Memorandum

To: *SCDNR*

From: *CDM Smith*

Date: *June 27, 2023*

Subject: *2023 Savannah SWAM Model Updates*

1.0 Introduction and Overview

The Savannah Basin baseline water quantity model was updated to incorporate newly available water use and return data and to extend the baseline hydrologic period of the model. Model updates included recalculating baseline 10-year average water demands (2012 to 2021) for all water users, adding new water users, removing water users with inactive registrations, and extending the baseline simulation period from January 2014 through December 2021. Extending the baseline simulation period required using recent USGS streamflow gage data, combined with water use and return data and area transposition methods, to "unimpair" flow records and generate unimpaired model headwater boundary condition flows. Updated downstream flow records were then used to validate model hydrologic parameterization.

The result of this work is an updated model with more recent representation of water demands in the basin and a larger range of hydrologic variability captured by the simulation period. Previously calibrated hydrologic parameters throughout the basin were validated with comparisons of modeled and gaged flows for the simulation extension period.

The Savannah Basin baseline water quantity model was also updated to incorporate recent enhancements to SWAM, the most significant being the addition of a scenario planning module.

2.0 Model Object Changes

Table 1 (all tables and figures are included in **Attachment A**) lists the explicit tributaries and the gages and reference gages used for computing headwater flows. **Table 2** lists the implicit tributaries and their reference gages used for confluence flows. Since the unimpaired flow (UIF) timeseries for 2014 to 2021 from the Georgia EPD dataset planning nodes BELL and MILLHAVN were not available, the Bell and MILLHAVN UIF timeseries were extended using SAV17 and SAV21, respectively, as reference gages. For the Savannah River Basin, implicit tributaries were used to estimate Georgia-side confluence flows. **Table 3** lists all tributary objects, their confluence location, drainage area, headwater area, drainage area ratio and subbasin flow factors. **Table 4** lists the reservoir inputs. **Table 5** lists the reservoir area-capacity relationship for all reservoirs. **Table 6** summarizes advanced reservoir operating rules. The reservoir area-capacity relationships and the

operating rules remain the same as in the original model. The evaporation time series were updated for each reservoir through 2021.

New water users represent those that are newly registered or have just recently surpassed the minimum water use threshold for inclusion in the model of 3 million gallons per month (MGM). Several new water users were added to the model, and several inactive users/intakes were removed. The updates model framework is shown in **Figure 1**. The water user objects added, removed, or had some sort of operations change are listed below.

Objects Added

- GA: Effingham

Objects Removed

- IN: MT Vernon Mills
- WS: Mohawk
- IR: Youmans Farm
- IR: Shirley Farm

Objects Altered

- IN: Allnex (name changed, previously called IN: Cytec)
- WS: Walhalla (added new withdraw source and discharge location, removed old withdraw and discharge)
- WS: Abbeville (added new discharge)
- PT: SC Rainey Station (added new discharge)
- IN: Milliken (added new discharge)
- IN: Owens Materials (discharge object, added new discharge)
- IN: US DOE (added new discharge)

Water demands associated with the new users were quantified based on the South Carolina Department of Health and Environmental Control (SCDHEC) reported water use and discharge databases. **Table 7** lists the surface water user objects included in the model and their sources of supply. Water demands are specified in the baseline model as monthly mean values for all water user objects.

3.0 Baseline Period Extension

The baseline simulation period was extended by eight years, through 2021. For the extension, model boundary condition (headwater) flows were developed for the additional eight years, on

both a monthly and daily timestep. As done for the original model development, unimpaired gaged flow data were used to estimate flows at ungaged model input locations. The unimpairment process exactly followed the process detailed elsewhere (CDM Smith, 2016) whereby unimpaired flows were calculated by adding in all known upstream consumptive water withdrawals and subtracting out upstream discharges from a downstream USGS gaged flow record. The statistical methods employed, and the assignment of reference gages, are described elsewhere (CDM Smith, 2016).

The USGS gages serve as key reference points for ungaged flow estimates at model input points. Area transposition methods, based on ratios of drainage areas, were used to estimate monthly and daily flows for the period extension, for key model headwater input locations. Again, the assignment of reference gages for this exercise matched that employed during the original model development.

In addition to extending model flow inputs, water demand estimates were updated to more accurately reflect current conditions. New baseline water demand, discharge and consumptive use estimates for the 10-year period 2012 through 2021 were developed using the SCDHEC reported water use and discharge data. These calculations were consistent with methodologies employed for the original baseline model development (CDM Smith, 2017). Updated mean monthly water demands and discharge parameters were entered into the model for all water user objects. The updated baseline water demands are provided in **Table 8** for industrial (IN), mining (MI), power/thermal (PT) and water supply (WS) users and in **Table 9** for agriculture (IR) and golf course (GC) users. Model return (discharge) locations and transbasin imports are listed in **Table 10**. Updated consumptive use percentages are provided in **Table 11**.

4.0 Model Validation

Existing model hydrologic parameters throughout the basin were validated using data associated with the extended simulation period. Comparison of modeled and gaged flow for the extension period (2014 to 2021) returned satisfactory results for basin gages used in the initial calibration and verification, thereby validating previous calibration work. Model validation results for the extension period that were generated using the updated baseline model are provided in **Attachment B**. Graphs depict the comparison of mean monthly and daily model simulated flows versus reported gage flows in cubic feet per second.

5.0 References

CDM Smith, 2016. Technical Memorandum –Unimpaired Flow Development Savannah River Basin, South Carolina.

CDM Smith, 2017. Technical Memorandum - Unimpaired Flow Dataset for the Savannah River Basin.

CDM Smith, 2017. South Carolina Surface Water Quantity Models – Savannah River Basin Model.

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Attachment A

Figure and Tables

Table 1. Gages and Reference Gages Used for Headwater Flows on Explicit Tributaries

	Headwater Input			USGS Reference Gage (Unimpaired)		
Project ID	**Type**	**USGS Number**	**SWAM Tributary**	**Project Gage ID**	**USGS Number**	**Stream**
SAV205	Ungaged		Chauga River	SAV00	02177000	Chattooga River
SAV200	Ungaged		Mainstem			
SAV204	Ungaged		Little River - Lake Keowee	SAV04	02185200	Little River
SAV207	Ungaged		Golden Creek	SAV06	02186000	Twelvemile Creek
SAV206	Ungaged		Twelvemile Creek			
SAV300	Ungaged		Lake Jocassee Local Inflow			
SAV302	Ungaged		Lake Keowee Local Inflow			
SAV304	Ungaged		Lake Hartwell Local Inflow			
SAV208	Ungaged		Coneross Creek	SAV08	02186645	Coneross Creek
SAV211	Ungaged		Six and Twenty Creek	SAV09	02186699	Eighteenmile Creek
SAV210	Ungaged		Three and Twenty Creek			
SAV209	Ungaged		Eighteenmile Creek			
SAV216	Ungaged		Beaver Creek	SAV14	02187910	Rocky River
SAV215	Ungaged		Big Generostee Creek			
SAV214	Ungaged		Rocky River			
SAV222	Ungaged		Sawney Creek	SAV17	02192500	Little River
SAV220	Ungaged		Long Cane Creek			
SAV219	Ungaged		Park Creek			
SAV217	Ungaged		Little River - Savannah River			
SAV306	Ungaged		Lake Russell Local Inflow			
SAV224	Ungaged		Beaverdam Creek	SAV21	02196000	Stevens Creek
SAV223	Ungaged		Turkey Creek			
SAV221	Ungaged		Hard Labor Creek			
SAV308	Ungaged		Lake Thurmond Local Inflow			
SAV228	Ungaged		Horse Creek	SAV28	02196690	Horse Creek
SAV229	Ungaged		Hollow Creek	SAV31	02197300	Upper Three Runs
SAV240	Ungaged		Lower Three Runs	SAV32	021973005	Tinker Creek
SAV00	Gaged	02177000	Tugaloo River	-	-	-
SAV01	Gaged	02184475	Howard Creek	-	-	-
SAV22	Gaged	02196250	Horn Creek	-	-	-
SAV27	Gaged	02196689	Little Horse Creek	-	-	-
SAV31	Gaged	02197300	Upper Three Runs	-	-	-
SAV32	Gaged	021973005	Tinker Creek	-	-	-

Table 2. Reference Gages Used for Confluence Flows on GA-Side Tributaries

	Ungaged Basin	USGS Reference Gage (Unimpaired)		
Project ID	**SWAM Tributary**	**Project Gage ID**	**USGS Number**	**Stream**
SAV402	Beaverdam Creek	BELL	02192000	Broad River
SAV404	Broad River			
SAV416	Brier Creek	MILLHAVN	02198000	Brier Creek
SAV408	Kiokee Creek			
SAV412	Spirit Creek			
SAV410	Uchee Creek			
SAV414	McBean Creek			
SAV406	Little River			

Table 3. Model Tributary Inputs

SWAM Tributary Object	Tributary Type	Confluence Stream	Confluence Location (mile)	Area (ac)	Headwater ID	End Mile	Original Drainage Ratio	Subbasin Flow Factor (unitless)
Savannah River (Mainstem)	Explicit	None	None	7,042,300	SAV200	24.0	-	0*
						65.0	-	0*
						94.0	-	0*
						131.5	-	0*
						500	-	0.1*
Beaver Creek	Explicit	Rocky River	16	10,814	SAV216	9.1	10.0	10.0
Beaverdam Creek	Explicit	Turkey Creek	17.2	27,939	SAV224	20.9	4.6	4.6
Big Generostee Creek	Explicit	Mainstem	67.2	53,042	SAV215	18.9	13.6	13.6
Chauga River	Explicit	Tugaloo River	26.1	32,623	SAV205	10	2.0	2.0
				70,760		31.4	4.3	4.3
Coneross Creek	Explicit	Mainstem	44.3	41,844	SAV208	9.8	4.9	4.9
				68,113		29.8	8.0	8.0
Eighteenmile Creek	Explicit	Mainstem	47.4	22,162	SAV209	8.6	4.5	4.5
				29,942		13.2	6.1	6.1
				38,105		25.8	7.8	7.8
Golden Creek	Explicit	Twelvemile Creek	13.9	10,243	SAV207	10	14.4	14.4
Hartwell Local Inflow	Explicit	Mainstem	64	88,568	SAV304	1	1.0	0.6
Hollow Creek	Explicit		176.2	71,317	SAV229	18.3	230.5	230.5
Horn Creek	Explicit	Stevens Creek	54.4	50,201	SAV22	19.1	5.6	5.6
Horse Creek	Explicit	Mainstem	1628.4	57,265	SAV228	11.4	13.1	13.1
				103,423		25	23.7	20.0
Howard Creek	Explicit	Mainstem	9.6	32,279	SAV01	9.7	43.5	43.5
Jocassee Local Inflow	Explicit	Mainstem	9	46,026	SAV300	1	1.0	1.0
Keowee Local Inflow	Explicit	Mainstem	23	72,101	SAV302	1	1.0	1.0
Little Horse Creek	Explicit	Horse Creek	15	29,515	SAV27	13.3	1.7	1.7
Little River - Lake Keowee	Explicit	Mainstem	23.8	46,176	SAV204	11.5	25.4	25.4
				104,996		20.2	57.8	57.8
Little River - Savannah River	Explicit	Mainstem	115	137,319	SAV217	25.6	4.3	4.3
				207,196		37.2	6.4	6.4
				382,813		61.7	7.4	7.4
Long Cane Creek	Explicit	Mainstem	45.4	146,017	SAV220	42.9	8.6	8.6
Lower Three Runs	Explicit	Mainstem	220.9	110,829	SAV240	27.9	20.3	20.3
Park Creek	Explicit	Little River - Savannah River	7.2	13,515	SAV219	11.9	7.0	7.0
Rocky River	Explicit	Mainstem	88.2	71,148	SAV214	15.6	3.3	3.3
				125,326		28.4	5.4	5.4
				178,188		50	7.8	7.8
Russell Local Inflow	Explicit	Mainstem	93	147,973	SAV306	1	1.0	1.0
Sawney Creek	Explicit	Little River - Savannah River	27.3	8,231	SAV222	8.2	14.1	14.1
Six and Twenty Creek	Explicit	Three and Twenty Creek	20.8	19,129	SAV211	9.5	9.7	9.7
				44,441		22.5	22.6	22.6
Stevens Creek	Explicit	Mainstem	144.4	159,302	SAV221	38.8	87.0	87.0
				473,486		65.7	116.1	116.1

Table 3. Model Tributary Inputs (continued)

SWAM Tributary Object	Tributary Type	Confluence Stream	Confluence Location (mile)	Area (ac)	Headwater ID	End Mile	Original Drainage Ratio	Subbasin Flow Factor (unitless)
Three and Twenty Creek	Explicit	Six and Twenty Creek	57.4	29,763	SAV210	7.2	1.8	1.8
				59,029		20.7	3.5	3.5
				105,751		31.1	3.7	3.7
Thurmond Local Inflow	Explicit	Mainstem	131	231,887	SAV308	1	1.0	1.0
Tinker Creek	Explicit	Upper Three Runs	5.1	33,657	SAV32	15	3.6	3.6
Tugaloo River	Explicit	Mainstem	56.9	178,677	SAV00	9.9	1.4	1.1
				453,959		26	3.2	1.5
				633,290		86.7	4.3	2.3
Turkey Creek	Explicit	Stevens Creek	38.8	182,705	SAV223	37.5	6.4	6.4
Twelvemile Creek	Explicit	Mainstem	35.5	66,661	SAV206	11.5	5.6	5.6
				98,972		32.9	7.4	7.4
Upper Three Runs	Explicit	Mainstem	193.1	122,486	SAV31	10.1	1.6	1.1
				157,568		29.1	2.2	2.0
Beaverdam Creek (GA)	GA-Side	Mainstem	89	78,843	SAV402	1	1.0	1.0
Brier Creek (GA)	GA-Side	Mainstem	249.5	543,037	SAV416	1	1.0	1.0
Broad River (GA)	GA-Side	Mainstem	99.5	961,919	SAV404	1	1.0	1.0
Kiokee Creek (GA)	GA-Side	Mainstem	135.3	70,936	SAV408	1	1.0	1.0
Little River (GA)	GA-Side	Mainstem	128.5	491,353	SAV406	1	1.0	1.0
McBean Creek (GA)	GA-Side	Mainstem	186.3	55,103	SAV414	1	1.0	1.0
Spirit Creek (GA)	GA-Side	Mainstem	169.6	66,999	SAV412	1	1.0	1.0
Uchee Creek (GA)	GA-Side	Mainstem	137.8	41,250	SAV410	1	1.0	1.0

**On the Mainstem, these are referred to as "gain/loss factors", not "subbasin flow factors".*

Table 4. Reservoir Inputs

Reservoir	Purpose	Receiving Stream	Temperature Station for Evaporation	Evaporation Station	Precipitation Station	Release Location (mi)	Storage Capacity (MG)	Dead Pool (MG)	Operating Rules
Bad Creek Reservoir	Power	Howard Creek	Clemson USC00381770	Clemson USC00381770	Salem 5 Nine USC00387589/ Walhalla USC00388887	0.2	11,578 (2316')	0	Advanced
Lake Jocassee	Power, recreation, and water supply	Mainstem	Clemson USC00381770	Clemson USC00381770	Salem 5 Nine USC00387589/ Walhalla USC00388887	10.8	406,368 (1115')	0	Advanced
Lake Keowee	Power, recreation, and water supply	Mainstem	Clemson USC00381770	Clemson USC00381770	Salem 5 Nine USC00387589/ Walhalla USC00388887	24	312,578 (805')	0	Advanced
Lake Tugaloo	Power and recreation	Tugaloo River	Clemson USC00381770	Clemson USC00381770	Long Creek USC00385278/ Walhalla USC00388887	10	5,865 (892')	0	Simple
Lake Yonah	Power and recreation	Tugaloo River	Clemson USC00381770	Clemson USC00381770	Long Creek USC00385278/ Walhalla USC00388887	13	2,085 (744')	0	Advanced
Lake Hartwell	Power, recreation, and water supply	Mainstem	Clemson USC00381770	Clemson USC00381770	Clemson Univ USC00381770	65	1,237,597 (679')	369,548 (625')	Advanced
Lake Secession	Power, recreation, and water supply	Rocky River	Calhoun Falls USC00381277	Clark Hills USC00381726	Anderson USC00380165	28.4	6,308 (548')	0	Simple
Lake Russell	Power, recreation, flood control, and water supply	Mainstem	Calhoun Falls USC00381277	Clark Hills USC00381727	Calhoun Falls USC00381277	94	542,478 (495')	293,064 (470')	Advanced
Lake Thurmond	Power, recreation, flood control, and water supply	Mainstem	Calhoun Falls USC00381277	Clark Hills USC00381728	Calhoun Falls USC00381277	131.5	1,343,920 (351')	477,372 (312')	Advanced

Note: For all reservoirs, the "Simple" area-capacity relationship table was used.

Table 5. Reservoir Area-Capacity Relationship

Reservoir	Volume (MG)	Area (Acres)
Bad Creek Reservoir	0	0
	1,008	50
	1,880	70
	3,077	109
	5,340	181
	6,862	225
	8,677	271
	11,578	346
Lake Jocassee	10	11
	5,391	660
	18,815	1,426
	60,026	2,871
	104,499	3,951
	162,655	4,986
	275,528	6,538
	319,793	7,038
	406,368	8,138
Lake Keowee	0	1
	1,275	542
	9,465	2,020
	28,483	3,879
	42,898	4,989
	84,115	7,750
	111,974	9,382
	145,418	11,165
	184,870	13,057
	230,575	15,025
	312,578	19,465
Lake Hartwell	0	0
	146,633	10,000
	369,548	27,650
	416,959	30,500
	469,487	34,000
	527,782	37,500
	592,593	41,750
	664,444	46,000
	743,723	50,975
	830,791	55,940
	962,298	61,400
	1,237,597	77,813

Reservoir	Volume (MG)	Area (Acres)
Lake Russell	0	0
	114,048	8,000
	173,861	10,000
	255,733	20,000
	293,064	23,380
	334,403	25,653
	379,997	29,340
	389,648	30,555
	394,541	30,739
	421,792	31,770
	483,538	35,150
	542,478	39,451
Lake Thurmond	0	0
	146,633	15,000
	356,004	36,200
	381,246	39,000
	462,709	43,750
	521,362	49,500
	606,084	57,000
	703,839	64,250
	817,887	70,250
	944,969	78,500
	1,007,533	85,570
	1,343,920	111,065
Lake Tugaloo	0	0
	5,865	300
Lake Yonah	0	0
	2,085	200
Lake Secession	0	0
	6,308	880

Table 6. Advanced Reservoir Rules for the Baseline Model

Reservoir	Priority	Type	Target	Months	Conditioned On:	Description
Dummy Fed Storage	1	Storage Curve (MG)	1,983,081	Jan 1 - Apr 1	None	Representative object which tracks 100% usable storage values seasonally for Russell, Thurmond, and Hartwell.
			1,983,081	Apr 2 - Oct 15	None	
			1,821,524	Oct 16 - Dec 15	None	
			1,821,524	Dec 16 - Dec 31	None	
Bad Creek Reservoir	1	Storage Curve (MG)	1,205 (2157')	Jan - Dec	Lake Keowee Storage >231,630 (90')	Storage targets set so that % usable storage mirrors that in Lake Keowee (i.e., reservoir fluctuations follow Keowee fluctuations).
			1,599 (2170')	Jan - Dec	Lake Keowee Storage >233,738 (90.5')	
			1,993 (2183')	Jan - Dec	Lake Keowee Storage >235,847 (91')	
			2,486 (2185')	Jan - Dec	Lake Keowee Storage >238,483 (91.5')	
			3,471 (2217')	Jan - Dec	Lake Keowee Storage >243,754 (92.5')	
			4456 (2234')	Jan - Dec	Lake Keowee Storage >249,025 (93.5')	
			5,441 (2251')	Jan - Dec	Lake Keowee Storage >254,297 (94.5')	
			6,426 (2264')	Jan - Dec	Lake Keowee Storage >259,568 (95.5')	
			7,411 (2276')	Jan - Dec	Lake Keowee Storage >264,840 (96.5')	
			8,396 (2287')	Jan - Dec	Lake Keowee Storage >270,111 (97.5')	
			9,381 (2296')	Jan - Dec	Lake Keowee Storage >275,382 (98.5')	
			10,366 (2305')	Jan - Dec	Lake Keowee Storage >280,654 (99.5')	
Lake Jocassee	1	Minimum Release (cfs)	47	Jan - Dec	USACE Res. Storage <0.65*	If USACE Res. usable storage is < 12%, then release replacement water for hydro seepage and leakage.
	2	Storage Curve (MG)	338,154 (78')	Jan - Dec	USACE Res. Storage <0.7*	Low storage value. Storage target set so that % storage equals USACE Res. % storage.
	3	Storage Curve (MG)	374,876 (93')	Jan - Dec	USACE Res. Storage <0.9*	Medium storage value. Storage target set so that % storage equals USACE Res. % storage.
			367,531 (90')	Jan - Dec	USACE Res. Storage <0.86*	
			360,187 (87')	Jan - Dec	USACE Res. Storage <0.82*	
			352,843 (84')	Jan - Dec	USACE Res. Storage <0.78*	
			345,498 (81')	Jan - Dec	USACE Res. Storage <0.74*	
	4	Storage Curve (MG)	389,564 (99')	Jan - Dec	USACE Res. Storage <2*	High storage value. Storage target set so that % storage equals USACE Res. % storage.
			385,892 (97')	Jan - Dec	USACE Res. Storage <0.98*	
			382,220 996')	Jan - Dec	USACE Res. Storage <0.94*	
			378,548 (94')	Jan - Dec	USACE Res. Storage <0.92*	
Lake Keowee	1	Minimum Release (cfs)	47	Jan - Dec	USACE Res. Storage <0.65*	If USACE Res. usable storage is < 12%, then release replacement water for hydro seepage and leakage.
	2	Storage Curve (MG)	243,754 (92.5')	Jan - Dec	USACE Res. Storage <0.7*	Low storage value. Storage target set so that % storage equals USACE Res. % storage.
	3	Storage Curve (MG)	270,111 (97.5')	Jan - Dec	USACE Res. Storage <0.9*	Medium storage value. Storage target set so that % storage equals USACE Res. % storage.
			264,840 (96.5')	Jan - Dec	USACE Res. Storage <0.86*	
			259,568 (95.5')	Jan - Dec	USACE Res. Storage <0.82*	
			254,297 (94.5')	Jan - Dec	USACE Res. Storage <0.78*	
			249,025 (93.5')	Jan - Dec	USACE Res. Storage <0.74*	
	4	Storage Curve (MG)	283,289 (100')	Jan - Dec	USACE Res. Storage <2*	High storage value. Storage target set so that % storage equals USACE Res. % storage.
			280,654 (99.5')	Jan - Dec	USACE Res. Storage <0.98*	
			275,382 (99')	Jan - Dec	USACE Res. Storage <0.94*	
			272,747 (98')	Jan - Dec	USACE Res. Storage <0.92*	
Lake Hartwell	1	Minimum Release (cfs)	2,000	Jan - Dec	Ratio of Hartwell & Thurmond and day of week	Matching Thurmond fluctuations through reservoir releases, triggered by relative comparison of Hartwell vs. Thurmond storage. If Hartwell is greater than 90% of Thurmond storage, release to maintain storage balance. Release target and moving trigger factor adjusted as part of model validation process. For monthly model only.
	2	Storage Curve (MG)	369,548 (625')	Jan - Dec	Thurmond Storage <477,372 (312') and day of week	Matching Thurmond fluctuations during time of drought. First 15 feet of drawdown, matching Thurmond foot for foot. Then based on %usable storage. Also, on weekends don't release anything. Subject to max release of 20,000 cfs. For daily timestep only.
			1,237,597 (679')	Jan - Dec	Day of week	
	3	Storage Curve (MG)	634,824 (648')	Apr 2 - Oct 15	Thurmond Storage <572,195 (318') & day of week	Matching Thurmond fluctuations during time of drought. First 15 feet of drawdown, matching Thurmond foot for foot. Then based on %usable storage. Subject to max release of 20,000 cfs. For daily timestep only.
			540,196 (641')	Oct 16 - Dec 15	Thurmond Storage <506,699 (314') & day of week	
			540,196 (641')	Dec 16 - Dec 31	Thurmond Storage <506,699 (314') & day of week	
			634,824 (648')	Jan 1 - Apr 1	Thurmond Storage <572,195 (318') & day of week	
			606,377 (646')	Apr 2 - Oct 15	Thurmond Storage <538,307 (316') & day of week	
			369,548 (625')	Oct 16 - Dec 15	Thurmond Storage <477,372 (312') & day of week	
			369,548 (625')	Dec 16 - Dec 31	Thurmond Storage <477,372 (312') & day of week	
			606,377 (646')	Jan 1 - Apr 1	Thurmond Storage <538,307 (316') & day of week	
			407,086 (629')	Apr 2 - Oct 15	Thurmond Storage <506,699 (314') & day of week	
			369,548 (625')	Oct 16 - Dec 15	Thurmond Storage <477,372 (312') & day of week	
			369,548 (625')	Dec 16 - Dec 31	Thurmond Storage <477,372 (312') & day of week	
			407,086 (629')	Jan 1 - Apr 1	Thurmond Storage <506,699 (314') & day of week	

Table 6. Advanced Reservoir Rules for the Baseline Model (continued)

Reservoir	Priority	Type	Target	Months	Conditioned On:	Description
Lake Hartwell (continued)	4	Storage Curve (MG)	727,235 (654')	Apr 2 - Oct 15	Thurmond Storage <684,288 (324') & day of week	Matching Thurmond fluctuations during time of drought. First 15 feet of drawdown, matching Thurmond foot for foot. Then based on %usable storage. Subject to max release of 20,000 cfs. For daily timestep only.
			664,444 (650')	Oct 16 - Dec 15	Thurmond Storage <606,084 (320') & day of week	
			664,444 (650')	Dec 16 - Dec 31	Thurmond Storage <606,084 (320') & day of week	
			727,235 (654')	Jan 1 - Apr 1	Thurmond Storage <684,288 (324') & day of week	
			695,237 (652')	Apr 2 - Oct 15	Thurmond Storage <645,186 (322') & day of week	
			634,824 (648')	Oct 16 - Dec 15	Thurmond Storage <572,195 (318') & day of week	
			634,824 (648')	Dec 16 - Dec 31	Thurmond Storage <572,195 (318') & day of week	
			695,237 (652')	Jan 1 - Apr 1	Thurmond Storage <645,186 (322') & day of week	
			664,444 (650')	Apr 2 - Oct 15	Thurmond Storage <606,084 (320') & day of week	
			606,377 (646')	Oct 16 - Dec 15	Thurmond Storage <538,307 (316') & day of week	
			606,377 (646')	Dec 16 - Dec 31	Thurmond Storage <538,307 (316') & day of week	
			664,444 (650')	Jan 1 - Apr 1	Thurmond Storage <606,084 (320') & day of week	
	5	Storage Curve (MG)	830,791 (660')	Apr 2 - Oct 15	None	Normal operating guide curve. Plus conditional drawdown rules based on drawdown at Thurmond. Matching Thurmond fluctuations during time of drought. First 15 feet of drawdown, matching Thurmond foot for foot. Then based on %usable storage. Subject to max release of 20,000 cfs. For daily timestep only.
			760,472 (656')	Oct 16 - Dec 15	None	
			760,472 (656')	Dec 16 - Dec 31	None	
			830,791 (660')	Jan 1 - Apr 1	None	
			794,980 (658')	Apr 2 - Oct 15	Thurmond Storage <772,268 (328') & day of week	
			727,235 (654')	Oct 16 - Dec 15	Thurmond Storage <684,288 (324') & day of week	
			727,235 (654')	Dec 16 - Dec 31	Thurmond Storage <684,288 (324') & day of week	
			794,980 (658')	Jan 1 - Apr 1	Thurmond Storage <772,268 (328') & day of week	
			760,472 (656')	Apr 2 - Oct 15	Thurmond Storage <726,649 (326') & day of week	
			695,237 (652')	Oct 16 - Dec 15	Thurmond Storage <645,186 (322') & day of week	
			695,237 (652')	Dec 16 - Dec 31	Thurmond Storage <645,186 (322') & day of week	
			760,472 (656')	Jan 1 - Apr 1	Thurmond Storage <726,649 (326') & day of week	
Lake Russell	1	Minimum Release (cfs)	4,200	Jan - Dec	Thurmond Storage <477,372 (312')	Depletes Russell Storage and replenishes Thurmond storage, when Thurmond drops below Level 4.
	2	Storage Curve (MG)	334,403 (475')	Jan - Dec	None	Normal operating storage curve
Lake Thurmond	1	Minimum Release (cfs)	3,100	Nov 1 - Jan 31	Thurmond Storage >477,372 (312')	Minimum releases during Level 3 & 4 drought conditions. First row = Level 3 & 4, early winter, drought conditions. Second row = Level 3, rest of year, drought conditions. Third row = Level 4, rest of year, drought condition.
			3,800	Feb 1 - Oct 31	Thurmond Storage >477,372 (312')	
			3,600	Feb 1 - Oct 31	Thurmond Storage >0	
	2	Minimum Release (cfs)	4,200	Apr 2 - Oct 15	Thurm. Storage >726,649 (326') & BR28=0	Minimum releases during drought conditions. First 4 rows = normal operations. Second 4 rows = Level 1 + <BR28 drought condition. Third 3 rows = Level 2 drought condition.
			4,200	Oct 16 - Dec 15	Thurm. Storage >684,288 (324') & BR28=0	
			4,200	Dec 16 - Dec 31	Thurm. Storage >684,288 (324') & BR28=0	
			4,200	Jan 1 - Apr 1	Thurm. Storage >726,649 (326') & BR28=0	
			4,000	Apr 2 - Oct 15	Thurm. Storage >684,288 (324') & BR28=1	
			4,000	Oct 16 - Dec 15	Thurm. Storage >645,186 (322') & BR28=1	
			4,000	Dec 16 - Dec 31	Thurm. Storage >645,186 (322') & BR28=1	
			4,000	Jan 1 - Apr 1	Thurm. Storage >684,288 (324') & BR28=1	
			4,000	Feb 1 - Oct 31	Thurm. Storage >538,307 (316') & BR28=0	
			3,800	Feb 1 - Oct 31	Thurm. Storage >538,307 (316') & BR28=1	
			3,600	Nov 1 - Jan 31	Thurmond Storage >538,307 (316')	
	3	Storage Curve (MG)	817,887 (330')	Apr 2 - Oct 15	None	Normal operating storage curve, subject to max release of 30,000 cfs.
			726,649 (326')	Oct 16 - Dec 15	None	
			726,649 (326')	Dec 16 - Dec 31	None	
			817,887 (330')	Jan 1 - Apr 1	None	

* Moving trigger of fraction of total usable storage, represented by Dummy Fed storage object

Table 7. Water User Objects and Sources of Supply Included in the Savannah River Basin Model

Model Object ID	Facility Name	Source of Supply	Intake ID	Diversion Location (mi)	Permit Limit (MGM)	Note
WS: Abbeville	City of Abbeville	Lake Russell/Mainstem	01WS002S01	94.0	315	1
GC: Woodside	Woodside Plantation	Hollow Creek	02GC007S01	1.1	94	1
			02GC007S02		94	
GC: River Golf Club	River Golf Club - North Augusta	Mainstem	02GC008S01	152.6	30	1
GC: Sage Valley	Sage Valley Golf Club	Horse Creek	02GC012S01	4.6	NA	1
GC: The Reserve	The Reserve Club	Hollow Creek	02GC052S01	1.6	12	1
			02GC052S02		10	
IN: Kimberly-Clark	Kimberly-Clark Beech Island Mill	Mainstem	02IN003S01	157.1	1,607	1
IN: Allnex	Allnex Industries - Langley Plant	Horse Creek	02IN008S01	11.4	147	1
IN: US DOE	US DOE - Savannah River Site	Mainstem	02IN010S01	195.0	3,285	1
			02IN010S02		10,950	
			02IN010S03		10,950	
IR: Mason's Master Turf	Mason's Master Turf	Mainstem	02IR014S01	156.2	15	1,2
PT: SCE&G Urquhart Station	SCE&G Urquhart Station	Mainstem	02PT001S01	157.2	6,600	1
WS: Breezy Hill	Breezy Hill WTP	Little Horse Creek	02WS005S01	4.9	1,674	1
WS: North Augusta	City of North Augusta WTP	Mainstem	02WS007S01	150.4	583	1
			02WS007S02		1,302	
WS: Graniteville	Graniteville Water Treatment Facility	Horse Creek	02WS029S01	7.1	620	1
	WG Development LLC	Horse Creek	02WS030S01	3.5	122	1
MI: Hanson Aggregates	Hanson Aggregates - Anderson Facility	Beaver Creek	04MI002S01	3.1	29	1
PT: SC Rainey Station	Santee Cooper Rainey Generating Station	Mainstem	04PT002S01	68.0	509	1
IN: ARJWS	South Anderson Water Supply Intake	Lake Hartwell/Mainstem	04IN051S01	65.0	806	1
WS: ARJWS	Anderson Regional JWS	Lake Hartwell/Mainstem	04WS006S01	65.0	NA	1
WS: BJW&SA	Beaufort Jasper Water & Sewer Authority	Mainstem	07WS005S01	308.8	4,836	1
IR: WG Smith	WG Smith III	Turkey Creek	19IR012S01	5.4	8	1,2
IR: Gurosik Farm	Gurosik Farm	Stevens Creek	19IR055S01	56.9	23	1,2
			19IR055S02		2	1,2
			19IR055S03		13	1,2
			19IR055S04		18	1,2
WS: ECW&SA	Edgefield County W&S Authority	Mainstem	19WS001S01	144.9	698	1
GC: Keowee Falls	Cliffs Club At Keowee Falls	Lake Keowee/Mainstem	23GC015S01	24.0	30	1
WS: Greenville	Greenville Water System Adkins Treatment Plant	Lake Keowee/Mainstem	23WS007S01	24.0	4,650	1
GC: Hickory Knob	Hickory Knob State Park	Lake Thurmond/Mainstem	35GC002S01	131.5	NA	1

Note 1 indicates the withdrawal is currently active, and was included in both the baseline and calibration model.

Note 2 indicates registered limit for irrigation.

Note 3 indicates a GA-Side object of aggregated GA water use

Table 7. Water User Objects and Sources of Supply Included in the Savannah River Basin Model (continued)

Model Object ID	Facility Name	Source of Supply	Intake ID	Diversion Location (mi)	Permit Limit (MGM)	Note
GC: Savannah Lakes	Savannah Lakes Village POA	Lake Thurmond/Mainstem	35GC003S01	131.5	54	1
			35GC003S02		54	1
WS: McCormick	McCormick Water Treatment Plant	Lake Thurmond/Mainstem	35WS001S01	131.5	89	1
GC: Keowee Key	Keowee Key Golf Club	Lake Keowee/Mainstem	37GC001S01	24.0	45	1
IR: Holcombe Farm	Holcombe Farm	Little River - Lake Keowee	37IR005S01	1.5	10	1,2
IR: Head Lee Nursery	Head Lee Nursery	Coneross Creek	37IR011S02	7.5	282	1,2
IR: Calyx Farm	Calyx Farm	Little River - Lake Keowee	37IR058S01	11.0	29	1,2
PN: Oconee	Oconee Nuclear Station	Lake Keowee/Mainstem	37PN001S01	24.0	94,817	1
			37PN001S02		68	1
WS: Pioneer	Pioneer Rural Water - WTP	Lake Hartwell/Mainstem	37WS001S01	65.0	233	1
WS: Walhalla	City of Walhalla WTP	Lake Keowee/Mainstem	37WS009S01	24.0	203	1
WS: Westminster	City of Westminster WTP	Chauga River	37WS003S01	18.7	124	1
WS: Seneca	City of Seneca WTP	Lake Keowee/Mainstem	37WS004S01	24.0	930	1
GC: Keowee Springs	Cliffs Club At Keowee Springs	Lake Keowee/Mainstem	39GC007S01	24.0	17	1
GC: Walker	Walker Course at Clemson University	Lake Hartwell/Mainstem	39GC008S01	65.0	36	1
			39GC008S02		12	1
GC: Keowee Vineyards	Cliffs Club At Keowee Vineyards	Lake Keowee/Mainstem	39GC009S01	24.0	-	1
GC: Reserve at Keowee	The Reserve At Lake Keowee	Lake Keowee/Mainstem	39GC010S01	24.0	62	1
IN: Vulcan	Vulcan Contruction Materials	Golden Creek	39IN007S01	2.1	63	1
IN: Milliken	Milliken Pendleton Plant	Eighteenmile Creek	39IN008S01	13.3	78	1
IN: Clemson Energy	Clemson University Central Energy Plant	Lake Hartwell/Mainstem	39IN010S01	65.0	563	1
IN: Shaw	Shaw Industries Group	Twelvemile Creek	39IN013S01	17.2	103	1
WS: Easley Central WD	Easley Central Water District	Twelvemile Creek	39WS003S01	15.3	93	1
WS: Pickens	City of Pickens WTP	Twelvemile Creek	39WS005S01	0.1	159	1
			39WS005S02		60	1
GA: Brier Creek Use	Multiple	Brier Creek	Multiple	0.5	289	1,3
GA: Broad River Use	Multiple	Broad River	Multiple	0.5	205	1,3
GA: Tugaloo-Hartwell Use	Multiple	Lake Yonah/Tugaloo River	Multiple	13	304	1,3
		Lake Hartwell/Mainstem	Multiple	65	213	1,3
		Tugaloo River	Multiple	26	608	1,3
GA: Augusta Use	Multiple	Mainstem	Multiple	165	3934	1,3
GA: S. Augusta Use	International Paper Corporation - Augusta Mill	Mainstem	121-0191-02	169	2189	1,3
GA: Plant Vogtle	Georgia Power Co - Plant Vogtle	Mainstem	017-0191-05	199	2584	1,3
GA: Russell Use	Multiple	Lake Russell/Mainstem	Multiple	94	164	1,3
GA: Thurmond Use	Multiple	Lake Thurmond/Mainstem	Multiple	131.5	482	1,3
GA: Effingham Use	Multiple	Mainstem	Multiple	304.4	165	1,3

Note 1 indicates the withdrawal is currently active, and was included in both the baseline and calibration model.

Note 2 indicates registered limit for irrigation.

Note 3 indicates a GA-Side object of aggregated GA water use

Table 8. Baseline Model Average Monthly Demand for IN, MI, PT, PN, and WS Water Users

Baseline Model Average Monthly Demand (MGD)													
Water User	**Permit Limit (MGD)**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
WS: Abbeville	10.4	2.0	1.9	1.9	1.9	2.1	2.2	2.2	2.2	2.2	2.1	2.0	1.9
IN: Kimberly-Clark	52.9	8.2	8.2	8.8	8.0	9.0	8.8	9.4	9.1	9.6	9.1	9.3	9.4
IN: Allnex	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN: US DOE	828.5	9.9	9.9	9.8	9.8	9.7	9.9	9.7	9.8	9.8	9.7	9.9	9.8
PT: SCE&G Urquhart Station	217.1	152.9	132.1	114.1	134.1	142.0	192.2	214.7	219.5	180.0	138.8	124.3	125.4
WS: Breezy Hill	55.1	0.7	0.7	0.8	1.1	1.6	1.7	1.8	1.7	1.6	1.3	0.9	0.7
WS: North Augusta	62.0	2.7	2.8	2.7	3.6	4.6	5.0	4.9	4.6	4.7	3.9	3.2	2.7
WS: Graniteville	24.4	8.8	8.7	8.6	8.5	8.3	8.8	8.7	7.7	7.3	7.2	7.9	7.8
MI: Hanson Aggregates	1.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2
PT: SC Rainey Station	16.7	1.5	1.7	1.6	1.6	2.0	2.5	2.7	2.7	2.4	2.3	1.8	1.7
IN: ARJWS	26.5	5.2	5.0	5.2	5.1	4.9	4.7	4.9	5.1	5.5	5.4	5.3	5.3
WS: ARJWS	NA	16.4	16.6	16.5	17.7	19.0	20.4	21.1	20.6	20.4	19.0	17.2	16.0
WS: BJW&SA	159.1	22.5	22.7	22.1	25.4	31.2	32.1	33.0	32.2	30.9	29.0	26.2	23.1
WS: ECW&SA	22.9	3.6	3.5	3.9	4.6	5.2	5.5	5.5	5.2	4.9	4.4	4.1	3.6
WS: Greenville	153.0	20.4	18.7	19.4	21.2	21.8	25.9	27.4	26.9	26.6	25.2	22.5	21.5
WS: McCormick	2.9	0.9	0.8	0.9	1.0	1.1	1.1	1.2	1.1	1.1	1.0	0.9	0.9
PN: Oconee	3121.2	2393.8	2137.7	2075.2	2264.4	2486.3	2799.5	3046.6	3065.0	3060.5	2805.2	2318.0	2596.1
WS: Pioneer	7.6	1.5	1.6	1.5	1.6	2.0	1.6	0.7	0.9	2.1	1.9	1.8	1.8
WS: Walhalla	6.7	1.7	1.9	1.8	1.8	1.9	2.1	2.3	2.2	2.3	2.2	2.2	2.1
WS: Westminster	4.1	1.7	1.6	1.6	1.7	1.8	1.9	2.0	1.8	1.7	1.7	1.6	1.6
WS: Seneca	30.6	6.0	5.8	5.6	6.0	6.8	7.5	8.0	7.7	7.4	6.7	6.2	5.7
IN: Vulcan	2.1	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.1	0.3	0.1	0.1	0.1
IN: Milliken	2.6	1.3	1.3	1.3	1.3	1.3	1.3	1.1	1.2	1.2	1.3	1.2	1.1
IN: Clemson Energy	18.5	0.0	0.2	0.2	0.9	1.1	2.8	3.8	3.4	2.7	0.5	0.0	0.1
IN: Shaw	3.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
WS: Easley	0.0	1.1	1.1	1.1	1.1	1.2	1.3	1.3	1.3	1.4	1.3	1.2	1.1
WS: Pickens	7.2	1.4	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.4	1.3	1.3
IN: Clariant	NA	1.9	1.9	1.8	1.6	1.9	1.8	1.9	1.9	1.8	1.9	1.8	1.7
GA: Brier Creek Use	9.5	4.1	3.8	3.9	3.3	3.2	3.1	3.4	3.6	3.4	3.4	3.3	3.7
GA: Broad River Use	6.7	2.9	2.9	2.9	3.0	3.2	3.3	3.4	3.3	3.3	3.1	3.0	2.9
GA: Tugaloo-Hartwell Use	37.0	10.5	10.4	10.6	10.6	12.0	12.5	12.5	12.7	12.4	11.0	11.0	11.1
GA: Augusta Use	129.4	47.2	47.2	49.8	55.3	63.0	65.1	66.9	63.1	61.4	57.5	52.8	48.9
GA: S. Augusta Use	72.0	48.0	47.8	46.4	46.9	46.8	47.4	48.6	49.5	49.1	45.7	46.7	47.2
GA: Plant Vogtle	85.0	43.0	43.6	43.1	43.5	43.2	43.2	43.9	44.1	43.8	43.2	43.3	43.1
GA: Russell Use	5.4	1.4	1.5	1.5	1.5	1.5	1.6	1.5	1.6	1.5	1.5	1.4	1.3
GA: Thurmond Use	15.9	5.3	5.2	5.3	5.6	6.2	6.3	6.6	6.5	6.3	5.9	5.2	5.4
GA: Effingham Use	165.0	20.3	20.1	18.5	19.3	18.9	21.0	21.2	21.2	20.2	20.9	19.6	19.9

Permit limits shown in MGD rather than MGM for comparative purposes. Actual permit limits are in MGM.

Table 9. Baseline Model Average Monthly Demand for GC and IR Water Users

Baseline Model Average Monthly Demand (MGD)												
Water User	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
IR: Mason's Master Turf	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01
IR: WG Smith	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IR: Gurosik Farm	0.02	0.06	0.20	0.22	0.15	0.11	0.04	0.04	0.04	0.20	0.04	0.02
IR: Holcombe Farm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IR: Head Lee Nursery	0.03	0.04	0.07	0.11	0.12	0.17	0.16	0.16	0.14	0.12	0.09	0.04
IR: Calyx Farm	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00
GC: Woodside	0.00	0.01	0.04	0.16	0.29	0.28	0.34	0.31	0.23	0.17	0.05	0.01
GC: River Golf Club	0.00	0.01	0.03	0.06	0.08	0.09	0.11	0.07	0.08	0.07	0.03	0.00
GC: Sage Valley	0.01	0.02	0.12	0.20	0.34	0.25	0.30	0.24	0.23	0.17	0.05	0.01
GC: The Reserve	0.03	0.06	0.09	0.20	0.46	0.50	0.50	0.42	0.40	0.31	0.09	0.02
GC: Keowee Falls	0.01	0.03	0.06	0.17	0.18	0.27	0.29	0.20	0.22	0.10	0.09	0.03
GC: Hickory Knob	0.00	0.00	0.01	0.03	0.12	0.14	0.16	0.13	0.12	0.07	0.02	0.00
GC: Savannah Lakes	0.00	0.01	0.03	0.10	0.19	0.22	0.24	0.22	0.26	0.10	0.02	0.01
GC: Keowee Key	0.00	0.00	0.01	0.05	0.09	0.12	0.12	0.10	0.09	0.05	0.02	0.00
GC: Keowee Springs	0.01	0.02	0.05	0.07	0.15	0.16	0.19	0.12	0.16	0.08	0.03	0.00
GC: Walker	0.00	0.01	0.03	0.07	0.23	0.25	0.27	0.22	0.21	0.09	0.03	0.01
GC: Keowee Vineyards	0.00	0.01	0.01	0.05	0.11	0.13	0.14	0.12	0.14	0.08	0.03	0.00
GC: Reserve at Keowee	0.01	0.09	0.11	0.19	0.26	0.33	0.33	0.33	0.28	0.10	0.04	0.01

Table 10. Returns and Associated Model Objects

Model Object ID	Facility Name	NPDES Pipe ID	Associated Water Permit	Discharge Tributary	Model River Mile	% of Return Flow
Returns Represented Within Water User Objects						
WS: Abbeville	Sage Auto Interiors/Abbeville Plant	SC0000353-001, T1M	01WS002	Long Cane Creek	15.3	75
	Abbeville/Long Cane Creek	SC0040614-001				
	Calhoun Falls, Town Of	SC0025721-001		Sawney Creek	0.1	25
IN: Kimberly-Clark	Kimberly-Clark/Beech Island	SC0000582-001	02IN003	Mainstem	158.8	100
IN: Allnex	Allnex Industries Inc	SC0039730-001	02IN008	Horse Creek	11.5	100
IN: US DOE	US DOE/Savannah River Site	SC0000175-A01, A11, A1A, H02, M05	02IN010	Upper Three Runs	10.0	17.2
	US DOE/Savannah River Site	SC0000175-TH1, TH2		Upper Three Runs	10.7	7.3
	Ameresco SRS Biomass Cogeneration Facility	SC0049107-G05				
	US DOE/Savannah River Site	SC0000175-X08		Mainstem	195.8	0.5
	US DOE/SRS/D-Area Powerhouse	SC0047431-01D, D06, 01C, D01				
	US DOE/Savannah River Site	SC0000175-F08, H12, K18, L07		Mainstem	200.0	75
PT: SCE&G Urquhart Station	SCE&G/Urquhart Steam Station	SC0000574	02PT001	Mainstem	157.3	100
IN: ARJWS	First Quality Tissue SE LLC	SC0049115-001	04IN051	Big Generostee Creek	5.2	100
MI: Hanson Aggregates	Hanson Aggregates-Anderson Facility	SCG730222	04MI002	Beaver Creek	3.2	100
PT: Santee Cooper - Rainey	SCPSA/John Rainey Gen Station	SC0048135-001, 01A	04PT002	Mainstem	68.1	100
WS: ARJWS	Clemson/Cochran Road WWTP	SC0020010-001	04WS006	Twelvemile Creek	21.4	8.3
	Pickens CO PSC/Central-North	SC0024996-001				
	Anderson/Generostee Creek	SC0023752-001		Big Generostee Creek	4.1	37.2
	Anderson/Rocky River	SC0023744-001		Rocky River	7.6	39.1
	Clemson University WWTF	SC0034843-001		Mainstem	37.7	5.4
	Pendleton-Clemson Reg. WWTF	SC0035700-001		Eighteenmile Creek	14.8	10
WS: BJW&SA	BJW&SA/Hardeeville Church Road	SC0034584-001	07WS005	Mainstem	314	57
	BJW&SA/Cherry Point WWTP	SC0047279				
	BJW&SA/Port Royal Wtr Recl Fac	SC0048348-001		**Out of Basin (Salkehatchie)**	**1000**	43
	US Marine Corps Air Station	SC0000825-001				
WS: North Augusta/ WS: Breezy Hill/ WS: ECW&SA	Aiken PSA/Horse Creek WWTF	SC0024457-001	02WS007/ 02WS005/ 19WS001	Mainstem	155.6	100/ 100/ 60.1
WS: ECW&SA	ECW&SA/Brooks Street WWTP	SC0025330-001	19WS001	Beaverdam Creek	0.2	17.7
	ECW&SA/Johnston #1 Plant	SC0025691-001		**Out of Basin (Edisto)**	**1001**	22.2
WS: Greenville	Witty Adkins WTP	SCG646049	23WS007	Mainstem	21.9	7
	ReWa/Mauldin Road	SC0041211-001		**Out of Basin (Saluda/Broad)**	**1002**	93
	ReWa/Lower Reedy River Plant	SC0002461-001				
	ReWa/Georges Creek	SC0047309-001				
	ReWa/Durbin Creek	SC0040002-001				
	ReWa/Gilder Creek	SC0040525-001				
	ReWa/Pelham WWTF	SC0033804-001				

Table 10. Returns and Associated Model Objects (continued)

Model Object ID	Facility Name	NPDES Pipe ID	Associated Water Permit	Discharge Tributary	Model River Mile	% of Return Flow
WS: McCormick	Town of McCormick WTP	SCG646029	35WS001	Stevens Creek	27	100
	McCormick/Rocky Creek WWTF	SC0030783-001				
PN: Oconee	Duke Energy/Oconee Nuclear	SC0000515	37PN001	Little River-Lake Keowee	19.6	100
WS: Pioneer	Lake Hartwell WTP	SCG646068	37WS001	Tugaloo River	44.5	100
WS: Walhalla	City of Walhalla - Lake Keowee WTP	SCG646084	37WS009	Coneross Creek	7.7	2
WS: Walhalla/ WS: Seneca/ WS: Westminster	Oconee CO/Coneross Creek WWTF	SC0033553-001	37WS009/ 37WS004/ 37WS003	Coneross Creek	9.8	98/ 100/ 100
IN: Vulcan	Vulcan Materials Liberty Quarry	SCG730065	39IN007	Golden Creek	2.8	100
IN: Milliken	Milliken/Pendleton Plant	SC0000477-001, T1M	39IN008	Eighteenmile Creek	13.4	100
IN: Clemson Energy	Clemson Univ/Central Energy	SC0022004-001	39IN010	Mainstem	36.9	100
IN: Shaw	Shaw Industries Group/Clemson	SC0000302	39IN013	Twelvemile Creek	17.8	100
WS: Pickens	Pickens/12 Mile Rv & Wolf Crk	SC0047716-001	39WS005	Twelvemile Creek	5.1	100
IN: Clariant	Clariant Corp/Martin Plant	SC0042803	03IN001G	Mainstem	224.0	100
Transbasin Imports Represented by Discharge Objects						
Aiken/Newberry/ SCWSA Import	Aiken PSA/Horse Creek WWTF	SC0024457-001	02WS002	Mainstem	155.9	-
			36WS001			-
			41WS003			-
Belton Honea Import	Due West WWTF	SC0022403-001	04WS005	Park Creek	0.2	-
Greenwood Import	Greenwood/West Alexander WWTF	SC0022870-001	24WS001	Stevens Creek	0.2	-
Easley Import	Easley/Golden Creek Lagoon	SC0023035-001	39WS001	Golden Creek	0.4	-
In-basin Returns Represented by Individual or Aggregated Discharge Objects						
Pickens Roper	Pickens CO-Liberty/Roper	SC0026191-001	-	Twelvemile Creek	5.2	-
Pickens Middle	Pickens CO/Middle Reg. WWTF	SC0047856-001	-	Eighteenmile Creek	10.2	-
Pickens Eighteen	Pickens CO/Eighteen Mile Crk	SC0042994-001	-	Eighteenmile Creek	2.1	-
Owens Materials	Owens Corning Composite Materials/Anderson	SC0000400-001, 002	-	Beaver Creek	0.1	-
WP Prop Clemson	WP Prop Clemson/Clemson Fin Pl	SC0000591-001	-	Mainstem	40.0	-
Key Utility	Keowee Key Utility Systems Inc	SC0022322-001	-	Mainstem	17.0	-
Michelin	Michelin N America/Sandy Sprgs	SC0026701-001	-	Three and Twenty Creek	13.1	-
SC Minerals	SC Minerals Inc/N Augusta Mine	SC0027529-001	-	Horse Creek	16.4	-
Allendale	Allendale WWTF	SC0039918-001	-	Mainstem	231.0	-
US Army	US Army/J Strom Thurmond PWRPL	SC0047317-001	-	Mainstem	131.6	-

Note: Returns outside of the Savannah River Basin are indicated in ***bold*** .

Table 11. Baseline Model Monthly Consumptive Use Percentage

Baseline Model Average Monthly Consumptive Use (%)												
Water User	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
WS: Abbeville	22.6	20.4	25.0	32.5	40.1	43.2	43.7	44.2	45.9	41.5	36.9	21.5
IN: Kimberly-Clark	3.1	3.8	4.4	3.2	1.9	3.1	5.1	3.4	0.5	0.9	4.1	11.0
IN: Allenx	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN: US DOE	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	2.6	7.8	5.9
PT: SCE&G Urquhart Station	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
WS: Breezy Hill	80.8	80.8	80.8	80.8	80.8	80.8	80.8	80.8	80.8	80.8	80.8	80.8
WS: North Augusta	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0	44.0
WS: Graniteville	88.9	88.9	88.9	88.9	88.9	88.9	88.9	77.8	77.8	77.8	77.8	77.8
MI: Hanson Aggregates	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5	13.5
PT: SC Rainey Station	89.5	89.4	87.7	88.1	87.0	91.6	91.9	91.4	91.3	90.6	89.7	90.1
IN: ARJWS	24.4	26.1	24.8	28.7	24.7	23.9	27.6	34.8	34.8	31.2	28.6	27.1
WS: ARJWS	44.1	49.0	50.5	54.8	52.9	53.1	40.2	40.5	54.1	57.3	53.9	36.2
WS: BJW&SA	62.3	62.3	61.2	64.6	69.7	69.7	69.5	69.4	68.9	67.1	65.0	62.1
WS: ECW&SA	64.1	63.0	66.7	71.0	74.4	74.2	74.1	74.2	74.8	73.1	72.3	65.8
WS: Greenville	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0	42.0
WS: McCormick	14.3	15.7	19.6	25.9	29.8	32.1	36.3	34.8	39.3	34.4	27.0	20.2
PN: Oconee	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
WS: Pioneer	39.6	47.1	41.3	47.4	46.0	54.3	53.0	62.5	58.7	57.7	60.5	52.4
WS: Walhalla	74.7	74.0	74.5	74.0	74.4	74.4	75.5	74.4	75.1	75.7	74.3	74.5
WS: Westminster	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0	87.0
WS: Seneca	53.6	52.5	56.7	60.5	66.5	73.8	73.7	70.5	72.5	66.7	63.1	53.7
IN: Vulcan	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0	90.0
IN: Milliken	7.8	4.2	4.2	4.2	4.2	4.5	5.2	4.8	5.5	7.1	5.9	5.3
IN: Clemson Energy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IN: Shaw	53.1	45.7	45.3	55.6	55.1	56.8	57.0	50.0	51.6	53.4	50.3	72.7
WS: Easley	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
WS: Pickens	75.3	74.5	75.3	74.7	77.5	79.9	80.4	79.4	81.9	80.0	79.3	76.2
IN: Clariant	13.1	16.3	11.4	14.8	14.6	13.7	13.3	9.4	8.7	8.1	11.3	12.3
GA: Brier Creek Use	21.8	14.2	12.8	16.3	23.8	22.3	33.0	34.5	31.9	43.0	33.1	23.8
GA: Broad River Use	35.1	34.1	38.9	43.4	47.7	53.4	55.6	52.7	54.9	49.9	53.2	42.9
GA: Tugaloo-Hartwell Use	82.2	80.3	82.9	82.4	85.6	88.9	87.8	87.4	88.0	83.8	84.5	82.1
GA: Augusta Use	3.8	1.7	3.5	10.5	22.8	23.8	26.7	19.9	20.5	20.9	15.3	3.9
GA: S. Augusta Use	7.0	3.9	9.6	4.5	10.0	6.7	7.0	4.4	6.2	14.1	7.8	3.8
GA: Plant Vogtle	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
GA: Russell Use	26.5	27.1	21.2	18.5	16.9	15.2	15.2	14.9	13.7	16.9	21.4	25.7
GA: Thurmond Use	72.1	79.6	73.3	77.6	86.8	88.7	81.8	84.9	82.2	81.3	80.7	78.4
GA: Effingham Use	33.5	32.6	29.4	32.5	31.2	34.9	36.2	36.6	36.5	35.2	31.1	30.7

Table 12. Baseline Model Monthly Return Flows for Discharge Objects

Monthly Return Flow (MGD)							
Month	**Pickens Roper**	**Pickens Middle**	**Pickens Eighteen**	**Owens Materials**	**WP Prop Clemson**	**Key Utility**	**Michelin**
Jan	0.2	0.3	0.3	0.1	0.0	0.2	0.2
Feb	0.2	0.3	0.3	0.1	0.0	0.2	0.2
Mar	0.2	0.3	0.3	0.1	0.0	0.2	0.2
Apr	0.2	0.3	0.3	0.1	0.1	0.2	0.2
May	0.2	0.3	0.2	0.1	0.0	0.2	0.2
Jun	0.2	0.3	0.3	0.1	0.0	0.2	0.2
Jul	0.2	0.3	0.2	0.1	0.0	0.2	0.2
Aug	0.2	0.3	0.3	0.1	0.0	0.2	0.2
Sep	0.2	0.4	0.2	0.1	0.0	0.2	0.2
Oct	0.2	0.3	0.2	0.1	0.0	0.2	0.2
Nov	0.2	0.3	0.2	0.1	0.0	0.2	0.2
Dec	0.2	0.3	0.3	0.1	0.0	0.2	0.2
Month	**SC Minerals**	**Allendale**	**US Army**	**Aiken/ Newberry/ SCWSA Import**	**Belton Honea Import**	**Greenwood Import**	**Easley Import**
Jan	0.3	1.3	0.5	7.7	0.1	1.2	0.2
Feb	0.3	1.8	0.5	8.3	0.1	1.3	0.1
Mar	0.3	1.8	0.5	8.2	0.1	1.3	0.1
Apr	0.3	1.6	0.5	7.0	0.1	1.2	0.1
May	0.3	1.2	0.6	5.7	0.1	1.2	0.1
Jun	0.3	1.2	0.6	6.2	0.1	1.2	0.1
Jul	0.3	1.1	0.6	5.9	0.1	1.2	0.1
Aug	0.3	1.3	0.6	6.0	0.1	1.2	0.1
Sep	0.2	1.1	0.6	5.8	0.1	1.1	0.1
Oct	0.2	0.9	0.6	6.1	0.1	1.1	0.1
Nov	0.3	0.9	0.5	6.6	0.1	1.1	0.1
Dec	0.3	1.1	0.5	7.4	0.1	1.2	0.2

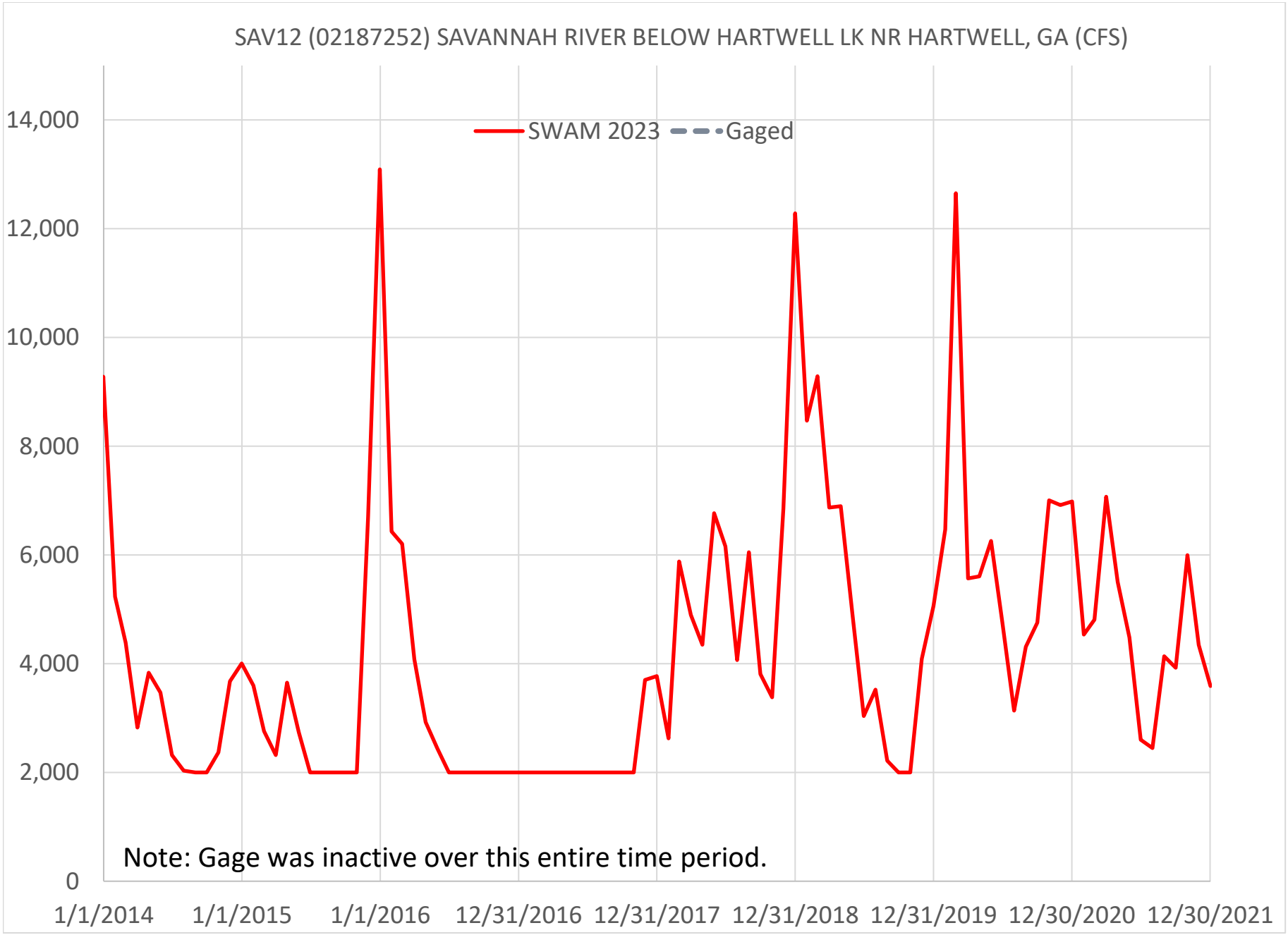
2023 Savannah SWAM Model Updates

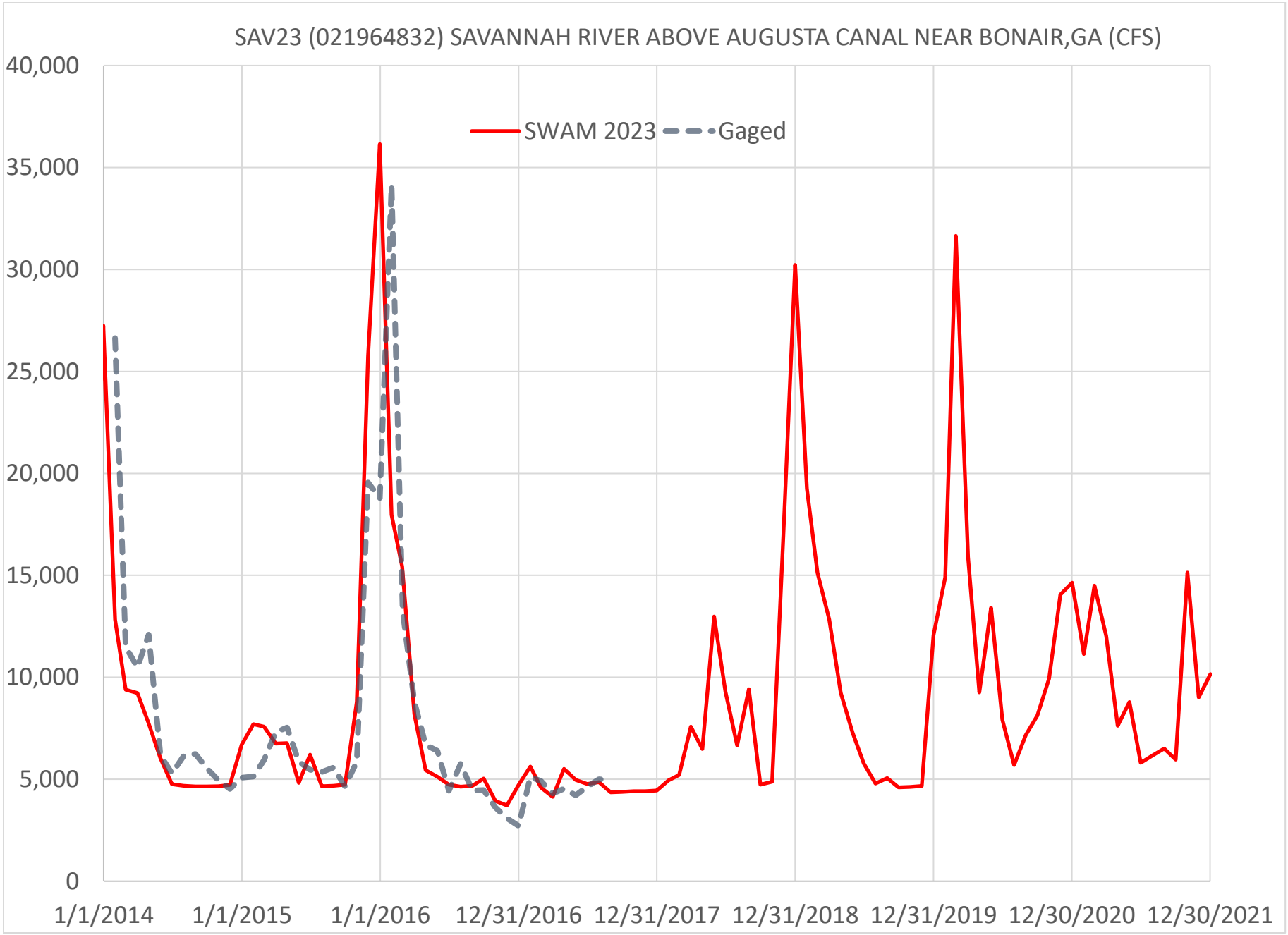
Attachment B

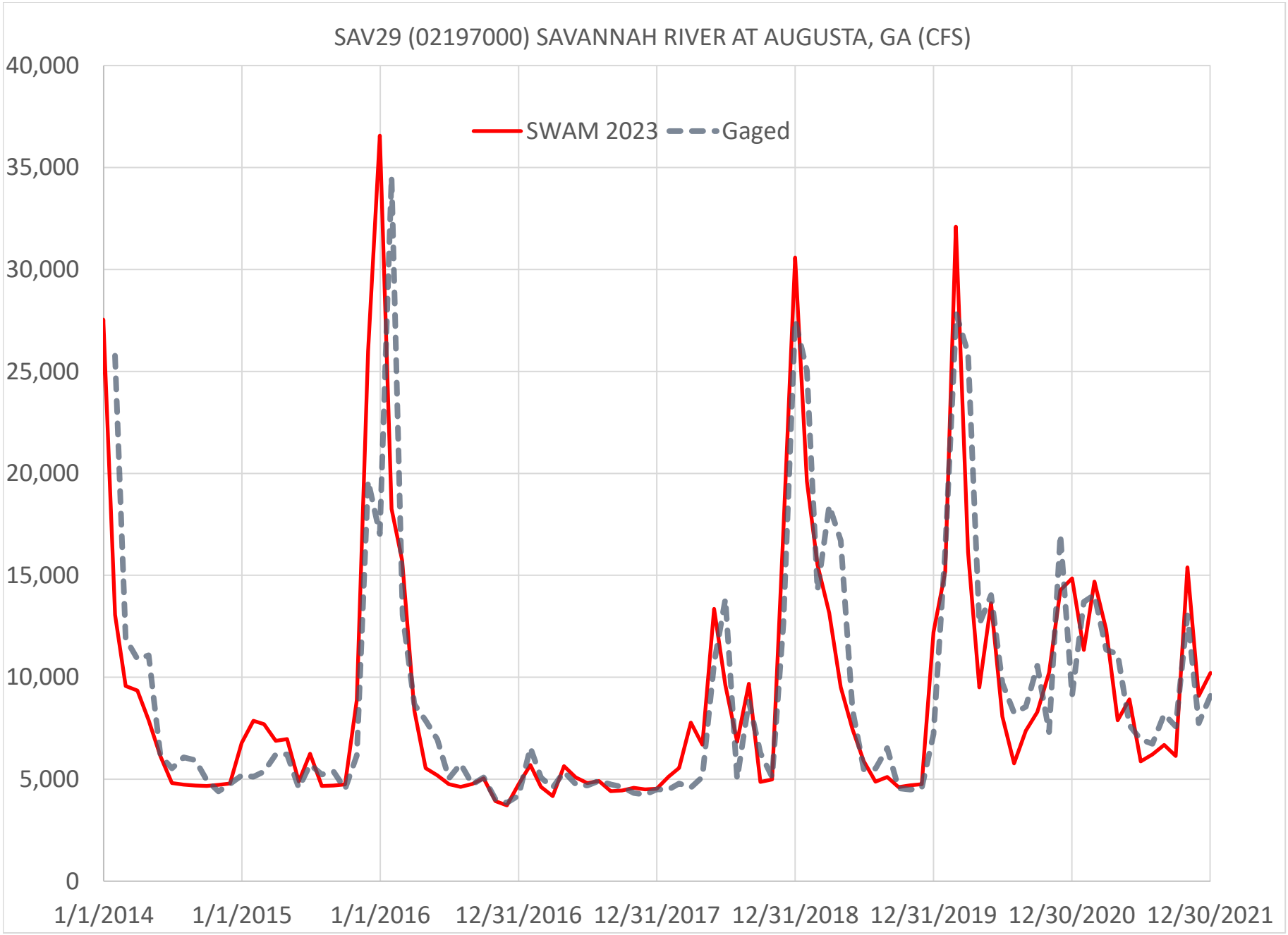
Validation Results

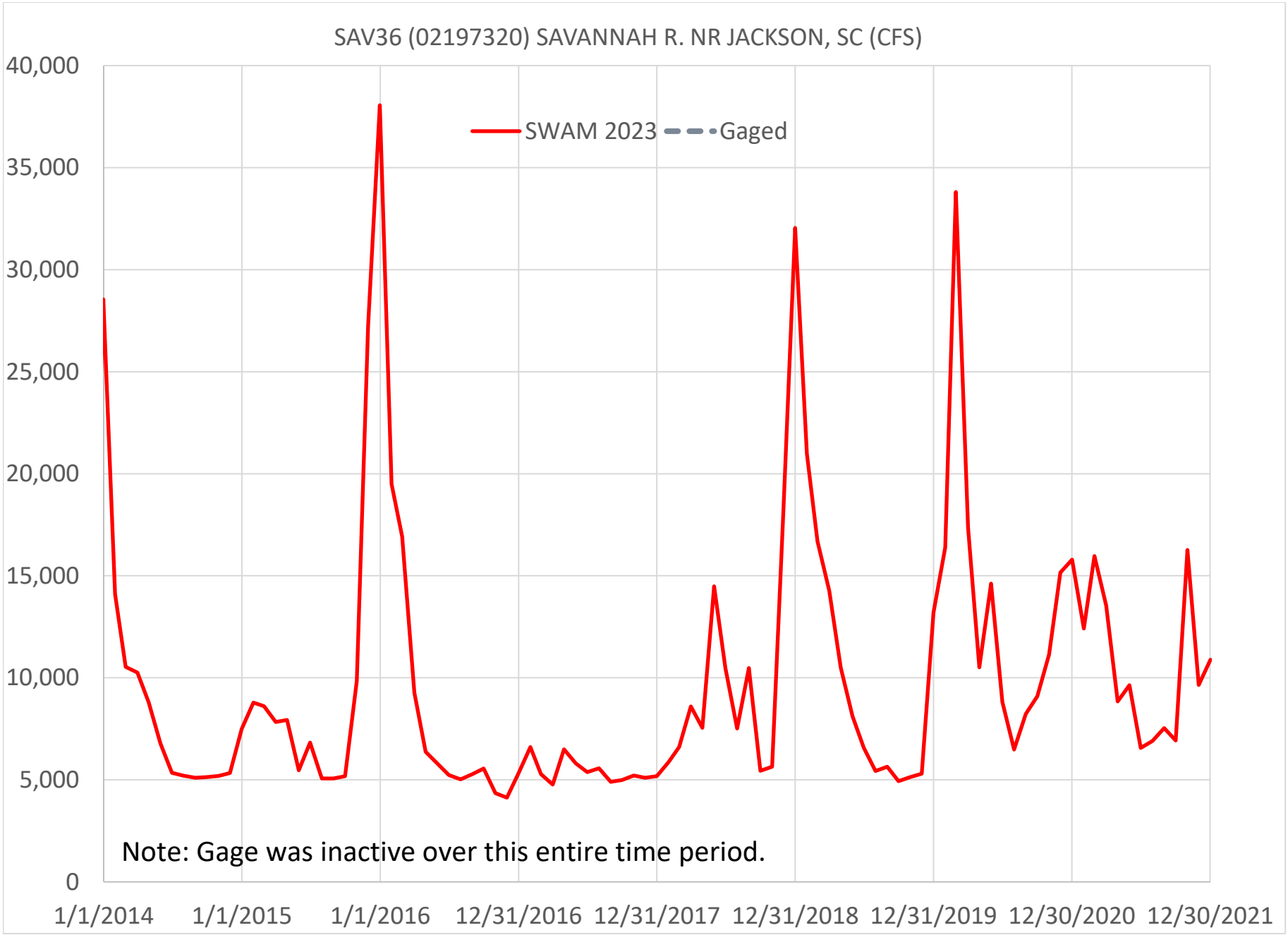
Attachment B

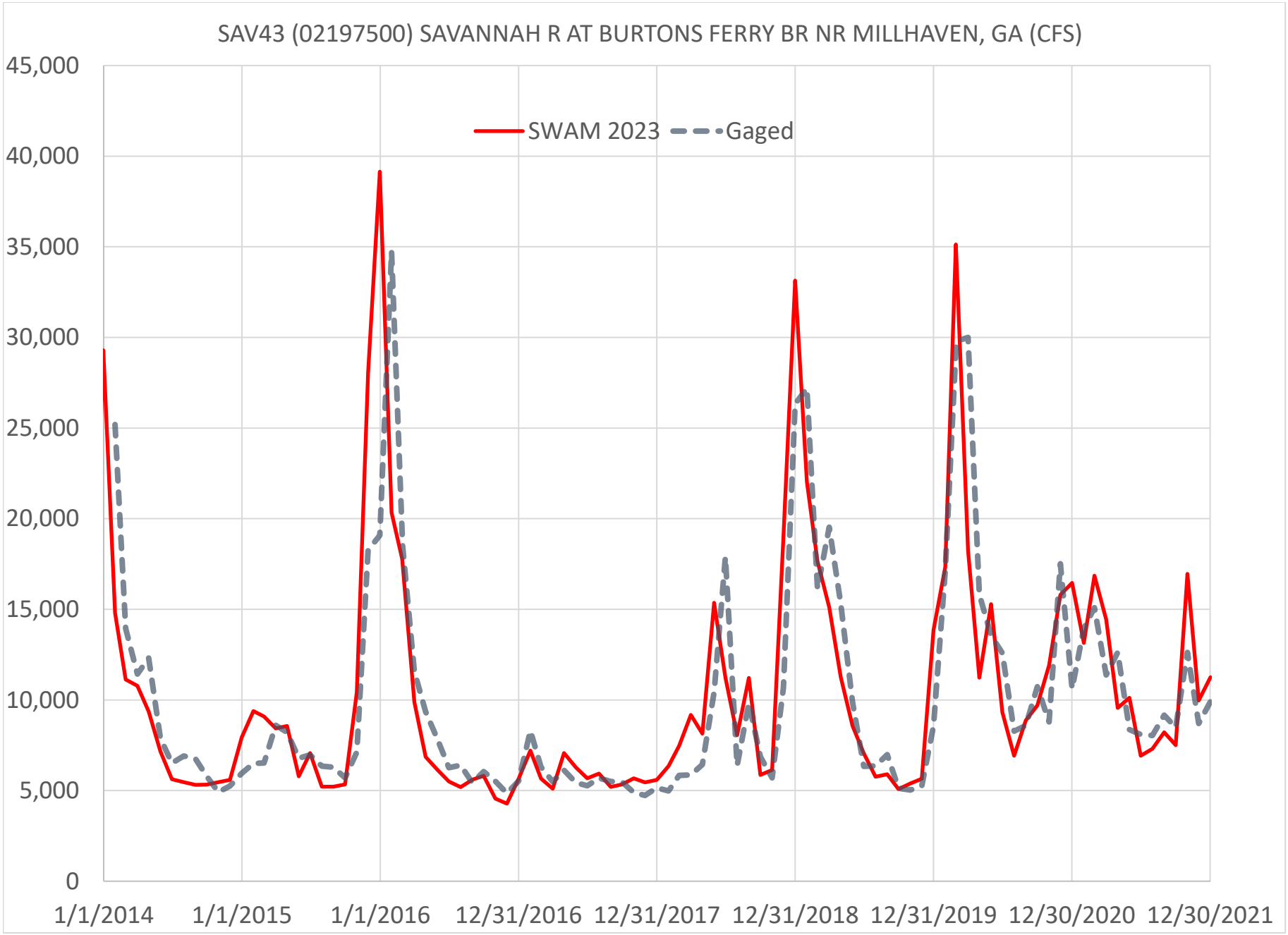
Monthly Validation Results

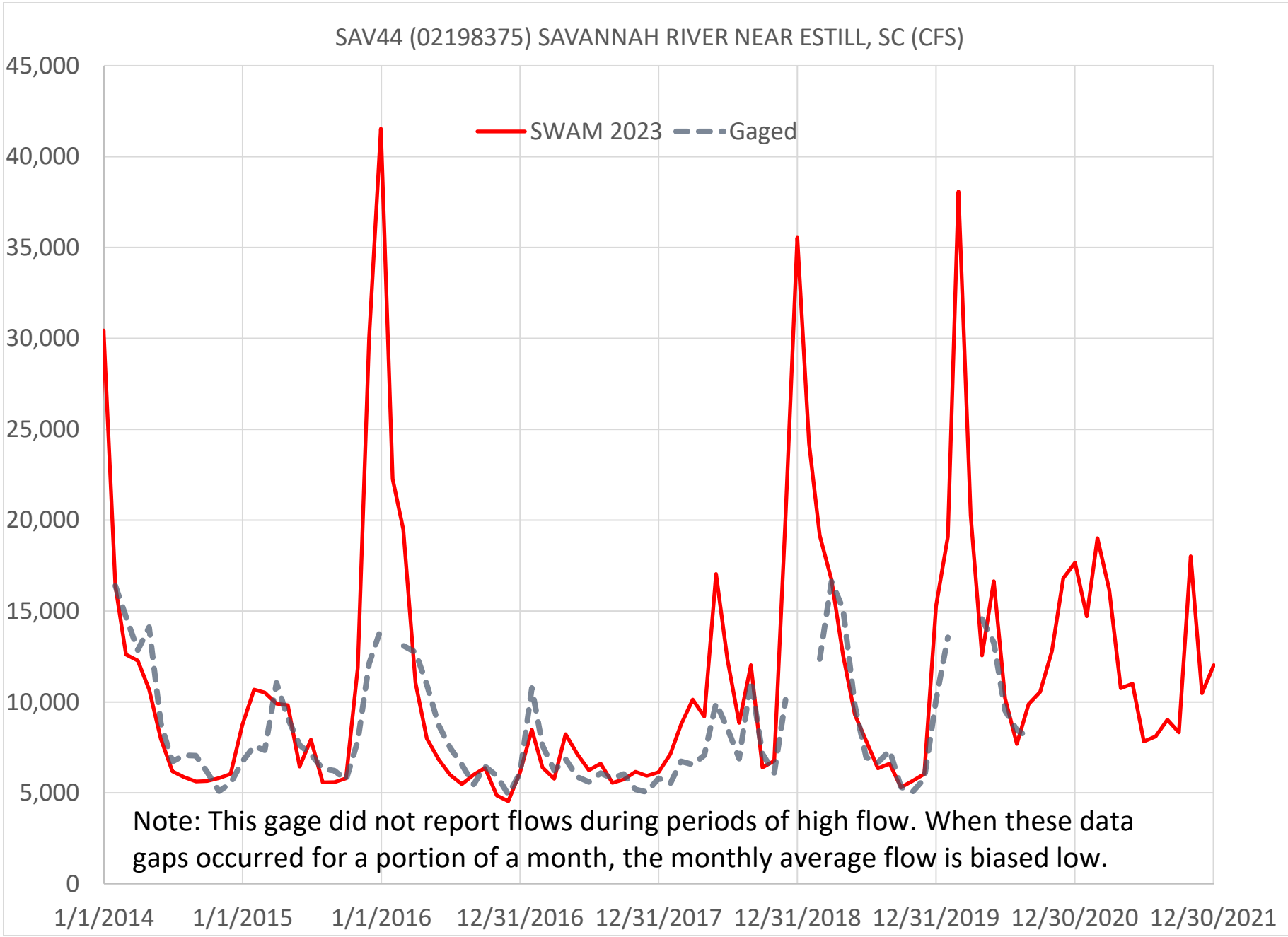

SAV12 (02187252) SAVANNAH RIVER BELOW HARTWELL LK NR HARTWELL, GA (CFS)
SWAM 2023
Gaged
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021
Note: Gage was inactive over this entire time period.

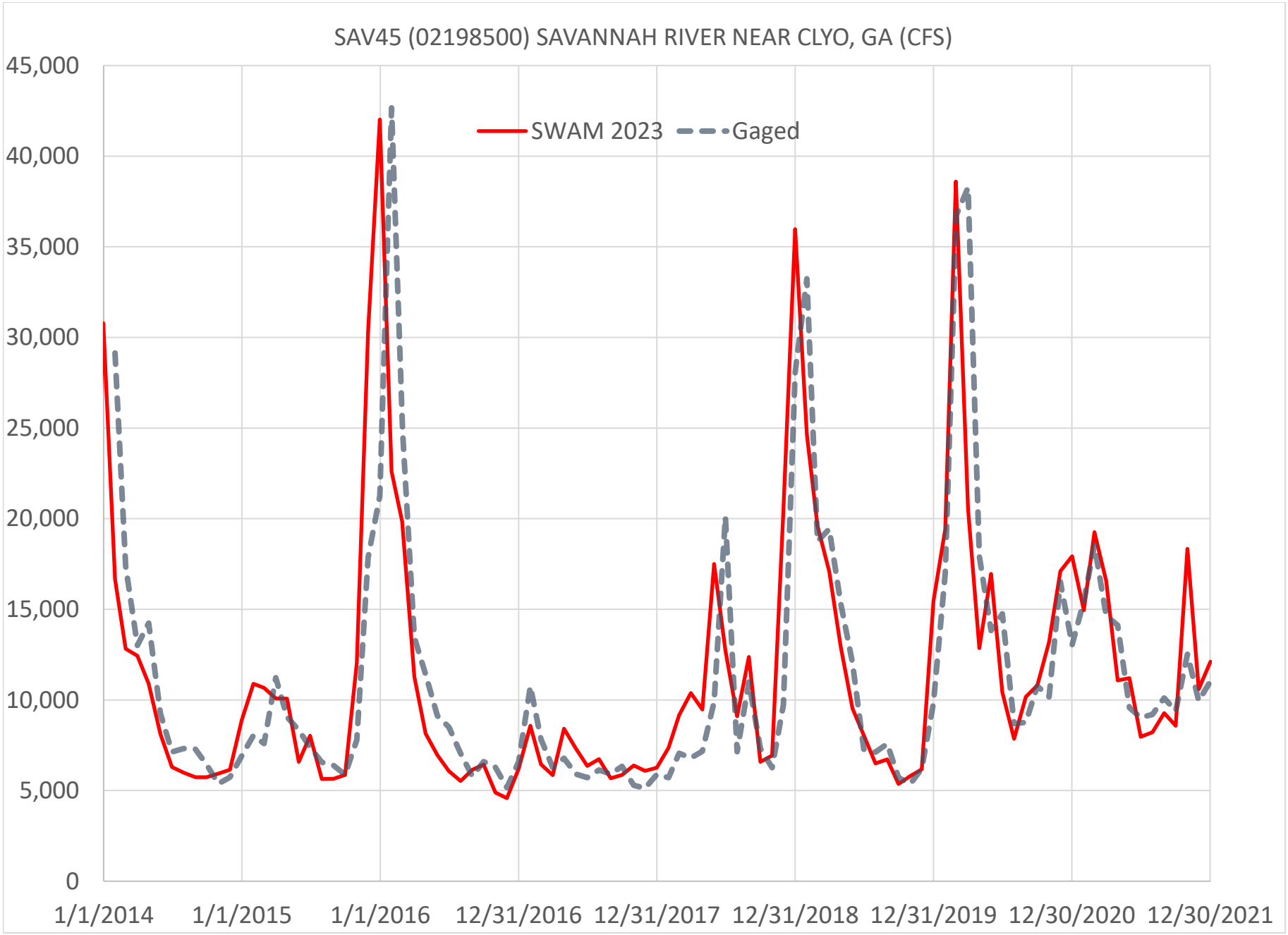

SAV23 (021964832) SAVANNAH RIVER ABOVE AUGUSTA CANAL NEAR BONAIR,GA (CFS)
SWAM 2023
Gaged
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

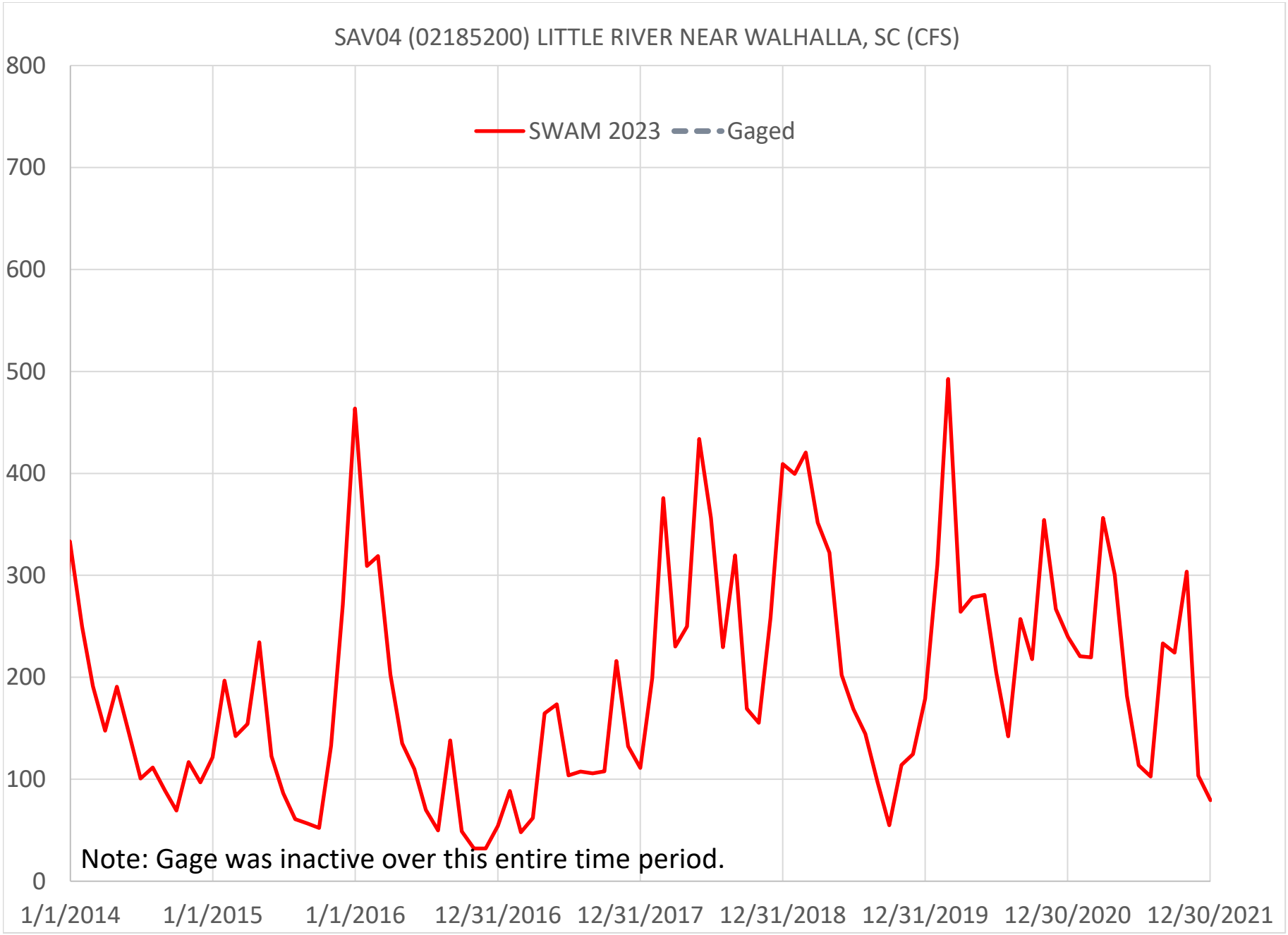

SAV29 (02197000) SAVANNAH RIVER AT AUGUSTA, GA (CFS)
SWAM 2023
Gaged
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

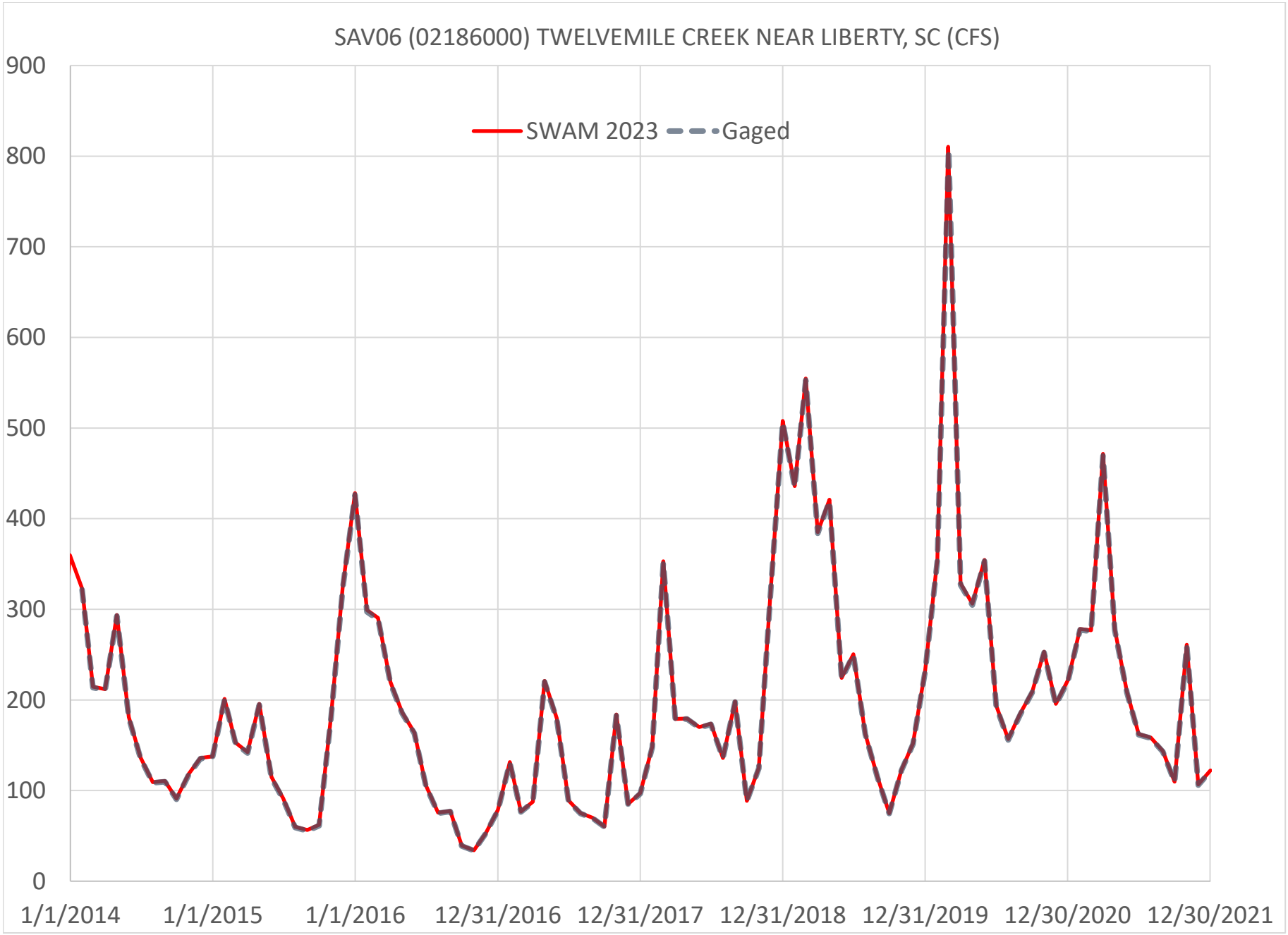

SAV36 (02197320) SAVANNAH R. NR JACKSON, SC (CFS)
SWAM 2023
Gaged
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021
Note: Gage was inactive over this entire time period.

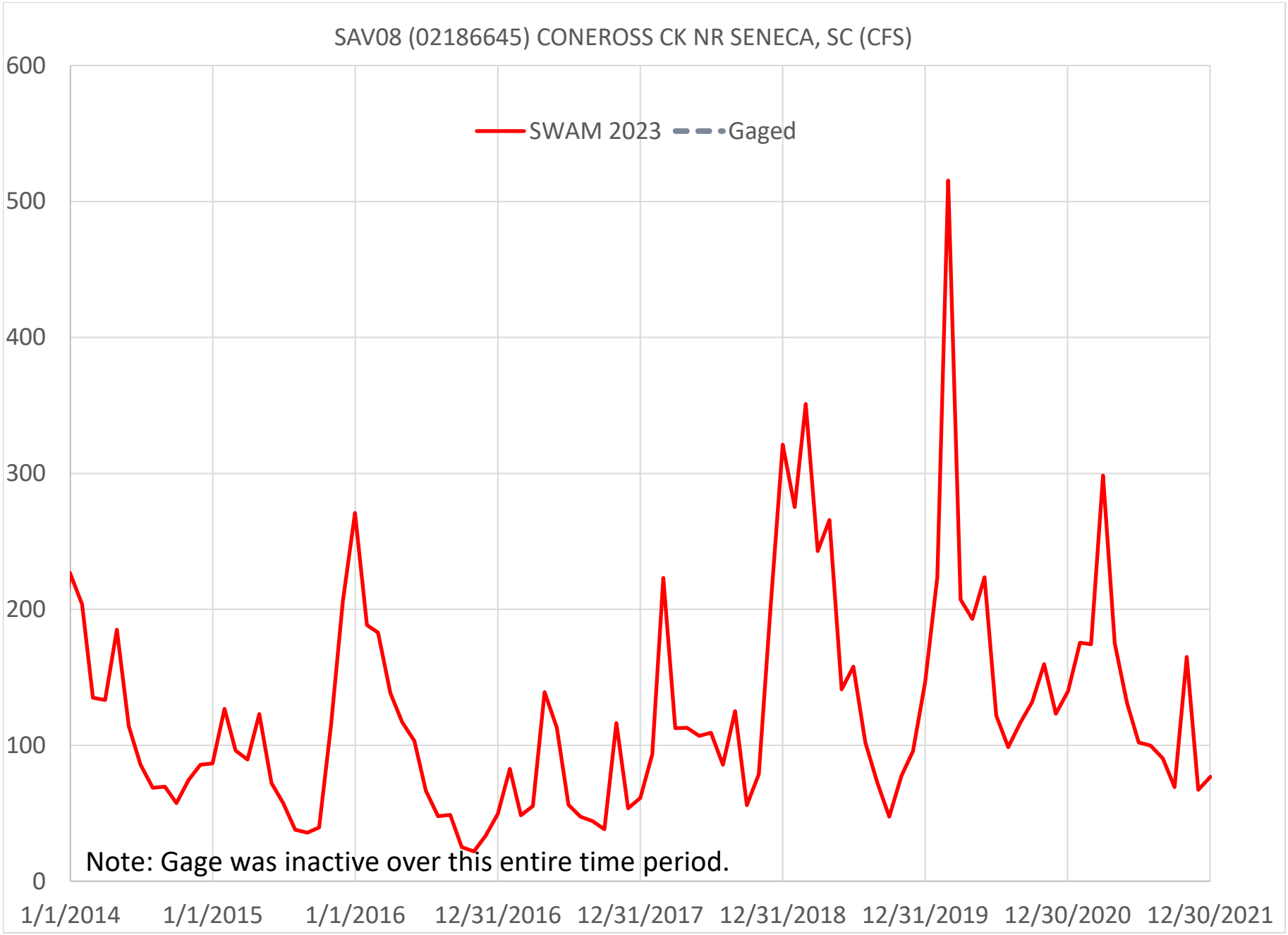

SAV43 (02197500) SAVANNAH R AT BURTONS FERRY BR NR MILLHAVEN, GA (CFS)
SWAM 2023
Gaged
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

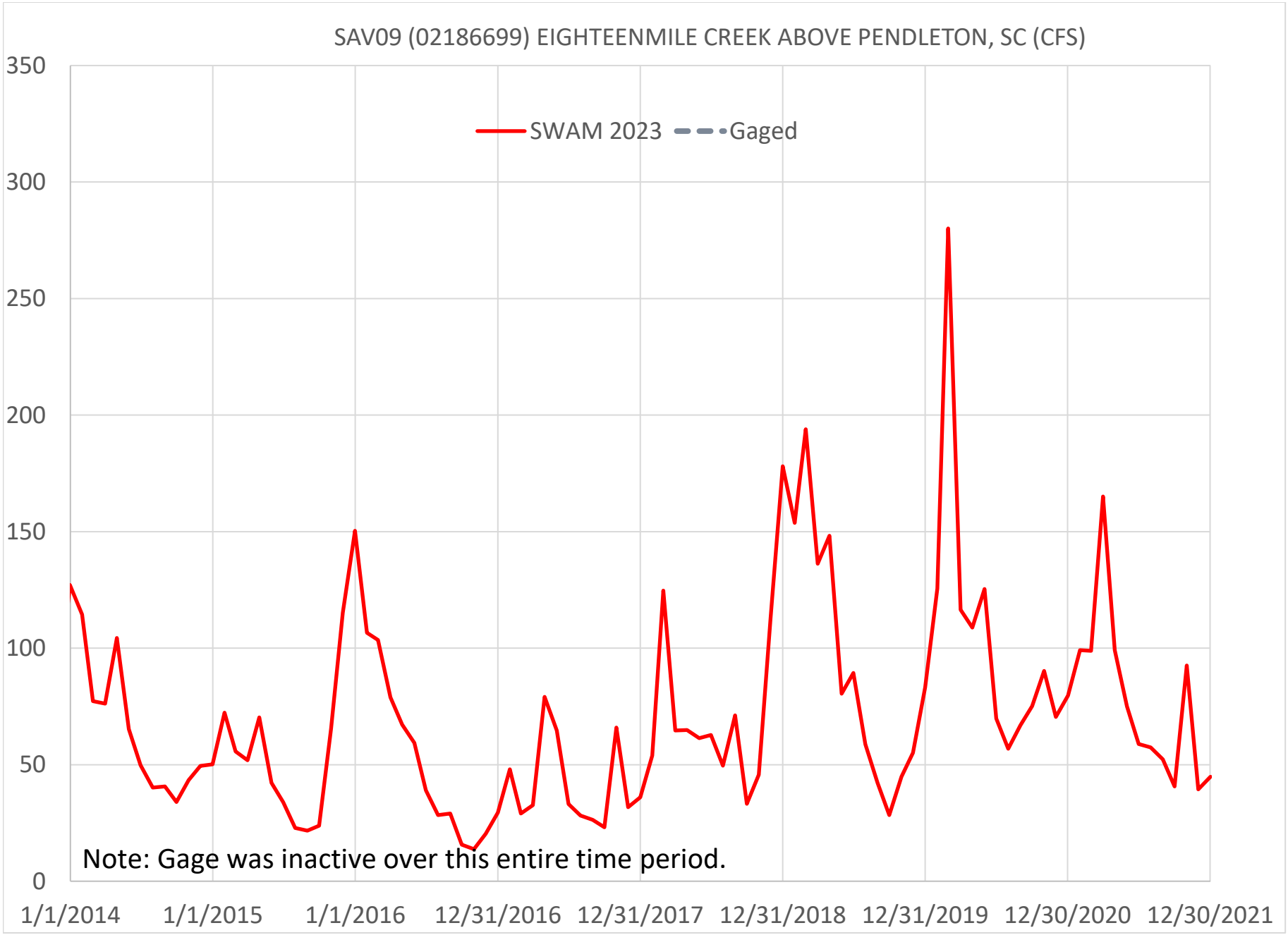

SAV44 (02198375) SAVANNAH RIVER NEAR ESTILL, SC (CFS)
SWAM 2023
Gaged
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021
Note: This gage did not report flows during periods of high flow. When these data gaps occurred for a portion of a month, the monthly average flow is biased low.

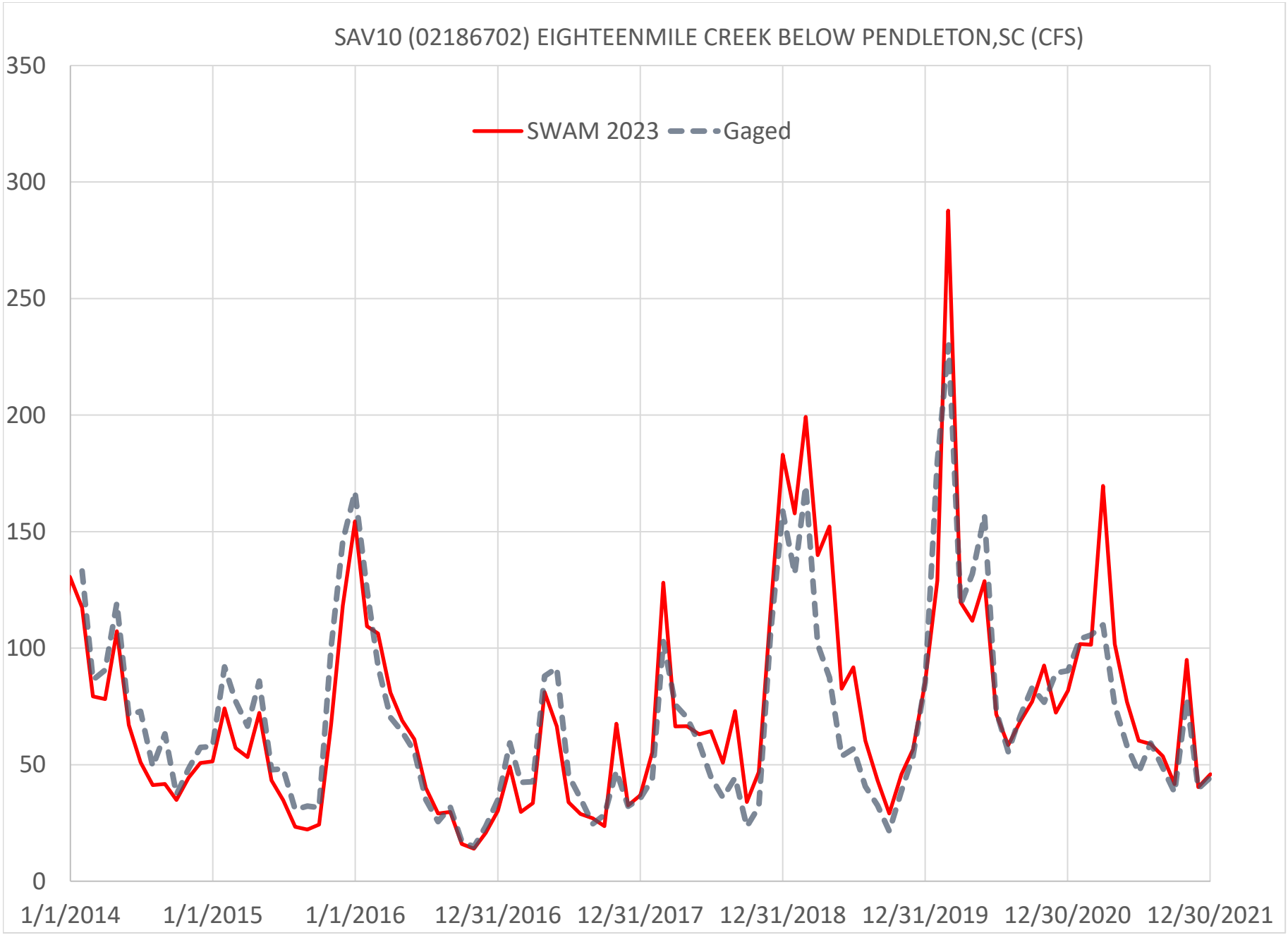

SAV45 (02198500) SAVANNAH RIVER NEAR CLYO, GA (CFS)
SWAM 2023
Gaged
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

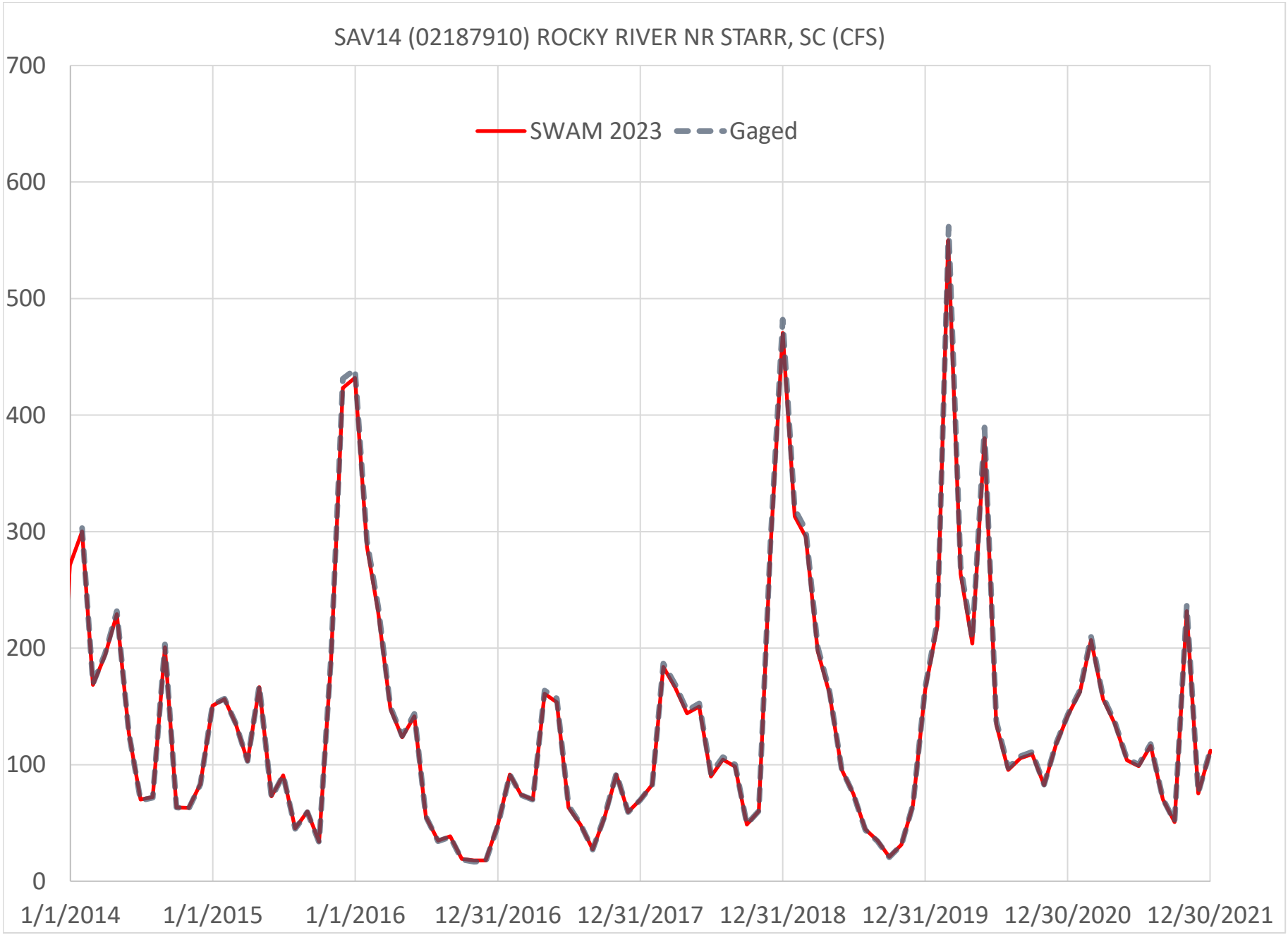

SAV04 (02185200) LITTLE RIVER NEAR WALHALLA, SC (CFS)
SWAM 2023
Gaged
800
700
600
500
400
300
200
100
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021
Note: Gage was inactive over this entire time period.

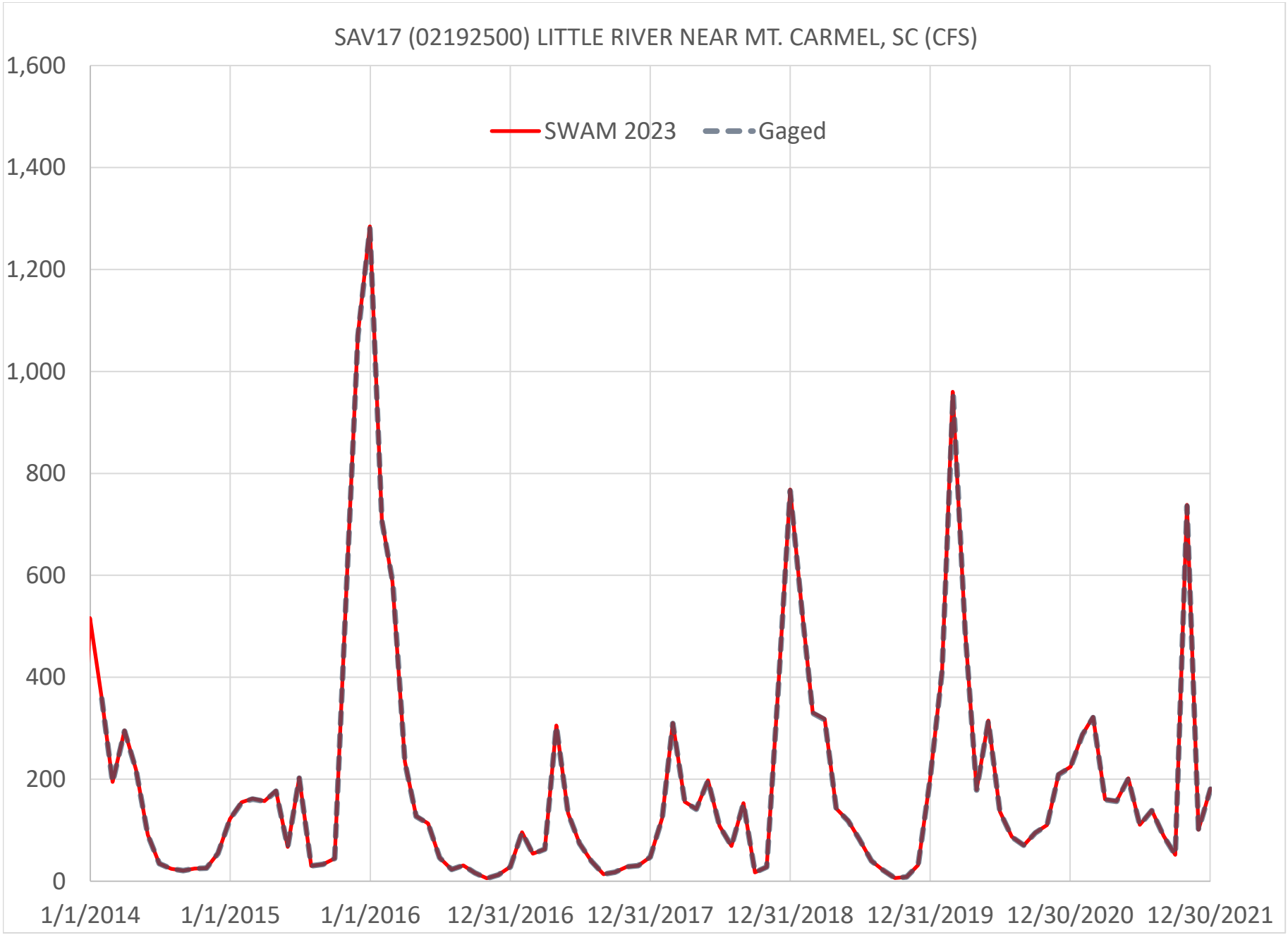

SAV06 (02186000) TWELVEMILE CREEK NEAR LIBERTY, SC (CFS)
SWAM 2023
Gaged
900
800
700
600
500
400
300
200
100
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

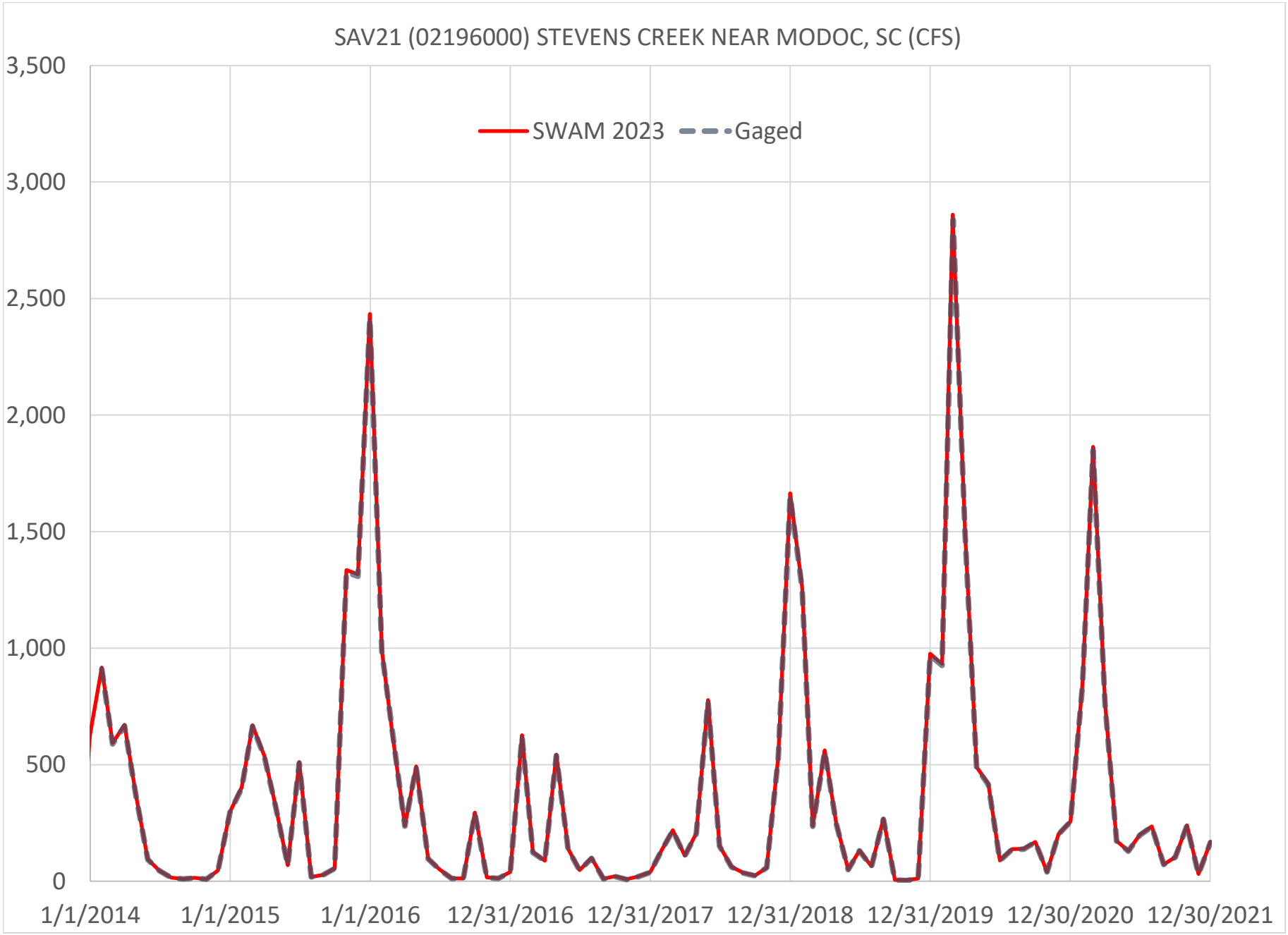

SAV08 (02186645) CONEROSS CK NR SENECA, SC (CFS)
SWAM 2023
Gaged
600
500
400
300
200
100
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021
Note: Gage was inactive over this entire time period.

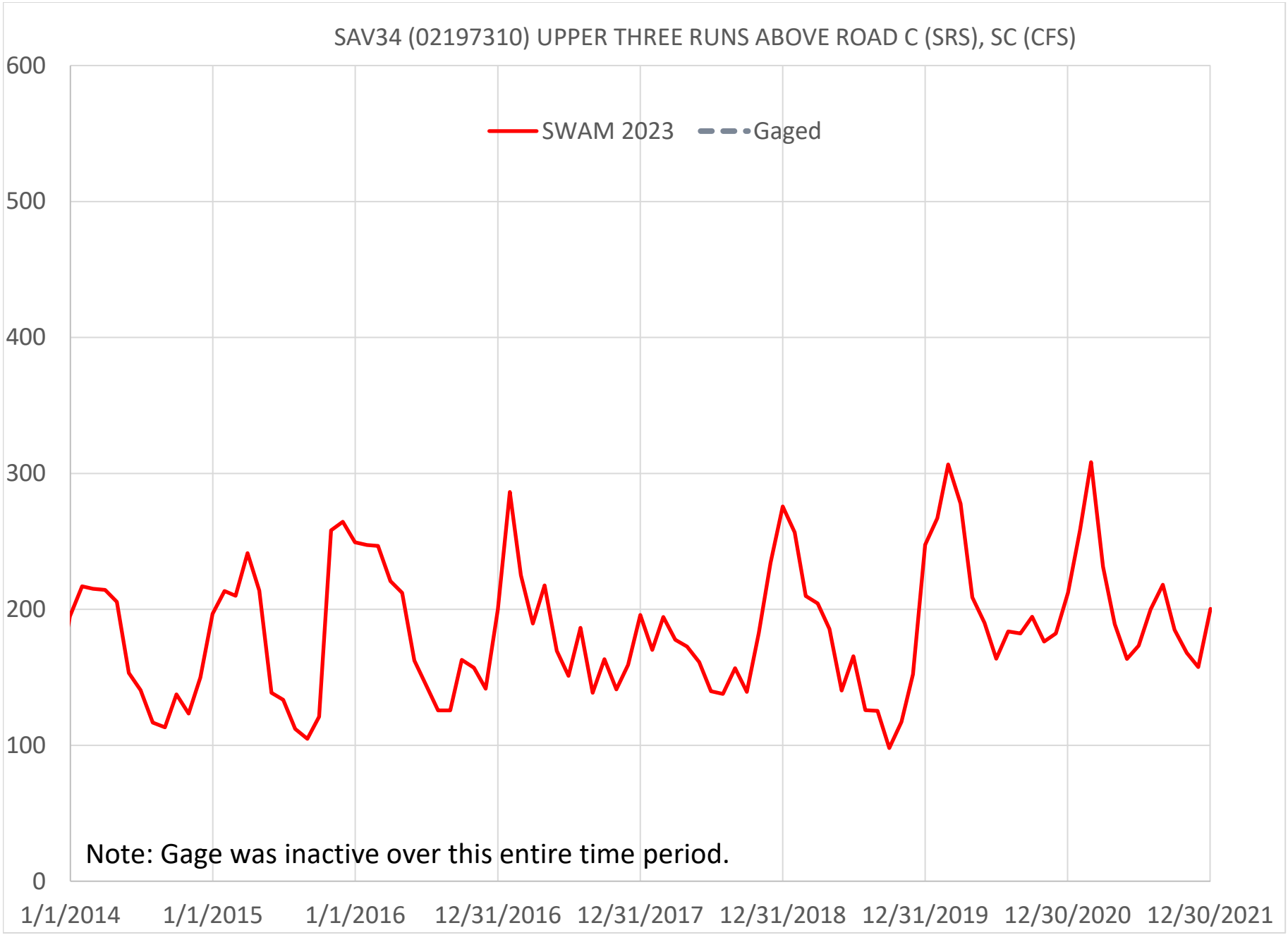

SAV09 (02186699) EIGHTEENMILE CREEK ABOVE PENDLETON, SC (CFS)
SWAM 2023
Gaged
350
300
250
200
150
100
50
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021
Note: Gage was inactive over this entire time period.

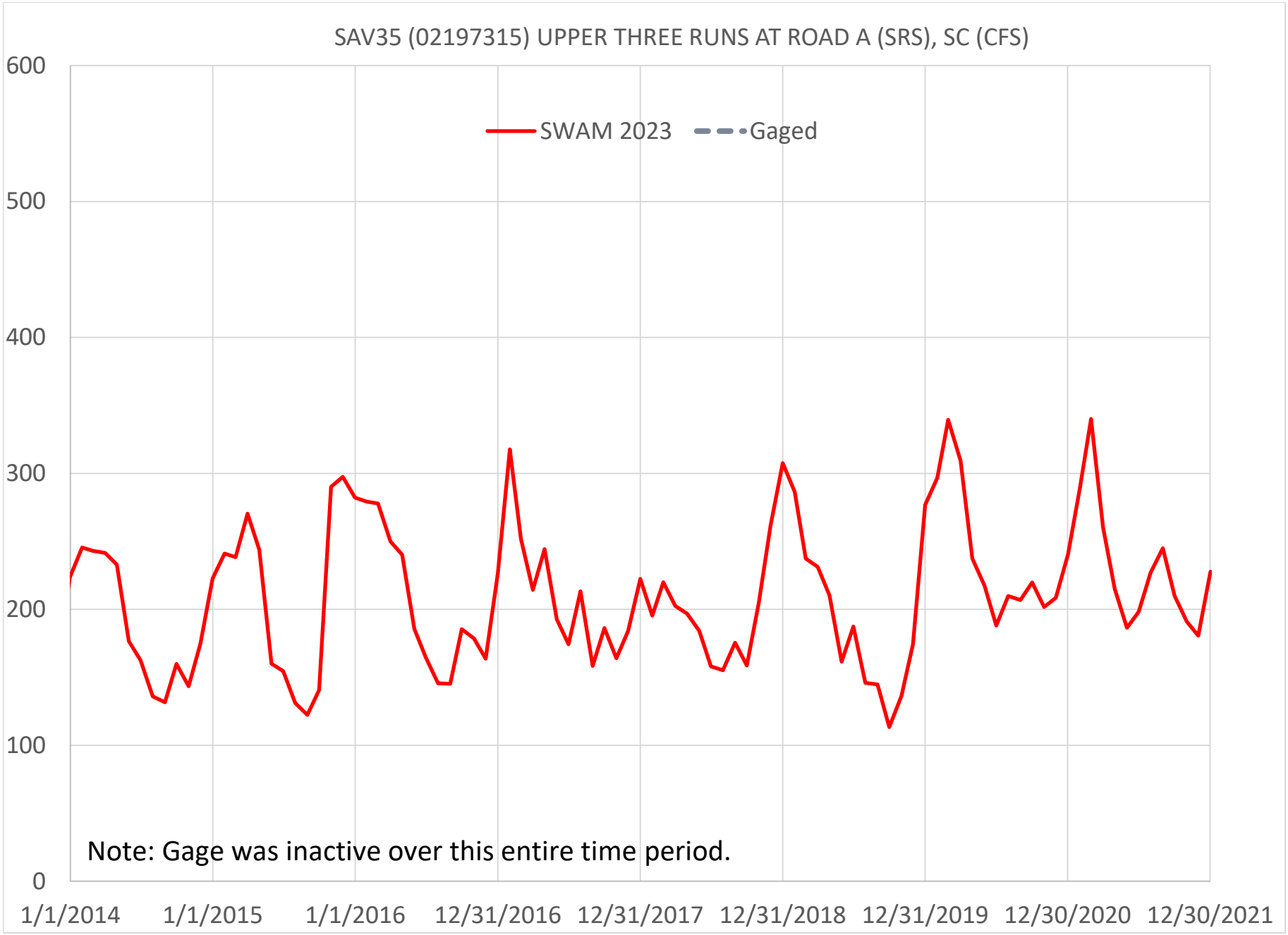

SAV10 (02186702) EIGHTEENMILE CREEK BELOW PENDLETON,SC (CFS)
SWAM 2023
Gaged
350
300
250
200
150
100
50
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

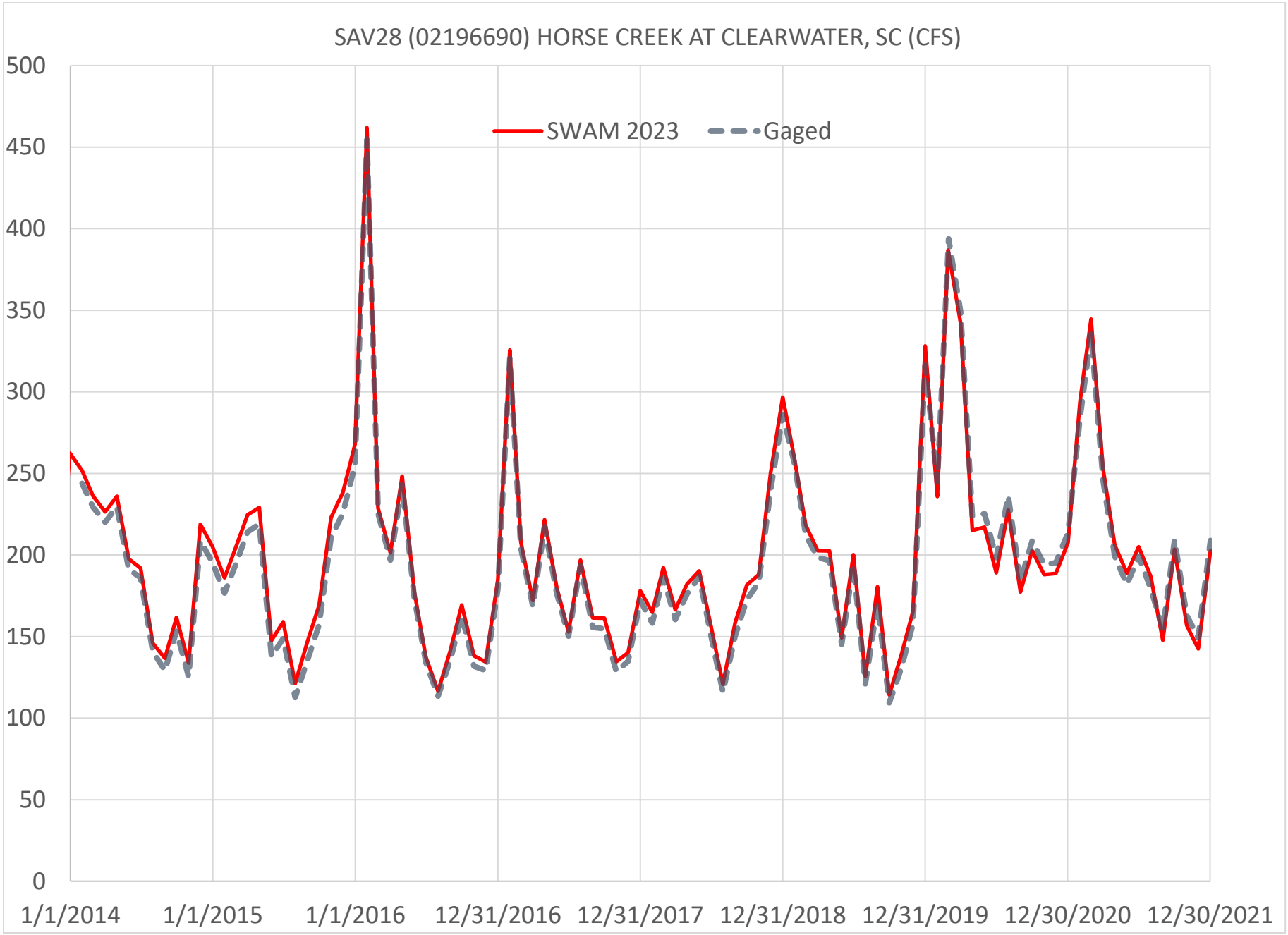

SAV14 (02187910) ROCKY RIVER NR STARR, SC (CFS)
SWAM 2023
Gaged
700
600
500
400
300
200
100
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021


SAV17 (02192500) LITTLE RIVER NEAR MT. CARMEL, SC (CFS)
SWAM 2023
Gaged
1,600
1,400
1,200
1,000
800
600
400
200
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021


SAV21 (02196000) STEVENS CREEK NEAR MODOC, SC (CFS)
SWAM 2023
Gaged
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

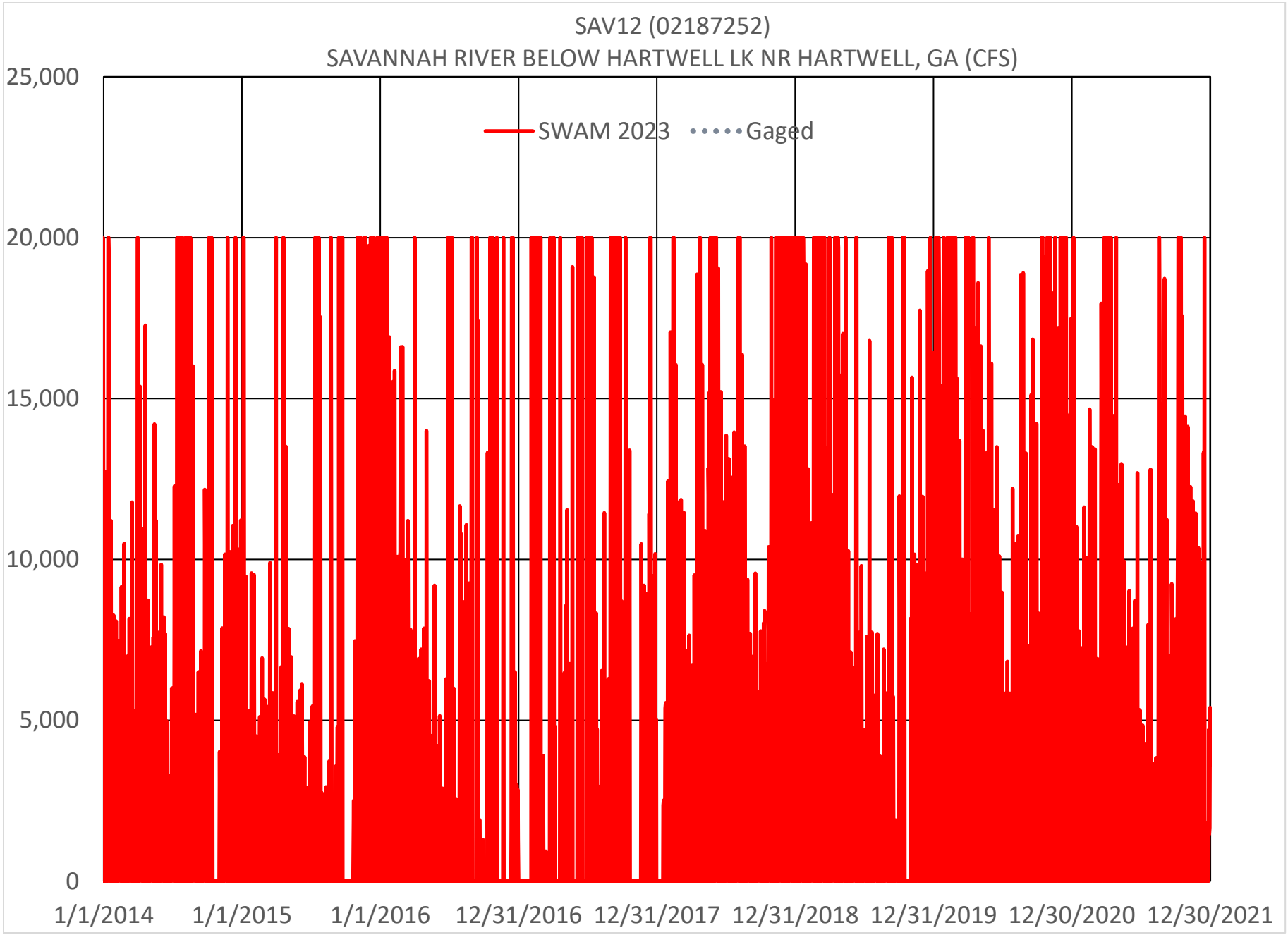

SAV34 (02197310) UPPER THREE RUNS ABOVE ROAD C (SRS), SC (CFS)
SWAM 2023
Gaged
600
500
400
300
200
100
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021
Note: Gage was inactive over this entire time period.

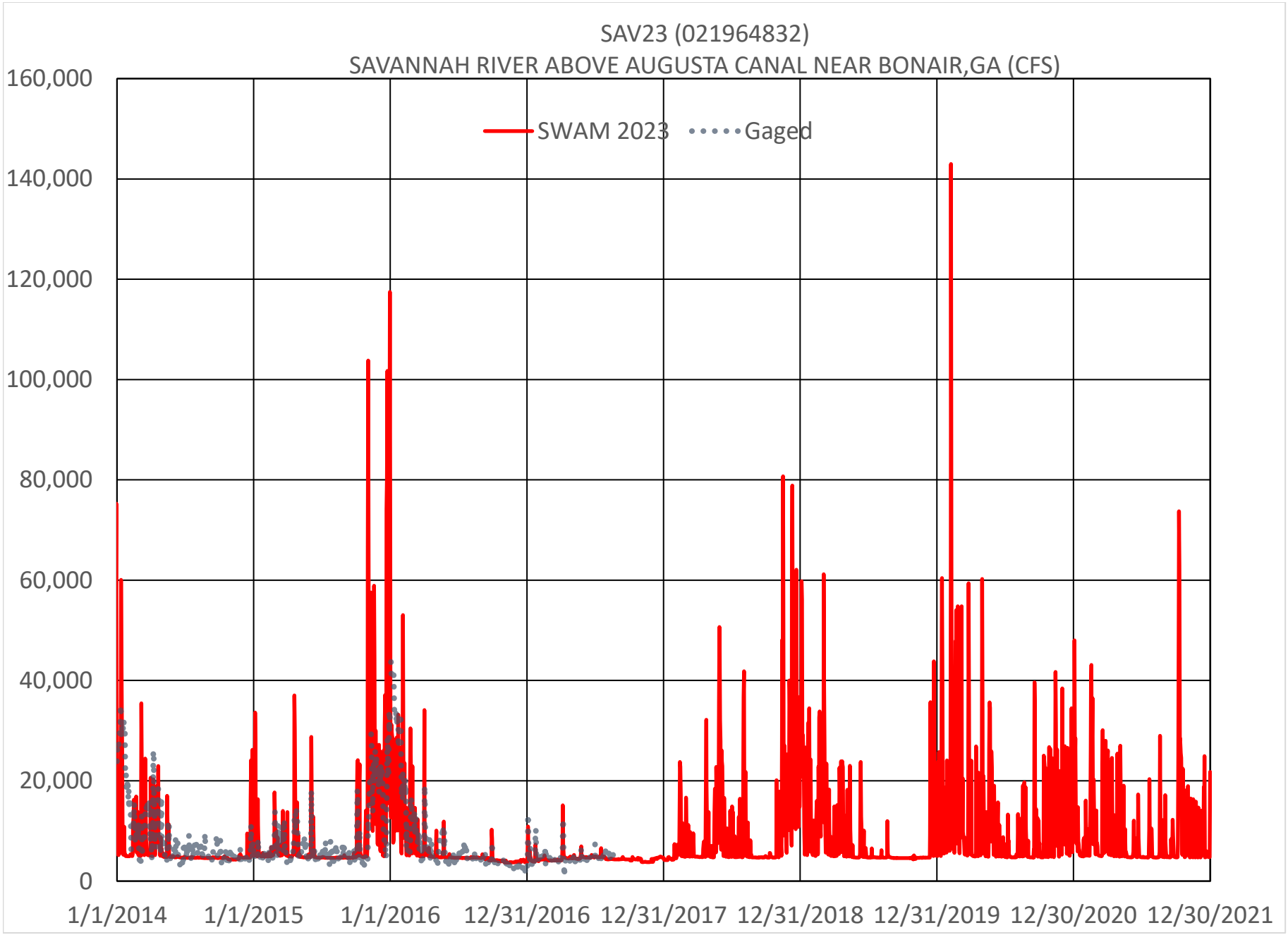

SAV35 (02197315) UPPER THREE RUNS AT ROAD A (SRS), SC (CFS)
SWAM 2023
Gaged
600
500
400
300
200
100
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021
Note: Gage was inactive over this entire time period.

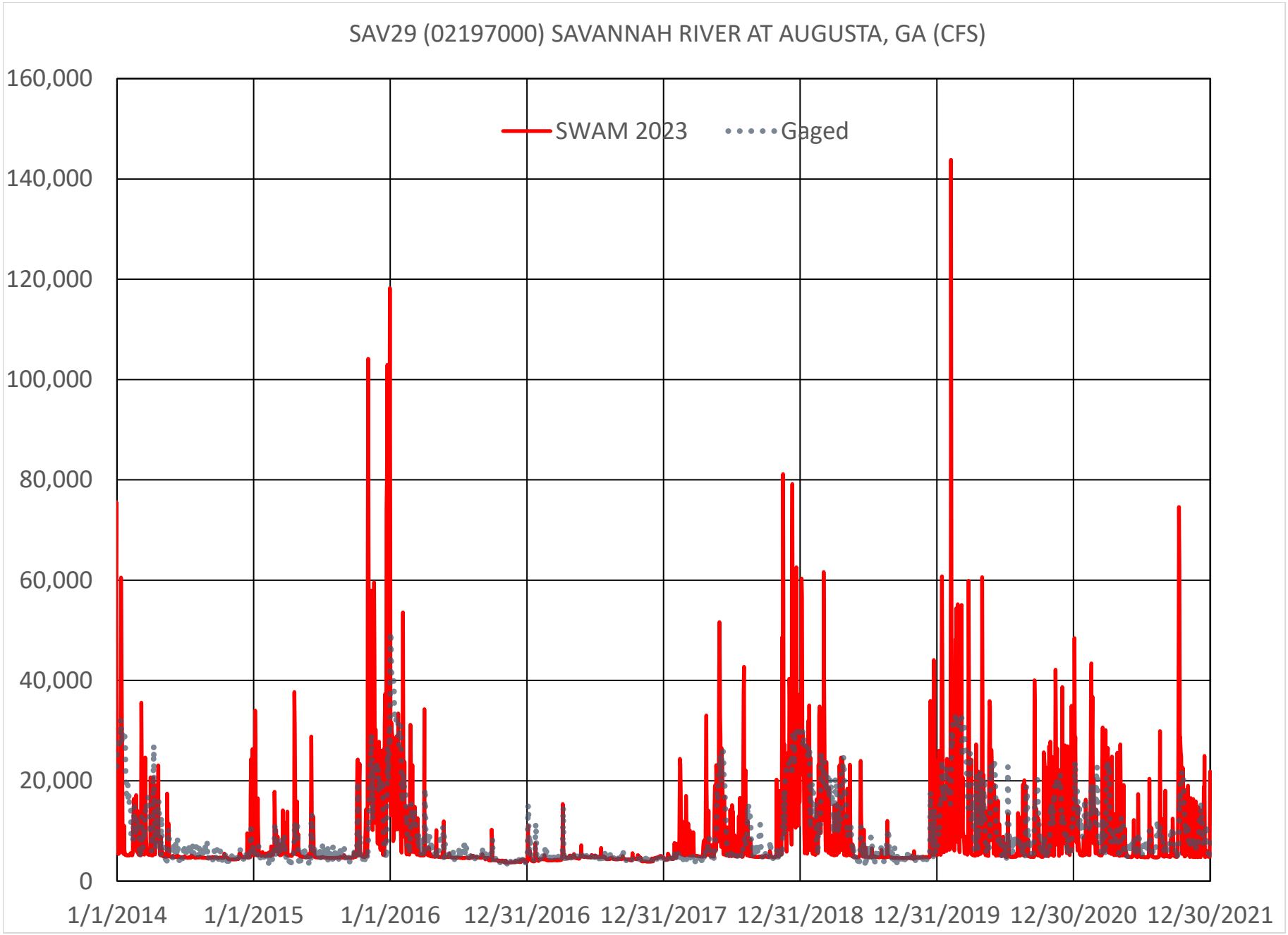

SAV28 (02196690) HORSE CREEK AT CLEARWATER, SC (CFS)
SWAM 2023
Gaged
500
450
400
350
300
250
200
150
100
50
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

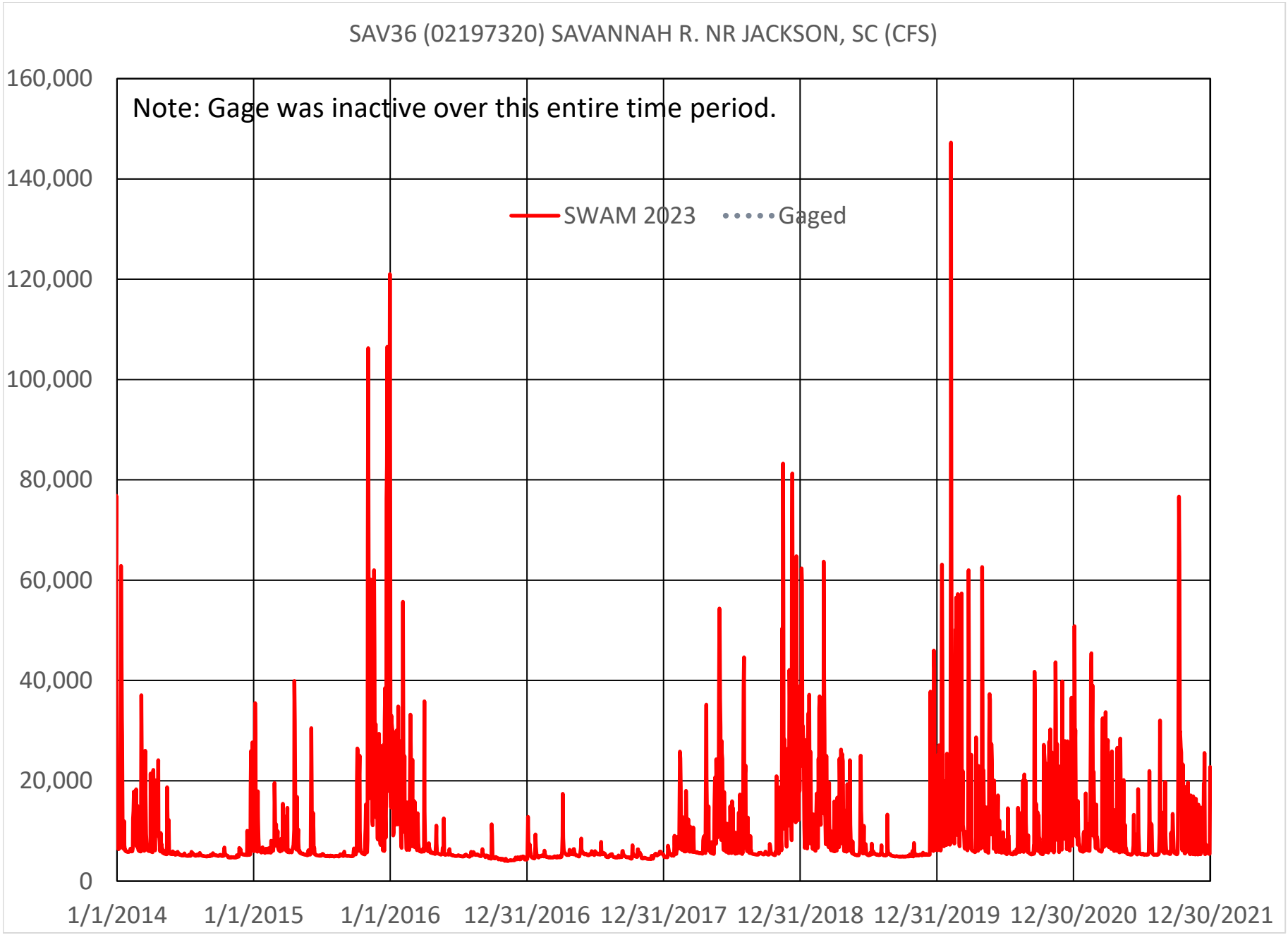
Attachment B

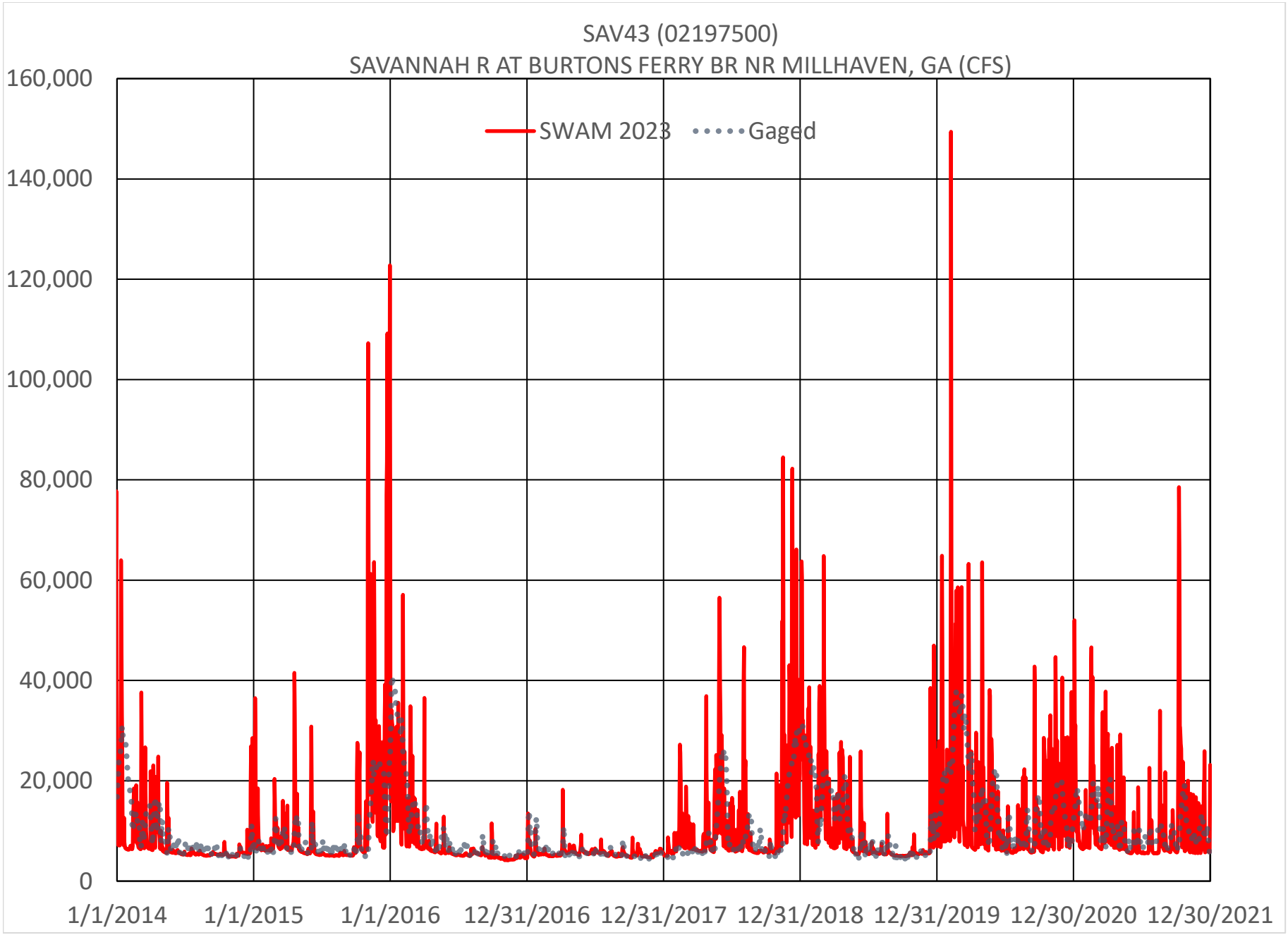
Daily Validation Results

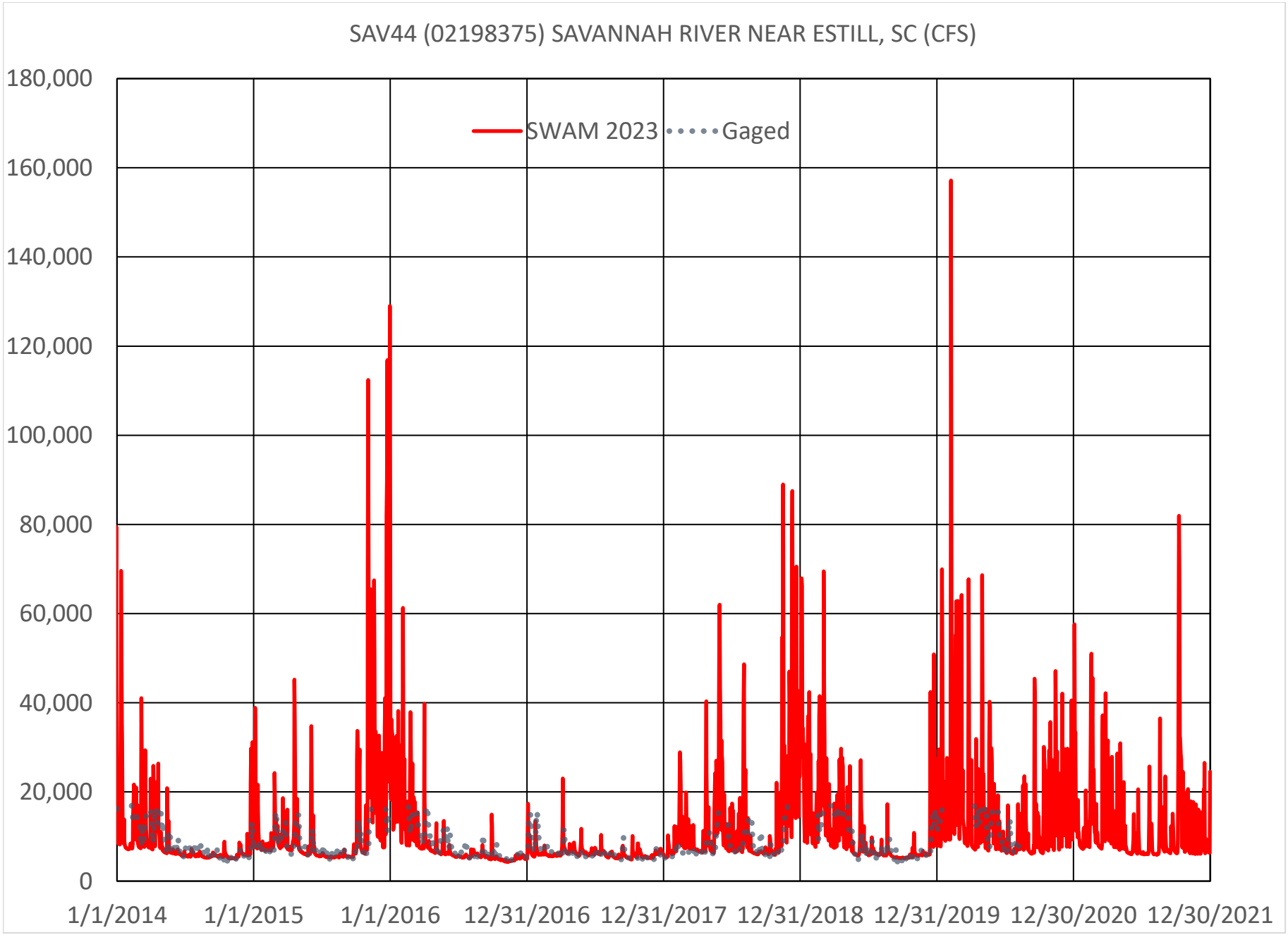

SAV12 (02187252)
SAVANNAH RIVER BELOW HARTWELL LK NR HARTWELL, GA (CFS)
SWAM 2023
Gaged
25,000
20,000
15,000
10,000
5,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

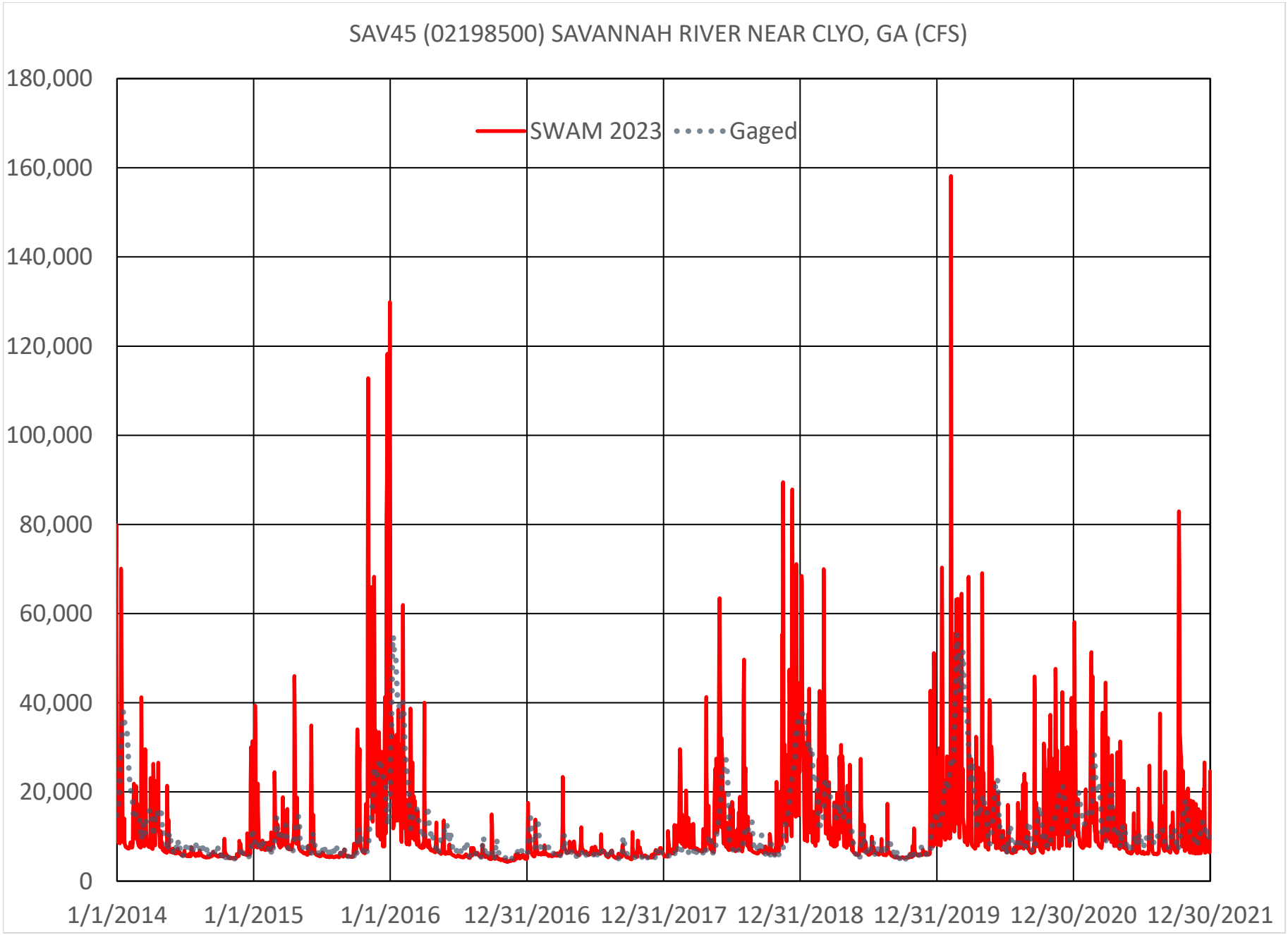

SAV23 (021964832)
SAVANNAH RIVER ABOVE AUGUSTA CANAL NEAR BONAIR,GA (CFS)
SWAM 2023
Gaged
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

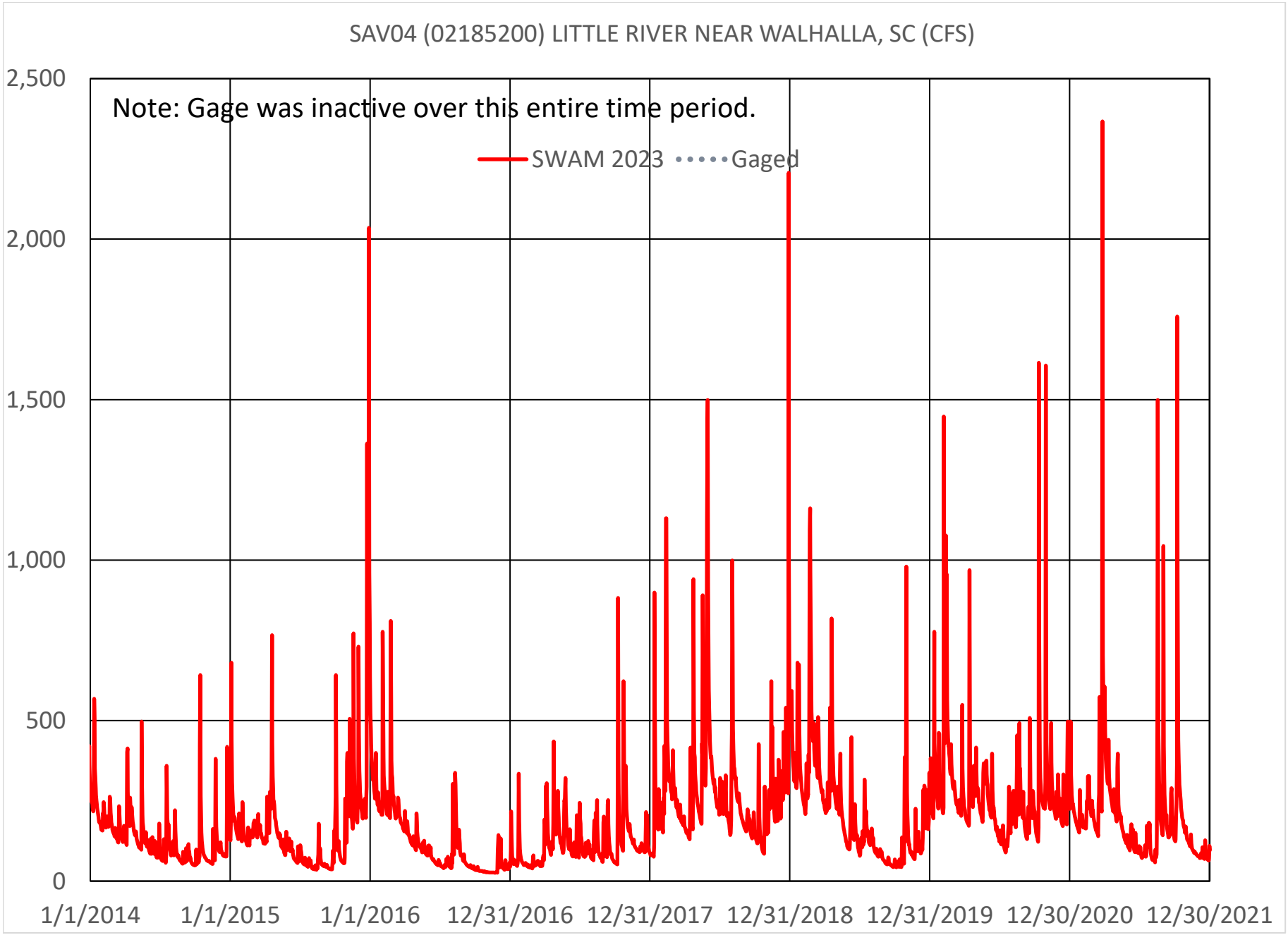

SAV29 (02197000) SAVANNAH RIVER AT AUGUSTA, GA (CFS)
SWAM 2023
Gaged
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

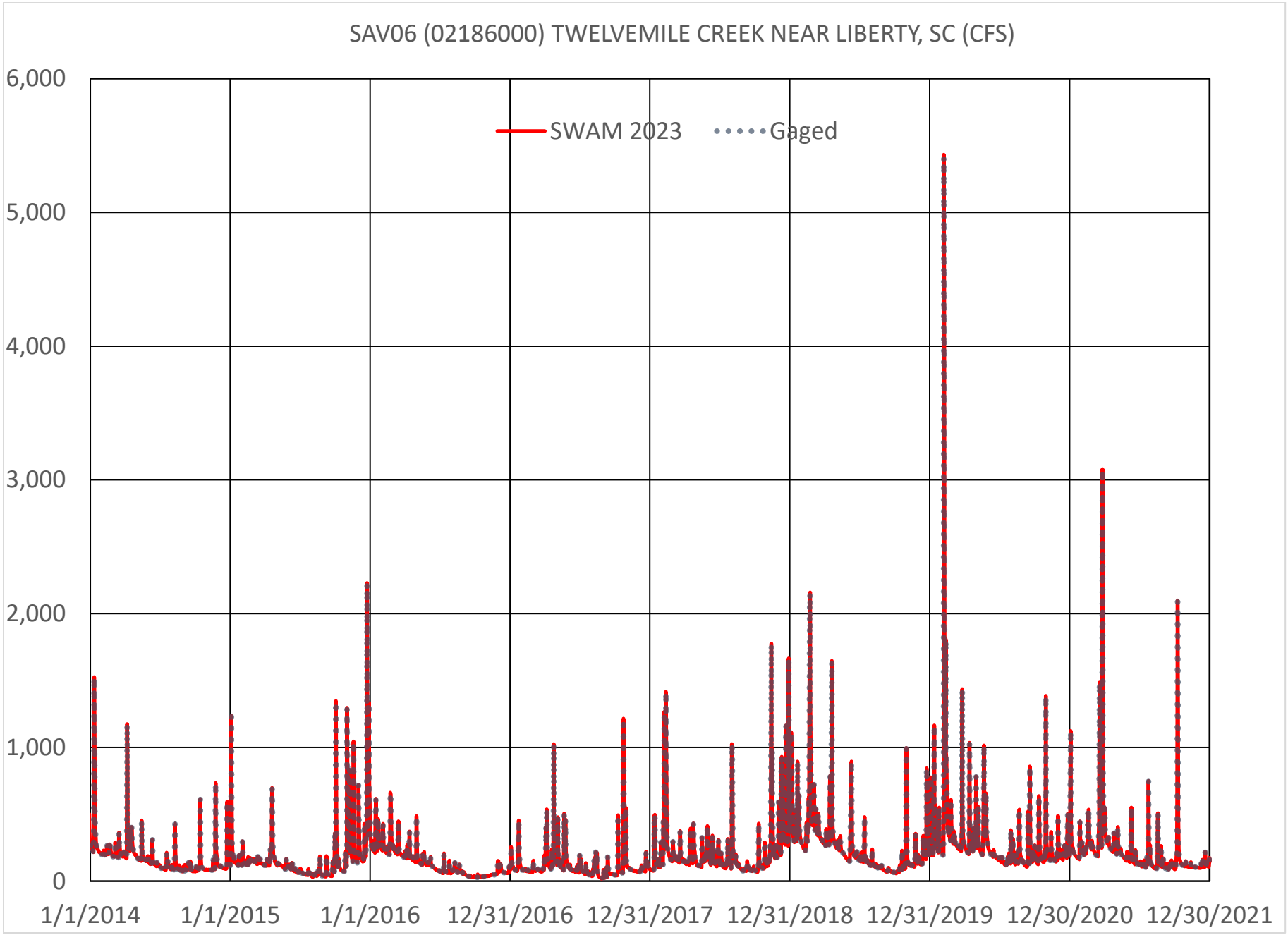

SAV36 (02197320) SAVANNAH R. NR JACKSON, SC (CFS)
Note: Gage was inactive over this entire time period.
SWAM 2023
Gaged
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

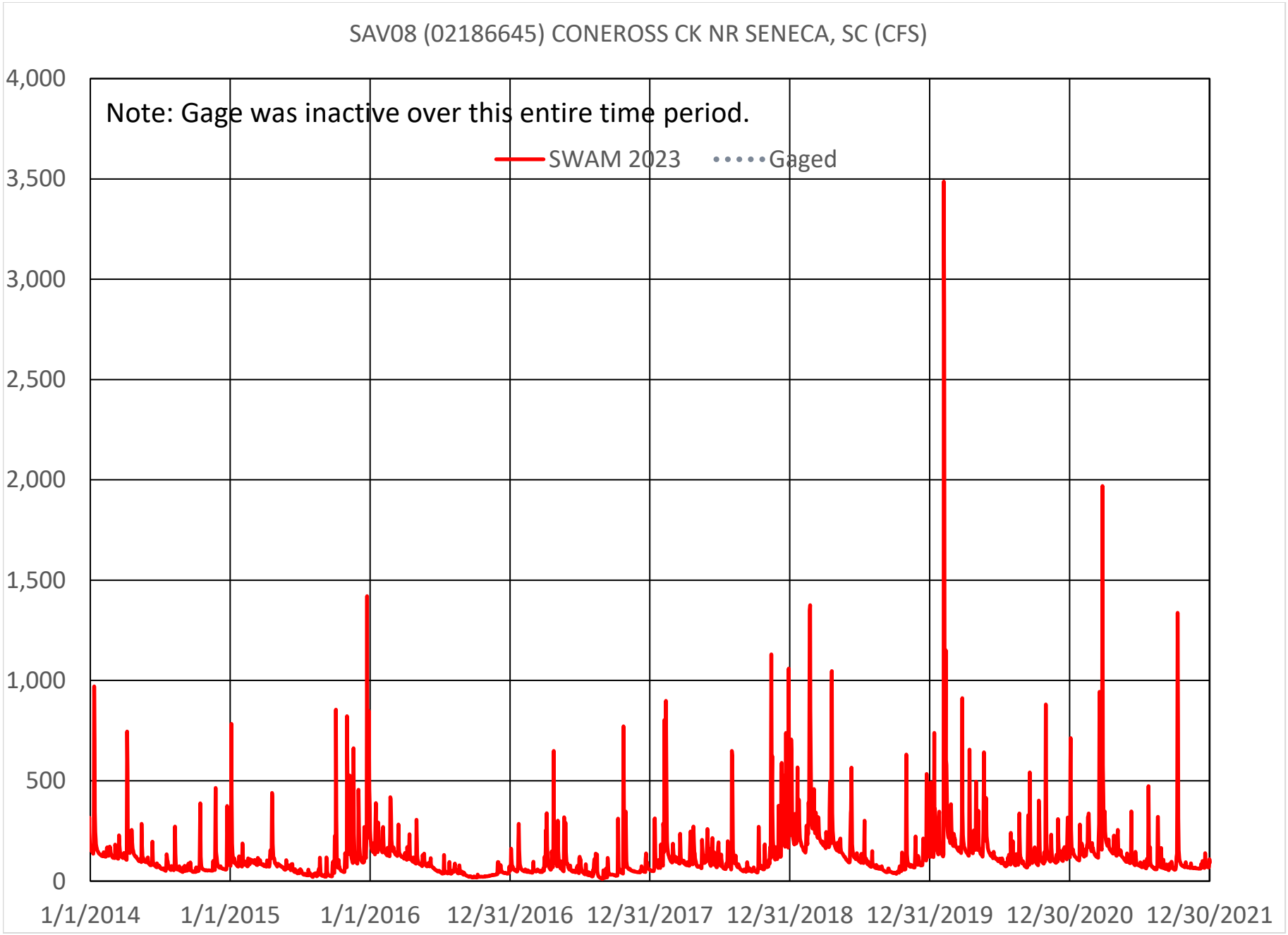

SAV43 (02197500)
SAVANNAH R AT BURTONS FERRY BR NR MILLHAVEN, GA (CFS)
SWAM 2023
Gaged
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

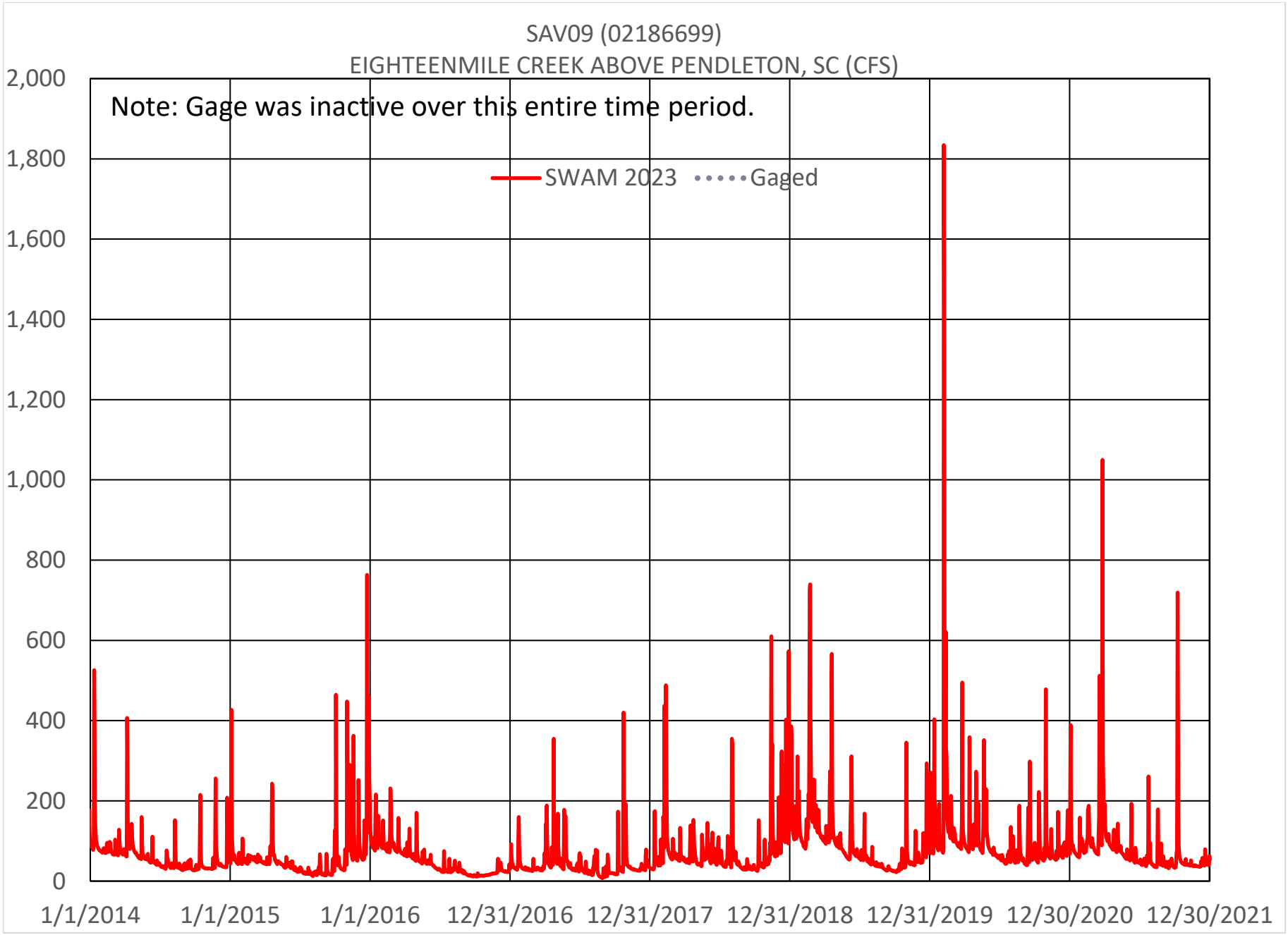

SAV44 (02198375) SAVANNAH RIVER NEAR ESTILL, SC (CFS)
SWAM 2023
Gaged
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

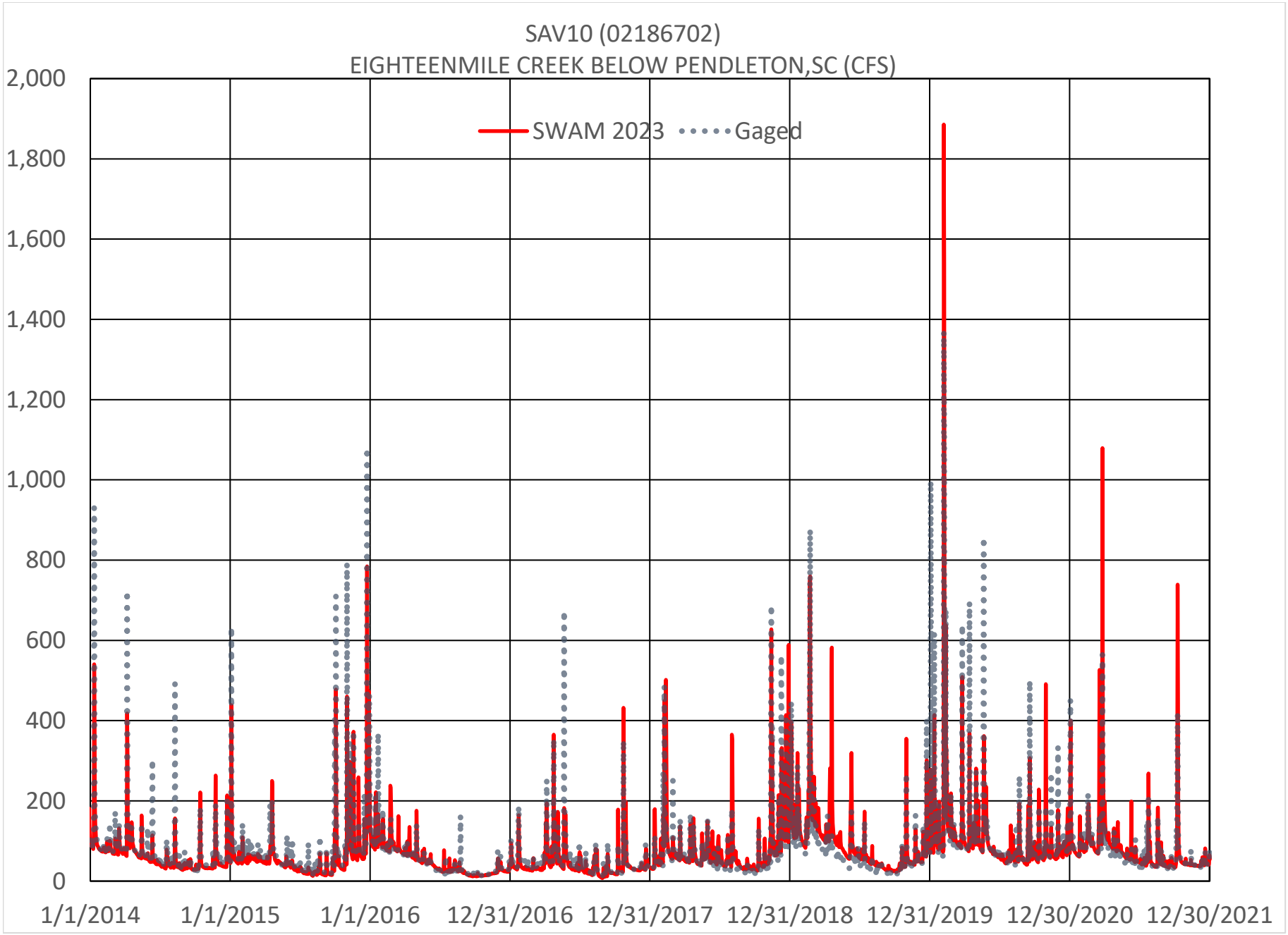

SAV45 (02198500) SAVANNAH RIVER NEAR CLYO, GA (CFS)
SWAM 2023
Gaged
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

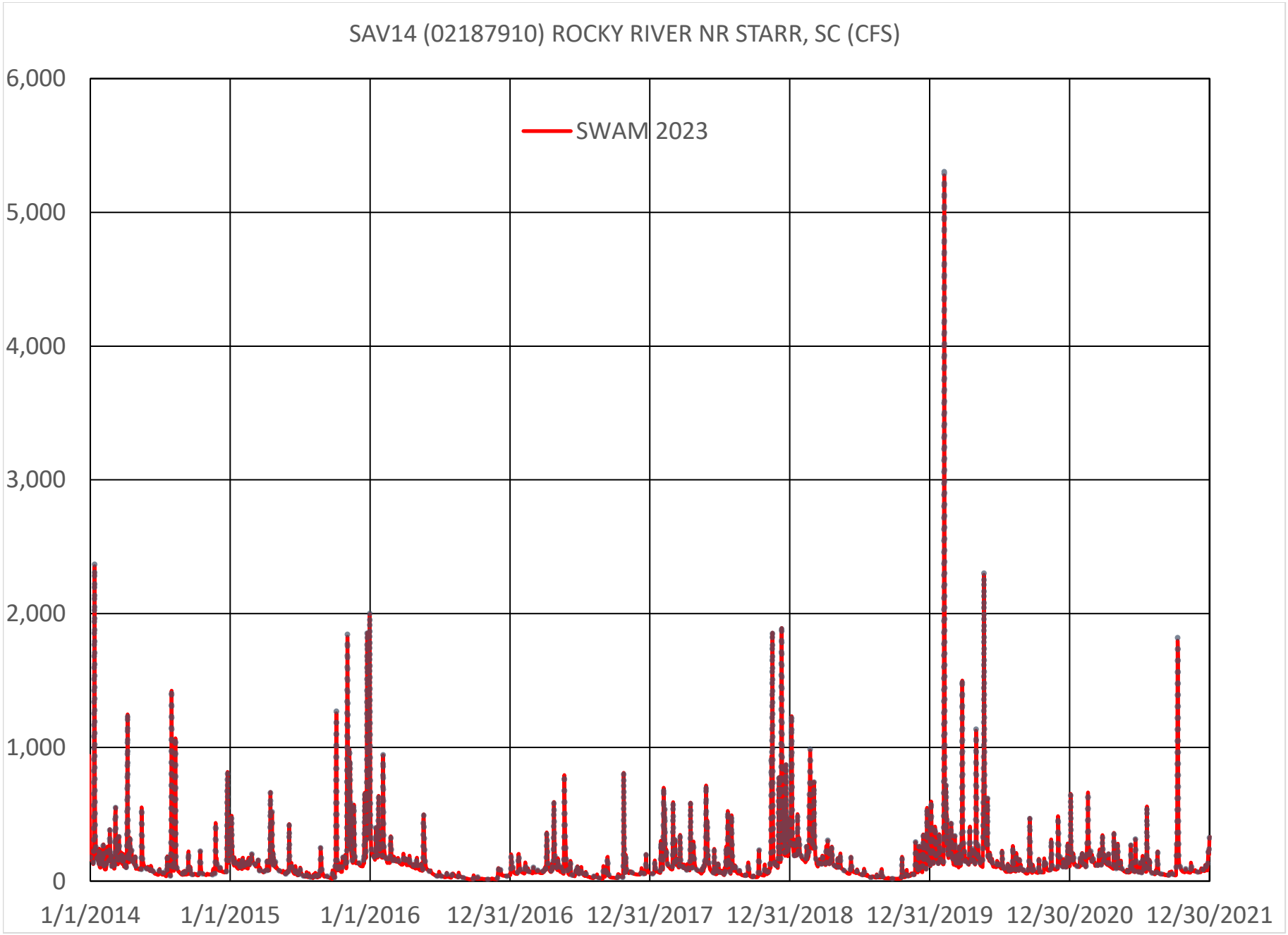

SAV04 (02185200) LITTLE RIVER NEAR WALHALLA, SC (CFS)
Note: Gage was inactive over this entire time period.
SWAM 2023
Gaged
2,500
2,000
1,500
1,000
500
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

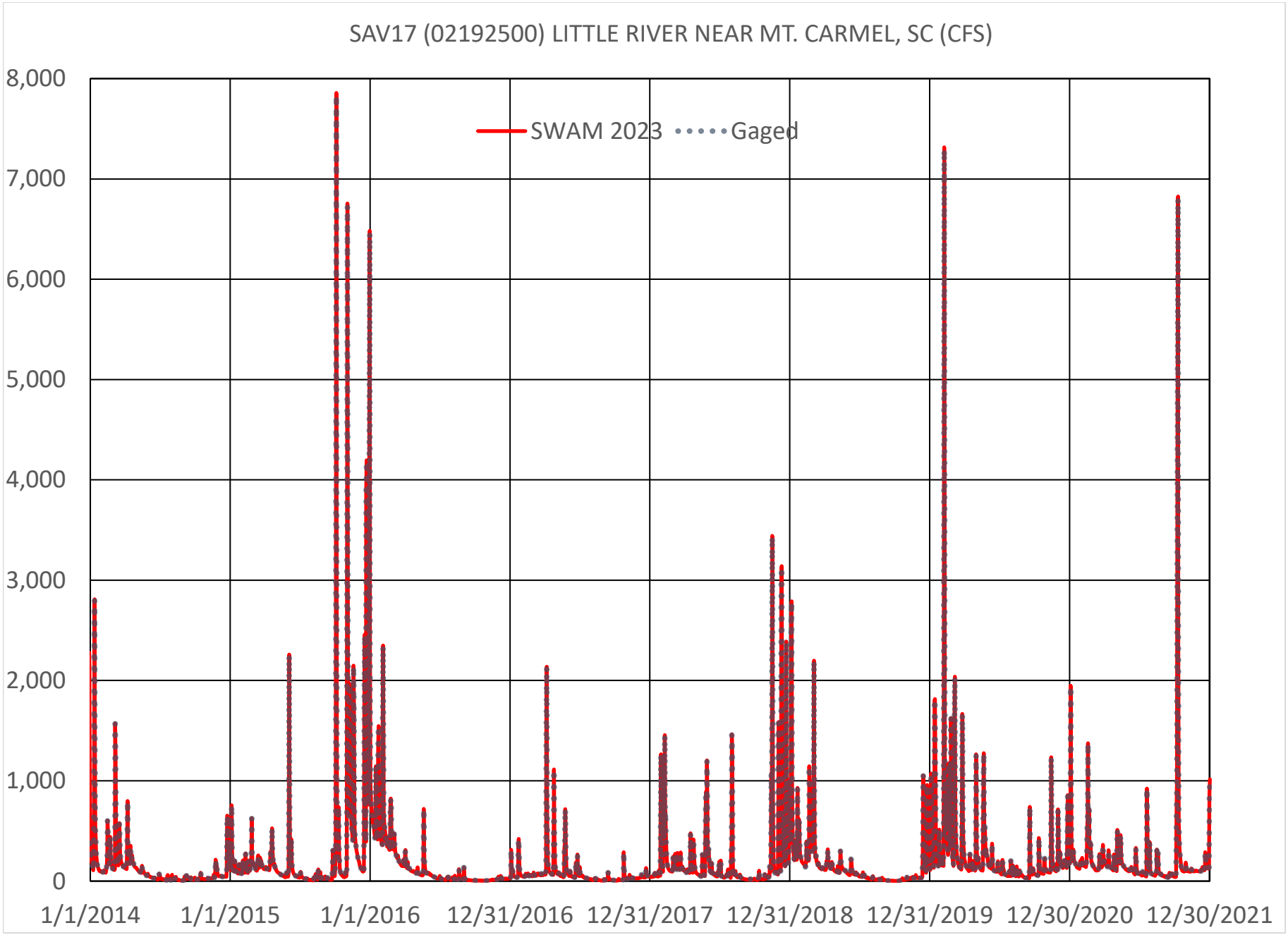

SAV06 (02186000) TWELVEMILE CREEK NEAR LIBERTY, SC (CFS)
SWAM 2023
Gaged
6,000
5,000
4,000
3,000
2,000
1,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

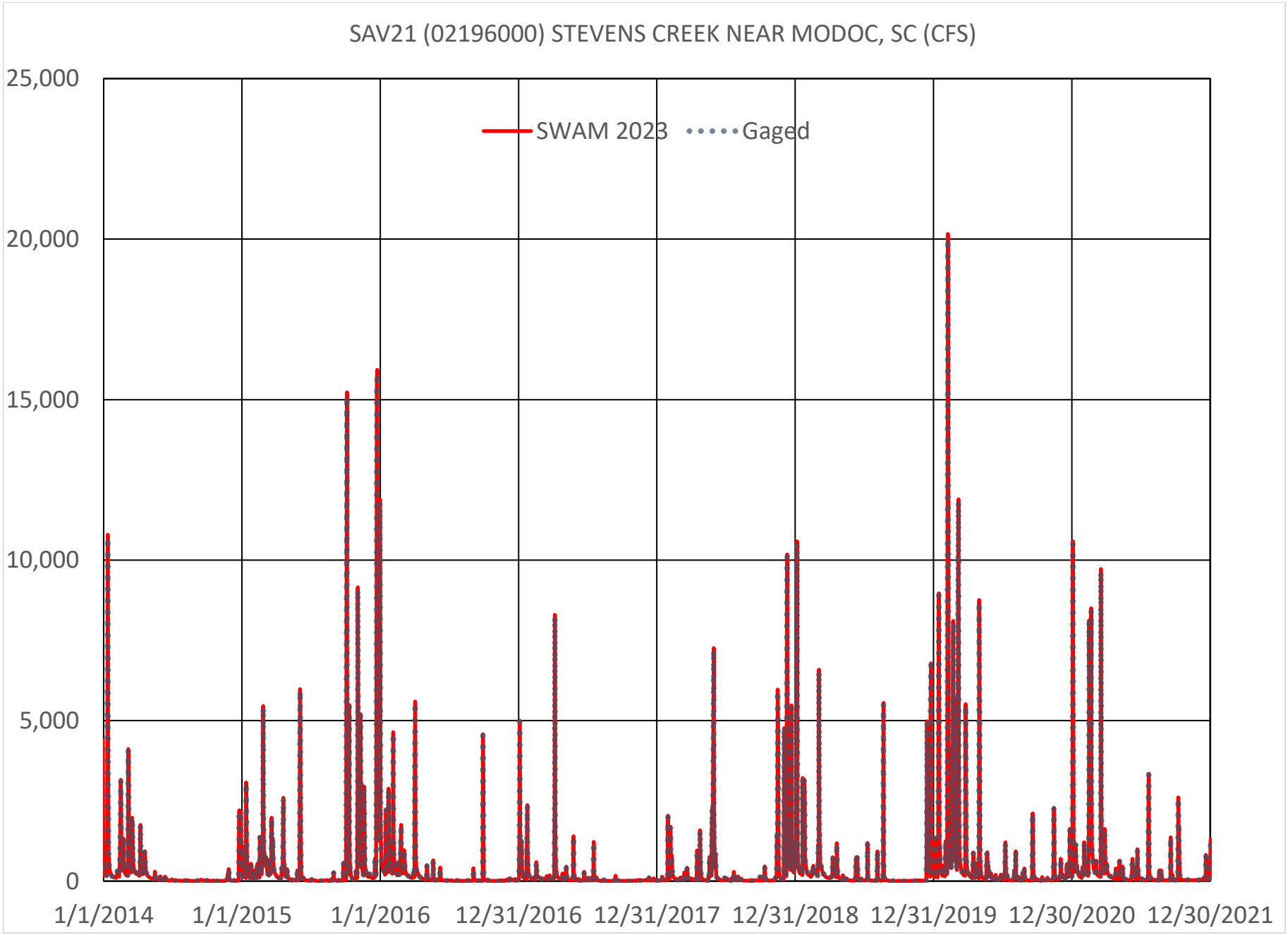

SAV08 (02186645) CONEROSS CK NR SENECA, SC (CFS)
Note: Gage was inactive over this entire time period.
SWAM 2023
Gaged
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

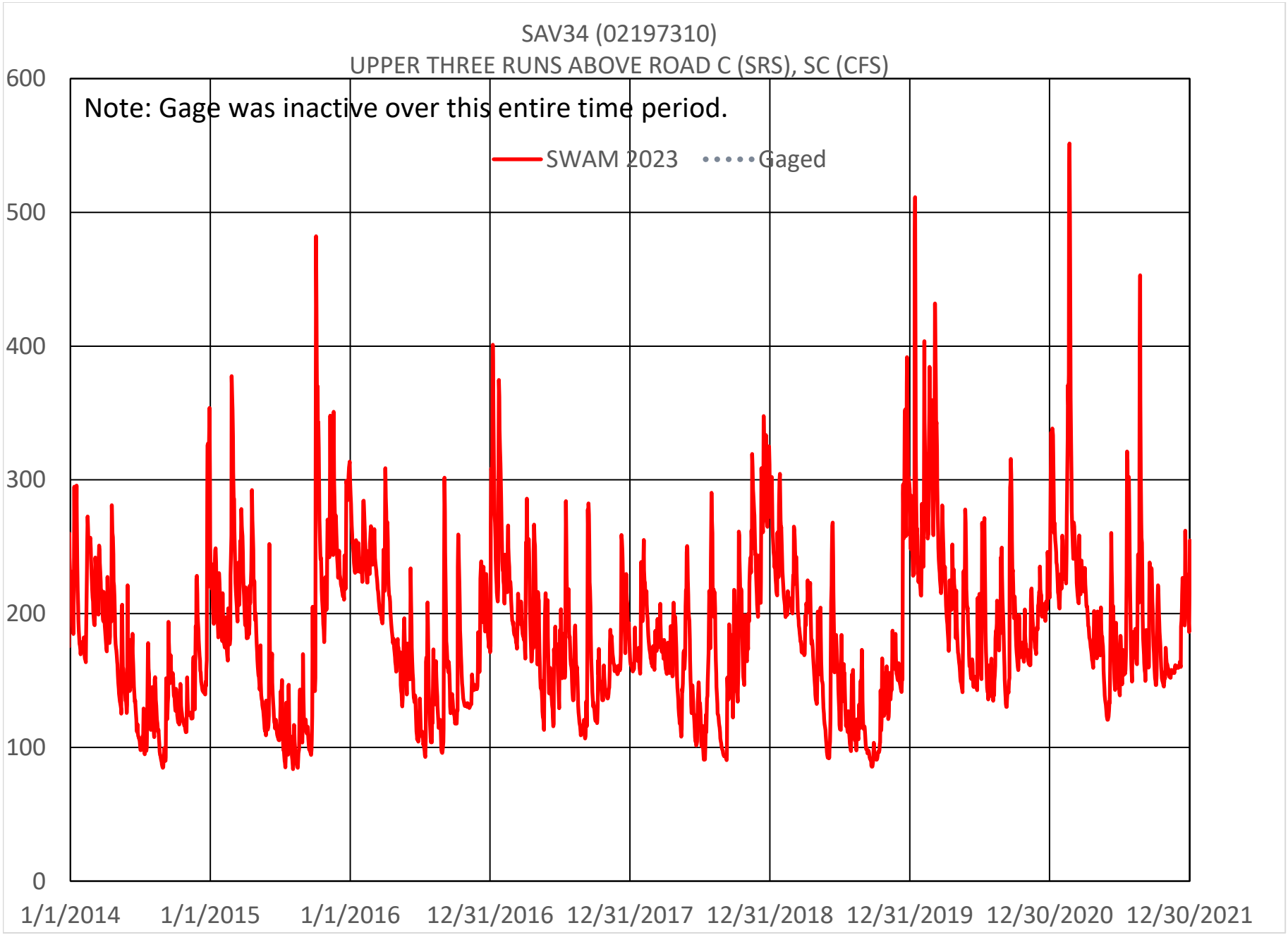

SAV09 (02186699)
EIGHTEENMILE CREEK ABOVE PENDLETON, SC (CFS)
Note: Gage was inactive over this entire time period.
SWAM 2023
Gaged
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

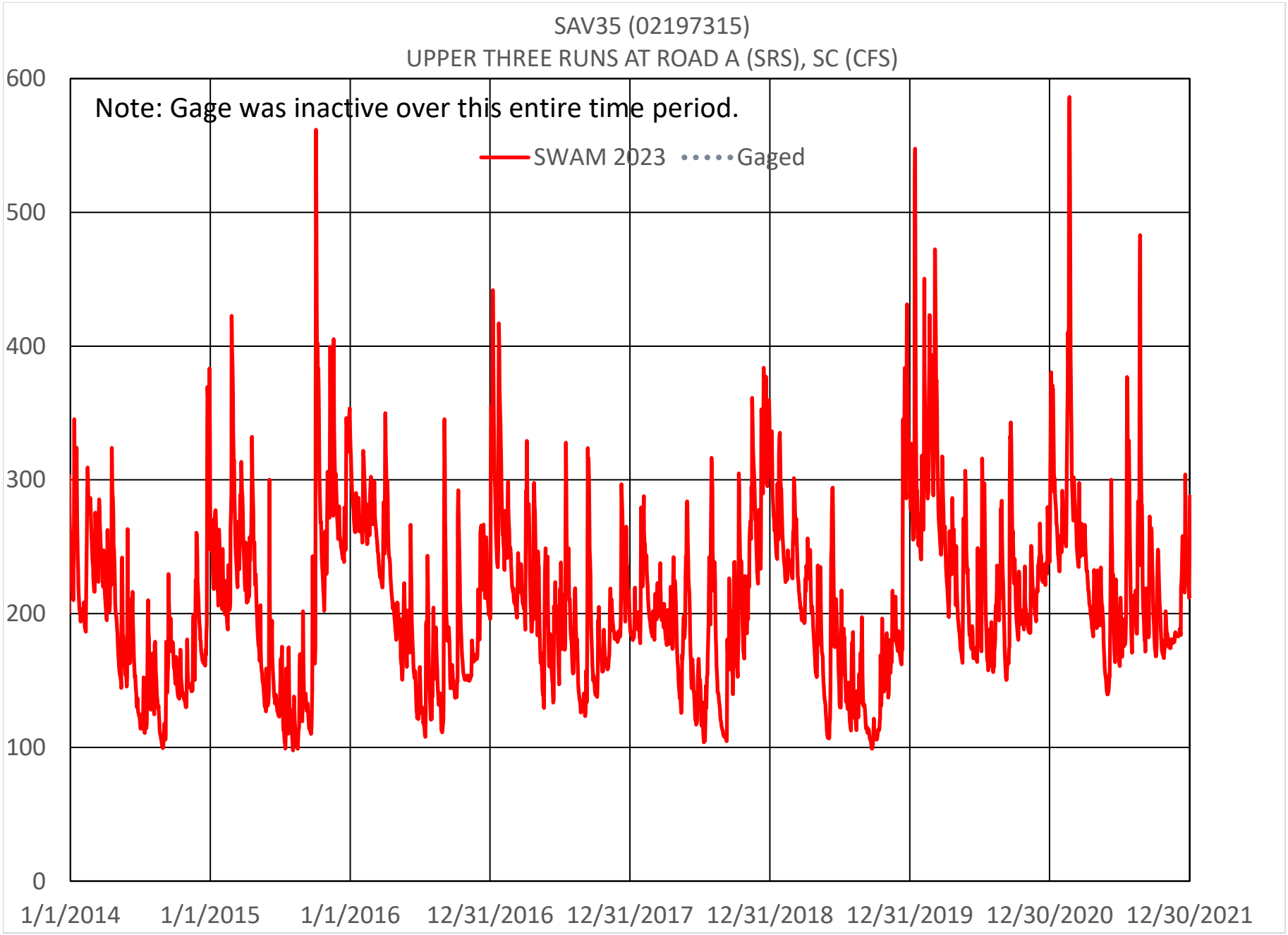

SAV10 (02186702)
EIGHTEENMILE CREEK BELOW PENDLETON,SC (CFS)
SWAM 2023
Gaged
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021

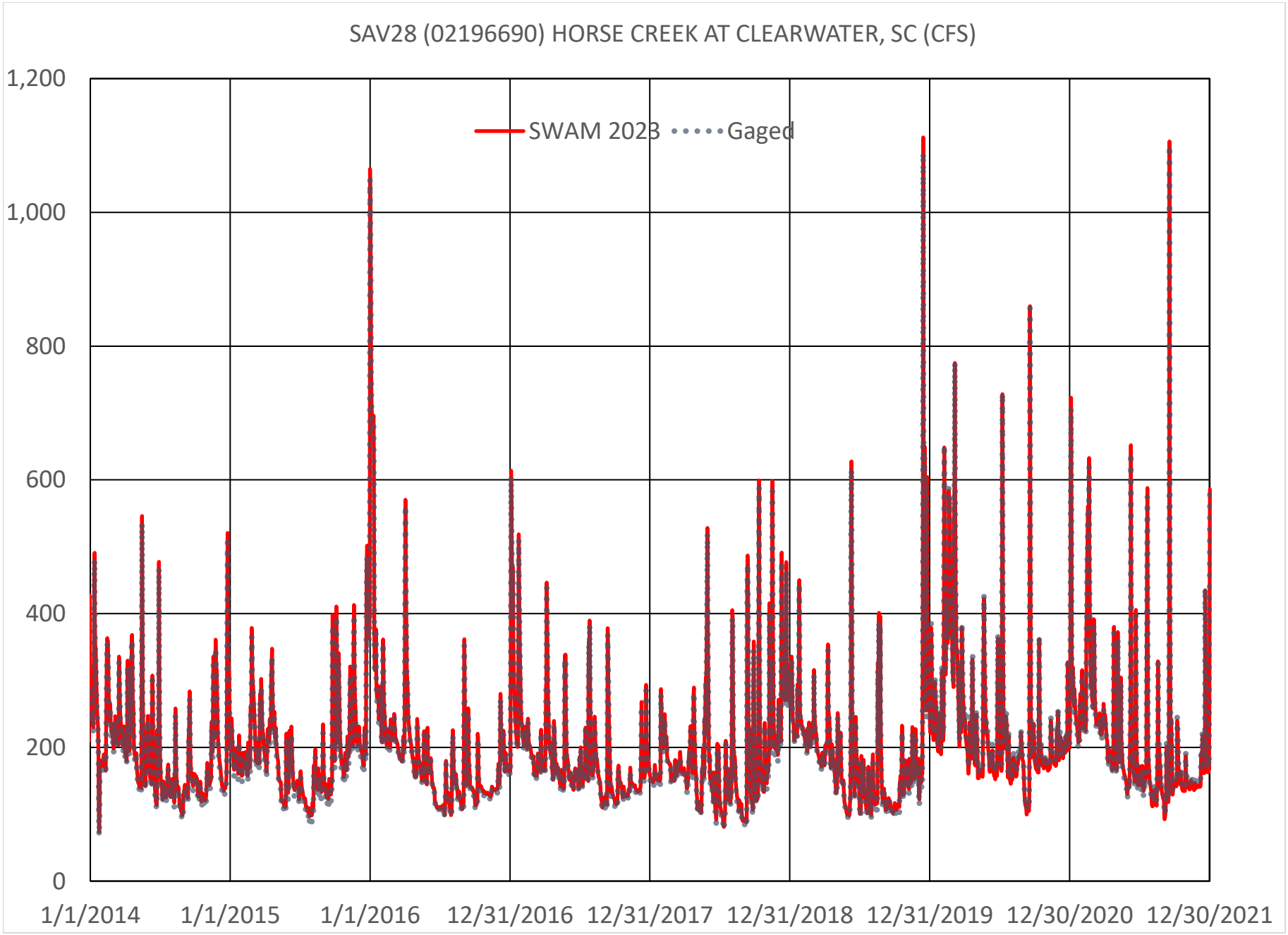

SAV14 (02187910) ROCKY RIVER NR STARR, SC (CFS)
SWAM 2023
6,000
5,000
4,000
3,000
2,000
1,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021


SAV17 (02192500) LITTLE RIVER NEAR MT. CARMEL, SC (CFS)
SWAM 2023
Gaged
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021


SAV21 (02196000) STEVENS CREEK NEAR MODOC, SC (CFS)
SWAM 2023
Gaged
25,000
20,000
15,000
10,000
5,000
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021


SAV34 (02197310)
UPPER THREE RUNS ABOVE ROAD C (SRS), SC (CFS)
Note: Gage was inactive over this entire time period.
SWAM 2023
Gaged
600
500
400
300
200
100
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021


SAV35 (02197315)
UPPER THREE RUNS AT ROAD A (SRS), SC (CFS)
Note: Gage was inactive over this entire time period.
SWAM 2023
Gaged
600
500
400
300
200
100
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021


SAV28 (02196690) HORSE CREEK AT CLEARWATER, SC (CFS)
SWAM 2023
Gaged
1,200
1,000
800
600
400
200
0
1/1/2014
1/1/2015
1/1/2016
12/31/2016
12/31/2017
12/31/2018
12/31/2019
12/30/2020
12/30/2021