

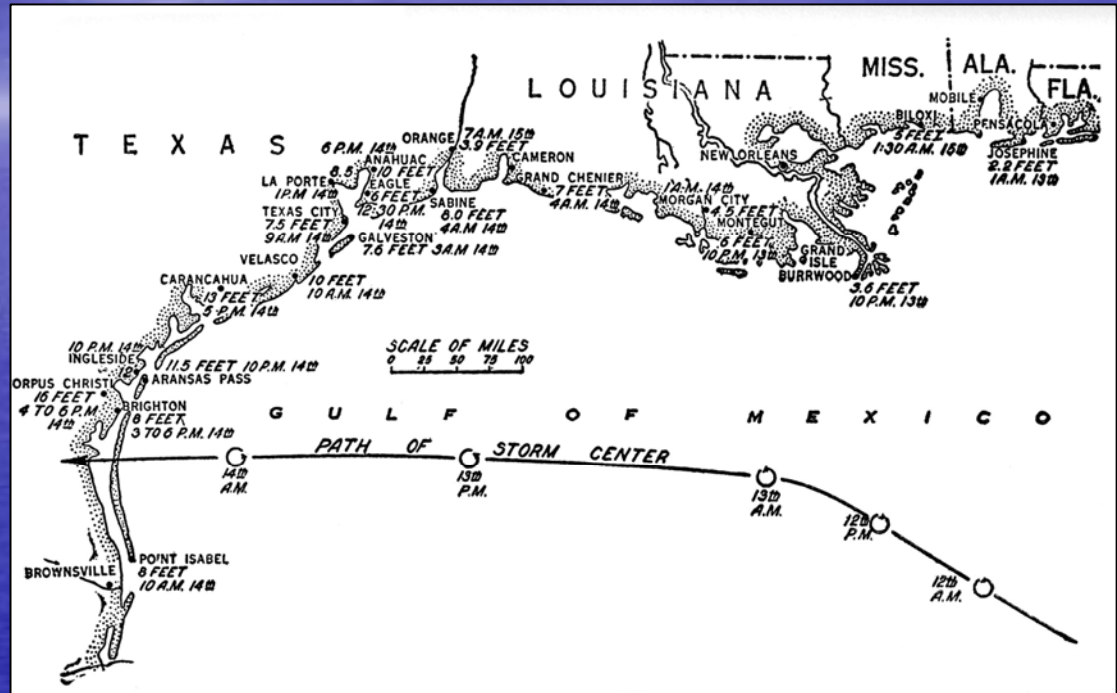
PART 3

IMPACT OF HURRICANES ON NEW ORLEANS AND THE GULF COAST 1900-1998

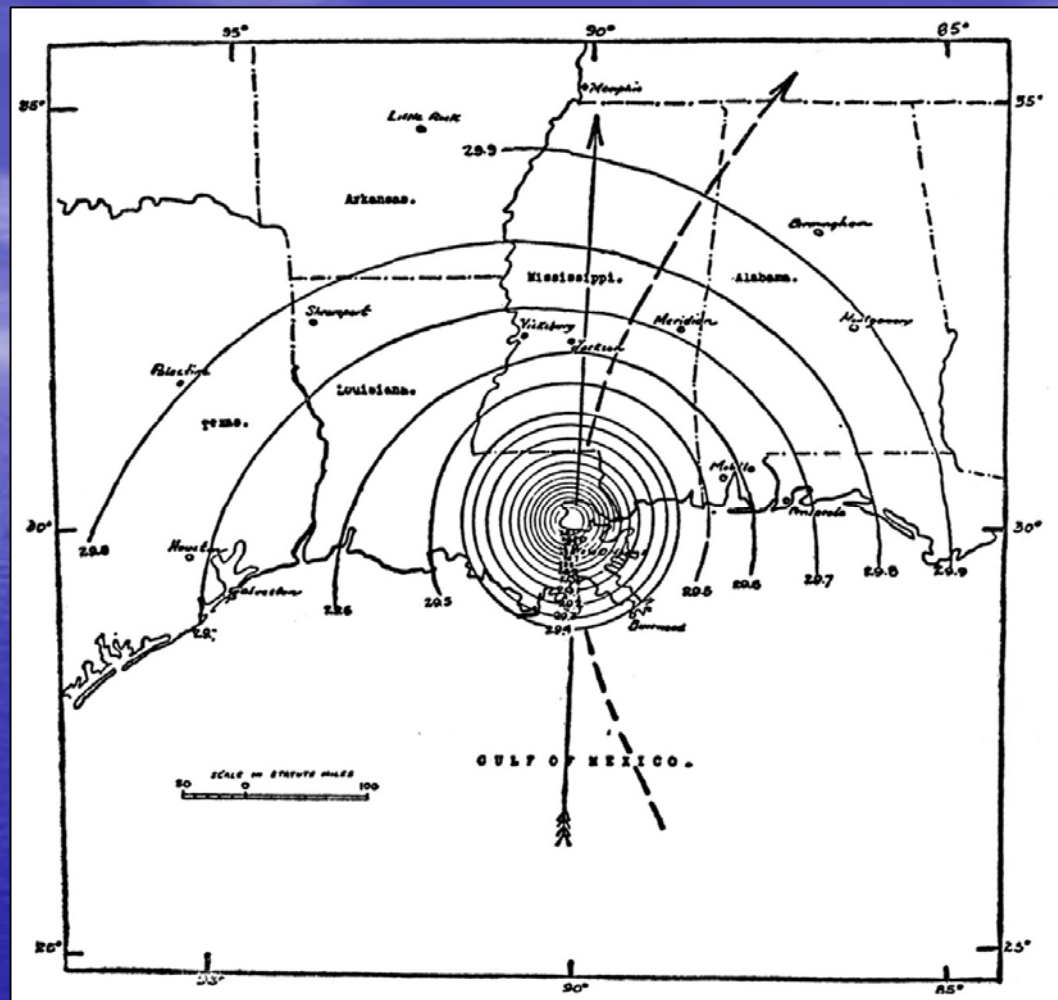
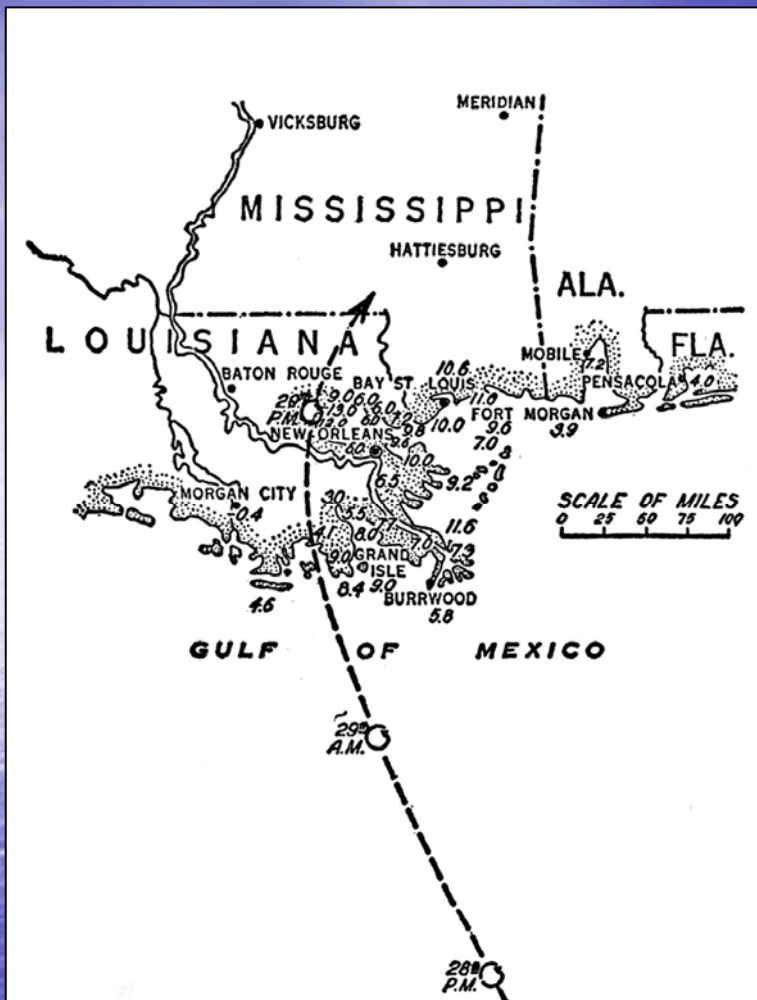
HURRICANE-CAUSED FLOODING OF NEW ORLEANS

- Since 1559, **172 hurricanes** have struck southern Louisiana (Shallat, 2000).
- Of these, **38** have caused flooding in New the Orleans area, usually via Lake Ponchartrain.
- Some of the more notable events have included: Some of the more notable events have included: **1812, 1831, 1860, 1915, 1947, 1965, 1969, and 2005.**

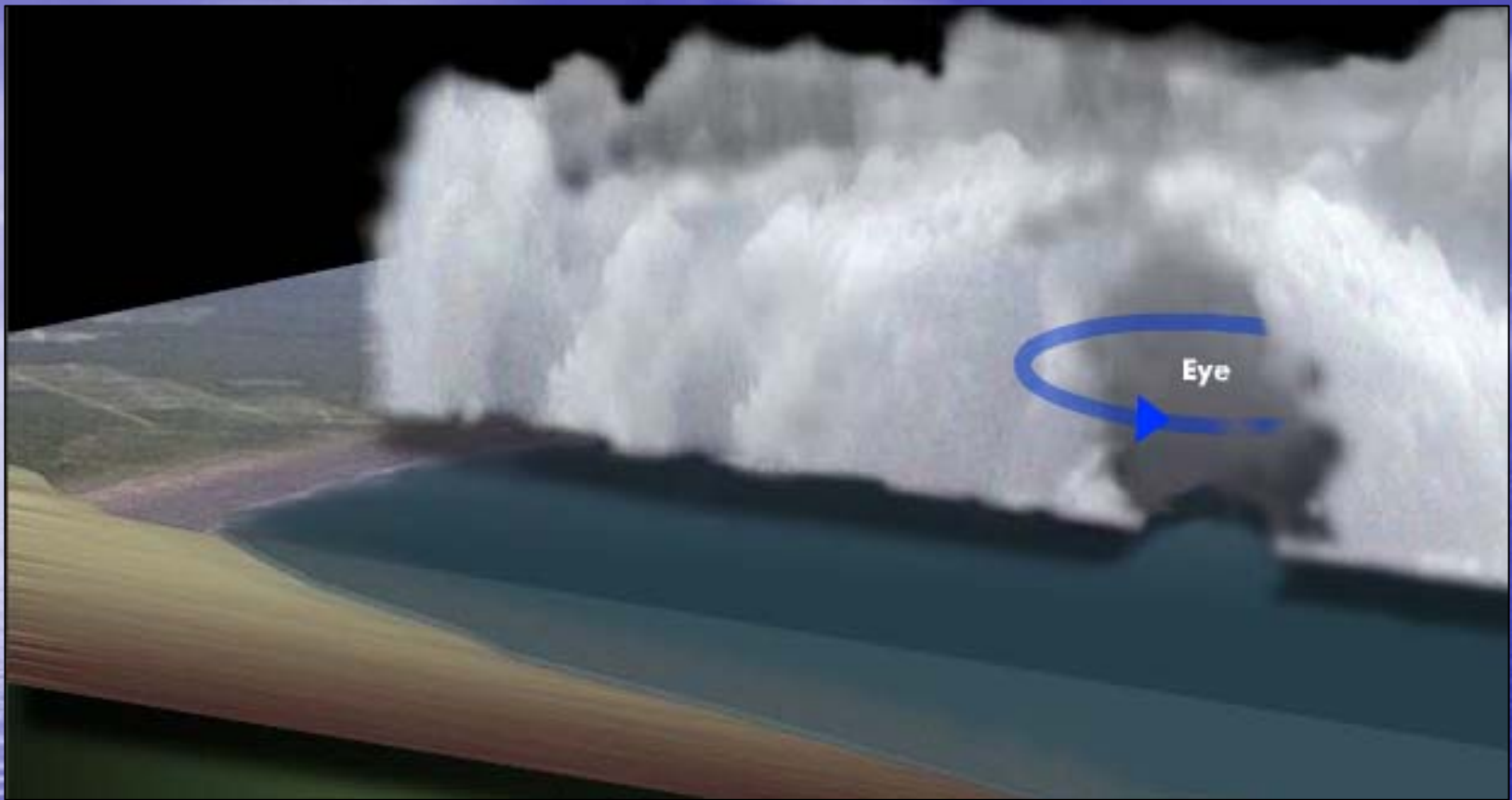
Isaac Monroe Cline



USWS meteorologist Isaac Monroe Cline pioneered the study of tropical cyclones and hurricanes in the early 20th Century, by recording barometric pressures, storm surges, and wind velocities.

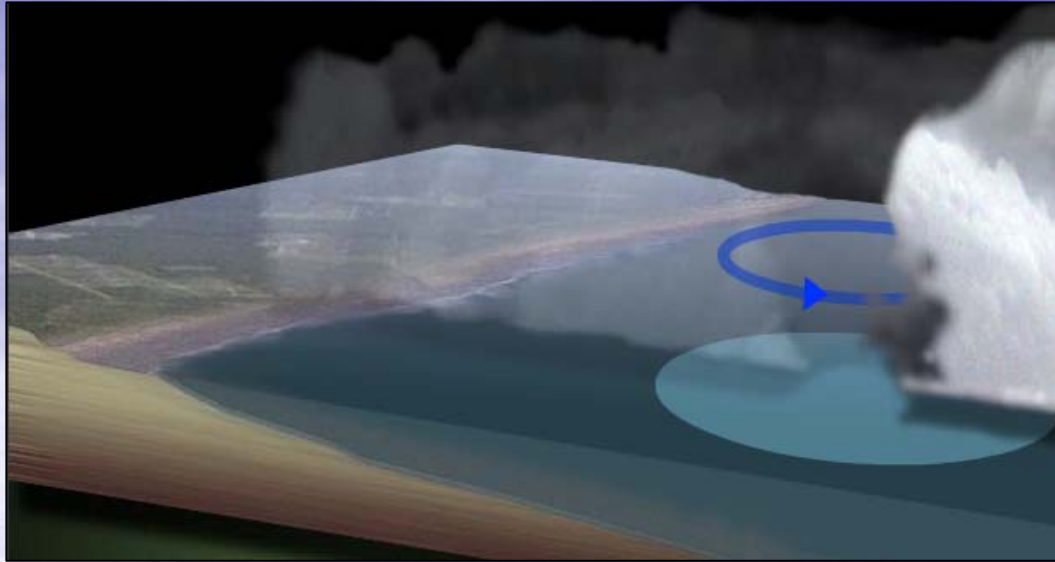


- Cline charted barometric gradients (right) and tracked the eyes of hurricanes as they approached landfall. This shows the event of Sept 29, 1915 hitting the New Orleans area.

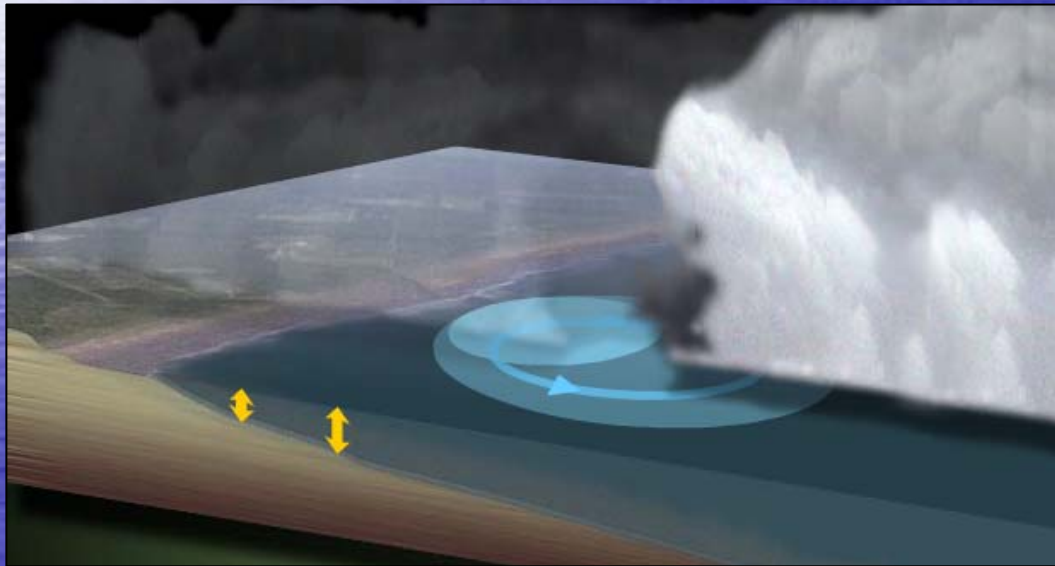


- **Storm or tidal surges** are caused by lifting of the oceanic surface by abnormal low atmospheric pressure beneath the eye of a hurricane. The faster the winds, the lower the pressure; and the greater the storm surge. At its peak, Hurricane Katrina caused a surge **53 feet high** under its eye as it approached the Louisiana coast, triggering a storm surge advisory of 18 to 28 feet in New Orleans (image from USA Today).

Storm Surge

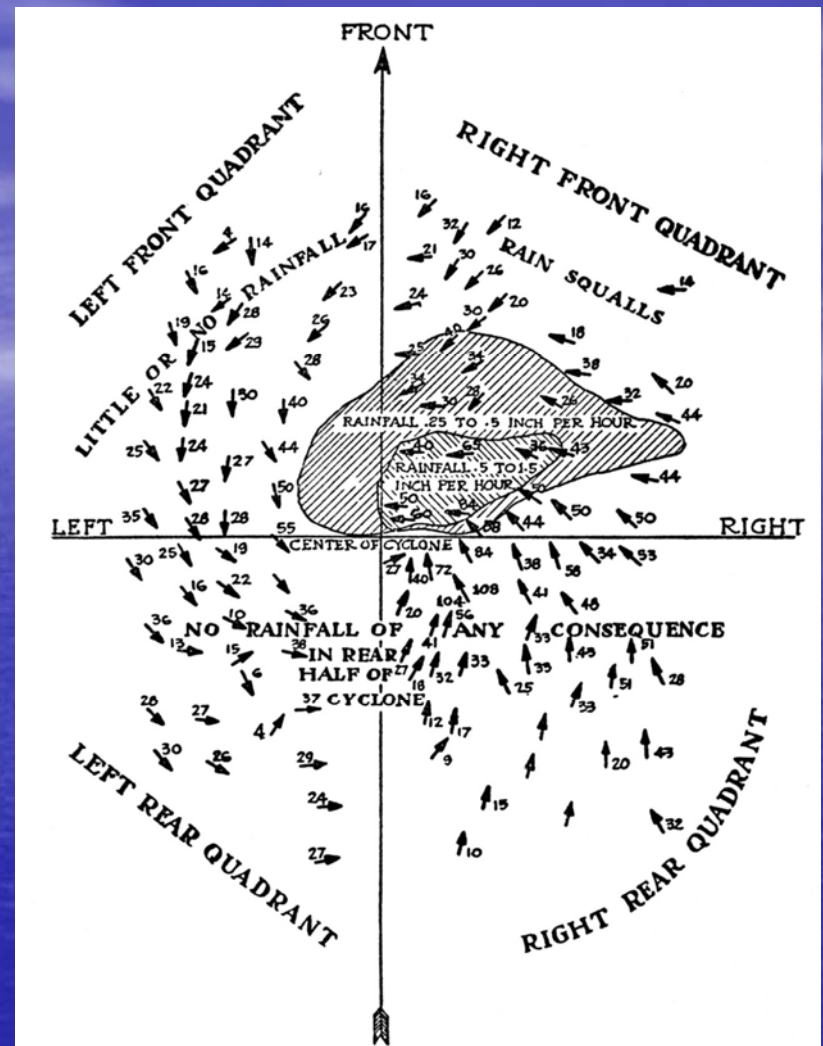
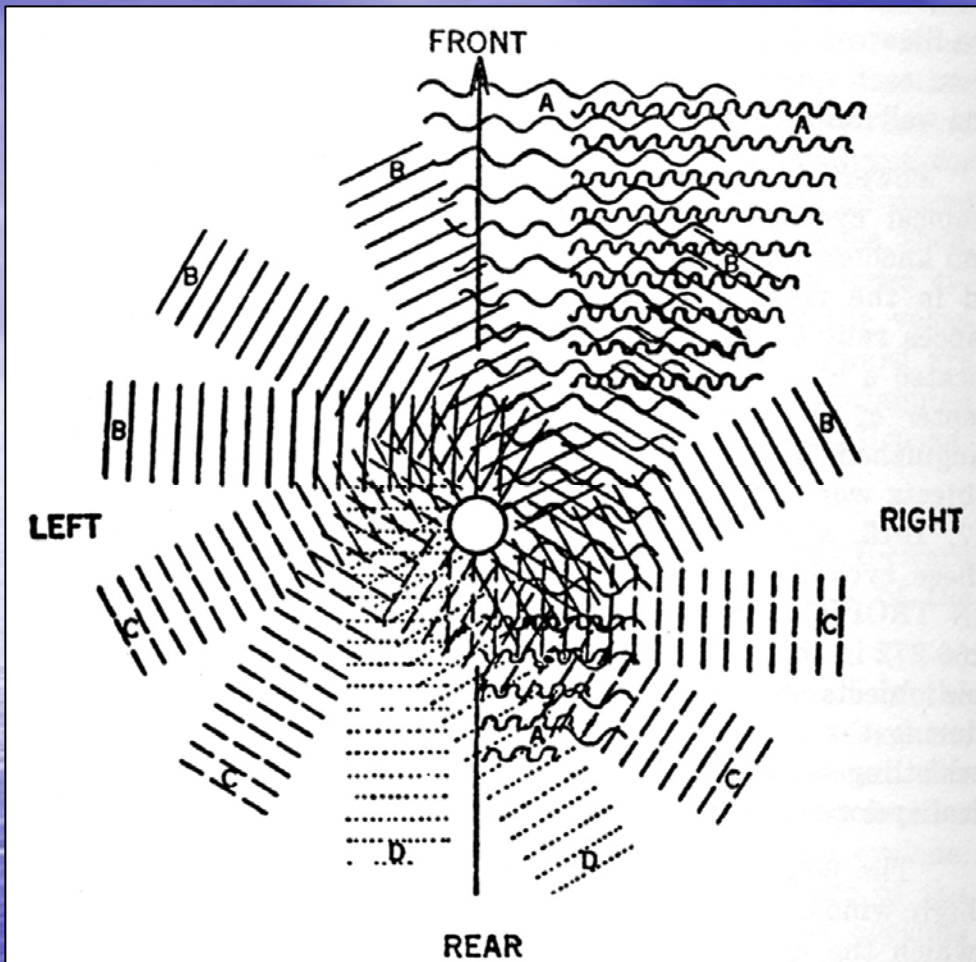


- The surge effect is minimal in the open ocean, because the water falls back on itself



- As the storm makes landfall, water is lifted onto the continent, locally elevating the sea level, much like a tsunami, but with much higher winds

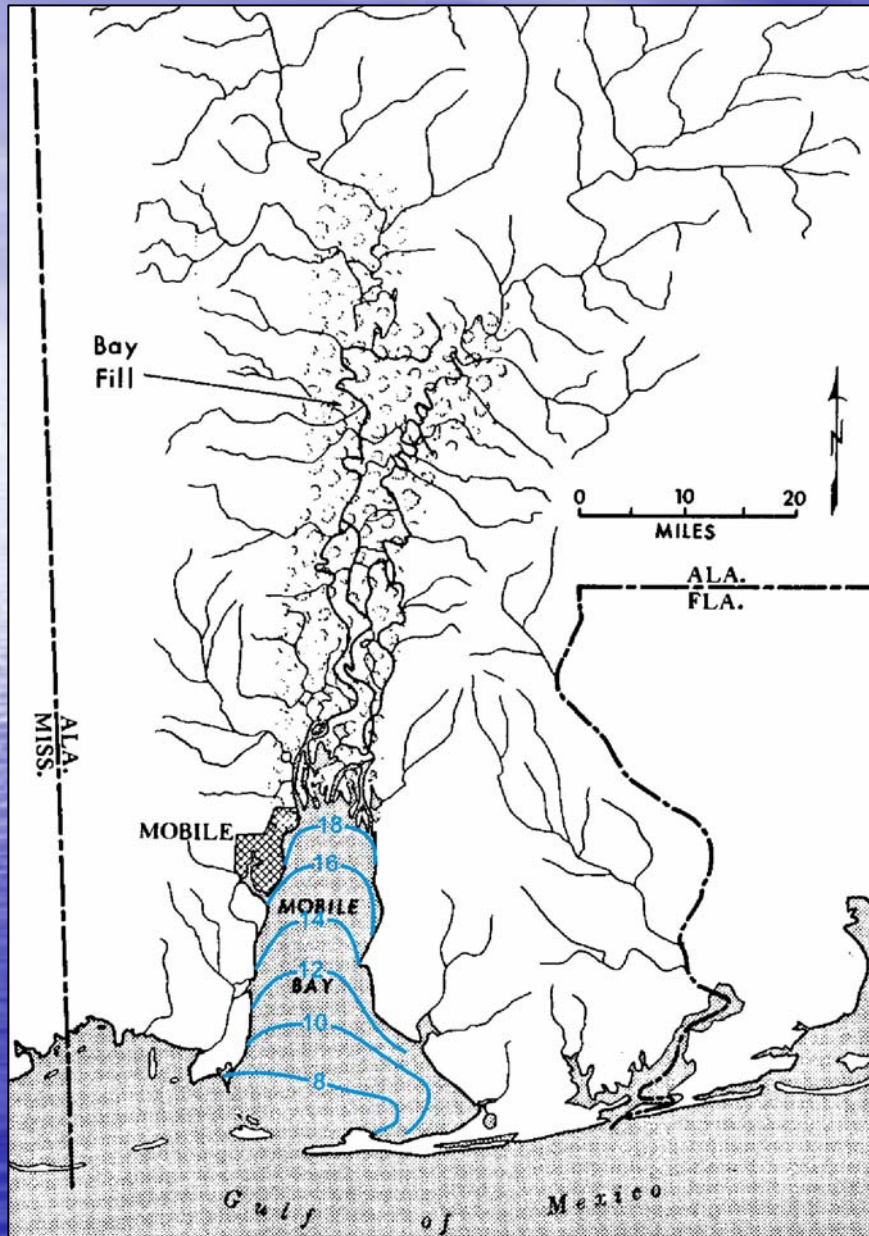
Images from USA Today



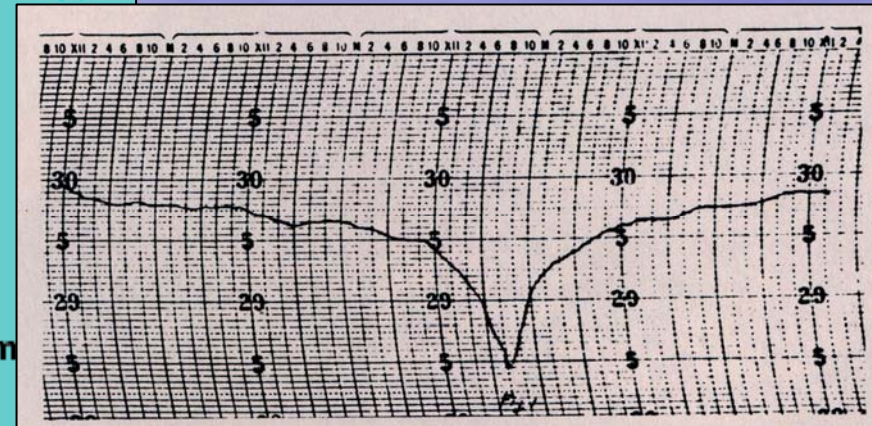
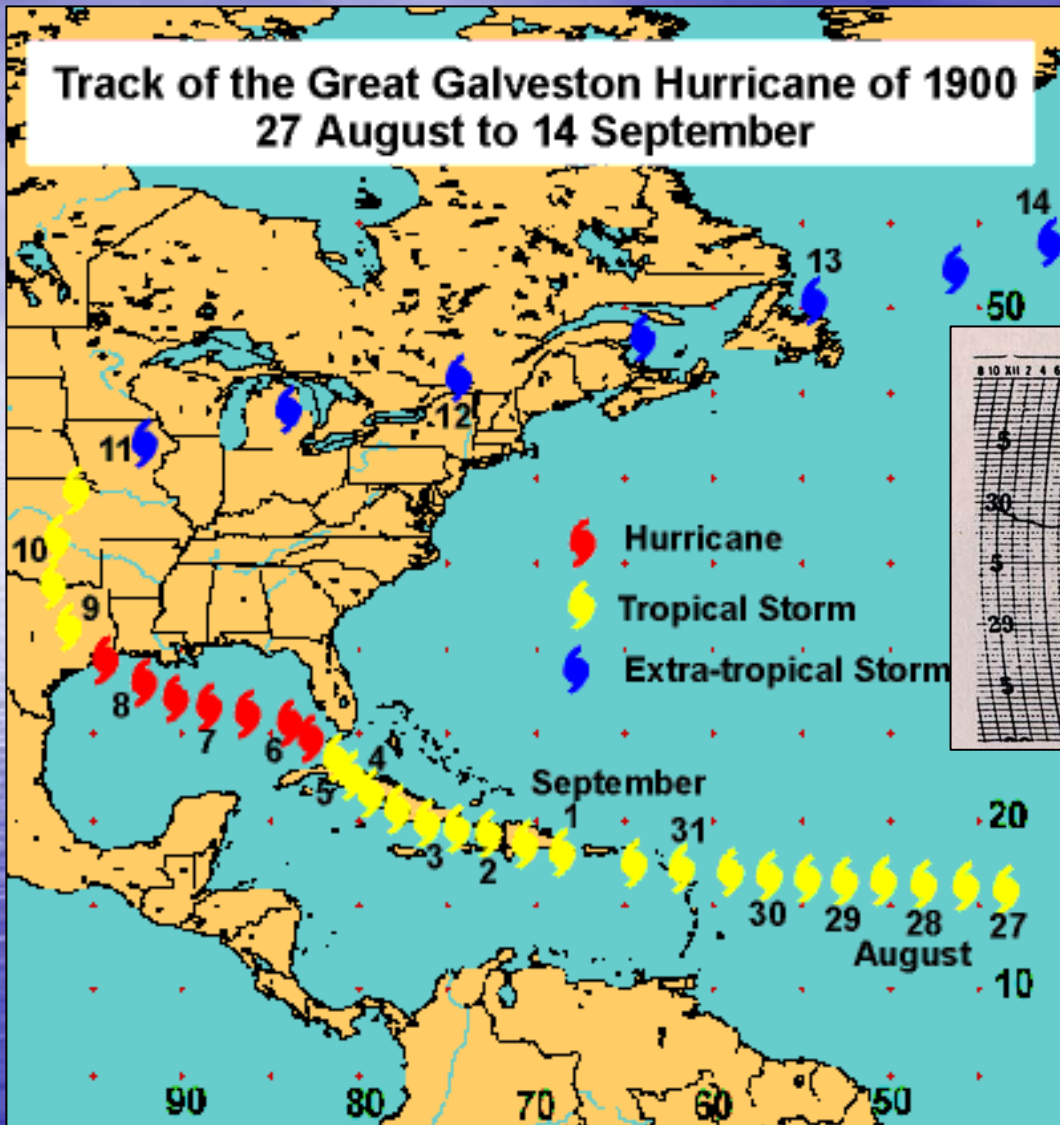
- Cline showed that it was then northeast quadrant of a cyclonic event that produced the greatest storm surge, in accordance with the drop in barometric pressure.

Trumpet shaped bays bad news

- A recent example was the 18 foot storm surge in upper Mobile Bay predicted for landfall of during Hurricane Ivan in 2004.



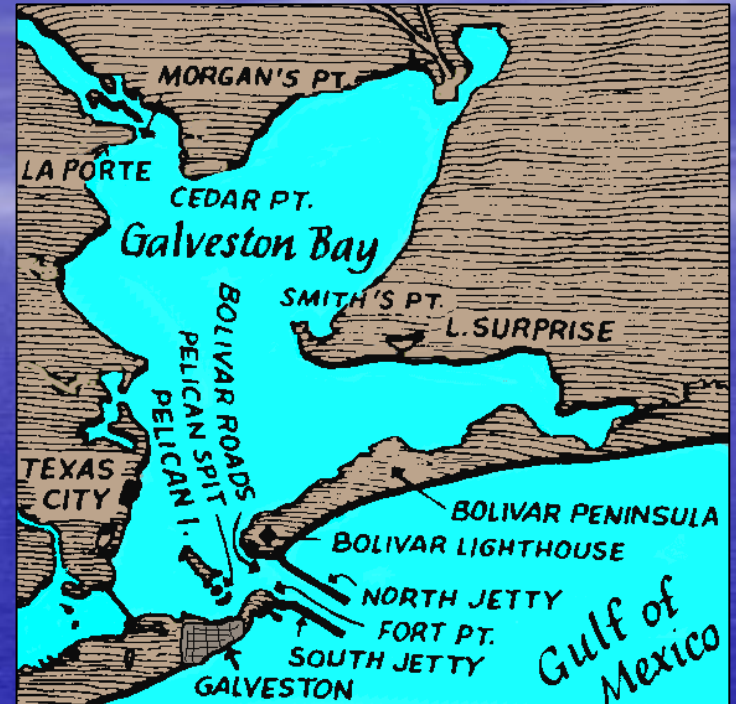
Deadliest natural disaster in American history

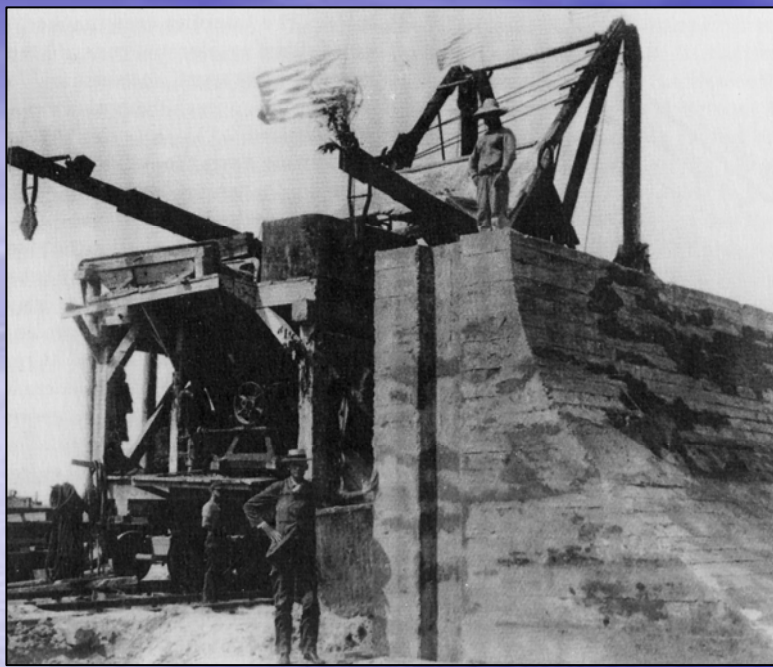


Cline's barometer record of the Galveston Hurricane, showing the dramatic drop in pressure caused by passage of the eye of the storm cell.

The deadliest storm in American history was the Galveston Hurricane of 1900, which killed between 6,000 and 8,000 people in Galveston, Texas. Cline was living there at the time and his wife was one of the victims.

Damage in Galveston was complete

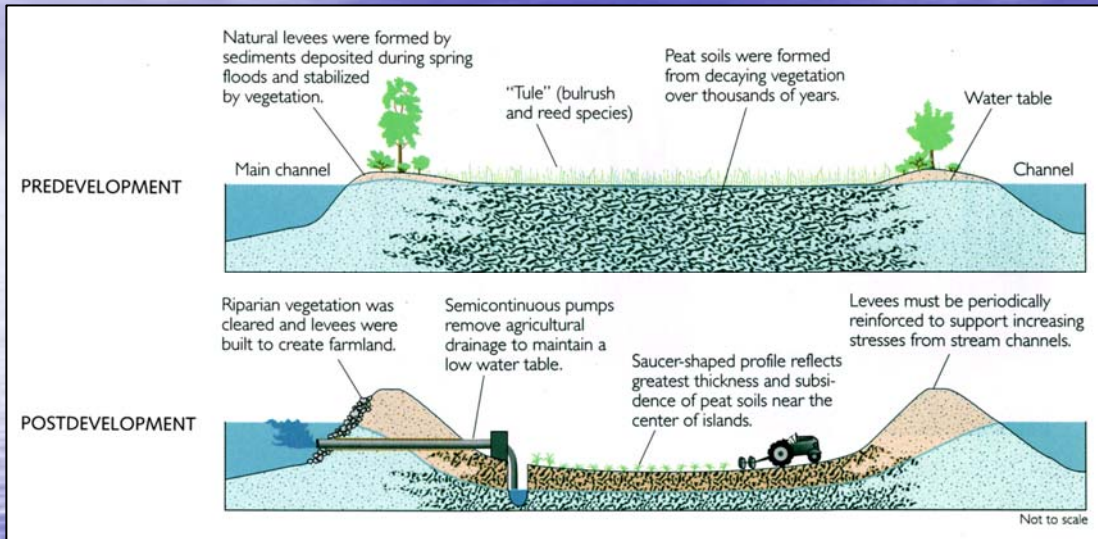




The city was rebuilt behind an 18 feet high concrete seawall and backfilled, raising the city by 15 feet.

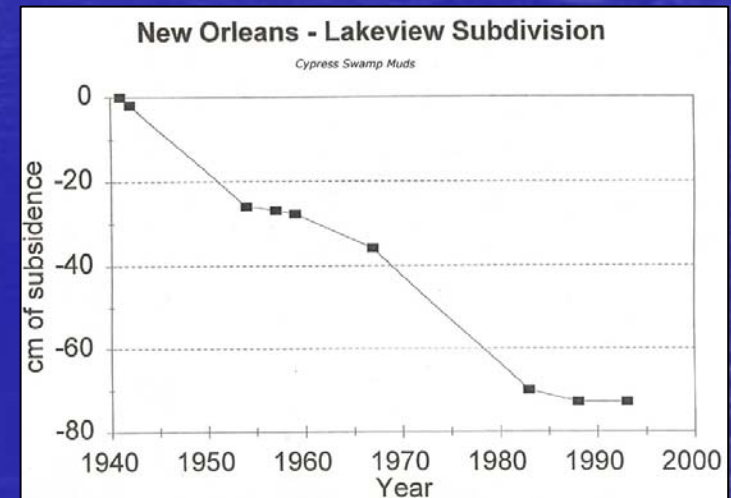
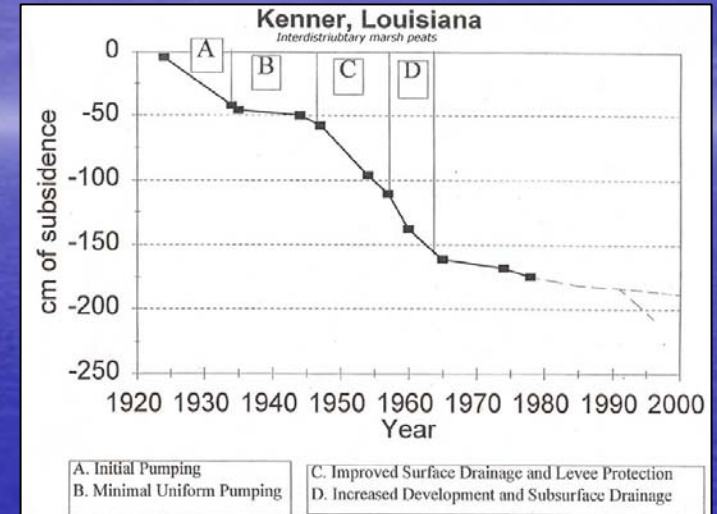


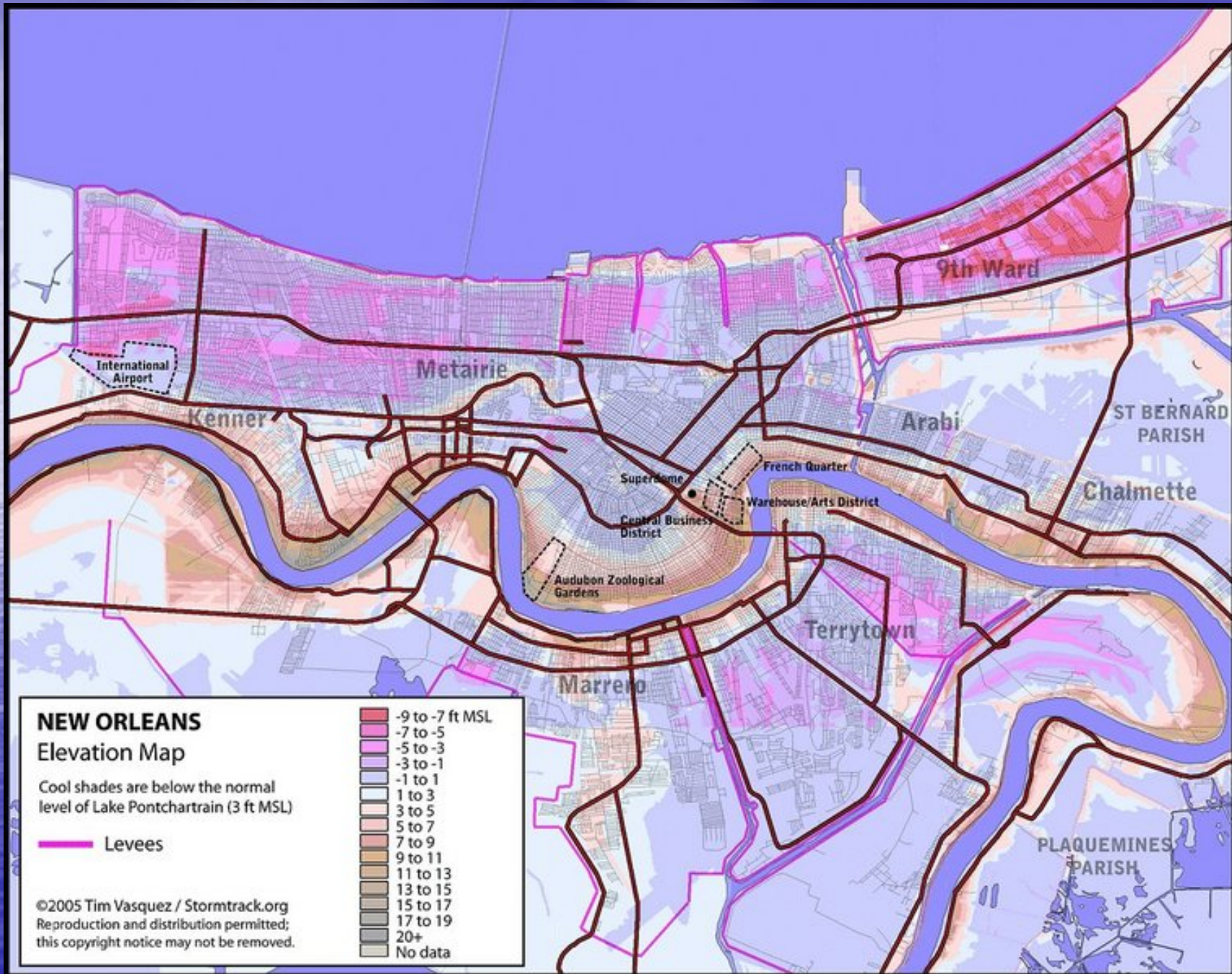
New Orleans is actively settling



A organic rich peat soils are oxidized, the ground settles, creating a depressed area below the grade of adjacent channels.

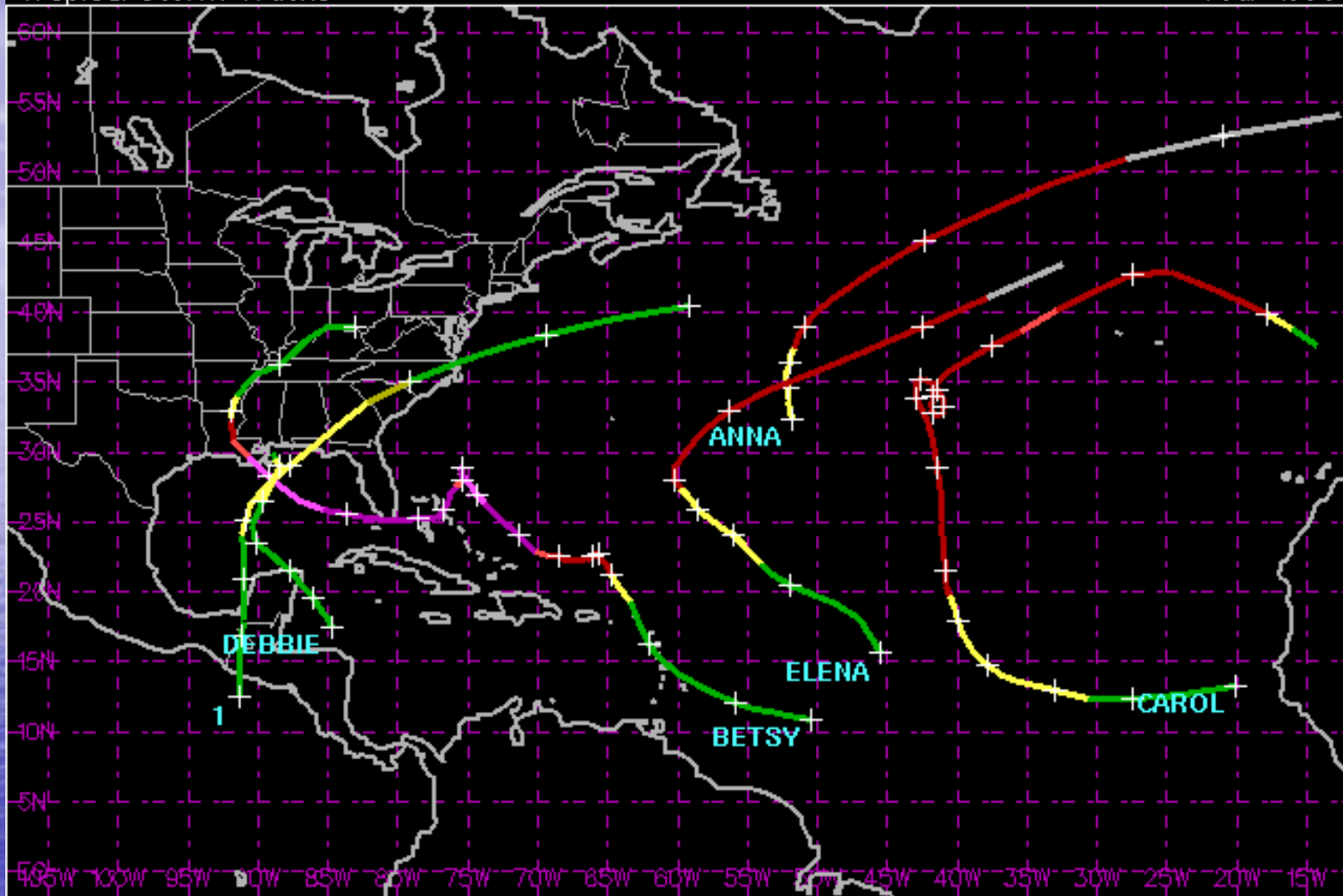
This fact complicated elevating Interstate 10 above flood inundation level, as the additional weight if fill would cause even more settlement.



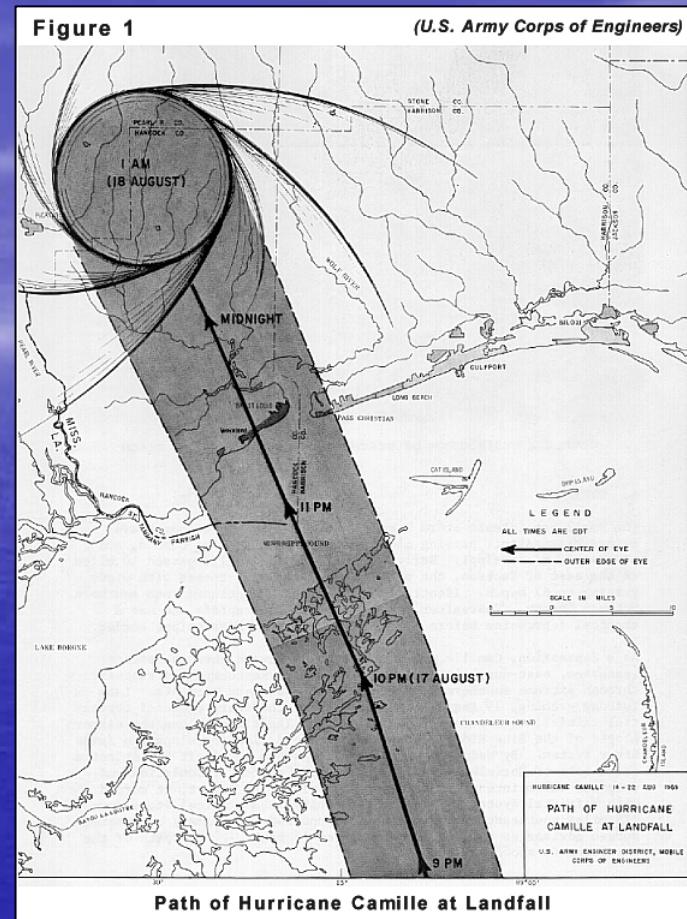
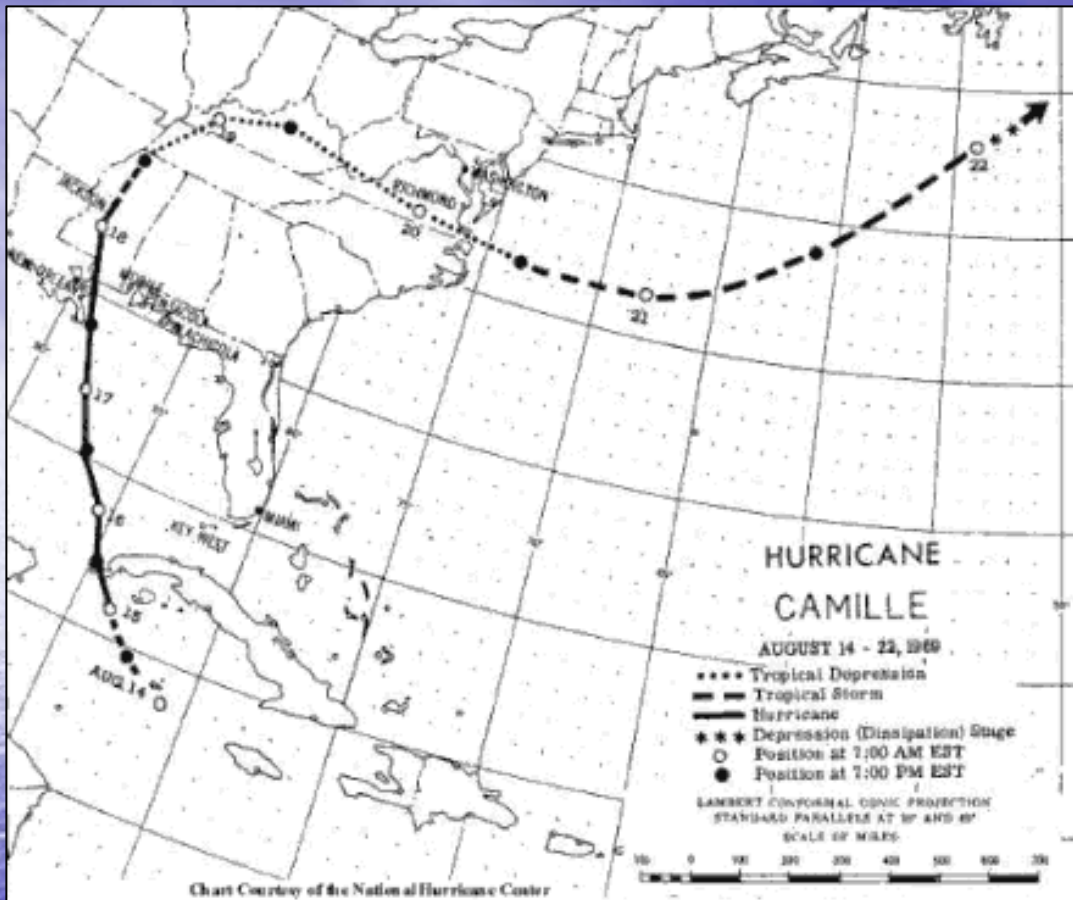


Tropical Storm Tracks

Year 1965

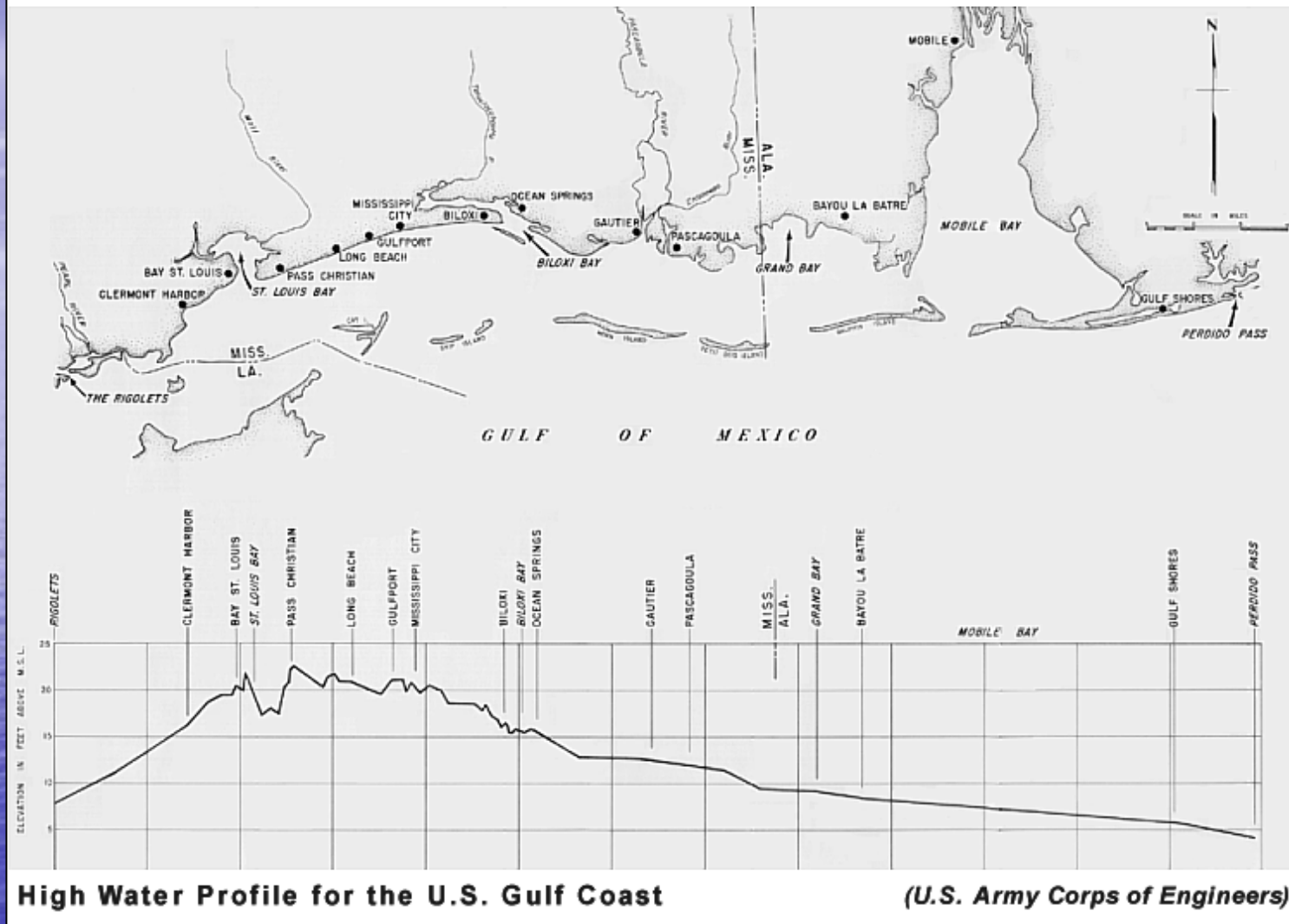


Hurricane Betsy clobbered New Orleans in 1965, with winds of up to 125 mph and a storm surge of 8 to 10 feet. It was the first hurricane to cause more than \$1 billion in damages.



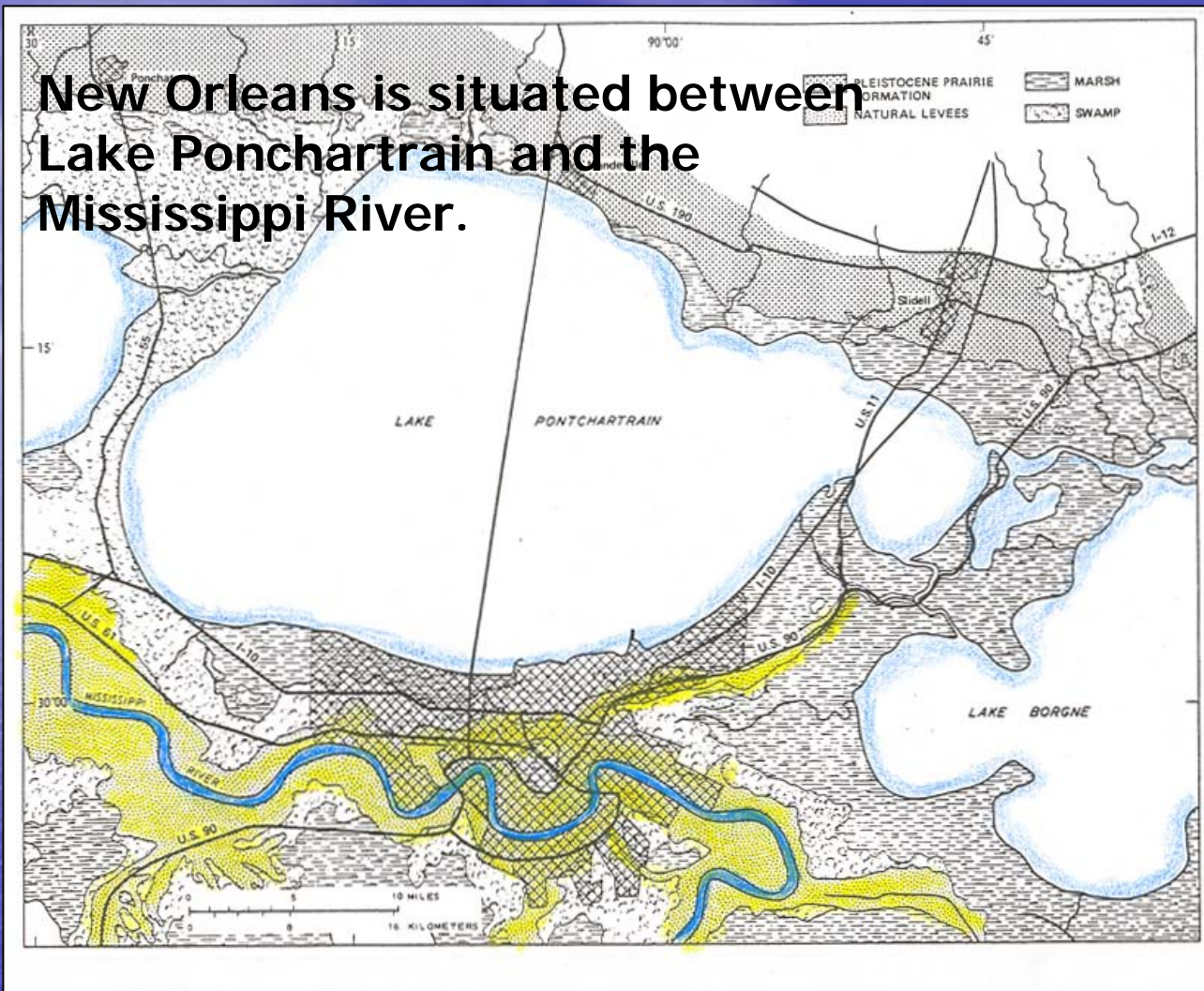
Betsy's record damage was eclipsed by **Hurricane Camille**, which struck the Gulf Coast in August 1969. It's eye made landfall about 60 miles east of New Orleans and went up the Mississippi Embayment, causing unprecedented levels of storm-related damage in Virginia, killing more than 300.

Figure 4



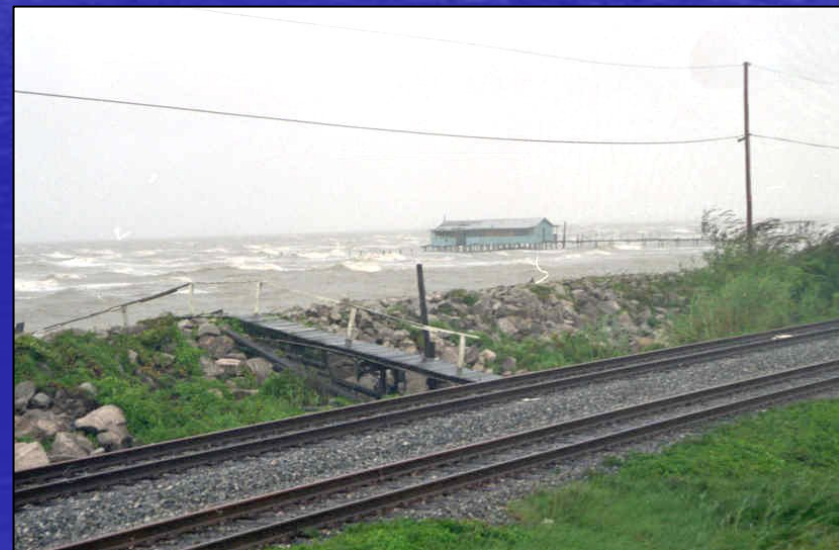
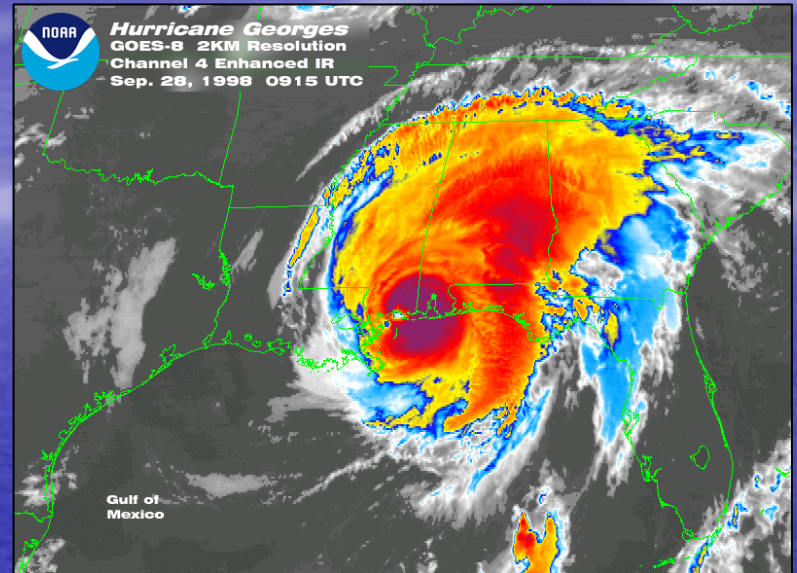
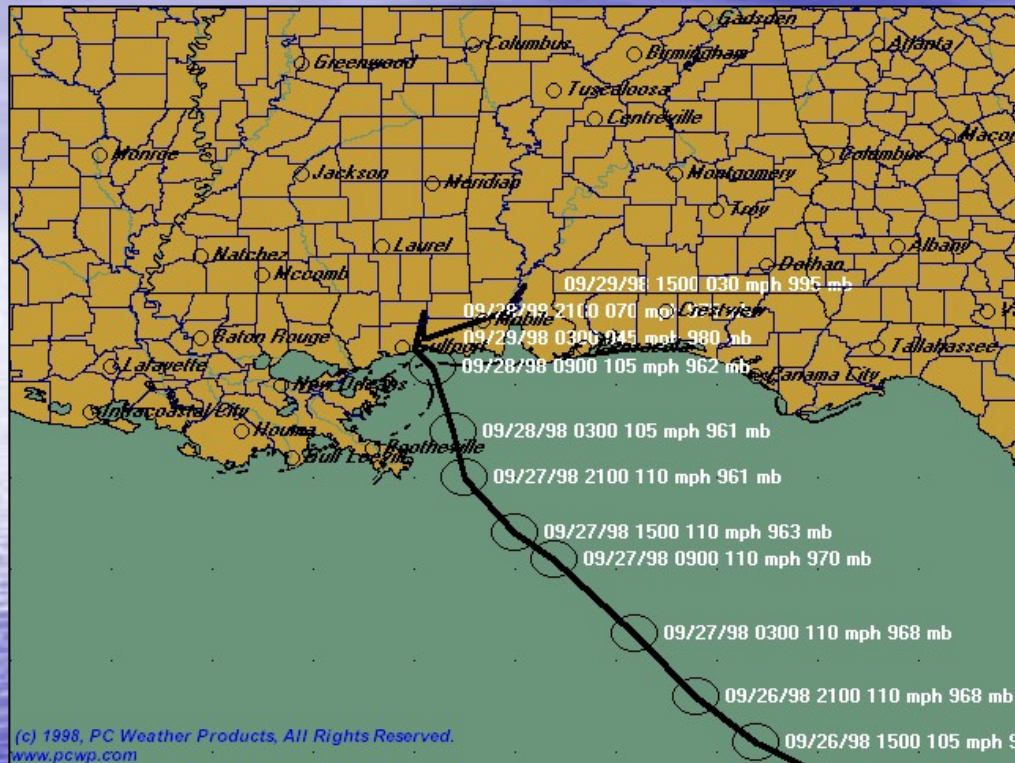
Recorded storm surge on Gulf of Mexico landfall of Hurricane Camille in 1969. Pass Christian recorded a storm surge of 22.5 feet, Bay St. Louis 20.2 feet, and Biloxi 16 feet.

New Orleans is situated between Lake Pontchartrain and the Mississippi River.



After Hurricanes Betsy (1965) and Camille (1969) it was proposed that the Corps of Engineers construct a tidal gate across the outlet of Lake Pontchartrain to prevent potentially destructive tidal surges from entering the lake and impacting the back side of New Orleans. This would have the added benefit of protecting the causeways and viaducts leading to the city.

Hurricane Georges Sept 1998



The **9 foot tidal surge** caused by Hurricane Georges came within inches of overtopping the Lake Pontchartrain levees and drainage canal gates on September 27, 1998.