Appendix B - Alabama-Coosa-Tallapoosa (ACT) Basin

1 ACT BASIN

1.1 DESCRIPTION OF BASIN

The headwater streams of the Alabama-Coosa-Tallapoosa (ACT) System rise in the Blue Ridge Mountains of Georgia and Tennessee and flow southwest, combining at Rome, Georgia, to form the Coosa River. The confluence of the Coosa and Tallapoosa Rivers in central Alabama forms the Alabama River, which flows through Montgomery and Selma and joins with the Tombigbee River at the bottom of the ACT Basin about 45 miles above Mobile to form the Mobile River. The Mobile River flows into Mobile Bay at an estuary of the Gulf of Mexico. The total drainage area of the ACT Basin is approximately 22,800 square miles.

Progressing downstream from the headwater are the Cities of Rome, Georgia, Gadsden, and Montgomery, Alabama in the central portion of Alabama. The largest metropolitan area in the basin is Montgomery, Alabama.

Figure B-1. ACT Basin

Beginning in the headwaters of northeast Georgia with spring fed mountain streams the slope is steep, with rapid runoff during rainstorms. Some of the most upstream tributaries are the Oostanaula River, the Conasauga River, Ellijay River, the Cartecay River and Etowah River.

The Etowah River, which joins the Oostanaula River at Rome, Georgia, to form the Coosa River, lies entirely within Georgia. It is formed by several small mountain creeks which rise on the southern slopes of the Blue Ridge Mountains at an elevation of about 3,250 feet. The river flows southerly, southwesterly, and then northwesterly for 150 miles to Rome, Georgia. The drainage basin of 1,860 square miles has a maximum width of about 40 miles and a length of about 70 miles. Allatoona Dam is located on the Etowah River near Cartersville, Georgia. It is a multiple-purpose Corps project placed in operation early in 1950 and provides storage for power and flood control. Principal tributaries of the Etowah River are Amicalola, Settingdown, Shoal, Allatoona, Pumpkinvine and Euharlee Creeks and Little River. Three of these, Allatoona and Shoal Creeks, and Little River drain into Lake Allatoona.

The Coosawattee River is 45 miles long; and has a fall of 650 feet, an average of 14.4 feet per mile. The Carters Project is located on the Coosawattee River at river mile 26.8. This federal project consists of an earth-fill dam, and a downstream re-regulation reservoir that accommodates pump-back operations.

The Conasauga River, with its tributary Jacks River, rises on the northern slopes of the Cohutta Mountains in Fanning County, Georgia, at an elevation of about 3,150 feet. Its drainage basin, 727 square miles, has a maximum width of 25 miles and a length of 40 miles. The eastern and northern portions of the basin are rugged and mountainous, containing peaks over 4,000 feet in elevation. The river flows 90 miles from the headwater to join the Coosawattee River to form the Oostanaula River.

From its source at the confluence of the Coosawattee and Conasauga Rivers at Newtown Ferry, Georgia., the Oostanaula River meanders southwesterly through a broad plateau for 47 miles to its mouth at Rome, Georgia. Its total drainage area is 2,160 square miles.

The Coosa River, which is formed by the Etowah and Oostanaula Rivers at Rome, Georgia, flows first westerly, then southwesterly and finally southerly a total distance of 286 miles to its mouth, 11 miles below Wetumpka, Alabama, where it joins the Tallapoosa to form the Alabama River. The drainage area of the Coosa River is approximately 10,200 square miles. Alabama Power Company operates eleven dams with seven on the Coosa River. These are Weiss Dam, H. Neely Henry Dam, Logan Martin Dam, Lay Dam, Mitchell Dam, and Jordan-Bouldin Dams.

The Tallapoosa River, with a drainage area of 4,680 square miles, rises in northwestern Georgia at an elevation of about 1,250 feet, and flows westerly and southerly for 268 miles, joining the Coosa River south of Wetumpka, Alabama to form the Alabama River. There are four large power dams owned by the Alabama Power Company on the Tallapoosa River. These are Harris Dam, Martin Dam, Yates Dam, and Thurlow Dam.

The Alabama River meanders from the head near Wetumpka through the Coastal Plain westerly for about 100 miles to Selma, Alabama. From there it flows southwesterly 214 miles to its mouth near Calvert, Alabama. There are three Corps projects on the Alabama River. Robert F. Henry Lock and Dam and Millers Ferry Lock and Dam provide for hydropower and navigation. Claiborne Lock and Dam provides for navigation only.

1.1.1 Climate

The chief factors that control the climate of the Alabama-Coosa-Tallapoosa Basin are its geographical position in the southern end of the Temperate Zone, its proximity to the Gulf of Mexico and South Atlantic Ocean, and its range in altitude from almost sea level at the southern end to over 4,000 feet in the Blue Ridge Mountains to the north. The proximity of the warm South Atlantic and the semitropical Gulf of Mexico insures a warm, moist climate. Extreme temperatures range from near 110 degrees in the summer to values below zero in the winter. Severe cold weather rarely lasts longer than a few days. The summers, while warm, are usually not oppressive. In the southern end of the basin the average maximum January temperature is 60 degrees and the average minimum January temperature is 37 degrees.

The Maximum average July temperature is 91 degrees; in the southern end of the basin the corresponding minimum value is 69 degrees. The frost-free season varies in length from about 200 days in the northern valleys to about 250 days in the southern part of the basin. Precipitation is mostly in the form of rain, but some snow falls in the mountainous northern region on an average of twice a year.

1.1.2 Precipitation

The entire ACT Watershed lies in a region which ordinarily receives an abundance of precipitation. The watershed receives a large amount of rain and it is well distributed throughout the year. Winter and spring are the wettest periods and early fall the driest. Light snow is not unusual in the northern part of the watershed, but constitutes only a very small fraction of the annual precipitation and has little effect on runoff. Intense flood producing storms occur mostly in the winter and spring. They are usually of the frontal-type, formed by the meeting of warm moist air masses from the Gulf of Mexico with the cold, drier masses from the northern regions, and may cause heavy precipitation over large areas. The storms that occur in summer or early fall are usually of the thunderstorm type with high intensities over smaller areas. Tropical disturbances and hurricanes can occur producing high intensities of rainfall over large areas.

1.1.3 Storms and Floods

Major flood-producing storms over the ACT Watershed are usually of the frontal type, occurring in the winter and spring and lasting from 2 to 4 days, with their effect on the basin depending on their magnitude and orientation. The axes of the frontal-type storms generally cut across the long, narrow basin. Frequently a flood in the lower reaches is not accompanied by a flood in the upper reaches and vice versa. Occasionally, a summer storm of the hurricane type, such as the storms of July 1916 and July 1994, will cause major floods over practically the entire basin. However, summer storms are usually of the thunderstorm type with high intensities over small areas producing serious local floods. With normal runoff conditions, from 5 to 6 inches of intense and general rainfall are required to produce wide spread flooding, but on many of the minor tributaries 3 to 4 inches are sufficient to produce local floods.

Historically, minor or major floods within the ACT Basin occur about two times per year. The storms which occurred in July 1916, December 1919, March 1929, February 1961, and July 1994 are of special interest because of the intensities of precipitation over large areas. It should be noted that they represent both the hurricane and frontal types which produce the great floods in this area.

1.1.4 Runoff Characteristics

Within the ACT Basin rainfall occurs throughout the year but is less abundant during the August through November time frame. The amount of this rainfall that actually contributes to streamflow varies much more than the rainfall. Several factors such as plant growth and the seasonal rainfall patterns contribute to the volume of runoff.

Table B-1 and Table B-2 present the average monthly runoff for the basin. These tables divide the basin at Rome Georgia to show the different percentages of runoff verses rainfall for the northern and southern sections. The mountainous areas exhibit flashier runoff characteristics and somewhat higher percentages of runoff.

Figure B-2 and Figure B-3 present the same information in graphical form.

Table B-1. Average Monthly Runoff at Rome, Georgia

AVERAGE MONTHLY RUNOFF IN ACT BASIN MEASURED AT ROME GEORGIA												
MONTH	**JAN**	**FEB**	**MAR**	**APRIL**	**MAY**	**JUNE**	**JULY**	**AUG**	**SEPT**	**OCT**	**NOV**	**DEC**
AVG MONTHLY FLOW (CFS) AT ROME	6,525	9,602	11,652	12,828	10,565	7,038	4,636	4,234	3,188	2,778	2,867	4,162
AVG RUNOFF IN INCHES AT ROME	1.86	2.47	3.33	3.54	3.01	1.94	1.32	1.21	0.88	0.79	0.79	1.19
AVG RAINFALL IN INCHES	5.15	4.97	5.96	4.79	4.22	3.92	4.89	3.77	3.82	3.05	3.90	4.87
PERCENT OF RAINFALL AS RUNOFF	36%	50%	56%	74%	71%	50%	27%	32%	23%	26%	20%	24%

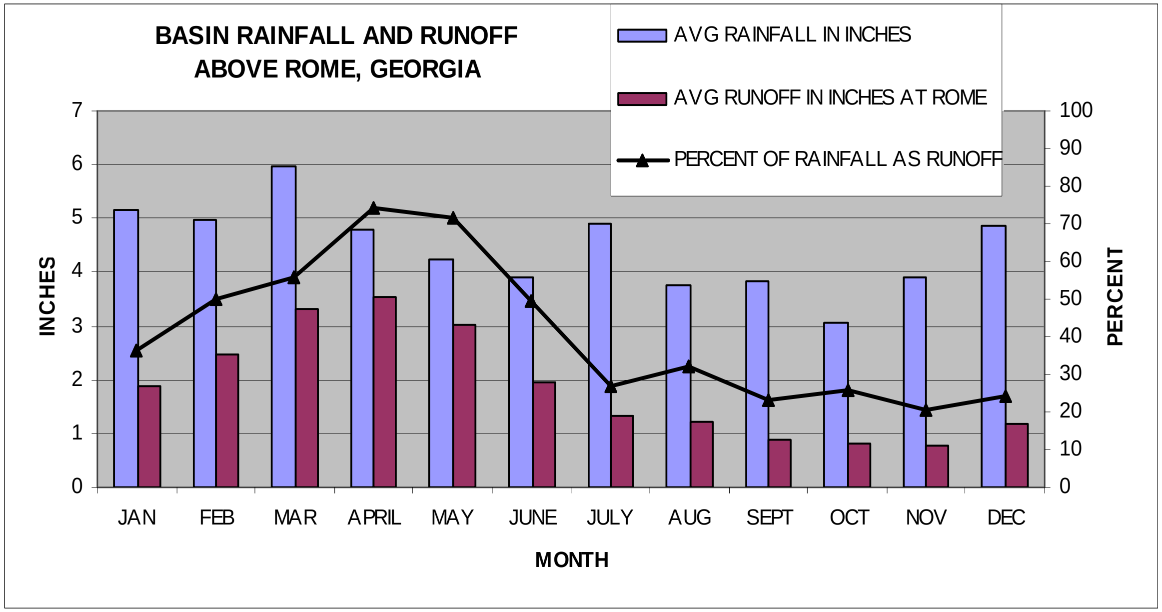


Figure B-2. Basin Rainfall and Runoff above Rome, Georgia

Table B-2. Average Monthly Runoff at Claiborne, Alabama

AVERAGE MONTHLY RUNOFF IN ACT BASIN MEASURED AT CLAIBORNE ALABAMA												
MONTH	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
AVG MONTHLY FLOW (CFS) AT CLAIBORNE	31,529	47,762	58,487	69,862	57,732	32,294	19,981	18,553	14,386	11,346	11,279	16,606
INCREMENTAL FLOW BETWEEN CLAIBORNE AND ROME	25,004	38,160	46,835	57,034	47,167	25,256	15,345	14,319	11,198	8,568	8,412	12,444
AVG RUNOFF IN INCHES BETWEEN CLAIBORNE AND ROME	1.65	2.52	3.10	3.77	3.12	1.67	1.01	0.95	0.74	0.57	0.56	0.82
AVG RAINFALL IN INCHES	5.19	5.15	6.10	4.90	4.18	4.16	5.28	3.95	3.63	2.84	4.07	4.93
PERCENT OF RAINFALL AS RUNOFF	32%	49%	51%	77%	75%	40%	19%	24%	20%	20%	14%	17%

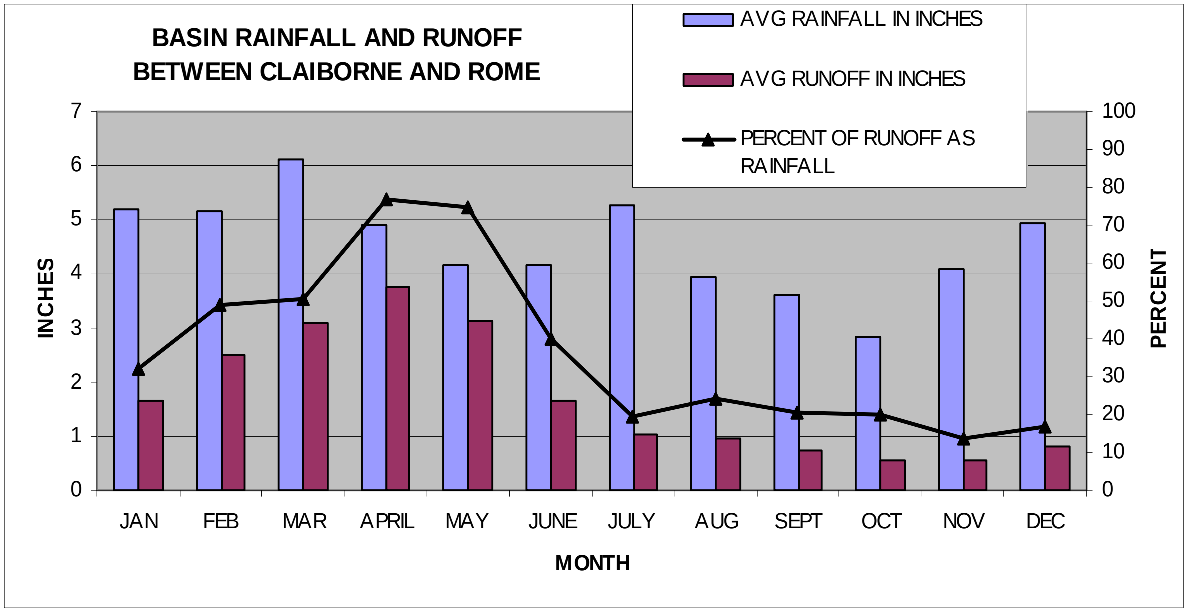


Figure B-3. Basin Rainfall and Runoff between Claiborne, Alabama and Rome, Georgia

1.2 RESERVOIRS

1.2.1 Reservoir Storage

Within the Alabama-Coosa-Tallapoosa River Basin there are five (5) federally owned reservoir projects; Carters Dam (Carters Lake), Allatoona Dam (Allatoona Lake), R.F. Henry Lock and Dam (Jones Bluff Powerhouse and Woodruff Reservoir), Millers Ferry Lock and Dam (William Danelly Lake), and Claiborne Lock and Dam (Claiborne Lake). These projects were built and are operated by the Corps, Mobile District Office. The Alabama Power Company owns and operates seven dams on the Coosa River and four on the Tallapoosa River.

The reservoir storage in the basin controlled by each of the reservoirs is listed in Table B-3 and shown graphically in Figure B-4. Claiborne Lock and Dam is not shown because the storage is insignificant.

Table B-3. ACT Basin Conservation Storage Percent by Acre-Feet

Project	Conservation Storage (ac-ft)	Percentage
*Allatoona	284,589	12%
*Carters	141,400	6%
Weiss	237,448	10%
Neely Henry	43,205	2%
L Martin	108,262	4%
Lay	77,478	3%
Mitchell	28,048	1%
Jordan/Bouldin	15,969	1%
Harris	191,129	8%
Martin	1,183,356	48%
Yates	5,976	0.2%
*RF Henry (Jones Buff)	47,179	2%
*Millers Ferry	64,900	3%
Total	**2,428,939**	

* Federal project

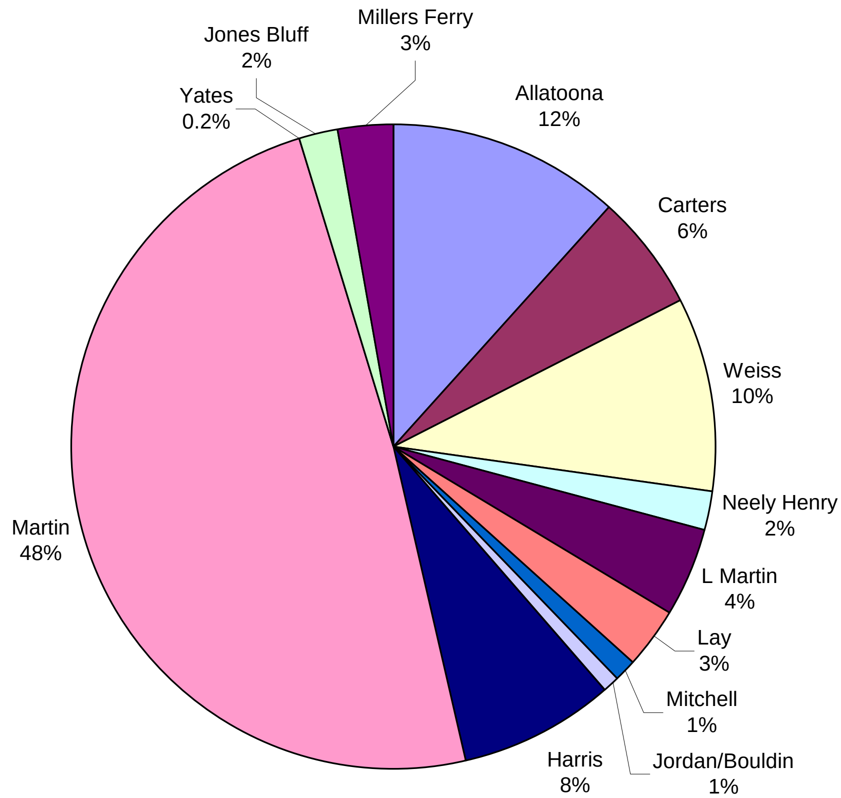


Figure B-4. ACT Basin Reservoir Conservation Storage Percent by Acre-Feet

The figure shows the greatest conservation storage (48%) in the basin is from the Alabama Power Company Lake Martin project on the Tallapoosa River. In addition, the Alabama Power Company controls 77% of the basin storage; federal projects (RF Henry, Millers Ferry, Allatoona, and Carters) control only 23%.

1.2.2 Reservoirs Selected for Yield

As shown above the only federal projects with significant storage are Allatoona and Carters. These two projects in the upper basin account for 18% of the total basin conservation storage. Therefore, yield analyses was performed on these two projects. These analyses are presented separately.

1.3 ALLATOONA DAM (ALLATOONA LAKE)

Allatoona Dam is located on the Etowah River in Bartow County, Georgia, about 32 miles northwest of Atlanta and 26 miles northeast of Rome, Georgia. The reservoir lies within Bartow, Cobb, and Cherokee Counties. The 1,110 square miles drainage area lies on the southern slopes of the Blue Ridge Mountains and consist of steep sloping mountain terrain.

Allatoona Dam is a multiple purpose project with principal purposes of flood control, hydropower, navigation, water quality, water supply, fish and wildlife enhancement and recreation. Its major flood protection area is Rome, Georgia, about 48 river miles downstream. Allatoona Dam operations, along with those of Carters Dam on the Coosawattee River which also contributes to flow at Rome, Georgia provide flood stage reductions at Rome. The project was completed in December 1949. An aerial photo of the dam is shown in Figure B-5.

Figure B-5. Allatoona Dam

1.3.1 Drainage Area

The Etowah River and its upstream tributaries originate in the Blue Ridge Mountains of northern Georgia, near the western tip of South Carolina. The northern boundary of the Allatoona drainage area is shared with the Carters Dam drainage area along a high ridge varying from elevation 1300 to 3800 feet NGVD and with the Tennessee and Chattahoochee Rivers along the eastern and southern boundaries along a lower ridge varying from elevation 1200 to 1900 feet NGVD. The creeks along the upper Etowah River have steep mountainous slopes which produce rapid runoff. However, the main stem above the reservoir is more than 70 miles long which produces large flood inflows that often persist for several days. The drainage area above the Allatoona Dam is 1,087 square miles.

The basin drainage area is shown on the following Figure B-6.

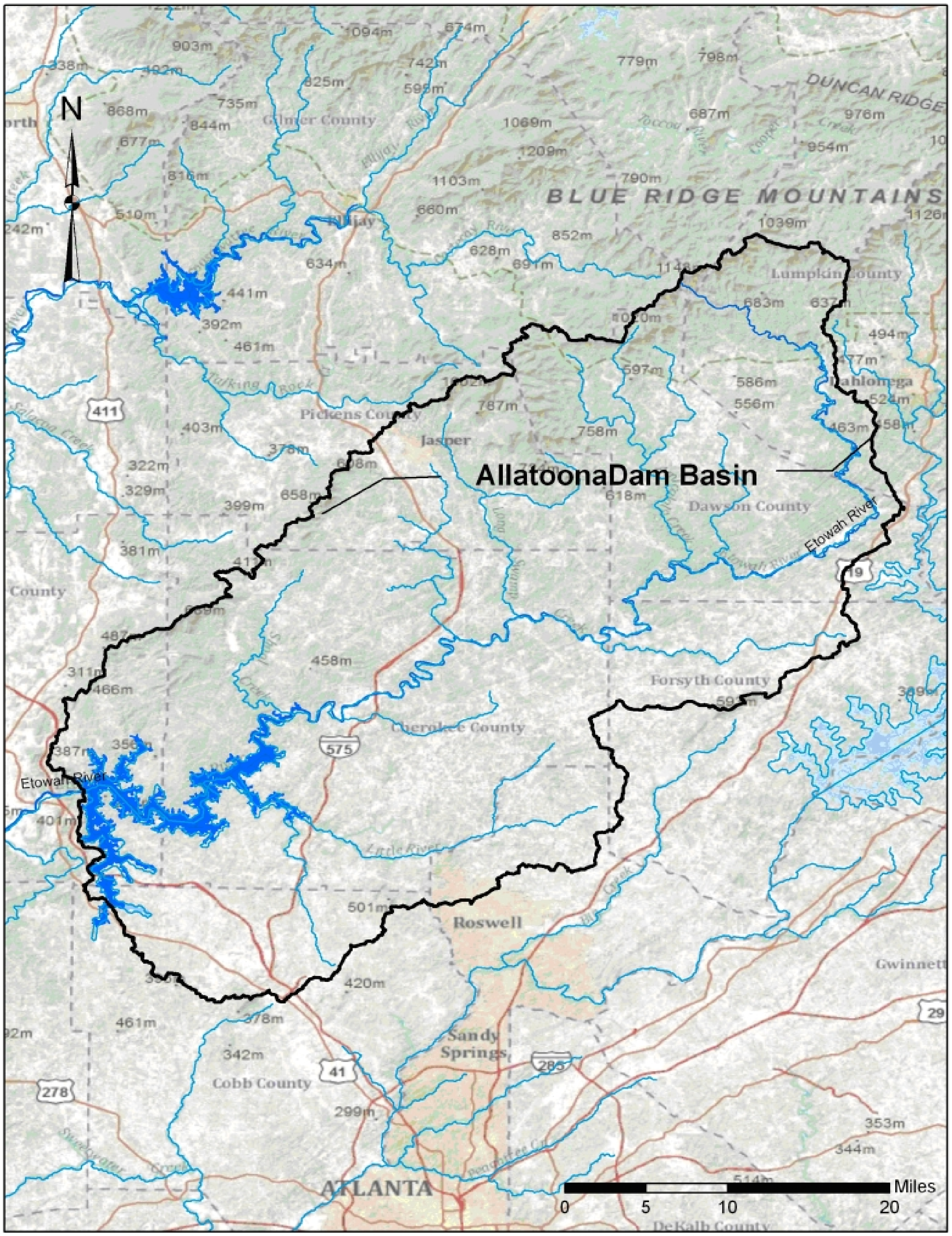


Figure B-6. Allatoona Basin Map

The Allatoona Dam basin controls five percent of the total ACT Basin area. The relation of the Allatoona drainage basin to the ACT Basin is shown in the following Figure B-7. The figure also shows where ACT flow may be influenced by the operation or presence of federal or

Alabama Power Company dams. The basin drainage areas above the federal dams and the Alabama Power Company dams are designated in different colors. The lower federal reservoirs are essentially run-of-the-river projects with limited storage.

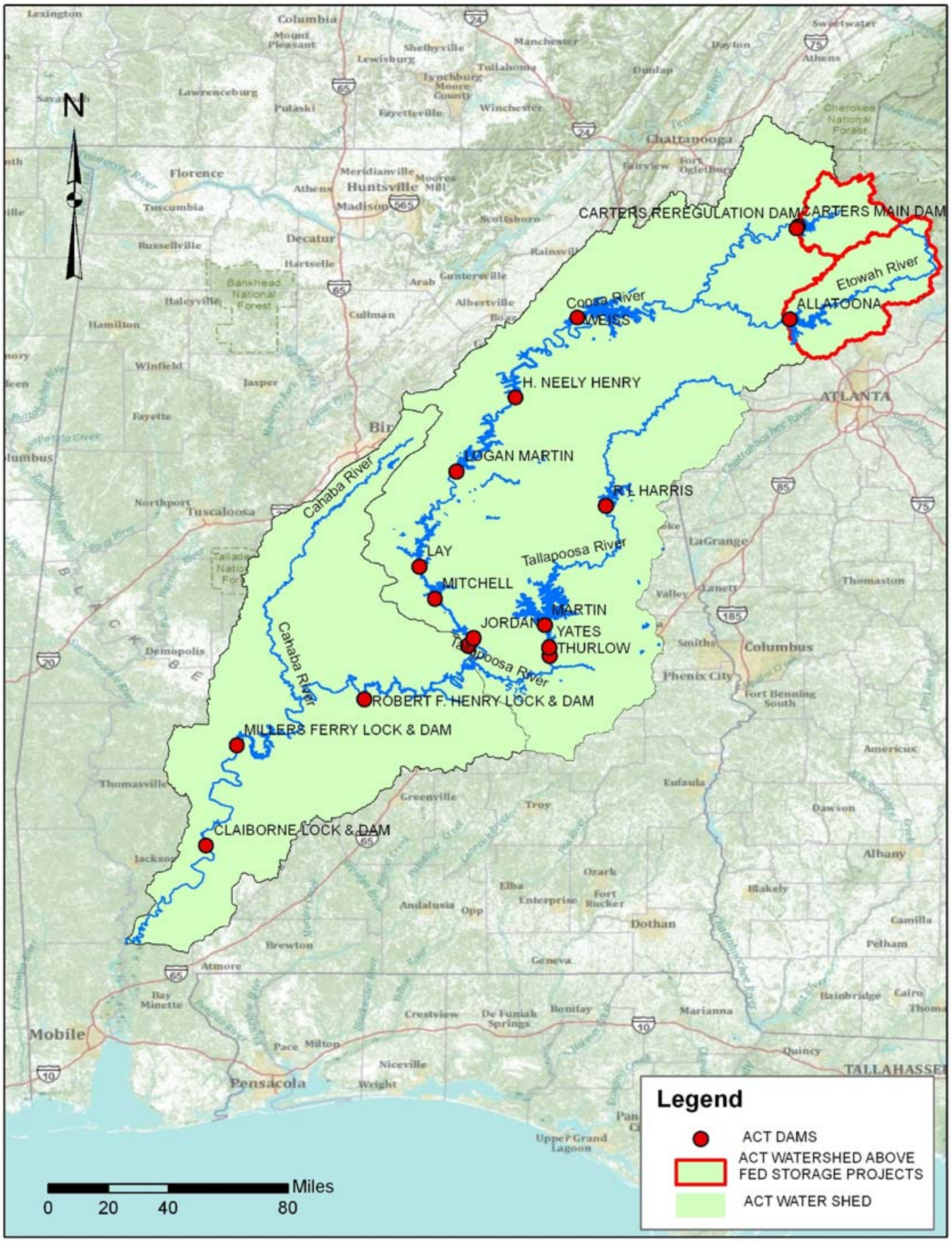


Figure B-7. Drainage Areas for Projects on the ACT

1.3.2 General Features

The project consists of Allatoona Lake extending 28 miles up the Etowah River at full summer conservation pool of 840 feet, a concrete gravity-type dam with gated spillway, earthen dikes, a 74,400 kilowatt (kW) power plant and appurtenances. The spillway section of the dam, with a crest at elevation 835 feet NGVD, has a total flow length of 500 feet, a net length of 400 feet, and a discharge capacity of 184,000 cfs at elevation 860 feet, full flood-control pool. It is equipped with 11 tainter gates. The powerhouse has two 36,000 kW main units and one 2,400 kW service unit, making a total power installation of 74,400 kW.

1.3.2.1 Dam

The dam is a concrete gravity-type structure with curved axis convex upstream, having a top elevation of 880 feet NGVD and an overall length of approximately 1,250 feet. The maximum height above the existing river bed is 190 feet. An 18-foot wide roadway is provided across the entire length of the dam.

1.3.2.2 Reservoir

The reservoir has a total storage capacity of 670,047 acre-feet at full flood-control pool, elevation 860 feet NGVD. At this elevation the reservoir covers a surface area of 19,201 acres (30 square miles) or 2.7 percent of the dam site drainage area. At full summer-level conservation pool, elevation 840 feet NGVD, the reservoir covers 11,862 acres and has a total storage capacity of 367,470 acre-feet; at full winter pool of elevation 823, the reservoir covers 7,610 acres and has a capacity of 202,770 acre-feet, at minimum conservation pool, elevation 800 feet, the area covered is 3,251 acres and the capacity is 82,890 acre-feet. Area and capacity curves are shown on Figure B-8 and in Table B-4.

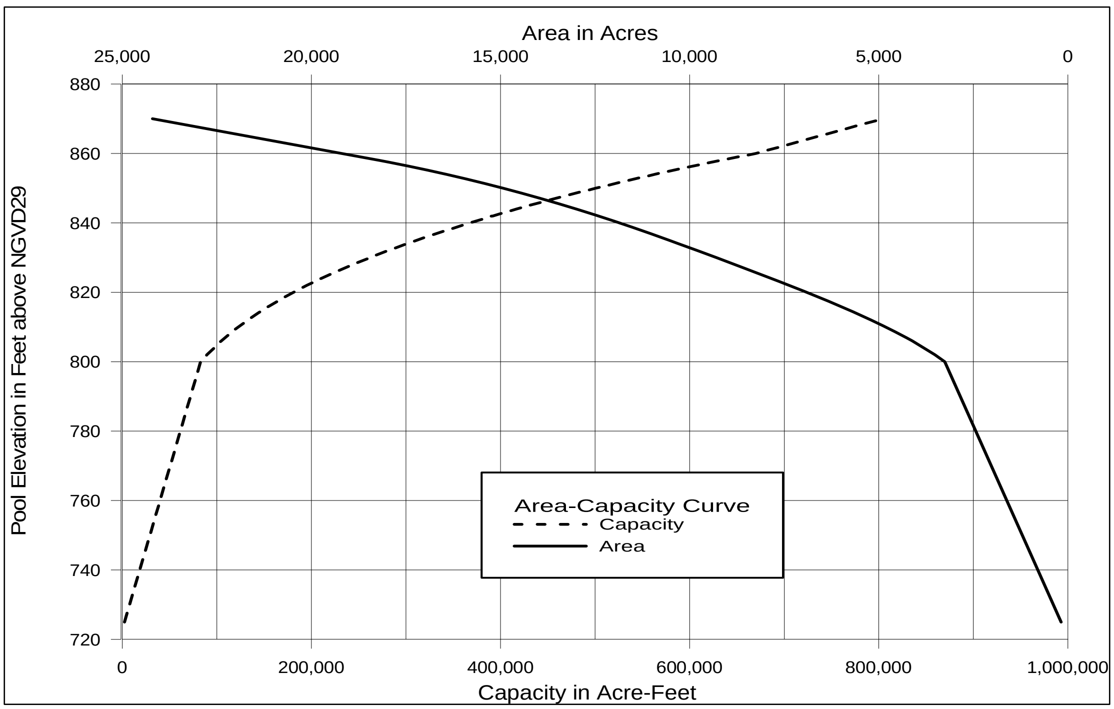


Figure B-8. Allatoona Area – Capacity Curves

Table B-4. Lake Allatoona Area and Capacity

Pool Elev	Total Area	Total Storage
(NGVD 29)	(ac)	(ac-ft)
695	0	0
725	182	2,359
750	508	10,382
760	734	16,534
770	1,042	25,326
780	1,493	37,861
790	2,190	56,021
* 800	3,251	82,891
801	3,381	86,207
802	3,516	89,655
803	3,657	93,241
804	3,804	96,971
805	3,957	100,851
806	4,116	104,887
807	4,281	109,085
808	4,452	113,451
809	4,629	117,991
810	4,812	122,711
811	5,001	127,617
812	5,196	132,715
813	5,397	138,011
814	5,602	143,511
815	5,811	149,217
816	6,024	155,135
817	6,241	161,267
818	6,462	167,619
819	6,686	174,193
820	6,913	180,993
821	7,142	188,021
822	7,373	195,279
** 823	7,606	202,769
824	7,841	210,493
825	8,078	218,453
826	8,317	226,651
827	8,558	235,089
828	8,801	243,769
829	9,046	252,893
830	9,293	261,863
831	9,542	271,281
832	9,793	280,994
833	10,045	290,868
834	10,298	301,040
835	10,552	311,465
836	10,808	322,145
837	11,067	333,082
838	11,329	344,281
839	11,594	355,743
*** 840	11,862	367,471
841	12,134	379,469
842	12,411	391,741
843	12,695	404,294
844	12,988	417,136
845	13,289	430,274
846	13,599	443,718
847	13,918	457,476
848	14,246	471,558
849	14,584	485,973
850	14,933	500,731
851	15,293	515,844
852	15,665	531,323
853	16,050	547,181
854	16,449	563,431
855	16,863	580,087
856	17,293	597,165
857	17,740	614,681
858	18,205	632,553
859	18,692	651,101
**** 860	19,201	670,047
870	24,200	804,000

* Bottom of conservation pool
** Top of winter conservation pool
*** Top of summer conservation pool
**** Top of flood control pool

1.3.3 Top of Conservation Pool

The top of conservation pool varies during the year from elevation 823 to 840 feet. Whenever surplus water is available the criteria is to hold the pool at elevation 840 from 30 April to 30 September, then decrease to 823 feet by 15 December, then hold 823 feet until 15 January, and then increase to 840 feet by 30 September, as shown in Figure B-9.

1.3.4 Regulation Plan

The Allatoona pool is generally regulated between winter pool elevation 823 and summer pool elevation 840. The pool may rise above elevation 840 for short periods of time during high flow periods. The top of the flood control pool is elevation 860. At this elevation, the area of the pool is 19,201 acres and the storage is 670,047 acre-feet.

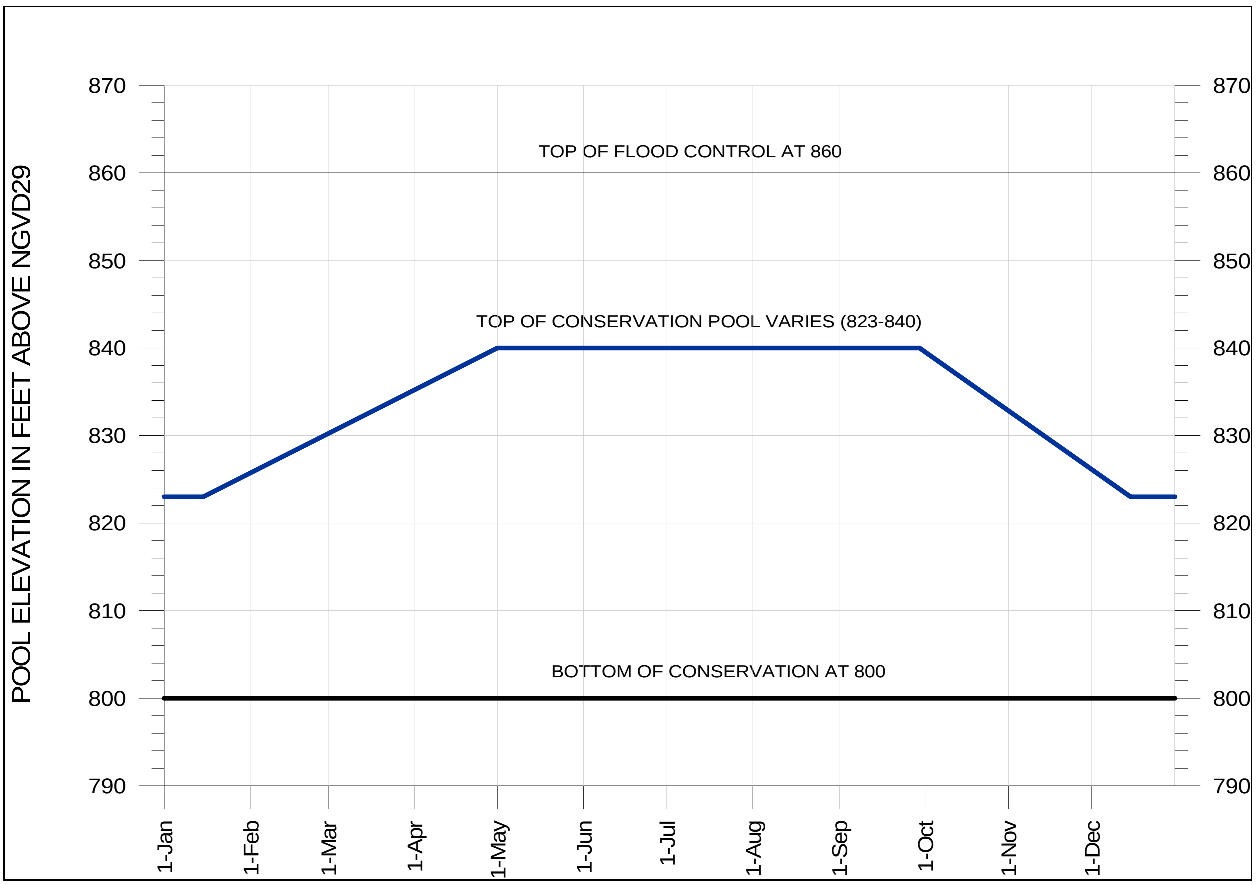


Figure B-9. Top and Bottom of Allatoona Conservation Pool

The storage for the yield analysis will be based on the storage in the conservation pool from elevation 800 to 823-840 (depending on the time of year).

1.3.5 Surface Water Inflows

Observed daily inflow, outflow (discharge), and pool elevation data for the period of record starting in March 1950, just after the pool filled, through the present (Oct 2009) are available. The data are presented in the following Figure B-10.

1.3.6 Unimpaired Flow

The existing unimpaired flow data set was updated through 2008 for use in the yield analysis. The daily data was smoothed using 3-, 5-, or 7-day averaging to eliminate small negative values. Although this averaging affects the peak values, the volume is the same and the yield computations were done on the smoothed data. A plot of this smoothed unimpaired daily flow averaged over each year for the period of record 1939 - 2008 is shown in Figure B-11. Daily flows for critical drought periods are plotted in more detail in Figures B-12 - B-16.

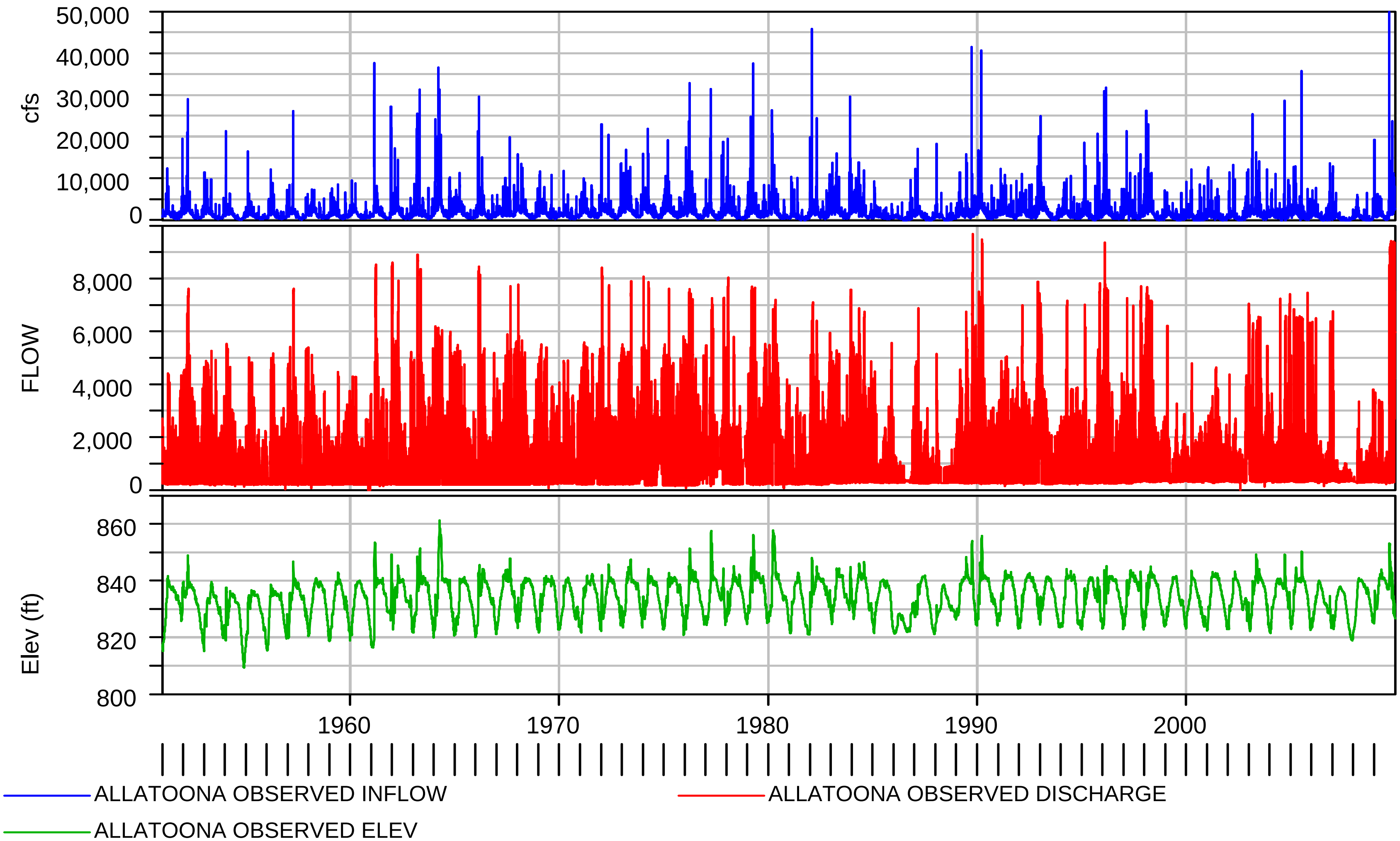


Figure B-10. Allatoona Inflow-Outflow-Pool Elevation (Jan 51 – Dec 2009)

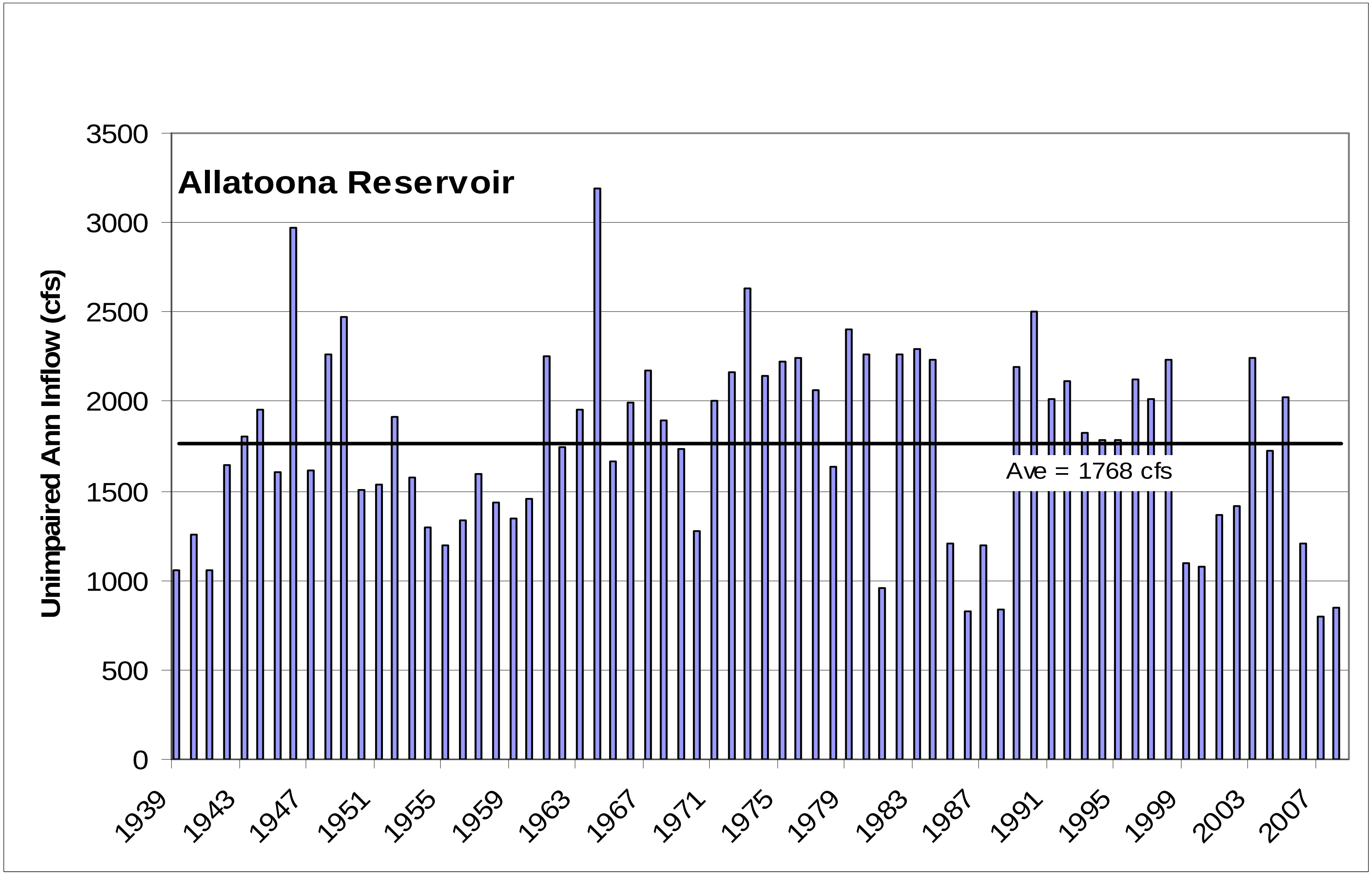


Figure B-11. Allatoona Unimpaired Annual Inflow Jan 1939 to Dec 2008

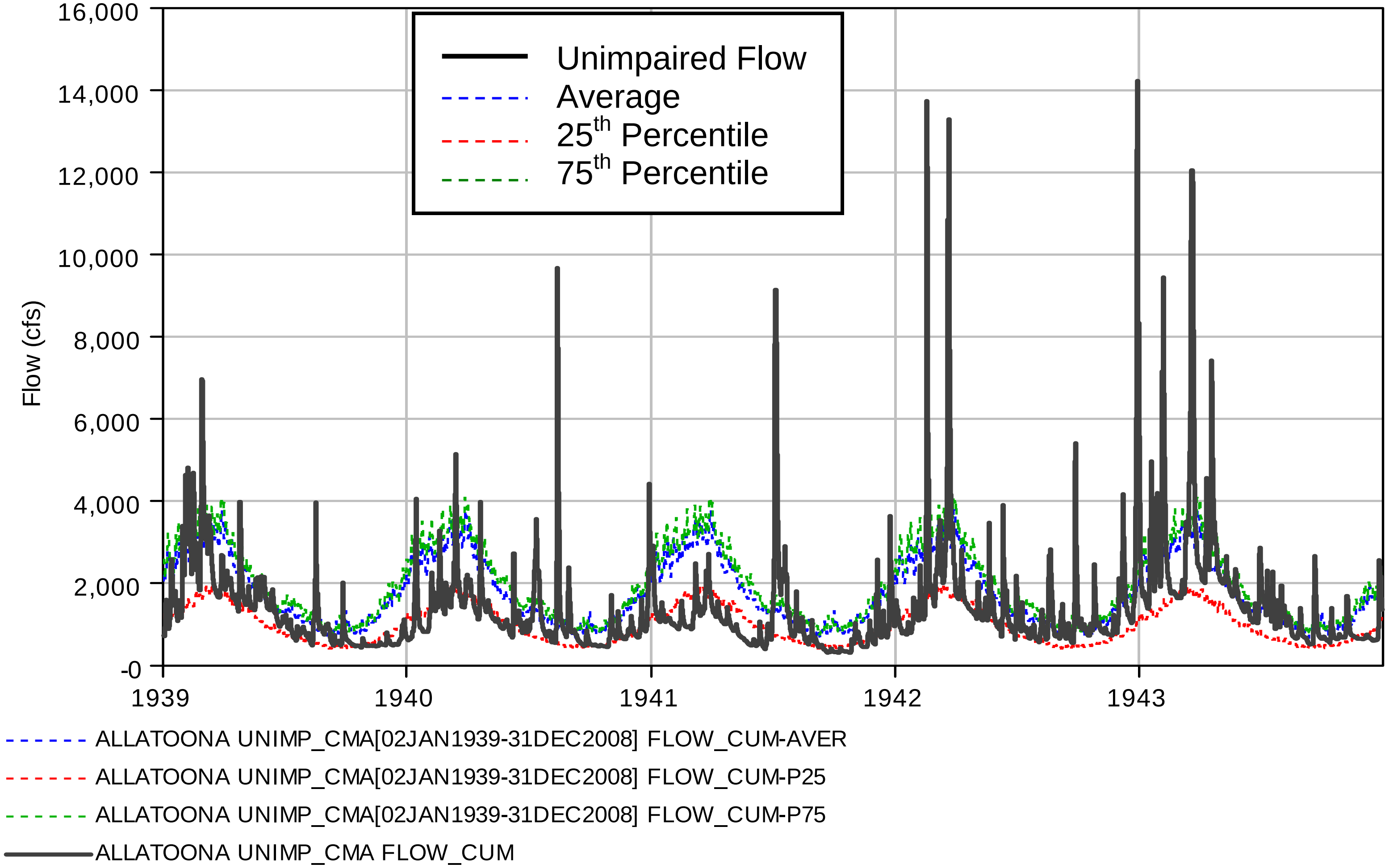


Figure B-12. Allatoona Unimpaired Inflow – 1939 - 1943 Drought; 75th Percentile, Average and 25th Percentile Flow

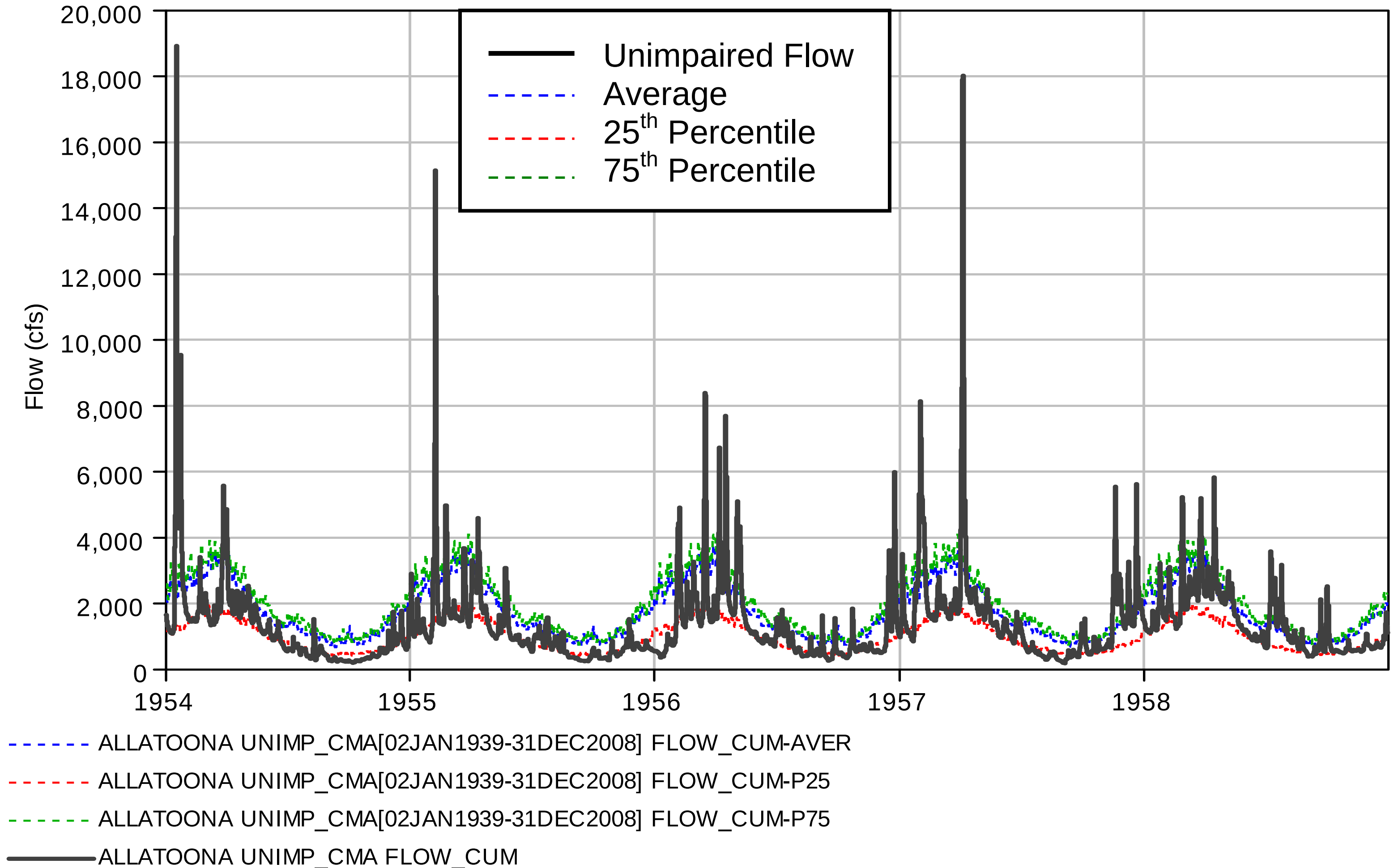
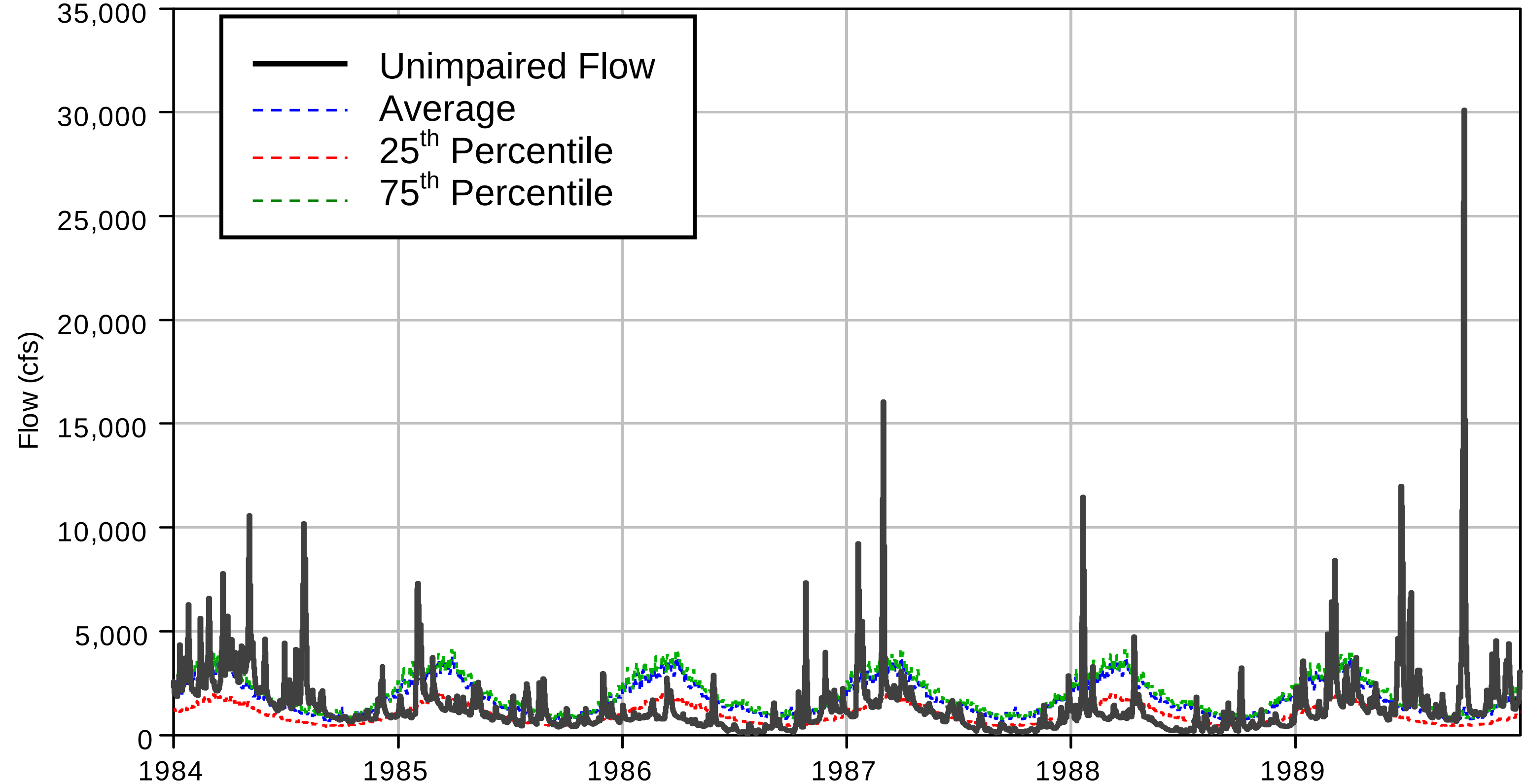


Figure B-13. Allatoona Unimpaired Inflow – 1954 - 1958 Drought; 75th Percentile, Average and 25th Percentile Flow



ALLATOONA UNIMP_CMA[02JAN1939-31DEC2008] FLOW_CUM-AVER

ALLATOONA UNIMP_CMA[02JAN1939-31DEC2008] FLOW_CUM-P25

ALLATOONA UNIMP_CMA[02JAN1939-31DEC2008] FLOW_CUM-P75

ALLATOONA UNIMP_CMA FLOW_CUM

Figure B-14. Allatoona Unimpaired Inflow – 1984 - 1989 Drought; 75th Percentile, Average and 25th Percentile Flow

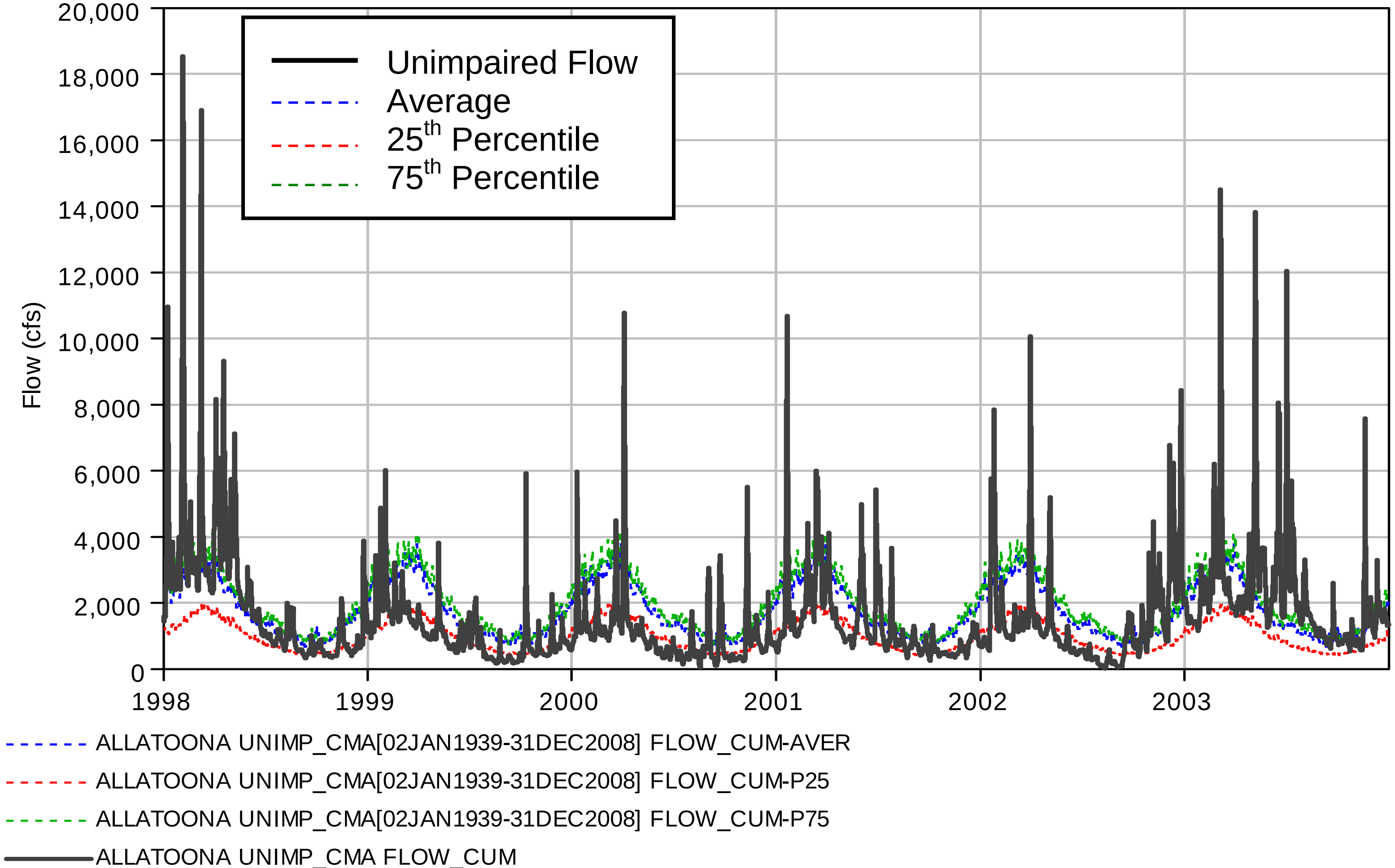


Figure B-15. Allatoona Unimpaired Inflow – 1998 - 2003 Drought; 75th Percentile, Average and 25th Percentile Flow

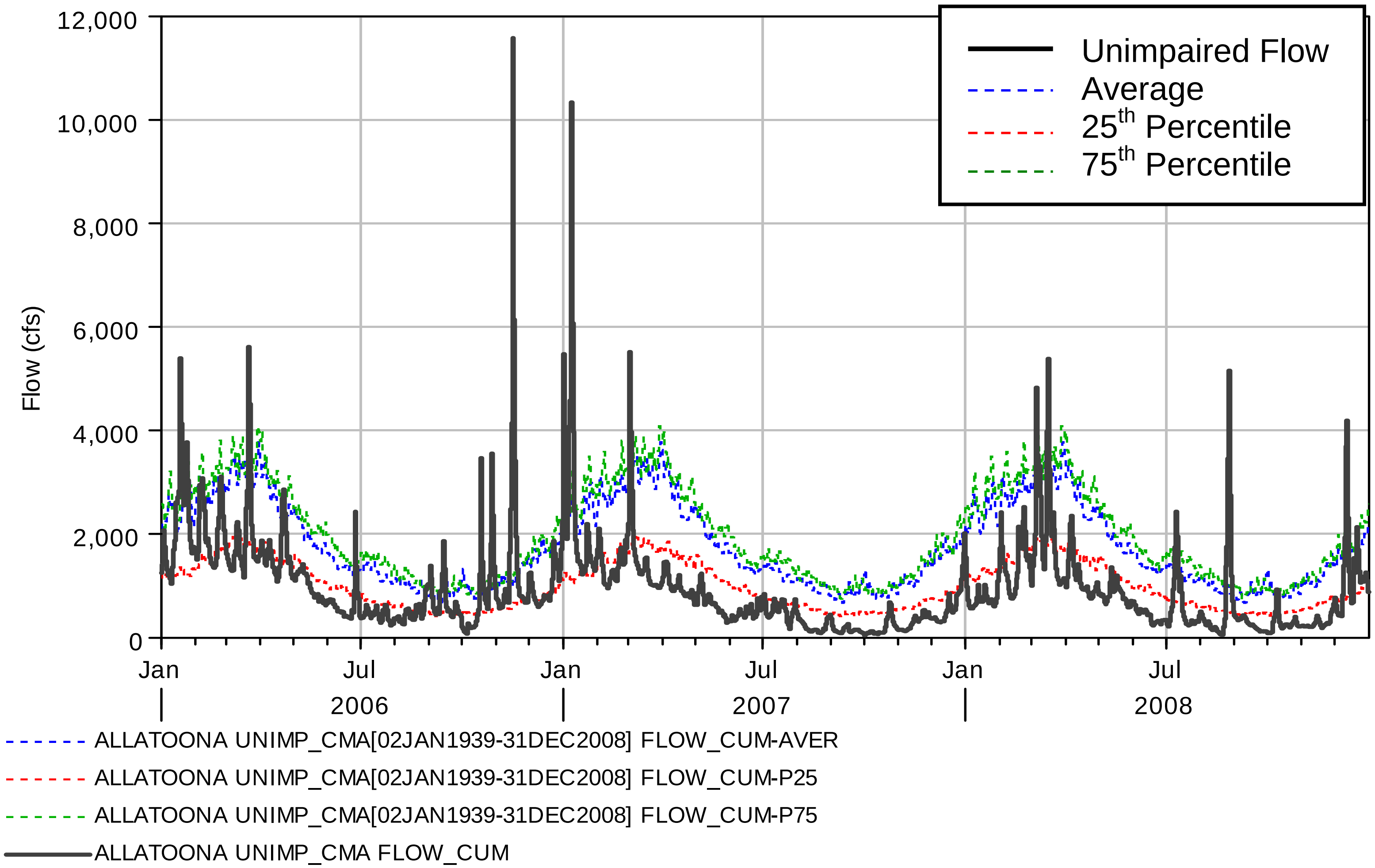


Figure B-16. Allatoona Unimpaired Inflow – 2006-2008 Drought; 75th Percentile, Average and 25th Percentile flow

1.4 CARTERS DAM (CARTERS LAKE)

The Carters project consists of the Carters Main Dam and the Reregulation Dam. The project is located on the Coosawattee River approximately 1.5 miles upstream of Carters, Georgia in northwest part of the state. It is about 60 miles north of Atlanta, Georgia, and approximately 50 miles southeast of Chattanooga, Tennessee. The reregulation dam was constructed approximately 1.8 miles downstream from the main dam. Both dams are located in Murray County with a large portion of the main reservoir extending into Gilmer County. The upper reaches of the reregulation pool extends into both Gordon and Gilmer Counties. The project was completed in 1975.

Carters project is designed primarily for flood control and hydroelectric power. Recreation, fish and wildlife conservation, and, water quality control are additional benefits of the project. An aerial photo of the dam is shown in Figure B-17.

Figure B-17. Carters Dam and Reregulation Dam

1.4.1 Drainage Area

The drainage area above Carters project is 373 square miles. The project is located at the northern end of the ACT River Basin. It is roughly square in shape with a maximum length and width of the basin is approximately 25 and 25 miles respectively. The Coosawattee River is formed by the juncture of the Ellijay and Cartecay Rivers at Ellijay, Georgia, about 21 miles upstream from the Carters project. These tributary streams rise in the Blue Ridge Mountains which have peaks up to 4000 feet NGVD. The southern boundary of the basin is shared with the northern boundary of the Allatoona Dam basin, which drains into the Etowah River. The Carters project basin is predominantly undeveloped. The basin drainage area is shown on the following Figure B-18.

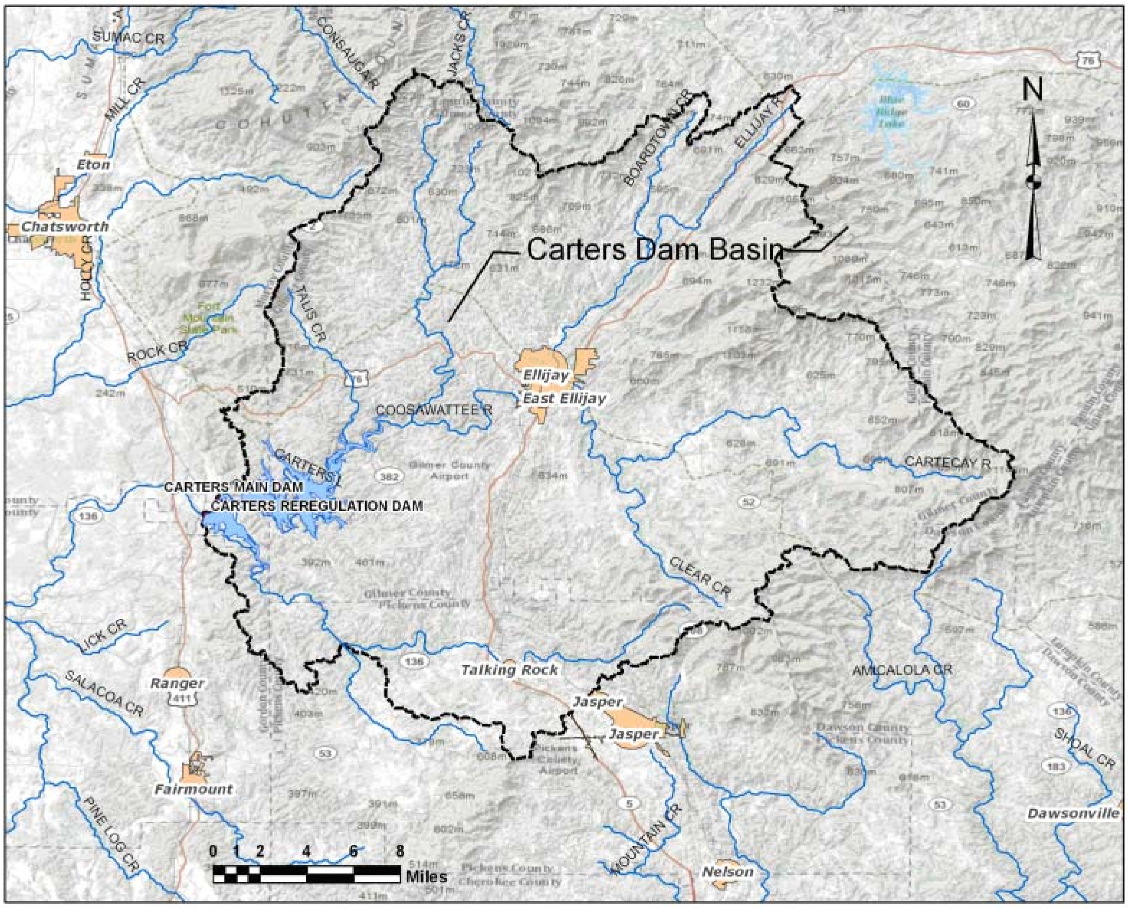


Figure B-18. Carters Basin Map

The Carters Dam basin controls two percent of the total basin area. The relation of the Carters drainage basin to the ACT Basin is shown in the following Figure B-19.

1.4.2 General Features

1.4.2.1 Main Dam

For the purposes of the yield analysis, only the influence of main dam will be analyzed since the reregulation dam has very little storage. The main dam consists of a 445-foot high rolled rock structure with an impervious earth core, powerhouse, an emergency gated spillway, saddle dikes, and low level sluice. The power house has two conventional 125,000 kW hydrogenerator turbine units (1 & 2) and two reversible 125,000 kW pump-turbine units (units 3 & 4), an erection bay, unloading bay and an entrance wing. The pump-back units are used along with the Carters Reregulation Dam, located 1.8 miles downstream of the main dam, to pump back water to the main reservoir during times of low power use. The reregulation dam consists of a gated spillway with earth and rock-fill dikes extending on either side to higher ground. The storage of the reregulation reservoir is not significant for yield computations. The overall length of the main dam is 2,053 feet.

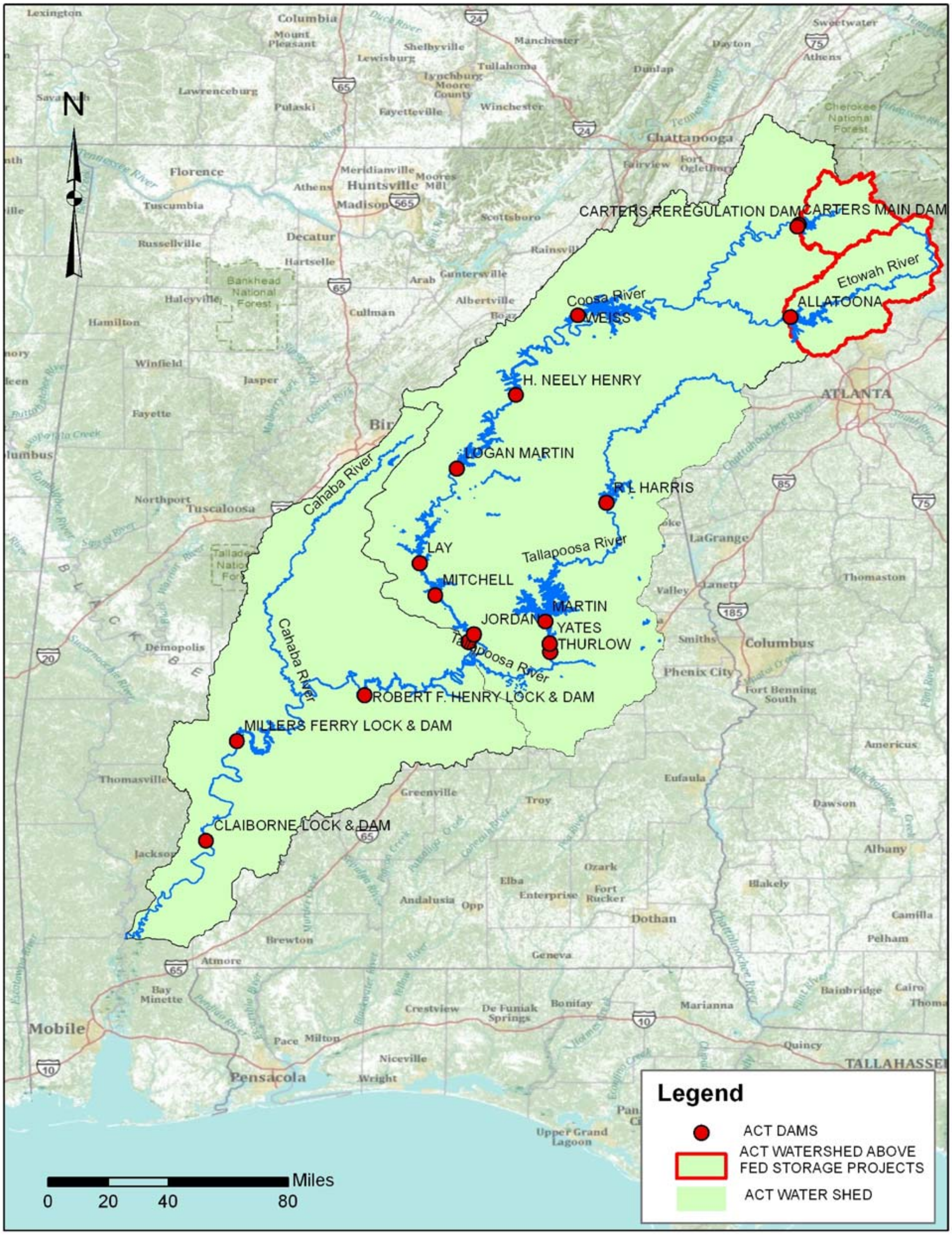


Figure B-19 – Drainage Areas For Projects on the ACT

1.4.2.2 Reservoir

The reservoir at maximum summer operating level (conservation pool) of elevation 1074, covers an area of 3,275 acres and has a total storage of 383,565 acre-feet. At the minimum operating level (conservation pool), elevation 1022, the reservoir covers an area of 2,196 acres and has a total storage of 242,163 acre-feet. Area and capacity curves are shown on Figure B-20 and in Table B-5.

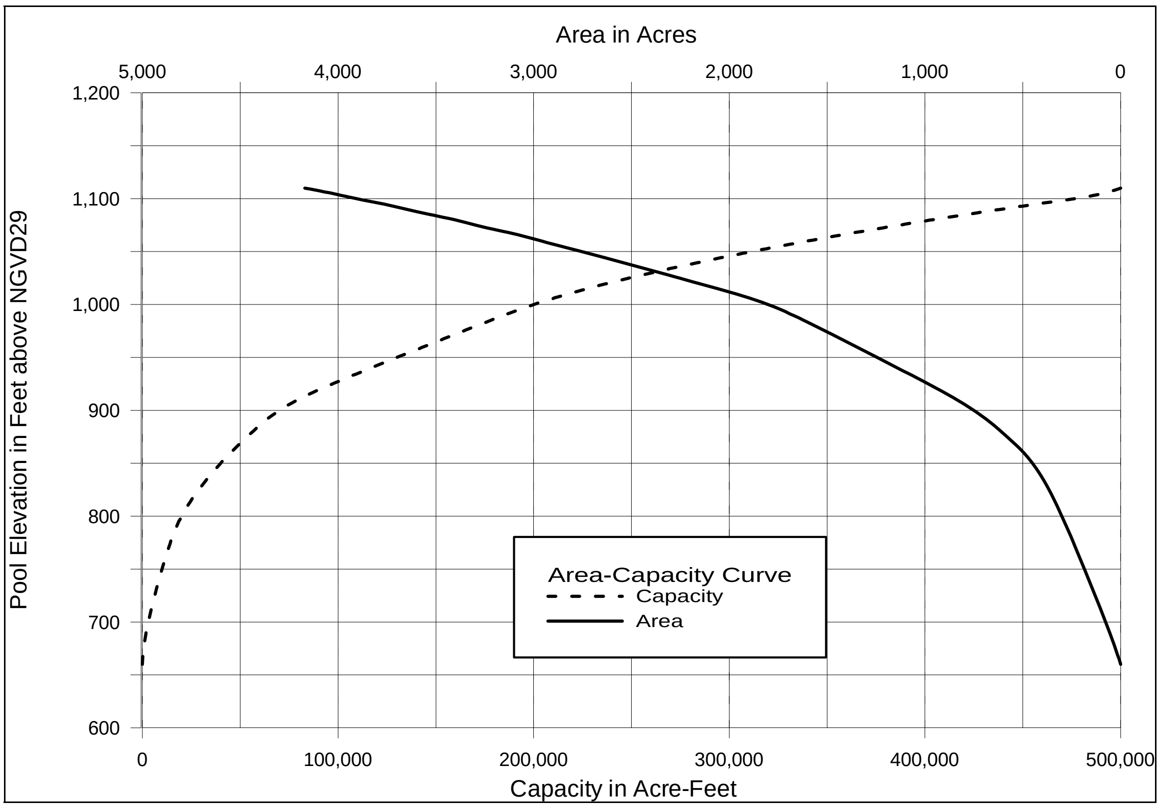


Figure B-20. Carters Area – Capacity Curves

Table B-5. Carters Reservoir Area and Capacity

Pool Elev (NGVD 29)	Total Area (ac)	Total Storage (ac-ft)
665	0	0
700	70	200
725	115	1,500
750	180	7,500
775	230	11,000
800	300	20,000
825	380	29,500
850	480	40,500
883	620	59,000
900	720	71,000
916	870	84,000
932	980	100,000
950	1,180	120,000
961	1,300	132,000
971	1,420	150,000
980	1,530	161,000
990	1,650	180,000
1000	1,800	195,000
1010	1,940	216,000
1020	2,158	237,810
*1022	2,196	242,163
1030	2,353	260,355
1040	2,552	284,880

Pool Elev (NGVD 29)	Total Area (ac)	Total Storage (ac-ft)
1050	2,754	311,403
1060	2,962	339,972
1065	3,060	355,050
**1070	3,179	370,671
***1072	3,230	377,073
****1074	3,275	383,565
1080	3,402	403,588
1085	3,530	420,923
1090	3,651	438,870
1095	3,770	457,442
1099	3,880	472,756
1105	4,030	491,030
1110	4,150	505,000
1120	4,400	550,000
1131	4,730	600,000
1142	5,000	650,000
1150	5,250	700,000
1160	5,530	750,000
1167	5,700	780,000
1169	5,800	800,000
1175	6,000	835,000
1182	6,500	880,000

* Bottom of power pool
** Crest of gated spillway
*** Top of power pool - November through April
**** Top of power pool - May through September

1.4.3 Top of Conservation Pool

The top of conservation pool varies during the year from elevation 1072 to 1074 feet. Whenever surplus water is available the criteria is to hold the pool at elevation 1074 from 1 May to 1 October, then decrease to 1072 feet by 15 October, then hold 1072 feet unti1 15 April, and then increase to 1074 feet by 1 May, as shown in Figure B-21.

1.4.4 Regulation Plan

The Carters pool is generally operated between the winter pool elevation 1072 and summer pool elevation of 1074. The pool may rise above elevation 1074 for short periods of time during high flow periods. The top of the flood control pool is elevation 1099. At this elevation, the area of the pool is 3,880 acres and the storage is 472,756 acre-feet.

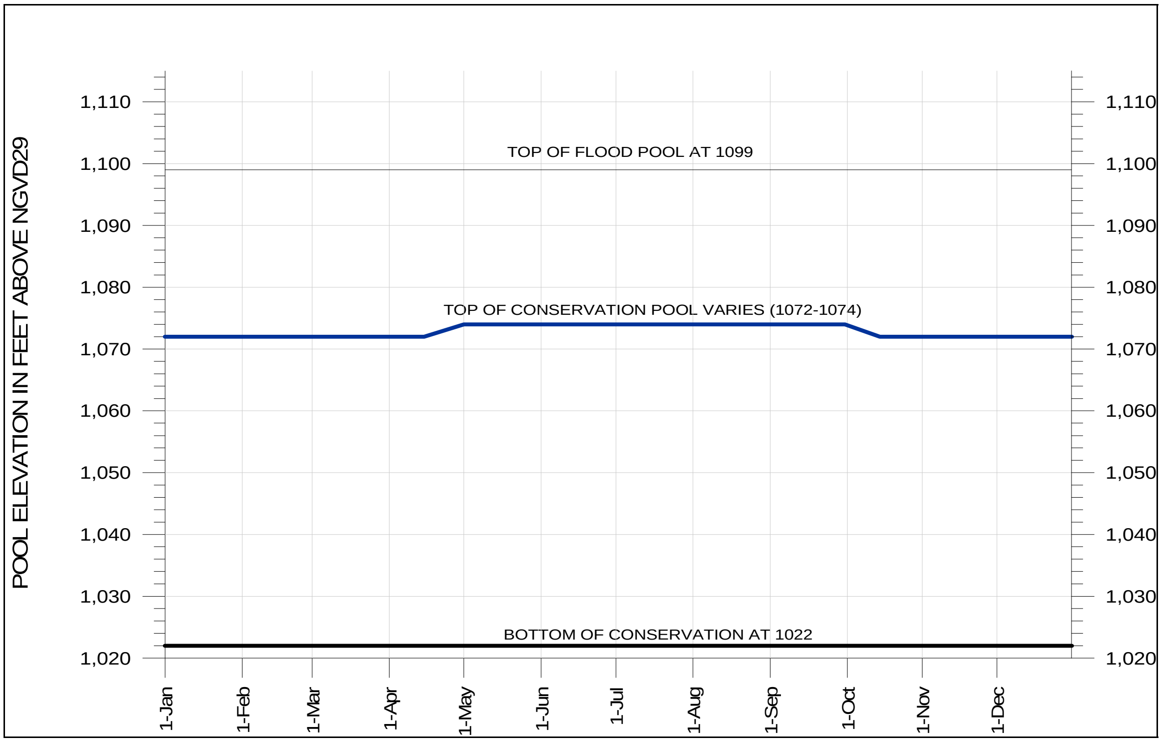


Figure B-21. Top and Bottom of Carters Conservation Pool

The storage for the yield analysis will be based on the storage in the conservation pool from 1022 to 1072-1074 (depending on the time of year).

1.4.5 Surface Water Inflows

Observed daily inflow, outflow (discharge), and pool elevation data for the period of record starting in July 1975, just after the pool filled, through the present (Oct 2009) are available. The data are presented in Figure B-22.

1.4.6 Unimpaired Flow

The existing unimpaired flow data set was updated through 2008 for use in the yield analysis. The daily data was not smoothed because no negative flows were present in the unimpaired flow. A plot of this unimpaired daily flow averaged over each year for the period of record 1939 – 2008 is shown in Figure B-23. Daily flows for critical drought periods are plotted in more detail in Figures B-24 – B-28.

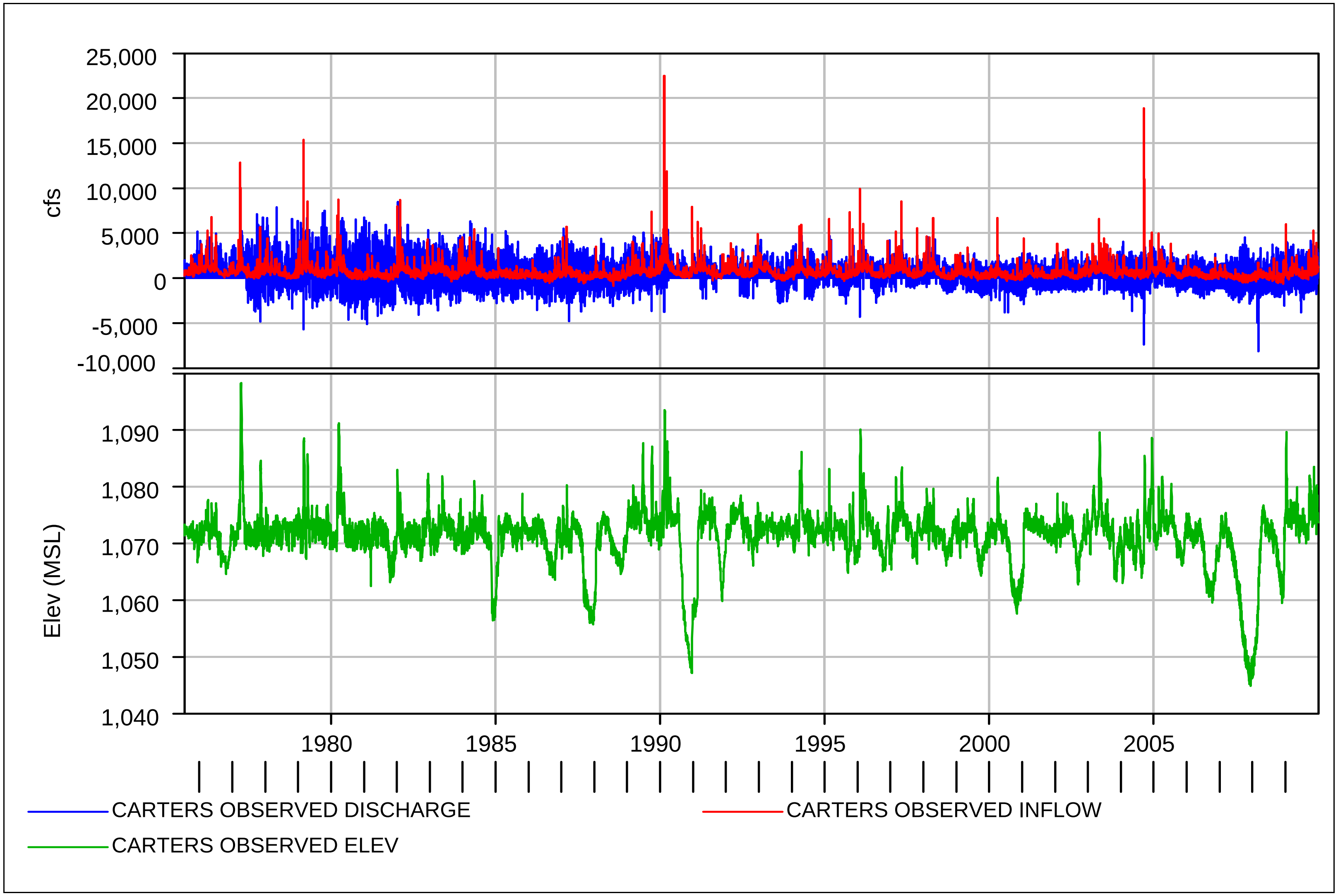


Figure B-22. Carters Inflow-Outflow-Pool Elevation (Jul 1975 – Dec 2009)
Note discharge values are negative because water is pumped back to the main reservoir.

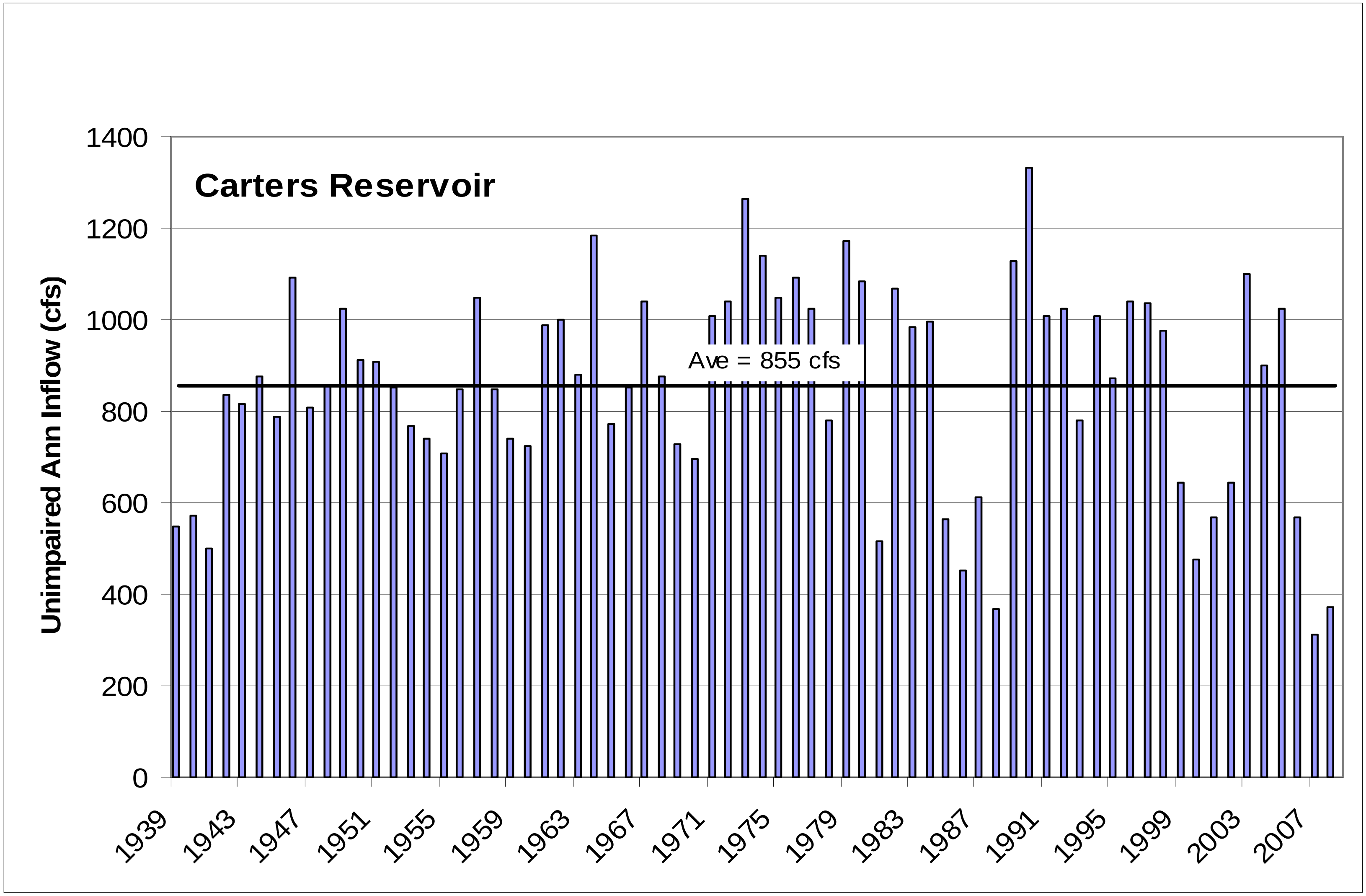


Figure B-23. Carters Unimpaired Annual Inflow Jan 1939 to Dec 2008

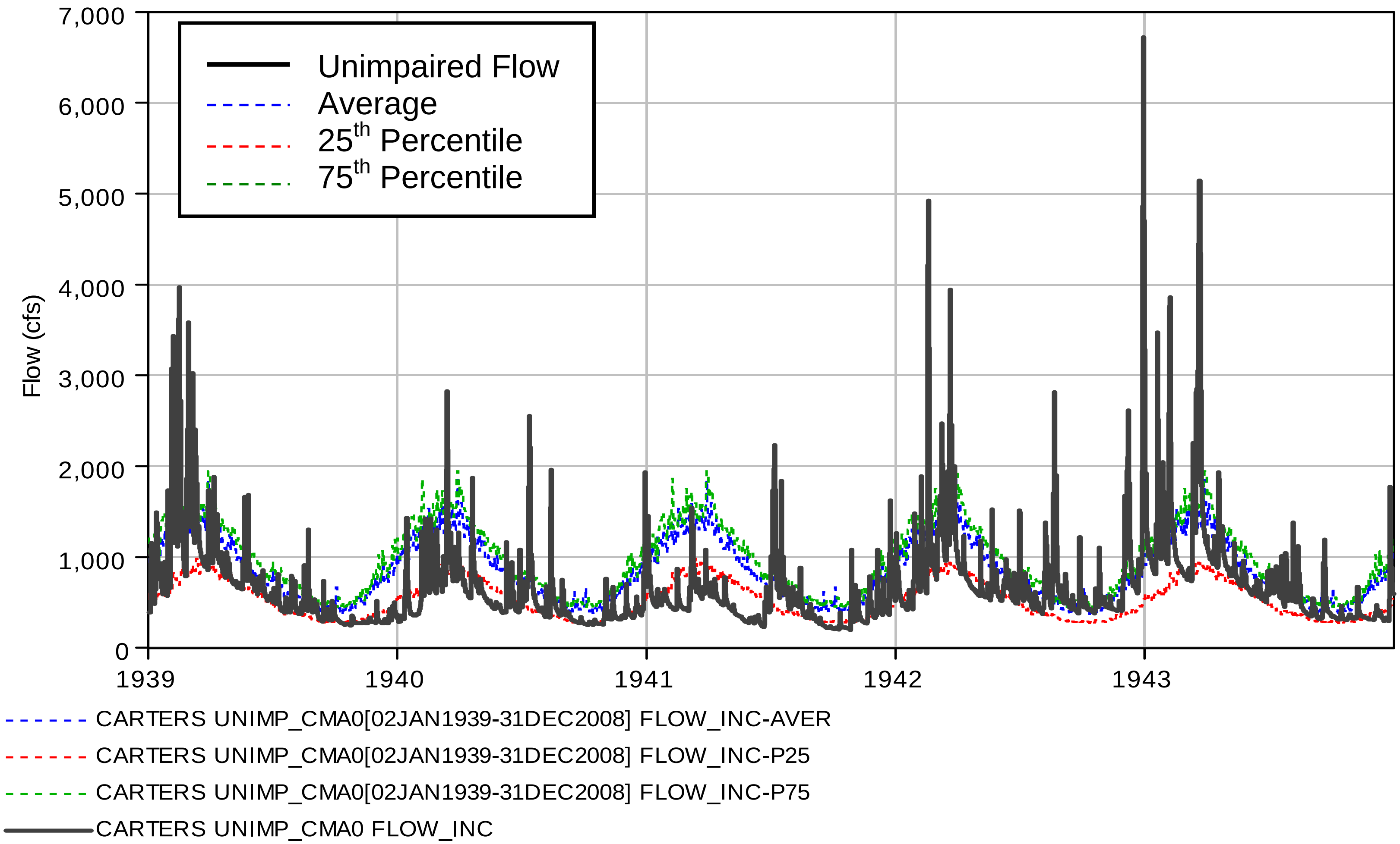


Figure B-24. Carters Unimpaired Inflow – 1940's Drought; 75th Percentile, Average and 25th Percentile Flow

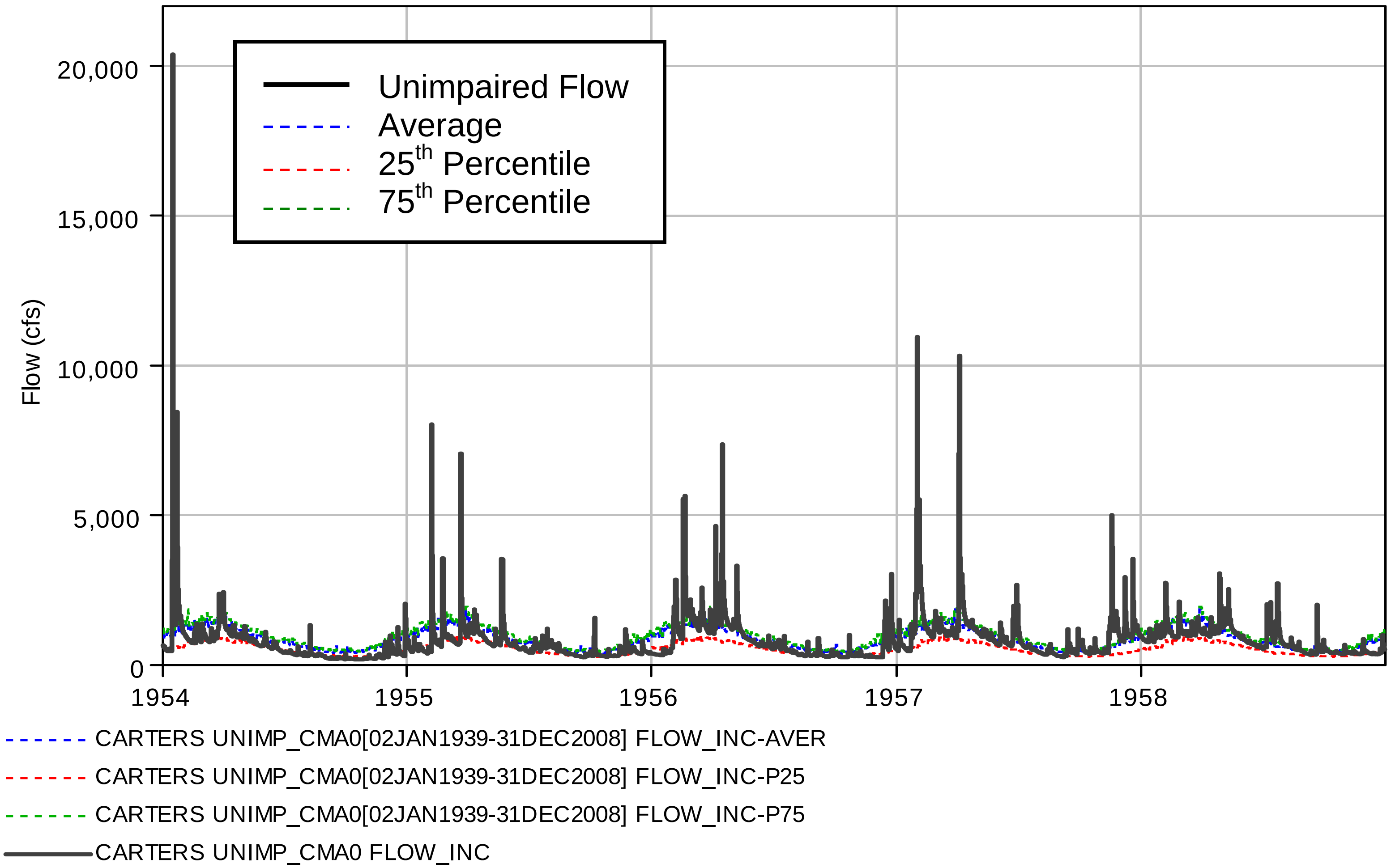


Figure B-25. Carters Unimpaired Inflow – 1950's Drought; 75th Percentile, Average and 25th Percentile Flow

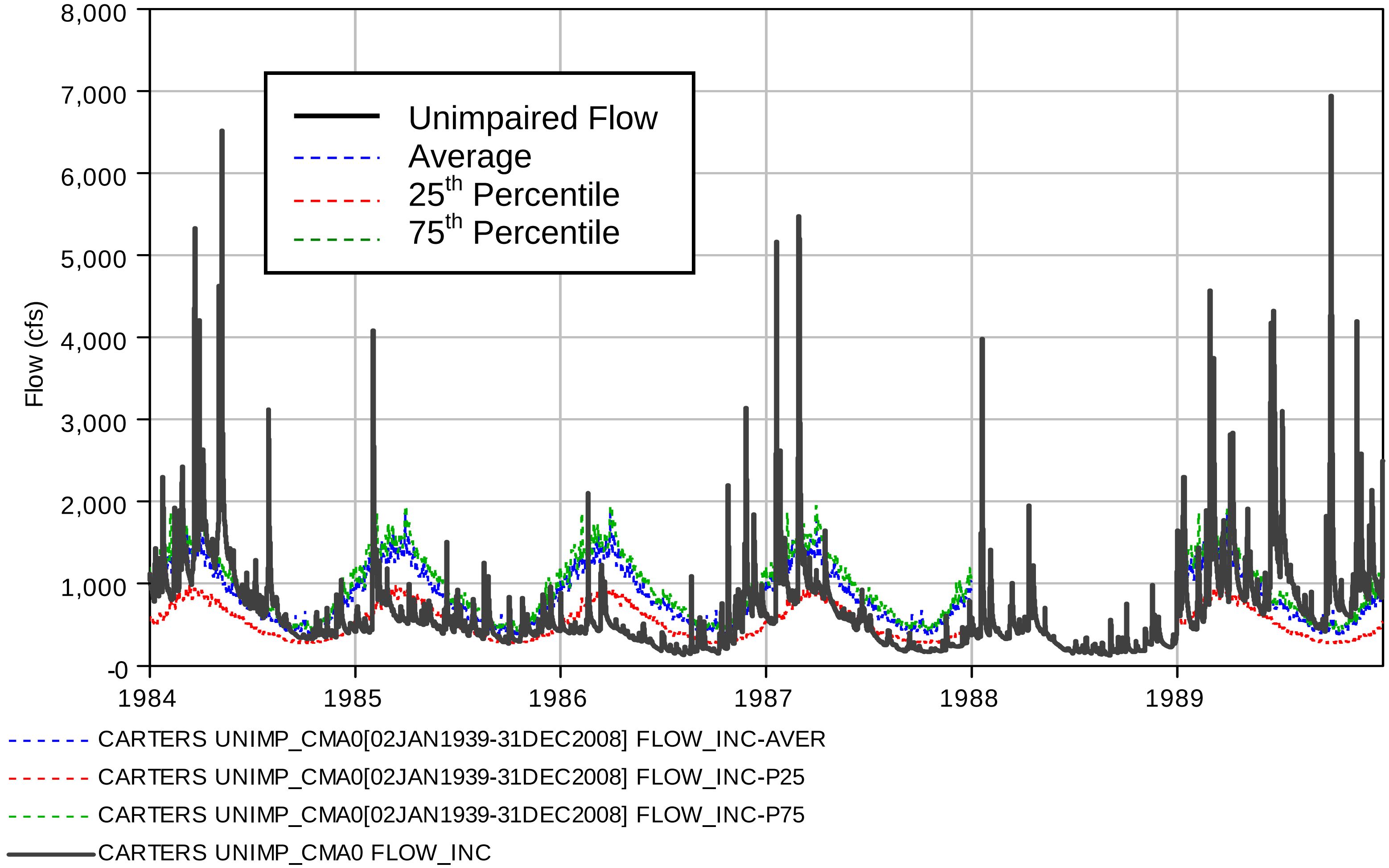
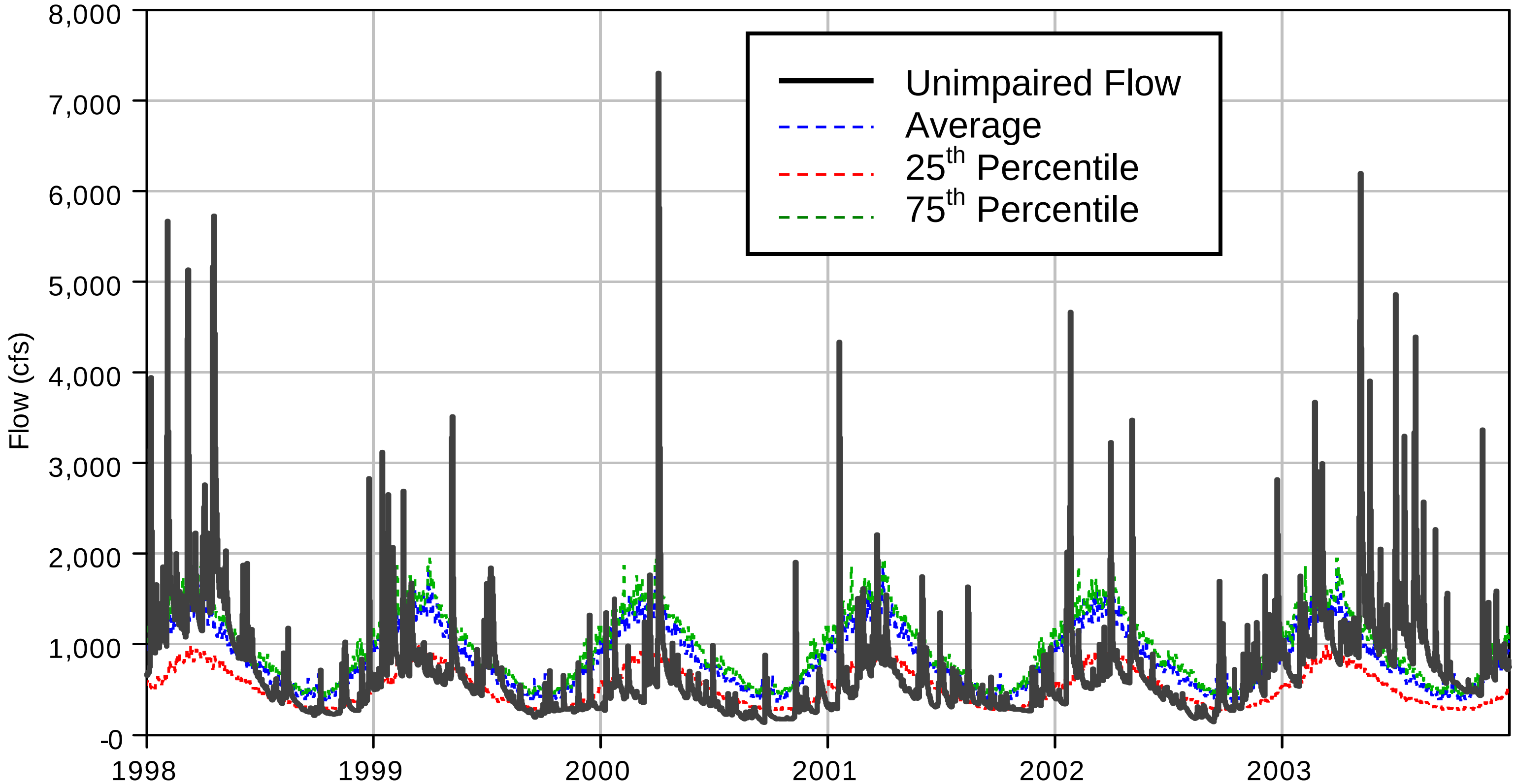


Figure B-26. Carters Unimpaired Inflow – 1980's Drought; 75th Percentile, Average and 25th Percentile Flow



CARTERS UNIMP_CMA0[02JAN1939-31DEC2008] FLOW_INC-AVER

CARTERS UNIMP_CMA0[02JAN1939-31DEC2008] FLOW_INC-P25

CARTERS UNIMP_CMA0[02JAN1939-31DEC2008] FLOW_INC-P75

CARTERS UNIMP_CMA0 FLOW_INC

Figure B-27. Carters Unimpaired Inflow – 2000 Drought; 75th Percentile, Average and 25th Percentile Flow

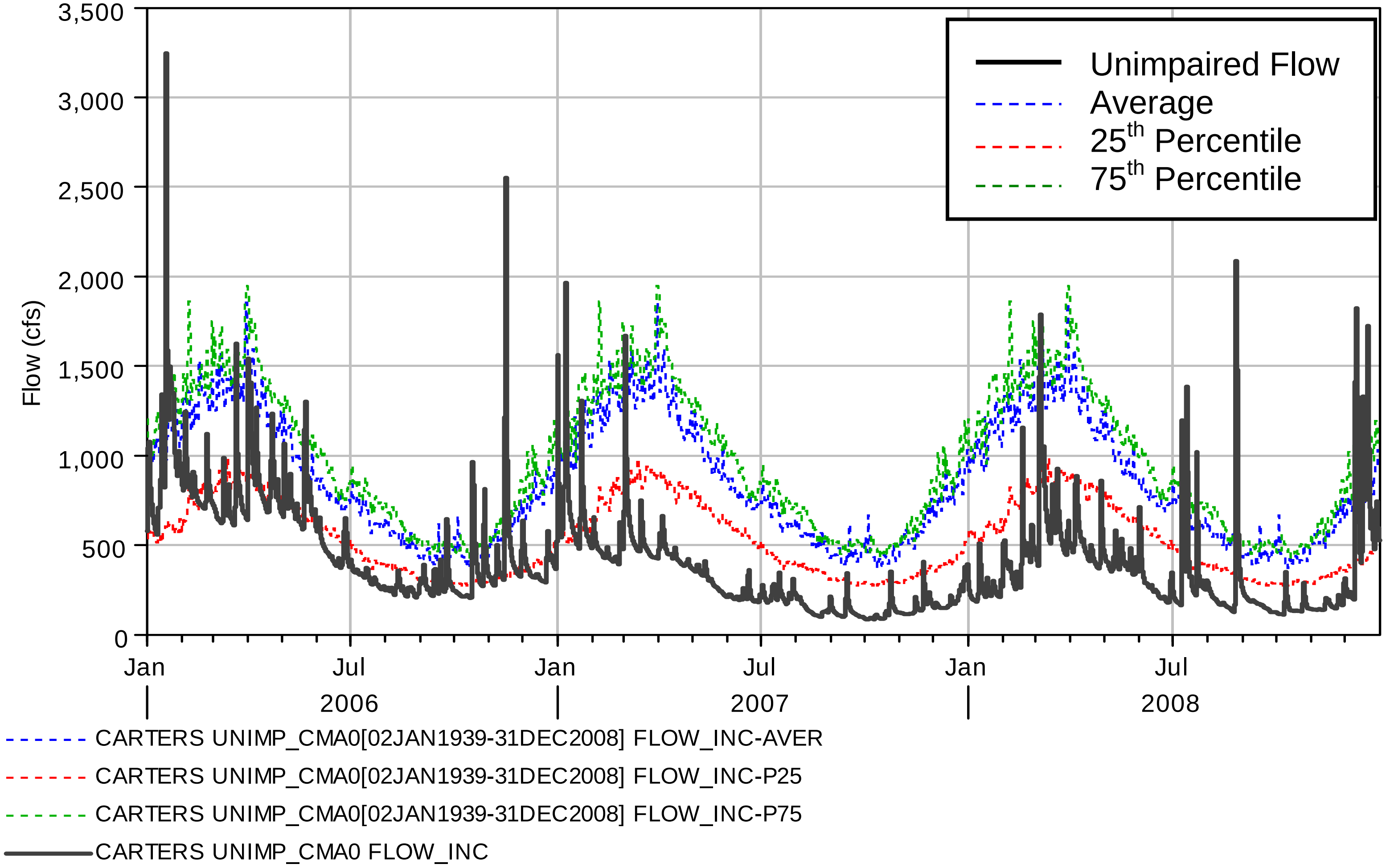


Figure B-28. Carters Unimpaired Inflow – 2007 Drought; 75th Percentile, Average and 25th Percentile Flow

1.5 ResSim MODELING

The ResSim model for the ACT Basin is shown below in Figure B-29.

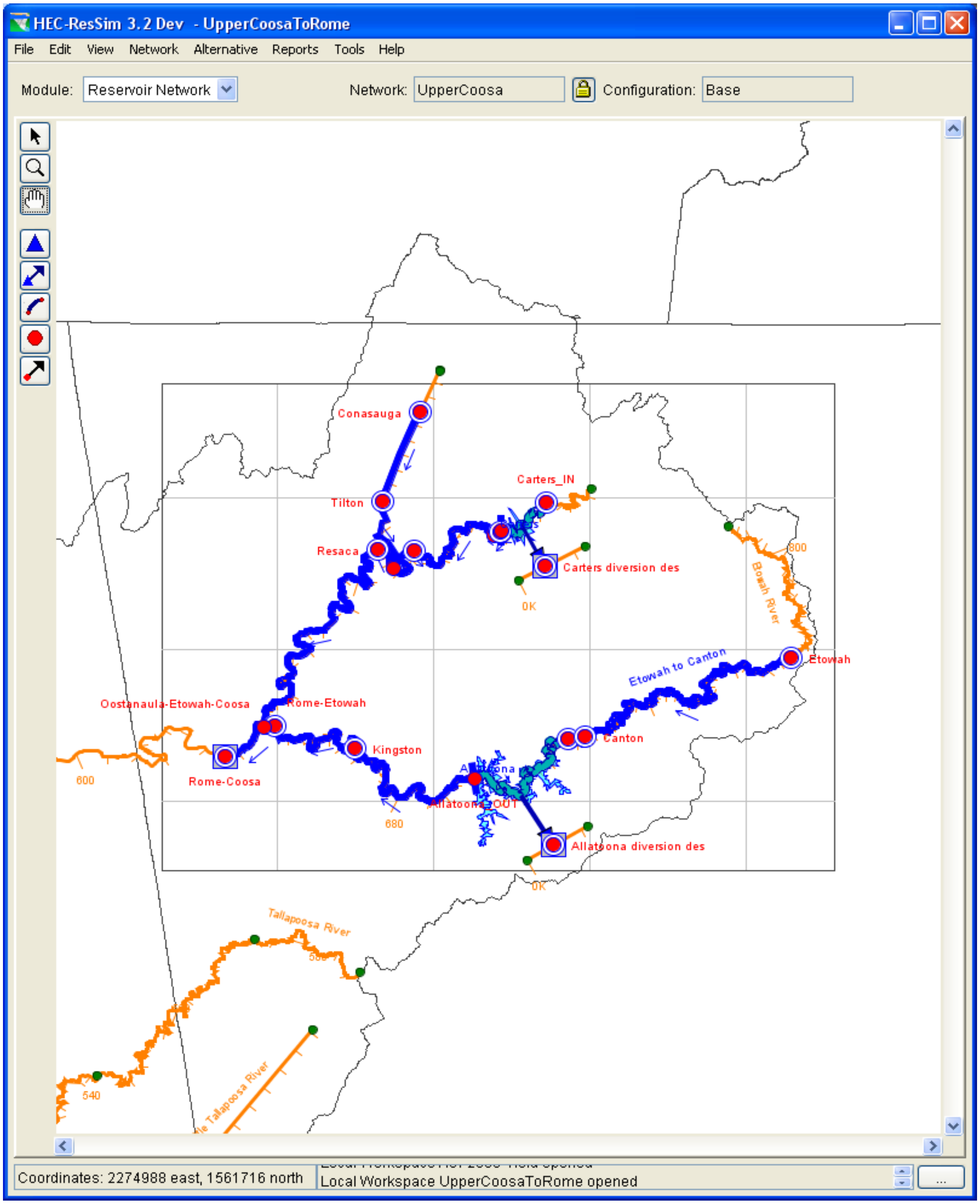


Figure B-29. ACT ResSim Model Schematic

ResSim version 3.2 Dev, November 2009 was utilized using the ResSim Watershed "UpperCoosaToRome" and the network "UpperCoosaYield" The ACT ResSim model includes two reservoirs, 12 non-reservoir locations and two diversion destinations. Since the ACT yield analysis is limited to the two headwater projects (Carters and Allatoona), only the upper portion, Etowah and Coosawattee Basins were included in the ACT model for yield. This includes the confluence of the Etowah and Coosawattee Rivers to the headwaters of Carters and Allatoona. Physical characteristics of each reservoir were incorporated into the model using the latest published reservoir operation manual. Yield computations are dependent on the conservation storage and hydrology. The regulation plan section for each reservoir above describes the conservation storage. The ResSim operation set only includes the diversion yield rules and the downstream flood control rules. Reservoir guidelines for determining releases are defined using the operation set.

Simulations were created for each of the five indentified drought periods. The beginning and end period were selected to capture the drawdown and refill of all projects. Since Allatoona has the greatest amount of storage, it determined the duration of the simulation period. Each yield method (A and B) includes five simulations for a total of 10 simulations. Each simulation determined the yield for a particular reservoir and drought period. Simulation naming, Method A - Year n Div, Method B - Year w Div.

Method A does not include the net river withdrawals and Method B does include the net river withdrawals in the yield determination. Each storage reservoir has a different operating set for the Method A and B alternatives, YieldNoDiv and YieldWDiv respectively.

For Methods A and B the upstream reservoir is the primary reservoir and the yield is met first before proceeding downstream. None of the yield is returned to the system. This assumes that the yield is diverted from the system and is consumptively used. For instance, on the ACT, this means that the critical yield computed at Carters was not counted as flow to meet a downstream flow target. This methodology determines the conservative individual project yield.

A diversion outlet is added to the each of the two reservoirs, Allatoona and Carters. Water from the reservoir is diverted through the outlet to a dummy location not connected to the system. None of the diverted water is returned to the system. The yield represents the maximum continuous flow of water through this outlet during one of the five drought periods, using all available conservation storage.

1.6 RESULTS

Method A (No Diversions) simulation results are presented in Table B-6, below. The graphical results for the pool elevations and critical yield flow values are presented in Figure B-30 and Figure B-31. The flow represents the total release from the reservoir. When the flow hydrograph rises above the constant yield value, flows are released through the reservoir.

Table B-6. ACT Project Yield Analysis without River Diversions, Method A

	Drought Period					
Project	**1940**	**1950**	**1980**	**2000**	**2007**	**Critical Yield (cfs)**
Allatoona	1100	1093	784	1035	729	729
Carters	578	675	458	558	390	390

Method A critical yield for Allatoona is 729 cfs and the critical period is the 2007 drought period.
Method A critical yield for Carters is 390 cfs and the critical period is the 2007 drought period.

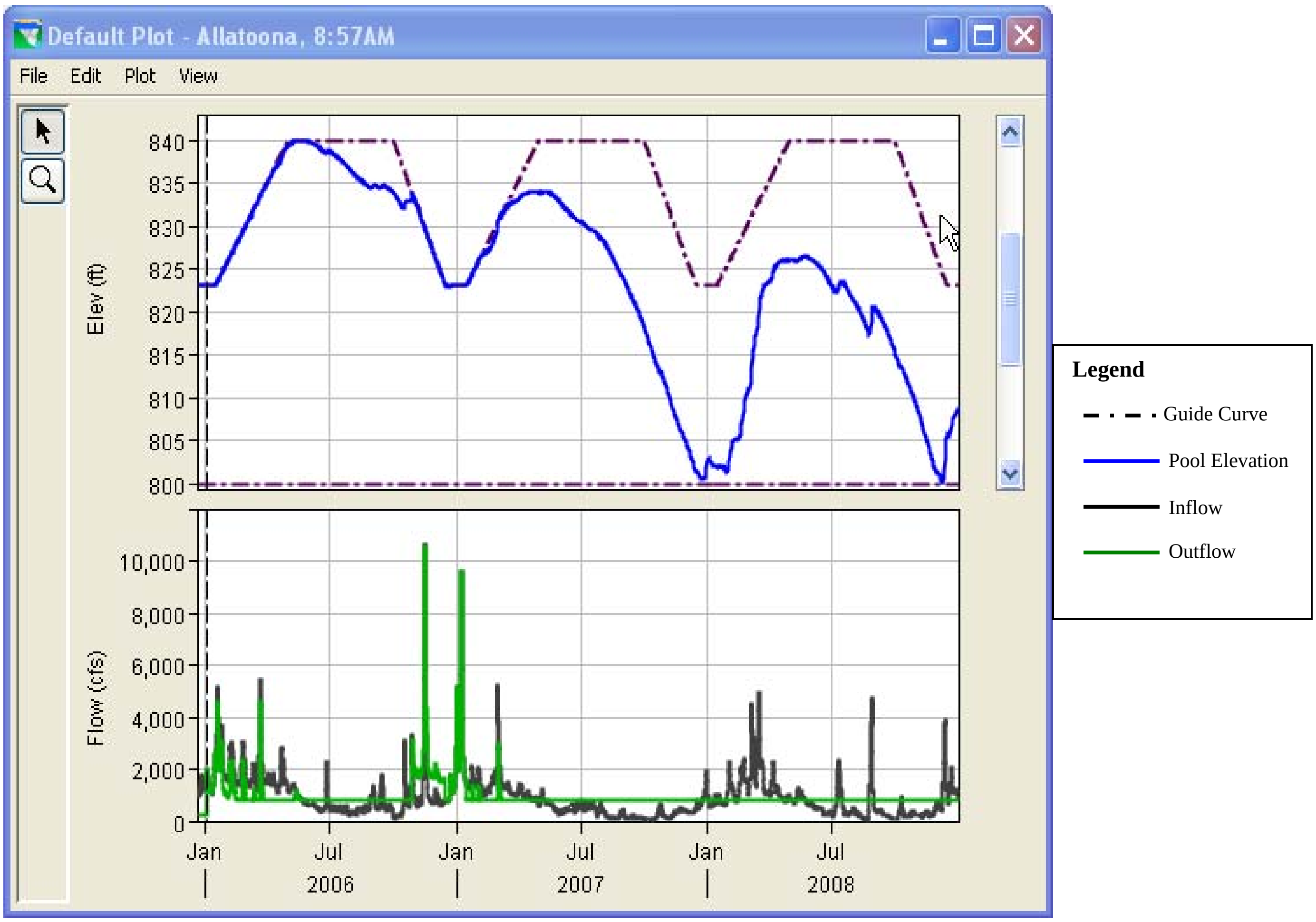


Figure B-30. Allatoona Critical Yield Result, Method A (No Diversions)

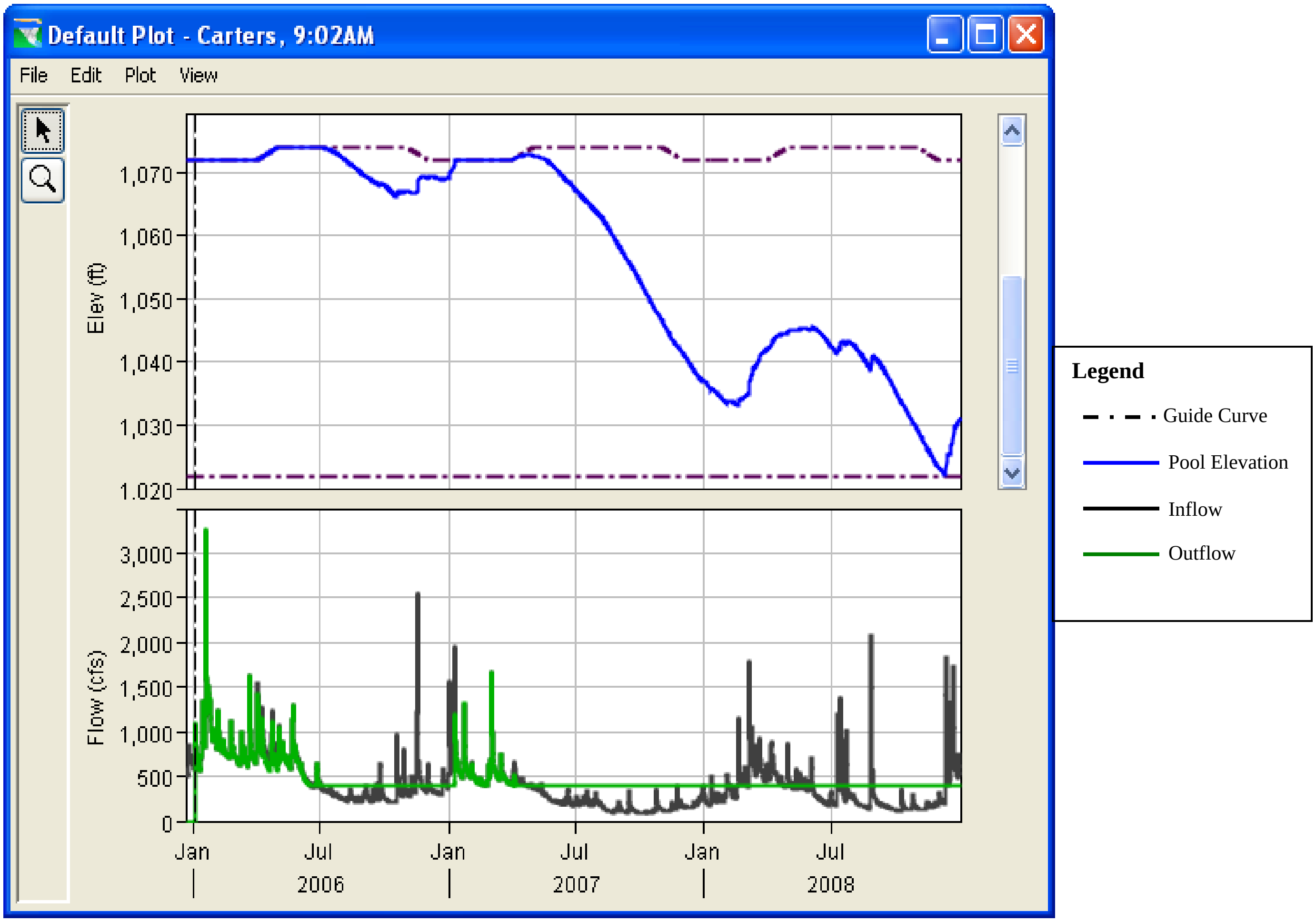


Figure B-31. Carters Critical Yield Result, Method A (No Diversions)

The drawdown period for each drought period is listed in Table B-7.

Table B-7. ACT Yield Drawdown Period

Drought Label	Allatoona	Carters
1940's	Jan 1941 - Mar 1942	Jul 1939 - Aug 1942
1950's	May 1954 - May 1956	Jun 1954 - Apr 1956
1980's	Dec 1985 - Jan 1987	Jul 1986 - Apr 1989
2000	Mar 1999 - Nov 2001	Jul 1999 - Mar 2003
2007	April 2007 – Sep 2009*	Mar 2007 – Sep 2009*

* Estimated based on 2009 hydrology

Method B (With Diversions) simulation results are presented below in Table B-8. The yield values listed capture the impact of net year 2006 river withdrawals above the Carters lakes from the Coosawattee River and tributaries, and above the Allatoona lakes from the Etowah River and tributaries. Graphical results of the pool elevation and yield flow values are presented in Figure B-32 and Figure B-33. As expected the yield values are reduced because the inflow into the reservoirs is reduced by the river withdrawal amounts. The critical yield reduction from Method A (729 cfs) to Method B (693 cfs) for Allatoona is 4.9% and for Carters the reduction from 390 cfs to 387 cfs is 0.8%.

Table B-8. ACT Projects Yield Analysis with River Diversions, Method B

	Drought Period					
Project	**1940**	**1950**	**1980**	**2000**	**2007**	**Critical Yield**
Allatoona	1064	1057	746	999	693	693
Carters	575	671	455	555	387	387

Method B critical yield for Allatoona is 693 cfs and the critical period is the 2007 drought period.
Method B critical yield for Carters is 387 cfs and the critical period is the 2007 drought period.

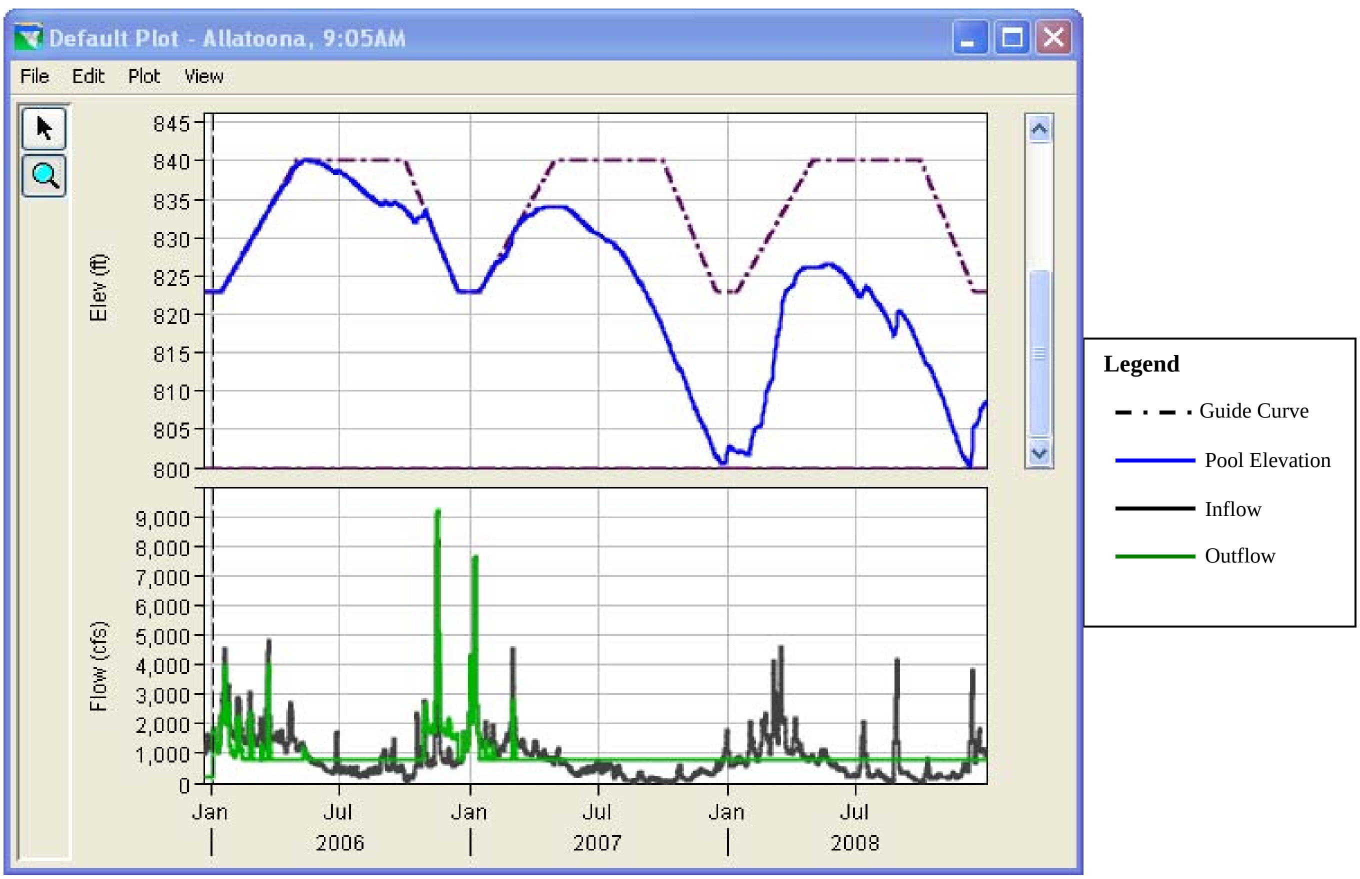


Figure B-32. Allatoona Critical Yield Result Method B (With Diversions)

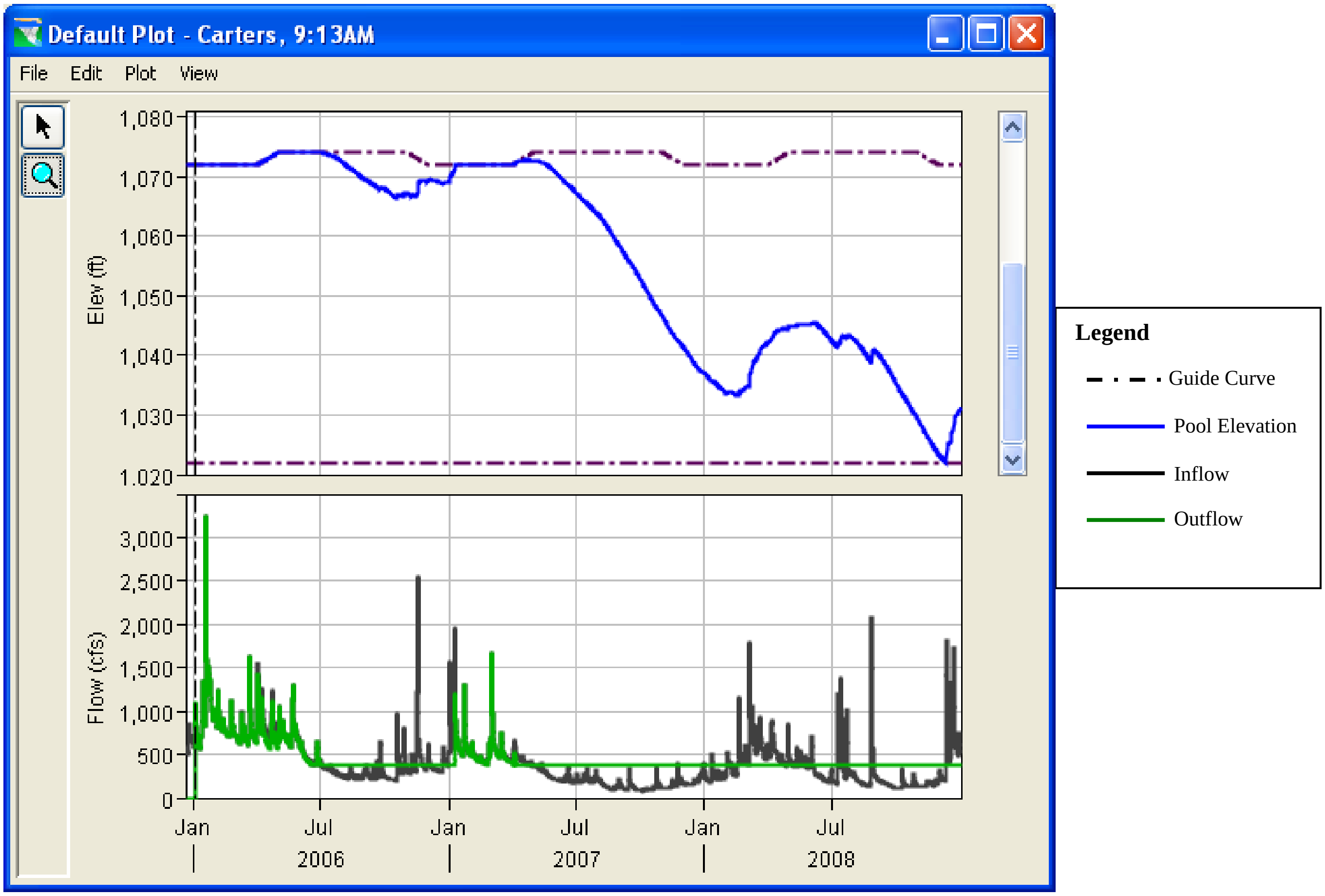


Figure B-33. Carters Critical Yield Result Method B (With Diversions)