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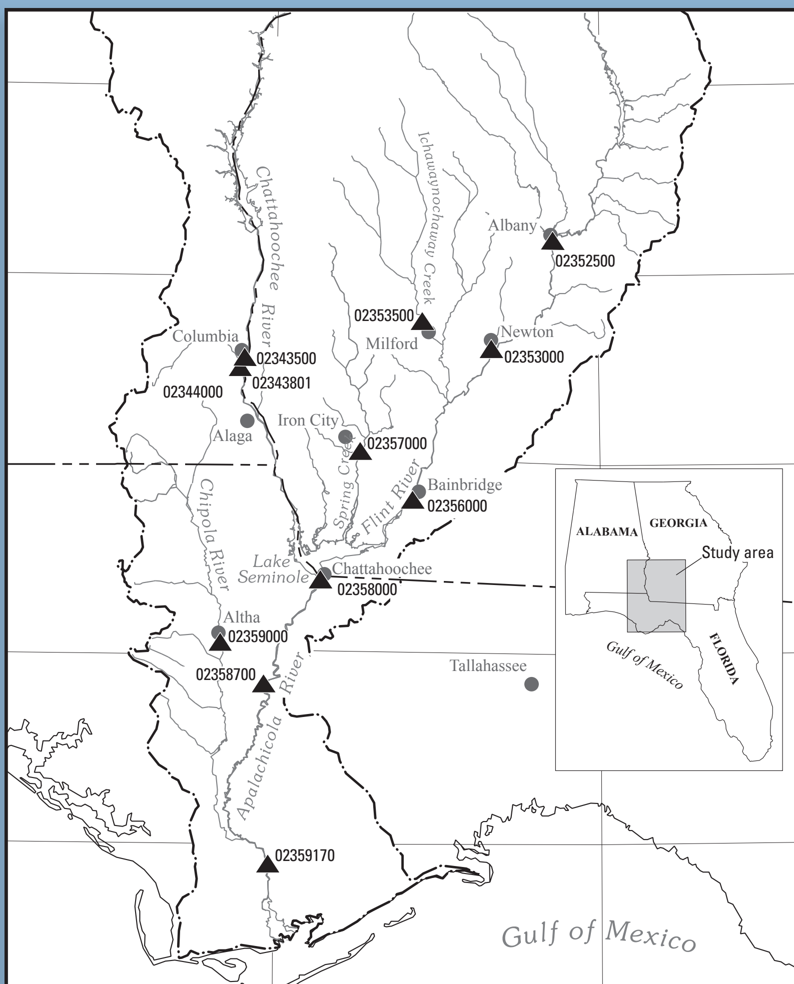
2010 Update–Streamflow Characteristics at Selected Sites in Southwestern Georgia, Southeastern Alabama, and Northwestern Florida, near Lake Seminole



Open-File Report 2011–1278

U.S. Department of the Interior
U.S. Geological Survey

2010 Update—Streamflow Characteristics at Selected Sites in Southwestern Georgia, Southeastern Alabama, and Northwestern Florida, near Lake Seminole

By Timothy C. Stamey

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U.S. Department of the Interior
U.S. Geological Survey

U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

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Contents

Abstract 1
Introduction 1
  Purpose and Scope 3
  Streamflow Station Numbering System 3
Streamflow Data Compilations 3
Streamflow Characteristics 4
  Comparison of Tributary Streamflow Characteristics 4
  Comparison of Inflow to and Outflow from Lake Seminole 4
Selected References....................10

Figures

1. Map showing location of selected streamflow stations in southwestern Georgia, southeastern Alabama, and northwestern Florida, near Lake Seminole 2
2. Graph showing flow-duration curves of inflow data for Lake Seminole near Chattahoochee, Florida, for 1929–53, 1958–70, and 1976–2010 8
3. Graph showing flow-duration curves of outflow data for Lake Seminole near Chattahoochee, Florida, for 1929–53, 1958–70, and 1976–2010 8

Tables

1. Selected streamflow stations in the lower Apalachicola-Chattahoochee-Flint River Basin in parts of Georgia, Alabama, and Florida; and periods of daily mean streamflow data available for analysis 3
2. Mean low-flow characteristics for various consecutive days at selected streamflow stations in the Apalachicola-Chattahoochee-Flint River Basin in parts of Georgia, Alabama, and Florida 5
3. Mean monthly and mean annual streamflow data at selected streamflow stations in parts of Georgia, Alabama, and Florida 6
4. Selected low-flow and flow-duration characteristics for selected streamflow stations for three selected periods in the Apalachicola-Chattahoochee-Flint River Basin in parts of Georgia, Alabama, and Florida 7
5. Mean low-flow characteristics for inflow to and outflow from Lake Seminole for various consecutive days 9
6. Mean monthly and mean annual streamflow for inflow to and outflow from Lake Seminole 9
7. Selected low-flow characteristics and flow-duration values for inflow to and outflow from Lake Seminole 9

Conversion Factors

Multiply	By	To obtain
	Length	
inch	2.54	centimeter (cm)
inch	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi^2)	259.0	hectare (ha)
square mile (mi^2)	2.590	square kilometer (km^2)
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

Acronyms and Abbreviations

ACF	Apalachicola-Chattahoochee-Flint River Basin
ADAPS	Automated Data Processing System
NWIS	National Water Information System
USGS	U.S. Geological Survey

2010 Update—Streamflow Characteristics at Selected Sites in Southwestern Georgia, Southeastern Alabama, and Northwestern Florida, near Lake Seminole

By Timothy C. Stamey

Abstract

Since the first edition of this report was published in 1996, continuous streamflow data have been recorded in the tri-state area of Alabama, Georgia, and Florida, near Lake Seminole. Several notable floods and severe droughts have occurred during this additional 16-year period that have sparked the need to include these additional recorded data into a comprehensive report for use by local, State, and Federal agencies. Flow durations, low-flow, and mean-flow analyses of daily mean discharges were compiled and analyzed for 12 streamflow stations during three selected periods that included pre-Lake Seminole (1929–53), post-Lake Seminole and pre-irrigation (1958–70), and post-Lake Seminole and post-irrigation (1976–2010), as well as for specified partial periods. The analyses yielded information on the variability of inflow to and outflow from Lake Seminole and the variability of flows in area streams.

Streamflow characteristics for Ichawaynochaway Creek at Milford, Georgia, and Chipola River near Altha, Florida, varied similarly from 1944–53 to 1958–70, with mean annual flows decreasing by about 8 and 6 percent, respectively. This decreasing trend continued from 1958–70 to 1976–2010 by about 10 and 2 percent, respectively. The mean annual streamflow for Spring Creek near Iron City, Georgia, however, remained basically unchanged from 1944–53 to 1958–70, as well as from 1958–70 to 1976–2010.

Streamflow characteristics for inflow to and outflow from Lake Seminole varied similarly during 1929–53, 1958–70, and 1976–2010. Mean 30-day low flows for inflow and outflow at Lake Seminole increased by about 24 to 11 percent, respectively, from 1929–53 to 1958–70; the values for 1976–2010 returned to near, but less than, the low-flow values of 1929–53.

Introduction

The Apalachicola-Chattahoochee-Flint (ACF) River Basin drains about 19,600 square miles (mi^2) and covers parts of Georgia, Alabama, and Florida (fig. 1). The basin stretches from the headwaters northeast of Atlanta, Georgia, to Apalachicola Bay in the Gulf of Mexico in northwestern Florida. The Chattahoochee and Flint Rivers converge below Bainbridge, Georgia, at Lake Seminole, formerly called Jim Woodruff Reservoir. Lake Seminole was formed in 1954 at the confluence of the Chattahoochee and Flint Rivers by an earth-and-concrete dam that was constructed by the U.S. Army Corps of Engineers for navigation and power-generation purposes. The Apalachicola River flows out of Lake Seminole near Chattahoochee, Florida, through northwestern Florida, into Apalachicola Bay, and then discharges into the Gulf of Mexico.

Increased and competing demands for water and the severe droughts of 1980–81, 1986, 1988, 1998–2002, and 2006–08 in the ACF River Basin have focused the attention of water managers and users in Georgia, Alabama, and Florida on the water resources of the basin. Of particular interest are the surface-water resources of the Chattahoochee, Flint, and Apalachicola Rivers and their major tributaries in the vicinity of Lake Seminole in southwestern Georgia (fig. 1). In 1993, the U.S. Geological Survey (USGS) entered into a cooperative agreement with the Georgia Department of Natural Resources, Environmental Protection Division, to compile and publish streamflow data for selected stations in the vicinity of Lake Seminole. The task was to compute streamflow characteristics, using the compiled data for selected periods, and compare observed changes in flow characteristics of tributary streams, as well as inflow to and outflow from Lake Seminole. This report is an update of the 1996 report (Stamey, 1996).

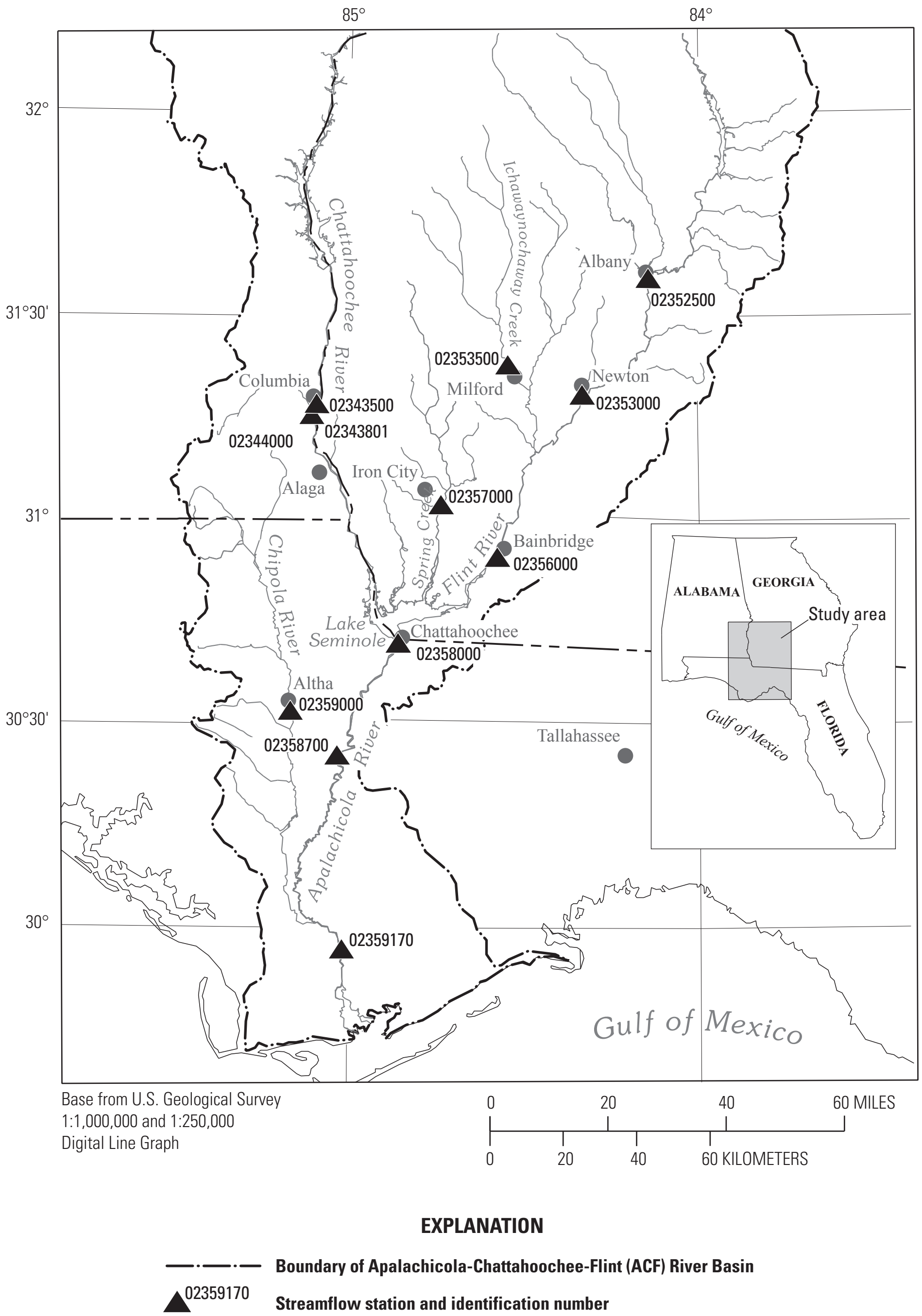

Figure 1. Location of selected streamflow stations in southwestern Georgia, southeastern Alabama, and northwestern Florida, near Lake Seminole.

Purpose and Scope

This report presents the updated results of flow-duration, low-flow, and mean-flow analyses of daily mean discharges for 12 streamflow stations in the lower part of the ACF River Basin; comparison of streamflow characteristics of Ichawaynochaway Creek at Milford, Georgia, to those of Chipola River near Altha, Florida; and a similar comparison of Lake Seminole inflow and outflow characteristics. The purpose of these comparisons is to determine if flow characteristics of streams upstream from Lake Seminole vary over time in a similar or dissimilar manner to those downstream from the lake.

The three periods of greatest interest to water managers are for streamflows prior to the impoundment of Lake Seminole in 1954; after the impoundment of Lake Seminole, but prior to the advent of intensive agricultural irrigation in the early 1970s; and after the widespread initiation of agricultural irrigation about 1976. To the extent possible, streamflow records were analyzed to characterize the pre-Lake Seminole conditions using data for 1929 through 1953 (period 1); post-Lake Seminole, and pre-irrigation conditions using data for 1958 through 1970 (period 2); and post-irrigation conditions using data for 1976 through 2010 (period 3).

Streamflow Station Numbering System

Streamflow stations are identified by a numbering system used by the USGS since October 1, 1950. Stations are listed in a downstream direction along the mainstream. All stations on a tributary entering upstream from a mainstream station are listed before that station. Each streamflow station is assigned a unique 8- to 14-digit number. The station number, such as 02353000, includes the 2-digit number “02,” which refers to the regional basin identifier, plus the 6- to 12-digit downstream order number “353000.”

Streamflow Data Compilations

A total of 12 streamflow stations in the lower ACF River Basin were identified as having daily mean streamflow records of sufficient length to be useful in this study (fig. 1). The names, drainage areas, and periods of streamflow record for the 12 stations are listed in table 1. Daily streamflow data for these 12 stations were retrieved from the USGS National Water Information System (NWIS) database using the Automated Data Processing System (ADAPS; U.S. Geological

Table 1. Selected streamflow stations in the lower Apalachicola-Chattahoochee-Flint River Basin in parts of Georgia, Alabama, and Florida; and periods of daily mean streamflow data available for analysis.

Station number	Station name	Drainage area, square miles	Available data
02343500	Chattahoochee River at Columbia, Alabama	8,040	October 1, 1928, to September 30, 1960
02343801	Chattahoochee River near Columbia, Alabama	8,210	October 1, 1975, to September 30, 2010
02344000	Chattahoochee River at Alaga, Alabama	8,340	May 1, 1938, to December 31, 1944 October 1, 1960, to September 30, 1970
02352500	Flint River at Albany, Georgia	5,310	October 1, 1929, to September 30, 2010
02353000	Flint River at Newton, Georgia	5,740	April 1, 1938, to September 30, 1945 October 1, 1946, to September 30, 1947 January 1, 1949, to September 30, 1950 October 1, 1956, to September 30, 2010
02353500	Ichawaynochaway Creek at Milford, Georgia	620	October 1, 1939, to September 30, 2010
02356000	Flint River at Bainbridge. Georgia	7,570	October 1, 1928, to September 30, 1971 October 1, 2001, to September 30, 2010
02357000	Spring Creek near Iron City, Georgia	527	June 11, 1937, to April 30, 1971 December 20, 1976, to September 30, 1978 June 7, 1982, to September 30, 2010
02358000	Apalachicola River at Chattahoochee. Florida	17,200	October 1, 1928, to September 30, 2010
02358700	Apalachicola River at Blountstown, Florida	17,600	October 1, 1957, to September 30, 2010
02359000	Chipola River near Altha, Florida	781	August 1, 1929, to September 30, 1931 March 1, 1943, to September 30, 2010
02359170	Apalachicola River near Sumatra, Florida	19,200	September 1, 1977, to September 30, 2010

Survey, 2003). All available data were compiled using standard USGS programs and statistical procedures.

Unless otherwise noted, references to a particular year of record in this report (for example, 1953) are for a water year. A water year begins on October 1 and ends on September 30 of the following year. For example, water year 1953 begins on October 1, 1952, and ends on September 30, 1953. Other year-date conventions such as climatic years, which begin on April 1 and end on March 31 of the following year, and calendar years, are noted when used. Throughout this report, the term *daily mean discharge* is referred to as *streamflow* or *discharge* without the modifying term of *daily mean*.

Streamflow Characteristics

Computations of streamflow characteristics include determinations of mean values for consecutive low-flow days, monthly and annual data, as well as selected flow-duration and low-flow frequency values. These streamflow statistics were computed using USGS standard applications (U.S. Geological Survey, 2003).

Mean low-flow characteristic data were computed, as available flow data permitted, for the three periods at 12 streamflow stations. Low-flow data computed from daily mean streamflows include mean discharges for consecutive 1-, 3-, 7-, 14-, 30-, 60-, 90-, 120-, and 183-day periods; (table 2); mean monthly and mean annual streamflow values (table 3); and estimates of low flows corresponding to four selected recurrence intervals as well as with flow-duration information for selected percent time flow is equaled or exceeded values (table 4).

The daily, monthly, and annual streamflow values shown in tables 2 and 3 are easily understood. The low-flow frequency and flow-duration statistics shown in table 4, however, are less intuitive. The low-flow frequency values shown in table 4 are the minimum consecutive n-day daily mean streamflow that occurs on average over the specified time period. For instance, a 7Q10 value is the lowest 7 consecutive-day flow that occurs on average once in 10 years. The 10-, 30-, 50-, 70-, and 90-percent exceedance flow-duration values shown in table 4 are the daily mean flows that are equaled or exceeded for the specified percent of time during the period analyzed. For example, a 10-percent flow-duration value for a station is the flow that is equaled or exceeded 10 percent of the time during the period of analysis. Low-flow and flow-duration computation methods are explained in greater detail in Riggs (1972) and Stedinger and Thomas (1985).

Comparison of Tributary Streamflow Characteristics

Streamflow characteristics for Ichawaynochaway Creek at Milford, Georgia (02353500), and Chipola River near Altha, Florida (02359000; tables 2, 3, and 4), vary similarly between period 1 and period 2. Data comparisons from table 2 indicate that a general decrease in low-flow characteristics occurred from period 1 to period 2 for streamflow stations 02353500 and 02359000. The decrease in streamflow for the consecutive low-flow periods for station 02353500 averaged about 12 percent, whereas station 02359000 averaged about 2 percent. However, Spring Creek near Iron City, Georgia (02357000), showed a small average increase in streamflow for consecutive low-flow periods of about 1 percent. Station 02353500 also showed a continued decrease in low-flow characteristics from period 1 to period 3 of about 41 percent, whereas station 02359000 showed a much smaller decrease of about 10 percent from period 1 to period 3.

Data comparisons from table 3 indicate that mean monthly streamflows during summer months (July–September) declined from period 1 to period 2 for all three tributary stations (02353500, 02357000, and 02359000). Summer streamflows continued to decline from period 2 to period 3 at station 02353500, whereas stations 02357000 and 02359000 showed only minimal declines for August.

Data comparisons from table 4 indicate that from period 1 to period 2, 7Q10 values for Ichawaynochaway Creek at Milford, Georgia (02353500), decreased about 6 percent, and for Chipola River near Altha, Florida (02359000), decreased about 10 percent. The 7Q10 values for Spring Creek near Iron City, Georgia (02357000), increased about 6 percent from period 1 to period 2. The 7Q10 for Ichawaynochaway Creek at Milford, Georgia (02353500), declined about 74 percent from period 2 to period 3, whereas the 7Q10 at Chipola River near Altha, Florida (02359000), decreased by about 7 percent from period 2 to period 3.

Comparison of Inflow to and Outflow from Lake Seminole

Data comparisons of inflow to and outflow from Lake Seminole for periods 1, 2, and 3 are difficult because of the inconsistency of streamflow record lengths. The outflow from Lake Seminole (Apalachicola River at Chattahoochee, Florida, 02358000), is the only station analyzed in this study that has a complete record for all three periods. Records for the three inflow stations—Flint River at Bainbridge, Georgia (02356000), Spring Creek near Iron City, Georgia (02357000), and Chattahoochee River at Alaga, Alabama (02344000)—are incomplete or missing for one or more years of data for the three periods of interest. Because all of the inflows are not accounted for, direct comparisons of actual values (inflows to and outflows from Lake Seminole) could not be calculated. Therefore, only the relative trends in each table should be examined.

To calculate comparisons of inflows to and outflows from Lake Seminole, inflow records consisting of the sum of recorded or estimated streamflow at Flint River at Bainbridge, Georgia (02356000), and Chattahoochee River at Alaga, Alabama (02344000), for periods 1, 2, and 3 were synthesized

Table 2. Mean low-flow characteristics for various consecutive days at selected streamflow stations in the Apalachicola-Chattahoochee-Flint River Basin in parts of Georgia, Alabama, and Florida.

[Values in cubic feet per second; —, insufficient or no data]

Period (climatic year)	Years analyzed	Consecutive low-flow periods								
		1-day	3-day	7-day	14-day	30-day	60-day	90-day	120-day	183-day
02343500 Chattahoochee River at Columbia, Alabama										
1	1929–53	2,780	2,940	3,170	3,310	3,620	4,170	4,670	5,000	6,070
2	1958–70	—	—	—	—	—	—	—	—	—
3	1976–2010	—	—	—	—	—	—	—	—	—
02343801 Chattahoochee River near Columbia, Alabama										
1	1929–53	—	—	—	—	—	—	—	—	—
2	1958–70	—	—	—	—	—	—	—	—	—
3	1976–2010	911	1,780	2,810	3,270	3,830	4,420	4,860	5,280	6,080
02344000 Chattahoochee River at Alaga, Alabama										
1	1929–53	—	—	—	—	—	—	—	—	—
2[a]	1961–70	2,260	3,070	4,020	4,530	5,020	5,840	6,360	6,700	7,700
3	1976–2010	—	—	—	—	—	—	—	—	—
02352500 Flint River at Albany, Georgia										
1[a]	1930–53	820	1,350	1,640	1,820	2,010	2,370	2,620	2,880	3,220
2	1958–70	1,030	1,220	1,570	1,780	1,980	2,280	2,730	2,870	3,380
3	1976–2010	949	1,050	1,180	1,310	1,500	1,700	1,910	2,160	2,660
02353000 Flint River at Newton, Georgia										
1	1929–53	—	—	—	—	—	—	—	—	—
2	1958–70	1,720	1,860	2,170	2,340	2,540	2,820	3,280	3,440	3,950
3	1976–2010	1,450	1,530	1,630	1,770	1,960	2,190	2,410	2,680	3,190
02353500 Ichawaynochaway Creek at Milford, Georgia										
1[a]	1944–53	270	276	286	313	341	377	431	484	538
2	1958–70	238	242	255	270	295	341	391	404	467
3	1976–2010	127	132	145	166	205	245	279	316	388
02356000 Flint River at Bainbridge, Georgia										
1	1929–53	3,170	3,330	3,500	3,620	3,820	4,240	4,530	4,850	5,360
2	1958–70	2,620	2,920	3,290	3,560	3,830	4,140	4,640	4,820	5,410
3	2002–2010	2,220	2,290	2,370	2,560	2,680	2,940	3,170	3,370	4,210
02357000 Spring Creek near Iron City, Georgia										
1[a]	1944–53	67.7	68.8	70.4	73.9	80.1	94.8	123	151	221
2	1958–70	68.5	69.9	72.8	75.9	85.1	104	124	141	191
3	1977–2010	36.6	37.6	39.8	44.5	56.6	77.3	96.2	110	175
02358000 Apalachicola River at Chattahoochee, Florida										
1	1929–53	8,150	8,330	8,620	8,880	9,350	10,230	11,050	11,960	13,420
2	1958–70	8,940	9,170	9,600	9,830	10,420	11,190	12,190	12,660	14,180
3	1976–2010	7,140	7,320	7,550	7,910	8,670	9,330	9,960	10,750	12,240
02358700 Apalachicola River at Blountstown, Florida										
1	1929–53	—	—	—	—	—	—	—	—	—
2	1958–70	9,250	9,450	9,830	10,100	10,620	11,440	12,530	12,960	14,500
3	1976–2010	7,840	7,930	8,140	8,400	9,030	9,620	10,160	10,680	12,160
02359000 Chipola River near Altha, Florida										
1[a]	1944–53	642	665	680	697	732	804	886	953	1,090
2	1958–70	636	658	673	693	731	800	875	929	1,030
3	1976–2010	581	589	603	624	660	729	772	815	949
02359170 Apalachicola River near Sumatra, Florida										
1	1929–53	—	—	—	—	—	—	—	—	—
2	1958–70	—	—	—	—	—	—	—	—	—
3[a]	1978–2010	8,490	8,650	8,920	9,260	10,120	11,010	11,790	13,180	15,140

[a] Only part of this period was analyzed.

Table 3. Mean monthly and mean annual streamflow data at selected streamflow stations in parts of Georgia, Alabama, and Florida.

[Values in cubic feet per second; —, insufficient or no data]

Period (water year)	Years analyzed	Mean monthly streamflow												
		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Mean annual
02343500 Chattahoochee River at Columbia, Alabama														
1	1929–53	5,260	6,670	9,900	14,770	16,310	22,950	17,350	11,220	7,280	8,470	7,370	5,490	11,070
2	1958–70	—	—	—	—	—	—	—	—	—	—	—	—	—
3	1976–2010	—	—	—	—	—	—	—	—	—	—	—	—	—
02343801 Chattahoochee River near Columbia, Alabama														
1	1929–53	—	—	—	—	—	—	—	—	—	—	—	—	—
2	1958–70	—	—	—	—	—	—	—	—	—	—	—	—	—
3	1976–2010	6,060	8,040	11,390	12,760	15,900	18,670	13,220	9,380	7,250	7,860	6,840	6,200	10,280
02344000 Chattahoochee River at Alaga, Alabama														
1	1929–53	—	—	—	—	—	—	—	—	—	—	—	—	—
2[a]	1961–70	7,480	8,220	12,550	16,480	18,950	21,410	19,720	11,880	8,760	8,100	8,020	7,220	12,360
3	1976–2010	—	—	—	—	—	—	—	—	—	—	—	—	—
02352500 Flint River at Albany, Georgia														
1[a]	1930–53	3,160	3,600	5,950	8,390	9,150	11,470	9,880	5,750	3,910	4,490	4,000	2,940	6,050
2	1958–70	3,280	3,290	5,310	8,660	11,060	12,860	10,920	5,720	4,730	4,300	3,780	2,610	6,350
3	1976–2010	2,720	3,620	5,880	7,570	9,550	10,940	8,080	4,680	3,330	4,200	2,740	2,430	5,460
02353000 Flint River at Newton, Georgia														
1	1929–53	—	—	—	—	—	—	—	—	—	—	—	—	—
2	1958–70	3,770	3,680	5,560	9,110	11,510	13,800	11,970	6,590	5,470	5,000	4,440	3,270	6,990
3	1976–2010	3,170	3,910	6,150	7,870	10,010	11,430	8,920	5,370	4,000	4,770	3,340	2,920	5,970
02353500 Ichawaynochaway Creek at Milford, Georgia														
1[a]	1944–53	447	558	858	1,050	1,160	1,440	1,220	815	570	761	654	515	837
2	1958–70	502	467	705	1,060	1,250	1,420	1,220	623	595	574	486	380	771
3	1976–2010	396	487	811	1,020	1,180	1,280	897	552	435	550	406	369	696
02356000 Flint River at Bainbridge, Georgia														
1	1929–53	5,240	5,320	7,660	10,680	11,870	16,320	14,040	9,240	6,470	6,700	6,370	4,980	8,730
2	1958–70	5,390	5,080	7,340	11,040	13,890	16,990	15,260	8,780	7,350	6,700	6,020	4,530	9,000
3	2002–2010	4,060	4,930	7,850	8,320	10,100	11,100	12,160	7,010	5,770	5,780	4,490	4,580	7,190
02357000 Spring Creek near Iron City, Georgia														
1[a]	1944–53	199	241	425	608	763	1,230	949	552	319	304	351	295	514
2	1958–70	307	201	349	670	965	1,190	1,000	433	333	283	253	159	510
3	1977–2010	192	180	479	746	1,040	1,310	821	311	267	326	251	189	514
02358000 Apalachicola River at Chattahoochee, Florida														
1	1929–53	12,400	13,340	19,190	27,360	30,260	42,230	35,450	23,740	16,440	17,390	16,150	12,630	22,190
2	1958–70	13,940	13,430	19,640	28,480	35,690	42,350	38,460	21,910	18,160	16,560	15,050	12,630	22,950
3	1976–2010	12,120	14,420	21,650	25,850	32,980	38,560	29,610	19,460	14,970	13,560	13,460	11,900	20,910
02358700 Apalachicola River at Blountstown, Florida														
1	1929–53	—	—	—	—	—	—	—	—	—	—	—	—	—
2	1958–70	14,370	13,570	19,540	28,650	32,350	42,580	38,570	22,090	18,600	16,880	15,520	13,240	23,180
3	1976–2010	12,530	14,390	21,400	25,950	33,320	38,440	29,350	19,890	15,700	15,000	13,990	12,260	20,960
02359000 Chipola River near Altha, Florida														
1[a]	1944–53	1,130	1,180	1,490	1,610	1,750	2,370	2,490	1,550	1,160	1,280	1,360	1,240	1,580
2	1958–70	1,180	936	1,170	1,850	2,080	2,420	2,230	1,390	1,140	1,170	1,180	989	1,480
3	1976–2010	979	997	1,340	1,750	2,210	2,470	1,960	1,290	1,230	1,300	1,110	994	1,460
02359170 Apalachicola River near Sumatra, Florida														
1	1929–53	—	—	—	—	—	—	—	—	—	—	—	—	—
2	1958–70	—	—	—	—	—	—	—	—	—	—	—	—	—
3[a]	1978–2010	14,520	15,930	23,880	28,580	37,720	42,690	35,770	23,090	18,650	20,300	17,960	15,660	24,500

[a] Only part of this period was analyzed.

Table 4. Selected low-flow and flow-duration characteristics for selected streamflow stations for three selected periods in the Apalachicola-Chattahoochee-Flint River Basin in parts of Georgia, Alabama, and Florida.

[Values in cubic feet per second; —, insufficient or no data]

Period (climatic year)	Years analyzed	Flow computed for selected low-flow statistics				Percentage of time flow was equaled or exceeded for selected exceedance values				
		7Q10	30Q2	60Q2	90Q2	10	30	50	70	90
02343500 Chattahoochee River at Columbia, Alabama										
1	1929–53	1,910	3,480	3,980	4,480	20,410	10,920	7,700	5,330	3,410
2	1958–70	—	—	—	—	—	—	—	—	—
3	1976–2010	—	—	—	—	—	—	—	—	—
02343801 Chattahoochee River near Columbia, Alabama										
1	1929–53	—	—	—	—	—	—	—	—	—
2	1958–70	—	—	—	—	—	—	—	—	—
3	1976–2010	1,820	3,680	4,280	4,660	21,150	11,350	7,780	4,570	2,000
02344000 Chattahoochee River at Alaga, Alabama										
1	1929–53	—	—	—	—	—	—	—	—	—
2[a]	1961–70	1,810	4,860	5,500	5,900	24,610	13,500	9,410	6,530	4,000
3	1976–2010	—	—	—	—	—	—	—	—	—
02352500 Flint River at Albany, Georgia										
1[a]	1930–53	1,100	1,940	2,290	2,550	12,280	6,130	4,050	3,000	1,880
2	1958–70	911	1,850	2,120	2,400	13,800	6,440	4,250	2,900	1,770
3	1976–2010	735	1,410	1,600	1,760	12,080	5,700	3,480	2,190	1,220
02353000 Flint River at Newton, Georgia										
1	1929–53	—	—	—	—	—	—	—	—	—
2	1958–70	1,440	2,360	2,590	2,910	14,380	7,240	4,840	3,580	2,350
3	1976–2010	1,060	1,860	2,070	2,250	12,260	6,530	4,150	2,750	1,650
02353500 Ichawaynochaway Creek at Milford, Georgia										
1[a]	1944–53	167	318	356	407	1,710	961	658	489	312
2	1958–70	157	285	332	361	1,530	786	530	390	268
3	1976–2010	40.7	201	238	268	1,440	735	469	314	172
02356000 Flint River at Bainbridge, Georgia										
1	1929–53	2,480	3,690	4,070	4,370	15,860	9,020	6,550	5,040	3,490
2	1958–70	2,260	3,610	3,840	4,150	17,820	9,510	6,550	4,980	3,480
3[a]	2002–2010	1,430	2,530	2,750	2,960	14,340	8,320	5,480	3,580	2,110
02357000 Spring Creek near Iron City, Georgia										
1[a]	1944–53	22.4	68.3	80.7	97.4	1,380	573	281	148	74.4
2	1958–70	23.7	80.4	94.4	106	1,160	476	246	147	72.5
3[a]	1977–2010	2.8	48.6	59.2	73.7	1,240	517	223	94.7	21.6
02358000 Apalachicola River at Chattahoochee, Florida										
1	1929–53	6,160	9,040	9,860	10,700	40,630	23,100	16,600	12,610	8,720
2	1958–70	7,190	10,000	10,400	11,000	45,580	24,080	16,610	12,630	9,880
3	1976–2010	4,860	8,400	9,020	9,550	43,310	21,570	14,920	11,100	6,830
02358700 Apalachicola River at Blountstown, Florida										
1	1929–53	—	—	—	—	—	—	—	—	—
2	1958–70	7,100	10,400	10,800	11,500	45,410	24,510	17,130	13,140	10,240
3	1976–2010	5,490	8,810	9,360	9,870	42,050	21,840	15,060	11,400	7,030
02359000 Chipola River near Altha, Florida										
1[a]	1944–53	474	716	769	795	3,060	1,850	1,200	910	698
2	1958–70	425	706	768	825	2,670	1,600	1,140	866	634
3	1976–2010	397	655	691	733	2,840	1,660	1,090	800	564
02359170 Apalachicola River near Sumatra, Florida										
1	1929–53	—	—	—	—	—	—	—	—	—
2	1958–70	—	—	—	—	—	—	—	—	—
3[a]	1978–2010	5,900	9,810	10,450	11,150	46,420	29,710	18,950	12,560	8,290

[a] Only part of this period was analyzed.

from available data. Streamflow at Chattahoochee River at Columbia, Alabama (02343500), and near Columbia, Alabama (02343801), are assumed to be equivalent to flow at Chattahoochee River at Alaga, Alabama (02344000). Drainage areas of these three stations vary only about 4 percent (8,040 to 8,340 mi^2; table 1). Streamflow records for Flint River at Bainbridge, Georgia (02356000), do not exist from 1971 to 2001. Flint River at Newton, Georgia (02353000), and Ichawaynochaway Creek at Milford, Georgia (02353500), account for all but 16 percent of the drainage area at Bainbridge (6,360 out of 7,570 mi^2; table 1). A least-squares linear regression equation using daily streamflow from Flint River at Newton, Georgia (02353000), and Ichawaynochaway Creek at Milford, Georgia (02353500), was developed having an acceptable r-square value of 0.98, which was used to estimate the streamflow of Flint River at Bainbridge, Georgia (02356000), for periods when Bainbridge streamflow records were not available. Finally, the recorded or estimated streamflows at Flint River at Bainbridge, Georgia (02356000), Chattahoochee River at Alaga, Alabama (02344000), and Spring Creek near Iron City, Georgia (02357000), were summed to produce a synthetic inflow record suitable for comparing to outflows at Apalachicola River at Chattahoochee, Florida (02358000).

The same low-flow characteristics, as previously discussed, were computed for the synthetic inflow data and the outflow station at Apalachicola River at Chattahoochee, Florida (02358000), as for the stations listed in tables 2, 3, and 4, and are shown in tables 5, 6, and 7. Flow-duration curves for periods 1, 2, and 3 for the synthetic inflow data at Apalachicola River at Chattahoochee, Florida (02358000), are shown in figures 2 and 3, respectively.

Data comparisons from table 5 indicate that a general increase in low-flow characteristics occurred from period 1 to period 2 for inflow to and outflow from Lake Seminole. Further comparisons indicate an overall decrease in low-flow characteristics for period 3 to levels below period 2, and near or below period 1.

Data comparisons from table 6 indicate similar differences in mean monthly streamflow for inflow to and outflow from Lake Seminole for all three periods, except during March and September for periods 1 and 2. Similar differences also are indicated for the mean annual streamflow data for all three periods.

Data comparisons from table 7 indicate a general increase in low-flow durations from period 1 to period 2, and a decrease from period 2 to period 3. Graphical plots of the flow-duration data are shown in figures 2 and 3 for all three periods, and are used for visual comparisons of the period data.

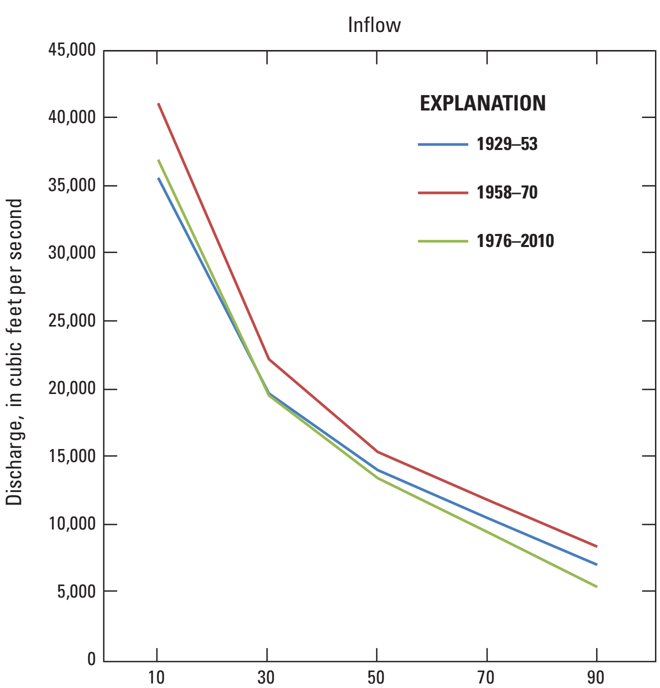

Figure 2. Flow-duration curves of inflow data for Lake Seminole near Chattahoochee, Florida, for 1929–53, 1958–70, and 1976–2010.

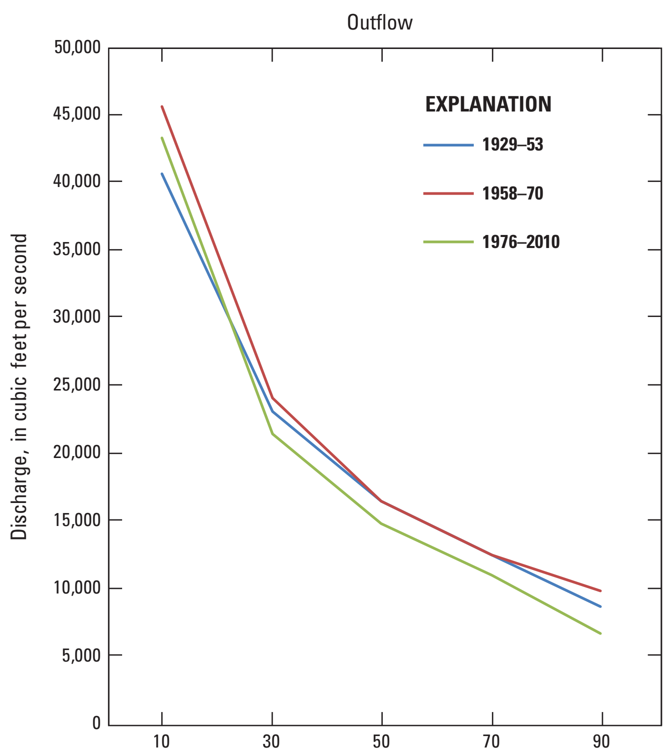

Figure 3. Flow-duration curves of outflow data for Lake Seminole near Chattahoochee, Florida, for 1929–53, 1958–70, and 1976–2010.

Table 5. Mean low-flow characteristics for inflow to and outflow from Lake Seminole for various consecutive days.

[Values in cubic feet per second]

Period (climatic year)	Years analyzed	Consecutive low-flow periods								
		1-day	3-day	7-day	14-day	30-day	60-day	90-day	120-day	183-day
Synthetic inflow data to Lake Seminole from Chattahoochee and Flint Rivers, Alabama and Georgia										
1	1929–53	6,100	6,400	6,740	6,960	7,440	8,390	9,140	9,970	11,240
2	1958–70	6,300	7,720	8,140	8,540	9,230	10,190	11,100	11,500	12,870
3	1976–2010	3,970	5,140	6,360	6,820	7,380	8,020	8,630	9,330	10,610
02358000 Apalachicola River at Chattahoochee, Florida										
1	1929–53	8,150	8,330	8,620	8,880	9,350	10,230	11,050	11,960	13,420
2	1958–70	8,940	9,170	9,600	9,830	10,430	11,190	12,190	12,660	14,180
3	1976–2010	7,140	7,330	7,550	7,910	8,670	9,330	9,960	10,750	12,240

Table 6. Mean monthly and mean annual streamflow for inflow to and outflow from Lake Seminole.

[Values in cubic feet per second]

Period (water year)	Years analyzed	Mean monthly streamflow												
		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Mean annual
Synthetic inflow data to Lake Seminole from Chattahoochee and Flint Rivers, Alabama and Georgia														
1	1929–53	10,490	12,020	17,860	25.150	28,530	39,200	31,040	20,290	13,480	15,130	13,700	10,520	19,760
2	1958–70	12,570	13,020	18,800	26,180	32,910	38,210	34,980	19,740	16,240	14,670	13,690	11,470	20,970
3	1976–2010	10,490	13,240	19,340	22,810	28,450	32,800	24,570	16,500	12,730	14,170	11,500	10,320	18,030
02358000 Apalachicola River at Chattahoochee, Florida														
1	1929–53	12,400	13,340	19,190	27,360	30,260	42,230	35,450	23,740	16,440	17,390	16,150	12,630	22,190
2	1958–70	13,940	13,430	19,640	28,480	35,690	42,350	38,460	21,910	18,160	16,560	15,050	12,630	22,950
3	1976–2010	12,120	14,420	21,650	25,850	32,980	38,560	29,610	19,460	14,970	13,560	13,460	11,900	20,910

Table 7. Selected low-flow characteristics and flow-duration values for inflow to and outflow from Lake Seminole.

[Values in cubic feet per second; —, insufficient or no data]

Period (climatic year)	Years analyzed	Flow computed for selected low-flow statistics				Percentage of time flow was equaled or exceeded for selected exceedance values				
		7Q10	30Q2	60Q2	90Q2	10	30	50	70	90
Synthetic inflow data to Lake Seminole from Chattahoochee and Flint Rivers, Alabama and Georgia										
1	1929–53	—	—	—	—	35,520	19,590	14,050	10,470	6,940
2	1958–70	—	—	—	—	41,120	22,230	15,290	11,700	8,390
3	1976–2010	—	—	—	—	36,910	19,540	13,420	9,360	5,420
02358000 Apalachicola River at Chattahoochee, Florida										
1	1929–53	6,160	9,040	9,860	10,700	40,630	23,100	16,600	12,610	8,720
2	1958–70	7,190	10,000	10,400	11,000	45,580	24,080	16,610	12,630	9,880
3	1976–2010	4,860	8,400	9,020	9,550	43,310	21,570	14,920	11,100	6,830

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