



# Rainfall and Stream Analysis

## 1996-2018

Joint Select Committee on Storm-Related  
River Debris / Damage in North Carolina

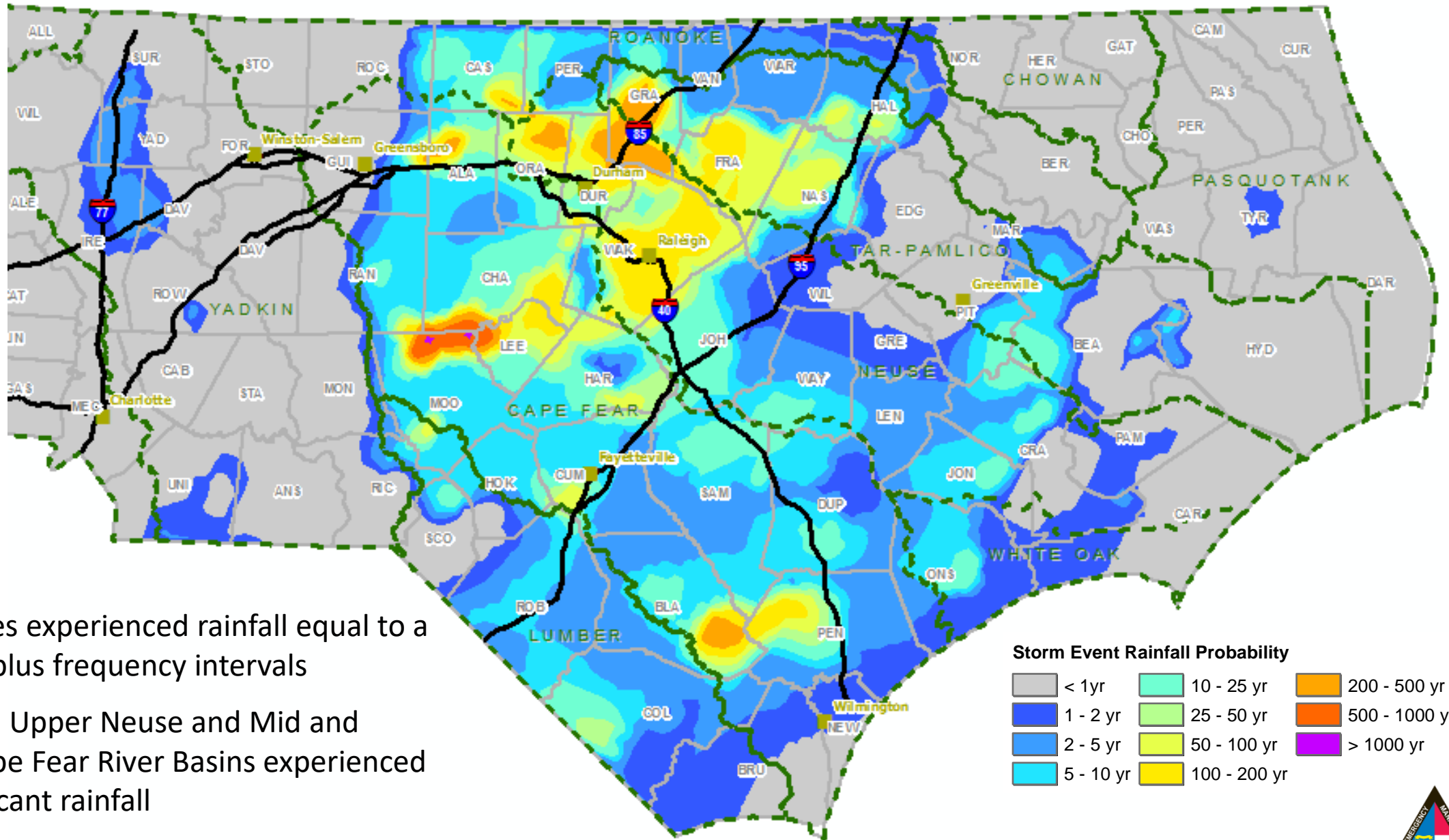
Michael A. Sprayberry, Director, NCEM/NCORR

November 26<sup>th</sup>, 2018

# Rainfall Analysis and Comparisons

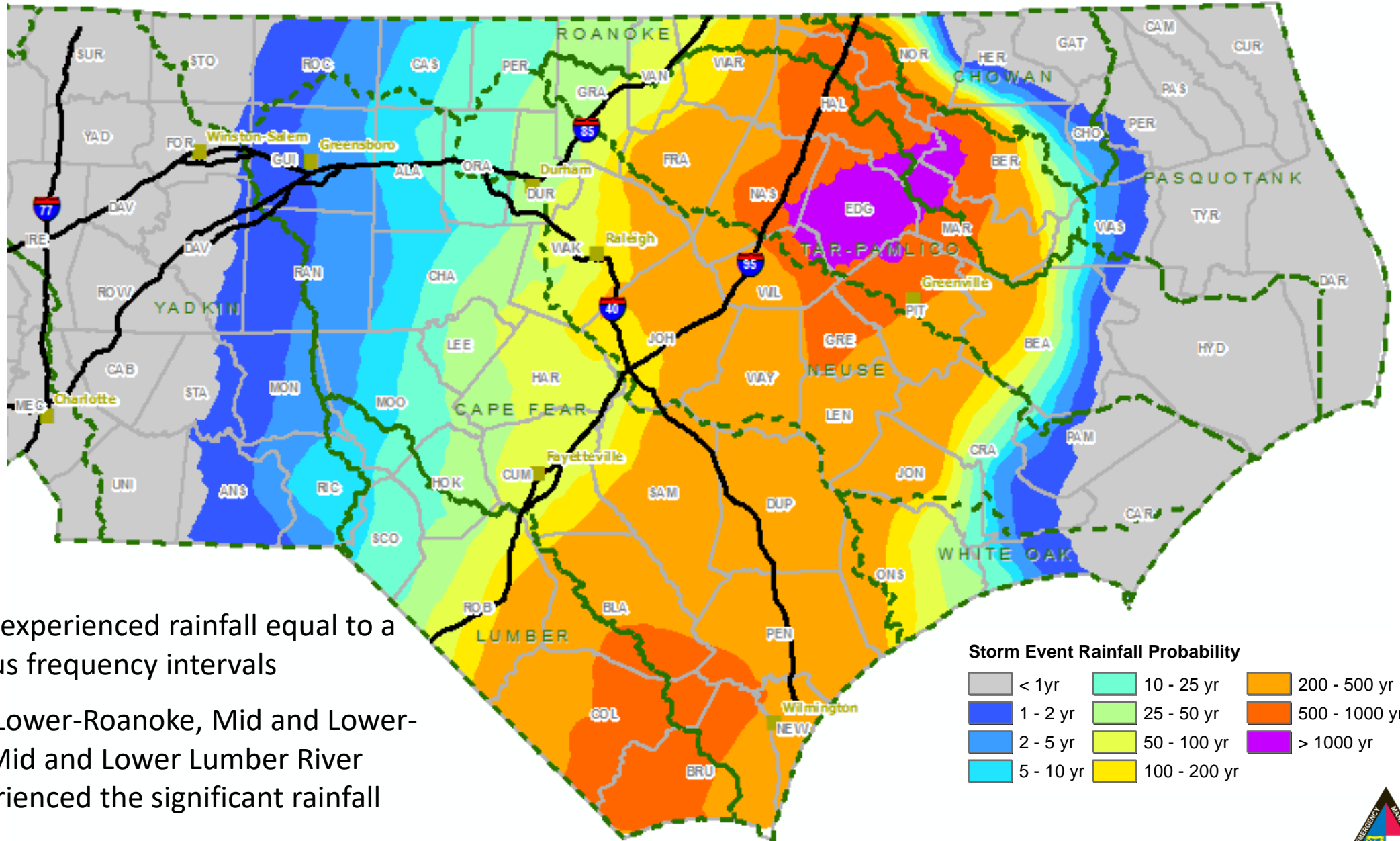
## Rainfall Return Period

# Hurricane Fran – September 1996



- 12 counties experienced rainfall equal to a 100-year plus frequency intervals
- Upper Tar, Upper Neuse and Mid and Lower-Cape Fear River Basins experienced the significant rainfall

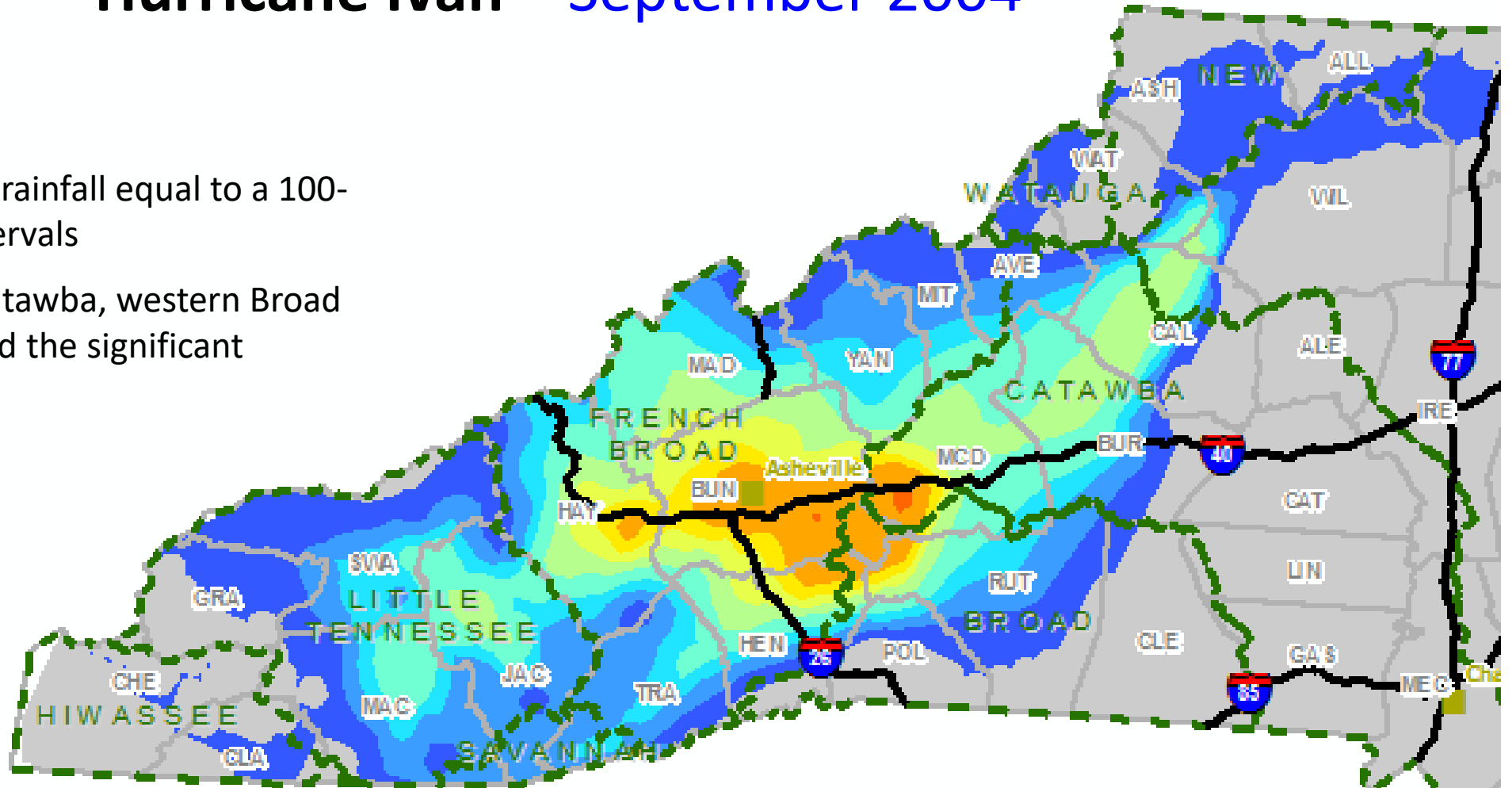
# Hurricane Floyd – September 1999



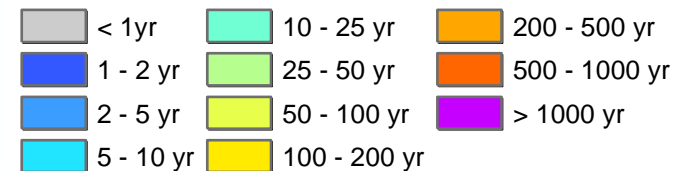
- 30 counties experienced rainfall equal to a 100-year plus frequency intervals
- Tar, Neuse, Lower-Roanoke, Mid and Lower-Cape Fear, Mid and Lower Lumber River Basins experienced the significant rainfall

# Hurricane Ivan – September 2004

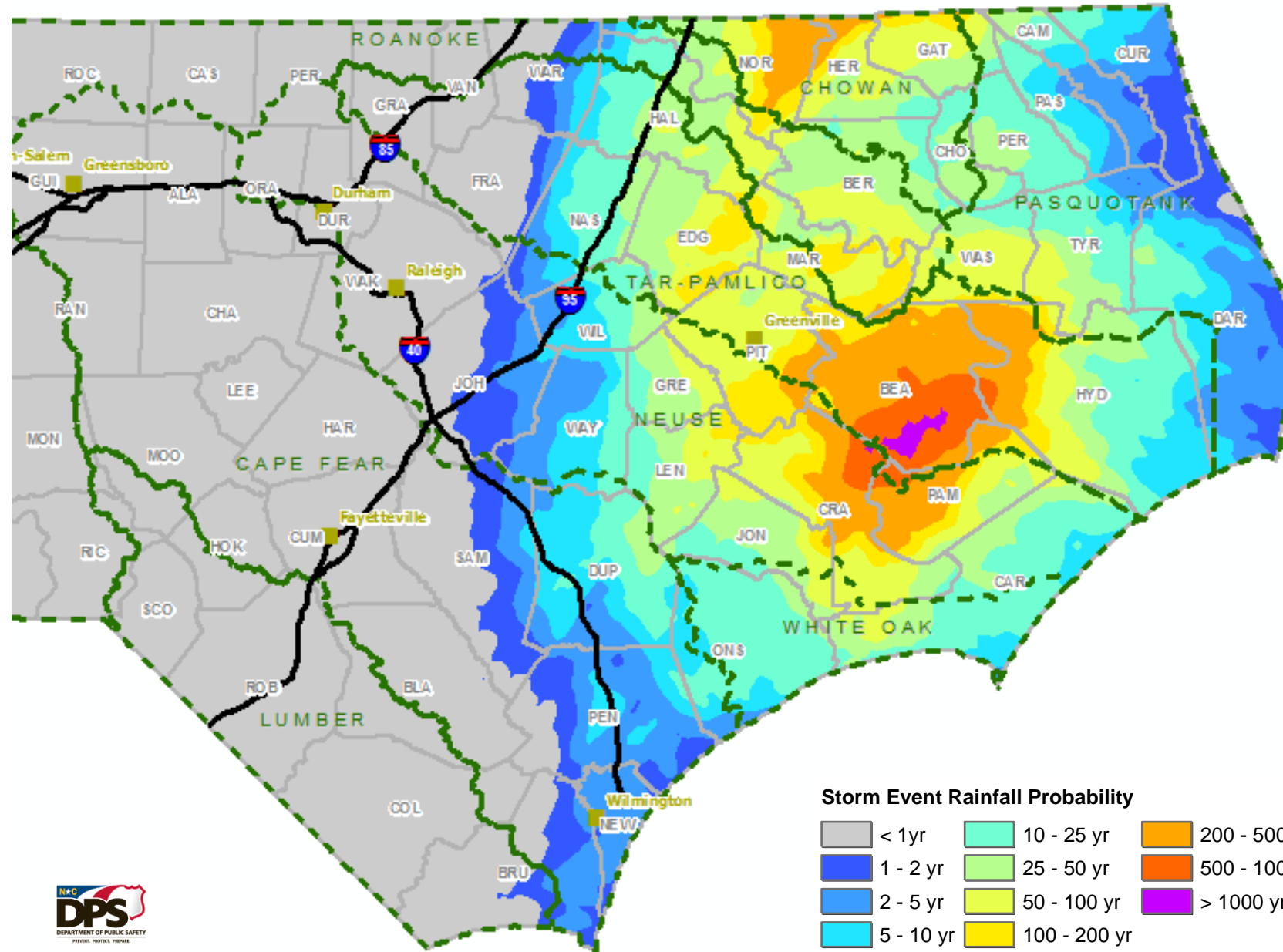
- 5 counties experienced rainfall equal to a 100-year plus frequency intervals
- French Broad, Upper Catawba, western Broad River Basins experienced the significant rainfall



Storm Event Rainfall Probability

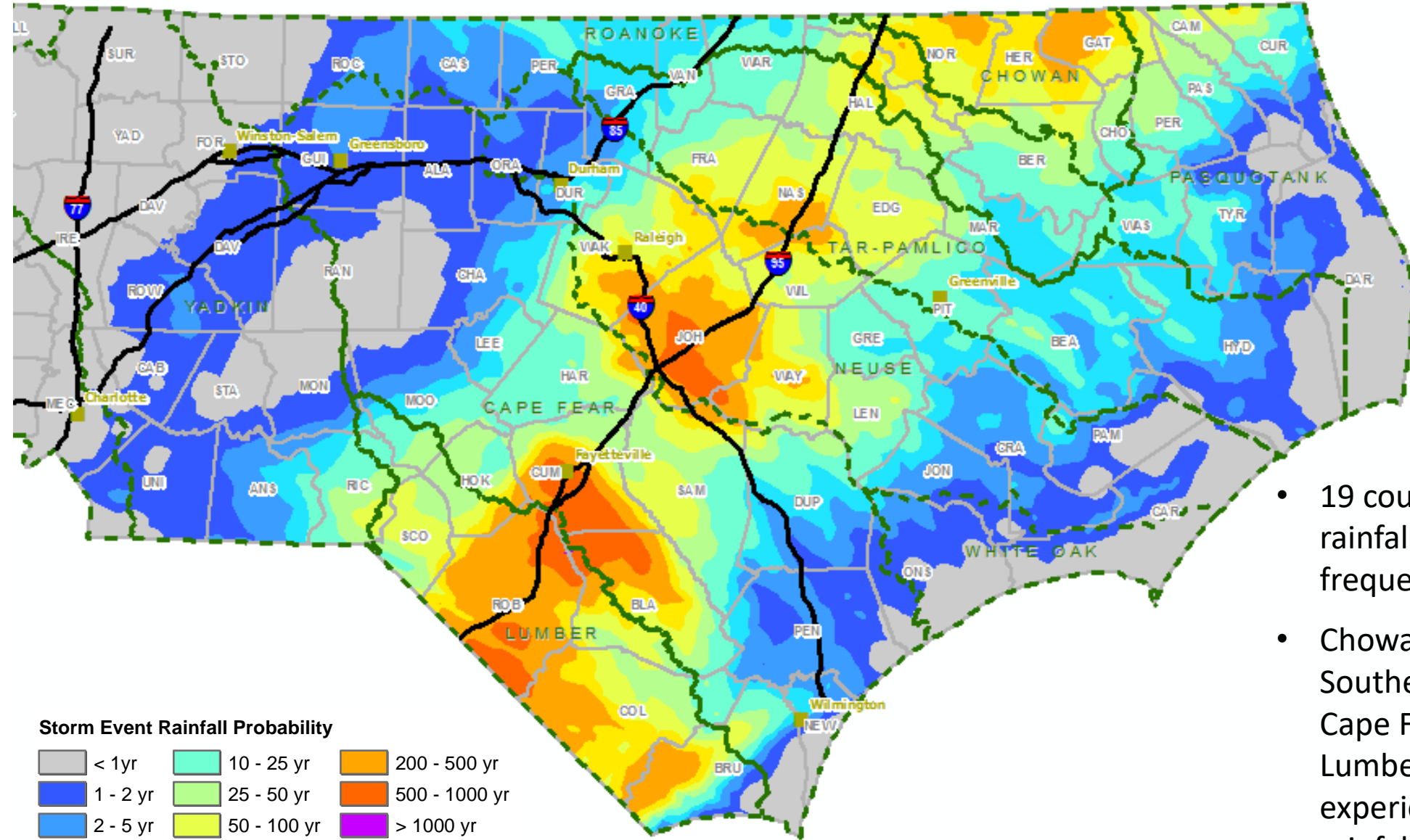


# Hurricane Irene – August 2011



- 11 counties experienced rainfall equal to a 100-year plus frequency intervals
- Chowan, Lower-Roanoke, Lower-Tar, Lower-Neuse River Basins experienced the significant rainfall

# Hurricane Matthew – October 2016

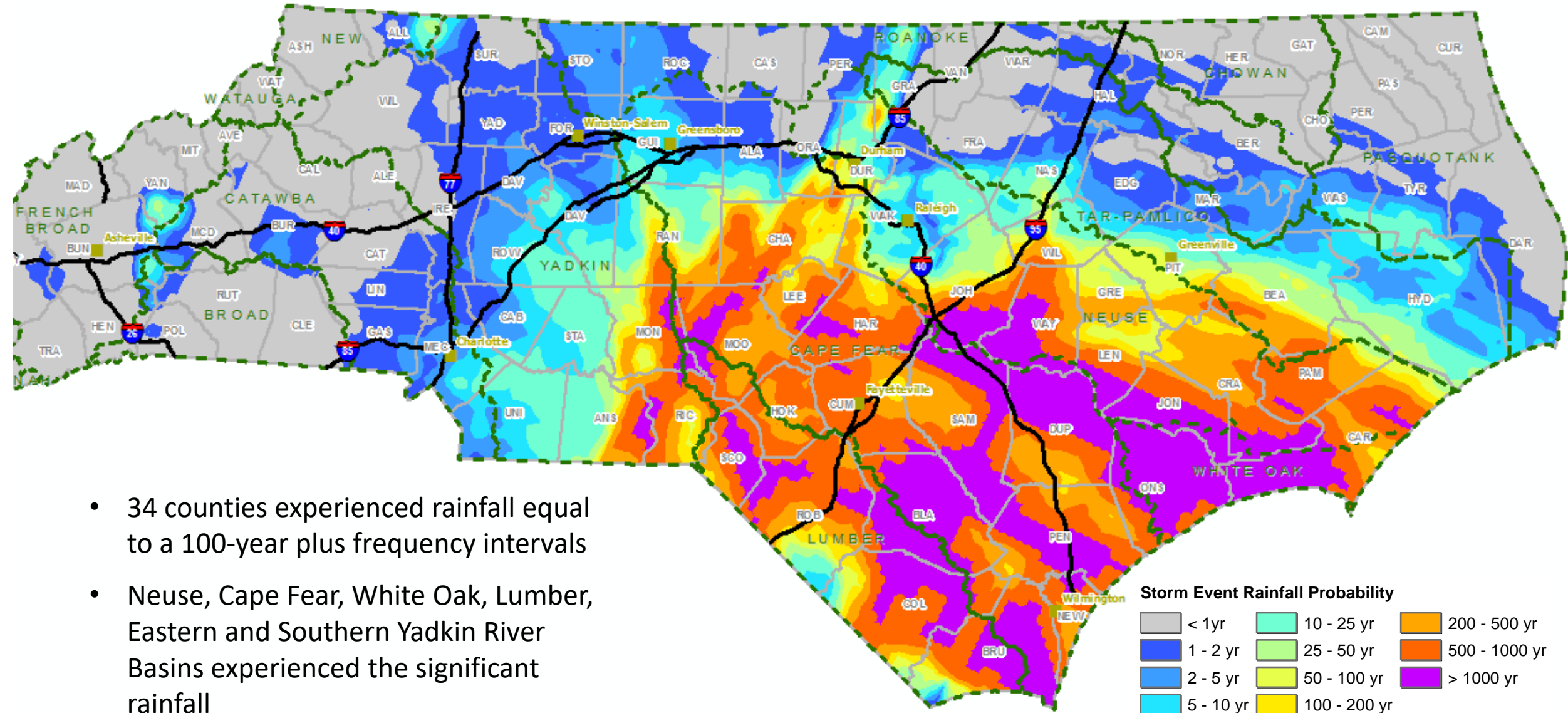


Storm Event Rainfall Probability

< 1 yr	10 - 25 yr	200 - 500 yr
1 - 2 yr	25 - 50 yr	500 - 1000 yr
2 - 5 yr	50 - 100 yr	> 1000 yr
5 - 10 yr	100 - 200 yr	

- 19 counties experienced rainfall equal to a 100-year plus frequency intervals
- Chowan, Lower-Roanoke, Mid-Southern-Tar, Mid-Neuse, Mid-Cape Fear, Mid and Lower Lumber River Basins experienced the significant rainfall

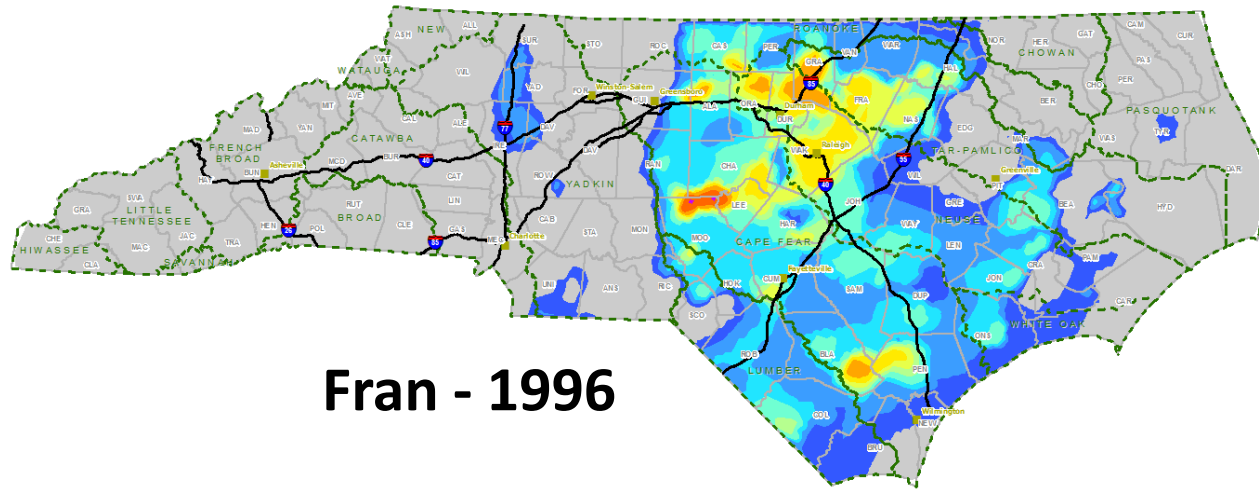
# Hurricane Florence – September 2018



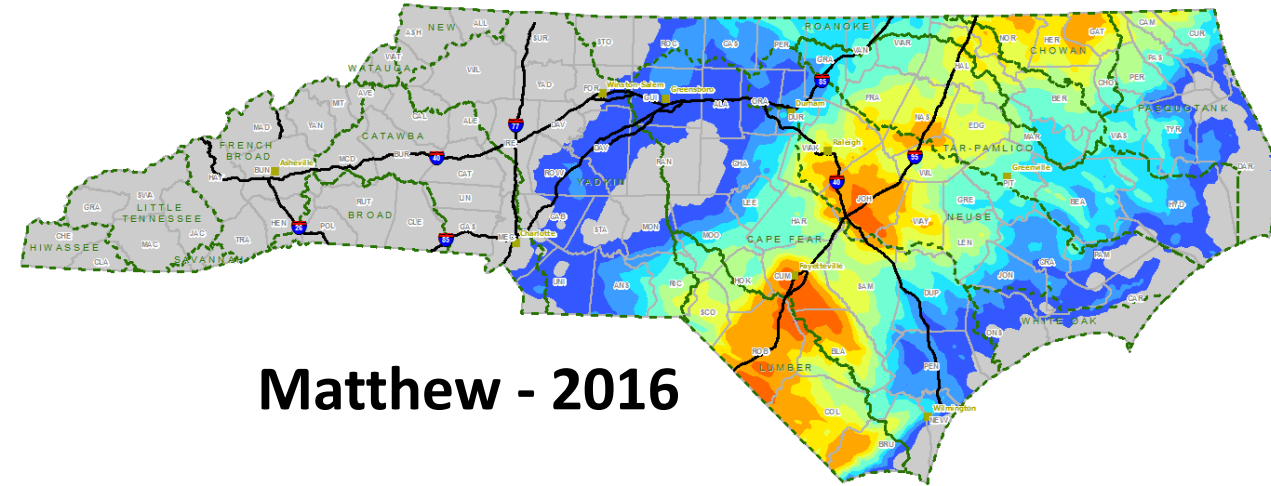
- 34 counties experienced rainfall equal to a 100-year plus frequency intervals
- Neuse, Cape Fear, White Oak, Lumber, Eastern and Southern Yadkin River Basins experienced the significant rainfall



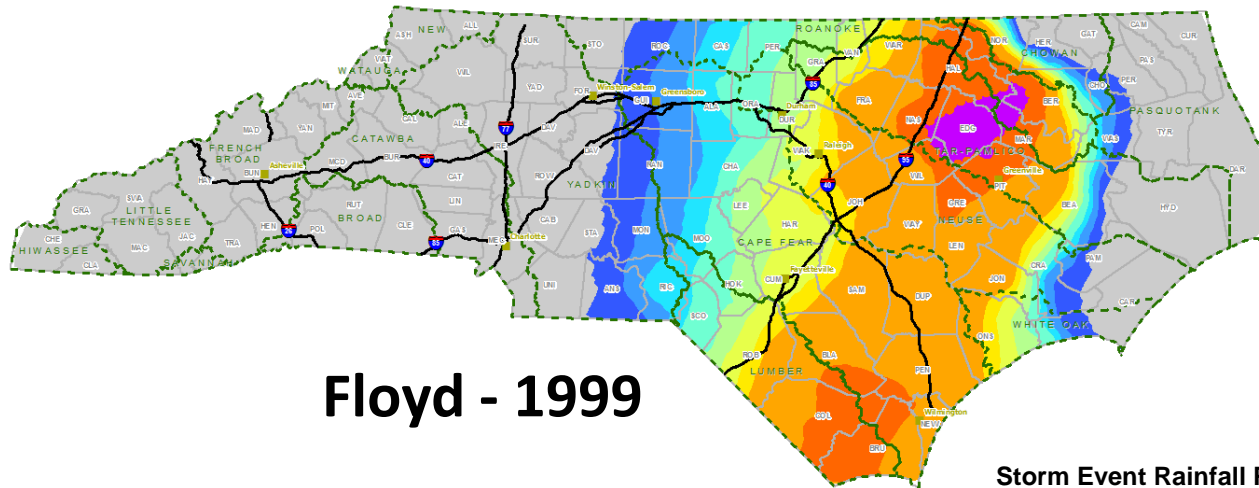
# Rainfall Frequency Interval – Event Comparison



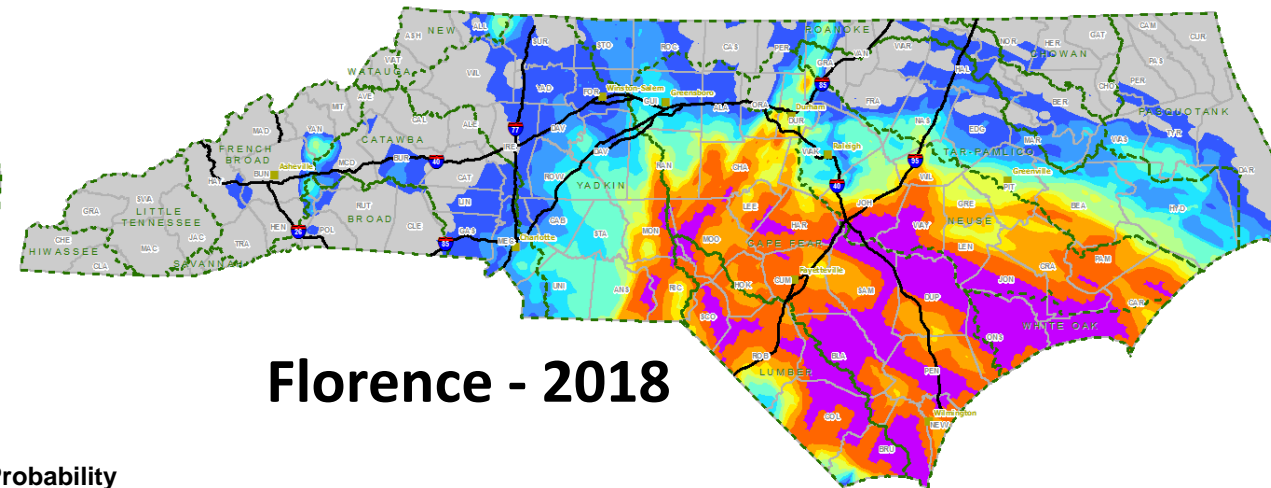
**Fran - 1996**



**Matthew - 2016**



**Floyd - 1999**



**Florence - 2018**

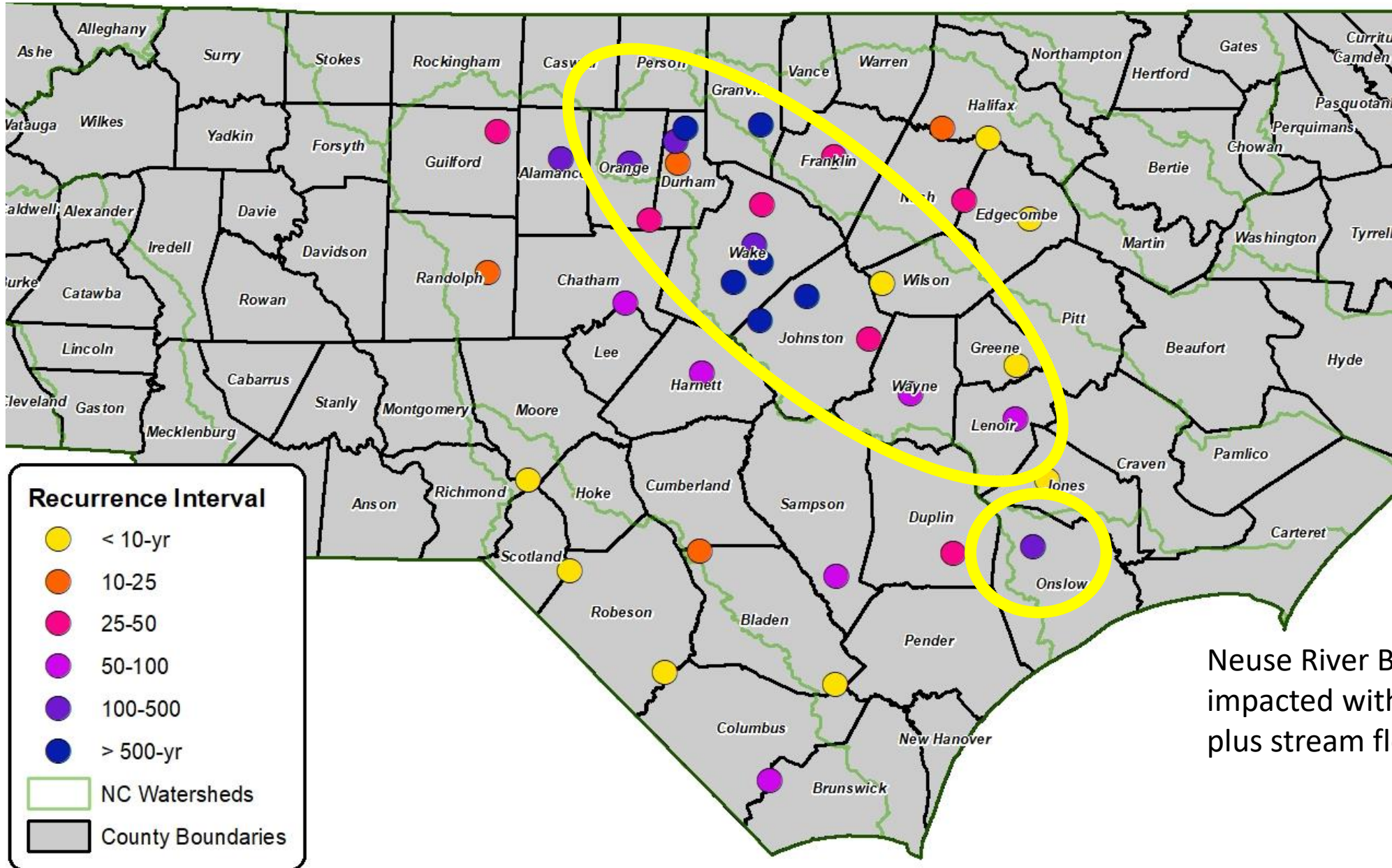
## Storm Event Rainfall Probability



# River Streamflow Comparisons

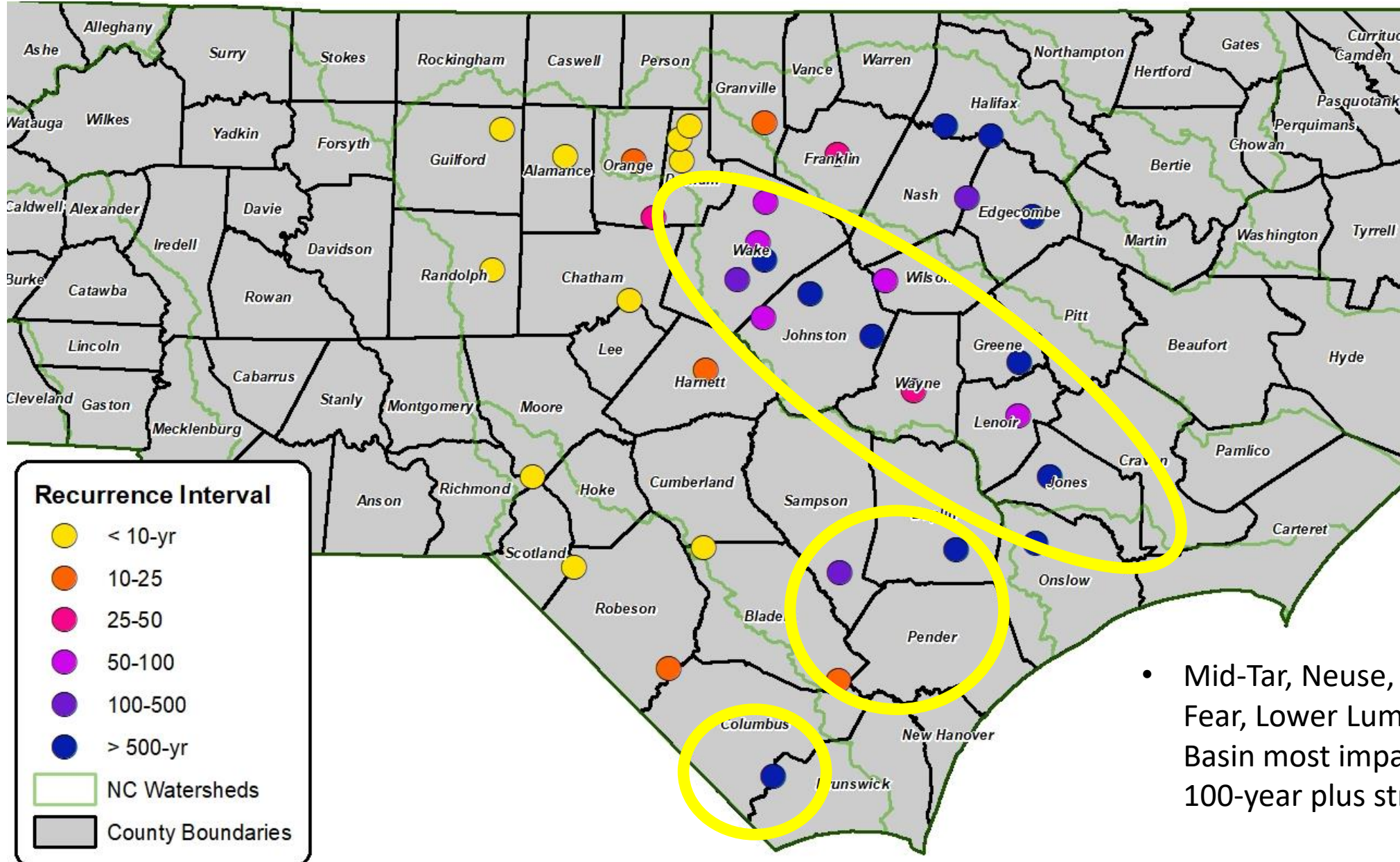
## Flood Return Period

# River Stage Return Periods – Hurricane Fran (1996)



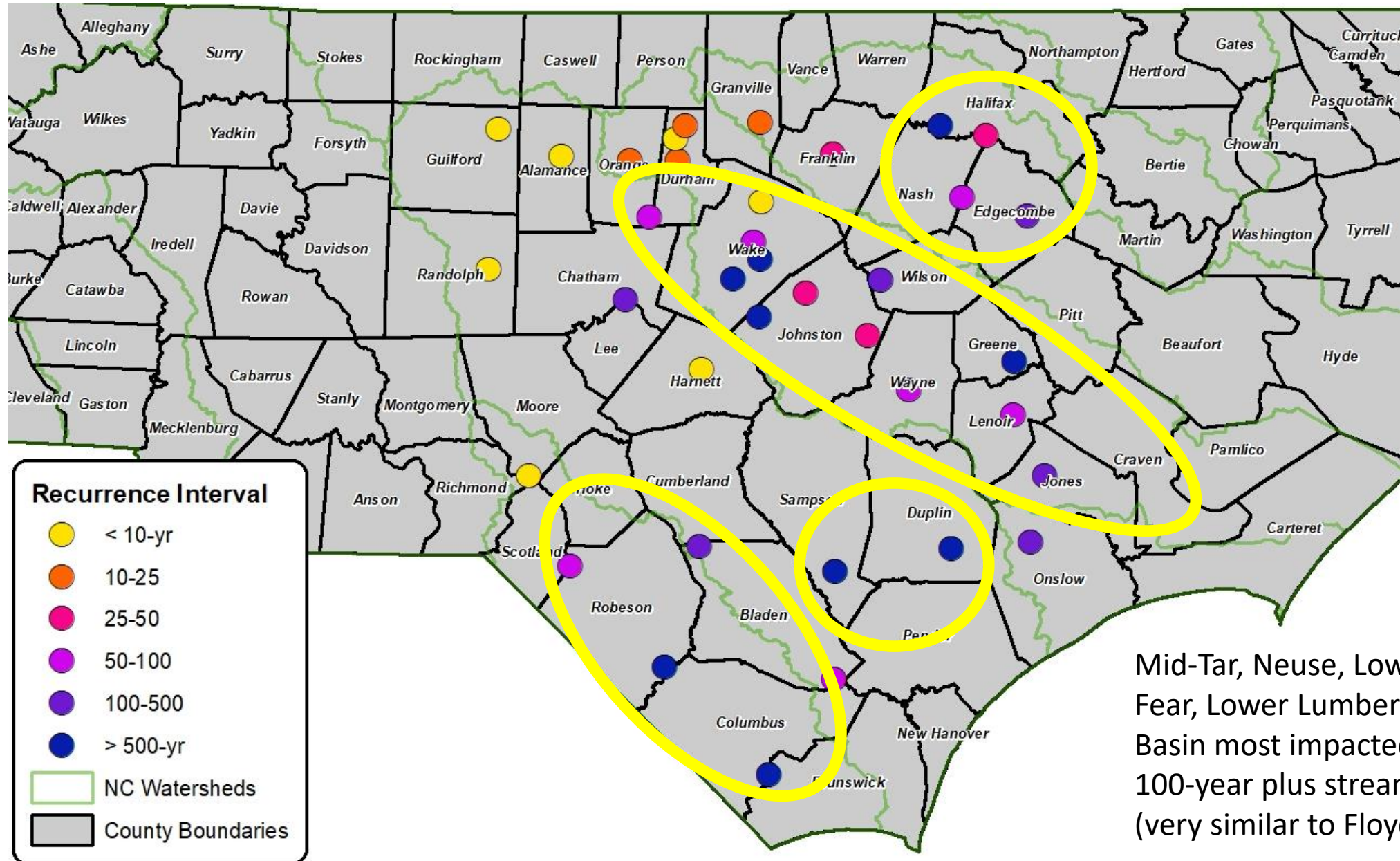
Neuse River Basin most impacted with 100-year plus stream flows

# River Stage Return Periods – Hurricane Floyd (1999)



- Mid-Tar, Neuse, Lower Cape Fear, Lower Lumber River Basin most impacted with 100-year plus stream flows

# River Stage Return Periods – Hurricane Matthew (2016)

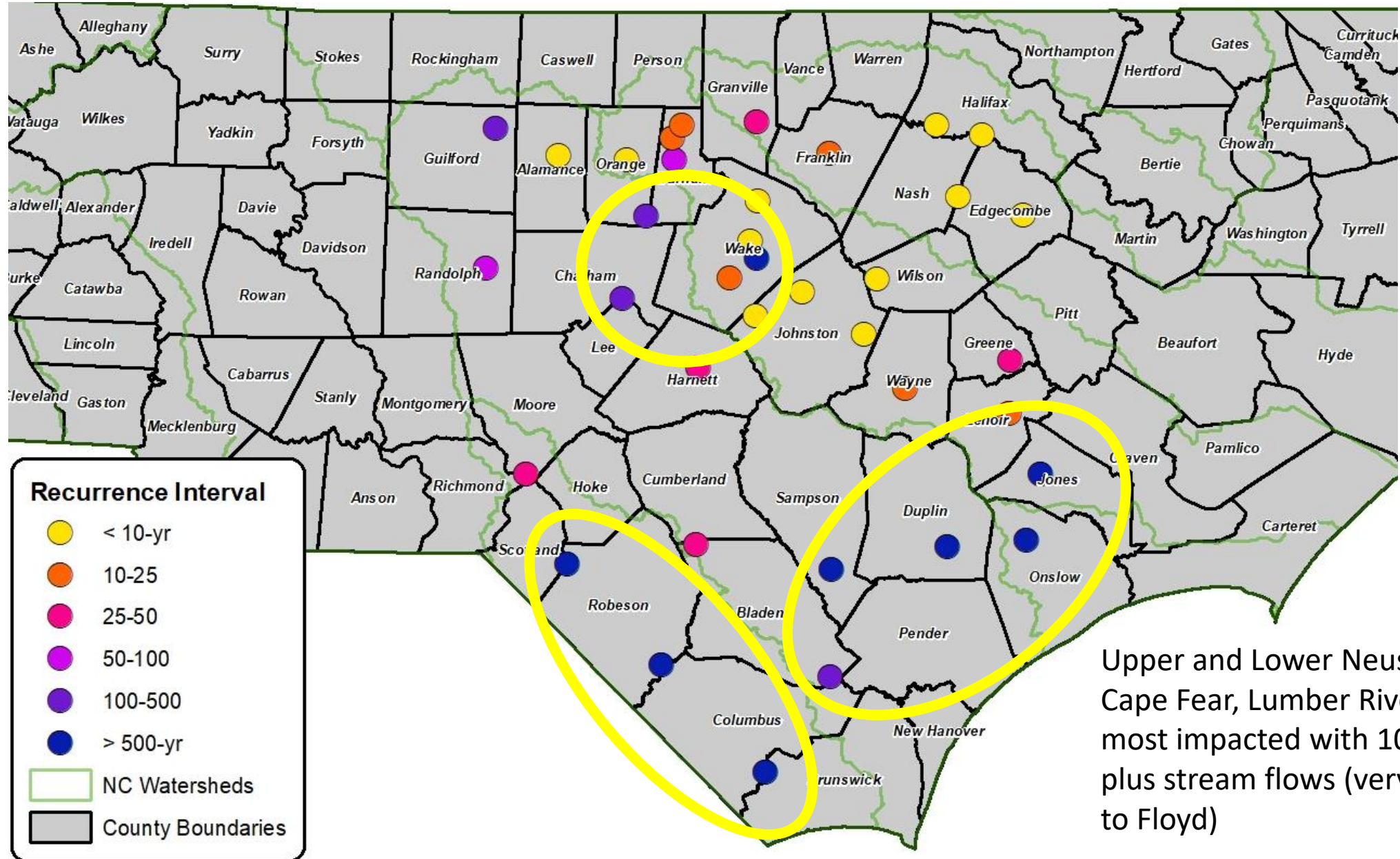


Mid-Tar, Neuse, Lower Cape Fear, Lower Lumber River Basin most impacted with 100-year plus stream flows (very similar to Floyd)

# Florence – Estimated Riverine Return Periods

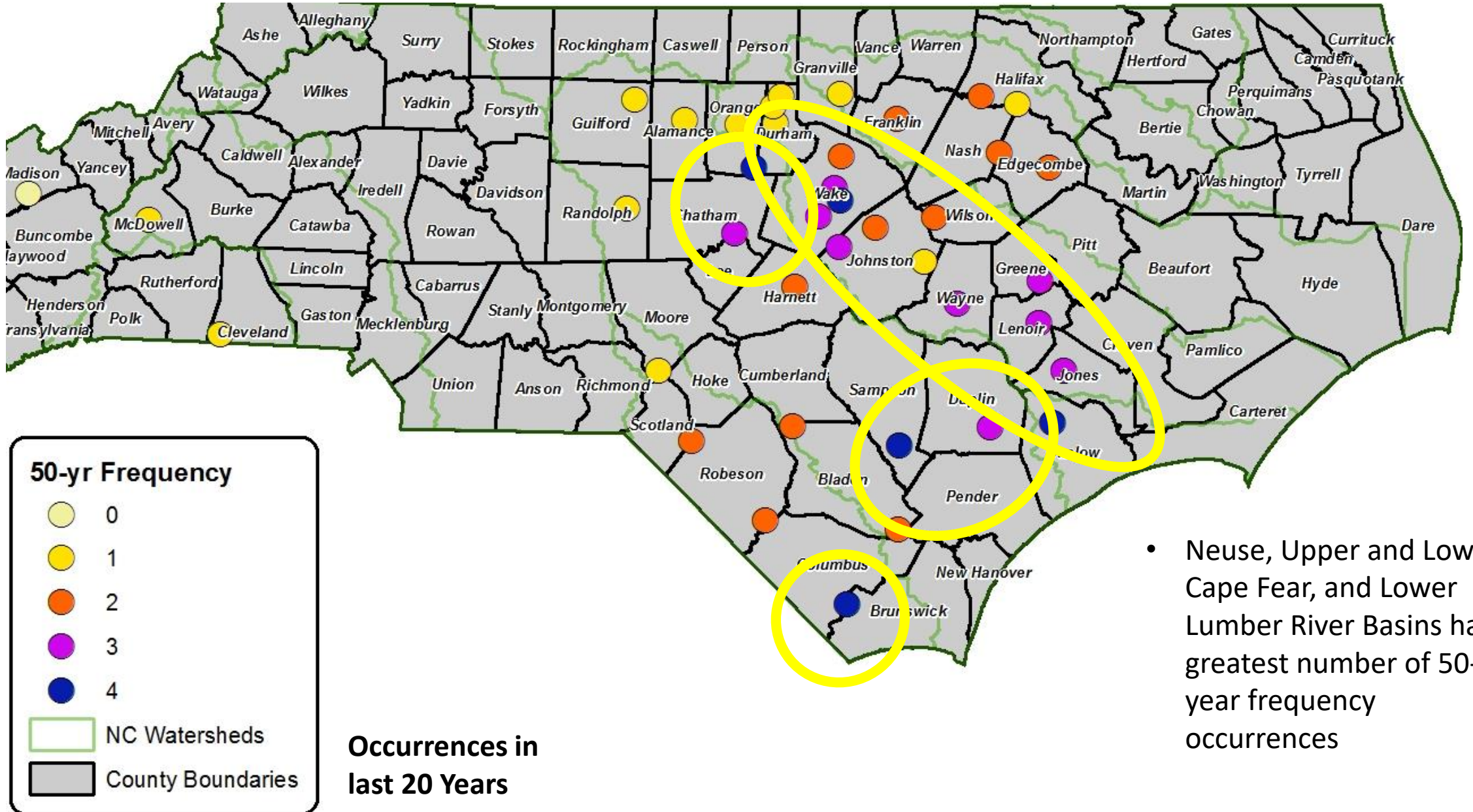
				Hurricane Florence (2018)	
SITE_ID	Type (Riverine or Coastal)	NAME	County	Flood Elevation	Est. Recurrent
				(NAVD88 ft)	Interval (years)
02105544	Riverine	CAPE FEAR RIVER AT LOCK 2 NEAR ELIZABETHTOWN, NC	Bladen	51.1	>500-yr
30001	Riverine	Lockwoods Folly River - Southport-Supply Rd SE	Brunswick	15.8	>500-yr
WHSN7	Riverine	Soules Swamp at S. Madison St in Whiteville	Columbus	60.6	>500-yr
FBLN7	Riverine	Lumber River at NC904 in Fair Bluff	Columbus	67.0	>500-yr
02103000	Riverine	Little River at Manchester	Cumberland	158.3	>500-yr
02108000	Riverine	NE Cape Fear River near Chinquapin	Duplin	40.6	>500-yr
TOWN7	Riverine	Town Creek at Us 258 near Pinetops	Edgecombe	61.6	>500-yr
TRTN7	Riverine	Trent R. at Trenton at N. Weber St	Jones	28.8	>500-yr
02092500	Riverine	Trent River near Trenton	Jones	42.0	>500-yr
02093000	Riverine	New River near Gum Branch	Onslow	27.2	>500-yr
02108619	Riverine	NE Cape Fear River at Castle Hayne	Pender	11.8	>500-yr
02108566	Riverine	Northeast Cape Fear River near Burgaw	Pender	24.6	>500-yr
02134500	Riverine	Lumber River at Boardman	Robeson	85.5	>500-yr
02133624	Riverine	Lumber River near Maxton	Robeson	191.8	>500-yr
02106500	Riverine	Black River near Tomahawk	Sampson	53.0	>500-yr
02092554	Riverine	Trent R. at Pollockville	Jones	16.5	500-yr
02087359	Riverine	Walnut Ck at Sunnybrook Dr, Raleigh	Wake	199.3	500-yr
02128000	Riverine	Little River near Star	Montgomery	430.9	400-yr
CHBN7	Riverine	Booker Creek at E. Franklin St	Orange	265.6	350-yr
02102908	Riverine	Flat Creek near Inverness	Hoke	199.7	300-yr
02102000	Riverine	Deep River at Moncure	Lee	199.5	300-yr
02105769	Riverine	Cape Fear River at Lock #1 near Kelly	Bladen	26.7	200-yr
BCUN7	Riverine	Black River at NC 210	Pender	20.3	175-yr
02126000	Riverine	Rocky River near Norwood	Stanly	248.4	175-yr
02146750	Riverine	Mcalpine Cr Blw McMullen Cr near Pineville	Mecklenburg	534.2	105-yr
0212467595	Riverine	Goose Ck at SR1525 near Indian Trail	Union	559.7	100-yr
WSNN7	Riverine	Hominy Swamp at Forest Hills Rd near Wilson	Wilson	119.7	100-yr

# River Stage Return Periods – Hurricane Florence (2018)



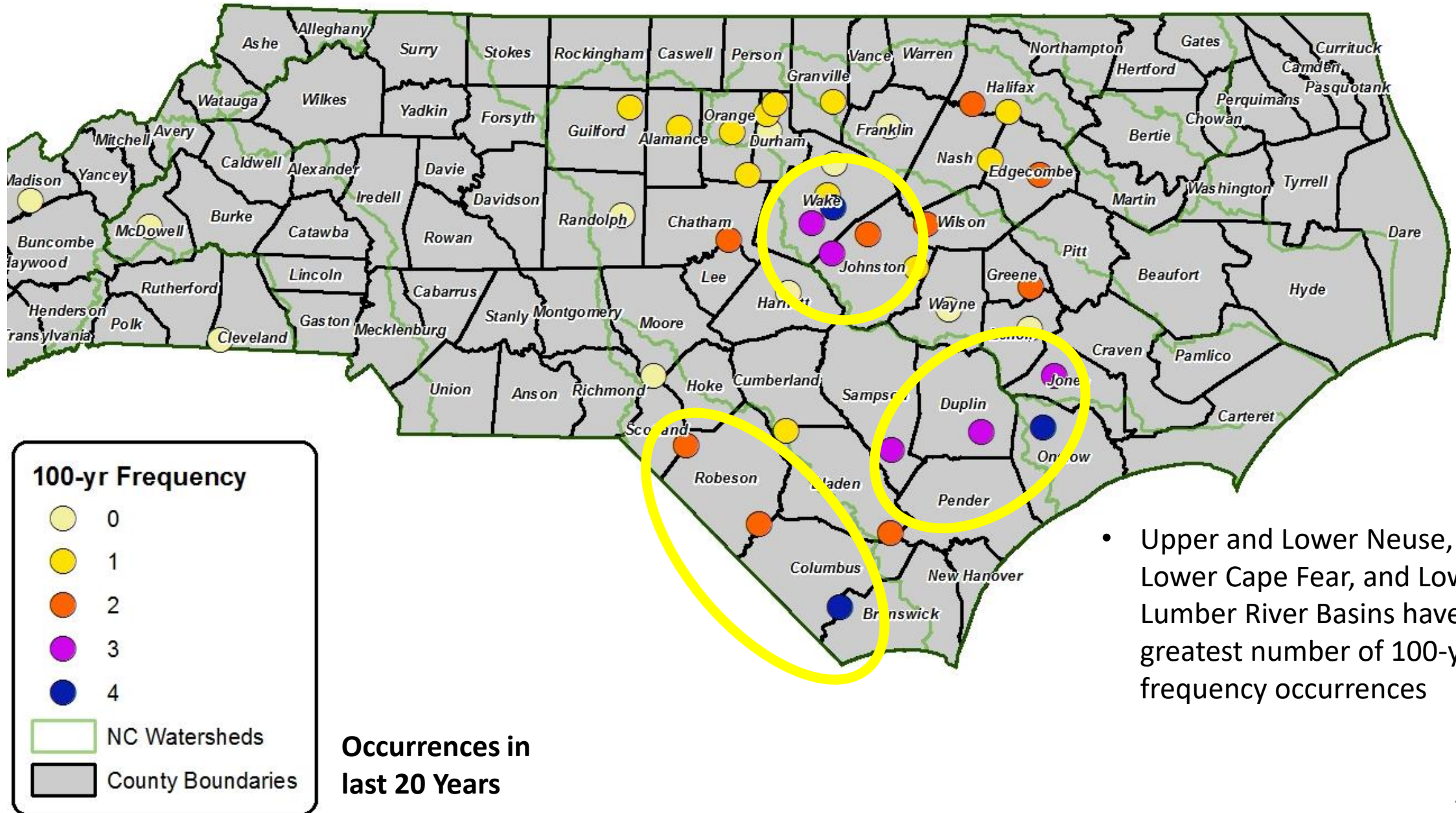
Upper and Lower Neuse, Lower Cape Fear, Lumber River Basins most impacted with 100-year plus stream flows (very similar to Floyd)

# 50-year Storm Frequency – Number of Occurrences (20 Years)





# 100-year Storm Frequency – Number of Occurrences (20 Years)



- Upper and Lower Neuse, Lower Cape Fear, and Lower Lumber River Basins have greatest number of 100-year frequency occurrences



# Closing Points

- The majority of significant rainfall events occur as a result of tropical or extratropical storm events.
- Due to the historical curvature of tropical storms along the Atlantic Basin, the six eastern river basins receive the greatest amount of rainfall in the state.
- Since 1996, North Carolina has experienced rainfall events equal to or greater than a 100-year frequency interval on average every 5 years.
- For both rainfall and stream stage, the Neuse, the Lower Cape Fear, and the Lumber River Basins have experienced the greatest number of occurrences of 50-, 100- and >500-year events.

*QUESTIONS?*