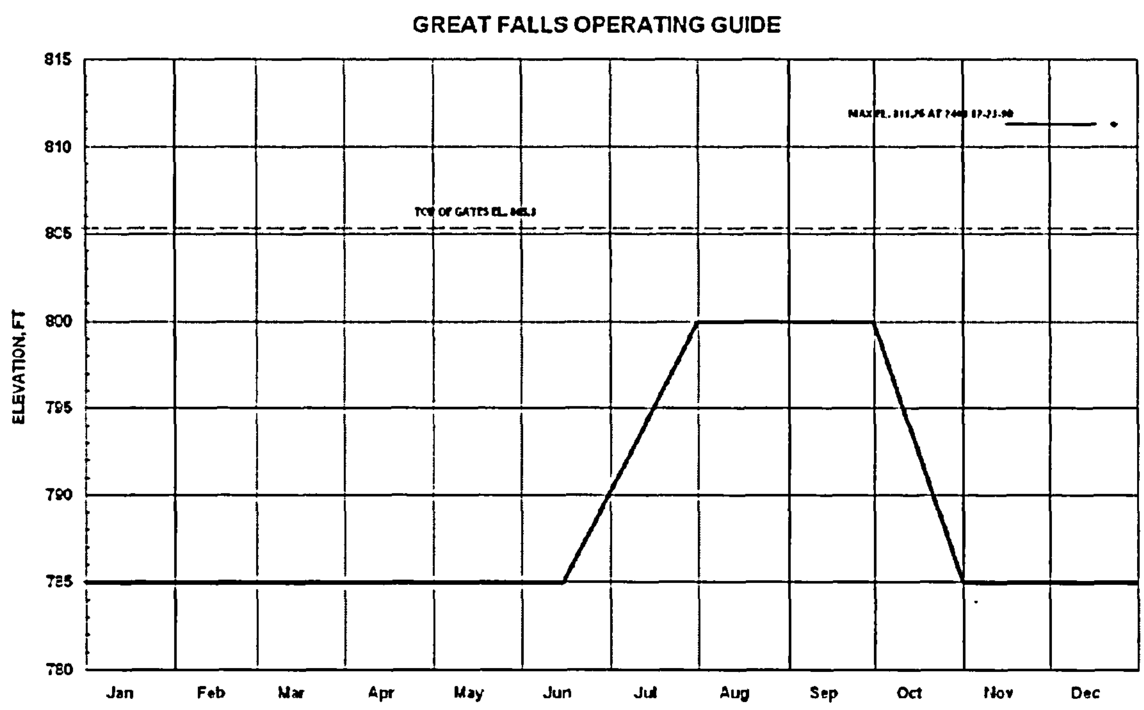


FORT LOUDOUN/TELLICO OPERATING GUIDE

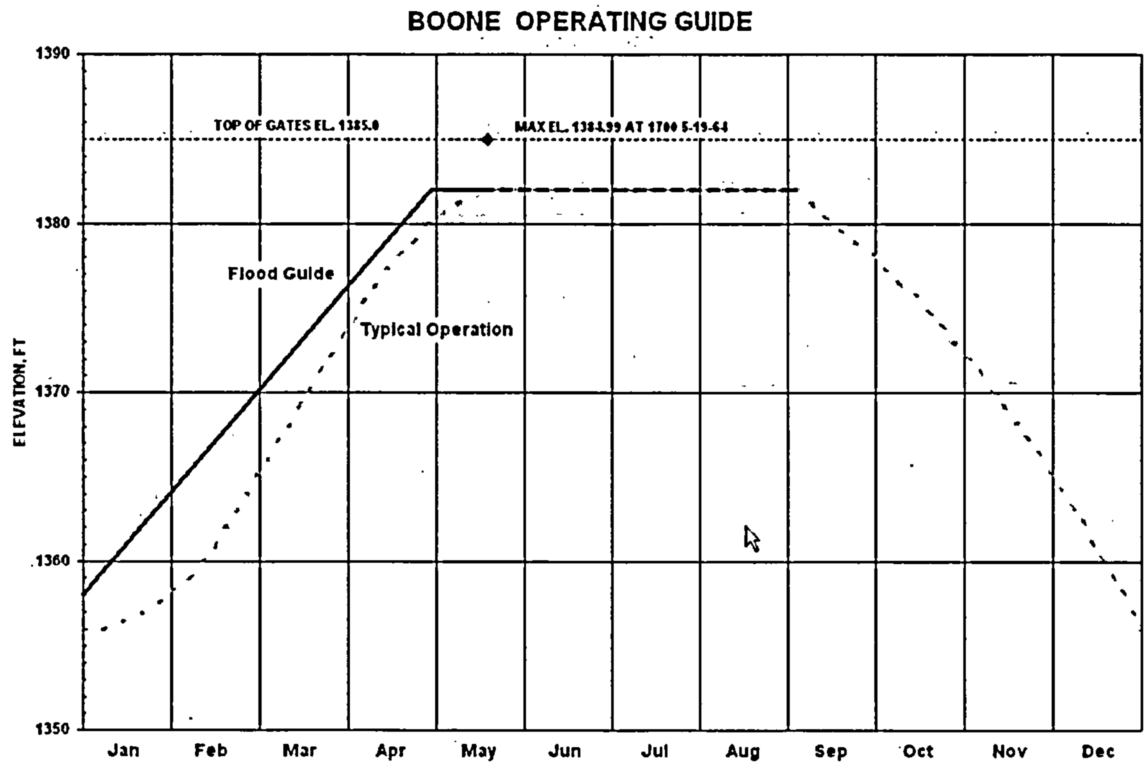


Operating guides for the 9 mainstem projects, Great Falls, and Boone under the Base Case (cont.)

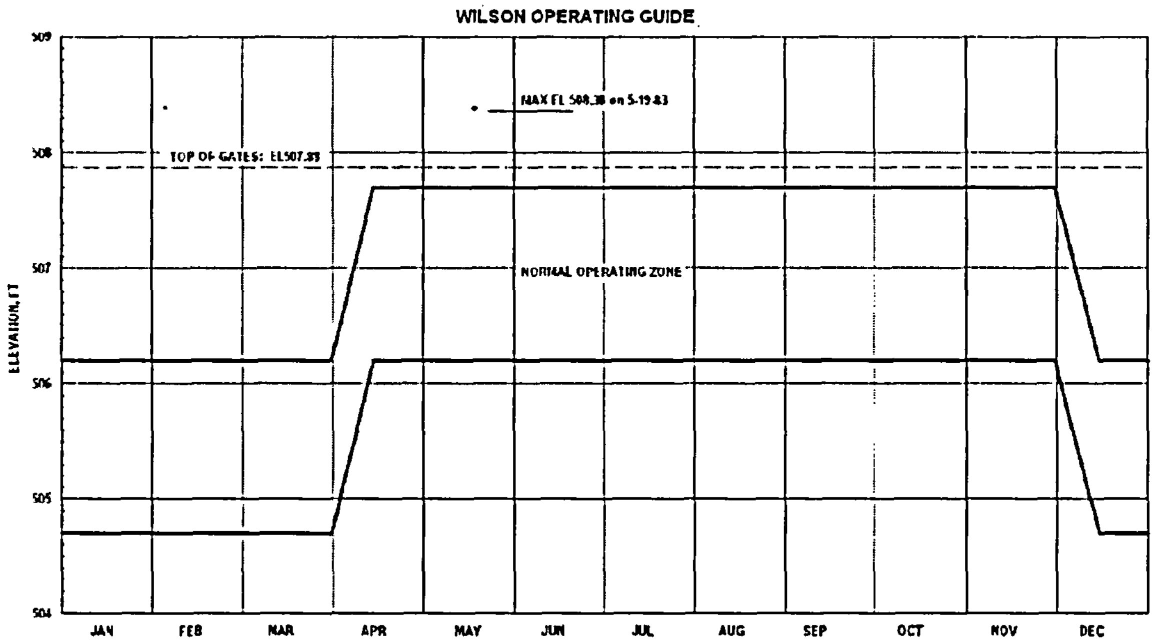


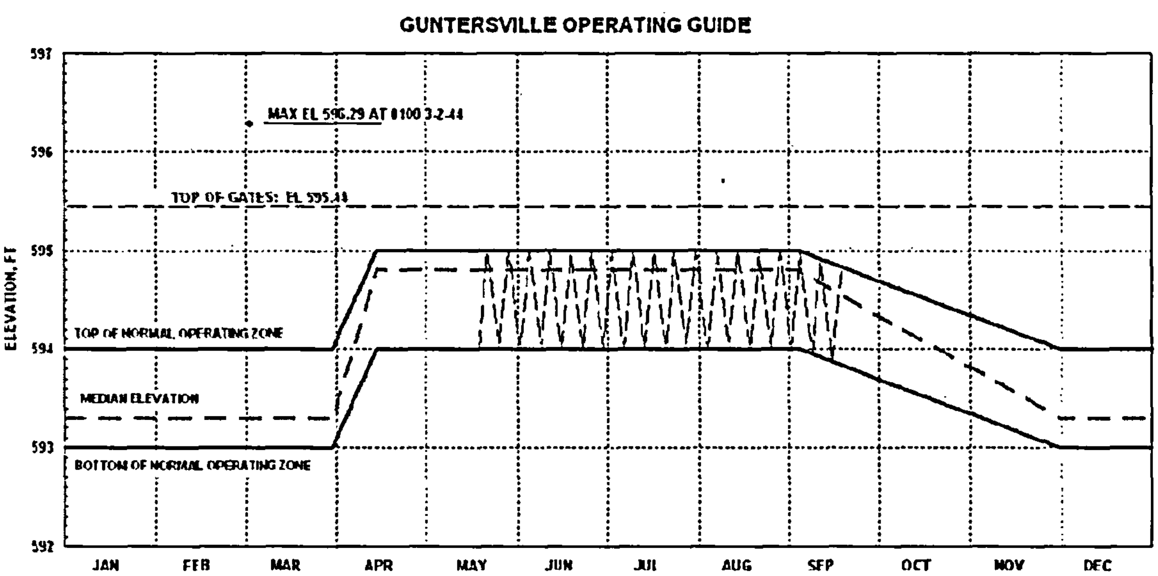


Operating guides for the 9 mainstem projects, Great Falls, and Boone under the Base Case (cont.)



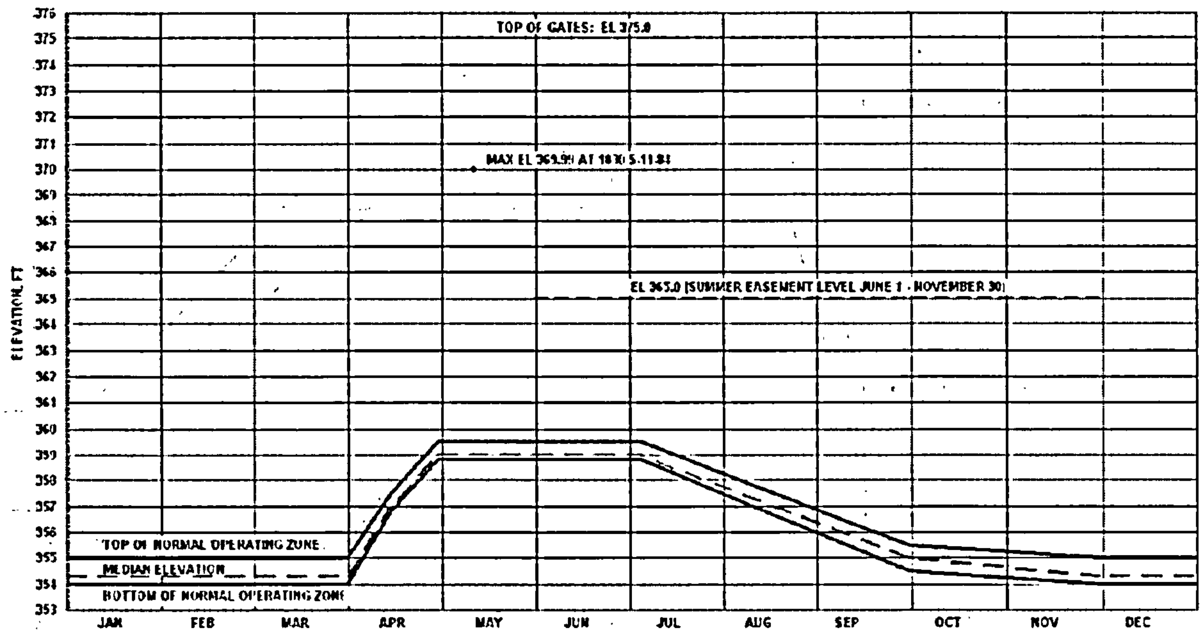
Operating guides for the nine mainstem projects, Great Falls, and Boone under the Preferred Alternative



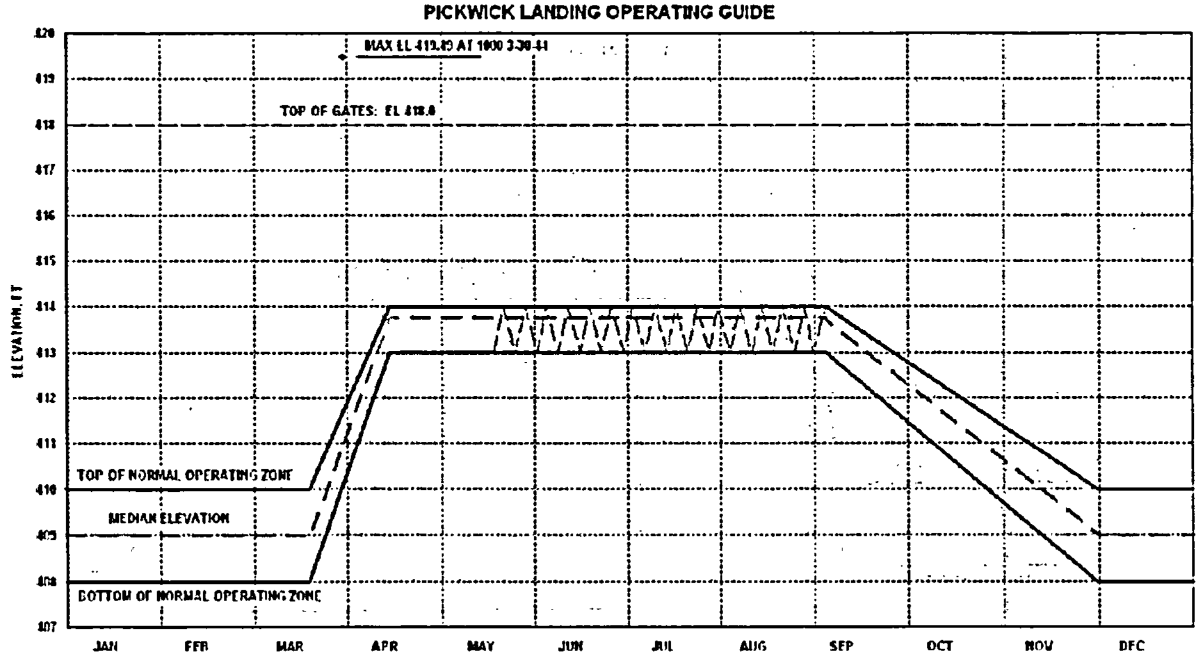


Operating guides for the nine mainstem projects, Great Falls, and Boone under the Preferred Alternative (cont.)

KENTUCKY OPERATING GUIDE

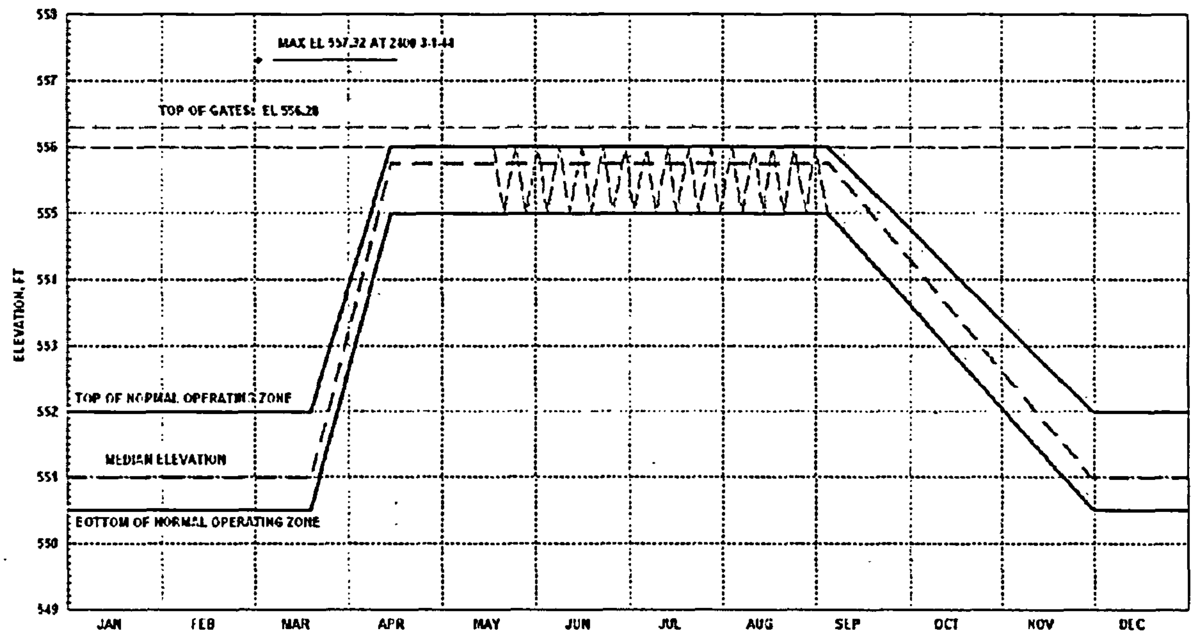


PICKWICK LANDING OPERATING GUIDE

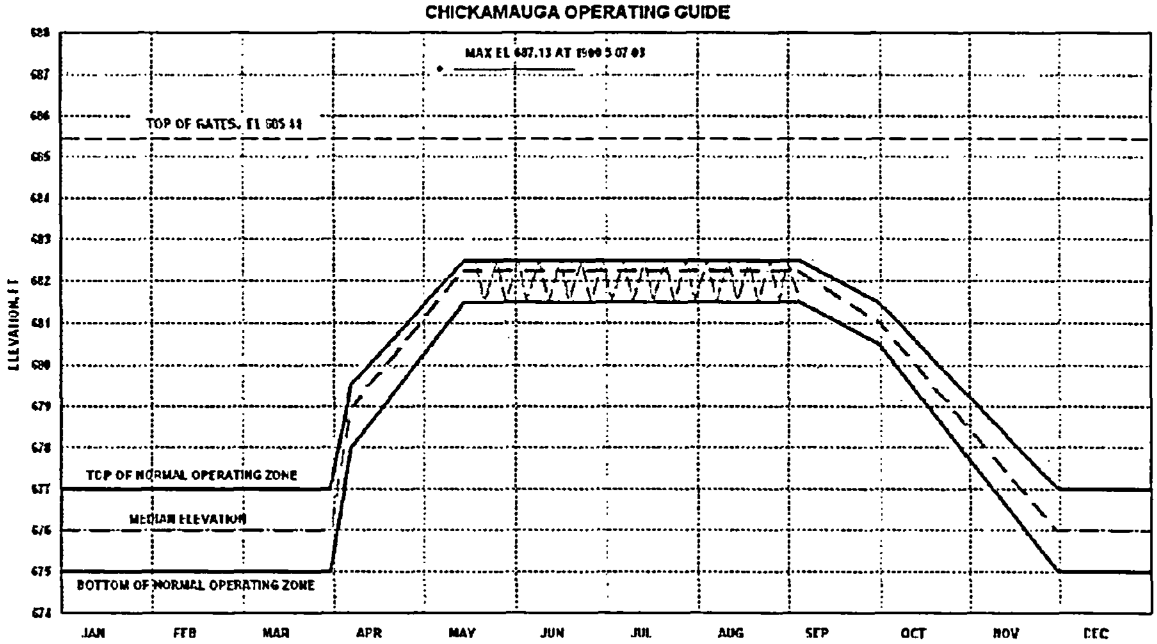


Operating guides for the nine mainstem projects, Great Falls, and Boone under the Preferred Alternative (cont.)

WHEELER OPERATING GUIDE

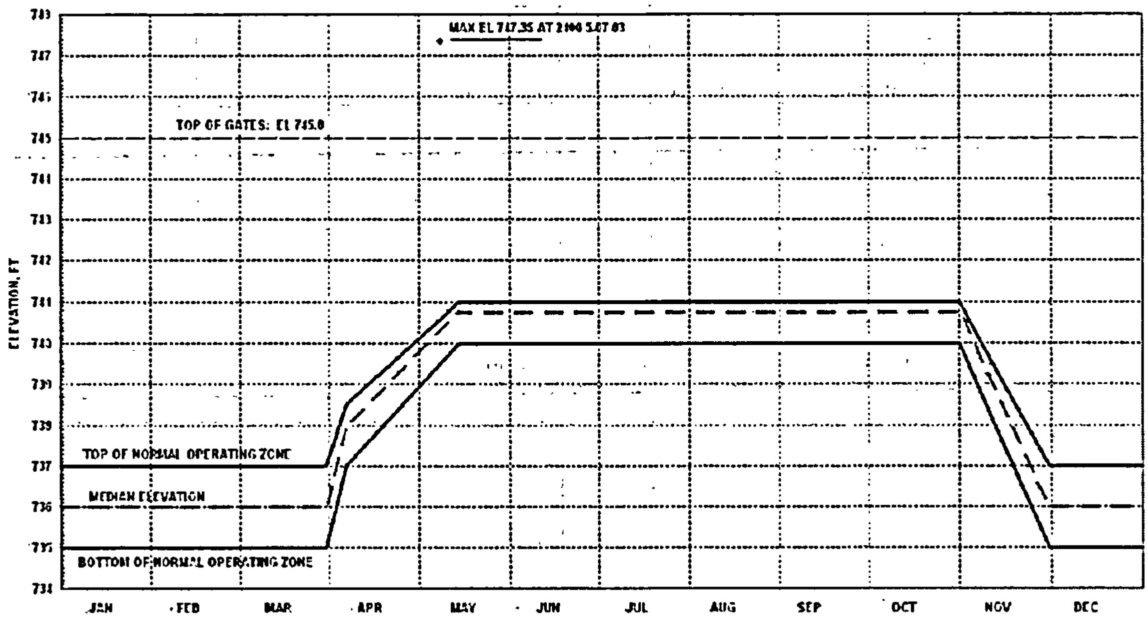


CHICKAMAUGA OPERATING GUIDE

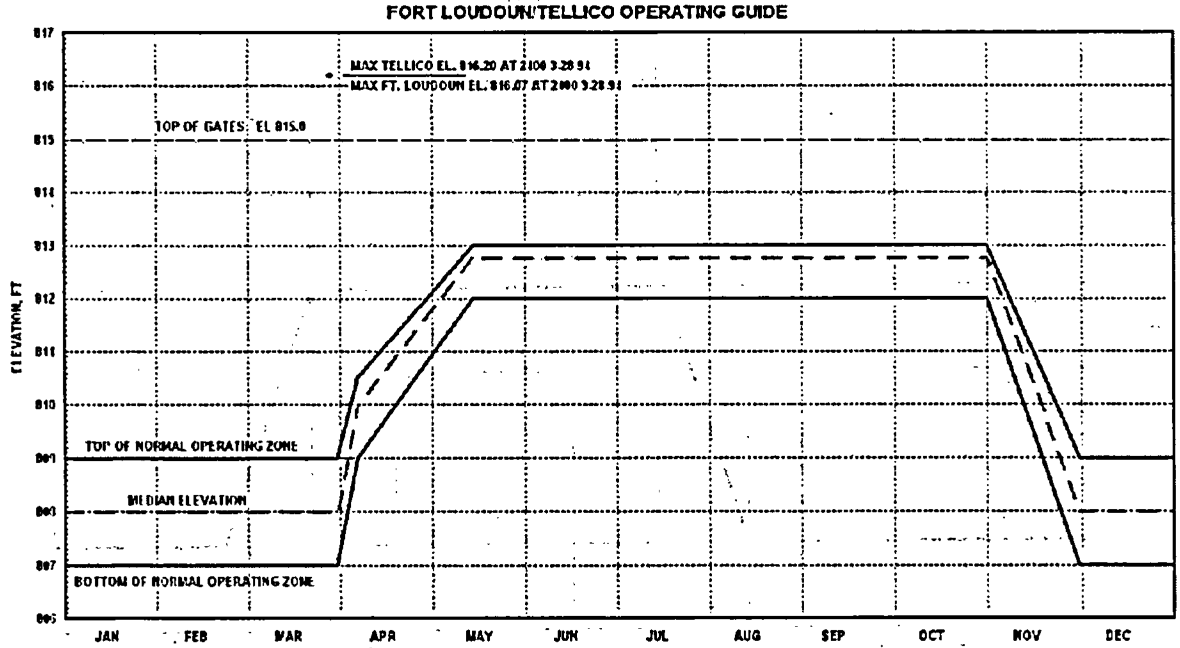


Operating guides for the nine mainstem projects, Great Falls, and Boone under the Preferred Alternative (cont.)

WATTS BAR OPERATING GUIDE

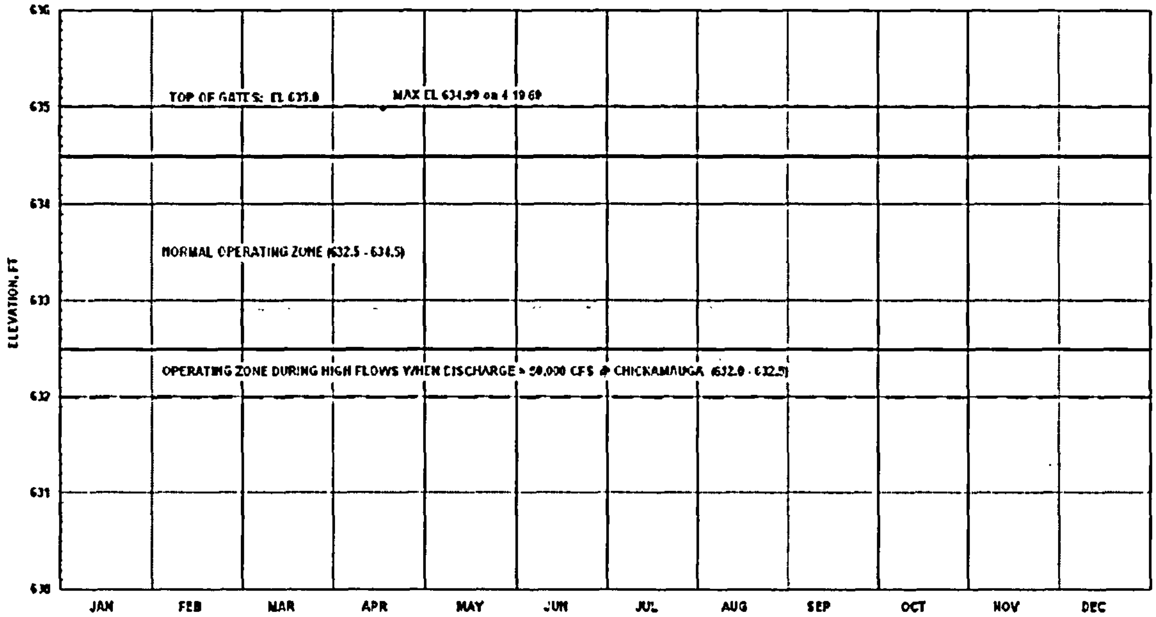


FORT LOUDOUN/TELLICO OPERATING GUIDE

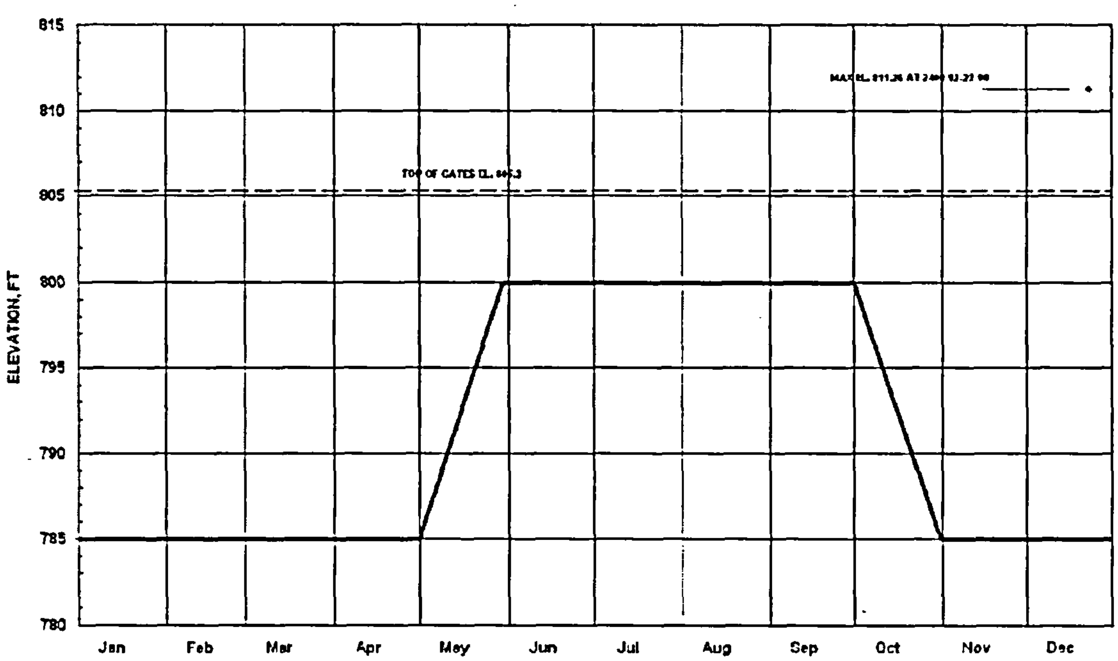


Operating guides for the nine mainstem projects, Great Falls, and Boone under the Preferred Alternative (cont.)

NICKAJACK OPERATING GUIDE

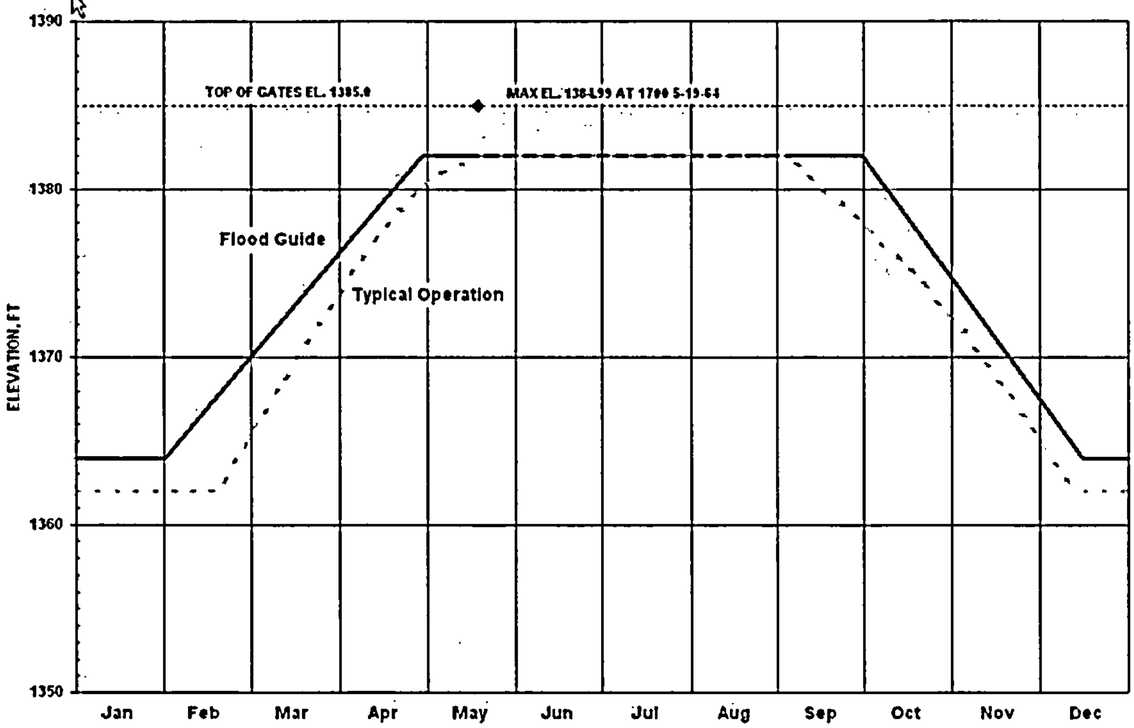


GREAT FALLS OPERATING GUIDE



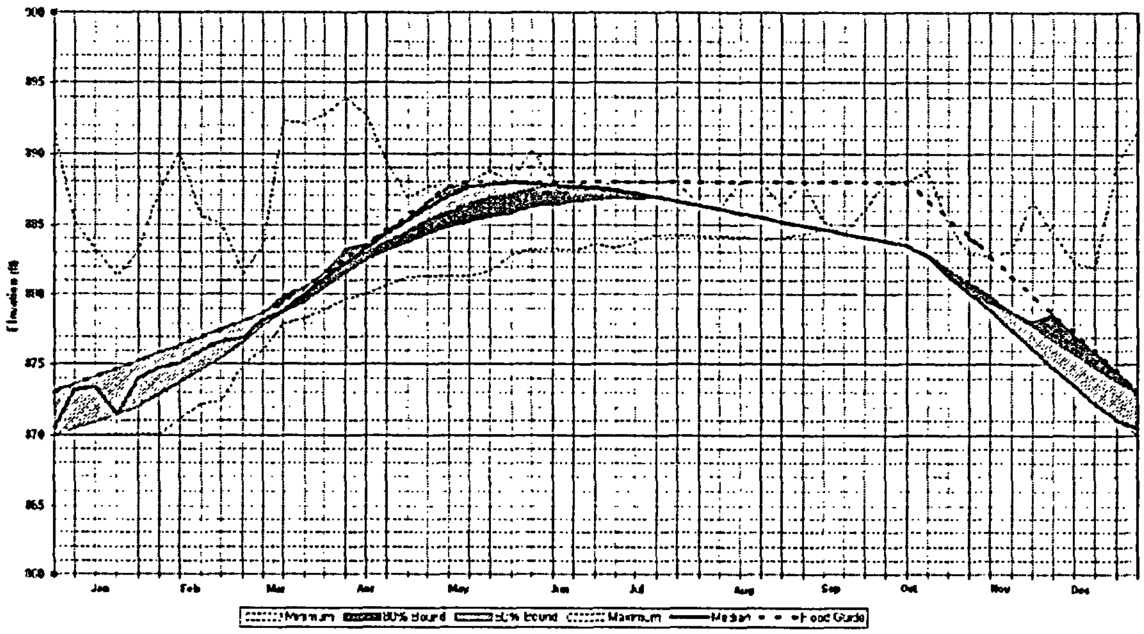
Operating guides for the nine mainstem projects, Great Falls, and Boone under the Preferred Alternative (cont.)

BOONE OPERATING GUIDE

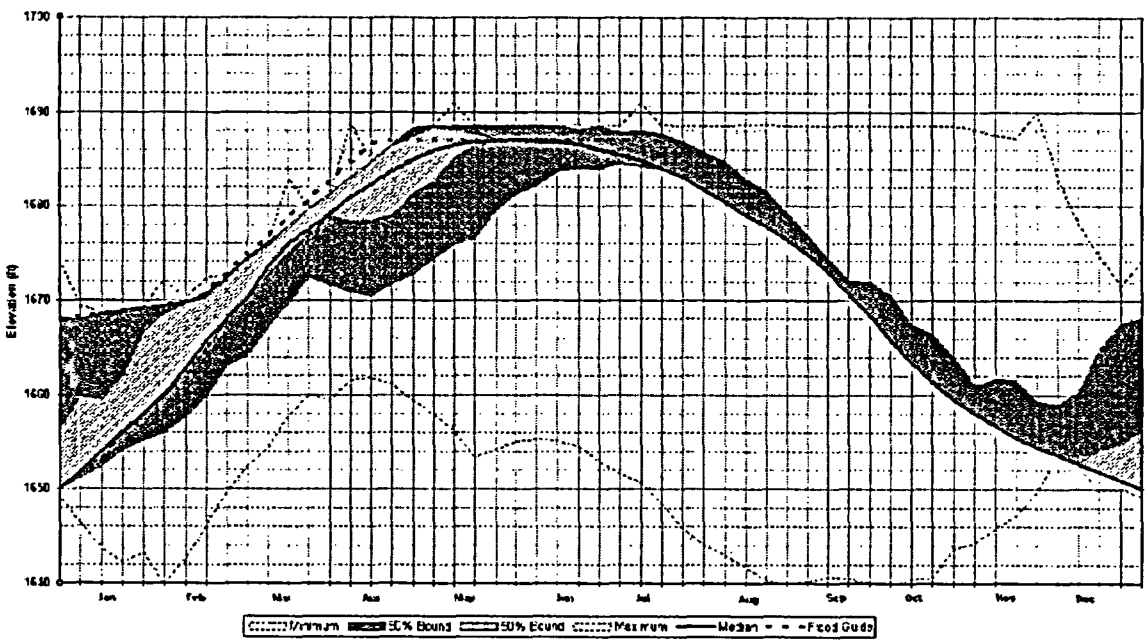


Elevation probability plots along with flood guide curves for tributary reservoirs under the Base Case

Tims Ford Reservoir

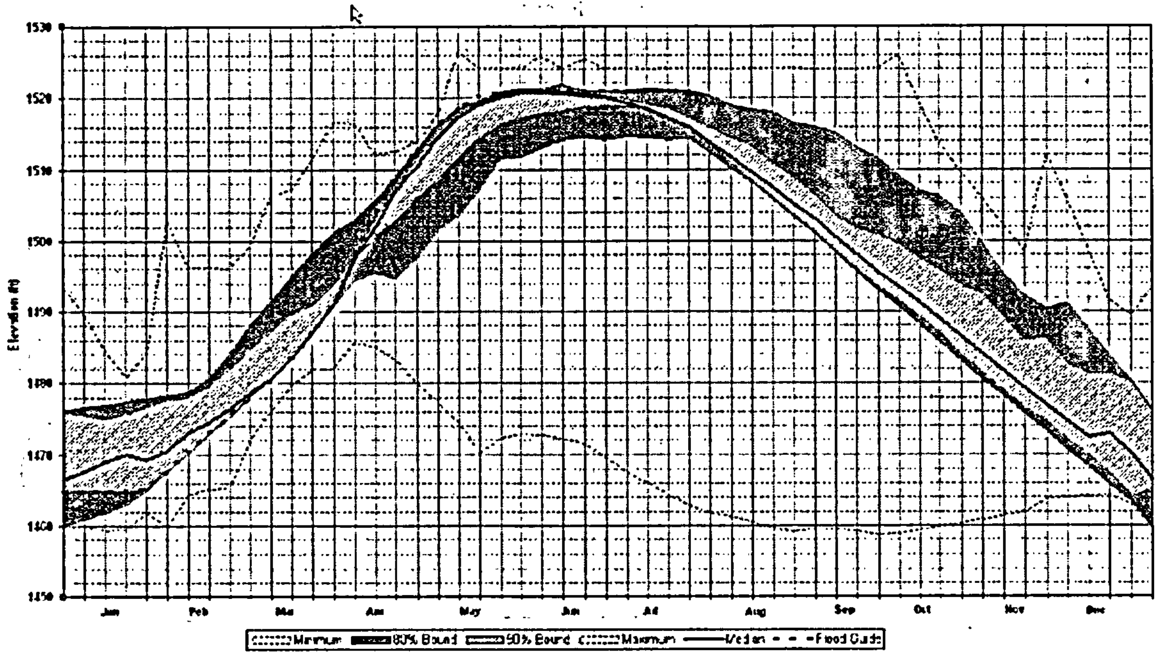


Blue Ridge Reservoir

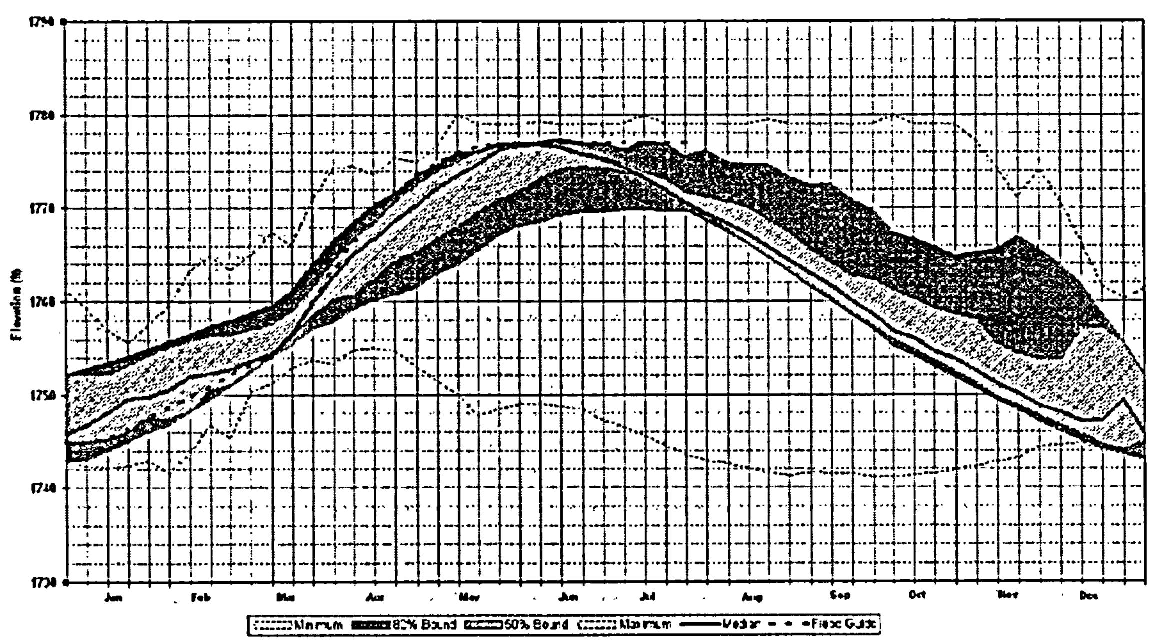


Elevation probability plots along with flood guide curves for tributary reservoirs under the Base Case (cont.)

Hiwassee Reservoir

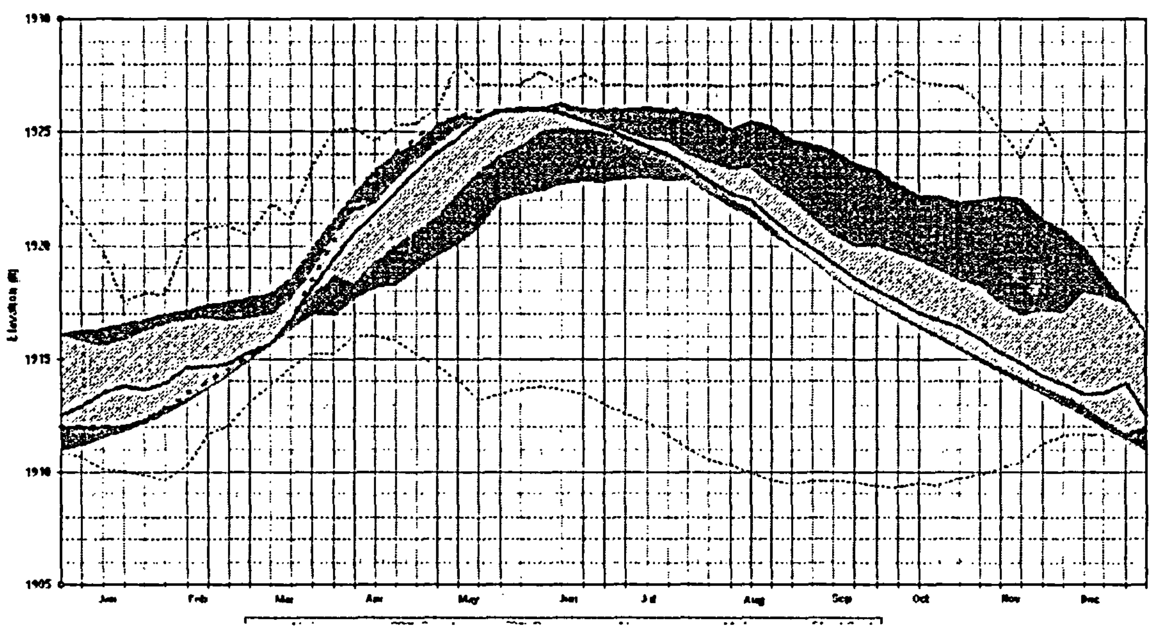


Nottely Reservoir

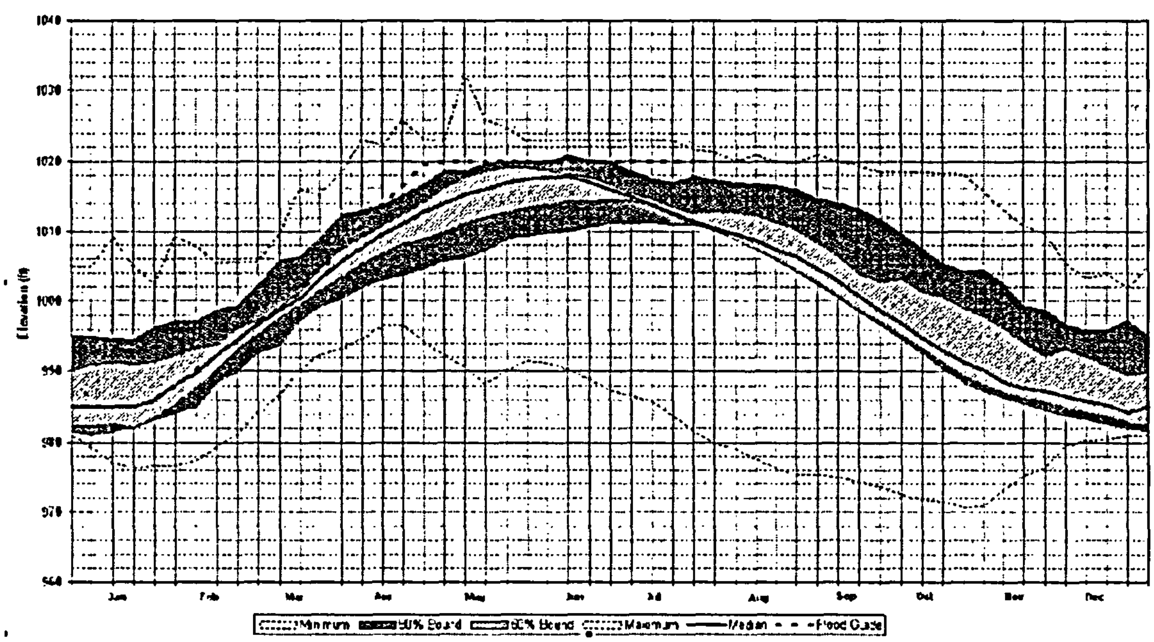


Elevation probability plots along with flood guide curves for tributary reservoirs under the Base Case (cont.)

Chatuge Reservoir

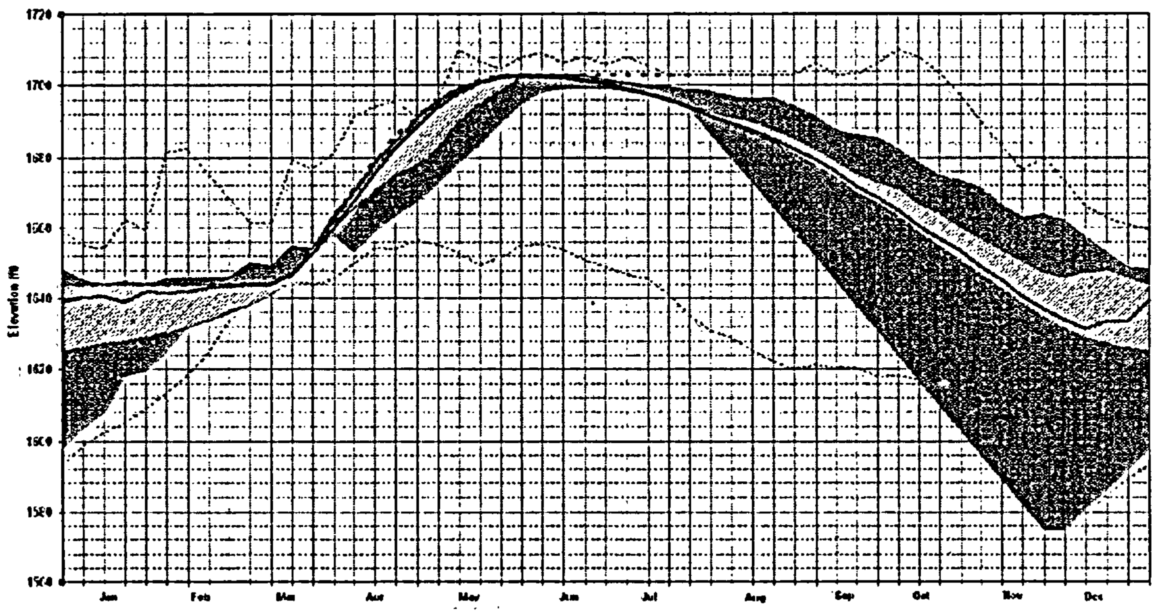


Norris Reservoir

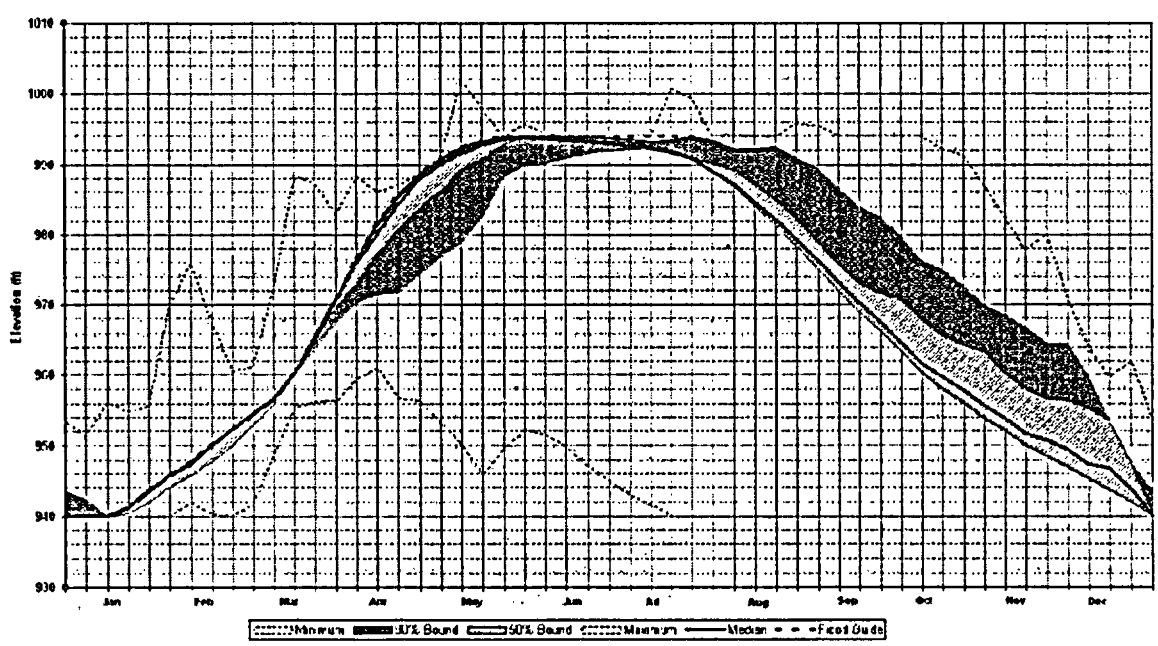


Elevation probability plots along with flood guide curves for tributary reservoirs under the Base Case (cont.)

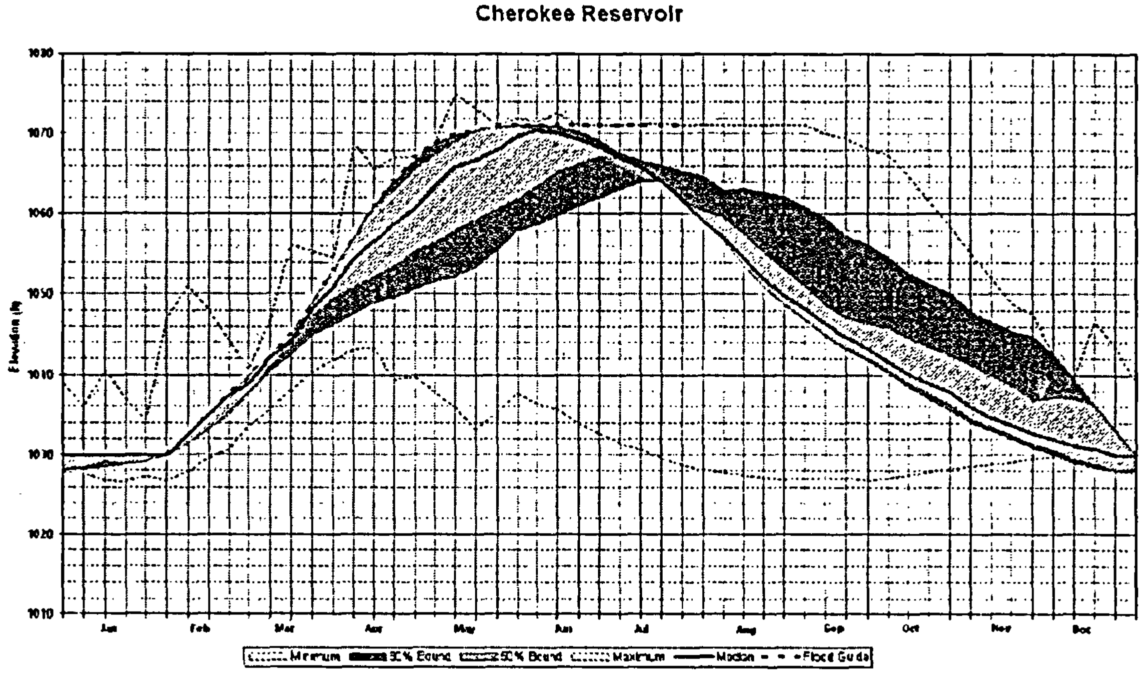
Fontana Reservoir

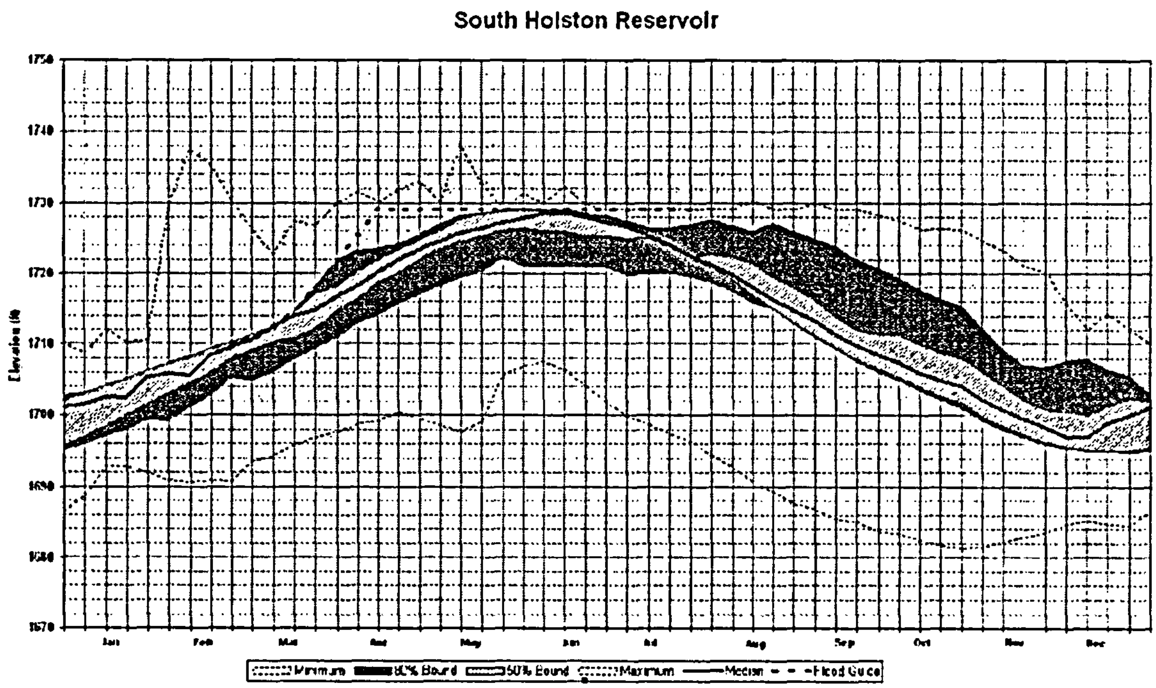


Douglas Reservoir

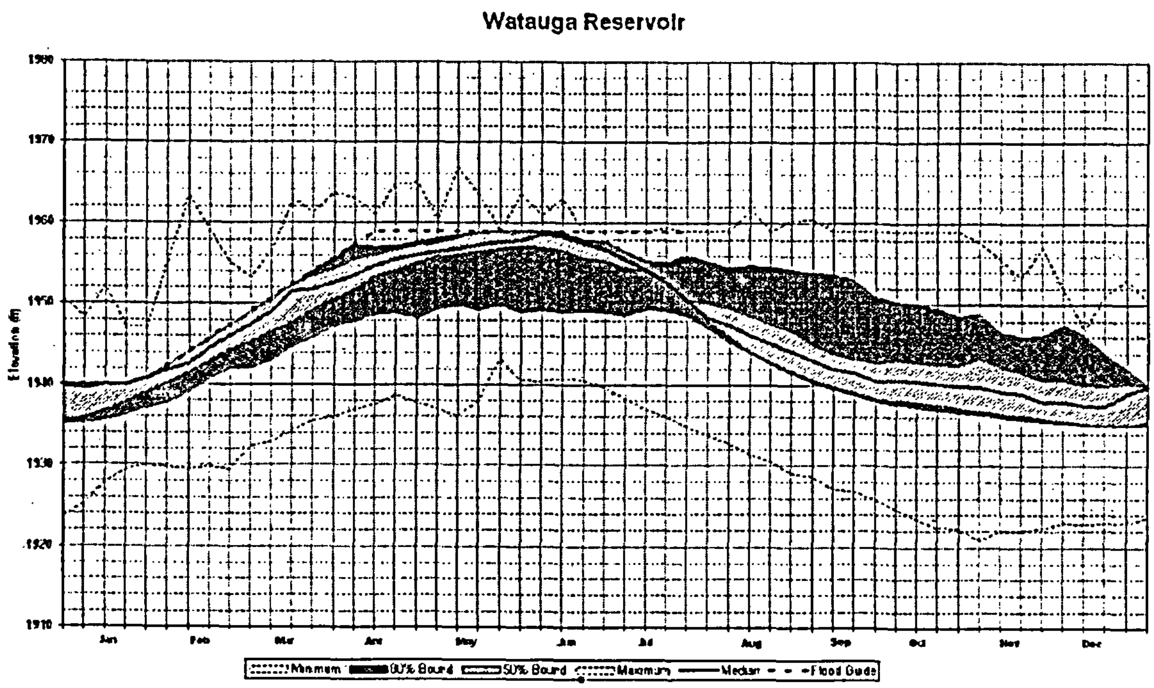


Elevation probability plots along with flood guide curves for tributary reservoirs under the Base Case (cont.)



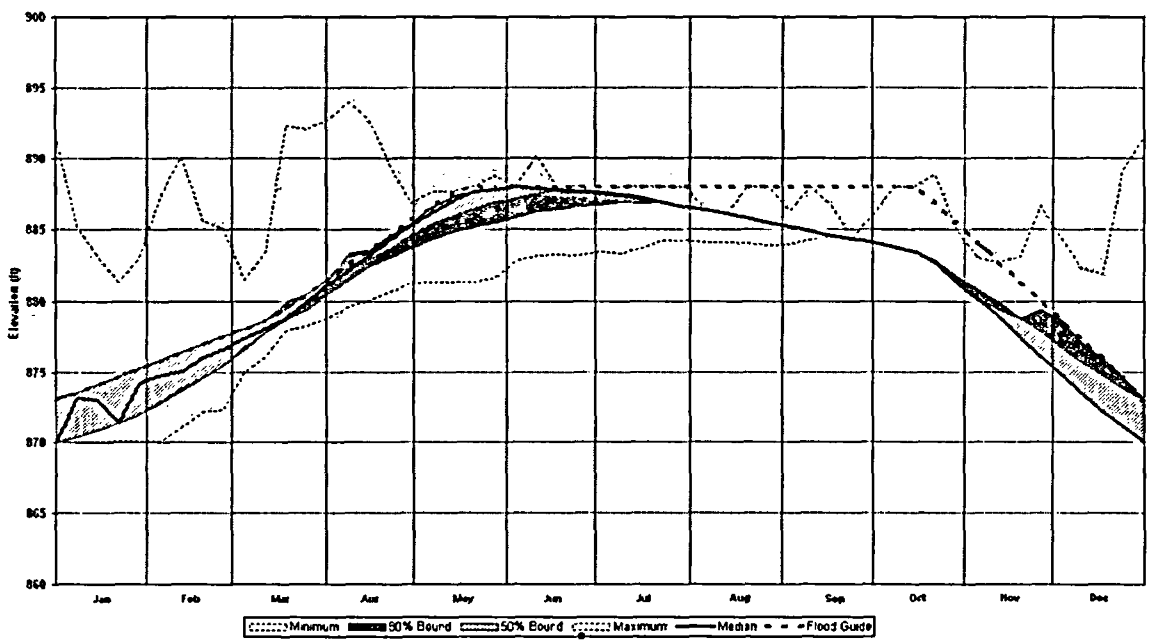


Elevation probability plots along with flood guide curves for tributary reservoirs under the Base Case (cont.)

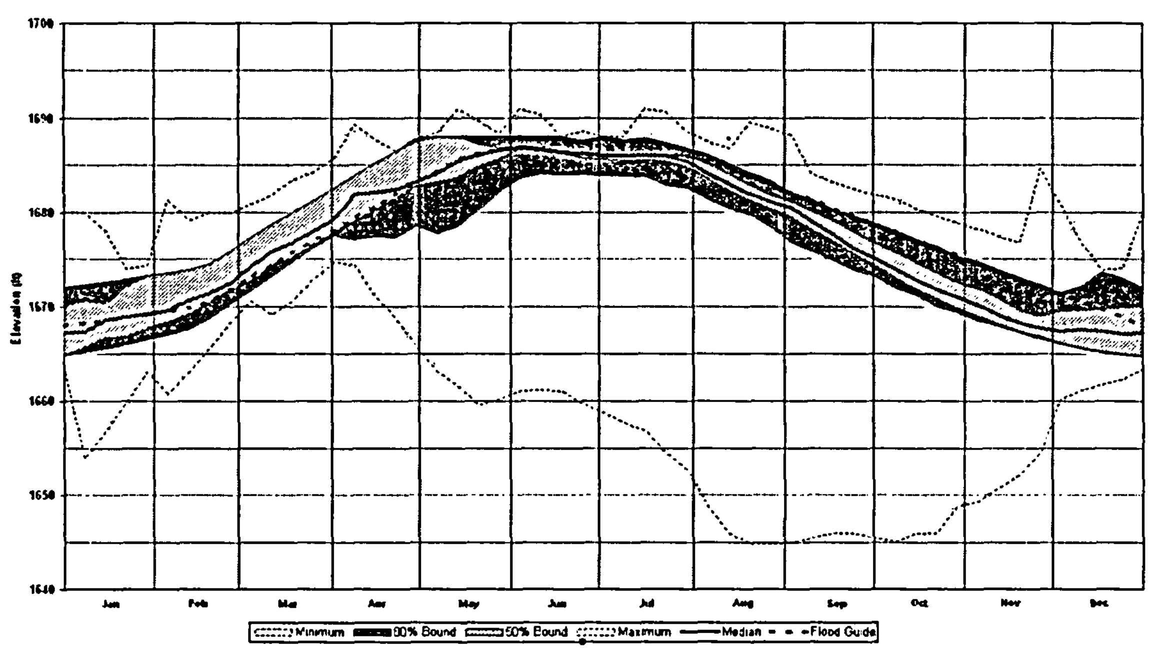


Elevation probability plots along with flood guide curves for tributary reservoirs under the Preferred Alternative

Tims Ford Reservoir

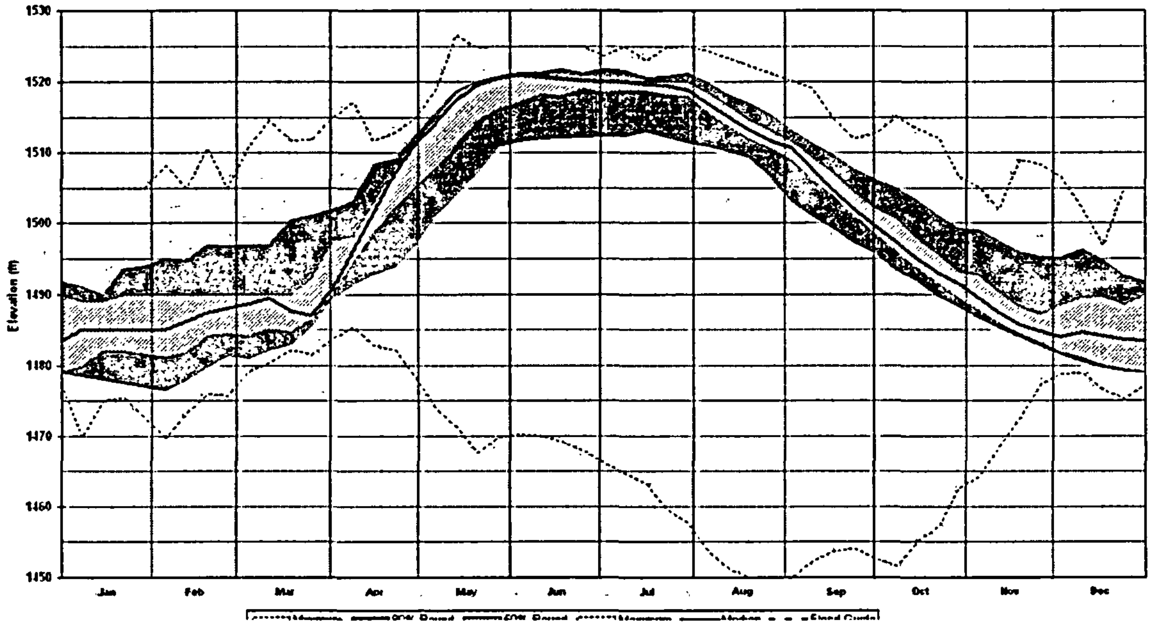


Blue Ridge Reservoir

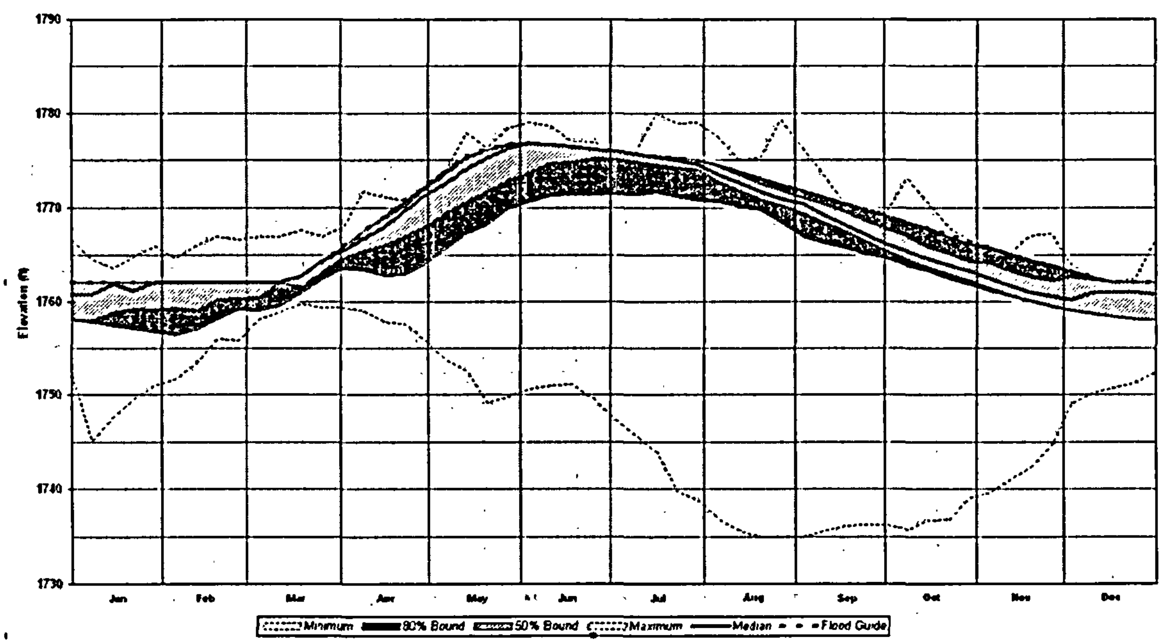


Elevation probability plots along with flood guide curves for tributary reservoirs under the Preferred Alternative (cont.)

Hiwassee Reservoir

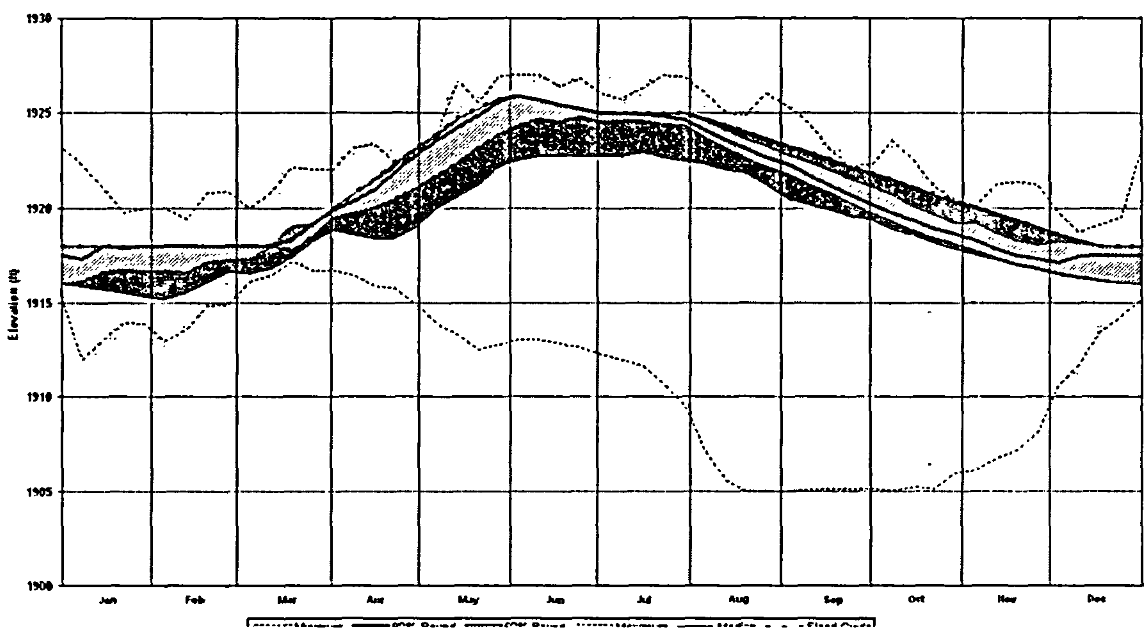


Nottely Reservoir

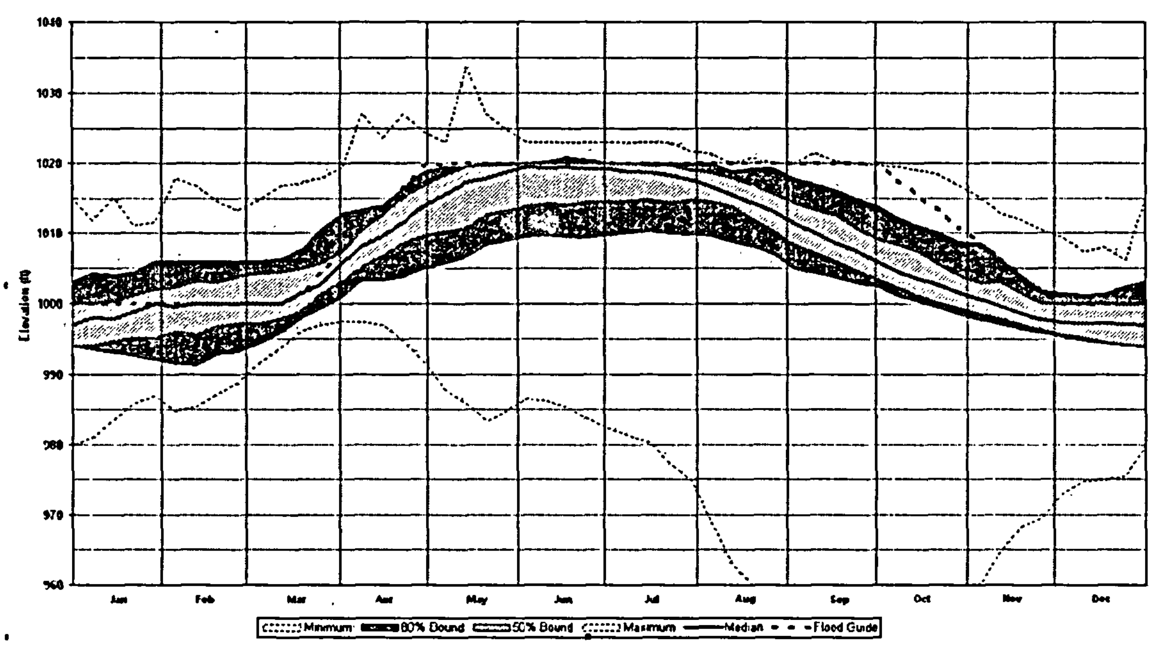


Elevation probability plots along with flood guide curves for tributary reservoirs under the Preferred Alternative (cont.)

Chatuge Reservoir

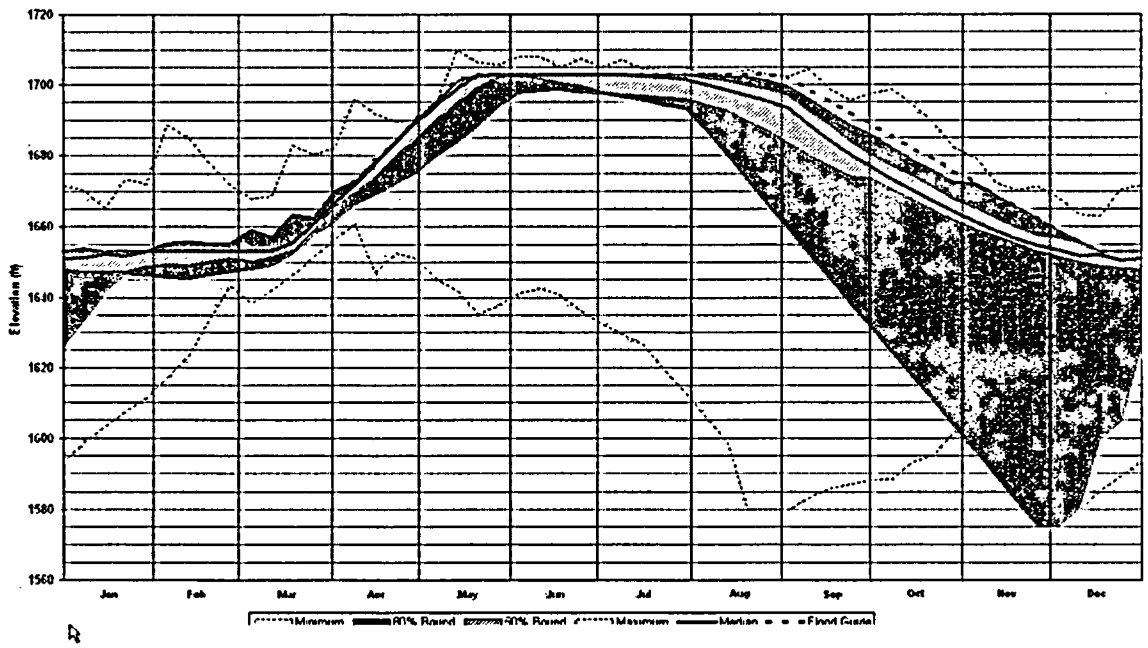


Norris Reservoir

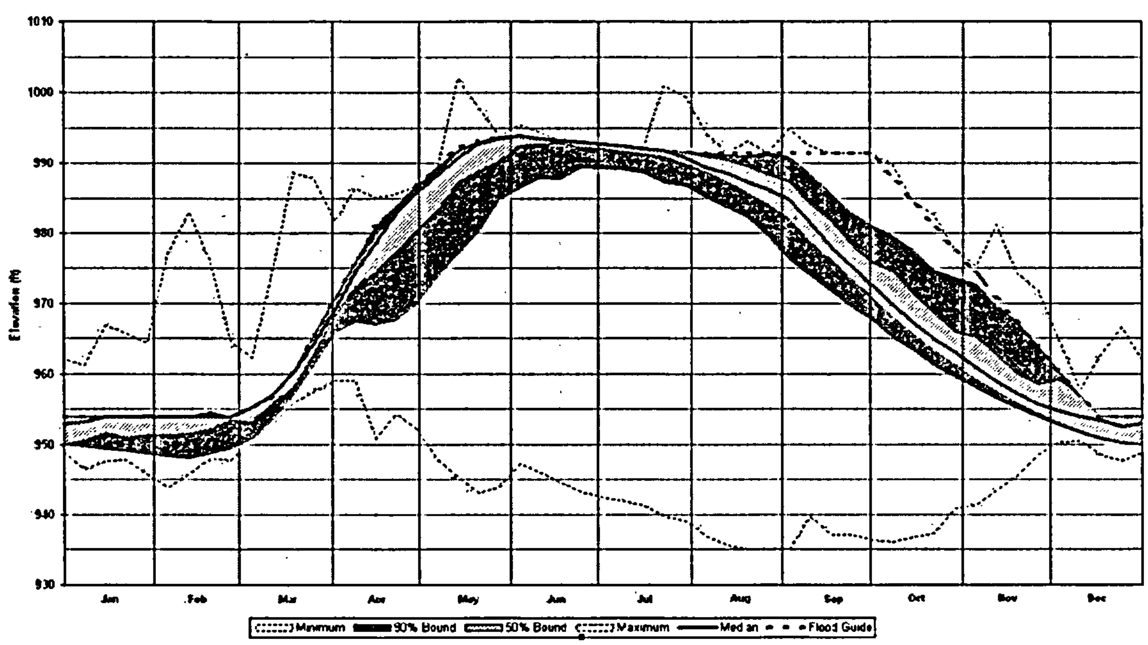


Elevation probability plots along with flood guide curves for tributary reservoirs under the Preferred Alternative (cont.)

Fontana Reservoir

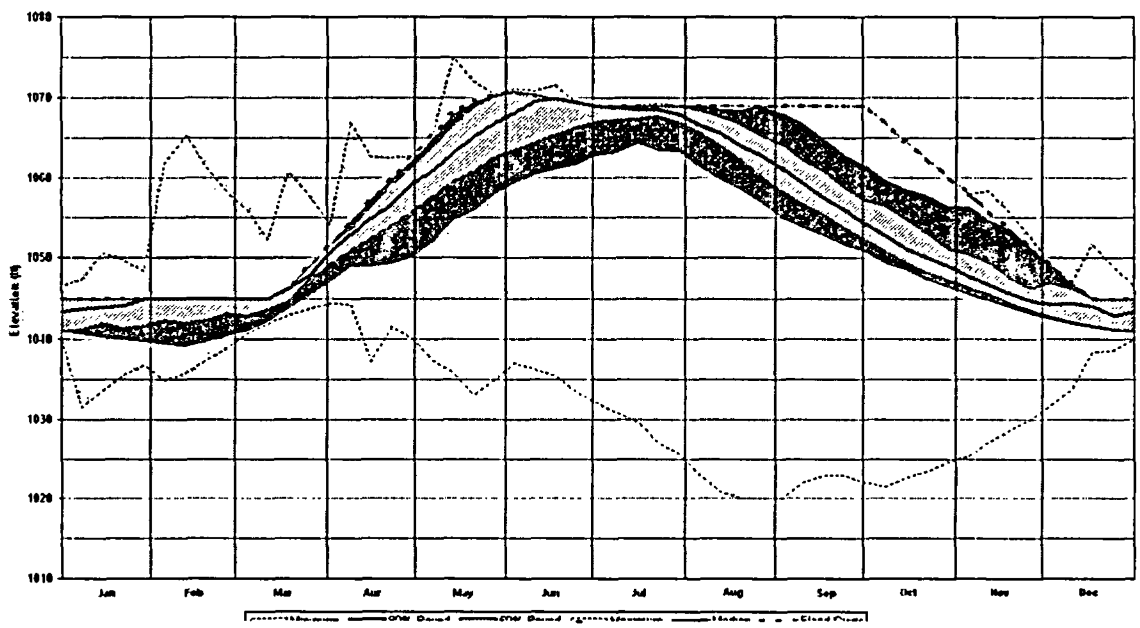


Douglas Reservoir

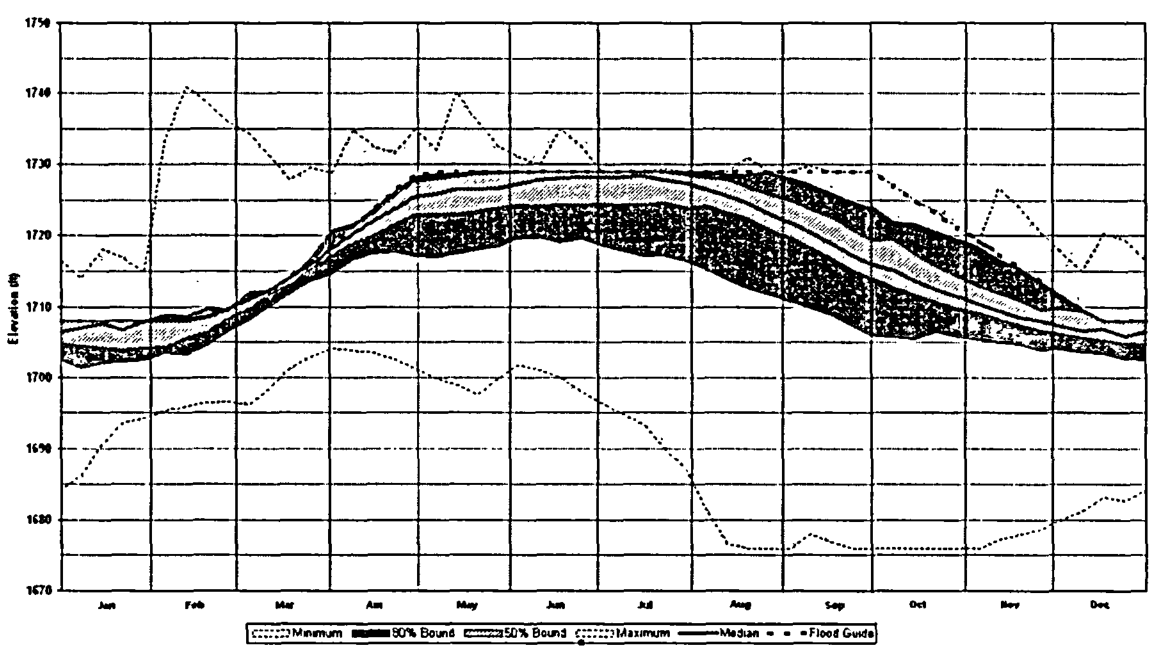


Elevation probability plots along with flood guide curves for tributary reservoirs under the Preferred Alternative (cont.)

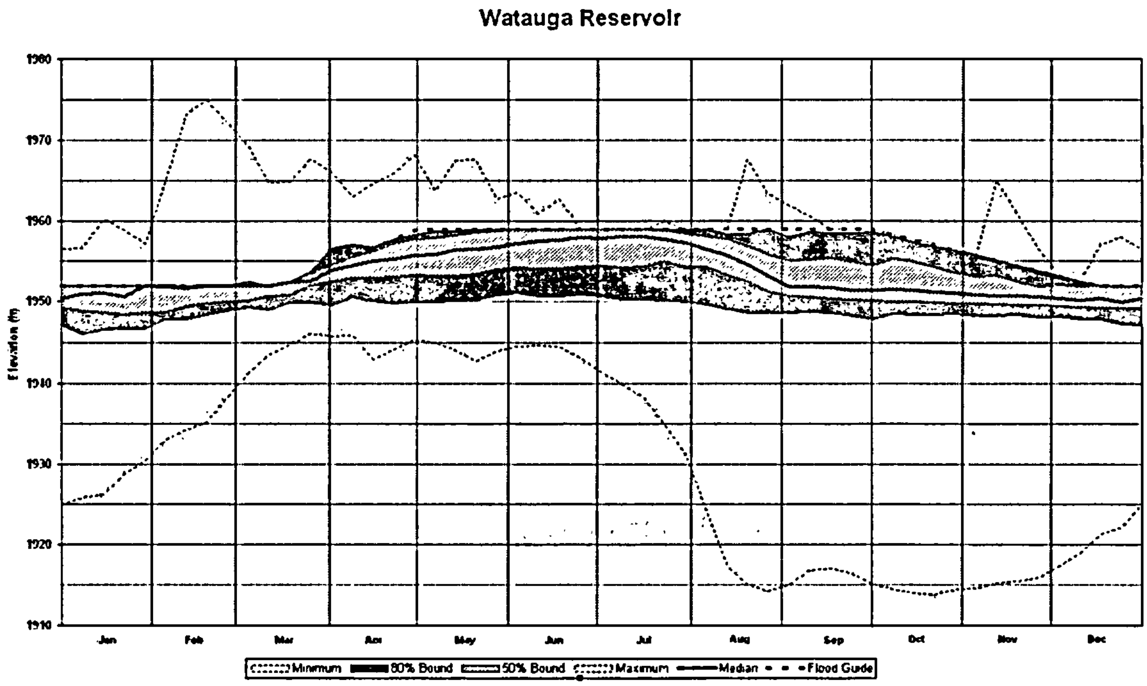
Cherokee Reservoir



South Holston Reservoir



Elevation probability plots along with flood guide curves for tributary reservoirs under the Preferred Alternative (cont.)



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Appendix D

Additional Information for Resource Areas

Tennessee Valley Authority
Reservoir Operations Study – Final Programmatic EIS

TVA

Appendix D

Appendix D1 Water Quality

Appendix D2 Groundwater Resources

Appendix D3 Aquatic Resources

Appendix D4 Wetlands

Appendix D5 Terrestrial Ecology

Appendix D6 Threatened and Endangered Species

Appendix D7 Cultural Resources

Appendix D8 Recreation

Appendix D9 Inter-Basin Transfers—A Sensitivity Analysis

Appendix D10 Social and Economic Resources

Appendix D1

Water Quality

Tennessee Valley Authority
Reservoir Operations Study – Final Programmatic EIS

TVA

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Table D1-01 303 (d) List of Impaired Waters along Mainstems and Major Tributaries of the TVA System

Waterbody ID	Affected Waterbody	State	County	Partially Impaired	Impaired	Cause	Pollutant Source
TN06010102 001-1000	South Fork Holston River	TN	Sullivan	5.5		Flow alterations Thermal modifications	Upstream impoundment
TN06010102 001-2000	South Fork Holston River	TN	Sullivan	2.4		Organic enrichment/ low DO Flow alterations Thermal modifications	Upstream impoundment
TN06010102 006-1000	Boone Reservoir	TN	Washington Sullivan	4,400 acres		PCBs Chlordane	Contaminated sediment
TN06010102 014-1000	South Fork Holston River	TN	Sullivan	4.4		Flow alterations Thermal modifications	Upstream impoundment
TN06010104 001-2000	Holston River	TN	Grainger Jefferson	26.9		Low DO Flow alteration	Upstream impoundment
TN06010107 006-2000	French Broad River	TN	Sevier	4.9		Low DO Thermal modifications Flow alteration	Upstream impoundment
TN06010201 1	Watts Bar Reservoir	TN	Rhea		3,900 acres	PCBs Mercury	Contaminated sediment
TN06010201 16	Tennessee River From Sweetwater Creek to Fort Loudoun Dam	TN	Loudon		10.8	Organic enrichment/ Low DO Flow alteration PCBs	Upstream impoundment Contaminated sediment
TN06010201 20	Fort Loudoun Reservoir	TN	Knox Loudoun		14,600 acres	PCBs	Contaminated sediment
TN06010201 026-1000	Little River	TN	Blount		7.1	PCBs	Contaminated sediment
TN06010204 001-1000	Tellico Reservoir	TN	Loudoun Monroe		16,500 acres	PCBs	Contaminated sediment

Table D1-01 303 (d) List of Impaired Waters along Mainstems and Major Tributaries of the TVA System (continued)

Waterbody ID	Affected Waterbody	State	County	Partially Impaired	Impaired	Cause	Pollutant Source
TN06010207 1	Clinch River and Tributaries	TN	Roane		42	PCBs Chlordane Metals	Industrial point source Contaminated sediment
TN06010207 006-1000	Melton Hill Reservoir	TN	Anderson		5,690 acres	PCBs Chlordane	Contaminated sediment
TN06010207 019-2000	Clinch River	TN	Anderson	7.4		Thermal modifications Flow alteration	Upstream impoundment
TN06020001 001-1000	Nickajack Reservoir	TN	Marion Hamilton	10,370.0 acres		PCBs Dioxins	Contaminated sediment
TN06020002 018-3000 & 4000	Hiwassee River	TN	Polk	11.4		Flow alteration	Upstream impoundment
TN06020003 004-1000 & 2000	Parksville-Reservoir Ocoee Dam #1 to Baker Creek is partial From Baker Creek to reservoir headwaters is not supporting	TN	Polk	704 acres	576 acres	Metals Siltation	Contaminated sediment
TN06020003 013-1000	Ocoee River-Parksville-Reservoir to Ocoee #2 Dam is not supporting	TN	Polk		4.7	Metals Flow alteration	Resource extraction Upstream impoundment
TN06020003 013.5-1000	Ocoee #2 Reservoir	TN	Polk		494 acres	Metals Siltation Flow alteration	Contaminated sediment Resource extraction Upstream impoundment
TN06020003 013.55-1000	Ocoee River From Reservoir #2 to Dam #3 is not supporting	TN	Polk		3.9	Metals Siltation Flow alteration	Contaminated sediment Resource extraction Upstream impoundment

Table D1-01 303 (d) List of Impaired Waters along Mainstems and Major Tributaries of the TVA System (continued)

Waterbody ID	Affected Waterbody	State	County	Partially Impaired	Impaired	Cause	Pollutant Source
TN06020003 013.7-1000	Ocoee #3 Reservoir	TN	Polk		480 acres	Metals Siltation	Abandoned mining Contaminated sediment
AL/06030004 060_01	Shoal Creek	AL	Limestone		X	Pathogens	Pasture grazing
AL/06030004 080_01	Big Creek	AL	Limestone	X		OE/DO	Pasture grazing
AL/Wheeler Res_02	Elk River	AL	Limestone	X		pH/OE/DO	Pasture grazing Nonirrigated crop production
AL/06030005 010_01	Big Nance Creek	AL	Lawrence		X	Pesticides, ammonia, siltation, OE/DO, pathogens	Nonirrigated crop production Int. animal feeding operation Landfills, Pasture grazing
AL/06030005 040_01	Town Creek	AL	Lawrence		X	OE/DO	Nonirrigated crop production Pasture grazing
	Nottely River Toccoa River	GA GA	Union Fannin	X X		Fecal coliform DO, fecal coliform	Non-point source Dam release/non-point source

Notes:
DO = Dissolved oxygen.
PCBs = Polychlorinated biphenyls.
OE = Organic enrichment.

Sources:
State of Alabama. 2002. Federal 303(d) List of Impaired Waters for Alabama.
State of Georgia. 2002. Federal 305(b)/303(d) List of Impaired Waters for Georgia.
State of Tennessee. 2002. Federal 303(d) List of Impaired Waters for Tennessee.

Table D1-02 **Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs for Alternatives Other Than the Summer Hydropower Alternative (see Table D1-03)**

Reservoir	Water Quality Category	Data (Average Condition)	Alternative[1]							
			Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
South Holston	Reservoir hydrodynamics	Summer residence time 6/1 - 9/30 (d)	435	579	634	641	449	677	556	483
		Days forebay surface-bottom temp. ≥4 °C (# d)	220	220	220	219	220	219	220	221
		Maximum forebay surface-bottom temp. diff. (°C)	22	22	22	22	22	22	22	22
		Sum daily total reservoir vol. (million m3-d)	254,604	268,309	279,998	268,037	251,940	281,604	269,932	261,428
	Dissolved oxygen	Sum daily vol. DO ≤5 (million m3-d)	45,300	48,845	49,953	48,527	45,280	50,218	50,023	47,644
		Minimum reservoir vol. DO ≥5 (mil. m3-d) on "worst-case"	174	200	205	181	172	210	198	185
		Sum daily vol. DO ≤2 (million m3-d) 7/1 – 10/31	15,020	14,762	14,500	14,828	15,320	14,417	14,957	15,068
		Sum daily vol. DO ≤2 (million m3-d) 6/1 – 9/30	10,309	10,239	10,089	10,045	10,434	10,076	10,308	10,387
		Sum daily vol. DO ≤1 (million m3-d)	9,563	9,202	8,999	9,239	9,707	8,879	9,287	9,526
	Temperature	Sum daily vol. temp. >26 (million m3-d)	1,568	1,835	1,851	1,526	1,540	1,852	1,764	1,674
		Sum daily vol. temp. ≤10 (million m3-d)	143,722	153,099	162,086	151,514	141,460	162,702	153,766	146,823

Table D1-02 **Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs for Alternatives Other Than the Summer Hydropower Alternative (see Table D1-03) (continued)**

Reservoir	Water Quality Category	Data (Average Condition)	Alternative[1]							
			Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Boone	Reservoir hydrodynamics	Summer residence time 6/1 - 9/30 (d)	25	31	32	30	25	30	33	29
		Days forebay surface-bottom temp. ≥4 °C (# d)	219	219	212	215	221	216	220	221
		Maximum forebay surface-bottom temp. diff. (°C)	19	19	19	18	19	19	19	19
		Sum daily total reservoir vol. (million m3-d)	37,885	37,849	37,385	37,108	37,931	37,368	37,876	38,416
	Dissolved oxygen	Sum daily vol. DO ≤5 (million m3-d)	5,568	7,088	6,476	6,127	5,820	6,837	6,822	6,177
		Minimum reservoir vol. DO ≥5 (mil. m3-d) on "worst-case"	64	57	59	52	63	59	60	61
		Sum daily vol. DO ≤2 (million m3-d) 7/1 – 10/31	17	579	618	312	122	372	625	183
		Sum daily vol. DO ≤2 (million m3-d) 6/1 – 9/30	38	627	592	285	199	367	621	199
		Sum daily vol. DO ≤1 (million m3-d)	1	93	33	36	50	46	28	17
	Temperature	Sum daily vol. temp. >26 (million m3-d)	1,966	2,357	2,386	1,195	1,976	2,376	2,458	2,306
		Sum daily vol. temp. ≤10 (million m3-d)	10,791	10,937	11,218	11,958	10,790	11,232	10,969	11,285

Table D1-02 **Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs for Alternatives Other Than the Summer Hydropower Alternative (see Table D1-03) (continued)**

Reservoir	Water Quality Category	Data (Average Condition)	Alternative[1]							
			Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Douglas	Reservoir hydrodynamics	Summer residence time 6/1 - 9/30 (d)	72	83	99	85	74	98	120	75
		Days forebay surface-bottom temp. ≥4 °C (# d)	182	183	186	174	181	186	186	182
		Maximum forebay surface-bottom temp. diff. (°C)	18	18	18	16	17	18	18	18
		Sum daily total reservoir vol. (million m3-d)	242,040	268,404	290,573	194,840	238,533	288,649	297,091	251,913
	Dissolved oxygen	Sum daily vol. DO ≤5 (million m3-d)	69,139	75,454	82,175	46,525	68,803	81,829	88,573	70,137
		Minimum reservoir vol. DO ≥5 (mil. m3-d) on "worst-case"	180	258	268	187	178	262	273	257
		Sum daily vol. DO ≤2 (million m3-d) 7/1 – 10/31	23,836	26,780	30,296	13,426	23,856	30,151	33,127	24,088
		Sum daily vol. DO ≤2 (million m3-d) 6/1 – 9/30	28,419	31,385	34,793	18,220	28,367	34,633	37,024	28,666
		Sum daily vol. DO ≤1 (million m3-d)	22,393	24,869	27,825	14,852	22,337	27,679	30,090	22,835
	Temperature	Sum daily vol. temp. >26 (million m3-d)	15,466	16,675	17,339	14,787	15,321	17,383	17,132	14,273
		Sum daily vol. temp. ≤10 (million m3-d)	41,499	54,958	59,495	44,999	40,816	59,263	55,964	49,140

Table D1-02 Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs for Alternatives Other Than the Summer Hydropower Alternative (see Table D1-03) (continued)

Reservoir	Water Quality Category	Data (Average Condition)	Alternative[1]							
			Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Melton Hill	Reservoir hydrodynamics	Summer residence time 6/1 - 9/30 (d)	16	20	24	26	15	23	23	19
		Days forebay surface-bottom temp. ≥4 °C (# d)	176	179	176	170	174	178	175	179
		Maximum forebay surface-bottom temp. diff. (°C)	17	17	17	17	17	18	17	17
		Sum daily total reservoir vol. (million m3-d)	43,418	43,308	43,103	43,142	43,179	46,531	43,029	45,513
	Dissolved oxygen	Sum daily vol. DO ≤5 (million m3-d)	314	771	987	1,442	291	743	1,196	529
		Minimum reservoir vol. DO ≥5 (mil. m3-d) on "worst-case"	105	101	98	94	106	104	93	110
		Sum daily vol. DO ≤2 (million m3-d) 7/1 – 10/31	11	85	80	117	14	25	179	9
		Sum daily vol. DO ≤2 (million m3-d) 6/1 – 9/30	28	108	98	145	25	26	193	27
		Sum daily vol. DO ≤1 (million m3-d)	8	41	31	54	7	5	81	7
	Temperature	Sum daily vol. temp. >26 (million m3-d)	1,870	2,769	3,131	3,537	1,816	2,806	2,980	2,045
		Sum daily vol. temp. ≤10 (million m3-d)	12,058	12,882	13,374	13,381	11,977	14,793	12,519	13,270

Table D1-02 **Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs for Alternatives Other Than the Summer Hydropower Alternative (see Table D1-03) (continued)**

Reservoir	Water Quality Category	Data (Average Condition)	Alternative[1]							
			Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Guntersville	Reservoir	Summer residence time 6/1 - 9/30 (d)	17	19	22	24	17	22	23	19
	hydrodynamics	Days forebay surface-bottom temp. ≥4 °C (# d)	55	57	58	56	52	56	62	57
		Maximum forebay surface-bottom temp. diff. (°C)	9	9	9	9	8	9	9	9
		Sum daily total reservoir vol. (million m3-d)	400,001	401,851	404,928	402,555	400,053	404,946	401,636	404,875
	Dissolved	Sum daily vol. DO ≤5 (million m3-d)	11,231	13,076	14,446	12,948	10,639	14,217	15,577	11,541
	oxygen	Minimum reservoir vol. DO ≥5 (mil. m3-d) on "worst-case"	896	887	875	898	902	892	870	929
		Sum daily vol. DO ≤2 (million m3-d) 7/1 – 10/31	1,290	1,939	2,455	1,652	1,361	2,436	2,750	1,102
		Sum daily vol. DO ≤2 (million m3-d) 6/1 – 9/30	2,279	3,080	3,612	3,041	2,264	3,529	3,806	1,913
		Sum daily vol. DO ≤1 (million m3-d)	1,767	2,329	2,721	2,015	1,441	2,587	2,400	1,342
	Temperature	Sum daily vol. temp. >26 (million m3-d)	105,019	107,543	110,937	111,577	105,043	110,923	107,693	109,153
		Sum daily vol. temp. ≤10 (million m3-d)	87,475	88,429	88,366	88,582	87,579	88,473	88,384	88,150

Table D1-02 Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs for Alternatives Other Than the Summer Hydropower Alternative (see Table D1-03) (continued)

Reservoir	Water Quality Category	Data (Average Condition)	Alternative[1]							
			Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Pickwick	Reservoir hydrodynamics	Summer residence time 6/1 - 9/30 (d)	16	18	21	23	15	21	22	18
		Days forebay surface-bottom temp. ≥4 °C (# d)	72	76	77	77	70	76	78	77
		Maximum forebay surface-bottom temp. diff. (°C)	10	10	10	10	10	10	10	10
		Sum daily total reservoir vol. (million m3-d)	368,754	383,813	386,237	368,547	376,538	386,268	382,471	375,957
	Dissolved oxygen	Sum daily vol. DO ≤5 (million m3-d)	21,309	24,122	25,515	25,042	20,893	25,396	26,298	22,442
		Minimum reservoir vol. DO ≥5 (mil. m3-d) on "worst-case"	717	703	692	723	712	698	670	757
		Sum daily vol. DO ≤2 (million m3-d) 7/1 – 10/31	3,342	4,937	6,069	5,351	3,246	6,018	5,971	4,268
		Sum daily vol. DO ≤2 (million m3-d) 6/1 – 9/30	5,304	7,124	8,285	7,834	5,127	8,187	8,172	6,212
		Sum daily vol. DO ≤1 (million m3-d)	3,447	4,583	5,492	4,965	3,247	5,454	5,107	3,983
	Temperature	Sum daily vol. temp. >26 (million m3-d)	99,407	101,415	102,172	102,402	98,953	102,392	98,233	103,794
		Sum daily vol. temp. ≤10 (million m3-d)	74,937	80,507	80,517	74,900	80,421	80,586	80,726	74,888

Table D1-02 Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs for Alternatives Other Than the Summer Hydropower Alternative (see Table D1-03) (continued)

Reservoir	Water Quality Category	Data (Average Condition)	Alternative[1]							
			Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Kentucky	Reservoir hydrodynamics	Summer residence time 6/1 - 9/30 (d)	39	45	51	48	36	51	50	41
		Days forebay surface-bottom temp. ≥4 °C (# d)	46	48	49	49	40	48	52	49
		Maximum forebay surface-bottom temp. diff. (°C)	8	8	8	8	8	8	9	9
		Sum daily total reservoir vol. (million m3-d)	989,951	1,013,106	1,071,116	993,578	1,037,845	1,071,091	1,014,296	988,419
	Dissolved oxygen	Sum daily vol. DO ≤5 (million m3-d)	34,388	39,615	43,010	41,858	31,333	42,918	53,955	38,445
		Minimum reservoir vol. DO ≥5 (mil. m3-d) on "worst-case"	2,194	2,284	2,324	2,203	2,215	2,335	2,068	2,204
		Sum daily vol. DO ≤2 (million m3-d) 7/1 – 10/31	2,824	3,416	5,205	4,727	1,723	5,252	8,079	3,180
		Sum daily vol. DO ≤2 (million m3-d) 6/1 – 9/30	3,504	4,216	5,974	5,420	1,916	6,027	10,395	4,229
		Sum daily vol. DO ≤1 (million m3-d)	954	918	1,881	1,721	492	1,941	4,753	1,028
	Temperature	Sum daily vol. temp. >26 (million m3-d)	267,947	278,028	281,759	278,123	268,687	282,336	273,752	264,727
		Sum daily vol. temp. ≤10 (million m3-d)	219,849	220,728	243,234	220,197	243,591	243,268	219,779	219,345

Table D1-02 Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs for Alternatives Other Than the Summer Hydropower Alternative (see Table D1-03) (continued)

Reservoir	Water Quality Category	Data (Average Condition)	Alternative[1]							
			Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Hiwassee	Reservoir hydrodynamics	Summer residence time 6/1 - 9/30 (d)	70	80	89	82	74	93	112	79
		Days forebay surface-bottom temp. ≥4 °C (# d)	232	222	221	225	220	221	226	220
		Maximum forebay surface-bottom temp. diff. (°C)	20	19	19	19	19	19	19	19
		Sum daily total reservoir vol. (million m3-d)	93,821	98,452	100,767	88,119	92,850	99,357	101,640	98,340
	Dissolved oxygen	Sum daily vol. DO ≤5 (million m3-d)	10,217	11,200	12,565	9,309	10,242	12,799	14,055	10,669
		Minimum reservoir vol. DO ≥5 (mil. m3-d) on "worst-case"	155	151	143	131	148	138	134	154
		Sum daily vol. DO ≤2 (million m3-d) 7/1 – 10/31	1,533	1,754	2,130	1,551	1,426	2,425	3,014	1,606
		Sum daily vol. DO ≤2 (million m3-d) 6/1 – 9/30	1,387	1,626	1,899	1,421	1,317	2,202	2,383	1,468
		Sum daily vol. DO ≤1 (million m3-d)	790	884	1,045	914	759	1,196	1,521	833
	Temperature	Sum daily vol. temp. >26 (million m3-d)	836	818	830	755	784	865	703	781
		Sum daily vol. temp. ≤10 (million m3-d)	27,005	30,540	30,100	26,403	28,027	29,505	31,419	40,376

Table D1-02 Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs for Alternatives Other Than the Summer Hydropower Alternative (see Table D1-03) (continued)

Reservoir	Water Quality Category	Data (Average Condition)	Alternative[1]							
			Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Watts Bar	Reservoir hydrodynamics	Summer residence time 6/1 - 9/30 (d)	21	24	27	29	21	27	30	23
		Days forebay surface-bottom temp. ≥4 °C (# d)	160	164	169	165	160	169	181	162
		Maximum forebay surface-bottom temp. diff. (°C)	16	16	16	15	15	16	16	16
		Sum daily total reservoir vol. (million m3-d)	340,084	349,162	350,967	330,958	348,132	350,960	348,422	341,731
	Dissolved oxygen	Sum daily vol. DO ≤5 (million m3-d)	67,675	70,125	71,312	68,096	67,647	71,283	64,592	81,841
		Minimum reservoir vol. DO ≥5 (mil. m3-d) on "worst-case"	370	364	362	345	367	365	393	312
		Sum daily vol. DO ≤2 (million m3-d) 7/1 – 10/31	12,590	17,418	21,576	20,969	12,169	21,308	17,002	21,580
		Sum daily vol. DO ≤2 (million m3-d) 6/1 – 9/30	16,816	22,115	25,093	23,928	16,331	25,001	20,069	27,665
		Sum daily vol. DO ≤1 (million m3-d)	6,557	9,953	13,097	12,776	6,174	12,886	9,029	14,604
	Temperature	Sum daily vol. temp. >26 (million m3-d)	40,633	43,911	48,667	51,454	39,894	48,104	57,879	41,602
		Sum daily vol. temp. ≤10 (million m3-d)	77,861	84,572	83,869	78,284	82,559	84,158	83,719	79,053

Note: DO = Dissolved oxygen.

Table D1-03 Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs under the Summer Hydropower Alternative (Based on Rainfall and Flows in 1990–1994, the Only Consecutive Years That Allowed Successful Model Runs)

Sites	Data	Modeled Metric Results for Base Case and Summer Hydropower Alternative	
		Base Case	Summer Hydropower
South Holston	Summer residence time 6/1 - 9/30 (days)	462	394
	Days forebay surface-bottom temp>=4 °C (d)	227	225
	Max. forebay surface-bottom temp. (°C)	22	22
	Sum daily res. vol. (million m3-d)	258,936	270,147
	Sum daily vol. DO<=5 (million m3-d)	50,030	51,161
	Min. res. vol. DO>=5 (mil. M3) on "worst-case" d	161	143
	Sum daily vol. DO<=2 (million m3-d) 7/1 - 10/31	17,410	17,459
	Sum daily vol. DO<=2 (million m3-d) 6/1 - 9/30	11,992	11,891
	Sum daily vol. DO<=1 (million m3-d)	9,563	11476
	Sum daily vol. temp. >26 (million m3-d)	1,648	1,644
	Sum daily vol. temp. <=10 (million m3-d)	141,907	147,451
Boone	Summer residence time 6/1 - 9/30 (days)	23	16
	Days forebay surface-bottom temp>=4°C (d)	223	209
	Max. forebay surface-bottom temp. (°C)	19	18
	Sum daily res. vol. (million m3-d)	37,907	31,886
	Sum daily vol. DO<=5 (million m3-d)	5,544	3,328
	Min. res. vol. DO>=5 (mil. M3) on "worst-case" d	65	46
	Sum daily vol. DO<=2 (million m3-d) 7/1 - 10/31	14	22
	Sum daily vol. DO<=2 (million m3-d) 6/1 - 9/30	12	22
	Sum daily vol. DO<=1 (million m3-d)	1	4
	Sum daily vol. temp. >26 (million m3-d)	2,088	1,299
	Sum daily vol. temp. <=10 (million m3-d)	10,207	10,416
Douglas	Summer residence time 6/1-9/30 (days)	78	57
	Days forebay surface-bottom temp>=4 °C (d)	195	192
	Max. forebay surface-bottom temp. (°C)	18	18
	Sum daily res. vol. (million m3-d)	256,182	253,705
	Sum daily vol. DO<=5 (million m3-d)	82,743	65,985

Table D1-03 Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs under the Summer Hydropower Alternative (Based on Rainfall and Flows in 1990–1994, the Only Consecutive Years That Allowed Successful Model Runs) (continued)

Sites	Data	Modeled Metric Results for Base Case and Summer Hydropower Alternative	
		Base Case	Summer Hydropower
Douglas	Min. res. vol. DO>=5 (mil. m3) on "worst-case" d	185	245
(continued)	Sum daily vol. DO<=2 (million m3-d) 7/1 - 10/31	28,774	19,046
	Sum daily vol. DO<=2 (million m3-d) 6/1 - 9/30	33,956	23,944
	Sum daily vol. DO<=1 (million m3-d)	22,393	18,765
	Sum daily vol. temp. >26 (million m3-d)	17,037	16,465
	Sum daily vol. temp. <=10 (million m3-d)	40,173	55,925
Hiwassee	Summer residence time 6/1-9/30 (days)	65	67
	Days forebay surface-bottom temp>=4 °C (d)	234	219
	Max. forebay surface-bottom temp. (°C)	20	18
	Sum daily res. vol. (million m3-d)	97,701	92,640
	Sum daily vol. DO<=5 (million m3-d)	11,410	8,463
	Min. res. vol. DO>=5 (mil. m3) on "worst-case" d	165	144
	Sum daily vol. DO<=2 (million m3-d) 7/1 - 10/31	1,672	1,212
	Sum daily vol. DO<=2 (million m3-d) 6/1 - 9/30	1,530	1,169
	Sum daily vol. DO<=1 (million m3-d)	832	708
	Sum daily vol. temp. >26 (million m3-d)	919	650
	Sum daily vol. temp. <=10 (million m3-d)	25,658	28,140
Melton Hill	Summer residence time 6/1 - 9/30 (days)	16	17
	Days forebay surface-bottom temp>=4 °C (d)	179	175
	Max. forebay surface-bottom temp. (°C)	17	17
	Sum daily res. vol. (million m3-d)	43,456	43,239
	Sum daily vol. DO<=5 (million m3-d)	457	420
	Min. res. vol. DO>=5 (mil. m3) on "worst-case" d	100	101
	Sum daily vol. DO<=2 (million m3-d) 7/1 - 10/31	18	26
	Sum daily vol. DO<=2 (million m3-d) 6/1 - 9/30	44	41
	Sum daily vol. DO<=1 (million m3-d)	8	13
	Sum daily vol. temp. >26 (million m3-d)	2,015	1,745
	Sum daily vol. temp. <=10 (million m3-d)	11,199	12,747

Table D1-03 Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs under the Summer Hydropower Alternative (Based on Rainfall and Flows in 1990–1994, the Only Consecutive Years That Allowed Successful Model Runs) (continued)

Sites	Data	Modeled Metric Results for Base Case and Summer Hydropower Alternative	
		Base Case	Summer Hydropower
Watts Bar	Summer residence time 6/1 - 9/30 (days)	19	16
	Days forebay surface-bottom temp>=4 °C (d)	165	164
	Max. forebay surface-bottom temp. (°C)	16	15
	Sum daily res. vol. (million m3-d)	340,184	324,583
	Sum daily vol. DO<=5 (million m3-d)	76,332	83,988
	Min. res. vol. DO>=5 (mil. m3) on "worst-case" d	338	238
	Sum daily vol. DO<=2 (million m3-d) 7/1 - 10/31	12,334	9,697
	Sum daily vol. DO<=2 (million m3-d) 6/1 - 9/30	16,706	13,707
	Sum daily vol. DO<=1 (million m3-d)	5,240	3,318
	Sum daily vol. temp. >26 (million m3-d)	42,298	38,316
	Sum daily vol. temp. <=10 (million m3-d)	72,490	75,557
Guntersville	Summer residence time 6/1-9/30 (days)	16	14
	Days forebay surface-bottom temp>=4 °C (d)	49	43
	Max. forebay surface-bottom temp. (°C)	8	8
	Sum daily res. vol. (million m3-d)	399,955	395,888
	Sum daily vol. DO<=5 (million m3-d)	8,694	4,933
	Min. res. vol. DO>=5 (mil. m3) on "worst-case" d	918	975
	Sum daily vol. DO<=2 (million m3-d) 7/1 - 10/31	744	83
	Sum daily vol. DO<=2 (million m3-d) 6/1 - 9/30	1,297	224
	Sum daily vol. DO<=1 (million m3-d)	1,767	135
	Sum daily vol. temp. >26 (million m3-d)	110,594	107,461
	Sum daily vol. temp. <=10 (million m3-d)	77,307	77,943
Pickwick	Summer residence time 6/1 - 9/30 (days)	14	12
	Days forebay surface-bottom temp>=4 °C (d)	61	49
	Max. forebay surface-bottom temp. (°C)	9	8
	Sum daily res. vol. (million m3-d)	369,048	357,611
	Sum daily vol. DO<=5 (million m3-d)	19,328	11,423
	Min. res. vol. DO>=5 (mil. m3) on "worst-case" d	730	756

Table D1-03 Summary of Modeling Results for Reservoir Dynamics and Water Quality Characteristics on Representative Reservoirs under the Summer Hydropower Alternative (Based on Rainfall and Flows in 1990–1994, the Only Consecutive Years That Allowed Successful Model Runs) (continued)

Sites	Data	Modeled Metric Results for Base Case and Summer Hydropower Alternative	
		Base Case	Summer Hydropower
Pickwick	Sum daily vol. DO<=2 (million m3-d) 7/1 - 10/31	2,757	609
(continued)	Sum daily vol. DO<=2 (million m3-d) 6/1 - 9/30	4,308	1,149
	Sum daily vol. DO<=1 (million m3-d)	3,447	577
	Sum daily vol. temp. >26 (million m3-d)	106,642	100,700
	Sum daily vol. temp. <=10 (million m3-d)	65,992	65,913
Kentucky	Summer residence time 6/1 - 9/30 (days)	36	32
	Days forebay surface-bottom temp>=4 °C (d)	36	29
	Max. forebay surface-bottom temp. (°C)	7	7
	Sum daily res. vol. (million m3-d)	989,985	965,189
	Sum daily vol. DO<=5 (million m3-d)	30,132	21,289
	Min. res. vol. DO>=5 (mil. m3) on "worst-case" d	2,239	2,137
	Sum daily vol. DO<=2 (million m3-d) 7/1 - 10/31	1,838	616
	Sum daily vol. DO<=2 (million m3-d) 6/1 - 9/30	2,118	691
	Sum daily vol. DO<=1 (million m3-d)	954	169
	Sum daily vol. temp. >26 (million m3-d)	272,324	260,420
	Sum daily vol. temp. <=10 (million m3-d)	199,719	199,681

Note:
DO = Dissolved oxygen.

Table D1-04 Summary of Modeling Results Providing Water Quality Characteristics in Representative Dam Releases under Alternatives Other Than the Summer Hydropower Alternative (Based on Rainfall and Flows during 1987–1994)

Sites	Data	Alternative							
		Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
South Holston	Annual average minimum (dissolved oxygen (DO) (mg/L)	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/years DO <5 mg/L	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/year temp >10 °C	91	70	65	80	95	62	65	82
	Annual average maximum temp	13.6	12.6	12.2	12.8	13.7	12.1	12.3	13.2
Boone	Annual average minimum DO (mg/L)	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/years DO <5 mg/L	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/year temp >10 °C	228	228	226	236	228	227	229	229
	Annual average maximum temp	17.4	18.6	19.1	18.3	17.5	18.6	18.7	18.3
Douglas	Annual average minimum DO (mg/L)	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/years DO <5 mg/L	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/year temp >10 °C	237	239	244	246	237	244	242	239
	Annual average maximum temp	24.3	24.2	23.6	25.2	24.3	23.6	22.9	24.2
Hiwassee	Annual average minimum DO (mg/L)	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/years DO <5 mg/L	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/year temp >10 °C	226	221	221	230	221	226	216	223
	Annual average maximum temp	20.6	20.7	20.3	21.5	21.1	20.4	19.8	20.9

Table D1-04 Summary of Modeling Results Providing Water Quality Characteristics in Representative Dam Releases under Alternatives Other Than the Summer Hydropower Alternative (Based on Rainfall and Flows during 1987–1994) (continued)

Sites	Data	Alternative							
		Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Melton Hill	Annual average minimum DO (mg/L)	5.6	4.9	4.3	4.3	6.0	4.8	3.9	5.6
	Average # days/years DO <5 mg/L	7	18	21	32	7	12	30	12
	Average # days/year temp >10°C	263	255	250	252	263	246	255	255
	Annual average maximum temp	23.9	24.9	25.0	25.7	23.9	23.9	24.7	23.4
Watts Bar	Annual average minimum DO (mg/L)	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/years DO <5 mg/L	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target	LIP target
	Average # days/year temp >10°C	274	272	272	274	273	272	273	272
	Annual average maximum temp	26.8	27.3	27.3	27.9	26.8	27.2	26.5	26.8
Guntersville	Annual average minimum DO (mg/L)	4.7	4.4	4.3	4.5	4.7	4.4	4.3	5.0
	Average # days/years DO <5 mg/L	19	24	28	23	18	26	31	12
	Average # days/year temp >10°C	282	281	281	281	281	281	281	281
	Annual average maximum temp	30.3	30.4	30.4	30.5	30.4	30.4	30.2	30.4
Pickwick	Annual average minimum DO (mg/L)	4.3	4.1	4.0	4.0	4.3	4.0	3.8	4.3
	Average # days/years DO <5 mg/L	30	39	43	42	29	44	48	36
	Average # days/year temp >10°C	281	281	281	282	281	281	281	281
	Annual average maximum temp	29.9	29.7	29.6	29.7	29.9	29.6	29.5	29.8
Kentucky	Annual average minimum DO (mg/L)	3.4	3.0	2.8	2.9	3.8	2.8	2.5	3.1
	Average # days/years DO <5 mg/L	47	54	57	60	39	57	60	56
	Average # days/year temp >10°C	272	272	272	272	271	272	272	272
	Annual average maximum temp	29.1	28.9	28.6	28.8	29.3	28.6	28.6	29.0

Note: LIP = Lake Improvement Plan.

Table D1-05 Summary of Modeled Water Quality Characteristics in Representative Dams under the Summer Hydropower Alternative (Based on Rainfall and Flows in 1990–1994, the Only Consecutive Years That Allowed Successful Model Runs)

Sites	Data	Alternative	
		Base Case	Summer Hydropower
South Holston	Annual average minimum DO (mg/L)	LIP target	LIP target
	Average # days/years DO <5 mg/L	LIP target	LIP target
	Average # days/year temp >10°C	96	105
	Annual average maximum temp	13.8	13.6
Boone	Annual average minimum DO (mg/L)	LIP target	LIP target
	Average # days/years DO <5 mg/L	LIP target	LIP target
	Average # days/year temp >10 °C	237	234
	Annual average maximum temp	17.5	19.3
Douglas	Annual average minimum DO (mg/L)	LIP target	LIP target
	Average # days/years DO <5 mg/L	LIP target	LIP target
	Average # days/year temp >10 °C	241	239
	Annual average maximum temp	24.0	24.8
Hiwassee	Annual average minimum DO (mg/L)	LIP target	LIP target
	Average # days/years DO <5 mg/L	LIP target	LIP target
	Average # days/year temp >10 °C	235	232
	Annual average maximum temp	20.9	22.0
Melton Hill	Annual average minimum DO (mg/L)	5.2	4.9
	Average # days/years DO <5 mg/L	11.0	10.2
	Average # days/year temp >10 °C	270.2	256.2
	Annual average maximum temp	23.9	23.7
Watts Bar	Annual average minimum DO (mg/L)	2.5	2.7
	Average # days/years DO <5 mg/L	127	134
	Average # days/year temp >10 °C	LIP target	LIP target
	Annual average maximum temp	LIP target	LIP target
Guntersville	Annual average minimum DO (mg/L)	4.9	5.7
	Average # days/years DO <5 mg/L	10	0
	Average # days/year temp >10 °C	292	291
	Annual average maximum temp	30.5	30.3

Table D1-05 Summary of Modeled Water Quality Characteristics in Representative Dams under the Summer Hydropower Alternative (Based on Rainfall and Flows in 1990–1994, the Only Consecutive Years That Allowed Successful Model Runs) (continued)

Sites	Data	Alternative	
		Base Case	Summer Hydropower
Pickwick	Annual average minimum DO (mg/L)	4.4	5.0
	Average # days/years DO <5 mg/L	22	2
	Average # days/year temp >10 °C	291	292
	Annual average maximum temp	30.1	30.4
Kentucky	Annual average minimum DO (mg/L)	3.7	4.3
	Average # days/years DO <5 mg/L	40	26
	Average # days/year temp >10 °C	279	279
	Annual average maximum temp	29.0	29.3

Notes:
DO = Dissolved oxygen.
LIP = Lake Improvement Plan.
mg/L = Milligrams per liter.

Appendix D2

Groundwater Resources

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D2.1 Reservoir Analysis

Assessment of the surface water and groundwater interactions involved two phases: (1) an initial screening-level analysis to determine the maximum zone of surface water influence on groundwater resources, and (2) a reservoir-specific analysis to determine potential effects on groundwater wells situated within the maximum zone of surface water influence identified in the screening-level analysis.

D2.1.1 Screening-Level Analysis

A screening-level analysis was performed to determine the maximum zone of surface water influence on groundwater resources around each TVA reservoir. The furthest distance from the reservoirs where a change in reservoir elevation could be discerned in the groundwater zone was calculated.

The calculation used an analytical solution to the natural situation and assumed a sudden change in reservoir elevation that propagates through groundwater. The calculation took as input the elevation change in the reservoir and calculated the decrease in this elevation change as it propagates into the subsurface groundwater zone. The model depends on the magnitude of the elevation change in the reservoir, aquifer properties (transmissivity and specific yield), and the duration of the changed condition. The distance at which no effect of the reservoir change is discernable in the groundwater zone was calculated for the duration of water increase. "No effect" is considered to be a change in groundwater elevation less than or equal to 0.1 feet.

The screening-level analysis used January 1 (minimum pool) and June 1 (maximum pool) elevations and a duration of 150 days as inputs to the calculation. This range in elevation provided an upper bound for changes in groundwater levels. None of the reservoir operations policy alternatives would produce a greater change in groundwater levels than those predicted by the screening-level analysis.

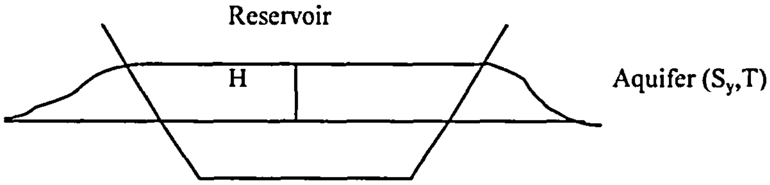
As discussed in Section 4.1, Introduction to Affected Environment, Zurawski (1978) divided the Tennessee River region into six physiographic and hydrologic provinces with distinctive characteristics: the Coastal Plain, Highland Rim, Central Basin, Cumberland Plateau (including the geologically distinct Sequatchie Valley), Valley and Ridge, and Blue Ridge. The approach of this analysis was to treat each province as consisting of a specific range of aquifer properties. This simplification allowed an initial breakdown of the Tennessee River Valley region, but did not lead to a site-specific analysis.

Calculation

The background and derivation of the calculation approach are described in Marsily (1986). The solution is appropriate for sudden variation in water elevation, in a semi-infinite domain. It fits the case of a semi-infinite aquifer initially in equilibrium with an initial elevation that is then subjected to a change in water elevation at the boundary. The aquifer can be confined or unconfined. The solution is taken from consideration of problems of heat and mass transport presented in Carslaw and Jaeger (1959), in Figure D2-01.

Figure D2-01 Calculation of Groundwater Table Elevation Changes

$$h(x, t) = H \operatorname{erfc}(x \sqrt{S_y / 4Tt})$$



In the equation $h(x, t) = H \operatorname{erfc}(x \sqrt{S_y / 4Tt})$, h (x,t) is the change in water table elevation resulting from a change H in reservoir pool levels with distance (x) and time (t) from the edge of the reservoir. S_y is the specific yield of the unconfined aquifer, a property of the aquifer. T is the transmissivity of the aquifer, a measure of the resistance to water flow in the aquifer. Values for transmissivity and specific yield used in the calculation are summarized in Table D2-01.

Calculation Assumptions, Limitations, and Sensitivity Analysis

This simple representation of surface water/groundwater interaction made several assumptions. A sensitivity analysis was conducted to test some of the assumptions. In general, the calculation results present the likely maximum extent of groundwater influence. Some of the key assumptions, and associated limitations, are described in the following:

Assumption One: Surface water and groundwater are interconnected. In addition, groundwater gradients were assumed to be away from reservoirs. These assumptions are the basis for this analysis, but in all provinces it is possible that the reservoirs are not connected to groundwater or that there is a connection, but the groundwater gradient is towards the reservoir. For example, in a study of Reelfoot Reservoir in the Coastal Plain physiographic province, McLaughlin (1988) concluded that the reservoir was not in communication with groundwater, despite being in an alluvial setting. In a study of the Highland Rim, Brahana and Bradley (1986a) identify sections of the Highland Rim region west of the Tennessee River where groundwater movement is primarily toward the Tennessee River. By assuming that all reservoirs are in communication with groundwater and that the groundwater moves in a direction toward the reservoirs, this analysis predicted a greater zone of groundwater influence than may be the case.

Table D2-01 Summary of Aquifer Properties for the Physiographic Provinces in the Tennessee River Region

Physiographic Province	Transmissivity (ft^2/day)		Specific Yield	
	Mean	Range	Representative Value	Range
Coastal Plain	500	10 to 10,000	0.2	0.1 to 0.3
Highland Rim	320	1 to 100	0.2	0.1 to 0.3
Central Basin	79	1 to 500	0.2	0.1 to 0.3
Cumberland Plateau	480	10 to 5,000	0.2	0.1 to 0.3
Sequatchie Valley	79	1 to 100	0.2	0.1 to 0.3
Valley and Ridge	140	10 to 5,000	0.2	0.1 to 0.3
Blue Ridge	120	10 to 500	0.2	0.1 to 0.3

Note:

Values for transmissivity, a measure of resistance to groundwater flow, are taken from the following Tennessee-specific literature sources: Brahana and Broshears (2001), Broshears and Bradley (1992), Hoos (1990), Wolfe et al. (1997), and Zurawski (1978). In addition, wider-ranging data compilations were consulted to broaden the range of properties, including the following: Lohman (1979), Freeze and Cherry (1979), De Marsily (1986) and Kruseman and de Ridder (1990). Values for specific yield, a measure of aquifer water storage volume, were obtained from Lohman (1979), Freeze and Cherry (1979), and Spitz and Moreno (1996).

Assumption Two: A single set of aquifer properties (transmissivity and specific yield) applies to an entire physiographic province. This assumption was variably true throughout the Tennessee River Valley. A sensitivity analysis was performed using high transmissivity/low specific yield and low transmissivity/high specific yield values for six reservoirs in the TVA system, Appalachia, Bear Creek, Blue Ridge, Boone, Normandy, and Wilson reservoirs. These reservoirs were chosen as they span the major types of aquifers in the Tennessee River Valley region including fractured bedrock, limestone, and unconsolidated aquifers.

In fractured bedrock of the Blue Ridge, the assumptions may be fairly good, except in heavily fractured areas. The sensitivity analysis indicated variation by a factor of 10 between the high transmissivity/low specific yield case and the low transmissivity/high specific yield case. Although a high degree of variation, it is relatively low for a general analysis of this sort.

In the limestone areas of the Central Basin Highland Rim, and Valley and Ridge provinces, the assumption may also be fairly good except in areas of karst. The sensitivity analysis gave a comparable range in variation to the fractured bedrock case. In karst terrains within these provinces, however, porosity and permeability can be very large, approaching open, interconnected cavities. In the karst subareas of these provinces the assumption could be very far off, and cannot be adequately modeled with this approach. The area of groundwater influence calculated for these provinces is reasonably accurate in non-karst zones; influence in karst zones are better addressed by identifying areas of seepage. Seeps and springs are the surface outlet for some karst areas. The discharge rate may be affected by project operations, but the range of change will be much smaller than other influences on seeps and springs, including precipitation, recharge, and existing reservoir operations.

In the alluvium of the Coastal Plain and regolith areas of the Highland Rim, Blue Ridge, and Valley and Ridge, the aquifer properties can vary by three or more orders of magnitude. A high degree of variation in groundwater influences is expected in these areas. The sensitivity analysis indicated a correspondingly high degree of variation: a factor of approximately 50 separated the results for the high transmissivity/low specific yield case from the low transmissivity/high specific yield case.

Owing to this variability, the "base case" analysis took a reasonable set of aquifer properties based on the literature. The values were chosen based on field observations of some of the surrounding materials of the reservoirs, and mid-range values from the literature.

Assumption Three: The boundary condition for the calculation is a constant head boundary at the edge of the reservoir. This condition is independent of the conditions in the reservoir, and assumes no change in elevation. This assumption gave a larger zone of groundwater influence than may actually be the case.

Assumption Four: The calculation only considers changes to water table elevation resulting from changes in reservoir level for cases of the water table being initially equal to the starting reservoir level. It does not consider the actual groundwater level, which could be less than the initial reservoir level. In this case, the model predicted greater zone of influences and greater groundwater elevation changes than are actually the case.

Assumption Five: The calculation assumes an immediate change in reservoir elevation. The change in elevation at the edge of the reservoir is also assumed to dissipate in the groundwater system according to a diffusion-like model. This model is appropriate for a one-dimensional analysis, but cannot reproduce effects in three dimensions, or effects due to changes in aquifer properties. No boundary condition was used for elevations in the surrounding aquifer, since this was the objective of the analysis.

Potentially Affected Groundwater Resources

Table D2-02 summarizes the results of the maximum groundwater influence calculations for the screening-level analysis. For the following reservoirs, at least one public water supply well was located within the calculated maximum zone of influence and was identified for further analysis: Cherokee, Douglas, Fort Loudoun, Kentucky, Norris, Ocoee #3, Tims Ford, and Watts Bar.

Table D2-02 Public Groundwater Wells within Maximum Zones of Influence of TVA Reservoirs

TVA Reservoir	Calculated Maximum Zone of Influence (feet)	Public Wells within Maximum Zone of Influence of Reservoir
Apalachia	1,050	0
Bear Creek	2,200	0
Blue Ridge	1,150	0
Boone	1,300	0
Cedar Creek	1,850	0
Chatuge	1,150	0
Cherokee	1,350	3
Chickamauga	1,140	0
Douglas	1,400	2
Fontana	1,325	0
Fort Loudoun	1,075	2
Fort Patrick Henry	1,050	0
Great Falls	1,870	0
Guntersville	1,600	0
Hiwassee	1,325	0
Kentucky	1,600	1
Little Bear Creek	1,820	0
Melton Hill	1,100	0
Nickajack	1,820	0
Normandy	1,800	0
Norris	1,350	1
Nottely	1,250	0
Ocoee #1	1,050	0
Ocoee #2	0	0
Ocoee #3	1,040	1
Pickwick	2,050	0
South Holston	1,330	0
Tellico	1,100	0
Tims Ford	1,875	1
Upper Bear Creek	2,090	0
Watauga	1,150	0
Watts Bar	1,100	2
Wheeler	1,650	0
Wilbur	1,150	0
Wilson	1,125	0

Notes:
The "maximum zone of influence" is the maximum zone of surface water influence on groundwater resources. No influence (0) is defined as changes in groundwater levels of less than 0.1 feet.

D2.1.2 Reservoir-Specific Analysis

Reservoirs identified in the screening-level analysis as containing public wells within the maximum zone of surface water influence were further analyzed with respect to specific policy alternatives. For each of the reservoir areas chosen for further analysis, the closest public well to the reservoir was designated as the most sensitive groundwater resource. The distances from these wells to the reservoirs were determined. In addition, median monthly changes in reservoir water levels were determined for all the alternatives. For all alternatives, the potential monthly change in groundwater levels at the wells closest to the reservoirs was calculated with respect to the Base Case.

The same solution to the differential equation and assumptions discussed in Section D2.1.1 was used to calculate the potential monthly change in groundwater levels at the closest wells to TVA reservoirs for each alternative. As inputs into the equation, values for transmissivity and specific yield appropriate to the reservoir area remained the same as the screening-level analysis. The distance from the reservoir to the closest groundwater well was used for distance (x) in the equation.

The analysis assumed that initial groundwater elevation at the wells was equal to reservoir water level elevations. Reservoir water level elevations in January were used as a starting point for the calculation as reservoir levels are usually lowest in this month. For each consecutive month (February to December), the change in median reservoir elevations from the previous month to the current month was used for H in the equation (H= median elevation for current month – median elevation for previous month). Time (t) was assumed to be 30 days for all months. For each alternative, the analysis was iterated for each month of the year. Changes in groundwater elevations at the closest groundwater wells for each month were added or subtracted from initial groundwater elevations (assumed to equal January reservoir water elevations) to project the cumulative change in groundwater elevations over the year. This result gives an estimation as to how groundwater elevations at the closest wells to the reservoirs would change for each alternative each month of the year, assuming that January groundwater elevations are equal to January reservoir elevations.

The Base Case would continue existing conditions to the year 2030. Since this alternative does not include a physical change and groundwater usage was assumed to remain fairly constant, there would be no adverse consequence to groundwater resources. All other alternatives were, therefore, analyzed with respect to the Base Case. The projected monthly changes in groundwater elevations at the wells for each alternative were then compared to the projected monthly changes in groundwater elevations at the wells for the Base Case. Any increase in groundwater levels was considered a beneficial effect on groundwater resources. A decrease in groundwater levels of more than 3 feet was considered an adverse effect on groundwater resources if the change occurred at or near reservoir minimum pool. This 3-foot threshold was based on the typical seasonal and annual changes in groundwater elevations attributable to non-reservoir influences and variation in groundwater use patterns. Due to the conservative nature of the calculations used in this analysis, any adverse effects on groundwater resources at any of the reservoirs were further analyzed to determine, to the extent possible, consistency with the assumptions outlined in the above calculations.

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Appendix D3

Aquatic Resources

TVA

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D3.1 Fish Index of Biotic Integrity (Used in Tailwaters)

An Index of Biotic Integrity (IBI) is used to assess environmental quality by applying ecologically based metrics to resident aquatic communities. TVA uses a 12-metric fish IBI to assess tailwater quality. Each metric rates the condition of one aspect of the community. Metrics are scored against the expected condition of regional un-impacted stream communities. Potential scores are 1-poor, 3-intermediate, or 5-best condition.

The 12 metrics used in the fish IBI are as follows:

1. Number of native species
2. Number of native darter species
3. Number of sunfish species
4. Number of native sucker species
5. Number of intolerant species
6. Percentage of fish as tolerant species
7. Percentage of fish as omnivores and stoneroller species
8. Percentage of fish as specialized insectivores
9. Percentage of fish as piscivores
10. Catch rate (average number per standardized sampling effort)
11. Percentage of fish as hybrids
12. Percentage of fish with disease, tumors, body damage, or other anomalies

To produce a site rating, scores for the 12 metrics are summed. Sites attain 1 of 6 possible ratings: (1) no fish, (2) very poor (12-22), (3) poor (28-34), (4) fair (40-44), (5) good (48-52), or (6) excellent (58-60) (Karr et al. 1986).

The worst rating, no fish, indicates that repetitive sampling fails to turn up any fish. Sites rating very poor have few fish present, fish tend to be introduced or tolerant species, hybrids are common, and disease and anomalies occur regularly on fish. Poor sites are dominated by omnivores (fish that eat plants, animals, and sometimes detritus), fish are tolerant of pollution and are habitat generalists, few top piscivores are present, and hybrids and disease are present. Sites attaining a fair rating have lowered species diversity, few intolerant forms, skewed trophic structure (increasing number of omnivores), and older age classes of top predators may be rare. Good ratings are attained when species richness is only slightly below regional expectations, mostly due to loss of most sensitive species, abundances or size distribution is not quite optimal, and trophic structure shows some signs of stress (more omnivores than usual and fewer piscivores than natural conditions). The highest rating, excellent, is attained by sites that are comparable to the best natural situations without influence of humans. Excellent sites have all regionally expected species for the habitat and stream size, including tolerant forms, a normal age-size distribution, all sex classes, and a balanced trophic structure.

D3.2 Benthic Index of Biotic Integrity (Used in Tailwaters)

TVA uses a Benthic Index of Biotic Integrity (BIBI) to monitor the benthic invertebrate community in tailwaters. The BIBI follows the standard methodology of an IBI as described for the fish IBI (Karr et al. 1986), except that it uses 10 metrics to assess benthic invertebrates.

TVA uses the following benthic metrics to monitor resident benthic communities:

1. Taxa richness
2. Number of intolerant snail and mussel species
3. Number of mayfly taxa
4. Number of caddisfly taxa
5. Number of stonefly taxa
6. Percent of individuals as oligochaetes
7. Percent of individual taxa that feed as collector-filterers
8. Percent of individuals that are predators (excluding chironomids and flatworms)
9. Percent of individuals in the top two dominant taxa
10. Total abundance

Sites can attain a BIBI score of 10 to 60, with higher scores representing higher quality communities and environmental conditions.

D3.3 Reservoir Fish Assemblage Index

The Reservoir Fish Assemblage Index (RFAI) is one component of the Vital Signs monitoring program (see Section 4.4, Water Quality). This index evaluates the status of resident fish populations in reservoirs. The method is similar to the Reservoir Benthic Index.

For classification purposes, reservoirs were divided into upper and lower mainstem or tributary reservoirs, with tributary reservoirs further classified by physiographic region. Within reservoirs, sites were classified into three zones: inflow, transition, and forebay. In cases where sample information was gathered with different types of gear, scoring criteria were adjusted to account for the difference.

There are 12 fish community metrics represented by four categories (species richness and composition, trophic composition, abundance, and fish health). There are eight species richness metrics, including:

1. Total number of species
2. Number top carnivores
3. Number of sunfish (excluding *Micropterus*)
4. Number of benthic invertivores
5. Number of intolerant species
6. Percentage of tolerant individuals
7. Percentage of dominance by one species
8. Number of non-native species

The two trophic composition metrics are:

1. Percentage of individuals as omnivores
2. Percentage of individuals as top carnivores

Abundance is evaluated using total catch per effort (number of individuals captured per electrofishing or gill net sample). Fish health is evaluated using the percentage of individuals with anomalies (disease, lesions, tumors, external parasites, deformities, and natural hybrids).

Sample results were compared to reference criteria and assigned a corresponding value: most degraded-1, moderate-3, or least degraded-5. A fish community was rated by summing the scores for all metrics. Conditions of the fish community at a sample location were rated as follows:

RFAI Score	12-21	22-31	32-40	41-50	51-60
Community Rating	Very Poor	Poor	Fair	Good	Excellent

D3.4 Reservoir Benthic Index

TVA monitors resident benthic invertebrate communities in 31 reservoirs as part of the Vital Signs monitoring program described in Section 4.4, Water Quality. Benthic communities are rated using seven metrics. The seven metrics used to classify reservoirs vary depending between reservoir type, either mainstem or tributary reservoir. Within tributary reservoirs, the scoring system varies by physiographic region (Blue Ridge, Ridge and Valley, or Interior Plateau). Further, in each reservoir, the benthic community varies with the amount of flow. Communities at the inflow of the reservoir pool are different than those in the mid-reservoir (transition area) or in the forebay.

The seven metrics used to assess mainstem reservoirs include the following:

1. Number of taxa (species or varieties)
2. Diversity of a sensitive taxa group (EPT)
3. Presence or absence of long-lived species
4. Percent of oligochaetes (tolerant organisms)
5. Percentage of dominant taxa (presence of diversity or not)
6. Density excluding chironomids and oligochaetes
7. Zero samples (proportion of samples with no organisms)

For tributary reservoirs, metrics number 2 and 3 are not used. Instead, they are replaced by two different metrics, the number of non-chironomid and oligochaete taxa (more is better), and chironomid density (again, more is better).

Each metric is worth a maximum of 5 points. Points are given in increments of most degraded-1, moderate-3, or least degraded-5. Sample results were compared to reference conditions which varied based upon, in tributary reservoirs, physiographic provinces and within reservoir zones discussed in Section D3.3. Similarly, mainstem reservoirs support different communities than tributary reservoirs and they have their own scoring criteria. Only inflow areas were evaluated for mainstem reservoirs. All metrics scores for a particular site are summed to obtain the Reservoir Benthic Index score. Benthic communities were rated as very poor (7-12), poor (13-18), fair (19-23), good (24-29), and excellent (30-35).

D3.5 Sport Fishing Index

The Sport Fishing Index (SFI) measures quantity and quality of angler success and fish population characteristics using four metrics (Hickman 2000). Two metrics measure quantity, and two indicate quality.

Metrics used to evaluate quantity of the fish population include:

1. Angler success
2. Catch-per-effort of sampling by biologists

Population quality metrics include:

1. Angler pressure
2. A group of five population quality indicators used by fishery biologists, including such aspects as the proportion of preferred, memorable, and trophy individuals, and fish weight relative to length (plump or thin)

For each fish sample, an individual species was scored on all four metrics. Metric scores were rated as a 5-low, 10-moderate, or 15-high with higher scores meaning a higher quality sport fishery. For a metric comprised of more than one part, the value of a scoring category was divided by the total number of parts to give its score. If one part of a five-part metric scored in the low category (5), it received 1 point (5 points/five parts); if scored in the moderate category, it was worth 2 points (10 points/five parts); and so on. Overall, each of the four metric groups was worth a total of 20 points. Consequently, SFI scores range from 20 (minimum) to 80 (maximum). Sometimes information was available from both TVA and state agency fish samples. In that case, state data were used for catch rate statistics and both data sets were used for population quality aspects. When data were not available for a particular aspect (e.g., angler catch statistics) or the value of one part of a multi-part metric was unknown, the scores of known parts were given more weight so that the total for each metric still equaled 20 points.

To determine the SFI for a particular reservoir, multiple samples are taken in that reservoir. TVA has monitored fish populations with the SFI method since 1996.

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Appendix D4

Wetlands

D4a. Methods for Identifying and Categorizing Potentially Affected Wetlands

D4b. Methods to Compare the Potential Effects of Alternatives on Wetlands

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D4a.1 Creation of a Groundwater Area of Influence Layer

A geographic information system (GIS) coverage of the 35 reservoirs and the connecting waters (Barkley Reservoir and Tombigbee Waterway) included in the Reservoir Operations Study (ROS) was developed by TVA. This coverage was used as a base for both the threatened and endangered species analysis and the wetlands study. Reach identification (ID) codes assigned by TVA were used to distinguish between the reservoirs and tailwaters. The coverage was annotated to include the reservoir and tailwater names and reach ID codes. Individual polygon coverages were created for each reservoir and tailwater. For each reservoir, a groundwater influence buffer was created based on the "distance of no effect from elevation change" calculated for the Groundwater Resources analysis (Sections 4.6 and 5.6). Table D4a-01 provides a list of the physiographic regions and buffer distances used in the wetland analysis.

For each tailwater, a groundwater area of influence polygon was created by: (1) buffering the tailwater with the same "distance of no effect from elevation change" used for the upstream reservoir (see Table D4a-01), (2) converting this buffer polygon to a grid, (3) using the grid as a mask while selecting out those areas of the digital elevation model (DEM) that were less than or equal to the (tailwater headwater elevation + 20 feet) and setting them equal to 1, (4) converting the 0/1 grid to a polygon coverage, and (5) reselecting only those polygons with a value of 1 directly connected to the tailwater. The headwater elevations used in the DEM comparison are shown in Table D4a-02.

The State Soil Geographic Database (STATSGO) provided supplemental information on hydric soils for the seven states included in the Tennessee River Valley: Tennessee, Georgia, Alabama, Virginia, North Carolina, Mississippi, and Kentucky. After creating coverage of mapping unit ID (MUID) polygons for the Tennessee Valley, attributes from the "comp" tables associated with each state's spatial layer were joined in. Each MUID, or soil mapping unit, consists of between 1 and 21 soil components (generally equivalent to a soil series). Each of these components is flagged Y/N for hydric properties, and the percentage of the MUID area that contains that particular component was calculated. For each MUID within the Tennessee Valley, the percentages of those components designated as being hydric were summed. This yielded a range from 0 to 81 percent hydric.

A cutoff value of 50 percent was used for hydric versus non-hydric MUIDs (this cutoff value also approximated the natural break in the data). Those MUIDs with hydric soil composing 50 percent or more of the area were selected to append to the groundwater influence buffers of the applicable reservoirs and tailwaters (Kentucky Reservoir and tailwater, Barkley Reservoir and tailwater, Pickwick tailwater, Guntersville Reservoir, and Nickajack tailwater).

Table D4a-01 Buffer Distances Used to Determine Reservoir Zones of Groundwater Influence

Reservoir	Reach ID	Physiographic Region	Buffer Distance (ft)
Apalachia	38	Blue Ridge	1,050
Barkley	78	Highland Rim	1,600
Bear Creek	24	Cumberland Plateau	2,200
Blue Ridge	48	Blue Ridge	1,150
Boone	67	Valley and Ridge	1,300
Cedar Creek	29	Highland Rim	1,850
Chatuge	42	Blue Ridge	1,150
Cherokee	63	Valley and Ridge	1,350
Chickamauga	13	Valley and Ridge	1,140
Douglas	74	Valley and Ridge	1,400
Fontana	60	Blue Ridge	1,325
Fort Loudoun	17	Valley and Ridge	1,075
Fort Patrick Henry	66	Valley and Ridge	1,050
Great Falls	76	Highland Rim	1,870
Guntersville	9	Cumberland Plateau	1,600
Hiwassee	39	Blue Ridge	1,325
Kentucky	2	Highland Rim	1,600
Little Bear Creek	31	Highland Rim	1,820
Melton Hill	52	Blue Ridge	1,020
Nickajack	11	Cumberland Plateau	1,850
Normandy	22	Highland Rim	1,800
Norris	54	Valley and Ridge	1,350
Nottely	50	Blue Ridge	1,250
Ocoee #1	44	Blue Ridge	1,050
Ocoee #2	45	Blue Ridge	0
Ocoee #3	46	Blue Ridge	1,040
Pickwick	4	Coastal Plain	2,050
South Holston	69	Valley and Ridge	1,330
Tellico	55	Valley and Ridge	1,100
Tims Ford	34	Highland Rim	1,875
Upper Bear Creek	26	Cumberland Plateau	2,100
Watauga	72	Blue Ridge	1,150
Watts Bar	15	Valley and Ridge	1,100
Wheeler	7	Highland Rim	1,650
Wilbur	71	Blue Ridge	1,150
Wilson	6	Highland Rim	1,125

Table D4a-02 Headwater Elevations Used in the Determination of the Tailwater Areas of Groundwater Influence

Tailwater	Reach ID	Headwater Elevation (ft)
Apalachia	37	1,204
Barkley	77	351
Bear Creek	23	571
Blue Ridge	47	1,555
Cedar Creek	28	581
Chatuge	41	1,883
Cherokee	62	935
Chickamauga	12	633
Douglas	73	876
Fontana	59	1,276
Fort Loudoun	16	741
Fort Patrick Henry	65	1,204
Great Falls	80	722
Guntersville	8	558
Kentucky	1	302
Little Bear Creek	30	620
Melton Hill	51	741
Nickajack	10	597
Normandy	21	800
Norris	53	817
Nottely	49	1,624
Ocoee	43	738
Pickwick	3	364
South Holston Dam	68	1,479
Tims Ford	33	754
Tombigbee Waterway	79	413
Upper Bear Creek	25	784
Watts Bar	14	682
Wilbur	70	1,643
Wilson	5	413

D4a.2 Creation of Wetland Layers and Selection of Potentially Affected Wetlands

National Wetland Inventory (NWI) data for the ROS study area were obtained from the U.S. Fish and Wildlife Service. The NWI wetlands were originally mapped at a scale of 1:24,000. Electronic NWI data were prepared and projected to the TN State Plane Coordinate System (NAD 82) by TVA. The data included polygon and linear features in separate coverages. All palustrine system polygons were selected. To pick up connected features that might lie outside the groundwater influence boundary, these polygonal features were merged if they were within 40 feet of this boundary. The merged polygons (clumps) of wetlands that lay wholly within or intersected the groundwater influence boundary were identified for each reservoir and tailwater. Individual palustrine polygons that lay within the selected merged/clumped features were selected. Polygons representing wetlands within the riverine and lacustrine systems (Cowardin classes Emergent [EM], Flat [FL], Aquatic Bed [AB], Unconsolidated Shore [US], and Unconsolidated Bottom Temporarily to Semi-Permanently Flooded [UBA, UBC, UBF, UBG, UBW, UBY, or UBZ]) were selected where they were wholly or partially within each groundwater influence boundary. All linear palustrine system features were selected and clipped to the groundwater influence boundary of each reservoir and tailwater. The lengths of the palustrine linear features within the groundwater influence area were multiplied by a maximum width of 60 feet to provide area estimates. Counts and areas of the selected polygons and linear features were summarized by Cowardin classification. The results for each reservoir and tailwater were summed to provide a summary of all potentially affected wetlands surrounding each reservoir/tailwater.

D4a.3 Categorization of Fringe Wetlands

All lacustrine and riverine polygons were selected. All lacustrine and riverine linear features were selected and buffered by a maximum width of 60 feet. The lacustrine and riverine polygons and buffered linear features were merged to provide a coverage of reservoirs and rivers. Palustrine polygons that intersected the reservoirs and rivers contained within each groundwater influence area were categorized as shoreline fringe wetlands.

D4a.4 Categorization of Island Wetlands

Palustrine polygons that lay completely within the reservoirs and rivers contained within each groundwater influence area were categorized as island wetlands.

D4a.5 Categorization of Surface-Water Isolated Wetlands

The National Hydrologic Dataset (NHD) (USGS 2003) coverages for the seven states of interest were compiled as a base. All NHD rivers/streams were selected, buffered by 1 foot, and appended to the NWI reservoirs and rivers coverage developed for the fringe and island wetland categorization. The affected linear palustrine features were buffered by 60 feet and appended to the merged/clumped palustrine polygon coverage.

All grouped palustrine features touching water were reselected and then the inverse of this set was used to determine which individual palustrine polygons and linear features to categorize as surface-water isolated.

D4a.6 Determination of Undeveloped Upland Area within the Groundwater Area of Influence

An estimate of the remaining undeveloped upland acreage (UU) around each reservoir was calculated by using grids with a cell size of 98.4 feet on each side and the following formula:

UU = groundwater area of influence – reservoir area – NWI polygons – NWI linear features buffered by 60 feet – urban/developed land

The urban/developed land layer used in this calculation was created by selecting low-intensity residential, high-intensity residential, and high-intensity commercial/industrial/transportation from the National Land Cover Dataset (NLCD).

D4a.7 System-Wide Totals

Because some of the same wetlands may be affected by adjacent reservoirs and tailwaters (thereby causing an overlap effect when the numbers for each reservoir and tailwater are added together), a series of system-wide calculations was performed. The groundwater influence areas for the 35 reservoirs, connecting waters, and 30 tailwaters were merged together into a single system-wide groundwater area of influence coverage. This system-wide groundwater influence area was then used in the processes described above to calculate system-wide counts and areas for potentially affected wetlands, fringe, island, and isolated wetlands, as well as to estimate the area of remaining undeveloped upland within the groundwater influence zone.

D4a.8 Reference

U.S. Geological Survey (USGS). 2003. National Hydrography Database. http://nhd.usgs.gov/.

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D4b.1 Introduction

For purposes of impact assessment, the ROS Weekly Scheduling Model (WSM) weekly guide curve model was used to compare changes in the duration of summer pool, summer pool fill dates, and maximum summer and winter pool elevations for system reservoirs under all nine alternatives. This assessment evaluated changes on 22 reservoirs where proposed changes would deviate from existing operations. The median year feature of the ROS model was selected for comparative purposes.

D4b.2 Parameter Selection

Four parameters (summer pool duration, maximum summer pool elevation, summer pool fill dates, and maximum extended winter pool elevation) were selected for analysis with the WSM weekly guide curve model to provide these data for each reservoir. These four parameters were selected because they have profound influences on wetland ecology and hydrology. The three summer pool parameters control the availability of water to wetlands during the growing season or the time of year that plants are actively growing. Water is a key element in wetlands; the amount of water in a wetland controls how large the wetland is, the type of wetland it is, and the kinds of plants and animals that live there. Winter pool conditions affect the exposure and development of flats.

Duration of summer pool was selected because the length of time that summer pool conditions are maintained controls the length of time that water is available in reservoir-influenced wetlands during the growing season. Maximum summer pool elevation was selected because the summer pool elevation controls the area that water can reach in reservoir-influenced wetlands. Summer fill date was selected because it influences when water is available in reservoir-influenced wetlands. Winter pool elevation was selected because it influences the extent to which flats are exposed for seed germination (seeds of most wetland and lacustrine plants cannot germinate under water), and it controls the exposure of flats for shorebird foraging habitat.

Changes in summer pool (duration and elevation) and winter pool (maximum elevation) conditions for all policy alternatives were compared with the Base Case to determine the effect (positive or negative) of each alternative on wetland habitats, wetland water regimes, and wetland functions and to determine an approximate magnitude of those effects. For the purpose of comparison, changes in wetlands on mainstem reservoirs, tributary reservoirs, and tailwaters were compared separately. Since the ROS model does not deal directly with tailwaters, evaluation of tailwater wetlands used data generated by water quality modeling conducted for the threatened and endangered species environmental impact analysis. Relevant data from this analysis included minimum surface water elevations that are expected to occur during 90 percent of the year in tailwaters below dams. Mainstem and tributary tailwaters were evaluated separately because this modeling indicated that proposed changes in tailwaters would vary considerably between the two groups.

D4b.3 Summer Pool Duration

Changes in summer pool duration are summarized in Tables D4b-01 through D4b-03. Table D4b-01 shows duration of summer pool measured in weeks for the Base Case and the policy alternatives. Table D4b-02 shows the change in duration of summer pool measured in weeks for the policy alternatives compared to the Base Case. Table D4b-03 shows the ratio of change in duration of summer pool measured for the policy alternatives compared to the Base Case. The ratios in Table D4b-03 were used to derive the coefficients that were used to describe the direction (positive or negative) and magnitude of effect for each reservoir under each alternative.

D4b.4 Summer Pool Elevation

Changes in summer pool elevation are summarized in Tables D4b-04 through D4b-06. Table D4b-04 shows elevation of summer pool measured in feet for the Base Case and the policy alternatives. Table D4b-05 shows the change in elevation of summer pool measured in feet for the policy alternatives compared to the Base Case. Table D4b-06 shows the ratio of change in elevation of summer pool measured for the policy alternatives compared to the Base Case. The ratios in Table D4b-06 were used to derive the coefficients that were used to describe the direction (positive or negative) and magnitude of effect for each reservoir under each alternative.

D4b.5 Summer Fill Dates

Under the Equalized Summer/Winter Flood Risk Alternative, the date that affected mainstem reservoirs would reach summer pool would be delayed several weeks when compared to existing operations. Table D4b-07 shows the change in summer fill date in weeks for the policy alternatives relative to the Base Case. Most of the mainstem reservoirs would be affected by this delay. Summer pool fill dates would not be delayed on tributary reservoirs.

D4b.6 Winter Pool Elevation

Maximum extended winter pool elevations would vary from reservoir to reservoir under the various alternatives. Winter pool elevations affect the exposure of flats in reservoirs. Exposed flats provide a mineral soil bed needed by seeds of various wetland and lacustrine plants for germination. Exposed flats also provide foraging habitat needed by many shorebirds for winter habitat or during spring and fall migrations. Table D4b-08 shows maximum extended winter pool elevations, and Table D4b-09 shows relative change in winter pool elevation relative to the Base Case.

Table D4b-01 Duration of Summer Pool (weeks)

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	10	13	18	5	13	10	18	13	10
Kentucky	10	13	18	5	13	10	18	13	10
Pickwick	12	16	21	8	18	12	21	16	20
Wilson	32	32	32	7	32	32	32	32	32
Wheeler	15	15	20	7	18	15	20	15	20
Guntersville	11	15	20	7	18	11	20	15	20
Chickamauga	10	14	19	6	18	10	19	14	16
Watts Bar	23	23	27	6	18	24	27	23	23
Fort Loudoun	27	27	27	6	17	27	27	27	23
Tributary Reservoirs									
Great Falls	9	16	16	3	3	9	13	13	18
Tims Ford	7	7	13	2	4	6	13	6	7
Blue Ridge	4	10	15	2	6	4	14	28	9
Hiwassee	3	8	14	2	11	7	7	18	8
Chatuge	2	9	14	1	4	2	7	21	1
Nottely	2	8	14	1	2	4	6	20	2
Norris	4	8	12	2	8	4	13	13	8
Fontana	2	8	13	1	4	3	14	18	10
Douglas	2	8	13	1	2	5	13	21	2
Boone	13	13	15	1	2	13	15	13	15
South Holston	3	9	8	1	3	3	9	6	6
Cherokee	2	8	13	1	3	2	13	15	6
Watauga	2	7	8	1	7	6	3	10	4

Table D4b-02 Changes in Summer Pool Duration (weeks) Relative to the Base Case

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	0	3	8	-5	3	0	8	3	0
Kentucky	0	3	8	-5	3	0	8	3	0
Pickwick	0	4	9	-4	6	0	9	4	8
Wilson	0	0	0	-25	0	0	0	0	0
Wheeler	0	0	5	-8	3	0	5	0	5
Guntersville	0	4	9	-4	7	0	9	4	9
Chickamauga	0	4	9	-4	8	0	9	4	6
Watts Bar	0	0	4	-17	-5	1	4	0	-4
Fort Loudoun	0	0	0	-21	-10	0	0	0	-4
Tributary Reservoirs									
Great Falls	0	7	7	-6	-6	0	4	4	9
Tims Ford	0	0	6	-5	-3	-1	6	-1	0
Blue Ridge	0	6	11	-2	2	0	10	24	5
Hiwassee	0	5	11	-1	8	4	4	15	5
Chatuge	0	7	12	-1	2	0	5	19	-1
Nottely	0	6	12	-1	0	2	4	18	0
Norris	0	4	8	-2	4	0	9	9	4
Fontana	0	6	11	-1	2	1	12	16	8
Douglas	0	6	11	-1	0	3	11	19	0
Boone	0	0	2	-12	-11	0	2	0	2
South Holston	0	6	5	-2	0	0	6	3	3
Cherokee	0	6	11	-1	1	0	11	13	4
Watauga	0	5	6	-1	5	4	1	8	2

Table D4b-03 Ratio of Changes in Duration of Summer Pool Compared to the Base Case

Reservoirs	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	10	0.30	0.80	-0.50	0.30	0.00	0.80	0.30	0.00
Kentucky	10	0.30	0.80	-0.50	0.30	0.00	0.80	0.30	0.00
Pickwick	12	0.33	0.75	-0.33	0.50	0.00	0.75	0.33	0.67
Wilson	32	0.00	0.00	-0.78	0.00	0.00	0.00	0.00	0.00
Wheeler	15	0.00	0.33	-0.53	0.20	0.00	0.33	0.00	0.33
Guntersville	11	0.36	0.82	-0.36	0.64	0.00	0.82	0.36	0.82
Chickamauga	10	0.40	0.90	-0.40	0.80	0.00	0.90	0.40	0.60
Watts Bar	23	0.00	0.17	-0.74	-0.22	0.04	0.17	0.00	-0.15
Fort Loudoun	27	0.00	0.00	-0.78	-0.37	0.00	0.00	0.00	-0.15
Tributary Reservoirs									
Great Falls	9	0.78	0.78	-0.67	-0.67	0.00	0.44	0.44	1.00
Tims Ford	7	0.00	0.86	-0.71	-0.43	-0.14	0.86	-0.14	0.00
Blue Ridge	4	1.50	2.75	-0.50	0.50	0.00	2.50	6.00	1.25
Hiwassee	3	1.67	3.67	-0.33	2.67	1.33	1.33	5.00	1.67
Chatuge	2	3.50	6.00	-0.50	1.00	0.00	2.50	9.50	-0.50
Nottely	2	3.00	6.00	-0.50	0.00	1.00	2.00	9.00	0.00
Norris	4	1.00	2.00	-0.50	1.00	0.00	2.25	2.25	1.00
Fontana	2	3.00	5.50	-0.50	1.00	0.50	6.00	8.00	4.00
Douglas	2	3.00	5.50	-0.50	0.00	1.50	5.50	9.50	0.00
Boone	13	0.00	0.15	-0.92	-0.85	0.00	0.15	0.00	0.15
South Holston	3	2.00	1.67	-0.67	0.00	0.00	2.00	1.00	1.00
Cherokee	2	3.00	5.50	-0.50	0.50	0.00	5.50	6.50	2.00
Watauga	2	2.50	3.00	-0.50	2.50	2.00	0.50	4.00	1.00

Table D4b-04 — Maximum Extended Summer Pool Elevation (feet)

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	359	359	359	359	359	359	359	359	359
Kentucky	359	359	359	359	359	359	359	359	359
Pickwick	414	414	414	414	414	414	414	414	414
Wilson	507	507	507	507	507	507	507	507	507
Wheeler	556	556	556	556	556	556	556	556	556
Guntersville	595	595	595	595	595	595	595	595	595
Chickamauga	682	682	682	682	682	682	682	682	682
Watts Bar	741	741	741	741	741	741	741	741	741
Fort Loudoun	813	813	813	813	813	813	813	813	813
Tributary Reservoirs									
Great Falls	800	800	800	800	800	800	800	800	800
Tims Ford	888	888	888	888	884	888	888	888	888
Blue Ridge	1,686	1,686	1,686	1,686	1,680	1,687	1,687	1,688	1,688
Hiwassee	1,520	1,520	1,520	1,520	1,508	1,521	1,520	1,521	1,521
Chatuge	1,926	1,926	1,926	1,926	1,923	1,926	1,926	1,926	1,926
Nottely	1,777	1,777	1,777	1,777	1,774	1,777	1,777	1,777	1,777
Norris	1,018	1,019	1,019	1,018	1,012	1,018	1,018	1,020	1,019
Fontana	1,703	1,703	1,703	1,703	1,682	1,703	1,703	1,703	1,703
Douglas	994	994	994	994	986	994	994	994	994
Boone	1,382	1,382	1,382	1,382	1,382	1,382	1,382	1,382	1,382
South Holston	1,729	1,729	1,729	1,729	1,727	1,728	1,729	1,728	1,728
Cherokee	1,070	1,071	1,071	1,071	1,067	1,070	1,071	1,071	1,069
Watauga	1,959	1,959	1,959	1,959	1,962	1,958	1,957	1,958	1,958

Table D4b-05 Changes in Summer Pool Elevation (feet) Relative to the Base Case

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	0	0	0	0	0	0	0	0	0
Kentucky	0	0	0	0	0	0	0	0	0
Pickwick	0	0	0	0	0	0	0	0	0
Wilson	0	0	0	0	0	0	0	0	0
Wheeler	0	0	0	0	0	0	0	0	0
Guntersville	0	0	0	0	0	0	0	0	0
Chickamauga	0	0	0	0	0	0	0	0	0
Watts Bar	0	0	0	0	0	0	0	0	0
Fort Loudoun	0	0	0	0	0	0	0	0	0
Tributary Reservoirs									
Great Falls	0	0	0	0	0	0	0	0	0
Tims Ford	0	0	0	0	-4	0	0	0	0
Blue Ridge	0	0	0	0	-6	1	1	2	2
Hiwassee	0	0	0	0	-12	1	0	1	1
Chatuge	0	0	0	0	-3	0	0	0	0
Nottely	0	0	0	0	-3	0	0	0	0
Norris	0	1	1	0	-6	0	0	2	1
Fontana	0	0	0	0	-21	0	0	0	0
Douglas	0	0	0	0	-8	0	0	0	0
Boone	0	0	0	0	0	0	0	0	0
South Holston	0	0	0	0	-2	-1	0	-1	-1
Cherokee	0	1	1	1	-3	0	1	1	-1
Watauga	0	0	0	0	3	-1	-2	-1	-1

Table D4b-06 Ratio of Change in Summer Pool Elevation Relative to the Base Case

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	0	0	0	0	0	0	0	0	0
Kentucky	0	0	0	0	0	0	0	0	0
Pickwick	0	0	0	0	0	0	0	0	0
Wilson	0	0	0	0	0	0	0	0	0
Wheeler	0	0	0	0	0	0	0	0	0
Guntersville	0	0	0	0	0	0	0	0	0
Chickamauga	0	0	0	0	0	0	0	0	0
Watts Bar	0	0	0	0	0	0	0	0	0
Fort Loudoun	0	0	0	0	0	0	0	0	0
Tributary Reservoirs									
Great Falls	0	0	0	0	0	0	0	0	0
Tims Ford	0	0	0	0	-0.00450	0	0	0	0
Blue Ridge	0	0	0	0	-0.00356	0.00059	0.00059	0.00119	0.001186
Hiwassee	0	0	0	0	-0.00789	0.00066	0	0.00066	0.000658
Chatuge	0	0	0	0	-0.00156	0	0	0	0
Nottely	0	0	0	0	-0.00169	0	0	0	0.000563
Norris	0	0.00098	0.00098	0	-0.00589	0	0	0.00196	0.000982
Fontana	0	0	0	0	-0.01235	0	0	0	0
Douglas	0	0	0	0	-0.00805	0	0	0	0
Boone	0	0	0	0	0	0	0	0	0
South Holston	0	0	0	0	-0.00116	-0.00058	0	-0.00058	-0.00058
Cherokee	0	0.00093	0.00093	0.00093	-0.00280	0	0.00093	0.00093	-0.00093
Watauga	0	0	0	0	0.00153	-0.00051	-0.00102	-0.00051	-0.00051

Table D4b-07 Changes in Summer Filling Date (weeks) Relative to the Base Case

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	0	0	0	0	-4	0	0	0	0
Kentucky	0	0	0	0	-4	0	0	0	0
Pickwick	0	0	0	0	-7	0	0	0	-1
Wilson	0	0	0	0	0	0	0	0	0
Wheeler	0	0	0	0	-6	0	0	0	0
Guntersville	0	0	0	0	-6	0	0	0	0
Chickamauga	0	0	0	0	-5	0	0	0	-4
Watts Bar	0	0	0	0	-5	0	0	0	-4
Fort Loudoun	0	0	0	0	0	0	0	0	-4
Tributary Reservoirs									
Great Falls	0	0	0	0	0	0	0	0	-2
Tims Ford	0	0	0	0	-14	0	0	0	0
Blue Ridge	0	0	0	0	-2	0	0	0	-4
Hiwassee	0	0	0	0	2	0	0	0	0
Chatuge	0	0	0	0	4	0	0	0	-1
Nottely	0	0	0	0	-2	0	0	0	0
Norris	0	0	0	0	-11	0	0	0	0
Fontana	0	0	0	0	-2	0	0	0	1
Douglas	0	0	0	0	-2	0	0	0	0
Boone	0	0	0	0	-13	0	0	0	0
South Holston	0	0	0	0	-7	0	0	0	-4
Cherokee	0	0	0	0	-8	0	0	0	-2
Watauga	0	0	0	0	4	0	0	0	-4

Note: Negative numbers indicate a delay from normal filling dates.

Table D4b-08 Maximum Extended Winter Pool Elevation (feet msl)

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	354.3	354.3	356	354.3	354.3	356	356	354.3	354.3
Kentucky	354.3	354.3	356	354.3	354.3	356	356	354.3	354.3
Pickwick	409	410.5	410.5	409	409	410.5	410.5	410.5	409
Wilson	505.5	505.5	505.5	505.5	505.5	505.5	505.5	505.5	505.5
Wheeler	551	552.5	552.5	551	552.5	552.5	552.5	552.5	551.5
Guntersville	593.3	593.3	593.3	593.3	593.3	593.3	593.3	593.3	593.3
Chickamauga	676	677.5	677.5	676	675	677.5	677.5	677.5	676
Watts Bar	736	737.5	737.5	736	735	737.5	737.5	737.5	736
Fort Loudoun	808	809.5	809.5	808	807	809.5	809.5	809.5	808
Tributary Reservoirs									
Great Falls	785	785	785	785	785	785	785	785	785
Tims Ford	873	877	871.8	871	865	872.5	871.5	877	873
Blue Ridge	1,650	1,670	1,660	1,660	1,669	1,650	1,660	1,678	1,667
Hiwassee	1,468	1,482	1,480	1,480	1,470	1,468	1,480	1,485	1,482
Chatuge	1,913	1,916	1,918	1,916	1,916	1,913	1,918.5	1,917	1,917.5
Nottely	1,747	1,757	1,763	1,755	1,761.5	1,747	1,763	1,762	1,761
Norris	985	999	1,005	1,005	996	985	1,005	1,000	998
Fontana	1,642	1,628	1,658	1,658	1,654	1,636	1,658	1,644	1,650
Douglas	940	958	958	958	946	940	956	958	953
Boone	1,356	1,356	1,356	1,356	1,364	1,356	1,356	1,356	1,362
South Holston	1,698	1,712	1,723	1,707	1,719	1,697	1,723	1,713	1,706
Cherokee	1,030	1,045	1,052	1,050	1,050	1,030	1,053	1,046	1,044
Watauga	1,937	1,946	1,955	1,944	1,954	1,938	1,948	1,952	1,950

Table D4b-09 Change in Winter Pool Elevation (feet) Relative to the Base Case

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	0	0	1.7	0	0	1.7	1.7	0	0
Kentucky	0	0	1.7	0	0	1.7	1.7	0	0
Pickwick	0	1.5	1.5	0	0	1.5	1.5	1.5	0
Wilson	0	0	0	0	0	0	0	0	0
Wheeler	0	1.5	1.5	0	1.5	1.5	1.5	1.5	0.5
Guntersville	0	0	0	0	0	0	0	0	0
Chickamauga	0	1.5	1.5	0	-1	1.5	1.5	1.5	0
Watts Bar	0	1.5	1.5	0	-1	1.5	1.5	1.5	0
Fort Loudoun	0	1.5	1.5	0	-1	1.5	1.5	1.5	0
Tributary Reservoirs									
Great Falls	0	0	0	0	0	0	0	0	0
Tims Ford	0	4	-1.2	-2	-8	-0.5	-1.5	4	0
Blue Ridge	0	20	10	10	19	0	10	28	17
Hiwassee	0	14	12	12	2	0	12	17	14
Chatuge	0	3	5	3	3	0	5.5	4	4.5
Nottely	0	10	16	8	14.5	0	16	15	14
Norris	0	14	20	20	11	0	20	15	13
Fontana	0	-14	16	16	12	-6	16	2	8
Douglas	0	18	18	18	6	0	16	18	13
Boone	0	0	0	0	8	0	0	0	6
South Holston	0	14	25	9	21	-1	25	15	8
Cherokee	0	15	22	20	20	0	23	16	14
Watauga	0	9	18	7	17	1	11	15	13

D4b.7 Tailwaters

Each alternative would result in different effects on flow in tailwaters. Changes in flow would in turn affect the elevation of the water surface in tailwaters, and these changes would affect mainstem reservoirs differently. A summary of anticipated changes in minimum elevations on mainstem and tributary tailwaters is shown in Table D4b-10. (See detailed descriptions of changes in Appendix D6b.)

In general, water elevations on tailwaters of mainstem reservoirs would increase from 1 to 2 feet over Base Case conditions for Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative; decrease up to 1 foot for the Equalized Summer/Winter Flood Risk Alternative minimum elevation; and increase up to 1 foot for the Commercial Navigation Alternative. On tailwater reservoirs, projected surface water elevations are expected to be essentially equal for the Base Case and Reservoir Recreation Alternative A, Reservoir Recreation Alternative A, the Equalized Summer/Winter Flood Risk Alternative, Commercial Navigation Alternative, and the Tailwater Recreation Alternative. Water levels on tributary tailwaters could increase up to 0.5 foot under the Tailwater Habitat Alternative. Because the water quality model was not able to provide any data for the Summer Hydropower Alternative, an inverse relationship was assumed between pool conditions on reservoirs and releases from dams to tailwaters. For example, as the duration of summer pool increases; the water released to tailwaters decreases.

D4b.8 Integration of Changes in Reservoir Conditions

Since summer pool conditions control wetland hydrology in reservoir and tailwater wetlands, summer pool data were used to determine the magnitude of effects for wetlands each reservoir and tailwater. Winter pool ratios were not used since they primarily affect exposure of flats during the dormant season for most plants. The ratio of changes in duration and elevation of summer pool and elevation compared to the Base Case (see Tables D4b-03 and D4b-06) were combined to create a unique set of coefficients for each reservoir. These two ratios were added for each reservoir and each alternative. Because this sum was greater than 1 (Table D4b-11), this sum was multiplied by 0.1 to produce a set of coefficients between 0 and 1 (Table D4b-12).

These coefficients were then multiplied by wetland acreages on each affected reservoir obtained from National Wetland Inventory data in order to derive a number that described the magnitude of potential impacts on each reservoir's and tailwaters' wetlands. This was done reservoir by reservoir for each wetland vegetation type, wetland water regime, and other selected wetland functional categories discussed in Section 4.8 . The derived values were summed for each reservoir affected by each alternative and sums were compared to evaluate the effect of each alternative on wetlands.

Table D4b-10 Potential Changes in Minimum Surface Water Elevations in Mainstem and Tributary Tailwaters

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem tailwaters	0	1–2 ft	1–2 ft	>2 ft	-1 ft	0–1 ft	1–2 ft	1–2 ft	1–2 ft
Tributary reservoirs	0	0	0	>2 ft	0	0	0	0–0.5 ft	0

Table D4b-11 Derivation of Reservoir-Specific Coefficients, Step 1: Sum Ratios of Changes in Summer Pool Duration and Elevation Relative to the Base Case

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	0	0.300	0.800	-0.500	0.300	0.000	0.800	0.300	0.00000
Kentucky	0	0.300	0.800	-0.500	0.300	0.000	0.800	0.300	0.00000
Pickwick	0	0.333	0.750	-0.333	0.500	0.000	0.750	0.333	0.66667
Wilson	0	0.000	0.000	-0.781	0.000	0.000	0.000	0.000	0.00000
Wheeler	0	0.000	0.333	-0.533	0.200	0.000	0.333	0.000	0.33333
Guntersville	0	0.364	0.818	-0.364	0.636	0.000	0.818	0.364	0.81818
Chickamauga	0	0.400	0.900	-0.400	0.800	0.000	0.900	0.400	0.60000
Watts Bar	0	0.000	0.174	-0.739	-0.217	0.043	0.174	0.000	-0.14815
Fort Loudoun	0	0.000	0.000	-0.778	-0.370	0.000	0.000	0.000	-0.14815
Tributary Reservoirs									
Great Falls	0	0.778	0.778	-0.667	-0.667	0.000	0.444	0.444	1.00000
Tims Ford	0	0.000	0.857	-0.714	-0.433	-0.143	0.857	-0.143	0.00000
Blue Ridge	0	1.500	2.750	-0.500	0.496	0.001	2.501	6.001	1.25119
Hiwassee	0	1.667	3.667	-0.333	2.659	1.334	1.333	5.001	1.66732
Chatuge	0	3.500	6.000	-0.500	0.998	0.000	2.500	9.500	-0.50000
Nottely	0	3.000	6.000	-0.500	-0.002	1.000	2.000	9.000	0.00056
Norris	0	1.001	2.001	-0.500	0.994	0.000	2.250	2.252	1.00098
Fontana	0	3.000	5.500	-0.500	0.988	0.500	6.000	8.000	4.00000
Douglas	0	3.000	5.500	-0.500	-0.008	1.500	5.500	9.500	0.00000
Boone	0	0.000	0.154	-0.923	-0.846	0.000	0.154	0.000	0.15385
South Holston	0	2.000	1.667	-0.667	-0.001	-0.001	2.000	0.999	0.99942
Cherokee	0	3.001	5.501	-0.499	0.497	0.000	5.501	6.501	1.99907
Watauga	0	2.500	3.000	-0.500	2.502	1.999	0.499	3.999	0.99949

Table D4b-12 Derivation of Reservoir-Specific Coefficients, Step 2: Multiply Sum of Ratio of Changes in Summer Pool Duration and Elevation Relative to the Base Case by 0.1

Reservoir	Alternative								
	Base Case	Reservoir Recreation A	Reservoir Recreation B	Summer Hydropower	Equalized Summer/Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
Mainstem Reservoirs									
Barkley	0	0.030	0.080	-0.050	0.030	0.000	0.080	0.030	0
Kentucky	0	0.030	0.080	-0.050	0.030	0.000	0.080	0.030	0
Pickwick	0	0.033	0.075	-0.033	0.050	0.000	0.075	0.033	0.066667
Wilson	0	0.000	0.000	-0.078	0.000	0.000	0.000	0.000	0
Wheeler	0	0.000	0.033	-0.053	0.020	0.000	0.033	0.000	0.033333
Guntersville	0	0.036	0.082	-0.036	0.064	0.000	0.082	0.036	0.081818
Chickamauga	0	0.040	0.090	-0.040	0.080	0.000	0.090	0.040	0.06
Watts Bar	0	0.000	0.017	-0.074	-0.022	0.004	0.017	0.000	-0.01481
Fort Loudoun	0	0.000	0.000	-0.078	-0.037	0.000	0.000	0.000	-0.01481
Tributary Reservoirs									
Great Falls	0	0.078	0.078	-0.067	-0.067	0.000	0.044	0.044	0.1
Tims Ford	0	0.000	0.086	-0.071	-0.043	-0.014	0.086	-0.014	0
Blue Ridge	0	0.150	0.275	-0.050	0.050	0.000	0.250	0.600	0.125119
Hiwassee	0	0.167	0.367	-0.033	0.266	0.133	0.133	0.500	0.166732
Chatuge	0	0.350	0.600	-0.050	0.100	0.000	0.250	0.950	-0.05
Nottely	0	0.300	0.600	-0.050	0.000	0.100	0.200	0.900	5.63E-05
Norris	0	0.100	0.200	-0.050	0.099	0.000	0.225	0.225	0.100098
Fontana	0	0.300	0.550	-0.050	0.099	0.050	0.600	0.800	0.4
Douglas	0	0.300	0.550	-0.050	-0.001	0.150	0.550	0.950	0
Boone	0	0.000	0.015	-0.092	-0.085	0.000	0.015	0.000	0.015385
South Holston	0	0.200	0.167	-0.067	0.000	0.000	0.200	0.100	0.099942
Cherokee	0	0.300	0.550	-0.050	0.050	0.000	0.550	0.650	0.199907
Watauga	0	0.250	0.300	-0.050	0.250	0.200	0.050	0.400	0.099949

D4b Methods to Compare the Potential Effects of Alternatives on Wetlands

The direction (positive or negative) of the coefficients in Tables D4b-10 and D4b-11 only mirror the direction of change in wetland conditions compared to the Base Case. The actual direction of effect depends on the relationship of the increase or decrease of hydroperiod (summer pool duration and elevation) on each parameter of interest. For example, an increase in hydroperiod might be beneficial for persistent emergent communities but the same increase may adversely affect scrub/shrub and forest wetlands by interfering with seed germination and survival. In these two situations the positive effect on hydroperiod would positively affect emergents and negatively affect woody plants.

Although the derived rating numbers were obtained by multiplying these coefficients with total NWI wetland acreage for each affected reservoir or tailwater, these numbers are not intended to predict the actual effects of each alternative in terms of wetland acres. Rather the products serve to illustrate the net direction (positive or negative) and potential net effect of each alternative on wetland functions in each reservoir or tailwater. Therefore, the ratings were ranked from 1 to 8, and the direction and rankings form the basis for the discussion in Section 4.8 (see Tables 4.8-01 through 4.8-06). These products were developed to compare the effects of the proposed alternatives in terms of their potential to enhance or diminish the functioning of affected wetlands.

Appendix D5

Terrestrial Ecology

Tennessee Valley Authority
Reservoir Operations Study – Final Programmatic EIS

TVA

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D5.1 Introduction

This appendix supports the description in the main document of the affected environment (Section 4.10) and environmental consequences (Section 5.10) for terrestrial ecology.

The area of the Tennessee River system within 0.25 mile of reservoir shorelines was the study area for terrestrial ecology, since this zone contains several plant and animal communities that depend on or are otherwise associated with current reservoir conditions.

The Tennessee Valley Authority (TVA) has identified a number of terrestrial plant and animal communities that occur in the study area. Several of these communities that depend on current reservoir conditions or are otherwise associated with the Tennessee River system could be affected by changes in TVA's reservoir operations policy. Direct impacts on habitats for these resources could result from manipulation of reservoir levels. In addition, some TVA lands are vulnerable because of their proximity to lands desirable for residential or industrial development. Habitats in these areas could be indirectly affected by changes in land use resulting from changes in the reservoir operation policy.

This technical appendix describes the vegetation communities and wildlife communities associated with habitats that could be affected by changes in the reservoir operations policy.

D5.2 Vegetation Communities

Vegetation communities in the Tennessee River Valley (Valley) can be grouped into two broad categories: lowland and upland. The following qualitative descriptions of plant communities in the study area emphasize uncommon plant communities because potential impacts on these communities were considered potentially more harmful than impacts on more regionally abundant plant communities. The plant communities influenced by reservoir levels and river flows were considered to have the greatest potential to be affected by changes in reservoir operations. Consequently, plant communities associated with wetlands and other lowland habitats form the majority of the discussion. However, some uncommon upland plant communities that are not directly influenced by reservoir levels were also addressed, because changes in reservoir operations could affect these resources indirectly (e.g., through changes in land use).

D5.2.1 Lowland Plant Communities

Lowland plant communities include those communities that are most likely to be directly influenced by changes in reservoir operations and habitats associated with creeks, streams, rivers, and reservoirs in the study area. Examples of communities associated with these habitats include bottomland hardwood forests, scrub/shrub wetlands, and flats vegetation. Plant communities occurring in riparian habitats adjacent to floodplain areas (e.g., streambank forests situated on terraces or levees) are also included in this category. The majority of globally imperiled communities identified from the wetlands subset of the NatureServe Explorer database (2001) fall in this category (see Tables 4.10-01 and 4.10-02 in Section 4.10, Terrestrial Ecology).

Bottomland hardwood forests occur in the floodplains of streams and rivers and in remnant floodplains and other low-elevation sites adjacent to reservoirs. These forests can also extend along terraces, natural levees, and back-lying sloughs. In the Valley, species commonly observed in these forests include black gum (*Nyssa sylvatica*); black willow (*Salix nigra*); water (*Quercus nigra*), willow (*Q. phellos*), and white (*Q. alba*) oaks; sweet-gum (*Liquidambar styraciflua*); hackberry (*Celtis occidentalis*); sugarberry (*C. laevigata*); sycamore (*Platanus occidentalis*); red (*Acer rubrum*) and silver (*A. saccharinum*) maples; box elder (*A. negundo*); cottonwood (*Populus deltoides*); green ash (*Fraxinus pennsylvanica*); river birch (*Betula nigra*); sycamore; and, in extremely wet areas, water tupelo (*Nyssa aquatica*) and bald cypress (*Taxodium distichum*). Five globally imperiled floodplain forest communities reported from the seven-state TVA region are known from the study area. The Appalachian montane alluvial forest and the swamp forest-bog complex are known from portions of the study area in the Blue Ridge Physiographic Region, the eastern Highland Rim rich floodplain terrace forest and the maple-hickory mesic floodplain forest are known from portions of the study area in the Highland Rim Physiographic Region, and the beech-mixed hardwood floodplain forest is known from portions of the study area in the Coastal Plain Physiographic Region. (Figure 4.1-02 in the main document illustrates the physiographic regions in the study area.)

Although not known to correspond with any of the globally imperiled wetland plant communities recognized by NatureServe, noteworthy stands of water tupelo forested wetlands have been described from Guntersville Reservoir along Dry Creek and inland on Bellefonte Island (TVA 2001). Several water tupelo stands also exist on portions of Wheeler Reservoir near Huntsville and Decatur, Alabama. In addition, a globally imperiled plant community dominated by giant cane (*Arundinaria gigantea*) (the giant cane shrubland) occurs in association with floodplain forests at scattered locations throughout the study area.

Four other globally imperiled floodplain forest communities reported from the seven-state TVA region have potential to occur in the study area, although specific locations of these communities have not been identified. The montane floodplain slough forest and the southern Appalachian bog (rhododendron type) could occur in portions of the study area in the Blue Ridge Physiographic Region, the pin oak–post oak lowland flatwoods could occur in portions of the study area in the Highland Rim and Coastal Plain Physiographic Regions, and the interior forested acid seep could occur in portions of the study area in the Coastal Plain Physiographic Region.

Scrub/shrub communities are often associated with bottomland hardwood forests but lack a well-defined forest canopy. In the study area, woody species commonly observed in scrub/shrub communities include black willow, buttonbush (*Cephalanthus occidentalis*), silky dogwood (*Cornus amomum*), river alder (*Alnus* sp.), Virginia willow (*Salix* sp.), swamp loosestrife (*Decodon verticillatus*), red and silver maples, box elder, sycamore, and green ash. One globally imperiled scrub/shrub plant community, Hiwassee/Ocoee bedrock scour vegetation, occurs in the study area along the Hiwassee and Ocoee Rivers in the Blue Ridge

Physiographic Region. The great rhododendron/peatmoss species shrubland could occur in portions of the study area in the Blue Ridge, but specific locations have not been identified.

Two globally imperiled herbaceous wetland communities that often occur in association with scrub/shrub wetlands could occur in the study area, although specific locations of these communities are not currently known from the area. The floodplain pool community could occur in portions of the study area in the Blue Ridge Physiographic Region, and the Kentucky prairie cordgrass marsh community could occur in portions of the study area in the Highland Rim Physiographic Region.

Reservoir flats occur in the drawdown zone between maximum summer and minimum winter pool elevations. As with other wetlands associated with the reservoir system, the cycle of flooding and soil exposure experienced by these flats communities is reversed from the natural pattern of summer drawdown and winter flooding that typifies most freshwater wetlands. Webb et al. (1988) reported on the flats flora and vegetation of six mainstem reservoirs. Amundsen (1994) reported on the ecology and dynamics of flats and riparian communities on Watts Bar Reservoir. These studies found these flats communities to be dominated by annual plant species, several of which complete their life cycle between the start of each annual winter drawdown and frost. These species include lowland rotala (*Rotala ramosior*), grasslike fimbry (*Fimbristylis miliacea*), yellow false pimpernel (*Lindernia dubia*), and both variable (*Cyperus difformis*) and white-edge (*C. flavicomus*) flatsedge. None of the globally imperiled wetland plant communities reported from the seven-state TVA region are known to be associated with reservoir flats in the study area.

Islands that are exposed at maximum summer pool typically support remnant upland plant communities toward the interior while being surrounded by a fringe of mesic- to hydrophytic- (and often early successional) woody species such as willow, sycamore, and yellow poplar (*Liriodendron tulipifera*) toward the water's edge. In contrast, if vegetated at all, islands exposed during winter drawdown are fringed by an emergent aquatic plant community (see Section 4.9, Aquatic Plants). None of the globally imperiled wetland plant communities reported from the seven-state TVA region are known to be associated with islands in the study area.

Springs, seeps, and vernal pools occur in lowland and upland habitats throughout the study area. They exhibit a range of connectivity to the reservoir system that depends on the underlying geology as well as the topographic setting. In the lowland habitats, species associated with springs include watercress (*Nasturtium officinale*), speedwell (*Veronica* sp.), loosestrife, and duckweed (*Limna minor*). Lowland seeps tend to be associated with the terraces or floodplains of small ravines and are often characterized by herbaceous wetland vegetation, such as sedges, rushes, jewel weed (*Impatiens capensis*), knotweed (*Polygonum* sp.), and royal (*Osmunda regalis*) and cinnamon (*O. cinnamomea*) ferns.

None of the globally imperiled wetland plant communities reported from the seven-state TVA region are known to be associated with lowland seeps, springs, or vernal pools in the study area. However, four globally imperiled plant communities for which specific locations have not been identified in the study area could be associated with these habitats in the area. The floodplain pool could occur in portions of the study area in the Blue Ridge Physiographic Region, the Kentucky prairie cordgrass marsh could occur in portions of the study area in the Highland Rim Physiographic Region, the midwest acid seep could occur in portions of the study area in the Highland Rim or Coastal Plain Physiographic Region, and the interior forested acid seep could occur in portions of the study area in the Coastal Plain Physiographic Region.

D5.2.2 Upland Plant Communities

Upland plant communities include all other terrestrial habitats lacking an aboveground hydrologic connection to a waterbody. These areas are typically situated at or above maximum summer pool levels. For the most part, the upland plant communities addressed in this appendix are located on, or immediately adjacent to, TVA reservoirs.

This category includes plant communities ranging from mountain ridge tops and valley slopes to glades, barrens, and bluffs that may occur along reservoir shorelines but are situated above maximum summer pool. The category also includes plant communities exhibiting a range of variation in seasonal moisture, such as wet prairies and meadows, upland ponds or other depressions, and rock shelters associated with seasonal precipitation. Some of these latter communities appear in the wetlands subset of the NatureServe Explorer database because they are characterized by species with high moisture requirements. In the majority of cases, these communities are not likely to be directly influenced by changes in reservoir operations; however, they could be subject to indirect impacts that might result from changes in reservoir operations.

Construction of reservoirs in the Valley raised water levels into areas that were formerly upland sites. In general, reservoir margins that remain predominately characterized by upland vegetation indicate that the adjacent reservoir exerts minimal influence on the composition of the shoreline vegetation. Although located immediately adjacent to the reservoir, these communities are unlikely to be directly affected by changes in reservoir levels. In contrast, areas formerly supporting upland vegetation that now consist of riparian vegetation indicate at least some reservoir influence on plant community composition (see the preceding discussion of lowland communities).

Glades and barrens are upland habitats that have been, in some cases, flooded or encroached on by reservoirs. Consequently, these upland communities often occur immediately adjacent to a waterbody. They may occur on sandstone or limestone and are less common in the Blue Ridge and Coastal Plain Physiographic Regions than in other regions. Limestone cedar glades support several regional endemics that are restricted to these habitats, many of which are federally or state-listed (see Section 4.13, Threatened and Endangered Species). Two globally imperiled wetland plant communities reported from the seven-state TVA region are known from limestone glade habitats in the study area. Both the limestone seep glade and the limestone glade streamside meadow occur along the Duck River in the Nashville Basin. The Cumberland sandstone flatrock glade could also occur along the Duck River in the Nashville Basin, but specific locations are not currently known from the area.

Rock shelters are also widely distributed through the Valley, particularly on the Cumberland Plateau. Like glades and barrens, these habitats tend to support regional endemics, many of which are either federally or state-listed (see Section 4.13, Threatened and Endangered Species). Bluffs are abundant on most reservoirs and stream reaches in the Valley; many of their lower reaches have been flooded or partly flooded by impoundment. Seepage areas associated with these rock shelters, cliff faces, or bluffs often support uncommon plant communities. Three globally imperiled wetland plant communities (the Cumberland Plateau rockhouse; the Cumberland Plateau wet sandstone cliff; and the Cumberland River limestone seep cliff) are known to occur in association with such habitats along Bear Creek and Upper Bear Creek Reservoirs.

Upland depressions, including those associated with seeps, springs, and vernal ponds, may lack an aboveground hydrologic connection to a waterbody but can be connected to these water sources via groundwater systems. None of the globally imperiled wetland plant communities reported from the seven-state TVA region are currently known from upland seeps, springs, or vernal pools in the study area. However, five globally imperiled plant communities for which specific locations are not currently known from the study area could be associated with these habitats in this area. The southern Appalachian acid seep, the southern Appalachian bog (rhododendron type), and the upland sweetgum–red maple pond could occur in portions of the study area in the Blue Ridge Physiographic Region; the white oak sandstone ridgetop depression forest could occur in portions of the study area in the Cumberland Plateau Physiographic Region; and the water tupelo sinkhole pond swamp could occur in portions of the study area in the Highland Rim Physiographic Region.

In addition, the globally imperiled Cumberland Plateau mesic hemlock-hardwood forest occurs in the study area along Bear Creek and Upper Bear Creek Reservoirs. This community is found along steep, mesic sandstone ravines.

D5.3 Associated Wildlife Communities

Ecological data on the terrestrial animals and their habitats that occur along TVA reservoirs were gathered from field interviews with subject matter experts, published reports, TVA land use plans and environmental assessments, and biological data collection centers. After a review of the broad context of the terrestrial ecology of TVA's reservoirs, the scope of the terrestrial ecology analysis was narrowed to focus on those animals and habitats closest to the reservoirs and most likely to be affected by operational changes. For the most part, these affected habitats consisted of lowland communities; therefore, these communities make up the majority of the discussion that follows.

The Tennessee River and its associated riparian zone provide habitat for a diversity of wildlife. Approximately 60 species of reptiles, 70 species of amphibians, 180 species of breeding birds, and 60 species of mammals occur in the Tennessee Valley region (modified from Ricketts et al. 1999). In addition, a variety of species of terrestrial invertebrates, such as spiders, insects, and land snails, occur in the region.

Factors such as habitat type and size, food availability, surrounding land use, and other constraints, determine the diversity and abundance of wildlife that occur in the vicinity of the reservoir system. Habitats types include emergent, scrub/shrub, and forested wetlands; upland and riparian forests; and early successional habitats. Shoreline features occurring in these habitats include caves and sinkholes, vernal ponds, river islands, and flats. In many cases, the highest diversity of species in an area occurs at the interface of high-quality wildlife habitats and the river.

Wildlife of the Tennessee River can be grouped into two broad categories: those that occur in upland communities and those that occur in lowland communities. Within each of these divisions, the following animal groups occur: migratory birds, game mammals, and non-game wildlife—including small mammals, reptiles, and amphibians. The dependence of each of these animal groups on habitats and changes in reservoir levels and river flow is discussed in the following sections. Although there is no clear distinction between plants and animals that occur in either upland or lowland communities, the following discussion groups species of animals into the habitat categories they are most closely associated with.

D5.3.1 Associated Wildlife in Lowland Areas

Wildlife habitats in lowland areas include bottomland hardwood forests, riparian forests, wetlands, shorelines, river islands, and flats. Riparian forests and other terrestrial habitats associated with aquatic resources, such as vernal ponds, rivers, and wetlands, are often the most productive habitats in a given area.

Wading birds of the Valley include great blue heron (*Ardea herodias*), great egret (*Ardea alba*), little blue heron (*Egretta caerulea*), black-crowned night-heron (*Nycticorax nycticorax*) and snowy egret (*Egretta thula*). While the larger colonies of breeding herons occur along the mainstem river system, tributary reservoirs also contain heron colonies. In addition to their importance to breeding wading birds, TVA reservoirs are important in late summer when juvenile birds in the region begin to disperse. Exposed flats and pockets of shallow water created by drawdowns afford foraging areas for these birds (Nicholson pers. comm.). Wetlands and river islands provide nesting, foraging, and roosting opportunities for wading birds and other species, such as the double-crested cormorant (*Phalacrocoras auritus*) and green heron (*Butorides virescens*).

During annual reservoir drawdowns, thousands of acres of flats are exposed along TVA reservoirs. Migrating and resident waterfowl, shorebirds, terns, and herons use flats for resting and foraging, primarily during the spring and fall migration periods. These birds prefer areas ranging from moist flats to shallow water (0 to 4 inches) and moist soils in the drawdown zone. Shorebirds found on inland shores concentrate on flooded fields, muddy freshwater ponds, river flats, and shallow-water areas along the shoreline with limited vegetation that provide invertebrate prey. Numbers of these birds vary by reservoir and largely depend on weather patterns and reservoir levels.

The most extensive flats are located on Kentucky Reservoir. These flats begin to appear as the water levels on Kentucky Reservoir drop to the 356.5-foot elevation. The larger flats on the reservoir are located at the mouth of the Duck River and in Birdsong, Blood River, Big Sandy, and Jonathan Creek embayments. Additional flats occur on Pickwick, Wheeler, Chickamauga, and Douglas Reservoirs.

The largest concentrations of shorebirds in the Valley typically occur during the fall migration period. In contrast to spring migration, agricultural fields are typically dry in fall due to seasonally low precipitation. Shorebirds that migrate through the Valley include spotted sandpiper (*Actitis macularia*), solitary sandpiper (*Tringa solitaria*), least sandpiper (*Calidris minutilla*), pectoral sandpiper (*C. melanotos*), semipalmated plover (*C. pusilla*), and greater (*T. melanoleuca*) and lesser (*T. flavipes*) yellowlegs. Some of these species, such as dunlin (*C. alpina*) and some sandpipers, often winter on TVA reservoirs (Simbeck pers. comm.).

In general, shorebirds need moist flats exposed by early August. These areas are important foraging areas during fall migration. The best conditions occur when the drawdown is slow and continuous. The prevalence of a continuous amount of moist soil conditions supports a prey base by not allowing all of the flats to dry out at the same time (Nicholson pers. comm.). Several reservoirs, such as Kentucky and Douglas, are currently operated at levels that are favorable to shorebirds. Pickwick and Wheeler Reservoirs also attract shorebirds but to a lesser extent, as flats on these reservoirs become exposed later in the migratory season.

Ring-billed (*Larus delawarensis*), herring (*L. argentatus*), and other gulls roost and feed in the immediate vicinity of several TVA hydroelectric dams. Although some gulls use these areas during summer, the highest abundance of gulls is during winter (December to March). These birds have become accustomed to feeding on shad and other forage fish that are killed or are otherwise stunned by dam releases (Simbeck pers. comm.). Gull feeding activity therefore may depend on the timing and duration of dam spillage.

Most waterfowl in the Valley are migratory and usually are present during fall and winter. While dabbling ducks (such as mallard [*Anas platyrhynchos*], gadwall [*Anas strepera*], American black duck [*Anas rubripes*], and blue-winged teal [*Anas discors*]) prefer more shallow waters, diving ducks (such as scaup [*Aythya* sp.], redhead [*Aythya americana*], and canvasback [*Aythya valisineria*]) forage in deeper waters. Depending on the species, the following conditions along reservoirs provide habitat for a favorable diversity of waterfowl: a mixture of water depths, wetlands, riparian vegetation, aquatic macrophytes, shallow-flooded overbank, vegetated flats, and agricultural fields.

Migrating waterfowl of the Valley include blue-winged teal, northern pintail (*Anas acuta*), ring-necked duck (*Aythya collaris*), American widgeon (*Anas americana*), common loon (*Gavia immer*), Northern shoveler (*Anas clypeata*), and gadwall. Nesting waterfowl in the Valley includes wood duck (*Aix sponsa*), Canada goose (*Branta canadensis*), mallard, and occasionally pied-billed grebe (*Podilymbus podiceps*), blue-winged teal, and hooded merganser (*Lophodytes cucullatus*). Numbers of migrating and wintering waterfowl vary in the region, depending on weather conditions, flyway populations, and other factors. Waterfowl tend to favor reservoirs with a mixture of vegetated flats and abundant emergent vegetation that provides cover and foraging opportunities. The majority of the waterfowl use on the Tennessee River occurs on the mainstem. The largest concentrations of waterfowl are observed on Kentucky, Wheeler, and Guntersville Reservoirs.

Game birds found in lowland communities include Common snipe (*Gallinago gallinago*), American woodcock (*Scolopax minor*), and eastern wild turkey (*Meleagris gallopavo* spp.). Raptors that use these habitats and nearby reservoirs include osprey (*Pandion haliaetus*), red-shouldered hawk (*Buteo lineatus*), barred owl (*Tyto alba*), and screech owl (*Otus asio*). Bottomland hardwood forests have been ranked among the highest priority of areas that provide optimal habitat for Neotropical songbirds (Hunter et al. 1993). Neotropical songbirds found in lowland habitats in the study area include prothonotary warbler (*Protonotaria citrea*), red-eyed vireo (*Vireo olivaceus*), wood thrush (*Hylocichla mustelina*), northern parula (*Parula americana*), yellow-throated warbler (*Dendroica dominica*), Louisiana waterthrush (*Seiurus motacilla*), and Baltimore oriole (*Icterus galbula*). Species such as the common yellowthroat (*Geothlypis trichas*), indigo bunting (*Passerina cyanea*) and belted kingfisher (*Ceryle alcyon*) use river islands in the study area.

Furbearers, such as muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), river otter (*Lontra canadensis*), beaver (*Castor canadensis*), and raccoon (*Procyon lotor*), use wetlands, river islands, and shoreline habitats in the study area for foraging and shelter. Beaver are prevalent in the Valley; their dams, which often create wetland habitats, can be found along the tributaries to TVA reservoirs. Beaver may be associated with changes in reservoir levels, especially in areas where low-gradient streams are influenced by a reservoir (Atkins pers. comm.). Areas influenced by beaver flooding often contain standing dead trees, which provide habitat for cavity-nesting birds and den sites for mammals, and serve as perches for foraging birds. Larger mammals (such as white-tailed deer [*Odocoileus virginianus*] and black bear [*Ursus americanus*]) also depend on lowland communities (such as riparian forests, vegetated shorelines, and wetlands) for food and cover.

Both game and non-game wildlife species found along the reservoirs depend on riparian forests as travel corridors. Dead wood from these forests provides floating logs along the shorelines. Wood accumulation creates basking sites and cover for turtles, snakes, and other species of wildlife (NAS 2002). Small mammals, birds, turtles, and snakes may also find foraging opportunities on these logs.

Some non-game species, such as frogs, toads, and salamanders, are highly dependent on habitats that support moist conditions. Non-game wildlife commonly occurring in lowland communities associated with reservoirs include small mammals, such as little brown bat (*Myotis lucifugus*), least shrew (*Cryptotis parva*), southern flying squirrel (*Glaucomys volans*), and white-footed mouse (*Peromyscus leucopus*). Amphibians found in lowland communities associated with reservoirs include bullfrog (*Rana catesbiana*), green frog (*Rana clamitans*), southern leopard frog (*Rana utricularia*), gray treefrog (*Hyla versicolor*), eastern newt (*Notophthalmus viridescens*), southern two-lined salamander (*Eurycea bislineata*), and several species in the mole salamander group—including mole (*Ambystoma talpoideum*), spotted (*Ambystoma maculatum*), and marbled

(*Ambystoma opacum*) salamanders. Reptiles found in lowland communities associated with reservoirs include common snapping turtle (*Chelydra serpentina*), red-eared slider (*Trachemys scripta*), painted turtle (*Chrysemys picta*), Ouachita map turtle (*Trachemys scripta*), common musk turtle (*Sternotherus odoratus*), spiny softshell (*Apalone spnifera*), northern water snake (*Nerodia sipedon*), eastern worm snake (*Carphophis amoenus*), and eastern cottonmouth (*Agkistrodon piscivorus*).

Like other species of wildlife, aquatic turtles have adapted to the dynamic conditions of the reservoir system. Most species of turtles in the Valley are highly aquatic; however, they depend on riparian habitats for nesting. Features such as shallow water with emergent vegetation, overhanging banks, expose sandbars, muskrat lodges, and rotting stumps along the shoreline provide nesting and basking habitat for turtles. The food habitats of aquatic turtles vary by species, but aquatic invertebrates, aquatic plants, and small fish are important components of their diet.

Important habitats in lowland communities in the study area that are used by non-game wildlife include vernal ponds, waterholes, and caves. Vernal ponds are temporary shallow pools, often found in woodlands. These areas are seasonally to semi-permanently flooded by rainfall, groundwater movement or reservoir overflow. Vernal ponds are often used as breeding sites for insects, salamanders, turtles, frogs, and toads.

Caves are sensitive ecological communities that are strongly influenced by conditions that limit light and nutrients and also maintain somewhat stable temperature and humidity levels. Many terrestrial animals depend on caves during all or part of their life cycle. These animals include birds, bats, rodents, salamanders, and insects. While caves are not restricted to lowland communities, the microclimate of many caves along the Tennessee River is influenced by reservoir levels. Numerous caves and rock shelters are located at the reservoir water level; therefore, water fluctuations within caves often determine the extent of wildlife use of a particular cave. Caves are habitats that are used by rare animals as well as more common species. Many caves in the Valley are threatened by recreational activities and uninformed human activities that cause disturbance to these environments. For the most part, cave-dwelling species have adapted to the dynamic changes in reservoir levels as a result of periodic flooding, and raising and lowering reservoir levels.

Water resources with subsurface connections to the reservoir, such as sinkholes, ponds, and quarries, are also used by wildlife. For example, bats often occupy crevices in sinkholes, and vultures can be found nesting around abandoned rock quarries.

D5.3.2 Associated Wildlife in Upland Areas

Upland communities include deciduous and coniferous woodlands, agricultural lands, old fields, and other early successional habitats. These areas may have an aquatic component, such as a wetland or a stream; however, they are generally located on dry sites and are not affected by periodic flooding. Seeps, springs, and streams that occur within upland communities provide a source of water for terrestrial animals that live there and may provide the very component that creates breeding and foraging habitat for invertebrates, reptiles, amphibians, birds, and mammals of the area. In many cases, drier upland habitats contain a lower diversity of wildlife species and are less productive from a wildlife standpoint than are lowland moist habitats. However, distinctive animal species are associated with upland communities, and it is important to note that many upland species regularly rely on lowland habitats for food, refuge, reproduction, and migration. Important habitat features found in upland communities include bluffs, rock outcrops, rock shelters, caves, and rock debris.

Migratory birds typically associated with uplands fall into the category of game birds, raptors, and neotropical songbirds. Game birds found in upland fields and forests include northern bobwhite (*Colinus virginianus*), mourning dove (*Zenaida macroura*), ruffed grouse (*Bonasa umbellus*), and American crow (*Corvus brachyrhynchos*). Raptors associated with fields and forests include red-tailed hawk (*Buteo jamaicensis*), broad winged hawk (*Buteo platypterus*), great horned owl (*Bubo virginianus*), Cooper's hawk (*Accipiter cooperii*), and American kestrel (*Falco sparverius*).

Southern Appalachian forests support some of the richest bird diversity in North America (Simons et al. 1998). Neotropical songbirds found in upland forests include summer tanager (*Piranga olivacea*), scarlet tanager (*Piranga rubra*), ovenbird (*Seiurus aurocapillus*), Kentucky warbler (*Oporornis formosus*), hooded warbler (*Wilsonia citrina*), black-and-white warbler (*Mniotilta varia*), and worm-eating warbler (*Helmitheros vermivorus*). Neotropical songbirds found in field communities include barn swallow (*Hirundo rustica*), prairie warbler (*Dendroica discolor*), common yellowthroat, white-eyed vireo (*Vireo griseus*), and field sparrow (*Spizella pusilla*).

Game mammals that occur in fields and forest of the Valley include elk (*Cervus elaphus*), black bear, white-tailed deer, bobcat (*Lynx rufus*), coyote (*Canis latrans*), and gray (*Urocyon cinereoargenteus*) and red (*Vulpes vulpes*) fox. Smaller game animals include woodchuck (*Marmota monax*), eastern gray squirrel (*Sciurus carolinensis*), and eastern cottontail (*Sylvilagus floridana*). Fox squirrel (*Sciurus niger*), coyote, and striped skunk (*Mephitis mephitis*) are found in both wet and drier habitats.

As with lowland communities, habitat features such as caves, vernal ponds, and waterholes are important in producing habitat diversity in upland communities in the study area. Non-game wildlife found in upland communities of the Valley includes small mammals such as eastern mole (*Scalopus aquaticus*), eastern chipmunk (*Tamias striatus*), eastern pipestrille (*Pipistrellus subflavus*), red bat (*Lasiurus borealis*), short-tailed shrew (*Blarina brevicauda*), deer mouse (*Peromyscus maniculatus*), and cotton rat (*Sigmodon hispidus*).

Reptiles and amphibians found in upland communities include spring peeper (*Pseudacris crucifer*), eastern narrowmouth toad (*Gastrophryne carolinensis*), eastern spadefoot (*Scaphiopus holbrookii*), American toad (*Bufo americanus*), upland chorus frog (*Pseudacris triseriata*), fence lizard (*Sceloporus undulatus*), eastern box turtle (*Terrapene carolina*), slimy salamander (*Plethodon glutinosus*), ringneck snake (*Diadophis punctatus*), black racer (*Coluber *constrictor*), northern copperhead (*Agkistrodon contortix*), gray rat snake (*Elaphe obsoleta*), and eastern hognose snake (*Heterodon platirhinos*).

D5.3.3 Terrestrial Animal Resources Unique to the Physiographic Regions in the Tennessee River Watershed

Because of their size, the mainstem reservoirs contain more wildlife habitat than tributary reservoirs. Mainstream reservoirs contain more flats, wintering waterfowl and gulls, heron colonies and wetlands than the tributary reservoirs. Several noteworthy terrestrial resources are associated with the physiographic regions in the study area.

In the Blue Ridge Physiograhic Region, the isolated and riverine conditions of Wilbur Reservoir attract large numbers of waterfowl, such as bufflehead (*Bucephala albeola*), hooded merganser, common golden-eye (*Bucephala clangula*), and white-winged scoter (*Melanitta fusca*) (Cottrell pers. comm.).

A population of green anoles (*Anolis carolinensis*), a lizard species that reaches its northernmost distribution in the Ridge and Valley Physiographic Region, occurs along Tellico Reservoir. Douglas Reservoir provides extensive flats and shallow-water habitats that are used heavily by migrating shorebirds and wading birds. Agricultural areas along Chickamauga Reservoir provide valuable habitat for migrating sandhill cranes (*Grus canadensis*). Watts Bar Reservoir is known to support large numbers of osprey.

In the Cumberland Plateau Physiographic Region, large stands of bottomland hardwoods/ forested wetlands occur on Guntersville Reservoir. Guntersville supports a large number of wintering ducks, and particularly large beaver impoundments are found on this reservoir. Guntersville Reservoir also supports an extensive network of caves and sandstone shelters and a large number of islands that are critical breeding areas for wading birds and amphibians. Upper Bear Creek Reservoir contains unique habitats, such as sandstone outcrops and remnant cove hardwood habitats, which are extremely rare in northwest Alabama. These communities provide habitat for a variety of amphibians, birds, and mammals.

Large tracts of bottomland hardwoods occur on Kentucky Reservoir in the Highland Rim and Coastal Plain Physiographic Regions. Kentucky Reservoir supports more waterfowl than any other impoundment in the Tennessee River system. Large numbers of gulls are known to congregate at Kentucky Dam during winter. Beaver impoundments on Kentucky Reservoir play an important role in wildlife habitat diversity there.

On Pickwick Reservoir, in the Coastal Plain Physiographic Region, gravel bars provide foraging areas for gulls and bald eagles (*Haliaeetus leucocephalus*) during fall and winter. A large number of gulls spend the winter foraging near Pickwick Dam. Numerous flooded sinkholes adjacent to Pickwick Reservoir provide habitat for wading birds and amphibians.

Wheeler Dam, in the Highland Rim Physiographic Region, supports a large wintering gull population. Large numbers of waterfowl winter on Wheeler Reservoir. American alligators

(*Alligator mississippiensis*) use waterholes near Wheeler Reservoir in winter (Atkins pers. comm.).

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Appendix D6

Threatened and Endangered Species

D6a. Threatened and Endangered Species List

D6b. Threatened and Endangered Species Evaluation

Tennessee Valley Authority

Reservoir Operations Study – Final Programmatic EIS

TVA

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Table D6a-01 Threatened and Endangered Species List

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (311)		**(10)**	**(311)**			**(72)**
Acalypha deamii	Deam's copperleaf		TS	F, E, A		3
Acer saccharum ssp. *leucoderme**	Chalk maple		TS	W, A	U	44*, 45*
*Acorus calamus**	Sweetflag		AP	E	S	7*, 9*
Adlumia fungosa	Climbing fumitory		TT	W, C		72
Agalinis auriculata	Earleaf foxglove		TE	D		51
Amsonia tabernaemontana var. *gattingeri**	Blue star		TS	G, O	X	20*
Anemone quinquefolia	Wood anemone		MP	W		23, 27
Apios priceana	Price potato-bean	E	KE, TE	W, A		2, 19, 78
Aplectrum hyemale	Putty-root		MP	W		4
*Aquilegia canadensis**	Wild Columbine		MP	C	U	4*
Arabis canadensis	Rockcress		MP	W, C		23
Arabis glabra	Tower mustard		TS	O, D		3
Arabis patens	Spreading rockcress		TE	C, W		18, 74
*Arenaria fontinalis**	Sandwort		TT	G, E	X	20*
Arenaria godfreyi	Godfrey sandwort		TE	E		70
Arenaria lanuginosa	Sandwort		TE	C, X, W		32
Asarum canadense	Wild ginger		MP	W		4, 27
Asplenium pinnatifidum	Pinnatifid spleenwort		MP	C		23
*Asplenium resiliens**	Blackstem spleenwort		MP	C	U	4*
Asplenium rhizophyllum	Walking fern		MP	C		4, 23
Asplenium trichomanes	Maidenhair spleenwort		MP	C		23
Aster pratensis	Barrens silky aster		TT	D		3

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Aster schreberi	Shreber aster		TS	W		62
Aster surculosus	Creeping aster		AP	X		9
Astragalus tennesseensis	Tennessee milk-vetch		TS	O		20
Athyrium thelypterioides	Silvery glade fern		MP	W		4
*Aureolaria patula**	False foxglove ~		TT	C, A	U	11*, 13*, 14*, 15*, 16*, 17*, 34*, 51*, 52*, 53*, 54*, 55*
Baptisia bracteata var. *leucophaea*	Cream wild indigo		KS, TS	X, D		2, 78
Bartonia virginica	Screwstem		KT	F		2
Berberis canadensis	American barberry		TS	C, G, W		54, 63, 64, 67
Bigelowia nuttallii	Nuttall's rayless golden-rod		AP	O		9
Botrychium jenmanii	Alabama grapefern		TT	X, D		63
Boykinia acontifolia	Brook saxifrage		AP	W, A		24
Bryoxiphium norvegicum	Sword moss		AP	C		26
*Buckleya distichophylla**	Sapsuck		TT	X	U	67*, 69*, 71, 72
Cacalia muehlenbergii	Great indian-plantain		MP	W		27
Callirhoe triangulata	Poppy-mallow ~		MP	X, D		23
*Camassia scilloides**	Wild hyacinth		MP	W	U	4*, 23*
Cardamine clematitis	Mountain bitter-cress		TT	F		12, 36
*Cardamine flagellifera**	Bitter-cress ~		TT	W, A	S	18*, 37*
Carex comosa	Bristly sedge		TT	F		78
Carex decomposita	Epiphytic sedge		KT	F		2
Carex gravida	Sedge ~		TS	C		14, 51, 52
Carex hitchcockiana	Sedge ~		TT	W		72
Carex jamesii	Sedge ~		MP	W		4

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Carex picta	Sedge ~		MP	X		4, 23
Carex oxylepis var. *pubescens*	Sedge ~		TS	A, C		3, 51
*Carex prasina**	Sedge ~		MP	F, A	U	4*
Carex purpurifera	Sedge ~		AP	W		9
*Carex seorsa**	Weak stellate sedge		MP	W	X	23*
Carex stricta	Sedge ~		MP	E		4
Carex virescens	Ribbed sedge		MP	W		23
Carya aquatica	Water hickory		KT	F		1
*Celastrus scandens**	Climbing bittersweet		AP	W, A	U	6*
Cerastium velutinum	Starry cerastium		TE	C		20
Cheilanthes lanosa	Wooly lip-fern		MP	C, O		4
*Chelone glabra**	Turtlehead ~		MP	F, E, A	X	23*
*Chelone lyonii**	Turtlehead ~		AP, MP	W	S	9*
Chimaphila maculata	Spotted wintergreen		MP	X		27
*Cimicifuga racemosa**	Black bugbane		MP	W	U	4*
*Cimicifuga rubifolia**	Bugbane ~		TT	W	U	14*, 15, 17, 51, 52*, 53, 54, 61, 62, 63, 64, 65, 78
Cladrastis kentukea	Yellowwood		MP	C, W		4
Claytonia caroliniana	Carolina spring-beauty		AP	W		9
*Clematis beadlei**	Clematis ~		MP	A, F	X	23*
*Clematis glaucophylla**	Leather-flower		TE	W, A	U	57*
*Conradina verticillata**	Cumberland rosemary	T	TT	G	I	51*
Corallorhiza wisteriana	Wister coral-root		AP	W		9
Coreopsis auriculata	Tickseed ~		MP	W		23
Coreopsis pulchra	Tickseed ~		AP	O		9

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Corydalis sempervirens	Pale corydalis		TE	O		71
Cotinus obovatus	Smoketree		AP, TS	X, O		8, 9, 11
Crataegus ashei	Ashe's hawthorn		AP	D		25
Cuscuta harperi	Dodder ~		AP	O		9, 26
Cymphyllus fraserianus	Fraser sedge		TS	W		72
*Cyperus dentatus**	Toothed cyperus		TS	A	S	37*
*Cyperus engelmannii**	Engelmann cyperus		TS	A, E	S	17*
Cypripedium acaule	Pink lady-slipper		GE, TE	X, W		37, 44, 45, 47, 50, 51, 52, 54, 63, 69, 72
Cypripedium kentuckiense	Lady-slipper		MP, TE	A, W		34
*Cypripedium reginae**	Showy lady-slipper		TE	F	U	72*
*Cystopteris tennesseensis**	Bladder-fern		AP	C	U	9*
Dalea candida	White prairie clover		TE	D, O		13
Dalea foliosa	Prairie clover	E	TE	O, D		20
Delphinium exaltatum	Tall larkspur		TE	O, D		13, 51, 52
Delphinium tricorne	Dwarf larkspur		MP	W		4, 23, 27
*Dentaria diphylla**	Broadleaf toothwort		MP	W	U	4*, 23*, 27*
*Dentaria heterophylla**	Toothwort ~		MP	W	U	4, 23, 27
Dicentra cucullaria	Dutchman breeches		AP, MP	W		4, 5, 27
*Didiplis diandra**	Water purslane		TT	E	S	70*
*Diervilla lonicera**	Bush honeysuckle ~		TT	C, W	U	11*, 12*, 14*, 15*, 51*, 52*, 53*
*Diervilla rivularis**	Riverbank bush honeysuckle		TT	A, C	U	44*
Dirca palustris	Leatherwood		MP	W		4
Disporum maculatum	Spotted mandrin		AP	W		9

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Dodecatheon meadia	Shooting star ~		MP	W, O		4, 27
Draba cuneifolia	Wedge-leaf whitlow-grass		TS	O		3
Draba ramosissima	Branching whitlow-wort		TS	C		36, 51, 52, 57, 58, 66, 67
Dryopteris cristata	Crested woodfern		TT	E		68
*Eleocharis intermedia**	Spike-rush ~		TS	E	S	54*, 78*
*Eleocharis wolfii**	Wolf spikerush		TS	F, E	X	20*, 22*
*Elodea canadensis**	Waterweed ~		AP	B, A	S	9*
*Elodea nuttallii**	Waterweed		TS	B, A	S	51*, 52*
Elymus svensonii	Wild rye ~		TE	C		19
Epilobium ciliatum	Willow-herb ~		TS	E		52
Eriogonum longifolium var. *harperi*	Harper umbrella plant		AP	C		8, 28
Erythronium albidum	White dogtooth-violet		AP	W		27
Erythronium rostratum	Dogtooth-violet ~		MP	W, A		4
Euonymus atropurpureus	Wahoo		MP	W, A		4, 27
Euonymus obovatus	Running strawberry bush		TS	W, A		4, 27
Eupatuorium steelei	Steele's joe-pye weed		TS	X		72
Festuca paradoxa	Fescue ~		TS	D, F		34
Fimbristylis puberula	Hairy fimbristylis		TT	D, F		3
Fothergilla major	Witch-alder ~		TT	C		12, 52
Frasera caroliniensis	American columbo		AP	D, W, O		31
Fraxinus quadrangulata	Blue ash		MP	X, W		4
*Fuirena squarrosa**	Umbrella grass		TS	E, A	S	37*
Galium asprellum	Rough bedstraw		TS	E		32
*Gelsemium sempervirens**	Yellow jessamine		TS	O	U	11*, 12*, 13*, 37*

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Gentiana austromontana	Gentian ~		TS	D		72
*Geum laciniatum**	Rough avens		TS	A	S	71*
Glyceria acutiflora	Manna-grass ~		TS	E		11
Gnaphalium helleri	Everlasting ~		TS	X		43, 51
Gymnocladus dioicus	Kentucky coffee-tree		MP	W		4
*Halesia carolina**	Carolina silverbell		AP	A	U	9*
Halesia tetraptera var. *tetraptera**	Common silverbell		KT	W	U	1*, 2*
Hedeoma hispida	Rough pennyroyal		KT	X		2
Helianthemum bicknellii	Sunrose ~		TE	X		57
Helianthus glaucophyllus	Sunflower ~		AP	W, X, D		9
Heteranthera dubia	Grassleaf mud-plantain		KS	A, E		78
*Heteranthera limosa**	Smaller mud-plantain		KS,TT	E	S	2*, 78*
Heuchera villosa var. *macrorhiza*	Alumroot ~		MP	C		4
Hexastylis contracta	Wild ginger ~		TS	W		75
Homaliadelphus sharpii	Sharp's homaliadelphus		TE	C		53, 54, 73
*Hottonia inflata**	Featherfoil		AP, TS	E	S	8*, 10*
Hybanthus concolor	Green violet		MP	W		4, 27
Hydrastis canadensis	Goldenseal		AP, TS	W		9, 11, 18, 19, 20, 22, 31, 51, 52, 54, 55, 67, 78
Hydrophyllum appendiculatum	Waterleaf ~		MP	W		4
Hydrophyllum macrophyllum	Waterleaf ~		MP	W		4
*Hydrophyllum viriginianum**	Virginia waterleaf		TT	W, A	U	69*
Hymenophyllum tayloriae	Gorge filmy fern		AP	C		26
*Hypericum adpressum**	Creeping St. John-wort		TT	E, F	S	11*

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Ilex montana	Mountain winterberry		MP	W, X		4
*Iris brevicaulis**	Lamance iris		TE	E	S	2*
*Iris fulva**	Red iris		TT	E, F	S	52*
Isoetes engelmannii	Quillwort ~		MP	E, A		23
*Isoetes lacustris**	Western quillwort		TE	B	S	36*, 55*
Isoetes melanopoda	Quillwort ~		TE	E		2
Isotria medeoloides	Small-whorled pogonia	T	GE, TE	W, X		48
Jamesianthus alabamensis	Jamesianthus		AP	F, A		29
Jeffersonia diphylla	Twinleaf		AP	W		8, 9
*Juglans cinerea**	Butternut		KS, TT	W, A	U	2*, 20*, 34*, 36*, 51*, 52*, 53*, 64*, 67*, 69*, 70*, 72*, 78*
Juncus brachycephalus	Short-head rush		TS	F		52, 75
*Juncus gymnocarpus**	Naked-fruit rush		TS	F, E	S	45*
Leavenworthia alabamica	Alabama glade-cress		AP	D, O		5
Leavenworthia exigua var. *exigua*	Glade cress ~		TS	O		3, 20
Leavenworthia exigua var. *lutea*	Pasture glade cress		AP	O		9
Lejeunea sharpii	Sharp's lejeunea		TE	C		34
Lesquerella densipila	Duck River bladderpod		AP, TT	D		19, 20, 32
Lesquerella lescurii	Lescur's bladder-pod		KS	D, E		78
*Leucothoe racemosa**	Fetterbush ~		TT	E	U	15*
Liatris cylindracea	Cylindric blazing star		TT	D		3, 11, 15, 51, 52
Ligusticum canadense	Lovage ~		MP	W		4
Lilium canadense	Canada lily		TT	E, F, W		51, 52, 54
Lilium michiganense	Michigan lily		TT	E, F		3, 52, 78

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Lilium philadelphicum	Wood lily		TE	E, F		12
Lilium superbum	Turkscap lily		KT, MP	D		2, 4, 23
Liparis loeselii	Loesel twayblade		TE	F, E		2
Lobelia amoena	Southern lobelia		TE	E, A		37, 44, 45, 46
*Lonicera canadensis**	American fly honeysuckle		TS	W, F	U	67*
Lonicera dioica	Smoothleaf honeysuckle		TS	W, C		16, 51, 52, 54, 64
Lonicera flava	Yellow honeysuckle		TS	W, C		11, 12
Luzula acuminata	Woodrush ~		MP	W		4, 23
Lycopodium porophilum	Rock clubmoss		AP, MP	C		26
Lysimachia fraseri	Loosestrife ~		KE, TE	A		2, 4, 12, 43, 44
Magnolia virginiana	Sweetbay		TT	F		65
Malus angustifolia	Crab apple		KS, TS	X, D		2, 78
Marshallia grandiflora	Barbara buttons ~		TE	G		51
*Marshallia obovata**	Barbara buttons ~		TT	W, A	S	36*
Marshallia trinervia	Barbara buttons ~		NS, TT	A		34
Meehania cordata	Meehan mint		TT	W		53, 54, 65
Melanthium latifolium	Broadleaf bunchflower		TE	W		22
Melanthium parviflorum	False hellebore ~		AP	W		9
*Melanthium woodii**	Ozark bunchflower		TE	F, E	U	54*
Melanthum virginicum	Bunchflower ~		KE	W		54
Menispermum canadense	Yellow parilla		MP	W, A		4
Mertensia virginica	Bluebells		MP	A		27
Mirabilis albida	Pale umbrella-wort		AP, TT	O		20, 28
Monarda clinopodia	Horsemint ~		AP	W		4
Monotropsis odorata	Pigmy-pipes		TT	X		1

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Muhlenbergia glabrifloris	Muhly ~		KS, TS	X, D		20, 78
Muhlenbergia tenuiflora	Muhly ~		MP	C, W		4
Najas gracillima	Thread-like naiad		KS	A, B		78
*Neobeckia aquatica**	Lake-cress		AP, KT, TS	B, E	S	2*, 7*, 78*
Neviusia alabamensis	Snow-wreath		AP, MP, TT	W, C		4, 7, 9, 33
Oenothera macrocarpa ssp. *macrocarpa*	Missouri primrose		TT	O		20
Oenothera perennis	Small sundrops		KE	E, A		2
*Oldenlandia uniflora**	Oldenlandia ~		KE	E, D	S	2*
Onosmodium molle ssp. *hispidissimum*	Hairy false gromwell		TS	X		11
Ophioglossum engelmannii	Adder-tongue ~		AP	O, D		3, 13, 18
Orobanche uniflora	One-flower cancer-root		AP	W		9
Osmorhiza longistylis	Anise-root		MP	W		4, 23, 27
Oxalis grandis	Wood-sorrel ~		AP	W		8, 9
Pachysandra procumbens	Allegheny-spurge		AP, MP	W		4, 6, 24, 26, 31
Panax quinquefolius	Ginseng		MP, TS	W		2, 4, 11, 12, 13, 17, 18, 22, 23, 34, 36, 44, 51, 52, 54, 63, 64, 69, 72, 78
Panicum acuminatum var. *leucothrix*	Panic-crass		TS	D, E		47
Parnassia grandifolia	Largeleaf grass-of-parnassus		TS	F, A		53, 54, 70
Paxistima canbyi	Cliff-green		TE	D, E		64
Pedicularis lanceolata	Swamp lousewort		TT	E		54
Pellaea atropurpurea	Purple cliff-brake		MP	C		4, 23

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Perideridia americana	Perideridia ~		MP	D, C		4
Phacelia bipinnatifida	Phacelia ~		MP	W		4
Phacelia dubia	Scorpion-weed		MP	O		4
Phacelia ranunculacea	Blue scorpion-weed		TS	W		78
*Philadelphus hirsutus**	Mock-orange ~		MP	C	U	4*
Philadelphus inodorus	Mock-orange ~		KT	C		2, 78
Phlox pilosa ssp. *ozarkana*	Downy phlox		TS	X, D		2
Phlox subulata	Moss phlox		TT	X, C		63
*Pinus virginiana**	Virginia pine		MP	X	U	4*, 23
*Pityopsis ruthii**	Ruth golden aster	E	TE	G	A	37*, 44*
Platanthera cristata	Crested fringed orchid		MP	E, D		4, 23
Platanthera flava var. *flava**	Southern rein orchid		AP, TS	F, E, A	S	7*, 9*, 34*
Platanthera integrilabia	Monkey-face orchid	C	AP, MP	F, A		4, 25
Platanthera orbiculata	Large roundleaf orchid		TT	W		69
Polemonium reptans	Greek valerian		MP	W, A		4, 23, 27
Polygala boykinii	Boykin milkwort		TS	O		20
Polygala mariana	Milkwort ~		TS	D		3, 13
Polymnia laevigata	Smooth leafcup		AP	C, W		9
Porella wataugensis	Liverwort ~		TT	C		58
*Potamogeton amplifolius**	Largeleaf pondweed		TT	B, A	S	55*
*Potamogeton epihydrus**	Creekgrass		TS	B, A	A	12*, 37*, 55*, 56*, 57*
*Potamogeton tennesseensis**	Pondweed ~		TT	A	A	37*, 55*
Prenanthes barbata	Barbed rattlesnake-root		TS	D, X		3
Prenanthes crepidinea	Nodding rattlesnake-root		TE	W, D, O		78
Ptilimnium capillaceum	Hair-like mock bishop-weed		KT	E		2, 78

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Ptilimnium nuttallii	Nuttall's mock bishop's-weed		KE	E, F, W		78
Radula voluta	Liverwort ~		TS	C		73
Ranunculus flabellaris	Buttercup ~		AP, TT	E		34
Rhamnus alnifolia	Alder-leaf buckthorn		TE	E, F		54
Rhododendron minus	Carolina rhododendron		AP	X, C		9
Rhynchospora capillacea	Capillary beakrush		TE	A		54
Ribes curvatum	Gooseberry ~		AP	W, X		9
Ruellia purshiana	Pursh petunia		TS	X		17, 51, 52, 63
Sabatia campestris	Prairie pink		MP	W, D		80
Sabatia capitata	Rose-gentian		TE	X, D		12
*Sacciolepis striata**	Gibbous panic-grass		TS	E	A	13*, 37*
Sagittaria brevirostra	Short-beaked arrowhead		TT	F, E		78
*Sagittaria platyphylla**	Ovate-leaved arrowhead		TS	E	S	13*
*Salix caroliniana**	Coastal plain willow		MP	G, A	X	4, 23*
Salvia azurea var. grandiflora	Blue sage		TS	D		2, 3
Salvia urticifolia	Sage ~		MP	X, D		23
*Sarracenia oreophila**	Green pitcher plant	E	GE, NE	E, A	S	42*
Saxifraga caroliniana	Saxifrage ~		TE	F, C		72
Schoenolirion croceum	Sunnybell ~		TT	O		20
*Scirpus fluviatilis**	River bulrush		AP	E	S	2*, 51*
Scutellaria montana	Mountain skullcap	E	TE	X		11, 12, 13, 37, 69
Scutellaria saxatilis	Rock skullcap		TT	X, W, C		37, 69
Sedum nevii	Stonecrop ~		AP, TE	C		9, 44, 45
Sedum ternatum	Stonecrop ~		MP	C, W		4, 27

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Selaginella arenicola ssp. *riddellii*	Spikemoss ~		AP	O		25, 26
Silene caroliniana ssp. *pensylvanica*	Wild pink ~		TT	C		67, 70
Silene ovata	Ovate catchfly		TE	W		22
Silphium brachiatum	Rosinweed ~		AP	X		8, 9
Silphium wasiotense	Kentucky rosin-weed		TE	W		53, 54
Smilacina stellata	Starflower solomons-seal		TE	W, A		65
Solidago flaccidifolia	Goldenrod ~		MP	W		4
Solidago ptarmicoides	Goldenrod ~		TE	D		14, 51, 52
Solidago sphacelata	Goldenrod ~		MP	X, C		4
Solidago uliginosa	Goldenrod ~		TS	F, E		66
*Sparganium androcladum**	Branching burreed		TE	E, A	S	70*, 71*
Sphenopholis pensylvanica	Swamp oats		KS	E, F		2
Spiraea virginiana	Virginia spiraea	T	TE	G		51
Spiranthes lucida	Shining ladies-tresses		TT	A, F		51
Sporobolus clandestinus	Rough dropseed		KT	D		77
Staphylea trifolia	Bladdernut		MP	W		4, 27
*Stellaria longifolia**	Longleaf stitchwort		KS	F, E	U	2*
Stellaria pubera	Giant chickweed		MP	W		4, 27
Stewartia ovata	Mountain-camellia		AP, MP	W, A		23, 25, 26
Stylisma humistrata	Southern morning-glory		TT	X		12
Sullivantia sullivantii	Sullivantia		TE	C		54
Symplocarpus foetidus	Skunk cabbage		TE	E		68, 70
Symplocos tinctoria	Horse sugar		TS	A, W		36, 37, 44, 45

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Synosma suaveolens	Sweet-scented indian-plantain		TT	X, W		78
Talinium calcaricum	Limestone fame-flower		TS	O		20, 32
Talinum mengesii	Fame-flower ~		AP	O		26
Tetragonotheca helianthoides	False-sunflower ~		TE	X		55
*Thalictrum mirabile**	Little mountain meadow-rue		AP	C	X	26*
Thuja occidentalis	Northern white cedar		TS	C, F		51, 52, 54, 67, 69, 72
Tiarella cordifolia	Foamflower		MP	W		4, 27
Tradescantia ernestiana	Spiderwort ~		MP	C, W		4
Trautvetteria caroliniensis	False-bugbane		MP	A, E		4
*Trepocarpus aethusae**	Trepocarpus		KE	A	S	2*, 78*
Trichomanes boschianum	Bristle fern		MP, TT	C		23, 27, 58
*Trichomanes petersii**	Dwarf filmy-fern		AP, TT	C	S	9, 36*, 58*
Trifolium calcaricum	Leo's trifolium		TE	O		20
Trifolium reflexum	Buffalo clover		TE	X, D		58
Trillium flexipes	Bent trillium		MP	W		4
Trillium lancifolium	Lance-leaf trillium		TE	W, A		12
Trillium recurvatum	Prairie trillium		AP	W		31
Trillium rugelli	Southern nodding trillium		TE	W		44
Trillium sessile	Toadshade ~		AP	W		32
Trillium sulcatum	Southern red trillium		AP	W		9
Triosteum angustifolium	Horse-gentian ~		AP, MP	D		9, 23, 27, 31, 80
Triphora trianthophora	Three-birds-orchid		MP	W		23
Tsuga caroliniana	Carolina hemlock		TT	X, O		8, 23
Ulmus serotina	September elm		KS	W, X, O		78

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Plants (continued)						
Vaccinium macrocarpon	American cranberry		TT	E		46
Viola canadensis	Canada violet		AP	W		9
Viola pubescens var. *eriocarpa*	Downy yellow violet		MP	W		4
Viola tripartita var. *tripartita*	Three-parted violet		TS	W		11, 12, 52
*Woodsia appalachiana**	Appalachian woodsia		TS	C	U	71*
Xerophyllum asphodeloides	Turkey-beard		TT	X		44
Xyris tennesseensis	Tennessee yellow-eyed grass	E	AP	F, A		28
Zigadenus elegans ssp. *glaucus**	White camas		TE	C	U	72*
Snails (14)		**(4)**	**(14)**			**(11)**
*Athearnia anthonyi**	Anthony's river snail	E	AS, TE	B, S	F	7, 10*
Campeloma decampi	Slender campeloma	E	AP	M, S		7
*Elimia interrupta**	Knotty elimia		NE	M	F	37*
*Lithasia armigera**	Armored rocksnail		AT, KS	B	F	1*, 3*, 5*, 78*
*Lithasia geniculata**	Ornate rocksnail		AT, KS	B	F	1*, 3*, 5*
*Lithasia lima**	Warty rocksnail		AT	B, M	F	5*
*Lithasia salebrosa**	Muddy rocksnail		AT, KS	B	F	1*, 5*, 78*
*Lithasia verrucosa**	Varicose rocksnail		AT, KS	B, M	F	1*, 3*, 5*, 10*, 23*, 32*
Mesodon clarki nantahala	Noonday globe	T	NT	W		60
*Pleurocera alveare**	Rugged hornsnail		AT	B, M	F	3*, 5*, 6*
*Pleurocera corpulenta**	Corpulent hornsnail		AT	B	F	5*, 10*
*Pleurocera curta**	Shortspire hornsnail		AT	B, M	F	1*, 3*, 5*, 8*
*Pleurocera walkeri**	Telescope hornsnail		AT	B, M	F	5*
Pyrgulopsis pachyta	Armored snail	E	AP	M, S		7

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Mussels (49)		(26)	(49)			(42)
*Alasmidonta raveneliana**	Appalachian elktoe	E	NE, TE	M	I	58*, 60*
Alasmidonta viridis	Slippershell mussel		NE	S		60
*Cumberlandia monodonta**	Spectaclecase		AP, TS	B, M	F	3*, 5*, 7*, 32*, 52*, 53*, 54
*Cyprogenia stegaria**	Fanshell	E	AP, KE, TE	B, M	F	1*, 3*, 5*, 8*, 14*
*Dromus dromas**	Dromedary pearlymussel	E	AP, TE	B, M	F	14*
*Ellipsaria lineolata**	Butterfly		AS	B, M	F	4*, 5*, 6*, 7*, 8*, 9*, 10*, 23*, 32*
*Elliptio dilatata**	Spike		AS, NS	B, M	F	5*, 8*, 10*, 32*, 33*, 37*, 40*, 60
*Epioblasma brevidens**	Cumberlandian combshell	E	AP, TE	M	X	20*, 23*, 30*
*Epioblasma capsaeformis**	Oyster mussel	E	TE	M	X	20*
*Epioblasma florentina walkeri**	Tan riffleshell	E	TE, VE	M	A	20*, 36, 37*
*Fusconaia barnesiana**	Tennessee pigtoe		AS, NE, VS	M	X	23*, 30*, 69
*Fusconaia cor**	Shiny pigtoe pearlymussel	E	AP, TE	M	F	32*, 33*
*Fusconaia cuneolus**	Fine-rayed pigtoe	E	AP, TE	M	F	32*, 33*, 53*
*Fusconaia subrotunda subrotunda**	Long solid		KT	B	F	1*
*Hemistena lata**	Cracking pearlymussel	E	AP, TE	B, M	F	3*, 5*, 32*, 33*
*Lampsilis abrupta**	Pink mucket	E	AP, KE, TE	B	F	1*, 2*, 3*, 5*, 7*, 8*, 10*, 12*, 14*, 16*, 23*, 51*, 61*, 73*
*Lampsilis fasciola**	Wavy-rayed lampmussel		AS, NS	M, S	F	23*, 41*, 60
*Lampsilis ovata**	Pocketbook		AS, KE	B, M	F	1*, 5*, 8*, 10*, 23*, 25*, 28*, 30*, 32*, 33*, 77*
*Lasmigona complanata**	White heelsplitter		MS	B, M	X	23*
*Lemiox rimosus**	Birdwing pearlymussel	E	TE, AS	M	F	19*, 20*, 32*, 33*

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Mussels (continued)						
*Lexingtonia dolabelloides**	Slabside pearlymussel	C	AP	M	F	19*, 20*, 21*, 23*, 32*, 33*, 34, 37*, 53*
*Ligumia recta**	Black sandshell		AS	B, M	F	4*, 5*, 6*, 8*, 10*, 23*
*Obovaria retusa**	Ring pink	E	AP, TE	B	F	1*, 3*, 4*
*Obovaria subrotunda**	Round hickorynut		AS	B, M	F	5*, 23*, 30*
Pegias fabula	Little-wing pearlymussel	E	TE, NS	M, S		60, 76
*Plethobasus cicatricosus**	White wartyback	E	AP, TE	B	F	3*, 5*
*Plethobasus cooperianus**	Orange-footed pimpleback	E	AS, KE, TE	B	F	1*, 3*, 5*, 8*, 14*, 16*
*Plethobasus cyphyus**	Sheepnose		AP	B, M	F	1*, 5*, 8*, 9*
*Pleurobema clava**	Clubshell	E	AP, TE	B, M	F	3*
*Pleurobema cordatum**	Ohio pigtoe		AS	B, M	F	4*, 5*, 6*, 8*, 10*, 23*
Pleurobema gibberum	Cumberland pigtoe	E	TE	M, S		76
*Pleurobema oviforme**	Tennessee clubshell		AS, TS	B, M	F	8*, 14*, 16*, 20*, 23*, 33*, 36, 37*
*Pleurobema plenum**	Rough pigtoe	E	AP, TE	B, M	F	3*, 4*, 5*, 7*, 8*, 14*
*Pleurobema rubrum**	Pyramid pigtoe		AP, KE	B, M	F	1*, 5*, 8*
*Potamilus alatus**	Pink heelsplitter		MS	B, M	X	23*
*Potamilus capax**	Fat pocketbook	E	KE	B	F	77*
*Potamilus ohiensis**	Pink papershell		AS	B	F	4*, 7*
*Ptychobranchus fasciolaris**	Kidneyshell		AS	M	F	5*, 10*, 23*
Ptychobranchus subtentum	Fluted kidneyshell	C	AS	M		54
*Quadrula cylindrica cylindrica**	Rabbitsfoot		AS, KT, TE	B, M	F	1*, 3*, 5*, 10*, 19*, 20*, 23*, 32*, 33*
Quadrula cylindrica strigillata	Rough rabbitsfoot	E	TE, VE	M		54
*Quadrula intermedia**	Cumberland monkeyface	E	AP, TE	M	F	20*, 32*, 33*
*Quadrula metanevra**	Monkeyface		AS	B, M	F	5*, 6*, 8*, 9*, 10*, 32*

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Mussels (continued)						
Toxolasma cylindrellus	Pale lilliput	E	TE	S		20
*Toxolasma lividus**	Purple lilliput		AS	B, S	F	4*, 5*, 6*, 7*, 8*, 23*
*Truncilla truncata**	Deertoe		AE	B, M	F	4*, 5*, 8*, 23*
Villosa perpurpurea	Purple bean	E	TE	M, S		64
Villosa trabalis *	Cumberland bean	E	TE	M, S	A	37*, 64*
*Villosa vanuxamensis**	Mountain creekshell		NT	M, S	F	41*
Insects (6)		**(0)**	**(6)**			**(0)**
Batriasymmodes spelaeus	A beetle		AS	C		6, 8
Batrisodes jonesi	A beetle		AS	C		5, 23
Folsomia candida	A springtail		AS	C		5
Ptomaphagus episcopus	A cave obligate beetle		AS	C		9
Ptomaphagus valentinei	A beetle		AS	C		9
Rhadine caudata	A ground beetle		AS	C		8
Crayfish (6)		**(0)**	**(6)**			**(0)**
Cambarus hamulatus	Troglobitic crayfish		AS	U		9
Cambarus hiwasseensis	Hiwassee crayfish		NS	M, S		41, 49
Cambarus jonesi	Troglobitic crayfish		AS	U		5, 7, 8
Cambarus veitchorum	A troglobitic crayfish		AT	U		7
Orconectes wrighti	A crayfish		TE	S		3
Procambarus pecki	Troglobitic crayfish		AS	U		5, 8
Other Arthropods (3)		**(0)**	**(3)**			**(1)**
Coras lamellosus	A pseudoscorpion		AS	C		9
Nesticus barri	A cave obligate spider		AS	C		9
Palaemonias sp.*	Undescribed caveshrimp		AS	U	Q	6*

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Fish (66)		**(11)**	**(66)**			**(29)**
*Acipenser fulvescens**	Lake sturgeon		KE, TE	B	F	17*, 18*, 61*, 62*, 73*
*Alosa alabamae**	Alabama shad		KE	B	F	1*
Ammocrypta clara	Western sand darter		TS	M, S		54
Atractoseus spatula	Alligator gar		KE, TS	B		2, 77
*Carpiodes velifer**	Highfin carpsucker		TS	M	F	3*, 13*, 19*, 32*, 36*, 52*, 64*, 73*, 74
Clinostomus funduloides ssp. *1*	Smoky dace		NS, TS	M, S		57, 60
*Cycleptus elongatus**	Blue sucker		TT	B, M	F	3*, 15, 16, 17, 19*, 52, 62, 73*, 78
*Cyprinella monacha**	Spotfin chub	T	AP, NT, TT	M	F	51, 57, 60, 64*, 65
Cyprinella spiloptera	Spotfin shiner		MS	M, S		4, 23
*Cyprinella whipplei**	Steelcolor shiner		MS	B, M, S	X	4, 23, 27*
*Elassoma alabamae**	Spring pygmy sunfish		AP	S	S	4, 7*
Erimystax cahni	Slender chub	T	TT	M		54
Erimystax insignis	Blotched chub		GT	M		50
*Esox niger**	Chain pickerel		KS	B, M	F	2*
*Etheostoma aquali**	Coppercheek darter		TT	M	X	19*, 20*, 21*
Etheostoma blennioides newmanni	Greenside darter		MS	M, S		23
Etheostoma boschungi	Slackwater darter	T	AP	M, S		5
*Etheostoma cinereum**	Ashy darter		TT	M, S	X	20*, 21*, 22, 33
*Etheostoma denoncourti**	Golden darter		TS	M	X	19*, 20*
Etheostoma flabellare	Fantail darter		MS	M, S		4
Etheostoma gutselli	Tuckasegee darter		TE	S		58
Etheostoma kennicotti	Stripetail darter		MS	M, S		4

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Fish (continued)						
*Etheostoma luteovinctum**	Redband darter		TS	S	X	20*, 21*
Etheostoma parvipinne	Goldstripe darter		KS	S		2
Etheostoma percnurum	Duskytail darter	E	TE	M, S		55
Etheostoma pseudovulatum	Egg-mimic darter		TE	S		19
*Etheostoma rufilineatum**	Redline darter		MS	M, S	X	4, 23, 27*
Etheostoma sp. *D**	Bluemask darter	E	TE	M, S	I	76*
*Etheostoma striatulum**	Striated darter		TT	S	X	20*, 21
*Etheostoma tuscumbia**	Tuscumbia darter		AP, TS	S	S	4, 7*, 8
Etheostoma vulneratum	Wounded darter		GE, NS	M		47, 48, 60
*Etheostoma wapiti**	Boulder darter	E	AP, TE	M	F	32*, 33*
Etheostoma zonistium	Bandfin darter		MS	S		4
Fundulus julisia	Barrens topminnow		TE	S		22
Hemitremia flammea	Flame chub		TS	S		20, 33, 34
Ichthyomyzon castaneus	Chestnut lamprey		KS	B		78
*Ichthyomyzon unicuspis**	Silver lamprey		TS	M	F	2*, 3*
Ictiobus niger	Black buffalo		KS	B, M		78
Lepomis miniatus	Spotted sunfish		KT	M		2
Lythrurus fasciolaris	Rosefin shiner		MS	M, S		4, 23
*Moxostoma carinatum**	River redhorse		GS	B, M	F	47*
Moxostoma duquesnei	Black redhorse		MS	B, M		23
*Moxostoma macrolepidotum**	Shorthead redhorse		MS	B	X	23*, 27*
Moxostoma sp. 2*	Sicklefin redhorse		NS	B, M	I	41*, 60*
Notropis boops	Bigeye shiner		MS	S		23
Notropis rubellus micropteryx	Rosyface shiner		MS	M, S		23
Notropis rupestris	Bedrock shiner		TS	S		21, 76

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Fish (continued)						
Noturus baileyi	Smoky madtom	E	TE	M		55
Noturus flavipinnis	Yellowfin madtom	T	TE	M		54, 55, 56
Noturus flavus	Stonecat		NE	M, S		60
Noturus sp. 3	Duck River saddled madtom		TT	M, S		20
*Noturus stanauli**	Pygmy madtom	E	TE	M	X	19*
*Percina aurantiaca**	Tangerine darter		GT, TS	M	A	36*, 37*, 47*, 51, 55, 64*, 65, 70, 72, 73*
*Percina burtoni**	Blotchside logperch		TS	M	X	2, 22, 36, 55
Percina macrocephala	Longhead darter		TT	M		21, 72
*Percina phoxocephala**	Slenderhead darter		TS	M	X	2,19*, 20*, 21
Percina sciera	Dusky darter		GS	M, S		48
Percina squamata	Olive darter		GT, NS	M		48, 60
*Percina tanasi**	Snail darter	T	TT	M	F	10*, 11, 12*, 14*, 16*, 17*, 18*, 32, 35*, 36*, 43*, 61*, 73*
Phenacobius crassilabrum	Fatlips minnow		VS	M, S		69
Phenacobius mirabilis	Suckermouth minnow		MS	M, S		23
Phoxinus tennesseensis	Tennessee dace		TS	S		36, 44, 51, 55, 64
*Polyodon spathula**	Paddlefish		AS	B	F	4*, 7
Rhinichthys atratulus	Blacknose dace		MS	M, S		4
*Speoplatyrhinus poulsoni**	Alabama cavefish	E	AP	U	Q	5*
*Typhlichthys subterraneus**	Southern cavefish		AP, TS	U	Q	3*, 5*, 7*, 75*, 76*
Amphibians (18)		**(0)**	**(18)**			**(2)**
Ambystoma talpoideum	Mole salamander		NS	A, W		49
Aneides aeneus	Green salamander		AP, ME	C		9, 23, 26, 27

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Amphibians (continued)						
*Cryptobranchus a. alleganiensis**	Eastern hellbender		AP, GS, MS, NS, TS	B, M, S	F	3*, 8, 17*, 18*, 19, 20*, 21, 23, 30*, 36*, 41, 42*, 47*, 49, 51*, 52*, 54*, 55*, 72, 76, 78
Desmognathus ocoee	Mountain dusky salamander		AS	S, F		9
Eurycea guttolineata	Three-lined salamander		KT	A, F, W		2
Eurycea junaluska	Junaluska salamander		TS	A, S		55
Eurycea l. longicauda	Longtail salamander		NS	A, C, F		58
Eurycea lucifuga	Cave salamander		ME	C, A, S		23, 27
Gyrinophilus palleucus	Tennessee cave salamander		AP, TT	U, C		5, 8, 9, 11, 13, 16, 18
Gyrinophilus porphyriticus	Spring salamander		ME	A, C, F		23
Hemidactylium scutatum	Four-toed salamander		MS, NS	A, F		23, 49
Hyla avivoca	Bird-voiced treefrog		KT	A, F		1
*Hyla cinerea**	Green treefrog		KS	A, F	S	2*
Hyla gratiosa	Barking treefrog		KS	A, W, F		78
Plethodon dorsalis	Zigzag salamander		MS	A, C		23
Pseudacris brachyphona	Mountain chorus frog		MS, NS	A, F		4, 23
Pseudotriton ruber	Red salamander		MS	A, F, S		4, 23
Rana areolata circulosa	Northern crawfish frog		KS	A, D, E		1
Reptiles (14)		**(0)**	**(14)**			**(3)**
*Apalone mutica mutica**	Midland smooth softshell		KS	B, M	F	2*
Apalone s. spinifera	Eastern spiny softshell		VS	B, M		69
Eumeces anthracinus pluvialis	Southern coal skink		AS, MS	A		4, 5, 23
Eumeces inexpectatus	Southeastern five-lined skink		KS	O, X		2, 78
*Graptemys ouachitensis**	Ouachita map turtle		MS	B, M	F	4*, 23*

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Reptiles (continued)						
Lampropeltis getula nigra	Black kingsnake		MS	D, E, X		4
Lampropeltis triangulum elapsoides	Scarlet kingsnake		KS	X, W		78
Lampropeltis triangulum triangulum	Eastern milk snake		AS	D		9
Macrochelys temmenckii	Alligator snapping turtle		AP, TS	B, M		2, 3, 5, 6, 27, 28, 78
Ophisaurus attenuatus longicaudus	Eastern slender glass lizard		TS	D, X		55
Pituophis m. melanoleucus	Northern pine snake		AS, KT, TT	X		10, 19, 43, 57, 78
Regina septemvittata	Queen snake		MS	A, S		23
*Sistrurus miliarius streckeri**	Western pigmy rattlesnake		KT, TT	A, F	S	2*, 3, 4, 20
Thamnophis sauritus	Eastern ribbon snake		KS	A, E		78
Birds (23)		**(6)**	**(22)**			**(8)**
Accipiter striatus	Sharp-shinned hawk		TS	X		54
Anhinga anhinga	Anhinga		TS	B		2
Aquila chrysaetos	Golden eagle		TT	C, X		78
Ardea herodias	Great blue heron		KS	A, B, E		1, 2, 77, 78
Bubulcus ibis	Cattle egret		KS	A, E		78
*Casmerodius albus**	Great egret		KE, TE	B, E, F	S	2*, 13*, 78*
*Charadrius melodus**	Piping plover	E/T		B, G	S	2*
Dendroica cerulea	Cerulean warbler		NS, TS	W		52, 60, 78
Egretta caerulea	Little blue heron		KE, TS	A, B, E		2, 78
*Falco peregrinus**	Peregrine falcon		AP, TE	A,C	R	8*, 12*, 18*

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Birds (continued)						
*Haliaeetus leucocephalus**	Bald Eagle	T	AP, KE, TS	A, B	R	2*, 3*, 4*, 8*, 9*, 10*, 13*, 14*, 15*, 16*, 22*, 31*, 54*, 55*, 63*, 64*, 73*, 78*
Ixobrychus exilis	Least bittern		TS	E		12, 13, 19, 34
*Limnothlypis swainsonii**	Swainson's warbler		TS	A, W	U	36*, 54, 69, 71
*Mycteria americana**	Wood stork	E	GE, ME	A, B	S	2*
Nictanassa violacea	Yellow-crowned night-heron		KT	A, B, E		2
Nicticorax nycticorax	Black-crowned night-heron		KT	A, B		78
Pandion haliateus	Osprey		AP, KT	A, B		2, 5, 9, 29, 78
Petrochelidon pyrrhonota	Cliff swallow		MS	C		4
Picoides borealis	Red-cockaded woodpecker	E	AP, ME, TS	X		9
Rallus elegans	King rail		TS	E		12
Riparia riparia	Bank swallow		KS	A		77
*Grus americana**	Whooping crane	E		D, E	S	13*
*Sterna antillarum**	Least Tern	E	KE	B, G	S	1*, 77*
Mammals (16)		**(2)**	**(16)**			**(4)**
*Corynorhinus rafinesquii**	Eastern big-eared bat		AP, NS, TS	C, W	R	6*, 9*, 54*, 60*, 69*
Mustela frenata	Long-tailed weasel		AP	W, D, F		5
Myotis austroriparius	Southeastern bat		KE	A, C		77
*Myotis grisescens**	Gray bat	E	AP, ME, TE, KE	C, B, A	R	2*, 3*, 4*, 5*, 6*, 7*, 8*, 9*, 11*, 12*, 13*, 14*, 15*, 16*, 17*, 19*, 20*, 22*, 26*, 33*, 34*, 53*, 54*, 62*, 68*, 76*, 77*, 78*
*Myotis leibii**	Eastern small-footed bat		NS, TS	C, W, X	R	11*, 53*, 59*

Table D6a-01 Threatened and Endangered Species List (continued)

Scientific Name	Common Name	Federal Status	State Status	Habitat Codes	Direct Effects Analysis	Reaches
Mammals (continued)						
Myotis septentrionalis	Northern long-eared bat		AS, MS, NS	C, W, X		4, 26, 58
*Myotis sodalis**	Indiana bat	E	AP, ME, TE, KE	A, C, W	R	9*, 11*, 19*, 22*, 33*, 53*, 54*, 58*, 59*, 62*, 76*, 77*, 78*
Napaeozapus insignis	Woodland jumping mouse		TS	A, W		34, 46, 64
Neotoma floridana haematoreia	Southern Appalachian woodrat		NS	C, W		60
Neotoma magister	Allegheny woodrat		TS	C		3, 11, 19, 20, 75
Parascalops breweri	Hairy-tailed mole		TS	W		65
Sorex cinereus	Common shrew		TS	A, F		11, 34
Sorex fumeus	Smoky shrew		TS	A, W		46, 53, 54, 69
Sorex longirostris	Southeastern shrew		TS	A, D, W		2, 3, 17, 18, 34, 51, 52, 53, 54, 64, 69, 78
Synaptomys cooperi	Southern bog lemming		TS	E, F, W		68
Zapus hudsonius	Meadow jumping mouse		TS	A, E		3, 19, 34, 78
Totals (526)		**(59)**	**(525)**			**(172)**

Table D6a-01 Threatened and Endangered Species List (continued)

Symbol Codes:
- ~ = Common name for group, not just this species.
- * = In states where it is protected, this species is known from areas within the waterbodies where it could be directly affected by ROS alternatives.

Federal Status Codes:
- C = Identified candidate.
- E = Endangered.
- T = Threatened.

State Status Codes:
- First letter = State designation:
  - A = Alabama, G = Georgia, K = Kentucky, M = Mississippi, N = North Carolina, T = Tennessee, V = Virginia.
- Second letter = Status in that state:
  - E = Endangered.
  - P = Protected (Alabama) - level of endangerment not specified.
  - S = Various "special concern" categories (e.g., in need of management, potential, and rare).
  - T = Threatened.

Habitat Codes:
- B = Big rivers.
- M = Small rivers and large creeks.
- S = Small creeks.
- U = Underground aquifers.
- A = Riparian areas along streams and ponds.
- G = Gravel bars or boulders in large creeks or rivers.
- E = Non-forested seeps, wetlands, or wet meadows.
- F = Forested seeps or wetlands.
- W = Moist woodlands.
- X = Xeric hardwood or coniferous forests, or mountain woods.
- D = Prairies, fields, roadsides, fencerows, or early successional woodlands.
- O = Limestone, sandstone, or granite outcrops (including cedar glades).
- C = Caves, sinkholes, rock houses, boulders, bluffs, or cliff faces.

Direct Effects Analysis Codes:
- A = Apalachia tailwater.
- F = Flowing water habitats.
- I = Reservoir inflow areas.
- Q = Underground aquifers.
- R = Wide-ranging species.
- S = Shorelines and associated wetlands.
- U = Upland habitats.

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D6b.1 Introduction

The largest cluster of protected species identified during the threatened and endangered species evaluation for the Reservoir Operations Study (ROS) Environmental Impact Statement (EIS) consists of 60 species that typically occur in the main channels of the rivers and streams, including at least some parts of the impounded mainstem Tennessee and Cumberland Rivers. Nearly all of these species are mollusks and fish; however, this cluster also includes two turtles and a large, completely aquatic, salamander (the hellbender). All of these species are typically found in habitats out in the river or stream, where the water is obviously moving.

Holding water in reservoirs can modify habitat conditions important to flowing-water species because temperature and dissolved oxygen (DO) levels stratify in reservoirs during late spring, summer, and early fall; and those changes affect the water released from the dams. During late fall, winter, and early spring, reservoir stratification does not occur and water released from dams is more likely to have temperature and DO characteristics similar to what occurs in unregulated streams. As described in Section 2.3 in the main document, the various types of changes could occur under TVA policy alternatives focus on when reservoir elevations would be raised or lowered, and when and how much water would be released from the dams. TVA aquatic biologists used these basic concepts to help identify 15 specific evaluation measures (metrics) that would indicate differences in direct effects of the policy alternatives. The metrics were designed to focus on specific locations and specific times of the year that are important to the reproduction and survival of federal-protected species living in flowing-water habitats. Times of the year when operations changes would be unlikely to affect flowing-water species were not addressed. Metrics were developed for each of the four types of waterbodies that are involved (warm tributary tailwaters, flowing mainstem reaches, pooled mainstem reaches, and cool-to-warm tributary tailwaters). The following paragraphs describe which metrics were selected for use with regard to each waterbody category, why each metric is pertinent to the evaluation for that waterbody type, and the results of those comparisons. All of this information is summarized and used in the threatened and endangered species evaluation presented in Section 5.13, Threatened and Endangered Species.

Data used to address all but one of these metrics (Metric #3) were derived from the hourly results of the Water Quality modeling work described in Section 4.4, Water Quality. The Water Quality modeling results predict the physical and chemical attributes of the reservoirs and regulated stream reaches, using the weather conditions and rainfall events that would have occurred during each of the 8 consecutive years included in the modeled period (1987 through 1994). In all of these evaluations, a two-tailed, paired mean similarity (t statistic) test was used to compare the results from each policy alternative with the Base Case. Alternatives found to be less than 5 percent likely to have an average value similar to the Base Case average (the 95-percent confidence level) were considered to be substantially different from the Base Case. Alternatives found to be between 5 and 20 percent likely to have an average value similar to the Base Case average (the 80-percent confidence level) were considered to be slightly different from the Base Case. While this latter confidence level is less rigorous than the 95-percent level often used in statistical analyses, it represents a more conservative approach that is appropriate when considering the protection of federal-listed species. Recognizing differences up to the

20-percent similarity level increases the likelihood of identifying changes that could affect habitats and species more often than would occur if only a much lower similarity level (e.g., 5 percent) was used. The biological interpretations of any differences identified during these comparisons were based on whether the change from the Base Case average was toward or away from what would be expected to occur in free-flowing stream habitats supporting populations of the pertinent protected species. The basis for each biological interpretation is included in the paragraph on the specific evaluation metric.

The specific sites where the metrics would be evaluated were selected based primarily on where protected aquatic species have been encountered in each of the affected waterbody types. In each of the four waterbody types, TVA biologists identified three or four specific sites where larger numbers of protected aquatic species were known to occur. For all metrics except Metric #3, results from the water quality model runs were used to generate the requested output data that would occur at or near those sites under the Base Case and each of the action alternatives. On the mainstem Tennessee River, the evaluation focused on sites at the upstream end of Kentucky Reservoir (the Pickwick Landing Dam tailwater), the upstream end of Pickwick Reservoir (the Wilson Dam tailwater), the upstream end of Wheeler Reservoir (the Guntersville Dam tailwater), and the upstream end of Chickamauga Reservoir (the Watts Bar Dam tailwater). On the tributaries, the evaluation focused on sites on the lower Elk River (both warm and cool-to-warm reaches downstream from Tims Ford Dam), the lower Holston River (both warm and cool-to-warm reaches downstream from Cherokee Dam), and the lower French Broad River (the warm reach downstream from Douglas Dam). Because no cool-to-warm reach had been identified on the lower French Broad River, the cool-to-warm reach on the Hiwassee River (downstream from Apalachia Dam) was added to complete the cool-to-warm comparison.

D6b.2 Pooled Mainstem Reaches

Most of the protected species that occur in the pooled reaches of the mainstem reservoirs are freshwater mussels or fish that live in parts of the impounded river channel where some current still keeps the bottom relatively silt-free. The extent of any changes in water level or water temperature in these impounded areas was not considered likely to affect the resident protected species populations; however, changes in water flow patterns and, especially, any resulting changes in the amount of DO present near the bottom could increase or decrease the amount of suitable habitat for these protected species. The one metric developed for this waterbody category was: **Metric #1. The total volume of water with DO less than 2 mg/L during the year.** Data from the Water Quality modeling work were requested for three mainstem reservoirs (Kentucky, Guntersville, and Chickamauga)—indicating the sum of daily reservoir volumes with DO less than 2 milligrams per liter (mg/L) during each of the 8 modeled years. Alternatives that were represented by average low DO volumes smaller than under the Base Case average (at the 80-percent confidence level or higher) were considered to provide more suitable habitat for protected aquatic species. Alternatives represented by average values larger than under the Base Case average (again, at the 80-percent confidence level or higher) were considered to provide less suitable habitat for these protected species. The results of this comparison (presented in the Metric #1 tables) indicate that all of the policy alternatives except the Tailwater Habitat Alternative would result in low DO volumes comparable to what would occur under the

Base Case. The Tailwater Habitat Alternative would result in larger volumes of low DO water (slightly less suitable habitat conditions for protected aquatic species) in Kentucky and Chickamauga Reservoirs.

D6b.3 Flowing Mainstem Reaches

As indicated in Table 4.12-03, 44 protected mollusks and fishes occur in flowing reaches of the mainstem Tennessee River downstream from the various dams and in the mainstem Cumberland River downstream from Barkley Dam. These species occur in or over rocky substrates where the current typically maintains at least moderate DO levels and minimizes the amount of sedimentation that stays on the bottom. Changes in the reservoir operations policy under the various alternatives might affect water levels; flow patterns; and, possibly, the duration of low DO concentrations in these waterbodies. Two metrics were developed to evaluate the potential effects of the alternatives in this waterbody category: **Metric #2. The amount of time when the water downstream from a dam held DO less than 2 mg/L during the summer period (July through October), and Metric #3. The minimum water level achieved 90 percent of the time during the year at a given point downstream from a dam.**

Data to address Metric #2 came from the results of the Water Quality modeling work in the form of hours during the summer period in each of the 8 modeled years when the discharge from the upstream dam contained less than 2 mg/L DO. The number of hours calculated for each alternative in the releases from Pickwick, Wilson, Guntersville, and Watts Bar Dams are presented in the Metric #2 tables. Alternatives found to have lower average values in comparison with the Base Case (at the 80-percent confidence level or higher) were considered to provide more DO benefit to resident protected species. The results of this comparison indicate that the Equalized Summer/Winter Flood Risk Alternative, Commercial Navigation Alternative, and Tailwater Recreation Alternative would produce DO conditions in mainstem tailwater releases similar to those under the Base Case at all four of these dams. Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Summer Hydropower Alternative, the Tailwater Habitat Alternative, and the Preferred Alternative resulted in modeled DO conditions similar to the Base Case at most of these dams; however, Reservoir Recreation Alternative A yielded higher values in the Guntersville discharge, Reservoir Recreation Alternative B yielded higher values in the Pickwick discharge, the Tailwater Habitat Alternative yielded higher values in the Wilson Dam discharge, and the Preferred Alternative yielded higher values in the Watts Bar discharge. Three of these higher values would result in slightly adverse effects on protected species habitats in those tailwaters; the value for the Preferred Alternative could result in substantially adverse effects over what could occur under the Base Case. Watts Bar, however, is one of two TVA mainstem dams (Fort Loudoun Dam is the other) where TVA committed to providing a minimum of 4 mg/L DO in the discharge as a part of the 1990 Lake Improvement Plan (see Section 4.4.2). While additional effort would be required to meet the minimum DO commitment at Watts Bar Dam if the Preferred Alternative was adopted, TVA would expend the money and effort to make sure that DO concentrations in the discharge would not be adversely affected.

Data to address Metric #3 are calculations made from the results of the Weekly Scheduling Model concerning the water elevations at locations where protected aquatic species occur that would be achieved 90 percent of the time during each of the 8 modeled years. These calculated water elevations for specific sites in the Pickwick, Wilson, Guntersville, and Watts Bar Dam tailwaters are presented in the Metric #3 tables. Alternatives found to have higher minimum water levels than those under the Base Case (at the 80-percent confidence level or higher) were considered to provide more wetted area in which protected aquatic species could occur. As indicated in the Metric #3 tables, two of the policy alternatives (the Equalized Summer/Winter Flood Risk Alternative and the Preferred Alternative) would result in mainstem tailwater elevations similar to what would occur under the Base Case at most or all of the comparison locations. All of the other alternatives would result in minimum tailwater elevations that would be higher (slightly or substantially more habitat for protected species) than would occur under the Base Case. The Equalized Summer/Winter Flood Risk Alternative was the only alternative that would yield lower minimum tailwater elevations (slightly less habitat) at any location; that effect would occur downstream from Watts Bar Dam.

D6b.4 Mainstem Summary

Most of the policy alternatives would produce substantially higher minimum water elevations (substantially more potential habitat for protected aquatic species) downstream from the mainstem dams (Metric #3). The exceptions to this pattern are the Equalized Summer/Winter Flood Risk Alternative and the Preferred Alternative, both of which would typically produce minimum water elevations similar to those produced under the Base Case. Very few of the policy alternatives would produce any differences in the number of hours with DO less than 2 mg/L released from the mainstem dams (Metric #2). The major exception to this pattern was the expectation of more hours of low DO discharges (substantially adverse habitat conditions) downstream from Watts Bar Dam under the Preferred Alternative; however, TVA has committed to providing a minimum of 4mg/L DO in the discharge from this dam. Other exceptions were more hours of low DO discharges (slightly adverse conditions) from Guntersville Dam under Reservoir Recreation Alternative A, downstream from Pickwick Dam under Reservoir Recreation Alternative B, and downstream from Wilson Dam under the Tailwater Habitat Alternative. Only the Tailwater Habitat Alternative would result in more water volume with DO less than 2 mg/L in at least some of the downstream reservoirs (Metric #1); that alternative yielded indications of more water with low DO (slightly adverse habitat conditions) in Kentucky and Chickamauga Reservoirs. Overall, only the Tailwater Habitat Alternative would result in decreased DO levels in mainstem reservoirs (slightly adverse habitat conditions) in comparison to what would occur under the Base Case, and only the Equalized Summer/Winter Flood Risk Alternative and the Preferred Alternative would result in minimum water levels as low as what would occur under the Base Case. All of the other alternatives would yield higher minimum water levels (providing slightly or substantially more habitat for protected aquatic species). The Preferred Alternative could result in more hours of low DO water downstream from Watts Bar Dam (substantially adverse habitat conditions); however, TVA would ensure that discharge continued to meet its existing 4-mg/l DO target.

D6b.5 Warm Tributary Tailwaters

Mollusks and fishes make up most of the protected aquatic species that occur in the warmer parts of regulated Tennessee River tributary streams—the warm tributary tailwater waterbodies. These waterbodies include a fairly wide variety of stream sizes and considerable variation in length from their upstream limits to the next downstream reservoir. All of them, however, flow within distinct river beds, have present temperature regimes more or less similar to nearby free-flowing streams, and support relatively diverse and abundant aquatic communities. These waterbodies also often support populations of at least some protected species. Changes in the reservoir operations policy affecting the dams and reservoirs upstream from these waterbodies could result in modifications to both the daily and seasonal averages and ranges of flows, stream elevations, and water temperatures. Six metrics were developed to evaluate the potential effects of the policy alternatives on these warm tailwaters, all of which were modeled at sites on the Elk, Holston, and French Broad Rivers where protected aquatic species are known to occur. These six metrics include one focused on the minimum water level at the site, three focused on flow and water temperature conditions during late spring (when many protected species are reproducing), and two focused on water temperature conditions during late summer (when many native species are accumulating food reserves that would allow them to survive during the colder winter months). These metrics and their evaluations are discussed in the following paragraphs.

Metric #4. The minimum water level achieved 90 percent of the time during the year at the selected sites. The data to address this metric were derived from the Water Quality modeling work in the form of the 90-percent occurrence minimum water elevation at each site during each of the 8 modeled years. The calculated elevations for the sites on the Elk, Holston, and French Broad Rivers are presented in the Metric #4 tables. Alternatives found to have higher minimum water levels than under the Base Case (at or above the 80-percent confidence level) were considered to provide more wetted area that could be inhabited by protected aquatic species. The results of these comparisons indicate that most of the alternatives would result in minimum elevations in warm tributary tailwaters that are similar to the elevations produced under the Base Case. The Equalized Summer/Winter Flood Risk Alternative would result in higher minimum tailwater elevations (slightly beneficial habitat conditions for protected aquatic species) at the French Broad River site. The Tailwater Habitat Alternative would result in higher minimum tailwater elevations at the Holston River site (substantially beneficial conditions) and the French Broad River site (slightly beneficial conditions), while the level at the Elk River site would be similar to the elevations produced under the Base Case.

Metric #5. The difference between the 90- and 10-percent instantaneous flow rates at the selected sites during the second and third weeks in June. These data points were derived from the Water Quality modeling work as the 90- and 10-percent instantaneous flow levels (in cubic feet per second) estimated to occur at these sites during this 2-week period in each of the 8 modeled years. Subtracting the smaller of these values (the 90-percent flow rate) from the larger describes the range in flows that would have existed at each of these sites during that 2-week period in each modeled year. The calculated range values and paired mean similarity test results are presented in the Metric #5 tables. Alternatives that yielded smaller flow ranges than under the Base Case (at or above the 80-percent confidence level) were considered to produce more stable flow conditions during this period. The comparisons indicate that all but two of the alternatives would result in flow ranges that would be similar to the Base Case at all three sites. Under the Equalized Summer/Winter Flood Risk Alternative, the flow range would be smaller (substantially beneficial habitat conditions) at the Holston River site and would remain similar to the Base Case at the Elk River and French Broad River sites. The Tailwater Habitat Alternative would result in smaller flow ranges (substantially beneficial habitat conditions) at both the Holston River and French Broad River sites, and would remain similar to the Base Case at the Elk River site.

Metric #6. The average water temperature at the selected sites during the second and third weeks in June. These data points were derived from the Water Quality modeling work as the estimated 50-percent occurrence water temperatures at these sites during this 2-week period in each of the 8 modeled years. These values and the associated paired t-test results are presented in the Metric #6 tables. Alternatives that resulted in higher average water temperatures than under the Base Case (at or above the 80-percent confidence level) were considered to be more similar to free-flowing stream reaches where protected aquatic species would be reproducing. As indicated in the tables, all but two of the alternatives would result in average late spring water temperatures at these sites that would be similar to what would occur under the Base Case. The Equalized Summer/Winter Flood Risk Alternative would result in higher average temperatures at all three sites (substantially beneficial habitat conditions at both the Holston River and French Broad River sites, and slightly beneficial conditions at the Elk River site). The Commercial Navigation Alternative would result in higher average temperatures (slightly beneficial habitat conditions) at the Holston River site and average temperatures similar to what would occur under the Base Case at both the French Broad River and Elk River sites.

Metric #7. The difference between the 90- and 10-percent instantaneous water temperatures at the selected sites during the second and third weeks in June. These data points were derived from the same Water Quality modeling work used for Metric #6; however for this metric, the extracted information focuses on the difference between the estimated 90- and 10-percent occurrence interval water temperatures at these sites during this 2-week period in each of the modeled years. The resulting temperature ranges and T-test results are presented in the Metric #7 tables. Alternatives that yielded narrower temperature ranges than under the Base Case (at or above the 80-percent confidence level) were considered to produce more stable temperature conditions during this period. These comparisons indicate that the temperature ranges produced under all but two of the modeled alternatives would be similar to the range produced under the Base Case. The Equalized Summer/Winter Flood Risk Alternative would produce temperature ranges at the Elk River and Holston River sites similar to the Base Case but would produce a wider temperature range (substantially adverse habitat conditions) during this period at the French Broad River site. The Tailwater Habitat Alternative would produce temperature ranges similar to the Base Case at the Elk River and French Broad River sites but a more narrow temperature range than under the Base Case (slightly beneficial habitat conditions) at the Holston River site.

Metric #8. The average water temperature at the selected sites during the third and fourth weeks in August. These data were derived from the same Water Quality modeling work and considered in the same way as the data extracted for Metric #6; however, this metric focused on a time 2 months later during the year. Alternatives that resulted in higher average temperatures than under the Base Case (at or above the 80-percent confidence level) were considered to enhance the growth and likely survival of protected aquatic species. The results presented in the tables for Metric #8 indicate that the three warm tailwater sites included in this comparison provided different results with regard to this metric. At the Elk River site, all of the policy alternatives yielded average temperatures similar to the Base Case. At the site in the French Broad River, nearly all of the alternatives yielded similar averages to the Base Case, while the Equalized Summer/Winter Flood Risk Alternative yielded a higher average summer water temperature than under the Base Case (substantially beneficial habitat conditions). At the Holston River site, only the Commercial Navigation Alternative yielded average temperatures similar to those under the Base Case; all of the other alternatives yielded lower average summer water temperatures (each indicating substantially adverse habitat conditions than those under the Base Case).

Metric #9. The difference between the 90- and 10-percent instantaneous water temperatures at the selected sites during the third and fourth weeks in August. This comparison and data set are comparable to Metric #7; however, the focus here is on a late-summer period instead of mid-June. Alternatives that yielded narrower temperature ranges than under the Base Case average were considered to enhance the growth and likely survival of protected aquatic species. The information presented in the tables for Metric #9 indicates that all but two of the modeled alternatives resulted in temperature ranges that were similar to the range produced under the Base Case. The Equalized Summer/Winter Flood Risk Alternative produced ranges similar to the Base Case at both the Holston River and Elk River sites. At the French Broad River site, however, the temperature range was more narrow (slightly beneficial habitat conditions) than under the Base Case. The Tailwater Habitat Alternative resulted in temperature ranges similar to the Base Case at the sites on the Elk River and French Broad River, but the temperature range at the Holston River site was narrower (substantially beneficial temperature range) than what would occur at that site under the Base Case.

D6b.6 Cool-to-Warm Tributary Tailwaters

A variety of mollusks and fishes occurs in the parts of regulated Tennessee River tributary streams characterized as cool-to-warm tailwaters. Like the warm tributary tailwaters, these waterbodies include a fairly wide variety of stream sizes and a considerable range of stream lengths from the upstream dams to their downstream limits. All of the flow and temperature regimes in these waterbodies are directly affected by the timing and volume of relatively cold releases from the upstream dams. In addition, these waterbodies support relatively sparse aquatic communities, even though populations of some protected species may be present. Changes in the operations policy affecting the dams and reservoirs upstream from these waterbodies could result in modifications to the daily and seasonal variations in flows, stream elevations, and water temperatures that could be more substantial than would occur in the warm tailwaters.

TVA aquatic biologists decided to use the same six metrics to evaluate the potential effects of the policy alternatives in these cool-to-warm tailwater waterbodies that were used to evaluate the warm tailwater reaches. The only differences in the data sources or use of these metrics were the locations of the sites where they would be applied. For the cool-to-warm tailwaters, the evaluation sites include locations on the Elk River and Holston River upstream from the warm tailwater sites evaluated on those same rivers. The other evaluation site is located on the Hiwassee River, in part because the French Broad River downstream from Douglas Dam does not have a recognized cool-to-warm reach. As before, the six metrics include one focused on the minimum water level at the site (Metric #10), three focused on flow and water temperature conditions during the same 2-week period in late spring (Metrics #11, 12, and 13), and two focused on water temperature conditions during the same 2-week period in late summer (Metrics #14 and 15).

The results and summary statistics associated with **Metric #10. The minimum water level achieved 90 percent of the time during the year at the selected sites,** are presented in the Metric #10 tables. As indicated in the description of companion Metric #4, alternatives found to have higher minimum water levels than under the Base Case (at or above the 80-percent confidence level) were considered to provide more wetted area that could be inhabited by protected aquatic species. The results of these comparisons indicate that nearly all of the alternatives would result in minimum water levels similar to those under the Base Case. The one exception to this uniform relationship occurred under the Tailwater Habitat Alternative, which yielded a higher minimum water level (substantially beneficial) at the Holston River site.

Results and summary statistics associated with **Metric #11. The difference between the 90- and 10-percent instantaneous flow rates at the selected sites during the second and third weeks in June,** are presented in the Metric #11 tables. Like the description for companion Metric #5, alternatives that yielded narrower flow ranges than under the Base Case (at or above the 80-percent confidence level) were considered to provide more stable streamflow conditions during this period. The comparisons indicate that all but two of the alternatives would result in mid-June flow ranges in cool-to-warm tributary tailwaters that are similar to ranges under the Base Case. The Equalized Summer/Winter Flood Risk Alternative would result in flow ranges similar to the Base Case at the Hiwassee River site but would produce a narrower flow range (slightly beneficial habitat conditions) at the Elk River site and a more narrow flow range (substantially beneficial) at the Holston River site. The Tailwater Habitat Alternative would result in flow ranges similar to the Base Case at the Elk River site but narrower (substantially beneficial) flow ranges at both the Holston River and Hiwassee River sites.

Results and statistics associated with **Metric #12. The average water temperature at the selected sites during the second and third weeks in June,** are presented in the Metric #12 tables. Alternatives that resulted in higher average water temperatures than under the Base Case (at or above the 80-percent confidence level) were considered to be more similar to free-flowing stream reaches where protected aquatic species would be spawning. As indicated in the tables for Metric #12, the Hiwassee River site reacted differently to this metric than the sites on both the Elk and Holston Rivers. The Hiwassee River site yielded higher (substantially beneficial) average water temperatures during this period for all of the policy alternatives compared with the Base Case. At the sites on the Elk and Holston Rivers, only the Equalized Summer/Winter Flood Risk Alternative yielded higher (substantially beneficial) average temperatures; all of the other alternatives yielded average temperatures similar to what would occur under the Base Case.

Data and statistics related to **Metric #13. The difference between the 90- and 10-percent instantaneous water temperatures at the selected sites during the second and third weeks in June**, are presented in the Metric #13 tables. As described for Metric #7, alternatives that yielded more narrow temperature ranges than under the Base Case (at or above the 80-percent confidence level) were considered to produce more stable temperature conditions during this period. These comparisons indicate that most of the policy alternatives would produce temperature ranges similar to those under the Base Case. The Tailwater Habitat Alternative would result in temperature ranges similar to the Base Case at the Holston River and Elk River sites but a more narrow (slightly beneficial) range at the Hiwassee River site. The Equalized Summer/Winter Flood Risk Alternative would produce temperature ranges similar to the Base Case at the Hiwassee River site, narrower (substantially beneficial) temperature ranges at the Elk River site, and wider (substantially adverse) temperature ranges at the Holston River site.

Results and statistics associated with **Metric #14. The average water temperature at the selected sites during the third and fourth weeks in August**, are presented in the Metric #14 tables. Alternatives that resulted in higher average temperatures than under the Base Case (at or above the 80-percent confidence level) were considered to enhance the growth and likely survival of protected aquatic species (same as for Metric #8). The results indicate that each cool-to-warm tributary tailwater reacted differently to this metric. At the Hiwassee River site, all of the policy alternatives would produce higher (substantially beneficial) average temperatures than would occur under the Base Case. At the Elk River site, Reservoir Recreation Alternative A, the Commercial Navigation Alternative, the Tailwater Habitat Alternative, and the Preferred Alternative would produce average temperatures similar to what would occur under the Base Case; while Reservoir Recreation Alternative B, the Equalized Summer/Winter Flood Risk Alternative, and the Tailwater Recreation Alternative would produce averages higher (slightly more beneficial) than would occur under the Base Case. At the Holston River site, all of the policy alternatives except the Commercial Navigation Alternative would produce lower (substantially adverse) average temperatures than would occur under the Base Case. The Commercial Navigation Alternative yielded average temperatures similar to what would be produced under the Base Case at the Holston River site.

Data and statistics related to **Metric #15. The difference between the 90- and 10-percent instantaneous water temperatures at the selected sites during the third and fourth weeks in August**, are presented in the tables for Metric #15. As described for Metric #9, alternatives that yielded more narrow temperature ranges than under the Base Case (at or above the 80-percent confidence level) were considered to produce more stable temperature conditions when protected aquatic species were growing and accumulating fat that might help them better survive the winter. These results also indicate that each of the three cool-to-warm tributary tailwaters reacted somewhat differently to this metric. At the Hiwassee River site, all of the policy alternatives yielded temperature ranges similar to what would occur under the Base Case. At the Elk River site, Reservoir Recreation Alternative A, the Commercial Navigation Alternative, the Tailwater Habitat Alternative, and the Preferred Alternative yielded ranges similar to the Base Case; while Reservoir Recreation Alternative B, the Equalized Summer/Winter Flood Risk Alternative, and the Tailwater Recreation Alternative yielded more narrow ranges (substantially beneficial) than would occur under the Base Case. At the Holston River site, the Commercial Navigation Alternative and the Preferred Alternative yielded ranges similar to the Base Case; while all of the other alternatives yielded ranges more narrow than would occur under the Base Case (slightly beneficial under Reservoir Recreation Alternative A and the Equalized Summer/Winter Flood Risk Alternative and substantially beneficial under Reservoir Recreation Alternative B, Tailwater Recreation Alternative, and the Tailwater Habitat Alternative).

D6b.7 Tributary Summary

With regard to the minimum water level metrics (Metrics #4 and #10), only the Equalized Summer/Winter Flood Risk Alternative and the Tailwater Habitat Alternative would produce effects different from what would occur under the Base Case. The Equalized Summer/Winter Flood Risk Alternative would result in higher minimum water levels (slightly more minimum wetted area) at the (warm) French Broad River site, while the Tailwater Habitat Alternative would result in higher minimum water levels at the site on the French Broad River (slightly beneficial habitat conditions) and at both sites on the Holston River (substantially beneficial conditions).

With regard to the mid-June flow range metrics (Metrics #5 and #11), only the Equalized Summer/Winter Flood Risk Alternative and the Tailwater Habitat Alternative would produce effects different from what would occur under the Base Case. The Equalized Summer/Winter Flood Risk Alternative would produce less variation in mid-June flow ranges at both sites on the Holston River (substantially beneficial habitat conditions for protected species) and at the cool-to-warm site on the Elk River (slightly beneficial conditions). The Tailwater Habitat Alternative would produce less variation in flow ranges (substantially beneficial conditions) at the sites on the Holston, French Broad, and Hiwassee Rivers but did not result in flow ranges any different from the Base Case at either site on the Elk River.

The four average temperature metrics (Metrics #6 and #12 concerning mid-June, and Metrics #8 and #14 concerning late August) tend to follow consistent patterns, at least on the individual rivers. All of the policy alternatives would produce higher (substantially beneficial) average temperatures than under the Base Case at the Hiwassee River site during both periods. All of the policy alternatives except the Commercial Navigation Alternative would produce lower (substantially adverse) average temperatures than under the Base Case at both Holston River sites in late August (Metric #14). The Equalized Summer/Winter Flood Risk Alternative would produce higher (substantially beneficial conditions) average temperatures at the cool-to-warm site on the Elk River during both periods, higher (slightly beneficial) average temperatures at the warm site on the Elk River in mid-June, and higher (substantially beneficial) average temperatures at both Holston River sites in mid-June.

Concerning the four temperature range metrics, the policy alternatives would produce very few differences from the ranges under the Base Case at the warm tailwater sites during either mid-June (Metric #7) or late August (Metric #9). Two of the exceptions to this pattern would occur under the Tailwater Habitat Alternative, which would produce less temperature variation at the warm reach site on the Holston River during both mid-June (slightly beneficial habitat conditions) and in late August (substantially beneficial conditions). The other exceptions would occur at the French Broad River site under the Equalized Summer/Winter Flood Risk Alternative, which would produce more temperature variation (substantially adverse conditions) in mid-June and less variation (slightly beneficial conditions) in late August than would occur under the Base Case.

In the cool-to-warm tailwater reaches, the effects of the alternatives on the temperature range metrics would differ, depending on which month was being examined. During mid-June (Metric #13), the Tailwater Habitat Alternative would produce less variation (slightly beneficial conditions) at the Hiwassee River site. Also during mid-June, the Equalized Summer/Winter Flood Risk Alternative would produce more temperature variation (substantially adverse habitat conditions) at the Holston River site and less temperature variation (substantially beneficial conditions) at the Elk River site. During late August (Metric #15), none of the alternatives would produce temperature variations different from the Base Case at the Hiwassee River site. At the Elk River site, Reservoir Recreation Alternative B, the Equalized Summer/Winter Flood Risk Alternative, and the Tailwater Recreation Alternative would produce less temperature variation (substantially beneficial conditions) during this period. At the Holston River site, five of the alternatives would produce less temperature variation during late August (slightly beneficial habitat conditions under Reservoir Recreation Alternative A and the Equalized Summer/Winter Flood Risk Alternative; substantially beneficial conditions under Reservoir Recreation B, the Tailwater Recreation Alternative, and the Preferred Alternative).

EVALUATION ABBREVIATIONS USED IN THE METRIC TABLES	
Abbreviation	**Definition**
A	Adverse effects on protected aquatic species
B	Beneficial effects on protected aquatic species
N	Not statistically different from the Base Case
S	Slightly (80- to 95-percent confidence level)
SS	Substantially (95-percent confidence level or higher)

Mainstem Reservoirs

Metric #1: Sum of daily volumes in mainstem reservoirs with DO less than 2 mg/L during January through December.

Data Units: Million cubic meters.

Evaluation Perspective: Smaller volumes of low DO water would indicate better habitat conditions for protected benthic species.

Kentucky Reservoir

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	3,285	4,582	5,518	4,430	1,777	5,346	11,547	4,863
1988	14,155	11,147	19,377	18,844	6,584	19,973	34,943	13,909
1989	174	351	1,143	906	180	1,233	1,371	253
1990	2,502	4,296	6,680	5,451	1,434	6,612	10,813	4,070
1991	1,535	2,356	2,448	2,012	1,232	2,496	2,561	2,087
1992	210	637	626	515	185	526	673	323
1993	6,033	9,757	11,078	10,403	3,741	11,048	20,392	7,955
1994	473	936	1,245	1,015	463	1,307	1,369	725
Average	**3,545.9**	**4,257.8**	**6,014.4**	**5,447.0**	**1,949.5**	**6,067.6**	**10,458.6**	**4,273.1**
Similarity		75.35%	39.80%	50.74%	40.05%	39.60%	15.41%	76.25%
Evaluation		N	N	N	N	N	SA	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Guntersville Reservoir

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	4,407	7,757	7,667	6,044	4,836	6,876	8,140	4,395
1988	10,739	9,688	11,676	8,566	7,895	11,432	12,522	6,922
1989	27	40	114	70	36	120	95	60
1990	608	2,036	2,623	2,036	666	2,374	2,112	1,073
1991	270	636	655	599	270	665	734	475
1992	846	1,236	1,018	6,55	655	1,068	1,291	1,542
1993	5,238	7,022	8,866	6,621	5,237	8,770	8,450	5,734
1994	275	417	387	2,360	275	345	166	386
Average	**2,801.2**	**3,604.0**	**4,125.8**	**3,368.9**	**2,483.8**	**3,956.2**	**4,188.8**	**2573.4**
Similarity		68.21%	53.82%	75.23%	85.61%	58.39%	53.11%	89.18%
Evaluation		N	N	N	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Chickamauga Reservoir

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	2,019	1,824	1,742	1,491	2,304	1,811	3,522	1,753
1988	1,919	2,278	2,411	1,586	1,963	2,389	3,444	2,143
1989	335	363	366	368	323	358	392	429
1990	1,626	1,329	1,226	1,124	1,644	1,254	1,968	1,403
1991	1,451	1,546	1,505	1,147	1,479	1,490	2,303	1,610
1992	1,173	1,321	1,294	1,170	1,214	1,314	1,683	1,267
1993	3,069	3,216	3,133	2,801	3,119	3,123	6,183	2,983
1994	870	1,018	1,050	899	866	1,041	1,491	1,054
Average	**1,557.8**	**1,611.9**	**1,590.9**	**1,323.2**	**1,614.0**	**1,597.5**	**2,623.2**	**1,580.2**
Similarity		89.94%	93.82%	55.05%	89.61%	92.57%	14.43%	95.56%
Evaluation		N	N	N	N	N	SA	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Mainstem Tailwaters

Metric #2: Number of hours of dam release with DO less than 2 mg/L during July through October.

Data Units: Hours.

Evaluation Perspective: Shorter amounts of time when the DO was low would indicate better conditions for protected benthic species.

Pickwick Dam Releases

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	0	2	2	0	0	0	0	2
1988	1	0	0	0	5	0	0	0
1989	0	0	0	0	0	0	0	0
1990	0	2	2	2	0	2	0	0
1991	0	0	5	0	0	0	0	0
1992	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
Average	0.1	0.5	1.1	0.3	0.6	0.3	0.0	0.3
Similarity		30.26%	14.69%	66.16%	44.58%	66.16%	33.43%	66.16%
Evaluation		N	SA	N	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Wilson Dam Releases

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	76	80	183	45	72	152	481	69
1988	228	235	236	196	323	243	495	41
1989	0	0	1	0	0	0	1	0
1990	32	47	66	96	30	60	277	34
1991	1	3	4	1	0	6	22	3
1992	0	11	13	8	2	18	69	6
1993	18	24	21	19	15	24	74	19
1994	0	1	1	1	0	1	0	1
Average	44.4	50.1	65.6	45.8	55.3	63.0	177.4	21.6
Similarity		88.66%	62.81%	97.09%	82.44%	66.34%	11.73%	44.83%
Evaluation		N	N	N	N	N	SA	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Guntersville Dam Releases

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	0	0	0	0	0	0	0	0
1988	0	2	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0
1990	0	4	5	0	0	0	0	0
1991	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0
Average	**0.0**	**0.8**	**0.6**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Similarity		17.59%	33.43%	100.00%	100.00%	100.00%	100.00%	100.00%
Evaluation		**SA**	**N**	**N**	**N**	**N**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Watts Bar Dam Releases

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	67	150	32	153	74	28	0	147
1988	73	77	59	0	10	21	741	130
1989	2	6	27	11	2	35	0	113
1990	41	87	57	103	43	72	0	332
1991	17	52	95	83	21	109	0	443
1992	109	85	144	70	130	156	645	370
1993	144	131	37	151	139	32	24	173
1994	3	34	40	65	3	54	0	230
Average	**57.0**	**77.8**	**61.4**	**79.5**	**52.8**	**63.4**	**176.3**	**242.3**
Similarity		41.62%	85.16%	41.86%	87.63%	79.99%	31.58%	0.16%
Evaluation		**N**	**N**	**N**	**N**	**N**	**N**	**SSA**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Mainstem Tailwaters

Metric #3 - Minimum water level achieved 90 percent of the time during the year at a given location.

Data Units: Elevation in feet above mean sea level.

Evaluation Perspective: Higher minimum water levels would indicate more available habitat for protected species.

Pickwick Dam Tailwater (TRM 190)

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	354.6	354.6	356.3	354.6	356.8	356.3	355.8	354.6
1988	354.6	354.6	356.0	354.6	356.4	356.0	355.3	354.6
1989	357.3	357.4	358.6	357.3	358.6	358.6	358.1	357.2
1990	355.7	356.7	357.8	355.7	358.4	357.8	357.4	355.8
1991	355.7	357.3	358.1	355.9	358.6	358.1	357.4	355.8
1992	355.7	356.7	357.5	355.7	357.4	357.7	357.3	355.7
1993	355.0	356.3	357.5	354.8	358.6	357.5	357.0	355.2
1994	356.3	357.3	358.6	355.9	358.6	358.6	357.7	356.26
Average	355.6	356.4	357.6	355.6	357.9	357.6	357.0	355.6
Similarity		17.00%	0.10%	91.37%	0.02%	0.09%	1.01%	95.57%
Evaluation		SB	SSB	N	SSB	SSB	SSB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Wilson Dam Tailwater (TRM 256)

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	409.5	411.1	411.0	409.2	410.7	411.0	411.0	409.7
1988	409.4	410.8	410.8	409.3	410.7	410.8	410.8	409.4
1989	411.1	411.9	412.2	410.7	411.7	412.1	411.8	411.1
1990	410.7	412.1	412.1	410.0	411.1	412.1	412.3	411.3
1991	410.5	412.1	412.1	410.8	411.1	412.1	412.0	411.1
1992	410.6	411.9	411.9	410.4	411.4	411.9	411.7	410.8
1993	410.3	411.7	411.9	410.2	411.0	411.9	411.9	410.8
1994	410.9	412.1	412.1	410.5	411.5	412.1	412.2	411.2
Average	410.4	411.7	411.8	410.1	411.2	411.8	411.7	410.7
Similarity		0.03%	0.03%	45.10%	0.86%	0.03%	0.04%	40.65%
Evaluation		SSB	SSB	N	SSB	SSB	SSB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Guntersville Dam Tailwater (TRM 349)

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	552.1	553.4	553.7	551.6	553.1	553.7	553.8	552.1
1988	551.8	553.2	553.2	551.4	552.7	553.2	553.3	551.9
1989	555.7	555.9	556.0	555.4	555.7	556.0	556.0	556.1
1990	554.3	555.3	555.5	553.8	554.6	555.5	555.3	555.1
1991	554.3	555.7	555.6	555.0	554.4	555.6	555.3	555.4
1992	554.8	555.7	555.7	554.1	555.1	555.7	555.4	555.7
1993	553.7	554.6	555.1	553.4	553.9	555.0	554.9	554.6
1994	555.7	555.8	555.7	554.8	555.8	555.7	555.3	555.8
Average	**554.1**	**555.0**	**555.1**	**553.7**	**554.4**	**555.1**	**554.9**	**554.6**
Similarity		18.71%	13.34%	63.29%	58.95%	13.79%	17.91%	50.43%
Evaluation		**SB**	**SB**	**N**	**N**	**SB**	**SB**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Watts Bar Dam Tailwater (RM 530)

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	676.0	677.6	677.9	675.0	677.5	677.9	678.0	676.4
1988	676.0	677.5	677.5	675.0	677.5	677.5	677.8	676.0
1989	678.2	678.6	679.3	677.6	678.6	679.3	678.9	677.4
1990	678.2	679.6	679.4	676.8	678.7	679.4	679.7	679.0
1991	679.1	680.0	680.0	678.2	679.3	680.0	680.0	679.1
1992	677.0	679.1	679.1	676.8	678.0	679.1	678.8	678.2
1993	677.7	679.1	679.6	677.4	678.5	679.4	679.9	678.2
1994	679.1	679.9	679.4	676.7	679.3	679.3	680.4	678.7
Average	**677.7**	**678.9**	**679.0**	**676.7**	**678.4**	**679.0**	**679.2**	**677.9**
Similarity		3.89%	2.29%	12.53%	15.24%	2.51%	1.55%	72.91%
Evaluation		**SSB**	**SSB**	**SA**	**SB**	**SSB**	**SSB**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Warm Tributary Tailwaters

Metric #4 - Minimum water level achieved 90 percent of the time during the year at a given location.

Data Units: Elevation in feet above mean sea level.

Evaluation Perspective: Higher minimum water levels would indicate more available habitat for protected aquatic species.

Holston River Mile 30

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	865.0	864.8	864.9	864.8	864.6	864.9	865.6	864.8
1988	863.9	863.9	864.0	863.8	863.8	863.9	864.2	863.8
1989	863.8	863.9	863.9	864.4	863.8	863.9	864.8	863.8
1990	863.9	863.9	863.9	863.9	863.9	863.9	865.1	863.9
1991	863.9	863.9	863.9	864.0	863.9	863.9	864.8	863.9
1992	863.8	863.8	863.9	864.4	863.9	863.9	864.9	863.9
1993	864.0	864.4	864.4	864.6	864.0	864.4	865.0	863.9
1994	864.9	864.9	865.0	864.7	864.9	865.0	865.5	864.8
Average	864.16	864.19	864.24	864.32	864.11	864.25	864.99	864.10
Similarity		88.24%	73.71%	45.86%	84.72%	71.12%	0.23%	81.27%
Evaluation		N	N	N	N	N	SSB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

French Broad River Mile 18

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	843.76	843.5	843.6	843.4	843.6	843.6	843.6	843.5
1988	843.4	843.4	843.4	843.4	843.4	843.4	843.4	843.4
1989	843.6	843.6	843.6	843.7	843.6	843.7	844.5	843.6
1990	843.6	843.4	843.4	843.5	843.6	843.5	843.7	843.5
1991	843.7	843.7	843.6	843.6	843.7	843.6	844.2	843.6
1992	843.7	843.6	843.6	843.6	843.7	843.6	844.3	843.6
1993	843.6	843.7	843.6	843.4	843.6	843.6	843.4	843.7
1994	843.8	843.7	843.7	843.6	843.8	843.7	844.7	843.8
Average	843.62	843.57	843.57	843.52	843.62	843.59	843.97	843.59
Similarity		37.04%	31.93%	10.75%	92.80%	54.55%	7.96%	58.44%
Evaluation		N	N	SB	N	N	SB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Elk River Mile 73

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	611.2	611.2	611.2	611.2	611.2	611.2	611.2	611.2
1988	611.0	611.0	611.0	611.0	611.0	611.0	611.0	611.0
1989	612.6	612.6	612.6	612.5	612.6	612.6	612.6	612.6
1990	611.9	611.9	611.3	611.2	611.9	611.3	611.9	611.9
1991	611.9	611.8	611.5	611.4	611.9	611.5	611.8	611.8
1992	611.9	611.9	611.7	611.6	611.9	611.7	611.9	611.9
1993	611.8	611.8	611.4	611.3	611.8	611.4	611.8	611.8
1994	612.3	612.3	612.3	611.8	612.3	612.3	612.3	612.3
Average	611.81	611.81	611.62	611.48	611.82	611.62	611.81	611.81
Similarity		98.74%	49.06%	22.17%	97.43%	49.06%	98.80%	98.50%
Evaluation		N	N	N	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Warm Tributary Tailwaters

Metric #5: Difference between 90 and 10 percentile instantaneous flows at a given location during second through third weeks of June.

Data Units: Flow range in cubic feet per second.

Evaluation Perspective: Less variation in flow rates during this period would indicate better spring conditions for protected species reproduction and growth.

Holston River Mile 30

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	8,212	4,682	4,682	1,920	5,427	5,383	2,529	6,227
1988	10,679	11,258	12,332	6,815	14,869	12,219	469	9,667
1989	13,407	13,155	13,155	13,255	13,131	13,156	4,380	13,096
1990	9,250	5,871	5,871	327	9,250	5,869	2,209	8,653
1991	10,942	8,268	8,268	1,986	10,942	8,222	1,681	9,025
1992	9,448	12,662	13,073	8,480	5,537	12,411	2,588	7,406
1993	6,254	4,065	4,087	725	6,254	4,065	2,578	2,943
1994	9,442	6,316	6,316	70	9,442	6,370	1,249	8,933
Average	9,704.4	8,284.6	8,473.1	4,197.1	9,356.6	8,461.8	2,210.2	8,243.8
Similarity		35.41%	43.88%	1.01%	81.38%	41.47%	0.00%	26.95%
Evaluation		N	N	SSB	N	N	SSB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

French Broad River Mile 18

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	10,199	8,764	8,764	9,436	8,380	8,764	4,376	10,517
1988	9,396	9,996	10,629	9,352	10,720	11,787	1,157	9,438
1989	18,119	18,119	18,119	19,384	18,119	18,119	8,640	18,012
1990	8,614	7,832	7,832	8,844	8,614	7,832	3,390	8,547
1991	14,620	13,095	13,095	17,196	14,620	13,095	2,900	14,522
1992	16,843	17,227	17,227	18,794	18,464	17,227	8,169	17,103
1993	8,594	8,210	8,210	9,335	8,594	8,037	3,138	8,577
1994	14,791	13,322	13,322	14,297	14,791	13,322	2,175	14,804
Average	**12,646.9**	**12,070.6**	**12,149.8**	**13,329.8**	**12,787.8**	**12,272.8**	**4,243.2**	**12,690.0**
Similarity		77.51%	80.42%	75.35%	94.58%	85.17%	0.02%	98.26%
Evaluation		**N**	**N**	**N**	**N**	**N**	**SSB**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Elk River Mile 73

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	104	104	104	104	104	104	104	104
1988	22	22	22	22	22	22	22	22
1989	5,539	5,539	5,458	7,119	5,539	5,458	5,359	5,539
1990	1,258	1,258	1,204	716	1,258	1,204	1,258	1,258
1991	3,217	3,217	3,072	899	3,217	3,072	3,118	3,217
1992	1,144	1,144	1,051	1,051	1,144	1,051	1,144	1,144
1993	1,169	1,169	996	520	1,169	996	1,169	1,169
1994	1,084	1,084	941	141	1,084	941	1,084	1,084
Average	**1,692.1**	**1,692.1**	**1,606.0**	**1,321.6**	**1,692.1**	**1,606.0**	**1,657.2**	**1,692.1**
Similarity		100.00%	92.61%	73.21%	100.00%	92.61%	96.97%	100.00%
Evaluation		**N**	**N**	**N**	**N**	**N**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Warm Tributary Tailwaters

Metric #6: The average instantaneous water temperatures at a given location during the second through third weeks in June.

Data Units: Water termpaturature range in degrees Celsius.

Evaluation Perspective: Higher mean water temperatures during this period would indicate better spring conditions for protected species reproduction and growth.

Holston River Mile 30

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	13.4	14.0	14.0	18.9	14.3	13.9	14.0	13.4
1988	12.0	10.9	11.6	11.0	16.2	11.8	9.9	10.1
1989	8.9	9.6	10.5	13.5	10.9	10.2	9.5	9.2
1990	13.3	13.8	14.2	24.5	13.3	14.1	13.6	13.4
1991	12.6	12.8	13.3	21.6	12.6	13.4	12.6	12.9
1992	12.9	13.4	11.5	13.0	17.9	11.9	12.7	14.0
1993	11.1	12.3	12.7	21.6	11.1	12.8	12.2	15.9
1994	14.0	14.6	14.6	25.4	14.0	14.7	14.3	14.1
Average	12.28	12.67	12.80	18.69	13.79	12.84	12.35	12.90
Similarity		64.77%	51.55%	0.74%	16.32%	48.32%	93.58%	53.07%
Evaluation		N	N	SSB	SB	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

French Broad River Mile 18

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	14.8	14.9	14.9	18.7	15.5	14.9	15.1	14.8
1988	19.2	18.1	17.8	20.3	20.5	17.9	18.6	18.5
1989	16.9	16.9	16.9	18.5	16.9	16.9	17.0	17.0
1990	17.4	17.5	17.6	19.8	17.4	17.4	17.6	17.2
1991	16.6	16.6	16.6	18.6	16.6	16.6	16.8	16.6
1992	16.6	16.5	16.5	17.8	16.6	16.6	16.6	16.6
1993	17.0	17.1	17.1	18.6	17.0	17.1	17.2	16.8
1994	17.39	17.3	17.4	19.2	17.2	17.4	17.4	17.4
Average	16.96	16.86	16.84	18.94	17.21	16.85	17.05	16.85
Similarity		85.08%	82.32%	0.17%	71.94%	83.20%	87.40%	83.73%
Evaluation		N	N	SSB	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Elk River Mile 73

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	26.7	26.7	26.7	26.6	26.7	26.7	26.7	26.7
1988	24.7	24.7	24.7	24.6	24.8	24.6	24.6	24.7
1989	18.8	18.8	18.9	20.2	18.8	18.8	18.8	18.8
1990	24.1	24.3	24.8	26.9	24.1	24.8	24.0	24.1
1991	21.5	21.4	21.6	25.6	21.5	21.7	21.4	21.5
1992	24.4	24.4	24.6	24.6	24.4	24.6	24.4	24.3
1993	22.7	22.9	23.7	26.9	23.0	23.6	22.8	22.8
1994	23.6	23.8	24.2	27.1	23.7	24.1	23.5	23.5
Average	23.31	23.38	23.64	25.32	23.38	23.61	23.29	23.31
Similarity		95.31%	78.34%	10.83%	95.07%	80.37%	98.94%	99.65%
Evaluation		N	N	SB	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Warm Tributary Tailwaters

Metric #7: Difference between 90 and 10 percentile instantaneous water temperatures at a given location during the second through third weeks in June.

Data Units: Water Temperature range in degrees Celsius.

Evaluation Perspective: Less variation in water temperatures during this period would indicate better spring conditions for protected species reproduction and growth.

Holston River Mile 30

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	3.1	3.5	3.5	4.8	3.2	3.3	1.8	3.2
1988	4.3	4.3	4.7	4.5	5.7	4.4	3.4	4.6
1989	2.6	2.6	2.7	8.1	10.0	2.6	2.3	2.7
1990	3.4	3.7	3.8	5.6	3.4	3.7	2.2	3.5
1991	2.9	3.3	3.3	9.3	2.9	3.2	1.7	3.4
1992	11.4	11.2	3.6	3.8	11.9	3.6	3.2	11.0
1993	4.2	4.4	4.4	7.0	4.2	4.5	3.1	13.6
1994	3.7	4.6	4.6	4.3	3.7	4.5	2.5	4.2
Average	4.44	4.70	3.81	5.92	5.62	3.72	2.53	5.77
Similarity		85.16%	55.40%	24.72%	46.59%	50.03%	8.76%	46.47%
Evaluation		N	N	N	N	N	SB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

French Broad River Mile 18

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	2.4	2.5	2.5	2.3	2.3	2.5	1.7	2.4
1988	3.2	3.2	2.6	3.6	3.6	2.8	3.3	3.4
1989	2.6	2.6	2.6	3.7	2.6	2.6	2.6	2.8
1990	2.8	2.9	2.9	6.1	2.8	2.9	2.3	2.9
1991	2.1	2.3	2.3	5.3	2.1	2.3	2.1	2.2
1992	2.0	1.9	1.9	2.1	2.1	2.0	2.2	2.2
1993	3.2	3.1	3.1	5.5	3.2	3.1	2.2	3.1
1994	2.9	3.2	3.2	6.0	3.0	3.2	2.8	3.0
Average	**2.64**	**2.72**	**2.64**	**4.32**	**2.71**	**2.68**	**2.40**	**2.74**
Similarity		74.08%	99.34%	1.40%	79.71%	86.99%	31.44%	68.00%
Evaluation		**N**	**N**	**SSA**	**N**	**N**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Elk River Mile 73

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	2.3	2.3	2.2	2.2	2.3	2.2	2.2	2.4
1988	5.5	5.5	5.8	5.4	5.1	5.7	5.6	5.6
1989	4.0	4.1	4.1	6.0	3.8	4.1	4.0	4.1
1990	3.7	3.2	3.6	2.5	3.8	3.5	3.6	3.6
1991	4.6	4.7	4.5	3.0	4.8	4.5	4.7	4.8
1992	5.1	5.1	5.0	5.0	5.0	4.9	4.8	5.0
1993	3.5	3.2	2.5	1.9	3.2	2.6	3.4	3.5
1994	6.1	5.2	5.8	3.7	5.8	5.9	5.3	5.6
Average	**4.34**	**4.15**	**4.17**	**3.72**	**4.22**	**4.18**	**4.19**	**4.32**
Similarity		75.35%	79.32%	38.70%	84.19%	80.64%	79.92%	96.18%
Evaluation		**N**	**N**	**N**	**N**	**N**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Warm Tributary Tailwaters

Metric #8: The average instantaneous water temperatures at a given location during the third through fourth weeks in August.

Data Units: Water temperature range in degrees Celsius.

Evaluation Perspective: Higher mean water temperatures during this period would indicate better summer conditions for protected species survival and growth.

Holston River Mile 30

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	24.7	19.2	18.1	20.5	24.5	18.7	16.9	21.6
1988	29.2	29.0	26.5	29.8	28.6	27.6	26.8	29.0
1989	23.0	19.6	19.5	19.3	22.3	19.4	18.8	20.5
1990	24.6	17.7	17.7	18.9	24.6	18.0	17.4	18.8
1991	25.6	17.1	17.3	20.5	25.6	17.7	16.8	19.1
1992	23.4	16.7	15.8	18.0	23.3	15.7	15.0	18.1
1993	23.5	16.6	15.4	17.8	23.5	15.4	14.7	18.0
1994	23.3	18.0	17.9	18.3	23.3	18.0	17.4	18.6
Average	24.66	19.23	18.53	20.39	24.46	18.83	17.98	20.45
Similarity		0.46%	0.07%	1.65%	84.45%	0.19%	0.06%	1.35%
Evaluation		SSA	SSA	SSA	N	SSA	SSA	SSA

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

French Broad River Mile 18

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	22.7	23.1	22.3	26.1	22.6	22.5	21.8	23.2
1988	26.8	26.8	26.0	26.8	27.3	26.3	26.2	26.5
1989	24.3	24.2	24.2	24.2	24.3	24.2	24.4	24.0
1990	22.4	21.2	21.2	24.6	22.4	21.2	21.4	21.8
1991	23.9	22.8	22.8	24.8	23.9	22.8	22.9	23.6
1992	23.2	22.3	21.3	24.4	23.2	21.3	21.5	22.7
1993	21.1	21.6	20.7	25.8	21.1	20.7	20.7	21.5
1994	23.8	23.8	23.8	24.7	23.8	23.8	23.8	24.0
Average	23.52	23.23	22.79	25.19	23.57	22.86	22.84	23.41
Similarity		74.03%	41.27%	2.66%	95.89%	46.49%	44.95%	88.75%
Evaluation		N	N	SSB	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Elk River Mile 73

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	27.3	27.3	27.3	27.2	27.3	27.3	27.3	27.4
1988	28.6	28.6	28.7	28.7	28.0	28.7	28.6	28.7
1989	24.2	23.5	25.8	24.1	23.7	25.7	23.5	24.0
1990	27.0	26.2	28.5	28.6	26.8	28.4	26.4	26.7
1991	24.4	24.0	26.4	26.4	24.5	26.4	24.0	24.1
1992	21.2	21.0	23.6	24.6	21.4	23.7	21.0	21.1
1993	26.8	26.1	29.4	29.3	26.8	29.3	26.1	26.8
1994	21.9	21.6	23.7	23.9	22.0	23.6	21.8	21.6
Average	25.19	24.79	26.66	26.60	25.04	26.64	24.84	25.04
Similarity		77.47%	24.90%	26.74%	91.39%	25.59%	79.87%	91.56%
Evaluation		N	N	N	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Warm Tributary Tailwaters

Metric #9: Difference between 90 and 10 percentile instantaneous water temperatures during third through fourth weeks of August at a given location.

Data Units: Temperature range in degrees Celsius.

Evaluation Perspective: Less variation in water temperature during this period would indicate better spring conditions for protected species survival and growth.

Holston River Mile 30

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	3.8	3.6	3.0	3.4	3.8	3.1	2.3	3.9
1988	3.0	3.0	2.9	2.2	2.4	2.7	3.2	3.4
1989	2.9	3.1	3.3	3.2	3.3	3.2	1.9	2.7
1990	3.2	3.6	4.2	3.6	3.2	4.1	2.6	3.2
1991	3.2	3.3	3.3	9.3	3.2	3.2	2.5	3.2
1992	2.6	3.1	2.8	3.1	2.7	2.9	2.3	3.3
1993	5.8	3.9	3.6	3.6	5.8	3.5	1.9	3.7
1994	6.7	3.1	3.1	2.9	6.7	3.4	3.0	3.3
Average	3.89	3.33	3.27	3.91	3.89	3.26	2.46	3.34
Similarity		32.10%	28.62%	98.92%	99.29%	27.47%	2.20%	33.33%
Evaluation		N	N	N	N	N	SSB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

French Broad River Mile 18

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	2.6	2.5	2.5	1.7	2.6	2.5	2.2	2.4
1988	1.7	1.9	1.7	1.9	2.0	1.7	1.5	1.8
1989	1.1	1.5	1.5	1.3	1.1	1.5	1.7	1.4
1990	2.4	2.6	2.9	1.7	2.4	2.9	1.8	2.7
1991	1.3	1.8	1.9	1.4	1.3	1.9	2.0	1.4
1992	1.8	1.9	1.7	1.1	1.8	1.7	2.0	1.8
1993	2.5	2.5	2.4	1.7	2.5	2.3	1.8	2.3
1994	1.5	1.6	1.6	1.5	1.5	1.6	1.9	1.4
Average	**1.87**	**2.02**	**2.03**	**1.54**	**1.91**	**2.02**	**1.86**	**1.90**
Similarity		56.82%	56.78%	15.43%	89.55%	58.58%	94.94%	91.78%
Evaluation		**N**	**N**	**SB**	**N**	**N**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Elk River Mile 73

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	2.6	2.7	2.6	2.7	2.6	2.6	2.6	2.7
1988	2.6	3.0	2.8	2.6	3.2	2.6	2.8	2.6
1989	4.0	4.1	2.7	3.9	3.7	2.8	3.9	4.0
1990	3.4	3.5	3.4	3.6	3.4	3.3	3.6	3.3
1991	2.6	2.7	2.8	2.8	2.4	2.9	2.8	3.4
1992	4.4	4.5	4.2	2.8	4.6	4.0	4.7	4.4
1993	3.4	3.4	3.0	3.1	3.2	3.1	3.4	3.4
1994	3.2	3.6	2.5	5.7	3.5	2.5	2.7	3.0
Average	**3.27**	**3.43**	**2.99**	**3.40**	**3.32**	**2.98**	**3.32**	**3.34**
Similarity		62.93%	39.79%	76.57%	87.15%	35.10%	89.20%	82.85%
Evaluation		**N**	**N**	**N**	**N**	**N**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Cool-to-Warm Tributary Tailwaters

Metric #10: Minimum water level achieved 90 percent of the time during the year at a given location.

Data Units: Elevation in feet above mean sea level.

Evaluation Perspective: Higher minimum water levels would indicate more available habitat for protected aquatic species.

Holston River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	911.47	911.35	911.47	911.38	911.39	911.48	912.15	911.44
1988	911.13	911.13	911.16	911.11	911.10	911.14	911.21	911.10
1989	911.11	911.13	911.14	911.27	911.11	911.14	911.49	911.12
1990	911.15	911.15	911.15	911.14	911.16	911.15	911.79	911.14
1991	911.14	911.14	911.15	911.16	911.14	911.15	911.42	911.13
1992	911.11	911.12	911.16	911.20	911.12	911.17	911.57	911.13
1993	911.17	911.19	911.19	911.29	911.17	911.20	911.59	911.14
1994	911.46	911.50	911.58	911.28	911.47	911.54	912.24	911.37
Average	**911.22**	**911.21**	**911.25**	**911.23**	**911.21**	**911.25**	**911.68**	**911.20**
Similarity		95.96%	69.86%	86.89%	87.55%	73.20%	0.44%	76.50%
Evaluation		N	N	N	N	N	SSB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Hiwassee River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	743.81	743.81	743.81	743.81	743.81	743.81	743.88	743.80
1988	743.81	743.81	743.81	743.81	743.81	743.81	743.86	743.80
1989	744.15	744.70	744.42	744.52	743.94	744.15	745.40	744.52
1990	743.93	743.93	743.88	743.93	743.93	743.88	744.10	743.88
1991	745.09	744.88	744.43	744.10	745.03	744.45	745.33	744.54
1992	743.88	743.86	743.86	743.87	743.89	743.87	744.13	743.84
1993	743.91	743.93	743.88	743.86	743.91	743.87	744.01	743.86
1994	745.33	745.36	745.82	745.33	745.33	746.17	745.51	745.13
Average	**744.24**	**744.29**	**744.24**	**744.15**	**744.21**	**744.25**	**744.53**	**744.17**
Similarity		88.27%	99.58%	76.94%	91.62%	97.68%	41.25%	80.95%
Evaluation		N	N	N	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Elk River Mile 125

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	720.25	720.25	720.25	720.25	720.25	720.25	720.26	720.25
1988	720.22	720.22	720.22	720.22	720.22	720.22	720.22	720.22
1989	720.37	720.37	720.36	720.36	720.37	720.36	720.37	720.37
1990	720.26	720.26	720.24	720.24	720.26	720.24	720.26	720.26
1991	720.29	720.29	720.28	720.27	720.29	720.28	720.29	720.29
1992	720.25	720.25	720.24	720.23	720.25	720.24	720.27	720.25
1993	720.26	720.26	720.25	720.24	720.26	720.25	720.26	720.26
1994	720.31	720.31	720.32	720.27	720.31	720.32	720.31	720.31
Average	**720.28**	**720.28**	**720.27**	**720.26**	**720.28**	**720.27**	**720.28**	**720.28**
Similarity		98.19%	86.00%	47.94%	99.70%	86.00%	82.01%	97.89%
Evaluation		**N**	**N**	**N**	**N**	**N**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Cool-to-Warm Tributary Tailwaters

Metric #11: Difference between 90- and 10-percent instantaneous flows during second through third weeks of June at a given location.

Data Units: Flow range in cubic feet per second.

Evaluation Perspective: Less variation in flow rates during this period would indicate better spring conditions for protected species reproduction and growth.

Holston River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	9,431	5,746	5,746	2,791	6,375	6,302	2,938	6,701
1988	11,242	11,191	12,142	7,245	15,858	11,733	469	10,935
1989	14,256	14,222	14,225	13,766	13,224	14,221	4,380	14,093
1990	9,775	6,327	6,327	148	9,775	6,330	2,737	9,714
1991	13,158	9,500	9,500	2,991	13,158	9,602	1,358	9,737
1992	9,820	13,493	13,736	10,152	6,413	13,737	3,030	7,604
1993	6,562	4,676	4,737	611	6,562	4,660	2,945	3,042
1994	9,765	6,619	6,619	95	9,765	6,818	966	9,707
Average	**10,501.0**	**8,972.1**	**9,129.0**	**4,724.9**	**10,141.2**	**9,175.4**	**2,353.0**	**8,914.6**
Similarity		34.07%	40.21%	1.18%	81.84%	40.79%	0.00%	29.26%
Evaluation		**N**	**N**	**SSB**	**N**	**N**	**SSB**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Hiwassee River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	2,465	2,465	2,465	2,616	2,465	2,400	992	2,398
1988	2,660	2,645	2,610	2,636	2,573	2,400	340	2,668
1989	4,260	4,260	4,260	2,072	4,259	4,361	4,406	3,380
1990	2,657	2,495	2,495	2,490	2,657	2,391	1,058	2,652
1991	2,402	2,550	2,551	2,635	2,402	2,456	397	2,061
1992	2,465	2,570	2,640	2,495	2,451	2,400	992	2,345
1993	2,661	2,489	2,489	2,480	2,661	2,391	770	2,684
1994	1,028	1,532	1,532	1,730	1,028	2,158	618	1,039
Average	**2,574.8**	**2,625.7**	**2,630.2**	**2,394.1**	**2,562.2**	**2,619.8**	**1,196.6**	**2,399.0**
Similarity		90.21%	89.33%	59.10%	97.74%	91.13%	2.76%	65.76%
Evaluation		N	N	N	N	N	SSB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Elk River Mile 125

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	6	6	6	6	6	6	6	6
1988	1	1	1	1	1	1	1	1
1989	3,844	3,844	3,842	3,905	3,844	3,842	3,628	3,844
1990	1,542	1,542	934	50	1,542	934	1,542	1,542
1991	3,694	3,694	3,496	65	3,694	3,496	3,455	3,694
1992	82	82	63	63	82	63	82	82
1993	2,216	2,216	1,843	28	2,216	1,843	2,216	2,216
1994	1,434	1,434	1,227	9	1,434	1,227	1,434	1,434
Average	**1,602.3**	**1,602.3**	**1,426.4**	**515.78**	**1,602.3**	**1,426.4**	**1,545.5**	**1,602.3**
Similarity		100.00%	82.39%	16.22%	100.00%	82.39%	94.17%	100.00%
Evaluation		N	N	SB	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Cool-to-Warm Tributary Tailwaters

Metric #12: The average instantaneous water temperatures at a given location during the second through third weeks in June at a given location.

Data Units: Water temperature in degrees Celsius.

Evaluation Perspective: Higher mean water temperatures during this period would indicate better spring conditions for protected species reproduction and growth.

Holston River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	11.9	11.8	11.8	14.7	12.0	11.9	11.8	11.8
1988	10.0	8.8	9.7	9.0	14.6	9.8	8.4	8.1
1989	8.0	8.8	9.8	10.6	8.0	9.5	9.0	8.6
1990	11.6	11.6	12.0	15.4	11.6	12.0	11.7	11.7
1991	11.2	11.1	11.6	14.5	11.2	11.7	11.1	11.2
1992	9.1	9.9	10.4	11.3	10.9	10.5	10.3	10.3
1993	8.8	8.9	9.4	12.9	8.8	9.4	8.8	9.7
1994	12.4	12.4	12.4	16.1	12.4	12.4	12.3	12.2
Average	**10.39**	**10.42**	**10.88**	**13.06**	**11.19**	**10.91**	**10.42**	**10.44**
Similarity		97.07%	50.06%	2.51%	40.24%	48.21%	96.47%	94.56%
Evaluation		N	N	SSB	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Hiwassee River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	12.0	14.3	14.4	15.5	14.8	15.6	14.9	14.8
1988	13.0	14.4	14.4	15.4	15.2	15.4	14.4	14.6
1989	12.8	14.5	14.5	15.1	14.4	14.4	14.4	14.9
1990	14.2	16.0	16.0	16.4	15.8	16.5	16.2	16.0
1991	14.2	15.9	15.9	16.6	15.7	15.9	15.8	15.9
1992	13.4	13.9	13.5	14.4	14.6	14.8	14.2	14.5
1993	12.4	15.1	15.1	15.4	14.5	15.6	14.9	14.8
1994	13.8	15.5	15.5	16.5	15.4	15.7	15.4	15.6
Average	**13.21**	**14.95**	**14.90**	**15.64**	**15.05**	**15.48**	**15.00**	**15.12**
Similarity		0.07%	0.12%	0.00%	0.01%	0.00%	0.03%	0.01%
Evaluation		SSB	SSB	SSB	SSB	SSB	SSB	SSB

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Elk River Mile 125

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	18.9	18.9	18.9	19.1	19.0	18.9	18.9	18.9
1988	18.6	18.6	18.7	18.8	18.6	18.7	18.6	18.6
1989	13.0	13.0	13.1	15.4	13.1	13.1	12.9	13.1
1990	17.2	17.1	17.6	21.6	17.2	17.6	17.1	17.3
1991	16.2	16.2	16.4	21.4	16.2	16.4	16.2	16.3
1992	18.4	18.4	19.1	19.3	18.4	19.1	18.4	18.4
1993	14.9	14.9	15.1	20.2	15.0	15.1	14.9	14.9
1994	17.1	17.2	17.5	21.3	17.2	17.5	17.2	17.2
Average	16.79	16.80	17.05	19.65	16.84	17.05	16.78	16.83
Similarity		99.56%	80.25%	1.35%	96.22%	80.43%	98.97%	97.01%
Evaluation		N	N	SSB	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Cool-to-Warm Tributary Tailwaters

Metric #13: Difference between 90 and 10 percentile instantaneous water temperatures at a given location during the second through third weeks in June at a given location.

Data Units: Water temperature range in degrees Celsius.

Evaluation Perspective: Less variation in water temperatures during this period would indicate better spring conditions for protected species reproduction and growth.

Holston River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	1.0	1.4	1.4	3.3	1.3	1.3	1.2	1.2
1988	3.5	2.6	2.9	2.4	7.0	3.0	2.2	2.2
1989	2.1	2.6	2.8	2.4	2.4	2.6	2.2	2.2
1990	2.0	1.5	1.4	5.0	1.9	1.4	1.5	1.5
1991	1.8	1.4	1.3	4.2	1.8	1.4	1.3	1.3
1992	2.3	2.2	0.9	1.1	4.1	1.0	1.2	1.2
1993	1.4	1.9	1.9	5.1	1.4	1.9	1.5	1.5
1994	1.4	1.2	1.2	5.3	1.4	1.2	1.4	1.4
Average	1.95	1.85	1.72	3.59	2.66	1.73	1.57	1.57
Similarity		77.49%	55.90%	1.70%	35.06%	56.69%	23.47%	23.47%
Evaluation		N	N	SSA	N	N	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Hiwassee River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	12.1	10.1	10.1	7.6	9.7	7.6	5.5	9.4
1988	7.0	6.3	6.8	5.8	4.9	6.8	5.7	6.5
1989	2.9	3.3	3.3	3.2	3.3	3.2	3.2	3.1
1990	6.2	7.0	7.0	7.6	5.8	5.5	5.2	5.5
1991	3.6	3.8	3.8	4.4	3.6	3.6	3.8	3.3
1992	8.8	7.7	5.1	6.3	7.4	5.9	4.8	7.5
1993	10.1	10.1	10.1	8.3	8.5	6.5	5.6	6.9
1994	3.7	3.6	3.6	3.8	3.5	3.5	4.0	3.4
Average	**6.80**	**6.48**	**6.24**	**5.89**	**5.83**	**5.33**	**4.73**	**5.71**
Similarity		83.98%	72.19%	51.58%	52.11%	28.75%	11.76%	46.20%
Evaluation		**N**	**N**	**N**	**N**	**N**	**SB**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Elk River Mile 125

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	3.8	3.8	3.8	3.8	3.9	3.9	3.8	3.8
1988	6.8	6.4	6.6	6.7	6.7	6.7	6.5	6.1
1989	7.3	7.4	7.4	9.3	7.4	7.4	7.0	10.2
1990	9.3	9.4	9.2	4.2	9.3	9.2	9.4	9.3
1991	9.4	9.5	9.6	5.2	9.4	9.6	9.4	9.6
1992	6.2	6.1	5.9	5.8	6.2	5.9	6.2	5.4
1993	10.6	10.8	10.7	4.7	10.8	10.7	10.8	11.7
1994	9.8	10.0	9.9	5.1	9.9	9.8	10.0	8.5
Average	**7.89**	**7.92**	**7.88**	**5.59**	**7.96**	**7.90**	**7.88**	**8.08**
Similarity		98.20%	98.82%	4.00%	95.75%	99.66%	99.25%	88.29%
Evaluation		**N**	**N**	**SSB**	**N**	**N**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Cool-to-Warm Tributary Tailwaters

Metric #14: The average instantaneous water temperatures at a given location during the third through fourth weeks in August at a given location.

Data Units: Water temperatures in degrees Celsius.

Evaluation Perspective: Higher mean water temperatures during this period would indicate better summer conditions for protected species survival and growth.

Holston River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	23.6	17.9	16.5	19.0	23.4	17.1	15.6	20.4
1988	27.8	27.5	25.1	28.6	26.8	26.2	25.5	27.9
1989	22.2	18.3	17.7	17.9	21.5	17.8	17.2	19.4
1990	23.6	16.2	15.5	17.3	23.6	15.8	14.9	17.2
1991	24.6	15.2	15.0	16.6	24.6	15.5	14.7	17.7
1992	22.6	15.4	13.8	16.5	22.4	13.8	13.0	16.8
1993	22.3	14.9	13.3	16.0	22.3	13.4	12.6	16.2
1994	19.8	16.8	16.6	17.1	19.8	16.7	16.5	17.2
Average	**23.31**	**17.77**	**16.71**	**18.64**	**23.07**	**17.04**	**16.24**	**19.11**
Similarity		0.51%	0.07%	1.44%	82.60%	0.18%	0.07%	1.83%
Evaluation		SSA	SSA	SSA	N	SSA	SSA	SSA

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Hiwassee River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	15.6	18.1	18.2	20.7	18.3	19.2	18.8	18.7
1988	18.4	20.3	19.5	21.1	21.4	19.7	20.0	20.3
1989	17.4	20.6	20.6	21.2	20.5	20.6	20.8	20.9
1990	18.3	19.7	19.7	20.8	20.1	20.0	20.0	20.1
1991	18.2	19.7	19.7	20.8	20.3	19.7	19.6	20.2
1992	16.6	17.8	17.8	19.0	18.4	17.9	17.3	18.1
1993	16.9	18.8	19.1	20.4	18.9	19.4	19.0	19.2
1994	18.0	20.6	20.6	21.4	20.6	20.6	20.6	21.1
Average	**17.42**	**19.46**	**19.41**	**20.66**	**19.81**	**19.64**	**19.51**	**19.83**
Similarity		0.04%	0.04%	0.00%	0.01%	0.01%	0.04%	0.03%
Evaluation		SSB	SSB	SSB	SSB	SSB	SSB	SSB

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Elk River Mile 125

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	20.1	20.1	20.2	20.3	20.1	20.1	20.0	20.1
1988	20.2	20.2	20.4	20.6	19.0	20.4	20.2	20.2
1989	18.3	18.1	18.7	17.9	18.3	18.7	18.2	18.3
1990	18.4	18.0	21.6	21.7	18.3	21.6	18.1	18.2
1991	17.5	17.4	20.3	20.3	17.6	20.3	17.4	17.5
1992	14.4	14.2	15.7	18.0	14.4	15.7	14.3	14.4
1993	16.8	16.6	20.5	20.7	16.8	20.5	16.6	16.7
1994	16.7	16.6	17.0	17.1	16.7	17.0	16.6	16.6
Average	17.81	17.66	19.30	19.58	17.64	19.28	17.68	17.76
Similarity		87.78%	15.46%	6.94%	85.15%	15.81%	89.27%	95.65%
Evaluation		N	SB	SB	N	SB	N	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Cool-to-Warm Tributary Tailwaters

Metric #15: Difference between 90- and 10-percent instantaneous water temperatures during third through fourth weeks of August at a given location.

Data Units: Temperature range in degrees Celsius.

Evaluation Perspective: Less variation in water temperature during this period would indicate better spring conditions for protected species survival and growth.

Holston River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	4.0	4.1	2.6	3.9	4.1	2.8	1.7	4.2
1988	2.0	3.2	2.4	2.7	2.5	2.4	2.4	4.7
1989	2.7	1.7	1.6	1.6	3.4	1.6	1.4	2.4
1990	3.7	1.7	1.7	1.8	3.7	1.7	1.5	2.5
1991	3.8	1.9	1.8	3.6	3.8	1.9	1.6	2.7
1992	2.8	2.4	1.7	2.4	2.9	1.6	1.3	3.3
1993	6.3	4.2	2.2	3.8	6.3	2.3	1.7	4.4
1994	2.8	1.7	1.7	1.8	2.9	2.0	1.7	2.3
Average	3.52	2.60	1.96	2.67	3.70	2.04	1.65	3.30
Similarity		15.04%	0.66%	16.64%	78.16%	0.98%	0.17%	70.50%
Evaluation		SB	SSB	SB	N	SSB	SSB	N

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

Hiwassee River Mile 48

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	4.5	3.6	5.2	3.2	3.8	4.2	4.9	3.6
1988	7.0	3.9	4.7	4.6	5.7	4.1	4.8	3.2
1989	2.5	2.5	3.0	2.4	2.5	3.0	3.2	2.4
1990	3.2	4.1	6.2	3.0	3.1	4.7	4.7	3.6
1991	2.5	2.7	2.6	2.4	2.4	2.6	2.6	2.5
1992	2.3	2.4	3.0	2.3	2.2	2.8	2.6	2.2
1993	3.3	3.4	6.6	3.0	3.1	4.7	4.7	3.6
1994	2.4	2.2	2.2	1.6	2.2	2.2	2.2	1.6
Average	**3.48**	**3.09**	**4.18**	**2.82**	**3.13**	**3.52**	**3.71**	**2.85**
Similarity		55.16%	40.68%	33.02%	63.16%	94.61%	74.54%	34.08%
Evaluation		**N**	**N**	**N**	**N**	**N**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

Elk River Mile 125

Year	Base Case	Reservoir Recreation A	Reservoir Recreation B	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred
1987	4.6	4.6	4.5	4.5	4.6	4.6	4.7	4.6
1988	4.3	4.3	4.3	4.2	11.3	4.2	4.2	4.3
1989	7.8	7.8	7.4	8.1	7.8	7.4	7.8	7.9
1990	10.1	10.0	5.1	5.0	9.9	5.3	10.0	10.1
1991	7.9	7.9	4.5	4.6	7.8	4.6	7.8	7.8
1992	7.8	7.9	6.1	4.2	7.8	6.1	7.8	7.8
1993	9.8	10.0	4.3	4.3	9.7	4.3	9.9	9.8
1994	7.0	7.1	6.8	7.4	7.0	6.7	7.0	7.0
Average	**7.41**	**7.45**	**5.37**	**5.28**	**8.23**	**5.40**	**7.41**	**7.41**
Similarity		97.30%	3.15%	3.59%	44.20%	3.32%	99.63%	99.63%
Evaluation		**N**	**SSB**	**SSB**	**N**	**SSB**	**N**	**N**

Note: Data for the Summer Hydropower Alternative could not be generated for all modeled years.

See Evaluation Abbreviations Used in the Metric Tables on page D6b-12.

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Appendix D7

Cultural Resources

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D7.1 Cultural Resources

The following culture history summary has been abstracted from the TVA Technical Report, *Archaeological Data Analysis of the Tennessee River Valley Associated with the Tennessee Valley Authority's Reservoir Operations Study* (Ahlman et. al. 2003).

D7.1.1 Paleoindian Period (10,000-8000 BC)

The Paleoindian period is the earliest known era of human occupation in North America. A small number of Paleoindian sites with intact stratigraphy and extensive cultural material assemblages have been excavated in the TVA region, primarily in the Highland Rim region.

Paleoindian populations are characterized as small nomadic or semi-nomadic bands with settlement and subsistence strategies based on hunting and collecting wild foods. The principal subsistence appears to have been herd animals, such as caribou, although solitary animals, such as elk and moose, were hunted also.

D7.1.2 Archaic Period (8000-1000 BC)

The Paleoindian period was followed by the Archaic period that has three divisions: Early (8000-6000 BC), Middle (6000-3000 BC), and Late (3000-1000 BC). As the climate moderated from glacial conditions into temperate ranges, people diversified their subsistence economy and focused on seasonal hunting, fishing, and collecting wild plant foods. Increased efficiency resulted in more complex societies, regional variability, trade and exchange networks, and population growth.

The Early Archaic period is marked by adaptations to a changing environment and increased use of smaller species of fauna. Settlements consisted of a main residential base camp located on alluvial terraces with smaller specialized hunting and gathering camps located in the uplands.

The Middle Archaic period is associated with a warmer and drier climate and a decrease in the number of sites recorded in the upper Tennessee River Valley. In general, however, populations and territories gradually increased with a significant population increase in the Highland Rim, Coastal Plain, and Nashville Basin regions.

The Late Archaic marks an increase in population, which has been attributed to improved adaptive strategies for extracting food from the local environments. Evidence from the Watts Bar Reservoir indicates a fourfold increase in the number of sites with Late Archaic components relative to the Middle Archaic. Late Archaic sites are situated in a variety of environmental settings, but upland locations are typically small, diffuse, lithic scatters reflective of short-term extraction sites. Riverine sites are larger in size and artifact density.

D7.1.3 Gulf Formational Period (1200-600 BC)

The Gulf Formational period replaces Late Archaic and Early Woodland periods in the Cumberland Plateau and Coastal Plain regions. Subsistence during this period involved hunting and gathering with increased reliance on cultivated plants. Few Gulf Formational sites have been found within the Tennessee River Valley; most are in the western end of Wheeler Reservoir. Limited excavations of Gulf Formational and Early Woodland period components in the southern Cumberland Plateau and Coastal Plain regions have revealed a continuation of settlement from the Late Archaic with large multi-seasonal base camps and smaller base camps.

D7.1.4 Woodland Period (1000 BC-AD 900)

The Woodland period has three subperiods: Early (1000 BC-AD 100), Middle (AD 100-600), and Late (AD 600-900). Some regional variation exists, for example, in the Coastal Plain dates for the three subperiods: Early (600-200 BC); Middle (200 BC-AD 700); and Late (AD 700-900). In the southern Cumberland Plateau region, there are two, rather than three, subperiods: Middle (300 BC-AD 600) and Late (AD 600-900).

In general, shifts in settlement and subsistence patterns, as well as changes in social organization, characterize the Woodland period. Pottery and structural remains suggest a less nomadic lifestyle. Limited excavations of Early Woodland period components in the Little Tennessee River Valley revealed large multi-seasonal base camps and smaller base camps with small logistical camps located on the first, second, and older river terraces. Little is known about the Early Woodland in the Highland Rim, Coastal Plain, and Nashville Basin regions.

The Pee Dee culture, a localized manifestation of the South Appalachian Mississippian tradition, debuts in the Early Woodland in the southern Blue Ridge and Piedmont. The Pee Dee culture had palisaded villages that encompassed a habitation area, a central plaza, and a temple mound. A significant change was the introduction of maize agriculture.

Settlement and subsistence of the Middle Woodland in the Highland Rim region is fairly well known, as a result of excavated sites at Normandy Reservoir. These sites include earth ovens, large cylindrical storage pits, and summer/winter structures that indicate long-term, multi-season occupation.

The Late Woodland period is less well-known. It marks the end of the construction of burial mounds, elaborate mortuary treatments, and long-distance trade of exotic goods. Late Woodland period sites have not been widely examined. Burial mounds have been the main focus of archaeological investigation.

Late Woodland groups in North Carolina followed different trajectories. In some areas, Middle Woodland continued until the Mississippian period, while in other areas, Late Woodland developed complex social systems and agricultural economies. In some areas, Late Woodland persisted to European contact in the sixteenth century and continued through the eighteenth century, while in other areas Late Woodland was subsumed into the South Appalachian Mississippian tradition.

D7.1.5 Mississippian Period (AD 900-1600)

The Mississippian period is well known, except for the Highland Rim region. It is divided into three subperiods: Early (AD 900-1000), Middle (AD 1000-1300), and Late (AD 1300-1600). The Mississippian period marks profound changes in prehistoric settlement and subsistence patterns that reflect an increase in social complexity, the rise of chiefdoms, a reliance on maize agriculture, and an increase in population. The subperiods are characterized by changing material culture, especially pottery and personal artifacts.

This period is characterized by large village sites located on floodplains, as well as by earthen mounds, settlement hierarchy, social stratification, and agricultural economy. In addition to large villages, the Mississippian period had specialized procurement or hunting locations. In the Appalachian Summit, Mississippian sites range from small farmsteads to large palisaded villages, often with small nearby sites. Palisaded villages were located along major streams and in the tributary valleys, on or adjacent to fertile bottomland soils with houses in a circular or oval pattern around a central plaza.

The Early Mississippian is characterized by large permanent settlements situated along first terraces, square or rectangular wall-trench houses with central hearths, and occasionally platform mounds.

During the Middle Mississippian, settlements were located on high ground away from river bottoms. Houses were circular or rectangular wall-trench structures.

The peak in prehistoric social complexity and organization is represented by the Late Mississippian period. Settlements were located primarily on second terraces, and varied in size from small hamlets to large towns. During the Late Mississippian, houses were often located around a central plaza with a platform mound, and defensive palisades surrounding towns.

The Pisgah phase represents the local manifestation of the South Appalachian Mississippian tradition, and characterizes the climax of Mississippian influence in the Appalachian Summit. Pisgah phase habitation sites consist of small farmsteads and relatively large village/mound complexes, usually located on floodplains.

The localized and later Qualla phase (after AD 1300) in the Appalachian Summit is the expression of the Lamar culture, which occurs in the northern half of Georgia, Alabama, South Carolina, eastern Tennessee, and western North Carolina. In North Carolina, Qualla sites are located in the Little Tennessee and Hiwassee drainages and Pisgah sites are east of the Tuckasegee drainage.

D7.1.6 Historic Period

The historic period began with Hernando de Soto's explorations in the mid-sixteenth century. De Soto visited several Native American villages within the Tennessee River Valley watershed in western North Carolina, eastern Tennessee, and northern Georgia. Many of these villages were inundated by Fontana, Tellico, Douglas, Chickamauga, and Guntersville reservoirs. There was little European contact with Native American tribes following de Soto's journey until the early eighteenth century.

Extensive European, Euro-American, and African-American settlement in the Tennessee River Valley followed the Revolutionary War when the area was formally opened for Euro-American settlement. By this time, the Native American populations had dwindled as a result of diseases introduced by contact with Europeans. Continued Euro-American expansion in the early nineteenth century led to the forced removal of Native American groups (i.e., Cherokee, Chickasaw, and Creek).

The nineteenth century saw a division in the land-use and agricultural system between the lower and upper Tennessee River Valley. During the Antebellum period land use and agriculture in the lower valley focused on large cotton plantations. In the postbellum period many large plantations were fragmented into smaller sharecropper farms. In the upper valley, where there were few large plantations, the agricultural system was mainly small to large farmsteads with a diversified agricultural system.

The predominant agricultural economy that ruled the valley throughout the nineteenth and early twentieth centuries was replaced with an industrialized economy by the mid-twentieth century. Industrialization was quickened by the creation of TVA, the promise of cheap hydroelectric power, and a relatively cheap labor force coming out of a post-Depression era economy.

This change has replaced the historic rural agrarian culture, particularly in the area of the eastern reservoirs. The historic populations of rural, agricultural economic livelihoods are being replaced by commuting and retiree developments. Rural and agricultural landscapes are being lost to residential development, lakefront development and marina development.

Table D7-01 Chronological Sequence Summary by Physiographic Region

Broad Period	Physiographic Region					
	Blue Ridge	Valley and Ridge	Cumberland Plateau	Highland Rim	Nashville Basin	Coastal Plain
Historic	AD 1600 +	AD 1600 +	AD 1600 +	AD 1600 +	AD 1600 +	AD 1600 +
Late Mississippian	AD 1600 Qualla AD 1300	AD 1600 Mouse Creek Dallas AD 1300	AD 1600 Henry Island Hobbs Island Kogers Island AD 1300	AD 1600 AD 1300	AD 1600 AD 1200	AD 1600 Walls AD 1200
Middle Mississippian	AD 1300	AD 1300 Hiwassee Island AD 1000	AD 1300	AD 1300	AD 1200 Dowd AD 1050	AD 1200
Early Mississippian	Pisgah AD 900	AD 1000 Martin Farm AD 900	Langston AD 900	Mason AD 900	AD 1050 Spencer Ad 900	AD 900
Late Woodland	AD 900 Pee Dee/ AD 700	AD 900 Hamilton AD 700	AD 1100 Flint River AD 700	AD 900 Mason AD 600	AD 900 Mason AD 700	AD 1000 McKelvay AD 500
Middle Woodland	AD 700 Connestee 100 BC	AD 700 Candy Creek 100 BC	AD 500 Copena Colbert 300 BC	AD 600 Owl Hollow McFarland AD 100	AD 700 Owl Hollow McFarland AD 100	AD 500 Copena Colbert 300 BC
Early Woodland	100 BC Swannanoa 1000 BC	100 BC Long Branch Watts Bar 1000 BC		AD 100 Long Branch Watts Bar 1100 BC	AD 100 Wade 700 BC	300 BC Long Branch Watts Bar 1100 BC
Gulf Formational			300 BC Alexander Bluff Creek 1200 BC			300 BC Hardin Bluff Creek Perry 2000 BC

Table D7-01 Chronological Sequence Summary by Physiographic Region (continued)

Broad Period	Physiographic Region					
	Blue Ridge	Valley and Ridge	Cumberland Plateau	Highland Rim	Nashville Basin	Coastal Plain
Late Archaic	1000 BC 3000 BC	1000 BC 3000 BC	1200 BC 3000 BC	1100 BC 3000 BC	700 BC Wade Little Bear Creek Ledbetter 3000 BC	1000 BC Wade Ledbetter Benton 3000 BC
Middle Archaic	3000 BC Bifurcate Tradition Kirk 6000 BC	3000 BC Bifurcate Tradition Kirk 6000 BC	3000 BC Bifurcate Tradition Kirk 6000 BC	3000 BC Bifurcate Tradition Kirk 6000 BC	3000 BC Bifurcate Tradition Kirk 6000 BC	3000 BC Bifurcate Tradition Kirk 6000 BC
Early Archaic	6000 BC Kirk Dalton 8000 BC	6000 BC Kirk Dalton 8000 BC	6000 BC Kirk Dalton 8000 BC	6000 BC Kirk Dalton 8000 BC	6000 BC Kirk Dalton 8000 BC	6000 BC Kirk Dalton 8000 BC
Paleoindian	8000 BC Dalton Clovis 10,000 BC	8000 BC Dalton Clovis 10,000 BC	8000 BC Dalton Clovis 10,000 BC	8000 BC Dalton Clovis 10,000 BC	8000 BC Dalton Clovis 10,000 BC	8000 BC Dalton Clovis 10,000 BC

Appendix D8

Recreation

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The recreation study was designed to provide system-wide estimates of recreation user days sufficient for understanding use of the 35 projects included in the TVA ROS EIS. The following table shows the relationship between former codes used to identify policy alternatives and the names used in the main document.

RESERVOIR OPERATIONS POLICY ALTERNATIVES EVALUATED IN DETAIL

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

Table D8-01 Recreation Use (User Days) at Mainstem Projects during August, September, and October

Project	Month	Total Recreation Use	Public Access Use			Commercial Use	Private Access Use
			Reservoir	Below Dam	Combined		
Chickamauga	August	141,738	14,590	4,876	19,466	51, 133	71, 139
	September	112,362	17,274	3,787	21,061	35,560	55,741
	October	64,102	9,789	1,895	11,684	21,801	30,618
Fort Loudoun	August	68,566	7,041	2,519	9,560	24,676	34,330
	September	54,499	8,336	2,103	10,439	17,161	26,900
	October	31,070	4,724	1,049	5,773	10,521	14,776
Guntersville	August	262,204	19,356	1,033	20,389	185,413	56,401
	September	249,289	20,144	1,986	22,130	179,276	47,883
	October	145,310	15,404	1,140	16,544	92,814	35,952
Kentucky	August	414,796	24,781	4,876	29,657	345,747	39,391
	September	279,687	33,552	3,787	37,340	210,914	31,433
	October	158,549	15,109	1,895	17,003	118,138	23,407
Nickajack	August	33,651	3,327	2,443	5,770	11,659	16,221
	September	26,797	3,939	2,040	5,979	8,108	12,710
	October	15,202	2,232	1,018	3,250	4,971	6,981
Pickwick	August	89,697	19,506	3,708	23,214	26,114	40,370
	September	81,279	20,966	3,123	24,090	25,625	31,565
	October	56,902	13,683	2,053	15,736	18,245	22,920
Tellico	August	52,465	9,421	0	9,421	32,151	10,892
	September	41,591	6,118	0	6,118	26,413	9,061
	October	26,418	6,324	0	6,324	13,401	6,692
Watts Bar	August	271,784	25,193	2,519	27,711	136,201	107,872
	September	188,833	25,345	2,103	27,448	90,911	70,474
	October	116,924	9,935	1,049	10,984	62,424	43,515
Wheeler	August	181,904	19,123	2,519	21,642	67,020	93,242
	September	144,412	22,641	2,103	24,744	46,608	73,060
	October	82,585	12,831	1,049	13,880	28,574	40,131

Table D8-01 Recreation Use (User Days) at Mainstem Projects during August, September, and October (continued)

Project	Month	Total Recreation Use	Public Access Use			Commercial Use	Private Access Use
			Reservoir	Below Dam	Combined		
Wilson	August	33,901	3,094	4,876	7,970	10,844	15,086
	September	26,813	3,663	3,787	7,450	7,541	11,821
	October	15,087	2,076	1,895	3,971	4,623	6,493
Mainstem Projects	**August**	**1,550,705**	**145,433**	**29,369**	**174,802**	**890,957**	**484,945**
	September	**1,205,563**	**161,979**	**24,820**	**186,799**	**648,118**	**370,646**
	October	**712,149**	**92,108**	**13,043**	**105,151**	**375,513**	**231,486**
All Projects	**August**	**3,123,864**	**257,151**	**93,296**	**350,447**	**1,916,286**	**857,131**
	September	**2,163,347**	**271,953**	**72,941**	**344,894**	**1,204,538**	**613,915**
	October	**1,282,124**	**141,457**	**37,126**	**178,583**	**723,732**	**379,808**

Table D8-02 Recreation Use (User Days) at Run-of-River Projects during August, September, and October

Project	Month	Total Recreation Use	Public Access Use: Reservoir	Public Access Use: Below Dam	Public Access Use: Combined	Commercial Use	Private Access Use
Apalachia	August	11,205	1,836	2,519	4,355	4,668	2,182
	September	8,009	1,314	2,103	3,417	3,167	1,425
	October	4,305	752	1,049	1,801	1,796	708
Fort Patrick Henry	August	5,442	1,146	2,519	3,664	1,400	378
	September	5,159	1,771	2,103	3,874	982	303
	October	3,020	1,148	1,049	2,197	614	209
Great Falls	August	29,845	4,063	2,443	6,507	15,626	7,713
	September	21,597	4,088	2,040	6,128	10,430	5,039
	October	12,893	1,602	1,018	2,620	7,162	3,111
Melton Hill	August	25,504	5,573	1,795	7,368	12,656	5,480
	September	24,638	9,713	1,645	11,358	8,877	4,403
	October	16,000	6,868	550	7,417	5,552	3,032
Ocoee #1	August	13,251	1,591	2,519	4,110	6,120	3,021
	September	9,763	1,601	2,103	3,704	4,085	1,973
	October	5,701	628	1,049	1,677	2,805	1,219
Ocoee #2	August	59,619	0	5,614	5,614	54,005	0
	September	30,300	0	3,392	3,392	26,908	0
	October	7,931	0	2,001	2,001	5,930	0
Ocoee #3	August	13,004	0	2,519	2,519	10,485	0
	September	5,606	0	1,467	1,467	4,139	0
	October	1,049	0	1,049	1,049	0	0
Wilbur	August	6,200	280	4,876	5,156	711	332
	September	4,687	200	3,787	3,987	483	217
	October	2,391	115	1,895	2,009	274	108
Run-of-River Projects	**August**	**164,070**	**14,489**	**24,804**	**39,293**	**105,671**	**19,105**
	September	**109,759**	**18,687**	**18,641**	**37,327**	**59,071**	**13,361**
	October	**53,291**	**11,112**	**9,660**	**20,772**	**24,132**	**8,387**
All Projects	**August**	**3,123,864**	**257,151**	**93,296**	**350,447**	**1,916,286**	**857,131**
	September	**2,163,347**	**271,953**	**72,941**	**344,894**	**1,204,538**	**613,915**
	October	**1,282,124**	**141,457**	**37,126**	**178,583**	**723,732**	**379,808**

Table D8-03 Recreation Use (User Days) at Tributary Projects during August, September, and October

Project	Month	Total Recreation Use	Public Access Use			Commercial Use	Private Access Use
			Reservoir	Below Dam	Combined		
Bear Creek	August	11,874	1,761	0	1,761	6,771	3,342
	September	8,475	1,771	0	1,771	4,520	2,183
	October	5,146	694	0	694	3,103	1,348
Blue Ridge	August	26,780	2,826	2,443	5,270	5,983	15,527
	September	21,237	4,025	2,040	6,065	5,313	9,859
	October	12,648	881	1,018	1,899	5,566	5,184
Boone	August	14,381	4,678	2,443	7,122	5,716	1,543
	September	14,521	7,232	2,040	9,272	4,010	1,239
	October	9,068	4,689	1,018	5,707	2,508	853
Cedars	August	18,953	2,810	0	2,810	10,808	5,335
	September	13,527	2,827	0	2,827	7,214	3,485
	October	8,214	1,108	0	1,108	4,954	2,152
Chatuge	August	106,121	7,305	2,443	9,748	54,480	41,893
	September	68,082	5,877	2,040	7,917	34,067	26,098
	October	38,071	919	1,018	1,937	19,519	16,616
Cherokee	August	190,296	4,556	2,519	7,075	143,760	39,461
	September	129,655	10,672	2,103	12,775	88,060	28,820
	October	82,912	1,835	1,049	2,884	60,030	19,998
Douglas	August	136,050	8,645	4,482	13,127	56,966	65,957
	September	75,984	3,551	2,393	5,943	31,881	38,160
	October	54,522	2,788	1,743	4,531	29,652	20,339
Fontana	August	68,015	13,862	2,443	16,306	35,239	16,469
	September	46,625	9,919	2,040	11,959	23,905	10,760
	October	25,596	5,675	1,018	6,693	13,557	5,346
Hiawassee	August	19,951	2,802	0	2,802	8,296	8,853
	September	11,164	2,076	0	2,076	3,079	6,009
	October	6,611	2,184	0	2,184	1,056	3,371
Little Bear Creek	August	10,276	1,524	0	1,524	5,860	2,892
	September	7,334	1,533	0	1,533	3,911	1,890
	October	4,453	601	0	601	2,686	1,167

Table D8-03 Recreation Use (User Days) at Tributary Projects during August, September, and October (continued)

Project	Month	Total Recreation Use	Public Access Use			Commercial Use	Private Access Use
			Reservoir	Below Dam	Combined		
Normandy	August	19,668	2,543	2,519	5,062	9,779	4,827
	September	14,342	2,558	2,103	4,661	6,528	3,153
	October	8,481	1,003	1,049	2,052	4,482	1,947
Norris	August	509,558	8,239	6,007	14,246	430,472	64,840
	September	240,875	8,092	3,692	11,784	184,257	44,834
	October	147,420	2,772	1,472	4,245	112,359	30,816
Nottely	August	25,758	3,457	2,443	5,900	13,295	6,562
	September	18,679	3,478	2,040	5,518	8,874	4,287
	October	11,122	1,363	1,018	2,381	6,094	2,647
South Holston	August	78,293	11,775	6,340	18,115	44,754	15,424
	September	56,667	8,882	4,783	13,665	33,173	9,830
	October	29,523	3,569	1,922	5,490	19,574	4,458
Tims Ford	August	117,694	10,776	2,519	13,295	58,258	46,141
	September	81,975	10,841	2,103	12,944	38,886	30,144
	October	50,613	4,250	1,049	5,299	26,701	18,613
Upper Bear Creek	August	26,496	3,555	2,519	6,074	13,673	6,749
	September	19,215	3,577	2,103	5,680	9,126	4,409
	October	11,440	1,402	1,049	2,451	6,267	2,722
Watauga	August	28,925	6,115	0	6,115	15,545	7,265
	September	19,668	4,376	0	4,376	10,545	4,747
	October	10,842	2,503	0	2,503	5,980	2,358
Tributary Projects	**August**	**1,409,089**	**97,229**	**39,122**	**136,351**	**919,658**	**353,080**
	September	**848,025**	**91,288**	**29,480**	**120,768**	**497,350**	**229,907**
	October	**516,684**	**38,237**	**14,423**	**52,661**	**324,087**	**139,936**
All Projects	**August**	**3,123,864**	**257,151**	**93,296**	**350,447**	**1,916,286**	**857,131**
	September	**2,163,347**	**271,953**	**72,941**	**344,894**	**1,204,538**	**613,915**
	October	**1,282,124**	**141,457**	**37,126**	**178,583**	**723,732**	**379,808**

Table D8-04 Recreation Use (User Days) at Mainstem Projects by Policy Alternative during August, September, and October

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Mainstem projects	Base	3,468,417	--	399,520	--	67,232	--	1,914,588	--	1,087,077	--
	2A	4,143,877	19.5%	409,028	2.4%	65,903	-2.0%	1,942,506	1.5%	1,726,440	58.8%
	3C	4,250,250	22.5%	414,407	3.7%	66,515	-1.1%	1,956,872	2.2%	1,812,456	66.7%
	4D	2,769,937	-20.1%	389,568	-2.5%	65,048	-3.2%	1,889,978	-1.3%	425,343	-60.9%
	5A	3,532,986	1.9%	398,070	-0.4%	62,500	-7.0%	1,895,678	-1.0%	1,176,737	8.2%
	6A	3,402,367	-1.9%	399,374	0.0%	67,178	-0.1%	1,913,943	0.0%	1,021,873	-6.0%
	7C	4,244,159	22.4%	413,699	3.5%	66,173	-1.6%	1,953,573	2.0%	1,810,714	66.6%
	8A	4,174,356	20.4%	414,304	3.7%	66,175	-1.6%	1,960,142	2.4%	1,733,734	59.5%
	Preferred	4,085,987	17.8%	406,309	1.7%	66,662	-0.8%	1,926,465	0.6%	1,686,551	55.1%
Chickamauga	Base	318,202	--	41,654	--	10,558	--	108,493	--	157,497	--
	2A	439,761	38.2%	43,478	4.4%	9,617	-8.9%	113,244	4.4%	273,423	73.6%
	3C	450,213	41.5%	44,482	6.8%	9,686	-8.3%	115,861	6.8%	280,185	77.9%
	4D	205,749	-35.3%	39,451	-5.3%	9,881	-6.4%	102,756	-5.3%	53,662	-65.9%
	5A	208,990	-34.3%	39,307	-5.6%	7,907	-25.1%	102,380	-5.6%	59,396	-62.3%
	6A	296,786	-6.7%	41,532	-0.3%	10,526	-0.3%	108,176	-0.3%	136,553	-13.3%
	7C	447,318	40.6%	43,993	5.6%	9,496	-10.1%	114,587	5.6%	279,243	77.3%
	8A	450,356	41.5%	44,555	7.0%	9,604	-9.0%	116,049	7.0%	280,149	77.9%
	Preferred	414,995	30.4%	42,526	2.1%	9,879	-6.4%	110,766	2.1%	251,823	59.9%
Fort Loudoun	Base	154,135	--	20,101	--	5,671	--	52,357	--	76,006	--
	2A	221,091	43.4%	21,963	9.3%	6,052	6.7%	57,206	9.3%	135,869	78.8%
	3C	218,486	41.7%	23,103	14.9%	6,348	11.9%	60,175	14.9%	128,860	69.5%
	4D	95,938	-37.8%	18,791	-6.5%	5,346	-5.7%	48,943	-6.5%	22,858	-69.9%
	5A	178,726	16.0%	21,582	7.4%	5,884	3.7%	56,215	7.4%	95,046	25.1%
	6A	147,096	-4.6%	20,194	0.5%	5,687	0.3%	52,598	0.5%	68,617	-9.7%
	7C	219,678	42.5%	23,268	15.8%	6,384	12.6%	60,604	15.8%	129,422	70.3%
	8A	218,462	41.7%	23,282	15.8%	6,400	12.8%	60,641	15.8%	128,140	68.6%
	Preferred	218,144	-31.4%	21,410	6.5%	5,932	4.6%	55,764	6.5%	135,039	77.7%

Table D8-04 Recreation Use (User Days) at Mainstem Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Guntersville	Base	656,803	--	54,905	--	4,159	--	457,504	--	140,236	--
	2A	722,100	9.9%	55,449	1.0%	4,230	1.7%	462,040	1.0%	200,381	42.9%
	3C	745,326	13.5%	55,800	1.6%	4,287	3.1%	464,966	1.6%	220,272	57.1%
	4D	566,337	-13.8%	53,802	-2.0%	4,020	-3.3%	448,315	-2.0%	60,199	-57.1%
	5A	748,648	14.0%	56,154	2.3%	4,309	3.6%	467,916	2.3%	220,268	57.1%
	6A	656,723	0.0%	54,896	0.0%	4,158	0.0%	457,433	0.0%	140,236	0.0%
	7C	746,318	13.6%	55,907	1.8%	4,289	3.1%	465,854	1.8%	220,268	57.1%
	8A	721,010	9.8%	55,333	0.8%	4,222	1.5%	461,073	0.8%	200,381	42.9%
	Preferred	748,977	14.0%	56,189	2.3%	4,314	3.7%	468,206	2.3%	220,268	57.1%
Kentucky	Base	853,031	--	73,442	--	10,558	--	674,800	--	94,231	--
	2A	891,972	4.6%	72,465	-1.3%	10,290	-2.5%	665,823	-1.3%	143,395	52.2%
	3C	893,925	4.8%	71,669	-2.4%	10,062	-4.7%	658,510	-2.4%	153,684	63.1%
	4D	830,339	-2.7%	75,593	2.9%	11,069	4.8%	694,565	2.9%	49,113	-47.9%
	5A	881,862	3.4%	71,263	-3.0%	10,014	-5.2%	654,784	-3.0%	145,801	54.7%
	6A	853,172	0.0%	73,456	0.0%	10,559	0.0%	674,926	0.0%	94,231	0.0%
	7C	893,144	4.7%	71,593	-2.5%	10,055	-4.8%	657,814	-2.5%	153,682	63.1%
	8A	891,988	4.6%	72,466	-1.3%	10,291	-2.5%	665,836	-1.3%	143,395	52.2%
	Preferred	828,914	-2.8%	71,126	-3.2%	10,032	-5.0%	653,524	-3.2%	94,231	0.0%
Nickajack	Base	75,650	--	9,498	--	5,501	--	24,739	--	35,913	--
	2A	103,093	36.3%	9,914	4.4%	5,011	-8.9%	25,822	4.4%	62,346	73.6%
	3C	105,496	39.5%	10,143	6.8%	5,046	-8.3%	26,419	6.8%	63,888	77.9%
	4D	49,810	-34.2%	8,996	-5.3%	5,148	-6.4%	23,430	-5.3%	12,236	-65.9%
	5A	49,971	-33.9%	8,963	-5.6%	4,120	-25.1%	23,345	-5.6%	13,543	-62.3%
	6A	70,758	-6.5%	9,470	-0.3%	5,485	-0.3%	24,666	-0.3%	31,137	-13.3%
	7C	104,780	38.5%	10,031	5.6%	4,947	-10.1%	26,128	5.6%	63,673	77.3%
	8A	105,505	39.5%	10,159	7.0%	5,004	-9.0%	26,462	7.0%	63,880	77.9%
	Preferred	97,522	28.9%	9,697	2.1%	5,148	-6.4%	25,257	2.1%	57,421	59.9%

Table D8-04 Recreation Use (User Days) at Mainstem Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Pickwick	Base	227,878	--	54,155	--	8,884	--	69,984	--	94,855	--
	2A	269,942	18.5%	54,692	1.0%	9,035	1.7%	70,678	1.0%	135,537	42.9%
	3C	284,312	24.8%	55,039	1.6%	9,157	3.1%	71,125	1.6%	148,992	57.1%
	4D	170,952	-25.0%	53,068	-2.0%	8,588	-3.3%	68,578	-2.0%	40,718	-57.1%
	5A	285,158	25.1%	55,388	2.3%	9,205	3.6%	71,577	2.3%	148,989	57.1%
	6A	227,857	0.0%	54,147	0.0%	8,882	0.0%	69,973	0.0%	94,855	0.0%
	7C	284,556	24.9%	55,144	1.8%	9,162	3.1%	71,261	1.8%	148,989	57.1%
	8A	269,665	18.3%	54,578	0.8%	9,019	1.5%	70,530	0.8%	135,537	42.9%
	Preferred	285,247	25.2%	55,422	2.3%	9,215	3.7%	71,621	2.3%	148,989	57.1%
Tellico	Base	120,474	--	21,864	--	0	--	71,965	--	26,645	--
	2A	150,151	24.6%	23,889	9.3%	0	--	78,631	9.3%	47,631	78.8%
	3C	153,015	27.0%	25,129	14.9%	0	--	82,712	14.9%	45,174	69.5%
	4D	95,725	-20.5%	20,438	-6.5%	0	--	67,273	-6.5%	8,013	-69.9%
	5A	134,062	11.3%	23,475	7.4%	0	--	77,268	7.4%	33,320	25.1%
	6A	118,317	-1.8%	21,965	0.5%	0	--	72,298	0.5%	24,055	-9.7%
	7C	153,980	27.8%	25,308	15.8%	0	--	83,301	15.8%	45,371	70.3%
	8A	153,596	27.5%	25,323	15.8%	0	--	83,352	15.8%	44,921	68.6%
	Preferred	147,276	22.2%	23,287	6.5%	0	--	76,649	6.5%	47,340	77.7%
Watts Bar	Base	577,541	--	60,472	--	5,671	--	289,536	--	221,861	--
	2A	755,662	30.8%	63,120	4.4%	5,166	-8.9%	302,214	4.4%	385,162	73.6%
	3C	773,666	34.0%	64,579	6.8%	5,203	-8.3%	309,198	6.8%	394,687	77.9%
	4D	412,398	-28.6%	57,274	-5.3%	5,308	-6.4%	274,225	-5.3%	75,591	-65.9%
	5A	418,204	-27.6%	57,065	-5.6%	4,247	-25.1%	273,223	-5.6%	83,668	-62.3%
	6A	546,995	-5.3%	60,295	-0.3%	5,654	-0.3%	288,689	-0.3%	192,357	-13.3%
	7C	768,127	33.0%	63,869	5.6%	5,101	-10.1%	305,798	5.6%	393,360	77.3%
	8A	774,179	34.0%	64,684	7.0%	5,159	-9.0%	309,701	7.0%	394,636	77.9%
	Preferred	717,383	24.2%	61,739	2.1%	5,307	-6.4%	295,603	2.1%	354,734	59.9%

Table D8-04 Recreation Use (User Days) at Mainstem Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Wheeler	Base	408,902	--	54,596	--	5,671	--	142,202	--	206,433	--
	2A	499,486	22.2%	55,137	1.0%	5,767	1.7%	143,612	1.0%	294,970	42.9%
	3C	530,104	29.6%	55,486	1.6%	5,845	3.1%	144,522	1.6%	324,251	57.1%
	4D	286,943	-29.8%	53,499	-2.0%	5,482	-3.3%	139,346	-2.0%	88,615	-57.1%
	5A	531,397	30.0%	55,838	2.3%	5,876	3.6%	145,439	2.3%	324,244	57.1%
	6A	408,870	0.0%	54,587	0.0%	5,670	0.0%	142,180	0.0%	206,433	0.0%
	7C	530,483	29.7%	55,592	1.8%	5,849	3.1%	144,798	1.8%	324,244	57.1%
	8A	499,061	22.0%	55,022	0.8%	5,758	1.5%	143,312	0.8%	294,970	42.9%
	Preferred	531,528	30.0%	55,873	2.3%	5,883	3.7%	145,529	2.3%	324,244	57.1%
Wilson	Base	75,800	--	8,834	--	10,558	--	23,008	--	33,401	--
	2A	90,620	19.6%	8,921	1.0%	10,737	1.7%	23,236	1.0%	47,726	42.9%
	3C	95,706	26.3%	8,978	1.6%	10,882	3.1%	23,383	1.6%	52,463	57.1%
	4D	55,746	-26.5%	8,656	-2.0%	10,206	-3.3%	22,546	-2.0%	14,338	-57.1%
	5A	95,968	26.6%	9,035	2.3%	10,939	3.6%	23,532	2.3%	52,462	57.1%
	6A	75,793	0.0%	8,832	0.0%	10,556	0.0%	23,005	0.0%	33,401	0.0%
	7C	95,774	26.4%	8,995	1.8%	10,889	3.1%	23,428	1.8%	52,462	57.1%
	8A	90,535	19.4%	8,902	0.8%	10,719	1.5%	23,188	0.8%	47,726	42.9%
	Preferred	96,001	26.6%	9,040	2.3%	10,952	3.7%	23,546	2.3%	52,462	57.1%

Note: Base = Base Case

[1] Alt. = Alternative. The chart to the right shows the relationship of the former codes used for policy alternatives and the names used in the main document.

[2] Percentages calculated relative to the August through October use numbers for the Base Case. Use numbers consider both internal and external recreation users.

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

Table D8-05 Recreation Use (User Days) at Run-of-River Projects by Policy Alternative during August, September, and October

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Run-of-river projects	Base	327,120	--	44,288	--	53,105	--	188,874	--	40,853	--
	2A	361,268	10.4%	46,941	6.0%	53,178	0.1%	192,845	2.1%	68,304	67.2%
	3C	365,263	11.7%	48,177	8.8%	52,907	-0.4%	194,923	3.2%	69,257	69.5%
	4D	278,848	-14.8%	42,754	-3.5%	47,978	-9.7%	171,595	-9.1%	16,522	-59.6%
	5A	335,404	2.5%	45,960	3.8%	51,609	-2.8%	190,346	0.8%	47,490	16.2%
	6A	324,532	-0.8%	44,349	0.1%	53,021	-0.2%	188,965	0.0%	38,197	-6.5%
	7C	364,526	11.4%	48,130	8.7%	52,374	-1.4%	194,765	3.1%	69,257	69.5%
	8A	342,995	4.9%	48,159	8.7%	47,507	-10.5%	179,935	-4.7%	67,393	65.0%
	Preferred	347,234	6.1%	45,734	3.3%	52,615	-0.9%	190,429	0.8%	58,456	43.1%
Apalachia	Base	23,519	--	3,902	--	5,671	--	9,630	--	4,315	--
	2A	26,782	13.9%	4,073	4.4%	5,166	-8.9%	10,052	4.4%	7,491	73.6%
	3C	27,330	16.2%	4,167	6.8%	5,203	-8.3%	10,284	6.8%	7,677	77.9%
	4D	19,595	-16.7%	3,696	-5.3%	5,308	-6.4%	9,121	-5.3%	1,470	-65.9%
	5A	18,644	-20.7%	3,682	-5.6%	4,247	-25.1%	9,088	-5.6%	1,627	-62.3%
	6A	22,888	-2.7%	3,891	-0.3%	5,654	-0.3%	9,602	-0.3%	3,741	-13.3%
	7C	27,044	15.0%	4,121	5.6%	5,101	-10.1%	10,171	5.6%	7,651	77.3%
	8A	27,309	16.1%	4,174	7.0%	5,159	-9.0%	10,301	7.0%	7,676	77.9%
	Preferred	26,022	10.6%	3,984	2.1%	5,307	-6.4%	9,832	2.1%	6,899	59.9%
Fort Patrick Henry	Base	13,622	--	4,065	--	5,671	--	2,996	--	890	--
	2A	14,909	9.5%	4,216	3.7%	5,975	5.4%	3,107	3.7%	1,612	81.1%
	3C	14,243	4.6%	3,967	-2.4%	5,764	1.6%	2,924	-2.4%	1,588	78.4%
	4D	13,916	2.2%	4,342	6.8%	5,923	4.4%	3,200	6.8%	451	-49.4%
	5A	15,319	12.5%	4,374	7.6%	6,097	7.5%	3,223	7.6%	1,625	82.6%
	6A	13,533	-0.7%	4,030	-0.8%	5,642	-0.5%	2,970	-0.8%	890	0.0%
	7C	13,879	1.9%	3,840	-5.5%	5,638	-0.6%	2,830	-5.5%	1,570	76.4%
	8A	14,112	3.6%	3,920	-3.6%	5,718	0.8%	2,889	-3.6%	1,585	78.0%
	Preferred	14,601	7.2%	4,117	1.3%	5,832	2.8%	3,034	1.3%	1,619	81.9%

Table D8-05 Recreation Use (User Days) at Run-of-River Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Great Falls	Base	64,335	--	9,753	--	5,501	--	33,218	--	15,863	--
	2A	72,953	13.4%	9,843	0.9%	5,448	-1.0%	33,524	0.9%	24,139	52.2%
	3C	75,084	16.7%	9,922	1.7%	5,500	0.0%	33,791	1.7%	25,871	63.1%
	4D	56,888	-11.6%	9,754	0.0%	5,645	2.6%	33,221	0.0%	8,267	-47.9%
	5A	73,533	14.3%	9,874	1.2%	5,484	-0.3%	33,631	1.2%	24,544	54.7%
	6A	64,448	0.2%	9,774	0.2%	5,523	0.4%	33,288	0.2%	15,863	0.0%
	7C	75,121	16.8%	9,929	1.8%	5,504	0.1%	33,817	1.8%	25,870	63.1%
	8A	72,403	12.5%	9,748	-0.1%	5,316	-3.4%	33,200	-0.1%	24,139	52.2%
	Preferred	62,976	-2.1%	9,536	-2.2%	5,098	-7.3%	32,479	-2.2%	15,863	0.0%
Melton Hill	Base	66,142	--	22,153	--	3,990	--	27,085	--	12,915	--
	2A	81,143	22.7%	24,205	9.3%	4,258	6.7%	29,594	9.3%	23,086	78.8%
	3C	82,952	25.4%	25,461	14.9%	4,465	11.9%	31,130	14.9%	21,895	69.5%
	4D	53,672	-18.9%	20,709	-6.5%	3,761	-5.7%	25,319	-6.5%	3,884	-69.9%
	5A	73,155	10.6%	23,785	7.4%	4,139	3.7%	29,081	7.4%	16,150	25.1%
	6A	65,125	-1.5%	22,255	0.5%	4,001	0.3%	27,210	0.5%	11,659	-9.7%
	7C	83,476	26.2%	25,643	15.8%	4,491	12.6%	31,351	15.8%	21,991	70.3%
	8A	83,304	25.9%	25,658	15.8%	4,502	12.8%	31,370	15.8%	21,773	68.6%
	Preferred	79,561	20.3%	23,595	6.5%	4,173	4.6%	28,848	6.5%	22,945	77.7%
Ocoee #1	Base	28,715	--	3,820	--	5,671	--	13,010	--	6,213	--
	2A	33,519	16.7%	3,987	4.4%	5,166	-8.9%	13,580	4.4%	10,786	73.6%
	3C	34,229	19.2%	4,079	6.8%	5,203	-8.3%	13,894	6.8%	11,053	77.9%
	4D	23,365	-18.6%	3,618	-5.3%	5,308	-6.4%	12,322	-5.3%	2,117	-65.9%
	5A	22,472	-21.7%	3,605	-5.6%	4,247	-25.1%	12,277	-5.6%	2,343	-62.3%
	6A	27,822	-3.1%	3,809	-0.3%	5,654	-0.3%	12,972	-0.3%	5,387	-13.3%
	7C	33,892	18.0%	4,035	5.6%	5,101	-10.1%	13,741	5.6%	11,015	77.3%
	8A	34,212	19.1%	4,086	7.0%	5,159	-9.0%	13,917	7.0%	11,051	77.9%
	Preferred	32,424	12.9%	3,900	2.1%	5,307	-6.4%	13,283	2.1%	9,934	59.9%

Table D8-05 Recreation Use (User Days) at Run-of-River Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Ocoee #2	Base	97,850	--	0	--	11,007	--	86,843	--	0	--
	2A	97,850	0.0%	0	--	11,007	0.0%	86,843	0.0%	0	--
	3C	97,850	0.0%	0	--	11,007	0.0%	86,843	0.0%	0	--
	4D	97,850	0.0%	0	--	11,007	0.0%	86,843	0.0%	0	--
	5A	97,850	0.0%	0	--	11,007	0.0%	86,843	0.0%	0	--
	6A	97,850	0.0%	0	--	11,007	0.0%	86,843	0.0%	0	--
	7C	97,850	0.0%	0	--	11,007	0.0%	86,843	0.0%	0	--
	8A	97,850	0.0%	0	--	11,007	0.0%	86,843	0.0%	0	--
	Preferred	97,850	0.0%	0	--	11,007	0.0%	86,843	0.0%	0	--
Ocoee #3	Base	19,659	--	0	--	5,035	--	14,624	--	0	--
	2A	19,659	0.0%	0	--	5,035	0.0%	14,624	0.0%	0	--
	3C	19,659	0.0%	0	--	5,035	0.0%	14,624	0.0%	0	--
	4D	0	-100.0%	0	--	0	-100.0%	0	-100.0%	0	--
	5A	19,659	0.0%	0	--	5,035	0.0%	14,624	0.0%	0	--
	6A	19,659	0.0%	0	--	5,035	0.0%	14,624	0.0%	0	--
	7C	19,659	0.0%	0	--	5,035	0.0%	14,624	0.0%	0	--
	8A	0	-100.0%	0	--	0	-100.0%	0	-100.0%	0	--
	Preferred	19,659	0.0%	0	--	5,035	0.0%	14,624	0.0%	0	--
Wilbur	Base	13,278	--	595	--	10,558	--	1,467	--	658	--
	2A	14,453	8.8%	617	3.7%	11,123	5.4%	1,522	3.7%	1,191	81.1%
	3C	13,916	4.8%	580	-2.4%	10,730	1.6%	1,432	-2.4%	1,173	78.4%
	4D	13,563	2.1%	635	6.8%	11,027	4.4%	1,568	6.8%	333	-49.4%
	5A	14,771	11.2%	640	7.6%	11,351	7.5%	1,579	7.6%	1,201	82.6%
	6A	13,206	-0.5%	590	-0.8%	10,504	-0.5%	1,455	-0.8%	658	0.0%
	7C	13,605	2.5%	562	-5.5%	10,497	-0.6%	1,386	-5.5%	1,160	76.4%
	8A	13,805	4.0%	573	-3.6%	10,646	0.8%	1,415	-3.6%	1,170	78.0%
	Preferred	14,141	6.5%	602	1.3%	10,857	2.8%	1,486	1.3%	1,196	81.9%

Table D8-05 Recreation Use (User Days) at Run-of-River Projects by Policy Alternative during August, September, and October (continued)

Note: Base = Base Case.

[1] Alt. = Alternative. The chart to the right shows the relationship of the former codes used for policy alternatives and the names used in the main document.

[2] Percentages calculated relative to the August through October use numbers for the Base Case. Use numbers consider both internal and external recreation users.

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

Table D8-06 Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Tributary projects	Base	2,773,798	--	226,754	--	83,025	--	1,741,095	--	722,924	--
	2A	3,402,655	22.7%	236,192	4.2%	85,243	2.7%	1,862,435	7.0%	1,218,785	68.6%
	3C	3,498,529	26.1%	248,539	9.6%	89,777	8.1%	1,952,155	12.1%	1,208,058	67.1%
	4D	2,251,311	-18.8%	223,598	-1.4%	80,239	-3.4%	1,663,652	-4.4%	283,822	-60.7%
	5A	2,945,333	6.2%	223,503	-1.4%	78,240	-5.8%	1,805,413	3.7%	838,177	15.9%
	6A	2,722,470	-1.9%	226,222	-0.2%	82,905	-0.1%	1,744,294	0.2%	669,049	-7.5%
	7C	3,506,354	26.4%	248,533	9.6%	89,642	8.0%	1,959,364	12.5%	1,208,815	67.2%
	8A	3,492,120	25.9%	250,298	10.4%	89,987	8.4%	1,964,151	12.8%	1,187,684	64.3%
	Preferred	3,302,700	19.1%	237,481	4.7%	85,309	2.8%	1,834,088	5.3%	1,145,822	58.5%
Bear Creek	Base	25,495	--	4,226	--	0	--	14,395	--	6,874	--
	2A	28,628	12.3%	4,268	1.0%	0	--	14,537	1.0%	9,822	42.9%
	3C	29,722	16.6%	4,295	1.6%	0	--	14,629	1.6%	10,797	57.1%
	4D	21,198	-16.9%	4,142	-2.0%	0	--	14,105	-2.0%	2,951	-57.1%
	5A	29,841	17.0%	4,323	2.3%	0	--	14,722	2.3%	10,797	57.1%
	6A	25,492	0.0%	4,226	0.0%	0	--	14,392	0.0%	6,874	0.0%
	7C	29,758	16.7%	4,304	1.8%	0	--	14,657	1.8%	10,797	57.1%
	8A	28,588	12.1%	4,259	0.8%	0	--	14,507	0.8%	9,822	42.9%
	Preferred	29,853	17.1%	4,325	2.3%	0	--	14,731	2.3%	10,797	57.1%
Blue Ridge	Base	60,665	--	7,732	--	5,501	--	16,862	--	30,570	--
	2A	83,753	38.1%	8,071	4.4%	5,011	-8.9%	17,600	4.4%	53,072	73.6%
	3C	85,695	41.3%	8,257	6.8%	5,046	-8.3%	18,007	6.8%	54,384	77.9%
	4D	38,858	-35.9%	7,323	-5.3%	5,148	-6.4%	15,970	-5.3%	10,416	-65.9%
	5A	38,857	-35.9%	7,297	-5.6%	4,120	-25.1%	15,912	-5.6%	11,529	-62.3%
	6A	56,512	-6.8%	7,710	-0.3%	5,485	-0.3%	16,812	-0.3%	26,505	-13.3%
	7C	85,124	40.3%	8,167	5.6%	4,947	-10.1%	17,809	5.6%	54,201	77.3%
	8A	85,688	41.2%	8,271	7.0%	5,004	-9.0%	18,036	7.0%	54,377	77.9%
	Preferred	79,136	30.4%	7,894	2.1%	5,148	-6.4%	17,215	2.1%	48,879	59.9%

Table D8-06 Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Boone	Base	37,970	--	16,600	--	5,501	--	12,234	--	3,635	--
	2A	42,283	11.4%	17,217	3.7%	5,796	5.4%	12,689	3.7%	6,582	81.1%
	3C	40,220	5.9%	16,202	-2.4%	5,591	1.6%	11,941	-2.4%	6,486	78.4%
	4D	38,389	1.1%	17,734	6.8%	5,745	4.4%	13,069	6.8%	1,840	-49.4%
	5A	43,577	14.8%	17,862	7.6%	5,914	7.5%	13,164	7.6%	6,637	82.6%
	6A	37,697	-0.7%	16,459	-0.8%	5,473	-0.5%	12,130	-0.8%	3,635	0.0%
	7C	39,123	3.0%	15,683	-5.5%	5,469	-0.6%	11,558	-5.5%	6,412	76.4%
	8A	39,825	4.9%	16,009	-3.6%	5,547	0.8%	11,798	-3.6%	6,471	78.0%
	Preferred	41,470	9.2%	16,812	1.3%	5,657	2.8%	12,390	1.3%	6,611	81.9%
Cedar Creek	Base	40,694	--	6,746	--	0	--	22,976	--	10,972	--
	2A	45,694	12.3%	6,813	1.0%	0	--	23,204	1.0%	15,677	42.9%
	3C	47,440	16.6%	6,856	1.6%	0	--	23,351	1.6%	17,233	57.1%
	4D	33,835	-16.9%	6,611	-2.0%	0	--	22,514	-2.0%	4,710	-57.1%
	5A	47,632	17.0%	6,900	2.3%	0	--	23,499	2.3%	17,233	57.1%
	6A	40,689	0.0%	6,745	0.0%	0	--	22,972	0.0%	10,972	0.0%
	7C	47,498	16.7%	6,869	1.8%	0	--	23,395	1.8%	17,233	57.1%
	8A	45,631	12.1%	6,799	0.8%	0	--	23,155	0.8%	15,677	42.9%
	Preferred	47,650	17.1%	6,904	2.3%	0	--	23,513	2.3%	17,233	57.1%
Chatuge	Base	212,275	--	14,101	--	5,501	--	108,066	--	84,607	--
	2A	279,409	31.6%	14,718	4.4%	5,011	-8.9%	112,798	4.4%	146,881	73.6%
	3C	286,024	34.7%	15,059	6.8%	5,046	-8.3%	115,405	6.8%	150,514	77.9%
	4D	149,682	-29.5%	13,355	-5.3%	5,148	-6.4%	102,351	-5.3%	28,827	-65.9%
	5A	151,311	-28.7%	13,307	-5.6%	4,120	-25.1%	101,978	-5.6%	31,907	-62.3%
	6A	200,649	-5.5%	14,060	-0.3%	5,485	-0.3%	107,750	-0.3%	73,355	-13.3%
	7C	283,984	33.8%	14,893	5.6%	4,947	-10.1%	114,136	5.6%	150,008	77.3%
	8A	286,174	34.8%	15,083	7.0%	5,004	-9.0%	115,592	7.0%	150,494	77.9%
	Preferred	265,152	24.9%	14,396	2.1%	5,148	-6.4%	110,331	2.1%	135,278	59.9%

Table D8-06 Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Cherokee	Base	402,863	--	17,063	--	5,671	--	291,849	--	88,279	--
	2A	501,387	24.5%	18,644	9.3%	6,052	6.7%	318,881	9.3%	157,809	78.8%
	3C	511,059	26.9%	19,611	14.9%	6,348	11.9%	335,432	14.9%	149,668	69.5%
	4D	320,666	-20.4%	15,951	-6.5%	5,346	-5.7%	272,820	-6.5%	26,550	-69.9%
	5A	447,951	11.2%	18,320	7.4%	5,884	3.7%	313,353	7.4%	110,394	25.1%
	6A	395,722	-1.8%	17,142	0.5%	5,687	0.3%	293,196	0.5%	79,697	-9.7%
	7C	514,278	27.7%	19,751	15.8%	6,384	12.6%	337,821	15.8%	150,322	70.3%
	8A	513,020	27.3%	19,763	15.8%	6,400	12.8%	338,026	15.8%	148,832	68.6%
	Preferred	491,794	22.1%	18,174	6.5%	5,932	4.6%	310,843	6.5%	156,845	77.7%
Douglas	Base	266,556	--	14,983	--	8,619	--	118,499	--	124,455	--
	2A	377,522	41.6%	16,371	9.3%	9,198	6.7%	129,475	9.3%	222,478	78.8%
	3C	374,063	40.3%	17,221	14.9%	9,646	11.9%	136,195	14.9%	211,001	69.5%
	4D	170,332	-36.1%	14,006	-6.5%	8,124	-5.7%	110,773	-6.5%	37,430	-69.9%
	5A	307,891	15.5%	16,087	7.4%	8,941	3.7%	127,230	7.4%	155,632	25.1%
	6A	255,097	-4.3%	15,052	0.5%	8,642	0.3%	119,046	0.5%	112,356	-9.7%
	7C	376,133	41.1%	17,343	15.8%	9,702	12.6%	137,165	15.8%	211,922	70.3%
	8A	374,149	40.4%	17,354	15.8%	9,726	12.8%	137,248	15.8%	209,822	68.6%
	Preferred	372,303	39.7%	15,958	6.5%	9,014	4.6%	126,211	6.5%	221,119	77.7%
Fontana	Base	140,236	--	29,457	--	5,501	--	72,702	--	32,576	--
	2A	143,130	2.1%	30,004	1.9%	6,501	18.2%	74,050	1.9%	32,576	--
	3C	186,390	32.9%	41,437	40.7%	10,106	83.7%	102,270	40.7%	32,576	--
	4D	135,333	-3.5%	28,389	-3.6%	4,305	-21.8%	70,065	-3.6%	32,576	--
	5A	102,606	-26.8%	19,517	-33.7%	2,343	-57.4%	48,170	-33.7%	32,576	--
	6A	139,218	-0.7%	29,189	-0.9%	5,411	-1.6%	72,041	-0.9%	32,576	--
	7C	192,416	37.2%	43,061	46.2%	10,501	90.9%	106,278	46.2%	32,576	--
	8A	196,236	39.9%	44,070	49.6%	10,825	96.8%	108,766	49.6%	32,576	--
	Preferred	163,663	16.7%	35,558	20.7%	7,772	41.3%	87,758	20.7%	32,576	0.0%

Table D8-06 Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Hiwassee	Base	37,726	--	7,062	--	0	--	12,431	--	18,233	--
	2A	52,000	37.8%	7,371	4.4%	0	--	12,976	4.4%	31,653	73.6%
	3C	53,253	41.2%	7,542	6.8%	0	--	13,276	6.8%	32,436	77.9%
	4D	24,675	-34.6%	6,689	-5.3%	0	--	11,774	-5.3%	6,212	-65.9%
	5A	25,271	-33.0%	6,664	-5.6%	0	--	11,731	-5.6%	6,876	-62.3%
	6A	35,245	-6.6%	7,041	-0.3%	0	--	12,395	-0.3%	15,808	-13.3%
	7C	52,915	40.3%	7,459	5.6%	0	--	13,130	5.6%	32,327	77.3%
	8A	53,283	41.2%	7,554	7.0%	0	--	13,297	7.0%	32,432	77.9%
	Preferred	49,054	30.0%	7,210	2.1%	0	--	12,692	2.1%	29,152	59.9%
Little Bear Creek	Base	22,063	--	3,657	--	0	--	12,457	--	5,948	--
	2A	24,774	12.3%	3,694	1.0%	0	--	12,580	1.0%	8,500	42.9%
	3C	25,721	16.6%	3,717	1.6%	0	--	12,660	1.6%	9,343	57.1%
	4D	18,344	-16.9%	3,584	-2.0%	0	--	12,207	-2.0%	2,553	-57.1%
	5A	25,824	17.0%	3,741	2.3%	0	--	12,740	2.3%	9,343	57.1%
	6A	22,060	0.0%	3,657	0.0%	0	--	12,455	0.0%	5,948	0.0%
	7C	25,752	16.7%	3,724	1.8%	0	--	12,684	1.8%	9,343	57.1%
	8A	24,740	12.1%	3,686	0.8%	0	--	12,554	0.8%	8,500	42.9%
	Preferred	25,835	17.1%	3,743	2.3%	0	--	12,748	2.3%	9,343	57.1%
Normandy	Base	42,492	--	6,104	--	5,671	--	20,789	--	9,927	--
	2A	47,863	12.6%	6,160	0.9%	5,616	-1.0%	20,980	0.9%	15,107	52.2%
	3C	49,218	15.8%	6,209	1.7%	5,670	0.0%	21,148	1.7%	16,191	63.1%
	4D	37,889	-10.8%	6,105	0.0%	5,820	2.6%	20,791	0.0%	5,174	-47.9%
	5A	48,241	13.5%	6,180	1.2%	5,654	-0.3%	21,047	1.2%	15,360	54.7%
	6A	42,571	0.2%	6,117	0.2%	5,694	0.4%	20,833	0.2%	9,927	0.0%
	7C	49,243	15.9%	6,214	1.8%	5,675	0.1%	21,164	1.8%	16,191	63.1%
	8A	47,465	11.7%	6,101	-0.1%	5,480	-3.4%	20,778	-0.1%	15,107	52.2%
	Preferred	41,478	-2.4%	5,968	-2.2%	5,256	-7.3%	20,327	-2.2%	9,927	0.0%

Table D8-06 Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Norris	Base	897,853	--	19,103	--	11,172	--	727,088	--	140,490	--
	2A	1,078,372	20.1%	20,872	9.3%	11,922	6.7%	794,434	9.3%	251,144	78.8%
	3C	1,108,314	23.4%	21,955	14.9%	12,504	11.9%	835,668	14.9%	238,187	69.5%
	4D	750,320	-16.4%	17,857	-6.5%	10,530	-5.7%	679,680	-6.5%	42,252	-69.9%
	5A	988,447	10.1%	20,510	7.4%	11,590	3.7%	780,662	7.4%	175,685	25.1%
	6A	887,670	-1.1%	19,191	0.5%	11,202	0.3%	730,444	0.5%	126,833	-9.7%
	7C	1,115,534	24.2%	22,112	15.8%	12,576	12.6%	841,619	15.8%	239,227	70.3%
	8A	1,113,717	24.0%	22,125	15.8%	12,607	12.8%	842,129	15.8%	236,856	68.6%
	Preferred	1,056,048	17.6%	20,346	6.5%	11,685	4.6%	774,409	6.5%	249,609	77.7%
Nottely	Base	55,559	--	8,298	--	5,501	--	28,263	--	13,496	--
	2A	66,604	19.9%	8,662	4.4%	5,011	-8.9%	29,501	4.4%	23,430	73.6%
	3C	68,101	22.6%	8,862	6.8%	5,046	-8.3%	30,182	6.8%	24,010	77.9%
	4D	44,375	-20.1%	7,860	-5.3%	5,148	-6.4%	26,769	-5.3%	4,598	-65.9%
	5A	43,711	-21.3%	7,831	-5.6%	4,120	-25.1%	26,671	-5.6%	5,090	-62.3%
	6A	53,641	-3.5%	8,274	-0.3%	5,485	-0.3%	28,180	-0.3%	11,702	-13.3%
	7C	67,492	21.5%	8,765	5.6%	4,947	-10.1%	29,851	5.6%	23,929	77.3%
	8A	68,119	22.6%	8,876	7.0%	5,004	-9.0%	30,232	7.0%	24,007	77.9%
	Preferred	64,055	15.3%	8,472	2.1%	5,148	-6.4%	28,855	2.1%	21,579	59.9%
South Holston	Base	164,484	--	24,226	--	13,045	--	97,502	--	29,712	--
	2A	193,791	17.8%	25,127	3.7%	13,743	5.4%	101,128	3.7%	53,794	81.1%
	3C	185,085	12.5%	23,645	-2.4%	13,257	1.6%	95,166	-2.4%	53,016	78.4%
	4D	158,707	-3.5%	25,881	6.8%	13,624	4.4%	104,162	6.8%	15,040	-49.4%
	5A	199,253	21.1%	26,067	7.6%	14,024	7.5%	104,914	7.6%	54,247	82.6%
	6A	163,387	-0.7%	24,021	-0.8%	12,978	-0.5%	96,677	-0.8%	29,712	0.0%
	7C	180,386	9.7%	22,889	-5.5%	12,969	-0.6%	92,120	-5.5%	52,408	76.4%
	8A	183,439	11.5%	23,364	-3.6%	13,153	0.8%	94,033	-3.6%	52,889	78.0%
	Preferred	190,733	16.0%	24,535	1.3%	13,413	2.8%	98,747	1.3%	54,037	81.9%

Table D8-06 Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October (continued)

Project	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
Tims Ford	Base	250,283	--	25,866	--	5,671	--	123,846	--	94,899	--
	2A	301,115	20.3%	26,104	0.9%	5,616	-1.0%	124,985	0.9%	144,410	52.2%
	3C	312,739	25.0%	26,313	1.7%	5,670	0.0%	125,983	1.7%	154,773	63.1%
	4D	205,006	-18.1%	25,869	0.0%	5,820	2.6%	123,857	0.0%	49,461	-47.9%
	5A	304,059	21.5%	26,188	1.2%	5,654	-0.3%	125,384	1.2%	146,834	54.7%
	6A	250,622	0.1%	25,921	0.2%	5,694	0.4%	124,108	0.2%	94,899	0.0%
	7C	312,859	25.0%	26,333	1.8%	5,675	0.1%	126,080	1.8%	154,771	63.1%
	8A	299,521	19.7%	25,852	-0.1%	5,480	-3.4%	123,778	-0.1%	144,410	52.2%
	Preferred	246,537	-1.5%	25,291	-2.2%	5,256	-7.3%	121,091	-2.2%	94,899	0.0%
Upper Bear Creek	Base	57,151	--	8,534	--	5,671	--	29,066	--	13,880	--
	2A	63,573	11.2%	8,619	1.0%	5,767	1.7%	29,354	1.0%	19,833	42.9%
	3C	65,860	15.2%	8,673	1.6%	5,845	3.1%	29,540	1.6%	21,801	57.1%
	4D	48,285	-15.5%	8,363	-2.0%	5,482	-3.3%	28,482	-2.0%	5,958	-57.1%
	5A	66,133	15.7%	8,728	2.3%	5,876	3.6%	29,727	2.3%	21,801	57.1%
	6A	57,144	0.0%	8,533	0.0%	5,670	0.0%	29,061	0.0%	13,880	0.0%
	7C	65,936	15.4%	8,690	1.8%	5,849	3.1%	29,596	1.8%	21,801	57.1%
	8A	63,484	11.1%	8,601	0.8%	5,758	1.5%	29,293	0.8%	19,833	42.9%
	Preferred	66,163	15.8%	8,734	2.3%	5,883	3.7%	29,746	2.3%	21,801	57.1%
Watauga	Base	59,435	--	12,994	--	0	--	32,071	--	14,370	--
	2A	72,758	22.4%	13,478	3.7%	0	--	33,263	3.7%	26,018	81.1%
	3C	69,627	17.1%	12,683	-2.4%	0	--	31,302	-2.4%	25,641	78.4%
	4D	55,418	-6.8%	13,882	6.8%	0	--	34,261	6.8%	7,274	-49.4%
	5A	74,727	25.7%	13,982	7.6%	0	--	34,509	7.6%	26,236	82.6%
	6A	59,054	-0.6%	12,884	-0.8%	0	--	31,799	-0.8%	14,370	0.0%
	7C	67,925	14.3%	12,277	-5.5%	0	--	30,300	-5.5%	25,347	76.4%
	8A	69,041	16.2%	12,532	-3.6%	0	--	30,930	-3.6%	25,580	78.0%
	Preferred	71,775	20.8%	13,160	1.3%	0	--	32,480	1.3%	26,135	81.9%

Table D8-06 Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October (continued)

Note: Base = Base Case.

[1] Alt. = Alternative. The chart to the right shows the relationship of the former codes used for policy alternatives and the names used in the main document.

[2] Percentages calculated relative to the August through October use numbers for the Base Case. Use numbers consider both internal and external recreation users.

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

Table D8-07 Recreation Use (User Days) by Policy Alternatives during August through October

Projects	Alt.[1]	Total Recreation Use	(%) to Base[2]	Public Reservoir Use	(%) to Base[2]	Public Use below Dam	(%) to Base[2]	Commercial Use	(%) to Base[2]	Private Access Use	(%) to Base[2]
All projects	Base	6,569,334	--	670,561	--	203,363	--	3,844,556	--	1,850,854	--
	2A	7,907,800	20.37%	692,160	3.22%	204,324	0.47%	3,997,786	3.99%	3,013,530	62.82%
	3C	8,114,041	23.51%	711,123	6.05%	209,198	2.87%	4,103,949	6.75%	3,089,770	66.94%
	4D	5,300,096	-19.32%	655,920	-2.18%	193,265	-4.97%	3,725,224	-3.10%	725,687	-60.79%
	5A	6,813,723	3.72%	667,534	-0.45%	192,349	-5.42%	3,891,437	1.22%	2,062,403	11.43%
	6A	6,449,369	-1.83%	669,945	-0.09%	203,104	-0.13%	3,847,202	0.07%	1,729,119	-6.58%
	7C	8,115,039	23.53%	710,362	5.94%	208,189	2.37%	4,107,702	6.84%	3,088,786	66.88%
	8A	8,009,471	21.92%	712,761	6.29%	203,669	0.15%	4,104,229	6.75%	2,988,812	61.48%
	Preferred	7,735,922	17.8%	689,524	2.8%	204,586	0.6%	3,950,983	2.8%	2,890,828	56.2%

Note: Base = Base Case.

[1] Alt. = Alternative. The chart to the right shows the relationship of the former codes used for policy alternatives and the names used in the main document.

[2] Percentages calculated relative to the August through October use numbers for the Base Case. Use numbers consider both internal and external recreation users.

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

Table D8-08 Changes in Recreation Use (User Days) at Mainstem Project by Policy Alternative during August, September, and October, Compared to the Base Case

Project	Alt.[1]	Total Recreation Use	Public Reservoir Use	Public Use below Dam	Commercial Use	Private Access Use
Mainstem projects	2A	675,460	9,508	-1,329	27,918	639,363
	3C	781,833	14,888	-718	42,284	725,379
	4D	-698,480	-9,952	-2,184	-24,610	-661,734
	5A	64,569	-1,450	-4,732	-18,909	89,660
	6A	-66,050	-146	-55	-644	-65,204
	7C	775,742	14,179	-1,060	38,985	723,637
	8A	705,939	14,784	-1,057	45,555	646,657
	Preferred	617,571	6,790	-571	11,878	599,474
Chickamauga	2A	121,559	1,824	-941	4,751	115,926
	3C	132,011	2,829	-873	7,368	122,688
	4D	-112,453	-2,203	-677	-5,737	-103,836
	5A	-109,212	-2,347	-2,651	-6,113	-98,102
	6A	-21,416	-122	-32	-317	-20,945
	7C	129,116	2,340	-1,063	6,094	121,746
	8A	132,154	2,901	-954	7,556	122,651
	Preferred	96,793	873	-679	2,273	94,325
Fort Loudoun	2A	66,956	1,862	381	4,849	59,863
	3C	64,351	3,002	676	7,819	52,854
	4D	-58,197	-1,311	-326	-3,414	-53,147
	5A	24,591	1,481	212	3,858	19,040
	6A	-7,039	93	16	242	-7,389
	7C	65,543	3,166	713	8,247	53,417
	8A	64,327	3,180	729	8,284	52,134
	Preferred	64,010	1,308	260	3,407	59,034
Guntersville	2A	65,297	544	70	4,536	60,146
	3C	88,523	896	128	7,463	80,037
	4D	-90,466	-1,103	-139	-9,188	-80,037
	5A	91,845	1,250	150	10,413	80,032
	6A	-80	-9	-1	-71	0
	7C	89,515	1,002	130	8,350	80,032
	8A	64,207	428	63	3,569	60,146
	Preferred	92,174	1,284	155	10,702	80,032
Kentucky	2A	38,941	-977	-268	-8,977	49,163
	3C	40,894	-1,773	-496	-16,290	59,453
	4D	-22,692	2,151	511	19,764	-45,119
	5A	28,830	-2,178	-544	-20,016	51,570
	6A	141	14	1	126	0
	7C	40,113	-1,849	-503	-16,986	59,451
	8A	38,957	-976	-267	-8,964	49,163
	Preferred	-24,117	-2,316	-526	-21,276	0

Table D8-08 Changes in Recreation Use (User Days) at Mainstem Project by Policy Alternative during August, September, and October, Compared to the Base Case (continued)

Project	Alt.[1]	Total Recreation Use	Public Reservoir Use	Public Use below Dam	Commercial Use	Private Access Use
Nickajack	2A	27,442	416	-490	1,083	26,433
	3C	29,846	645	-455	1,680	27,975
	4D	-25,840	-502	-353	-1,308	-23,677
	5A	-25,680	-535	-1,381	-1,394	-22,369
	6A	-4,893	-28	-16	-72	-4,776
	7C	29,130	533	-554	1,389	27,761
	8A	29,854	661	-497	1,723	27,967
	Preferred	21,872	199	-354	518	21,508
Pickwick	2A	42,064	537	150	694	40,682
	3C	56,434	883	272	1,142	54,137
	4D	-56,926	-1,088	-296	-1,406	-54,137
	5A	57,280	1,233	321	1,593	54,134
	6A	-21	-8	-2	-11	0
	7C	56,678	988	278	1,277	54,134
	8A	41,786	423	135	546	40,682
	Preferred	57,369	1,267	331	1,637	54,134
Tellico	2A	29,677	2,025	0	6,666	20,986
	3C	32,541	3,265	0	10,747	18,529
	4D	-24,749	-1,426	0	-4,692	-18,632
	5A	13,588	1,611	0	5,303	6,675
	6A	-2,157	101	0	332	-2,590
	7C	33,506	3,444	0	11,336	18,726
	8A	33,122	3,459	0	11,386	18,276
	Preferred	26,802	1,423	0	4,684	20,695
Watts Bar	2A	178,121	2,648	-506	12,678	163,300
	3C	196,126	4,107	-469	19,662	172,826
	4D	-165,142	-3,198	-364	-15,311	-146,270
	5A	-159,336	-3,407	-1,424	-16,313	-138,193
	6A	-30,545	-177	-17	-847	-29,504
	7C	190,587	3,397	-571	16,262	171,499
	8A	196,639	4,212	-513	20,165	172,775
	Preferred	139,842	1,267	-365	6,067	132,873
Wheeler	2A	90,584	541	96	1,410	88,537
	3C	121,202	891	174	2,320	117,818
	4D	-121,959	-1,096	-189	-2,856	-117,818
	5A	122,495	1,243	205	3,236	117,811
	6A	-32	-8	-1	-22	0
	7C	121,581	996	178	2,595	117,811
	8A	90,159	426	86	1,109	88,537
	Preferred	122,626	1,277	211	3,326	117,811

Table D8-08 Changes in Recreation Use (User Days) at Mainstem Project by Policy Alternative during August, September, and October, Compared to the Base Case (continued)

Project	Alt.[1]	Total Recreation Use	Public Reservoir Use	Public Use below Dam	Commercial Use	Private Access Use
Wilson	2A	14,820	88	179	228	14,325
	3C	19,906	144	324	375	19,063
	4D	-20,054	-177	-352	-462	-19,063
	5A	20,168	201	381	524	19,062
	6A	-7	-1	-2	-4	0
	7C	19,974	161	331	420	19,062
	8A	14,734	69	161	180	14,325
	Preferred	20,200	207	394	538	19,062

[1] Alt. = Alternative. The chart to the right shows the relationship of the former codes used for policy alternatives and the names used in the main document.

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

Table D8-09 Changes in Recreation Use (User Days) at Run-of-River Projects by Policy Alternative during August, September, and October, Compared to the Base Case

Project	Alt.[1]	Total Recreation Use	Public Reservoir Use	Public Use below Dam	Commercial Use	Private Access Use
Run-of-river projects	2A	34,148	2,653	72	3,971	27,451
	3C	38,143	3,889	-199	6,049	28,404
	4D	-48,271	-1,534	-5,127	-17,279	-24,331
	5A	8,285	1,673	-1,497	1,472	6,637
	6A	-2,588	61	-84	91	-2,656
	7C	37,407	3,842	-731	5,891	28,404
	8A	15,875	3,872	-5,599	-8,939	26,540
	Preferred	20,115	1,446	-490	1,555	17,603
Apalachia	2A	3,263	171	-506	422	3,176
	3C	3,812	265	-469	654	3,361
	4D	-3,924	-206	-364	-509	-2,845
	5A	-4,874	-220	-1,424	-543	-2,688
	6A	-630	-11	-17	-28	-574
	7C	3,525	219	-571	541	3,336
	8A	3,790	272	-513	671	3,360
	Preferred	2,503	82	-365	202	2,584
Fort Patrick Henry	2A	1,288	151	304	111	721
	3C	621	-97	92	-72	698
	4D	295	278	252	205	-440
	5A	1,698	309	426	228	735
	6A	-89	-34	-29	-25	0
	7C	257	-224	-33	-165	680
	8A	490	-145	47	-107	694
	Preferred	979	52	160	38	729
Great Falls	2A	8,618	90	-53	305	8,276
	3C	10,749	168	-1	573	10,008
	4D	-7,447	1	144	3	-7,595
	5A	9,198	121	-17	412	8,681
	6A	113	21	22	70	0
	7C	10,786	176	3	599	10,008
	8A	8,067	-5	-185	-18	8,276
	Preferred	-1,359	-217	-403	-739	0
Melton Hill	2A	15,000	2,052	268	2,509	10,172
	3C	16,809	3,308	476	4,045	8,981
	4D	-12,470	-1,444	-229	-1,766	-9,031
	5A	7,013	1,632	149	1,996	3,235
	6A	-1,017	102	11	125	-1,255
	7C	17,334	3,490	502	4,266	9,076
	8A	17,161	3,505	513	4,285	8,858
	Preferred	13,418	1,442	183	1,763	10,031

Table D8-09 Changes in Recreation Use (User Days) at Run-of-River Projects by Policy Alternative during August, September, and October, Compared to the Base Case (continued)

Project	Alt.[1]	Total Recreation Use	Public Reservoir Use	Public Use below Dam	Commercial Use	Private Access Use
Ocoee #1	2A	4,804	167	-506	570	4,573
	3C	5,514	259	-469	884	4,840
	4D	-5,350	-202	-364	-688	-4,096
	5A	-6,242	-215	-1,424	-733	-3,870
	6A	-892	-11	-17	-38	-826
	7C	5,177	215	-571	731	4,803
	8A	5,498	266	-513	906	4,838
	Preferred	3,709	80	-365	273	3,721
Ocoee #2	2A	0	0	0	0	0
	3C	0	0	0	0	0
	4D	0	0	0	0	0
	5A	0	0	0	0	0
	6A	0	0	0	0	0
	7C	0	0	0	0	0
	8A	0	0	0	0	0
	Preferred	0	0	0	0	0
Ocoee #3	2A	0	0	0	0	0
	3C	0	0	0	0	0
	4D	-19,659	0	-5,035	-14,624	0
	5A	0	0	0	0	0
	6A	0	0	0	0	0
	7C	0	0	0	0	0
	8A	-19,659	0	-5,035	-14,624	0
	Preferred	0	0	0	0	0
Wilbur	2A	1,175	22	565	55	533
	3C	638	-14	172	-35	516
	4D	285	41	469	100	-325
	5A	1,493	45	793	112	543
	6A	-72	-5	-54	-12	0
	7C	327	-33	-61	-81	502
	8A	527	-21	88	-52	513
	Preferred	863	8	299	19	538

[1] Alt. = Alternative. The chart to the right shows the relationship of the former codes used for policy alternatives and the names used in the main document.

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

Table D8-10 **Change in Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October, Compared to the Base Case**

Project	Alt.[1]	Total Recreation Use	Public Reservoir Use	Public Use below Dam	Commercial Use[1]	Private Access Use
Tributary projects	2A	628,858	9,438	2,218	121,340	495,862
	3C	724,731	21,785	6,751	211,061	485,134
	4D	-522,487	-3,156	-2,786	-77,443	-439,102
	5A	171,535	-3,251	-4,785	64,318	115,253
	6A	-51,328	-532	-120	3,199	-53,875
	7C	732,557	21,779	6,617	218,270	485,891
	8A	718,323	23,544	6,961	223,057	464,761
	Preferred	528,902	10,727	2,284	92,994	422,898
Bear Creek	2A	3,133	42	0	143	2,948
	3C	4,227	69	0	235	3,923
	4D	-4,297	-85	0	-289	-3,923
	5A	4,347	96	0	328	3,923
	6A	-3	-1	0	-2	0
	7C	4,263	77	0	263	3,923
	8A	3,093	33	0	112	2,948
	Preferred	4,358	99	0	337	3,923
Blue Ridge	2A	23,088	339	-490	738	22,501
	3C	25,029	525	-455	1,145	23,814
	4D	-21,808	-409	-353	-892	-20,155
	5A	-21,809	-436	-1,381	-950	-19,042
	6A	-4,154	-23	-16	-49	-4,065
	7C	24,459	434	-554	947	23,631
	8A	25,022	539	-497	1,174	23,807
	Preferred	18,470	162	-354	353	18,309
Boone	2A	4,313	617	295	455	2,946
	3C	2,250	-398	90	-293	2,851
	4D	419	1,134	244	836	-1,795
	5A	5,607	1,262	413	930	3,002
	6A	-272	-140	-28	-103	0
	7C	1,154	-916	-32	-675	2,777
	8A	1,856	-591	46	-435	2,836
	Preferred	3,500	212	156	156	2,976
Cedar Creek	2A	5,000	67	0	228	4,706
	3C	6,747	110	0	375	6,262
	4D	-6,859	-135	0	-461	-6,262
	5A	6,938	154	0	523	6,262
	6A	-5	-1	0	-4	0
	7C	6,804	123	0	419	6,262
	8A	4,938	53	0	179	4,706
	Preferred	6,957	158	0	537	6,262

Table D8-10 Change in Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October, Compared to the Base Case (continued)

Project	Alt.[1]	Total Recreation Use	Public Reservoir Use	Public Use below Dam	Commercial Use	Private Access Use
Chatuge	2A	67,134	617	-490	4,732	62,275
	3C	73,749	958	-455	7,339	65,907
	4D	-62,593	-746	-353	-5,715	-55,780
	5A	-60,964	-794	-1,381	-6,088	-52,700
	6A	-11,625	-41	-16	-316	-11,251
	7C	71,709	792	-554	6,070	65,401
	8A	73,899	982	-497	7,526	65,888
	Preferred	52,877	295	-354	2,264	50,671
Cherokee	2A	98,524	1,580	381	27,032	69,530
	3C	108,197	2,548	676	43,583	61,389
	4D	-82,197	-1,113	-326	-19,029	-61,729
	5A	45,088	1,257	212	21,504	22,115
	6A	-7,140	79	16	1,347	-8,582
	7C	111,415	2,688	713	45,972	62,043
	8A	110,157	2,700	729	46,177	60,553
	Preferred	88,931	1,110	260	18,994	68,566
Douglas	2A	110,966	1,388	579	10,976	98,023
	3C	107,507	2,238	1,028	17,696	86,546
	4D	-96,224	-977	-495	-7,726	-87,026
	5A	41,335	1,104	323	8,731	31,177
	6A	-11,459	69	24	547	-12,099
	7C	109,577	2,360	1,083	18,666	87,467
	8A	107,593	2,371	1,107	18,749	85,367
	Preferred	105,747	975	396	7,712	96,664
Fontana	2A	2,895	546	999	1,349	0
	3C	46,154	11,980	4,605	29,568	0
	4D	-4,902	-1,068	-1,197	-2,637	0
	5A	-37,629	-9,940	-3,158	-24,532	0
	6A	-1,018	-268	-90	-661	0
	7C	52,181	13,604	5,000	33,576	0
	8A	56,001	14,613	5,324	36,065	0
	Preferred	23,428	6,101	2,270	15,057	0
Hiwassee	2A	14,274	309	0	544	13,420
	3C	15,527	480	0	844	14,203
	4D	-13,051	-373	0	-657	-12,021
	5A	-12,455	-398	0	-700	-11,357
	6A	-2,482	-21	0	-36	-2,425
	7C	15,189	397	0	698	14,094
	8A	15,556	492	0	866	14,199
	Preferred	11,328	148	0	260	10,920

Table D8-10 Change in Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October, Compared to the Base Case (continued)

Project	Alt.[1]	Total Recreation Use	Public Reservoir Use	Public Use below Dam	Commercial Use	Private Access Use
Little Bear Creek	2A	2,711	36	0	124	2,551
	3C	3,658	60	0	203	3,395
	4D	-3,719	-73	0	-250	-3,395
	5A	3,762	83	0	284	3,395
	6A	-2	-1	0	-2	0
	7C	3,689	67	0	227	3,395
	8A	2,677	29	0	97	2,551
	Preferred	3,772	86	0	291	3,395
Normandy	2A	5,372	56	-55	191	5,179
	3C	6,726	105	-1	359	6,263
	4D	-4,603	1	148	2	-4,753
	5A	5,750	76	-17	258	5,433
	6A	80	13	23	44	0
	7C	6,752	110	3	375	6,263
	8A	4,974	-3	-191	-11	5,179
	Preferred	-1,014	-136	-415	-462	0
Norris	2A	180,519	1,769	751	67,346	110,653
	3C	210,461	2,853	1,332	108,579	97,697
	4D	-147,533	-1,246	-642	-47,408	-98,238
	5A	90,593	1,408	418	53,573	35,194
	6A	-10,183	88	31	3,356	-13,658
	7C	217,681	3,009	1,404	114,531	98,737
	8A	215,864	3,022	1,435	115,040	96,366
	Preferred	158,195	1,243	513	47,320	109,119
Nottely	2A	11,045	363	-490	1,238	9,934
	3C	12,542	564	-455	1,919	10,513
	4D	-11,184	-439	-353	-1,495	-8,898
	5A	-11,848	-468	-1,381	-1,592	-8,407
	6A	-1,918	-24	-16	-83	-1,795
	7C	11,933	466	-554	1,587	10,433
	8A	12,560	578	-497	1,968	10,510
	Preferred	8,496	174	-354	592	8,083
South Holston	2A	29,308	901	698	3,626	24,082
	3C	20,601	-580	212	-2,335	23,304
	4D	-5,777	1,655	579	6,661	-14,672
	5A	34,769	1,842	980	7,413	24,535
	6A	-1,097	-205	-67	-825	0
	7C	15,902	-1,337	-76	-5,382	22,697
	8A	18,955	-862	108	-3,469	23,178
	Preferred	26,249	310	369	1,246	24,325

Table D8-10 Change in Recreation Use (User Days) at Tributary Projects by Policy Alternative during August, September, and October, Compared to the Base Case (continued)

Project	Alt.[1]	Total Recreation Use	Public Reservoir Use	Public Use below Dam	Commercial Use	Private Access Use
Tims Ford	2A	50,833	238	-55	1,139	49,512
	3C	62,456	446	-1	2,137	59,874
	4D	-45,276	2	148	11	-45,438
	5A	53,777	321	-17	1,538	51,935
	6A	339	55	23	262	0
	7C	62,576	467	3	2,234	59,872
	8A	49,239	-14	-191	-68	49,512
	Preferred	-3,746	-575	-415	-2,755	0
Upper Bear Creek	2A	6,422	85	96	288	5,953
	3C	8,709	139	174	474	7,922
	4D	-8,866	-171	-189	-584	-7,922
	5A	8,982	194	205	662	7,921
	6A	-7	-1	-1	-5	0
	7C	8,785	156	178	530	7,921
	8A	6,333	67	86	227	5,953
	Preferred	9,012	200	211	680	7,921
Watauga	2A	13,323	483	0	1,193	11,647
	3C	10,192	-311	0	-768	11,271
	4D	-4,017	888	0	2,191	-7,096
	5A	15,292	988	0	2,438	11,866
	6A	-381	-110	0	-271	0
	7C	8,490	-717	0	-1,770	10,977
	8A	9,607	-462	0	-1,141	11,210
	Preferred	12,341	166	0	410	11,765

[1] Alt. = Alternative. The chart to the right shows the relationship of the former codes used for policy alternatives and the names used in the main document.

Alternative Name	Former Number Code
Reservoir Recreation A	2A
Reservoir Recreation B	3C
Summer Hydropower	4D
Equalized Summer/Winter Flood Risk	5A
Commercial Navigation	6A
Tailwater Recreation	7C
Tailwater Habitat	8A

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Appendix D9

Inter-Basin Transfers—A Sensitivity Analysis

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An inter-basin transfer (IBT) occurs when water is moved from one watershed to another watershed. In 2000, the 13 IBTs from the Tennessee River watershed diverted 5.61 million gallons per day (mgd). These IBTs have been included as part of the Base Case, and the impacts of these withdrawals were considered in the impact assessments for the relevant resource areas. In addition, for this analysis, it was assumed that operation of the locks through the Tennessee–Tombigbee Waterway would eventually reach the level projected when the waterway was authorized. This additional IBT, which would divert an additional 600 mgd from the TVA reservoir system and the Tennessee River watershed, was also included in the impact assessments. This assumption is conservative and may result in overstated related impacts.

There are increasing demands on available water supplies in the Southeast. Alabama, Georgia, Mississippi, and Florida are already involved in disputes over water supply use. Inquiries that have been made about the availability of water from the Tennessee River system to meet demands outside the watershed could result in additional IBTs from the TVA reservoir system. Because TVA does not know the location, timing or magnitude of potential IBTs, TVA decided not to speculate about potential additional IBTs in its primary ROS analyses. When requests to approve additional IBTs under Section 26a of the TVA Act are received, TVA would analyze the environmental, economic, and operational effects of these requests both individually and in the aggregate. TVA would also work closely with potentially affected states and communities in these assessments.

Although specific IBTs are too speculative to address in the ROS, TVA conducted an initial sensitivity analysis to investigate whether the policy alternatives allowed for the potential of large IBTs from the TVA system occurring in the future. The results of that analysis are reported in this appendix.

Bohac (2003) discussed the possibility that water-short areas external to the Tennessee River watershed could look to the Tennessee River for water supply in the future. Based on a review of water needs in areas outside the watershed, requests for IBT withdrawals were assumed to be received from the Blount County/Birmingham, Alabama, area; the 18- to 20-county area comprising the Atlanta Metropolitan Area; North Georgia; and Northeast Mississippi. The point of withdrawal for these areas would likely be Chickamauga, Guntersville, and Pickwick Reservoirs, which all are mainstem storage reservoirs. Table D9-01 shows the potential amount of withdrawals for those areas for 2030. These amounts were used to determine the sensitivity of the Base Case and the policy alternatives to large transfers of water from the Tennessee River.

Table D9-01 Potential Inter-Basin Transfers by 2030

Assumed Water Transfer Destination	Point of Withdrawal	Assumed Transfer (2030) (mgd)
North Georgia and Atlanta	Chickamauga	264
Blount County–Birmingham, Alabama	Guntersville	180
Northeast Mississippi	Pickwick	17

TVA used the Weekly Scheduling Model (WSM) to conduct the sensitivity analysis for IBT withdrawals (see Appendix C for a brief description of the WSM). Reservoir levels from the model results for the Base Case were compared to reservoir levels for the policy alternatives to identify the policy alternative that showed the greatest change in median reservoir elevations. Reservoir Recreation Alternative B showed the greatest change in median reservoir elevations.

Water withdrawals for the IBTs were added as an input to the WSM, and a second-iteration model run was completed. Table D9-02 shows the effect of withdrawals from Chickamauga, Guntersville, and Pickwick Reservoirs at upstream tributary storage reservoirs. The results shown are based on analysis of the 90th and 10th percentile ranges of reservoir elevations—that is, the reservoir elevation that would be exceeded at least 10 percent of the time but not exceeded 90 percent of the time. Reservoir elevations outside this range would occur infrequently due to drought or extremely wet weather conditions. The general seasonality of these effects is also shown. The analysis found that, for both the Base Case and Reservoir Recreation Alternative B, no change in median reservoir elevations would be likely should the IBTs be implemented.

Table D9-02 Weekly Scheduling Model Results That Include Potential Inter-Basin Transfers under the Base Case and Reservoir Recreation Alternative B

Reservoir	Base Case		Reservoir Recreation Alternative B	
	Elevation Difference – 90th Percentile (feet)	Elevation Difference – 10th Percentile (feet)	Elevation Difference – 90th Percentile (feet)	Elevation Difference – 10th Percentile (feet)
Watauga	0 to 1 (August-October)	0	0	Less than 0.5 (July)
South Holston	0 to 1 (August-October)	0	0	Less than 0.5 (October)
Cherokee	0 to 0.5 (October)	0	0	0 to 1 (July-September)
Douglas	0 to 0.5 (October)	0 to 2 (June-July)	0	0 to 1 (July-September)
Norris	0 to 0.5 (October)	0 to 0.5 (June)	0	0 to 1 (July-November)
Fontana	Less than 0.5	0	0	0
Chatuge	Less than 0.5	0	0	0
Nottely	0 to 1 (November)	0	0	Less than 0.5 (August)
Blue Ridge	0	0 to 0.5 (June-July)	0	0 to 2 (March - September)
Chickamauga	0	Less than 0.5 (April)	0	0

Table D9-02 shows that the effect of the IBTs would be to reduce some tributary reservoir levels by a small amount under infrequent conditions. Under the Base Case, during unusually wet conditions in which reservoir levels were above normal (90th percentile or no more than 10 percent of the time), IBTs would cause some tributary reservoirs to fall from 0 to 1 foot below their elevations without the transfers for a period of 1 to 3 months. This would likely occur in the late summer and fall periods. Similarly, during unusually dry conditions (10th percentile, or no more than 10 percent of the time) in which reservoir elevations were already below normal, IBTs could cause some tributary reservoirs elevations to fall an additional 0.0 to 0.5 foot for 1 to 2 months during summer. One reservoir (Douglas) was up to 2 feet below where it would have been without the transfers for 1 to 2 months. Under the Base Case, no impacts on mainstem reservoirs were noted except on Chickamauga Reservoir. In approximately 1 year in 10, Chickamauga Reservoir would be delayed in being filled by about 1 week. Otherwise, no effect was observed for mainstem reservoirs.

Under Reservoir Recreation Alternative B, IBTs would not affect reservoir elevations in unusually wet years. During dry conditions, when reservoir elevations were below normal, IBTs would cause some tributary reservoirs to drop up to 1 foot below their levels without the transfers for one to several months during summer. One reservoir (Blue Ridge) was as much as 2 feet below its level without a transfer for 1 to 2 months. No impacts on mainstem reservoirs were noted.

This sensitivity analysis shows that IBTs are not likely to substantially affect future reservoir elevations, under either the Base Case or the most conservative assumptions for the policy alternatives under most hydrologic conditions. However, this conclusion is only valid for the assumptions used. IBTs with other withdrawal points or withdrawal quantities might result in different outcomes. It must also be recognized that the reservoir elevation differences discussed above would occur about 1 year in 10. Under very dry conditions, which would occur less often than 1 year in 10, IBTs might cause more significant elevation differences than discussed above.

Literature Cited

Bohac, C. E. 2003. Water Supply Inventory and Needs Analysis. Tennessee Valley Authority, Navigation and Hydraulic Engineering. Draft. Chattanooga, TN. December.

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Appendix D10

Social and Economic Resources

Tennessee Valley Authority
Reservoir Operations Study – Final Programmatic EIS

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Table D10-01 List of Counties Constituting Each Sub-Region in the TVA ROS Area

Sub-Region	State	County	Sub-Region	State	County
Alabama	AL	Cherokee	Knoxville	TN	Blount
Alabama	AL	Colbert	Knoxville	TN	Campbell
Alabama	AL	Cullman	Knoxville	TN	Claiborne
Alabama	AL	DeKalb	Knoxville	TN	Cocke
Alabama	AL	Franklin	Knoxville	TN	Cumberland
Alabama	AL	Jackson	Knoxville	TN	Fentress
Alabama	AL	Lauderdale	Knoxville	TN	Grainger
Alabama	AL	Lawrence	Knoxville	TN	Hamblen
Alabama	AL	Limestone	Knoxville	TN	Jefferson
Alabama	AL	Madison	Knoxville	TN	Knox
Alabama	AL	Marshall	Knoxville	TN	Loudon
Alabama	AL	Morgan	Knoxville	TN	Morgan
Chattanooga	GA	Catoosa	Knoxville	TN	Pickett
Chattanooga	GA	Chattooga	Knoxville	TN	Roane
Chattanooga	GA	Fannin	Knoxville	TN	Scott
Chattanooga	GA	Gordon	Knoxville	TN	Sevier
Chattanooga	GA	Murray	Knoxville	TN	Union
Chattanooga	GA	Towns	Mississippi	MS	Alcorn
Chattanooga	GA	Union	Mississippi	MS	Attala
Chattanooga	GA	Walker	Mississippi	MS	Benton
Chattanooga	GA	Whitfield	Mississippi	MS	Calhoun
Chattanooga	NC	Cherokee	Mississippi	MS	Chickasaw
Chattanooga	NC	Clay	Mississippi	MS	Choctaw
Chattanooga	TN	Bledsoe	Mississippi	MS	Clay
Chattanooga	TN	Bradley	Mississippi	MS	Itawamba
Chattanooga	TN	Grundy	Mississippi	MS	Kemper
Chattanooga	TN	Hamilton	Mississippi	MS	Lafayette
Chattanooga	TN	Marion	Mississippi	MS	Leake
Chattanooga	TN	McMinn	Mississippi	MS	Lee
Chattanooga	TN	Meigs	Mississippi	MS	Lowndes
Chattanooga	TN	Monroe	Mississippi	MS	Marshall
Chattanooga	TN	Polk	Mississippi	MS	Monroe
Chattanooga	TN	Rhea	Mississippi	MS	Neshoba
Chattanooga	TN	Sequatchie	Mississippi	MS	Noxubee
Knoxville	TN	Anderson	Mississippi	MS	Oktibbeha

Table D10-01 List of Counties Constituting Each Sub-Region in the TVA ROS Area (continued)

Sub-Region	State	County	Sub-Region	State	County
Mississippi	MS	Panola	Nashville	TN	Hickman
Mississippi	MS	Pontotoc	Nashville	TN	Houston
Mississippi	MS	Prentiss	Nashville	TN	Humphreys
Mississippi	MS	Scott	Nashville	TN	Jackson
Mississippi	MS	Tallahatchie	Nashville	TN	Lawrence
Mississippi	MS	Tate	Nashville	TN	Lewis
Mississippi	MS	Tippah	Nashville	TN	Lincoln
Mississippi	MS	Tishomingo	Nashville	TN	Macon
Mississippi	MS	Union	Nashville	TN	Marshall
Mississippi	MS	Webster	Nashville	TN	Maury
Mississippi	MS	Winston	Nashville	TN	Montgomery
Mississippi	MS	Yalobusha	Nashville	TN	Moore
Nashville	KY	Allen	Nashville	TN	Overton
Nashville	KY	Butler	Nashville	TN	Perry
Nashville	KY	Christian	Nashville	TN	Putnam
Nashville	KY	Cumberland	Nashville	TN	Robertson
Nashville	KY	Edmonson	Nashville	TN	Rutherford
Nashville	KY	Grayson	Nashville	TN	Smith
Nashville	KY	Logan	Nashville	TN	Stewart
Nashville	KY	Lyon	Nashville	TN	Sumner
Nashville	KY	Monroe	Nashville	TN	Trousdale
Nashville	KY	Simpson	Nashville	TN	Van Buren
Nashville	KY	Todd	Nashville	TN	Warren
Nashville	KY	Trigg	Nashville	TN	Wayne
Nashville	KY	Warren	Nashville	TN	White
Nashville	TN	Bedford	Nashville	TN	Williamson
Nashville	TN	Cannon	Nashville	TN	Wilson
Nashville	TN	Cheatham	NC non-PSA	NC	Buncombe
Nashville	TN	Clay	NC non-PSA	NC	Graham
Nashville	TN	Coffee	NC non-PSA	NC	Haywood
Nashville	TN	Davidson	NC non-PSA	NC	Henderson
Nashville	TN	Dekalb	NC non-PSA	NC	Jackson
Nashville	TN	Dickson	NC non-PSA	NC	Macon
Nashville	TN	Franklin	NC non-PSA	NC	Madison
Nashville	TN	Giles	NC non-PSA	NC	Mitchell
Nashville	TN	Hardin	NC non-PSA	NC	Swain

Table D10-01 List of Counties Constituting Each Sub-Region in the TVA ROS Area (continued)

Sub-Region	State	County	Sub-Region	State	County
NC non-PSA	NC	Transylvania	Western	KY	Marshall
NC non-PSA	NC	Watauga	Western	TN	Benton
NC non-PSA	NC	Yancey	Western	TN	Carroll
Tri-Cities	NC	Avery	Western	TN	Chester
Tri-Cities	TN	Carter	Western	TN	Crockett
Tri-Cities	TN	Greene	Western	TN	Decatur
Tri-Cities	TN	Hancock	Western	TN	Dyer
Tri-Cities	TN	Hawkins	Western	TN	Fayette
Tri-Cities	TN	Johnson	Western	TN	Gibson
Tri-Cities	TN	Sullivan	Western	TN	Hardeman
Tri-Cities	TN	Unicoi	Western	TN	Haywood
Tri-Cities	TN	Washington	Western	TN	Henderson
Tri-Cities	VA	Lee	Western	TN	Henry
Tri-Cities	VA	Washington	Western	TN	Lake
VA non-PSA	VA	Bland	Western	TN	Lauderdale
VA non-PSA	VA	Dickenson	Western	TN	Madison
VA non-PSA	VA	Grayson	Western	TN	McNairy
VA non-PSA	VA	Russell	Western	TN	Obion
VA non-PSA	VA	Scott	Western	TN	Shelby
VA non-PSA	VA	Smyth	Western	TN	Tipton
VA non-PSA	VA	Tazewell	Western	TN	Weakley
VA non-PSA	VA	Wise			
VA non-PSA	VA	Wythe			
Western	KY	Calloway			
Western	KY	Carlisle			
Western	KY	Fulton			
Western	KY	Graves			
Western	KY	Hickman			

Note: Non-PSA = Not in the Power Service Area.

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Appendix E

Prime Farmland Technical Report

TVA

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TECHNICAL REPORT FOR PRIME FARMLAND

SEPTEMBER 2003

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Technical Report for Prime Farmland

Prepared for
TENNESSEE VALLEY AUTHORITY

Prepared by
NORMANDEAU ASSOCIATES, INC.
25 Nashua Road
Bedford, NH 03110

R-19301.008

September 2003

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Executive Summary

The soils within the TVA region are a valuable resource for agriculture and forest production. The TVA, as a federal agency, is mandated by the Farmland Protection and Policy Act (FPPA) to complete a prime farmland review prior to initiating a program. The FPPA is intended to minimize the impact of Federal programs on the unnecessary and irreversible conversion of farmland to nonagricultural uses. Farmland conversion and soil erosion are considered the major issues that could potentially impact prime farmland as a result of TVA actions. In addition, soil erosion was considered a by-product of land use change.

An overview is provided of the soils within the TVA region by physiographic region. Soils are influenced by topography, slope and aspect with prime farmland soils occurring primarily in valleys where the soils are deep, fertile and nearly level. The rate of farmland conversion to non-farm use was variable across the region. Based on a review of Census of Agriculture data for the period 1987 to 1997, the twenty counties within the TVA region that have experienced 10 percent and higher rates of conversion to non-farm use are within commuting distance of large population centers. Farmland conversion is anticipated to result in an increase in erosion due to the removal of vegetation and exposure of soils. The erosion of this resource impacts the quality and extent of productive soils as well degrades downstream water resources and associated uses. Soil erosion along the shoreline, which is discussed in more detail in Section 4.16, Shoreline Erosion, initially was thought to affect prime farmland. After preliminary investigation, erosion along the shoreline was considered an insignificant impact on prime farmland and not considered further in this report.

The extent of prime farmland within the counties of the TVA region was based on data provided by the Natural Resources Conservation Service (NRCS). The highest acreage occurs within the Highland Rim, Coastal Plain, and Valley and Ridge Regions. An analysis of the acreage of prime farmland within 0.25 mile of seven representative reservoirs determined that the majority of the prime farmland is in forestland. Agricultural land (pasture/hay and cropland) is the second largest use and non-farm use is a small percentage of the total.

A comparison of the Base Case with the policy alternatives assumed that reservoir operation activities that increase the rate of development along the shoreline of the reservoirs and rivers would result in a loss of prime farmland due to a combination of conversion and erosion. Farmland conversion and soil erosion under the Base Case were considered to be insignificant within 0.25 mile of the TVA shoreline. One alternative (the Commercial Navigation Alternative was anticipated to have similar impacts as the Base Case while five alternatives (the Preferred Alternative, Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative) would result in an increase in rates of conversion and erosion. Two alternatives (the Summer Hydropower Alternative and the Equalized Summer/Winter Flood Risk Alternative) would result in slower rates of conversion compared to the Base Case.

Prime Farmland

List of Abbreviations and Acronyms

FPPA	Farmland Protection Policy Act
NRCS	Natural Resources Conservation Service
ROS	Reservoir Operations System
SMI	Shoreline Management Initiative
STATSGO	State Soil Geographic Database
TVA	Tennessee Valley Authority
TVA Region	Counties bordering the TVA system

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1 Introduction

1.1 Key Issues

The key issues for soils are (1) the identification of the soil resources within the Tennessee Valley Authority (TVA) system having high agricultural value (classified as prime farmland) and (2) soils that are susceptible to erosion. Farmland conversion and soil erosion are the key issues for this resource and were used to determine potential impacts associated with the policy alternatives. The following report provides a regional overview of the soils within the six physiographic regions encompassing the TVA system. A discussion is provided on soils designated as prime farmland by the USDA Natural Resources Conservation Service (NRCS), based on criteria of the Farmland Protection and Policy Act (FPPA; 7CFR 658.1 et seq.). A comparison is provided of cropland conversion by physiographic region during the period 1987 to 1997 and discussion of potential trends. An overview is also provided of the erosion potential of soils within the region. Representative reservoirs were selected for a more detailed review of soil and land use characteristics and the effect reservoir operation changes may have on land use and soil erosion. Soil erosion was considered a secondary impact, as a result of farmland conversion to development. Shoreline erosion, which is discussed in Section 4.16, Shoreline Erosion, was determined not to be a key factor in loss of prime farmland.

Farmland is considered prime or unique as determined by the appropriate state or local unit of government. Prime farmland is defined as:

"Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Prime farmland includes land that possesses the above characteristics but are being used currently to produce livestock and timber" (7 U.S.C. 4201 et seq.).

1.2 Metrics to be Used as Indices of Impact

Farmland conversion involves the conversion of cropland to non-farm uses such as residential housing. Floods also affect farmland; however, the impact of flooding was considered to be an economic impact as it pertains to loss of use and crop loss. Flooding therefore is discussed in Section 4.25, Social and Economic Resources.

Soil erosion affects the quality and extent of productive soils as well as degrades downstream water resources and associated uses. In addition, the transport and deposition of sediment reduces the water storage capacity of reservoirs. A more detailed analysis of shoreline susceptibility to erosion is provided in Section 4.16, Shoreline Erosion.

Soil erosion was considered as both a direct and indirect impact due to changes in reservoir operations. The direct impact on prime farmland and soils would result from erosion along the shoreline, which is discussed in Section 4.16. Indirect effects would result from land use activities occurring in the "backlands" (lands extending 0.25 mile from the shoreline and generally in private ownership) that would either influence farmland conversion or increase soil erosion.

1.3 Highlight of Impact Methodology

The lands extending 0.25 mile from the shoreline were assumed to be the area indirectly influenced by TVA reservoir operations (TVA 1998). A secondary region (TVA region) consists of those counties bordering the reservoirs of the TVA system. The data for this resource are summarized by physiographic region as well as by grouping reservoirs by location (relative eastern and western) and by type (tributary and mainstem). Summary data tables are provided in Appendix A.

Data on the acres of prime farmlands and total extent of soils within a county have been provided by the county NRCS offices within the TVA region. The NRCS indicated that updates to a number of county soil surveys are in progress and that the acreage data will be revised in the near future. Acreage of prime farmland soils by county are provided in Appendix B. Information on erodible soils is from published resources and the NRCS.

As data were not available on conversion of prime farmland, trends in farmland conversion were based on total cropland data by county from the Census of Agriculture. The Census defines cropland as "land from which crops were harvested or hay was cut; land in orchards, citrus groves, vineyards, nurseries, and greenhouses; cropland used only for pasture or grazing; land in cover crops, legumes, and soil-improvement grasses; land on which all crops failed; land in cultivated summer fallow; and idle cropland".

An assessment of the general extent of prime farmland within the TVA region was conducted using data provided by county offices of the Natural Resources Conservation Service (NRCS). The prime farmland and erosion data were obtained from the State Soil Geographic (STATSGO) database (USDA, NRCS 1994) for the states within the TVA region. STATSGO is at a scale of 1:250,000, having a minimum area of detail of 625 hectares (1,544 acres) and thus is suitable for a general characterization. The soil erosion assessment used the STATSGO database (NRCS 1994a-d) to provide an estimate of the erosion potential of soils within 0.25 mile of the TVA system shoreline. The potential for an increase in soil erosion was based on changes in land use resulting in vegetation cover type changes increasing soil exposure.

Seven representative reservoirs were selected for a more detailed review of farmland conversion and soil erosion in the backlands. The representative tributary reservoirs (and their respective physiographic region) included Chatuge (Blue Ridge), Cherokee (Valley and Ridge), Tims Ford (Highland Rim), and Normandy (Highland Rim). The representative mainstem reservoirs included: Ft. Loudoun (Valley and Ridge), Nickajack (Cumberland Plateau), and Kentucky (Coastal Plain and Highland Rim). These reservoirs represent five of the six physiographic regions and were selected to provide a range of characteristics, including land that is available for residential development (from 15 to 84 percent), varying acreage of farmland, and varying rates of development (Table 1-1).

Table 1-1 Characteristics of Representative Reservoirs

Physiographic Region	Reservoir	County/State	Mainstem/ Tributary	Miles of shoreline[1]	Shoreline Available for Development[1]		1997 Acres of Farmland[2]	Rate of Development[3]
					(%)	(miles)		
Blue Ridge	Chatuge	Towns, GA; Clay, NC.	Tributary	128	62	79.6	26,996	High
Valley and Ridge	Cherokee	Grainger, Hamblen, Hawkins, Jefferson, TN	Tributary	394	44	172.3	393,793	Medium
Valley and Ridge	Ft. Loudoun	Knox, Blount, Loudon TN	Mainstem	378	84	317.2	254,994	High
Coastal Plain/Highland Rim (50:50)	Kentucky	Hardin, TN	Mainstem	2,064	45	936.9	115,598	Medium
Cumberland Plateau	Nickajack	Marion, Hamilton, TN	Mainstem	178	55	98	107,882	Low
Highland Rim	Normandy	Bedford, Coffee, TN	Tributary	75	15	11.2	271,230	Low
Highland Rim	Tims Ford	Franklin, Moore, TN	Tributary	308	15	47.7	184,041	High

1 Sum of flowage easement and TVA-owned residential shoreland (TVA 1998).
2 Sum of acres in counties that contain reservoir. Source: Oregon State University Libraries, Corvallis, Oregon. GovStats. Available at http://govinfo.library.orst.edu/php/agri/index.php.
3 TVA 1990.

1.4 Regulatory and TVA Management Activities

1.4.1 Regulatory

The TVA, as a federal agency, is mandated by the FPPA to complete a prime farmland review prior to initiating a program. Congress passed the Agriculture and Food Act of 1981 (Public Law 97-98) containing the FPPA—Subtitle I of Title XV, Section 1539-1549. The final rules and regulations were published in the Federal Register on June 17, 1994. The review should (1) identify and take into account adverse effects that may occur due to TVA activities on the preservation of farmland; (2) consider alternative actions, as appropriate, that could lessen the adverse effects; and (3) ensure that TVA programs, to the extent practicable, are compatible with State and units of local government and private programs and policies to protect farmland. The FPPA does not authorize the Federal Government to regulate the use of private or nonfederal land or, in any way, affect the property rights of owners. This programmatic EIS provides an overview of the prime farmland resource in the TVA region and evaluates potential effects on prime farmland that could result from reservoir operations policy alternatives.

Parcels allocated by TVA for development prior to the passage of the FPPA would be excluded and the remaining parcels with 10 or more acres of soils classified as prime farmland would be required to complete the FPPA process prior to development. The FPPA defines farmland as not including land already in or committed to urban development or water storage. Farmland "already in" urban development or water storage includes:

- All lands with a density of 30 structures per 40-acre area.
- Lands identified as "urbanized area" on the Census Bureau Map, or as urban areas mapped with a "tint overprint" on the USGS topographical maps, or as "urban built-up" on the USDA Important Farmland Maps (7CFR 658.2).

Section 26A of The TVA Act (U.S. Congress, 1933, as amended) established standards to minimize soil erosion by requiring soil stabilization measures and vegetation management, which reduce the erosion potential from development activities. These activities are required for all development projects on lands under the jurisdiction of the TVA.

1.4.2 TVA Management Activities

TVA initiated a comprehensive reservoir management planning process in 1979. Since that time, land management plans have been completed and approved by the TVA board of directors for seven mainstem reservoirs. The land planning process identifies and evaluates the most suitable use of the land and then allocates the land into clearly defined zones. TVA considers leases for agricultural land as a short-term use with renewable leases, which can be compatible with TVA Land Use Zones. It was anticipated that Zone 3 (Sensitive Resource Management) and Zone 4 (Natural Resource Conservation) inherently protect prime farmland, whether it was currently cropped or in forest. Prime farmland allocated to Zone 2 (TVA Project Operations), Zone 5 (Industrial/Commercial Development), and Zone 7 (Residential Access or Residential Development) would be allocated for a use that would convert prime farmland to non-farm use. Zone 6 (Recreation and State Park Expansion) may result in limited impacts to prime farmland.

The land planning process identifies and evaluates the most suitable use of the land and then allocates the land into clearly defined zones. TVA considers leases for agricultural land as a short-term use with renewable leases, which are compatible with TVA land use zones. It is assumed that the same zones will protect prime farmland based on allowable uses.

More detailed assessments using FPPA criteria will be conducted as land management plans for specific reservoirs are written and updated. Subsequent assessments will complete Form AD 1006, Farmland Conversion Impact Rating when appropriate (with assistance from the NRCS), which includes summarizing total acres of prime farmland to be converted directly and indirectly by the proposed program and assigning a total score for the rating process. Sites receiving a score greater than 160 must be given further consideration for prime farmland protection.

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2 Affected Environment

2.1 Soils

The TVA system encompasses six physiographic regions (Fenneman 1938) that range from the mountainous Blue Ridge Region in the east to the nearly level Coastal Plain Region in the west (Figure 2-1). The soils within the region vary as a result of climate, parent material, and topography.

The climate within the TVA region is generally temperate, averaging 62°F, with the coolest temperatures occurring within the Cumberland and Unaka Mountains with an average of 45°F. The soils rarely freeze and then generally only to a depth of approximately 4 inches (Springer and Elder 1980). The majority of the TVA region receives between 51 and 55 inches of rain annually (DeSelm and Schmidt 2001). The Blue Ridge Region, which includes the Unaka range, receives between 43 and 79 inches of rainfall compared to 43 and 55 inches for the Valley and Ridge Region, which lies within the rain shadow of the Cumberland Plateau. The Cumberland Plateau receives over 59 inches of precipitation annually.

2.1.1 Physiographic Regions

The following review of soils within the physiographic regions is from Springer and Elder (1980). Over 50 percent of the TVA region is within two regions, 35 percent in the Highland Rim and 32 percent in the Valley and Ridge (Table 2-1).

Soils of the Blue Ridge

The Blue Ridge Region is mountainous, including the Great Smoky Mountain in the Unaka Range, with elevations ranging from 1,000 feet to over 6,000 feet. The soils of the Blue Ridge Region are derived from highly metamorphosed parent material. Bedrock in the southern portion of the region is predominately phyllite, slate, sandstone and quartzite while granite and gneiss dominate the northern portion. The soils consist of highly weatherable material and the depth varies from 1 to 3 feet at higher elevations and side slopes from 3 to 7 feet on the lower slopes. The valleys contain a variety of soils and are generally productive. The major uses are pasture, hay, burley tobacco, and vegetables.

Soils of the Valley and Ridge

The Valley and Ridge Region is bounded to the east by the Unaka Mountain Range and to the west by the Cumberland Plateau and Mountains. This region is also referred to as the "Great Valley of East Tennessee." The topography is variable ranging from wooded parallel ridges and narrow, cleared valleys to broad expanses of rolling to hilly pasture and cropland. Streams and rivers generally follow the strike of the rock formations, although occasional gaps have formed at right angles through the ridges. The parent material of the valleys generally consist of soft shales and clayey limestones while the ridges are mostly sandstones and hard shale with some cherty, dolomitic limestone. Soil depths range from shallow over shales and sandstones to very deep over the dolomitic limestone. The upland soils are primarily highly leached, strongly acid with low fertility. Because of the variable landscape, soils properties vary over short distances resulting in small patches of productive land intermixed with average land or large tracts of rough land. The region is used primarily for pasture, hay, forest, and burley tobacco.

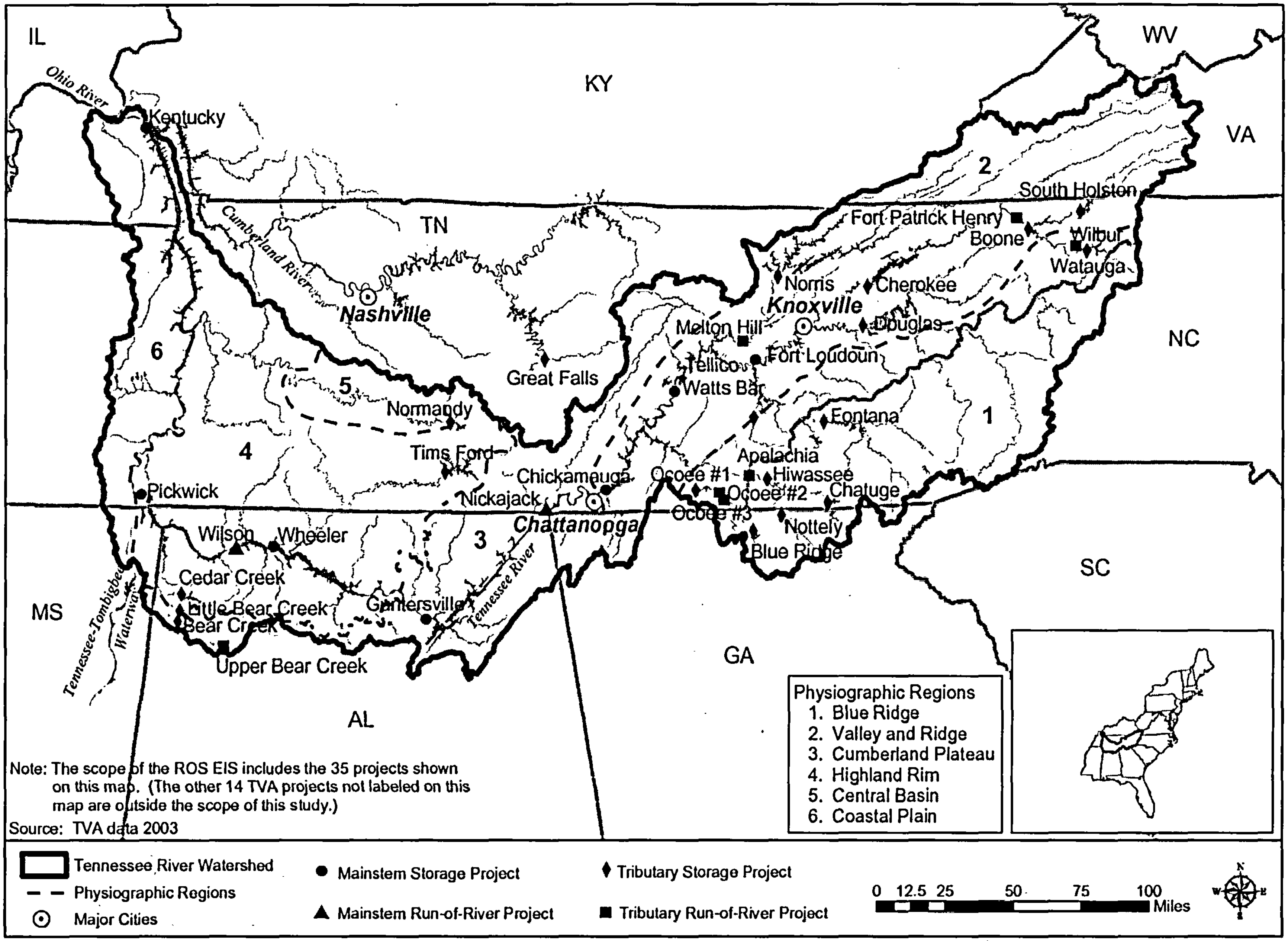

Figure 2.1 Physiographic Regions within the Tennessee River Watershed

Table 2-1 Acreage of Farmland by Physiographic Region

Physiographic Region	Land Area of TVA region		1987 Farmland (Acres)[2]	1997 Farmland (Acres)[2]	Farmland Conversion 1987 to 1997 (%)[2]	Percent 1997 Farmland in Region (%)
	Acres[1]	Percent				
Blue Ridge	1,358,904	8	169,900	155,283	-9.4	18
Coastal Plain	2,756,088	15	1,133,281	1,103,998	-2.7	40
Cumberland Plateau	1,805,350	10	400,790	418,355	4.2	23
Highland Rim	6,235,935	35	2,435,068	2,462,078	1.1	39
Valley and Ridge	5,757,232	32	2,204,114	2,025,877	-8.8	35
Total	**18,296,866**		**6,343,153**	**6,165,591**	**-2.9**	**34**

[1] NRCS county soil surveys.
[2] Source: Oregon State University Libraries, Corvallis, Oregon. GovStats. Available at http://govinfo.kerr.orst.edu/php/agri/index.php.

Soils of the Cumberland Plateau

The Cumberland Plateau is bounded to the west and east by escarpments. The terrain is gently rolling to hilly highland with deeply cut gorges. The plateau elevation is approximately 1,700 to 1,900 feet with a few mountain peaks in the northeastern part that range to 3,000 feet. The parent material consists of sandstones and shales resulting in soils 2 to 4 feet deep that are well drained, loamy, strongly acid and low in natural fertility. Coal mining is important in this region. Much of the area is forested, with cleared areas used primarily for pasture and hay and small crops such as corn, vegetables, small grain, soybeans, and tobacco.

Soils of the Central Basin

The Central Basin formed as a result of weathering of a limestone dome. The present basin is 60 miles wide and 120 miles long (including the Elk River basin) (Fenneman 1938). Limestone underlies the majority of the basin with thin layers of shale, siltstone, and sandstone in small inclusions. Soil depths range from several inches in large tracts of "cedar glades" to 6 to 8 feet near rivers where alluvium has been deposited. Productive cropland tends to be in small tracts, mostly on narrow river bottoms and old terraces due to the prevalence of shallow soils. The soils tend to be redder and of lower phosphorus content than the soils in the outer part of the basin. The outer part of the basin is dominated by rocks high in phosphorus compared to the inner part of the basin where phosphorus content is lower. The terrain is hilly and steep with scattered parcels of undulating and rolling land. Soils are highly productive.

Soils of the Highland Rim

The Highland Rim is the largest region within the TVA region. The terrain is predominately undulating to hilly except in the western part, which is more dissected and ranges from hilly to steep. Limestone, much of it cherty, underlies most of the region with limestone sinks a common feature in the eastern and northern parts of the region. The hill slope soils were formed from limestone and have clayey and cherty subsoils. The more level areas and hill caps have soils formed from thin loess (wind blown material) and limestone residuum. The soils are highly leached, strongly acid with low fertility except near the Kentucky-Tennessee border. Forest, hay and pasture are the main uses of the soils.

Soils of the Coastal Plain

This region is hilly with fairly wide tracts of stream bottoms and broad expanses of level and undulating terraces adjacent to and only a few feet higher than the bottoms. The parent material is predominately sands and clays deposited in ancient seas. Generally the soils are highly leached, low in fertility, and strongly acid. Quality cropland is found mainly on the bottoms and terraces, which are intensively cultivated for soybeans, corn, cotton, and hay. Control of erosion is of major concern as evidenced by deep gullies that are common on some hillsides.

2.1.2 Representative Reservoirs

The following is a brief overview of the soils bordering the representative reservoirs based on the General Soil Map of Tennessee (scale of 1:750,000) and associated text (Springer and Elder 1980), which provides an overview of soil units consisting of soil series commonly found within a region. Chatuge Reservoir is in the hilly Blue Ridge Region. The bedrock contains highly weatherable minerals including arkosic sandstone, graywacke, and feldspathic quartzite. The soils tend to be deep, ranging from 7 to 8 feet, in the coves and lower slopes. Ditney and Jeffrey soils are on the upper slopes of mountains. Brookshire and Spivey soils are in the coves and lower parts of the slopes where colluvium has collected.

The Cherokee and Fort Loudoun Reservoirs are within the Valley and Ridge Region. The topography is predominantly hilly and steep with scattered tracks of level to rolling land on the narrow bottoms, terraces and broad hilltops. The ridges are underlain primarily by sandstones and hard shale with some areas of cherty, dolomitic limestone. Soft shales and clayey limestones generally form the valleys. The hills and ridges include the Fullerton-Dewey units, which are deep, well drained, with cherty and clayey soils formed from dolomitic limestone.

The Nickajack reservoir is in the Cumberland Plateau. The Waynesboro-Etowah-Sequatchie - Allen unit is undulating to hilly, deep, well drained, clayey and loamy soils from alluvium and colluvium. Clayey limestone underlies several feet of alluvium and colluvium within this unit. The potential for farming is high with the main limitations being slope, flooding in bottomlands, and poor drainage along the edge of floodplains.

The Tims Ford and Normandy Reservoirs are within the Highland Rim Region, which is distinctive for its red soils. The soils generally are strongly acid, permeable, well drained, and very deep over limestone bedrock. The Waynesboro-Decatur-Bewleyville-Curtistown unit is undulating and rolling, red and dark-red well-drained clayey and loamy soils from alluvium and thin loess. Red or dark red clayey subsoils formed from either alluvium or limestone residuum or both. The upper portion of the soils differs based on color and texture. Soils with fragipans are also noted in this unit. The potential for farming is high in this unit with the major limitations being susceptibility to erosion and slope.

Kentucky Reservoir is on the boundary between the Coastal Plain Region to the west and Highland Rim Region to the east. The Bodine-Mountview-Dickson unit is hilly and steep, excessively drained, cherty soils from limestone, and undulating, well-drained and moderately well drained silty soils from thin loess and limestone. The soils on the foot slopes commonly are deep and cherty; some have fragipans

2.2 Farmland Conversion

2.2.1 Existing Trends

The total land area within the TVA region is 18,296,866, of which 1,791,351 acres (or 10 percent) is within 0.25 mile of the TVA system shoreline. Of the total acreage in the TVA region, 6,165,591 acres are farmland, representing 34 percent of the total land area (Table 2-1). The smallest amount of land in the TVA region is located in the Blue Ridge Region (8 percent), of which 18 percent was farmland compared to the Valley and Ridge and Highland Rim Regions—which make up a combined 67 percent of the region and account for 74 percent of farmland in the region. The Coastal Plain Region has the largest percentage of farmland, 40 percent, or 1,103,998 acres. The Highland Rim Region has 2,462, 078 acres of farmland for 39 percent of its total land area and the Valley and Ridge Region has 35 percent farmland, or 2,025,877 acres. The Cumberland Plateau Region has 418, 355 acres of farmland representing 23 percent of its total land area.

Prime Farmland

During the decade 1987 to 1997, the Census of Agriculture indicated that over 50 percent of the counties within the TVA region experienced conversion of farmland to non-farm use, with 20 counties experiencing 10 percent and higher conversion (Figure 2-2, Appendix Tables A-1 and A-2). The reduction in farmland was assumed to reflect a number of factors, including population growth and viability of agriculture in the region due to competition and economies of scale. The converted areas generally were located within a reasonable commute of large population centers in Tennessee: Kingsport and Knoxville in the Valley and Ridge Region, and Chattanooga in the Coastal Plain. The large population centers in Alabama included Florence and Huntsville in the Highland Rim Region.

The Census of Agriculture indicated that 22 counties experienced an increase in farmland, the majority occurring in Alabama (Highland Rim) and along the northern portion of Kentucky Reservoir (Coastal Plain and Highland Rim) (Appendix A, Table A-3). These numbers reflect a strong farm economy within those regions.

A review of farmland conversion by physiographic region finds that the Valley and Ridge and Blue Ridge Regions have seen the largest conversion of farmland in the last decade, with an 8.8 percent and 9.4 percent decline, respectively (Table 2-1). Overall, the TVA region experienced a 2.9-percent or 177,562-acre decline in farmland.

The total acreage of prime farmland in the TVA region is 3,849,358 acres, representing 62 percent of the total farmland acreage and 21 percent of the land area in the TVA region (Table 2-2). Over 50 percent of the farmland reported in 1997 by the Census of Agriculture in the Coastal Plain, Cumberland Plateau, and Highland Rim Regions had been categorized by NRCS as prime farmland (Figure 2-3). Counties with over 31 percent of the total acreage in prime farmland are found primarily in the Coastal Plain and Highland Rim Regions; counties with over 45 percent of the total acreage in prime farmland include Calloway County in Kentucky; Limestone and Madison Counties in Alabama, and Coffee County in Tennessee (Appendix Table A-4).

Table 2-3 summarizes the estimated acreage of prime farmland within 0.25 mile of the representative reservoirs. The extent of prime farmland by land use was based on the STATSGO (NRCS 1994) data layer overlaid with Landsat TM imagery, with a resolution of 30 meters (ca. 1992) to which U.S. Geological Survey land use classifications had been applied. Prime farmland ranges from none bordering Chatuge Reservoir to an estimated 37 percent (or 30,163 acres) of the land area within 0.25 mile of Kentucky Reservoir and 17,443 acres (or 71 percent) of the land bordering Tims Ford Reservoir.

An analysis was conducted on the type of land use (agricultural or forest) of prime farmland bordering the representative reservoirs (Table 2-3). Over 50 percent of the prime farmland is in forestland for all six reservoirs. Over 30 percent of the acreage of prime farmland for Tims Ford, Ft. Loudoun, and Nickajack Reservoirs are in agricultural use (pasture/hay and cropland). Kentucky, Tims Ford, and Nickajack Reservoirs have the highest percent of prime farmland in non-farm use—16, 11, and 11 percent, respectively.

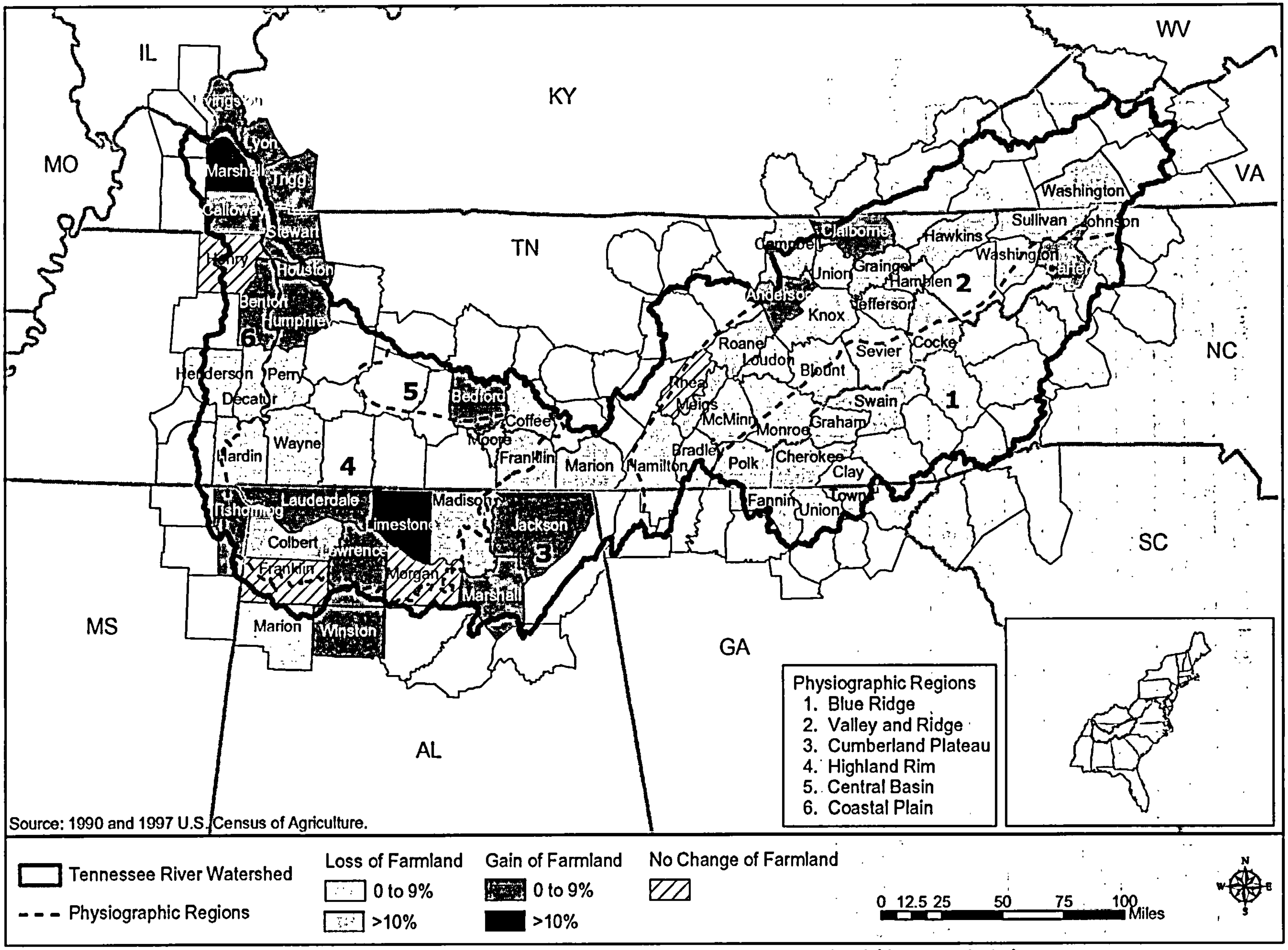

Figure 2.2 Farmland Conversion within Counties in the Tennessee River Watershed (1987 to 1997)

Prime Farmland

Table 2-2 Acreage of Prime Farmland in the TVA Region by Physiographic Region

Physiographic Region	1997 Farmland[1]	Prime Farmland[2]	
	Acres	Acres	Percent
Blue Ridge	155,283	36,460	23
Coastal Plain	1,103,998	766,741	69
Cumberland Plateau[3]	418,355	485,122	116
Highland Rim	2,462,078	1,826,591	74
Valley and Ridge	2,025,877	614,480	30
Total	**6,165,591**	**3,849,358**	**62**

[1] Source: Oregon State University Libraries, Corvallis, Oregon. GovStats. Available at http://govinfo.library.orst.edu/php/agri/index.php.

[2] Data provided by Natural Resources Conservation Service county offices.

[3] Cumberland Plateau farmland data provided by the Agricultural Census does not appear to be accurate based on the prime farmland data, which are based on actual NRCS field analysis.

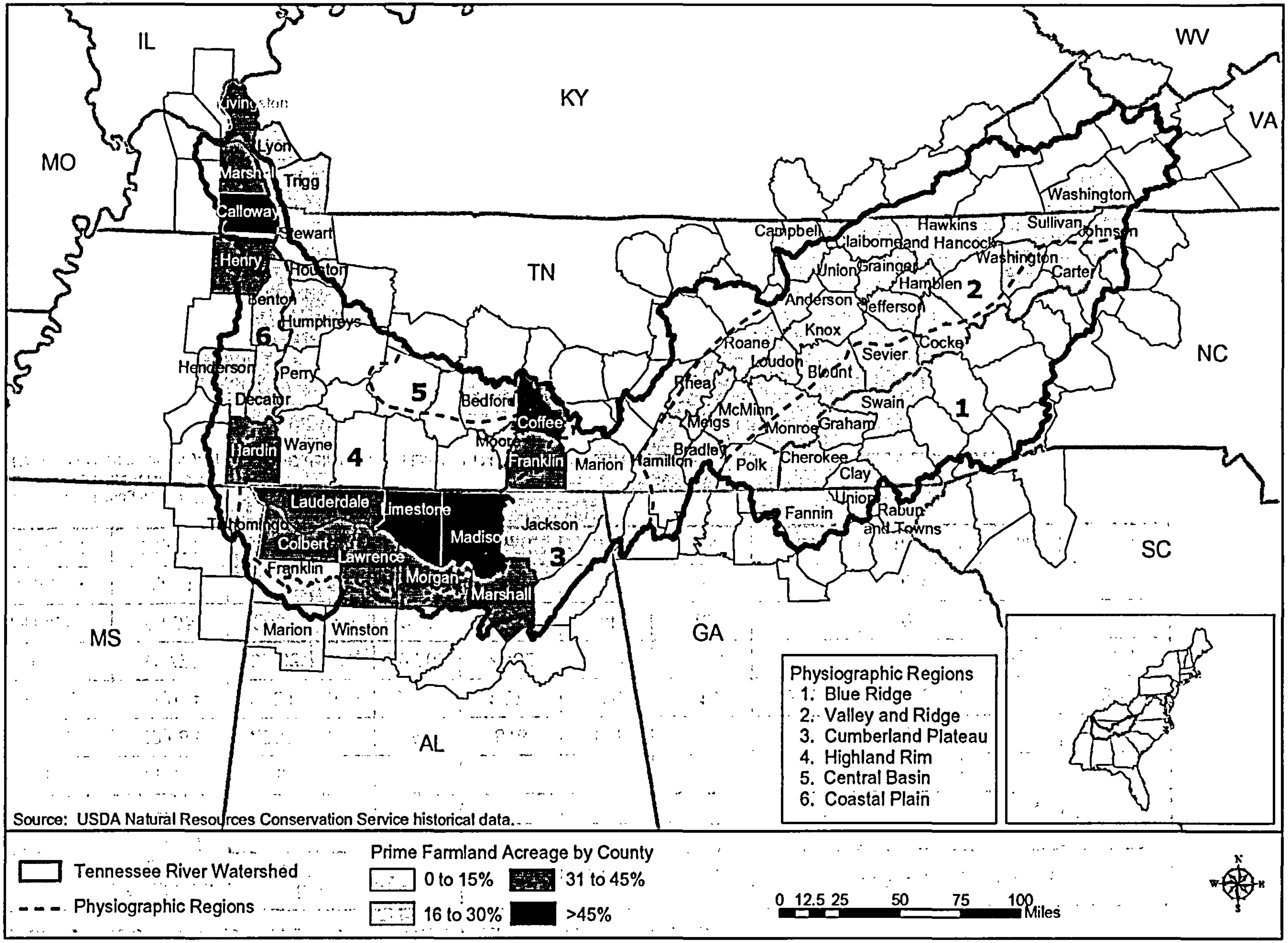

Figure 2.3 Prime Farmland Acreage by County in the Tennessee River Watershed

Table 2-3 Land Use of Prime Farmland within 0.25 Mile of Representative Reservoirs

Reservoir	Total Land within 0.25 Mile (acres)[1]	Prime Farmland (acres)[2]	Prime Farmland %	Forest-land (acres)[3]	Pasture/ Hay (acres)[3]	Row Crops (acres)[3]	Non-Farm (acres)[3]	Prime Farmland Land Use: Forest-land	Prime Farmland Land Use: Pasture/ Hay	Prime Farmland Land Use: Row Crops	Prime Farmland Land Use: Non-Farm
Chatuge	11,047	none									
Cherokee	32,088	4,059	13%	2,802	818	164	275	69%	20%	4%	7%
Ft. Loudoun	27,914	4,454	16%	2,415	1,676	250	113	54%	38%	6%	3%
Kentucky	81,779	30,163	37%	20,203	2,482	2,550	4928	67%	8%	8%	16%
Nickajack	9,085	369	4%	210	75	44	40	57%	20%	12%	11%
Normandy	9,831	319	3%	238	51	14	16	75%	16%	4%	5%
Tims Ford	24,491	17,443	71%	9,653	3,161	2,730	1899	55%	18%	16%	11%

1 Landsat TM imagery (ca. 1992).
2 STATSGO (USDA NRCS 1994).
3 Data generated by overlaying STATSGO data layer with Landsat TM imagery to which U.S. Geological Survey land use classification was applied.

A comparison of the reservoir groupings in the SMI found that the eastern tributary reservoirs have the highest average decline in farmland (11 percent) and the lowest prime farmland acreage (average 6.1 percent) in the TVA system (Table 2-4). The western commercially navigable reservoirs have the highest acreage of prime farmland, with an increase in farmland acreage of 2.3 percent during the last decade. The eastern commercially navigable and western tributary reservoirs have moderate acreage in prime farmland (average 16.5 and 25.4 percent, respectively) with declining farmland acreage of 6.3 and 5.2 percent, respectively.

2.2.2 Future Trends

Population trend data indicate that the population will continue to grow within the TVA region with the eastern portion experiencing the highest increases. Census data indicate that the population in the TVA region has shown moderate increases throughout the system from 1990 to 1997 ranging from 7.8 to 8.6 percent within the reservoir groupings (Table 2-5). Individual counties experienced higher rates including Jefferson, Loudon and Sevier Counties in Tennessee, and Towns and Union Counties in Georgia, which experienced over 18 percent increases in population during the period 1990 to 1997 (Figure 2-4, Appendix Table A-5).

It was anticipated that the decline in farmland within the majority of counties bordering the TVA region would continue based on anticipated land use pressures from development and recreation as outlined in Section 4.15, Shoreline Development and Land Use, and Section 4.24, Recreation. The highest rate of conversion is expected to continue to occur in the eastern portion of the region based on past trends. The conversion of farmland was projected to the year 2030 based on the assumption of a fixed rate of conversion, using the average conversion rate for counties bordering the representative reservoirs during the decade 1987 to 1997 (Table 2-6). A further assumption was made that farmland conversion would occur at a faster rate than forestland conversion, as farmland has the characteristics considered ideal for development, and all the farmland would be prime farmland. The SMI established a maximum residential buildout of 38 percent for the entire TVA system, projected to occur by 2023.

Based on these assumptions, farmland conversion would be less than the SMI maximum buildout of 38 percent by the Year 2023. Kentucky and Normandy Reservoirs would actually experience an increase in prime farmland if current conversion rates continue (Table 2-6). The majority of these impacts would occur on private backlands, where erosion control and stabilization measures vary by county. Overall, it is anticipated that prime farmland conversion would occur at very low rates under the Base Case, of which the majority would occur on backlands due to activities not directly related to the ROS.

Table 2-4 Acreage of Farmland by Reservoir Grouping

Reservoir	Total Prime Farmland in County[1] (acres)	Total Land in County[1] (acres)	% Prime Farmland	Farmland Conversion Rate[2]
Eastern Commercially Navigable Waterway Reservoirs				
Chickamauga	254,688	1,183,360	21.5%	-5.2%
Ft. Loudoun	123,638	843,794	14.7%	-7.1%
Melton Hill	120,143	938,523	12.8%	-6.2%
Nickajack	157,503	827,870	19.0%	-6.14%
Tellico	116,670	936,594	12.5%	-7.1%
Watts Bar	125,964	731,163	17.2%	-6.6%
Total	898,606	5,461,304	16.5%	-6.3%
Eastern Tributary Reservoirs				
Apalachia	NA[3]	NA		
Blue Ridge	8,345	461,000	1.8%	-29.0%
Boone	49,500	484,890	10.2%	-4.5%
Chatuge	10,859	482,886	2.2%	-22.0%
Cherokee	73,456	961,000	7.6%	-12.8%
Douglas	98,494	840,860	11.7%	-13.0%
Fontana	3,114	193,018	1.6%	-7.0%
Ft. Patrick Henry	49,500	484,890	10.2%	-7.5%
Hiwassee	NA	NA		
Norris	43,492	1,162,068	3.7%	-4.0%
Nottely	8,345	461,000	1.8%	-4.5%
Ocoee Project	19,715	282,900	7.0%	-15.9%
South Holston	27,153	624,100	4.4%	-13.0%
Wautaga	23,130	413,360	5.6%	-13.0%
Wilbur	14,142	222,000	6.4%	3.4%
Total	429,245	7,073,972	6.1%	-11.0%
Western Commercially Navigable Waterway Reservoirs				
Guntersville	391,730	1,595,720	24.5%	3.3%
Kentucky	1,000,013	3,836,740	26.1%	2.2%
Pickwick	507,882	1,514,520	33.5%	-4.5%
Wheeler	1,168,253	2,610,690	44.7%	3.6%
Wilson	482,196	1,318,570	36.6%	6.8%
Total	3,550,074	10,876,240	32.6%	2.3%
Western Tributary Reservoirs				
Bear Creek Project	54,405	475,870	11.4%	-2.0%
Beech River Project	119,288	540,800	22.1%	-6.2%
Normandy	206,922	582,200	35.5%	1.6%
Tims Ford	138,120	442,100	31.2%	-14.2%
Total	518,735	2,040,970	25.4%	-5.2%

[1] NRCS county data. Farmland data available only for Graham County, North Carolina. Census of Agriculture, 1987 to 1997.

[2] Percent change from 1987 to 1997.

[3] NA = Data not available.

Table 2-5 Population Change by Reservoir Group

Reservoir Group	Population			Percent Increase	
	1980	1990	1997	1980-1990	1990-1997
Eastern Commercially Navigable	1,938,482	1,942,305	2,106,918	0.2%	7.8%
Eastern Tributary	1,379,939	1,361,513	1,489,709	-1.4%	8.6%
Western Commercially Navigable	1,265,428	1,265,428	1,383,283	0.0%	8.5%
Western Tributary	222,209	222,209	241,158	0.0%	7.9%
Total	4,808,038	4,793,445	5,223,065	-0.3%	8.2%

[1] US Census, source: http://govinfo.kerr.orst.edu.

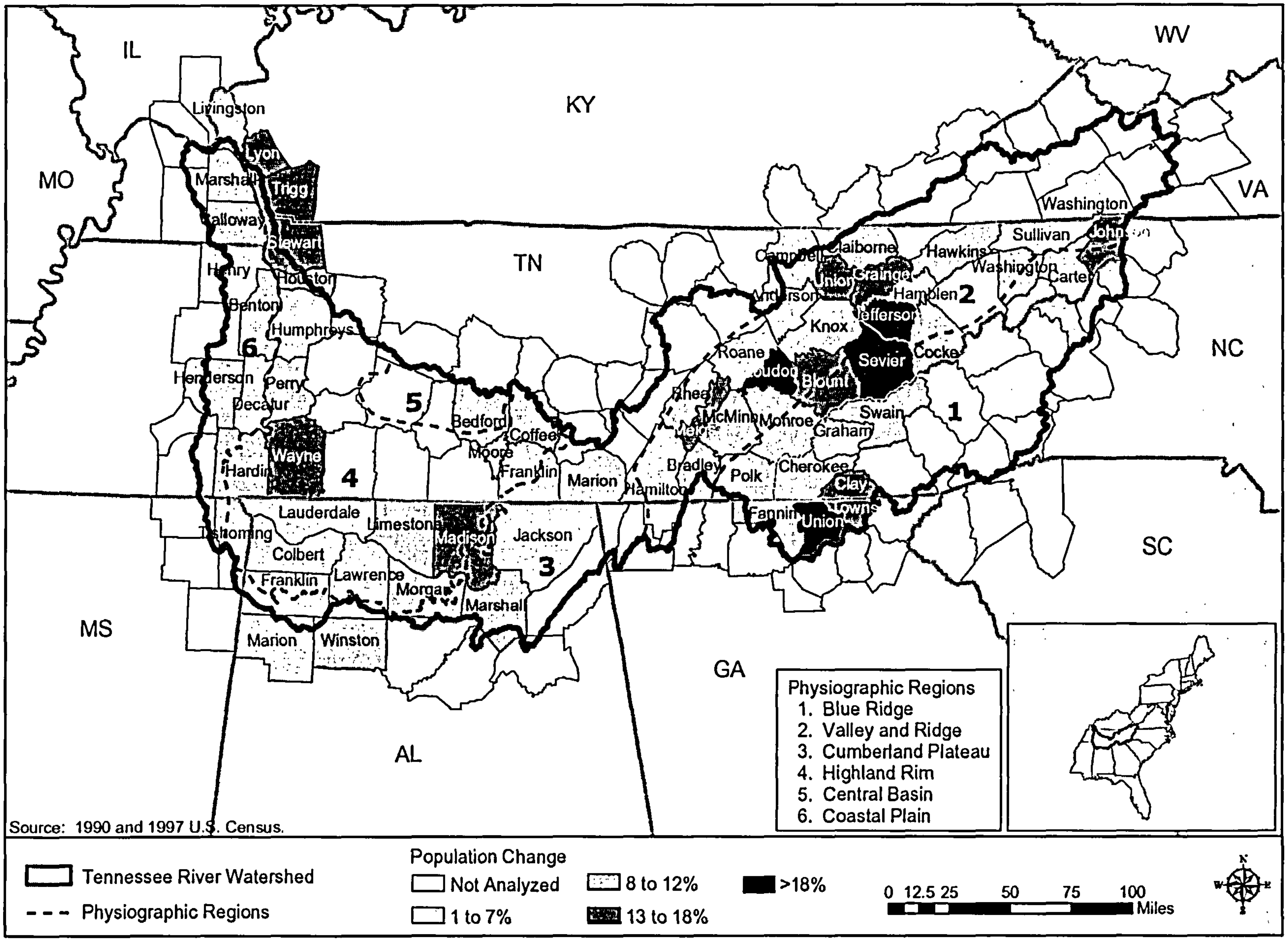

Figure 2.4 Percent Population Change in the Tennessee River Watershed (1990 to 1997)

Table 2-6 Projection of Prime Farmland Conversion within 0.25 Mile of Representative Reservoirs

Reservoir	Total Prime Farmland in Cropland[1] (acres)	Farmland Conversion Rate[2]	Projected Prime Farmland Conversion (acres)				
			Year 2010	Year 2020	Year 2030	Total Converted (Acres)	SMI Buildout Cap[3]
Chatuge	--[4]	--					
Cherokee	982	-12.8%	-125	-109	-95	-330	373
Ft. Loudoun	1,926	-7%	-136	-127	-118	-380	732
Kentucky	5,032	+2.2%	+110	+113	+115	+338	1,912
Nickajack	119	-6.1%	-7	-7	-6	-21	45
Normandy	65	+1.6%	+1	+1	+1	+3	25
Tims Ford	5,891	-14.2%		-719	-616	-2,173	2,239

[1] Sum of pasture/hay and row crops from Landsat TM imagery (ca. 1992) (NRCS 1994).
[2] Rate based on 1987 and 1998 farmland conversion data, Oregon State University Libraries, Corvallis Oregon. GovStats. Available at http://govinfo.kerr.orst.edu/php/commerce/state/show.php.
[3] SMI maximum buildout of 38 percent.
[4] Chatuge Reservoir had no cropland within 0.5 mile.

2.3 Soil Erosion

2.3.1 Existing Trends

An overview of the extent of erodible soils in the TVA region was based on average K factors for soil associations. The K factor is a relative index of susceptibility of bare, cultivated soil to particle detachment and transport by rainfall (USDA Soil Survey Staff 1993). Soil erodibility depends on slope and soil physical characteristics, as well as vegetative cover. A more detailed analysis of shoreline erosion is provided in Section 4.16, Shoreline Erosion.

Soil erodibility is variable within the TVA region. Of the six physiographic regions, the regions with the highest estimated area of erodible soils are the Coastal Plain, Blue Ridge, and Highland Rim (NRCS 1997).

The potential for erosion for the majority of the soils within 0.25 mile of the representative reservoirs is considered moderate (Table 2-7). Kentucky Reservoir has the highest acreage of highly erodible soils (24,608 acres) and Tims Ford the second highest (5,299 acres).

2.3.2 Future Trends

The future trends discussed for farmland conversion also apply to soil erosion, as erosion is directly influenced by changes in land use. Soil erosion is anticipated to continue as land is converted from forestland, although the degree of erosion would be lessened through practices such as those required by Section 26A regulations. Activities in the backlands that are not under TVA jurisdiction come under the jurisdiction of county regulations, which may not specify minimum standards for erosion control.

Table 2-7 Erosion Potential of Soils within 0.25 Mile of Representative Reservoirs

Reservoir	Erodibility Potential (acres)[1]		
	Low	Moderate	High
Cherokee	32,783	29,489	287
Normandy		9,445	386
Nickajack	3,956	5,128	
Tims Ford		19,192	5,299
Ft. Loudoun		27,914	
Kentucky		27,453	24,608
Total	36,739	118,621	30,580

[1] The following ranges were used in assessing erodibility:
K = <0.2 are considered low as water infiltrates readily.
K = 0.2 to 0.3 are considered moderate, with moderate structural stability and infiltration.
K = >0.3 are considered high, with low infiltration rates (Brady 1990).

Source: STATSGO (NRCS 1994).

3 Environmental Consequences

3.1 Introduction and Assessment Methodology

The impact analysis focuses on the backlands—the land extending from the shoreline out 0.25 mile, which would be indirectly affected by farmland conversion and soil erosion due to land use changes brought about by changes in reservoir operations.

The majority of prime farmland bordering the reservoirs is forestland, with cropland the second most common cover type. It was assumed that conversion of prime farmland to residential/industrial/commercial use is an irretrievable loss due to the expense to restore land to agricultural use. The following analysis also assumed that reservoir operation activities that increase the rate of development along the shoreline of the reservoirs and rivers would result in a loss of prime farmland.

The factors influencing erosion include changes in land use that result in the removal of vegetation and exposure of soil. Land in forest was considered to be the least susceptible to erosion while herbaceous cover, such as lawns and cropland (particularly row crops), were considered more vulnerable to erosion (Brady 1990). In addition, the anticipated increase in foot and vehicle traffic with associated roads and trails was assumed to result in additional areas of exposed soils.

Anticipated impacts by the alternatives were assessed relative to the Base Case, which includes ongoing impacts as a result of current operations as well as indirect impacts resulting from adjacent land uses related to commercial/industrial business, farming, and residential activities outside the control of TVA. The SMI established a total residential buildout of 38 percent for the entire TVA system shoreline, which was projected to occur by 2023. The proposed alternatives also would be required to comply with the SMI, and therefore would differ from the Base Case by influencing the rate of development (see Section 4.15, Shoreline Development and Land Use). Table 3-1 provides a summary of the alternatives.

3.2 Alternatives Analysis

3.2.1 Base Case

The Base Case would continue the current reservoir pool level and tailwater release policies for the integrated operation of dams and reservoirs. Reservoir operations influence shoreline development by the duration of high water levels during the summer recreation season; the timing of water releases for recreation use; and overall reservoir fluctuations, which affect shoreline exposure and resultant visual quality.

Based on farmland conversion data, the loss of farmland would be expected to continue, particularly within the eastern tributary reservoirs, which have the highest rate of farmland conversion in the TVA system. The loss would be attributed to factors unrelated to TVA's reservoir operations policy, including proximity of reservoirs to large urban populations. Most likely, development would focus initially on existing cropland due to the low cost of site preparation. The total loss of prime farmland under the Base Case is considered very low compared to the prime farmland resource within the counties bordering the TVA system..

Table 3-1. Summary of Impacts on Prime Farmland and Soils by Policy Alternative.

Alternative								
Base Case	Reservoir Recreation Alternative A	Reservoir Recreation Alternative B	Summer Hydropower	Equalized Summer/ Winter Flood Risk	Commercial Navigation	Tailwater Recreation	Tailwater Habitat	Preferred Alternative
Farmland conversion is considered minimal compared to overall resources of counties bordering the TVA system. Section 26A standards would minimize erosion on land bordering shoreline. Erosion controls in backlands depend on county regulations, which are variable.	Farmland conversion and resultant soil erosion are projected to increase at a slightly faster rate than under the Base Case, but the total amount of farmland conversion through 2030 is expected to be similar to the Base Case.	Farmland conversion and resultant soil erosion are projected to increase at a faster rate than under Reservoir Recreation Alternative A, but the total amount of farmland conversion through 2030 is expected to be similar to the Base Case.	Farmland conversion and soil erosion are projected to be slower than under the Base Case. The total amount of farmland conversion through 2030 may be less than under the Base Case.	Farmland conversion and soil erosion are projected to be slower than under the Base Case. The total amount of farmland conversion, however, may be less than under the Base Case.	Farmland conversion and soil erosion are projected to be at a similar rate to the Base Case, but the total amount of farmland conversion through 2030 is expected to be similar to the Base Case.	Farmland conversion and soil erosion are projected to increase at a faster rate than under Reservoir Recreation Alternative B, but the total amount of farmland conversion through 2030 is expected to be similar to the Base Case.	Farmland conversion and soil erosion are projected to increase at a slightly faster rate than under Reservoir Recreation Alternative B, but the total amount of farmland conversion through 2030 is expected to be similar to the Base Case.	Farmland conversion and soil erosion are projected to increase at a higher rate than under the Base Case, but the total amount of farmland conversion through 2030 is expected to be similar to the Base Case.

The erosion potential of soils in the backlands was estimated to be moderate based on a review of six representative reservoirs. Current TVA standards for soil stabilization and vegetation management under Permit 26A result in minimizing the impact of erosion. The major difference between the Base Case and the policy alternatives will be the effect increased rates of development would have on soil erosion within the backlands, where county soil erosion and stabilization regulations are variable to non-existent.

Farmland conversion at the county level is projected based on conversion rates (Census of Agriculture, 1987 to 1997) for the reservoir groupings. The farmland conversion rate for the western commercially navigable reservoirs was ranked as low; the eastern commercially navigable and western tributary reservoirs as moderate; and the eastern tributary reservoirs as high (low = <4 percent; moderate = 4.1 to 9 percent, and high - >10 percent) (see Table 2-4). Overall, farmland conversion projections estimated insignificant loss of prime farmland within 0.25 mile of the TVA shoreline under the Base Case; most of the conversion would occur due to factors unrelated to TVA's reservoir operations. Erosion controls within the backland would continue to depend on county-specific regulations.

3.2.2 Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, Tailwater Recreation Alternative, Tailwater Habitat Alternative, and the Preferred Alternative

The rate of farmland conversion and soil erosion under Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, and the Tailwater Habitat Alternative was considered higher than that under the Base Case for all the eastern tributary and eastern commercially navigable reservoirs and four of the western commercially navigable reservoirs. Under these alternatives, the rate of conversion for the western tributary reservoirs would not change. The Tailwater Recreation Alternative would result in the highest rate of conversion compared to Reservoir Recreation Alternative B. Conversion under both the Tailwater Recreation Alternative and Reservoir Recreation Alternative B would be higher than under Reservoir Recreation Alternative A. Conversion under the Tailwater Habitat Alternative would increase at a slightly higher rate than under the Base Case.

The Preferred Alternative would result in a higher rate of farmland conversion and soil erosion for a majority of the eastern tributaries and four mainstem reservoirs. There would be no change to the western tributaries compared to the Base Case.

3.2.3 Summer Hydropower Alternative and Equalized Summer/Winter Flood Risk Alternative

The rate of farmland conversion and soil erosion under the Summer Hydropower Alternative and Equalized Summer/Winter Flood Risk Alternative was considered slower than under the Base Case for all reservoirs.

3.2.4 Commercial Navigation Alternative

The Commercial Navigation Alternative would result in similar impacts on prime farmland and soil erosion as the Base Case.

3.3 Conclusions

The land use buildout rate, as described in the SMI, would continue to occur under all alternatives, including the Base Case. Therefore, the conversion of prime farmland out to 2030 would be similar under all alternatives. However, development may be accelerated under certain alternatives, resulting in an accelerated rate of prime farmland conversion. Erosion controls in the backlands would continue to depend on county-specific regulations, which govern land development and minimizing erosion from construction sites.

Table 3-1 provides a summary of impacts on prime farmland and soils by policy alternative. Under the Base Case, farmland conversion and soil erosion were considered to be minimal within 0.25 mile of the TVA shoreline. Impacts under the Commercial Navigation Alternative would be similar to those for the Base Case. Reservoir Recreation Alternative A, Reservoir Recreation Alternative B, the Tailwater Recreation Alternative, the Tailwater Habitat Alternative, and the Preferred Alternative would increase the rates of farmland conversion and soil erosion. The highest rates would result under the Tailwater Recreation Alternative, and the rates under the Tailwater Habitat Alternative would increase only slightly from those under the Base Case. The Summer Hydropower Alternative and the Equalized Summer/Winter Flood Risk Alternative would result in slower rates of farmland conversion and therefore slower impacts on prime farmland and soils compared to the Base Case.

4 Supporting Information

4.1 Glossary

Backlands –Lands extending 0.25 mile from the shoreline and generally in private ownership.

Prime farmland – Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion. Prime farmland includes land that possesses the above characteristics but are being used currently to produce livestock and timber" (7 U.S.C.: 4201 et seq.).

Section 26A – Section 26a of the TVA Act.

TVA Region – Counties bordering the TVA system.

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Appendix A

Tables

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Table A-1 Counties with Farmland Conversion Exceeding 10% (1987 to 1997)

Physiographic Region	Reservoir	County	State	1987 (Acres)	1997 (Acres)	Percent Change
Blue Ridge	Blue Ridge	Fannin	GA	19,413	15,052	-28.97%
Blue Ridge	Chatuge	Towns	GA	10,638	8,708	-22.16%
Blue Ridge	Ocoee Project	Polk	TN	37,228	32,122	-15.90%
Blue Ridge	Apalachia, Hiwassee	Cherokee	NC	27,100	24,533	-10.46%
Coastal Plain	Pickwick	Colbert	AL	145,104	115,542	-25.59%
Cumberland Plateau	Nickajack	Marion	TN	56,177	51,060	-10.02%
Highland Rim	Tims Ford	Franklin	TN	152,578	131,976	-15.61%
Highland Rim	Wheeler	Madison	AL	235,478	210,455	-11.89%
Highland Rim	Tims Ford	Moore	TN	57,642	52,065	-10.71%
Valley and Ridge	Watauga	Johnson	TN	62,446	49,475	-26.22%
Valley and Ridge	Douglas	Cocke	TN	89,277	75,222	-18.68%
Valley and Ridge	Cherokee	Hawkins	TN	167,866	146,888	-14.28%
Valley and Ridge	Norris	Campbell	TN	34,850	30,683	-13.58%
Valley and Ridge	S. Holston	Washington	VA	202,709	178,496	-13.57%
Valley and Ridge	S. Holston, Ft. Patrick Henry, Boone	Sullivan	TN	97,537	86,402	-12.89%
Valley and Ridge	Cherokee, Douglas	Hamblen	TN	58,434	51,996	-12.38%
Valley and Ridge	Watts Bar, Chickamauga	Meigs	TN	54,949	48,977	-12.19%
Valley and Ridge	Cherokee, Douglas	Jefferson	TN	109,592	98,067	-11.75%
Valley and Ridge	Norris, Cherokee	Grainger	TN	108,212	96,842	-11.74%
Valley and Ridge	Melton Hill, Watts Bar	Roane	TN	58,739	53,110	-10.60%

Source: Oregon State University Libraries, Corvallis, Oregon. GovStats. Available at http://govinfo.library.orst.edu/php/agri/index.php.

Prime Farmland

Table A-2 Conversion of Farmland (1987 to 1997)

Physiographic Region	Reservoir	County	State	1987 (Acres)	1997 (Acres)	Percent Change
Blue Ridge	Blue Ridge	Fannin	GA	19,413	15,052	-28.97%
Blue Ridge	Chatuge	Towns	GA	10,638	8,708	-22.16%
Blue Ridge	Ocoee Project	Polk	TN	37,228	32,122	-15.90%
Blue Ridge	Apalachia, Hiwassee	Cherokee	NC	27,100	24,533	-10.46%
Blue Ridge	Fontana	Swain	NC	7,258	6,624	-9.57%
Blue Ridge	Fontana	Graham	NC	7,533	7,194	-4.71%
Blue Ridge	Nottely	Union	GA	23,141	22,156	-4.45%
Blue Ridge	Wilbur, Watauga	Carter	TN	37,589	38,894	3.36%
Blue Ridge	Chatuge	Clay	NC	withheld	18,288	
Total				**169,900**	**155,283**	**-9.41%**
Coastal Plain	Pickwick	Colbert	AL	145,104	115,542	-25.59%
Coastal Plain	Beech River Project	Henderson	TN	163,685	152,034	-7.66%
Coastal Plain	Guntersville, Bear Creek Project	Marion	AL	105,586	98,078	-7.66%
Coastal Plain	Pickwick, Kentucky	Hardin	TN	121,098	115,598	-4.76%
Coastal Plain	Kentucky, Beech River Project	Decatur	TN	91,591	88,399	-3.61%
Coastal Plain	Kentucky	Henry	TN	186,659	185,304	-0.73%
Coastal Plain	Pickwick	Tishomingo	MS	43,216	44,866	3.68%
Coastal Plain	Kentucky	Calloway	KY	137,781	145,909	5.57%
Coastal Plain	Kentucky	Benton	TN	64,560	68,931	6.34%
Coastal Plain	Kentucky	Marshall	KY	74,001	89,337	17.17%
Total				**1,133,281**	**1,103,998**	**-2.65%**
Cumberland Plateau	Nickajack	Marion	TN	56,177	51,060	-10.02%
Cumberland Plateau	Guntersville	Jackson	AL	208,014	221,166	5.95%
Cumberland Plateau	Guntersville, Wheeler	Marshall	AL	136,599	146,129	6.52%
Total				**400,790**	**418,355**	**4.20%**
Highland Rim	Tims Ford	Franklin	TN.	152,578	131,976	-15.61%
Highland Rim	Wheeler	Madison	AL	235,478	210,455	-11.89%
Highland Rim	Tims Ford	Moore	TN	57,642	52,065	-10.71%
Highland Rim	Kentucky	Perry	TN	58,327	54,390	-7.24%
Highland Rim	Normandy	Coffee	TN	143,496	135,615	-5.81%
Highland Rim	Kentucky	Wayne	TN	135,209	130,012	-4.00%
Highland Rim	Wheeler	Morgan	AL	159,757	158,711	-0.66%
Highland Rim	Bear Creek Project	Franklin	AL	127,653	128,437	0.61%
Highland Rim	Kentucky	Humphreys	TN	120,570	121,983	1.16%
Highland Rim	Kentucky	Stewart	TN	55,703	56,517	1.44%
Highland Rim	Bear Creek Project	Winston	AL	57,923	59,090	1.97%
Highland Rim	Kentucky	Trigg	KY	111,362	116,966	4.79%
Highland Rim	Wheeler, Wilson, Pickwick	Lauderdale	AL	199,960	211,586	5.49%

Table A-2 Conversion of Farmland (1987 to 1997) (Continued)

Physiographic Region	Reservoir	County	State	1987 (Acres)	1997 (Acres)	Percent Change
Highland Rim	Normandy	Bedford	TN	207,434	221,058	6.16%
Highland Rim	Kentucky	Livingston	KY	110,028	117,279	6.18%
Highland Rim	Kentucky	Houston	TN	45,691	48,735	6.25%
Highland Rim	Kentucky	Lyon	KY	44,702	48,344	7.53%
Highland Rim	Wheeler, Wilson	Lawrence	AL	188,365	204,970	8.10%
Highland Rim	Wheeler	Limestone	AL	223,190	253,889	12.09%
Total				**2,435,068**	**2,462,078**	**1.10%**
Valley and Ridge	Watauga	Johnson	TN	62,446	49,475	-26.22%
Valley and Ridge	Douglas	Cocke	TN	89,277	75,222	-18.68%
Valley and Ridge	Cherokee	Hawkins	TN	167,866	146,888	-14.28%
Valley and Ridge	Norris	Campbell	TN	34,850	30,683	-13.58%
Valley and Ridge	S. Holston	Washington	VA	202,709	178,496	-13.57%
Valley and Ridge	S. Holston, Ft. Patrick Henry, Boone	Sullivan	TN	97,537	86,402	-12.89%
Valley and Ridge	Cherokee, Douglas	Hamblen	TN	58,434	51,996	-12.38%
Valley and Ridge	Watts Bar, Chickamauga	Meigs	TN	54,949	48,977	-12.19%
Valley and Ridge	Cherokee, Douglas	Jefferson	TN	109,592	98,067	-11.75%
Valley and Ridge	Norris, Cherokee	Grainger	TN	108,212	96,842	-11.74%
Valley and Ridge	Melton Hill, Watts Bar	Roane	TN	58,739	53,110	-10.60%
Valley and Ridge	Douglas	Sevier	TN	78,192	71,677	-9.09%
Valley and Ridge	Tellico	Blount	TN	101,397	93,209	-8.78%
Valley and Ridge	Chickamauga	McMinn	TN	137,843	127,322	-8.26%
Valley and Ridge	Ft. Loudoun	Monroe	TN	104,646	96,929	-7.96%
Valley and Ridge	Melton Hill, Ft. Loudoun	Knox	TN	94,701	87,809	-7.85%
Valley and Ridge	Melton Hill, Ft. Loudoun, Tellico, Watts Bar	Loudon	TN	77,665	73,976	-4.99%
Valley and Ridge	Norris	Union	TN	53,305	51,290	-3.93%
Valley and Ridge	Ft. Patrick Henry, Boone	Washington	TN	123,904	119,670	-3.54%
Valley and Ridge	Chickamauga	Bradley	TN	92,127	90,067	-2.29%
Valley and Ridge	Chickamauga, Nickajack	Hamilton	TN	57,708	56,822	-1.56%
Valley and Ridge	Watts Bar, Chickamauga	Rhea	TN	55,956	56,049	0.17%
Valley and Ridge	Melton Hill, Norris	Anderson	TN	40,472	40,928	1.11%
Valley and Ridge	Norris	Claiborne	TN	141,587	143,971	1.66%
Total Valley and Ridge				**2,204,114**	**2,025,877**	**-8.80%**
Total Farmland				**6,343,153**	**6,165,591**	**-2.88%**

Source: Oregon State University Libraries, Corvallis, Oregon. GovStats. Available at http://govinfo.library.orst.edu/php/agri/index.php.

Table A-3 Counties with Increasing Farmland Acreage (1987 to 1997)

Physiographic Region	Reservoir	County	State	1987 (Acres)	1997 (Acres)	Percent Change
Blue Ridge	Wilbur, Watauga	Carter	TN	37,589	38,894	3.36%
Coastal Plain	Kentucky	Marshall	KY	74,001	89,337	17.17%
Coastal Plain	Kentucky	Benton	TN	64,560	68,931	6.34%
Coastal Plain	Kentucky	Calloway	KY	137,781	145,909	5.57%
Coastal Plain	Pickwick	Tishomingo	MS	43,216	44,866	3.68%
Cumberland Plateau	Guntersville, Wheeler	Marshall	AL	136,599	146,129	6.52%
Cumberland Plateau	Guntersville	Jackson	AL	208,014	221,166	5.95%
Highland Rim	Wheeler	Limestone	AL	223,190	253,889	12.09%
Highland Rim	Wheeler, Wilson	Lawrence	AL	188,365	204,970	8.10%
Highland Rim	Kentucky	Lyon	KY	44,702	48,344	7.53%
Highland Rim	Kentucky	Houston	TN	45,691	48,735	6.25%
Highland Rim	Kentucky	Livingston	KY	110,028	117,279	6.18%
Highland Rim	Normandy	Bedford	TN	207,434	221,058	6.16%
Highland Rim	Wheeler, Wilson, Pickwick	Lauderdale	AL	199,960	211,586	5.49%
Highland Rim	Kentucky	Trigg	KY	111,362	116,966	4.79%
Highland Rim	Bear Creek Project	Winston	AL	57,923	59,090	1.97%
Highland Rim	Kentucky	Stewart	TN	55,703	56,517	1.44%
Highland Rim	Kentucky	Humphreys	TN	120,570	121,983	1.16%
Highland Rim	Bear Creek Project	Franklin	AL	127,653	128,437	0.61%
Valley and Ridge	Norris	Claiborne	TN	141,587	143,971	1.66%
Valley and Ridge	Melton Hill, Norris	Anderson	TN	40,472	40,928	1.11%
Valley and Ridge	Watts Bar, Chickamauga	Rhea	TN	55,956	56,049	0.17%

Source: Oregon State University Libraries, Corvallis, Oregon. GovStats. Available at http://govinfo.library.orst.edu/php/agri/index.php.

Table A-4 Prime Farmland Acreage by County and Physiographic Region[1]

Physiographic Region	County	State	Total Prime Farmland (Acres)	Total Land in County (Acres)	Prime Farmland in County (%)
Blue Ridge	Fannin and Union	GA	8,345	461,000	1.81%
Blue Ridge	Rabun and Towns	GA	3,430	341,760	1.00%
Blue Ridge	Cherokee	NC	NA[2]	NA[2]	
Blue Ridge	Clay	NC	7,429	141,126	5.26%
Blue Ridge	Graham	NC	3,114	193,018	1.61%
Blue Ridge	Swain	NC	NA[2]	339,200	
Blue Ridge	Carter	TN	14,142	222,000	6.37%
Total Land[3]			**36,460**	**1,358,904**	**2.68%**
Coastal Plain	Colbert	AL	133,794	399,170	33.52%
Coastal Plain	Marion	AL	54,405	475,870	11.43%
Coastal Plain	Tishomingo	MS	50,702	279,640	18.13%
Coastal Plain	Benton	TN	66,230	245,248	27.01%
Coastal Plain	Decatur	TN	58,070	211,200	27.50%
Coastal Plain	Hardin	TN	131,832	375,680	35.09%
Coastal Plain	Henderson	TN	61,218	329,600	18.57%
Coastal Plain	Henry	TN			
Coastal Plain	Calloway	KY	124,410	245,760	50.62%
Coastal Plain	Marshall	KY	86,080	193,920	44.39%
Total Land			**766,741**	**2,756,088**	**27.82%**
Cumberland Plateau	Jackson	AL	172,069	721,100	23.86%
Cumberland Plateau	Marshall	AL	165,256	398,750	41.44%
Cumberland Plateau	Hamilton	TN	103,098	352,000	29.29%
Cumberland Plateau	Marion	TN	44,699	333,500	13.40%
Total Land			**485,122**	**1,805,350**	**26.87%**
Highland Rim	Franklin	AL	65,125	413,830	15.74%
Highland Rim	Lauderdale	AL	191,554	460,030	41.64%
Highland Rim	Lawrence	AL	156,848	459,370	34.14%
Highland Rim	Limestone	AL	228,552	388,700	58.80%
Highland Rim	Madison	AL	271,929	520,380	52.26%
Highland Rim	Morgan	AL	154,114	383,460	40.19%
Highland Rim	Winston	AL	NA[2]	404,290	
Highland Rim	Livingston	KY	76,402	219,085	34.87%
Highland Rim	Lyon	KY	37,490	142,726	26.27%
Highland Rim	Trigg	KY	80,320	275,320	29.17%
Highland Rim	Bedford	TN	37,340	304,200	12.27%
Highland Rim	Coffee	TN	169,582	278,000	61.00%
Highland Rim	Franklin	TN	123,045	358,400	34.33%
Highland Rim	Houston	TN	29,381	132,500	22.17%
Highland Rim	Humphreys	TN	59,776	352,064	16.98%
Highland Rim	Moore	TN	15,075	83,700	18.01%
Highland Rim	Perry	TN	23,804	271,100	8.78%
Highland Rim	Stewart	TN	48,148	318,080	15.14%
Highland Rim	Wayne	TN	58,106	470,700	12.34%
Total Land			**1,826,591**	**6,235,935**	**29.29%**

Table A-4 Prime Farmland Acreage by County and Physiographic Region[1] (Continued)

Physiographic Region	County	State	Total Prime Farmland (Acres)	Total Land in County (Acres)	Prime Farmland in County (%)
Valley and Ridge	Anderson	TN	16,260	214,400	7.58%
Valley and Ridge	Blount	TN	54,051	362,871	14.90%
Valley and Ridge	Bradley	TN	41,174	216,320	19.03%
Valley and Ridge	Campbell	TN	5,926	317,500	1.87%
Valley and Ridge	Claiborne	TN	6,136	277,963	2.21%
Valley and Ridge	Cocke	TN	33,211	277,760	11.96%
Valley and Ridge	Grainger	TN	7,438	193,700	3.84%
Valley and Ridge	Hamblen	TN	12,032	112,000	10.74%
Valley and Ridge	Hawkins and Hancock	TN	32,915	454,400	7.24%
Valley and Ridge	Jefferson	TN	21,071	200,900	10.49%
Valley and Ridge	Johnson	TN	8,988	191,360	4.70%
Valley and Ridge	Knox	TN	46,128	329,600	14.00%
Valley and Ridge	Loudon	TN	23,459	151,323	15.50%
Valley and Ridge	McMinn	TN	42,207	278,400	15.16%
Valley and Ridge	Meigs	TN	25,905	122,240	21.19%
Valley and Ridge	Monroe	TN	39,160	422,400	9.27%
Valley and Ridge	Polk	TN	19,715	282,900	6.97%
Valley and Ridge	Rhea	TN	42,304	214,400	19.73%
Valley and Ridge	Roane	TN	34,296	243,200	14.10%
Valley and Ridge	Sevier	TN	32,180	250,200	12.86%
Valley and Ridge	Sullivan	TN	14,461	275,100	5.26%
Valley and Ridge	Union	TN	7,732	158,505	4.88%
Valley and Ridge	Washington	TN	35,039	209,790	16.70%
Valley and Ridge	Washington	VA	12692	349,000	3.64%
Total Land			**601,788**	**5,757,232**	**10.45%**
Total in TVA region			**3,716,702**	**17,913,509**	**20.75%**

[1] Data provided by Natural Resources Conservation Service county offices.
[2] NA = Not available.
[3] Totals only include counties in which both total prime farmland and total land in county are provided.

Table A-5 Population Change by Reservoir[1]

Physiographic Region	Reservoir	County	State	1990	1997	Percent Change
Eastern Commercially Navigable Waterway Reservoirs						
Valley and Ridge	Chickamauga	Bradley	TN	73,712	80,250	8.15%
Valley and Ridge	Chickamauga	Hamilton	TN	285,536	294,676	3.10%
Valley and Ridge	Chickamauga	McMinn	TN	42,383	45,890	7.64%
Valley and Ridge	Chickamauga	Meigs	TN	8,033	9,697	17.16%
Valley and Ridge	Chickamauga	Rhea	TN	24,344	27,588	11.76%
Subtotal				**434,008**	**458,101**	**5.26%**
Valley and Ridge	Ft. Loudoun	Knox	TN	335,749	365,626	8.17%
Valley and Ridge	Ft. Loudoun	Loudon	TN	31,255	38,234	18.25%
Valley and Ridge	Ft. Loudoun	Blount	TN	85,969	100,377	14.35%
Subtotal				**452,973**	**504,237**	**10.17%**
Valley and Ridge	Melton Hill	Anderson	TN	68,250	71,429	4.45%
Valley and Ridge	Melton Hill	Knox	TN	335,749	365,626	8.17%
Valley and Ridge	Melton Hill	Loudon	TN	31,255	38,234	18.25%
Valley and Ridge	Melton Hill	Roane	TN	47,227	49,909	5.37%
Subtotal				**482,481**	**525,198**	**8.13%**
Valley and Ridge	Nickajack	Hamilton	TN	285,536	294,676	3.10%
Cumberland Plateau	Nickajack	Marion	TN	24,860	26,733	7.01%
Subtotal				**310,396**	**321,409**	**3.43%**
Valley and Ridge	Tellico	Blount	TN	85,969	100,377	14.35%
Valley and Ridge	Tellico	Loudon	TN	31,255	38,234	18.25%
Valley and Ridge	Tellico	Monroe	TN	30,541	33,934	10.00%
Subtotal				**147,765**	**172,545**	**14.36%**
Valley and Ridge	Watts Bar	Loudon	TN	31,255	38,234	18.25%
Valley and Ridge	Watts Bar	Meigs	TN	8,033	9,697	17.16%
Valley and Ridge	Watts Bar	Rhea	TN	24,344	27,588	11.76%
Valley and Ridge	Watts Bar	Roane	TN	47,227	49,909	5.37%
Subtotal				**110,859**	**125,428**	**11.62%**
Eastern Tributary Reservoirs						
Blue Ridge	Apalachia	Cherokee	NC	20,170	22,282	9.48%
Blue Ridge	Blue Ridge	Fannin	GA	15,992	18,090	11.60%
Valley and Ridge	Boone	Sullivan	TN	143,596	150,684	4.70%
Valley and Ridge	Boone	Washington	TN	92,315	101,558	9.10%
Subtotal				**235,911**	**252,242**	**6.47%**
Blue Ridge	Chatuge	Clay	NC	7,155	8,292	13.71%
Blue Ridge	Chatuge	Towns	GA	6,754	8,167	17.30%
Subtotal				**13,909**	**16,459**	**15.49%**
Valley and Ridge	Cherokee	Grainger	TN	17,095	19,462	12.16%
Valley and Ridge	Cherokee	Hamblen	TN	50,480	53,737	6.06%
Valley and Ridge	Cherokee	Hawkins	TN	44,565	48,777	8.64%
Valley and Ridge	Cherokee	Jefferson	TN	33,016	45,054	26.72%
Subtotal				**145,156**	**167,030**	**13.10%**
Valley and Ridge	Douglas	Cocke	TN	29,141	31,597	7.77%
Valley and Ridge	Douglas	Hamblen	TN	50,480	53,737	6.06%
Valley and Ridge	Douglas	Jefferson	TN	33,016	45,054	26.72%
Valley and Ridge	Douglas	Sevier	TN	51,043	62,602	18.46%
Subtotal				**163,680**	**192,990**	**15.19%**

Table A-5 Population Change by Reservoir[1] (Continued)

Physiographic Region	Reservoir	County	State	1990	1997	Percent Change
Blue Ridge	Fontana	Graham	NC	7,196	7,657	6.02%
Blue Ridge	Fontana	Swain	NC	11,268	12,189	7.56%
Subtotal				**18,464**	**19,846**	**6.96%**
Valley and Ridge	Ft. Patrick Henry	Sullivan	TN	143,596	150,684	4.70%
Valley and Ridge	Ft. Patrick Henry	Washington	TN	92,315	101,558	9.10%
Subtotal				**235,911**	**252,242**	**6.47%**
Blue Ridge	Hiwassee	Cherokee	NC	20,170	22,282	9.48%
Subtotal				**20,170**	**22,282**	**9.48%**
Valley and Ridge	Norris	Anderson	TN	68,250	71,429	4.45%
Valley and Ridge	Norris	Campbell	TN	35,079	37,859	7.34%
Valley and Ridge	Norris	Claiborne	TN	26,137	28,999	9.87%
Valley and Ridge	Norris	Grainger	TN	17,095	19,462	12.16%
Valley and Ridge	Norris	Union	TN	13,694	15,913	13.94%
Subtotal				**160,255**	**173,662**	**7.72%**
Blue Ridge	Nottely	Union	GA	11,993	15,675	23.49%
Subtotal				**11,993**	**15,675**	**23.49%**
Blue Ridge	Ocoee Project	Polk	TN	13,643	14,703	7.21%
Subtotal				**13,643**	**14,703**	**7.21%**
Valley and Ridge	S. Holston	Sullivan	TN	143,596	150,684	4.70%
Valley and Ridge	S. Holston	Washington	VA	45,887	48,802	5.97%
Subtotal				**189,483**	**199,486**	**5.01%**
Blue Ridge	Watauga	Carter	TN	51,505	53,082	2.97%
Valley and Ridge	Watauga	Johnson	TN	13,766	16,556	16.85%
Subtotal				**65,271**	**69,638**	**6.27%**
Blue Ridge	Wilbur	Carter	TN	51,505	53,082	2.97%
Subtotal				**51,505**	**53,082**	**2.97%**
Western Commercially Navigable Waterway Reservoirs						
Cumberland Plateau	Guntersville	Jackson	AL	47,796	50,751	5.82%
Coastal Plain	Guntersville	Marion	AL	29,830	30,813	3.19%
Cumberland Plateau	Guntersville	Marshall	AL	70,832	78,893	10.22%
Subtotal				**148,458**	**160,457**	**7.48%**
Coastal Plain	Kentucky	Benton	TN	14,524	16,311	10.96%
Coastal Plain	Kentucky	Calloway	KY	30,735	33,072	7.07%
Coastal Plain	Kentucky	Decatur	TN	10,472	10,766	2.73%
Coastal Plain	Kentucky	Hardin	TN	22,633	24,746	8.54%
Coastal Plain	Kentucky	Henry	TN	27,888	29,702	6.11%
Highland Rim	Kentucky	Houston	TN	7,018	7,801	10.04%
Highland Rim	Kentucky	Humphreys	TN	15,813	16,797	5.86%
Highland Rim	Kentucky	Livingston	KY	9,062	9,330	2.87%
Highland Rim	Kentucky	Lyon	KY	6,624	8,012	17.32%
Coastal Plain	Kentucky	Marshall	KY	27,205	29,832	8.81%
Highland Rim	Kentucky	Perry	TN	6,612	7,487	11.69%
Highland Rim	Kentucky	Stewart	TN	9,479	11,257	15.79%
Highland Rim	Kentucky	Trigg	KY	10,361	12,072	14.17%
Highland Rim	Kentucky	Wayne	TN	13,935	16,553	15.82%
Subtotal				**212,361**	**233,738**	**9.15%**

Table A-5 Population Change by Reservoir[1] (Continued)

Physiographic Region	Reservoir	County	State	1990	1997	Percent Change
Coastal Plain	Pickwick	Colbert	AL	51,666	53,047	2.60%
Coastal Plain	Pickwick	Hardin	TN	22,633	24,746	8.54%
Highland Rim	Pickwick	Lauderdale	AL	79,661	84,241	5.44%
Coastal Plain	Pickwick	Tishomingo	MS	17,683	18,563	4.74%
Subtotal				**171,643**	**180,597**	**4.96%**
Highland Rim	Wheeler	Lauderdale	AL	79,661	84,241	5.44%
Highland Rim	Wheeler	Lawrence	AL	31,513	33,386	5.61%
Highland Rim	Wheeler	Limestone	AL	54,135	60,700	10.82%
Highland Rim	Wheeler	Madison	AL	238,912	272,293	12.26%
Highland Rim	Wheeler	Marshall	AL	70,832	78,893	10.22%
Highland Rim	Wheeler	Morgan	AL	100,043	108,304	7.63%
Subtotal				**575,096**	**637,817**	**9.83%**
Highland Rim	Wilson	Colbert	AL	51,666	53,047	2.60%
Highland Rim	Wilson	Lauderdale	AL	79,661	84,241	5.44%
Highland Rim	Wilson	Lawrence	AL	31,513	33,386	5.61%
Western Tributary Reservoirs						
Highland Rim	Bear Creek Project	Franklin	AL	27,814	29,613	6.08%
Coastal Plain	Bear Creek Project	Marion	AL	29,830	30,813	3.19%
Highland Rim	Bear Creek Project	Winston	AL	22,053	23,913	7.78%
Subtotal				**79,697**	**84,339**	**5.50%**
Coastal Plain	Beech River Project	Decatur	TN	10,472	10,766	2.73%
Coastal Plain	Beech River Project	Henderson	TN	21,844	23,998	8.98%
Subtotal				**32,316**	**34,764**	**7.04%**
Highland Rim	Normandy	Bedford	TN	30,411	34,162	10.98%
Highland Rim	Normandy	Coffee	TN	40,339	45,520	11.38%
Subtotal				**70,750**	**79,682**	**11.21%**
Highland Rim	Tims Ford	Franklin	TN	34,725	37,146	6.52%
Highland Rim	Tims Ford	Moore	TN	4,721	5,227	9.68%
Subtotal				**39,446**	**42,373**	**6.91%**

[1] Source: US Census

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Appendix B
Prime Farmland Soils

Virginia
Tennessee
North Carolina
Mississippi
Kentucky
Georgia
Alabama

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Table B-1 Prime Farmland—Virginia

County	Soil Name	Slope	Acres
Washington County	Allegheny loam	2 to 7 percent slopes	307
	Botetourt loam	2 to 7 percent slopes, rarely flooded	811
	Ebbing loam	2 to 7 percent slopes, rarely flooded	797
	Ernest silt loam	2 to 7 percent slopes	274
	Frederick silt loam	2 to 7 percent slopes	1,227
	Ingledove loam	2 to 7 percent slopes, rarely flooded	644
	Lobdell loam	0 to 3 percent slopes, occasionally flooded	722
	Monongahela silt loam	2 to 7 percent slopes	192
	Shottower loam	2 to 7 percent slopes	208
	Sindion silt loam	0 to 3 percent slopes, occasionally flooded	3,456
	Speedwell loam	0 to 3 percent slopes, occasionally flooded	588
	Tate loam	2 to 7 percent slopes	33
	Tumbling loam	2 to 7 percent slopes	409
	Wheeling loam	2 to 7 percent slopes, rarely flooded	767
	Wolfgap fine sandy loam	0 to 3 percent slopes, occasionally flooded	652
	Wyrick-Marble complex	2 to 7 percent slopes	1,605
Total Farmland			**12,692**
Total Acres in County			**346,000**

Prime Farmland

Table B-2 Prime Farmland — Tennessee

County	Soil Name	Slope	Acres
Anderson County	Capshaw silt loam	2 to 5 percent slopes	416
	Collegedale silt loam	2 to 5 percent slopes	322
	Emory silt loam	0 to 4 percent slopes	431
	Etowah silt loam	2 to 5 percent slopes	424
	Greendale silt loam	2 to 5 percent slopes	422
	Hamblen silt loam		4,190
	Holston loam	2 to 5 percent slopes	186
	Leadvale silt loam	2 to 7 percent slopes	992
	Lily loam	3 to 10 percent slopes	932
	Monongahela loam	2 to 5 percent slopes	990
	Newark silt loam		1,267
	Newark variant loam	0 to 3 percent slopes	901
	Sequatchie loam	0 to 5 percent slopes	858
	Sewanee-Ealy complex	0 to 3 percent slopes	1,399
	Staser loam		1,347
	Tasso silt loam	2 to 7 percent slopes	701
	Whitwell loam	1 to 3 percent slopes	482
Total Farmland			**16,260**
Total Acres in County			**214,400**
Bedford County	Arrington silt loam	occasionally flooded	
	Braxton silt loam	2 to 5 percent slopes, eroded	4,280
	Bluestocking silt loam	occasionally flooded	
	Capshaw silt loam	0 to 2 percent slopes	3,520
	Capshaw silt loam	2 to 5 percent slopes	12,700
	Dellrose cherty silt loam	5 to 12 percent slopes	
	Eagleville silt clay loam	occasionally flooded	
	Egam silt loam	occasionally flooded	
	Godwin silt loam	occasionally flooded	
	Harpeth silt loam	0 to 2 percent slopes	560
	Harpeth silt loam	2 to 5 percent slopes	8,200
	Lomand silt loam	0 to 2 percent slopes	400
	Lomand silt loam	2 to 5 percent slopes	
	Lynnville silt loam	occasionally flooded	
	Mountview silt loam	2 to 5 percent slopes	1,280
	Nesbitt silt loam	0 to 2 percent slopes	1,120
	Nesbitt silt loam	2 to 5 percent slopes	5,280
	Raus silt loam	0 to 2 percent slopes	
	Raus silt loam	2 to 5 percent slopes	
	Roellen cherty silt loam	5 to 12 percent slopes	
	Tupelo silt loam	occasionally flooded	
Total Farmland			**37,340**
Total Acres in County			**304,200**
Benton County	Alva fine sandy loam	2 to 4 percent slopes	322
	Briensburg silt loam	2 to 4 percent slopes (Collins)	9,961
	Dexter silt loam	eroded undulating phase (Lexington)	264
	Dickson silt loam	eroded undulating phase	3,287

Table B-2 Prime Farmland—Tennessee (Continued)

County	Soil Name	Slope	Acres
Benton County (continued)	Dickson silt loam	Undulating phase	1,179
	Dulac silt loam	eroded undulating phase	5,972
	Dulac silt loam	Undulating phase	2,441
	Egam silty clay loam		
	Ennis cherty silt loam		1,819
	Ennis silt loam (Pruition)		2,609
	Eupora fine sandy loam (Mantachie)		2,465
	Freeland silt loam	Undulating phase	2,027
	Freeland silt loam	Undulating phase	603
	Greendale cherty silt loam	undulating phase (Humphreys)	8,087
	Hatchie silt loam	1 to 3 percent slopes	2,268
	Humphreys cherty silt loam		986
	Humphreys silt loam	1 to 5 percent slopes (Pruition)	2,125
	Huntington silt loam (Pruition)		
	Hymon fine sandy loam (Mantachie)		
	Hymon silt loam (Mantachie)		3,912
	Lax silt loam	eroded undulating phase	241
	Lindside silt loam		
	Lindside silty clay loam		
	Lobelville silt loam (Lindside)		13,561
	Paden silt loam	Undulating phase	253
	Providence silt loam	eroded undulating phase	636
	Providence silt loam	Undulating phase	98
	Sequatchie fine sandy loam		
	Shannon fine sandy loam (Ochlockonee)		54
	Shannon silt loam (Ochlockonee)		85
	Taft silt loam		975
	Wolftever silt loam		
	Wolftever silty clay loam	eroded phase	
Total Farmland			**66,230**
Total Acres in County			**245,248**
Blount County	Alcoa loam	eroded gently sloping phase	253
	Barbourville fine sandy loam	gently sloping phase	2304
	Barbourville fine sandy loam	gently sloping phase	3248
	Cumberland silty clay loam	eroded gently sloping phase	409
	Dunmore silty clay loam	eroded gently sloping phase	1406
	Decatur silty clay loam	eroded gently sloping phase	1573
	Dewey silty clay loam	eroded gently sloping phase	2051
	Emory silt loam	level phase	406
	Emory silt loam	gently sloping phase	9978
	Emory silty clay loam	gently sloping phase	1097
	Etowah silt loam	eroded gently sloping phase	497

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Blount County (continued)	Farragut silty clay loam	eroded gently sloping phase	1240
	Greendale silt loam		2379
	Hamblen loam		1124
	Hamblen silt loam		2707
	Hamblen silt loam	local alluvium phase	4036
	Hayter silt loam	gently sloping phase	761
	Hermitage silt loam	gently sloping phase (Etowah)	882
	Hermitage silt loam	eroded gently sloping phase (Etowah)	1679
	Jefferson fine sandy loam	gently sloping phase	384
	Leadvale silt loam	gently sloping phase	709
	Leadvale silt loam	eroded gently sloping phase	483
	Lindside silt loam		2249
	Minvale silt loam	eroded gently sloping phase	356
	Muse silt loam	eroded gently sloping phase	692
	Neubert silt loam		2705
	Pace silt loam	gently sloping phase (Tasso)	724
	Sequatchie fine sandy loam		462
	Sequatchie loam		741
	Sequatchie silt loam		1409
	Staser fine sandy loam		1141
	Staser loam		1104
	Staser silt loam		1115
	Waynesboro loam	eroded gently sloping phase	253
	Whitesburg silt loam	gently sloping phase	838
	Whitwell loam		656
Total Farmland			**54,051**
Total Acres in County			**362,871**
Bradley County	Apison silt loam	eroded undulating phase	
	Apison silt loam	Undulating phase	
	Barbourville loam		
	Barbourville stony loam		
	Capshaw silt loam	Undulating phase	
	Cotaco loam		
	Cotaco silt loam		
	Cumberland silty clay loam	eroded undulating phase	
	Decatur silty clay loam	eroded undulating phase	
	Dewey silty clay loam	eroded undulating phase	
	Emory silt loam		
	Etowah silt loam	eroded rolling phase	
	Etowah silt loam	eroded undulating phase	
	Etowah silt loam	Undulating phase	
	Farragut silty clay loam	eroded undulating phase	
	Fullerton silt loam	eroded undulating phase	
	Greendale cherty silt loam		
	Greendale silt loam		
	Hamblen silt loam		

Table B-2 Prime Farmland—Tennessee (Continued)

County	Soil Name	Slope	Acres
Bradley County (continued)	Hermitage silt loam	eroded undulating phase	
	Hermitage silt loam	Undulating phase	
	Holston loam	eroded undulating phase	
	Huntington loam		
	Huntington silt loam		
	Jefferson loam	eroded undulating phase	
	Leadvale silt loam	eroded undulating phase	
	Leadvale silt loam	Undulating phase	
	Lindside silt loam		
	Minvale silt loam	eroded undulating phase	
	Minvale silt loam	Undulating phase	
	Monongahela silt loam	Undulating phase	
	Muse silt loam	eroded undulating phase	
	Muse silt loam	Undulating phase	
	Neubert silt loam		
	Pace silt loam	eroded undulating phase	
	Pace silt loam	Undulating phase	
	Sequatchie loam		
	Staser loam		
	Staser silt loam		
	Tyler silt loam		
	Whitwell loam		
	Wolftever silt loam	Undulating phase	
Total Farmland			**41,174**
Total Acres in County			**216,320**
Campbell County	Collegedale silt loam	2 to 5 percent slopes	379
	Ealy loam	occasionally flooded	1,689
	Etowah silt loam	2 to 5 percent slopes	887
	Hamblen silt loam	occasionally flooded	851
	Sequatchie loam	1 to 5 percent slopes, occasionally flooded	334
	Sewanee silt loam	occasionally flooded	639
	Swafford loam	occasionally flooded	175
	Whitwell loam	occasionally flooded	972
Total Farmland			**5,926**
Total Acres in County			**317,500**
Carter County	Allen loam		104
	Altavista silt loam		220
	Buncombe loamy fine sand		400
	Camp silt loam		217
	Chewacla fine sandy loam		698
	Chewacla gravelly fine sandy loam		633
	Congaree fine sandy loam		1828
	Congaree loam		274
	Emory silt loam		124
	Greendale silt loam		434
	Hamblen loam		1054

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Carter County (continued)	Hayter loam		181
	Jefferson gravelly loam		279
	Lindside silt loam		231
	Masada gravelly silt loam		175
	Masada silt loam		1768
	Ooltewah silt loam		101
	Sequatchie gravelly loam		1269
	Sequatchie loam		3507
	Staser fine sandy loam		181
	State loam		464
Total Farmland			**14,142**
Total Acres in County			**222,000**
Claiborne County	Caylor (Etowah) silt loam	gently sloping phase	84
	Greendale silt loam		1,216
	Holston fine sandy loam		277
	Leadvale silt loam		460
	Lindside silt loam		839
	Monongahela silt loam		151
	Ooltewah (Lindside) silt loam		523
	Philo fine sandy loam (SL)		2,137
	Pope fine sandy loam		607
	Robertsville clay loam (SIL)		107
	Sequatchie fine sandy loam		1,302
Total Farmland			**6,126**
Total Acres in County			**277,963**
Cocke County	Altavista loam		229
	Augusta silt loam		464
	Barbourville fine sandy loam		2,174
	Barbourville silt loam		3,159
	Buncombe loamy fine sand		1,515
	Camp (Shelocta) silt loam		111
	Congaree fine sandy loam		1,272
	Congaree loam		833
	Cotaco fine sandy loam		1,996
	Emory silt loam		1,257
	Greendale silt loam		3,912
	Hamblen fine sandy loam		1,121
	Hamblen silt loam		2,049
	Holston loam	Undulating phase	1,128
	Leadvale silt loam	Undulating phase	478
	Lindside silt loam		952
	Monongahela silt loam		1,312
	Monongahela silt loam	eroded phase	387
	Nolichucky loam	Undulating phase	275
	Ooltewah (Hamblen) silt loam		396
	Sequatchie fine sandy loam		503
	Staser fine sandy loam		
	Staser silt loam		395

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Cocke County (continued)	State loam		2,199
	Waynesboro loam	Undulating phase	187
	Whitesboro silt loam		4,907
Total Farmland			**33,211**
Total Acres in County			**277,760**
Coffee County	Armour silt loam	eroded, gently sloping phase	558
	Baxter cherty silt loam	gently sloping phase	1,284
	Baxter cherty silty clay loam	severely eroded, gently sloping phase	—
	Captina silt loam	level phase (1 to 2%)	47
	Captina silt loam	gently sloping phase	1,450
	Captina silt loam	eroded, gently sloping phase	
	Cookeville silt loam	gently sloping phase (Dewey)	358
	Cookeville silt loam	eroded, gently sloping phase (Dewey)	2,163
	Cumberland silt loam	gently sloping phase	283
	Cumberland silt loam	eroded, gently sloping phase	2,649
	Decatur silty clay loam	eroded, gently sloping phase	301
	Dickson silt loam	gently sloping phase	24,809
	Dickson silt loam	eroded, gently sloping phase	21,859
	Dunning silt loam	drained, overwash phase	375
	Dunning silt loam	silty substratum phase	754
	Dunning silty clay loam	drained phase	358
	Emory silt loam		2,785
	Etowah silt loam	eroded, gently sloping phase	531
	Etowah silt loam	eroded, gently sloping phosphatic phase	24
	Greendale cherty silt loam		584
	Greendale silt loam		4,487
	Hamblen fine sandy loam		2,188
	Hamblen fine sandy loam	local alluvium phase	709
	Hartsells fine sandy loam	gently sloping phase	790
	Hermitage silt loam	gently sloping phase	774
	Hermitage silt loam	eroded, gently sloping phase	879
	Holston loam	gently sloping phase	1,209
	Holston loam	eroded, gently sloping phase	2,444
	Humphreys silt loam	gently sloping phase	836
	Huntington cherty silt loam	local alluvium phosphatic phase	1,938
	Huntington cherty silt loam	phosphatic phase	349
	Huntington silt loam	local alluvium phosphatic phase	187
	Huntington silt loam	phosphatic phase	200
	Lawrence silt loam		15,796
	Lee silt loam	(if drained)	—
	Lindside cherty silt loam	local alluvium phosphatic phase	350

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Coffee County (continued)	Lindside cherty silt loam	phosphatic phase	385
	Lindside silt loam	local alluvium phase	806
	Lindside silt loam	phosphatic phase	356
	Lobelville cherty silt loam	local alluvium phase	461
	Lobelville silt loam		3,622
	Lobelville silt loam	local alluvium phase	8,305
	Monongahela loam	level phase	96
	Monongahela loam	gently sloping phase	2,678
	Monongahela loam	eroded, gently sloping phase	286
	Mountview silt loam	gently sloping	11,595
	Mountview silt loam	eroded, gently sloping phase	19,081
	Mountview silt loam	gently sloping shallow phase	2,184
	Mountview silt loam	eroded, gently sloping shallow phase	5,439
	Mountview silty clay loam	severely eroded, gently sloping phase	249
	Nolichucky loam	gently sloping phase	366
	Nolichucky loam	eroded, gently sloping phase	662
	Pace cherty silt loam	eroded, gently sloping phosphatic phase	412
	Pace cherty silt loam	eroded, gently sloping phase	456
	Pembroke silt loam	eroded gently sloping phase	650
	Prader fine sandy loam	(if drained)	—
	Sango silt loam		7,850
	Sequatchie fine sandy loam	level phase	129
	Sequatchie fine sandy loam	gently sloping phase	301
	Sequatchie fine sandy loam	eroded, gently sloping phase	1,458
	Staser fine sandy loam		604
	Staser fine sandy loam	local alluvium phase	400
	Taft silt loam		786
	Taft silt loam	overwash phase	288
	Tyler loam		2,709
	Tyler loam	overwash phase	346
	Waynesboro clay loam	severely eroded, gently sloping	362
	Waynesboro loam	gently sloping phase	285
	Whitwell loam	level phase	714
	Whitwell loam	gently sloping phase	753
	Whitwell loam	eroded, gently sloping phase	200
Total Farmland			**169,582**
Total Acres in County			**278,000**
Decatur County	Alva find sandy loam (Collins)	0 to 2 percent slopes	423
	Briensburg silt loam (Collins)		6,041
	Dexter silt loam	eroded undulating phase (Lexington)	
	Deanburg		630
	Dickson silt loam	eroded undulating phase	548

Table B-2 Prime Farmland—Tennessee (Continued)

County	Soil Name	Slope	Acres
Decatur County (continued)	Dickson silt loam	Undulating phase	860
	Dulac silt loam	eroded undulating phase	2,795
	Dulac slightly eroded undulating phase		699
	Dulac silt loam	Undulating phase	1,334
	Egam silty clay loam		1,096
	Emory silt loam		3,698
	Ennis cherty slit loam		731
	Ennis silt loam (Pruition)		3,107
	Eupora fine sandy loam (luka)		3,535
	Freeland silt loam	eroded undulating phase	3,093
	Freeland silt loam		723
	Greendale cherty silt loam	undulating phase (Humphreys)	3,521
	Hatchie fine sandy loam (Loam)		398
	Hatchie silt loam		1,118
	Humphreys cherty silt loam		1,295
	Humphreys silt loam (Pruition silt loam)	0 to 2 percent slopes	226
	Huntington silt loam (Pruition)		248
	Hymon fine sandy loam (Mantachie)		2,494
	Hymon silt loam (Mantachie)		4,408
	Lindside silt loam		4,292
	Lindside silty clay loam		376
	Maury silty clay loam	eroded undulating phase	172
	Paden silt loam	eroded undulating phase	1,427
	Paden silt loam	Undulating phase	537
	Pickwick silt loam	eroded undulating phase	1,268
	Pickwick silt loam	Undulating phase	275
	Savannah loam	eroded undulating phase	604
	Savannah loam	Undulating phase	515
	Sequatchie fine sandy loam		1,010
	Shannon fine sandy loam (Ochlocknee)		1,151
	Shannon silt loam (Ochlocknee)		666
	Taft silt loam		1,032
	Tigrett silt loam (Statler)		344
	Wolftever silt loam		376
	Wolftever silt loam	slightly eroded phase	516
	Wolftever silty clay loam	eroded phase	488
Total Farmland			**58,070**
Total Acres in County			**211,200**

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Franklin County	Barbourville fine sandy loam		135
	Baxter cherty silt loam	Undulating phase	626
	Baxter cherty silt loam	eroded undulating phase	2,006
	Capshaw silt loam		3,230
	Cotaco fine sandy loam		702
	Cumberland and Etowah loams	Undulating phase	317
	Cumberland and Etowah loams	eroded, undulating phase	3,291
	Cumberland and Etowah silt loams	Undulating phase	463
	Cumberland and Etowah silty clay loams	eroded, undulating phase	16,785
	Decatur silt loam, undulating phase		81
	Decatur silty clay loam	eroded, undulating phase	3,890
	Dewey silt loam	Undulating phase	208
	Dewey silty clay loam	eroded, undulating phase	5,495
	Dickson silt loam	Undulating phase	12,016
	Dickson silt loam	eroded, undulating phase	13,102
	Egam silty clay loam		1,696
	Emory cherty silt loam		499
	Emory silt loam		10,185
	Ennis cherty silt loam		1,605
	Greendale cherty silt loam		993
	Greendale silt loam		2,284
	Hermitage silt loam	eroded, undulating phase	1,150
	Holston loam, undulating phase		560
	Holston loam	eroded, undulating phase	1,987
	Humphreys cherty silt loam		573
	Huntington fine sandy loam		2,686
	Huntington silt loam		328
	Lawrence silt loam		4,866
	Lindside fine sandy loam		3,208
	Lindside silty clay loam		553
	Lobelville cherty silt loam		1,790
	Mountview silt loam	Undulating phase	899
	Mountview silt loam	eroded, undulating phase	4,134
	Nolichucky loam	eroded, undulating phase	451
	Nolichucky loam	eroded, rolling phase	147
	Ooltewah silt loam		4,519
	Pace cherty silt loam	eroded, undulating phase	237
	Sequatchie fine sandy loam	Undulating phase	2,960
	Taft silt loam		2,038
	Tyler silt loam		3,060
	Waynesboro loam	Undulating phase	105
	Waynesboro loam	eroded, undulating phase	2,169

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Franklin County (continued)	Whitwell loam		5,016
Total Farmland			**123,045**
Total Acres in County			**358,400**
Grainger County	Dewey silt loam		
	Elk silt loam		
	Etowah silt loam		
	Hamblen silt loam		
	Sewanee loam		
	Shady loam		
Total Farmland			**7,438**
Total Acres in County			**193,700**
Hamblen County	Altavista silt loam		384
	Chewacla loam		128
	Congaree fine sandy loam		704
	Congaree loamy fine sand		320
	Decatur silt loam	undulating, 2 to 5 percent slope	128
	Dewey silt loam	undulating, 2 to 5 percent slope	192
	Dunning silty clay loam		
	Emory silt loam		2,240
	Etowah silt loam	undulating, 2 to 5 percent slope	
	Greendale silt loam		960
	Hamblen silt loam		2,624
	Holston very fine sandy loam	undulating, 2 to 5 percent slope	768
	Huntington silt loam		
	Leadvale silt loam	undulating, 2 to 5 percent slope	
	Lindside silt loam		1,280
	Monongahela very fine sandy loam	undulating, 2 to 5 percent slope	768
	Staser silt loam		512
	State loam		384
	Whitesburg silt loam		640
Total Farmland			**12,032**
Total Acres in County			**112,000**
Hamilton County	Capshaw silt loam	2 to 6 percent slopes	5,229
	Crossville loam	2 to 5 percent slopes	1,792
	Dewey silt loam	2 to 6 percent slopes	4,869
	Emory silt loam		526
	Ennis cherty silt loam		1,554
	Etowah silt loam	2 to 5 percent slopes	8,405
	Fullerton cherty silt loam	3 to 7 percent slopes	18,633
	Hamblen silt loam		3,823

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Hamilton County (continued)	Holston loam	2 to 6 percent slopes	2,060
	Humphreys cherty silt loam	1 to 6 percent slopes	695
	Lily loam	2 to 7 percent slopes	17,874
	Lonewood silt loam	2 to 6 percent slopes	4,757
	Lobelville cherty silt loam		475
	Newark silt loam		4,474
	Nesbitt silt loam	2 to 6 percent slopes	1,780
	Roane cherty silt loam	2 to 6 percent slopes	1,383
	Sequatchie loam	2 to 7 percent slopes	7,325
	Sewanee variant silt loam		5,054
	Staser loam		440
	Tupelo silt loam	0 to 3 percent slopes	2,875
	Waynesboro loam	3 to 8 percent slopes	5,034
	Whitwell loam		3,548
	Woodmont silt loam		493
Total Farmland			**103,098**
Total Acres in County			**352,000**
Hardin County	Beason silt loam		5,993
	Captina silt loam	0 to 2 percent slopes (Paden)	805
	Captina silt loam	2 to 5 percent slopes, eroded	1,699
	Collins fine sandy loam		1,467
	Collins loam	local alluvium	4,936
	Collins silt loam		1,453
	Dexter clay loam	2 to 5 percent slopes, severely eroded	205
	Dexter loam	2 to 5 percent slopes, eroded	318
	Dulac silt loam	2 to 5 percent slopes	1,679
	Dulac silt loam	2 to 5 percent slopes, eroded	684
	Egam silty clay loam		4,282
	Ennis cherty silt loam		2,494
	Ennis cherty silt loam		3,090
	Ennis fine sandy loam (Pruition)		2,527
	Ennis silt loam (Pruition)		6,412
	Ennis silt loam	local alluvium (Pruition)	1,058
	Falaya loam	local alluvium (Enville)	4,164
	Falaya silt loam		3,492
	Freeland loam	2 to 5 percent slopes, eroded	1,917
	Hatchie loam		1,381
	Humphreys cherty silt loam	2 to 5 percent slopes, eroded	544
	Humphreys silt loam	2 to 5 percent slopes, eroded (Sequatchie)	1,382
	Huntington fine sandy loam (Pruition)		1,932
	Huntington silt loam (Pruition)		1,319
	Lindside silt loam		3,009

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Hardin County (continued)	Lindside silty clay loam		1,283
	Lobelville cherty silt loam		858
	Lobelville silt loam		3,070
	Mantachie fine sandy loam		2,490
	Paden silt loam	2 to 5 percent slopes	4,299
	Paden silt loam	2 to 5 percent slopes, eroded	9,266
	Pickwick silt loam	2 to 5 percent slopes	3,551
	Pickwick silt loam	2 to 5 percent slopes, eroded	2,887
	Pickwick silty clay loam	2 to 5 percent slopes, severely eroded	4,630
	Sequatchie fine sandy loam	0 to 2 percent slopes	281
	Sequatchie fine sandy loam	2 to 5 percent slopes, eroded	681
	Sequatchie loam	2 to 8 percent slopes, severely eroded	326
	Silerton silt loam	2 to 5 percent slopes	5,934
	Silerton silt loam	2 to 5 percent slopes, eroded	1,000
	Silerton silt loam	5 to 8 percent slopes	5,402
	Silerton silt loam	5 to 8 percent slopes, eroded	645
	Taft silt loam		1,674
	Vicksburg loam (Ochlockonee)		512
	Vicksburg loam	local alluvium (Ochlockonee)	3,538
	Waynesboro clay loam	2 to 5 percent slopes, severely eroded	634
	Waynesboro clay loam	5 to 8 percent slopes, severely eroded	1,553
	Waynesboro fine sandy loam	2 to 5 percent slopes (Etowah)	1,064
	Waynesboro fine sandy loam	5 to 8 percent slopes (Etowah)	9,177
	Waynesboro very gravelly sandy loam	25 to 45 percent slopes (Saffell)	—
	Wolftever silt loam	0 to 2 percent slopes	4,412
	Wolftever silt loam	2 to 5 percent slopes	621
	Wolftever silt loam	2 to 5 percent slopes, eroded	3,165
	Wolftever silty clay loam	2 to 5 percent slopes, severely eroded	637
Total Farmland			**131,832**
Total Acres in County			**375,680**
Hawkins and Hancock Counties	Altavista silt loam		700
	Cloudland loam	2 to 5 percent slopes	2,150
	Dunning silty clay loam		160
	Ealy loam		300
	Emory silt loam		300
	Etowah silt loam	2 to 5 percent slopes	700
	Greendale silt loam		1,250
	Hamblen silt loam		6,185
	Holston loam	2 to 5 percent slopes	2,000
	Leadvale silt loam	2 to 5 percent slopes	610

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Hawkins and Hancock Counties (continued)	Lindside silt loam		530
	Melvin silt loam		1,030
	Minvale silt loam	2 to 5 percent slopes	140
	Sensabaugh gravelly loam		2,420
	Sequatchie loam		580
	Sewanee loam		2,360
	Shouns silt loam	3 to 12 percent slopes	2,000
	Staser silt loam		3,210
	Statler silt loam		600
	Sullivan loam		1,770
	Taft silt loam		940
	Whitesburg silt loam		2,200
	Whitwell loam		780
Total Farmland			**32,915**
Total Acres in County			**454,400**
Henderson County	Calloway silt loam	gently sloping phase	268
	Calloway silt loam	eroded gently sloping phase	665
	Dexter fine sandy clay loam	severely eroded gently sloping phase	142
	Dexter fine sandy loam	eroded gently sloping phase	704
	Dexter silt loam	gently sloping phase	810
	Dulac-Tippah silt loams	eroded gently sloping phase	358
	Dulac silt loam	eroded gently sloping deep phase	3,777
	Dulac-Tippah silt loams	gently sloping phases	137
	Freeland fine sandy loam	eroded gently sloping phase	218
	Freeland silt loam	eroded gently sloping phase	5,057
	Hatchie silt loam	gently sloping phase	4,314
	Hymon fine sandy loam (luka)		563
	Hymon fine sandy loam	local alluvium phase (luka)	4,955
	Hymon silt loam (Collins)		562
	Hymon silt loam	local alluvium phase (Collins)	6,126
	Ina fine sandy loam (Manatachie)		1,422
	Ina fine sandy loam	local alluvium phase (Manatachie)	5,971
	Ina loamy fine sand	local alluvium phase (Manatachie)	782
	Ina silt loam (Manatachie)		15,891
	Ina silt loam	local alluvium phase (Arkabutla)	—
	Lexington silt loam	eroded gently sloping phase	6,303
	Providence silt loam	eroded gently sloping phase	1,038
	Shannon silt loam	local alluvium phase (Vicksburg)	534
	Silerton silt loam	eroded gently sloping phase	424
	Tippah silt loam	gently sloping shallow phase	197

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Total Farmland			61,218
Total Acres in County			329,600
Henry County	Brandon silt loam	Undulating	
	Brandon silt loam	eroded, undulating	
	Briensburg fine sandy loam (Collins)		
	Briensburg silt loam (Collins)		
	Calloway silt loam	Level	
	Calloway silt loam	Undulating	
	Calloway silt loam	eroded undulating phase	
	Center silt loam	Level	
	Center silt loam	Undulating	
	Center silt loam	eroded, undulating	
	Dexter silt loam	Undulating (Lexington)	
	Dexter silt loam	eroded, undulating (Lexington)	
	Dulac silt loam	eroded, undulating	
	Dulac silt loam		
	Ennis silt loam (Pruition)		
	Freeland silt loam	Level	
	Freeland silt loam	Undulating	
	Freeland silt loam	eroded, undulating	
	Greendale cherty silt loam (Humphreys)		
	Grenada silt loam	Level	
	Grenada silt loam	Undulating	
	Hatchie fine sandy loam	Level	
	Hatchie fine sandy loam	Undulating	
	Hatchie silt loam	Level	
	Hatchie silt loam	Undulating	
	Hatchie silt loam	eroded, undulating	
	Hilly land	coastal plain material	
	Hymon fine sandy loam (Iuka)		
	Hymon silt loam (Collins)		
	Lax silt loam	Undulating	
	Lax silt loam	eroded, undulating	
	Lexington silt loam	Undulating	
	Lindside and Lobelville silt loams (Lindside)		
	Loring silt loam	Level	
	Loring silt loam	Undulating	
	Loring silt loam	eroded, undulating	
	Memphis silt loam	Level	
	Memphis silt loam	Undulating (Lexington)	
	Memphis silt loam	eroded, undulating (Lexington)	
	Paden silt loam	eroded, undulating	

Table B-2 Prime Farmland—Tennessee (Continued)

County	Soil Name	Slope	Acres
Henry County (continued)	Providence silt loam	Undulating	
	Providence silt loam	eroded, undulating	
	Shannon fine sandy loam (Ocklockonee)		
	Shannon silt loam (Vicksburg)		
	Tigrett fine sandy loam (Statler)		
	Tigrett silt loam (Statler)		
	Tippah silt loam	eroded undulating phase	
Total Farmland			**119,964**
Total Acres in County			**383,357**
Houston County	Briensburg silt loam		406
	Dickson silt loam	Undulating phase	20
	Dickson silt loam	eroded undulating phase	2,640
	Egam silty clay loam		1,783
	Ennis cherty silt loam		461
	Ennis silt loam		361
	Greendale cherty silt loam	Undulating phase	1,817
	Humphreys cherty silt loam		1,425
	Humphreys silt loam		9,251
	Lobelville cherty silt loam		1,096
	Lobelville silt loam		3,518
	Mountview silt loam	Undulating phase	1,207
	Mountview silt loam	eroded undulating phase	1,255
	Paden silt loam	eroded undulating phase	387
	Pickwick silt loam	Undulating phase	144
	Pickwick silt loam	eroded undulating phase	761
	Pickwick silt loam	eroded rolling phase	1,086
	Taft silt loam		338
	Tigrett silt loam		1,365
Total Farmland			**29,321**
Total Acres in County			**132,500**
Humphreys County	Dickson silt loam		6,272
	Ennis fine sandy loam		704
	Ennis gravelly silt loam		2,048
	Ennis silt loam		5,760
	Humphreys silt loam		13,632
	Huntington silt loam		5,184
	Huntington silt loam	dark-subsoil	896
	Huntington silty clay loam		2,496
	Huntington very fine sandy loam		768
	Lawrence silt loam		256
	Lindside silty clay loam		2,176
	Lindside silty loam		3,776
	Lindside silty clay loam	high-bottom	1,792
	Paden silt loam		5,952

Table B-2 Prime Farmland—Tennessee (Continued)

County	Soil Name	Slope	Acres
Humphreys County (continued)	Pope fine sandy loam		832
	Taft silt loam		320
	Wolftever silty clay loam		1,728
	Wolftever silty clay loam	Compact	4,480
	Wolftever silty clay loam	Deep	704
Total Farmland			**59,776**
Total Acres in County			**352,064**
Jefferson County	Beason silt loam	occasionally flooded	803
	Collegedale silt loam	2 to 5 percent slopes, eroded	501
	Decatur silt loam	2 to 5 percent slopes, eroded	1,668
	Dunmore silt loam	2 to 5 percent slopes, eroded	913
	Emory silt loam	rarely flooded	1,295
	Etowah silt loam	2 to 5 percent slopes	2,586
	Lindside silt loam	occasionally flooded	3,206
	Muse silt loam	2 to 5 percent slopes	894
	Nolichucky silt loam	2 to 5 percent slopes, eroded	2,884
	Nolin silt loam	occasionally flooded	1,437
	Staser fine sandy loam	overwash, rarely flooded	973
	Swafford silt loam	1 to 4 percent slopes, rarely flooded	2,084
	Tasso silt loam	2 to 5 percent slopes	1,276
	Whitesburg silt loam	occasionally flooded	551
Total Farmland			**21,071**
Total Acres in County			**200,900**
Johnson County	Camp silt loam		1,244
	Chewacla loam		130
	Chewacla gravelly fine sandy loam		282
	Congaree fine sandy loam		69
	Dunning silt loam		389
	Greendale silt loam		226
	Hamblen loam		1,340
	Hayter loam	Undulating phase	746
	Masada silt loam	Undulating phase	45
	Prader silt loam		622
	Sequatchie loam	Undulating phase	1,845
	Sequatchie silt loam	Undulating phase	834
	Staser fine sandy loam		151
	Tyler silt loam		122
	Whitwell silt loam		943
Total Farmland			**8,988**
Total Acres in County			**191,360**
Knox County	Alcoa silt loam	eroded undulating phase	334
	Camp (Emory) silt loam		210
	Chewacla silt loam		271
	Congaree fine sandy loam		390

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Knox County (continued)	Congaree fine sandy loam	low bottom phase	447
	Congaree silt loam		783
	Congaree silt loam	low bottom phase	92
	Cumberland silty clay loam	eroded undulating phase	295
	Decatur silt loam	Undulating phase	377
	Decatur silty clay loam	eroded undulating phase	1,556
	Dewey silt loam	Undulating phase	227
	Dewey silty clay loam	eroded undulating phase	1,257
	Emory and Abernathy (Lindside silt loams)		1,165
	Emory silt loam	Undulating phase	9,076
	Etowah silt loam	Undulating phase	208
	Etowah silty clay loam	eroded undulating phase	907
	Farragut silty clay loam	eroded undulating phase	421
	Fullerton loam (CR-L)	eroded undulating phase	224
	Fullerton loam (CR-L)	Undulating phase	187
	Fullerton silt loam (CR-SIL)	eroded undulating phase	1,014
	Fullerton silt loam (CR-SIL)	Undulating phase	327
	Greendale cherty silt loam	Undulating phase	255
	Greendale silt loam	Undulating phase	8,451
	Hamblen fine sandy loam		1,713
	Hamblen silt loam		1,190
	Huntington silt loam		779
	Huntington silt loam	low bottom phase	130
	Lindside silt loam		9,716
	Neubert loam	Undulating phase	895
	Oolteway (Hamblen) silt loam		1,284
	Staser fine sandy loam		275
	Staser fine sandy loam	low bottom phase	140
	Staser silt loam		933
	Waynesboro loam	eroded undulating phase	217
	Wolftever silty clay loam	eroded undulating phase	382
Total Farmland			**46,128**
Total Acres in County			**329,600**
Loudon County	Alcoa loam	gently sloping phase	211
	Barbourville silt loam		187
	Cumberland silty clay loam	eroded gently sloping phase	409
	Congaree loam	nearly level phase	1,053
	Congaree loam	sloping phase (Sequatchie)	252
	Decatur silty clay loam	eroded gently sloping phase	385
	Dewey silty clay loam	eroded gently sloping phase	748
	Emory silt loam		4,292
	Emory silty clay loam		441
	Etowah silt loam	gently sloping phase	654
	Farragut silty clay loam	eroded gently sloping phase	164
	Fullerton silt loam	gently sloping phase (Dewey)	814

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Loudon County (continued)	Greendale cherty silt loam		894
	Greendale silt loam		2,205
	Hermitage silt loam	gently sloping phase (Etowah)	1,589
	Huntington loam	nearly level phase	1,155
	Huntington loam	sloping phase (Sequatchie)	260
	Landisburg cherty silt loam	gently sloping phase (Tasso)	340
	Landisburg silt loam	gently sloping phase (Tasso)	667
	Leadvale silt loam	gently sloping phase	471
	Lindside silt loam		1,930
	Lindside silt loam	local alluvium phase	928
	Lobelville cherty silt loam		182
	Minvale silt loam	gently sloping phase	439
	Neubert loam		888
	Sequatchie fine sandy loam	gently sloping phase	236
	Sequatchie loam	gently sloping phase	264
	Sequatchie loam	sloping phase	264
	Taft silt loam		183
	Waynesboro loam	eroded gently sloping phase	153
	Wolftever silt loam	eroded moderately steep phase	801
Total Farmland			**23,459**
Total Acres in County			**151,323**
Marion County	Barbourville loam		2,036
	Capshaw silt loam	Undulating phase	270
	Capshaw silt loam	eroded undulating phase	1,780
	Cumberland silty clay loam	eroded undulating phase	366
	Emory silt loam		2,138
	Etowah silty clay loam	eroded undulating phase	1,946
	Greendale cherty silt loam		297
	Greendale silt loam		832
	Hamblen loam		2,063
	Hartsells fine sandy loam	Undulating phase	7,128
	Hartsells fine sandy loam	eroded undulating phase	1,073
	Hermitage silt loam	eroded undulating phase	221
	Huntington fine sandy loam		697
	Huntington loam		1,291
	Huntington silt loam		1,821
	Lindside silt loam		2,946
	Minvale silt loam	eroded undulating phase	116
	Pace silt loam	eroded undulating phase	392
	Sequatchie fine sandy loam	Undulating phase	1,049
	Sequatchie fine sandy loam	eroded undulating phase	357
	Sequatchie loam	Undulating phase	3,052
	Sequatchie loam	eroded undulating phase	4,395
	Staser fine sandy loam		1,422
	Staser loam		2,263
	Taft silt loam		976

Prime Farmland

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Marion County (continued)	Waynesboro loam	eroded undulating phase	188
	Whitwell loam		1,941
	Wolftever silt loam	Undulating phase	1,643
Total Farmland			44,699
Total Acres in County			333,500
McMinn County	Alcoa loam	eroded undulating phase	216
	Barbourville loam		825
	Cotaco loam		
	Cotaco silt loam		
	Cumberland silt loam	Undulating phase	251
	Cumberland silty clay loam	eroded undulating phase	172
	Decatur silty clay loam	eroded undulating phase	1,657
	Dewey clay loam	eroded undulating phase	255
	Dewey silty clay loam	eroded undulating phase	1,321
	Emory and Abernathy silt loams		
	Emory silt loam		689
	Etowah silt loam	Undulating phase	1,285
	Farragut silty clay loam	eroded undulating phase	815
	Fullerton loam	eroded undulating phase	448
	Fullerton silt loam	eroded undulating phase	569
	Greendale cherty silt loam		2,781
	Greendale silt loam		6,702
	Hamblen and Lindside silt loams		8,418
	Hamblen and Lindside silty clay loams		362
	Hayter loam	Undulating phase	175
	Hermitage silt loam	Undulating phase	2,396
	Holston loam	eroded undulating phase	193
	Holston loam	Undulating phase	270
	Jefferson loam	Undulating phase	334
	Leadvale silt loam	Undulating phase	1,320
	Monongahela silt loam		953
	Neubert loam		1,916
	Ooltewah silt loam		630
	Pace silt loam	Undulating phase	2,329
	Sequatchie fine sandy loam	Undulating phase	467
	Staser and Huntington silt loams		2,776
	Waynesboro loam	eroded undulating phase	176
	Whitesburg silt loam		1,310
	Wolftever silt loam	Undulating phase	196
Total Farmland			**42,207**
Total Acres in County			**278,400**

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Meigs County	Beason silt loam		1,020
	Capshaw silt loam	2 to 5 percent slopes	1,695
	Chagrin silt loam		390
	Decatur silt loam	2 to 5 percent slopes	355
	Egam silty clay loam		390
	Emory silt loam		1,225
	Ennis cherty silt loam		1,050
	Etowah silt loam	2 to 5 percent slopes	2,185
	Etowah gravelly silt loam	2 to 5 percent slopes	255
	Etowah gravelly silt loam	5 to 12 percent slopes	655
	Holston loam	2 to 5 percent slopes	240
	Humphreys silt loam	2 to 5 percent slopes	1,240
	Lindside silt loam		6,385
	Lobelville cherty silt loam		1,300
	Minvale cherty silt loam	5 to 12 percent slopes	1,350
	Newark silt loam		2,095
	Staser fine sandy loam	coarse subsoil variant	725
	Tarklin silt loam	2 to 8 percent slopes	965
	Tarklin cherty silt loam	2 to 5 percent slopes	405
	Tarklin cherty silt loam	5 to 12 percent slopes	505
	Whitwell loam	0 to 5 percent slopes	440
	Wolftever silt loam	1 to 5 percent slopes	1,035
Total Farmland			**25,905**
Total Acres in County			**122,240**
Monroe County	Alcoa loam	2 to 5 percent slopes	445
	Allegheny loam		830
	Altavista silt loam		1,170
	Atkins silt loam		605
	Beason silt loam		1,305
	Chagrin silt loam		1,270
	Decatur silt loam	2 to 5 percent slopes	1,770
	Dewey silt loam	2 to 5 percent slopes	1,180
	Dunmore silt loam	2 to 5 percent slopes	950
	Dunning silty clay loam		300
	Emory silt loam		2,820
	Etowah silt loam	2 to 5 percent slopes	3,195
	Greendale silt loam		905
	Hamblen silt loam		6,105
	Leadvale silt loam	2 to 5 percent slopes	
	Lobdell silt loam		
	Minvale silt loam	2 to 5 percent slopes	2,825
	Neubert loam		2,030
	Newark silt loam		1,860
	Philo silt loam		2,085
	Pope loam		1,455
	Sequatchie loam		365
	Staser loam		1,250
	Statler loam		2,355

Table B-2 Prime Farmland—Tennessee (Continued)

County	Soil Name	Slope	Acres
Monroe County (continued)	Transylvania loam		1,195
	Waynesboro loam	2 to 5 percent slopes	410
	Whitwell loam		480
Total Farmland			39,160
Total Acres in County			422,400
Moore County	Armour silt loam	0 to 2 percent slopes	
	Armour silt loam	2 to 5 percent slopes	
	Arrington cherty silt loam		
	Arrington silt loam		
	Capshaw silt loam	0 to 2 percent slopes	
	Capshaw silt loam	2 to 5 percent slopes	
	Dellrose cherty silt loam	2 to 5 percent slopes	
	Dickson silt loam	0 to 2 percent slopes	
	Dickson silt loam	2 to 5 percent slopes	
	Egam silt loam		
	Ennis cherty silt loam		
	Ennis silt loam		
	Etowah gravelly silt loam	2 to 5 percent slopes (cherty silt loam)	
	Fullerton cherty silt loam	2 to 5 percent slopes	
	Humphreys cherty silt loam	2 to 5 percent slopes	
	Humphreys silt loam	2 to 5 percent slopes	
	Lobelville cherty silt loam		
	Lobelville silt loam		
	Lynnville cherty silt loam		
	Lynnville silt loam		
	Maury silt loam	2 to 5 percent slopes	
	Mountview cherty silt loam	2 to 5 percent slopes (silt loam)	
	Mountview silt loam	2 to 5 percent slopes	
	Pickwick silt loam	2 to 5 percent slopes	
	Taft silt loam		
Total Farmland			**15,075**
Total Acres in County			**83,700**
Perry County	Bruno fine sandy loam	0 to 3 percent slopes	
	Bruno loamy fine sand	0 to 3 percent slopes	
	Egam silty clay loam		
	Emory silt loam	2 to 5 percent slopes	
	Ennis cherty loam	0 to 3 percent slopes	
	Ennis silt loam	0 to 3 percent slopes (cherty silt loam)	
	Greendale cherty loam	2 to 5 percent slopes	
	Humphreys cherty loam	1 to 5 percent slopes	
	Humphreys cherty loam	1 to 5 percent slopes, eroded	
	Humphreys silt loam	1 to 5 percent slopes (Armour)	

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Perry County (continued)	Humphreys silt loam	1 to 5 percent slopes, eroded (Armour)	
	Huntington silt loam	0 to 3 percent slopes	
	Lindside silt loam	0 to 3 percent slopes	
	Lindside silty clay loam	0 to 3 percent slopes	
	Lobelville cherty silt loam	0 to 3 percent slopes	
	Lobelville silt loam	0 to 3 percent slopes	
	Pace cherty silt loam	2 to 5 percent slopes	
	Paden silt loam	2 to 5 percent slopes, eroded	
	Paden silt loam	2 to 5 percent slopes	
	Pickwick silt loam	2 to 5 percent slopes	
	Sango silt loam	1 to 5 percent slopes (1 to 4 percent slopes)	
	Sequatchie fine sandy loam	1 to 6 percent slopes	
	Sequatchie fine sandy loam	1 to 6 percent slopes, eroded	
	Wolftever silt loam	1 to 6 percent slopes	
	Wolftever silty clay loam	1 to 6 percent slopes	
Total Farmland			**23,804**
Total Acres in County			**271,100**
Polk County	Arkaqua-Suches Complex	occasionally flooded	
	Congaree loam	rarely flooded	
	Decatur silt loam	2 to 6 percent slopes, eroded	
	Emory silt loam	occasionally flooded	
	Etowah silt loam	2 to 6 percent slopes	
	Hamblen silt loam	occasionally flooded	
	Leadvale silt loam	occasionally flooded (rare)	
	State loam	rarely flooded	
	Suches loam	occasionally flooded	
	Tate loam	2 to 8 percent slopes	
	Waynesboro loam	2 to 6 percent slopes, eroded	
Total Farmland			**19,715**
Total Acres in County			**282,900**
Rhea County	Abernathy silt loam (Emory)		960
	Allen very fine sandy loam	2 to 5 percent slopes (FSL)	448
	Apison very fine sandy loam	2 to 5 percent slopes (SIL)	256
	Apison very fine sandy loam	2 to 5 percent slopes, eroded (SIL)	192
	Burgin clay loam	(Dunning sil)	448
	Conasauga silt loam	2 to 5 percent slopes	896
	Crossville loam	2 to 5 percent slopes	320
	Cumberland gravelly fine sandy loam	2 to 5 percent slopes (Waynesboro gr-fsl)	192
	Cumberland silty clay loam	2 to 5 percent slopes, eroded	384
	Dewey silt loam	2 to 5 percent slopes	128
	Dewey silty clay loam	2 to 5 percent slopes, eroded	1,344
	Dunning silty clay loam		960

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Rhea County (continued)	Egam silty clay loam		576
	Emory silt loam	2 to 5 percent slopes	576
	Etowah silt loam	2 to 5 percent slopes	64
	Etowah silty clay loam	2 to 5 percent slopes, eroded	1,152
	Fullerton cherty silt loam	2 to 5 percent slopes	2,368
	Fullerton silt loam	2 to 5 percent slopes (Dunmore)	320
	Greendale silt loam	2 to 5 percent slopes	2,560
	Hartsells fine sandy loam	2 to 5 percent slopes	4,224
	Holston very fine sandy loam	2 to 5 percent slopes (FSL)	640
	Huntington fine sandy loam (Staser)		960
	Huntington silt loam		1,024
	Jefferson very fine sandy loam	2 to 5 percent slopes (FSL)	1,408
	Lindside silt loam		1,408
	Lindside silty clay loam		512
	Melvin silt loam		1,600
	Nolichucky fine sandy loam	1 to 5 percent slopes (2-5)	128
	Ooltewah fine sandy loam (Hamblen)		64
	Ooltewah silt loam (Hamblen)		1,600
	Philo fine sandy loam (SL)		2,368
	Philo silt loam		384
	Pope loamy fine sand (FSL)		320
	Pope silt loam		640
	Roane gravelly silt loam		3,200
	Roane silt loam (CR-SIL)		640
	Sequatchie fine sandy loam	0 to 2 percent slopes	2,176
	Sequatchie loamy fine sand	1 to 5 percent slopes (FSL)	1,408
	Staser loamy fine sand (FSL)		448
	Taft silt loam		1,088
	Waynesboro fine sandy loam	2 to 5 percent slopes	320
	Waynesboro gravelly fine sandy loam	2 to 5 percent slopes	128
	Wolftever silt loam	0 to 2 percent slopes	1,472
Total Farmland			**42,304**
Total Acres in County			**214,400**
Roane County	Allen very fine sandy loam		896
	Apison very fine sandy loam		576
	Greendale silt loam		1,208
	Hartsells very fine sandy loam (Lily)		448
	Huntington silt loam (Arrington)		3,904
	Jefferson gravelly fine sandy loam		640
	Leadvale very fine sandy loam		2,112

Table B-2 Prime Farmland—Tennessee (Continued)

County	Soil Name	Slope	Acres
Roane County (continued)	Lindside silt loam		896
	Nolichucky		768
	Philo very fine sandy loam (SIL)		1,920
	Pope gravelly fine sandy loam		2,560
	Pope loamy fine sand		1,728
	Pope very fine sandy loam		9,088
	Roane gravelly loam		3,584
	Sequatchie very fine sandy loam		1,856
	Waynesboro very fine sandy loam		576
	Wolftever silt loam		1,536
Total Farmland			**34,296**
Total Acres in County			**243,200**
Sevier County	Braddock loam	2 to 5 percent slopes, eroded	499
	Comb loam	rarely flooded	1,214
	Decatur silt loam	2 to 5 percent slopes	730
	Dewey silt loam	2 to 5 percent slopes, eroded	531
	Etowah loam	2 to 5 percent slopes	1,895
	Holston loam	2 to 5 percent slopes	1,131
	Leadvale silt loam	2 to 5 percent slopes	506
	Lonon gravel loam	2 to 5 percent slopes, eroded	553
	Pope sandy loam	occasionally flooded	2,280
	Rosman sandy loam	occasionally flooded	1,624
	Sequatchie loam	rarely flooded	2,675
	Shelockta silt loam	2 to 5 percent slopes	966
	Stedman silt loam	occasionally flooded	13,787
	Statler loam	occasionally flooded	1,688
	Waynesboro loam	2 to 5 percent slopes, eroded	753
	Whitesburg silt loam	occasionally flooded	1,348
Total Farmland			**32,180**
Total Acres in County			**250,200**
Stewart County	Armour silt loam	0 to 2 percent slopes, gravelly substratum	
	Armour silt loam	2 to 5 percent slopes, gravelly substratum	
	Armour silt loam	2 to 5 percent slopes, eroded	
	Bewleyville silt loam	2 to 5 percent slopes, eroded	
	Dickson silt loam	2 to 5 percent slopes, eroded	
	Dickson silt loam	2 to 5 percent slopes	
	Dickson silt loam	0 to 2 percent slopes	
	Egam silty clay loam	occasionally flooded	
	Humphreys gravelly silt loam	2 to 5 percent slopes	
	Lax silt loam	2 to 5 percent slopes	
	Lindside silt loam	occasionally flooded	
	Lobelville gravelly silt loam	occasionally flooded	

Table B-2 Prime Farmland—Tennessee (Continued)

County	Soil Name	Slope	Acres
Stewart County (continued)	Newark silt loam	occasionally flooded	
	Nolin silt loam	occasionally flooded	
	Ocana gravelly silt loam	occasionally flooded	
	Ochlocknee fine sandy loam	occasionally flooded	
	Paden silt loam	2 to 5 percent slopes, eroded	
	Sequatchie fine sandy loam	2 to 5 percent slopes	
	Sequatchie fine sandy loam	0 to 2 percent slopes, occasionally flooded	
	Staser fine sandy loam	occasionally flooded	
	Wolftever silt loam	2 to 5 percent slopes, occasionally flooded	
Total Farmland			**48,148**
Total Acres in County			**318,080**
Sullivan County	Bellamy loam	2 to 5 percent slopes	3,877
	Holston loam	2 to 5 percent slopes	1,688
	Pettyjon loam	0 to 2 percent slopes, rarely flooded	819
	Steadman silty clay loam	0 to 2 percent slopes, occasionally flooded	8,077
Total Farmland			**14,461**
Total Acres in County			**275,100**
Union County	Alluvial soils	undifferentiated (Lindside)	
	Caylor (Etowah) silt loam	Undulating phase	
	Dewey silt loam	Undulating phase	
	Emory silt loam	Undulating phase	
	Fullerton silt loam (CR-SIL)	Undulating phase	
	Greendale silt loam	Undulating phase	
	Lindside silt loam		
	Ooltewah (Lindside) silt loam		
	Phil fine sandy loam		
	Pope fine sandy loam		
	Sequatchie fine sandy loam		
Total Farmland			**7,732**
Total Acres in County			**158,505**
Washington County	Augusta loam		191
	Barbourville loam		566
	Chewacla loam		185
	Congaree fine sandy loam		1,124
	Congaree loam		316
	Cumberland silt loam	Undulating phase	948
	Emory silt loam		1,006
	Greendale silt loam		12,370
	Hamblen loam		686
	Hamblen silt loam		315
	Hayter loam	Undulating phase	350
	Hayter stony loam	Undulating phase	211

Table B-2 Prime Farmland — Tennessee (Continued)

County	Soil Name	Slope	Acres
Washington County (continued)	Hermitage silt loam	Undulating phase	693
	Holston loam	Undulating phase	250
	Jefferson loam	Undulating phase	413
	Leadvale silt loam	Undulating phase	636
	Lindside silt loam		4,575
	Masada loam	Undulating phase	226
	Melvin silt loam		1,230
	Monongahela loam		108
	Monongahela silt loam		259
	Ooltewah silt loam		532
	Pace silt loam	Undulating phase	3,418
	Sequatchie loam		862
	Staser loam		394
	Tyler silt loam		148
	Waynesboro loam	Undulating phase	212
	Weaver silt loam		2,128
	Whitesburg silt loam		687
Total Farmland			**35,039**
Total Acres in County			**209,790**
Wayne County	Armour silt loam	0 to 2 percent slopes, occasionally flooded	2,990
	Armour silt loam	gravelly substratum, 2 to 5 percent slopes	2,240
	Brandon silt loam	2 to 5 percent slopes	2,180
	Braxton silt loam	2 to 5 percent slopes	150
	Dickson silt loam	2 to 5 percent slopes	2,170
	Egam silty clay loam	occasionally flooded	100
	Ennis gravelly silt loam	occasionally flooded	11,060
	Hamblen silt loam	occasionally flooded	?
	Humphreys gravelly silt loam	2 to 5 percent slopes	7,250
	Lax silt loam	2 to 5 percent slopes	9,270
	Lee gravelly silt loam	occasionally flooded	3,750
	Lobelville cherty silt loam	occasionally flooded	6,070
	Luverne fine sandy loam	2 to 5 percent slopes	1,130
	Mountview silt loam	2 to 5 percent slopes	900
	Mountview silt loam	2 to 5 percent slopes, eroded	310
	Pickwick silt loam	2 to 5 percent slopes	730
	Silerton silt loam	2 to 5 percent slopes	4850
	Silerton silt loam	2 to 5 percent slopes, eroded	870
	Taft silt loam		770
	Wolftever silt loam	0 to 2 percent slopes, occasionally flooded	940
	Wolftever silt loam	2 to 5 percent slopes, rarely flooded	370
Total Farmland			**58,100**
Total Acres in County			**470,700**

Table B-3 Prime Farmland — North Carolina

County	Soil Name	Slope	Acres
Cherokee County (acreage not available)	Arkaqua loam	0 to 2 percent slopes, occasionally flooded	
	Braddock clay loam	2 to 8 percent slopes, eroded	
	Braddock gravelly loam	2 to 8 percent slopes, very stony	
	Braddock loam	2 to 8 percent slopes	
	Cullowhee fine sandy loam	0 to 3 percent slopes, occasionally flooded	
	Dillard loam	1 to 5 percent slopes, rarely flooded	
	Evard-Hayesville complex	2 to 8 percent slopes	
	Nantahala loam	2 to 8 percent slopes	
	Reddies loam	0 to 3 percent slopes, occasionally flooded	
	Rosman loam	0 to 3 percent slopes, occasionally flooded	
	Rosman-urban land complex	0 to 3 percent slopes, occasionally flooded	
	Statler loam	1 to 5 percent slopes, rarely flooded	
	Tate loam	2 to 8 percent slopes	
	Tate loam	8 to 15 percent slopes	
	Tate loam	15 to 30 percent slopes	
	Thurmont fine sandy loam	2 to 8 percent slopes	
	Thurmont-Dillard complex	2 to 8 percent slopes	
	Thurmont-Dillard complex	8 to 15 percent slopes	
	Toxaway loam	0 to 2 percent slopes, occasionally flooded	
Total Farmland			N/A*
Total Acres in County			N/A
Clay County	Arkaqua loam	0 to 2 percent slopes, rarely flooded	167
	Arkaqua loam	0 to 2 percent slopes, frequently flooded	718
	Braddock loam	2 to 8 percent slopes	638
	Braddock clay loam	2 to 8 percent slopes, eroded	351
	Dillard loam	1 to 6 percent slopes, rarely flooded	344
	French fine sandy loam	0 to 3 percent slopes, frequently flooded	939
	Hayesville loam	2 to 8 percent slopes	105
	Hayesville clay loam	2 to 8 percent slopes, eroded	470
	Lonon loam	2 to 8 percent slopes	250
	Reddies loam	0 to 2 percent slopes, frequently flooded	928
	Rosman fine sandy loam	0 to 2 percent slopes, rarely flooded	401
	Rosman fine sandy loam	0 to 2 percent slopes, frequently flooded	693

Table B-3 Prime Farmland — North Carolina (Continued)

County	Soil Name	Slope	Acres
Clay County (continued)	Statler loam	1 to 5 percent slopes, rarely flooded	533
	Tate loam	2 to 8 percent slopes	727
	Toxaway loam	0 to 2 percent slopes, frequently flooded	165
Total Farmland			**7,429**
Total Land in County			**141,126**
Graham County	Braddock clay loam	2 to 8 percent slopes, eroded	50
	Dillard fine sandy loam	1 to 5 percent slopes, rarely flooded	321
	Reddies loam	0 to 3 percent slopes, occasionally flooded	916
	Statler loam	2 to 8 percent slopes, rarely flooded	271
	Unison loam	2 to 8 percent slopes	231
	Thurmont-Dillard Complex	2 to 8 percent slopes	1,325
Total Farmland			**3,114**
Total Acres in County			**193,018**
Jackson County	Braddock clay loam	2 to 8 percent slopes, eroded	350
	Cullowhee fine sandy loam	0 to 2 percent slopes, occasionally flooded	945
	Dillard loam	1 to 5 percent slopes, rarely flooded	483
	Dillsboro loam	2 to 8 percent slopes	345
	Reddies fine sandy loam	0 to 2 percent slopes, occasionally flooded	318
	Rosman fine sandy loam	0 to 2 percent slopes, occasionally flooded	370
	Saunook gravelly loam	2 to 8 percent slopes	675
	Statler loam	1 to 5 percent slopes, rarely flooded	443
	Sylva-Whiteside complex	0 to 2 percent slopes	772
	Whiteside-Tuckasegee complex	2 to 8 percent slopes	2,435
Total Farmland			**7,136**
Total Acres in County			**316,877**
Swain County Not available			

Prime Farmland

Table B-4 Prime Farmland — Mississippi

County	Soil Name	Slope	Acres
Tishomingo	Guyton silt loam		542
	Jena silt loam		3,585
	Kirkville loam		5,115
	Mantachie loam		25,210
	Ora loam	2 to 5 percent slopes, eroded	1,945
	Paden silt loam	0 to 2 percent slopes	710
	Quitman fine sandy loam	0 to 2 percent slopes	1,145
	Ruston sandy loam	2 to 5 percent slopes, eroded	1,170
	Savannah silt loam	0 to 2 percent slopes	715
	Savannah silt loam	2 to 5 percent slopes, eroded	10,565
Total Farmland			**50,702**
Total Acres in County			**279,640**

Table B-5 Prime Farmland—Kentucky

County	Soil Name	Slope	Acres
Calloway County	Bibb loamy fine sand	Overwash	350
	Bibb silt loam		1,425
	Calloway silt loam	0 to 2 percent slopes	14,060
	Calloway silt loam	2 to 6 percent slopes	10,265
	Calloway silt loam	2 to 6 percent slopes, eroded	4,175
	Collins silt loam		9,970
	Falaya silt loam		12,210
	Grenada silt loam	0 to 2 percent slopes	15,720
	Grenada silt loam	2 to 6 percent slopes	27,515
	Iuka silt loam		4,665
	Loring silt loam	2 to 6 percent slopes	5,450
	Loring silt loam	2 to 6 percent slopes, eroded	4,565
	Mantachie silt loam		2,585
	Memphis silt loam	2 to 6 percent slopes	820
	Ochlocknee gravelly loam		1,565
	Ochlocknee silt loam		2,495
	Vicksburg silt loam		1,605
	Waverly silt loam		4,710
	Wheeling silt loam	2 to 6 percent slopes	260
Total Farmland			**124,410**
Total Acres in County			**245,760**
Livingston County	Ashton silt loam	0 to 4 percent slopes, occasionally flooded	3,520
	Chavies fine sandy loam	2 to 6 percent slopes	260
	Dunning silty clay	frequently flooded	670
	Elk silt loam	0 to 2 percent slopes	350
	Elk silt loam	2 to 6 percent slopes	1,830
	Henshaw silt loam	rarely flooded	4,740
	Huntington silt loam	frequently flooded	3,470
	Karnak silty clay	frequently flooded	1,120
	Licking silt loam	2 to 6 percent slopes	1,610
	Lindside silt loam	frequently flooded	9,580
	Loring silt loam	2 to 6 percent slopes	20,480
	McGary silt loam	rarely flooded	4,210
	Melvin silt loam	frequently flooded	820
	Memphis silt loam	2 to 6 percent slopes	1,810
	Nelse loam	frequently flooded	2,270
	Nelse-Huntington complex	frequently flooded	312
	Newark silt loam	frequently flooded	5,860
	Nolin silt loam	frequently flooded	5,080
	Otwell silt loam	2 to 6 percent slopes	4,870
	Peoga silt loam		1,680
	Wheeling silt loam	0 to 2 percent slopes	370
	Wheeling silt loam	2 to 6 percent slopes	1,490
Total Farmland			**76,402**
Total Acres in County			**219,085**

Table B-5 Prime Farmland—Kentucky (Continued)

County	Soil Name	Slope	Acres
Lyon County	Clifty gravelly silt loam		3,500
	Crider silt loam	2 to 6 percent slopes	1,500
	Elk silt loam	0 to 2 percent slopes	430
	Elk silt loam	2 to 6 percent slopes	250
	Hammack silt loam	2 to 6 percent slopes	370
	Lawrence silt loam		480
	Lax silt loam	2 to 6 percent slopes	2,100
	Lindside silt loam		2,900
	Melvin silt loam		650
	Newark silt loam		2,800
	Nicholson silt loam	0 to 2 percent slopes	20
	Nicholson silt loam	2 to 6 percent slopes	13,400
	Nolin silt loam		8,450
	Otwell silt loam	0 to 2 percent slopes	240
	Otwell silt loam	2 to 6 percent slopes	400
Total Farmland			**37,490**
Total Acres in County			**142,720**
Marshall County	Bibb loamy fine sand	Overwash	50
	Bibb silt loam		280
	Calloway silt loam	0 to 2 percent slopes	5,230
	Calloway silt loam	2 to 6 percent slopes	1,975
	Calloway silt loam	2 to 6 percent slopes, eroded	270
	Collins silt loam		7,790
	Falaya silt loam		12,440
	Forestdale silt loam		1,490
	Grenada silt loam	0 to 2 percent slopes	5,410
	Grenada silt loam	2 to 6 percent slopes	20,575
	Huntington silt loam		515
	Iuka silt loam		2,660
	Loring silt loam	2 to 6 percent slopes	4,725
	Loring silt loam	2 to 6 percent slopes, eroded	2,235
	Mantachie silt loam		1,360
	Memphis silt loam	2 to 6 percent slopes	1,290
	Ochlockonee gravelly loam		685
	Ochlocknoee silt loam		3,090
	Vicksburg silt loam		3,440
	Waverly silt loam		10,005
	Wheeling silt loam	2 to 6 percent slopes	565
Total Farmland			**86,080**
Total Acres in County			**193,920**
Trigg County	Clifty gravelly silt loam		7,500
	Crider silt loam	0 to 2 percent slopes	280
	Crider silt loam	2 to 6 percent slopes	12,500
	Elk silt loam	0 to 2 percent slopes	400
	Elk silt loam	2 to 6 percent slopes	1,130
	Hammack silt loam	2 to 6 percent slopes	7,890

Table B-5 Prime Farmland—Kentucky (Continued)

County	Soil Name	Slope	Acres
Trigg County	Lawrence silt loam		600
	Lax silt loam	2 to 6 percent slopes	6,800
	Lindside silt loam		6,640
	Melvin silt loam		430
	Newark silt loam		1,510
	Nicholson silt loam	0 to 2 percent slopes	100
	Nicholson silt loam	2 to 6 percent slopes	13,900
	Nolin silt loam		17,840
	Otwell silt loam	0 to 2 percent slopes	150
	Otwell silt loam	2 to 6 percent slopes	520
	Sadler silt loam	0 to 2 percent slopes	150
	Sadler silt loam	2 to 6 percent slopes	1,160
	Zanesville silt loam	2 to 6 percent slopes	820
Total Farmland			**80,320**
Total Acres in County			**275,840**

Table B-6 Prime Farmland — Georgia

County	Soil Name	Slope	Acres
Rabun and Towns Counties	Dillard sandy loam	2 to 6 percent slopes	860
	Tusquitee loam	4 to 10 percent slopes	2,570
Total Farmland			**3,430**
Total Acres in Counties			**341,760**
Fannin and Union Counties	Dillard fine sandy loam	2 to 6 percent slopes	2,690
	Suches loam	0 to 2 percent slopes, occasionally flooded	3,845
	Thurmont fine sandy loam	2 to 6 percent slopes	1,810
Total Farmland			**8,345**
Total Acres in Counties			**461,000**

Table B-7 Prime Farmland—Alabama

County	Soil Name	Slope	Acres
Colbert County	Bewleyville silt loam	2 to 6 percent slopes	6,716
	Capshaw silt loam	2 to 6 percent slopes	12,149
	Chenneby silt loam	0 to 2 percent slopes, occasionally flooded	19,417
	Chenneby silt loam	0 to 2 percent slopes, ponded	1,247
	Decatur silt loam	2 to 6 percent slopes	45,546
	Dickson silt loam	0 to 3 percent slopes	1,715
	Emory silt loam	0 to 2 percent slopes, ponded	13,596
	Etowah silt loam	2 to 6 percent slopes	3,694
	Fullerton cherty silt loam	2 to 6 percent slopes	2,641
	Pruitton and Sullivan silt loams	0 to 2 percent slopes, occasionally flooded	7,587
	Savannah loam	1 to 5 percent slopes	2,357
	Tupelo-Colbert complex	0 to 4 percent slopes	7,669
	Wynnville silt loam	2 to 6 percent slopes	9,460
Total Farmland			133,794
Total Acres in County			399,170
Franklin County	Albertville fine sandy loam	2 to 6 percent slopes, eroded	1,780
	Cahaba fine sandy loam	0 to 2 percent slopes	353
	Cahaba fine sandy loam	2 to 6 percent slopes	1,062
	Cane loam	2 to 6 percent slopes, eroded	280
	Captina silt loam	2 to 6 percent slopes (Leadvale)	862
	Decatur silt loam	2 to 6 percent slopes, eroded	1,451
	Decatur silty clay loam	2 to 6 percent slopes, severely eroded	3,278
	Greenville loam	2 to 6 percent slopes, eroded	770
	Greenville loam	2 to 6 percent slopes, severely eroded	267
	Huntington silt loam	local alluvium	646
	Iuka fine sandy loam		6,788
	Iuka fine sandy loam	local alluvium	806
	Lindside silt loam (Chenneby)		4,568
	Lindside silt loam	local alluvium (Chenneby)	297
	Linker fine sandy loam	2 to 6 percent slopes, eroded	2,295
	Ochlockonee fine sandy loam		7,274
	Ora fine sandy loam	2 to 6 percent slopes, eroded	2,479
	Ora fine sandy loam	heavy substratum, 2 to 6 percent slopes, eroded	610
	Prentiss fine sandy loam	0 to 2 percent slopes	990
	Prentiss fine sandy loam	2 to 6 percent slopes	702
	Ruston fine sandy loam	2 to 6 percent slopes (Smithdale)	2,272
	Savannah very fine sandy loam	0 to 2 percent slopes	355
	Savannah very fine sandy loam	2 to 6 percent slopes	1,900
	Savannah very fine sandy loam	2 to 6 percent slopes	19,223
	Talbott silt loam	2 to 6 percent slopes, eroded (Remlap)	3,264
	Tilden fine sandy loam	2 to 6 percent slopes, eroded (Ora)	553
Total Farmland			**65,125**
Total Acres in County			**413,830**

Table B-7 Prime Farmland—Alabama (Continued)

County	Soil Name	Slope	Acres
Jackson County	Abernathy fine sandy loam		853
	Abernathy silt loam	undulating phase	2,098
	Abernathy silt loam	level phase	1,379
	Allen fine sandy loam	eroded undulating phase	910
	Allen fine sandy loam	undulating phase	779
	Barbourville-Cotaco fine sandy loams		2,711
	Capshaw silt loam	undulating phase	5,716
	Capshaw silt loam	level phase	1,896
	Clarksville cherty silt loam	eroded undulating phase	108
	Clarksville cherty silt loam	undulating phase	586
	Crossville loam	undulating phase	4,628
	Cumberland loam	undulating phase	202
	Cumberland silt loam	eroded undulating phase	747
	Cumberland silty clay loam	eroded undulating phase	1,984
	Dewey cherty silt loam	eroded undulating phase	80
	Dewey silt loam	undulating phase	445
	Dewey silty clay loam	eroded undulating phase	1,122
	Egam silt loam		4,347
	Egam silty clay loam		2,817
	Enders silt loam	eroded undulating phase	485
	Enders silt loam	undulating phase	2,337
	Etowah loam	undulating phase	4,921
	Etowah loam	level phase	709
	Etowah silt loam	undulating phase	6,865
	Etowah silt loam	level phase	316
	Fullerton cherty silt loam	eroded undulating phase	1,138
	Fullerton cherty silt loam	undulating phase	1,038
	Fullerton silt loam	eroded undulating phase	127
	Fullerton silt loam	undulating phase	193
	Greendale cherty silt loam	eroded undulating phase	166
	Greendale cherty silt loam	undulating phase	3,592
	Greendale cherty silt loam	level phase	553
	Hanceville fine sandy loam	eroded undulating phase	74
	Hanceville fine sandy loam	undulating phase	750
	Hartsells fine sandy loam	eroded undulating phase	2,514
	Hartsells fine sandy loam	undulating shallow phase	7,338
	Hartsells fine sandy loam	eroded undulating shallow phase	519
	Hartsells fine sandy loam	undulating phase	47,152
	Hermitage silty clay loam	eroded undulating phase	288
	Hollywood silty clay	undulating phase	1,300
	Hollywood silty clay	level phase	2,104
	Holston loam	undulating phase	3,246
	Holston loam	level phase	1,787
	Huntington silt loam		6,182
	Jefferson fine sandy loam	eroded undulating phase	1,104
	Jefferson fine sandy loam	undulating phase	3,597

Table B-7 Prime Farmland—Alabama (Continued)

County	Soil Name	Slope	Acres
Jackson County (continued)	Lindside silt loam		7,622
	Lindside silty clay		588
	Lindside silty clay loam		3,862
	Monongahela loam	undulating phase	921
	Monongahela loam	level phase	697
	Philo-Atkins silt loams		8,208
	Pope fine sandy loam		190
	Sequatchie fine sandy loam	undulating phase	4,802
	Sequatchie fine sandy loam	level phase	1,268
	Taft silt loam		1,346
	Talbott silt loam	undulating phase	859
	Talbott silty clay loam	eroded undulating phase	2,506
	Tyler very fine sandy loam		3,133
	Waynesboro fine sandy loam	eroded undulating phase	433
	Waynesboro fine sandy loam	undulating phase	434
	Wolftever silt loam	undulating phase	561
	Wolftever silt loam	level phase	836
Total Farmland			**172,069**
Total Acres in County			**721,100**
Lauderdale County	Armour silt loam		1,274
	Chenneby silt loam		2,224
	Choccolocco silt loam		1,040
	Decatur silt loam	2 to 6 percent slopes	20,412
	Dewey silt loam	2 to 6 percent slopes	32,413
	Dickson silt loam	0 to 2 percent slopes	7,964
	Dickson silt loam	2 to 6 percent slopes	79,318
	Etowah silt loam	2 to 8 percent slopes	3,900
	Fullerton cherty silt loam	2 to 6 percent slopes	4,826
	Grasmere silty clay loam		7,877
	Humphreys cherty silt loam		888
	Lobelville cherty silt loam		18,331
	Pruitton silt loam		9,667
	Staser silt loam		1,420
Total Farmland			**191,554**
Total Acres in County			**460,030**
Lawrence County	Abernathy fine sandy loam	level phase	1,214
	Abernathy fine sandy loam	undulating phase	2,055
	Abernathy silt loam	level phase	8,330
	Abernathy silt loam	undulating phase	3,479
	Allen fine sandy loam	eroded undulating phase	1,388
	Barbourville fine sandy loam	eroded undulating phase	836
	Cotaco silt loam	eroded undulating phase	2,670
	Cumberland loam	undulating phase	7,462
	Cumberland loam		400
	Cumberland loam	undulating phase	7,000
	Cumberland loam	undulating phase	279

Table B-7 Prime Farmland—Alabama (Continued)

County	Soil Name	Slope	Acres
Lawrence County (continued)	Decatur and Cumberland silt loams	undulating phase	331
	Decatur and Cumberland silty clay loams	eroded undulating phase	17,467
	Dewey cherty silty clay loam	eroded undulating phase	466
	Enders loam	undulating phase	438
	Etowah loam	eroded undulating phase	17,765
	Etowah loam	undulating phase	2,395
	Etowah silt loam	undulating phase	289
	Etowah silty clay loam	eroded undulating phase	693
	Hamblen fine sandy loam		5,212
	Hartsells fine sandy loam	eroded undulating phase	187
	Hollywood silty clay		8,734
	Huntington silt loam		132
	Jefferson fine sandy loam	undulating phase	1,974
	Johnsburg loam		632
	Lindside silty clay loam		7,309
	Linker fine sandy loam	eroded undulating phase	3,140
	Monongahela and Holston fine sandy loams	eroded undulating phase	2,987
	Monongahela and Holston fine sandy loams	level phase	851
	Monongahela and Holston fine sandy loams	undulating phase	1,001
	Nolichucky fine sandy loam	eroded undulating phase	2,257
	Philo fine sandy loam		872
	Ruston sandy loam	undulating phase	185
	Sequatchie fine sandy loam	eroded undulating phase	1,423
	Sequatchie fine sandy loam	undulating phase	1,098
	Staser fine sandy loam		289
	Talbott silt loam	eroded undulating phase	1,017
	Talbott silt loam	undulating phase	470
	Talbott silty clay loam	eroded undulating phase	7,735
	Tilsit silt loam	eroded undulating phase	20,416
	Tilsit silt loam	undulating phase	2,900
	Tyler and Monongahela fine sandy loams	eroded undulating phase	1,742
	Tyler and Monongahela fine sandy loams	level phase	5,555
	Tyler and Monongahela fine sandy loams	undulating phase	2,259
	Tyler fine sandy loam		1,138
	Waynesboro fine sandy loam	eroded undulating phase	376
Total Farmland			**156,848**
Total Acres in County			**459,370**
Limestone County	Abernathy fine sandy loam		427
	Abernathy silt loam	undulating phase	2,037
	Abernathy silt loam	level phase	13,801

Table B-7 Prime Farmland — Alabama (Continued)

County	Soil Name	Slope	Acres
Limestone County (continued)	Baxter cherty silt loam	eroded undulating phase	5,612
	Baxter cherty silt loam	undulating phase	1,387
	Cumberland clay loam	eroded undulating phase	458
	Cumberland fine sandy loam	undulating phase	362
	Cookeville silt loam	eroded undulating phase	30,758
	Cookeville silt loam	undulating phase	2,427
	Capshaw loam		274
	Cumberland silty clay loam	eroded undulating phase	5,017
	Cumberland silt loam	undulating phase	760
	Cumberland silt loam	level phase	624
	Dickson cherty silt loam	eroded undulating phase	2,431
	Dickson cherty silt loam	undulating phase	1,215
	Dickson silt loam	eroded undulating phase	24,177
	Dickson silt loam	undulating phase	12,938
	Dickson silt loam	level phase	19,513
	Decatur silty clay loam	eroded undulating phase	16,960
	Dewey silt loam	slightly eroded undulating phase	1,395
	Dewey silt loam	level phase	768
	Decatur silt loam	slightly eroded undulating phase	6,493
	Decatur silt loam	level phase	7,240
	Dewey silty clay loam	eroded undulating phase	16,859
	Egam silty clay loam		526
	Ennis silt loam		4,255
	Ennis silt loam	shallow phase	503
	Ennis cherty silt loam		960
	Etowah silt loam	undulating phase	466
	Etowah silt loam	level phase	3,245
	Etowah silty clay loam	eroded undulating phase	773
	Greendale cherty silt loam	undulating phase	2,895
	Greendale silt loam	undulating phase	10,715
	Greendale silt loam	level phase	650
	Hollywood silty clay	level phase	623
	Huntington silt loam		2,963
	Humphreys silt loam	level phase	3,264
	Humphreys cherty silt loam	undulating phase	1,427
	Lawrence silt loam		9,762
	Maury silt loam	eroded undulating phase	994
	Sango silt loam		5,624
	Taft silt loam		3,708
	Wolftever silt loam		1,266
Total Farmland			**228,552**
Total Acres in County			**388,700**
Madison County	Abernathy cherty silt loam		1,222
	Abernathy fine sandy loam		3,665
	Abernathy silt loam		30,540
	Allen fine sandy loam	Undulating	407
	Allen fine sandy loam	eroded, undulating	4,377

Table B-7 Prime Farmland — Alabama (Continued)

County	Soil Name	Slope	Acres
Madison County (continued)	Baxter cherty silt loam	Undulating	1,120
	Baxter cherty silt loam	eroded, undulating	10,511
	Captina and Capshaw loams	Undulating	499
	Captina and Capshaw silt loams	Level	4,215
	Captina and Capshaw silt loams	Undulating	1,252
	Cookeville silt loam	undulating	2,779
	Cookeville silt loam	eroded, undulating	13,560
	Cumberland loam	Undulating	150
	Cumberland loam	eroded, undulating	5,382
	Decatur and Cumberland silt loams	level	2,688
	Decatur and Cumberland silt loams	undulating	11,524
	Decatur and Cumberland silty clays	gullied	1,731
	Decatur and Cumberland silty clay loams	eroded, undulating	48,944
	Dewey cherty silty clay loam	eroded, undulating	3,298
	Dickson cherty silt loam	undulating	3,410
	Dickson cherty silt loam	eroded, undulating	4,937
	Dickson silt loam	level	2,036
	Dickson silt loam	undulating	12,216
	Dickson silt loam	eroded, undulating	5,930
	Egam silty clay loam		1,832
	Etowah cherty silt loam	undulating	509
	Etowah loam	level	305
	Etowah loam	undulating	764
	Etowah loam	eroded, undulating	373
	Etowah silt loam	level	1,273
	Etowah silt loam	Undulating	2,749
	Etowah silty clay loam	eroded, undulating	2,659
	Greendale cherty silt loam		3,716
	Greendale silt loam		10,455
	Hamblen fine sandy loam		1,893
	Hartsells fine sandy loam	undulating	1,349
	Hartsells fine sandy loam	eroded, undulating	305
	Hartsells fine sandy loam Hartsells fine sandy loam	undulating, shallow eroded, undulating, shallow	244 214
	Hermitage cherty silt loam	eroded, undulating	2,688
	Hermitage silt loam	Undulating	814
	Hermitage silt loam	eroded, undulating	1,547
	Hollywood silty clay		2,400
	Hollywood silty clay	eroded, undulating	226
	Holston fine sandy loam	Level	2,647
	Holston fine sandy loam Humphreys cherty silt loam	Undulating	1,425 3,156
	Humphreys silt loam		2,698

Table B-7 Prime Farmland — Alabama (Continued)

County	Soil Name	Slope	Acres
Madison County (continued)	Huntington fine sandy loam		1,222
	Huntington silt loam		4,785
	Jefferson fine sandy loam	Undulating	682
	Jefferson fine sandy loam	eroded, undulating	1,298
	Lawrence silt loam		4,581
	Lee silt loam		5,294
	Lickdale silt loam		46
	Lindside silty clay loam		13,947
	Linker fine sandy loam	eroded, undulating	204
	Monongahela fine sandy loam		3,354
	Pearman loam		265
	Sequatchie fine sandy loam		1,222
	Sequatchie fine sandy loam	Eroded	1,731
	Taft silt loam		774
	Talbott cherty silty clay loam	eroded, undulating	1,043
	Talbott fine sandy loam	eroded, undulating	188
	Talbott silty clay loam	eroded, undulating	1,726
	Tyler very fine sandy loam		4,785
	Wolftever silt loam		560
	Wolftever silt loam	Eroded	366
Total Farmland			**271,929**
Total Acres in County			**520,380**
Marion County	Bama loam	2 to 6 percent slopes	920
	Bassfield loamy sand		750
	Cahaba fine sandy loam	0 to 2 percent slopes	760
	Cahaba fine sandy loam	2 to 6 percent slopes	1,200
	Choccolocco silt loam		284
	Kirkville loam		810
	Nauvoo loam	2 to 6 percent slopes	490
	Ora silt loam	2 to 6 percent slopes	12,600
	Ruston fine sandy loam	2 to 6 percent slopes	5,300
	Savannah loam	0 to 2 percent slopes	4,050
	Savannah loam	2 to 6 percent slopes	26,750
	Townley silt loam	2 to 6 percent slopes	491
Total Farmland			**54,405**
Total Acres in County			**475,870**
Marshall County	Albertville very fine sandy loam	eroded, gently sloping	16,653
	Alcoa silt loam	eroded, gently sloping	555
	Allen-Waynesboro fine sandy loams	eroded, gently sloping	5,690
	Captina silt loam	eroded, gently sloping	5,718
	Captina silty clay loam	severely eroded, gently sloping	222
	Captina-Colbert soils	gently sloping	333
	Crossville fine sandy loam	eroded, gently sloping, moderately deep	5,662

County	Soil Name	Slope	Acres
	Cumberland and Hermitage silty clay loams	severely eroded, gently sloping	2,220

Table B-7 Prime Farmland — Alabama (Continued)

County	Soil Name	Slope	Acres
Marshall County (continued)	Egam silty clay loam		1,443
	Egam silty clay loam	sandy substratum	1,110
	Egam-Newark silty clay loams		4,663
	Etowah loam	eroded, gently sloping	305
	Hartsells fine sandy loam	gently sloping	555
	Hartsells fine sandy loam	eroded, gently sloping, shallow	75,347
	Hartsells fine sandy loam	eroded, gently sloping, shallow	555
	Hartsells sandy clay loam	severely eroded, gently sloping, shallow	222
	Hollywood clay		56
	Huntington fine sandy loam		2,109
	Huntington loam	local alluvium	555
	Huntington silt loam		56
	Huntington silt loam	local alluvium	472
	Jefferson fine sandy loam	eroded, gently sloping	622
	Linker fine sandy loam	eroded, gently sloping	6,717
	Linker sandy clay loam	severely eroded, gently sloping	7,771
	Lobelville cherty silt loam	local alluvium	555
	Minvale cherty silt loam	gently sloping	555
	Minvale cherty silt loam	eroded, gently sloping	5,551
	Monongahela fine sandy loam	eroded, gently sloping	611
	Monongahela fine sandy loam	Overwash	555
	Philo and Stendall soils	local alluvium	2,470
	Pope fine sandy loam		111
	Taft silt loam	Level	361
	Taft silt loam	eroded, gently sloping	2,220
	Tilsit very fine sandy loam	gently sloping	555
	Tilsit very fine sandy loam	eroded, gently sloping	11,102
	Tyler fine sandy loam		111
	Wolftever silt loam	eroded, gently sloping	111
Total Farmland			**165,256**
Total Acres in County			**398,750**
Morgan County	Abernathy fine sandy loam		2,983
	Abernathy silt loam		5,125
	Allen fine sandy loam	eroded, undulating	3,797
	Allen fine sandy loam	Undulating	475
	Captina and Capshaw loams	Undifferentiated	1,695
	Captina and Capshaw silt loams	Undifferentiated	2,713
	Christian loam	Undulating	521
	Christian loam	Undulating	2,658

County	Soil Name	Slope	Acres
	Cotaco loam		2,983
	Crossville loam	Undulating	154
	Cumberland silt loam	Level	308
	Cumberland silt loam	Undulating	799
	Cumberland silty clay loam	eroded, undulating	3,717

Table B-7 Prime Farmland — Alabama (Continued)

County	Soil Name	Slope	Acres
Morgan County (continued)	Decatur silt loam	Undulating	606
	Decatur silty clay loam	eroded, undulating	2,947
	Dewey cherty silt loam	Undulating	864
	Dewey cherty silty clay loam	eroded, undulating	217
	Dewey silt loam	Undulating	1,146
	Dewey silty clay loam	eroded, undulating	1,473
	Egam silty clay loam		2,417
	Enders loam	eroded, undulating	2,084
	Enders loam	Undulating	1,319
	Etowah loam	Level	736
	Etowah loam	Undulating	1,723
	Etowah silty clay loam	eroded, undulating	560
	Hanceville fine sandy loam	eroded, undulating	1,244
	Hanceville fine sandy loam	Undulating	389
	Hartsells fine sandy loam	eroded, undulating	3,764
	Hartsells fine sandy loam	Undulating	5,116
	Hartsells fine sandy loam	Undulating	469
	Hartsells loam	Undulating	277
	Hollywood loam		249
	Hollywood silty clay		8,618
	Holston fine sandy loam	eroded, undulating	643
	Holston fine sandy loam	Level	3,336
	Holston fine sandy loam	Undulating	4,965
	Holston gravelly fine sandy loam	Undulating	312
	Holston gravelly fine sandy loam	eroded, undulating	347
	Huntington fine sandy loam	Sanded	540
	Huntington silt loam		1,055
	Jefferson fine sandy loam	eroded, undulating	2,140
	Jefferson fine sandy loam	Undulating	1,003
	Johnsburg loam		778
	Lindside silty clay loam		5,849
	Linker fine sandy loam	eroded, undulating	4,789
	Linker fine sandy loam	Undulating	2,303
	Monongahela fine sandy loam		3,478
	Nolichucky fine sandy loam	Undulating	129
	Nolichucky fine sandy loam	eroded, undulating	117
	Nolichucky gravelly fine sandy loam	eroded, undulating	250
	Philo fine sandy loam		1,485
	Philo-Lindside soils	Undifferentiated	5,461

County	Soil Name	Slope	Acres
	Pope fine sandy loam		664
	Sequatchie fine sandy loam		2,541
	Sequatchie fine sandy loam	eroded	1,682
	Taft silt loam		1,097
	Talbott loam	eroded, undulating	1,457
	Talbott silt loam	Undulating	2,146

Table B-7 Prime Farmland—Alabama (Continued)

County	Soil Name	Slope	Acres
Morgan County (continued)	Talbott silty clay loam	eroded, undulating	3,964
	Tilsit silt loam	eroded, undulating	12,024
	Tilsit silt loam	Level	1,384
	Tilsit silt loam	Undulating	9,685
	Tyler fine sandy loam		1,346
	Tyler silt loam		4,118
	Waynesboro fine sandy loam	eroded, undulating	6,910
	Waynesboro fine sandy loam	Undulating	821
	Wolftever silt loam		1,149
Total Farmland			**154,114**
Total Acres in County			**383,460**
Winston County	Bama sandy loam	2 to 6 percent slopes	—
	Hartsells fine sandy loam	2 to 6 percent slopes	—
	Enders fine sandy loam	2 to 6 percent slopes	—
	Savannah fine sandy loam	2 to 6 percent slopes	—
	Locust fine sandy loam	0 to 2 percent slopes	—
	Locust fine sandy loam	2 to 6 percent slopes	—
	Albertville silt loam	2 to 6 percent slopes	—
	Leadvale silt loam	0 to 2 percent slopes	—
	Leadvale silt loam	2 to 6 percent slopes	—
	Nauvoo fine sandy loam	2 to 6 percent slopes	—
	Townley fine sandy loam	2 to 6 percent slopes	—
	Holston fine sandy loam	2 to 6 percent slopes	—
	Taft silt loam	0 to 2 percent slopes	—
	Wynnville fine sandy loam	0 to 2 percent slopes	—
	Wynnville fine sandy loam	2 to 6 percent slopes	—
Total Farmland			**not known**
Total Acres in County			**404,290**