Surface Water Resources of the Upper Savannah River Basin

Upper Savannah River Basin Council – Meeting #3, October 11, 2023

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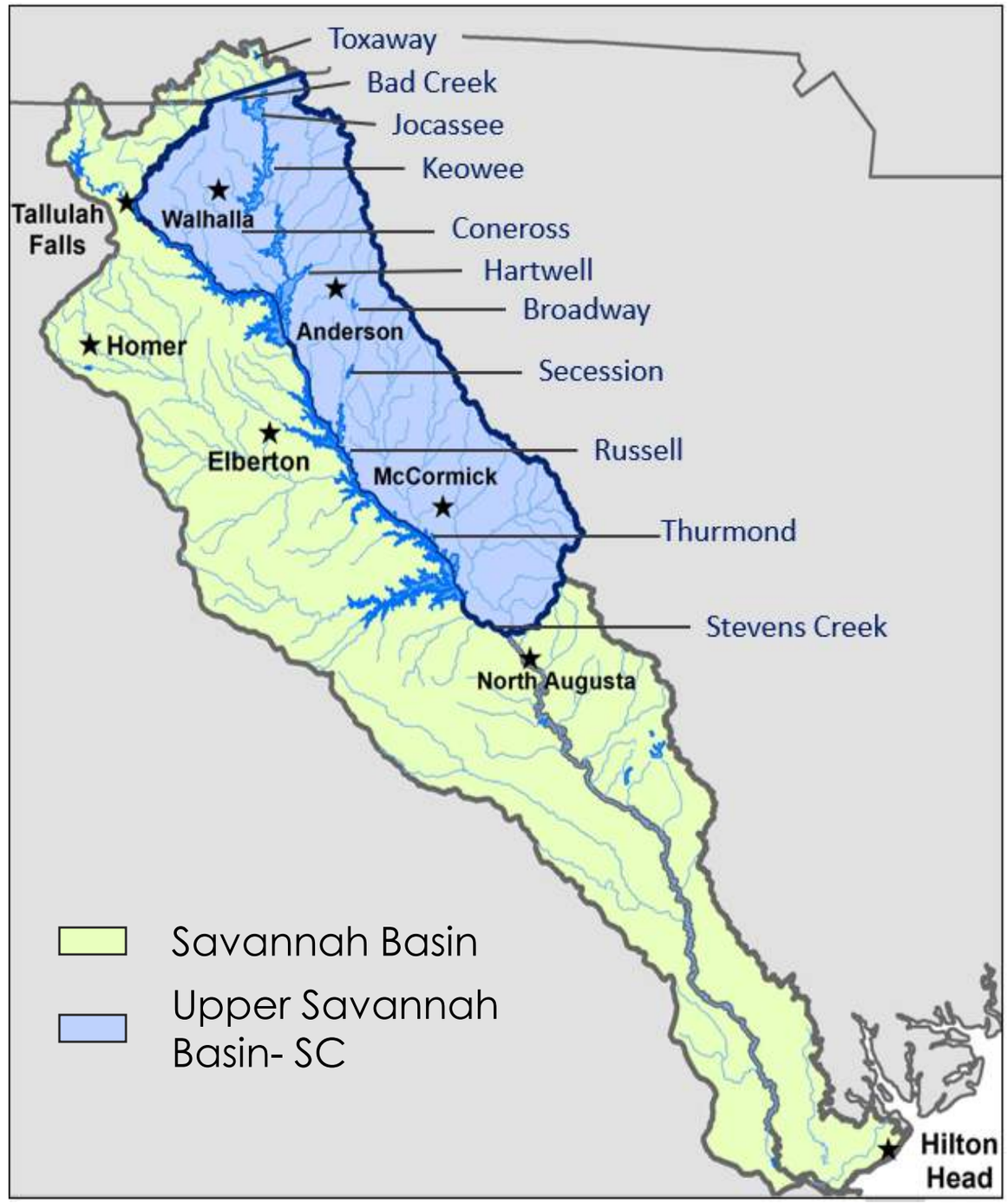
SC Department of Natural Resources

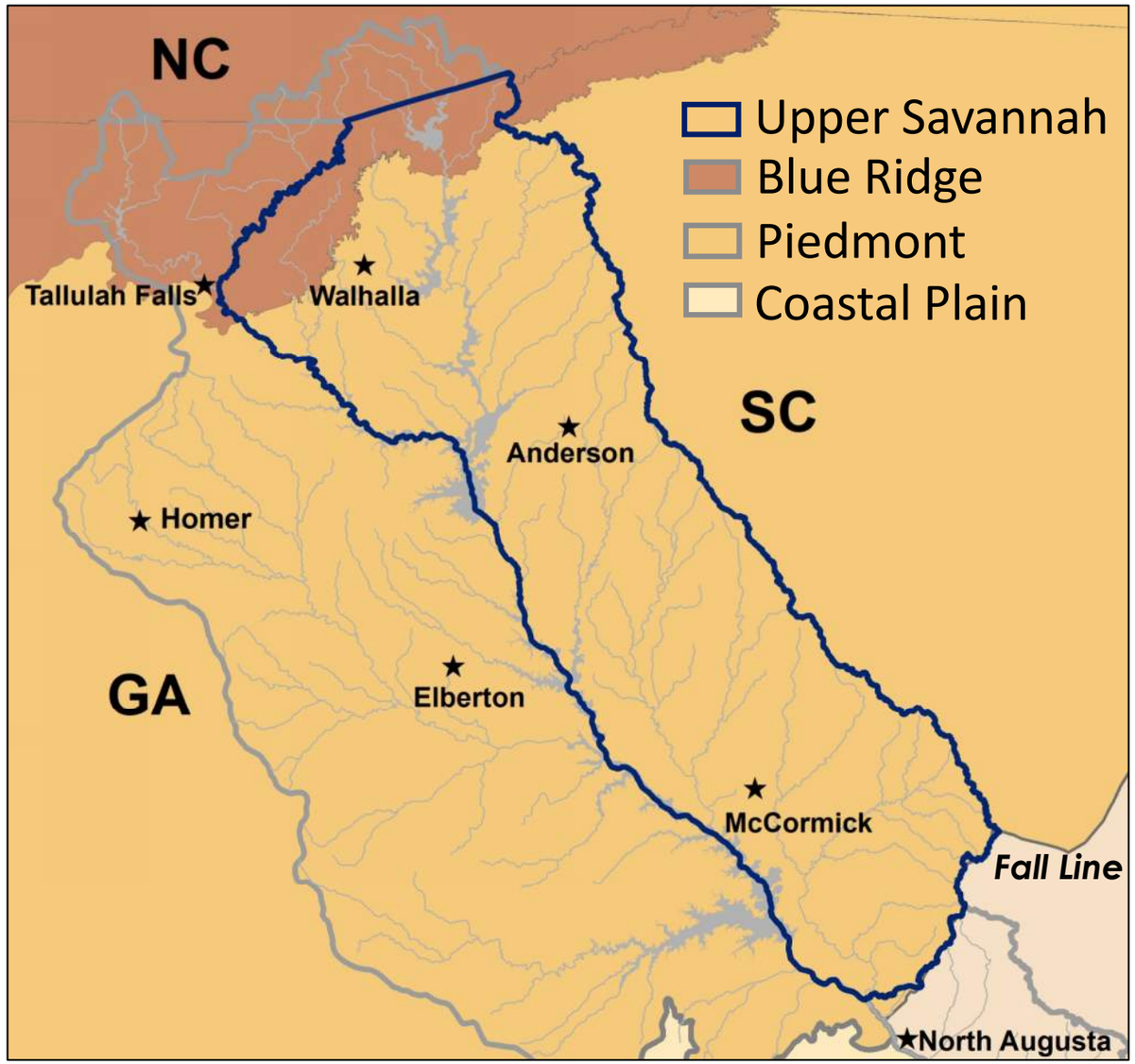
Savannah Basin Overview

- Length = 314 miles, with headwaters in the mountains of NC, GA, and SC.
- Spans 3 states – NC, GA, SC
- Area = 10,971 sq. mi.
  - GA – 5,821 sq. mi. (53.1%)
  - SC – 4,979 sq. mi. (45.4%)
  - NC – 171 sq. mi. (1.6%)
  - Upper Savannah (SC) - 3,195 sq. mi.
- Upper basin dominated by reservoirs operated by Duke Energy, Georgia Power, and the U.S. Army Corps of Engineers.



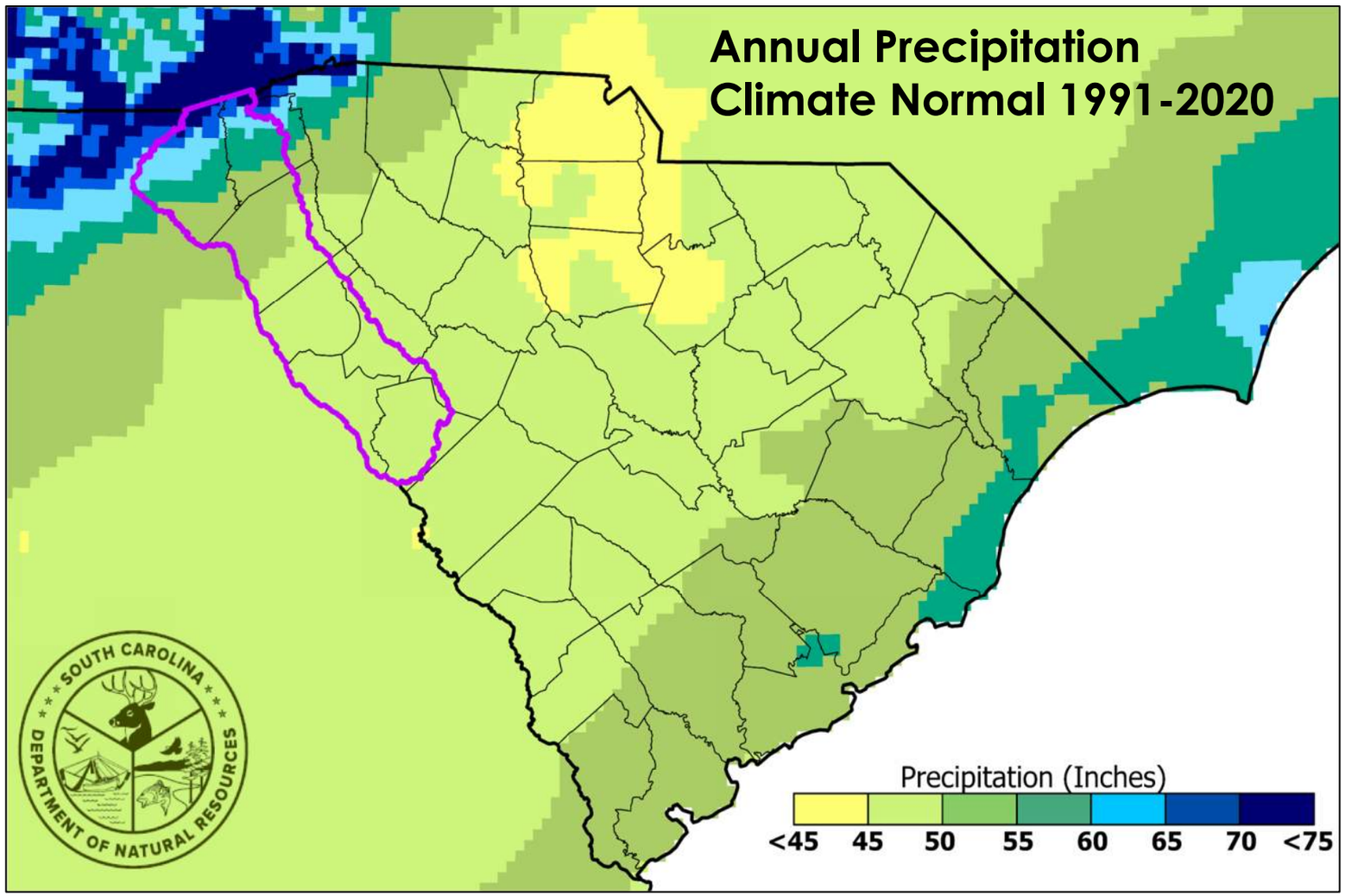
Physiographic Provinces

- Blue Ridge Mountains
  - Rugged terrain and streams have higher gradient.
- Piedmont
  - Elevation ranges from 1000 ft above MSL at foothills of Blue Ridge to 400 ft near the Fall Line.
  - Underlain by fractured crystalline rock.
  - Most overlying soil (saprolite) is made up of moderately to poorly permeable silty clay loams.
- Coastal Plain
  - Topographic relief is relatively lower.
  - Composed of sand, limestone, and clay beds with better infiltration capacity.



1991-2020 Rainfall-Climate Normal

Average annual rainfall ranges from 75" in the Blue Ridge province to 45" in the lower part of the basin.



Savannah Basin- Rainfall Patterns

Northwest Climate Division – Average Annual Rainfall
and 5-year Running Average

Wetter Periods
Drier Periods

Max: 73 in
1929

Avg: 50 in

Min: 31 in
2016

POR : 127 years

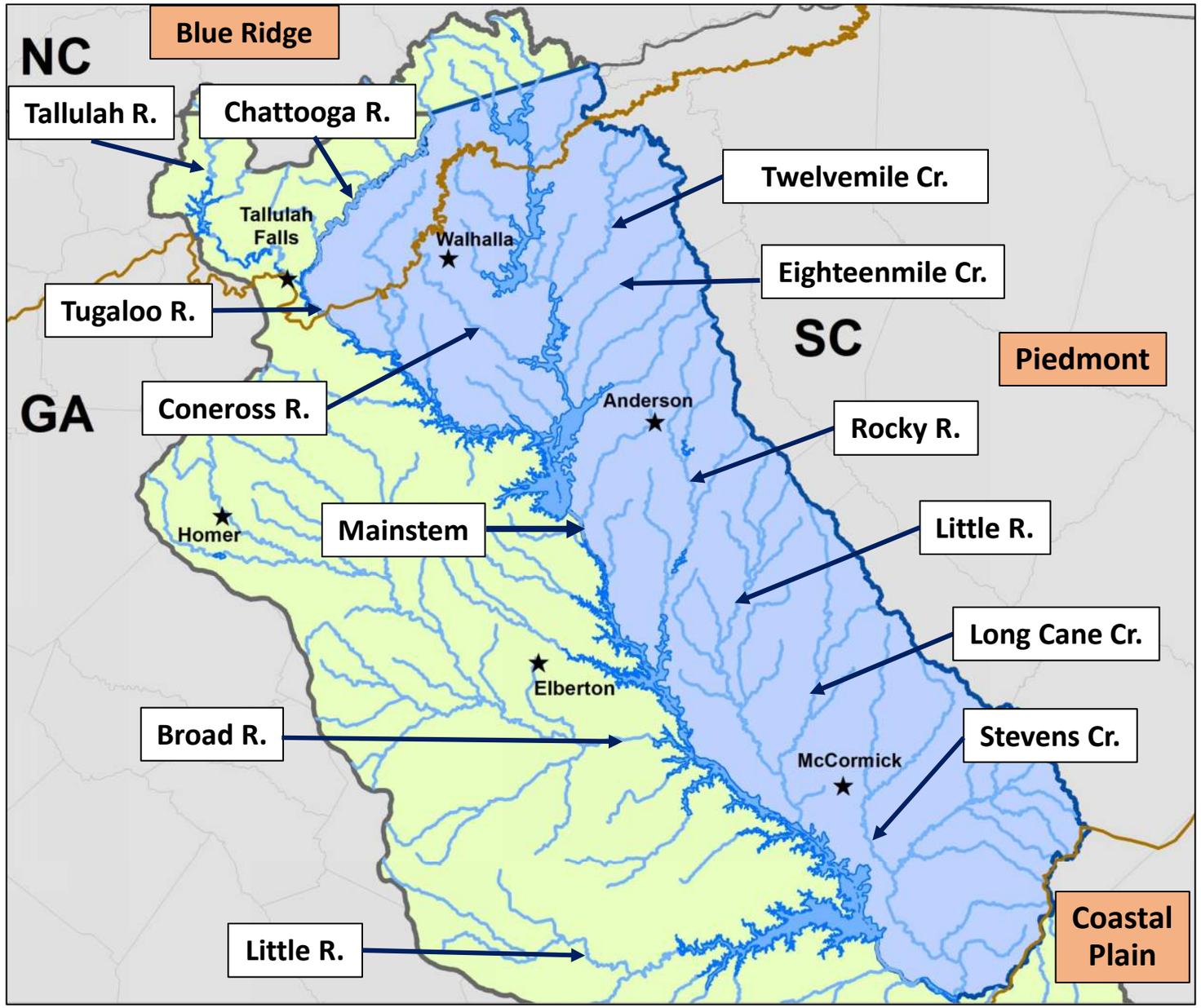
Precipitation (inches)

80.11
70.11
60.11
50.11
40.11
30.11

1895
1920
1950
1980
2010
2022

SCIPP (www.southernclimate.org)

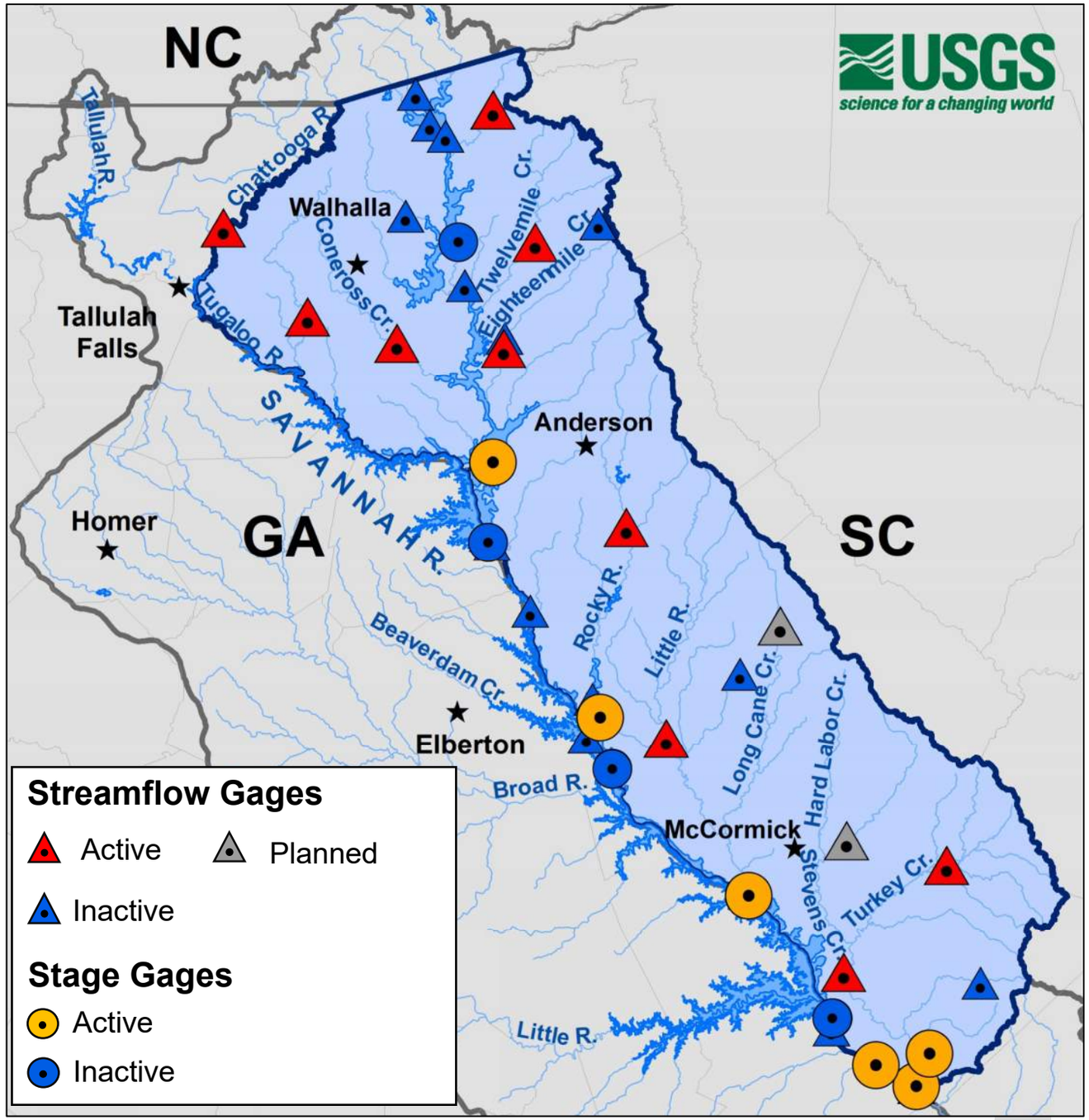
Upper Savannah- Streamflow



- Upper basin including mainstem Savannah is heavily regulated.
- Generally higher baseflow/more sustained flow in Blue Ridge and inner Piedmont areas.
- Lower Piedmont streams have much less baseflow contribution and are generally flashier (Stevens Creek).

Surface Water Monitoring Network

- 10 active USGS streamflow gaging sites.
  - Sites measure volumetric discharge(cfs – cubic feet per second)and stage.
- 6 additional USGS stage sites.
- Period of record extending back to 1940's for a few sites.



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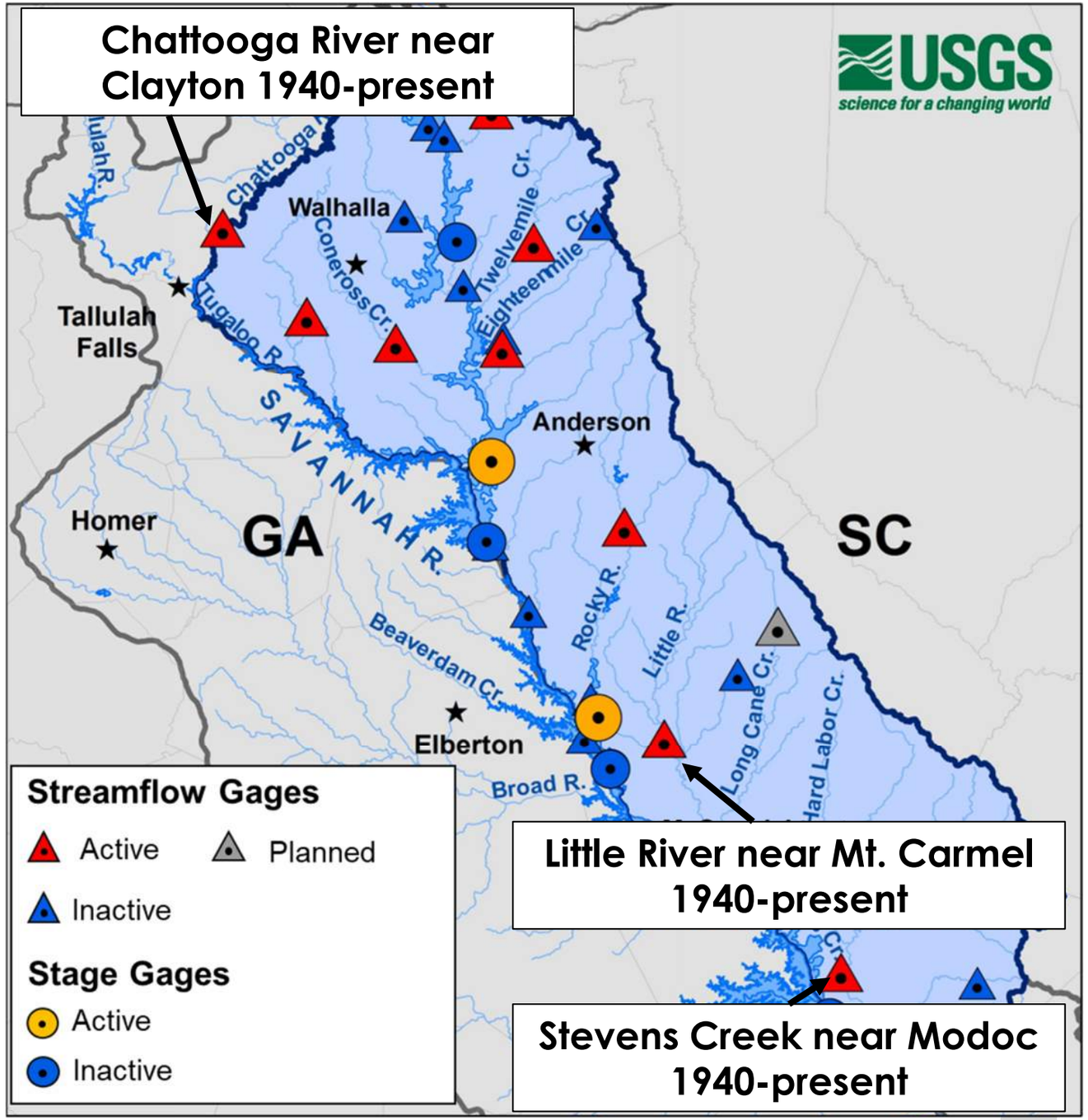
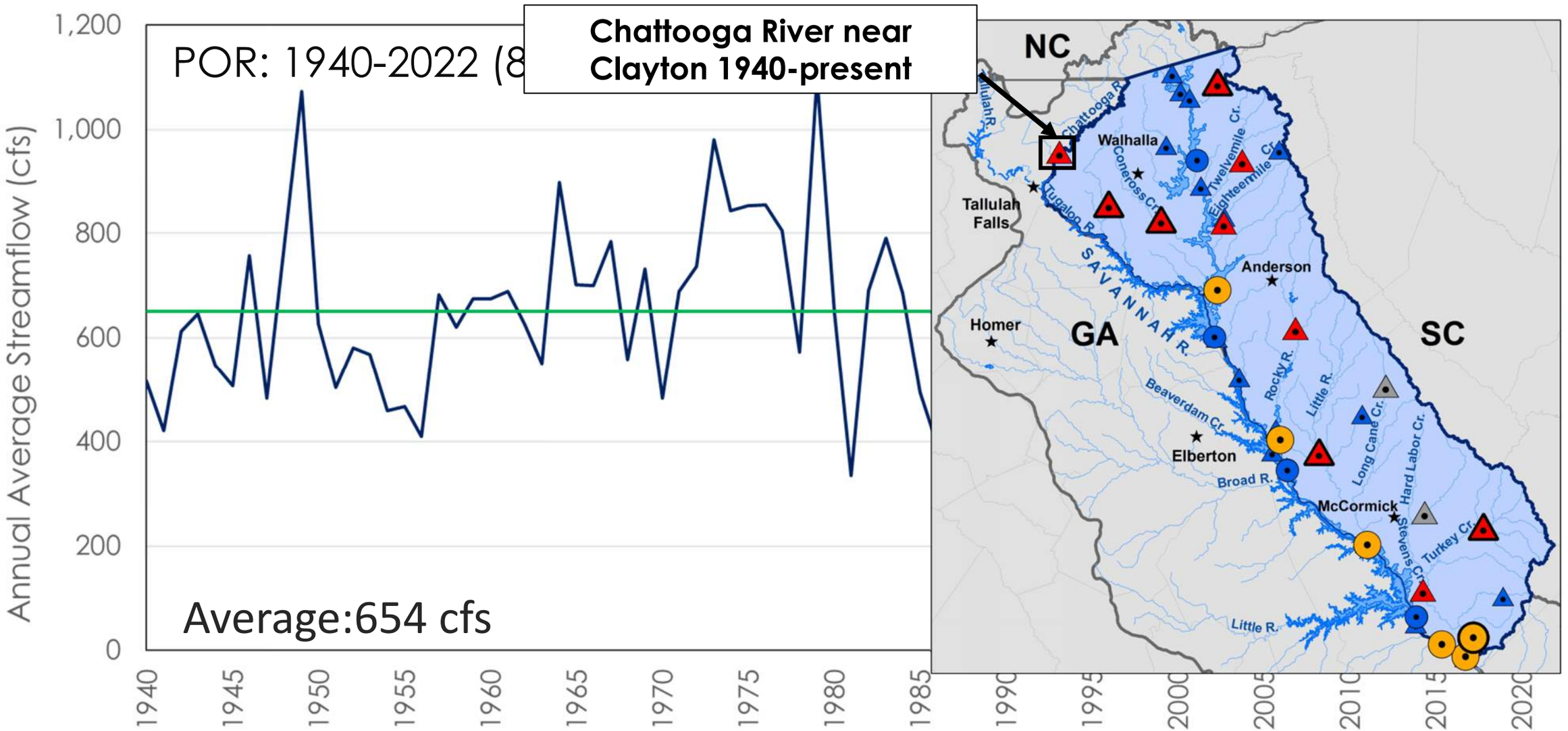


Average Annual Flows-Chattooga River near Clayton



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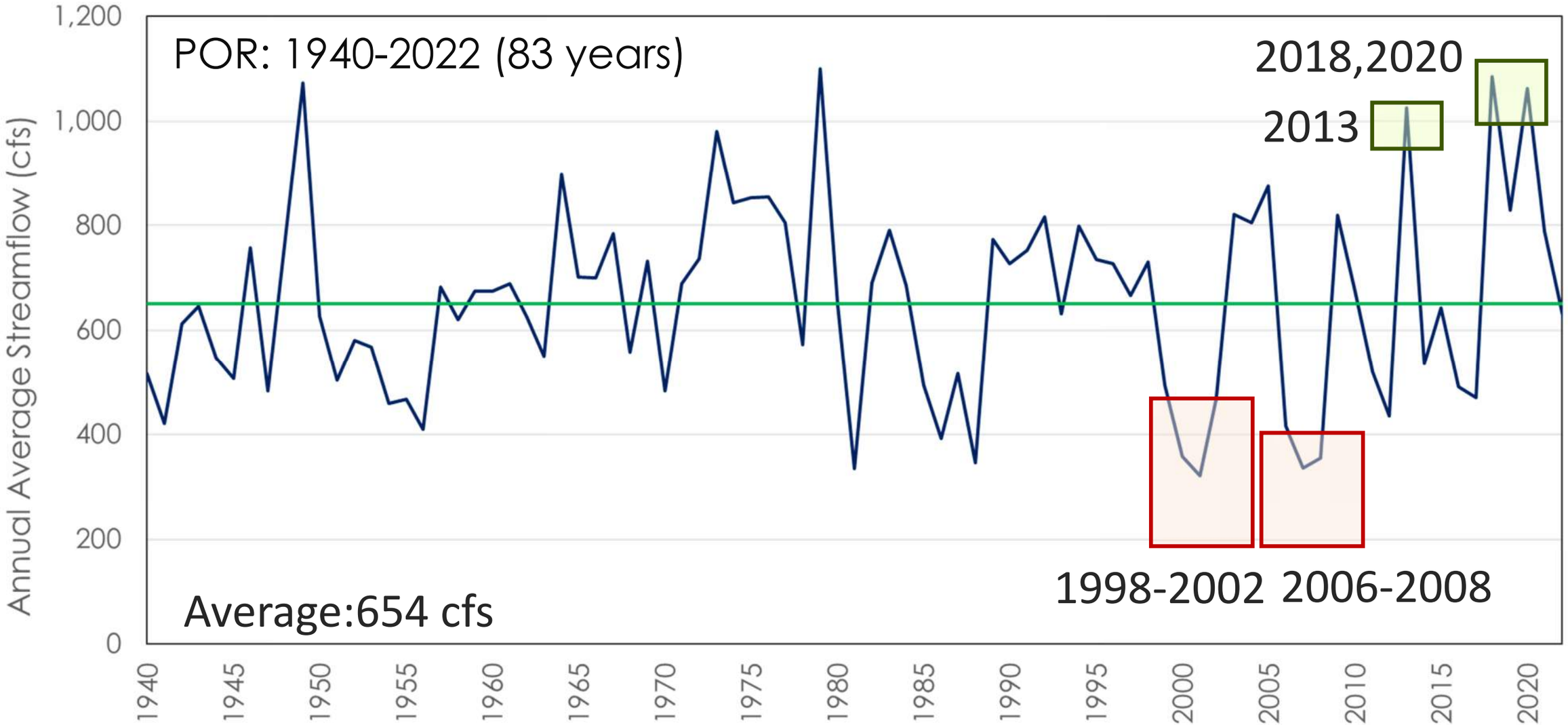
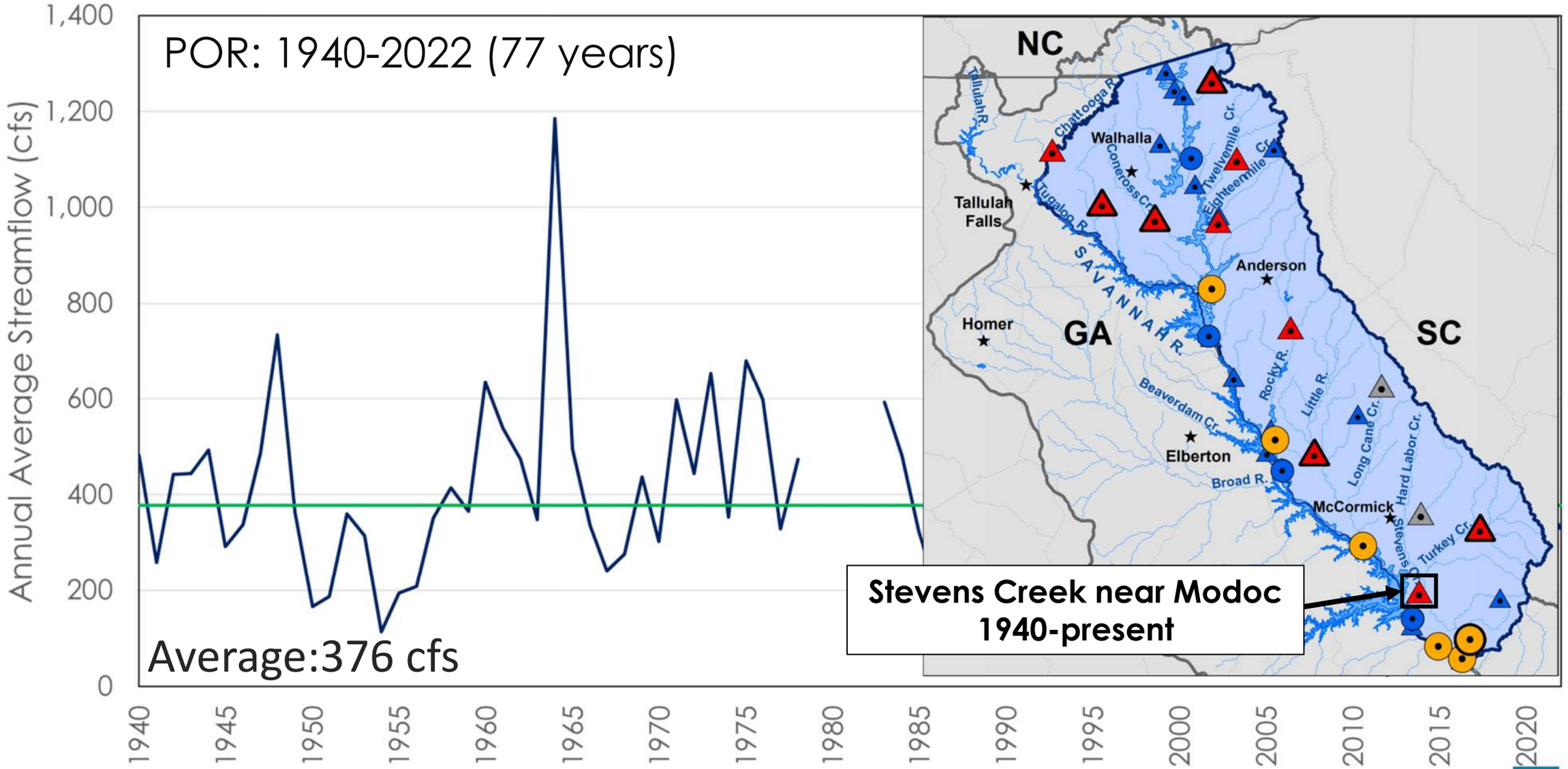


Average Annual Flows-Stevens Creek near Modoc



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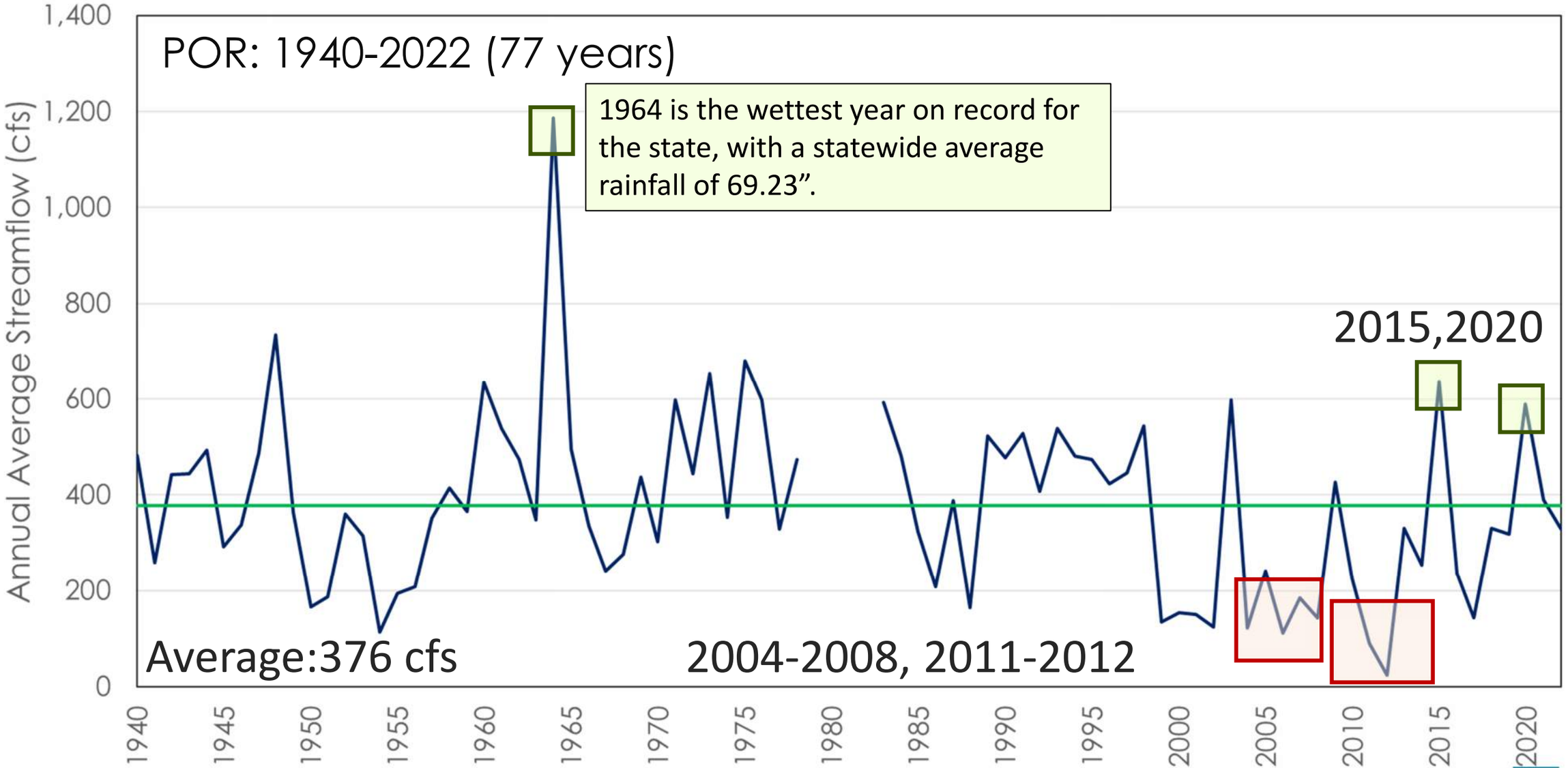

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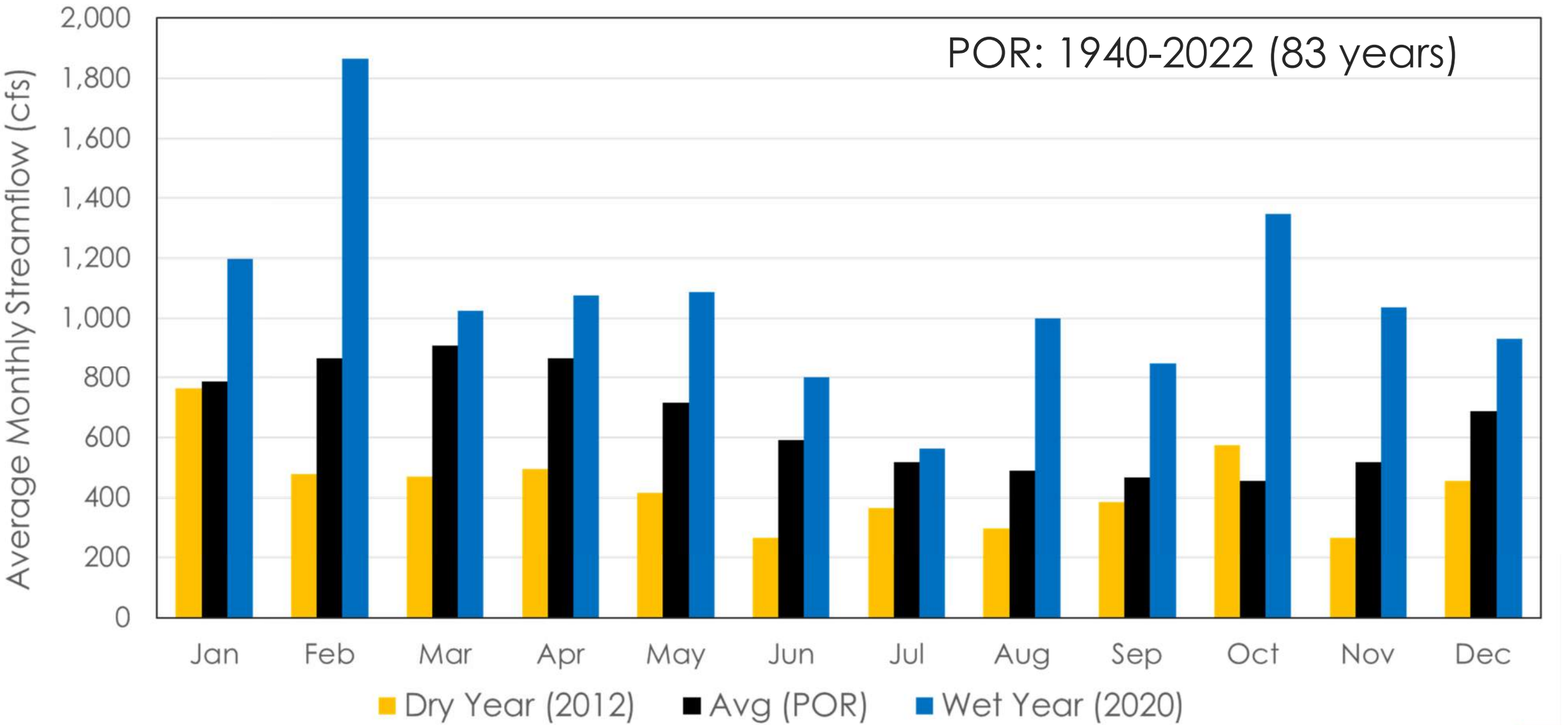

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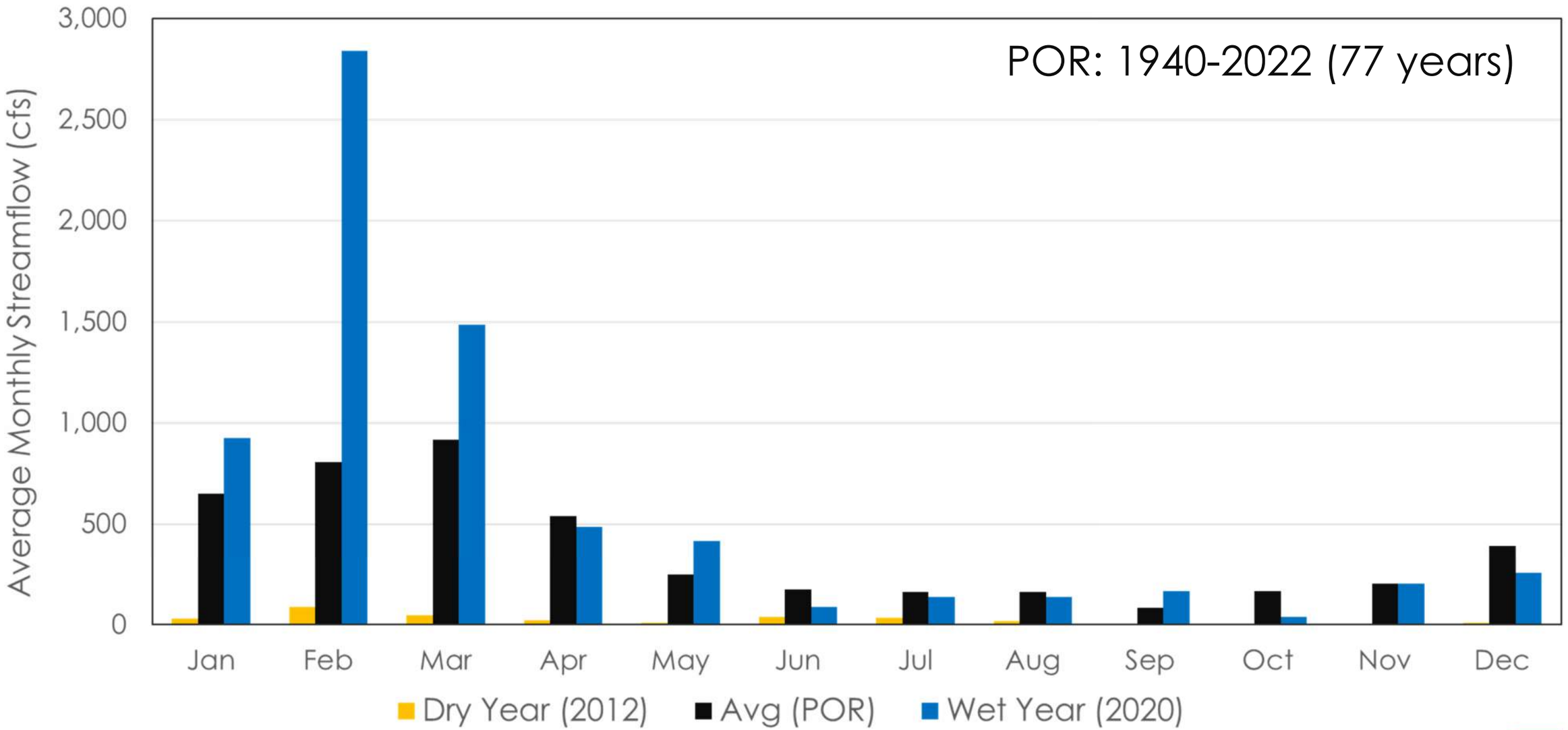
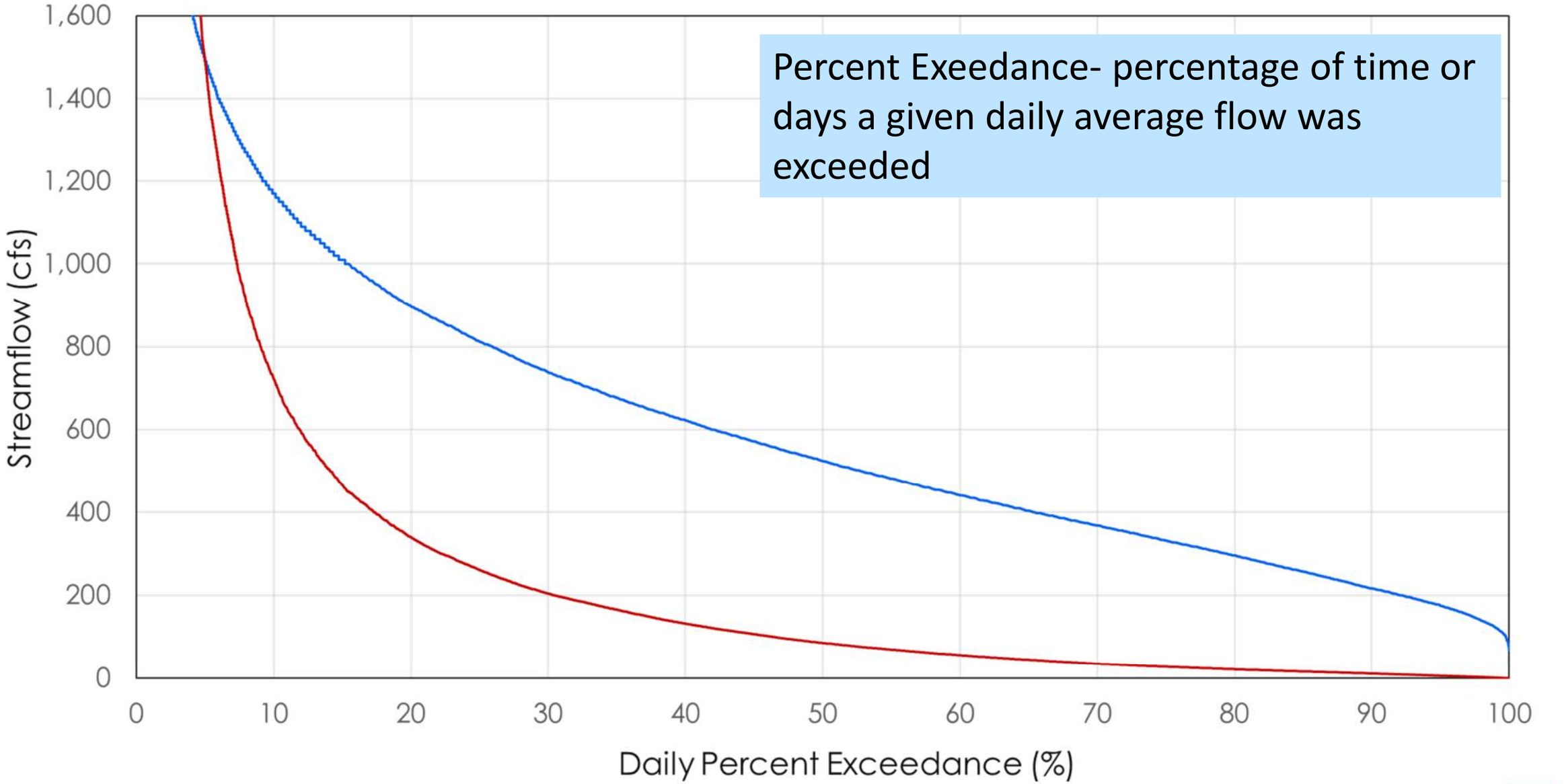
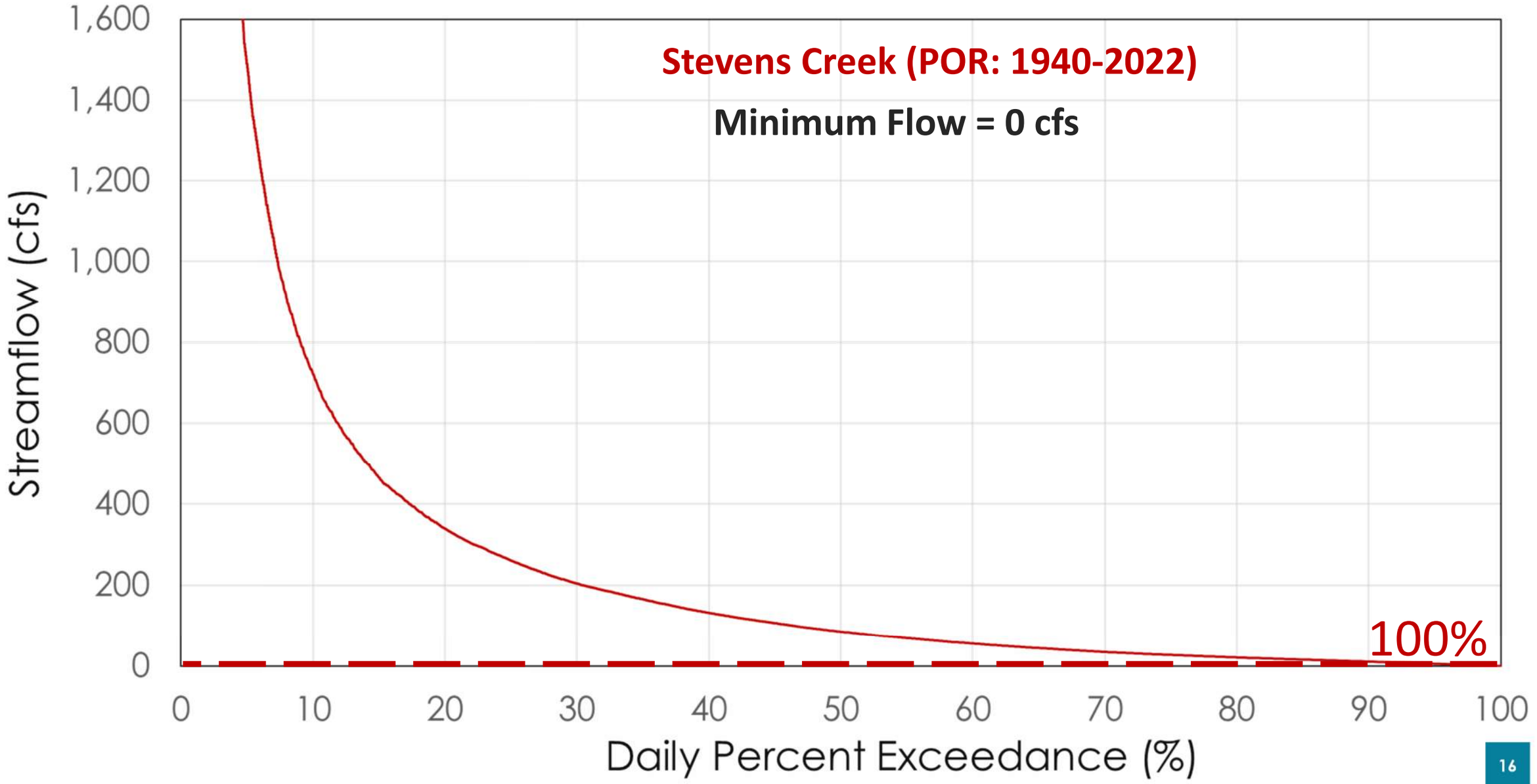


Flow Duration Curve



Flow Duration Curve- Stevens Creek



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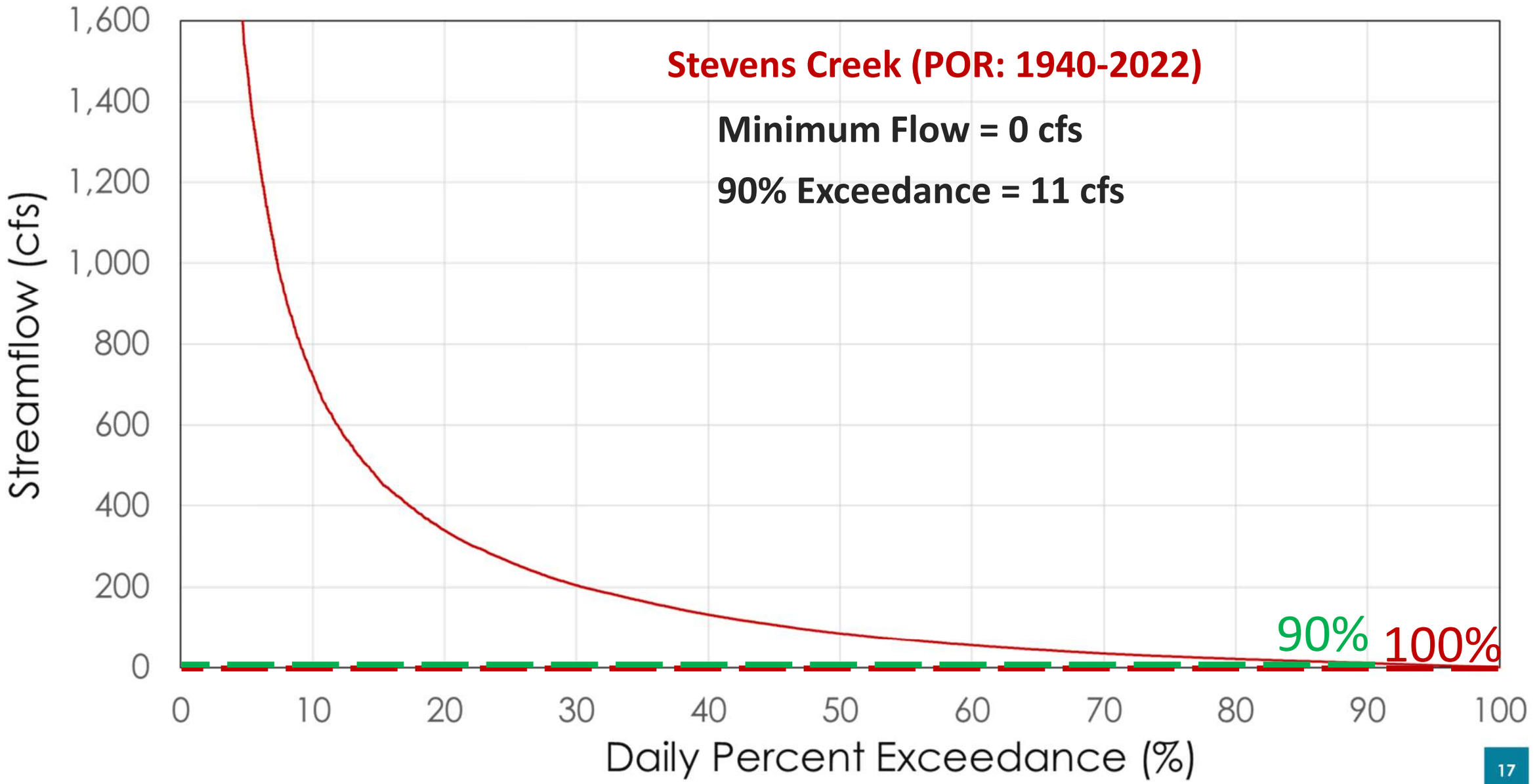

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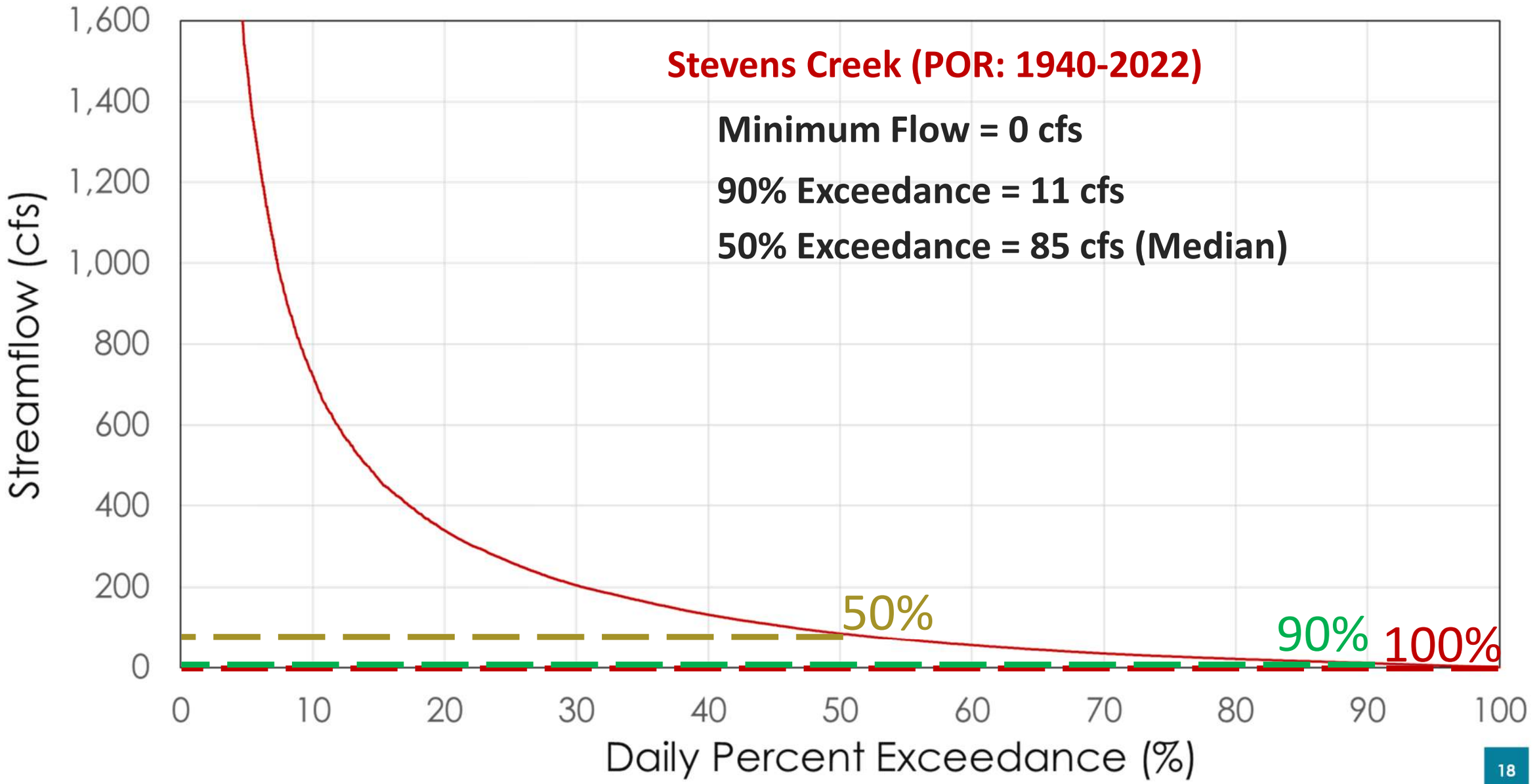

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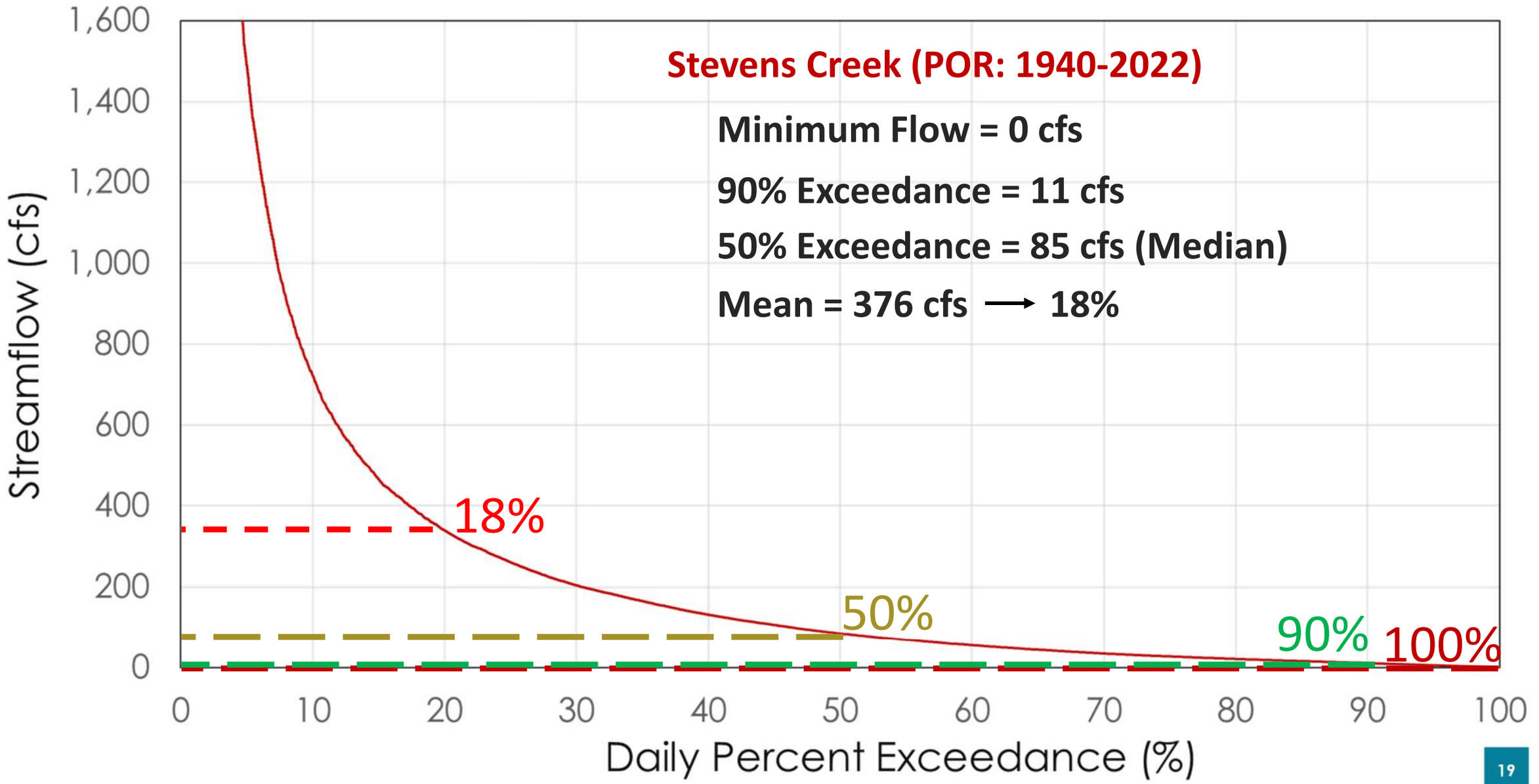
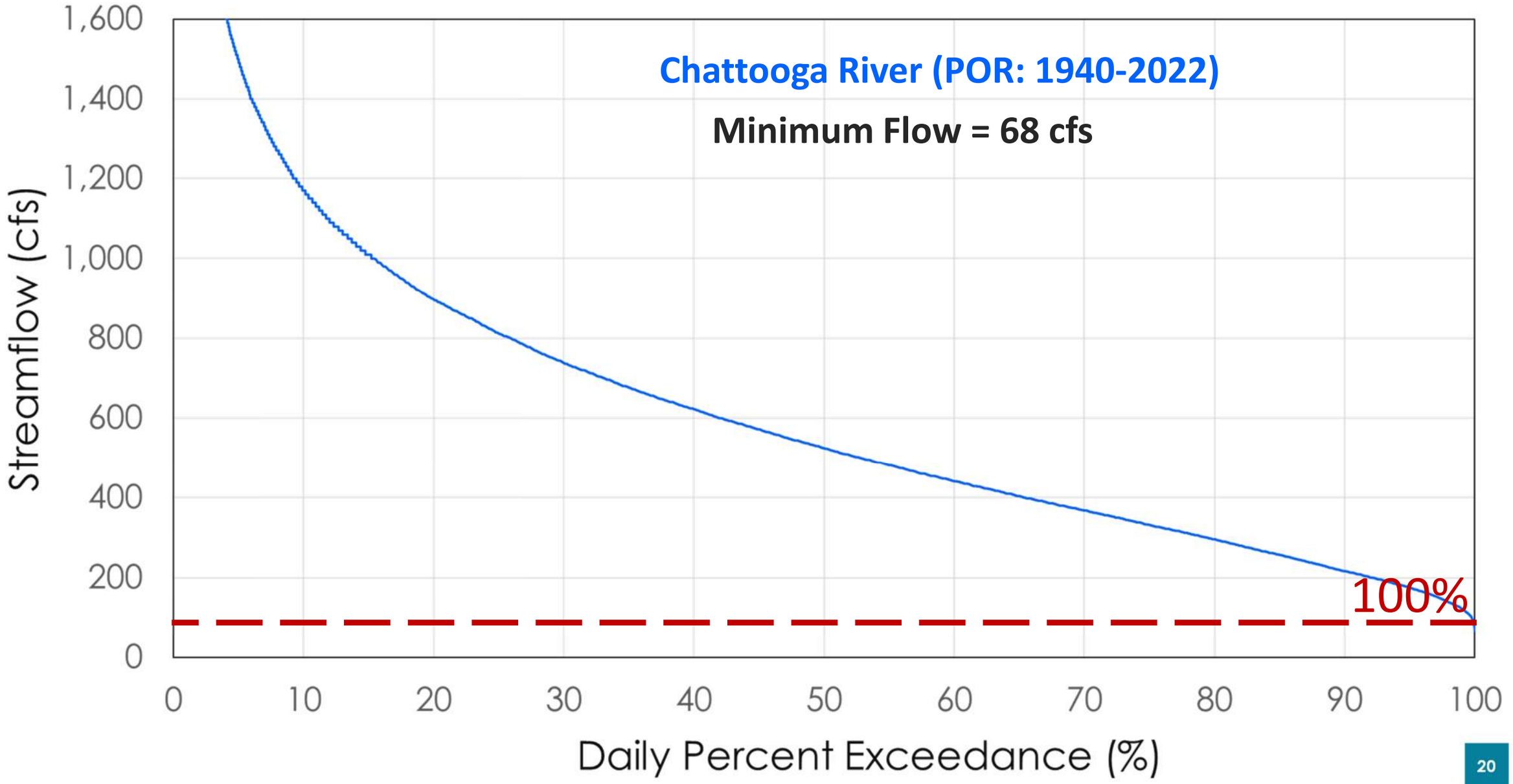
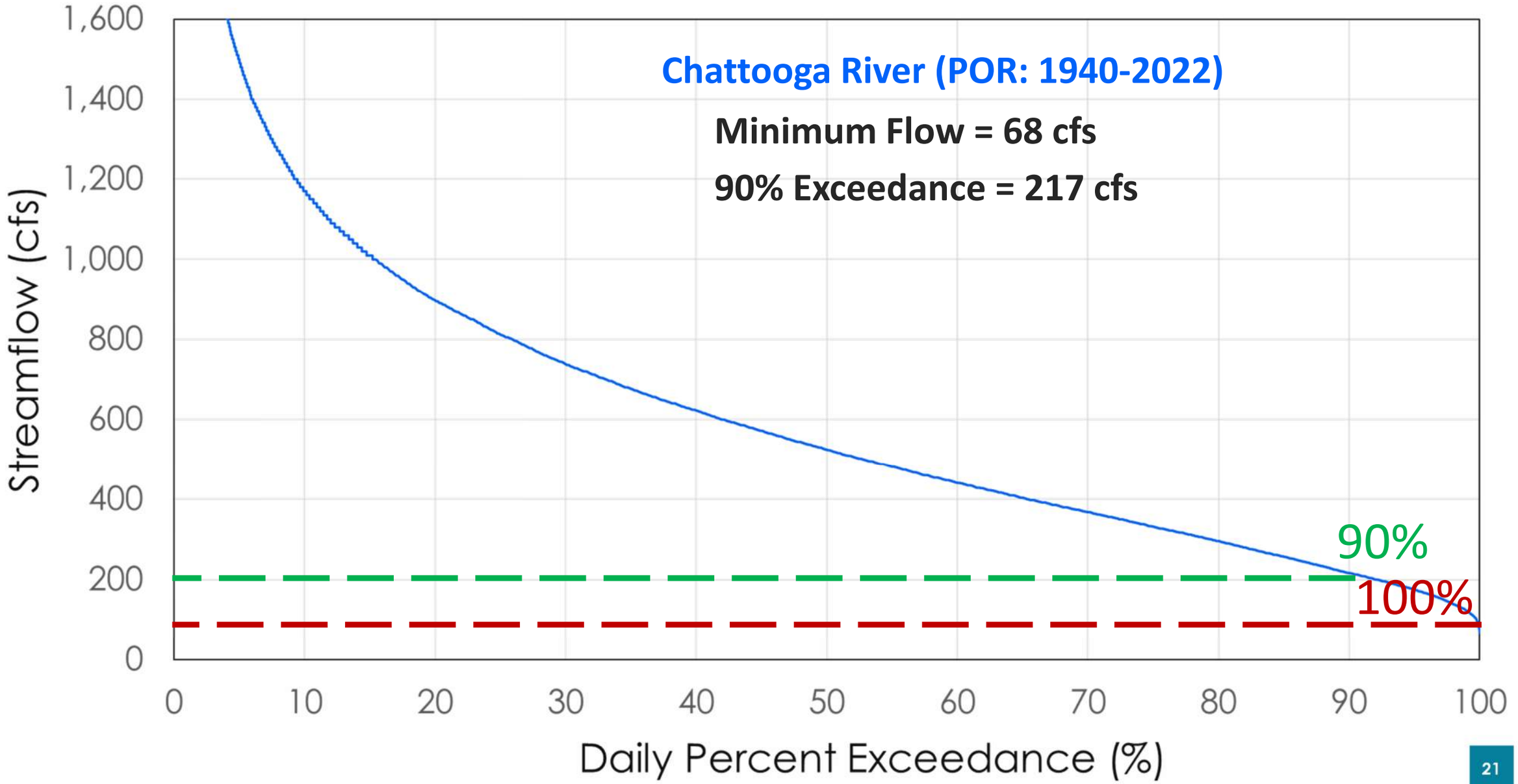


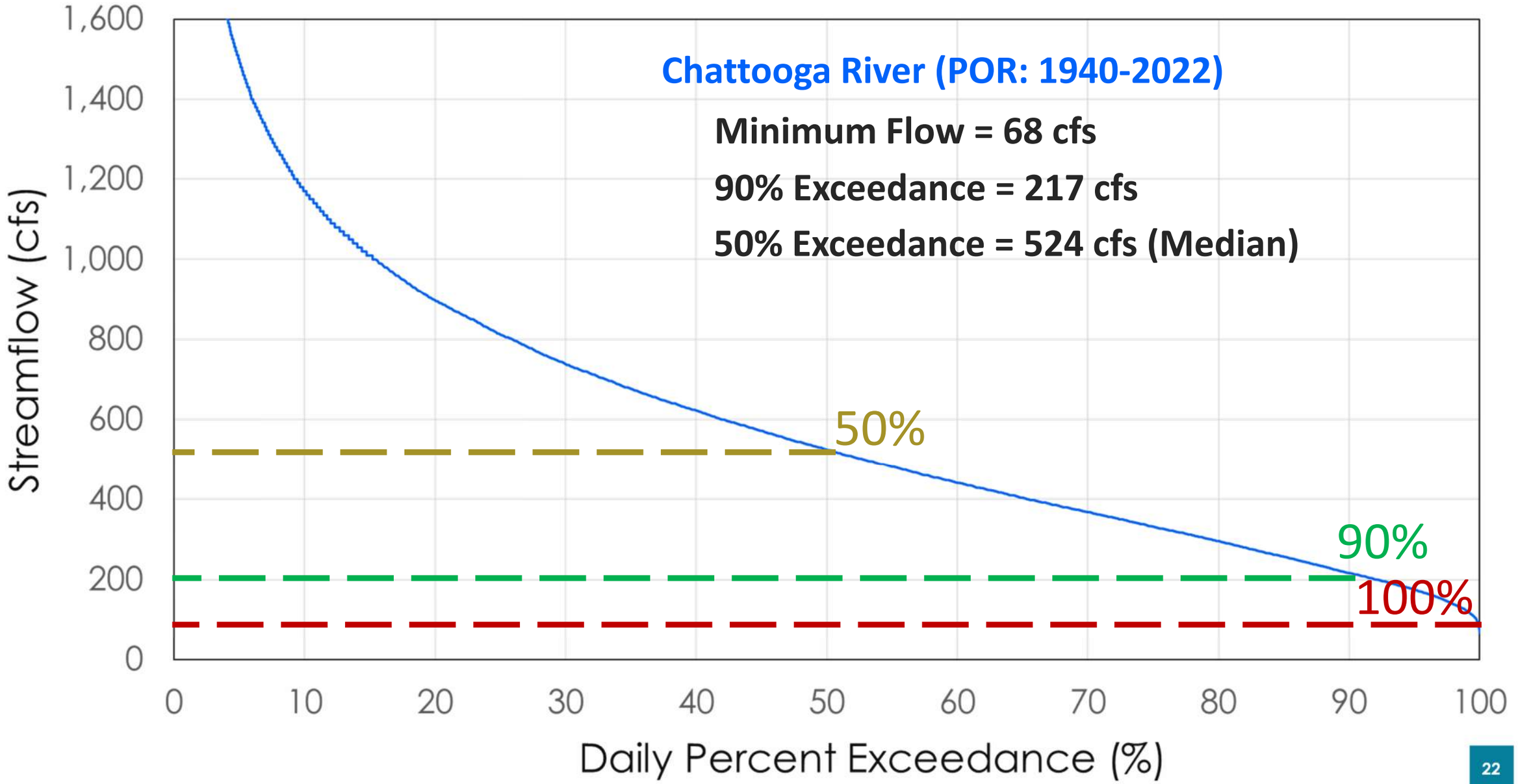
Flow Duration Curve- Chattooga River



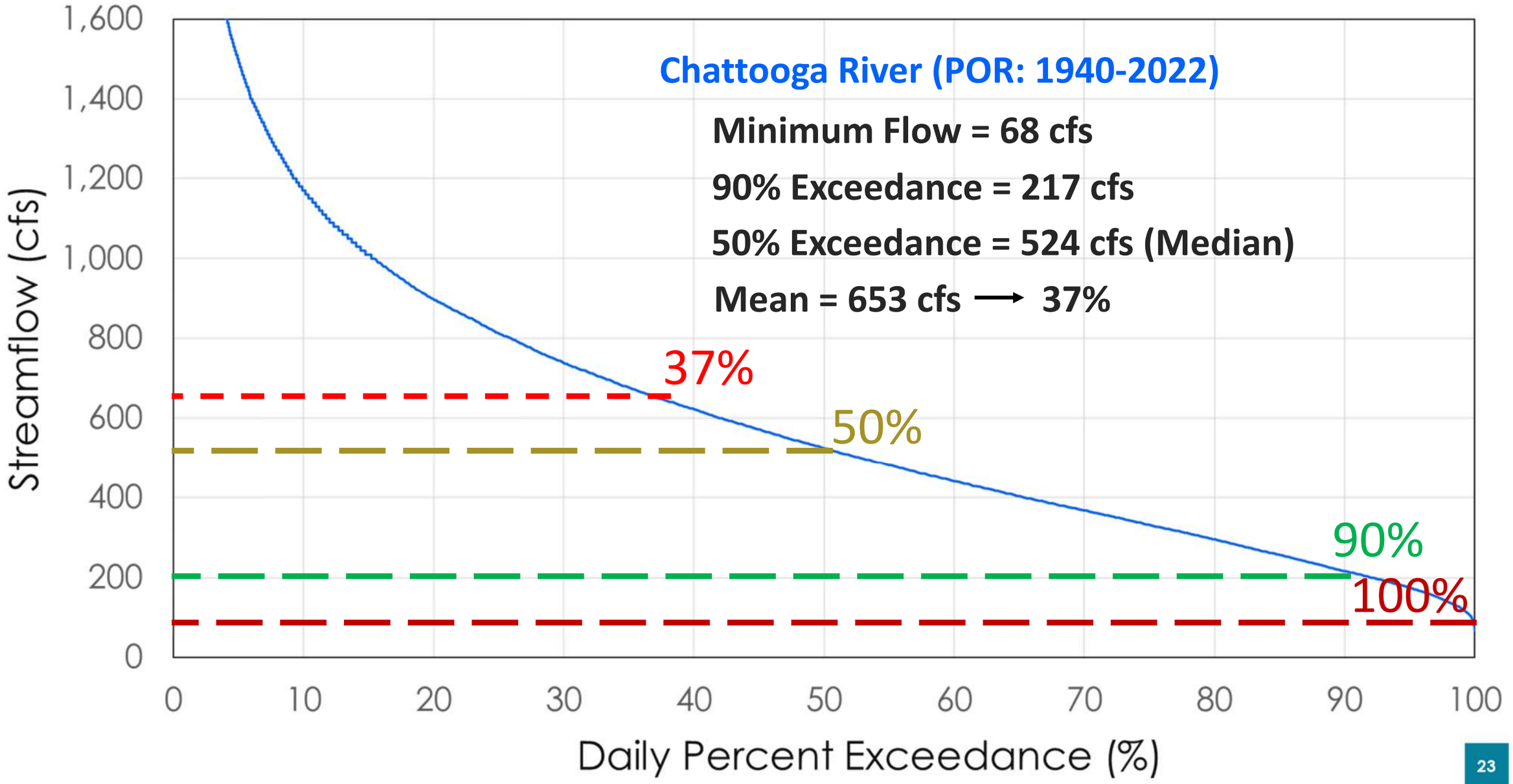
Flow Duration Curve- Chattooga River



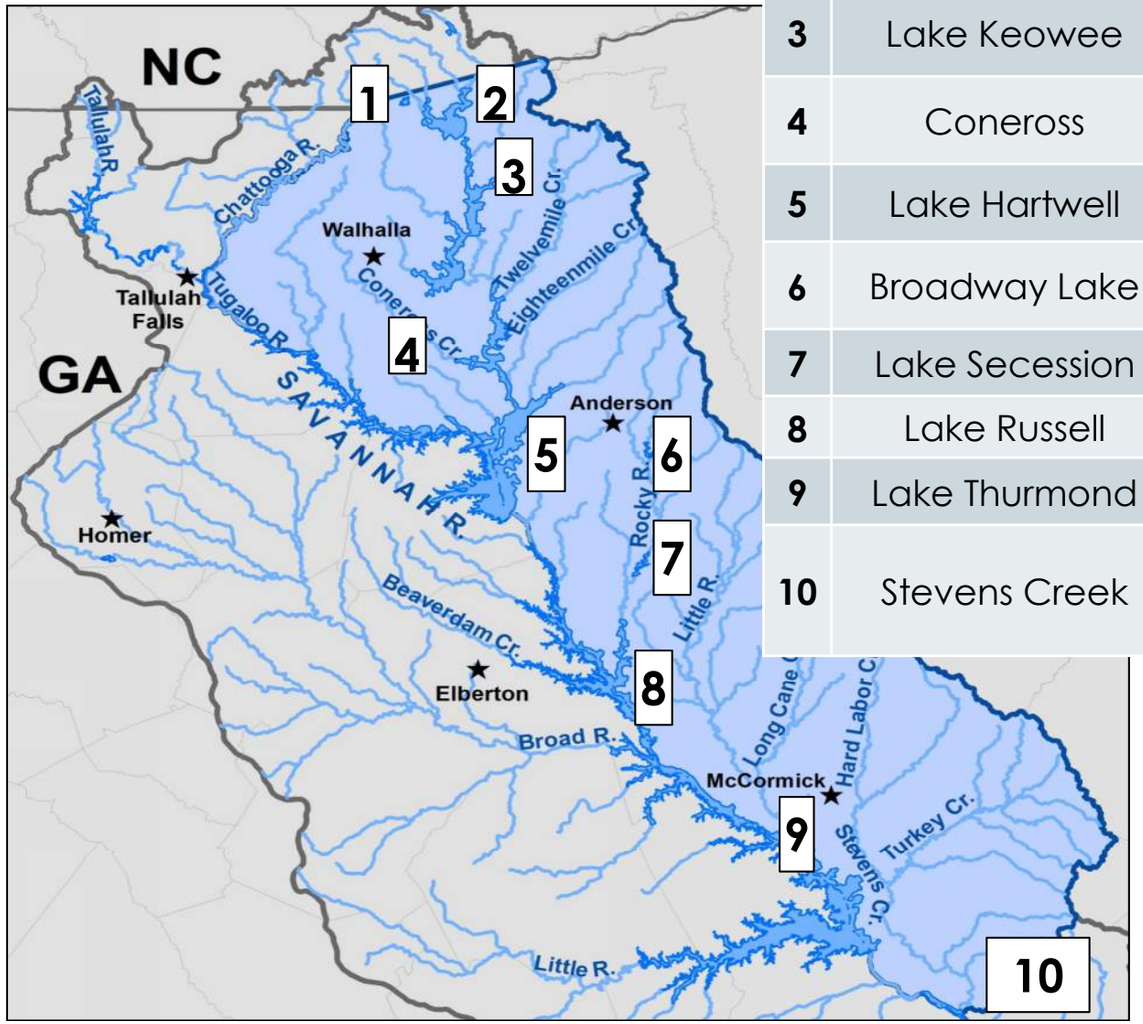
Flow Duration Curve- Chattooga River



Flow Duration Curve- Chattooga River



Upper Savannah Basin Reservoirs -SC

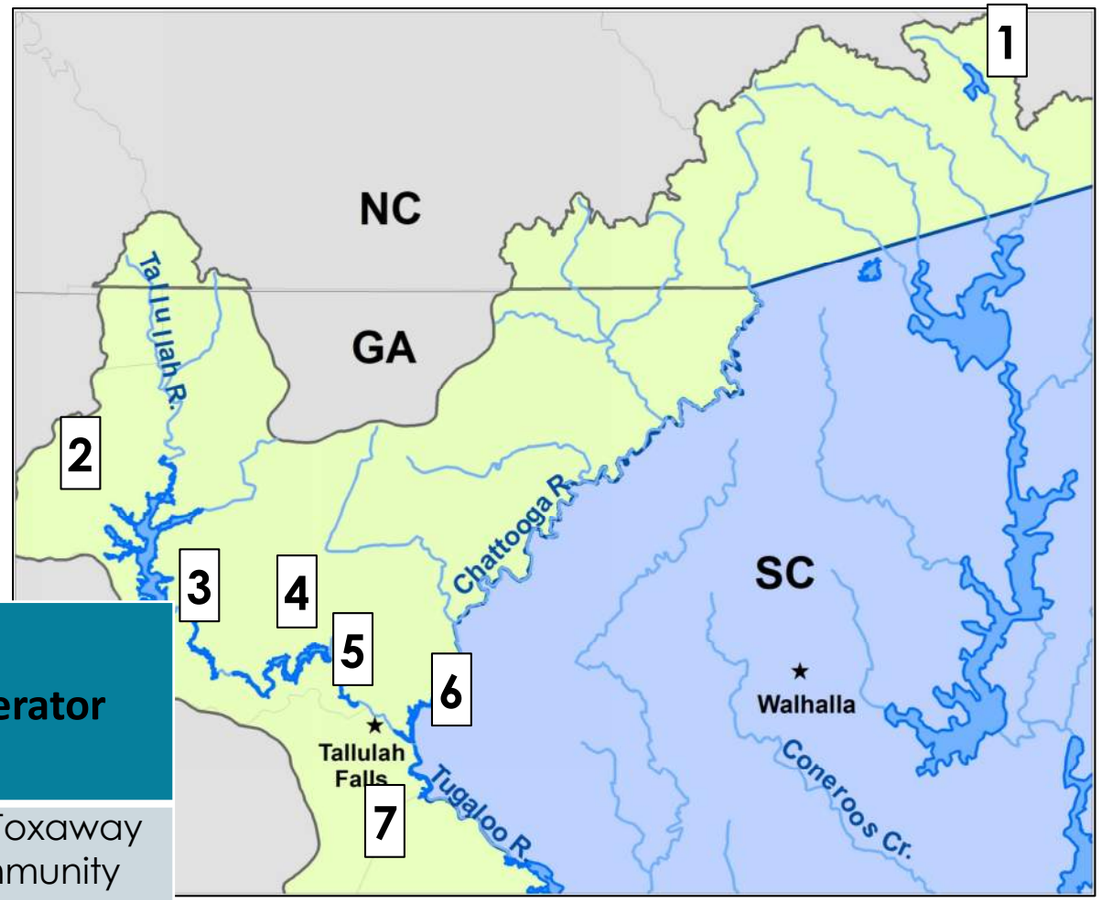


ID	Name	Stream	Surface area (acres)	Total Storage (acre-feet)	Usable Storage (acre-feet)	Operator
1	Bad Creek Reservoir	Bad Creek	363	35,513	31,808	Duke Energy
2	Lake Jocassee	Whitewater-Toxaway	7,980	1,185,000	225,387	Duke Energy
3	Lake Keowee	Keowee-Little River	17,660	1,000,000	364,884	Duke Energy
4	Coneross	Coneross Creek	15.4	62	--	Coneross Power Corporation
5	Lake Hartwell	Savannah River	55,950	2,550,100	1,416,000	USACE
6	Broadway Lake	Rocky River	300	1,800	--	Anderson County Parks Department
7	Lake Secession	Rocky River	1,362	31,200	10,000	City of Abbeville
8	Lake Russell	Savannah River	26,653	1,026,000	126,800	USACE
9	Lake Thurmond	Savannah River	72,000	2,510,000	1,045,000	USACE
10	Stevens Creek	Savannah River & Stevens Creek	2,400	23,600	7,800	Dominion Energy

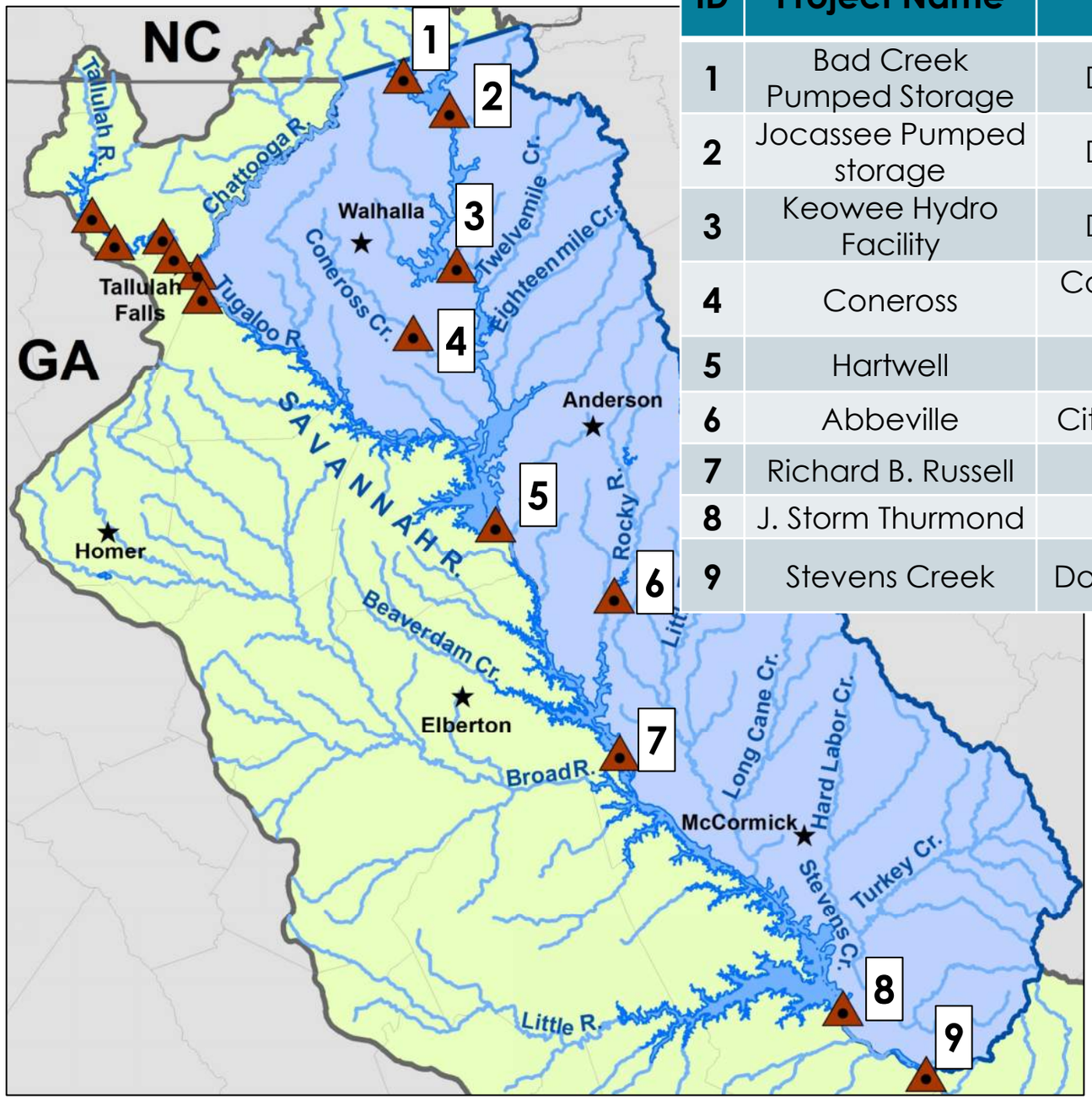
- 9 Reservoirs greater than 200 acres.
- Used for hydroelectric power, flood control, water supply, recreation, fish and wildlife management.

Upper Savannah Basin Reservoirs – NC and GA

- 6 Reservoirs greater than 200 acres.
- Used for hydroelectric power, recreation, fish and wildlife management.



ID	Name	Stream	Surface area (acres)	Total Storage (acre-feet)	Usable Storage (acre-feet)	Operator
1	Lake Toxaway	Toxaway River	640	21,550	--	Lake Toxaway Community Assoc.
2	Lake Burton	Tallulah River	2,775	108,000	90,000	Georgia Power
3	Lake Seed	Tallulah River	260	8,250	5,350	Georgia Power
4	Lake Rabun	Tallulah River	780	31,100	21,900	Georgia Power
5	Lake Tallulah Falls	Tallulah River	63	2,450	1,490	Georgia Power
6	Lake Tugalo	Chattooga River	597	43,000	14,000	Georgia Power
7	Lake Yonah	Tugaloo River	293	10,200	6,000	Georgia Power

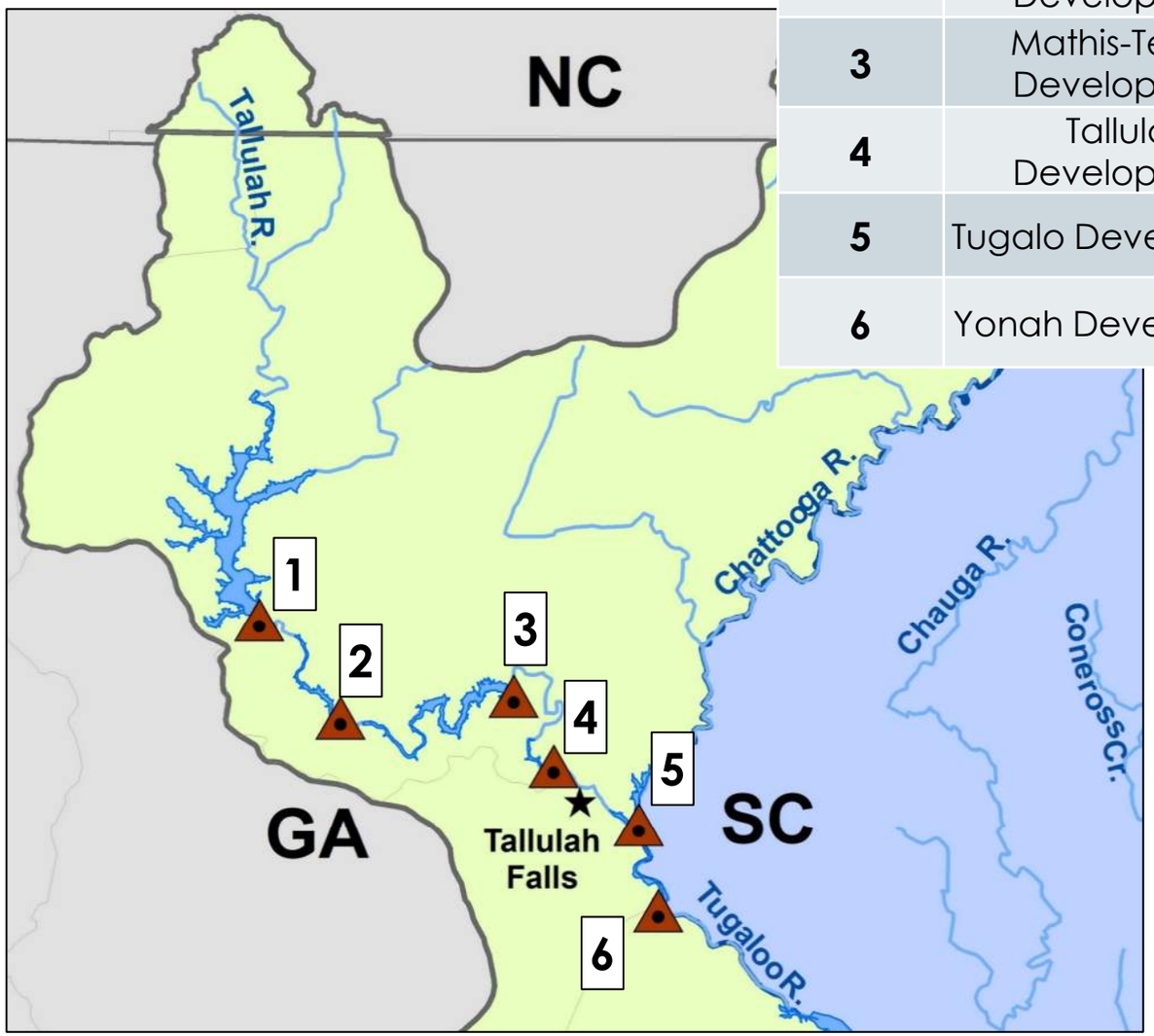


ID	Project Name	Operator	Impounded Stream	Impounded Lake	Capacity (MW)
1	Bad Creek Pumped Storage	Duke Energy	Bad Creek	Bad Creek reservoir	1,065
2	Jocassee Pumped storage	Duke Energy	Whitewater-Toxaway	Lake Jocassee	710
3	Keowee Hydro Facility	Duke Energy	Keowee-Little River	Lake Keowee	157.5
4	Coneross	Coneross Power CORP	Coneross Creek	Coneross Creek reservoir	0.9
5	Hartwell	USACE	Savannah	Lake Hartwell	428
6	Abbeville	City of Abbeville	Rocky River	Lake Secession	2.6
7	Richard B. Russell	USACE	Savannah	Lake Russell	644
8	J. Storm Thurmond	USACE	Savannah	Lake Thurmond	402.5
9	Stevens Creek	Dominion Energy	Savannah River-Stevens Creek	Stevens Creek reservoir	17.3

Hydroelectric Projects-SC

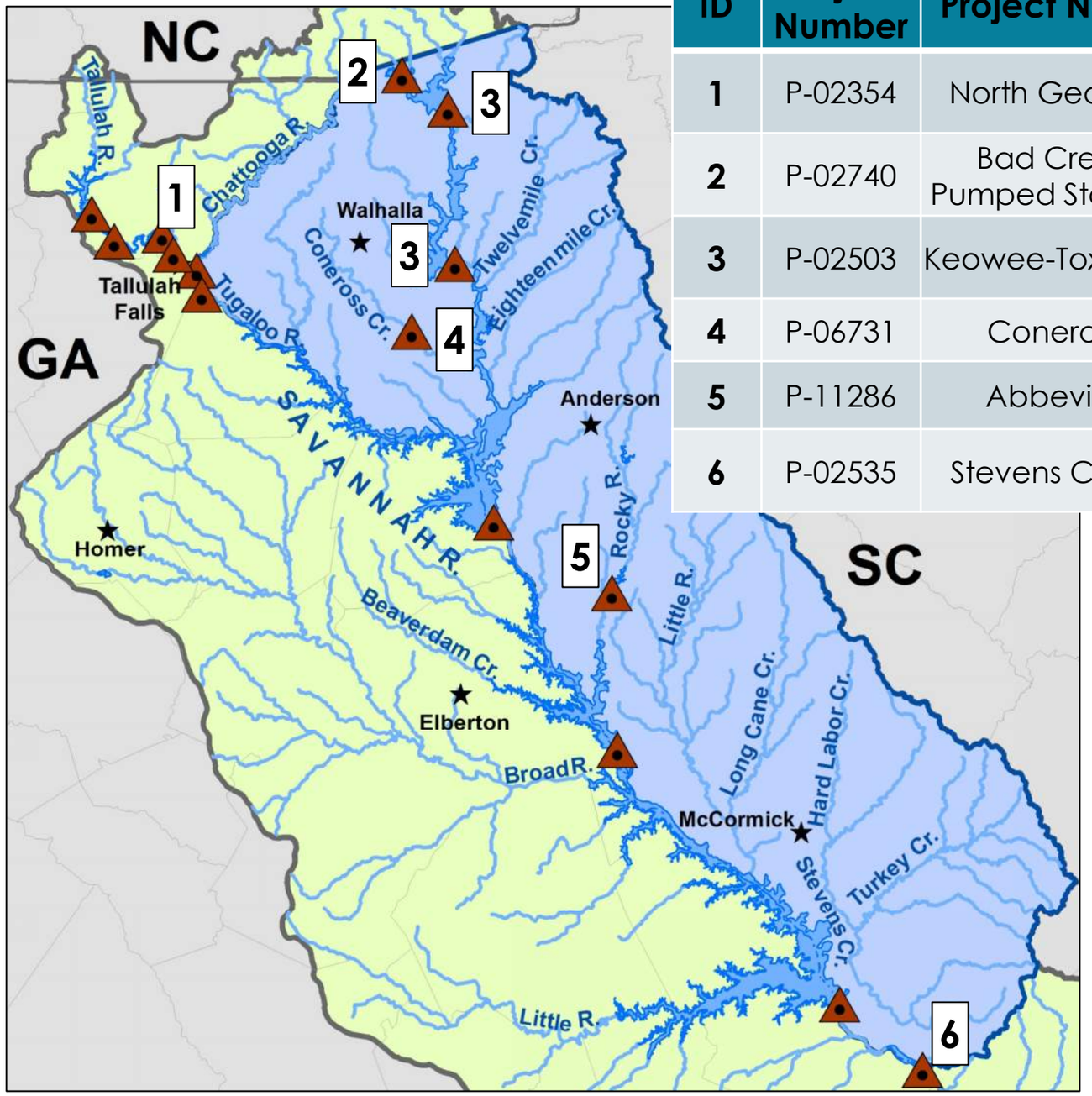
- 9 Hydroelectric Power projects in SC.

ID	Project Name	Impounded Stream	Impounded Lake	Capacity (MW)
1	Burton Development	Tallulah	Lake Burton	8.1
2	Nacoochee Development	Tallulah	Lake Seed	4.8
3	Mathis-Terrora Development	Tallulah	Lake Rabun	23
4	Tallulah Development	Tallulah	Tallulah Falls Lake	72
5	Tugalo Development	Tallulah	Tugaloo Lake	68.2
6	Yonah Development	Tugaloo	Lake Yonah	22.5



Hydroelectric Projects-GA

- Georgia Power Company manages 6 chain lakes under their North Georgia Hydro Group.
- These 6 projects together produce 192.2 MW of electricity.



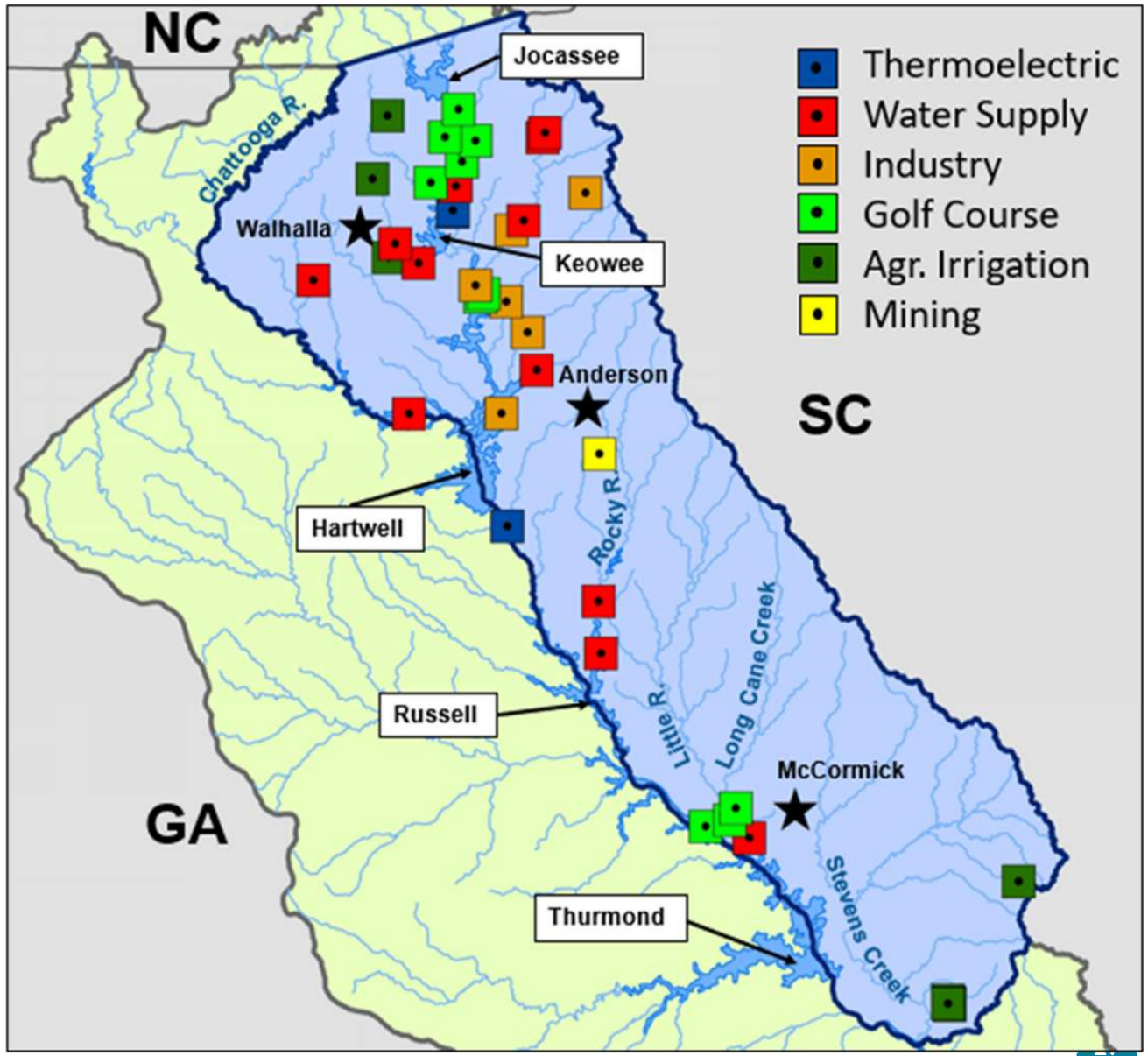
ID	Project Number	Project Name	Licensee	Issue Date	Expiration Date	Capacity (MW)
1	P-02354	North Georgia	Georgia Power	10/03/1996	09/30/2036	192.2
2	P-02740	Bad Creek Pumped Storage	Duke Energy	08/01/1977	07/31/2027	1,065
3	P-02503	Keowee-Toxaway	Duke Energy	08/16/2016	08/31/2046	867.6
4	P-06731	Coneross	Coneross Power Corp	02/01/2022	01/31/2062	0.9
5	P-11286	Abbeville	City of Abbeville	12/24/1997	11/30/2027	2.6
6	P-02535	Stevens Creek	Dominion Energy	11/22/1995	10/31/2025	17.3

Hydroelectric Projects-FERC (GA-SC)

- Six projects licensed by the Federal Energy Regulatory Commission (FERC).

Savannah Basin Water Use

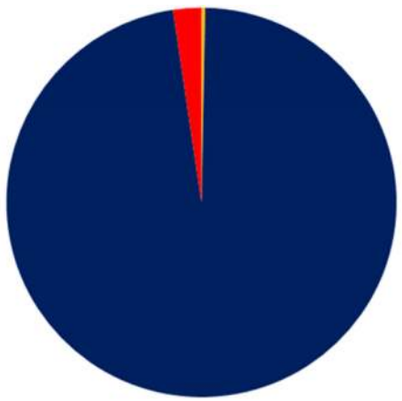
- Map shows active permits and registrations under the South Carolina Surface Water Withdrawal, Permitting, Use, and Reporting Act 2011.
- Planning will focus primarily on the basin's surface water resources (99.9% of withdrawals from surface water sources).



Data source: SCDHEC Watershed Atlas

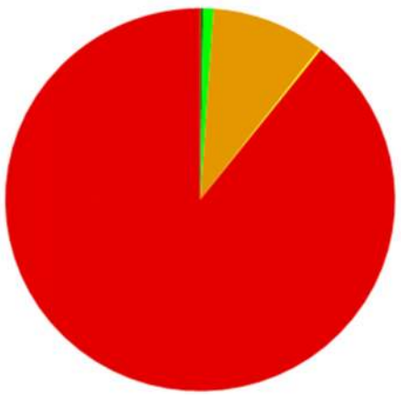
2022 Reported Surface Water Withdrawals

Including Thermoelectric Power

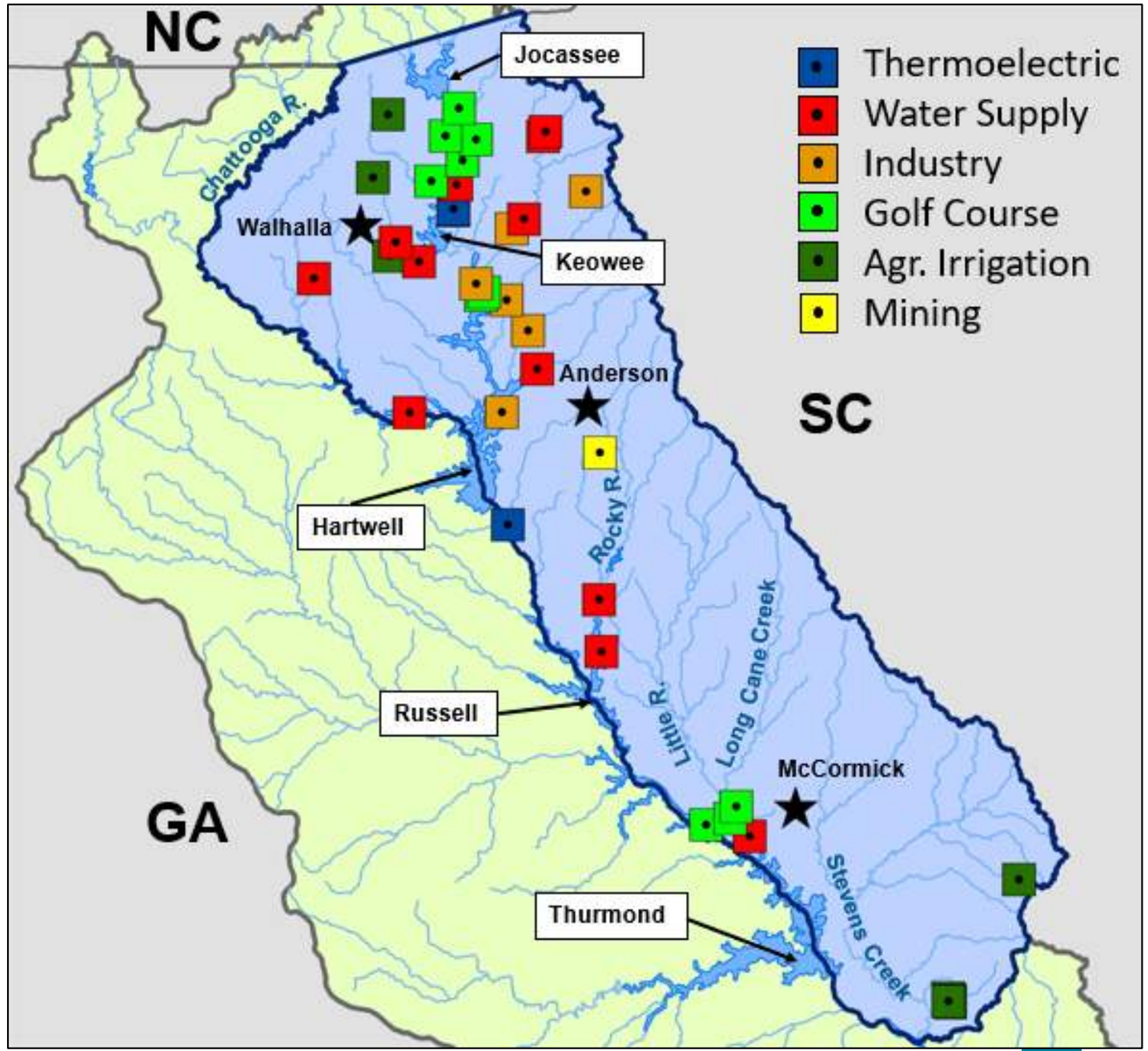


- Thermoelectric (97.4%)
- Water Supply (2.3%)
- Industry (< 1%)
- Golf Course (< 1%)
- Agr. Irrigation (< 1%)
- Mining (< 1%)

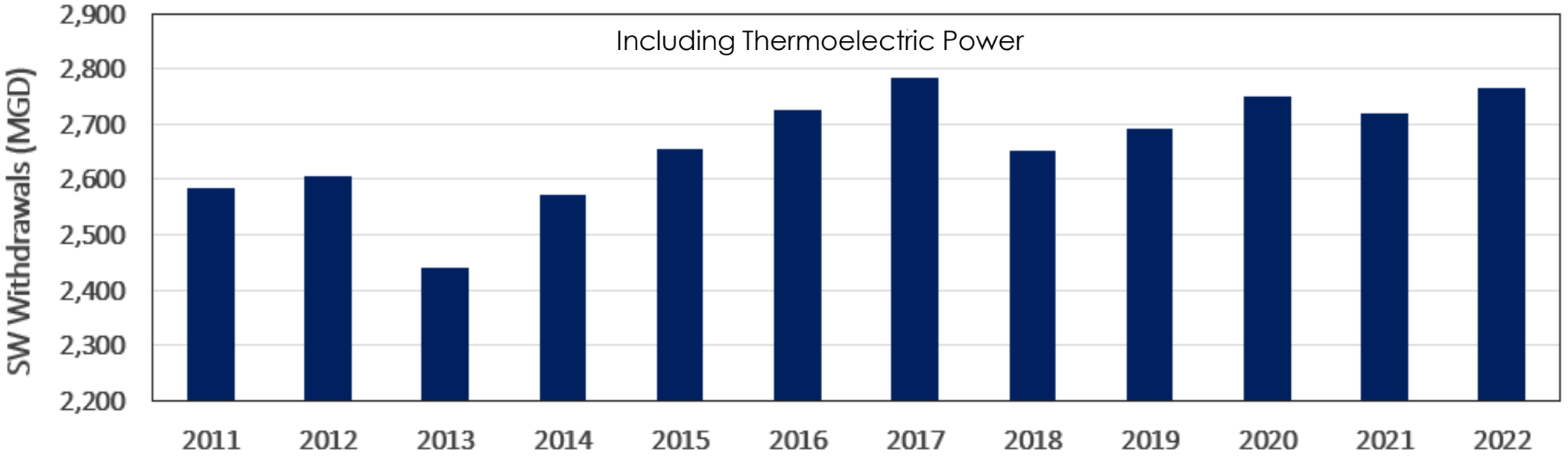
Excluding Thermoelectric Power

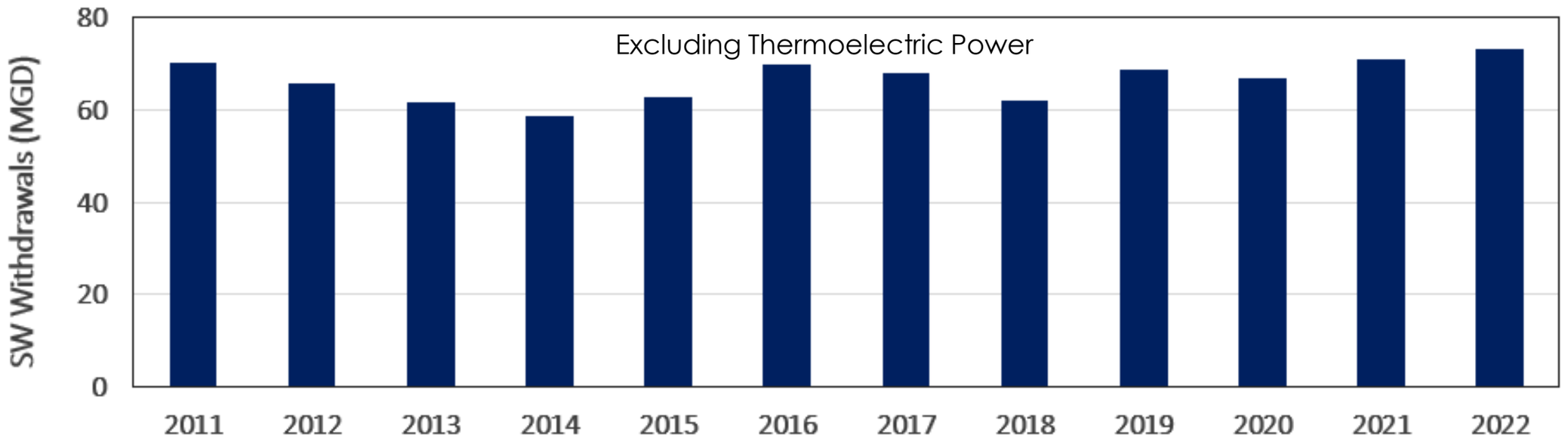


- Water Supply (88.5%)
- Industry (10.1%)
- Golf Course (1%)
- Agr. Irrigation (< 1%)
- Mining (< 1%)

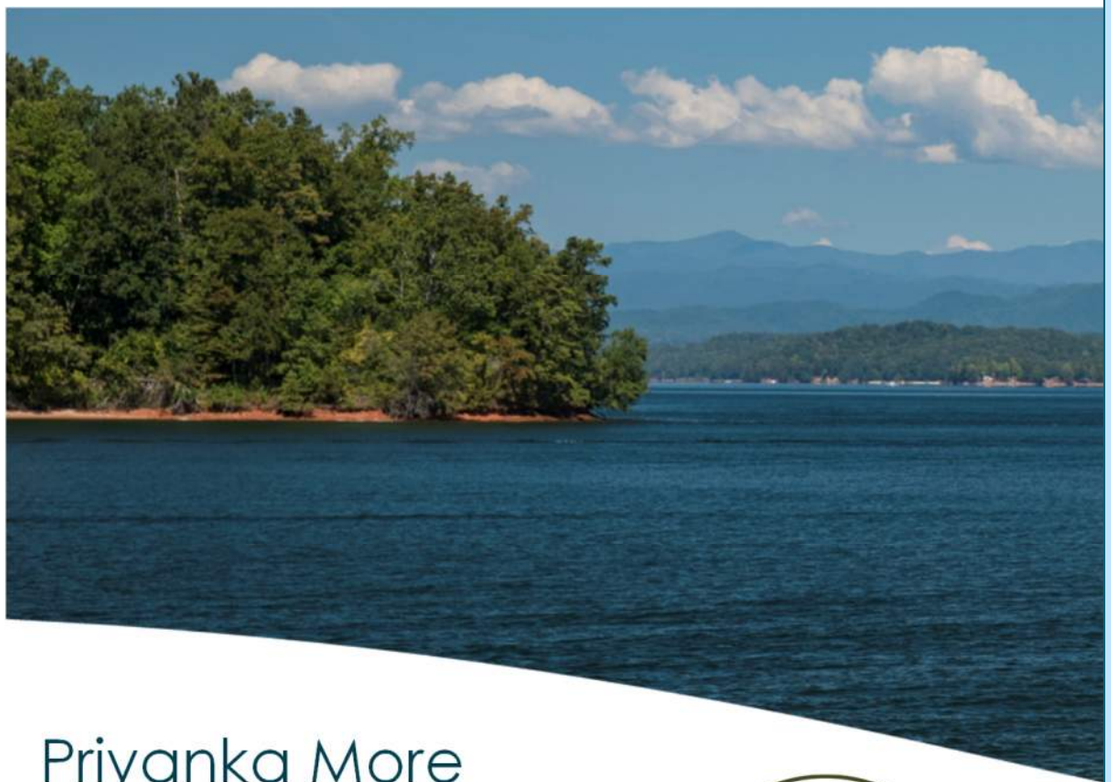


Reported Surface Water Withdrawals (2011-2022)





Summary



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SC Department of Natural Resources

- Variable rainfall throughout the basin
  - Blue Ridge province: 75 inches
  - Coastal Plain: 45 inches
- Highly variable flows in the basin
  - Higher baseflow contribution in the upper basin
- Upper Savannah basin is heavily regulated- reservoirs support power generation, water supply, and recreation
- Planning will focus primarily on the basin's surface water resources