SKYWARN 2011

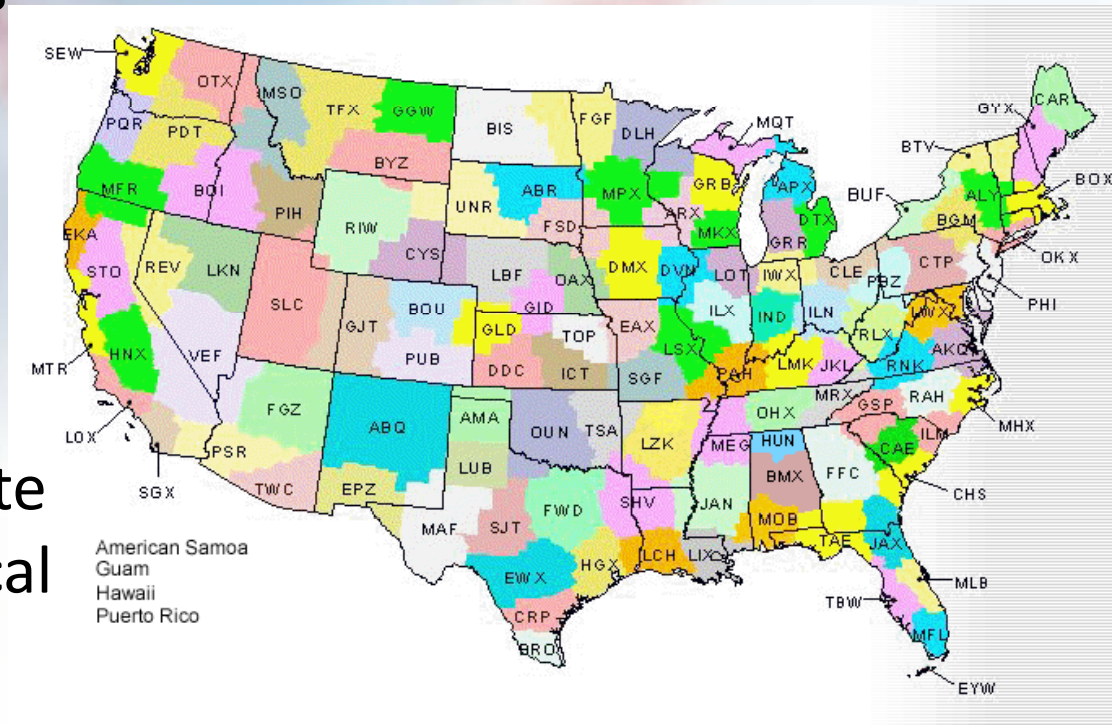
2011 Spotter Training

Part 1

- Introduction
- 2010 Overview
- Thunderstorm Hazards, Safety
  - Before the Storm
  - During the Storm
  - After the Storm
- What, when and how to report

National Weather Service

- Federal government
  - Department of Commerce
    - National Oceanic and Atmospheric Administration (NOAA)
- 13 River Forecast Centers
- 21 Central Weather Service Units
- 6 Regional Headquarters
- 122 Weather Forecast Offices
- 9 Offices which provide special services on a national level (Storm Prediction Center, Climate Prediction Center, Tropical Prediction Center)

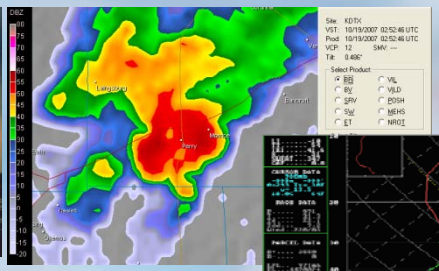


NWS Detroit/Pontiac

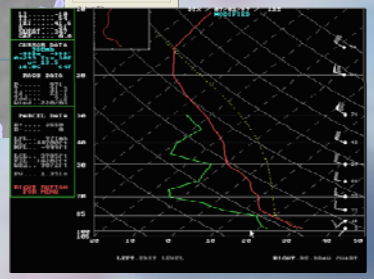
- A team of 24 professionals
  - Meteorologist, Hydrologist,
  - Electronics/IT, Administrative
- Mission: Forecasts and warnings for the protection of life and property
- Forecasts and warnings issued 24/7
- 17 counties in Southeast Michigan
- All or portions of Lakes Huron, St. Clair and Erie

From Spotters to Warning the Public

Spotter



Radar



Environment

Public - Action

NWS

Dissemination

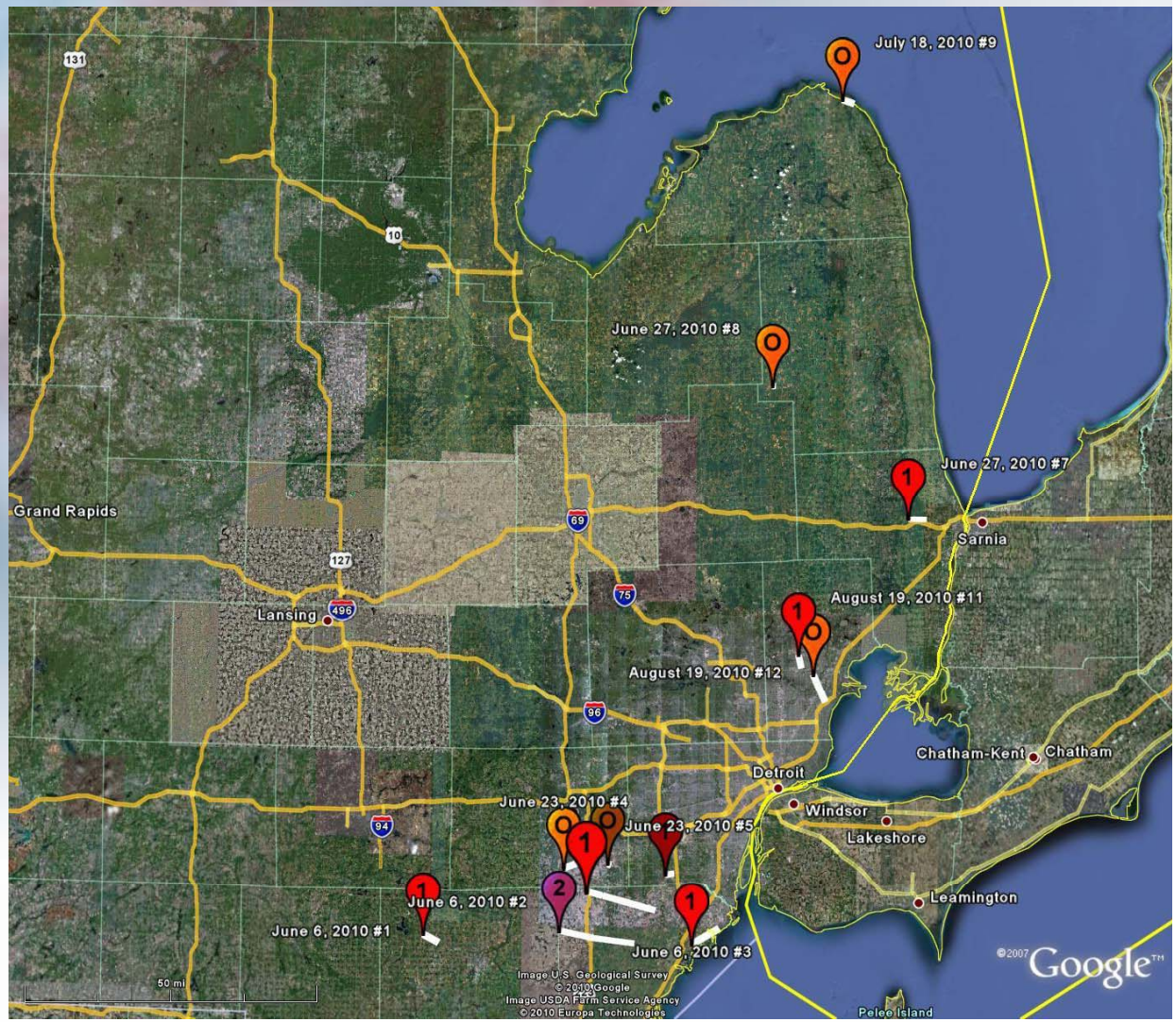
Review of Last Year

DTX	Warnings	Warnings Verified	NOT Verified	Events	Fully Warned	Partially Warned	NOT Warned	Lead Time	LT 1st Event
2008	139	102	37	341	297	1	43	23.0	22.9
2009	54	32	22	102	91	0	11	23.1	23.1
2010	122	82	40	230	209	4	17	23.6	23.6

Year(s)	Severe Event Detection	False Alarm	Lead Time
1995-2007	81 %	27 %	19.3
2008	87 %	27 %	23.0
2009	89 %	41 %	23.1
2010	91%	33%	23.6

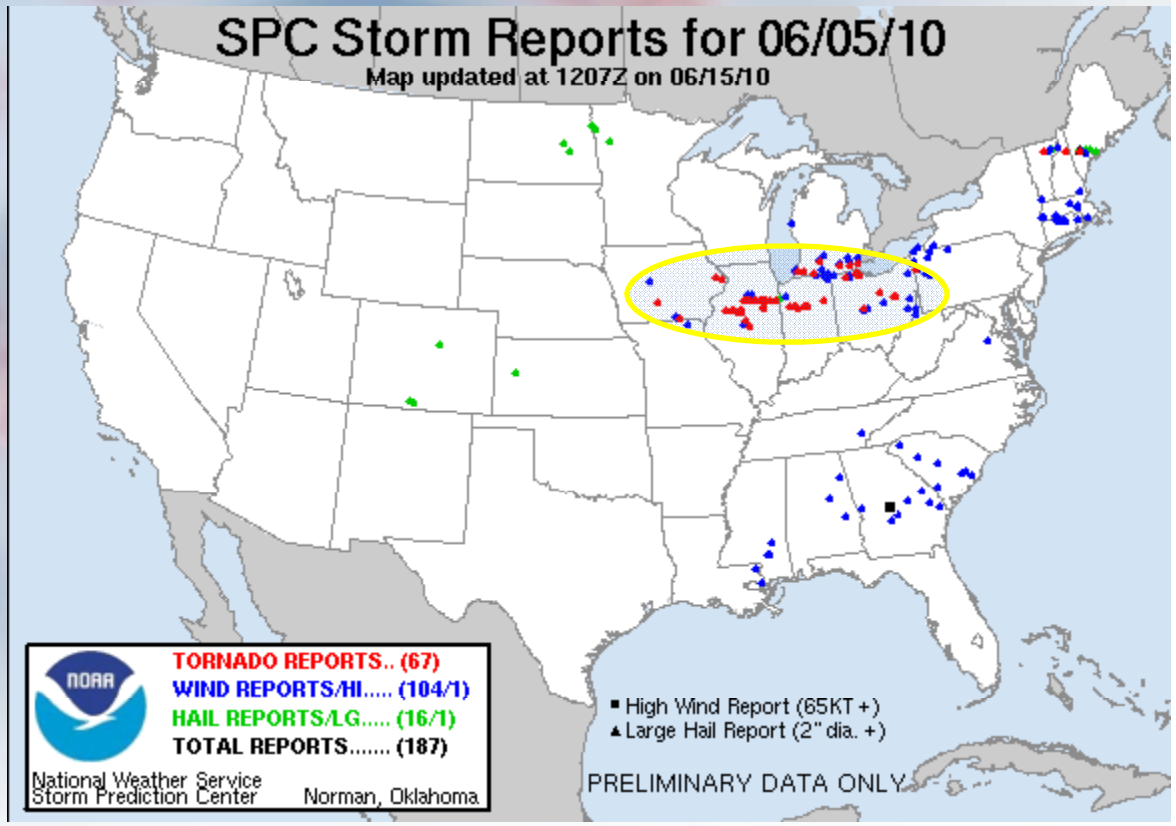
2010 Tornadoes

- Southeast MI
  - 12 Tornadoes
  - 6th most in SE MI History
  - Most since 2004
- All of Michigan
  - 27 Tornadoes
  - Most since 2001



June 5-6 Southern Great Lakes Tornado Outbreak

- 43 tornadoes
- IA to PA
- 5 p.m. June 5 to 7 a.m. June 6
- 9 deaths and 75 injuries
- EF Scale



EF Scale	EF 0	EF 1	EF 2	EF 3	EF 4
Number	15	14	10	3	1

Local June 5-6 Tornado Outbreak

- Dundee EF2
- Toledo Area EF4

However….

- Those were not the only significant events…

Courtesy of Saginaw News

September 21 Tri Cities, Flint and Thumb Squall Line

June 27 Wadhams Tornado

April 6 Largo Tornado

Unfortunately, 1 death and 4 injuries.

Arbor, and Adrian

Thunderstorm Hazards - Tornadoes

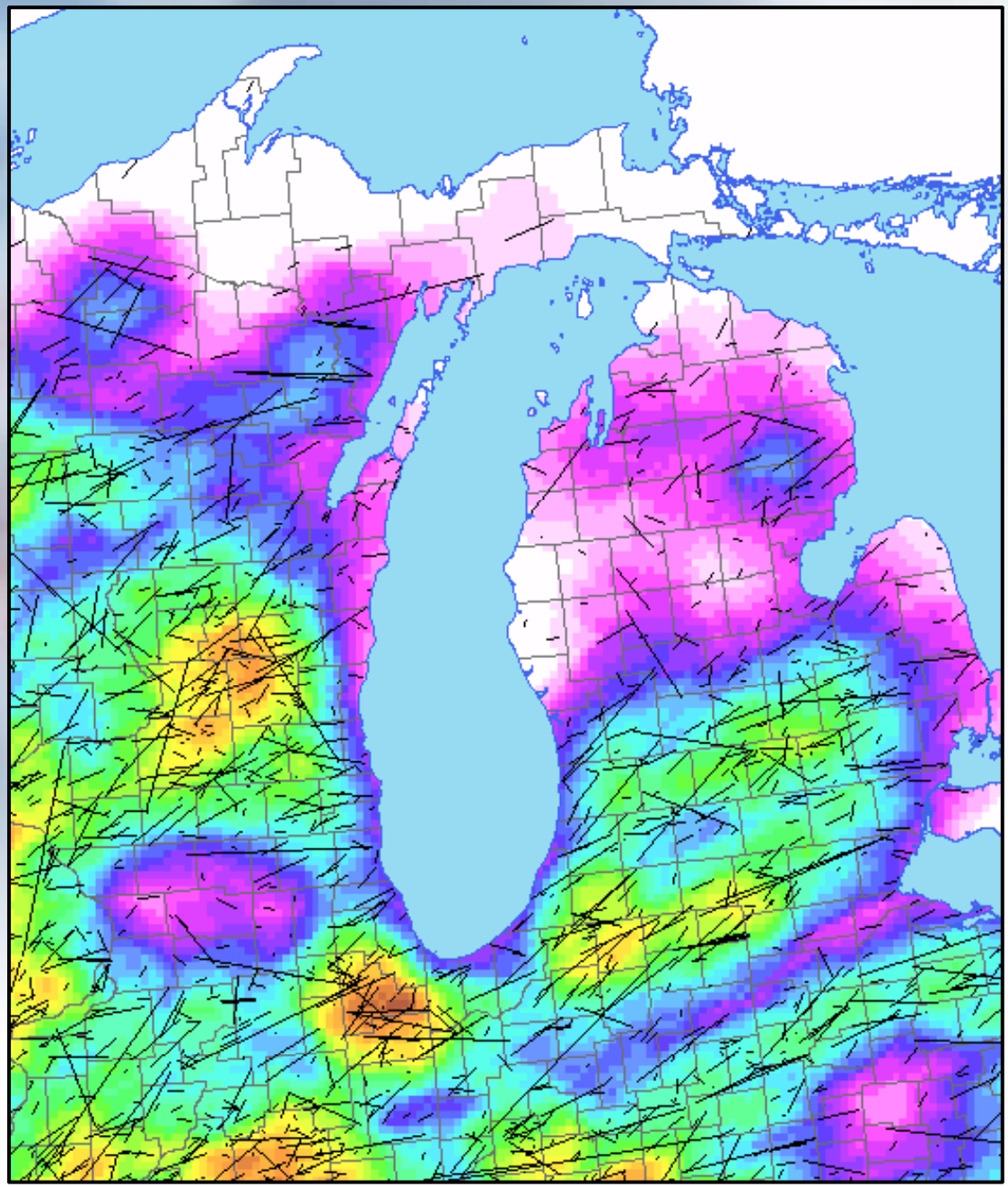
Willow, MI (Southern Wayne County) June 27th, 2010

Thunderstorm Hazards - Tornadoes

- Michigan averages 15 tornadoes a year
- Southeast Michigan averages 5.5 tornadoes a year
- The United States receives more tornadoes than any other country in the world, more than 1,000 annually!

Willow Tornado

Tornado Density



Michigan Tornadoes

- 67% Classified as EFO or EF1 (Weak)
  - On ground for < 10 minutes; typically track < 3 miles
  - Wind Speeds of 65-110 MPH
  - Can develop quickly and occasionally without warning
- Around 30% Classified as EF2 or EF3 (Strong)
  - Typically on ground for over 10 minutes and track 10-25 miles
  - Wind Speeds of 111-165 MPH
  - Typically develop from well developed storms, so usually have longer lead times.
- <5% Classified as EF4 or EF5 (Devastating)
  - Typically on ground for up to an hour and can track 20-50 miles
  - Winds Speeds > 165 MPH
  - Develop from well defined supercell storms, so usually have longer lead times.

Non-Tornadic
Severe Weather Events

Straight Line Winds

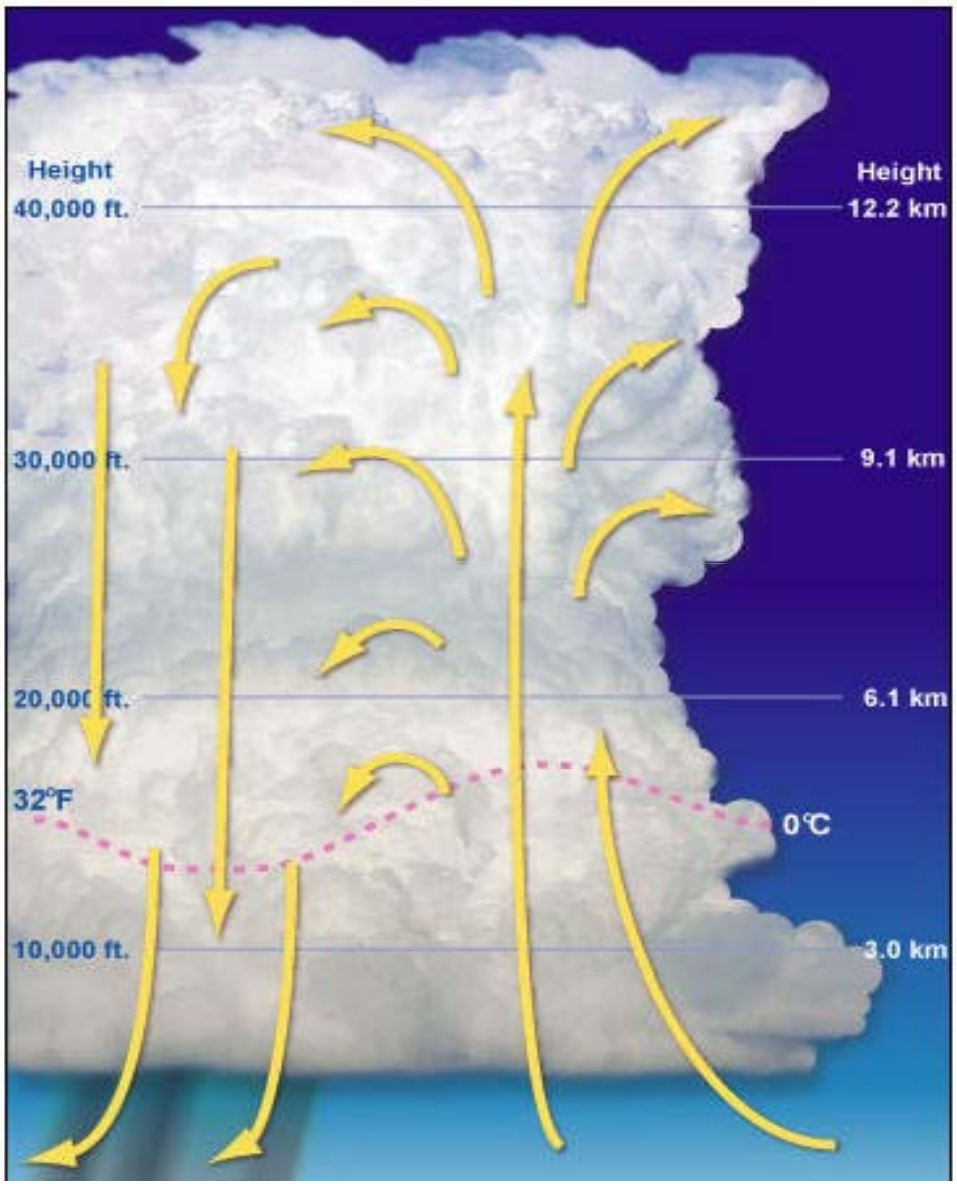
- **Severe Thunderstorm Winds >= 58 mph.**
- Can exceed 100 mph on rare cases.
- Damage is more widespread than tornadoes but less extreme.

Davison Aug 19, 2010
Photos Courtesy of Kevin Usealman NBC25

Straight Line Winds

-Outflow from a thunderstorm that blows in one direction.
-Also called downbursts or microbursts.

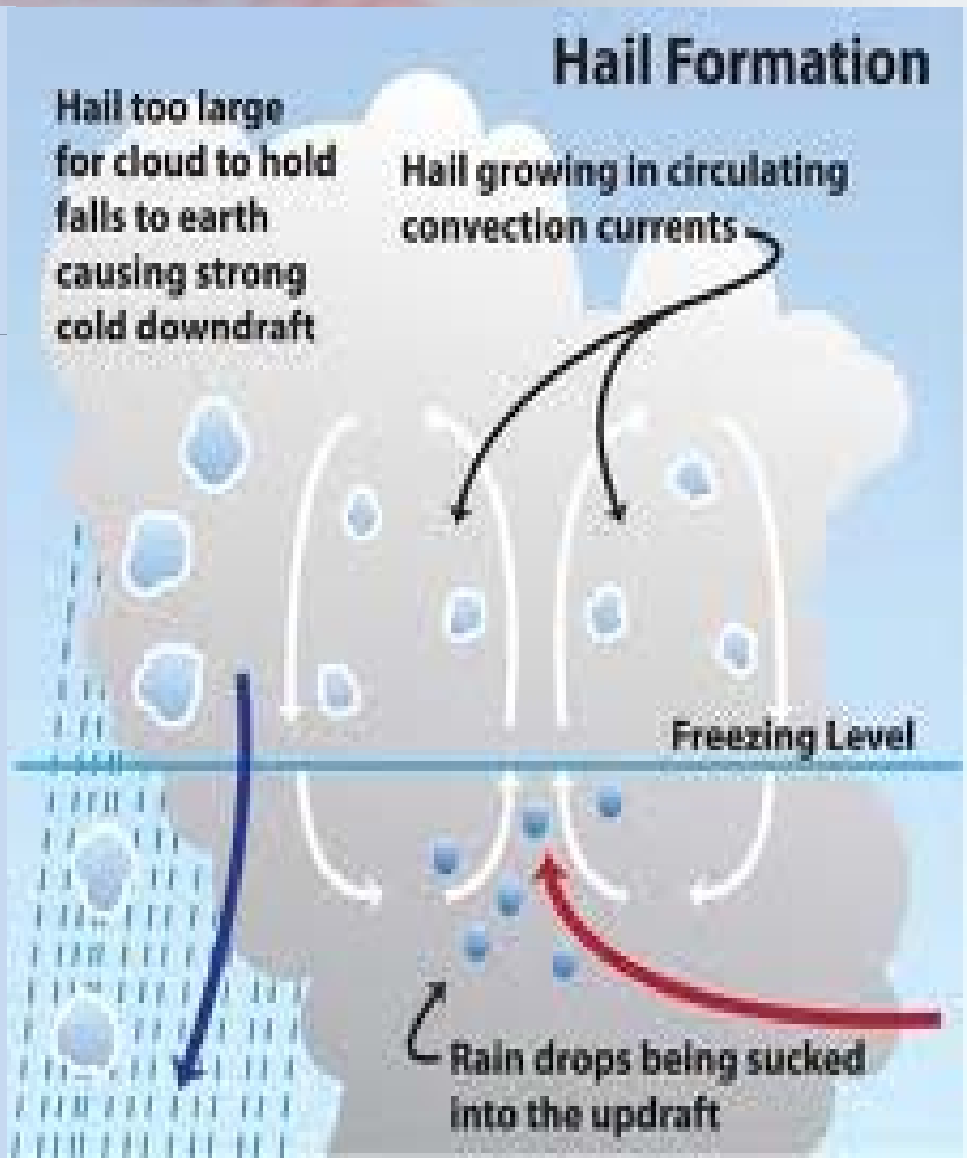
Straight Line Winds



- The stronger the thunderstorm updraft, the higher the region of raindrops will be in the tops of the cloud.
- The downdraft originates from precipitation drag associated with falling raindrops.
- Evaporative cooling from dry air on the edge of the cloud accelerates the downdraft (cold air is more dense).
- The stronger the updraft, the higher up the downdraft will originate, so the stronger the winds will be when the downdraft reaches the ground.

Hail

- Forms as supercooled rain drops collide with and freeze to ice crystals.
- Need a strong thunderstorm updraft to sustain large ice particles in the clouds.
- Cold and dry air aloft promote more ice crystals in the top of clouds and thus provide a more favorable environment for hail.
- When hail becomes too large for the updraft, it falls to the ground.
- **HAIL ONE INCH IN DIAMTER OR LARGER IS CONSIDERED SEVERE.**



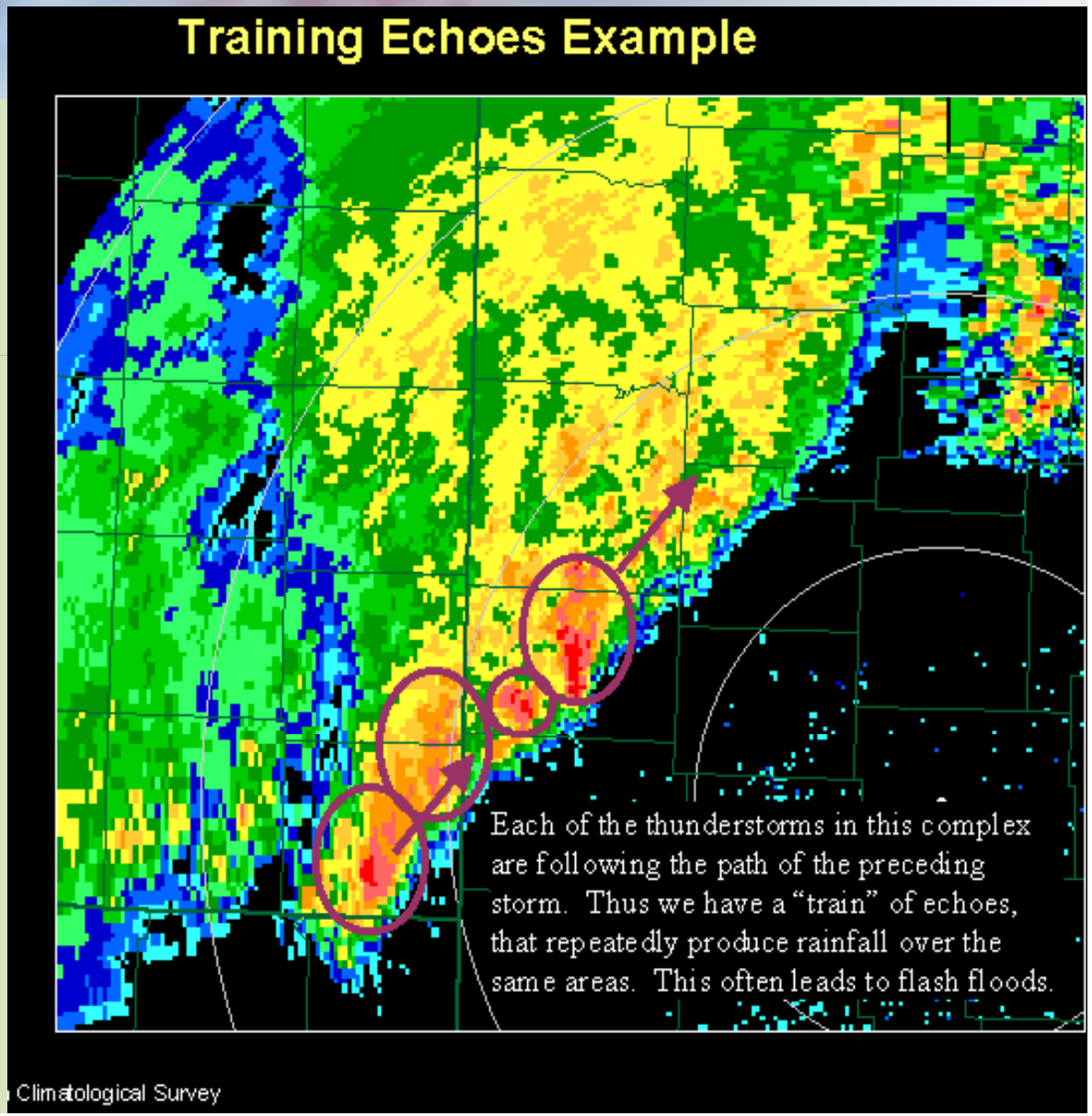
Flash Flooding

- Flash Flooding
  - Localized heavy rain from thunderstorms
  - Typically 3-5” in under 3 hours
  - A greater problem in urban areas
- Areal Flooding
  - Widespread flooding due to heavy rain on saturated soils over a longer time period.

Marion, IL

Flash Flooding

- Need very high atmospheric moisture and slow moving thunderstorms.
- Echo Training is common during these events. This is where storms develop in one single location and repeatedly move over the same areas.



Flooding

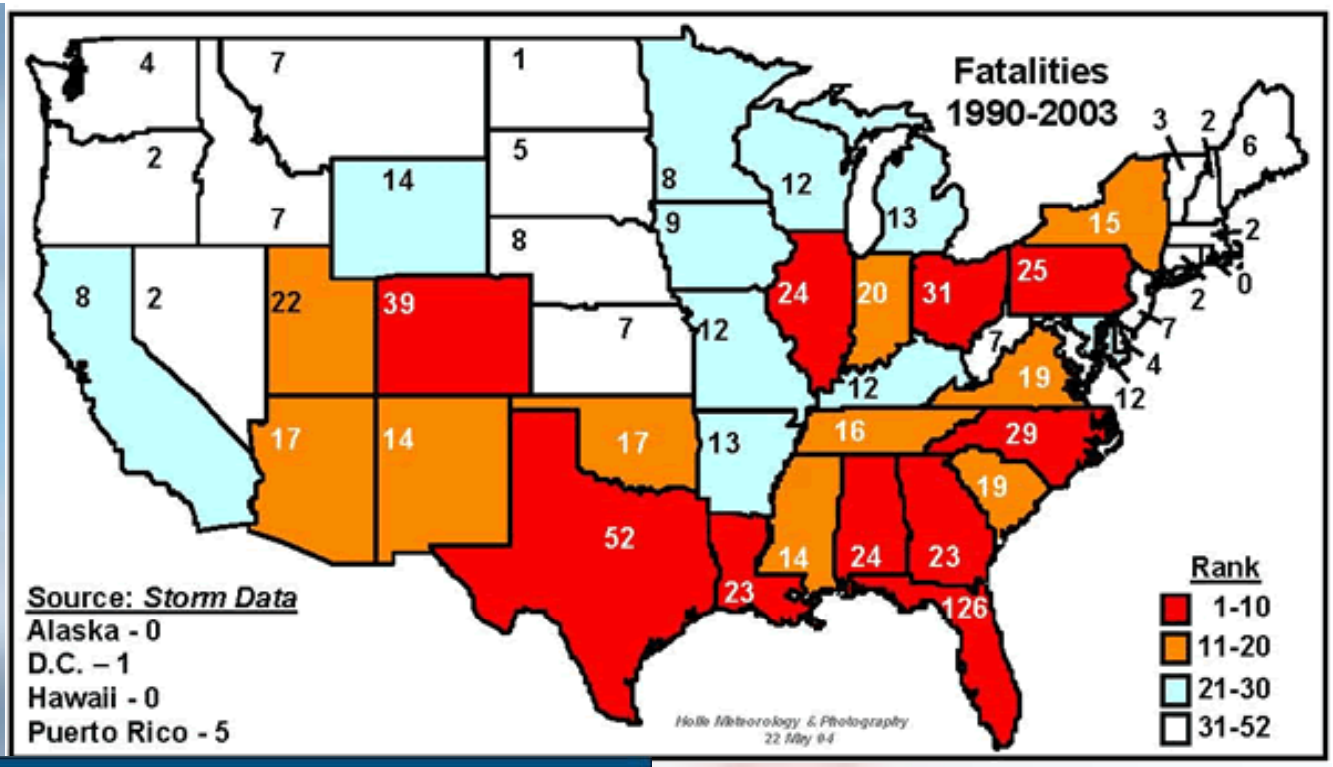
- River Flooding
  - Combination of heavy rain, snow melt, ice jams, frozen ground

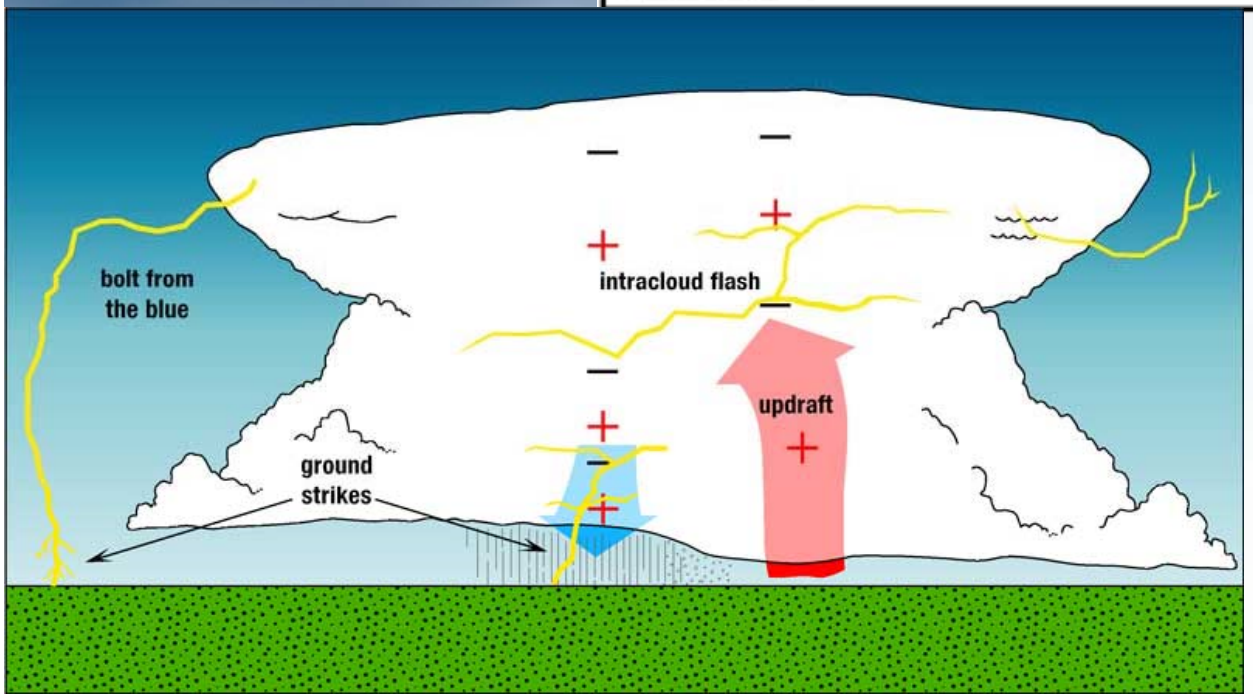
Flooding in Monroe (left) and Dundee(top) along the River Raisin March 10-14, 2009

Lightning

- Forms due to charge separations between the tops of thunderstorms, the base of thunderstorms and the ground.
- The charge separation is thought to occur when ice and supercooled water become present in the tops of the clouds.

Midland Sep 21, 2010
Photo Courtesy of John McCoy


Fatalities
1990-2003
4
7
1
2
5
14
7
8
12
9
13
3
2
6
15
2
8
2
22
39
8
7
12
24
20
31
25
0
2
7
4
19
12
12
17
14
17
13
16
29
19
52
14
24
23
23
126
Source: Storm Data
Alaska - 0
D.C. – 1
Hawaii - 0
Puerto Rico - 5
Rank
1-10
11-20
21-30
31-52
Hollé Meteorology & Photography
22 May 04


bolt from
the blue
intracloud flash
updraft
ground
strikes

Weather Hazards Review

Which of the following is not enough to classify a thunderstorm as severe?

a) Hail greater than 1 inch in diameter

Answer

b) Lightning

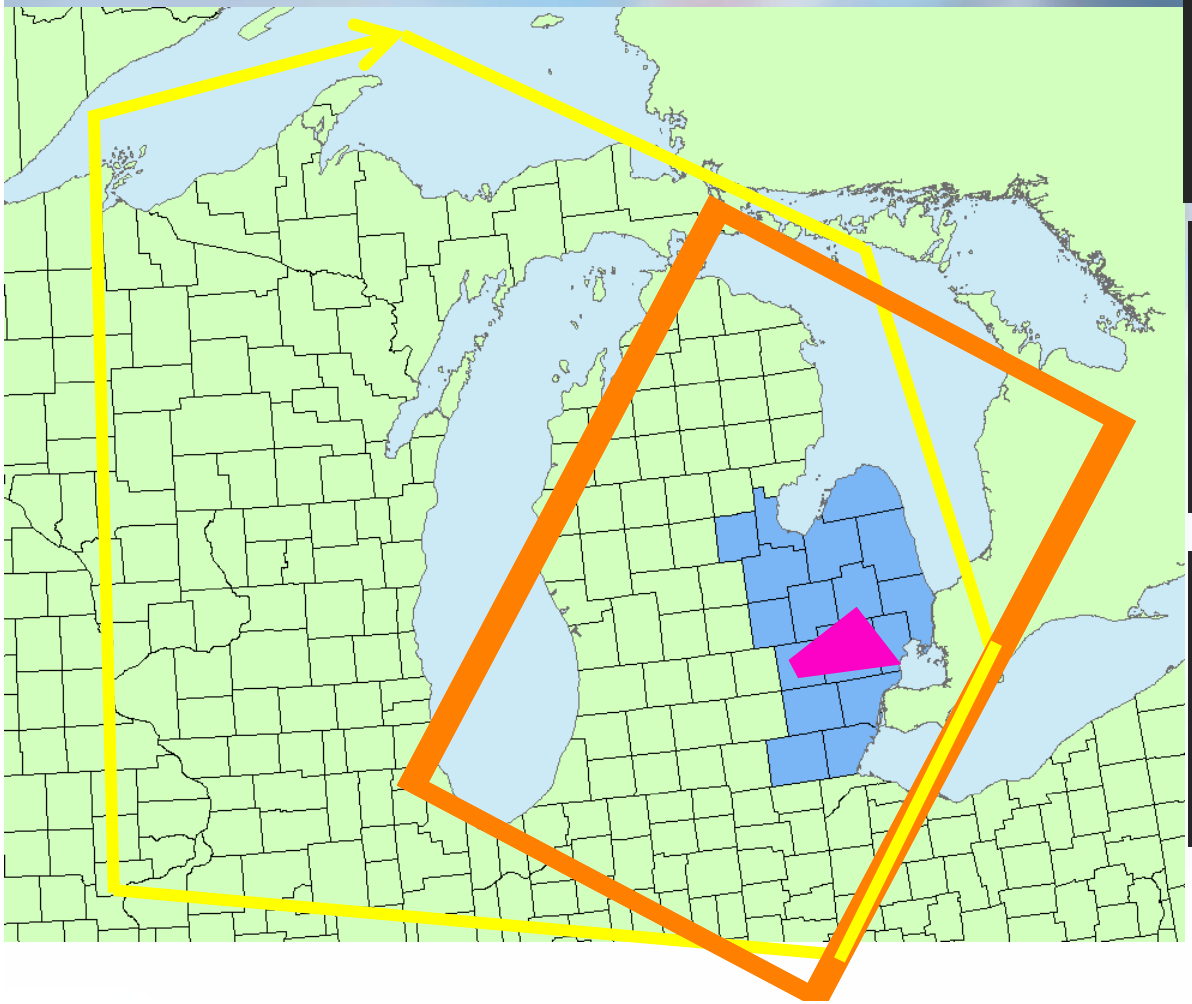
c) A Tornado

d) Strong wind gusts in excess of 58 mph

Before the Storm Arrives

- Thunderstorm Outlooks
  - Convective outlooks issued by Storm Prediction Center
  - Hazardous Weather Outlook Issued by NWS Detroit/Pontiac
- Watches
  - Conditions favorable for severe weather in or near the watch area
  - Issued by the Storm Prediction Center
- Warnings
  - Severe weather is imminent or occurring in the warning area
  - Issued by the NWS Detroit/Pontiac

NWS Products Issued for Severe Weather



Outlook

- Several days in advance
- General idea of area and what is expected

Watch

- 2-6 hours in advance
- More specific threat, area, and timing

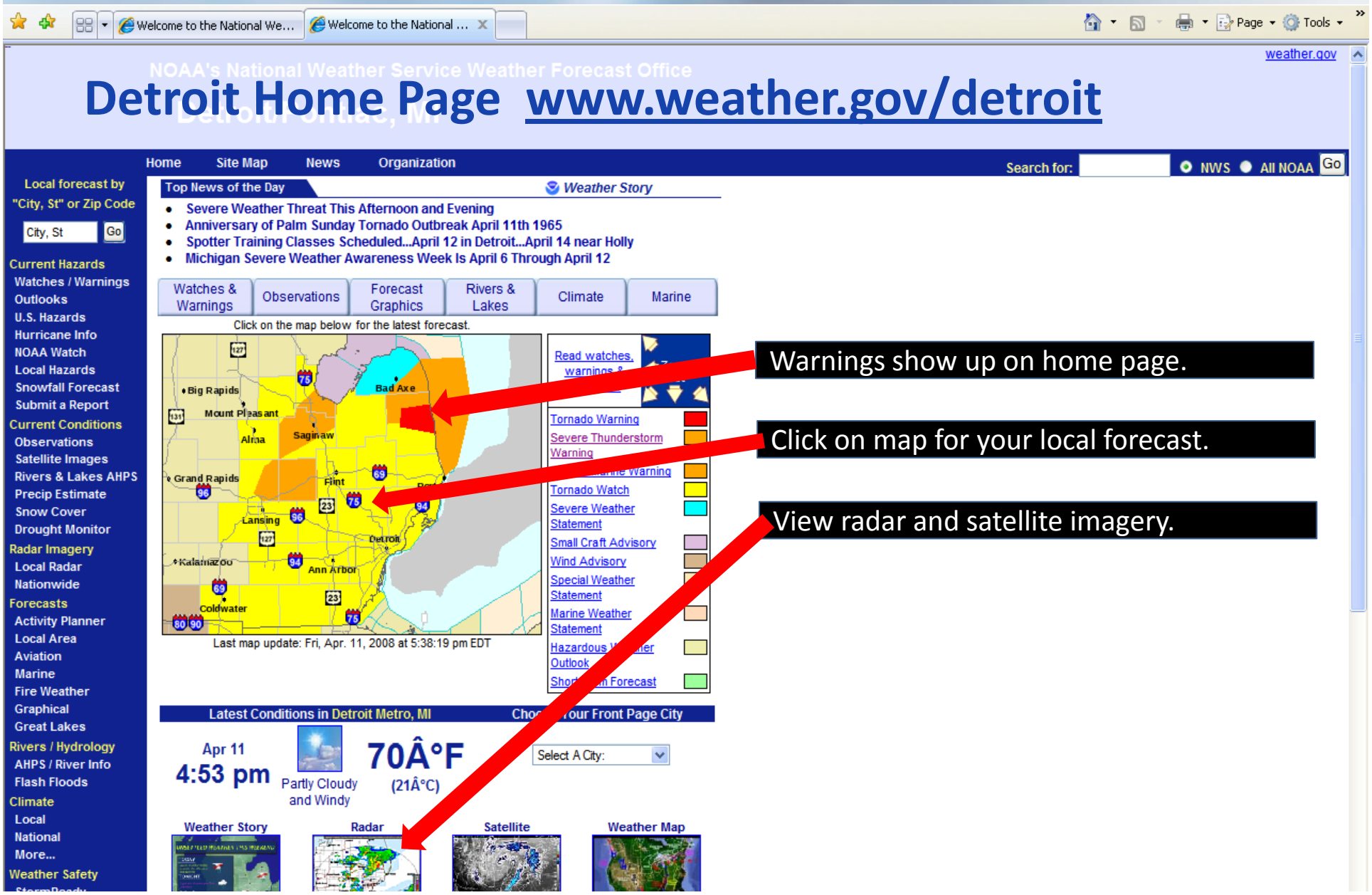
Warning

- 10-60 minutes in advance
- Very specific threat, area, and timing

Before the Storm Arrives

- Severe Thunderstorm Warning
  - **Thunderstorm Wind Gusts >= 58 MPH**
  - **And/Or Hail 1 Inch in Diameter or Larger**
- Tornado Warning
  - Doppler Radar Indicates Strong Rotation
  - Confirmed Reports of a Tornado

Weather Resources



Warnings show up on home page.

Click on map for your local forecast.

View radar and satellite imagery.

Weather Resources

Fcst_DTX_Schd.pdf (application/pdf Ob... | Storm Prediction Center

NOAA's National Weather Service

Storm Prediction Center

www.spc.noaa.gov

Site Map | News | Organization | Search for:

Local forecast by "City, St" or "ZIP"
City, St Go

UTC/GMT/Zulu Time
19 : 19 : 17

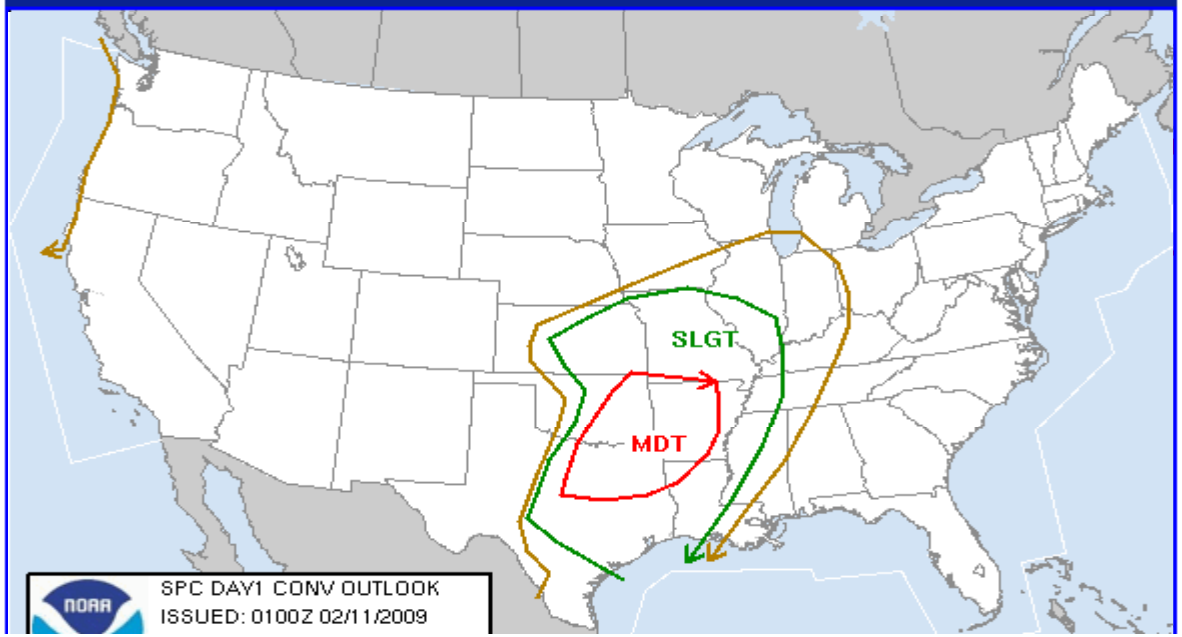
- Overview
- SPC Products
  - All SPC Forecasts
  - Current Watches
  - Meso. Discussions
  - Conv. Outlooks
  - Fire Wx Forecasts
  - RSS Feeds
- Weather Information
  - Storm Reports
  - NWS Hazards Map
  - Watch/Warning Map
  - National RADAR
  - Product Archive
  - Norman, OK WX
- Research
  - Non-op. Products
  - Forecast Tools
  - Svr. Tstm. Events
  - SPC Publications
- Education & Outreach
  - About the SPC
  - SPC FAQ
  - About Tornadoes
  - About Derechos
  - WCM Page
  - Enh. Fujita Page
  - Cool Images
  - Our History
  - Public Affairs

Top News of the Day

- **The following Weather Watches are currently in effect:** 18...
- **The following Mesoscale Discussions are currently in effect:** 145...
- **Note:** Starting **January 5, 2010**, the daily storm report summaries will record **1 inch and greater diameter hail**, as well as severe thunderstorm wind and tornado reports. Please see this link for more information.

More news items below the overview graphic. Updated: 2010-02-24 19:12:18 GMT

Overview | Conv. Outlooks | Watches | MDs | Reports | Mesoanalysis | Fire | Hazards



National Weather Service • Since 187

Weather Resources

Local Television and Radio Broadcasts

Easily view warning polygons on TV!

Weather Radio

Broadcasts
- weather forecasts
- observations
- warnings

Programmable
- for your county
- for specific hazards

Battery back-up during power outages.

Tone Alerts for warnings when not in use!

Mobile Alerts

- http://mobile.weather.gov to access radar or warning information
- Free Email or Text Alerts for Severe Weather
  - Available from many local news stations and the Weather Channel
  - Based on Zip Code
- Phone Voice Alerts for Severe Weather
  - Based on Zip Code
  - Usually a monthly fee

Future Technology

- CMAS(Commercial Mobile Alert System)
  - Free Service to the public
  - Uses location of cell tower to alert all persons in affected areas for
    - Tornado Warnings
    - Presidential Emergency Messages
    - Amber Alerts
    - Automatically enrolled with option to opt out
  - Targeted for spring 2012 with current testing in California and Florida

Before the Storm Arrives – Cloud Features
Shelf Clouds

Before the Storm Arrives
Lightning Safety

- Best Place to be is Indoors (Closed Structure)
- Get Out of the Water
- Automobile Can Offer Safety
- Do NOT go Outside to Film the Storm

Before the Storm Arrives

- Go indoors and stay away from windows
- Be alert to possible Severe Thunderstorm or Tornado Warnings
- Be ready to report severe weather to the NWS

Before the Storm Arrives

- No need to report anything – your safety should be your top priority
- Do not report dark or scary clouds
- No need to report shelf clouds
- Do not report radar signatures

During the Storm

During the Storm – Wall Clouds

Washtenaw Co May 21, 2010

Lapeer Co Aug 15, 2010

During the Storm – Tornadoes and Funnel Clouds

Tornado

A violently rotating column of air extending from a thunderstorm and in contact with the ground.

Funnel Cloud

A rotating, funnel-shaped cloud extending from a thunderstorm base, but not in contact with the ground.

Note: Funnel does not touch ground and no debris is seen at the surface!

Tornado VS Funnel Cloud

During the Storm – Tornado Safety

When a TORNADO WARNING is in effect…

- Go to the basement immediately!
- Get under something sturdy
  - Desk, stairwell
- Get in the tornado safety position
- Cover yourself with pillows, blankets, extra clothes to shield debris
- Stay in basement until warning expires

During the Storm – Tornado Safety

When a TORNADO WARNING is in effect and there is NO BASEMENT available…

- Seek shelter in an interior room with no windows
  - Closet, bathroom
  - Stay away from exterior walls
  - Debris can puncture walls

- If driving…pull over and get into a building
- DO NOT try to out-run the tornado

During the Storm – Green Sky

- Effect of the reflection of the water droplets in the storm cloud.
- The reflection usually produces a dark blue color, but can be green in the evening when the blue light mixes with red light.
- Typically need a very strong storm with a lot of big rain drops or hail.

What to Report: Wind

Wind Gusts of 40 MPH or Greater

- 25-31 Large branches in motion; whistling heard in telephone wires
- 32-38 Whole trees in motion; inconvenience felt in walking against the wind
- **39-54** Twigs break off trees; wind generally impedes progress
- **55-72** Damage to chimneys, TV antennas; pushes over shallow rooted trees
- **73-112** Peels surfaces off roofs; windows broken; light mobile homes overturned; moving cars pushed off road
- **113-157** Roofs torn off houses; cars lifted off ground

What to Report: Wind

Estimating Wind Speed

- Takes experience (most people over-estimate)
- Avoid “heavy” or ”strong” to describe wind
- If possible, measure the wind with an anemometer

When Reporting High Winds…

- Did you measure or estimate the wind gust?
- Did the wind produce damage?
- Describe any damage

What to Report: Hail

When Reporting Hail…

- Let us know whether it was measured or estimated
- If you cannot measure the hail, use coins or other known objects to describe the size
- Avoid using “marble-sized” to describe hail
- Report size of largest hailstone

What to Report: Hail

Hail ½ inch or Greater

Pea	0.25 - .375 inch	Lime	2.00 inches
Plain M&M	0.50 inch	Tennis Ball	2.50 inches
Penny	0.75 inch	Baseball	2.75 inches
Nickel	0.88 inch	Large Apple	3.00 inches
Quarter	1.00 inch (15/16")	Softball	4.00 inches
Half dollar	1.25 inch	Grapefruit	4.50 inches
Walnut/Ping Pong	1.50 inch	Computer CD/DVD	4.75 - 5.00 inches
Golf ball	1.75 inch		

What to Report: Funnel Clouds

Funnel Cloud: A rotating column of air that is NOT in contact with the ground, tops of buildings, or tree tops

Monroe, MI

Sarnia, Ontario

What to Report: Tornadoes

- Report all tornadoes
- Please tell us your location and direction you are looking
- Seek shelter!
- Do NOT report a wall cloud, unless it is present with a tornado or funnel cloud

June 29, 2005
Newago, MI

What to Report: Tornadoes

When Reporting a Tornado…

- Is it rotating? Do you see debris or electrical flashes?
- Good and accurate reports = Good warnings
- Bad reports lead to false alarms
  - If not sure, wait and keep watching.

Provide Frequent Updates!

Livingston County

What to Report: Flooding

- Rainfall of 1 inch or greater in a “storm”
  - 12-24 hours in winter
  - 1-3 hours for thunderstorms
- Flooding that covers roads or threatens property
- River flooding
- Ice jams

Hamburg, MI
September 2008
Gillis Benedict / Daily Press & Argus

Dundee, MI
February 11, 2009

After the Storm – Safety

*Don’t rush out to find damage!

Possible Dangers Include:

- Downed power lines
- Lightning (can strike up to 10 miles away from storm)
- Trees and/or water across roadways
- Weakened structures

After the Storm - LSR

- Local Storm Report (LSR)
  - Primary Means to Distribute Storm Information to the Public and Media
  - Storm Spotters Comprise Most of the Reports
- Storm Prediction Center's Storm Reports Archive
  - www.spc.noaa.gov/climo/online/

After the Storm – Post Storm Damage

What to Report: Post-Storm Damage

- Please tell us about any storm damage
  - Large tree limbs
  - Downed trees and power lines
  - Structural damage
- Damage reports, even after the fact, help us verify warnings

St Clair Co Tornado Damage June, 2010

What to Report: Post-Storm Precipitation

HAIL

- Largest hail stone in the area

RAINFALL

- Storm total rainfall amounts

How to Report

1) Toll-Free Spotter Hotline
   - Unlisted, 24 hours

   1-800-808-0006

2) Amateur Radio, Local Nets, and MICON

3) Packet Radio

   K8DTX-5, 145.76 MHz

4) eSpotter

   espotter.weather.gov

How to Report

- When reporting, tell us:
  - Your location
    - City
    - Address or closest major intersection
- What you are seeing
- If you are reporting wind or hail, please tell us if its Measured or Estimated
- Time of the event (if known)
- Any Damage

Remember: TEL (TimeEventLocation)


Halftime
10 Minute Break