

Name _____
CORE (circle) 1 2 3 4

All about *Hurricanes*

Measuring the Storm and Impact of Hurricane Katrina

We have studied precipitation, winds and air pressure, now it's time to take a look at what can happen when tropical storms form. Tropical storms, or *hurricanes*, are thought to occur by an "extra" low pressure front. This front causes strong winds to develop as the low pressure front draws air near its center. Here, air speeds up and forms high cumulonimbus clouds quickly. The air becomes warm as water vapor condenses and the heat makes air rise even faster than before. As the air moves faster, even stronger winds are generated.

Quick Review:

(Answer the following questions:)

1. Briefly describe a low pressure front:

2. What do cumulonimbus clouds look like (hint: what does its name mean?)?

Hurricane Katrina hit the Southwest Coast of the United States in August, 2005. It impacted over 108,000 square miles and left 450,000 people homeless (200,000 in Louisiana alone). Winds broke 130 miles per an hour (mph) as the hurricane hit land and rain fell at a rate of 10-12 in per a square inch. The minimum Waves from the ocean rose up to 30 feet and flooding became a major problem. After the storm, more than 1.37 million households requested assistance and the government responded by sending \$105 Billion dollars in Federal Funds (\$22 Billion of that money went to Louisiana).



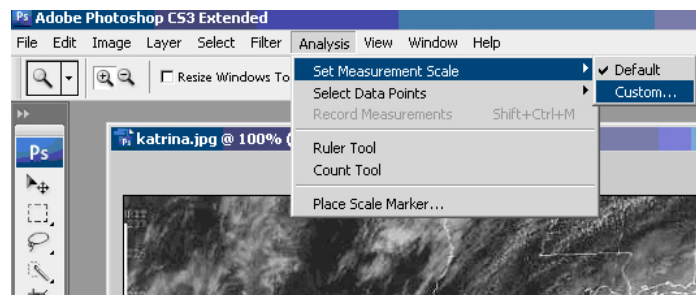
Image 1. Hurricanes, like Katrina that hit New Orleans, can move houses with wind and break roads apart with incoming water. It can destroy everything a person owns.

So just how big *was* this storm and what kind of impact did it have on the city of New Orleans?

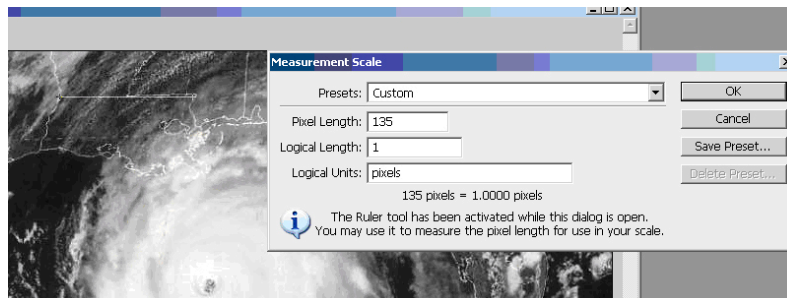
For this activity, we will be using **Photoshop CS** to measure Hurricane Katrina and the flooding of the Superdome. We will answer the following questions using the Analysis feature in the tool bar. Read directions *carefully*. There are pictures to help you along the way.

How big was Katrina?

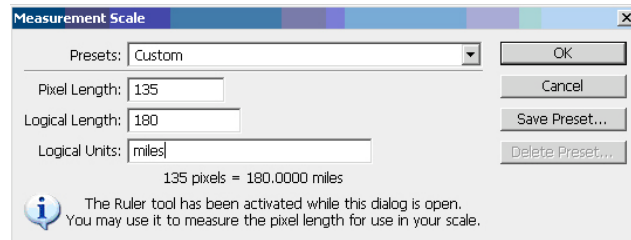
1. Open *Photoshop CS*.
2. Go to the menu bar, select *File* and then *Open*. A list of images appears on the screen. Select the *Katrina Storm.jpg* file by double clicking the icon twice.
3. In order to measure the size of the storm, we must first set the scale of the image. We can do this by selecting a reference in the image of which we know the size. For instance, Louisiana is outlined in this image and we know that the state is 130 miles wide. Go to the menu bar, select *Analysis > Set Measurement Scale > Custom*.



4. A tool box will pop up on the screen with *Pixel length*, *Logical length*, and *Logical Units*. The *Pixel length* will be the length object in the image we select (the object which we know its true length). Since we know the length of Louisiana, we use our pointer (which is now a ruler) to select one side of the state and connect it to the other side of the state by clicking one side and dragging to the other. The *Pixel length* box should have a number close to 135 (pixels).

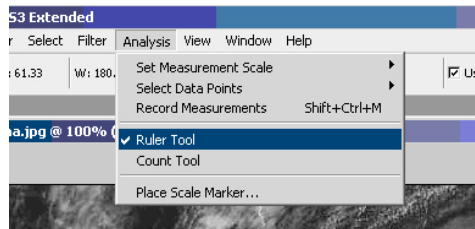


5. We know that Louisiana is 130 miles across. So now type in 130 as your *Logical length* and *miles* as your *Logical unit* - your window should now look like this:

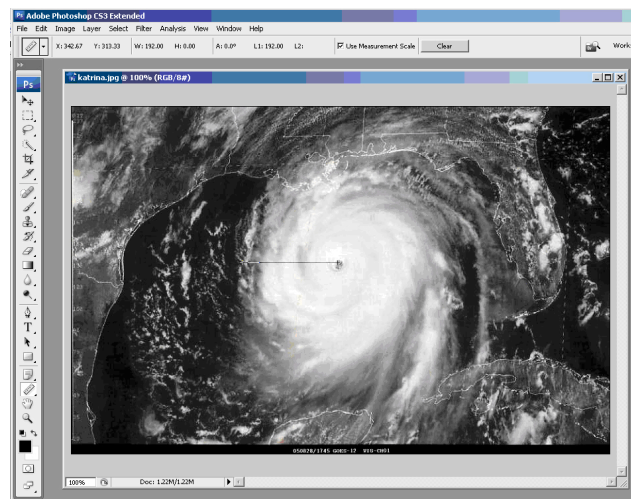


6. Now its time to measure Katrina. Hurricanes have a center called *the eye of the storm*. A system of clouds looks as if it has a hole in the center, where the air is slowly sinking which clears the rough weather. If you were under the storm, you would see clear skies and feel a calm as the eye passes over you and then the stormy weather returns.

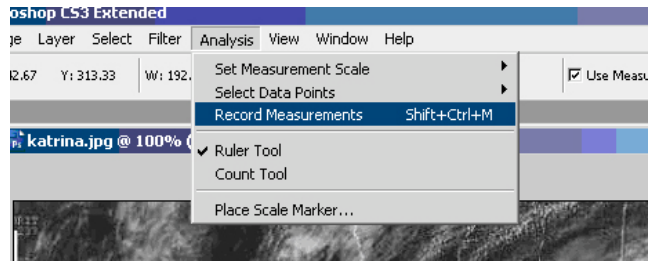
Go to the menu bar and select *Analysis > Ruler Tool*. Now your pointer has transformed into the ruler again. Click the edge of the storm and drag to the eye of the storm, clicking again to connect the line.



Your line should look like this:



7. Go back up to the menu bar and select *Analysis > Record Measurements*.



A window appears on your screen that looks like this:

 A screenshot of the 'Measurement Log' window in Photoshop. It has a tab labeled 'Record Measurements'. Below the tab is a table with the following data:

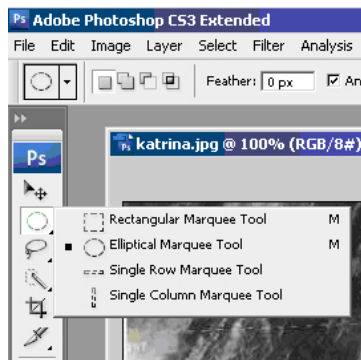
	Label	Date and Time	Document	Source	Scale	Scale Units	Scale Factor	Count	Length	Angle
0001	Ruler 1	12/11/2007 11:43:53 PM	katrina.jpg	Ruler Tool	Custom (135 pixels = ...	miles	0.750000	1	192.000000	0.000000

What is important is the *Length* of the line that we drew. This is the *radius* of Hurricane Katrina. Remember we changed the units to miles when we set our measurements, so the length of the radius of Hurricane Katrina is 192 miles.

Question: What is the *diameter* of the storm (distance across)? _____
 Don't forget your units!

We can find the *area* of the storm by using the *Elliptical Selection Tool*.

8. Go to the side toolbar and select the dotted square box, hold down the mouse to open up a window of options. We can tell this button to change what we want it to be. We want it to be a circle. So move the mouse over to the *Elliptical Marquee Tool*. Now the button should have a dotted circle.



Now click and drag a circle over the storm. If you miss, just click on the circle you made and drag it over the storm.

9. Now go back up to the menu bar and select *Analysis > Record Measurements*. This gives you a window with the area of the circle selected (the storm):

Animation (Frames)

Measurement Log

Record Measurements

	Label	Date and Time	Document	Source	Scale	Scale Units	Scale Factor	Count	Length	Angle	Area	Perimeter
0001	Ruler 1	12/11/2007 11:43:53 PM	katrina.jpg	Ruler Tool	Custom (135 pixels = ...	miles	0.750000	1	192.000000	0.000000		
0002	Measurement 1	12/11/2007 11:44:55 PM	katrina.jpg	Selection	Custom (135 pixels = ...	miles	0.750000	1			116124.44...	1283.123773

This says that the *area* of the storm was 116,124 square miles at the peak of the storm (when this image was taken). Your measurement might be a little different depending on the scale that you set, but pretty close to this estimate.

Now that we know how large the storm was, we can follow its path from when it developed to when it subsided.

Go up to the menu bar and select *Open > Path of Katrina.jpg*.

The following page in this handout lists the classification or stages of hurricanes. The table lists the range of wind speeds of Hurricane Katrina and the picture next to it shows when Katrina was at each stage (color coordinated on your screen). Use this picture and the method of measurement you have learned to answer the following questions:

Don't forget to set your scale of measurement!

Question: How many miles did Hurricane Katrina travel as a Category-5 storm? _____

Question: How many miles did Hurricane Katrina travel as a Category-4 storm? _____

(Add both parts together!)

Question: How many miles did Hurricane Katrina travel as a Category-3 storm? _____

Question: How many miles did Hurricane Katrina travel as a Category-2 storm? _____

Impact at the Superdome

The superdome in Louisiana has been the center for football, concerts, and basketball ever since 1971. During Katrina, the Superdome flooded. For this activity we will apply what we have learned about the analysis tool and figure out how much water flooded the Superdome and its property.

For starters, we need some facts!

The Superdome can house up to 85,000 people and sits on 52 acres of property. It is 82.3 meters tall and the diameter of the Dome is 210 meters across.

This is a picture of the Superdome before and after the storm:



All of the darker regions are where water flooded the area.

Go to the menu bar and select *Open > Superdome.jpg*.

Use your knowledge of Photoshop Analysis to answer the following question:

How much water (in square meters) surrounded the Superdome? _____

(Hint: you can use the *Magic Wand Tool* to select large areas of water and adjust the *Brightness and Contrast* to see the image more clearly)

Magic Wand Tool: On the side tool bar next to the button with the magnet, on top of the button with the pen.

Brightness and Contrast:

Go to the menu bar and select *Image > Adjustments > Brightness and Contrast*

You can play with the bars until you get the picture the way you like!