Red Rover, Red Rover, Let Windy Come Over

And other weather phenomena impacting American housing.

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Abstract

Cleverly named Windy by The Association in 1967 (Friedman, 1967), the song personifies Mother Nature, whom everyone agrees usually has an interesting way of announcing her moods.

"Who's reachin' out to capture a moment
Everyone knows it's Windy.
And Windy has stormy eyes
That flash at the sound of lies"

When Windy is upset, those stormy eyes are known to cause trouble. Temper tantrums are known to have wind sheers frequently relocating patio furniture and children's toys; outrage rains hail anywhere from the size of a pea to a softball is found pelting automobiles, shingles, and windows; and if the mood is infuriation, tornados are unleashed on the human filled terrarium we call home.

Depending on where the weather front is in relation to your home, your friends, or your family the weather can be entirely different. It is possible to have a downpour at one house and across the street does not see even a drop. With this unpredictability, when looking for a family home, I want to have the correct insurance for when Windy comes to call. But should the homeowner purchase wind, hail, tornados, a mix of the bunch? Insurance companies have their algorithms but naturally, do not want to share the information with the general public. Even if a service is offered in the area is it worth it to purchase, if the weather condition is likely to appear only once in a blue moon?

A popular American children's game, Red Rover, has children standing in two lines, or fronts, each team of children take turns chanting the taunt

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"Red Rover, Red Rover
Let {child's name} come over."

The chosen child then proceeds to run across the divide and break through the other team's front, if caught the child now belongs to that team (Wikipedia, 202). This study looks at wind, hail, and tornado locations across different counties within the United States since the 1950s. The purpose is to identify areas of high or low negative weather phenomena (wind, hail, tornado). Although the children's game is harmless fun, the question your house is asking you is: Red Rover, Red Rover, is Windy coming over?

Keywords

- Tornado Paths
- Hail
- Wind Gusts
- Storms
- United States of America
- Counties

Data Requirements

United States Counties

To provide data results based upon the different US counties, the counties must be known from a reliable source. The best data source is that of the publicly available open-source data provided by Esri for ArgGIS as it takes, filters, and formats the 2010 United States Census Bureau's data for the counties (Esri, 2022).

This dataset provides raster vector information for the coordinates comprising the boundary polygon of each county for all 50 states as well as the District of Columbia. The shapefile contains 3,143 records so the 253MB file size is not unreasonable. Although 61 different attributes are recorded for each record, most of the data is census and population in nature. The remaining ten fields useful for land area are: Name, STATE_NAME, STATE_FIPS, CNTY_FIPS, FIPS, SQMI, Shape Length (in meters^2), Shape_Area (in meters^2), Shape_Area (in feet^2), and Shape_Length (in feet^2).

Weather Phenomena

Weather data is best obtained from the National Oceanic and Atmospheric Administration's (NOAA) website for the National Weather Service (National Oceanic and Atmospheric Administration, 2022). Although the data is limited to the contiguous United States, the datasets show that of the paths of the weather events by use of polylines with the endpoints being that of the starting Cartesian coordinate of the storm and the ending Cartesian coordinate of the storm.

Hail

The dataset on hail provides the path of every hailstorm January 1955 till December 2020. The shapefile contains 370,766 records and a 266MB file size. 23 different attribute fields are recorded for each record. Without listing them all, the fields fall into the categories of date and time, state, storm location and geographical information, storm magnitude, storm damages, and injuries or fatalities.

Tornado

The dataset on tornadoes provides the path of every hailstorm January 1950 till December 2020. The shapefile contains 66,244 records but only a 50MB file size. There are 24 different attribute fields recorded for each record. Without listing them all, the fields fall into the categories of date and time, state, storm location and geographical information, storm magnitude and windspeed, storm damages, and injuries or fatalities.

Wind

The dataset on tornadoes provides the path of every hailstorm January 1955 till December 2020. The shapefile contains 462,478 records and a 368MB file size. There are 24 different attribute fields recorded for each record. Without listing them all, the fields fall into the categories of date and time, state, storm location and geographical information, storm magnitude and windspeed, storm damages, and injuries or fatalities.

Process Description

The datasets collected will be imported into pgAdmin for analysis. To compare the different weather phenomena, one first needs a similar dataset. Although the tables may remain in their own table, they do need to have the same date range. Despite all weather types recording through December 2020, the start dates are different. Therefore, the start date needs to match the latest date, in this case January 1955. For both the hail and wind datasets (tornado is already restricted to 1955^{+}), the filter of the "yr" field for values greater or equal to 1955 will be used.

It is worth noting that although the county lines may be different in 2020 than in the 1950s since the goal is to determine a current county's likelihood of occurrence with the weather, the historical location of the county lines is not necessary. The weather phenomena are still located in the same locations, regardless of where the humans have drawn their arbitrary lines.

Next the weather tables will need to be joined with the counties, to identify the county in question for each weather event. The first analysis that is now possible is the number of hail, tornado, or wind events in each state and each county. From here the counts can also be ranked to find the top or bottom most popular options. In addition to this, the total number of events per weather event is also comparable. Just the count alone doesn't mean much, a high number of events could all be from 1955 and therefore unlikely to occur again, or all from 2020 and therefore very dangerous and highly likely to occur again. To distinguish between the two, further analysis is required. To align each phenomenon with the county, a spatial join of the county's geometry will be intersected with the weather dataset's "slat", "slon", "elat", and "elon" fields for identifying the storms start and end points, as well as the path of the storm. It is possible for a storm to cross multiple counties.

The next step is to look at the weather data year over year per county. This will allow us to see if a county has an increasing or decreasing trend in hail, tornadoes, and/or wind storms. This requires the storms to first be collected, or ordered, by the year, then grouped by the county. Statical values useful with this dataset include finding counties with an increase (or decrease) in the last decade compared to the county's yearly average and the counties with the most (or least) type of storm per year.

For ease of comparison (due to the large county numbers) another result set to look at is taking a limited number of counties of interest and identifying any patterns of increase/decrease per phenomena. One such example is taking Oklahoma County and the 6 counties that circumnavigate it. Another county of interest is Tarrant County (due to the large recent growth in the metropolitan area of the county) and the 6 counties that encapsulate it and compose the metroplex.

With the exception of the Top Ten lists (or bottom 10 lists), an additional way to present the data is in mapping the results.

References

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