

How can looking at Hurricane tracks help to understand them?

Hurricanes are an example of a natural hazard that can be investigated in the Key Stage 3 Geography national curriculum and in most examination syllabi. They provide an opportunity to cover a wide range of concepts, processes, range and content including human and physical geography as well as exploring the interactions between people and the environment including the causes and consequence of these interactions. Finally, students can look at how to plan for and manage their future impact.

Hurricanes, Typhoons and Cyclones are often studied as they are known to happen every year at around the same time so can be timetabled in to programmes of studies. The other main reason is that these tropical storms have clear causes and the impacts and management strategies are relatively easy to understand.

This example looks at how major cities such as Cairns are at risk of tropical storms such as Cyclone Yasi in 2011. Although we are focussing on one particular website here to develop different GIS skills there are many other websites that focus on tropical storms.

<http://www.stormpulse.com/> A live hurricane mapping site monitoring tropical storms around North America. This site provides a very detailed report on possible and actual storms occurring in the north Atlantic and NE Pacific Oceans.

<http://www.nhc.noaa.gov/> This is the US government's NOAA National Hurricane Center website that has current and past information on hurricanes such as hurricane seasons and even storm surge simulations.

<http://www.tropicalstormrisk.com/> This site allows you to look at live tropical storm data from around the world, and see how and where they develop as they happen.

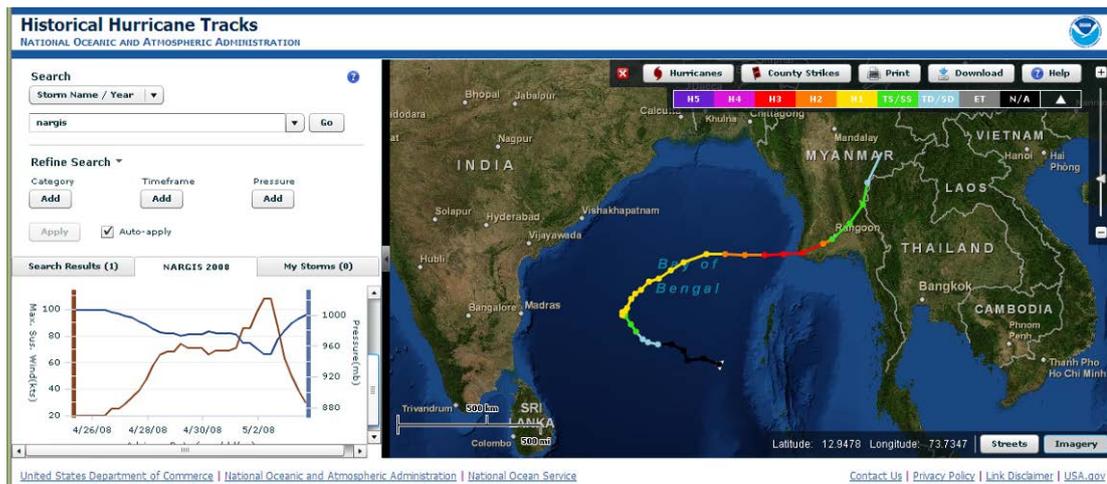
The website we will focus on is the Historical hurricane tracks site.

<https://coast.noaa.gov/hurricanes/>

It uses the GIS skills/tools of attribute searching and the use of buffers. An attribute search is when you ask the GIS system to search data for specific requirements and show only these results on the map or chart. Users can initiate a search by either Location, Storm name/Year and by Ocean basin, and also query by storm name, zipcode (US postcode), place name, Latitude/longitude and climatology (region). There is also the option to set a search around the location within a particular distance, this is known as a 'buffer search'. The base map can be toggled between a street map and satellite imagery. This is useful as it can allow for certain event impacts to be investigated.

Instructions for NOAA Historical Hurricane Tracks tool Has the Cairns, Australia always been at risk from Cyclones?

Website URL: <https://coast.noaa.gov/hurricanes/>



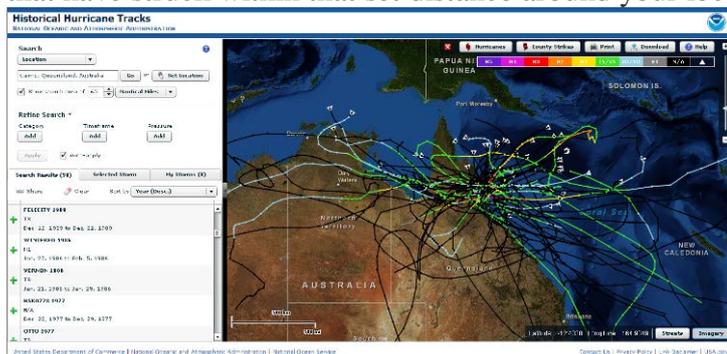
This example will focus on Cairns, Australia but the process could be used with any tropical storm around the world.

The Historical Hurricane Tracks tool is an interactive mapping application that allows users to easily search and display storm tracks and information about tropical storms from around the world over a long period of time from the mid 1850s through to the present day.

To start this investigation using the search tool on the left hand side enter the location in the **enter location** box. Before clicking go decide how big your search area around the named location should be. This is known as a buffer. This is done by typing in a **number** in the box below the enter location box then choosing which **unit of measure** to use. Then click **go**.

Q1. Why would this value, the distance around a named location, be important when studying tropical storms?

A map will appear with all the storm tracks plotted and on the left a table of all the search results hurricanes that have struck within that set distance around your location.



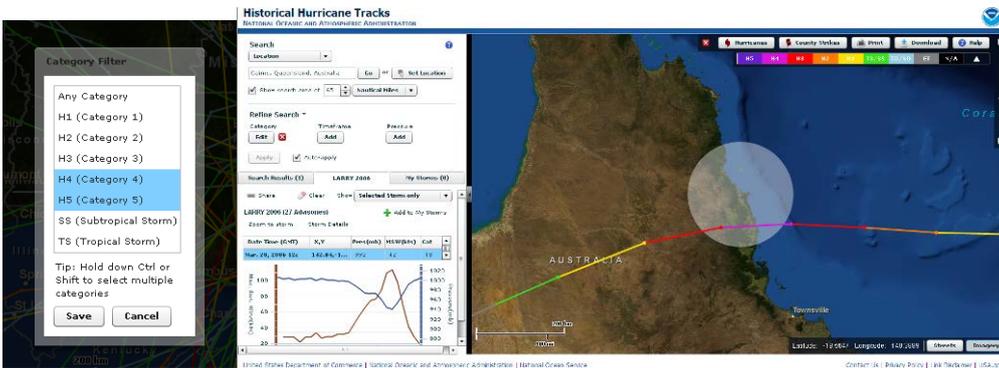
Q2. How many tropical storms has the named location had?

Q3. Using the **sort by** tool in the search results table when were the earliest and most recent hurricanes?



Q4. Using the **refine search** tool in the search tool area above the results table, refine your results to see how many of each storm type there has been?

This is done by Clicking **category ADD** and a box will appear. Here you can select the types of storms you want. When selected click save and the site will refine the initial search results to show only the storms of a selected category.



These are the results that refined the previous search down to storms that were category 4 or 5.

Category 1	
Category 2	
Category 3	
Category 4	
Category 5	

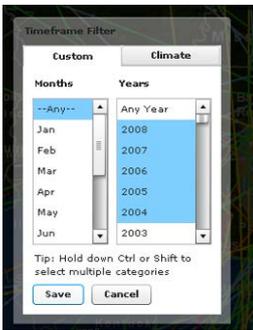
Q5a. Which is the most common category of storm?

Q5b. Can you suggest a possible reason for this?

Q6. Why might this be important in planning how to prepare for tropical storms?

Further refining can be carried out by searching by timeframe, a given period of time for example the 1980s and even pressure - that is the air pressure that the storm gets down to as in a tropical storm air pressure can be very low. This is important as this will have an impact on storm surges that are caused by intense tropical storms. Basically the lower the air pressure the bigger the storm surge as less air pressing down on the sea.

Q7. Using the refining search tools work out what is the storm season for your named area?



month	J	F	M	A	M	J	J	A	S	O	N	D
frequency												

If we now use the **search by name** tool at the top where we initially searched the database for storms around a named location we can look at individual storms. Type in a name into the box and a range of results will appear depending upon how many storms with that name have happened. Select the one you want for example there has been 14 George's. When selected that tropical storm's track will appear on the map and in the results table a chart will appear showing the air pressure vs windspeed. Here is an example from George in 2007.



If you scroll your cursor over any point of the track you will see this point highlighted on the chart.

Screenprint your search result in to your answer.

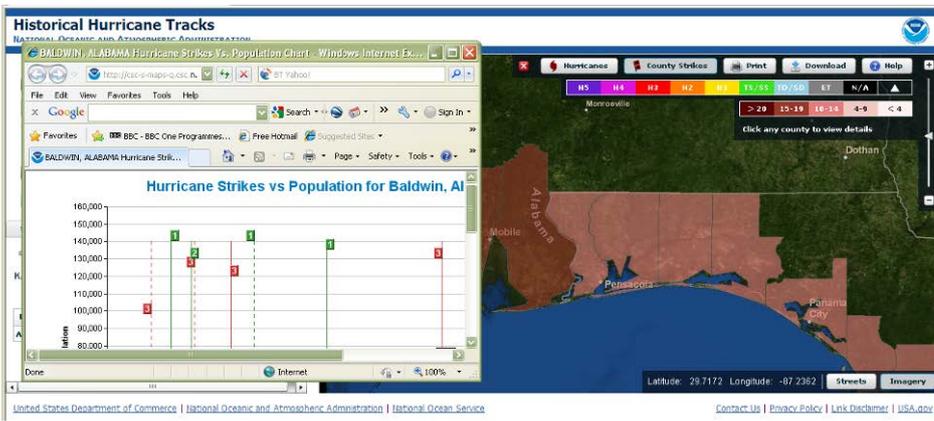
Q7. Where does the storm start and why?

Q8. What happens as the storm develops over the ocean? Why is this?

Q9. What happens to the storm as it hits land and moves inland? Why is this?

This website also has information on how many hurricanes have struck counties on the coastline of the USA over time and against population. Counties are similar to our local authorities in size and organisation. Use this information to see whether the named area has become more vulnerable over time. This is important when planning for hurricanes.

Clicking on the '**County Strikes**' tab will show for the USA the amount of hurricane strikes in US counties over time in the form of an overlay map. Clicking on a county will produce a graph in a new window showing population and hits over time like the example below.



Q10. Has your named area become more vulnerable over time? Include a screenprint of your named area results.

Additional Lesson ideas:

1. Investigate the risk of a particular storm or hurricane of specified magnitude hitting a particular place.
2. Focus on a city and how it has always been at risk from tropical storms.
3. How far north have tropical storms/hurricanes affected the US or how far south have tropical storms affected Australia?
4. Has a named city such as Sydney been at risk of tropical storms in the past? Why would a hurricane strike be a major concern for Manila? What would the possible impacts and effects be?
5. Give each student a different city on the coast and ask them to find out how many storms have hit their city over the last 50 years? Ask them to set a buffer of 100km. Why a 100km? You may need an atlas to allocate coastal towns. Do the same task with cities inland, do you get a similar pattern? Get students to compare their results and see if there is a location that seems to be “safer”? Is there a pattern? What factors determine this pattern?
6. Is there a difference between El Niño and La Niña events? Get pupils to investigate different events and see if more events happen under El Niño or La Niña events?
7. Is there a difference between different times of the year? When is the main hurricane season? Ask the pupils to investigate different months and see when the season starts and finishes. Why is the hurricane season from X to Y? Suggest reasons for this.
8. Are there anomalies? If so why might these have happened?
9. Why is the buffer distance from a direct hit important when investigating the path of the tropical storms?
10. Use data to predict future patterns of storm activity in the future?