

## The History of Flooding in Louisiana

Hurricanes: History By Barbara McCarragher Hurricane Katrina may be the most memorable storm in New Orleans history, but its trajectory across the Pelican State was far from unique. Louisiana was hit by 49 of the 273 hurricanes that made landfall on the American Atlantic Coast between 1851 and 2004. In addition, eighteen of the ninety-two major hurricanes with Saffir-Simpson ratings of category 3 or above have struck the state (U.S. mainland hurricane strikes by state, 1851-2004). On average, one major storm crosses within 100 nautical miles of New Orleans every decade (King, 2006). Hurricane intensity is measured by the Saffir-Simpson scale, which uses wind speed, storm surge, and barometric pressure. Standard pressure is 1013.2 millibars (Swanson, 2004). The storm surge, the result of the wind-whipped water, is the most dangerous of these elements in terms of potential loss of life (Fitzpatrick 17). Combined with the astronomical (normal) tide and other factors, the storm surge produces a hurricane storm tide that can be 15 feet or more above the normal tide level. The waves superimposed on this tide are also a huge threat because the repeated pounding can destroy most structures. Keep in mind that a cubic yard of water weighs approximately 1700 tons, which exerts a huge amount of pressure on any structure in its path (Storm Surge). In addition, assuming all factors are equal, doubling the height of a wave increases the energy by a factor of four (Zebrowski, 2005). This creates a recipe for disaster for any coastal city not prepared to hold up in a hurricane. Hurricanes have been a part of New Orleans history since the city was settled in the early 18th century by the French (Fitzpatrick, 1999). With an average elevation of 1.8 meters (6 feet) below sea level, New Orleans is a shallow depression ringed by levees and thus vulnerable to massive flooding because there is nowhere for floodwaters to go (Yamazaki, 2002). A storm surge from a slow-moving Category 3, 4, or 5 storm can reach 30 feet (Fitzpatrick, 1999). This can create problems because the pumps designed to pump out the city can not work when they are completely submerged. Jefferson and Orleans parishes ranked first and second among communities receiving repeat payments for damage claims between 1978 and 1995 under the National Flood Insurance Program. These two parishes alone accounted for twenty percent of the properties with repeat losses. They had an average of nearly three claims per property for a total of \$308 million (New Orleans Hurricane Risk). Some people have called Katrina the "most anticipated natural disaster in modern American history." Even before the storm, the Federal Emergency Management Agency (FEMA) listed a hurricane strike in New Orleans as one of the direst threats to the nation, on par with a large California earthquake or a terrorist attack on New York City (Bourne). New Orleans history offers its own perspective, including the four most destructive storms of the twentieth century: the Hurricane of 1947, Betsy, Camille, and Georges (Yamazaki, 2002). The Hurricane of 1947 made landfall near the Chandeleur Islands of Louisiana on September 19th. Wind gusts of 112 miles per hour and a central pressure of 967 millibars (mb) were measured at what is now New Orleans International Airport, which was less than 2 meters (6.5 feet) of water. A storm surge of 3 meters (9.8 ft.) reached the bayou village of Shell Beach, which is a 40-minute drive southeast of the city (Yamazaki, 2002). It's significant to note that old Shell Beach now lies beneath five feet of water due to wetlands loss caused by the Mississippi Gulf River Outlet, which was constructed in 1968 (Bourne). The 1947 Hurricane claimed 51 lives, flooded Jefferson Parish to a depth of 1 meter (3.28 ft), and caused 100 million dollars of damage in New Orleans. Levees along the south shore of Lake Pontchartrain to protect Orleans and Jefferson parishes were built in response to the destruction. Hurricane Betsy made landfall on September 10th, 1965 at Grand Isle, Louisiana with a pressure of 948 mb, gusts of 160 miles per hour (mph), and a forward speed of 22 mph. The island was completely flooded by the 4.8 m (15.7 ft) storm surge. Offshore oil rigs, public utilities, and commercial boats all suffered severe damage. New Orleans witnessed gusts of 135 mph, a 3 meter (9.8 ft) storm surge, and the worst flooding in decades. Eighty-one people died, and damage in southeast Louisiana totaled \$1.4 billion. After the overtopping of the levees, it took nearly eight hours to get the pumping systems back to normal (Fitzpatrick, 1999). The Orleans Levee Board responded by raising the levee height to 12 feet. The most significant storm for Mississippi and Louisiana during the 20th century was Hurricane Camille, which struck the Mississippi coast on August 17th, 1969 with a small diameter and a forward speed of 14 mph (Yamazaki, 2002). Camille was one of only three storms to hit the U.S. mainland as a Category 5 during the 20th century, rivaled by Florida's 1935 Labor Day Hurricane and Andrew in 1992. The pressure was 901 millibars and the winds were estimated at 175 mph before later data gave a wind speed of 201 mph, making it the only 20th century storm to satisfy the all the Category 5 criteria at landfall and the catalyst for the development of the Saffir-Simpson scale (Yamazaki, 2002). The record-setting storm surge was officially measured at 24.6 feet inside a surviving structure, but experts expect that it surpassed 28 feet (Zebrowski, 2005). The storm then caused massive flooding and landslides, particularly in the Appalachians, as it curved through Tennessee, Kentucky, and the Virginias. Property damage exceeded 11 billion dollars (\$350 million in Louisiana alone) even though the storm turned north in time to miss New Orleans (Yamazaki, 2002). Despite the huge amount of damage caused by Camille, it could have been much worse for Louisiana, especially in Plaquemines Parish (Zebrowski, 2005). At least some of the forecasting and communication mistakes made during 1957's Hurricane Audrey were corrected before the Category 5 hurricane hit in a similar area. Several hundred thousand people would have been trapped and the death toll could have reached the tens of thousands if similar errors had been made (Zebrowski, 2005). Many people evacuated before the National Hurricane Center issued the warning. Most people distrusted the NHC and with good cause. The NHC sent out the order to evacuate only four hours before the hurricane made landfall. If the people had waited for the official warning, they would have been stuck in traffic on a single lane road. Many people would have been drowned trying to escape the city (Zebrowski, 2005). However, things turned out very well. Because of the success of the evacuation, only seven deaths were directly attributed to the hurricane out of the estimated national total of 335 (Zebrowski, 2005). The southern part of Plaquemines Parish was transformed into a lagoon approximately twenty miles long and a half mile wide by Camille's rainfall and numerous levee failures (Zebrowski, 2005). Barely any homes remained and only a few large buildings were intact under the 1.4 trillion cubic feet of water. This made communication rather difficult, so very few

people outside of Louisiana know about the extent of the damage here (Zebrowski, 2005). The estimated death toll of 335 is actually quite low given Camille's severity. Further analysis reveals that a coordinated evacuation warning and effort was the determining factor. There were no deaths among the thousands of offshore oil workers because they had completely evacuated. In Plaquemines Parish one in twenty-five hundred people died because the city was almost completely empty. Despite the near-total destruction on the Mississippi Gulf Coast, the evacuation of over eighty-five thousand people and the impressive storm preparation steps resulted in a death rate of less than one person in seven hundred. The only area with a catastrophic death rate (more than one fatality per hundred residents) was Nelson County, Virginia, where no evacuation warning was possible (Zebrowski, 2005). The mortality rates offer a clear correlation between the level of preparation and the human cost of such a disaster. Smooth mass evacuations in Mississippi and Plaquemines Parish overcame long-standing racial tensions. Communities came together in immediate recovery efforts. Residents and local politicians overcame their distrust of the federal government because they did not have the resources to rebuild on their own (Zebrowski, 2005). The greatest lesson of Camille is that even extremely violent storms do not need to result in catastrophic loss of life and the disintegration of social structure. The people affected never forgot Camille, but the nation as a whole allowed the memory of the destruction, the importance of efficient preparation, and the cohesive recovery methods fade into the background. The immediate response to Katrina was slow, uncoordinated, and inadequate (Zebrowski, 2005). Will the same mistake be repeated if the lessons of Katrina also go unlearned? Two final storms worth mentioning are Hurricanes Georges and Ivan, which both exposed the vulnerabilities of New Orleans. Georges inflicted extensive damage on numerous Caribbean islands before making landfall near Biloxi, Mississippi on September 28, 1998 with a maximum sustained surface wind of 104 mph and a central pressure of 964 mb. The maximum storm surge in Louisiana was 2.7 m (8.9 ft) at Point à la Hache, which severely eroded the Chandeleur Islands, the first line of storm surge defense for southeast Louisiana and southern Mississippi. Four hundred sixty people died; however, none of these people were in Louisiana. The flooding for Georges was actually a full category higher than its category 2-3 intensity on the Saffir-Simpson scale because it was such a slow-moving storm. The hurricane actually shifted to the east and missed New Orleans, but the evacuation raised major concerns. Theft and vandalism occurred when approximately 14,000 people poured into the Superdome when it was functioning as a shelter. Georges also led to more attempts to improve the levees along the canals connecting the city to Lake Pontchartrain (New Orleans Hurricane Risk). Hurricane Ivan exposed major evacuation issues as more than a million people tried to leave the greater New Orleans area on Tuesday September 14, 2004, creating a traffic jam worse than the traffic when people evacuated for Georges. The state police enacted contraflow traffic patterns in the afternoon, but the 60 miles between New Orleans and Baton Rouge was a seven hour ordeal (New Orleans Hurricane Risk). Overall, in order to better prepare for the future, we have no better source than the past. Hurricanes have hit before, exposing weaknesses in the plans that formed by the government in the years past. This time, we have to opportunity to prevent this sort of destruction from happening ever again. We can not let the people in this country forget the lessons of the past.