

# Climatology of South Carolina

## Broad River Basin Council

Elliot D. Wickham

South Carolina State Climatology Office

SC Department of Natural Resources

Thursday, June 9th, 2022

STATION		THERMOMETER				THERMOMETER				REGISTER		DEW POINT		ITS COLOUR AND FORCE		WEATHER.		QUANTITY.	
		ATTACHED				EXPOSED IN THE SHADE				THERMOMETER									
		No.				No.				No.		No.		No.		No.		No.	
		A.M.				P.M.				A.M.		P.M.		A.M.		P.M.		A.M.	
3000	3000	58	64	62	58	63	53	66	54.0	N.E. 2	S.E. 2	Cloudy							
3001	3001	61	73	68	62	74	68	75	59.2	W. 1	S.E. 2	Fair							
3002	3002	62	67	57	53	62	57	57	55.7	N.E. 2	N.E. 3	Rain	0.18						
3003	3003	52	57	56	53	57	56	47	47.2	N.E. 2	N.E. 3	Cloudy							
3004	3004	58	61	57	58	62	57	51	53.3	E. 2	N.E. 3	Rain	0.75						
3005	3005	61	61	62	61	62	62	52	58.7	S. 1	N.E. 2	Rain	1.64						
3006	3006	58	61	61	58	61	61	53	56.8	N.E. 1	N.E. 2	Rain	2.07						
3007	3007	51	59	51	52	58	46	43	45.7	N.W. 2	N.W. 3	Fair							
3008	3008	54	65	61	54	65	61	48	48.3	N.W. 2	N.W. 2	Fair							
3009	3009	53	60	60	52	61	60	47	48.0	E. 2	S.E. 3	Cloudy							
3010	3010	62	71	67	63	72	64	55	60.2	S.E. 2	S.E. 3	Rain	0.55						
3011	3011	63	70	64	63	72	64	58	60.2	N.W. 1	N.W. 2	Fair							
3012	3012	56	70	64	56	71	64	50	49.2	N.W. 1	E. 2	Fair							
3013	3013	60	75	70	61	75	60	55	57.7	S.E. 1	E. 2	Rain	0.35						
3014	3014	67	70	58	67	70	56	63	61.8	S. 2	N.W. 4	Rain	0.42						
3015	3015	58	58	49	58	53	43	58	43.3	N.W. 3	N.W. 4	Cloudy							
3016	3016	50	65	66	50	69	66	44	44.3	S.W. 2	S.W. 4	Fair							
3017	3017	64	66	61	64	65	60	59	57.7	N.W. 1	N.W. 3	Cloudy							
3018	3018	48	61	55	48	62	55	43	40.0	N.E. 2	S.W. 3	Fair							
3019	3019	52	66	62	53	67	62	45	48.0	S. 2	S. 2	Fair							
3020	3020	58	76	69	58	77	68	53	54.0	S.W. 1	S.W. 2	Fair							
3021	3021	64	78	70	65	79	69	59	61.0	S.W. 1	S.W. 2	Fair							
3022	3022	67	82	73	67	83	73	62	60.7	W. 1	S.W. 2	Fair							
3023	3023	65	73	66	65	73	66	60	57.0	N.E. 2	E. 3	Fair							
3024	3024	60	74	71	61	75	71	55	58.7	E. 1	E. 2	Fair							
3025	3025	70	80	73	71	81	73	65	66.5	S.W. 1	S. 2	Cloudy							
3026	3026	70	76	68	70	76	67	65	64.8	W. 1	N.W. 2	Rain	0.16						
3027	3027	60	75	69	60	76	69	54	54.3	E. 2	S.E. 2	Fair							
3028	3028	63	75	69	62	75	63	62	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	
		prevailing months -	
		Quantity of	
		Inches	



# SC State Climatology Office Team



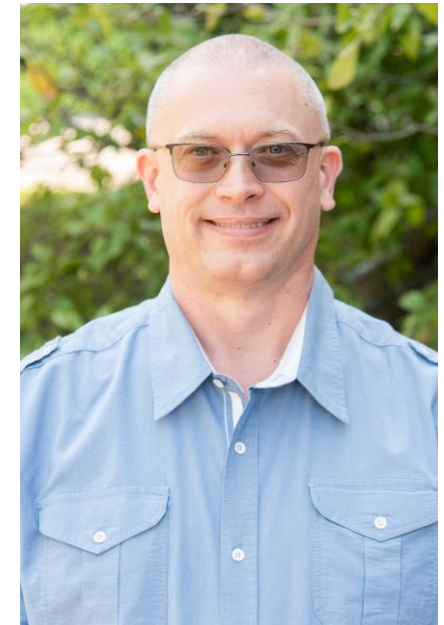
Hope Mizzell  
South Carolina  
State Climatologist



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

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Coordinate and collect weather observations for the purpose of climate monitoring

2

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Summarize and disseminate weather and climate information

3

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Perform climate and weather impact assessments

4

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

5

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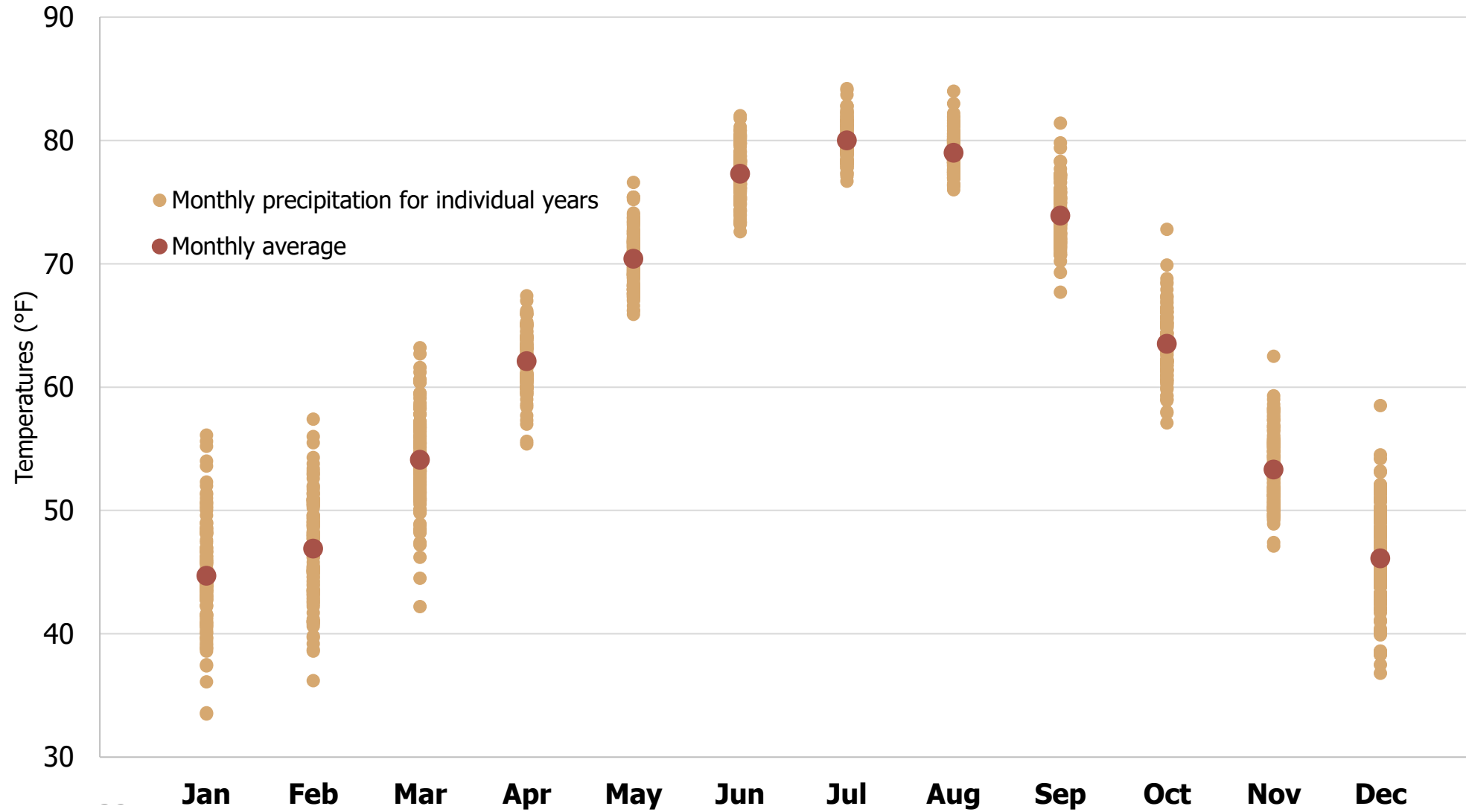
Conduct applied climate research



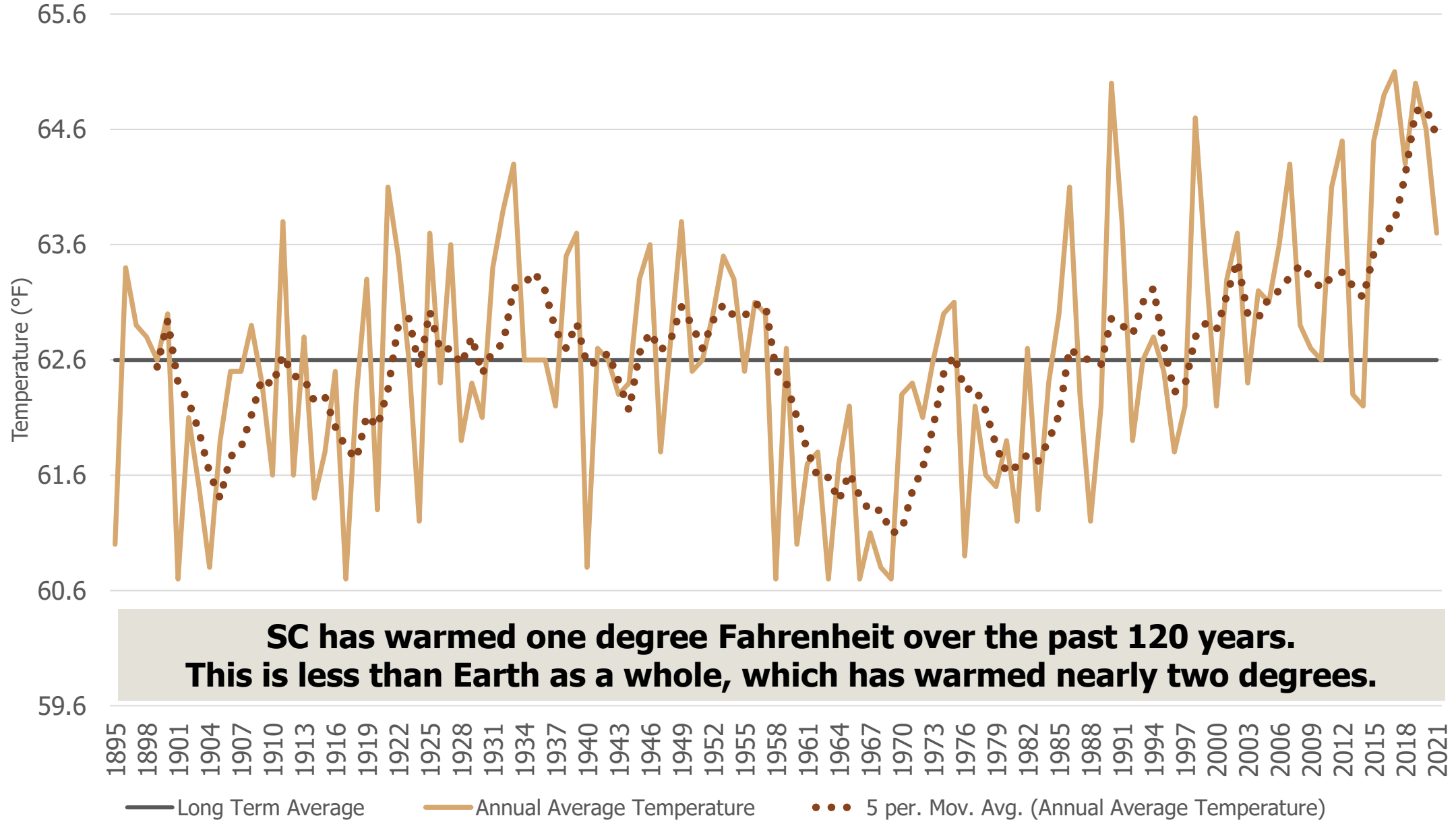
# Temperatures

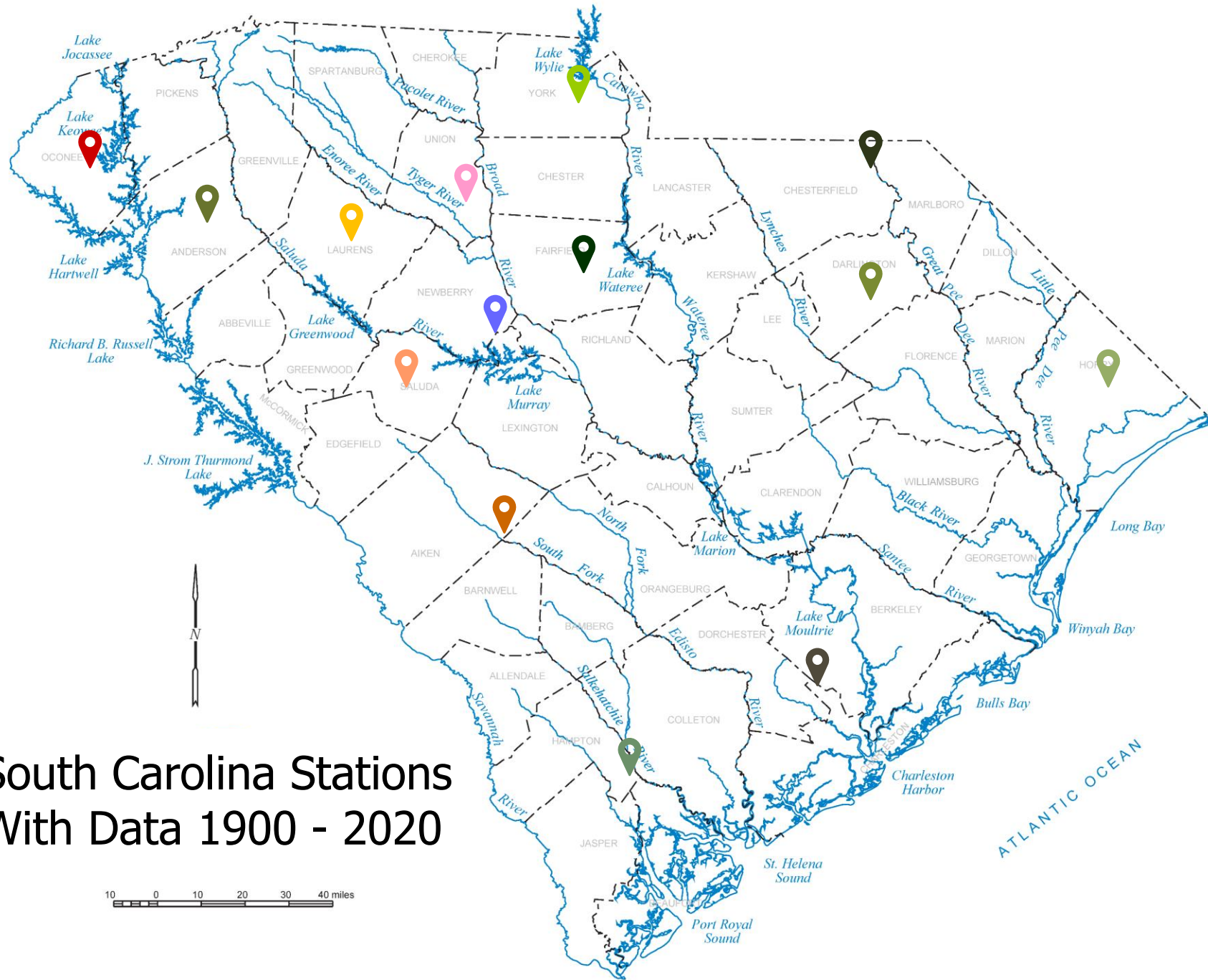


# South Carolina Monthly Average Temperature (1895 – 2021)



# South Carolina Annual Average Temperature (1895 – 2021)





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

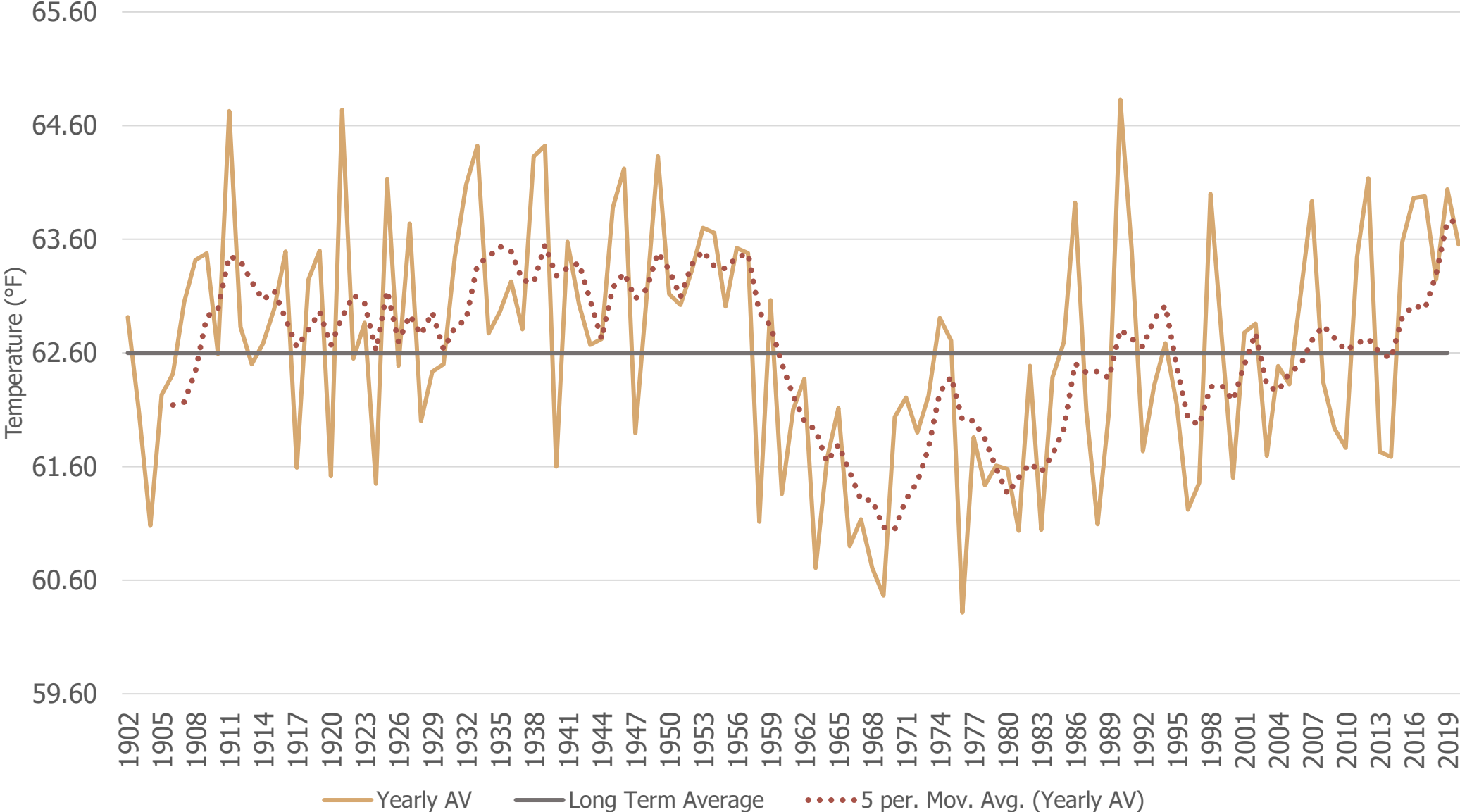
# South Carolina Stations With Data 1900 - 2020

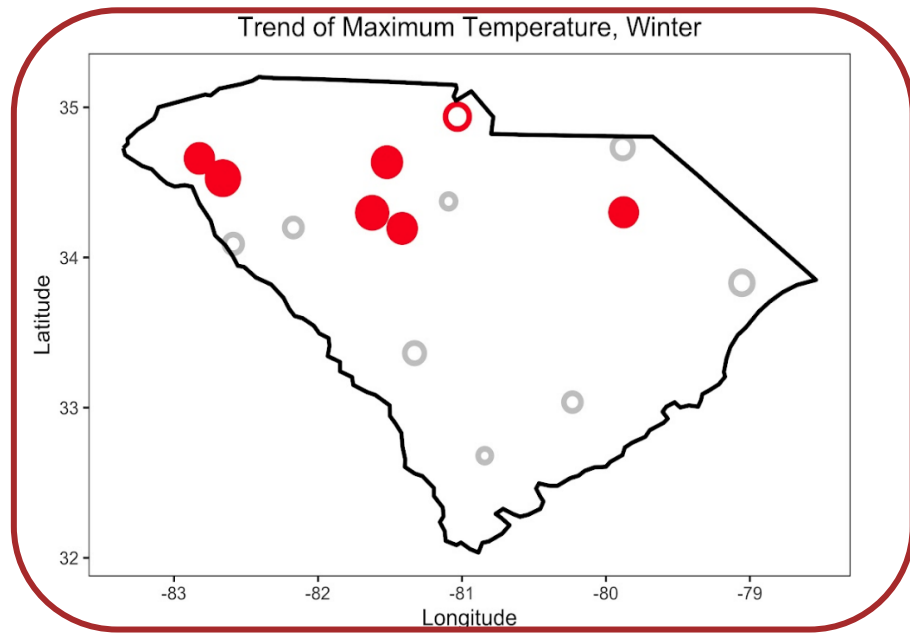
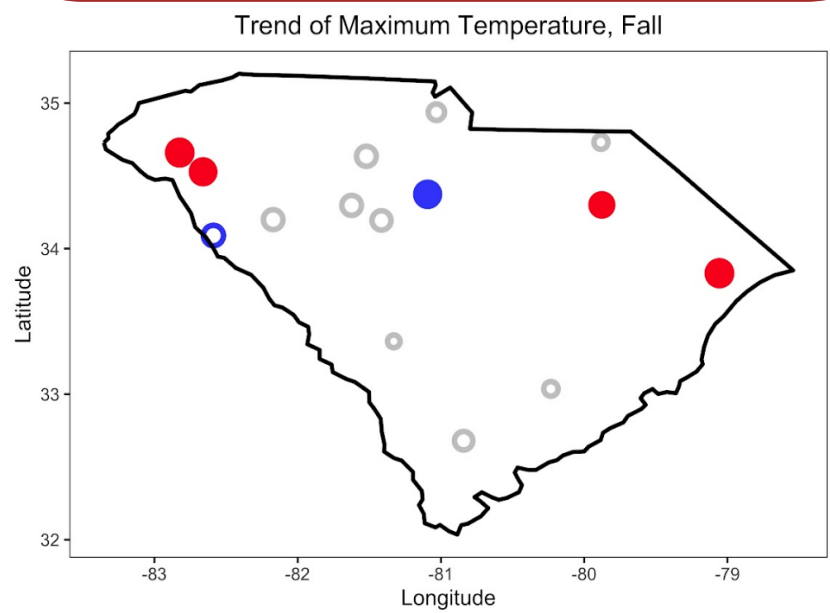
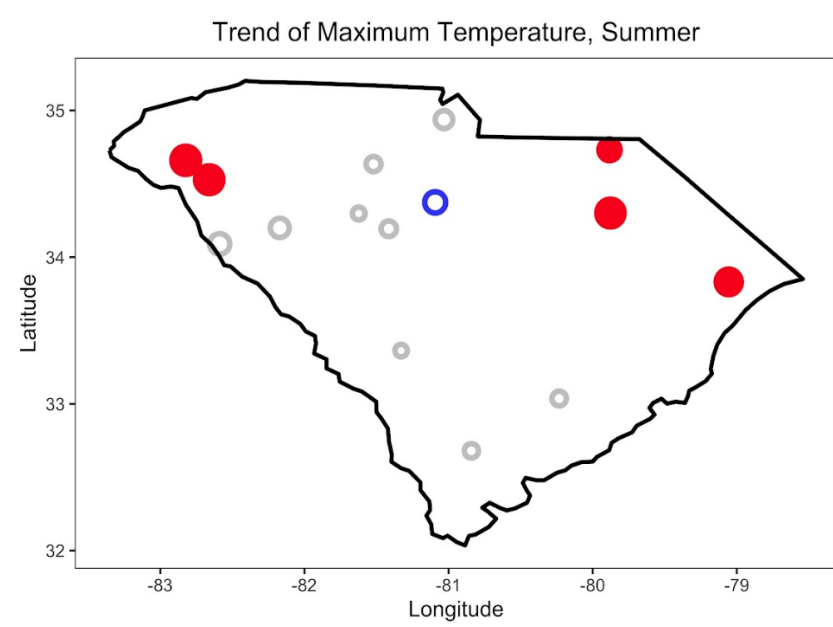
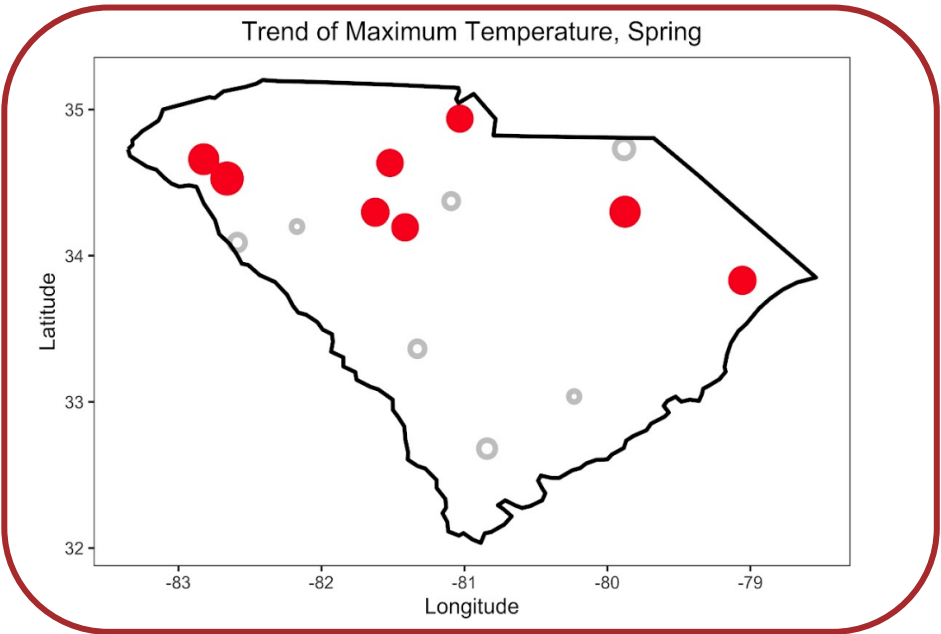




# South Carolina Long-Term Stations

## Annual Average Temperature (1902 – 2020)

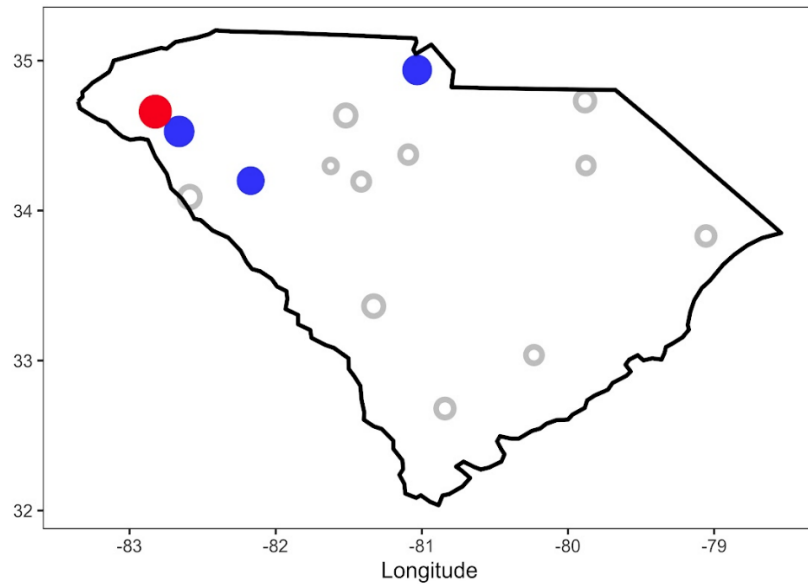




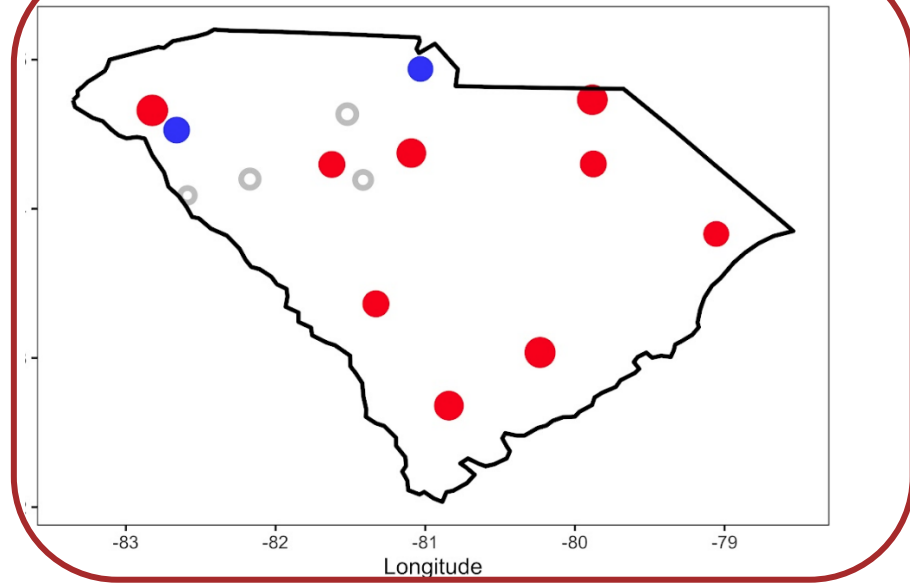
- Decrease
- Statistically-significant decrease

- Increase
- Statistically-significant increase

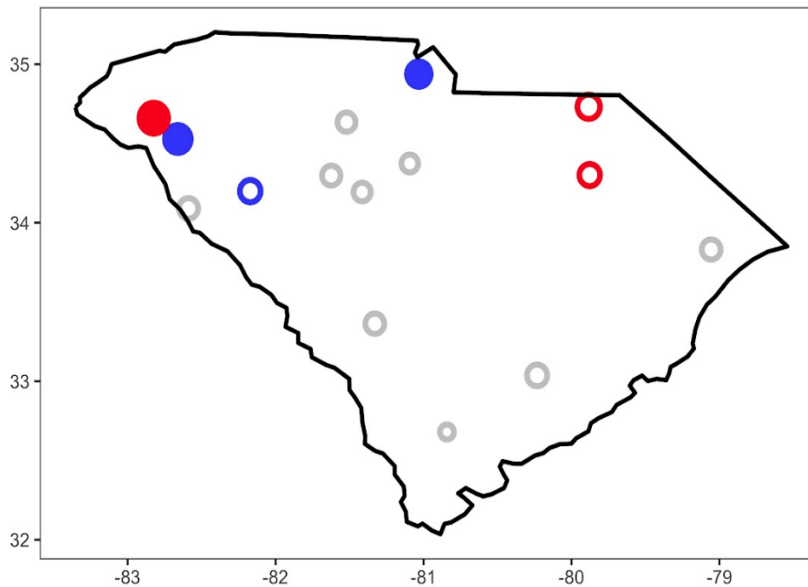
Trend of Minimum Temperature, Spring



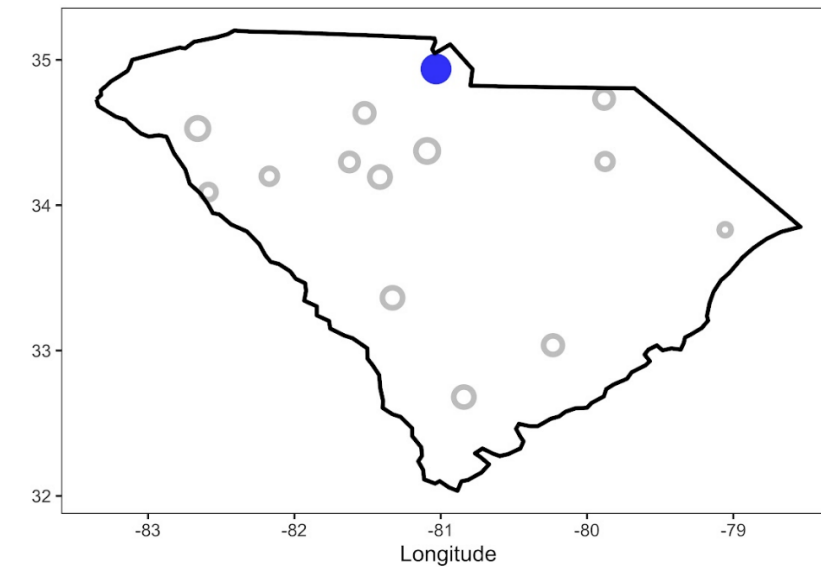
Trend of Minimum Temperature, Summer



Trend of Minimum Temperature, Fall



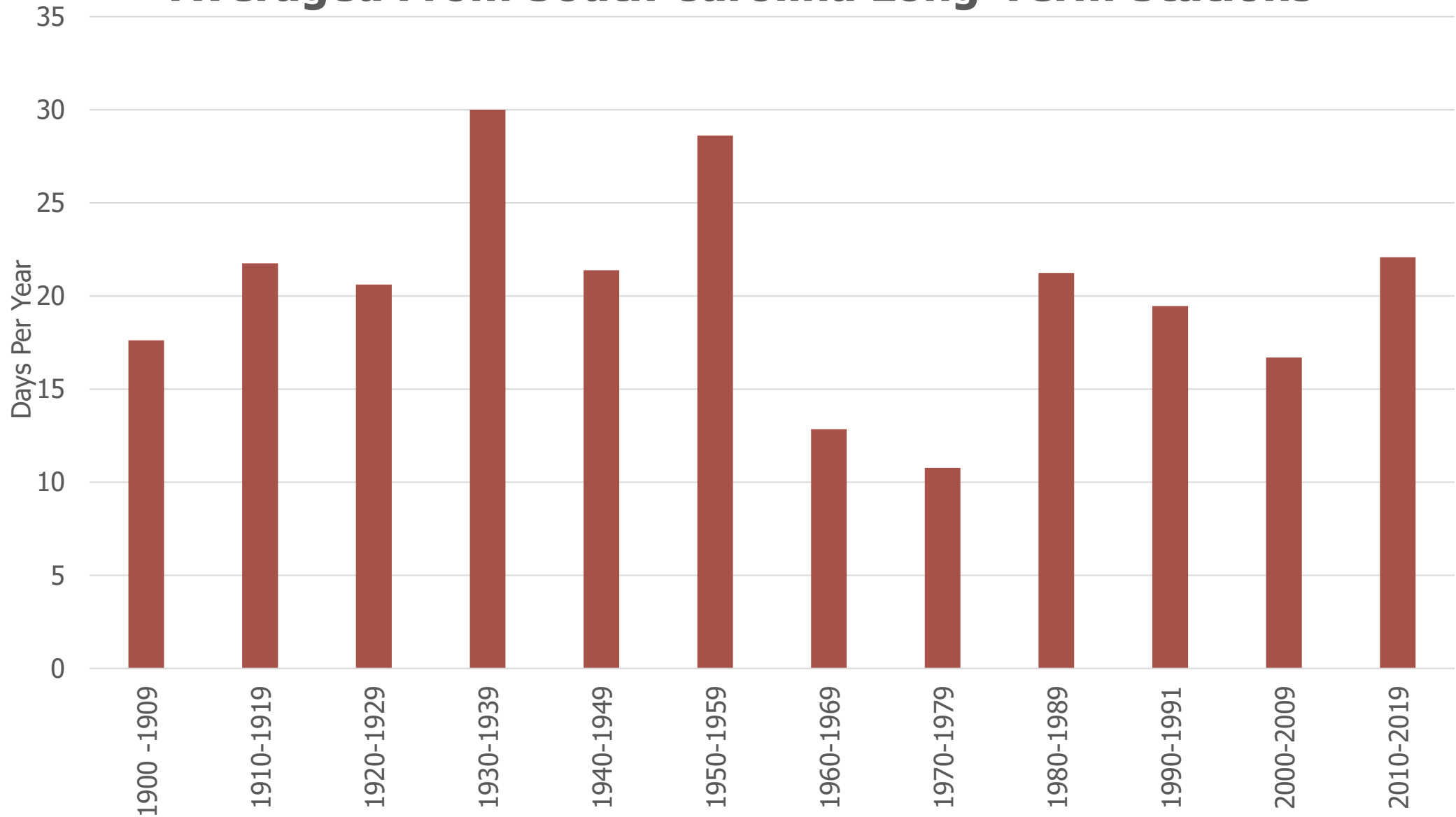
Trend of Minimum Temperature, Winter



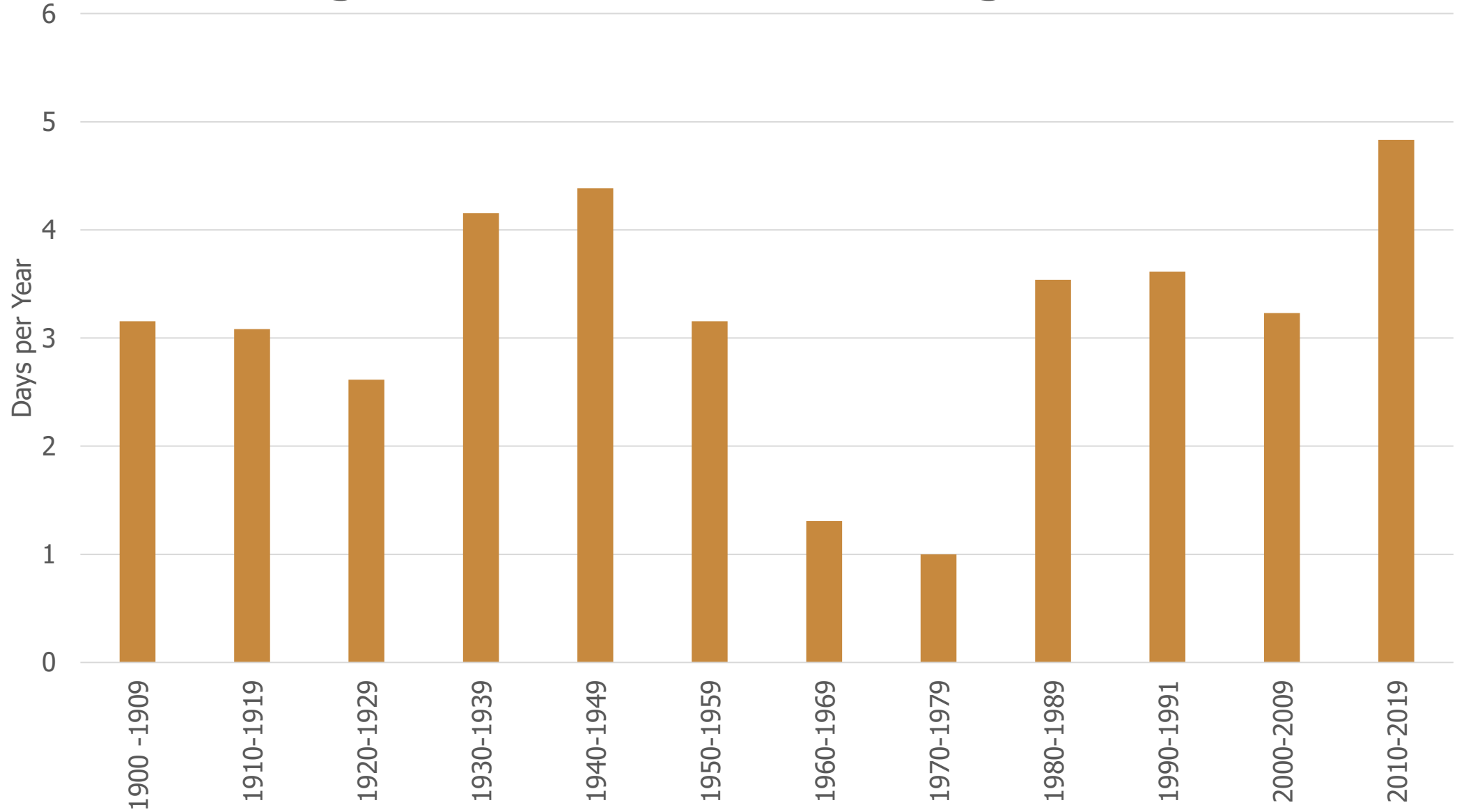
- Statistically-significant decrease
- Decrease

- Increase
- Statistically-significant increase

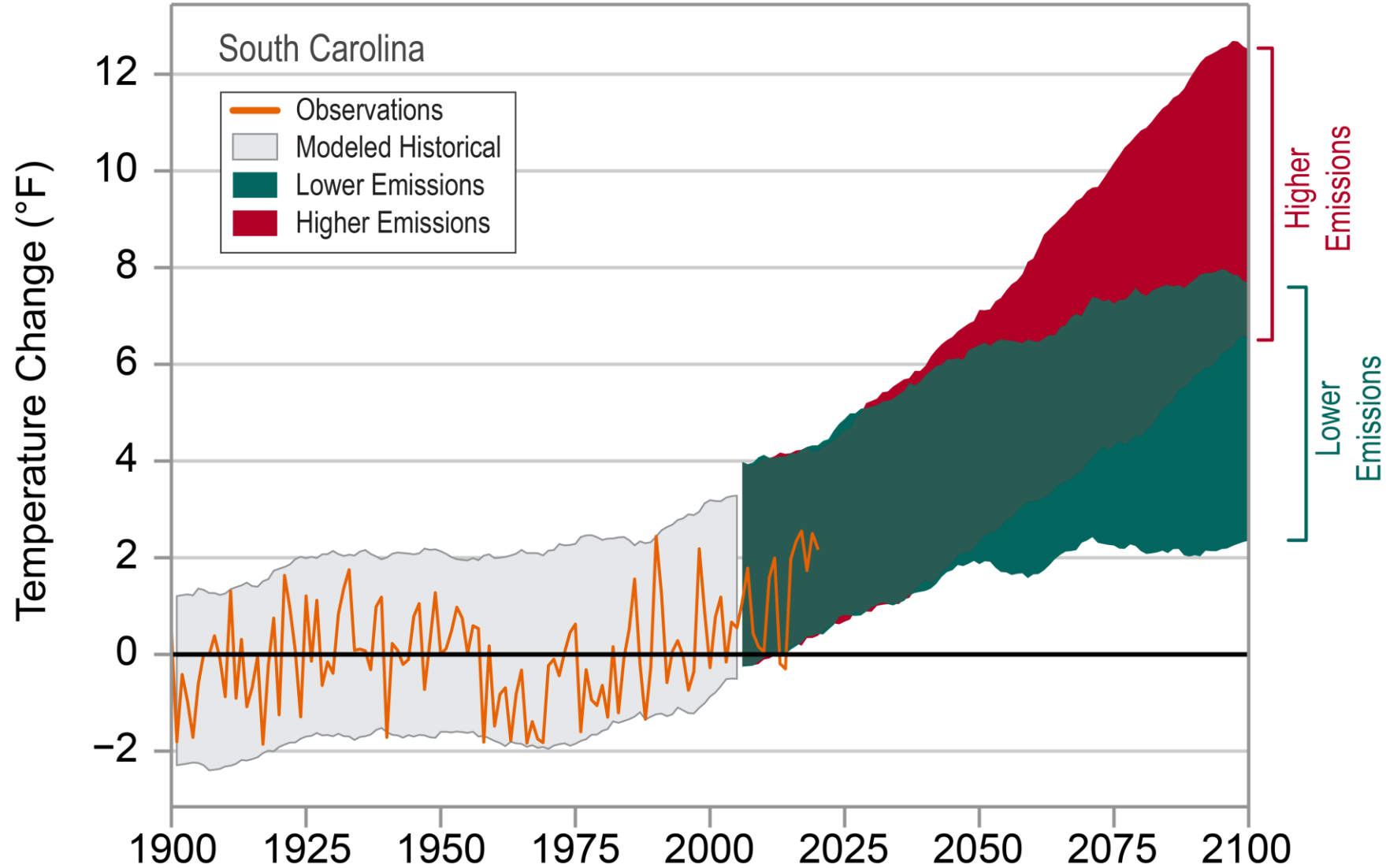
# Number of Days Maximum Temperature Above 95°F Averaged From South Carolina Long-Term Stations

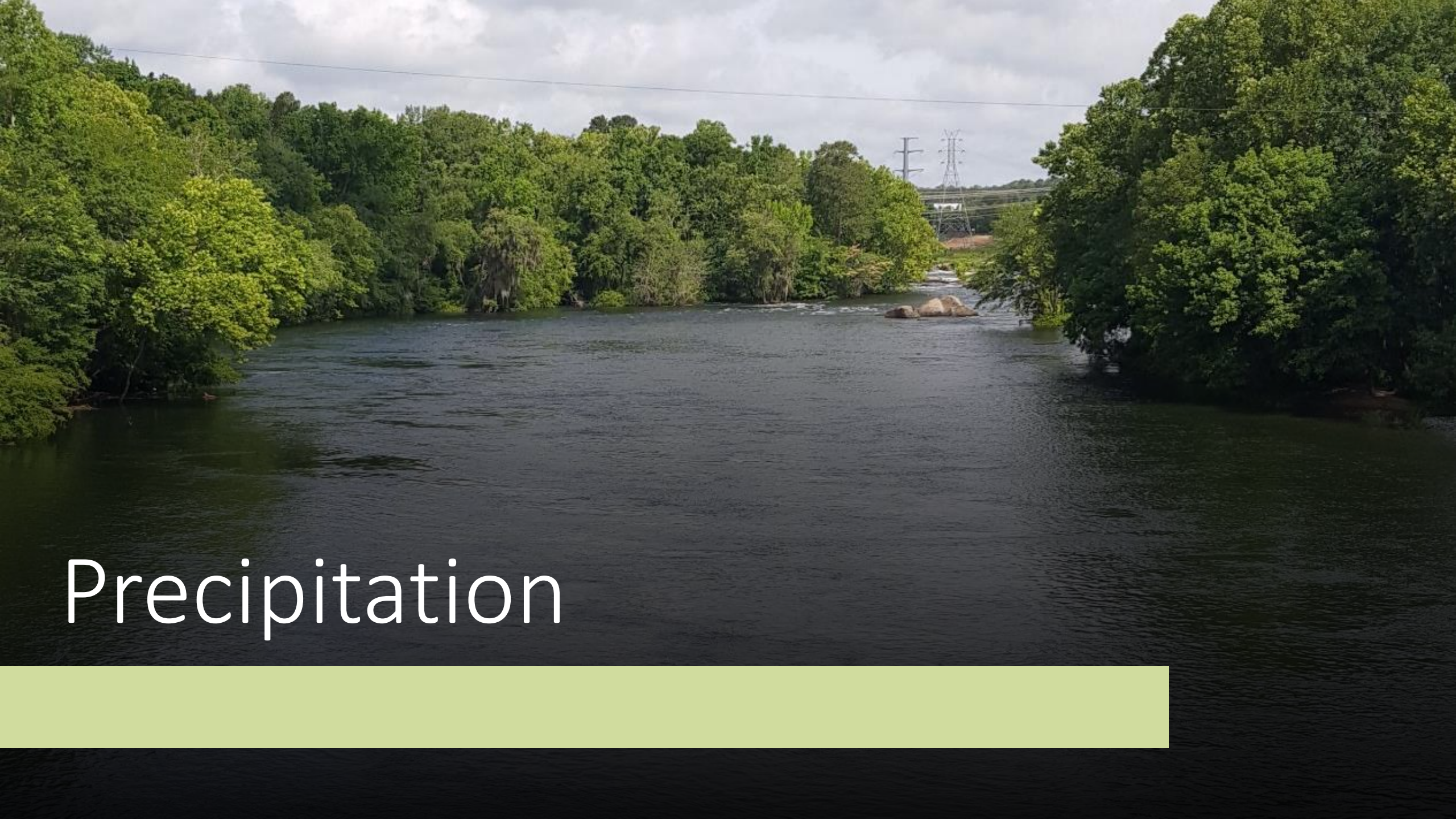


# Number of Days Minimum Temperature Above 75°F Averaged From South Carolina Long-Term Stations



# Observed and Projected Temperature Change

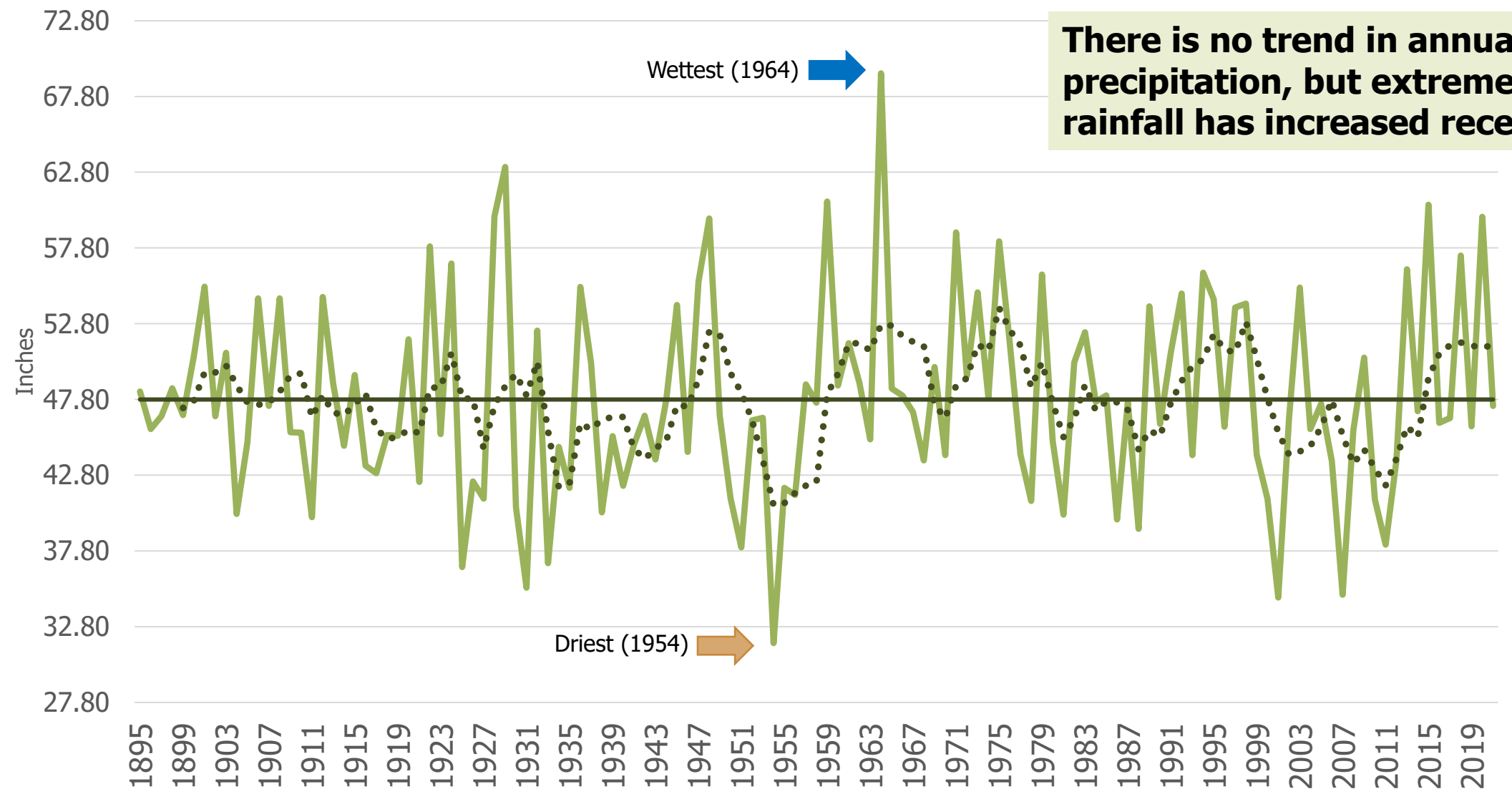




# Precipitation



# South Carolina Annual Precipitation (1895 – 2021)

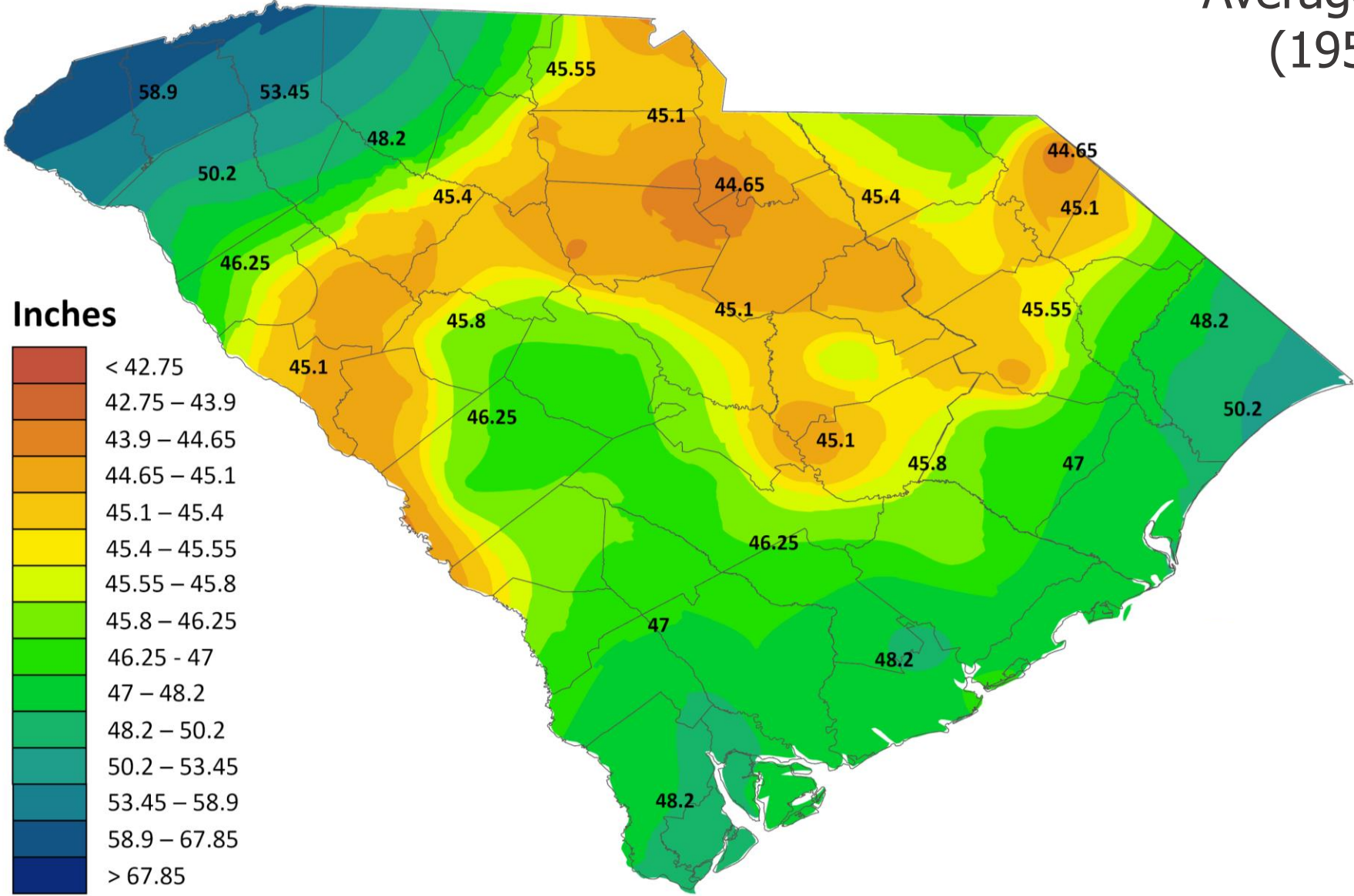


**There is no trend in annual precipitation, but extreme rainfall has increased recently.**

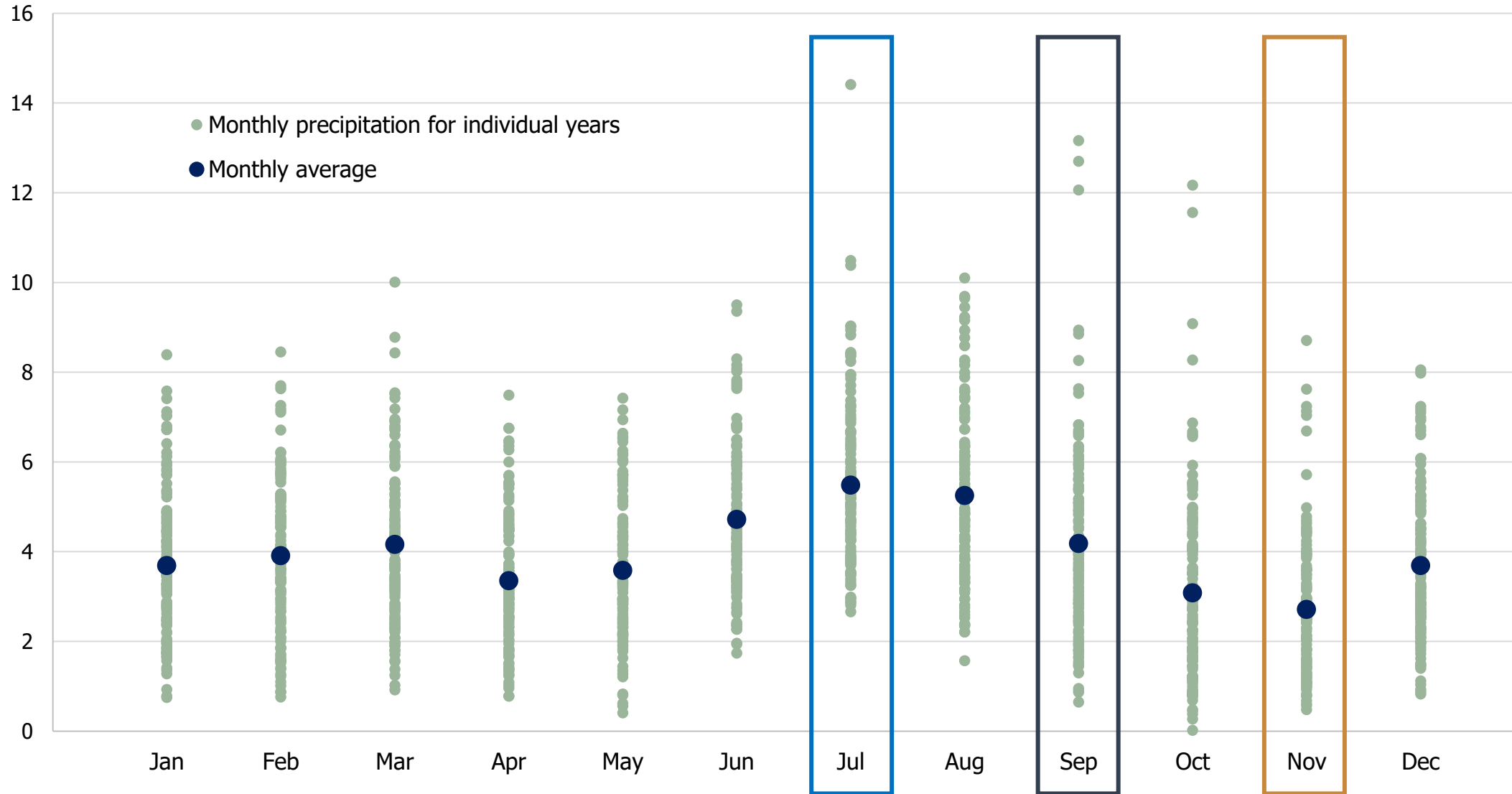
— Precipitation    — Avg    ••••• 5 per. Mov. Avg. (dfm)



# South Carolina Annual Average Precipitation (1950 – 2021)



# 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)

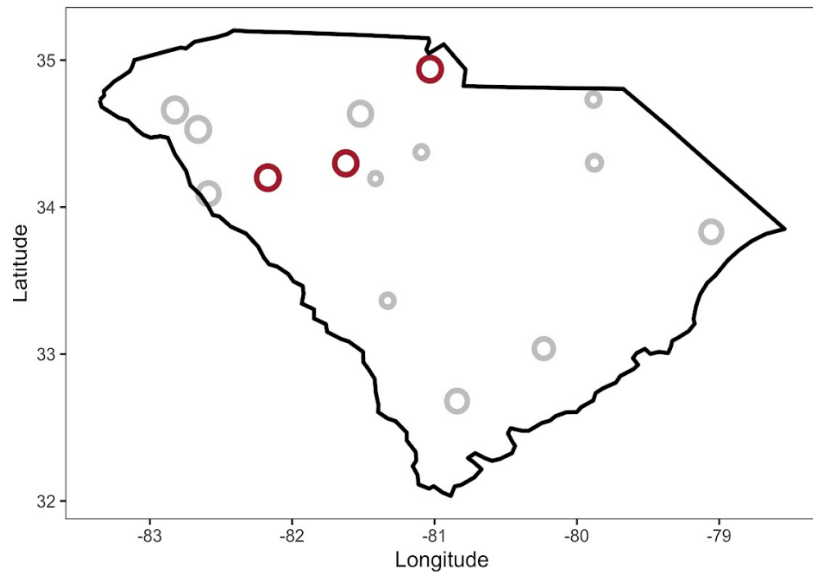
Note: Percent of Normal based on 1902- 2020 average of 47.85"

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% +

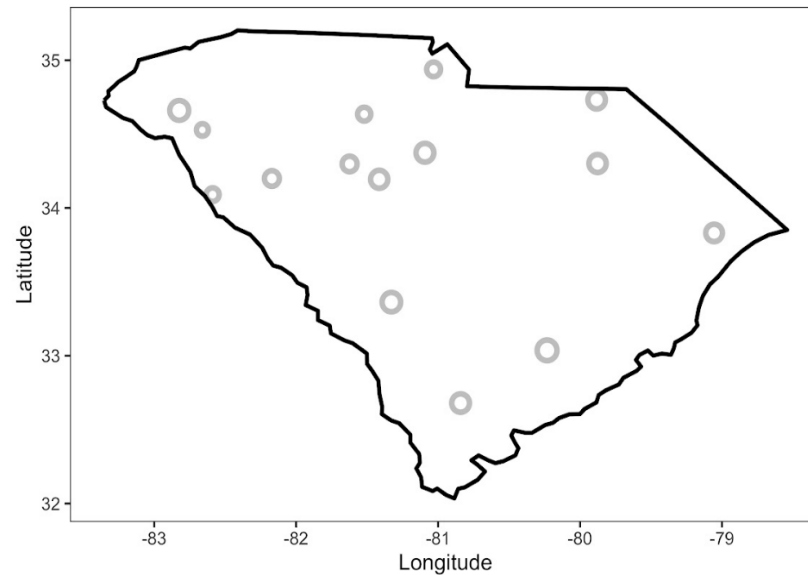
★ 4 of 10 wettest occurred during 2001-2020

+ 2 of 10 wettest occurred during 1921-1940

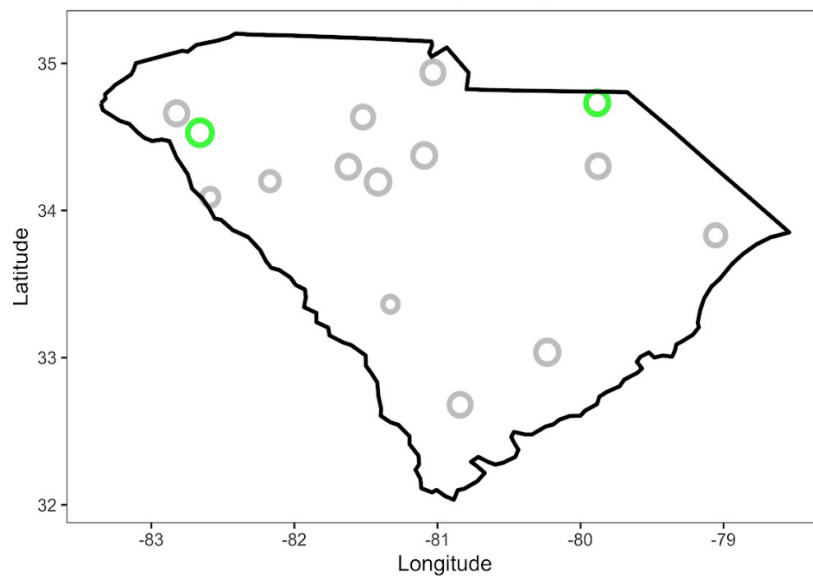
Trend of Precipitation, Winter



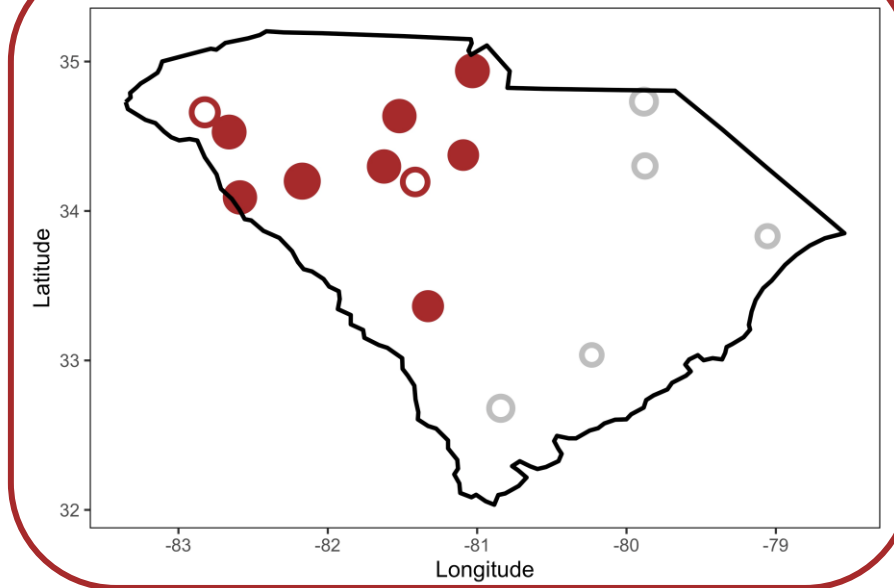
Trend of Precipitation, Spring



Trend of Precipitation, Fall



Trend of Precipitation, Summer



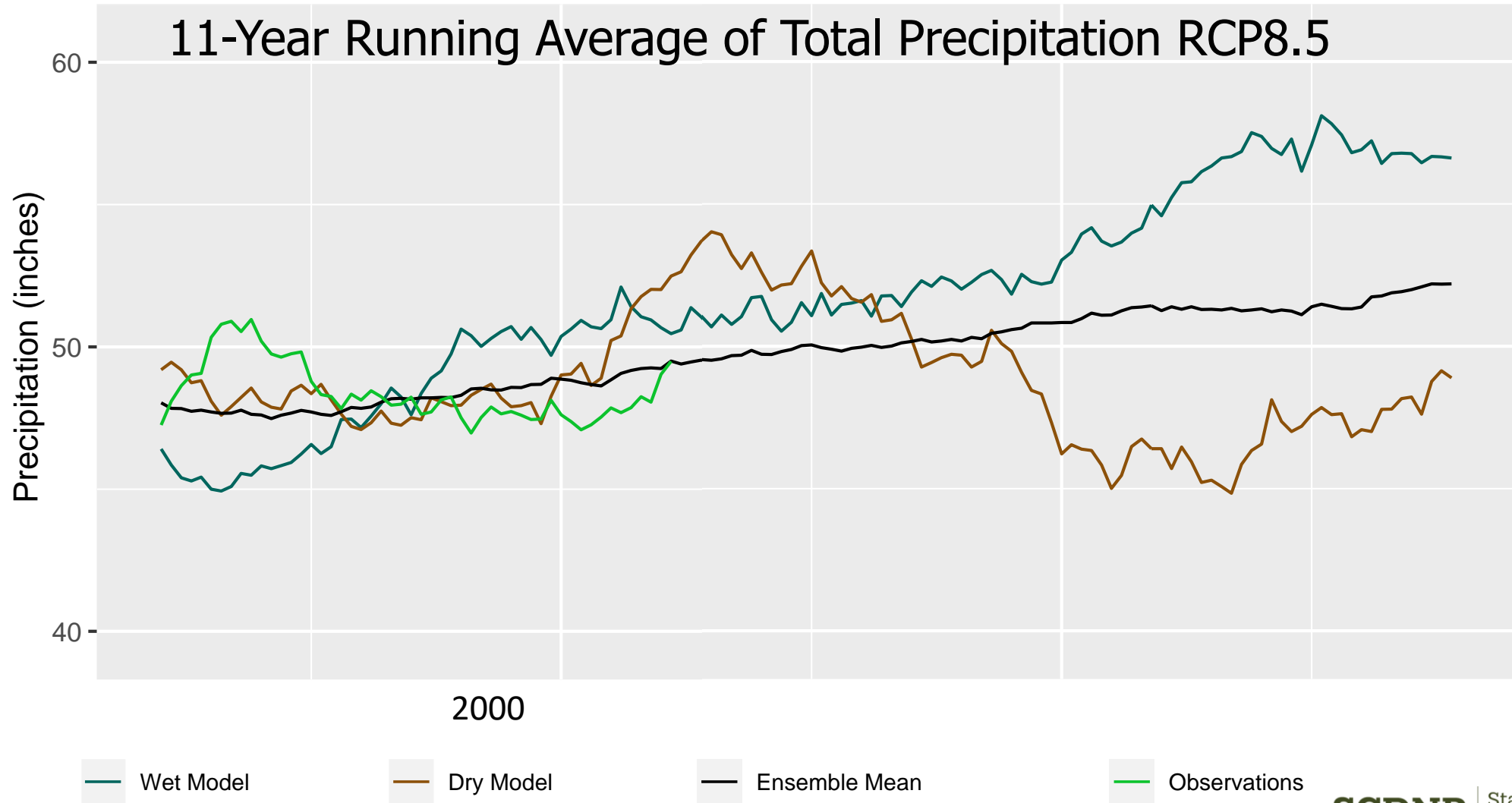
○ Decrease

○ Increase

● Statistically-significant decrease

# Precipitation Projections

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



Wet Model

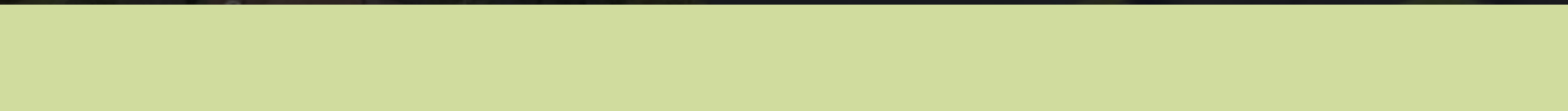
Dry Model

Ensemble Mean

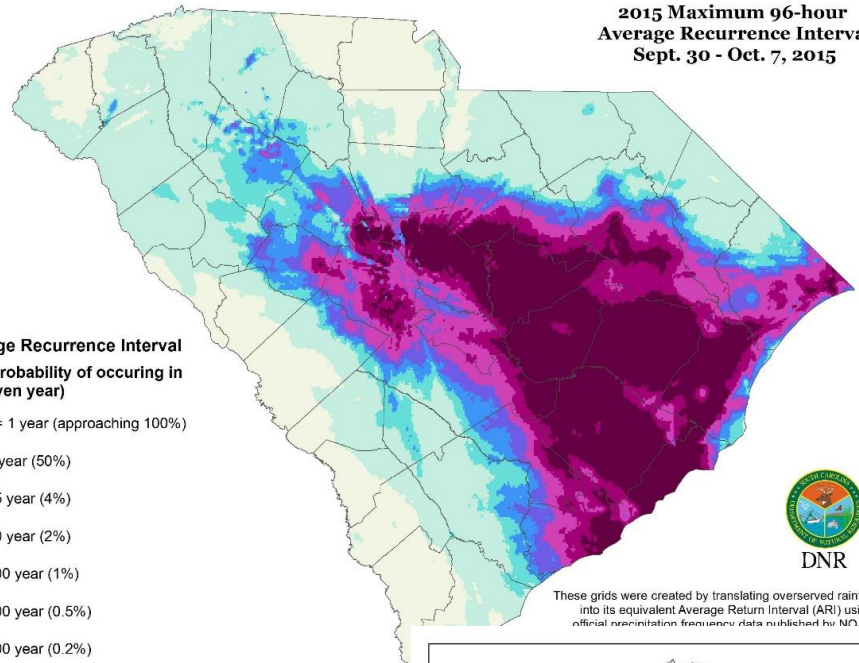
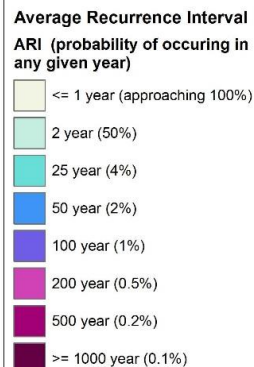
Observations



# Extreme Rainfall

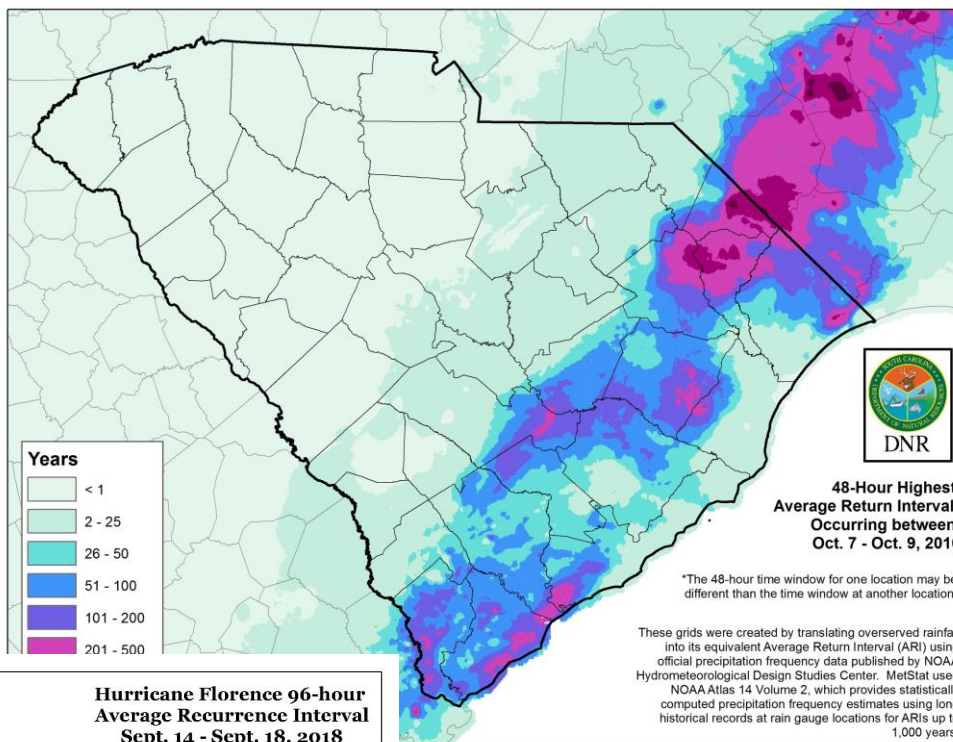
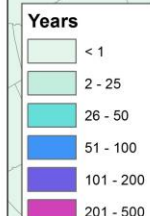


**2015 Maximum 96-hour  
Average Recurrence Interval  
Sept. 30 - Oct. 7, 2015**



DNR

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



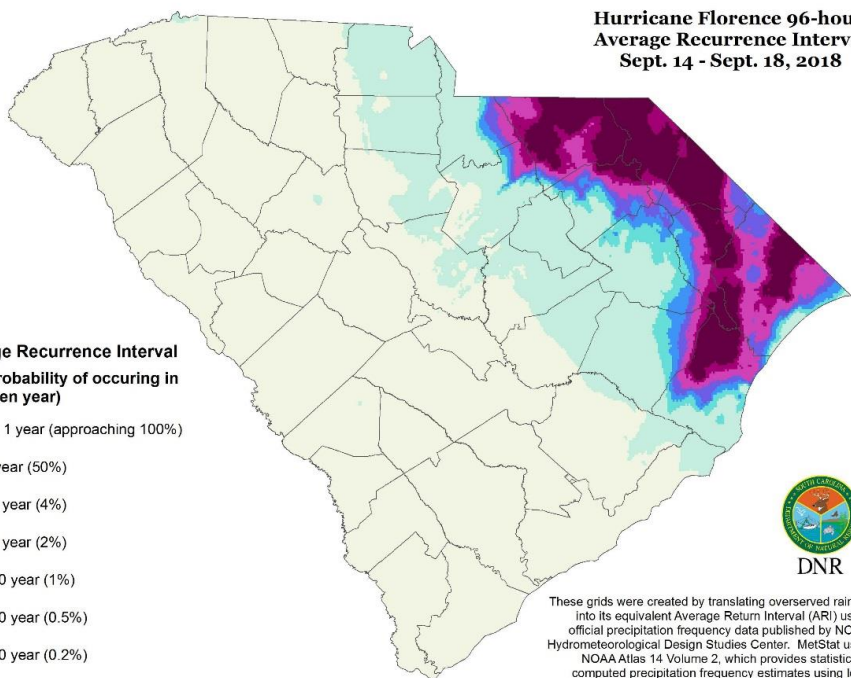
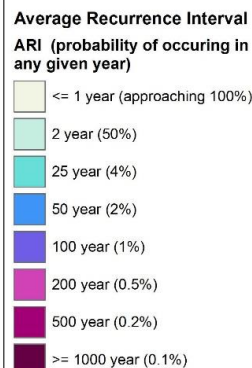
DNR

**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.

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



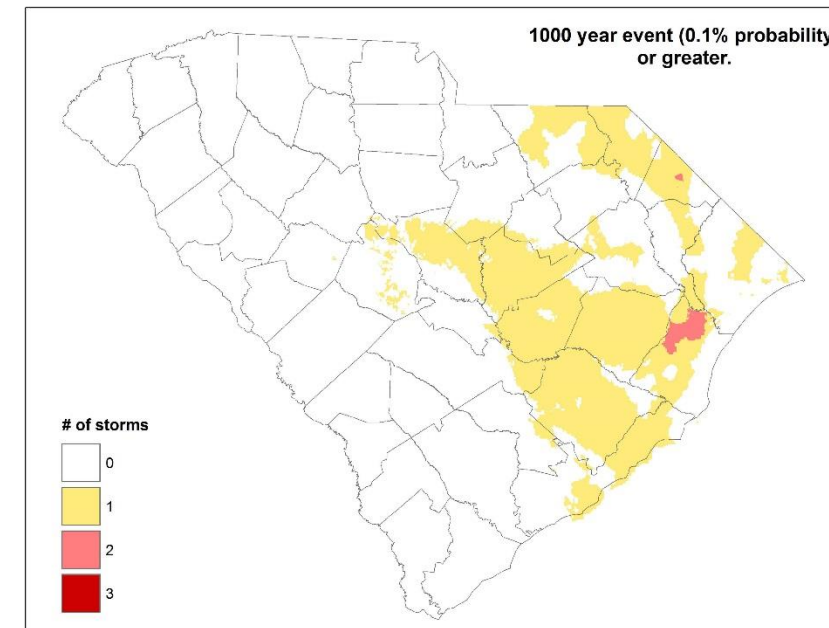
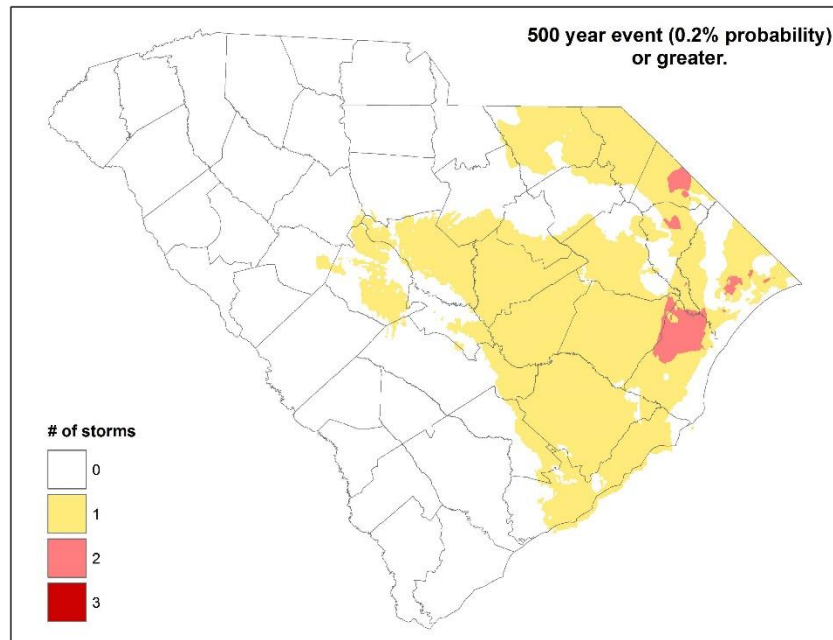
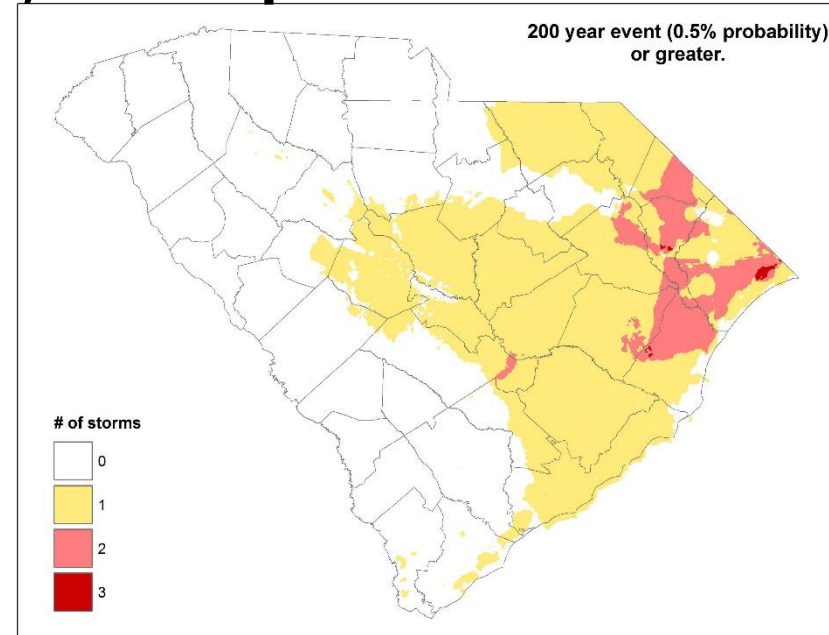
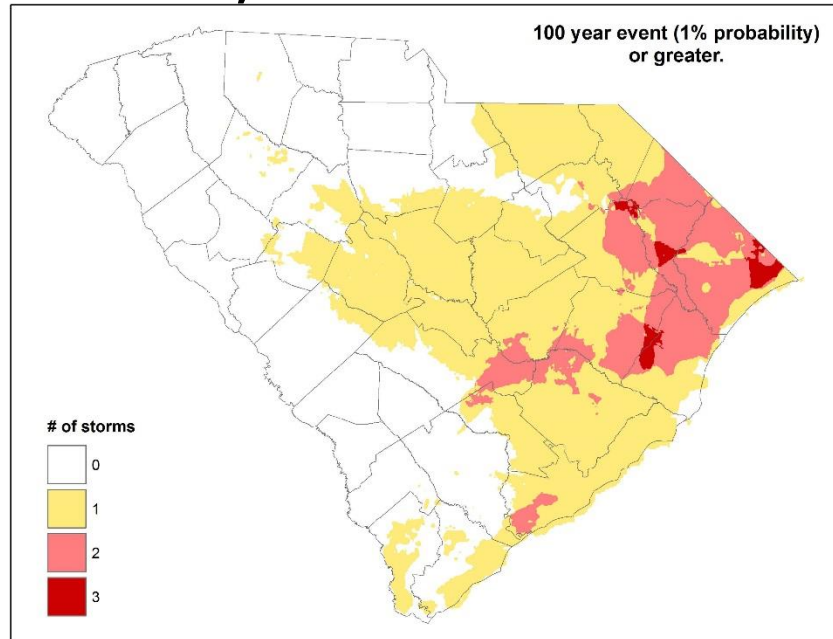
DNR

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.

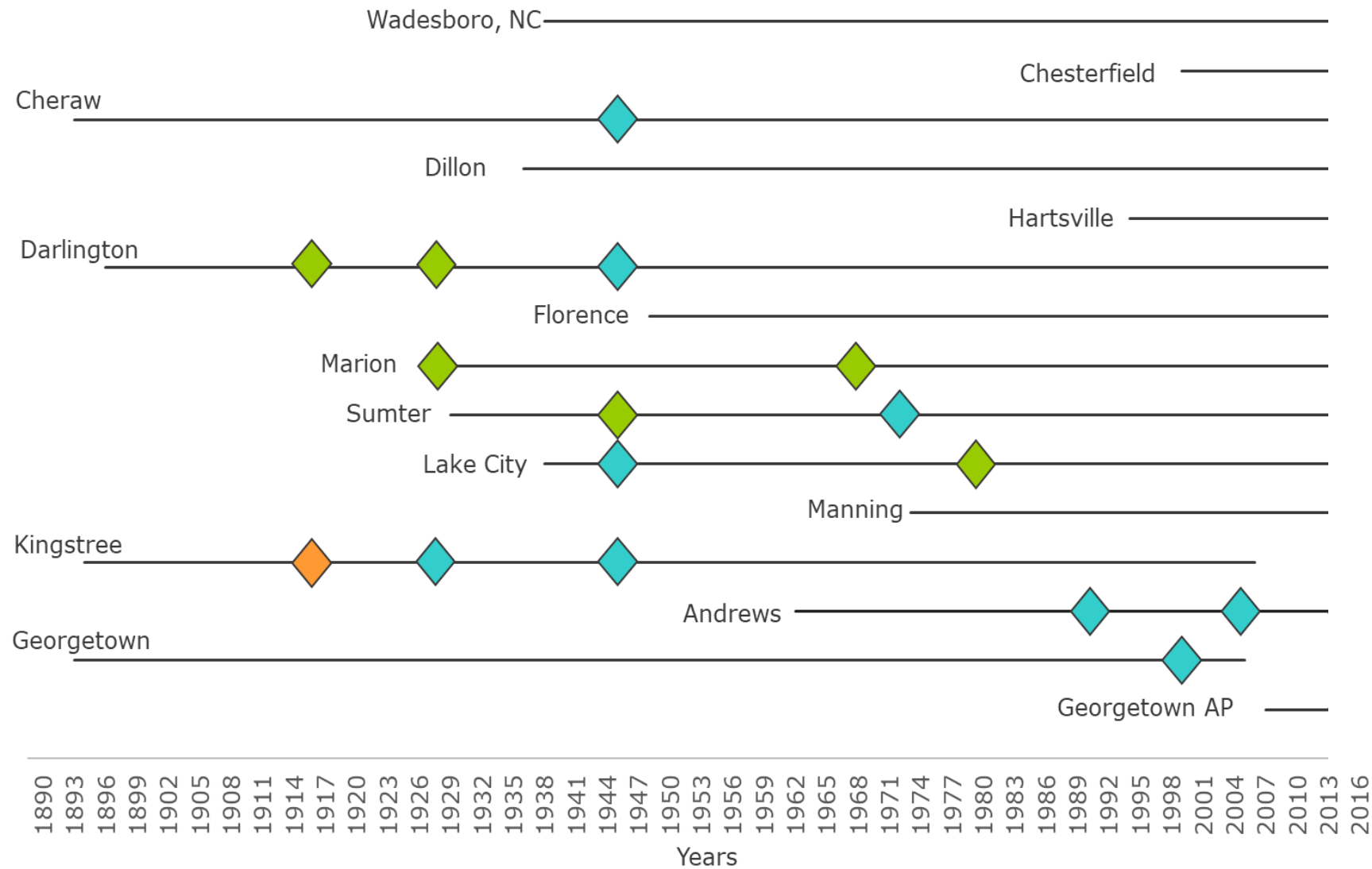
Areas in purple met or exceeded the 500-year event, a probability of 0.2% happening each year



# 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



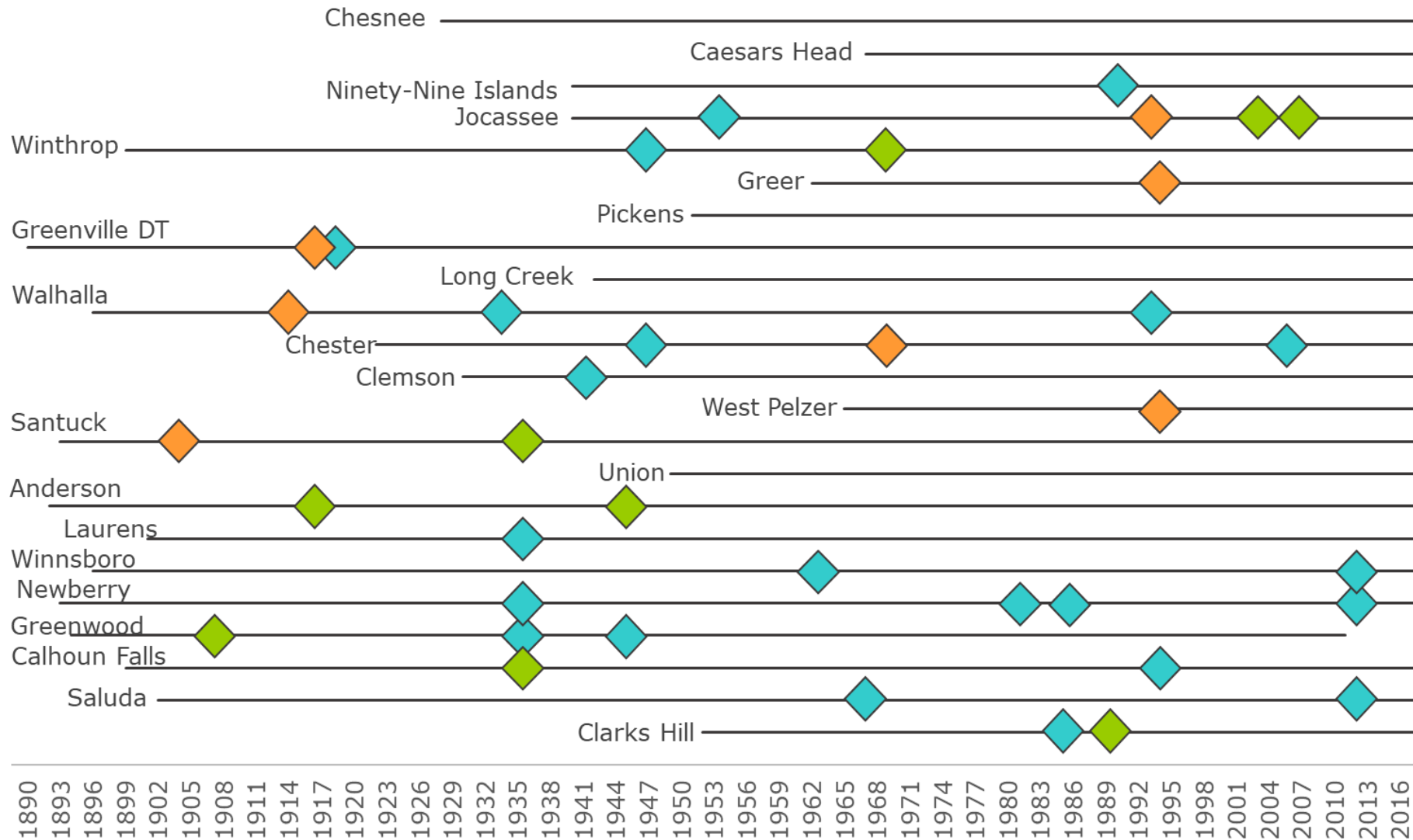
The purposes of ARI/AEP analysis, the following scale will be used in this

**Average Recurrence Intervals (AEP)**

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

(Ending 2020)

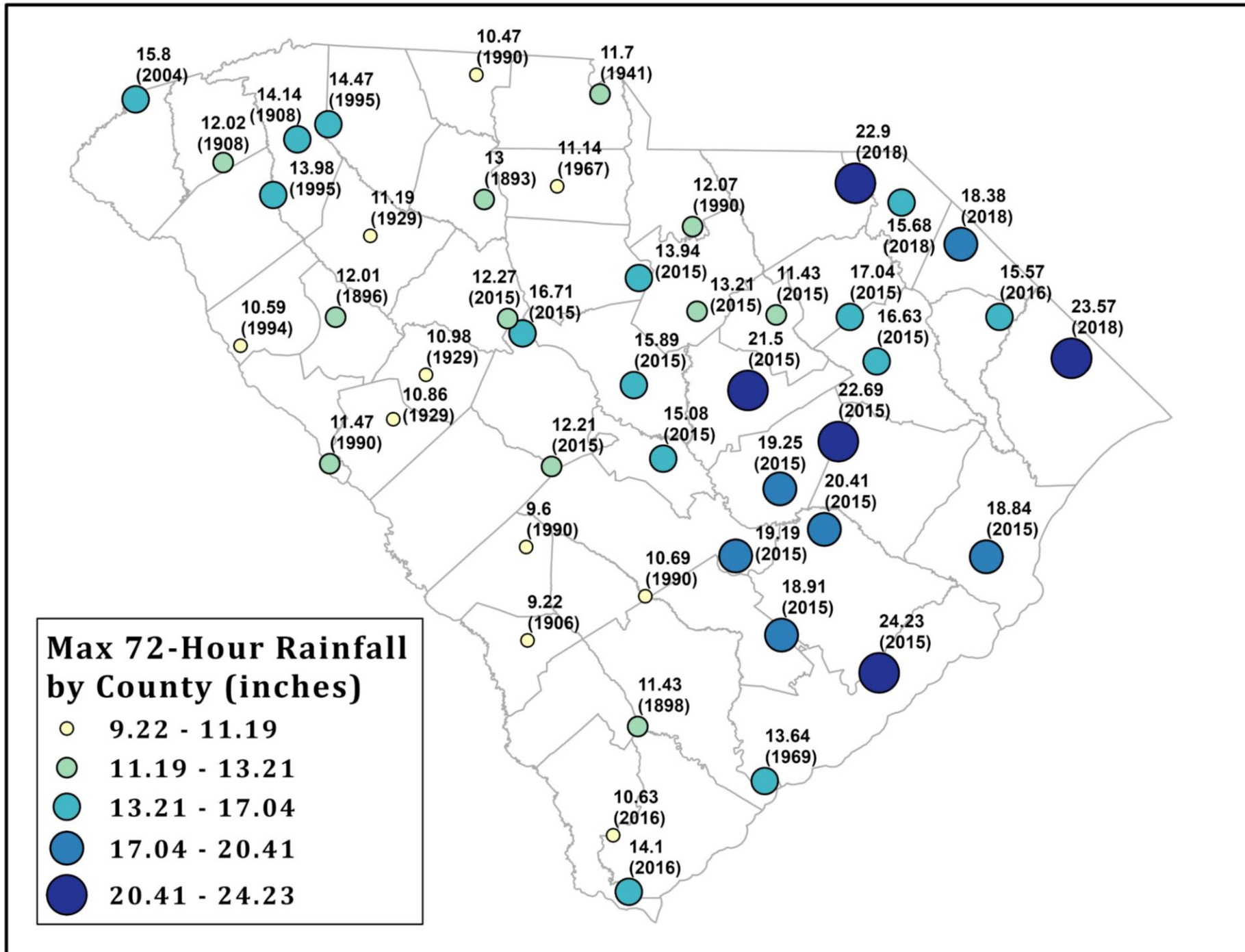
# Timeline Of Maximum 4-day Rainfall Events In The Upstate



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

**Average Recurrence Intervals (AEP)**

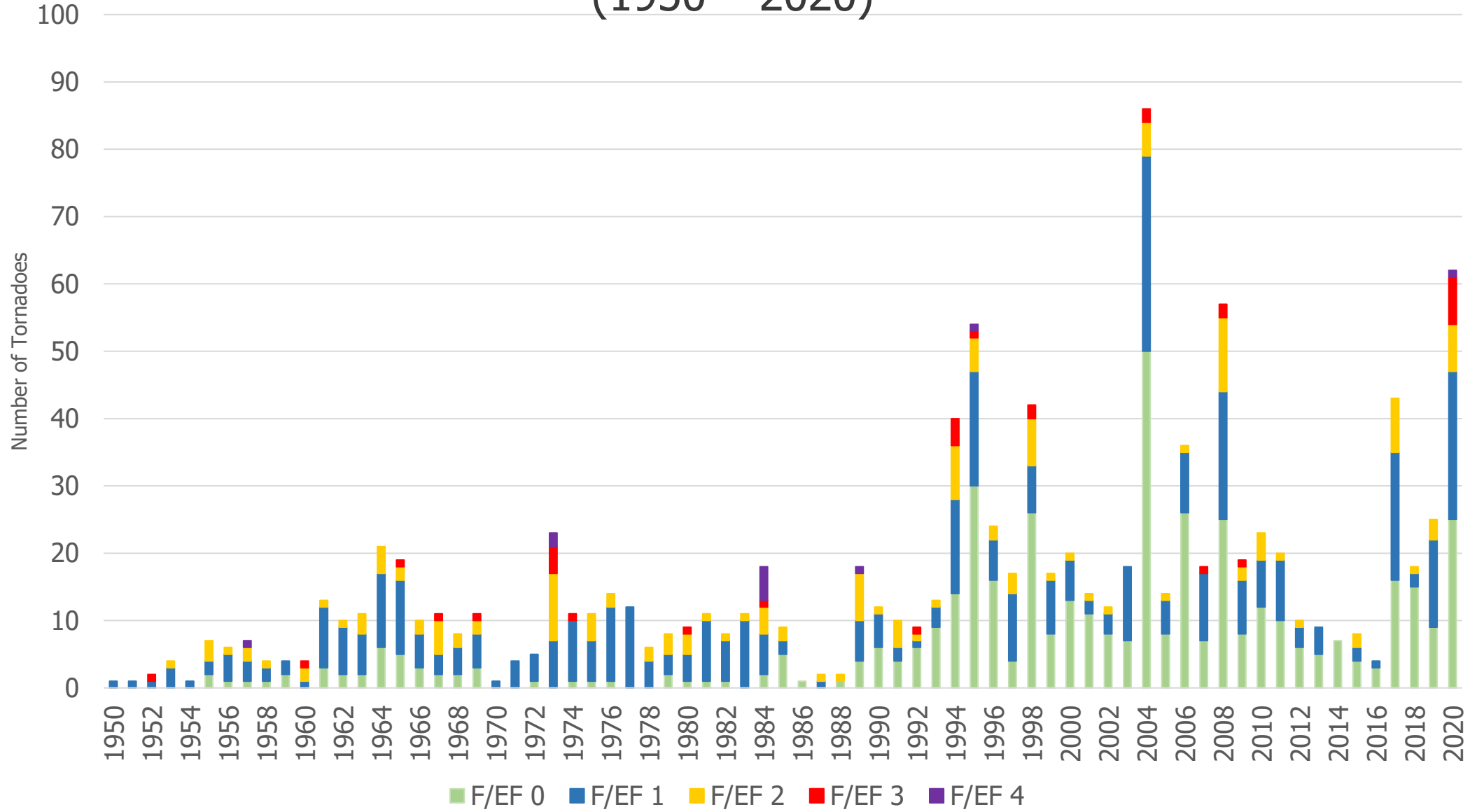
- 1,000 Year (0.1%)
- 500 Year (0.2%)
- 200 Year (0.5%)
- 100 Year (1.0%)



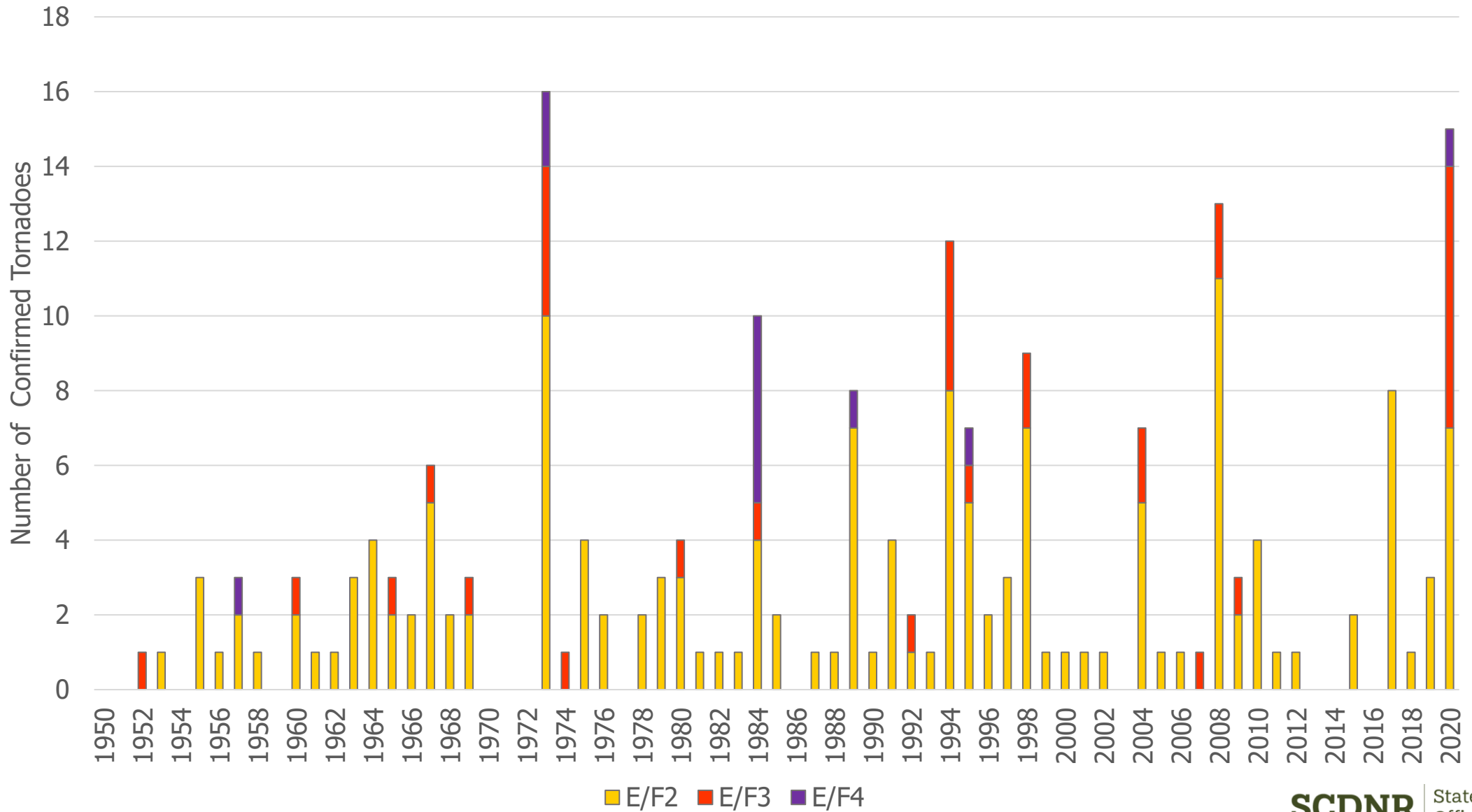


# Tornadoes

# Confirmed South Carolina Tornadoes (1950 – 2020)

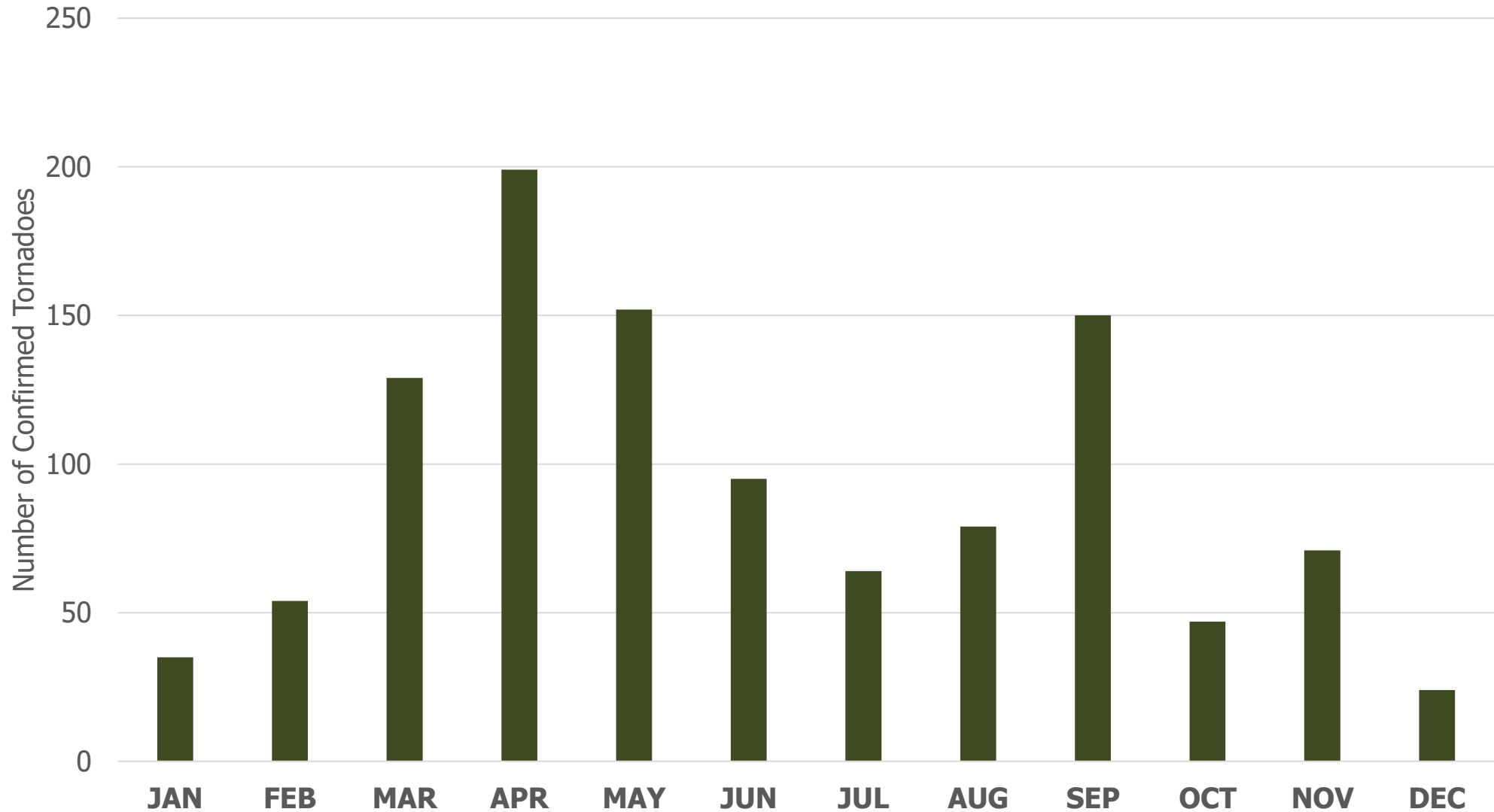


# South Carolina (EF2, EF3, and EF4) Tornadoes (1950 - 2020)



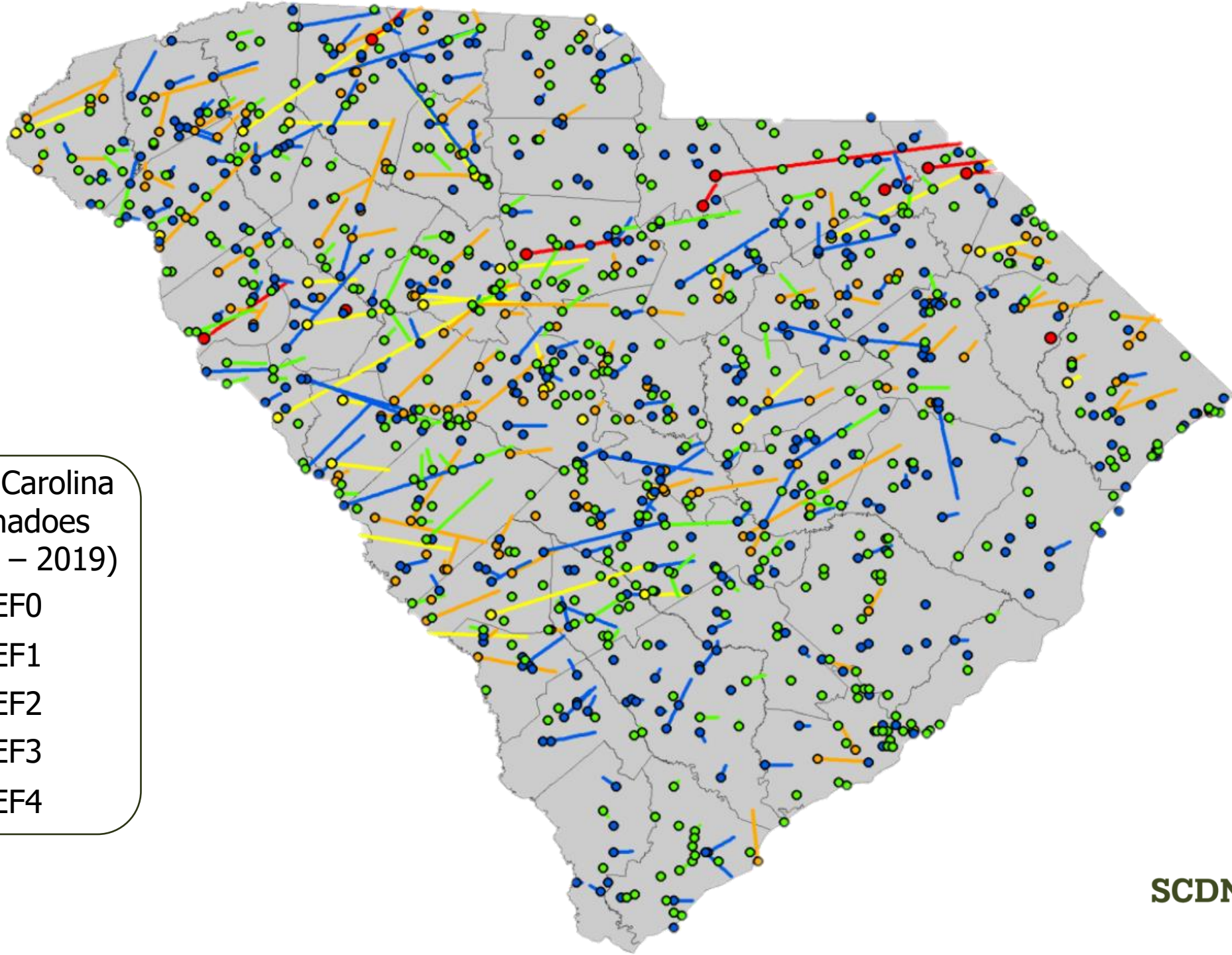


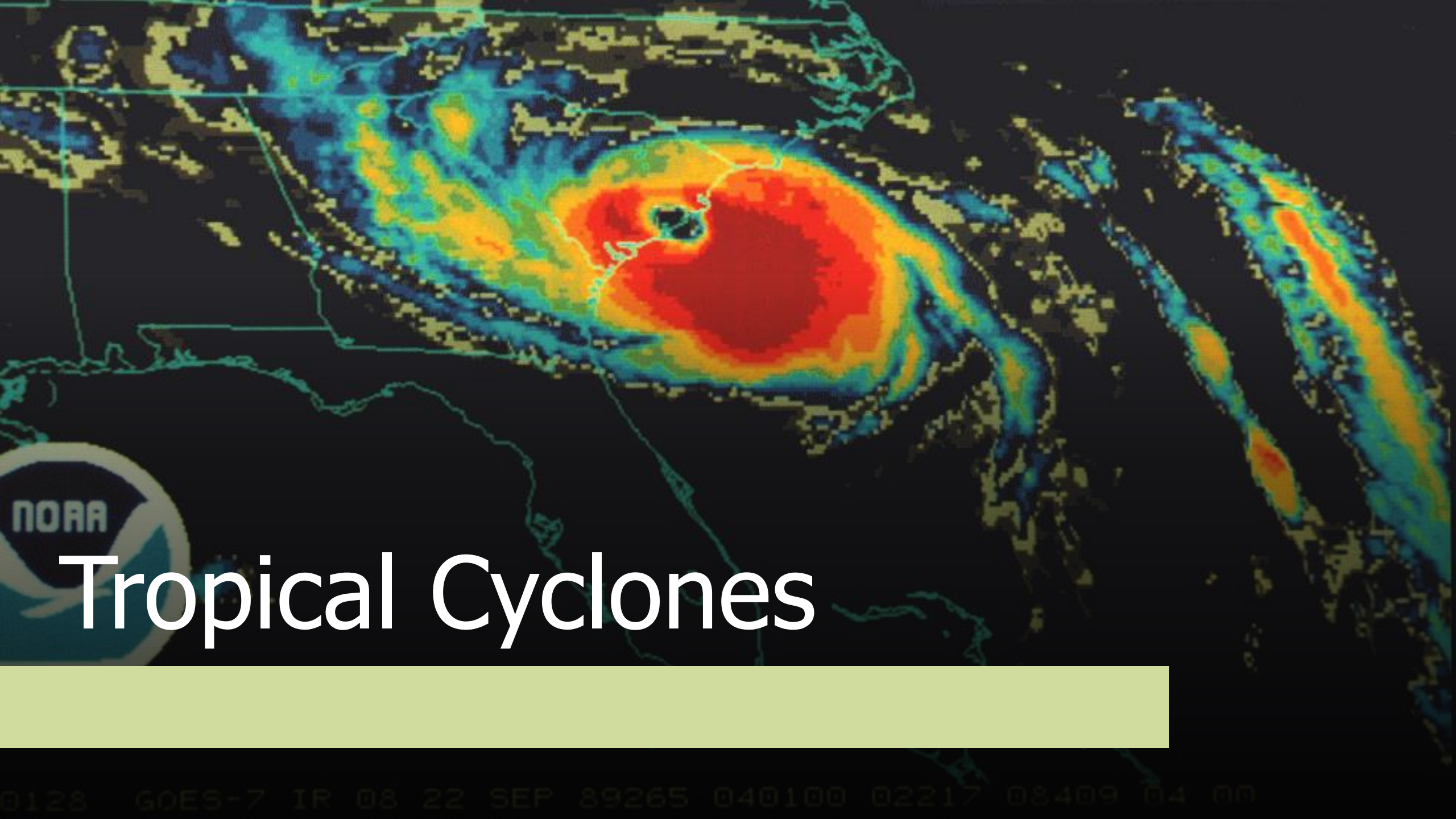
# South Carolina Monthly Tornado Counts (1950 - 2020)



South Carolina  
Tornadoes  
(1950 – 2019)

- EF0
- EF1
- EF2
- EF3
- EF4





# Tropical Cyclones

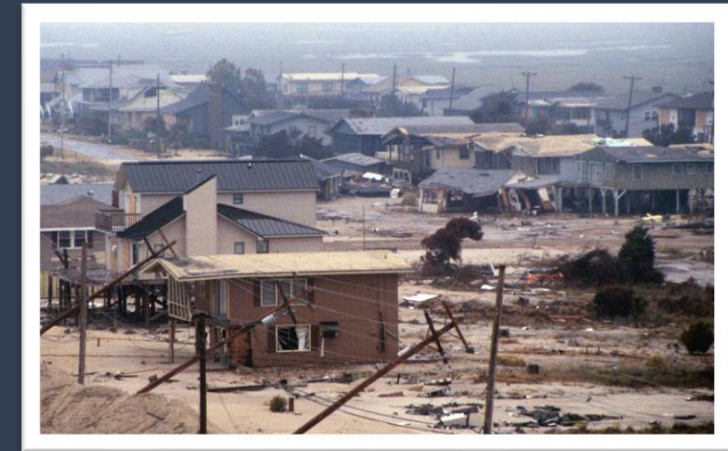


# Tropical Storms are part of South Carolina's Climatology and History.

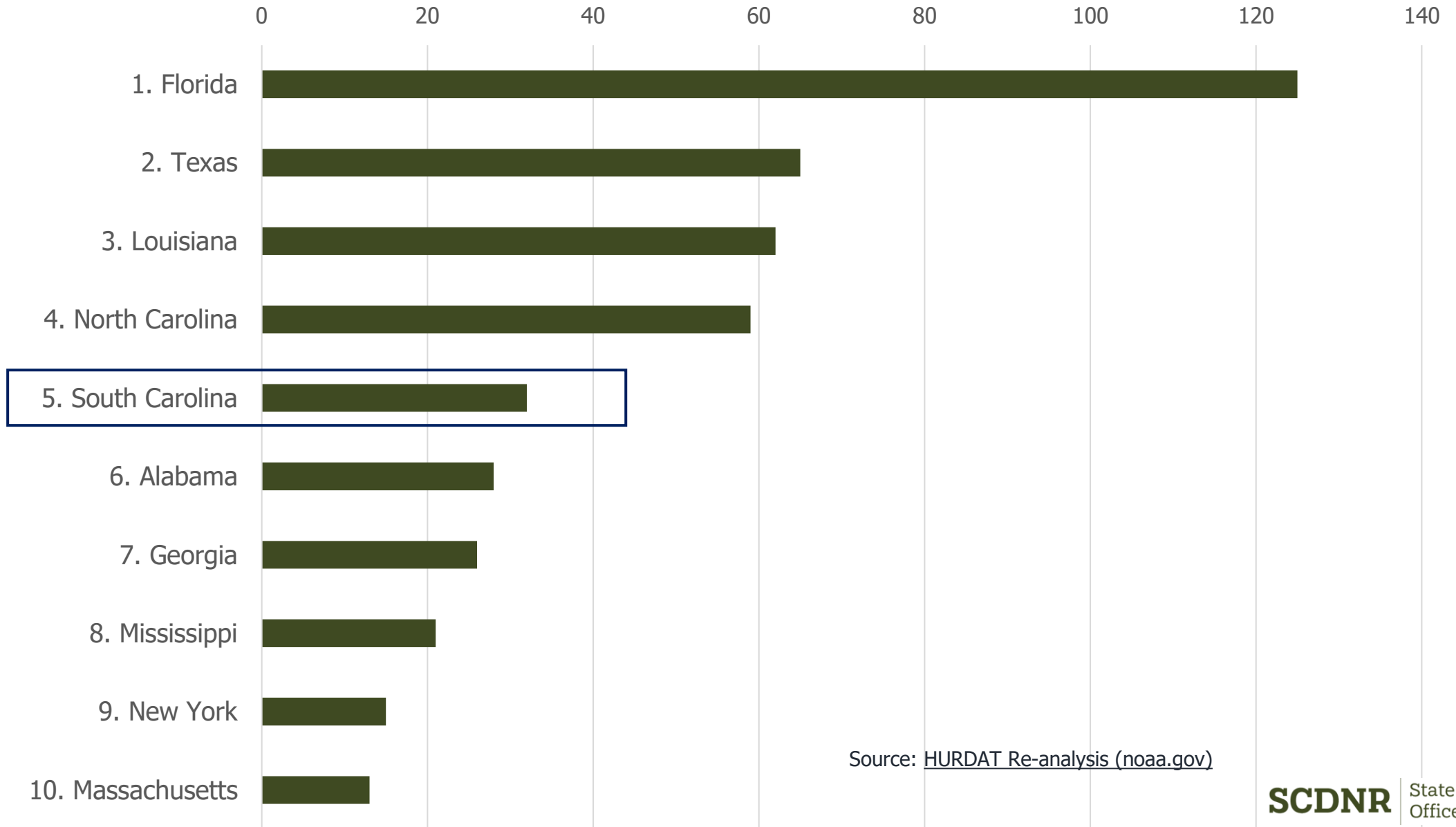
Impacts are not limited to the coast.

Inland portions of the state have been affected by:

- Heavy rains
- Flooding
- High winds
- Tornadoes



# 10 States Where Hurricanes Hit the Most



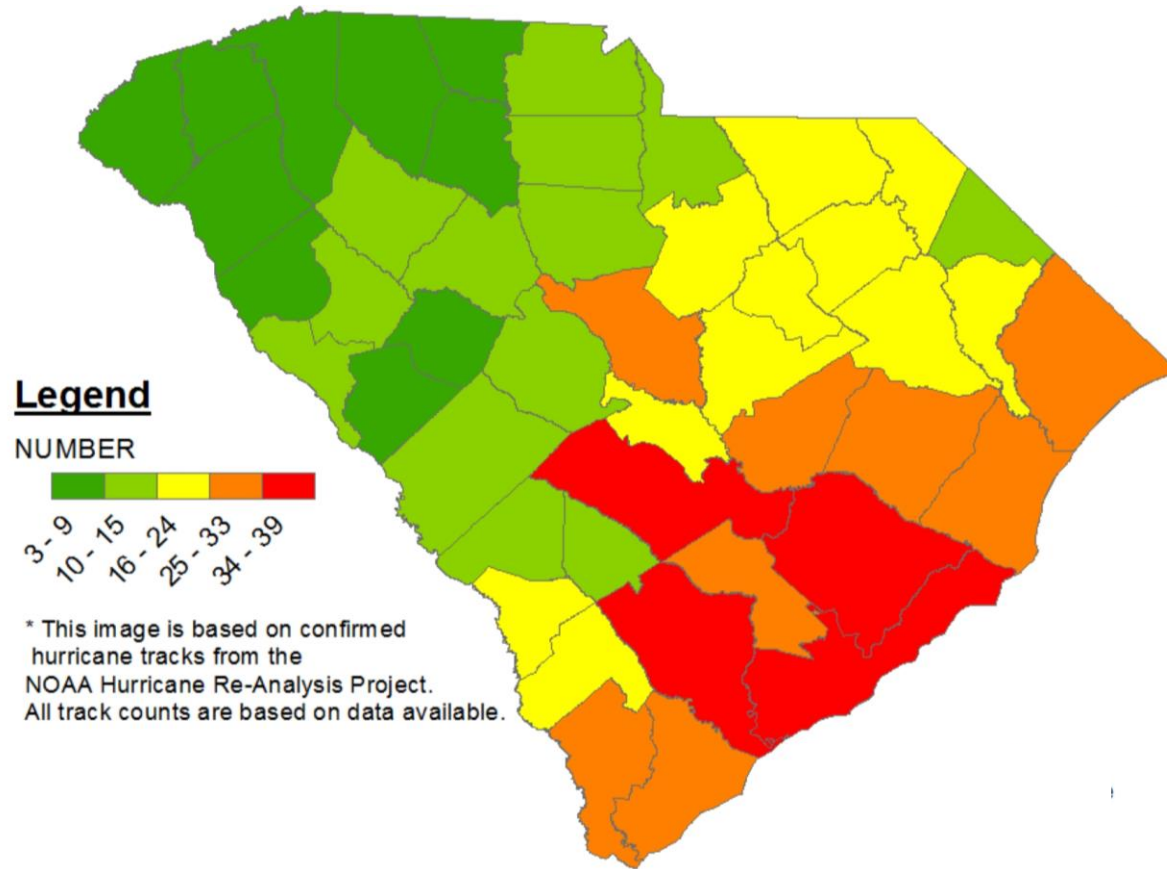
Source: [HURDAT Re-analysis \(noaa.gov\)](#)

# Tracks Of Tropical Cyclones To Impact South Carolina



# 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

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