

# Welcome

Jeff Orrock

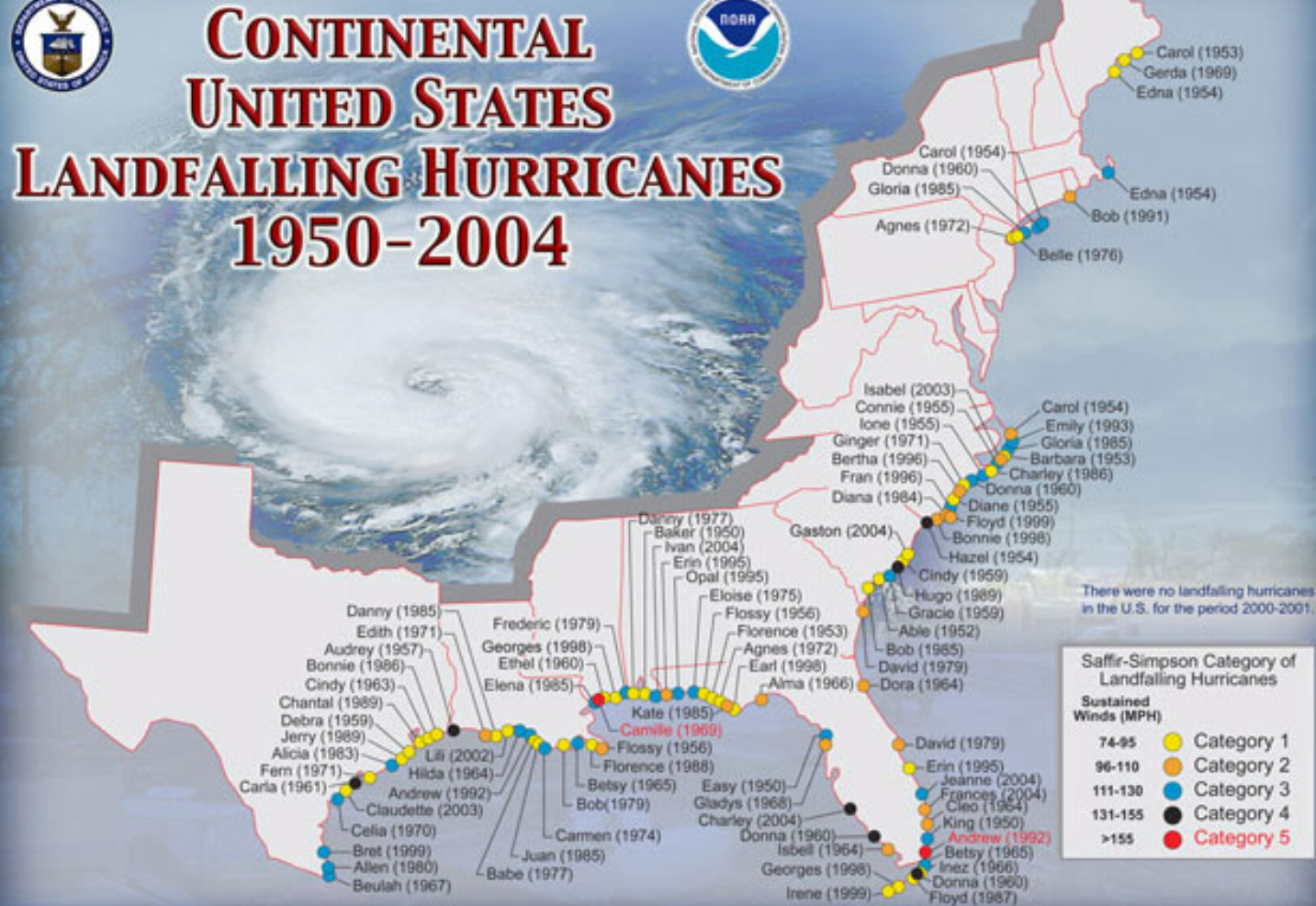
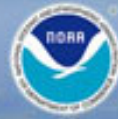
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# CONTINENTAL UNITED STATES LANDFALLING HURRICANES 1950-2004



NOAA'S NATIONAL CLIMATIC DATA CENTER, ASHEVILLE, NORTH CAROLINA

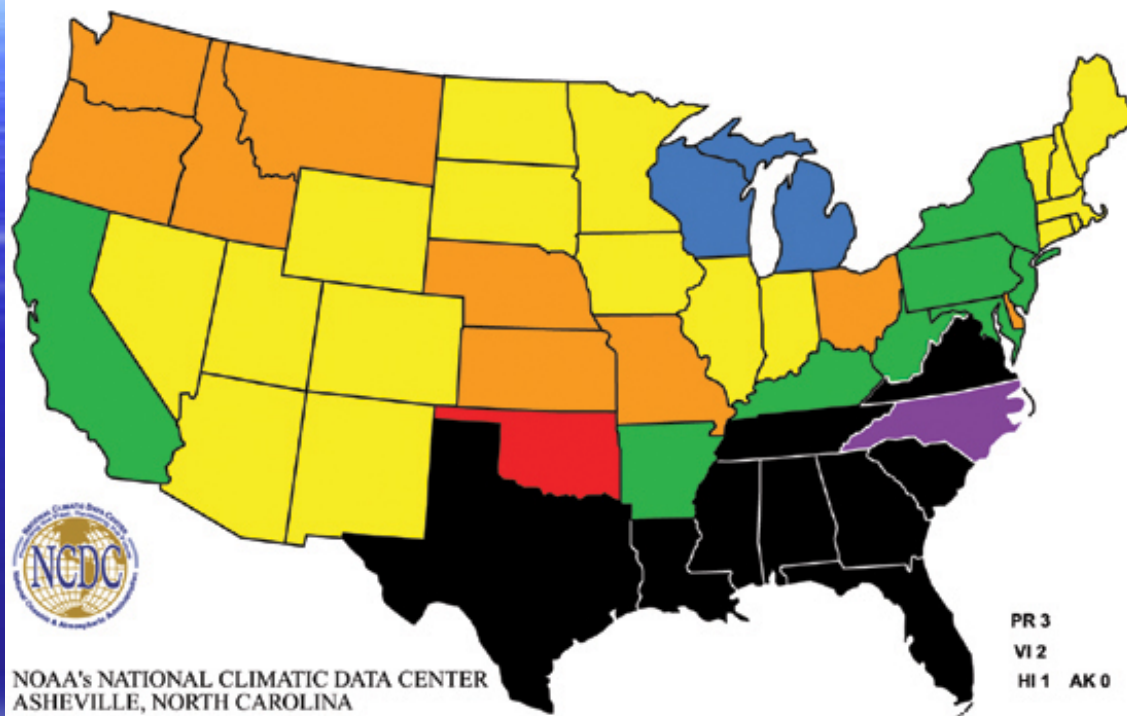
*Protecting the Past... Revealing the Future*

Sources: Operational Significant Event Imagery and the Environmental Applications Team (EAT) of the Satellite Services Division (SSD) of NESDIS; Tropical Prediction Center, National Hurricane Center; NOAA Coastal Services Center; Hurricane History by Jay Barnes; NASA; NCDC; NCEP, NOAA, NOAA Photo Library.





# Billion Dollar Climate and Weather Disasters 1980 - 2004



NOAA's NATIONAL CLIMATIC DATA CENTER  
ASHEVILLE, NORTH CAROLINA

NUMBER OF EVENTS	DISASTER TYPE	NUMBER OF EVENTS	PERCENT FREQUENCY	NORMALIZED DAMAGES (Billions of Dollars)	PERCENT DAMAGE
1 - 3	Tropical Storms/Hurricanes	20	32.3%	144	36.8%
4 - 6	Non-Tropical Floods	12	19.4%	55	14.1%
7 - 9	Heatwaves/Droughts	10	16.2%	144	36.8%
10 - 12	Severe Weather	7	11.3%	13	3.3%
13 - 15	Fires	6	9.6%	13	3.3%
16 - 20	Freezes	2	3.2%	6	1.6%
21 - 25	Blizzards	2	3.2%	9	2.3%
	Ice Storms	2	3.2%	5	1.3%
	Noreaster	1	1.6%	2	0.5%
		62		391	

Please note that the national map color-coded by state reflects a summation of billion dollar events, for each state affected--ie, it does not mean that each state shown suffered at least \$1 billion in losses for each event.

**So Much Weather...  
So Little Time**

**The Weather Channel**

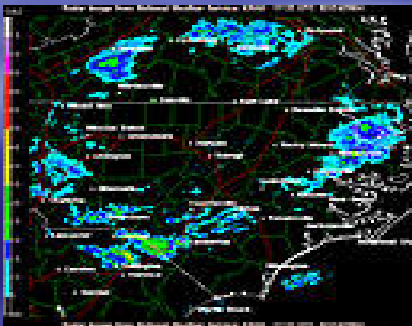
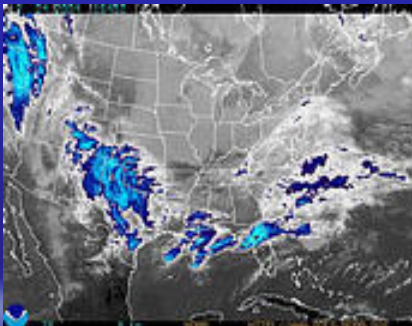
**National Weather  
Service**

**Local Media**

**Internet**

**Accuweather**

# Daily Weather Information



On the Internet...

[weather.gov/rah](http://weather.gov/rah)

- severe weather
- tropical weather
- winter weather
- flash flooding

NWS products, satellite and radar images, preparedness information, and more!

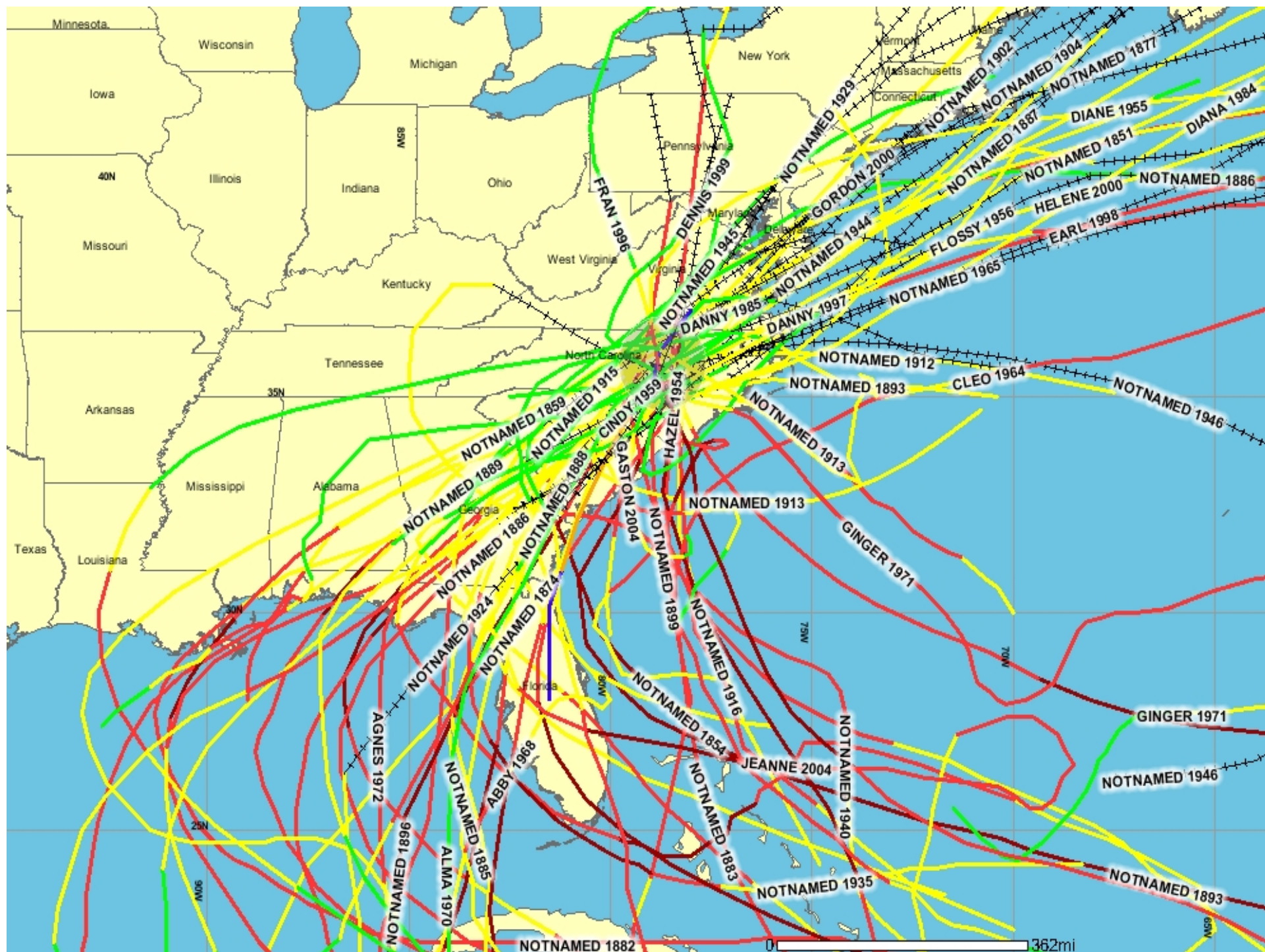
*Reference for key decision makers for consistency of operations.*

**Those who forget history... are  
condemned to repeat it !!**

**Why do we make wrong  
decisions?**

- Lack of Experience
- “Disasters happen to other people”
- Faulty Conceptual Model
- Overconfidence
- Missing Key Information / Inconsistent
- Over Projection of Trends





# It can't happen to me!

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Based on nationwide survey

Only 15% of people interviewed claimed to be prepared for disaster

Many of these people thought preparedness was having police, fire and poison control numbers next to the phone

52% think disasters can happen where they live but

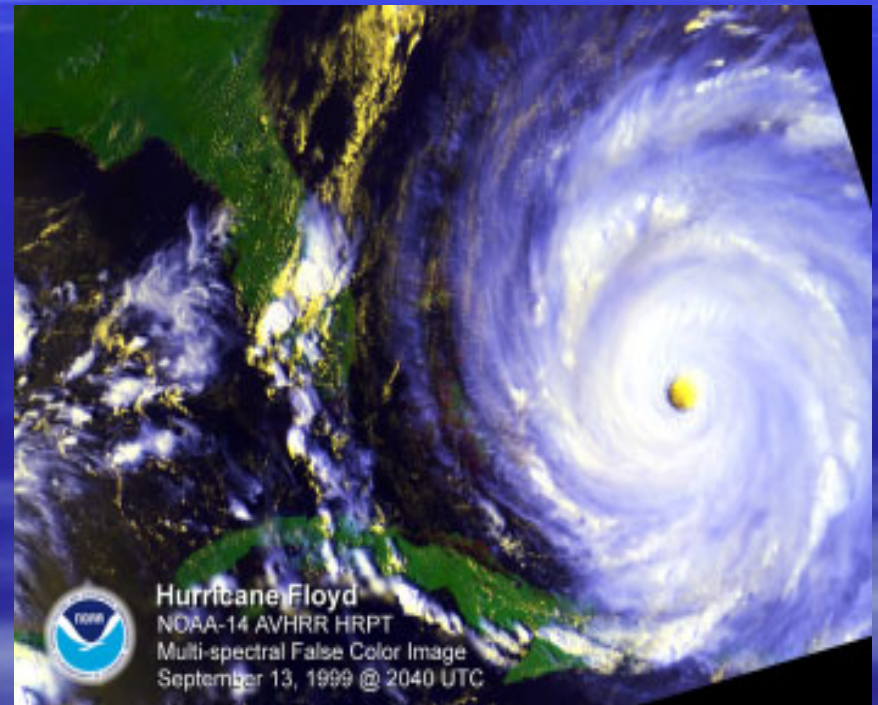
Only 12% think it can happen to them



# Hurricane Floyd

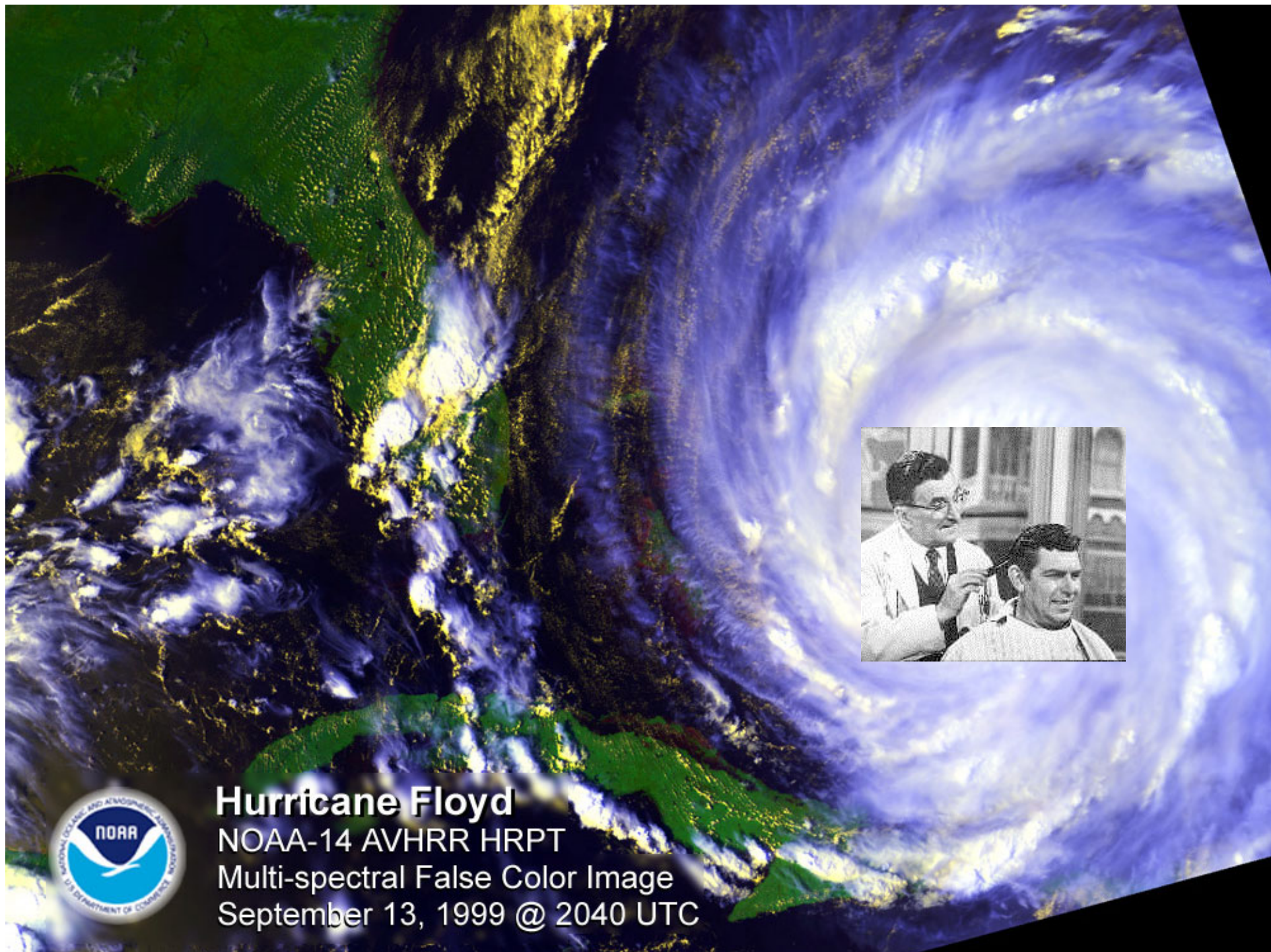
## September 7-17, 1999

### Worst disaster in state history



**Hurricane Floyd landfall September 16, 1999, near Cape Fear, NC as a Category 2.**





**Hurricane Floyd**  
NOAA-14 AVHRR HRPT  
Multi-spectral False Color Image  
September 13, 1999 @ 2040 UTC



# North Carolina's Worst Disaster

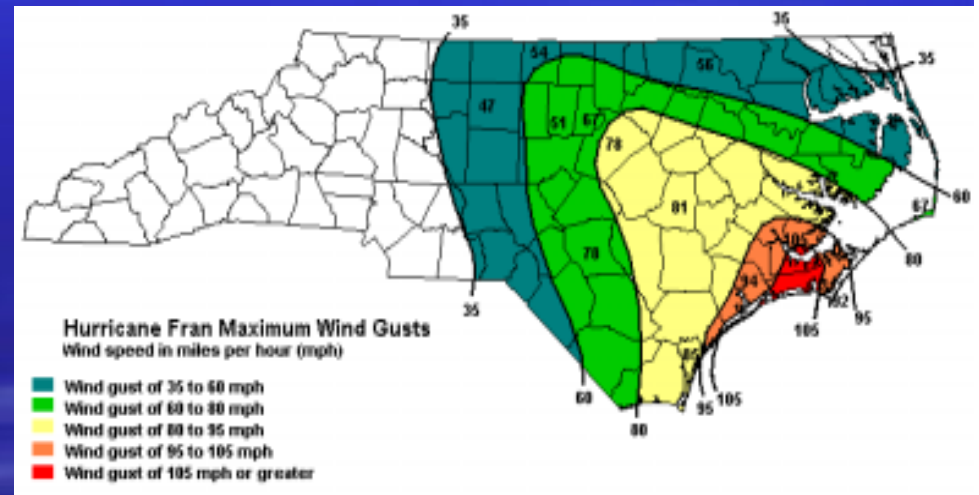
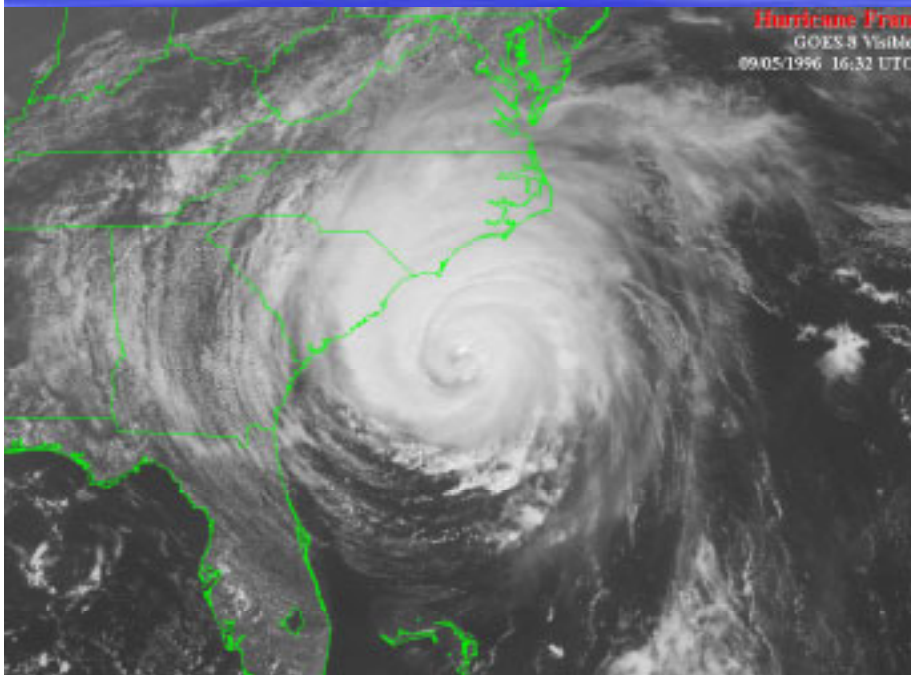
- 100,000+ sheltered
- 1500 rescued
- 7000 homes destroyed
- 50,000+ homes damaged
- 12,000 serious damage
- \$3 billion damage in NC
- Most FEMA disaster declarations in NC (13) for any weather event.
- One of the most costly U.S. hurricanes





# Hurricane Fran

## August 23 – September 8, 1996



Hurricane Fran landfall Sept. 6, 1996 at Cape Fear, NC as a Category 3. Preliminary report estimate 34 deaths (some may have been indirect) with damages of \$1.6 billion in the U.S.

# The Cost of Fran in NC

- \$2.3 billion to homes and businesses.
- **\$1.1 billion to public property.**
- \$700 million Agricultural damage
- **Wake County (Raleigh and vicinity) alone reported over \$900 million in damage to residential and commercial property.**
- \$1 billion Forestry/timber losses
- **NC total was around \$5 billion, making Fran the third most costly hurricane in U.S. history at that time.**
- More than 1 million people were without power and other utilities.
- **Tens of thousands of buildings were damaged and it could have been worse!!!!**
- Red Cross operated 134 shelters in 51 counties, housing 9,426 people on the night of the storm.
- **Almost a half-million residents in North and South Carolina evacuated during Fran.**



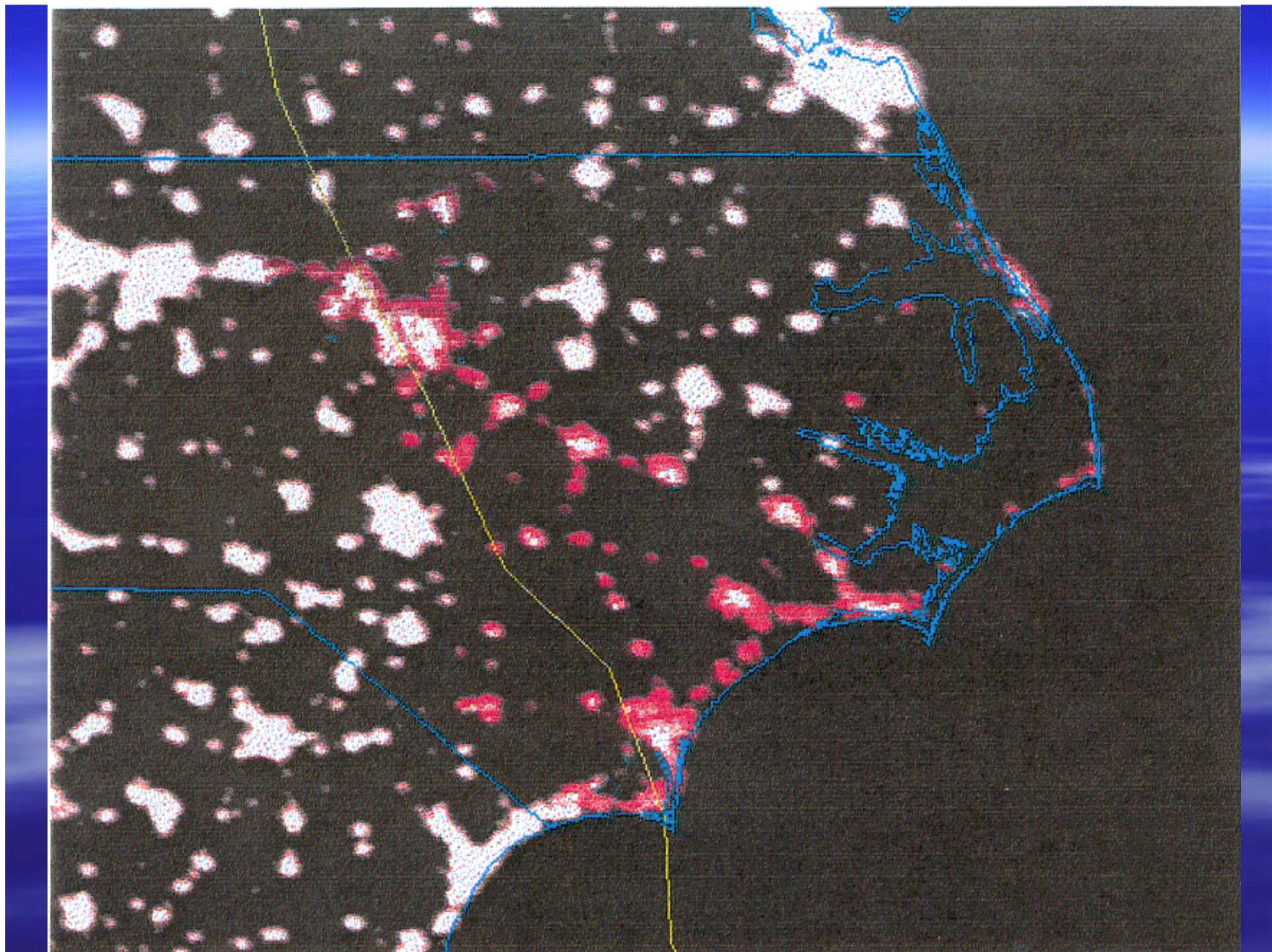


# The Flooding...The Wind



5,500 downed poles, 3,000 miles of destroyed lines, 2,800 transformers, 53 high-voltage transmission lines and 87 substations.

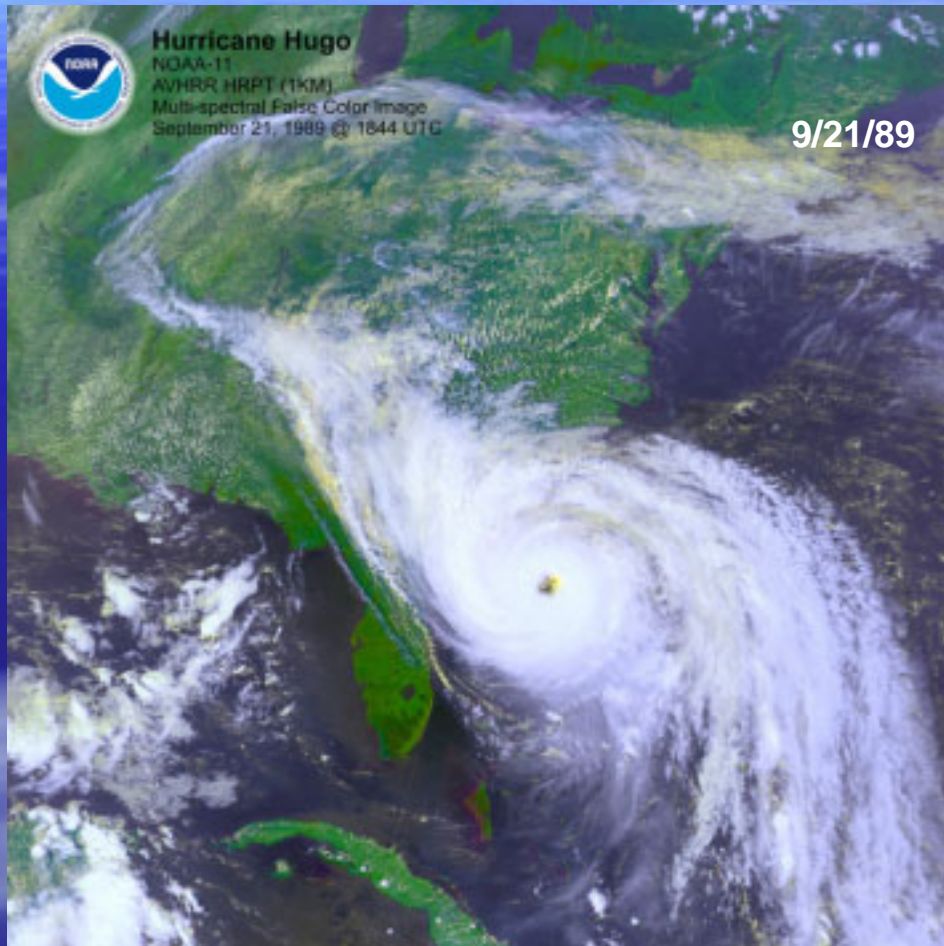






# Hurricane Hugo

## September 10-22, 1989



Hurricane Hugo landfall Sept. 22, 1989 near Charleston at Sullivan's Island, SC as a Category 4. 150 miles wide swath of damage

Preliminary report estimate 21 deaths with a damage estimate of \$7 billion for the U.S. 3 times more trees down than Mt. Saint Helens

# Hugo...a glimpse of reality

- 6 billion board feet of trees destroyed (70% of trees down in some areas)
- Charlotte lost about 8000 trees
- 1.5 million people w/o power.
- Charlotte was out of power for days resulting in large amounts of raw sewage being dumped
- 8800 power poles, 700 miles of cable/wire and 6300 transformers replaced.





# 1950's Hurricanes

- **Hurricane Gracie** – September 29, 1959; landfall estimated near Beaufort, SC as a Category 3.
- **Hurricane Audrey** – June 27, 1957; landfall at Texas-Louisiana border as a Category 4.
- **Hurricane Ione** – September 19, 1955; landfall near Salter Path, NC as a Category 3.
- **Hurricane Diane** – August 17, 1955; landfall over Carolina Beach, NC as a Category 1.
- **Hurricane Connie** – August 12, 1955; landfall at Cape Lookout, NC as a Category 3.
- **Hurricane Hazel** – October 15, 1954; landfall at North Carolina/South Carolina border as a Category 4.
- **Hurricane Edna** – September 11, 1954; landfall at Martha's Vineyard and Nantucket then across eastern tip of Cape Cod as a Category 3.
- **Hurricane Carol** – August 30, 1954; landfall at Outer Bank, NC as a Category 2. August 31, 1954; landfall on eastern Long Island and southeastern Connecticut as a Category 3,
- **Hurricane Barbara** – August 13, 1953; landfall between Morehead City and Ocracoke, NC as a Category 1.
- **Hurricane King** – October 17, 1950; estimated landfall near Key Biscayne, FL as a Category 3.

Hurricane Hazel, 1954



# Hazel – 1954 Cat 4



PHOTO COURTESY OF THE CAPE FEAR MUSEUM



PHOTO COURTESY OF THE N.C. DIVISION OF  
ARCHIVES AND HISTORY

## The Benchmark for North Carolina Hurricanes.

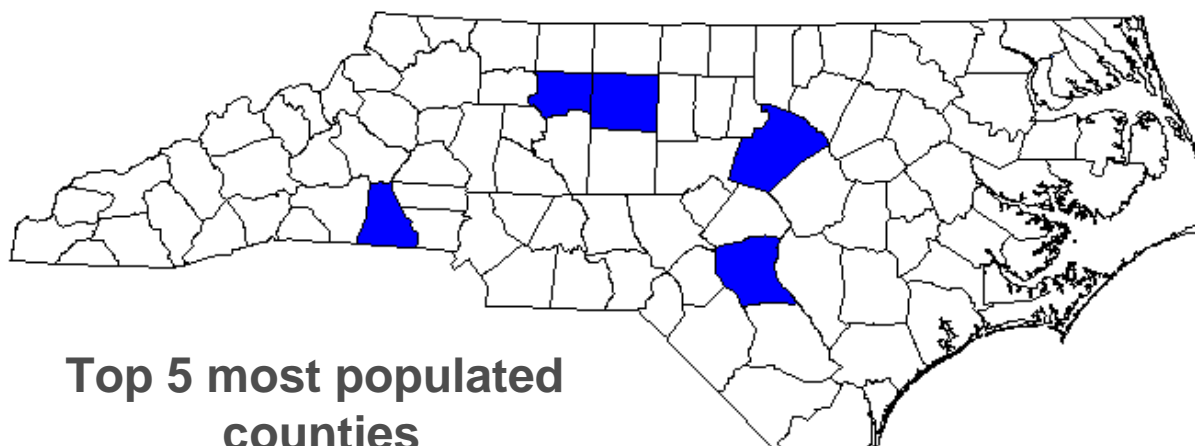
By most accounts, it was the most destructive hurricane in Tar Heel history. Estimates of 150-mph extremes were reported from several locations, including Holden Beach, Calabash, and Little River Inlet. In North Carolina the toll was heavy: 19 people killed and over 200 injured; 15,000 homes and structures destroyed; 39,000 structures damaged; thirty counties with major damage; and an estimated \$136 million in property losses.



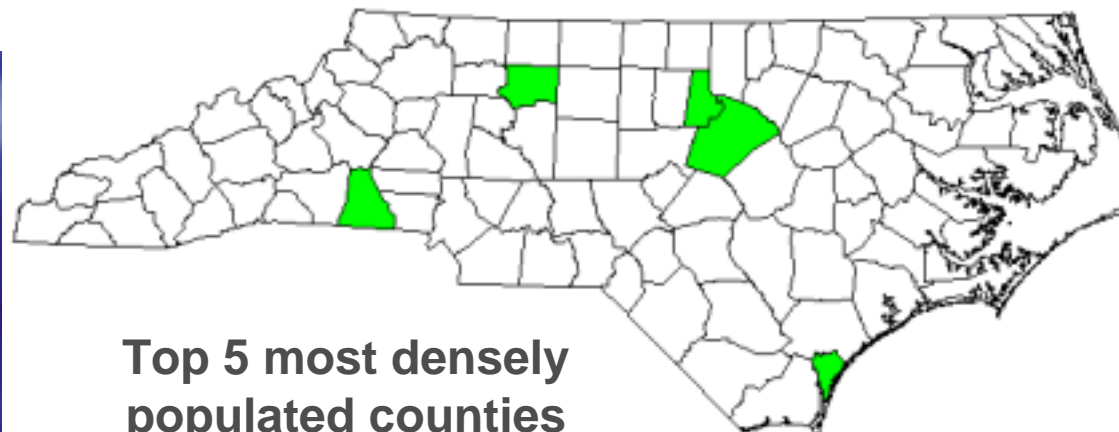
# Population...Then & Now

State population has increased from 4 million to 8.4 million

Coastal populations have more than quadrupled

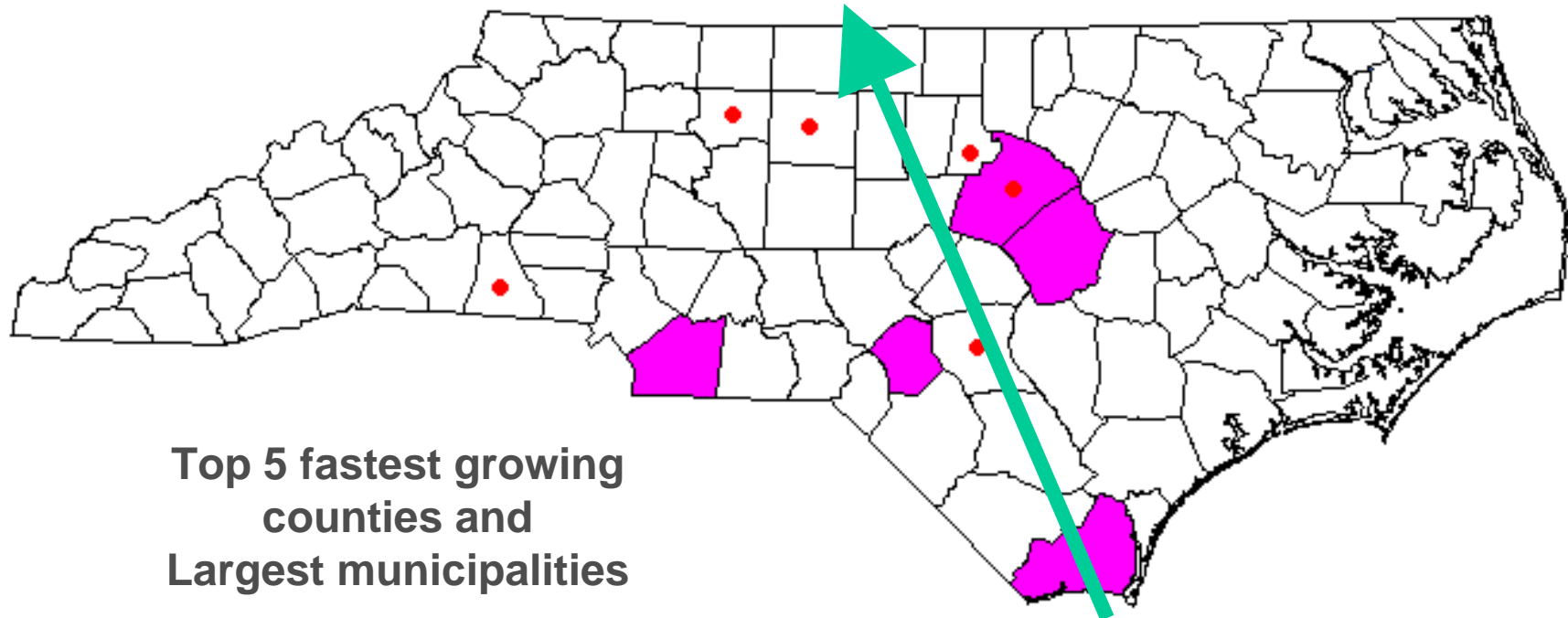


Top 5 most populated counties



Top 5 most densely populated counties

# Population and Impacts



Hazel or Hugo size storm moving from SE coast into central NC impacting some of the most densely populated areas in the state. Winds in excess of 90 mph along with 8-10 inches of rain. Cut all major east-west and north-south roads in the state. Damage to hundreds of thousands of homes and businesses leaving people with shelter, water, food and electricity for weeks.

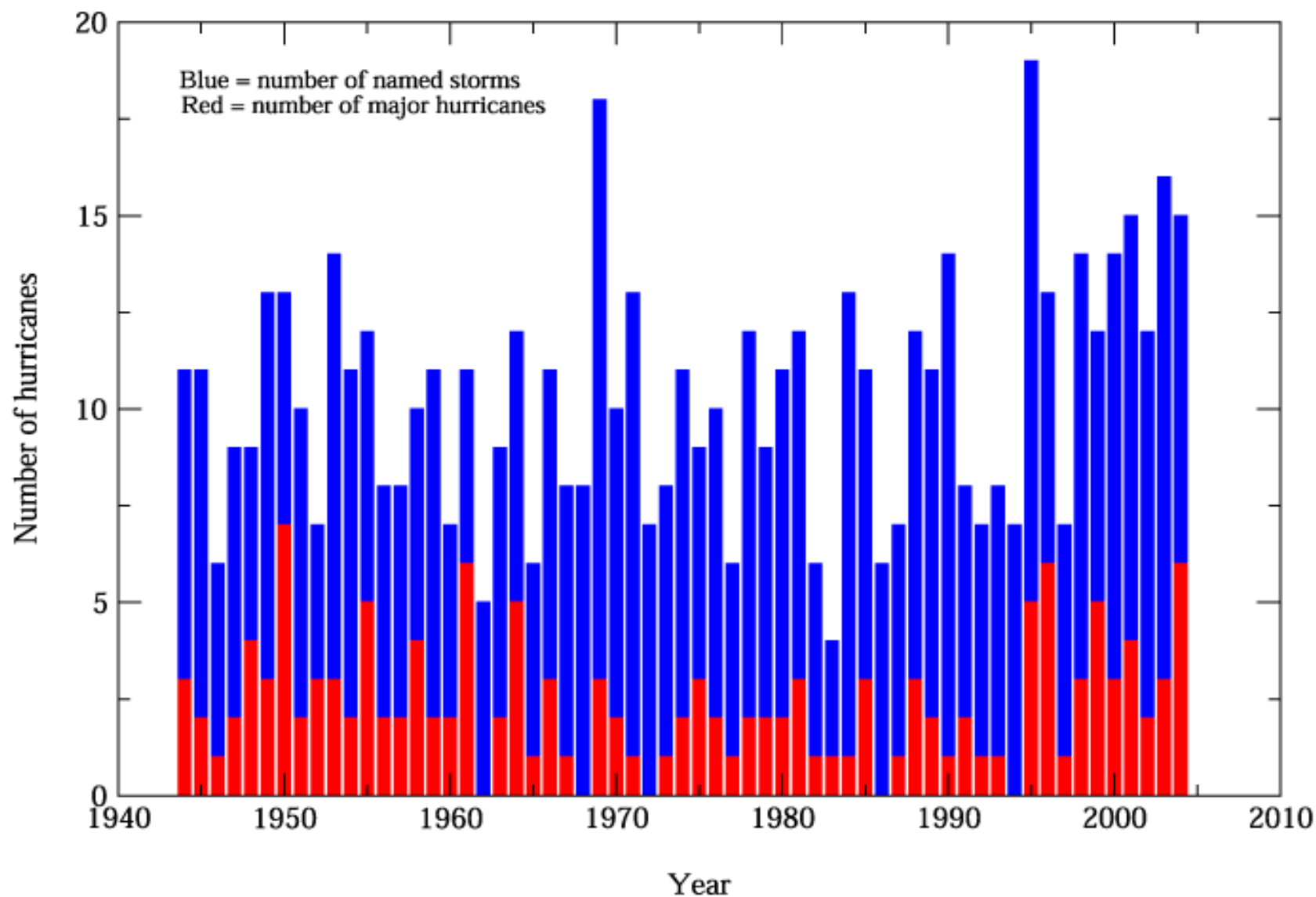


# All Roads Lead To Raleigh

We must be prepared!!!



## Annual Number of Atlantic Tropical Storms and Hurricanes 1944-2004

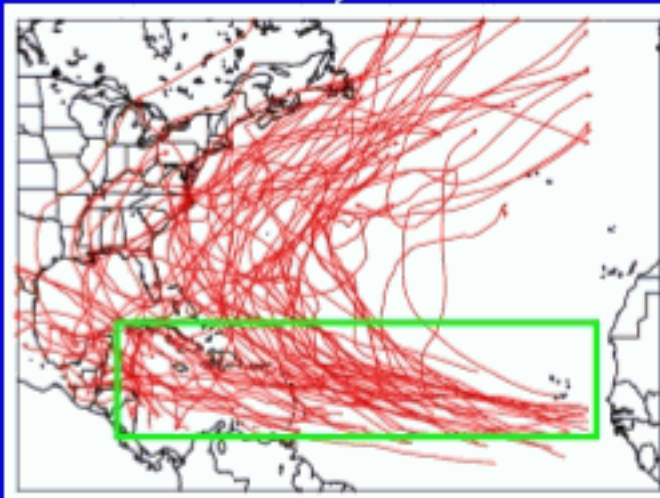




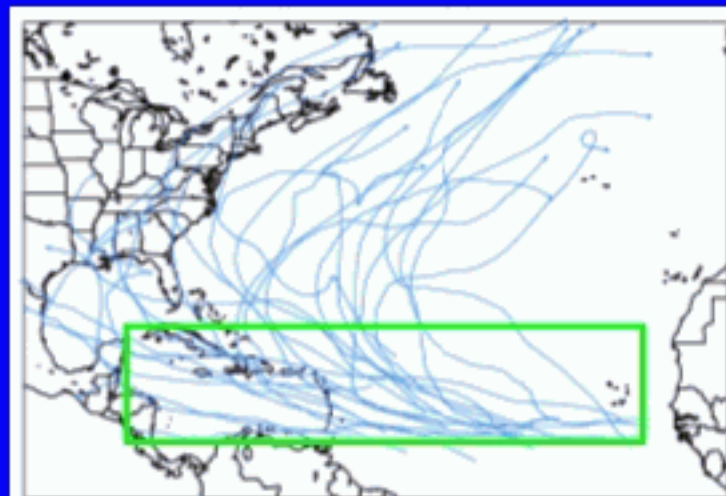


# Tracks of Major Hurricanes first named in Tropical Atlantic and Caribbean Sea

**Above-Normal 24-Years  
1955-1970, 1995-2002**



**Below-Normal 24-Years  
1971-1994**



**Comparison of Above-Normal and below-normal periods:**

**67 Major hurricanes vs. 27 (more than twice as many)**

**42 Landfalls vs. 15 (almost 3 times as many)**

**31 landfalls as MH vs. 15 (twice as many)**

**Major Hurricanes are defined by wind speeds at or above 115 mph, and are indicated by categories 3-5 on the Saffir-Simpson scale. Green box indicates the Main development region, consisting of the tropical Atlantic and Caribbean Sea.**



Law of Averages...

One land falling hurricane every 3-4 years

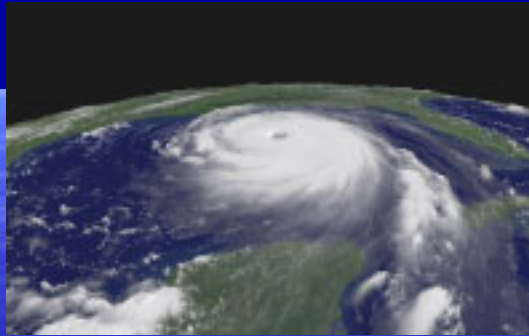
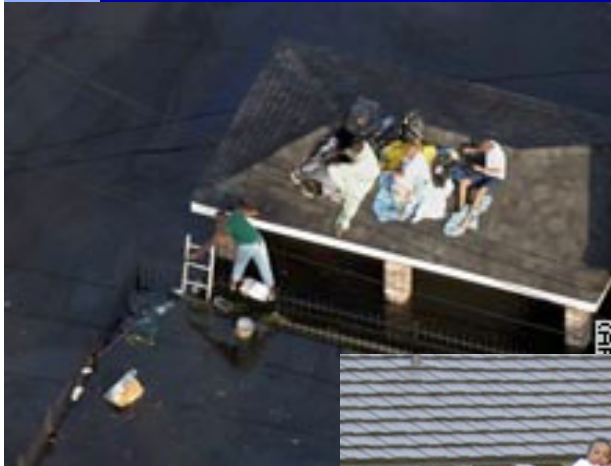
One or more hurricanes will impact the NC every one and a half years.

**In the next 10-15 years, there *may* be a terrorist attack in NC.**

**In the next 10-15 years there will be several hurricanes impact the state from the mountains to the coast with a high likelihood of more than one declared disaster**



# Bottom Line...It WILL happen here!



**Thank you for your time**

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