A SEVERE WEATHER CLIMATOLOGY FOR THE CHARLESTON, WV WFO COUNTY WARNING AREA

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1. INTRODUCTION

The National Weather Service's (NWS) primary responsibility is to provide the public with information on impending severe weather that threatens life and property. A forecaster can be better prepared to anticipate and react to the timing, strength, and nature of severe weather with a general understanding of local severe weather. This is the motivation for conducting this local study. This study has been updated in 2021 to add the data from 2013 through March 2020. Additional graphics showing the number of days with severe weather events have been included. A section displaying data about significant and destructive severe thunderstorms as well as a section displaying the impacts from severe weather events within the area have been added.

The NWS Weather Forecast Office (WFO) in Charleston, WV has warning and forecast responsibility for 49 counties (Figure 1). The combination of counties, referred to as the County Warning Area (CWA), includes four counties in northeast Kentucky, two counties in southwest Virginia, nine counties in southeast Ohio, and thirty-four counties in West Virginia.

Figure 1

The Charleston, WV CWA is comprised of 21,963 square miles. The terrain across the CWA is quite variable. The higher mountain peaks of the Appalachian Mountains, with some elevated inhabited valleys, defines the eastern third of the CWA. The highest point within the CWA, Snowshoe Mountain (4765 feet), lies within Pocahontas County. Across the middle third of the CWA, west of the Appalachians, the terrain transitions into very steep, densely wooded hilltops and carved river valleys. A slope of 400-500 feet from any hilltop to river is not uncommon. Finally the western third of the CWA is made of rolling hills and is more agricultural in land use, with the main stem Ohio River flowing through it. The lowest point in the CWA is along the Ohio River in Greenup County, KY (495 feet) near South Shore.

The population in the CWA is comprised of several metro areas with higher population density, surrounded by less dense rural areas (Figure 2).

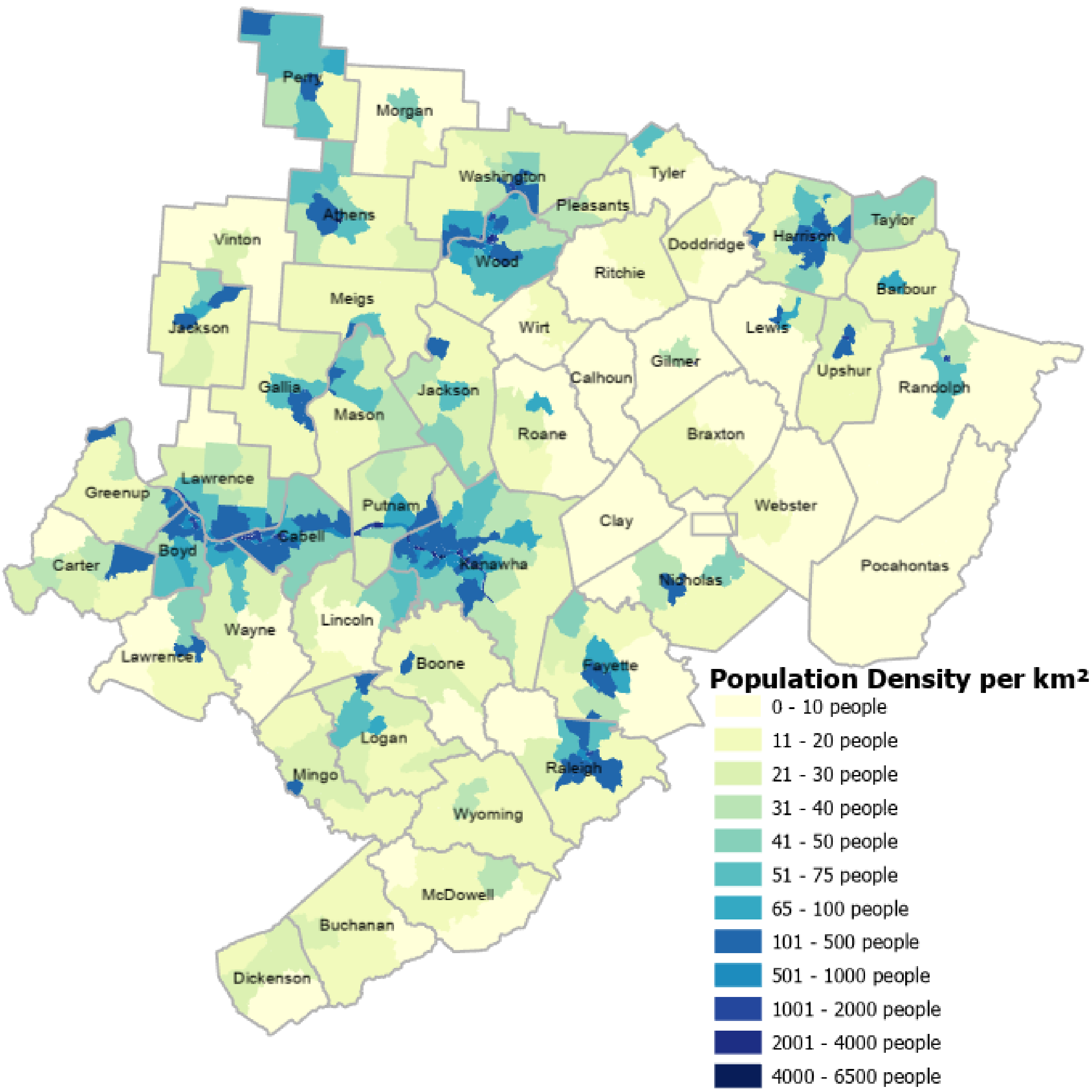


Figure 2

2. DATA

The National Centers for Environmental Information (NCEI), formerly known as the National Climatic Data Center (NCDC), in Asheville, NC, provides online access to severe weather data all across the country. Weather offices send local storm reports from a severe weather event to the Storm Prediction Center (SPC), located in Norman, Oklahoma. The storm reports are verified and then archived at NCEI. Storm data archived at NCEI includes tornado, hail, and thunderstorm wind gust reports from 1950 through the present.

Data used for this study includes any tornado, hail, and thunderstorm wind gust reports for each county in the Charleston, WV CWA. Data for all three types of severe weather events is from January 1, 1950 to March 31, 2020. The times of these events are all in Eastern Standard Time (EST).

The NWS defines a severe thunderstorm as a storm that meets one or more of the following criteria:

- A tornado
- Hail one inch in diameter or larger (0.75 inches before 2010)
- Wind of at least 50 knots (58 mph) or wind which causes damage, including multiple trees or power lines blown down

3. CLIMATOLOGY

A. All Severe Events

The frequency and distribution of severe weather events varies from year to year. An overall increasing trend can be seen in the yearly graph below (Figure 3). Much of this can be attributed to an increase in population, infrastructure, spotter training, and technology, as well as a more concerned effort by the WFO to find reports. Spatially, there are report “hot spots” around population centers in the CWA, with fewer reports from the more rural areas (Figure 4).

In addition to looking at the number of severe events, or reports, across the area; the number of days with at least one severe event were computed over the 70 year period (Figure 5). Organizing the data in this way may take out some of the influence that population can have by combining multiple reports for the same event in an area into one report. Thus, a populated area that gives many reports of the same event would be more comparable to a rural area that may only have one or two reports for an event. The hotspots where severe weather days have occurred appear to be in similar locations to the map containing all severe reports, however certain counties jump out slightly more than they do when examining all of the reports, especially in areas that have less severe days overall. Population still plays a factor with this data as an event may be completely missed in a rural area while it is more likely to have at least one report in a populated area. A downfall of displaying the data in this way is that if there were more than one separate event in a county on one day the data for that county were counted as one day instead of as separate severe events. Nevertheless, it provides another perspective on where severe weather has occurred in the CWA.

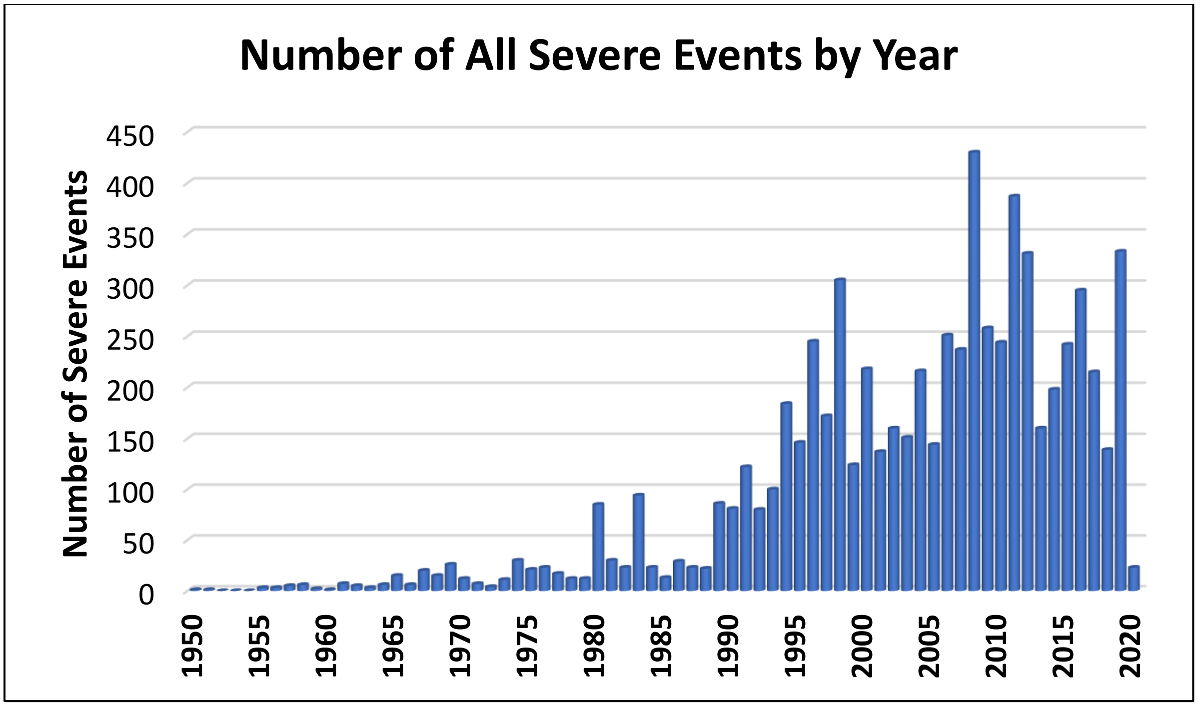
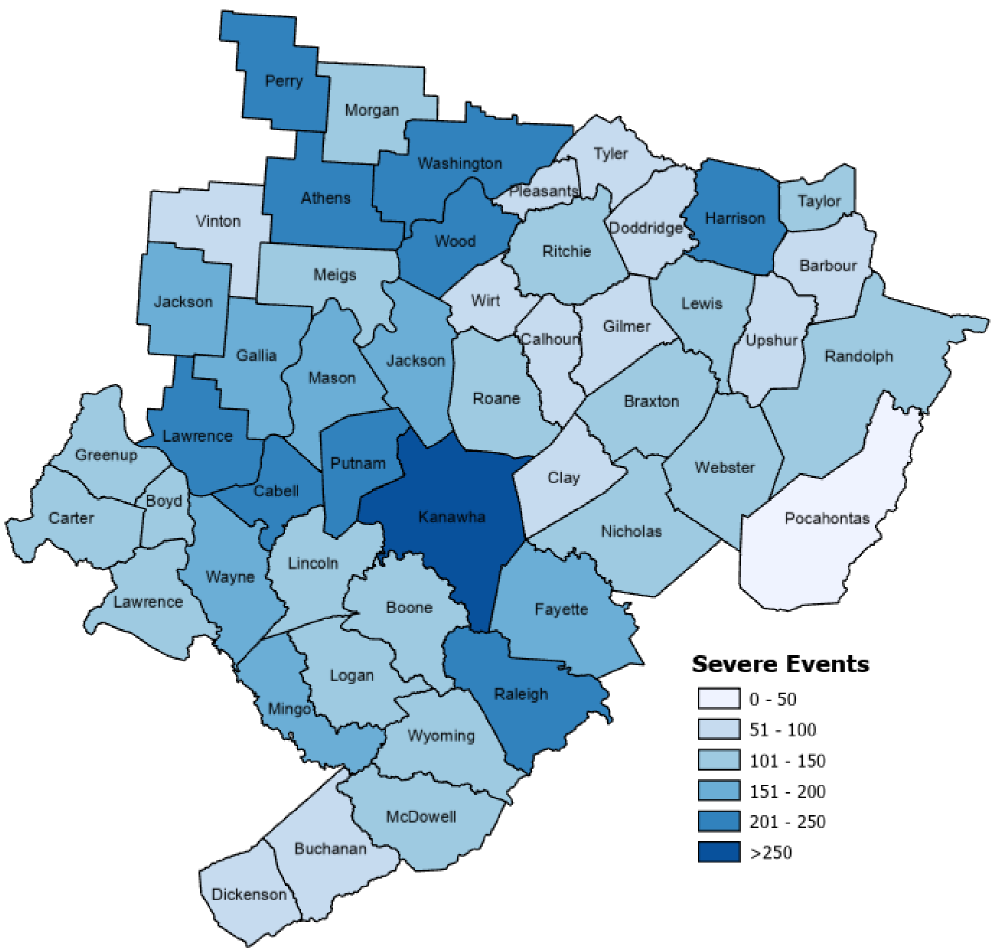


Figure 3



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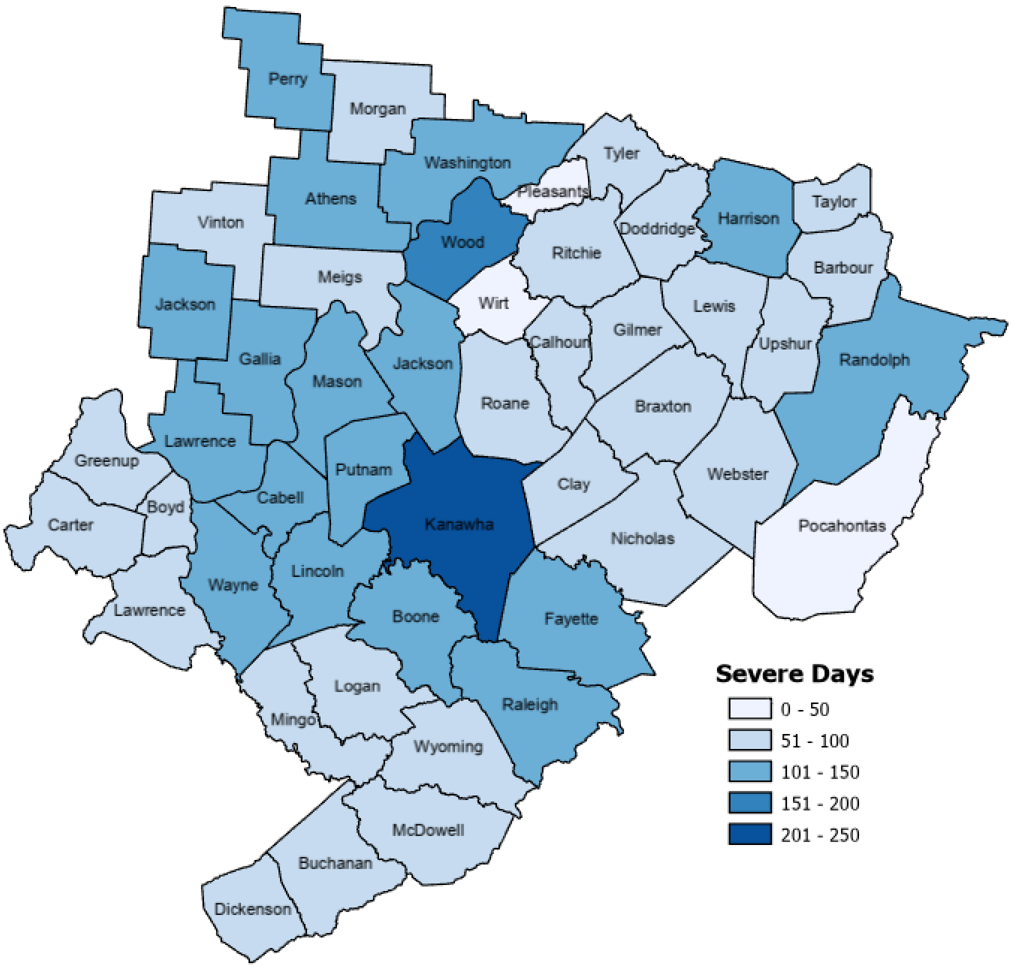


Figure 5

1. *Monthly Frequency*

The monthly distribution of severe weather events across the Charleston, WV CWA represents a "bell-shaped" curve (Figure 6). There have been a total of 7029 severe weather events during the study period. The peak month for severe weather is June, during which over 26% (1838) of all severe weather events occurred. Around 63% (4427) of all severe weather events occurred during the late spring to summer months of May, June, and July. The number of events dramatically drops off after July through September with the transition of late summer to fall. However, severe weather is possible and has been observed in all twelve months.

Similar to displaying the severe days per county, the number of severe days per month were also determined (Figure 7). For each month, the number of unique days with at least one severe event are shown, yielding 1161 days with severe events compared to the 7029 total reports. June still has the highest number of severe days with 23% (265) of severe weather days and July follows June closely with around 22% (255) of the days. There is not as large of a gap between June and July (23% to 22% respectively) when compared to the data with all of the events (26% in June to 21% in July). Including May, the summer months still lead in severe days, similar to the severe events per month, with around 61% (710) of the severe days.

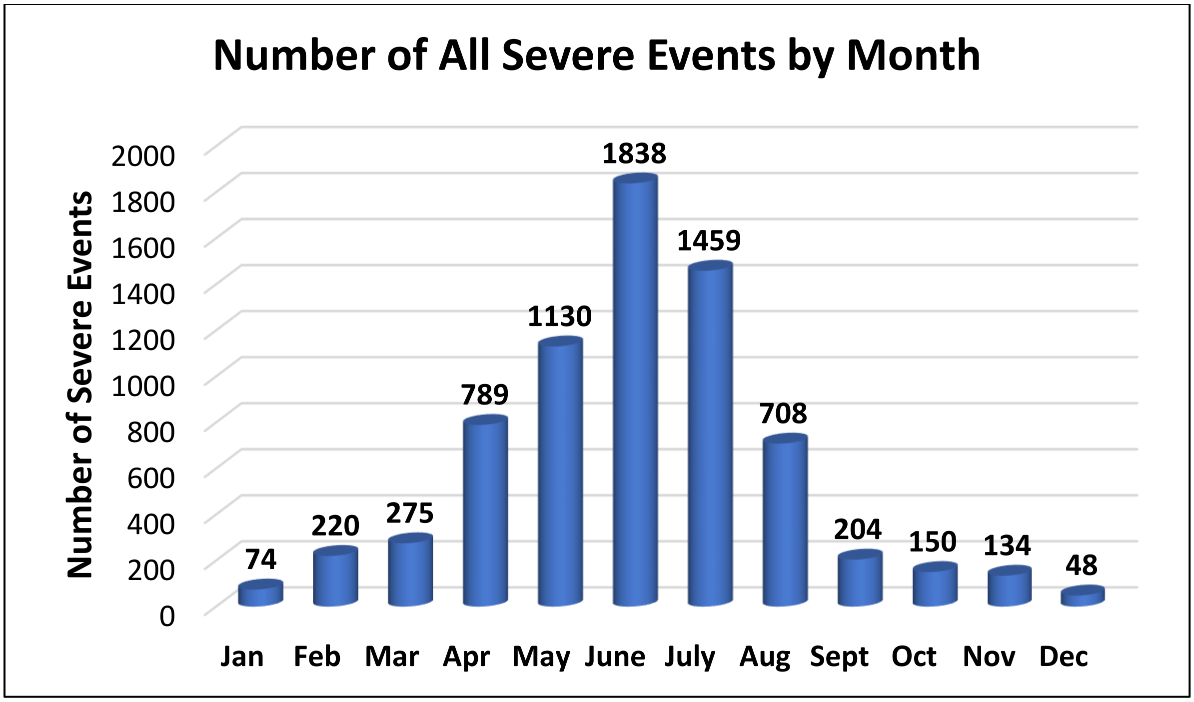


Figure 6

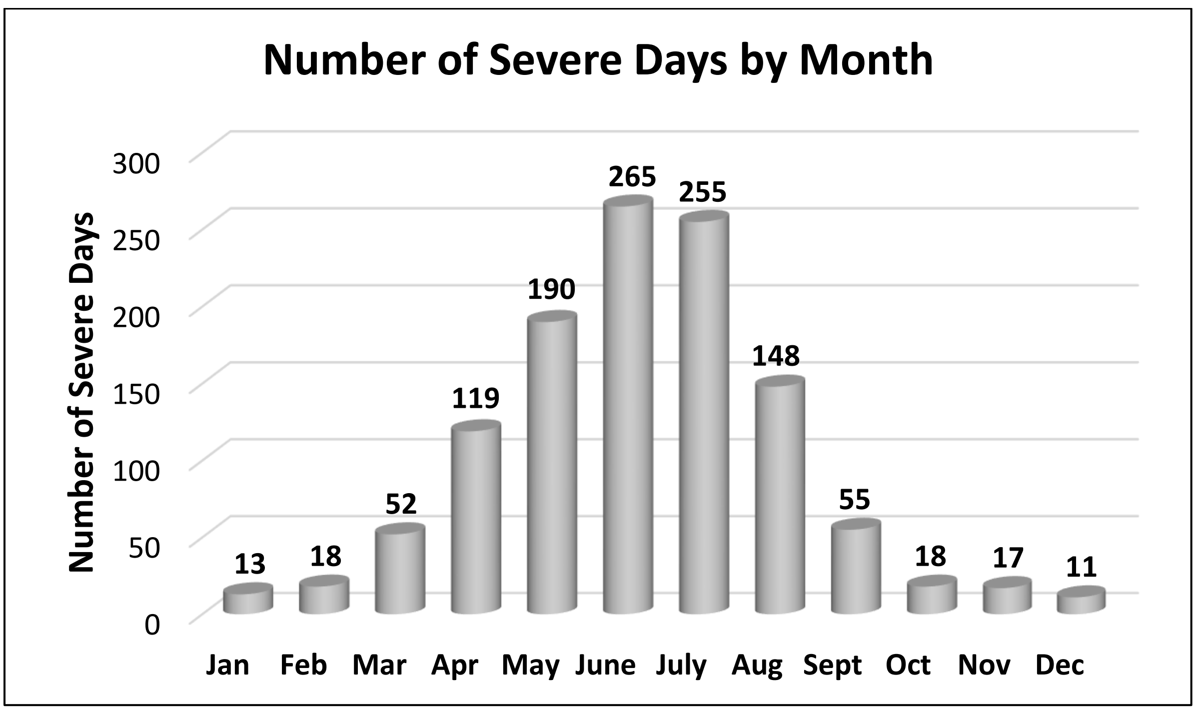


Figure 7

2. Hourly Frequency

The majority of severe weather events occur during the afternoon and evening hours, which coincides well with the peak heating of the day and highest instability in the atmosphere. About 83% (5821) of all severe weather events took place between 1 PM and 9 PM (Figure 8). The peak time of day for all events occurred between 4 PM and 6 PM. A smaller secondary mode appeared just after midnight, which may be due to Mesoscale Convective Systems (MCS) that develop upstream in the afternoon and push through during the late hours. Severe weather is least likely to happen during the morning hours between 4 AM and 9 AM, during which about 3% (236) of all events occurred.

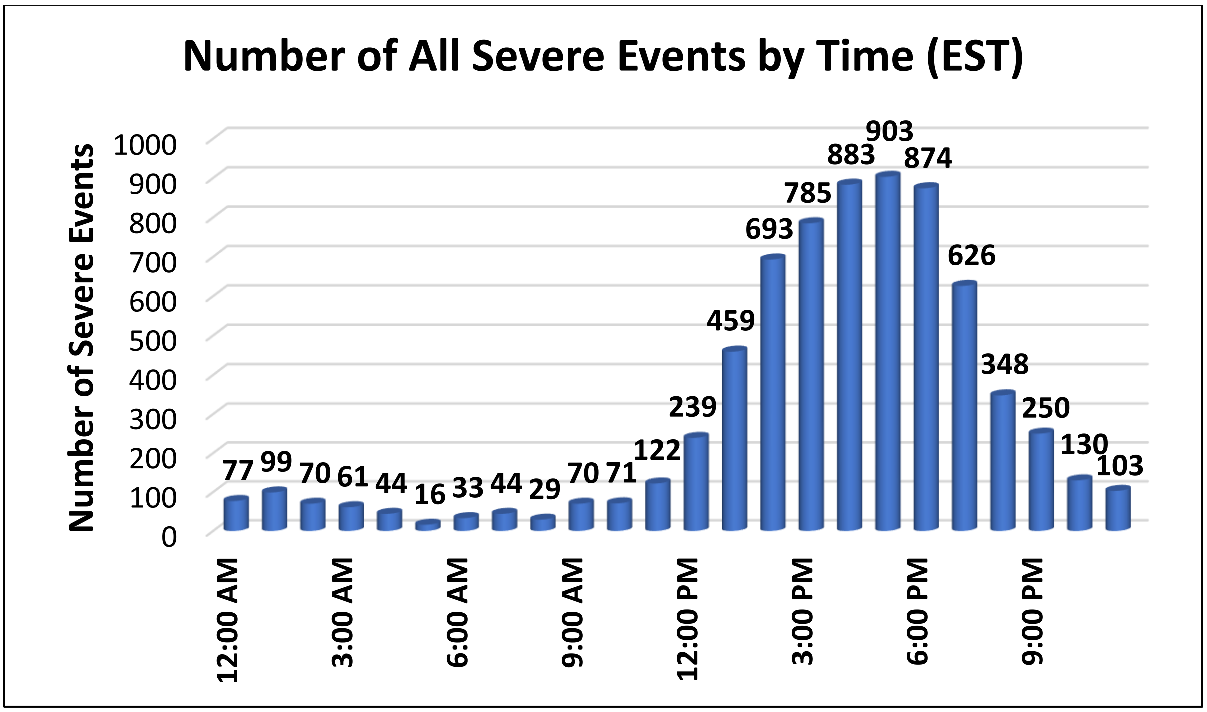
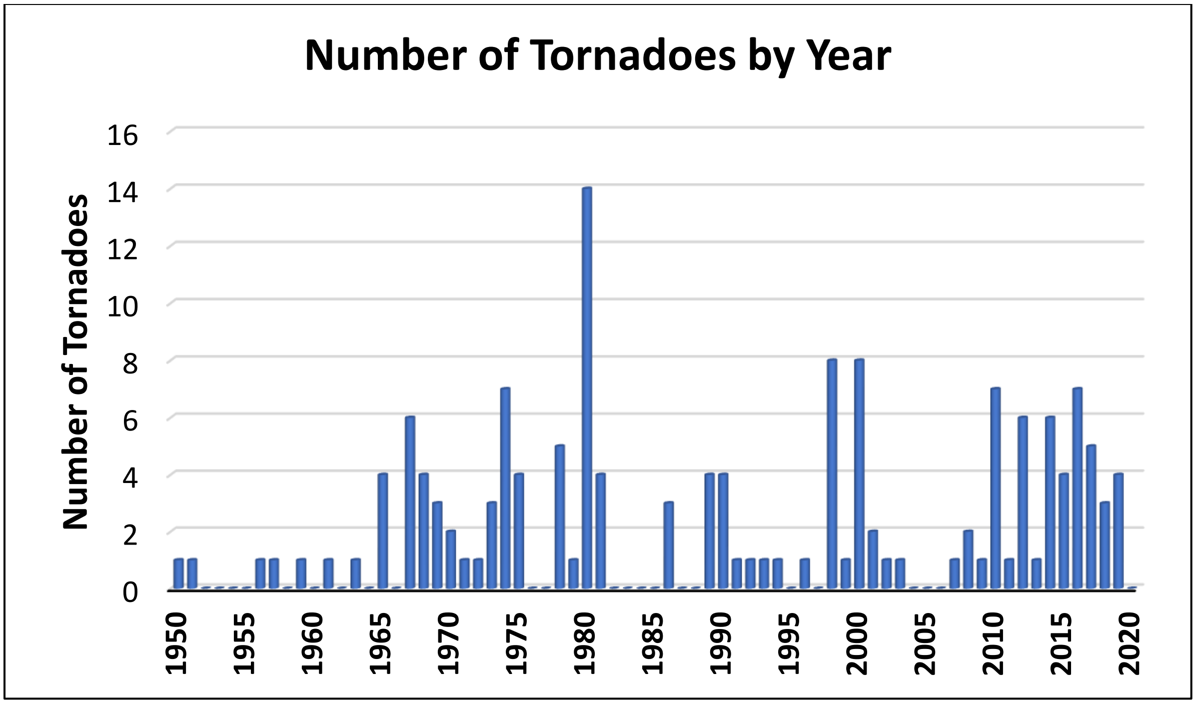


Figure 8

B. <u>Tornadoes</u>

The frequency of tornadoes across the Charleston, WV CWA is very low compared to other areas of the country. Over the 70 year period, there were 151 confirmed tornadoes. This is an average of about 2 tornadoes per year (Figure 9). With the exception of Raleigh County, most of the tornadoes were observed in counties along the Ohio River and extending into Southeast Ohio (Figure 10). This is graphically represented through a “hot spot” analysis which shows where tornadoes are most likely to occur based on statistically significant spatial clusters of confirmed tornadoes (Figure 12). It is theorized that the lack of rugged steep terrain plays a role in the density of tornadoes in Southeast Ohio and along the Ohio River. This idea may also be a contributing factor to the anomaly in Raleigh County where all of the tornadoes reported were across the eastern part of the county which is a high plateau where the slope is not as great. The counties with no tornado reports are all located along the eastern half of the CWA and predominantly where the terrain is more rugged when compared to the areas with more reports.



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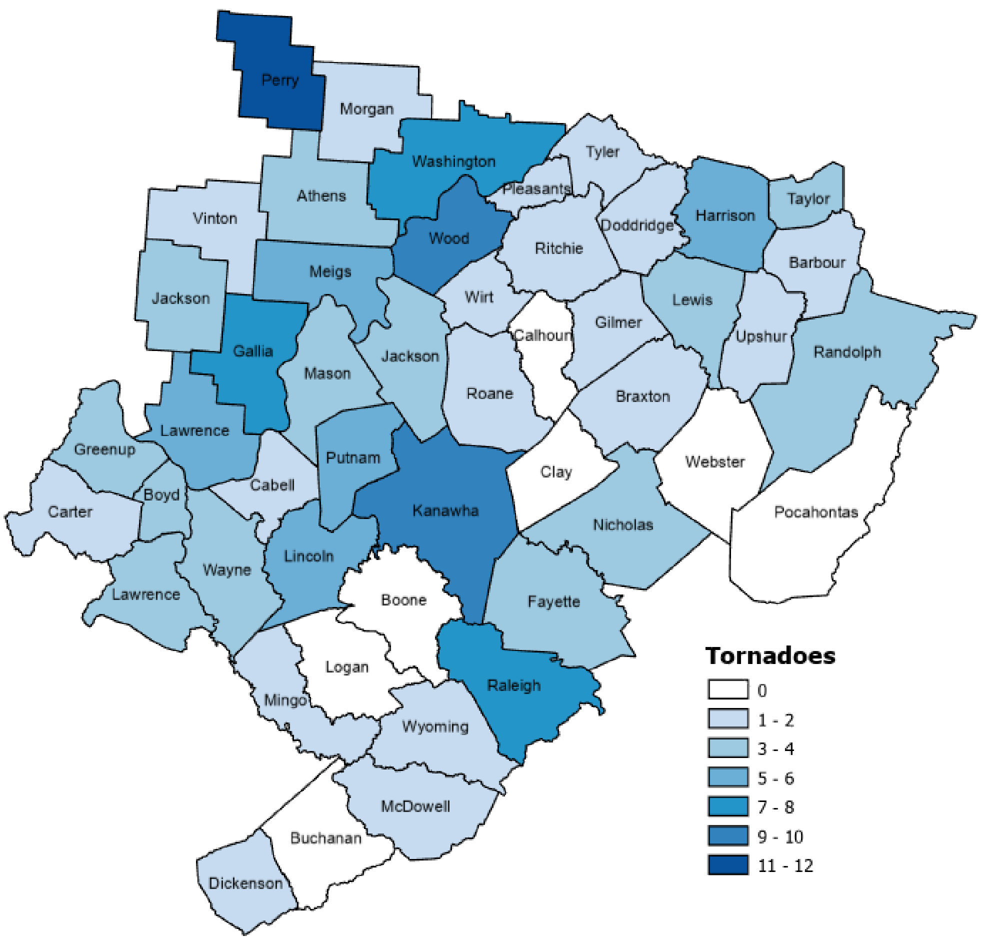


Figure 10

Figure 11

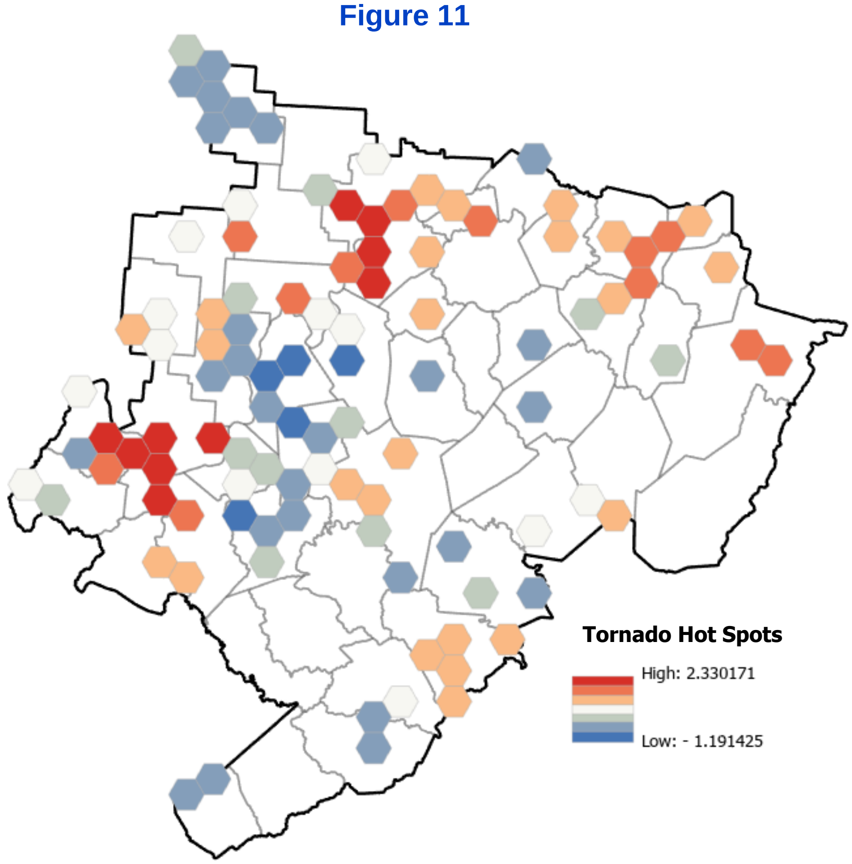


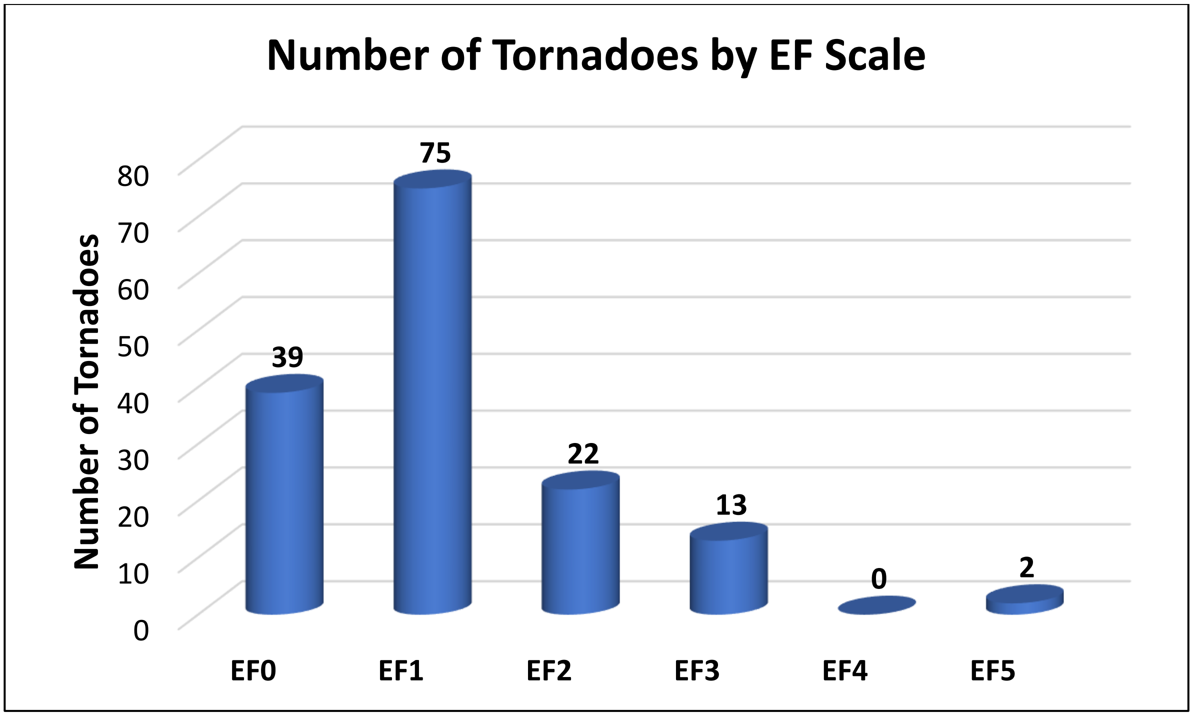
Figure 12

A. Magnitude

Tornado magnitude, or strength, is determined by using the Enhanced Fujita (EF) Scale (Table 1). A majority of the tornadoes observed in the Charleston, WV CWA have been weak in magnitude (Figure 13). 75% of all confirmed tornadoes since 1950 have been rated EF1 or weaker (Figure 14). Strong tornadoes (EF2-EF5) are not as common across the area with 37 of the 151 tornadoes in the CWA determined to be strong (Figures 15-17). Of the strong tornadoes, violent tornadoes are defined as EF4 and EF5 tornadoes. Only two violent tornadoes reports have been recorded in the CWA and both reports were of an EF5 tornado in April of 1968. Otherwise, EF2 and EF3 tornadoes make up the vast majority of the strong tornado reports for the area. Based on the data for the CWA, strong tornadoes had two peaks, one in early to mid-spring and another in mid-summer, and most have occurred during the afternoon and evening. However, with such a small sample size, monthly and hourly statistics should be used with caution. Strong tornadoes mostly have occurred along the Ohio River, similar to where most of the overall tornado reports were for the area (Figure 17). Again, there is an exception with both Raleigh and Fayette counties which each had three strong tornadoes reports, however it can be noted that the longer tornado paths recorded for these counties were along the eastern, and less rugged, half of the counties (Figure 17). The longest tornado path in the Charleston, WV CWA entered in Lawrence County, KY from the Jackson, KY (JKL) WFO's CWA, and spans across Wayne and Lincoln counties in West Virginia (Figure 16). A majority of the other tornado paths in the CWA were much shorter and only include portions of one or two counties.

EF Number	Estimated 3 Second Wind Gust (MPH)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

Table 1



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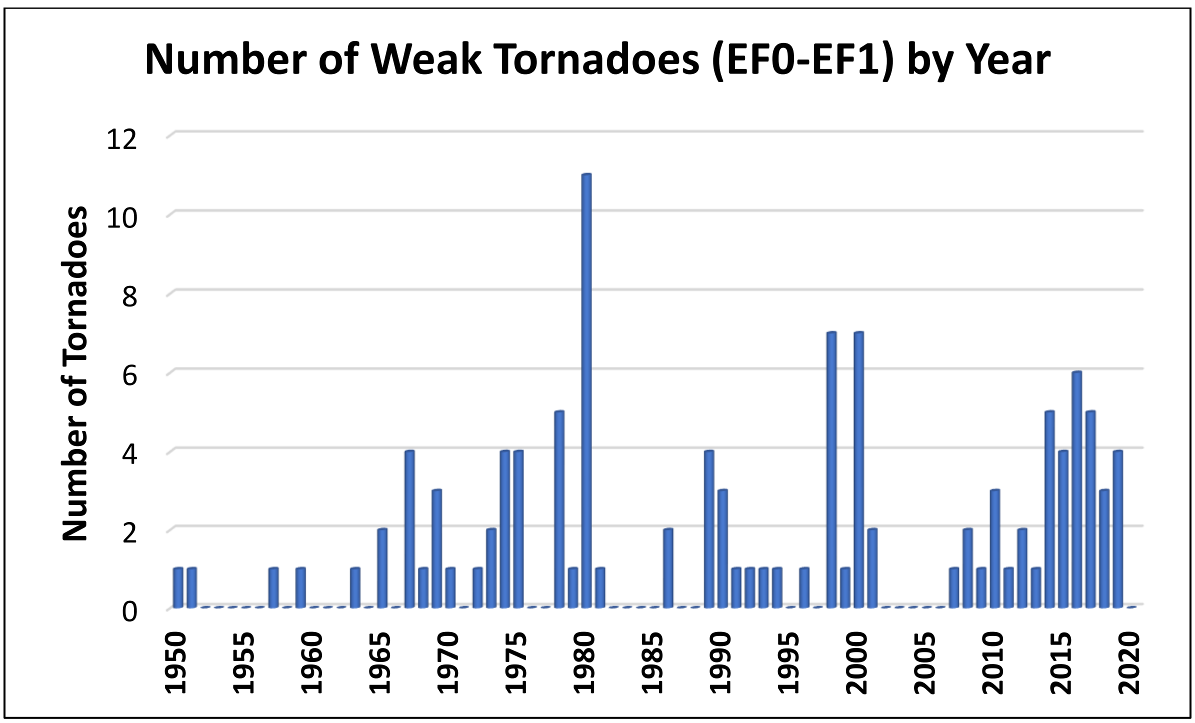

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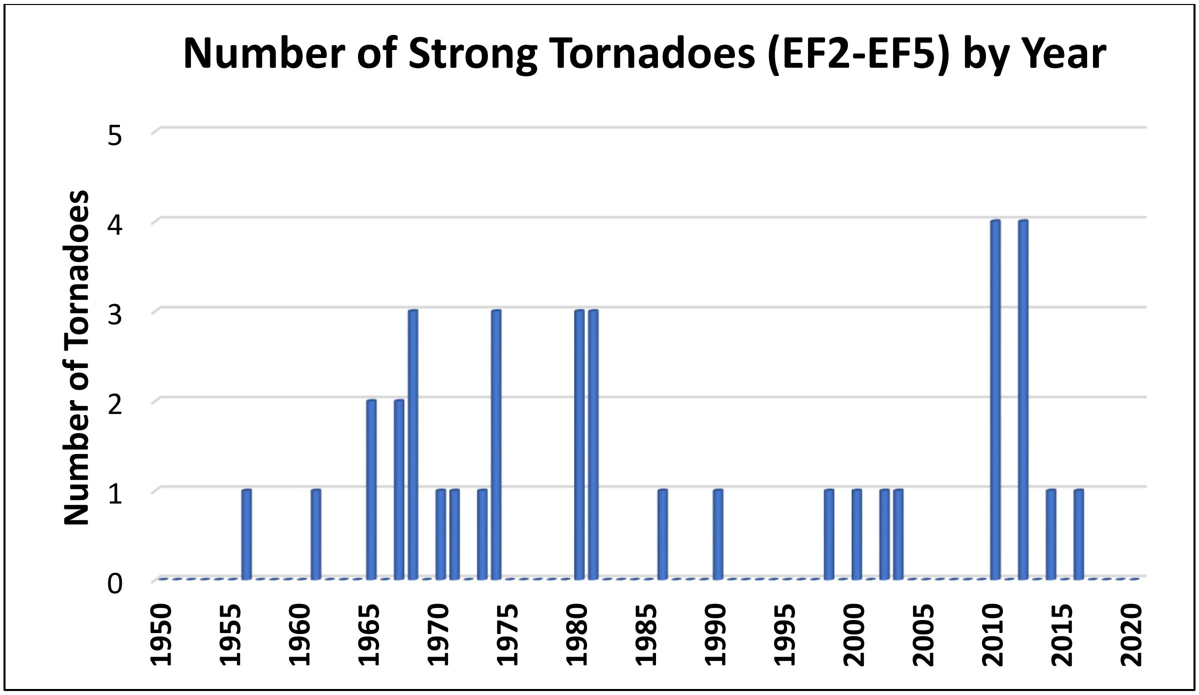

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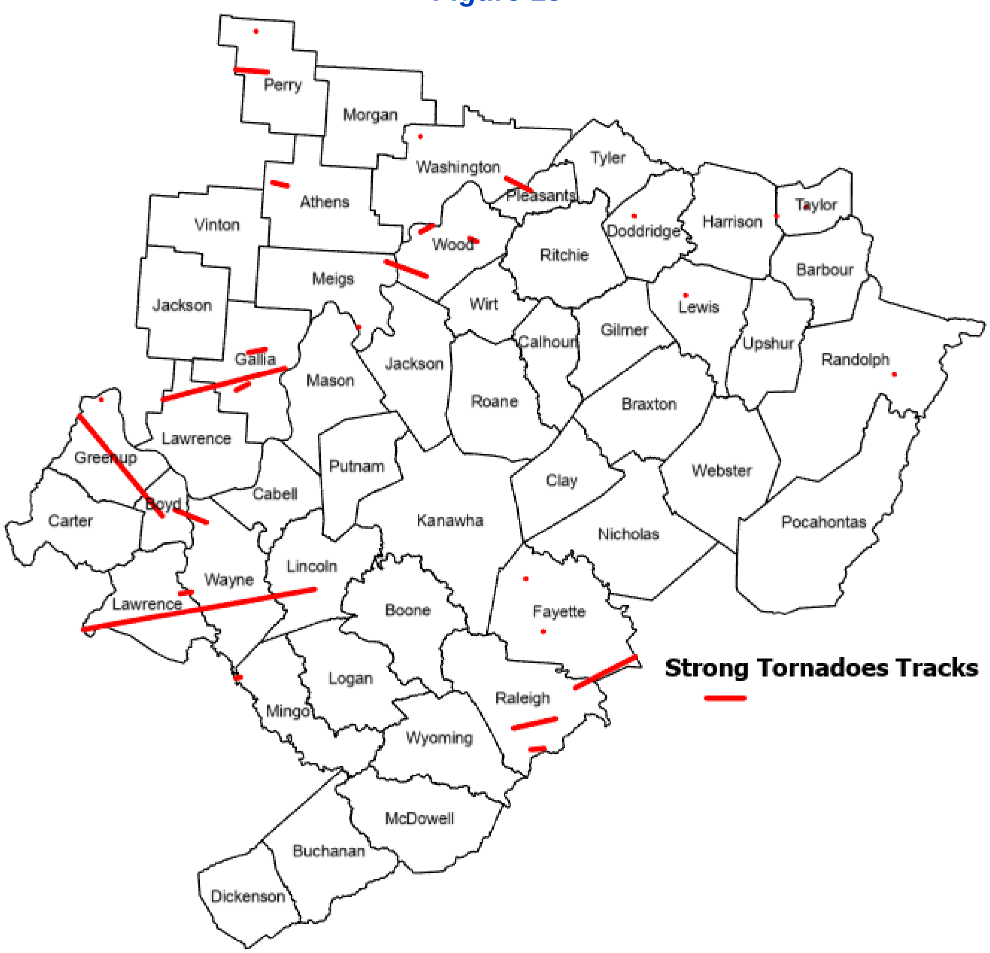

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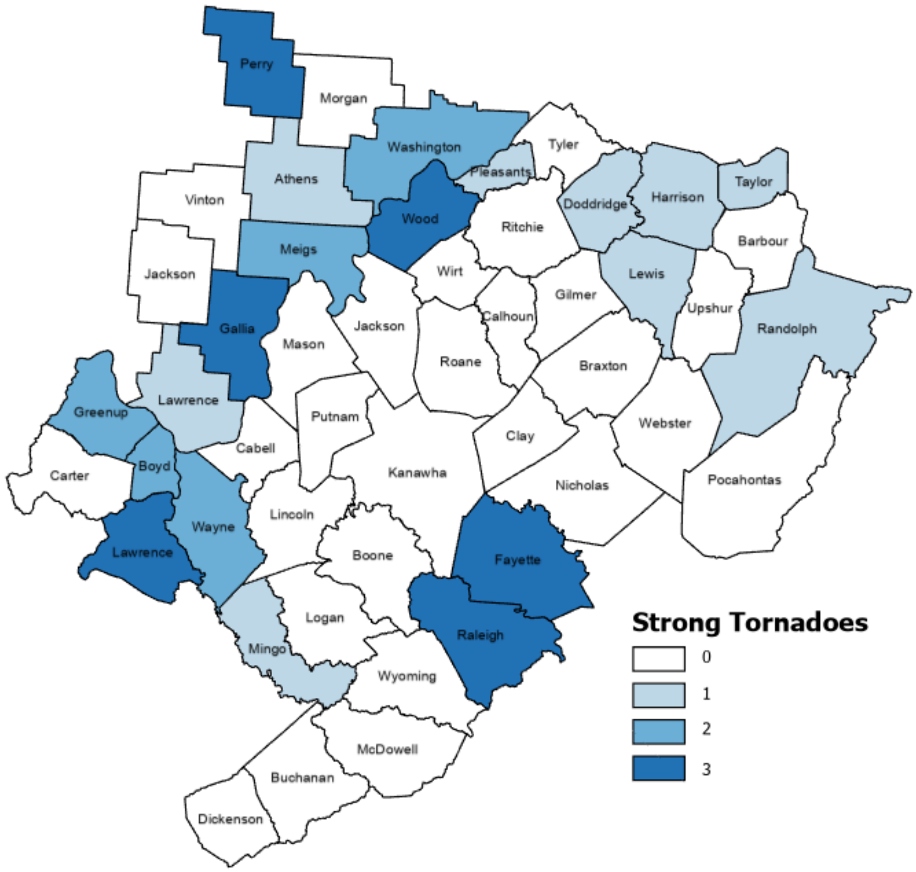
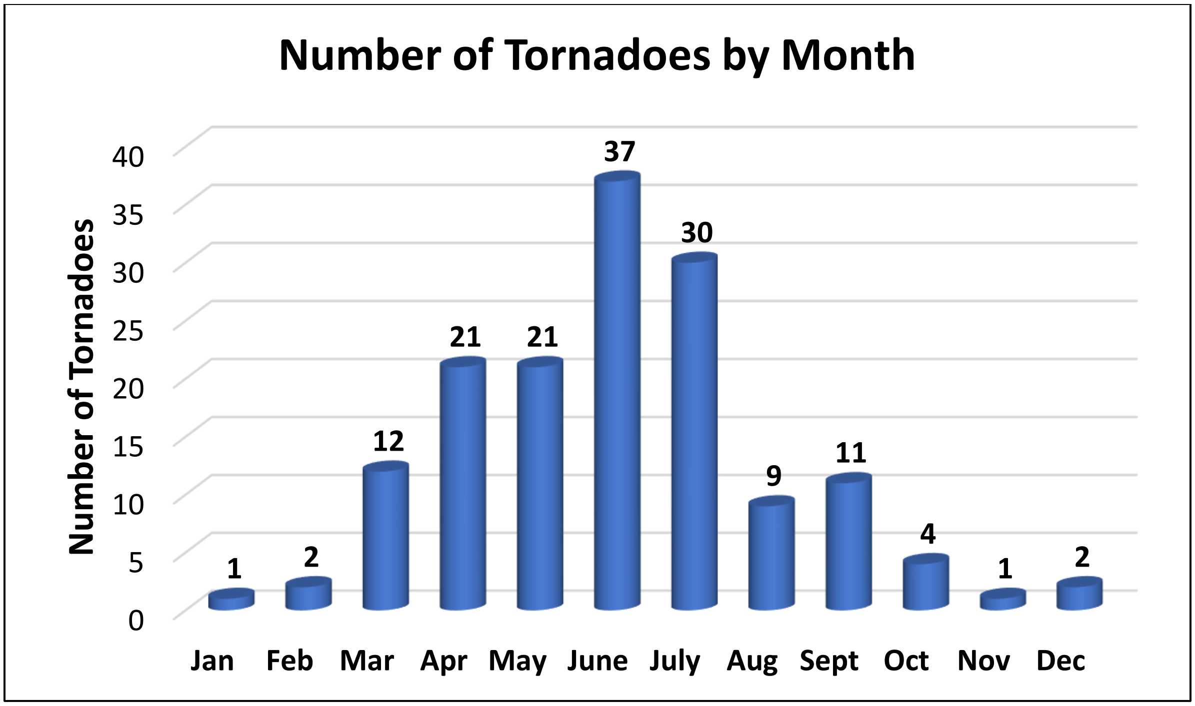


Figure 17

B. Monthly Frequency

Almost 72% of tornado events have occurred during the four month period of April through July, with the peak month of June (Figure 18). The occurrence of tornadoes decreases fairly rapidly on either side of this four month period, particularly from July to August. However, it should be noted that tornadoes have occurred in all 12 months. There are two peaks for strong (EF2 and higher) tornadoes in April and July, however there is a small drop off that occurs between these months (Figure 20). The distribution of weak tornadoes is similar to the total number of tornadoes per month as more tornadoes that have occurred in the area were weak tornadoes (Figure 21). However, the June peak for weak tornadoes stands out more than the peak for all tornado data.

Like with the severe events, the days per month with at least one tornado report were also determined (Figure 19). However, note that it is much more unlikely to have multiple reports for the same tornado when compared to hail and wind events due to the way tornado reports are determined by the WFO, so any days with one or more tornado likely did have multiple tornadoes occur on that day. One main difference to note with the tornado days per month compared to all of the tornado reports is that while April and May have the same number of tornadoes reported, April has less individual days with tornadoes than May. Thus, April likely has a few days that had multiple tornadoes. September also has more reports of tornadoes than August does, however when looking at the number of days with tornadoes, August actually has one more day than September on which tornadoes have occurred. Additionally, the sharp decrease from July to August is still visibly present.



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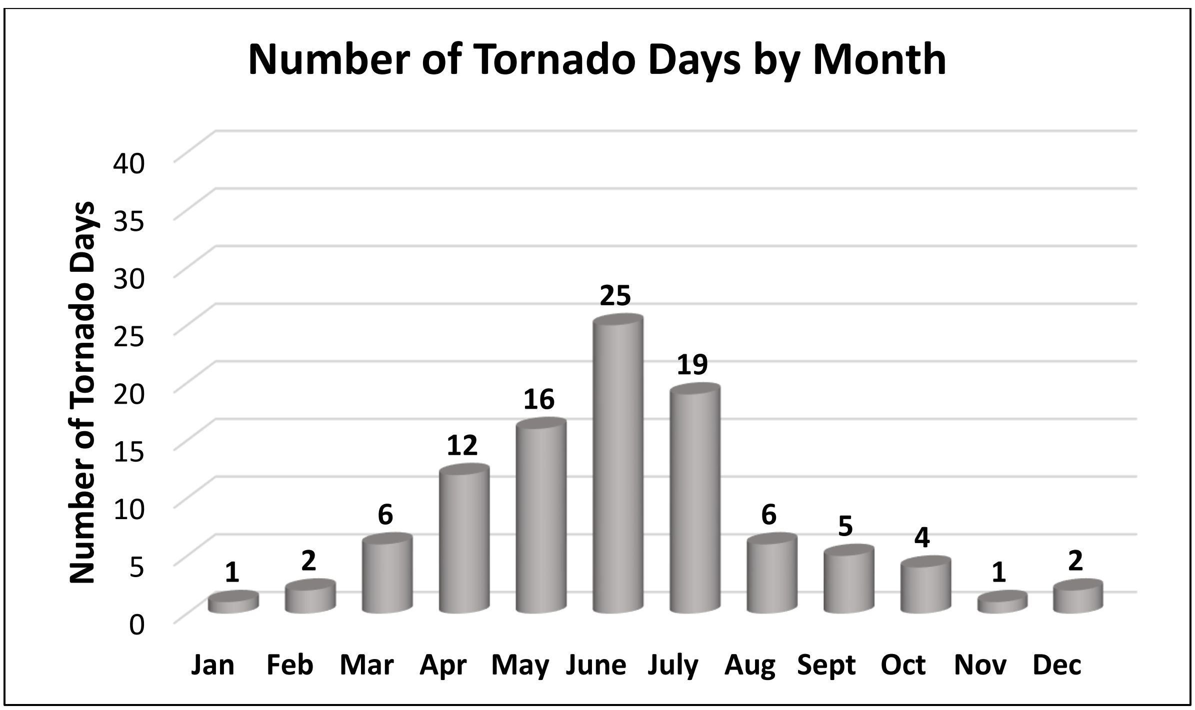

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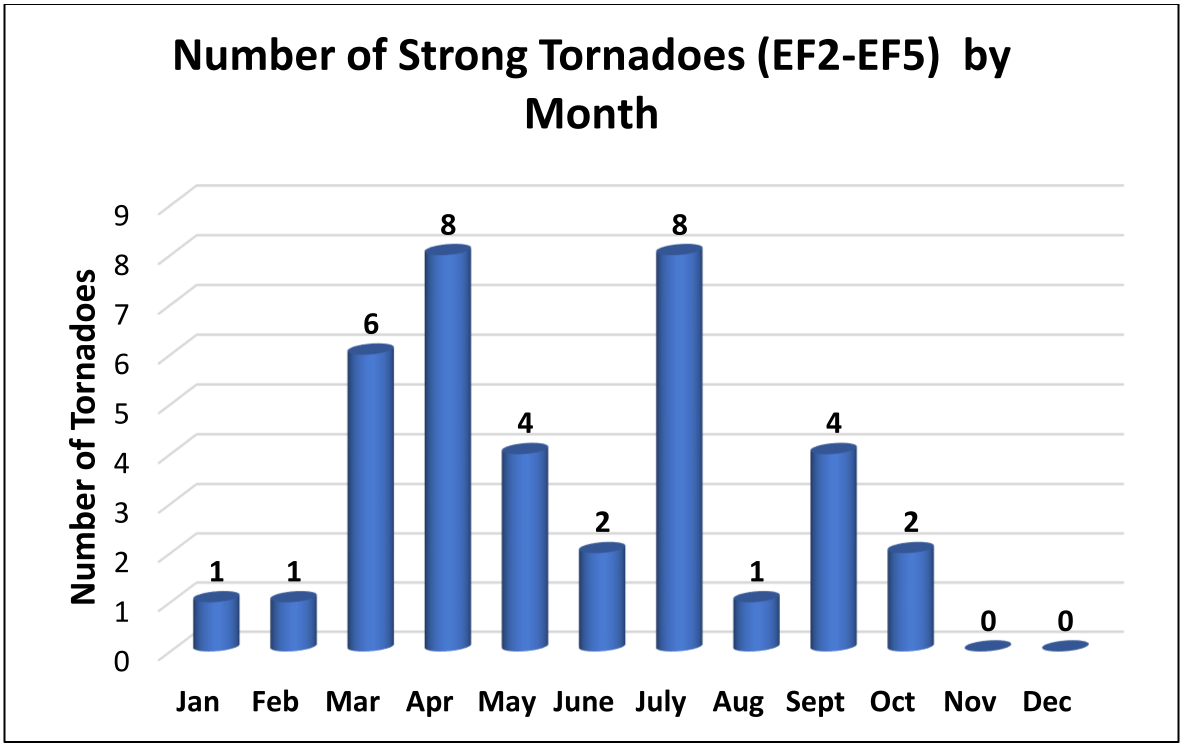

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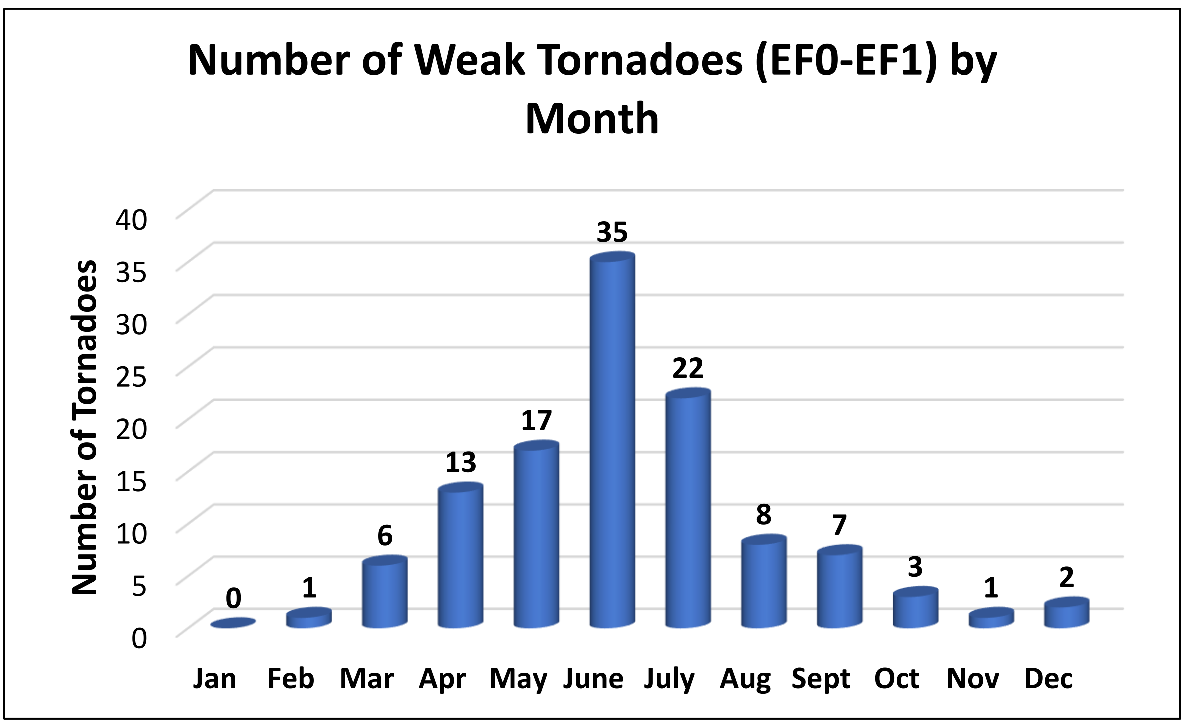


Figure 21

C. Hourly Frequency

Tornadoes typically occur during the afternoon and evening hours, peaking during the 5 to 6 PM hour range (Figure 22). Around 68% (102) of the tornadoes took place between the hours of 3 PM and 8 PM. Only a few tornadoes have occurred (3 in the 70 year period) between 6 AM and 11 AM. Strong tornadoes are also most likely to occur during the afternoon and evening, however there are a few outliers that happened in the early morning (Figure 23).

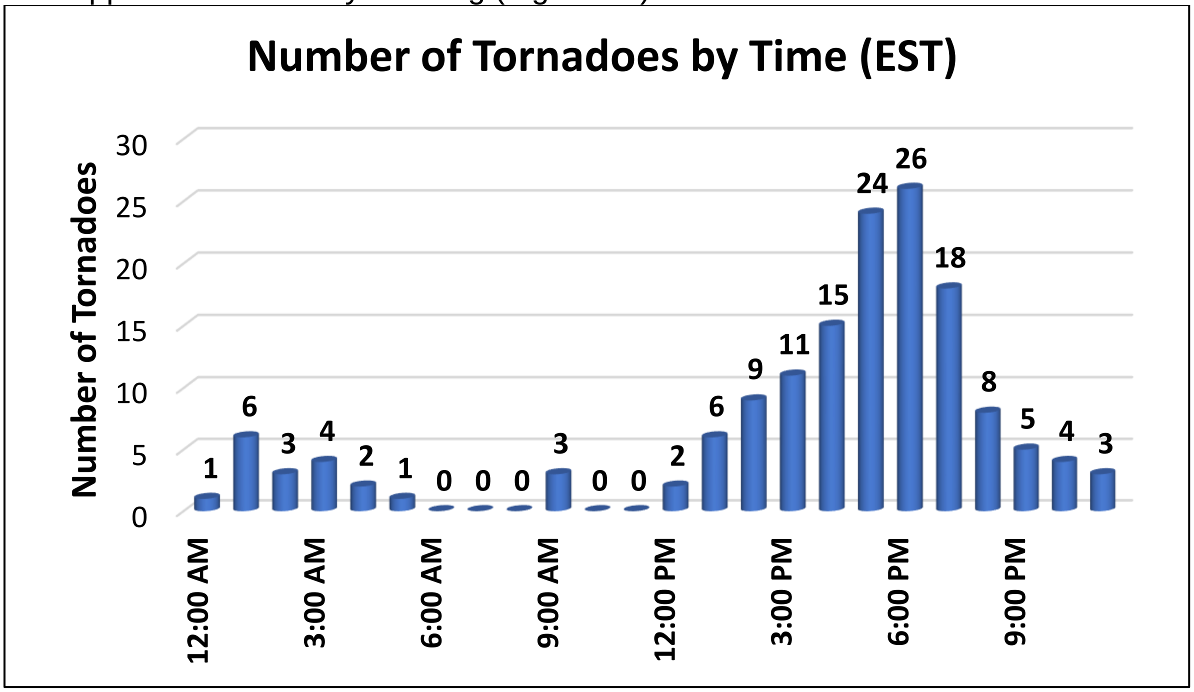


Figure 22

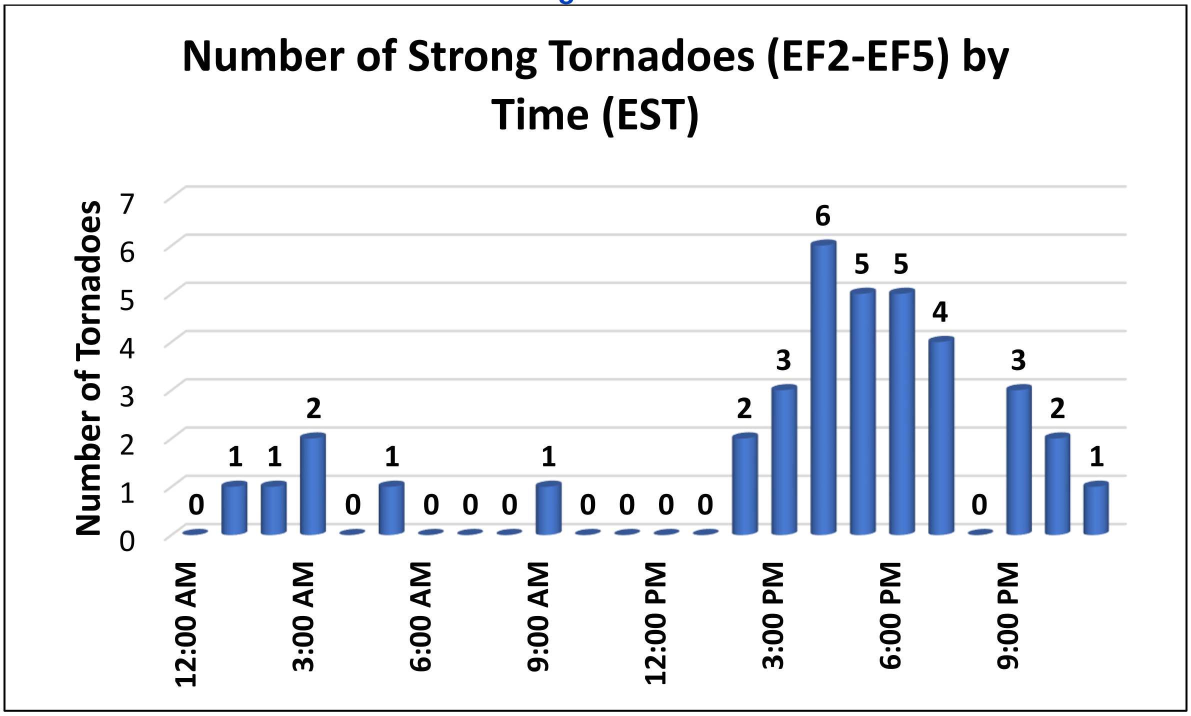
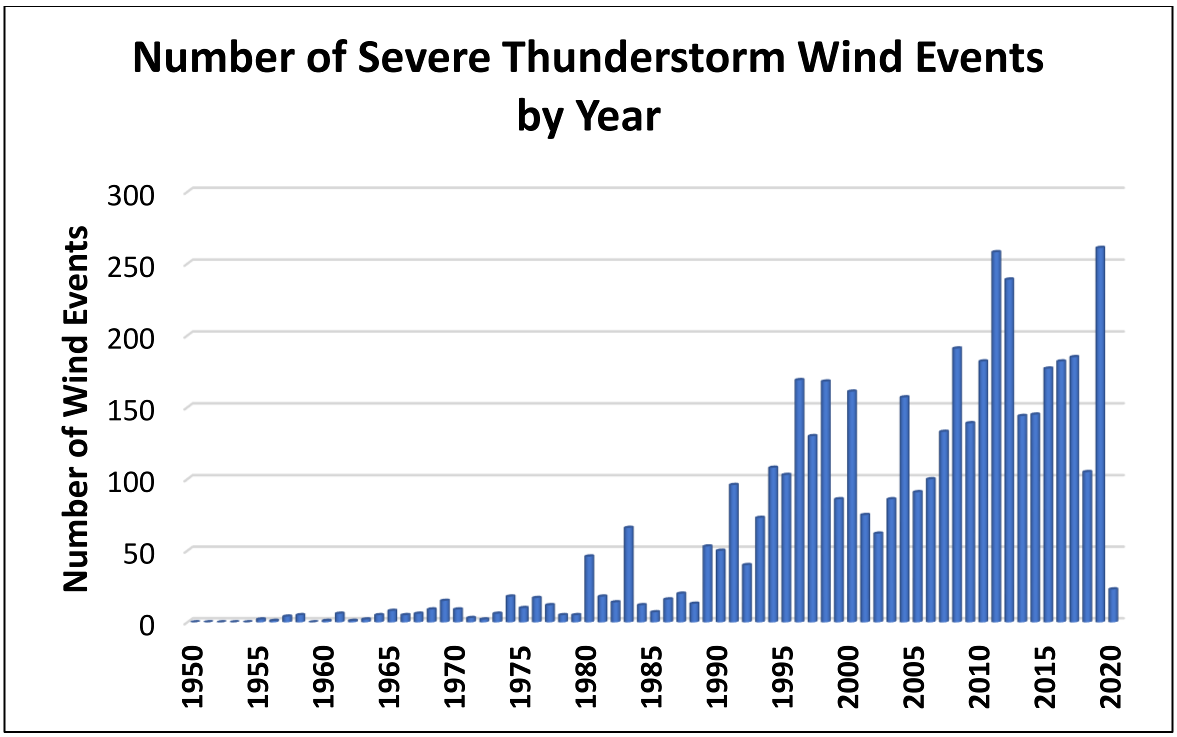


Figure 23

C. Thunderstorm Wind Events

Strong, damaging winds resulting from intense thunderstorms, fast moving squall lines, or bow echoes are the most frequent type of severe weather event across the Charleston, WV CWA. Over the 70-year period between 1950 and 2020, there were 4541 thunderstorm wind events (nearly 65% of all severe events). With thunderstorm wind events comprising the bulk of severe events for the CWA, it is no surprise that the year to year trends are similar to all events combined, with a gradual increasing trend visible (Figures 24-27).

When collecting and analyzing the NCEI data, about 35% (1612) of the wind events did not have magnitudes associated with them, or they were reported with a magnitude of 0 knots. Most of these events occurred prior to 2002 and were due to a difference in how wind reports used to be recorded. Before the early 2000s, only the damage caused by a wind event was recorded and no magnitudes were assigned. A change in how wind reports were recorded was implemented in the early 2000s where both the damaged that occurred as well as an estimated magnitude were assigned to each event. To reiterate the definition of a severe thunderstorm: thunderstorm wind events need to have a magnitude of at least 50 knots (58 mph) or cause damage, such as trees or power lines blown down; so because these events met the damage portion of the severe criteria, they were acceptable to be included in this study.



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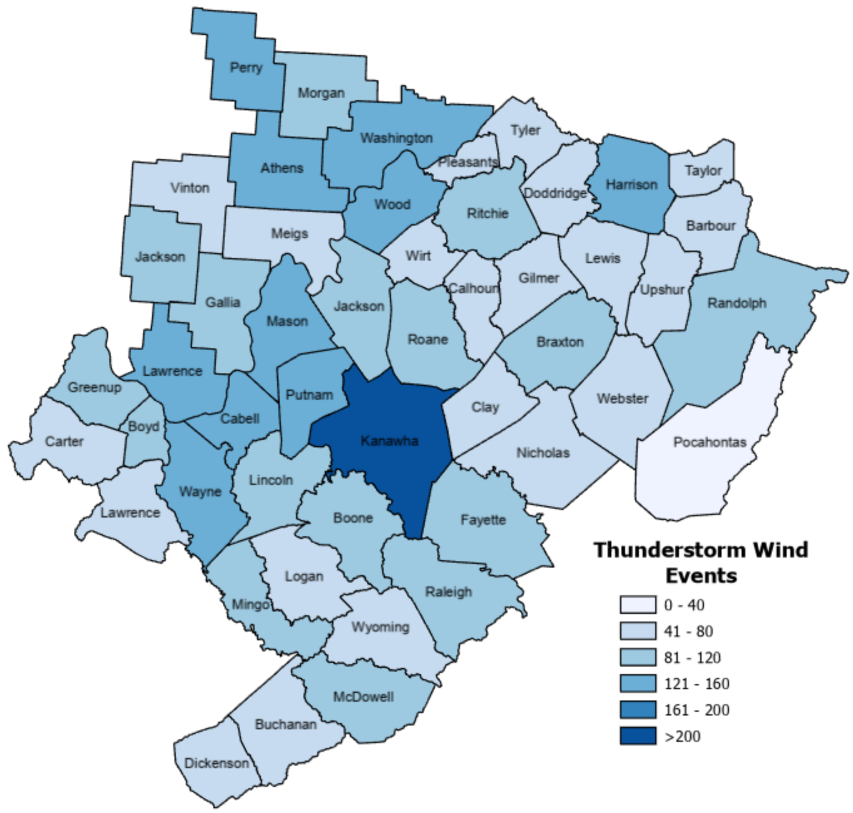

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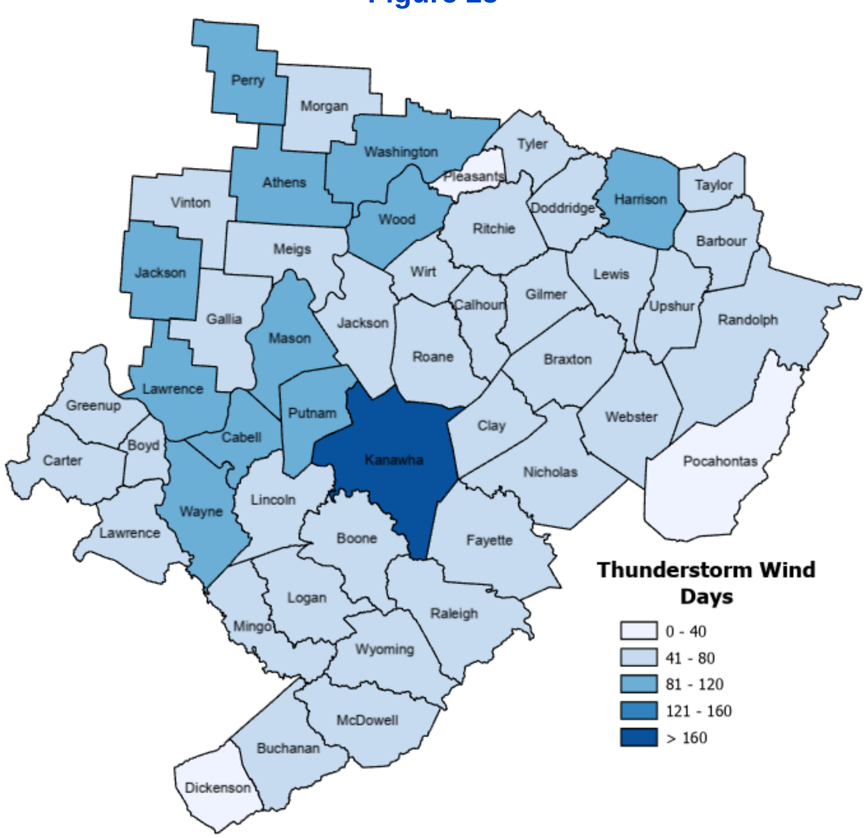

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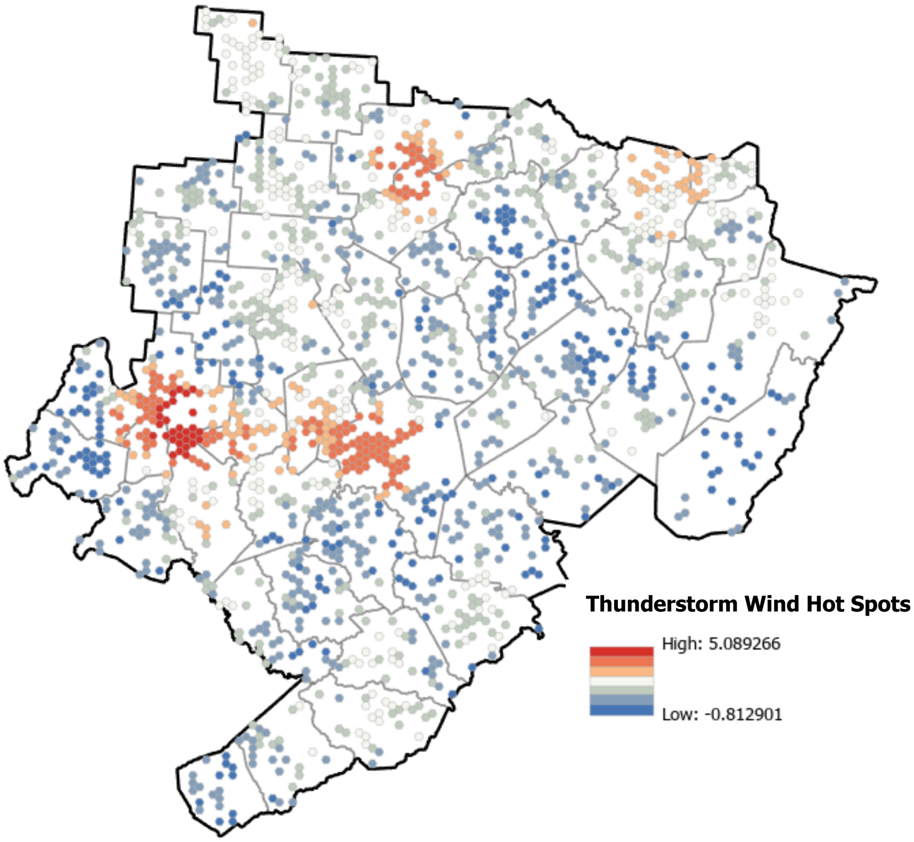
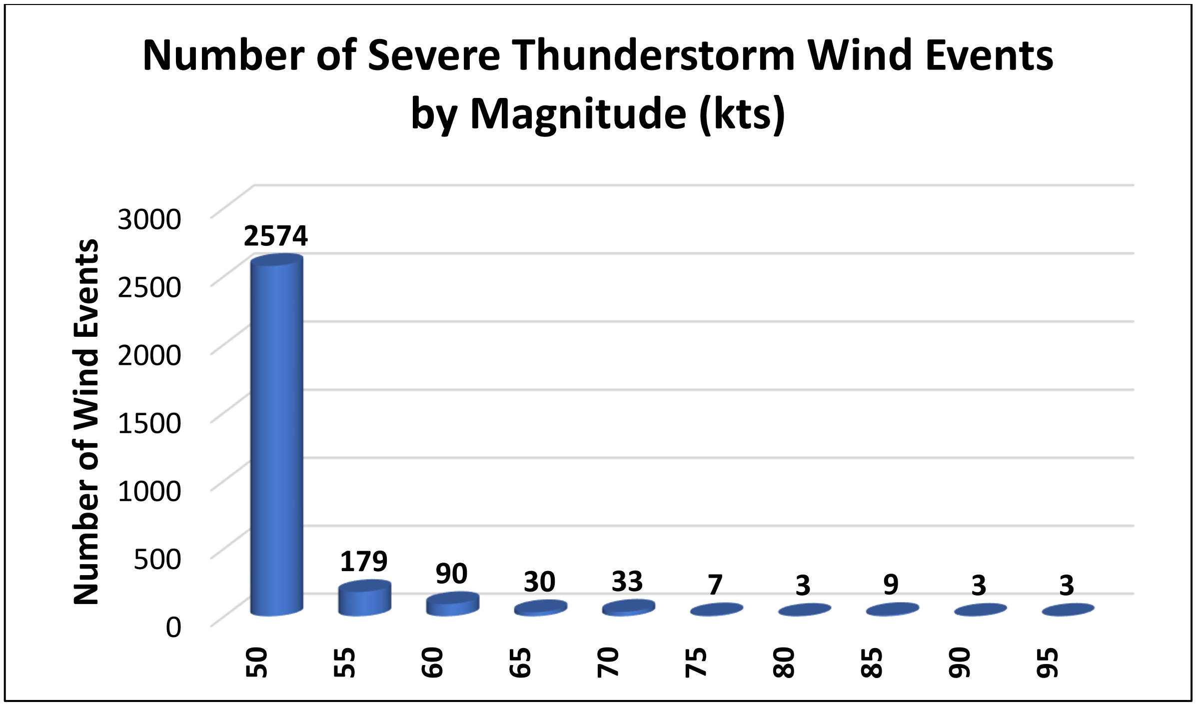


Figure 27

1. *Magnitude*

Most of the wind events in the Charleston, WV CWA fall in the low end of the severe range, between 50-60 knots (Figure 28). Only 6% of all of the wind events contained gusts over 60 knots. The “missing” magnitudes, due to the previous way of recording wind events, were not included when displaying the data by magnitude (Figures 28-30). These “missing” magnitudes are reflected the most in the graphics breaking magnitude of the events down by year where very few events had been assigned a magnitude prior to 2002 (Figure 29). The data has an uptick in reports following 2002 when reports were required to have estimated magnitudes assigned.



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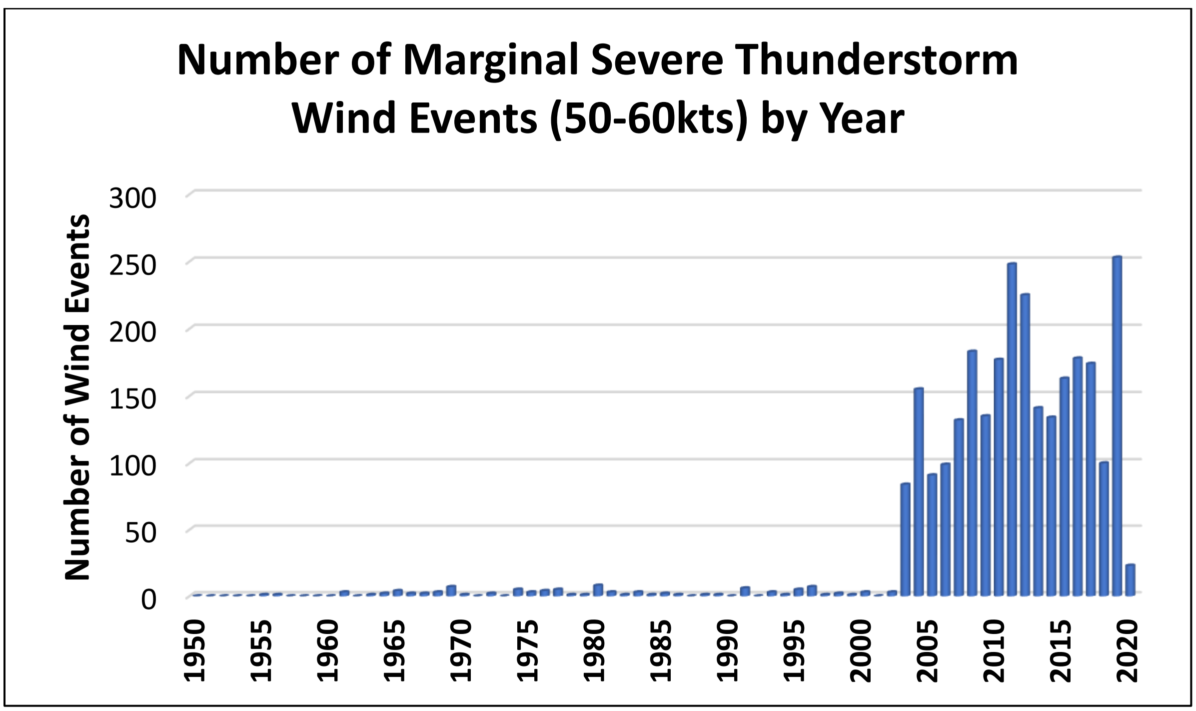

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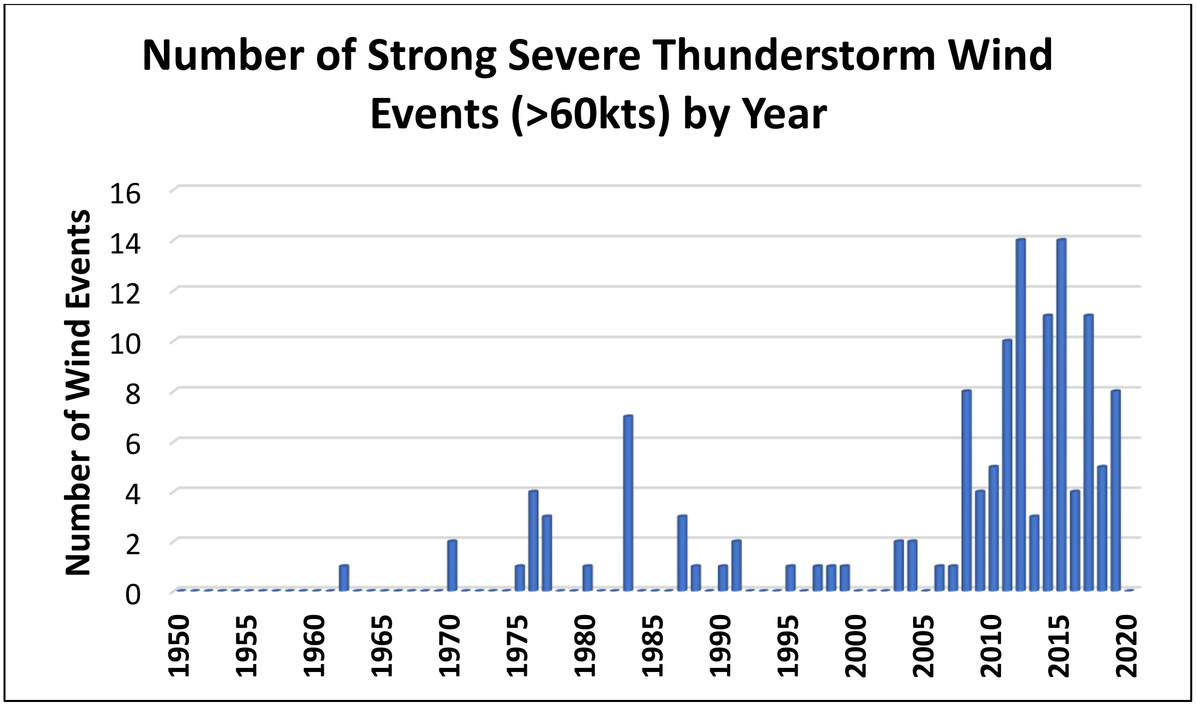
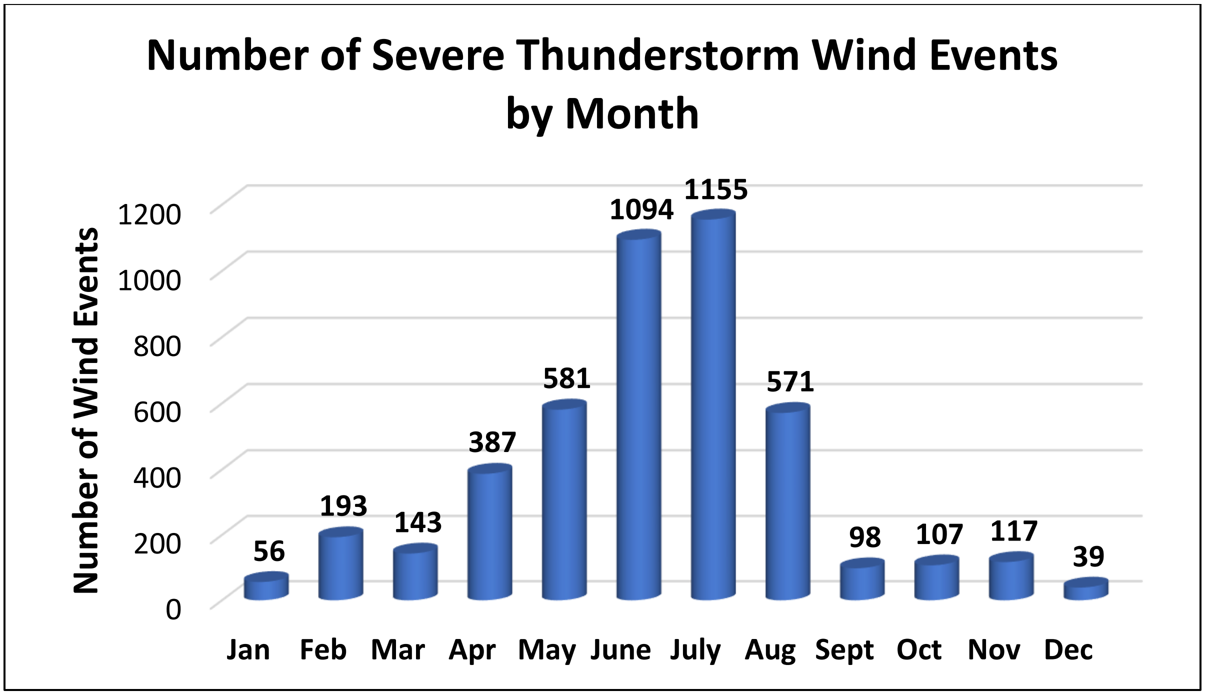


Figure 30

2. *Monthly Frequency*

July is the peak month for wind events, representing 25% (1155) of the thunderstorm wind events, with June not far behind with 24% (1094) of the total wind events (Figure 31). The months between April and August contain about 83% (3401) of the thunderstorm wind events. There is a sharp increase in events from March to April (143 to 387 events, respectively) and another large increase from May to June (581 to 1094 events). A fairly sharp decline in events occurs between August and September (571 to 98 events). The least active months for thunderstorm wind events are December and January, during which around 2% (95) of events have been documented. Similarly to all thunderstorm wind events, the events over 60 knots are most likely in July (Figure 34).

The overall distribution for the data of thunderstorm wind days is slightly more similar to a standard bell curve. The sharp increases in data are still present, however they do not appear as drastic of jumps as in the data with all the events, except for the jump from August to September. The small increasing trend from September through November is not present with the data of the wind days, indicating that either multiple individual wind events occurred on the same day for October and November, or multiple reports were given for the same event during these months. Similarly, February, which had more events reported than in March, had about half the number of individual days with severe wind events than March did.



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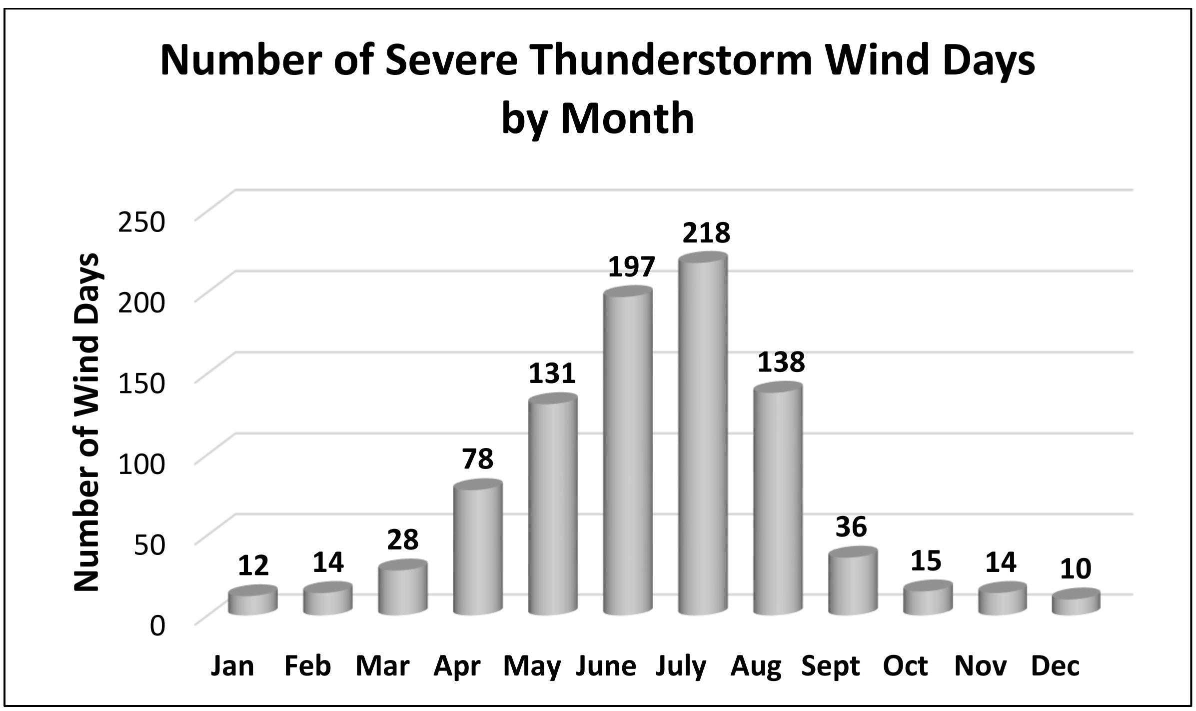

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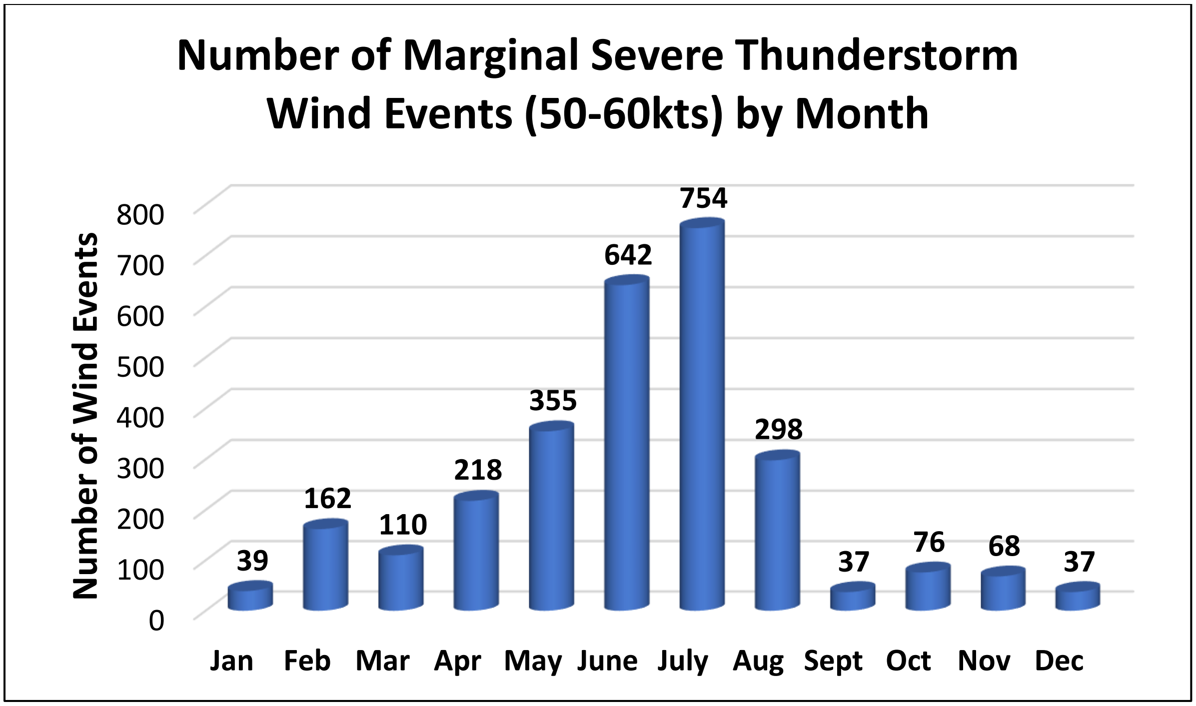

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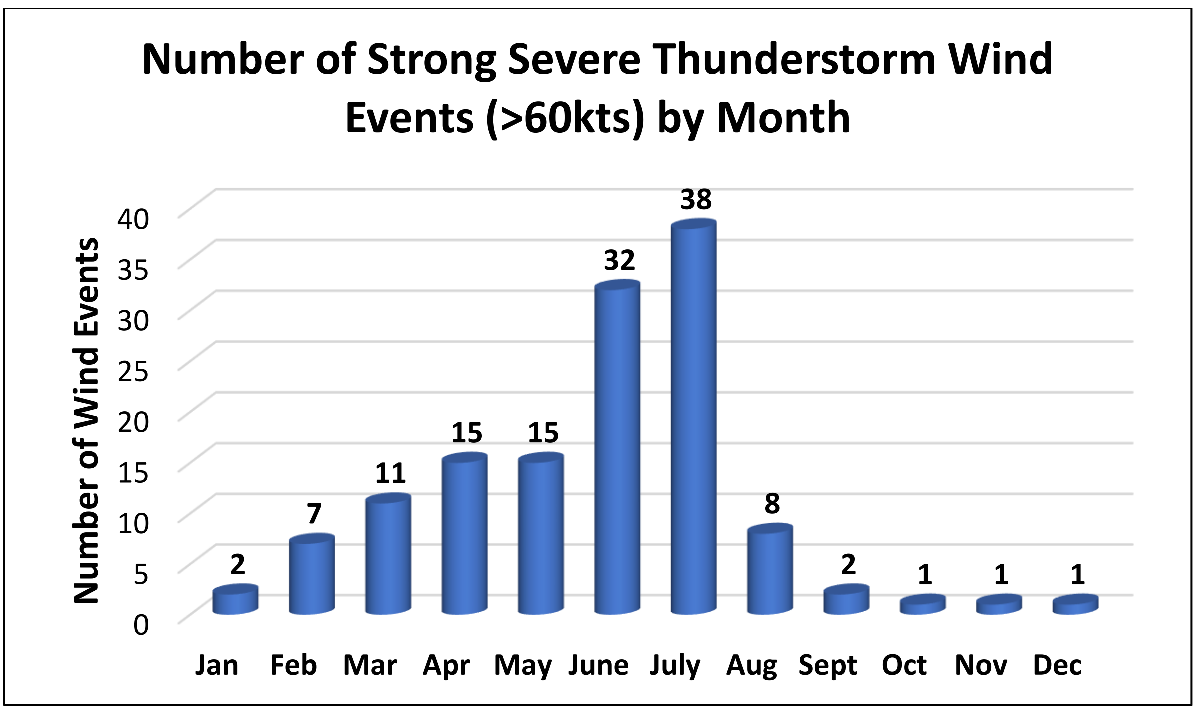


Figure 34

3. Hourly Frequency

Thunderstorm wind events are most common during the afternoon and evening hours, with 79% (3593) of all thunderstorm wind events occurring between noon and 8 PM (Figure 35). Thunderstorm wind events peak between 3 PM and 6 PM, with 47% (2156) of events occurring during this time. Much like the data containing all severe weather events, wind events have a secondary, smaller mode around and just after midnight. This is believed to be related to Mesoscale Convective Systems (MCS) that develop upstream in the afternoon and push through during the late night hours. Thunderstorm wind events drop off significantly between 4 AM and 8 AM. However, thunderstorm wind events have occurred during all hours of the day.

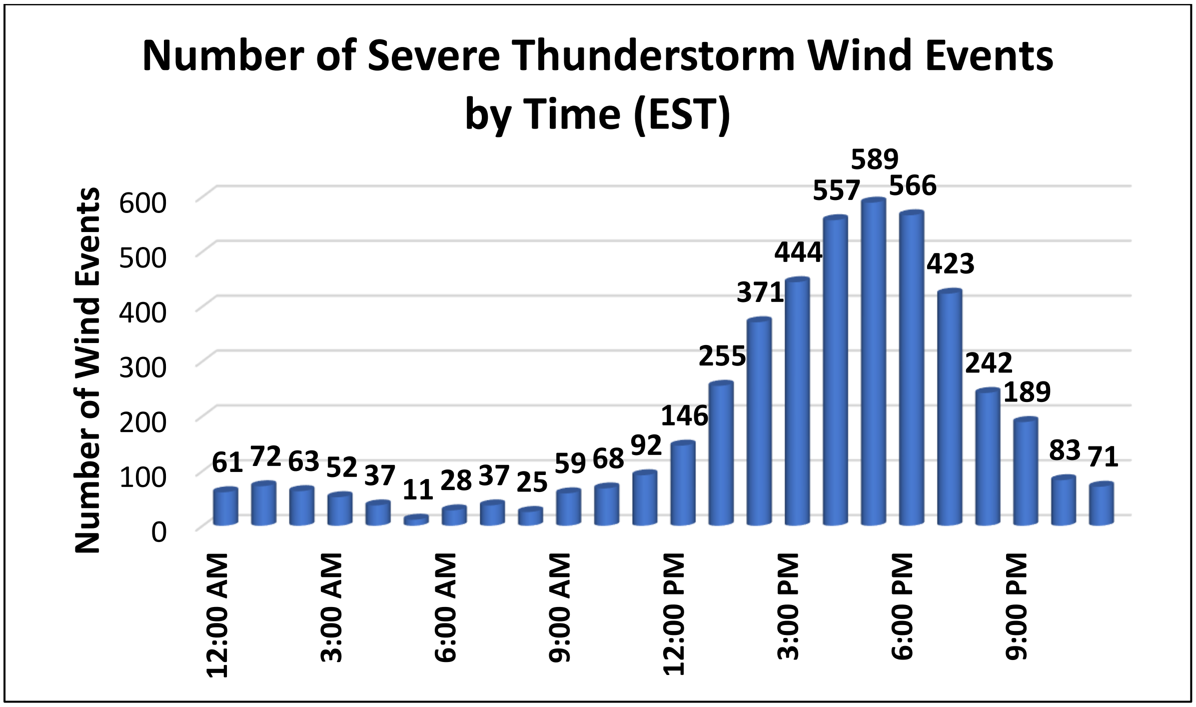
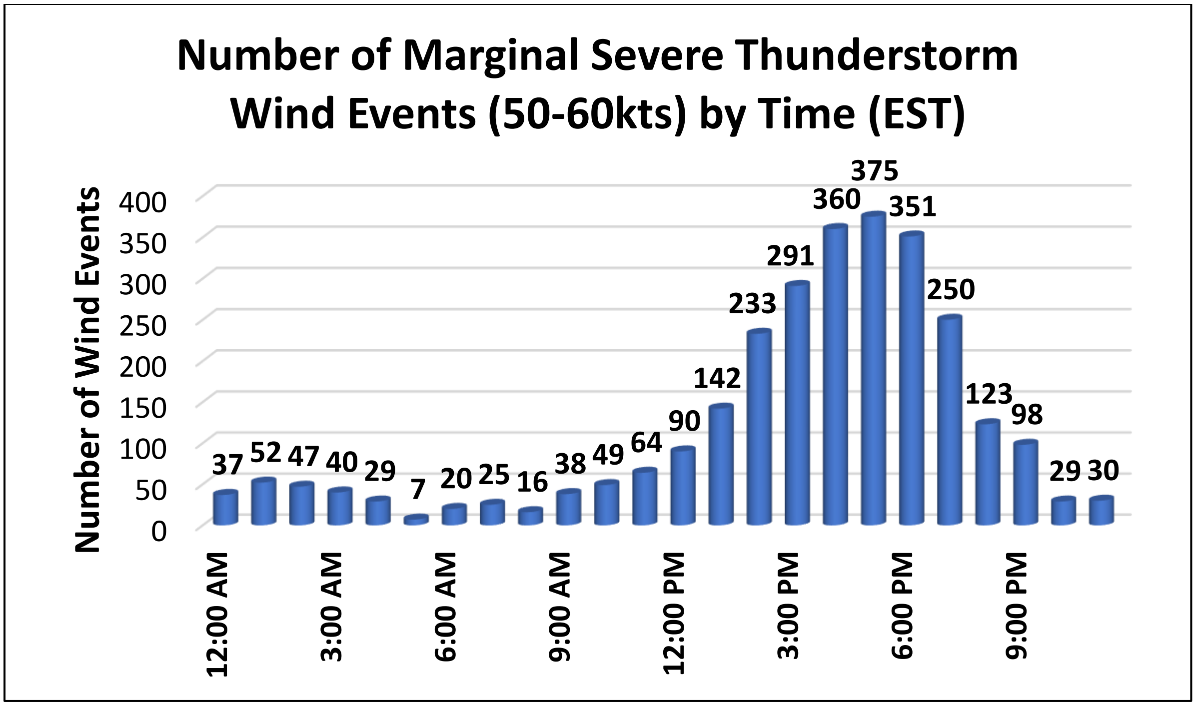


Figure 35



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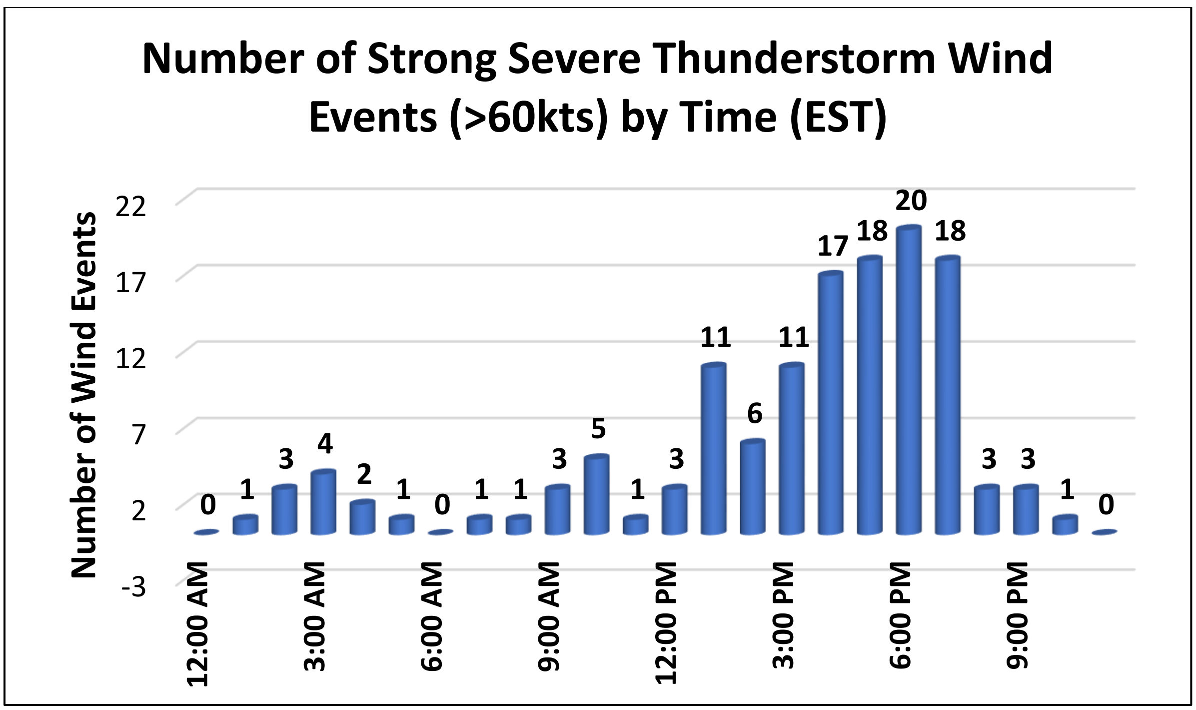
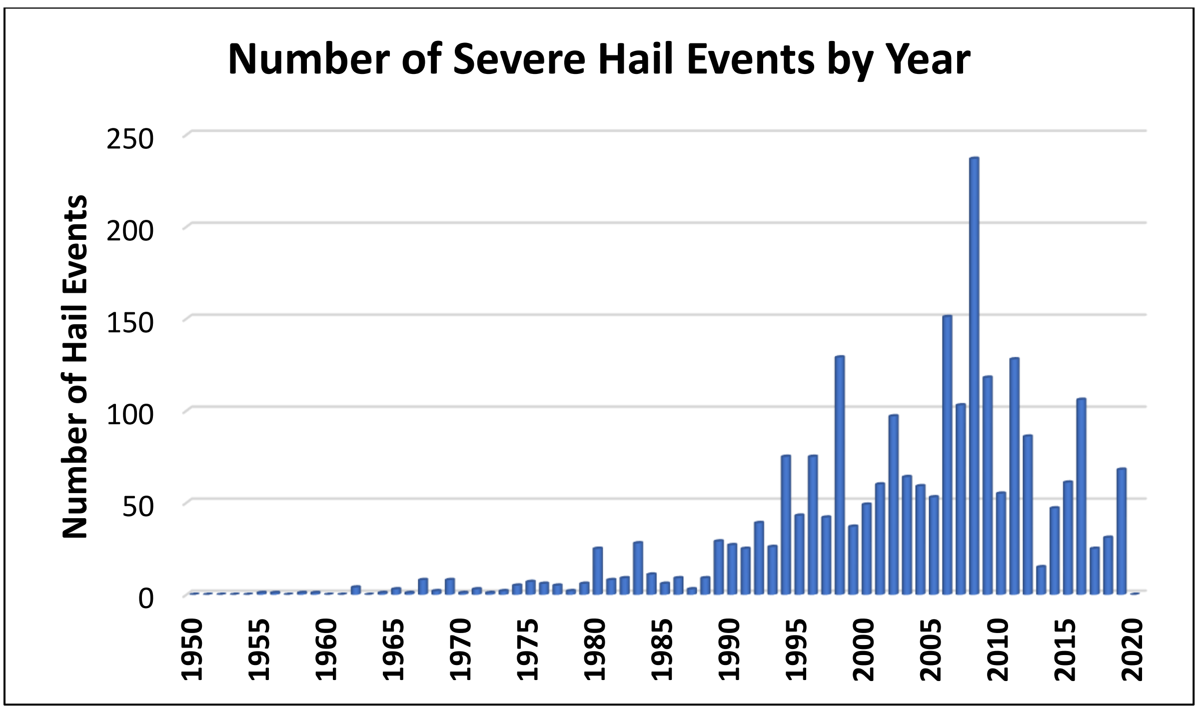


Figure 37

D. Hail Events

Hail reports require special handling when looking at climatology because the criteria for severe hail was changed in 2010. Up through 2010, severe hail was identified as any stones 0.75 inches in diameter or larger. However, this was increased to one inch or larger after studies determined that damage is not common with hailstones less than one inch in diameter. This creates a bit of a dilemma when looking at severe statistics, especially in the Charleston, WV CWA where large hail is not as common as other locations, such as the Midwest and Southern Plains. Even after 2010, 0.75 inch hail reports are still sometimes archived from hail events, however due to the change in criteria, it is possible that some forecasters may not LSR these reports, or at least every incoming 0.75 inch report, as they no longer reach criteria. Thus, for the purpose of this study, any hail reports included from before 2010 include those 0.75 inches and larger as they meet the severe criteria that was in place during that timeframe, while reports after 2010 include only those 1 inch and larger to match up with current criteria. Additional graphics have hail magnitudes broken down into marginal (0.75 inches to 1 inch) and large (greater than 1 inch) hail.

There have been 2337 hail events, and event counts vary quite a bit from year to year (Figure 38). Spatial and hot spot maps indicate that hail reports are well correlated with population density (Figures 39-41). It is surmised that a number of hail reports are missed in the more rural and wooded areas of the CWA, where real time observation is less common. The map of days with hail events somewhat mitigates the population issue as it removes what may be multiple reports for the same event, but population is still a factor with this data as, once again, reports may be completely missed in rural areas.



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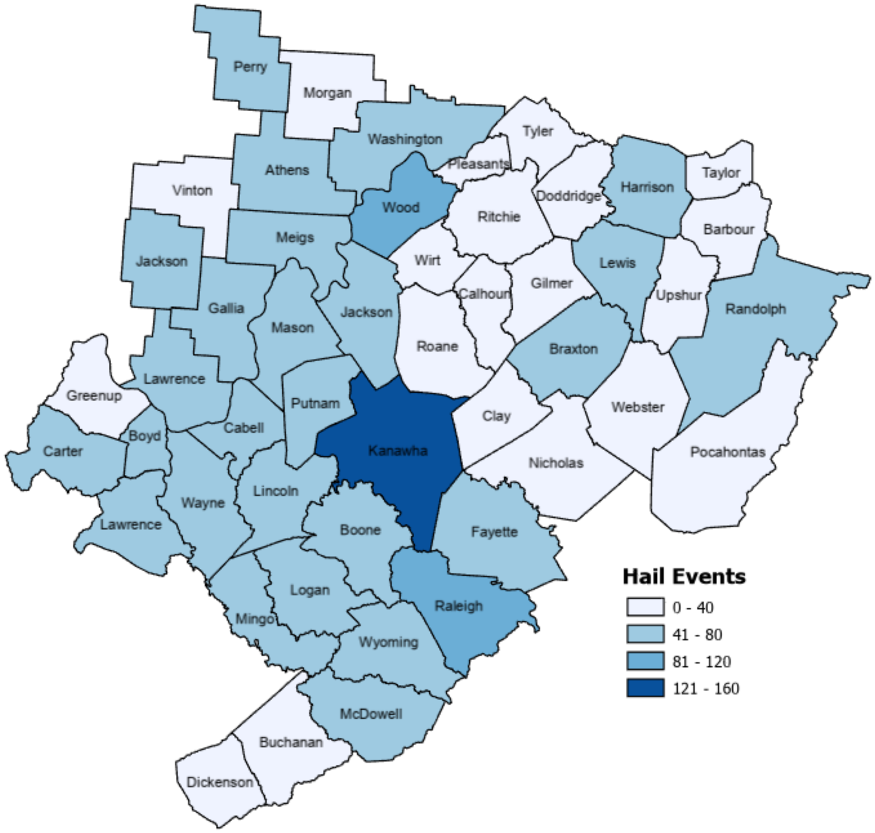

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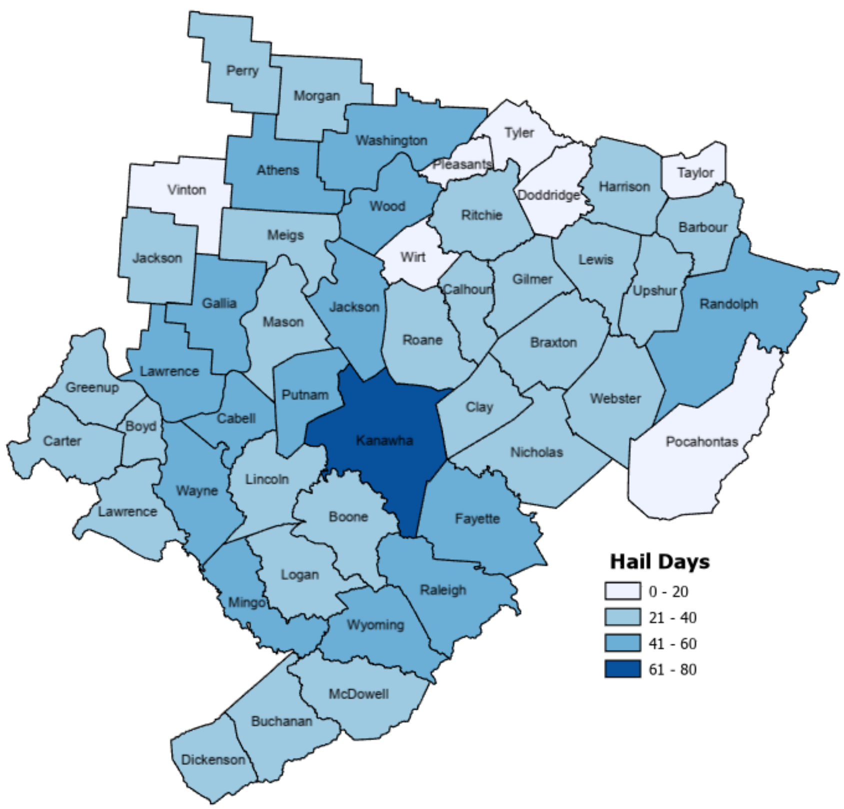

Figure 40

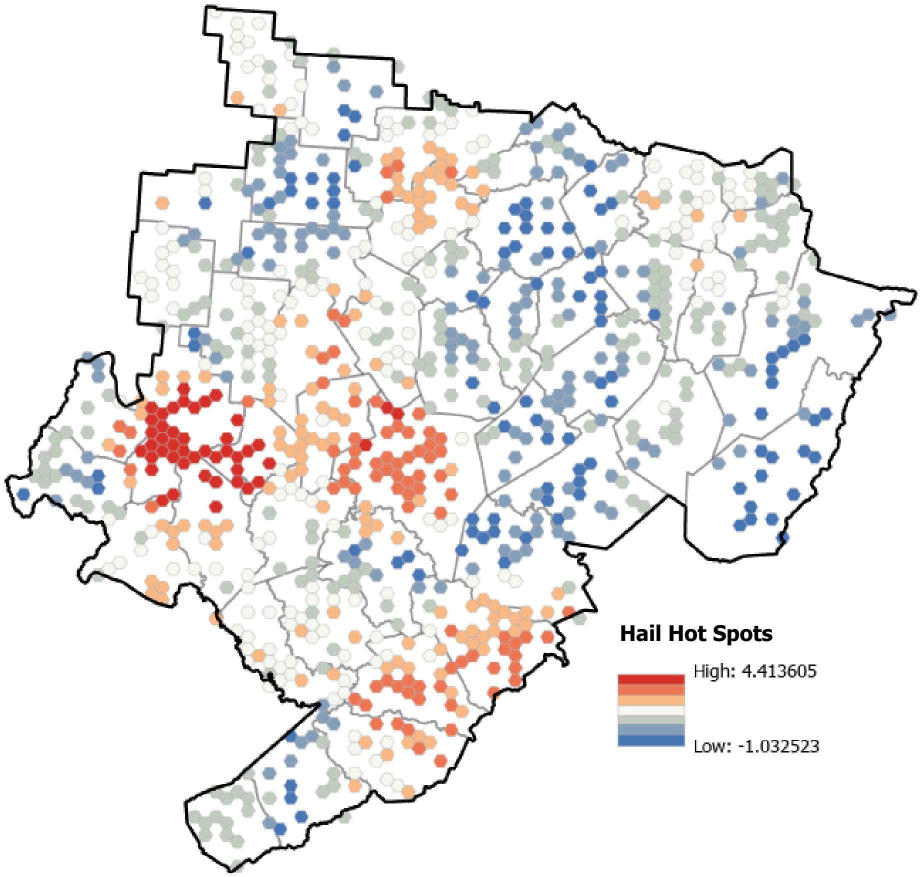

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Figure 41

1. *Magnitude*

Large hail is relatively rare in the Charleston, WV CWA. When considering only large (1 inch or larger) hail, there have been 596 events, which is about 26% of all hail events, and about 8% of all severe events. 0.75 and 1 inch reports make up most of the hail reports for the CWA, with all of the 0.75 inch reports included taking place before 2010 (Figure 42). For the hail reports larger than 1 inch, golf ball sized hail (1.75 inch) makes up the most reports with around 43% (257) of the large hail reports, and ping pong ball sized hail (1.25 inch) follows with about 28% (164) of the reports. There have been 3 hail reports over the 70 year period that were 4 inches or larger. Just like with all hail events, the yearly count varies quite drastically from year to year (Figures 43-44).

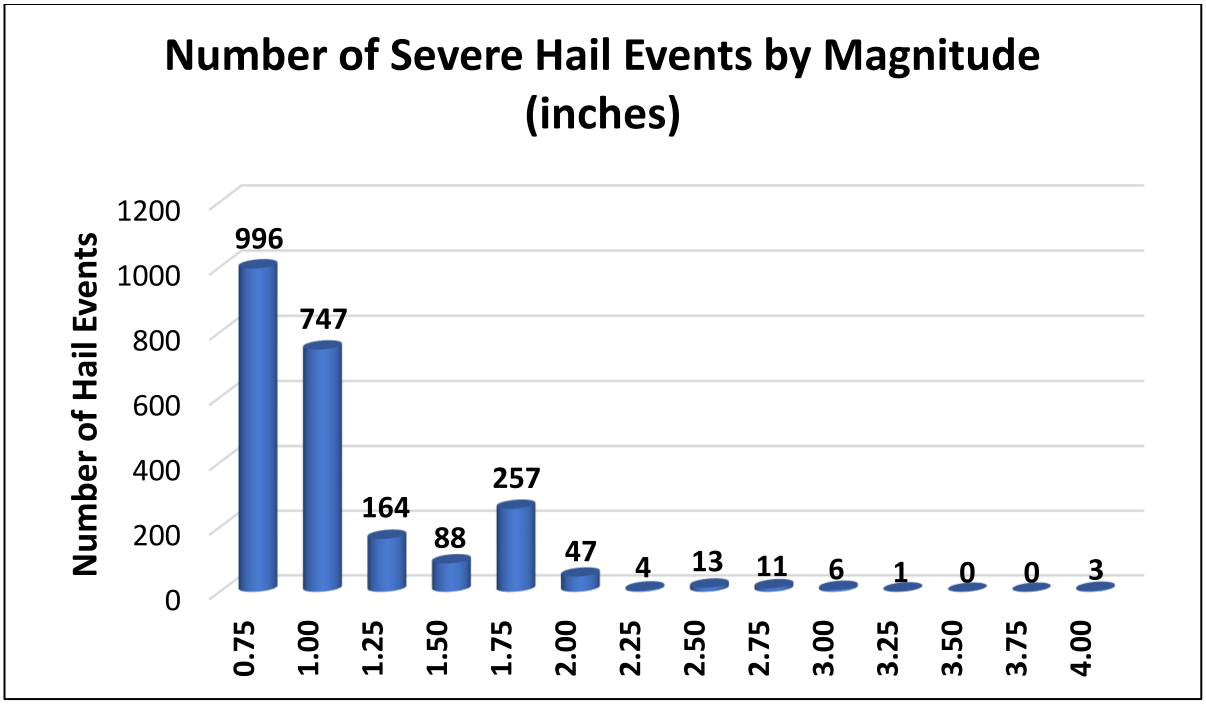

Figure 42

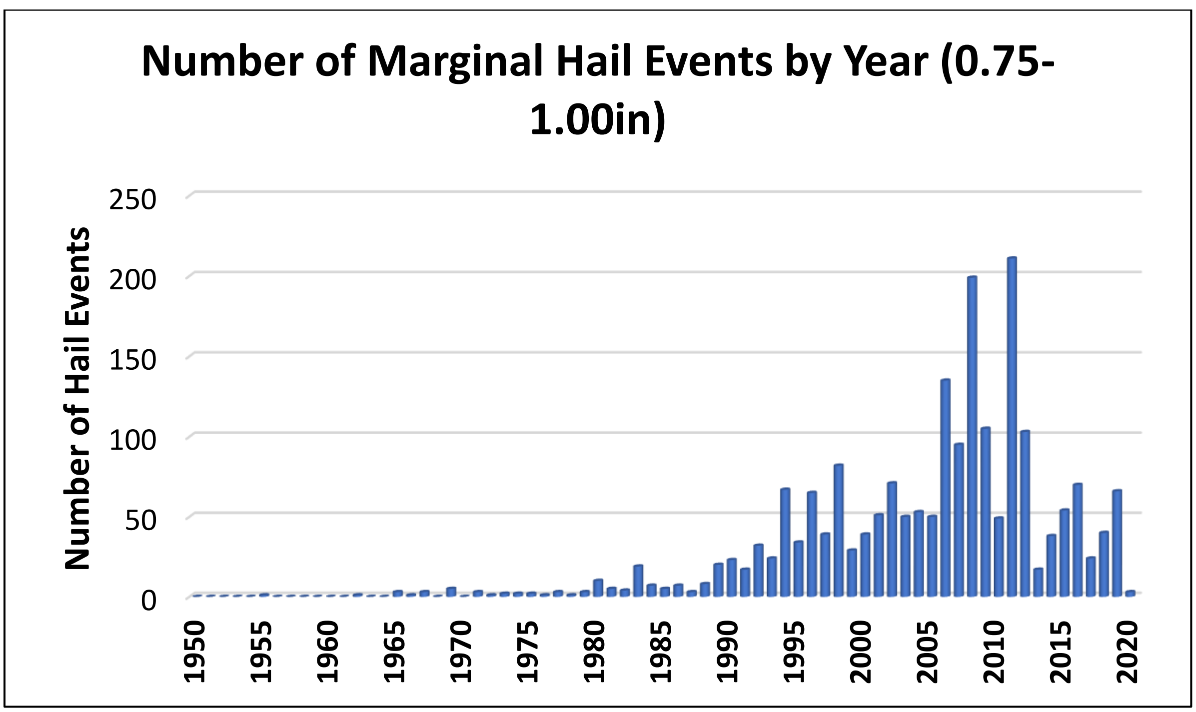

Figure 43

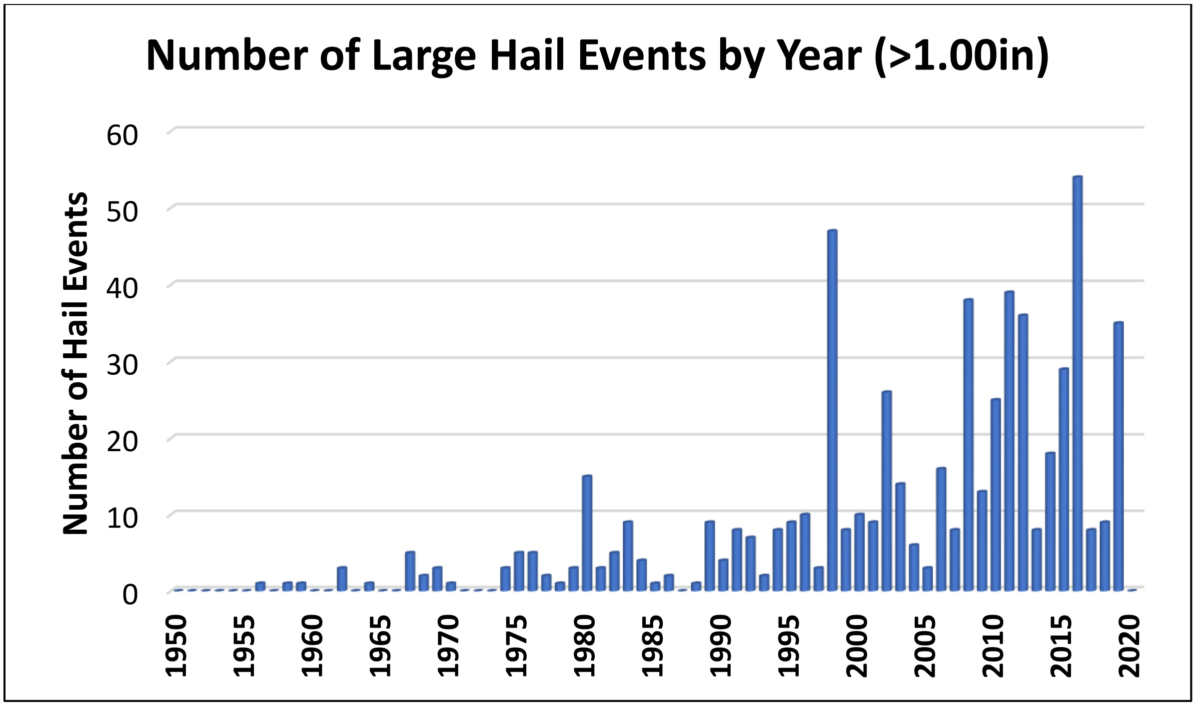

Figure 44

2. Monthly Frequency

Typically, the spring and summer months are the most common for thunderstorms which produce hail (Figure 45). There is a sharp increase in the number of hail reports from March (120) to the peak month of June (707). Nearly 81% of the hail events (1890) occurred from April through July. There is a decrease in thunderstorms that produce hail during the transition from summer to fall (95 events in September compared to 38 events in October). The three month period of November through January is very inactive (41 events). When separating marginal and large hail, the overall trends remain similar (Figures 45-46). However, April through June stand out slightly more for large hail with around 72% of the large hail events occurring within those months.

The display of severe hail days by month shows a more even distribution of the data (Figure 46). There is still a drop between June and July, however it is not as drastic as the data containing all hail events per month. On the other hand, there appears to be a more noticeable gap from April to June and from July to August than with the total hail report data.

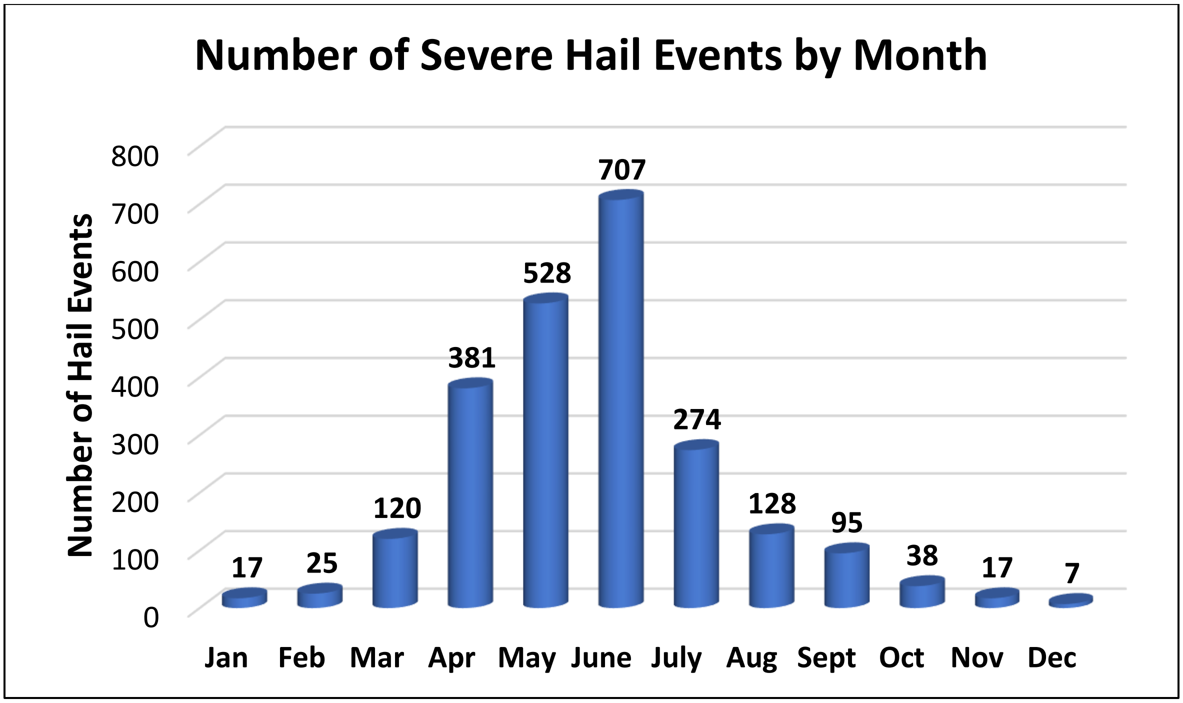

Figure 45

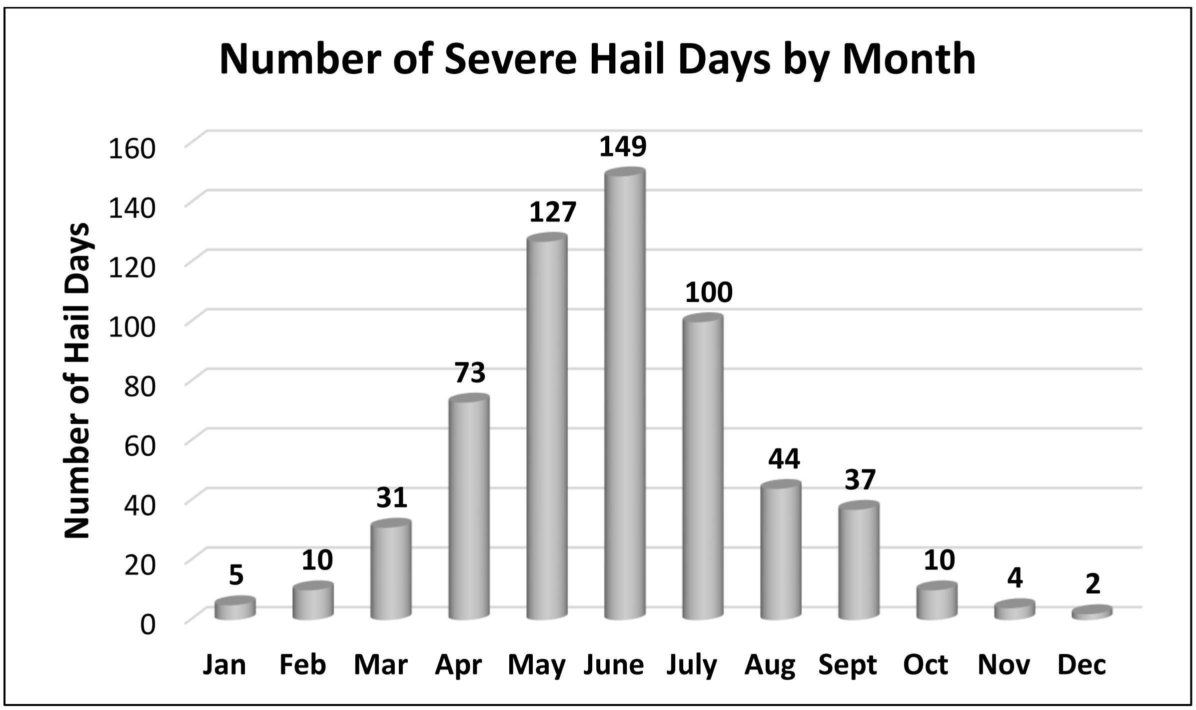

Figure 46

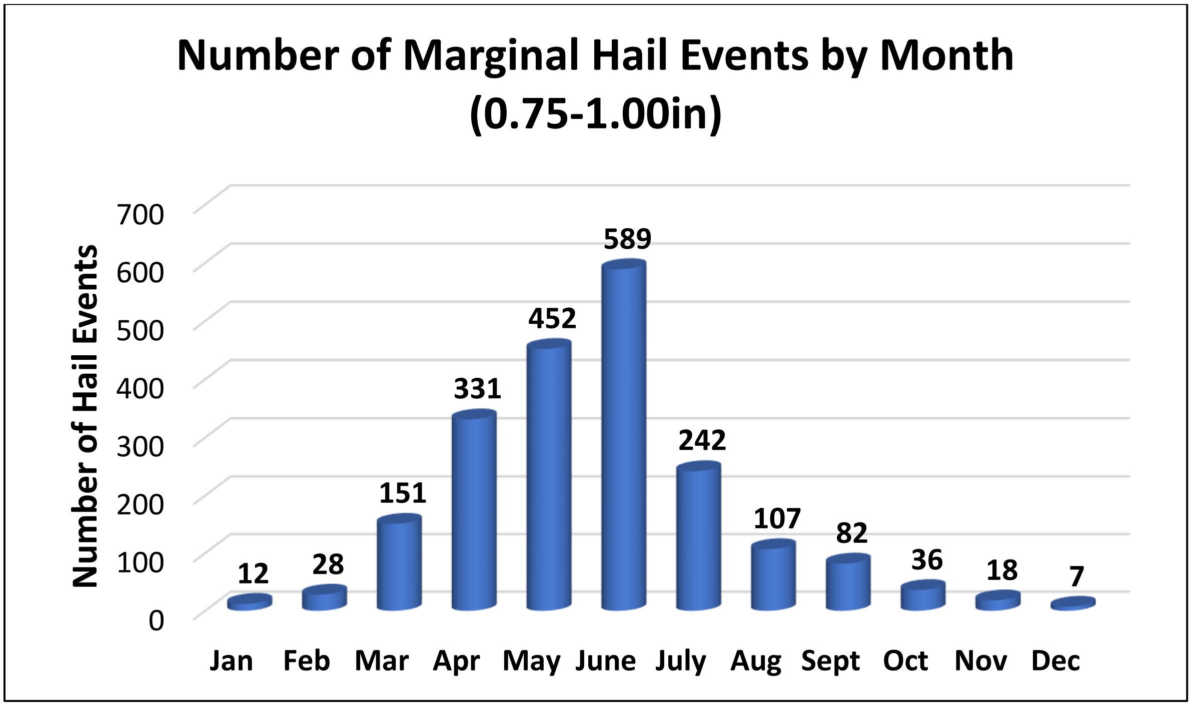

Figure 47

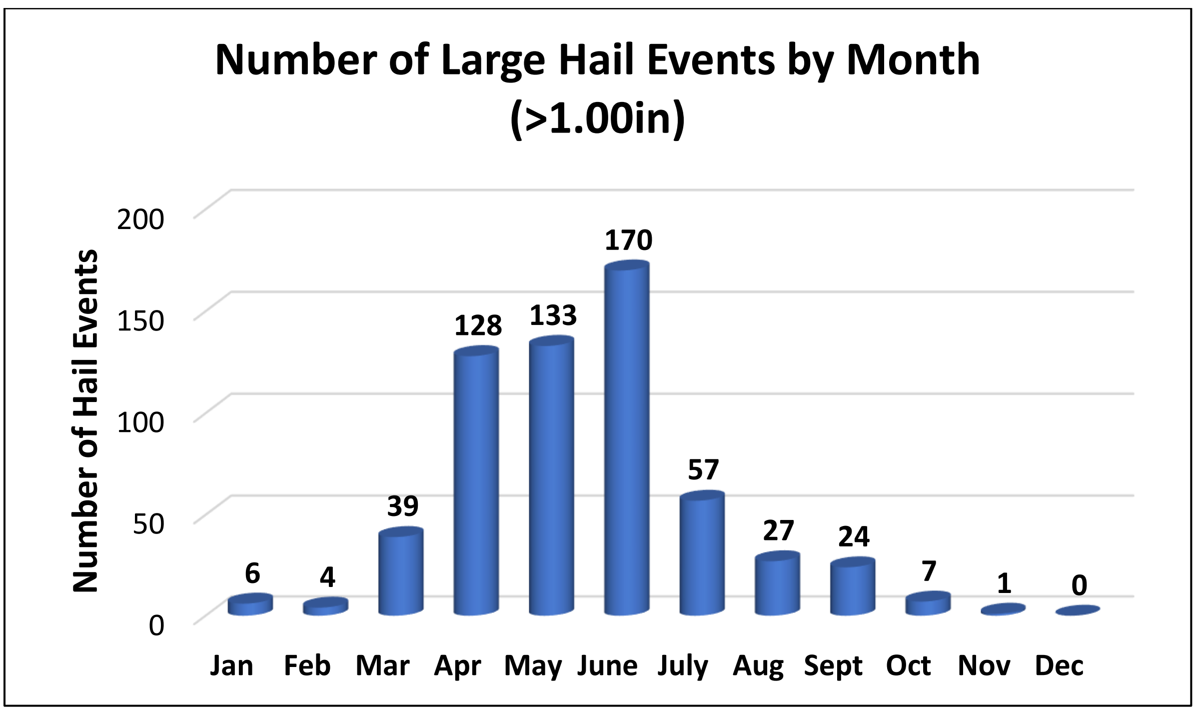

Figure 48

3. *Hourly Frequency*

The frequency of hail events is the highest in the afternoon and evening hours (Figure 49). Around 82% (1909) of all events occurred between 1 PM and 7 PM, with the peak occurring between 2 PM and 4 PM. Hail events are less frequent between 2 AM and 10 AM, however much like other severe weather types, hail can occur at any time of the day. When separating marginal and large hail events, the trends remain very similar (Figure 50-51).

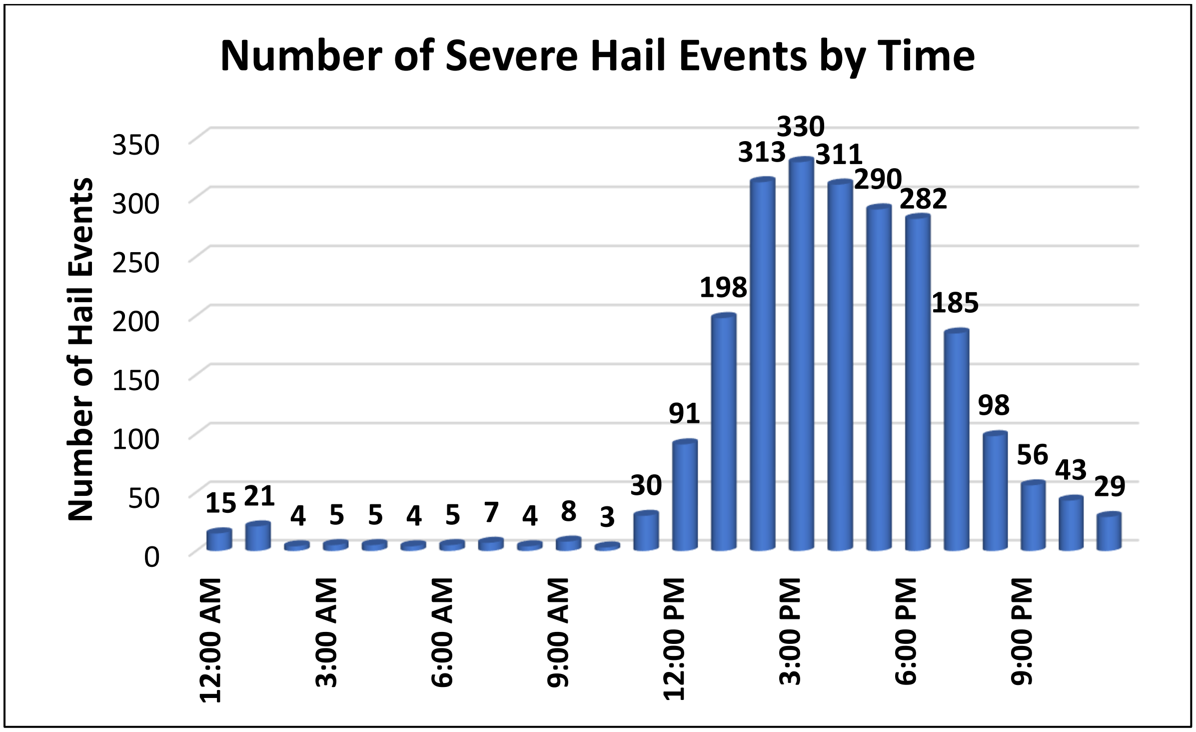

Figure 49

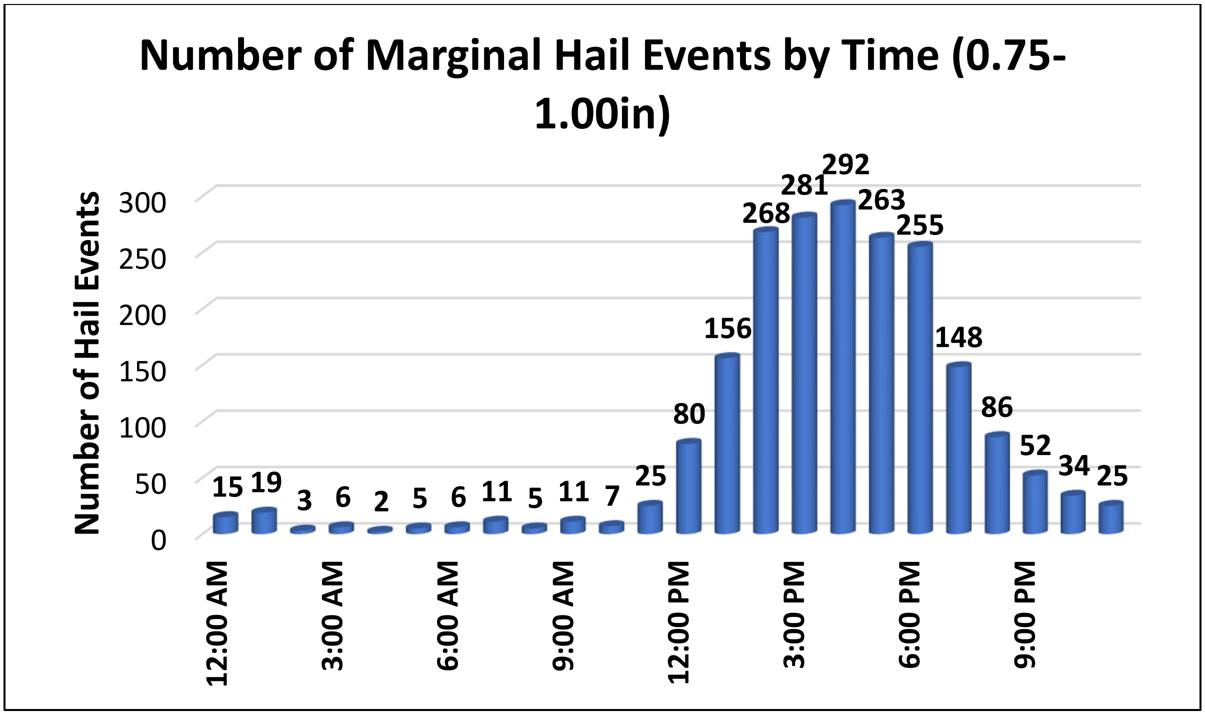

Figure 50

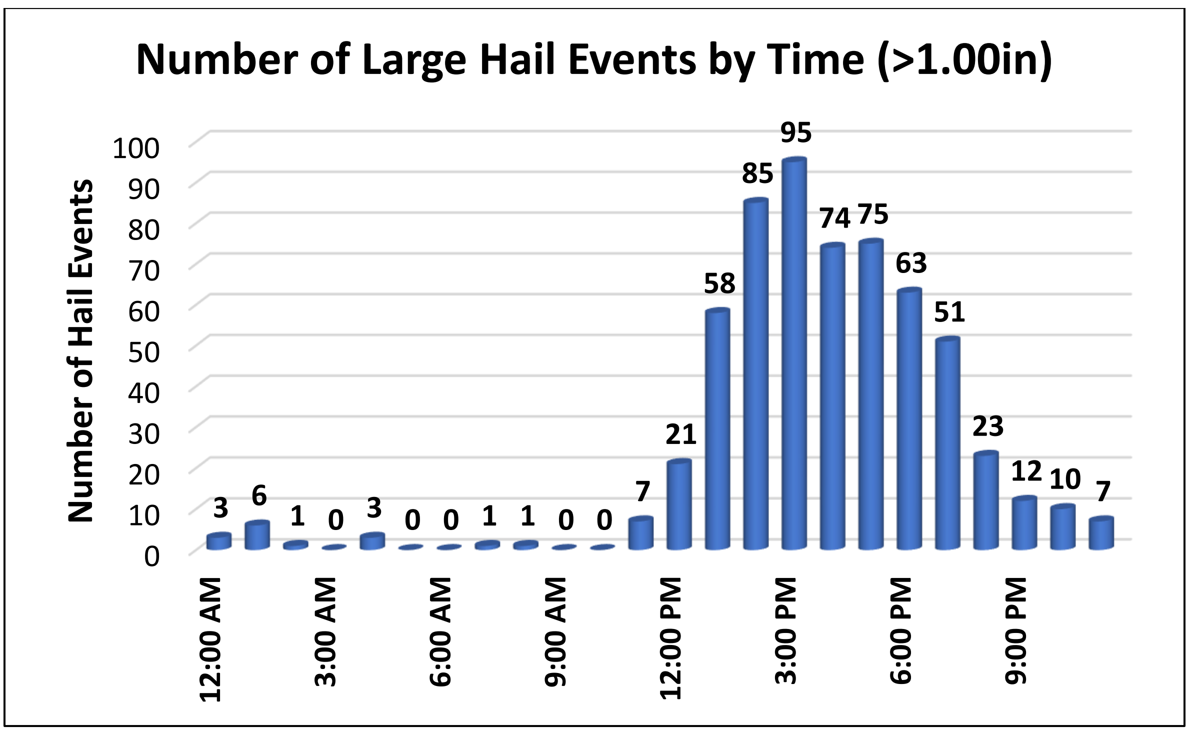

Figure 51

E. Significant Severe Events.

In addition to defining severe thunderstorms, the SPC also gives a definition for significant severe thunderstorms. A significant severe thunderstorm will meet one or more of the following criteria:

- A tornado that produces EF2 or greater damage
- Hail two inches in diameter or larger
- Wind 65 knots (75 mph) or greater

The yearly data for significant severe events shows a similar distribution to the data containing all severe events, which is logically consistent as the significant events are a subset of all of the severe events (Figure 52). There were more significant severe events reported within the last century or so, which, as mentioned with the severe events, may be due to the increase in factors such as population, technology, and a stronger effort to find reports through the WFO itself. Overall, most of the CWA is susceptible to significant severe weather events. Only a few counties have no reports of significant severe events, with two out of three of these counties along the northeastern West Virginia mountains (Figure 54). The areas that stand out as having the most significant severe events are similar to those that jump out with the severe events as well.

To delve even further using a recent change the National Weather Service has implemented: definitions have been developed for “destructive”, “considerable”, and “base” damage threat categories. The destructive damage threat calls for 80 mph (70 kt) winds and/or 2.75 inch diameter hail. The criteria for the destructive category is slightly higher than the criteria for an event to be considered a significant severe event, thus the destructive events shown are a subset of the total significant severe events over the area. The considerable category is for 70 mph (61 kt) winds and/or 1.75 inch diameter hail and the base threat is same as the standard severe thunderstorm definition with one inch diameter hail and/or 58 mph (50 kt) winds. As of August 2^{nd}, 2021, any severe thunderstorm warnings meeting the damage threat criteria of destructive will now activate Wireless Emergency Alerts (WEA) on smartphones, while considerable and base tagged severe thunderstorm warnings will not alert the WEA system as in the past. Over the 70 year period, just under 80 events met this destructive damage threat criteria with 34 of the 49 counties in the Charleston, WV CWA experiencing at least one destructive event over the time period (Figure 56). This is about 1% of the total severe events recorded and averages out to about one destructive event a year. Overall, these destructive events are not very common for the forecast area, however they also cannot be completely ruled out.

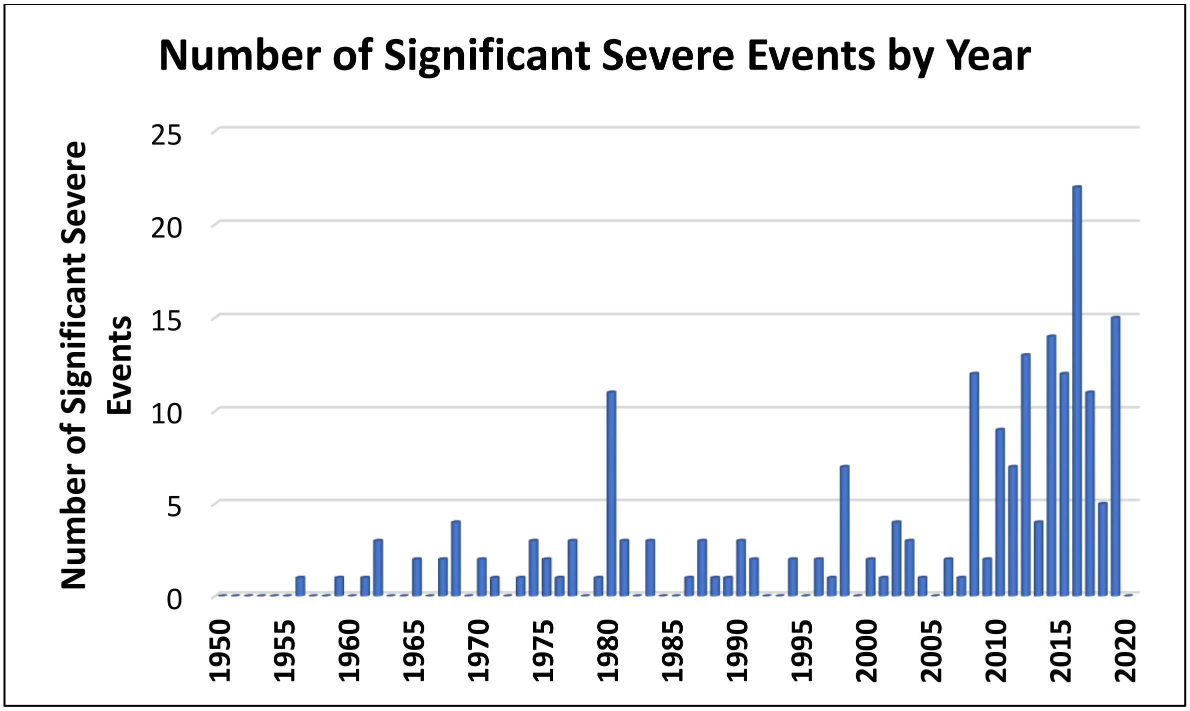

Figure 52

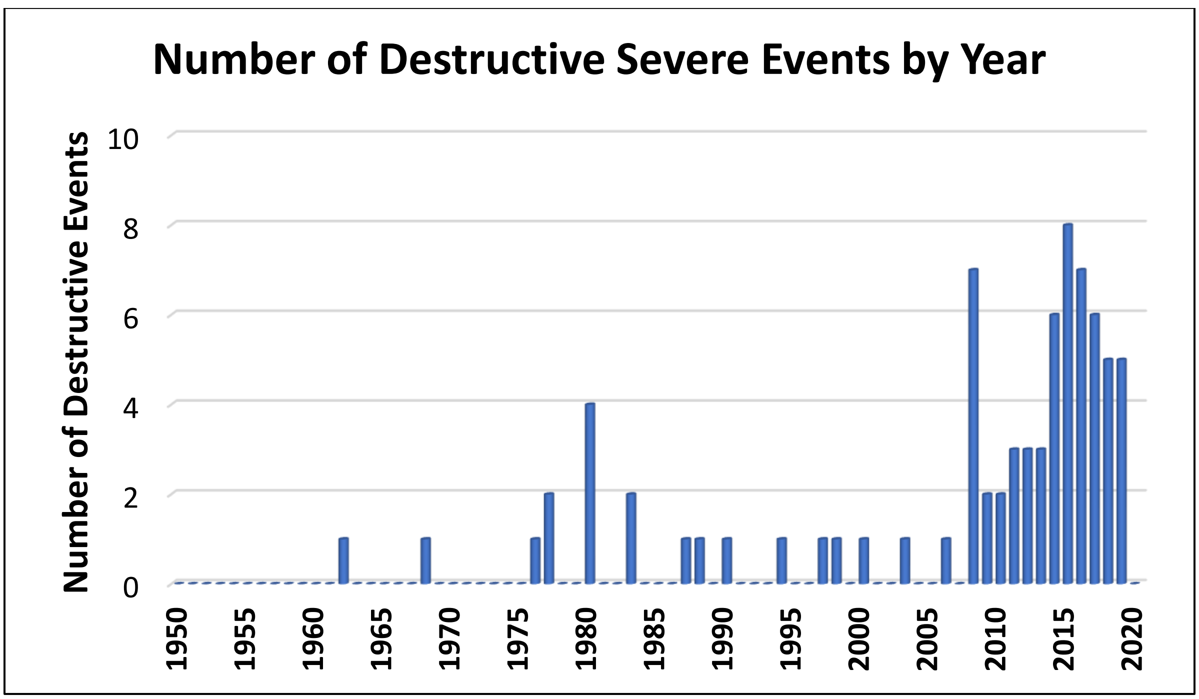

Figure 53

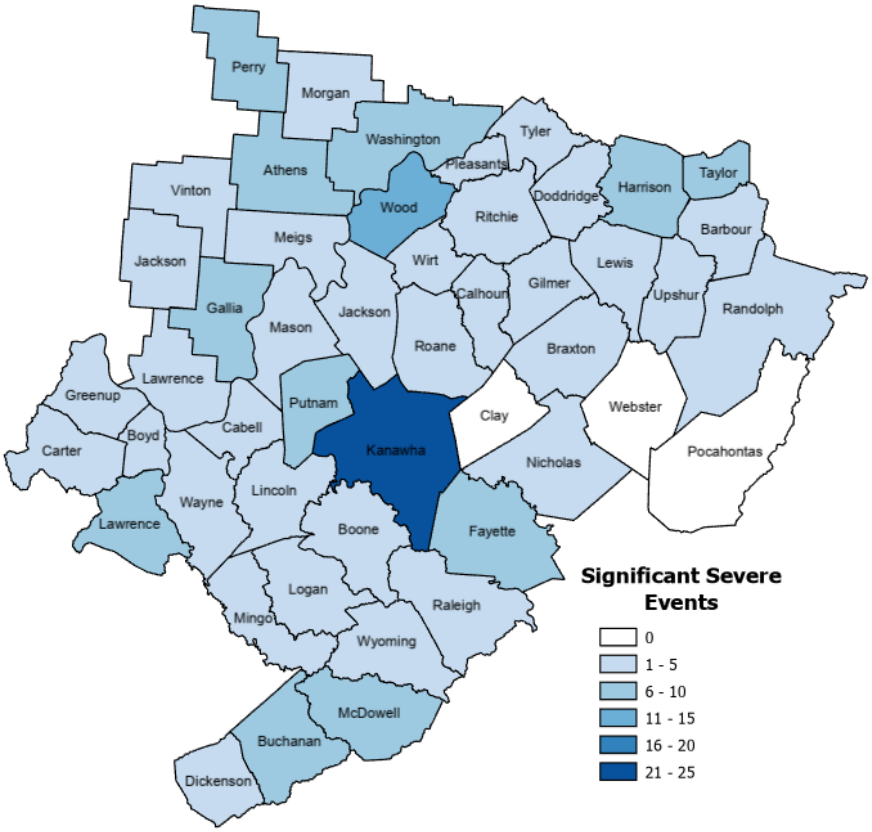

Figure 54

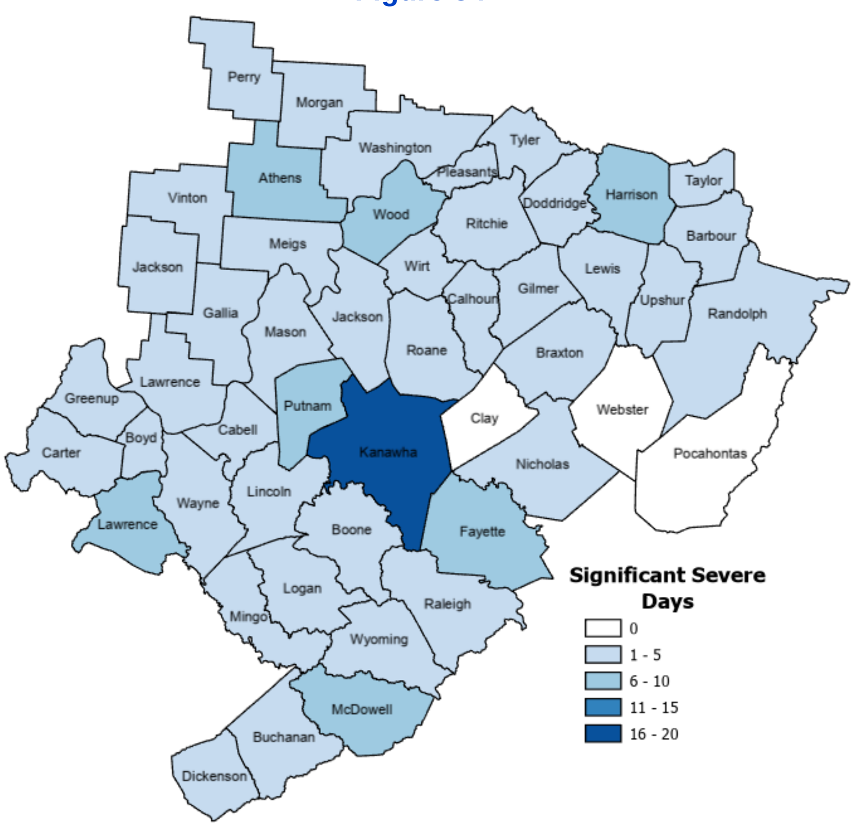

Figure 55

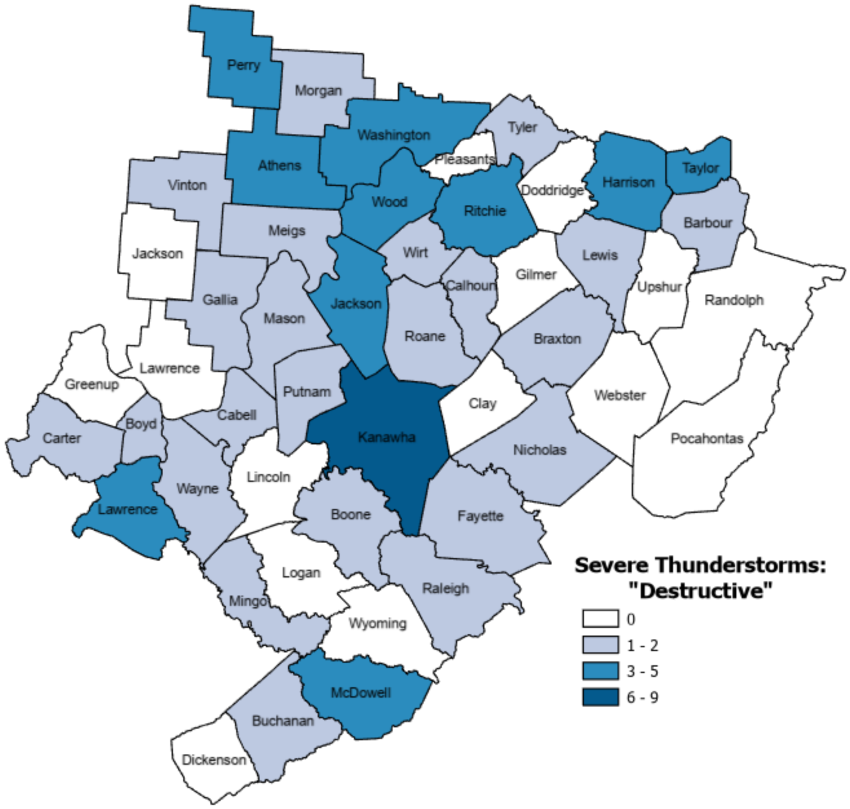

Figure 56

1. *Monthly Frequency*

Every month except December has had at least one significant severe event (Figure 57). June and July tied for having the most significant severe events per month with an overall increasing trend in the number of significant severe events from January through July (Figure 57). However, when looking at the days per month with at least one significant severe event, June has had more unique days with these events of the two (Figure 58). April through July have had the most events with about 79% (164) of the significant severe events, and there is a large drop off from July to August. When breaking each month down into the three severe weather types, wind and hail events make up most of the significant severe events, likely because the area has had mostly weak tornadoes and overall many more hail and thunderstorm wind events have occurred (Figure 59). For April through June, there were more hail than wind events, however August had far more significant severe thunderstorm wind events than hail.

For the events that qualify for the “destructive” damage threat, an increasing trend can also be seen for the first half of the year with a peak month of July containing the most destructive events (Figure 60). June and July make up about 57% (44) of the events with only a few events occurring during the fall and winter months.

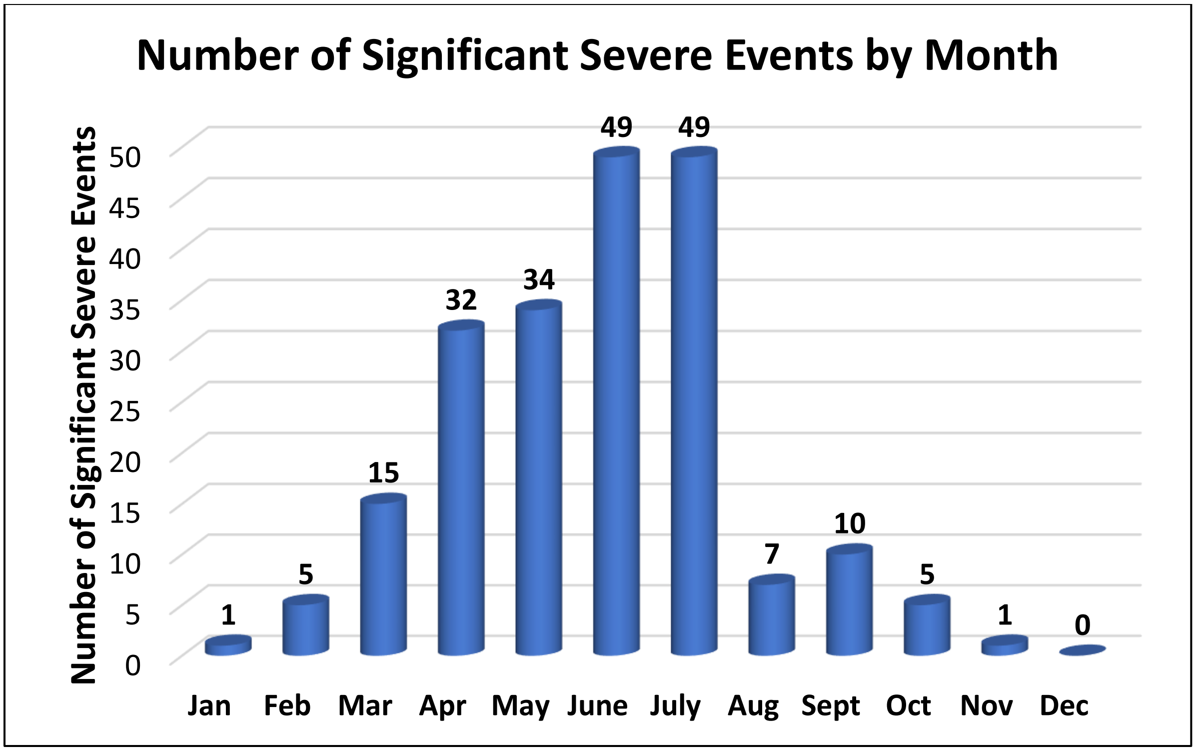

Figure 57

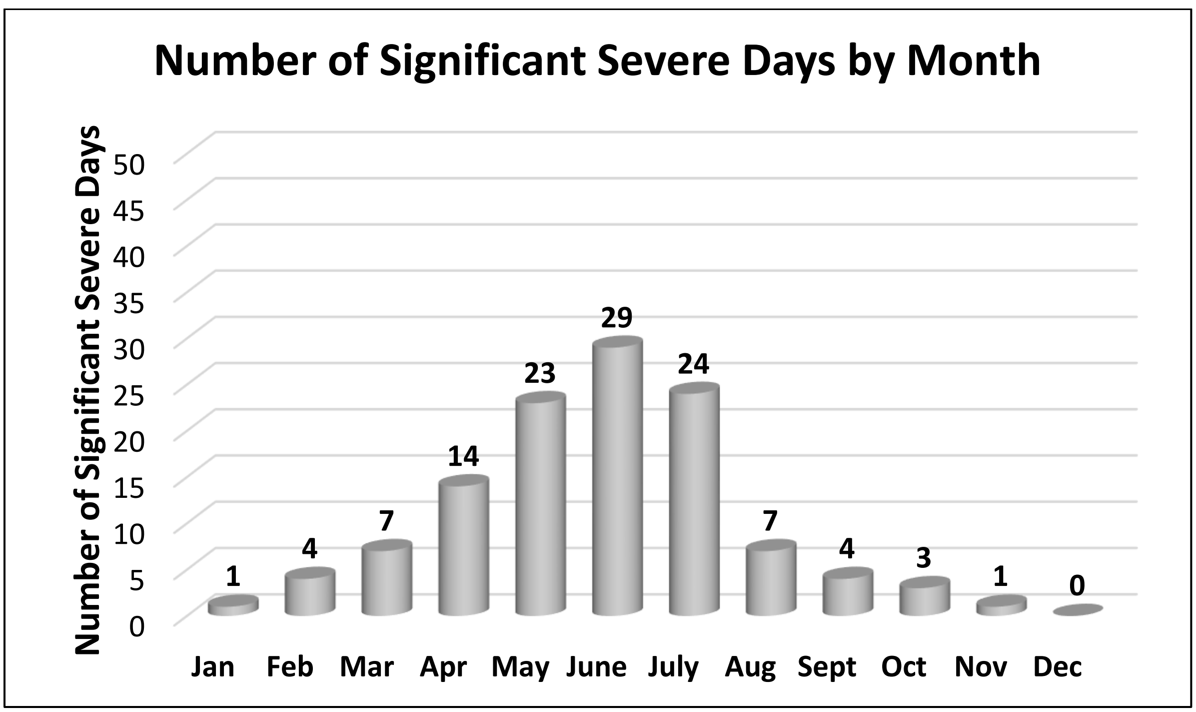

Figure 58

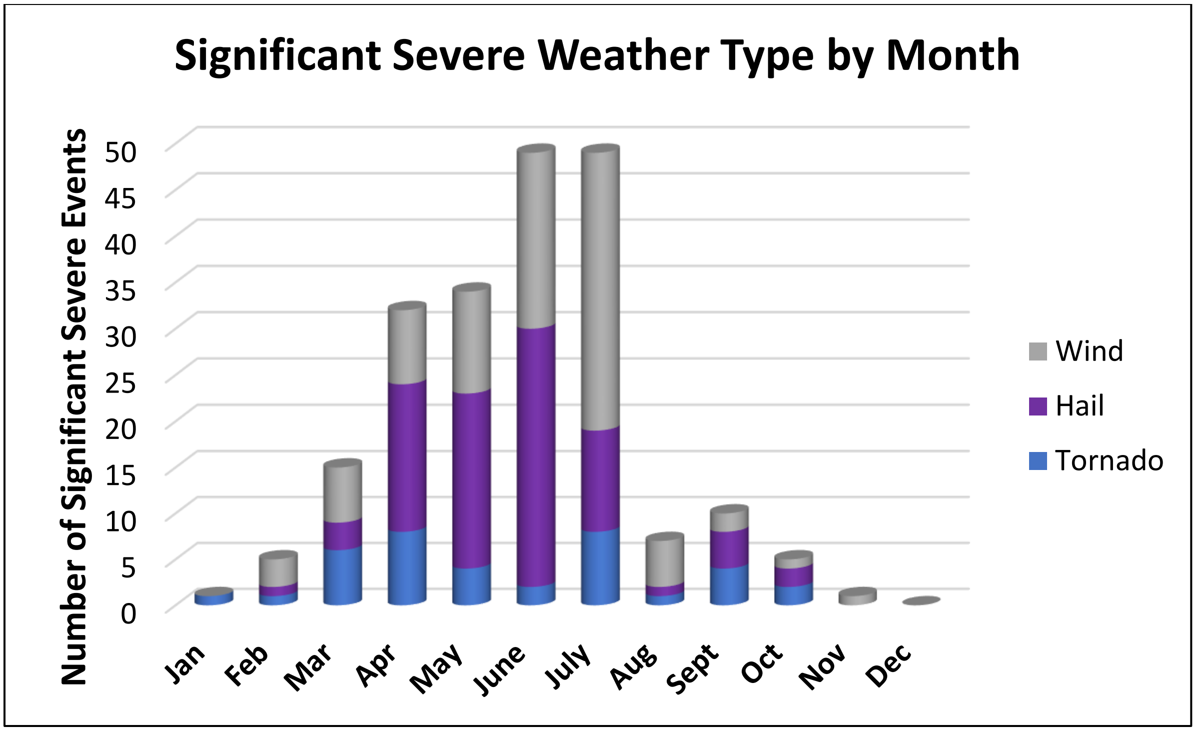

Figure 59

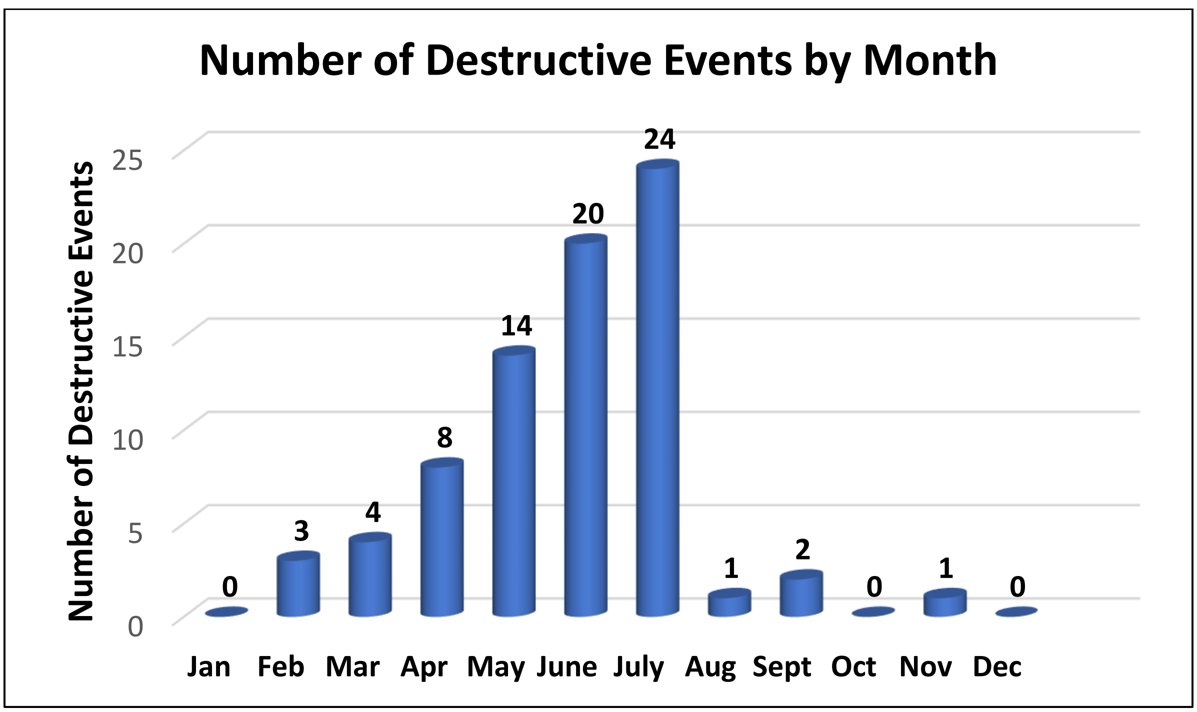

Figure 60

2. *Hourly Frequency*

Most significant severe events occurred in the afternoon to early evening, following a similar pattern to the total severe events (Figure 61). Additionally, there is also a small peak during the early morning hours, around 3 AM, just as with the severe event data. 168 events occurred from 1 PM to 7 PM, which is about 81% of all of the significant severe events.

81% (62) of the destructive events also occurred between 1 PM to 7 PM, showing a similar spread to the significant severe events (Figure 62). The destructive events also shows a smaller peak from 2 AM to 4 AM.

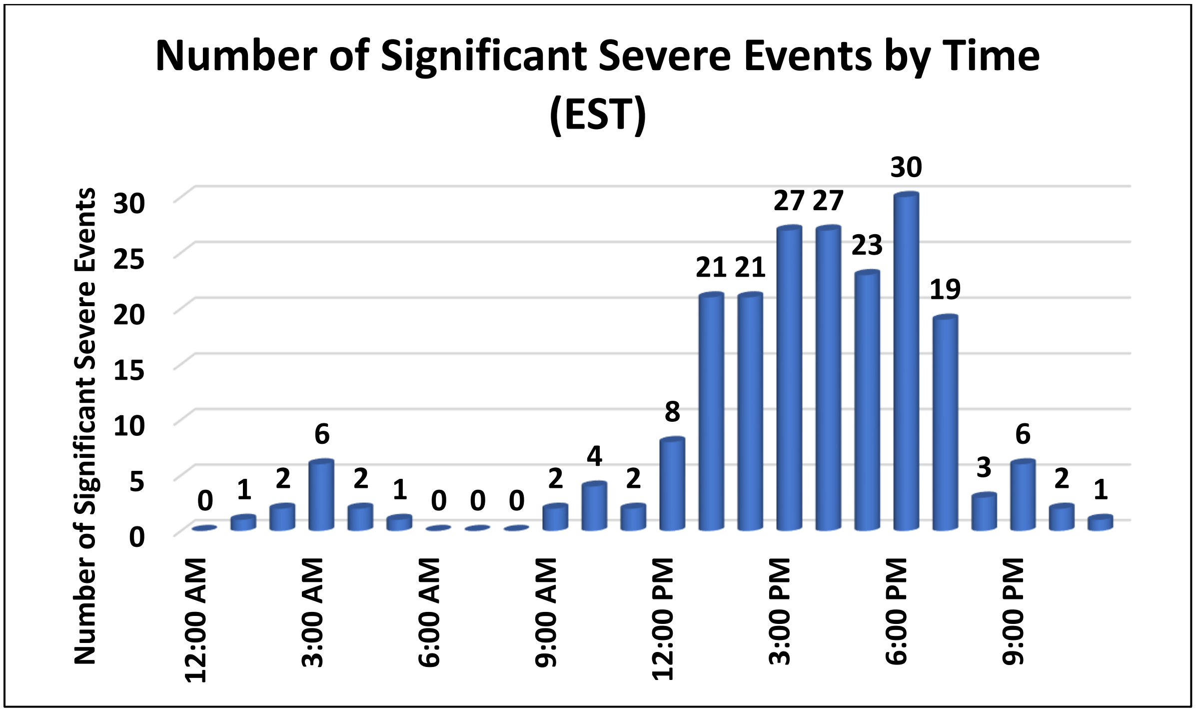

Figure 61

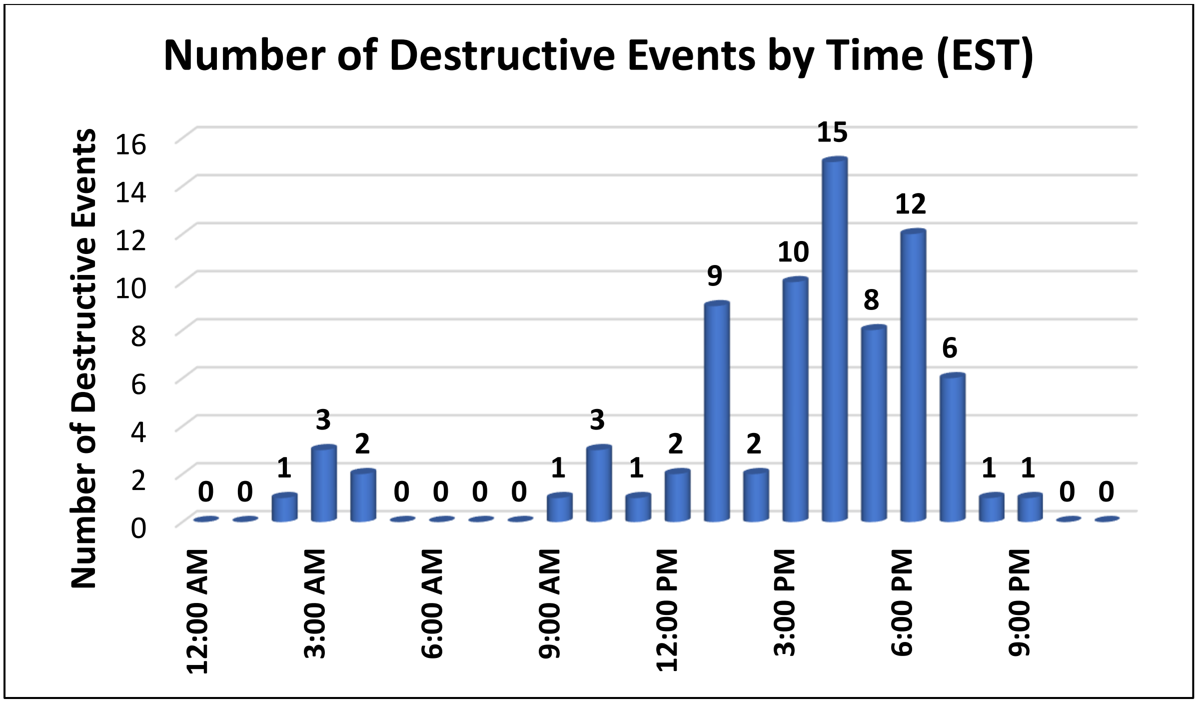

Figure 62

4. IMPACTS

Severe weather has caused damage to both life and property. For the Charleston, WV CWA, severe thunderstorm wind events have caused the most fatalities, injuries, and property damage of the three severe types over the 70 year period, with tornadoes following (Figures 63-65). Hail events have led to some injuries and property damage, but overall appear to have had less of an impact than the other types. June had by far the most property damage from each type of severe weather, with thunderstorm wind events causing the most damage (Figure 65). April and July follow behind June in damage, however July only had damage from wind and tornado events, and no property damage from hail events. Though thunderstorm wind events have led to the most damage to both life and property, this may be due to the sheer number of wind events compared to tornado and hail events within the forecast area. As mentioned previously, thunderstorm wind events make up 64% of all severe weather types, and thus could be a factor in why these events have such a large impact.

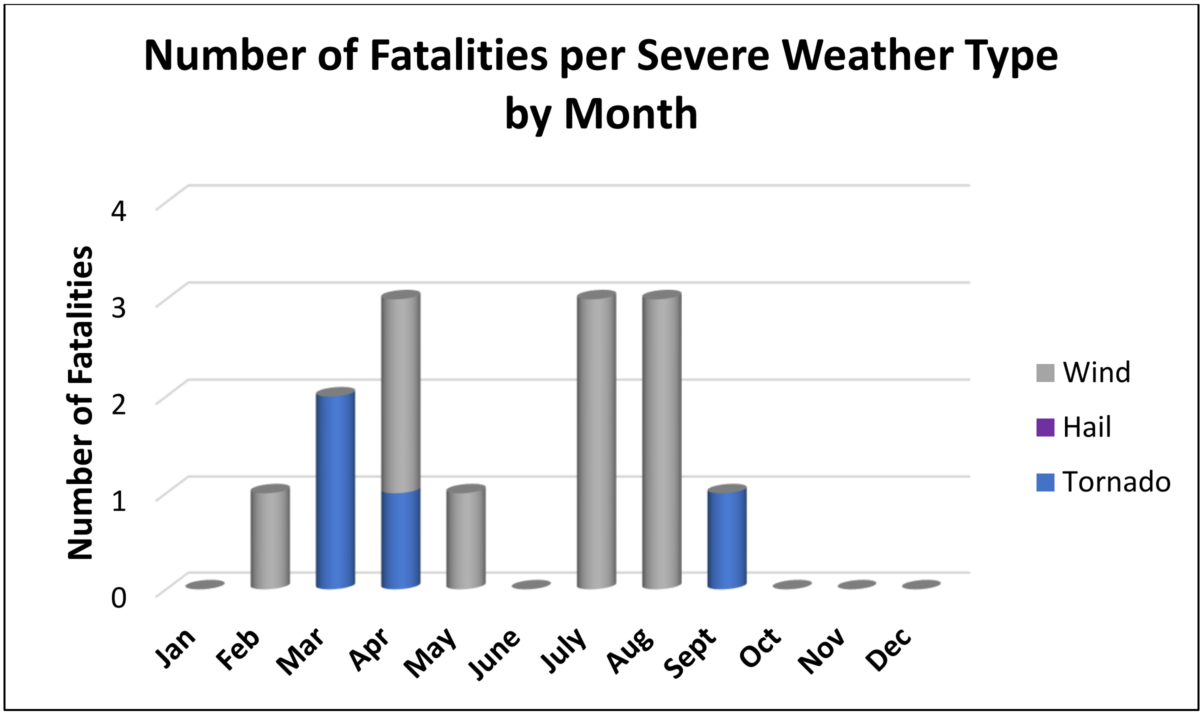

Figure 63

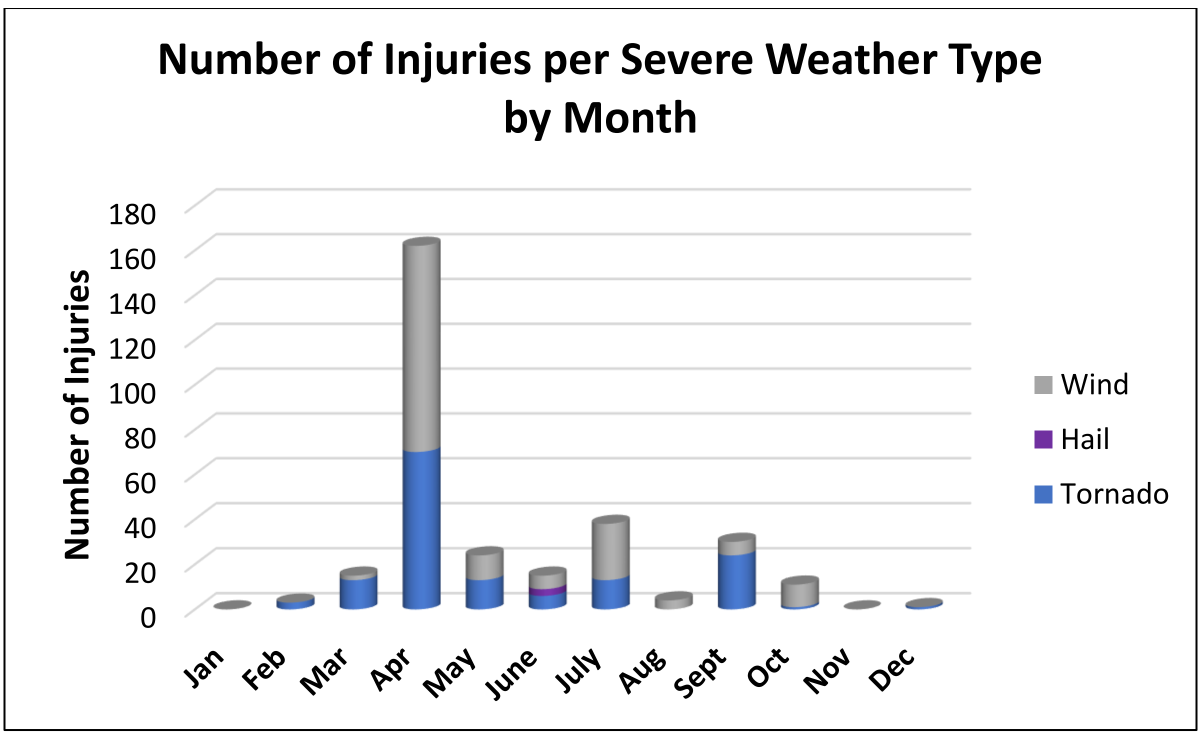

Figure 64

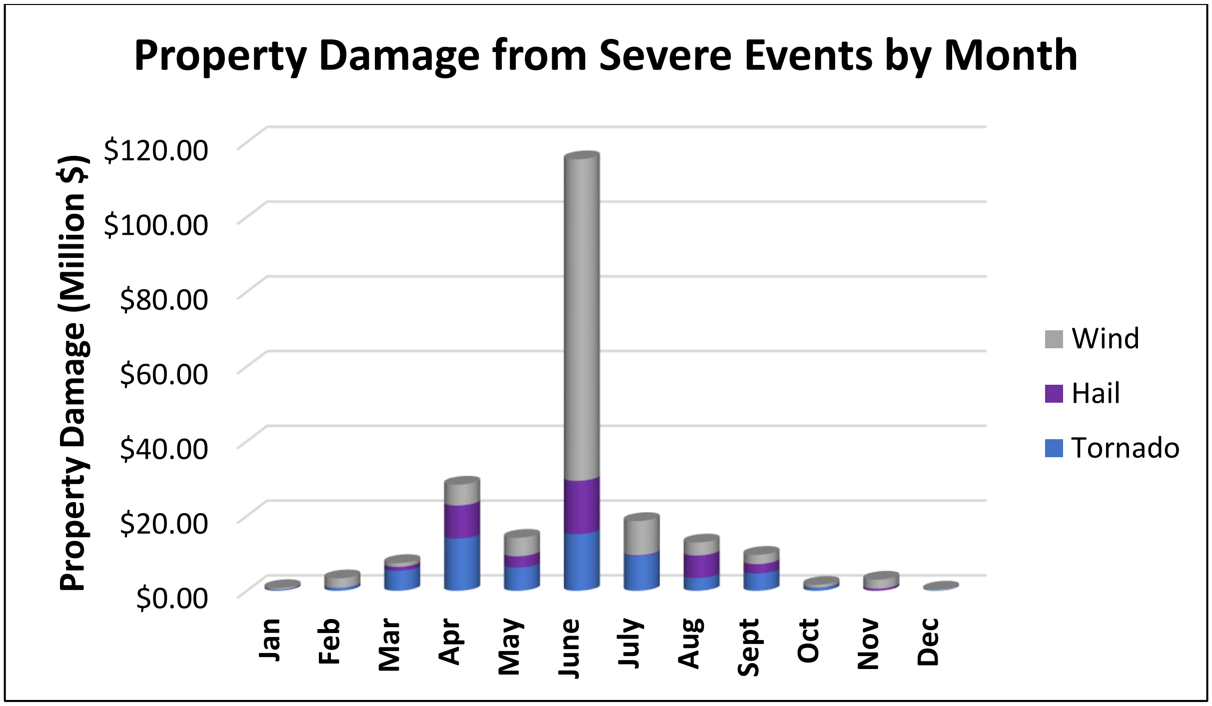

Figure 65

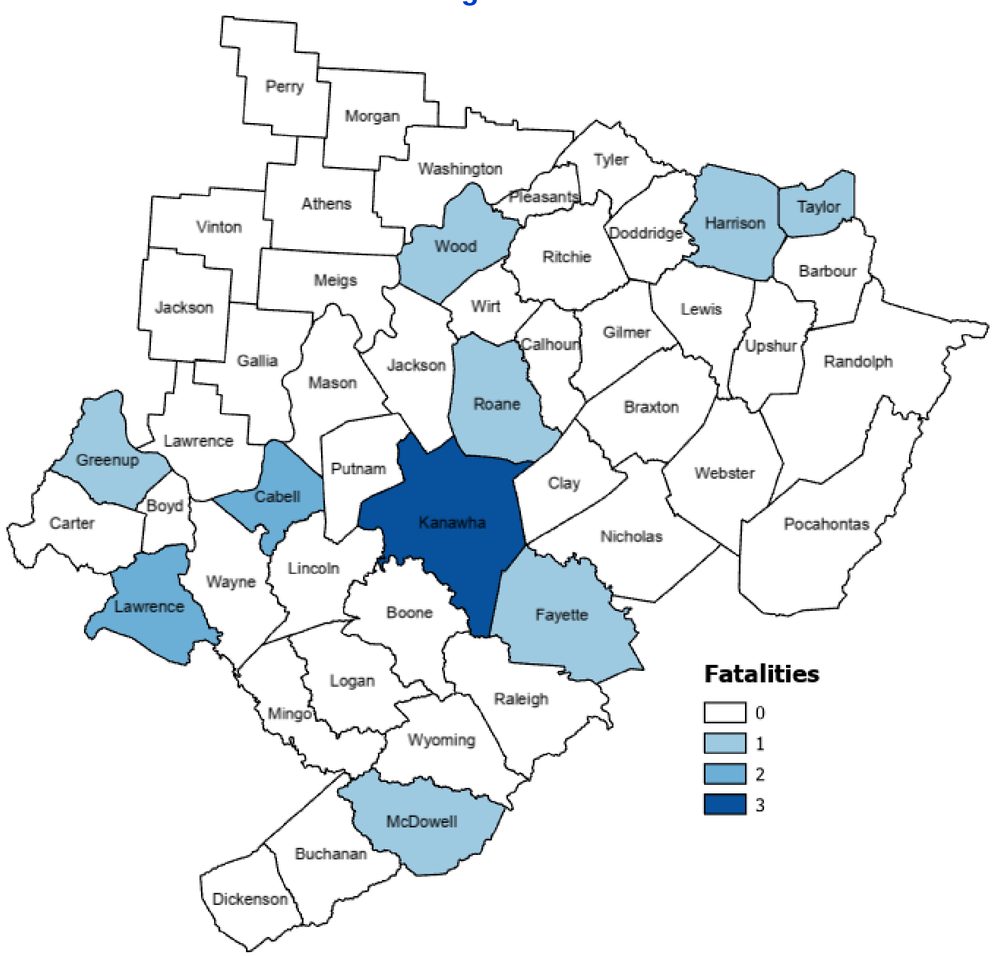

Figure 66

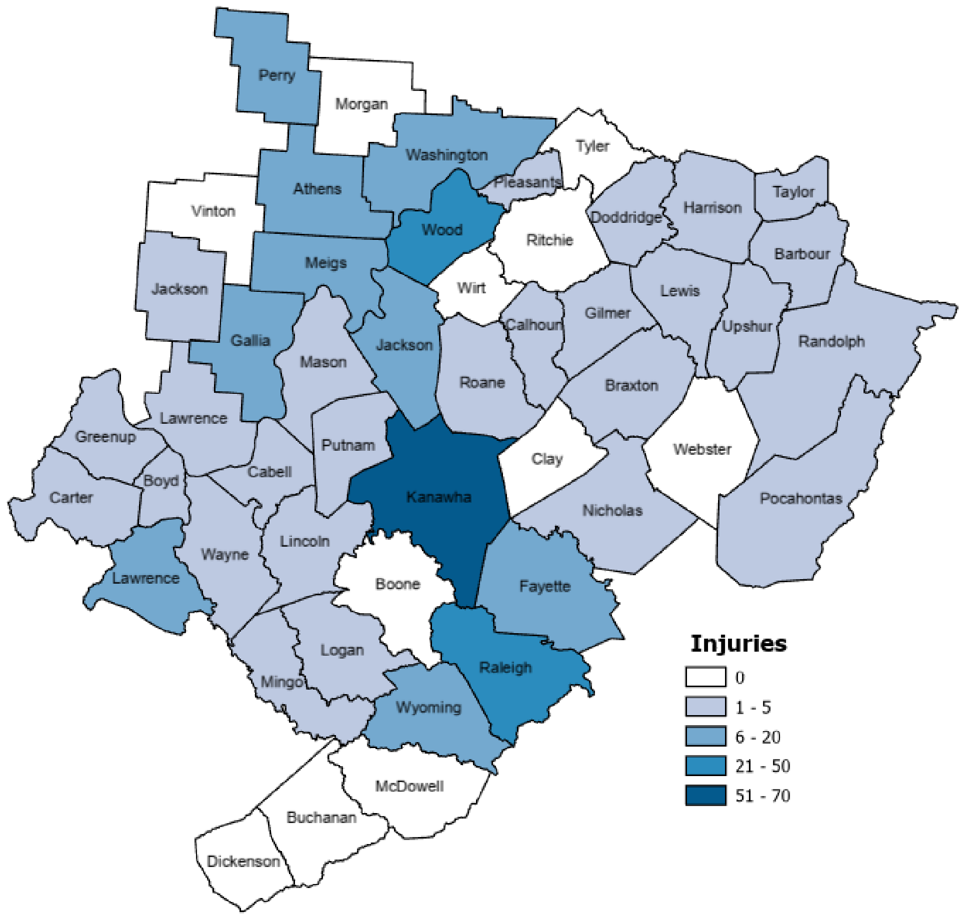

Figure 67

5. SUMMARY AND CONCLUSIONS

- The peak month for all severe modes combined is June, with the period May through July comprising over 62% of severe events.
- Over 82% of all severe weather events occur during the afternoon and evening, with a peak between 4 PM and 6 PM.
- Tornado events are not very common in the CWA, with an average of around 2 tornadoes per year.
- 75% of tornadoes were weak tornadoes, either EF0 or EF1.
- Nearly 72% of all tornadoes occur from April through July, with June being the peak month.
- Tornadoes are most likely to occur in the late afternoon and early evening, with a peak from 5 PM to 6 PM.
- Thunderstorm wind events are the most frequent type of severe weather, comprising over 64% of all severe events.
- The majority (over 95%) of thunderstorm wind events fall in the low end range of severe criteria (50-60 kts).

- Thunderstorm wind events are most common in late spring and summer, with a peak in June and July.
- Strong thunderstorm wind events (> 60 kts) are most common in June and July.
- Over 79% of thunderstorm wind events occur in the afternoon and evening. However, there is a secondary weak peak just after midnight.
- Hail reports vary from year to year, likely related to population density and storm paths. Large hail (greater than 1 inch) is less common, only occurring about 25% of the time.
- Hail is most likely during the spring and early summer, peaking in June and falling off fairly quickly through the rest of the summer.
- Like other forms of severe weather, hail is most likely during the afternoon and evening, peaking between 2 PM and 3 PM.
- Significant severe events have been more common within the last 10 to 15 years.
- About 79% of significant severe events have occurred from April to July.
- 77 events meet the recently defined “destructive” threat criteria for severe thunderstorms, about 1% of all severe reports.
- Thunderstorm wind events have caused the most fatalities, injuries, and property damage of the three severe weather types.
- Hail events have not led to any known fatalities in the CWA.

The advantage of establishing a local severe weather climatology is to provide a historical database and resource for the staff at WFO Charleston, WV, to use in efforts of improving severe weather warning service. Becoming familiar with the peak times of year and day that severe weather occurs, the staff will have an increased awareness and will be able to make more informed decisions regarding warnings and staffing needs.