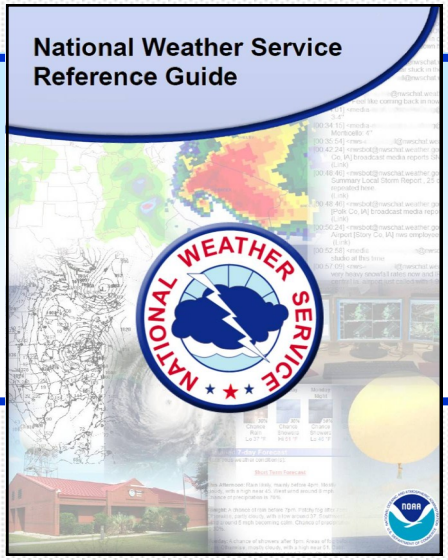


7. Outreach and Education

Table of Contents

Activities	2
Safety Campaigns	3
Safety Rules	5
StormReady/TsunamiReady	9
Severe Weather Spotter Training	11
Education and Training Courses	15
Meteorology and Hydrology Career and Job Resources	18

Click on description to go directly to the page.

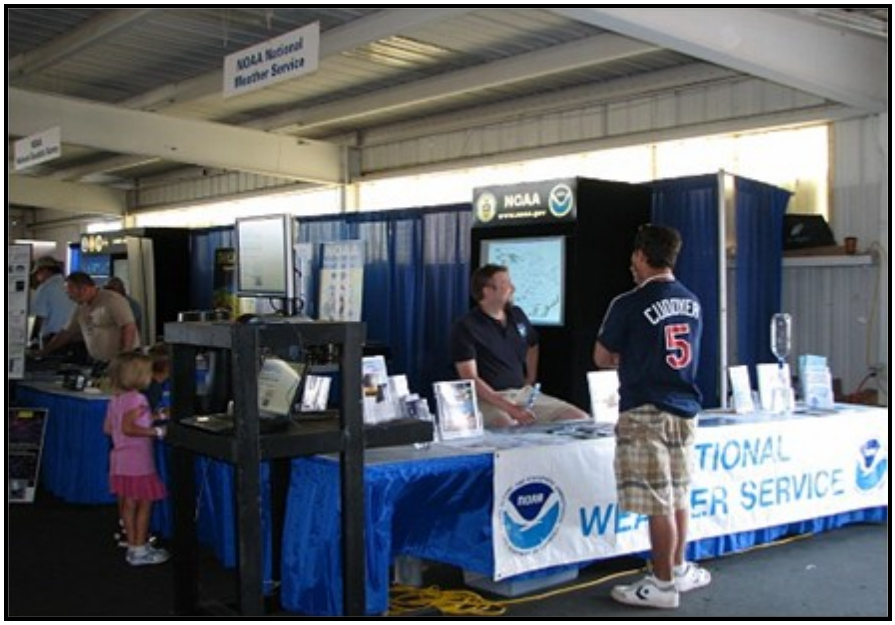
7. Outreach and Education

Getting involved in the community is a vital part of the NWS mission. Local offices have opportunities to get out of the office and interact with the public through school talks, local events and spotter talks as well as regional and national events. Outreach activities provide an avenue to educate the public on what weather is, who we are and what we do.

Outreach Activities

As a service-orientated organization, nearly everything the NWS produces can be considered "outreach." Its forecasts and warnings are one type of outreach. However, there are also face-to-face outreach efforts. There are many ways a WFO may become involved and interact with their partners, users, and the public. The extent of NWS participation depends on staffing and budget levels. Contact your local NWS office for details.

National events: The NWS participates in several national events, including, but not limited to, the annual International Association of Emergency Managers (IAEM) conference, American Meteorological Society (AMS) conference, National Weather Association (NWA) conference, Experimental Aircraft Association (EAA) Air Venture, National Hurricane Conference, Severe Weather Workshop and National Science Teachers Association conference.



Local NWS offices may have individuals presenting papers or posters at the national events, and/or staff an exhibit table that has brochures or weather demonstration equipment.

Regional events: There are numerous regional workshops and conferences spanning every facet of weather forecasting, from aviation to marine to fire weather to severe weather. Some may be sponsored by NOAA-related entities at universities or research facilities, while others are organized by local NWS offices. Contact your local NWS office for details.

State events: State-level events that NWS offices have participated in include, but are not limited to, Governor's Conferences, Emergency Management Association conferences, Sheriff Association conferences, 911 Dispatcher Conferences, insurance industry conferences, science teacher conferences and safety conferences.

Local events: Some NWS offices may find the best outreach involves one or two large events; others may partake in many different small events throughout the year. Some possible local events are: fairs or carnivals; fishing, boating, and other outdoor activity shows, and school and university fairs or shows.

NWS Safety Campaigns

http://www.weather.gov/safety.php

Calendar of awareness weeks:

http://www.weather.gov/os/severeweather/severewxcal.shtml

Air Quality Awareness Week

http://www.weather.gov/airquality/

The NWS and the Environmental Protection Agency (EPA) urge Americans to "Be Air Aware" through its air quality awareness days. Air Quality Awareness Week typically occurs during the last week of April.

Flood Safety Awareness Week

http://www.floodsafety.noaa.gov/

Flooding is a coast to coast threat to the United States and its territories in all months of the year. National Flood Safety Awareness Week is intended to highlight some of the many ways floods can occur, the hazards associated with floods and what you can do to save life and property.

Heat Awareness Day

http://www.nws.noaa.gov/om/heat/index.shtml

In the past 10 years, heat has been the single greatest cause of weather related death in the U.S. The NWS works to make people aware of the extreme effects.

Hurricane Preparedness

http://www.nws.noaa.gov/om/hurricane/index.shtml

http://www.nhc.noaa.gov/HAW2/english/intro.shtml

History teaches that a lack of hurricane awareness and preparation are common threads among all major hurricane disasters. By knowing your vulnerability and what actions you should take, you can reduce the effects of a hurricane disaster. Hurricane Preparedness Week is typically held during the last week of May.

The goal of this Hurricane Preparedness Web site is to inform the public about the hurricane hazards and provide knowledge which can be used to take **ACTION**. This information can be used to save lives at work, home, while on the road, or on the water.

National Lightning Safety Awareness Week

http://www.lightningsafety.noaa.gov/

Summer is the peak season for one of the nation's deadliest weather phenomena, lightning, but don't be fooled, lightning strikes year round. In order to reduce lightning injuries and fatalities, the National Weather Service promotes Lightning Safety Awareness Week the last week of June.

The goal of the website is to safeguard U.S. residents from lightning.

National Rip Current Awareness Week

http://www.ripcurrents.noaa.gov/

Rip currents are currents of water moving away from shore. The strongest rip currents can attain speeds reaching 8 feet per second, faster than an Olympic swimmer can sprint! On average, more people die every year from rip currents than from shark attacks, tornadoes or lightning. According to the United States Lifesaving Association, 80 percent of surf beach rescues are attributed to rip currents and more than 100 people die annually from drowning in rip currents.

In an effort to heighten public awareness of rip currents at surf beaches, each year NOAA designates the first full week of June as national Rip Current Awareness Week, coinciding with the traditional start of the summer vacation season.

Tornado and Severe Weather Awareness

http://www.weather.gov/om/severeweather/index.shtml

Each year, many people are killed or seriously injured by tornadoes and severe thunderstorms despite advance warning. Some did not hear the warning; others heard the warning but did not believe it would happen to them. The following preparedness information, combined with timely severe weather watches and warnings, may save your life. If you hear a warning or observe threatening skies, only you can make the decision to seek safety. This could be the most important decision you will ever make.

Average # of US deaths per year 1999-2008	
Flooding	65
Lightning	42
Tornadoes	63
Hurricanes	117
Heat	162
Cold	21
Winter Storm	33
Wind	43

Tsunami Awareness Weak

http://nthmp.tsunami.gov/tsunamiweek.html

Every day of the year, Americans along our nation's coasts face the threat of being impacted by a destructive tsunami. During National Tsunami Awareness Week, we call attention to the importance of planning ahead and securing our homes and property in preparation for a potential tsunami.

Turn Around, Don't Drown

http://www.weather.gov/os/water/tadd/

Turn Around Don't Drown (TADD) is a National Weather Service year-round campaign to warn people of the hazards of walking or driving a vehicle through flood waters.

Winter Weather Awareness

http://www.nws.noaa.gov/om/winter/index.shtml

Each year, dozens of Americans die due to exposure to cold. Add to that number, vehicle accident fatalities, fires due to dangerous use of heaters and other winter weather fatalities and you have a significant threat. Threats, such as hypothermia and frostbite, can lead to loss of fingers and toes or cause permanent kidney, pancreas and liver injury and even death. You must prepare properly to avoid these extreme dangers. You also need to know what to do if you see symptoms of these threats.

NOAA Weather Radio All Hazards (NWR) Awareness Day

Several states conduct their own NWR Awareness Day campaign, in conjunction with state and Tribal Nation emergency managers. Messages, such as Public Information Statements, may be recorded on various radio broadcasts as well as disseminated onto the NOAA Weather Wire circuit and other computer channels. Citizens are encouraged to purchase weather radio receiver units as well as buy weather radios as gifts. Weather radios provide watch and warning information directly from NWS offices.

Weather Safety Rules

http://www.nws.noaa.gov/om/severeweather/index.shtml

Boating Weather Safety Rules

- Keep an eye out for the approach of dark, threatening clouds, which may be associated with thunderstorms; a steadily increasing wind or sea; any developing decrease in visibility such as fog; and any increase in wind velocity opposite in direction to strong tidal current. A dangerous rip tide condition may form steep waves that can breach a boat.
- Check NOAA weather radio broadcasts for the latest forecasts and warnings.
- If a thunderstorm catches you off guard, remember that not only gusty winds but also lightning poses a threat to safety. Stay below deck if possible. Keep away from metal objects that are not grounded to the boat's protection system. Do not touch more than one grounded object simultaneously or you may become a shortcut for electrical surges passing through the protection system. Put on a life jacket and prepare for rough waters.

Dust Storm Driving Safety Rules

- If dense dust is observed blowing across or approaching a roadway, pull your vehicle off the pavement as far as possible, stop, turn off lights, set the emergency brake and take your foot off the brake pedal to ensure that tail lights are not illuminated.
- Do not enter the dust storm area if you can avoid it.
- If you cannot pull off the roadway, go at a speed suitable for visibility, turn on lights and sound horn occasionally. Use the painted center line to guide you. Look for a safe place to pull off the roadway.
- Never stop on the traveled portion of the roadway.

Flood/Flash Flood Rules

- Be prepared to evacuate at a moment's notice. Leave areas subject to flooding including dips, low areas in canyons, washes, etc.
- Stay away from floodwaters. If you come upon a flowing stream where water is above your ankles, stop, turn around, and go another way. Six inches of swiftly moving water can sweep you off your feet.
- DO NOT drive through moving water. Find another route. Seek higher ground, as rapid rising water may engulf the vehicle and its occupants and sweep them away. Most cars can be swept away by less than two feet of moving water.
- Be especially cautious at night when it is harder to recognize flood danger.
- Do not camp or park your vehicle along streams and washes, particularly during threatening conditions.

Fog Driving Safety Rules

- Drive with lights on low beam. High beams will reflect off the fog and further impair visibility.
- Slow down…Slow down…Slow down.
- Listen for traffic you cannot see.
- Use wipers and defrosters as necessary for maximum visibility.
- Be patient. Do not pass lines of traffic.

- Do not stop on a freeway or heavily traveled road. If your vehicles stalls or becomes disabled, get out and move away from the vehicle to avoid personal injury.
- Consider postponing your trip until the fog clears. Usually by late morning or during the afternoon, visibilities improve.

Heat Wave Safety Rules

- Slow down. Strenuous activities should be reduced, eliminated or rescheduled to the coolest time of the day. Individuals at risk should stay in the coolest available place, not necessarily indoors.
- Dress for summer. Lightweight, light colored clothing reflects heat and sunlight and helps your body maintain normal temperatures.
- Try not to eat as much. Foods that increase metabolic heat production also increase water loss. Drink plenty of water or other non-alcoholic fluids. Your body needs water to keep cool. Drink plenty of fluids even if you do not feel thirsty (unless your physician has directed otherwise).
- Do not drink alcoholic beverages. This is the same advice given for extremely cold weather. Alcoholic beverages will constrict the blood vessels, which will prevent adequate blood circulation to remove excess heat.
- Spend more time in air-conditioned places. Air conditioning in homes and other buildings markedly reduces danger from the heat. If you cannot afford an air conditioner, spending some time each day (during hot weather) in an air-conditioned environment affords some protection.
- Do not get too much sun. Sunburn makes the job of heat dissipation that much more difficult.
- Do not leave your children or pets alone inside automobiles during extremely hot days. The temperature inside vehicles can climb rapidly and may exceed 100 degrees.
- Do not take salt tablets unless specified by a physician.

Lightning Safety Rules

- Do not use corded telephones except for emergencies.
- Avoid contact with computers or any equipment connected to electrical power.
- Avoid plumbing and water, including showers, baths, sinks and faucets.
- Remain inside until 30 minutes after the last rumble of thunder.
- If you are caught outside and absolutely cannot get to a substantial shelter, avoid projecting above the surrounding landscape, such as standing on a hilltop.
- In a forest, seek shelter in a low area under a thick growth of small trees. In open areas, go to a low place such as a ravine or valley.
- Get away from open water, tractors and other metal farm equipment and small metal vehicles such as motorcycles, bicycles or golf carts.
- Avoid wire fences, clotheslines, metal pipes and rails. Put down golf clubs.
- Lightning victims do not carry an electrical charge. If someone is struck by lightning, call 911 for help and begin CPR if necessary.

Tornado Safety Rules

- Avoid windows, doors and outside walls. Protect your head.
- In homes and small buildings, go to the basement or to an interior part of the building on the lowest level, such as a closet, bathroom or interior hallway. Get underneath something sturdy.
- In schools, nursing homes, hospitals, factories and shopping centers, go to pre-designated shelter areas. Interior hallways on the lowest floor are usually the best.
- In high-rise buildings, go to interior small rooms or hallways.
- If in a mobile home or outside, go to the nearest sturdy shelter.

  If no sturdy shelter is available:

  - Immediately get into a vehicle, buckle your seat belt and try to drive to the closest sturdy shelter.
  - If flying debris occurs while you are driving, pull over and park. Now you have the following options as a last resort:
    - Stay in the car with the seat belt on. Put your head down below the windows, covering with your hands and a blanket if possible.
    - If you can safely get noticeably lower than the level of the roadway, exit your car and lie in that area, covering your head with your hands.

Tsunami Safety Rules

- A strong earthquake felt in a low-lying coastal area is a natural warning of possible, immediate danger. Keep calm and quickly move to higher ground away from the coast.
- Approaching tsunamis are *sometimes* heralded by noticeable rise or fall of coastal waters. Tsunamis are usually accompanied by a loud roar that sounds like a train or aircraft. These are nature's signs that a tsunami is occurring and should be heeded.
- Never go down to the beach to watch for a tsunami! Tsunamis can move faster than a person can run!
- The upper floors of high, multi-story, reinforced concrete hotels can provide refuge if there is no time to quickly move inland or to higher ground.
- If you are on a boat or ship and there is time, move your vessel to deeper water (at least 100 fathoms). If it is the case that there is concurrent severe weather, it may be safer to leave the boat at the pier and physically move to higher ground.
- A tsunami is not a single wave, but a series of waves. Stay out of danger until an "ALL CLEAR" is issued by a competent authority.

Winter Storm Safety Rules

- Check battery powered equipment before the storm arrives. A portable radio or television set may be your only contact with the world outside.
- Check your food stock and extra supplies. Supplies should include only non-perishable items, as a power failure will eliminate cooking or refrigeration possibilities.
- Stay indoors during storms unless you are in peak physical condition. If you must go outside, avoid over-exertion.
- Do not over exert yourself shoveling snow. It is extremely hard work for anyone in less than prime physical condi-

tion and can bring on a heart attack; a major cause of death during and after winter storms.

If a Blizzard Traps You in Your Automobile

- Avoid overexertion and exposure. Attempting to push your car, shovel heavy drifts or perform other difficult chores during a blizzard may cause a heart attack, even for someone in good physical condition.
- Stay in your vehicle. Do not attempt to walk out of a blizzard. Disorientation comes quickly in blowing and drifting snow. You are more likely to be found when sheltered in your car.
- Keep fresh air in your car. Freezing wet snow and wind driven snow can completely seal the passenger compartment.
- Avoid carbon monoxide poisoning by running the motor and heater sparingly and only with the downwind window open for ventilation. Make sure the tailpipe is unobstructed.
- Do not stay in one position for long. Exercise by clapping hands and moving arms and legs vigorously from time to time.
- Turn on dome light at night to help make your vehicle visible to rescue workers.
- Keep watch. Do not allow all occupants of the car to sleep at once.

Winter Travel Safety Rules

- If the storm exceeds or even tests your limitation, seek available refuge immediately.
- Plan your travel and select primary and alternate routes.
- Check the latest weather information on NOAA Weather Radio (NWR) or your car radio.
- Try not to travel alone; two or three persons are preferable.
- Always fill your gasoline tank before entering open country, even for a short distance.

Winter Travel Kit

- Blankets or sleeping bags
- Matches and candles
- Empty 3 lb coffee can with plastic lid (for melting snow for drinking)
- Facial tissue
- Paper towels
- Extra clothing
- High calorie, non-perishable food
- Compass
- Shovel
- Sack of sand
- Flashlight or signal light
- Windshield scrapper
- Jumper cables
- Tire chains
- Tow chains
- Fire extinguisher
- Catalytic heater

StormReady®/ TsunamiReady™

StormReady/TsunamiReady, a joint effort of the NWS, and local, state, and Tribal Nation emergency managers, is an NWS-administered, national community preparedness program that helps arm America's communities with the communication and safety skills needed to save lives and property before and during a weather or tsunami emergency. It helps community leaders and emergency managers strengthen local safety programs. In general, to be considered, a community, Tribal Nation, or entity must possess a solid communication network, and provide verification of its multi-hazard emergency operations plan.

Specifically, in order to become StormReady/TsunamiReady the community, Tribal Nation, or entity must:

- Establish a 24-hour warning point and emergency operations center
- Have multiple methods to receive and disseminate severe weather warnings and information for their community
- Have various methods to monitor weather conditions locally
- Promote the importance of public readiness
- Develop a formal hazardous weather action plan, including severe weather spotter training and drills

This program started in 1999 in Tulsa, OK. By February, 2010, over 1500 communities in 49 states had earned their StormReady/TsunamiReady designation.

Reasons to be StormReady/TsunamiReady: Americans live in the most severe weather-prone country on Earth. Each year, Americans cope with an average of 10,000 thunderstorms, 5,000 floods, 1,000 tornadoes and an average of two land-falling deadly hurricanes. Additionally, the U.S. faces winter storms, intense summer heat, high winds, wild fires and other deadly weather impacts. You can make sure your community is ready for the weather with the National Weather Service's StormReady/TsunamiReady program.

Some 90% of all presidentially declared disasters are weather related, leading to around 500 deaths per year and nearly $14 billion in damage. StormReady/TsunamiReady communities are better prepared to save lives from the onset of severe weather through advanced planning, education and awareness. No community is storm proof, but StormReady/ TsunamiReady can help communities save lives.

Additionally, by becoming StormReady/TsunamiReady**,** communities or Tribal Nations can earn points through the insurance industry that count toward a certain threshold level at which point the community's residents and businesses are able to get a rate-reduction on their hazard insurance policy.

Your town/organization can be StormReady/ TsunamiReady: Any incorporated village, city or even an entire county or Tribal Nation, can earn a StormReady/ TsunamiReady designation. In addition, Indian Nations, universities, commercial sites, military bases and major government sites can become StormReady/ TsunamiReady**.**

Schools and organizations can also be involved, but these entities become StormReady/ TsunamiReady "Supporters." As a Supporter, they are not required to set up a 24-hour warning center, nor do they get the free informational signs. However, they must meet all of the other population-based criteria.

Many communities and Tribal Nations have already satisfied most of the StormReady/ TsunamiReady criteria – it's just a matter of completing the application and making sure the remainder of the criteria are met to earn the official designation. The WCM will assist the community or Tribal Nation in their efforts and point out any shortcomings.

How to Start the Process of Becoming StormReady®/ TsunamiReady®

- Become familiar with all of the StormReady®/ TsunamiReady® material on-line at: http://www.stormready.noaa.gov.
- Contact the WCM at your local NWS office to inform them of your intentions. http://www.stormready.noaa.gov/contact.htm
- Identify one or two individuals within the community to spearhead the community's certification process (satisfy the criteria needed for designation).
- Fill out an application: http://www.stormready.noaa.gov/apply.htm

What happens when a community becomes StormReady®/TsunamiReady®?
Upon earning its designation, community leaders have the option of setting up a public ceremony with NWS officials, the media and other invitees. At this public ceremony, NWS officials will present two free informational signs (2 foot by 2 foot) to be erected in high pedestrian traffic areas. Additional signs can be obtained at a cost. These are not legal road signs. A certificate declaring the community or county StormReady®/ TsunamiReady will also be presented.

Severe Weather Spotter Training

Severe weather spotter classes introduce a variety of identification techniques to spotters that enable them to properly identify and report severe weather events to the local WFOs. Additionally, spotters are taught how to identify cloud features that usually precede the development of tornadoes and straight -line winds.

Importance of Spotters

Spotters are needed to verify what the NWS Doppler radar system is detecting, which includes everything from a tornado to heavy snow. Doppler radar can not see below cloud base for features beyond about 50 miles from the radar site, and spotters provide ground-truth information by reporting what is happening at the cloud base. Spotter information is used directly in the warning decision process.

Setting Up a Spotter Class

In most cases, the county emergency management director, or a Tribal government official, will request that a spotter class(es) be held in their county or Tribal Nation. Additionally, a safety officer of a business or academic institution may request a spotter class for their security staff, especially if they are working toward a StormReady® designation. Requests from other individuals are coordinated with the WCM. In some cases, a ham radio club may set up a spotter class for only their membership. Typically, the county EM director determines how many classes will be held in their county (from one to four per year.) The population of the county or Tribal Nation, and the number of counties within the County Warning Area will also have an effect on the number of spotter classes. If a county or Tribal Nation has a large population, then more than one spotter class may be needed. On the other hand, if a WFO is responsible for a large number of counties, then some counties may have to be combined in some years or entirely skipped.

Who Can Attend Spotter Classes?

Depending on a county's or Tribal Nation's internal policy, some classes will be restricted to only first responders (EMs, law enforcement, fire fighters, 911 dispatchers, etc.), while other classes are open to all spotters, government agencies and the general public (one doesn't have to be a spotter in order to attend). Some classes may be restricted to only amateur radio operators. Ultimately, the person who requested the spotter talk determines who attends.

There is no hard, fast rule for age limit of who is welcome to attend spotter training, but experience has shown that the most effective spotters are at least 16 years old.

When Are Spotter Classes Held?

Most spotter classes are conducted during the months of January, February, March, April and May. Classes are held earlier in the year in the southern states and later in Spring in the northern states. Normally, the classes are held in the evening in order to maximize attendance. However, depending on the county, some classes are held in the afternoon or even in the morning in order to minimize overtime paid to county or city employees. In some cases, an early morning class may be held for county highway departments or law enforcement officials. The county's EM director will have a feel for what is best for their county.

Depending on local requirements, some spotter classes may be conducted in the summer, fall, or winter seasons. The WCM and Emergency Manager will determine if and when spotter classes are held.

Length of Spotter Classes

Most spotter classes have durations of 1.5 to 2 hours, but some may be as short as 1 hour or as long as 3 hours. Longer classes will usually have 1 or 2 short breaks built in. The county or Tribal Nation EM director will have a feel for what is best for their situation.

How many people attend spotter classes?

Class size varies considerably, ranging from 5 to 10 to as many as 300 to 400. However, most are in the range of 30 to 60. The amount of advertisement done by EMs, the media and the NWS has an effect on class attendance.

Schedule of classes

Each WFO will post their class schedule on their website, either in the "Top News of the Day" section and/or on a Sky-Warn page. Additionally, some offices post a spotter class schedule on the NWS Outreach and Education Event System (NOEES) website at: https://apps.weather.gov/outreach/events.php. Contact the local WCM if you can not find the schedule.

Type/format of spotter class

All WFOs provide a basic severe weather spotter class, however some also provide an intermediate to advanced class. Some WFOs merge basic, intermediate and advanced ideas into one class. The county's or Tribal Nation's emergency management director will have a feel for what is best for their county, and they will need to work with the WCM to determine what course of action to take.

Spotter class format will generally fall into two categories: 1) The WCM, or another designated individual, conducts an in-person class in a room set up by and Emergency Manager or other First Responder, 2) The WCM, or another designated individual, conducts a class remotely via GoToMeeting or GoToWebinar capabilities, or similar technology.

Certification and ID Numbers

Some WFOs or county and Tribal Nation EM directors provide signed paper certificates and/or ID numbers for spotters, while others do not. The actual practice varies from one county to the next. Some WFOs train 2000 to 4000 spotters each year, thereby making it difficult to keep track of certification and ID numbers. The county's and Tribal Nation's emergency management director will have a feel for what is best for their situation.

Although not finalized, certification and ID numbers have been proposed as part of the University Corporation for Atmospheric Research's (UCAR) Cooperative Program for Operational Meteorology, Education and Training (COMET®) initiative which provides on-line severe weather spotter training. Additionally, a national database of severe weather spotters was proposed. Please refer to the COMET® website for updated information as it becomes available.

How do severe weather spotters relay their reports to the NWS?

There are a variety of methods that can be used to relay reports to the local WFO. Telephone calls, regular e-mail, e-Spotter, amateur radio and the National Public Observation Program (NPOP) are all options. Of course, relaying the report to the county or city 911 Communications Center will suffice since they will relay the report to the local WFO as time permits.

Training materials

The NWS has worked with the University Corporation for Atmospheric Research's (UCAR) Cooperative Program for Operational Meteorology, Education and Training (COMET®) to create national training modules for Skywarn Weather

Spotters. Two modules are currently available: "The Role of the Skywarn Spotter" and "Skywarn Spotter Convective Basics". COMET's Skywarn Weather Spotter Course can be accessed here: https://www.meted.ucar.edu/training_course.php?id=23. In the future when funding permits, additional training modules on other hazards - flooding, winter weather, tropical cyclones, advanced convection - will be available. It is up to the local WCM/WFO to determine if supplemental local training is needed in addition to these COMET modules to receive your certification as a Skywarn Weather Spotter. Please visit your local WFO's Skywarn weather spotter web page for more information: http://www.weather.gov/skywarn/.

The NWS has also updated its Skywarn Weather Spotter's Field Guide in June 2011: http://www.weather.gov/os/brochures/SGJune6-11.pdf. Otherwise, there is a wealth of spotter training material on the internet; use your favorite search engine on these words – spotter training, severe weather, SkyWarn, tornadoes, downburst winds, etc.

What happens with the severe weather report after it is used in the warn/no warn process?

Each WFO is required to keep verification statistics (False Alarm Ratio – FAR and Probability of Detection – POD), which enable the WFO to judge the effectiveness of its warning program. Severe weather reports allow a WFO to calculate performance statistics.

If a severe weather event occurred within the valid time period of a warning, then it is considered to be detected, and the POD increases. A POD of 1.000 is a perfect score. If the severe weather event occurred outside of the warning valid time, then it is considered a missed event and the POD goes down. Similarly, a warning is considered to be verified if an event occurred within that warning's valid time period, and the FAR for that warning is 0.000. An overall FAR of zero would be a perfect score. However, if there were no severe weather events during the warning valid time, then the warning is considered a false alarm and the FAR increases.

The severe reports are compiled into a national publication entitled *Storm Data,* which is an official document of severe weather phenomena in the U.S. Below are a two related links:

http://www.nws.noaa.gov/directives/sym/pd01016005curr.pdf

http://www7.ncdc.noaa.gov/IPS/sd/sd.html;jsessionid=E415B310D5CED1E5497EBE9A5564BD1E

Refer to the *Storm Data* section in the Non-Routine Products Section in this Guidebook for more details about *Storm Data*.

WFO personnel will incorporate spotter reports into a product entitled "Preliminary Local Storm Report (LSR)." LSRs are disseminated to the news media and other NWS offices via various computer circuits and are posted on the WFO web sites: http://www.crh.noaa.gov/hazards/mkx . Here is an LSR sample:

```
PRELIMINARY LOCAL STORM REPORT
NATIONAL WEATHER SERVICE BALTIMORE MD/WASHINGTON DC
321 PM EDT THU OCT 14 2010

..TIME...   ...EVENT...      ...CITY LOCATION...     ...LAT.LON...
..DATE...   ....MAG....      ..COUNTY LOCATION..ST.. ...SOURCE....
            ..REMARKS..

0155 PM     TSTM WND DMG     2 WSW CLEMENTS          38.32N  76.76W
10/14/2010                   ST. MARYS          MD   911 CALL CENTER

            SEVERAL TREES DOWN AND DAMAGE TO A PORCH ROOF
```

The reports listed here are only preliminary and ultimately may not reflect events correctly. This is especially true for tornado reports that are received during a severe event but may not be able to be verified with damage or photos after the event.

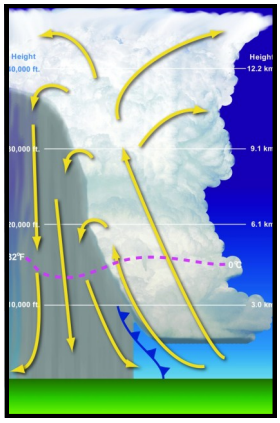
Definitions of Severe Weather Events and Clouds Used in Spotter Classes

Information provided on this page do not replace or substitute for material presented in NWS-provided severe weather spotter classes. The information provided below is only for quick reference purposes. A complete NWS glossary can be found at this link: http://forecast.weather.gov/glossary.php? Refer to the SkyWarn and Awareness type web pages on the NWS WFO web sites for additional severe weather spotter information and resources.

Tornado: A violently, rotating, column of air, extending from the cloud-base to the ground. The tornado is rotating air/wind — you can't see air. There may or may not be a visible condensation-funnel associated within the tornado. (Photo: Rusty Kapela)

Funnel-cloud: A funnel-shaped, rotating cloud feature extending from a cloud base, but is not in contact with the ground; nor is there any swirling/rotating dirt & debris spray/whirl at the ground-level (nothing going on at ground-level). (Photo: Doug Raflik)

Rotating Wall Cloud: A localized, persistent, often abrupt lowering from a convective rain-free base. Wall clouds can range from a fraction of a mile up to nearly five miles in diameter, and normally are found on the south or southwest (inflow) side of the thunderstorm. When seen from within several miles, many wall clouds exhibit rapid upward motion and cyclonic rotation. However, not all wall clouds rotate. Rotating wall clouds usually develop before strong or violent tornadoes, by anywhere from a few minutes up to nearly an hour. Some wall clouds look like beer-barrels, or big flat thumbs, or may be fragmented. Some wall clouds don't rotate. (Photo: Frank Weisensel)



Downburst: A strong downdraft current of air from a cumulonimbus cloud, often associated with intense thunderstorms. Downdrafts may produce damaging winds at the surface. A microburst is a convective downdraft with an affected outflow area of less than 2 miles wide and peak winds lasting less than 5 minutes. Microbursts may induce dangerous horizontal/vertical wind shears, which can adversely affect aircraft performance and cause property damage. A macroburst is a convective downdraft with an affected outflow area of at least 2 miles wide and peak winds lasting between 5 and 20 minutes. Intense macrobursts may cause tornado-force damage of up to EF3 intensity. Yellow arrows pointing downward in image indicate the downburst.

Shelf Cloud: A horizontally-orientated, low-hanging, shelf or snowplow-shaped cloud feature on the front side of downbursts, most common with squall lines (a line of thunderstorms). Some non-rotating, cloud fragments (scud) on the underside of the shelf cloud may briefly resemble funnel-clouds or tornadoes. These scary-looking, non-rotating cloud fragments (scud) generate the vast majority of false tornado and funnel-cloud reports from spotters and non-spotters. (Photo: David Paterson)

Education & Training Courses

Federal Emergency Management Agency (FEMA) Emergency Management Institute (EMI)

EMI has resident courses (on-campus) and an Independent Study Program (ISP) that involves distance learning. Since many disasters that emergency managers and first-responders deal with are weather-related, weather issues will be a part of some of EMI's courses.

For detailed information about EMI educational opportunities, go to this web site:
http://training.fema.gov/ or http://training.fema.gov/IS/.

A description of a typical course follows.

IS-271 Anticipating Hazardous Weather & Community Risk– if you are an emergency manager or first-responder, this course will help you by:

- Enhancing your ability to **recognize potentially hazardous weather and flooding situations** and how they may affect your community
- Familiarizing you with NWS products so that you understand how to **use and interpret forecasts**
- Encouraging you to **develop a partnership** with the NWS well in advance of a threat

For more information on this course, visit this web site: http://training.fema.gov/EMIWeb/IS/IS271.asp

Prototype Curriculum for Associate Degrees in Emergency Management

EMI has a list of proposed courses for an associate degree via EMI at the following link:

http://74.125.113.132/search?q=cache:NWIEBnZIt28J:training.fema.gov/EMIWeb/downloads/proto.doc+FEMA-NWS+courses&cd=7&hl=en&ct=clnk&gl=us

Locally-taught EMI weather- related courses

Some EMI courses are taught by state-level emergency management in conjunction with WCMs from the NWS. Contact your state-level Emergency Management Training Officer or the WCM who services your area for detains. For example:

G272 - Warning Coordination - This 1½-day field course is the latest in the hazardous weather series of courses produced in partnership with the NWS. It is designed to be conducted jointly by an NWS WCM and state emergency management staff for an audience of local emergency managers. Every year the United States experiences more severe weather than any other country in the world. In order to reduce deaths, injuries, and property losses, emergency managers must work closely with the NWS and the news media to provide effective warnings that can be received and understood by people at risk. This course is intended to help facilitate that process.

Course topics include The Social Dimensions of Warning Response; Developing Effective Warning Messages; Developing an Effective Community Warning Process; and working with the news media to create a Weather Warning Partnership.

Cooperative Program for Operational Meteorology, Ed., and Training (COMET®)

The COMET® program supports, enhances and stimulates learning about atmospheric and related sciences. Here is COMET's web site: http://www.comet.ucar.edu

In 1989 the University Corporation for Atmospheric Research (UCAR) and the NWS established COMET to promote a better understanding of mesoscale meteorology and to maximize the benefits of new weather technologies. Today the COMET program addresses education and training needs in the atmospheric and related sciences through three main activities:

Distance Education: COMET uses multimedia training materials including web, CD-ROM and teletraining delivery methods to serve earth science education and training needs by providing interactive experiences for learners at a distance. The majority of these remote training opportunities are available at no cost on their **MetEd** website (http://www.meted.ucar.edu/).

Residence and Virtual Courses: COMET offers advanced hydrometeorological education for the working professional in a state-of-the-art classroom and forecasting laboratory environment at the COMET facility in Boulder, CO. The courses are taught jointly by university faculty, operational forecasters and other leaders in atmospheric and related sciences. These classes include both lectures and hands-on exercises that simulate the forecast environment.

The Outreach Program: With funding from the NWS and other agencies, COMET provides financial support to universities for applied research projects conducted in collaboration with local operational forecast offices. These projects promote the transfer of science to practice and serve the public well.

Internationally, in partnership with the NWS and the World Meteorological Organization, COMET is working to improve access to weather data and training by the global meteorological community.

Universities and Colleges Offering Degrees in Emergency Management

FEMA has an extensive listing of colleges, universities and other institutions offering various degrees and courses in emergency management, homeland security and other related fields. Here is the link: http://training.fema.gov/emiweb/edu/collegelist/

Online Resources

- **NOAA Education Resources**
  NOAA's many educational activities are distributed across the agency. These sites have been designed to help students, teachers, librarians and the general public access the many educational activities, publications and booklets that have been produced.

  NOAA Resources for Teachers and Students
  http://www.education.noaa.gov/
  NOAA Resources for Children
  http://www.education.noaa.gov/sweather.html
  NOAA Central Library- Journal Articles, Books, and Photos
  http://www.lib.noaa.gov/

- **NWS Education Resources**

  NWS Education/Outreach
  The following contain links to NOAA's web sites that contain information about weather education and outreach.
  http://www.weather.gov/education.php
  http://www.weather.gov/om/edures.shtml
  http://www.magazine.noaa.gov/stories/mag201.htm

NWS Publications
The Office of Climate, Water, and Weather Services produces outreach materials to increase the public's awareness of weather safety and emergency preparedness. Many publications are ONLY available online.
http://www.weather.gov/os/brochures.shtml

NWS Glossary
This glossary contains information on more than 2,000 terms, phrases and abbreviations used by the NWS. Many of these terms and abbreviations are used by NWS forecasters to communicate between each other and have been in use for many years and before many NWS products were directly available to the public. It is the purpose of this glossary to aid the general public in better understanding NWS products.
http://www.weather.gov/glossary

JETSTREAM – Online School for Weather
JetStream is an NWS Online Weather School. This site is designed to help educators, emergency managers or anyone interested in learning about weather and weather safety. The information contained in JetStream is arranged by subject; beginning with global and large scale weather patterns followed by lessons on air masses, wind patterns, cloud formations, thunderstorms, lightning, hail, damaging winds, tornadoes, tropical storms, cyclones and flooding. Interspersed in JetStream are "Learning Lessons" which can be used to enhance the educational experience.
http://www.srh.noaa.gov/srh/jetstream/

Local NWS web sites – Educational and Preparedness Information
Each local NWS office has additional educational and preparedness information on their web site. Go to the left hand menu of an office's web site and look for the links entitled "Education" or Preparedness." The "Top News of the Day" section and "Top News Archives" may also have educational information in specific stories. Many offices also have storm write-ups in the top news archives or in other sections of the site.

- **American Meteorological Society**
  The American Meteorological Society (AMS) has a membership of more than 14,000 professionals, scientists, professors and students. The society "promotes the development and dissemination of information and education on the atmospheric and related oceanic and hydrologic sciences and the advancement of their professional applications."
  http://www.ametsoc.org/amsedu

- **National Weather Association**
  The National Weather Association (NWA) is a nonprofit association that promotes excellence in operational meteorology and related activities since its inception in 1975.
  http://www.nwas.org

- **Department of Homeland Security**
  http://www.dhs.gov/index.shtm

Career and Job Resources

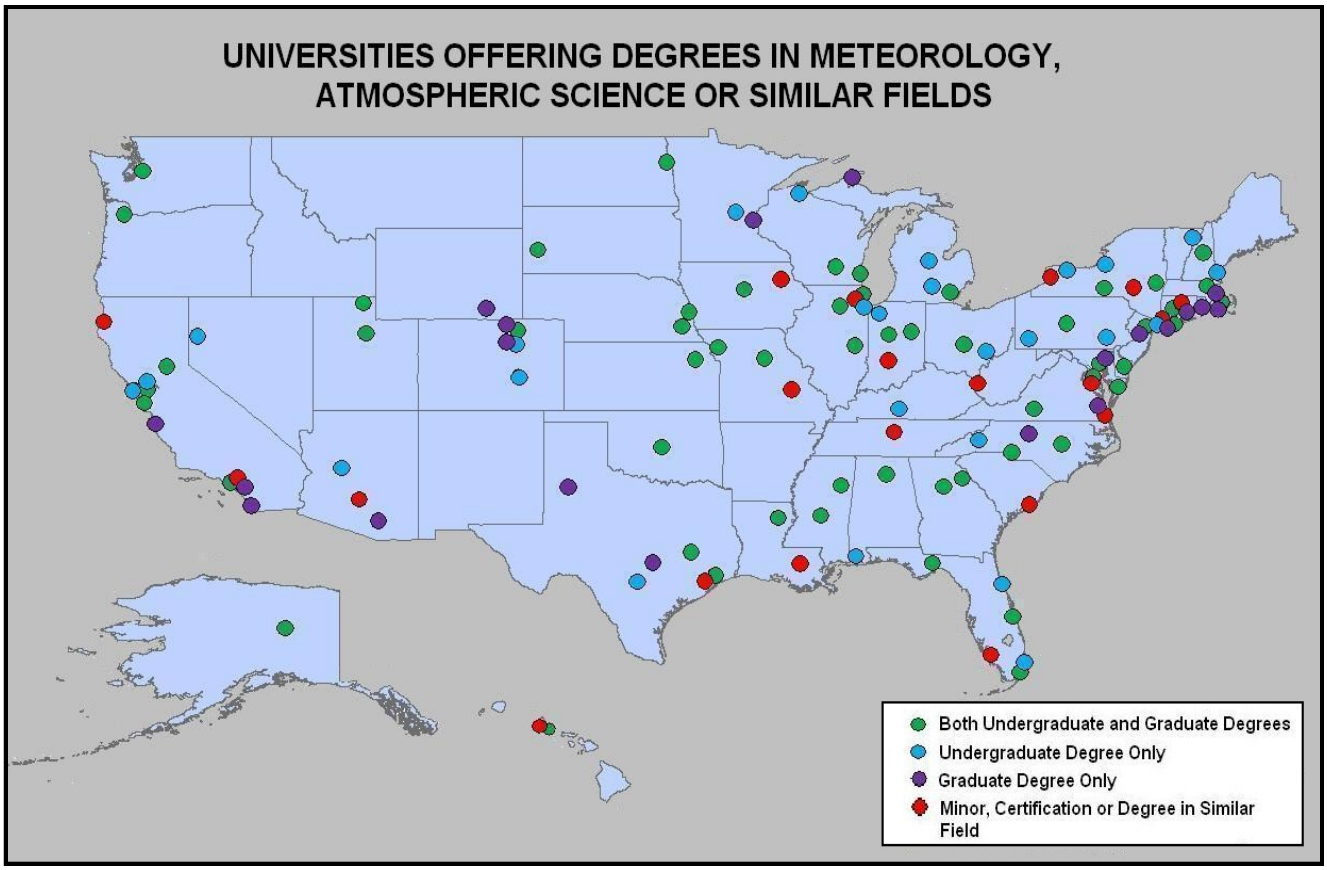
Careers

The Meteorologists and Hydrologists employed by the NWS have a bachelors or higher degree in:

- Meteorology,
- Atmospheric Science, or
- Hydrology (Physical Science or Engineering).

Meteorologist/Forecaster: A degree in **Meteorology**, **Atmospheric Science** or other natural science major that included at least 24 semester hours in meteorology/atmospheric science courses, 6 semester hours of physics, 3 semester hours of differential equations, and 9 semester hours of course work for a physical science major.

The NWS is this nation's largest employer of meteorologists. However, the NWS hires only about 50-75 new meteorologists annually, while universities graduate hundreds.



Hydrologist: For employment as a hydrologist the minimum is a degree in physical or natural science or engineering that included at least 30 semester hours in any combination of courses in hydrology, the physical sciences, geophysics, chemistry, engineering science, soils, mathematics, aquatic biology, atmospheric science, meteorology, geology, oceanography or the management or conservation of water resources. The course work must have included at least 6 semester hours in calculus (including both differential and integral calculus) and at least 6 semester hours in physics.

Because of the intensive requirements at the college level, one must generally have an interest in both math and science. Students interested in meteorology and hydrology should concentrate in the high levels of math, physics and chemistry.

NWS Student Educational Employment Programs: There are employment opportunities and services to consider that allow students to work part-time in the National Weather Service. The Student Educational Employment Program provides employment opportunities to students who are enrolled or accepted for enrollment as degree seeking students taking at least a half-time academic, technical, or vocational course load in an accredited high school, technical, vocational, 2 or 4-year college or university, graduate or professional school. More information can be found at http://www.nws.noaa.gov/eeo/studentresearchopportunities.php

Student Career Experience Program (SCEP)

This program offers valuable work experience directly related to the student's academic field of study. It provides formal periods of work and study while attending school. It requires a commitment by the student, school and the NWS. The SCEP position is a part-time, paid position with no guaranteed promotion. However, after successful completion of education and work requirements, students may be eligible for permanent employment as a meteorological intern when a vacancy becomes available. Having SCEP experience will make the student more competitive. The number of days and hours may vary from office to office, but normally the students work up to 8 hours per day during the week days of their summer vacation and over the semester break. They may also work a limited number of days during the semester, such as once per week. The actual day(s) of the week is negotiable. Contact your local NWS office for details.

Student Temporary Employment Program (STEP)

Job opportunities under this program offer temporary employment with no guaranteed promotion. Employment can range from summer jobs to positions that last as long as you are a student. The STEP position is a part-time, paid position. These employment opportunities need not be related to your academic field of study.

Student Volunteer

The NWS also offers unpaid training opportunities to students in high school and college. These opportunities provide work experience related to a student's academic program. The program allows students to explore career options as well as develop personal and professional skills. As a student volunteer, students will be exposed to the various missions and responsibilities of the NWS. The student volunteer appointment has an overall maximum time period of 180 days (roughly 6 months). The number of days and hours may vary from office to office, but normally the students work up to 8 hours on one to three days per week during their summer vacation. The actual day of the week is negotiable.

Career Resources

National Weather Service Career Information
http://www.weather.gov/careers.php

National Severe Storm Laboratory FAQ on Meteorology Careers
http://www.nssl.noaa.gov/faq/faq_careers.php

NOAA Education for Students
http://www.education.noaa.gov/students.html

National Weather Service School and Student Information
http://www.srh.noaa.gov/jetstream/nws/careers.htm

NOAA Careers
http://www.careers.noaa.gov/

Weather Careers
http://www.srh.noaa.gov/jetstream/nws/careers.htm

United Corporation for Atmospheric Research Career Opportunities
http://www.fin.ucar.edu/hr/careers/

State Climatology Offices in the United States
http://www.stateclimate.org/

NOAA Regional Climate Centers
http://www.ncdc.noaa.gov/oa/climate/regionalclimatecenters.html

NOAA Weather Education Resources
http://www.weather.gov/om/edures.shtml

National Severe Storm Laboratory's Listing of Meteorology Degree Programs
http://www.nssl.noaa.gov/faq/schools.html

NOAA's Education Opportunities for Students
http://www.magazine.noaa.gov/stories/mag201.htm

All Federal Employment

USAJOBS is the official job site of the U.S. Federal Government. The site is a one-stop source for Federal jobs and employment information.
http://usajobs.gov/

Department of Labor Job Outlook for Atmospheric Scientists

The Department of Labor's Bureau of Labor Statistics provides an occupational outlook handbook with information on different types of jobs. The Handbook gives information on the training and education needed, earnings, expected job prospects, what workers do on the job and working conditions.
http://www.bls.gov/oco/ocos051.htm