



The Storm :

1928 Remembered

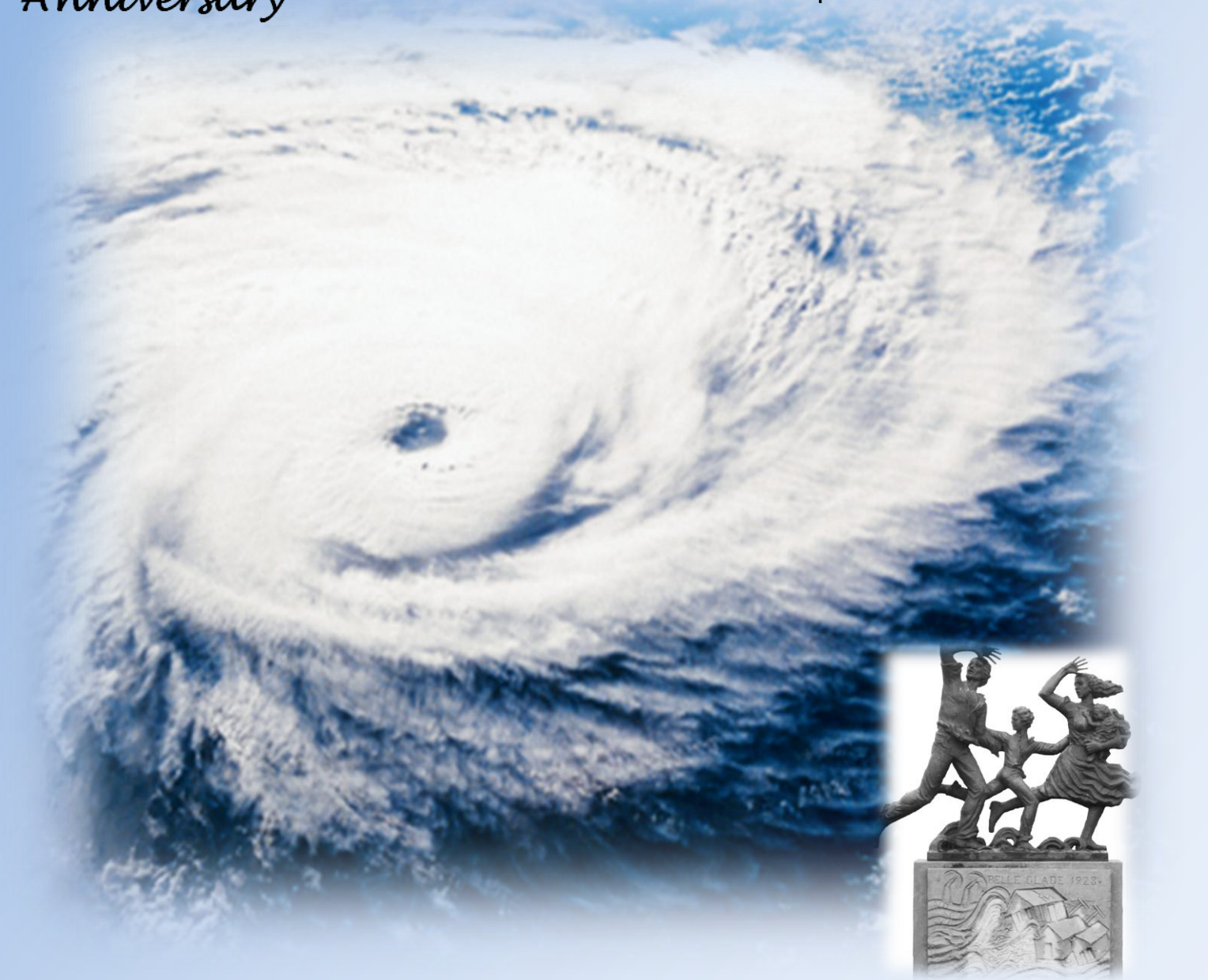
80th

Anniversary



Special Exhibit

16 September - 31 December 2008



Teacher's Guide

Prepared by the Historical Society of Palm Beach County

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Acknowledgements

A special thank you to the *Palm Beach Post* for permission to re-print sections from the *Storm of '28* tabloid (2003) and to The Weather Channel for information from their online encyclopedia.

Teachers

In order to receive in-service points, be sure to complete the pre and post visit activities and fill out the Staff Development forms at the end of this guide. Send them to Karen Bradley, K-12 Arts ED Resource Teacher, 3310 Forest Hill Boulevard, C-225, West Palm Beach, FL 33406-5813.



The Storm: 1928 Remembered

Exhibit Dates: 16 September – 31 December 2008

The Storm of 1928 was one of the most devastating natural disasters in U.S. history. In its wake, cities and towns were demolished. Communities on the eastern edge of Lake Okeechobee were washed away in a matter of minutes and whole families were lost that terrible night. When it was over, 2,500-3,000 people had lost their lives in Palm Beach County. The Richard and Pat Johnson Palm Beach County History Museum will mark the 80th anniversary of the Storm of '28 with a special exhibit entitled *The Storm: 1928 Remembered* on September 16, 2008. The exhibit is a collaboration between the Historical Society of Palm Beach County and the Storm of '28 Memorial Park Coalition. With assistance from the South Florida Water Management District's GIS Lab, the exhibit will feature a scale relief model of Lake Okeechobee and the dike before the storm. Visitors will get a feel for the enormity of the event through an original artwork titled, "What does an eight foot wall of water look like?" Additional items on display from the period include a radio and telegraph key that provided the only source of long distance communication.



Teacher's Guide to the Special Exhibit

The Storm: 1928 Remembered

For Teachers: All sections of this guide may be reproduced for your students.

Suggested Pre-visit Activities

Please see pages 20-26 for three Pre-visit Activities. Prior to visiting the museum, please review with your class What a Hurricane is, What causes a Hurricane, The Stages of Development, The Saffir-Sampson Category, and Terms to Know.

Suggested Post-visit Activities

Please see pages 27-28 for two Post-visit Activities.

Copy the Hurricane Tracking Map (pg. 26) and give it to your students. Instruct them to track a tropical storm/hurricane between September and November.

Suggested Reading

Hurston, Zora Neale. *Their Eyes Were Watching God*. HarperCollins Publishers, 2006.

Kleinberg, Eliot. *Black Cloud*. New York: Carroll & Graf Publishers, 2003.

Mykle, Robert. *Killer Cane: The Deadly Hurricane of 1928*. New York: Cooper Square Press, 2002.

Websites to Visit

National Oceanic and Atmospheric Administration <http://www.noaa.gov/>

National Hurricane Center <http://www.nhc.noaa.gov/>

Local News Stations

Channel 25 WPBF ABC <http://www.wpbf.com/index.html>

Channel 12 WPEC CBS <http://www.cbs12.com/>

Channel 5 WPTV NBC <http://www.wptv.com/>

University of Illinois

Storm tracker Interactive

Track hurricanes from 1950-2007

[http://ww2010.atmos.uiuc.edu/\(Gh\)/guides/mtr/hurr/hurtrack/index.html](http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/hurr/hurtrack/index.html)

Florida Sunshine State Standards

Science

- SC.4.N.1.1 Raise questions about the natural world, use appropriate reference materials that support understanding to obtain information (identifying the source), conduct both individual and team investigations through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.
- SC.4.N.3.1 Explain that models can be three dimensional, two dimensional, an explanation in your mind, or a computer model.
- SC.4.P.10.1 Observe and describe some basic forms of energy, including light, heat, sound, electrical, and the energy of motion.
- SC.4.P.10.2 Investigate and describe that energy has the ability to cause motion or create change.
- SC.4.P.10.4 Describe how moving water and air are sources of energy and can be used to move things.
- SC.4.P.12.1 Recognize that an object in motion always changes its position and may change its direction.

Social Studies

- SS.A.1.2.1 Understands how individuals, ideas, decisions, and events can influence history.
- SS.A.5.2.4 Understands social and cultural transformations of the 1920s and 1930s.
- SS.A.6.2.3 Knows the significant individuals, events, and social, political, and economic characteristics of different periods in Florida's history.
- SS.A.6.2.4 Understands the perspectives of diverse cultural, ethnic, and economic groups with regard to past and current events in Florida's history.
- SS.B.2.2.2 Understands how the physical environment supports and constrains human activities.



Vocabulary

Coriolis Effect	The apparent curving motion of anything, such as wind, caused by Earth's rotation. It was first described in 1835 by French scientist Gustave-Gaspard Coriolis.
Cyclone	An area of low atmospheric pressure with winds blowing around it, Counter-clockwise in the Northern Hemisphere, clockwise in the Southern Hemisphere.
Hurricane	A tropical cyclone with winds of 74 mph or more.
Latitude	The distance on Earth's surface measured in degrees north and south of the equator.
Longitude	The distance on Earth's surface measured in degrees east and west from the prime meridian.
Millibar	A metric unit of air pressure measurement. The average atmospheric pressure at sea level is 1013 millibars.
Storm surge	Quickly rising ocean water levels associated with hurricanes that can cause widespread flooding.
Tropical cyclone	A low-pressure system in which the central core is warmer than the surrounding atmosphere.
Tropical depression	A tropical cyclone with maximum sustained winds near the surface of less than 39 mph.
Tropical storm	A tropical cyclone with 39 to 74 mph winds.

The Hurricane of 1928

(Re-printed with permission of the *Palm Beach Post*)

Introduction

The storm of 1928 was called San Felipe II. This hurricane caused massive devastation in the Caribbean but was the most destructive in Palm Beach County, especially around Lake Okeechobee. On September 13, 1928, this storm cut a path of destruction through the Caribbean, devastating Guadeloupe, St. Kitts, Montserrat, Puerto Rico, the Virgin Islands, and Nassau, Bahamas, before reaching the United States coastline. The SS *Commack* crew was the first to report the location of the storm by radio in the far eastern Atlantic near the Cape Verde islands. The hurricane's position was 17 degrees north, latitude and 48 degrees west, longitude. Puerto Rico received a direct hit from the storm, leaving at least 300 dead and many more dying from starvation and disease in the weeks that followed. In the end, over 1,575 people lost their lives in the Caribbean.



Day of the Storm

On September 16, 1928, the hurricane reached the Palm Beach County coastline at approximately 6 p.m. This was a Category 4 hurricane with a barometric pressure of 27.43 and a wind velocity estimated at between 150 and 160 miles per hour. The area most affected stretched from Pompano to Jupiter. It moved west to the Everglades, passing over Belle Glade, Pahokee, South Bay, and the southeast shore of Lake Okeechobee. Counties most affected by the storm were Palm Beach, Broward, Okeechobee, Martin, and Hendry. It cut a path of destruction through the state and affected more than 112,000 individuals.

After passing Bartow, the storm began curving northward and northeastward, and then passed Jacksonville with diminished intensity at 1:00 a.m., September 18, 1928. The storm then left Florida and was tracked as far north as Parris Sound, Canada. West Palm Beach reported 18.42 inches of rain during the week of the storm and over 10 inches fell as the storm passed through.

It was reported that the eye of the hurricane produced a lull that lasted about 40 minutes and that the storm was moving at 14 miles per hour. This lull lasted for about 50 minutes in the eastern section of the lake, allowing the crest of Lake Okeechobee to reach an elevation of 26.3 feet. This area incurred a catastrophic loss of life resulting from a 15-foot storm surge. Between 2,500 – 3,000 people, many of them migrant workers, lost their lives during the storm and resulting flood. Storm waters in the South Bay section of the lake were driven ten feet above the lake level. Much of the devastation and loss of life was caused by Lake Okeechobee overrunning its banks and the dikes being washed away.

On the day of the storm, around 2:00 p.m., many of the people around the lake had gotten word of the impending danger rapidly approaching them. In South Bay several men tried to drive the rugged roads around the lake to warn people to seek shelter. A group of women and children gathered on Huffman's Barge anchored on the lake. They all survived the storm. Thousands of other landowners, families, laborers and unknown victims did not.

The Jupiter Lighthouse was positioned at the northern point of the storm path. Maritime vessels, cruise ships, and pleasure boats depended on the lighthouse to make landfall. The lighthouse keeper, Captain Seabrook, and his son refused to let the Lighthouse become dark

during the storm. Prior to the storm the light had been converted from oil burners to electricity. As the storm reached the coast, all power lines were downed, and the lighthouse auxiliary generator failed to work. Without electricity, the light's mantle had to be turned by hand. Captain Seabrook was sick; therefore his son Franklin worked the mantle. As a result, the light from the lighthouse shone through one of the county's most violent hurricanes.

Preparation and Warning

The Red Cross played a major role preparing for the storm and helping the state recover after the hurricane. They began their preparation by analyzing the hurricane of 1926. They attempted to comprehend the parts and sections of a hurricane along with the basic storm forecasting. Early hurricane forecasting relied primarily on short-wave communications from ships at sea. This was only reliable if a ship happened to be in the area of the storm. The Red Cross chapters also formed 10 subcommittees to deal with water, food, medical supplies, shelter, clothing, and transportation. Plans were made for emergency care, hospitalization centers, canteen centers, transportation of refugees, and movement of supplies and other necessities.

Many efforts were made to warn people about the hurricane. Local folklore accounts state that Seminole Indians sensed that a storm was approaching. Some document that the Indians noticed the migration of sea birds, unusual blooming of the saw grass and the unnatural activity of the wildlife. The Seminoles tried to warn residents of the Everglades and Lake Okeechobee areas. Few took heed. Those that did leave the area with the Native Americans were spared.

After the Storm

The Red Cross volunteers in Palm Beach County used 93 cars to make an average of 553 trips per day to the affected areas around Lake Okeechobee. Fifty-one trucks made an average of 206 trips per day. Thirty-eight motorboats and four airplanes were also employed in this effort. The railroads provided free freight and express until the 28th of September.



The Glades Hotel in Belle Glade after the Storm of '28.

At 2 p.m., the storm had caused downed telephone wires that interrupted telephone communications. Amateur radio operators came to the rescue by providing communication services until telephone and telegraph lines were repaired. Florida's Governor Martin was not notified of the severity and impact of the storm in the Lake Okeechobee area for three days. He toured the area and observed the bodies of an African American widow and her eight children on the back porch of a house in Pahokee. He was also told about an old timer, C. L. Reddick, whose dead body had been guarded for five days by his dog. Due to the exhaustive nature of the rescue effort, the governor ordered additional replacements for rescue workers as well as requesting an increase in the number of sleeping cots, blankets, and clothing for both victims and workers.

Conditions for the relief workers were unbearable. The horrific task of rounding up bodies that had for days been exposed to Florida's climate of sun and rain brought the strongest men to their knees. The authorities issued a "no work, no food" order. Military personnel made all able-bodied men join the work teams. Those who refused to work were jailed, and some were even shot. The work was gruesome, as some bodies were beyond recognition and some had appendages dangling from the bodies. After the first few days, African American, Bahamian, and

Caucasian bodies were indistinguishable, and the stench of decomposing bodies was almost



Florida State Historical Marker at the Mass Burial Site located at 25th Street and Tamarind Avenue in West Palm Beach.

unbearable. After the first two weeks, bodies were soaked with fuel oil and cremated, some singly and some in groups of a dozen or more. The majority of the Caucasian bodies were identified and buried at Woodlawn cemetery in West Palm Beach, while the bodies of African Americans and Bahamians were laid in a mass gravesite at 25th Street and Tamarind Avenue in West Palm Beach, Florida. These decomposed bodies were dumped into the ground, one on top of the other, with the addition of lime. This mass gravesite, the final resting place for 674 black victims, remained unmarked and un-kept until 2004.

Men of all races worked together to locate survivors. The work was grueling with little or no relief in sight. Insects and wild animals, such as snakes and alligators, made the work even more difficult. The first relief efforts began along the coast followed by efforts along Lake

Okeechobee and the Glades areas. Many of the people who managed to survive the hurricane in those areas had been swept for miles into the saw grass and were forced to walk or wade back to whatever recognizable roadway they could find. Many were very weak and/or injured while others perished as they wandered aimlessly through the Everglades.

The Hurricane of 1928, San Felipe II, was the second largest natural disaster to occur in the United States. It is important to learn the history of these natural phenomena, and it is imperative that we prepare for these natural disasters before they occur. Hurricane preparation means hurricane survival.



The 1928 Monument at the Belle Glade Library.

Chronology of the Storm of '28

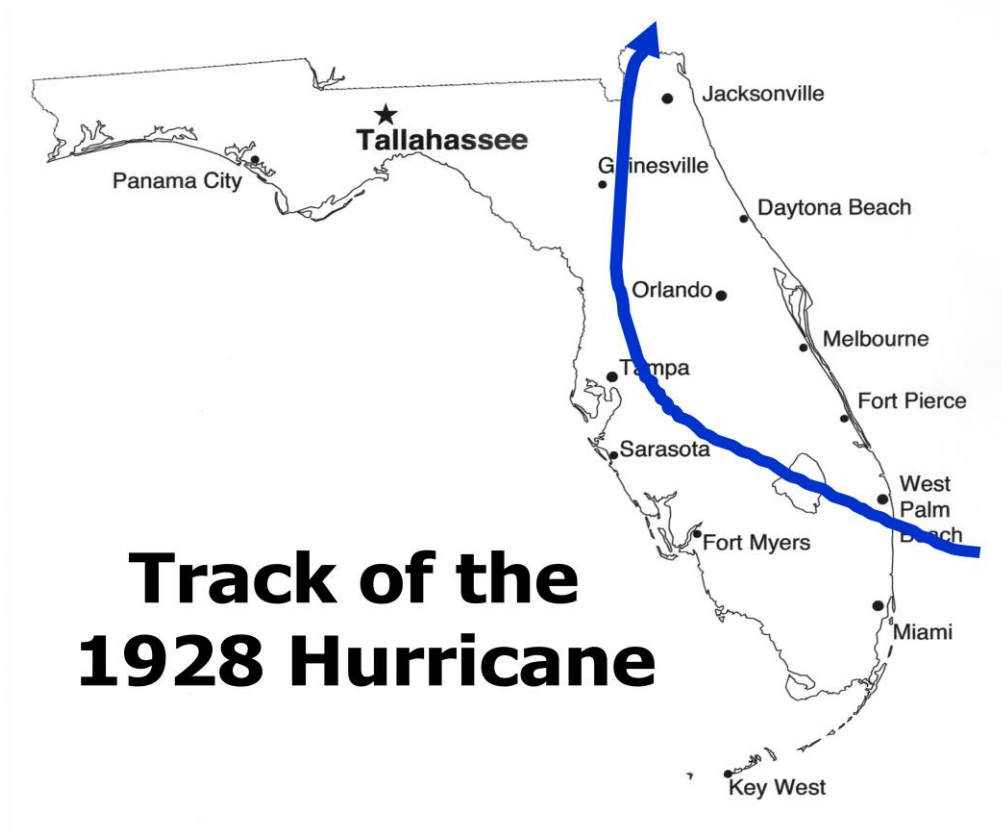
10 -19 September

10 Sept 1928	Monday	Morning	600 miles east of Barbados-first evidence of storm
		8:00 P.M.	First warning of the island of Martinique issued
11 Sept 1928	Tuesday	3:00 P.M.	The approach of hurricane is indicated by shifting of winds at Barbados
12 Sept 1928	Wednesday	12:00 P.M.	Hurricane makes landfall at Pointe à Pitre, Guadeloupe
		Evening	Hurricane strikes St. Kitts and Montserrat
13 Sept 1928	Thursday	11:00 A.M.	St. Croix is hit by hurricane
		Evening	Hurricane makes landfall at Puerto Rico
14 Sept 1928	Friday	Morning	Hurricane is off northeast coast of Haiti
15 Sept 1928	Saturday	Midnight	Hurricane hits Turk Island; Warnings are issued for the Florida coast
16 Sept 1928	Sunday	2:00 A.M.	Hurricane is north of Nassau
		10:30 A.M.	Hurricane flags hoisted from Miami north to Daytona Beach
		6:00 P.M.	Eye of hurricane makes landfall near Palm Beach
		9:15 P.M.	Eye passes over Canal Point
		10:45 P.M.	Highest winds at Canal Point estimated at 160 mph
17 Sept 1928	Monday	7:00 A.M.	Hurricane passes east of Tampa near Bartow
		1:00 P.M.	Hurricane passes west of Jacksonville
18 Sept 1928	Tuesday	Evening	Hurricane is in North Carolina
19 Sept 1928	Wednesday		Remnants of hurricane merge with a storm in Canada

Facts about the Storm of '28

Names of the Storm	San Felipe II, Storm of '28, Lake Okeechobee Hurricane
Highest winds in Florida (estimated)	160 mph
Florida rainfall	18.42 inches 15-22 September 1928
Deaths	
Guadeloupe	600-1,200
Grand Turk	18
Nassau	3
Martinique	3
Puerto Rico	312-1,600
Total Caribbean	1,224-2,824+
Florida	Originally 1,836 but changed to 2,500+ in 2003
Philadelphia area	7
New Jersey coast	3
Maryland	1
Florida damage and Red Cross relief	
Affected area	112,200 people in 20 counties
Buildings destroyed or damaged	32,400
Damage	\$75 million (in 1920s dollars)
Livestock killed	1,278
Poultry lost	47,389
Families given aid	30,325
Volunteers assisting	3,390

Eliot Kleinberg, *Black Cloud*. New York: Carroll & Graf Publishers, 2003



Approximate location of landfall of the Hurricane of September 1928 at about 6:15 p.m. It was also known as the Great Okeechobee/San Felipe Hurricane.



Between 9:15-10:00 p.m. the eye of the 1928 hurricane swept water out of Lake Okeechobee and over the towns of Belle Glade, Pahokee, South Bay, and other lake shore communities. More than 2,500 people died.

Lake Okeechobee, 1928



The map shows the areas around Lake Okeechobee that were flooded during the Storm of '28.

Lord, Somebody Got Drowned

Poem by an unknown writer about the Storm of '28. This appeared in a story in the October 24, 1928 issue of the *Palm Beach Post*. The story does not give the author's name.

On the sixteenth day of September, in the year of 1928, God
started to riding early and He rode to very late.

In the storm, oh in the storm, Lord somebody got drowned.

Got drowned, Lord, in the storm!

He rode out on the ocean, chained the lightning to his
wheel. Stepped on the land at West Palm Beach, and the
wicked hearts did yield.

Over in Pahokee, families rushed out the door.

And somebody's poor mother has never been seen no more.

Some mothers looked at their children, and as they looked
they began to cry. Cried, oh my Lord, have mercy, if you
don't we all must die!

Schoolhouses, halls and theaters, in the storm, they was all
blown down. In the city of West Palm Beach, only two
churches left in town.

I'll tell you, you wicked people, what you had better all do.

Go down and get the Holy Ghost, and live a good life, too.

Out around Lake Okeechobee, all scattered on the ground.

The last account of the dead folks, there was twenty-two
hundred found.

South Bay, Belle Glade and Pahokee, they tell me they all
went down. And in the little town of Chosen, they say
everybody got drowned.

Some folks are still missing, and ain't been found, they
say. But this we know, they will come forth on the Resur-
rection Day.

When Gabriel sounds the trumpet and the dead begin to rise.

I'll meet those saints from Chosen, up in the heavenly skies.

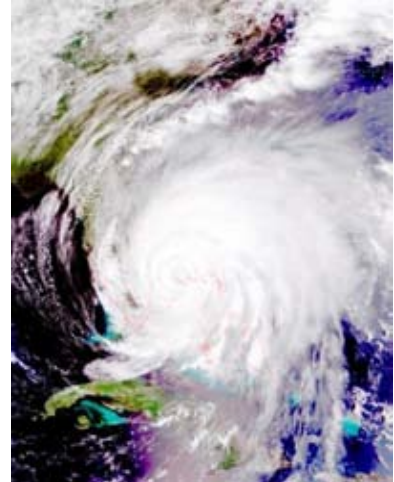
In the storm, oh in the storm, Lord somebody got drowned.

Got drowned, Lord, in the storm!

Quoted in Eliot Kleinberg, *Black Cloud*. New York: Carroll & Graf Publishers, 2003, 248-249; "West Palm Beach Storm," 1928 Hurricane Box 1, Historical Society of Palm Beach County.

What is a Hurricane?

Weather is a concern for Florida residents and visitors, especially the hurricane season, which runs from 1 June through 30 November each year. A hurricane is a large, powerful, tropical storm, rotating in a counter-clockwise motion. The storms that become hurricanes form over the warm waters of the Atlantic Ocean as they head west from Africa, the Caribbean Sea, and the Gulf of Mexico. The typical hurricane is usually circular in shape and can be up to 300 miles wide with wind speeds of seventy-four miles per hour and higher.



What Causes a Hurricane?

(Information courtesy The Weather Channel, <http://www.weather.com/encyclopedia/tropical/forecast.html>)

A hurricane is a "tropical cyclone" which is a generic term for low pressure systems with a defined wind circulation and is formed over tropical, or sometimes subtropical, waters. Tropical depressions, tropical storms, hurricanes, and typhoons are all tropical cyclones. These storms can develop in the Gulf of Mexico, the Caribbean Sea, the Pacific and Atlantic Oceans. Hurricanes, cyclones, and typhoons are all the same kind of storms but the names are used in different regions of the world. Hurricanes form in the Atlantic Ocean, Caribbean Sea, and Northeast Pacific Ocean. Cyclones develop in the Indian and South Pacific Oceans, and typhoons form in the Northwest Pacific Ocean. These storms develop in moist tropical air. About every four to five days, a tropical wave of low pressure moves along with westerly winds. Some of these waves develop into tropical depressions, tropical storms, and hurricanes.

In developing tropical cyclones, strong thunderstorms occur. Air pressure drops at the surface of these storms. This low pressure attracts warm moist air from the ocean's surface. The Coriolis force causes the resulting low-level winds to blow (spiral) in a counter-clockwise direction around the center of the low in the Northern Hemisphere. (Winds swirl clockwise in the Southern Hemisphere.)

Typically, an "eye" forms when the tropical cyclone reaches hurricane strength, but an eye is not necessary for a tropical cyclone to become a hurricane. Another way to think of a hurricane is as a large heat engine. The fuel is moisture from warm ocean water. The moisture is converted to heat in the thunderstorms that form. Spiral rain bands that surround the tropical cyclone's core help feed the circulation more heat energy.

As air nears the center, it rises rapidly and condenses into clouds and rain. The condensation releases tremendous amounts of heat into the atmosphere. The result is lower surface pressure and strengthening winds.

In this way, the tropical cyclone's engine refuels itself, concentrating its power in a donut-shaped area, called the eye wall, surrounding the center. The eye wall typically contains the strongest surface winds.

Sinking air at the center clears the tropical cyclone of clouds and forms the "eye." Falling surface pressure can occur only if air mass is removed from the circulation center. This is accomplished by wind flowing away from the circulation in the upper atmosphere.

Stages of Development

(Information courtesy The Weather Channel, <http://www.weather.com/encyclopedia/tropical/forecast.html>)

Tropical Cyclone Stages

The word "hurricane" is derived from the Spanish word, *huracan*. The word *huracan* probably came from *Hurakan*, the Mayan storm god, or any of a number of other Caribbean Indian terms for evil spirits or big winds.

Although the word was originally used to describe any localized tropical cyclone in the West Indies, it now classifies the powerful tropical cyclones that develop in the North Atlantic Ocean, the Gulf of Mexico, the Caribbean Sea, or the eastern North Pacific Ocean, east of the International Dateline and north of the equator.

A hurricane's life cycle passes through four distinct stages: tropical disturbance, tropical depression, tropical storm and finally, a hurricane. All are classified as tropical cyclones.

Tropical Disturbance

A tropical disturbance is a discreet system of clouds, showers, and thunderstorms that originates in the tropics and maintains its identity for 24 hours or more.

Tropical waves are a type of tropical disturbance. They are troughs of low pressure that move generally from east to west, embedded in the tropical easterlies. They are also called easterly waves.

Tropical Depression

When a tropical disturbance develops a closed circulation (counter-clockwise winds blowing around a center of low pressure in the Northern Hemisphere), it is designated a tropical depression. Tropical depressions contain maximum sustained one-minute winds at 10-meter elevation of 38 mph (33 knots) or less.

Tropical Storm

A tropical cyclone is given a name by the National Hurricane Center once it reaches tropical storm status. Tropical storms have maximum sustained one-minute winds of 39-73 mph (34-63 knots).

Hurricane

Hurricanes have sustained one-minute winds of at least 74 mph (64 knots). Winds in most hurricanes can become much stronger.

Hurricanes are categorized on a scale of 1 to 5 based on their wind speed, barometric pressure, and destructive potential. This is known as the Saffir-Simpson Scale, named after its originators, Herbert Saffir and Dr. Robert Simpson.

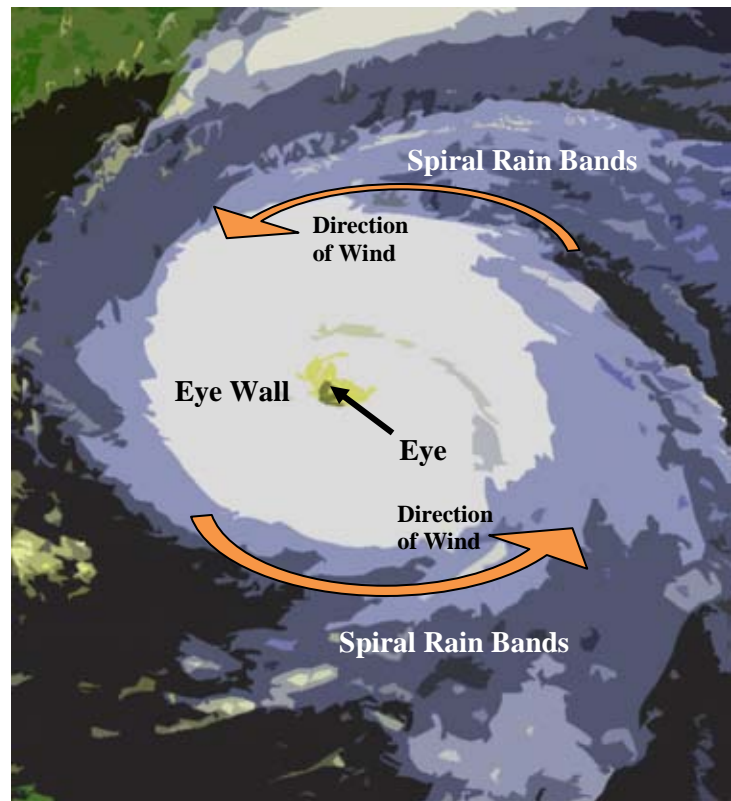
The Saffir-Simpson Hurricane Scale

This scale was developed in the early 1970s by Herbert Saffir, a consulting engineer in Coral Gables, Florida, and Dr. Robert Simpson, then director of the National Hurricane Center. The scale is based primarily on wind speeds and includes estimates of barometric pressure and storm surge associated with each of the five categories. It is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall.

Category	Winds (mph)	Pressure (millibars)	Pressure (inches)	Storm Surge	Damage
1	74-95	<980	<28.94	4 - 5 feet	Minimal
2	96-110	979-965	28.91 - 28.50	6 - 8 feet	Moderate
3	111-130	964-945	28.47 - 27.91	9 - 12 feet	Extensive
4	131-155	944-920	27.88 - 27.17	13 - 18 feet	Extreme
5	>155	<920	<27.17	18+ feet	Catastrophic

The Body of a Hurricane

The inner core of the hurricane is known as the eye of the storm—a clear-skied, calm area at the center patch where winds are lightest and pressure is lowest. A ring of clouds called the eye wall, surrounds the eye. The eye wall contains thunder-storm clouds. This part of the hurricane's body is where the heaviest rains and winds originate. Spiral rain bands make up the outermost ring. The rain bands swirl inward towards the center of the hurricane.

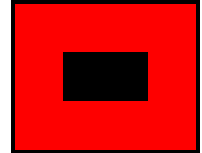


Terms to Know...

Tropical Storm Watch: Tropical Storm conditions with sustained winds from 39-74 mph are possible in your area within the next 36 hours.

Tropical Storm Warning: Tropical Storm conditions are expected in your area within the next 24 hours. One flag is displayed for a Tropical Storm Warning (at right).

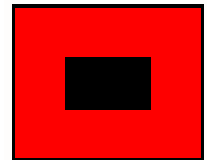
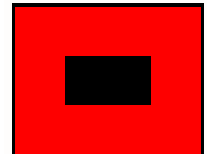
Tropical Storm flag



Hurricane Watch: Hurricane conditions with sustained winds of 74 mph or higher are possible in your area within the next 36 hours. People in the area should execute disaster plans and protective measures should begin which include evacuations of low lying areas and barrier islands.

Hurricane Warning: Hurricane conditions are expected in your area within 24 hours. Once warning has been issued, people in the affected area should be completing protective measures, including moving to a safe location to ride out the storm. Two flags are displayed for a hurricane (at right).

Hurricane Warning flag



This photograph shows just how powerful the winds were during the 1928 hurricane. They were strong enough to drive this board into the trunk of a palm tree.

Naming Hurricanes

To help meteorologists to track and identify storms as they travel across the ocean, they are given names. This helps because there can be several storms at once, so we do not get the storms confused with each other.

For years hurricanes in the Caribbean were named after a particular saint's day on which the storm hit land. In the late nineteenth century, a meteorologist in Australia began using women's names for storms that occurred in the South Pacific. In 1953 the U.S. National Weather Service also started using female names for storms. Meteorologists did not use both men's and women's names until 1979.

Names are alphabetical, one name for each letter. The letters Q, U, and Z are not used. Hurricanes in the Atlantic Ocean will have names from one of three languages, English, Spanish, or French. These are the major languages bordering the Atlantic.

There are six lists of names that the World Meteorological Organization uses in rotation. The same lists are used every six years. A new name is added to a list only if one is retired because that named storm caused significant damage and/or death. There are sixty-seven names that have been retired including Andrew, Camille, Katrina, Charley, Frances, Ivan, Jeanne, and Wilma. If all the names are used in a year, weather forecasters then use the Greek alphabet. See below for the six lists of names.

<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>
Arthur	Ana	Alex	Arlene	Alberto	Andrea
Bertha	Bill	Bonnie	Bret	Beryl	Barry
Cristobal	Claudette	Colin	Cindy	Chris	Chantal
Dolly	Danny	Danielle	Don	Debby	Dorian
Edouard	Erika	Earl	Emily	Ernesto	Erin
Fay	Fred	Fiona	Franklin	Florence	Fernand
Gustav	Grace	Gaston	Gert	Gordon	Gabrielle
Hanna	Henri	Hermine	Harvey	Helene	Humberto
Ike	Ida	Igor	Irene	Isaac	Ingrid
Josephine	Joaquin	Julia	Jose	Joyce	Jerry
Kyle	Kate	Karl	Katia	Kirk	Karen
Laura	Larry	Lisa	Lee	Leslie	Lorenzo
Marco	Mindy	Matthew	Maria	Michael	Melissa
Nana	Nicholas	Nicole	Nate	Nadine	Nestor
Omar	Odette	Otto	Ophelia	Oscar	Olga
Paloma	Peter	Paula	Philippe	Patty	Pablo
Rene	Rose	Richard	Rina	Rafael	Rebekah
Sally	Sam	Shary	Sean	Sandy	Sebastien
Teddy	Teresa	Tomas	Tammy	Tony	Tanya
Vicky	Victor	Virginie	Vince	Valerie	Van
Wilfred	Wanda	Walter	Whitney	William	Wendy

Hurricane Preparedness

(Re-printed, in part, with permission of the *Palm Beach Post*)

Folklore and oral accounts state that the Seminole Indians had predicted the storm was coming and warned residents to leave the area. The Indians left prior to the storm, and there were no recorded Indian deaths in the storm.

After the great Hurricane of 1926, the Disaster Preparedness and Relief Committee of the Palm Beach Chapter of the American Red Cross was organized with 10 subcommittees to address specific areas. Each committee consisted of a chairman, an engineer, and prominent men and women of Palm Beach County. Today, volunteers for the American Red Cross assist people in preventing, preparing for, and responding to emergencies.

It is believed that if the citizens of Belle Glade and the neighboring towns that were hardest hit during the Storm of 1928 had received sufficient warning, many lives would have been spared. The lesson to learn from this storm is that there must be early preparation to ensure safety.

Unlike meteorologists in 1928, weather forecasters of the twenty-first century are able to predict hurricanes days before the storms reach land. They have Hi-Tech equipment such as radars, satellites, tropical buoys that transmit environmental information, computer models that predict the route a storm will take, hurricane hunters that fly into the eye of the storm to gather weather information, and much more to keep us informed and ready. The National Hurricane Center in Miami issues storm warning when needed so people can prepare for or evacuate an area that is going to be hit by a hurricane.

Local media (radio, television, and our computers) keep the public informed about approaching storms. By watching or listening to weather reports, we are more up to date about what is happening and can prepare for a hurricane. News reporters also provide live broadcasts of local officials discussing the situation and when necessary issue orders for evacuations.

Federal, state, and local governments have emergency services to assist the population when a hurricane strikes. There are designated hurricane shelters for people to go to if their house is cannot with stand a storm or if they are told to evacuate. Organizations like FEMA and the Red Cross assist with recovery efforts and provide funds so people can start to re-build their lives.

These are all tools that are used to prepare the public for hurricanes. But what can you do to prepare yourself, family, and home for hurricane season?

The following list contains steps that should be taken to prepare for hurricane season:

- Develop a family plan of action - include information such as location of the nearest hurricane shelter (address and telephone number), evacuation procedures (transportation needed), special-needs assistance (elderly or physically impaired).
- Create a family hurricane supply kit - include items such as water, soup (non-perishable food), flashlight, batteries, and medical supplies (bandages, scissors, thermometer, gloves etc.). Remember, your family will probably never need to use your hurricane supply kit, but it is always better to be prepared.
- Pet preparation - include a supply kit with pet food, water, photos of pet(s), can opener and vaccination records.

Pre and Post Visit Activities



Reading Comprehension

Name: _____

The Storm of '28

(Re-printed with permission of the *Palm Beach Post*)

The storm of 1928 was called San Felipe II. This hurricane caused massive devastation in the Caribbean but was the most destructive in Palm Beach County, especially around Lake Okeechobee. On September 13, 1928, this storm cut a path of destruction through the Caribbean, devastating Guadeloupe, St. Kitts, Montserrat, Puerto Rico, the Virgin Islands, and Nassau, Bahamas, before reaching the United States coastline. The SS *Commack* crew was the first to report the location of the storm by radio in the far eastern Atlantic near the Cape Verde islands. The hurricane's position was 17 degrees north, latitude and 48 degrees west, longitude. Puerto Rico received a direct hit from the storm, leaving at least 300 dead and many more dying from starvation and disease in the weeks that followed. In the end, over 1,575 people lost their lives in the Caribbean.

Day of the Storm

On September 16, 1928, the hurricane reached the Palm Beach County coastline at approximately 6 p.m. This was a Category 4 hurricane with a barometric pressure of 27.43 and a wind velocity estimated at between 150 and 160 miles per hour. The area most affected stretched from Pompano to Jupiter. It moved west to the Everglades, passing over Belle Glade, Pahokee, South Bay, and the southeast shore of Lake Okeechobee. Counties most affected by the storm were Palm Beach, Broward, Okeechobee, Martin, and Hendry. It cut a path of destruction through the state and affected more than 112,000 individuals.

After passing Bartow, the storm began curving northward and northeastward, and then passed Jacksonville with diminished intensity at 1:00 a.m., September 18, 1928. The storm then left Florida and was tracked as far north as Parrs Sound, Canada. West Palm Beach reported 18.42 inches of rain during the week of the storm and over 10 inches fell as the storm passed through.

It was reported that the eye of the hurricane produced a lull that lasted about 40 minutes and that the storm was moving at 14 miles per hour. This lull lasted for about 50 minutes in the eastern section of the lake, allowing the crest of Lake Okeechobee to reach an elevation of 26.3 feet. This area incurred a catastrophic loss of life resulting from a 15-foot storm surge. Between 2,500 – 3,000 people, many of them migrant workers, lost their lives during the storm and resulting flood. Storm waters in the South Bay section of the lake were driven ten feet above the lake level. Much of the devastation and loss of life was caused by Lake Okeechobee overrunning its banks and the dikes being washed away.

On the day of the storm, around 2:00 p.m., many of the people around the lake had gotten word of the impending danger rapidly approaching them. In South Bay several men tried to drive the rugged roads around the lake to warn people to seek shelter. A group of women and children gathered on Huffman's Barge anchored on the lake. They all survived the storm. Thousands of other landowners, families, laborers and unknown victims did not.

The Jupiter Lighthouse was positioned at the northern point of the storm path. Maritime vessels, cruise ships, and pleasure boats depended on the lighthouse to make landfall. The lighthouse keeper, Captain Seabrook, and his son refused to let the Lighthouse become dark

during the storm. Prior to the storm the light had been converted from oil burners to electricity. As the storm reached the coast, all power lines were downed, and the lighthouse auxiliary generator failed to work. Without electricity, the light's mantle had to be turned by hand. Captain Seabrook was sick; therefore his son Franklin worked the mantle. As a result, the light from the lighthouse shone through one of the county's most violent hurricanes.

Preparation and Warning

The Red Cross played a major role preparing for the storm and helping the state recover after the hurricane. They began their preparation by analyzing the hurricane of 1926. They attempted to comprehend the parts and sections of a hurricane along with the basic storm forecasting. Early hurricane forecasting relied primarily on short-wave communications from ships at sea. This was only reliable if a ship happened to be in the area of the storm. The Red Cross chapters also formed 10 subcommittees to deal with water, food, medical supplies, shelter, clothing, and transportation. Plans were made for emergency care, hospitalization centers, canteen centers, transportation of refugees, and movement of supplies and other necessities.

Many efforts were made to warn people about the hurricane. Local folklore accounts state that Seminole Indians sensed that a storm was approaching. Some document that the Indians noticed the migration of sea birds, unusual blooming of the saw grass and the unnatural activity of the wildlife. The Seminoles tried to warn residents of the Everglades and Lake Okeechobee areas. Few took heed. Those that did leave the area with the Native Americans were spared.

After the Storm

The Red Cross volunteers in Palm Beach County used 93 cars to make an average of 553 trips per day to the affected areas around Lake Okeechobee. Fifty-one trucks made an average of 206 trips per day. Thirty-eight motorboats and four airplanes were also employed in this effort. The railroads provided free freight and express until the 28th of September.

At 2 p.m., the storm had caused downed telephone wires that interrupted telephone communications. Amateur radio operators came to the rescue by providing communication services until telephone and telegraph lines were repaired. Florida's Governor Martin was not notified of the severity and impact of the storm in the Lake Okeechobee area for three days. He toured the area and observed the bodies of an African American widow and her eight children on the back porch of a house in Pahokee. He was also told about an old timer, C. L. Reddick, whose dead body had been guarded for five days by his dog. Due to the exhaustive nature of the rescue effort, the governor ordered additional replacements for rescue workers as well as requesting an increase in the number of sleeping cots, blankets, and clothing for both victims and workers.

Conditions for the relief workers were unbearable. The horrific task of rounding up bodies that had for days been exposed to Florida's climate of sun and rain brought the strongest men to their knees. The authorities issued a "no work, no food" order. Military personnel made all able-bodied men join the work teams. Those who refused to work were jailed, and some were even shot. The work was gruesome, as some bodies were beyond recognition and some had appendages dangling from the bodies. After the first few days, African American, Bahamian, and Caucasian bodies were indistinguishable, and the stench of decomposing bodies was almost unbearable. After the first two weeks, bodies were soaked with fuel oil and cremated, some singly and some in groups of a dozen or more. The majority of the Caucasian bodies were identified and buried at Woodlawn cemetery in West Palm Beach, while the bodies of African Americans and Bahamians were laid in a mass gravesite at 25th Street and Tamarind Avenue in

West Palm Beach, Florida. These decomposed bodies were dumped into the ground, one on top of the other, with the addition of lime. This mass gravesite, the final resting place for 674 black victims, remained unmarked and un-kept until 2004.

Men of all races worked together to locate survivors. The work was grueling with little or no relief in sight. Insects and wild animals, such as snakes and alligators, made the work even more difficult. The first relief efforts began along the coast followed by efforts along Lake Okeechobee and the Glades areas. Many of the people who managed to survive the hurricane in those areas had been swept for miles into the saw grass and were forced to walk or wade back to whatever recognizable roadway they could find. Many were very weak and/or injured while others perished as they wandered aimlessly through the Everglades.

The Hurricane of 1928, San Felipe II, was the second largest natural disaster to occur in the United States. It is important to learn the history of these natural phenomena, and it is imperative that we prepare for these natural disasters before they occur. Hurricane preparation means hurricane survival.

Answer the following questions:

1. What was the name of the first ship to report the storm?

2. What counties in Florida did the Storm of '28 affect?

3. How high was the storm surge?

4. What is the folklore about how the Seminole Indians knew the hurricane was coming?

5. What is located at 25th Street and Tamarind Avenue in West Palm Beach?

Reading Comprehension

Name: _____

Stages of Development

(Information courtesy The Weather Channel, <http://www.weather.com/encyclopedia/tropical/forecast.html>)

Tropical Cyclone Stages

The word "hurricane" is derived from the Spanish word, *huracan*. The word *huracan* probably came from *Hunraken*, the Mayan storm god, or *Hurakan*, or any of a number of other Caribbean Indian terms for evil spirits or big winds.

Although the word was originally used to describe any localized tropical cyclone in the West Indies, it now classifies the powerful tropical cyclones that develop in the North Atlantic Ocean, the Gulf of Mexico, the Caribbean Sea, or the eastern North Pacific Ocean, east of the International Dateline and north of the equator.

A hurricane's life cycle passes through four distinct stages: tropical disturbance, tropical depression, tropical storm and finally, a hurricane. All are classified as tropical cyclones.

Tropical Disturbance

A tropical disturbance is a discreet system of clouds, showers, and thunderstorms that originates in the tropics and maintains its identity for 24 hours or more.

Tropical waves are a type of tropical disturbance. They are troughs of low pressure that move generally from east to west, embedded in the tropical easterlies. They are also called easterly waves.

Tropical Depression

When a tropical disturbance develops a closed circulation (counterclockwise winds blowing around a center of low pressure in the Northern Hemisphere), it is designated a tropical depression. Tropical depressions contain maximum sustained one-minute winds at 10-meter elevation of 38 mph (33 knots) or less.

Tropical Storm

A tropical cyclone is given a name by the National Hurricane Center once it reaches tropical storm status. Tropical storms have maximum sustained one-minute winds of 39-73 mph (34-63 knots).

Hurricane

Hurricanes have sustained one-minute winds of at least 74 mph (64 knots). Winds in most hurricanes can become much stronger.

Hurricanes are categorized on a scale of 1 to 5 based on their wind speed, barometric pressure, and destructive potential. This is known as the Saffir-Simpson Scale, named after its originators, Herbert Saffir and Dr. Robert Simpson.

Answer the following questions:

1. What is the origin of the word “hurricane?”

2. List the four stages of hurricane formation.

1. _____ 2. _____

3. _____ 4. _____

Map Exercise

Name: _____

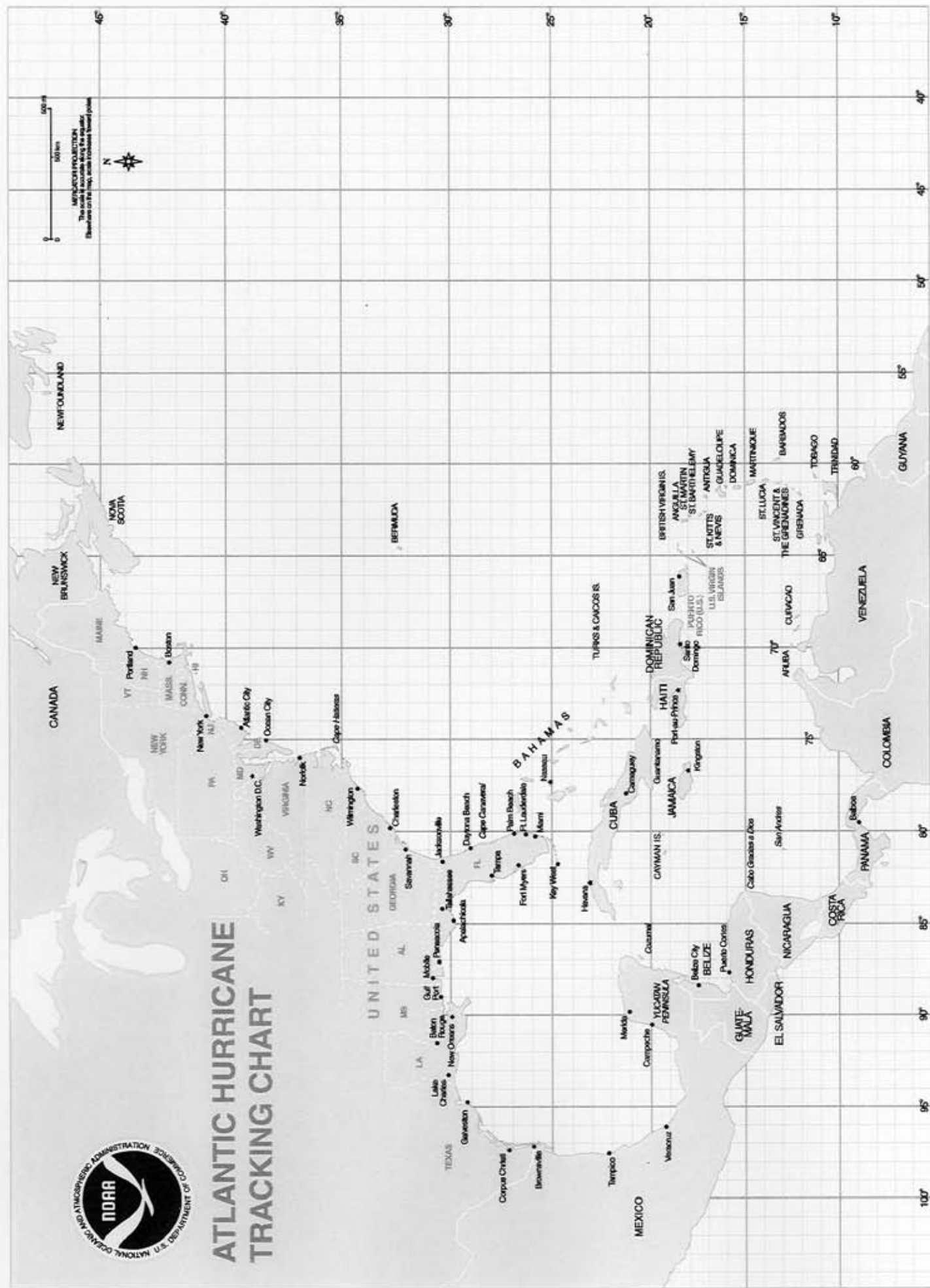
Track the 1928 Hurricane

Use the following information to plot on the tracking map the path of the hurricane of 1928.

How to Track a Hurricane

To locate the eye of a hurricane, listen for the latest coordinates by tuning into local radio or television stations or weather web sites such as the National Hurricane Center, www.nhc.noaa.gov, which provides that information. On the hurricane tracking map, find the lines that run east to west, these are called latitudes. The lines running north and south are longitudes. The latitude will always be given first. Find the corresponding latitude along the side of the map and the longitude along the top or bottom. Follow the two lines until they intersect and place a mark there. That is where the hurricane eye is.

Date	Time	Position		Pressure	Wind Speed (mph)
1928		Latitude (N)	Longitude (W)		
9-Sep	6:00 PM	15.00	42.5	990	55
10-Sep	6:00 PM	15.5	45.5	975	70
11-Sep	6:00 PM	15.7	55.7	960	85
12-Sep	6:00 PM	16.2	62.0	938	115
13-Sep	6:00 PM	17.9	65.8	931	140
14-Sep	6:00 PM	20.0	70.0	933	135
15-Sep	6:00 PM	22.8	73.5	933	135
16-Sep	6:00 PM	26.0	78.5	935	130
17-Sep	6:00 PM	28.5	82.0	970	90
18-Sep	6:00 PM	33.1	80.0	985	60
19-Sep	6:00 PM	37.0	77.0	1002	40
20-Sep	6:00 PM	40.2	78.0	1002	40



Answer

Name: _____

Using the below chart to answer the following questions.

1. How many hurricanes struck the U.S. mainland from 2001 to 2006? Of that, how many were major hurricanes (category 3, 4, 5)?

2. How many major hurricanes struck the U.S. mainland from 1941 to 1950?

3. What is the total number of major hurricanes from 1901 to 2006?

Decade	Saffir-Simpson Category					All 1,2,3,4,5	Major 3,4,5
	1	2	3	4	5		
1901-1910	10	4	4	0	0	18	4
1911-1920	10	4	4	3	0	21	7
1921-1930	5	3	3	2	0	13	5
1931-1940	4	7	6	1	1	19	8
1941-1950	8	6	9	1	0	24	10
1951-1960	8	1	5	3	0	17	8
1961-1970	3	5	4	1	1	14	6
1971-1980	6	2	4	0	0	12	4
1981-1990	9	1	4	1	0	15	5
1991-2000	3	6	4	0	1	14	5
2001-2006	6	2	6	1	0	15	7

Interactive Activity

Create Your Own Hurricane

This interactive “Create-A-Cane” allow students to create a hurricane by changing the winds, latitude, moisture, and ocean temperature. Have students go online at:

<http://www.nhc.noaa.gov/HAW2/pdf/canelab.htm>. The activity is provided by the National Hurricane Center and the National Oceanic and Atmospheric Administration.

ABC Order

Name _____

Date _____

Every year the National Hurricane Center issues the list of hurricane names in alphabetical order. Below is the list of names for the 2008 Hurricane Season. They are out of order. Put the names in alphabetical order.

Kyle	_____
Wilfred	_____
Paloma	_____
Marco	_____
Teddy	_____
Arthur	_____
Vicky	_____
Hanna	_____
Dolly	_____
Omar	_____
Ike	_____
Bertha	_____
Nana	_____
Cristobal	_____
Laura	_____
Sally	_____
Josephine	_____
Edouard	_____
Rene	_____
Gustav	_____
Fay	_____

Answer Key

The Storm of '28

1. SS *Commack*
2. Palm Beach, Broward, Okeechobee, Martin, and Hendry Counties.
3. 15-foot storm surge
4. Local folklore accounts state that Seminole Indians sensed that a storm was approaching. Some document that the Indians noticed the migration of sea birds, unusual blooming of the saw grass and the unnatural activity of the wildlife. The Seminoles tried to warn residents of the Everglades and Lake Okeechobee areas. Few took heed. Those that did leave the area with the Native Americans were spared.
5. A mass grave site containing the bodies of 674 African Americans who were killed during the storm.

Stages of Development

1. The word "hurricane" is derived from the Spanish word, *huracan*. The word *huracan* probably came from *Huraken*, the Mayan storm god, or any of a number of other Caribbean Indian terms for evil spirits or big winds.
2. Tropical disturbance, tropical depression, tropical storm, hurricane.

Answer

1. 15; 7
2. 10
3. 69

ABC Order

Arthur
Bertha
Cristobal
Dolly
Edouard
Fay
Gustav
Hanna
Ike
Josephine
Kyle

Laura
Marco
Nana
Omar
Paloma
Rene
Sally
Teddy
Vicky
Wilfred

**Staff Development Sign In - Part A**COMPONENT NUMBER

Participants **MUST** complete Part A (social security page) **AND** Part B (name page) to be assigned inservice points. Submit originals with the Component Evaluation (PBSD 0471) to the Staff Development office, FHESC B-101.

COMPONENT TITLE		DATE(S) FROM _____ TO _____	
COORDINATING SCH/DEPT. NO.	WORKSHOP COORDINATOR	TELEPHONE NUMBER / PX () -	
INSTRUCTOR(S)		WORKSHOP LOCATION NO.	WORKSHOP LOCATION

	SOCIAL SECURITY NUMBER	DISTRICT EMPLOYEE		COMPLETED BY TRAINER		
		YES	NO	COMPLETED YES	NO	POINTS ASSIGNED
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THE SCHOOL DISTRICT OF PALM BEACH COUNTY

Staff Development Sign In - Part B

COMPONENT NUMBER

Participants **MUST** complete Part A (social security page) **AND** Part B (name page) to be assigned inservice points. Submit originals with the Component Evaluation (PBSD 0471) to the Staff Development office, FHESC B-101.

COMPONENT TITLE		DATE(S) FROM _____ TO _____	
COORDINATING SCH/DEPT. NO.	WORKSHOP COORDINATOR	TELEPHONE NUMBER / PX () -	
INSTRUCTOR(S)		WORKSHOP LOCATION NO.	WORKSHOP LOCATION

PRINT YOUR NAME

LAST FOUR DIGITS OF
SOCIAL SECURITY NUMBER

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