

# The April 27, 2014 Windstorm

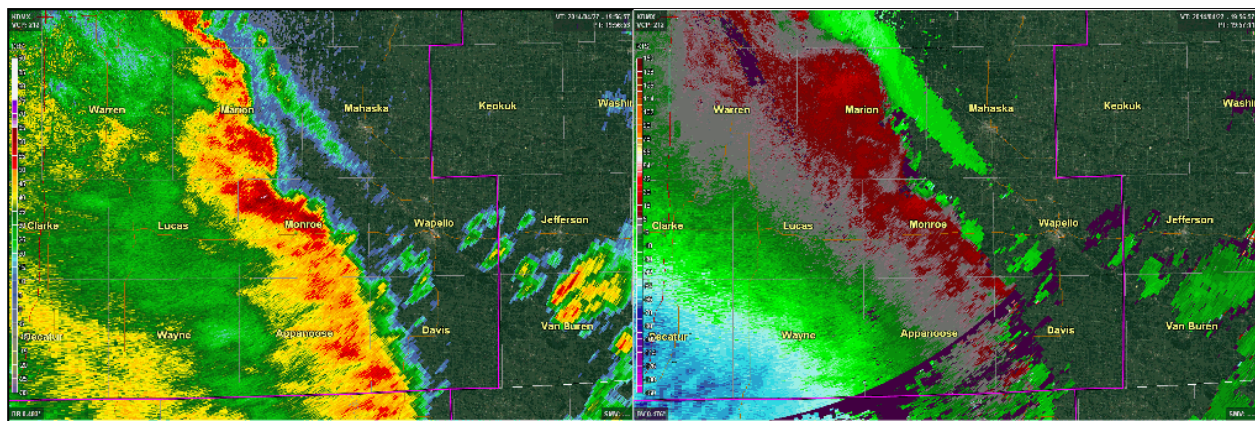
**Note:** This report covers damage that occurred in Mahaska, Monroe, Appanoose, Wapello, and Davis counties. For more information on damage that occurred in Keokuk County and areas to the north and east, please see the [report issued by the NWS in Davenport](#).

## Summary

The afternoon of April 27 saw a line of thunderstorms race northeastward across central and southern Iowa. While these storms brought small hail to western parts of the state and the Des Moines area, the greatest damage occurred over southeastern Iowa due to high winds. The wind damage occurred along two main corridors, the first of which extended from northern Monroe County near Lovilia to central Mahaska County, including the city of Oskaloosa. The second damage swath extended from south central Appanoose County northeastward to Johnson County.

While the majority of this damage was classified as downburst/straight-line wind damage, there is some evidence that a tornadic circulation began developing in far northern Wapello County before it moved northeastward into the town of Martinsburg in Keokuk County. A detailed report of these two swaths of damage, as well as how the survey team analyzed the damage, is below.

[Click Here to See an Interactive Map of the Damage Paths](#)



**Radar loop from 2:24pm to 3:36pm CDT on April 27 as the line of thunderstorms raced through southeastern Iowa. The left image is base reflectivity and the right image is base velocity. Note that the radar did a poor job sampling the velocity since the wind vectors were normal to the radar beam. The two areas of higher wind speeds match the damage tracks reasonably well.**

## Lovilia to Oskaloosa

A survey team from the NWS in Des Moines assessed the damage path from Lovilia to Oskaloosa and concluded that it was all the result of downbursts/straight-line winds. Contrary to initial reports, there was no evidence of a tornado touchdown in Lovilia. The only damage found in town was three broken tree sections and light siding damage to one building. This intermittent and weak straight-line wind damage trail continued northeastward through southwestern Mahaska County before strengthening to the southwest of Beacon at 3:10pm CDT. This increase in intensity is supported by data from the Des Moines WSR-88D radar. These winds snapped 4-5 large wooden power lines to the west of town, with winds estimated at 80 to 90 mph. Two large sheds/small outbuildings were destroyed just southwest of Beacon, with the debris thrown into power lines and a trailer park just across the road to the northeast. The wind removed sections of roofs from at least two trailers and tossed the debris almost 200 yards to the northeast. Other intermittent tree and roof damage took place on the southern and eastern sides of Beacon. Estimated winds in the town were between 70 and 75 mph.

These straight-line winds progressed rapidly into southwest Oskaloosa just after 3:15pm CDT. Dozens of trees were snapped or uprooted in the town, with the greatest concentration of damage running from Edmundson Park on the southwest corner of the city northeast to the city hospital on the town's eastern side. While trees suffered the bulk of the damage there was light shingle damage to some roofs and several pole lines were snapped. The Oskaloosa Family Medical Center had its roof peeled back and draped over the northern side of the building. Despite the severity of the damage to the building, the roof decking remained in one piece and there was no damage to surrounding buildings and trees. Wind speeds in this area were estimated to be around 85 mph.



## Cincinnati to Northern Ottumwa

Straight-line winds along the leading edge of the squall line were also responsible for a broad and intermittent path of damage from southern Appanoose County to northern Ottumwa. Trees and farm outbuildings sustained the most damage from the winds, with the resultant flying debris damaging houses and cars. This flying debris also resulted in one injury to a homeowner southwest of Udell in the eastern part of the county.

The coverage and intensity of the winds lessened as the storm shifted into southwestern Wapello County, but there were still isolated pockets of heavier damage. The storm strengthened as it approached the western end of Ottumwa with the strongest winds grazing the western and northern sides of the city. Once again, damage was almost exclusively to trees and outbuildings with house damage generally due to trees or other debris striking the roofs/sides.



## Far Northern Wapello County

There was little to no damage for five miles to the northeast of Ottumwa. However, the storm strengthened 3 miles south of the Keokuk

County line with damage to multiple farm buildings, trees and power lines. This damage exhibited some characteristics of a broad, cyclonic circulation. It is believed that an EF1 tornado formed 2 miles south of the county line, west of Agency-Hedrick Road, and tracked northeastward out of Wapello County and into the town of Martinsburg.



### Davis County

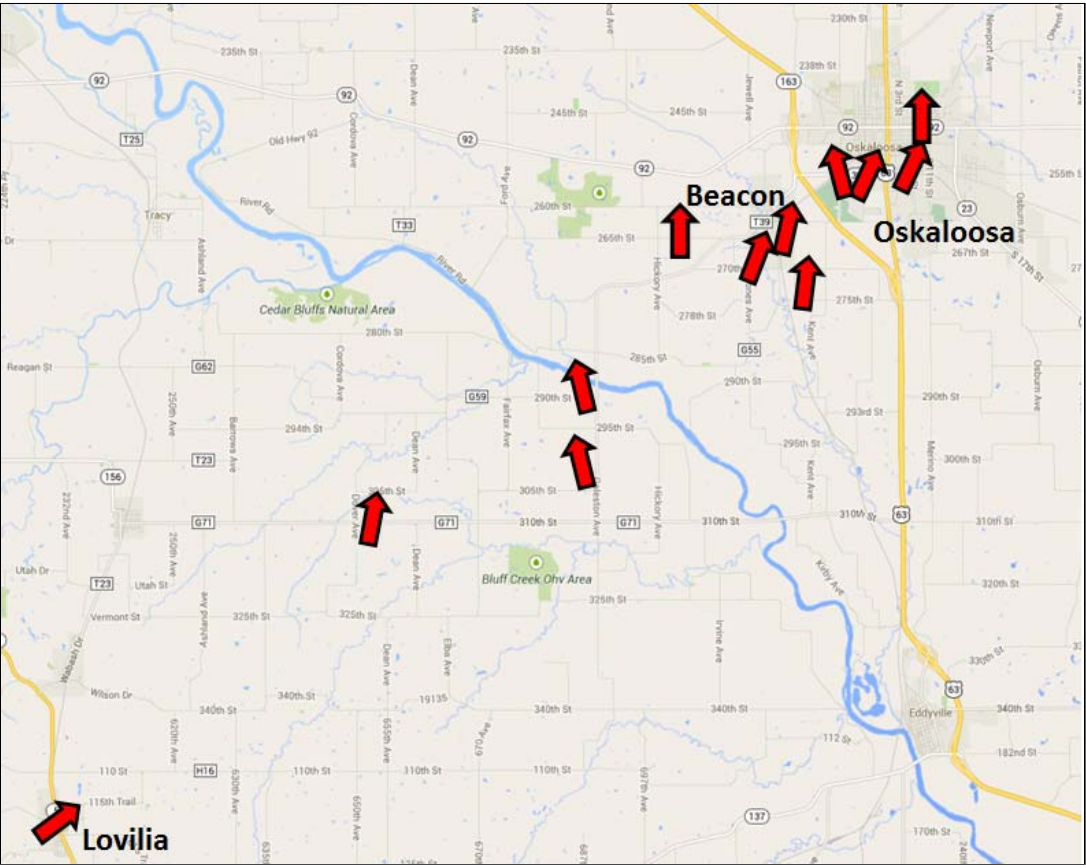
Another report of a possible tornado was received near the town of Floris. It was later determined that this phenomenon was a gustnado, rather than a tornado. Gustnadoes are similar to tornadoes in that there is a circulation at the surface. However, unlike a tornado, gustnadoes are not connected to the base of the storm and are typically much weaker than tornadoes.

### The Storm Survey Process

The NWS process of storm surveying typically involves sending one or more meteorologists to assess the damage inflicted by the storm to estimate the strength of the winds. In the case of the April 27 event, the survey crew also had to determine whether a tornado or straight-line winds inflicted the damage because there were no known photos or credible sightings of a tornado and radar data was inconclusive. To ascertain the origin of the damage, the survey crew analyzed the type and integrity of structures/trees that were impacted, the degree to which they were damaged, the concentration of damage, and finally the orientation that the debris was thrown/trees downed.

The survey in the city of Oskaloosa revealed that while the strongest winds occurred along a fairly narrow path less than a mile wide, the damage along this line was rather sporadic with no clear, tight path that would be indicative of a tornado. Large trees, a number of which were hollow or had weaker root systems, were snapped or uprooted with many houses sustaining damage from the falling trees. The trees all fell either to the north or northeast, with trees in Edmundson Park falling in a slightly divergent pattern (northwest on the west side of the park, northeast on the east side). Straight-line winds or a localized downburst were also the culprit for removing the roof of the Oskaloosa Family Medical Center. The roof peeled off in one piece and draped neatly over the north side of the building, with no twisting motion or dismemberment that would be seen in a tornado. The lack of any tree or structural damage surrounding the building points to a lower wind speed than might otherwise be inferred by this degree of damage and also infers that the winds may have exploited a weakness in the roof design.

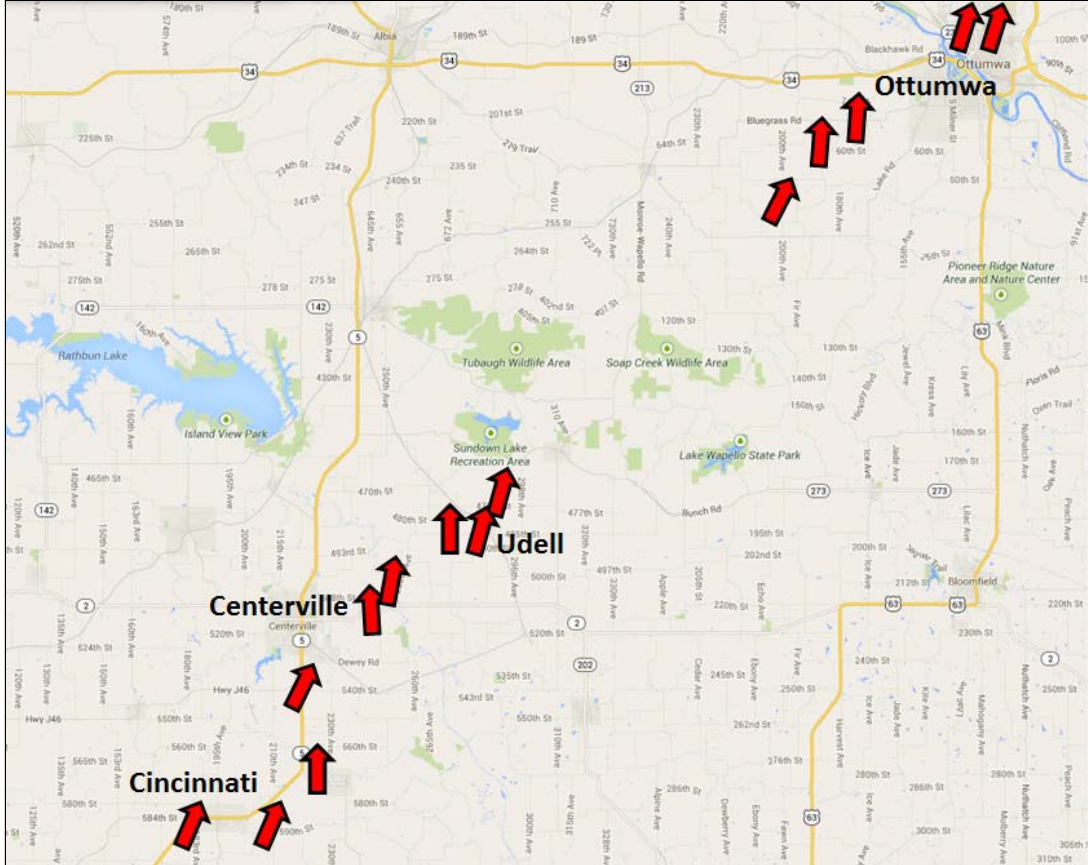
A similar damage pattern was found through the southern portion of Beacon, just southwest of Oskaloosa. Once again, debris over a several mile wide swath was all blown north to northeast with no sign of any tornadic convergence. The snapped power lines west of town were some of the most severe damage in the area, but there is some uncertainty as to whether flying debris got tangled in the lines and compromised the poles (photos of the downed poles show field tiling wrapped around the wires). The damage became more sporadic the further one went southwest of Beacon, with all of the downed trees pointing generally north to northeast. The survey team investigated a report of a tornado in Lovilia but found little to no damage in town and no evidence that would correspond to a tornado. The environment that afternoon was conducive for the formation of low, menacing scud clouds that could have easily been mistaken for a tornado. It is believed that this is what was observed, rather than a tornado.



**Map of the damage trail found by the survey team from Lovilia to Oskaloosa. The red arrows indicate the direction the debris flew or trees fell.**

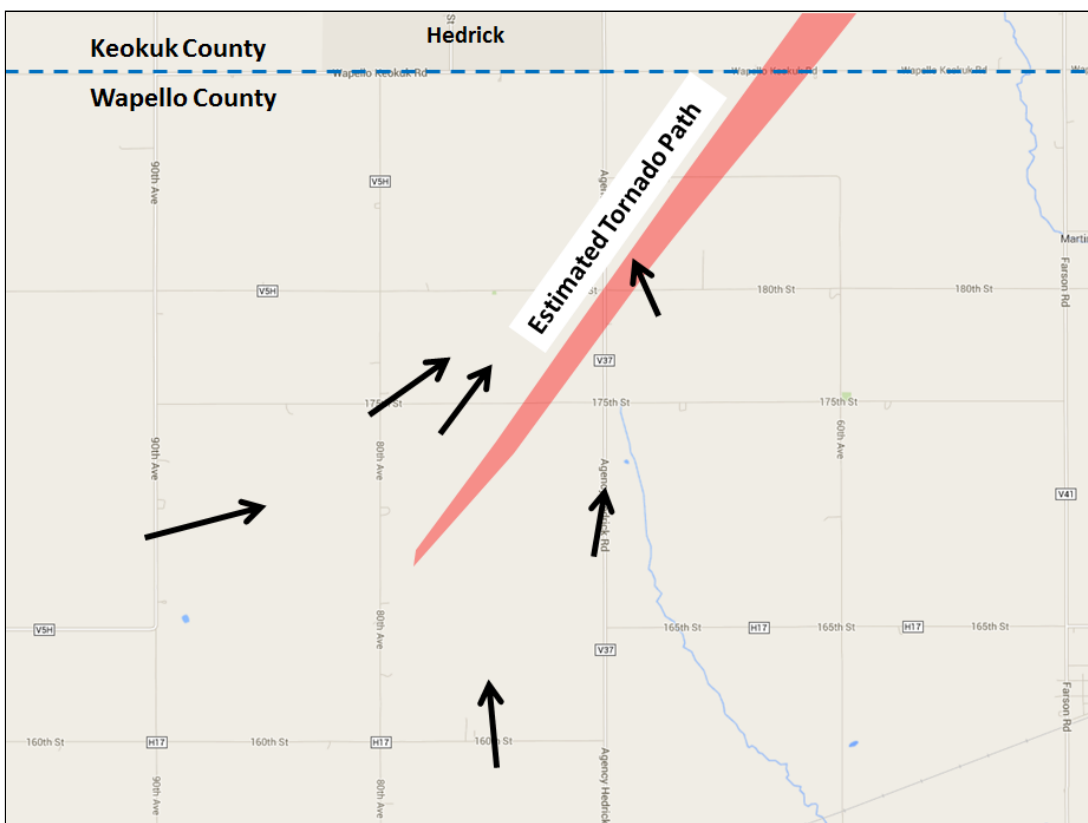
The trail of damage from Cincinnati to northwest Ottumwa was intermittent and broad at best with all of the damage oriented north to northeast (see map below). Old trees and either weak or susceptible outbuildings were the primary targets. One horse barn east of Cincinnati was open to the south and had half of its roof peeled off and deposited 50 yards due north, almost intact. A nearby shed with garage doors facing south had the doors blown in and the roof blown across the street and into a tree due north. The roof was relatively intact. Again, this pattern is very consistent with straight-line winds since there was no convergent debris trail and the buildings failed on their exposed southern sides, which is where the straight-line winds would have been coming from.





**Map of the damage trail found by the survey team from Cincinnati to Ottumwa. The red arrows indicate the direction the debris flew or trees fell.**

A damage trail was reacquired in far northern Wapello County which possessed several characteristics not observed throughout the survey up to that point, most notably an increase in the concentration of damage and a broad convergent pattern to the debris fields. This was especially noticeable on the southern fringe of the damage with the debris blown just west of due north, while a mile and a half to the northwest, part of a machine shed and a tractor trailer were blown 200-300 yards ENE. To the NE of this point, a grain bin and sections of a hog barn were ripped off and blown in a more NE fashion. Another mile to the NE, two power line poles were bent to the northwest. These wind vectors are plotted on the map below, along with an estimated tornado track based on these fields and an extrapolation of a stronger circulation track that formed as the storm moved into Keokuk County. The derived wind field is missing a strong westward or southward component that would have more firmly solidified the presence of a tornado. However, due to the storm's high rate of speed of 60 mph and the fact that the tornado was embedded in southwesterly straight-line winds of 60-70 mph may have masked this pattern.



**Map of the wind damage patterns near the forming tornado and the estimated tornado path.**

While the survey itself took 10 hours during the day of April 28, the surveyors were unable to thoroughly cover the entire five county region affected by the storms. This underscores one of the limitations of a human ground survey: the enormous amount of time and resources needed to cover any large stretch of ground to locate small scale phenomena like tornadoes. New advances in surveying technology such as specialized software installed on tablets to input damage points and high resolution satellite imagery have greatly aided our ability to locate and document these events. However, the NWS still heavily relies on reports from the public and storm spotters to hone in on the areas that would require a survey. Thus, if you witness severe weather, it is crucial that you [relay your report to the National Weather Service](#).

## Acknowledgments

NWS Des Moines thanks the following partners for their assistance during our storm survey on April 28th. Their help allowed us to better target our efforts.

- Mahaska County Emergency Management Agency
- Oskaloosa Fire Department
- Appanoose-Davis-Lucas-Monroe Counties Emergency Management Agency
- Wapello County Emergency Management Agency

We also wish to thank the NWS Quad Cities, IA/IL office for their help in surveying the beginning of the tornado track in northeastern Wapello County.