

**SEVERE WEATHER—TORNADO
SAFETY INFORMATION
2009**



**IT'S THAT TIME AGAIN!
ANOTHER SEVERE WEATHER SEASON
(MARCH-NOVEMBER) IS UPON US.**

**BY BECOMING INFORMED, AND BY PLANNING AND
PREPARING FOR LIKELY DISASTERS, WE CAN
SAFELY ENJOY THE SEASONS TO COME.**

**ATTACHED IS SOME INFORMATION ON HOW TO
PREPARE OURSELVES AND OUR DWELLINGS FOR
SEVERE WEATHER AND ITS EFFECTS.**

**MORE INFORMATION AT
WWW.CITYOFSOUTHFIELD.COM
GO TO DEPARTMENTS/EMERGENCY MANAGEMENT**

PLEASE STAY SAFE, WE CARE ABOUT YOU.

**SOUTHFIELD EMERGENCY MANAGEMENT
248-796-5990**



Michigan Tornado Chart

The following is a list of tornadoes experienced by each county in Michigan:

County	1950-2008	2008	County	1950-2008	2008
Alcona	11	1	Lake	2	0
Alger	6	0	Lapeer	20	0
Allegan	25	1	Leelanau	3	0
Alpena	14	0	Lenawee	31	0
Antrim	9	0	Livingston	24	0
Arenac	7	0	Luce	2	0
Baraga	2	0	Mackinac	5	0
Barry	18	1	Macomb	18	0
Bay	12	0	Manistee	2	1
Benzie	4	0	Marquette	6	0
Berrien	28	0	Mason	5	1
Branch	15	0	Mecosta	9	0
Calhoun	15	0	Menominee	7	0
Cass	14	0	Midland	8	0
Charlevoix	4	0	Missaukee	8	0
Cheboygan	6	0	Monroe	28	0
Chippewa	6	0	Montcalm	11	0
Clare	8	1	Montmorency	6	0
Clinton	17	0	Muskegon	7	0
Crawford	10	0	Newaygo	12	0
Delta	11	1	Oakland	31	0
Dickinson	7	0	Oceana	5	0
Eaton	25	2	Ogemaw	14	1
Emmet	5	0	Ontonagon	2	0
Genesee	41	0	Osceola	16	1
Gladwin	9	0	Oscoda	5	0
Gogebic	3	0	Otsego	3	0
Grand Traverse	4	0	Ottawa	18	0
Gratiot	14	0	Presque Isle	6	0
Hillsdale	23	0	Roscommon	8	0
Houghton	1	0	Saginaw	21	0
Huron	12	0	Sanilac	14	0
Ingham	27	1	Schoolcraft	3	0
Ionia	17	0	Shiawassee	25	0
Iosco	11	0	St. Clair	20	0
Iron	5	0	St. Joseph	9	0
Isabella	13	0	Tuscola	17	0
Jackson	17	0	Van Buren	18	2
Kalamazoo	23	1	Washtenaw	24	0
Kalkaska	7	0	Wayne	28	1
Kent	31	0	Wexford	7	0
Keweenaw	2	0			

A single tornado can cross county lines. Therefore, the sum of the counties will not equal the State totals.



Tornado/Thunderstorm Safety

Preparing for a tornado/thunderstorm:

- Plan ahead. Be sure everyone in your household knows where to go and what to do in case of a tornado warning.
- Know the safest location for shelter in your home, workplace and school. Load bearing walls near the center of the basement or lowest level generally provide the greatest protection.
- Know the location of designated shelter areas in local public facilities, such as schools, shopping centers and other public buildings.
- Have emergency supplies on hand, including a battery-operated radio, flashlight and a supply of fresh batteries, first-aid kit, water and cell phone.
- Make an inventory of household furnishings and other possessions. Supplement it with photographs of each room. Keep in a safe place.

What to do when a thunderstorm approaches your area:

- Seek safe shelter when you first hear thunder, see dark threatening clouds developing overhead or lightning. Count the seconds between the time you see lightning and hear the thunder. You should already be in a safe location if that time is less than 30 seconds. Stay inside until 30 minutes after you last hear thunder. Lightning can strike more than 10 miles away from any rainfall!
- When you hear thunder, run to the nearest large building or a fully enclosed vehicle (soft-topped convertibles are not safe). You are not safe anywhere outside.
- If you are boating or swimming, get to land and shelter immediately.
- Telephone lines and metal pipes can conduct electricity. Unplug appliances not necessary for receiving weather information. Use plug-in telephones only in an emergency.

What to do when a tornado warning is issued for your area:

- Quickly move to shelter in the basement or lowest floor of a permanent structure.
- In homes and small buildings go to the basement and get under something sturdy, like a workbench or stairwell. If no basement is available, go to an interior part of the home on the lowest level. A good rule of thumb is to put as many walls between you and the tornado as possible.
- In schools, hospitals and public places move to designated shelter areas. Interior hallways on the lowest floors are generally best.
- Stay away from windows, doors and outside walls. Broken glass and wind blown projectiles cause more injuries and deaths than collapsed buildings. Protect your head with a pillow, blanket or mattress.
- Mobile homes and vehicles offer virtually no shelter. Leave them and go to the nearest shelter. Highway overpasses **do not** offer shelter.
- If there is no shelter nearby, the best alternative is to find a low spot away from trees, fences and poles, but not in a place subject to flooding. Shield your head with your arms.
- If you are boating or swimming, get to land and shelter immediately.



Grayling Funnel, July 15, 2008

After a tornado/thunderstorm:

- Inspect your property and motor vehicles for damage. Write down the date and list damages for insurance purposes. Check for electrical problems and gas leaks and report them to the utility company at once.
- Watch out for fallen power lines. Stay out of damaged buildings until you are sure they are safe and will not collapse. Secure your property from further damage or theft.
- Use only approved or chlorinated supplies of drinking water. Check food supplies.



Tornado Facts

1. What is a tornado?

It is a column of violently rotating winds extending down from a thunderstorm cloud and touching the surface of the earth.

2. What is the difference between a tornado and a funnel cloud?

A funnel cloud is also a column of violently rotating winds extending down from a thunderstorm; however, it does not touch the earth.

3. How many tornadoes usually occur in Michigan every year?

An average of 16 tornadoes occurs in Michigan each year. Since 1950, 242 persons have been killed due to tornadoes. During this same time, Michigan has experienced 920 tornadoes.

4. When do tornadoes generally occur?

Most tornadoes occur during the months of May, June, July and August in the late afternoon and evening hours. However, tornadoes can occur anytime of the day or night in almost any month during the year.

5. How fast do tornadoes travel?

Tornadoes generally travel from the southwest and at an average speed of 30 miles per hour. However, some tornadoes have very erratic paths, with speeds approaching 70 mph.

6. How far do tornadoes travel once they touch the ground?

The average Michigan tornado is on the ground for less than 10 minutes and travels a distance of about 5 miles. However, they do not always follow the norm, and have been known to stay on the ground for more than an hour and travel more than 100 miles.

7. What is a tornado watch?

A tornado/severe thunderstorm watch is issued whenever conditions exist for severe weather to develop. Watches are usually for large areas about two-thirds the size of Lower Michigan and are usually two-to-six hours long. Watches give you time to plan and prepare.

8. What is a tornado warning?

The local National Weather Service (NWS) office issues a tornado warning whenever NWS Doppler Radar indicates a thunderstorm capable of producing a tornado or when a tornado has been sighted by a credible source. A severe thunderstorm warning is issued whenever a severe thunderstorm is observed or NWS Doppler Radar indicates a thunderstorm capable of producing damaging winds or large hail.

Warnings are issued for even smaller areas, such as parts of counties. "Storm-based" warnings began on October 1, 2007. The NWS now issues warnings for the threatened area in a shape of a polygon. The "polygon" warnings will only include sections of a county or group of counties, and are usually 30 to 90 minutes in length. You must act immediately when you first hear the warning. If severe weather is reported near you, seek shelter immediately. If not, keep a constant lookout for severe weather and stay near a shelter.

9. How do I find out about a warning if my electricity is already out?

NOAA All Hazard Weather Radio with battery back-up capability is your best source to receive the warning. In some areas, civil emergency sirens may be your first official warning. In addition, if your television or radio has battery back-up capability, you may receive NOAA's National Weather Service warnings from local media.

Michigan Committee for Severe Weather Awareness
4899 South Complex Drive, S.E. Grand Rapids, MI 49512

Flooding Causes Four Deaths and Over \$100 Million in Damages in 2008

FOR IMMEDIATE RELEASE

March 23, 2009

(GRAND RAPIDS, MI) - In 2008, 21 flash flood warnings and 137 flood warnings were issued by the National Weather Service across the state of Michigan. The impact of flooding on lives and property was significant, and 2008 will be remembered as a very active year. Flooding in 2008 resulted in the loss of four lives and over \$100 million in economic and property damage across the state.

To focus attention on flood safety planning, Governor Jennifer M. Granholm has declared March 29 – April 4, 2009, as Severe Weather Awareness Week in Michigan. Residents are encouraged to familiarize themselves with flood safety procedures.

“In 2008 significant flooding occurred in many areas across Michigan’s lower peninsula. Three out of the four lives lost to flooding in 2008 occurred in the early morning hours when automobiles were driven into flood waters. Flash flooding can be especially dangerous at night, as rapid flooding of low lying areas accompanied with swift currents can wash out roads and bridges. Washed out roads and bridges can be especially difficult to detect at night, and quickly lead to life threatening situations for travelers,” said Mark Walton, Service Hydrologist with the National Oceanic and Atmospheric Administration’s National Weather Service in Grand Rapids. Flash flooding is the number one weather related killer and is one of the reasons the National Weather Service is promoting the flood safety message of, “Turn Around Don’t Drown.”

Flooding started early in 2008, with ice jams causing flooding in isolated locations along the Grand, St. Joseph, Muskegon, and White rivers in February. In June, flooding resulted in Presidential Disaster Declarations being declared for Allegan, Barry, Eaton, Lake, Mason, Osceola, and Ottawa counties. Damage to public infrastructure (mostly roads and bridge washouts) was estimated to exceed \$8.8 million for these seven counties. In September, flooding resulted in local states of emergency for Allegan, Eaton, and Kalamazoo counties, and caused widespread flooding over much of the southern half of Michigan. Damage to public infrastructure was estimated to exceed \$11 million for this event. And finally in December, widespread flooding occurred in 17 counties in southwest lower Michigan when a rare December thunderstorm deposited several inches of rain over a rapidly melting snowpack. The hardest hit area was Ottawa County, which during the height of the flooding had more than 80 county roads rendered impassable. Ottawa County declared a local State of Emergency and damage to public infrastructure (mostly road washouts) and private structures from flooding was estimated to exceed \$3 million.

The Michigan Department of Environmental Quality estimates that about 6 percent of Michigan’s land is flood-prone, this includes about 200,000 buildings. The southern half of the lower peninsula contains the areas with the most flood damage potential.

-MORE-

According to the Michigan Committee for Severe Weather Awareness, flooding along Michigan's rivers can occur any time of the year, and is most likely the result of excessive rainfall and/or a combination of rainfall and snowmelt. Ice jams also cause flooding in winter and early spring. Severe thunderstorms may cause flooding any time of the year, although these are normally localized, and have more impact on watercourses with smaller drainage areas.

Oftentimes, flooding may not necessarily be directly attributable to a river, stream or lake overflowing its banks. Rather, it may simply be the combination of excessive rainfall and/or snowmelt, saturated or frozen ground, and inadequate drainage. With no place to go, the water will find the lowest elevations/areas that are often not in a floodplain. This type of flooding is becoming increasingly prevalent in Michigan, as development outstrips the ability of the drainage infrastructure to properly carry and disperse the water flow.

Residents should be aware that regular homeowners' insurance policies do not cover damages that result from flooding. Coverage is available through a federal program, the National Flood Insurance Program (NFIP). However, in Michigan only about 15 percent of structures subject to flooding are actually insured against the risk.

Currently, there are approximately 806 Michigan communities participating in the National Flood Insurance Program, and over 25,732 policies in force with coverage of nearly \$3.96 billion. Since 1978, there have been 9,137 flood insurance claims filed in Michigan under the NFIP for a total of \$40.9 million. Under the NFIP, a flood is defined in part, as a general and temporary condition of partial or complete inundation of normally dry land areas from overflow of inland or tidal waters, or from the unusual and rapid accumulation of runoff of surface waters from any source.

It is important to note that this flood definition would cover general street flooding that was coming into a home, and does not have to come from a river. In the standard flood insurance policy, direct physical losses by "flood" are covered. Also covered are losses resulting from erosion caused by waves or currents of water exceeding anticipated cyclical levels or erosion accompanied by a severe storm, flash flood, abnormal tidal surge, or the like. Basement flooding is a covered hazard under the NFIP policy. However, homeowners should be aware that personal property is not covered in a basement location. Losses from water seepage, sewer back up, or hydrostatic pressure are covered only when they occur in conjunction with a general condition of flooding.

To purchase flood insurance under the NFIP, residents must live in one of the participating communities. Coverage can be obtained through most licensed property/casualty insurance agents. If you would like more information about the NFIP, please contact Les Thomas, Michigan Department of Environmental Quality, Land and Water Management Division, P.O. Box 30458, Lansing, MI 48909, by email to thomasl@michigan.gov, or by telephone at 517-335-3448.

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For additional information: Mark Walton, Chair, 616/949-0643, Ext. 493, or any member of the MCSWA



Flood Safety

Preparing for a flood:

- Make an itemized list of personal property well in advance of a flood occurring. Photograph the interior and exterior of your home. Store the list, photos and documents in a safe place.
- Memorize the safest and fastest route to high ground. Assemble a disaster supplies kit containing: first aid kit, canned food and can opener, bottled water, extra clothing, rubber boots and gloves, NOAA Weather Radio, battery-operated radio, emergency cooking equipment, flashlight and extra batteries.
- If you live in a frequently flooded area, keep sandbags, plastic sheets and lumber on hand to protect property. Install check valves in building sewer traps to prevent flood water from backing up into the drains of your home.
- Know the elevation of your property in relation to nearby streams and other waterways, and plan what you will do and where you will go in a flood emergency.

When a flood threatens:

- If forced to leave your property and time permits, move essential items to safe ground, fill tanks to keep them from floating away and grease immovable machinery.
- Store a supply of drinking water in clean bathtubs and in large containers.
- Get out of areas subject to flooding. This includes dips, low spots, floodplains, etc.

During a flood:

- Avoid areas subject to sudden flooding.
- Even six inches of fast moving floodwater can knock you off your feet, and a depth of two feet will float your car! Never try to walk, swim or drive through such swift water.
- Do not attempt to drive over a flooded road. STOP! Turn around and go another way.
- Keep children from playing in floodwaters or near culverts and storm drains.

After a flood:

- Boil drinking water before using. If fresh food has come in contact with floodwaters, throw it out.
- Seek necessary medical care at the nearest hospital. Food, clothing, shelter and first aid are available at Red Cross shelters.
- Use flashlights, not lanterns or torches, to examine buildings. Flammables may be inside.
- Do not handle live electrical equipment in wet areas. Electrical equipment should be checked and dried before being returned to service.

Where can I find additional safety information?

“Turn Around, Don’t Drown” are literally words to live by. This slogan highlights the nationwide flood safety public awareness campaign to help reduce flood-related deaths in the United States. The poster, a [Turn Around, Don’t Drown](#) sign, window sticker, FLASH card and a NOAA National Weather Service flood safety brochure are also available online at <http://www.nws.noaa.gov/os/water/tadd>.



Flood Facts

1. What is a flood and when do most occur?

A flood is the inundation of a normally dry area caused by an increased water level in an established watercourse, such as a river, stream, or drainage ditch, or ponding of water at or near the point where the rain fell. Floods can occur anytime during the year. However, many occur seasonally after winter snow melts or heavy spring rains.

2. What are flash floods?

Flash floods occur suddenly, usually within 6 hours of the rain event, and result from heavy localized rainfall or levee failures. Flash floods can begin before the rain stops. Water level on small streams may rise quickly in heavy rainstorms, especially near the headwaters of river basins. Heavy rains can also cause flash flooding in areas where the floodplain has been urbanized.

3. What are other causes of flooding in Michigan?

Ice jams and dam failures can also cause both flooding and flash flooding.

4. Are people killed as a result of floods?

Many people are killed by flash floods when driving or walking on roads and bridges that are covered by water. In fact, flash floods are the number one weather-related killer in the United States. Even six inches of fast-moving flood water can knock you off your feet, and a depth of only two feet of water will float many of today's automobiles. If you are in a car and water starts rising, get out and move to higher ground.

5. What is a flood watch?

A flood watch indicates that flash flooding or flooding is possible within the designated WATCH area -- be alert. It is issued to inform the public and cooperating agencies that current and developing weather conditions are such that there is a threat of flooding, but the occurrence is neither certain nor imminent.

6. What is a flash flood or flood warning?

A flash flood or flood warning indicates that flash flooding or flooding is already occurring or imminent within the designated WARNING area -- take necessary precautions at once. When a flash flood or flood warning is issued for your area, act quickly. Get out of areas subject to flooding and avoid areas where flooding has already occurred.

7. What is a flash flood or flood statement?

A flash flood or flood statement is used for follow-up information regarding a flash flood or flood event.



Flood Protection

Ways to protect your house and property from flooding.

Basement flood protection can involve a variety of changes to your house and property—changes that can vary in complexity and cost. You may be able to make some types of changes yourself. Complicated or large scale changes or those that affect the structure of your house or its electrical wiring and plumbing should be carried out only by a professional contractor licensed to work in your state, county, or city. Below are some examples of flood protection.

- **Install Sewer Backflow Valves.** In some flood prone areas, flooding can cause sewage from sanitary sewer lines to back up into houses through drainpipes. Sewage backup not only causes damage, but also creates health hazards. Backflow valves have a variety of designs ranging from simple to complex. This is something that only a licensed plumber or contractor should do.
- **Raise or Flood Proof Heating, Ventilating, and Air Conditioning Equipment.** In flood prone houses, a good way to protect HVAC equipment is to elevate it above the areas that flood. Another method is to leave the equipment where it is and build a concrete or masonry block flood wall around it.
- **Anchor Fuel Tanks.** Unanchored fuel tanks can be easily moved by floodwaters. One way to anchor a tank is to attach it to a large concrete slab whose weight is great enough to resist the force of floodwaters. Elevate tanks to a minimum of at least one foot above the base flood elevation (BFE). Floating and/or damaged tanks pose serious threats not only to you, your family, and your house, but also to public safety and the environment.
- **Raise Electrical System Components.** Any electrical system component, including service panels (fuse and circuit boxes), meters, switches, and outlets, are easily damaged by floodwaters. All components of the electrical system, including the wiring, should be raised at least one foot above the base flood elevation (BFE).
- **Raise Washers and Driers.** Washers and driers can easily be damaged in a flood. In order to prevent this from happening, utilities can be placed on cinder blocks one foot above the base flood elevation (BFE).
- **Add a sump pump in your basement.** Sump pumps can help keep groundwater from entering your home's interior.
- **Cut drywall so that it is one-half to 1-inch off the floor.** This is especially important in basements. Concrete floors commonly absorb ground moisture—especially in winter months. That moisture can wick up the wallboard if it's touching the floor, allowing mold to grow out-of-sight within the walls. (You can hide the gap with wood or rubberized floor trim.)
- **Don't forget to buy flood insurance.** Flood insurance provides year-round financial protection and improves your ability to quickly recover when severe storms strike and cause unexpected flooding. Call your local insurance agent or 1-800-720-1090 to reach National Flood Insurance Program specialists.



Flood Insurance

1. Is flood damage covered by my homeowners insurance?

Flood damage is excluded in nearly all homeowners and renters insurance policies but, if desired, can be purchased as a separate policy.

2. Where do I get flood insurance?

Any licensed property/casualty insurance agent can sell a flood insurance policy. If you experience trouble in locating an agent, contact the National Flood Insurance Program's (NFIP) agent referral program at 1-888-CALL FLOOD.

3. Is there a waiting period before my flood insurance policy becomes effective?

There is a 30-day waiting period before a new or modified flood insurance policy becomes effective.

4. Are all flood insurance policies the same?

Flood insurance coverage can be purchased for homes and businesses – separate coverage must be purchased for the building and its contents.

5. Do I need to live in a floodplain to get flood insurance?

You do not need to live in a floodplain to purchase flood insurance – coverage is available to any building located in a community that has qualified for the National Flood Insurance Program. For a listing of Michigan communities participating in the NFIP, you may visit <http://www.fema.gov/fema/csb.shtm>.

6. Is water back up in basements covered by a flood insurance policy?

Coverage for water back up in basements (drains/sewers) is excluded from the flood insurance policy.

7. Can I get coverage for water back up in basements?

Although basement water back up is excluded under most homeowners' insurance policies, coverage can be obtained by purchasing an endorsement. Most insurance companies offer sewer and drain back up as optional coverage. Coverage and limits vary by insurance company, so check with your agent/company about specifics. Some insurers include full coverage for sump pump failure while others specify items that are covered.

8. Are there steps I can take to minimize losses from water back up in basements?

- Never store perishables or valuables in basements that you can't afford to lose or replace.
- Do not store any item near basement drains.
- Check storm drain lines to make sure they're clear of debris, roots, etc.
- Grade the property around your home to drain water away from it.
- Install gutters and make sure downspouts are extended away from the foundation in order to carry water away from the basement walls.
- Use shelving or store items several inches above the potential water level in order to prevent loss.
- If you do have some water seepage following storms, take corrective measures to alleviate problems in the future.



Lightning Safety

Lightning can provide a spectacular display of light on a dark night. This awesome show of nature also causes death and destruction. Lightning is the visible discharge of electrical energy. It is often accompanied by thunder – which is a sonic boom created by the same discharge. **If you hear thunder, lightning is a threat**, even if the storm seems miles away and the sky is blue. Lightning's electrical energy seeks a path to ground – your home, the trees in your yard or even *you* can be that chosen path!

SAFETY TIPS

1. **PLAN** your evacuation and safety measures. At the first sign of lightning or thunder, activate your emergency plan. Lightning often precedes rain, so do not wait for the rain to begin before suspending activities.

No place is absolutely safe from lightning; however, some places are much safer than others. The **SAFEST** location during lightning activity is a large enclosed building, not a picnic shelter or shed. The second safest location is an enclosed metal vehicle, car, truck, van, etc., but **NOT** a convertible, bike or other topless or soft top vehicle.

2. IF **OUTDOORS**, get **INSIDE** a suitable shelter **IMMEDIATELY!** When a safe location is not nearby:

The lightning safety community reminds you that there is **NO** safe place to be outside in a thunderstorm. Don't kid yourself--you are **NOT** safe outside.

Being stranded outdoors when lightning is striking nearby is a harrowing experience. Your first and only truly safe choice is to get to a safe building or vehicle. If you like to camp, climb, bike (motorcycle or bicycle), boat, scuba dive, or enjoy other outdoor activities and find yourself in a place where you cannot get to a safe vehicle or shelter, outdoor safety tips are available at www.lightningsafety.noaa.gov/outdoors.htm. These will not prevent you from being hit, just **SLIGHTLY** lessen the odds.

3. IF **INDOORS**, avoid:
 - Water
 - Doors and windows
 - Using the telephone and headsets.

Turn off, unplug, and stay away from appliances, computers, power tools, and TVs. Lightning could strike exterior wires, inducing shocks to inside equipment.

4. **SUSPEND ACTIVITIES** for 30 minutes after the last observed lightning or thunder.
5. Individuals struck by lightning do not carry an electrical charge and can be handled safely. Apply First Aid procedures to a lightning victim if you are qualified to do so. Call 911 or send for help immediately. **Know Your Emergency Telephone Numbers!**

For additional information visit NOAA's lightning safety website:
www.lightningsafety.noaa.gov

Storm Based Warnings

Ushering in a New Era

On October 1, 2007, NOAA's National Weather Service began issuing *Storm Based Warnings* for tornadoes, severe thunderstorms, flash floods and marine hazards. *Storm Based Warnings* are more geographically specific for these short-duration weather events.

Why Storm Based Warnings?

Storm Based Warnings show the specific meteorological or hydrological threat area and are not restricted to geopolitical boundaries. By focusing on the true threat area, warning polygons will improve NWS warning accuracy and quality. *Storm Based Warnings* will promote improved graphical warning displays, and in partnership with the private sector, support a wider warning distribution through cell phone alerts, pagers, and web-enabled Personal Data Assistants (PDAs). The media will be able to display the polygons showing the public at large where the area of maximum threat is, and better depict who or what is at greatest risk.

If the typical *Storm Based Warning* was one-quarter the size of the typical warned county, the economic value to the public due to reduced cost of sheltering is a minimum of \$100 million per year. Emergency managers will be able to make better decisions on what resources may be required and where. Law Enforcement and Fire Departments can know which areas need to be put on alert. Schools and businesses can more accurately determine whether they may or may not need to activate their tornado procedures and close down operations. Other government agencies and customers, such as the FAA and airlines, will be able to make better risk assessments.

Storm Based Warning Process

Instead of issuing warnings by county, your local NOAA NWS Weather Forecast Office will be able to narrow their focus on a portion of a county (or counties) that have the greatest threat for being impacted by severe weather. The warned area is defined by latitude and longitude coordinates and depicted by polygons. The calculated movement of severe storms can be indicated through this technique as well. All of this information will be appended to the bottom of NOAA NWS *Storm Based Warnings*.

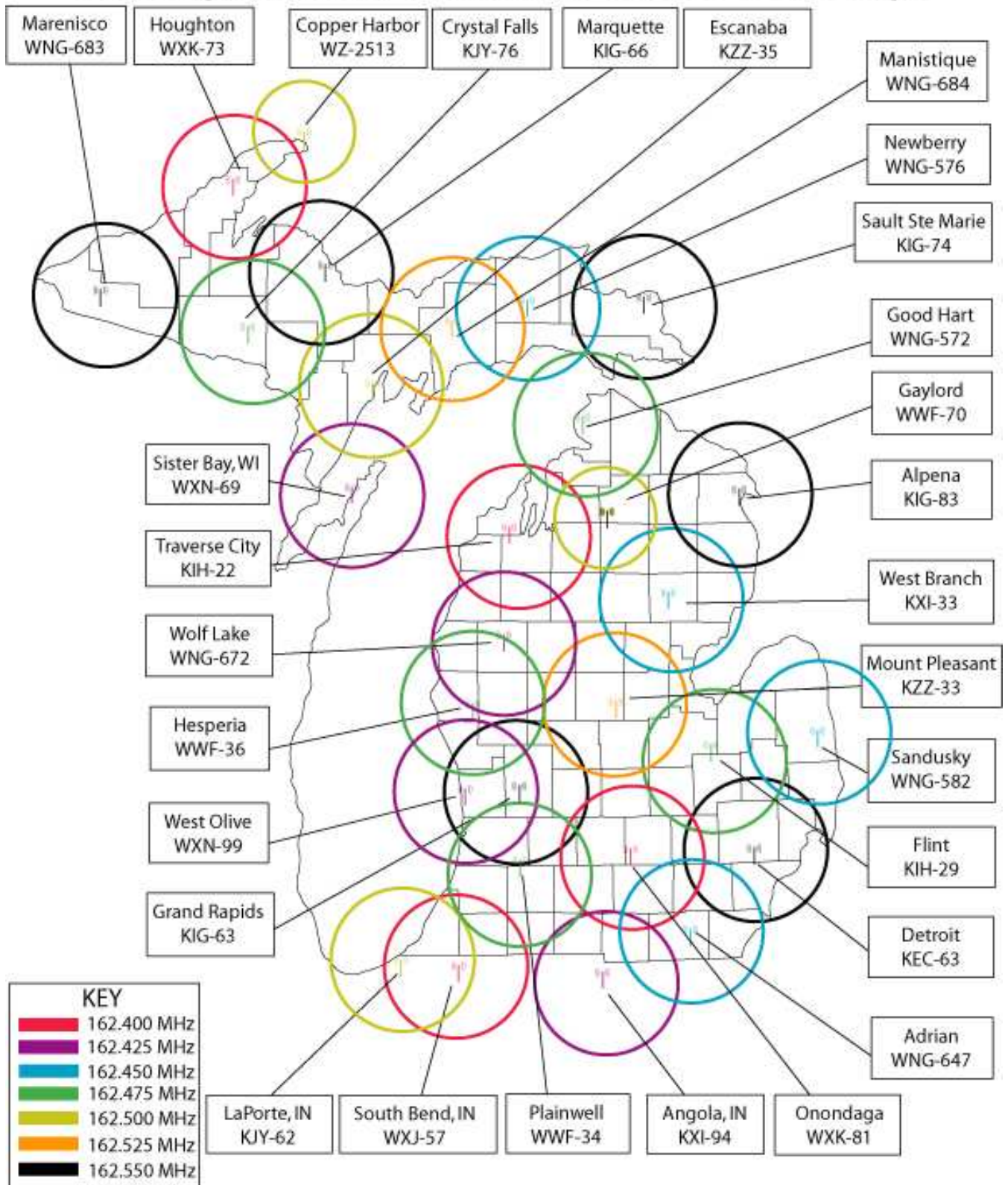
For audio broadcasts, portions of counties are described by compass points (e.g. northeast, south central, etc.). The use of familiar landmarks such as parks, highways or rivers as reference points will also help describe the warned area. Warning polygons can shrink in area, but never expand. If a severe storm is expected to track outside of the current warning area, a new *Storm Based Warning* will be issued for the region now at risk. When severe weather is no longer expected, your local NOAA NWS Weather Forecast Offices allows the warning to expire.

Short-term Challenges

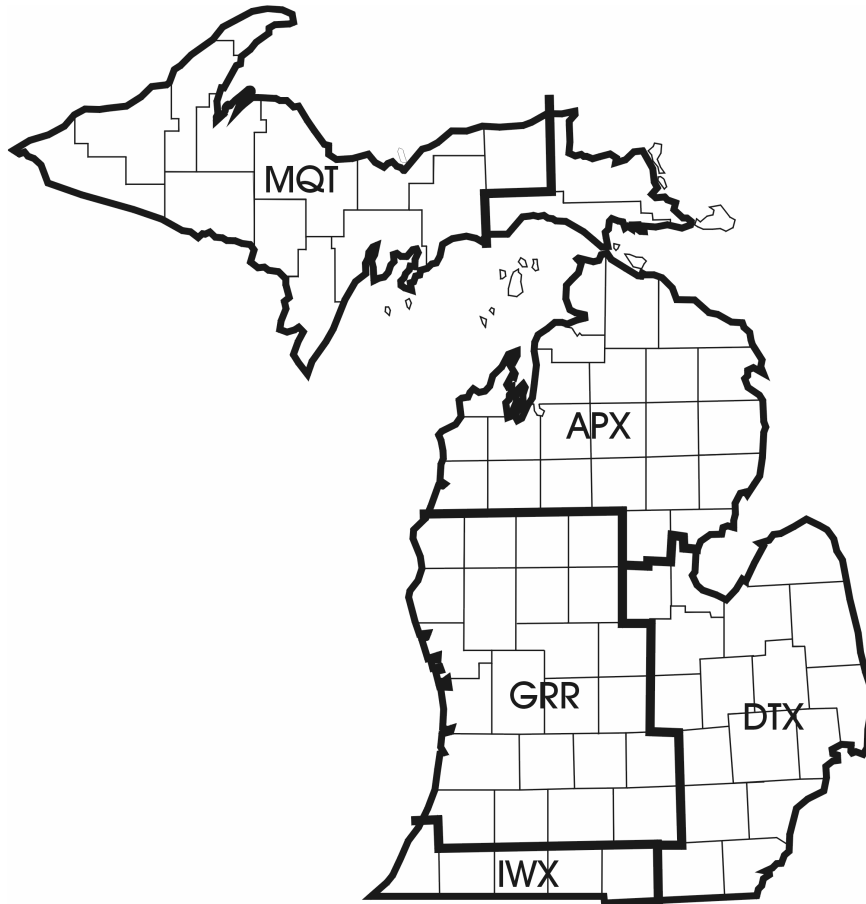
With any change in service, come a few short-term challenges that must be overcome. The most significant with *Storm Based Warnings* is there will be times where multiple warnings are in effect for the same county. This possibility must be managed with clear wording in NOAA NWS messages, and by raising the awareness of NOAA NWS customers and partners.

A second challenge is that legacy warning dissemination technologies cater to the 'warning by county' culture. The advent of digital technology has, almost overnight, revolutionized communication. *Storm Based Warnings*, unlike textual warnings by county, meshes well with digital communication technologies such as Graphical Information Systems (GIS).

Michigan NOAA Weather Radio Coverage



NOAA's National Weather Service



Detroit/Pontiac

NWS Office, NOAA
9200 White Lake Road
White Lake, MI 48386-1126
(248) 625-3309, Ext. 726
Contact: Richard Pollman
www.weather.gov/dtx
Richard.Pollman@noaa.gov

Grand Rapids

NWS Office, NOAA
4899 South Complex Drive, SE
(616) 949-0643, Ext. 726
Contact: Jamie Bielinski
www.weather.gov/grr
Jamie.Bielinski@noaa.gov

Gaylord

NWS Office, NOAA
8800 Passenheim Road
Gaylord, MI 49735-9454
(989) 731-3384, Ext. 726
Contact: Jim Keysor
www.weather.gov/apx
James.Keysor@noaa.gov

Marquette

NWS Office, NOAA
112 Airport Drive South
(906) 475-5782, Ext. 726
Contact: Matthew Zika
www.weather.gov/mqt
Matthew.Zika@noaa.gov

Northern Indiana

NWS Office, NOAA
7506 East 850 N.
Syracuse, IN 46567
(574) 834-1104, Ext. 726
Contact: Michael Lewis
www.weather.gov/iwx
Michael.Lewis@noaa.gov