

Surface Water Resources of the Pee Dee Basin

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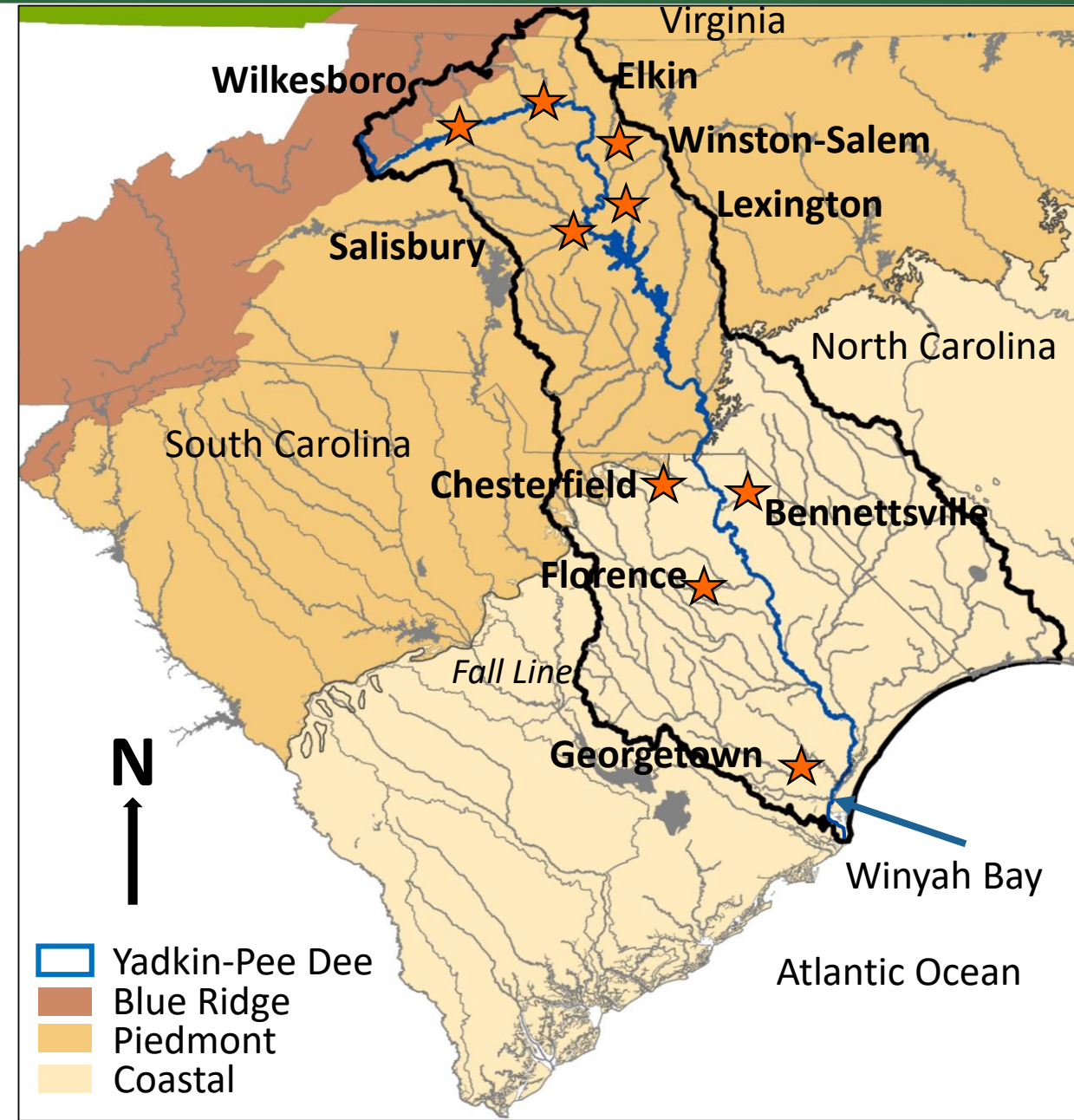


Yadkin-Pee Dee Basin Overview



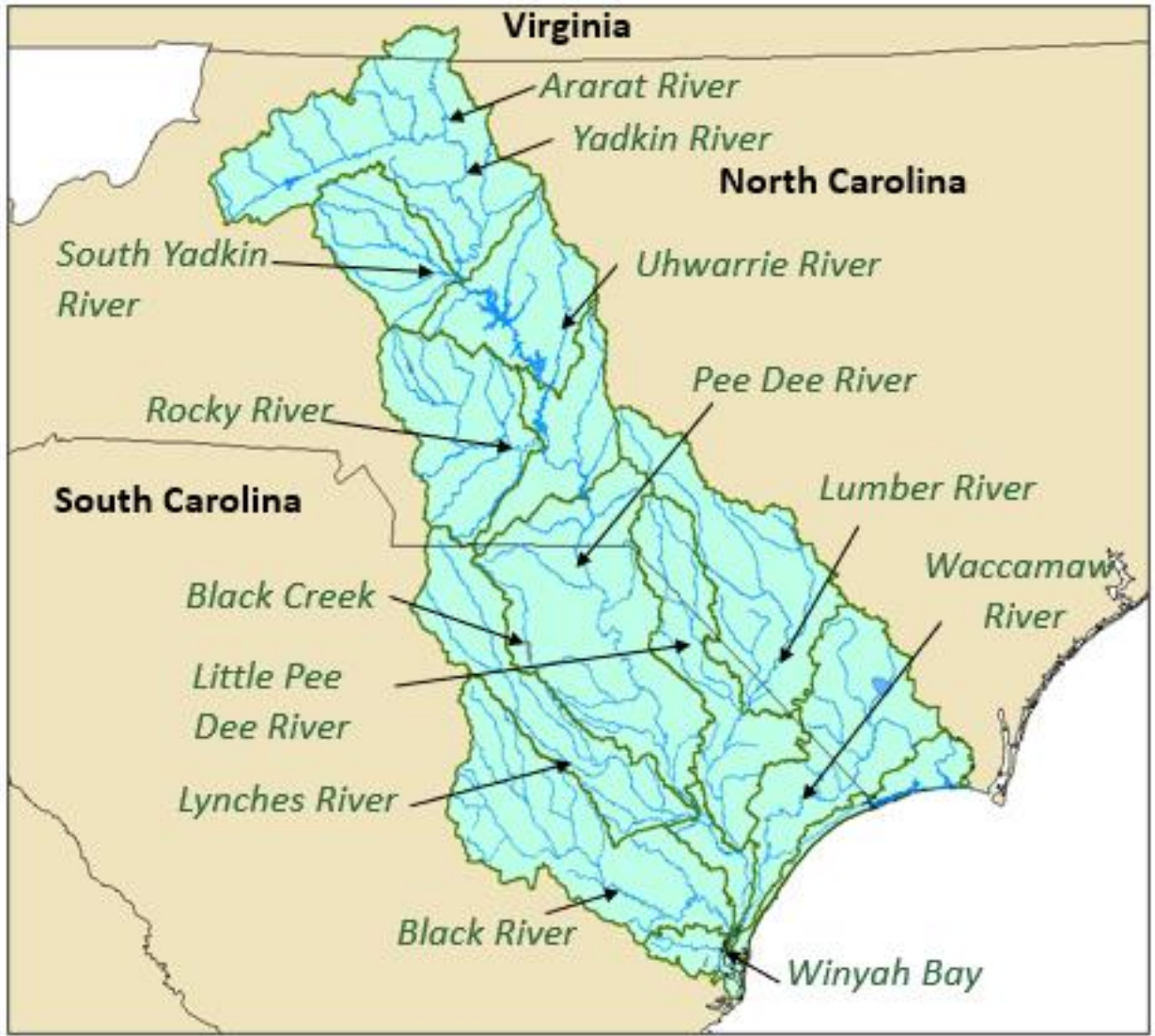
Basin Description

- Largest basin in the Carolinas draining portions of VA, NC, and SC
 - Total Area = 18,521 sq.mi
 - VA portion = (0.6%, 116.9 sq.mi)
 - NC portion = (57%, 10,521.5 sq.mi)
 - SC portion = (42%, 7,828.8 sq.mi)
- Mainstem Yadkin-Pee Dee headwaters originate in the Blue Ridge province
- Mainstem runs for > 400 miles
- Most of the basin is within Piedmont and Coastal Plain province





Major Tributaries and Reservoirs



Major NC tributaries flowing into SC include the Lumber and Waccamaw

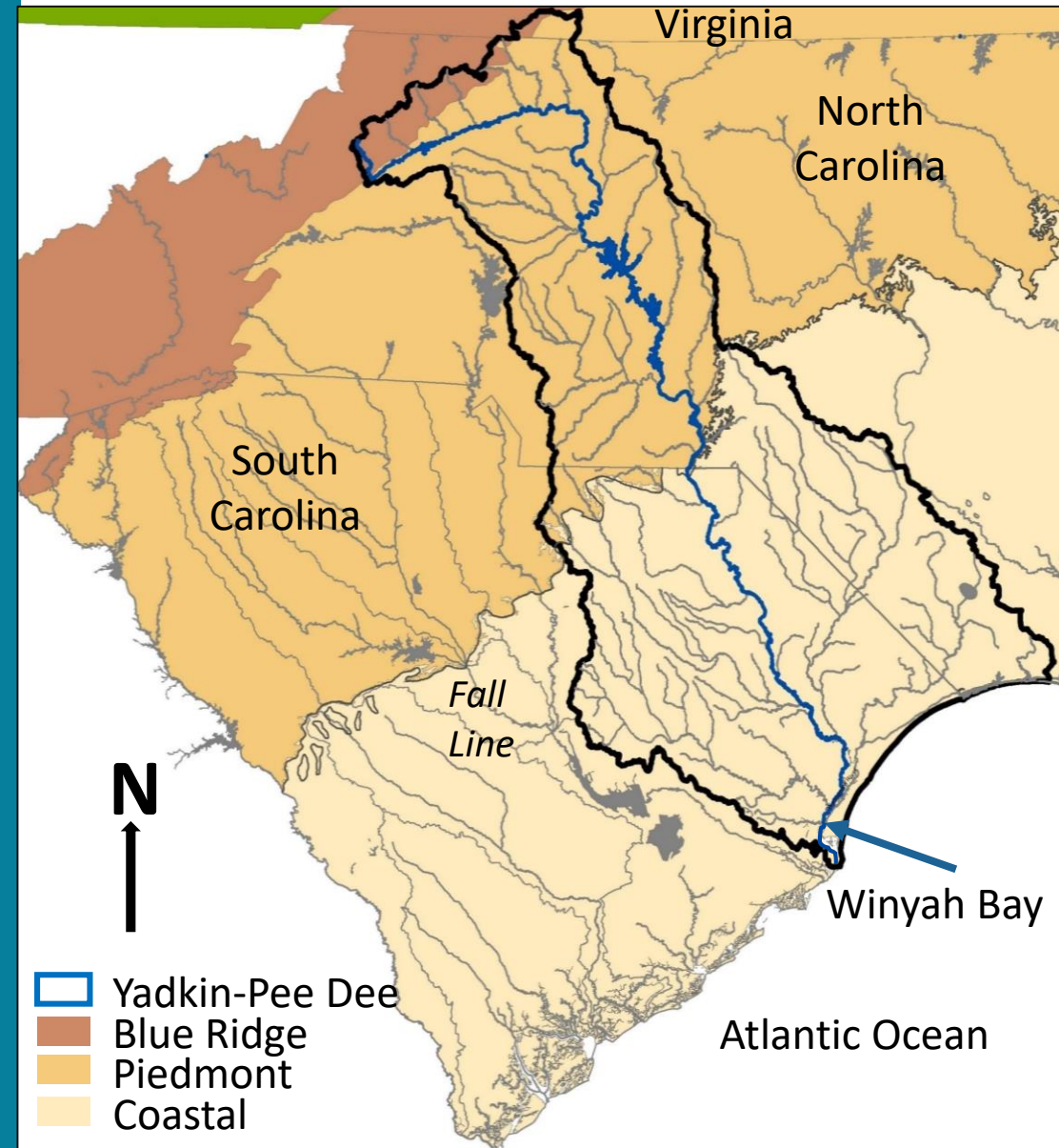
- 7 Major Reservoirs
 - 1- USACE (Flood control)
 - 4- Cube Hydro Carolinas
 - 3- Duke Energy ProgressHydropower generation and closely regulated by FERC
- The 7 NC reservoirs regulate only 38% of the entire Yadkin-Pee Dee basin area



Physiographic Provinces

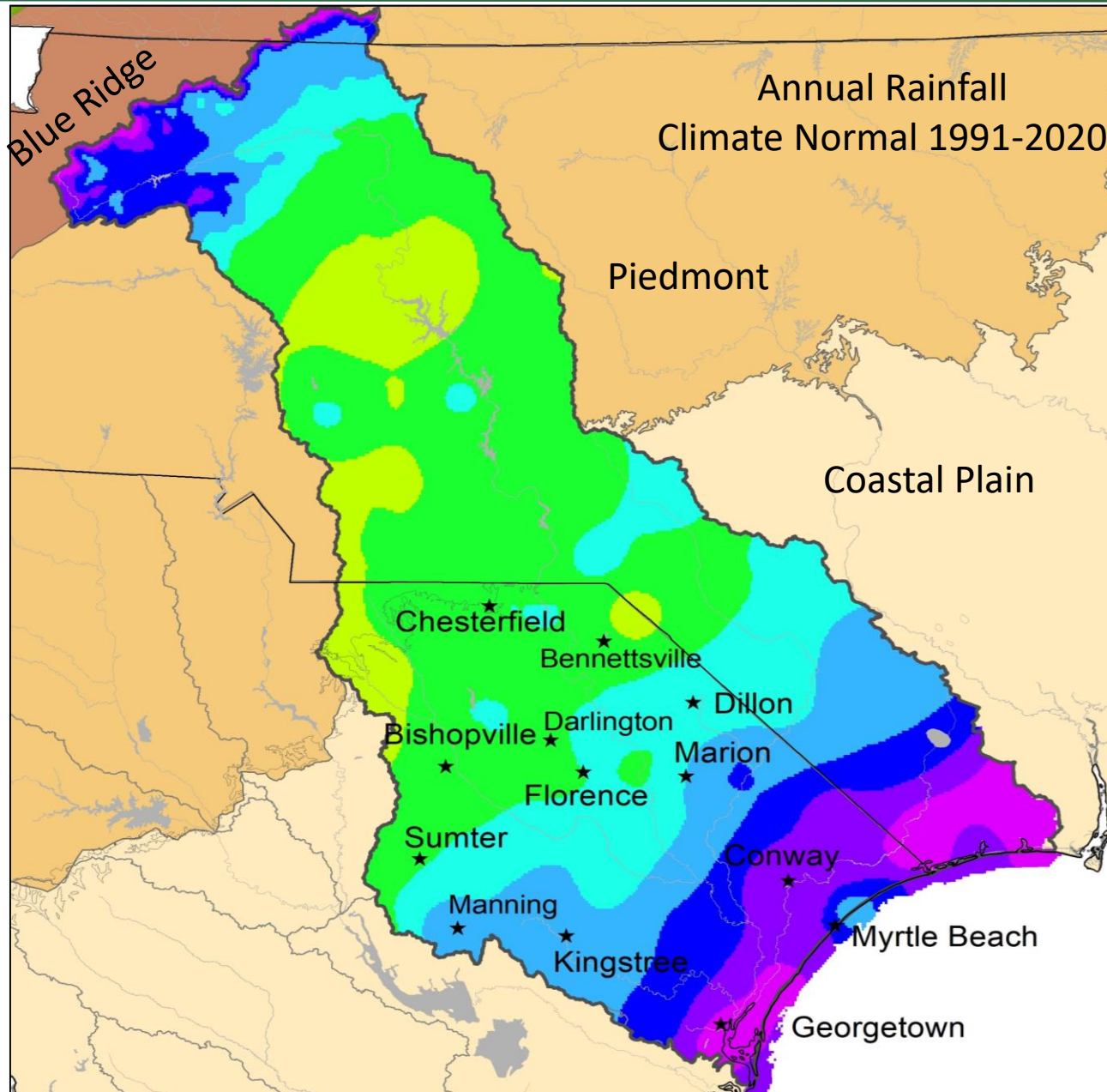


- Blue Ridge Mountains
 - Rugged terrain and streams have higher gradient
- Piedmont
 - Elevation ranges from 1000 ft above MSL at foothills of Blue Ridge to 400 ft near the Fall Line
 - Underlain by fractured crystalline rock, consisting of intrusive granite, gneiss, schist, and metamorphosed volcanic 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
 - Large parts of the lower Coastal Plain river systems are swamplands
 - Readily absorbs rainfall and retards runoff to stream channels, causing streamflow to rise and fall gradually





1991-2020 Rainfall - Climate Normal



- Rainfall ranges from 65 inches to 43 inches
- Higher rainfall near the mountains and in coastal areas
- Rainfall patterns in NC and coastal weather events will impact flows in SC

Rainfall (Inches)

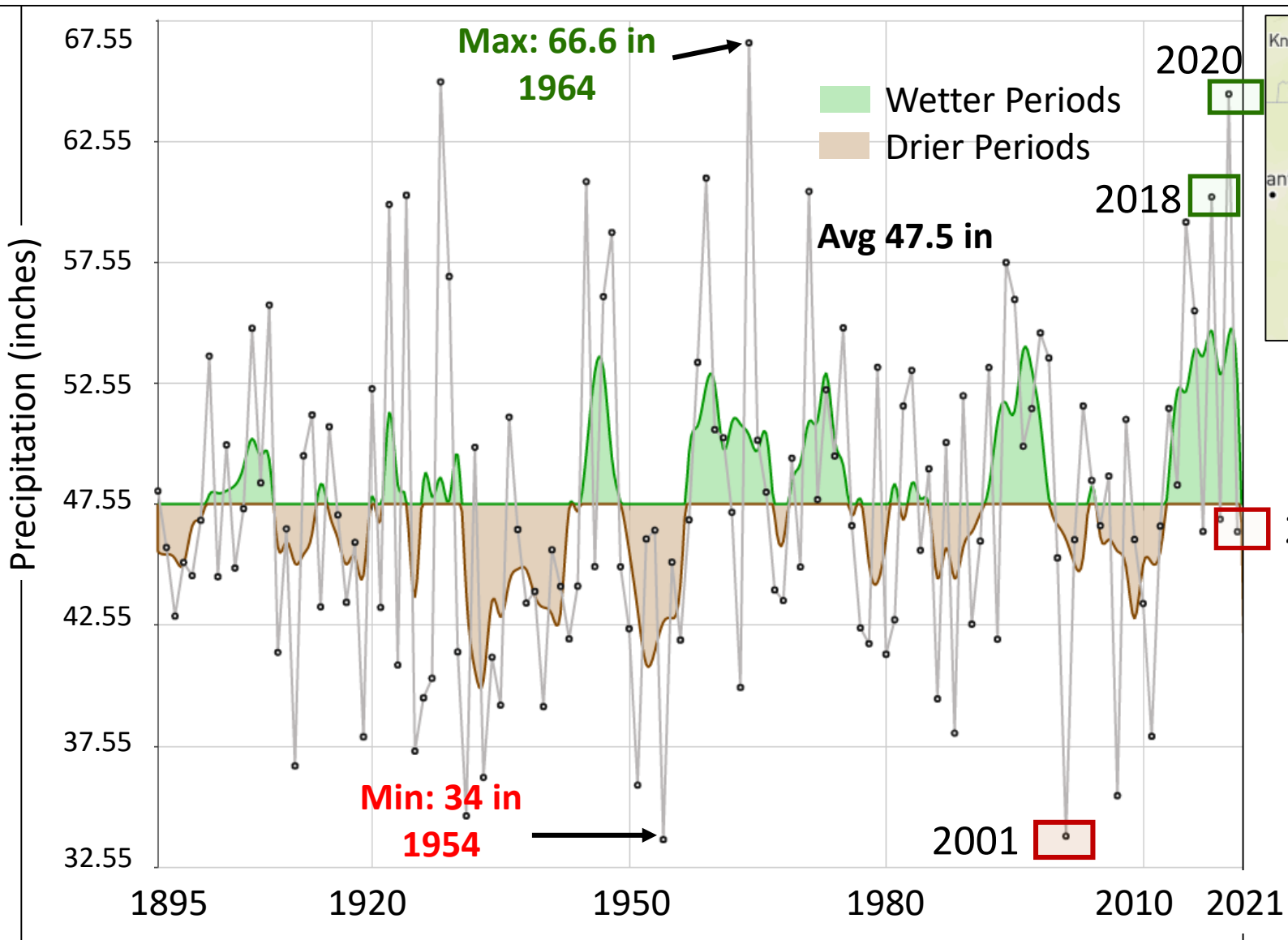


<https://prism.oregonstate.edu/normals/>



Rainfall Patterns

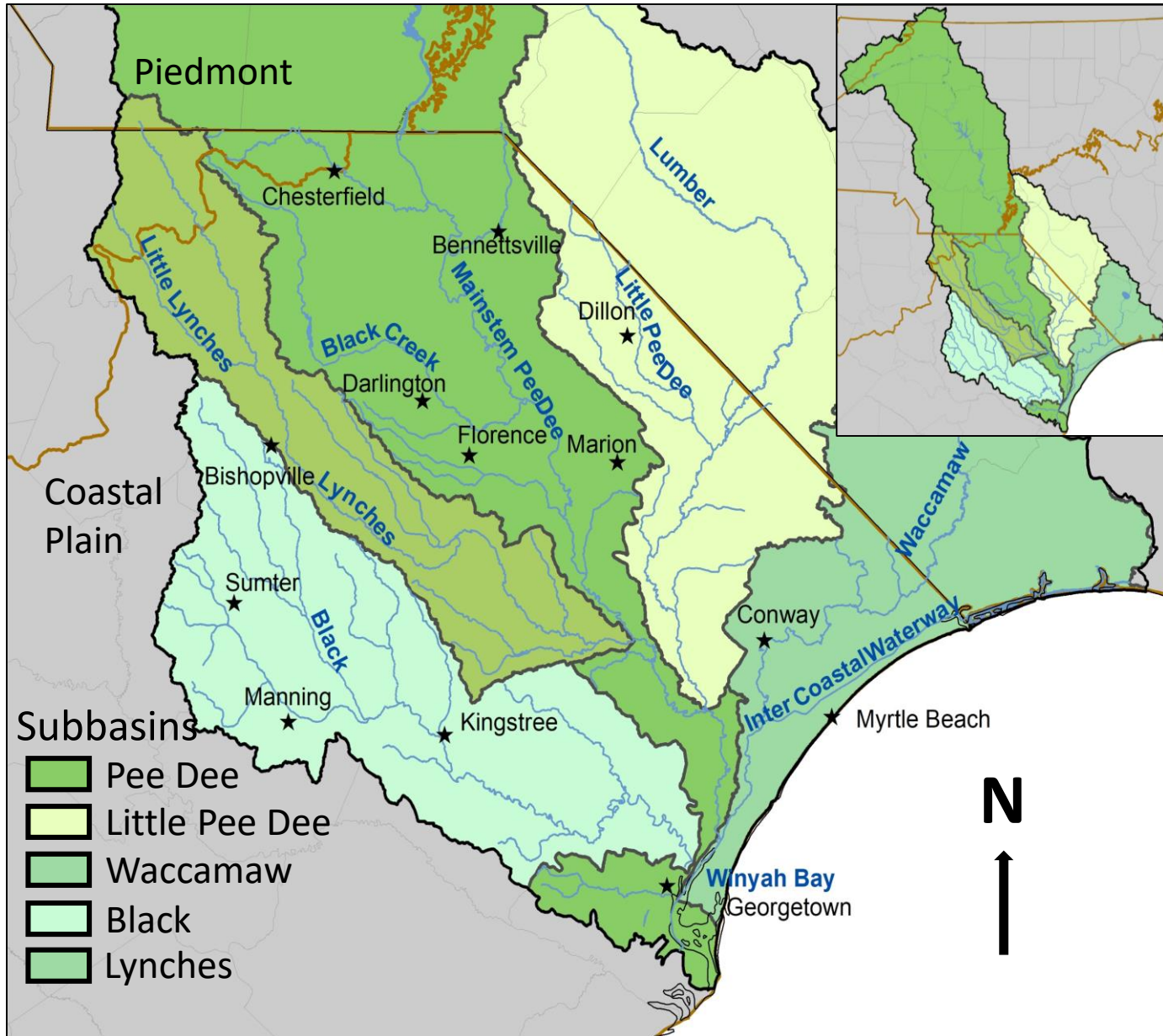
Northeast Climate Division – Average Annual Rainfall and 5-year Running Average



POR : 1895 -2021
(126 years)

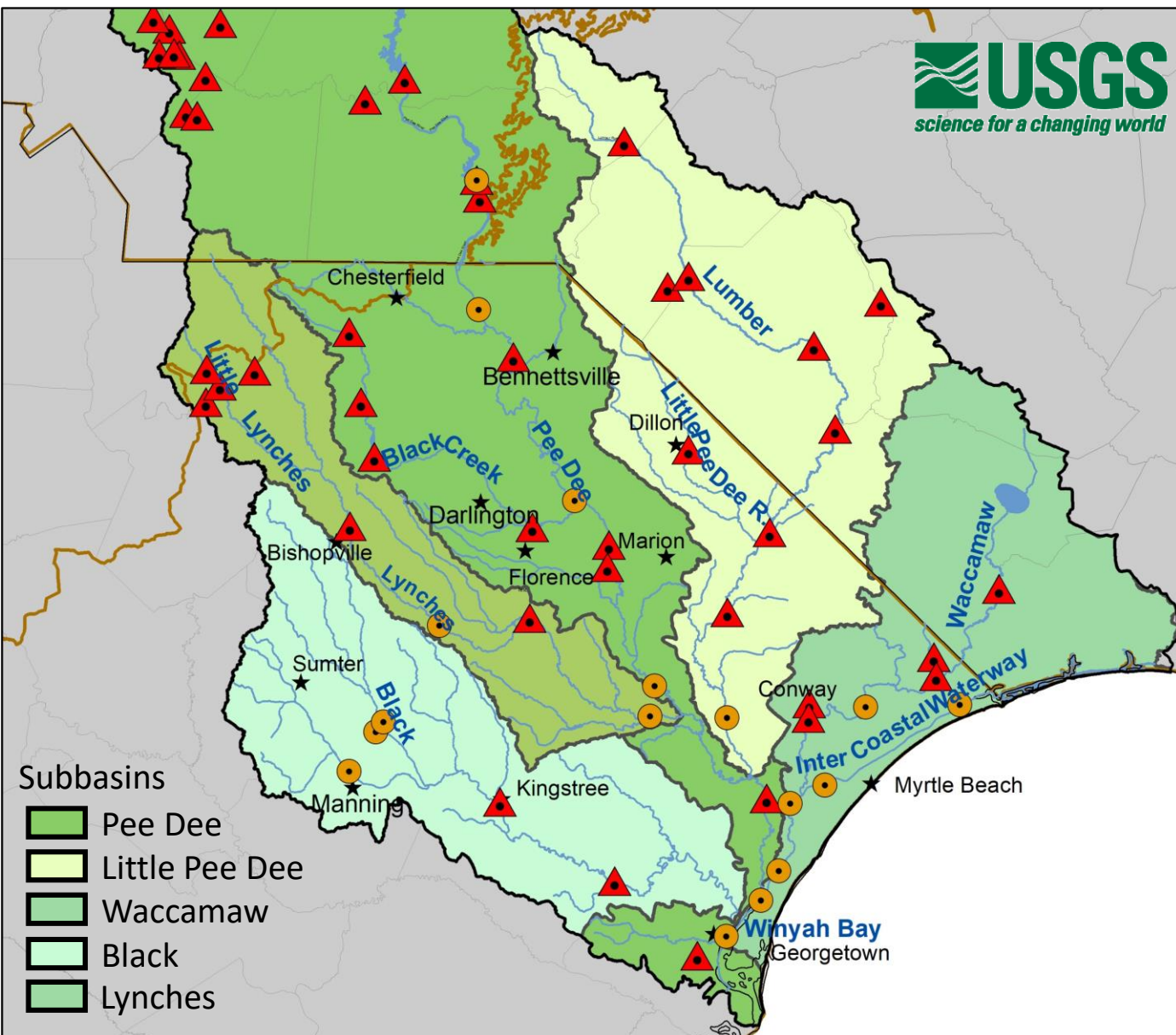


Subbasins Description



- Area of entire basin – 18,521 sq.mi
 - Mainstem – 53%
 - Little Pee Dee River – 17%
 - Black River – 11%
 - Waccamaw – 11%
 - Lynch – 8%
- Area of basin within SC – 7,829 sq.mi
 - Mainstem – 33%
 - Black River – 26%
 - Lynch – 18%
 - Little Pee Dee – 14%
 - Waccamaw – 9%
- Lynch, Lumber, and Little Pee Dee have higher baseflow contribution as they originate in sandhills
- Headwaters of Black River and Waccamaw originate in swamps

Surface Water Monitoring Network



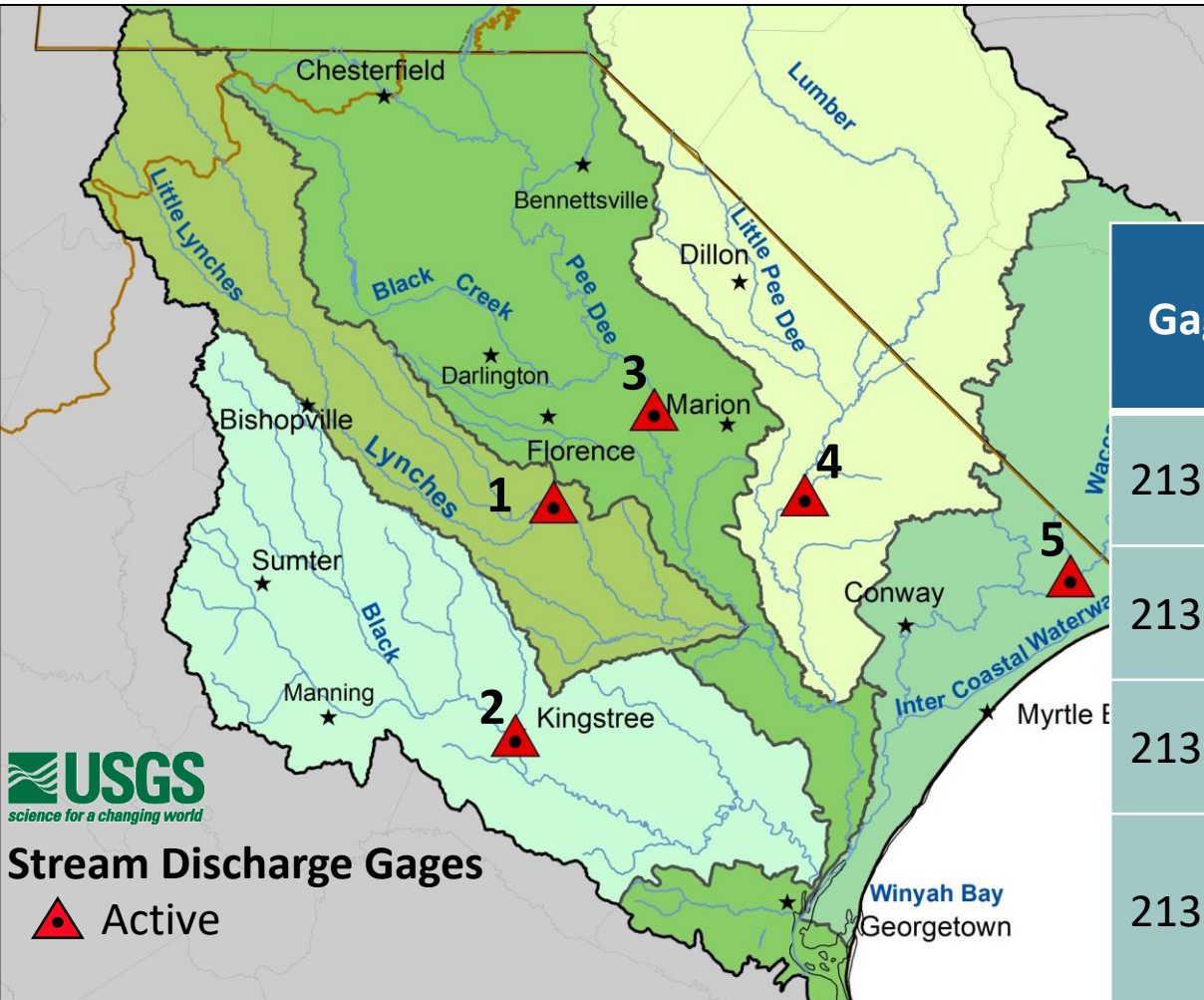
- 24 Active USGS streamflow gages in SC and 39 in NC
- Longest period of record > 90 years
- Period of record (POR) extends back to the 1920s for several sites
 - Example – Lynches at Effingham (1929), Black River at Kingstree (1929)
- Coastal areas have more stage gages than discharge gages
 - Difficult to measure discharge due to tidal influence



Surface Water Monitoring Network



1. Lynchess River at Effingham
2. Black River at Kingstree
3. Pee Dee River at Pee Dee
4. Little Pee Dee River at Galivants Ferry
5. Waccamaw River near Longs



Gage #	Gage name	POR	Mean (cfs)	Min (cfs)	Max (cfs)	DA (sq.mi)
2132000	Lynchess R. at Effingham	1929-2022	1,004	69.2 (2002)	24,500 (1945)	1,030
2136000	Black R. at Kingstree	1929-2022	948	2.0 (1954)	78,200 (2015)	1,252
2131000	Pee Dee R. at Pee Dee	1938-2022	9,545	653 (2007)	217,000 (1945)	8,830
2135000	Little Pee Dee R. at Galivants Ferry	1942-2022	2,984	72.8 (2002)	64,000 (2018)	2,790
2110500	Waccamaw R. near Longs	1950-2022	1,267	1.0 (1954)	53,700 (2018)	1,110



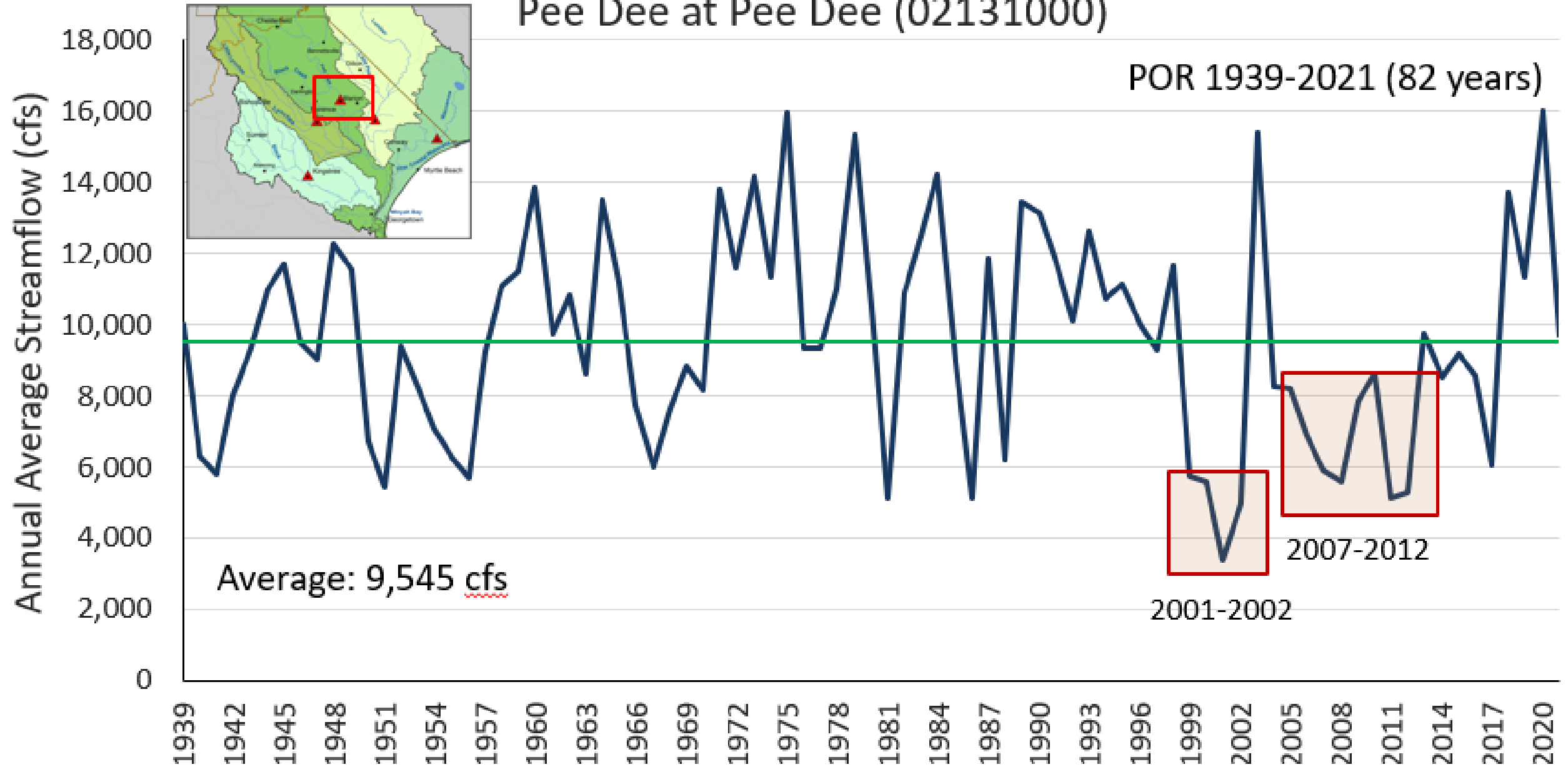


Average Annual Streamflow



Pee Dee at Pee Dee (02131000)

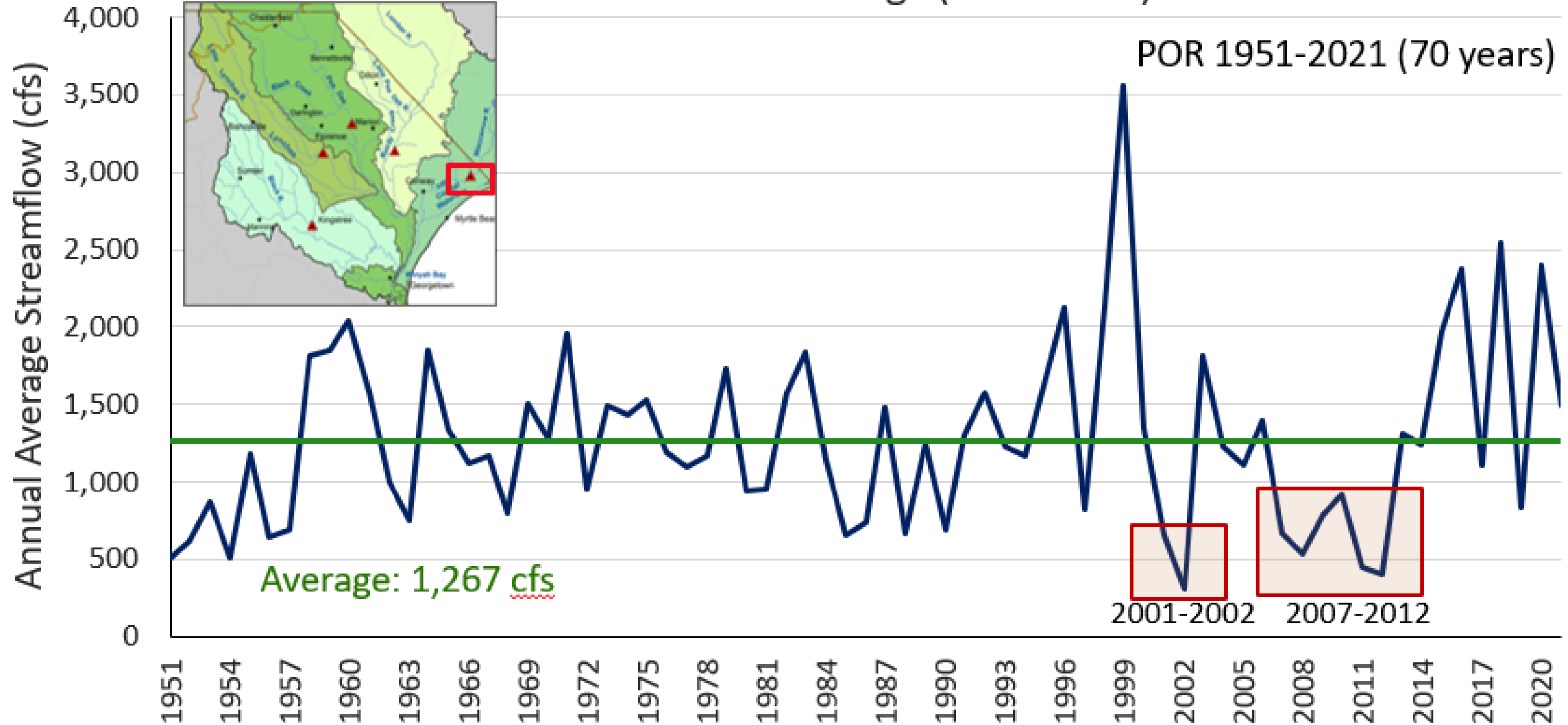
POR 1939-2021 (82 years)





Average Annual Streamflow

Waccamaw at Longs (02110500)



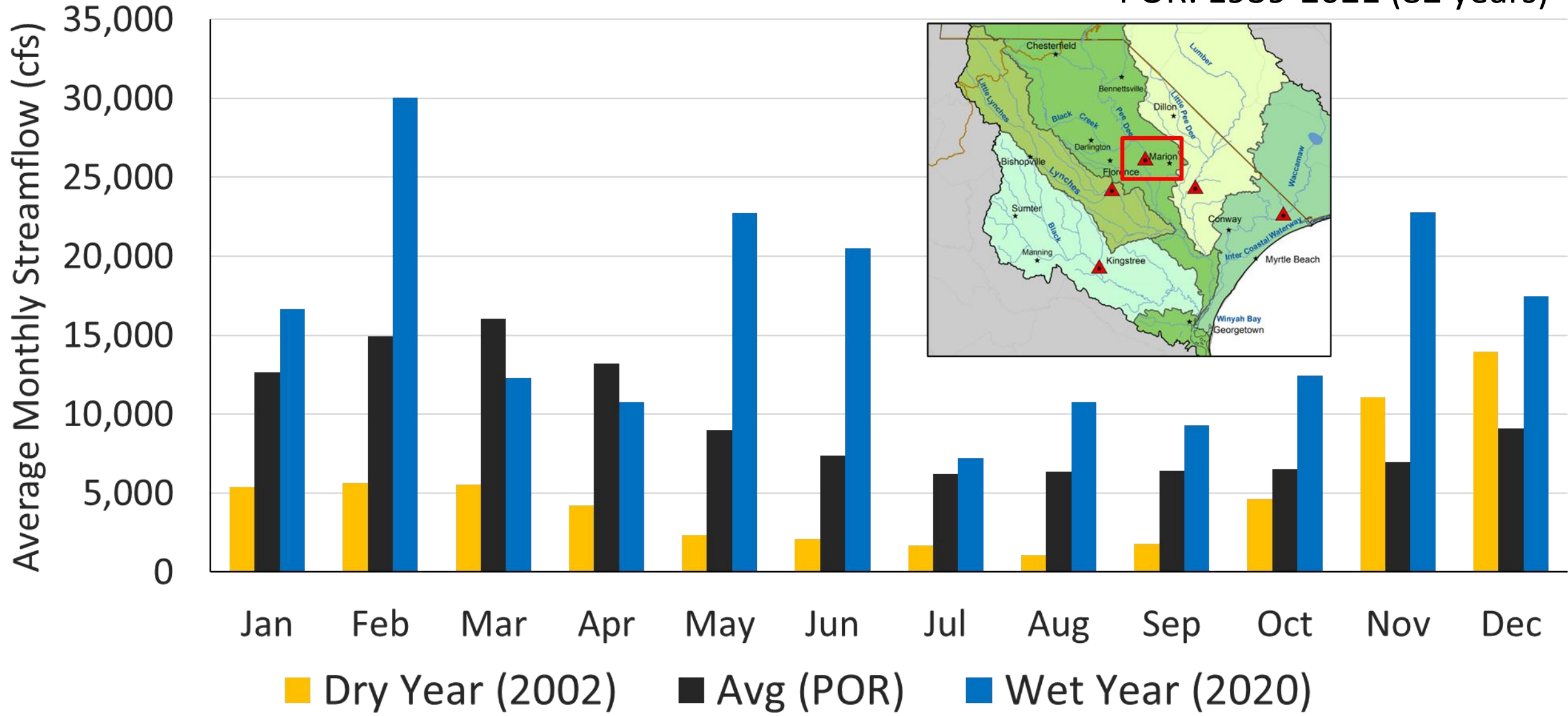


Average Monthly Flows



Pee Dee at Pee Dee

POR: 1939-2021 (82 years)



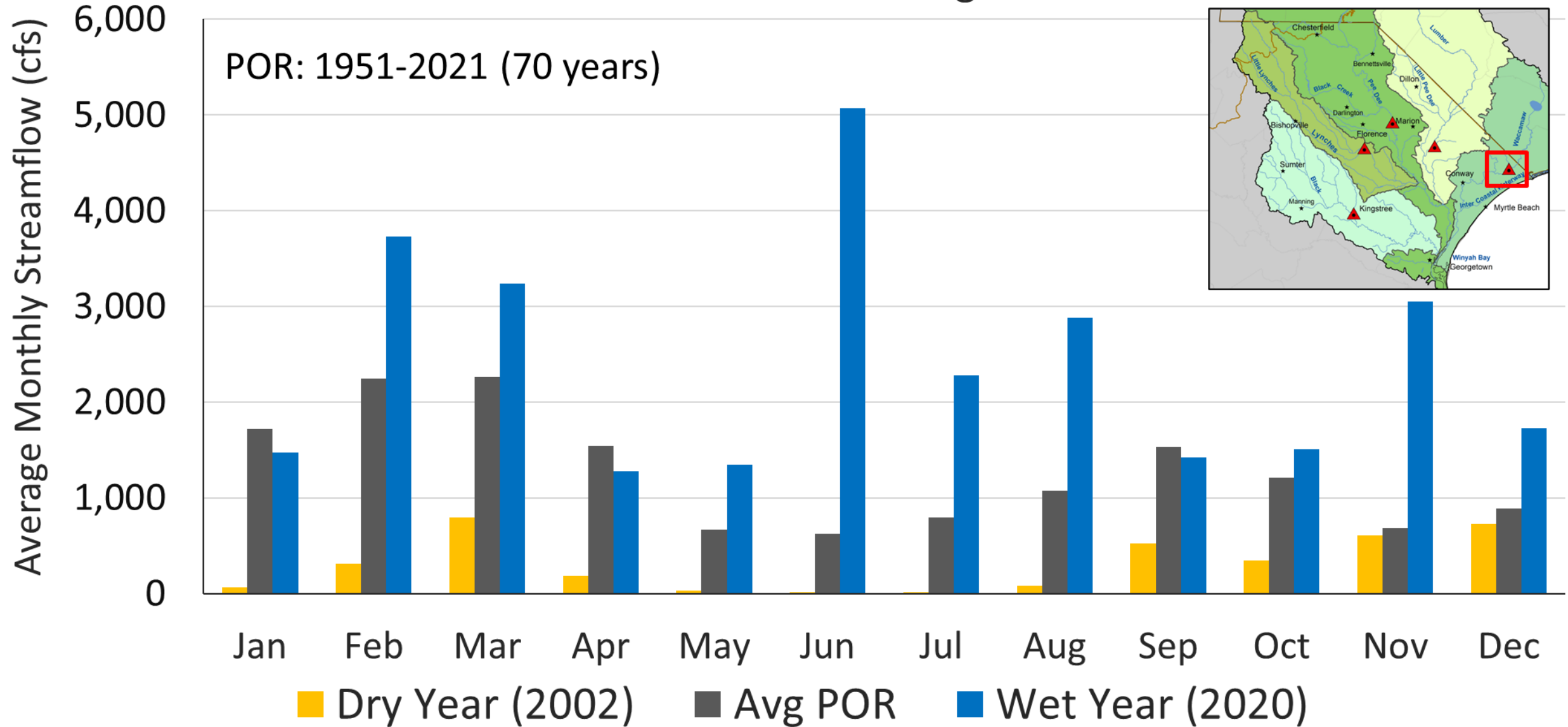


Average Monthly Flows



Waccamaw at Longs

POR: 1951-2021 (70 years)





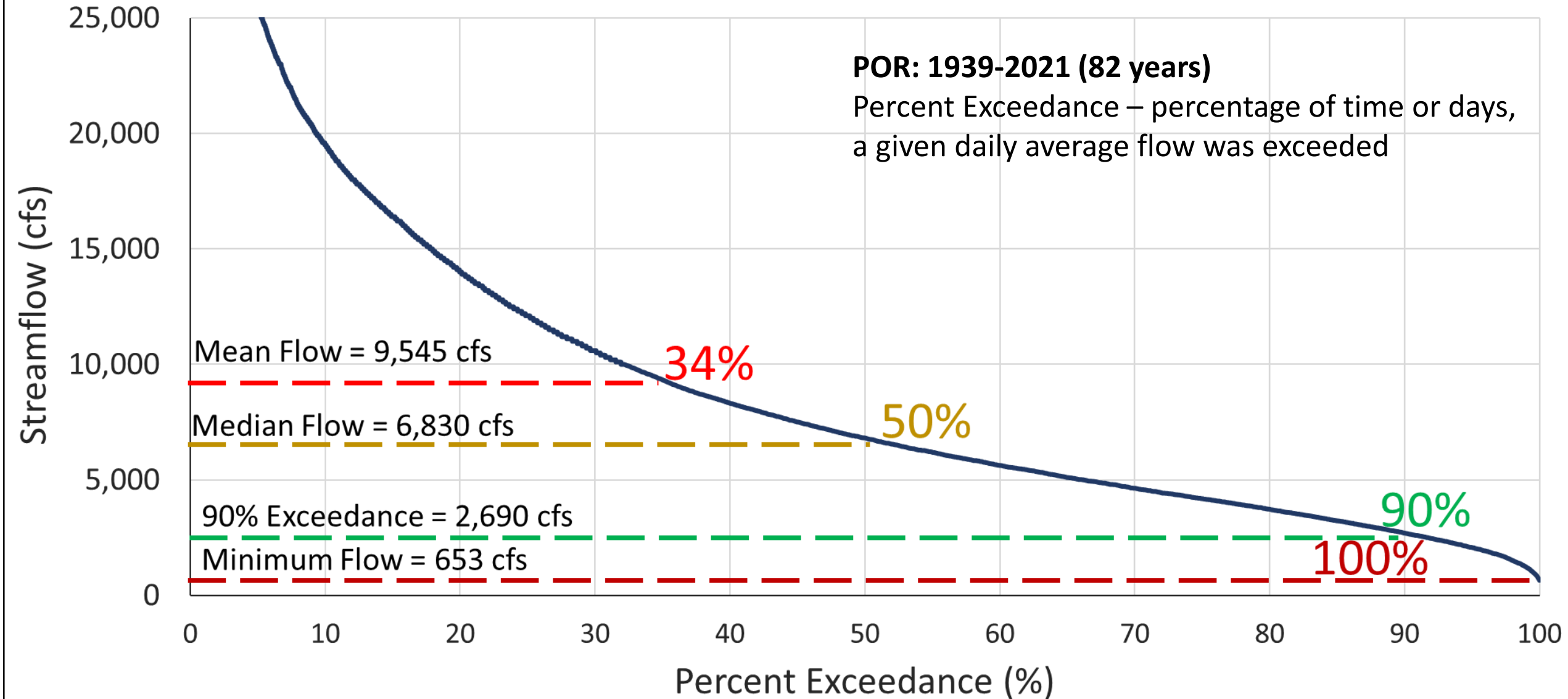
Flow Duration Curve



Pee Dee at Pee Dee

POR: 1939-2021 (82 years)

Percent Exceedance – percentage of time or days, a given daily average flow was exceeded





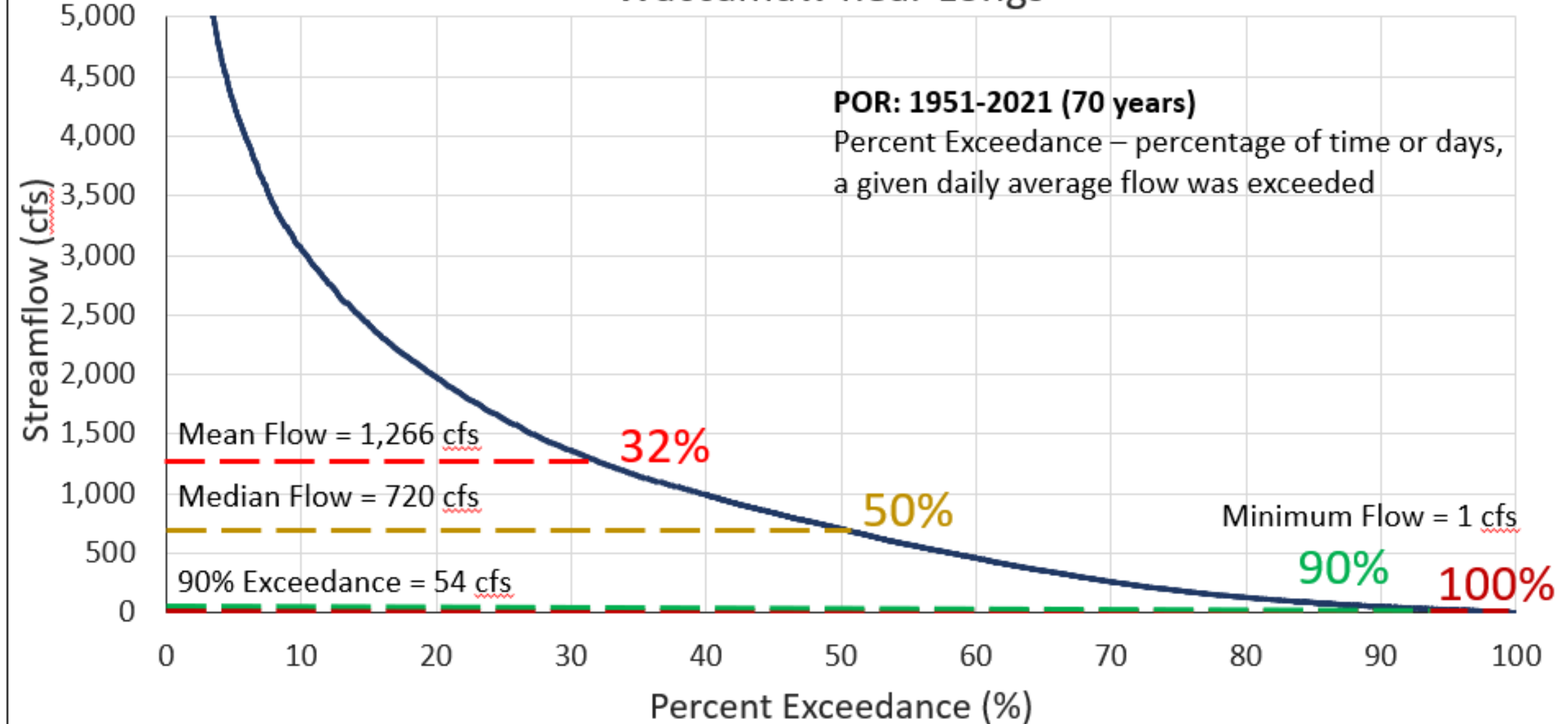
Flow Duration Curve



Waccamaw near Longs

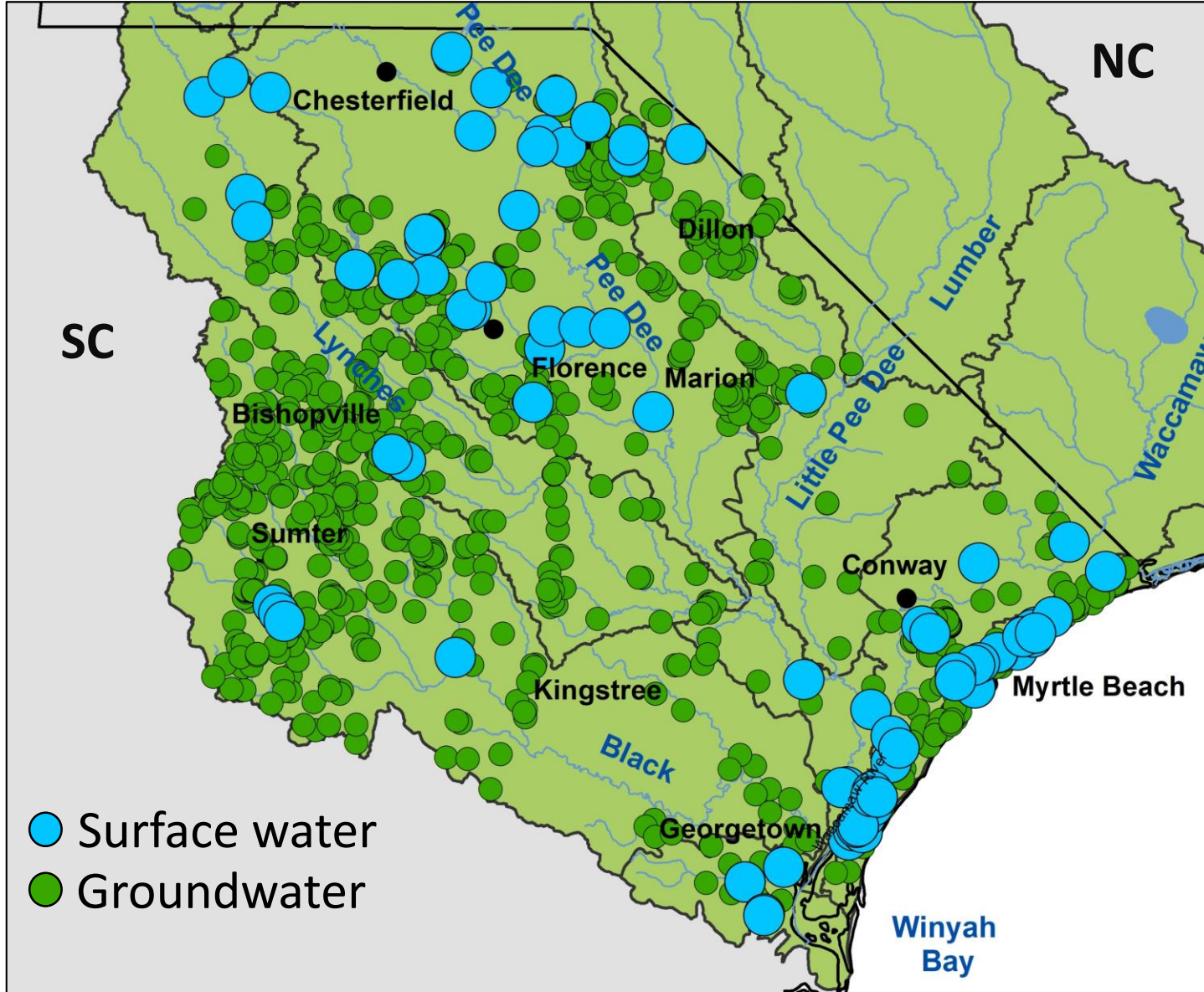
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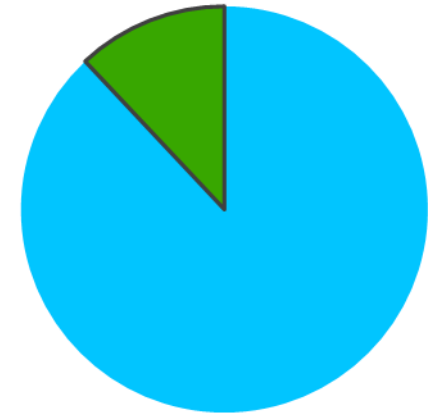




2021 Reported Water Withdrawals in SC



Both surface water and groundwater are important resources in the basin

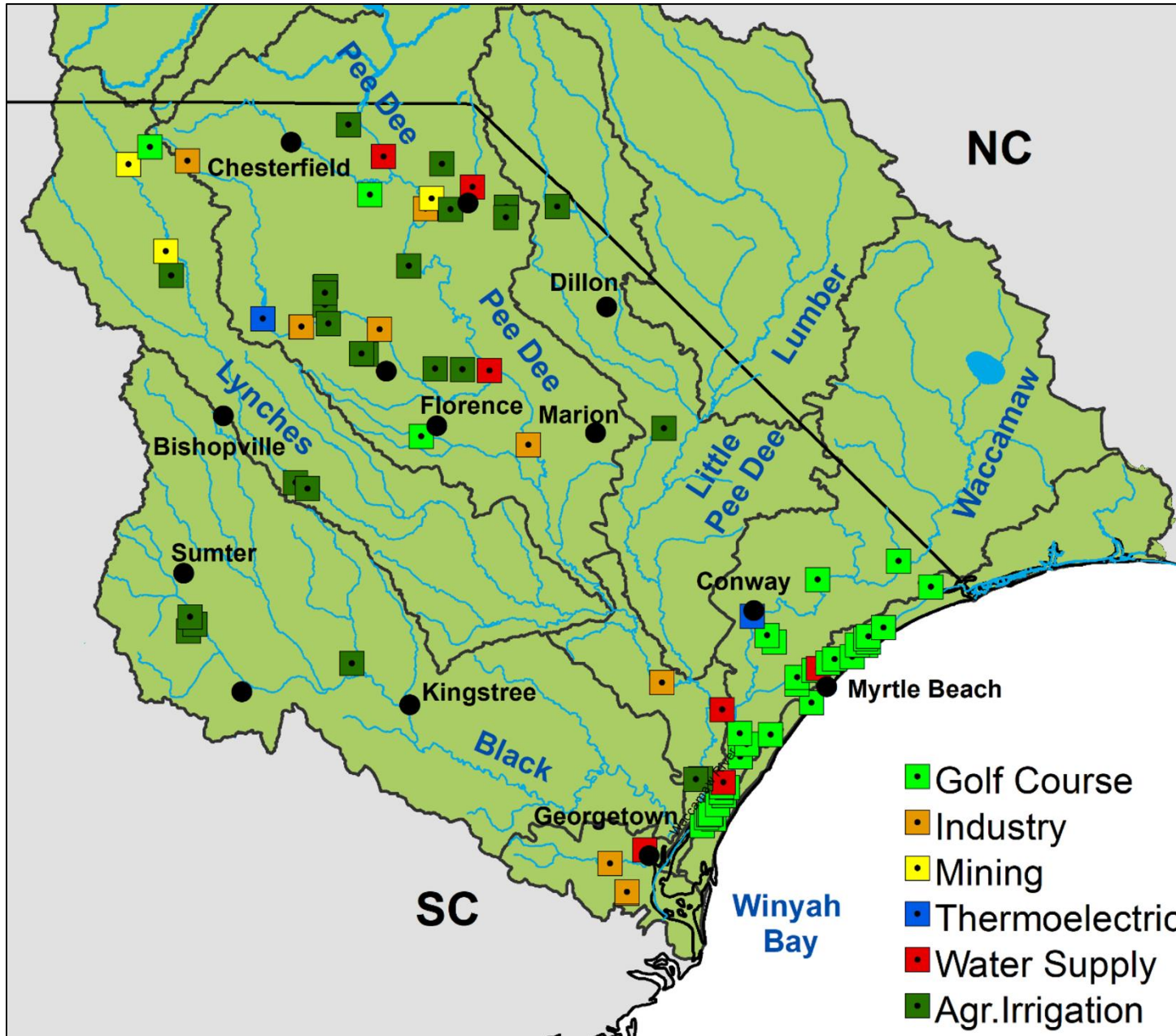


Including Energy

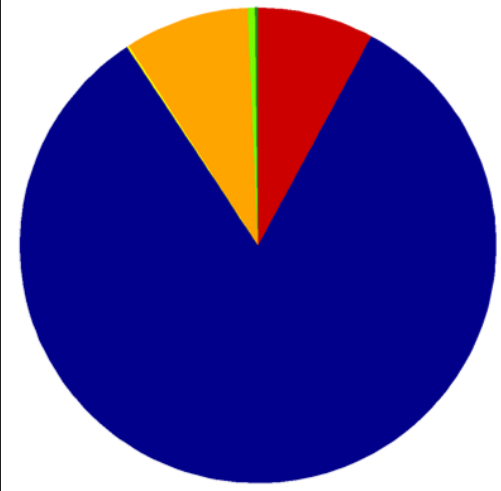


Excluding energy

2021 Reported Surface Water Withdrawals in SC

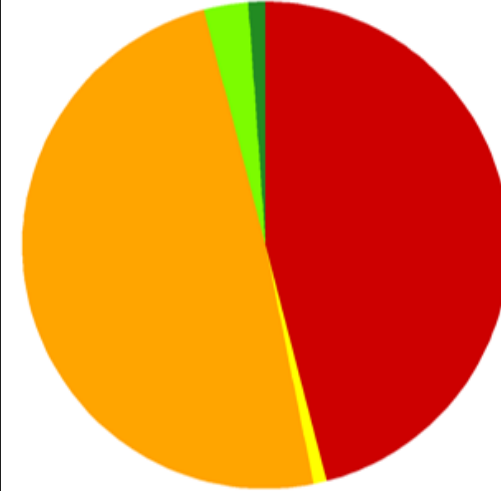


Including Energy



- Thermoelectric 82.8%
- Industry 8.4%
- Water Supply 7.9%
- Golf Course 0.5%
- Ag. Irrigation 0.2%
- Mining 0.2%

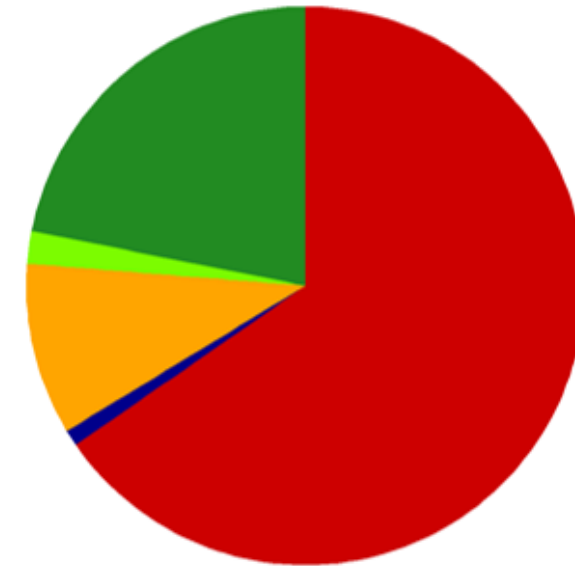
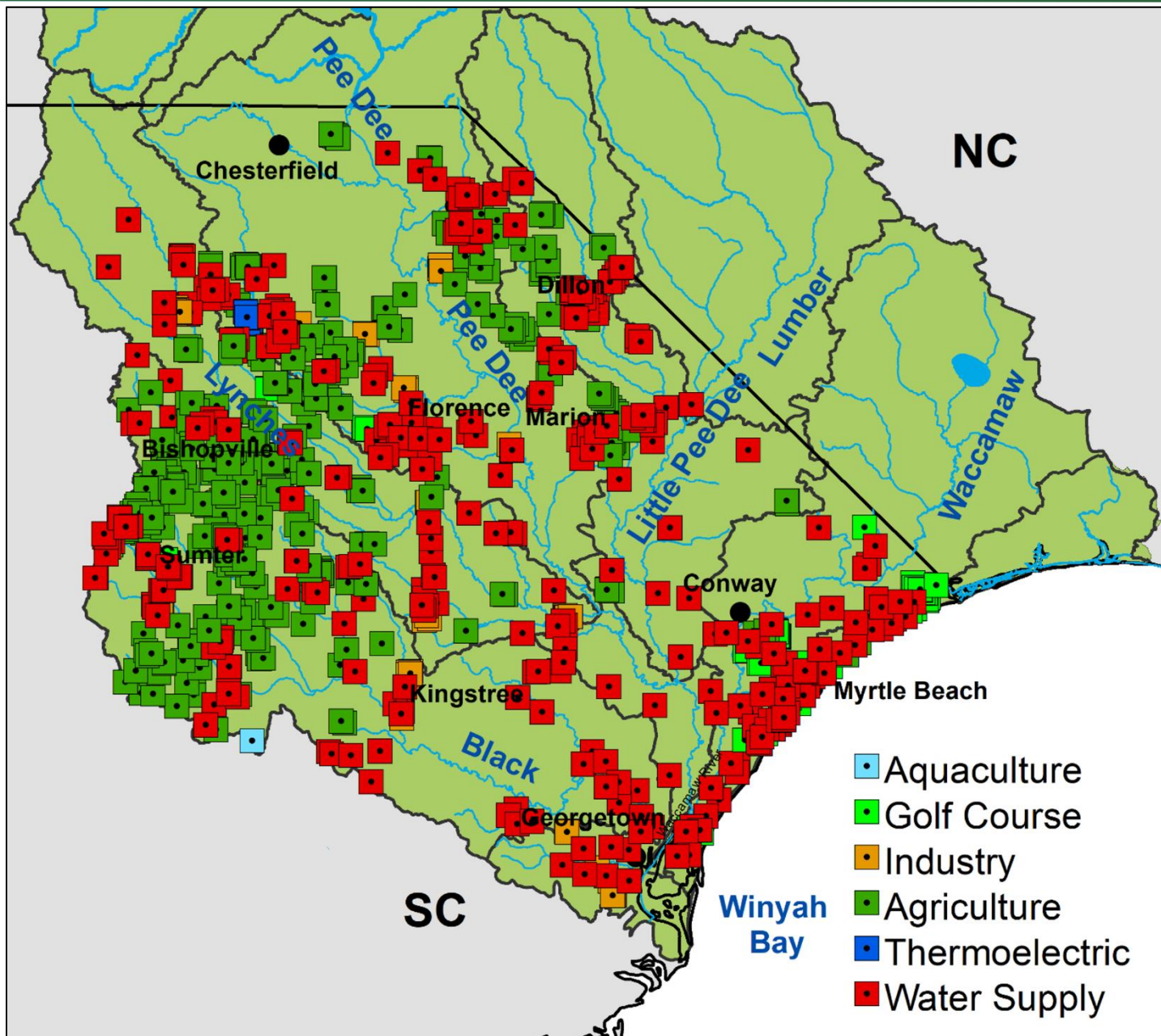
Excluding Energy



- Industry 49.1%
- Water Supply 46.0%
- Golf Course 2.9%
- Ag. Irrigation 1.1%
- Mining 0.9%

Data source: SCDHEC Water Use Database

2021 Reported Groundwater Withdrawals in SC



- Water Supply 65.4%
- Ag. Irrigation 21.9%
- Industry 10.0%
- Golf Course 1.9%
- Thermoelectric 0.9%

Data source: SCDHEC Water Use Database



Summary



SCDNR Contacts



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- Flows in the basin can be highly variable
 - Recent multi-year droughts have stressed the water resources in the basin
- Pee Dee River Basin extends into VA, NC, SC
 - Water availability in SC will be influenced by hydrologic conditions in NC
- Only 38% of the basin is regulated
- Complex hydrology
 - Major river systems like Black River, Waccamaw, and Little Pee Dee converge with the mainstem near the coast
 - Baseflows vary significantly from one subbasin to the next based on the geology
- Surface and Groundwater resources are important in the basin