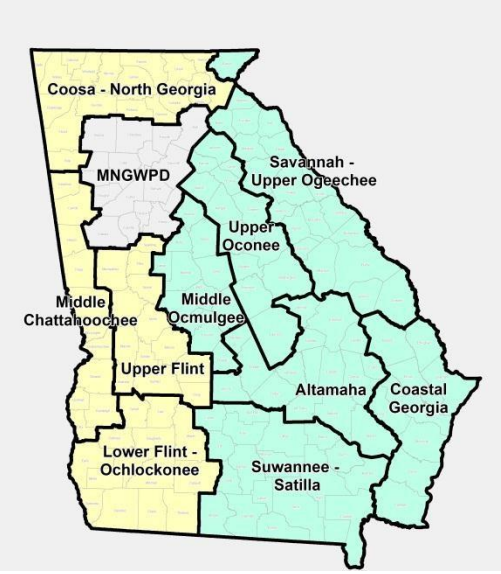
Joint Council Meeting #1 – Eastern Councils
Thursday, June 23, 2016

Dubose Porter Center
Oconee Fall Line Technical College
560 Pinehill Road
Dublin, GA 31021



Surface Water Availability Slides and Handouts – This package includes the following slides presented by Dr. Zeng and a handout with additional detail:

- Surface Water Availability Resource Assessment
- Surface Water Availability Resource Assessment – Handout

State Water Plan
Surface Water Availability Resource Assessment

June 2016

Agenda:

- Resource Assessment Objectives
- New Information and Tools
- Assessment Approach
- Assessment Results

Resource Assessment Objectives

- Assess current availability of surface water resource by answering the following:
  - How much water have we received from Mother Nature?
  - How much water have we used (off-stream needs)?
  - How much water do we potentially need to leave in the streams (in-stream needs)?
  - Do we potentially have an issue meeting both?

Resource Assessment Objectives

- Identify and quantify potential gaps between currently available resource and combined current needs
  - Unregulated Basins: potential shortage of water to meet both off-stream and in-stream needs (frequency and depth)
  - Regulated Basins: potential shortage of water to meet both off-stream needs and flow needs as identified by reservoir regulations

New Information and Tools

- Consumptive water use data through 2013
- Extended UIF data through 2013 for SO, OOA, OSSS, and TN Basins, and extended UIF data through 2011 for ACF and ACT Basins
- Agricultural metering data
- Farm ponds surveyed in Flint, Ogeechee, and Suwannee Basins
- Carsonville, Macon 2 and Lumber 2 nodes added
- ResSim and HEC-5 model developed

Assessment Approach

- Development of consumptive water use data
- Development of unimpaired flow data (UIF data)
- Development of computer models simulating water management and reservoir operations
  - Simple mass balance in unregulated basins
  - Reservoir operation part of regulated basins
- Post-simulation processing to help identify potential issues

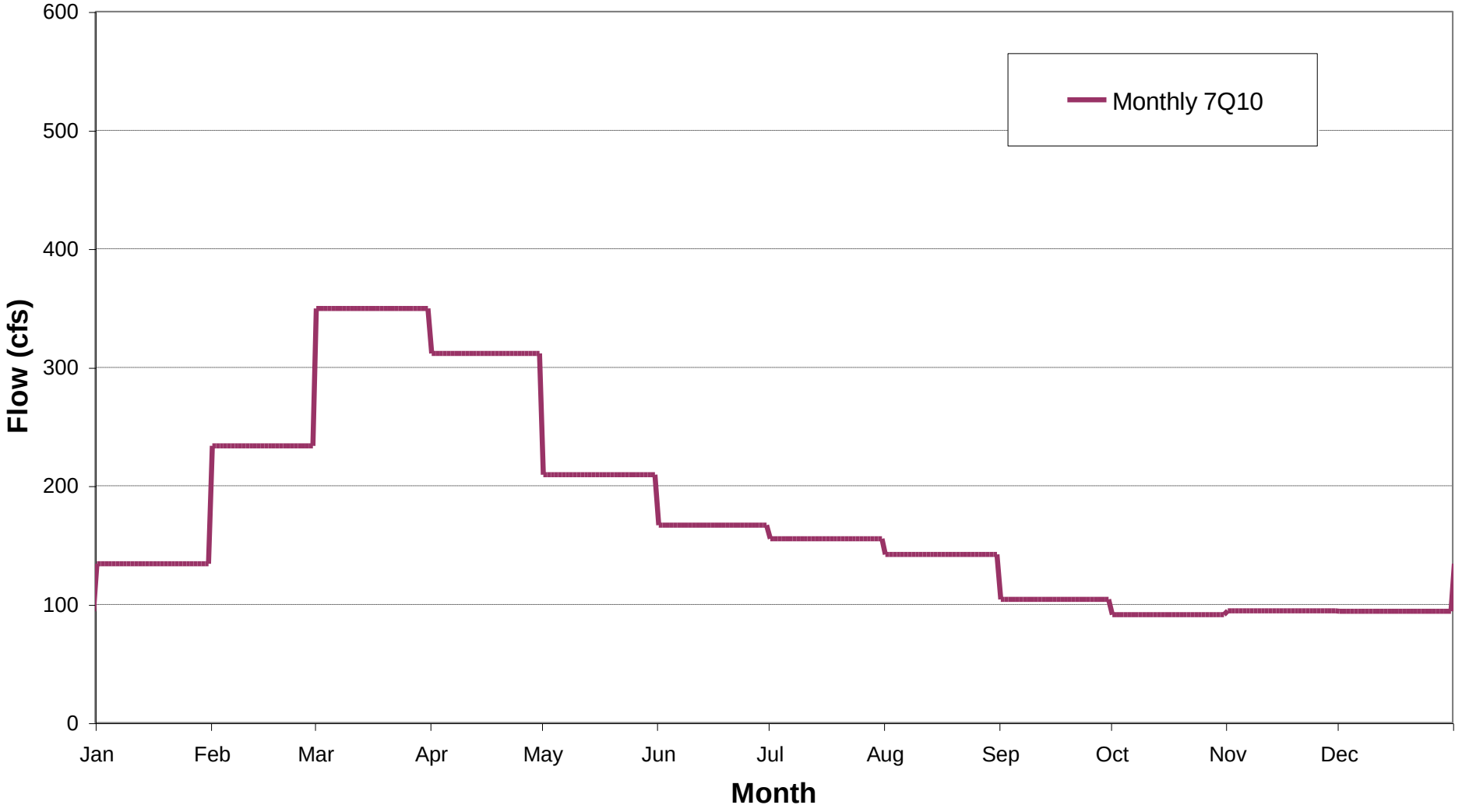
Assessment Approach Limitations

- Regional planning level resolution
  - Results at 70+ basic nodes and 40+ planning nodes
- Models used for broad scale regional planning, not for individual permitting decisions

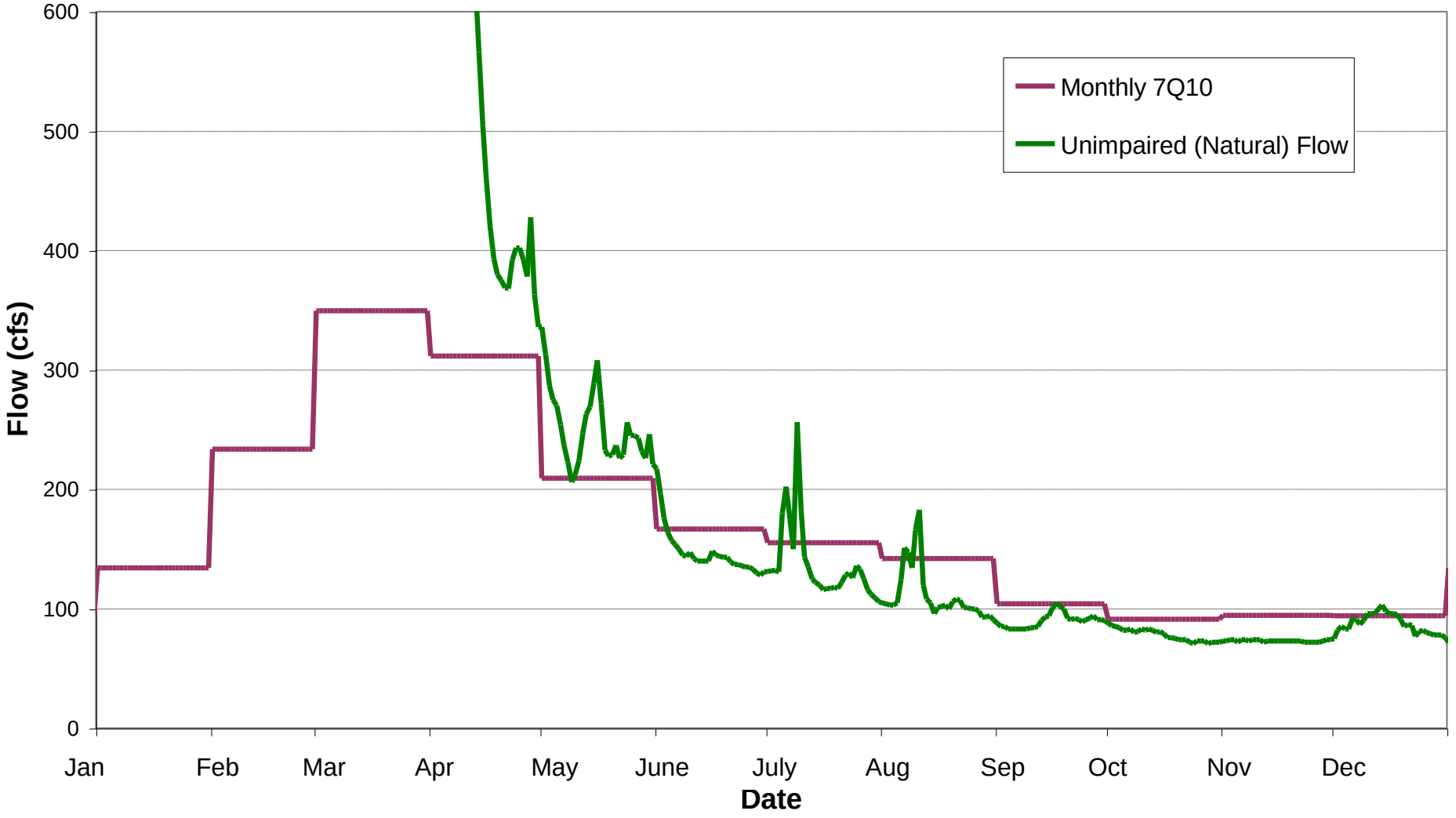
Identifying Potential Resource Gaps (Unregulated)

- Step 1 – Determine monthly 7Q10 for each of the unregulated Planning Nodes
- Step 2 – Determine unimpaired or “natural” flow for a node by removing man-made effects on flow observed at that node for the 70 year period
- Step 3 – Develop Flow Regime by taking the less of the two
- Step 4 – Identify gaps between availability and demand by comparing the Flow Regime to modeled stream flow assuming all water demands are being met

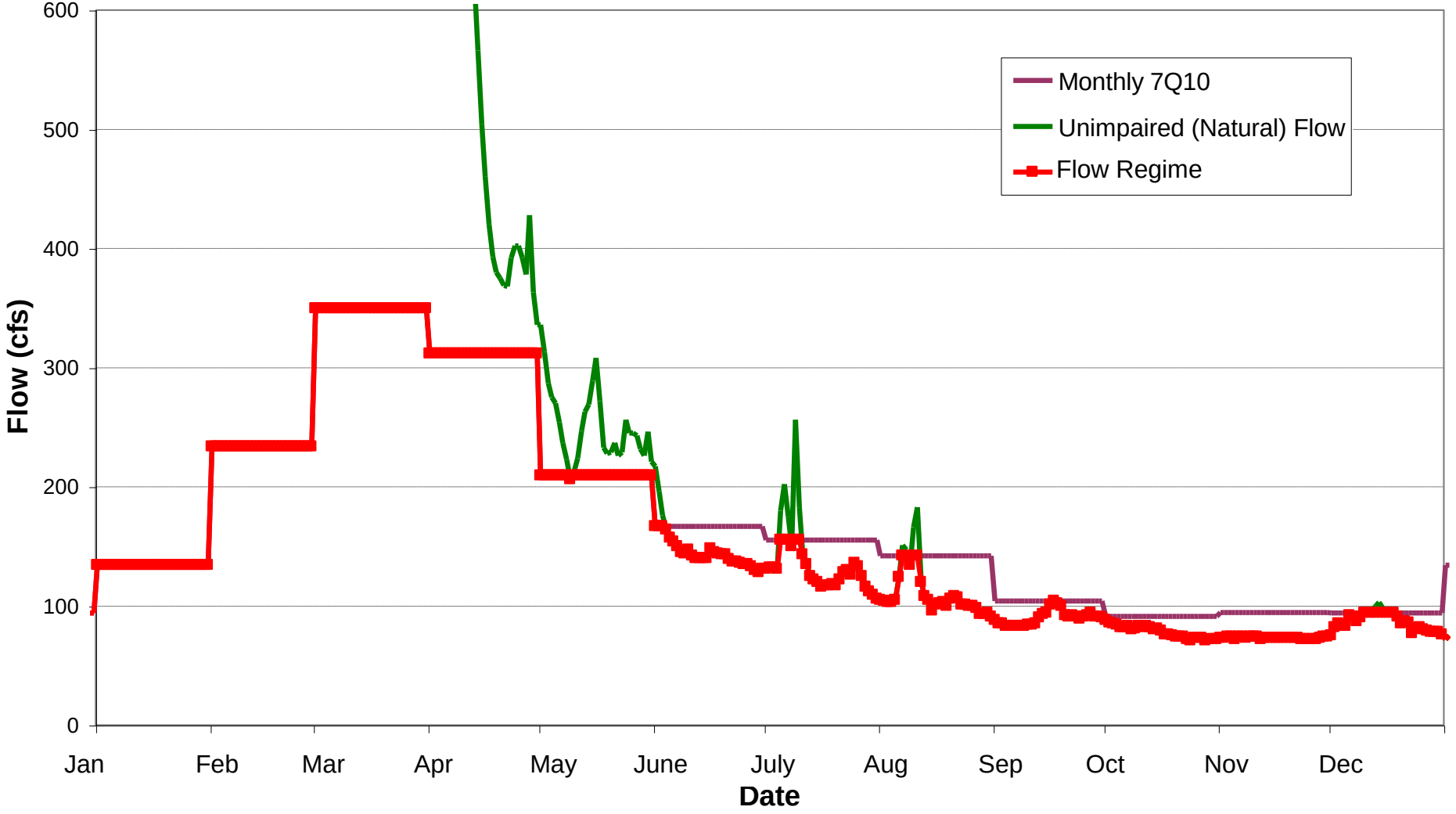
Step 1 – Determine Monthly 7Q10



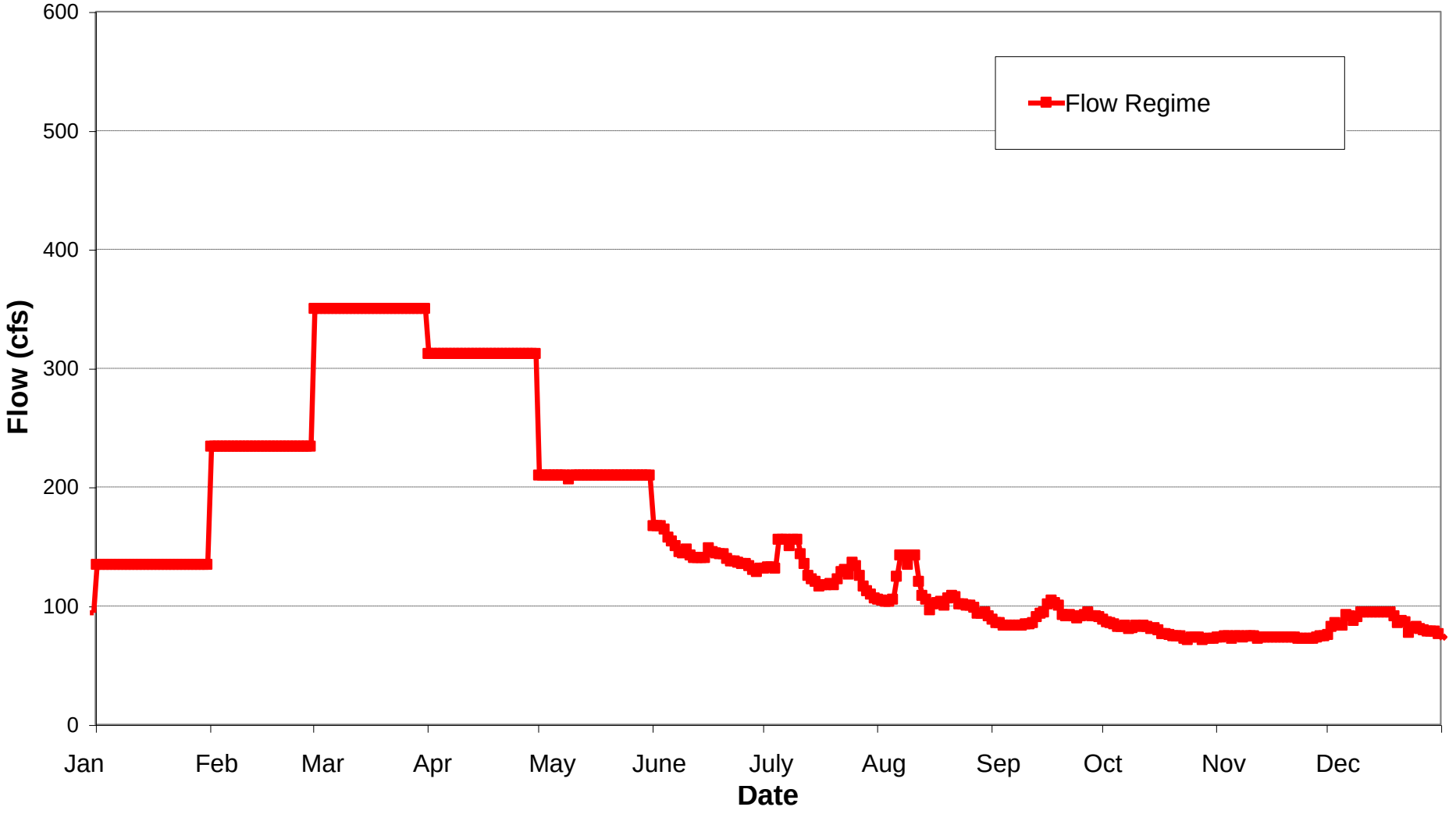
Step 2 – Determine Unimpaired Flow



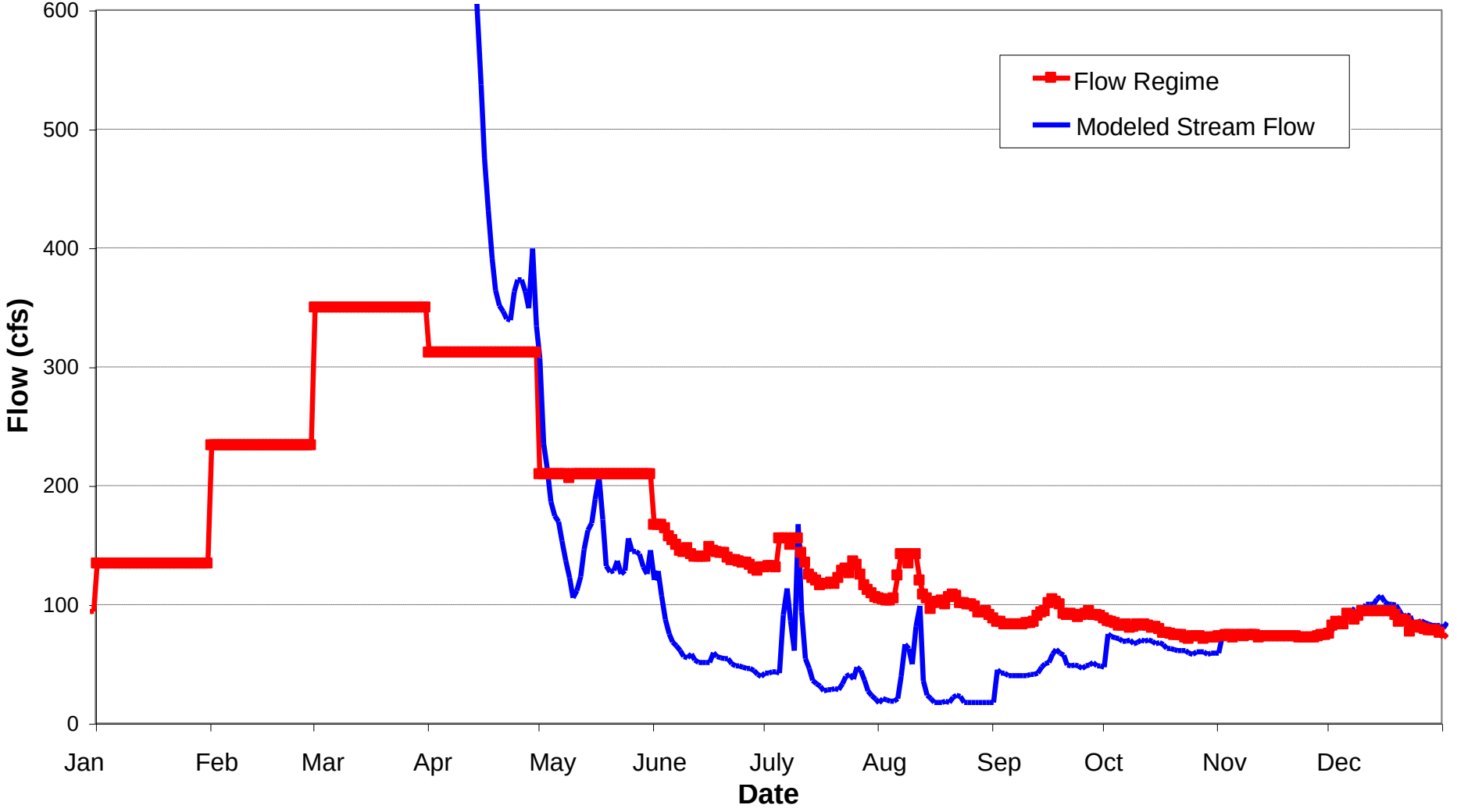
Step 3 – Take Monthly 7Q10 or Natural Flow, Whichever is Lower…



Step 3 – …to Develop Flow Regime

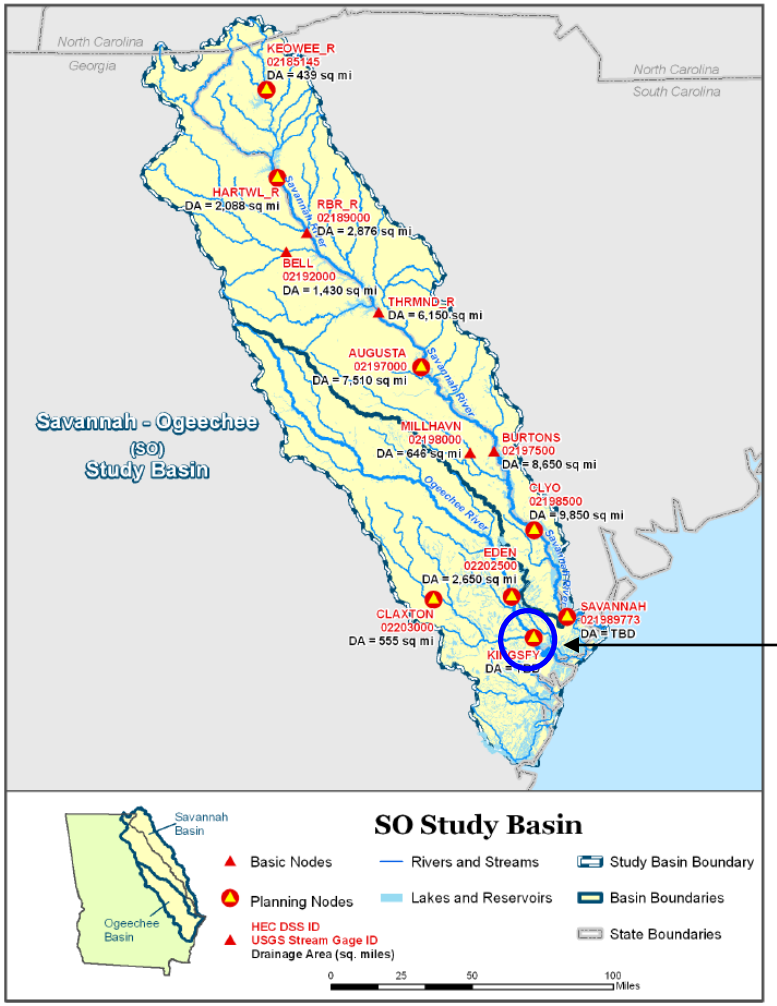


Step 4 – Identify Gaps by Comparing Modeled Stream Flow to Flow Regime



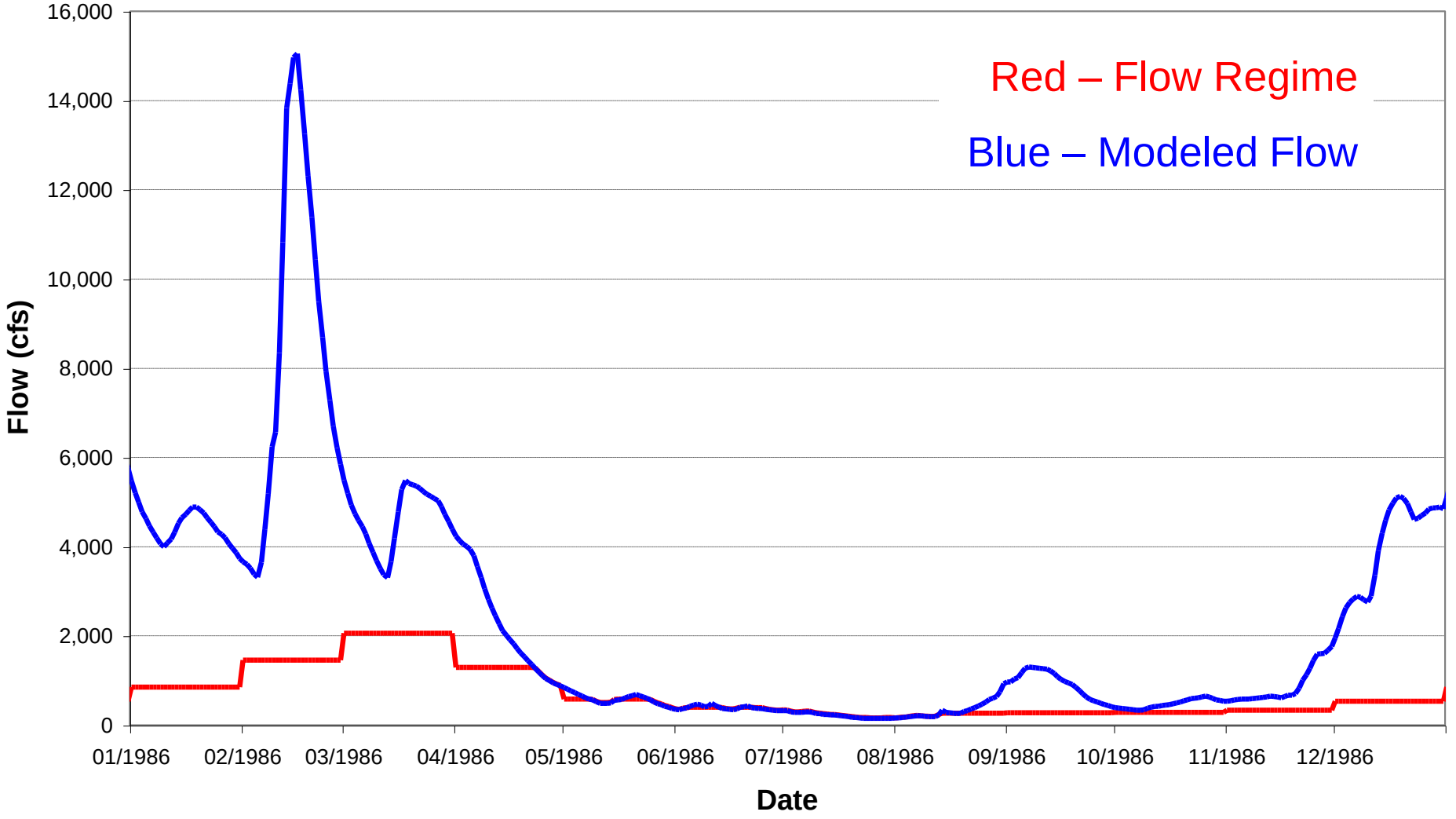
Modeled Stream Flow Assumes Water Demand Fully Met

Kings Ferry in the Ogeechee River Basin



Kings Ferry

Potential Gap at Kings Ferry in the Ogeechee River



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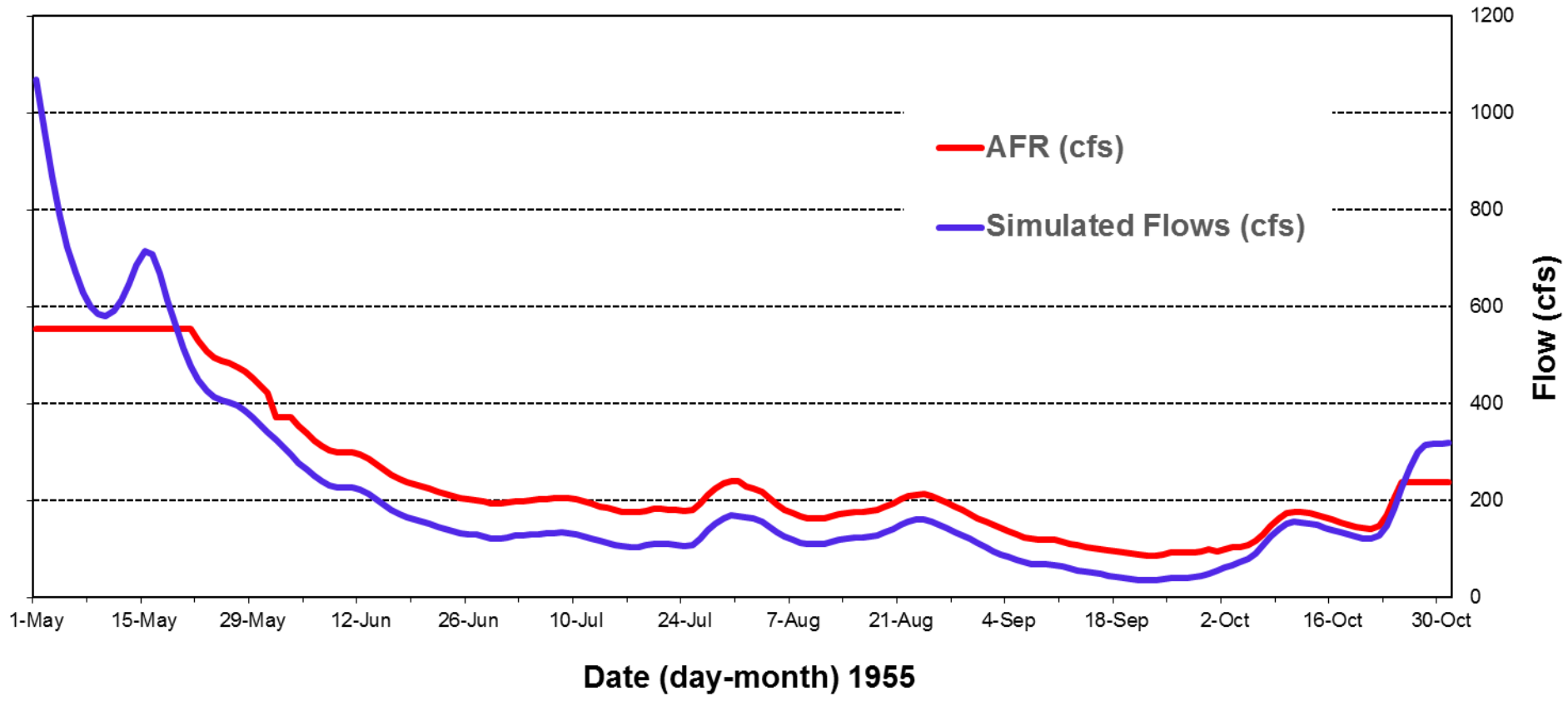

Modeled Stream Flow Assumes Water Demand Fully Met

Flow Regime Potential Shortfall at Kings Ferry in Ogeechee River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1 -day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939 – 2007)	4	11	3,720	17	257
Round 2 (1939 – 2013)	6	35	3,635	82	430

Characteristics of Potential Gaps at Kings Ferry

Gap event duration by category for Kings Ferry	Number of gap events		Total gap days by category, 1939-2013		Average daily flow deficit per gap event (cfs)	Average cumulative flow deficit per gap event (cfsd)
1 – 7 days	52	(50.5%)	184	(0.7%)	19	89
8 – 14 days	18	(17.5%)	186	(0.7%)	32	328
15 – 30 days	18	(17.5%)	366	(1.3%)	33	677
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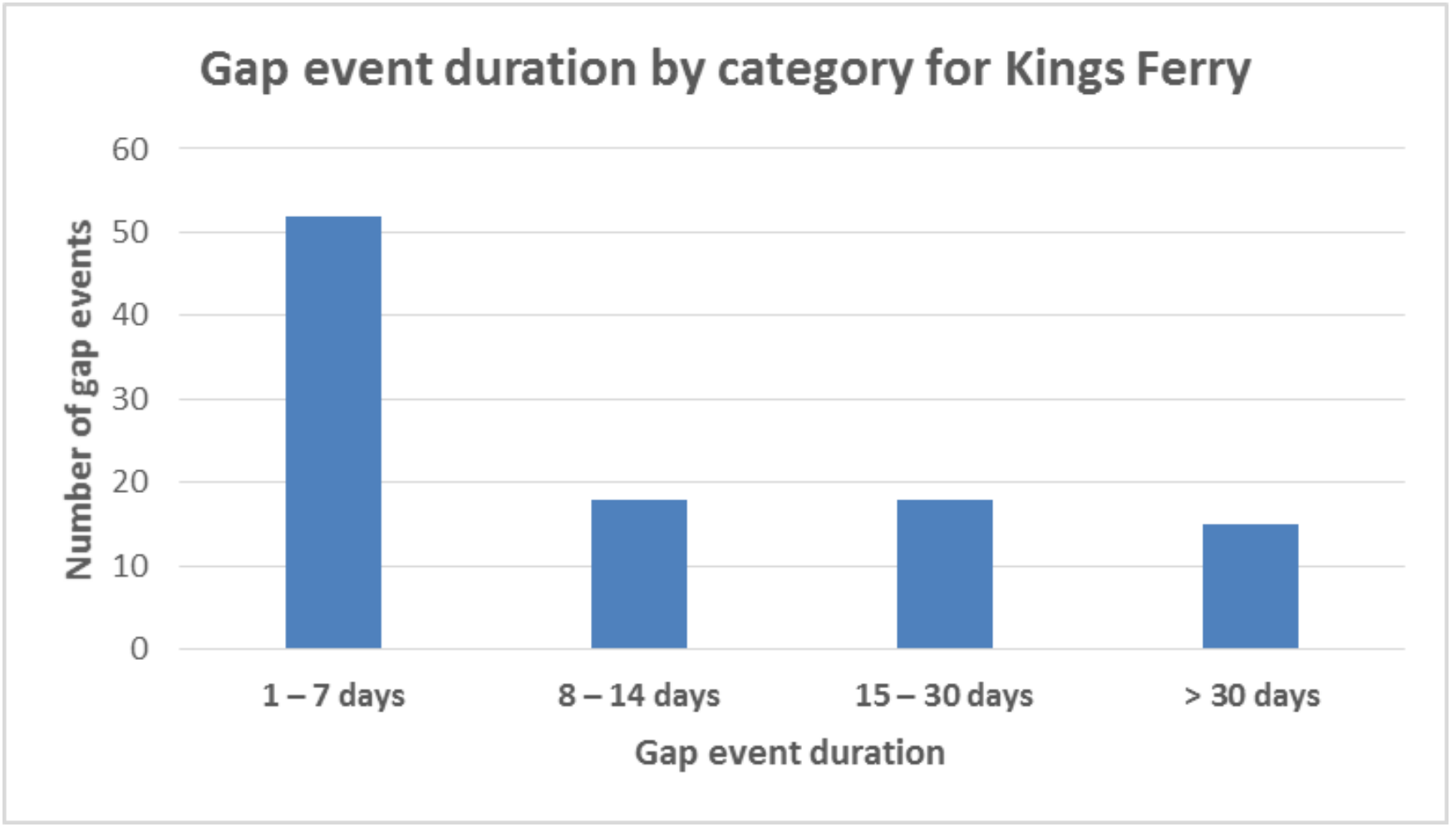
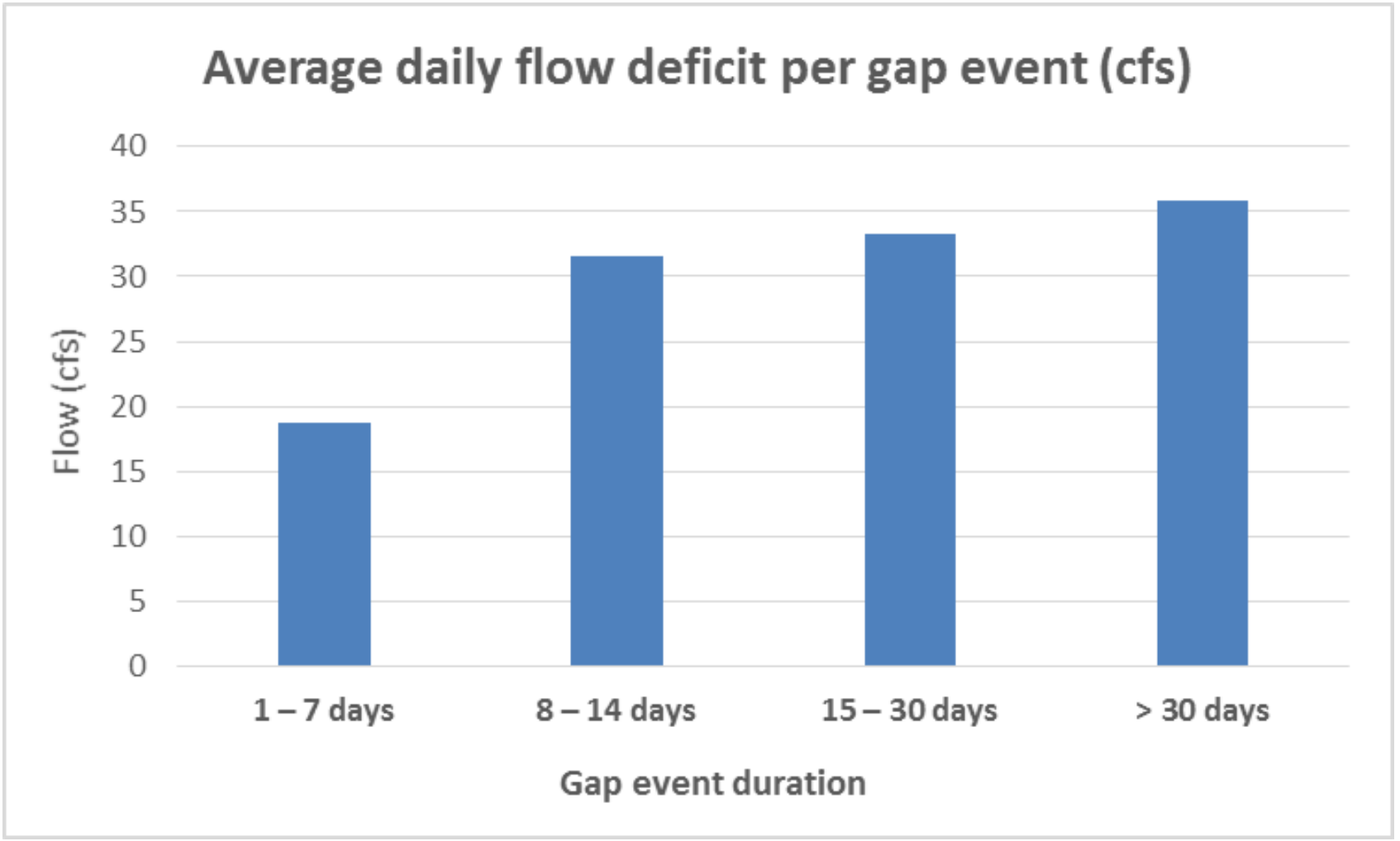
Totals (∑)	103	(100.0%)	1600	(5.8%)		

Characteristics of Potential Gaps at Kings Ferry

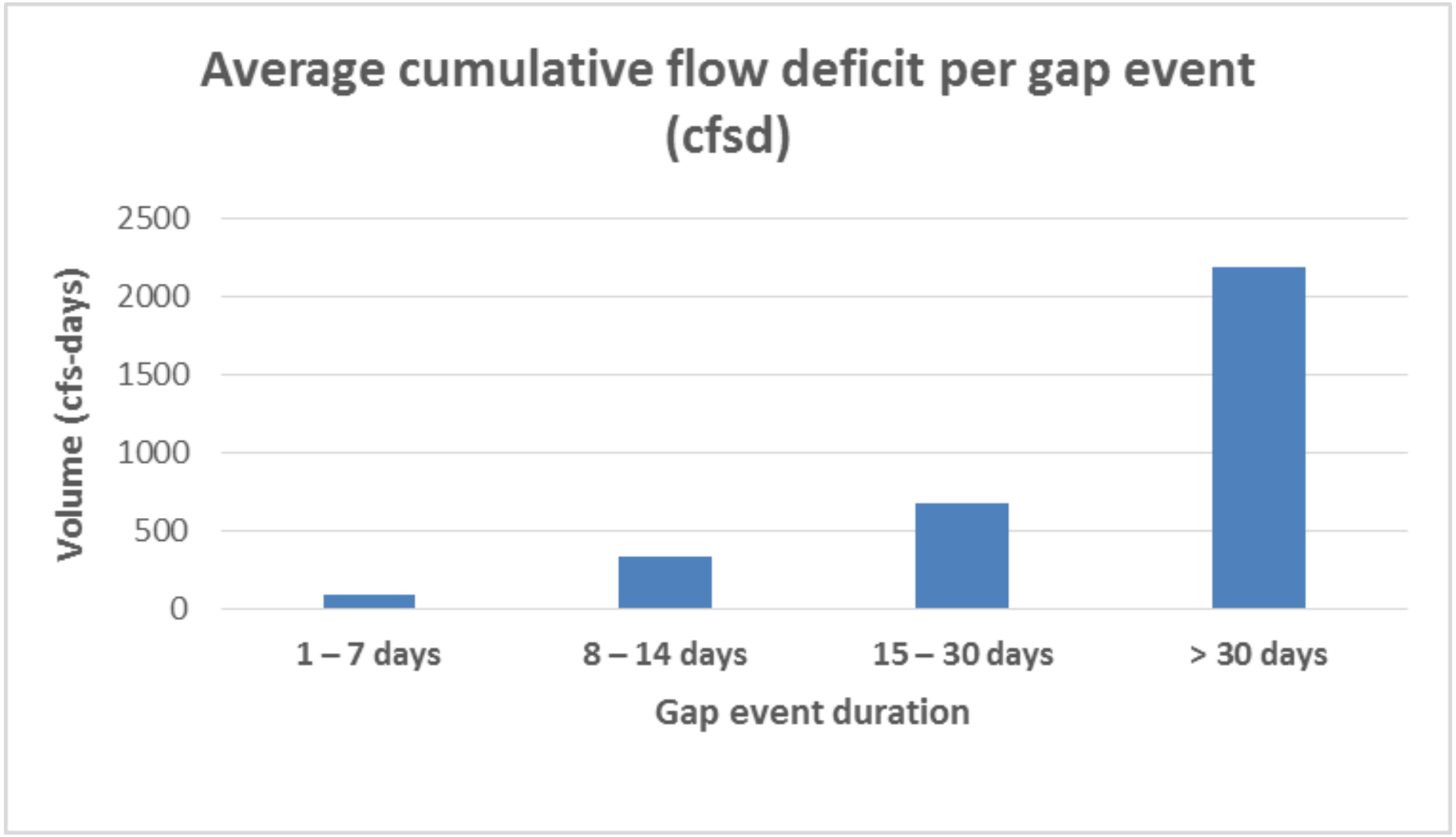


Characteristics of Potential Gaps at Kings Ferry

Long Term Average Flow Approximately 3600 cfs



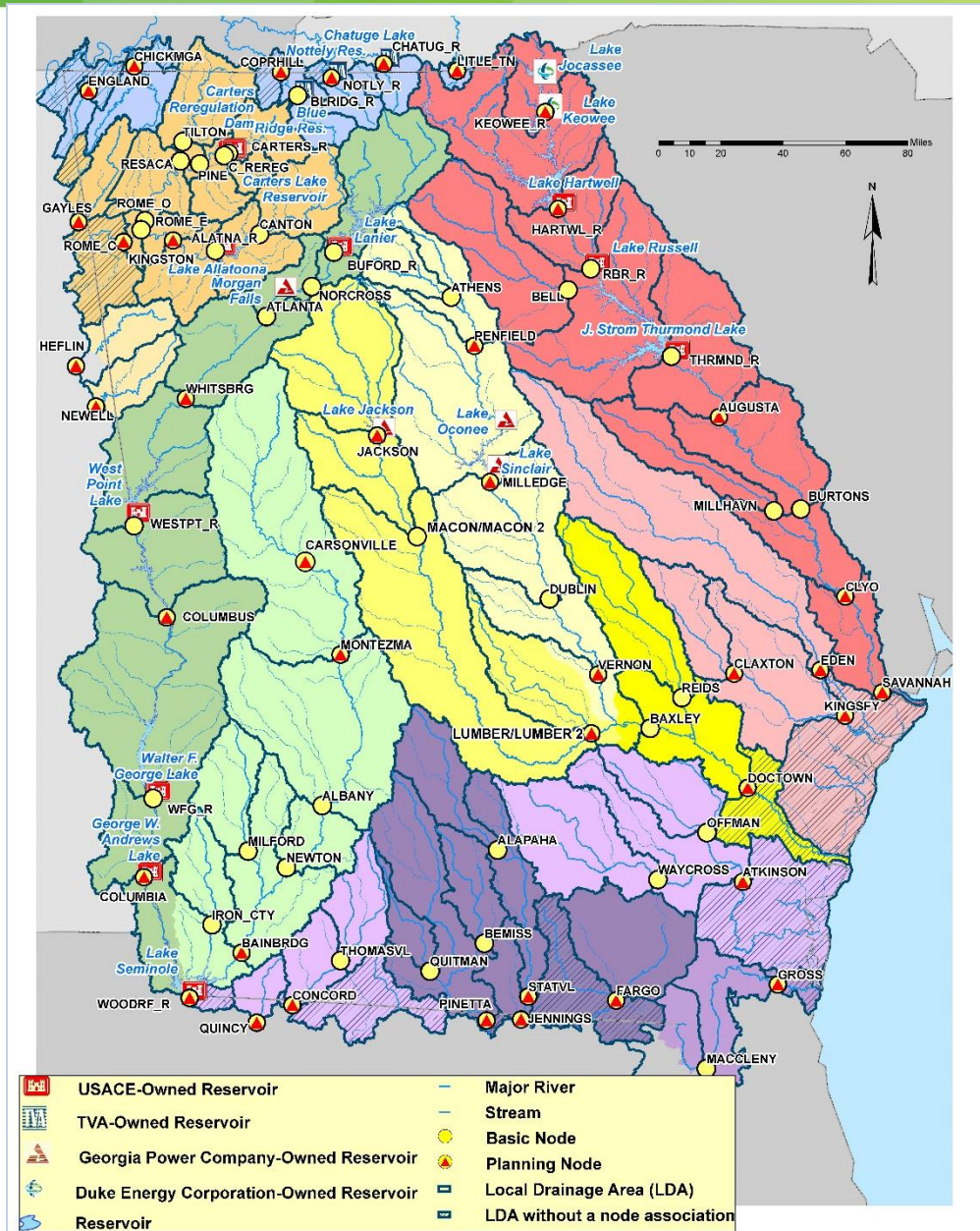
Characteristics of Potential Gaps at Kings Ferry



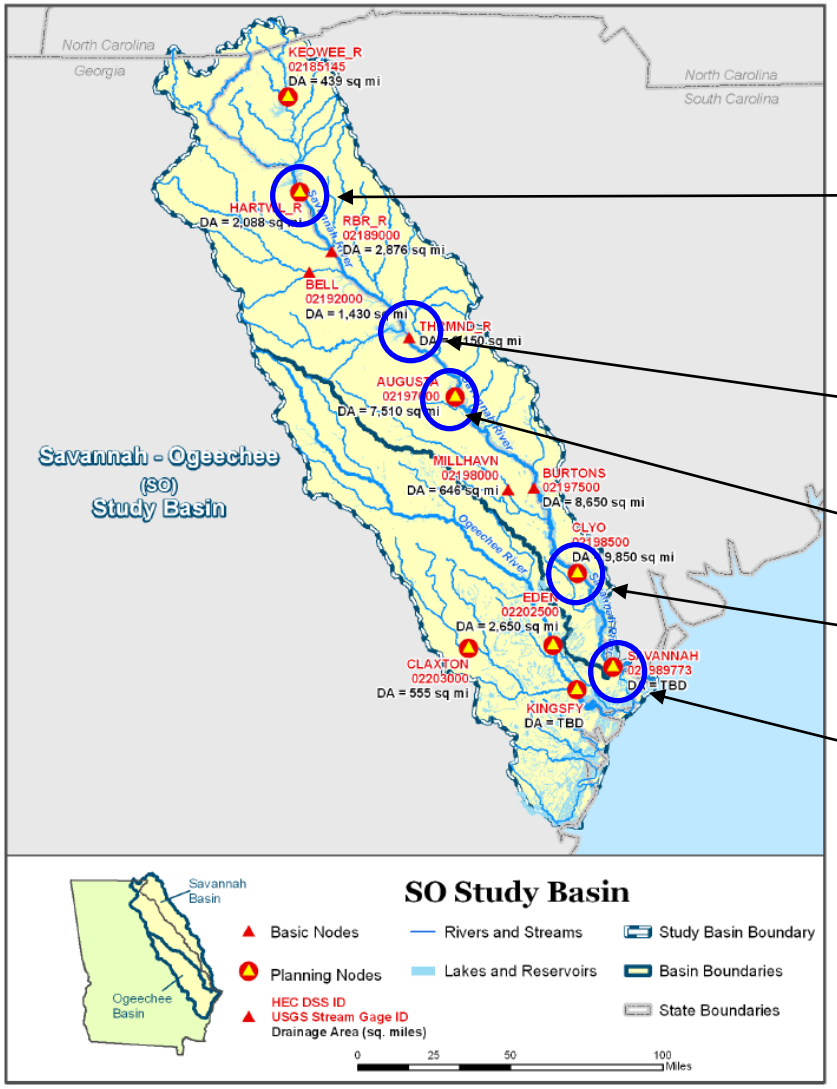
Identifying Potential Resource Gaps (Regulated)

- Step 1 – Run reservoir operation models in regulated river basins simulating existing operating plans by Corps, Georgia Power, TVA
- Step 2 – Determine whether consumptive demands placed in basin are met
- Step 3 – Determine whether flow targets prescribed by operating plans are met
- Step 4 – Evaluate whether upstream conservation storage has been exhausted through critical period

Major Reservoirs in Georgia



Savannah River Basin



Hartwell

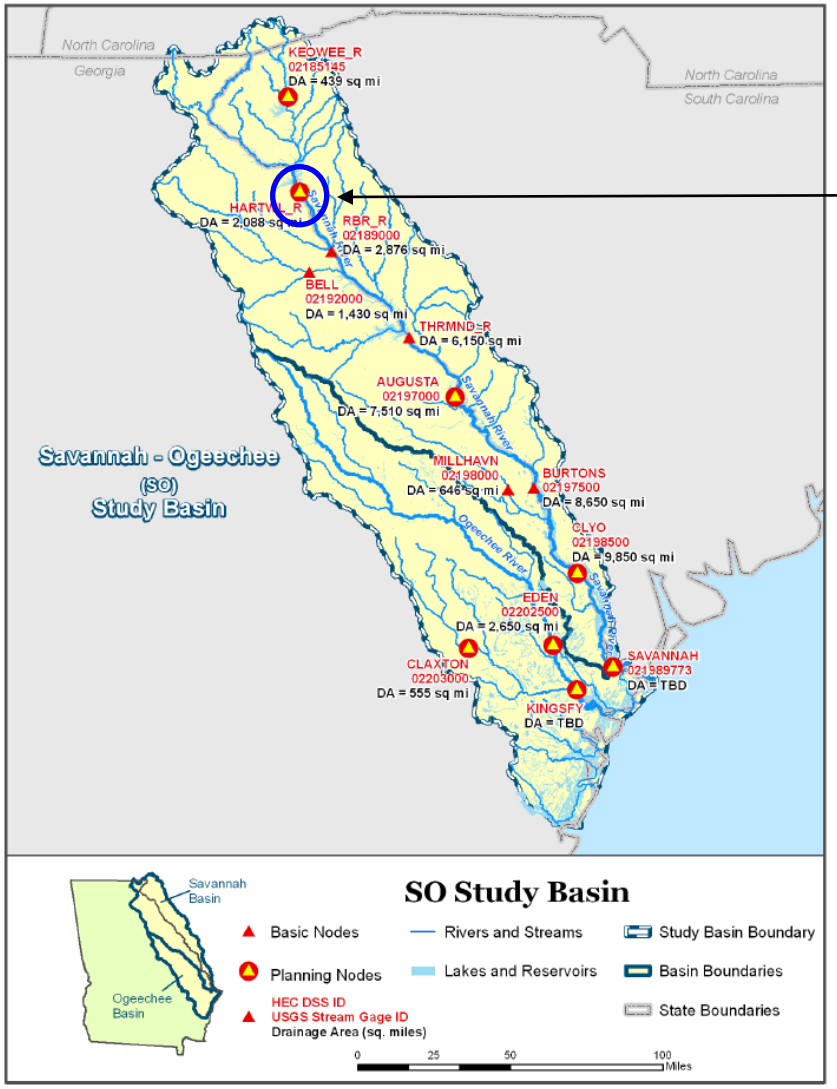
Thurmond

Augusta

Clyo

Savannah

Hartwell

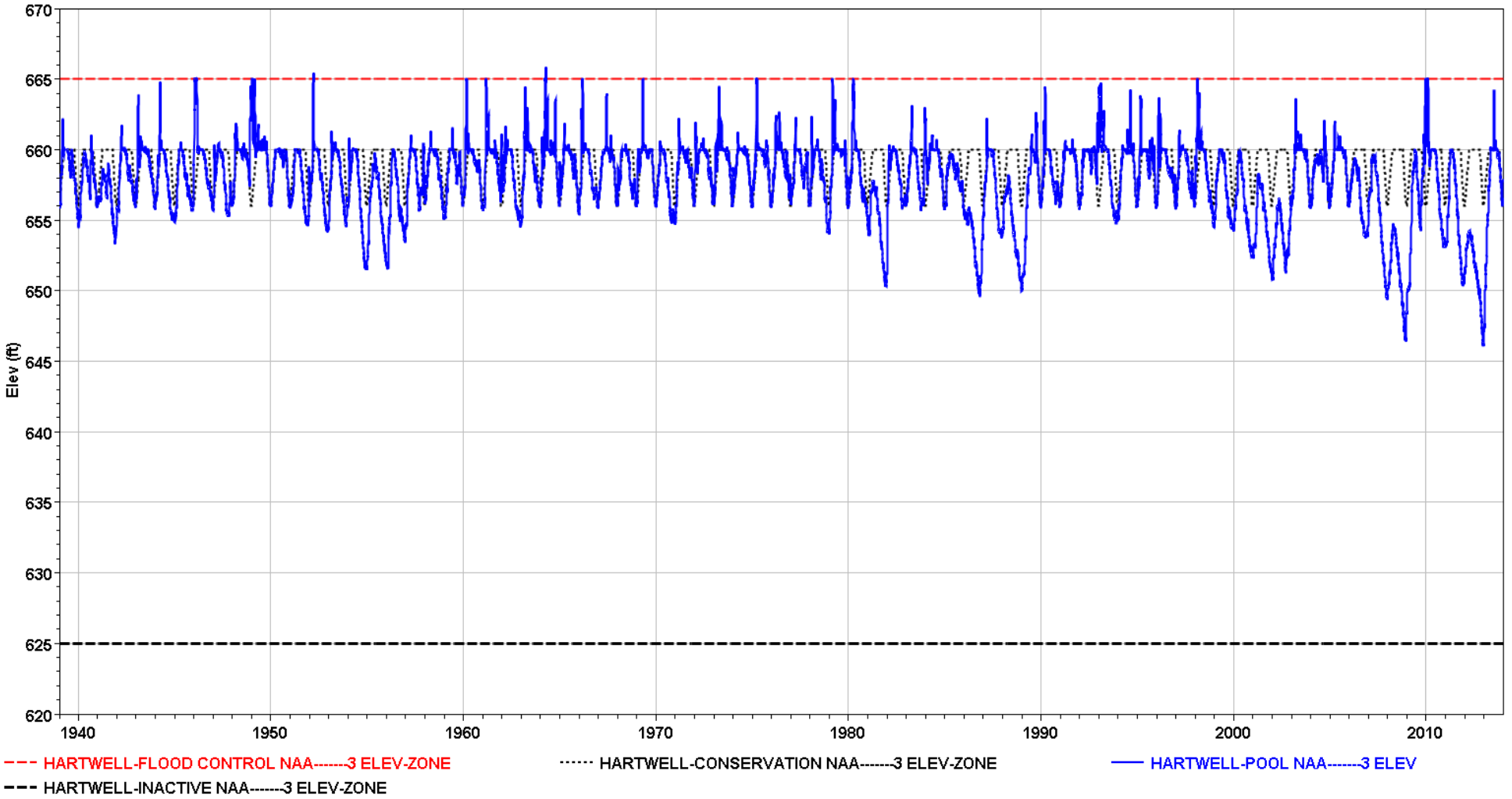


Hartwell

Conservation Storage Capacity

1,415,500 acre-feet

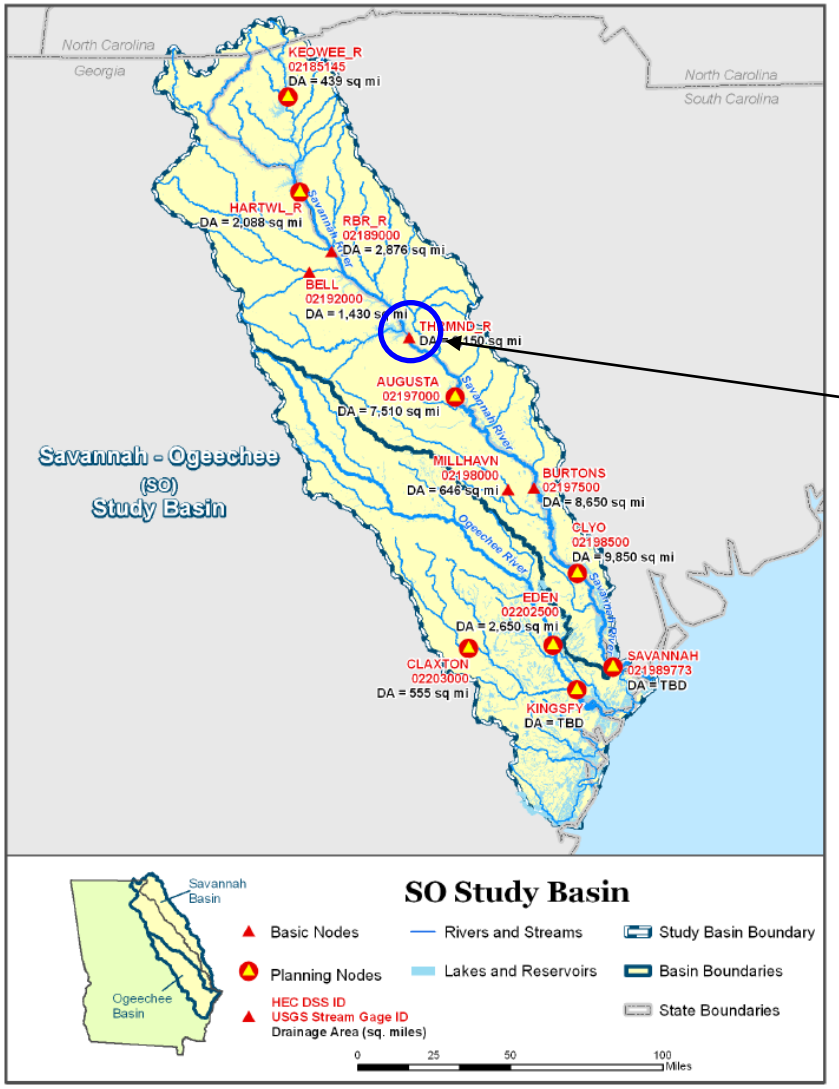
Hartwell Reservoir Elevation



RA Results at Hartwell

Demand shortage (cfs)	At-site flow requirement shortage (cfs)	Minimum conservation storage remaining (acre-feet)	Minimum percentage of conservation storage remaining	Basin-wide flow requirement shortage
0	0	730,525	52%	N/A

Thurmond

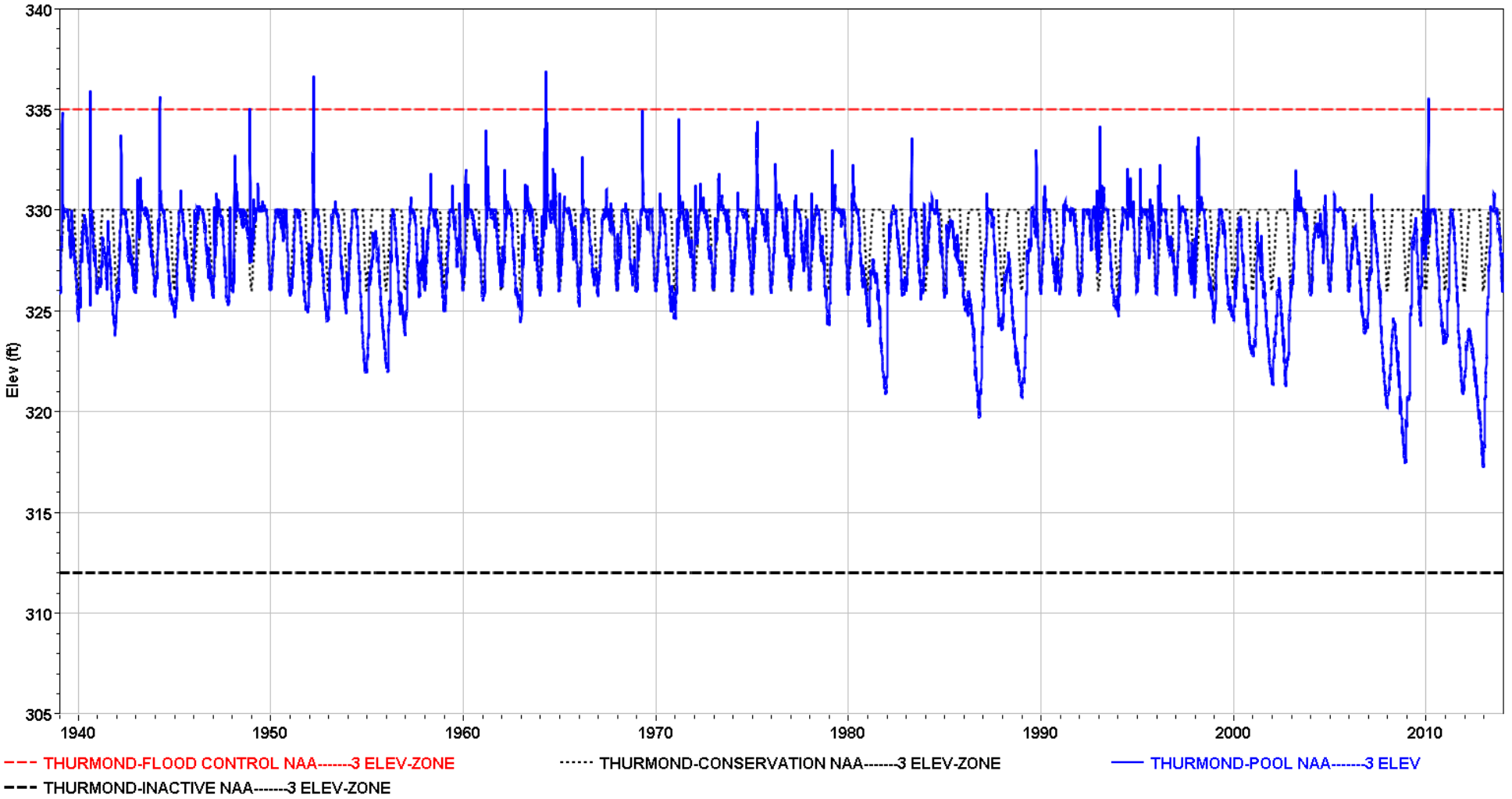


Thurmond

Conservation Storage Capacity

1,045,000 acre-feet

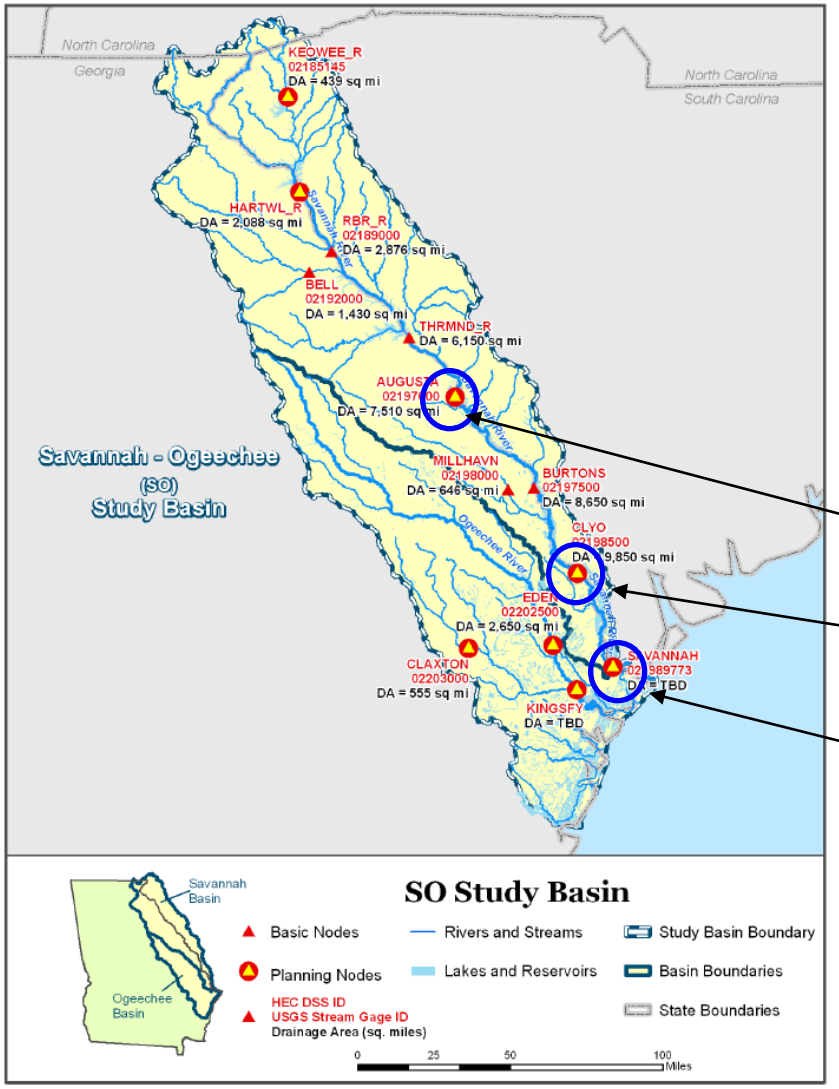
Thurmond Reservoir Elevation



RA Results at Thurmond

Demand shortage (cfs)	At-site flow requirement shortage (cfs)	Minimum conservation storage remaining (acre-feet)	Minimum percentage of conservation storage remaining	Basin-wide flow requirement shortage
0	0	252,106	24%	N/A

Augusta, Clyo, and Savannah



Augusta

Clyo

Savannah

RA Results at Augusta, Clyo, & Savannah

Demand shortage (cfs)	Minimum flow requirement (cfs)	Minimum flow requirement shortage (cfs)	Minimum upstream conservation storage remaining (acre-feet)	Minimum percentage of upstream conservation storage remaining
0	3,600 (Augusta) 0 (Clyo) 0 (Savannah)	0	730,525 at Hartwell 252,106 at Thurmond	52% at Hartwell 24% at Thurmond

Summary – Savannah River Basin

- Water demand (off stream needs) and Flow Regime (instream needs as specified by the Corps' Water Control Plan) can be fully met by available water and storage
- There is reserve storage in the major Corps storage reservoirs' conservation pool through the most critical drought
- Agreement allowing storage use will have to be reached with reservoir owners

Summary – Ogeechee River Basin

- Water demand (off stream needs) and Flow Regime (instream needs) cannot be fully met by available water during drought conditions at Claxton, Eden, and Kings Ferry
- This gap is much larger at Claxton than at Eden and Kings Ferry

Summary – Comp 2

- Comprehensive plan by GA and SC
- Working with Corps to update water control manual

Questions

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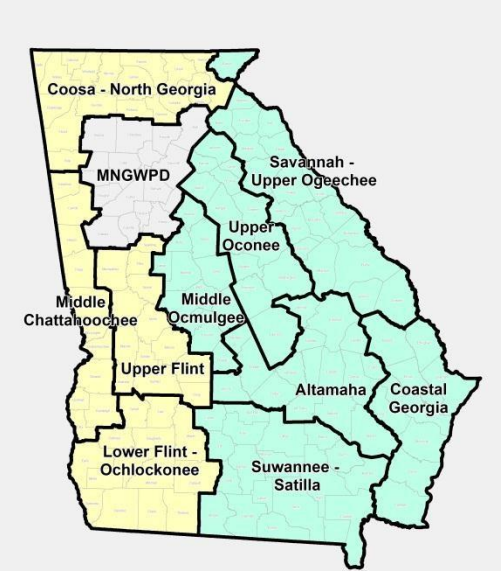
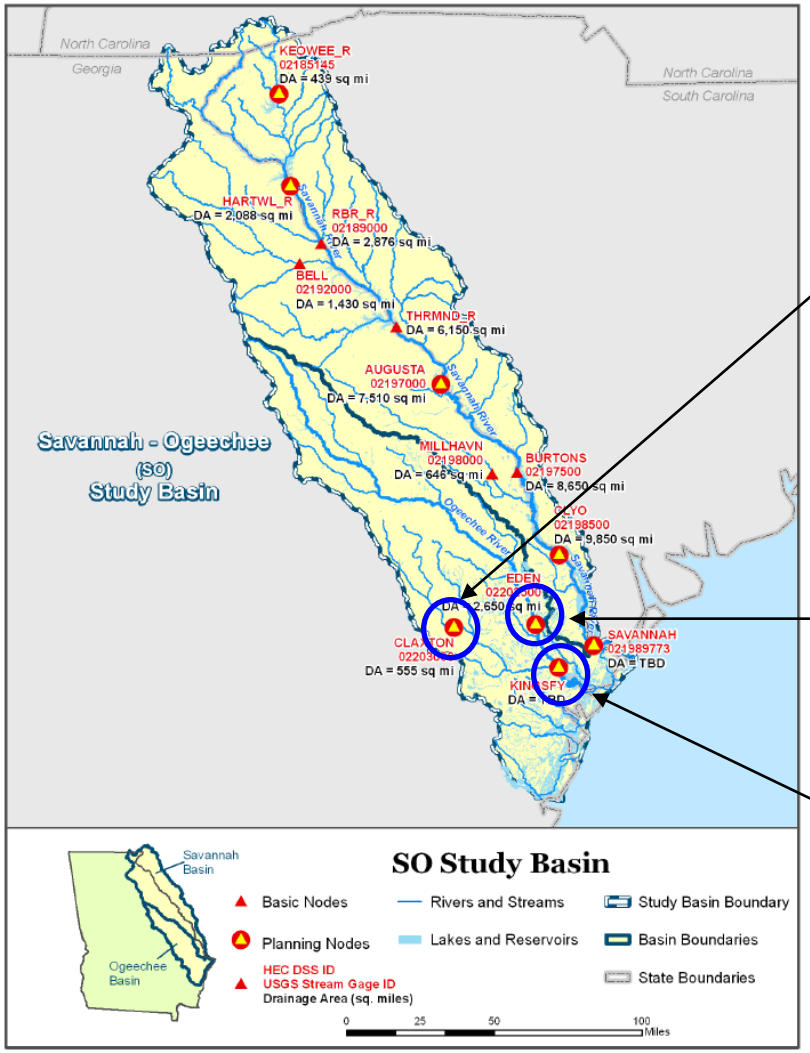


Surface Water Availability Handout

Ogeechee River Basin

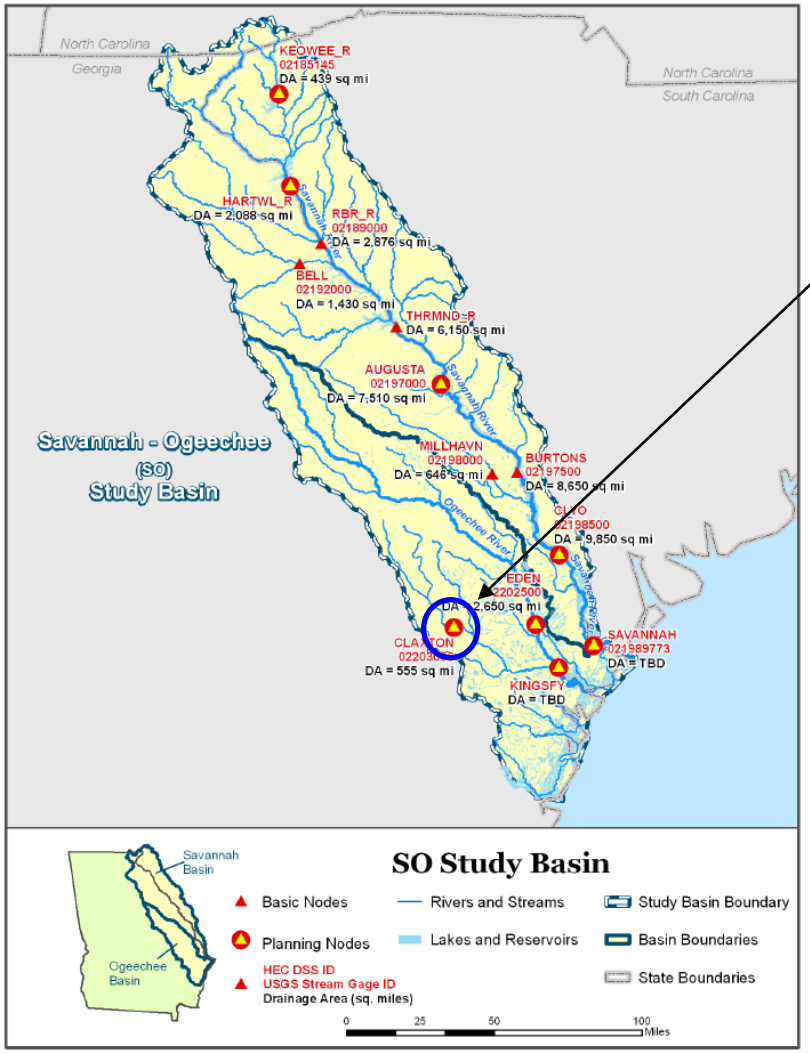


Claxton

Eden

Kings Ferry

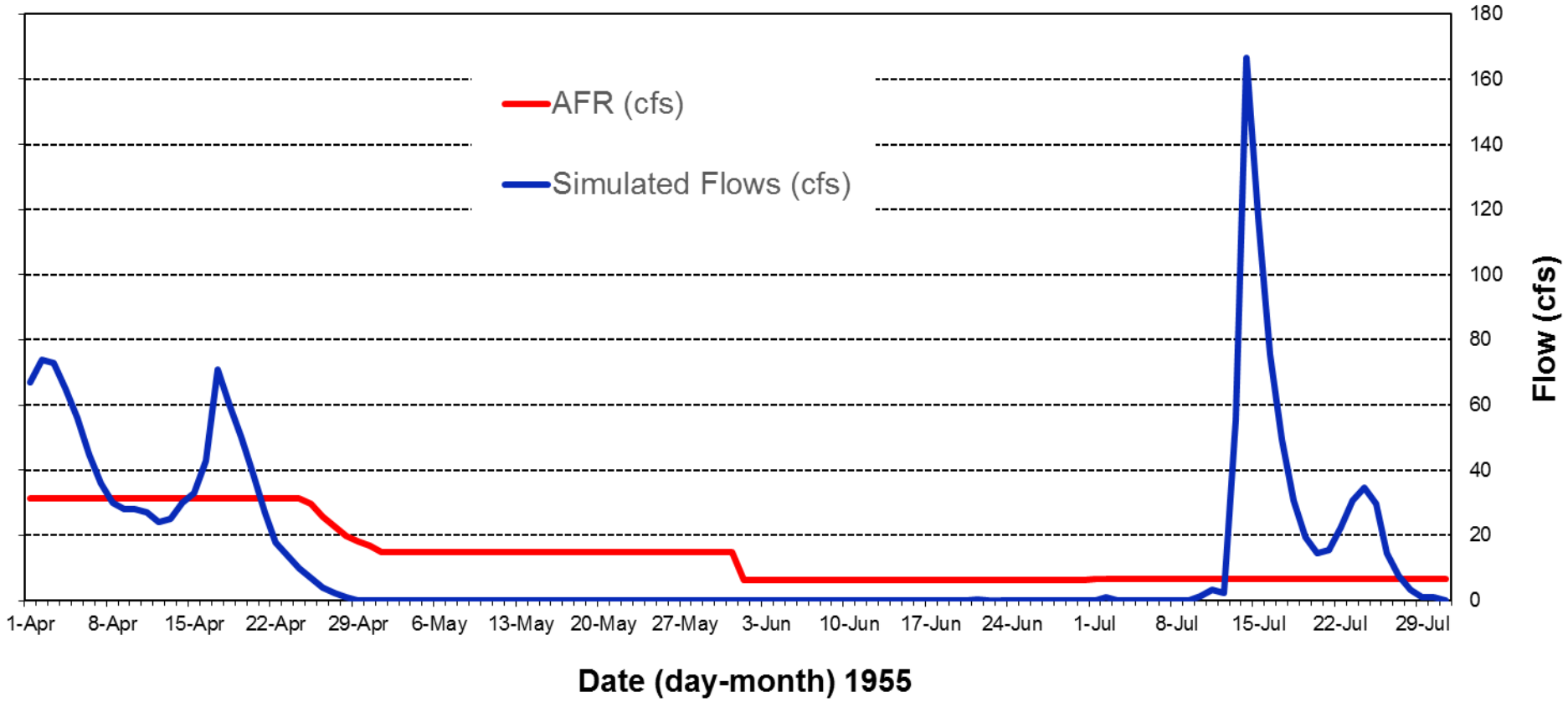
Claxton in the Ogeechee River Basin



Claxton

Potential Gap at Claxton in the Ogeechee River Basin

Most Severe Flow Gaps at Claxton in the Ogeechee Basin



Modeled Stream Flow Assumes Water Demand Fully Met

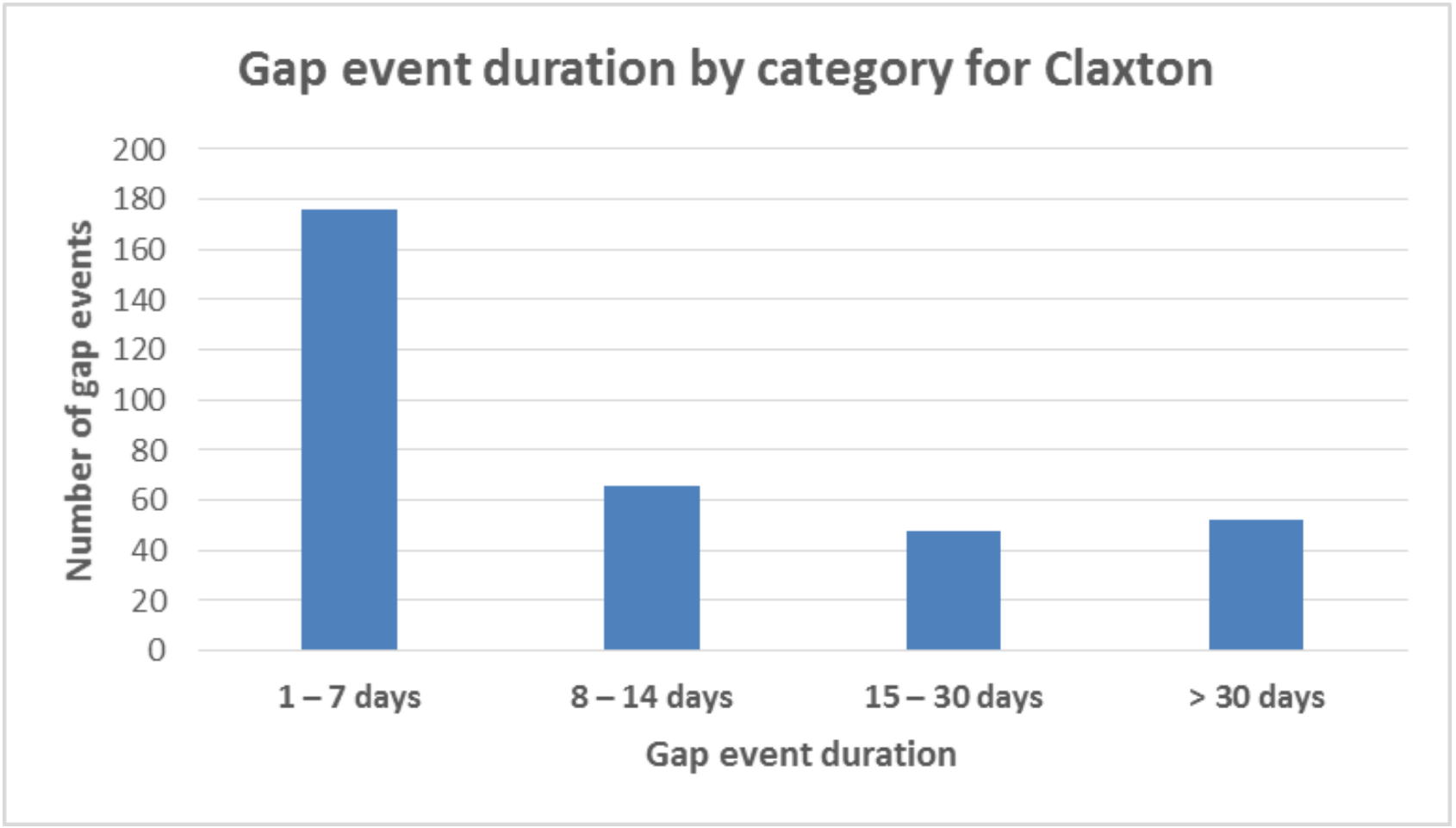
Flow Regime Potential Shortfall at Claxton in Ogeechee River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1-Day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939-2007)	18	5	457	15	15
Round 2 (1939-2013)	21	6	448	43	94

Characteristics of Potential Gaps at Claxton

Gap event duration by category for Claxton	Number of gap events		Total gap days by category, 1939-2013		Average daily flow deficit per gap event (cfs)	Average cumulative flow deficit per gap event (cfsd)
1 – 7 days	176	(51.5%)	591	(2.2%)	5	18
8 – 14 days	66	(19.3%)	706	(2.6%)	6	68
15 – 30 days	48	(14.0%)	1024	(3.7%)	7	142
> 30 days	52	(15.2%)	3332	(12.2%)	6	371
Totals (∑)	342	(100.0%)	5653	(20.6%)		

Characteristics of Potential Gaps at Claxton



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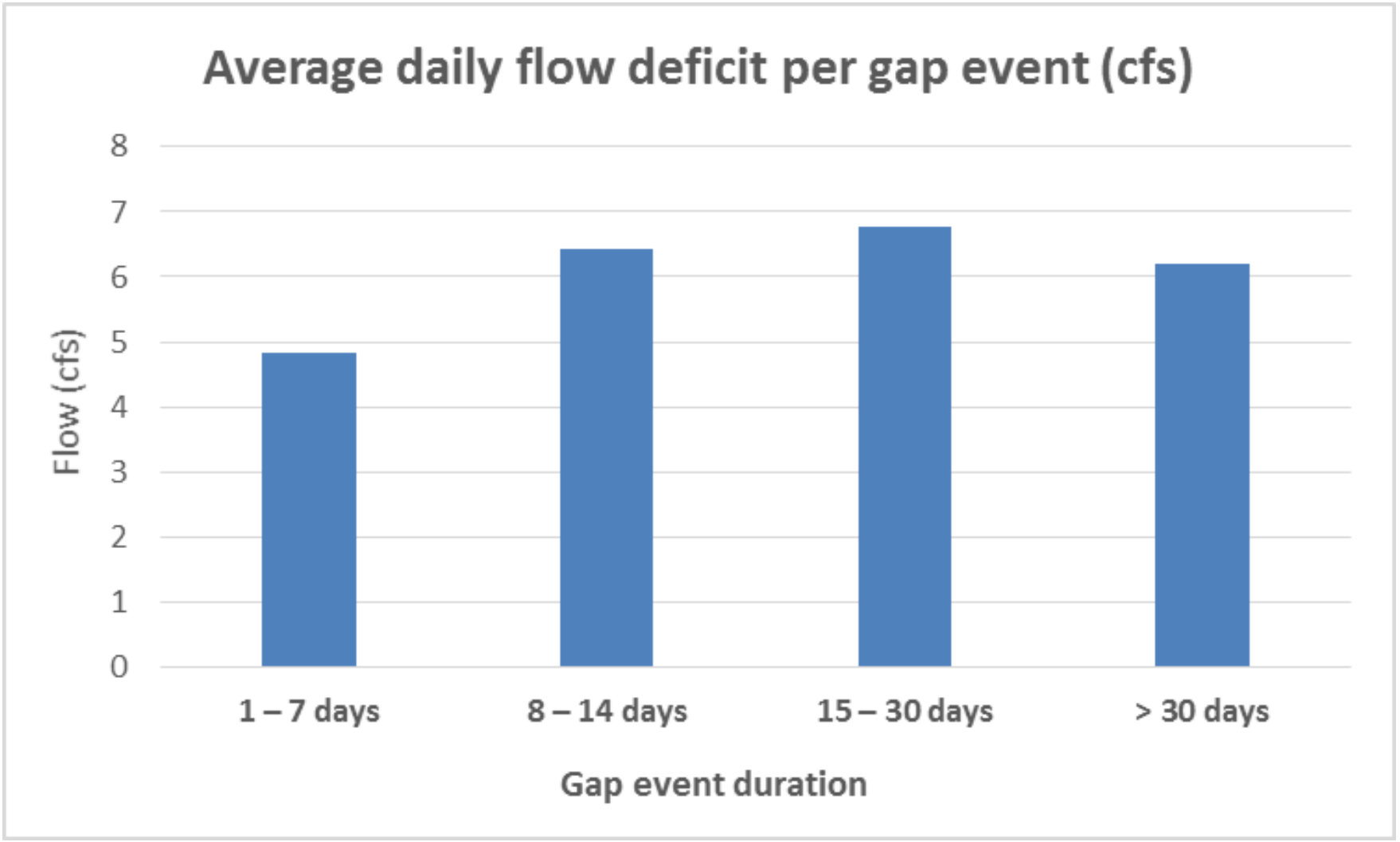

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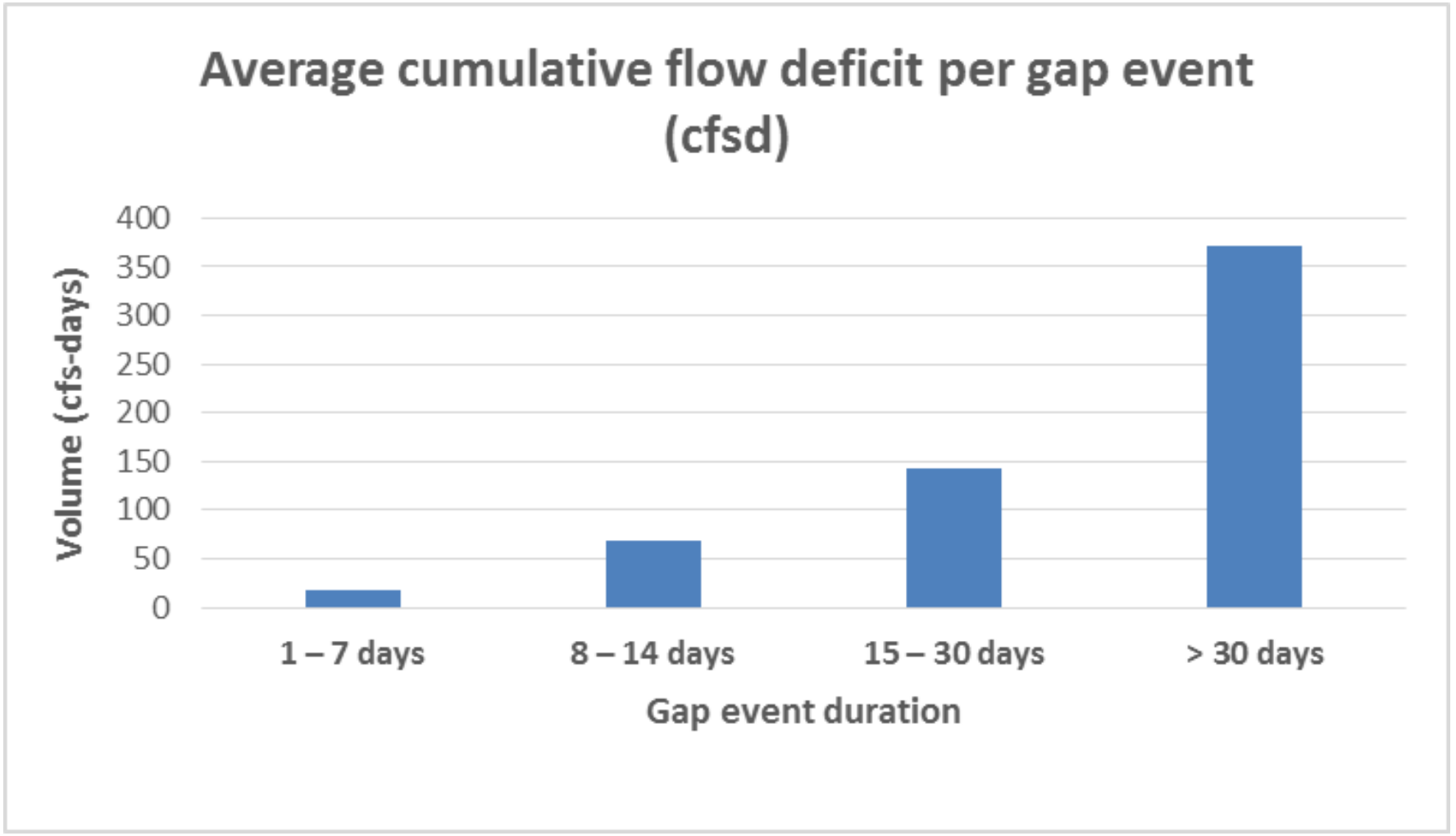
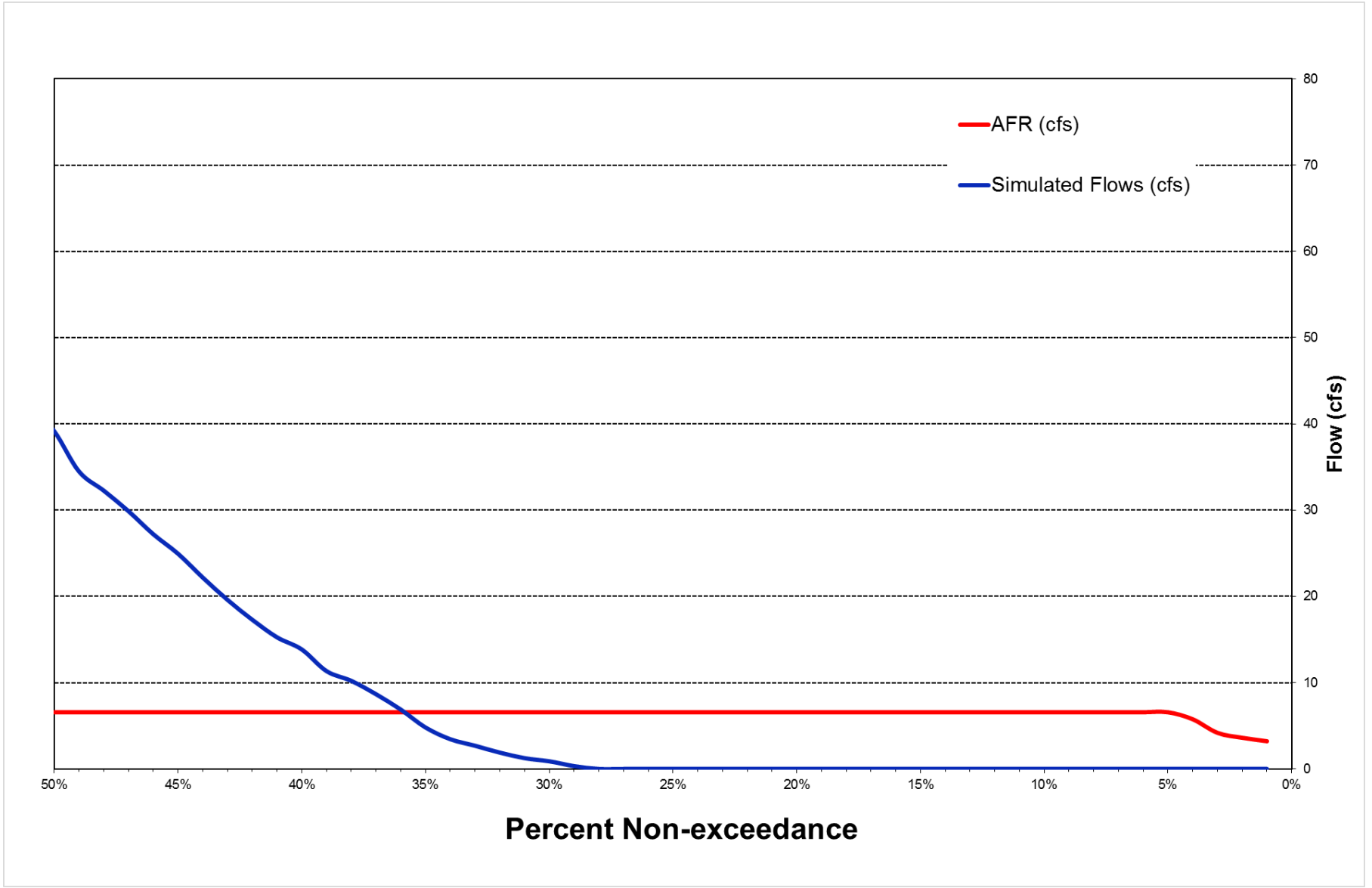
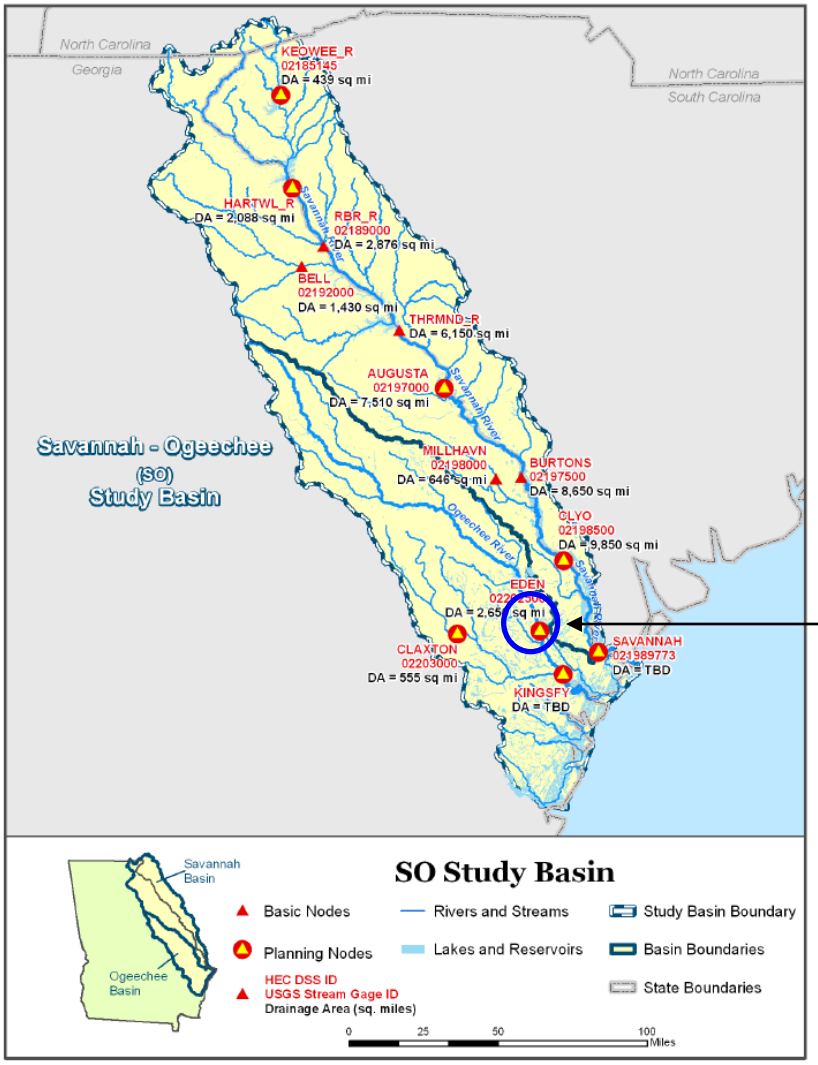


July Flow Exceedance Curves at Claxton in the Ogeechee River Basin

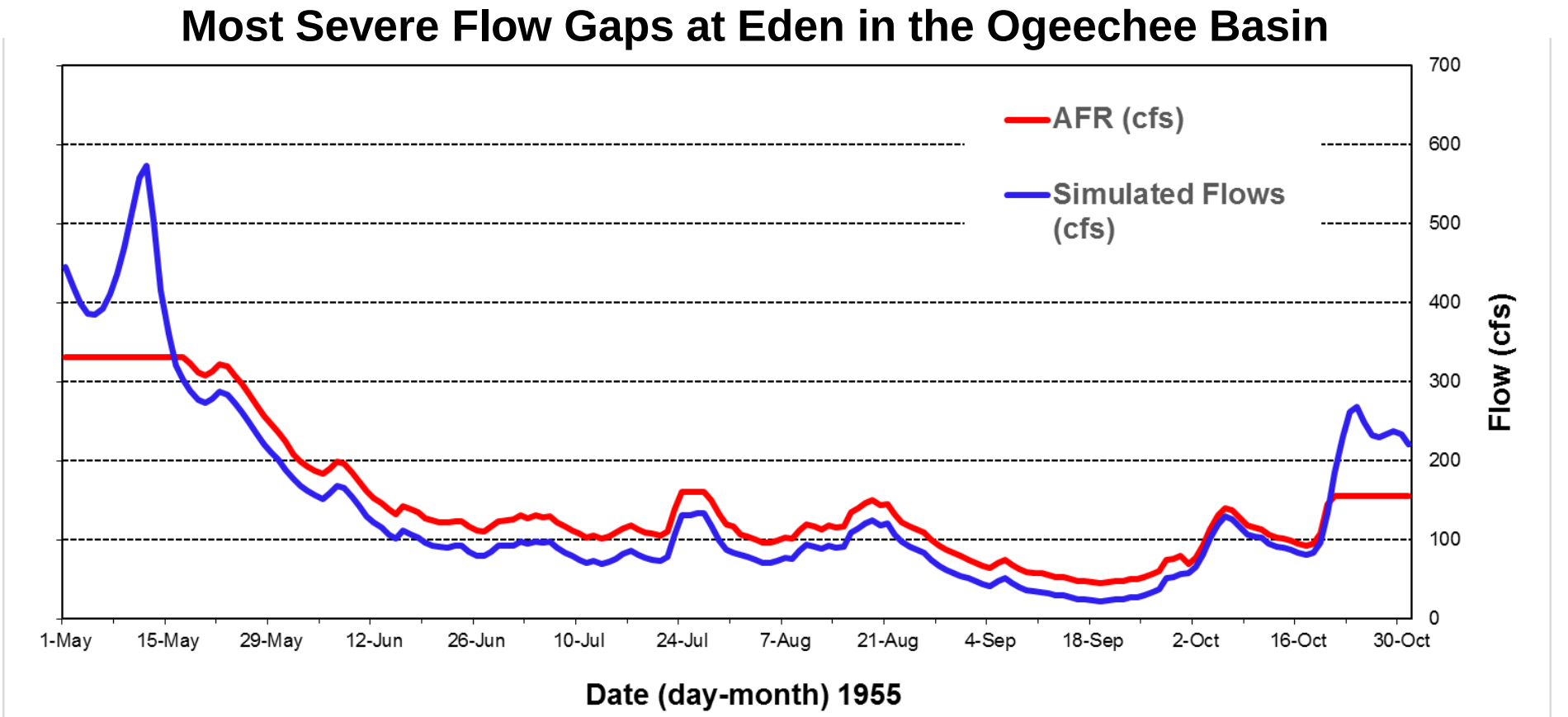


Eden in the Ogeechee River Basin



Eden

Potential Gap at Eden in the Ogeechee River Basin



Modeled Stream Flow Assumes Water Demand Fully Met

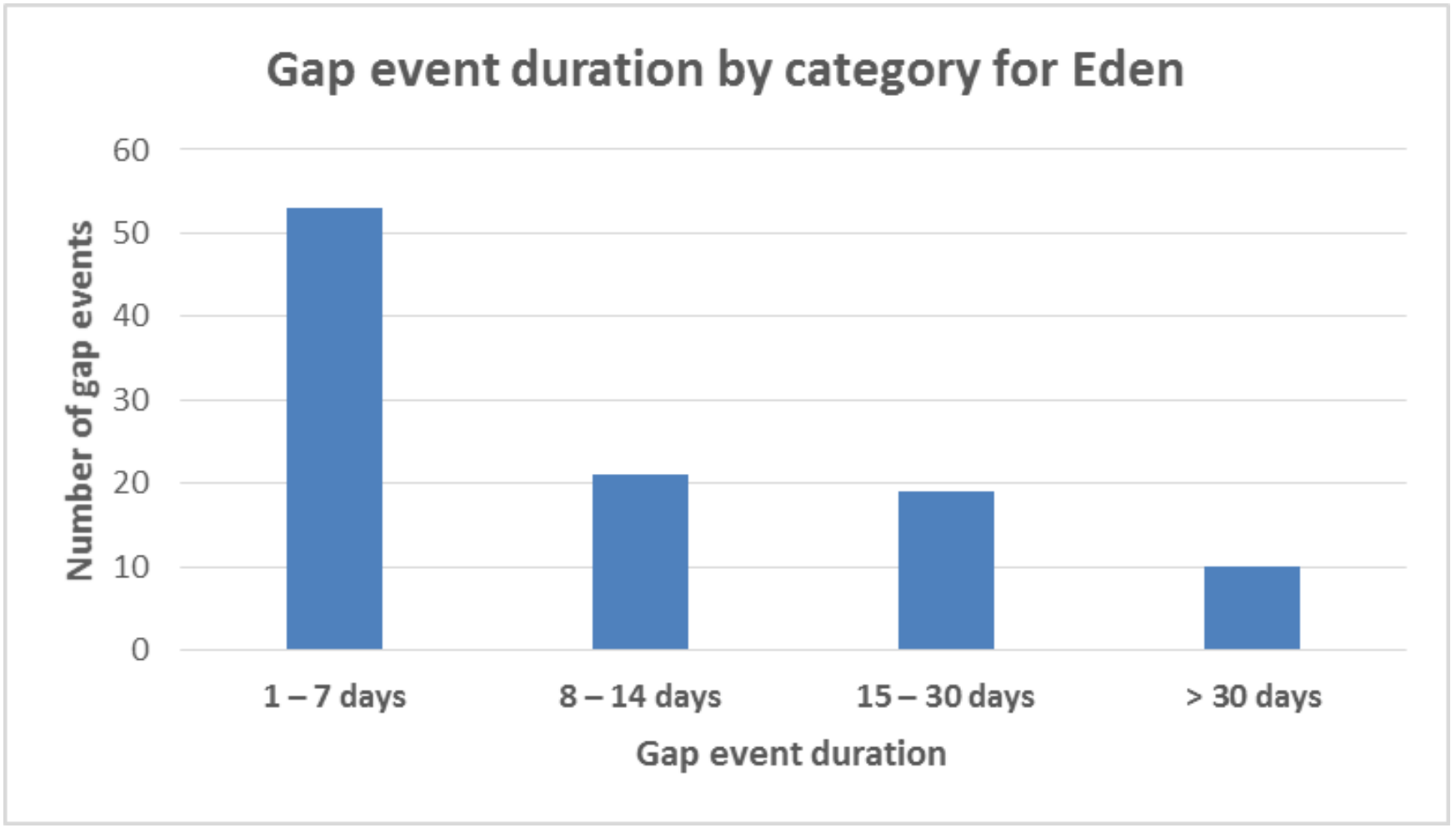
Flow Regime Potential Shortfall at Eden in Ogeechee River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1-Day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939-2007)	6	20	2,257	42	201
Round 2 (1939-2013)	6	16	2,207	35	139

Characteristics of Potential Gaps at Eden

Gap event duration by category for Eden	Number of gap events		Total gap days by category, 1939-2013		Average daily flow deficit per gap event (cfs)	Average cumulative flow deficit per gap event (cfsd)
1 – 7 days	53	(51.5%)	202	(0.7%)	49	11
8 – 14 days	21	(20.4%)	207	(0.8%)	132	13
15 – 30 days	19	(18.4%)	423	(1.5%)	377	17
> 30 days	10	(9.7%)	761	(2.8%)	1249	16
Totals (∑)	103	(100.0%)	1593	(5.8%)		

Characteristics of Potential Gaps at Eden



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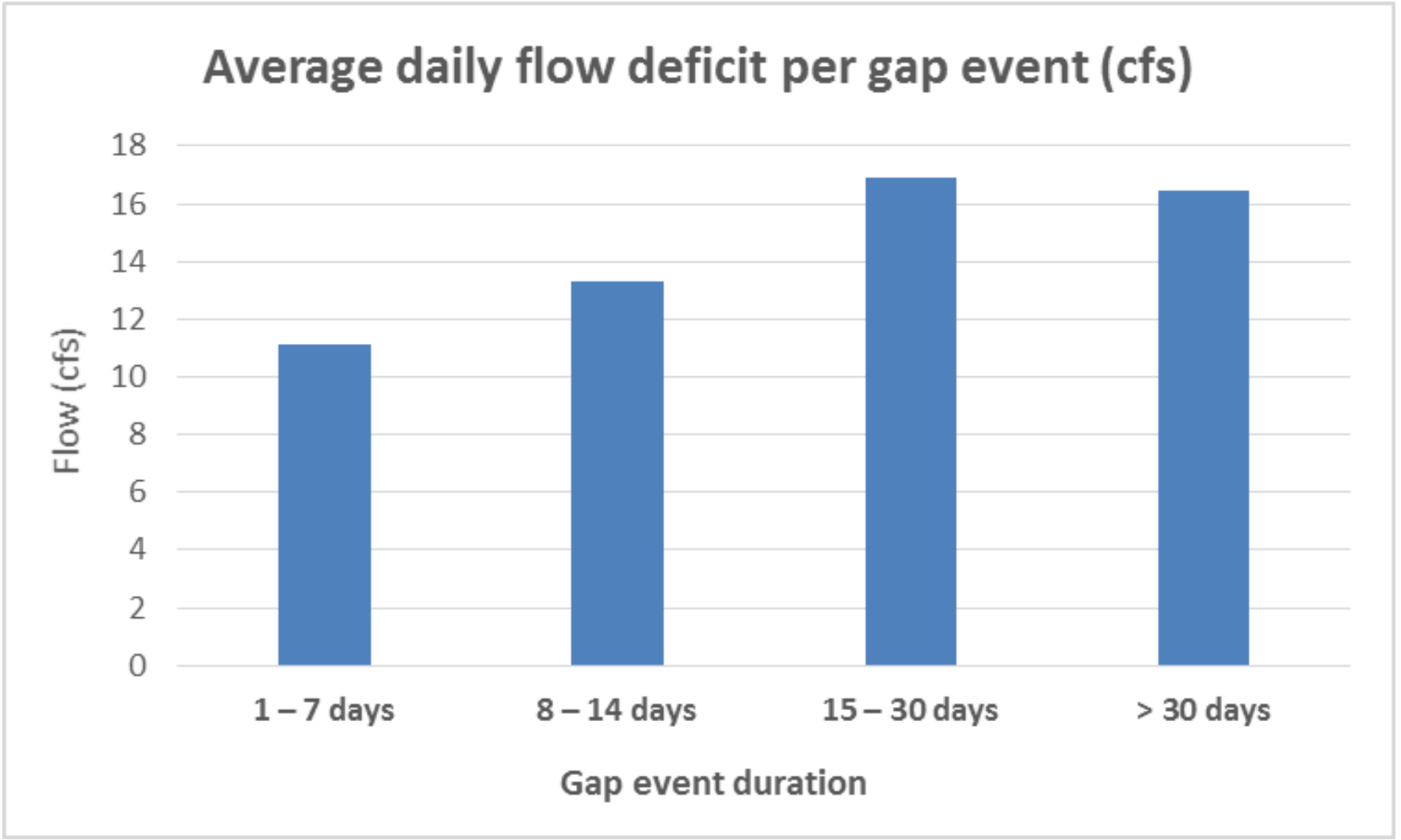

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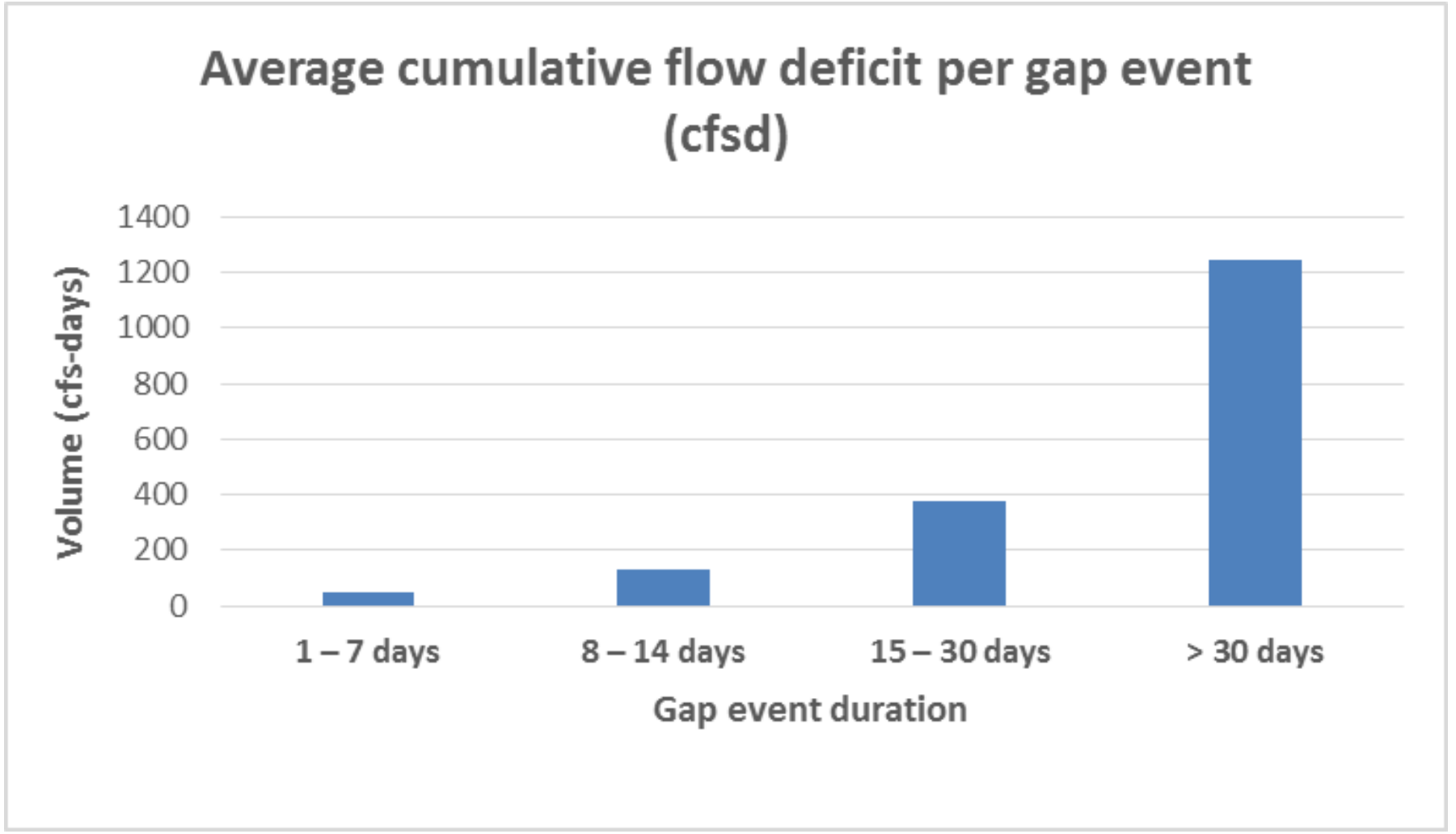

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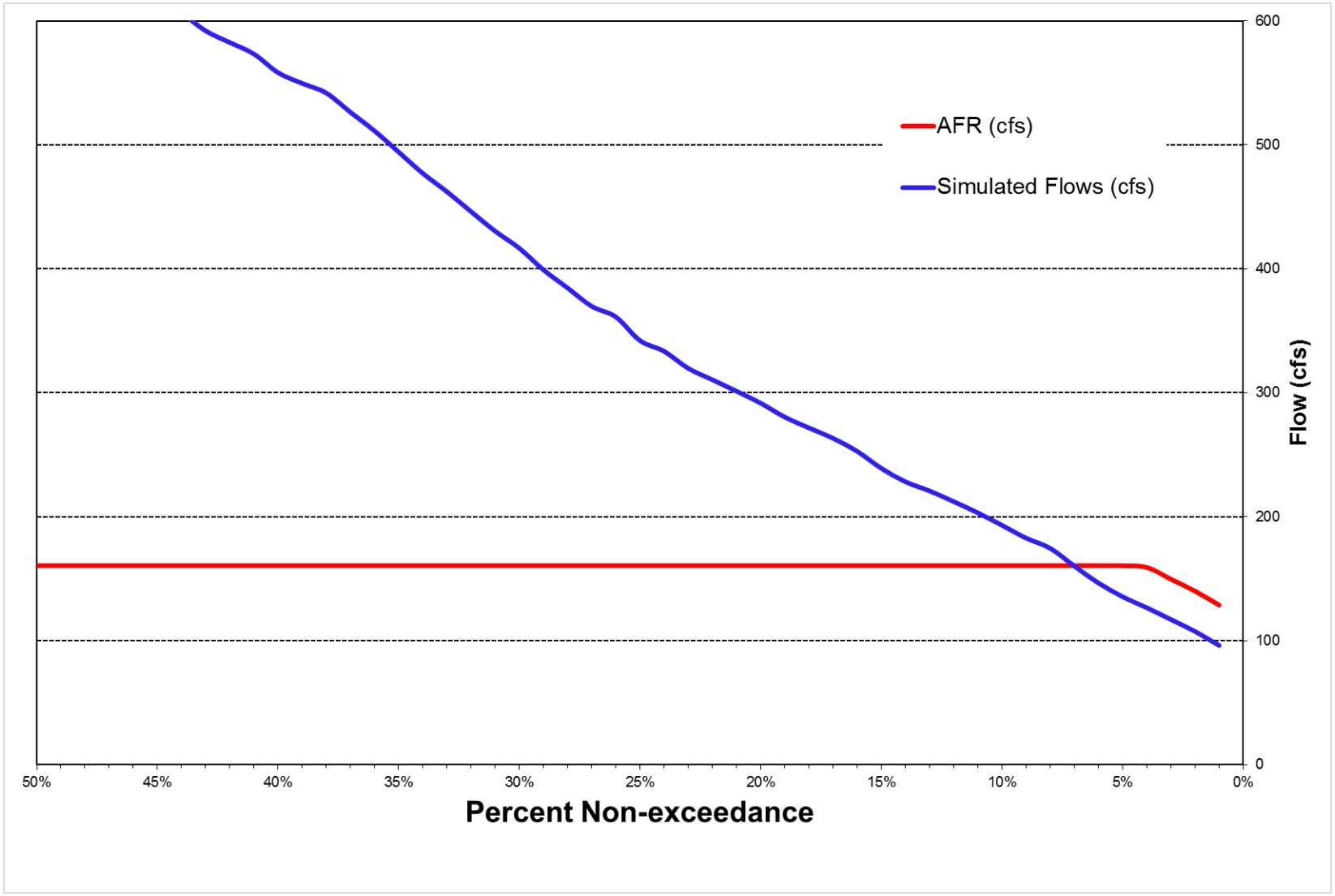
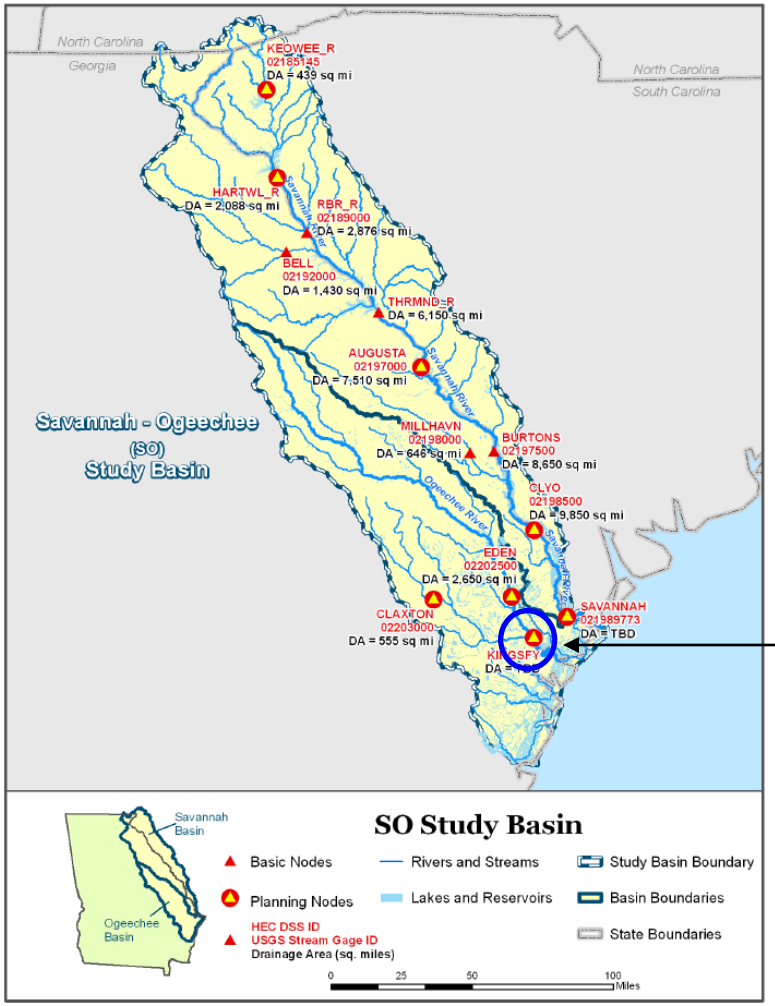
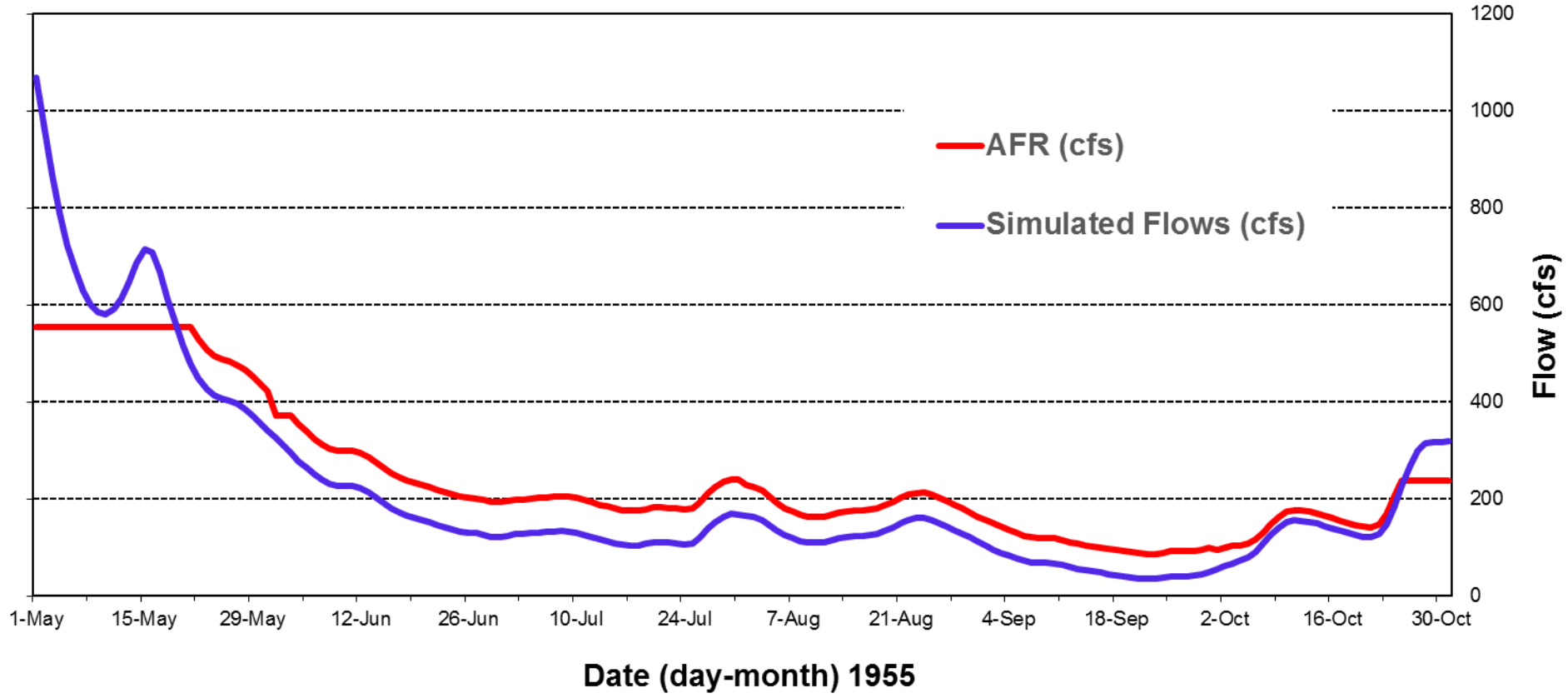


Kings Ferry in the Ogeechee River Basin



Kings Ferry

Potential Gap at Kings Ferry in the Ogeechee River Basin



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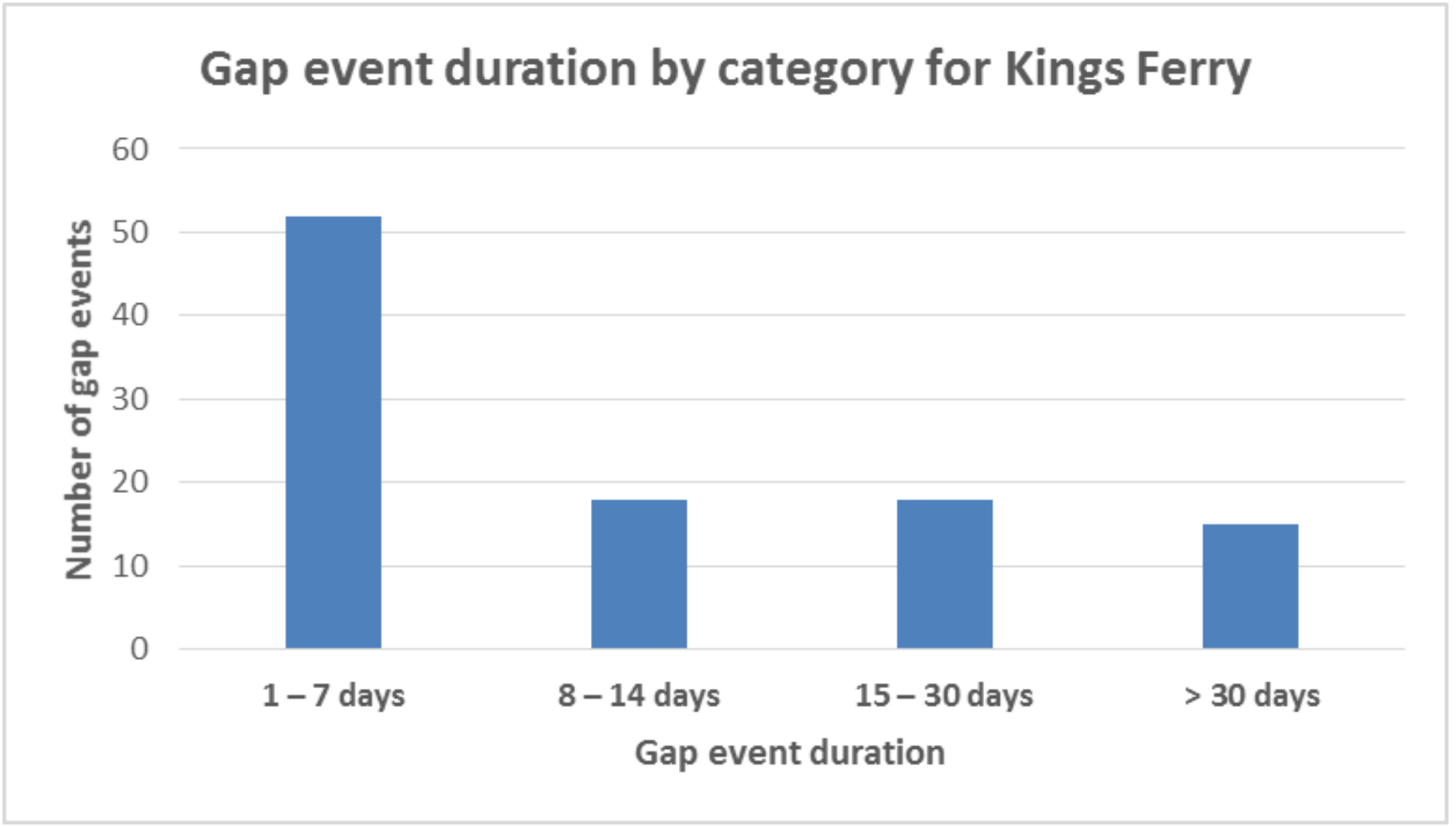

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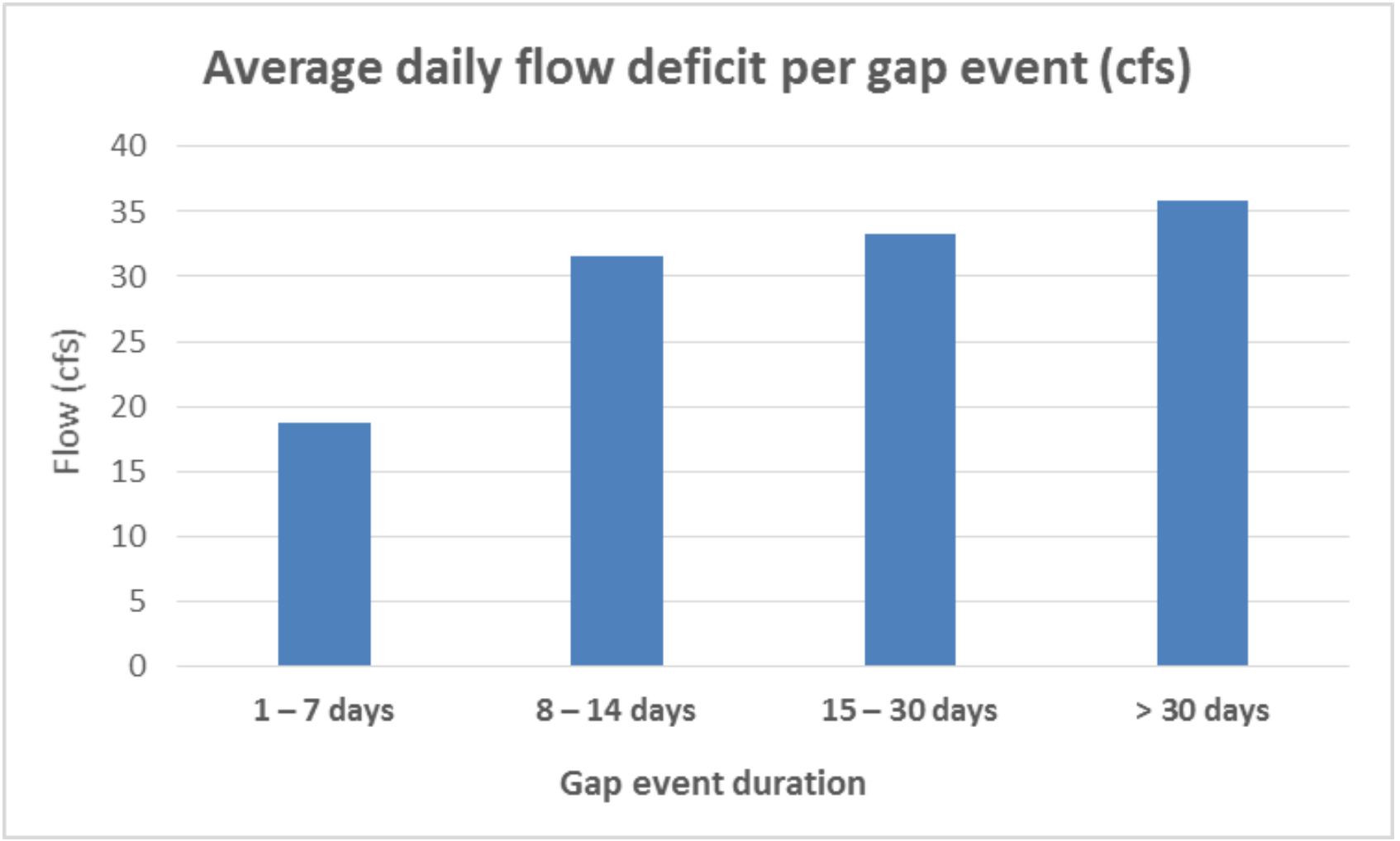

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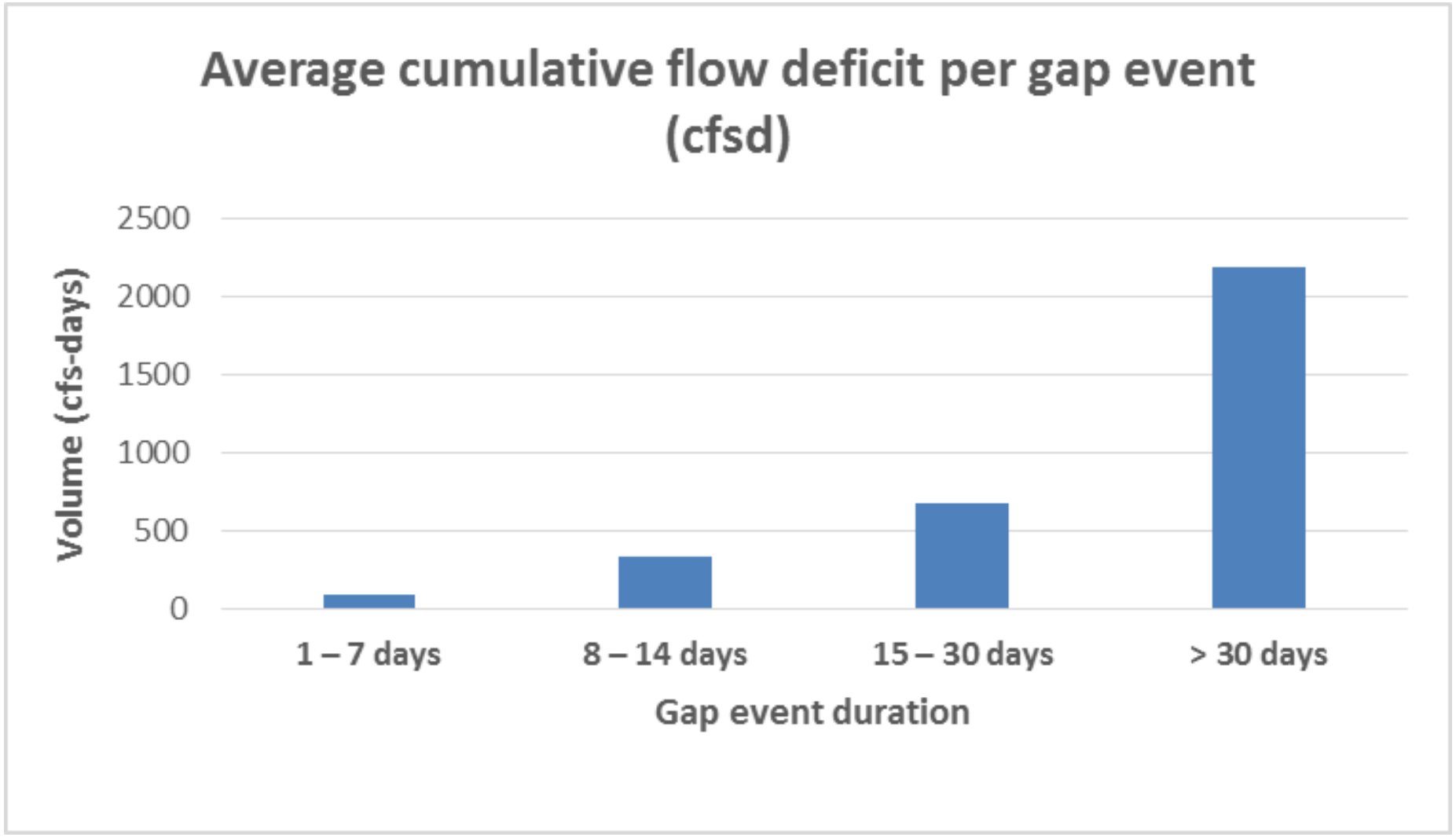

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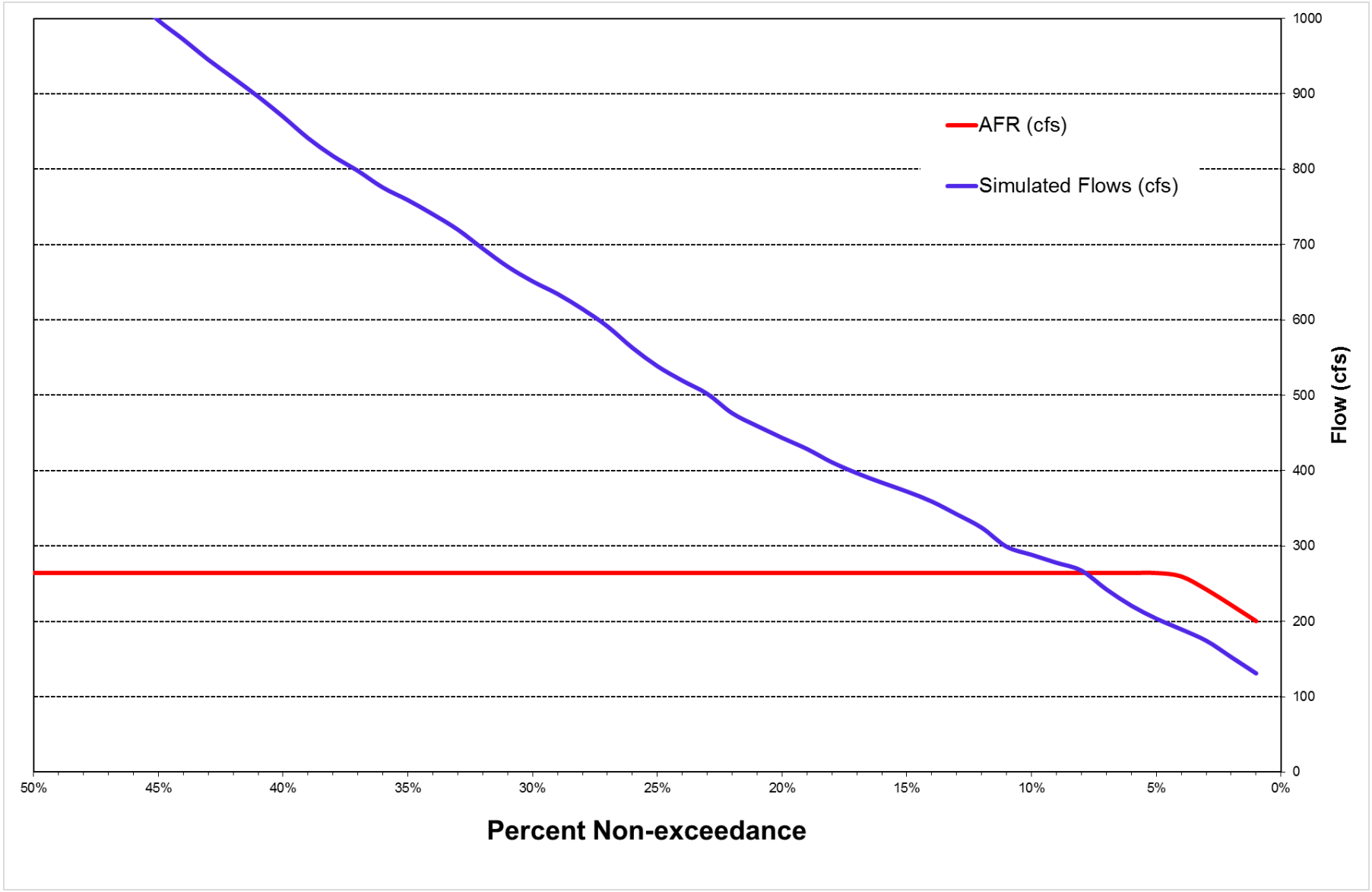
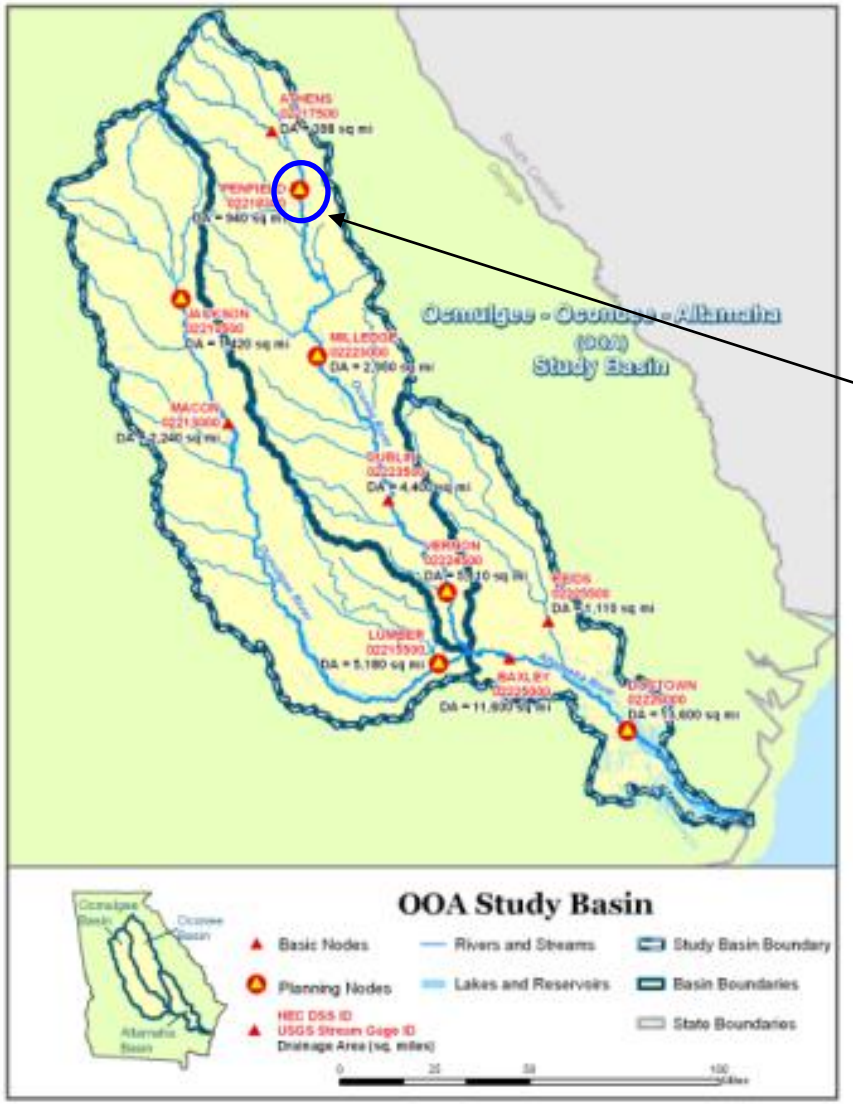
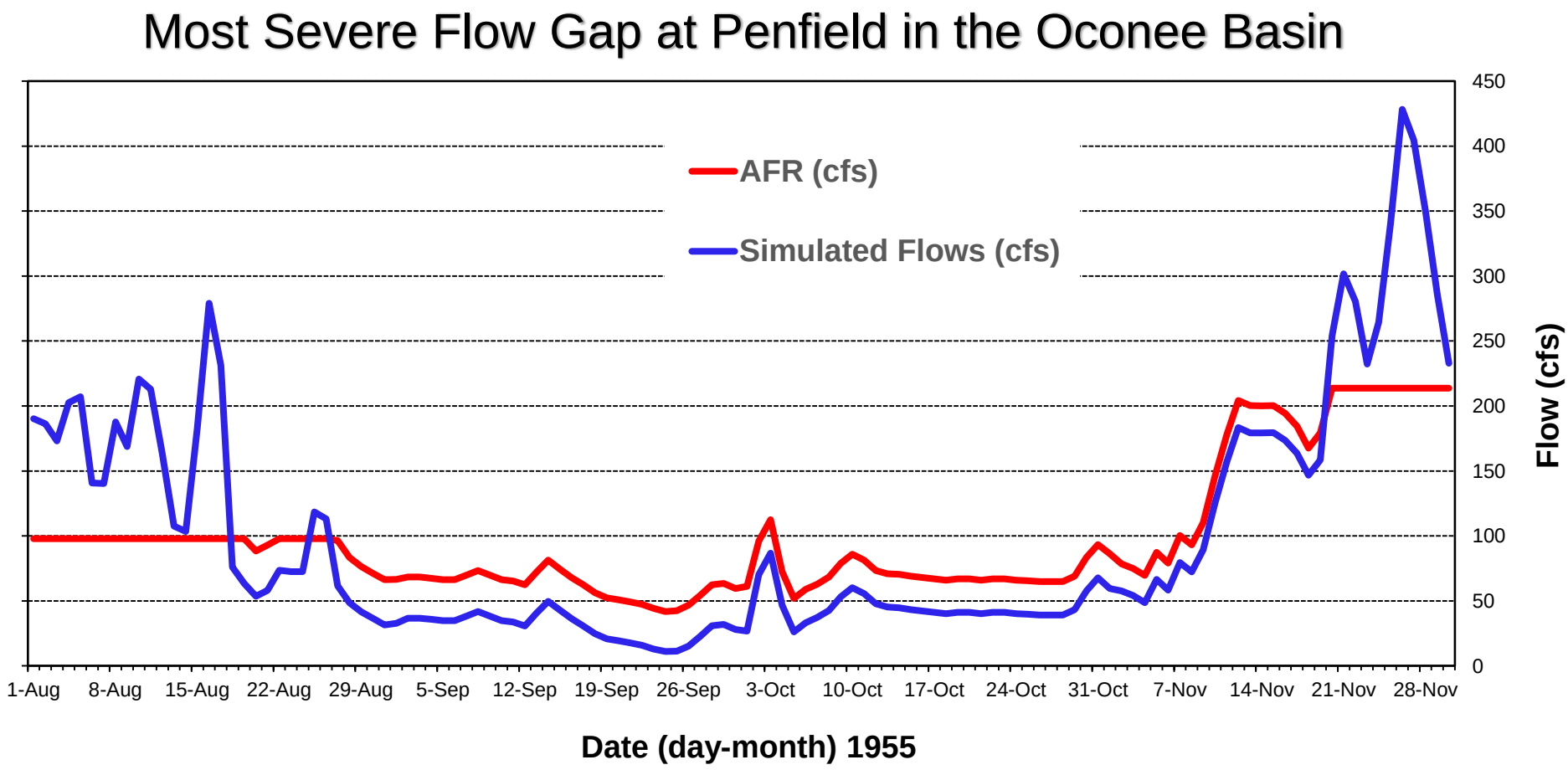


Oconee River Basin



Penfield

Potential Gap at Penfield in the Oconee River Basin



Modeled Stream Flow Assumes Water Demand Fully Met

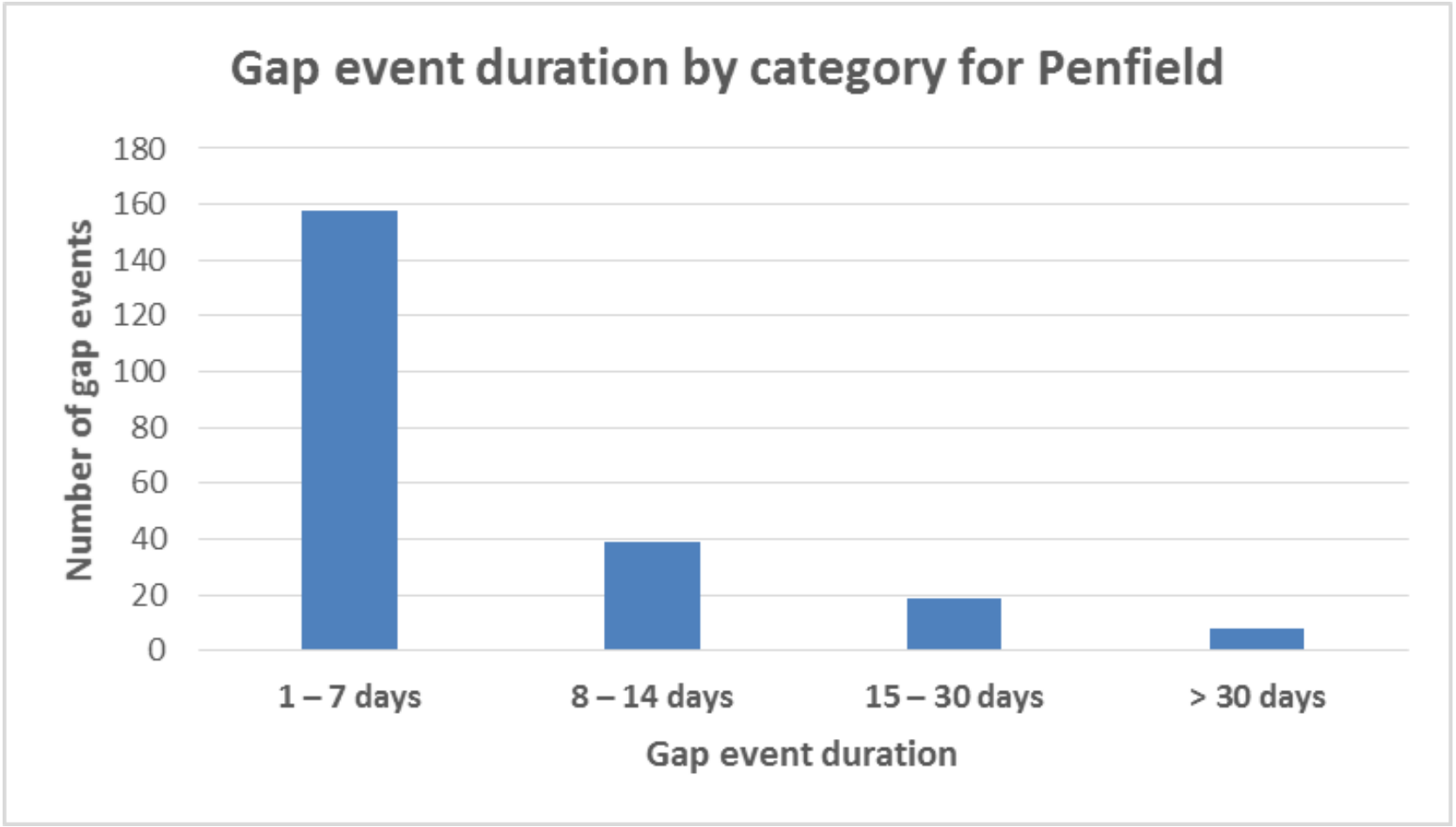
Flow Regime Potential Shortfall at Penfield in Oconee River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1-Day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939-2007)	0	0	1245	NA	NA
Round 2 (1939-2013)	6	21	1203	35	72

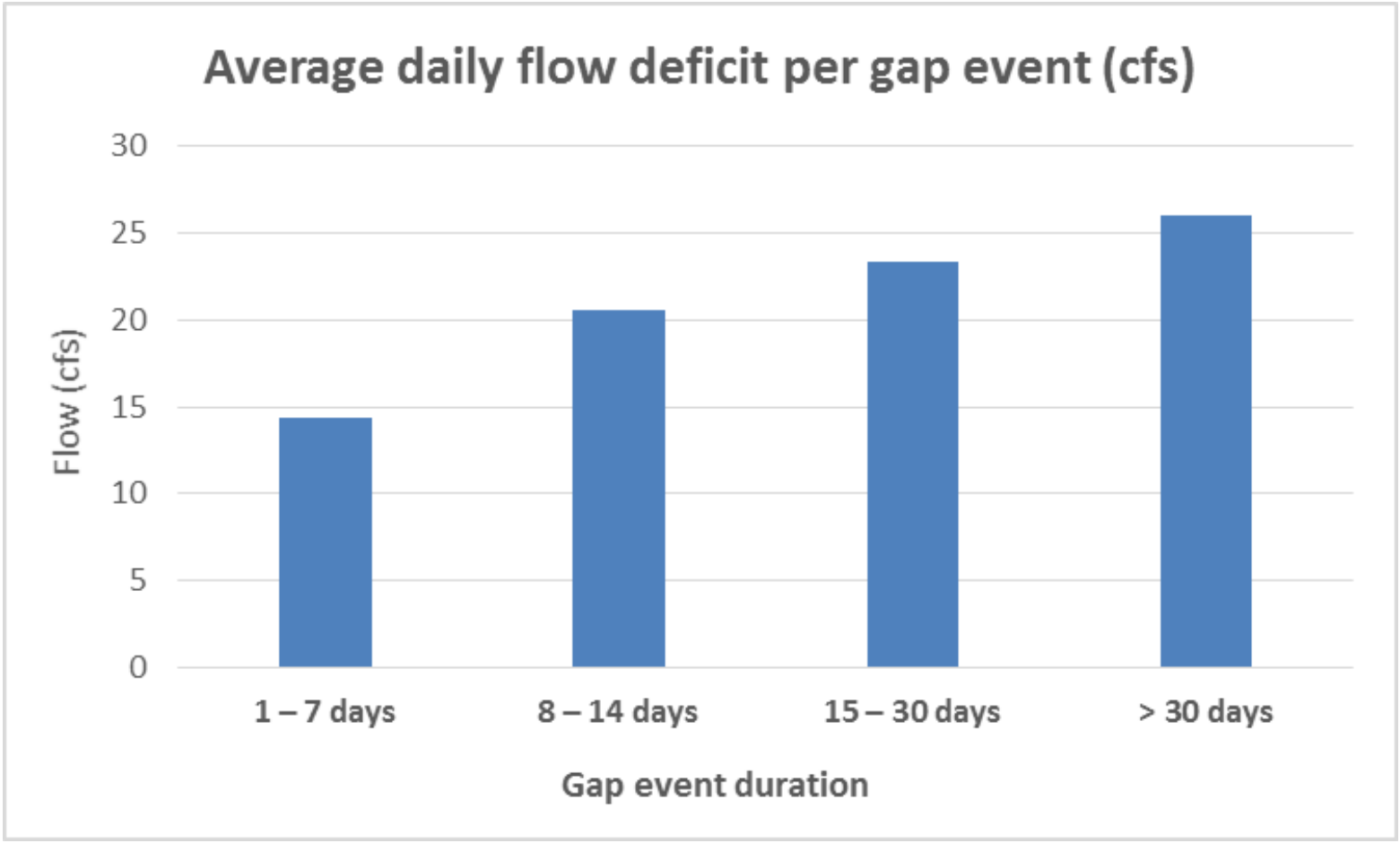
Characteristics of Potential Gaps at Penfield

Gap event duration by category for Penfield	Number of gap events		Total gap days by category, 1939-2013		Average daily flow deficit per gap event (cfs)	Average cumulative flow deficit per gap event (cfsd)
1 – 7 days	158	(70.5%)	491	(1.8%)	14	51
8 – 14 days	39	(17.4%)	402	(1.5%)	21	212
15 – 30 days	19	(8.5%)	395	(1.4%)	23	490
> 30 days	8	(3.6%)	428	(1.6%)	26	1396
Totals (∑)	224	(100.0%)	1716	(6.3%)		

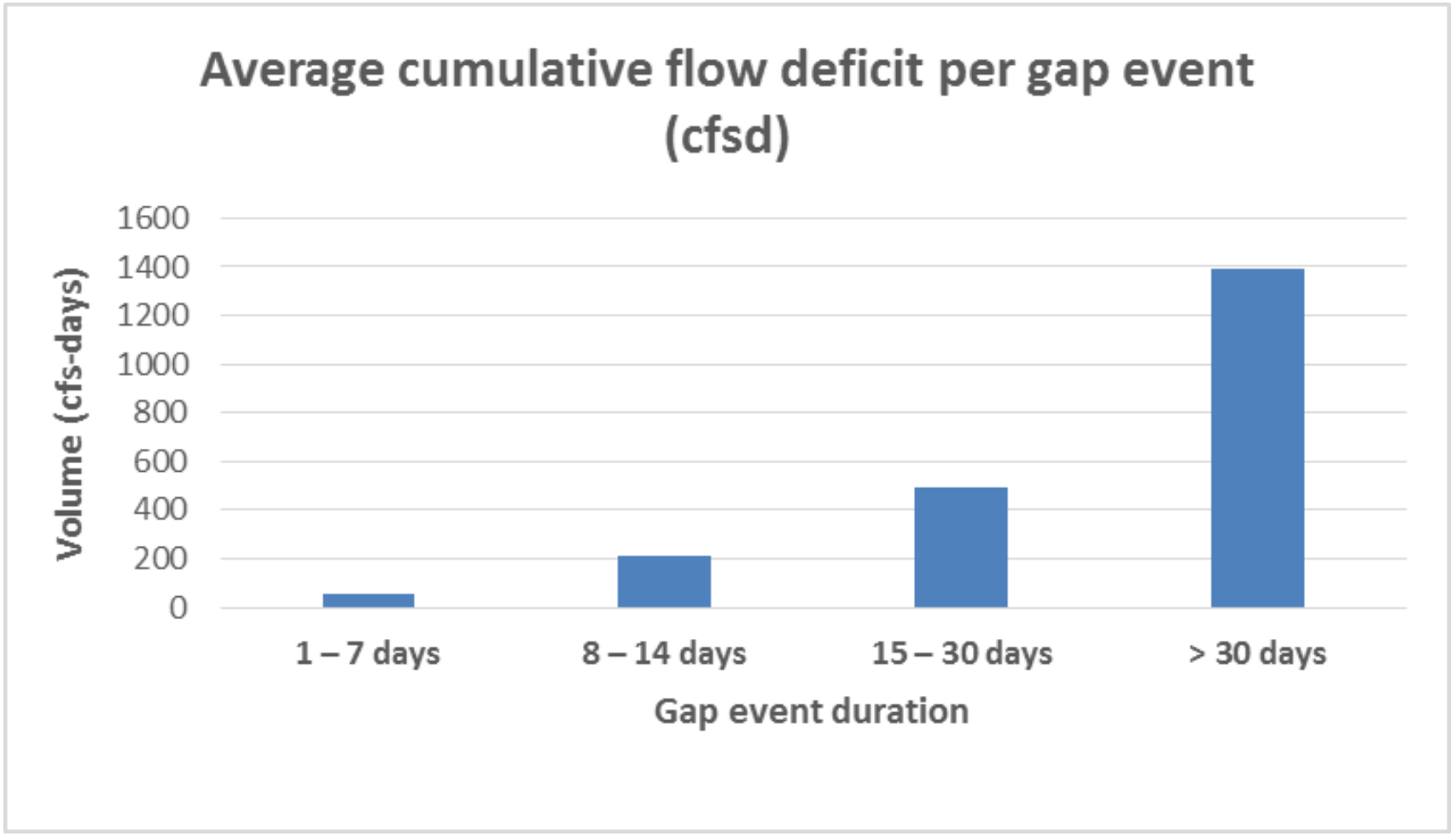
Characteristics of Potential Gaps at Penfield



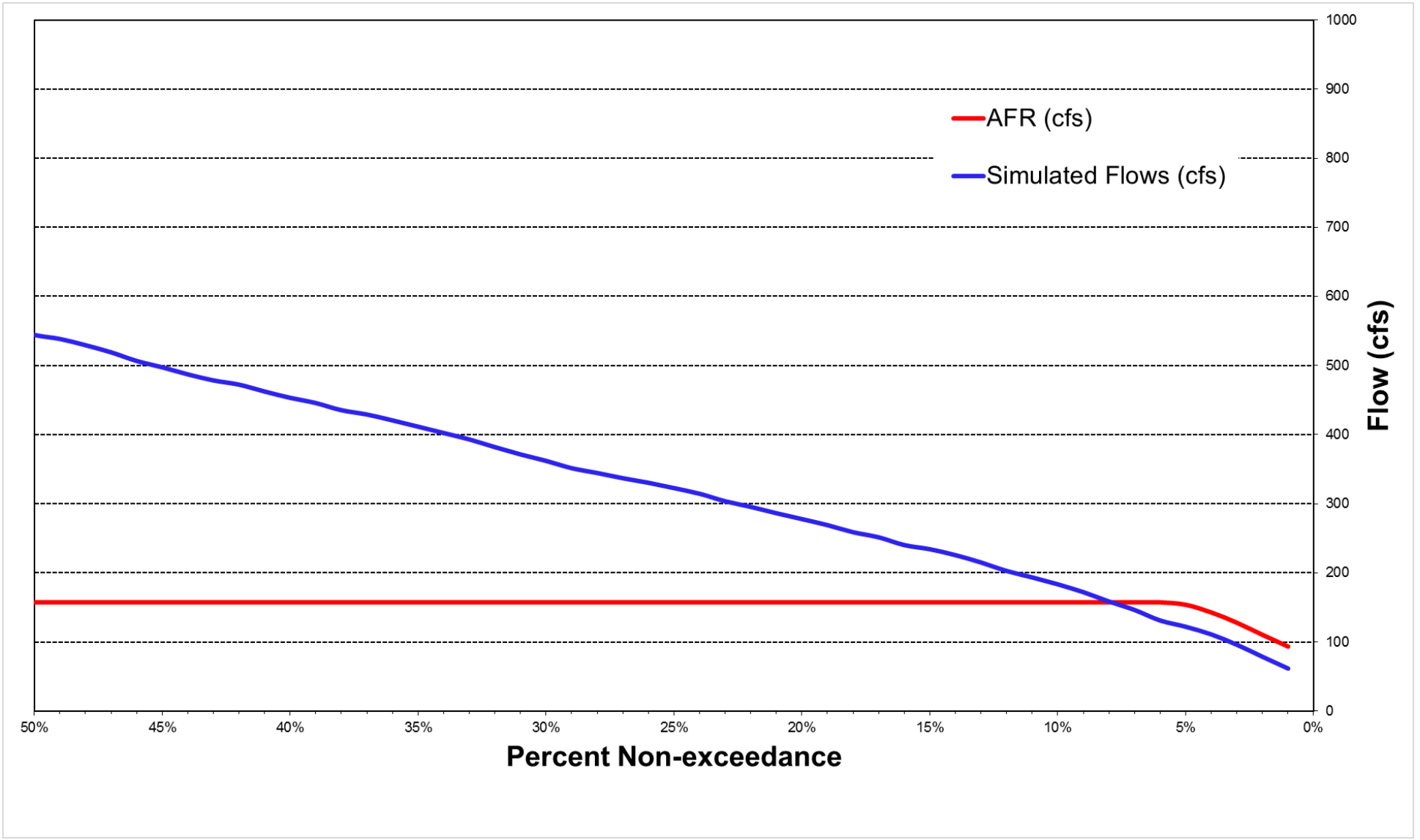
Characteristics of Potential Gaps at Penfield



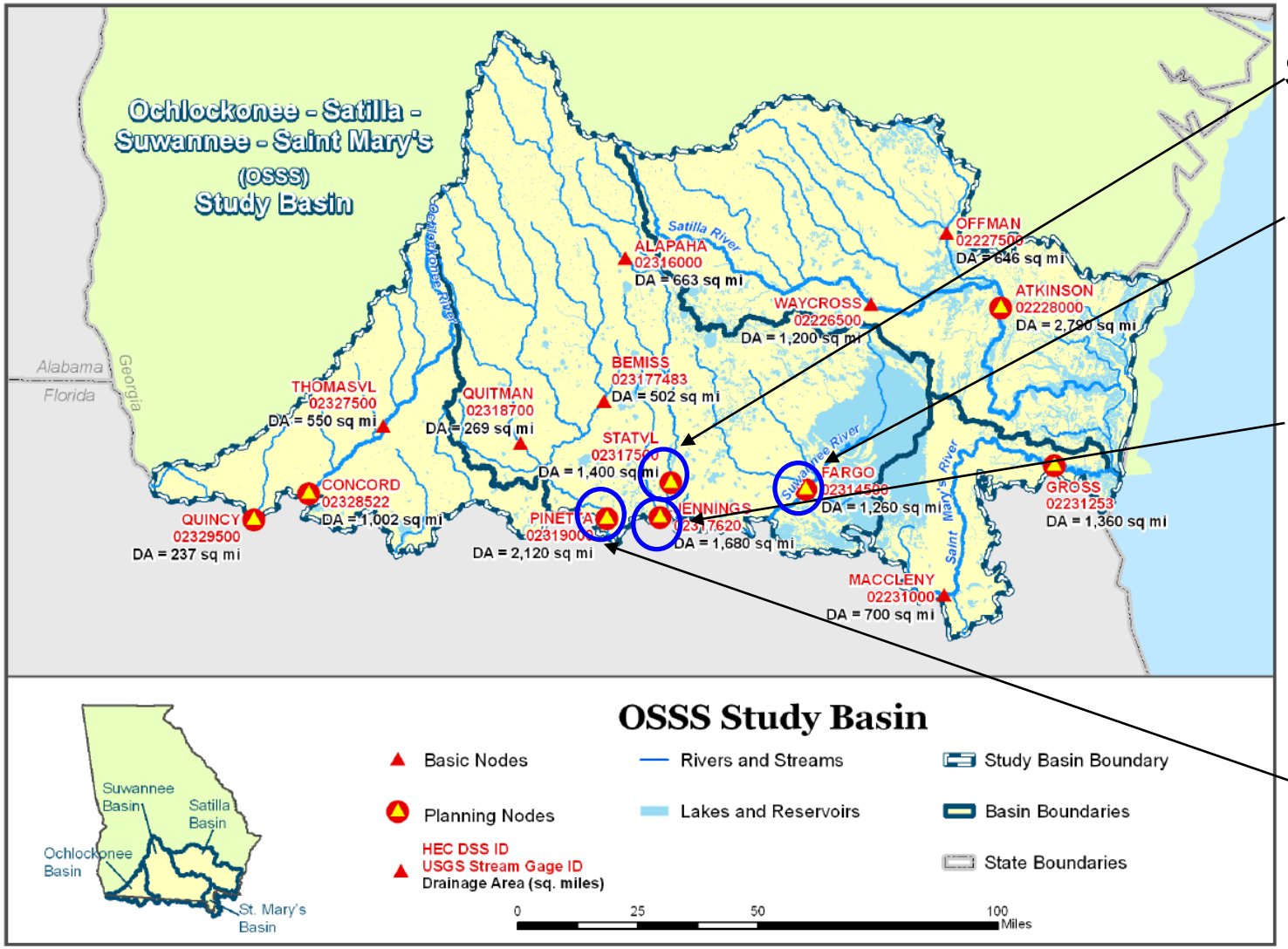
Characteristics of Potential Gaps at Penfield



July Flow Exceedance Curves at Penfield in the Oconee River Basin



Suwannee River Basin



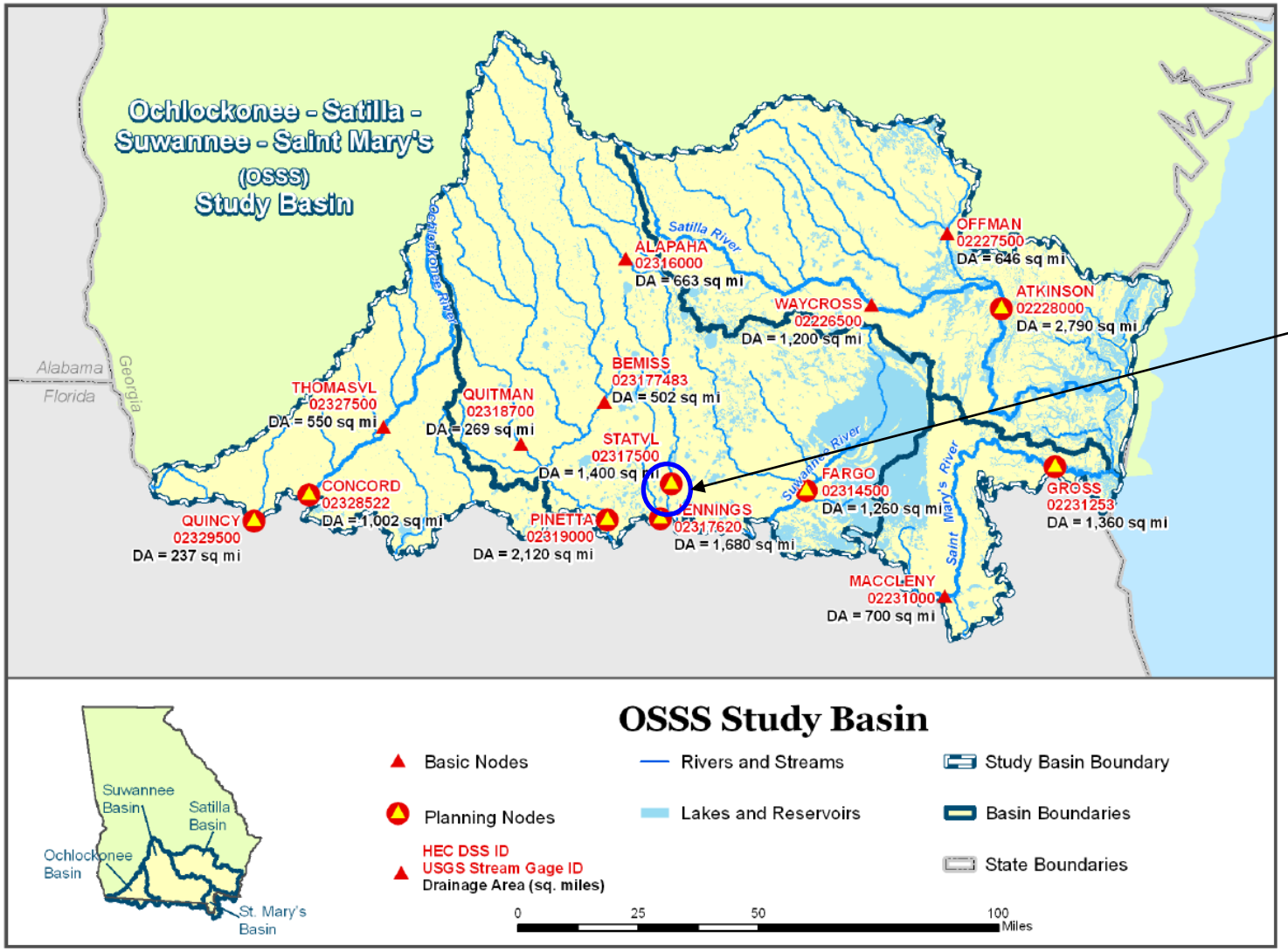
Statenville

Fargo

Jennings

Pinetta

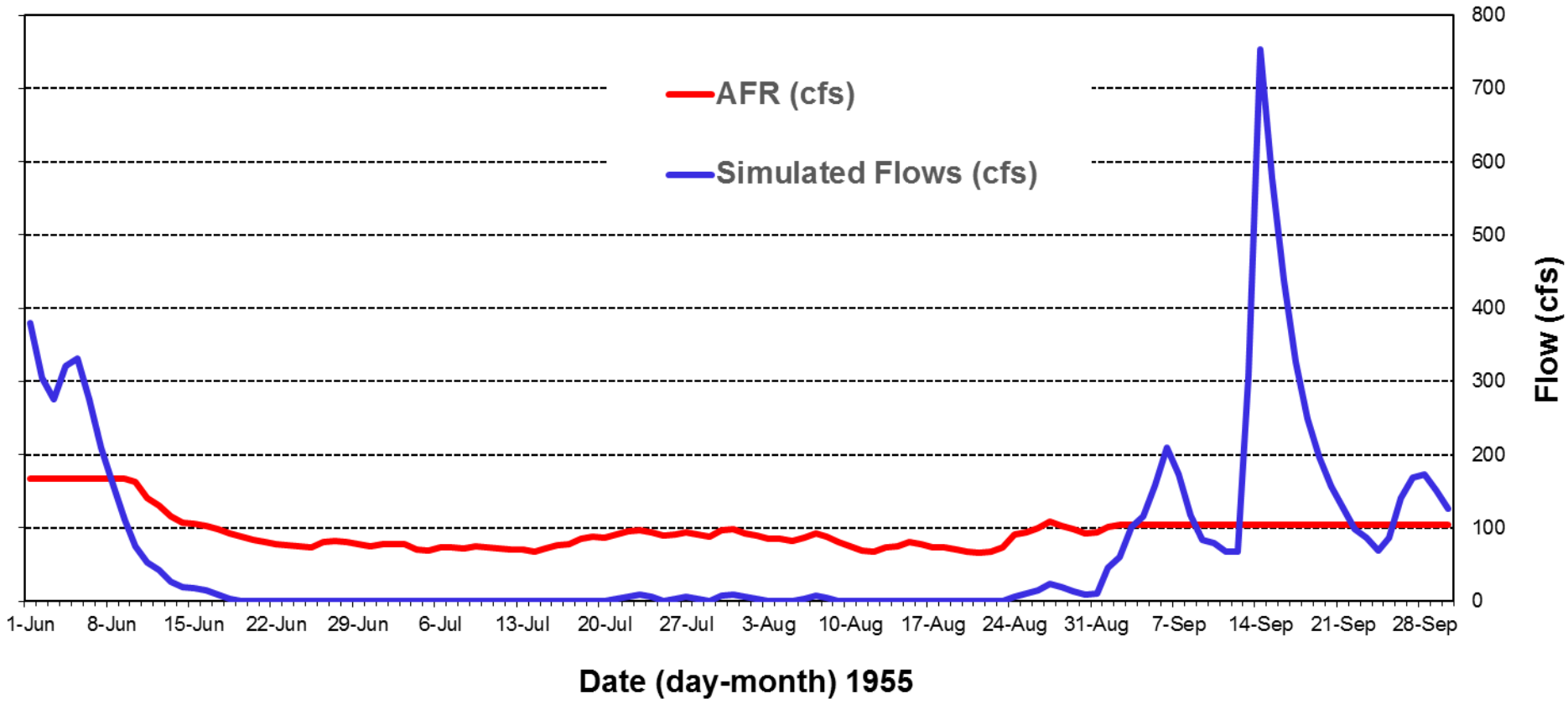
Pinetta in the Suwannee River Basin



Pinetta

Potential Gap at Pinetta in the Suwannee River Basin

Most Severe Flow Gaps at Pinetta in the Suwannee Basin



Modeled Stream Flow Assumes Water Demand Fully Met

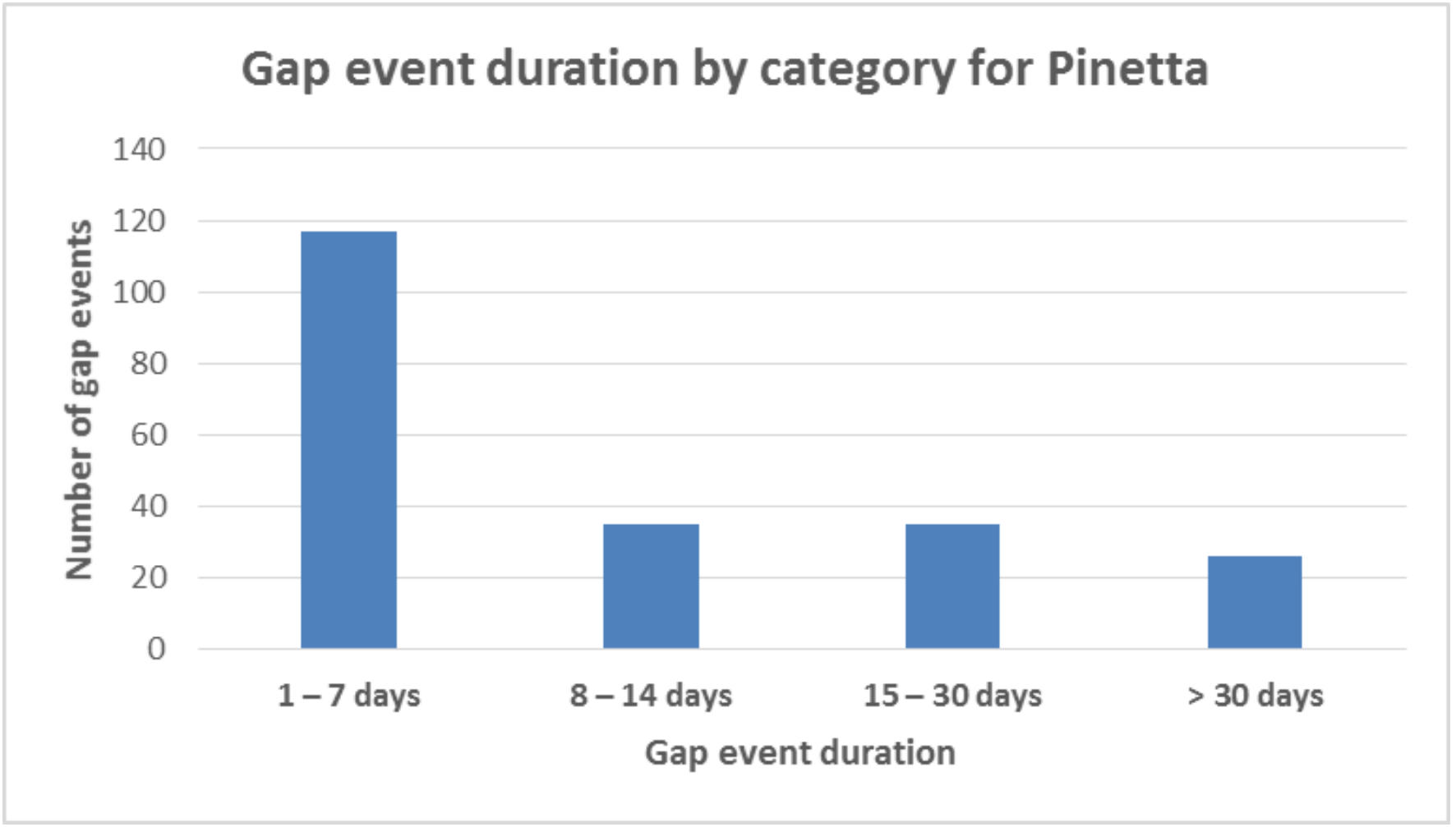
Flow Regime Potential Shortfall at Pinetta in Suwannee River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1-Day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939-2007)	3	<1	1715	<1	1
Round 2 (1939-2013)	11	41	1695	100	190

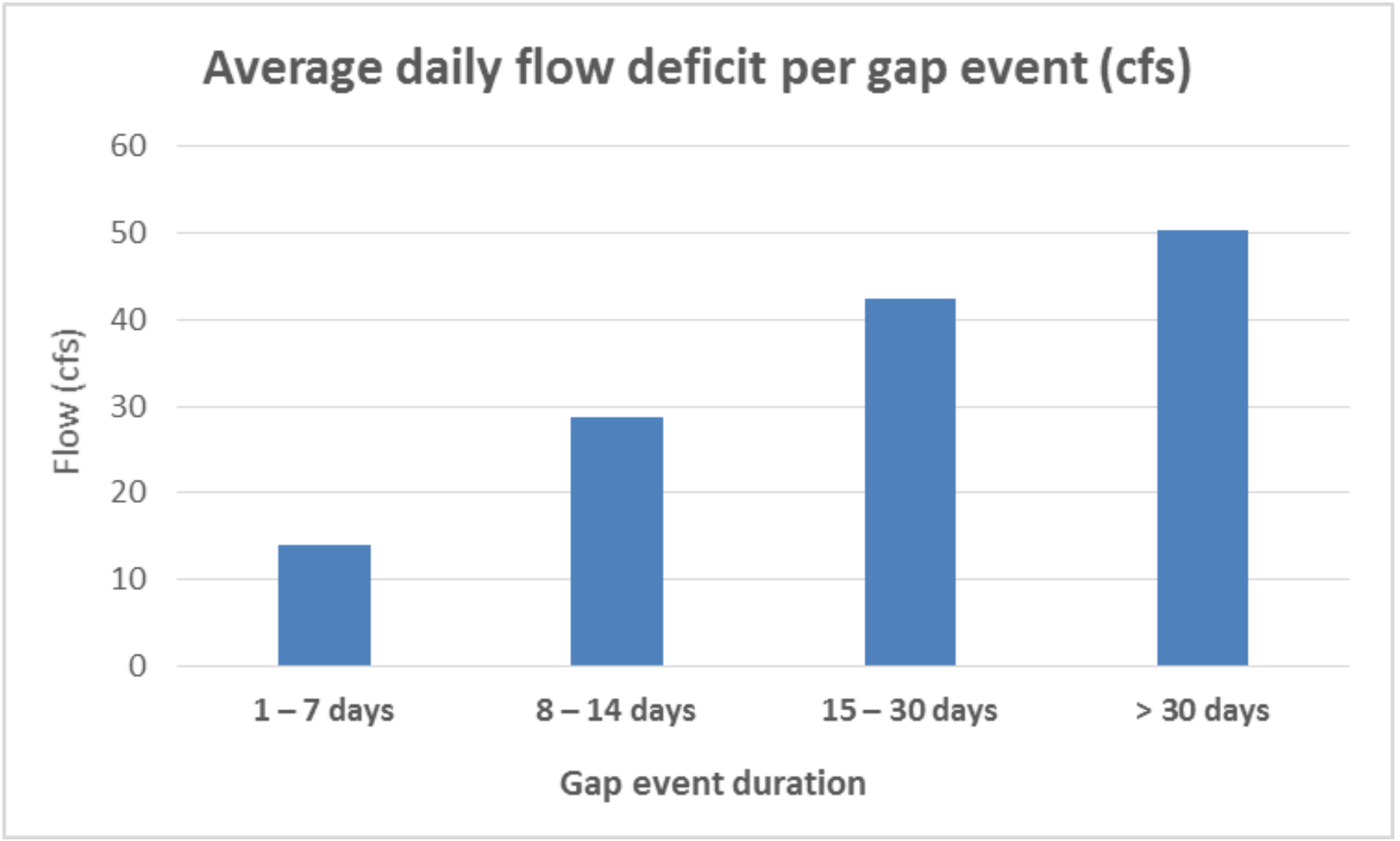
Characteristics of Potential Gaps at Pinetta

Gap event duration by category for Pinetta	Number of gap events		Total gap days by category, 1939-2013		Average daily flow deficit per gap event (cfs)	Average cumulative flow deficit per gap event (cfsd)
1 – 7 days	117	(54.9%)	417	(1.5%)	14	59
8 – 14 days	35	(16.4%)	370	(1.4%)	29	319
15 – 30 days	35	(16.4%)	729	(2.7%)	42	903
> 30 days	26	(12.2%)	1466	(5.4%)	50	2823
Totals (∑)	213	(100.0%)	2982	(10.9%)		

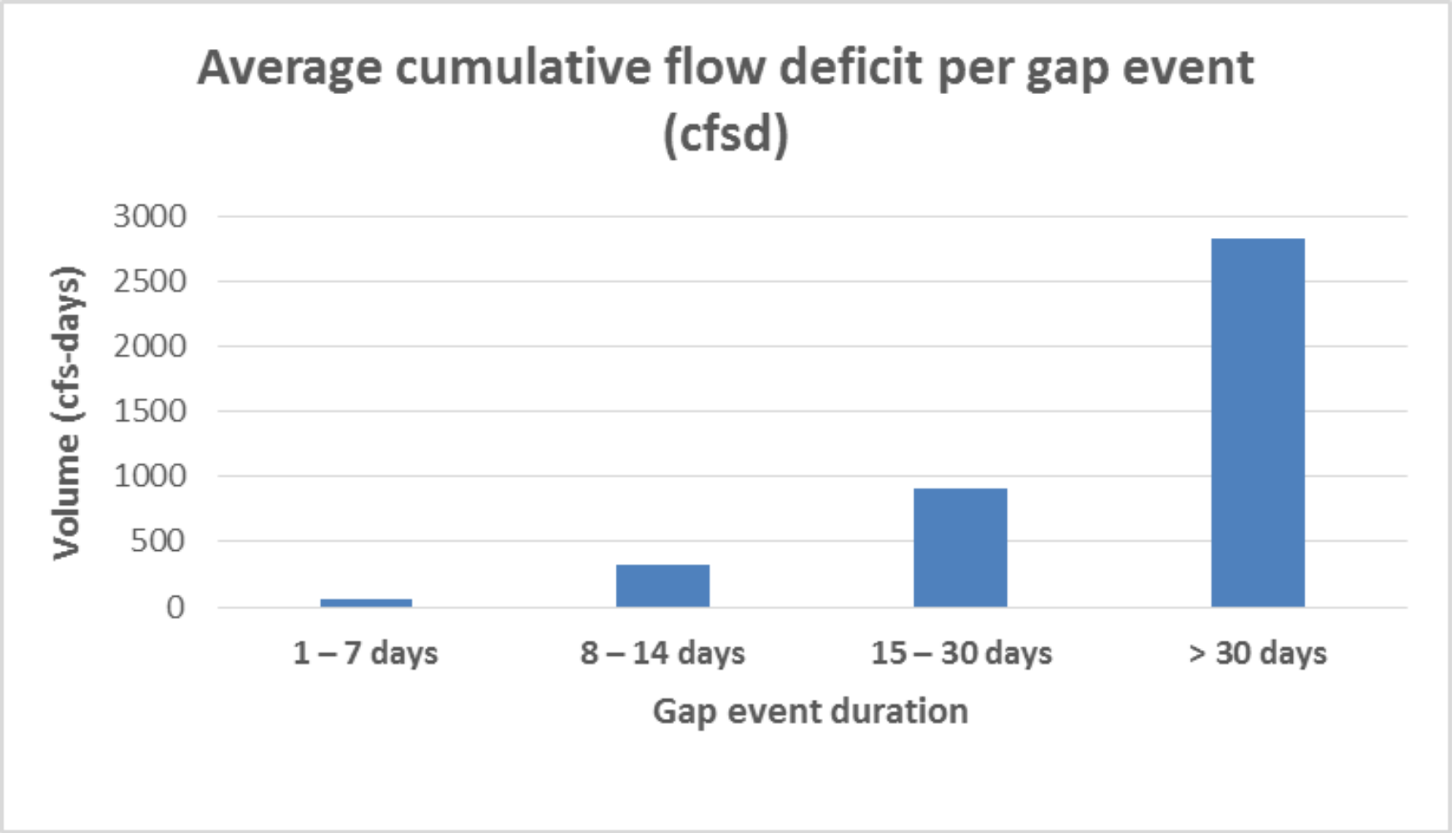
Characteristics of Potential Gaps at Pinetta



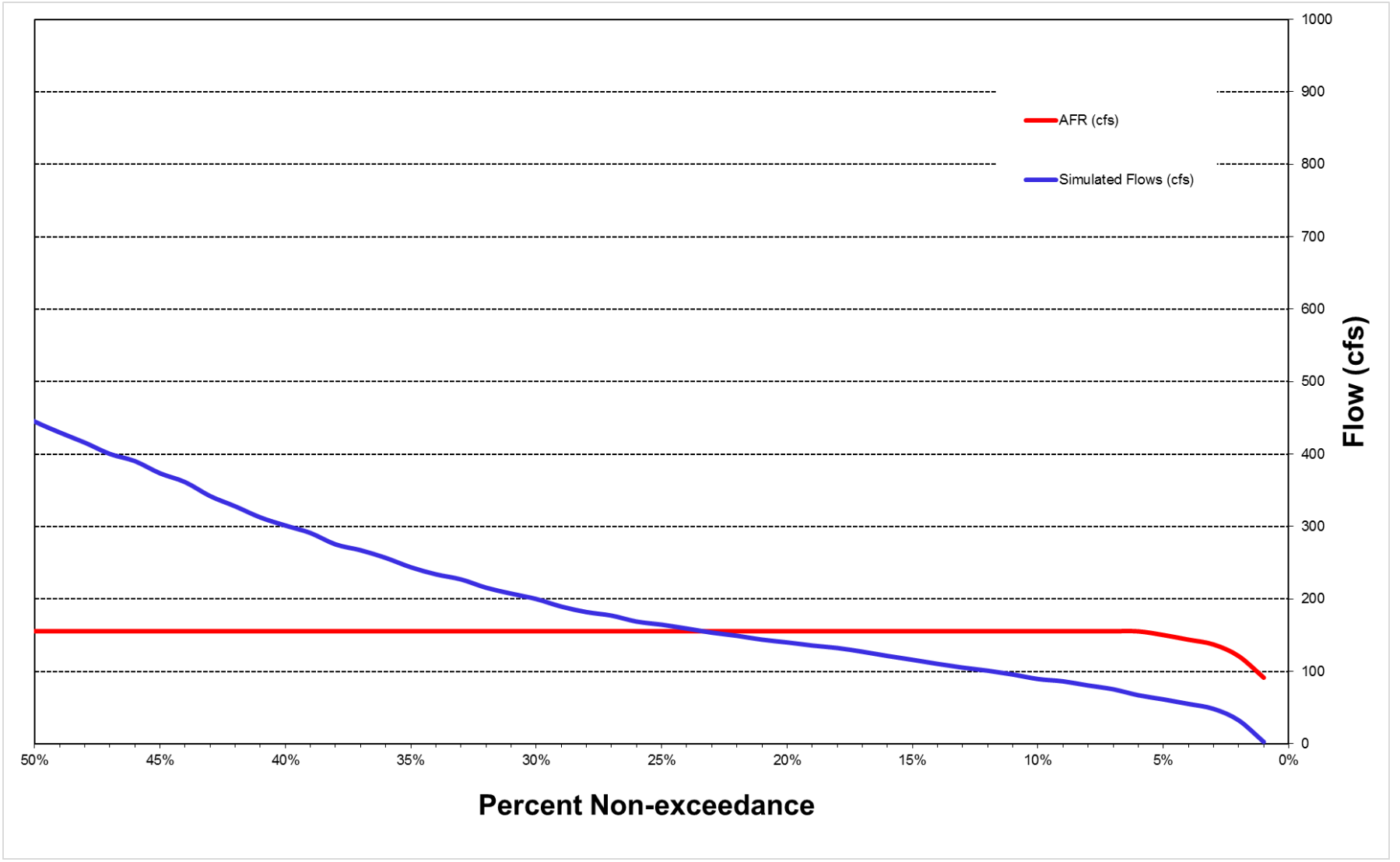
Characteristics of Potential Gaps at Pinetta



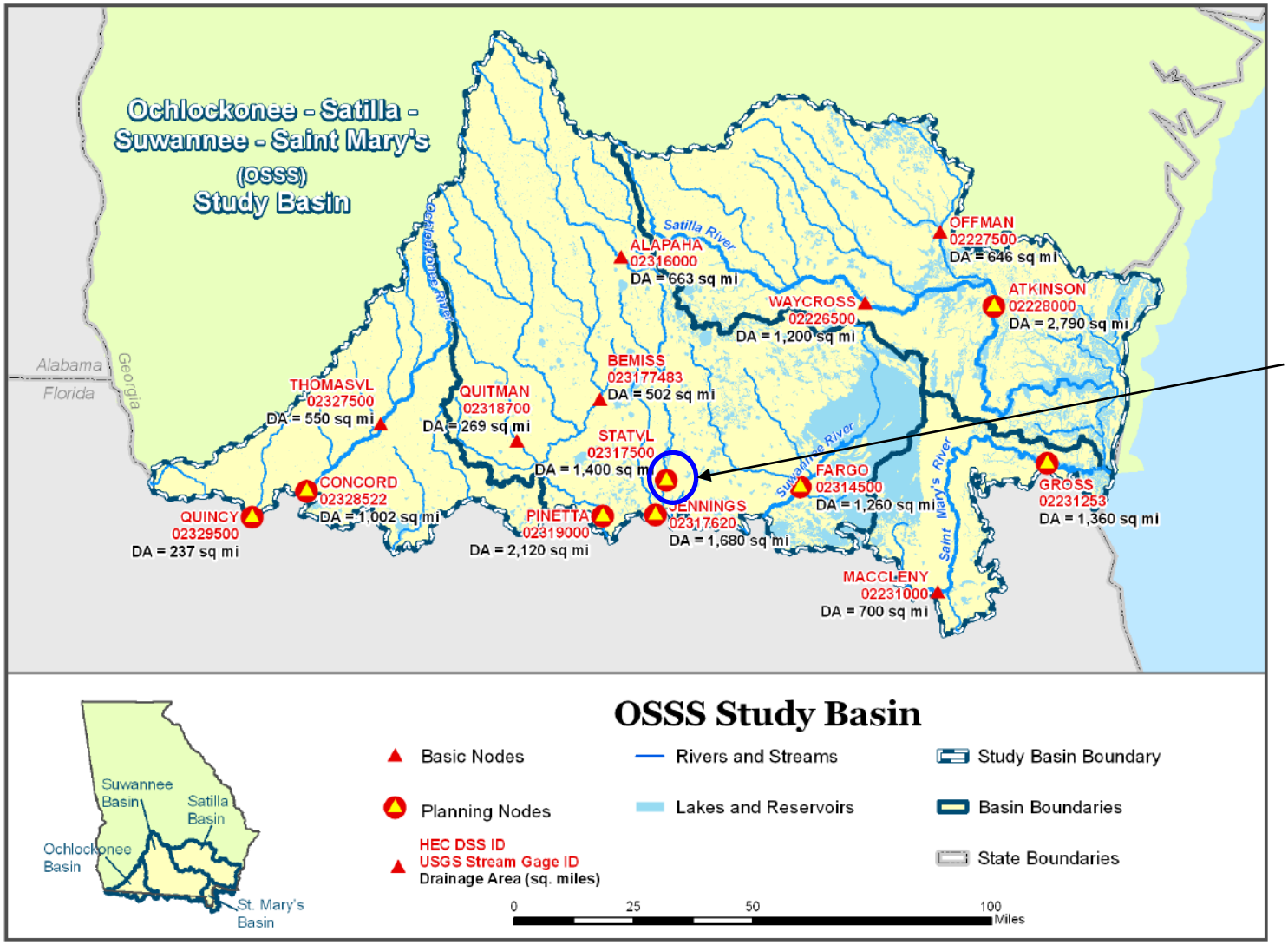
Characteristics of Potential Gaps at Pinetta



July Flow Exceedance Curves at Pinetta in the Suwannee River Basin

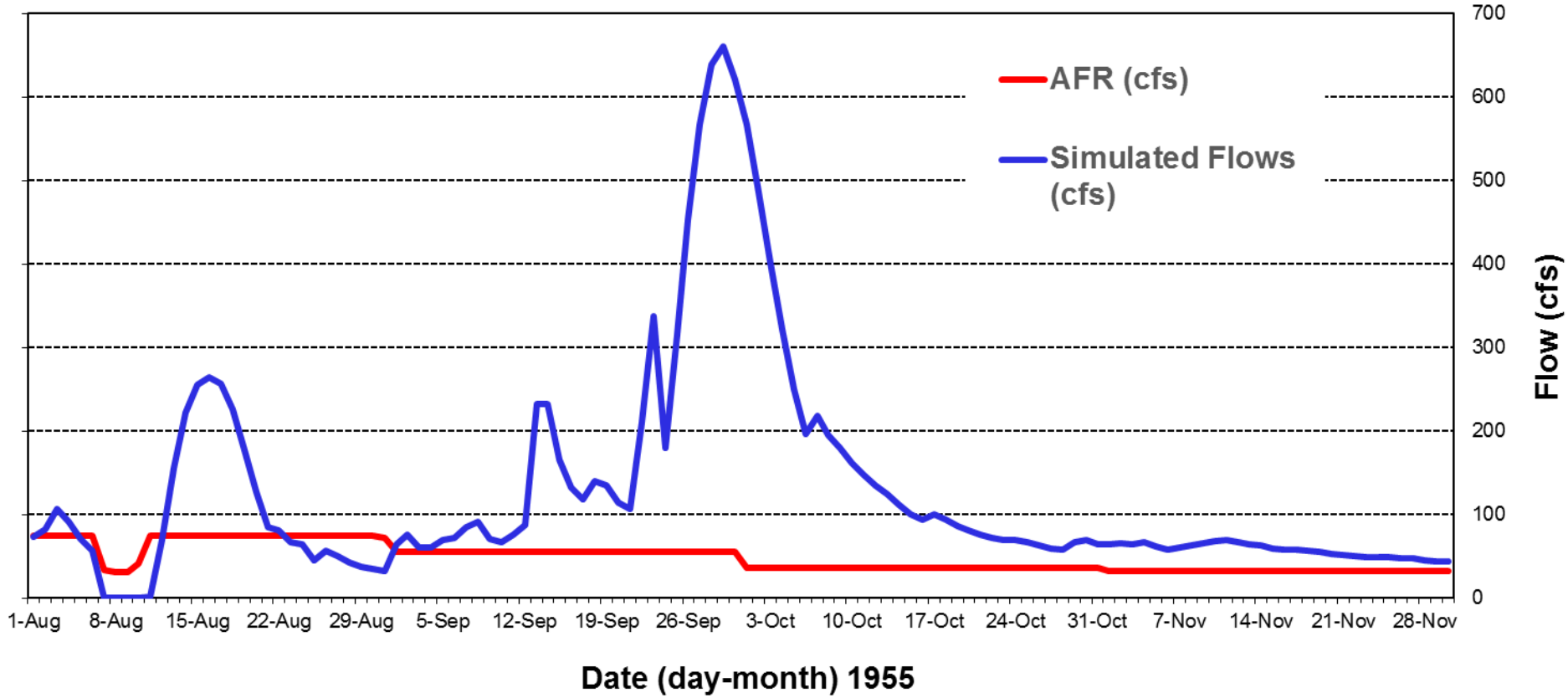


Statenville in the Suwannee River Basin



Potential Gap at Statenville in the Suwannee River Basin

Most Severe Flow Gaps at Statenville in the Suwannee Basin



Modeled Stream Flow Assumes Water Demand Fully Met

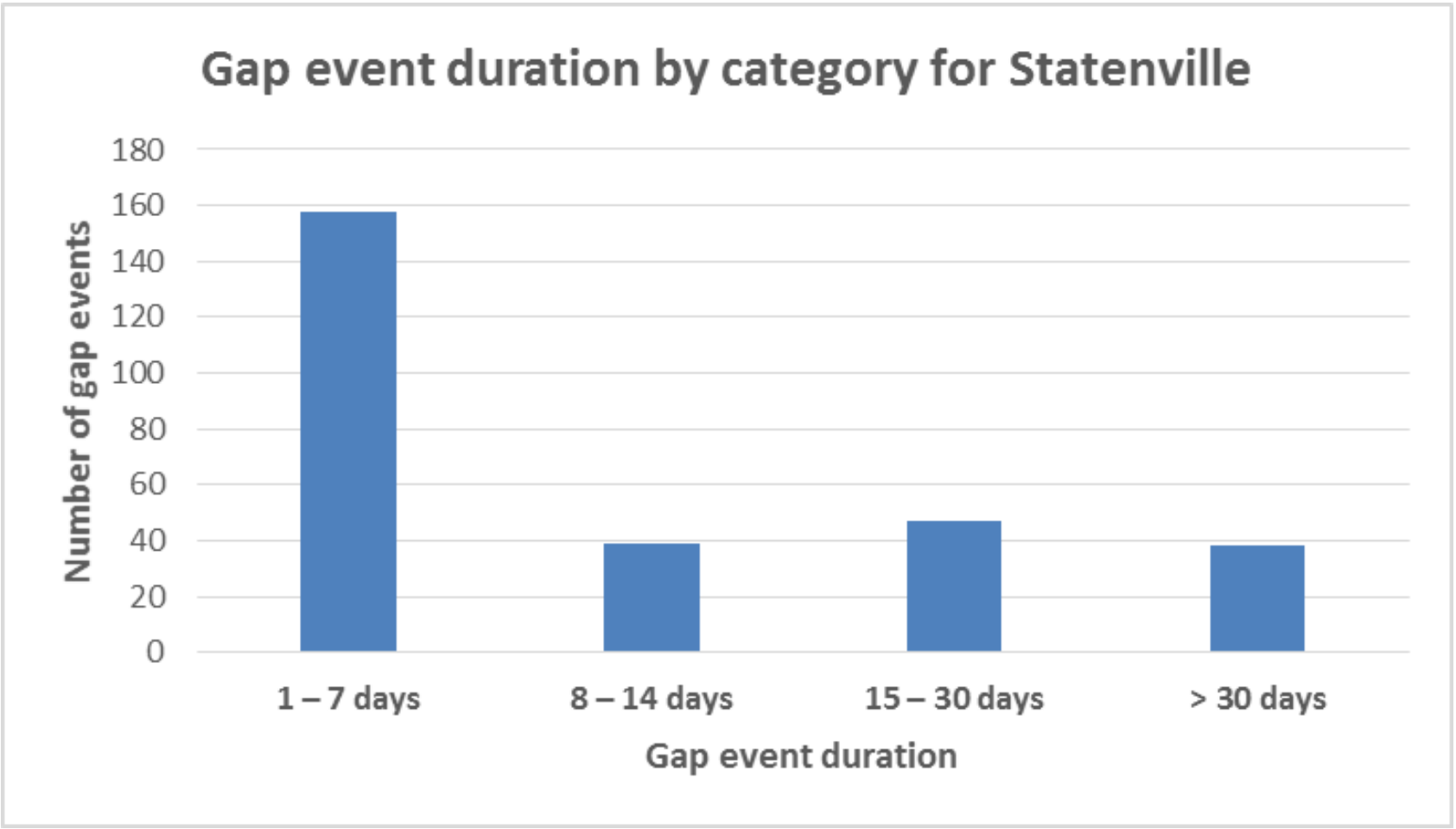
Flow Regime Potential Shortfall at Statenville in Suwannee River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1-Day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939-2007)	20	31	1,060	92	95
Round 2 (1939-2013)	16	24	1050	84	100

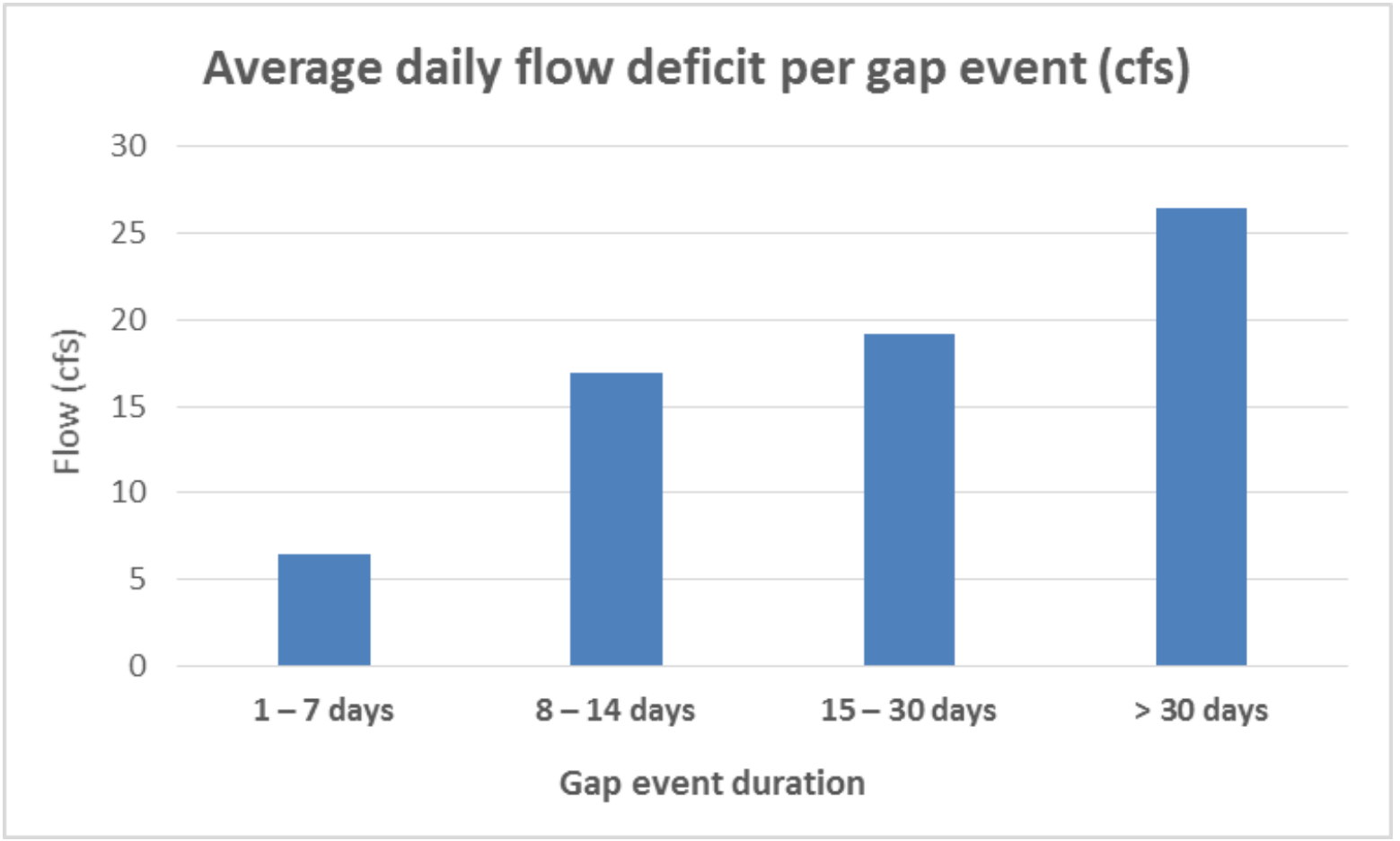
Characteristics of Potential Gaps at Statenville

Gap event duration by category for Statenville	Number of gap events		Total gap days by category, 1939-2013		Average daily flow deficit per gap event (cfs)	Average cumulative flow deficit per gap event (cfsd)
1 – 7 days	158	(70.5%)	416	(1.5%)	6	24
8 – 14 days	39	(17.4%)	483	(1.8%)	17	182
15 – 30 days	47	(8.5%)	986	(3.6%)	19	421
> 30 days	38	(3.6%)	2558	(9.3%)	26	1976
Totals (∑)	282	(100.0%)	4443	(16.2%)		

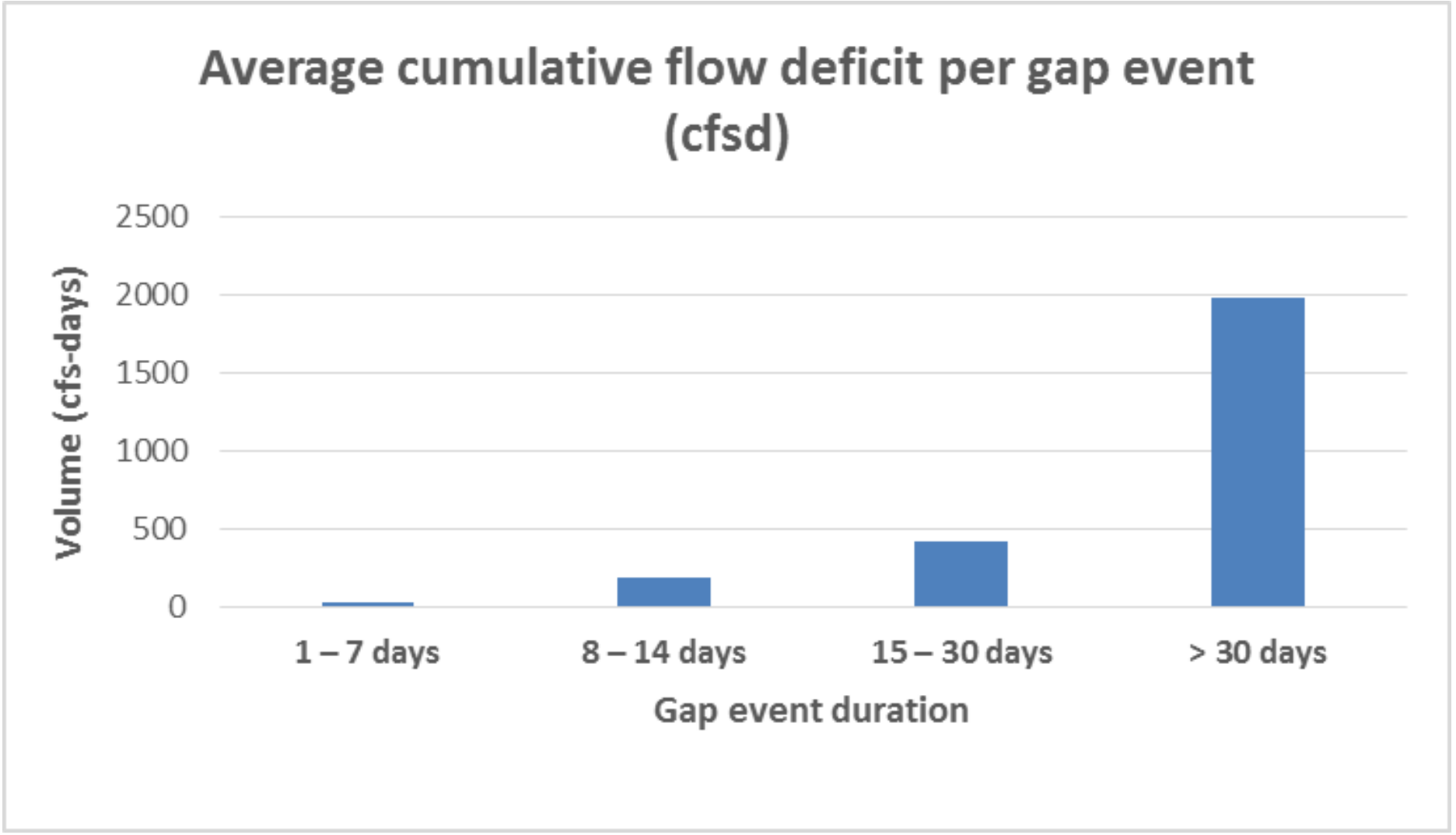
Characteristics of Potential Gaps at Statenville



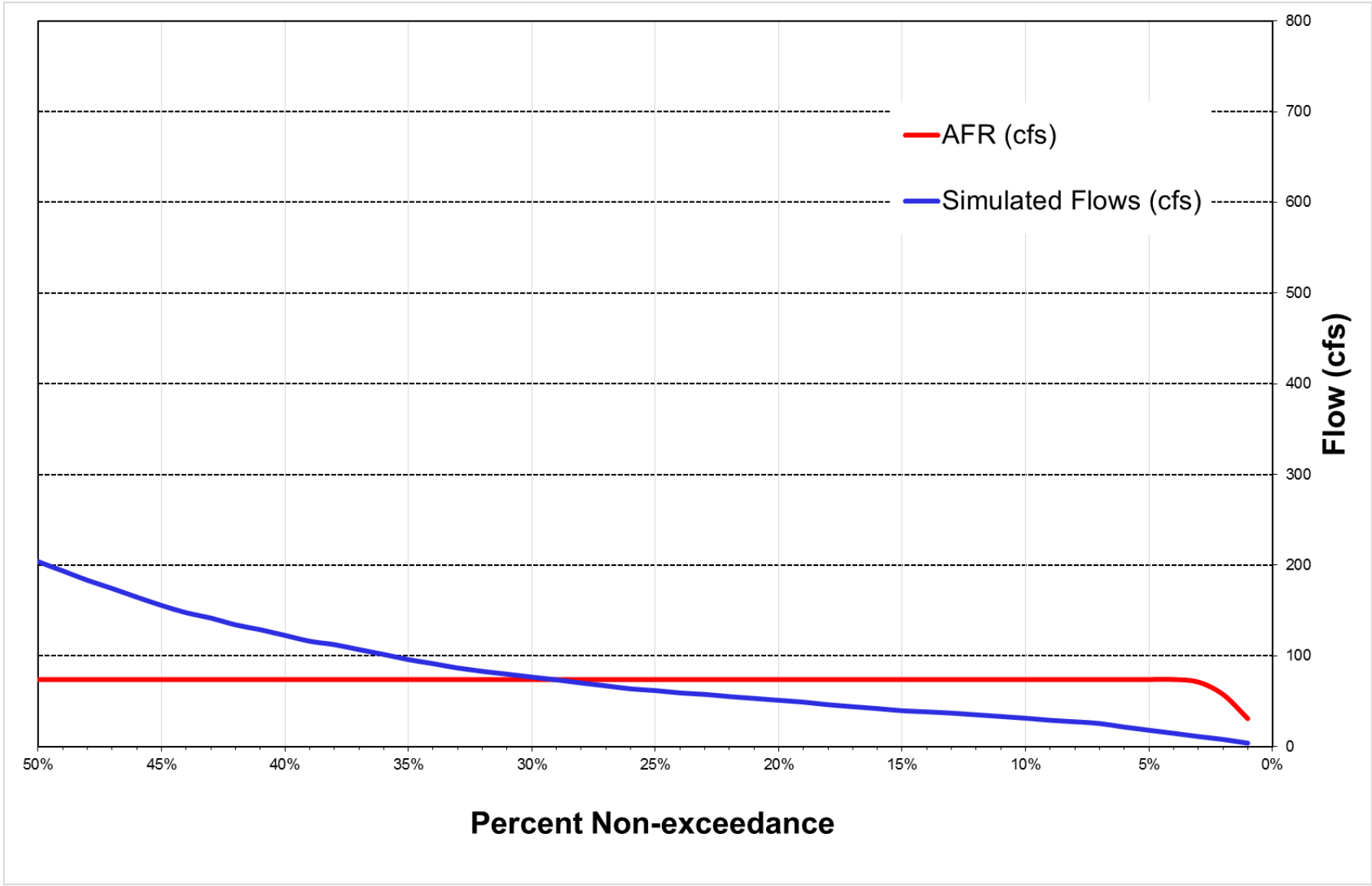
Characteristics of Potential Gaps at Statenville



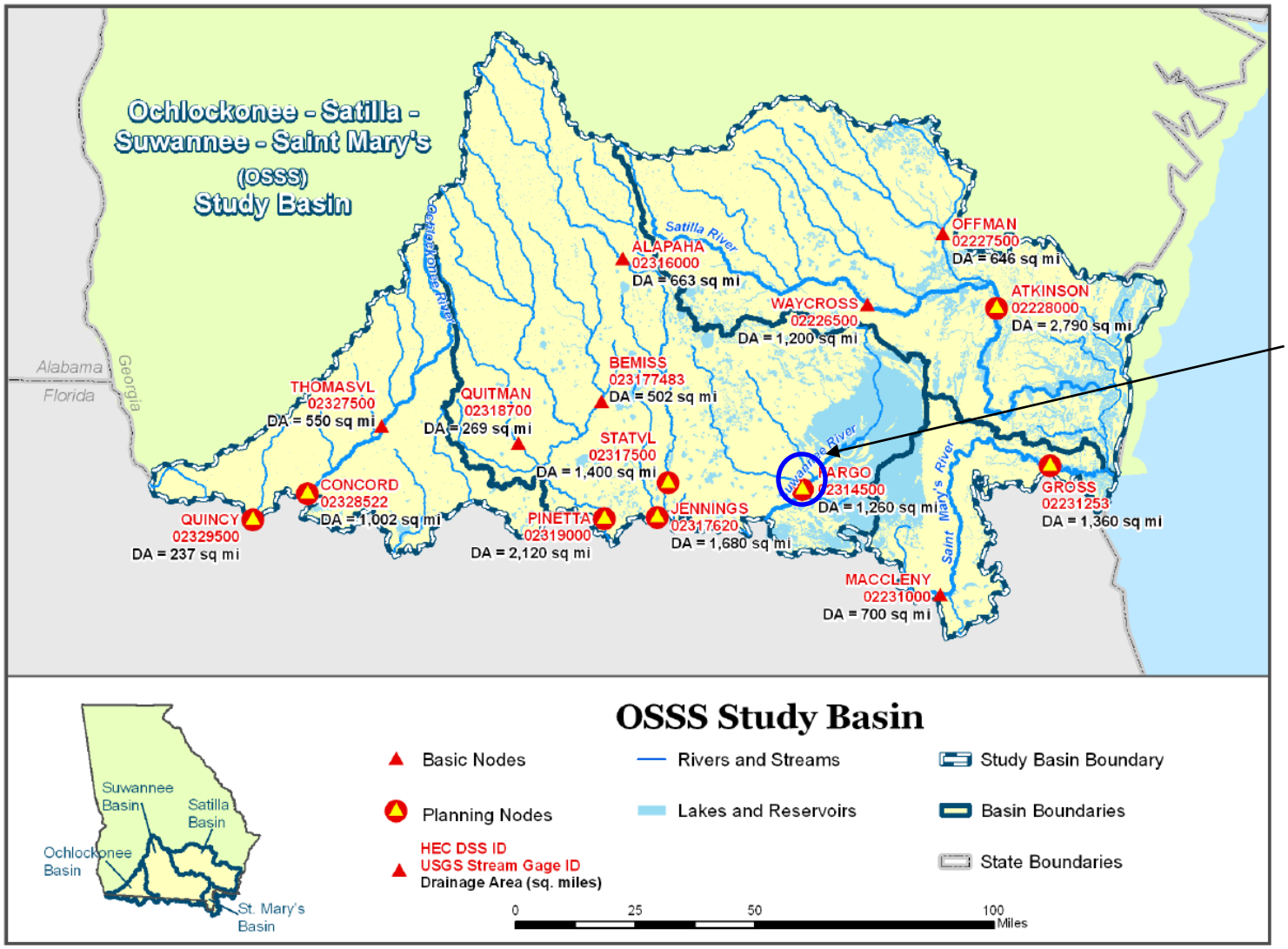
Characteristics of Potential Gaps at Statenville



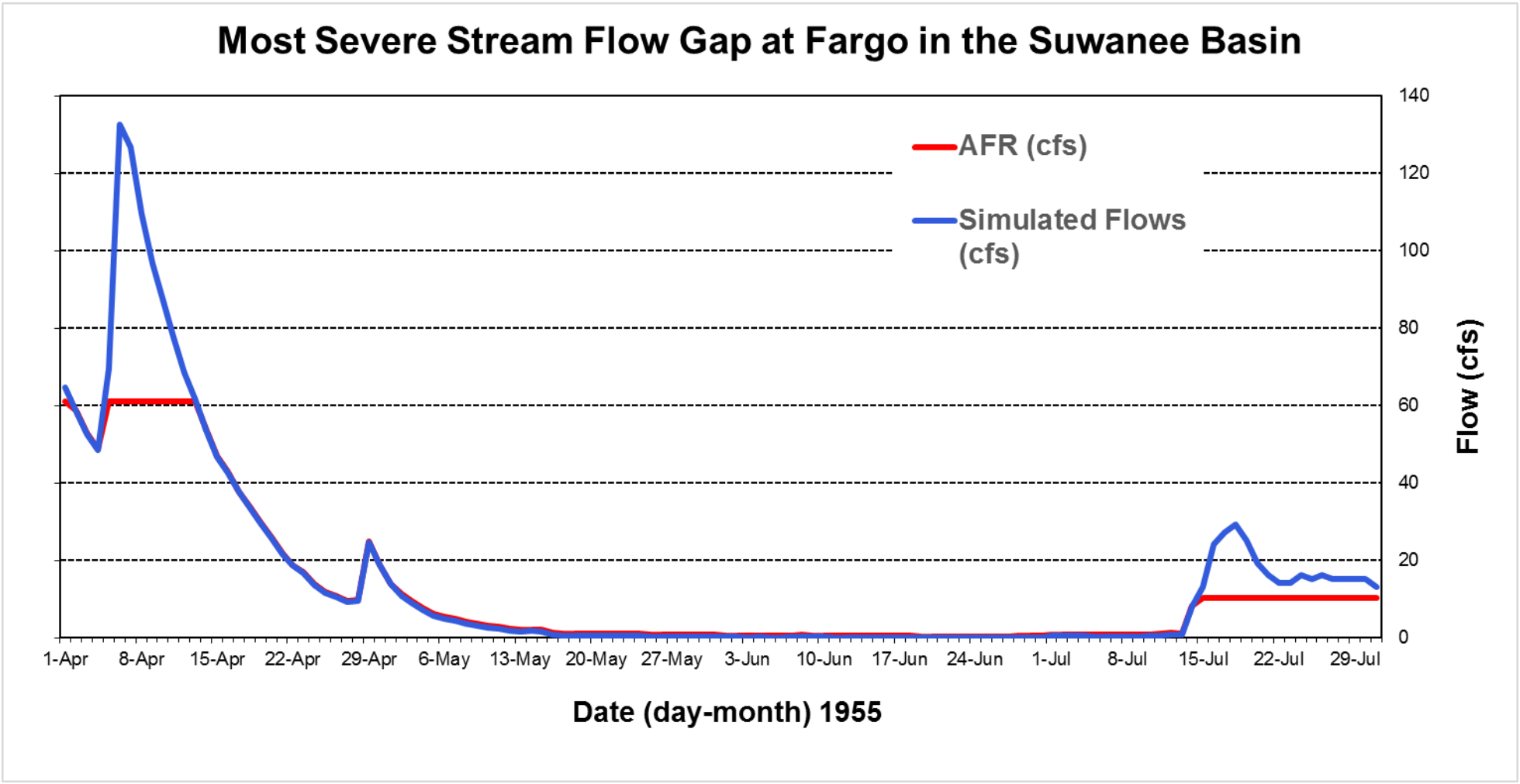
July Flow Exceedance Curves at Statenville in the Suwannee River Basin



Fargo in the Suwannee River Basin



Potential Gap at Fargo in the Suwannee River Basin



Modeled Stream Flow Assumes Water Demand Fully Met

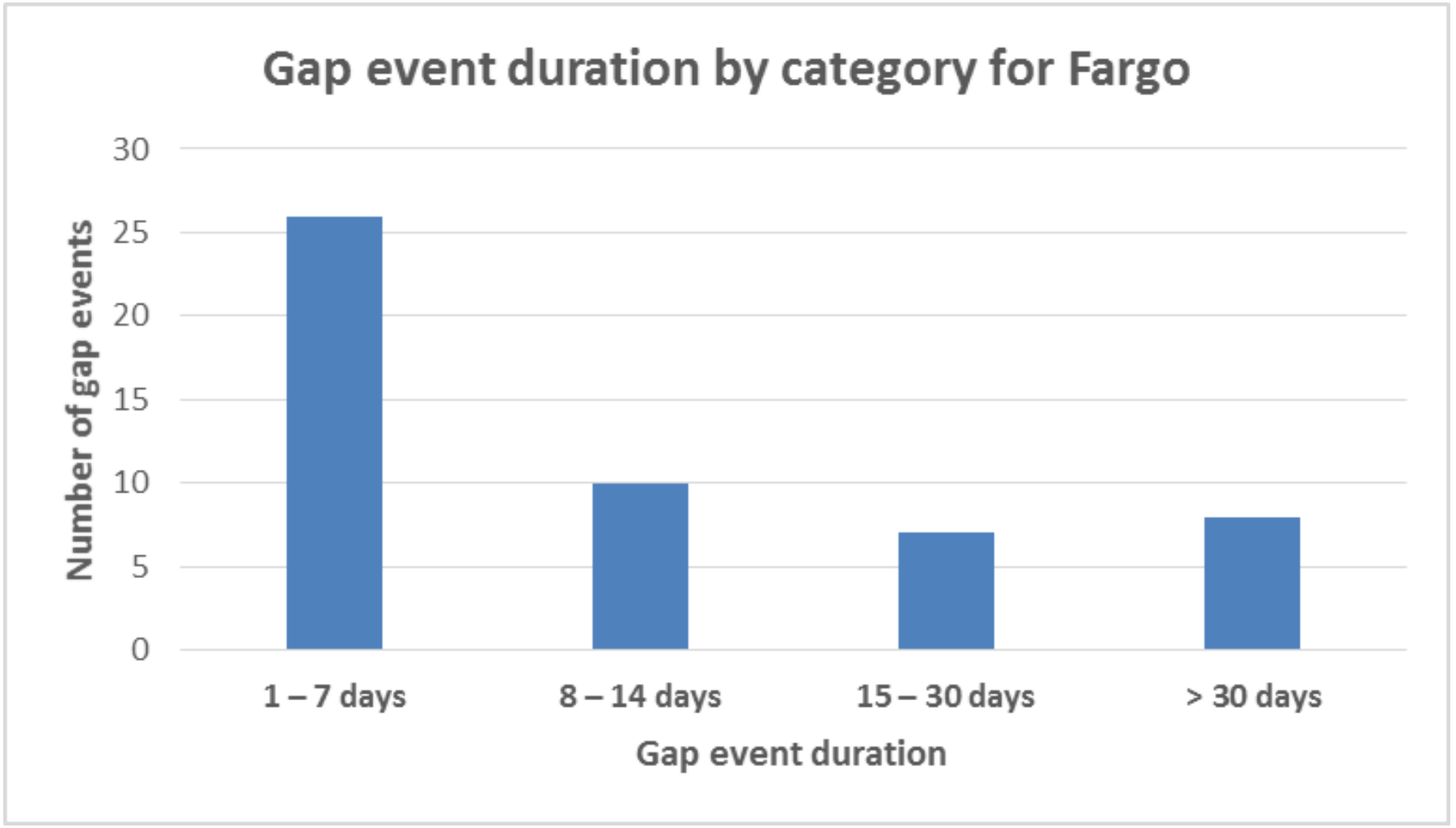
Flow Regime Potential Shortfall at Fargo in Suwannee River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1-Day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939-2007)	3	<1	959	<1	1
Round 2 (1939-2013)	3	<1	928	1	1

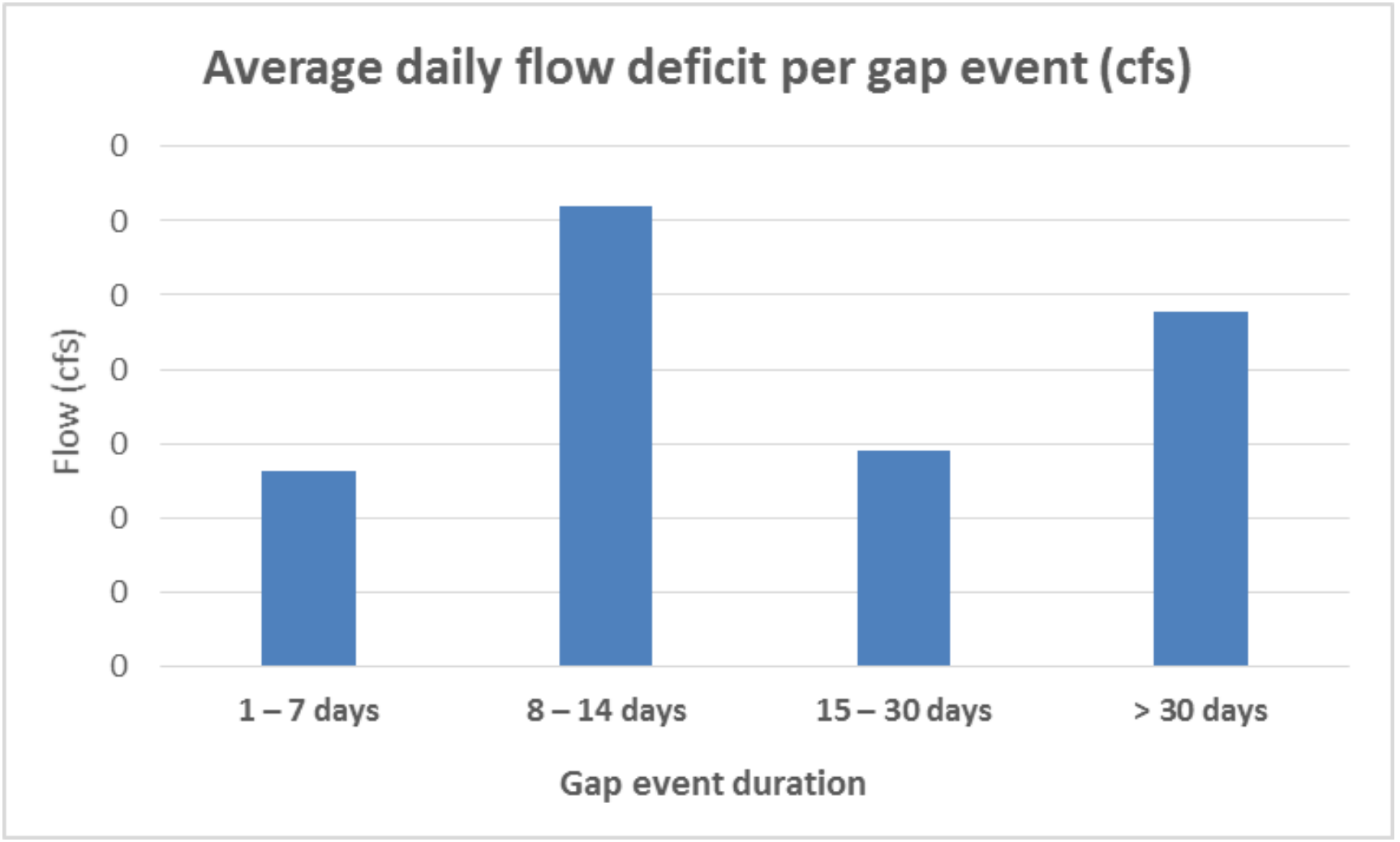
Characteristics of Potential Gaps at Fargo

Gap event duration by category for Fargo	Number of gap events		Total gap days by category, 1939-2013		Average daily flow deficit per gap event (cfs)	Average cumulative flow deficit per gap event (cfsd)
1 – 7 days	26	(51.0%)	82	(0.3%)	0	1
8 – 14 days	10	(19.6%)	106	(0.4%)	0	3
15 – 30 days	7	(13.7%)	148	(0.5%)	0	6
> 30 days	8	(15.7%)	415	(1.5%)	0	16
Totals (∑)	51	(100.0%)	751	(2.7%)		

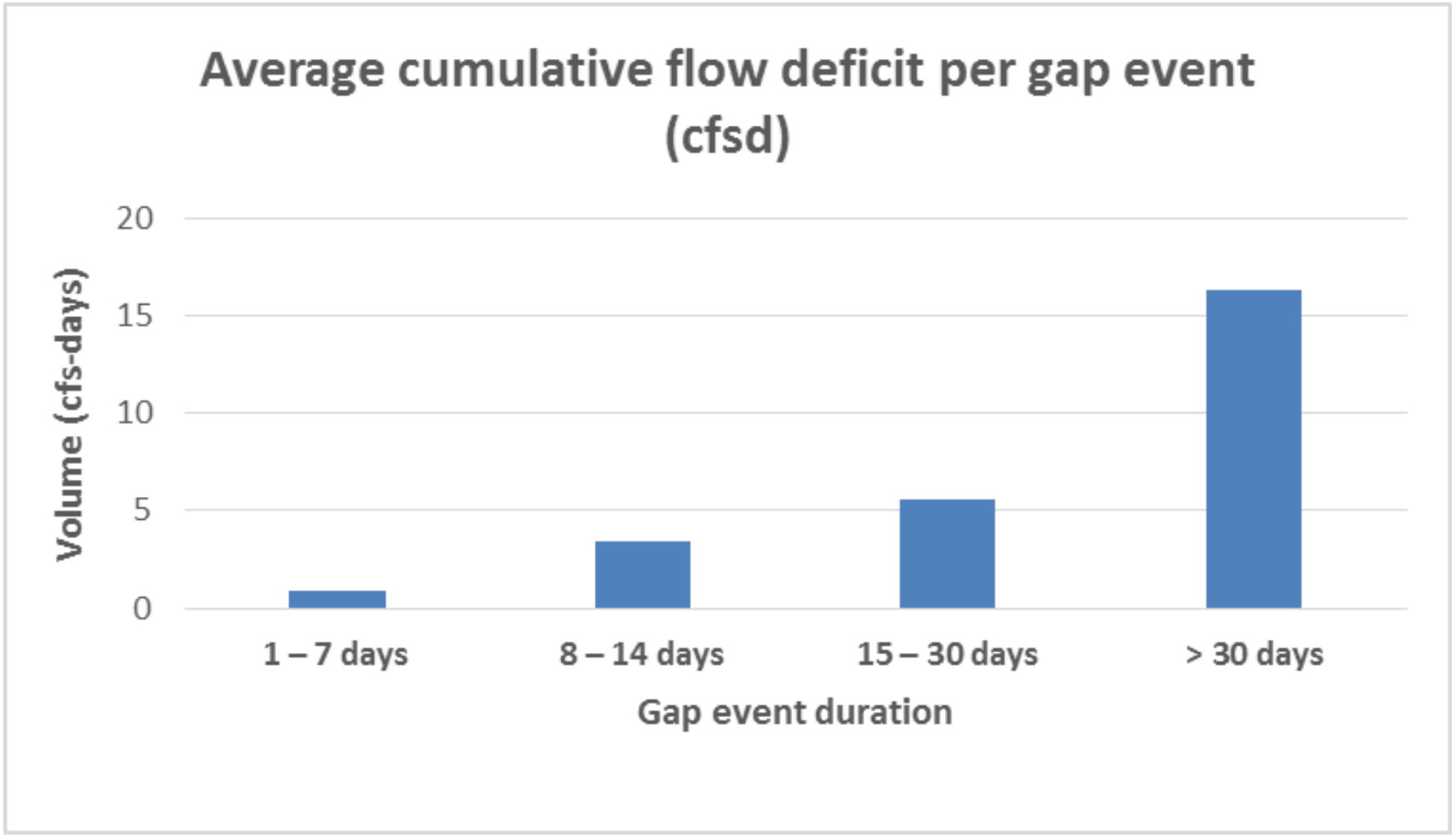
Characteristics of Potential Gaps at Fargo



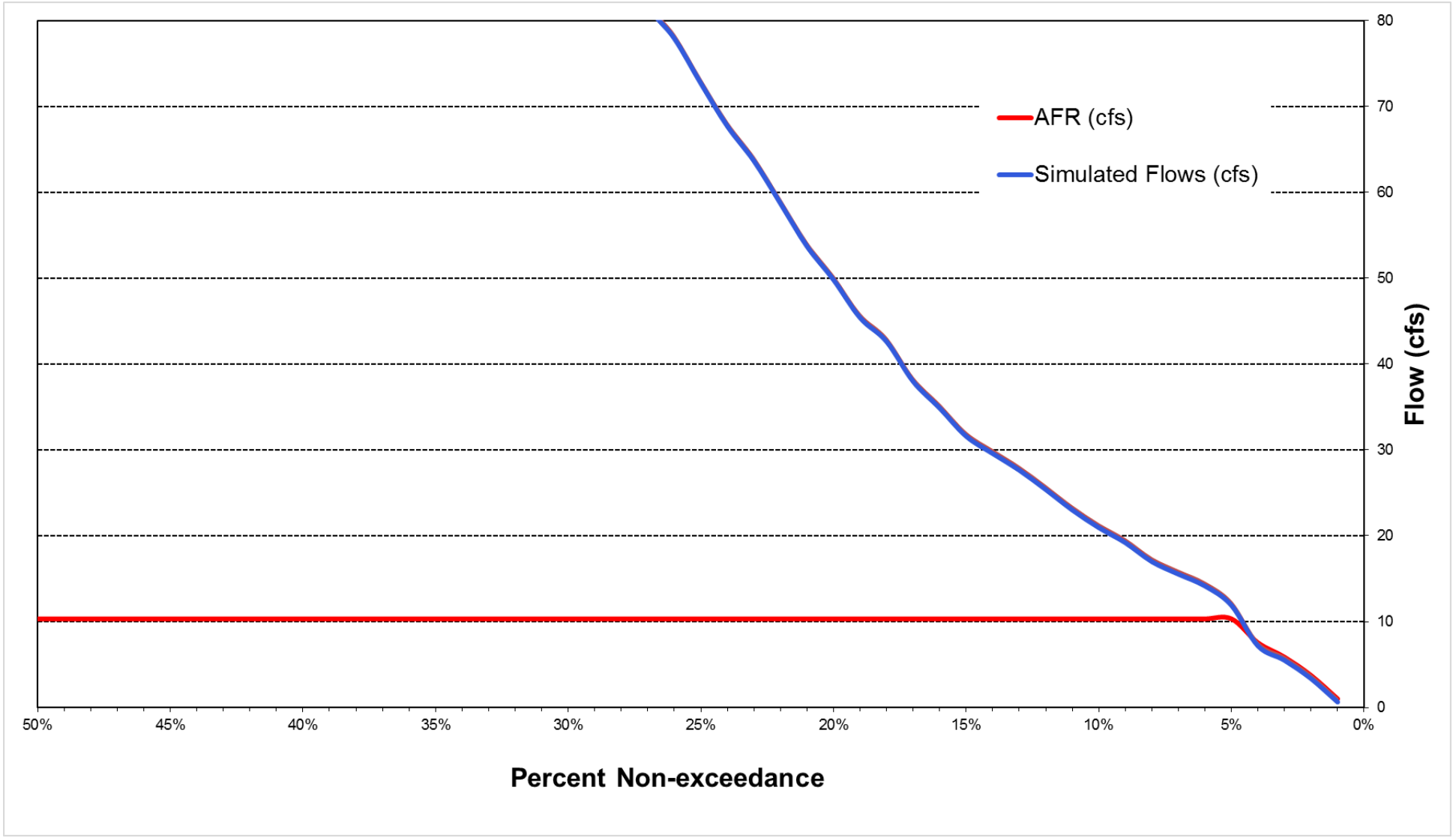
Characteristics of Potential Gaps at Fargo



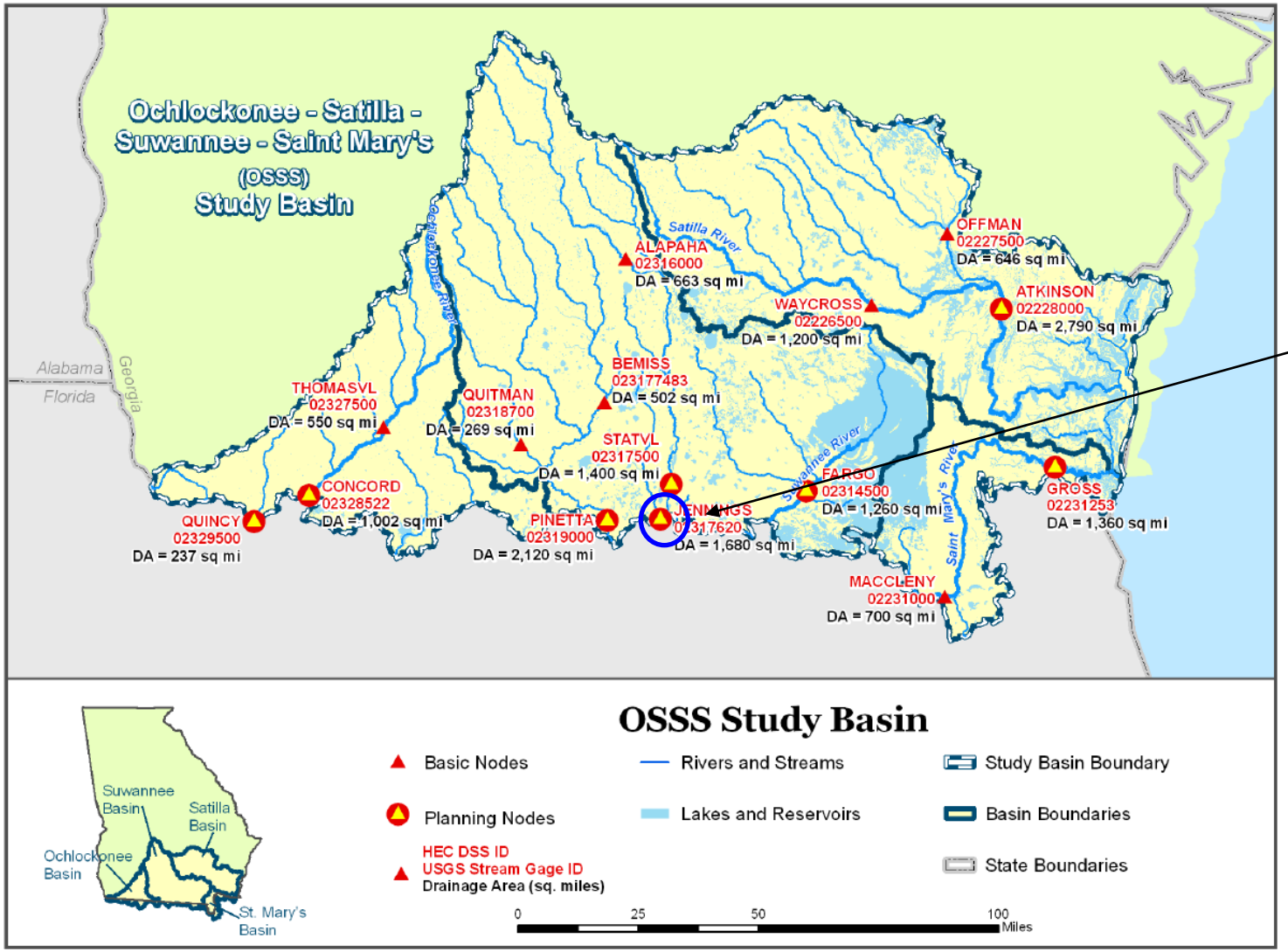
Characteristics of Potential Gaps at Fargo



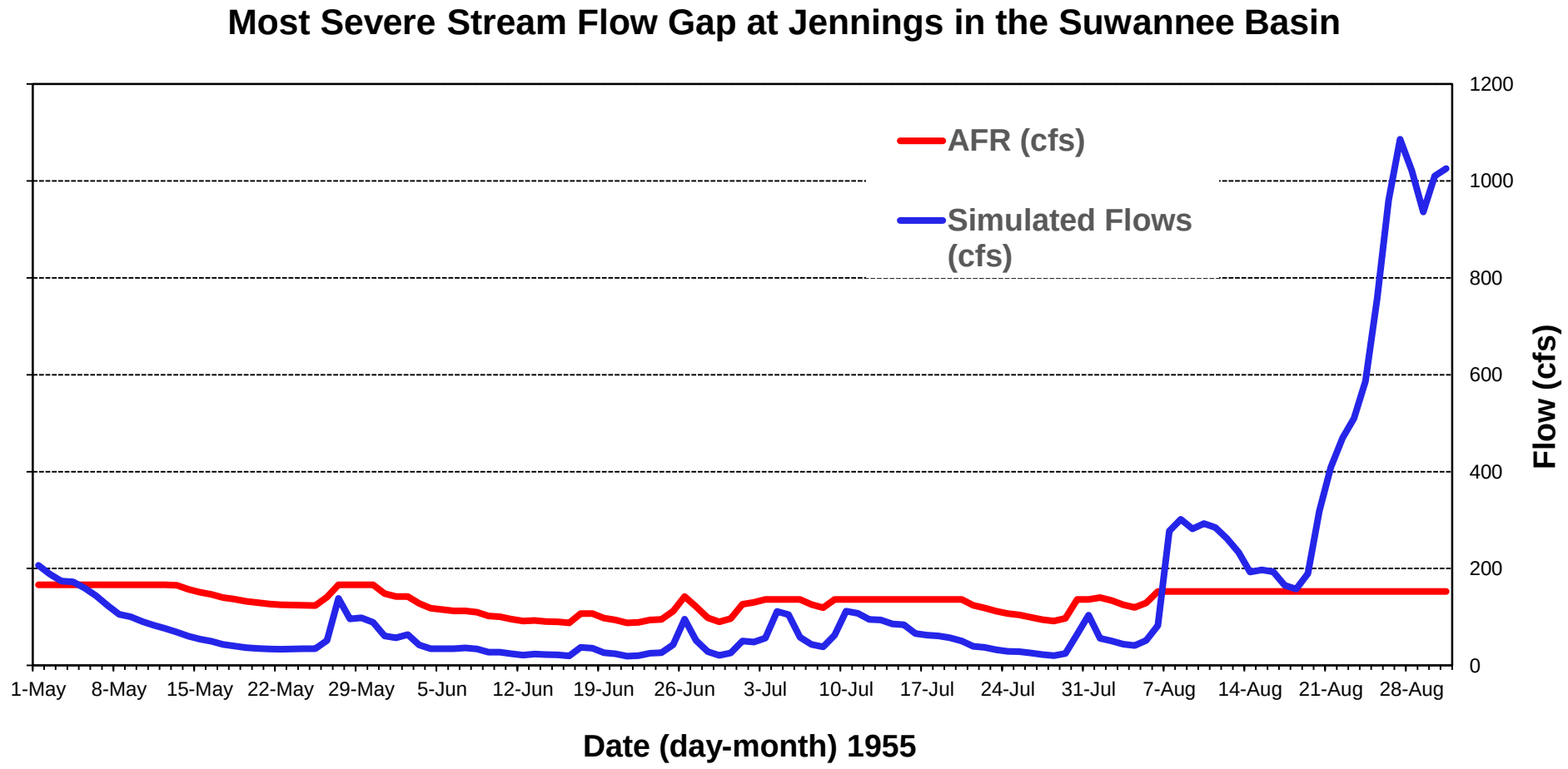
July Flow Exceedance Curves at Fargo in the Suwannee River Basin



Jennings in the Suwannee River Basin



Potential Gap at Jennings in the Suwannee River Basin



Modeled Stream Flow Assumes Water Demand Fully Met

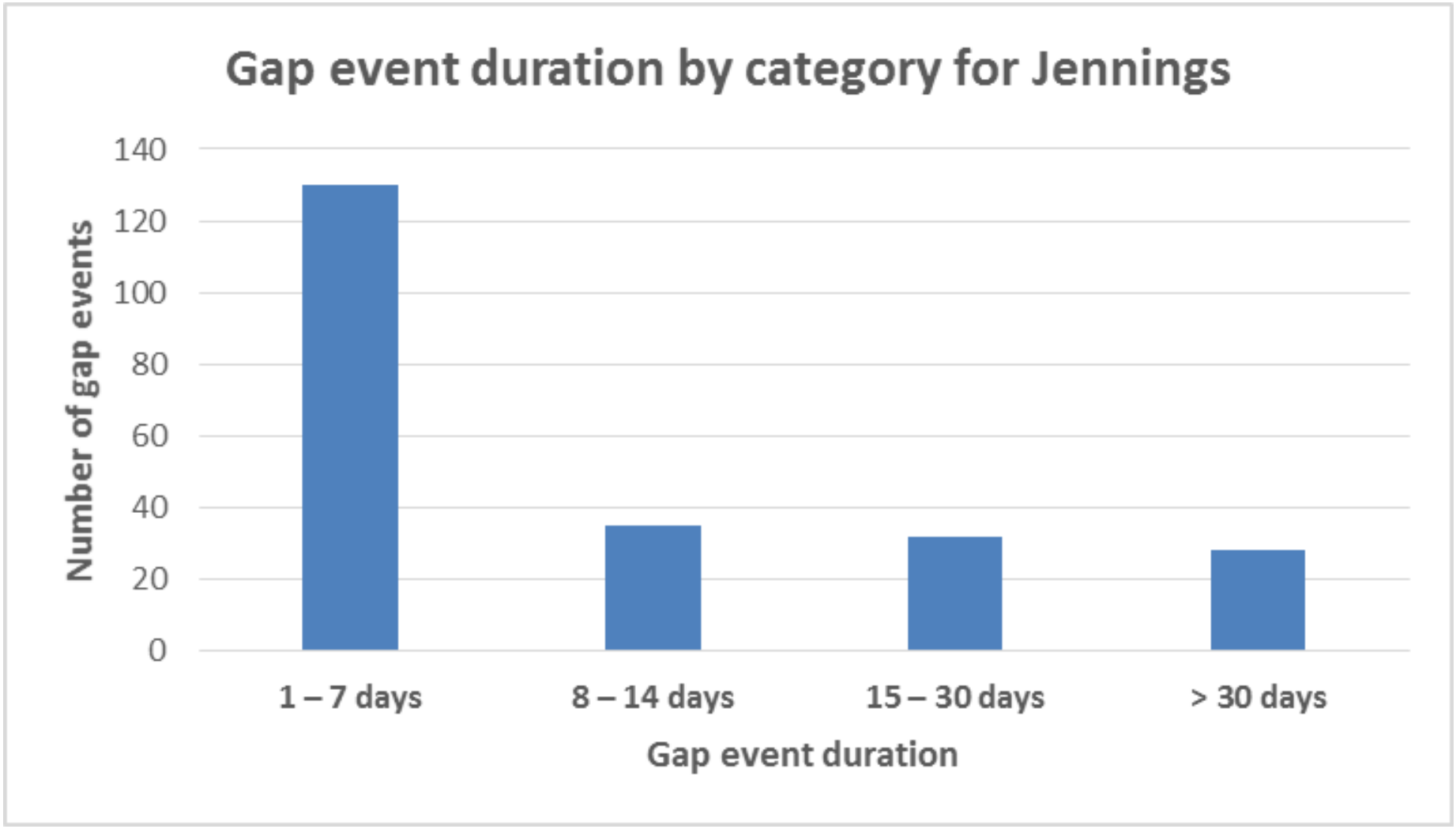
Flow Regime Potential Shortfall at Jennings in Suwannee River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1-Day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939-2007)	3	<1	1390	<1	1
Round 2 (1939-2013)	11	32	1366	97	158

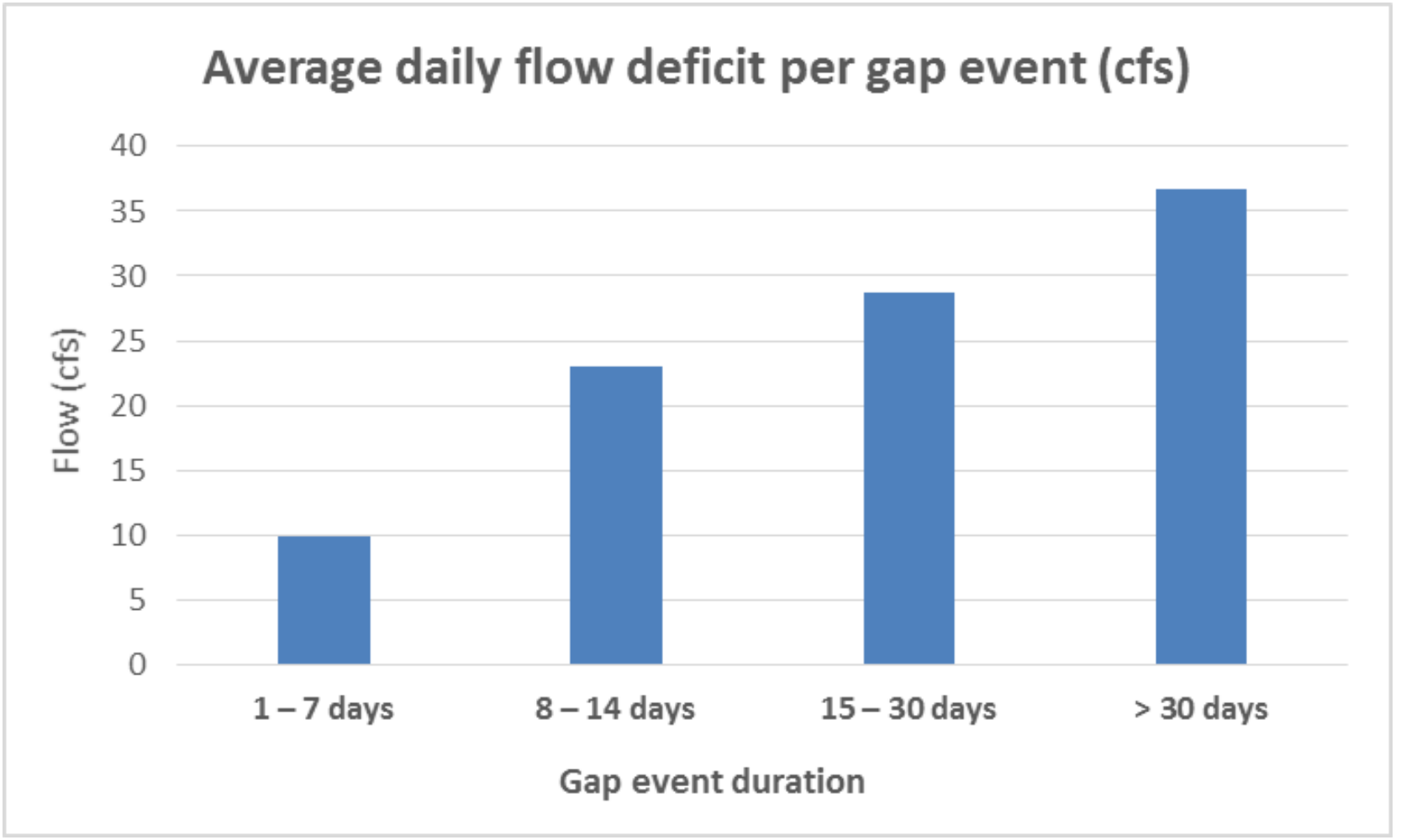
Characteristics of Potential Gaps at Jennings

Gap event duration by category for Jennings	Number of gap events		Total gap days by category, 1939-2013		Average daily flow deficit per gap event (cfs)	Average cumulative flow deficit per gap event (cfsd)
1 – 7 days	130	(57.8%)	415	(1.5%)	10	39
8 – 14 days	35	(15.6%)	379	(1.4%)	23	248
15 – 30 days	32	(14.2%)	685	(2.5%)	29	637
> 30 days	28	(12.4%)	1579	(5.8%)	37	2243
Totals (∑)	225	(100.0%)	3058	(11.2%)		

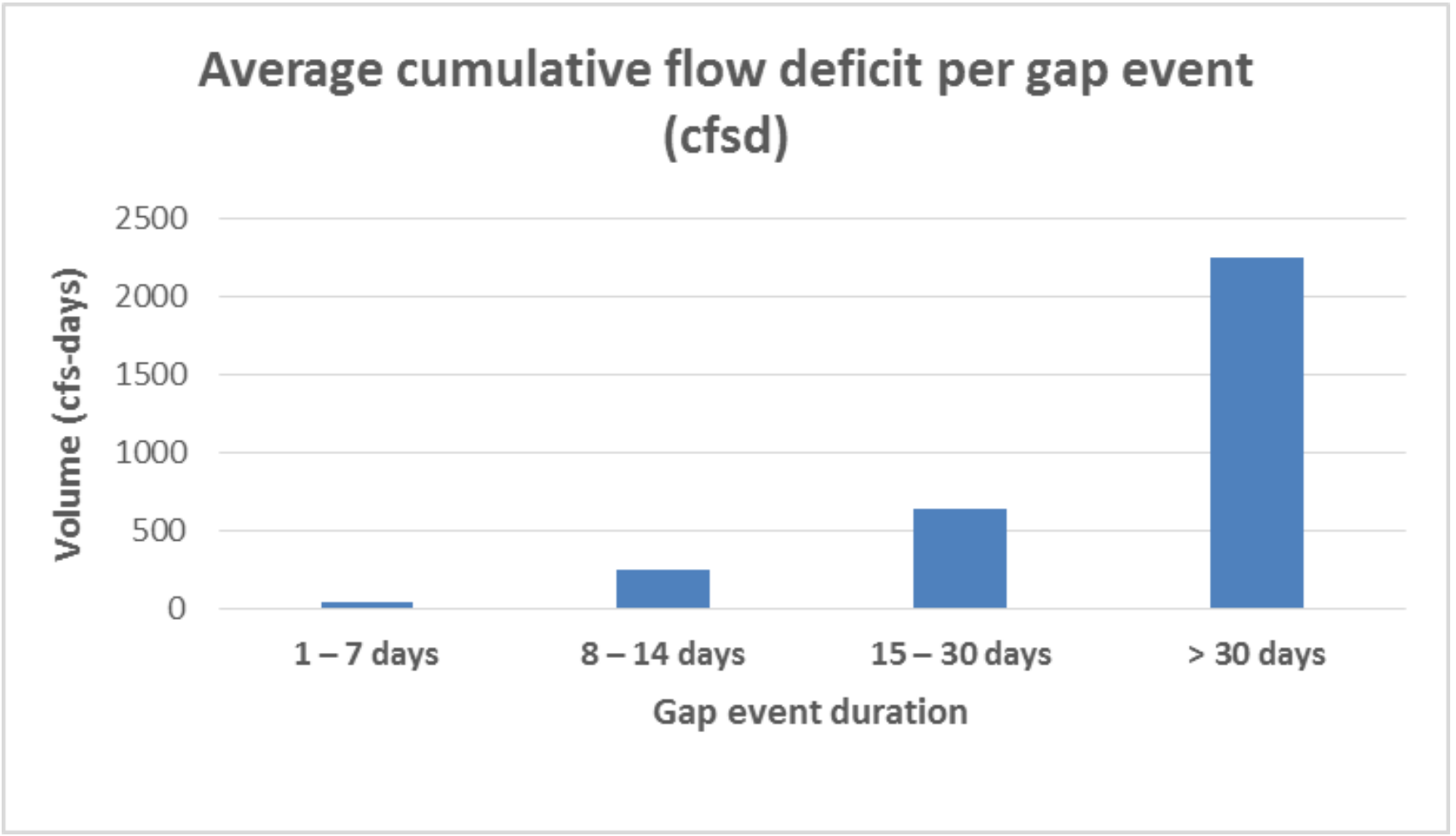
Characteristics of Potential Gaps at Jennings



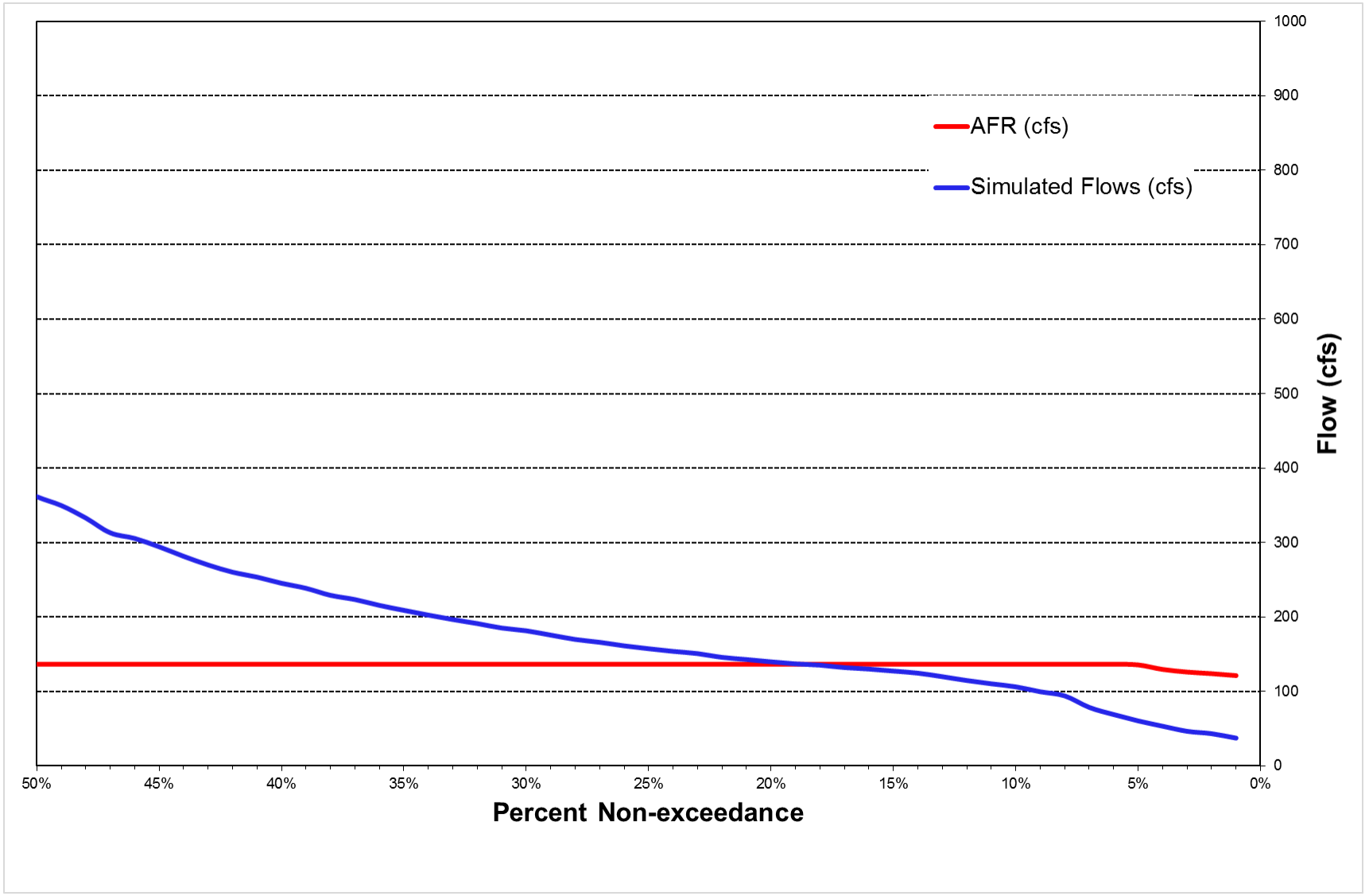
Characteristics of Potential Gaps at Jennings



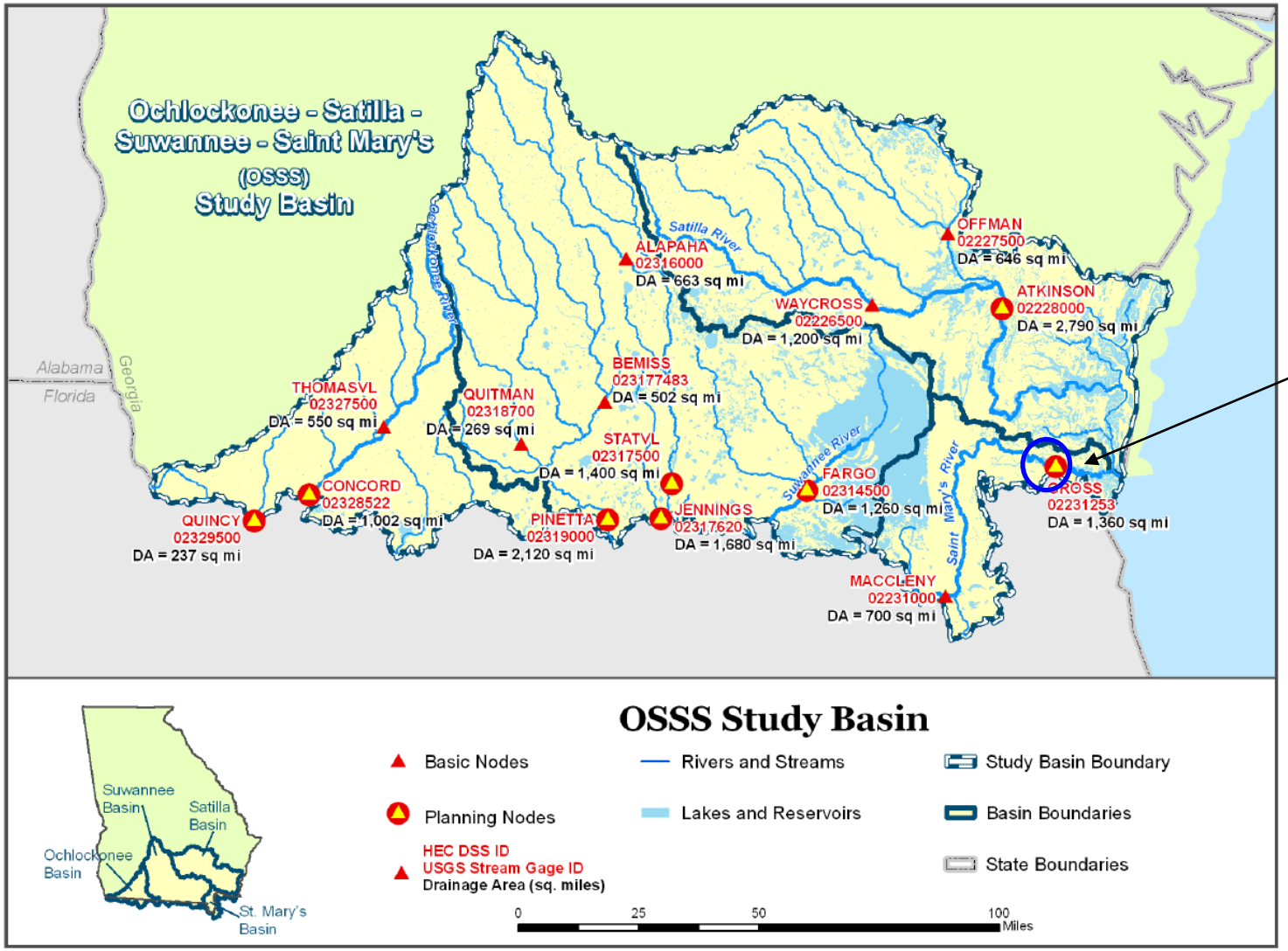
Characteristics of Potential Gaps at Jennings



July Flow Exceedance Curves at Jennings in the Suwannee River Basin



St. Mary's River Basin



Gross

Potential Gap at Gross in the St. Mary's River Basin

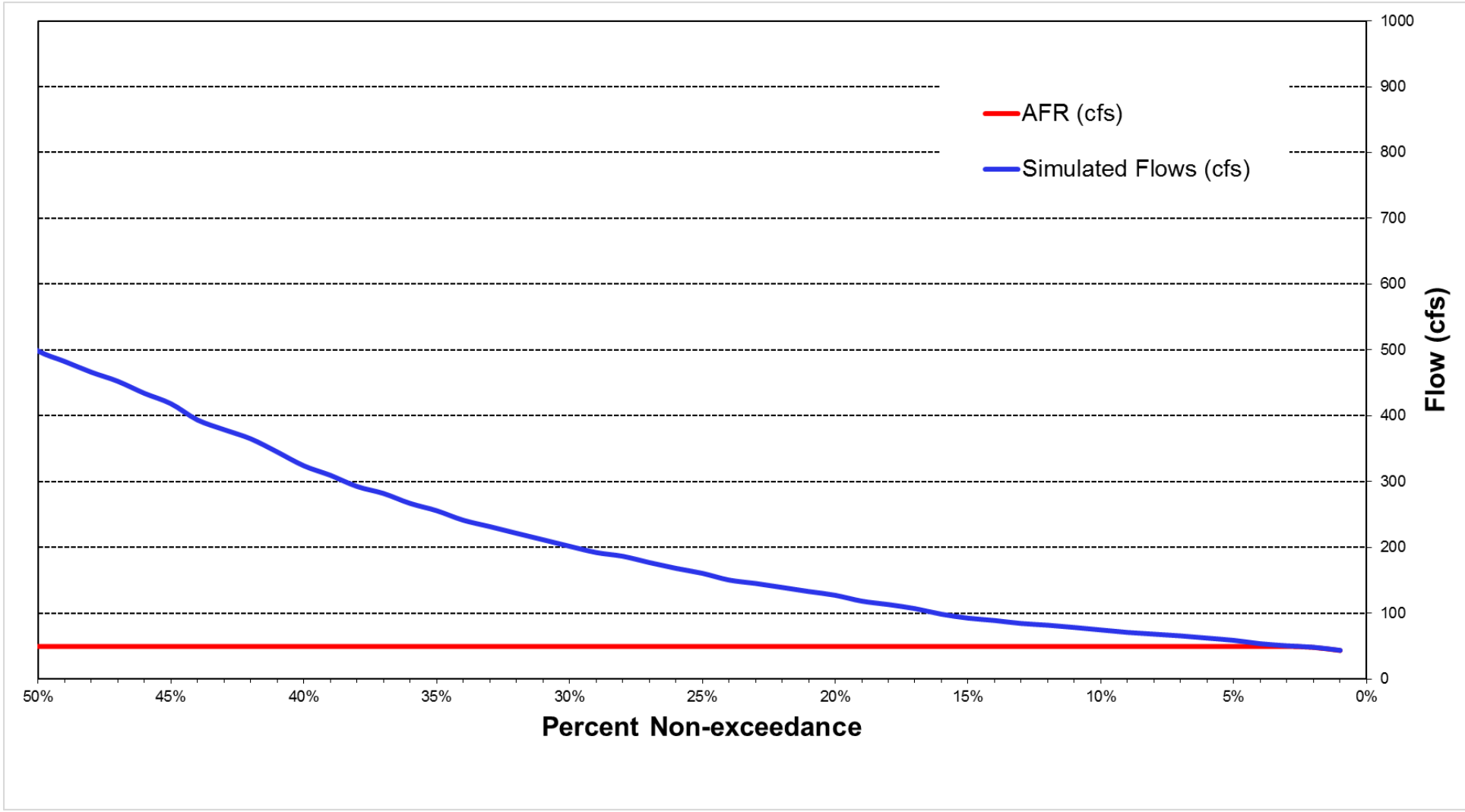
No gaps found

Modeled Stream Flow Assumes Water Demand Fully Met

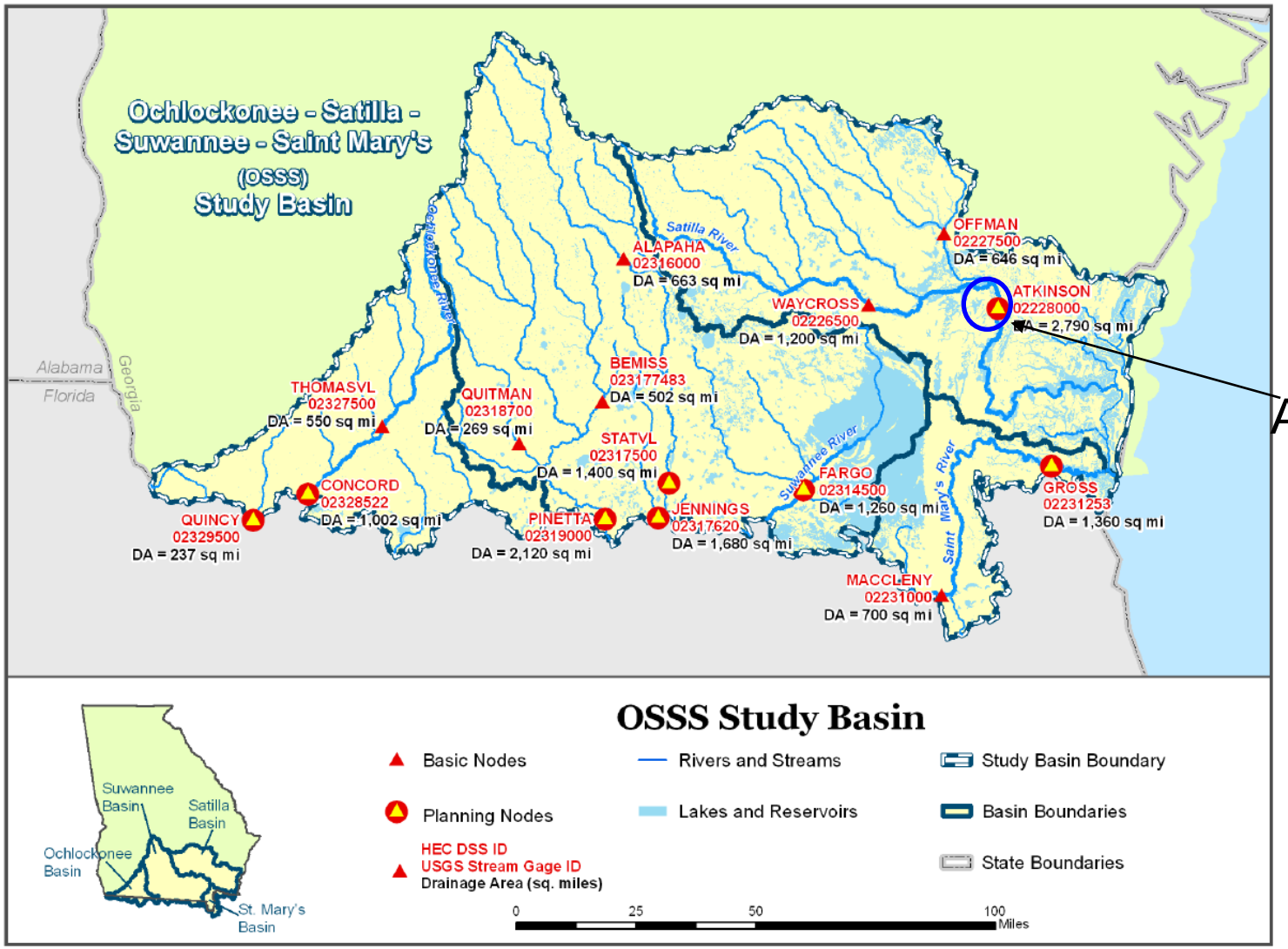
Flow Regime Potential Shortfall at Gross in St. Mary's River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1-Day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939-2007)	0	0	1,240	0	NA
Round 2 (1939-2013)	0	0	1,214	0	NA

July Flow Exceedance Curves at Gross in the St. Mary's River Basin

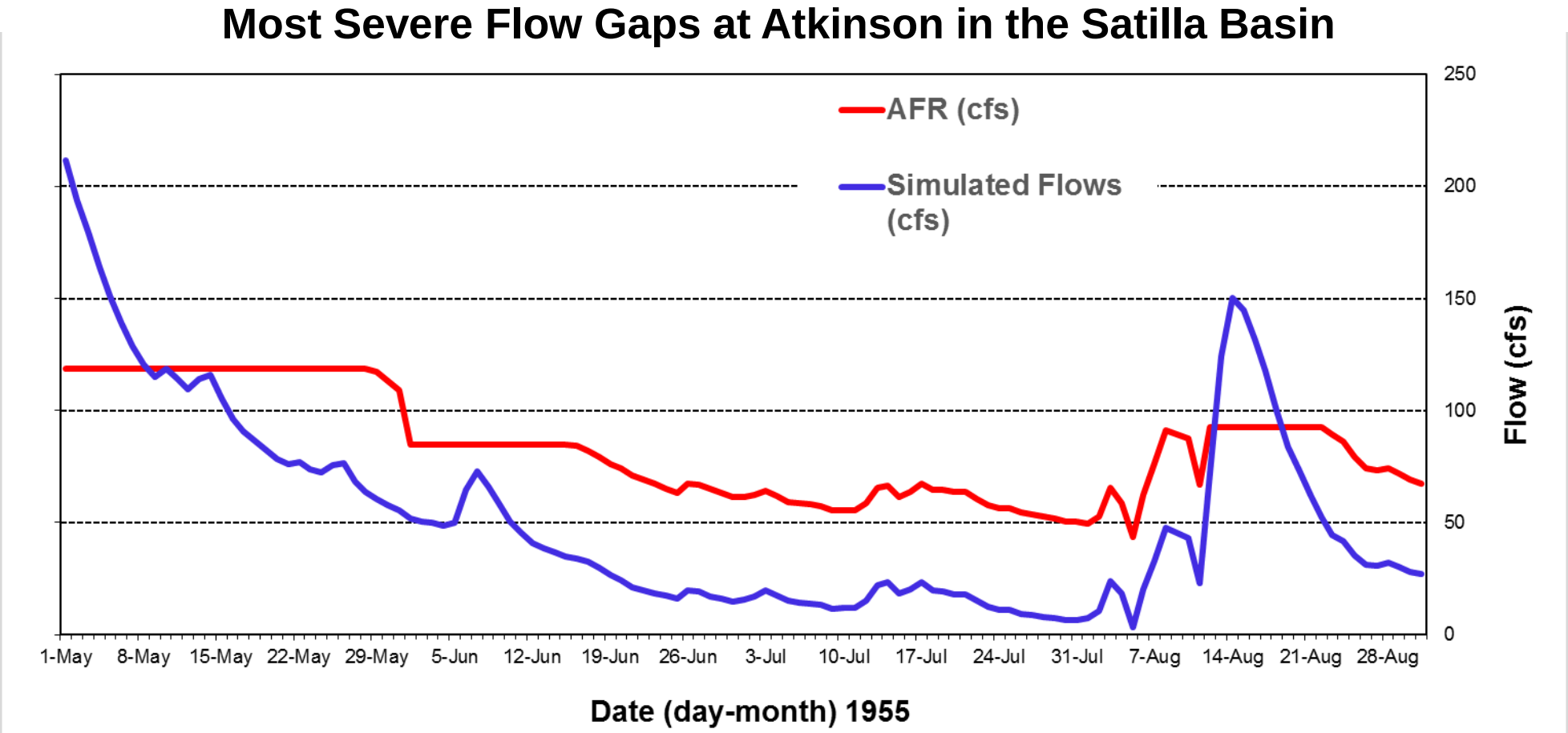


Satilla River Basin



Atkinson

Potential Gap at Atkinson in the Satilla River Basin



Modeled Stream Flow Assumes Water Demand Fully Met

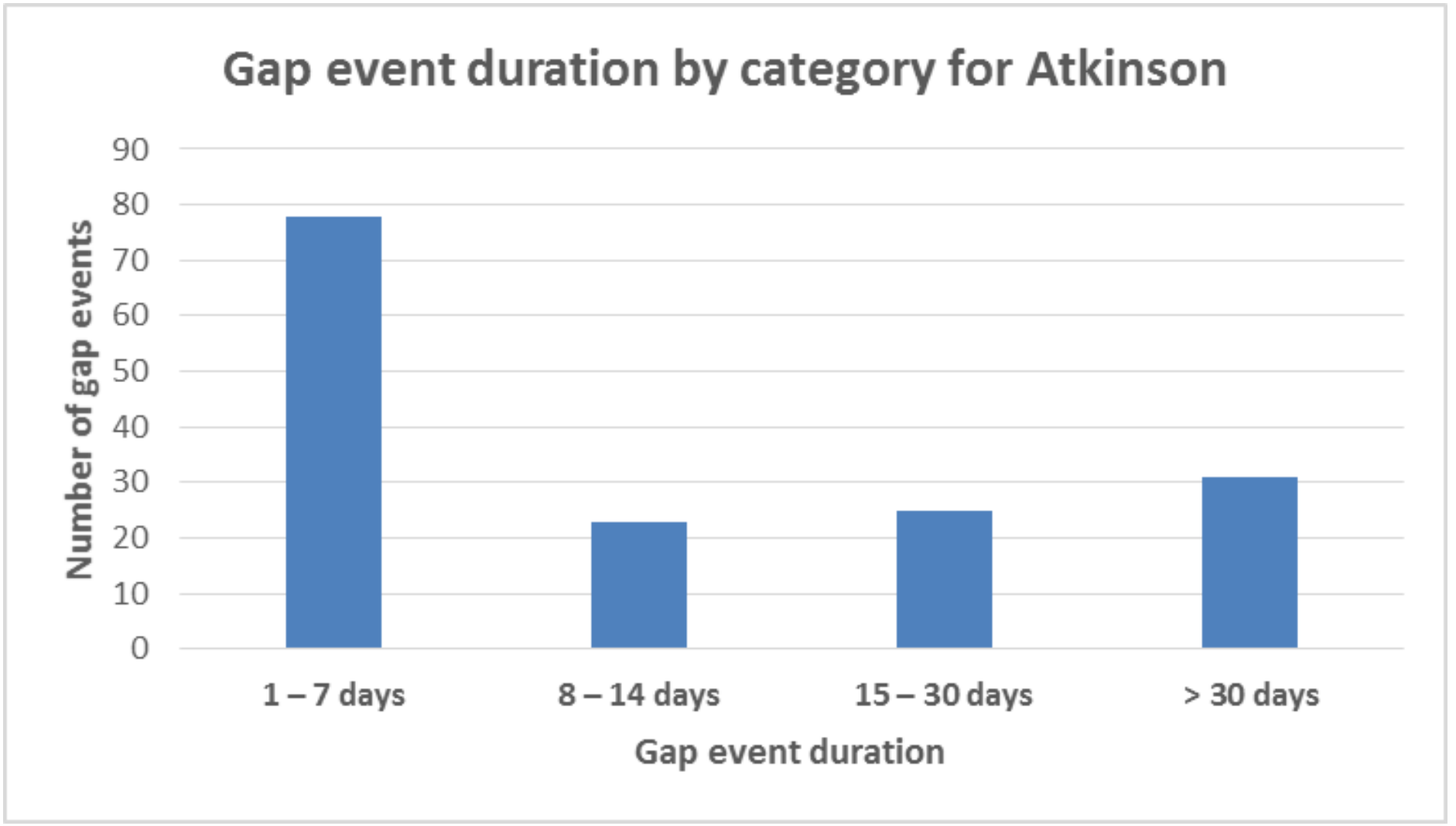
Flow Regime Potential Shortfall at Atkinson in Satilla River Basin

	Length of Shortfall (% of time)	Average Shortfall (cfs)	Long-term Average Flow (cfs)	Maximum 1-Day Shortfall (cfs)	Corresponding Flow Regime (cfs)
Round 1 (1939-2007)	11	17	2,258	233	365
Round 2 (1939-2013)	10	23	2,209	63	102

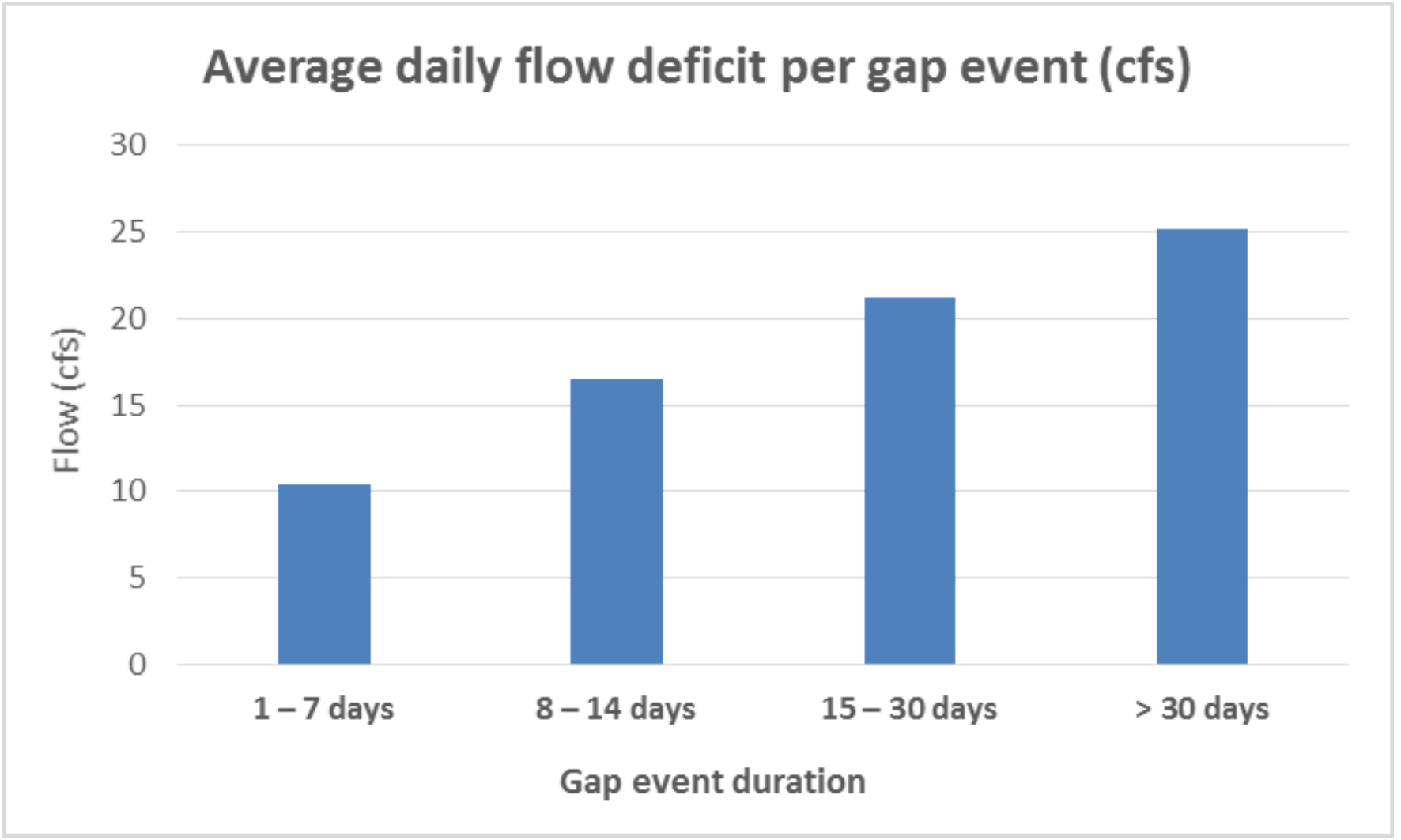
Characteristics of Potential Gaps at Atkinson

Gap event duration by category for Atkinson	Number of gap events		Total gap days by category, 1939-2013		Average daily flow deficit per gap event (cfs)	Average cumulative flow deficit per gap event (cfsd)
1 – 7 days	78	(49.7%)	255	(0.9%)	10	39
8 – 14 days	23	(14.6%)	231	(0.8%)	16	165
15 – 30 days	25	(15.9%)	558	(2.0%)	21	502
> 30 days	31	(19.7%)	1582	(5.8%)	25	1285
Totals (∑)	157	(100.0%)	2626	(9.6%)		

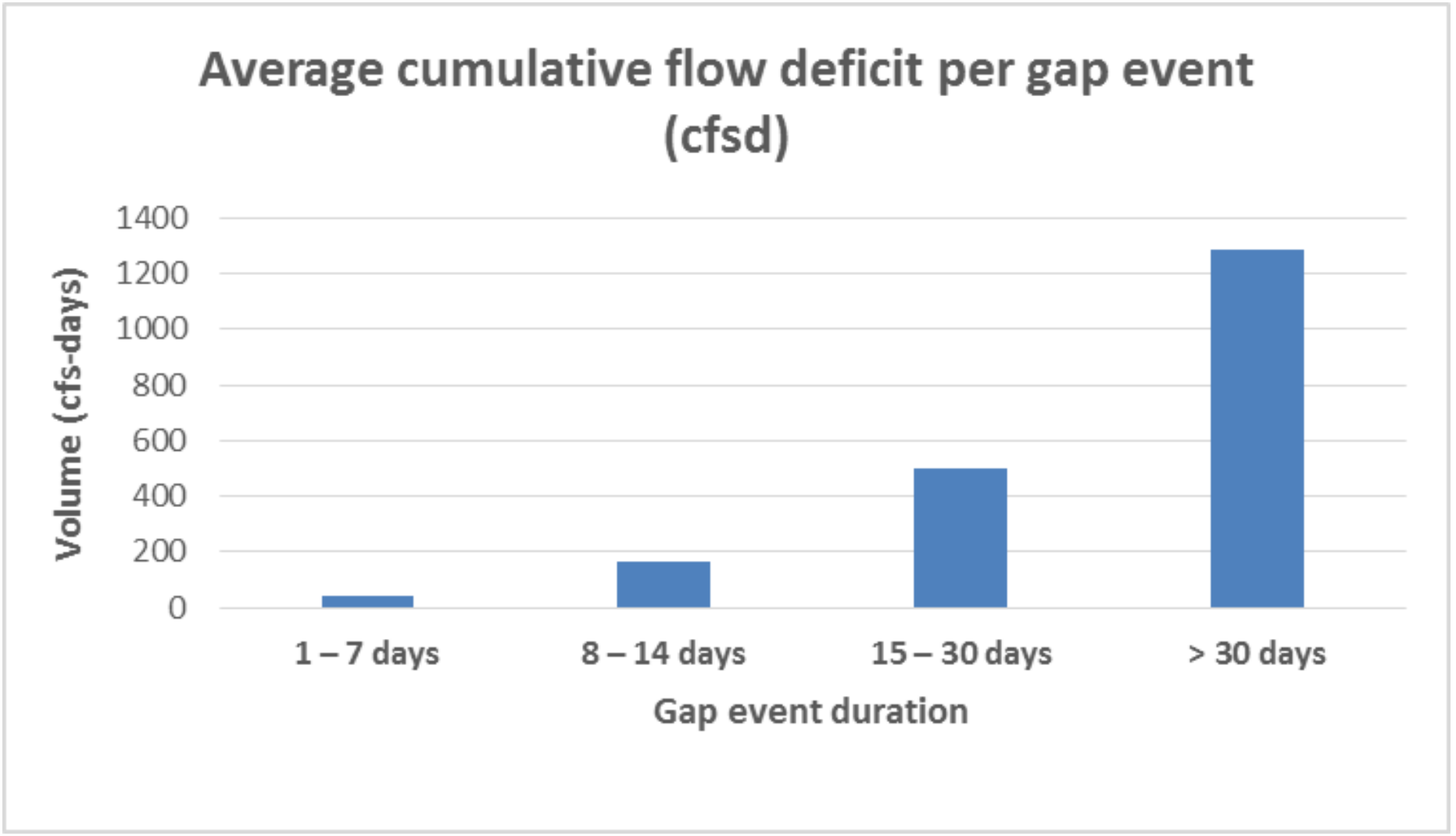
Characteristics of Potential Gaps at Atkinson



Characteristics of Potential Gaps at Atkinson



Characteristics of Potential Gaps at Atkinson



July Flow Exceedance Curves at Atkinson in the Satilla River Basin