Southern Nuclear Operating Company

AR-07-0197

Enclosure 1

List of RAI # 2.4.1-1 Response Data Files

NOTE: The pages that follow contain the same electronic file listing information that was previously provided to the NRC in the enclosure (Attachment 1) to SNC's submittal letter AR-06-2865, dated December 27, 2006. The files whose names have been shaded are contained in hard-copy format in Enclosure 2. The files whose names have been enclosed by borders have been converted to satisfy NRC electronic submission criteria and are now located on a compact disc in Enclosure 3.

(a) DIGITAL MAPS

- GIS Work
  - 24kgrid_metadata_shp.pdf
  - Basin Map no labels.jpg
  - Gage.mxd
  - GageLocationMap.jpg
  - GageLocationMapAnnotated.jpg
  - NWS basins above Vogtle.bmp
  - USGS gage locations labeled.jpg
  - USGS Quad Index Map.jpg
  - VogtleWatershed.bmp
  - Shape Files
    - BasinH12.dbf
    - BasinH12.prj
    - BasinH12.sbn
    - BasinH12.sbx
    - BasinH12.shp
    - BasinH12.shp.xml
    - BasinH12.shx
    - SavanaRiverPoly.dbf
    - SavanaRiverPoly.prj
    - SavanaRiverPoly.sbn
    - SavanaRiverPoly.sbx
    - SavanaRiverPoly.shp
    - SavanaRiverPoly.shp.xml
    - SavanaRiverPoly.shx
    - SC_hu12polygon.dbf
    - SC_hu12polygon.prj
    - SC_hu12polygon.sbn
    - SC_hu12polygon.sbx
    - SC_hu12polygon.shp
    - SC_hu12polygon.shp.xml
    - SC_hu12polygon.shx
  - NWS watershed files
    - basinsoutlines.txt
    - NWScoords Input to CORPCON.txt
    - nwsfi.txt
    - NWSout.txt
    - NWSwatersheds.dgn
    - NWSwatersheds.dwg
    - USGSgagesNatCoords.txt
    - USGSgagesUTM.txt
    - USGSgagesUTM1.txt
- USGS Quadrangles
  - Topo website
- Bathymetry
  - Fishing website

(b) HYDROLOGIC FEATURES

- Proposed Water Management Changes
  - www.sas.usace.army.mil_projects_projects_brunharb.pdf
  - www.sas.usace.army.mil_projects_projects_clemdam.pdf
  - www.sas.usace.army.mil_projects_projects_hartrehb.pdf
  - www.sas.usace.army.mil_projects_projects_lowshbas.pdf
  - www.sas.usace.army.mil_projects_projects_nsbld.pdf
  - www.sas.usace.army.mil_projects_projects_oatescrk.pdf
  - www.sas.usace.army.mil_projects_projects_rbrdam.pdf
  - www.sas.usace.army.mil_projects_projects_rbrmitigation.pdf
  - www.sas.usace.army.mil_projects_projects_shwrda96.pdf
  - www.sas.usace.army.mil_projects_projects_srbcomp.pdf
  - www.sas.usace.army.mil_projects_projects_thurrehb.pdf
- Dam Data
  - US Army Corps link
  - LBC&W Letter.pdf
  - WCMDamSections.pdf
- Channel Diversion Data
  - Topo Website
  - Composite Top Map_VEGP1971.pdf

(c) HYDROLOGIC TIME SERIES

- Hydrology Calculations
  - PMF
    - HMR51.djvu
    - HMR52.djvu
  - PMP
    - Complete.djvu
  - USGS gage data
    - gage7000.bmp
    - gage7320.bmp
    - gage7500.bmp
    - gage8500.bmp
    - List of USGS Savannah R gages.txt
    - Savannah River gages.txt
    - Savannah River gages2.txt
  - Annual Mean flow
    - AugustaGAAvgAnnualQs.pdf
    - BurtonsFerryAverageAnnualQ.pdf
    - JacksonAnnuaMean.pdf

Hydrology Calculations (Cont'd)

Annual Peak
- annpeak.txt
- AugustaAnnualPeakQs.pdf
- BurtonsFerryAnnualPeak.pdf
- CalhounAnnualPeakQs.pdf
- CalhounFallsAnnualPeakQs.pdf
- ClyoAnnualPeakQ.pdf
- JacksonAnnualPeakQ.pdf
- peak.txt
- peak7000.txt
- peak7000Watstore.txt
- peaktabformatted.txt
- Qpeak302197000.txt
- Qpeak302197320.txt
- Qpeak302197500.txt
- Qpeak302198500.txt
- Qpeak7000mdy.txt
- USGSReport1990.pdf

Average Daily
- avgdaily.txt
- AugustaGAAnnualAvgDailyQs.pdf
- AugustadailyQ.bmp
- BurtonsFerryAverageDaily.pdf
- CalhounFallsAnnualAvgDailyQs.pdf
- ClyoGAAnnualAvgDailyQs.pdf
- JacksonAnnualAvgDailyQs.pdf

Daily
- daily.txt [Note: file name corrected from previously specified "day.txt"]
- CommonPeriod.bmp
- CommonPeriodAnnotated.bmp
- DailyQ7000.bmp
- DayQJackson.txt
- QdailyAugusta.txt
- QdailyBurtonsFerry.txt
- QdailyClyo.txt
- TotalPeriod&closures.bmp
- TotalPeriod.bmp

Low Flow (SWSTAT Model)
- low.txt
- SNOClow.wdm
- SNOclow.wdu

Monthly
- month.txt
- AugustaMonthlyAvgQs.pdf
- BurtonsFerryMonthlyQ.pdf
- CalhounMonthlyAvgQs.pdf
- ClyoMonthlyQs.pdf
- JacksonMonthlyQs.pdf

- Hydrometeorologic Data
  - Ice jam events
  - Air Temperature
    - (NCDC 2003).pdf
    - Vogtle Temperature 1984.xls
    - Vogtle Temperature 1985.xls
    - Vogtle Temperature 1986.xls
    - Vogtle Temperature 1987.xls
    - Vogtle Temperature 1988.xls
    - Vogtle Temperature 1989.xls
    - Vogtle Temperature 1990.xls
    - Vogtle Temperature 1991.xls
    - Vogtle Temperature 1992.xls
    - Vogtle Temperature 1993.xls
    - Vogtle Temperature 1994.xls
    - Vogtle Temperature 1995.xls
    - Vogtle Temperature 1996.xls
    - Vogtle Temperature 1997.xls
    - Vogtle Temperature 1998.xls
    - Vogtle Temperature 1999.xls
    - Vogtle Temperature 2000.xls
    - Vogtle Temperature 2001.xls
    - Vogtle Temperature 2002.xls
  - SR Water Temperature
    - (Dyar and Alhadeff 1997).pdf
- Stream Flow Data
  - Augusta gages
  - Burtons Ferry gages
  - Waynesboro gages
  - Jackson gages
  - USGS mean-daily flow_Augusta 40-03_April21.txt
  - USGS mean-daily flow_Augusta 84-39_April23.txt
  - USGS mean-daily flow_BurtonsFerry 40-03_April20.txt
  - USGS mean-daily flow_Jackson 72-02_April20.txt
  - USGS Near Waynesboro.pdf
- Bathymetry Near Intake
  - Intake Cross Section Points.xls
  - Plant Vogtle River Survey Discharge Cross Sections.pdf
  - Plant Vogtle River Survey Intake Cross Sections.pdf
  - Plant Vogtle River Survey Topo.pdf
- Groundwater Head Data
  - esp_gw_data.xls

(d) MODELING DATA

NWS Model

basins.txt
hucs012Plane3.jpg
hucs012Plane4.jpg
HUCsInNWSbasin.dbf
HUCsInNWSbasin.dbf.xml
HUCsINNWSbasins.jpg
IncludedHUCs.dbf
IncludedHUCs.jpg
NWSRFS documentation.msg
NWSRFS documentation.txt
NWSRFS for Savannah River.msg
Nwsrfs for Savannah Rvr.txt
NWSsubbasins.dbf
NWSsubbasins.dbf.xml
NWSwatersheds.dgn
NWSwatersheds.dwg
Savannah River Routing parameters.msg
Savannah River routing parameters.txt
Savannah River Unit Hydrographs.msg
Savannah Rvr Unit Hydrographs.txt
SP_hucs012.jpg
srblagk.txt
srbuhg.txt
USGS_data.jpg
Vogtle_FIG_1.2_4_esbwr_V8_9_2.jpg

HEC-RAS Files

DamBreak.zip

Southern Nuclear Operating Company

AR-07-0197

Enclosure 2

Hard-Copy Data

24kgrid_metadata_shp.pdf

24kgrid

Shapefile

Description | **Spatial** | **Attributes**

Horizontal coordinate system

Geographic coordinate system name: GCS_Assumed_Geographic_1

Details

Bounding coordinates

Horizontal

In decimal degrees

West: -160.375000

East: -66.875000

North: 49.500000

South: 18.875000

In projected or local coordinates

Left: -160.375000

Right: -66.875000

Top: 49.500000

Bottom: 18.875000

Spatial data description

Vector data information

ESRI description

24kgrid

ESRI feature type: Simple

Geometry type: Polygon

Topology: FALSE

Feature count: 56617

Spatial Index: FALSE

Linear referencing: FALSE

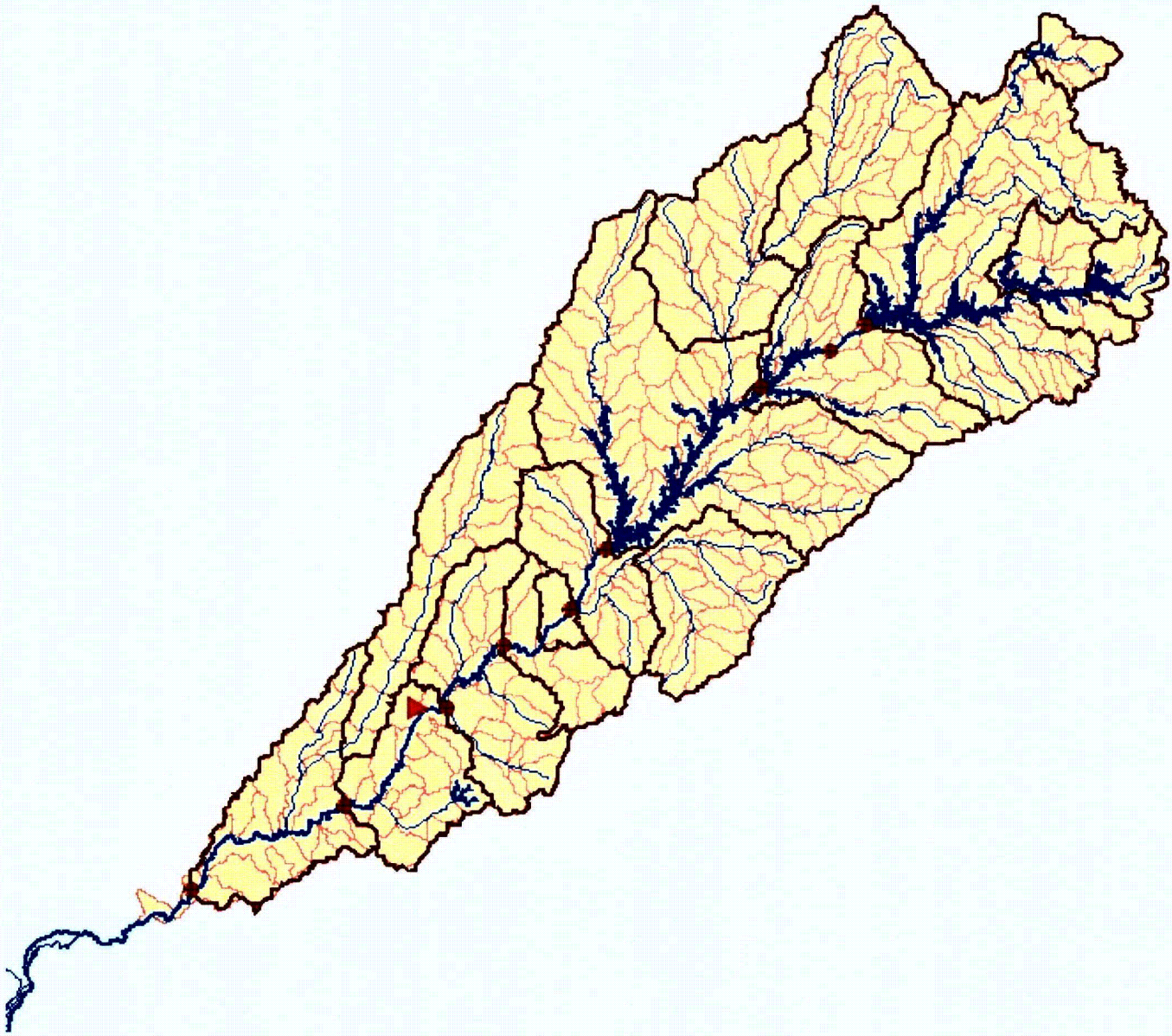
SDTS description

Feature class: SDTS feature type, feature count

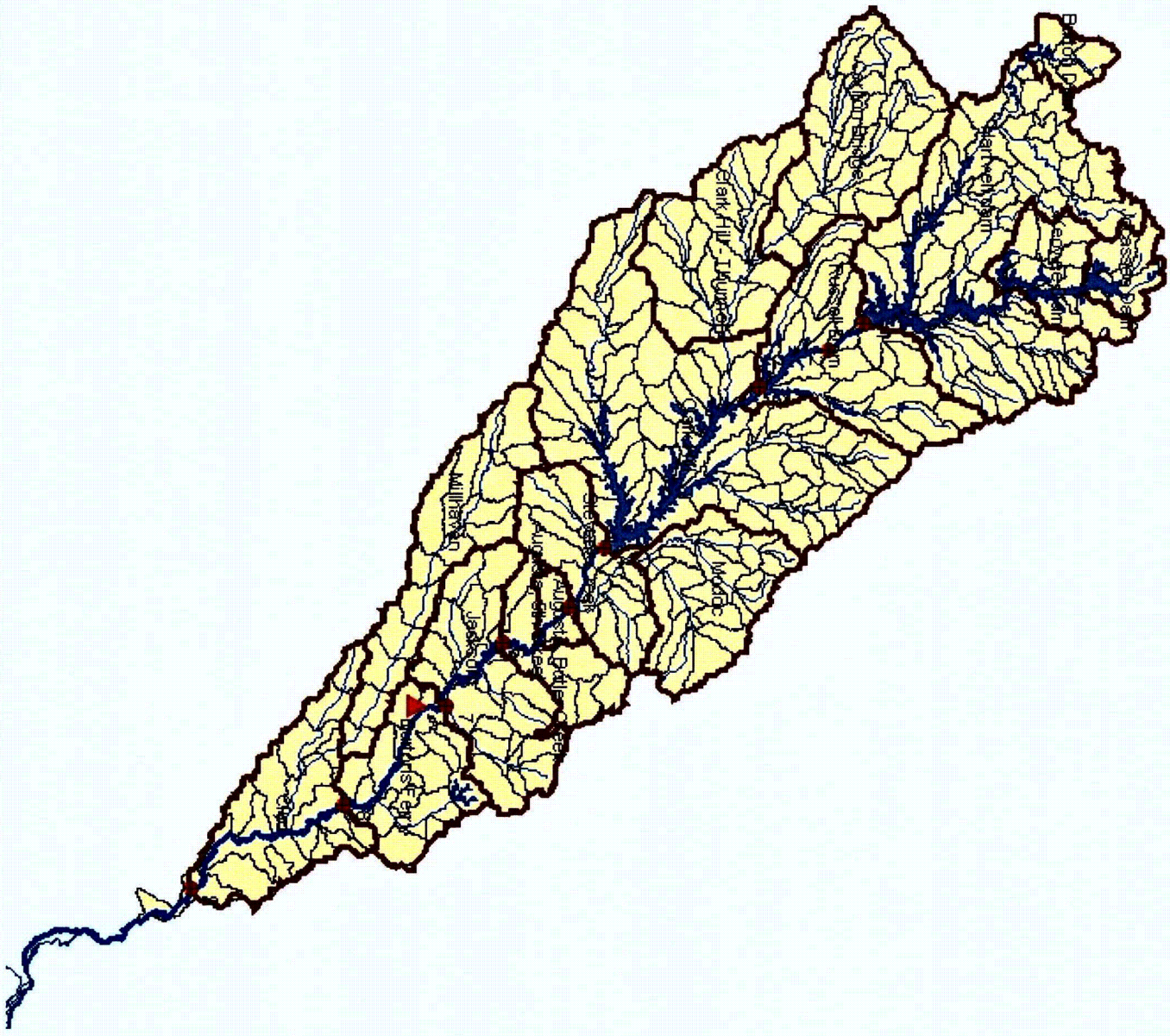
- 24kgrid: G-polygon, 56617

Basin Map no labels.jpg

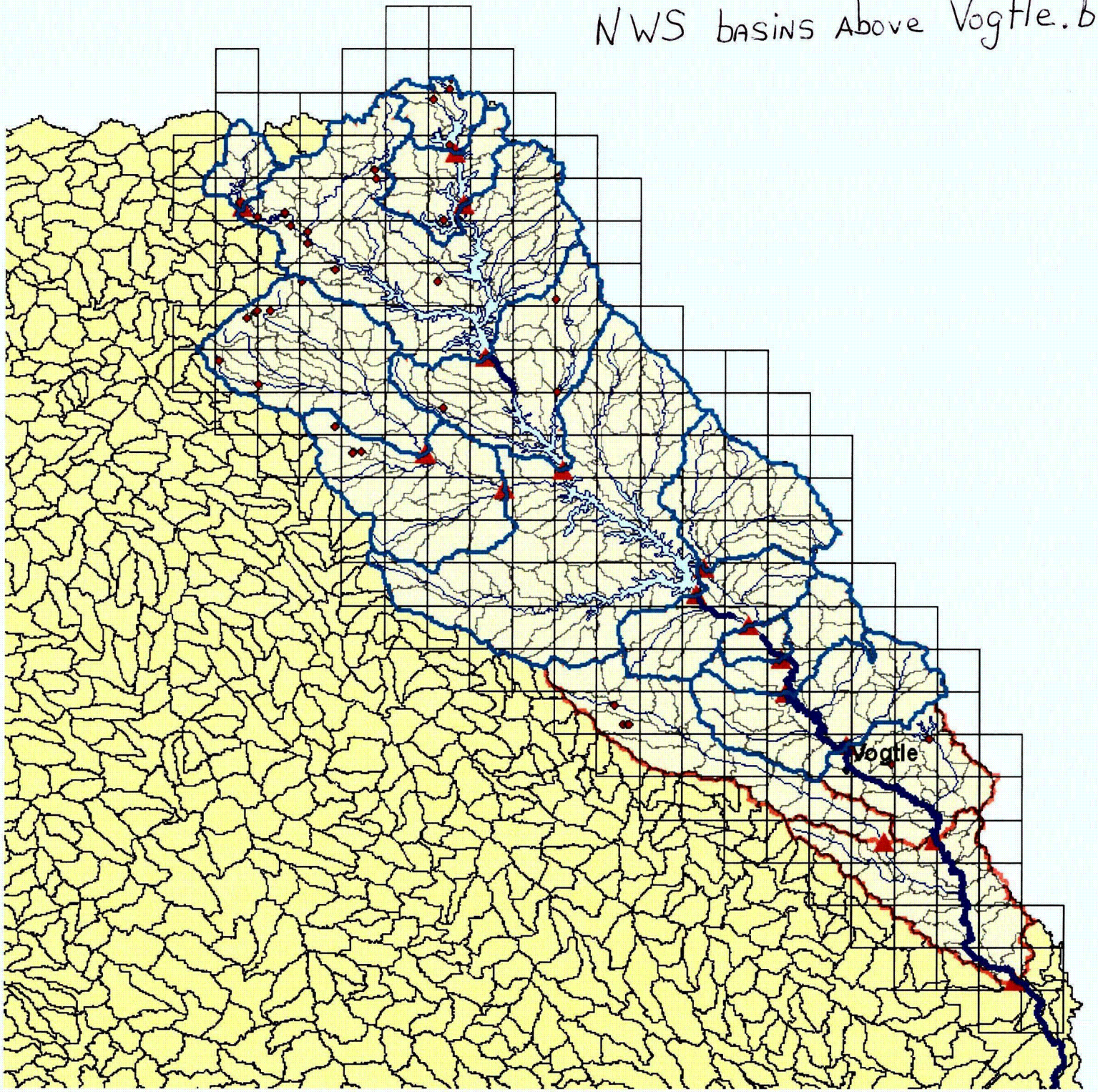
Gage Location Map.jpg



Gage Location Map Annotated.jpg

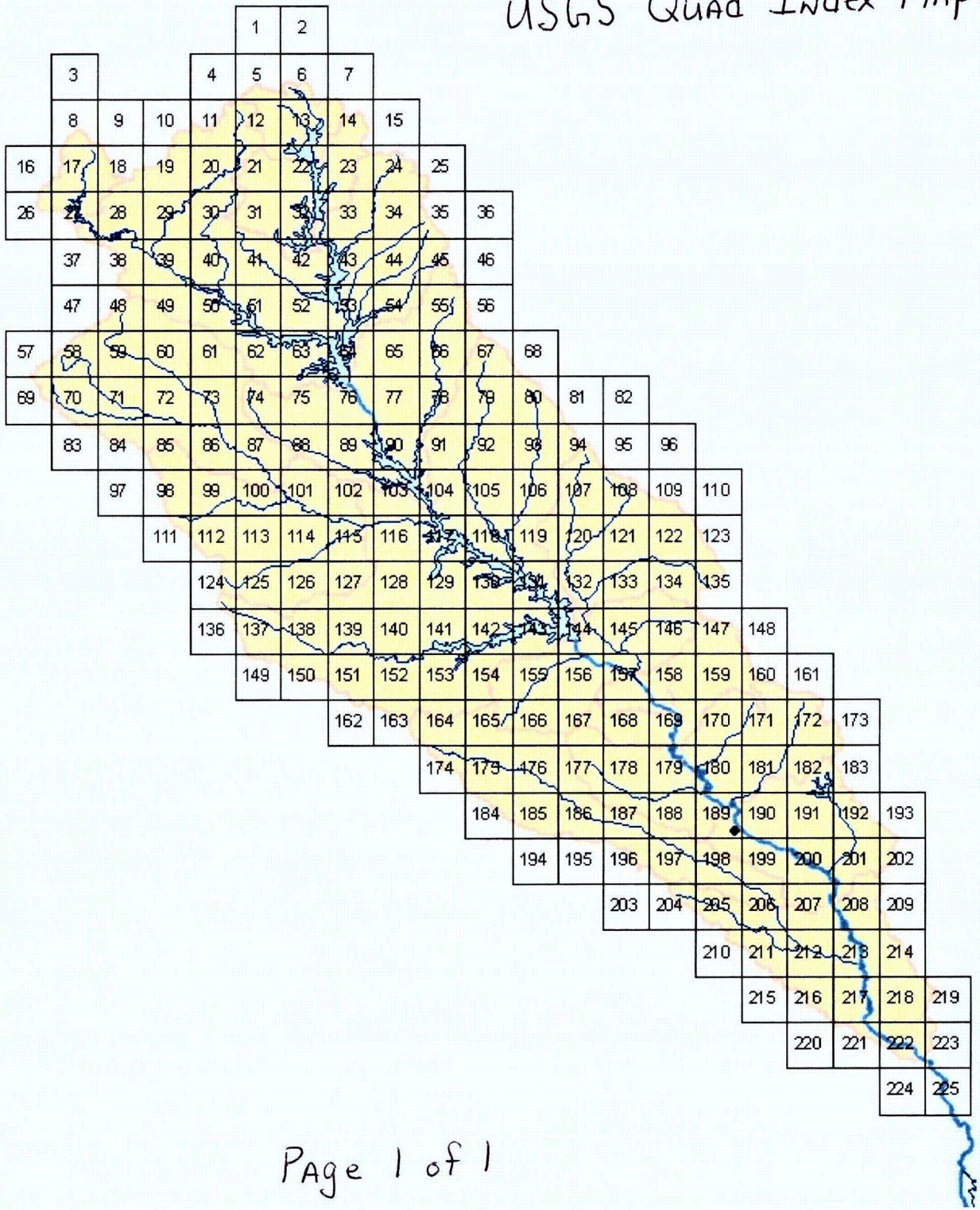


NWS basins above Vogtle.bmp

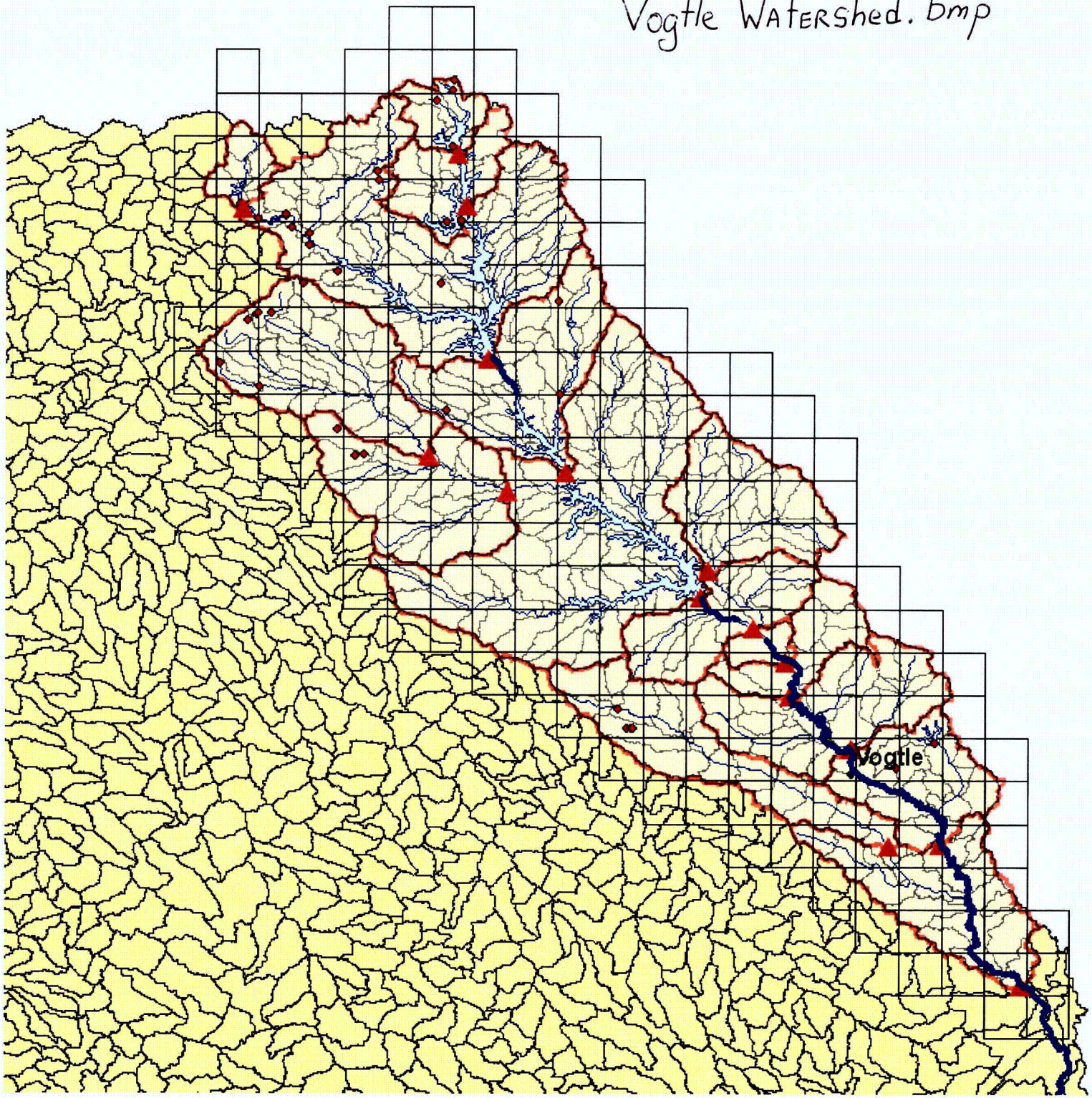


USGS gage locations labeled.jpg

USGS Quad Index Map.jpg



Vogtle Watershed.bmp



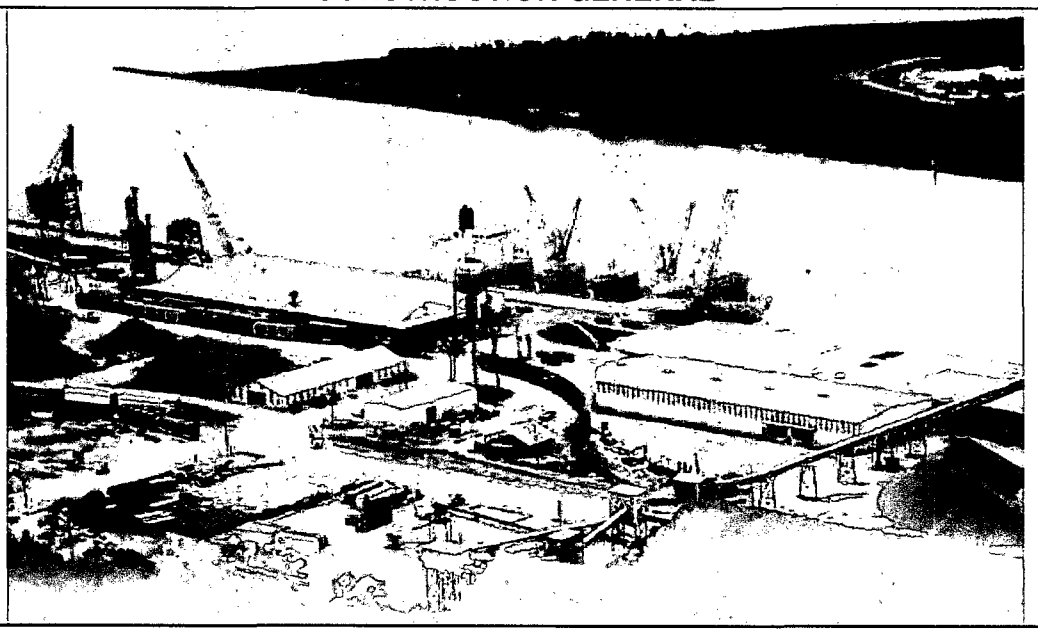
```
Volume in drive M is FRES0304-F
Volume Serial Number is 9CCF-FA19

Directory of M:\list\GIS work\NWS watershed files

12/05/2006  05:34 PM    <DIR>          .
12/05/2006  05:34 PM    <DIR>          ..
01/24/2006  11:49 AM           194,037 basinsoutlines.txt
01/25/2006  04:08 PM           174,337 NWScoords Input to CORPCON.txt
12/05/2006  05:34 PM                34 nwsfi.txt
01/25/2006  05:44 PM           358,755 NWSout.txt
01/27/2006  01:56 PM           354,304 NWSwatersheds.dgn
01/26/2006  01:21 AM           380,871 NWSwatersheds.dwg
05/22/2006  05:33 PM               216 USGSgagesNatCoords.txt
05/22/2006  05:37 PM               242 USGSgagesUTM.txt
05/22/2006  05:37 PM               242 USGSgagesUTM1.txt
          9 File(s)      1,463,038 bytes
          2 Dir(s)  53,735,170,048 bytes free
```

g1, 34 21 15, 82 48 55
g2, 34 15 20, 82 44 42
g3, 34 04 15, 82 38 30
g4, 33 38 40, 82 12 05
g5, 33 33 06, 82 02 19
g6, 33 22 25, 81 56 35
g7, 33 13 01, 81 46 04
g8, 32 56 20, 81 30 10
g9, 32 31 41, 81 16 08

g1,460453.419,1584603.487
g2,481461.073,1548590.834
g3,512371.836,1481212.690
g4,645647.529,1325735.338
g5,695227.940,1292000.653
g6,724479.076,1227266.540
g7,778205.824,1170426.936
g8,859891.449,1069675.783
g9,932915.134,920744.309

g1,460453.419,1584603.487
g2,481461.073,1548590.834
g3,512371.836,1481212.690
g4,645647.529,1325735.338
g5,695227.940,1292000.653
g6,724479.076,1227266.540
g7,778205.824,1170426.936
g8,859891.449,1069675.783
g9,932915.134,920744.309

CONSTRUCTION GENERAL



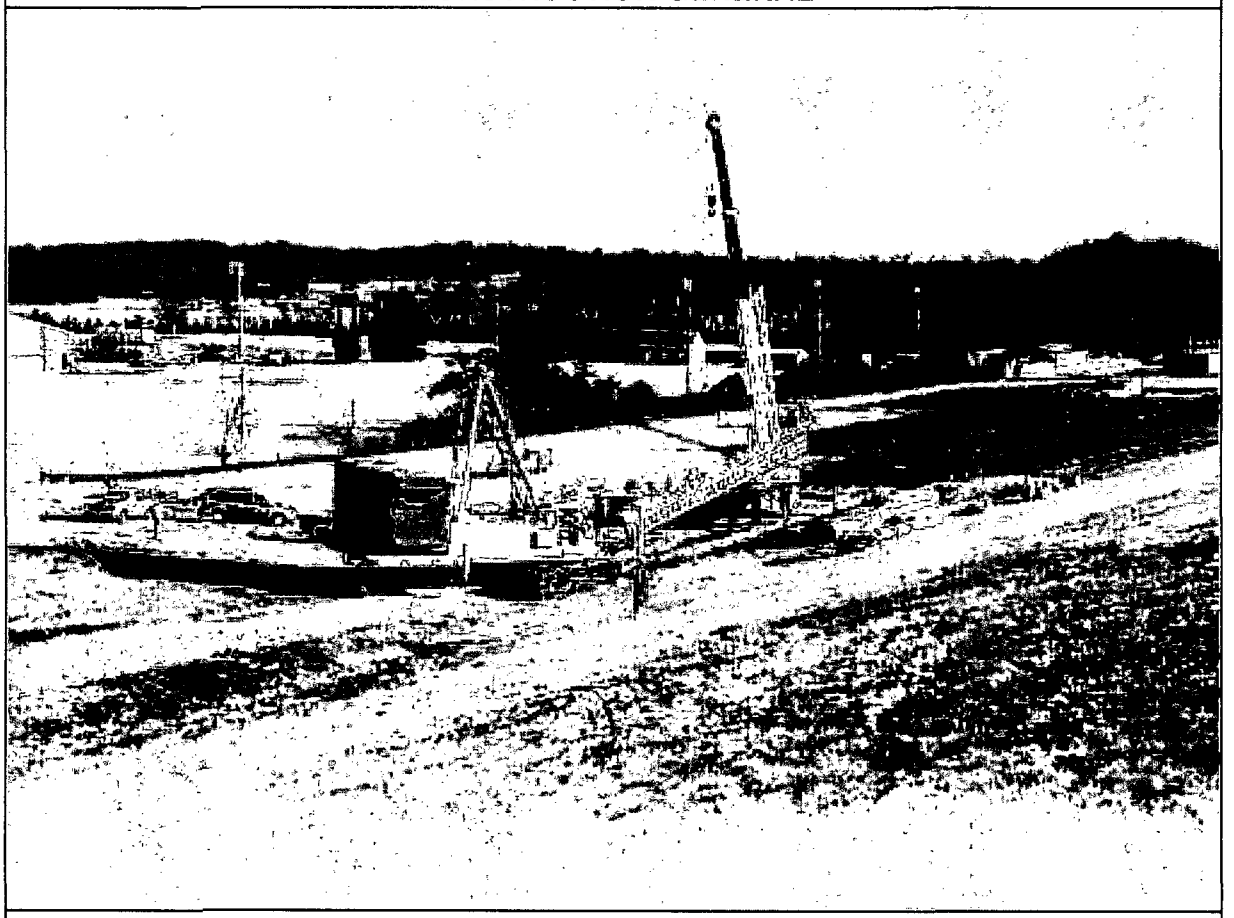
BRUNSWICK HARBOR DEEPENING

AUTHORITY	Study authorized pursuant to House Committee on Public Works resolution adopted 25 August 1960. Project authorized in WRDA 99.	
PURPOSE	Deep Draft Navigation	
SPONSORS	Georgia Ports Authority - Feasibility and PED Georgia Department of Transportation - Construction	
PLAN OF IMPROVEMENT	The recommended project includes deepening of the entrance channel from a depth of 32 to 38 feet, deepening the inner harbor channels to terminal facilities along East River and Colonels Island from a depth of 30 to 36 feet, and creating a new turning basin in Upper East River and the raising of Andrews Island Dikes to regain lost capacity.	
PROJECT COST	**Total Project First Cost**	**$ 101,581,000**
	Cost Share 65/35 Federal Non-Federal	$ 65,109,000 $ 36,472,000
SCHEDULE	■ Chief of Engineers Report signed 6 October 1998 ■ PED phase initiated 13 October 1998 ■ ROD signed on 12 May 1999 ■ Project authorized in WRDA 1999 ■ PCA signed 5 April 2002 ■ Construction initiated 16 September 2002 ■ Post Authorization Change (PAC) Report to increase cost estimate and 902 limit submitted Sep 2003 ■ New authorized amount approved in Energy Bill Dec 2003 ■ Construction scheduled for completion in Jan 06	
FEDERAL FUNDING	FY 04 (Work Allowance) $ 5,564,000 FY 05 (Budget) $ 9,267,000	
REMAINING	■ Finalize plans and specifications for Jekyll Island	

SIGNIFICANT ACTIONS	Mitigation contract and Phase II rock portion. ■ Award of Inner Harbor dredging.
REMARKS	The Brunswick Pilots and the US Coast Guard are extremely concerned over navigation safety issues that exist in the vicinity of the new Sidney Lanier Bridge since the existing 200 foot channel is cut through rock and needs to be expanded to the new 400 foot authorized width. The most significant economic impact will be caused by the inability of large car carriers to transit the harbor to the Colonel's Island Auto Processing Facility.
MAP	■ Half size, low resolution (72 dpi) ■ Full size, higher resolution (150 dpi)
Congressional Fact Book	**March 2004**

[Return to Main Page]

CONSTRUCTION GENERAL



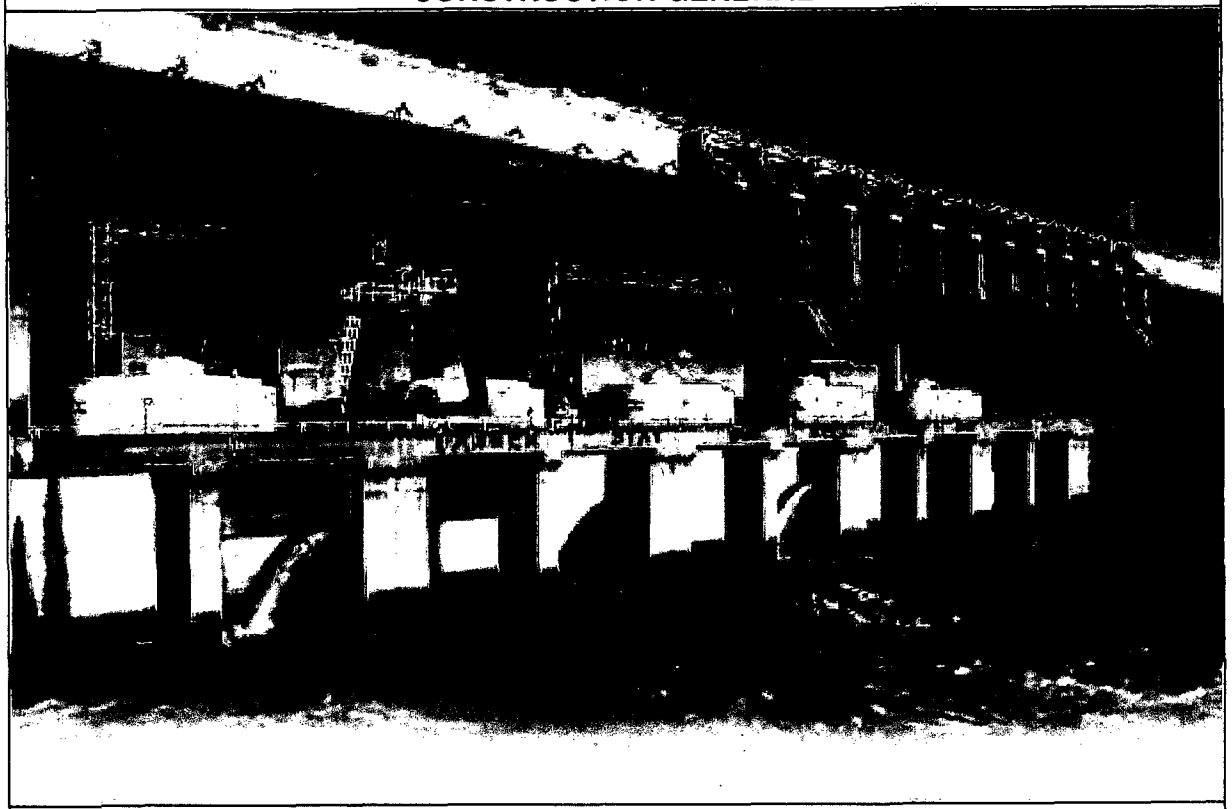
CLEMSON UPPER AND LOWER DIVERSION DAMS
CLEMSON, SC - HARTWELL LAKE

PROJECT DESCRIPTION	Flood Control Acts of 1950 and 1958 (original project authorization) - Part of Hartwell Lake project WRDA 76 f/Cost Allocation WRDA 86 f/15% Cost Sharing WRDA 2000 f/Seismic Remediation
PURPOSE	Constructed in 1960-61 as part of Hartwell project to protect lowlands at Clemson University. Seismic remediation will further protect the university against catastrophic impacts which could exceed $1.1 Billion in physical and economic damages as well as prevent probable loss of human life.
PLAN OF IMPROVEMENT	■ To remediate geotechnical deficiency by providing a "deep soil cement mix" as a repair method ■ The fix is designed to provide additional strength to prevent total liquefaction failure during earthquake events that can be triggered by seismic events as low as 0.07 to 0.10g. Such event has a return probability of once in every 475 yrs. or in other words a 1 in 10 chance of occurring in any fifty year period. ■ Dam Safety Assurance Program Evaluation Report was approved by Mr. Jim Crews, CESAD Dam Safety Officer, on 15 May 2000 and submitted to HQUSACE. ■ HQUSACE submitted approved Evaluation Report to ASA (CW) on 15 June 2000.
SCHEDULE	■ Complete Design - Jun 2003 ■ Award Construction Contract - Sep 2003 ■ Complete Construction - Mar 2005
PROJECT COST	FY04 (Work Allowance) $ 800,000 FY05 (Budget) $3,800,000

FEDERAL FUNDING	■ Total Federal CG Appropriation Required is $9,761,000 ■ Cost-shared with SEPA and water supply users in Lavonia, GA and Hart County, GA.	
ISSUES	None	
SUMMARY	■ The Savannah District completed final design and award was made on 26 Sep 2003. The construction was budgeted for completion in September 2003. However, final design was not completed until June 2003. Construction is scheduled to take 18 months with completion in FY 05. ■ Cost share payments will be made by increasing existing annual payments in accordance with existing contracts and in accordance with WRDA 76 and WRDA 86 requirements.	
REMARKS	Located near the campus of Clemson University, the area protected by the dams could contain tens of thousands of people. Any delay in this project increases the risk to health and safety for the citizens of the area, if an earthquake should strike the area.	
MAP	Half size, lower resolution (72 dpi)	Full size, high resolution (150 dpi)
Congressional Fact Book		**March 2004**

[Return to Main Page]

CONSTRUCTION GENERAL



HARTWELL LAKE POWERHOUSE, GA & SC (Major Rehab)

AUTHORITY	Flood Control Acts of 1950 and 1958 (original project authorization) and HQUSACE guidance for Major Rehab Program.
PURPOSE	Improve reliability and outputs of the hydropower plant at Hartwell Dam.
PLAN OF IMPROVEMENT	■ Rewind 4 generators, replace stator cores ■ Replace/refurbish key electrical/mechanical peripheral equipment ■ Refurbish turbines and water passages ■ Replace 6 single-phase transformers with 2 three-phase transformers ■ Refurbish/repair/replace headgates, stoplogs and drafttube gates. ■ Refurbish switchyard ■ Excitor replacement
PROJECT COST	$32,700,000
SCHEDULE	■ Completion of Evaluation Report July 1993 ■ Completion of PED December 1995 ■ Circuit Breaker supply contract 100% complete ■ Generator rewind contract awarded July 1996, currently 100% complete ■ Transformer Supply contract 100% complete ■ Circuit Breaker Installation 100% complete ■ Transformer Installation 100% complete ■ Phase I - Project physically complete September 2000 ■ Phase II - Switchyard upgrade added to project Summer 2001 ■ Project completion scheduled for Sep 2005
FEDERAL FUNDING	FY 04 (Work Allowance) $ 1,085 FY 05 (Budget) $ 733,000
REMAINING SIGNIFICANT	■ Install switchyard circuit breakers and complete switchyard upgrade ■ Install exciters

ACTIONS		
REMARKS	Hartwell's power plant switchyard serves as a connection point between several different power-generating facilities. Timely completion of the rehab project will lessen impacts on the production and delivery of electricity to the preference customers, not only that power produced by the Hartwell power plant, but also that power produced in the vicinity.	
MAP	Half size, low resolution (72dpi)	Full size, higher resolution (150dpi)
Congressional Fact Book		**March 2004**

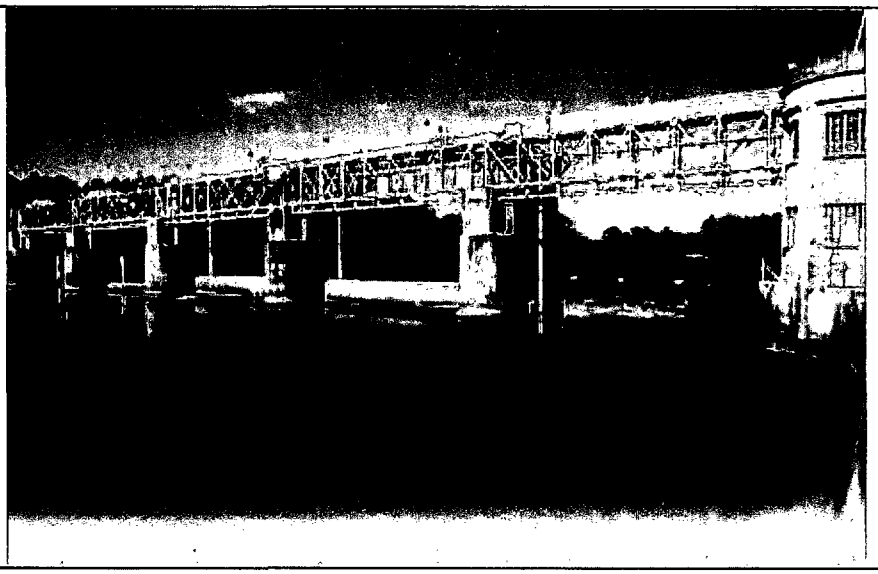
[Return to Main Page]

CONSTRUCTION GENERAL

LOWER SAVANNAH RIVER ENVIRONMENTAL RESTORATION, GA & SC		
AUTHORITY	WRDA 1996, Public Law 104-303, Section 102.	
PURPOSE	Environmental Restoration and Water Quality Restoration surrounding cuts #3 and #4 and Mill Creek.	
SPONSOR	City of Savannah, Georgia	
PLAN OF IMPROVEMENT	The plan includes construction of a partial diversion structure at the entrance to navigation cut #3 and cutoff bend #3 (river mile 40.9), improvement to the channel to the mouth of Bear Creek in bend #3 and restoration of the mouth of Mill Creek (river mile 42.0).	
PROJECT COST	Cost Share: 75/25 Federal Non-Federal **Total Project Cost**	 $ 3,435,000 $ 1,145,000 $ 4,580,000
SCHEDULE	■ PCA Execution July 2000 ■ Award Construction Contract September 2001 ■ Initiation of Construction November 2001 ■ Project Physical Completion September 2002 ■ Completed O&M Manual June 2003	
FEDERAL FUNDING	FY 04 (Work Allowance) $ 0 FY 05 (Budget) $ 0	
REMAINING SIGNIFICANT ACTIONS	■ Continue 5 year monitoring program	
MAP	Half size, low resolution (72 dpi)	Full size, higher resolution (150 dpi)

[Return to Main Page]

CONSTRUCTION GENERAL



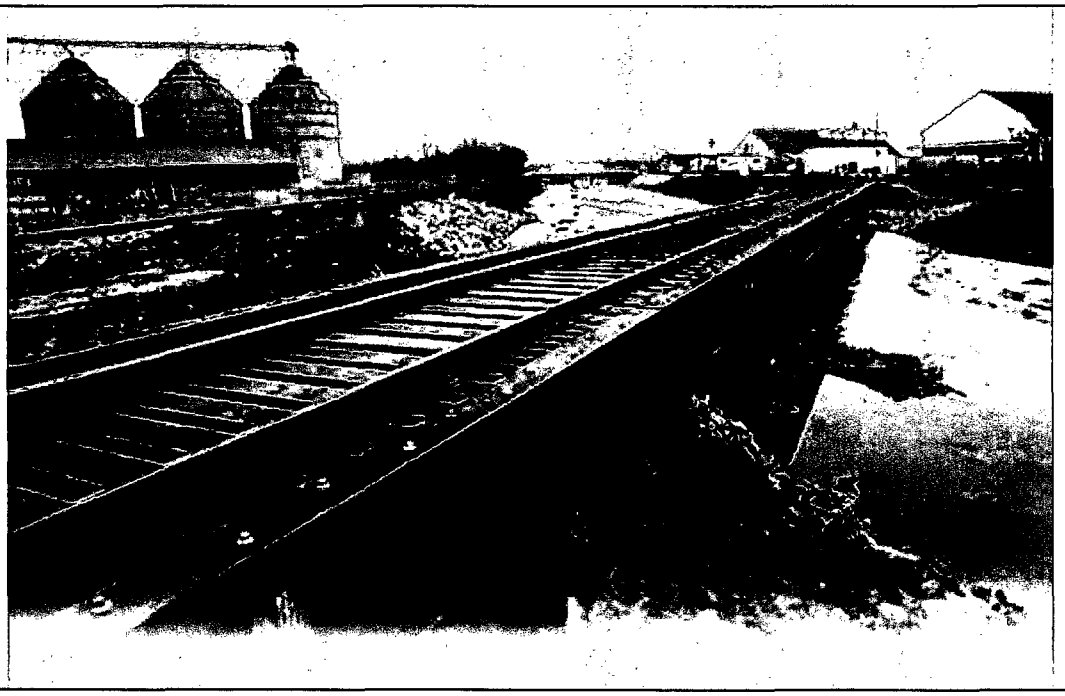
NEW SAVANNAH BLUFF LOCK AND DAM, GA

AUTHORITY	Original authorization was Flood Control Act 1970, Section 216 for commercial navigation purposes. Authorization for repair and transfer in WRDA 2000, amended by Omnibus Appropriations Act.
PURPOSE	■ Structure was completed in 1937 to serve commercial navigation on the Savannah River Below Augusta Navigation project. ■ Commercial navigation ceased in 1979. ■ Structure serves critical need by maintaining constant pool elevation, which serves both municipal and industrial water supply intakes and boat races and regattas, even during periods of low flow. ■ Amend 216 study to address repair of the facility, addition of a fish-way and transfer of the facility to the City of N. Augusta and Aiken County, S.C.
POTENTIAL SPONSORS	■ Study is 100% Federally funded. Major stakeholders (City of Augusta, City of N. Augusta, Aiken Co. industries) are actively involved.
STUDY COST	PED Federal: $1,121,000 Non-Federal: 0 **Total**: $1,121,000 Section 216 Studies are 100% Federally funded.
SCHEDULE	■ Initiated Feasibility Phase July 1998 ■ Final Section 216 Feasibility Level Report - Oct. 2000 ■ Revised Section 216 Feasibility Level Report September 2002 ■ Addendum to the 216 Study consisting of 35% design and estimate ■ March 2003 ■ Completed 100% design on lock mechanical work – Sep 2003
STATUS	■ Report recommended deauthorization due to no cost sharing partners ■ Congressional action WRDA 2000 & Omnibus Appropriations Act for FY

	2001 ■ Authorize transfer of structure ■ Direct full repair of full Federal expense ■ Provide fish passage at full Federal expense ■ Complete Report with 35% design reflecting Congressional direction ■ Mar 2003 ■ Execute MOU with local interests – FY 05 ■ FY 2005 CG funds needed to initiate construction	
FEDERAL FUNDING	FY 04 (Work Allowance) $ 10,000 FY 05 (Budget) $ 0	
REMAINING SIGNIFICANT ACTIONS	Complete MOU, complete all design and construction.	
REMARKS	The refurbishing this of Lock and Dam to a serviceable level is needed to prevent failure of one or more Lock and Dam components. A failure of these components would eliminate recreational lockage through to Augusta, and would eliminate the Corps' ability to provide lockage to pass andromous fish upstream.	
MAP	Full size, high resolution (72 dpi)	Full size, higher resolution (150 dpi)
Congressional Fact Book		**March 2004**

[Return to Main Page]

CONSTRUCTION GENERAL



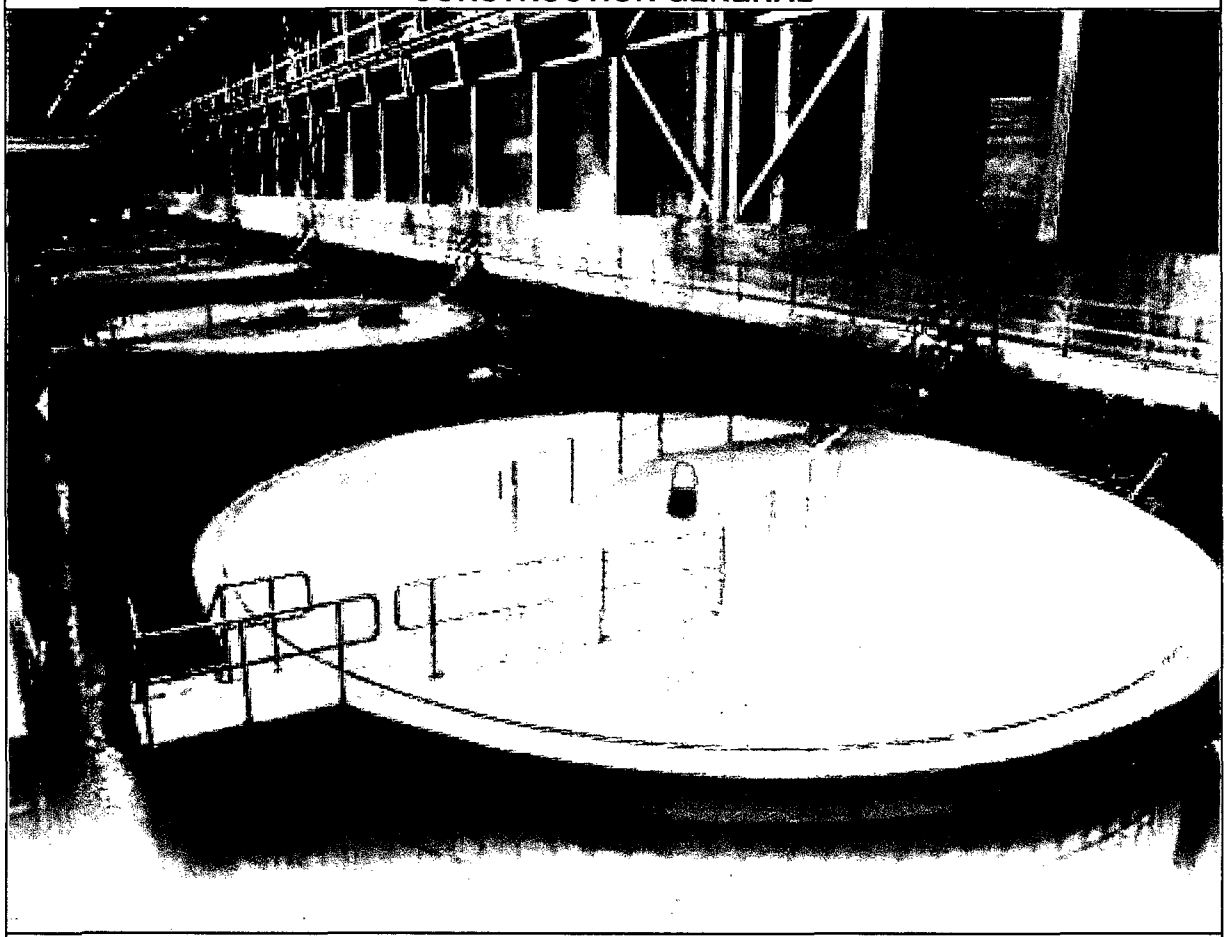
OATES CREEK

AUTHORITY	Water Resources Development Act of 1986
PURPOSE	Correct the deficiencies in the Oates Creek Flood Control Project in Augusta, Georgia. Original project included widening and realigning over 13,000 feet of channel with either grass-lines or concrete channel and is now not meeting the designed flood protection. Deficiency Correction new start for FY 2001.
SPONSOR	Augusta-Richmond County, Georgia
PLAN OF IMPROVEMENT	Includes remedial work on the upper and lower earthen channels. Excavate channel bottom repairing and regarding in the upper channel, construction of a drop structure and rip-rapping lower half of the side slope. Also regarding in the lower channel removal of damaged erosion control matting, and placement of a 12 foot wide concrete low flow channel to eliminate erosion problems. Objective in the upper channel is to prevent erosion and head cutting in the channel bottom. Objective in the lower channel is to enable mowing and easier maintenance.
PROJECT COST	Cost Share: 65/35 Federal $1,755,000 Non-Federal $ 945,000 **Total Project Cost** $2,700,000
SCHEDULE	■ PCA Executed Aug 2003 ■ Shelve project for possible FY 06 funding
FEDERAL FUNDING	FY 04 (Work Allowance) $ 1,000 FY 05 (Budget) $ 0
REMAINING SIGNIFICANT ACTIONS	Secure funding – and award construction contract for repair
REMARKS	Contract award on this project will significantly improve Richmond County's ability to effectively maintain the project, which affects the flood-fighting capability of the project. Which in turn reduces potential for flood damages and correspondly quality of life for nearby residents.
	■ Half size, low resolution (72 dpi)

MAPS	■ Full size, higher resolution (150 dpi)
Congressional Fact Book	**March 2004**

[Return to Main Page]

CONSTRUCTION GENERAL

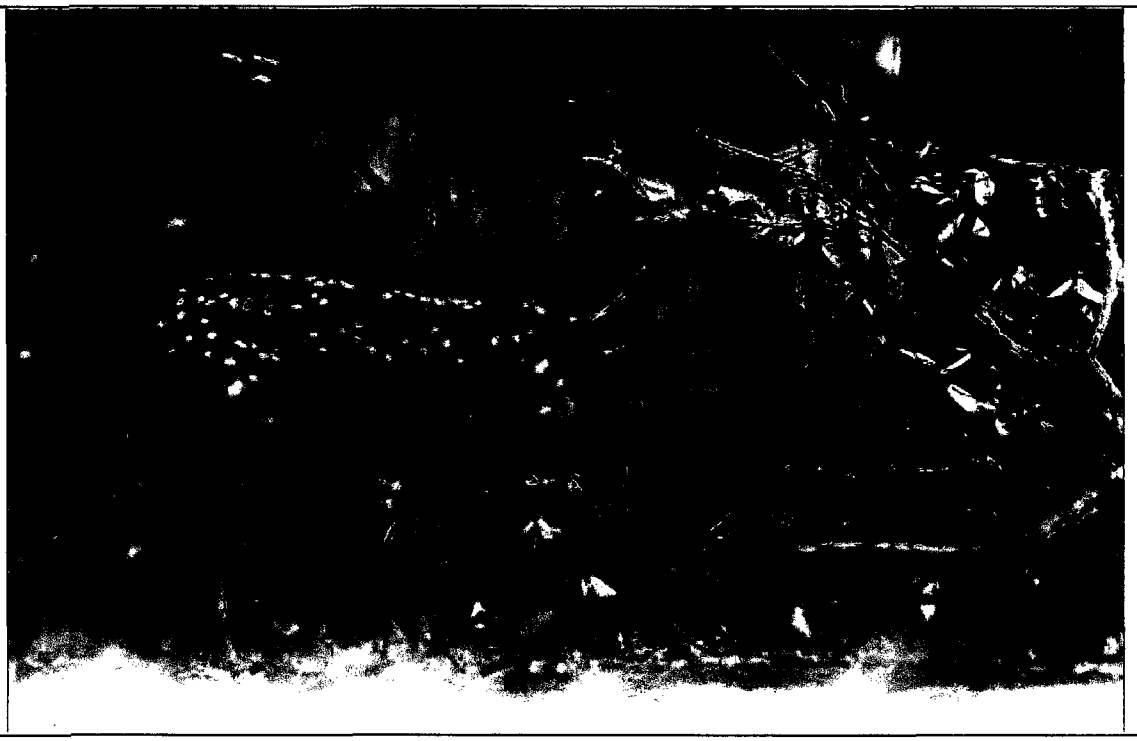


RICHARD B. RUSSELL DAM & LAKE, GA & SC	
AUTHORITY	Flood Control Act of 1966, modified by WRDA of 1976 and WRDA of 1986.
PURPOSE	Multiple purpose hydroelectric project
PLAN OF IMPROVEMENT	■ Concrete Dam (1,884' x 195') and Reservoir (26,650 acres) ■ Powerhouse (648 MW) ■ 4 Conventional Units (328 MW) ■ 4 Reversible Pump-Turbine Units (320 MW) ■ 5 Cost Shared State Parks and Other Recreational Facilities (Public Law 89-72)
PROJECT COST	■ $626 Million (All Work - Current Estimate to Complete) ■ Includes total pumped storage cost of $138 million ■ Including environmental work, pumped storage doubles hydropower capacity for 22% of the total project cost.
SCHEDULE	■ Project is 99% complete ■ Completed Phase III Environmental Testing October 1996 ■ Completed final Phase III Environmental Report Review August 1997 ■ Completed NEPA documentation with Environmental Assessment (EA) August 1999

	■ U.S. filed motion for Summary Judgment in December 1999 to dissolve the 14 year injunction than banned commercial operation ■ Plaintiffs filed a motion of opposition to Summary Judgment in February 2000 ■ Georgia also filed a motion in February 2000 to intervene ■ U.S. filed a motion of opposition to Georgia's request in March 2000 ■ U.S. District Court permitted to enter the lawsuit in June 2000 ■ The Hearing on the Corps Motion for Decision by Summary Judgment was conducted 17 Oct 2000. After 18 months, the U.S. District Court provided a favorable decision on 3 May 2002 permitting the commercial operation of pumped storage. After initial checkout testing of the units and the environmental monitoring protection systems, the District declared the pump units and associated maximum 320 MW available to SEPA in September 2002	
FEDERAL FUNDING	FY 04 (Work Allowance) $1,845,000 FY 05 (Budget) $4,600,000	
SITUATION WITH STATE RESOURCE AGENCIES	With commercial operations, we continue to perform the required environment monitoring and coordination of data with the resource agencies on a quarterly basis.	
COURSE OF ACTION	The Savannah District has implemented springtime pumping limitations and other mitigation measures, that include construction of an oxygenation system in JST Lake to mitigate potential summertime temperature impacts to the fishery habitat as well as environmental monitoring of a commercial operation for at least five years commitment and decision to operate the project in accordance with these measures are contained in the final NEPA documentation, signed 17 August 1999. Colonel Joseph K. Schmitt, the Savannah District Commander, signed the NEPA decision document and Finding of No Significant Impact (FONSI) in Aug 1999. Funding for the JST O2 system and other measures have been approved, but construction and implementation are dependent upon receipt of funds as requested in FY 05 and FY 06.	
SUMMARY	With commercial operation now gained through a U.S. District Court decision, the environmental monitoring will continue into FY 10. The project will be physically complete in FY 07 with completion of the 02 system to be installed in JST and completion of the installation of the static start system for pumped storage and installation of new SF6 circuit breakers is scheduled for FY 05.	
REMARKS	Delays in completion of environmental features will limit the full operation of the pump-back units, which will limit power production to the preference customers in the Southeast.	
MAP	Full size, high resolution (72 dpi)	Full size, higher resolution (150 dpi)
Congressional Fact Book		**March 2004**

[Return to Main Page]

CONSTRUCTION GENERAL



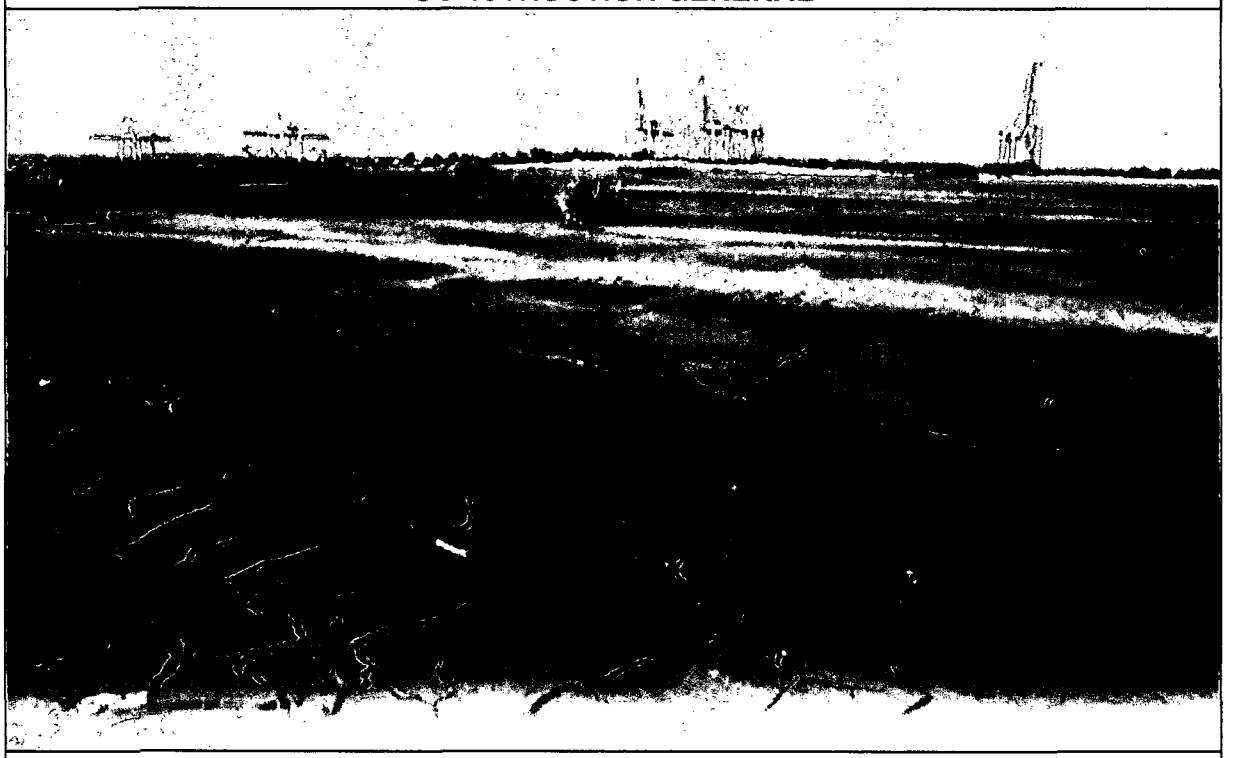
RICHARD B. RUSSELL
SOUTH CAROLINA MITIGATION LANDS

EA and Appendices	PDF format click here
AUTHORITY	WRDA 1986, 1999, modified by WRDA 2000
PURPOSE	Convey title of 10,165 acres of land in South Carolina from Federal ownership to the State of South Carolina to continue wildlife management of these lands as part of the mitigation of the Richard B. Russell project. Additionally, the Secretary would pay $4,850,000 in a lump sum to the State to replace the annual O&M payments the U. S. Army Corps of Engineers makes to the State of South Carolina for wildlife management of these lands.
PROJECT COST	$4,850,000
SCHEDULE	■ Re-submit Letter Report - Dec 2001 ■ Submitted PMP, Draft MOA, and Draft Disposal Deed May 2002 ■ ASA (CW) approval of preliminary documents – Jan 2003 ■ Execute MOA - Jul 2004 ■ Complete Environmental Documentation – Sep 2004 ■ Complete RE Closure Documents – Aug 2005
FEDERAL FUNDING	FY 04 (O&M) $10,000 FY 05 (O&M) $50,000 FY 04 (CG) $3,362,000 FY 05 (CG) $0
REMAINING SIGNIFICANT ACTION	Execute MOA with State, complete environmental and RE closure documents, transfer lands and pay State and obtain reimbursement of transfer costs.
MAPS	■ Half size, low resolution (72 dpi) ■ Full size, higher resolution (150 dpi)

Congressional Fact Book	March 2004

[Return to Main Page]

CONSTRUCTION GENERAL



SAVANNAH HARBOR WRDA '96 IMPLEMENTATION

AUTHORITY	WRDA of 1996; Policy Guidance Letter No. 47	
PURPOSE	To reduce the costs of dredge material disposal for our non-Federal Sponsor	
SPONSOR	Georgia Department of Transportation (GADOT)	
PROPOSED PLAN OF IMPROVEMENT	WRDA '96 allowed for the cost sharing of Federal Project dredge material diked disposal areas initial construction and long-term maintenance. The purpose of this project is to transfer 65% of the costs of dredge material disposal from the non-Federal sponsor to the Federal Government as allowed by this Law.	
COST OF IMPLEMENTATION	Federal Non-Federal **Total**	$ 21,970,000 $ 11,830,000 $33,800,000
IMPLEMENTATION	The above costs for implementation includes the maintenance of dikes GADOT has raised since WRDA '96, and future costs of dike raising and O&M costs. The sponsor is not seeking reimbursement for costs associated with construction of these dike raisings they have funded since WRDA '96.	
SCHEDULE	HQUSACE, ASA(CW) waiver approval District Draft of PCA Sponsor Concurrence with PCA PCA Package transmitted to HQUSACE Sponsor Concurrence with HQ Strike-thru HQUSACE, ASA PCA Approval WRDA '96 PCA Executed	
STATUS	An update to the Dredge Material Management Plan (DMMP) for Savannah Harbor has been finalized and reviewed by South Atlantic Division and HQUSACE. All comments have been coordinated with the GADOT and resolved, with the exception of one. A waiver request has been prepared for approval to begin the Operations and Maintenance of the existing disposal areas (that have been raised since October 96) immediately upon the execution of the Projects Cooperation Agreement to resolve that exception.	

	Awaiting resolution of the waiver request is the sole remaining issue, which once resolved, will allow the PCA to be processed.	
FEDERAL FUNDING	FY 04 (Work Allowance) $ 41,600 (O&M Funds) FY 05 (Budget) $2,900,000 (CG Funds)	
REMAINING SIGNIFICANT ACTIONS	■ Approval of the waiver request ■ Draft, Finalize, and Execute the PCA	
MAP	Half size, low resolution (72 dpi)	Full size, higher resolution (150 dpi)
Congressional Fact Book		**March 2004**

[Return to Main Page]

GENERAL INVESTIGATIONS

SAVANNAH RIVER BASIN COMPREHENSIVE, GA & SC

AUTHORITY	WRDA 1986, 1999, modified by WRDA 2000	
STUDY AUTHORIZING LANGUAGE	"Sec. 414. Savannah River Basin Comprehensive Water Resources Study (a) In general--The Secretary shall conduct a comprehensive study to address the current and future needs for flood damage prevention and reduction, water supply, and other related water resources needs in the Savannah River Basin. (b) Scope--The scope of the study shall be limited to an analysis of water resources issues that fall within the traditional civil works missions of the Army Corps of Engineers. (c) Coordination--Notwithstanding paragraph (2), the Secretary shall ensure that the study is coordinated with the Environmental Protection Agency and ongoing watershed study by the Agency of the Savannah River Basin."	
PURPOSE	■ Conduct basin-wide water resources management study focusing on water quantity related issues. ■ Investigate current operational plans for 3 Federal reservoirs to determine if changes or reallocations are warranted to meet current and future needs for flood control, water supply, fish and wildlife enhancement, drought control, water quality, recreation, and other related purposes.	
SPONSORS	■ Georgia Department of Natural Resources ■ South Carolina Department of Natural Resources	
STUDY & COST FORMAT	Reconnaissance Phase $548,000 ■ 18	Feasibility Phase $4 million ■ 9 years ■ 50/50 cost-shared ■ Formulate alternatives

	months ■ 100% Federally funded ■ Develop detailed plan of study	to meet current and future basin water resources needs
SCHEDULE	■ Initiated Reconnaissance Phase February 1998 ■ Completed Reconnaissance Report July 1999 ■ Signed FCSA June 2000 ■ Initiated Feasibility Study June 2000 ■ Complete Study September 2009	
FEDERAL FUNDING	FY 04 (Work Allowance) $130,000 FY 05 (Budget) $250,000	
STATUS	Feasibility Phase underway and is approximately 40% complete. The original time frame has been extended by 4 years to reflect funding restraints on the Federal side.	
REMAINING SIGNIFICANT ACTIONS	■ Finalize HEC Res Sims Model - Feb 04 ■ Finalize USGS 50 yr Hydrologic Model - Feb 04 ■ Complete Water Allocation Op Scenarios - Feb 04 ■ Complete Drought Management Evaluations & Recommendations - Sep 04 ■ Initiate and Complete any NEPA actions for Drought Mgt - Oct 04 ■ Complete any NEPA EA Actions - Jan 05 ■ Complete any NEPA EIS Actions - Jun 05 ■ Complete all Model Run Evaluations - Jun 05 - Complete Phase I Recommendations and ■ Draft Decision Documents - Sep 05 ■ Initiate Phase II actions - Oct 05	
RELATIONSHIP	**EPA Watershed Project is focusing on water quality,** **and other basin needs** ■ Preserve and enhance aquatic ecosystems in recognition of multiple uses. ■ Articulating goals and objectives. ■ Developing recommendations for short term and long-term action by various stakeholders or groups of stakeholders. **The Corps of Engineers' Water Resources Study is focusing on water quantity** ■ Investigate current operational plans for 3 reservoirs to determine if changes are warranted to meet current and future needs. ■ Address flood control, water supply, fish and wildlife enhancement, drought control, water quality, recreation, aquatic plant control. ■ COE study is a means to implement certain recommendations of EPA's study. ■ Study management plan includes EPA Policy Committee as part of study coordination activities.	
WEBSITE	Additional study information and progress can be	

	found on the study's web page.	
MAPS	Half size, low resolution (72 dpi)	Full size, higher resolution (150 dpi)
Congressional Fact Book		**March 2004**

[Return to Main Page]

CONSTRUCTION GENERAL

THURMOND LAKE POWERHOUSE, GA & SC (Major Rehab)

AUTHORITY	Flood Control Act of 1944 (original project authorization) and HQUSACE guidance for Major Rehab Program.
PURPOSE	Improve reliability and outputs of the hydropower plant at Thurmond Dam.
PLAN OF IMPROVEMENT	■ Rewind 7 generators ■ Replace 7 hydroelectric turbines with dissolved oxygen improving turbines ■ Replace/refurbish key electrical/mechanical peripheral equipment, (Governor, Exciters and Circuit Breakers) ■ Replace 4 transformers
PROJECT COST	$69,200,000
SCHEDULE	■ Completion of Feasibility Report March 1994 ■ Completion of PED April 1996 ■ Circuit Breaker Supply contract 100% complete ■ Exciters Supply contract 100% complete ■ Installation contract for Circuit Breakers and Exciters 100% complete ■ Transformer supply contract 100% complete ■ Generator rewind contract 100% complete ■ Turbine supply contract 70% complete ■ Project physically complete September 2006
FEDERAL FUNDING	■ FY 04 (Work Allowance) $3,465,000 ■ FY 05 (Budget) $4,000,000
REMAINING SIGNIFICANT ACTIONS	■ Continue Turbine Replacement Contract
	■ Half size, low resolution (72 dpi)

MAP	■ Full size, higher resolution (150 dpi)
Congressional Fact Book	**March 2004**

[Return to Main Page]

LBC&W Letter.pdf

50-269
50-270
50-287

LBC&W ASSOCIATES OF SOUTH CAROLINA ■ 1800 GERVAIS STREET, COLUMBIA, SOUTH CAROLINA 29202

November 15, 1972

RECEIVED NOV 20 1972

Mr. L. G. Hulman
Senior Hydraulic Engineer
Site Analysis Branch
Directorate of Licensing
Atomic Energy Commission
7920 Norfolk Avenue
Bethesda, Maryland 20014

Dear Mr. Hulman

1. In accordance with contract # AT(49-24)-008, dated 31 October 1972, and associated understandings, I have made hydrologic engineering studies pertaining to the Keowee-Toxaway development of the Duke Power Company's Oconee Nuclear Station in Oconee County, South Carolina. A concise summary of my findings and conclusions is presented herein. Supporting technical details in documented form are available for your review if desired.

2. The assignment related specially to the following:

a. Computation of probable maximum flood (PMF) hydrographs of inflow into Jocassee and Keowee Reservoirs, respectively;

b. Routing of the PMF hydrographs through Jocassee and Keowee Reservoirs under critical assumptions, to determine hydrographs of reservoir stages and outflow rates;

c. Computation of wave characteristics and vertical heights of runup on embankments of the Jocassee, Keowee and Little River Dams, respectively, that might coincide with maximum reservoir stages during the probable maximum floods;

d. A summary of conclusions regarding estimates referred to above, particularly as they relate to the safety of the dams against failure during extreme floods.

3. The policy concepts, methods, hydrometeorological criteria, and basic flood routing assumptions adhered to in the assignment conform essentially with those adopted by the Atomic Energy Commission to govern the determination of spillway capacities and freeboard requirements for very large dams, generally as summarized in the February 1972 draft, Standard Format and Contents of Safety Analysis Reports for Nuclear Power Plants.

6371

LBC&W Letter.pdf

PERTINENT DATA

4. Following is a brief summary of physical features that relate to the studies:

a. Keowee Lake, controlling 439 square miles, is formed by a 150-foot high earthfill dam on the Keowee River and a 170-foot high earthfill dam on Little River; a "connecting canal" joins lakes formed by these two dams, and is large enough to allow the two lakes to act as one. The Keowee and Little River Dams each have top elevations of 815' msl. On each dam the upstream embankment is surfaced with dumped rock for erosion protection above elevation 772' msl, which has a slope at 1' V to 2.0' H. The downstream embankment has a slope of 1' V to 2.5' H.

b. The 385-foot high rockfill Jocassee Dam, located about 12 miles upstream from Keowee Dam, controls 148 square miles of the total 439 square mile basin above the Keowee-Little River Dams. The top elevation of the embankment is 1125' msl. Upstream and downstream rockfill embankments each have a slope of 1' V to 1.75' horizontal in the upper 100 feet of elevation, which includes the zone considered in estimating potential wave runup effects.

c. Keowee Lake has a gross storage capacity of 956,000 acre-feet at a normal full-pool elevation of 800' msl, with a surface area of 18,372 acres (29 square miles). The Jocassee Reservoir has a gross storage capacity of 1,160,000 acre-feet at a normal full-pool elevation of 1,110 feet msl, and a surface area of 7565 acres (12 square miles).

d. The Keowee Dam spillway consists of four tainter gates, 38' W x 35' H, with a crest elevation of 765' msl and a total discharge capacity of 106,000 cubic feet per second at a normal full-pool level of 800' msl. The Jocassee spillway has two tainter gates, 38' W x 33' H, crest elevation 1077' msl, with a combined capacity of 46,200 cfs at a normal full-pool level of 1,110 msl.

e. In addition to spillways, the Keowee and Jocassee Dams have power turbines capable of discharging substantial quantities of water. Operating plans for Jocassee Dam provide for releases up to 15,000 cfs through power turbines to augment spillway discharges during floods, if needed. However, such turbine operations could be precluded by interruptions in power loadings or for other reasons under emergency conditions associated with extreme floods. Accordingly, in the studies reported herein, releases through power turbines were assumed as zero in routing the Probable Maximum Flood through the reservoirs.

LBC&W Letter.pdf

CRITICAL FLOOD ESTIMATES

5. Probable Maximum Precipitation (PMP) estimates for the 439 square mile basin above Keowee Lake, and relevant sub-division thereof, were obtained from Hydrometeorological Report No. 33 of the U. S. Weather Bureau (now NOAA). Alternative areal distributions of PMP quantities were tested to develop critical flood producing relations. The Probable Maximum Flood from the 148 square mile basin above Jocassee Dam would result when the heaviest PMP concentration occurred over this area; the critical PMF hydrograph at Keowee Dam would result with the heaviest PMP amounts concentrated over the 291 square mile intermediate area between Jocassee and the dams forming Keowee Lake. PMF hydrographs were computed by application of synthetic unit hydrographs to estimates of PMP rainfall-excess assuming an infiltration index of .06 inch per hour. The synthetic unit hydrographs were derived for component drainage areas tributary to full reservoirs to account for the accelerating effects of unusually large water surfaces of Lake Keowee and Lake Jocassee at normal full-pool elevations, which represent more than 9 percent of the total 439 square mile drainage area. The selection of coefficients used in developing synthetic unit hydrographs were based on studies of unit hydrographs derived from analyses of major floods.

6. The computed PMF hydrograph of inflow into Jocassee Lake had a peak of 245,000 cfs, and a runoff volume of 210,000 acre-feet (26.6 inches runoff from 148 sq. mi.). Assuming the reservoir would be filled to elevation 1,110' msl at the beginning of the PMF, and all releases made through the two spillway gates, a peak reservoir stage of 1,122.5' msl was computed; stages exceeding 1,119.7' msl would prevail for 12 hours. The peak rate of reservoir outflow through the spillway would be 72,000 cfs.

7. The computed PMF hydrograph of inflow into Lake Keowee had a peak of 450,000 cfs, and a runoff volume of 550,000 acre-feet (23.5 inches runoff from 439 square miles). Assuming the reservoir would be initially filled to elevation 800' msl, and all releases made through the four spillway gates, a peak reservoir level of 809.8' msl was computed; levels exceeding 806.6' msl would prevail for 12 hours. These values are predicated on the assumption that all concurrent releases from Jocassee Reservoir are made through the spillway, without flows through power turbines.

FREEBOARD FOR WAVE ACTION

8. Following is a review of the apparent adequacy of existing dams to safely accommodate wave action in Lake Jocassee and Lake Keowee in the event high winds blowing toward the dams should prevail for several hours while reservoir levels are equal to or near the maximum elevations indicated for PMF conditions. Relevant procedures and computational aids contained in publications by the Army Corps of Engineers (EC 1110-2-27, and ETL 1110-2-8, dated 1 August 1966) were used in the analyses.

LBC&W Letter.pdf

9. Wind records and analyses show that wind velocities as high as 35 to 40 miles per hour over-land, for durations of 1 to 6 hours, may occur infrequently in the vicinity of Lake Jocassee and Lake Keowee. Research studies indicate that over-land wind velocities of 35 to 40 mph would accelerate approximately 25 percent over the open water surfaces near the dams - that is to over-water velocities of 44 to 50 mph. Whether or not such winds might coincide with peak reservoir levels during the PMF, and be oriented over the "effective fetch" in a critical direction toward the respective dams, is largely a matter of conjecture. In general, studies show that wind directions tend to change substantially over local areas as storm centers move, even though velocities in various directions may persist at high rates for several hours. In general recognition of the improbability of the most critical wind velocity-duration-direction relations coinciding with maximum reservoir levels, the publications cited above provide for adoption of "design wind" criteria that are considered reasonable on the basis of available data and design objectives involved. Estimates based on these criteria are used as aids to over-all judgement of possible wave effects on project features. In the instant case, a "design wind" corresponding to an over-land velocity of 25 mph for a period of 6 hours was considered reasonable in estimating heights of runup that might be expected during the PMF. However, the possible effects of wave action that could conceivably result from winds equal to 40 mph over-land were also considered to assure that hazards from possible breaching of the dams from wave erosion would not exist even during extreme conditions. (Wind velocities cited herein refer to "over-land" rates; however, corrections for velocity increases over water have been accounted for in wave computations).

10. The Jocassee Dam top elevation of 1125' msl provides a freeboard of 2.5' above the computed maximum reservoir level during the PMF elevation 1122.5' msl. Computations indicate that a sustained wind velocity equivalent to 25 mph over-land, acting on a 2.5-mile "effective fetch," could result in "significant waves" (h_s) 1.9 feet high, which would break and run up the face of Jocassee Dam to a vertical height of approximately 2.5 feet above reservoir levels prevailing during the PMF; a negligible amount of wave splash or over-wash from waves exceeding h_s might pass over the crest of the dam. For corresponding conditions, a sustained wind velocity equal to 40 mph over-land would produce runup approximately 1.5 feet higher, and moderate amounts of wave-splash and wave over-wash might pass over the crest of the dam for a period of a few hours. In view of the characteristics of the rockfill embankments of Jocassee Dam, it is concluded that this wave action would not be sufficient to represent any risk of breaching of the embankment of Jocassee Dam.

11. The Keowee Dam top elevation of 815' msl provides a freeboard of 5.2 feet above the computed maximum reservoir level during the PMF elevation 809.8' msl. A sustained wind velocity comparable to 40 mph over-land, blowing toward the dam over an effective fetch of 2.2 miles would produce significant waves 3.2' high, capable of running up 4.0 feet on the riprap embankment (slope 1:2); the maximum wave in a spectrum of 100 waves would run up about one foot higher. Accordingly, computations indicate that Keowee Dam is high enough to prevent wave over-wash under the most cirtical PMF conditions. The same conclusion is applicable to Little River Dam, where the effective fetch (1.9 miles) is less than for the Keowee Dam.

LBC&W Letter.pdf

CONCLUSIONS

12. Procedures and Criteria. The policy concepts, methods, hydrometeorological criteria, and basic flood routing assumptions used in the subject studies are consistent with sound engineering practices associated with the design of very large dams in the United States; they foster a safe degree of conservatism in evaluations pertaining to the projects covered by this report.

13. Jocassee Dam and Reservoir.

a. The Probable Maximum Flood hydrograph of inflow into Lake Jocassee would have a peak discharge of approximately 245,000 cfs, and a runoff volume of 210,000 acre-feet.

b. A maximum reservoir level of 1,122.5' msl could be attained in Lake Jocassee during the PMF under the most adverse circumstances considered reasonably possible.

c. The top elevation of 1,125' msl of Jocassee Dam provides a freeboard allowance for possible wave runup on the rockfill embankment equal to 2.5 feet above the peak PMF reservoir level (1,122.5' msl) estimated herein. It is remotely possible that sustained wind velocities (equal to 25 to 40 mph over land), blowing toward the dam could cause wave runup and some wave over-wash of the Jocassee embankment for a few hours during the PMF. However, the rockfill composition of the dam embankment is such as to preclude breaching of the embankment from wave wash of the general magnitude indicated.

14. Keowee and Little River Dams.

a. The Probable Maximum Flood Hydrograph of inflow into Lake Keowee would have a peak discharge of approximately 450,000 cfs and a runoff volume of 550,000 acre-feet.

b. A maximum reservoir level of approximately 810.' msl could be attained in Lake Keowee during the PMF under the most critical circumstances considered reasonably possible.

LBC&W Letter.pdf

c. It is remotely possible that sustained wind velocities (40 mph or less over land), blowing toward the dams during the PMF could cause wave runup on the riprap covered face of each dam approaching crest elevation 815' msl.

Albert L. Cochran

ALBERT L. COCHRAN
Director of Special Projects
Lyles, Bissett, Carlisle & Wolff

ALC:ad

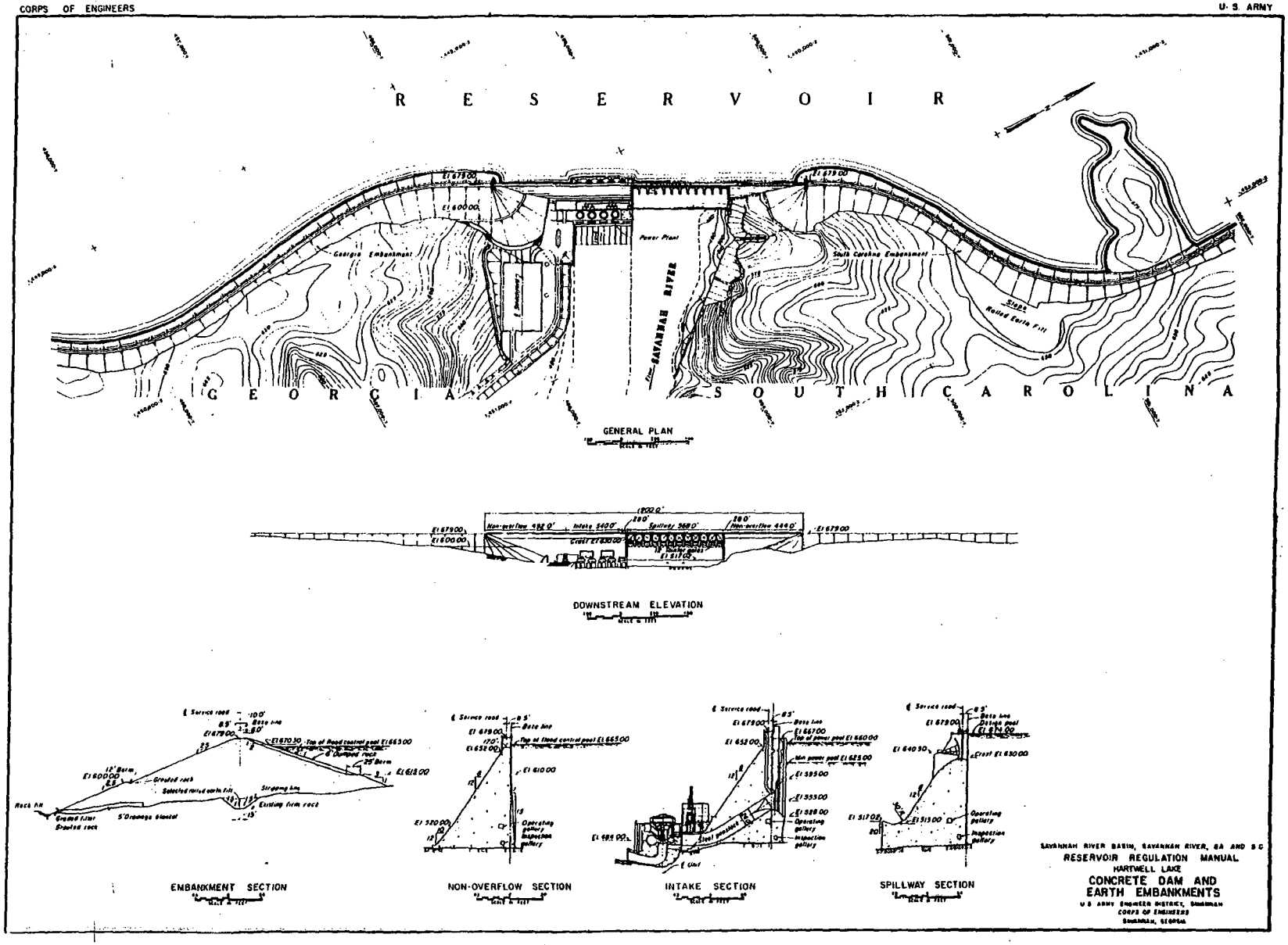


Plate H7.2

Page 1 of 3

WCMDamSections.pdf

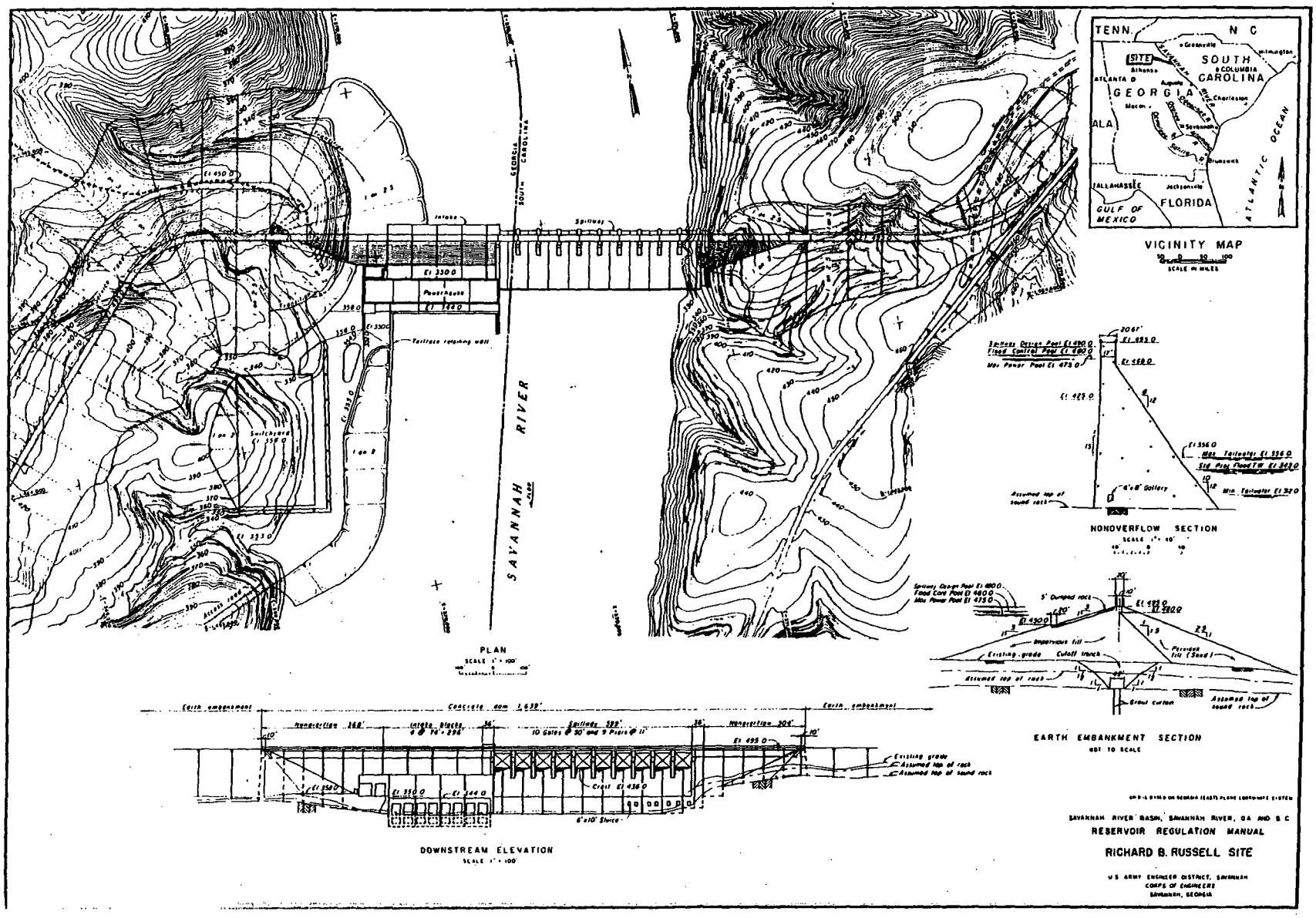


Plate R7.2

WCMDamSections.pdf

Page 2 of 3

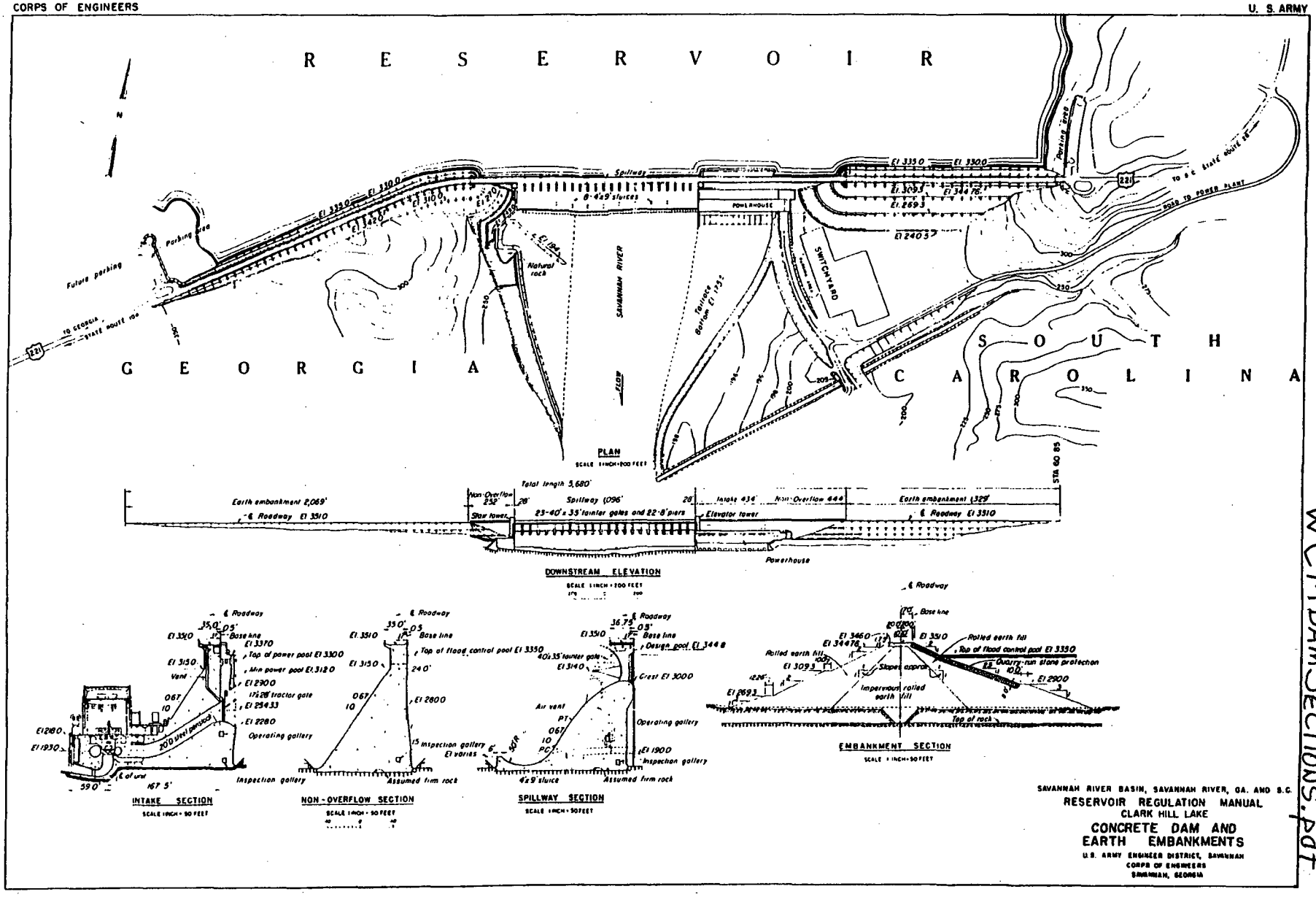
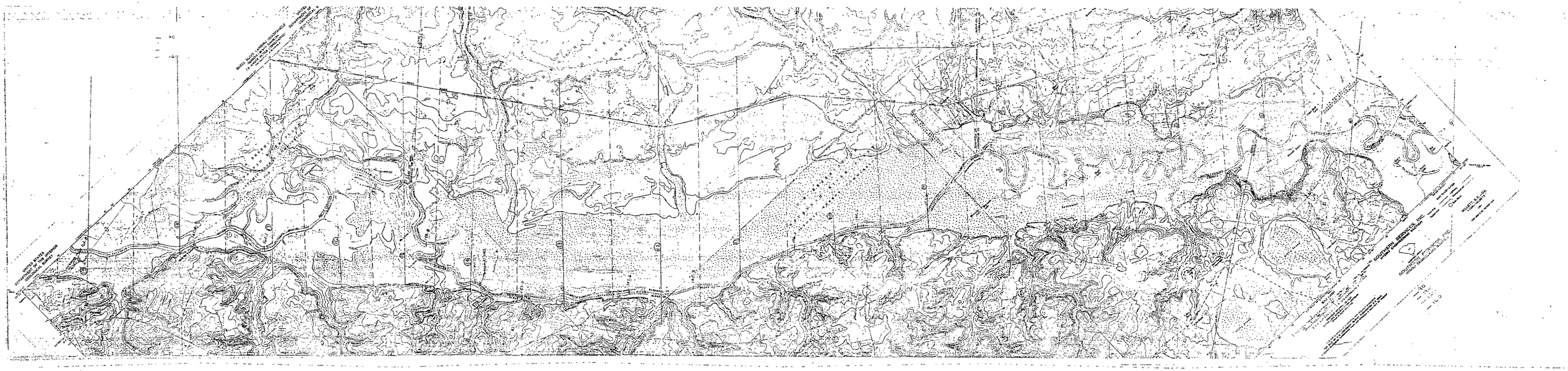


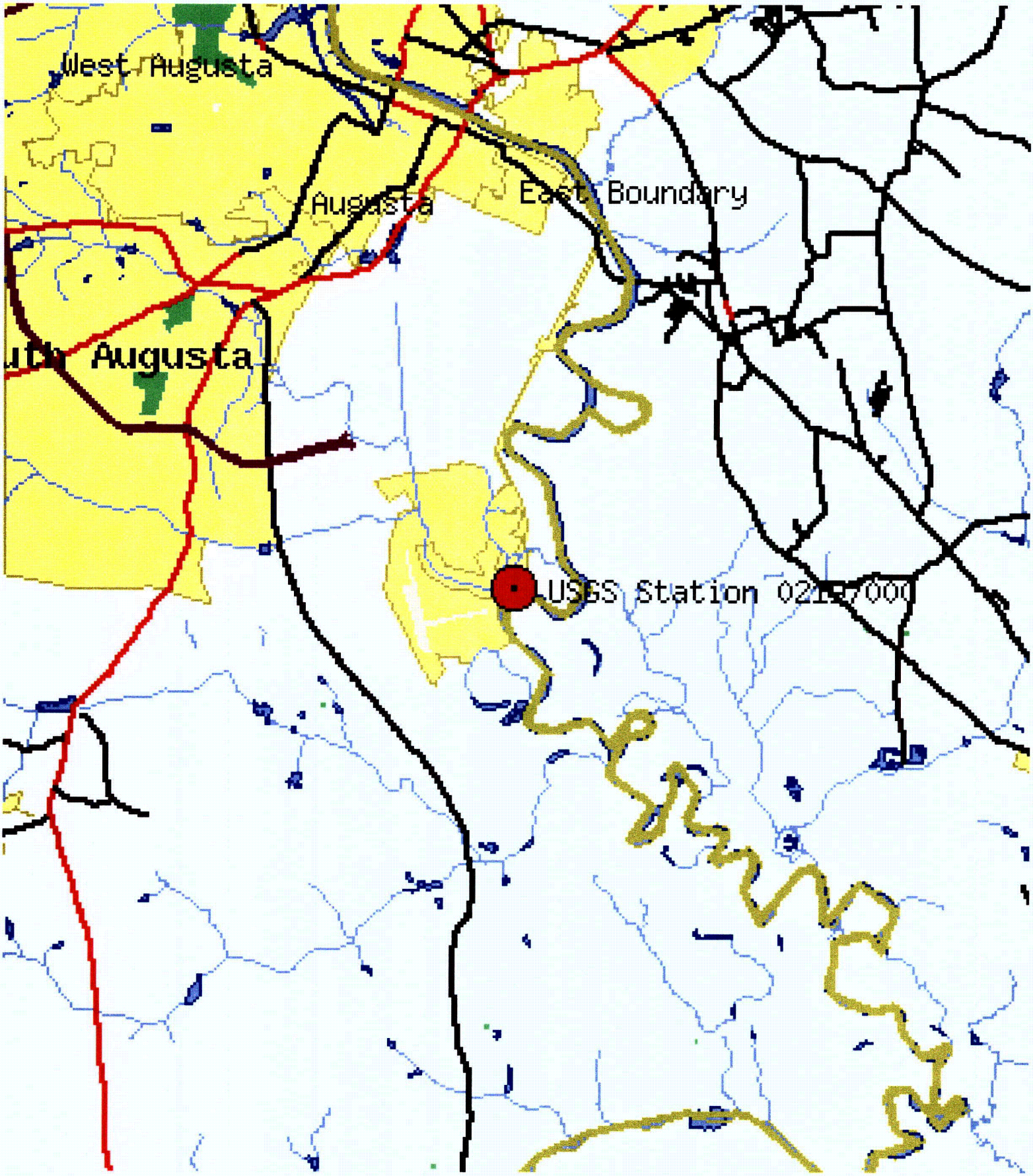
Plate T7.2

WCMDamSections.pdf

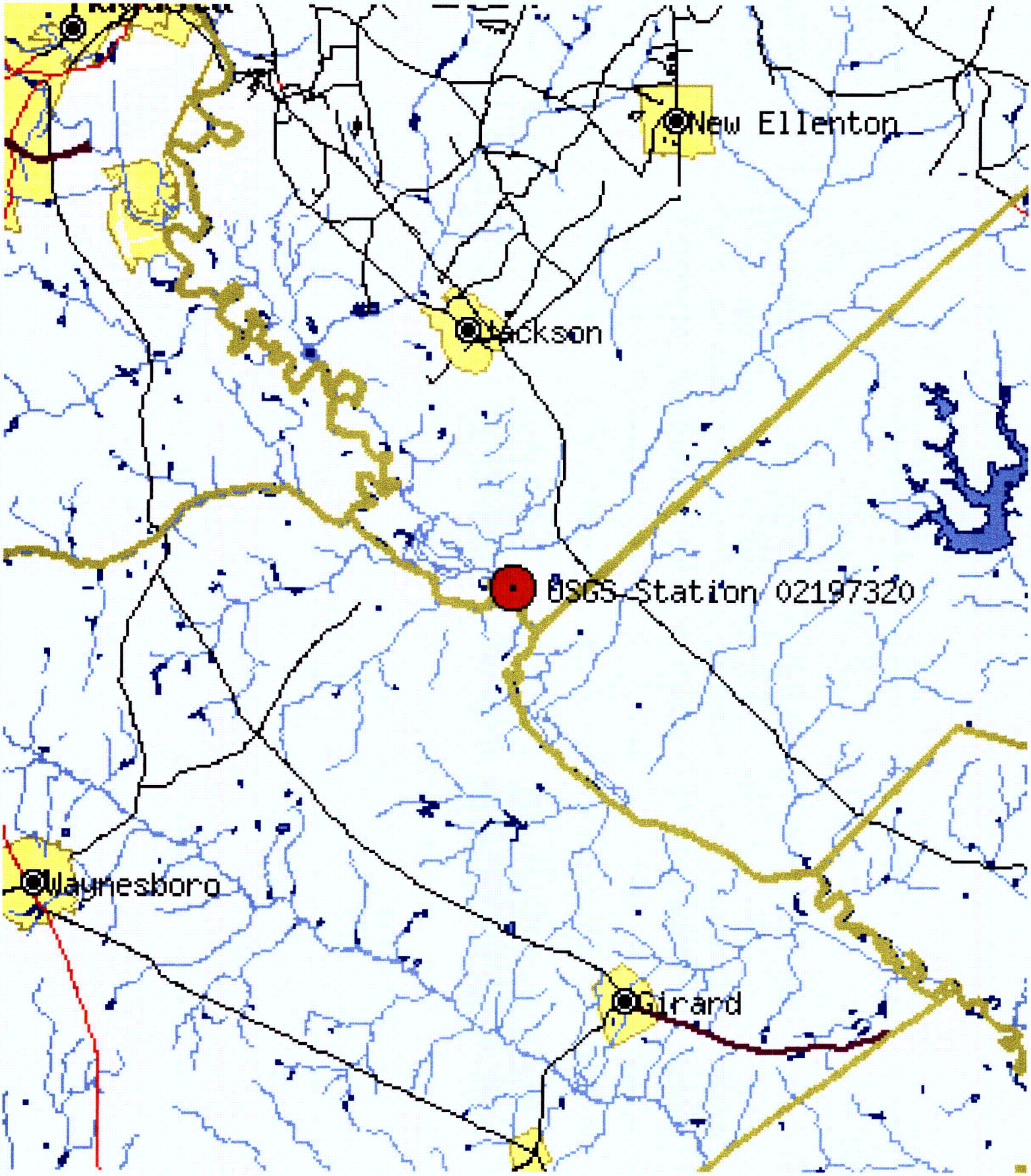
Composite Top Map_VEGP1971.pdf



gage7000.bmp

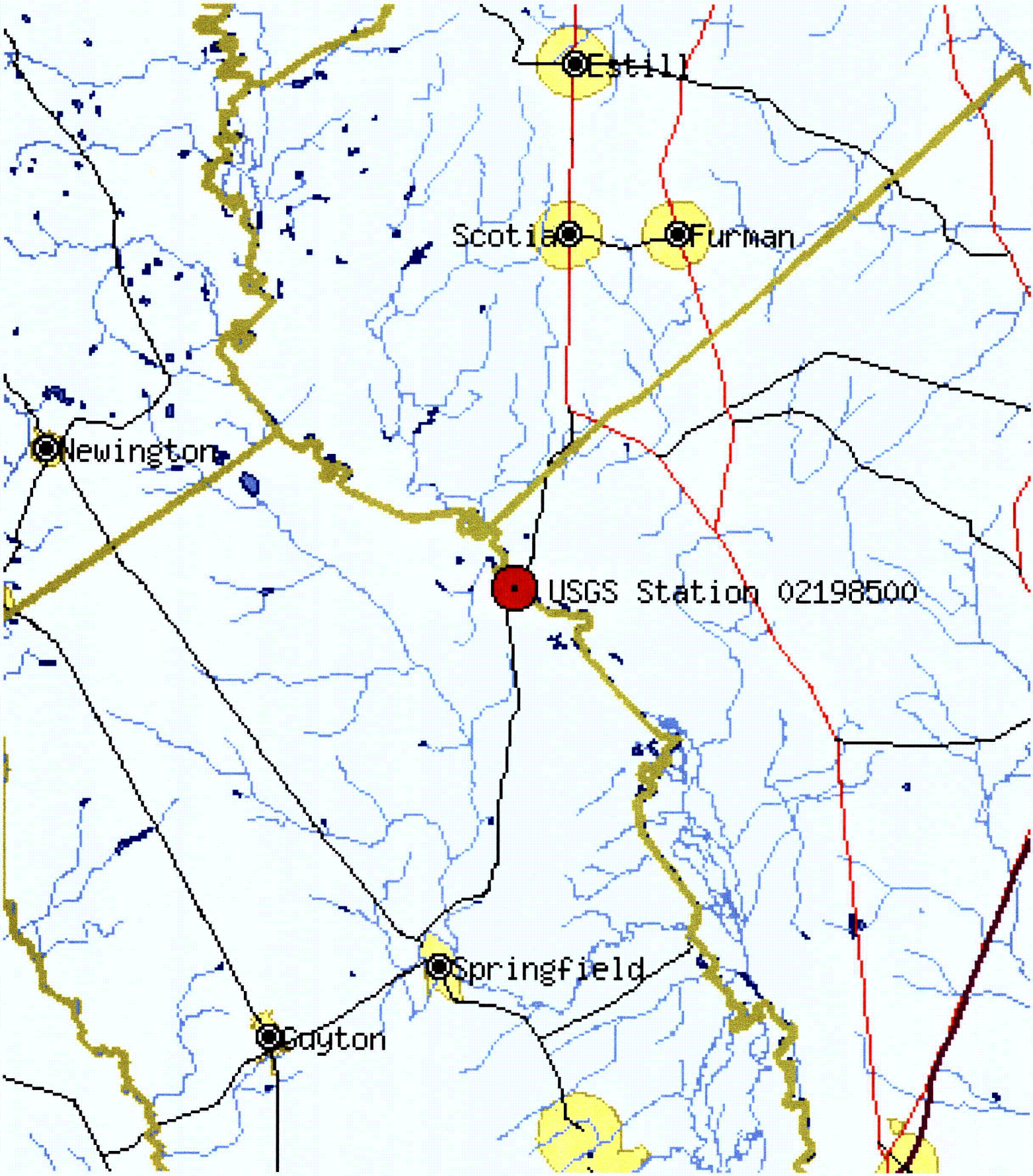


gage7320.bmp



gage 7500.bmp

gage8500.bmp



```
#
# USGS NWISWeb site number list
#
# This file can be used to retrieve data from the
# USGS NWISWeb internet based retrieval system using
# the 'File of site Numbers' search criteria.
#
# This file can be editted, but the number of columns
# must be equal for each row, and the 'site_no' column
# must remain.
#
# The columns include:
#  agency_cd  -- Agency code.  If no value is found, 'USGS' is assumed
#  site_no    -- USGS site number
#  station_nm -- USGS site name. This column is include for viewing only,
#                it is not used by the nwisweb system.
#
agency_cd site_no     station_nm
5s        15s         56s
USGS      02187252 SAVANNAH RIVER BELOW HARTWELL LK NR HARTWELL, GA
USGS      02187500 SAVANNAH RIVER NEAR IVA,S.C.
USGS      02189000 SAVANNAH RIVER NEAR CALHOUN FALLS, S. C.
USGS      02195000 SAVANNAH RIVER NEAR CLARKS HILL, S.C.
USGS      02196484 SAVANNAH RIVER NEAR NORTH AUGUSTA, SC
USGS      02197000 SAVANNAH RIVER AT AUGUSTA, GA
USGS      021973007          MILL CREEK AT SAVANNAH RIVER SITE, SC
USGS      021973012          CROUCH BR NR H AREA AT SAVANNAH RIVER SITE, SC
USGS      021973055          UPPER THREE RUNS ABOVE F-AREA AT SAVANNAH RIVER SI
USGS      02197320 SAVANNAH R. NR JACKSON, SC
USGS      02197321 X-004 AT SAVANNAH RIVER SITE, SC
USGS      02197323 D-006 AT SAVANNAH RIVER SITE, SC
USGS      02197324 D-003 AT SAVANNAH RIVER SITE, SC
USGS      02197334 SITE NO. 3 AT SAVANNAH RIVER SITE, SC
USGS      02197338 SITE NO. 5 AT SAVANNAH RIVER SITE, SC
USGS      02197339 SITE NO. 5B AT SAVANNAH RIVER SITE, SC
USGS      02197340 SITE NO. 6 AT SAVANNAH RIVER SITE, SC
USGS      021973405          C-001 AT SAVANNAH RIVER SITE, SC
USGS      02197342 SITE NO. 7 AT SAVANNAH RIVER SITE, SC
USGS      021973424          C-003 AT SAVANNAH RIVER SITE, SC
USGS      021973426          C-004 AT SAVANNAH RIVER SITE, SC
USGS      02197345 K-011, AT SAVANNAH RIVER SITE, SC
USGS      021973455          INDIAN GRAVE BRANCH AT SAVANNAH RIVER SITE, SC
USGS      021973471          PEN BRANCH AT RD B, AT SAVANNAH RIVER SITE, SC
USGS      02197351 P-013 AT SAVANNAH RIVER SITE, SC
USGS      021973515          STEEL CK ABOVE RD B AT SAVANNAH RIVER SITE, SC
USGS      021973525          L-007 OUTFALL AT SAVANNAH RIVER SITE, SC
USGS      02197354 P-007 AT SAVANNAH RIVER SITE, SC
USGS      021973565          STEEL CREEK @ ROAD A @ SAVANNAH RIVER SITE, SC
USGS      02197362 P-19 AT SAVANNAH RIVER SITE, SC
USGS      02197500 SAVANNAH R AT BURTONS FERRY BR NR MILLHAVEN, GA
```

USGS 02198500 SAVANNAH RIVER NEAR CLYO, GA

```
#
#
# US Geological Survey
# retrieved: 2006-01-13 18:36:26 EST
# URL: http://waterdata.usgs.gov/nwis/dvstat
#
# The Site File stores location and general information about ground water,
# surface water, and meteorological sites
# for sites in USA.
#
# The following selected fields are included in this output:
#
#  agency_cd       -- Agency
#  site_no         -- Site identification number
#  station_nm      -- Site name
#  lat_va          -- DMS latitude
#  long_va         -- DMS longitude
#  coord_acy_cd    -- Latitude-longitude accuracy
#  coord_datum_cd  -- Latitude-longitude datum
#  state_cd        -- State code
#  county_cd       -- County code
#  alt_va          -- Altitude of Gage/land surface
#  alt_acy_va      -- Altitude accuracy
#  alt_datum_cd    -- Altitude datum
#  huc_cd          -- Hydrologic unit code
#
#
# query started 2006-01-13 18:36:26 EST
#
# there are 32 sites matching the search criteria.
#
#
agency_cd site_no    station_nm lat_va    long_va   coord_acy_cd      coord_datum_cd    state_cd
county_cd alt_va     alt_acy_va alt_datum_cd        huc_cd
5s        15s        50s        11s       12s       1s        10s     2s        3s      8s        3s
10s       16s
USGS      02187252   SAVANNAH RIVER BELOW HARTWELL LK NR HARTWELL, GA          342115
0824855   S          NAD27      45        007       470.                NGVD29    03060103
USGS      02187500   SAVANNAH RIVER NEAR IVA,S.C.      341520    0824442   U         NAD27     45
007       432.26                NGVD29    03060103
USGS      02189000   SAVANNAH RIVER NEAR CALHOUN FALLS, S. C.          340415    0823830   U
NAD27     45         001        363.53                NGVD29    03060103
USGS      02195000   SAVANNAH RIVER NEAR CLARKS HILL, S.C.     333840    0821205   U
NAD27     13         073        182.69                NGVD29    03060103
USGS      02196484   SAVANNAH RIVER NEAR NORTH AUGUSTA, SC333306         0820219   U
NAD27     45         037        150.                  NGVD29    03060106
USGS      02197000   SAVANNAH RIVER AT AUGUSTA, GA     332225    0815635   U         NAD27     13
245       96.58                 NGVD29    03060106
USGS      021973007             MILL CREEK AT SAVANNAH RIVER SITE, SC       331914    0813532   F
NAD27     45         011        177.4     5         NGVD29    03060106
```

```
USGS    021973012       CROUCH BR NR H AREA AT SAVANNAH RIVER SITE, SC  331727
0813857 F       NAD27   45      003     230.            NGVD29  03060106
USGS    021973055       UPPER THREE RUNS ABOVE F-AREA AT SAVANNAH RIVER SI
331741  0814133 R       NAD27   45      003     120     5       NGVD29  03060106
USGS    02197320 SAVANNAH R. NR JACKSON, SC     331301  0814604 R       NAD27   45
003     77.00   5       NGVD29  03060106
USGS    02197321 X-004 AT SAVANNAH RIVER SITE, SC 331237 0814538 U      NAD27   45
003     110.            NGVD29  03060106
USGS    02197323 D-006 AT SAVANNAH RIVER SITE, SC 331212 0814438 U      NAD27   45
011     120.            NGVD29  03060106
USGS    02197324 D-003 AT SAVANNAH RIVER SITE, SC 331207 0814434 U      NAD27   45
011     120             NGVD29  03060106
USGS    02197334 SITE NO. 3 AT SAVANNAH RIVER SITE, SC  331631  0813912 R
NAD27   45      011     198.9   .10     NGVD29  03060106
USGS    02197338 SITE NO. 5 AT SAVANNAH RIVER SITE, SC  331650  0814015 U
NAD27   45      003     250.6           NGVD29  03060106
USGS    02197339 SITE NO. 5B AT SAVANNAH RIVER SITE, SC 331629  0814006 R
NAD27   45      003     191.2   .1      NGVD29
USGS    02197340 SITE NO. 6 AT SAVANNAH RIVER SITE, SC  331623  0814005 U
NAD27   45      003     187.9           NGVD29  03060106
USGS    021973405       C-001 AT SAVANNAH RIVER SITE, SC 331513 0814053 U
NAD27   45      011     245             NGVD29  03060106
USGS    02197342 SITE NO. 7 AT SAVANNAH RIVER SITE, SC  331440  0814145 U
NAD27   45      011     155.    251     NGVD29  03060106
USGS    021973424       C-003 AT SAVANNAH RIVER SITE, SC 331447 0814027 U
NAD27   45      011     280.            NGVD29  03060106
USGS    021973426       C-004 AT SAVANNAH RIVER SITE, SC 331420 0814025 U
NAD27   45      011     220.            NGVD29  03060106
USGS    02197345 K-011, AT SAVANNAH RIVER SITE, SC 331240 0814028 U     NAD27   45
011     200.            NGVD29  03060106
USGS    021973455       INDIAN GRAVE BRANCH AT SAVANNAH RIVER SITE, SC 331245
0814031 M       NAD27   45      003     225.            NGVD29  03060106
USGS    021973471       PEN BRANCH AT RD B, AT SAVANNAH RIVER SITE, SC  331212
0813851 U       NAD27   45      011     160.            NGVD29  03060106
USGS    02197351 P-013 AT SAVANNAH RIVER SITE, SC 331353 0813506 U      NAD27   45
011     260.            NGVD29  03060106
USGS    021973515       STEEL CK ABOVE RD B AT SAVANNAH RIVER SITE, SC  331258
0813613 U       NAD27   45      011     208             NGVD29  03060106
USGS    021973525       L-007 OUTFALL AT SAVANNAH RIVER SITE, SC 331226 0813727 U
NAD27   45      011     195.42          NGVD29  03060106
USGS    02197354 P-007 AT SAVANNAH RIVER SITE, SC 331333 0813439 U      NAD27   45
011     310             NGVD29  03060106
USGS    021973565       STEEL CREEK @ ROAD A @ SAVANNAH RIVER SITE, SC  330844
0813744 U       NAD27   45      011     110.0           NGVD29  03060106
USGS    02197362 P-19 AT SAVANNAH RIVER SITE, SC  331406  0813500 U     NAD27   45
011     270.            NGVD29  03060106
USGS    02197500 SAVANNAH R AT BURTONS FERRY BR NR MILLHAVEN, GA        325620
0813010 U       NAD27   13      251     52.42           NGVD29  03060106
USGS    02198500 SAVANNAH RIVER NEAR CLYO, GA   323141  0811608 R       NAD27   13
103     13.39   0       NGVD29
```

```
#
#
# US Geological Survey
# retrieved: 2006-01-13 18:47:09 EST
# URL: http://waterdata.usgs.gov/nwis/dvstat
#
# The Site File stores location and general information about ground water,
# surface water, and meteorological sites
# for sites in USA.
#
# The following selected fields are included in this output:
#
# site_no        -- Site identification number
# drain_area_va   -- Drainage area
# contrib_drain_area_va -- Contributing drainage area
# discharge_begin_date -- Daily streamflow data begin date
# discharge_end_date -- Daily streamflow data end date
# discharge_count_nu -- Daily streamflow data count
# peak_begin_date -- Peak streamflow data begin date
# peak_end_date   -- Peak streamflow data end date
# peak_count_nu   -- Peak streamflow data count
#
#
# query started 2006-01-13 18:47:09 EST
#
# there are 32 sites matching the search criteria.
#
#
site_no     drain_area_va         contrib_drain_area_va         discharge_begin_date discharge_end_date
discharge_count_nu  peak_begin_date     peak_end_date         peak_count_nu
15s         8s          8s
02187252 2090.                1984-10-01          1999-09-30          4502      1985-01-21
1999-08-24          15
02187500 2231.00              1950-10-01          1981-09-30          11323     1949-10-08
1981-07-24          32
02189000 2876.00              1896-10-01          1979-09-30          17044     1897-04-05
1980-03-28          82
02195000 6150.00              1940-05-14          1954-06-30          5161      0000-00-00
0000-00-00          0
02196484 7150.                1988-10-01          2002-09-30          5113      1989-09-21
2002-03-04          13
02197000 7508.                1883-10-01          2003-09-30          35793     1796-01-17
2004-06-14          133
021973007                             1994-10-01          2000-09-30          1394      1995-01-07
2000-09-23          3
021973012                             1991-10-01          2002-09-30          4018      1992-04-21
2001-07-03          10
021973055                             2001-05-11          2002-09-30          508       2002-02-08
2002-02-08          1
02197320 8110.00              1971-10-01          2002-09-30          10733     1972-01-21
```

2002-03-05 30
02197321 1983-12-16 1996-09-30 4673 1984-02-27
1996-06-08 12
02197323 1984-05-23 2003-09-30 7070 1984-06-29
2004-09-27 21
02197324 1983-12-15 2000-09-30 6085 1984-06-29
2000-09-22 17
02197334 5.95 1972-10-01 1999-09-30 9714 1979-11-02
1999-06-29 19
02197338 0.28 1972-10-01 2002-09-30 10928 1984-05-07
2002-03-12 19
02197339 0.57 1980-10-01 2002-09-30 8035 1984-05-07
2002-02-06 19
02197340 7.53 1972-10-01 2002-09-30 10903 1979-11-02
2002-08-27 23
021973405 1983-12-15 1996-09-30 4674 1984-07-01
1996-08-24 13
02197342 12.5 1972-10-01 2002-09-30 10869 1979-11-03
2002-02-07 22
021973424 1983-12-15 1996-09-30 4674 1984-05-28
1996-08-13 13
021973426 1983-12-16 1996-09-30 4622 1984-05-28
1996-03-07 13
02197345 1983-12-16 1996-09-30 4673 1984-03-14
1996-06-14 13
021973455 2.06 1986-10-23 1996-09-30 3631 1987-03-01
1996-06-14 10
021973471 1983-12-16 1996-09-30 4673 1984-05-28
1996-06-14 13
02197351 1983-12-20 1996-09-30 4669 1984-03-07
1996-08-03 13
021973515 1986-04-02 2002-09-30 6026 1986-06-10
2002-02-07 17
021973525 1985-10-01 2002-09-30 6183 1985-10-17
2002-03-05 17
02197354 1983-12-20 1996-09-30 4500 1984-07-19
1996-09-04 13
021973565 1985-03-01 2002-09-30 6423 1985-06-08
2002-02-07 18
02197362 1983-12-16 1996-09-30 4673 1984-02-21
1995-12-19 13
02197500 8650 1939-10-01 2003-09-30 18993 1929-10-00
2003-03-21 53
02198500 9850 1929-10-01 2003-09-30 25567 1925-01-24
2004-03-03 80

AugustaGAAvgAnnualQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Calendar Year Streamflow Statistics for the Nation

USGS 02197000 SAVANNAH RIVER AT AUGUSTA, GA

Available data for this site Surface-water: Annual streamflow statistics GO

Richmond County, Georgia
Hydrologic Unit Code 03060106
Latitude 33°22'25", Longitude 81°56'35" NAD27
Drainage area 7,508. square miles
Gage datum 96.58 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s
1884	10,630	1931	6,806	1955	5,367	1979	11,710
1885	9,642	1932	11,990	1956	5,550	1980	11,670
1886	12,620	1933	7,461	1957	7,645	1981	5,921
1887	9,718	1934	8,112	1958	10,300	1982	7,409
1888	16,780	1935	7,492	1959	8,569	1983	10,990
1889	12,700	1936	17,100	1960	11,110	1984	11,220
1890	8,665	1937	12,800	1961	9,349	1985	6,556
1891	14,050	1938	7,671	1962	8,746	1986	5,803
1896	7,802	1939	9,298	1963	10,020	1987	8,203
1897	9,730	1940	8,898	1964	18,530	1988	4,888
1898	9,894	1941	6,765	1965	10,800	1989	7,153
1899	11,270	1942	8,982	1966	9,398	1990	10,630
1900	12,310	1943	10,820	1967	9,152	1991	10,010
1901	16,430	1944	10,360	1968	8,281	1992	10,510
1902	12,290	1945	7,930	1969	9,821	1993	12,160

AugustaGAAvgAnnualQs.pdf

1903	13,530	**1946**	11,070	**1970**	6,967	**1994**	10,220
1904	5,528	**1947**	10,360	**1971**	9,479	**1995**	11,340
1905	8,676	**1948**	14,099	**1972**	9,957	**1996**	10,120
1906	15,840	**1949**	13,890	**1973**	12,740	**1997**	9,270
1925	7,892	**1950**	7,691	**1974**	9,840	**1998**	13,669
1926	7,743	**1951**	6,222	**1975**	13,590	**1999**	5,409
1927	6,219	**1952**	8,221	**1976**	12,290	**2000**	4,729
1928	11,210	**1953**	7,372	**1977**	10,320	**2001**	4,827
1929	21,130	**1954**	6,944	**1978**	9,336	**2002**	4,419
1930	7,637						

Questions about data Water Webserver Team Top
Feedback on this website NWISWeb Support Team Explanation of terms

Surface Water data for USA: Calendar Year Streamflow Statistics
http://waterdata.usgs.gov/nwis/annual/calendar_year?

Retrieved on 2006-03-16 18:14:56 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.57 1.32 nadww01

BurtonsFerryAverageAnnualQ.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

Calendar Year Streamflow Statistics for the Nation

USGS 02197500 SAVANNAH R AT BURTONS FERRY BR NR MILLHAVEN, GA

Available data for this site Surface-water: Annual streamflow statistics GO

Screven County, Georgia
Hydrologic Unit Code 03060106
Latitude 32°56'20", Longitude 81°30'10" NAD27
Drainage area 8,650 square miles
Gage datum 52.42 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s
1940	9,607	1953	8,622	1966	11,180	1991	11,670
1941	7,546	1954	7,382	1967	10,570	1992	11,860
1942	10,010	1955	5,974	1968	9,624	1993	14,449
1943	12,490	1956	6,309	1969	10,950	1994	11,800
1944	11,750	1957	8,312	1983	12,350	1995	12,770
1945	8,301	1958	11,040	1984	12,760	1996	11,440
1946	12,470	1959	9,748	1985	7,167	1997	10,440
1947	11,770	1960	13,110	1986	6,175	1998	16,020
1948	15,640	1961	10,910	1987	8,955	1999	6,320
1949	15,459	1962	10,580	1988	5,367	2000	5,451
1950	8,764	1963	11,140	1989	7,966	2001	5,772
1951	7,010	1964	20,500	1990	11,860	2002	5,168
1952	9,328	1965	12,780				

Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team
Top
Explanation of terms
Surface Water data for USA: Calendar Year Streamflow Statistics
http://waterdata.usgs.gov/nwis/annual/calendar_year?

Retrieved on 2006-04-14 17:43:00 EDT
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.25 1.25 nadww01

JacksonAnnuaMean.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

Calendar Year Streamflow Statistics for the Nation

USGS 02197320 SAVANNAH R. NR JACKSON, SC

Available data for this site Surface-water: Annual streamflow statistics GO

Aiken County, South Carolina
Hydrologic Unit Code 03060106
Latitude 33°13'01", Longitude 81°46'04" NAD27
Drainage area 8,110.00 square miles
Gage datum 77.00 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s
1981	6,050	1986	5,978	1999	6,309
1982	7,509	1988	5,213	2000	5,372
1985	6,751	1989	7,912	2001	5,437

Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team

Top
Explanation of terms

Surface Water data for USA: Calendar Year Streamflow Statistics
http://waterdata.usgs.gov/nwis/annual/calendar_year?

Retrieved on 2006-04-01 16:50:59 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.27 1.25 nadww01

```
Volume in drive M is FRES0304-F
Volume Serial Number is 9CCF-FA19

Directory of M:\list\Hydrology Calcs\USGS gage data\Annual Peak

12/05/2006  05:24 PM    <DIR>          .
12/05/2006  05:24 PM    <DIR>          ..
12/05/2006  05:24 PM                34 annpeak.txt
03/16/2006  06:19 PM            75,231 AugustaAnnualPeakQs.pdf
04/14/2006  04:42 PM            56,950 BurtonsFerryAnnualPeakQ.pdf
03/16/2006  06:10 PM            44,699 CalhounAnnualPeakQs.pdf
03/16/2006  06:22 PM            64,516 CalhounFallsAnnualPeakQs.pdf
03/16/2006  06:27 PM            64,395 ClyoAnnualPeakQ.pdf
03/16/2006  06:24 PM            52,779 JacksonAnnualPeakQ.pdf
01/17/2006  05:22 PM             9,895 peak.txt
01/17/2006  04:59 PM            11,978 peak7000.txt
01/17/2006  05:22 PM             9,895 peak7000Watstore.txt
01/17/2006  05:20 PM            11,978 peaktabformatted.txt
01/17/2006  02:35 PM             9,895 Qpeak302197000.txt
01/17/2006  02:59 PM             2,373 Qpeak302197320.txt
01/17/2006  02:52 PM             4,073 Qpeak302197500.txt
01/17/2006  03:09 PM             6,025 Qpeak302198500.txt
01/17/2006  03:43 PM            11,978 Qpeak7000mdy.txt
03/16/2006  03:47 PM         3,340,773 USGSReport1990.pdf
          17 File(s)      3,777,467 bytes
           2 Dir(s)  53,735,227,392 bytes free
```

AugustaAnnualPeakQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Peak Streamflow for the Nation

USGS 02197000 SAVANNAH RIVER AT AUGUSTA, GA

Available data for this site Site home page GO

Richmond County, Georgia
Hydrologic Unit Code 03060106
Latitude 33°22'25", Longitude 81°56'35" NAD27
Drainage area 7,508. square miles
Gage datum 96.58 feet above sea level NGVD29

Output formats

- Table
- Graph
- Tab-separated file
- WATSTORE formatted file
- Reselect output format

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1796	Jan. 17, 1796	38.0	280,000[2]
1840	May 28, 1840	37.5	260,000[2]
1852	Aug. 29, 1852	36.8	230,000[2]
1864	Jan. 01, 1864	34.0	160,000[2]
1865	Jan. 11, 1865	36.4	220,000[2]
1876	Dec. 30, 1875	28.60	86,400
1877	Apr. 14, 1877	31.40	119,000
1878	Nov. 23, 1877	23.50	51,500
1879	Aug. 03, 1879	22.00	44,000
1880	Dec. 16, 1879	30.10	102,000
1881	Mar. 18, 1881	32.20	130,000
1882	Sep. 12, 1882	29.30	93,300
1883	Jan. 22, 1883	30.80	111,000

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1937	Jan. 04, 1937	30.10	91,400
1938	Oct. 21, 1937	30.10	91,400
1939	Mar. 02, 1939	24.10	90,900
1940	Aug. 15, 1940	29.40	239,000
1941	Jul. 08, 1941	22.89	53,300
1942	Mar. 23, 1942	24.56	105,000
1943	Jan. 20, 1943	25.10	117,000
1944	Mar. 22, 1944	25.53	128,000
1945	Apr. 27, 1945	23.16	64,000
1946	Jan. 09, 1946	24.43	97,200
1947	Jan. 22, 1947	23.97	86,000
1948	Feb. 10, 1948	23.90	83,200
1949	Nov. 30, 1948	26.61	154,000
1950	Oct. 09, 1949	20.10	32,500

AugustaAnnualPeakQs.pdf

1884	Apr. 16, 1884	28.00	81,000
1885	Jan. 26, 1885	27.50	77,000
1886	May 21, 1886	32.50	135,000
1887	Jul. 31, 1887	34.50	173,000
1888	Sep. 11, 1888	38.70	303,000
1889	Feb. 19, 1889	33.30	149,000
1890	Feb. 27, 1890	22.90	48,500
1891	Mar. 10, 1891	35.50	197,000
1892	Jan. 20, 1892	32.80	140,000
1893	Feb. 14, 1893	25.00	60,000
1894	Aug. 07, 1894	24.00	54,000
1895	Jan. 11, 1895	30.40	106,000
1896	Jul. 10, 1896	30.50	107,000
1897	Apr. 06, 1897	29.30	93,300
1898	Sep. 02, 1898	31.30	117,000
1899	Feb. 08, 1899	31.00	113,000
1900	Feb. 15, 1900	32.70	138,000
1901	Apr. 04, 1901	31.80	124,000
1902	Mar. 01, 1902	34.60	175,000
1903	Feb. 09, 1903	33.20	147,000
1904	Aug. 10, 1904	25.50	63,000
1905	Feb. 14, 1905	25.80	64,800
1906	Jan. 05, 1906	29.60	96,600
1907	Oct. 05, 1906	23.60	52,000
1908	Aug. 27, 1908	38.80	307,000
1909	Jun. 05, 1909	28.70	87,300
1910	Mar. 02, 1910	26.40	69,800
1911	Apr. 14, 1911	19.10	32,800
1912	Mar. 17, 1912	36.80	234,000
1913	Mar. 16, 1913	35.10	156,000
1914	Dec. 31, 1913	24.30	48,000
1915	Jan. 20, 1915	28.20	61,000
1916	Feb. 03, 1916	31.00	82,400
1917	Mar. 06, 1917	29.20	68,000
1918	Jan. 30, 1918	25.50	45,500
1919	Dec. 24, 1918	35.00	128,000
1920	Dec. 11, 1919	35.40	133,000

1951	Oct. 22, 1950	22.32	46,300
1952	Mar. 06, 1952	21.53	39,300[5]
1953	May 08, 1953	20.80	35,200[6]
1954	Mar. 30, 1954	17.39	25,500[6]
1955	Apr. 15, 1955	16.77	23,900[6]
1956	Apr. 12, 1956	14.70	18,600[6]
1957	May 07, 1957	14.08	18,000[6]
1958	Apr. 18, 1958	22.91	66,300[6]
1959	Jun. 08, 1959	18.65	28,500[6]
1960	Feb. 14, 1960	20.58	34,900[6]
1961	Apr. 02, 1961	20.56	34,800[6]
1962	Jan. 09, 1962	20.09	32,500[6]
1963	Mar. 23, 1963	19.52	31,300[6]
1964	Apr. 09, 1964	24.16	87,100[6]
1965	Dec. 27, 1964	20.62	34,600[6]
1966	Mar. 06, 1966	21.50	39,300[6]
1967	Aug. 25, 1967	18.10	26,500[6]
1968	Jan. 12, 1968	20.94	35,900[6]
1969	Apr. 21, 1969	22.24	45,600[6]
1970	Apr. 01, 1970	17.68	25,200[6]
1971	Mar. 05, 1971	23.30	63,900[6]
1972	Jan. 20, 1972	20.36	33,700[6]
1973	Apr. 08, 1973	21.63	40,200[6]
1974	Feb. 23, 1974	20.13	32,900[6]
1975	Mar. 25, 1975	22.24	45,600[6]
1976	Jun. 05, 1976	20.27	33,300[6]
1977	Apr. 07, 1977	20.50	34,200[6]
1978	Jan. 26, 1978	21.98	43,100[6]
1979	Feb. 27, 1979	21.13	37,300[6]
1980	Mar. 31, 1980	22.33	47,200[6]
1981	Feb. 12, 1981	14.70	17,700[6]
1982	Jan. 02, 1982	19.39	30,700[6]

AugustaAnnualPeakQs.pdf

1921	Feb. 11, 1921	35.10	129,000
1922	Feb. 16, 1922	32.00	92,000
1923	Feb. 28, 1923	28.00	59,700
1924	Sep. 22, 1924	28.00	59,700
1925	Jan. 20, 1925	36.50	150,000
1926	Jan. 20, 1926	27.30	55,300
1927	Dec. 30, 1926	24.00	39,000
1928	Aug. 17, 1928	40.40	226,000
1929	Sep. 27, 1929	46.30	343,000
1930	Oct. 02, 1929	45.10	350,000
1931	Nov. 17, 1930	19.90	26,100
1932	Jan. 09, 1932	30.40	93,800
1933	Oct. 18, 1932	30.30	92,600
1934	Mar. 05, 1934	28.50	73,200
1935	Mar. 14, 1935	27.40	63,700
1936	Apr. 08, 1936	41.20	258,000
1983	Apr. 10, 1983	23.21	66,100[6]
1984	May 05, 1984	20.35	34,000[6]
1985	Feb. 07, 1985	17.89	25,700[6]
1986	Oct. 03, 1985	15.74	21,000[6]
1987	Mar. 06, 1987	18.98	29,200[6]
1988	Feb. 05, 1988	10.61	13,600[6]
1989	Sep. 22, 1989	15.33	20,200[6]
1990	Feb. 27, 1990	20.69	35,300[6]
1991	Oct. 13, 1990	22.80	59,200[6]
1992	Mar. 27, 1992	16.29	22,100[6]
1993	Jan. 14, 1993	21.81	45,100[6]
1994	Jul. 01, 1994	21.40	40,700[6]
1995	Feb. 19, 1995	20.28	33,600[6]
1996	Feb. 05, 1996	20.48	34,400[6]
1997	Mar. 10, 1997	18.11	26,300[6]
1998	Feb. 07, 1998	21.63	43,000[6]
1999	Feb. 02, 1999	14.72	19,000[6]
2000	Jan. 25, 2000	13.25	16,800[6]
2002	Mar. 04, 2002	7.14	8,510[6]
2003	May 24, 2003	20.42	31,600[6]
2004	Jun. 14, 2004	13.82	17,600[6]

[?] Peak Streamflow Qualification Codes.

- 2 -- Discharge is an Estimate
- 5 -- Discharge affected to unknown degree by Regulation or Diversion
- 6 -- Discharge affected by Regulation or Diversion

Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team

Top
Explanation of terms

Surface Water for USA: Peak Streamflow
http://waterdata.usgs.gov/nwis/peak?

Retrieved on 2006-03-16 18:17:20 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.55 1.29 nadww01

BurtonsFerryAnnualPeak.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

Peak Streamflow for the Nation

USGS 02197500 SAVANNAH R AT BURTONS FERRY BR NR MILLHAVEN, GA

Available data for this site: Site home page GO

Screven County, Georgia
Hydrologic Unit Code 03060106
Latitude 32°56'20", Longitude 81°30'10" NAD27
Drainage area 8,650 square miles
Gage datum 52.42 feet above sea level NGVD29

Output formats

- Table
- Graph
- Tab-separated file
- WATSTORE formatted file
- Reselect output format

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1930	Oct. 1929	30.80	220,000
1940	Aug. 18, 1940	27.00	141,000
1941	Jul. 13, 1941	18.20	38,400
1942	Mar. 26, 1942	22.00	73,000
1943	Jan. 23, 1943	22.60	80,900
1944	Mar. 26, 1944	23.40	89,300
1945	May 01, 1945	18.80	42,900
1946	Jan. 12, 1946	21.60	68,600
1947	Jan. 25, 1947	21.53	67,500
1948	Feb. 14, 1948	21.10	61,000
1949	Dec. 03, 1948	24.91	108,000
1950	Oct. 14, 1949	14.87	18,500
1951	Oct. 27, 1950	16.53	25,700
1952	Mar. 29, 1952	18.26	38,500[5]
1953	May 13, 1953	17.52	31,800[6]
1954	Apr. 06, 1954	14.40	17,600[6]
1955	Apr. 18, 1955	13.21	15,000[6]
1956	Mar. 19, 1956	11.82	13,700[6]
1957	May 11, 1957	12.27	
1965	Apr. 04, 1965	17.66	32,800[6]
1966	Mar. 09, 1966	18.05	37,100[6]
1967	Jun. 17, 1967	15.47	22,000[6]
1968	Jan. 16, 1968	16.64	26,800[6]
1969	Apr. 25, 1969	18.31	37,200[6]
1970	Apr. 04, 1970	14.14	18,200[6]
1983	Apr. 15, 1983		60,000[6]
1984	May 12, 1984	17.83	33,900[6]
1985	Feb. 10, 1985	14.69	19,700[6]
1986	Nov. 25, 1985	12.71	15,200[6]
1987	Mar. 10, 1987	16.79	27,600[6]
1988	Oct. 02, 1987	10.80	11,900[6]
1989	Mar. 26, 1989	14.73	19,800[6]
1990	Mar. 02, 1990	18.14	36,000[6]
1991	Oct. 17, 1990	17.66	32,700[6]
1992	Mar. 30, 1992	14.17	18,300[6]
1993	Jan. 10, 1993	18.66	39,600[6]

BurtonsFerryAnnualPeak.pdf

			13,900[6]
1958	Apr. 22, 1958	18.94	41,400[6]
1959	Jun. 13, 1959	16.59	27,400[6]
1960	Feb. 17, 1960	18.28	37,100[6]
1961	Apr. 25, 1961	17.60	32,400[6]
1962	Jan. 15, 1962	16.75	27,400[6]
1963	Mar. 27, 1963	17.22	29,200[6]
1964	Apr. 15, 1964	22.10	71,700[6]
1994	Aug. 26, 1994	17.79	33,600[6]
1995	Mar. 01, 1995	17.86	34,100[6]
1996	Feb. 16, 1996	17.70	33,000[6]
1997	Mar. 14, 1997	16.95	28,400[6]
1998	Feb. 10, 1998	18.70	39,900[6]
1999	Feb. 05, 1999	12.84	16,100[6]
2000	Jan. 28, 2000	12.20	15,200[6]
2001	Mar. 07, 2001	11.33	13,400[6]
2002	Feb. 09, 2002	7.25	8,950[6]
2003	Mar. 21, 2003	17.34	29,300[6]

Peak Streamflow Qualification Codes.

- 5 -- Discharge affected to unknown degree by Regulation or Diversion
- 6 -- Discharge affected by Regulation or Diversion

Questions about data Water Webserver Team Top
Feedback on this website NWISWeb Support Team Explanation of terms
Surface Water for USA: Peak Streamflow
http://waterdata.usgs.gov/nwis/peak?

Retrieved on 2006-04-14 17:40:53 EDT
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.26 1.28 nadww01

CalhounAnnualPeakQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Calendar Year Streamflow Statistics for the Nation

USGS 02189000 SAVANNAH RIVER NEAR CALHOUN FALLS, S. C.

Available data for this site Surface-water: Annual streamflow statistics GO

Abbeville County, South Carolina
Hydrologic Unit Code 03060103
Latitude 34°04'15", Longitude 82°38'30" NAD27
Drainage area 2,876.00 square miles
Gage datum 363.53 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s	Year	Annual mean streamflow, in ft^3/s
1897	5,635	1948	6,191	1959	4,778	1969	5,527
1931	3,840	1949	8,104	1960	5,629	1970	3,906
1939	4,572	1950	5,084	1961	4,433	1971	4,691
1940	4,227	1951	3,978	1962	4,263	1972	5,484
1941	3,495	1952	5,013	1963	5,276	1973	7,344
1942	4,579	1953	4,789	1964	9,111	1974	6,371
1943	5,624	1954	3,809	1965	6,424	1975	7,402
1944	5,130	1955	3,260	1966	5,424	1976	6,962
1945	4,471	1956	3,756	1967	5,713	1977	6,100
1946	6,062	1957	4,956	1968	4,934	1978	5,370
1947	4,362	1958	5,084				

Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team
Top
Explanation of terms

Surface Water data for USA: Calendar Year Streamflow Statistics
http://waterdata.usgs.gov/nwis/annual/calendar_year?

CalhounAnnualPeakQs.pdf

Retrieved on 2006-03-16 18:08:46 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.54 1.29 nadww01

Calhoun Falls Annual Peak Qs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Peak Streamflow for the Nation

USGS 02189000 SAVANNAH RIVER NEAR CALHOUN FALLS, S. C.

Available data for this site Site home page GO

Abbeville County, South Carolina
Hydrologic Unit Code 03060103
Latitude 34°04'15", Longitude 82°38'30" NAD27
Drainage area 2,876.00 square miles
Gage datum 363.53 feet above sea level NGVD29

Output formats

- Table
- Graph
- Tab-separated file
- WATSTORE formatted file
- Reselect output format

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1897	Apr. 05, 1897	15.30	57,400
1900	Feb. 14, 1900	19.70	76,500
1901	Sep. 18, 1901	17.40	66,500
1902	Feb. 28, 1902	19.60	76,100
1903	Jun. 07, 1903	15.40	57,800
1904	Aug. 09, 1904	9.90	33,900
1905	Jul. 02, 1905	13.00	47,400
1906	Mar. 20, 1906	11.80	42,200
1907	Oct. 04, 1906	9.90	33,900
1908	Aug. 25, 1908	28.20	114,000
1909	Jun. 04, 1909	12.20	43,900
1910	Mar. 01, 1910	12.50	45,200
1911	Jan. 04, 1911	7.50	23,500
1912	Mar. 16, 1912	19.50	75,700

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1940	Aug. 13, 1940	11.52	96,500[6]
1941	Jul. 07, 1941	6.70	36,300[6]
1942	Feb. 18, 1942	7.73	47,200[6]
1943	Jan. 18, 1943	8.21	53,100[6]
1944	Mar. 20, 1944	7.91	49,500[6]
1945	Apr. 25, 1945	6.40	33,300[6]
1946	Jan. 08, 1946	9.41	68,400[6]
1947	Jan. 20, 1947	7.47	44,800[6]
1948	Mar. 07, 1948	6.11	29,800[6]
1949	Nov. 29, 1948	8.94	61,800[6]
1950	Oct. 08, 1949	5.98	29,400[6]
1951	Oct. 21, 1950	5.98	28,800[6]

CalhounFallsAnnualPeakQs.pdf

1913	Mar. 15, 1913	13.20	48,300
1914	Dec. 30, 1913	7.20	22,200
1915	Jul. 01, 1915	10.90	38,300
1916	Dec. 30, 1915	12.40	44,800
1917	Mar. 25, 1917	11.30	40,000
1918	Aug. 03, 1918	8.10	26,100
1919	Dec. 23, 1918	15.70	59,100
1920	Dec. 10, 1919	16.60	63,100
1921	Feb. 09, 1921	14.00	51,800
1922	Mar. 11, 1922	10.10	34,800
1923	Dec. 19, 1922	10.30	35,700
1924	Sep. 21, 1924	11.30	40,000
1925	Jan. 19, 1925	9.40	31,700
1926	Jan. 19, 1926	8.60	28,300
1927	Dec. 29, 1926	8.50	27,800
1928	Aug. 17, 1928	11.90	130,000
1929	Sep. 27, 1929	8.70	85,400
1930	Oct. 02, 1929	10.10	105,000
1931	Apr. 23, 1931	4.22	15,800
1932	Dec. 04, 1931	7.10	41,400
1933	Oct. 17, 1932	11.60	97,600
1934	Jun. 05, 1934	7.00	39,400
1935	Jan. 10, 1935	6.00	29,400
1936	Apr. 07, 1936	11.50	96,200[6]
1937	Oct. 01, 1936	9.00	63,000[6]
1938	Oct. 20, 1937	8.20	53,100[6]
1939	Aug. 19, 1939	7.88	49,600[6]
1952	Mar. 24, 1952	8.65	58,000[6]
1953	Feb. 22, 1953	6.94	38,400[6]
1954	Jan. 17, 1954	7.44	44,600[6]
1955	Feb. 07, 1955	6.89	40,200[6]
1956	Sep. 26, 1956	7.02	40,200[6]
1957	Apr. 06, 1957	6.79	38,100[6]
1958	Nov. 19, 1957	6.76	38,100[6]
1959	Jun. 02, 1959	6.41	32,800[6]
1960	Feb. 13, 1960	5.03	19,600[6]
1961	Mar. 08, 1961	4.79	17,400[6]
1962	Dec. 19, 1961	5.62	26,000[6]
1963	Apr. 30, 1963	6.12	30,900[6]
1964	Apr. 08, 1964	8.08	60,000[6]
1965	Oct. 06, 1964	6.91	44,800[6]
1966	Mar. 04, 1966	7.50	52,500[6]
1967	Jun. 05, 1967	6.76	39,900[6]
1968	Jan. 10, 1968	6.17	33,200[6]
1969	Jan. 20, 1969	7.04	43,400[6]
1970	Jul. 29, 1970	5.89	32,000[6]
1971	Mar. 04, 1971	6.97	45,600[6]
1972	Jan. 10, 1972	6.20	35,700[6]
1973	Dec. 16, 1972	6.80	43,400[6]
1974	Apr. 05, 1974	5.84	31,400[6]
1975	Mar. 14, 1975	7.32	47,100[6]
1976	Mar. 16, 1976	6.72	39,400[6]
1977	Mar. 30, 1977	6.35	35,200[6]
1978	Jan. 26, 1978	7.16	45,000[6]
1979	Apr. 13, 1979	7.78	52,900[6]
1980	Mar. 28, 1980	10.30	91,400[6]

[?] Peak Streamflow Qualification Codes.

- 6 -- Discharge affected by Regulation or Diversion

CalhounFallsAnnualPeakQs.pdf

Questions about data Water Webserver Team Top
Feedback on this website NWISWeb Support Team Explanation of terms

Surface Water for USA: Peak Streamflow
http://waterdata.usgs.gov/nwis/peak?

Retrieved on 2006-03-16 18:21:33 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.53 1.31 nadww01

ClyoAnnualPeakQ.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Peak Streamflow for the Nation

USGS 02198500 SAVANNAH RIVER NEAR CLYO, GA

Available data for this site Site home page GO

Effingham County, Georgia
Hydrologic Unit Code
Latitude 32°31'41", Longitude 81°16'08" NAD27
Drainage area 9,850 square miles
Gage datum 13.39 feet above sea level NGVD29

Output formats

- Table
- Graph
- Tab-separated file
- WATSTORE formatted file
- Reselect output format

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1925	Jan. 24, 1925	23.90	134,000
1926	Jan. 28, 1926	15.40	31,400
1927	Mar. 06, 1927	13.40	20,600
1928	Aug. 23, 1928	22.30	106,000
1929	Mar. 11, 1929	23.60	128,000
1930	Oct. 06, 1929	29.70	270,000
1931	Nov. 28, 1930	12.77	18,200
1932	Jan. 15, 1932	19.18	59,600
1933	Jan. 04, 1933	19.20	59,600
1934	Jun. 15, 1934	17.20	43,800
1935	Mar. 22, 1935	15.20	29,100
1936	Apr. 13, 1936	26.00	176,000
1937	Jan. 11, 1937	19.40	65,800
1938	Apr. 16, 1938	17.80	48,400

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1965	Apr. 06, 1965	16.52	38,000[6]
1966	Mar. 11, 1966	17.10	42,800[6]
1967	Jun. 22, 1967	13.67	22,500[6]
1968	Jan. 21, 1968	14.84	28,000[6]
1969	Apr. 29, 1969	16.74	39,700[6]
1970	Apr. 07, 1970	13.31	21,000[6]
1971	Mar. 06, 1971	18.11	54,500[6]
1972	Jan. 26, 1972	16.30	36,400[6]
1973	Apr. 15, 1973	17.29	44,500[6]
1974	Mar. 01, 1974	15.78	33,000[6]
1975	Mar. 24, 1975	17.83	50,600[6]
1976	Jun. 14, 1976	15.87	33,500[6]

ClyoAnnualPeakQ.pdf

1939	Mar. 08, 1939	20.40	70,100
1940	Aug. 22, 1940	23.60	128,000
1941	Jul. 17, 1941	16.30	36,500
1942	Mar. 29, 1942	20.00	73,000
1943	Jan. 27, 1943	20.00	73,000
1944	Mar. 29, 1944	21.60	95,200
1945	May 05, 1945	16.00	34,400
1946	Jan. 16, 1946	19.50	64,400
1947	Jan. 28, 1947	19.40	63,200
1948	Feb. 17, 1948	19.66	71,000
1949	Dec. 06, 1948	22.17	104,000
1950	Oct. 19, 1949	12.21	16,000
1951	Nov. 01, 1950	13.38	22,600
1952	Apr. 02, 1952	16.90	41,300[5]
1953	May 17, 1953	15.80	35,800[6]
1954	Apr. 12, 1954	12.49	18,800[6]
1955	Apr. 23, 1955	11.35	15,500[6]
1956	Mar. 22, 1956	10.47	14,100[6]
1957	May 15, 1957	11.15	15,000[6]
1958	Apr. 25, 1958	17.41	45,500[6]
1959	Jun. 18, 1959	14.36	26,000[6]
1960	Feb. 19, 1960	17.35	40,900[6]
1961	Apr. 25, 1961	16.20	34,900[6]
1962	Jan. 19, 1962	14.87	28,200[6]
1963	Mar. 31, 1963	15.27	29,200[6]
1964	Apr. 18, 1964	20.22	83,800[6]
1977	Dec. 22, 1976	15.85	33,400[6]
1978	Feb. 03, 1978	16.81	38,700[6]
1979	Apr. 27, 1979	16.34	36,600[6]
1980	Apr. 02, 1980	18.40	58,600[6]
1981	Feb. 16, 1981	10.39	13,600[6]
1982	Jan. 11, 1982	12.89	19,500[6]
1983	Apr. 17, 1983	18.40	58,600[6]
1984	May 14, 1984	16.48	37,700[6]
1985	Feb. 15, 1985	12.89	19,500[6]
1986	Nov. 28, 1985	11.50	15,800[6]
1987	Mar. 13, 1987	15.57	29,700[6]
1988	Oct. 04, 1987	8.93	11,400[6]
1989	Sep. 26, 1989	10.54	14,200[6]
1990	Mar. 05, 1990	16.70	39,400[6]
1991	Oct. 20, 1990	16.09	34,900[6]
1992	Apr. 03, 1992	12.57	17,600[6]
1993	Jan. 13, 1993	18.51	60,100[6]
1994	Aug. 30, 1994	16.29	36,500[6]
1995	Mar. 04, 1995	16.84	40,700[6]
1996	Mar. 21, 1996	16.79	36,900[6]
1997	Mar. 17, 1997	15.27	30,300[6]
1998	Mar. 12, 1998	18.00	53,000[6]
1999	Feb. 07, 1999	10.86	14,600[6]
2000	Jan. 30, 2000	9.75	13,000[6]
2001	Mar. 20, 2001	9.90	14,400[6]
2002	Feb. 10, 2002	5.77	8,260[6]
2003	Mar. 24, 2003	16.75	39,900[6]
2004	Mar. 03, 2004	12.77	18,500[6]

Peak Streamflow Qualification Codes.

- 5 -- Discharge affected to unknown degree by Regulation or Diversion
- 6 -- Discharge affected by Regulation or Diversion

Questions about data Water Webserver Team Top

ClyoAnnualPeakQ.pdf

Feedback on this website NWIS Web Support Team Explanation of terms

Surface Water for USA: Peak Streamflow
http://waterdata.usgs.gov/nwis/peak?

Retrieved on 2006-03-16 18:26:47 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.53 1.3 nadww01

JacksonAnnualPeakQ.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Peak Streamflow for the Nation

USGS 02197320 SAVANNAH R. NR JACKSON, SC

Available data for this site Site home page GO

Aiken County, South Carolina
Hydrologic Unit Code 03060106
Latitude 33°13'01", Longitude 81°46'04" NAD27
Drainage area 8,110.00 square miles
Gage datum 77.00 feet above sea level NGVD29

Output formats

- Table
- Graph
- Tab-separated file
- WATSTORE formatted file
- Reselect output format

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1972	Jan. 21, 1972	19.02	
1973	Apr. 09, 1973	19.71	
1974	Feb. 24, 1974	18.64	
1975	Sep. 16, 1975	20.22	
1976	Jul. 06, 1976	18.84	
1977	Apr. 08, 1977	18.85	
1978	Jan. 28, 1978	19.65	
1979	Apr. 28, 1979	19.12	
1980	Apr. 01, 1980	20.72	
1981	Feb. 13, 1981	15.16	17,300[6]
1982	Feb. 20, 1982	17.12	20,500[6]
1983	Apr. 11, 1983	21.57	
1984	Mar. 09, 1984	19.30	

Water Year	Date	Gage Height (feet)	Stream-flow (cfs)
1987	Mar. 07, 1987	18.35	
1988	Feb. 06, 1988	12.42	13,200[6]
1989	Sep. 23, 1989	14.90	16,800[6]
1990	Feb. 28, 1990	19.61	
1991	Oct. 14, 1990	20.05	
1992	Mar. 27, 1992	16.26	18,800[6]
1994	Jul. 03, 1994	19.19	
1995	Feb. 20, 1995	18.91	
1996	Mar. 16, 1996	18.86	
1997	Mar. 11, 1997	18.41	
1998	Feb. 09, 1998	19.83	[6]
1999	Oct. 28, 1998	15.23	17,300[6]
2000	Jan. 26, 2000	14.86	16,500[6]

JacksonAnnualPeakQ.pdf

1985	Feb. 08, 1985	17.21	20,600[6]	2001	Mar. 06, 2001	13.75	15,500[6]
1986	Nov. 24, 1985	14.29	15,900[6]	2002	Mar. 05, 2002	8.77	8,870[6]

[?] Peak Streamflow Qualification Codes.

- 6 -- Discharge affected by Regulation or Diversion

Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team

Top
Explanation of terms

Surface Water for USA: Peak Streamflow
http://waterdata.usgs.gov/nwis/peak?

Retrieved on 2006-03-16 18:23:05 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.52 1.27 nadww01

```
Z02197000          USGS
H02197000  3322250815635001345245SW030601067508.      96.58
N02197000  SAVANNAH RIVER AT AUGUSTA, GA
Y02197000
302197000  17960117 2800002      38.0
302197000  18400528 2600002      37.5
302197000  18520829 2300002      36.8
302197000  18640101 1600002      34.0
302197000  18650111 2200002      36.4
302197000  18751230  86400      28.60
302197000  18770414 119000      31.40
302197000  18771123  51500      23.50
302197000  18790803  44000      22.00
302197000  18791216 102000      30.10
302197000  18810318 130000      32.20
302197000  18820912  93300      29.30
302197000  18830122 111000      30.80
302197000  18840416  81000      28.00
302197000  18850126  77000      27.50
302197000  18860521 135000      32.50
302197000  18870731 173000      34.50
302197000  18880911 303000      38.70
302197000  18890219 149000      33.30
302197000  18900227  48500      22.90
302197000  18910310 197000      35.50
302197000  18920120 140000      32.80
302197000  18930214  60000      25.00
302197000  18940807  54000      24.00
302197000  18950111 106000      30.40
302197000  18960710 107000      30.50
302197000  18970406  93300      29.30
302197000  18980902 117000      31.30
302197000  18990208 113000      31.00
302197000  19000215 138000      32.70
302197000  19010404 124000      31.80
302197000  19020301 175000      34.60
302197000  19030209 147000      33.20
302197000  19040810  63000      25.50
302197000  19050214  64800      25.80
302197000  19060105  96600      29.60
302197000  19061005  52000      23.60
302197000  19080827 307000      38.80
302197000  19090605  87300      28.70
302197000  19100302  69800      26.40
302197000  19110414  32800      19.10
302197000  19120317 234000      36.80
302197000  19130316 156000      35.10
302197000  19131231  48000      24.30
302197000  19150120  61000      28.20
302197000  19160203  82400      31.00
```

302197000	19170306	68000	29.20
302197000	19180130	45500	25.50
302197000	19181224	128000	35.00
302197000	19191211	133000	35.40
302197000	19210211	129000	35.10
302197000	19220216	92000	32.00
302197000	19230228	59700	28.00
302197000	19240922	59700	28.00
302197000	19250120	150000	36.50
302197000	19260120	55300	27.30
302197000	19261230	39000	24.00
302197000	19280817	226000	40.40
302197000	19290927	343000	46.30
302197000	19291002	350000	45.10
302197000	19301117	26100	19.90
302197000	19320109	93800	30.40
302197000	19321018	92600	30.30
302197000	19340305	73200	28.50
302197000	19350314	63700	27.40
302197000	19360408	258000	41.20
302197000	19370104	91400	30.10
302197000	19371021	91400	30.10
302197000	19390302	90900	24.10
302197000	19400815	239000	29.40
302197000	19410708	53300	22.89
302197000	19420323	105000	24.56
302197000	19430120	117000	25.10
302197000	19440322	128000	25.53
302197000	19450427	64000	23.16
302197000	19460109	97200	24.43
302197000	19470122	86000	23.97
302197000	19480210	83200	23.90
302197000	19481130	154000	26.61
302197000	19491009	32500	20.10
302197000	19501022	46300	22.32
302197000	19520306	393005	21.53
302197000	19530508	352006	20.80
302197000	19540330	255006	17.39
302197000	19550415	239006	16.77
302197000	19560412	186006	14.70
302197000	19570507	180006	14.08
302197000	19580418	663006	22.91
302197000	19590608	285006	18.65
302197000	19600214	349006	20.58
302197000	19610402	348006	20.56
302197000	19620109	325006	20.09
302197000	19630323	313006	19.52
302197000	19640409	871006	24.16
302197000	19641227	346006	20.62
302197000	19660306	393006	21.50

302197000	19670825	265006	18.10
302197000	19680112	359006	20.94
302197000	19690421	456006	22.24
302197000	19700401	252006	17.68
302197000	19710305	639006	23.30
302197000	19720120	337006	20.36
302197000	19730408	402006	21.63
302197000	19740223	329006	20.13
302197000	19750325	456006	22.24
302197000	19760605	333006	20.27
302197000	19770407	342006	20.50
302197000	19780126	431006	21.98
302197000	19790227	373006	21.13
302197000	19800331	472006	22.33
302197000	19810212	177006	14.70
302197000	19820102	307006	19.39
302197000	19830410	661006	23.21
302197000	19840505	340006	20.35
302197000	19850207	257006	17.89
302197000	19851003	210006	15.74
302197000	19870306	292006	18.98
302197000	19880205	136006	10.61
302197000	19890922	202006	15.33
302197000	19900227	353006	20.69
302197000	19901013	592006	22.80
302197000	19920327	221006	16.29
302197000	19930114	451006	21.81
302197000	19940701	407006	21.40
302197000	19950219	336006	20.28
302197000	19960205	344006	20.48
302197000	19970310	263006	18.11
302197000	19980207	430006	21.63
302197000	19990202	190006	14.72
302197000	20000125	168006	13.25
302197000	20020304	85106	7.14
302197000	20030524	316006	20.42
302197000	20040614	176006	13.82

```
#
# U.S. Geological Survey
# National Water Information System
# Retrieved: 2006-01-17 16:59:23 EST
#
# --------------------WARNING--------------------
# The data you have obtained from this automated
# U.S. Geological Survey database have not received
# Director's approval and as such are provisional
# and subject to revision.  The data are released
# on the condition that neither the USGS nor the
# United States Government may be held liable for
# any damages resulting from its use.
#
# More data may be available offline.
# #For more information on these data,  contact  Water Webserver Team.

# This file contains the annual peak streamflow data.
#
# This information includes the following fields:
#
#  agency_cd     Agency Code
#  site_no       USGS station number
#  peak_dt       format MM/DD/YYYY
#  peak_va       Annual peak streamflow value in cfs
#  peak_cd       Peak Discharge-Qualification codes (see explanation below)
#  gage_ht       Gage height for the associated peak streamflow in feet
#  gage_ht_cd    Gage height qualification codes
#  year_last_pk  Peak streamflow reported is the highest since this year
#  ag_dt         Date of maximum gage-height for water year (if not concurrent with peak)
#  ag_tm         Time of maximum gage-height for water year (if not concurrent with peak
#  ag_gage_ht    maximum Gage height for water year in feet (if not concurrent with peak
#  ag_gage_ht_cd maximum Gage height code
#
# Sites in this file include:
#  USGS 02197000 SAVANNAH RIVER AT AUGUSTA, GA
#
# Peak Streamflow-Qualification Codes(peak_cd):
#   1 ... Discharge is a Maximum Daily Average
#   2 ... Discharge is an Estimate
#   3 ... Discharge affected by Dam Failure
#   4 ... Discharge less than indicated value,
#         which is Minimum Recordable Discharge at this site
#   5 ... Discharge affected to unknown degree by
#         Regulation or Diversion
#   6 ... Discharge affected by Regulation or Diversion
#   7 ... Discharge is an Historic Peak
#   8 ... Discharge actually greater than indicated value
#   9 ... Discharge due to Snowmelt, Hurricane,
#         Ice-Jam or Debris Dam breakup
```

```
#  A ... Year of occurrence is unknown or not exact
#  B ... Month or Day of occurrence is unknown or not exact
#  C ... All or part of the record affected by Urbanization,
#        Mining, Agricultural changes, Channelization, or other
#  D ... Base Discharge changed during this year
#  E ... Only Annual Maximum Peak available for this year
#
# Gage height qualification codes(gage_ht_cd,ag_gage_ht_cd):
#  1 ... Gage height affected by backwater
#  2 ... Gage height not the maximum for the year
#  3 ... Gage height at different site and(or) datum
#  4 ... Gage height below minimum recordable elevation
#  5 ... Gage height is an estimate
#  6 ... Gage datum changed during this year
#
#
agency_cd site_no    peak_dt    peak_tm    peak_va    peak_cd    gage_ht    gage_ht_cd          year_last_pk
ag_dt      ag_tm     ag_gage_ht            ag_gage_ht_cd         modify_dt
5s         15s       10d        6s         8s         27s        8s         13s        4s       10d        6s
8s         11s       19d
USGS       02197000  01/17/1796                       280000     2          38.0
                                 2006-01-15 21:47:56
USGS       02197000  05/28/1840                       260000     2          37.5
                                 2006-01-15 21:47:56
USGS       02197000  08/29/1852                       230000     2          36.8
                                 2006-01-15 21:47:56
USGS       02197000  01/01/1864                       160000     2          34.0
                                 2006-01-15 21:47:56
USGS       02197000  01/11/1865                       220000     2          36.4
                                 2006-01-15 21:47:56
USGS       02197000  12/30/1875                       86400                 28.60
                                 2006-01-15 21:47:56
USGS       02197000  04/14/1877                       119000                31.40
                                 2006-01-15 21:47:56
USGS       02197000  11/23/1877                       51500                 23.50
                                 2006-01-15 21:47:56
USGS       02197000  08/03/1879                       44000                 22.00
                                 2006-01-15 21:47:56
USGS       02197000  12/16/1879                       102000                30.10
                                 2006-01-15 21:47:56
USGS       02197000  03/18/1881                       130000                32.20
                                 2006-01-15 21:47:56
USGS       02197000  09/12/1882                       93300                 29.30
                                 2006-01-15 21:47:56
USGS       02197000  01/22/1883                       111000                30.80
                                 2006-01-15 21:47:56
USGS       02197000  04/16/1884                       81000                 28.00      3
                                 2006-01-15 21:47:56
USGS       02197000  01/26/1885                       77000                 27.50
                                 2006-01-15 21:47:56
```

USGS	02197000	05/21/1886	2006-01-15 21:47:56	135000	32.50	
USGS	02197000	07/31/1887	2006-01-15 21:47:56	173000	34.50	
USGS	02197000	09/11/1888	2006-01-15 21:47:56	303000	38.70	
USGS	02197000	02/19/1889	2006-01-15 21:47:56	149000	33.30	
USGS	02197000	02/27/1890	2006-01-15 21:47:56	48500	22.90	
USGS	02197000	03/10/1891	2006-01-15 21:47:56	197000	35.50	
USGS	02197000	01/20/1892	2006-01-15 21:47:56	140000	32.80	3
USGS	02197000	02/14/1893	2006-01-15 21:47:56	60000	25.00	
USGS	02197000	08/07/1894	2006-01-15 21:47:56	54000	24.00	
USGS	02197000	01/11/1895	2006-01-15 21:47:56	106000	30.40	
USGS	02197000	07/10/1896	2006-01-15 21:47:56	107000	30.50	3
USGS	02197000	04/06/1897	2006-01-15 21:47:56	93300	29.30	
USGS	02197000	09/02/1898	2006-01-15 21:47:56	117000	31.30	
USGS	02197000	02/08/1899	2006-01-15 21:47:56	113000	31.00	
USGS	02197000	02/15/1900	2006-01-15 21:47:56	138000	32.70	
USGS	02197000	04/04/1901	2006-01-15 21:47:56	124000	31.80	
USGS	02197000	03/01/1902	2006-01-15 21:47:56	175000	34.60	
USGS	02197000	02/09/1903	2006-01-15 21:47:56	147000	33.20	
USGS	02197000	08/10/1904	2006-01-15 21:47:56	63000	25.50	
USGS	02197000	02/14/1905	2006-01-15 21:47:56	64800	25.80	
USGS	02197000	01/05/1906	2006-01-15 21:47:56	96600	29.60	
USGS	02197000	10/05/1906	2006-01-15 21:47:56	52000	23.60	
USGS	02197000	08/27/1908	2006-01-15 21:47:56	307000	38.80	3
USGS	02197000	06/05/1909	2006-01-15 21:47:56	87300	28.70	
USGS	02197000	03/02/1910	2006-01-15 21:47:56	69800	26.40	

USGS	02197000	04/14/1911	2006-01-15 21:47:56	32800	19.10	
USGS	02197000	03/17/1912	2006-01-15 21:47:56	234000	36.80	
USGS	02197000	03/16/1913	2006-01-15 21:47:56	156000	35.10	
USGS	02197000	12/31/1913	2006-01-15 21:47:56	48000	24.30	
USGS	02197000	01/20/1915	2006-01-15 21:47:56	61000	28.20	
USGS	02197000	02/03/1916	2006-01-15 21:47:56	82400	31.00	
USGS	02197000	03/06/1917	2006-01-15 21:47:56	68000	29.20	
USGS	02197000	01/30/1918	2006-01-15 21:47:56	45500	25.50	
USGS	02197000	12/24/1918	2006-01-15 21:47:56	128000	35.00	
USGS	02197000	12/11/1919	2006-01-15 21:47:56	133000	35.40	
USGS	02197000	02/11/1921	2006-01-15 21:47:56	129000	35.10	
USGS	02197000	02/16/1922	2006-01-15 21:47:56	92000	32.00	
USGS	02197000	02/28/1923	2006-01-15 21:47:56	59700	28.00	
USGS	02197000	09/22/1924	2006-01-15 21:47:56	59700	28.00	
USGS	02197000	01/20/1925	2006-01-15 21:47:56	150000	36.50	3
USGS	02197000	01/20/1926	2006-01-15 21:47:56	55300	27.30	
USGS	02197000	12/30/1926	2006-01-15 21:47:56	39000	24.00	
USGS	02197000	08/17/1928	2006-01-15 21:47:56	226000	40.40	
USGS	02197000	09/27/1929	2006-01-15 21:47:56	343000	46.30	
USGS	02197000	10/02/1929	2006-01-15 21:47:56	350000	45.10	
USGS	02197000	11/17/1930	2006-01-15 21:47:56	26100	19.90	
USGS	02197000	01/09/1932	2006-01-15 21:47:56	93800	30.40	
USGS	02197000	10/18/1932	2006-01-15 21:47:56	92600	30.30	3
USGS	02197000	03/05/1934	2006-01-15 21:47:56	73200	28.50	
USGS	02197000	03/14/1935	2006-01-15 21:47:56	63700	27.40	

USGS	02197000	04/08/1936	2006-01-15 21:47:56	258000		41.20	
USGS	02197000	01/04/1937	2006-01-15 21:47:56	91400		30.10	3
USGS	02197000	10/21/1937	2006-01-15 21:47:56	91400		30.10	
USGS	02197000	03/02/1939	2006-01-15 21:47:56	90900		24.10	
USGS	02197000	08/15/1940	2006-01-15 21:47:56	239000		29.40	
USGS	02197000	07/08/1941	2006-01-15 21:47:56	53300		22.89	
USGS	02197000	03/23/1942	2006-01-15 21:47:56	105000		24.56	
USGS	02197000	01/20/1943	2006-01-15 21:47:56	117000		25.10	
USGS	02197000	03/22/1944	2006-01-15 21:47:56	128000		25.53	
USGS	02197000	04/27/1945	2006-01-15 21:47:56	64000		23.16	
USGS	02197000	01/09/1946	2006-01-15 21:47:56	97200		24.43	
USGS	02197000	01/22/1947	2006-01-15 21:47:56	86000		23.97	
USGS	02197000	02/10/1948	2006-01-15 21:47:56	83200		23.90	
USGS	02197000	11/30/1948	2006-01-15 21:47:56	154000		26.61	3
USGS	02197000	10/09/1949	2006-01-15 21:47:56	32500		20.10	
USGS	02197000	10/22/1950	2006-01-15 21:47:56	46300		22.32	
USGS	02197000	03/06/1952	2006-01-15 21:47:56	39300	5	21.53	
USGS	02197000	05/08/1953	2006-01-15 21:47:56	35200	6	20.80	
USGS	02197000	03/30/1954	2006-01-15 21:47:56	25500	6	17.39	
USGS	02197000	04/15/1955	2006-01-15 21:47:56	23900	6	16.77	
USGS	02197000	04/12/1956	2006-01-15 21:47:56	18600	6	14.70	
USGS	02197000	05/07/1957	2006-01-15 21:47:56	18000	6	14.08	
USGS	02197000	04/18/1958	2006-01-15 21:47:56	66300	6	22.91	
USGS	02197000	06/08/1959	2006-01-15 21:47:56	28500	6	18.65	
USGS	02197000	02/14/1960	2006-01-15 21:47:56	34900	6	20.58	

USGS	02197000	04/02/1961	2006-01-15 21:47:56	34800	6	20.56
USGS	02197000	01/09/1962	2006-01-15 21:47:56	32500	6	20.09
USGS	02197000	03/23/1963	2006-01-15 21:47:56	31300	6	19.52
USGS	02197000	04/09/1964	2006-01-15 21:47:56	87100	6	24.16
USGS	02197000	12/27/1964	2006-01-15 21:47:56	34600	6	20.62
USGS	02197000	03/06/1966	2006-01-15 21:47:56	39300	6	21.50
USGS	02197000	08/25/1967	2006-01-15 21:47:56	26500	6	18.10
USGS	02197000	01/12/1968	2006-01-15 21:47:56	35900	6	20.94
USGS	02197000	04/21/1969	2006-01-15 21:47:56	45600	6	22.24
USGS	02197000	04/01/1970	2006-01-15 21:47:56	25200	6	17.68
USGS	02197000	03/05/1971	2006-01-15 21:47:56	63900	6	23.30
USGS	02197000	01/20/1972	2006-01-15 21:47:56	33700	6	20.36
USGS	02197000	04/08/1973	2006-01-15 21:47:56	40200	6	21.63
USGS	02197000	02/23/1974	2006-01-15 21:47:56	32900	6	20.13
USGS	02197000	03/25/1975	2006-01-15 21:47:56	45600	6	22.24
USGS	02197000	06/05/1976	2006-01-15 21:47:56	33300	6	20.27
USGS	02197000	04/07/1977	2006-01-15 21:47:56	34200	6	20.50
USGS	02197000	01/26/1978	2006-01-15 21:47:56	43100	6	21.98
USGS	02197000	02/27/1979	2006-01-15 21:47:56	37300	6	21.13
USGS	02197000	03/31/1980	2006-01-15 21:47:56	47200	6	22.33
USGS	02197000	02/12/1981	2006-01-15 21:47:56	17700	6	14.70
USGS	02197000	01/02/1982	2006-01-15 21:47:56	30700	6	19.39
USGS	02197000	04/10/1983	2006-01-15 21:47:56	66100	6	23.21
USGS	02197000	05/05/1984	2006-01-15 21:47:56	34000	6	20.35
USGS	02197000	02/07/1985	2006-01-15 21:47:56	25700	6	17.89

USGS	02197000	10/03/1985	2006-01-15 21:47:56	21000	6	15.74	
USGS	02197000	03/06/1987	2006-01-15 21:47:56	29200	6	18.98	
USGS	02197000	02/05/1988	2006-01-15 21:47:56	13600	6	10.61	
USGS	02197000	09/22/1989	2006-01-15 21:47:56	20200	6	15.33	
USGS	02197000	02/27/1990	2006-01-15 21:47:56	35300	6	20.69	
USGS	02197000	10/13/1990	2006-01-15 21:47:56	59200	6	22.80	
USGS	02197000	03/27/1992	2006-01-15 21:47:56	22100	6	16.29	
USGS	02197000	01/14/1993	2006-01-15 21:47:56	45100	6	21.81	
USGS	02197000	07/01/1994	2006-01-15 21:47:56	40700	6	21.40	
USGS	02197000	02/19/1995	2006-01-15 21:47:56	33600	6	20.28	
USGS	02197000	02/05/1996	2006-01-15 21:47:56	34400	6	20.48	
USGS	02197000	03/10/1997	2006-01-15 21:47:56	26300	6	18.11	
USGS	02197000	02/07/1998	2006-01-15 21:47:56	43000	6	21.63	
USGS	02197000	02/02/1999	2006-01-15 21:47:56	19000	6	14.72	
USGS	02197000	01/25/2000	2006-01-15 21:47:56	16800	6	13.25	6
USGS	02197000	03/04/2002	2006-01-15 21:47:56	8510	6	7.14	
USGS	02197000	05/24/2003	2006-01-15 21:47:56	31600	6	20.42	
USGS	02197000	06/14/2004	2006-01-15 21:47:56	17600	6	13.82	

```
Z02197000          USGS
H02197000  332225081563500134524 5SW030601067508.      96.58
N02197000  SAVANNAH RIVER AT AUGUSTA, GA
Y02197000
302197000  17960117 2800002      38.0
302197000  18400528 2600002      37.5
302197000  18520829 2300002      36.8
302197000  18640101 1600002      34.0
302197000  18650111 2200002      36.4
302197000  18751230  86400      28.60
302197000  18770414 119000      31.40
302197000  18771123  51500      23.50
302197000  18790803  44000      22.00
302197000  18791216 102000      30.10
302197000  18810318 130000      32.20
302197000  18820912  93300      29.30
302197000  18830122 111000      30.80
302197000  18840416  81000      28.00
302197000  18850126  77000      27.50
302197000  18860521 135000      32.50
302197000  18870731 173000      34.50
302197000  18880911 303000      38.70
302197000  18890219 149000      33.30
302197000  18900227  48500      22.90
302197000  18910310 197000      35.50
302197000  18920120 140000      32.80
302197000  18930214  60000      25.00
302197000  18940807  54000      24.00
302197000  18950111 106000      30.40
302197000  18960710 107000      30.50
302197000  18970406  93300      29.30
302197000  18980902 117000      31.30
302197000  18990208 113000      31.00
302197000  19000215 138000      32.70
302197000  19010404 124000      31.80
302197000  19020301 175000      34.60
302197000  19030209 147000      33.20
302197000  19040810  63000      25.50
302197000  19050214  64800      25.80
302197000  19060105  96600      29.60
302197000  19061005  52000      23.60
302197000  19080827 307000      38.80
302197000  19090605  87300      28.70
302197000  19100302  69800      26.40
302197000  19110414  32800      19.10
302197000  19120317 234000      36.80
302197000  19130316 156000      35.10
302197000  19131231  48000      24.30
302197000  19150120  61000      28.20
302197000  19160203  82400      31.00
```

302197000	19170306	68000	29.20
302197000	19180130	45500	25.50
302197000	19181224	128000	35.00
302197000	19191211	133000	35.40
302197000	19210211	129000	35.10
302197000	19220216	92000	32.00
302197000	19230228	59700	28.00
302197000	19240922	59700	28.00
302197000	19250120	150000	36.50
302197000	19260120	55300	27.30
302197000	19261230	39000	24.00
302197000	19280817	226000	40.40
302197000	19290927	343000	46.30
302197000	19291002	350000	45.10
302197000	19301117	26100	19.90
302197000	19320109	93800	30.40
302197000	19321018	92600	30.30
302197000	19340305	73200	28.50
302197000	19350314	63700	27.40
302197000	19360408	258000	41.20
302197000	19370104	91400	30.10
302197000	19371021	91400	30.10
302197000	19390302	90900	24.10
302197000	19400815	239000	29.40
302197000	19410708	53300	22.89
302197000	19420323	105000	24.56
302197000	19430120	117000	25.10
302197000	19440322	128000	25.53
302197000	19450427	64000	23.16
302197000	19460109	97200	24.43
302197000	19470122	86000	23.97
302197000	19480210	83200	23.90
302197000	19481130	154000	26.61
302197000	19491009	32500	20.10
302197000	19501022	46300	22.32
302197000	19520306	393005	21.53
302197000	19530508	352006	20.80
302197000	19540330	255006	17.39
302197000	19550415	239006	16.77
302197000	19560412	186006	14.70
302197000	19570507	180006	14.08
302197000	19580418	663006	22.91
302197000	19590608	285006	18.65
302197000	19600214	349006	20.58
302197000	19610402	348006	20.56
302197000	19620109	325006	20.09
302197000	19630323	313006	19.52
302197000	19640409	871006	24.16
302197000	19641227	346006	20.62
302197000	19660306	393006	21.50

302197000	19670825	265006	18.10
302197000	19680112	359006	20.94
302197000	19690421	456006	22.24
302197000	19700401	252006	17.68
302197000	19710305	639006	23.30
302197000	19720120	337006	20.36
302197000	19730408	402006	21.63
302197000	19740223	329006	20.13
302197000	19750325	456006	22.24
302197000	19760605	333006	20.27
302197000	19770407	342006	20.50
302197000	19780126	431006	21.98
302197000	19790227	373006	21.13
302197000	19800331	472006	22.33
302197000	19810212	177006	14.70
302197000	19820102	307006	19.39
302197000	19830410	661006	23.21
302197000	19840505	340006	20.35
302197000	19850207	257006	17.89
302197000	19851003	210006	15.74
302197000	19870306	292006	18.98
302197000	19880205	136006	10.61
302197000	19890922	202006	15.33
302197000	19900227	353006	20.69
302197000	19901013	592006	22.80
302197000	19920327	221006	16.29
302197000	19930114	451006	21.81
302197000	19940701	407006	21.40
302197000	19950219	336006	20.28
302197000	19960205	344006	20.48
302197000	19970310	263006	18.11
302197000	19980207	430006	21.63
302197000	19990202	190006	14.72
302197000	20000125	168006	13.25
302197000	20020304	85106	7.14
302197000	20030524	316006	20.42
302197000	20040614	176006	13.82

```
#
# U.S. Geological Survey
# National Water Information System
# Retrieved: 2006-01-17 17:20:25 EST
#
# --------------------WARNING--------------------
# The data you have obtained from this automated
# U.S. Geological Survey database have not received
# Director's approval and as such are provisional
# and subject to revision.  The data are released
# on the condition that neither the USGS nor the
# United States Government may be held liable for
# any damages resulting from its use.
#
# More data may be available offline.
# #For more information on these data,  contact  Water Webserver Team.

# This file contains the annual peak streamflow data.
#
# This information includes the following fields:
#
#  agency_cd     Agency Code
#  site_no       USGS station number
#  peak_dt       format YYYY-MM-DD
#  peak_va       Annual peak streamflow value in cfs
#  peak_cd       Peak Discharge-Qualification codes (see explanation below)
#  gage_ht       Gage height for the associated peak streamflow in feet
#  gage_ht_cd    Gage height qualification codes
#  year_last_pk  Peak streamflow reported is the highest since this year
#  ag_dt         Date of maximum gage-height for water year (if not concurrent with peak)
#  ag_tm         Time of maximum gage-height for water year (if not concurrent with peak
#  ag_gage_ht    maximum Gage height for water year in feet (if not concurrent with peak
#  ag_gage_ht_cd maximum Gage height code
#
# Sites in this file include:
#  USGS 02197000 SAVANNAH RIVER AT AUGUSTA, GA
#
# Peak Streamflow-Qualification Codes(peak_cd):
#   1 ... Discharge is a Maximum Daily Average
#   2 ... Discharge is an Estimate
#   3 ... Discharge affected by Dam Failure
#   4 ... Discharge less than indicated value,
#         which is Minimum Recordable Discharge at this site
#   5 ... Discharge affected to unknown degree by
#         Regulation or Diversion
#   6 ... Discharge affected by Regulation or Diversion
#   7 ... Discharge is an Historic Peak
#   8 ... Discharge actually greater than indicated value
#   9 ... Discharge due to Snowmelt, Hurricane,
#         Ice-Jam or Debris Dam breakup
```

```
#  A ... Year of occurrence is unknown or not exact
#  B ... Month or Day of occurrence is unknown or not exact
#  C ... All or part of the record affected by Urbanization,
#        Mining, Agricultural changes, Channelization, or other
#  D ... Base Discharge changed during this year
#  E ... Only Annual Maximum Peak available for this year
#
# Gage height qualification codes(gage_ht_cd,ag_gage_ht_cd):
#  1 ... Gage height affected by backwater
#  2 ... Gage height not the maximum for the year
#  3 ... Gage height at different site and(or) datum
#  4 ... Gage height below minimum recordable elevation
#  5 ... Gage height is an estimate
#  6 ... Gage datum changed during this year
#
#
agency_cd site_no    peak_dt    peak_tm    peak_va    peak_cd    gage_ht    gage_ht_cd          year_last_pk
ag_dt      ag_tm     ag_gage_ht            ag_gage_ht_cd         modify_dt
5s         15s       10d        6s         8s         27s        8s         13s        4s       10d        6s
8s         11s       19d
USGS       02197000  1796-01-17                       280000     2          38.0
                                 2006-01-15 21:47:56
USGS       02197000  1840-05-28                       260000     2          37.5
                                 2006-01-15 21:47:56
USGS       02197000  1852-08-29                       230000     2          36.8
                                 2006-01-15 21:47:56
USGS       02197000  1864-01-01                       160000     2          34.0
                                 2006-01-15 21:47:56
USGS       02197000  1865-01-11                       220000     2          36.4
                                 2006-01-15 21:47:56
USGS       02197000  1875-12-30                       86400                 28.60
                                 2006-01-15 21:47:56
USGS       02197000  1877-04-14                       119000                31.40
                                 2006-01-15 21:47:56
USGS       02197000  1877-11-23                       51500                 23.50
                                 2006-01-15 21:47:56
USGS       02197000  1879-08-03                       44000                 22.00
                                 2006-01-15 21:47:56
USGS       02197000  1879-12-16                       102000                30.10
                                 2006-01-15 21:47:56
USGS       02197000  1881-03-18                       130000                32.20
                                 2006-01-15 21:47:56
USGS       02197000  1882-09-12                       93300                 29.30
                                 2006-01-15 21:47:56
USGS       02197000  1883-01-22                       111000                30.80
                                 2006-01-15 21:47:56
USGS       02197000  1884-04-16                       81000                 28.00      3
                                 2006-01-15 21:47:56
USGS       02197000  1885-01-26                       77000                 27.50
                                 2006-01-15 21:47:56
```

USGS	02197000	1886-05-21	2006-01-15 21:47:56	135000	32.50	
USGS	02197000	1887-07-31	2006-01-15 21:47:56	173000	34.50	
USGS	02197000	1888-09-11	2006-01-15 21:47:56	303000	38.70	
USGS	02197000	1889-02-19	2006-01-15 21:47:56	149000	33.30	
USGS	02197000	1890-02-27	2006-01-15 21:47:56	48500	22.90	
USGS	02197000	1891-03-10	2006-01-15 21:47:56	197000	35.50	
USGS	02197000	1892-01-20	2006-01-15 21:47:56	140000	32.80	3
USGS	02197000	1893-02-14	2006-01-15 21:47:56	60000	25.00	
USGS	02197000	1894-08-07	2006-01-15 21:47:56	54000	24.00	
USGS	02197000	1895-01-11	2006-01-15 21:47:56	106000	30.40	
USGS	02197000	1896-07-10	2006-01-15 21:47:56	107000	30.50	3
USGS	02197000	1897-04-06	2006-01-15 21:47:56	93300	29.30	
USGS	02197000	1898-09-02	2006-01-15 21:47:56	117000	31.30	
USGS	02197000	1899-02-08	2006-01-15 21:47:56	113000	31.00	
USGS	02197000	1900-02-15	2006-01-15 21:47:56	138000	32.70	
USGS	02197000	1901-04-04	2006-01-15 21:47:56	124000	31.80	
USGS	02197000	1902-03-01	2006-01-15 21:47:56	175000	34.60	
USGS	02197000	1903-02-09	2006-01-15 21:47:56	147000	33.20	
USGS	02197000	1904-08-10	2006-01-15 21:47:56	63000	25.50	
USGS	02197000	1905-02-14	2006-01-15 21:47:56	64800	25.80	
USGS	02197000	1906-01-05	2006-01-15 21:47:56	96600	29.60	
USGS	02197000	1906-10-05	2006-01-15 21:47:56	52000	23.60	
USGS	02197000	1908-08-27	2006-01-15 21:47:56	307000	38.80	3
USGS	02197000	1909-06-05	2006-01-15 21:47:56	87300	28.70	
USGS	02197000	1910-03-02	2006-01-15 21:47:56	69800	26.40	

USGS	02197000	1911-04-14	2006-01-15 21:47:56	32800	19.10	
USGS	02197000	1912-03-17	2006-01-15 21:47:56	234000	36.80	
USGS	02197000	1913-03-16	2006-01-15 21:47:56	156000	35.10	
USGS	02197000	1913-12-31	2006-01-15 21:47:56	48000	24.30	
USGS	02197000	1915-01-20	2006-01-15 21:47:56	61000	28.20	
USGS	02197000	1916-02-03	2006-01-15 21:47:56	82400	31.00	
USGS	02197000	1917-03-06	2006-01-15 21:47:56	68000	29.20	
USGS	02197000	1918-01-30	2006-01-15 21:47:56	45500	25.50	
USGS	02197000	1918-12-24	2006-01-15 21:47:56	128000	35.00	
USGS	02197000	1919-12-11	2006-01-15 21:47:56	133000	35.40	
USGS	02197000	1921-02-11	2006-01-15 21:47:56	129000	35.10	
USGS	02197000	1922-02-16	2006-01-15 21:47:56	92000	32.00	
USGS	02197000	1923-02-28	2006-01-15 21:47:56	59700	28.00	
USGS	02197000	1924-09-22	2006-01-15 21:47:56	59700	28.00	
USGS	02197000	1925-01-20	2006-01-15 21:47:56	150000	36.50	3
USGS	02197000	1926-01-20	2006-01-15 21:47:56	55300	27.30	
USGS	02197000	1926-12-30	2006-01-15 21:47:56	39000	24.00	
USGS	02197000	1928-08-17	2006-01-15 21:47:56	226000	40.40	
USGS	02197000	1929-09-27	2006-01-15 21:47:56	343000	46.30	
USGS	02197000	1929-10-02	2006-01-15 21:47:56	350000	45.10	
USGS	02197000	1930-11-17	2006-01-15 21:47:56	26100	19.90	
USGS	02197000	1932-01-09	2006-01-15 21:47:56	93800	30.40	
USGS	02197000	1932-10-18	2006-01-15 21:47:56	92600	30.30	3
USGS	02197000	1934-03-05	2006-01-15 21:47:56	73200	28.50	
USGS	02197000	1935-03-14	2006-01-15 21:47:56	63700	27.40	

USGS	02197000	1936-04-08	258000		41.20	
		2006-01-15 21:47:56				
USGS	02197000	1937-01-04	91400		30.10	3
		2006-01-15 21:47:56				
USGS	02197000	1937-10-21	91400		30.10	
		2006-01-15 21:47:56				
USGS	02197000	1939-03-02	90900		24.10	
		2006-01-15 21:47:56				
USGS	02197000	1940-08-15	239000		29.40	
		2006-01-15 21:47:56				
USGS	02197000	1941-07-08	53300		22.89	
		2006-01-15 21:47:56				
USGS	02197000	1942-03-23	105000		24.56	
		2006-01-15 21:47:56				
USGS	02197000	1943-01-20	117000		25.10	
		2006-01-15 21:47:56				
USGS	02197000	1944-03-22	128000		25.53	
		2006-01-15 21:47:56				
USGS	02197000	1945-04-27	64000		23.16	
		2006-01-15 21:47:56				
USGS	02197000	1946-01-09	97200		24.43	
		2006-01-15 21:47:56				
USGS	02197000	1947-01-22	86000		23.97	
		2006-01-15 21:47:56				
USGS	02197000	1948-02-10	83200		23.90	
		2006-01-15 21:47:56				
USGS	02197000	1948-11-30	154000		26.61	3
		2006-01-15 21:47:56				
USGS	02197000	1949-10-09	32500		20.10	
		2006-01-15 21:47:56				
USGS	02197000	1950-10-22	46300		22.32	
		2006-01-15 21:47:56				
USGS	02197000	1952-03-06	39300	5	21.53	
		2006-01-15 21:47:56				
USGS	02197000	1953-05-08	35200	6	20.80	
		2006-01-15 21:47:56				
USGS	02197000	1954-03-30	25500	6	17.39	
		2006-01-15 21:47:56				
USGS	02197000	1955-04-15	23900	6	16.77	
		2006-01-15 21:47:56				
USGS	02197000	1956-04-12	18600	6	14.70	
		2006-01-15 21:47:56				
USGS	02197000	1957-05-07	18000	6	14.08	
		2006-01-15 21:47:56				
USGS	02197000	1958-04-18	66300	6	22.91	
		2006-01-15 21:47:56				
USGS	02197000	1959-06-08	28500	6	18.65	
		2006-01-15 21:47:56				
USGS	02197000	1960-02-14	34900	6	20.58	
		2006-01-15 21:47:56				

USGS	02197000	1961-04-02	34800	6	20.56	2006-01-15 21:47:56
USGS	02197000	1962-01-09	32500	6	20.09	2006-01-15 21:47:56
USGS	02197000	1963-03-23	31300	6	19.52	2006-01-15 21:47:56
USGS	02197000	1964-04-09	87100	6	24.16	2006-01-15 21:47:56
USGS	02197000	1964-12-27	34600	6	20.62	2006-01-15 21:47:56
USGS	02197000	1966-03-06	39300	6	21.50	2006-01-15 21:47:56
USGS	02197000	1967-08-25	26500	6	18.10	2006-01-15 21:47:56
USGS	02197000	1968-01-12	35900	6	20.94	2006-01-15 21:47:56
USGS	02197000	1969-04-21	45600	6	22.24	2006-01-15 21:47:56
USGS	02197000	1970-04-01	25200	6	17.68	2006-01-15 21:47:56
USGS	02197000	1971-03-05	63900	6	23.30	2006-01-15 21:47:56
USGS	02197000	1972-01-20	33700	6	20.36	2006-01-15 21:47:56
USGS	02197000	1973-04-08	40200	6	21.63	2006-01-15 21:47:56
USGS	02197000	1974-02-23	32900	6	20.13	2006-01-15 21:47:56
USGS	02197000	1975-03-25	45600	6	22.24	2006-01-15 21:47:56
USGS	02197000	1976-06-05	33300	6	20.27	2006-01-15 21:47:56
USGS	02197000	1977-04-07	34200	6	20.50	2006-01-15 21:47:56
USGS	02197000	1978-01-26	43100	6	21.98	2006-01-15 21:47:56
USGS	02197000	1979-02-27	37300	6	21.13	2006-01-15 21:47:56
USGS	02197000	1980-03-31	47200	6	22.33	2006-01-15 21:47:56
USGS	02197000	1981-02-12	17700	6	14.70	2006-01-15 21:47:56
USGS	02197000	1982-01-02	30700	6	19.39	2006-01-15 21:47:56
USGS	02197000	1983-04-10	66100	6	23.21	2006-01-15 21:47:56
USGS	02197000	1984-05-05	34000	6	20.35	2006-01-15 21:47:56
USGS	02197000	1985-02-07	25700	6	17.89	2006-01-15 21:47:56

USGS	02197000	1985-10-03	2006-01-15 21:47:56	21000	6	15.74	
USGS	02197000	1987-03-06	2006-01-15 21:47:56	29200	6	18.98	
USGS	02197000	1988-02-05	2006-01-15 21:47:56	13600	6	10.61	
USGS	02197000	1989-09-22	2006-01-15 21:47:56	20200	6	15.33	
USGS	02197000	1990-02-27	2006-01-15 21:47:56	35300	6	20.69	
USGS	02197000	1990-10-13	2006-01-15 21:47:56	59200	6	22.80	
USGS	02197000	1992-03-27	2006-01-15 21:47:56	22100	6	16.29	
USGS	02197000	1993-01-14	2006-01-15 21:47:56	45100	6	21.81	
USGS	02197000	1994-07-01	2006-01-15 21:47:56	40700	6	21.40	
USGS	02197000	1995-02-19	2006-01-15 21:47:56	33600	6	20.28	
USGS	02197000	1996-02-05	2006-01-15 21:47:56	34400	6	20.48	
USGS	02197000	1997-03-10	2006-01-15 21:47:56	26300	6	18.11	
USGS	02197000	1998-02-07	2006-01-15 21:47:56	43000	6	21.63	
USGS	02197000	1999-02-02	2006-01-15 21:47:56	19000	6	14.72	
USGS	02197000	2000-01-25	2006-01-15 21:47:56	16800	6	13.25	6
USGS	02197000	2002-03-04	2006-01-15 21:47:56	8510	6	7.14	
USGS	02197000	2003-05-24	2006-01-15 21:47:56	31600	6	20.42	
USGS	02197000	2004-06-14	2006-01-15 21:47:56	17600	6	13.82	

```
Z02197000          USGS
H02197000   332225081563500134524 5SW030601067508.      96.58
N02197000   SAVANNAH RIVER AT AUGUSTA, GA
Y02197000
302197000   17960117 2800002      38.0
302197000   18400528 2600002      37.5
302197000   18520829 2300002      36.8
302197000   18640101 1600002      34.0
302197000   18650111 2200002      36.4
302197000   18751230  86400      28.60
302197000   18770414 119000      31.40
302197000   18771123  51500      23.50
302197000   18790803  44000      22.00
302197000   18791216 102000      30.10
302197000   18810318 130000      32.20
302197000   18820912  93300      29.30
302197000   18830122 111000      30.80
302197000   18840416  81000      28.00
302197000   18850126  77000      27.50
302197000   18860521 135000      32.50
302197000   18870731 173000      34.50
302197000   18880911 303000      38.70
302197000   18890219 149000      33.30
302197000   18900227  48500      22.90
302197000   18910310 197000      35.50
302197000   18920120 140000      32.80
302197000   18930214  60000      25.00
302197000   18940807  54000      24.00
302197000   18950111 106000      30.40
302197000   18960710 107000      30.50
302197000   18970406  93300      29.30
302197000   18980902 117000      31.30
302197000   18990208 113000      31.00
302197000   19000215 138000      32.70
302197000   19010404 124000      31.80
302197000   19020301 175000      34.60
302197000   19030209 147000      33.20
302197000   19040810  63000      25.50
302197000   19050214  64800      25.80
302197000   19060105  96600      29.60
302197000   19061005  52000      23.60
302197000   19080827 307000      38.80
302197000   19090605  87300      28.70
302197000   19100302  69800      26.40
302197000   19110414  32800      19.10
302197000   19120317 234000      36.80
302197000   19130316 156000      35.10
302197000   19131231  48000      24.30
302197000   19150120  61000      28.20
302197000   19160203  82400      31.00
```

302197000	19170306	68000	29.20
302197000	19180130	45500	25.50
302197000	19181224	128000	35.00
302197000	19191211	133000	35.40
302197000	19210211	129000	35.10
302197000	19220216	92000	32.00
302197000	19230228	59700	28.00
302197000	19240922	59700	28.00
302197000	19250120	150000	36.50
302197000	19260120	55300	27.30
302197000	19261230	39000	24.00
302197000	19280817	226000	40.40
302197000	19290927	343000	46.30
302197000	19291002	350000	45.10
302197000	19301117	26100	19.90
302197000	19320109	93800	30.40
302197000	19321018	92600	30.30
302197000	19340305	73200	28.50
302197000	19350314	63700	27.40
302197000	19360408	258000	41.20
302197000	19370104	91400	30.10
302197000	19371021	91400	30.10
302197000	19390302	90900	24.10
302197000	19400815	239000	29.40
302197000	19410708	53300	22.89
302197000	19420323	105000	24.56
302197000	19430120	117000	25.10
302197000	19440322	128000	25.53
302197000	19450427	64000	23.16
302197000	19460109	97200	24.43
302197000	19470122	86000	23.97
302197000	19480210	83200	23.90
302197000	19481130	154000	26.61
302197000	19491009	32500	20.10
302197000	19501022	46300	22.32
302197000	19520306	393005	21.53
302197000	19530508	352006	20.80
302197000	19540330	255006	17.39
302197000	19550415	239006	16.77
302197000	19560412	186006	14.70
302197000	19570507	180006	14.08
302197000	19580418	663006	22.91
302197000	19590608	285006	18.65
302197000	19600214	349006	20.58
302197000	19610402	348006	20.56
302197000	19620109	325006	20.09
302197000	19630323	313006	19.52
302197000	19640409	871006	24.16
302197000	19641227	346006	20.62
302197000	19660306	393006	21.50

302197000	19670825	265006	18.10
302197000	19680112	359006	20.94
302197000	19690421	456006	22.24
302197000	19700401	252006	17.68
302197000	19710305	639006	23.30
302197000	19720120	337006	20.36
302197000	19730408	402006	21.63
302197000	19740223	329006	20.13
302197000	19750325	456006	22.24
302197000	19760605	333006	20.27
302197000	19770407	342006	20.50
302197000	19780126	431006	21.98
302197000	19790227	373006	21.13
302197000	19800331	472006	22.33
302197000	19810212	177006	14.70
302197000	19820102	307006	19.39
302197000	19830410	661006	23.21
302197000	19840505	340006	20.35
302197000	19850207	257006	17.89
302197000	19851003	210006	15.74
302197000	19870306	292006	18.98
302197000	19880205	136006	10.61
302197000	19890922	202006	15.33
302197000	19900227	353006	20.69
302197000	19901013	592006	22.80
302197000	19920327	221006	16.29
302197000	19930114	451006	21.81
302197000	19940701	407006	21.40
302197000	19950219	336006	20.28
302197000	19960205	344006	20.48
302197000	19970310	263006	18.11
302197000	19980207	430006	21.63
302197000	19990202	190006	14.72
302197000	20000125	168006	13.25
302197000	20020304	85106	7.14
302197000	20030524	316006	20.42
302197000	20040614	176006	13.82

```
Z02197320          USGS
H02197320    331301081460400454500 3SW030601068110.00      77.00
N02197320    SAVANNAH R. NR JACKSON, SC
Y02197320
302197320    19720121              19.02
302197320    19730409              19.71
302197320    19740224              18.64
302197320    19750916              20.22
302197320    19760706              18.84
302197320    19770408              18.85
302197320    19780128              19.65
302197320    19790428              19.12
302197320    19800401              20.72
302197320    19810213  173006        15.16
302197320    19820220  205006        17.12
302197320    19830411              21.57
302197320    19840309              19.30
302197320    19850208  206006        17.21
302197320    19851124  159006        14.29
302197320    19870307              18.35
302197320    19880206  132006        12.42
302197320    19890923  168006        14.90
302197320    19900228              19.61
302197320    19901014              20.05
302197320    19920327  188006        16.26
302197320    19940703              19.19
302197320    19950220              18.91
302197320    19960316              18.86
302197320    19970311              18.41
302197320    19980209      6         19.83
302197320    19981028  173006        15.23
302197320    20000126  165006        14.86
302197320    20010306  155006        13.75
302197320    20020305   88706         8.77
```

```
Z02197500          USGS
H02197500    32562008130100013452 51SW030601068650      52.42
N02197500    SAVANNAH R AT BURTONS FERRY BR NR MILLHAVEN, GA
Y02197500
302197500    192910  220000          30.80
302197500    19400818 141000          27.00
302197500    19410713  38400          18.20
302197500    19420326  73000          22.00
302197500    19430123  80900          22.60
302197500    19440326  89300          23.40
302197500    19450501  42900          18.80
302197500    19460112  68600          21.60
302197500    19470125  67500          21.53
302197500    19480214  61000          21.10
302197500    19481203 108000          24.91
302197500    19491014  18500          14.87
302197500    19501027  25700          16.53
302197500    19520329 385005          18.26
302197500    19530513 318006          17.52
302197500    19540406 176006          14.40
302197500    19550418 150006          13.21
302197500    19560319 137006          11.82
302197500    19570511 139006          12.27
302197500    19580422 414006          18.94
302197500    19590613 274006          16.59
302197500    19600217 371006          18.28
302197500    19610425 324006          17.60
302197500    19620115 274006          16.75
302197500    19630327 292006          17.22
302197500    19640415 717006          22.10
302197500    19650404 328006          17.66
302197500    19660309 371006          18.05
302197500    19670617 220006          15.47
302197500    19680116 268006          16.64
302197500    19690425 372006          18.31
302197500    19700404 182006          14.14
302197500    19830415 600006
302197500    19840512 339006          17.83
302197500    19850210 197006          14.69
302197500    19851125 152006          12.71
302197500    19870310 276006          16.79
302197500    19871002 119006          10.80
302197500    19890326 198006          14.73
302197500    19900302 360006          18.14
302197500    19901017 327006          17.66
302197500    19920330 183006          14.17
302197500    19930110 396006          18.66
302197500    19940826 336006          17.79
302197500    19950301 341006          17.86
302197500    19960216 330006          17.70
```

302197500	19970314	284006	16.95
302197500	19980210	399006	18.70
302197500	19990205	161006	12.84
302197500	20000128	152006	12.20
302197500	20010307	134006	11.33
302197500	20020209	89506	7.25
302197500	20030321	293006	17.34

```
Z02198500          USGS
H02198500   323141081160800134510 3SW     9850      13.39
N02198500   SAVANNAH RIVER NEAR CLYO, GA
Y02198500
302198500   19250124 134000      23.90
302198500   19260128  31400      15.40
302198500   19270306  20600      13.40
302198500   19280823 106000      22.30
302198500   19290311 128000      23.60
302198500   19291006 270000      29.70
302198500   19301128  18200      12.77
302198500   19320115  59600      19.18
302198500   19330104  59600      19.20
302198500   19340615  43800      17.20
302198500   19350322  29100      15.20
302198500   19360413 176000      26.00
302198500   19370111  65800      19.40
302198500   19380416  48400      17.80
302198500   19390308  70100      20.40
302198500   19400822 128000      23.60
302198500   19410717  36500      16.30
302198500   19420329  73000      20.00
302198500   19430127  73000      20.00
302198500   19440329  95200      21.60
302198500   19450505  34400      16.00
302198500   19460116  64400      19.50
302198500   19470128  63200      19.40
302198500   19480217  71000      19.66
302198500   19481206 104000      22.17
302198500   19491019  16000      12.21
302198500   19501101  22600      13.38
302198500   19520402 413005      16.90
302198500   19530517 358006      15.80
302198500   19540412 188006      12.49
302198500   19550423 155006      11.35
302198500   19560322 141006      10.47
302198500   19570515 150006      11.15
302198500   19580425 455006      17.41
302198500   19590618 260006      14.36
302198500   19600219 409006      17.35
302198500   19610425 349006      16.20
302198500   19620119 282006      14.87
302198500   19630331 292006      15.27
302198500   19640418 838006      20.22
302198500   19650406 380006      16.52
302198500   19660311 428006      17.10
302198500   19670622 225006      13.67
302198500   19680121 280006      14.84
302198500   19690429 397006      16.74
302198500   19700407 210006      13.31
```

302198500	19710306	545006	18.11
302198500	19720126	364006	16.30
302198500	19730415	445006	17.29
302198500	19740301	330006	15.78
302198500	19750324	506006	17.83
302198500	19760614	335006	15.87
302198500	19761222	334006	15.85
302198500	19780203	387006	16.81
302198500	19790427	366006	16.34
302198500	19800402	586006	18.40
302198500	19810216	136006	10.39
302198500	19820111	195006	12.89
302198500	19830417	586006	18.40
302198500	19840514	377006	16.48
302198500	19850215	195006	12.89
302198500	19851128	158006	11.50
302198500	19870313	297006	15.57
302198500	19871004	114006	8.93
302198500	19890926	142006	10.54
302198500	19900305	394006	16.70
302198500	19901020	349006	16.09
302198500	19920403	176006	12.57
302198500	19930113	601006	18.51
302198500	19940830	365006	16.29
302198500	19950304	407006	16.84
302198500	19960321	369006	16.79
302198500	19970317	303006	15.27
302198500	19980312	530006	18.00
302198500	19990207	146006	10.86
302198500	20000130	130006	9.75
302198500	20010320	144006	9.90
302198500	20020210	82606	5.77
302198500	20030324	399006	16.75
302198500	20040303	185006	12.77

```
#
# U.S. Geological Survey
# National Water Information System
# Retrieved: 2006-01-17 15:43:40 EST
#
# --------------------WARNING--------------------
# The data you have obtained from this automated
# U.S. Geological Survey database have not received
# Director's approval and as such are provisional
# and subject to revision.  The data are released
# on the condition that neither the USGS nor the
# United States Government may be held liable for
# any damages resulting from its use.
#
# More data may be available offline.
# #For more information on these data,  contact  Water Webserver Team.

# This file contains the annual peak streamflow data.
#
# This information includes the following fields:
#
#  agency_cd     Agency Code
#  site_no       USGS station number
#  peak_dt       format MM/DD/YYYY
#  peak_va       Annual peak streamflow value in cfs
#  peak_cd       Peak Discharge-Qualification codes (see explanation below)
#  gage_ht       Gage height for the associated peak streamflow in feet
#  gage_ht_cd    Gage height qualification codes
#  year_last_pk  Peak streamflow reported is the highest since this year
#  ag_dt         Date of maximum gage-height for water year (if not concurrent with peak)
#  ag_tm         Time of maximum gage-height for water year (if not concurrent with peak
#  ag_gage_ht    maximum Gage height for water year in feet (if not concurrent with peak
#  ag_gage_ht_cd maximum Gage height code
#
# Sites in this file include:
#  USGS 02197000 SAVANNAH RIVER AT AUGUSTA, GA
#
# Peak Streamflow-Qualification Codes(peak_cd):
#   1 ... Discharge is a Maximum Daily Average
#   2 ... Discharge is an Estimate
#   3 ... Discharge affected by Dam Failure
#   4 ... Discharge less than indicated value,
#         which is Minimum Recordable Discharge at this site
#   5 ... Discharge affected to unknown degree by
#         Regulation or Diversion
#   6 ... Discharge affected by Regulation or Diversion
#   7 ... Discharge is an Historic Peak
#   8 ... Discharge actually greater than indicated value
#   9 ... Discharge due to Snowmelt, Hurricane,
#         Ice-Jam or Debris Dam breakup
```

```
#  A ... Year of occurrence is unknown or not exact
#  B ... Month or Day of occurrence is unknown or not exact
#  C ... All or part of the record affected by Urbanization,
#        Mining, Agricultural changes, Channelization, or other
#  D ... Base Discharge changed during this year
#  E ... Only Annual Maximum Peak available for this year
#
# Gage height qualification codes(gage_ht_cd,ag_gage_ht_cd):
#  1 ... Gage height affected by backwater
#  2 ... Gage height not the maximum for the year
#  3 ... Gage height at different site and(or) datum
#  4 ... Gage height below minimum recordable elevation
#  5 ... Gage height is an estimate
#  6 ... Gage datum changed during this year
#
#
agency_cd site_no    peak_dt    peak_tm    peak_va    peak_cd    gage_ht    gage_ht_cd          year_last_pk
ag_dt     ag_tm      ag_gage_ht            ag_gage_ht_cd         modify_dt
5s        15s        10d        6s         8s         27s        8s         13s        4s       10d        6s
8s        11s        19d
USGS      02197000   01/17/1796                       280000     2          38.0
                                 2006-01-15 21:47:56
USGS      02197000   05/28/1840                       260000     2          37.5
                                 2006-01-15 21:47:56
USGS      02197000   08/29/1852                       230000     2          36.8
                                 2006-01-15 21:47:56
USGS      02197000   01/01/1864                       160000     2          34.0
                                 2006-01-15 21:47:56
USGS      02197000   01/11/1865                       220000     2          36.4
                                 2006-01-15 21:47:56
USGS      02197000   12/30/1875                       86400                 28.60
                                 2006-01-15 21:47:56
USGS      02197000   04/14/1877                       119000                31.40
                                 2006-01-15 21:47:56
USGS      02197000   11/23/1877                       51500                 23.50
                                 2006-01-15 21:47:56
USGS      02197000   08/03/1879                       44000                 22.00
                                 2006-01-15 21:47:56
USGS      02197000   12/16/1879                       102000                30.10
                                 2006-01-15 21:47:56
USGS      02197000   03/18/1881                       130000                32.20
                                 2006-01-15 21:47:56
USGS      02197000   09/12/1882                       93300                 29.30
                                 2006-01-15 21:47:56
USGS      02197000   01/22/1883                       111000                30.80
                                 2006-01-15 21:47:56
USGS      02197000   04/16/1884                       81000                 28.00      3
                                 2006-01-15 21:47:56
USGS      02197000   01/26/1885                       77000                 27.50
                                 2006-01-15 21:47:56
```

USGS	02197000	05/21/1886	135000	32.50		
		2006-01-15 21:47:56				
USGS	02197000	07/31/1887	173000	34.50		
		2006-01-15 21:47:56				
USGS	02197000	09/11/1888	303000	38.70		
		2006-01-15 21:47:56				
USGS	02197000	02/19/1889	149000	33.30		
		2006-01-15 21:47:56				
USGS	02197000	02/27/1890	48500	22.90		
		2006-01-15 21:47:56				
USGS	02197000	03/10/1891	197000	35.50		
		2006-01-15 21:47:56				
USGS	02197000	01/20/1892	140000	32.80	3	
		2006-01-15 21:47:56				
USGS	02197000	02/14/1893	60000	25.00		
		2006-01-15 21:47:56				
USGS	02197000	08/07/1894	54000	24.00		
		2006-01-15 21:47:56				
USGS	02197000	01/11/1895	106000	30.40		
		2006-01-15 21:47:56				
USGS	02197000	07/10/1896	107000	30.50	3	
		2006-01-15 21:47:56				
USGS	02197000	04/06/1897	93300	29.30		
		2006-01-15 21:47:56				
USGS	02197000	09/02/1898	117000	31.30		
		2006-01-15 21:47:56				
USGS	02197000	02/08/1899	113000	31.00		
		2006-01-15 21:47:56				
USGS	02197000	02/15/1900	138000	32.70		
		2006-01-15 21:47:56				
USGS	02197000	04/04/1901	124000	31.80		
		2006-01-15 21:47:56				
USGS	02197000	03/01/1902	175000	34.60		
		2006-01-15 21:47:56				
USGS	02197000	02/09/1903	147000	33.20		
		2006-01-15 21:47:56				
USGS	02197000	08/10/1904	63000	25.50		
		2006-01-15 21:47:56				
USGS	02197000	02/14/1905	64800	25.80		
		2006-01-15 21:47:56				
USGS	02197000	01/05/1906	96600	29.60		
		2006-01-15 21:47:56				
USGS	02197000	10/05/1906	52000	23.60		
		2006-01-15 21:47:56				
USGS	02197000	08/27/1908	307000	38.80	3	
		2006-01-15 21:47:56				
USGS	02197000	06/05/1909	87300	28.70		
		2006-01-15 21:47:56				
USGS	02197000	03/02/1910	69800	26.40		
		2006-01-15 21:47:56				

USGS	02197000	04/14/1911	2006-01-15 21:47:56	32800	19.10	
USGS	02197000	03/17/1912	2006-01-15 21:47:56	234000	36.80	
USGS	02197000	03/16/1913	2006-01-15 21:47:56	156000	35.10	
USGS	02197000	12/31/1913	2006-01-15 21:47:56	48000	24.30	
USGS	02197000	01/20/1915	2006-01-15 21:47:56	61000	28.20	
USGS	02197000	02/03/1916	2006-01-15 21:47:56	82400	31.00	
USGS	02197000	03/06/1917	2006-01-15 21:47:56	68000	29.20	
USGS	02197000	01/30/1918	2006-01-15 21:47:56	45500	25.50	
USGS	02197000	12/24/1918	2006-01-15 21:47:56	128000	35.00	
USGS	02197000	12/11/1919	2006-01-15 21:47:56	133000	35.40	
USGS	02197000	02/11/1921	2006-01-15 21:47:56	129000	35.10	
USGS	02197000	02/16/1922	2006-01-15 21:47:56	92000	32.00	
USGS	02197000	02/28/1923	2006-01-15 21:47:56	59700	28.00	
USGS	02197000	09/22/1924	2006-01-15 21:47:56	59700	28.00	
USGS	02197000	01/20/1925	2006-01-15 21:47:56	150000	36.50	3
USGS	02197000	01/20/1926	2006-01-15 21:47:56	55300	27.30	
USGS	02197000	12/30/1926	2006-01-15 21:47:56	39000	24.00	
USGS	02197000	08/17/1928	2006-01-15 21:47:56	226000	40.40	
USGS	02197000	09/27/1929	2006-01-15 21:47:56	343000	46.30	
USGS	02197000	10/02/1929	2006-01-15 21:47:56	350000	45.10	
USGS	02197000	11/17/1930	2006-01-15 21:47:56	26100	19.90	
USGS	02197000	01/09/1932	2006-01-15 21:47:56	93800	30.40	
USGS	02197000	10/18/1932	2006-01-15 21:47:56	92600	30.30	3
USGS	02197000	03/05/1934	2006-01-15 21:47:56	73200	28.50	
USGS	02197000	03/14/1935	2006-01-15 21:47:56	63700	27.40	

USGS	02197000	04/08/1936	258000		41.20	
		2006-01-15 21:47:56				
USGS	02197000	01/04/1937	91400		30.10	3
		2006-01-15 21:47:56				
USGS	02197000	10/21/1937	91400		30.10	
		2006-01-15 21:47:56				
USGS	02197000	03/02/1939	90900		24.10	
		2006-01-15 21:47:56				
USGS	02197000	08/15/1940	239000		29.40	
		2006-01-15 21:47:56				
USGS	02197000	07/08/1941	53300		22.89	
		2006-01-15 21:47:56				
USGS	02197000	03/23/1942	105000		24.56	
		2006-01-15 21:47:56				
USGS	02197000	01/20/1943	117000		25.10	
		2006-01-15 21:47:56				
USGS	02197000	03/22/1944	128000		25.53	
		2006-01-15 21:47:56				
USGS	02197000	04/27/1945	64000		23.16	
		2006-01-15 21:47:56				
USGS	02197000	01/09/1946	97200		24.43	
		2006-01-15 21:47:56				
USGS	02197000	01/22/1947	86000		23.97	
		2006-01-15 21:47:56				
USGS	02197000	02/10/1948	83200		23.90	
		2006-01-15 21:47:56				
USGS	02197000	11/30/1948	154000		26.61	3
		2006-01-15 21:47:56				
USGS	02197000	10/09/1949	32500		20.10	
		2006-01-15 21:47:56				
USGS	02197000	10/22/1950	46300		22.32	
		2006-01-15 21:47:56				
USGS	02197000	03/06/1952	39300	5	21.53	
		2006-01-15 21:47:56				
USGS	02197000	05/08/1953	35200	6	20.80	
		2006-01-15 21:47:56				
USGS	02197000	03/30/1954	25500	6	17.39	
		2006-01-15 21:47:56				
USGS	02197000	04/15/1955	23900	6	16.77	
		2006-01-15 21:47:56				
USGS	02197000	04/12/1956	18600	6	14.70	
		2006-01-15 21:47:56				
USGS	02197000	05/07/1957	18000	6	14.08	
		2006-01-15 21:47:56				
USGS	02197000	04/18/1958	66300	6	22.91	
		2006-01-15 21:47:56				
USGS	02197000	06/08/1959	28500	6	18.65	
		2006-01-15 21:47:56				
USGS	02197000	02/14/1960	34900	6	20.58	
		2006-01-15 21:47:56				

USGS	02197000	04/02/1961	34800	6	20.56	
			2006-01-15 21:47:56			
USGS	02197000	01/09/1962	32500	6	20.09	
			2006-01-15 21:47:56			
USGS	02197000	03/23/1963	31300	6	19.52	
			2006-01-15 21:47:56			
USGS	02197000	04/09/1964	87100	6	24.16	
			2006-01-15 21:47:56			
USGS	02197000	12/27/1964	34600	6	20.62	
			2006-01-15 21:47:56			
USGS	02197000	03/06/1966	39300	6	21.50	
			2006-01-15 21:47:56			
USGS	02197000	08/25/1967	26500	6	18.10	
			2006-01-15 21:47:56			
USGS	02197000	01/12/1968	35900	6	20.94	
			2006-01-15 21:47:56			
USGS	02197000	04/21/1969	45600	6	22.24	
			2006-01-15 21:47:56			
USGS	02197000	04/01/1970	25200	6	17.68	
			2006-01-15 21:47:56			
USGS	02197000	03/05/1971	63900	6	23.30	
			2006-01-15 21:47:56			
USGS	02197000	01/20/1972	33700	6	20.36	
			2006-01-15 21:47:56			
USGS	02197000	04/08/1973	40200	6	21.63	
			2006-01-15 21:47:56			
USGS	02197000	02/23/1974	32900	6	20.13	
			2006-01-15 21:47:56			
USGS	02197000	03/25/1975	45600	6	22.24	
			2006-01-15 21:47:56			
USGS	02197000	06/05/1976	33300	6	20.27	
			2006-01-15 21:47:56			
USGS	02197000	04/07/1977	34200	6	20.50	
			2006-01-15 21:47:56			
USGS	02197000	01/26/1978	43100	6	21.98	
			2006-01-15 21:47:56			
USGS	02197000	02/27/1979	37300	6	21.13	
			2006-01-15 21:47:56			
USGS	02197000	03/31/1980	47200	6	22.33	
			2006-01-15 21:47:56			
USGS	02197000	02/12/1981	17700	6	14.70	
			2006-01-15 21:47:56			
USGS	02197000	01/02/1982	30700	6	19.39	
			2006-01-15 21:47:56			
USGS	02197000	04/10/1983	66100	6	23.21	
			2006-01-15 21:47:56			
USGS	02197000	05/05/1984	34000	6	20.35	
			2006-01-15 21:47:56			
USGS	02197000	02/07/1985	25700	6	17.89	
			2006-01-15 21:47:56			

USGS	02197000	10/03/1985	2006-01-15 21:47:56	21000	6	15.74	
USGS	02197000	03/06/1987	2006-01-15 21:47:56	29200	6	18.98	
USGS	02197000	02/05/1988	2006-01-15 21:47:56	13600	6	10.61	
USGS	02197000	09/22/1989	2006-01-15 21:47:56	20200	6	15.33	
USGS	02197000	02/27/1990	2006-01-15 21:47:56	35300	6	20.69	
USGS	02197000	10/13/1990	2006-01-15 21:47:56	59200	6	22.80	
USGS	02197000	03/27/1992	2006-01-15 21:47:56	22100	6	16.29	
USGS	02197000	01/14/1993	2006-01-15 21:47:56	45100	6	21.81	
USGS	02197000	07/01/1994	2006-01-15 21:47:56	40700	6	21.40	
USGS	02197000	02/19/1995	2006-01-15 21:47:56	33600	6	20.28	
USGS	02197000	02/05/1996	2006-01-15 21:47:56	34400	6	20.48	
USGS	02197000	03/10/1997	2006-01-15 21:47:56	26300	6	18.11	
USGS	02197000	02/07/1998	2006-01-15 21:47:56	43000	6	21.63	
USGS	02197000	02/02/1999	2006-01-15 21:47:56	19000	6	14.72	
USGS	02197000	01/25/2000	2006-01-15 21:47:56	16800	6	13.25	6
USGS	02197000	03/04/2002	2006-01-15 21:47:56	8510	6	7.14	
USGS	02197000	05/24/2003	2006-01-15 21:47:56	31600	6	20.42	
USGS	02197000	06/14/2004	2006-01-15 21:47:56	17600	6	13.82	

USGSReport1990.pdf

FLOOD FREQUENCY OF THE SAVANNAH RIVER AT AUGUSTA, GEORGIA

U.S. GEOLOGICAL SURVEY
Water-Resources Investigations Report 90-4024

Prepared in cooperation with
U.S. ARMY CORPS OF ENGINEERS

(95 total pages)

FLOOD FREQUENCY OF THE SAVANNAH RIVER

AT AUGUSTA, GEORGIA

By Curtis L. Sanders, Jr., Harold E. Kubik, Joseph T. Hoke, Jr., and William H. Kirby

---

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 90-4024

Prepared by

U.S. GEOLOGICAL SURVEY and

U.S. ARMY CORPS OF ENGINEERS

Columbia, South Carolina

1990

DEPARTMENT OF THE INTERIOR

MANUEL LUJAN, JR., Secretary

U.S. GEOLOGICAL SURVEY

Dallas L. Peck, Director

Comments on the utility of this report or requests for additional information on the Water Resources of South Carolina should be directed to:

District Chief
U.S. Geological Survey
1835 Assembly Street, Suite 677A
Columbia, South Carolina 29201

Copies of this report may be purchased from:

U.S. Geological Survey
Books and Open-File Reports
Federal Center, Bldg. 810
Box 25425
Denver, Colorado 80225

CONVERSION FACTORS AND ABBREVIATIONS OF UNITS

The inch-pound units used in this report may be converted to metric (International System) units by the following factors:

Multiply	By	To obtain
acre-foot (acre-ft)	1,233	cubic meter (m^3)
cubic foot (ft^3)	2.832×10^{-2}	cubic meter (m^3)
cubic foot per second (ft^3/s)	2.832×10^{-2}	cubic meter per second (m^3/s)
foot (ft)	0.3048	meter (m)
inch (in.)	25.4	millimeter (mm)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.59	square kilometer (km^2)

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929) - a geodetic datum derived from a general adjustment of the first-order level networks of both the United States and Canada, formerly called Sea Level Datum of 1929.

CONTENTS

	Page
Abstract	1
Introduction	1
Purpose and scope	2
Description of study area	3
Previous studies	5
Acknowledgments	5
Available flood records	5
Approach	10
Simulated peak discharges	15
Unregulated peak discharges	19
Regulated peak discharges	21
Computation of daily lake-inflow hydrographs for the period 1927-51	21
Simulation of initial pool elevation	22
Computation of hourly inflow hydrographs	26
Hydrograph method	27
Area A	27
Area D	41
Area E	42
Area B and C	42
Rainfall-runoff method	67
Relation of regulated to unregulated peak discharges	67
Unregulated flood frequency	69
Regulated flood frequency	76
Summary	83
References	84

ILLUSTRATIONS

		Page
Figure 1.	Map showing location of study area and location of gaging stations in the study area	4
2-6.	Graphs showing:	
	2. Annual peak discharges and simulated unregulated peak discharges for the Savannah River at Augusta, Ga. (02197000) for 1786-1985	9
	3. Flood-frequency relations based on two different periods of record for the Broad River above Carlton, Ga. (02191300)	12
	4. Flood-frequency relations based on two different periods of record for the Savannah River near Calhoun Falls, S.C. (02189000)	13
5.	Map showing areas, drainage areas, and gaging stations used in estimating unregulated inflow hydrographs	16
6.	Schematic diagram of the study area	17
7-16.	Maps showing lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storms of:	
	7. August 23-26, 1908	30
	8. March 14-16, 1912	31
	9. August 1928	32
	10. February 26 to March 3, 1929	33
	11. March 3-6, 1929	34
	12. September 25-27, 1929	35
	13. September 29 to October 2, 1929	36
	14. April 1-9, 1936	37
	15. August 11-15, 1940	38
	16. November 26-29, 1948	39
17-24.	Graphs showing estimated inflow hydrographs for areas A-E for:	
	17. Flood of August 1908	48
	18. Flood of March 1912	49
	19. Flood of August 1928	50
	20. Flood of February to March 1929	51
	21. Floods of September and October 1929	52
	22. Flood of April 1936	53
	23. Flood of August 1940	54
	24. Flood of November 1948	55

Page

25-32. Graphs showing measured flood hydrograph/s for unregulated conditions and simulated hydrograph/s for the regulated conditions for the Savannah River at Augusta, Ga. (02197000) for:
25. Flood of August 1908 56
26. Flood of March 1912 57
27. Flood of August 1928 58
28. Flood of February to March 1929 59
29. Floods of September and October 1929 60
30. Flood of April 1936 61
31. Flood of August 1940 62
32. Flood of November to December 1948 63
33. Relation between regulated peak discharges and unregulated peak discharges for the Savannah River at Augusta, Ga. (02197000) 68
34. Unregulated peak discharge frequency curve for the Savannah River at Augusta, Ga. (02197000) 74
35. Unregulated and regulated peak discharge frequency curves for the Savannah River at Augusta, Ga. (02197000) 79

TABLES

Table 1. Characteristics of major reservoirs on the Savannah River upstream of Augusta, Ga. 3
2. Annual peak stages and discharges for the Savannah River at Augusta, Ga. (02197000) for the period 1796-1985 7
3. Drainage areas and periods of record for gaging stations in the Savannah River basin from which stage and discharge data were obtained 8
4. Published peak stages for early floods of the Savannah River at Augusta, Ga. (02197000) 11
5. Measured regulated and simulated unregulated peak discharges for the Savannah River at Augusta, Ga. (02197000) for the period 1952-1985 20
6. Equations for computing daily inflow hydrographs 23
7. Simulated initial lake elevations prior to major floods 26
8. Areal rainfall amounts for the floods of 1908, 1912, 1928, 1929, 1930, 1936, 1940, and 1949 water years 40

TABLES--Continued

Page

9. Muskingum routing parameters used in the HEC-5 model for the Savannah River from Hartwell Dam near Hartwell, Ga. (02187250) to the Savannah River near Augusta, Ga. (02197000) 44
10. Measured and simulated peak discharges for regulated and unregulated conditions for the Savannah River at Augusta, Ga. (02197000) 64
11. Peak discharges and frequency plotting positions for unregulated conditions for the Savannah River at Augusta, Ga. (02197000) 70
12. Discharges of unregulated floods of selected percent chance exceedances of the Savannah River at Augusta, Ga. (02197000) 75
13. Peak discharges and frequency plotting positions for regulated conditions for the Savannah River at Augusta, Ga. (02197000) 80
14. Discharges of regulated floods of selected percent chance exceedances of the Savannah River at Augusta, Ga. (02197000) 82

FLOOD FREQUENCY OF THE SAVANNAH RIVER AT AUGUSTA, GEORGIA

By

Curtis L. Sanders, Jr., U.S. Geological Survey
Harold E. Kubik, U.S. Army Corps of Engineers
Joseph T. Hoke, Jr., U.S. Army Corps of Engineers
William H. Kirby, U.S. Geological Survey

ABSTRACT

A flood-frequency study of the Savannah River at Augusta, Georgia (02197000) was made to provide information on floods of various probabilities of occurrence. The study was complicated by the fact that the Savannah River upstream of Augusta has been regulated since water year 1952 by one or more of three large Federal multi-purpose dams. Although the period of record, available for analysis of regulated conditions was 34 years, the pre-impoundment period was important to the flood-frequency analysis because it included a number of large floods that, even when adjusted for regulation, exceed all floods since water year 1952. A reservoir routing model was used to adjust nine such floods for the effects of regulation by the dams. The model results also were used to develop a relation for estimating regulated peak discharges for additional unregulated floods as far back as 1796 that could not be modeled because of lack of data. The one-percent chance exceedance flood for current (1990) reservoir operation criteria on the Savannah River at Augusta was computed to be 180,000 cubic feet per second.

INTRODUCTION

Increased development of the Savannah River flood plain and greater interest in managing development to minimize damages caused by floods have emphasized the need for reliable information on flood frequency of the Savannah River at Augusta, Georgia. The U.S. Geological Survey (USGS) and the U.S. Army Corps of Engineers (COE) jointly made a study to provide such information.

Although peak discharges for major floods since 1796 at this site have been documented, the flood-frequency analysis was complicated because the Savannah River upstream from Augusta has been regulated since water year 1952 due to construction of three large Federal multi-purpose projects: Hartwell Dam, Richard B. Russell Dam, and J. Strom Thurmond Dam (formerly called Clarks Hill). These reservoirs have changed the statistical characteristics of flooding on the river, and the regulated flow records are those most directly relevant to present and future conditions.

The analysis could not be based solely on the regulated period of record, however, because the period since regulation began has been exceptionally free of large storms such as those that occurred prior to regulation. Most of those large storms were caused by infrequent climatic events, including hurricanes.

The record of floods prior to commencement of regulation in 1951 could not be combined directly with the record of regulated floods. Instead, to compile a homogeneous record for statistical analysis, it was necessary to use hydraulic simulation models to determine the effects of reservoir regulation on flood magnitudes. Using these models, the regulated post-1951 flood records were converted into equivalent de-regulated records which could be combined with the pre-1952 observed unregulated floods. In addition, the models were used to simulate the effects of regulation on nine unregulated floods for which sufficient data were available for computation. In this way, a homogeneous record of unregulated flows and a homogeneous record of regulated flows were developed for statistical analysis.

The extended record of unregulated floods was analyzed by standard procedures of flood-frequency analysis. The resultant unregulated flood frequency curve is representative of flood hydrology on the basin in the long term in the absence of regulation. The unregulated frequency curve was combined with relations between corresponding regulated and unregulated flood magnitudes to derive a frequency curve representative of regulated conditions. In addition, an independent graphical frequency analysis of the regulated data was performed.

Purpose and Scope

The purpose of this report is to provide discharges for floods of selected percent chances of exceedance for the Savannah River at Augusta (station number 02197000) based on current reservoir operating criteria (1990) (COE, 1974).

This report presents the results of the flood-frequency analysis and describes procedures used in the analysis to:

- generate unregulated-peak discharge data during periods when regulated flow conditions existed;
- generate regulated peak discharge data for major floods during periods when unregulated conditions existed; and
- develop the flood-frequency relation from the adjusted data.

The flood-frequency data presented in this report for regulated conditions are based on 1990 reservoir operating procedures. This analysis may not apply if substantial changes are made in the operation of the three large reservoirs upstream of Augusta.

Description of Study Area

The Seneca and Tugaloo Rivers, which originate in the Blue Ridge physiographic province, join within Lake Hartwell. The Savannah River flows from Hartwell Dam to the Atlantic Ocean, forming the State boundary between South Carolina and Georgia (fig. 1). The river transects two physiographic provinces, the Piedmont and the Coastal Plain (Cooke, 1936). The city of Augusta is on the Fall Line, which separates these two provinces. The slope of the river ranges from an average of about 3 feet per mile in the Piedmont to less than 1 foot per mile in the Coastal Plain.

Upstream from the Fall Line, three large Federal multi-purpose dams (Hartwell Lake, Richard B. Russell Lake, and J. Strom Thurmond Lake, formerly Clarks Hill Lake) provide hydropower, water supply, recreational facilities and a limited degree of flood control (table 1). J. Strom Thurmond Dam is responsible for most of the flow regulation that affects the Savannah River at Augusta. J. Strom Thurmond Dam and Lake will hereafter be referenced as Thurmond Dam and Lake. Richard B. Russell Lake and Dam will hereafter be referenced as Russell Lake and Dam. Stevens Creek Dam, built in 1916 and located between Thurmond Dam and Augusta, impounds a minor run-of-the-river reservoir compared to the three major reservoirs. Stevens Creek dam and other dams upstream of Hartwell Lake have little impact on flood discharges at Augusta.

Table 1.--Characteristics of major reservoirs on the Savannah River upstream of Augusta, Georgia

[mi^2, square miles]

Lake	Month and year filling began[1]	Drainage area (mi^2)	Storage (1,000 acre-feet)		
			Flood	Conservation	Total
Hartwell	Feb. 1961	2,088	293,000	1,416,000	2,843,000
Richard B. Russell	Oct. 1984	2,900	140,000	127,000	1,026,000
J. Strom Thurmond	Dec. 1951	6,144	390,000	1,045,000	2,900,000

[1]Partial filling due to construction could have occurred prior to this date.

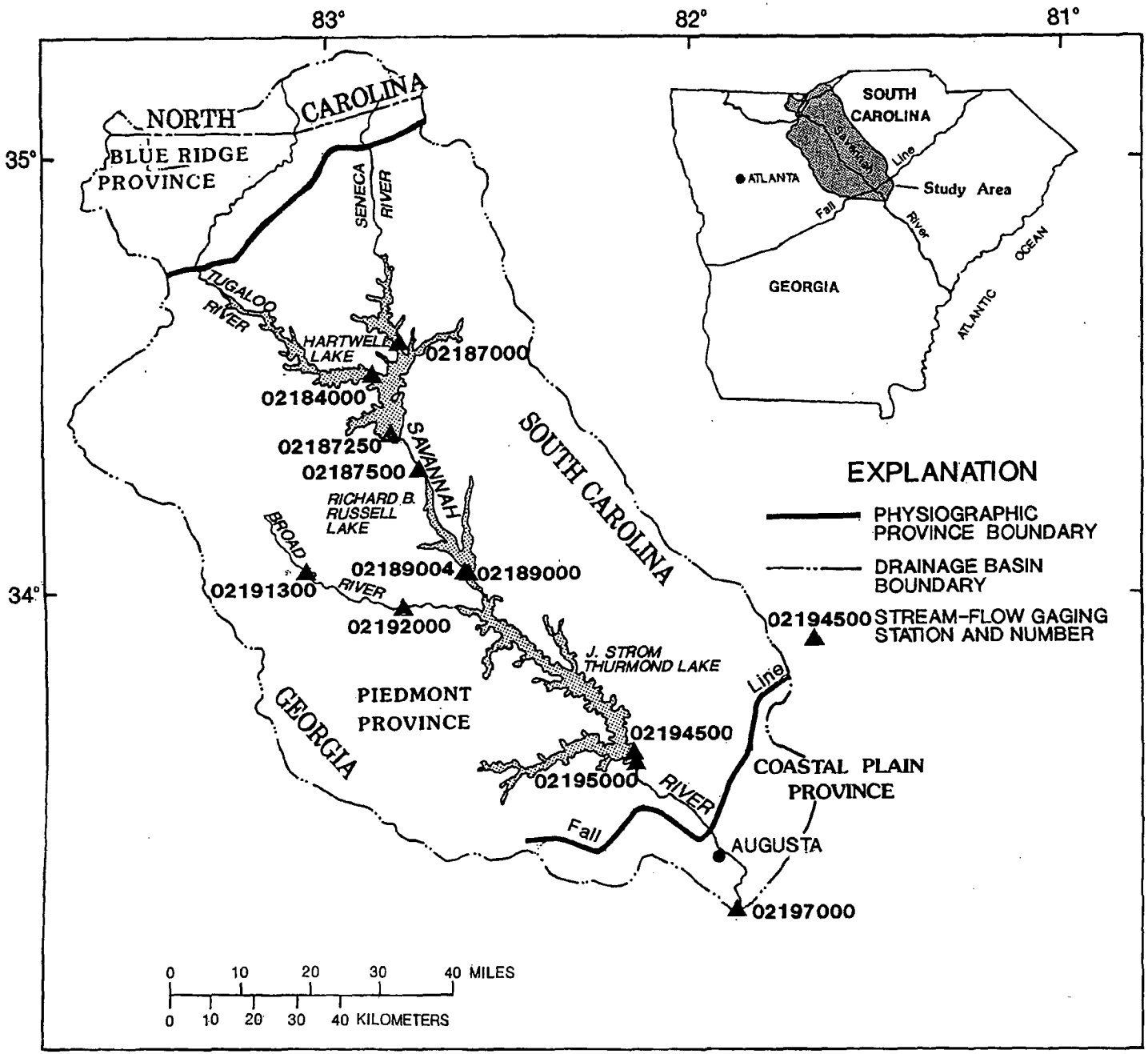


Figure 1.--Location of study area and location of gaging stations in the study area.

Previous Studies

The first comprehensive listing of floods of the Savannah River was published in U.S. House of Representatives Executive Documents No. 1 and 213 in 1890. Updated listings of floods in Georgia, along with frequency relations, were published by Carter (1951); Bunch and Price (1962); and Price (1979). A similar USGS report for South Carolina (Whetstone, 1982) lists peak discharges for the Savannah River at Calhoun Falls, Augusta and Clyo, and provides unregulated flood-frequency information based on the period prior to 1952 and regulated flood-frequency information based on the period 1952-79.

The USGS tabulated peak discharges for floods prior to 1962 for several gaging stations in the Savannah River basin (Speer and Gamble, 1964). The COE (1971) developed flood profiles for the Savannah River downstream of Augusta for recurrence intervals of 5, 10, 15, 50, and 100 years. Other studies that provide information on peak discharges and floods are documented in several House Documents presented in the reference section of this report. Other useful reports include: two by Emigh (1914 and 1929) of the Weather Bureau, reports by Patterson (1889) and Phillips (1892); and several reports by the COE (1929, 1945, 1952, 1953 and 1974). An unsteady-flow computer model has been used by the USGS to determine flood profiles between Augusta and Clyo for 4 historic floods of various magnitudes (McDonald and Sanders, 1987).

Acknowledgments

The assistance of Rachel Brewer, city clerk of Augusta, Ga., in locating historic information pertaining to floods in Augusta, is gratefully acknowledged. The authors are also indebted to the Federal Energy Regulatory Commission, which provided additional information regarding floods in Augusta, and to Dr. Edward Cashin, a professor of Augusta College, who has been extremely helpful in providing information regarding the history of Augusta.

AVAILABLE FLOOD RECORDS

Some information is available on floods in Augusta as early as 1722 and for flood stages, as early as 1796. A stage of 40 feet (ft) for the flood of 1796 was first published by the U.S. Weather Bureau (USWB) (Emigh, 1914). A stage gage was established on the Savannah River in Augusta at 5th Street about 1835; the datum of the gage and for the city was the low water of 1835.

Daily stage readings were published for the Savannah River at Augusta from 1875 to July 1952 by the National Weather Service (formerly U.S. Weather Bureau). Stages were recorded continuously from about 1927 to 1936 at 5th or 13th Streets in Augusta, except for short periods when the recorder was removed due to bridge construction or relocation of the gage. A staff gage was used when the recorder was not operated. The gage was located at 5th Street from 1927 to 1932, and at 13th Street from October 1, 1932, to September 30, 1936. On July 4, 1934, a staff gage was established on the Savannah River near Butler Creek, 13 miles downstream at a different datum, and used until July 30, 1936. A water stage recorder was operated at the Butler Creek site from October 1, 1936 to November 10, 1948, when the gage was moved 0.2 miles upstream to its present location at the New Savannah Bluff Lock and Dam. The station name (Savannah River at Augusta, Ga.) and station number (02197000), have not changed, and peak discharges at the four sites are considered equivalent.

Peak discharges prior to 1912 were determined using a stage-discharge rating established by discharge measurements made during the 1890's and early 1900's. The COE first published discharges for the major floods in U.S. House of Representatives Executive Documents No. 1 and 213 and the U.S. Weather Bureau published discharges for the major floods in 1891. The USGS listed the peak stages and discharges for the floods of 1840, 1852, 1865, 1876, and 1888, and maximum daily stages and discharges for "all the large floods" from 1840 to 1905, (Murphy, 1906). The USGS published peak stages and discharges for the Savannah River in 1951 (Carter, 1951).

Carter (1951) indicates that discharges for all floods above 225,000 ft^3/s (cubic feet per second) are known (either by direct measurement or indirect calculations). Newspapers and other publications (listed in References) used to verify the occurrences of floods indicate that, in addition to the floods used in the analysis described in this report, notable floods also occurred on the Savannah River in 1722, 1741, 1793, 1820, 1824, 1830, 1833, 1851, 1854, 1870 and 1875. The Augusta Gazette (Chronicle) newspaper began publication in October, 1785. It appears that the newspaper (its name changed several times over the years) reported any major flooding of the city.

Flood data for all floods of the Savannah River at Augusta used in this analysis are listed in table 2 and plotted in figure 2. The flood data are presented by water year. A water year is the 12-month period October 1 through September 30, and is designated by the calendar year in which it ends. Other gaging stations in the study area with records of stage and discharge used in this study are listed in table 3 and shown in figure 1.

Table 2.--Annual peak stages and discharges for the Savannah River at Augusta, Ga. (02197000) for the period 1796 - 1985

[ft, feet; ft³/s, cubic feet per second]

Water year	Date	Stage (ft)	Discharge (ft³/s)	Water year	Date	Stage (ft)	Discharge (ft³/s)	Water year	Date	Stage (ft)	Discharge (ft³/s)
[1]1796	Jan. 17	40	360,000	1909	June 5	28.7	87,300	1947	Jan. 22	23.97	86,000
1840	May 28	37.8	270,000	1910	Mar. 2	26.4	69,800	1948	Feb. 10	23.90	83,200
[2]1852	Aug. 29	37.4	250,000	1911	Apr. 14	19.1	32,800	1949	Nov. 30	26.61	154,000
[3]1864	Jan. 1	34.9	185,000	1912	Mar. 17	36.8	234,000	1950	Oct. 9	20.10	32,500
1865	Jan. 11	36.9	240,000	1913	Mar. 16	35.1	156,000	1951	Oct. 22	22.32	46,300
1876	Dec. 30	28.6	86,400	1914	Dec. 31	24.3	48,000	[6]1952	Mar. 6	21.53	39,300
1877	Apr. 14	31.4	119,000	1915	Jan. 20	28.2	61,000	1953	May 8	20.80	35,200
1878	Nov. 23	23.5	51,500	1916	Feb. 3	31.0	82,400	1954	Mar. 30	17.39	25,500
1879	Aug. 3	22.0	44,000	1917	Mar. 6	29.2	68,000	1955	Apr. 15	16.77	23,900
1880	Dec. 16	30.1	102,000	1918	Jan. 30	25.5	45,500	1956	Apr. 12	14.70	18,600
1881	Mar. 18	32.2	130,000	1919	Dec. 24	35.0	128,000	1957	May 7	14.08	18,000
1882	Sept.12	29.3	93,300	1920	Dec. 11	35.4	133,000	1958	Apr. 18	22.91	66,300
1883	Jan. 22	30.8	111,000	1921	Feb. 11	35.1	129,000	1959	June 8	18.65	28,500
1884	Apr. 16	28.0	81,000	1922	Feb. 16	32.0	92,000	1960	Feb. 14	20.58	34,900
1885	Jan. 26	27.5	77,000	1923	Feb. 28	28.0	59,700	[7]1961	Apr. 2	20.56	34,800
1886	May 21	32.5	135,000	1924	Sept.22	28.0	59,700	1962	Jan. 9	20.09	32,500
1887	July 31	34.5	173,000	1925	Jan. 20	36.5	150,000	1963	Mar. 23	19.52	31,300
1888	Sept.11	38.7	303,000	1926	Jan. 20	27.3	55,300	1964	Apr. 9	24.16	87,100
1889	Feb. 19	33.3	149,000	1927	Dec. 30	24.0	39,000	1965	Dec. 27	20.62	34,600
1890	Feb. 27	22.9	48,500	1928	Aug. 17	40.4	226,000	1966	Mar. 6	21.50	39,300
1891	Mar. 10	35.5	197,000	1929	Sept 27	46.3	343,000	1967	Aug. 25	18.10	26,500
1892	Jan. 20	32.8	140,000	1930	Oct. 2	45.1	350,000	1968	Jan. 12	20.94	35,900
1893	Feb. 14	25.0	60,000	1931	Nov. 17	19.9	26,100	1969	Apr. 21	22.24	45,600
1894	Aug. 7	24.0	54,000	1932	Jan. 9	30.4	93,800	1970	Apr. 1	17.68	25,200
1895	Jan. 11	30.4	106,000	1933	Oct. 18	30.3	92,600	1971	Mar. 5	23.30	63,900
1896	July 10	30.5	107,000	1934	Mar. 5	28.5	73,200	1972	Jan. 20	20.36	33,700
1897	Apr. 6	29.3	93,300	1935	Mar. 15	27.4	63,700	1973	Apr. 8	21.63	40,200
1898	Sept. 2	31.3	117,000	1936	Apr. 8	41.2	258,000	1974	Feb. 23	20.13	32,900
1899	Feb. 8	31.0	113,000	1937	Jan. 4	30.1	91,400	1975	Mar. 25	22.24	45,600
1900	Feb. 15	32.7	138,000	1938	Oct. 21	30.1	91,400	1976	June 5	20.27	33,300
1901	Apr. 4	31.8	124,000	1939	[4]Mar. 2	[5] 24.10	90,900	1977	Apr. 7	20.50	34,200
1902	Mar. 1	34.6	175,000	1940	Aug. 15	29.40	239,000	1978	Jan. 26	21.98	43,100
1903	Feb. 9	33.2	147,000	1941	July 8	22.89	53,300	1979	Feb. 27	21.13	37,300
1904	Aug. 10	25.5	63,000	1942	Mar. 23	24.56	105,000	1980	Mar. 31	22.33	47,200
1905	Feb. 14	25.8	64,800	1943	Jan. 20	25.10	117,000	1981	Feb. 12	14.70	17,700
1906	Jan. 5	29.6	96,600	1944	Mar. 22	25.53	128,000	1982	Jan. 2	19.39	30,700
1907	Oct. 5	23.6	52,000	1945	Apr. 27	23.16	64,000	[8]1983	Apr. 10	23.21	66,100
1908	Aug. 27	38.8	307,000	1946	Jan. 9	24.43	97,200	1984	Mar. 5	20.35	34,000
								1985	Feb. 7	17.89	25,700

Note: [1] Flood of January 17, 1796, reached a stage of about 40 feet (at site and datum of Fifth Street gage), marked by local residents; discharge approximately 360,000 ft³/s, by slope conveyance study. Little information exists and the data are considered approximate. Data furnished by the U.S. Army Corps of Engineers.

[2] A horizontal line in "Water year" column indicates discontinuous record.

[3] U.S. House of Representatives Document No. 64.

[4] Lines across the "Date" and "Discharge" columns indicate a change in the site that significantly affects the stage-dischage relation.

[5] A line across the "Stage" column indicates a change in gage datum and means that the stages above and below the line are not comparable.

[6] Filling of Thurmond Lake began in December 1951.

[7] Filling of Hartwell Lake began in February 1961.

[8] Filling of Russell Lake began in October 1984.

Table 3.--Drainage areas and periods of record for gaging stations in the Savannah River basin from which stage and discharge data were obtained

Station number	Site or station	Drainage area, square miles	Period of record
02184000	Tugaloo River near Hartwell, Ga.	909	1925-1927 1940-1960
02187000	Seneca River near Anderson, S.C.	1,026	1928-1959
02187250	Hartwell Lake near Hartwell, Ga.	2,088	1959-current year
02187500	Savannah River near Iva, S.C.	2,231	1950-current year
02189000	Savannah River near Calhoun Falls, S.C.	2,876	1896-1898 1899-1900 1930-1932 1938-1982
02189004	Richard B. Russell near Calhoun Falls, S.C.	2,900	1984-current year
02191300	Broad River above Carlton, Ga.	760	1898-1988
02192000	Broad River near Bell, Ga.	1,430	1926-1932 1937-current year
02194500	Thurmond Lake near Clarks Hill, S.C.	6,150	1951-current year
02195000	Savannah River near Clarks Hill, S.C.	6,150	1940-1954
02197000	Savannah River at Augusta, Ga.	7,508	1883-1891 1896-1906 1925-current year

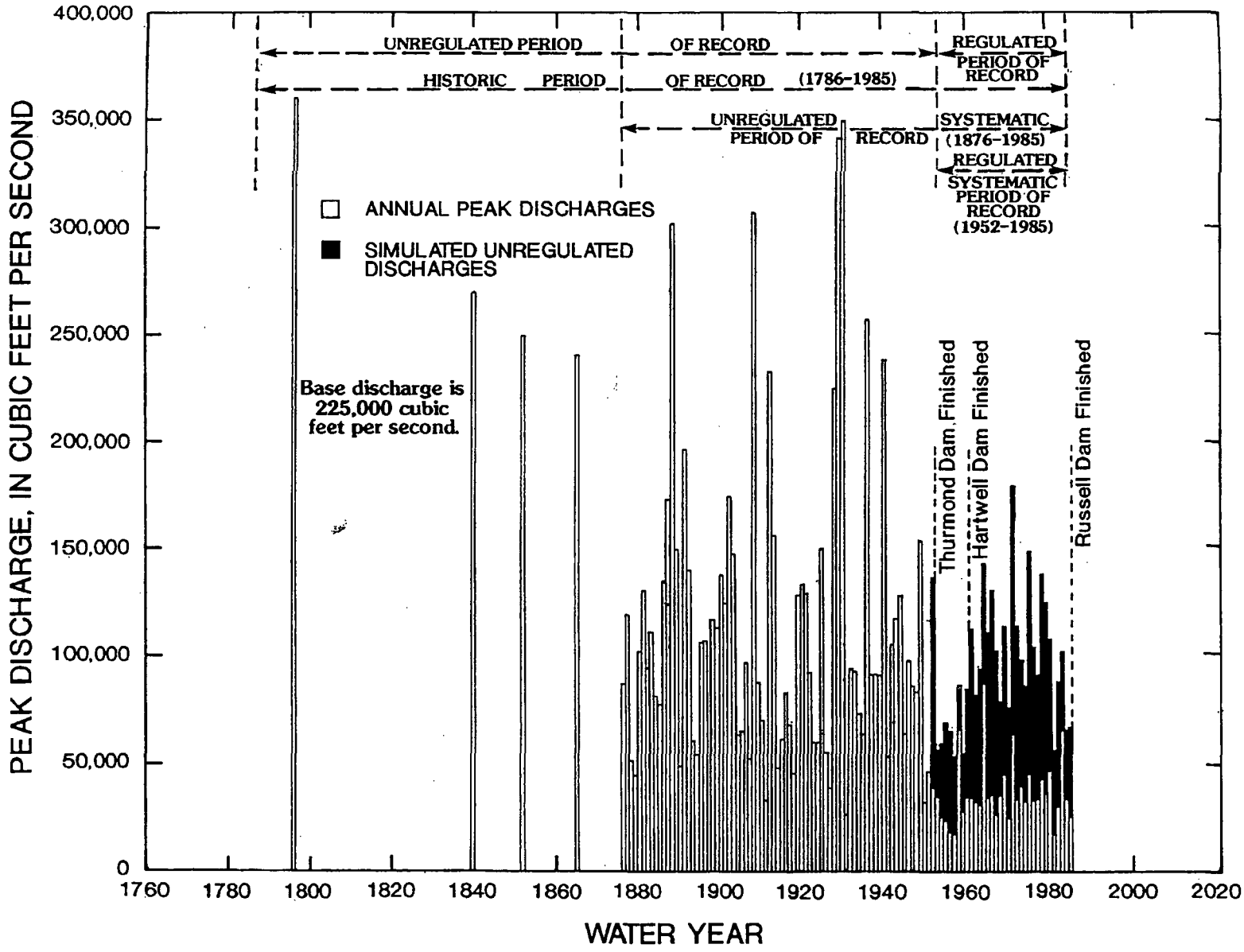


Figure 2.--Annual peak discharges and simulated unregulated peak discharges for the Savannah River at Augusta, Ga. (02197000) for 1786-1985.

Based on information currently (1990) available, the range of uncertainty for the stage of the flood of 1796 extends from 37 to 41 ft, with a corresponding range of discharge from 240,000 ft^3/s to 410,000 ft^3/s. The published stage of 40 feet and discharge of 360,000 ft^3/s were used in the frequency analysis of this report. The first reference to a stage of 40 ft appeared in House Executive Document No. 23, dated January 1881. Other references that show a stage of 40 ft are Emigh (1914), COE (1929), House Document No. 64 (1935), and Carter (1951). Carter (USGS, written commun., 3/23/50) indicates that in 1930 the COE had knowledge of a high-water mark for the 1796 flood and had determined the discharge by a slope-conveyance computation; no records of the high-water mark or the computation are available at this time (1990).

Publications prior to House Document No. 64 (1935) list various values for peak stages for several early floods on the Savannah River at Augusta. Most publications indicate that the gage at the 5th street bridge was read routinely from 1 to 4 times daily (Hall and Hall, 1907). During floods the gage was read more frequently. Therefore, the differences may be because some publications may show observed stage and other publications may show the interpolated peak stage based on more than one observed stage. These floods and the peak stages published prior to 1951 and those used in this report are listed in table 4.

APPROACH

Peak discharges for 5 historic and for floods in water years 1876-1985 as given in table 2 consist of unregulated peak discharges prior to 1952 and regulated peak discharges since 1952.

To determine the one-percent chance exceedance flood, a flood in which the peak discharge has a one-percent chance of being exceeded in any year, it is desirable to use the longest period of record possible (Interagency Advisory Committee on Water Data, 1982).

The period of record used for a flood-frequency analysis can have a substantial effect on the discharge for a given probability of exceedance; for example, the one-percent chance exceedance flood computed for the Broad River near Carlton, Ga. for the period 1898-1985 is 49 percent greater than that computed for the period 1952-85 (fig. 3). Similarly, the one-percent chance exceedance flood computed for the Savannah River near Calhoun Falls, S.C. for the period 1900-1960 is 18 percent greater than that computed for the period 1931-60 (fig. 4). These differences would be even greater if the large floods that occurred during the eighteenth and nineteenth centuries were included. The peak discharges for neither river were subject to significant regulation during these periods.

Table 4.--Published peak stages for early floods of the Savannah River at Augusta, Ga. (02197000)

[dashes indicate no data]

Flood	U.S. House of Representatives Executive Document No. 213 1890	Murphy 1906	Emigh 1914	U.S. House of Representatives Document No. 615 1916	Corps of Engineers 1929	U.S. House of Representatives Document No. 64 1935	Carter 1951	This report 1990
1796	--	--	40	39.5	40	40.0	40	[1]40
1840	37.5	37.8	37.8	37.8	37.8	37.8	37.8	37.8
1852	36.8	36.8	37.4	37.4	37.4	37.4	37.4	37.4
1864	34.0	--	34.9	34.9	34.9	34.9	--	34.9
1865	36.4	36.4	36.9	36.9	36.9	36.9	36.9	36.9
1888	38.7	38.7	38.7	38.8	38.7	38.7	38.7	38.7
1908	--	--	38.8	38.9	38.8	38.8	38.8	38.8

[1]An analysis of the flood frequency in this report includes discharges for stages of 37, 40, and 41 feet for the flood of 1796.

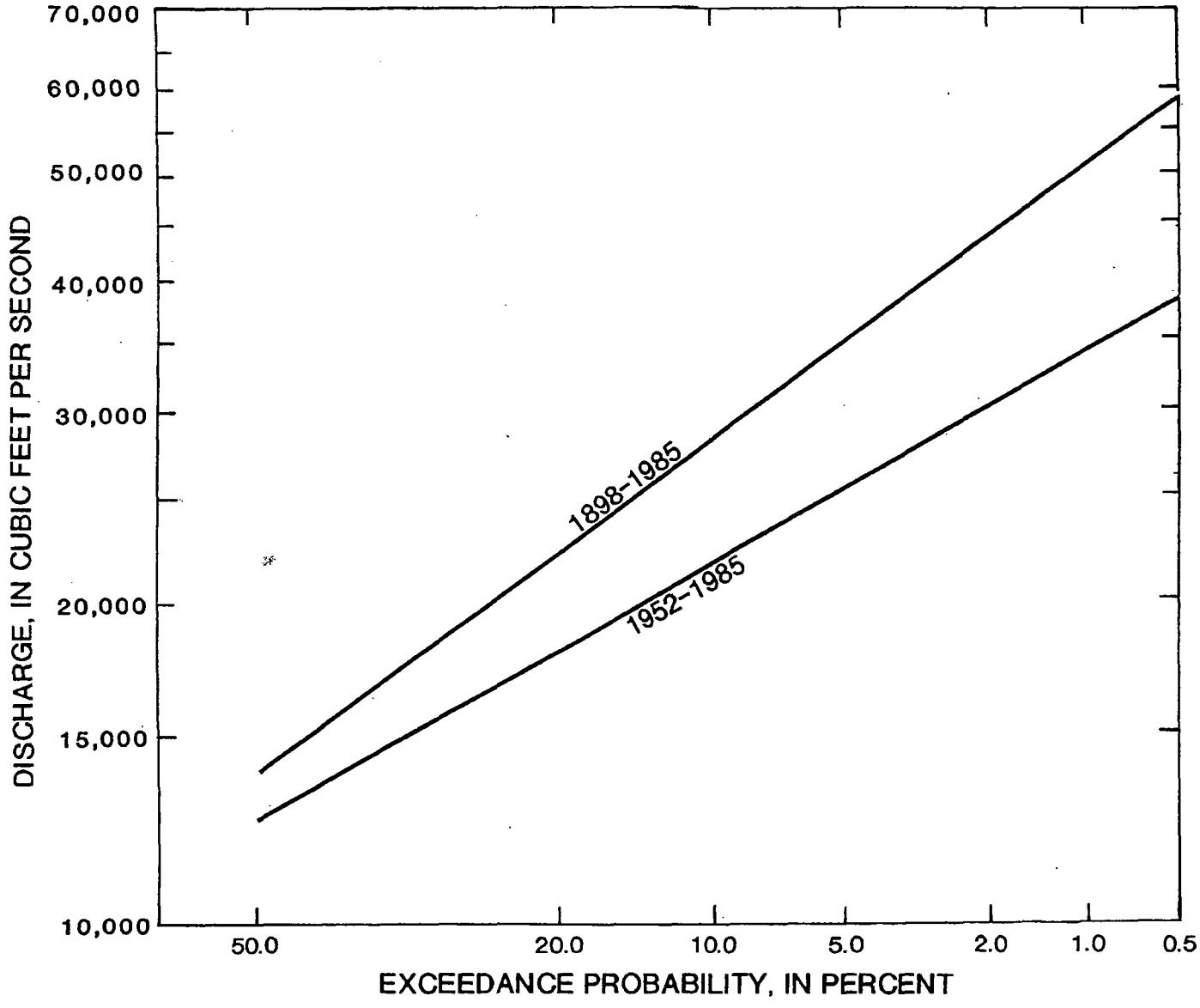


Figure 3.--Flood-frequency relations based on two different periods of record for the Broad River above Carlton, Ga. (02191300)

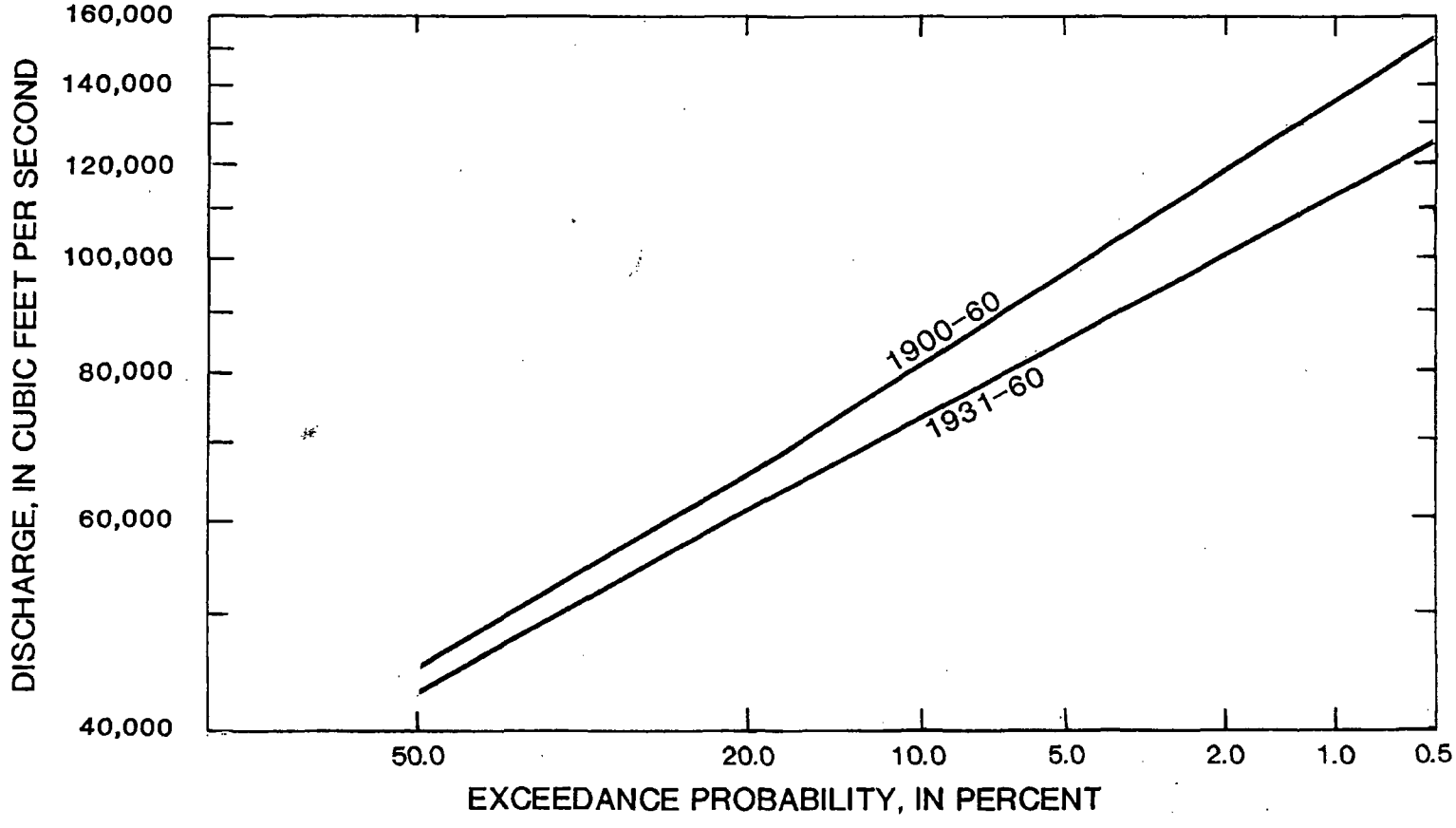


Figure 4.--Flood-frequency relations based on two different periods of record for the Savannah River near Calhoun Falls, S.C. (02189000).

The analysis used in this report utilizes the period of record from 1786 through 1985 and includes the combined regulation capability of Thurmond, Hartwell and Russell Dams, and is based on 1990 dam operating criteria (COE, 1974). The period of record commences with the water year (1786) in which the Augusta Chronicle commenced publication, because the Chronicle apparently reported any significant flooding of Augusta for the period of record.

The approach used in the analysis was:

A. Peak discharges for regulated conditions for 1952-85 were converted to peak discharges for unregulated conditions using a streamflow routing model and inflow hydrographs estimated from daily streamflow and reservoir storage data.

reverse reservoir routing?

B. Peak discharges for nine major unregulated floods were converted to peak discharge for regulated conditions, using a reservoir routing model, current reservoir operation criteria, streamflow routing parameters, inflow hydrographs, and simulated initial lake elevations. The inflow hydrographs were developed using a rainfall-runoff model or using hydrographs of the Broad River near Bell, Ga. (02192000) or above Carlton, Ga. (02191300) adjusted for relative drainage area size, storm rainfall amounts, and calibration residuals. Hypothetical regulated peak discharges were also developed using the unregulated discharges multiplied by factors of 1.25, 1.50, and 2.00.

   Initial lake elevations were determined for the beginning of major floods using a reservoir routing model and daily flows computed from daily discharge data at gaging stations. Median daily lake elevations were used when inflow data were not available for use in the reservoir routing model.

C. A relation between regulated and unregulated peak discharges was graphically established using the data from steps A and B.

D. A flood-frequency relation for unregulated conditions was developed by fitting a Pearson Type III distribution to the logarithms of the unregulated peak discharges. A systematic record period of 1876-1985, a historical period of 1786-1985, and a historical flood threshold of 225,000 ft^3/s were used. For an explanation of the significance of these flood-frequency parameters, see Hydrology Subcommittee Bulletin 17B (Interagency Committee on Water Data, 1982).

E. The flood-frequency relation for unregulated conditions was converted to a flood-frequency relation for regulated conditions using total probability methods and the relation between regulated and unregulated peak discharges.

F. Frequency plotting positions were computed for the highest 10 regulated peak discharges above a historic threshold discharge of 90,000 ft^3/s using a historic period of 1786-1985 and for the measured regulated peak discharges for water years 1952-85, historically adjusted to match the longer period. The 10 highest discharges were either simulated or obtained from the regulated-unregulated frequency relation.

G. The final regulated flood frequency relation was obtained by averaging the independent estimates developed in steps E and F.

SIMULATED PEAK DISCHARGES

The regulated peak discharges for water years 1952-85 were converted to unregulated peak discharges using daily lake stage and storage data, daily discharge data and the streamflow routing capabilities of the HEC-1 computer program (COE, 1985). Unregulated peak discharges for floods during water years 1908, 1912, 1928, March and September 1929, 1930, 1936, 1940, and 1949, were converted to regulated peak discharges using estimated daily, hourly, and bi-hourly hydrographs, streamflow routing parameters, 1990 lake operation criteria and the HEC-5 reservoir-routing computer program (COE, 1982).

The lake system and areas A-E for which hydrographs were computed are shown in figure 5 and schematically in figure 6. Hydrographs for areas A and C were combined for use in simulating unregulated peak discharges for water years 1952-85, regulated peak discharges for the 1936 flood, and initial lake elevations for 1927-85. The inflow hydrographs for each of the areas represent the flow contributed by the area to the river or lake. The "local inflow" of an area is the difference between the flow from an immediate upstream area and the outflow from the area in question.

Regulated discharges for the Savannah River at Augusta for 1952-85 were converted to unregulated discharges by routing of inflows using the HEC-1 streamflow model (COE, 1985). HEC-1 has rainfall-runoff modeling capability, which was used to generate hourly inflow hydrographs for the 1936 flood.

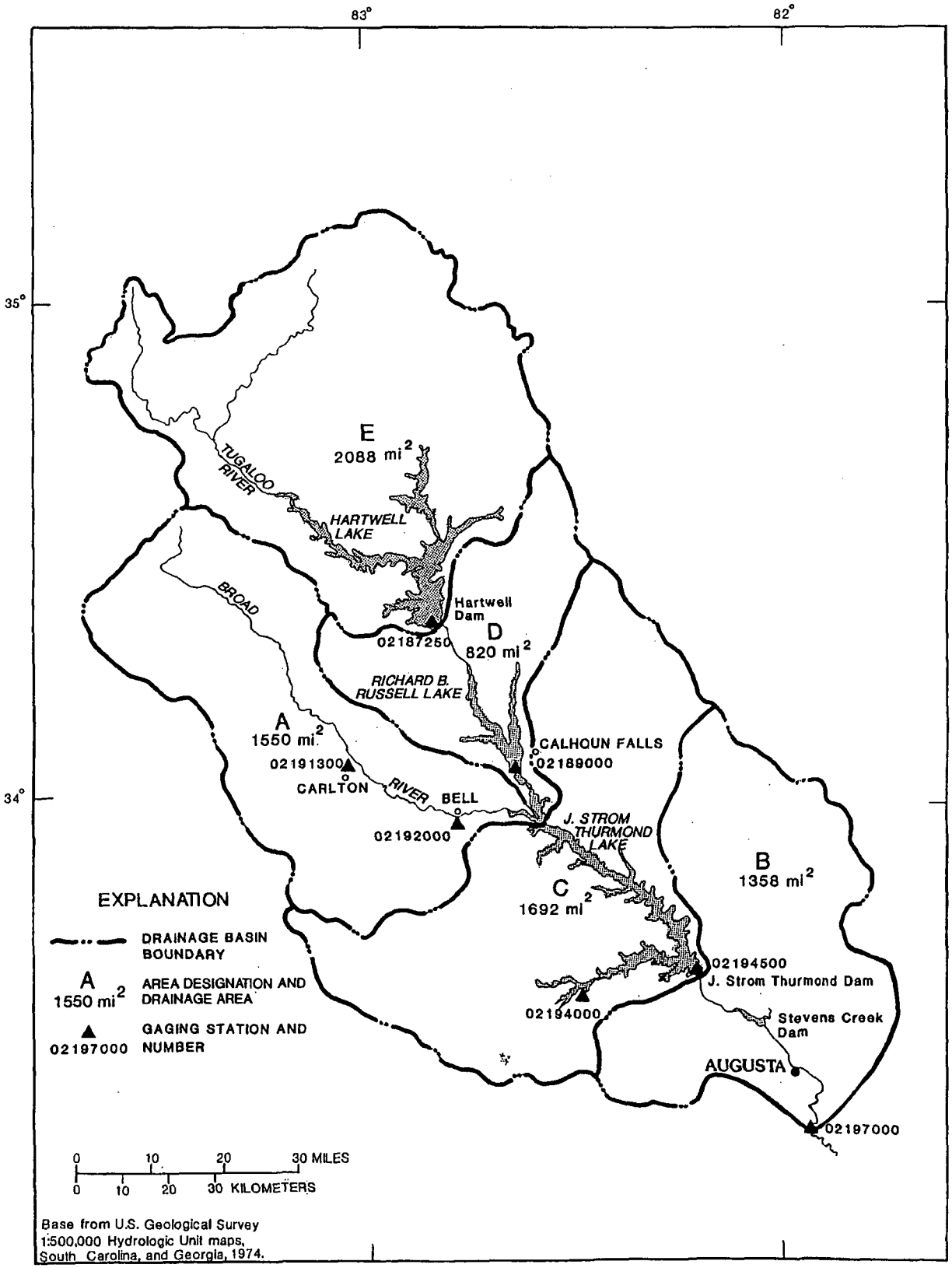


Figure 5.--Areas, drainage areas, and gaging stations used in estimating unregulated inflow hydrographs.

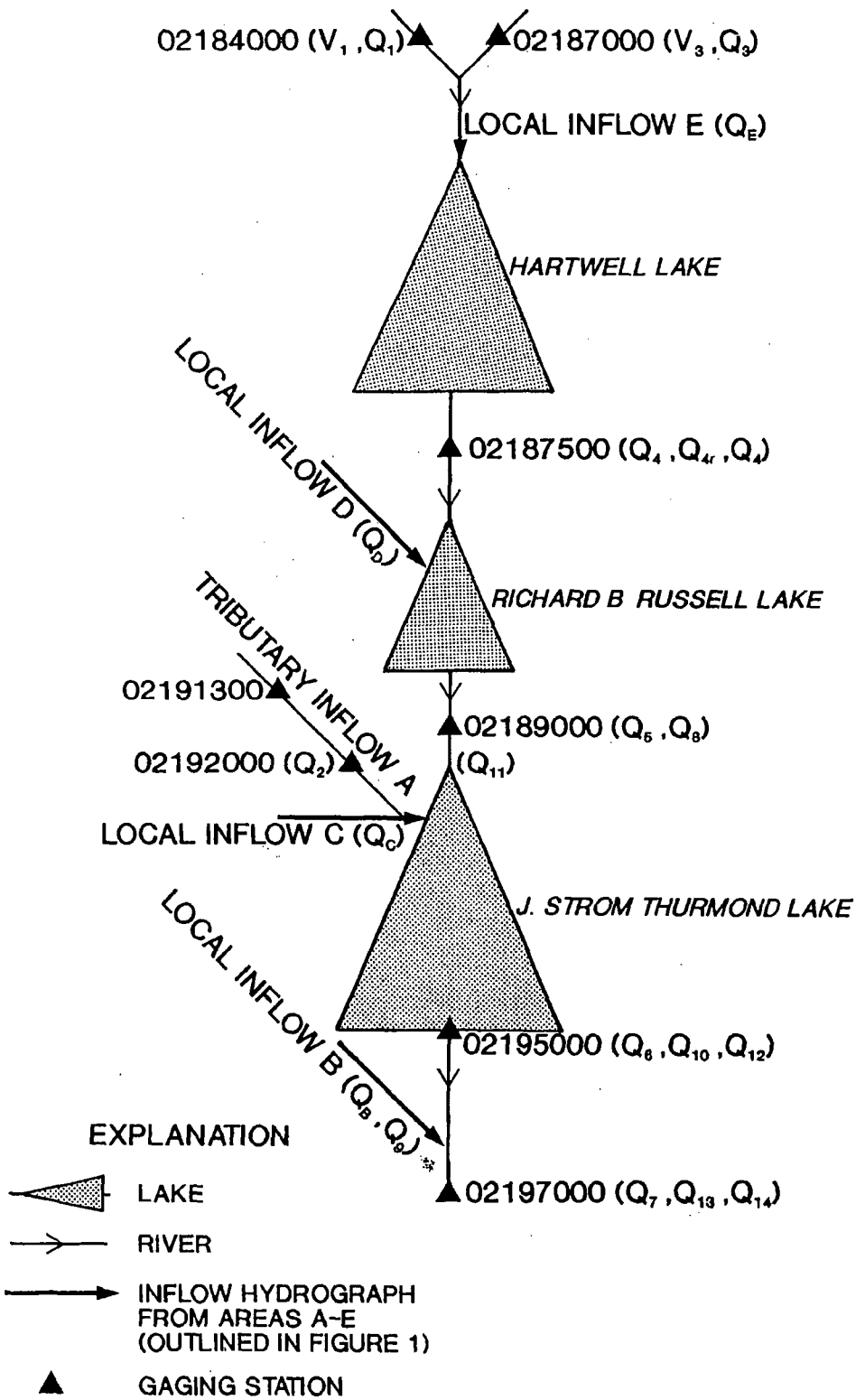


Figure 6.--Schematic diagram of the study area.

The HEC-1 computer program is a generalized hydrologic program developed by the COE Hydrologic Engineering Center (HEC) to simulate the surface-runoff response of a river basin to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components (COE, 1985). Input to the HEC-1 computer program consisted of routing parameters, inflow hydrographs, precipitation data, and interception/infiltration parameters. The HEC-1 program supports a variety of hydrologic computation procedures. In this study, the Soil Conservation Service (SCS) curve number method was used to compute rainfall excess, the unit hydrograph method was used to compute discharge from rainfall excess and the Muskingum method was used for flood routing in channels.

A reservoir routing model, HEC-5 (COE, 1982), was used to route daily inflow hydrographs through the three reservoirs to establish initial lake elevations for hourly hydrographs for eight floods, which were routed through the system using the HEC-5 model.

The HEC-5 computer program is a generalized hydrologic reservoir computer program developed by the COE Hydrologic Engineering Center to simulate operation of reservoirs for flood-control purposes during a single flood or for conservation purposes (such as maintenance of minimum flows for water supply) and for period-of-record routings (COE, 1982). The HEC-5 model was developed to assist in planning studies for evaluation of proposed reservoirs, and to assist in sizing the flood control and conservation storage requirements for a specified project. The program allows simulation of the sequential operation of a system of reservoirs of any configuration for short-interval historic or synthetic floods. For detailed information, refer to the users manual (COE, 1982).

Input to the HEC-5 model consisted of routing parameters, stage-storage relations for reservoirs, reservoir operation rules and constraints, system configuration, inflow hydrographs, and initial pool elevations.

The Muskingum method for channel routing was used to route hydrographs through channel reaches and through each reservoir to the dam. The Muskingum method approximates outflow from a channel reach as a linear function of inflows at current and previous time steps. Flow was routed through the dams using reservoir storages, reservoir operation criteria (COE, 1974), and flow constraints at downstream locations.

HEC-5 was modified to accommodate the complex channel flow capacity criteria specified in plate A-7-1 of the "Reservoir Regulation Manual, Savannah River Basin," (COE, 1974).

Requirements for releases from Thurmond Dam include:

1) maintenance of minimum weekly average flow of 3,600 ft^3/s for water supply and hydropower generation,

2) variation of operating channel flow capacity at Augusta from 20,000 ft^3/s to 30,000 ft^3/s, depending on pool elevations,

3) releases in excess of 30,000 ft^3/s to prevent dam overtopping, and

4) maintenance of discharge at Augusta equal to maximum local inflow during periods of falling reservoir stages during floods to lower lake levels as quickly as possible.

Unregulated Peak Discharges

Regulated peak discharges were converted to unregulated peak discharges by the following methodology:

1. For water years 1952-85, daily inflow hydrographs were estimated using peak discharge, daily discharge, and daily lake elevation data. Local inflows were computed from the hydrologic storage equation, Local Inflow = Outflow - Upstream Inflow + Change in Storage. Where there were no reservoirs in the areas where local inflows were computed, the changes in storage was assumed to be zero. Where the areas included reservoirs, changes in storage were computed using measured lake elevations and relations of lake storage to lake elevation (COE, 1974). Negative daily local inflows sometimes resulted using the change-in-storage method, most likely because of non-equilibrium conditions at the time of day when reservoir elevations were measured. These negative inflows were set at a representative minimum flow. In such cases, all hydrograph ordinates were multiplied by a constant to adjust the computed volume to equal the measured volume. Inflow hydrographs were transferred to other locations in proportion to drainage area ratios.

2. The daily inflow hydrographs were converted to 2-hour hydrographs by interpolation, and then routed through the regulated river system to ensure that flood volumes were preserved.

3. The 2-hour inflow hydrographs were then routed through the stream system without the reservoirs, using HEC-1, to simulate unregulated hydrographs and peak discharges for the water years 1952-85 (fig. 2 and table 5).

Table 5.--Measured regulated and simulated unregulated peak discharges for the Savannah River at Augusta, Ga. (02197000) for the period 1952-1985

[ft^3/s, cubic feet per second]

Water year	Measured regulated discharge (ft^3/s)	Simulated unregulated discharge (ft^3/s)
1952	39,300	137,000
1953	35,200	56,400
1954	25,500	59,100
1955	23,900	68,400
1956	18,600	65,200
1957	18,000	53,400
1958	66,300	86,100
1959	28,500	54,900
1960	34,900	84,700
1961	34,800	113,000
1962	32,500	81,700
1963	31,300	94,000
1964	87,100	143,000
1965	34,600	111,000
1966	39,300	131,000
1967	26,500	102,000
1968	35,900	79,000
1969	45,600	114,000
1970	25,200	74,300
1971	63,900	180,000
1972	33,700	114,000
1973	40,200	98,000
1974	32,900	86,000
1975	45,600	149,000
1976	33,300	104,000
1977	34,200	90,900
1978	43,100	138,000
1979	37,300	125,000
1980	47,200	108,000
1981	17,700	56,100
1982	30,700	88,000
1983	66,100	102,000
1984	34,000	65,600
1985	25,700	66,300

Regulated Peak Discharges

Regulated discharges were simulated for flood events during water years 1908, 1912, 1928, March and September 1929, 1930, 1936, 1940 and 1949 by:

1. Assuming initial lake elevations for the 1908 and 1912 floods to be equal to median daily lake levels at Hartwell and Thurmond Lakes and the rule curve elevation for Russell Lake.

2. Estimating daily inflow hydrographs into each lake for the period 1927-1951.

3. Simulating daily lake elevations for the period 1927-1951 using the daily inflow hydrographs and the HEC-5 model to provide initial lake elevations for the floods being routed.

4. Estimating hourly inflow hydrographs for the floods being routed, using a rainfall-runoff model or using hydrographs of the Broad River near Bell, Ga. (02192000) or above Carlton, Ga. (02191300) adjusted for relative drainage area size, storm rainfall amounts, and calibration residuals. Hypothetical regulated peak discharges were also developed using the unregulated discharges multiplied by factors of 1.25, 1.50, and 2.00.

5. Calibrating the HEC-5 model using hydrographs from gaging stations on the Savannah River.

6. Routing the calibrated inflow hydrographs to Augusta using the HEC-5 model with regulated conditions.

Computation of Daily Lake Inflow Hydrographs for the Period 1927-51

Daily lake inflow hydrographs were estimated for 1927-51 and used with the HEC-5 program to estimate initial pool elevations for floods in water years 1928, 1929, 1930, 1936, 1940, and 1949, for which hourly hydrographs were available. The procedure used to compute daily inflow hydrographs depended on available data.

Local inflows were computed from the hydrologic storage equation as explained previously. Some hydrographs were computed by multiplying daily discharges collected at other sites on the same stream in an area by the ratios of the drainage areas of the sites.

During the subtraction process, negative flows were occasionally computed. These negative flows were eliminated by the following steps:

1. computing the annual means of the unadjusted daily values,

2. adjusting all flows below a reasonable minimum flow to the minimum flow,

3. computing the annual means of the adjusted daily flows, and

4. preserving measured annual volume, by multiplying the adjusted daily flows of step 2 by the ratios of the annual means of the unadjusted values to the annual means of the adjusted annual means in step 3.

Equations for computing daily inflows are listed in table 6.

Simulation of Initial Pool Elevations

Initial pool elevations for the 1928, March and September 1929, 1930, 1936, 1940, and 1949 water-year floods were determined by routing the daily inflow hydrographs through the reservoirs using HEC-5. Current requirements for flood control, hydropower, and conservation storage were incorporated into the model. Hydropower production loads were used according to Southeastern Power Administration contract requirements. Storage rule curves obtained from the Reservoir Regulation Manual (COE, 1974) for Thurmond and Hartwell Lakes and the Interim Reservoir Regulation Criteria (COE, written commun., 1983) for Russell Lake. Channel capacity at Augusta was set according to Plate A.7.1 of the Reservoir Regulation Manual (COE, 1974). Initial pool elevations for Hartwell and Thurmond Lakes for the 1908 and 1912 floods were estimated using median daily lake elevations for periods preceding the flood dates for years 1963-85 (Hartwell) and 1971-85 (Thurmond), excluding 1981. Records for calendar year 1981 for both lakes and prior to 1971 for Thurmond Lake were excluded because of uncharacteristically low lake elevations. The rule-curve elevation was used for Russell Lake. Initial pool elevations are listed in table 7.

Table 6.--Equations for computing daily inflow hydrographs

Period (inclusive)	Equations for computing daily discharge
	to Hartwell Lake
October 1927 - June 1928	$Q_{E1} = K_1 Q_{4r} (D_h/D_i)$
July 1928 - January 1940	$Q_{E2} = Q_3(V_4 D_h/V_3D_i)$
February 1940 - September 1950	$Q_{E3} = (Q_1+Q_3) (V_4 D_h/D_i(V_1+V_3))$
October 1950 - June 1961	$Q_{E4} = Q_4 D_h/D_i$
	to Russell Lake
October 1927 - May 1930	$Q_{D1} = Q_{E1} (D_r-D_h)/D_h$
April 1930 - April 1932	$Q_{D2} = Q_5-Q_8$
May 1932 - March 1938	$Q_{D1} = Q_E (D_r-D_h)/D_h$
April 1938 - January 1961	$Q_{D2} = Q_5-Q_8$
	to Thurmond Lake
October 1927 - March 1930	$Q_{C1} = Q_7-Q_9-Q_{10}$
April 1930 - April 1832	$Q_{C2} = Q_7-Q_9-Q_{11}$
May 1932 - March 1938	$Q_{C1} = Q_7-Q_9-Q_{10}$
April 1938 - May 1940	$Q_{C2} = Q_7-Q_9-Q_{10}$
June 1940 - June 1954	$Q_{C3} = Q_{12}-Q_{10}$
	to the reach of the Savannah River between Thurmond Dam and the Savannah River at Augusta, Georgia (02197000)
October 1927 - May 1940	$Q_{B1} = K_1 Q_7$
June 1940 - June 1954	$Q_{B2} = Q_7-Q_{14}$

Table 6.--Equations for computing daily inflow hydrographs--Continued

where

D_h is the drainage area for Hartwell Lake near Hartwell, Ga. (02187250); in mi^2.

D_i is the drainage area for the Savannah River near Iva, S.C. (02187500), in mi^2.

D_r is the drainage area for the Richard B. Russell Lake near Calhoun Falls, S.C. (02189004), in mi^2.

K_1 is an adjustment factor (1.05) to preserve volumes.

K_2 is an average of factors (K_3) computed by the equation:

$$K_3 = \frac{Q_{13} - Q_{12}}{Q_7}$$

Q_{B1-2} is the daily mean discharge from area B to the Savannah River at Augusta (02197000) in ft^3/s.

Q_{C1-3} is the daily mean discharge from areas A and C at Thurmond Dam, in ft^3/s.

Q_{D1-2} is the daily mean discharge from area D at Russell Dam, in ft^3/s.

Q_{E1-2} is the daily mean discharge from area E to Hartwell Lake, in ft^3/s.

Q_1 is the daily mean discharge for the Tugaloo River near Hartwell, Ga. (02184000) in ft^3/s;

Q_2 is the daily mean discharge for the Broad River near Bell, Ga. (02192000) in ft^3/s;

Q_3 is the daily mean discharge for the Seneca River near Anderson, S.C. (02187000) in ft^3/s;

Q_4 is the daily mean discharge for the Savannah River near Iva, S.C. (02187500) in ft^3/s;

Q_{4r} is the daily mean discharge for the Savannah River near near Iva, in ft^3/s, computed from the regression equation: $Q_{4r} = 39.99\ Q_2^{0.664}$

Q_5 is the daily mean discharge for Savannah River near Calhoun Falls, S.C. (02189000)in ft^3/s;

Q_6 is the daily mean discharge for Savannah River near Clarks Hill, S.C. (02195000) in ft^3/s;

Table 6.--Equations for computing daily inflow hydrographs--Continued

Q_7 is the daily mean discharge for the Savannah River at Augusta, Ga. (02197000), in ft^3/s;

Q_8 is the daily mean discharge as determined by routing the Hartwell inflows to the Savannah River near Calhoun Falls, S. C. (02189000) using the HEC-1 Model, in ft^3/s;

Q_9 is the daily mean discharge for the reach of the Savannah River between Thurmond Dam and the Savannah River at Augusta (02197000), in ft^3/s;

Q_{10} is the daily mean discharge as determined by routing the Hartwell and Russell inflows to Thurmond Dam using the HEC MATHPK program (Robert Carl, written commun.), in ft^3/s;

Q_{11} is the daily mean discharge, to Thurmond Lake as determined by routing the flow of the Savannah River at Calhoun Falls, S.C. (02189000) to Thurmond Lake using the HEC MATHPK program, in ft^3/s;

Q_{12} is the daily mean discharge, for the Savannah River near Clarks Hill, S.C. (02195000), in ft^3/s;

Q_{13} is the daily mean discharge as determined by routing the flow of the Savannah River near Clarks Hill, S.C. (02195000) to the Savannah River at Augusta, Ga. (02197000), by the HEC-1 program in ft^3/s;

Q_{14} is the daily mean discharge as determined by routing the flow of the Savannah River near Clarks Hill, S. C. (02195000) to the Savannah River at Augusta, (02197000), by the HEC MATHPK program, in ft^3/s;

V_1 is the accumulated daily discharge for the Tugaloo River near Hartwell, Ga. (02184000), in ft^3/s;

V_3 is the accumulated daily discharge for the Seneca River near Anderson, S.C. (02187000), in ft^3/s.

V_4 is the accumulated daily discharge for the Savannah River near Iva, S.C. (02187500), in ft^3/s.

Table 7.--Simulated initial lake elevations prior to major floods

Beginning flood date	Initial lake elevation (feet)		
	Hartwell	Russell	Thurmond
Aug. 21, 1908	658.6	475.0	329.7
Mar. 14, 1912	657.8	475.0	328.6
Aug. 13, 1928	660.0	475.0	330.3
Sept. 25, 1929	657.2	474.1	327.7
Mar. 24, 1936	659.0	475.0	328.5
Aug. 12, 1940	648.8	472.0	321.5
Nov. 26, 1948	656.4	475.0	327.5

Computation of Hourly Inflow Hydrographs

For the 1908, 1912, 1928, March and September 1929, 1930, 1940, and 1949 water-year floods, measured hydrographs were available for the following stations: Broad River near Bell, Ga. (02192000), Broad River above Carlton, Ga. (02191300), Savannah River near Calhoun Falls, S.C. (02189000), and Savannah River at Augusta, Ga. (02197000). The peak discharges for the eight floods for which measured hourly hydrographs were available occurred on the following dates:

Calendar date	Water year
August 27, 1908	1908
March 17, 1912	1912
August 17, 1928	1928
March 6, 1929	1929
September 27, 1929	1929
October 2, 1929	1930
August 15, 1940	1940
November 30, 1948	1949

Hereafter, these floods will be identified by month and (or) water year rather than by calendar date.

Regulated peak discharges at Augusta for the eight floods were estimated using measured hourly hydrographs and rainfall maps to estimate initial hourly hydrographs for five areas of the Savannah River upstream of Augusta, labeled A through E in figures 5 and 6. Shapes of the initial hourly hydrographs were derived from hydrographs of the Broad River above Carlton and near Bell. The initial hourly hydrographs were then adjusted for timing and discharge residuals at Augusta, and routed through the reservoirs using the HEC-5 reservoir flow-routing model. This method of determining hourly hydrographs is described as "hydrograph method" in this report.

The rainfall-runoff option of the HEC-1 model was used to simulate inflow hydrographs for the 1936 flood because measured discharge data were not available for the Savannah River near Calhoun Falls, S.C. (02189000). This method of determining inflow hydrograph is described as "rainfall-runoff method" in this report.

Hypothetical inflow hydrographs were computed by multiplying the discharges of the inflow hydrographs by factors of 1.25, 1.50, and 2.00. The hypothetical inflow hydrographs were used to determine the effects of regulation for floods larger than were actually experienced.

Hydrograph Method

Initial hydrograph shapes for areas of the Savannah River drainage basin upstream of Augusta were determined in the hydrograph method by using observed hydrographs for the Broad River, adjusted by relative drainage areas and rainfall volume. Hydrographs for areas B and C were refined further by adding prorated residuals between the computed hydrograph and the measured hydrograph of the Savannah River at Augusta. Hydrographs for areas C, D, and E were subsequently adjusted to shapes greater in discharge and shorter in time to account for the effect of shorter travel times through the reservoirs. Stevens Creek Reservoir was assumed to have negligible impact on large floods in the Savannah River, compared to the much larger flow regulation effected by Hartwell Lake, Russell Lake, and Thurmond Reservoir.

Area A.--An hourly hydrograph for area A, the Broad River drainage basin upstream from its mouth, beginning with construction of a "shape" hydrograph, was computed as described below:

1. The shapes of the hydrographs for the Broad River above Carlton, Ga., (760 mi^2) (square miles) and near Bell, Ga., (1,430 mi^2) were assumed to be representative of the shape of initial hourly hydrographs for areas A, B, C, and D, which range from 820 mi^2 to 1,692 mi^2. The Carlton hydrographs were used for the 1908 and 1912 floods because records were not available for the Bell gage. Hydrographs for the 1928, 1929, 1930, 1940, and 1949 floods were estimated using measured hydrographs at Bell.

2. Measured hydrograph discharges were multiplied by the factor Ry, and measured hydrograph times were multiplied by the factor Rx, to maintain a direct relation between volume and R (the drainage area ratio) where:

$$R = A_B/A_G,$$

$$Ry = R^{0.58}, \text{ and}$$

$$Rx = R/R^{.58},$$

and

A_B is the drainage area of the Broad River at its mouth, in mi^2 (table 3),

A_G is the drainage area for the Broad River above Carlton, Ga. (02191300) or near Bell, Ga. (02192000), in mi^2, and

$^{0.58}$ is the average slope of the relation of flood discharge of selected frequencies to drainage area, (Price, 1979 p. 17).

R is the ratio of the drainage area of the Broad River at its mouth to the drainage area above Carlton, Ga. (02191300) or near Bell, Ga. (02192000).

Ry is the drainage area adjustment factor for the hydrograph discharge. Peak discharges at two sites vary directly with the 0.58 exponent of the ratio of their respective drainage areas. The exponent of 0.58 is based on the slope of the regression between peak discharge for selected recurrence intervals and drainage area, as determined by Price (1979, p. 17).

Rx is the drainage area adjustment factor for the hydrograph time base. Hydrograph volumes were determined to vary directly with drainage area ratio on the average.

3. Operation (2) broadened the hydrograph and moved the centroid and peak later in time. The hydrographs were adjusted so that the hydrographs at the mouth occurred 20 hours later than at the Broad River above Carlton or 8 hours later than at the Broad River near Bell as projected from concurrent hydrographs at the two stations.

Discharges of the "shape hydrographs" constructed for the mouth of the Broad River were then multiplied by R_A to adjust for rainfall volume, assuming that flood volumes vary directly with the ratio of rainfall volumes upstream of the two sites and runoff and loss rates are similar. The following equations were used:

$$V_A = V_G(P_G A_G + P_A (A_B - A_G))/P_G A_G, \text{ and}$$

$$R_A = V_A/V_S,$$

where

V_A is the hydrograph volume at the mouth of the Broad River, in ft^3/s-hrs, adjusted for rainfall and drainage area,

V_G is the hydrograph volume at the gaging station, in ft^3/s-hrs,

V_S is the volume of the "shape hydrograph", in ft^3/s-hrs,

P_G is the average rainfall, in inches, for the drainage area upstream of the Broad River above Carlton, Ga. (02191300) or near Bell, Ga. (02192000) as derived from rainfall given in table 8 and from rainfall maps shown in figures 7-16.

P_A is the average rainfall, in inches, for the drainage area between the Broad River above Carlton, or near Bell and the mouth of the Broad River, derived and tabulated as described for P_G,

A_G as previously described, and

R_A is the ratio of the hydrograph volume at the mouth of the Broad River (adjusted for rainfall and drainage area) to the volume of the "shape hydrograph."

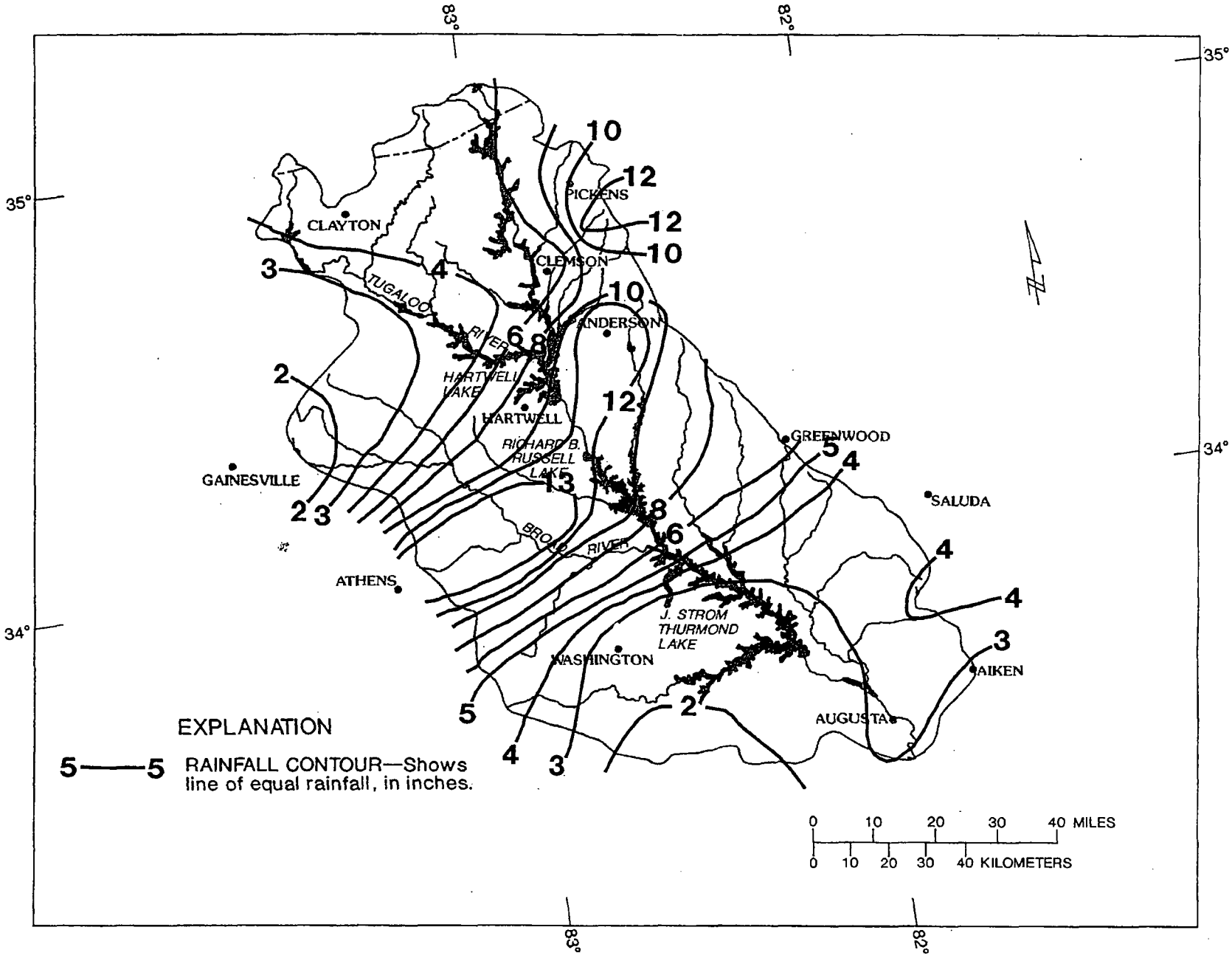


Figure 7.-- Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of August 23-26, 1908.

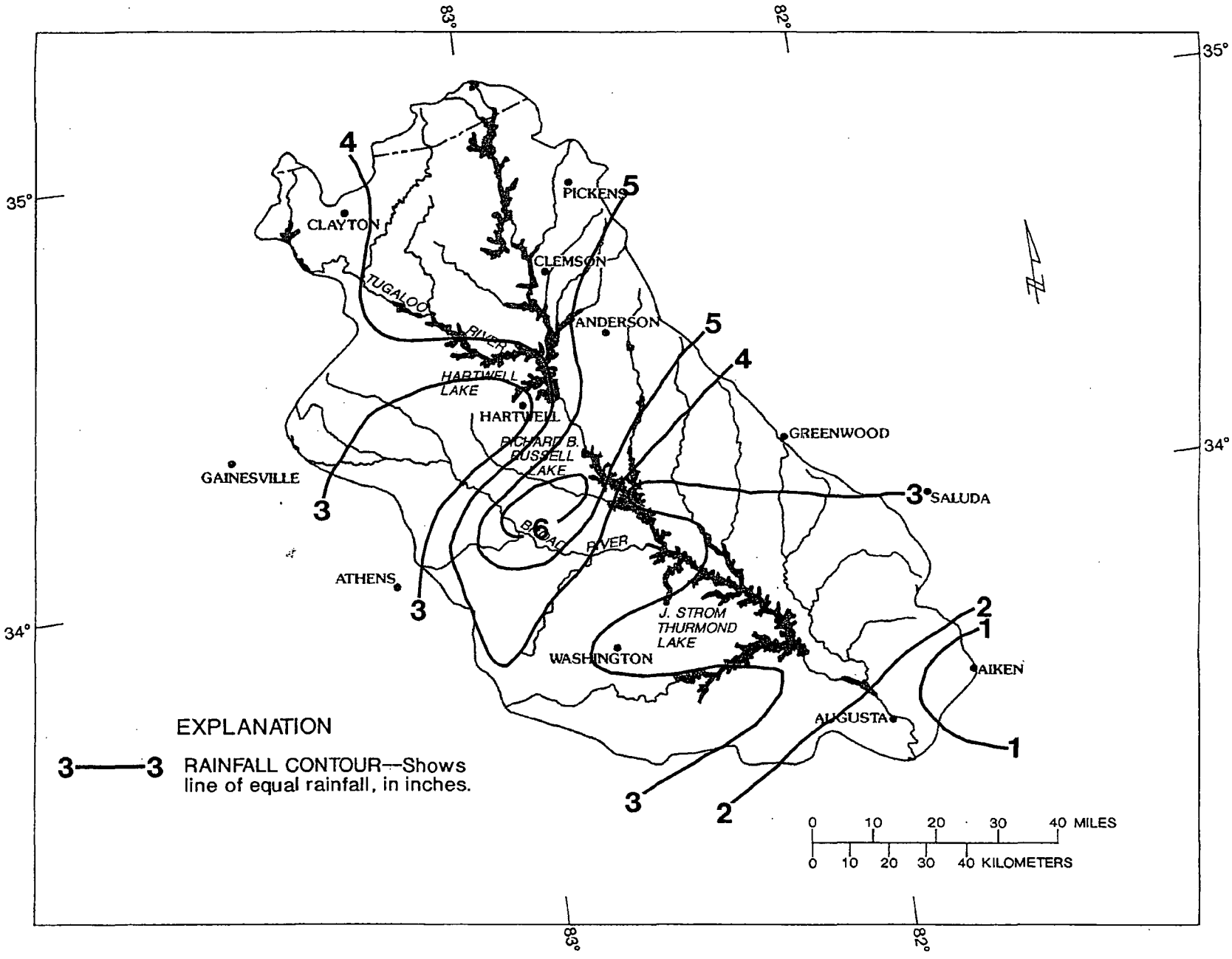


Figure 8.--Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of March 14-16, 1912.

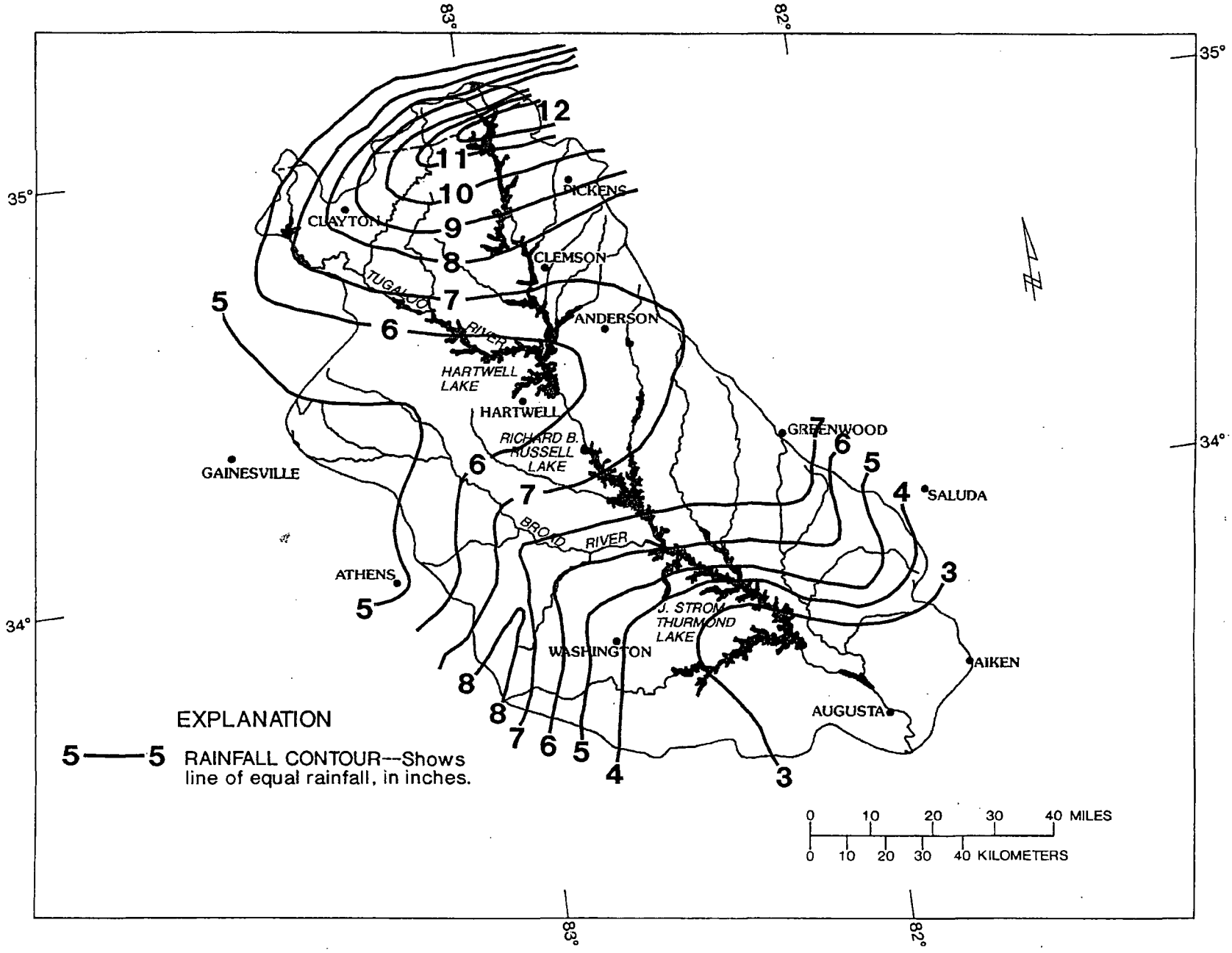


Figure 9.--Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of August 1928.

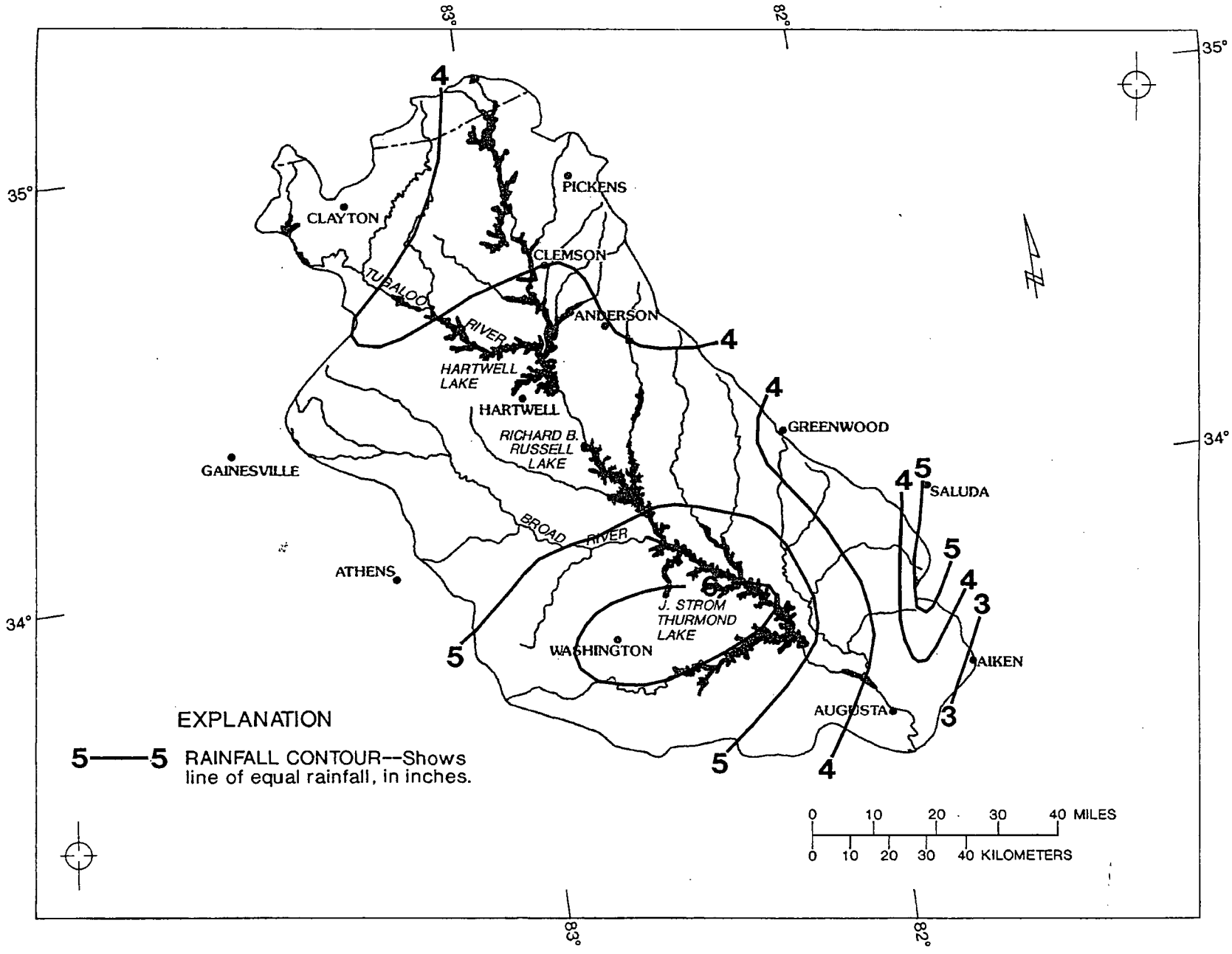


Figure 10.--Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of February 26 to March 3, 1929.

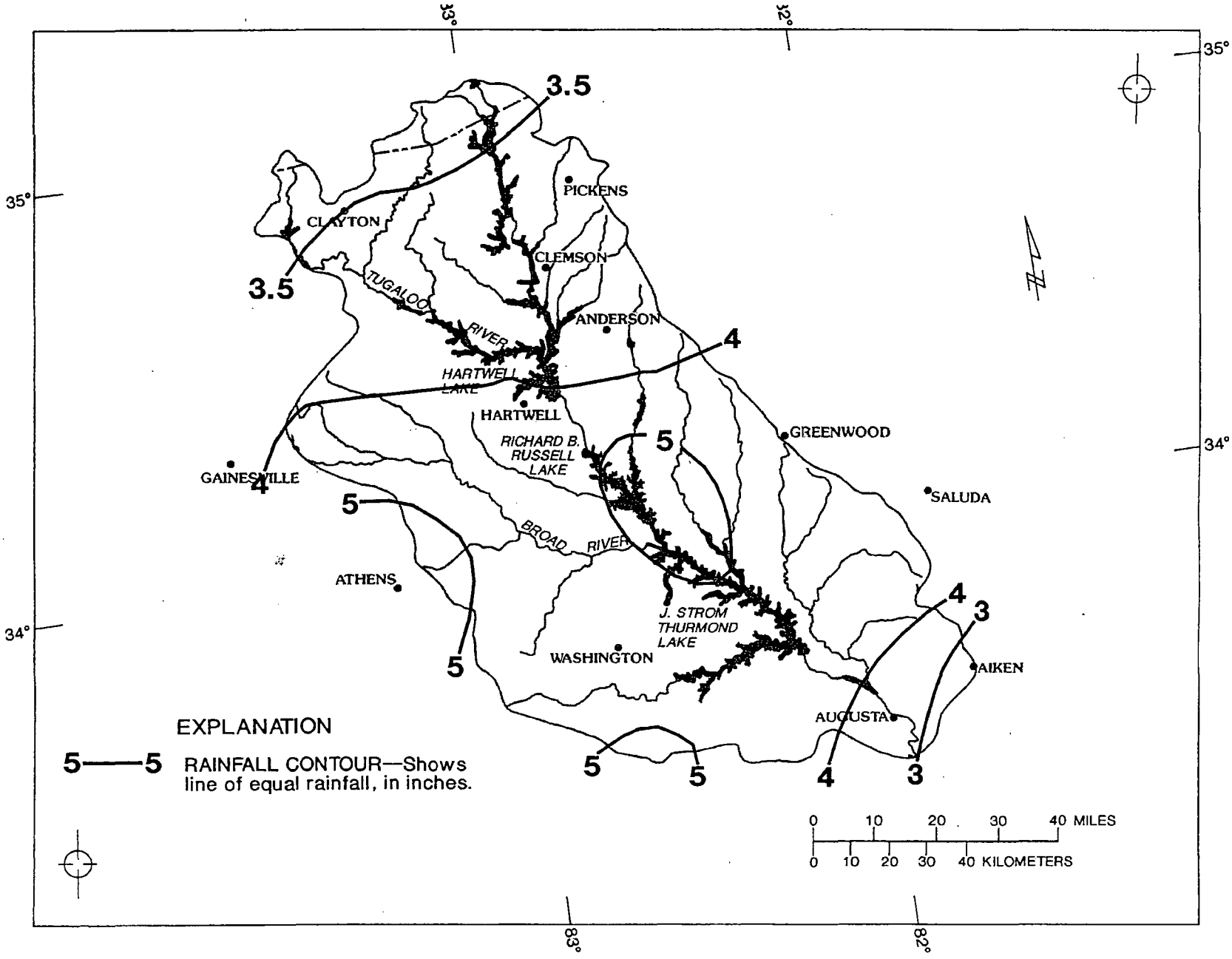


Figure 11.--Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of March 3-6, 1929.

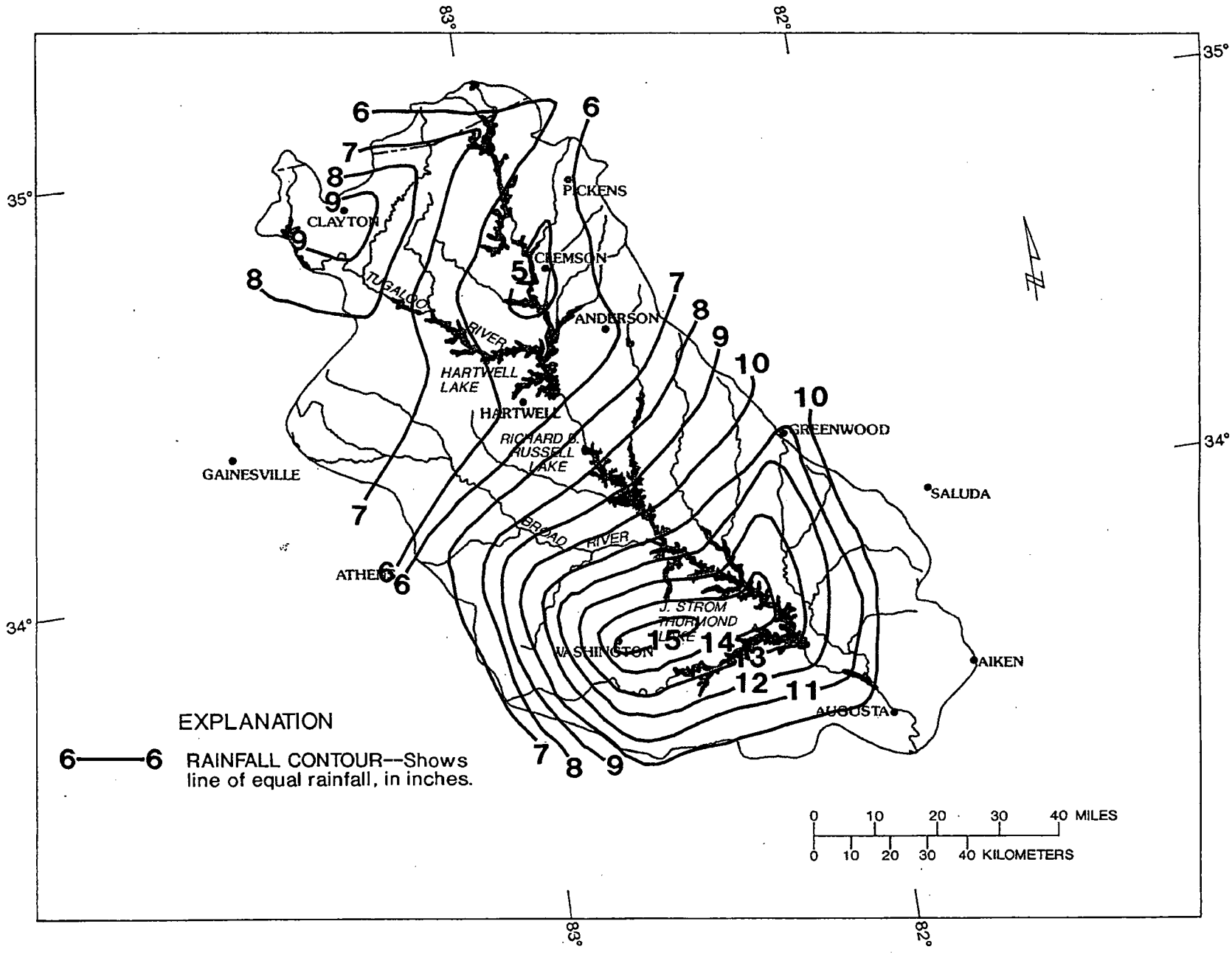


Figure 12.--Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of September 25-27, 1929.

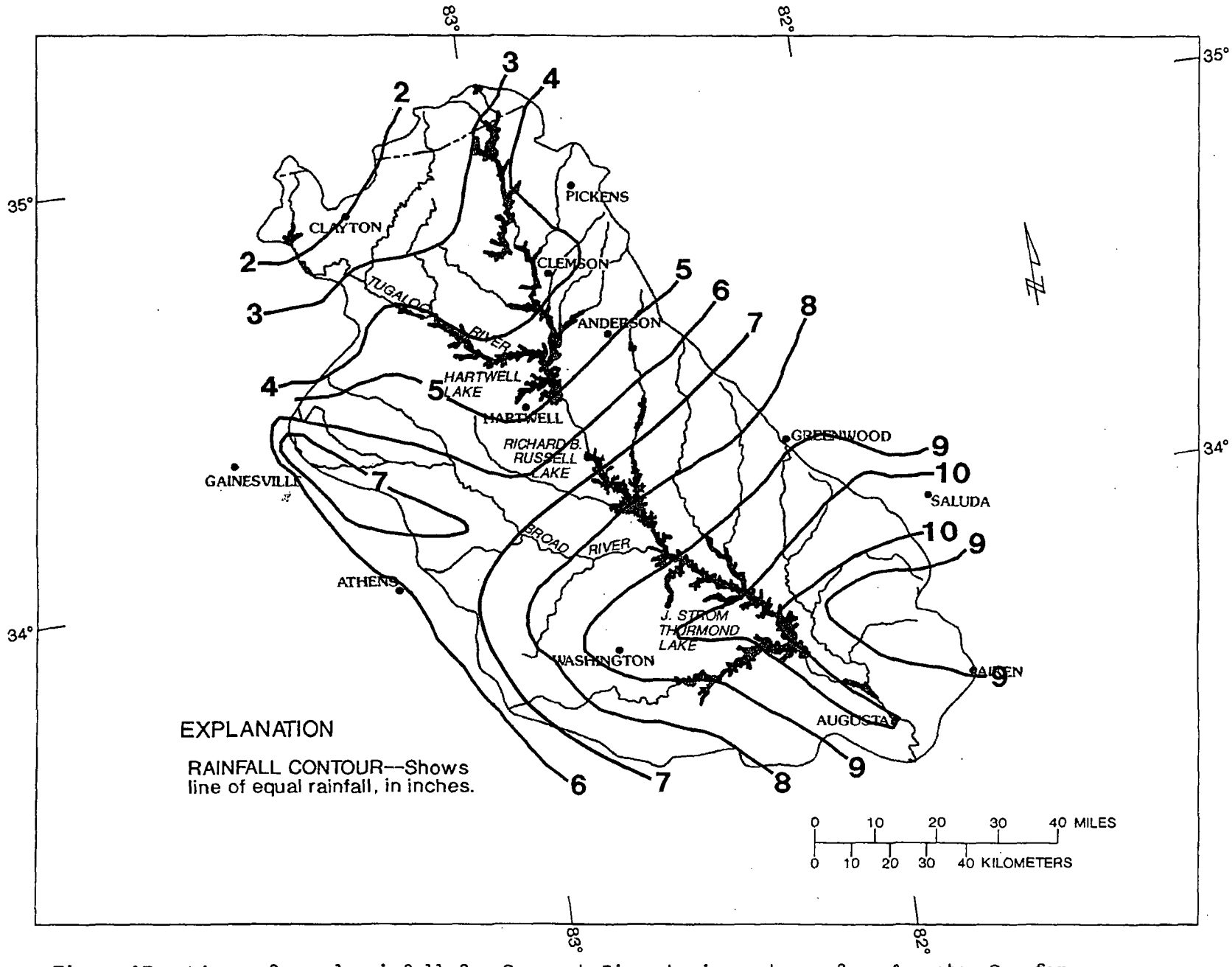


Figure 13.--Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of September 29 to October 2, 1929.

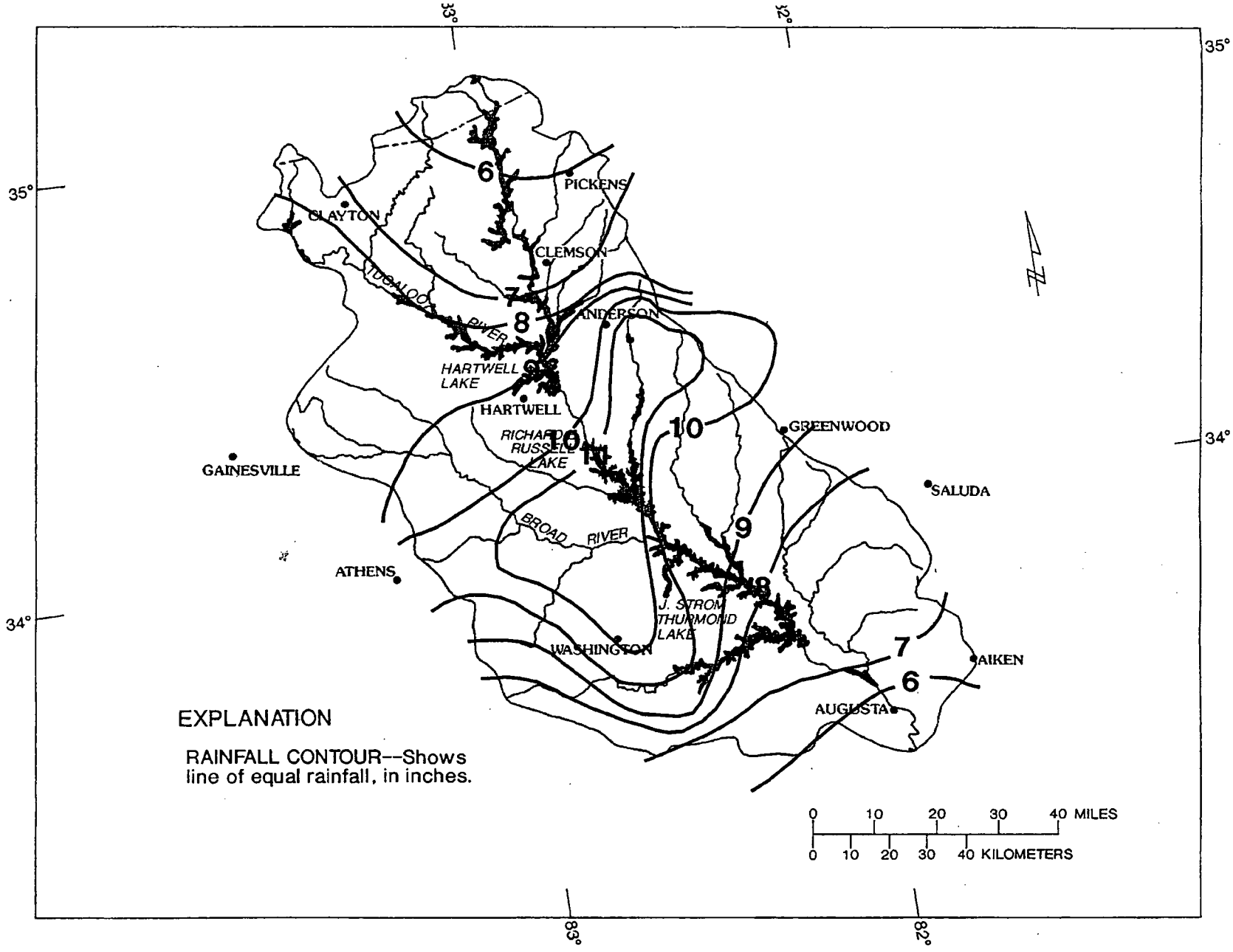


Figure 14.--Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of April 1-9, 1936.

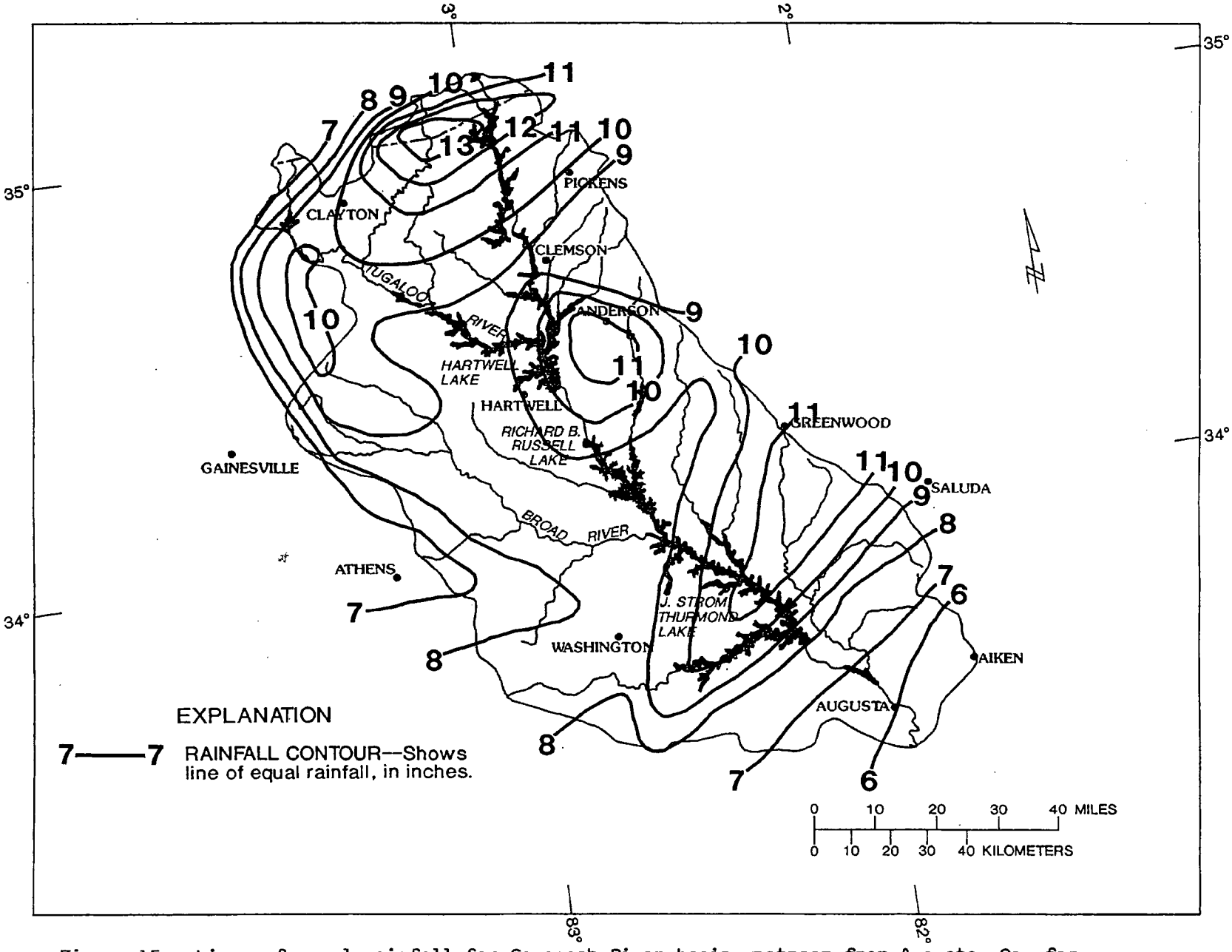


Figure 15.--Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of August 11-15, 1940.

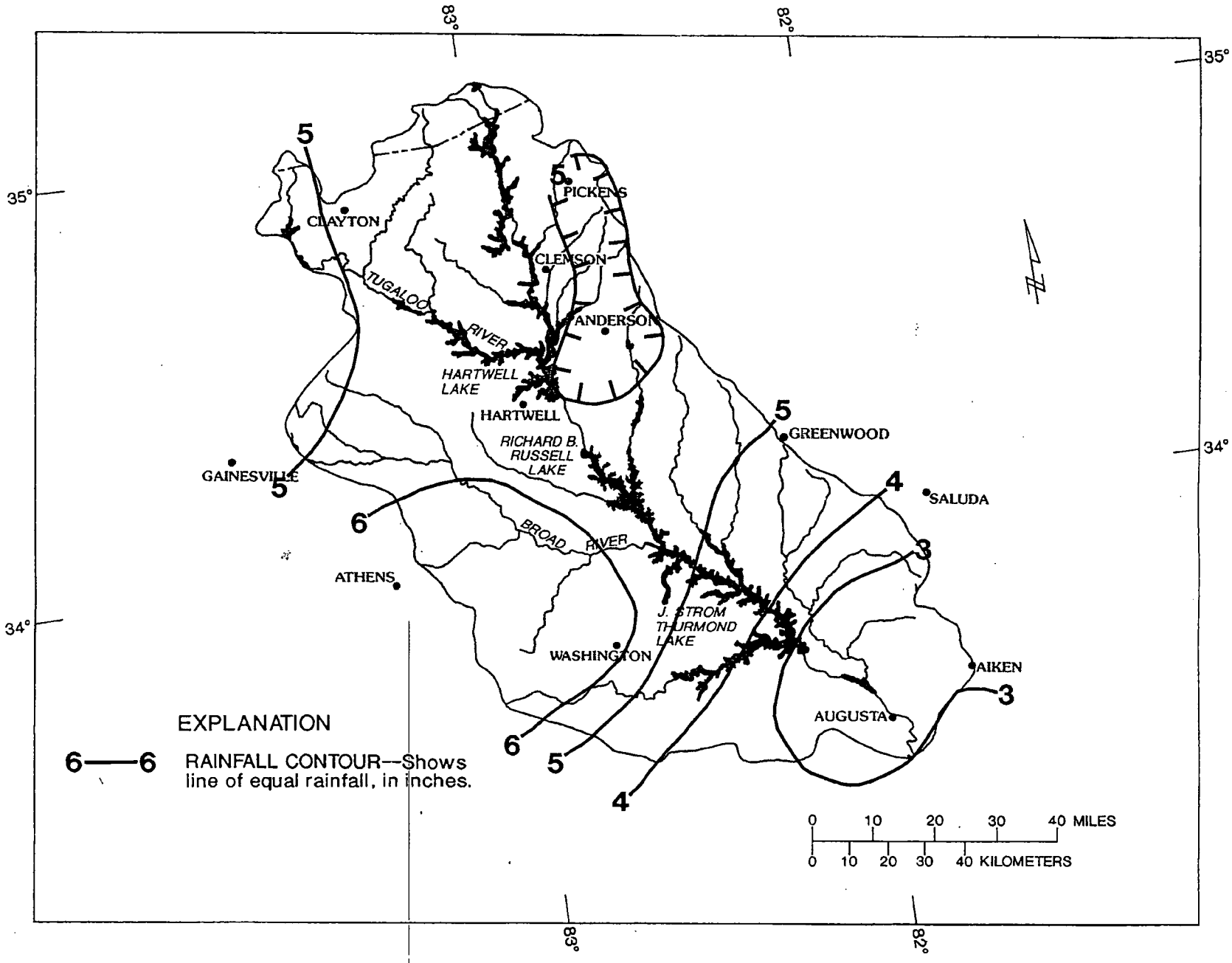


Figure 16.--Lines of equal rainfall for Savannah River basin upstream from Augusta, Ga. for storm of November 26-29, 1948.

Table 8.--Areal rainfall amounts for the floods of 1908, 1912, 1928, 1929, 1930, 1936, 1940, and 1949 water years

[dashes indicate no data]

Area	Amount of rainfall for indicated flood, in inches								
	Aug. 1908	Mar. 1912	Aug. 1928	Mar.[1] 1929	Sept. 1929	Oct. 1930	Apr.[2] 1936	Aug. 1940	Nov. 1949
A, mouth of Broad River to station 02191300	10.28	4.28	--	--	--	--	--	--	--
A, upstream of station 02191300	4.85	3.25	--	--	--	--	--	--	--
A, mouth of Broad River to station 02192000	--	--	6.43	5.26, 4.98	10.88	8.50	11.30	8.60	6.04
A, upstream of station 02192000	--	--	5.85	4.67, 4.48	8.04	6.68	9.91	8.32	6.03
B, station 02197000 to Thurmond Dam	3.23	2.34	3.91	4.26, 4.16	10.25	9.42	7.10	8.58	3.21
C, Thurmond Dam to downstream of Broad River	4.49	3.36	5.22	5.36, 4.75	11.80	8.62	9.26	9.18	5.22
D, Upstream of Broad River to Hartwell Dam	11.42	4.83	6.50	4.43, 4.32	7.29	6.23	10.08	9.53	5.08
E, Upstream of Hartwell Dam	7.12	4.25	8.00	4.08, 3.69	6.69	3.48	7.20	9.44	5.09

[1]Rainfall amounts for floods of March 1 and 6, 1929.

[2]Rainfall-runoff method rather than hydrograph method was used for computing inflow hydrographs.

The hydrograph for the Broad River at its mouth for the 1908 flood was not adjusted for rainfall, because the large difference between rainfall amounts downstream and upstream of the Carlton gage resulted in unrealistic hydrograph simulations.

Area D.--Hourly hydrographs for area D were created by first creating a "shape hydrograph" from measured hydrographs for the Broad River above Carlton or near Bell as was done for the Broad River at its mouth. Discharges of the "shape hydrograph" were then multiplied by a ratio (R_D), using the equations:

$$V_D = V_G P_D A_D / P_G A_G, \text{ and}$$

$$R_D = V_D / V_S,$$

where

V_D is the hydrograph volume for area D, in ft^3/s-hrs,

P_D is the average rainfall volume, in inches, for the drainage area D,

A_D is the drainage area of area D, in mi^2, and

A_G, V_G, P_G, and V_S are as previously defined.

Rainfall adjustments were not made for the 1908 and 1912 floods because the large difference between rainfall amounts for the area upstream of the Broad River above Carlton and rainfall for area D resulted in hydrographs with volumes too large in comparison with observed hydrographs for the Savannah River near Calhoun Falls.

The initial hydrographs for area D (and also areas C and E) were shortened in time and increased in discharge, to reflect the effect of shorter travel times through the reservoir compared to travel time for natural conditions. Pre-and post-reservoir 6-hour unit hydrographs developed by the COE (1969) and an average time of rainfall excess of 12 hours for the drainage basin between Russell and Hartwell dams were used to make the adjustments, according to the following methodology:

1. Twelve-hour unit hydrographs were generated for pre- and post-reservoir conditions. The post-reservoir hydrograph was computed for a minimum flood-pool elevation of 475 feet above sea level for Russell Lake.

2. Discharges of the pre-reservoir hydrograph were multiplied by a flow factor of 1.25 because the average discharge of the 12-hour unit hydrographs for post-reservoir conditions was 25 percent greater than the average discharge for pre-reservoir conditions.

3. The bases of the hydrographs were shortened to preserve volumes, by dividing the time increments by 1.25.

4. The time difference between peak flows of the pre- and post-reservoir 12-hour unit hydrographs was 6 hours, and the timing of the peaks of the revised hydrographs was adjusted to maintain the same time differential.

Area E.--Hourly hydrographs for area E were computed by subtracting the hydrographs for area D from the observed hydrographs for the Savannah River near Calhoun Falls, S.C. (02189000) and adjusting the resultant hydrograph 7 hours earlier. Routing by the Muskingum method indicated that there was very little attenuation of the inflow hydrograph between Hartwell Dam and Russell Dam. The hydrographs for area D were moved from zero to four hours later to avoid computation of negative discharges.

The hydrographs for area E were adjusted to reflect the effects of shorter travel times through the reservoir as was done for area D, using unit hydrograph information developed by the COE (1952). The average time of rainfall excess was 18 hours at Hartwell Dam. After developing 18-hour unit hydrographs and a flow ratio of 1.17, the hydrographs were adjusted, as previously explained. The timing of the peaks of the revised hydrograph peaks were adjusted to maintain a 9-hour differential, the time difference between peak flows of the pre- and post-reservoir 18-hour unit hydrographs.

Areas B and C.--As shown in figure 5 and 6, area B lies between Thurmond Dam and the Savannah River at Augusta. Area C lies between Thurmond Dam and downstream of the confluence at the Savannah and Broad Rivers. Hourly hydrographs were computed for areas B and C by the following method:

1. "Shape hydrographs" were created for areas B and C using the same methodology as described for area D. Volumes of these hydrographs (V_{SB} and V_{SC}) were computed.

2. Volumes were computed for the inflow hydrographs, based on volumes of hydrographs of the Broad River at its mouth and of the Savannah River near Calhoun Falls and Augusta adjusted by drainage area ratios and average rainfall amounts as shown by the equations:

$$V_{DIF} = V_{AUG} - V_A - V_{DE},$$

$$V_B = V_{DIF}\ P_B\ A_B/(P_B\ A_B + P_C\ A_C), \text{ and}$$

$$V_C = V_{DIF}\ P_C\ A_C/(P_B\ A_B + P_C\ A_C),$$

where

V_{DIF} is the total volume of runoff in ft^3/s-hours, for areas B and C;

V_{AUG} is the volume of runoff in ft^3/s-hours, of the measured unregulated hydrograph for the Savannah River at Augusta (02197000);

V_A is the volume of runoff, in ft^3/s-hours, of area A;

V_{DE} is the total volume of runoff, in ft^3/s-hours, of areas D and E combined from measured discharges for the Savannah River near Calhoun Falls;

V_B and V_C are the volumes of runoff, in ft^3/s-hours, of areas B and

P_B and P_C are the average rainfalls, in inches, of areas B and C, respectively; and

A_B and A_C are the drainage areas, in mi^2, of areas B and C, respectively.

3. The "shape hydrographs" were then adjusted for volume by multiplying the discharges by the following ratios:

$$R_B = V_B/V_{SB}$$

$$R_C = V_C/V_{SC}$$

where

$V_{SB,SC}$ = volume of runoff, in ft^3/s-hours, of the "shape hydrographs" for areas B and C, respectively.

4. The hydrographs developed in step 3 and the hydrographs for areas A and D-E were then routed downstream to Augusta using HEC-1 and compared with the measured hydrograph at that location. Muskingum routing coefficients used in the model are given in table 9.

Table 9.--Muskingum routing parameters used in the HEC-5 model for the Savannah River from Hartwell Dam near Hartwell, Ga. (02187250) to the Savannah River near Augusta, Ga. (02197000)

Reach	Natural conditions			Regulated conditions		
	X	K (hours)	Number of sub-reaches	X	K (hours)	Number of sub-reaches
For all floods:						
Hartwell Dam to Russell Dam	0.2	7.5	5	0.0	4.0	1
Russell Dam to Broad River	0.2	3.0	3	0.2	3.0	3
For the 1908, 1912, 1928, 1929, and 1930 floods:						
Broad River to Thurmond Dam	0.2	9.0	6	0.0	6.0	1
Thurmond Dam to Augusta, Ga.	0.2	10.0	5	0.2	10.0	5
For the 1940 and 1948 floods:						
Broad River to Thurmond Dam	0.2	15.0	5	0.0	6.0	1
Thurmond Dam to Augusta, Ga.	0.2	16.0	8	0.2	16.0	8

Note: X = constant which expresses the relative importance of inflow and outflow in determining storage.

K = constant which is the ratio of storage to discharge, expressed in hours.

5. Hydrographs for areas B and C were then shifted as much as 6 hours earlier or later, except for the 1928 flood for which both hydrographs were shifted 12 hours earlier in time. For the 1940 and 1949 floods, the Muskingum "K" routing coefficient was adjusted to achieve a "best fit" of the routed hydrograph to the measured hydrograph of the Savannah River at Augusta. The Muskingum "K" routing coefficient is about equal to the travel time of the flood through the reach. The value of "K" was increased by 6 hours for the unregulated flood of 1940 because the flood was a two-peak event, and the travel time of the second flood was lengthened because travel of the second flood was impeded by the presence of the first flood in the lower reaches. The value of "K" was increased by 6 hours for the 1949 unregulated flood because that flood was of much lower magnitude than the other floods, and its travel time would be greater because of greater flow resistance and length of travel.

6. An adjustment was made to the hydrographs for areas B and C to distribute residuals between the routed and measured hydrographs, based on the following:

   (a) Drainage areas A, B, and C are nearly the same (fig. 5). Therefore, area A was used to define a preliminary "shape" hydrograph for areas B and C.

   (b) Area A is longer and narrower than areas B and C (fig. 5), and, therefore, the final hydrographs for areas B and C would be expected to be shorter in time and greater in discharge than a "shape hydrograph" derived from area A.

   (c) The "shape hydrograph" derived from area A does not reflect differences in rainfall distribution within areas B and C.

   (d) The residuals between the routed hydrograph and the measured hydrograph for the Savannah River at Augusta are assumed to reflect the differences described in (6b) and (6e) and are used to refine the hydrographs developed in step 5.

Hydrographs for areas B and C were adjusted for residuals by the following method:

1. The hydrograph for area C was moved downstream to the Savannah River at Augusta by advancing it in time by 10 hours for hydrographs measured at 5th Street in Augusta and 11 hours for hydrographs measured at the present Butler Creek site. Routing was not necessary, because the Muskingum routing showed very little hydrograph attenuation for the reach.

2. The hydrograph for area C was then combined with the hydrograph for area B.

3. Residuals were computed by:

   a. Simulating the hydrograph for the Savannah River at Augusta using the hydrographs of areas B and C unadjusted for residuals, the Broad River hydrograph at its mouth, and the Savannah River hydrograph upstream of Broad River.

   b. Subtracting the simulated hydrograph from the measured hydrograph at Augusta to obtain the residuals.

4. The residual for each specific time was then prorated by the ratio of the discharge of area B (or C) to the summed discharge of areas B and C and added to the discharge of area B (or C) according to the following equations:

$$Q_T = Q_B + Q_C,$$

$$R_B = R_T\ Q_B/Q_T,$$

$$R_C = R_T\ Q_C/Q_T,$$

$$Q_{FB} = Q_B + R_B, \text{ and}$$

$$Q_{FC} = Q_C + R_C,$$

where

Q_T is the total discharge, in ft^3/s, for a specific time on the hydrograph;

Q_B and Q_C are the discharges, in ft^3/s, for areas B and C, respectively;

R_T is the residual discharge, in ft^3/s;

R_B and R_C are the prorated residual discharges, in ft^3/s, for areas B and C, respectively;

Q_{FB} and Q_{FC} are the discharges, in ft^3/s, at areas B and C, respectively adjusted for residual discharge.

Except for the 1928 flood, the resulting hydrographs looked reasonable in comparison with the measured Augusta hydrographs. The Broad River hydrograph was not well suited for the 1928 flood, because the residual adjustment resulted in a double peak for the hydrographs for areas B and C. Therefore, these hydrographs were manually smoothed and verified by steps 5 and 6 that follow.

5. The adjusted hydrograph for area C was then moved to Thurmond Dam by moving it 10 or 11 hours earlier depending on the location of the Augusta gage.

6. All hydrographs were then routed to Augusta for a final comparison with the measured hydrograph. Minor negative flows computed at the beginning and ending tails of the hydrographs were adjusted to a minimum value.

As previously described for areas D and E, the hydrograph for area C was adjusted in shape to reflect the effects of shorter travel times through the reservoir, using unit hydrograph information developed by the COE (1945). However, post-reservoir 6-hour unit hydrographs were not available for area C. The unit hydrograph was determined by deriving hydrographs for the lake area and non-lake area from the pre-reservoir hydrograph, consistent with the methods used for Hartwell and Russell Lakes, and combining them with unit tributary hydrographs using accelerated travel times. The average time of rainfall excess was 36 hours for the Savannah River basin at Thurmond Dam. After developing 36-hour unit hydrographs and a flow ratio of 1.13, the hydrographs were adjusted as previously explained. The time difference between pre- and post-reservoir hydrographs was adjusted to 12 hours to agree with the relative timing of the unit hydrograph peaks.

The computed inflow hydrographs for the eight floods are shown in figures 17-24. The simulated regulated hydrographs and the measured unregulated hydrographs for the Savannah River at Augusta are shown in figures 25-32. Peak discharges simulated for regulated conditions are listed in table 10.

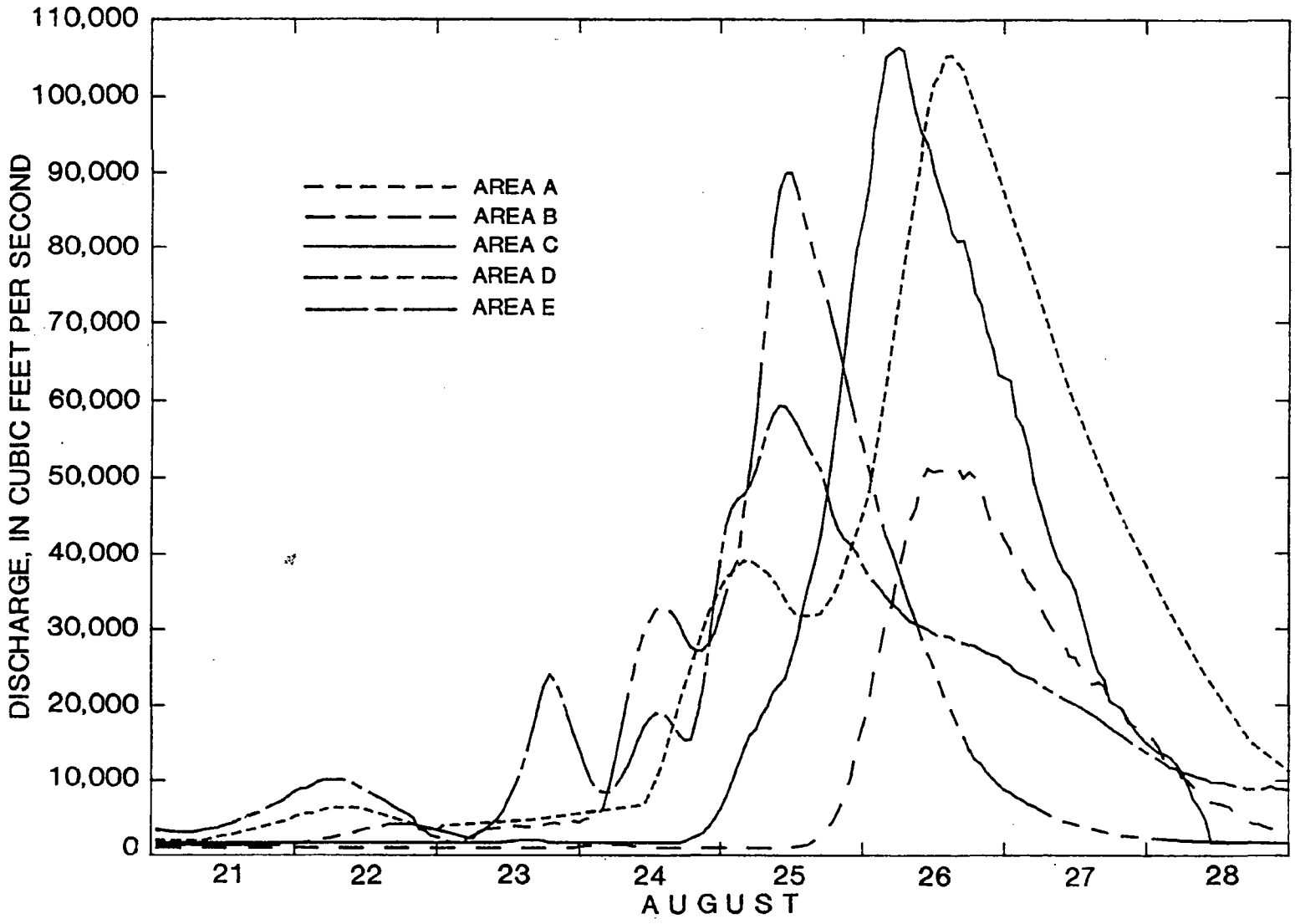


Figure 17.--Estimated inflow hydrographs for areas A-E for flood of August 1908.

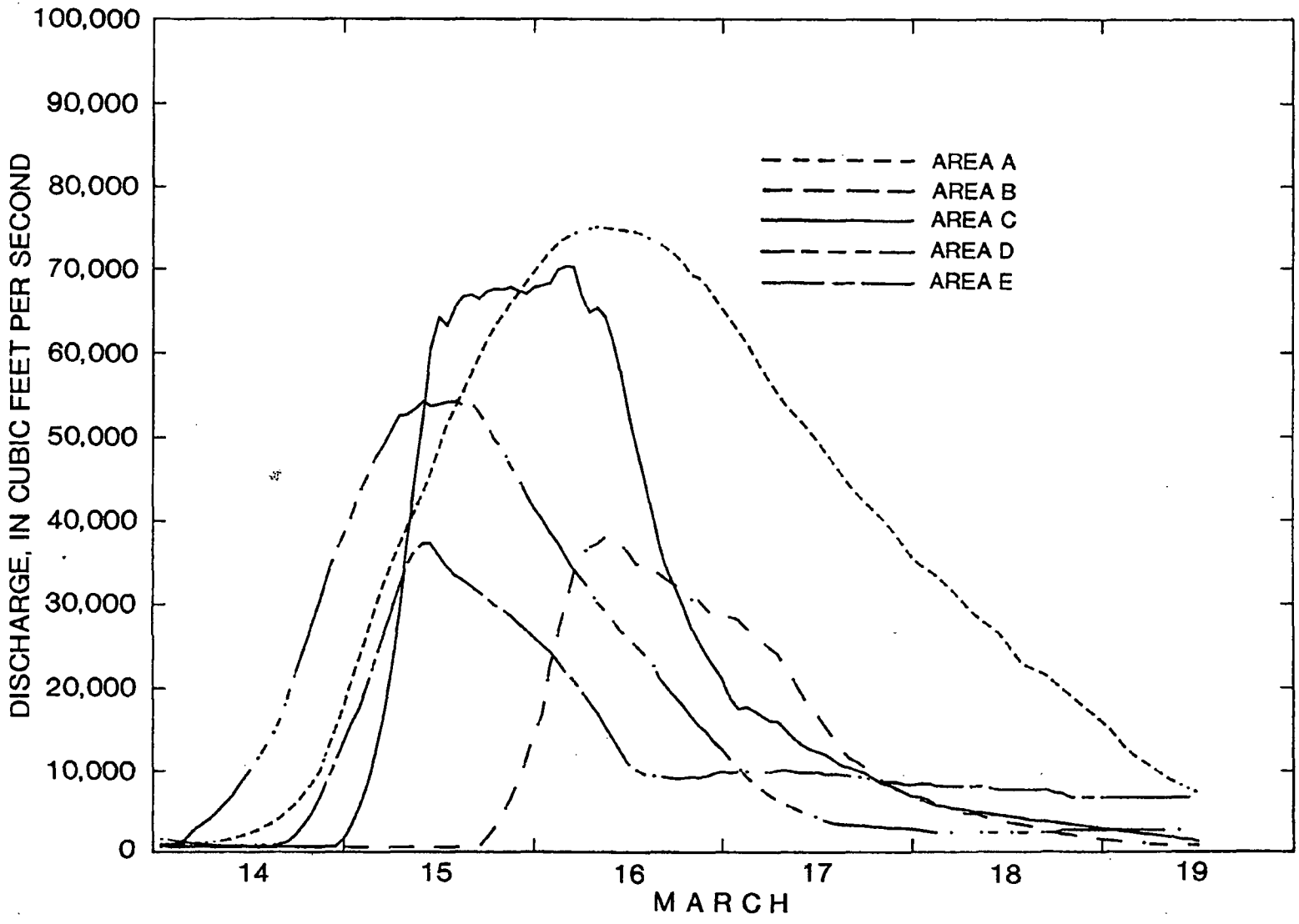
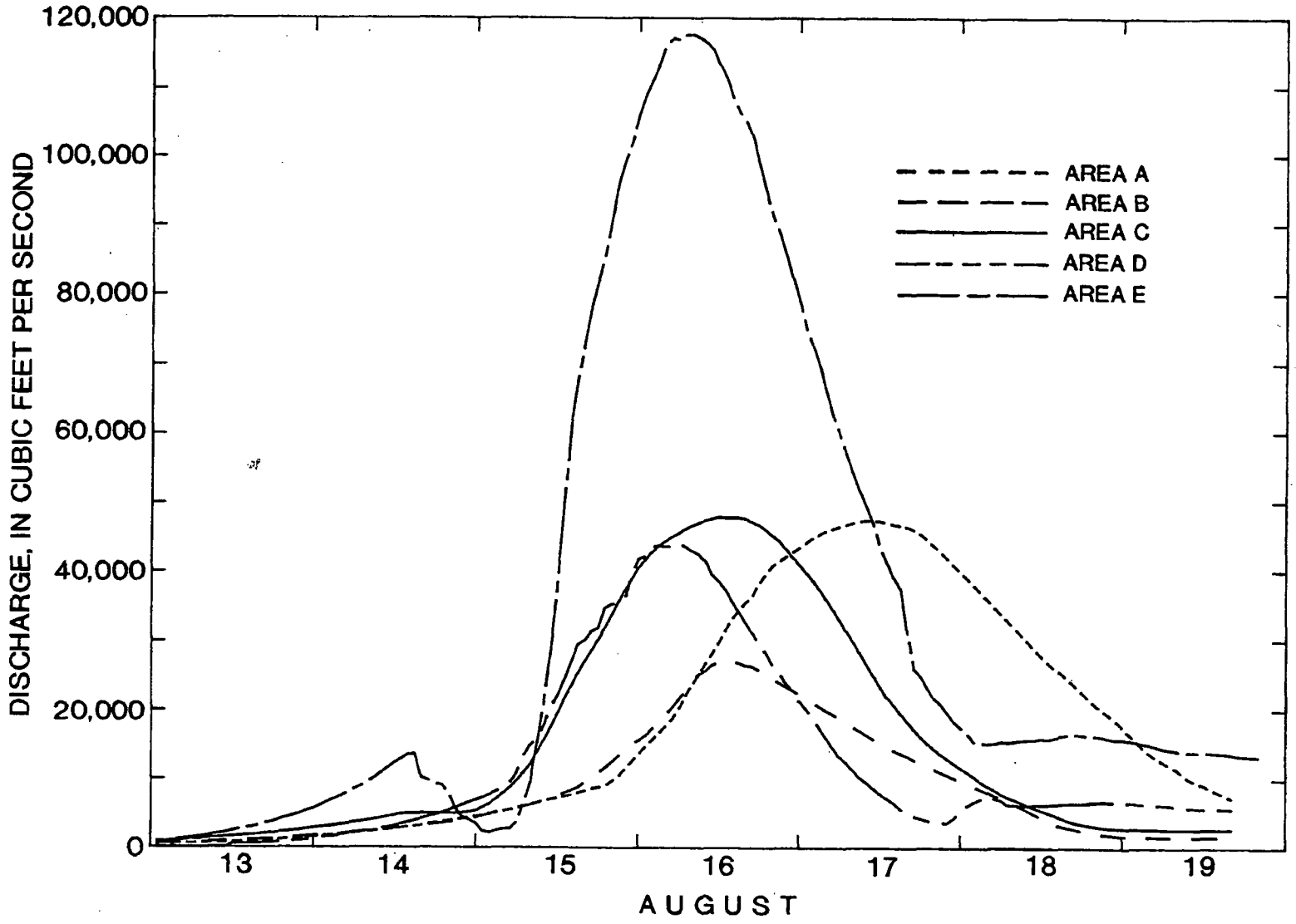


Figure 18.--Estimated inflow hydrographs for areas A-E for flood of March 1912.


120,000
100,000
80,000
60,000
40,000
20,000
0
DISCHARGE, IN CUBIC FEET PER SECOND
13
14
15
16
17
18
19
AUGUST
AREA A
AREA B
AREA C
AREA D
AREA E

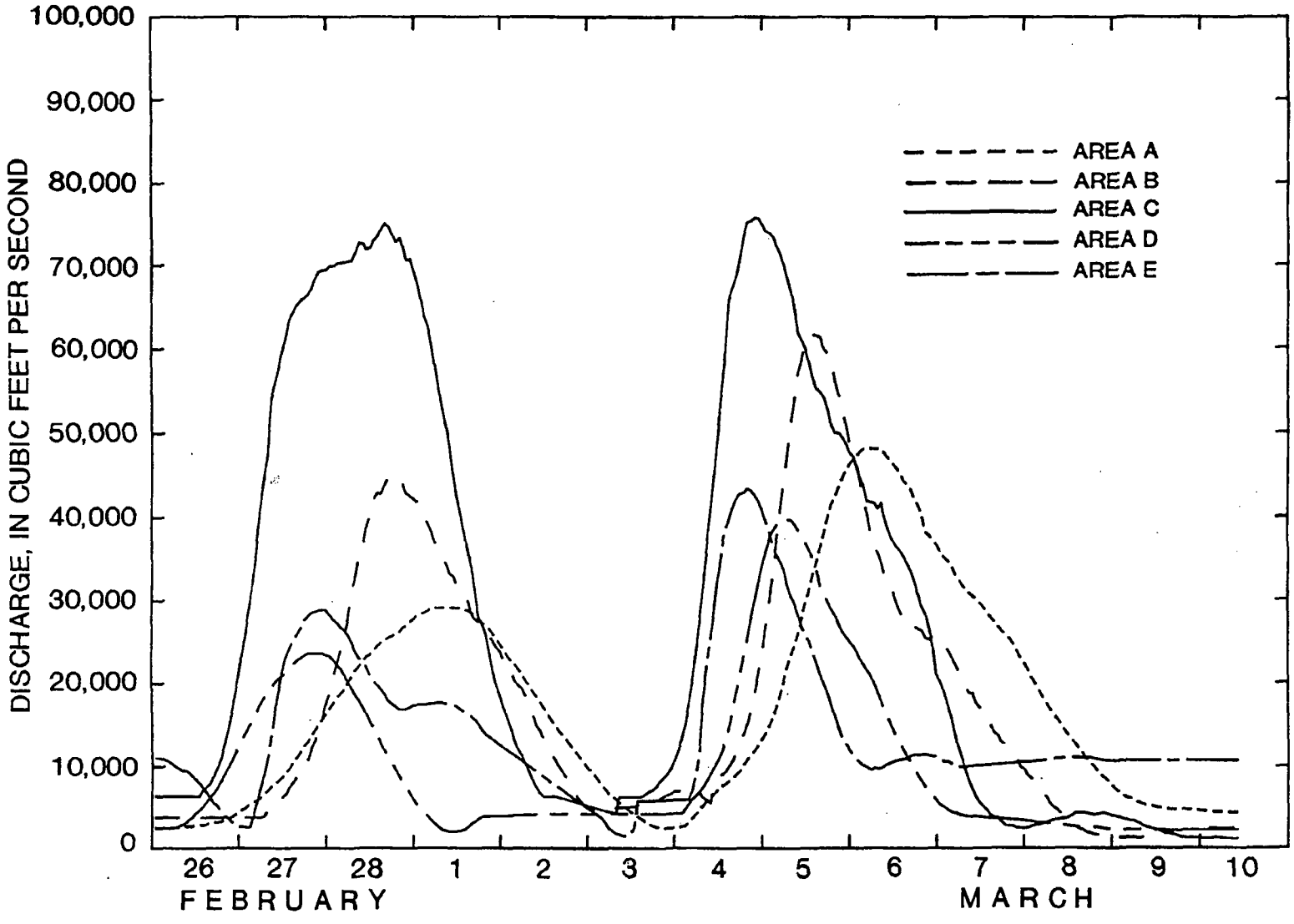


Figure 20.--Estimated inflow hydrographs for areas A-E for flood of February to March 1929.

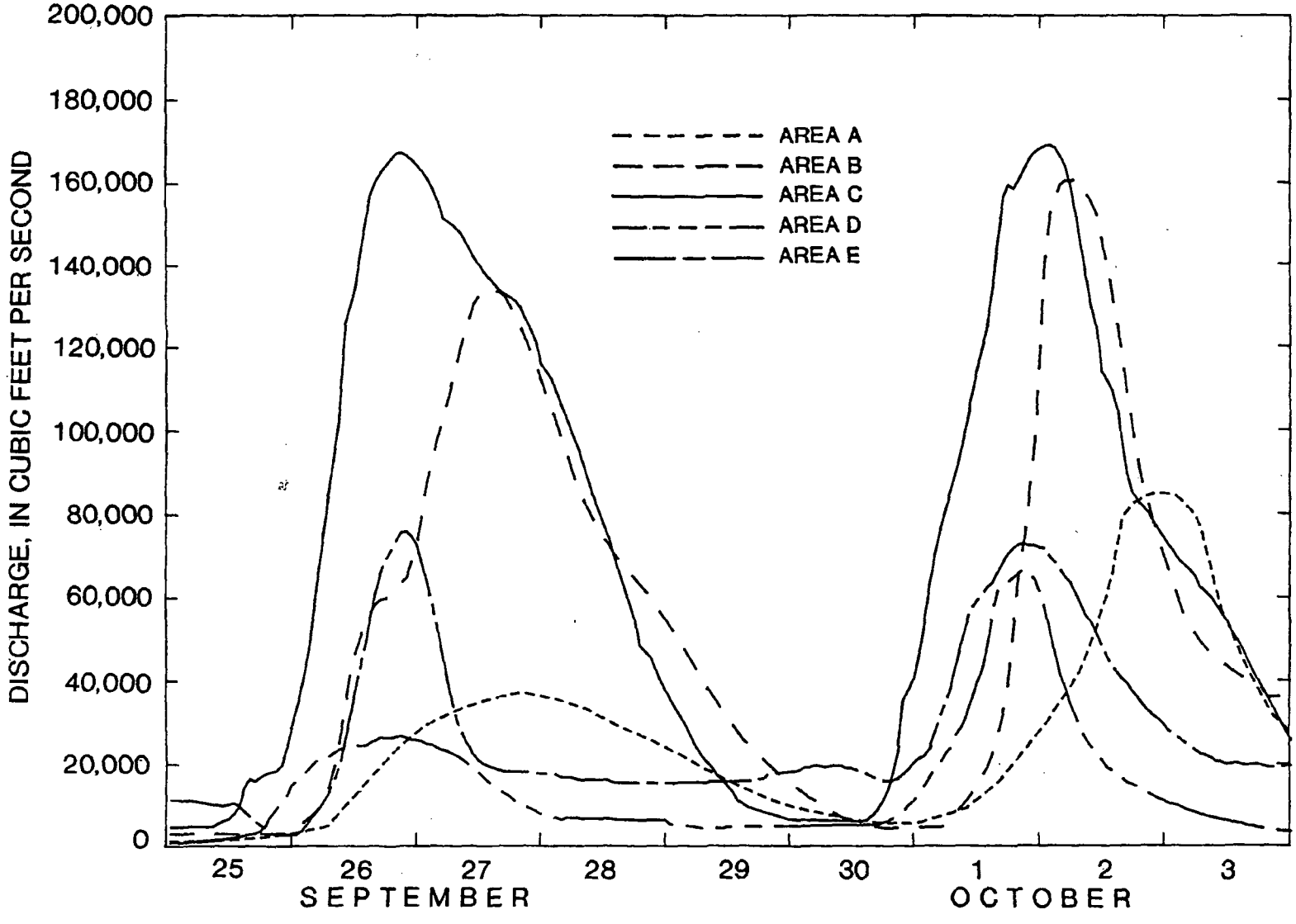


Figure 21.--Estimated inflow hydrographs for areas A-E for floods of September and October 1929.

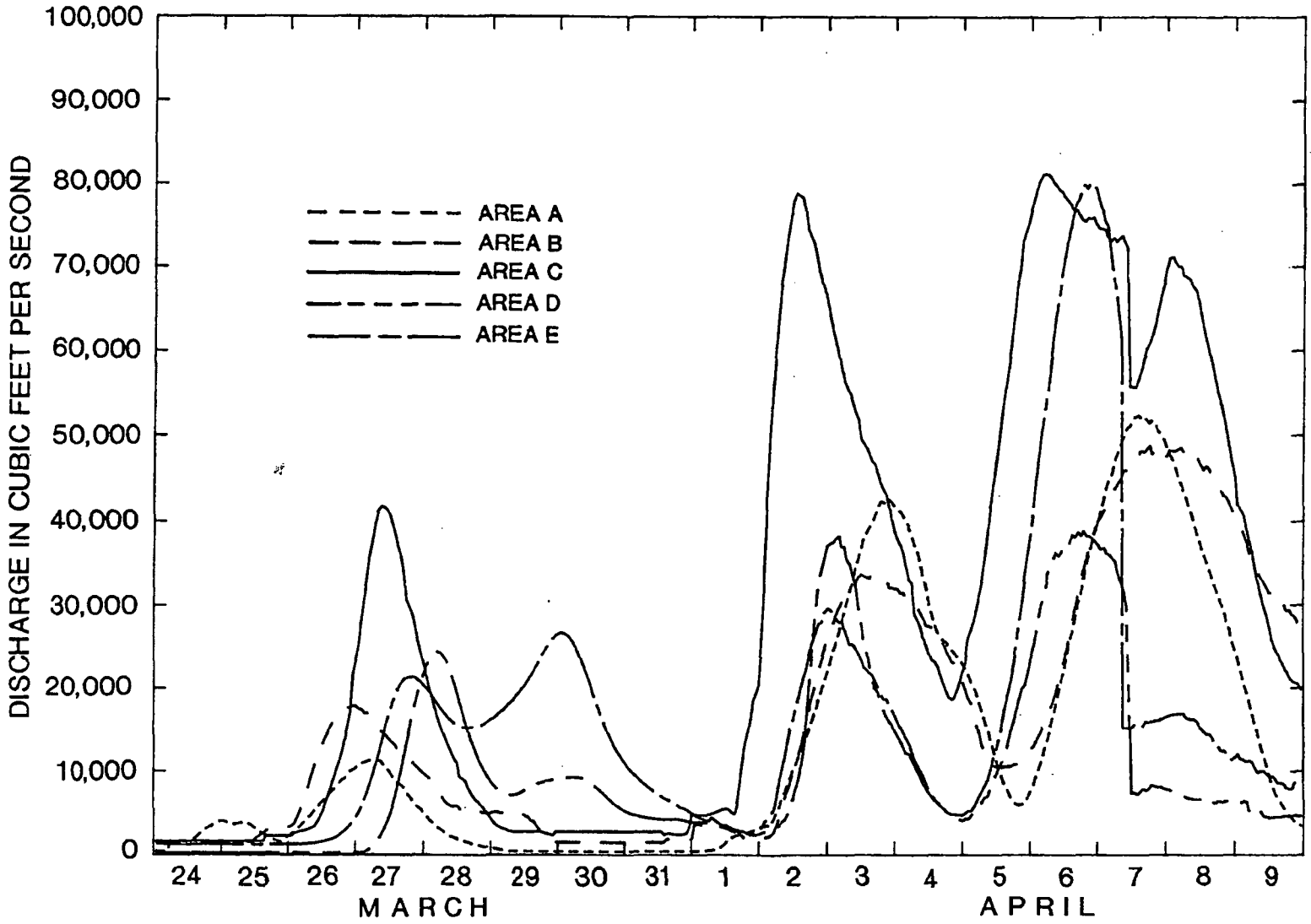


Figure 22.--Estimated inflow hydrographs for areas A-E for flood of April 1936.

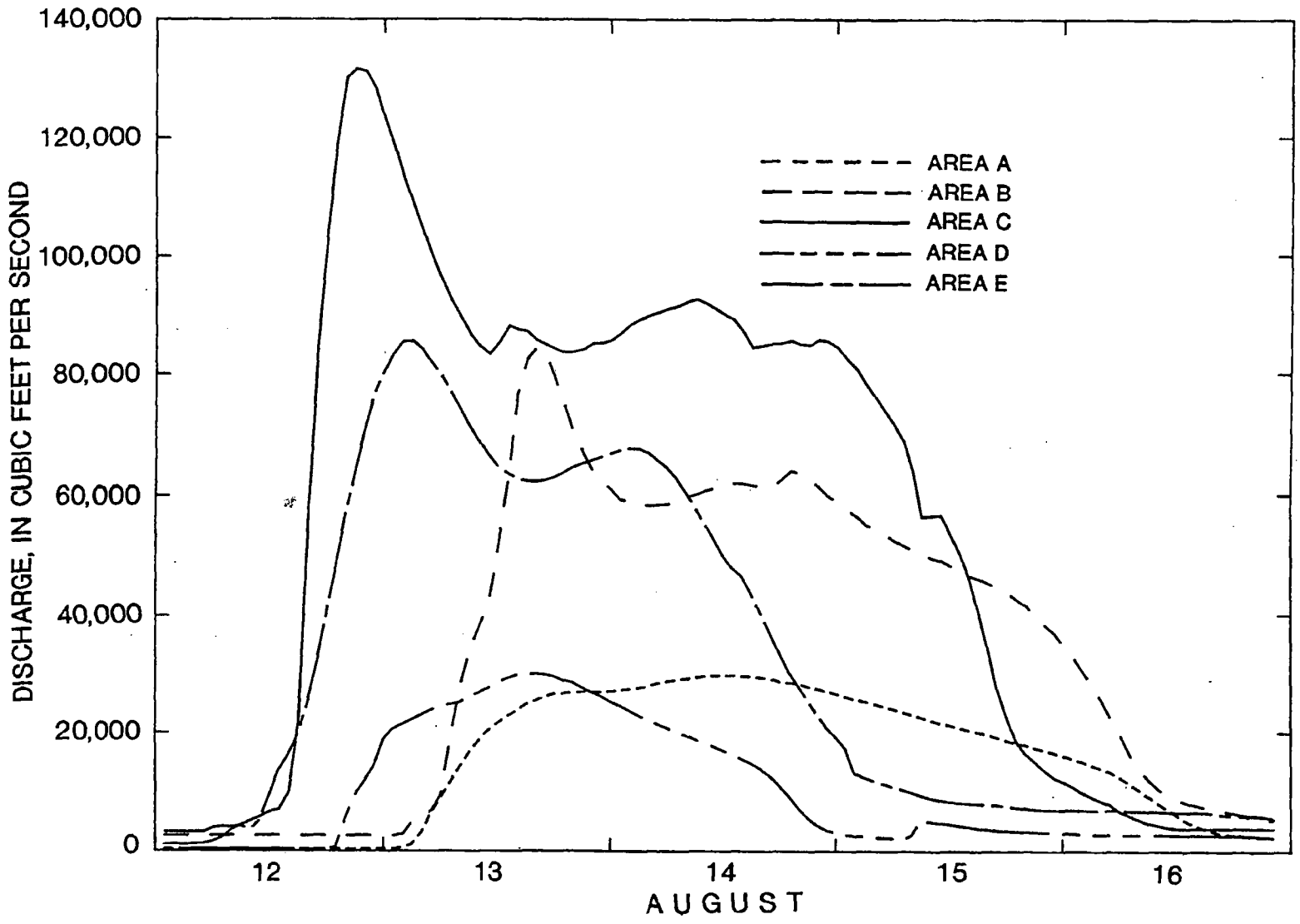


Figure 23.--Estimated inflow hydrographs for areas A-E for flood of August 1940.

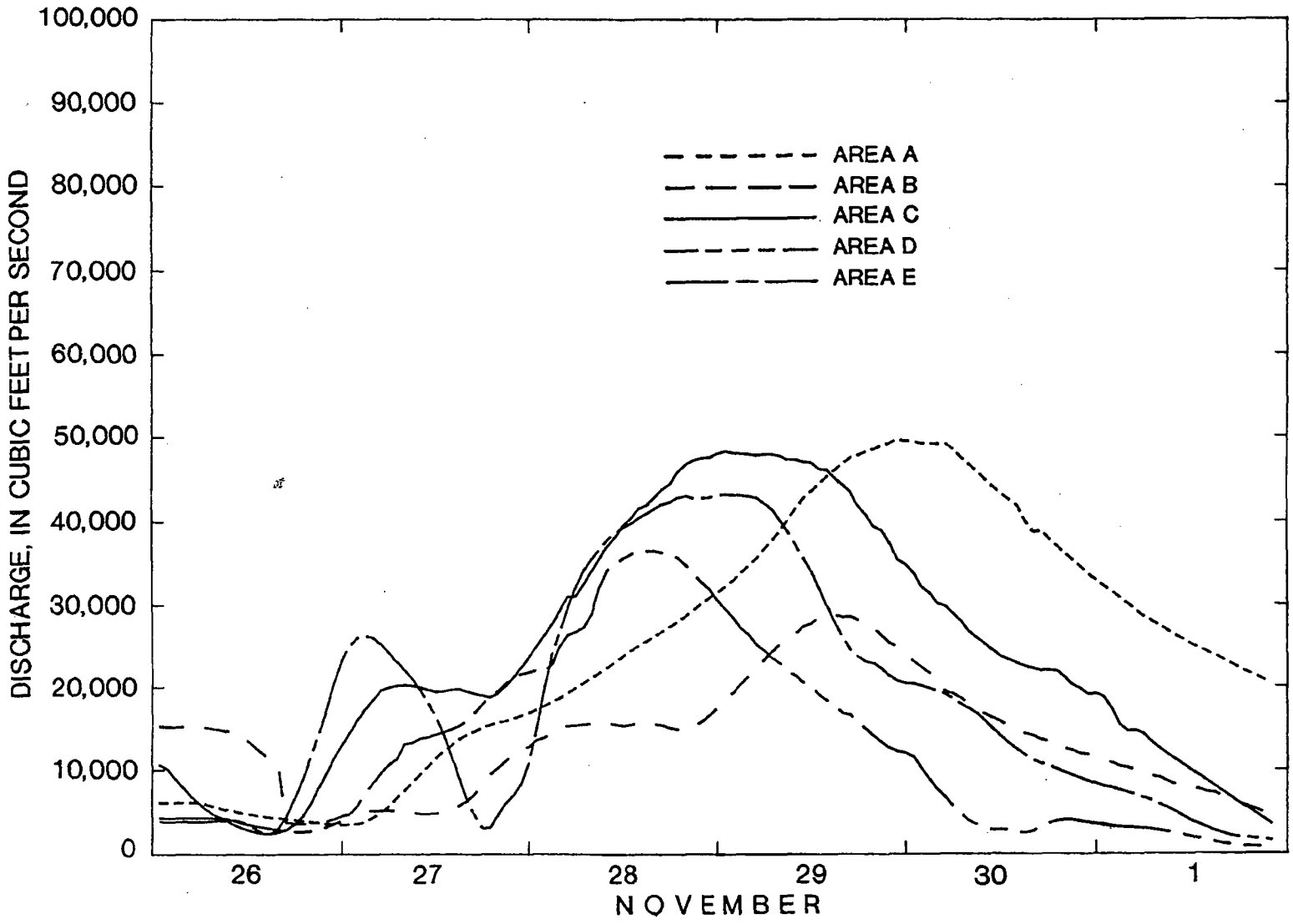


Figure 24.--Estimated inflow hydrographs for areas A-E for flood of November 1948.

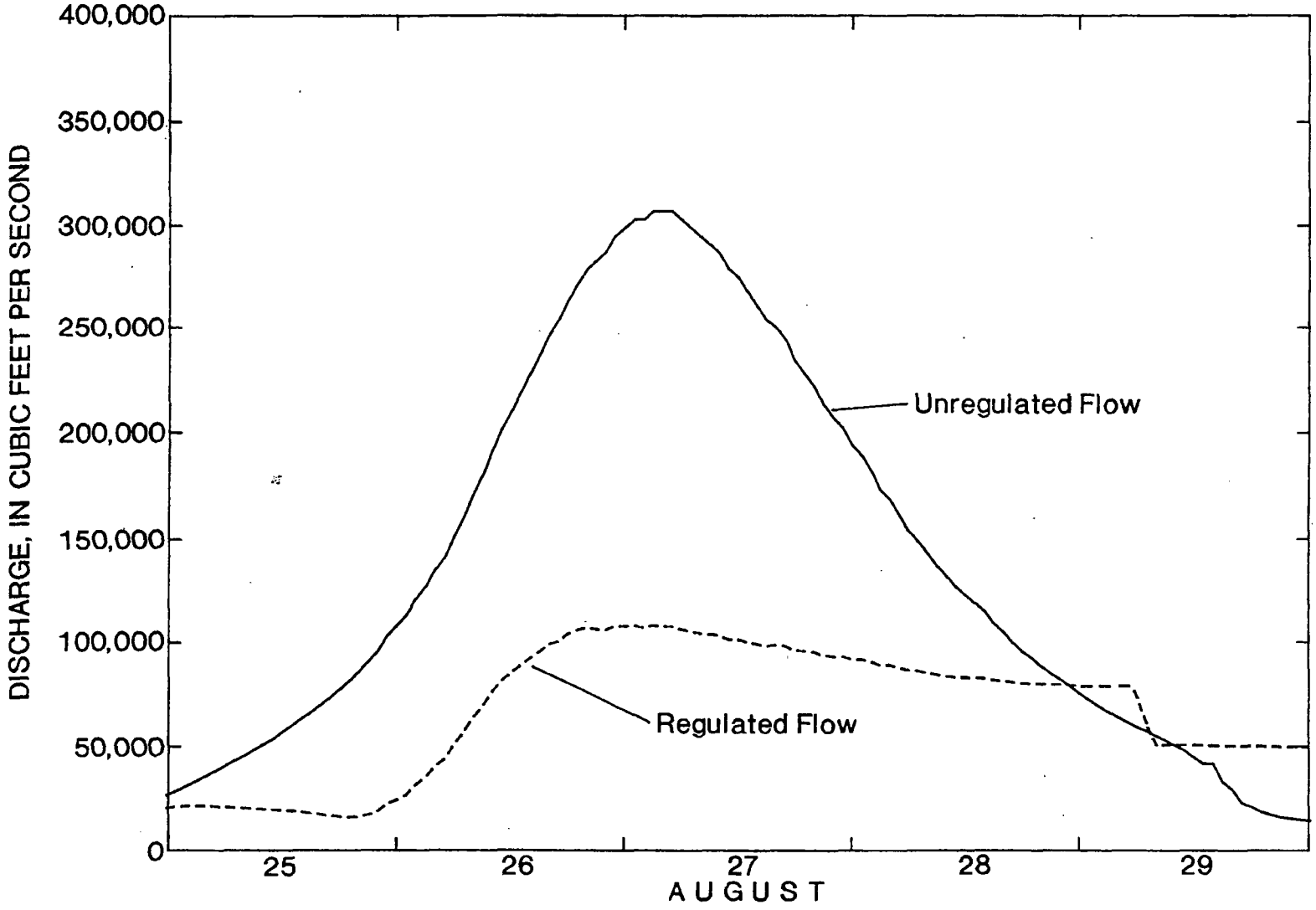


Figure 25.--Measured flood hydrograph for unregulated conditions and simulated hydrograph for the regulated conditions for the Savannah River at Augusta, Ga. (02197000) for flood of August 1908.

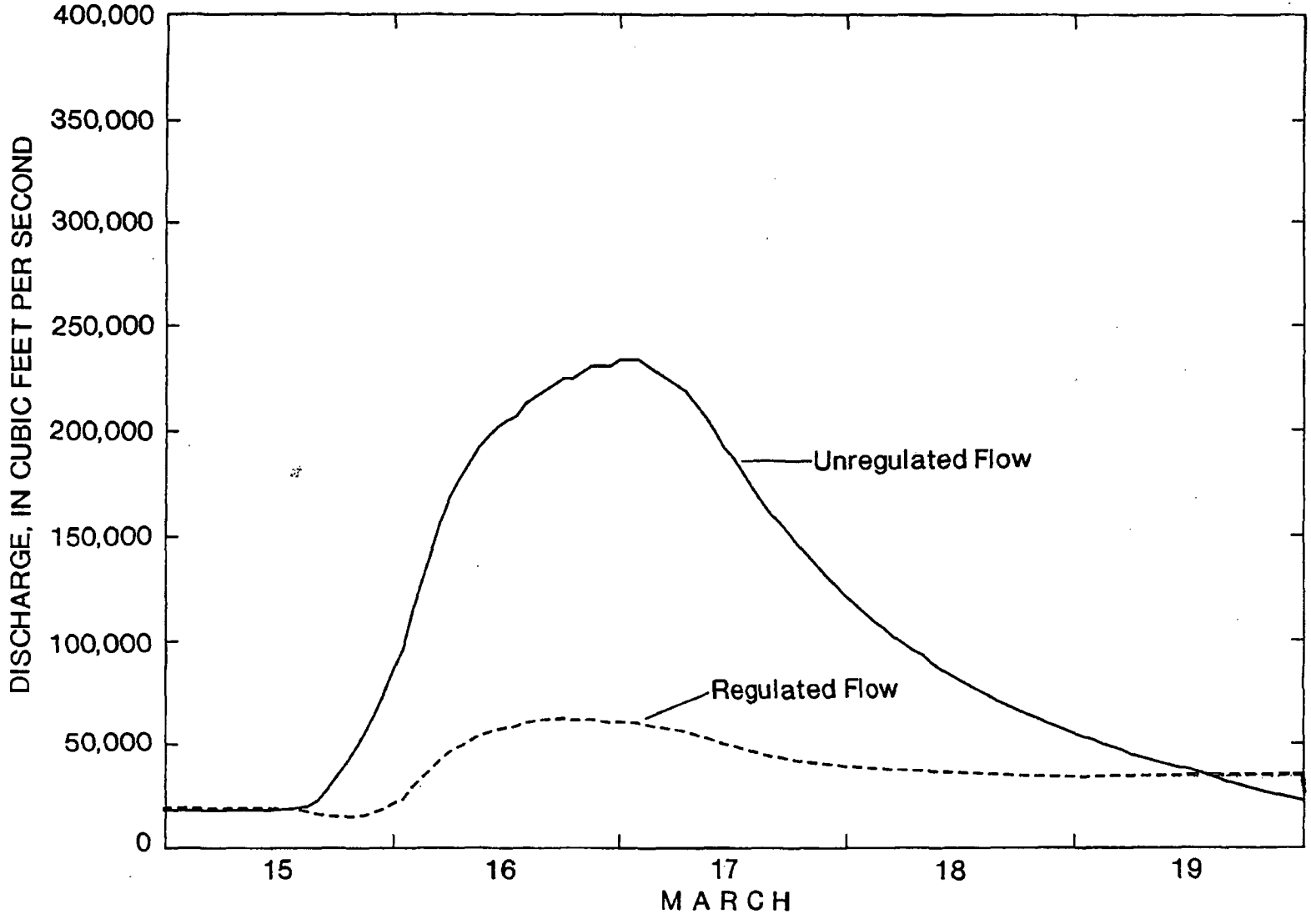


Figure 26.--Measured flood hydrograph for unregulated conditions and simulated hydrograph for the regulated conditions for the Savannah River at Augusta, Ga. (02197000) for flood of March 1912.

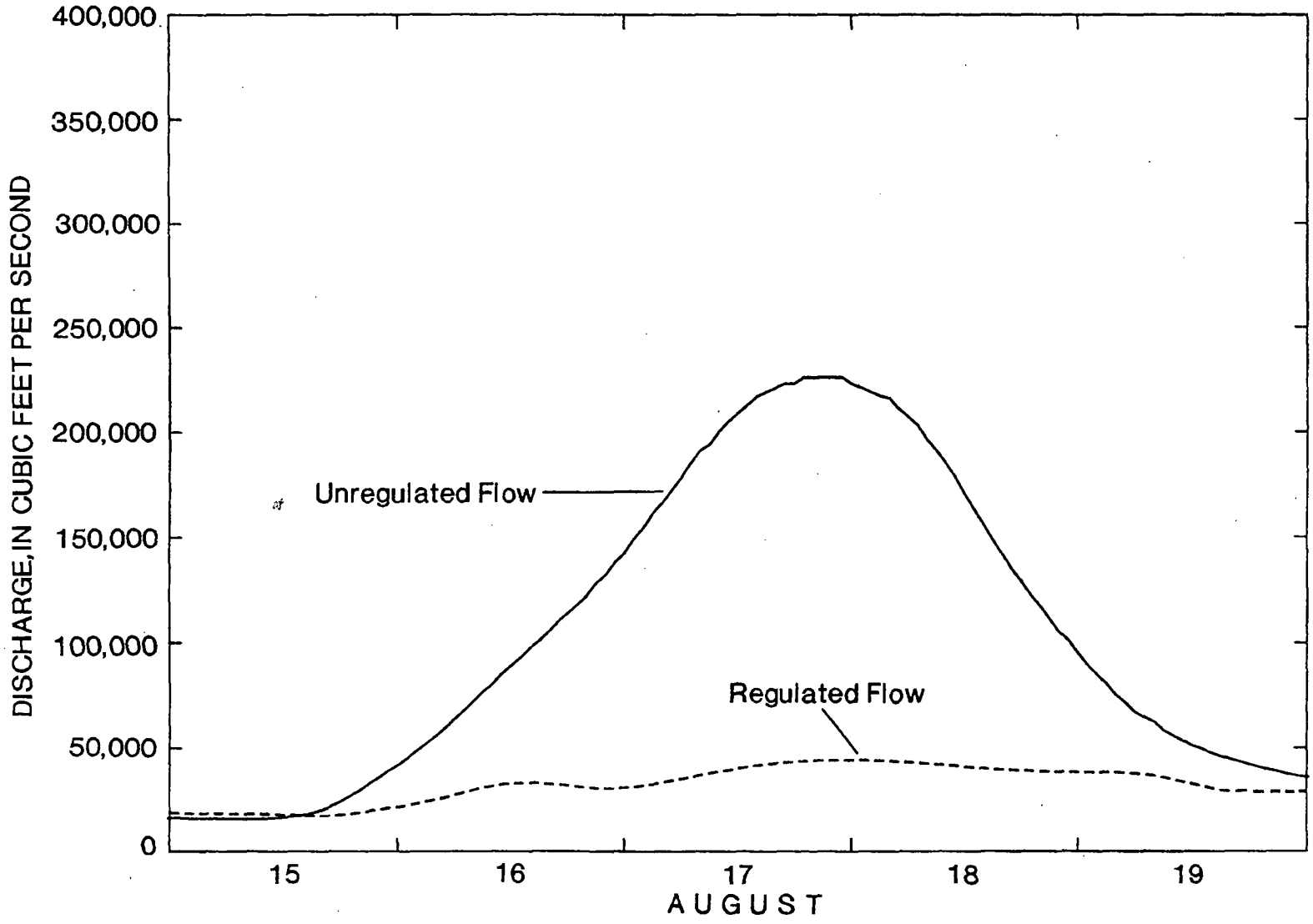


Figure 27.--Measured flood hydrograph for unregulated conditions and simulated hydrograph for the regulated conditions for the Savannah River at Augusta, Ga. (02197000) for flood of August 1928.

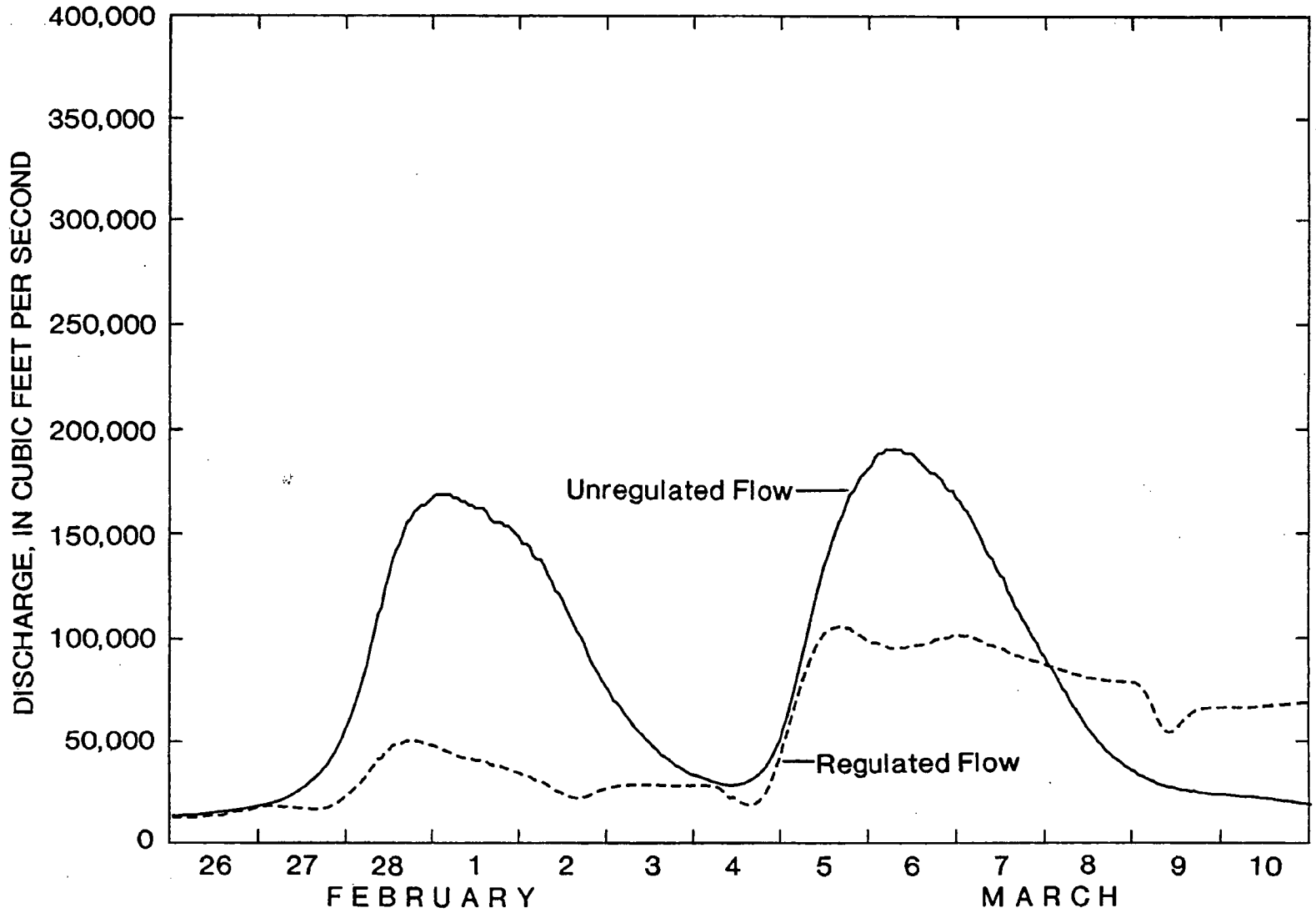


Figure 28.--Measured flood hydrographs for unregulated conditions and simulated hydrographs for the regulated conditions for the Savannah River at Augusta, Ga. (02197000) for flood of March 1929.

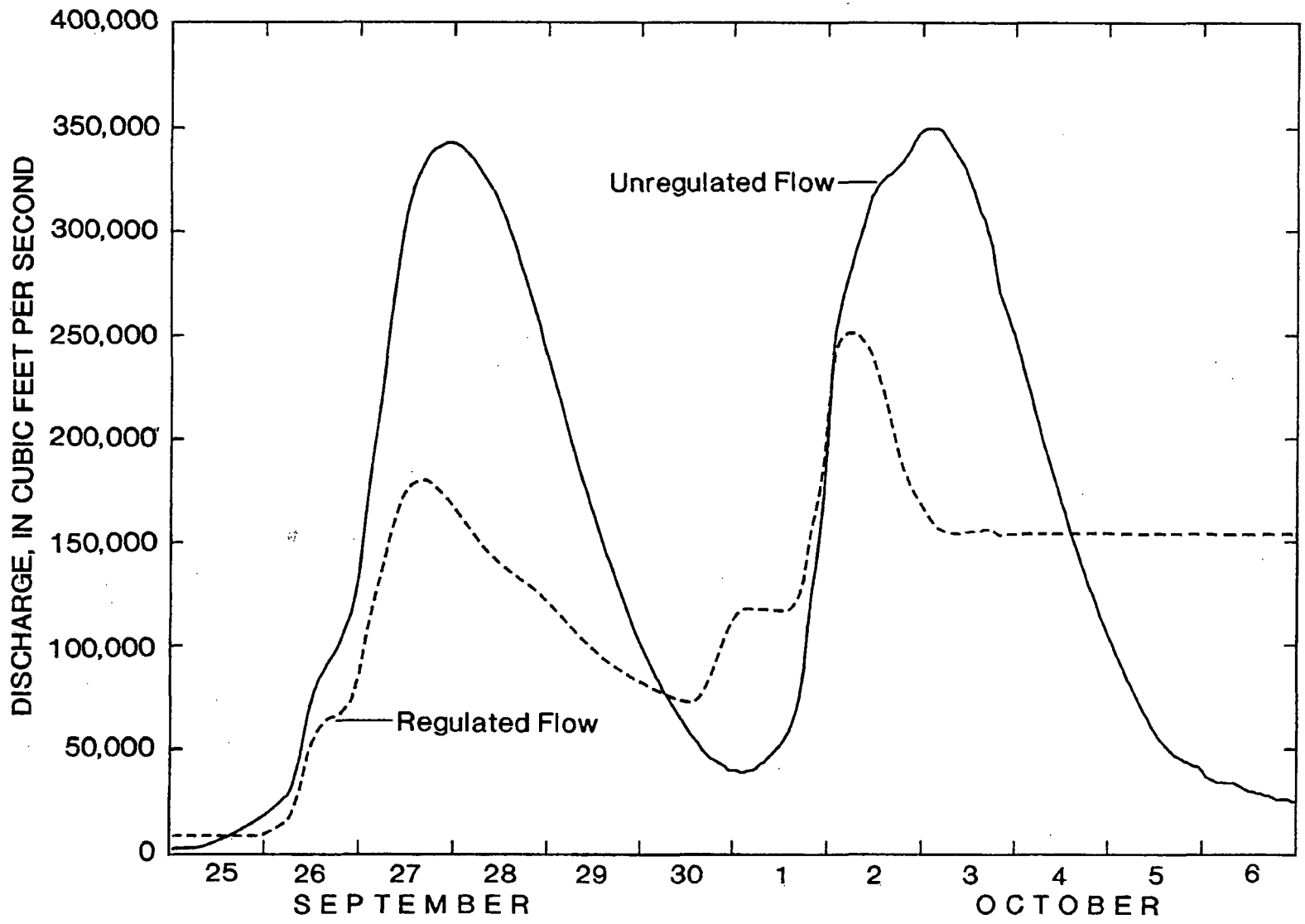


Figure 29.--Measured flood hydrographs for unregulated conditions and simulated hydrograph for the regulated conditions for the Savannah River at Augusta, Ga. (02197000) for floods of September and October 1929.

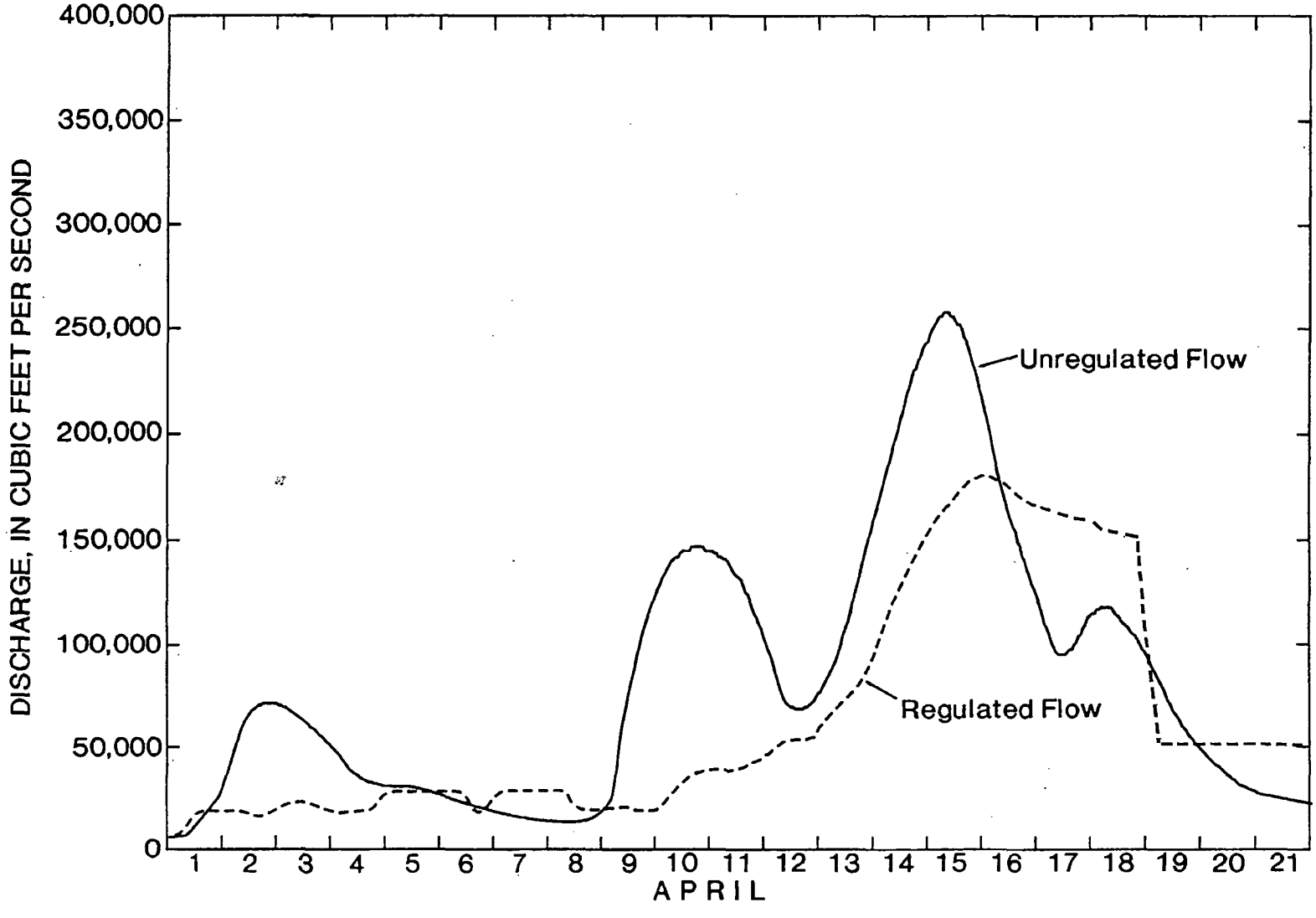


Figure 30.--Measured flood hydrographs for unregulated conditions and simulated hydrographs for the regulated conditions for the Savannah River at Augusta, Ga. (02197000) for flood of April 1936.

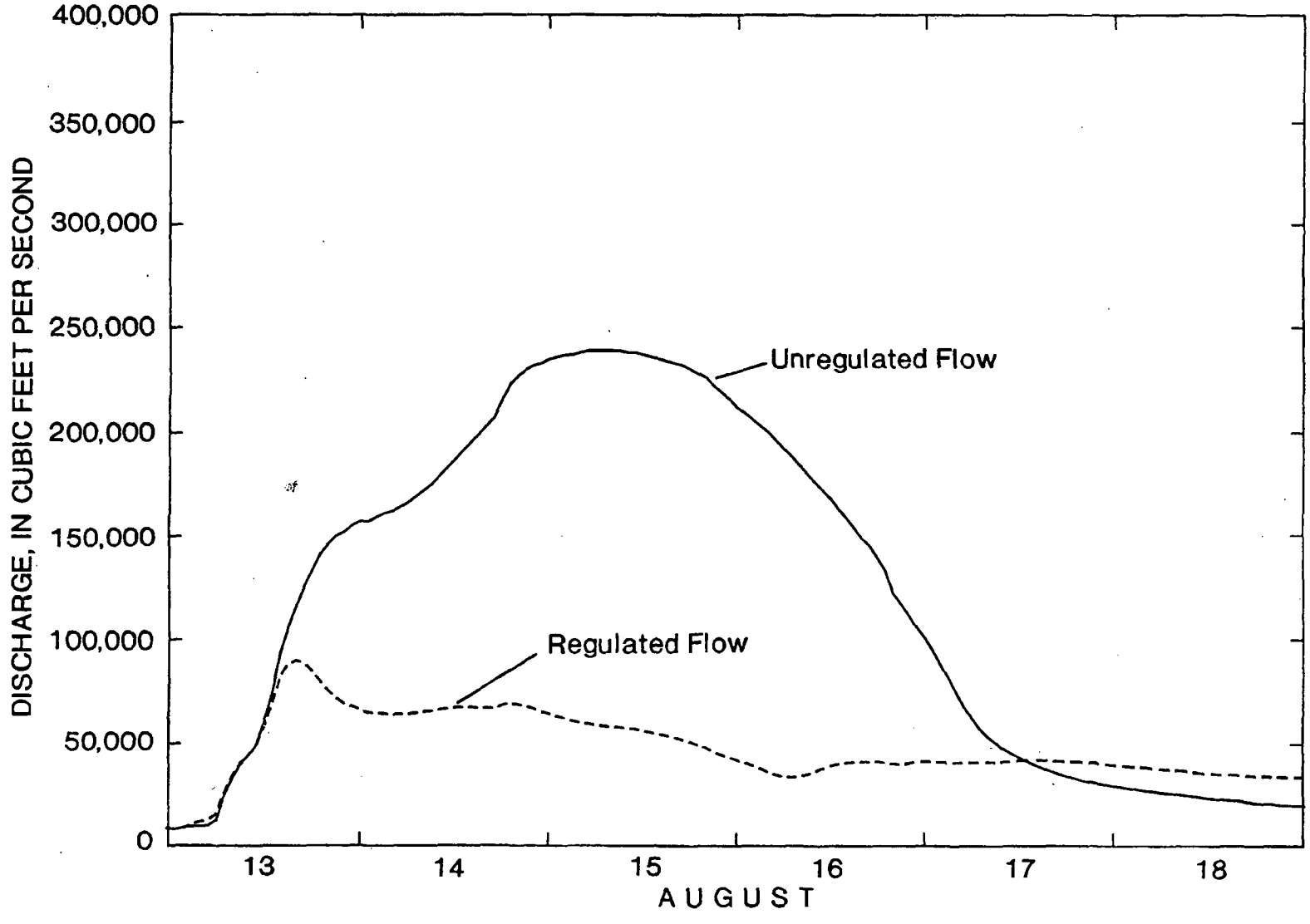


Figure 31.--Measured flood hydrographs for unregulated conditions and simulated hydrographs for the regulated conditions for the Savannah River at Augusta, Ga. (02197000) for flood of August 1940.

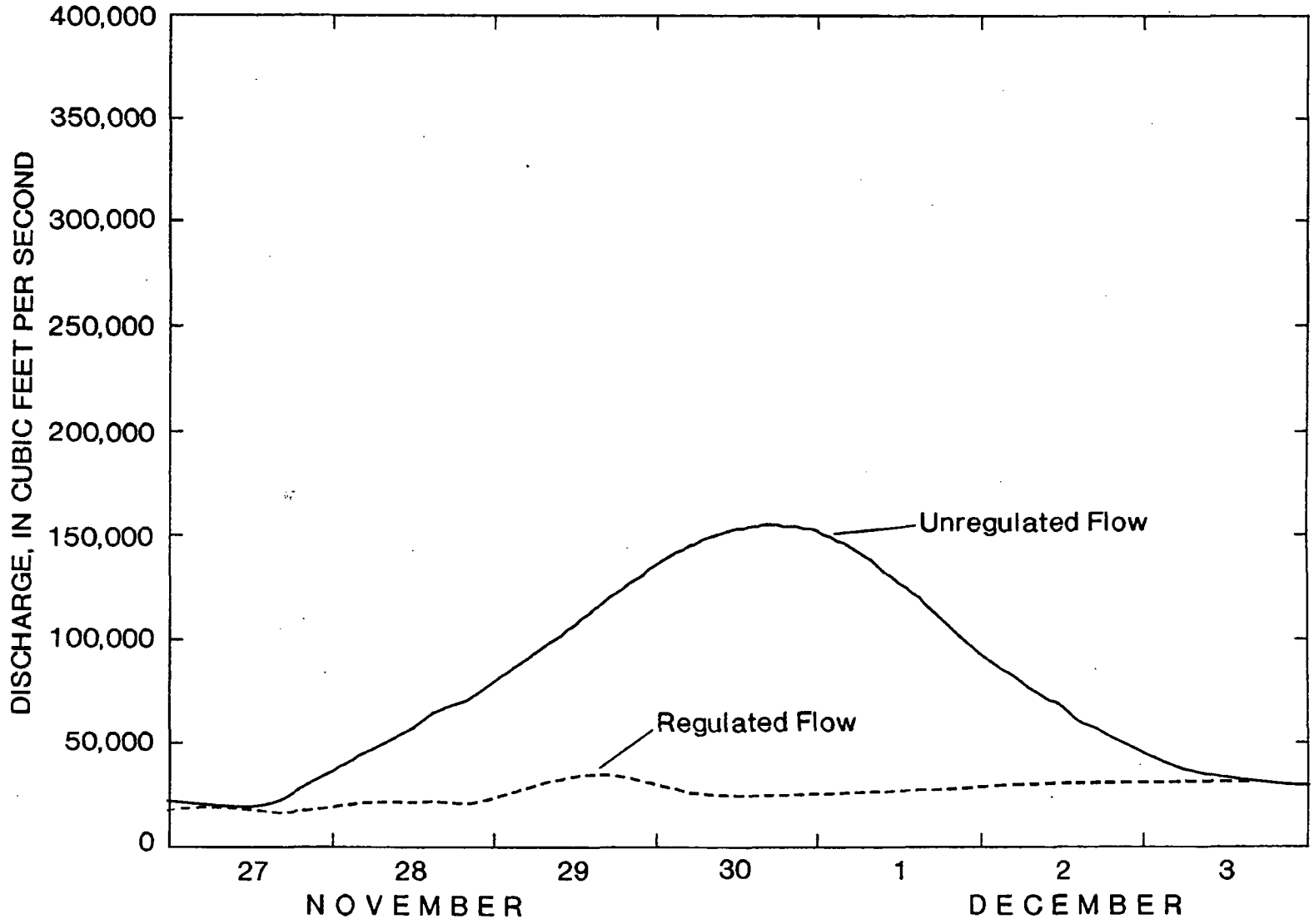


Figure 32.--Measured flood hydrographs for unregulated conditions and simulated hydrographs for the regulated conditions for the Savannah River at Augusta, Ga. (02197000) for flood of November to December 1948.

Table 10.--Measured and simulated regulated and unregulated peak discharges for the Savannah River at Augusta, Ga. (02197000)

[ft^3/s, cubic feet per second; dashes indicate no data]

Month	Water year	[1]Amplification factor	Unregulated discharge (ft^3/s)	Regulated discharge (ft^3/s)
January	1796	--	[2]360,000	[4]191,000
May	1840	--	[2]270,000	[4]118,000
August	1852	--	[2]250,000	[4]105,000
January	1865	--	[2]240,000	[4] 99,700
September	1888	--	[2]303,000	[4]143,000
August	1908	--	[2]307,000	[3]108,000
August	1908	1.25	[3]383,000	[3]153,000
August	1908	1.50	[3]459,000	[3]202,000
August	1908	2.00	[3]613,000	[3]331,000
March	1912	--	[2]234,000	[3] 62,700
March	1912	1.25	[3]291,000	[3] 92,800
March	1912	1.50	[3]349,000	[3]120,000
March	1912	2.00	[3]465,000	[3]187,000
August	1928	--	[2]226,000	[3] 44,200
August	1928	1.25	[3]282,000	[3] 66,400
August	1928	1.50	[3]339,000	[3]102,000
August	1928	2.00	[3]452,000	[3]182,000
March	1929	--	[2]190,000	[3]106,000
March	1929	1.25	[3]343,000	[3]134,000
March	1929	1.50	[3]286,000	[3]167,000
March	1929	2.00	[3]381,000	[3]247,000
September	1929	--	[2]343,000	[3]180,000
September	1929	1.25	[3]429,000	[3]237,000
September	1929	1.50	[3]514,000	[3]298,000
September	1929	2.00	[3]686,000	[3]421,000
October	1930	--	[2]350,000	[3]252,000
October	1930	1.25	[3]437,000	[3]328,000
October	1930	1.50	[3]524,000	[3]400,000
October	1930	2.00	[3]699,000	[3]491,000

Table 10.--Measured and simulated regulated and unregulated peak discharges for the Savannah River at Augusta, Ga. (02197000)--Continued

[ft^3/s, cubic feet per second; dashes indicate no data]

Month	Water year	[1]Amplification factor	Unregulated discharge (ft^3/s)	Regulated discharge (ft^3/s)
April	1936	--	[2]258,000	[3]181,000
April	1936	1.25	[3]322,000	[3]265,000
April	1936	1.50	[3]386,000	[3]346,000
April	1936	2.00	[3]515,000	[3]488,000
August	1940	--	[2]239,000	[3] 90,200
August	1940	1.25	[3]299,000	[3]111,000
August	1940	1.50	[3]358,000	[3]134,000
August	1940	2.00	[3]478,000	[3]203,000
November	1949	--	[2]154,000	[3] 34,700
November	1949	1.25	[3]194,000	[3] 52,700
November	1949	1.50	[3]232,000	[3] 78,400
November	1949	2.00	[3]310,000	[3]129,000
March	1952	--	[3]137,000	[2] 39,300
May	1953	--	[3] 56,400	[2] 35,200
March	1954	--	[3] 59,100	[2] 25,500
April	1955	--	[3] 68,400	[2] 23,900
April	1956	--	[3] 65,200	[2] 18,600
May	1957	--	[3] 53,400	[2] 18,000
April	1958	--	[3] 86,100	[2] 66,300
June	1959	--	[3] 54,900	[2] 28,500
February	1960	--	[3] 84,700	[2] 34,900
April	1961	--	[3]113,000	[2] 34,800
January	1962	--	[3] 81,700	[2] 32,500
March	1963	--	[3] 94,000	[2] 31,300
April	1964	--	[3]143,000	[2] 87,100
April	1964	1.25	[3]197,000	[3]154,000
April	1964	1.50	[3]236,000	[3]190,000
April	1964	2.00	[3]315,000	[3]266,000

Table 10.--Measured and simulated regulated and unregulated peak discharges for the Savannah River at Augusta, Ga. (02197000)--Continued

[ft^3/s, cubic feet per second; dashes indicate no data]

Month	Water year	[1]Amplification factor	Unregulated discharge (ft^3/s)	Regulated discharge (ft^3/s)
December	1965	--	[3]111,000	[2] 34,600
March	1966	--	[3]131,000	[2] 39,300
August	1967	--	[3]102,000	[2] 26,500
January	1968	--	[3] 79,000	[2] 35,900
April	1969	--	[3]114,000	[2] 45,600
April	1970	--	[3] 74,300	[2] 25,200
March	1971	--	[3]180,000	[2] 63,900
January	1972	--	[3]114,000	[2] 33,700
April	1973	--	[3] 98,000	[2] 40,200
February	1974	--	[3] 86,000	[2] 32,900
March	1975	--	[3]149,000	[2] 45,600
June	1976	--	[3]104,000	[2] 33,300
April	1977	--	[3] 90,900	[2] 34,200
January	1978	--	[3]138,000	[2] 43,100
February	1979	--	[3]125,000	[2] 37,300
March	1980	--	[3]108,000	[2] 47,200
February	1981	--	[3] 56,100	[2] 17,700
January	1982	--	[3] 88,000	[2] 30,700
April	1983	--	[3]102,000	[2] 66,100
May	1984	--	[3] 65,600	[2] 34,000
February	1985	--	[3] 66,300	[2] 25,700

[1]Factor by which inflow hydrographs were multiplied to synthesize larger floods.

[2]Discharge was measured.

[3]Discharge was simulated by computer modeling.

[4]Discharge was simulated from relation of regulated discharge to unregulated discharge.

Rainfall-Runoff Method

A rainfall-runoff model (HEC-1) was used to simulate hourly hydrographs for the 1936 flood upstream from Thurmond Dam. Discharge data were not available for the Savannah River at Calhoun Falls and for the Broad River near Bell, therefore, the hydrographs to Hartwell, Russell, and Thurmond Lakes were simulated using HEC-1. Hydrographs for the reach from Thurmond Dam (02195000) to Augusta are from the Savannah District Reservoir Regulation Manual Plate A-25 (COE, 1974).

Daily rainfall data for 20 gages in the Savannah River basin upstream from Thurmond Dam for January through April 1936 were obtained from the NWS. Using these data, Thiessen polygons were determined to estimate the areal distribution of rainfall over the basin. The daily rainfall data were adjusted to hourly values and linearly interpolated.

Models were developed for each area using the SCS unit hydrograph method (SCS, 1972; McCuen, 1982) in HEC-1. SCS curve numbers for the areas ranged from 62 to 99. A curve number of 99 was used for rainfall on lakes. Hourly rainfall values were input and weighted according to the Thiessen polygons. Inflow hydrographs to each of the three lakes were computed using HEC-1 for the period of heaviest rainfall, mid-March to mid-April.

The unregulated inflows were routed to Augusta using the Muskingum routing method. The simulated unregulated discharges were compared to measured discharges and adjustments were made to HEC-1 parameters as necessary to calibrate the models. Once the models were calibrated, regulated discharges were simulated using the unregulated inflow hydrographs and the HEC-5 model with reservoir storage and current operation data. The simulated regulated hydrograph and the measured unregulated hydrograph are shown in figure 30. The peak discharge for regulated conditions is listed in table 10.

RELATION OF REGULATED TO UNREGULATED PEAK DISCHARGES

Regulated peak discharges were related to unregulated discharges using measured and simulated data for the floods of 1908, 1912, 1928, March and September 1929, 1930, 1936, 1940, 1949, and 1952-85.

The relation was determined graphically (fig. 33) from data listed in table 10.

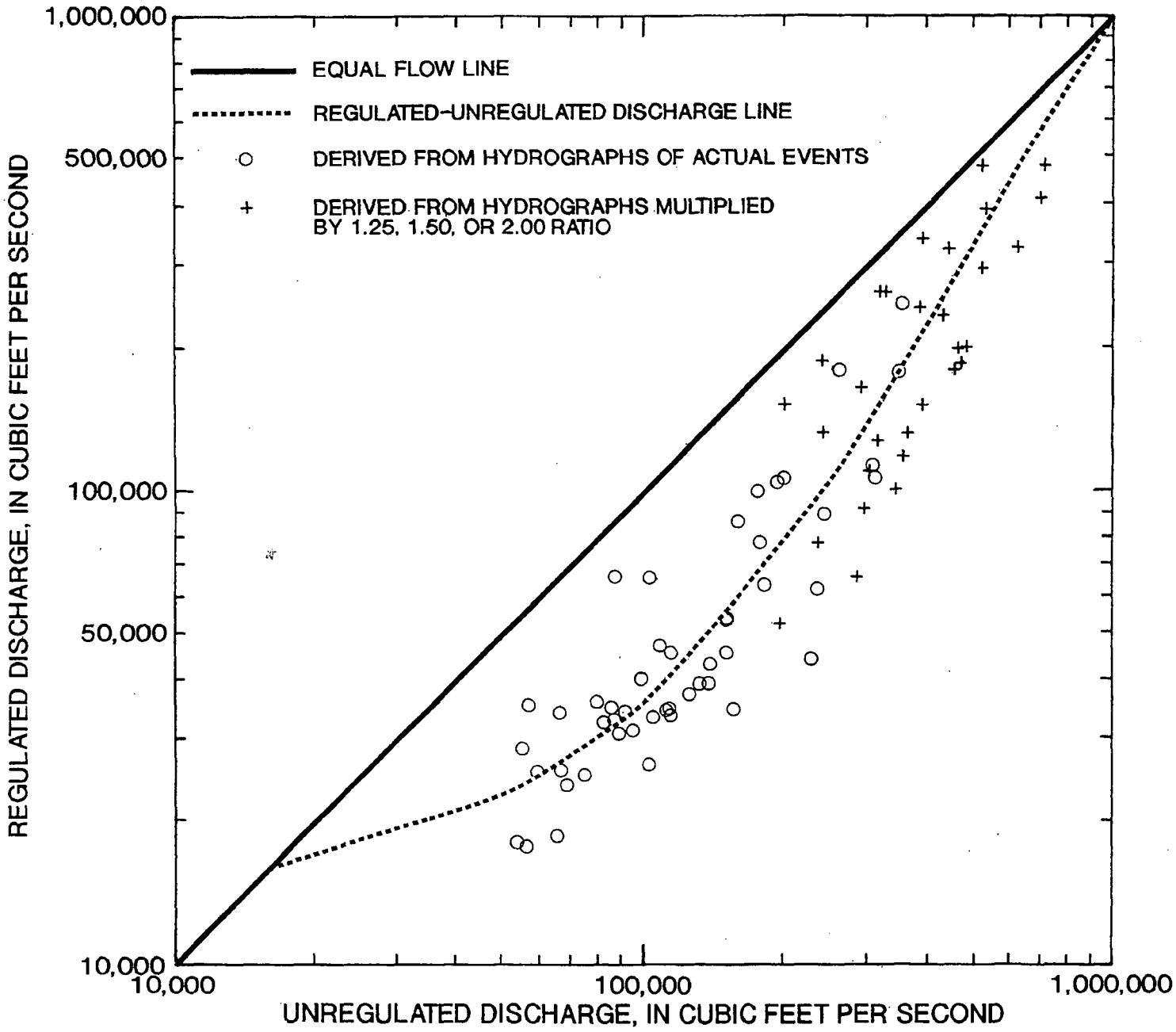


Figure 33.--Relation between regulated peak discharges and unregulated peak discharges for the Savannah River at Augusta, Ga. (02197000).

The data in figure 33 show that the reservoirs have little effect on the extremely large floods because reservoir storage is small compared to the flood volume. The scatter in the points in figure 33 is caused by differences in initial pool elevations, flood volumes, and timing of inflow hydrographs. The relation in figure 33 reflects average conditions for a wide range of flood flows. The logarithmic residuals from the curve of relation are normally distributed with a mean and standard deviation of -.016 and 0.145 respectively.

UNREGULATED FLOOD FREQUENCY

A flood frequency curve for unregulated flow (table 11 and fig. 34) was derived from measured unregulated peak discharges at Augusta, listed in table 2 for water years 1786-1951, and from simulated unregulated peak discharges for water years 1952-85, listed in table 5, using the log-Pearson Type III method as described by the Interagency Advisory Committee on Water Data (IACWD, 1982). A systematic record period of 1876-1985 and a historic record period of 1786-1985 were used. The record of peak discharges is considered to be complete for peak discharges equal to or greater than 225,000 ft^3/s (Carter, 1951).

Reports by the COE (1929, 1974) indicate that all peak discharges above 165,000 ft^3/s were probably known for the period since 1796. Although this may be the case, if it were true it would imply that the probability of having a 54-year period (1786-1839) with only one flood (1796) exceeding 165,000 ft^3/s would be only 0.019 and that the probability of having only four such floods in the 90-year pre-systematic record (1786-1875) would be only 0.033. These probabilities are based on the occurrence of 12 floods greater than 165,000 ft^3/s in the 110-year systematic record period 1876-1985. Because it is rather unlikely that so few floods of this magnitude would have occurred during the periods considered, the possibility was considered that a higher threshold would be more appropriate. Emigh (1914) indicates that widespread flooding actually occurred at stages exceeding about 36 ft (210,000 ft^3/s); floods exceeding this level almost certainly would have been recorded. A slightly higher discharge of 225,000 ft^3/s was used as a threshold by Carter (1951). Under the hypothesis that the flood record is complete above this level, the probabilities quoted above become 0.097 and 0.22, which are considerably more likely. It is more likely, therefore, that the criteria for a complete historical record of floods above a certain threshold (IACWD, 1982) would be met if the historical flood threshold were set at 225,000 ft^3/s rather than at 165,000 ft^3/s; therefore, the higher value was used in this study.

Table 11.--Peak discharges and frequency plotting positions for unregulated conditions for the Savannah River at Augusta, Ga. (02197000)

[ft^3/s, cubic feet per second]

Chronological		Ranked		
Water year	Peak discharge	Water year	Peak discharge (ft^3/s)	Frequency plotting position (percent)
1796	360,000	1796	360,000	0.50
1840	270,000	1930	350,000	1.00
1852	250,000	1929	343,000	1.49
1865	240,000	1908	307,000	1.99
1876	86,400	1888	303,000	2.49
1877	119,000	1840	270,000	2.99
1878	51,500	1936	258,000	3.48
1879	44,000	1852	250,000	3.98
1880	102,000	1865	240,000	4.48
1881	130,000	1940	239,000	4.98
1882	93,300	1912	234,000	5.47
1883	111,000	1928	226,000	5.97
1884	81,000	1891	197,000	6.68
1885	77,000	1971	180,000	7.59
1886	135,000	1902	175,000	8.51
1887	173,000	1887	173,000	9.43
1888	303,000	1913	156,000	10.35
1889	149,000	1949	154,000	11.26
1890	48,500	1925	150,000	12.18
1891	197,000	1889	149,000	13.10
1892	140,000	1975	149,000	14.01
1893	60,000	1903	147,000	14.93
1894	54,000	1964	142,800	15.85
1895	106,000	1892	140,000	16.76
1896	107,000	1900	138,000	17.68
1897	93,300	1978	138,000	18.60
1898	117,000	1952	136,900	19.52
1899	113,000	1886	135,000	20.43
1900	138,000	1920	133,000	21.35
1901	124,000	1966	131,000	22.27
1902	175,000	1881	130,000	23.18
1903	147,000	1921	129,000	24.10
1904	63,000	1919	128,000	25.02
1905	64,800	1944	128,000	25.93
1906	96,600	1979	125,000	26.85
1907	52,000	1901	124,000	27.77

Table 11.--Peak discharges and frequency plotting positions for unregulated conditions for the Savannah River at Augusta, Ga. (02197000)

[ft^3/s, cubic feet per second]

Chronological		Ranked		
Water year	Peak discharge	Water year	Peak discharge (ft^3/s)	Frequency plotting position (percent)
1908	307,000	1877	119,000	28.68
1909	87,300	1898	117,000	29.60
1910	69,800	1943	117,000	30.52
1911	32,800	1969	114,000	31.44
1912	234,000	1972	114,000	32.35
1913	156,000	1899	113,000	33.27
1914	48,000	1961	113,000	34.19
1915	61,000	1883	111,000	35.10
1916	82,400	1965		
1917	68,000	1980	108,000	36.94
1918	45,500	1896	107,000	37.85
1919	128,000	1895	106,000	38.77
1920	133,000	1942	105,000	39.69
1921	129,000	1976	104,000	40.61
1922	92,000	1880	102,000	41.52
1923	59,700	1967	102,000	42.44
1924	59,700	1983	102,000	43.36
1925	150,000	1973	98,000	44.27
1926	55,300	1946	97,200	45.19
1927	39,000	1906	96,600	46.11
1928	226,000	1963	94,000	47.02
1929	343,000	1932	93,800	47.94
1930	350,000	1882	93,300	48.86
1931	26,100	1897	93,300	49.78
1932	93,800	1933	92,600	50.69
1933	92,600	1922	92,000	51.61
1934	73,200	1937	91,400	52.53
1935	63,700	1938	91,400	53.44
1936	258,000	1939	90,900	54.36

Table 11.--Peak discharges and frequency plotting positions for unregulated conditions for the Savannah River at Augusta, Ga. (02197000)--Continued

[ft^3/s, cubic feet per second]

Chronological		Ranked		
Water year	Peak discharge	Water year	Peak discharge (ft^3/s)	Frequency plotting position (percent)
1937	91,400	1977	90,900	55.28
1938	91,400	1982	88,000	56.19
1939	90,900	1909	87,300	57.11
1940	239,000	1876	86,400	58.03
1941	53,300	1958	86,100	58.95
1942	105,000	1947	86,000	59.86
1943	117,000	1974	86,000	60.78
1944	128,000	1960	84,700	61.70
1945	64,000	1948	83,200	62.61
1946	97,200	1916	82,400	63.53
1947	86,000	1962	81,700	64.45
1948	83,200	1884	81,000	65.36
1949	154,000	1968	79,000	66.28
1950	32,500	1885	77,000	67.20
1951	46,300	1970	74,300	68.12
1952	136,900	1934	73,200	69.03
1953	56,400	1910	69,800	69.95
1954	59,100	1955	68,400	70.87
1955	68,400	1917	68,000	71.78
1956	65,200	1985	66,300	72.70
1957	53,400	1984	65,600	73.62
1958	86,100	1956	65,200	74.53
1959	54,900	1905	64,800	75.45
1960	84,700	1945	64,000	76.37
1961	113,000	1935	63,700	77.29

Table 11.--Peak discharges and frequency plotting positions for unregulated conditions for the Savannah River at Augusta, Ga. (02197000)--Continued

[ft^3/s, cubic feet per second]

Chronological		Ranked		
Water year	Peak discharge	Water year	Peak discharge (ft^3/s)	Frequency plotting position (percent)
1962	81,700	1904	63,000	78.20
1963	94,000	1915	61,000	79.12
1964	142,800	1893	60,000	80.04
1965	111,000	1923	59,700	80.95
1966	131,000	1924	59,700	81.87
1967	102,000	1954	59,100	82.79
1968	79,000	1953	56,400	83.70
1969	114,000	1981	56,100	84.62
1970	74,300	1926	55,300	85.54
1971	180,000	1959	54,900	86.45
1972	114,000	1894	54,000	87.37
1973	98,000	1957	53,400	88.29
1974	86,000	1941	53,300	89.21
1975	149,000	1907	52,000	90.12
1976	104,000	1878	51,500	91.04
1977	90,900	1890	48,500	91.96
1978	138,000	1914	48,000	92.87
1979	125,000	1951	46,300	93.79
1980	108,000	1918	45,500	94.71
1981	56,100	1879	44,000	95.62
1982	88,000	1927	39,000	96.54
1983	102,000	1911	32,800	97.46
1984	65,600	1950	32,500	98.38
1985	66,300	1931	26,100	99.29

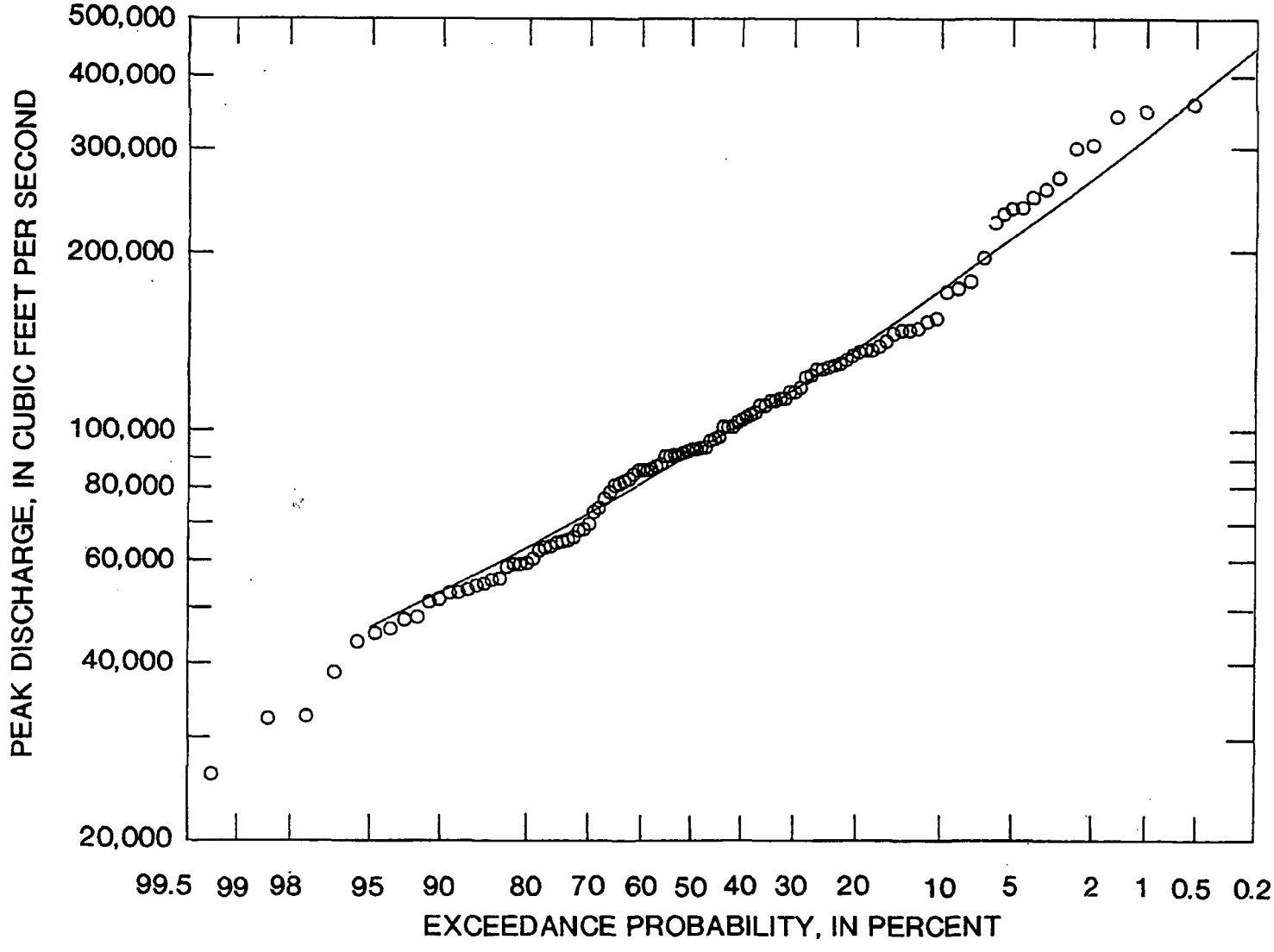


Figure 34.--Unregulated peak discharge frequency curve for the Savannah River at Augusta, Ga. (02197000).

Table 12.--Discharges of unregulated floods of selected percent chance exceedances of the Savannah River at Augusta, Ga. (02197000)

[ft^3/s, cubic feet per second]

Percent chance of exceedance	Peak discharge (ft^3/s)
50	92,000
20	138,000
10	174,000
4	226,000
2	269,000
1	316,000
0.5	368,000
0.2	445,000

The Interagency Advisory Committee on Water Data (1982) suggests that the flood frequency relation should be tested for the sensitivity of lower exceedance probabilities to inclusion of floods that exceed the low outlier criteria by small amounts. The initially computed low outlier criterion was 20,800 ft^3/s, compared to the three smallest floods, which had peak discharges of 32,800, 26,100, and 32,500 ft^3/s for 1911, 1931, and 1950, respectively.

The estimated one-percent chance exceedance flood was insensitive to alternative values of the low-outlier criterion in the range of 35,000 to 70,000 ft^3/s. The estimated one-percent chance exceedance flood changed markedly when the criterion was lowered to include the three smallest floods. This sensitivity of the one-percent chance exceedance flood to the magnitudes of the smallest observed floods is not hydrologically reasonable; therefore, the low outlier criterion was set at 35,000 ft^3/s.

The one-percent chance exceedance flood for unregulated conditions for the Savannah River at Augusta is 316,000 ft^3/s. Peak discharges for other exceedance probabilities are listed in table 12 and shown in figure 34.

An analysis was performed to test the sensitivity of the unregulated flood frequency relation to variations in the peak stage and discharge of the 1796 flood, ranging from 37 to 41 feet and 240,000 to 410,000 ft^3/s. Discharges computed for the one-percent chance exceedance flood were three percent lower and one percent higher, respectively, for the lower and upper ranges of peak discharge estimates.

REGULATED FLOOD FREQUENCY

A regulated flood frequency relation for the Savannah River at Augusta was developed by adjusting the unregulated frequency relation for regulated conditions using the relation between regulated and unregulated peak discharges and an application of the total probability theorem. Graphical procedures and computation of probability distributions were used and the results compared. The two methods of analysis are called "total probability method" and the "plotting position method" in this report.

The unregulated flood frequency relation (fig. 34) quantifies the effect of hydrometeorological variables that determine unregulated flood occurrence and magnitude. The relation between regulated and unregulated peak discharges (fig. 33) quantifies the predictable portion of the effect of reservoir-operation variables on the regulated magnitude of a given unregulated flood. The residuals about the trend line of the regulated-unregulated relation quantify the unpredictable effect of reservoir-operation and hydrometeorological variables on the regulated magnitude of a given unregulated flood.

A graphical comparison of unregulated peak flows of the Broad River near Bell with concurrent regulated peak flows of the Savannah River at Augusta showed that regulated peak flows at Augusta for the period 1952-61 did not differ significantly from those during the 1962-85 period after Hartwell Dam was constructed. Russell Lake is considered to have little impact on flood control, because of its relatively small flood control storage. Therefore, the record 1952-85 was considered to be homogeneous with respect to the construction of Hartwell and Russell Dams.

The total probability method is based on the so-called Total Probability Theorem (Mood and others, 1974; Benjamin and Cornell, 1970) which expresses the probability of an event in terms of a sum of

probabilities of constituent events. As applied to regulated flows, the Total Probability Theorem states that

$$P(Q_r > x) = \sum P(Q_u = z)\ P(Q_r > x \mid Q_u = z)$$

where Q_r is the regulated flood magnitude, Q_u is the unregulated flood magnitude, P is the probability of the indicated event, and $P(Q_r > x \mid Q_u = z)$ is the conditional probability that Q_r exceeds x, given that Q_u equals z. The sum includes all possible values of Q_u. The probability $P(Q_u = z)$ is defined by the unregulated frequency curve. The conditional probability is defined by the regulated-flood trend line and the statistics of the residuals, as follows. The relation between the regulated and unregulated floods can be expressed as

$$Q_r = H(Q_u) + \varepsilon$$

where H is the mathematical function that represents the trend line in figure 33 and ε is a random variable representing the residuals between the actual regulated flow, Q_r, and the trend line. All variables in this relation are expressed in terms of logarithms. The conditional probability then can be expressed as

$$P(Q_r > x \mid Q_u = z) = P(\varepsilon > x - H(z) \mid Q_u = z)$$

The probability distribution of ε is determined by means of statistical analysis of the residuals. This result therefore may be substituted into the Total Probability formula, with the result:

$$P(Q_r > x) = \sum P(Q_u = z)\ P(\varepsilon > x - H(z) \mid Q_u = z)$$

Because both probability terms in this formula are known, the formula can be evaluated and the probability of Q_r's exceeding x can be determined.

Evaluation of this formula was carried out numerically by a computer program (W. Kirby, USGS, written commun., 1990). For use in the program, the unregulated frequency curve was defined by its quantiles at annual exceedance probabilities of 0.5, 0.1, and 0.01; the regulated-flood trend line was defined by 14 points read off the curve in figure 33; and the probability distribution of ε was defined by the mean and standard deviation of logarithmic residuals from the trend line in figure 33. The computer program computed the regulated-flood exceedance probabilities for selected values of discharges x. The results are shown as a regulated frequency curve in figure 35. The unregulated frequency relation of figure 34 also is shown in figure 35 for comparison. These results are consistent with results of similar computations performed independently by the COE's method of coincident frequency analysis, computer program CFA (H.E. Kubik, COE, written commun., 1990).

A flood frequency relation was also computed using the Weibull probability plotting position method presented by the Interagency Committee on Water Data (1982). Regulated flood magnitudes and their frequency plotting positions are given in Table 13. A historic period of record of 1786 to 1985 and a systematic period of record of 1952-85 were used. A regulated historic threshold discharge of 90,000 ft^3/s was determined by converting the 225,000 ft^3/s unregulated historic threshold discharge to regulated discharge using the relation in figure 33. Regulated discharges for ten floods were determined above this threshold discharge from results of model simulations or from conversion of unregulated peak discharges to regulated peak discharges (table 10) using the relation in figure 33. Measured regulated peak discharges were available for water years 1952-85. Results of the plotting position method are shown in figure 35 along with the total probability results.

Comparison of the total probability and plotting-position curves as shown in figure 35 indicates agreement within about 15 percent throughout the range of probabilities of interest. This level of agreement is within the limits of uncertainty of either method. Therefore, the average results of the two methods are adopted and listed in table 14. The one-percent chance exceedance flood under 1990 reservoir operating conditions is 180,000 ft^3/s. The results of this analysis may be become inapplicable if significant changes are made in reservoir operating procedures.

A sensitivity analysis of the effects of possible inaccuracies in the 1796 peak discharge on the regulated flood-frequency relation was conducted. Variations in the 1796 discharge from 240,000 to 410,000 ft^3/s (stages 37 to 41 feet) were considered. Under these variations, discharges computed for the one-percent chance exceedance flood were -4 percent and +4 percent of the one-percent chance exceedance flood.

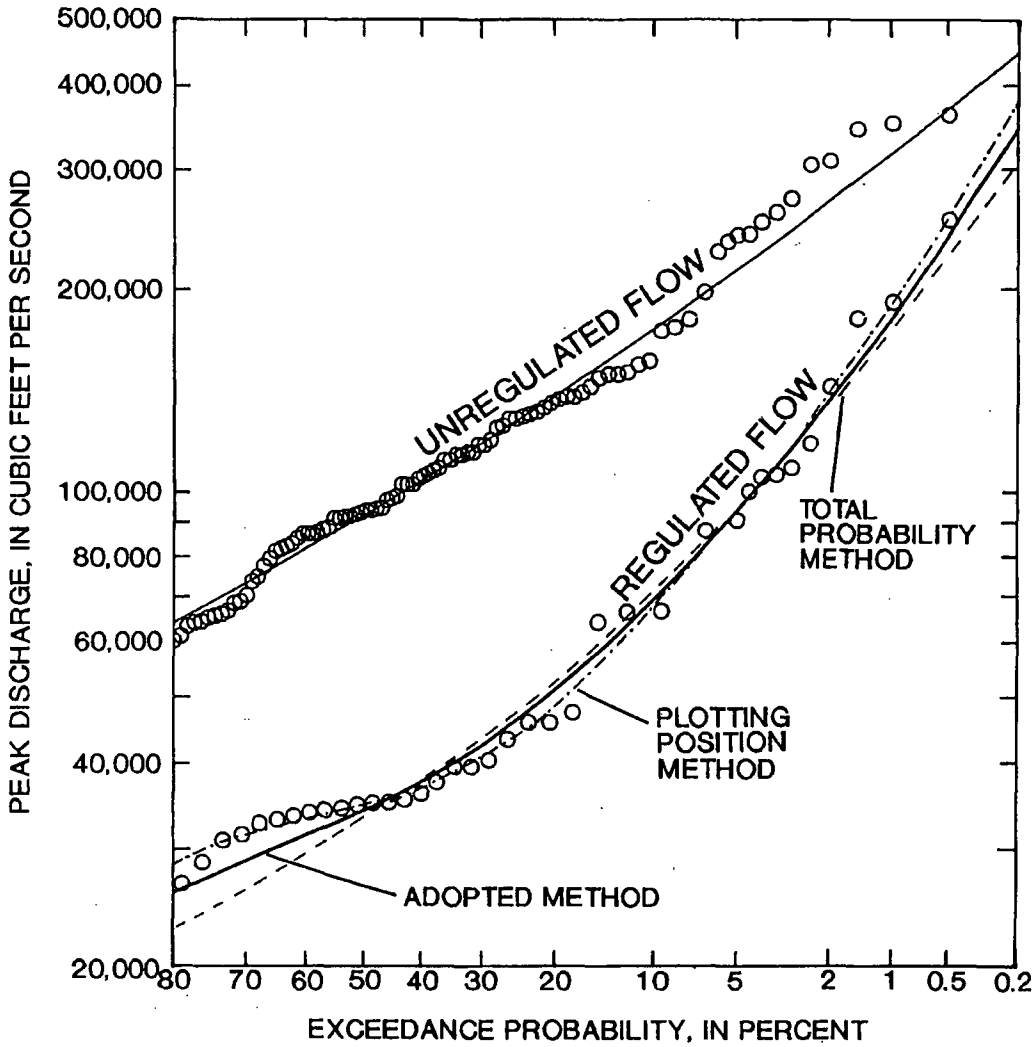


Figure 35.--Unregulated and regulated peak discharge frequency curves for the Savannah River at Augusta, Ga. (02197000).

Table 13.--Peak discharges and frequency plotting positions for regulated conditions for the Savannah River at Augusta, Ga. (02197000)

[ft^3/s, cubic feet per second]

Chronological		Ranked		
Water year	Peak discharge (ft^3/s)	Water year	Peak discharge (ft^3/s)	Frequency plotting position (percent)
1796	191,000	1930	252,000	0.50
1840	118,000	1796	191,000	1.00
1852	105,000	1936	181,000	1.49
1865	99,700	1888	143,000	1.99
1888	143,000	1840	118,000	2.49
1908	108,000	1908	108,000	2.98
1929	106,000	1929	106,000	3.48
1930	252,000	1852	105,000	3.98
1936	181,000	1865	99,700	4.48
1940	90,200	1940	90,200	4.97
1952	39,300	1964	87,100	6.61
1953	35,200	1958	66,300	9.39
1954	25,500	1983	66,100	12.17
1955	23,900	1971	63,900	14.95
1956	18,600	1980	47,200	17.74
1957	18,000	1969	45,600	20.51
1958	66,300	1975	45,600	23.29
1959	28,500	1978	43,100	26.08
1960	34,900	1973	40,200	28.86
1961	34,800	1952	39,300	31.64
1962	32,500	1966	39,300	34.42
1963	31,300	1979	37,300	37.20
1964	87,100	1968	35,900	39.98
1965	34,600	1953	35,200	42.76
1966	39,300	1960	34,900	45.54
1967	26,500	1961	34,800	48.32
1968	35,900	1965	34,600	51.10
1969	45,600	1977	34,200	53.88
1970	25,200	1984	34,000	56.66
1971	63,900	1972	33,700	59.44

Table 13.--Peak discharges and frequency plotting positions for regulated conditions for the Savannah River at Augusta, Ga. (02197000)--Continued

[ft^3/s, cubic feet per second]

Chronological		Ranked		
Water year	Peak discharge (ft^3/s)	Water year	Peak discharge (ft^3/s)	Frequency plotting position (percent)
1972	33,700	1976	33,300	62.22
1973	40,200	1974	32,900	65.00
1974	32,900	1962	32,500	67.78
1975	45,600	1963	31,300	70.56
1976	33,300	1982	30,700	73.34
1977	34,200	1959	28,500	76.12
1978	43,100	1967	26,500	78.90
1979	37,300	1985	25,700	81.68
1980	47,200	1954	25,500	84.46
1981	17,700	1970	25,200	87.24
1982	30,700	1955	23,900	90.02
1983	66,100	1956	18,600	92.80
1984	34,000	1957	18,000	95.58
1985	25,700	1981	17,700	98.36

Table 14.--Discharges of regulated floods of selected percent chance exceedances of the Savannah River at Augusta, Ga. (02197000)

[ft^3/s, cubic feet per second]

Percent chance of exceedance	Peak discharge (ft^3/s)
50	34,500
20	51,500
10	69,000
4	105,000
2	140,000
1	180,000
0.5	240,000
0.2	345,000

SUMMARY

A flood-frequency relation was established for the Savannah River at the long-term gaging station at Augusta, Georgia (02197000) to fill an increasing need for reliable information on floods of various exceedance probabilities. The flood-frequency analysis was complicated by the fact that the Savannah River upstream of Augusta has experienced regulation of flow caused by Thurmond, Hartwell and Russell Dams, which began filling in 1951, 1961, and 1984, respectively.

In addition to the 5 historic floods, unregulated peak discharge data for the Savannah River at Augusta are available for water years 1876-1951, and regulated peak discharge data are available for 1952-85. Because it is necessary to use the longest possible period of record in flood-frequency analyses and especially because of the absence of major floods since 1951, unregulated major floods prior to 1952 were adjusted for regulation and were included in the analysis. Regulated peak discharges since 1951 were also converted to unregulated peak discharges for use in determining the unregulated flood-frequency relation.

Unregulated discharges for the 1952-85 period were simulated using daily streamflow records converted to 2-hour data and routed to Augusta (02197000) without regulation to simulate unregulated peak discharges to be included in an unregulated peak discharge data base for 1786-1985. An unregulated flood frequency relation was generated using the log-Pearson Type III method, using a historical threshold discharge of 225,000 ft^3/s and a low-outlier threshold of 35,000 ft^3/s. The one-percent chance exceedance unregulated discharge for the Savannah River at Augusta is 316,000 ft^3/s.

Nine large unregulated floods were adjusted for regulated conditions using the HEC-5 computer model and hourly inflow hydrographs estimated from discharge records at gaging stations within the basin and from rainfall-runoff modeling. Routing parameters and initial pool elevations estimated by daily flow routings or by median lake elevations were also used in the HEC-5 model. Regulated peak discharges were related to unregulated peak discharges. These relations were used to convert unregulated peak discharge to regulated peak discharges for selected unregulated floods that could not be modeled.

A flood-frequency relation for regulated conditions was developed by the graphical method using a regulated historic base discharge of 90,000 ft^3/s and by total-probability computations. The regulated one-percent chance exceedance flood for the Savannah River at Augusta for current (1990) reservoir operation methodology is 180,000 ft^3/s. The regulated flood-frequency relation may change if reservoir operation methods change.

REFERENCES

Augusta Chronicle and Gazette of the State, January 23, 1796: Augusta, Georgia.

-----, January 30, 1796: Augusta, Georgia.

-----, February 6, 1796: Augusta, Georgia.

Augusta Chronicle and Georgia Gazette, Thursday March 9, 1820: Augusta, Georgia.

-----, Saturday September 18, 1824: Augusta, Georgia.

Bunch, C.M., and Price, McGlone, 1962, Floods in Georgia, magnitude and frequency: U.S. Geological Survey Open-File Report, Atlanta, Georgia, 152 p.

Benjamin, J.R., Cornell, C.A., 1970, Probability, Statistics, and Decision for Civil Engineers: McGraw-Hill New York, 684 p.

Carter, R.W., 1951, Floods in Georgia, magnitude and frequency: U.S. Geological Survey, Circular 100.

Cashin, Edward J., 1980, The Story of Augusta: Richmond County Board of Education, Augusta, Georgia.

Charleston Daily Courier, Tuesday August 31, 1852: Charleston, S.C.

-----, Wednesday September 1, 1852: Charleston, S.C.

Charleston News and Courier, September 2, 1888, The fury of the floods: Charleston, S.C.

Cooke, C.W., 1936, Geology of the Coastal Plain of South Carolina: U.S. Geological Survey Bulletin 867, 196 p.

Corley, Florence Fleming, 1960, The Confederate City: Columbia, S.C.

Courier, June 1840: Charleston, S.C.

-----, September 2, 1852: Charleston, S.C.

Daily Chronicle and Sentinel, Thursday May 28, 1840: Augusta, Georgia.

-----, Saturday May 30, 1840: Augusta, Georgia.

-----, Wednesday March 1, 1851: Augusta, Georgia.

-----, April 10, 1851, Augusta, Georgia.

-----, August 29, 1852: Augusta, Georgia.

-----, September 9, 1852, Health of Augusta: Augusta, Georgia.

-----, August 31, 1852: Augusta, Georgia.

-----, August 20, 1858: Augusta, Georgia.

-----, January 3, 1864: Augusta, Georgia.

-----, January 13, 1865: Augusta, Georgia.

-----, August 1, 1866: Augusta, Georgia.

-----, March 15, 1870, Batteaux used in the Street: Augusta, Georgia.

Elliot, Daniel, and Doyon, Ray, 1981, Archaeology and Historical Geography of the Savannah River Floodplain near Augusta, Georgia: Southeastern Wildlife Services, Inc., Athens, Ga.

Emigh, E.D., January 1914, Freshets in the Savannah River: U.S. Department of Agriculture, Weather Bureau. (Monthly Weather Review)

-----, Report on the floods in the Savannah River, September and October, 1929: U.S. Department of Agriculture, Weather Bureau, October 18, 1929.

Georgia State Gazette and Independent Register, Saturday, March 16, 1793: Augusta, Georgia.

Hall, B.M., and Hall, M.R., 1907, Water Resources of Georgia: U.S. Geological Survey Water Supply and Irrigation Paper no. 197.

-----, 1908, Water Powers of Georgia: Geological Survey of Georgia, Bulletin No. 16.

Hall, M.B., and Hoyt, J.C., 1905, Progress of Stream Measurements for calendar year 1904: U.S. Geological Survey Water Supply and Irrigation Paper no. 127.

Hoyt, J.C., 1904; Progress of stream measurements for calendar year 1903: U.S. Geological Survey Water Supply and Irrigation Paper, no. 98.

Interagency Advisory Committee on Water Data, 1982, Guidelines for determining flood flow frequency: Hydrology Subcommittee, U.S. Geological Survey Bulletin No. 17B.

Jones, C.C., and Dutcher, Salem, 1890, Memorial History of Augusta, Georgia: D. Mason and Co., Syracuse, N.Y.

McDonald, B.B., and Sanders, C.L., 1987, Simulated flood discharges and elevations for the Savannah River, South Carolina and Georgia, using an unsteady streamflow model: U.S. Geological Survey Water-Resources Investigations Report 84-4158, 34 p.

McCuen, R.H., 1982, A guide to hydrologic analysis using SCS methods. Prentice-Hall, Inc., Englewood Cliffs, N.J., 145 p.

Mood, A.M., Graybill, F.A., and Boes, D.C., 1974, Introduction to the Theory of Statistics 3rd Ed.: McGraw-Hill, New York, 56 p.

Murphy, E.C., 1906, Destructive floods in the United States in 1905: U.S. Geological Survey Water Supply and Irrigation Paper No. 162, 111 p.

Newell, F.H., 1903; Progress of stream measurements for calendar year 1902: U.S. Geological Survey Water Supply and Irrigation Paper No. 83.

O'Neall, J.B. and Chapman, A.M., 1892, The Annals of Newberry: Aull and Houseal, Newberry, S.C.

Patterson, George, 1889, The Savannah, her destructive floods, their Causes and Speedy Remedy: J.M. Richardson, Augusta, Georgia.

Phillips, William, 1892, Topography and Hydrography in the vicinity of Augusta, Georgia: John M. Weigle and Co., Augusta, Georgia.

Price, McGlone, 1979, Floods in Georgia, magnitude and frequency: U.S. Geological Survey Water Resources Investigations Report 78-137

Russell, L., 1891, Stages of water, Miscellaneous River Stations 1875 to 1889, Inclusive, Part III: U.S. War Department.

South Carolina Historical Magazine, July 1970, John Tobler's Description of South Carolina (1753): South Carolina Historical Society, Charleston, S.C.

Speer, P.R., and Gamble, C.R., 1964, Magnitude and frequency of floods in the United States. Part 2A. South Atlantic slope basins, James River to Savannah River: U.S. Geological Survey Water-Supply Paper 1673, 329 p.

Spencer, R.E., Rivers and Floods: U.S. Weather Bureau, Monthly Weather Review, v. 57, October 1929.

Tri-weekly Chronicle and Sentinel, Thursday Morning, May 28, 1840: Augusta, Georgia.

U.S. Army Corps of Engineers, 1945, Savannah River basin, Clark Hill project: U.S. Army Corps of Engineers, South Atlantic Division, Definite Project Report, v. 2, app. 1, p. I-19, I-23, plates 106-7.

-----, 1952, Savannah River basin, Hartwell Reservoir: U.S. Army Corps of Engineers, South Atlantic Division, Definite Project Report, v. 2, app. 1, p. 1-11, plates 54-5.

-----, 1969, Trotters Shoals Dam and Reservoir, Savannah River: U.S. Army Corps of Engineers, South Atlantic Division, Design Memorandum 2 - Hydrology and Hydraulics Analysis, p. 38, plate 29.

-----, 1971, Special flood hazard information report, Savannah River, Augusta, Georgia: U.S. Army Corps of Engineers, Savannah District, 13 p.

-----, 1983, Interim Reservoir Regulation Criteria, Richard B. Russell Dam and Lake: Written communication.

-----, Hydrologic Engineering Center, 1982, HEC-5, Simulation of Flood Control and Conservation Systems Users Manual.

-----, Hydrologic Engineering Center, 1985, HEC-1, Flood hydrograph package, users manual.

-----, Savannah District, 1929, Report of flood study on Savannah River at Augusta, Georgia: Report No. 10059/43-61.

-----, Savannah District, June 1953, Savannah River Basin-Reservoir Regulation Manual.

-----, Savannah District, 1974, Savannah River Basin-Reservoir Regulation Manual.

U.S. Geological Survey, 1899, Water Supply and Irrigation Paper No. 27: Government Printing Office, Washington.

U.S. House of Representatives, Executive Document No. 124, 1854, vol. 12, 33rd Congress, 1st session.

-----, Executive Document No. 90, 1879, vol. 16, 45th Congress, 3rd session.

-----, Executive Document No. 23, 1881, vol. 18, 46th Congress, 3rd session.

-----, Executive Document No. 213, 1890, 51st Congress, 1st session.

-----, Executive Document No. 1, 1890, part 2, VII, 51st Congress, 2nd session.

-----, Executive Document No. 255, 1891, 51st Congress, 2nd session.

-----, Executive Document No. 50, 1892, vol. 28, 52nd Congress, 3rd session.

U.S. House of Representatives, Document No. 962, 1908, vol 20, 60th Congress, 1st session.

-----, Document No. 487, 1919, vol. 27, 61st Congress, 2nd session.

-----, Document No. 1319, 1913 vol. 27, 62nd Congress, 3rd session.

-----, Document No. 1389, 1913, 62nd Congress, 3rd session.

U.S. House of Representatives Document No. 615, 1916, vol. 23, 64th Congress, 1st session.
-----, Document No. 1243, 1916, vol. 25, 64th Congress, 1st session.
-----, Document No. 1934, 1917, vol. 22, 64th Congress, 2nd session.
-----, Document No. 333, 1917, vol. 34, 65th Congress, 1st session.
-----, Document No. 985, 1918, vol. 18, 65th Congress, 2nd session.
-----, Document No. 101, 1928, 70th Congress, 1st session.
-----, Document No. 64, 1935, 74th Congress, 1st session.
U.S. Soil Conservation Service, 1972, Hydrographs: National Engineering Handbook, Section 4.
U.S. Weather Bureau, 1929, Monthly Weather Review, October 1929, Volume 57, 1929: U.S. Department of Agriculture.
Whetstone, Benjamin H., 1982, Techniques for Estimating Magnitude and Frequency of Floods in South Carolina: U.S. Geological Survey Water Resources Investigations Report 82-1, 78 p.
Wingfield, Nesbit, The Savannah River Levee, Augusta, Ga.: Engineering News, v. 72, no. 6, August 6, 1914.

```
Volume in drive M is FRES0304-F
Volume Serial Number is 9CCF-FA19

Directory of M:\list\Hydrology Calcs\USGS gage data\Average Daily

12/05/2006  05:24 PM    <DIR>          .
12/05/2006  05:24 PM    <DIR>          ..
03/15/2006  09:33 AM            58,060 AugsutaGAAnnualAvgDailyQs.pdf
02/13/2006  11:03 AM         2,104,702 AugustadailyQ.bmp
12/05/2006  05:24 PM                34 avgday.txt
04/14/2006  04:30 PM            58,091 BurtonsFerryAverageDaily.pdf
03/15/2006  09:31 AM            58,373 CalhounFallsAnnualAvgDailyQs.pdf
03/15/2006  09:35 AM            58,512 ClyoGAAnnualAvgDailyQs.pdf
03/15/2006  09:34 AM            57,478 JacksonAnnualAvgDailyQs.pdf
          7 File(s)      2,395,250 bytes
          2 Dir(s)  53,735,227,392 bytes free
```

AugustaGAAnnualAvgDailyQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

Daily Streamflow Statistics for the Nation

USGS 02197000 SAVANNAH RIVER AT AUGUSTA, GA

Available data for this site Surface-water: Daily streamflow statistics GO

Richmond County, Georgia
Hydrologic Unit Code 03060106
Latitude 33°22'25", Longitude 81°56'35" NAD27
Drainage area 7,508. square miles
Gage datum 96.58 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

Day of month	Mean of daily mean values for this day for 98 years of record[1], in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	10790	11320	17390	16289	10680	8129	7708	8359	8281	7717	5987	8172
2	11380	11860	15900	16230	10950	8078	8381	8139	8205	10460	6316	7694
3	11360	11960	14110	17210	10570	8107	7871	8541	7546	10080	6574	7651
4	12460	12860	13420	15820	10130	7917	7126	8446	7586	8478	6847	8232
5	13170	13380	14440	14099	9711	7943	7085	7901	7451	7249	6990	8680
6	12130	13339	14920	15170	9621	8233	7356	8065	7634	7143	6782	8617
7	11860	13850	15029	15920	9875	8760	7357	8125	7709	6793	6303	8444
8	12600	15250	15910	15740	10160	8985	7993	7921	7986	6526	6310	8281
9	12650	15590	16410	15490	10140	8532	8653	8440	7689	6696	6763	8289
10	12080	15459	16070	15120	10110	8316	8541	8329	8819	7243	6846	8670
11	11550	15330	14549	14560	9318	8103	7732	7352	9687	7243	6650	8512
12	11790	15190	13940	13650	8830	8026	7387	7287	7867	7047	6635	8372
13	12240	14620	14520	12780	8648	8111	7342	7680	6671	7058	6901	8580
14	11610	14330	14940	12730	8600	8570	7788	8807	6223	6582	7357	8793
15	11200	14090	14690	13110	8388	8829	7669	9442	6372	6121	7344	9559
16	10860	13469	15490	13619	8393	9036	7872	9381	6331	5916	7227	10260
17	11570	13880	15880	13450	8369	8825	7699	9570	6543	6188	7475	9995
18	12350	15020	14779	12270	7988	8540	7635	9034	7583	6975	7398	9486
19	13900	15020	13869	11650	7629	8056	7612	8447	7598	6931	7311	9025
20	15450	14170	14490	11670	8318	7589	7735	8776	6913	6854	7297	8854
21	14820	14130	15780	11620	9137	7369	7393	8078	6540	7215	6879	9797

AugustaGAAnnualAvgDailyQs.pdf

22	12730	15110	16450	11370	9283	7657	7171	7790	6591	7233	6834	9845
23	11580	14790	16189	10830	9216	7228	6961	7473	6438	7373	6792	9854
24	11800	14010	16550	10380	8788	7318	6879	7321	6270	7584	7131	9289
25	11990	13780	15960	10060	8499	8373	7196	7213	6418	7035	7296	9232
26	12190	13880	15079	10500	7805	8399	7623	7367	6989	6491	7352	9595
27	11760	14160	15370	10500	7795	7699	7499	7301	8905	6709	7551	10100
28	11260	16089	15380	10190	7904	7406	7428	7615	8902	6778	7584	10090
29	11310	11980	15300	9767	7866	7209	7655	8207	7516	6342	7950	10160
30	11450		16800	10480	7794	7598	8445	8447	7140	6319	8448	11020
31	11250		16920		7823		8962	8352		6173		11100

1 -- Available period of record may be less than value shown for certain days of the year.

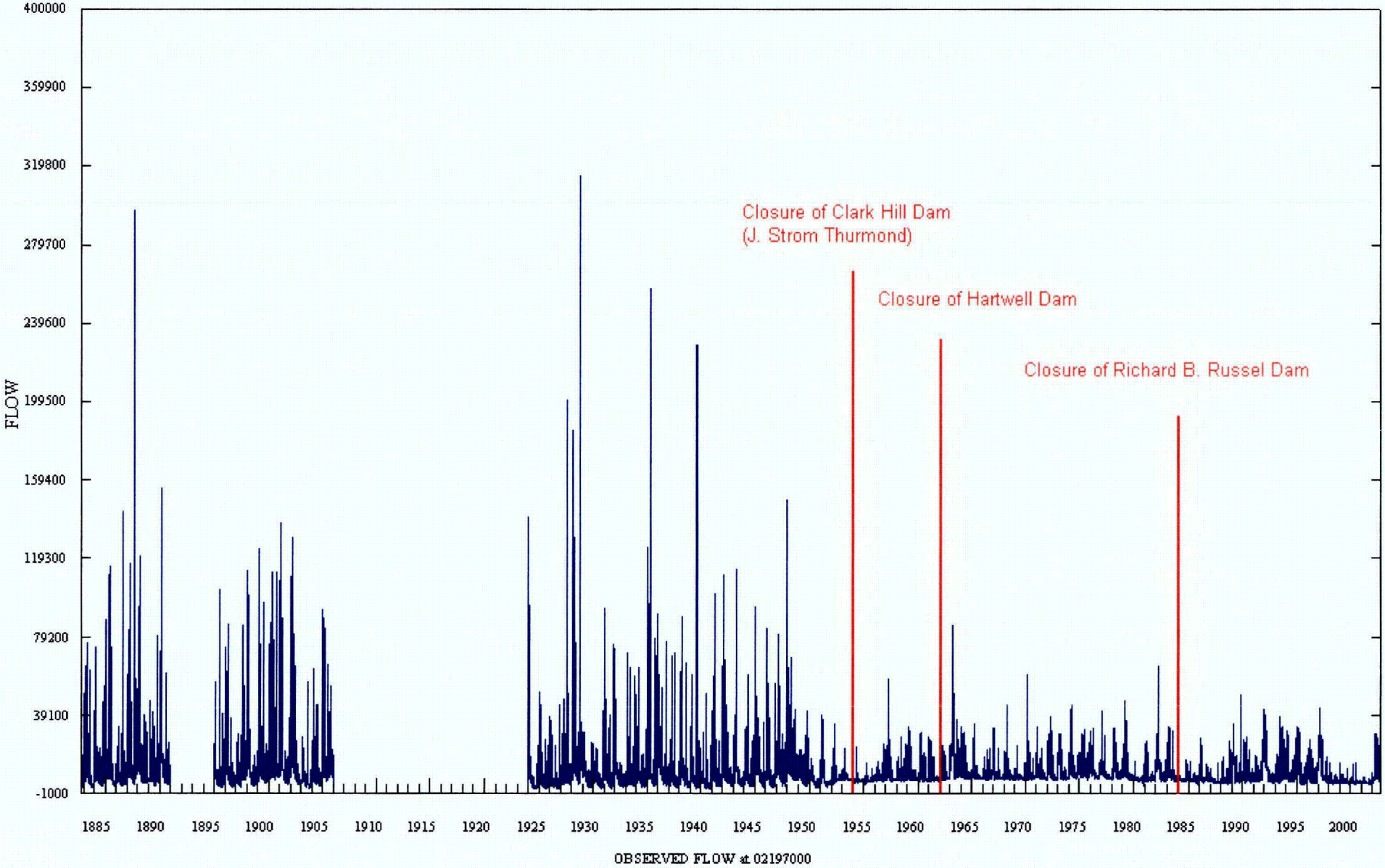
Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team

Top
Explanation of terms

Surface Water data for USA: Daily Streamflow Statistics
http://waterdata.usgs.gov/nwis/dvstat?

Retrieved on 2006-03-15 09:32:51 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.36 1.33 nadww01

Augustadaily Q.bmp



BurtonsFerryAverageDaily.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

Daily Streamflow Statistics for the Nation

USGS 02197500 SAVANNAH R AT BURTONS FERRY BR NR MILLHAVEN, GA

Available data for this site Surface-water: Daily streamflow statistics GO

Screven County, Georgia
Hydrologic Unit Code 03060106
Latitude 32°56'20", Longitude 81°30'10" NAD27
Drainage area 8,650 square miles
Gage datum 52.42 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

Day of month	Mean of daily mean values for this day for 52 years of record[1], in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	11640	11900	14530	16120	11670	8270	7836	7533	8094	6845	7130	8937
2	11370	12130	14499	16080	11890	8214	7980	7644	8149	6871	7009	9615
3	11430	12170	14549	15980	11930	8037	8060	7695	8228	6858	7056	9981
4	11910	12180	14720	15720	12160	7935	8041	7682	8357	6918	7115	9803
5	11980	12120	14829	15609	12410	7801	8040	7712	8495	6889	7252	9366
6	11760	11810	14840	15400	12360	7713	7950	7830	8406	6957	7376	9141
7	11410	11680	14850	15070	12120	7718	8050	7961	8309	6954	7402	8978
8	11230	11920	15160	14779	11940	7653	8087	8053	8129	6974	7470	8855
9	11120	12310	15659	14430	11780	7742	8060	8098	7913	7054	7448	8950
10	11510	12609	15920	14140	11660	7946	8133	8123	7887	7166	7363	9013
11	12070	12860	16480	14090	11650	8173	8250	8114	7852	7272	7351	9081
12	12220	13239	17170	14560	11620	8339	8346	7986	7718	7372	7425	9075
13	11970	13650	17390	15040	11490	8564	8400	7962	7743	7492	7330	9058
14	11700	14110	17120	15230	11300	8704	8333	7931	7677	7566	7299	9178
15	11650	14480	16650	15129	11110	8718	8310	7944	7562	7597	7443	9410
16	11760	14530	16310	14729	10880	8806	8327	8556	7498	7674	7685	9572
17	11740	14440	16120	14490	10610	8694	8304	9731	7277	7613	7674	9626
18	11730	14249	16050	14430	10290	8511	8376	10130	7150	7411	7548	9686
19	11840	14120	15900	14420	10050	8397	8615	9983	7060	7316	7639	9708
20	12220	14060	15790	14260	9678	8231	8642	9682	7006	7304	7758	9599
21	12680	14099	15960	14120	9302	8082	8769	9205	6937	7412	7778	9540

BurtonsFerryAverageDaily.pdf

22	13339	14640	16260	13710	9030	8146	8665	8847	6899	7499	7781	9636
23	14080	15359	16460	13280	8872	8375	8532	8534	7032	7498	7776	9637
24	14240	15750	17200	13100	8857	8257	8510	8351	7109	7566	7873	9662
25	13940	15480	18060	12920	9013	7987	8231	8309	7194	7657	8028	9821
26	13410	15070	18340	12420	8956	8036	8057	8310	7155	7856	8088	10070
27	12910	14810	18150	12020	8702	8025	7911	8290	7161	8068	8070	10410
28	12400	14690	17620	11750	8601	7838	7647	8208	6929	8098	8036	10550
29	11770	15150	16870	11520	8470	7682	7516	8102	6723	8005	8162	10850
30	11450		16350	11510	8421	7723	7498	8116	6761	7699	8371	11320
31	11560		16180		8327		7573	8088		7339		11660

1 -- Available period of record may be less than value shown for certain days of the year.

Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team

Top
Explanation of terms

Surface Water data for USA: Daily Streamflow Statistics
http://waterdata.usgs.gov/nwis/dvstat?

Retrieved on 2006-04-14 17:29:02 EDT
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.37 1.37 nadww01

CalhounFallsAnnualAvgDailyQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

Daily Streamflow Statistics for the Nation

USGS 02189000 SAVANNAH RIVER NEAR CALHOUN FALLS, S. C.

Available data for this site Surface-water: Daily streamflow statistics GO

Abbeville County, South Carolina
Hydrologic Unit Code 03060103
Latitude 34°04'15", Longitude 82°38'30" NAD27
Drainage area 2,876.00 square miles
Gage datum 363.53 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

Day of month	Mean of daily mean values for this day for 49 years of record[1], in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	5364	5898	6560	8923	6925	5443	4455	3872	4237	3286	3630	4632
2	5084	6221	6427	8229	6832	5161	4482	4081	3904	3078	3827	4534
3	5719	5796	6734	7558	6824	4698	4020	4167	3718	2960	3821	4435
4	5632	6219	7497	7158	6529	5023	3008	4237	3547	3205	4180	5338
5	5596	5686	6972	8424	5786	5796	3114	4531	3558	3488	4082	6139
6	6324	5925	6452	8819	5454	5555	3935	4285	3642	3323	4048	5638
7	7437	7683	7408	8529	5380	5587	4638	4310	4473	3224	3810	5778
8	6593	6761	7349	8164	5243	6334	4592	4356	4503	3887	3820	5563
9	5991	6038	6340	8194	5215	5651	4681	4450	4410	3780	3864	4983
10	6304	6226	5744	6916	5039	4783	4567	4226	3976	3412	3780	5151
11	6274	6374	6054	6539	5265	4809	4260	3953	3885	3451	3932	4961
12	5577	6749	6824	7098	5606	4912	4617	3676	3593	3463	3866	5437
13	5061	8015	7053	7949	5521	5155	5113	5354	3819	3246	4227	5333
14	5664	8108	7193	8068	5405	5225	4718	5460	3958	3128	3872	5486
15	5451	6564	6791	7346	5621	4838	4503	4829	4023	3178	4062	6332
16	5840	6167	7183	7791	5561	4552	4880	4299	3899	3248	4064	5910
17	6253	6370	6959	7460	5493	4819	4899	4407	3956	3186	4004	5658
18	6401	6974	6071	6864	5345	5148	4658	4863	3937	3299	4532	5487
19	6468	6621	6076	6996	5339	4973	5127	4654	3711	3282	4809	5520
20	7141	6584	6982	7193	5422	5021	4759	4114	3667	3340	4662	5688
21	7074	7106	7352	6842	5789	5171	4663	4012	3741	3639	4303	6548

CalhounFallsAnnualAvgDailyQs.pdf

22	6061	7211	8108	6423	5717	5128	4353	4114	3478	3333	4507	6862
23	5743	6675	8035	6193	5491	4999	4414	4290	3301	3131	4308	6130
24	5919	6069	8340	6133	5611	5239	4326	4160	3375	3287	4284	5631
25	6107	5968	7747	6176	5157	5323	4268	4246	3428	3189	4317	4358
26	5687	6205	7591	6311	4968	5114	4391	3963	3705	3524	4400	4748
27	5432	6620	7547	6261	4722	4701	4367	3760	3852	3427	4870	6071
28	5945	6525	7624	6064	4845	4901	4231	4016	3731	3201	5000	5934
29	5903	5381	7737	6111	5369	5269	4003	4081	3386	3481	5503	6425
30	5555		8100	6932	5325	4942	4129	4709	3125	3492	5053	6429
31	6005		8063		5419		4098	5175		3446		5769

1 -- Available period of record may be less than value shown for certain days of the year.

Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team

Top
Explanation of terms

Surface Water data for USA: Daily Streamflow Statistics
http://waterdata.usgs.gov/nwis/dvstat?

Retrieved on 2006-03-15 09:29:21 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.71 1.4 nadww01

ClyoGAAnnualAvgDailyQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

Daily Streamflow Statistics for the Nation

USGS 02198500 SAVANNAH RIVER NEAR CLYO, GA

Available data for this site Surface-water: Daily streamflow statistics GO

Effingham County, Georgia
Hydrologic Unit Code
Latitude 32°31'41", Longitude 81°16'08" NAD27
Drainage area 9,850 square miles
Gage datum 13.39 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

Day of month	Mean of daily mean values for this day for 70 years of record[1], in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	12350	14199	17480	19510	13250	9907	9131	8949	8719	9002	8894	9338
2	12730	14099	17310	19110	12920	9794	8953	8987	8562	10330	8646	9492
3	13289	14050	17120	18650	12730	9685	8856	8910	8489	10340	8442	9840
4	13490	14260	17150	18610	12780	9588	8883	8801	8417	10350	8267	10390
5	13450	14490	17480	18400	12810	9484	8853	8784	8438	10380	8159	10780
6	13450	14720	17900	18380	12790	9330	8721	8729	8571	10380	8116	10900
7	13450	14900	18170	18320	12860	9240	8642	8678	8681	10340	8114	10920
8	13420	14970	18090	18320	13060	9220	8633	8645	8721	10370	8077	10840
9	13250	14920	17960	18160	13050	9294	8594	8620	8733	10370	8086	10640
10	13089	14970	17790	18120	12900	9439	8567	8579	8658	10390	8127	10520
11	13050	15090	17730	17980	12580	9585	8624	8673	8587	9298	8271	10530
12	13260	15170	17660	17760	12290	9675	8691	8778	8495	8901	8412	10560
13	13569	15250	17850	17660	12130	9700	8654	8750	8339	8628	8559	10550
14	14140	15459	18170	17720	12090	9777	8634	8728	8153	8450	8562	10590
15	14399	15880	18520	17930	12060	9946	8739	8737	8080	8324	8517	10700
16	14290	16310	18700	18090	11980	10090	8933	8744	8068	8293	8502	10850
17	14050	16620	18610	17940	11890	10170	9028	8681	8104	8243	8464	10980
18	13890	16830	18480	17620	11700	10160	9038	8606	8026	8232	8459	11160
19	13919	16770	18300	17190	11480	10040	9055	9260	7887	8258	8566	11300
20	13910	16690	18140	16740	11310	9950	9098	9891	7779	8224	8718	11400

ClyoGAAnnual/AvgDailyQs.pdf

21	13940	16490	17980	16380	11140	9821	9113	10130	7655	8168	8764	11590
22	14040	16310	17890	16089	10900	9654	9087	10160	7567	8134	8804	11640
23	14280	16260	17930	15870	10640	9497	9090	9989	7499	8177	8880	11680
24	14530	16420	18060	15550	10410	9421	9075	9646	7497	8212	8950	11700
25	14979	16670	18170	15170	10240	9327	9070	9314	7574	8265	9024	11760
26	15490	17040	18690	14829	10170	9249	9070	9101	7635	8486	9175	11740
27	15640	17350	19360	14560	10200	9258	9024	9033	7635	8611	9352	11710
28	15509	17470	20010	14280	10150	9344	8868	9082	7639	8743	9418	11820
29	15230	18810	20190	13960	10070	9357	8724	9069	7604	8919	9371	11950
30	14879		20050	13640	10010	9252	8612	9002	7537	9001	9329	12070
31	14490		19760		9990		8649	8868		9039		12180

1 -- Available period of record may be less than value shown for certain days of the year.

Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team

Top
Explanation of terms

Surface Water data for USA: Daily Streamflow Statistics
http://waterdata.usgs.gov/nwis/dvstat?

Retrieved on 2006-03-15 09:35:10 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.36 1.33 nadww01

JacksonAnnualAvgDailyQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

Daily Streamflow Statistics for the Nation

USGS 02197320 SAVANNAH R. NR JACKSON, SC

Available data for this site Surface-water: Daily streamflow statistics GO

Aiken County, South Carolina
Hydrologic Unit Code 03060106
Latitude 33°13'01", Longitude 81°46'04" NAD27
Drainage area 8,110.00 square miles
Gage datum 77.00 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

Day of month	Mean of daily mean values for this day for 31 years of record[1], in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	8843	10990	10650	11520	9351	8778	8337	7511	7725	7052	7188	8115
2	9091	11140	11050	10540	8757	8383	7974	7581	7334	7079	7167	8850
3	9807	11920	11320	10560	8860	7941	7691	7778	7141	7541	7088	8730
4	9931	11990	11470	10660	8858	8393	7922	7877	7433	7708	7193	8524
5	9759	11430	12559	10900	9146	8316	7743	7420	7791	7885	7261	8674
6	9677	11560	12140	11150	8650	8323	8097	7441	7891	7779	7233	8840
7	9407	11650	12040	10630	8578	8328	8102	7409	7778	7589	7218	8908
8	9032	11730	12160	10290	7630	8169	7924	7463	7395	7581	7141	9053
9	9086	11620	12240	10180	7377	8247	7316	7566	7322	7791	7225	9121
10	9402	11830	12020	10470	8088	7944	7700	7752	7428	7937	7354	8978
11	9922	11430	11100	10920	7937	8374	7524	7465	7247	7994	7435	9219
12	10540	11980	11480	10510	8381	8175	7107	7766	7042	7991	7510	9271
13	10800	12060	11790	10360	8695	8682	7079	7695	7059	7850	7542	9356
14	10870	11850	11920	9937	8551	8554	7042	7798	7047	7693	7745	9084
15	10640	11930	11740	9614	8096	8441	7183	7859	7299	7367	8222	9007
16	10430	11840	11510	10490	8221	8061	7270	7835	7208	7330	8354	9235
17	10510	10920	11570	10510	8368	7730	7478	7945	7015	7739	7940	9326
18	10770	10540	11340	10150	8784	7774	7583	8110	6855	7308	7681	9248
19	11290	11110	10750	9529	9375	7715	7551	8038	6841	7717	7734	9064
20	11480	10840	10560	9320	8814	7670	7688	7437	6826	7695	7644	9841
21	11260	10200	10800	9484	8461	8276	7558	7482	6702	7905	7584	9628

JacksonAnnualAvgDailyQs.pdf

22	11430	10260	10990	9388	8173	8800	7393	7431	7010	7758	7739	9536
23	11580	10760	10220	9379	8739	8878	7469	7361	7161	7848	8381	9469
24	11300	11080	9758	9780	9255	8404	7360	7312	7366	8257	8387	9350
25	11240	11250	10010	9456	9503	8230	7209	7335	7141	8340	8529	9362
26	10980	11090	11160	9380	9236	8154	7234	7284	7216	8108	8117	9653
27	10900	11380	11150	9780	9021	8113	7057	7332	7115	7974	7992	9524
28	11230	10990	10860	9542	8956	8240	6866	7430	6977	8022	7863	9155
29	10720	10540	11550	9237	9177	8481	6835	8035	7106	7759	8077	8781
30	10850		11950	9728	9396	8469	7195	7984	7017	7360	8527	8777
31	10870		11900		9236		7465	7957		7160		8816

1 -- Available period of record may be less than value shown for certain days of the year.

Questions about data Water Webserver Team
Feedback on this website NWISWeb Support Team

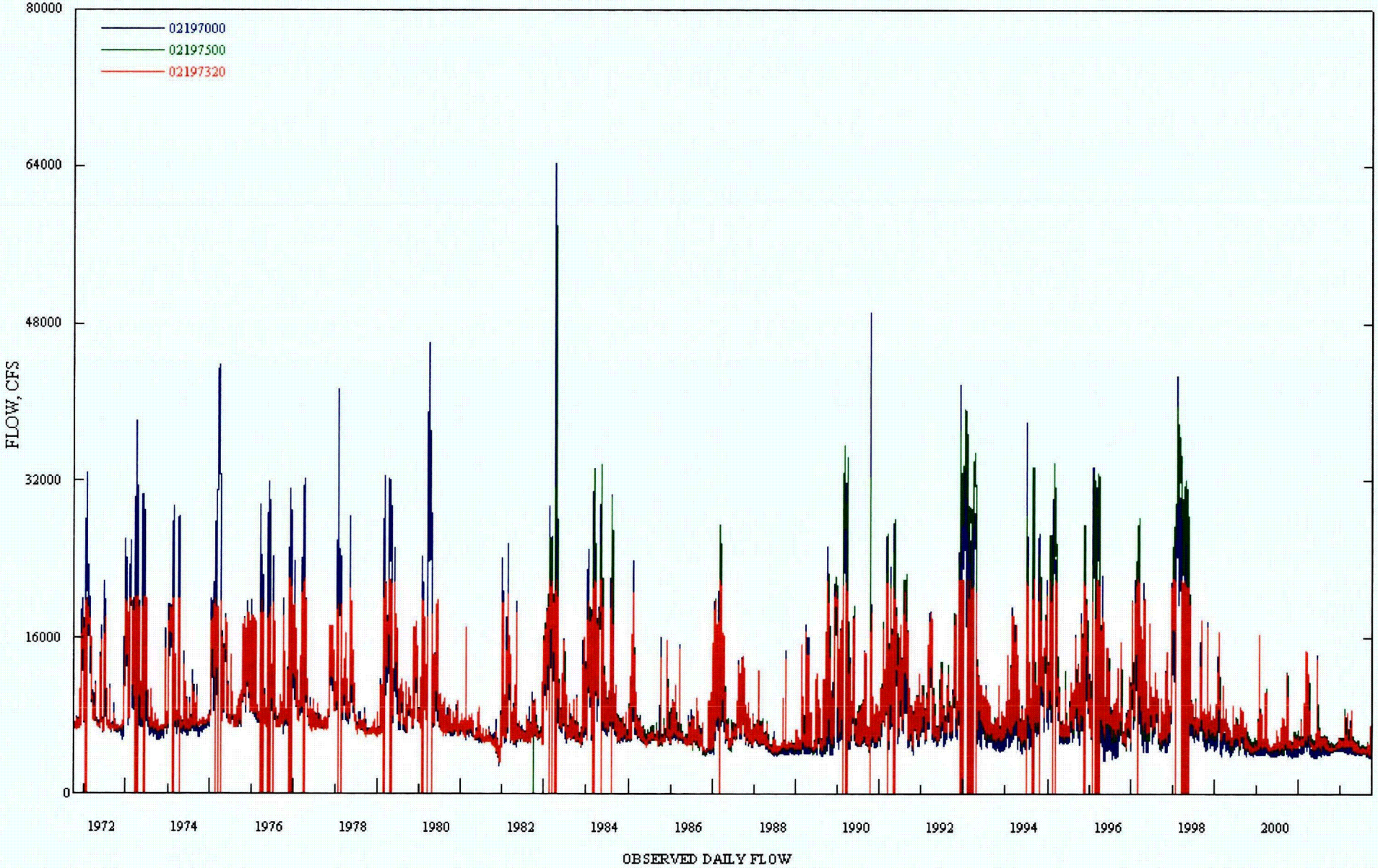
Top
Explanation of terms

Surface Water data for USA: Daily Streamflow Statistics
http://waterdata.usgs.gov/nwis/dvstat?

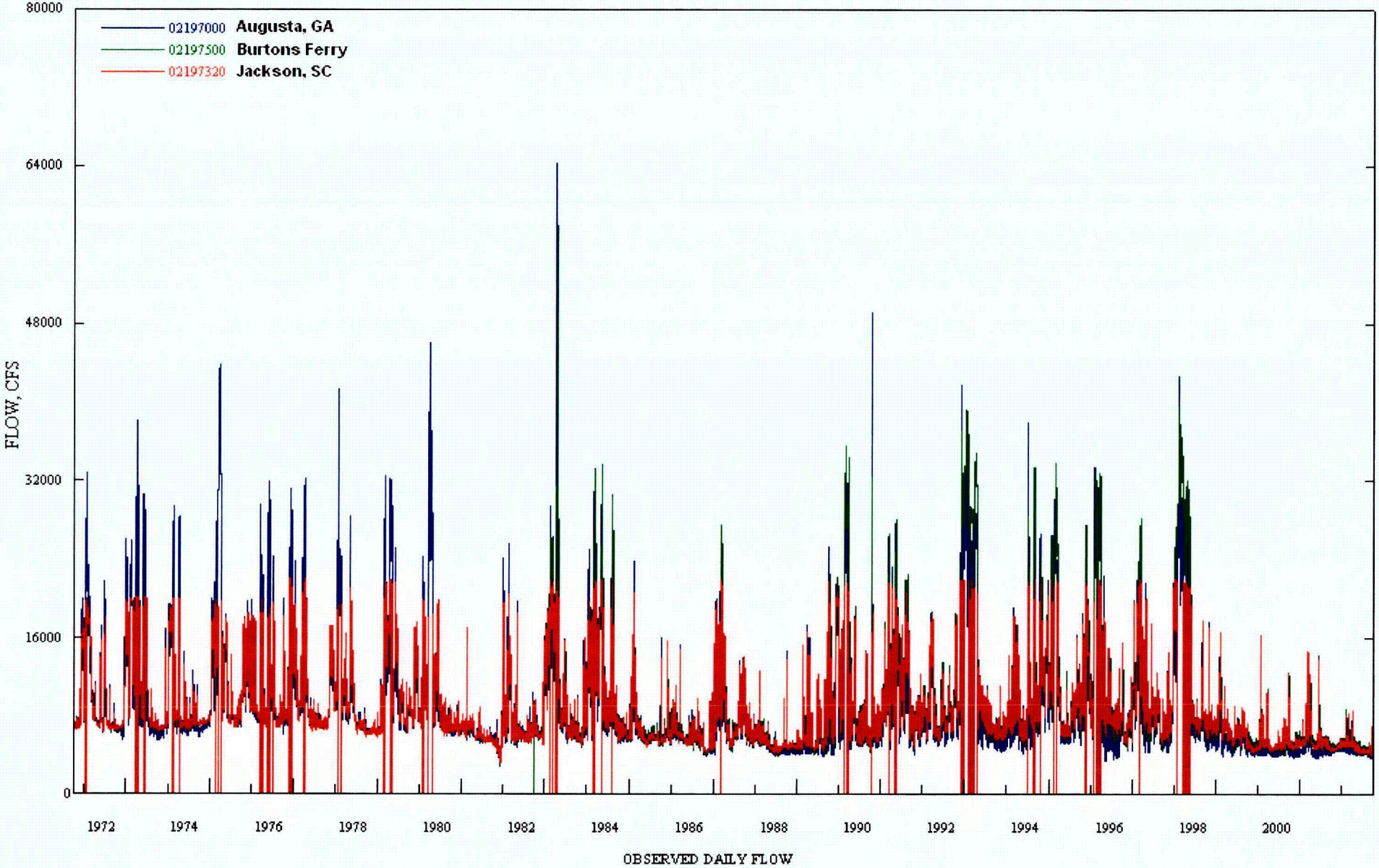
Retrieved on 2006-03-15 09:34:05 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.4 1.36 nadww01

```
Volume in drive M is FRES0304-F
Volume Serial Number is 9CCF-FA19

Directory of M:\list\Hydrology Calcs\USGS gage data\Daily

12/05/2006  05:24 PM    <DIR>          .
12/05/2006  05:24 PM    <DIR>          ..
04/21/2006  01:32 PM         2,104,702 CommonPeriod.bmp
04/22/2006  12:49 PM         2,104,702 CommonPeriodAnnotated.bmp
12/05/2006  05:24 PM                34 daily.txt
01/17/2006  04:44 PM         2,104,702 DailyQ7000.bmp
04/21/2006  01:25 PM           347,004 DayQJackson.txt
01/17/2006  04:38 PM         1,155,707 QdailyAugusta.txt
01/17/2006  02:51 PM           614,360 QdailyBurtonsFerry.txt
11/11/2006  01:00 PM           934,276 QdailyClyo.txt
04/21/2006  01:27 PM           286,720 SNOClow.wdm
04/21/2006  11:06 AM                60 SNOClow.wdu
04/21/2006  01:53 PM         2,104,702 TotalPeriod&closures.bmp
04/21/2006  01:37 PM         2,104,702 TotalPeriod.bmp
          12 File(s)     13,861,671 bytes
           2 Dir(s)  53,735,219,200 bytes free
```

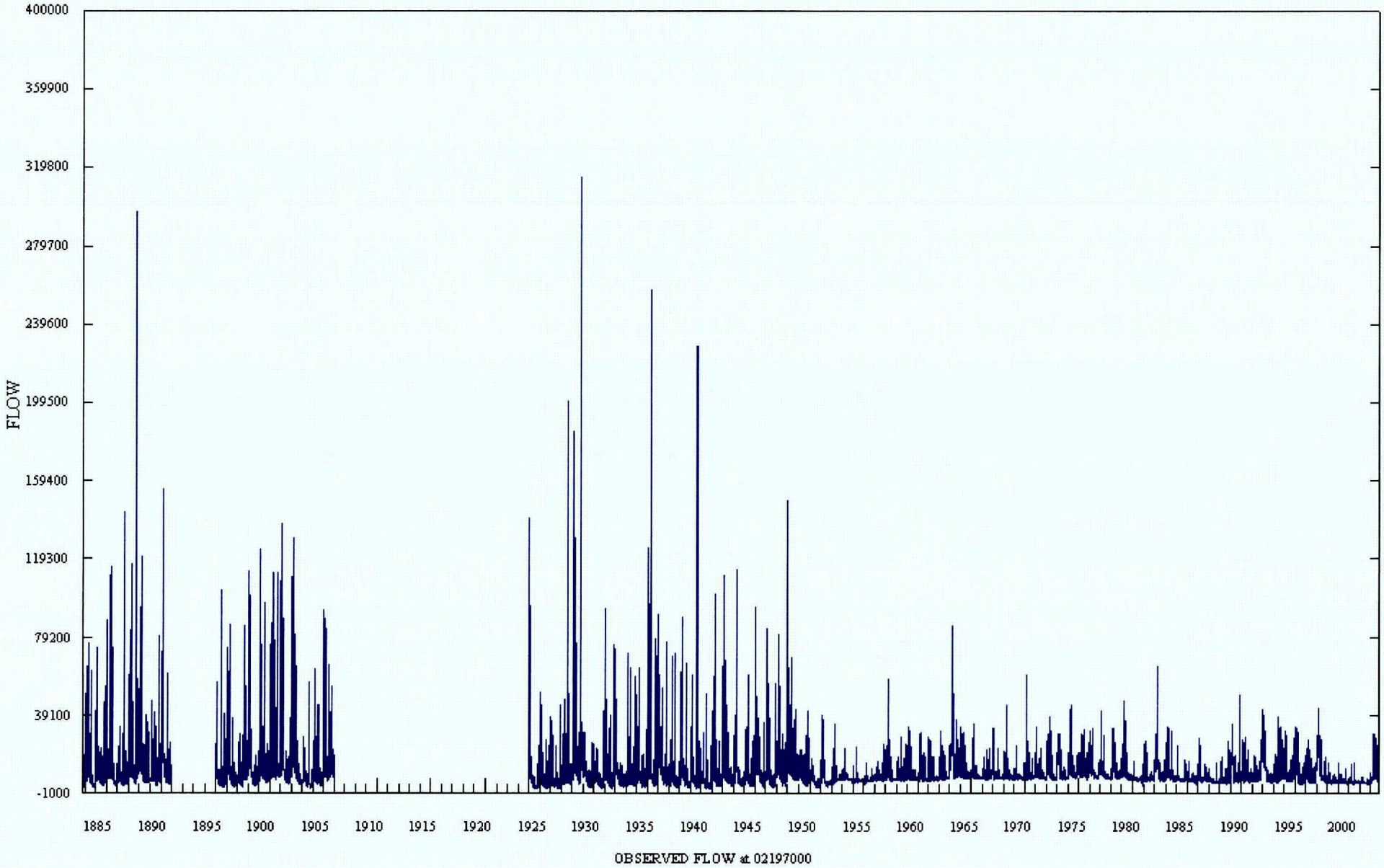
CommonPeriod.bmp



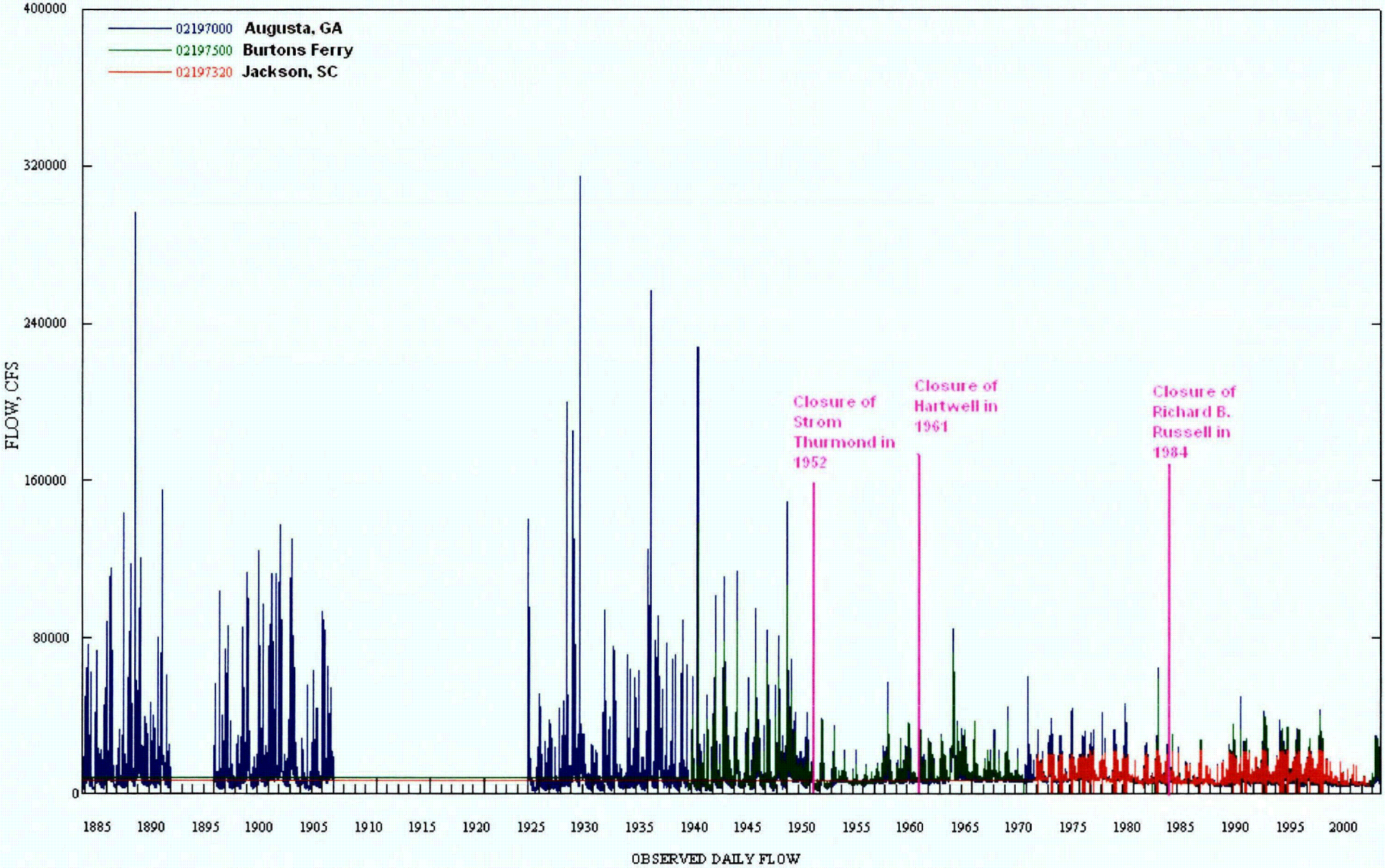
CommonPeriodAnnotated.bmp



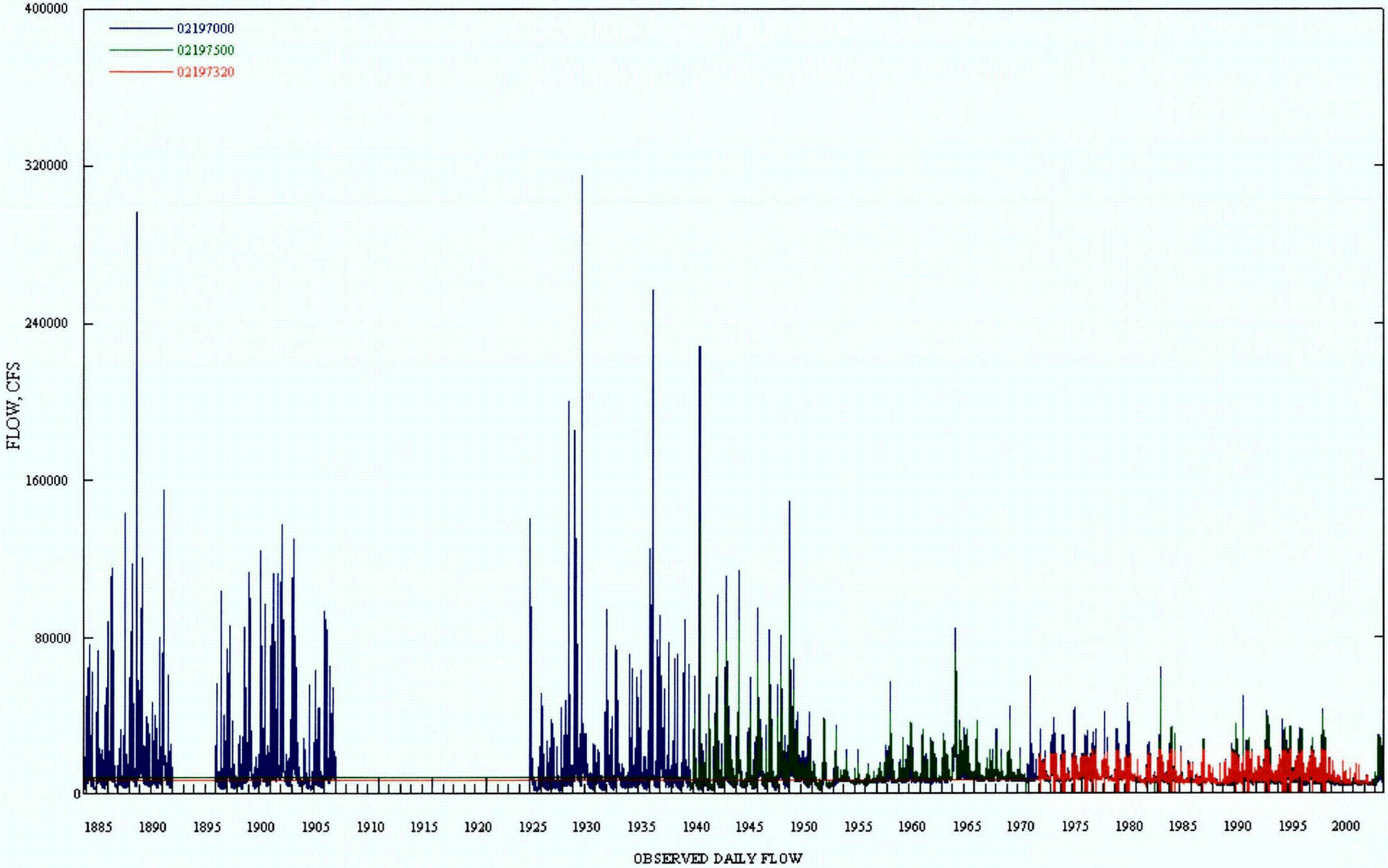
DailyQ7000.bmp



TotalPeriod+closures.bmp



TotalPeriod.bmp



```
Volume in drive M is FRES0304-F
Volume Serial Number is 9CCF-FA19

Directory of M:\list\Hydrology Calcs\USGS gage data\Low Flow

12/05/2006  05:25 PM    <DIR>          .
12/05/2006  05:25 PM    <DIR>          ..
04/01/2006  07:17 PM            12,533 3&7dayLowFlowFRQNCY.OUT
01/17/2006  04:53 PM             2,906 DURANL7000.OUT
04/01/2006  06:12 PM             2,840 DURANLshortAugSeries.OUT
12/05/2006  05:25 PM                34 low.txt
04/01/2006  06:24 PM            16,772 NDAY.OUT
               5 File(s)         35,085 bytes
               2 Dir(s)  53,735,219,200 bytes free
```

```
Volume in drive M is FRES0304-F
Volume Serial Number is 9CCF-FA19

Directory of M:\list\Hydrology Calcs\USGS gage data\Monthly

12/05/2006  05:25 PM    <DIR>          .
12/05/2006  05:25 PM    <DIR>          ..
03/16/2006  06:14 PM           107,811 AugustaMonthlyAvgQs.pdf
04/14/2006  04:38 PM            74,590 BurtonsFerryMonthlyQ.pdf
03/16/2006  06:07 PM            71,898 CalhounMonthlyAvgQs.pdf
03/16/2006  06:28 PM            88,440 ClyoMonthlyQs.pdf
03/16/2006  06:25 PM            59,178 JacksonMonthlyQs.pdf
12/05/2006  05:25 PM                34 month.txt
               6 File(s)        401,951 bytes
               2 Dir(s)  53,735,219,200 bytes free
```

AugustaMonthlyAvgQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Monthly Streamflow Statistics for the Nation

USGS 02197000 SAVANNAH RIVER AT AUGUSTA, GA

Available data for this site Surface-water: Monthly streamflow statistics GO

Richmond County, Georgia
Hydrologic Unit Code 03060106
Latitude 33°22'25", Longitude 81°56'35" NAD27
Drainage area 7,508. square miles
Gage datum 96.58 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

YEAR	Monthly mean streamflow, in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	De
1883										2,611	3,901	4,2
1884	10,570	13,300	33,180	18,100	6,536	14,979	8,337	4,618	2,698	2,370	2,903	9,9
1885	21,820	15,800	8,516	5,878	7,036	6,463	3,888	3,929	7,793	11,730	11,970	11,2
1886	23,720	9,367	13,100	21,560	19,570	16,580	19,230	7,259	5,363	3,283	5,261	6,7
1887	6,128	13,080	9,900	5,387	4,645	6,398	12,450	35,030	4,957	5,570	4,305	8,5
1888	16,940	19,880	24,650	14,740	13,790	8,493	5,256	6,097	47,850	12,250	19,510	12,8
1889	26,570	30,840	15,830	10,650	6,219	7,451	10,750	15,509	9,469	4,975	10,060	5,4
1890	5,137	9,023	12,340	7,661	9,608	5,491	8,192	6,002	8,249	19,540	5,429	7,0
1891	14,660	34,300	43,060	17,650	8,755	8,647	6,534	13,669	5,622	3,520	5,951	7,5
1896	11,260	16,820	7,005	5,298	4,907	3,951	16,800	3,431	3,403	2,792	7,904	10,2
1897	9,167	24,470	20,200	18,630	7,516	5,538	7,301	8,177	4,100	3,741	3,857	5,2
1898	6,519	4,929	6,298	11,710	4,415	3,574	11,160	13,440	21,490	14,520	10,130	10,3
1899	16,020	34,870	24,790	14,380	7,638	6,090	5,145	5,128	5,554	5,608	4,808	7,0
1900	7,262	26,240	18,330	20,090	9,265	22,700	9,589	5,775	6,197	6,681	7,432	9,7
1901	14,280	16,560	15,140	25,380	15,340	19,570	8,979	26,260	20,570	9,170	7,547	18,5

AugustaMonthlyAvgQs.pdf

1902	11,690	27,600	36,000	13,460	8,394	7,487	5,525	5,843	7,460	6,423	5,850	12,7
1903	10,590	39,560	32,930	19,900	10,040	17,280	7,275	8,195	5,316	4,179	4,979	4,4
1904	5,585	9,206	8,579	5,512	4,292	4,088	3,769	11,700	3,795	2,079	3,015	4,7
1905	7,073	18,780	7,274	5,416	9,759	4,704	12,609	7,745	4,218	3,916	3,789	19,2
1906	28,670	10,650	23,290	10,760	8,022	16,100	19,480	16,180	19,620	18,140	8,824	9,5
1925	40,410	10,240	8,892	7,369	5,211	3,258	3,001	1,706	1,453	2,656	5,757	4,5
1926	12,960	16,330	11,920	11,930	3,985	3,434	4,958	6,858	3,992	3,118	5,437	8,6
1927	5,840	10,400	10,340	5,845	3,427	5,613	9,276	3,569	2,727	2,625	3,121	12,0
1928	6,566	9,379	9,545	13,289	13,339	8,328	10,060	29,970	14,470	7,495	6,317	5,5
1929	8,176	22,690	52,440	14,870	20,670	10,350	8,318	5,870	35,850	42,170	16,990	15,1
1930	13,400	12,010	12,010	8,906	7,296	5,588	4,806	3,645	4,511	3,348	7,627	8,7
1931	9,933	6,967	8,287	10,780	9,360	3,794	4,720	4,304	2,501	2,399	2,614	15,7
1932	20,430	17,890	12,260	9,640	7,203	10,600	4,157	9,261	3,409	11,020	10,510	27,3
1933	14,860	19,910	9,088	8,305	6,966	5,020	5,124	4,611	5,284	3,385	3,580	4,3
1934	5,286	6,111	15,430	7,816	8,017	15,900	6,368	5,920	4,748	10,580	4,387	6,5
1935	11,620	8,819	12,130	10,510	6,963	4,361	6,805	6,899	6,247	2,923	7,043	5,6
1936	40,960	23,470	16,640	58,700	7,889	5,766	4,322	6,857	4,024	18,750	5,770	12,6
1937	31,619	23,180	13,610	18,320	13,710	7,244	5,518	8,195	6,793	13,270	6,245	6,4
1938	6,468	4,812	8,597	19,680	6,218	8,517	13,919	7,191	3,978	3,010	4,387	5,1
1939	6,503	25,090	22,400	10,740	8,399	6,032	5,860	11,830	4,927	3,412	3,192	4,3
1940	8,433	13,890	10,150	8,762	4,497	4,436	4,571	27,130	8,205	2,682	6,602	7,5
1941	8,308	5,188	10,730	7,052	3,615	6,138	15,870	5,322	2,735	2,325	2,673	10,8
1942	7,382	13,650	26,590	8,490	8,897	5,832	5,784	7,266	5,046	4,072	4,472	10,3
1943	26,329	14,670	19,380	14,610	8,975	6,725	13,619	6,219	4,932	3,662	4,528	6,1
1944	10,460	18,720	33,670	20,620	9,586	5,936	4,745	4,493	3,701	3,953	4,066	4,6
1945	5,802	13,400	9,961	12,720	6,855	4,507	5,182	5,008	7,770	3,897	4,527	15,9
1946	26,179	21,370	16,560	15,740	13,080	7,316	5,522	5,368	3,906	7,506	5,844	5,0
1947	21,560	8,909	16,070	14,610	6,030	5,870	4,366	4,336	3,248	4,887	20,450	13,9
1948	11,310	29,049	24,120	17,220	8,419	6,631	10,330	8,349	6,834	4,791	21,250	21,6
1949	17,920	25,140	12,860	14,549	18,670	11,900	14,190	11,800	13,080	9,557	9,393	8,4
1950	9,481	8,759	11,570	7,607	5,907	7,448	6,916	4,358	8,250	8,541	5,165	8,3
1951	6,581	7,451	9,764	11,440	6,580	5,963	4,570	3,464	3,389	2,728	4,196	8,6
1952	8,654	5,842	29,080	21,820	6,782	4,342	3,627	3,889	3,332	3,385	4,017	3,7
1953	4,084	5,889	11,390	6,460	15,150	5,778	5,750	5,696	7,231	7,171	6,498	7,1
1954	7,247	7,269	9,420	11,460	7,306	6,575	6,230	5,677	5,584	5,818	5,846	4,9
1955	4,600	5,278	5,767	7,119	5,804	5,227	5,205	5,225	4,995	4,976	5,076	5,1
1956	4,418	4,861	5,668	6,171	6,031	5,425	5,266	5,547	6,189	5,437	5,622	5,9
1957	6,105	5,988	6,772	8,225	9,802	6,138	6,143	6,171	6,452	7,347	9,310	13,1

Augusta Monthly AvgQs.pdf

1958	12,780	14,030	15,120	23,520	12,260	6,609	8,796	7,835	5,879	5,722	5,675	5,7
1959	6,026	7,395	7,322	6,721	5,780	13,060	6,613	7,070	8,559	12,680	12,400	9,2
1960	15,070	28,480	18,660	18,020	9,029	6,267	6,414	7,344	6,538	6,514	5,867	5,9
1961	6,198	9,951	11,980	21,770	7,425	6,783	8,840	7,700	7,835	5,679	5,537	12,7
1962	14,960	9,978	13,180	15,420	7,963	8,189	5,676	5,992	6,050	5,960	5,852	5,8
1963	9,178	9,885	18,450	7,675	14,900	10,090	11,220	7,875	7,488	6,559	6,826	9,8
1964	16,360	16,720	27,510	43,850	27,050	7,143	10,970	11,900	14,480	17,740	10,950	17,6
1965	17,610	10,120	17,450	16,370	9,574	12,760	7,652	9,027	7,959	7,057	6,958	7,0
1966	8,783	13,610	23,610	7,201	10,480	9,031	6,830	6,731	6,896	6,478	6,478	6,7
1967	8,718	8,439	9,228	6,870	7,036	14,440	8,713	8,625	8,740	6,286	7,593	15,1
1968	18,440	7,175	7,199	7,554	7,620	9,607	7,366	7,500	6,808	6,649	6,834	6,4
1969	10,210	13,590	11,350	20,800	13,680	7,370	6,942	7,128	7,177	6,602	6,586	6,8
1970	6,945	7,093	8,552	8,093	6,582	6,548	7,059	6,889	6,562	6,460	6,283	6,5
1971	7,151	7,314	21,580	8,658	9,374	7,339	7,248	8,471	7,306	7,198	7,504	14,1
1972	19,250	16,160	8,569	7,737	9,347	10,390	8,429	7,129	7,078	6,581	6,385	12,5
1973	15,260	19,080	18,180	25,620	11,030	22,830	7,906	7,469	6,344	6,076	6,153	7,8
1974	16,160	22,350	8,762	13,900	7,865	7,093	7,302	8,181	7,238	6,451	6,814	7,0
1975	12,170	18,140	28,490	21,380	13,430	9,235	8,231	7,546	7,882	11,100	13,139	12,6
1976	12,250	10,410	16,750	12,600	11,120	16,940	13,200	7,379	7,612	8,880	9,583	20,5
1977	13,210	8,924	13,020	20,180	8,396	7,745	7,612	7,235	6,909	7,045	11,940	11,6
1978	16,300	17,990	9,746	8,012	12,070	8,532	7,082	6,833	6,694	6,470	6,435	6,4
1979	6,821	11,040	18,690	24,720	11,800	14,449	7,629	7,778	7,317	8,491	10,800	11,3
1980	13,160	12,520	23,610	26,750	10,610	11,590	7,720	7,196	7,094	6,535	6,916	6,5
1981	6,670	7,211	6,390	6,179	5,691	6,203	5,587	5,667	5,840	5,294	4,624	5,7
1982	9,346	11,620	7,779	8,098	6,104	5,985	5,931	5,988	6,855	6,697	5,975	8,8
1983	13,780	17,210	17,230	26,210	8,244	9,724	6,489	6,573	6,467	6,067	5,534	9,0
1984	12,780	14,160	19,060	14,190	17,040	8,252	8,120	15,570	7,367	6,239	6,014	5,7
1985	6,252	12,360	7,050	6,133	5,515	5,256	5,715	5,678	5,575	6,581	6,636	6,4
1986	7,461	6,609	6,534	5,557	5,479	5,834	5,954	6,092	5,516	4,514	4,561	5,5
1987	8,365	10,660	15,290	9,937	5,639	5,353	6,136	8,671	9,440	7,036	6,284	5,8
1988	5,998	6,082	5,637	5,172	4,476	4,271	4,219	4,320	4,847	4,939	4,442	4,3
1989	4,734	5,290	6,149	5,794	4,672	4,810	6,001	5,541	7,814	13,150	5,977	15,5
1990	10,120	21,640	25,100	7,892	11,580	6,450	6,546	8,340	6,825	10,580	6,433	6,5
1991	7,422	9,371	12,310	11,570	16,830	9,222	10,900	14,810	6,983	6,353	7,201	6,8
1992	7,825	7,483	12,030	8,722	5,664	8,098	6,524	8,050	7,050	11,240	15,880	27,2
1993	30,240	22,920	22,910	19,040	8,241	7,644	6,938	6,885	5,553	5,223	5,363	5,6
1994	7,362	7,544	9,658	8,775	5,779	7,576	12,050	15,820	9,531	13,460	11,280	13,4
1995	13,930	19,020	18,980	7,388	5,897	6,127	6,843	8,000	9,342	9,907	18,610	12,6

AugustaMonthlyAvgQs.pdf

1996	9,627	24,210	23,460	9,290	7,935	8,307	5,220	6,047	6,986	8,204	5,455	7,2
1997	10,640	13,860	14,960	9,127	9,117	8,644	7,325	8,489	5,306	6,430	6,491	11,0
1998	21,530	30,600	24,960	22,460	19,020	7,571	6,768	6,522	7,651	6,566	6,183	5,5
1999	5,669	7,711	5,704	5,620	4,735	4,878	5,499	6,173	5,812	4,764	4,288	4,2
2000	5,921	4,882	5,014	4,371	4,089	4,269	4,359	5,180	5,661	4,387	4,196	4,4
2001	4,853	4,908	7,038	4,764	4,037	5,160	4,564	4,589	4,284	4,436	4,527	4,7
2002	4,690	4,774	4,687	4,641	4,250	4,139	4,246	4,204	4,318	3,973	4,304	4,8
2003	4,126	5,548	17,820	13,660	19,060	14,199	16,850	10,420	5,514			
Mean of monthly streamflows	12,100	14,120	15,370	13,080	8,979	8,098	7,669	8,168	7,413	7,115	7,038	9,1

Questions about data Water Webserver Team Top
Feedback on this website NWISWeb Support Team Explanation of terms

Surface Water data for USA: Monthly Streamflow Statistics
http://waterdata.usgs.gov/nwis/monthly?

Retrieved on 2006-03-16 18:12:58 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.84 1.62 nadww01

BurtonsFerryMonthlyQ.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

Monthly Streamflow Statistics for the Nation

USGS 02197500 SAVANNAH R AT BURTONS FERRY BR NR MILLHAVEN, GA

Available data for this site Surface-water: Monthly streamflow statistics GO

Screven County, Georgia
Hydrologic Unit Code 03060106
Latitude 32°56'20", Longitude 81°30'10" NAD27
Drainage area 8,650 square miles
Gage datum 52.42 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

YEAR	Monthly mean streamflow, in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	De
1939										4,182	3,807	4,7
1940	9,086	14,790	10,680	9,345	5,114	5,071	5,078	28,040	9,677	3,573	6,783	8,1
1941	9,548	6,139	9,687	9,919	4,192	5,262	19,400	6,375	3,597	2,984	3,284	9,7
1942	11,030	14,670	28,120	11,900	9,450	7,007	6,498	7,473	5,739	4,945	5,249	8,1
1943	27,530	21,820	21,240	16,320	10,740	7,371	15,380	7,433	5,931	4,566	5,540	6,4
1944	12,630	18,780	33,880	25,430	13,270	6,894	5,651	5,308	4,576	4,602	4,332	5,9
1945	6,787	12,290	11,690	10,270	11,840	5,172	5,405	6,006	8,201	4,877	5,024	12,3
1946	33,190	22,330	16,690	19,180	14,099	8,167	6,172	5,966	4,574	8,020	6,210	5,5
1947	21,510	10,480	17,680	16,660	7,625	7,618	5,541	5,497	4,479	5,954	22,070	16,1
1948	12,860	30,440	26,710	21,570	9,045	8,674	10,430	9,177	7,979	6,818	12,150	32,4
1949	21,650	26,870	14,970	15,759	20,630	13,050	15,050	12,100	16,100	10,510	10,470	9,3
1950	11,070	10,450	12,580	9,574	6,944	8,663	7,730	5,608	8,917	8,696	6,109	8,9
1951	7,864	8,425	10,550	12,730	7,483	6,615	5,233	4,147	3,861	3,598	5,094	8,6
1952	9,916	7,315	28,710	26,620	8,169	4,705	4,178	4,628	4,091	4,074	4,813	4,6
1953	5,649	7,137	13,350	8,969	16,640	6,878	6,571	6,314	8,058	7,910	7,320	8,4
1954	8,609	8,011	9,425	12,670	7,786	6,591	6,422	5,844	5,742	5,880	6,198	5,5
1955	5,594	6,256	6,401	8,094	6,331	5,648	5,604	5,629	5,523	5,233	5,578	5,8
1956	5,067	6,192	7,342	7,745	7,098	5,941	5,531	5,890	6,665	5,842	5,887	6,5
1957	6,522	6,820	7,753	8,958	10,450	7,000	6,497	6,433	7,137	8,660	8,769	14,5
1958	13,660	15,270	16,660	24,310	13,980	7,559	9,066	8,178	5,881	5,810	6,080	6,3
1959	6,972	9,057	8,823	7,846	6,365	13,990	7,128	7,198	9,130	14,240	15,650	10,7

BurtonsFerryMonthlyQ.pdf

1960	15,609	32,429	24,520	23,490	11,250	7,593	7,534	8,249	7,261	7,252	6,478	6,6
1961	7,255	9,672	16,130	24,200	10,900	7,413	10,650	8,817	9,717	6,181	6,540	13,4
1962	18,760	11,860	17,820	18,270	9,399	9,320	6,808	6,866	6,834	6,812	7,032	7,2
1963	10,640	11,920	17,980	10,670	15,480	10,130	13,260	8,787	8,462	7,695	7,566	10,8
1964	17,850	20,040	27,080	46,240	29,980	8,418	11,140	13,310	20,010	20,150	14,240	17,7
1965	21,180	12,770	19,010	21,870	11,770	13,640	9,797	10,580	8,836	8,121	7,934	7,9
1966	10,130	13,289	30,180	9,741	12,850	11,030	8,041	7,988	7,776	7,530	7,543	7,9
1967	10,460	9,752	11,230	8,155	8,282	15,960	10,530	9,677	10,580	7,252	8,632	16,3
1968	22,200	10,070	8,643	8,535	8,479	10,500	8,075	8,093	7,524	7,459	7,937	7,8
1969	10,500	17,050	12,709	18,970	17,910	8,366	7,751	7,910	8,092	7,342	7,433	7,8
1970	7,954	8,308	9,695	10,070	7,660	7,457	7,685	7,794	7,268			
1982										7,158	6,356	8,9
1983	15,609	19,670	20,720	29,540	9,621	10,460	7,268	6,929	7,027	6,408	6,150	9,5
1984	13,780	14,950	23,540	15,580	21,300	9,361	8,470	17,810	7,924	6,848	6,770	6,5
1985	6,987	13,719	7,813	6,530	5,873	5,779	6,156	6,098	5,658	6,413	7,681	7,8
1986	8,158	8,178	7,887	5,915	5,481	5,953	5,649	6,153	5,558	4,657	4,529	6,0
1987	9,893	11,700	17,780	11,650	6,246	5,639	6,298	8,660	9,573	7,495	6,596	6,1
1988	6,502	6,516	6,089	5,886	4,994	4,856	4,510	4,484	5,469	5,336	4,981	4,8
1989	5,419	5,785	7,108	6,855	5,053	5,296	6,717	5,694	8,867	14,800	6,450	17,2
1990	11,560	20,770	30,240	10,620	12,310	7,526	6,788	8,535	7,623	12,690	7,136	6,8
1991	8,217	10,760	14,929	14,560	19,830	10,210	11,810	19,220	8,322	6,619	7,845	7,5
1992	9,016	8,560	13,230	11,120	6,385	9,812	8,122	9,026	7,731	13,210	14,380	31,3
1993	35,290	28,220	27,389	26,000	9,788	8,379	7,016	6,858	6,259	5,993	6,632	6,6
1994	8,378	9,021	11,290	10,420	6,387	6,717	15,709	16,010	12,420	15,509	13,010	16,2
1995	16,550	19,080	24,640	8,388	6,253	7,288	7,138	8,834	10,290	10,780	18,210	16,1
1996	9,575	26,379	25,450	13,630	9,622	10,380	6,764	7,482	7,518	8,511	5,336	7,2
1997	11,510	14,610	19,350	10,360	11,250	9,212	7,737	8,795	5,654	6,932	7,497	12,5
1998	24,510	33,880	31,310	27,200	24,420	8,671	7,436	6,903	8,613	7,375	6,929	6,3
1999	6,745	9,690	6,946	6,653	5,536	5,325	6,420	6,431	6,418	5,685	5,119	5,1
2000	7,143	6,080	6,029	4,849	4,514	4,786	4,718	5,268	6,258	5,096	5,205	5,4
2001	5,961	5,806	7,900	6,501	5,319	6,313	5,645	5,445	5,256	4,935	4,984	5,2
2002	5,517	5,870	5,687	5,734	4,881	4,700	4,746	4,718	4,573	4,577	5,197	5,8
2003	5,224	6,419	18,730	16,410	19,140	19,110	19,510	13,320	7,211			
Mean of monthly streamflows	12,130	13,580	16,189	14,199	10,490	8,144	8,163	8,346	7,547	7,381	7,591	9,6

Questions about data Water Webserver Team Top

BurtonsFerryMonthlyQ.pdf

Feedback on this website NWIS Web Support Team Explanation of terms

Surface Water data for USA: Monthly Streamflow Statistics
http://waterdata.usgs.gov/nwis/monthly?

Retrieved on 2006-04-14 17:37:09 EDT
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.46 1.41 nadww01

CalhounMonthlyAvgQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Monthly Streamflow Statistics for the Nation

USGS 02189000 SAVANNAH RIVER NEAR CALHOUN FALLS, S. C.

Available data for this site Surface-water: Monthly streamflow statistics | GO

Abbeville County, South Carolina
Hydrologic Unit Code 03060103
Latitude 34°04'15", Longitude 82°38'30" NAD27
Drainage area 2,876.00 square miles
Gage datum 363.53 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

YEAR	Monthly mean streamflow, in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1896										1,822	5,646	6,470
1897	4,456	11,360	10,950	13,350	6,010	4,698	4,415	2,655	1,873	2,240	2,819	3,355
1898	4,497	3,231	3,639	5,394								
1899				9,630	5,799	4,920	3,444	3,031	2,870	2,549	2,474	4,495
1900	5,168	13,360	9,485	10,050	5,235	11,430	3,019	2,700	4,231			
1930				4,794	4,715	3,459	2,657	2,039	2,223	2,309	3,790	4,791
1931	4,243	3,231	4,014	5,931	4,499	2,566	2,848	2,854	2,111	1,772	1,945	9,915
1932	9,727	6,827	5,945	5,457								
1938				5,958	3,413	4,164	5,844	4,755	2,808	2,173	3,068	3,095
1939	3,887	10,620	7,957	5,182	4,837	3,764	2,841	6,431	2,681	2,318	2,278	2,507
1940	2,940	5,000	4,399	4,481	2,867	2,602	2,896	11,140	4,296	2,304	3,534	4,251
1941	4,311	3,083	4,291	3,741	2,665	2,268	7,557	3,187	1,970	1,845	1,915	4,935
1942	3,444	6,461	8,322	3,943	4,721	3,921	3,442	4,389	3,486	2,685	3,040	7,151
1943	10,790	7,002	7,568	7,534	5,521	4,831	7,163	4,185	3,428	2,698	3,167	3,625
1944	4,956	7,927	12,490	8,734	5,528	3,892	3,177	2,853	2,990	2,646	3,009	3,471

CalhounMonthlyAvgQs.pdf

1945	3,842	6,506	5,699	6,609	4,243	3,163	3,100	3,187	3,965	2,915	3,430	7,166
1946	12,930	11,410	9,397	7,136	7,485	4,579	3,883	3,734	2,616	3,201	3,474	3,207
1947	9,152	4,603	5,198	5,849	3,666	3,585	2,497	2,255	2,100	3,245	6,192	4,035
1948	4,299	8,011	8,981	6,857	4,655	3,739	5,903	5,607	4,146	2,940	11,290	8,018
1949	9,328	10,670	7,274	9,067	9,067	7,312	9,661	7,559	8,540	6,984	6,370	5,625
1950	6,318	6,039	6,506	5,242	4,034	5,477	4,883	3,330	6,114	4,837	3,328	4,990
1951	3,444	3,994	5,507	5,779	4,414	4,329	2,891	2,350	2,138	1,728	3,086	8,060
1952	5,014	6,330	16,910	7,387	5,014	3,649	2,434	3,640	2,363	1,933	2,271	3,160
1953	6,292	9,588	7,856	4,745	6,605	3,822	3,323	2,283	2,330	2,161	2,121	6,606
1954	9,577	5,384	6,415	6,283	4,235	3,402	2,106	1,611	1,216	978	1,524	3,042
1955	3,322	6,344	3,867	5,104	4,781	2,735	3,011	2,674	1,665	1,760	2,077	2,023
1956	1,889	6,763	6,126	7,824	4,187	2,396	2,755	1,685	3,285	2,428	2,507	3,452
1957	4,232	6,675	5,934	8,491	4,207	3,968	2,676	2,056	2,346	4,316	8,310	6,531
1958	6,146	6,830	7,141	9,266	7,653	4,184	5,521	3,914	2,624	2,745	2,414	2,684
1959	3,517	4,471	4,833	6,270	5,598	6,913	4,069	2,185	4,526	5,736	4,339	4,942
1960	7,252	10,380	8,259	9,299	5,454	4,153	3,739	4,324	3,703	4,581	3,159	3,487
1961	3,655	3,091	3,560	5,175	969	4,512	4,983	5,040	4,873	2,559	3,762	10,900
1962	5,597	1,648	1,792	6,737	4,711	5,733	3,415	4,475	3,672	3,847	2,812	6,528
1963	4,786	2,945	8,820	6,223	7,799	3,669	5,812	4,817	3,817	3,784	3,988	6,516
1964	6,398	6,813	11,230	21,510	10,780	4,063	6,984	6,377	5,345	10,980	8,042	10,750
1965	5,718	5,225	10,220	9,243	6,634	8,438	5,637	6,100	5,881	5,011	4,432	4,506
1966	4,866	4,873	11,320	4,630	7,312	6,119	3,856	5,764	4,727	3,817	3,757	3,910
1967	5,459	3,855	3,935	2,935	4,543	11,030	4,587	6,356	5,020	3,454	7,030	10,280
1968	9,270	3,585	4,842	5,407	3,887	5,021	4,462	5,412	4,135	4,158	4,408	4,504
1969	6,541	8,085	4,836	6,092	7,147	5,397	4,578	5,890	4,060	3,783	5,177	4,943
1970	3,694	3,496	3,791	5,508	3,054	4,046	5,215	4,216	4,949	2,843	2,828	3,242
1971	3,873	4,387	4,358	3,639	4,850	3,962	3,741	4,251	5,362	2,399	7,150	8,332
1972	7,231	7,802	4,634	3,555	5,820	6,366	4,216	5,835	4,358	2,599	4,425	9,015
1973	7,455	8,500	10,400	11,000	9,232	12,440	4,891	5,462	4,787	3,568	4,583	6,029
1974	12,080	12,260	6,269	7,380	6,062	4,838	5,744	6,393	5,197	2,276	3,913	4,472
1975	4,887	7,831	13,050	10,550	8,497	5,029	4,426	5,094	4,570	8,132	9,244	7,556
1976	6,713	6,131	8,044	8,802	7,662	10,980	8,247	4,780	4,296	3,610	6,490	7,825
1977	7,915	3,527	5,580	13,840	4,742	4,663	4,381	5,047	4,500	4,066	6,898	7,975
1978	9,713	8,052	5,740	4,105	7,336	5,329	4,228	4,456	4,516	3,019	3,887	4,202
1979	4,584	6,444	10,430	13,800	8,957	10,140	5,440	5,772	5,177			
Mean of monthly streamflows	5,987	6,536	7,126	7,255	5,555	5,142	4,396	4,344	3,785	3,342	4,248	5,578

CalhounMonthlyAvgQs.pdf

Questions about data Water Webserver Team
Feedback on this website NWIS Web Support Team

Top
Explanation of terms

Surface Water data for USA: Monthly Streamflow Statistics
http://waterdata.usgs.gov/nwis/monthly?

Retrieved on 2006-03-16 18:05:25 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.7 1.45 nadww01

ClyoMonthlyQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Monthly Streamflow Statistics for the Nation

USGS 02198500 SAVANNAH RIVER NEAR CLYO, GA

Available data for this site Surface-water: Monthly streamflow statistics | GO

Effingham County, Georgia
Hydrologic Unit Code
Latitude 32°31'41", Longitude 81°16'08" NAD27
Drainage area 9,850 square miles
Gage datum 13.39 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

YEAR	Monthly mean streamflow, in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	De
1929										83,660	19,440	21,2
1930	18,580	20,390	16,790	14,140	9,361	8,050	7,040	5,913	6,521	5,081	9,468	10,9
1931	13,300	9,129	10,400	12,530	11,610	5,315	5,271	5,800	3,098	2,772	3,232	12,3
1932	24,350	17,370	17,870	11,830	8,525	10,470	6,349	9,612	4,416	10,520	12,230	19,5
1933	27,360	22,910	16,370	11,090	9,573	6,142	6,744	5,318	6,979			
1937										10,520	10,840	8,7
1938	9,233	6,993	9,275	22,960	7,663	9,678	7,822	15,890	5,173	4,249	5,514	5,9
1939	8,327	20,560	31,050	13,600	9,493	7,487	6,506	10,450	7,298	5,094	4,321	5,1
1940	9,487	13,320	12,820	10,340	5,935	5,659	5,705	32,860	9,971	4,293	7,204	8,8
1941	10,670	7,180	9,833	11,240	4,873	4,951	21,260	7,430	4,119	3,431	3,847	7,5
1942	14,879	13,680	29,180	17,220	9,391	9,072	7,328	7,841	6,483	5,406	5,597	8,4
1943	26,100	23,750	19,740	16,400	12,659	8,151	14,570	8,205	6,222	4,679	5,719	6,1
1944	14,000	18,110	34,780	30,780	14,610	7,426	6,165	5,535	5,199	5,164	4,855	6,8
1945	7,604	10,670	13,640	9,871	12,470	5,496	5,435	7,242	9,327	5,456	5,157	10,1
1946	34,230	19,590	17,310	17,970	14,280	9,243	6,704	6,500	5,007	8,299	7,346	6,2

ClyoMonthlyQs.pdf

1947	19,280	12,860	20,290	20,800	9,733	9,479	6,514	6,152	5,250	7,124	26,510	20,7
1948	17,760	37,320	33,880	30,850	10,820	9,983	10,920	10,140	9,550	8,511	11,200	39,1
1949	23,670	26,930	17,980	16,710	22,240	13,890	15,150	12,760	17,700	11,440	11,150	9,8
1950	11,640	11,260	13,400	10,610	7,500	9,273	7,871	6,318	10,330	8,080	8,253	9,4
1951	9,156	9,259	11,080	14,050	8,288	6,783	5,737	4,793	4,209	4,207	5,869	8,7
1952	11,590	8,907	27,930	31,150	10,040	5,836	4,635	5,019	4,500	4,776	5,330	5,2
1953	6,546	8,321	16,130	11,540	18,160	7,511	6,697	6,556	8,196	9,262	7,899	9,8
1954	9,814	8,484	10,880	14,120	8,950	7,089	6,646	5,960	5,893	5,919	6,470	6,0
1955	6,347	7,318	7,049	9,750	7,209	6,307	6,232	6,248	6,570	5,824	6,217	6,7
1956	5,853	7,483	9,142	9,039	7,892	6,287	6,015	6,324	6,897	6,918	6,617	7,3
1957	7,584	7,735	8,519	10,130	11,980	8,119	6,923	6,679	7,619	10,220	8,609	17,1
1958	15,370	18,670	19,530	27,589	17,310	8,492	9,977	8,645	6,353	6,028	6,207	6,8
1959	7,992	11,880	12,080	9,964	6,771	14,070	7,813	7,963	9,826	14,399	19,280	12,3
1960	15,960	34,460	29,470	27,130	13,500	8,239	8,072	9,083	7,573	7,645	7,039	7,5
1961	8,493	9,986	19,680	25,570	15,179	7,815	11,230	9,997	11,020	6,560	6,934	12,4
1962	21,530	12,200	21,130	19,950	11,900	9,994	7,241	7,319	7,292	8,028	7,833	7,9
1963	11,830	16,139	17,340	14,630	16,540	11,540	16,540	9,582	8,932	8,658	8,270	11,8
1964	19,640	24,550	29,170	55,679	33,890	9,415	11,080	15,659	23,520	21,150	16,730	18,0
1965	24,660	17,350	22,300	27,780	14,060	13,390	13,200	12,609	9,692	8,875	8,696	8,6
1966	11,870	14,280	33,670	11,640	13,380	13,760	9,072	8,773	7,970	7,648	7,664	8,0
1967	12,540	11,060	12,980	8,413	8,941	15,980	12,150	9,586	12,180	7,680	8,877	15,6
1968	23,890	12,780	9,299	9,110	8,946	10,920	8,397	8,103	7,542	7,642	8,175	8,1
1969	9,775	18,590	13,289	17,880	22,560	9,194	8,082	8,667	9,381	7,709	7,785	8,4
1970	8,850	9,532	11,360	12,720	7,843	7,529	7,728	7,988	7,504	7,715	8,421	8,7
1971	10,880	11,170	25,640	15,420	12,559	9,685	9,215	12,260	9,745	9,469	9,463	19,1
1972	20,840	26,320	12,500	10,370	10,890	10,520	13,130	8,400	7,864	7,407	7,704	11,3
1973	20,760	27,080	22,970	34,870	15,040	27,770	14,670	10,650	8,633	8,303	8,200	10,4
1974	18,070	26,960	17,170	17,230	9,475	8,934	8,318	9,853	8,671	7,582	7,848	8,5
1975	13,830	22,410	32,400	36,980	16,980	14,349	11,860	9,414	9,700	11,470	15,350	15,5
1976	13,869	14,790	15,730	18,370	11,540	21,740	16,490	8,664	8,629	11,210	10,670	24,4
1977	20,070	11,450	16,210	25,920	9,938	8,043	7,667	8,189	7,619	7,668	11,990	14,5
1978	15,840	26,910	12,540	10,220	14,050	9,955	7,835	7,531	7,181	6,696	6,820	7,3
1979	8,234	10,360	26,290	24,150	19,830	17,850	9,815	9,105	9,358	10,250	11,880	14,4
1980	12,550	20,040	27,639	41,750	13,160	15,420	8,497	7,201	6,919	7,845	7,975	7,7
1981	7,782	9,345	8,161	8,159	6,232	7,618	6,075	6,729	6,176	5,629	5,315	6,4
1982	12,380	12,480	11,460	8,554	8,855	7,276	7,233	7,169	7,199	7,660	6,584	8,7
1983	15,170	21,170	23,800	31,450	12,830	10,650	7,893	7,141	7,393	6,715	6,593	10,4
1984	13,769	16,470	27,389	16,900	25,330	10,570	8,918	18,860	8,262	7,075	6,899	6,8

ClyoMonthlyQs.pdf

1985	7,246	14,490	8,804	7,087	6,106	5,850	6,159	6,373	6,115	6,600	8,554	9,8
1986	8,790	9,996	8,832	6,664	5,860	6,216	5,810	6,294	6,062	5,191	5,195	7,1
1987	12,100	14,449	20,910	13,730	6,945	6,304	6,722	8,697	10,060	7,894	6,895	6,6
1988	7,334	7,504	7,043	6,699	5,830	4,925	4,696	4,879	6,520	6,006	5,550	5,5
1989	6,324	6,723	9,033	9,022	6,141	6,006	7,456	6,326	9,387	15,050	7,179	16,9
1990	14,920	19,330	33,190	14,420	11,490	8,662	7,066	8,302	8,081	14,770	9,526	8,1
1991	10,470	14,520	18,280	16,510	20,800	13,030	13,350	22,530	11,280	7,528	8,560	8,1
1992	10,390	9,812	13,860	12,850	6,808	10,800	9,308	10,300	9,189	15,110	14,190	35,6
1993	43,930	32,560	30,140	32,229	11,110	9,063	7,460	7,214	6,186	5,749	6,682	7,2
1994	9,185	10,070	12,770	11,760	7,272	7,133	16,039	14,390	16,680	16,280	15,270	17,0
1995	18,900	21,260	30,340	10,200	7,178	8,703	7,741	10,530	12,390	11,580	17,370	18,2
1996	10,400	25,119	25,720	17,200	10,380	11,140	8,167	8,810	8,381	9,169	6,279	8,3
1997	12,470	15,110	22,020	11,380	12,530	9,729	8,853	9,944	6,370	7,627	9,222	13,1
1998	28,480	42,490	39,360	30,730	27,339	10,860	8,406	7,836	9,885	8,108	8,146	7,4
1999	8,233	11,000	7,816	7,470	6,625	6,518	8,443	7,554	7,193	6,156	5,423	5,5
2000	7,279	7,282	7,117	5,698	4,948	5,129	5,183	5,767	6,620	5,826	5,545	5,9
2001	6,665	6,533	10,190	7,944	5,417	6,786	5,862	5,457	5,212	4,962	5,048	5,3
2002	5,619	6,027	6,070	5,930	5,101	4,825	4,805	4,661	5,119	4,934	5,663	6,7
2003	6,304	7,554	21,620	21,310	20,020	22,500	20,340	15,530	8,433			
Mean of monthly streamflows	13,980	15,709	18,280	17,090	11,690	9,608	8,861	9,030	8,112	9,059	8,634	11,0

Questions about data Water Webserver Team Top
Feedback on this website NWIS Web Support Team Explanation of terms

Surface Water data for USA: Monthly Streamflow Statistics
http://waterdata.usgs.gov/nwis/monthly?

Retrieved on 2006-03-16 18:27:46 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.78 1.5 nadww01

JacksonMonthlyQs.pdf

Water Resources

Data Category: Surface Water | Geographic Area: United States | go

OUTAGE SCHEDULED: Thursday March 16, 2006 from 7PM - 7:30PM EST for maintenance

The nwis.waterdata.usgs.gov server will be undergoing routine maintenance Thursday, March 16, 2006 at 7PM EST for approximately 30 minutes. During this outage, NWISWeb Water Quality, Ground Water Levels and Historical Daily Value data will NOT be available.

Real-time data will continue to be available at http://waterdata.usgs.gov/nwis

Monthly Streamflow Statistics for the Nation

USGS 02197320 SAVANNAH R. NR JACKSON, SC

Available data for this site Surface-water: Monthly streamflow statistics | GO

Aiken County, South Carolina
Hydrologic Unit Code 03060106
Latitude 33°13'01", Longitude 81°46'04" NAD27
Drainage area 8,110.00 square miles
Gage datum 77.00 feet above sea level NGVD29

Output formats

HTML table of all data
Tab-separated data
Reselect output format

YEAR	Monthly mean streamflow, in ft^3/s											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	De
1971										6,973	7,280	13,9
1972		16,350	8,499	7,641	9,220	9,777	9,149	7,106	6,868	6,682	6,765	11,7
1973	14,810	18,670			11,180		9,275	8,005	6,852	6,695	6,692	8,4
1974	16,960		9,538		8,120	7,244	7,295	8,364	7,554	7,206	7,250	7,4
1975	12,839				13,930	9,854	8,653	7,502	8,194	11,750	14,570	13,5
1976	13,230	11,640						7,396	7,692	9,382	9,967	
1977	14,870	9,364	13,760		8,704	7,573	7,368	7,276	7,133	7,249	12,910	13,0
1978			11,110	8,677	13,289	9,101	6,879	6,830	6,524	6,180	6,461	6,3
1979	6,737					16,820	8,685	8,529	7,794	8,745	11,460	12,5
1980					11,090	13,030	7,822	7,242	7,073	6,927	7,208	6,6
1981	6,803	7,836	6,898	6,641	5,679	6,710	5,465	5,689	5,656	5,071	4,563	5,7
1982	10,120	11,570	8,308	8,070	6,393	5,926	5,900	5,959	6,669	6,714	6,016	8,7
1983	14,779				9,075	10,500	6,951	6,627	6,701	6,136	5,798	9,1
1984	12,950	14,240		14,560		8,859	8,265		7,655	6,500	6,451	6,0
1985	6,482	13,260	7,478	6,283	5,568	5,351	5,820	5,725	5,486	6,521	6,876	6,6

JacksonMonthlyQs.pdf

1986	7,601	7,170	6,904	5,750	5,403	5,739	5,869	6,354	5,555	4,859	4,582	5,9
1987	9,399	11,590		11,010	5,896	5,434	6,221	8,941	9,859	7,552	6,455	5,8
1988	6,160	6,193	5,728	5,461	4,720	4,560	4,530	4,628	5,423	5,487	4,958	4,7
1989	5,162	5,833	6,983	6,701	5,123	5,334	6,739	5,978	8,670	14,280	6,924	16,8
1990	11,380			9,043	11,950	6,817	6,401	8,358	7,180		7,105	7,0
1991	8,097	10,170		13,160		9,750	11,430	16,510	7,645	6,621	7,560	7,4
1992	8,793	8,283	12,910	10,080	5,990	8,673	7,509	8,723	7,806	12,630		
1993					9,660	8,632	7,620	7,573	6,437	6,147	6,498	6,6
1994	8,413	8,672	10,990	10,070	6,594	7,270			11,270		12,860	15,4
1995	15,210			8,012	6,330	6,937	7,422	9,027	10,630	11,290		14,1
1996	9,469			11,820	9,943	10,710	7,407	8,096	8,050	8,769	5,634	7,6
1997	11,790	14,850		11,160	11,490	9,784	8,263	9,418	6,090	7,312	7,570	12,2
1998						8,659	7,476	7,018	8,901	7,826	7,416	6,7
1999	7,096	9,446	7,075	6,901	5,789	5,672	6,427	6,761	6,528	5,088	4,600	4,5
2000	6,505	5,637	5,746	4,883	4,680	4,990	4,901	5,659	6,342	5,041	4,956	5,1
2001	5,531	5,637	8,030	5,830	4,837	5,968	5,169	5,094	4,763	4,659	4,744	5,0
2002	5,110	5,306	5,355	5,185	4,575	4,388	4,441	4,462	4,711			
Mean of monthly streamflows	9,858	10,090	8,457	8,426	7,893	7,933	7,080	7,409	7,216	7,458	7,315	8,8

Questions about data Water Webserver Team Top
Feedback on this website NWISWeb Support Team Explanation of terms

Surface Water data for USA: Monthly Streamflow Statistics
http://waterdata.usgs.gov/nwis/monthly?

Retrieved on 2006-03-16 18:24:32 EST
Department of the Interior, U.S. Geological Survey
Privacy Statement || Disclaimer || Accessibility || FOIA
1.6 1.37 nadww01

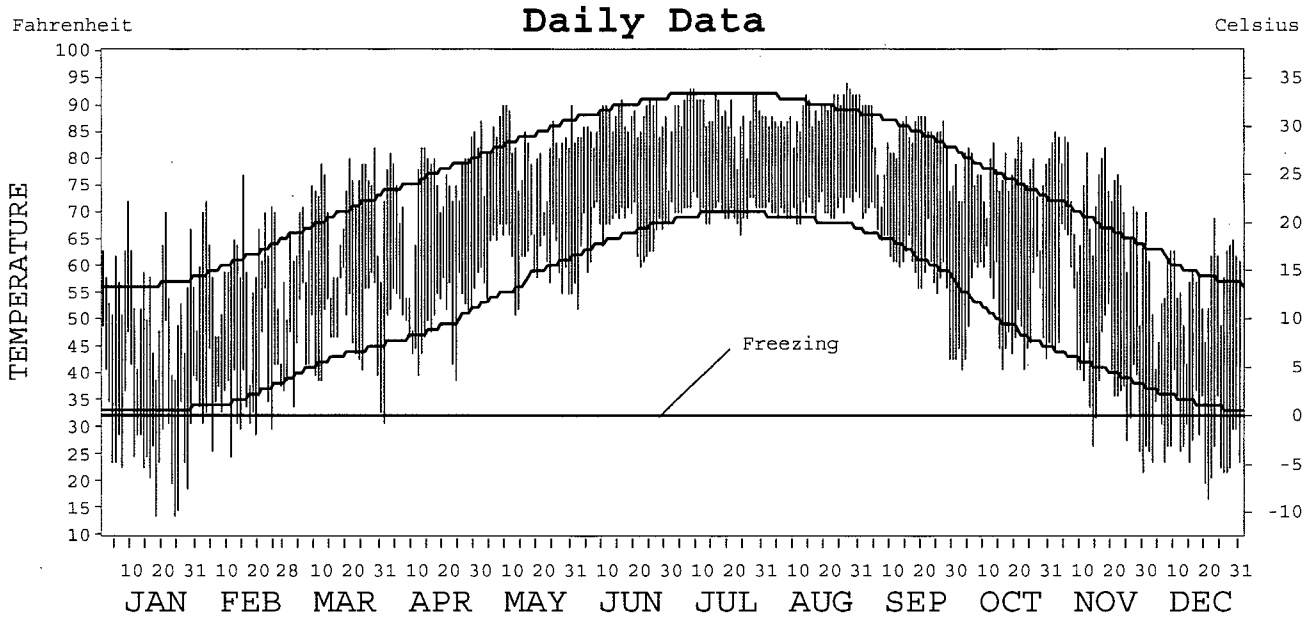
(NCDC 2003).pdf

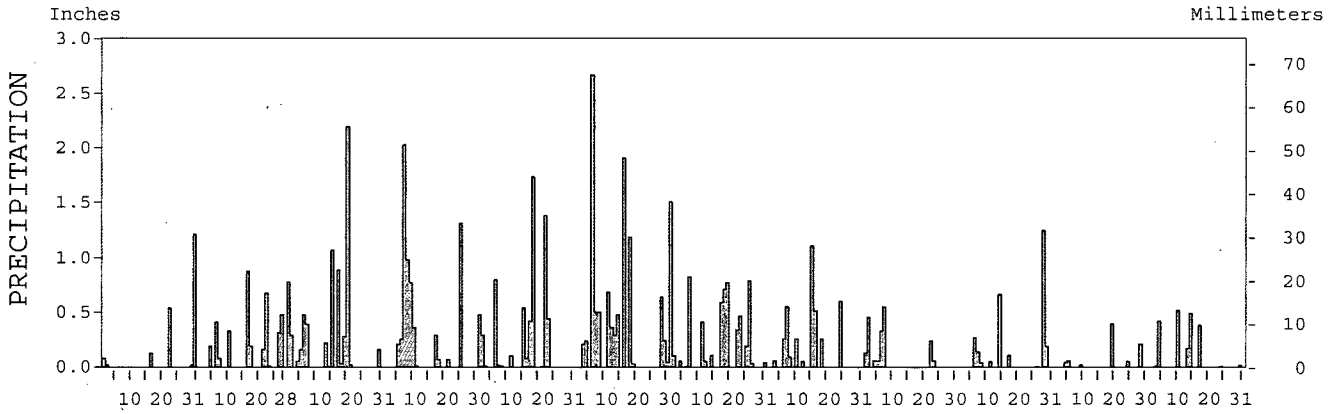
2003 LOCAL CLIMATOLOGICAL DATA
ANNUAL SUMMARY WITH COMPARATIVE DATA

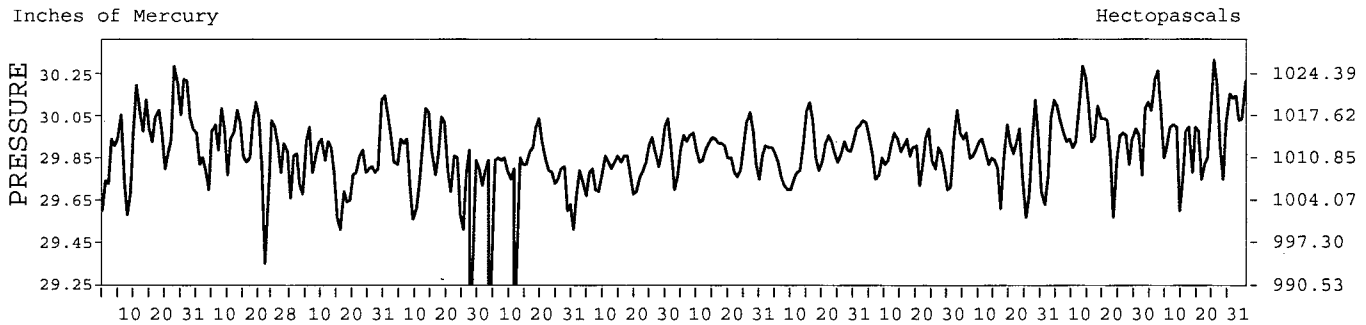
ISSN 0198-1587

AUGUSTA,
GEORGIA (AGS)

Daily Data







I CERTIFY THAT THIS IS AN OFFICIAL PUBLICATION OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, AND IS COMPILED FROM RECORDS ON FILE AT THE NATIONAL CLIMATIC DATA CENTER.

Thomas R Karl

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE	NATIONAL CLIMATIC DATA CENTER ASHEVILLE, NORTH CAROLINA	DIRECTOR NATIONAL CLIMATIC DATA CENTER

(NCDC 2003).pdf

METEOROLOGICAL DATA FOR 2003

AUGUSTA, GA (AGS)

LATITUDE: 33° 22′ 11″ N LONGITUDE: 81° 57′ 53″ W ELEVATION (FT): GRND: 160 BARO: 163 TIME ZONE: EASTERN (UTC + 5) WBAN: 03820

	ELEMENT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	MEAN DAILY MAXIMUM	54.1	59.8	68.9	74.0	81.6	87.1	88.0	89.0	83.8	76.9	72.5	56.7	74.4
	HIGHEST DAILY MAXIMUM	72	77	82	85	90	91	93	94	90	84	85	70	94
	DATE OF OCCURRENCE	09	15	29	30	31+	27+	09+	27	04+	21	02	01	AUG 27
	MEAN DAILY MINIMUM	29.6	36.1	47.6	50.0	61.1	65.9	70.3	70.8	61.5	50.8	42.7	28.0	51.2
	LOWEST DAILY MINIMUM	14	25	33	31	51	52	66	68	43	41	22	17	14
	DATE OF OCCURRENCE	24+	11	31	01	13	02	24	12+	30+	23+	30	21	JAN 24+
	AVERAGE DRY BULB	41.9	48.0	58.3	62.0	71.4	76.5	79.2	79.9	72.7	63.9	57.6	42.4	62.8
	MEAN WET BULB	36.5	43.0	53.3	56.6	65.7	70.1	73.5		66.1	58.3	52.5	37.4	
	MEAN DEW POINT	27.3	37.2	49.1	52.2	62.3	67.1	71.5		62.6	54.3	48.0	31.5	
	NUMBER OF DAYS WITH:													
	MAXIMUM ≥ 90°	0	0	0	0	3	8	14	15	4	0	0	0	44
	MAXIMUM ≤ 32°	0	0	0	0	0	0	0	0	0	0	0	0	0
	MINIMUM ≤ 32°	21	8	0	1	0	0	0	0	0	0	6	24	60
	MINIMUM ≤ 0°	0	0	0	0	0	0	0	0	0	0	0	0	0
H/C	HEATING DEGREE DAYS	712	472	215	105	4	0	0	0	12	73	246	694	2533
	COOLING DEGREE DAYS	0	0	14	22	210	351	446	470	247	45	33	0	1838
RH	MEAN (PERCENT)	61	72	77	75	77	78	83	83	77	77	77	73	76
	HOUR 01 LST	71	82	85	87	88	90	94	94	92	92	91	89	88
	HOUR 07 LST	75	84	91	93	89	88	94	93	92	91	93	89	89
	HOUR 13 LST	43	57	62	56	59	58	66	66	52	52	52	48	56
	HOUR 19 LST	58	64	69	67	73	77	80	82	79	83	80	75	74
S	PERCENT POSSIBLE SUNSHINE													
W/O	NUMBER OF DAYS WITH:													
	HEAVY FOG(VISBY ≤ 1/4 MI)	3	3	4	12	5	3	6	7	13	9	9	6	80
	THUNDERSTORMS	0	1	5	2	7	8	14	8	2	2	0	0	49
CLOUDINESS	SUNRISE-SUNSET: (OKTAS)													
	CEILOMETER (≤ 12,000 FT.)													
	SATELLITE (> 12,000 FT.)													
	MIDNIGHT-MIDNIGHT: (OKTAS)													
	CEILOMETER (≤ 12,000 FT.)													
	SATELLITE (> 12,000 FT.)													
	NUMBER OF DAYS WITH:													
	CLEAR													
	PARTLY CLOUDY													
	CLOUDY													
PR	MEAN STATION PRESS. (IN.)	29.97	29.90	29.81			29.81	29.89	29.88	29.87	29.87	29.98	30.00	
	MEAN SEA-LEVEL PRESS. (IN.)	30.12	30.06	29.96			29.96	30.04		30.03	30.03	30.14	30.16	
WINDS	RESULTANT SPEED (MPH)	4.2		0.7	1.2	1.7	1.0	0.7	0.7	1.8	0.8	0.7	2.3	
	RES. DIR. (TENS OF DEGS.)	27		35	06	27	22	21	20	02	34	29	29	
	MEAN SPEED (MPH)	7.3	6.6	5.6	5.7	6.2	4.2	4.9	3.7	4.6	3.9	4.7	4.8	5.2
	PREVAIL.DIR.(TENS OF DEGS.)	25	28	08	15	25	19	20	15	02	02	29	29	24
	MAXIMUM 2-MINUTE WIND:													
	SPEED (MPH)	30	37	30	23	32	31	33	29	29	28	29	30	37
	DIR. (TENS OF DEGS.)	33	30	29	30	24	28	33	32	29	30	27	29	30
	DATE OF OCCURRENCE	23	04	20	05	18	11	19	16	04	14	28	19	FEB 04
	MAXIMUM 5-SECOND WIND:													
	SPEED (MPH)	37	45	36	28	43	43	45	37	36	36	38	39	45
	DIR. (TENS OF DEGS.)	34	31	28	31	22	31	31	32	29	30	27	30	31
	DATE OF OCCURRENCE	23	04	20	05	18	11	18	16	04	14	28	19	JUL 18
PRECIPITATION	WATER EQUIVALENT:													
	TOTAL (IN.)	2.00	3.72	7.02	6.35	6.32	9.99	7.00	3.75	1.87	2.72	0.77	2.02	53.53
	GREATEST 24-HOUR (IN.)	1.23	0.79	2.42	2.03	1.76	2.81	1.58	1.62	0.55	1.44	0.39	0.66	2.81
	DATE OF OCCURRENCE	29-30	26-27	19-20	07	22-23	06-07	01-02	15-16	07	28-29	19	13-14	JUN 06-07
	NUMBER OF DAYS WITH:													
	PRECIPITATION ≥ 0.01	6	11	15	11	14	15	17	10	8	9	6	8	130
	PRECIPITATION ≥ 0.10	3	9	11	8	9	13	12	7	5	6	2	5	90
	PRECIPITATION ≥ 1.00	1	0	2	2	2	3	1	1	0	1	0	0	13
SNOWFALL	SNOW,ICE PELLETS,HAIL:													
	TOTAL (IN.)	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T
	GREATEST 24-HOUR (IN.)	T	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T
	DATE OF OCCURRENCE	23												JAN 23
	MAXIMUM SNOW DEPTH (IN.)	T	0	0	0	0	0	0	0	0	0	0	0	T
	DATE OF OCCURRENCE	23												JAN 23
	NUMBER OF DAYS WITH:													
	SNOWFALL ≥ 1.0	0	0	0	0	0	0	0	0	0	0	0	0	0

(NCDC 2003).pdf

NORMALS, MEANS, AND EXTREMES

AUGUSTA, GA (AGS)

LATITUDE: 33° 22′ 11″ N LONGITUDE: 81° 57′ 53″ W ELEVATION (FT): GRND: 160 BARO: 163 TIME ZONE: EASTERN (UTC + 5) WBAN: 03820

	ELEMENT	POR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
TEMPERATURE °F	NORMAL DAILY MAXIMUM	30	56.5	61.3	69.2	76.7	83.9	89.6	92.0	90.2	85.3	76.5	67.8	59.1	75.7
	MEAN DAILY MAXIMUM	47	56.4	60.7	68.2	76.8	83.9	89.4	91.9	90.6	85.6	76.9	68.3	59.1	75.6
	HIGHEST DAILY MAXIMUM	53	82	86	89	96	99	105	107	108	101	97	90	82	108
	YEAR OF OCCURRENCE		2002	1962	1995	1986	2000	1952	1980	1983	1999	1954	1961	1998	AUG 1983
	MEAN OF EXTREME MAXS.	55	74.3	76.1	80.6	88.8	93.4	98.1	99.0	97.9	94.6	88.3	81.5	76.1	87.4
	NORMAL DAILY MINIMUM	30	33.1	35.5	42.5	48.1	57.2	65.4	69.6	68.4	62.4	49.6	40.9	34.7	50.6
	MEAN DAILY MINIMUM	47	32.8	34.7	40.3	49.0	57.9	65.9	70.1	69.1	63.3	50.6	41.5	34.4	50.8
	LOWEST DAILY MINIMUM	53	-1	0	0	26	35	47	55	54	36	22	15	5	-1
	YEAR OF OCCURRENCE		1985	1998	1998	1982	1971	1984	1951	1968	1967	1952	1970	1981	JAN 1985
	MEAN OF EXTREME MINS.	55	16.6	18.9	25.0	33.5	43.6	54.6	62.5	60.6	49.7	34.2	24.8	18.5	36.9
	NORMAL DRY BULB	30	44.8	48.4	55.9	62.4	70.5	77.5	80.8	79.3	73.8	63.1	54.4	46.9	63.1
	MEAN DRY BULB	55	45.2	48.5	55.3	63.0	71.1	77.9	81.0	80.1	74.6	64.1	54.5	46.9	63.5
	MEAN WET BULB	48	40.3	42.8	48.3	55.5	63.3	69.7	72.7	72.3	67.4	57.3	48.4	41.7	56.6
	MEAN DEW POINT	48	34.4	36.0	41.4	49.4	58.8	65.9	69.7	69.4	64.3	53.3	43.1	36.1	51.8
	NORMAL NO. DAYS WITH:														
	MAXIMUM ≥ 90°	30	0.0	0.0	0.0	0.6	5.9	16.0	23.5	19.4	9.4	0.6	0.0	0.0	75.4
	MAXIMUM ≤ 32°	30	0.4	0.2	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7
	MINIMUM ≤ 32°	30	15.0	11.5	4.6	0.9	0.0	0.0	0.0	0.0	0.0	0.6	6.5	13.1	52.2
	MINIMUM ≤ 0°	30	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
H/C	NORMAL HEATING DEG. DAYS	30	617	469	301	129	21	1	0	0	5	118	317	547	2525
	NORMAL COOLING DEG. DAYS	30	1	2	15	52	191	385	506	459	285	74	15	1	1986
RH	NORMAL (PERCENT)	30	70	67	66	66	70	72	74	77	77	75	74	72	72
	HOUR 01 LST	30	80	77	77	80	86	87	88	91	90	89	86	82	84
	HOUR 07 LST	30	84	84	85	86	87	87	89	92	92	91	89	85	88
	HOUR 13 LST	30	55	50	48	45	48	52	54	56	55	50	51	54	52
	HOUR 19 LST	30	68	61	57	55	60	63	67	72	77	78	74	71	67
S	PERCENT POSSIBLE SUNSHINE														
W/O	MEAN NO. DAYS WITH:														
	HEAVY FOG(VISBY≤1/4 MI)	53	3.5	2.7	2.1	2.4	2.3	1.3	1.6	3.1	3.8	3.6	3.9	3.9	34.2
	THUNDERSTORMS	53	0.9	1.8	2.7	3.6	6.0	9.3	12.0	9.4	3.4	1.3	0.8	0.7	51.9
CLOUDINESS	MEAN:														
	SUNRISE-SUNSET (OKTAS)	1			7.2		3.2	4.0	5.6	4.8		5.6		4.0	
	MIDNIGHT-MIDNIGHT (OKTAS)	1			6.4		4.0	4.0	4.8	4.0					
	MEAN NO. DAYS WITH:														
	CLEAR	1	2.0	2.0	9.0		14.0	7.0	2.0	6.0	3.0	7.0	5.0	10.0	
	PARTLY CLOUDY	1		2.0	1.0		2.0	8.0	2.0	2.0	2.0	4.0	1.0	1.0	
	CLOUDY	1	2.5	3.0	12.0		3.0	4.0		6.0	7.0	3.0	1.0	7.0	
PR	MEAN STATION PRESSURE(IN)	30	29.97	29.93	29.88	29.86	29.83	29.84	29.87	29.88	29.89	29.93	29.96	29.98	29.90
	MEAN SEA-LEVEL PRES. (IN)	47	30.14	30.09	30.04	30.02	30.00	29.99	30.03	30.01	30.04	30.08	30.11	30.15	30.06
WINDS	MEAN SPEED (MPH)	27	6.8	7.1	7.4	7.0	6.2	5.8	5.6	5.0	5.2	5.3	5.5	6.2	6.1
	PREVAIL.DIR(TENS OF DEGS)	28	28	29	29	18	14	14	24	14	04	04	29	29	24
	MAXIMUM 2-MINUTE:														
	SPEED (MPH)	9	40	37	40	37	44	45	36	38	36	38	38	35	45
	DIR. (TENS OF DEGS)		26	30	29	28	29	34	21	01	02	34	18	28	34
	YEAR OF OCCURRENCE		1997	2003	1999	2001	1995	1998	1995	2002	1997	1995	2001	2000	JUN 1998
	MAXIMUM 5-SECOND:														
	SPEED (MPH)	9	54	45	51	55	52	53	47	49	45	52	49	43	55
	DIR. (TENS OF DEGS)		25	31	29	34	29	33	21	01	01	33	03	28	34
	YEAR OF OCCURRENCE		1997	2003	1999	1997	1995	1998	1998	2002	1997	1995	1995	2000	APR 1997
PRECIPITATION	NORMAL (IN)	30	4.50	4.11	4.61	2.94	3.07	4.19	4.07	4.48	3.59	3.20	2.68	3.14	44.58
	MAXIMUM MONTHLY (IN)	53	8.91	7.67	11.92	8.43	9.61	9.99	11.43	11.34	9.51	14.82	7.76	8.65	14.82
	YEAR OF OCCURRENCE		1987	1961	1980	1961	1979	2003	1967	1986	1975	1990	1985	1981	OCT 1990
	MINIMUM MONTHLY (IN)	53	0.75	0.69	0.88	0.60	0.36	0.68	1.02	0.65	0.31	T	0.09	0.32	T
	YEAR OF OCCURRENCE		1981	1968	1968	1970	2000	1984	1987	1980	1984	1953	1960	1955	OCT 1953
	MAXIMUM IN 24 HOURS (IN)	53	3.61	3.69	5.31	3.96	4.44	5.08	3.71	5.98	7.30	8.57	3.82	3.12	8.57
	YEAR OF OCCURRENCE		1960	1985	1967	1955	1981	1981	1979	1964	1998	1990	1985	1970	OCT 1990
	NORMAL NO. DAYS WITH:														
	PRECIPITATION ≥ 0.01	30	11.0	8.7	9.8	7.4	9.0	10.1	11.2	10.9	7.8	6.2	7.2	9.5	108.8
	PRECIPITATION ≥ 1.00	30	1.2	1.2	1.3	0.8	0.8	1.4	1.1	1.4	0.9	1.0	0.8	0.7	12.6
SNOWFALL	NORMAL (IN)	30	0.3	1.0	0.*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.4
	MAXIMUM MONTHLY (IN)	49	2.6	14.0	1.1	T	0.0	T	0.0	0.0	0.0	0.0	T	1.0	14.0
	YEAR OF OCCURRENCE		1992	1973	1980	1992		1994					1968	1993	FEB 1973
	MAXIMUM IN 24 HOURS (IN)	49	2.6	13.7	1.1	T	0.0	T	0.0	0.0	0.0	0.0	T	1.0	13.7
	YEAR OF OCCURRENCE		1992	1973	1980	1992		1994					1968	1993	FEB 1973
	MAXIMUM SNOW DEPTH (IN)	47	2	13	1	0	0	0	0	0	0	0	0	1	13
	YEAR OF OCCURRENCE		1988	1973	1980									1958	FEB 1973
	NORMAL NO. DAYS WITH:														
	SNOWFALL ≥ 1.0	30	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3

(NCDC 2003).pdf

PRECIPITATION (inches) 2003 AUGUSTA, GA (AGS)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1974	3.99	5.76	2.32	4.02	4.15	3.63	4.05	3.86	2.83	0.09	2.38	4.05	41.13
1975	3.71	5.22	5.23	4.43	5.01	5.10	5.32	3.53	9.51	1.29	2.12	4.58	55.05
1976	3.51	0.95	4.11	2.00	6.12	4.77	2.00	1.81	6.12	5.06	3.61	5.61	45.67
1977	3.66	1.90	8.18	1.22	2.53	1.80	3.07	7.84	3.26	3.48	3.71	3.01	43.66
1978	7.76	1.50	3.54	3.58	2.16	1.59	1.70	4.91	1.34	1.12	2.50	1.26	32.96
1979	3.40	7.34	2.48	5.27	9.61	1.56	6.12	3.56	4.81	1.50	1.95	1.85	49.45
1980	4.07	3.17	11.92	1.28	1.84	4.31	2.12	0.65	5.06	1.62	2.24	0.96	39.24
1981	0.75	5.26	2.62	2.27	5.29	7.08	1.72	6.20	0.72	2.91	0.91	8.65	44.38
1982	3.00	4.60	1.54	5.23	3.78	3.46	3.56	3.09	1.91	3.65	2.34	4.93	41.09
1983	4.47	6.02	6.86	5.47	1.93	3.90	1.44	4.99	5.40	2.31	4.64	5.24	52.67
1984	3.40	4.93	5.88	6.50	7.55	0.68	7.70	4.42	0.31	1.00	0.65	1.25	44.27
1985	3.22	6.63	1.28	0.97	1.75	2.92	3.71	1.79	0.39	6.21	7.76	1.65	38.28
1986	1.46	2.51	3.23	1.02	2.80	1.41	6.26	11.34	0.74	3.92	4.93	4.12	43.74
1987	8.91	7.23	4.27	0.77	1.57	5.75	1.02	3.99	2.04	0.18	4.06	1.38	41.17
1988	4.30	3.30	3.14	5.04	1.60	4.89	1.77	3.47	5.55	5.40	1.30	1.31	41.07
1989	1.51	3.23	4.37	5.24	2.96	8.84	8.15	3.19	3.73	2.14	1.29	4.68	49.33
1990	2.71	2.70	2.03	1.07	1.84	1.44	1.92	6.46	1.11	14.82	2.57	1.98	40.65
1991	7.50	1.97	8.51	3.15	5.76	5.57	11.12	6.98	1.36	0.57	1.39	2.53	56.41
1992	4.57	4.50	3.69	2.70	1.19	4.82	7.04	5.72	3.28	4.94	6.71	2.24	51.40
1993	5.94	3.23	7.57	1.52	1.28	1.54	2.47	2.77	3.45	4.24	1.58	2.70	38.29
1994	3.94	4.24	6.40	1.14	0.95	6.15	3.41	6.70	0.62	9.02	2.62	3.01	48.20
1995	6.54	7.00	1.02	2.09	2.70	5.44	3.82	4.92	7.01	4.24	2.20	3.60	50.58
1996	3.49	1.75	5.13	1.71	1.96	4.09	6.39	6.24	2.96	1.90	0.70	2.06	38.38
1997	3.67	4.84	2.27	3.35	1.61	3.65	5.83	2.24	5.89	5.04	5.02	6.94	50.35
1998	7.50	6.36	6.10	7.13	2.06	2.31	2.63	3.04	8.74	0.02	0.58	1.37	47.84
1999	5.57	2.52	2.73	2.02	1.19	6.43	3.68	2.27	5.43	2.81	1.12	0.97	36.74
2000	6.45	1.01	2.92	1.13	0.36	5.50	3.03	6.63	6.01	0.03	3.38	1.40	37.85
2001	2.64	1.98	7.43	0.94	3.76	4.98	5.00	1.28	3.56	0.18	0.83	0.97	33.55
2002	2.63	2.33	3.71	1.43	2.00	4.55	4.58	1.60	6.74	2.94	4.01	4.26	40.78
2003	2.00	3.72	7.02	6.35	6.32	9.99	7.00	3.75	1.87	2.72	0.77	2.02	53.53
POR= 133 YRS	3.87	4.08	4.54	3.33	3.22	4.29	4.87	4.61	3.47	2.59	2.53	3.32	44.72

WBAN : 03820

AVERAGE TEMPERATURE (°F) 2003 AUGUSTA, GA (AGS)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1974	56.8	48.6	58.7	61.8	71.8	74.2	78.4	78.4	73.2	60.5	52.0	45.9	63.4
1975	47.4	50.1	53.1	60.7	72.5	75.8	77.5	80.6	74.5	66.7	56.7	47.4	63.6
1976	42.6	53.7	60.4	63.3	67.9	75.3	80.3	78.3	72.4	59.7	48.4	44.3	62.2
1977	35.5	44.6	59.2	65.1	72.4	80.2	82.7	79.7	76.5	60.9	58.5	46.2	63.5
1978	39.1	40.1	52.5	63.2	69.5	78.2	81.8	80.8	75.5	62.6	58.9	48.1	62.5
1979	41.4	44.0	56.5	63.1	70.6	74.8	80.0	79.6	74.3	62.4	55.6	45.9	62.4
1980	45.9	43.1	52.5	63.2	70.7	77.9	83.7	82.3	77.3	61.4	52.5	45.1	63.0
1981	39.6	48.6	52.3	65.2	68.3	81.1	81.5	77.0	71.4	59.3	51.6	41.2	61.4
1982	40.1	48.9	56.3	58.7	70.2	79.8	82.5	78.7	73.0	64.0	56.9	53.1	63.5
1983	41.9	46.7	54.4	58.8	70.6	75.4	82.6	83.3	72.8	65.1	53.9	44.5	62.5
1984	43.0	50.2	55.3	61.3	69.9	78.5	79.8	80.3	72.8	72.0	52.5	55.2	64.2
1985	42.1	48.8	58.7	65.7	73.2	80.4	81.7	80.3	75.2	70.7	64.6	44.2	65.5
1986	42.7	52.6	55.8	63.4	72.5	81.5	86.0	79.6	77.6	66.2	60.9	48.4	65.6
1987	44.6	47.3	54.8	60.6	73.1	79.2	82.5	83.8	75.8	57.8	56.5	50.4	63.9
1988	41.1	46.0	55.5	62.4	69.1	76.3	81.2	81.4	75.4	59.0	55.6	45.7	62.4
1989	50.5	50.4	57.6	62.9	69.2	78.9	80.9	80.0	74.7	65.4	55.8	41.4	64.0
1990	51.8	56.7	59.4	62.4	71.5	79.4	83.5	82.0	76.2	66.6	56.3	51.5	66.4
1991	46.8	52.3	58.5	66.4	75.3	78.5	82.3	80.5	75.1	65.0	51.9	50.4	65.3
1992	46.4	51.0	54.1	61.2	67.6	75.8	81.8	79.1	75.6	62.3	55.5	46.6	63.1
1993	50.1	46.4	53.6	60.7	72.4	81.5	86.3	82.4	77.7	65.1	55.8	45.5	64.8
1994	42.4	50.8	58.7	65.6	68.4	78.6	79.5	77.8	72.3	63.3	57.4	50.5	63.8
1995	46.1	47.8	58.0	64.2	72.3	76.0	81.3	80.8	73.1	65.6	50.5	44.5	63.4
1996	44.5	48.8	51.1	60.9	72.4	76.8	80.5	78.1	73.3	61.9	51.2	48.2	62.3
1997	47.3	51.4		59.6	66.7	74.4	80.5	78.2	74.0	63.2	51.2	46.8	
1998	49.3			62.0	74.7	81.5	83.1	79.8	75.3	65.7	58.0	51.7	
1999	48.3	50.0	51.8	66.0	68.3	76.7	81.2	83.0	72.6	63.2	56.0	46.6	63.6
2000	43.9	50.1	58.1	60.3	74.4	79.2	80.4	79.1	72.7	62.4	52.9	38.5	62.7
2001	44.0	52.5	53.1	63.8	70.8	77.0	79.3	80.4	72.5	61.4	58.9	51.5	63.8
2002	47.0	46.5	57.1	67.3	69.7	78.1	82.1	80.0	77.4	67.1	52.2	44.4	64.1
2003	41.9	48.0	58.3	62.0	71.4	76.5	79.2	79.9	72.7	63.9	57.6	42.4	62.8
POR= 129 YRS	46.8	48.9	55.4	63.7	72.0	78.7	81.3	80.3	75.6	64.9	54.9	47.7	64.2

(NCDC 2003).pdf

HEATING DEGREE DAYS (base 65°F) 2003 AUGUSTA, GA (AGS)

YEAR	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
1974-75	0	0	11	152	393	588	539	415	374	171	3	0	2646
1975-76	0	0	2	62	285	540	687	320	167	97	29	2	2191
1976-77	0	0	0	191	490	635	906	565	206	65	13	0	3071
1977-78	0	0	0	153	215	578	797	689	380	93	33	0	2938
1978-79	0	0	0	103	184	531	723	582	265	79	15	2	2484
1979-80	0	0	4	125	294	584	588	631	385	97	17	0	2725
1980-81	0	0	10	143	370	608	778	452	391	67	33	0	2852
1981-82	0	0	13	187	400	730	765	446	286	206	7	0	3040
1982-83	0	0	6	125	253	383	710	504	332	198	8	0	2519
1983-84	0	0	23	66	326	630	674	424	306	146	31	1	2627
1984-85	0	0	4	16	382	296	710	451	222	75	5	0	2161
1985-86	0	0	6	28	83	639	685	342	287	112	12	0	2194
1986-87	0	5	0	82	170	513	625	491	319	177	5	0	2387
1987-88	0	0	0	220	266	448	732	545	294	102	12	0	2619
1988-89	0	0	1	209	282	594	441	411	258	153	41	0	2390
1989-90	0	0	8	97	282	722	403	244	202	118	11	0	2087
1990-91	0	0	7	93	263	417	560	355	223	52	3	0	1973
1991-92	0	0	3	76	404	461	570	398	339	160	45	0	2456
1992-93	0	0	9	103	289	565	457	518	348	148	6	0	2443
1993-94	0	0	7	86	300	599	693	401	220	62	34	0	2402
1994-95	0	0	1	88	232	446	580	476	225	89	11	0	2148
1995-96	0	0	11	94	438	629	626	460	425	165	27	0	2875
1996-97	0	0	2	127	410	516	545	383		176	46	5	
1997-98	0	0	0	127	408	556	491			114	0	0	
1998-99	0	0	0	67	214	413	509	415	403	87	19	0	2127
1999-00	0	0	12	111	270	561	648	424	216	154	2	0	2398
2000-01	0	0	10	109	380	816	646	344	364	110	1	0	2780
2001-02	0	0	15	157	198	416	555	511	270	56	43	0	2221
2002-03	0	0	0	59	387	630	712	472	215	105	4	0	2584
2003-	0	0	12	73	246	694							

WBAN : 03820

COOLING DEGREE DAYS (base 65°F) 2003 AUGUSTA, GA (AGS)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1974	1	4	16	48	226	284	420	421	265	22	11	3	1721
1975	2	3	11	51	242	332	395	488	293	122	43	0	1982
1976	0	0	30	51	127	320	482	419	228	34	0	0	1691
1977	0	0	33	77	250	461	555	465	355	34	27	0	2257
1978	0	0	1	46	177	402	531	497	324	35	9	13	2035
1979	0	0	9	29	197	301	473	460	288	52	20	0	1829
1980	0	0	2	50	201	396	585	543	385	39	0	0	2201
1981	0	0	6	79	143	491	515	378	208	19	4	0	1843
1982	0	0	23	22	174	450	549	431	254	100	16	21	2040
1983	0	0	10	18	187	318	555	573	263	76	0	0	2000
1984	0	0	13	39	188	411	468	481	244	241	16	1	2102
1985	9	4	33	100	263	468	525	480	318	209	78	0	2487
1986	0	0	12	71	248	501	655	464	383	126	56	4	2520
1987	0	0	8	48	264	432	548	590	331	5	17	1	2244
1988	0	1	5	31	147	346	510	518	323	32	8	1	1922
1989	0	8	38	99	178	423	500	471	305	117	12	0	2151
1990	0	18	36	49	219	438	578	536	350	151	9	6	2390
1991	0	6	29	99	329	414	542	483	310	82	16	14	2324
1992	0	1	6	56	135	330	526	444	331	27	14	0	1870
1993	2	0	2	27	240	503	666	547	393	96	31	2	2509
1994	0	9	28	82	149	418	456	403	227	40	9	4	1825
1995	0	0	17	75	244	338	514	497	262	122	10	0	2079
1996	0	1	2	50	264	362	487	414	257	40	4	1	1882
1997	3	8		21	105	294	489	418	277	80	0	0	
1998	10			29	304	502	570	463	316	95	13	9	
1999	2	0	0	124	128	359	512	563	247	64	8	0	2007
2000	2	0	13	20	298	433	487	444	247	38	21	0	2003
2001	1	2	0	83	187	365	449	487	244	57	23	4	1902
2002	5	2	34	132	197	399	538	472	377	134	8	0	2298
2003	0	0	14	22	210	351	446	470	247	45	33	0	1838

(NCDC 2003).pdf

SNOWFALL (inches) 2003 AUGUSTA, GA (AGS)

YEAR	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	TOTAL
1974-75	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	T	0.0	0.0	0.0	T
1975-76	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	T
1976-77	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.5
1977-78	0.0	0.0	0.0	0.0	0.0	0.0	T	1.1	0.0	0.0	0.0	0.0	1.1
1978-79	0.0	0.0	0.0	0.0	0.0	T	0.0	3.4	0.0	0.0	0.0	0.0	3.4
1979-80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	1.1	0.0	0.0	0.0	5.3
1980-81	0.0	0.0	0.0	0.0	0.0	T	0.0	T	0.0	0.0	0.0	0.0	T
1981-82	0.0	0.0	0.0	0.0	0.0	0.0	1.5	T	0.0	0.0	0.0	0.0	1.5
1982-83	0.0	0.0	0.0	0.0	0.0	0.0	T	T	T	0.0	0.0	0.0	T
1983-84	0.0	0.0	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	0.0	T
1984-85	0.0	0.0	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	0.0	T
1985-86	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	0.0	T
1986-87	0.0	0.0	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	0.0	T
1987-88	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	2.3
1988-89	0.0		0.0	0.0	0.0	T	0.0	3.7	0.0	0.0	0.0	0.0	
1989-90	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.4
1990-91	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0	0.0	T
1991-92	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	T	0.0	0.0	2.6
1992-93	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	T	0.0	0.0	0.0	T
1993-94	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	T	1.0
1994-95	0.0	0.0	0.0	0.0	0.0	0.0	0.0	T	0.0	0.0			
1995-96	0.0	0.0	0.0	0.0	0.0	0.0		1.4	0.0	0.0	0.0	0.0	
1996-97	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
1997-98													
1998-99					0.0	0.0	0.0	T	0.0	0.0	0.0	0.0	
1999-00	0.0	0.0	0.0	0.0	0.0	0.0							
2000-01													
2001-02													
2002-03						T	T	0.0	0.0	0.0	0.0	0.0	
2003-	0.0	0.0	0.0	0.0	0.0	0.0							
POR= 49 YRS	0.0	0.0	0.0	0.0	T	0.1	0.3	0.7	T	T	0.0	T	1.1

WBAN : 03820

REFERENCE NOTES:

PAGE 1:
THE TEMPERATURE GRAPH SHOWS NORMAL MAXIMUM AND NORMAL MINIMUM DAILY TEMPERATURES (SOLID CURVES) AND THE ACTUAL DAILY HIGH AND LOW TEMPERATURES (VERTICAL BARS).

PAGE 2 AND 3:
H/C INDICATES HEATING AND COOLING DEGREE DAYS.
RH INDICATES RELATIVE HUMIDITY
W/O INDICATES WEATHER AND OBSTRUCTIONS
S INDICATES SUNSHINE.
PR INDICATES PRESSURE.
CLOUDINESS ON PAGE 3 IS THE SUM OF THE CEILOMETER AND SATELLITE DATA NOT TO EXCEED EIGHT EIGHTHS(OKTAS).

GENERAL:
T INDICATES TRACE PRECIPITATION, AN AMOUNT GREATER THAN ZERO BUT LESS THAN THE LOWEST REPORTABLE VALUE.
+ INDICATES THE VALUE ALSO OCCURS ON EARLIER DATES.
BLANK ENTRIES DENOTE MISSING OR UNREPORTED DATA.
NORMALS ARE 30-YEAR AVERAGES (1971 - 2000).
ASOS INDICATES AUTOMATED SURFACE OBSERVING SYSTEM.
PM INDICATES THE LAST DAY OF THE PREVIOUS MONTH.
POR (PERIOD OF RECORD) BEGINS WITH THE JANUARY DATA MONTH AND IS THE NUMBER OF YEARS USED TO COMPUTE THE MEAN. INDIVIDUAL MONTHS WITHIN THE POR MAY BE MISSING.
WHEN THE POR FOR A NORMAL IS LESS THAN 30 YEARS, THE NORMAL IS PROVISIONAL AND IS BASED ON THE NUMBER OF YEARS INDICATED.
0.* OR * INDICATES THE VALUE OR MEAN-DAYS-WITH IS BETWEEN 0.00 AND 0.05.
CLOUDINESS FOR ASOS STATIONS DIFFERS FROM THE NON-ASOS OBSERVATION TAKEN BY A HUMAN OBSERVER. ASOS STATION CLOUDINESS IS BASED ON TIME-AVERAGED CEILOMETER DATA FOR CLOUDS AT OR BELOW 12,000 FEET AND ON SATELLITE DATA FOR CLOUDS ABOVE 12,000 FEET.
THE NUMBER OF DAYS WITH CLEAR, PARTLY CLOUDY, AND CLOUDY CONDITIONS FOR ASOS STATIONS IS THE SUM OF THE CEILOMETER AND SATELLITE DATA FOR THE SUNRISE TO SUNSET PERIOD.

GENERAL CONTINUED:
CLEAR INDICATES 0 - 2 OKTAS, PARTLY CLOUDY INDICATES 3 - 6 OKTAS, AND CLOUDY INDICATES 7 OR 8 OKTAS. WHEN AT LEAST ONE OF THE ELEMENTS (CEILOMETER OR SATELLITE) IS MISSING, THE DAILY CLOUDINESS IS NOT COMPUTED.
WIND DIRECTION IS RECORDED IN TENS OF DEGREES (2 DIGITS) CLOCKWISE FROM TRUE NORTH. "00" INDICATES CALM. "36" INDICATES TRUE NORTH.
RESULTANT WIND IS THE VECTOR AVERAGE OF THE SPEED AND DIRECTION.
AVERAGE TEMPERATURE IS THE SUM OF THE MEAN DAILY MAXIMUM AND MINIMUM TEMPERATURE DIVIDED BY 2.
SNOWFALL DATA COMPRISE ALL FORMS OF FROZEN PRECIPITATION, INCLUDING HAIL.
A HEATING (COOLING) DEGREE DAY IS THE DIFFERENCE BETWEEN THE AVERAGE DAILY TEMPERATURE AND 65° F.
DRY BULB IS THE TEMPERATURE OF THE AMBIENT AIR.
DEW POINT IS THE TEMPERATURE TO WHICH THE AIR MUST BE COOLED TO ACHIEVE 100 PERCENT RELATIVE HUMIDITY.
WET BULB IS THE TEMPERATURE THE AIR WOULD HAVE IF THE MOISTURE CONTENT WAS INCREASED TO 100 PERCENT RELATIVE HUMIDITY.

ON JULY 1, 1996, THE NATIONAL WEATHER SERVICE BEGAN USING THE "METAR" OBSERVATION CODE THAT WAS ALREADY EMPLOYED BY MOST OTHER NATIONS OF THE WORLD. THE MOST NOTICEABLE DIFFERENCE IN THIS ANNUAL PUBLICATION WILL BE THE CHANGE IN UNITS FROM TENTHS TO EIGHTS(OKTAS) FOR REPORTING THE AMOUNT OF SKY COVER.

(NCDC 2003).pdf

2003
AUGUSTA,
GEORGIA (AGS)

The boundary between the Piedmont Plateau and the Coastal Plain, known as the Fall Line, crosses the Savannah River basin in a general northeast-southwest direction near Augusta, Georgia. The Weather Service Office at Bush Field is located in the Savannah River Valley approximately 2 miles west of the river and 203 miles above the mouth of the Savannah. Hills some 200 feet higher than the station are found slightly more than 1 mile to the west and approximately 4 miles to the southwest, and some 5 miles to the south and southeast. Swampland is found immediately to the north, east, and south of the station.

The length of the growing season averages 241 days. The average last occurrence in the spring of temperatures of 32 degrees is mid-March, and the first in the fall is mid-November.

Measurable snow is a rarity and then remains on the ground only a short time. Ice storms, damaging winds, and very low temperatures are also of rare occurrence.

Augusta has been protected, to a great extent, from flooding of the Savannah River by the construction of two multipurpose dams. The Clark Hill Dam is located 21.7 miles above the city and Hartwell Dam has been constructed 89 miles above Augusta.

(NCDC 2003).pdf

STATION LOCATION

AUGUSTA, GEORGIA

LOCATION	Occupied From	Occupied To	Airline Distances and Directions from previous Location	LATITUDE NORTH	LONGITUDE WEST	ELEVATION ABOVE SEA LEVEL: GROUND TEMPERATURE SITE	ELEVATION ABOVE GROUND: WIND INSTRUMENT	EXTREME THERMOMETERS	PSYCHROMETER	SUNSHINE SWITCH	TIPPING BUCKET RAIN GAUGE	WEIGHING RAIN GAGE	8 INCH RAIN GAGE	HYGROTHERMOMETER	AUTOMATIC OBSERVING EQUIPMENT *	REMARKS
*NOTE:																* TYPE M = AMOS T = AUTOB S = ASOS W = AWOS
AIRPORT																
Administration Building Daniel Field Airport Wrightsboro Road	7/3/41	2/14/44	400 ft. W	33°28′	82°02′	420	46	29	29				29			Army 8/25/42 to 9/19/42.
Administration Building (2nd floor)Daniel Field Airport, Wrightsboro Rd	2/14/44	6/30/50	Same Bldg.	33°28′	82°02′	420	46 d43	5	5			e4	3			d. Effective 2/21/46. e. Installed September 1949.
Transient Building + Bush Field +Dept. of Commerce Bldg eff. 12/16/55 Weather Bureau Bldg. eff. 12/1/68. Weather Service Bldg. eff. 12/14/71. Weather Service/FAA Bldg eff. 5/29/87.	7/1/50	05/01/94	7.5 mi. SSE	33°22′	81°58′	143 i145 j136	25 g20 k20	6	6	NA	NA m3	3 f4	3	NA h5 n5 p5	NA	f. Raised 8/25/51. g. Effective 3/9/63. h. Commissioned 1700′ ESE of thermometer site 2/1/64. i. Effective 2/1/64. j. Value from resurvey 3/28/68. k. Minor move 2/15/76. m. Installed 9/23/76. n. Type change 7/28/82. p. Type change 12/16/85.
Bush Field	05/01/94	Present	NA	33°22′	81°58′	q160									S	ASOS Commissioned 05/01/94. q. Ground elevation.

For Hard Copy Subscription:
Price and ordering information: NCDC Subscripting Service Center,310 State Route 956, Building 300, Rocket Center, WV 26726.

INQUIRIES/COMMENTS CALL: Toll Free (866) 742–3322

Visit our Web Site for other weather data:www.ncdc.noaa.gov

Non–Subscription Request:
NCDC Customer Services;
Phone: 828–271–4800
Fax: 828–271–4876
Email: ncdc.orders@noaa.gov

OFFICAL BUSINESS
PENALTY FOR PRIVATE USE $300
CHANGE SERVICE REQUESTED

FIRST CLASS
POSTAGE & FEES PAID
United States Department of Commerce
NOAA Permit No. G – 19

* NOTES: For earlier station history see previous edition.