

National Severe Weather Workshop 2006

Midwest City, Oklahoma
March 2-4, 2006



Review of Record- Setting August 18, 2005 Tornado Outbreak in Wisconsin



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WFO Milwaukee/Sullivan

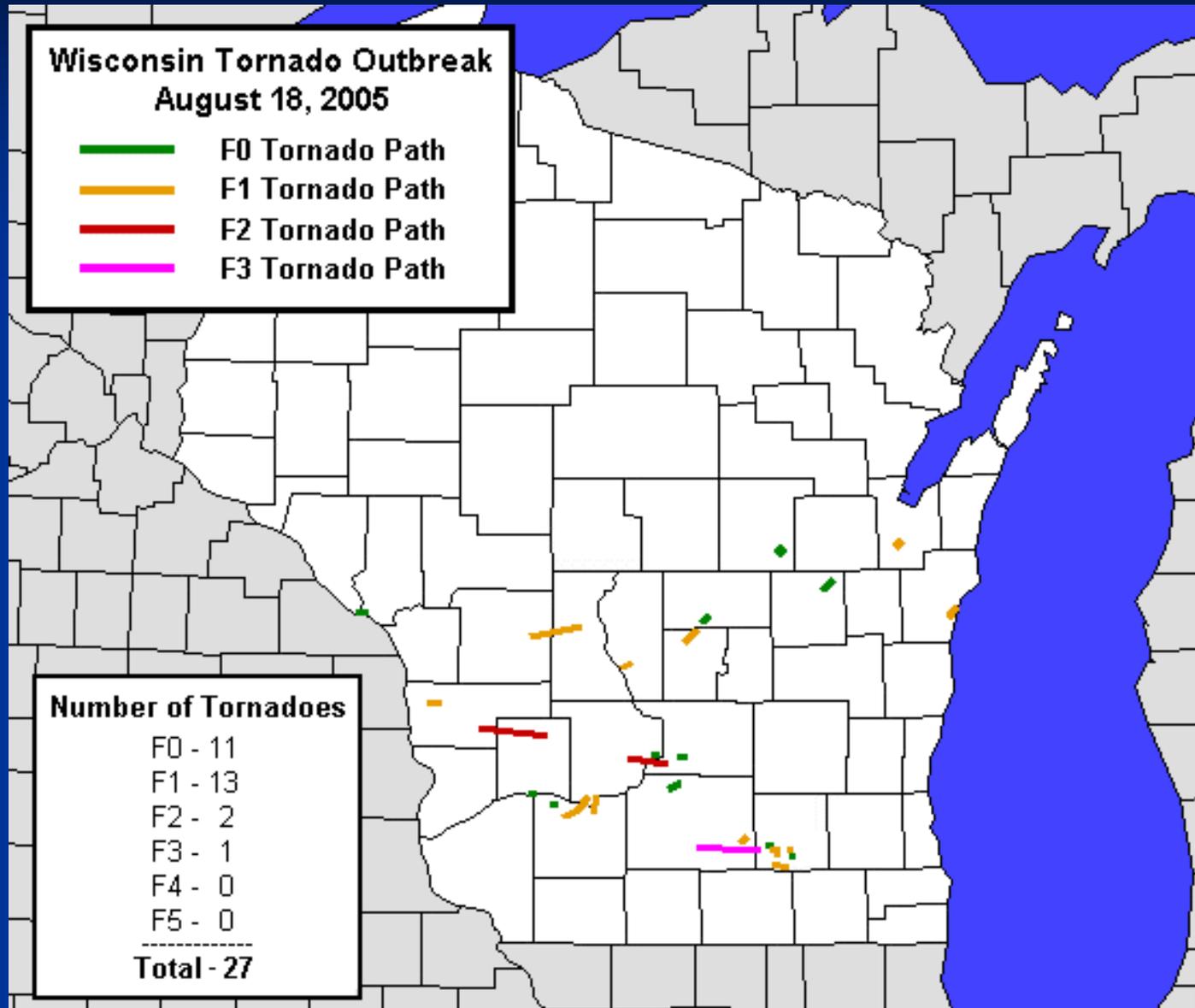
An Ominous Cloud Forms South of the Madison Area...



What happened?

- 27 tornadoes developed across central and southern Wisconsin (1 death & 27 injuries)
- Broke or contributed to several tornado records:
 - Daily - statewide and MKX CWA for anytime of the year: 27 and 16 (old records: 24 and 11)
 - August – old record was 15 in 1979 (27 is 3rd highest “any-month” total – record is 30 in June 2005!
 - Yearly (62 tornadoes – previous record was 43 in 1980, average is 21 per year)
- 11 F0s, 13 F1s, 2 F2s, 1 F3 (Stoughton tornado)

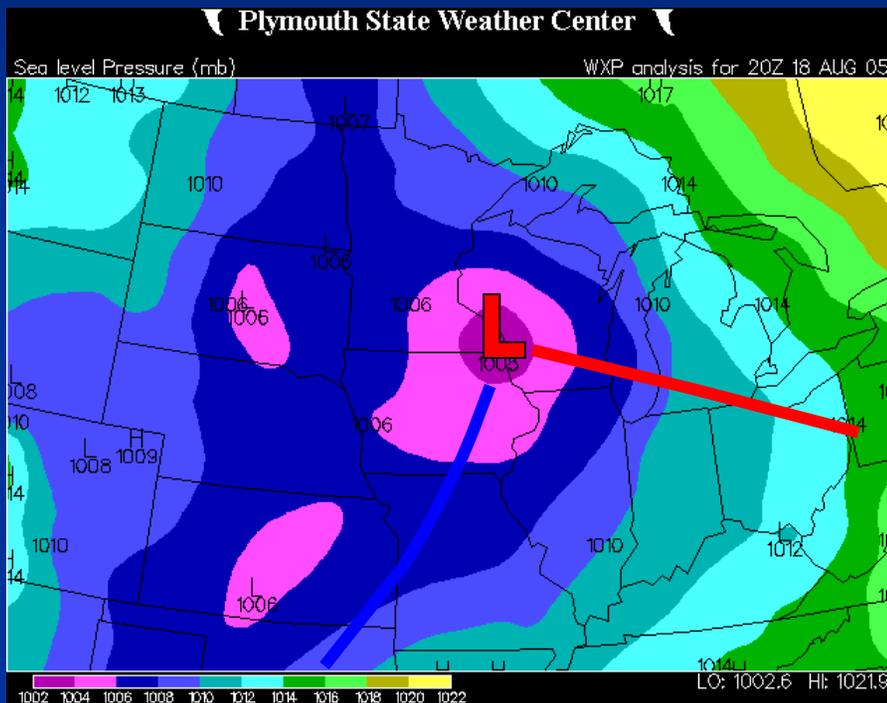
Tornado Plot



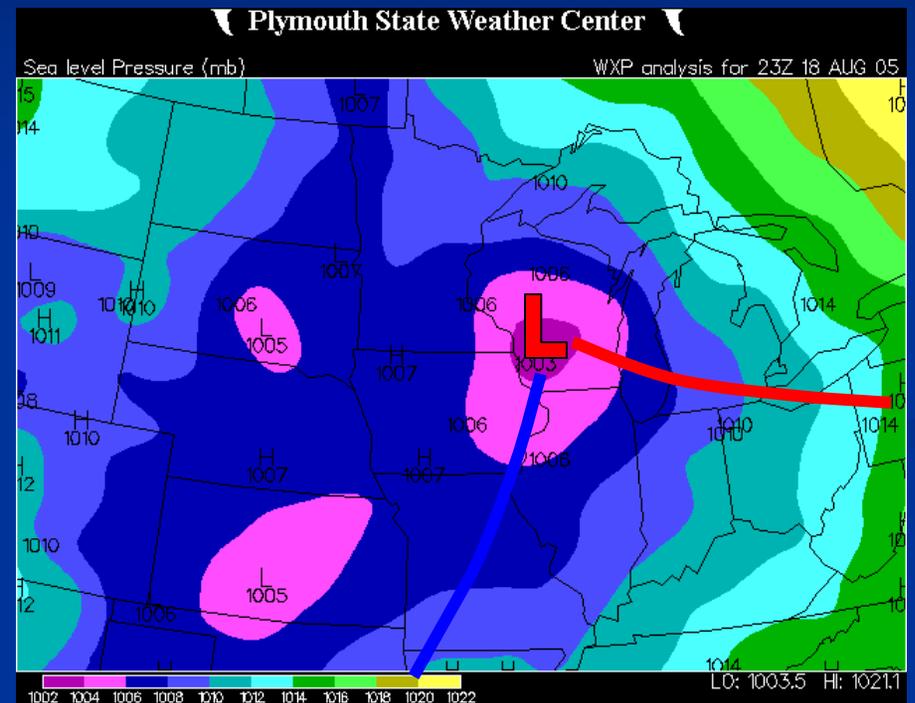
Set up for something big...

- Temperatures in lower 80s
- Dew Points in lower 70s
- Lifted Index (LI's) -3 to -6 (atmosphere unstable)
- Mixed Layer CAPE around 3000 j/kg
(atmospheric buoyancy)
- Nearly 50 knots of Effective Bulk Shear
(change in wind speed from surface to ~18,000 ft.)
- 0 -1 km low-level helicity 200 to 300 j/kg
(potential for atmosphere to rotate)
- Morning convection followed by strong afternoon heating (similar to 1996 Oakfield, WI, F5 tornado set-up)

Aug 18th sea level pressure

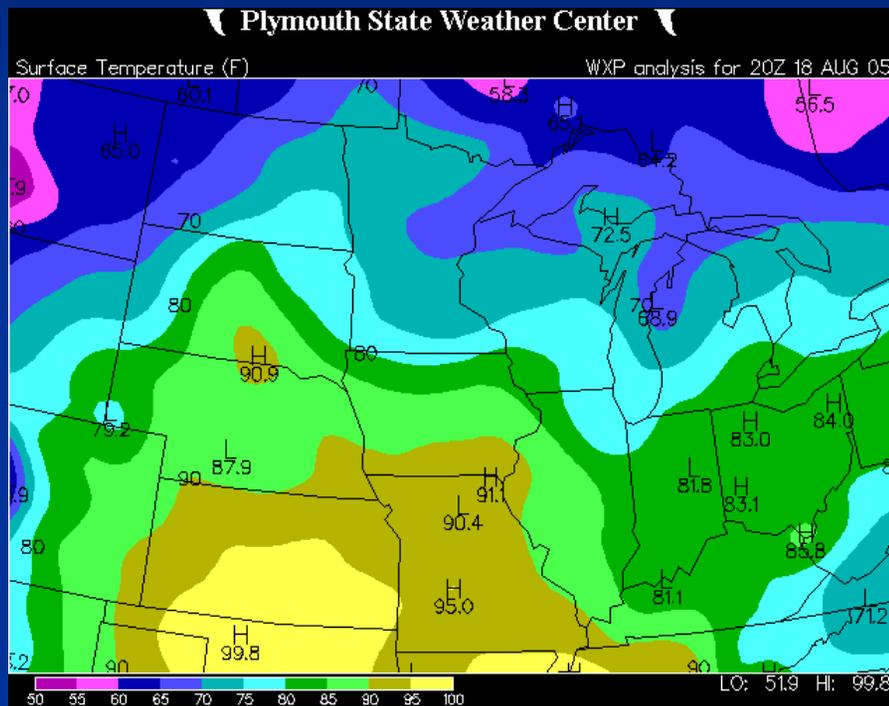


20z – 3 hours before Stoughton tornado

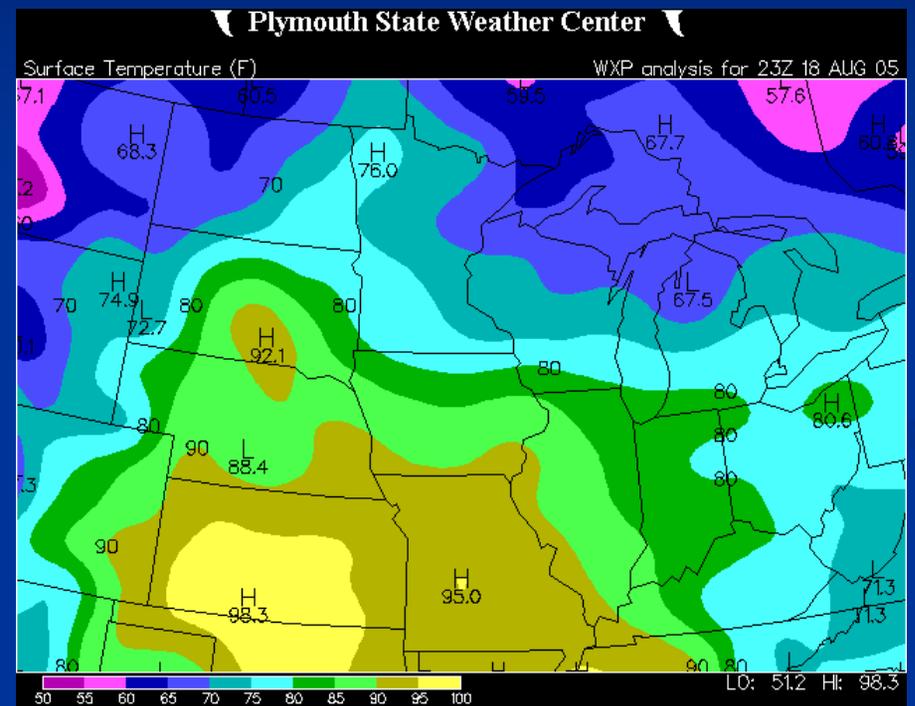


23z – time of Stoughton tornado

Aug 18th surface temperatures

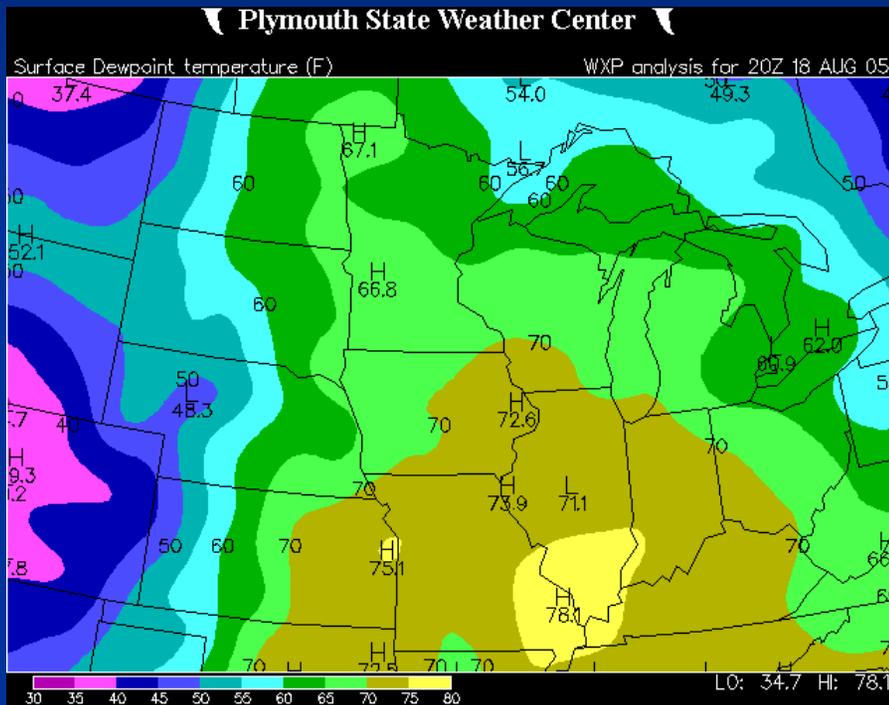


20z – 3 hours before Stoughton tornado

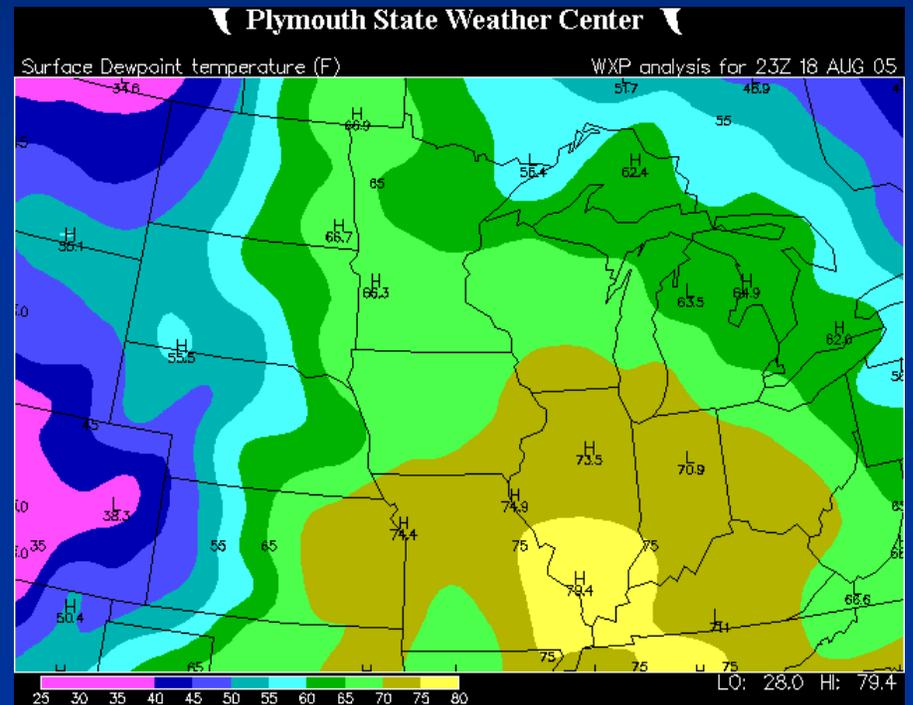


23z – time of Stoughton tornado

Aug 18 surface dew points

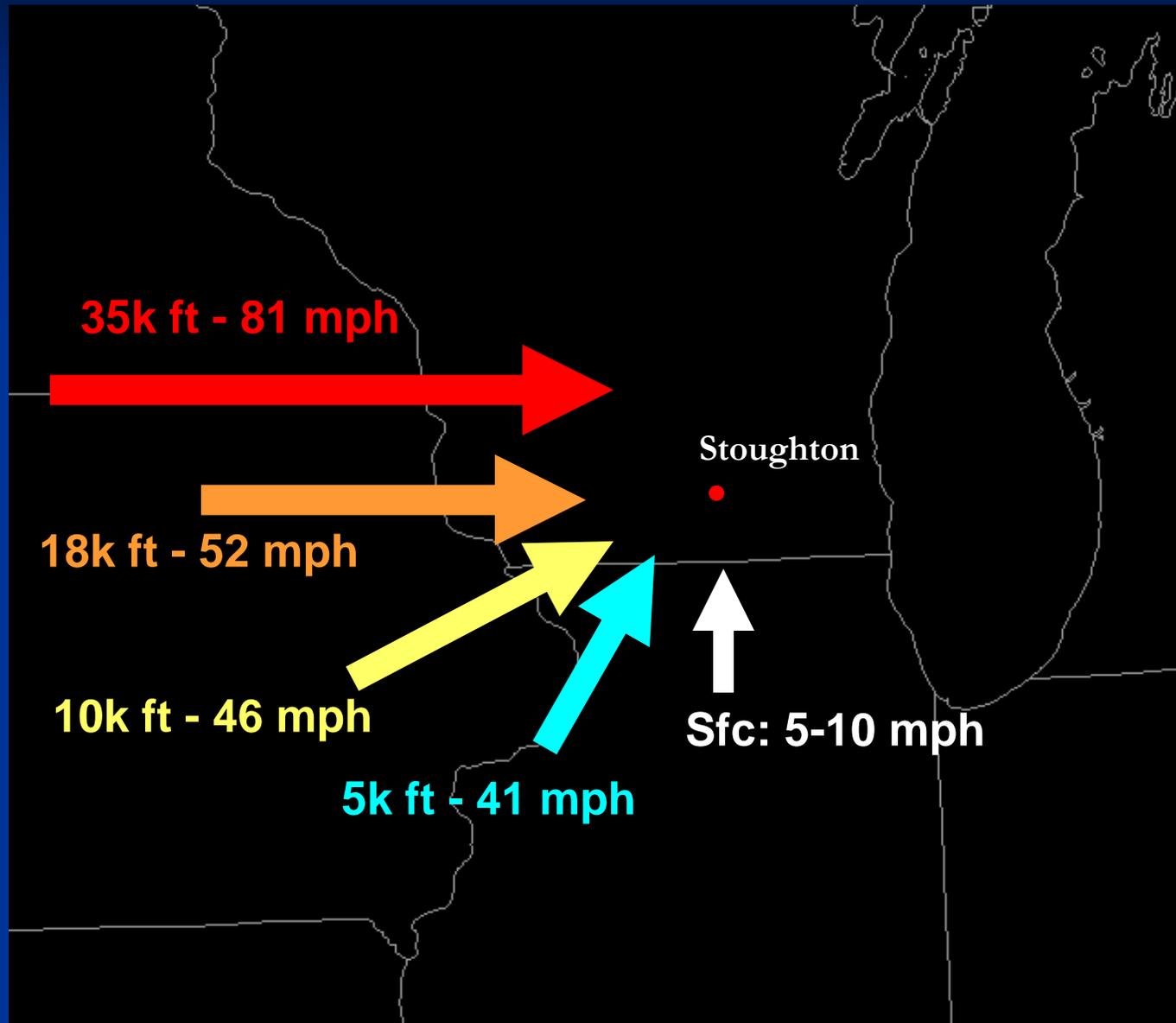


20z – 3 hours before Stoughton tornado



23z – time of Stoughton tornado

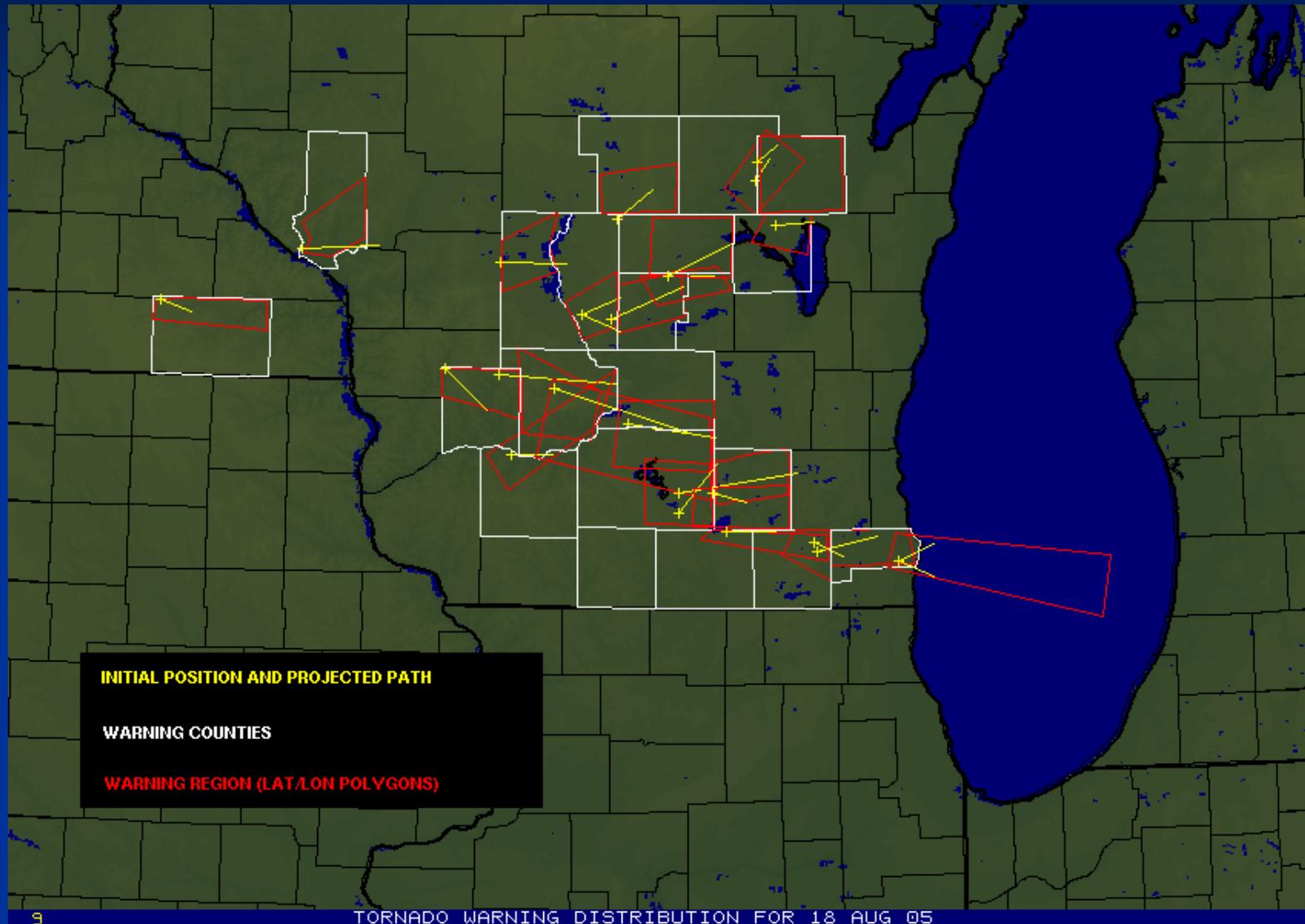
Vertical Wind Profile at 23z



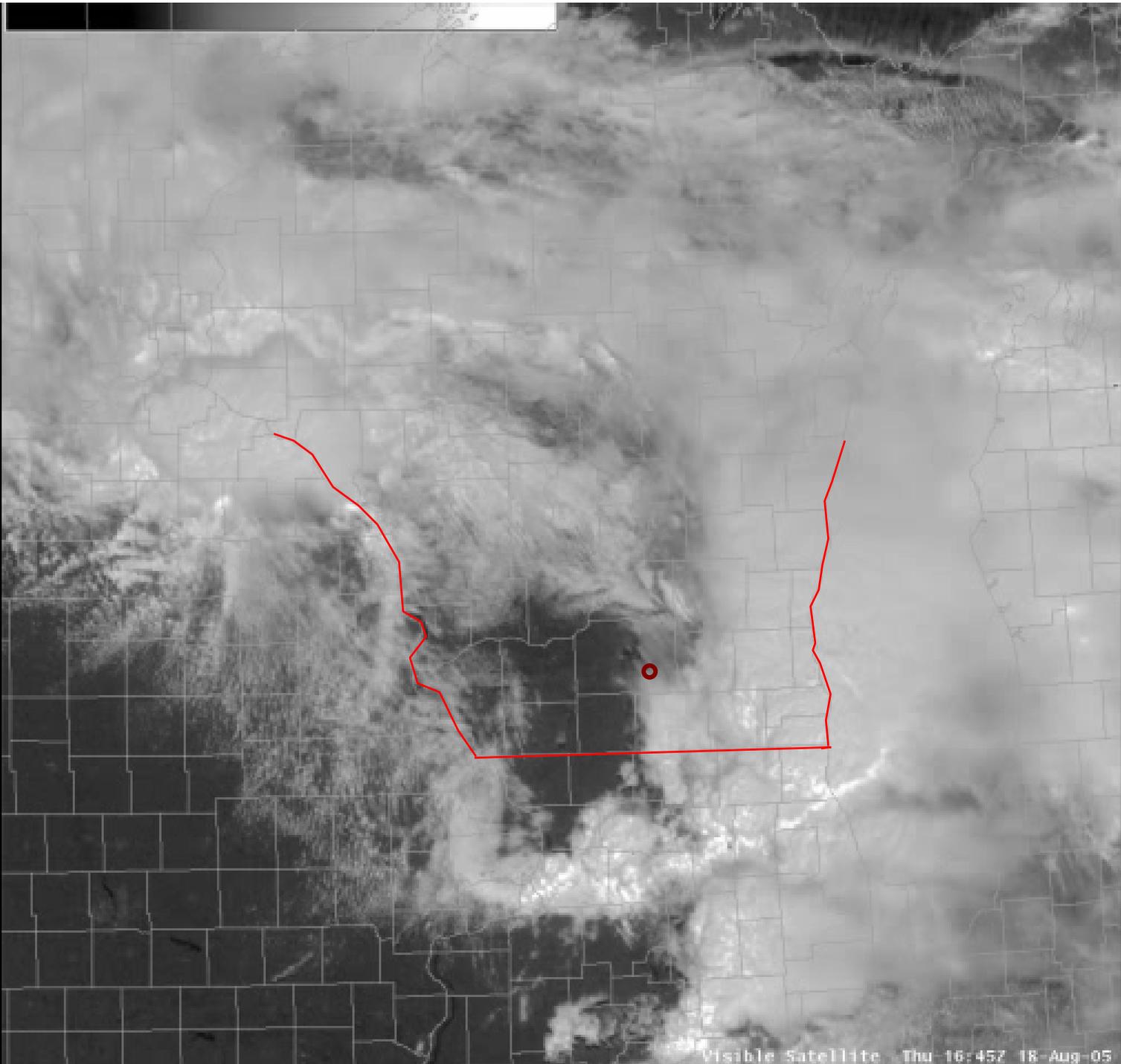
Thunderstorms at Distance



County Warnings Issued

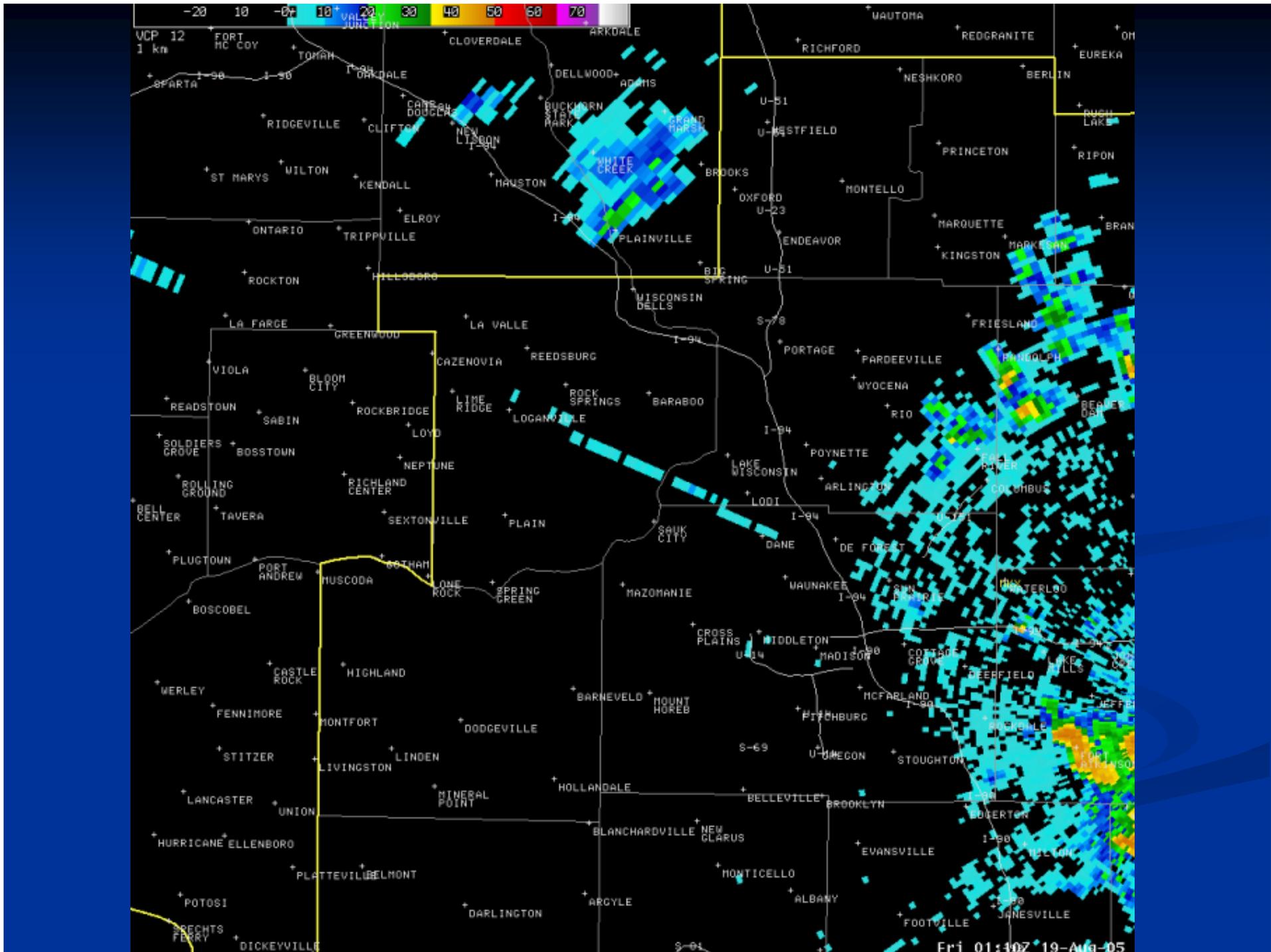


Satellite Animation

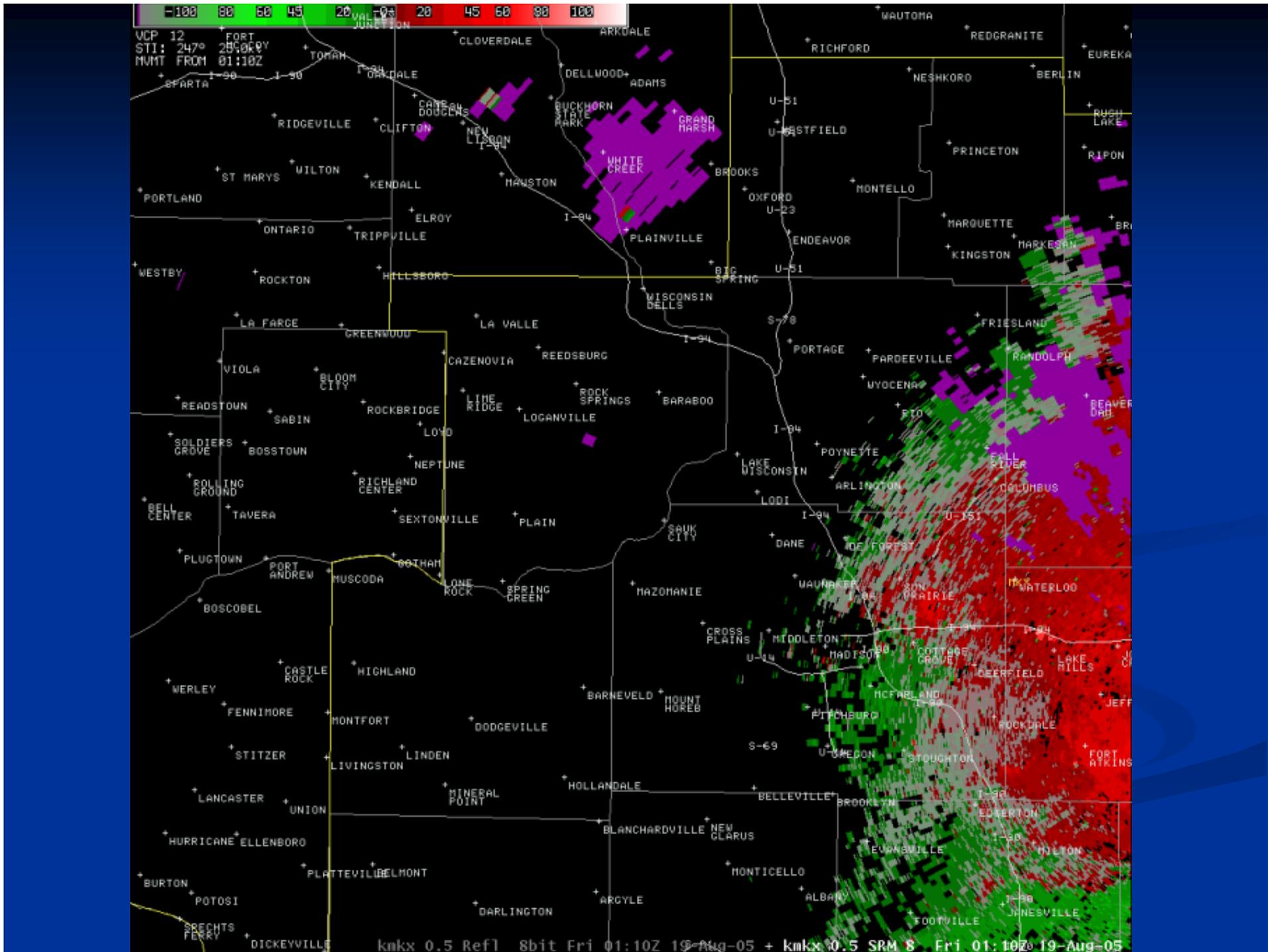


Visible Satellite Thu 16:45Z 18-Aug-05

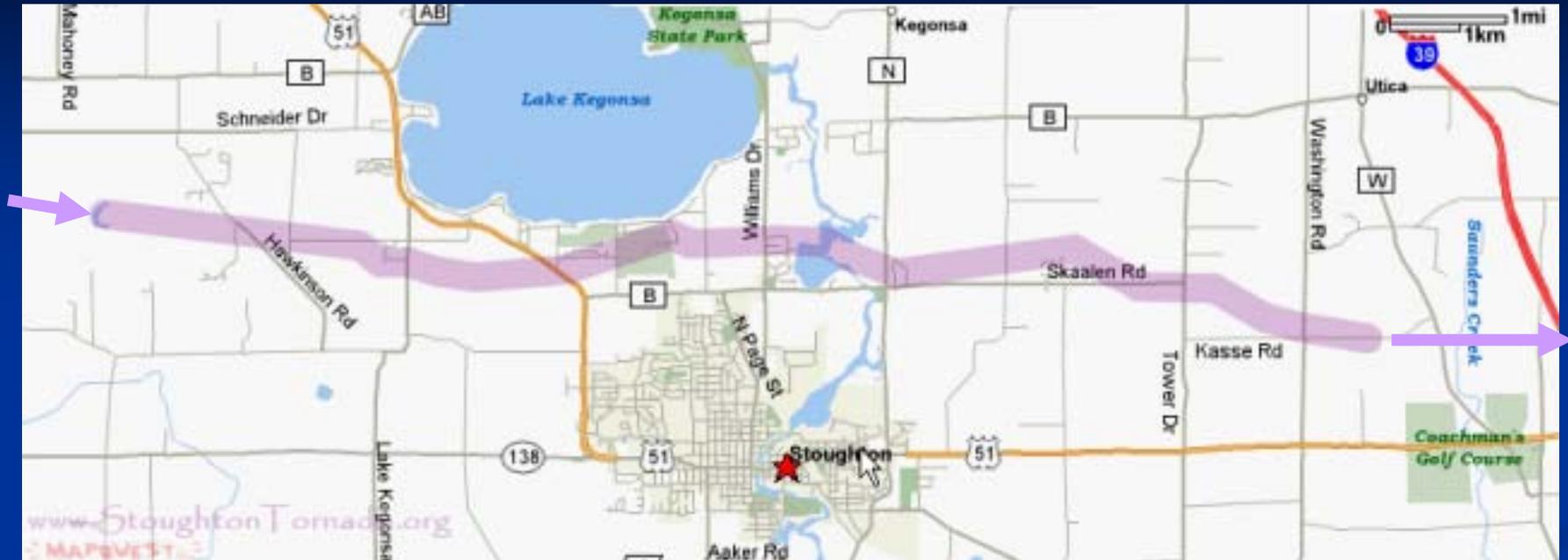
Radar Animation



Fri 01:10Z 19-Aug-05

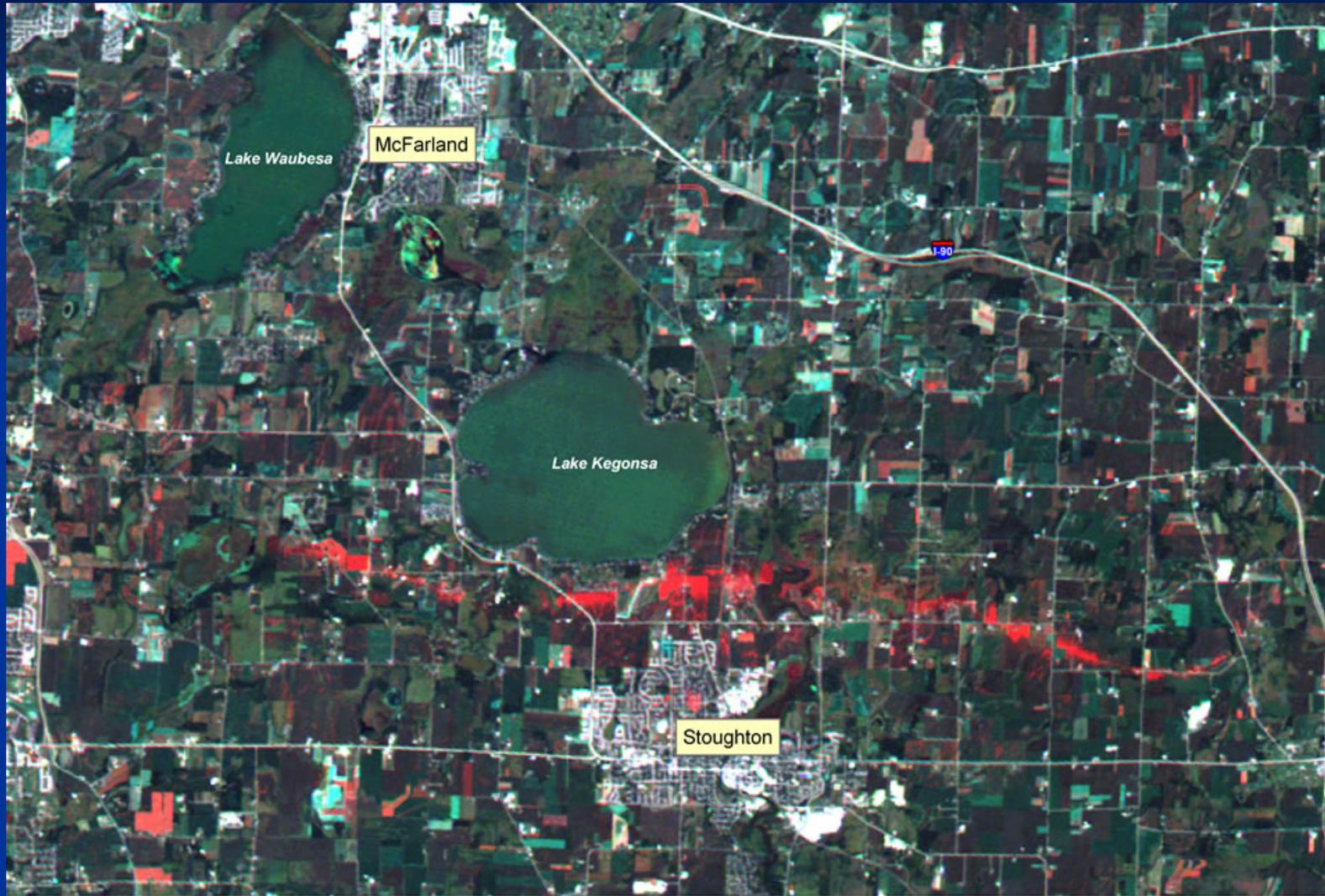


Stoughton Tornado Path



- * Path length was about 18.5 miles
- 615 pm to 708 pm (start location in Fitchburg and ending location in Town of Oakland in Jefferson County).
- Max width about 600 yards, but RFD damaged noted south of core damage area, and some inflow band damage on north side.

Stoughton Tornado Path



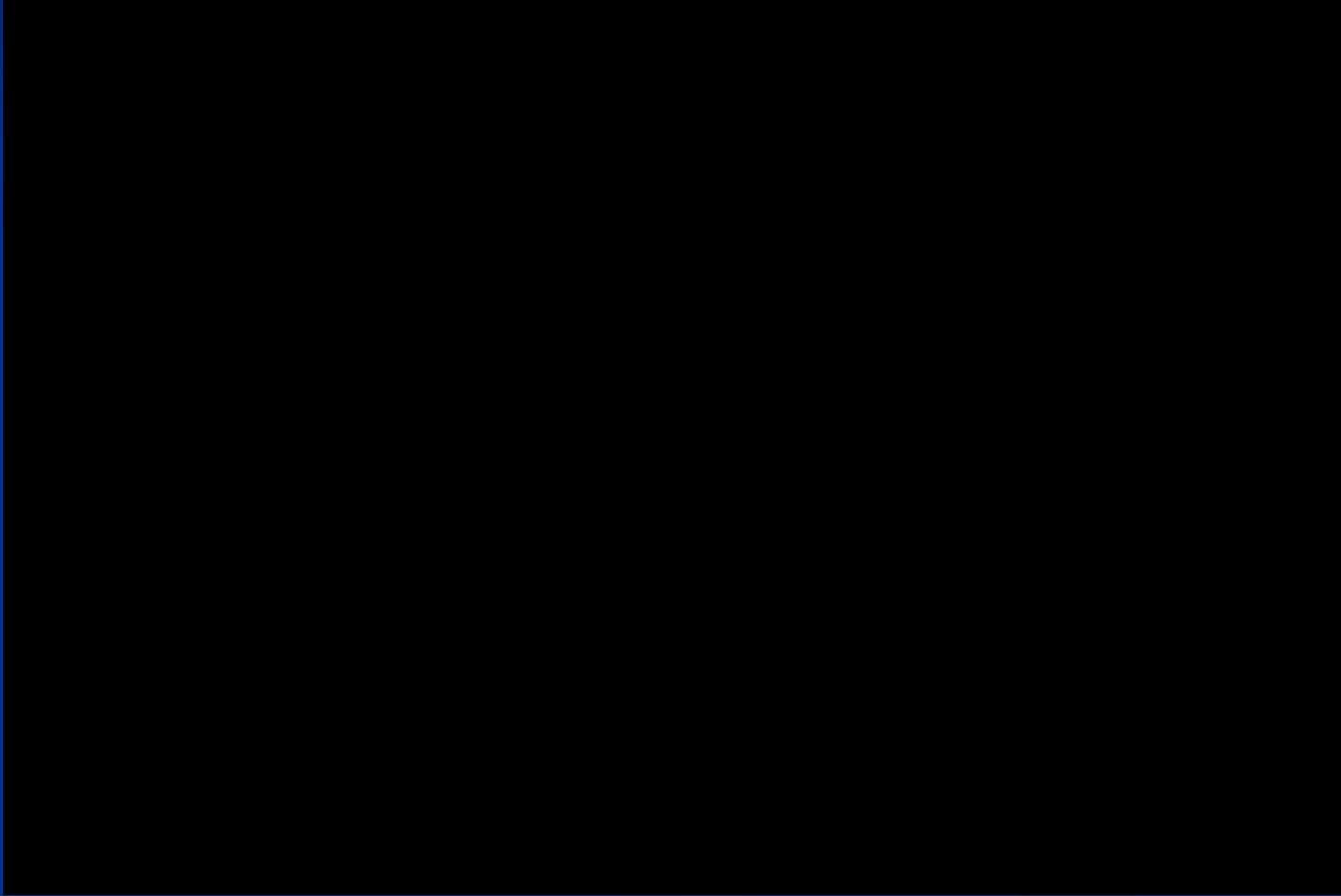
Courtesy of: Environmental Remote Sensing Center - University of Wisconsin-Madison

Stoughton Tornado



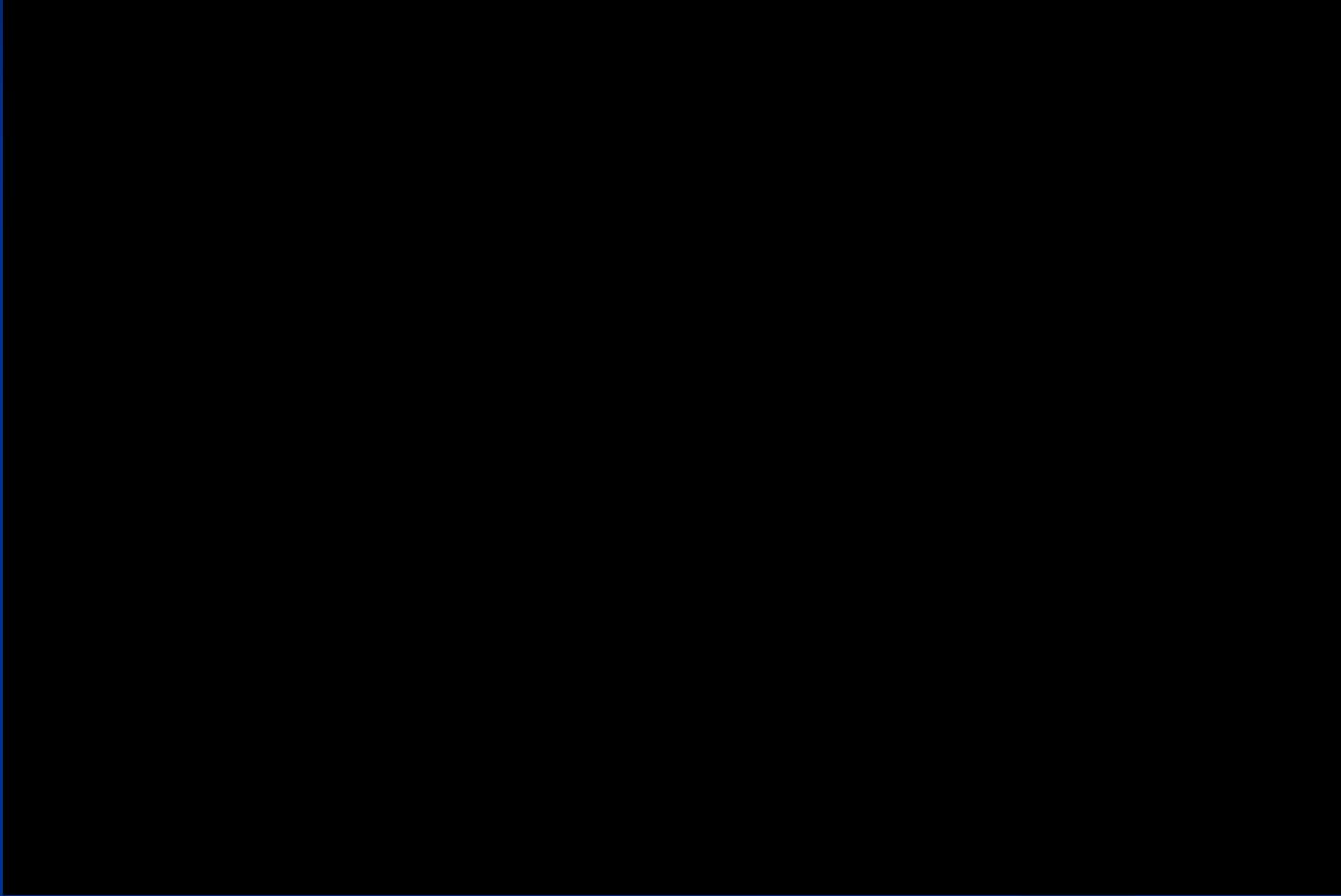
Video

Stoughton Tornado



Video

Stoughton Tornado



Video

Damaged Homes



Photo by: Steve Apps - Wisconsin State Journal

The Reaction



Residents survey damage on Oak View Dr. in the Oak Knoll subdivision.



A neighbor looks at tornado damage to a home near the Stoughton Country Club.



Rated at top of F3 (~200 mph) due to very slow forward motion (10 to 15 mph or even stationary) and non-anchored homes

Death & Injury Totals

- Only 1 directly-related death and 27 injuries, which is incredibly low for number and strength of August 18th tornadoes....**WHY?**
- **“Warning System”** worked.

Strong partnership between NWS, State Emergency Management, broadcast media, law enforcement officials, fire fighters, and other emergency response organizations allowed for quick delivery of critical weather information to the public, which likewise responded quickly and appropriately.

Pre-Storm Preparedness

- Annual severe weather spotter training conducted for decades.
- State has an Emergency Alert System plan to handle weather and non-weather emergencies.
- Dane County has their own EAS plan.
- Annual Tornado & Severe Weather Awareness Week campaign (statewide) for many years – drill day on Thursday.

Storm Prediction Center Efforts

- Convective Outlook Day-2 from 08/17/05 had southern Wisconsin in slight risk for severe thunderstorms.
- Convective Outlook Day-1 issued 1:00 A.M. on the 18th had southern Wisconsin in a slight risk of isolated tornadoes and severe thunderstorms for the afternoon & evening hours.
- Tornado Watch issued for southern Wisconsin issued at 2:50 P.M. (lead time of 2.5 hours to start of Stoughton tornado).

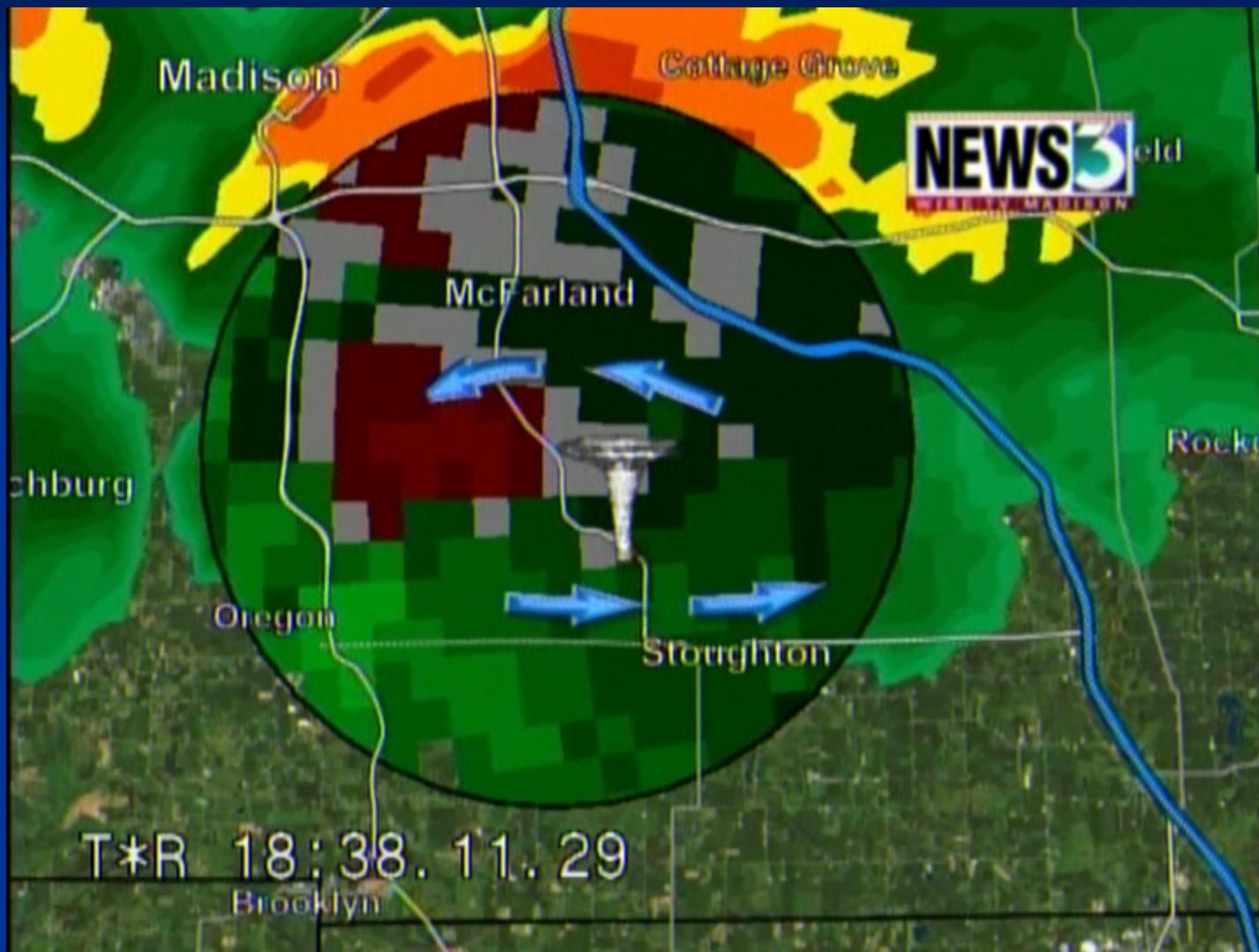
WFO Milwaukee Efforts

- 21 county tornado warnings issued, with 12 verifying, giving us a low FAR of 0.429
- 19 county tornado events, with 18 preceded by a tornado warning, giving us a high POD of 0.947
- Average lead time for 19 county tornado events was 17 minutes.
- Stoughton tornado preceded by two Dane County tornado warnings with lead times of 54 minutes and 9 minutes.

Media Efforts

- Commercial radio and TV stations broadcast watch and warning information repeatedly.
- TV meteorologists (3, 15, 27) in Madison, and WTMJ TV-4 in Milwaukee, went to wall-to-wall coverage (continuous – no breaks).
- WISC TV-3 and WKOW TV-27 in Madison utilized new software that displayed mesocyclone rotation on reflectivity image so that viewers could see roughly where tornado was located.

TV-3 & TV-27 Radar Display



State & County Response

- Governor Doyle and State Representatives toured Viola and Stoughton damage areas.
- State Emergency Management activated Emergency Operations Center immediately after first damage reports.
- State Duty Officer and other State, Regional, and County officials worked until 1 or 2 am.
- EOC was in active mode for over a month, frequently 16 hours per day.
- Outdoor sirens in Dane County activated 5 times

Quotes

- **ABC World News Tonight:**

- *“Although it was amazing, the low death total was no accident” ... “The steady drumbeat of warnings on radio and TV throughout the afternoon alerted people that they were in danger.”*

- **The Capital Times (Madison, WI, daily newspaper) quoting the Dane County Sheriff as saying,**

- *“Hard to believe there weren’t more deaths” ... “after a day of extensive warnings, many people had evacuated the area or taken safety precautions.”*

- **Milwaukee WITI-TV Broadcast Meteorologist, Bart Adrian:**

- *“WFO MKX made an extraordinary response to an extraordinary weather situation.”*

Emergency Response Organizations & Media Helped Recover Items



Debris found in southwest Waukesha Co.



Post-storm Media Coverage

The screenshot shows the madison.com website in a Mozilla browser window. The browser's address bar displays the URL <http://www.madison.com/index.php?redir=TCT>. The website header includes the madison.com logo and navigation links for Classifieds, Jobs, Autos, Homes, Rentals, and Obituaries. A search bar is visible with a dropdown menu set to 'Calendar'. The main content area features a red-bordered search bar and a list of links, including 'Storm photo galleries: The Capital Times and Wisconsin State Journal', 'Here's the lineup for Triple M's 'Build Your Own Blues Festival'', and 'Talented Workers Ahead: The Classified Career Fair is September 26'. Below this is a section titled 'ABOVE THE FOLD' with the subtext 'Top selections from all sections'. A red box highlights the date and time 'Fri, Aug 19, 2005 12:45 pm' and the main headline 'One killed, 21 hurt as tornadoes hit in Stoughton area'. The article text begins with 'TCT: LOCAL STOUGHTON - In the rainy aftermath of the storm in which tornadoes killed one person, wounded 21 others and leveled a broad swath of homes, the survivors got aboard buses to be taken away from the > Full text'. To the right of the text is a photograph of a destroyed building. The right sidebar contains a 'Madison weather' section with current conditions (80° F, SW 0.0, 60% Hum., 0.0" Precip.) and a 'Forecast, radar and weather cam!' link. Below the weather is an advertisement for 'Carolina Apartments' and another for 'Mallards'.

Impressive post-storm media coverage – broadcast, print, and on-line

Stoughton – Wall Cloud to Tornado

1



2



3



4



5



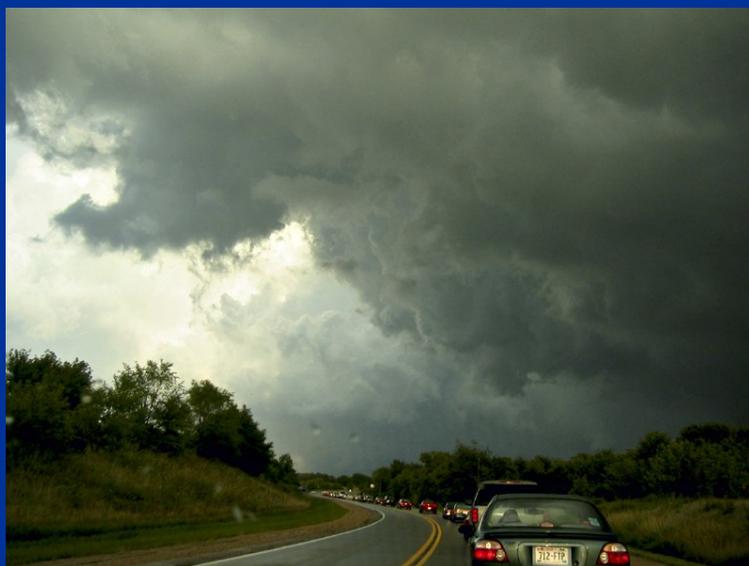
Photo by: Chad Nichols

6



Photo by: Eric Olson

7



8



Photo by: Colin McDermott

Stoughton Tornado



Photo by: Rose Phetteplace

9

Lake Kegonsa



Photo by: Dale Bernstein

10

Fort Atkinson, Jefferson Co.



Some of the Other Tornadoes



Consequences of Outbreak

- 1 death and 27 injuries resulted
(1 death and 23 injuries with Stoughton tornado)
- Property damage and clean-up/protective costs estimated at \$43.07 M
(\$34.3 M with Stoughton tornado)
- Crop damage estimated at \$1.35 M
(\$750K with Stoughton tornado)
- Debris from the Stoughton tornado was found scattered across Waukesha and Milwaukee Counties...50 to 70 miles to the east!

Questions??



Tornado grows in size as it approaches Stoughton, WI.



Closer view of the Tornado



The tornado moved across southern Dane County, killing one person and destroying hundreds of homes.



Tornado at full strength



***A Capital Times* reader's view of the twister in
Stoughton.**



Damage of home along Oak View Dr. and Yahara Dr. in the town of Pleasant Springs.



Residents survey damaged home in the Oak Knoll subdivision.



Large pieces of metal wrap around trees at a Stoughton home.



An airplane is flipped upside down in a structure damaged by the tornado.



Oak Knoll subdivision along Oak View Drive in Pleasant Springs.



Police block a road during cleanup efforts in Stoughton.



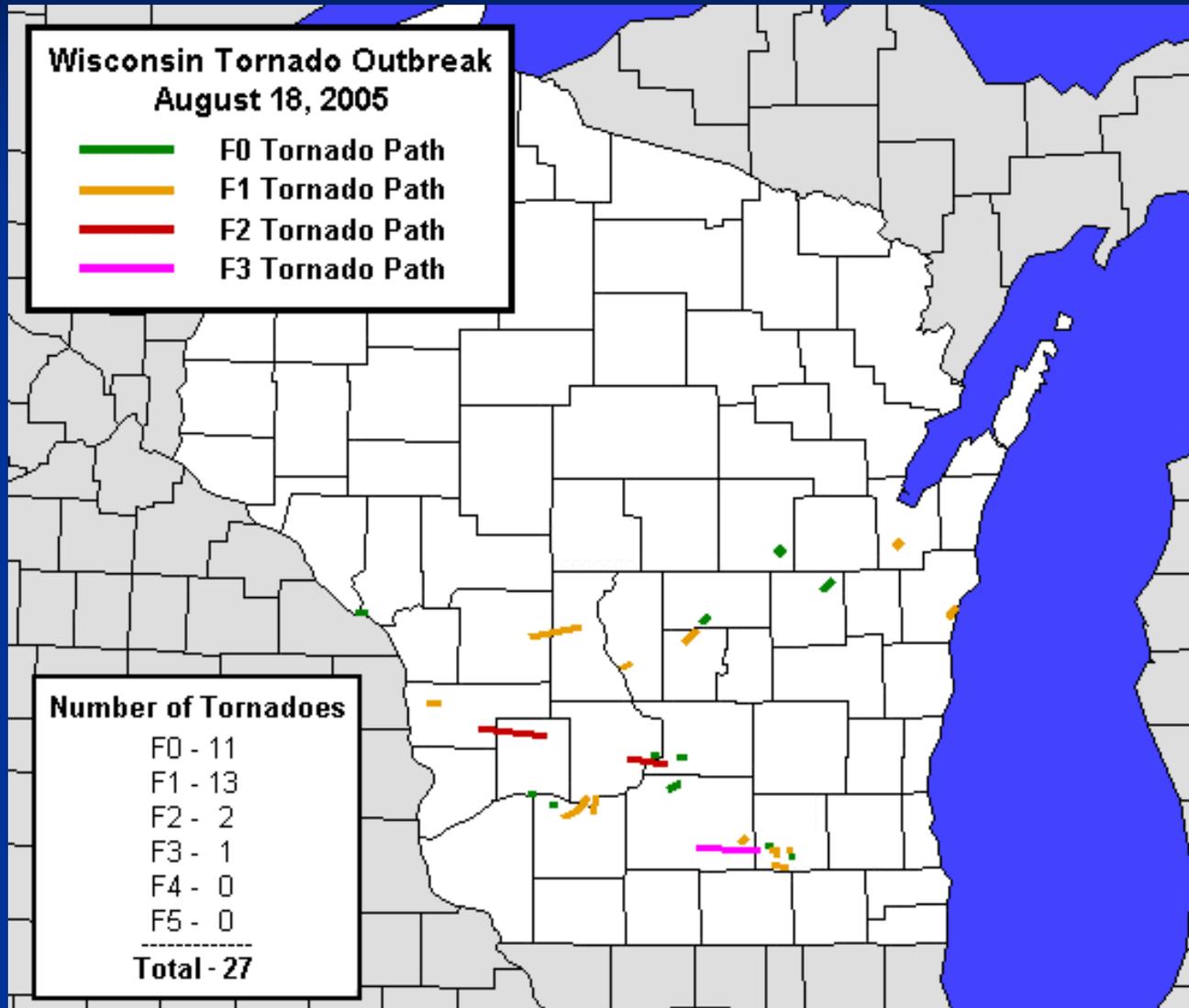




Home near Stoughton Country Club with the storm exiting the area.



Tornado Plot



At least one formed funnel approaches Stoughton, Wi



North view of approaching tornado in Stoughton.



A tornado picks up strength as it heads toward Stoughton.



Tree and exterior damage along Oak View Dr. in Oak Knoll subdivision in Pleasant Springs.



Stoughton Industrial Park damage from Marty's Car Museum.



Tom Domarski surveys damage to a neighbor's home near Stoughton Country Club Thursday evening. Domarski's home is pictured in background.



Home damaged by tornado near Stoughton Country Club Thursday evening.



Tornado damage of truck and homes near Stoughton Country Club Thursday evening.



Lenny Peaslee, a chef at Stoughton Country Club, surveys damage to the roof of the clubhouse Thursday evening.



Wind damage to home at the end of Yahara Dr. in the Oak Knoll subdivision.



Displaced residents line up outside City Hall in downtown Stoughton Friday morning to receive wristbands to gain access back into their homes that were damaged during Thursday night's tornado.



A firefighter surveys the area of County Club Rd. Friday morning after a tornado went through north of Stoughton.



Twisters rip across state
A McFarland firefighter searches through debris of a house and looks for survivors Thursday after a tornado sweeps through a neighborhood north of Stoughton on Highway 51.



Twisters rip across state
A McFarland firefighter searches through debris of a house and looks for survivors Thursday.



**Twisters rip across state
Tornado damage of houses with roofs
torn off near the Stoughton County Club.**



**Twisters rip across state
Firefighters sift through debris in the aftermath of
Thursday's tornado near Stoughton.**



A firefighter searches through debris of a house and looks for survivors Thursday.



Firefighters search through house debris looking for survivors after a tornado ripped through a neighborhood.



A vehicle is flipped onto a demolished structure damaged by the tornado in Stoughton.



An elderly woman sifts through rubble at a Stoughton home leveled by Thursday's tornado.



A Monona fire engine moves slowly down a road in Stoughton early Friday.



Dozens of homes were destroyed Thursday when a tornado struck Stoughton. On Friday, cleanup efforts began for area residents.



Jeremiah Bennett starts to clean up the tornado damage to his home in the Oak Knoll Subdivision in Stoughton.



**A large uprooted tree dwarfs a man along
Lake Kegonsa Road in Stoughton.**









Dark clouds hang on the horizon north of the Interstate 90/Highway 51 interchange near Edgerton.



A driver speeds away from the advancing tornado.





**The storm damaged dozens of homes in the
Stoughton area.**



Debris littered many neighborhoods.









Village of Dane Tornado – F0



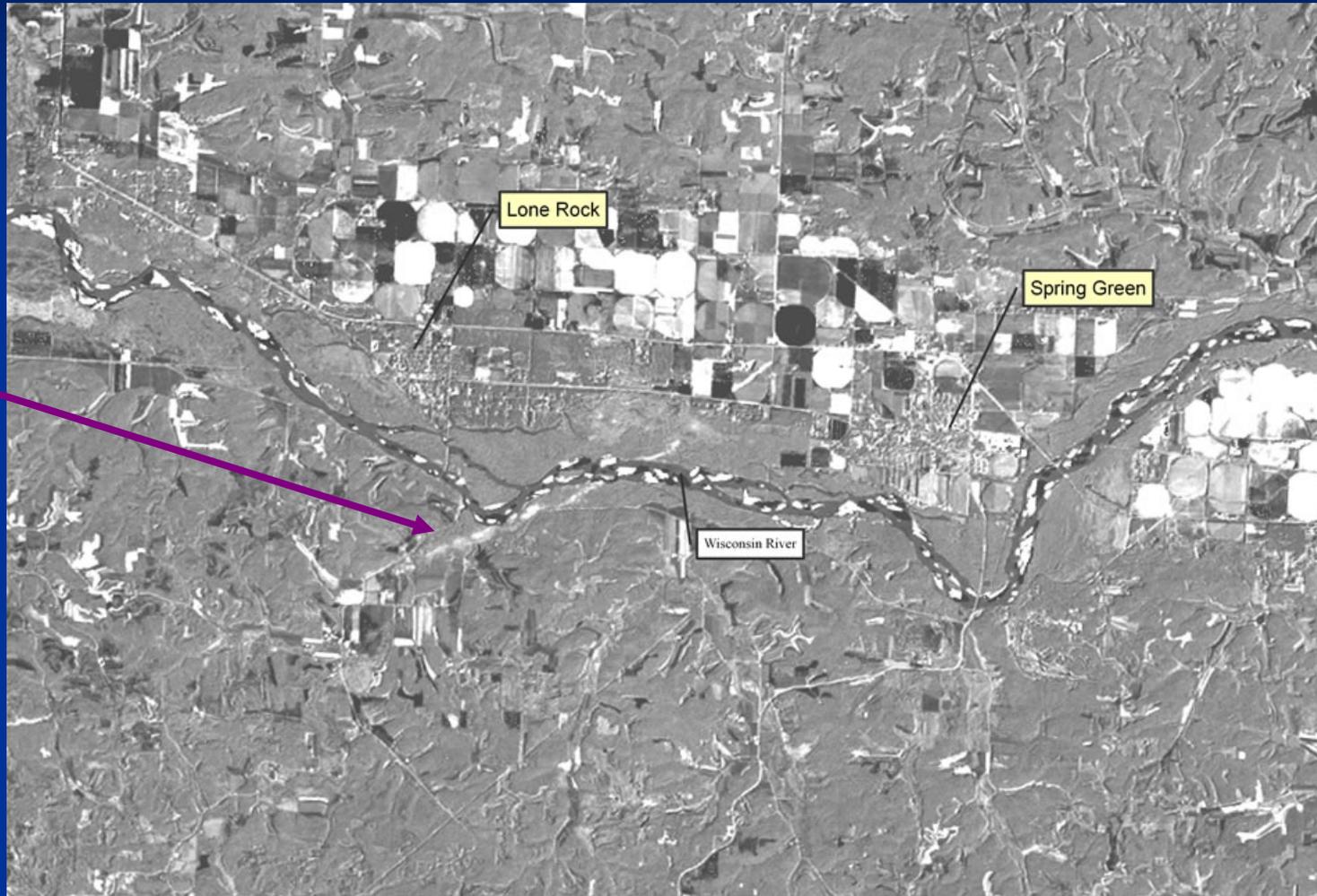
Photo by: John Horn



Stoughton Tornado – Multiple Vortex

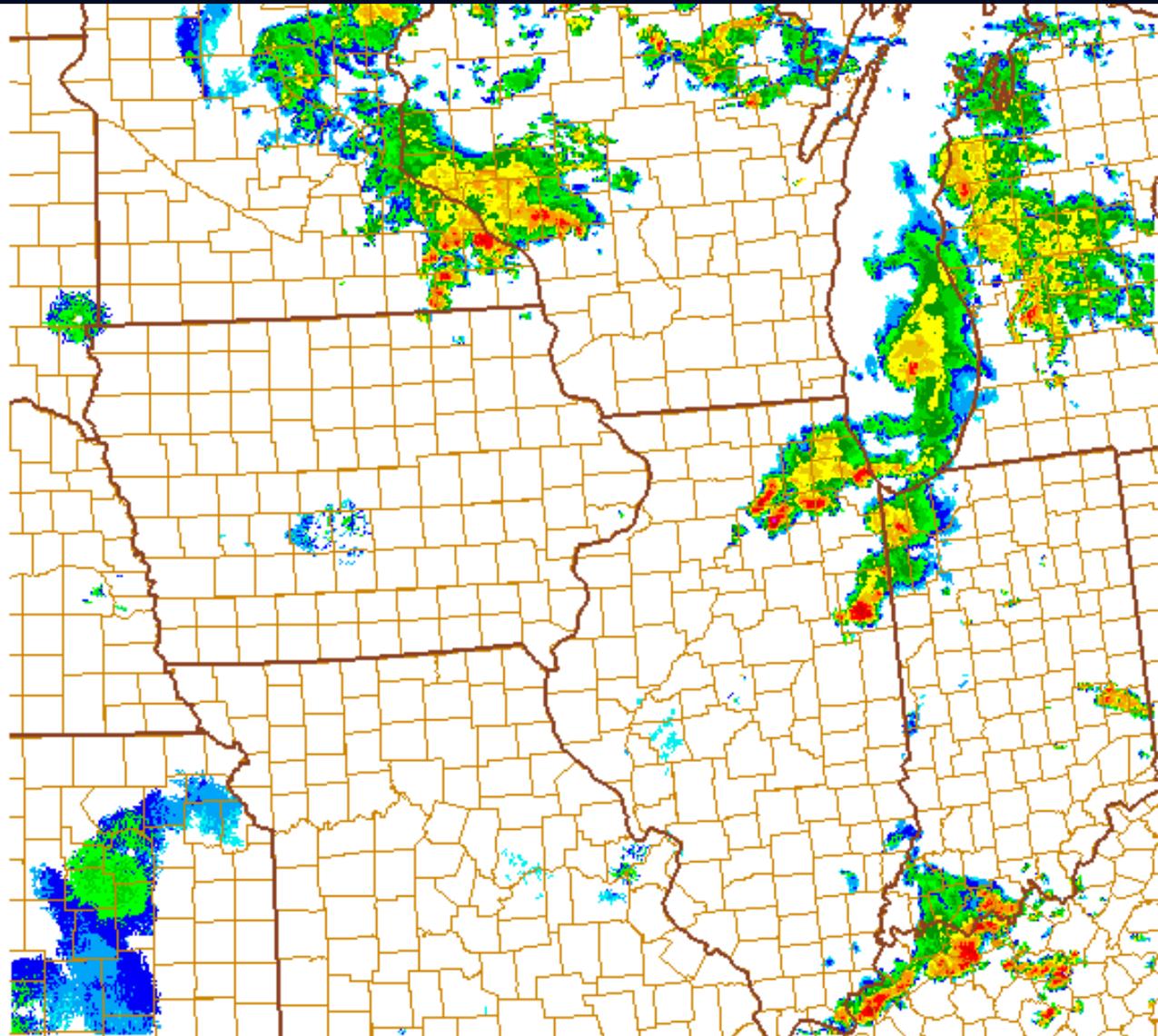


Spring Green Tornado Path



A tornado forms over the Stoughton area.

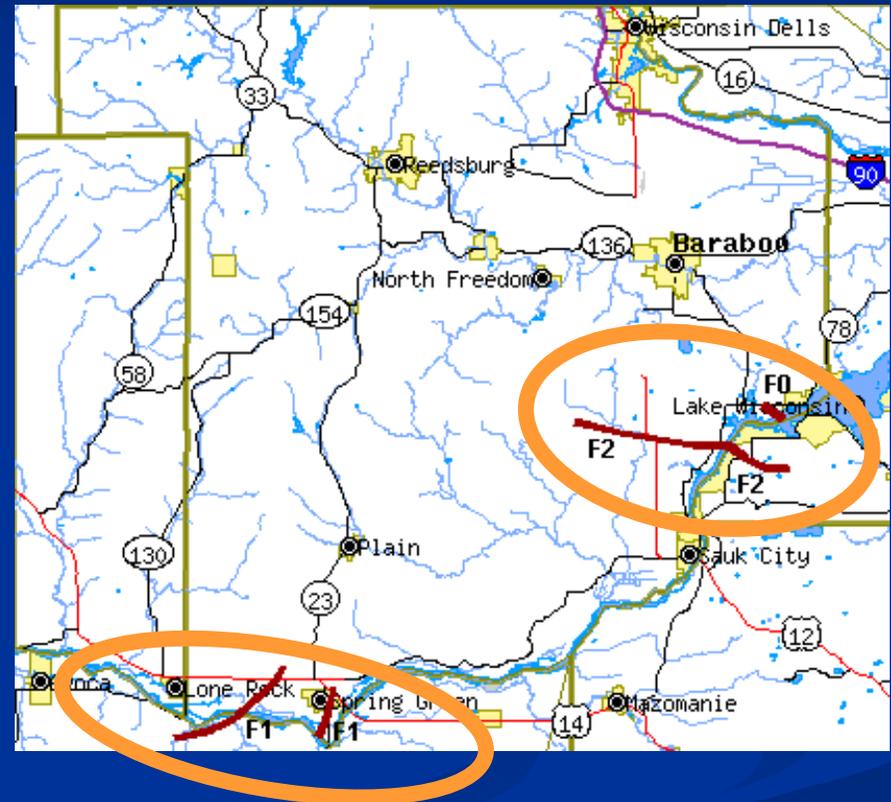
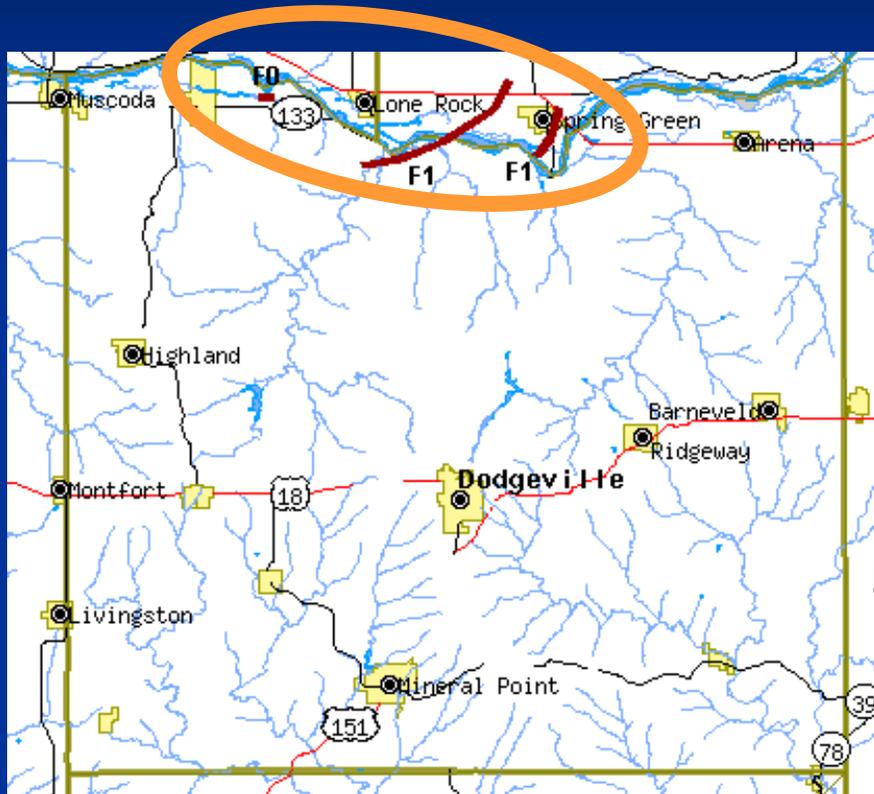




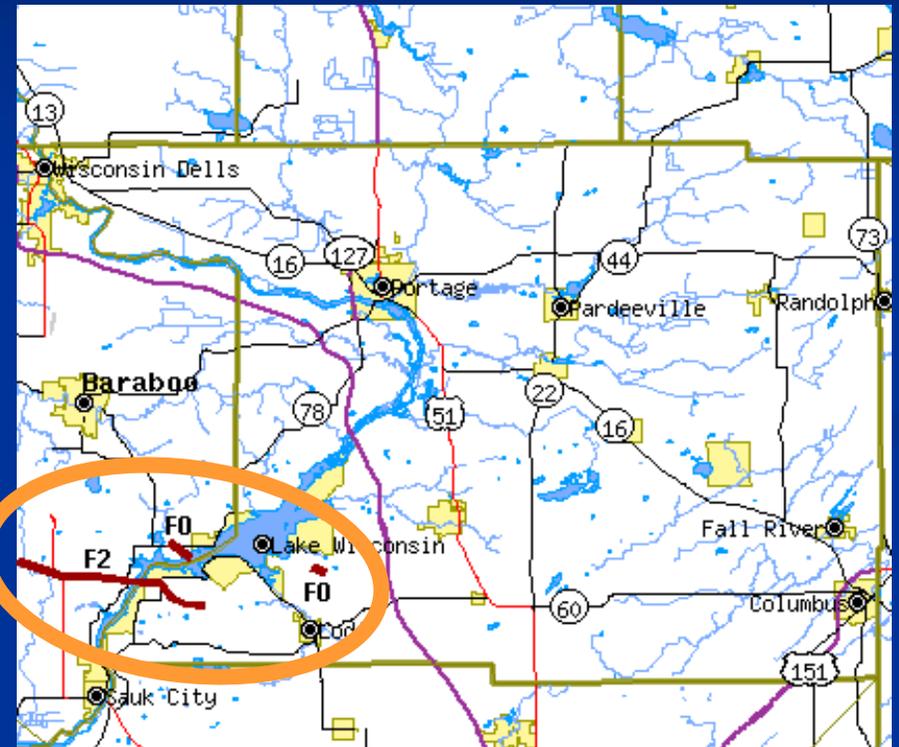
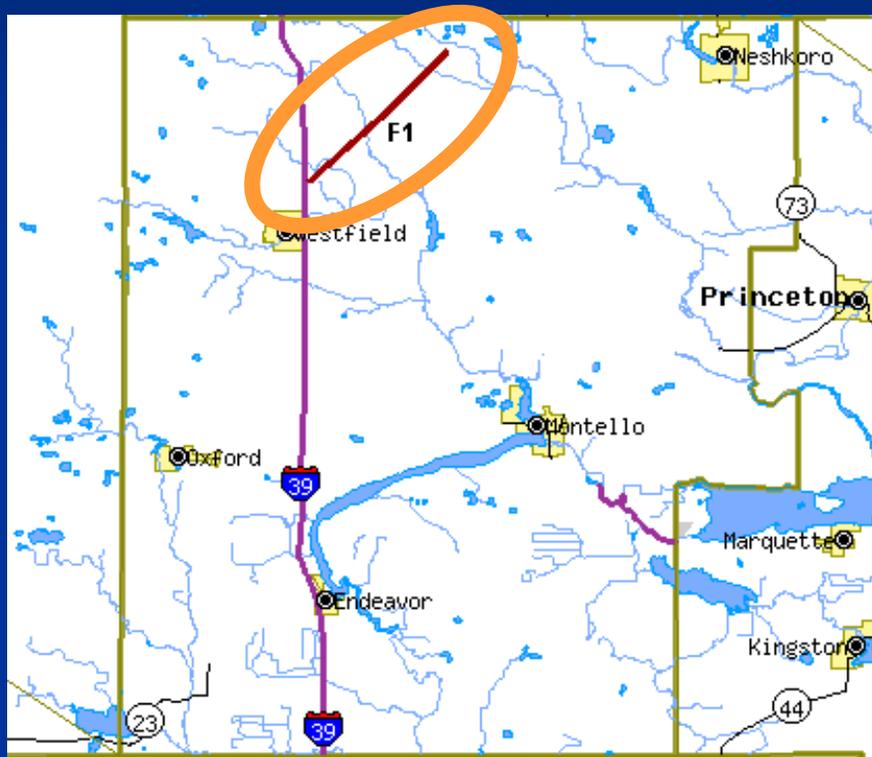
NWS Composite Reflectivity
20050818/1841

Tornado Plots

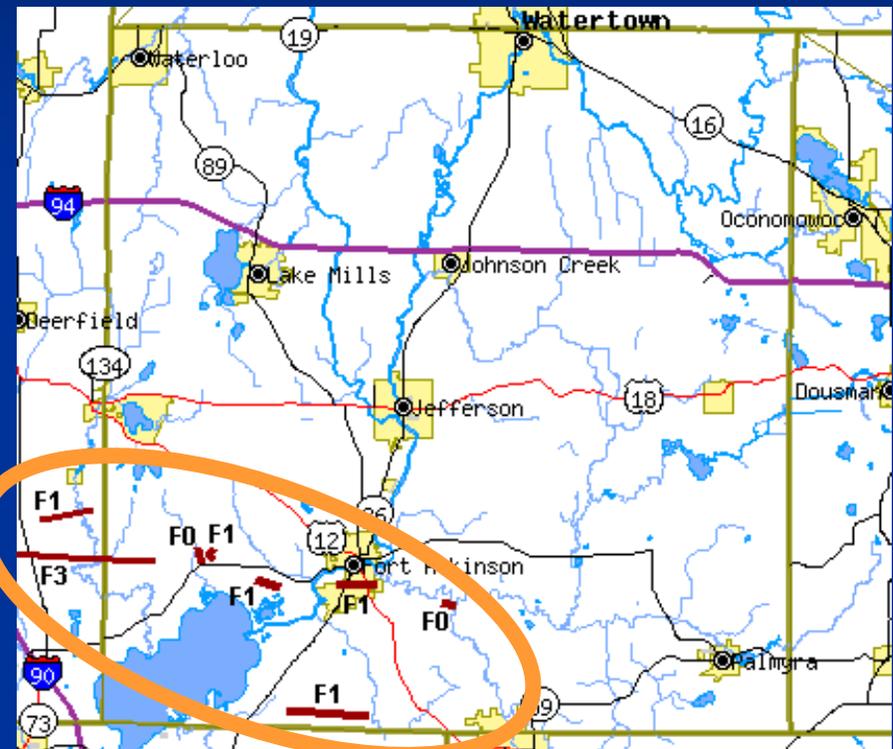
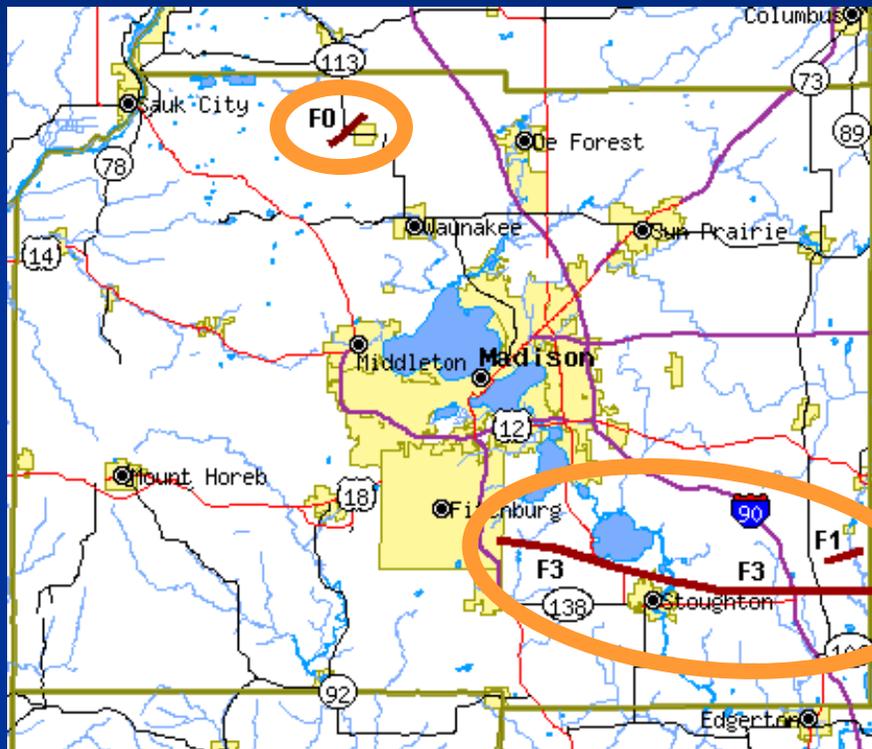
Iowa and Sauk counties



Marquette and Columbia counties



Dane and Jefferson counties

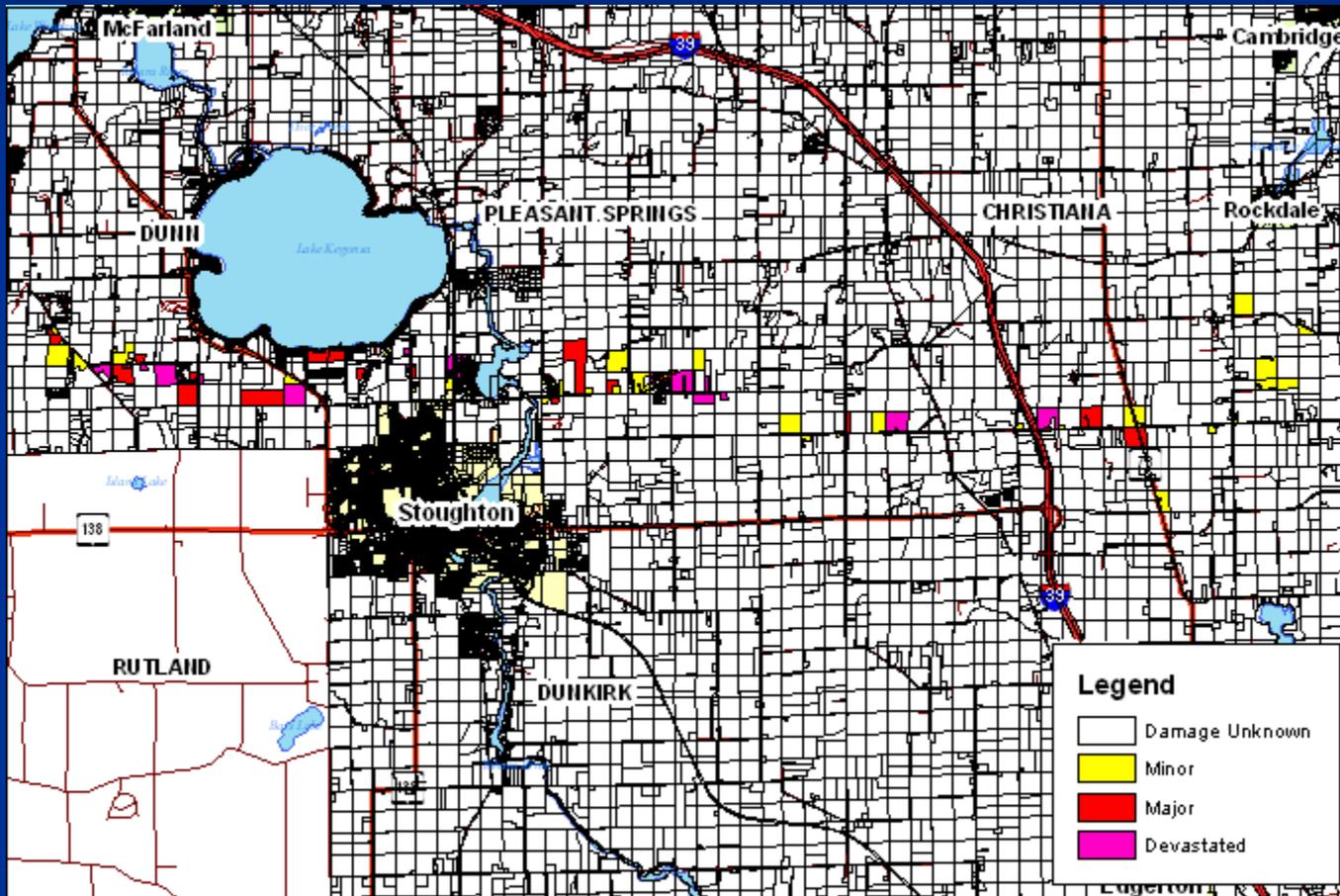


Debris being lifted into the air

Colin McDermott
Stoughton
Dane County
August 18, 2005



WEM GIS Project – Damage Assessment



State Response

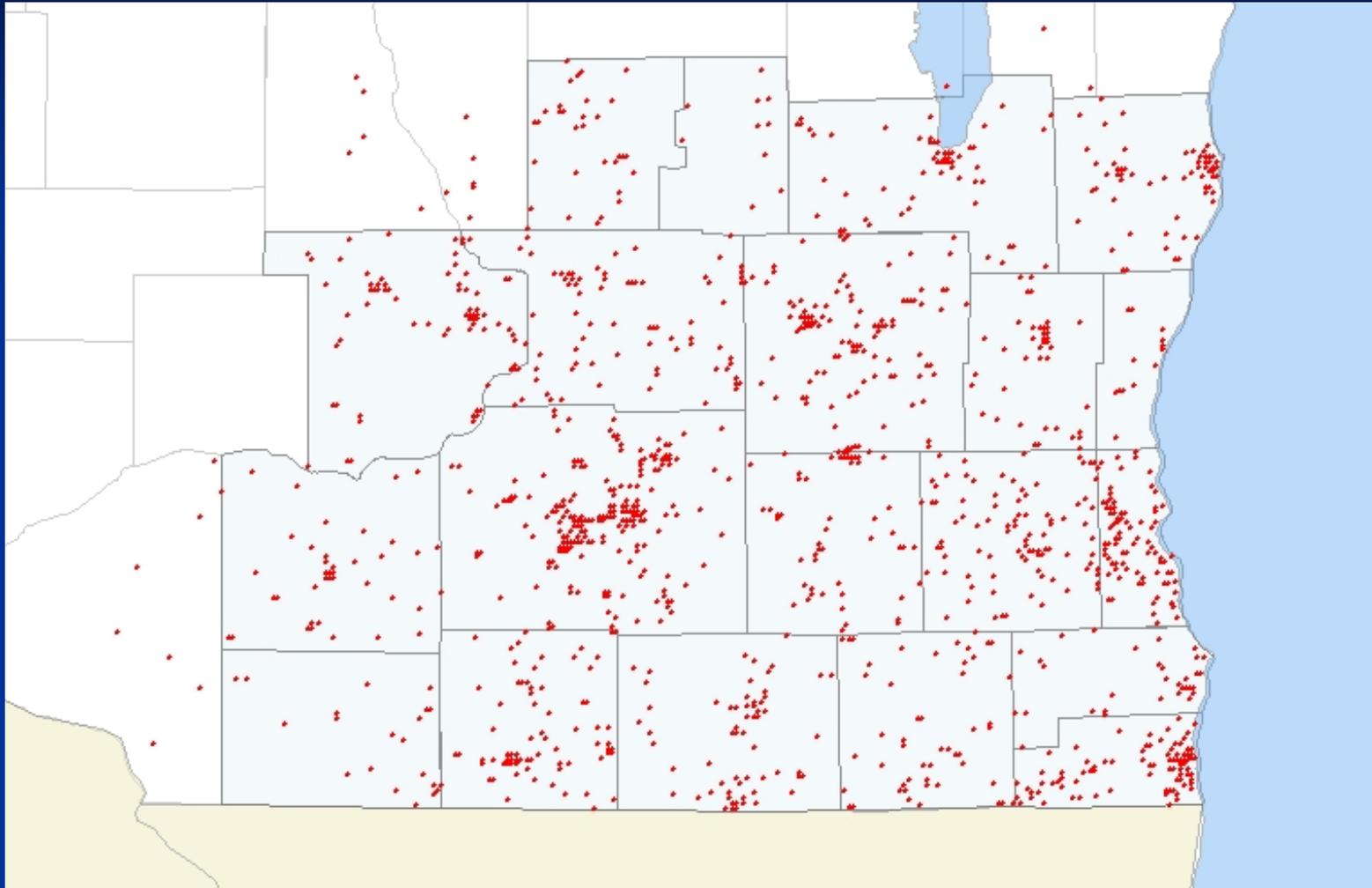
- Governor Doyle and State Representatives toured Viola and Stoughton damage areas.
- Department of Natural Resources conducted flyovers for aerial damage assessments.
- Emergency response organizations jumped into action to set up temporary shelter, food, & water...not to mention clean-up activities.

Volunteers Were Ready

At least 80 off-duty medical staff members reported to Stoughton Hospital after the tornado... without officially being called



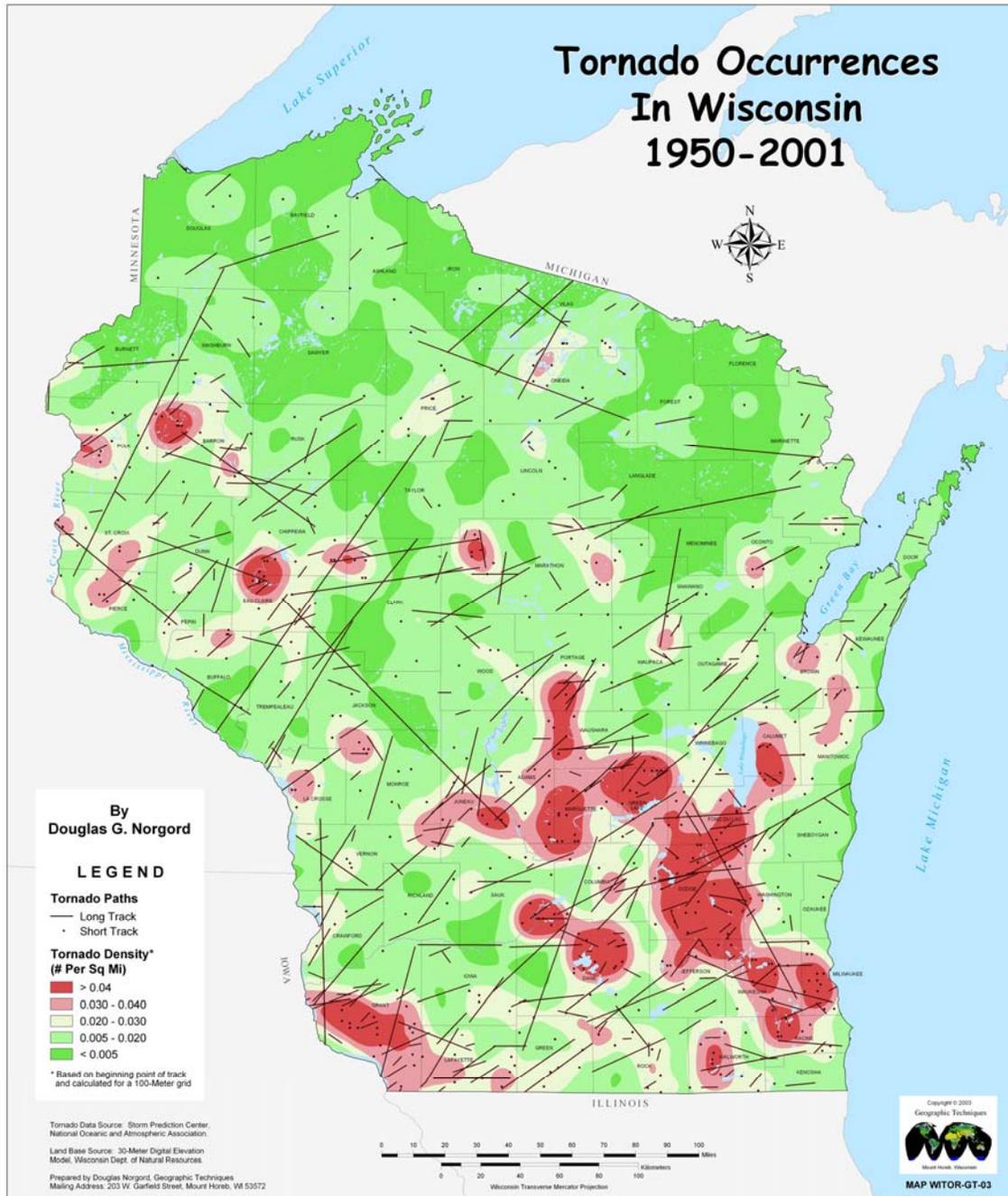
General Public Spotters



...in addition to hams, fire fighters, law enforcement officials, and other response types

Wisconsin Tornado Density Plot

Yearly average = 21
Peak month is June
Peak spin-up hour is
6 to 7 pm



Federal Disaster Money

- Presidential Major Disaster Declaration denied for Vernon, Sauk, and Dane County.
- Small Business Association granted physical disaster loans to 12 counties.