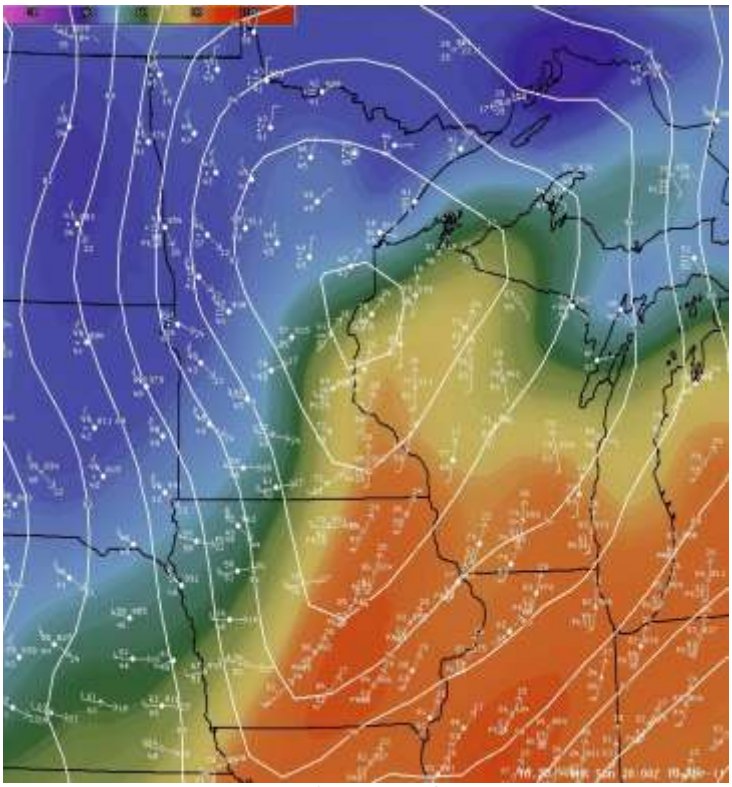
April 10, 2011: Western Wisconsin Winds and Tornadoes

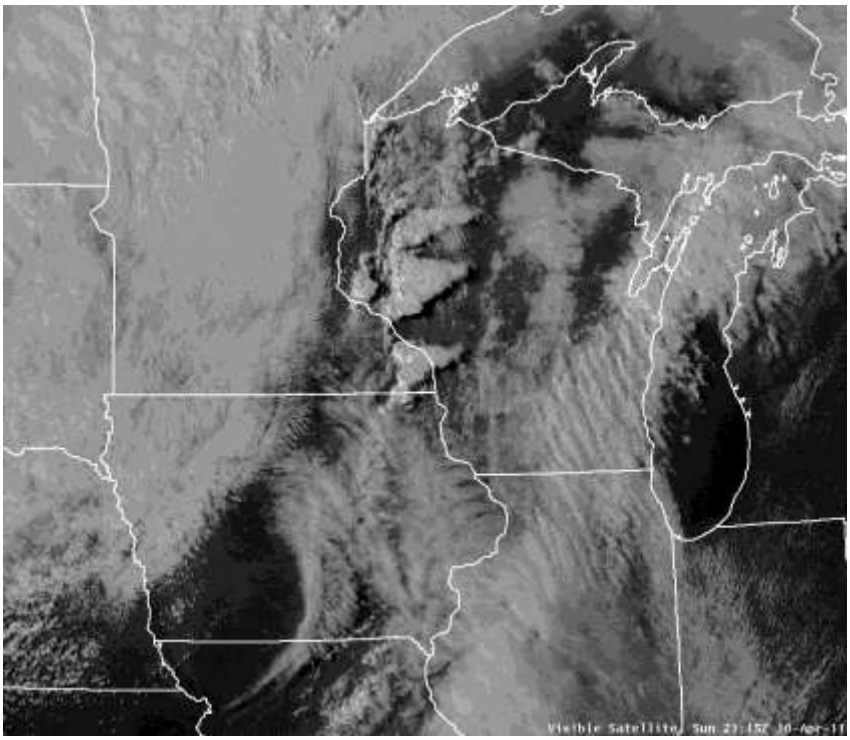
Synopsis

On Sunday April 10th, early season severe thunderstorms with tornadoes, winds, and hail developed across western Wisconsin and southeast Minnesota and evolved eastward. For western and northern Wisconsin, the 14 tornadoes for an early season event were quite anomolous, making this event the largest April outbreak on record in Wisconsin.

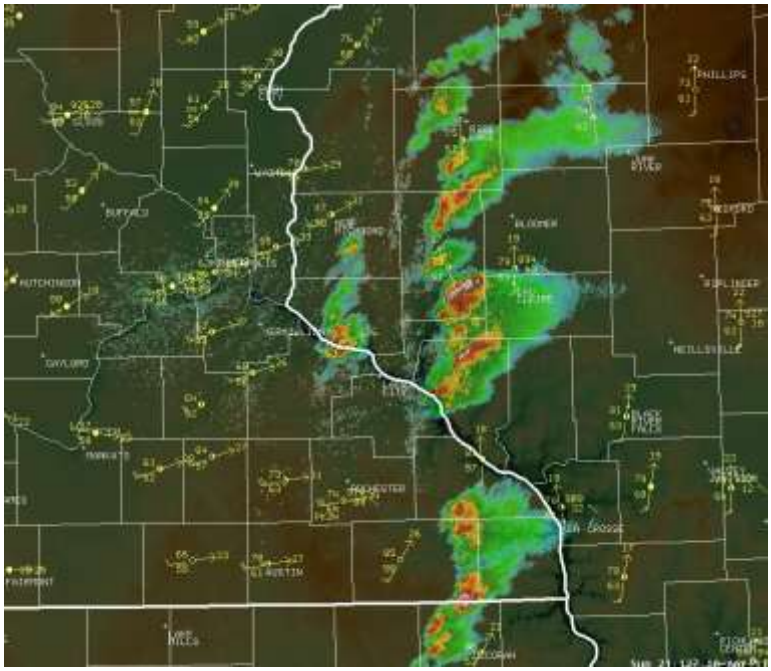
The primary ingredients for severe weather were a strong system, well above normal warmth and moisture, and vigorous winds in the mid to upper level atmosphere. The strong system was an area of low pressure moving northeast across southern Minnesota during the afternoon of the 10th. It would sweep a cold front eastward, with temperatures in the 40s behind the front. As for ahead of the front, communities basked in the 70s, even lower 80s, across Wisconsin. These temperatures were 20 to 30 degrees above early April normals. The dew points were in the lower to mid 60s, also well above normal. In fact, the Minneapolis St. Paul International Airport broke a dew point record for that day, reaching 61°. The warmth and moisture created instability, which was focused across western Wisconsin and southeast Minnesota by the incoming strong system. As the cold front approached, winds began to shift and converge, and where this occurred would develop thunderstorms not long after 3 pm. Due to the strong shear in the atmosphere, the storms were supercells, implying they possessed rotation. These are the most common type of storm to produce tornadoes. In addition, the large amounts of instability and somewhat low freezing level in the atmosphere, allowed for hail from the deeper thunderstorms. In western Wisconsin, the hail was up to the size of just larger than golf balls. In Houston County in far southeast Minnesota, hail of up to three inches in diameter was observed. The rate of movement on the storms was an impressive 55 to 70 mph.



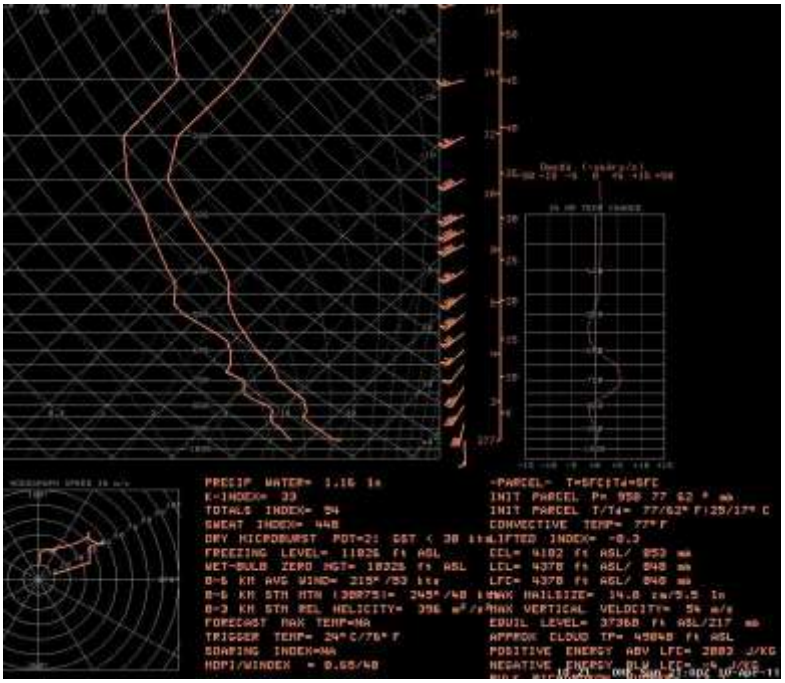
3 pm Surface Weather Map



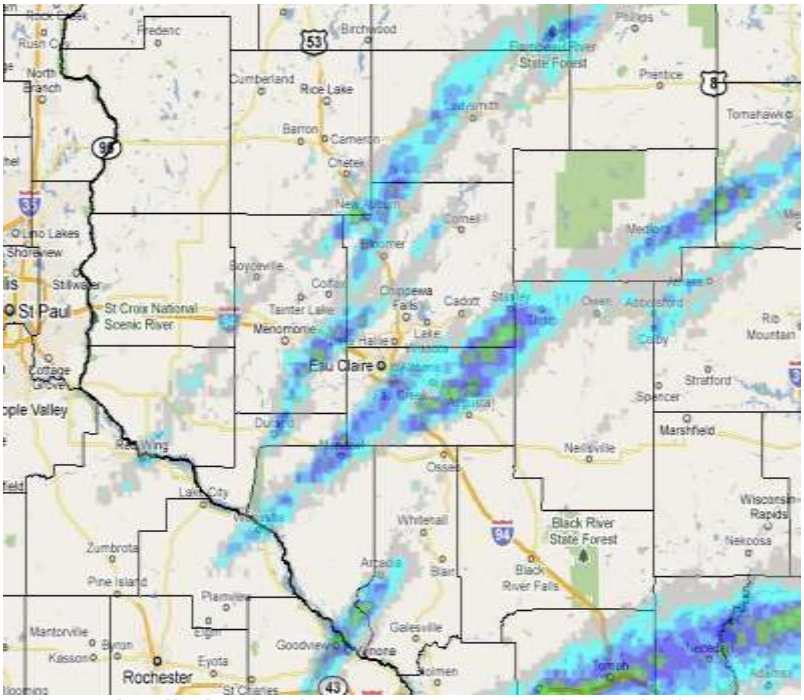
4:15 pm GOES Visible Satellite Image: *This image depicts the deep thunderstorm clouds from southeast Minnesota into western Wisconsin. Note the shadows casted under the tops (or anvils) of the thunderstorms*



4:12 pm NWS Doppler Radar Reflectivity: *Storms initiated in a line across western Wisconsin and southeast Minnesota and evolved east. The main line of storms on this graphic is on the wind shift line, which is a boundary and leads to enhanced convergence. In the presence of instability, such a boundary can be a focus for thunderstorms. The storm cell over Red Wing was actually on the cold front, again an example of a boundary.*



4 pm Model Analysis of the Atmosphere Over Eau Claire: *This image is from a high resolution computer model. It is a sounding plot, or a vertical analysis over a single point, in this case Eau Claire. This is analyzed at 4 pm. Note the increasing wind speeds and the changing in direction with height, indicative of large shear. The wind profiles also suggested the potential for rapidly moving storms and splitting supercells.*

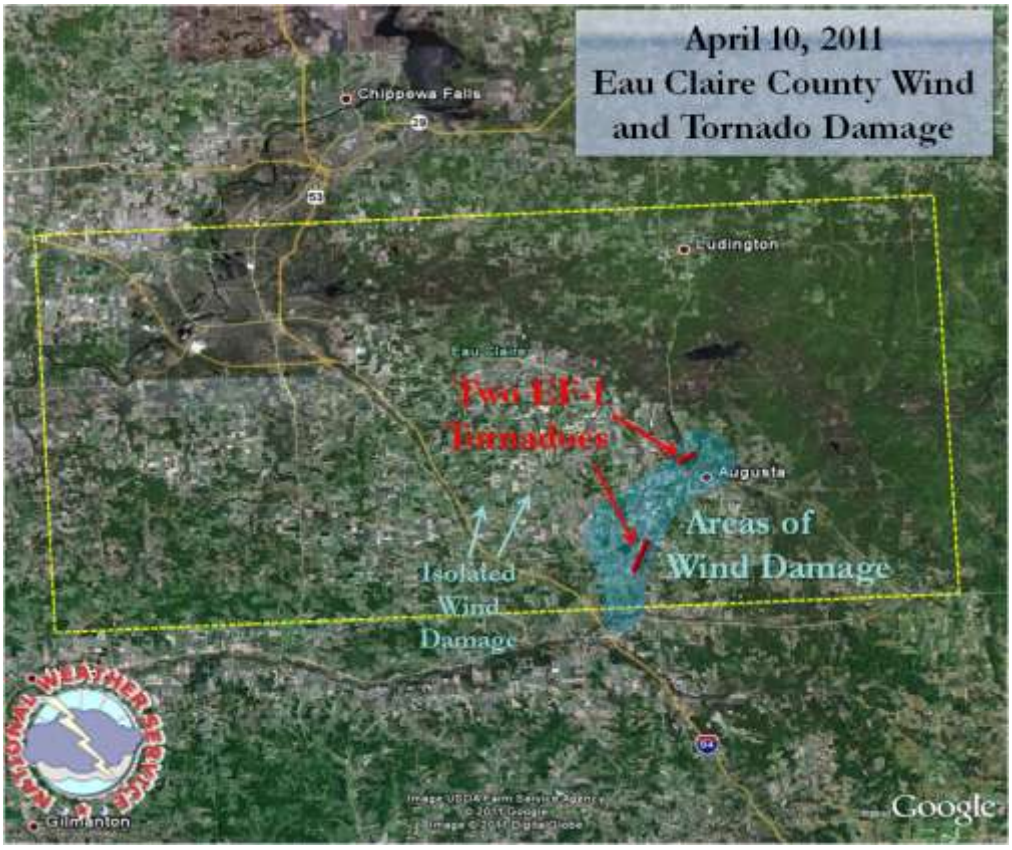


Radar Maximum Estimated Hail Size for the Event: *NWS Doppler Radar has many algorithms that can calculate various storm-based parameters to assist NWS warning forecasters in storm interrogation as well as recapping what occurred. One of those is MESH, or Maximum Estimated Size of Hail. This is based on the thunderstorm's reflected power, or reflectivity, and the environmental temperature profile and correlating these through past research to give a hail size forecast. While the magnitude is rarely perfect, it can often give a reasonable idea of hail size. In addition, looking at this parameter over time and space can reveal where the heaviest hail damage may have occurred.*

Event Perspective

- Across Wisconsin, there were **14 tornadoes**, making it the **largest April outbreak on record in Wisconsin**.
- It had been almost **17 years since a tornado had occurred in Eau Claire County**, with the last one being on August 27, 1994, when an F3 tornado struck the town of Foster.
- The two EF-1 tornadoes in Eau Claire County were the **earliest in the calendar year that a tornado had occurred in Eau Claire County**.

Damage Survey Results



A damage survey team conducted a survey in Eau Claire County, following the severe storms that tracked through the area on April 10th. The survey focused on the area where damage reports had been received by law enforcement and storm spotters, which was mainly from Foster to northeast of Augusta and south to Osseo.

This was a complex survey, as it appeared likely that 2 storms interacted. One was a supercell moving northeast, while the other storm was moving north-northeast from Trempeleau County. The storms appeared to intersect near Augusta, but began interacting even before that. Both storms were moving 60-70 mph based on radar and eye-witness accounts.

Straight-Line Winds: southern Eau Claire County through Augusta

Magnitude: 65-80 mph, with isolated speeds up to 90 mph.
Location: Beginning in Osseo, moving northward along County Road R into Augusta, ending about 1 mile north of Augusta.
Timing: About 455 PM CDT through 506 PM CDT, based on radar and public reports.

The worst damage was at a farmstead just east of County Road R. There, several utility poles were snapped and thrown, a stronger out-building was partially damaged,

and most of a hilltop grove or larger trees were snapped. Wind speeds were likely 85 to 95 mph at this time.

In other damage areas, almost all notable wind impacts were to out-buildings and barns or to trees. There were some homes that had minor shingle damage. Debris from these structures were scattered to the north. Within both Osseo and Augusta there were several large trees uprooted.

This was primarily caused by the storm moving northeast from Osseo. As it neared Augusta, it likely had some interaction with the supercell storm moving northeast from the Foster area. Together, this may have produced some of the strong winds seen in Augusta.

Tornado Southwest of Augusta

Magnitude: EF-1, with maximum wind speeds of 95 to 105 mph
Location: Roughly 5 miles southwest of Augusta to 3.5 miles southwest of Augusta
Path Length: around 1.5 miles
Timing: Less than 2 minutes, between 457 PM CDT and 503 PM CDT

Two farmsteads were directly impacted by the tornado. One had severe tree damage with many large trees uprooted in a path indicative of a tornado. There was also a manufactured home heavily damaged. The other farmstead had a garage completely destroyed, a barn heavily destroyed, and minor damage to the home.

This appears to have been the earliest tornado touchdown on record in Eau Claire County, and the only one in April since consistent record keeping began in 1950.

Tornado Northwest of Augusta

Magnitude: EF-1, with maximum wind speeds of 90 to 100 mph. A sensor near the vortex path had a gust of 78 mph.
Location: Approximately 1.3 miles northwest of Augusta
Path length: ½ to ¾ mile
Timing: Approximately 504 PM CDT to 506 PM CDT… possibly less based on spotter eye-witness account

One out-building was destroyed and three others at 2 separate properties experienced significant structural damage. There were numerous large trees snapped along highway 27.

Photos

Damage done to a barn near the end of an EF-1 tornado path a few miles southwest of Augusta.

From the EF-1 tornado southwest of Augusta, this is downed tree damage to a manufactured home.

This is a large downed tree, with an ~8 ft diameter uprooted bulb, from the EF-1 tornado southwest of Augusta.

Debris folded around the tree branches, near straight-line wind damage southwest of Augusta.

Damage from the EF-1 tornado just northeast of Augusta. These large row of trees as well as utility poles had been downed by the tornado along highway 27.

Tall grass blown down near the beginning of the tornado path just northeast of Augusta.

Debris thrown one half mile down path along the tornado northeast of Augusta. The sensor in the foreground measured a wind speed of 78 mph near the tornado's passage.

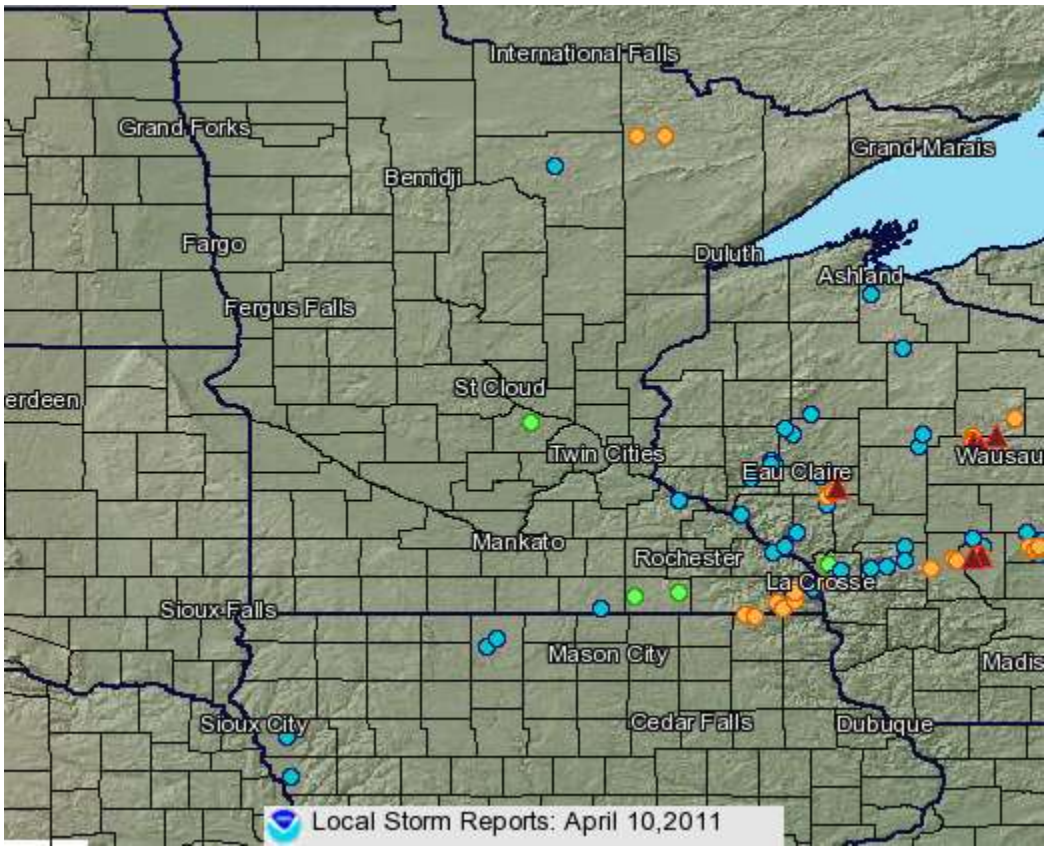
Radar

4:56 pm Radar Image: Supercell thunderstorm with a reflectivity appendage and inflow notch. These are almost always signs of rotation within the storm, which the velocity signatures had also indicated. At this time, the storm had a wall cloud and a tornado warning was in effect. The storm approaching from the south was producing wind damage as it spread northward.

5:00 pm Radar Image: The two storms were approaching each other. Possible interaction may have produced the first EF-1 tornado which happened near this time. Widespread wind damage is continuing on the northern side of the storm that had moved over Osseo.

5:05 pm Radar Image: The northern supercell's rotation area is just northeast of Augusta, where a tornado is occurring at this time. The two cells were about to merge, and likely their interaction was at least partially responsible for tornado development.

Storm Reports



..TIME... ..DATE...	...EVENT... ....MAG.... ..REMARKS..	...CITY LOCATION... ..COUNTY LOCATION	ST..	...LAT.LON... ...SOURCE....
0330 PM 04/10/2011	HAIL M1.00 INCH	SPRING VALLEY PIERCE	WI	44.85N 92.24W CO-OP OBSERVER
	TIME WAS ESTIMATED.			
0335 PM 04/10/2011	HAIL M0.50 INCH	5 W MENOMONIE DUNN	WI	44.89N 92.02W TRAINED SPOTTER
0410 PM 04/10/2011	HAIL E1.00 INCH	3 SE RED WING GOODHUE	MN	44.55N 92.56W TRAINED SPOTTER
0412 PM 04/10/2011	HAIL M1.75 INCH	8 NNE DURAND DUNN	WI	44.74N 91.90W TRAINED SPOTTER
0414 PM 04/10/2011	HAIL M0.50 INCH	7 S MENOMONIE DUNN	WI	44.79N 91.91W TRAINED SPOTTER
0420 PM 04/10/2011	HAIL M1.00 INCH	ELK MOUND DUNN	WI	44.88N 91.69W STORM CHASER

I-94/HWY 29 EXIT RAMP AREA.

0421 PM	HAIL	2 NNW ELK MOUND		44.90N 91.70W
04/10/2011	M0.88 INCH	DUNN	WI	TRAINED SPOTTER
0422 PM	HAIL	2 W ELK MOUND		44.88N 91.73W
04/10/2011	M2.00 INCH	DUNN	WI	TRAINED SPOTTER
0422 PM	HAIL	2 NW ELK MOUND		44.90N 91.72W
04/10/2011	M1.00 INCH	DUNN	WI	TRAINED SPOTTER

NORTH OF 29 ON HWY 40

0436 PM	HAIL	3 NNW BLOOMER		45.15N 91.52W
04/10/2011	M1.00 INCH	CHIPPEWA	WI	TRAINED SPOTTER
0441 PM	FUNNEL CLOUD	1 S FOSTER		44.63N 91.31W
04/10/2011		EAU CLAIRE	WI	TRAINED SPOTTER
0442 PM	HAIL	4 S MENOMONIE		44.83N 91.91W
04/10/2011	M0.88 INCH	DUNN	WI	TRAINED SPOTTER
0445 PM	HAIL	1 W NEW AUBURN		45.20N 91.59W
04/10/2011	M1.75 INCH	CHIPPEWA	WI	TRAINED SPOTTER
0445 PM	HAIL	4 S ISLAND LAKE		45.27N 91.37W
04/10/2011	M0.75 INCH	CHIPPEWA	WI	TRAINED SPOTTER
0448 PM	HAIL	FALL CREEK		44.76N 91.27W
04/10/2011	M0.75 INCH	EAU CLAIRE	WI	TRAINED SPOTTER
0500 PM	TSTM WND DMG	5 SSW AUGUSTA		44.62N 91.17W
04/10/2011		EAU CLAIRE	WI	LAW ENFORCEMENT

ROOFS OFF 2 MOBILE HOMES.

0500 PM	TORNADO	5 SW AUGUSTA		44.63N 91.19W
04/10/2011	F1	EAU CLAIRE	WI	NWS STORM SURVEY

EF1 TORNADO WITH MAXIMUM WIND SPEED OF 95 TO 105 MPH. PATH LENGTH APPROX 1.5 MILES...PATH WIDTH APPROX 200 YARDS...ON THE GROUND FOR APPROX 2 MINUTES. 2 FARMSTEADS WERE DIRECTLY IMPACTED WITH SEVERE TREE DAMAGE INCLUDING UPROOTED TREES AND A GARAGE THAT WAS COMPLETELY DESTROYED.

0500 PM	HAIL	FALL CREEK		44.76N 91.27W
04/10/2011	M1.00 INCH	EAU CLAIRE	WI	TRAINED SPOTTER
0505 PM	HAIL	ISLAND LAKE		45.32N 91.37W
04/10/2011	M1.75 INCH	RUSK	WI	LAW ENFORCEMENT

HWY 40 AND COUNTY RD D

0505 PM	TORNADO	1 NW AUGUSTA		44.69N 91.14W
04/10/2011	F1	EAU CLAIRE	WI	NWS STORM SURVEY

EF1 TORNADO WITH MAXIMUM WIND SPEEDS OF 90 TO 100 MPH. PATH LENGTH APPROX THREE QUARTERS OF A MILE...PATH WIDTH APPROX 150 YARDS...ON THE GROUND FOR APPROX 1 MINUTE. TREES DOWN...SEVERAL STRUCTURES DAMAGED...AND SNAPPED POWER POLES.

0505 PM	TSTM WND GST	1 NNW AUGUSTA		44.69N 91.13W
04/10/2011	M78.00 MPH	EAU CLAIRE	WI	PARK/FOREST SRVC

MEASURED AT RAWS SITE.

0509 PM	HAIL	AUGUSTA		44.68N 91.12W
04/10/2011	M1.00 INCH	EAU CLAIRE	WI	LAW ENFORCEMENT

0509 PM	TSTM WND GST	AUGUSTA		44.68N 91.12W
04/10/2011	E60.00 MPH	EAU CLAIRE	WI	TRAINED SPOTTER

ESTIMATED FROM SHERIFF.