

Climatology of South Carolina

Pee Dee River Basin Council

Hope Mizzell & Elliot Wickham
 South Carolina State Climatology Office
 SC Department of Natural Resources
 September 27th, 2022

STATION		THERMOMETER				REGISTER				DEW POINT		ITS COLOUR AND FORCE		WEATHER		QUANTITY	
NO.		APPROX.				EXPOSED IN THE SHADE				THERMOMETER		WIND		DIRECTION		RAIN	
		T. M.				T. M.				T. M.		T. M.		T. M.		T. M.	
3001	3001	58	64	62	53	66	54.0	N.E. 2	S.E. 2	Cloudy							
3002	3002	61	73	68	62	74	68	59.2	W. 1	S.E. 2	Fair						
3003	3003	62	62	57	53	62	57	55.7	N.E. 2	N.E. 3	Rain	0.18					
3004	3004	52	57	56	53	57	56	47.2	N.E. 2	N.E. 3	Cloudy						
3005	3005	56	61	57	54	61	57	51	61	50.8	N.E. 2	N.E. 3	Cloudy				
3006	3006	58	62	57	53	62	57	51	63	53.3	E. 2	N.E. 3	Rain	0.75			
3007	3007	61	61	62	61	62	62	53	64	55.7	S. 1	N.E. 2	Rain	1.64			
3008	3008	58	61	61	58	61	61	53	62	56.8	N.E. 1	N.E. 2	Rain	2.07			
3009	3009	51	59	51	52	58	46	43	43	45.7	N.W. 2	N.W. 3	Fair				
3010	3010	54	65	61	54	65	61	48	68	48.3	N.W. 2	N.W. 2	Fair				
3011	3011	53	60	60	52	61	60	47	61	48.0	E. 2	S.E. 3	Cloudy				
3012	3012	62	71	67	63	72	64	55	72	60.2	S.E. 2	S.E. 3	Rain	0.55			
3013	3013	63	72	64	63	72	64	55	73	60.2	N.W. 1	N.W. 2	Fair				
3014	3014	56	70	64	56	71	64	50	72	49.2	N.W. 1	E. 2	Fair				
3015	3015	60	75	61	61	75	60	55	75	57.7	S.E. 1	E. 2	Rain	0.35			
3016	3016	67	70	67	67	70	67	63	71	61.8	S. 2	N.W. 4	Rain	0.42			
3017	3017	58	58	49	58	53	43	58	43	43.3	N.W. 3	N.W. 4	Cloudy				
3018	3018	65	66	60	64	66	44	70	44	44.3	S.W. 2	S.W. 4	Fair				
3019	3019	64	66	61	64	65	60	59	65	57.7	N.W. 1	N.W. 3	Cloudy				
3020	3020	65	65	48	62	55	43	62	62	40.0	N.E. 2	S.W. 3	Fair				
3021	3021	62	62	53	67	62	45	69	48	48.0	S. 2	S. 2	Fair				
3022	3022	58	76	69	58	77	65	53	77	54.0	S.W. 1	S.W. 2	Fair				
3023	3023	64	78	70	65	79	69	59	78	61.0	S.W. 1	S.W. 2	Fair				
3024	3024	67	82	73	67	83	73	62	83	60.7	W. 1	S.W. 2	Fair				
3025	3025	65	73	66	65	73	66	60	74	57.0	N.E. 2	E. 3	Fair				
3026	3026	60	74	71	61	75	71	55	75	58.7	E. 1	E. 2	Fair				
3027	3027	70	80	73	71	81	73	65	81	66.5	S.W. 1	S. 2	Cloudy				
3028	3028	70	76	65	70	76	67	65	76	64.8	W. 1	N.W. 2	Rain	0.16			
3029	3029	60	75	69	60	76	69	54	76	54.3	E. 2	S.E. 2	Fair				
3030	3030	63	75	69	62	75	63	62	82	61.7	S.W. 1	S.W. 2	Fair				

April 1861

Charleston Board of Health Daily Weather Observations

from the "remarks" column:

April 12-"Rain most of the day, Bombardment of Sumter!"

April 13-"Cloudless day, Surrender of Fort Sumter!"

April 14-"Bright and cloudless Sabbath, Evacuation of F Sumter!"

REMARKS.		ABSTRACTS FOR	
1. Cloudy most of the day & at night.		Barometer	
2. Pleasant and clear day.		Maximum	
3. Cloudy and cold - Rain before daylight.		Minimum	
4. Cloudy and disagreeable day.		Range	
5. Cloudy and unpleasant day.			
6. Cloudy morning Rain after 3 P.M.			
7. Rain all day - very disagreeable.		Thermometer	
8. Rain all day - Heavy and continued showers.		Mean, 7th to 59.20 - 2.00	
9. Clear, cool and cloudless day.		Hottest Day, 24th - 6	
10. Beautiful and pleasant day.			
11. Cloudy most of the day.			
12. Rain most of the day - Bombardment of Sumter!		Thermometer	
13. Cloudless day - Surrender of Fort Sumter!		Mean, 7th to 59.50 - 2.00	
14. Bright & cloudless Sabbath - Evacuation of F Sumter!		Maximum, 7th to 71.20	
15. Bright morning - Cloudy & Rain after 4 P.M.		Minimum, 7th to 48.00	
16. Rain, disagreeable - but windy after 4 P.M.			
17. Cloudy most of the day - wind high.			
18. Bright and pleasant day - high wind.		Register	
19. Cloudy most of the day - clear after 4 P.M.		Mean Night, 53.76 -	
20. Cloudless and beautiful day.			
21. Beautiful and cloudless Sabbath day.		Dew Point	
22. Clear and delightful day.		Mean	
23. Bright and pleasant day.			
24. Cloudless and warm day.		Winds	
25. Clear and pleasant day.			
26. Bright and cloudless day.		Winds	
27. Cloudy with light shower in morning - clear afterwards.		North 0.	
28. Rain at 4 A.M. - clear & cloudless afterwards.		South east 7.	
29. Cloudless and delightful day.		South west 6.	
30. Warm and cloudless day.		South 3.	
		South east 2.	
		South west 5.	
		East 4.	
		West 3.	
		Weather	
		Fair, 15 days - Cloudy, 7th	
		Variable months -	
		Quantity of	
		Inches	



SC State Climatology Office Team



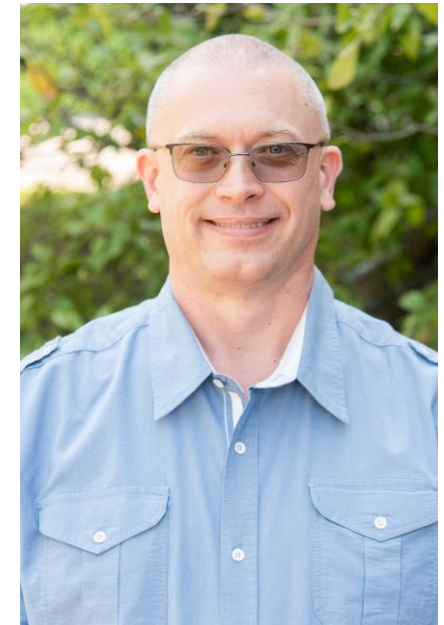
Hope Mizzell
South Carolina
State Climatologist



Melissa Griffin
Assistant State
Climatologist



Elliot Wickham
Water Resource
Climatologist



Frank Strait
Severe Weather
Liaison

What Is A State Climatology Office?

Promote climate and weather awareness and knowledge through the development and delivery of science-based climate services and tools on a local and state level.



Climate Office Responsibilities

1

Coordinate and collect weather observations for the purpose of climate monitoring

2

Summarize and disseminate weather and climate information

3

Perform climate and weather impact assessments

4

Demonstrate the value of climate information in the decision-making process

5

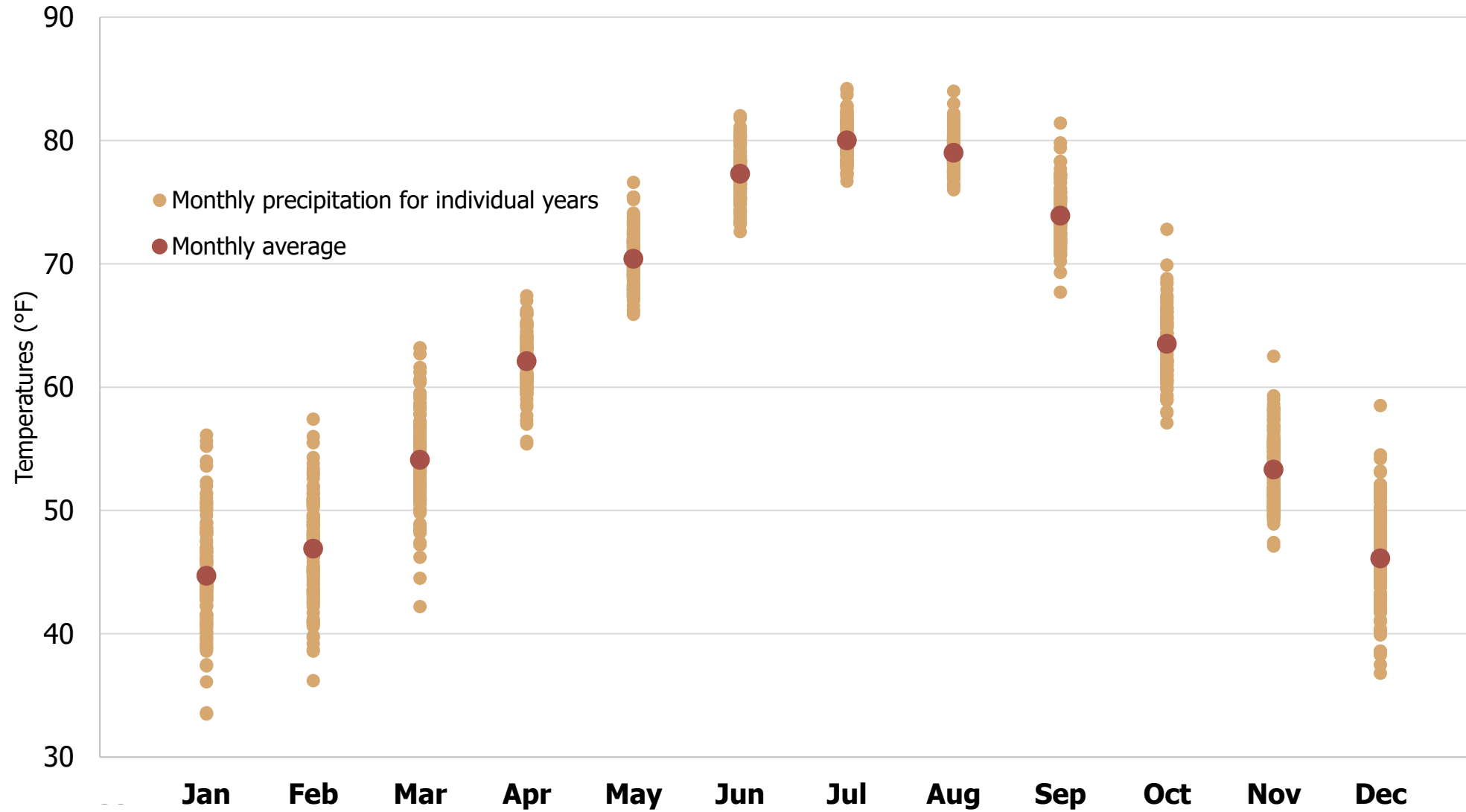
Conduct applied climate research



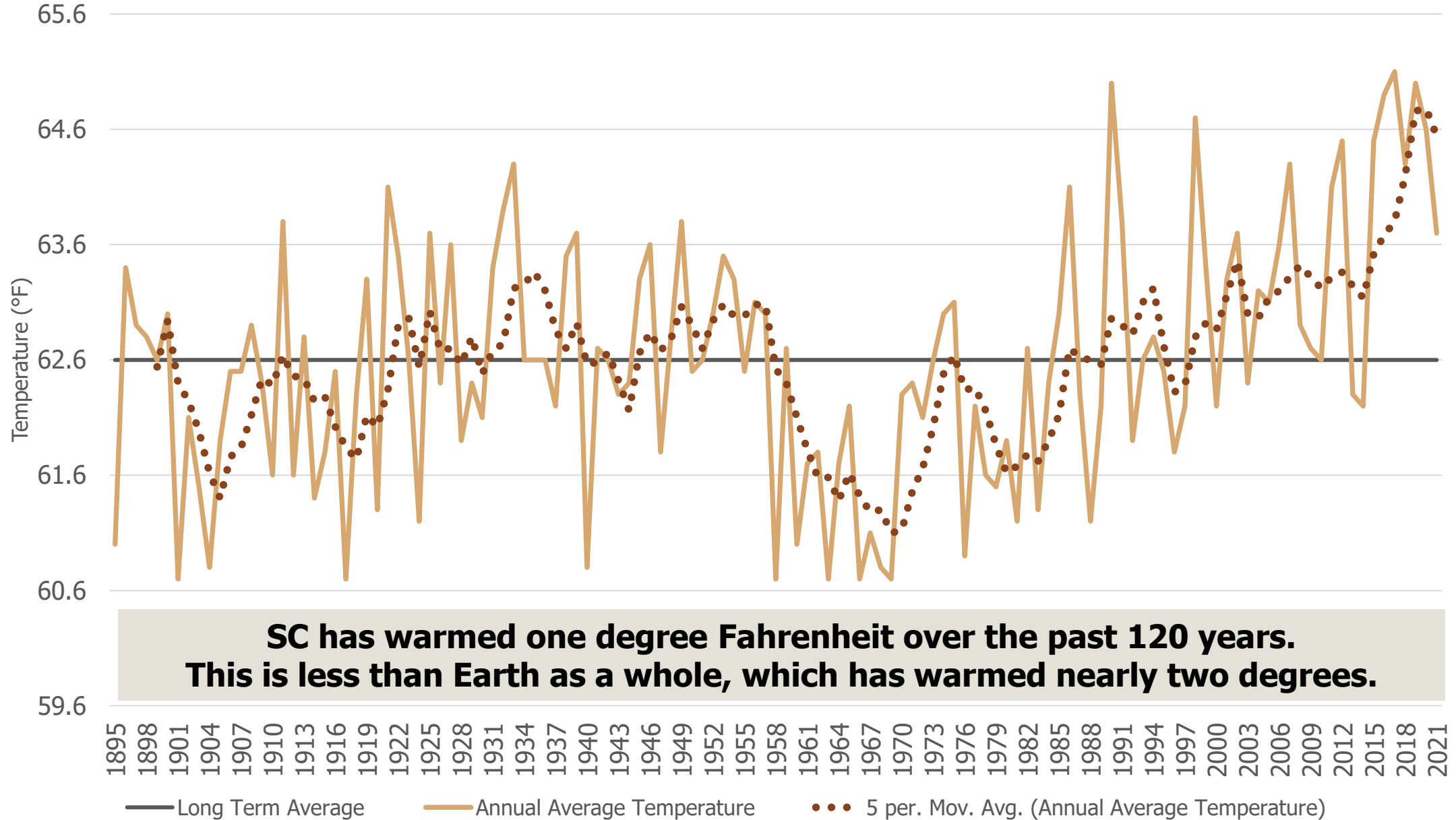
Temperatures

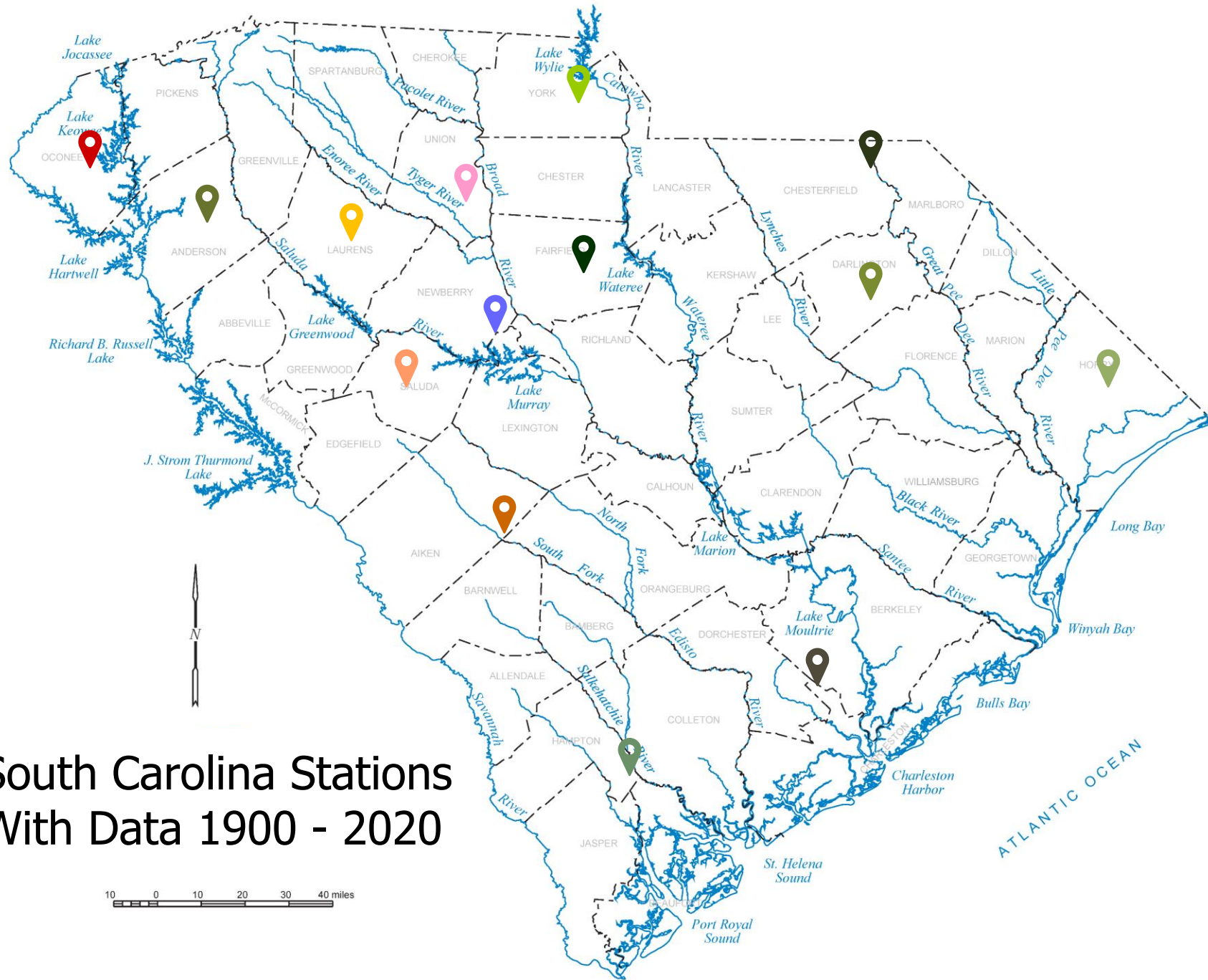


South Carolina Monthly Average Temperature (1895 – 2021)



South Carolina Annual Average Temperature (1895 – 2021)



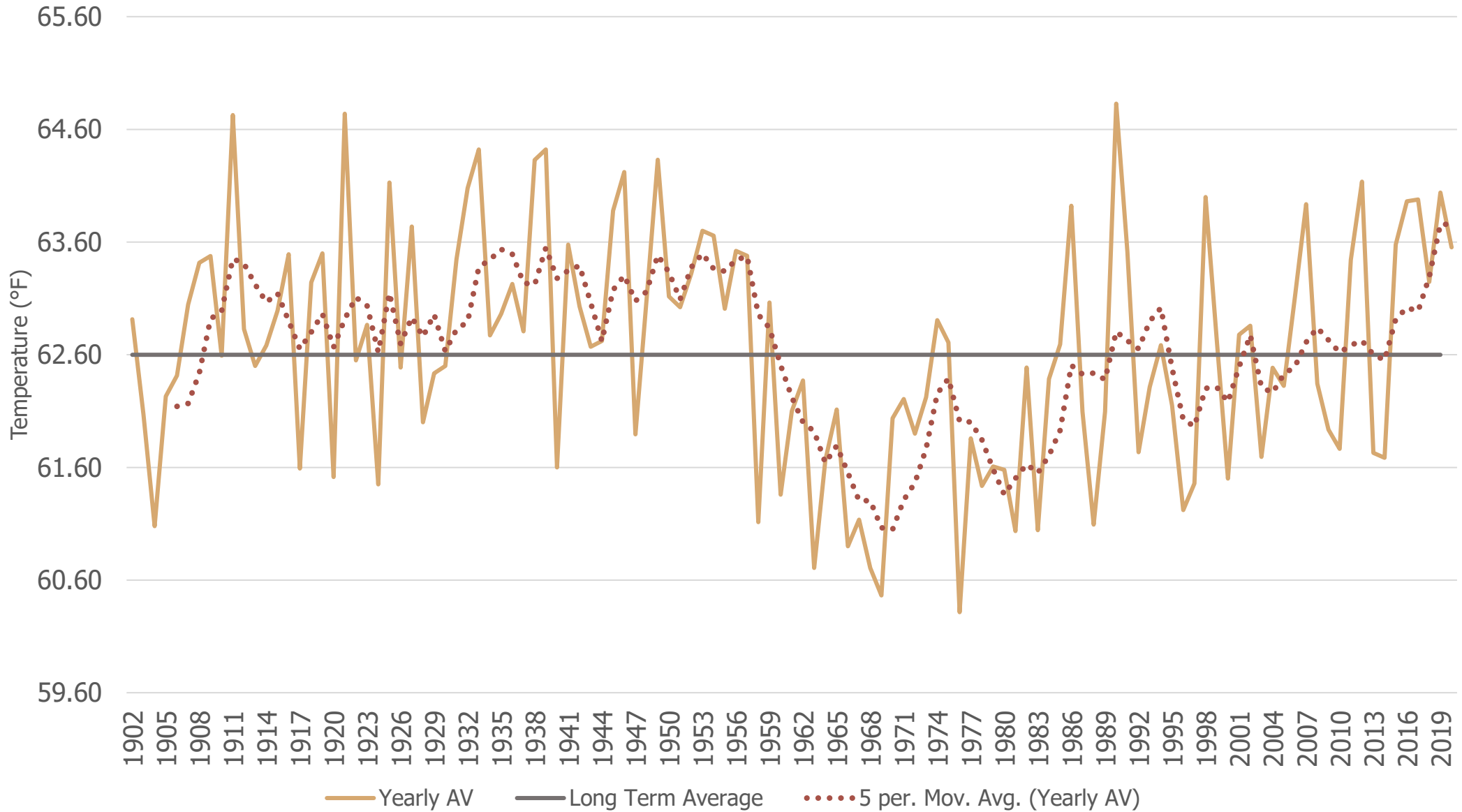


South Carolina Stations With Data 1900 - 2020

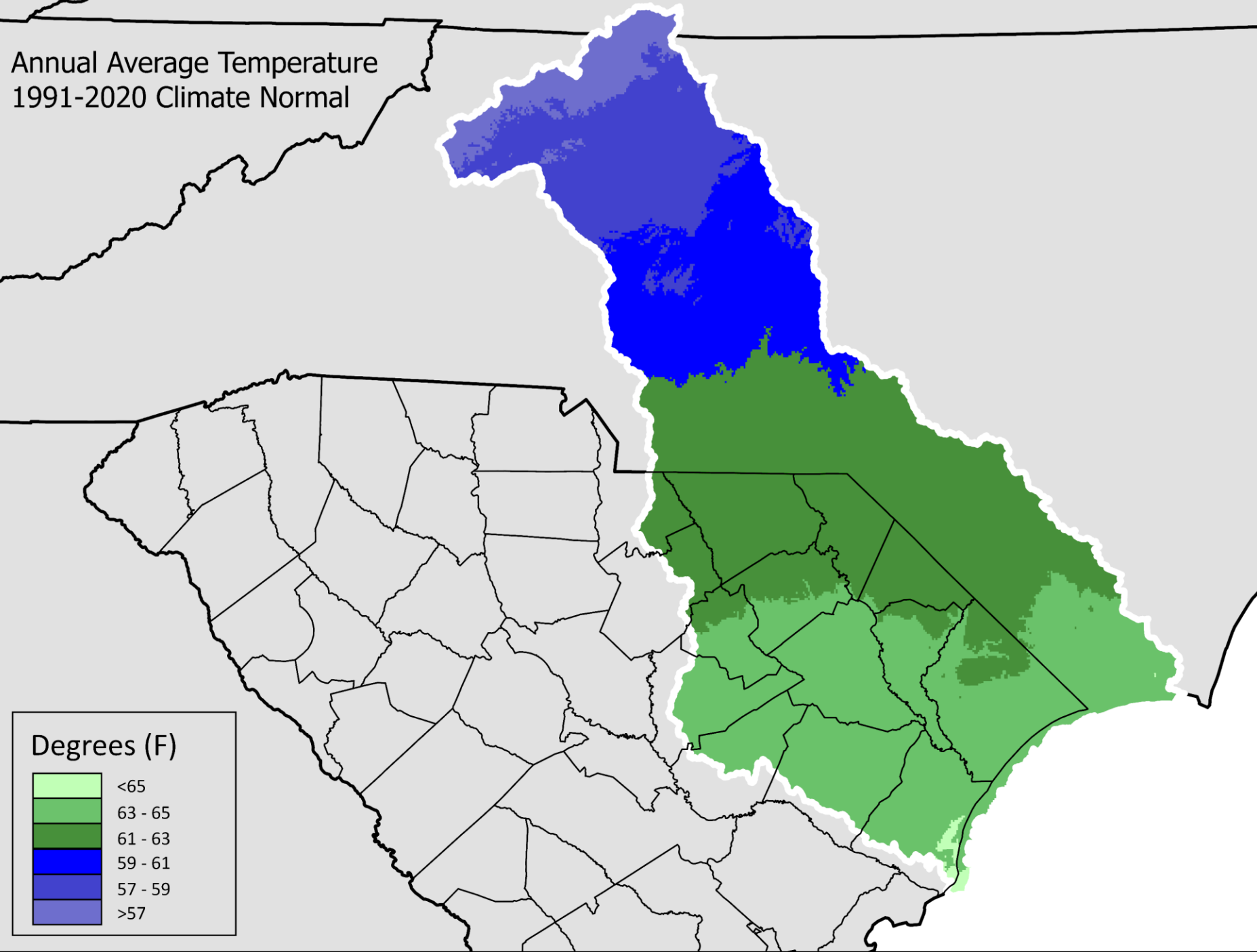
- 📍 Anderson
- 📍 Blackville
- 📍 Cheraw
- 📍 Conway
- 📍 Darlington
- 📍 Laurens
- 📍 Little Mountain
- 📍 Saluda
- 📍 Santuck
- 📍 Summerville
- 📍 Walhalla
- 📍 Winnsboro
- 📍 Winthrop University
- 📍 Yemassee

South Carolina Long-Term Stations

Annual Average Temperature (1902 – 2020)



Annual Average Temperature
1991-2020 Climate Normal

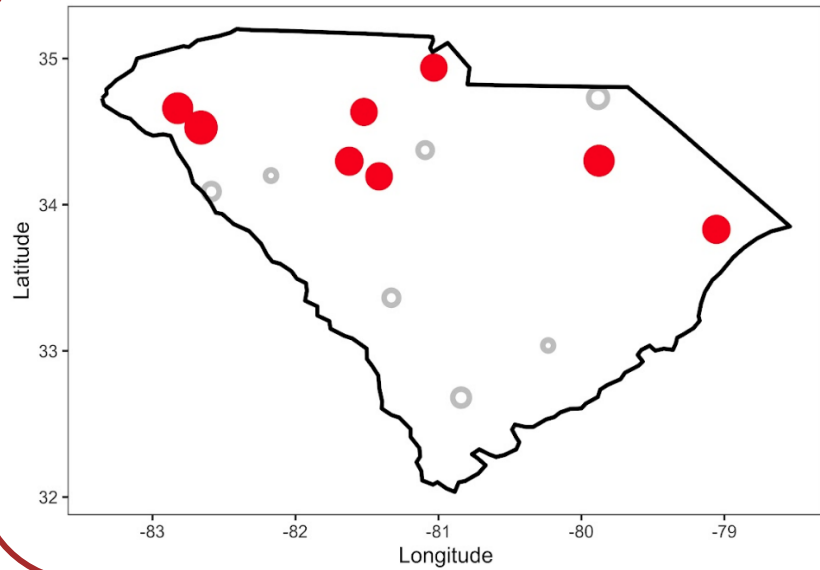


Annual Average temperatures range from just below 57 degrees to just above 65 degrees (F).

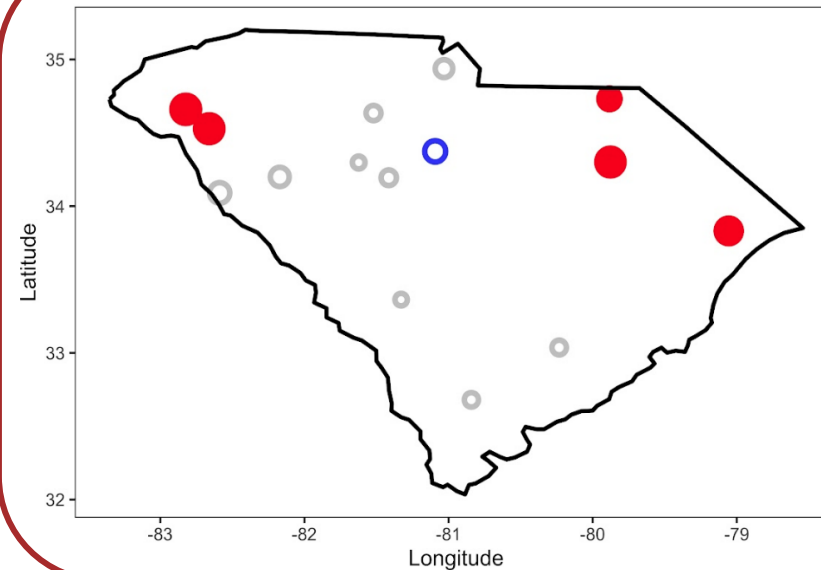
Annual Average Temperature increases as you move down the basin.

In the South Carolina Portion of the Basin, temperatures range from 61 degrees to just above 65 degrees (F)

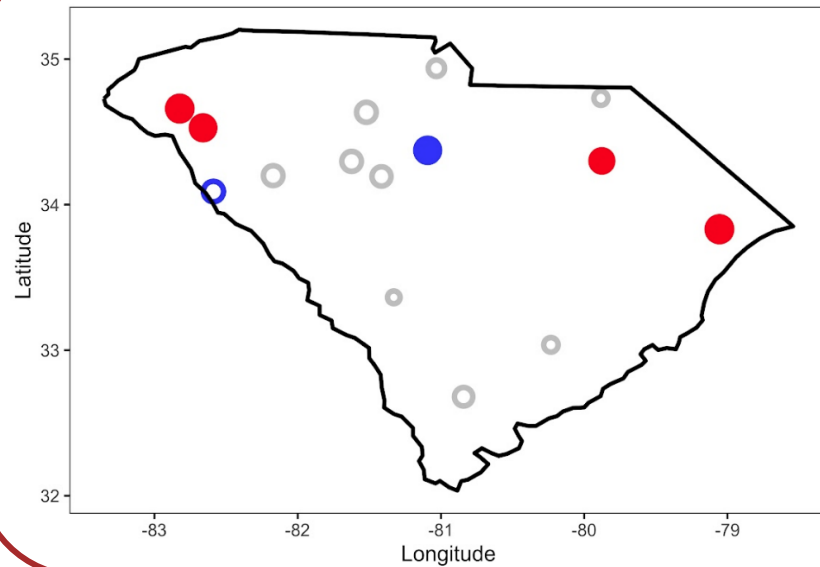
Trend of Maximum Temperature, Spring



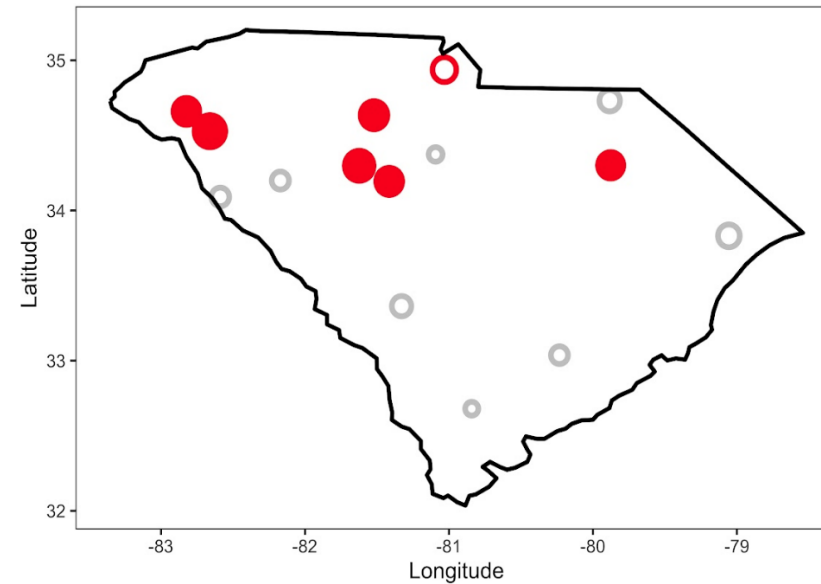
Trend of Maximum Temperature, Summer



Trend of Maximum Temperature, Fall



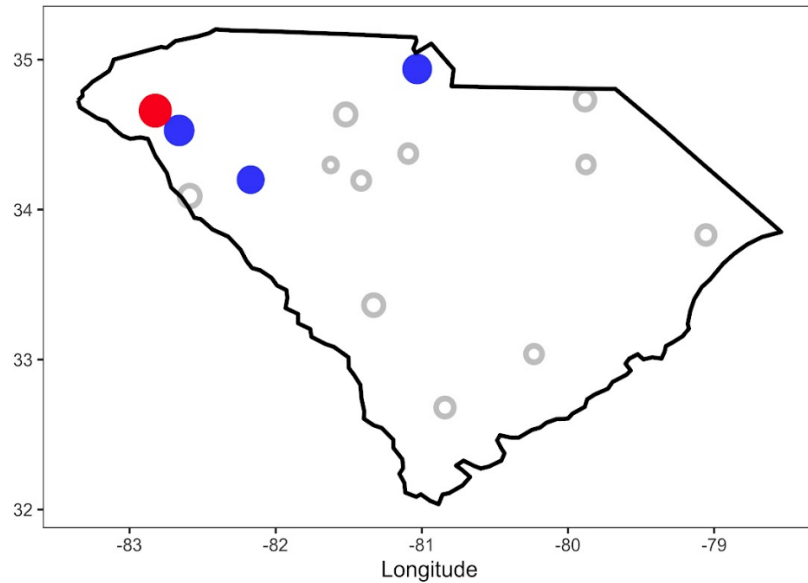
Trend of Maximum Temperature, Winter



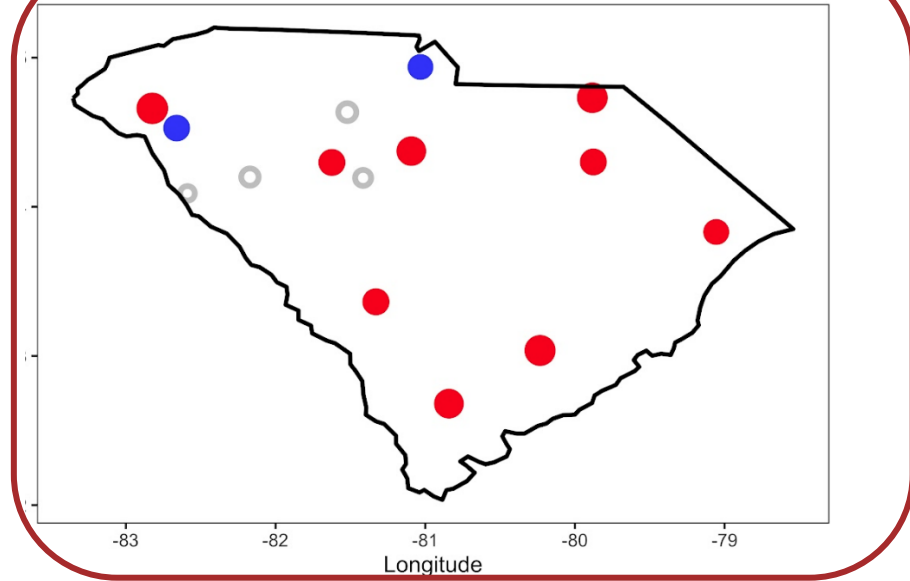
- Decrease
- Statistically-significant decrease

- Increase
- Statistically-significant increase

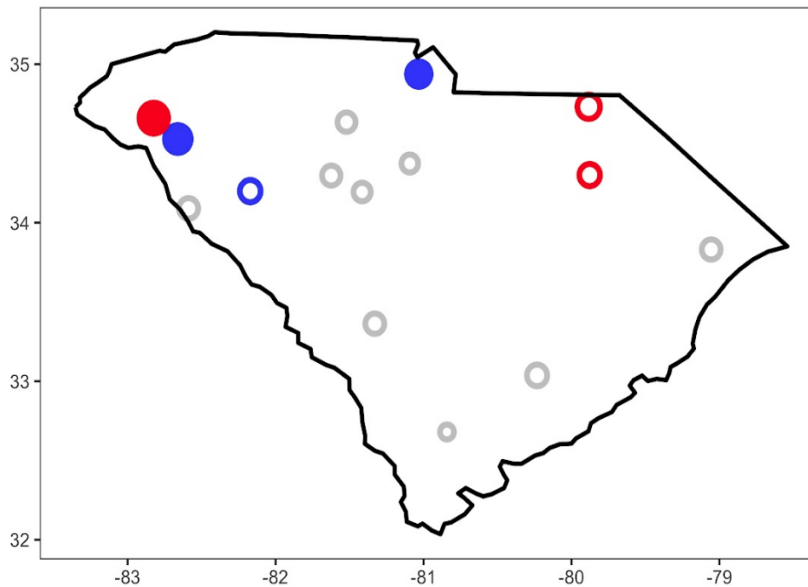
Trend of Minimum Temperature, Spring



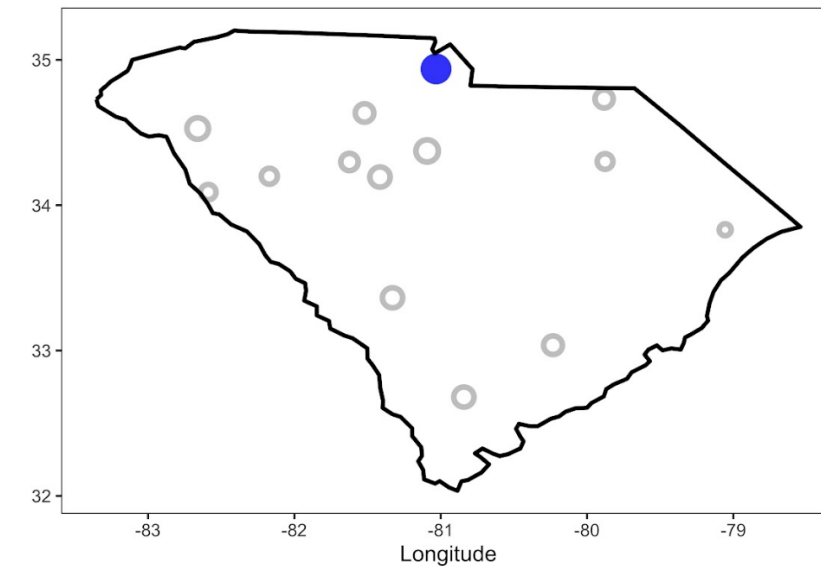
Trend of Minimum Temperature, Summer



Trend of Minimum Temperature, Fall



Trend of Minimum Temperature, Winter

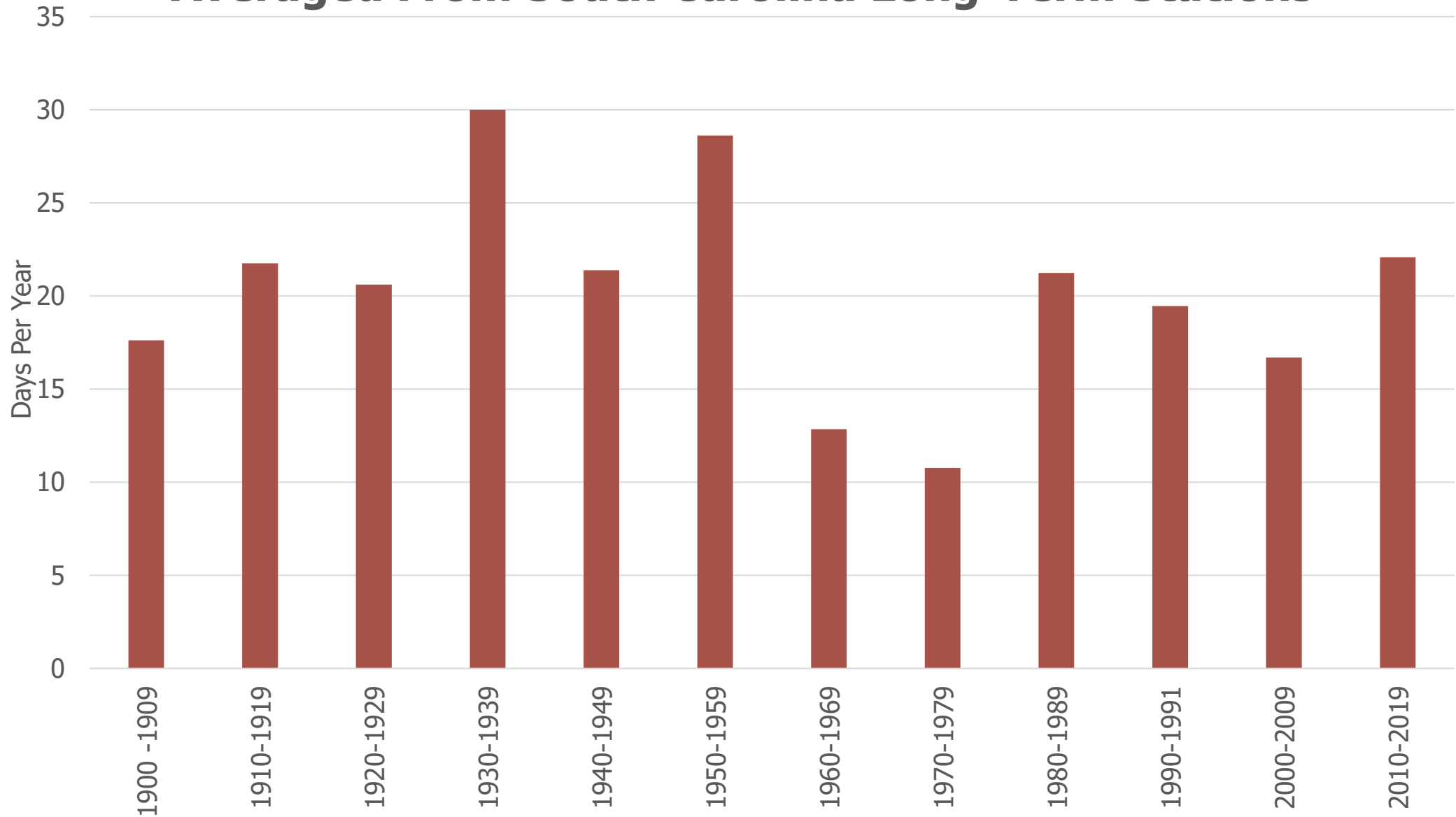


- Statistically-significant decrease
- Decrease

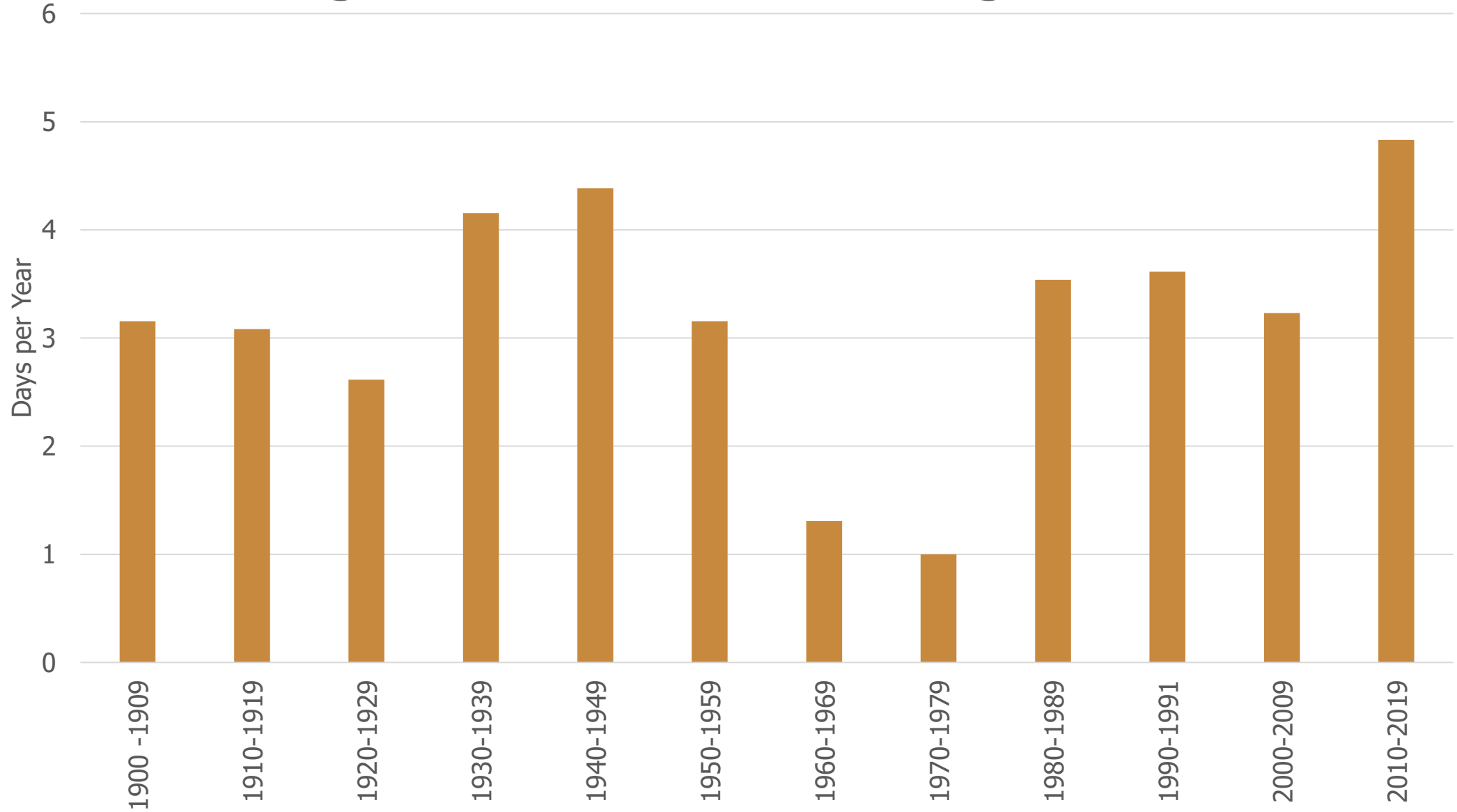
- Increase
- Statistically-significant increase



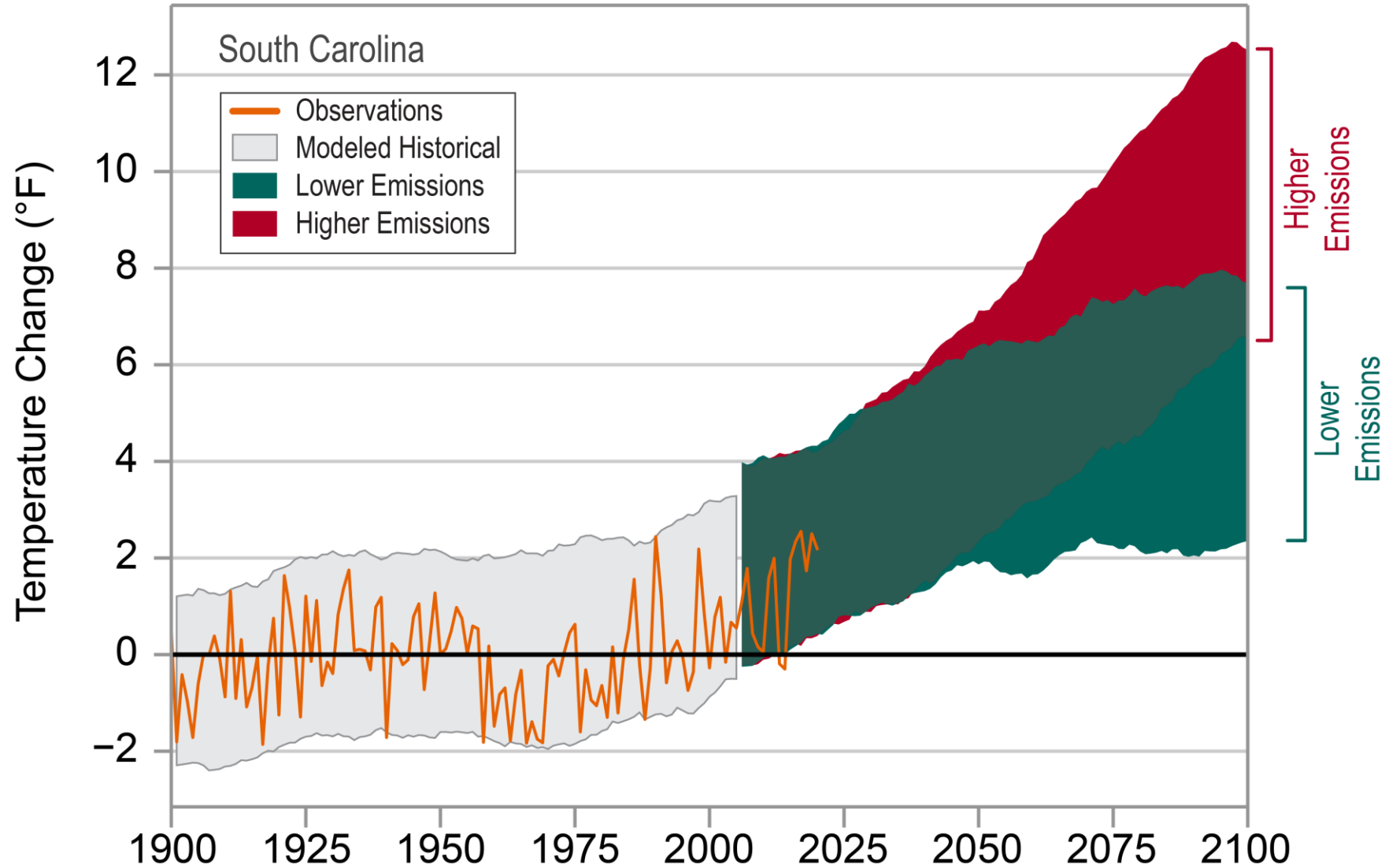
Number of Days Maximum Temperature Above 95°F Averaged From South Carolina Long-Term Stations

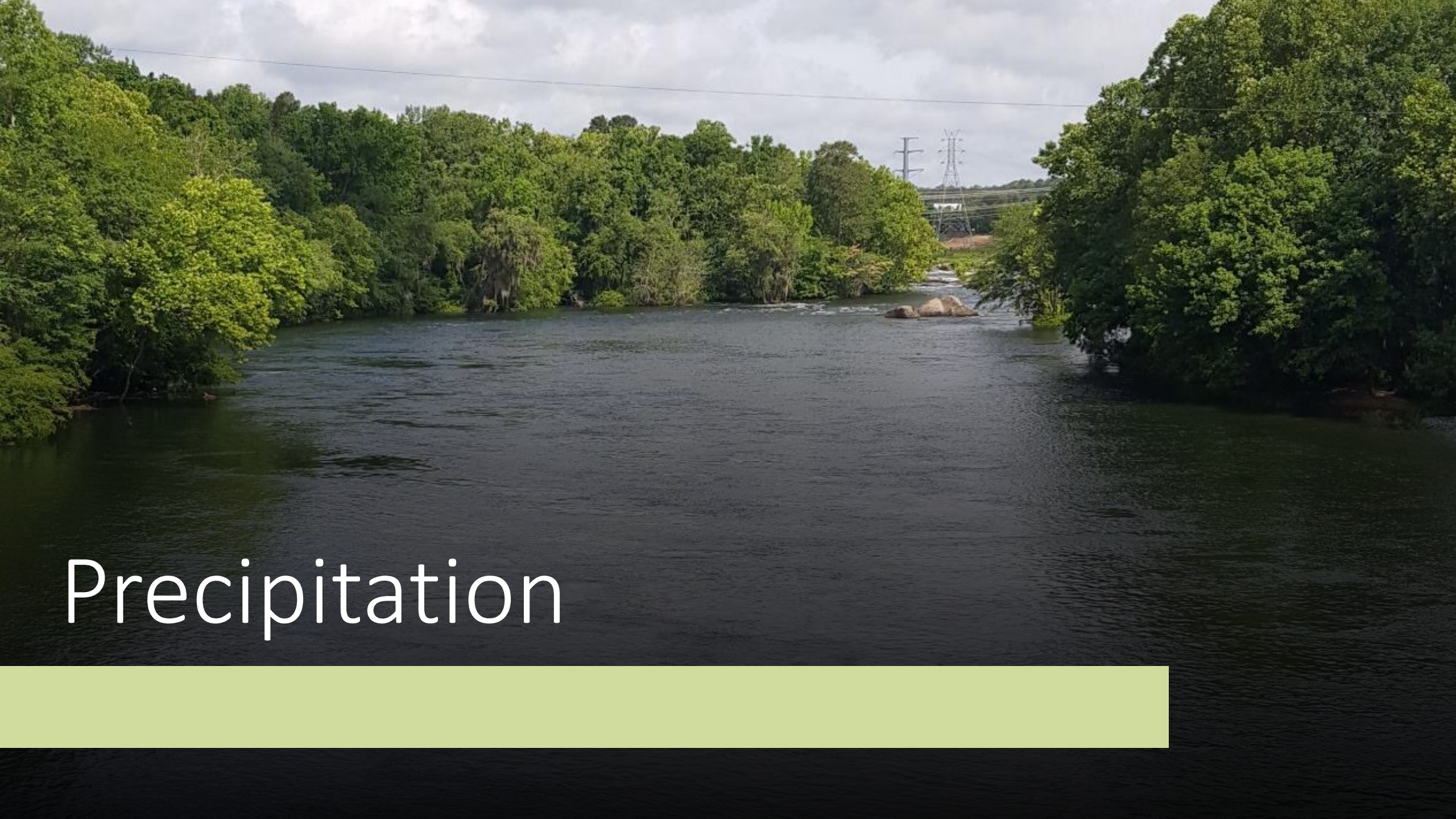


Number of Days Minimum Temperature Above 75°F Averaged From South Carolina Long-Term Stations



Observed and Projected Temperature Change

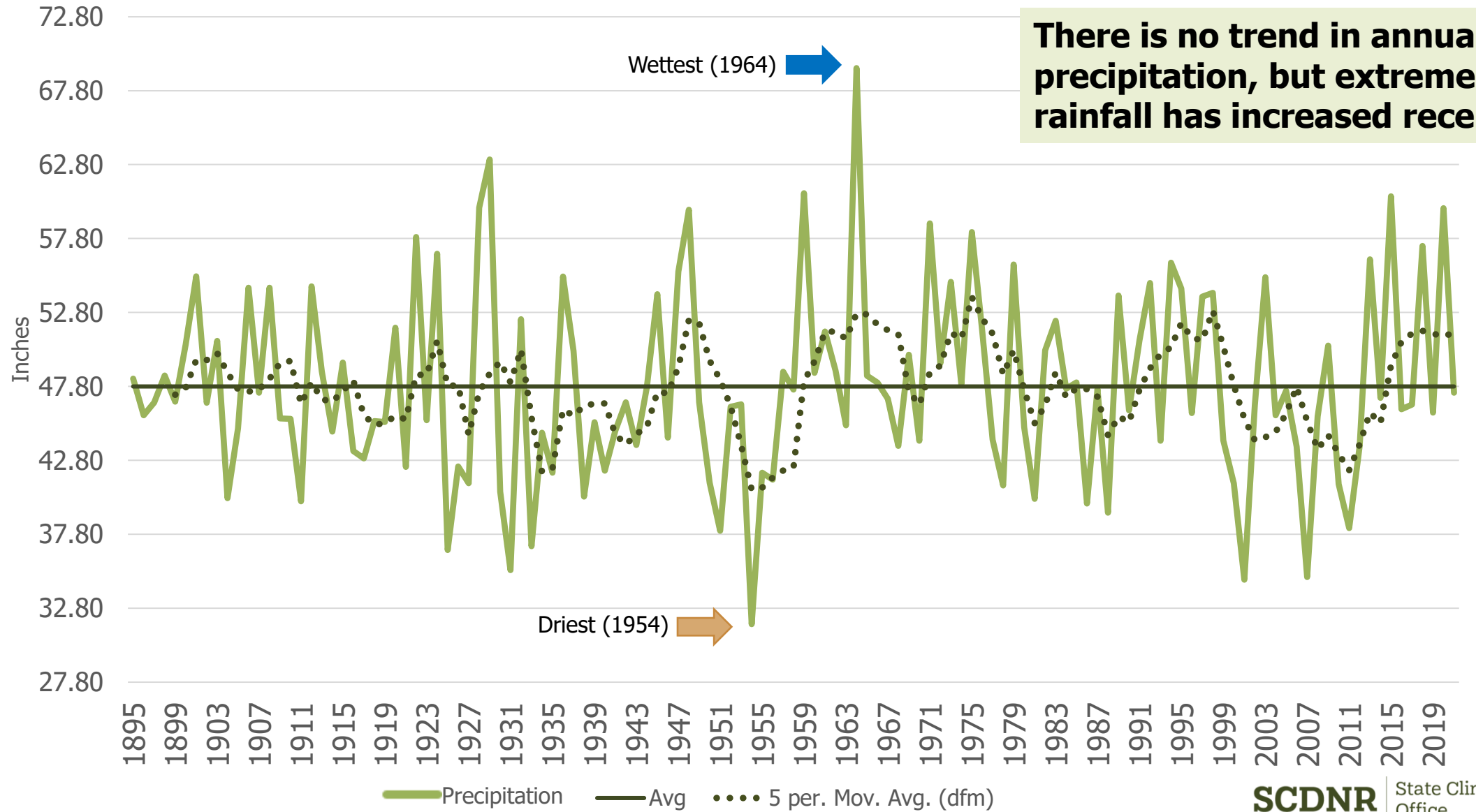




Precipitation

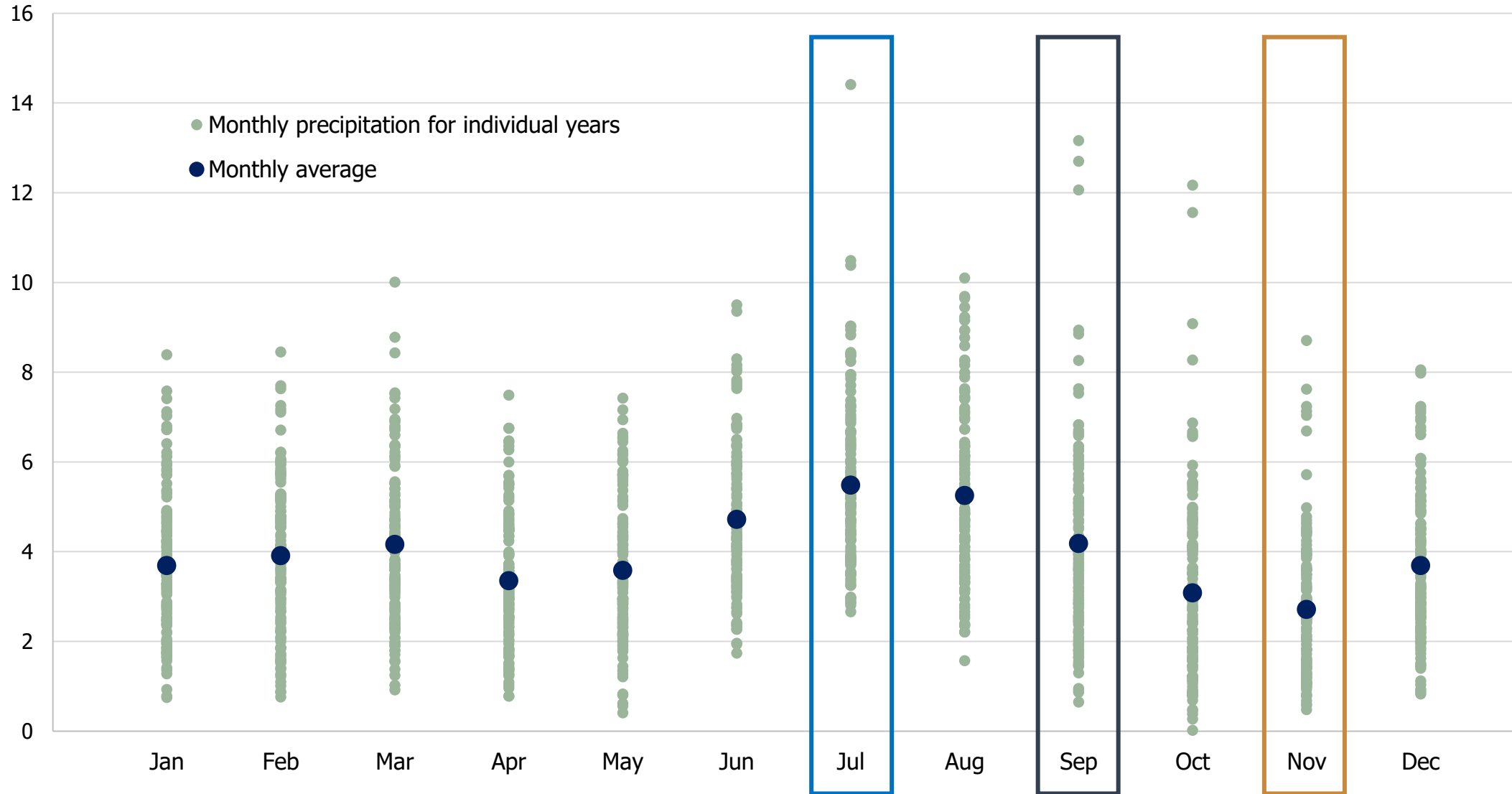


South Carolina Annual Precipitation (1895 – 2021)



There is no trend in annual precipitation, but extreme rainfall has increased recently.

South Carolina Monthly Precipitation (1895 – 2021)



Ten Driest Years from Long-Term Stations in South Carolina (1902 – 2020)

Note: Percent of Normal based on 1902- 2020 average of 47.85"

Year	Rainfall Total	Percent of Normal
★ 2007	33.18"	69.35%
1954	33.27"	69.53%
★ 2001	33.50"	70.01%
1925	36.13"	75.52% +
1931	37.04"	77.41% +
1933	37.24"	77.84% +
★ 2011	39.10"	81.72%
1986	39.74"	83.06%
1938	39.81"	83.21% +
1921	39.93"	83.45% +

★ 3 of 10 driest occurred during 2001-2020

+ 5 of 10 driest occurred during 1921-1940

Ten Wettest Years from Long-Term Stations in South Carolina (1902 – 2020)

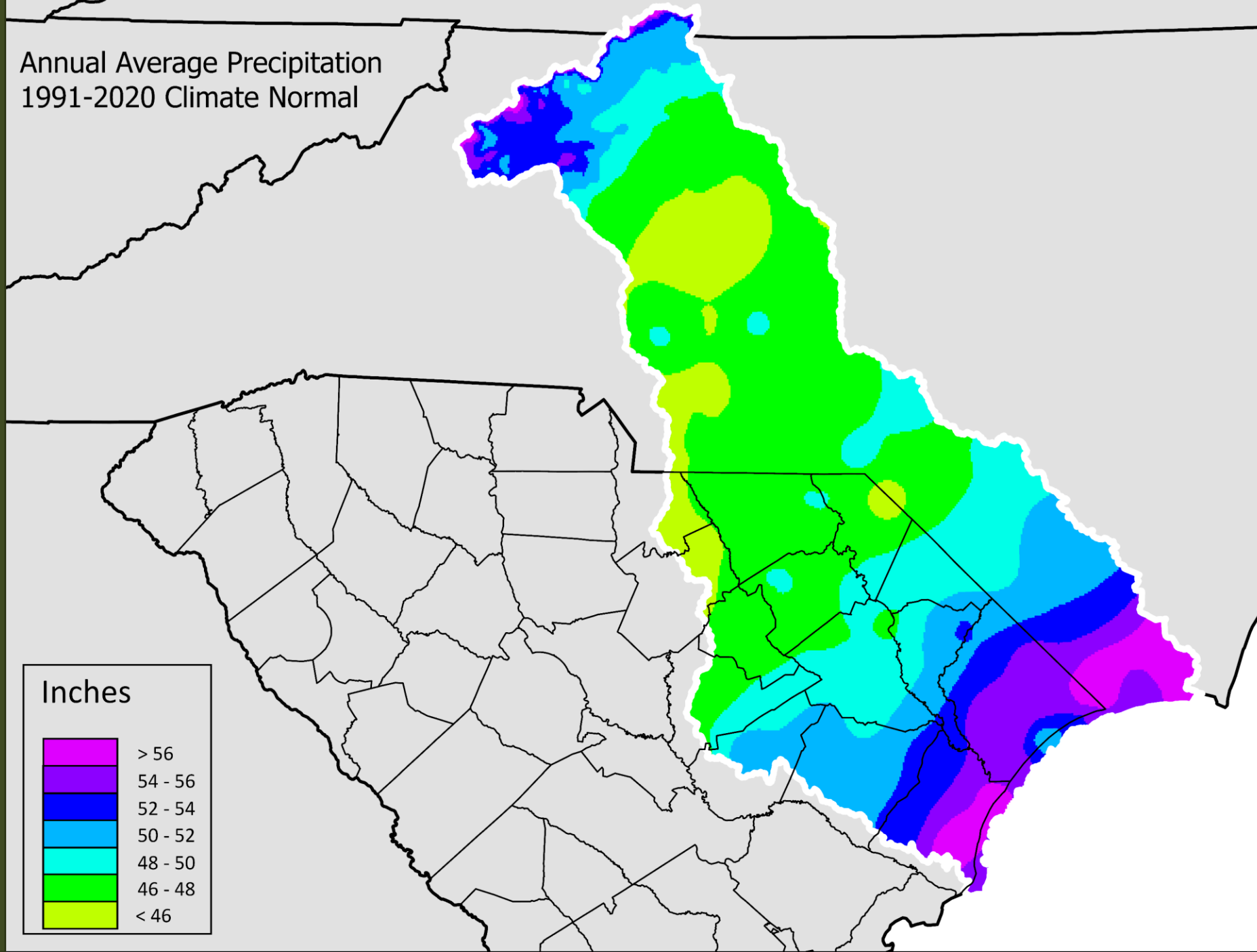
Note: Percent of Normal based on 1902- 2020 average of 47.85"

Year	Rainfall Total	Percent of Normal
1964	70.23"	146.79%
1929	64.73"	135.28% +
★ 2018	61.98"	129.54%
★ 2015	61.90"	129.38%
1959	61.10"	127.69%
★ 2020	60.77"	127.01%
1948	58.98"	123.27%
★ 2013	58.86"	123.03%
1975	58.73"	122.74%
1924	57.98"	121.19% +

★ 4 of 10 wettest occurred during 2001-2020

+ 2 of 10 wettest occurred during 1921-1940

Annual Average Precipitation
1991-2020 Climate Normal



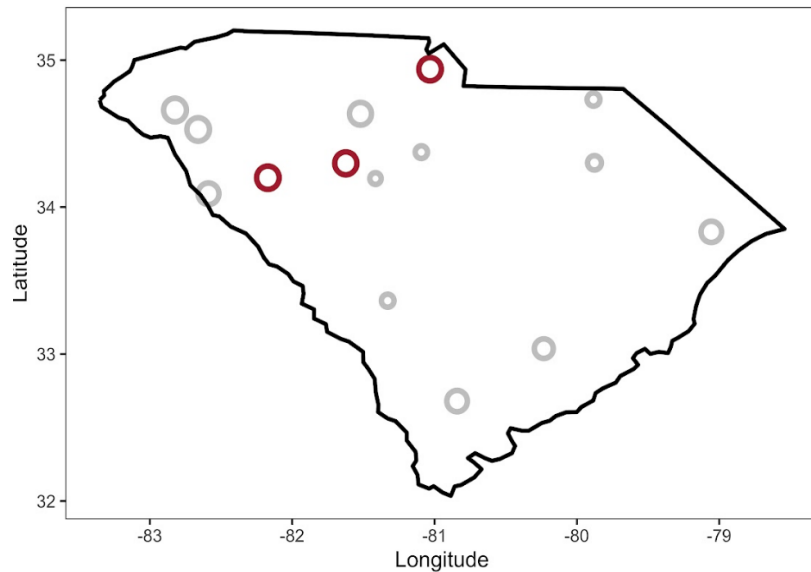
Annual Average Precipitation range from below 46 inches to above 56 inches.

Annual Average precipitation varies throughout the basin.

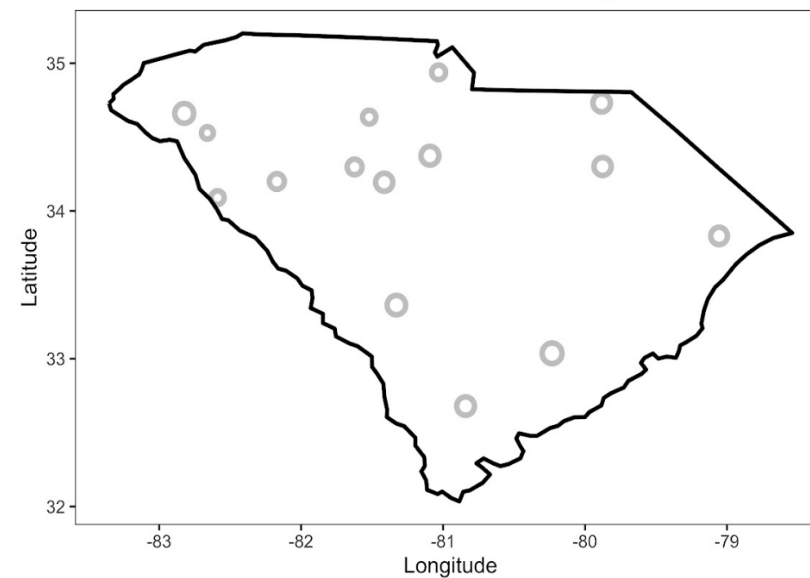
- Higher precipitation in the NC mountains and along the coast.
- Lower amounts in the piedmont and sandhills

The South Carolina portion of the Pee Dee sees the entire range of precipitation (>56in to <65in)

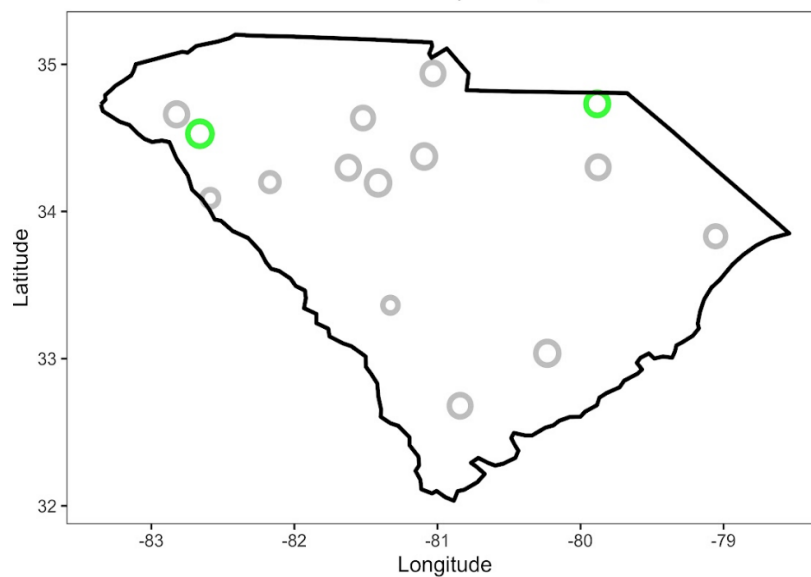
Trend of Precipitation, Winter



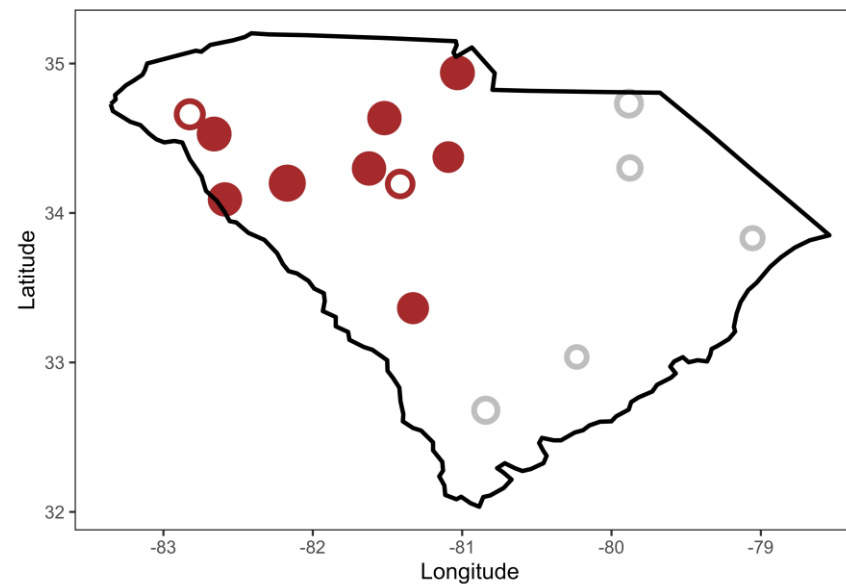
Trend of Precipitation, Spring



Trend of Precipitation, Fall



Trend of Precipitation, Summer



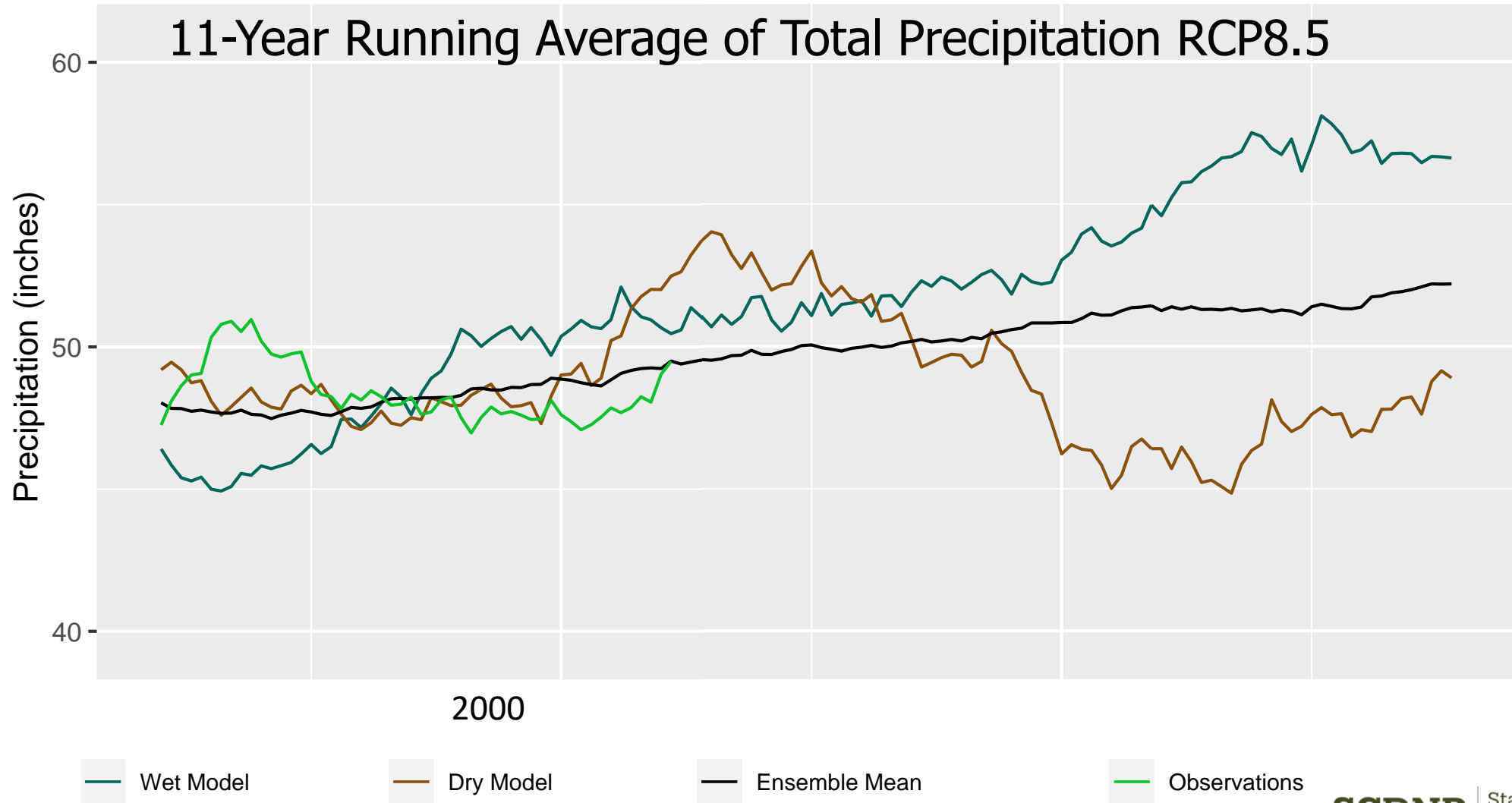
○ Decrease

○ Increase

● Statistically-significant decrease

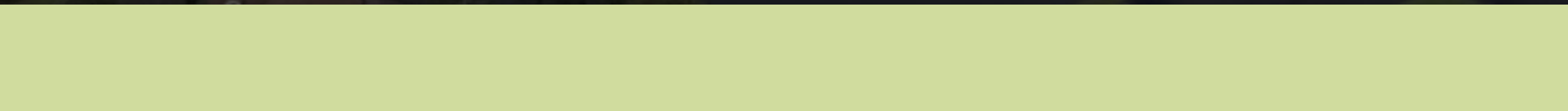
Precipitation Projections

- Modest increases in annual precipitation
- Continued annual and decadal variability

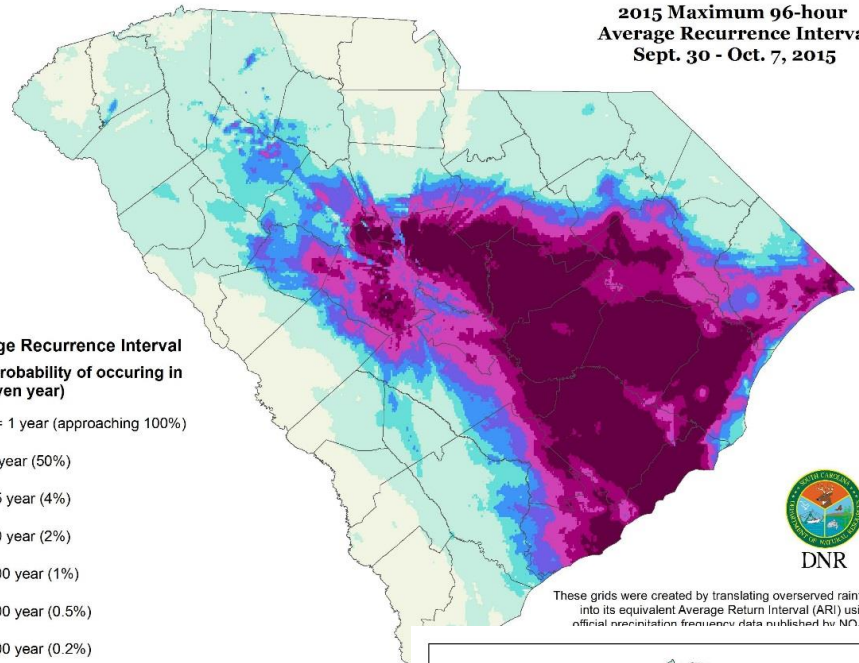




Extreme Rainfall



2015 Maximum 96-hour Average Recurrence Interval Sept. 30 - Oct. 7, 2015

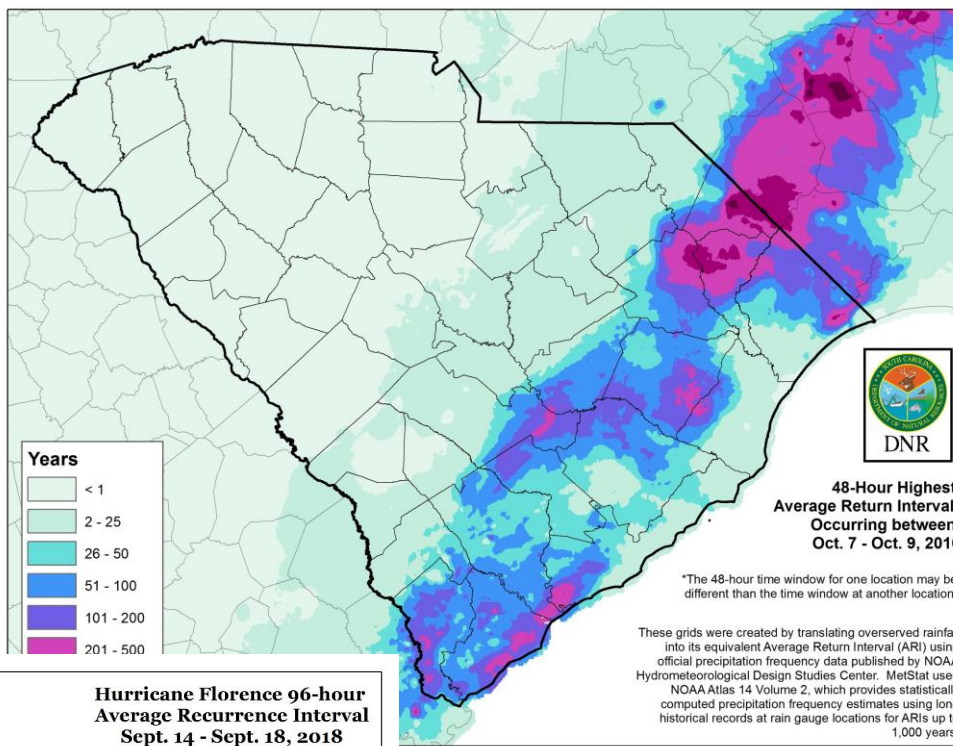


DNR

These grids were created by translating overserved rainfall into its equivalent Average Return Interval (ARI) using official precipitation frequency data published by NOAA

Average Recurrence Interval ARI (probability of occurring in any given year)

- <= 1 year (approaching 100%)
- 2 year (50%)
- 25 year (4%)
- 50 year (2%)
- 100 year (1%)
- 200 year (0.5%)
- 500 year (0.2%)
- >= 1000 year (0.1%)



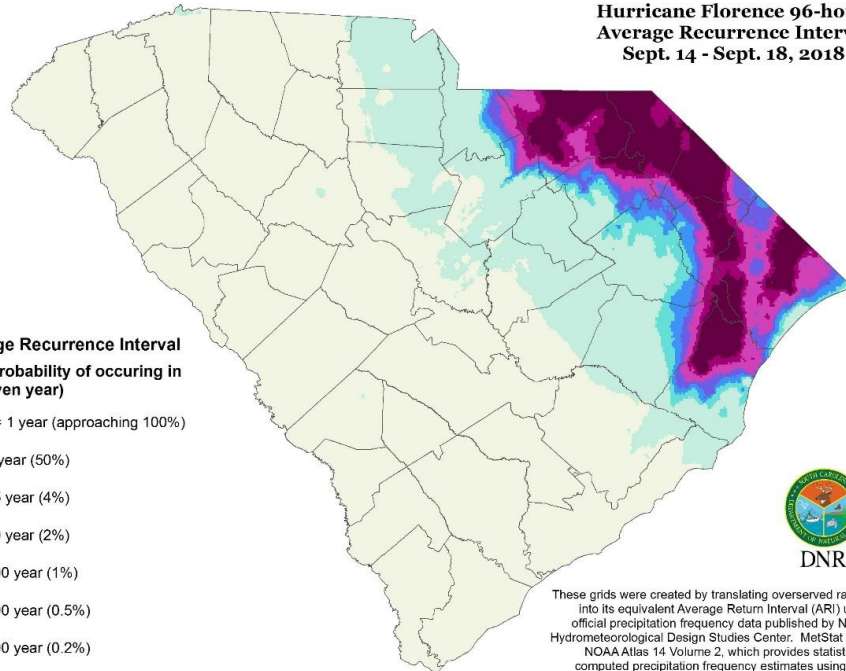
48-Hour Highest Average Return Interval* Occurring between Oct. 7 - Oct. 9, 2016

*The 48-hour time window for one location may be different than the time window at another location.

These grids were created by translating overserved rainfall into its equivalent Average Return Interval (ARI) using official precipitation frequency data published by NOAA Hydrometeorological Design Studies Center. MetStat used NOAA Atlas 14 Volume 2, which provides statistically computed precipitation frequency estimates using long historical records at rain gauge locations for ARIs up to 1,000 years.

- Years**
- < 1
 - 2 - 25
 - 26 - 50
 - 51 - 100
 - 101 - 200
 - 201 - 500

Hurricane Florence 96-hour Average Recurrence Interval Sept. 14 - Sept. 18, 2018



DNR

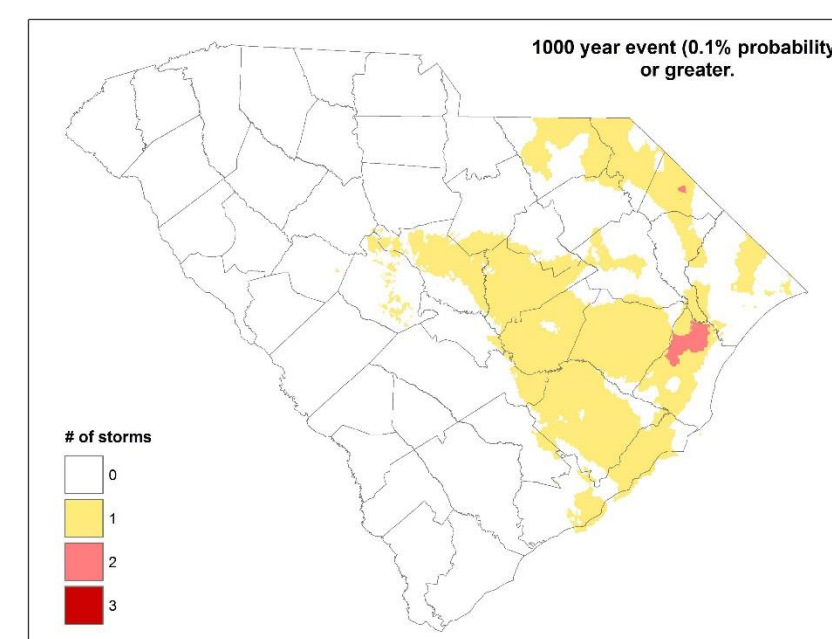
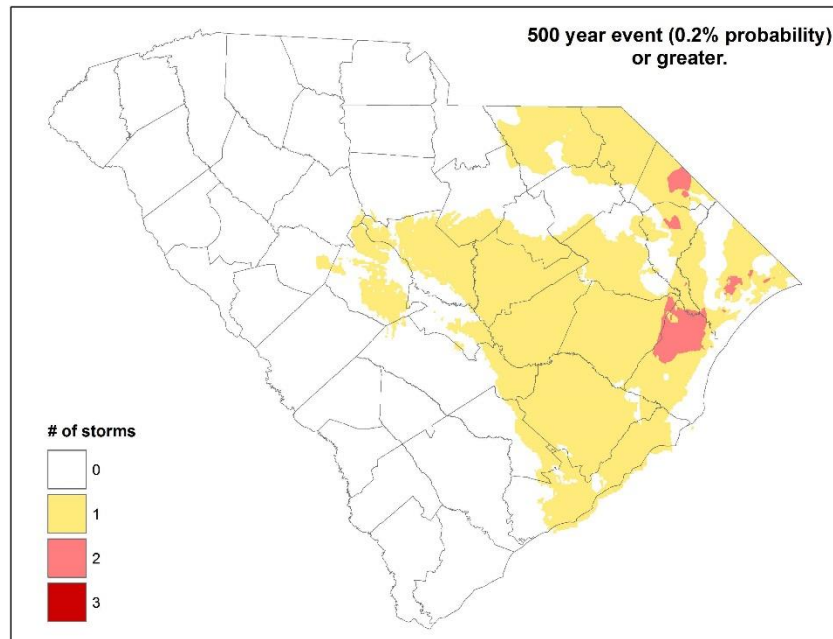
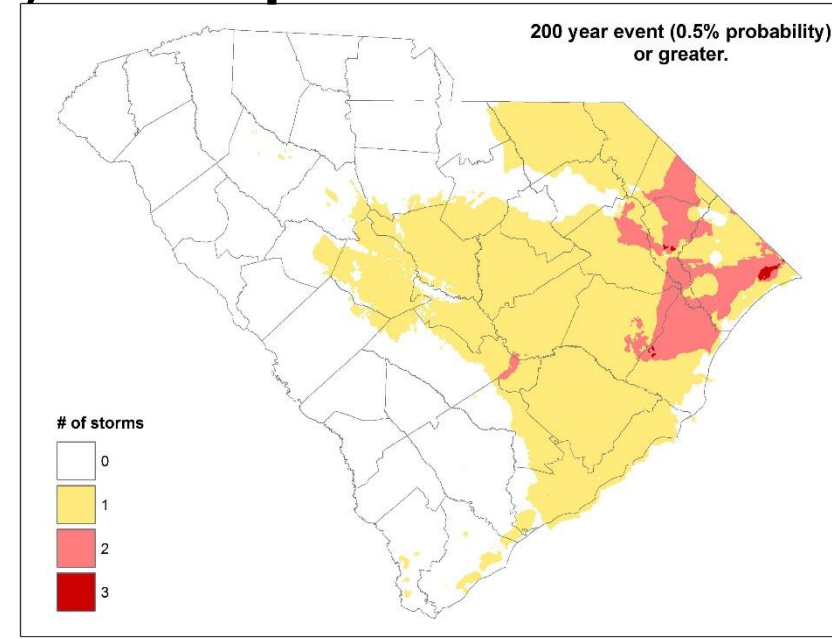
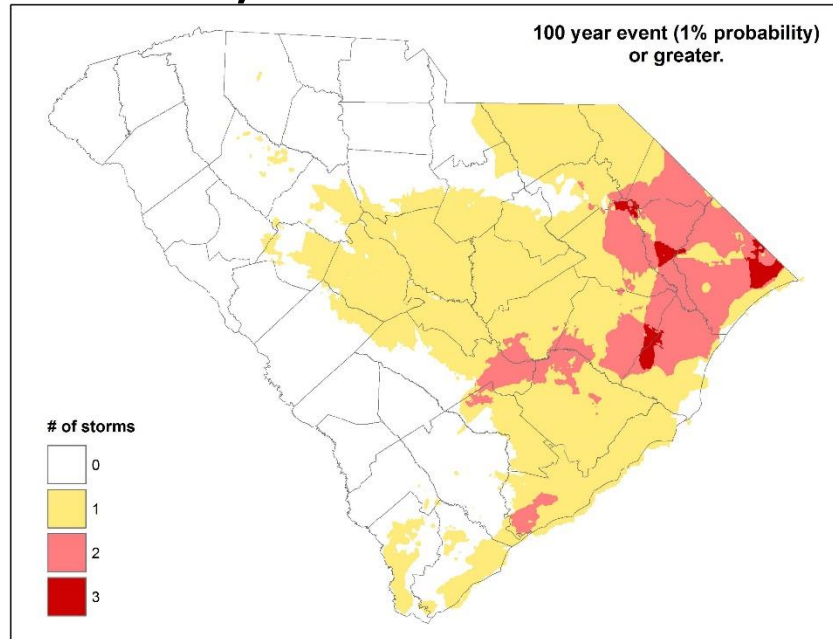
These grids were created by translating overserved rainfall into its equivalent Average Return Interval (ARI) using official precipitation frequency data published by NOAA Hydrometeorological Design Studies Center. MetStat used NOAA Atlas 14 Volume 2, which provides statistically computed precipitation frequency estimates using long historical records at rain gauge locations for ARIs up to 1,000 years.

Average Recurrence Interval ARI (probability of occurring in any given year)

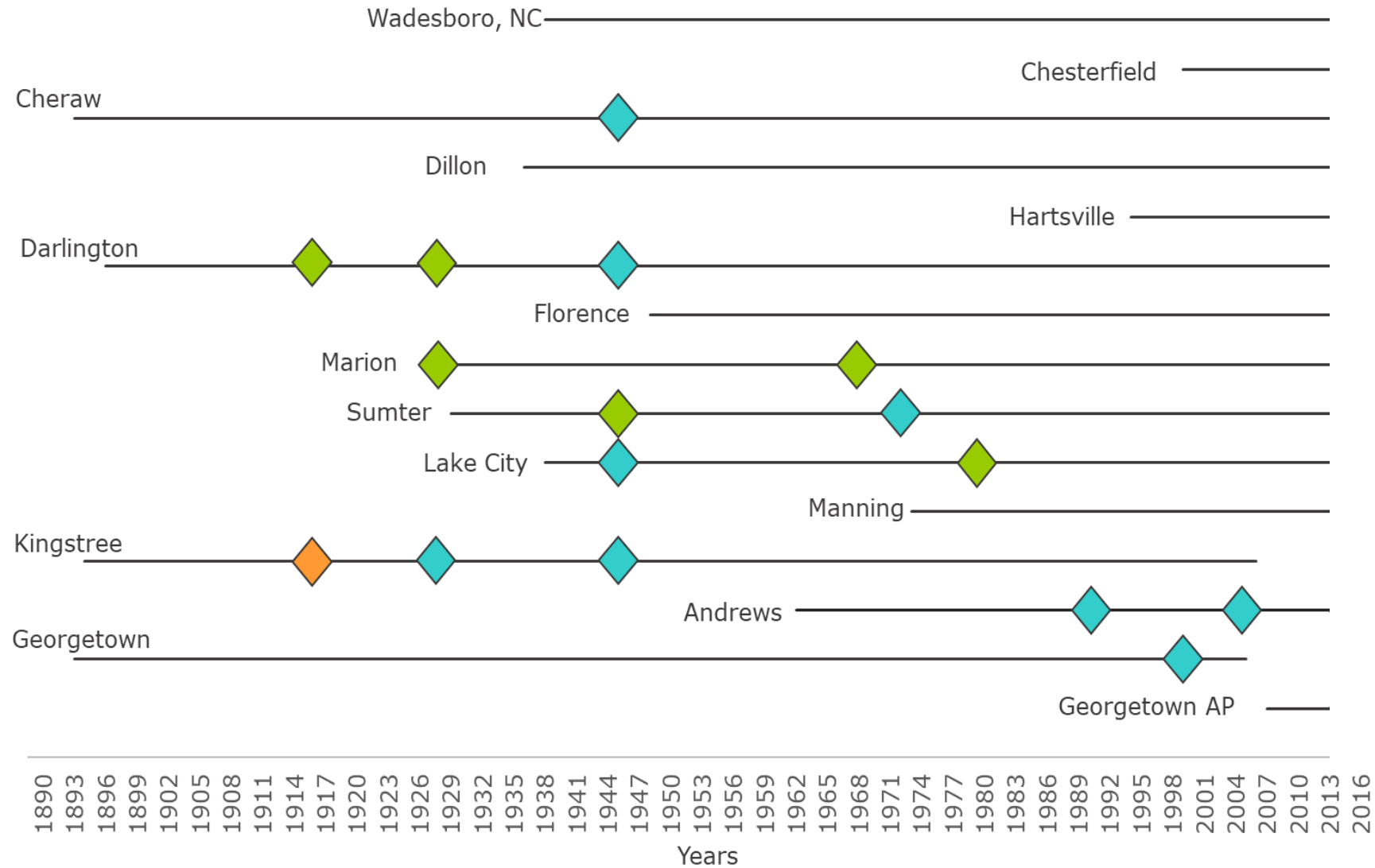
- <= 1 year (approaching 100%)
- 2 year (50%)
- 25 year (4%)
- 50 year (2%)
- 100 year (1%)
- 200 year (0.5%)
- 500 year (0.2%)
- >= 1000 year (0.1%)

Areas in purple met or exceeded the 500-year event, a probability of 0.2% happening each year

Areas impacted by one or more of the recent extreme storms (October 2015, Hurricane Matthew 2016, and Tropical Storm Florence 2018)



Timeline 4-day Maximum Rainfall Events Along The Pee Dee Watershed



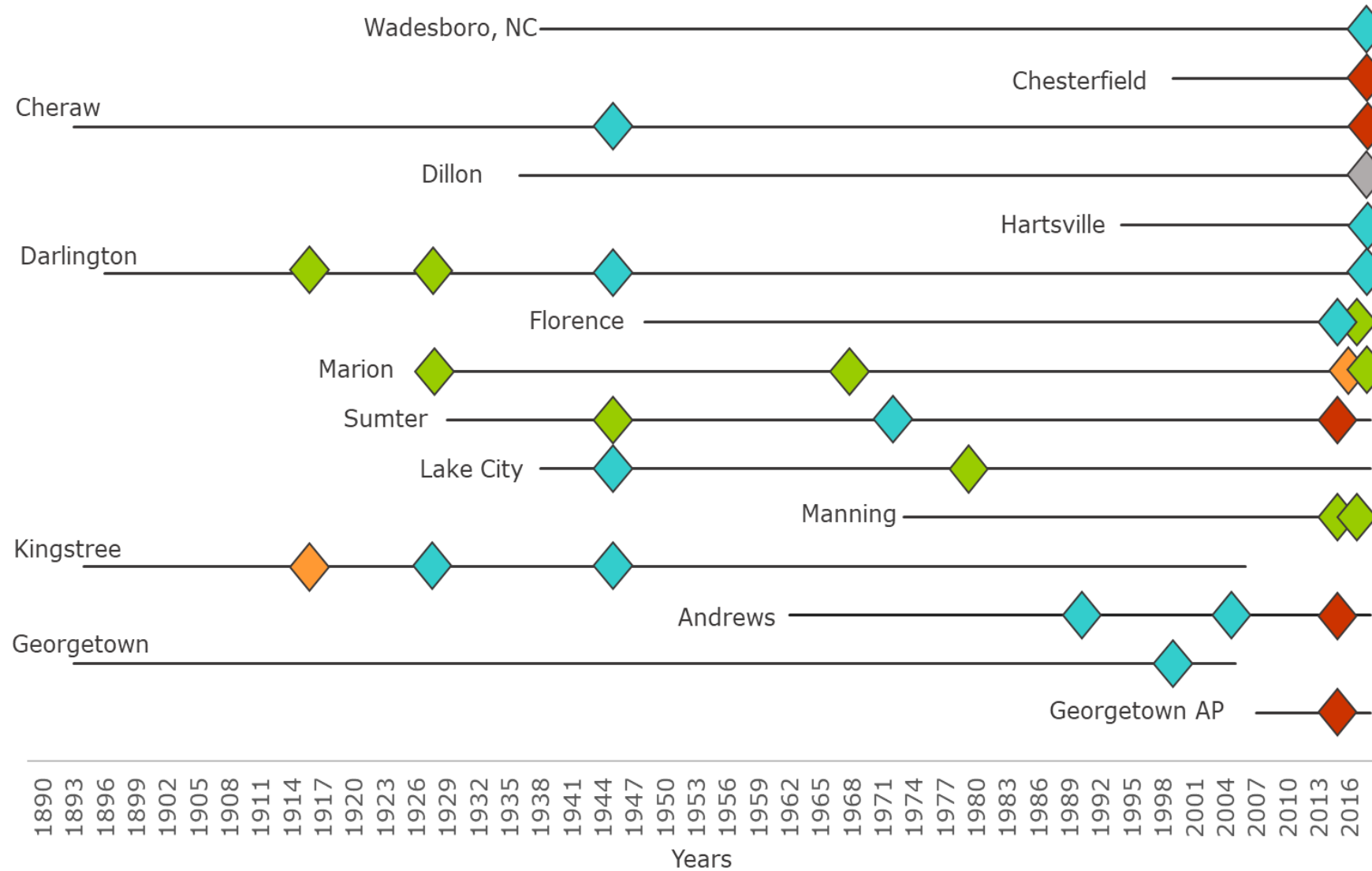
The purposes of ARI/AEP analysis, the following scale will be used in this

Average Recurrence Intervals (AEP)

- ◆ 1,000 Year (0.1%)
- ◆ 500 Year (0.2%)
- ◆ 200 Year (0.5%)
- ◆ 100 Year (1.0%)

(Ending 2014)

Timeline 4-day Maximum Rainfall Events Along The Pee Dee Watershed



The purposes of ARI/AEP analysis, the following scale will be used in this

Average Recurrence Intervals (AEP)

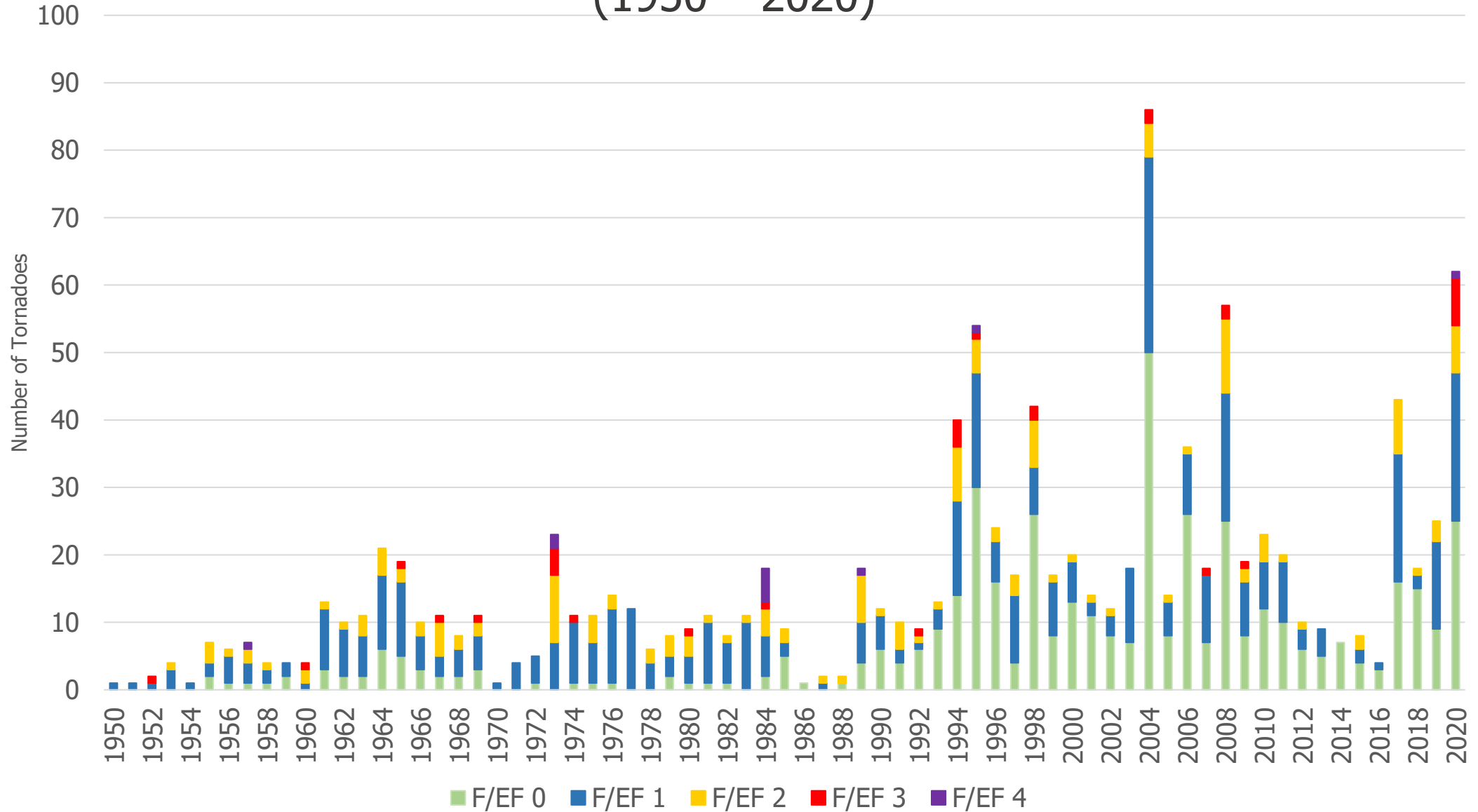
- 1,000 Year (0.1%)
- 500 Year (0.2%)
- 200 Year (0.5%)
- 100 Year (1.0%)

(Ending 2020)

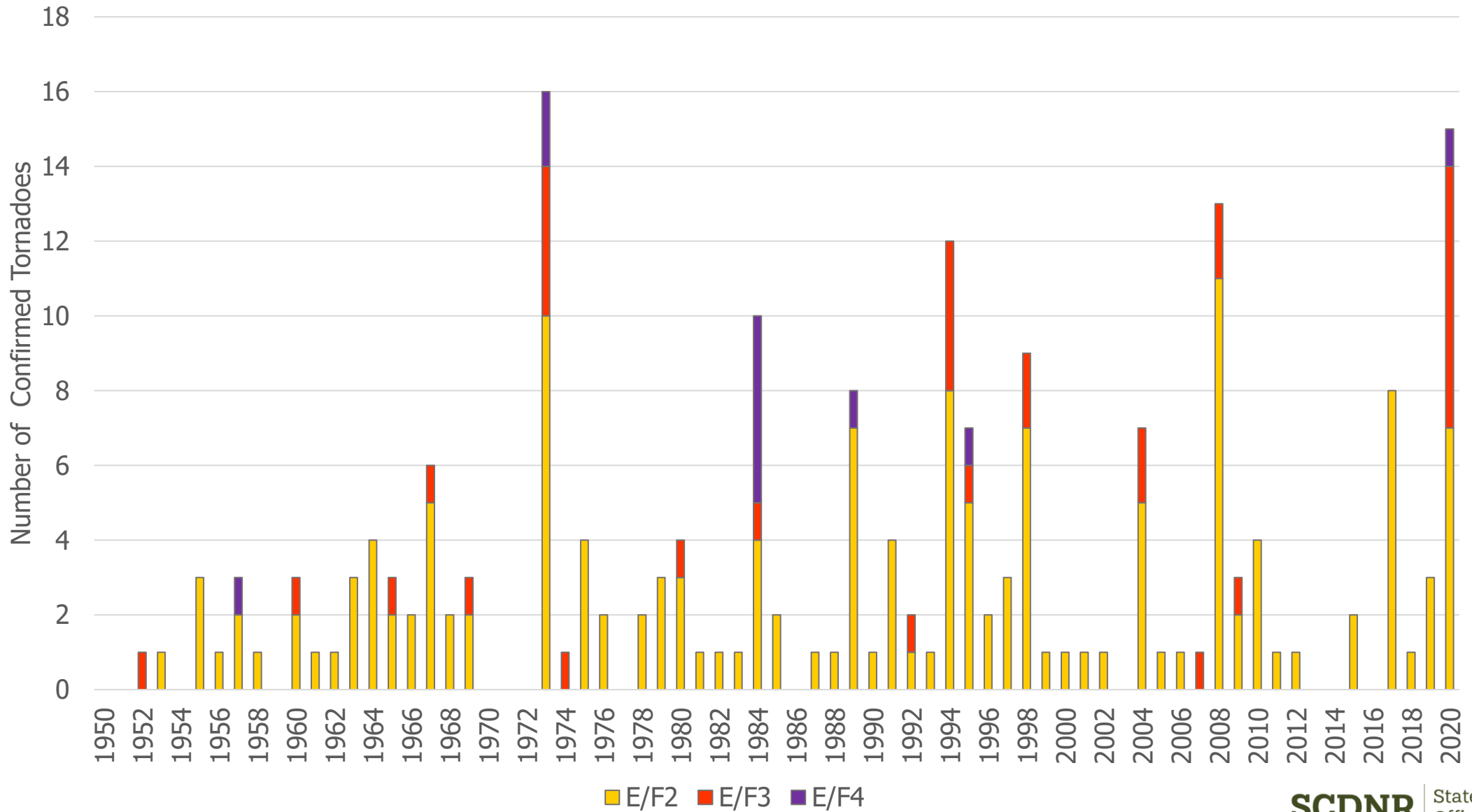


Tornadoes

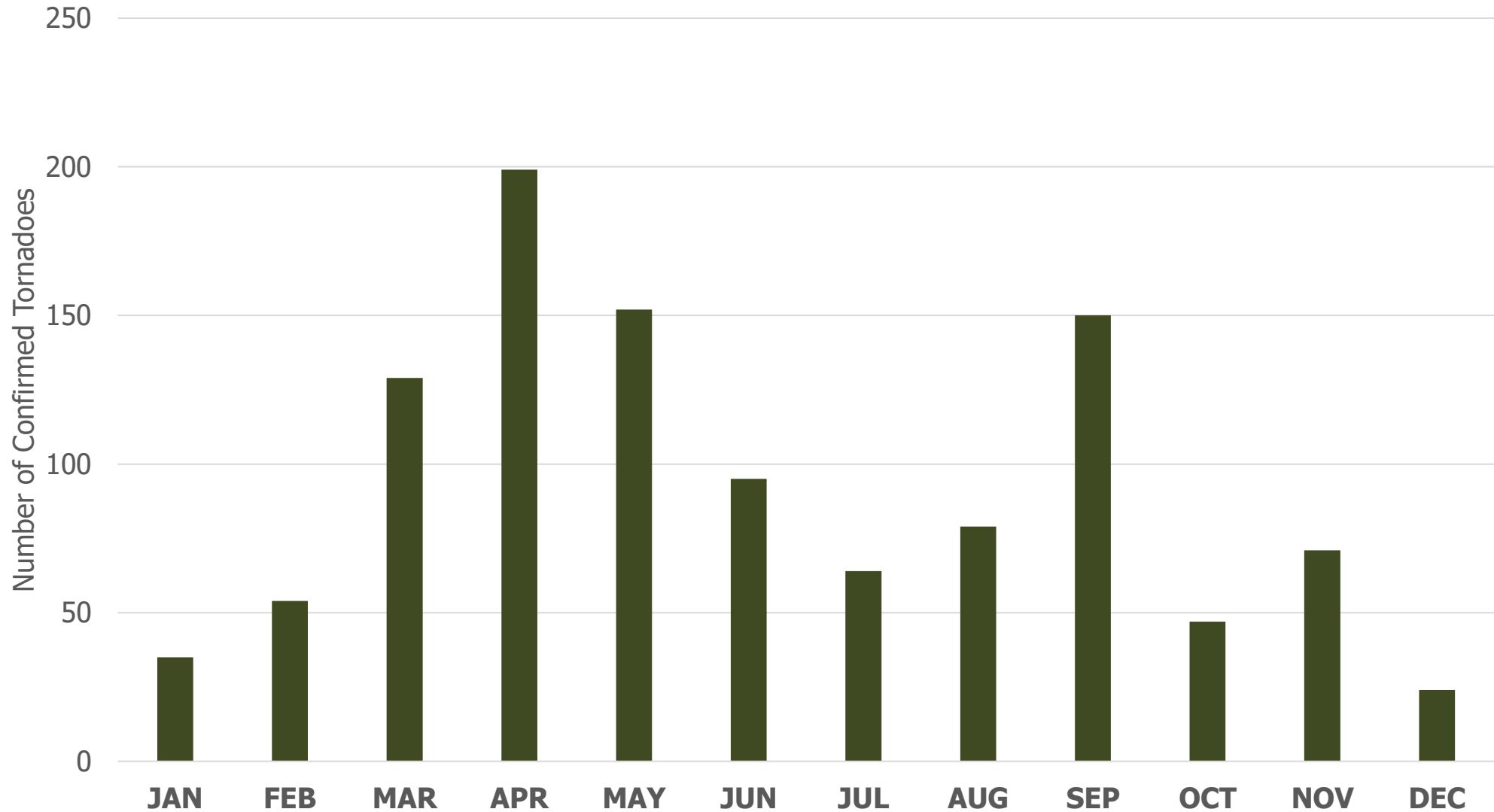
Confirmed South Carolina Tornadoes (1950 – 2020)



South Carolina (EF2, EF3, and EF4) Tornadoes (1950 - 2020)

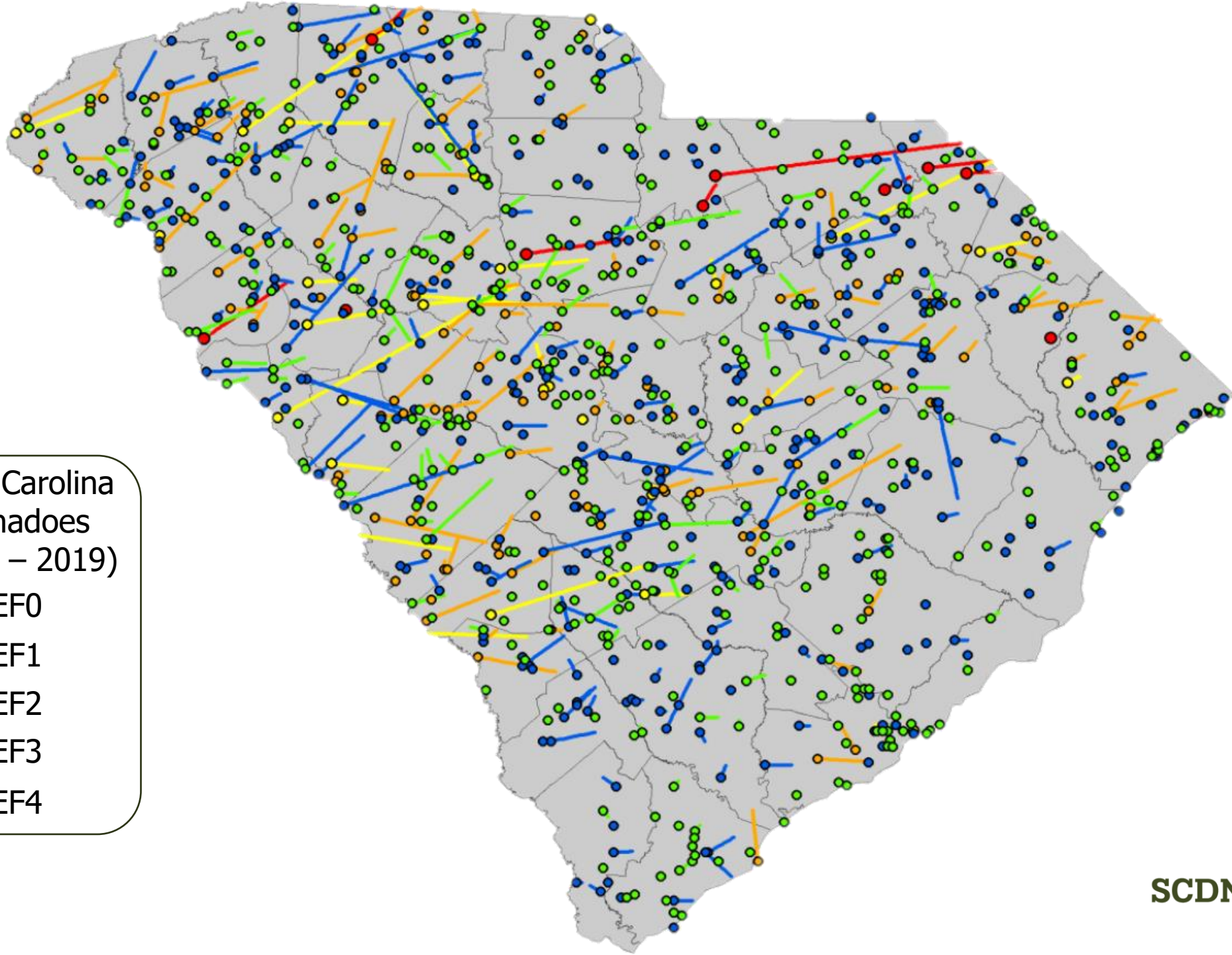


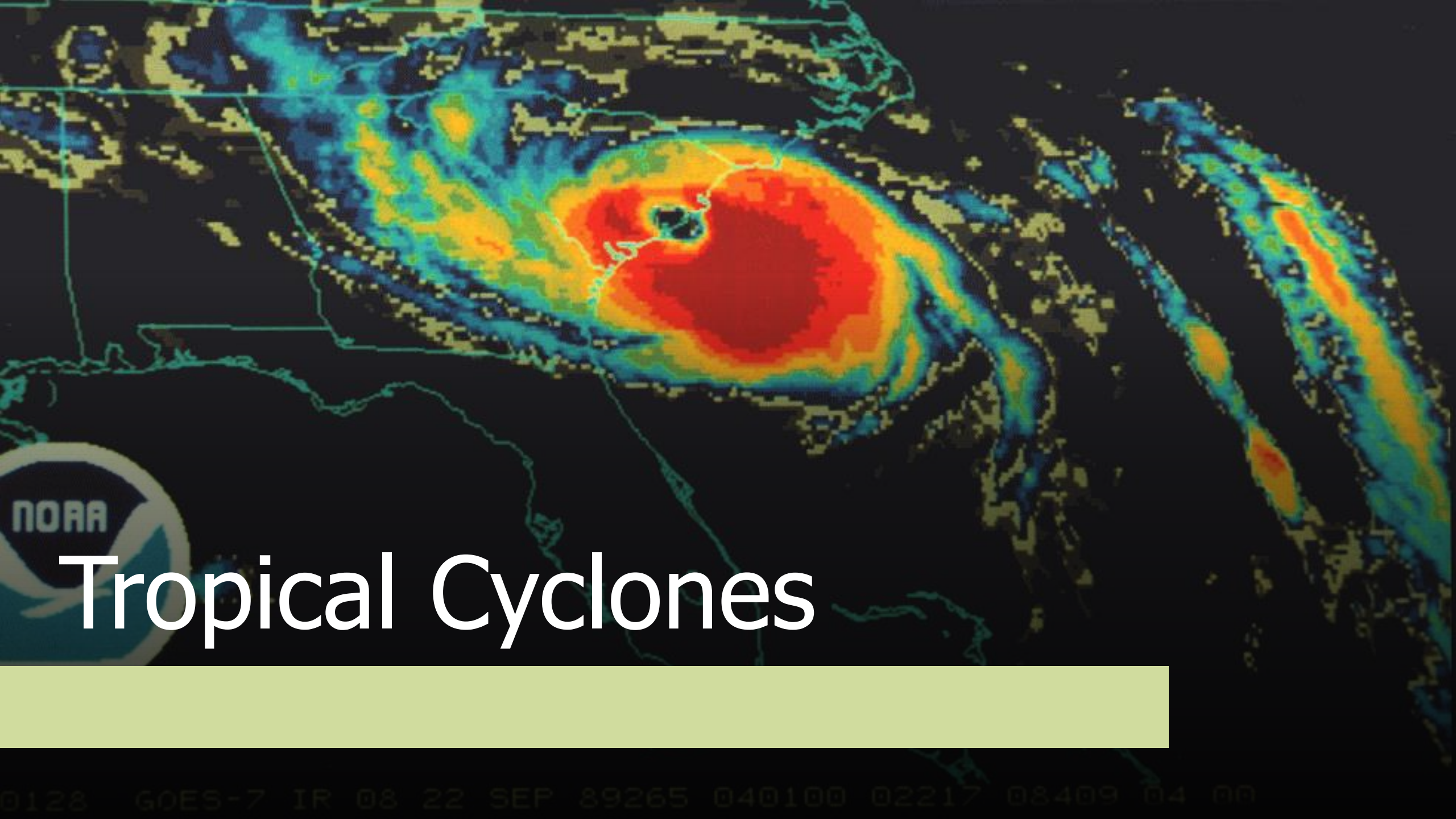
South Carolina Monthly Tornado Counts (1950 - 2020)



South Carolina
Tornadoes
(1950 – 2019)

- EF0
- EF1
- EF2
- EF3
- EF4





Tropical Cyclones



Tropical Storms are part of South Carolina's Climatology and History.

Impacts are not limited to the coast.

Inland portions of the state have been affected by:

- Heavy rains
- Flooding
- High winds
- Tornadoes



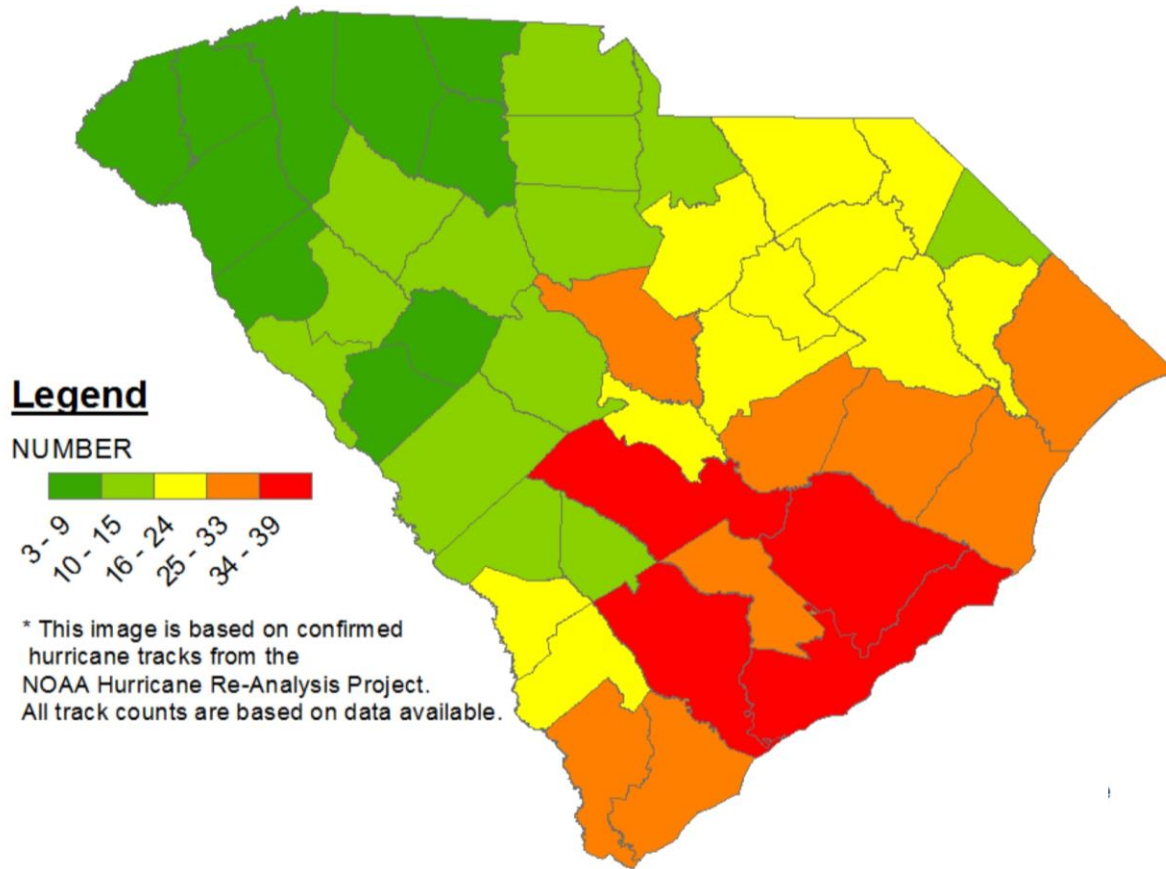
Tracks Of Tropical Cyclones To Impact South Carolina



80%
CHANCE OF
BEING
IMPACTED BY
A TROPICAL
SYSTEM EACH
YEAR

SOUTH CAROLINA TROPICAL CYCLONES BY THE NUMBERS

*based on
1851-2021 period of record



THE BREAKDOWN:

- 260** SYSTEMS HAVE IMPACTED SC
- 138** HAVE TRACKED INTO THE STATE
- 60** WERE CATEGORY 1 OR HIGHER
- 44** MADE DIRECT LANDFALL ON THE COAST
- 4** MAJOR (CAT. 3+) LANDFALLS

Thank you

Hope: MizzellH@dnr.sc.gov 803-734-9568

Elliot: WickhamE@dnr.sc.gov 803-465-1098

