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DPST-82-578

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May 19, 1982

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USEFUL CHARACTERISTICS OF THE SAVANNAH RIVER (U)

SUMMARY

This report provides tabular information about the Savannah River including significant activities and discharges along the Savannah River, river water temperature data near Jackson at SRP, flow information, and reservoir parameters for Clarks Hill, Richard B. Russell and Hartwell reservoirs.

INTRODUCTION

The Savannah Basin has a surface area of 10,577 square miles. Of this total, 175 square miles are in southwestern North Carolina, 4581 square miles are in western South Carolina, and 5821 square miles are in eastern Georgia. The headwaters of the Savannah River are on the forested slopes of the Blue Ridge Mountains of North Carolina, South Carolina, and Georgia. The Savannah River is formed by the convergence of the Seneca and Tugaloo Rivers near Hartwell, Georgia.

The average annual rainfall of the Savannah Basin varies from more than 80 inches in the mountains to 44 inches in the central area. Rainfall at Augusta, Georgia averages about 5 inches per month. The two driest months are October and November

The Savannah River is of prime importance to SRP as it supplies cooling water and process water. The usage rate of Savannah River water varies from about 300 cfs to about 1000 cfs depending on the power levels of the reactors.

DISCUSSION

Annual Flow Rate at Augusta, Georgia

The average annual discharge rate measured at Augusta over the past 72 years of gauge history is 10,300 cfs. The maximum measured discharge rate was 350,000 cfs on October 3, 1929. The

minimum flow was 648 cfs on September 24, 1939. These extremes have been eliminated by the control provided by Clarks Hill and Hartwell reservoirs.

The annual river flow rates for 1963 through 1978 are shown in Figure 1 and Table 1. These are the mean daily flow rate and daily maximum and daily minimum flow rates at the Augusta gauging station for the calendar years. There is no general trend during this data period. The mean flow ranges from 6967 cfs in 1970 to 18530 cfs in 1964. The nineteen year mean is 10702 cfs. The maximum daily flow rate ranges from 22,500 cfs in 1967 to 84,500 cfs in 1964, with a mean of 38094 cfs. Minimum daily flows range from 4460 cfs in 1971 to 6720 cfs in 1975, with a mean of 5846 cfs.

7Q10* Value for Flow at Augusta, Georgia

Analysis of the daily flows in the Savannah River reported by the U.S. Geological Survey permits the estimation of the frequency that low flows will occur. The seven-day consecutive low flow records (Table 2) were examined from 1964-1981 to estimate the 7Q10. This period was selected because flow in the river has been regulated since 1964 by Hartwell and Clarks Hill Dams. Lower

* Seven-day minimum flow value with a recurrence interval of 10 years.

flows were observed prior to filling of these facilities but are not considered pertinent to the regulated system that now exists. The predicted 7Q10 is approximately 5630 cfs (Table 3, Figure 2) for Augusta, Georgia.

Savannah River Monthly Flow Rates

The monthly flow rates are shown in Table 4 and Figure 3 for the Augusta gauging station. The data are for the period January 1964 through September 1980. The data show a cyclical pattern of maximum flow rates in March and April, minimum flow rates in August and September.

Comparable data for the Jackson gauging station are not available because the gauge is not calibrated for flow rates over 20,000 cfs.

Gauge Height vs Flow Rate at Augusta, GA

The Augusta gauging station is located at New Savannah lock and dam. This is at river mile 187.4, 12 miles downstream from Augusta. Measurements have been continuous since January 1925.

The Augusta gauge height versus Savannah River flow rate is shown in Table 5 and Figure 4. The zero of the gauge is 96.0 feet above mean sea level (MSL).

Gauge Height vs Flow Rate at Jackson, SC

The Jackson gauging station is located 1.4 miles downstream from Upper Three Runs Creek, 6.2 miles downstream of Jackson, at river mile 156.8. Measurements have been continuous since October 1971. Only flow rates below 20,000 cfs are measured.

The relationship between Jackson gauge height and Savannah River flow rate is shown in Table 6 and Figure 5. The data are extrapolated to 22,000 cfs. The gauge zero is 77.0 feet above MSL.

Savannah River Temperature

The Savannah River temperatures near Jackson, S.C. are shown in Table 7 and Figure 6. Monthly data include the period from January 1971 through September 1980. The average maximum temperature in July, August, and September was 25.3°C. The maximum temperature observed in the period was 26°C.

Clarks Hill Reservoir

Clarks Hill Dam was completed in March 1953. The reservoir filling was complete by July 1954. The capacity of Clarks Hill Reservoir as a function of elevation above MSL is shown in Table 8 and Figure 7. Full pool elevation is 330 feet with a water capacity of 2.51×10^6 acre-feet.

Richard B. Russell Reservoir

The Richard B. Russell Dam is under construction. Construction completion and reservoir filling is to begin in June 1983. Filling is to be complete by December 1984. The capacity of the Richard B. Russell Reservoir as a function of elevation above MSL is shown in Table 9 and Figure 8. The full pool elevation will be 475 feet with a water capacity of 1.03×10^6 acre-feet.

Hartwell Reservoir

The Hartwell Dam was completed in 1962. The capacity of the Hartwell Reservoir as a function of elevation above MSL is shown in Table 10 and Figure 9. The full pool elevation is 660 feet with a capacity of 2.55×10^6 acre-feet.

Savannah River Miles

A fairly comprehensive listing of river miles is given in Table 11. This list was originally compiled by D. W. Hayes and D. I. Ross in a memo dated April 15, 1974. The information is included here for documentation and because river mile location is of general interest.

Mileages were obtained from the following U.S. Corps of Engineers and U.S. Geological Survey publications:

1. River Mile 0.0 to 21.4: Annual Survey - U.S. Coastal Highway 17 to Sea, 1972. (USACE).

2. River Mile 21.4 to 210.3: Savannah River Below Augusta, Navigation Charts, 1972. (USACE).

3. River Mile 237.7 to 305.0: Water Resources Data for South Carolina, Part 1, Surface Water Records, 1972. (USGS).

Table 1. Savannah River annual flow rates at Augusta gauging station, cfs.

Calendar Year	Mean	Maximum	Minimum
63	10020	30600	5350
64	18530	84500	6560
65	10800	30000	6300
66	9398	32500	6120
67	9152	22500	5740
68	8298	32200	5890
69	9821	44100	5800
70	6967	23200	5420
71	9480	59700	4460
72	9960	32700	5460
73	12740	38100	5450
74	9840	29300	5810
75	14290	43900	6720
76	12290	31900	6000
77	10310	32200	6350
78	9336	41300	6110
Mean	10702	38094	5846

Table 2. Seven consecutive day minimum flow at New Savannah Bluff Lock and Dam (Augusta, Ga.)

Year*	Flow rate, cfs
1964	5810
1965	6905
1966	6605
1967	6357
1968	6019
1969	6014
1970	6174
1971	5768
1972	6339
1973	6025
1974	5748
1975	6242
1976	7447
1977	7244
1978	6773
1979	6299
1980	6738
1981	6512

* Year ends 3/31.

Table 3. Data for 1964-1981.

Recurrence interval, years	7-day minimum flow, cfs
2	6320
5	5760
10	5630
20	5350
30	5200

Table 4. Savannah River monthly average flow rates at Augusta, GA, cfs.

		Mean	Minimum	Maximum
January	mean	12850	7050	22220
	range	6821-19260	4460-9830	11400-41300
February	mean	12980	7990	19580
	range	7093-22350	5930-15000	8960-32500
March	mean	16110	7740	28800
	range	7200-28490	6030-10100	10400-59700
April	mean	16508	7608	28810
	range	6870-43850	5710-12000	9990-84500
May	mean	11000	6760	21050
	range	6580-27045	5740-8090	8020-50200
June	mean	11590	6750	19500
	range	6550-22830	5940-15900	7230-31900
July	mean	7660	6470	11616
	range	6942-13200	5920-7530	8230-24200
August	mean	7820	6380	12370
	range	6730-11900	5770-6900	7550-36700
September	mean	7653	6320	10510
	range	6340-14480	5740-7000	6930-32400
October	mean	7850	6320	10700
	range	6080-17740	5450-8350	6710-26300
November	mean	8140	6510	11550
	range	6150-11940	5420-8220	6730-25100
December	mean	10660	7390	16100
	range	6450-20530	5460-13900	6980-33000

Table 5. Savannah River flow rate at Augusta, GA versus Gauge Height, cfs

Gauge Height, ft	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
96	2880	2970	3060	3150	3240	3330	3420	3510	3600	3690
97	3780	3870	3960	3970	4060	4150	4240	4330	4420	4510
98	4600	4690	4780	4870	4960	5050	5140	5230	5320	5410
99	5500	5590	5680	5770	5860	5950	6040	6130	6220	6310
100	6400	6490	6580	6670	6760	6850	6940	7030	7120	7210
101	7300	7390	7480	7570	7660	7750	7840	7930	8020	8110
102	8200	8290	8380	8470	8560	8650	8740	8830	8920	9010
103	9100	9190	9280	9370	9460	9550	9640	9730	9820	9910
104	10000	10100	10200	10300	10400	10500	10600	10700	10800	10900
105	11000	11100	11200	11300	11400	11500	11600	11700	11800	11900
106	12000	12100	12200	12300	12400	12500	12600	12700	12800	12900
107	13000	13110	13220	13330	13440	13550	13660	13770	13880	13990
108	14100	14220	14340	14460	14580	14700	14820	14940	15060	15180
109	15300	15420	15540	15660	15780	15900	16040	16180	16320	16460
110	16600	16740	16880	17020	17180	17340	17500	17660	17840	18020
111	18200	18400	18600	18800	19020	19240	19460	19680	19920	20160
112	20400	20660	20920	21180	21440	21700	22000	22300	22600	22900
113	23200	23500	23800	24100	24400	24700	25000	25300	25600	25900
114	26200	26500	26800	27100	27400	27700	28000	28300	28600	28900
115	29200	29500	29800	30100	30400	30700	31000	31350	31700	32050
116	32400	32750	33100	33450	33800	34150	34500	34900	35300	35700
117	36200	36700	37300	37900	38600	39300	40000	40800	41600	42400
118	43300	44200	45200	46300	47500	48800	50200	51700	53300	55100
119	57100	59300	61500	63800	66300	68900	71500	74100	76700	79300
120	81900	84500	87100	89900	92700	95500	98300	101100	103900	106700
121	109500	113300	115100	117900	120700	123500	126300	129100	131900	134700
122	137500	140300	143100	145900	148700	151500	154300	157100	159900	162700
123	165500									

Table 6. Gauge Height versus Savannah River flow rate at Jackson, SC, cfs

Gauge Reading, ft	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
82	4700	4800	4900	5000	5100	5200	5300	5400	5500	5600
83	5700	5803	5905	6007	6107	6208	6307	6406	6505	6603
84	6700	6813	6925	7038	7150	7261	7372	7483	7595	7704
85	7814	7924	8034	8143	8252	8360	8469	8577	8685	8793
86	8900	9021	9141	9262	9383	9503	9621	9743	9864	9984
87	10100	10220	10340	10460	10580	10700	10820	10940	11060	11180
88	11300	11430	11560	11690	11820	11950	12080	12210	12340	12470
89	12600	12740	12880	13020	13160	13300	13440	13580	13720	13860
90	14000	14150	14300	14450	14590	14740	14890	15040	15190	15340
91	15490	15640	15790	15940	16090	16240	16390	16540	16700	16850
92	17000	17160	17320	17480	17640	17800	17960	18120	18280	18440
93	18600	18770	18930	19100	19270	19440	19610	19780	19950	20120
94	20290	20460	20630	20800	20970	21140	21310	21480	21650	21830
95	22000									

Table 7. Savannah River temperatures near Jackson, S.C., °C.

		Mean	Minimum	Maximum
January	mean	9.4	7.3	12.0
	range	6.0-12.5	4.5-10.5	8.5-14.5
February	mean	9.4	6.8	12.0
	range	6.5-12.5	4.5-10.5	8.5-14.5
March	mean	12.1	9.5	14.8
	range	9.0-13.5	6.0-12.5	12.0-16.5
April	mean	15.5	13.1	18.5
	range	14.0-17.0	12.5-14.0	16.5-21.0
May	mean	18.6	16.1	20.9
	range	18.0-20.5	14.0-18.5	18.5-22.5
June	mean	21.1	18.7	23.3
	range	19.0-22.5	17.0-21.5	21.5-24.5
July	mean	23.0	20.7	25.1
	range	22.5-23.5	19.0-21.5	24.5-26.0
August	mean	23.9	21.8	25.6
	range	23.5-24.5	21.0-23.0	25.0-26.0
September	mean	23.6	21.1	25.3
	range	23.0-24.5	19.5-22.5	24.5-26.0
October	mean	20.2	17.3	23.0
	range	19.5-21.0	15.5-18.0	22.0-24.0
November	mean	16.9	13.6	19.9
	range	15.0-18.5	11.5-17.0	16.5-21.5
December	mean	12.0	9.1	14.8
	range	9.0-13.0	7.5-10.0	10.5-17.5

Table 8. Clarks Hill Elevation and Capacity

Elevation above MSL, ft	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000
180	0	206	14	232	68
181	0.25	207	15.5	233	72
182	0.50	208	17	234	76
183	0.75	209	18.5	235	80
184	1.00	210	20	236	85
185	1.25	211	21.5	237	90
186	1.5	212	23	238	95
187	1.75	213	24.5	239	100
188	2.00	214	26	240	105
189	2.25	215	27.5	241	112
190	2.50	216	29	242	119
191	2.75	217	30.5	243	126
192	3.00	218	32	244	133
193	3.25	219	33.5	245	126
194	3.50	220	35	246	147
195	3.75	221	37.5	247	154
196	4.00	222	40	248	161
197	4.25	223	42.5	249	168
198	4.5	224	45.0	250	175
199	4.75	225	47.5	251	183
200	5.00	226	50	252	191
201	6.50	227	52.5	253	199
202	8.00	228	55	254	207
203	9.50	229	57.5	255	215
204	11	230	60	256	224
205	12	231	64	257	233

Table 8. (continued)

Elevation above MSL, ft	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000
258	242	284	597	310	1,374
259	251	285	615	311	1,420
260	260	286	638	312	1,465
261	270	287	661	313	1,510
262	280	288	684	314	1,555
263	290	289	707	315	1,600
264	300	290	730	316	1,652
265	310	291	755	317	1,704
266	322	292	780	318	1,756
267	334	293	805	319	1,808
268	346	294	830	320	1,860
269	358	295	855	321	1,920
270	370	296	884	322	1,980
271	384	297	913	323	2,040
272	398	298	942	324	2,100
273	412	299	971	325	2,160
274	426	300	1,000	326	2,230
275	440	301	1,034	327	2,300
276	457	302	1,068	328	2,370
277	474	303	1,102	329	2,440
278	491	304	1,136	330	2,510
279	508	305	1,170	331	2,588
280	525	306	1,211	332	2,666
281	543	307	1,252	333	2,744
282	561	308	1,293	334	2,822
283	579	309	1,334	335	2,900

Table 8. (continued)

Elevation above MSL, ft	Acre-ft x 1000
336	2,980
337	3,060
338	3,140
339	3,220
340	3,300
341	3,388
342	3,476
343	3,564
344	3,652
345	3,740
346	3,842
347	3,944
348	4,046
349	4,148

Table 9. Richard B. Russell Reservoir Elevation and Capacity

Elevation above MSL, ft	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000
320	0	346	3.97	372	21.2
321	.011	347	4.31	373	22.3
322	.033	348	4.66	374	23.6
323	.067	349	5.03	375	24.8
324	.111	350	5.42	376	26.2
325	.166	351	5.83	377	27.6
326	.231	352	6.26	378	29.0
327	.308	353	6.71	379	30.5
328	.395	354	7.19	380	32.1
329	.492	355	7.69	381	33.8
330	.601	356	8.22	382	35.5
331	.720	357	8.77	383	37.3
332	.850	358	9.35	384	39.2
333	.991	359	9.96	385	41.1
334	1.14	360	10.6	386	43.2
335	1.315	361	11.3	387	45.3
336	1.48	362	12.0	388	47.5
337	1.67	363	12.7	389	49.8
338	1.87	364	13.5	390	52.2
339	2.09	365	14.3	391	54.7
340	2.31	366	15.1	392	57.3
341	2.55	367	16.0	393	60.0
342	2.81	368	17.0	394	62.7
343	3.07	369	18.0	395	65.6
344	3.36	370	19.0	396	68.6
345	3.66	371	20.0	397	71.8

Table 9. (continued)

Elevation above MSL, ft	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000
398	75.0	423	205	448	477
399	78.4	424	213	449	492
400	81.9	425	221	450	507
401	85.5	426	229	451	523
402	89.2	427	237	452	539
403	93.1	428	246	453	555
404	97.1	429	255	454	572
405	101	430	264	455	590
406	106	431	273	456	607
407	110	432	283	457	625
408	115	433	293	458	644
409	119	434	303	459	662
410	124	435	313	460	682
411	129	436	324	461	702
412	135	437	335	462	722
413	140	438	346	463	742
414	146	439	358	464	763
415	152	440	370	465	785
416	158	441	382	466	806
417	164	442	395	467	829
418	170	443	408	468	852
419	177	444	421	469	876
420	183	445	434	470	899
421	190	446	448	471	924
422	198	447	462	472	949

Table 9. (continued)

Elevation above MSL, ft	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000
473	974	499	1830
474	1000	500	1871
475	1026	501	1913
476	1053	502	1955
477	1081	503	1999
478	1109		
479	1137		
480	1166		
481	1196		
482	1226		
483	1257		
484	1288		
485	1320		
486	1352		
487	1385		
488	1419		
489	1453		
490	1488		
491	1524		
492	1560		
493	1596		
494	1633		
495	1672		
496	1710		
497	1749		
498	1789		

Table 10. Hartwell Elevation and Capacity

Elevation above MSL, ft	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000	Elevation above MSL	Acre-ft x 1000
600	595	626	1162	652	2134
601	611	627	1191	653	2182
602	628	628	1220	654	2232
603	645	629	1249	655	2282
604	663	630	1280	656	2334
605	681	631	1311	657	2386
606	699	632	1342	658	2440
607	718	633	1374	659	2494
608	737	634	1407	660	2550
609	756	635	1441	661	2606
610	776	636	1475	662	2664
611	797	637	1510	663	2722
612	818	638	1546	664	2781
613	839	639	1583	665	2843
614	861	640	1620	666	2905
615	883	641	1658	667	2968
616	906	642	1697	668	3032
617	929	643	1737	669	3097
618	953	644	1777	670	3163
619	977	645	1819	671	3230
620	1002	646	1861	672	3299
621	1027	648	1948	673	3368
622	1054	649	1993	674	3439
623	1080	650	2039		
624	1107	651	2086		
625	1134				

Table 11. Savannah River miles from Savannah Harbor.

Location	Mile
Entrance to Savannah Harbor	0.0
Fort Pulaski - Pilot House, GA	0.8
Intracoastal Waterway Crossing, GA	5.0
South Channel Entrance, GA	10.1
Fort Jackson, GA	11.0
Downtown - Savannah, GA	14.2
Eugene Talmadge Bridge (Highway 17A)	15.0
Seaboard Airline RR Bridge	16.5
Union Camp, GA	16.6
U.S. Highway 17 (through Port Wentworth, GA)	21.4
McCoombs Cut, SC and Knoxboro Creek, GA	26.2
Seaboard Coastline RR Bridge	27.3
Port Wentworth Watter Supply Intake - Abercorn Creek, GA	29.0
Collins Creek, GA	29.9
Woods Landing, SC	33.6
Purysburg, SC	34.7
Beaufort-Jasper Water Supply Canal, SC	39.2
Ebenezer Landing, GA	44.7
Ebenezer Creek, GA	44.8
Seaboard Airline RR Bridge and USGS Gaging St., Clyo, GA	60.9
State Highway 119 (Garnett, SC - Clyo, GA)	61.5
Stokes Bluff Landing SC	64.2
Cedar Bluff Landing, GA	68.3
Buck Creek, GA	92.6
Brier Creek, GA	97.6
Cohen's Bluff Landing, SC	104.0
Swift Creek, GA	114.3
U.S. Highway 301: River #10[1] paddlewheel and PANS[2] Station AB — Diatom Traps #8 (118.7)[3] and #9 (118.6)[3]	118.7
River #9: Paddlewheel[1]	122.7
PANS Station #6: Diatom Traps #3 (122.8)[3] and #4 (133.6)[1]	123.0
Johnson's Landing, SC	124.3
Lower Three Runs Creek, SC	129.0
Stoney Bluff Landing, GA	132.9
Sweetwater Creek, GA	133.5
Little Hell Landing, SC	134.5

[1] GA side of river.

[2] Philadelphia Academy of Natural Science.

[3] SC side of river.

Table 11. (continued)

Location	Mile
PANS Station #5	135.6
River #8: Paddlewheel[1]	140.4
Steel Creek Landing, SC	141.4
Steel Creek, SC (SRP)	141.6
PANS Station #3	144.2
Griffin's Landing, GA	147.2
Four Mile Creek, SC (SRP)	150.4
Vogtle Plant, GA - outlet	150.7
- inlet	151.6
River #4: Paddlewheel[2]	
Hancock Landing, GA (Upper end of Vogtle site but not part of Property)	151.7
Beaver Dam Creek, SC (SRP)	152.1
681-5G (400-D) Pump House, SC (SRP)	155.2
681-3G Pump House, SC (SRP)	155.4
681-4G (CMX-TNX) Pumphouse, SC (SRP)	156.2
SRP Boat Dock and USGS Gaging Station[3], SC	156.8
681-1G Pump House (SRP)	157.1
Upper Three Runs, SC (SRP)	157.2
River #2: Paddlewheel[2]	158.5
PAN Station #1: Diatom Traps #1[2] and #2[1]	160.6
Pontoon Boat #1[1]	161.7
Shell Bluff Landing, GA	161.9
Jackson Boat Landing, SC	170.4
Silver Bluff Landing, SC	174.4
Hollow Creek, SC	176.0
Spirit Creek, GA (Continental Can Oxidation Pond)	182.8
Butler's Creek, GA (Augusta Sewage)	187.2
New Savannah Bluff Lock and Dam, GA	187.5
State Highway 28 - Sandbar Ferry Bridge	195.8
Horse Creek, SC	197.4
U.S. Highway 1	199.5
U.S. Highway 25	200.7
North Augusta Boat Landing, SC	201.9
Interstate 20	204.9

[1] GA side of river.

[2] SC side of river.

[3] Though located at the SRP boat dock, it is designated the "Savannah River, near Jackson, SC," Station.

Table 11. (continued)

Location	Mile
Augusta City Dam and Canal Entrance, GA	209.3
Stevens Creek Dam	210.3
Clarks Hill at Dam*	237.7
Hartwell Reservoir at Dam*	305.0

* These are official mileages listed in the USGS publication, but could be corrected for rechanneling of the river. The updating of the values to 1972 would require subtracting 16 miles from Clarks Hill and Hartwell Reservoir mileages. All other river miles are current as of 1972.

Figure 1. Annual Savannah River Flow Rate at Augusta, GA

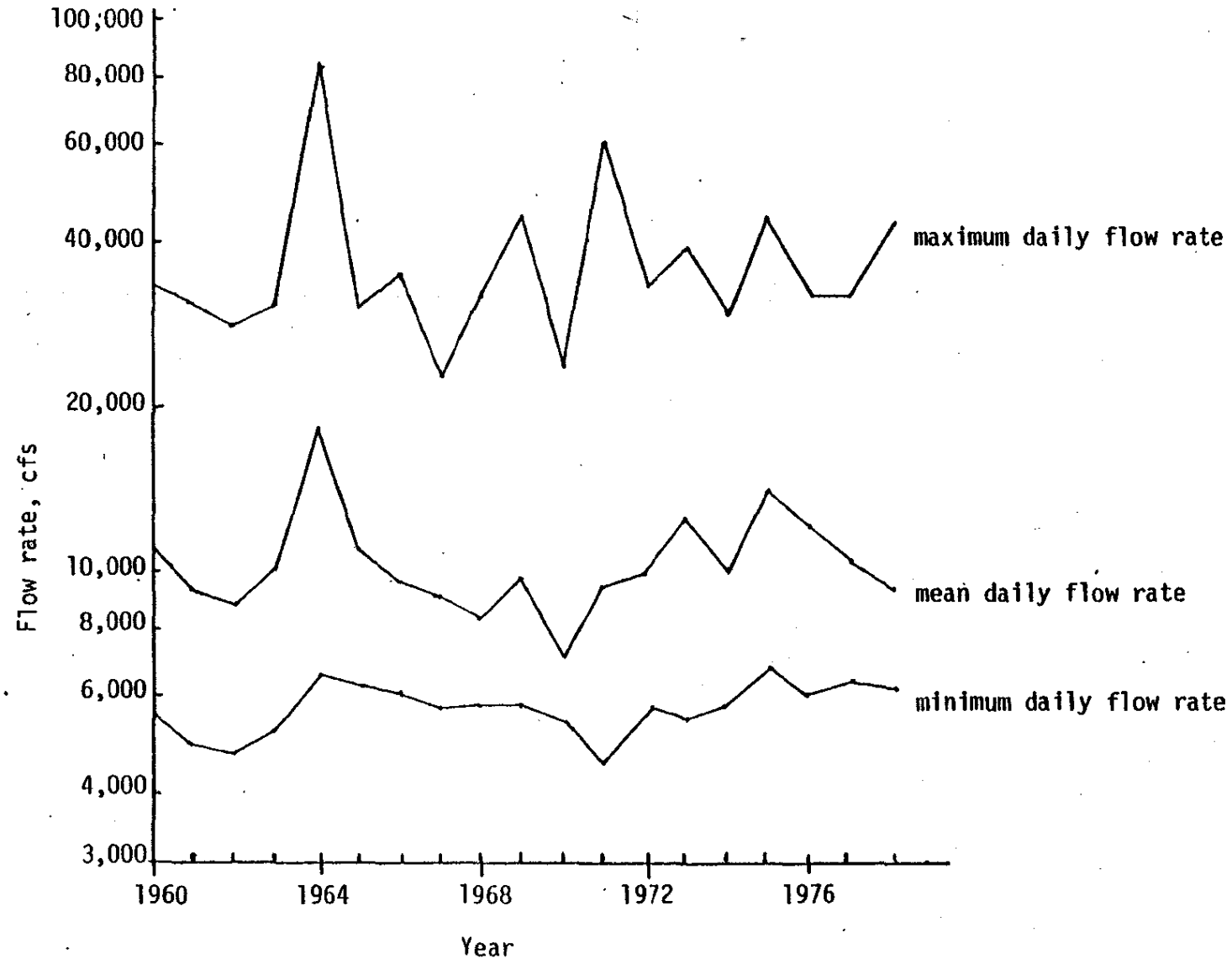

Figure 2. Recurrence Interval for 7-day Consecutive Flow

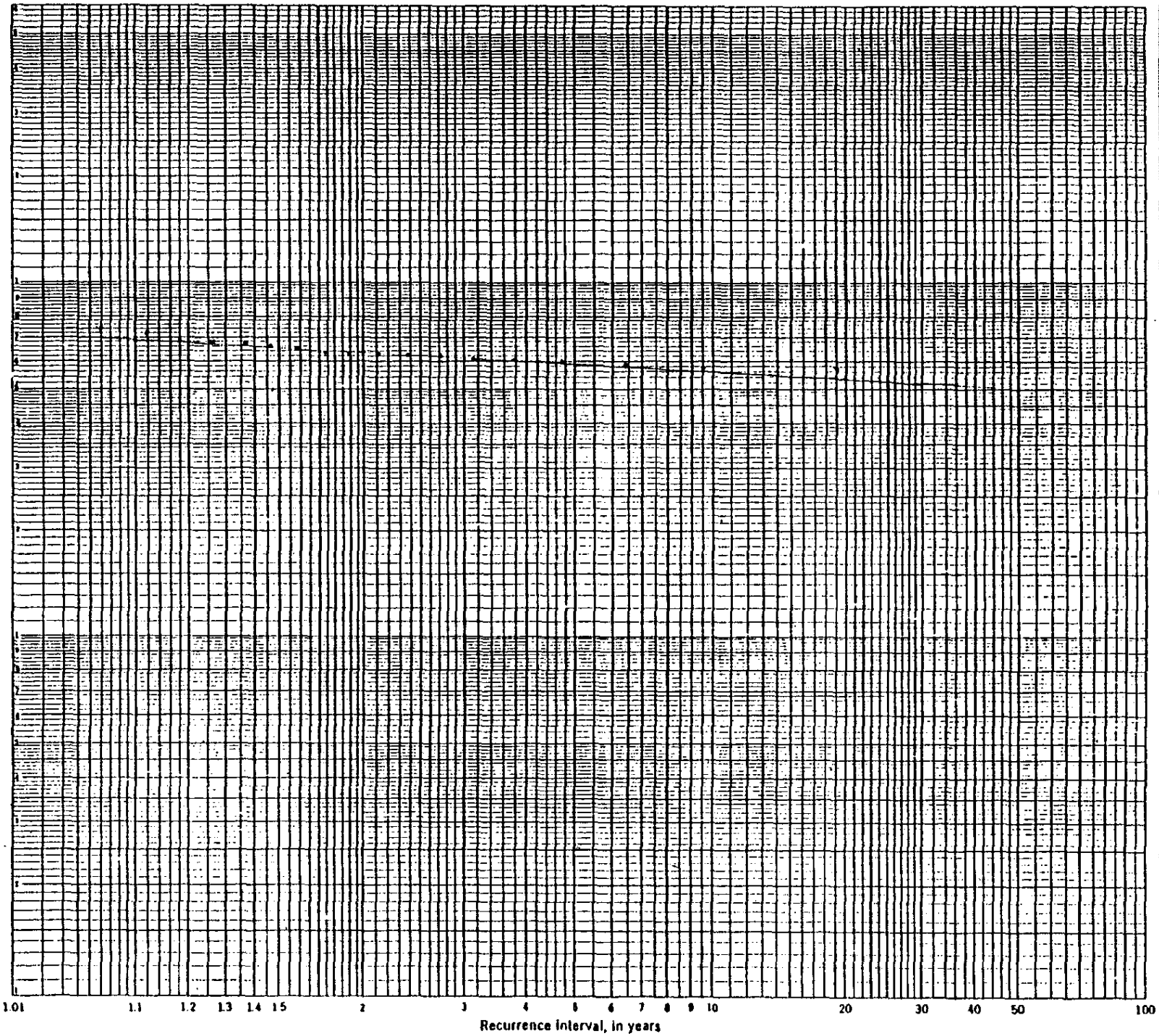

Figure 3. Savannah River Monthly Average of Daily Flow Rates at Augusta, GA

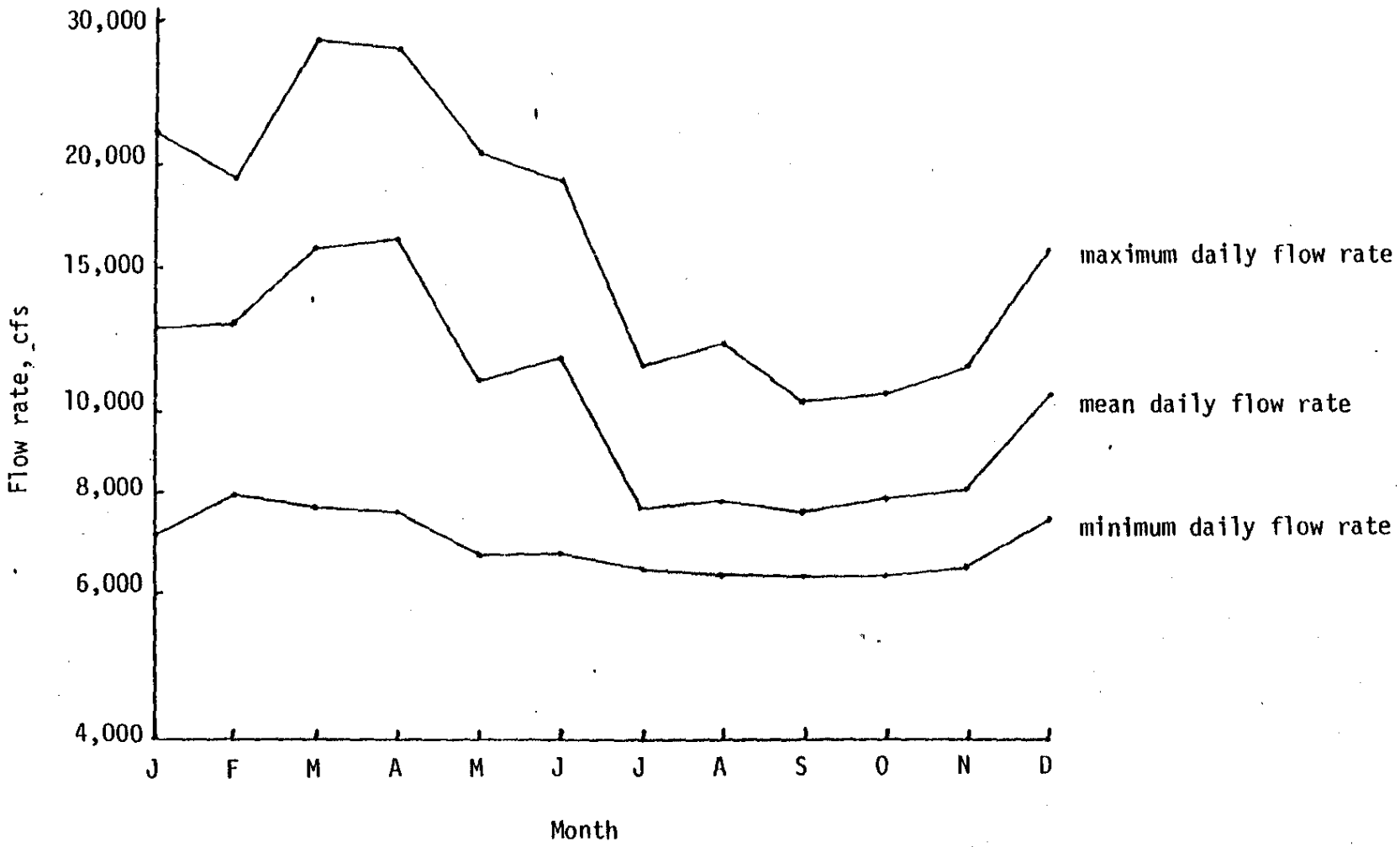

Figure 4. Savannah River Flow Rate versus Gauge Height at Augusta, GA

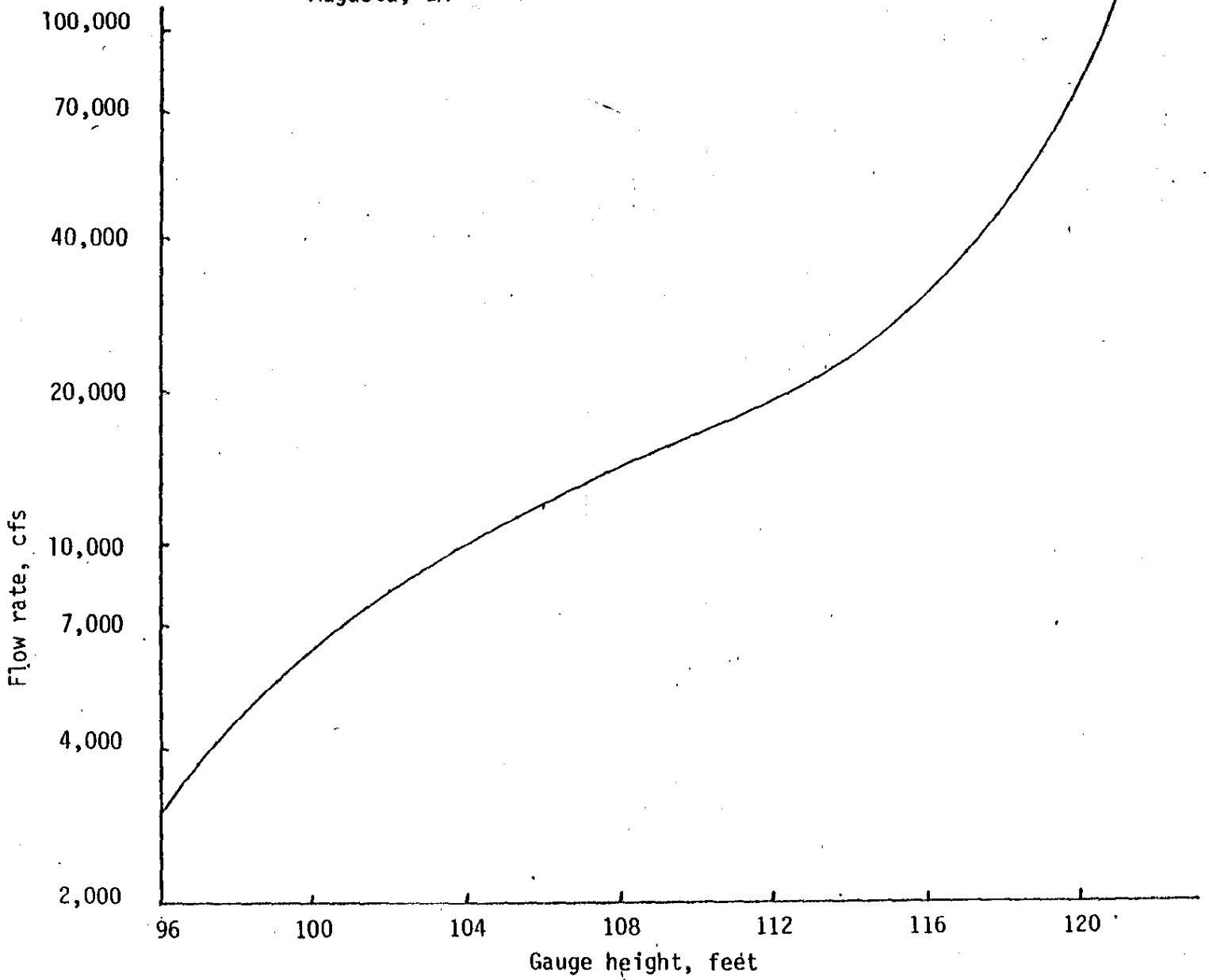

Figure 5. Savannah River Flow Rate versus Gauge Height at Jackson, SC

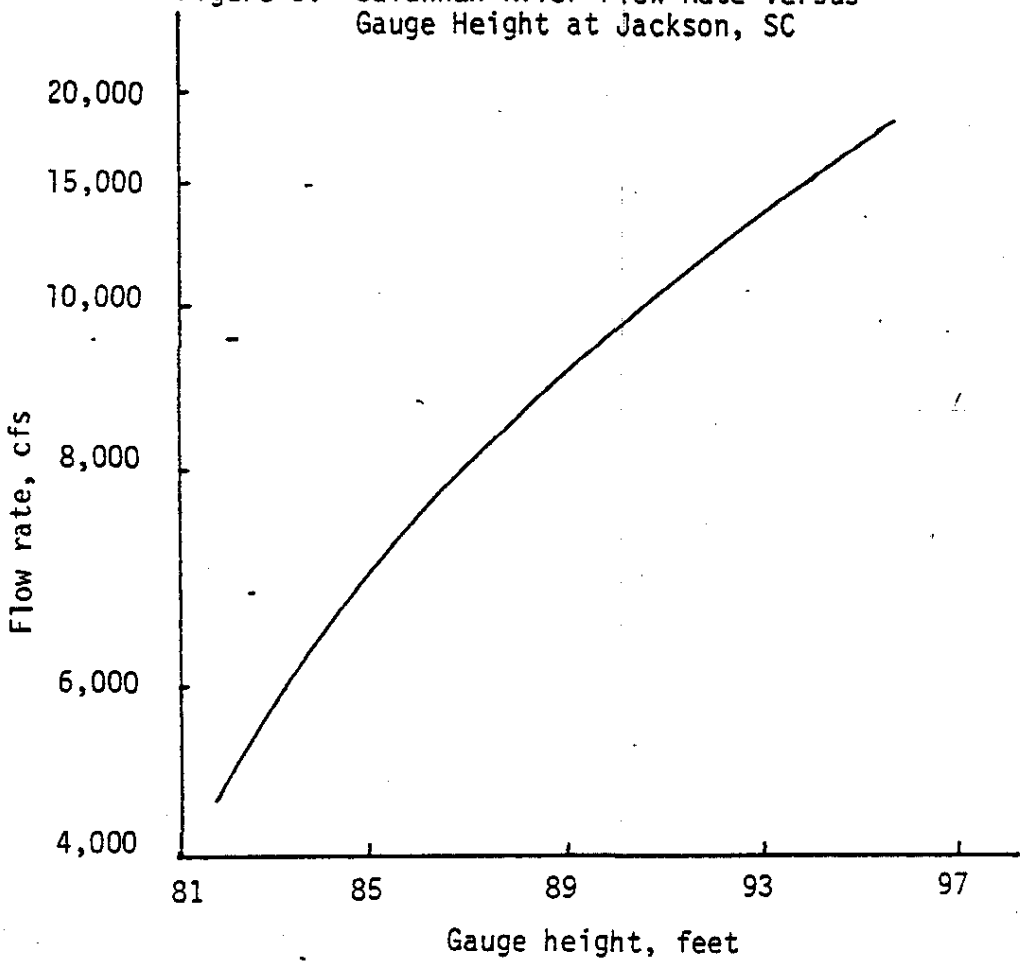

Figure 6. Monthly Savannah River Temperature Ranges at Jackson, SC

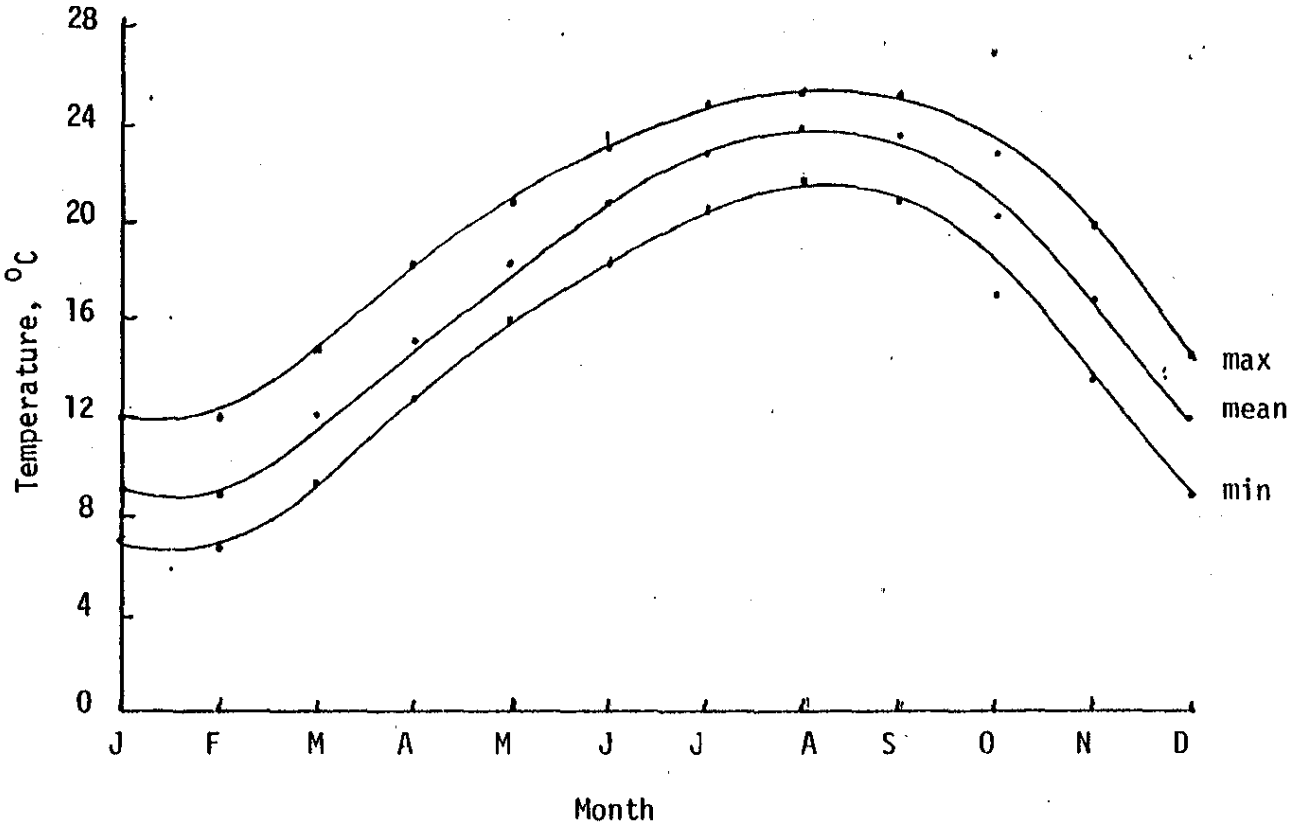

Figure 7. Clarks Hill Reservoir Elevation and Capacity

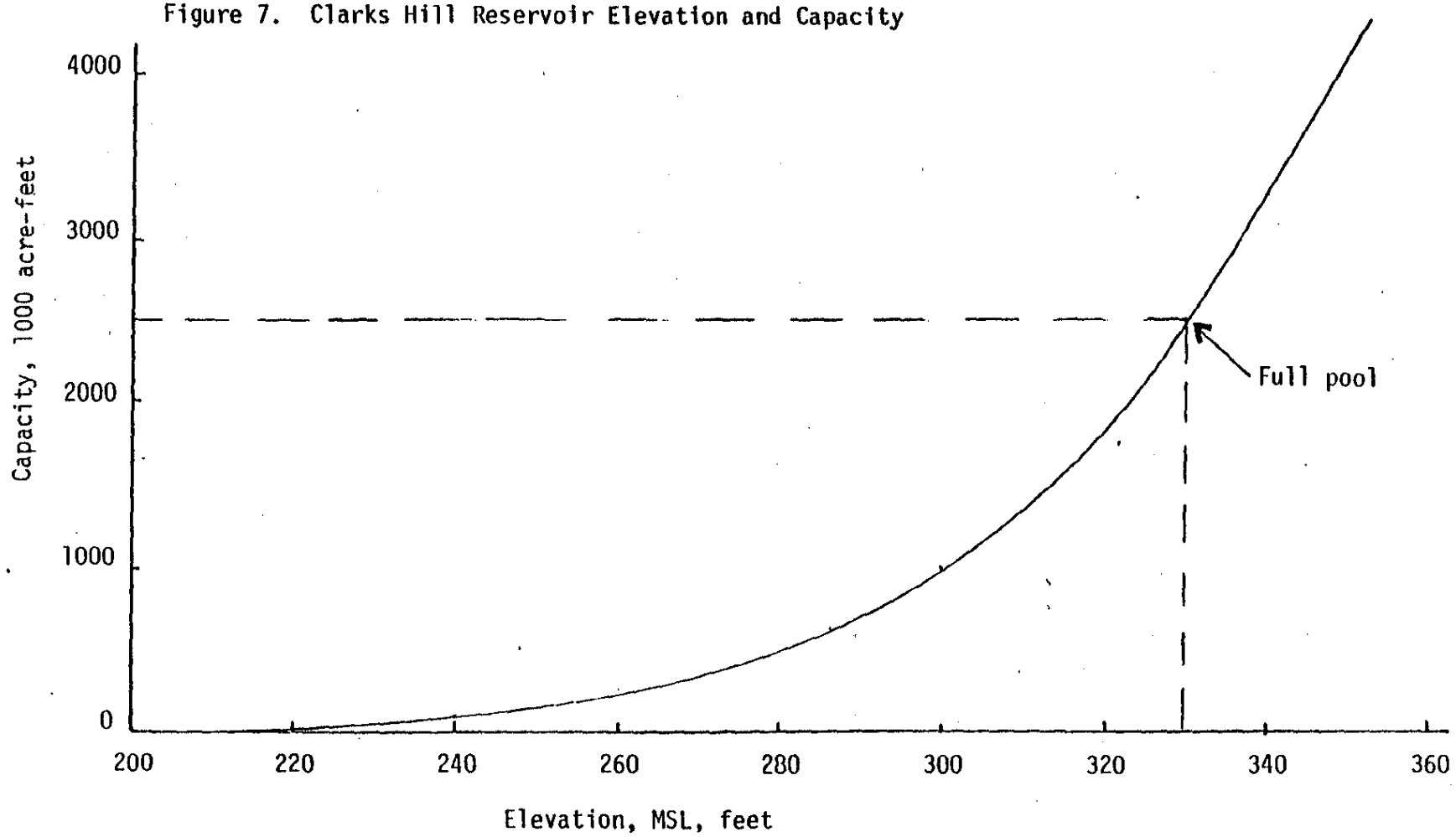

Figure 8. Russell Reservoir Elevation and Capacity